



Plate 11. R11/1795. Face of scoria stone wall which runs along the edge of foreshore (previously identified by Packington-Hall).





Plate 12. R11/1795. Wharf piles in intertidal zone (previously identified by Packington-Hall).



Plate 13. R11/1795. Structural rubble scattered along the foreshore at the western edge of the Duder Brickworks .





Plate 14. Concrete footings half buried in the foreshore below R11/1795.



Plate 15. R11/1795. Brick rubble (part of a structure?) and iron cases scattered on the edge of the foreshore.





Plate 16. R11/1795. Concrete machine mount amongst the structural rubble in the vicinity of the Duder Brickworks.

### 6.3 Summary of Results

In summary, the brickworks site appears to be divided into two distinct areas. The upper part of the site which housed the primary 1890s buildings and kilns, was extensively modified with the demolition of the brickwork buildings, and the construction and demolition of the naval housing facility that subsequently occupied the site. Packington-Hall's 1992 resistivity survey of this part of the brickworks suggests that a fair amount of subsurface brick rubble, and less certainly, that possible subsurface portions of one or more of the kilns remains. However, given the amount of demolition associated with the destruction of the brickworks and subsequent erection and demolition of the Naval housing, it is likely that any potential remnant features associated with the brickworks located above the coastal escarpment will be limited to subsurface features associated with internal subfloor kiln components.

Below the coastal escarpment and adjacent to the foreshore of Ngataranga Bay was an ancillary area, which included a platform with at least one early kiln structure associated with brick manufacture during the 1870s, a wharf and an access road running from the wharf to Lake Road.

Currently, there is a surviving portion of the early 1870s kiln structure (the brick clamp), albeit covered by vegetation, as well as quantities of scattered demolition material from above the coastal escarpment. This lower platform does not appear to have been substantially modified since the closure of the brickworks in the 1930s. The lower walking track crosses the site and has merged with what is likely the original access road from the wharf to Lake Road. It is possible that there may be other structures amongst the vegetation on either side of the track as well as possible subsurface remains below the modern topsoil development. The rubble that litters the sides of the walkway may potentially indicate other structures associated with the brickworks.

West of the brickwork remains, along the lower walkway there is evidence for general prehistoric activity in the area in the form of midden scatters, however, no additional evidence of associated prehistoric settlement was identified within the glade.



## **7 ARCHAEOLOGICAL VALUES**

The following statements of archaeological values are made in regard to the criteria identified in Section 23 of the HPA. These criteria are considered as part of the assessment on the HPT archaeological authority application form.

### **7.1 Condition**

The condition of the shell deposits associated with R11/2181 identified during the field survey is extremely poor. These middens are remnant deposits that have been exposed along cuttings for the walkways or have eroded from upslope and have been damaged and scattered by ongoing foot traffic. It is unknown if other intact subsurface material exists.

The condition of the Duder Brickworks R11/1795 is also very poor. Rubble from the demolition of the 1890s buildings located above the coastal escarpment has been dumped down the face of the coastal escarpment and into the foreshore and there is no evidence of intact surface features associated with the 1890s buildings or kilns. Previous investigations suggest there may be intact subsurface remains located above the coastal escarpment, but these would be limited due to ongoing building and demolition throughout the 20th century. Below the main site, however, is a large terrace on which a number of other structures were located, including what appears to be a portion of brick clamp associated with the early brickworks (1870s), as well as a seawall, wharf and access road. These features are largely intact and in reasonably good condition.

### **7.2 Rarity**

Discrete, small, shell midden exposures are relatively common features along the coastal margins of Auckland. Although lacking rarity value in themselves, the sites are indicative of wider prehistoric activity in the region.

The Duder Brickworks (R11/1795) was one of sixty brickworks that operated in the Auckland area in the 19<sup>th</sup> to early 20<sup>th</sup> centuries (Eaves 1990:9). The main buildings of the brickworks dated to the 1890s, although the surviving clamp is an example of an earlier manual brick making process dating to the 1870s. The majority of brickworks in Auckland operated from the 1860s to the 1900s. Although industrial sites from this period are relatively common, few sites have been archaeological investigated in any detail and most have been completely destroyed or covered over in concrete. The Duder Brickworks were demolished in the 1930s-1950s but intact surface features and potential subsurface features still remain relatively undisturbed. These remaining site features, while not unique are rare to some extent.

### **7.3 Contextual Value**

The Duder Brickworks is associated with the development of the heavy clay industry in Auckland. The history of the site spans the change in technological process from manual brick-making to mechanisation, including the introduction of steam and later electrical power.

### **7.4 Information Potential**

Despite the large numbers of brickworks, comparatively few have been archaeological investigated in any detail (e.g., Pollen Brickworks – Best 1986, Best & Clough 1988; Burke Brickworks – Best & Clough 1998; Auckland Brick & Tile Company – Best & Clough 2000; R. O. Clarke – Clough et al 2008). Packington-Hall's 1992 report collates a large amount of information on the history of the Duder Brickworks, but no archaeological excavations have been carried out to ground truth his



resistivity results or further investigate the lower platform where there is clear evidence for early brick manufacture (i.e. the clamp).

Investigation of the brickworks has the potential to provide further information on the technological processes that were carried out and the development of the site.

## **7.5 Amenity Value**

The Duder Brickwork site has high amenity value as it is located along a public walkway in the Mary Barrett Glade. There is potential to rehabilitate the site and provide interpretation panels along the walkways. The middens are remnant features and are located in the area of the Mary Barrett Glade that will be closed to public access. These remnant deposits have little amenity value.

## **7.6 Cultural Associations**

The middens are assumed to be associated with Ngati Paoa occupation of Duder's Point. The Duder Brickworks is associated with late 19<sup>th</sup> century European settlement industry and development of the Devonport area.

# **8 ASSESSMENT OF EFFECTS:**

## **8.1 Proposed Works**

As part of the Initial Feasibility Report for the Mary Barrett Glade Track Upgrade (Snowsill 2010), it was determined that upgrading the entirety of the tracks to the required safety standards was an extensive and costly undertaking; requiring the construction of retaining walls, replacement bridges, benched steps, vegetation removal, track formation, the installation of guardrails along the much of the existing walkways and modifications to a number of stormwater pipes that run down the escarpment and construction of a boardwalk along the foreshore. As a result, it was determined that the remedial works would only be undertaken of a limited portion of the lower walkway from the Lake Road entrance to the location of the Duder Brickworks. The earthworks associated with this proposal are limited and include minor grading of the existing walkway, vegetation clearance and installation of post and rail gates at either end of the walkway section. Schematics showing the area of the proposed walkway remedial works are illustrated in Figures 7-9.

### **8.1.1 Earthworks associated with walking track remediation**

The vegetation management proposed as part of the remedial works will be limited to minor clearance of loose vegetation and mulch without ground disturbance. The remediated walking track will be predominantly built up with gravel aggregates with timber edging. These edgings will be held in place by steel reinforcing bars on the outside edge. In any areas of soft ground, a geotextile barrier cloth will be laid prior to placement of new gravel.

At the end of the track, a post and rail fence will be installed to provide a physical barrier and a fixed warning sign advising against further access as the remainder of the track is unsafe. This fence will require excavations for the fence posts to a depth of 75cm by 30cm wide.

As part of the remediation works, an existing modern culvert is to be repaired by North Shore City Council. This repair work will be undertaken by inserting a new PVC or similar pipe through the existing steel one and will not require excavation of the walking track.



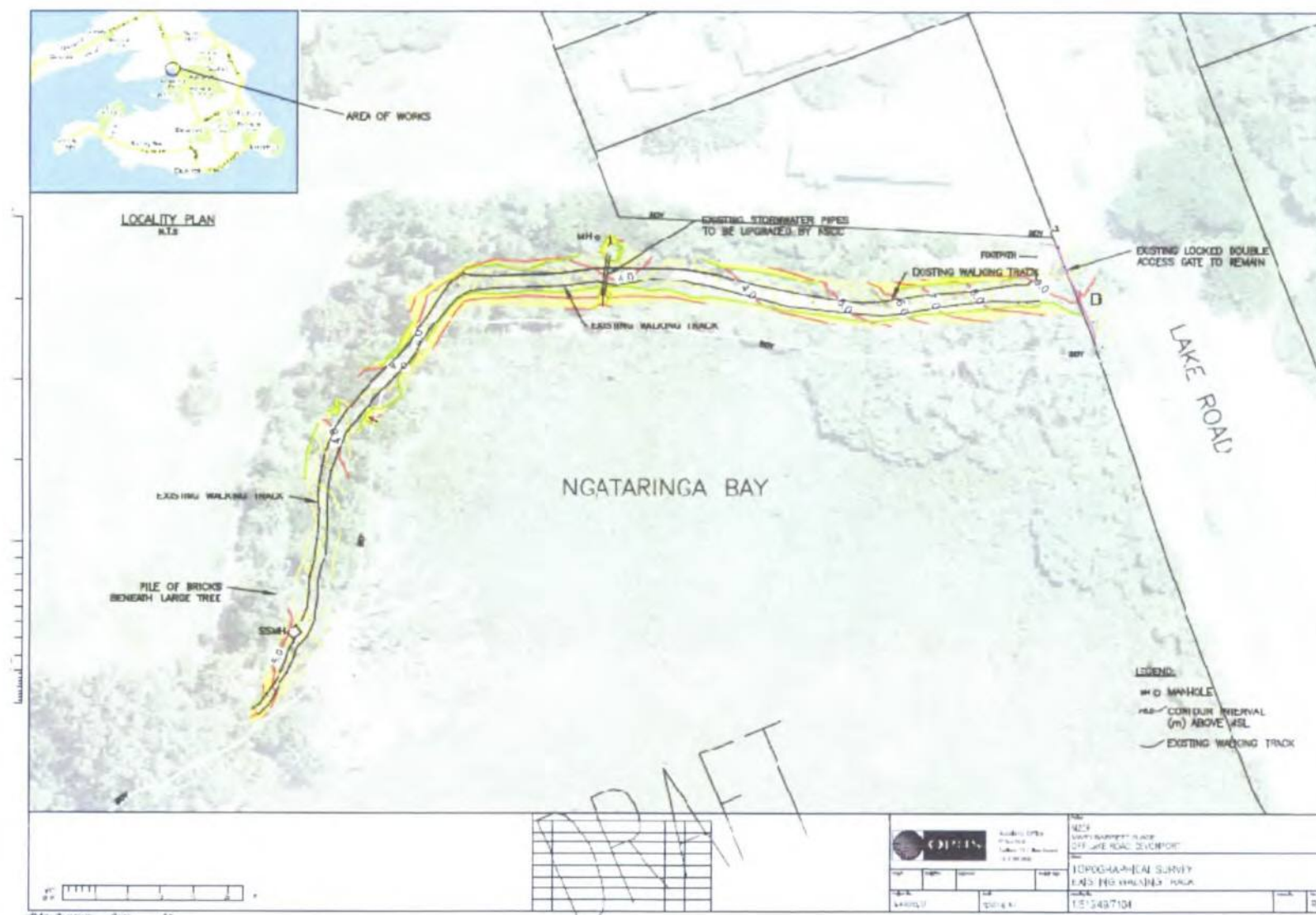
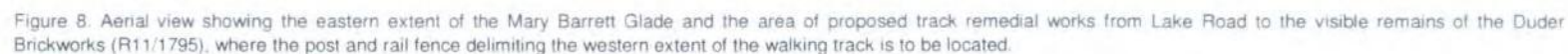


Figure 7. Aerial view showing the eastern extent of the Mary Barrett Glade and the area of proposed track remedial works from Lake Road to the visible remains of the Duder Brickworks (R11/1795) located on the coastal foreshore of Ngatarunga Bay.





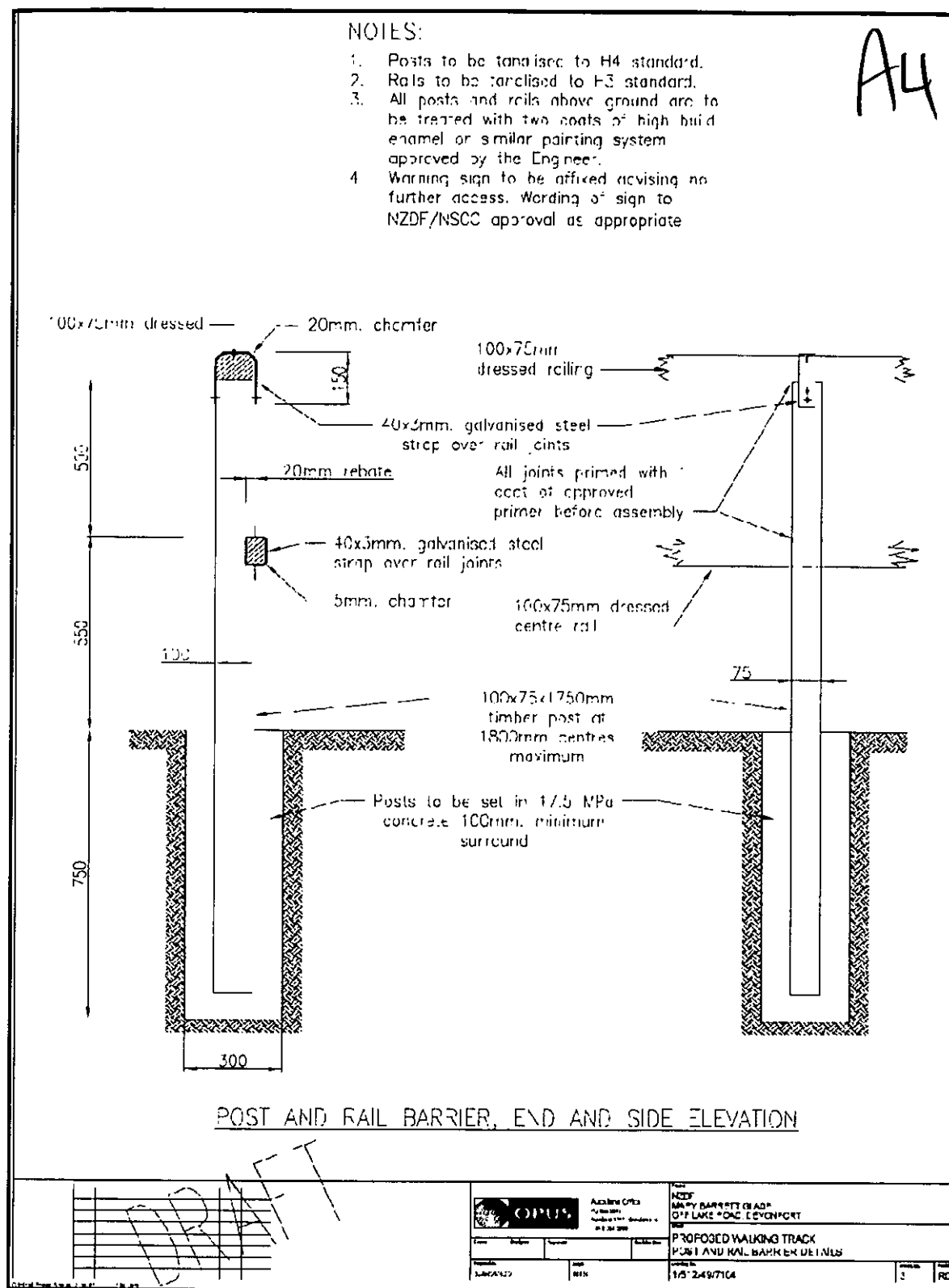


Figure 9. Schematic illustrating detail of the post and rail barrier fence located in the vicinity of the remains of the Duder Brickworks (R11/1795), which will demarcate the western extent of the remediated walking track.



## **8.2 Effect of Proposed Works**

The Duder Brickworks is currently defined as a 100m long section of escarpment that extends from the grassed area along Wakakura Crescent down to the foreshore (see Fig. 5). This includes both the main area of the brickworks located above the escarpment (where it possible that remnant subsurface structures may still exist) and the large platform on the coastal bank below which leads to the old wharf. On and around the edges of this platform, there is one partially intact structural feature (i.e. a clamp) and structural rubble from the demolition of the main site in the 20<sup>th</sup> century. It is not clear what subsurface remains exist on this platform as no test pitting was undertaken. To the east of the main platform is a track leading to Lake Road, which forms the eastern extent of the current walkway. This track is almost certainly an original road associated with the brickworks and as such, forms part of the 19<sup>th</sup> century Duder Brickworks.

Any earthworks within the surrounds of the Duder Brickworks site have the potential to disturb unrecorded subsurface structures, particularly at the western extent of the proposed walking track remedial works. Similarly, there are also a number of small, scattered remnant midden exposures west of the brickworks and it is possible that there are other unrecorded midden deposits along the coastal escarpment. The proposed remedial earthworks are minor, but the potential exists, albeit remote, that project earthworks may disturb intact midden deposits in this area.

## **8.3 Mitigation of Effects**

The HPA protects all archaeological sites whether they are recorded or not recorded at all. Sites may not be damaged or destroyed unless an authority to modify an archaeological site has been issued by the NZHPT. An authority can be sought under Section 11 to modify a particular site or sites, or under Section 12 for all types of sites that may be present within a specified area.

There are two recorded archaeological sites within the Mary Barrett Glade covering both prehistoric activity (R11/2181) and remains of the Duder Brickworks (R11/1795). Although the proposed project earthworks are minimal, ground disturbance on the site of the brickworks along the lower coastal escarpment has the potential to impact on archaeological material. It is recommended that an archaeological authority should be sought for all project works under Section 11 of the HPA.

Consultation with the appropriate iwi representative will be required as the authority will include the potential of encountering prehistoric Maori material. It is recommended that this consultation is initiated immediately so as not to delay the Authority application.

The NZHPT will impose conditions for required mitigation work on any authority issued for the project. These requirements are influenced to a certain extent by the recommendations for mitigation provided in this report, but the NZHPT can, and does, impose the conditions it considers appropriate to the level of potential modification to archaeological material. These requirements will ultimately dictate what level of archaeological mitigation work the project archaeologist is work obligated to undertake on behalf of the applicant. It is likely that the NZHPT will require archaeological supervision of the project works ranging from continual monitoring of earthworks in the vicinity of the Duder Brickworks to incremental site inspections for short periods in other areas. Depending on what may be potentially uncovered, there may also be a requirement for minor archaeological excavation and recording as works proceed.

## **Other Considerations**

This is an assessment of effects on archaeological values and does not include an assessment of Maori values. Such assessments can only be made by the tangata whenua. It should be noted that archaeological survey techniques (based on visual inspection and minor sub-surface testing) cannot

necessarily identify all sub-surface archaeological features, or detect wahi tapu and other sites of traditional significance to Maori, especially where these have no physical remains.

## **9 RECOMMENDATIONS:**

The following recommendations are made:

1. That an authority is sought and obtained under Section 11 of the Historic Places Act 1993 to modify potential subsurface remains associated with archaeological site R11/1795 (the Duder Brickworks) as well as any unrecorded subsurface remains located within the coastal margins of the Ngataranga Bay that may be potentially affected by the proposed project. This is a legal requirement.
2. That any archaeological mitigation required by the New Zealand Historic Places under an Authority granted in relation to the proposed remedial earthworks in the Mary Barrett Glade is carried out by a suitably qualified archaeologist.
3. That all intact structures associated with the Duder Brickworks (i.e. wharf, stone wall, brick clamp, should be avoided completely.
4. That strict provision is made in any Authority granted by the New Zealand Historic Places Trust for the ongoing protection of the remaining archaeological features within the Mary Barrett Glade, particularly as it relates to ongoing vegetation management of the coastal reserve.
5. An Authority should be sought immediately to avoid delays during construction. It should be noted that about 3 months should be allowed for the processing of authorities, which includes a statutory stand down period of 15 working days before an authority can be exercised).
6. Consultation with Ngati Paoa should begin immediately in order to complete the authority application.

## **10 REFERENCES:**

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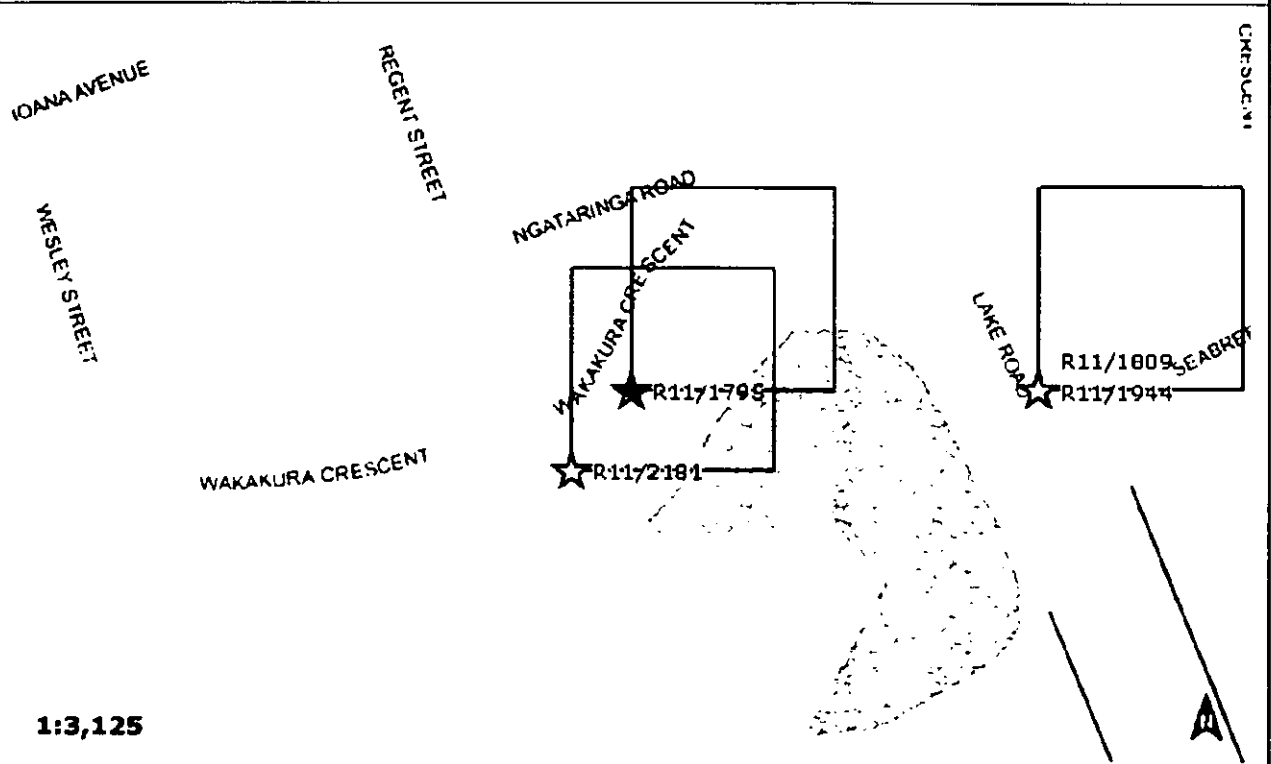
## **Appendix 1**

### **NZAA Site Record Forms**



Duder Brickworks Archaeological Assessment

NEW ZEALAND ARCHAEOLOGICAL ASSOCIATION

 <div>Site Record Form</div>	<div>NZAA SITE NUMBER: R11/1795</div> <div>SITE TYPE: Industrial</div> <div>SITE NAME(s):</div> <div>DATE RECORDED:</div>
<div>SITE COORDINATES (NZTM) Easting: 1759857      Northing: 5923907      Source: CINZAS</div>	
<div>IMPERIAL SITE NUMBER:      METRIC SITE NUMBER: R11/1795</div>	
<div></div>	
<div>Finding aids to the location of the site</div>	
<div>Brief description</div> <div>BRICKWORKS</div>	
<div>Recorded features</div> <div>Brickworks</div>	
<div>Other sites associated with this site</div>	

Duder Brickworks Archaeological Assessment

<b>NEW ZEALAND ARCHAEOLOGICAL ASSOCIATION</b> <b>SITE RECORD FORM (METRIC)</b> Metric map number: R11 Metric map name: Auckland Metric map edition: 1		NZAA METRIC SITE NUMBER: R11/1795 DATE VISITED: 1992 SITE TYPE: Historic Brickworks SITE NAME: MAORI: OTHER: R&R Duder											
Grid Reference Easting <span style="border: 1px solid black; padding: 2px;">2670300</span> Northing <span style="border: 1px solid black; padding: 2px;">6485600</span>													
1. Aids to relocation of site (attach a sketch map): Ngataranga Bay, Devonport. Refer: A J Packington-Hall <u>Intensive Survey of the Historic R &amp; R Duder Brickworks in Devonport, Auckland, Auckland University 1992 - App.B Map D2, Sect.3 P.6</u>													
2. State of site and possible future damage:  Well protected by established and well maintained grass cover, some erosion of shoreline back. Little likelihood of substantial damage from human activity.													
3. Description of site (Supply full details, history, local environment, references, sketches, etc. If extra sheets are attached, include a summary here):  Refer:  A J Packington-Hall <u>Intensive survey of the Historic R &amp; R Duder Brickworks in Devonport, Auckland, Auckland University 1992.</u>  Section 3: Site description and surface features, p.6 Section 6: Sequence of construction, development, and demolition of the R & R Duder Brickworks, p.18 Section 8: References  Copy of reference in NZAA Reprint file													
4. Owner: Royal NZ Navy Address: HMNZ Dockyard Devonport AUCKLAND		Tenant/Manager:  Address:											
5. Nature of information (hearsay, brief or extended visit, etc.): Intensive Field Survey Photographs (ref. numbers): AJ Packington-Hall, <u>Intensive Survey of the Historic R &amp; R Duder Brickworks, Sect. 8, p.23</u> Aerial photographs (reference numbers, and clarity of site): AJ Packington-Hall <u>Intensive Survey of the Historic R &amp; R Duder Brickworks, Sect. 8, P.23.</u>													
6. Reported by: A J Packington-Hall Address: 16 Pierre Rd Milford AUCKLAND		Filekeeper: Date: 15 SEP 1993											
7. New Zealand Historic Places Trust (for office use)													
<table border="1" style="border-collapse: collapse; width: 100%;"> <tr> <td style="text-align: center; width: 50px;">20</td> <td>Type of site</td> </tr> <tr> <td style="text-align: center;">- -</td> <td>Local environment today</td> </tr> <tr> <td style="text-align: center;">AA</td> <td>Land classification</td> </tr> </table>		20	Type of site	- -	Local environment today	AA	Land classification	<table border="1" style="border-collapse: collapse; width: 100%;"> <tr> <td style="text-align: center; width: 50px;">38</td> <td>present condition and future danger of destruction</td> </tr> <tr> <td style="text-align: center;">ML</td> <td>Local body</td> </tr> </table>		38	present condition and future danger of destruction	ML	Local body
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Duder Brickworks Archaeological Assessment

NEW ZEALAND ARCHAEOLOGICAL ASSOCIATION <b>SITE RECORD FORM</b>		NZAA NZMS1 SITE NUMBER <u>211/1795</u> DATE VISITED <u>1992 &amp; JUN. 1996</u> SITE TYPE <u>HISTORIC BRICKWORKS</u> SITE NAME: <del>XXXXXX</del> <u>R.R. DUDER</u> <u>OTHER BRICKWORKS</u>																																																	
Grid Reference      Easting <u>703</u> Northing <u>856</u>																																																			
1. Aids to relocation of site (attach a sketch map) Located in Devonport Ward of North Shore City: north shoreline of Wharfedale Bay; site boundaries = Wharfedale Rd. in north, Wharfedale Bay shoreline in south, west boundaries of properties facing Lake Rd. Continued on attached/separate sheet .....																																																			
2. State of site and possible future damage 1) Part of site on shoreline reserve recently replanted with native trees and protected by reserve status Continued on attached/separate sheet .....																																																			
3. Description of site (Supply full details, history, local environment, references, sketches, etc. If extra sheets are attached, include a summary here) Brickworks from c 1875 to c 1935; used brickmaking technology ranging from handmade bricks fired in clamps (ie. c 1875 to 1900) to machine made, wire cut, bricks fired in rectangular and beehive downdraft kilns (ie. 1900 to c 1935). Archaeological features remaining: 1) Reef remains (c 1900) 2) Drystone retaining wall at shoreline (c 1900) 3) Brick, etc. dunnos along steep shoreline scarp immediately north of shoreline reserve 4) Scatter machine parts, bricks, etc along shoreline 5) Extensive domestic dump at eastern end of shoreline reserve including bottles dating 1870's/1912 to 1920's Continued on attached/separate sheet .....																																																			
4. Owner Royal N.Z. Navy Address Devonport North Shore City Council Takapuna		<del>XXXXXX</del> Manager Royal N.Z. Navy Address Property Dept., Devonport North Shore City Council, Parks Dept., Takapuna																																																	
5. Nature of information (hearsay, brief or extended visit, etc.) Intensive survey 1992; revisited Jun. 1996 Photographs (reference numbers, and where they are held) A.J. Packington-Hall, 31a Greendale Spur, Glenfield, North Shore City, Auckland. Aerial photographs (reference numbers, and clarity of site) Air Logistics Ltd. (Whites Aviation), Browns Bay; Ref. 242009, 10/4/52: site clearly visible																																																			
6. Reported by A.J. Packington-Hall Address 31a Greendale Spur, Glenfield, North Shore City, Auckland. Ph: 443 4706		Filekeeper Date																																																	
7. Key words <u>BRICKWORKS</u>																																																			
8. New Zealand Register of Archaeological Sites (for office use) NZHPT Site Field Code																																																			
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Duder Brickworks Archaeological Assessment

N.Z.A.A. Site No.: .....

R.A.P. DUDER BRICKWORKS: DEVENPORT

(N.Z.A.A. Site Record Form Continued .....

Sect.1 Aids to Relocation;

in east, Wesley Rd. in west: part of site on land owned by Royal N.Z. Navy (ie. Wakakura Cr.), part on public reserve along Ngataranga Bay shoreline; part of site on public shoreline reserve marked by "Historic Site" sign


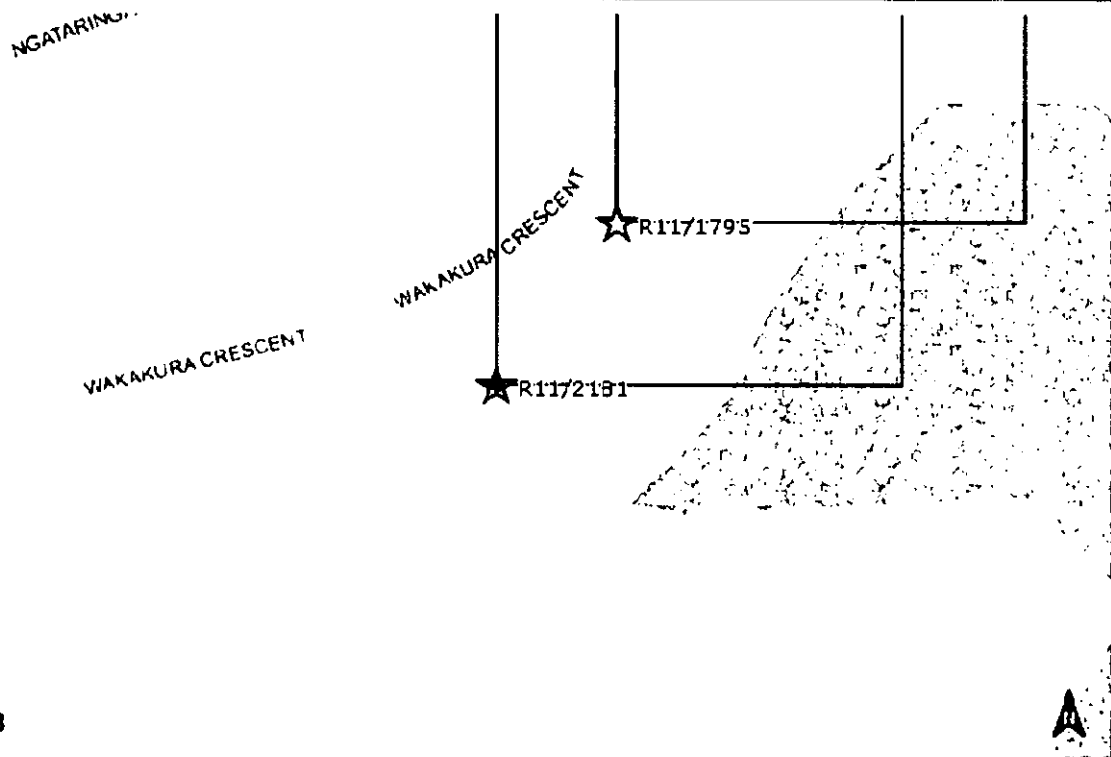
Sect.2 State of Site and Possible Future Damage;

- 2) part of site between steep shoreline bank immediately north of shoreline reserve and Ngataranga Rd. owned by Royal N.Z. Navy (ie. Wakakura Cr.) under well maintained grass cover, accommodation buildings, roads, etc.: site has potential to contain/custodian in the future; remains are well protected as long as Royal N.Z. Navy maintains ownership.

Sect.3 Description of Site;

- 6) Brick structure under large Tawitukua tree on large shoreline terrace; Poss. remains of a brick clamp; custodian reports that an arch was still visible in this structure some years ago; bricks from which structure composed stacked, not mortared
- 7) Sub-surface remains of rectangular floor (raft tile (ie. constructed 1990) a short distance north of steep shoreline bank 1 m off shore north of shoreline reserve.
- 8) Various earthworks associated with brickworks;
  - a. shoreline terrace and road leading to it from Lake Rd.
  - b. terraces remaining from brickworks claypits to south of Ngataranga Pt. (Refer attached "Research Project 1992" report.)

Duder Brickworks Archaeological Assessment

 <p><b>ARCHSITE</b> archaeological site recording scheme</p>	<p><b>Site Record Form</b></p>	<p><b>NZAA SITE NUMBER:</b> R11/2181</p>
		<p><b>SITE TYPE:</b> Midden/Oven</p>
		<p><b>SITE NAME(s):</b></p>
		<p><b>DATE RECORDED:</b></p>
<p><b>SITE COORDINATES (NZTM)</b> Easting: 1759827      Northing: 5923867      Source: CINZAS</p>		
<p><b>IMPERIAL SITE NUMBER:</b>      <b>METRIC SITE NUMBER:</b> R11/2181</p>		
 <p><b>1:1,563</b></p>		
<p><b>Finding aids to the location of the site</b></p>		
<p><b>Brief description</b> MIDDENS</p>		
<p><b>Recorded features</b> Midden</p>		
<p><b>Other sites associated with this site</b></p>		



Duder Brickworks Archaeological Assessment

<b>NEW ZEALAND ARCHAEOLOGICAL ASSOCIATION</b> <b>SITE RECORD FORM (NZMS 260)</b> Map number _____ Map name Auckland _____ Map edition _____		NZAA METRIC SITE NUMBER <b>R11/1795</b> DATE VISITED <b>11/2001</b> SITE TYPE <b>Brickworks / Derelict</b> SITE NAME: MAORI <b>Middens within</b> <b>R&amp;R Duder Brickworks</b>													
Grid Reference	Easting	Northing													
1. Aids to relocation <i>attach a sketch map</i> . <b>See Packerston Halls Survey map (attached)</b> <b>with amendments</b>															
2. State of site and possible future damage: <b>On a walking track, or near to it</b> <b>in the Mary Barrett Glade</b>															
3. Description of site <i>(supply full details, history, local environment, references, sketches, etc. If extra sheets are attached include a summary here)</i> :															
4. Owner	Address	Tenant/Manager	Address												
<b>Unknown, but most probably</b> <b>The North Shore City Council</b>															
5. Nature of information <i>(hearsay, brief or extended visit, etc)</i> : Photographs <i>(reference numbers)</i> : Aerial photographs <i>(reference numbers and clarity of site)</i> :															
<b>See photos attached to this</b> <b>report</b>															
6. Reported by	Address	Filekeeper	Date												
<b>David Kardner</b> <b>8 Kea St. Meadowbank</b> <b>Auckland. 5211439</b>		<b>Garry Law</b> <b>03 SEP 2003</b>													
7. Keywords: <b>Middens, Iron Plough, in R&amp;R Duder Brickworks site - Mary Barrett</b> <b>Glade</b>															
8. New Zealand Register of Archaeological Sites <i>(for office use)</i> NZHPT Site Field Code															
Latitude S		Longitude E													
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<table border="1" style="display: inline-table; width: 40px; height: 20px;"> <tr><td> </td><td> </td></tr> <tr><td> </td><td> </td></tr> <tr><td> </td><td> </td></tr> </table>							Local Environment today	<table border="1" style="display: inline-table; width: 40px; height: 20px;"> <tr><td> </td><td> </td></tr> <tr><td> </td><td> </td></tr> <tr><td> </td><td> </td></tr> </table>							Security code
<table border="1" style="display: inline-table; width: 40px; height: 20px;"> <tr><td> </td><td> </td></tr> <tr><td> </td><td> </td></tr> <tr><td> </td><td> </td></tr> </table>							Land Classification	<table border="1" style="display: inline-table; width: 40px; height: 20px;"> <tr><td> </td><td> </td></tr> <tr><td> </td><td> </td></tr> <tr><td> </td><td> </td></tr> </table>							Local body

Duder Brickworks Archaeological Assessment

Page 1 of 3

NEW ZEALAND ARCHAEOLOGICAL ASSOCIATION  
**SITE RECORD FORM (NZMS 260)**

Map number *White Aviation Photo 30475 2/10/59*  
 Map name *Auckland DOST 1 Deposit Plan 20927 19/9/27*  
 Map edition *See Packington Hqd. Report 72*

NZAA METRIC SITE NUMBER *R11/2181*  
 DATE VISITED *2/11/2007 (2001) XX*  
 SITE TYPE  
 SITE NAME: MAORI - *Middens (small) N42*  
 OTHER - *R&R Duder Brickworks*

Grid Reference Easting *2 2670268 ± 6m* Northing *2 6485557 ± 6m*  
*1 2670283 ± 9m* *1 6485559 ± 9m*

1. Aids to relocation attach a sketch map:  
*See accompanying map. - A.T. Packington Hqd. 15/7/92. With amended details D.F. Gardner. 2/11/2007.*

2. State of site and possible future damage:  
*This seaward site - now known as the Mary Barrett Glade. All (both middens, small & fragmentary, rubble - a pipi) eroding out of terrace. v. Shrub sided vegetation underneath. Both middens degrading possibly by or from rain run-off.*

3. Description of site (supply full details, history, local environment, references, sketches, etc. If extra sheets are attached include a summary here): *R&R Duder Historic Brickworks.*

4. Owner *North Shore Council?* Tenant/Manager  
 Address *ARC?* Address

5. Nature of information (hearsay, brief or extended visit, etc)  
 Photographs (reference numbers) *See accompanying 8/white photos of middens*  
 Aerial photographs (reference numbers and clarity of site): *1 & 2.*

6. Reported by *David F. Gardner* Filekeeper *Andy Dood*  
 Address *44. Crossfield Rd.* Date *24/06/2003*  
*Glendowie.*

7. Keywords:  
*Midden Midden, Brickwork site (Historic) degradation, erosion.*

8. New Zealand Register of Archaeological Sites (for office use)  
 NZHPT Site Field Code

Latitude S		Longitude E	
<i>4</i>	<i>A</i>	<i>B</i>	<i>B</i>
Type of site		Present condition and future danger of destruction	
Local Environment today		Security code	
Land Classification		Local body	

GPS: *[Garmin 12XL Series 2. Programme 2000.]*

*[Signature]*

**Appendix 2**  
**Report on R11/1795 Duder's Brickworks**  
(Prepared by T. Packington –Hall 1992)



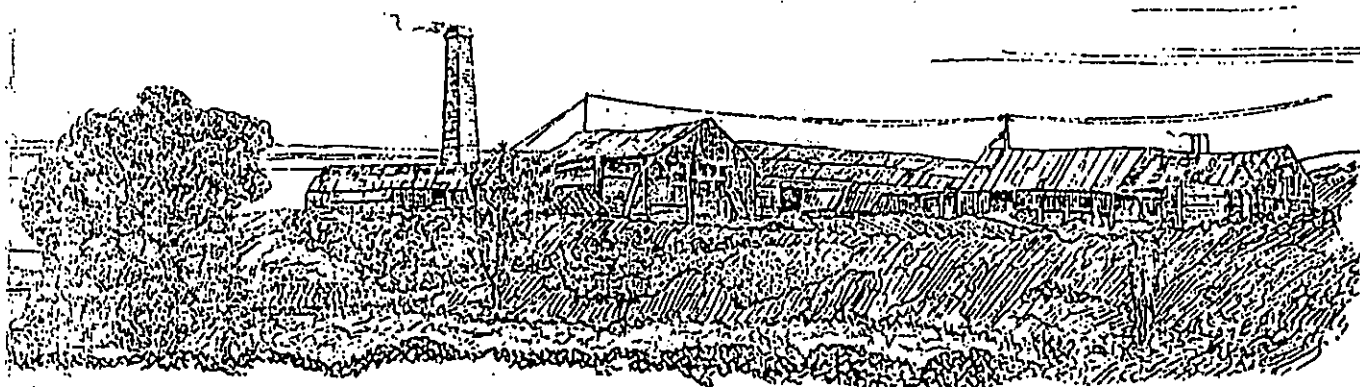
UNIVERSITY OF AUCKLAND

ANTHROPOLOGY - APPROACHES TO ARCHAEOLOGICAL SCIENCE - 03.342

RESEARCH PROJECT 1992

INTENSIVE SURVEY OF THE HISTORIC R. AND R. DUDER BRICKWORKS SITE  
IN DEVONPORT, AUCKLAND.

A.J. PACKINGTON-HALL (8970722)



The R. and R. Duder brickworks, Ngataringa Bay, from Lake Rd.  
(Titchener P. Apr. 1978 | Mar. 1979, P.11)



REFERENCE  
COPY ONLY

NORTH SHORE LIBRARIES

<sup>1</sup>  
DEVONPORT PUBLIC LIBRARY

UNIVERSITY OF AUCKLAND

ANTHROPOLOGY - APPROACHES TO ARCHAEOLOGICAL SCIENCE - 03.342

RESEARCH PROJECT 1992

INTENSIVE SURVEY OF THE HISTORIC R. AND R. DUDER BRICKWORKS IN  
DEVONPORT, AUCKLAND.

A.J. PACKINGTON-HALL (8970722)

## 1. INTRODUCTION

This survey has been undertaken as a research project for the 'Approaches to Archaeological Science' (03.342) paper at Auckland University in 1992.

The broad intention of this paper is to practically demonstrate the role of scientific methods of data collection, such as photogrammetric mapping and soil resistivity surveying, in an intensive survey of a historic archaeological site. The more specific objectives being to combine information derived from various sources as a base from which the sequence of construction, technological development, and demolition of the R. and R. Duder brickworks can be inferred. A further objective being to provide a comprehensive record of surface and sub-surface remains associated with the R. and R. Duder brickworks.

This paper is divided into a number of broad sections describing the methods used to collect the information, description of the information collected, and, the interpretation of the information in the form of a sequence of construction, development, and demolition. The comprehensive appendices included in this paper contain more detailed and illustrative material.

## 2. METHODOLOGY

### 1) Documentary evidence, historic maps, and photographs:

The following sources have been searched for references to the R.

and R. Duder brickworks:

- a. Institute and Museum Library: document, map, and photographic collections
- b. Auckland Public Library: document, map, and photographic collections.
- c. Takapuna Public Library: local history, map, and photographic collections.
- d. Devonport Public Library: local history, map, and photographic collections.
- e. Department of Land and Survey Information, Auckland: historic maps.
- f. Lands and Deeds Office, Auckland: historic maps and deeds.
- g. Jack Diamond Research Collection: documents, books, and photographs.
- h. M. Philson Research Collection: documents, photographs, and artefactual material associated with the Duder family.
- i. Devonport Borough Council: historic maps and aerial photographs.
- j. National Archives, Auckland: N.Z. Insurance Coy. file, and Defence Department correspondence.
- k. Various books and publications related to the general history of the heavy clay industry, and the R. and R. Duder brickworks in particular. These sources are listed in Section 8. 'References'.

ii) Surface collection of artefactual materials:

A systematic surface collection was conducted as part of this survey, the objectives being to obtain an indication of artefact distributions and establish a comparative collection of artefactual materials from the site. The area examined was on the seaward side of the present boundary fence, as the large quantity of artefactual material eroding from steep banks enabled the collection of samples without disturbing the sub-surface relationships. This area was divided into squares and a rough count of artefact types in situ was made for each square. Where a sample was removed from the site its position was accurately recorded on a map, by triangulating its position with two fixed features also shown on the map. A clinometer, measuring tape, and sighting compass were used to determine these triangulations. All samples taken from the site have subsequently been classified and catalogued.



Although this surface collection and artefact count has not revealed any detailed information, some general trends in artefact distribution did emerge from the subsequent analysis. These general trends have been summarised in Section 3. 'Site Description and Surface Features'.

(Refer Appendix B, Map D2)

iii) Alidade and plain table survey:

This survey was conducted using a Kern telescopic alidade and plain table.

The radiation method was used, with the plain table being set up roughly in the middle of the area to be mapped. Each detail was sighted and its distance determined using a measuring tape. The range of observations was extended by using a number of stations, the position of each station being determined from the previous station.

The data from this survey defined the land contours shown on Map D2 in Appendix B.

iv) Soil resistivity sub-surface survey:

A soil resistivity survey was conducted to achieve the following objectives:

- a. Determine the positions of structural foundations associated with the R. and R. Duder brickworks.
- b. Map the kiln flues as an aid to the identification of the kiln types constructed at the R. and R. Duder brickworks.

A Marti<sup>cl</sup>Clark soil resistivity meter, and a Wenner quadripole array with a probe spacing of 1.0m was used to obtain the resistivity measurements. On this basis the maximum depth below the surface from which resistivity measurements were obtained approximates 1.5m.

The reference measuring tape was laid out parallel to the wall of a building on the site, and a further measuring tape was laid out at ninety degrees to the reference tape for placement of the quadripole probes at the desired spacings. The quadripole array was

advanced by one probe spacing along the measuring tape using the 'leap-frog' method, and when one traverse had been completed in this way the measuring tape was moved 1.0m along the reference tape. This procedure was repeated until the entire survey frame had been completed. The magnetic bearing of the reference tape was observed using a sighting compass, and recorded. Each resistivity measurement was noted to scale on a field sheet.

The data contained in the field sheets was used to computer generate maps of average resistivity contours using the Rockware GRIDZO 6 program.

The information provided by this soil resistivity survey is discussed in Section 5. 'Soil Resistivity Sub-Surface Survey'.

v) Photogrametric mapping:

Present R.N.Z.N. residential structures and a tarseal road (ie. Wakakura Crs.) were transferred on to Map D2 in Appendix B from aerial photographs.

The method used to transfer the positions and dimensions of these structures from the aerial photographs to Map D2 required three operations:

- a. Establishing control on the ground by measuring the dimensions of the structures and their geometrical relationships to fixed points on the ground which were visible in the photographs.
- b. Determination of the relative orientation of the photographs to each other, and their absolute orientation to the ground control.
- c. Plotting the positions of the structures on to the map from the photographs.

Radial triangulations were determined in which the aerial photographs were used to provide their own control, this network of photogrametric control points were then adjusted within the ground controls. The principle points in both photographs of the stereo pair were thus determined, adjusted to the scale and projection of the map.

As only one stereo pair covered the whole site at a moderate scale, the angle of tilt was calculated as not exceeding three degrees, and the surface relief was less than ten percent of the flying height,

this graphical method is considered adequate.

(Sandover J.A. 1967,P.255|310)

vi) Classification of heavy clay products:

The classification of heavy clay products used in this paper is that advocated by J.T. Diamond. The only modification of Mr. Diamond's classification method as used in this paper is that colours of ceramic products are described with reference to Munsell colour chart formulae. The essential features of this classification are as follows:

Brick Shape, type or variety (eg. soap, split, coping, perforated, airbrick, etc.), pipe or tile.

- Method of Manufacture:

a. Hand Molded;

- slop molded with shiny sides
- sand molded with impressions of the sand on the surface of the brick. However, sand can also be sprinkled on drying bricks in hacks.
- Combination of slop and sand molding.
- Stock sand molded, with an impressed brand and motif.

b. Wirecut or extruded.

c. Pressed

d. Lightweight, with a different clay composition to common brick.

e. Firebrick, with a different clay composition to common brick.

- Manufactory Impressions:

These are the result of either the technology used or the behaviour of the people employed in the manufacturing process. They include the following:



- a. Brand name.
- b. Wrecuts, which can be horizontal or arced.
- c. Screw marks, which can be in line or opposite. Also note measurements.
- d. Frog marks, note the design as well as the shape of the corners, and measurements.
- e. Hack marks.
- f. Any thumb, nail, and pipe impressions. Also note the crown arrow if this appears on the brick.

- External Appearance:

This covers all observable characteristics not already mentioned, as follows:

- a. Size (length x breadth x thickness). It should also be indicated whether the unit is a brickbat or piece, and any other evident damage.
- b. Weight in grams.
- c. Colour, developed from a Munsell colour chart.
- d. Glazed or unglazed, which reflects the intended use of the finished product.
- e. Surface features, which includes features such as extra sand which may have been sprinkled on during air drying, vitrified material, unburned portions of the unit. These could have occurred during firing and give indications of the kiln type, or the position of the unit in the kiln during firing.
- f. Condition of the unit. The surface condition of the unit could provide information about the clay or the firing. A very friable brick could be underfired or made from poorly mixed clay, a very hard brick could be the opposite.

- Body of the Mix (Internal Appearance):

Observations regarding the materials used, which could indicate the technology used during manufacture.

3. SITE DESCRIPTION AND SURFACE FEATURES.

The site on which the R. and R. Duder brickworks was formerly situated is in the Devonport Ward of North Shore City. The sites eastern boundary is defined by the rear of allotments facing Lake Rd., to the west by Wesley St., Ngataringa Rd. in the north, and

Ngataringa Bay to the south.

Steep banks occur along the shoreline, with a possibly artificial platform towards the eastern end of the site just above high water level. North of the boundary fence at the top of this bank the ground rises to a wide terrace which closely approximates the position of the former brickworks clay pit. To the north of this wide terrace the ground rises again to Ngataringa Rd. The area north of the boundary fence is presently occupied by blocks of residential units for the accomodation of Naval personnel, ancillary structures, a tarseal road (ie. Wakakura Crs.), and a tarseal car park. The area not so occupied is under well maintained and established grass cover.

No structural or artefactual remains attributable to the R. and R. Duder brickworks are visible on the surface north of the boundary fence.

(Refer Appendix B, Map D2)

Along the shoreline, and, between the shoreline and the boundary fence, a large quantity of structural remains and artefactual material are visible on the surface. Large amounts of all types of brick known to have been manufactured by R. and R. Duder, complete and fragmentary ceramic pipes of all types, and ceramic kiln test peices, are eroding from the shoreline banks. A similar distribution of material can be seen littering the shoreline. At the shoreline platform towards the eastern end of the site a scoria stone wall extends along the shoreline with the wooden piles of the old brickworks wharfe a short distance off-shore (Refer Appendix C, Plates II and III: Appendix B, Map D2, a, b, and scoria stone wall). A brick structure under a large Pohutukawa tree can also be seen on this platform (Refer Appendix B, Map D2, b: Appendix C, Plate I). These structures are presently in the position in which they were origionally constructed. Red chert pebble filled concrete structures and machine parts can be seen eroding from the bank immediately to the west of the shoreline platform (Refer Appendix C, Plates VII, VIII, IX: Appendix B, Map D2, d, f, g). A collapsed brick structure is also visible here, lying on the surface (Refer Appendix B, Map D2, e). Two large plate iron boxes (approximately 1200cm x 900cm), other iron parts, and a pile of black soot covered common bricks lie in the mud at the shoreline in front of this area

TABLE 1: Artefact distributions.

Art. Distr. Type	Art. Types	Area of Site Where Distr. Type Found	Period
A	Db1,Db2,Db3,Db4,Db5 - Db5 most common Dp1,Dp2,Dp3,Dp4,Dp5, Dp6 - and other unidentified fragments. Dt1,Dt2,Dt3 (Refer Appendix E)	Background distribution over whole site, along shoreline, and between shoreline and boundary fence. (Refer Appendix B, Map D2)	Whole period of R. and R. Duder brick production c1878 1934
B	Domestic debris (Refer Appendix G)	Extreme eastern end of site. (Refer Appendix B, Map D2)	Poss. late 1870's onwards
C	Structural remains which are at present in the position in which they were originally constructed. Structures a and b, and the scoria stone wall. Refer Appendix D)	Platform just above high water level towards eastern end of site. (Refer Appendix B, Map D2)	Prob. post 1890
D	Structures removed from the position of their original construction. Structures c,d,e, f,g. (Refer Appendix D)	Immediately to the west of the shore- line platform on which the Type C distribution occurs (Refer Appendix B, Map D2)	Prob 1890 structures pushed over bank when demolished

Db - Brick Types

Dp - Ceramic Pipe Types

Dt - Kiln Test Piece Types

(Refer Appendix B, Map D2, c).

Analysis of the surface artefact type count conducted during this survey (Refer Section 2, ii) indicate four discretely differentiated types of artefact distribution. These artefact distribution types are summarised in Table 1 on page 8 of this section. A reasonable interpretation of the pattern of artefact distribution summarised in Table 1 would be as follows.

The Type A distribution would seem consistent with rejected products being dumped over the steep shoreline banks. This interpretation is supported by the very obvious defects observed in the fabric and glazes of the bricks and ceramic pipes found in this distribution type. The presence of hand made stock bricks, and machine made wirecut bricks including frog marks of various dimensions, suggests that this distribution type covers the whole period of brick manufacture by R. and R. Duder from the late 1870's to the middle 1930's. (Refer Appendix E, D1, D2, D3, D4, D5)

The domestic debris forming the Type B distribution is probably associated with the early residential developments in the immediate vicinity of the eastern end of the R. and R. Duder brickworks site, which began in the middle 1880's and accelerated around the turn of the century (Land Trans. Off., Deeds Rec., 3A, Vol. 2, P. 2015). The range of dates for bottles found in this distribution (ie. late 1870's, with the majority dating to around the turn of the century, with fewer from later periods) supports this view. (Refer Appendix B, Map D2; Appendix G, Plates I, II, III)

In the Type C distribution on the shoreline platform the scoria stone wall and brickworks wharfe were probably built shortly prior to July 1890 as part of the new brickworks facilities (Titcher P. Apr. 1978 | Mar. 1979), and certainly no later than 1902 (Cyclopedia of N.Z. 1902, P. 533). The brick structure under the large Pohutukawa tree is constructed of bricks laid without mortar, and may be the remains of an early (ie. pre 1890) brick clamp reported as having been used on this site (Philson M. 1990, P. 79; Duder H., pers. comm., 1967). However, an excavation of this structure would be required to confirm this interpretation. A small road from the brickworks to the vicinity of the shoreline platform at which

these structural remains are situated can be seen in a photograph dated 1924 (Refer Section 6, Photograph 1). The position of this road is presently marked by a ground subsidence under the boundary fence at the extreme eastern end of the site. A terrace road from the shoreline platform to lake Rd. (refer Appendix B, Map D2) is still in existence. The centering of these transport oriented works (ie. the road from the brickworks to the platform, the platform to Lake Rd., and the wharfe) on this area, suggests that it was probably the brickyard where finished heavy clay products were displayed for sale and ultimately removed from the site. The absence of Type A deposits on this shoreline platform lends further support to this interpretation. (Refer Appendix D, Plates V, VI, VII)

The Type D distribution is found immediately to the west of the shoreline platform on which the Type C distribution occurs (Refer Appendix B, Map D2, c, d, e, f, g). The material comprising this distribution type consist of structural remains of red chert pebble filled concrete, machine parts, and collapsed brick structure, all overlaying distribution Type A deposits. A pile of black soot covered common bricks, two large plate iron boxes, and other iron parts are visible along the shoreline in this area. The Type A deposits underlying the Type D distribution suggests that these Type D materials reached their present position after the brickworks ceased production in 1934. It seems probable that the Type D distribution occurred when the brickworks were demolished in 1942 and c1955, and would be consistent with the structures and machines being pushed over the steep shoreline bank to their present position. (Refer Appendix D, Plates V, VI, VII)

#### 4. SOIL RESISTIVITY SUB-SURFACE SURVEY

The soil resistivity survey discussed in this section was conducted using the method described in Section 2, iv, of this paper. The survey was begun at 1.00pm on 5/10/92, and was completed by 2.58pm. The soil condition was slightly moist, no rain having fallen on the day prior to the survey, with heavy rain falling on the three days preceeding this. The reference tape was laid out one metre to the west of the western wall of a block of residential units on the site, and parallel to it. The datum point was fixed at the south-western corner of this building, and the bearing was observed with a sighting



compass as 358 degrees magnetic. The method used to collect the resistivity data for this survey includes an inherent error factor of up to half the probe spacing (ie. 0.5m).

Total resistivity values were used to construct the resistivity profiles contained in this section. The information provided by this means enabled the approximation of the positions of standing features such as walls, and dispersed features such as brick debris, to be defined. This data, and the information provided by a computer generated map of average resistivity contours, were used to construct the interpretative map shown in Fig.1, on page 15.

No indications of sub-surface remains which could be attributed to the circular 'beehive' kiln known to have been constructed on the site c1890 were detected.

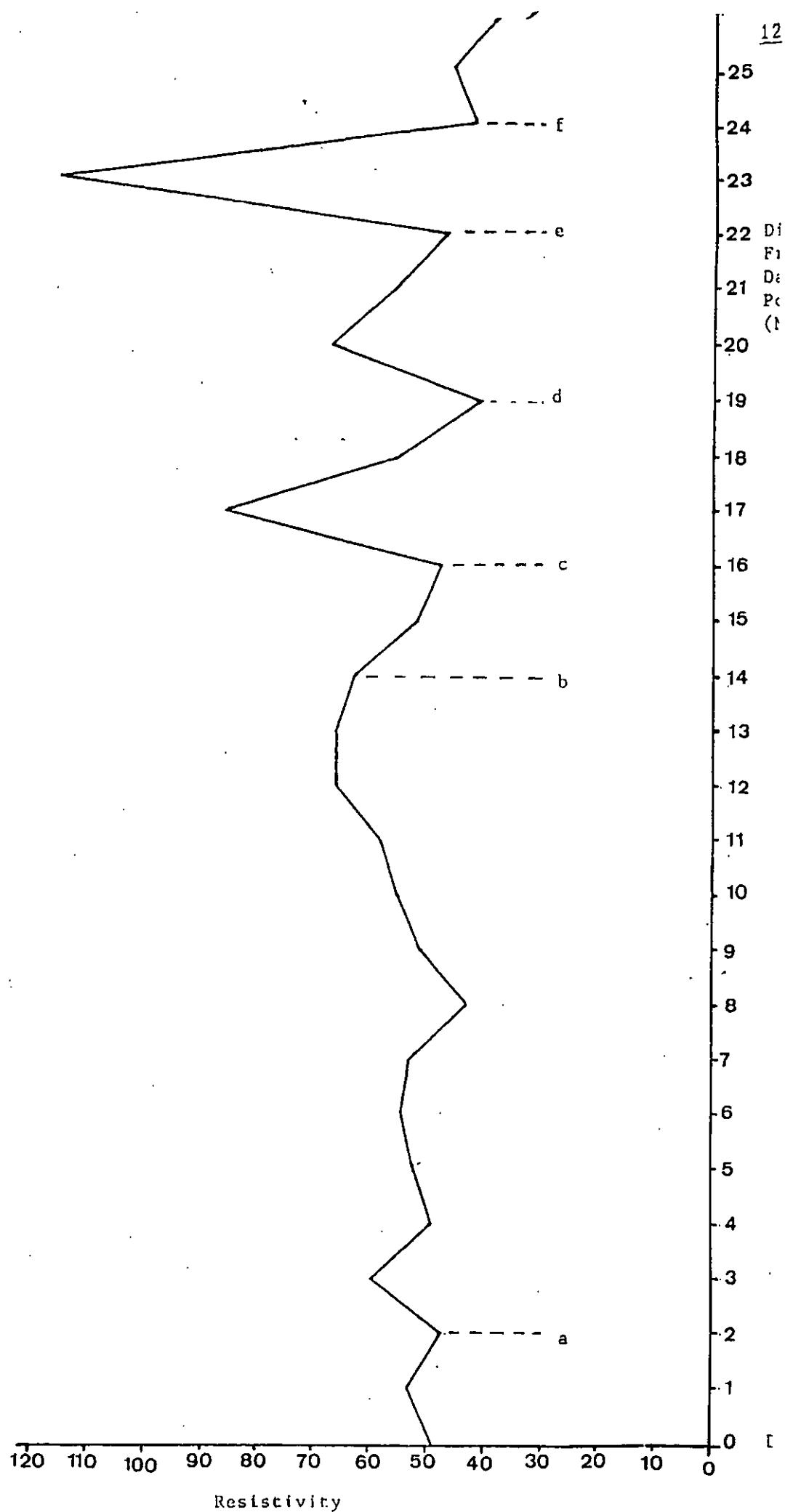
In a position closely approximating that of a square kiln, the location and dimensions of which had previously been derived from documentary sources (Refer Appendix B, Map D2), a large resistivity anomaly was encountered (Refer Resistivity Profile A,b,c,d,f, P.12). This feature is interpreted as a complex of five walls in close proximity forming the remains of a structure with a width of approximately 10m, which closely approximates the width of the previously mentioned square kiln. The short distance between these walls has caused the 'M' shaped resistivity profile curves usual for standing structures of this nature to be obscured to some extent. Nevertheless, given the close coincidence of position and dimensions previously mentioned, a reasonable interpretation of these resistivity anomalies is that they represent the brick longitudinal structural elements of this square kiln (Refer Fig.1, P.15).

The kiln's southern wall (Refer Resistivity Profile A,b) is obscured by an anomaly which probably results from a tightly packed brick debris. Resistivity anomalies resulting from dispersed sources which are modified by the presence of a standing structure are characteristically found to exhibit a flattened inverted 'V' shaped curve on top of an increase in resistivity, such as is found here. In such cases the standing structure causing the modification to the background curve is usually found at one of the decreases in resistivity on either side of the peak in the flattened 'V'. This anomaly is so interpreted, the southern wall being further located

RESISTIVITY PROFILE A

Reference Tape

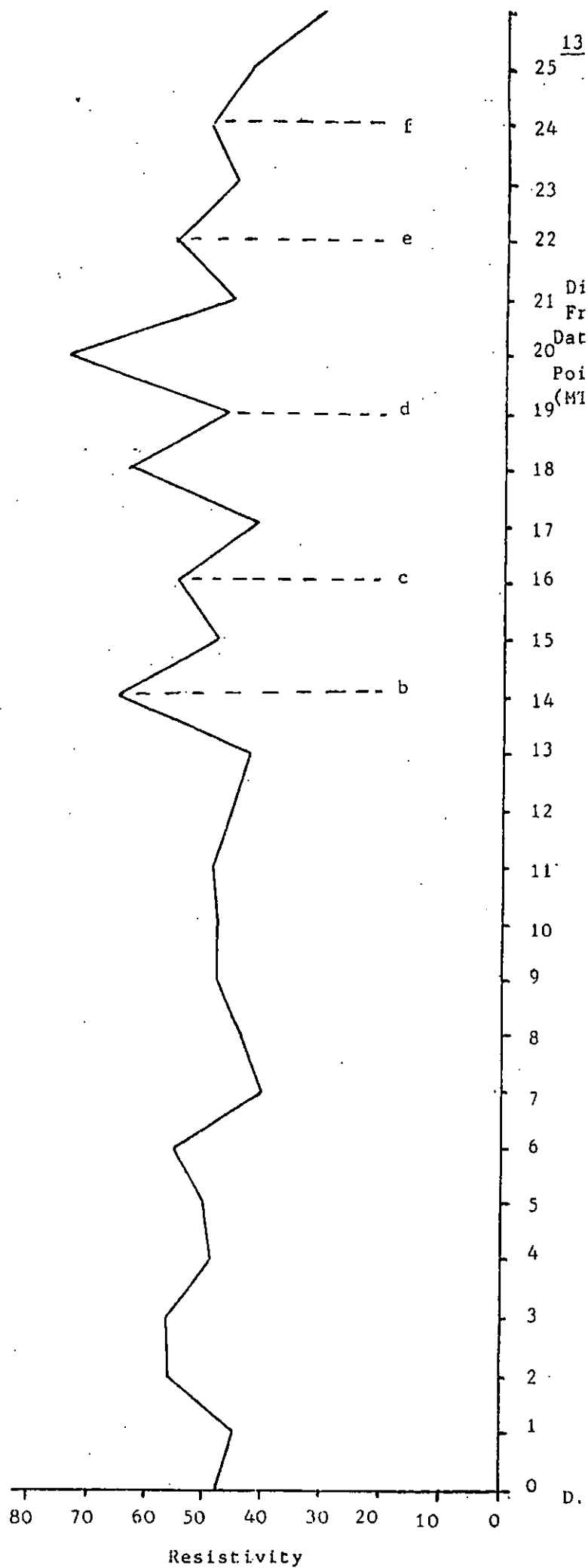
358° M



RESISTIVITY PROFILE B.

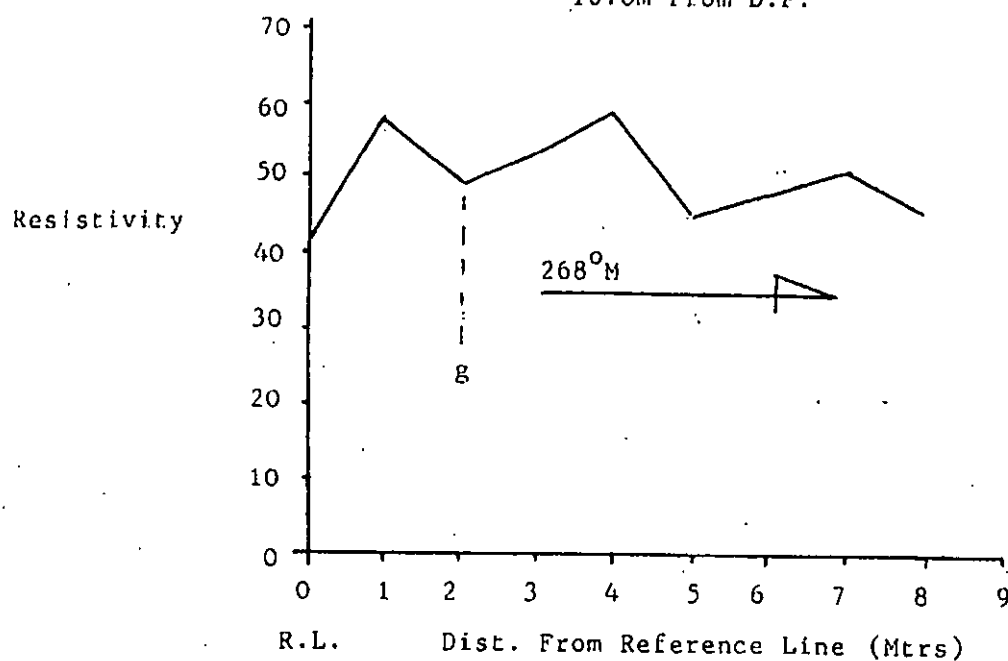
2.0m West of Reference Tape

358°M



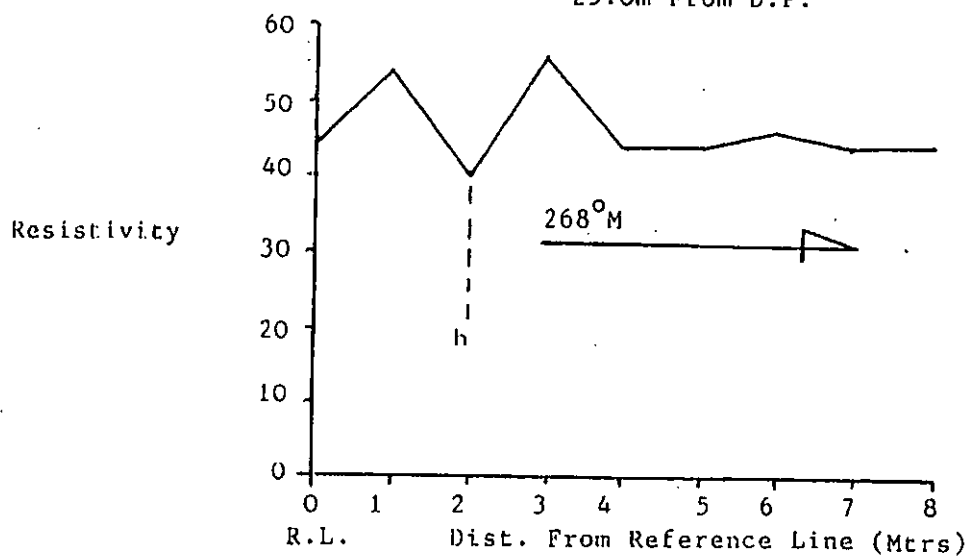
# RESISTIVITY PROFILE C

16.0m From D.P.



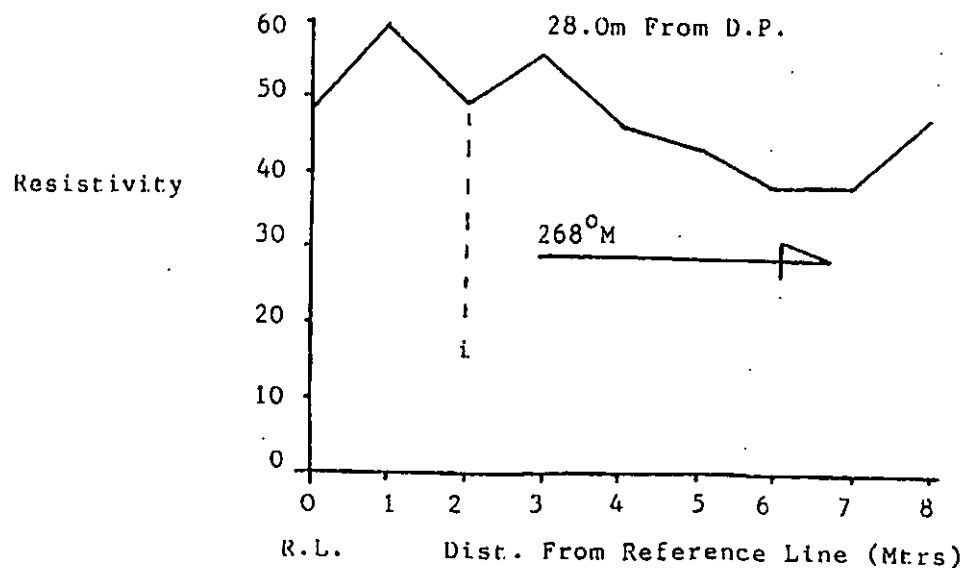
# RESISTIVITY PROFILE D

25.0m From D.P.



# RESISTIVITY PROFILE E

28.0m From D.P.



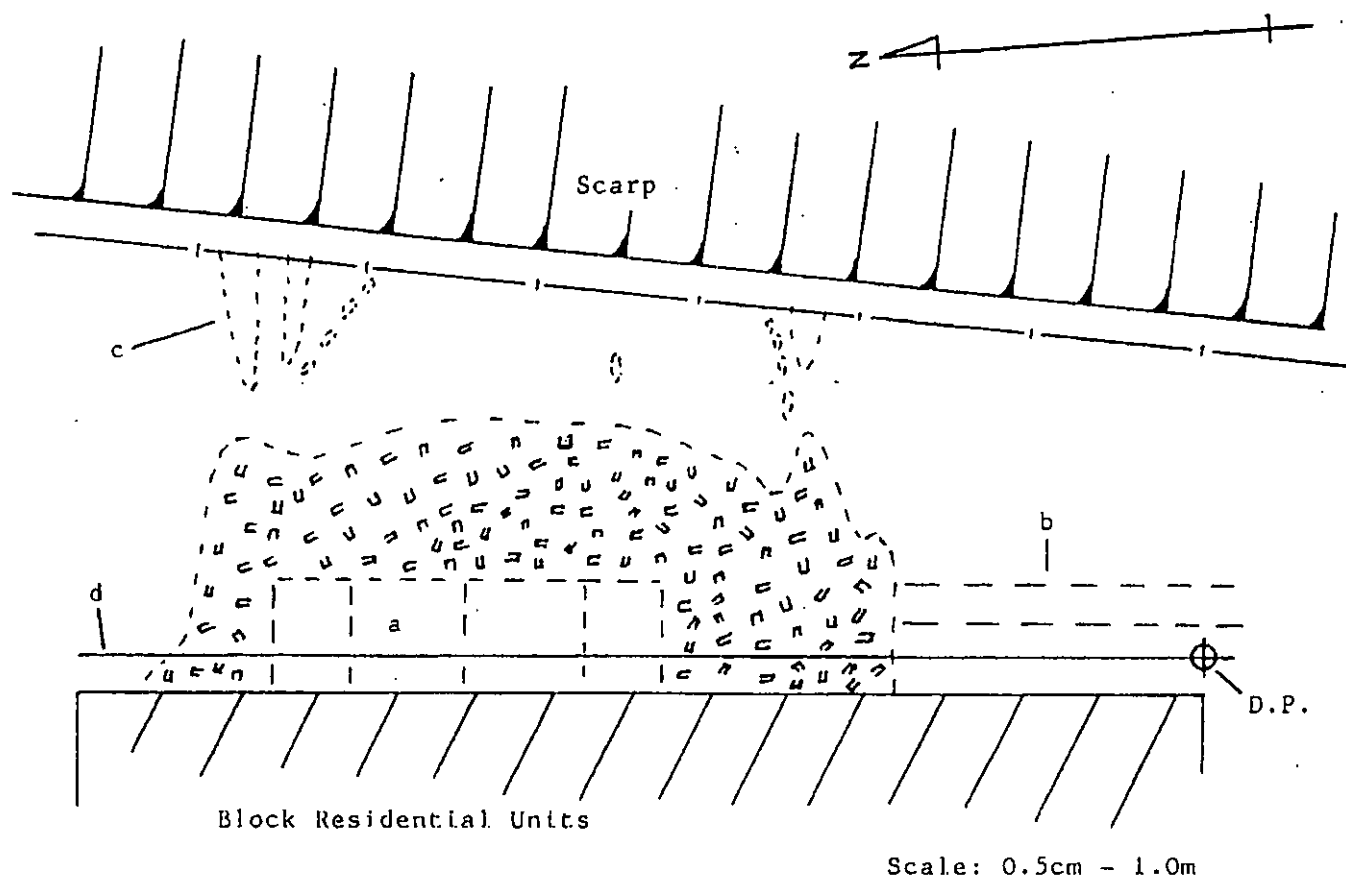
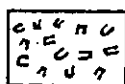


FIG. 1: Interpretation of the data resulting from the R. and R. Duder brickworks soil resistivity survey 2/10/92.

KEY

- |————— Boundary Fence
- Surface Features
- - - - - Sub-Surface Features Deduced From Resistivity Anomalies.



Debris From Demolition of Kiln.

- a - Remains of kiln structure (brick).
- b - Brick flue from kiln to chimney.
- c - Sewage pipes.
- d - Reference tape.

D.P. - Datum Point.



Profile A as a model.

The resistivity anomaly between 8m and 14m from the datum point (Refer Resistivity Profile A,P.12) is likely to result from dispersed brick debris caused by the demolition of the upper structure of the kiln.

Resistivity Profile B shows a clear indication of only one of the five walls detected in Resistivity Profile A (ie. Feature d, Resistivity Profile B). However, some form of structure was clearly indicated and it was felt that it may have been the remains of a wall running parallel with the resistivity profile, the uneven top of which might have caused the peaks in the profile graph. To test this hypothesis a resistivity profile was constructed through this anomaly at a right angle. The resulting graph gives a clear indication of a standing wall structure (Refer Resistivity Profile C,g). This structure is interpreted as being the western wall of the kiln.

The computer generated map of average resistivity contours suggests that an area of brick debris surrounds the remains of the kiln. The area of this debris has been approximately plotted on the map shown in Fig.1, on page 15. And, probably results from the demolition of the kiln in 1942 or c1955.

About 3m to the south of the remains of the kiln's southern wall, a lineal resistivity anomaly was detected (Refer Resistivity Profile D,h: Resistivity Profile E,i). This feature is separated from the remains of the square kiln by the area of brick debris, and is most likely to be the flue from the kiln to the remotely placed 100ft high brickworks chimney. This chimney is known to have been situated in the approximate position of the southern end of this resistivity anomaly (Refer Section 6, Photograph 1).

The data previously described is summarised in the map shown in Fig. 1 on page 15, and is entirely consistent with the remains of the sub-floor plenum chamber of a square down draught brick kiln (Refer Appendix J, Plate IV).

# 5. HEAVEY CLAY PRODUCTS MANUFACTURED BY R. AND R. DUDER

In common with the majority of Aucklands heavey clay manufacturers, R. and R. Duders brickworks were based on the Miocene clays of which such extensive deposits occur throughout the Auckland region (Refer Appendix B,Map D1) (Eaves M. 1990,P.8|9).

The clay at the R. and R. Duder brickworks has variously been described as 'of high quality,containing no rocks or other impurities', and,of various qualities allowing a variety of manufactures (Cyclopedia of N.Z. 1902,P.533).The chemical composition of these clays was probabley very similar to that at the Auckland Gas Coy.'s brickworks,a short distance away on the opposite side of Ngataringa Bay,and which is listed below.

Silica .....	72.80 percent
Alumina .....	26.12 percent
Ferric Oxide .....	0.46 percent
Titanic Oxide .....	Trace
lime .....	0.14 percent
Magnesia .....	0.21 percent
Potash .....	Trace
Soda .....	0.68 percent
SO <sub>3</sub> as Sulphates .....	<u>Trace</u>
	100.41

Specific Gravity ..... 2.28 percent  
(Auckland Gas Coy. 1923,P.4)

The products manufactured by R. and R. Duder included common and ornamental bricks,special bricks for chimney heads and basements, and,tiles for bakers ovens.Pipes of all types were made,including salt glazed inspection pipes and yard sinks.Buchan,P,and Herald traps could be obtained from the firm.Garden edgings and flower pots were also manufactured. (Cyclopedia of N.Z.,P.533) (Refer Appendix E)

Mr Cooper and Mr. Savidan were responsible for the mamufacture of garden urns (Refer Appendix E,D22 and D23) which were made by hand onthe potters wheel. (Philson M. 1986,P.80).They probabley also

made the terra cotta garden chairs referred to in Appendix E,D20 and D21 of this paper.

Among the major projects constructed in R. and R. Duder brick are the Pump House and chimney at Lake Pupuke in Takapuna (Philson M. 1986,P.80),and the reservoir at the top of Mt. Victoria in Devonport (Titchener P. Apr. 1978|Mar 1979,P.23).A house built in the 1920's for Mr. P. Johnson,a part owner of the brickworks and relative of the Duder brothers,is constructed entirely of R. and R. Duder bricks. This house is presently in existence and provides a fine example of the full range of R. and R. Duder bricks (Refer Appendix B,20927,Lot 3).

#### 6. SEQUENCE OF CONSTRUCTION,DEVELOPEMENT,AND DEMOLITION OF THE R. AND R. DUDER BRICKWORKS

The site on which the R. and R. Duder brickworks was built is part of a block of land purchased by Mr. Thomas Duder from the crown grantee,Mr. William White,in 1847 for £50 (Land Transfer Office, 3A 2015,22|5|1847).The land was subsequently used to graze stock (Philson M. 1990,P.78).

In August 1875 Robert and Richard Duder obtained ownership of the land (Land Transfer Office,3A 2015,52240C,5|8|1875),and later in the year leased a few acres to a brickmaker (Philson M. 1990,P.78). This brickmaker erected a shed on the site,and proceeded to hand manufacture bricks by hand in wooden molds (Duder H. June 9 1967) on a small scale of about 600 bricks per day (Diamond J. Dec. 1983, P.26).The bricks were fired in 'clamps',which consisted of layers of stacked bricks with straw fuel between each layer (Duder H. June 9 1967) (Refer Appendix H,Plates I and II:Appendix J,Plates I and II).After a few years of operation the brickmaker left for the Coromandel gold rush,and as he owed rent on the property where his brickworks were situated the Duder brothers took the brickmaking business in lieu of payment (Duder H. June9 1967).

Robert Duder subsequently hired a brickmaker named Andrews on wages, and the small scale hand manufacture of bricks continued as previously (MacKay J. 1963).

During July 1890 new facilities were opened at the R. and R. Duder

brickworks (Titchener P. Apr 1978|Mar 1979,P.11).The new brickworks was equipped with two kilns having a capacity of 20,000 bricks each (Cyclopedia of N.Z. 1902,P.533).One of these was a 'beehive' down draught type (Brickell B. June 1991) approximately 15m in diameter, the other being a square down draught kiln approximately 15m long by 10m wide (Refer Appendix B,20927:Section 4.).A brickworks building approximately 45m long by 10m wide was also constructed at this time. Three brick drying sheds each 120ft. long completes the structural inventory,the materials from which they were constructed suggests structures very similar to those shown in Appendix K. (King R.9 Dec 1942).

(Refer Appendix J,Plates III and IV)

A 6hp Tangye steam engine and boiler of the type shown in Appendix I provided the motive power for the brickworks (Cyclopedia of N.Z. 1902,P.533).

The low rate of production of the brickmaking machine suggests that it may have been an earlier man-powered machine modified for steam motivation (Diamond J. 1983,P.26).No further detail is known about these machines,general types of heavy clay manufacturing machines likely to have been in use during the 1880's and 1890's are shown in Appendix H.

Sometime prior to 1924 a Siemens alternating current electric motor was installed (Crum J. 14 July 1944:See Photograph 1,1924,P.19, electric power poles visible),and this probably replaced the previous steam plant.

Sometime between 1934 and 1936 the 100ft. high brick chimney collapsed in a storm.And,as R. and R. Duder had been unable to operate the brickworks on an economic basis for many years prior (Crum J. 14 July 1944),it seems likely that the brickworks stopped production at this date.

Little modernisation apart from the instalation of the electric motor prior to 1924 seems to have been undertaken.The brickworks machinery and buildings in used in the middle 1930's were those installed in 1890 (Crum J. 14 July 1944).



PHOTOGRAPH 1: The R. and R. Duder brickworks at Ngataringa Bay  
from Lake Rd.  
(Duder H. 1924)

Two aerial photographs taken in 1939 (Whites Aviation 1939a and 1939b) show the brickworks complete with the exception of part of the chimney.

In May 1942 the Army occupied the brickworks and demolished the remaining part of the chimney, taking the 1000 bricks to Camp Takapuna. The Army also demolished the brick drying sheds at this time, using the 6000 to 7000 super feet of 9"x 1" timber to construct ammunition stores. (King R. 9 Dec 1942)

In July 1944 the brickworks remained intact, with the exception of the chimney and the brick drying sheds. The 1890's brick and pipe manufacturing machines also remain on the site at this date.  
(Crum J. 14 July 1944)

An aerial photograph taken in 1946 (Whites Aviation 1946) shows



only the circular beehive kiln and the brickworks building remaining on the site. The square kiln had been demolished sometime between July 1944 and 1946.

An aerial photograph of 1952 (Whites Aviation 1952) shows the same structures as in 1946.

In February 1953 the General Government acquired the R. and R. Duder brickworks property by proclamation (Refer Appendix A, Plate III) under the Public Works Act.

An aerial photograph dated 1955 (Whites Aviation 1955) shows the preparatory land development prior to the construction of Naval residential units, with the circular beehive kiln and the brickworks building no longer there.

#### 7. ACKNOWLEDGEMENTS

I am greatly indebted to Mr. Jack Diamond, well known industrial archaeologist, for the generous use he has allowed me with regard to his research collection, and for his regular and valuable advice.

My thanks must also go to Mrs. M. Philson, authour of 'The Duder Family in New Zealand', for the considerable use I have made of her research collection, and extensive knowledge of the Duder family.

The North Shore historian Mr. Paul Titcheners kind permission to use the illustration from his 'Beginnings' series as the frontispiece of this paper is greatly appreciated. As was his advice at some odd hours of the night.

My thanks go to the Royal New Zealand Navy for their permission to conduct this survey.

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APPENDIX A: Documents Referred to in Text



# SEARCH COPY REGISTER

17 SEP 1992

[Land and Deeds-4]

NEW ZEALAND

Form B.

Reference: Vol. 467, Folio 207  
Transfer No. 486668  
Application No.  
Order for N/O No.



Register-book.

Vol. 988, folio 195

## CERTIFICATE OF TITLE UNDER LAND TRANSFER ACT

This Certificate, dated the eighth day of February, one thousand nine hundred and fifty-one  
under the hand and seal of the District Land Registrar of the Land Registration District of AUCKLAND Witnesseth that  
ROBERT PENMAN of Auckland, mercantile broker,

is seized of an estate in fee-simple (subject to such reservations, restrictions, encumbrances, liens, and interests as are notified by memorial under written or endorsed hereon, subject also to any existing right of the Crown to take and lay off roads under the provisions of any Act of the General Assembly of New Zealand) in the land hereinafter described, as the same is delineated by the plan hereon bordered HEREON, be the several dimensions a little more or less, that is to say: All that parcel of land containing ten acres two roods decimal eight eight perches  
more or less situated in the Borough of Devonport being Lots 4 and 5 Deposited Plan 20927 and being portion  
Allotment 3 Section 1 Parish of Takapuna.

METRIC AREA IS 4.2514ha

Conversion Factors:  
1 Acre = 4046m<sup>2</sup>  
1 Perch = 25.29m<sup>2</sup>  
1 Link = 1012 metres

Devonport Borough



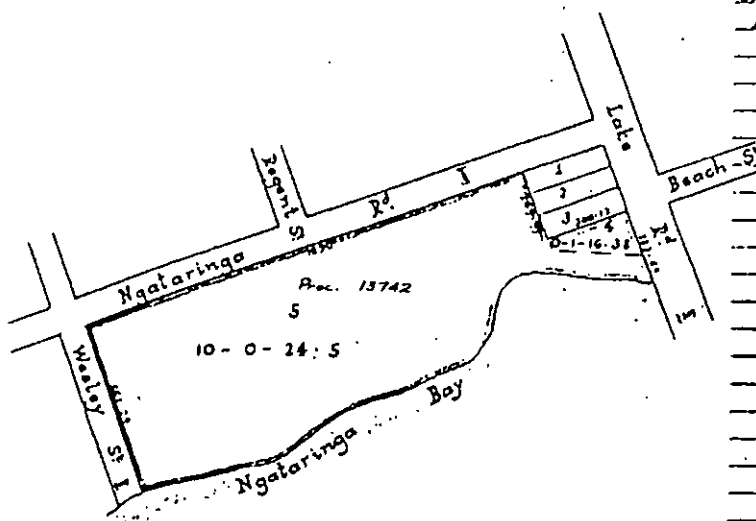
Mortgage 353560 Robert Penman to Bank of New Zealand.  
Produced 8/2/1951 at 11,350/-

X 17879 Granted by the Minister of Works entered 19/11/1953 at 10/-

Production 13782 to prove the within land for building of the General Post Office at 1553/10/-

THIS REPRODUCTION (ON A REDUCED SCALE) CERTIFIED TO BE A TRUE COPY OF THE ORIGINAL REGISTER FOR THE PURPOSES OF SECTION 215A LAND TRANSFER ACT 1952.

L. G. Gorman D.L.R.



Total Area - 10 - 2 - 00 - 88  
Scale - 4 Chains - 1 Inch

988/195  
e61/88b

**CANCELLED.**  
 44-4-1951  
 C. New Zealand Insurance Company Limited  
 and Percy Adolph Thurnon to sign  
 name. Cyle produced 24/11/1951 at  
 12.5 pm. *Receivable*  
 707/172. *AK*  
 Transfer debts of Late 445 plan 2022  
 the registered proprietor to Robert  
 Bennett - produced 8-2-1951 at 11.30  
 928/195. *signature: A. S. Q.*



**DUPLICATE DESTROYED**  
 44-4-1951  
*Emc*



[Extract from N.Z. Gazette No. 1, 18 January 1953, page 6]

*Land Taken for Buildings of the General Government in the Borough of Devonport*

[Ss.] G. W. M. NORRIE, Governor-General

A PROCLAMATION

PURSUANT to the Public Works Act 1928, I, Lieutenant-General Sir Charles Willoughby Moke Norrie, the Governor-General of New Zealand, hereby proclaim and declare that the land described in the Schedule hereto is hereby taken for buildings of the General Government; and I also declare that this Proclamation shall take effect on and after the 10th day of January 1953.

SCHEDULE

APPROXIMATE area of the piece of land taken: 10 acres 2 roods 0.88 perch.  
Being Lots 4 and 5, D.P. 20027, being part Allotment 3, Section 1, Parish of Takapuna, situated in the Borough of Devonport, and being the whole of the land comprised and described in certificate of title, Volume 988, folio 195 (Auckland Land Registry).

Given under the hand of His Excellency the Governor-General, and issued under the Seal of New Zealand, this 22nd day of December 1952.

W. S. GOOSMAN, Minister of Works.

GOD SAVE THE QUEEN!

(P.W. 27/268/22; D.O. 2/12/52/2/1)

R. E. OWAN, Government Printer, Wellington.

988/195

14th July, 1944.

Mr. Woolams,  
N.Z. Insurance Co.,  
Queen Street,  
AUCKLAND...C.I.

Dear Sir,

As requested by you, I recently visited Duder's Brick & Pipe Works at Devonport, and inspected certain of the plant and machinery. Not knowing the condition of this plant before occupation of the Military Forces, I cannot give you definitely a fair estimate of the amount of damage which may have been done, nor could I suggest who may have caused any such damage.

However, as you have suggested, my practical knowledge of this class of work probably makes my estimate as sound as any that could be found.

Regarding Plaster Moulds:-

I have consulted both with the moulder who last used these moulds Mr. Arthur Jones and with a previous manager Mr. George Holmes and I now have a very fair idea of both the numbers and the quality of moulds. Many were practically worn out, many were out of date and the number claimed is not accurate. Replacement cost now of all useful moulds would be about £100 (wages £70, material £30.) I consider therefore that £70 would be a fair value for compensation of part worn moulds.

Brick-machine:-

Suffering normal neglect through lack of use during many years.

Brick-cutting-off table:-

Very rusty, needs cleaning up;- Damage £10.

Tile-cut-off table:-

Could not find this. Value when operating approximately £15.

Pipe-machine:-

Rusty. Parts missing include Pipe dies and balance weights. would cost £150 to bring this machine to good working order.

PLATE V,a,b,c,d: Letter to Mr. Woolams, N.Z. Insurance, Auckland, and, attributed to J. Crum.

Recovered by J.T. Diamond (Field Officer, Historic Places Trust, Auckland) from under the floor boards of the Crum Brick, Tile and Pottery brickworks at Avondale just prior to its demolition in the late 1960's.

Chimney:-

Partially collapsed in big storm some eight or ten years ago. Cracked at top, and loose bricks still falling would be dangerous to any occupants.

Sheds:-

Very old and would not suggest whether they fell or were pushed.

Conclusion:-

As a practical clayworker I find it difficult to place any real value on sheds, and plant which have served their usefulness for fifty or sixty years. For many years past, even before closing, Messrs. Duders Ltd., were unable to operate the works economically. Modern labour trends would greatly aggravate this position.

Yours faithfully,  
THE CRUM BRICK, TILE & POTTERY CO. LTD.

DIRECTOR.

RE R. & R. DUDER ESTATE

Field tile table	Removed from Engine house and left exposed to weather now useless
Brick cut off table	
Brick press	
18 pulleys of various sizes. <i>Steel 2ft</i>	
1 small blacksmiths forge	Disappeared
4 dies of pipe machine 4", 6", 9" & 12"	Brass linings and bells cut out, taken away and left in weather useless
6 dies of Field tile machine 2", 3" & 4"	ditto
Starting gear for 60H.P.	Was in Engine room on wall, all parts except frame disappeared
Siemens Alt. Motor	Various small parts taken away
Siemens Motor as above	
Box of brass fittings, taps odds and ends	disappeared
Steel hand drill	Was on wall near door. - disappeared
Driving belt 78ft x 12" (endless)	Belt cut and left uncovered in weather practically useless
Hand flanging machine	{ Was in main shed, various parts missing }
Pipe making machine	{ ditto ditto }
	{ This part of shed was removed leaving above in open }
3 Off bearing barrows	These were bricked up in square kiln
8 Brick barrows <i>at 11</i>	Mostly missing remaining broken, 1600
2 Iron barrows <i>at 11</i>	wheels gone etc. Both Iron barrows missing.
Various slices, rakes, and fire bars	ditto.
12 Steel runner plates 24ft x 9" x 1/2"	All these were in the part of main shed that was taken down, a few are visible in various different places. Most, all except say 4, seem to have disappeared.
6 " " " 10 " x 9" x 1/2"	
2 12 " flat plates 8 " x 3ft x 1/2"	
Timber removed	see last list
Sheets galv. iron	removed as in last list
Bricks	" " " " " "
Chimney demolished by Army authorities without consulting owners or permission. Chimney was 100' high and was told by a former Manager who was present when built that it contained good bricks.	
Brick making machine	The roofing over these pieces of machinery has been removed while

Main line of shafting  
Grinding pan

8 m. for moulds made  
more moulds than were  
occupied by Army. Consequently  
being exposed to weather considerable  
deterioration has taken place.

Plaster of paris - Moulds:-			
12	18 "P" trap moulds	4" Ford.	65. 10. 0
12	Buchan-trap-"	4" Ford.	59. 10. 0
36	Bend moulds	4" Gld.	215. 0. 0
12	Inspection pipe	2 Pkys.	5. 3. 10. 0
12	" moulds	4"	14. 0. 0
12	" lid moulds	4"	15. 0. 0
12	Stopper on Biscuit		15. 0. 0
12	Vent moulds	9" x 6"	19. 0. 0
6	"	9" x 3"	5. 10. 0
4	Chimney top moulds		21. 10. 0
4	assorted shapes & sizes		13. 1. 0
4	Bread crock moulds		7. 0. 0
6	Flower pot moulds	various sizes	7. 0. 0
24	Plaster of paris rollers	for tile machine	15. 15. 0
4	Buchan-trap moulds		17. 10. 0
12	6" "P" trap moulds		29. 10. 0
6	12. 6" Bend moulds	7-10-0 each	8. 0. 0
6	6" Inspec. pipe moulds		11. 0. 0
6	6" lid		17. 10. 0
6	6" Stopper on biscuit		14. 10. 0
6	9" Bend moulds		
3	9" P. Trap		
3	9" Buchan Trap moulds		

All these articles were made of plaster of paris and were stored away in locked iron shed, formerly the mens lunch room. This shed was taken down and re-erected alongside the Army hutments and the moulds etc. were thrown out in the open and being plaster of paris rapidly disintegrated by weather, rain etc.

533. 15. 0

18/2. 10. 0 + 5. 5. 10. 0

Plaster of paris - Moulds - 2000

Trap mould 12. 6" and 11. 6"

12. 6" 2-10-0

11. 6" 2-0-0

12. 6" 1-9-13

11. 6" 3-0-0

12. 6" 1-9-13

11. 6" 3-0-0

12. 6" 1-9-13

11. 6" 3-0-0

12. 6" 1-9-13

11. 6" 3-0-0

12. 6" 1-9-13

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12. 6" 1-9-13

11. 6" 3-0-0

12. 6" 1-9-13

11. 6" 3-0-0



No 49

97. Ngatamua Road

June 9, 1964.

Dear Jack.  
Duder's Bricks.

At long last I have put a few notes together re. the story of R & R Duder as brickworks owners.

Dates are quite approx. as I am not old enough to remember the beginning & no worthwhile records are left now.

I am sorry no photos are available and I could like one myself.

At one stage the works looked quite picturesque behind nice pohutukawas at a full tide, & with a cutter at the wharf.

The Richardson collection ought to have a photo or two, as Douglas Richardson was a great friend of the Duder's, & took lots of photos in Devonport area.

Hoping all this is some help to you.  
Kind regards

Humphrey (Duder)

# DUDER'S BRICKWORKS, DEVONPORT, AUCKLAND.

28.12

"R and R Duder" was the trade name for the products of Duder's Brick & Pipe Works in Ngataringa Bay, Devonport, for about 70 years dating from the 1880's.

The land was purchased in 1847 by Thomas Duder, as a sheep grazing run of about 80 acres. Thomas Duder was the first white man to settle at what was then called "Flagstaff" & he lived on the waterfront near what is now Church St., Devonport.

Part of this land passed to twin sons, Richard and Robert Duder, active business men and sportsmen in Devonport. Possibly more famous for their race horses than for their bricks, although thousands branded "R & R Duder" are now appearing in the rubble of buildings now being demolished in Auckland in the 1960's.

Kauri gum was plentiful in the soil, and one character considered the clay was good for brick-making. He secured a lease of a few acres from R & R Duder & set about making bricks, by the old land method of clay packed into wooden moulds of brick dimensions. These were dried in the air & then burned in "clamps", which were mounds of dried bricks stacked with straw, & other fuel for burning the bricks.

After a few years, when the rush to the gold fields started, this character came to Bob Duder, and said: "I want to go to the gold fields, but I haven't got any money".

"I know you haven't paid us any rent yet,

2

Said Bob, "What about that?"  
 "Ah, Bob you better take the lot, gear, tools, bricks & all, eh?"  
 "Right-oh, said Bob, off you go to the gold rush" and probably gave him cash for his fare.

So R. & R. & I suddenly found they possessed an old shed & a few picks & shovels & barrows & a small stock of bricks on a brickfield. Another brickmaker was found in due course & employed on wages & so another industry was added to Budder's many activities.

About this time the present Lake Road was built across the mud flat which is now the Waitimata Golf Course & so brought the brick yard much closer to Devonport, business area.

The clay proved excellent for bricks and especially for drainage pipes. So a prosperous industry developed on a 10 acre section. It had extensive buildings & engine houses, and modern brick and pipe kilns. First steam and later electricity operated the machinery, and got class bricks of all kinds; wire-cut pressed, fancy bricks, and glazed bricks and other goods. Field tiles and vitreous glazed sanitary pipes & fittings are still underground in various sections in Auckland.

A foreign-born artisan produced fancy tiles for gardens, & garden urns and novelties in glazed ware.

3.

No 48

Duder's owned some small vessels, and a wharf was built at the brickworks, and coal was brought and bricks etc. shipped away by sea, when tide was full.

By the middle 1830's both Richard & Robert Duder had died, but the works continued to manufacture till just before the 2nd World War in 1939.

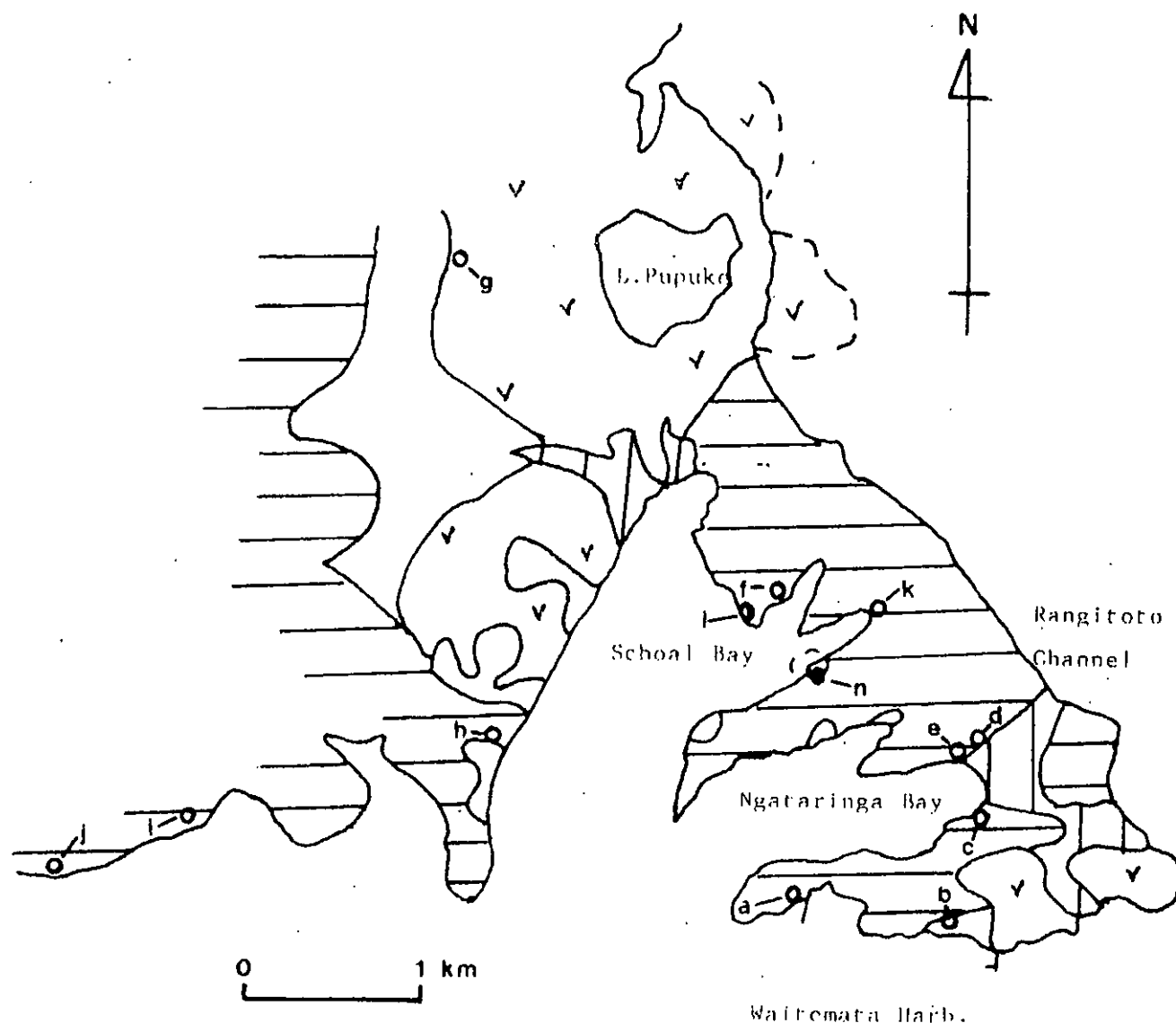
The brickyard has all been cleared away, & the land developed into a Naval Housing village, at the corner of Lake Road and Ngatarainga Road.

The remainder of the 80 acre farm was subdivided in 1884, & is now a pleasant residential area.

The writer has his home in part of it, which has been in the family ownership for 120 years, on Duder's point, looking out onto the western harbour scene.

Humphrey Duder  
June 1967.

Pers. Com. Humphrey Duder. 1967. R & R. Duder Richard and Robert. They had 2 kilns, one for bricks and one for pipes, fancy tiles for gardens, urns and other novelties for gardens.



AUCKLAND - NORTH SHORE - HEAVEY CLAY DEPOSITS AND DISTRIBUTION OF BRICKWORKS

MAP D1

SCALE: 2.5cm | 1.0km

# KEY



Miocene Clay Deposit



Pleistocene Clay Deposit



Volcanic Deposit



Brickworks Site

a - Jas. Hammond, c 1844 | c 1850's

b - Garden Tce., 1887 | 1888

c - Auck. Gas Co., 1885 | 1970

d - Tiller and King, c 1852 | c 1875

e - R. and R. Duder, c 1875 | c 1936

f - J. Dunning, 1880 | ?

g - Charlie Smart, 1915 | 1934

h - Phillip Gallan, 1847 | 1860

i - Chelsea Sugar Works, 1883 | 1885

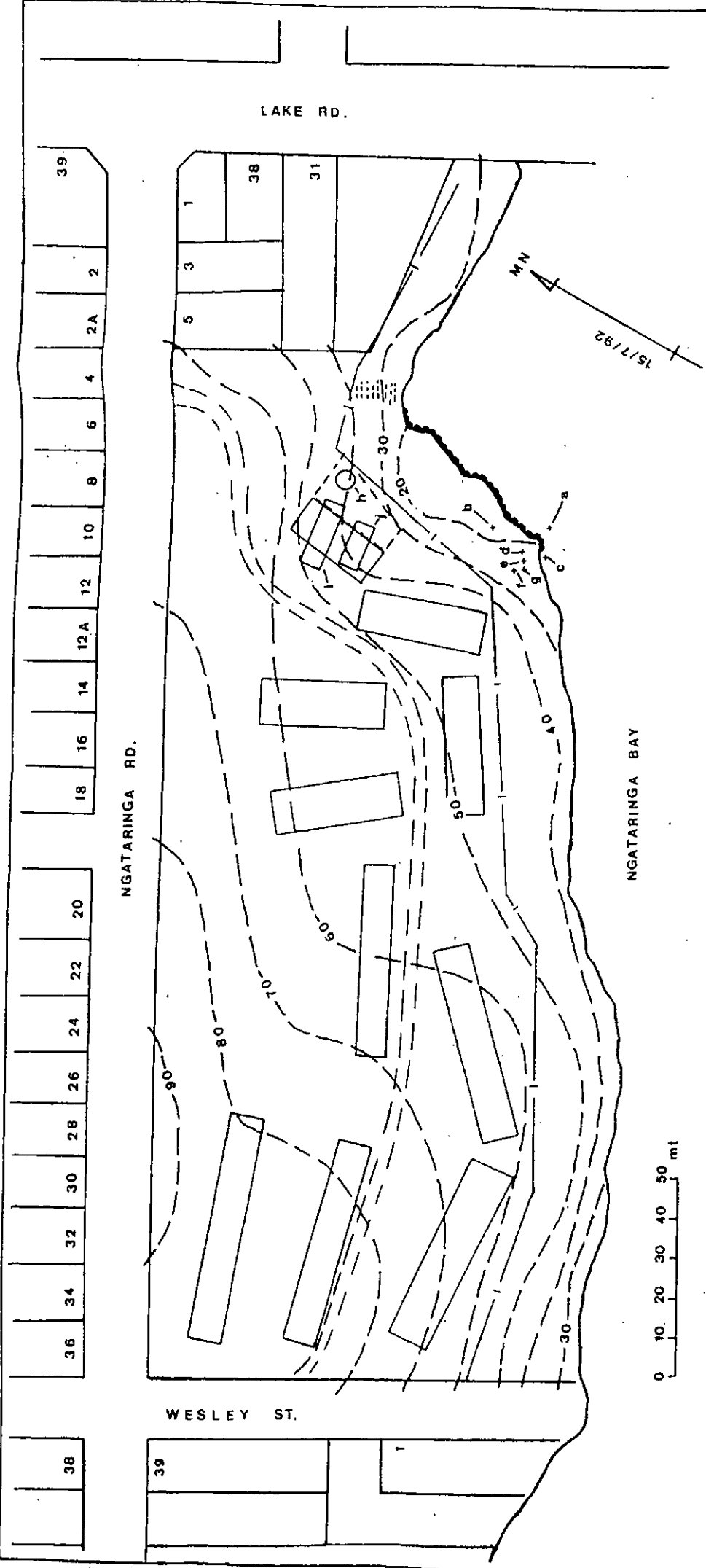
j - Kauri Pr. (Walter Carnall, c 1865 | c 1866

k - John Andrews, c 1859 | early 1860's

l - Bradley, 1880's

n - Beech and Jas. Wither, c 1860

REFERENCES - Crum J. 1951; Eaves M. 1990, P.8 | 9 and P.39; Hutchinson W. 1973, P.30; MacKay J. Apr. 1969, P.14; O'Neill A., P.2 | 3; Walsh 1979, P.22 | 28



R. & R. DUDER BRICKWORKS, DEVONPORT, AUCKLAND.

MAP D2	Scale: 0.5 mm = 1.0 mt	N.Z.A.A. -
Surveyed & Drawn: A.J. Packington - Hall		
Site Type: Historic Brickworks	Grid Ref.:	

References:

Whites Aviation - Air Photo. 30495 - 21/10/59  
 D.O.S.L.I. - Deposited Plan 20927 - 19/9/27

Note:

Horizontal Scale Metric/Land Contour Heights Feet  
 Above Mean Low Water Level

20927



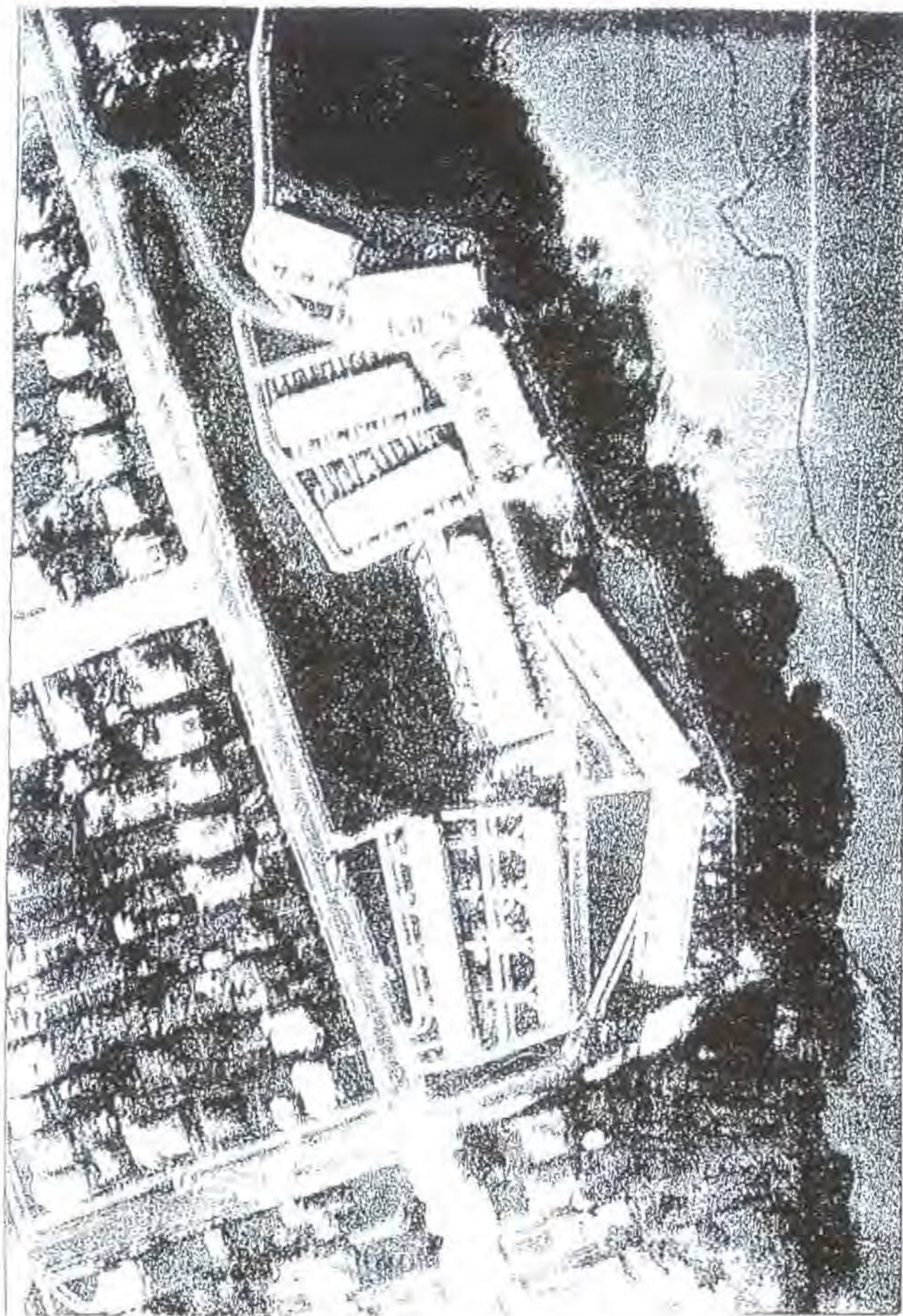


PLATE I: Aerial Photograph - Whites Aviation 30495, 21/10/59.  
R. and R. Duder brickworks site.





PLATE III: Aerial photograph - Whites Aviation 242009, 10/4/52,  
R. and R. Duder brickworks site.  
a. Circular kiln.  
b. Brickworks  
c. Clay pit.

APPENDIX D: Photographs of structural remains and artefactual material



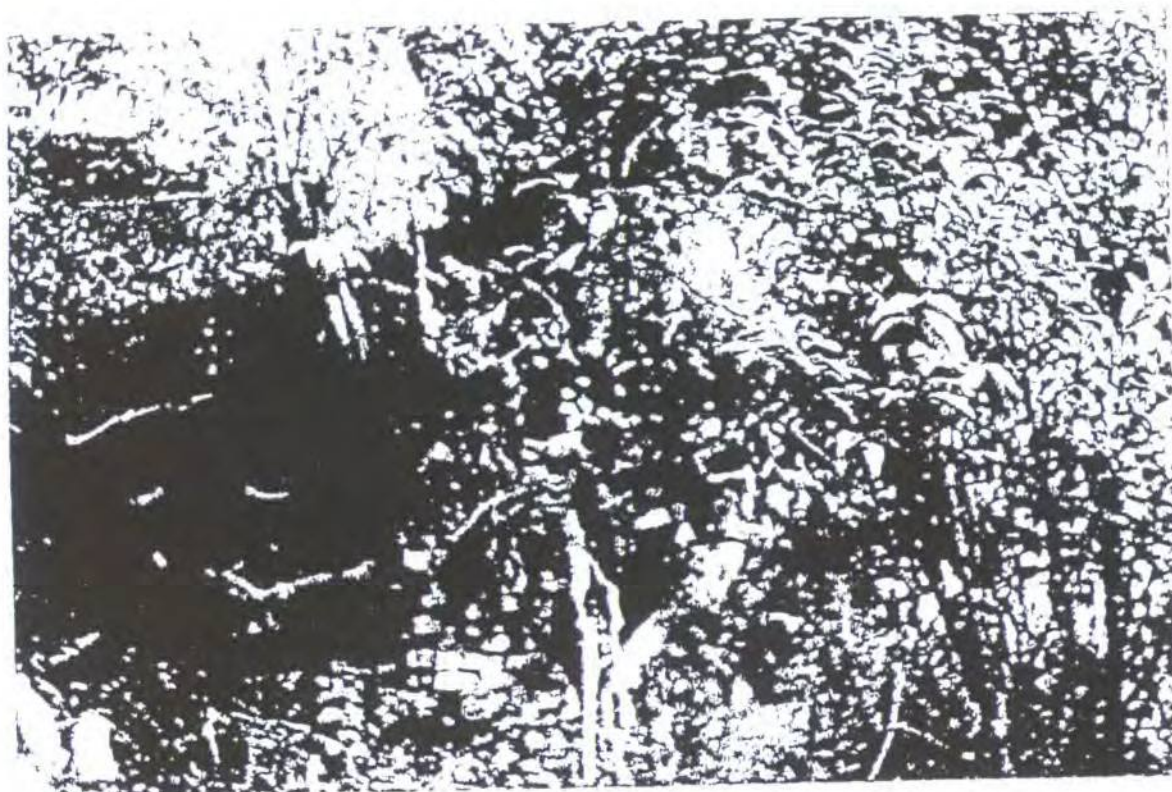


PLATE I: Brick structure under a large Pohutukawa tree on a platform near the shoreline at the R. and R. Duder brickworks site.  
(1992)



PLATE II: Scoria stone wall along the eastern shoreline at the  
R. and R. Duder brickworks site.  
(1992)





PLATE III: Wooden piles, remains of the R. and R. Duder brickworks  
wharfe.  
(1992)



PLATE IV: Squared scoria block in the vicinity of the shoreline  
scoria stone wall.  
(1992)

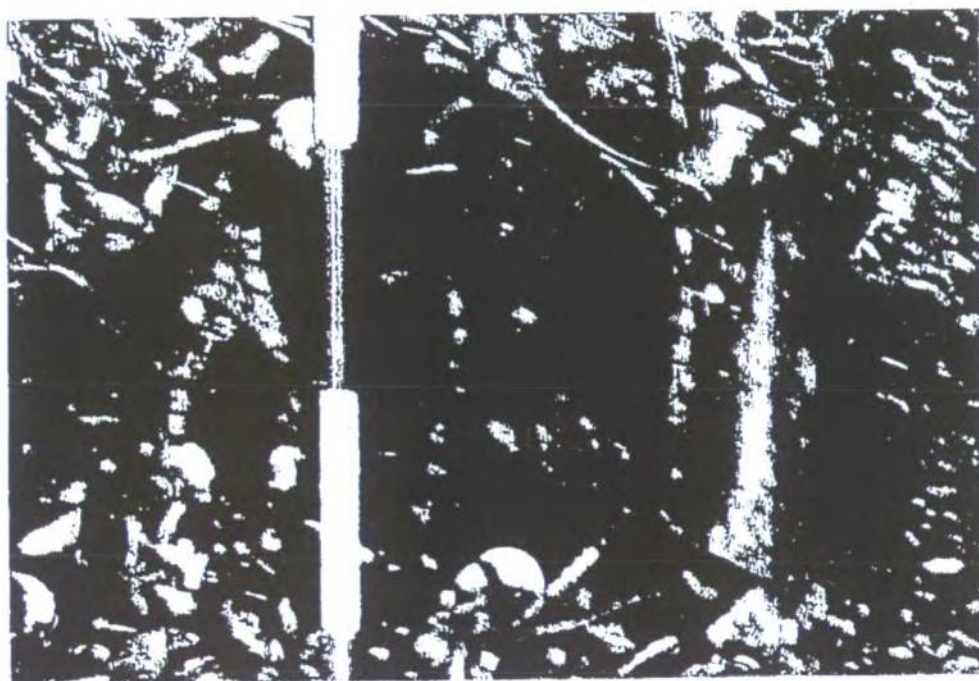


PLATE V: Machine part eroding from the bank immediately to the west of the sjoreline platform

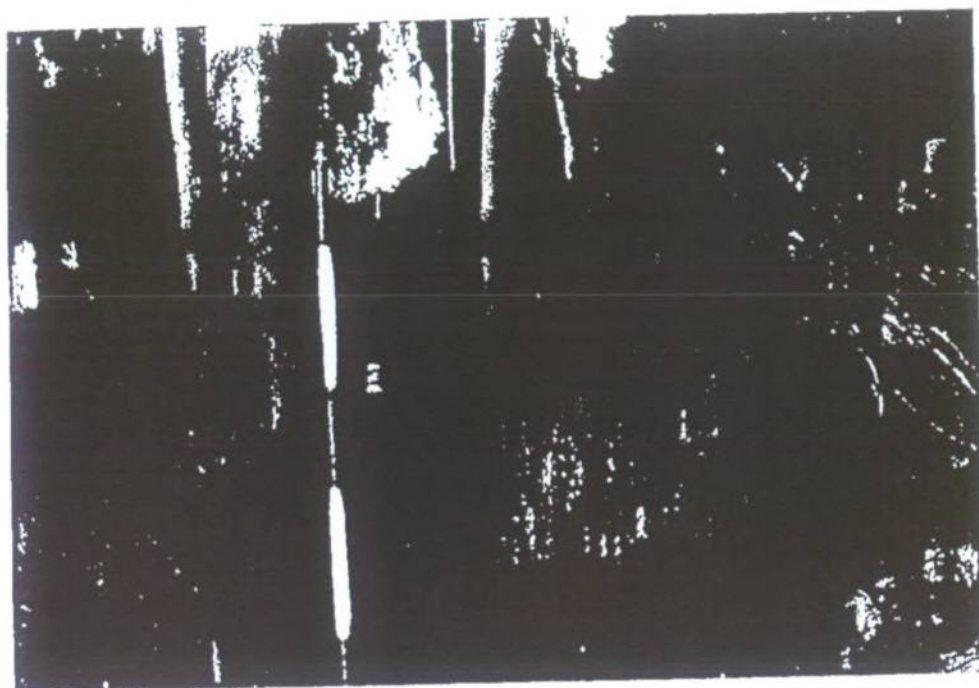


PLATE VI: Red chert pebble filled concrete structure eroding from  
a steep bank immediately to the west of the shoreline  
platform



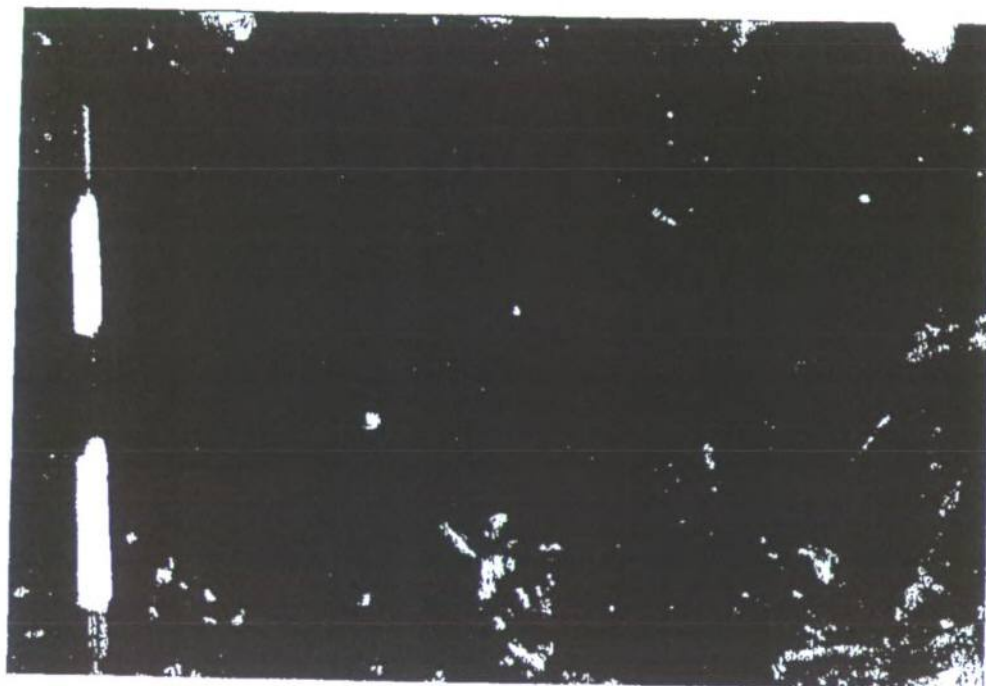
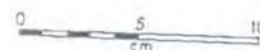
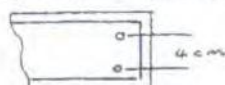


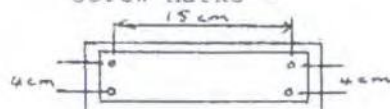
PLATE VII: Machine part under a red chert pebble filled concrete structure eroding from a steep bank immediately to the west of the shoreline platform.

UNIT NO. - D1  
 TYPE NO. - Db1  
 SITE FROM WHICH SAMPLE OBTAINED -  
 R. and R. Duder Brickworks  
 Devonport  
 Auckland  
 BRICK TYPE|VARIETY - Stock Brick (Peice)  
 METHOD OF MANUFACTURE - Hand Molded  
 MANUFACTORY IMPRESSIONS -  
 Brand - DUDER  
 Wirecuts - None  
 Screw Marks (Dims) -



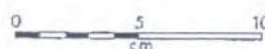
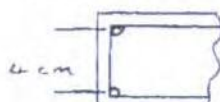
Frog Mark - Oblong|Rounded Sides  
 Other - Brand Lettering 25mm High  
 EXTERNAL APPEARANCE -  
 Size (L x B x T) - 11cm x 10.75cm x 6.5cm  
 Weight - 866.5gm  
 Colour (Munsell) - 10R 6|8 Reddish Orange  
 Condition - Friable  
 INTERNAL APPEARANCE -  
 Colour (Munsell) - 7.5YR 8|1 Light Grey  
 7.5Y 8|1 Light Grey Inclusions  
 Condition - Very Friable|Unevenly Mixed

UNIT NO. - D2  
 TYPE NO. - Db2  
 SITE FROM WHICH SAMPLE OBTAINED -  
 60 Beresford St.,  
 Bayswater,  
 Takapuna  
 BRICK TYPE|VARIETY - Pressed Brick  
 METHOD OF MANUFACTURE - Pressed  
 MANUFACTORY IMPRESSIONS -  
 Brand Name - R and R Duder  
 Wirecuts - Paralell to Edge  
 Screw Marks -



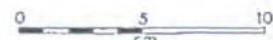
Frog Mark - Oblong|Square Sides  
 EXTERNAL APPEARANCE -  
 Size (L x B x T) - 22cm x 10.5cm x 7.75cm  
 Weight -  
 Colour (Munsell) - 2.5YR 7|6 Pale Yellowish Orange  
 2.5Y 8|4 Pale Yellow Inclusion  
 Condition - Hard  
 INTERNAL APPEARANCE -  
 Colour (Munsell) - 2.5YR 7|8 Orange  
 Condition - Hard|Unevenly mixed  
 GENERAL -  
 Obtained From The Remains OF A Chimney OF A House Built In 1911

UNIT NO. - D3  
 TYPE NO. - Db3  
 SITE FROM WHICH SAMPLE OBTAINED -  
 R. and R. Duder Brickworks  
 Devonport  
 Auckland  
 BRICK TYPE|VARIETY - Pressed Brick  
 METHOD OF MANUFACTURE - Pressed  
 MANUFACTORY IMPRESSIONS -  
 Brand Name - R and R  
 Wirecuts - Paralell To Edge  
 Screw Marks (Dims.) -



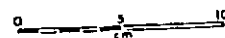
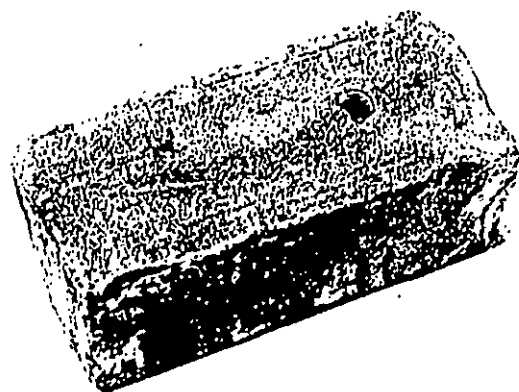
Frog Mark - Champfered Sides|Oblong  
 EXTERNAL APPEARANCE -  
 Size (L X B X T) - 11cm x 10.75cm x 6.5cm  
 Weight - 132.7gm  
 Colour (Munsell) - Glaze: 5YR 4|8 Reddish Brown  
 Unglazed: 7.5YR 8|4 Light Yellow Orange  
 Condition - Hard|Evenly Mixed  
 INTERNAL APPEARANCE -  
 Colour (Munsell) - 7.5 8|1 Light Grey  
 Condition - Hard|Very Evenly Mixed

UNIT NO. - D4  
 TYPE NO. - Db4  
 SITE FROM WHICH SAMPLE OBTAINED -  
 R. and R. Duder Brickworks  
 Devonport  
 Auckland  
 BRICK TYPE|VARIETY - Glazed Brick  
 METHOD OF MANUFACTURE - Wirecut  
 MANUFACTORY IMPRESSIONS -  
 Brand Name - None  
 Wirecuts - Paralell with edge  
 Screw Marks - None  
 Frog Mark - None  
 EXTERNAL APPEARANCE -  
 Size (L x B x T) - 21.25cm x 9.75cm x 6.75cm  
 Weight -  
 Colour (Munsell) - Glaze: 5YR 4|1 Brownish Grey  
 INTERNAL APPEARANCE -  
 Colour (Munsell) - 5YR 8|1 Light Grey  
 Condition - Hard|Evenly Mixed



UNIT NO. - D5  
TYPE NO. - D55  
SITE FROM WHICH SAMPLE OBTAINED -  
R. and R. Duder Brickworks  
Devonport  
Auckland  
BRICK TYPE|VARIETY - Common Brick  
METHOD OF MANUFACTURE - Wirecut  
MANUFACTORY IMPRESSIONS -  
Brand Name - None  
Wirecuts - Paralell to Edge  
Screw Marks (Dims.) - None  
Frog Mark - None  
EXTERNAL APPEARANCE -  
Size (L X B X T) - 23cm x 10.75cm x 8cm  
Weight -  
Colour (Munsell) - 5YR 8|3 Pale Orange  
Condition - Friable  
INTERNAL APPEARANCE -  
Colour (Munsell) - 7.5Y 8|1 Light Grey  
Condition - Friable|Unevenly Mixed

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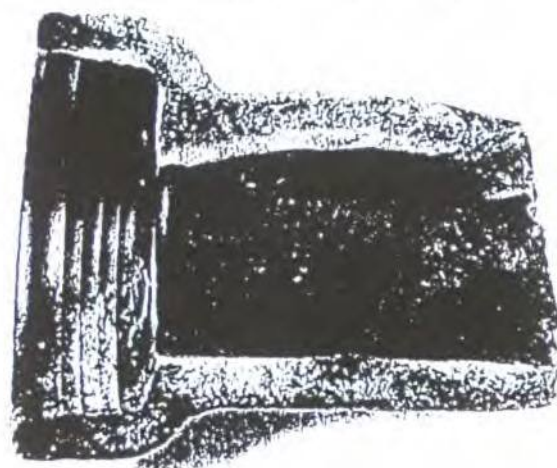




UNIT NO. - D6  
 TYPE NO. - Dp1  
 SITE FROM WHICH  
 SAMPLE OBTAINED -  
 R. and R. Duder Brickworks  
 Devonport  
 Auckland  
 BRICK TYPE/VARIETY -  
 Pipe  
 METHOD OF MANUFACTURE -  
 Machine  
 MANUFACTORY IMPRESSIONS -  
 Wirecuts - Parallel Across  
 End  
 EXTERNAL APPEARANCE -  
 Size (L x O.D. x I.D.) -  
 40.5cm x 20cm x 10cm  
 Colour (Munsell) -  
 Glaze: 2.5YR 6/8 Orange  
 Condition - Friable/Evenly Mixed  
 GENERAL -  
 This Type of Pipe Commonly Used As Chimney Flues For Coppers.



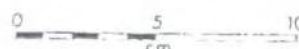
UNIT NO. - D7  
 TYPE NO. - Dp2  
 SITE FROM WHICH  
 SAMPLE OBTAINED -  
 R. and R. Duder Brickworks  
 Devonport  
 Auckland  
 METHOD OF MANUFACTURE -  
 Early Machine  
 EXTERNAL APPEARANCE -  
 Est. Pipe Diam. (O.D. x I.D.) -  
 17cm x 11.5cm  
 Est. Socket Diam. (O.D. x I.D.) -  
 21cm x 11.5cm  
 Size of Fragment (L x B) -  
 25cm x 19.5cm  
 Weight - 1878.3gm  
 Colour (Munsell) -  
 Glaze: 2.5YR 4/3 Dull Reddish Brown  
 INTERNAL APPEARANCE -  
 Colour (Munsell) - 2.5YR 4/3 Dull Reddish Brown  
 Condition - Friable/Evenly Mixed



UNIT NO. - D8  
 TYPE NO. - Dp3  
 SITE FROM WHICH  
 SAMPLE OBTAINED -  
 R. and R. Duder Brickworks  
 Devonport  
 Auckland  
 BRICK TYPE|VARIETY -  
 Pipe  
 METHOD OF MANUFACTURE -  
 Early Machine  
 EXTERNAL APPEARANCE -  
 Est. Pipe Diam. (O.D. x I.D.) -  
 27cm x 22cm  
 Est. Socket Diam. (O.D. x I.D.) -  
 37cm x 32cm  
 Size of Fragment (L x B) -  
 30cm x 15.5cm  
 Colour (Munsell) -  
 Glaze: 2.5YR 3|2 Dark Reddish Brown  
 INTERNAL APPEARANCE -  
 Colour (Munsell) -  
 2.5YR 7|8 Orange  
 Condition -  
 Hard|Evenly Mixed



UNIT NO. - D9  
 TYPE NO. - Dp4  
 SITE FROM WHICH  
 SAMPLE OBTAINED -  
 R. and R. Duder Brickworks  
 Devonport  
 Auckland  
 BRICK TYPE|VARIETY -  
 Pipe  
 METHOD OF MANUFACTURE -  
 EXTERNAL APPEARANCE -  
 Est. Pipe Diam. (O.D. x I.D.) -  
 11cm x 7.5cm  
 Size of Fragment (L x B) -  
 12cm x 12cm  
 Colour (Munsell) -  
 Slip: 7.5R 4|4 Dusky Red  
 Weight - 735.3gm  
 INTERNAL APPEARANCE -  
 Colour (Munsell) -  
 2.5YR Orange  
 Condition -  
 Hard|Evenly Mixed





UNIT NO. - D10  
TYPE NO. - Dp5  
SITE FROM WHICH  
SAMPLE OBTAINED -  
R. and R. Duder Brickworks  
Devonport  
Auckland  
BRICK TYPE|VARIETY -  
Pipe  
METHOD OF MANUFACTURE -

EXTERNAL APPEARANCE -  
Est. Pipe Diam. (O.D. x I.D.) -  
26cm x 21cm  
Size of Fragment (L x B) -  
26cm x 26cm  
Colour (Munsell)-  
2.5Y Very Dark Reddish Brown  
Weight -  
INTERNAL APPEARANCE -  
Colour (Munsell) -  
5YR 7/4 Dull Orange  
Condition -  
Hard|Evenly Mixed



UNIT NO. - D11  
TYPE NO. - Dp6  
SITE FROM WHICH  
SAMPLE OBTAINED -  
R. and R. Duder Brickworks  
Devonport  
Auckland  
BRICK TYPE|VARIETY -  
Pipe  
METHOD OF MANUFACTURE -

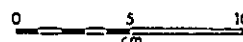
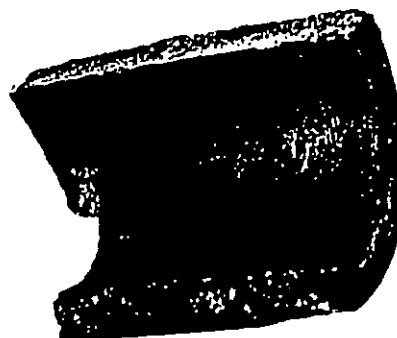
EXTERNAL APPEARANCE -  
Est. Pipe Diam. (O.D. x I.D.) -  
16cm x 10cm  
Size of Fragment (L x B) -  
22cm x 15cm  
Weight - 1477gm  
Colour (Munsell) -  
Glaze: 5YR 4/6 Reddish Brown  
INTERNAL APPEARANCE -  
Colour (Munsell) -  
Outside: 5G 7/1 Light Greenish Grey  
Core: 2.5YR Pale Reddish Orange  
Condition -  
Hard|Evenly Mixed



UNIT NO. - D12  
TYPE NO. - Dp6  
SITE FROM WHICH  
SAMPLE OBTAINED -  
R. and R. Duder Brickworks  
Devonport  
Auckland  
BRICK TYPE|VARIETY -  
Pipe  
METHOD OF MANUFACTURE -

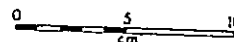
EXTERNAL APPEARANCE -  
Est. Pipe Diam. (O.D. x I.D.) -  
15cm x 11cm  
Size of Fragment (L x B) -  
17cm x 14cm  
Weight - 871.7gm  
Colour (Munsell) -

INTERNAL APPEARANCE -  
Colour (Munsell) -  
7.5YR 8|6 Light Orange Yellow  
Condition - Hard|Evenly Mixed



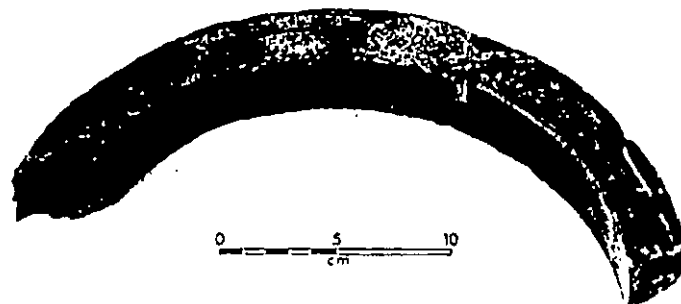
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UNIT NO. - D13  
TYPE NO. - Dp7  
SITE FROM WHICH  
SAMPLE OBTAINED -  
R. and R. Duder Brickworks  
Devonport  
Auckland  
BRICK TYPE|VARIETY -  
Pipe Socket  
METHOD OF MANUFACTURE -  
Hand (Wheel)  
EXTERNAL APPEARANCE -  
Est. Socket Diam. (O.D. x I.D.) -  
20cm x 15cm  
Weight - 1438.5gm  
Colour (Munsell) -  
Glaze: 10YR 7|4 Dull Yellow Orange  
INTERNAL APPEARANCE -  
Colour (Munsell) -  
5YR 8|7 Pale Orange  
Condition -  
Hard|Evenly Mixed



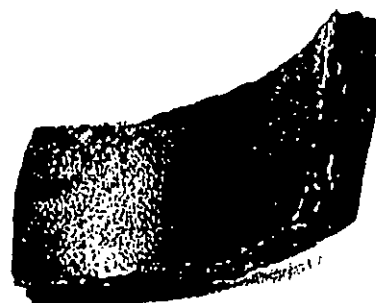


UNIT NO. - D14  
TYPE NO. - Dt1  
SITE FROM WHICH  
SAMPLE OBTAINED -  
R. and R. Duder Brickworks  
Devonport  
Auckland  
BRICK TYPE|VARIETY -  
Kiln Test Peice  
EXTERNAL APPEARANCE -  
Size (L x B x T) -  
27cm x 4.5cm x 3.75cm  
Colour (Munsell) -  
Slip: 5YR 3|4 Dark Reddish Brown  
Weight - 736.8gm  
INTERNAL APPEARANCE -  
Colour (Munsell)-  
5YR 8|2 Light Grey  
Condition -  
Hard|Evenly Mixed

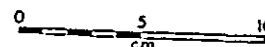
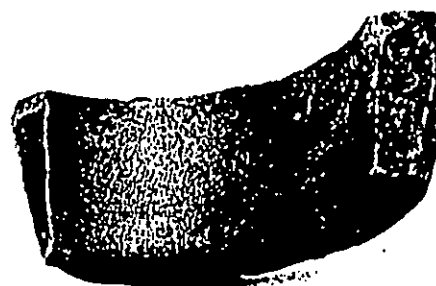


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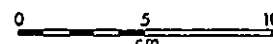
UNIT NO. - D15  
TYPE NO. - Dt2  
SITE FROM WHICH  
SAMPLE OBTAINED -  
R. and R. Duder Brickworks  
Devonport  
Auckland  
EXTERNAL APPEARANCE -  
Size (L x B x T) -  
17.5cm x 7.5cm x 2.5cm  
Colour (Munsell) -  
Glaze: 2.5YR 3|3 Dark Reddish Brown  
Weight - 635.7gm  
INTERNAL APPEARANCE -  
Colour (Munsell) -  
2.5YR 6|3 Dull Orange  
Condition -  
Hard|Evenly Mixed



UNIT NO. - D16  
 TYPE NO. - Dt3  
 SITE FROM WHICH  
 SAMPLE OBTAINED -  
 R. and R. Duder Brickworks  
 Devonport  
 Auckland  
 BRICK TYPE|VARIETY -  
 Kiln Test Peice  
 EXTERNAL APPEARANCE -  
 Size (L x B x T) -  
 19cm x 7.5cm x 4.8cm  
 Weight -  
 Colour (Munsell) -  
 Slip:2.5YR 5|2 Greyish Red  
 INTERNAL APPEARANCE -  
 Colour (Munsell) -  
 Outside:2.5YR 7|4 Pale Reddish Orange  
 Core:2.5YR 6|1 Reddish Grey  
 Condition -  
 Hard|Evenly Mixed

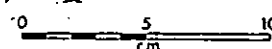


UNIT NO. - D17  
 TYPE NO. - Dt4  
 SITE FROM WHICH  
 SAMPLE OBTAINED -  
 R. and R. Duder Brickworks  
 Devonport  
 Auckland  
 EXTERNAL APPEARANCE -  
 Size (L x B x T) -  
 16cm x 7.5cm x 5.5cm  
 Weight - 631.7gm  
 Colour (Munsell) -  
 Glaze:2.5Gy 7|1 Light Olive Grey  
 INTERNAL APPEARANCE -  
 Colour (Munsell) -  
 2.5YR 7|6 Orange  
 7.5Y 8|1 Light Grey, Inclusion  
 7.5Y 4|1 Grey, Inclusion  
 Condition -  
 Friable|Unevenly Mixed

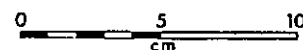
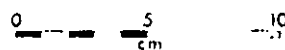


UNIT NO. - D18  
TYPE No. - Dt4  
SITE FROM WHICH  
SAMPLE OBTAINED -  
R. and R. Duder Brickworks  
Devonport  
Auckland  
BRICK TYPE|VARIETY -  
Kiln Test Peice  
EXTERNAL APPEARANCE -  
Size (L x B x T) -  
16.5cm x 6.7cm x 5.3cm  
Weight -  
Colour (Munsell) -  
Glaze:7.5Y 6|2 Greyish Olive  
INTERNAL APPEARANCE -  
Colour (Munsell) -  
10R 6|8 Reddish Orange  
Condition -  
Hard|Evenly Mixed

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UNIT NO. - D19  
TYPE NO. - Dc1  
SITE FROM WHICH  
SAMPLE OBTAINED -  
R. and R. Duder Brickworks  
Devonport  
Auckland  
BRICK TYPE|VARIETY -  
Inspection Cover  
METHOD OF MANUFACTURE -  
Hand  
EXTERNAL APPEARANCE -  
Size (L x B x T) -  
14cm x 11.5cm x 2.2cm  
Weight - 579.6gm  
Colour (Munsell) -  
Glaze: 10R 3|4 Reddish Brown  
INTERNAL APPEARANCE -  
Colour (Munsell) -  
5YR 8|4 Pale Orange  
Condition -  
Hard|Evenly Mixed



UNIT NO. - D20  
TYPE NO. - Dn1  
SITE FROM WHICH  
SAMPLE OBTAINED -

BRICK TYPE/VARIETY -  
Novelty Item  
METHOD OF MANUFACTURE -  
Hand  
EXTERNAL APPEARANCE -  
Size (L x H x W) -

Colour (Munsell) -  
Glaze: 2.5YR 4/3 Dull Reddish Brown  
INTERNAL APPEARANCE -  
Colour (Munsell) -  
5YR 7/4 Dull Orange  
Condition -  
Hard/Evenly Mixed  
GENERAL -  
Garden Seat



UNIT NO. - D21  
TYPE NO. - Dn1  
SITE FROM WHICH  
SAMPLE OBTAINED -

BRICK TYPE/VARIETY -  
Novelty Item  
METHOD OF MANUFACTURE -  
Hand  
EXTERNAL APPEARANCE -  
Size (L x H x W) -

Colour (Munsell) -  
2.5YR 3/2 Dark Reddish Brown: Glaze  
INTERNAL APPEARANCE -  
Colour (Munsell) -  
2.5YR 7/8 Orange  
Condition -  
Hard/Evenly Mixed



UNIT NO. - D22 and D23  
TYPE NO. - Dn2  
SITE FROM WHICH  
SAMPLE OBTAINED -  
M. Philson Collection  
Glenfeild  
Auckland  
BRICK TYPE|VARIETY -  
Novelty Item  
MANUFACTORY IMPRESSIONS -  
Brand Name -



EXTERNAL APPEARANCE -  
Colour (Munsell) -  
(D21)Glaze:2.5YR 3|3 Dull Reddish Brown  
(D22)Glaze:5YR 3|4 Dark Reddish Brown  
INTERNAL APPEARANCE -  
Colour (Munsell) -  
(D21)10R 6|8 Reddish Orange  
(D22)2.5YR 7|6 Orange  
Condition -  
(D21 and D ) Hard|Evenly Mixed  
GENERAL -  
D21 and D22 appear in photograph dated c1907 (Philson M. 1990,P.86)

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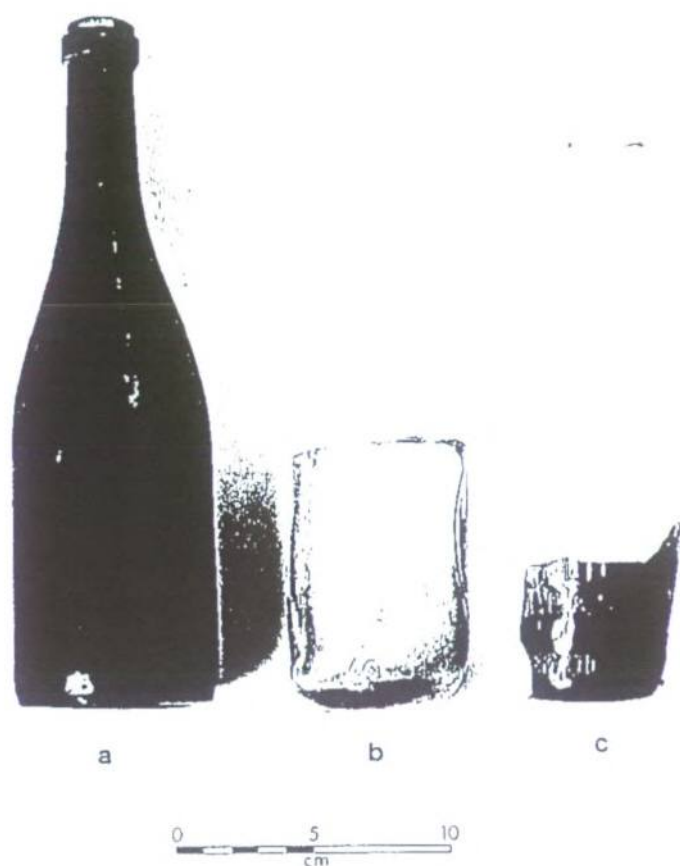


PLATE I: a. Green beer bottle with separate 'applied top', bare iron pontil, and two piece molded body. This type of bottle was developed from the French Champagne bottle, and were used in New Zealand due to the lack of any others designed for the purpose from the late 1870's to 1912. (Tasker J. 1984)  
 b. Clear bottle fragment, possibly 1920's. (Tasker J. 1984)  
 c. Olive Green bottle fragment, possibly 1920's (Tasker J. 1989).





PLATE II: a. Grey and Menzies soft drink bottle 1920's. (Tasker J. 1989 )  
b. Clear glass octagonal bottle, 1920's. (Tasker J. 1989)  
c. Gordons Gin bottle, possible late nineteenth century. (Tasker J. 1984)  
d. Circular section, clear glass bottle, probably 1890|1900. (Tasker J. 1989)



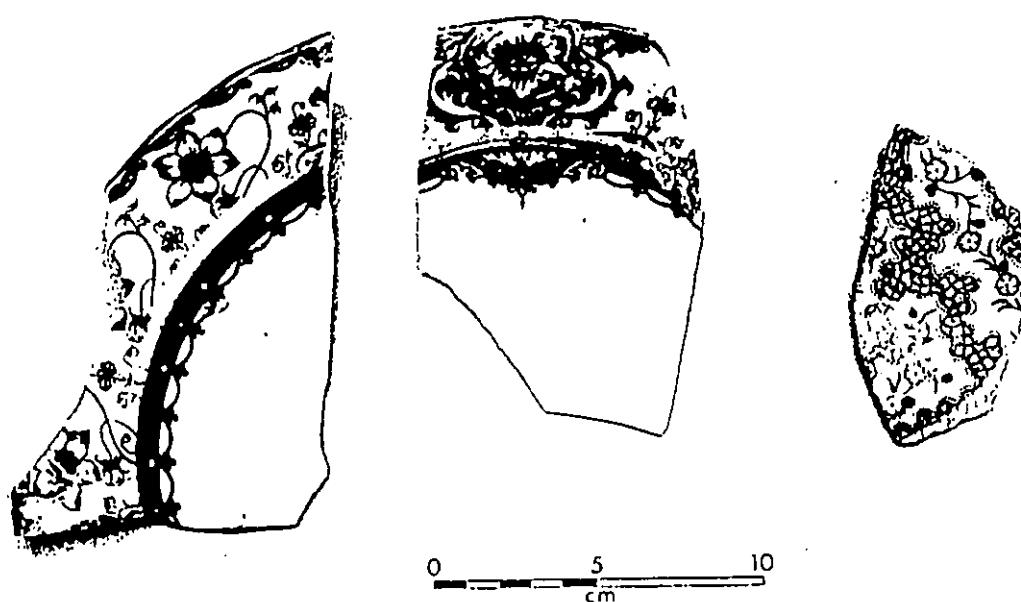


PLATE IV: Domestic china fragments, undated

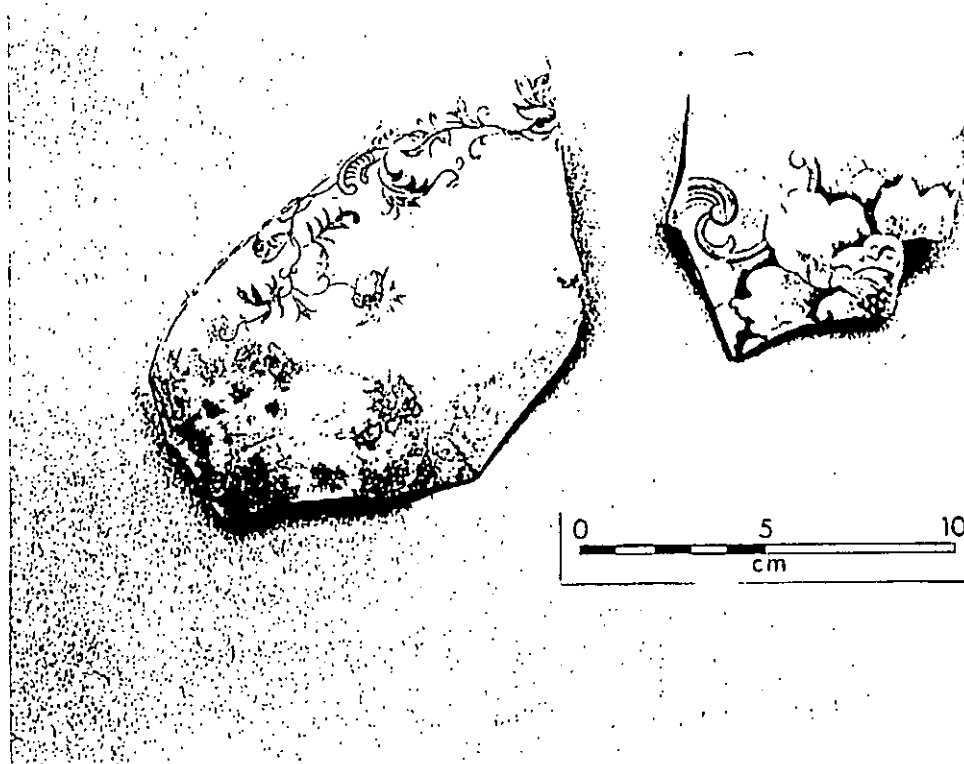


PLATE V: Domestic china fragments, undated.

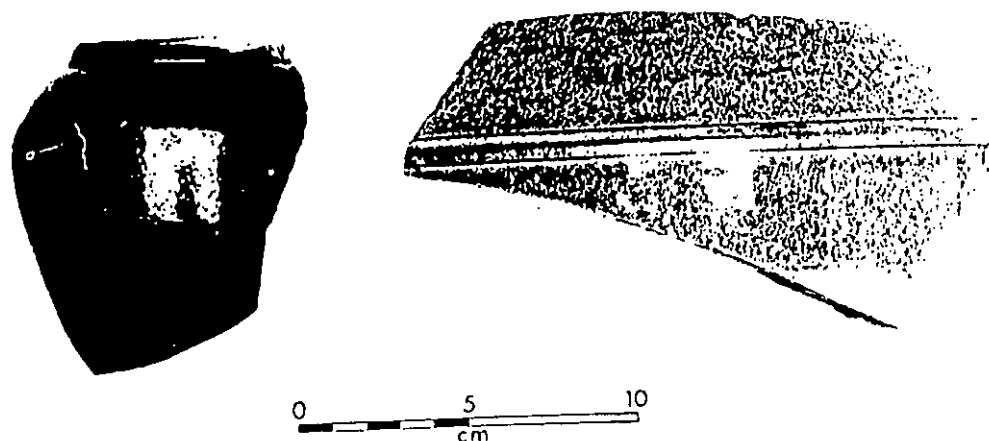


PLATE VI: Domestic china fragments, undated

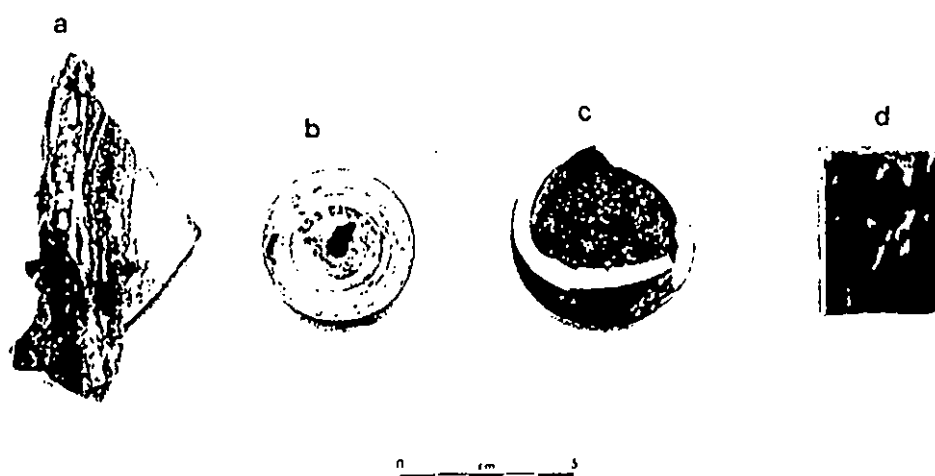


PLATE VII: a. Burned domestic china fragment, undated.  
b. Porcelaine furniture castor, undated.  
c. Domestic china fragment, undated.  
d. Green pocelaine tile, undated.

APPENDIX H: Types of heavy clay manufacturing machines and equipment  
in use c 1875|c 1890.

PLATE I: Method of hand manufacturing bricks.



a



b



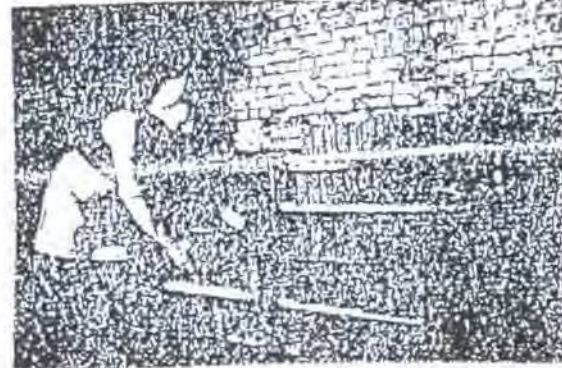
c



d



e



f

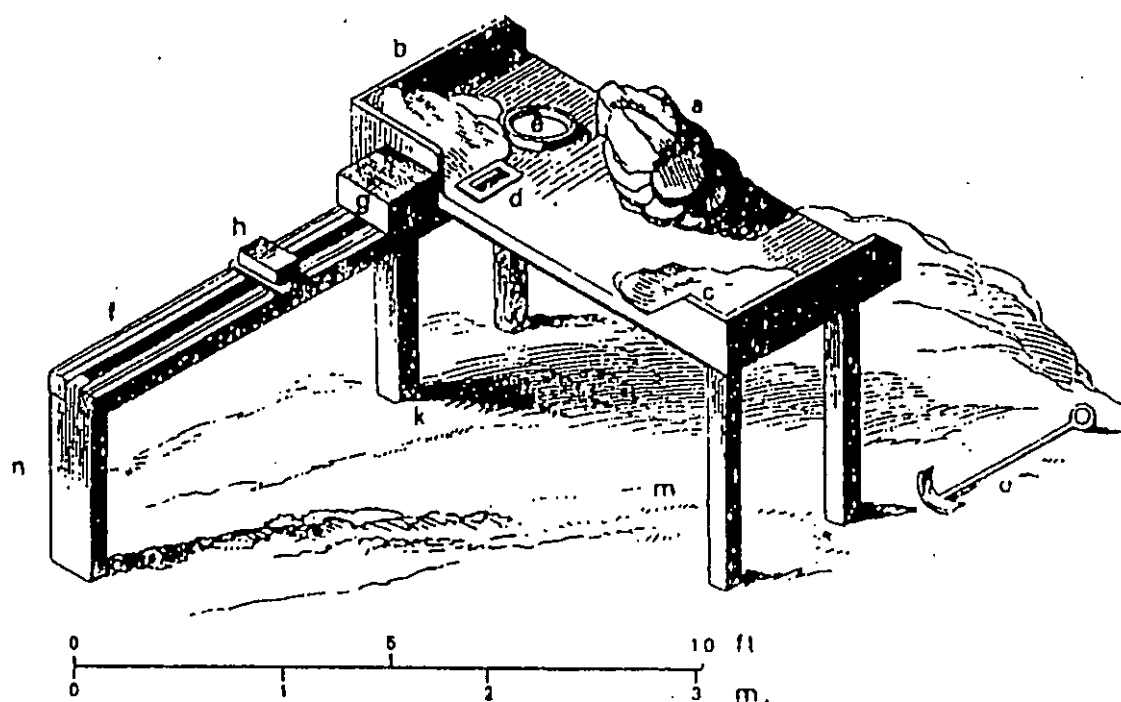
- a. Taking clay from a heap on the bench, "two handed cuckle."
- b. Forming a "clot" by rolling in dry sand.
- c. Throwing the clot into the wooden mold.
- d. Cutting off the excess clay with a wire bow.
- e. Mold lifted off the "stock board" and turned out onto the "pallet".
- f. Bricks stacked in "stallage" to dry

(Hammond M. 1981, P.11|14)



PLATE II: Molders table used in the hand manufacture of brick.

A4



- a. Clot of clay after pugging.
- b. Molders sand.
- c. Clot molders sand.
- d. Stock board.
- e. Water tub.
- f. The Page, new bricks on pallets are placed here and slide away from the molder.
- g. Pallets awaiting use.
- h. A newly made brick, ready for the taking off boy.
- k. The molders place.
- o. The Cuckold, a concave shovel used for cutting off the ground earth as it is ejected from the pugmill.

(Woodforde J. 1976, P.99)

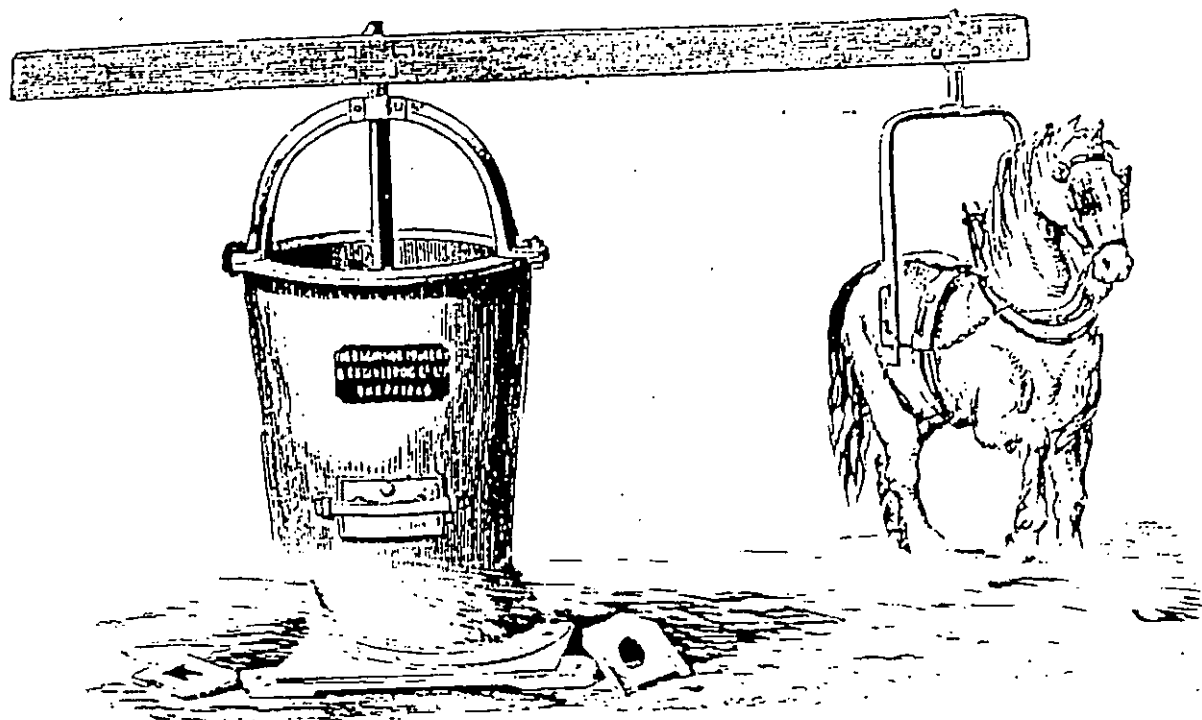


PLATE III: A horse powered pugmill, c 1830.  
(Bourry E. 1926, P.279)

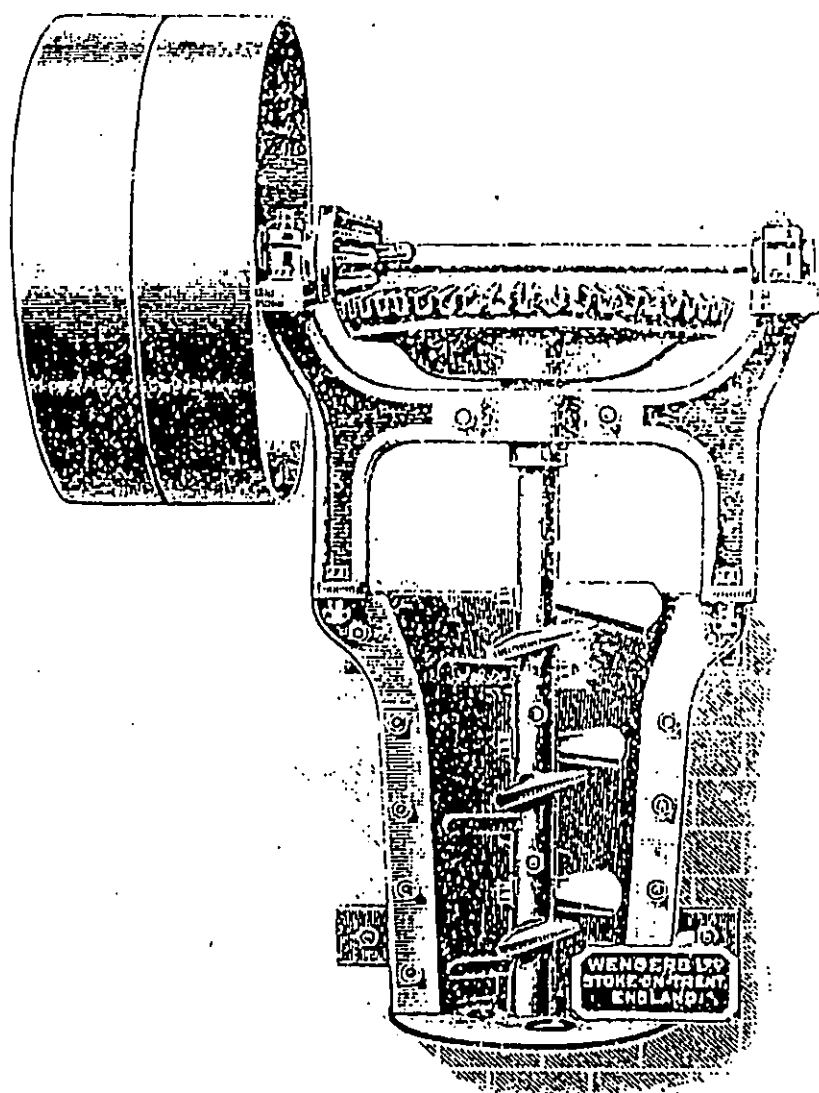


PLATE IV: A steam powered vertical pugmill, c 1850.  
(Dobson E. 1903, P.182)

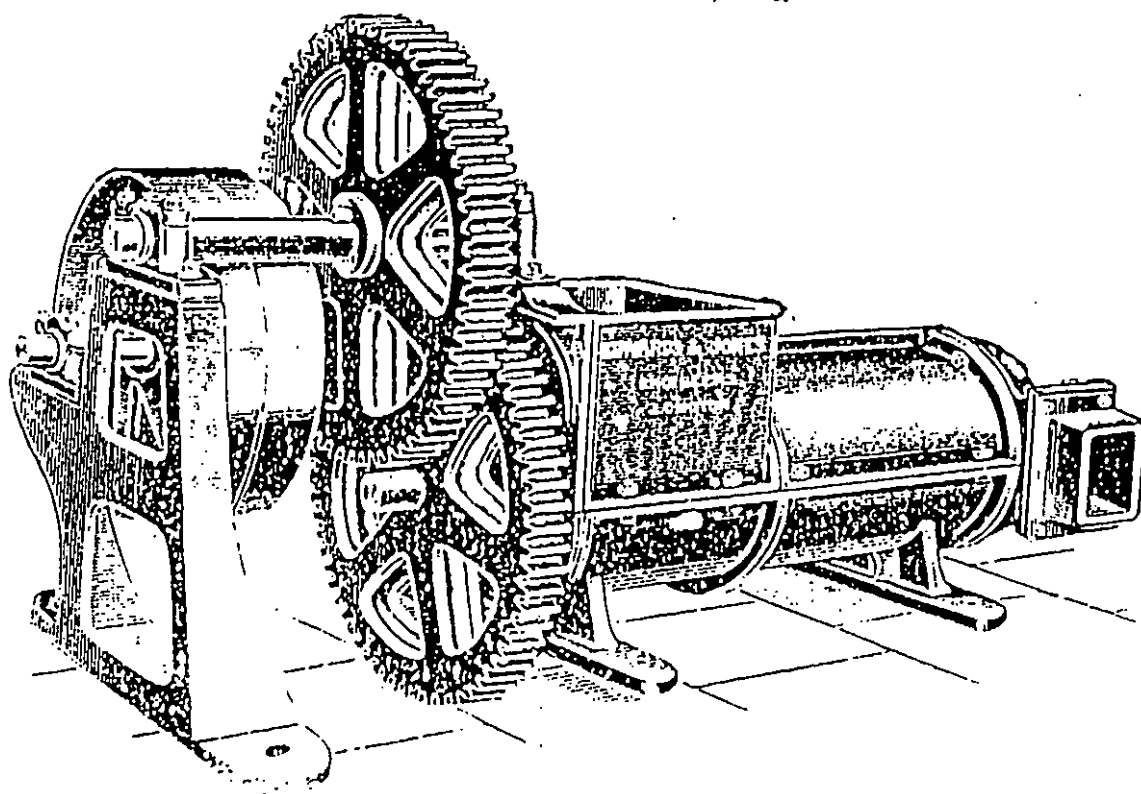


PLATE V: A steam powered horizontal pugmill, c 1860.  
(Bourry E. 1926, P.95)

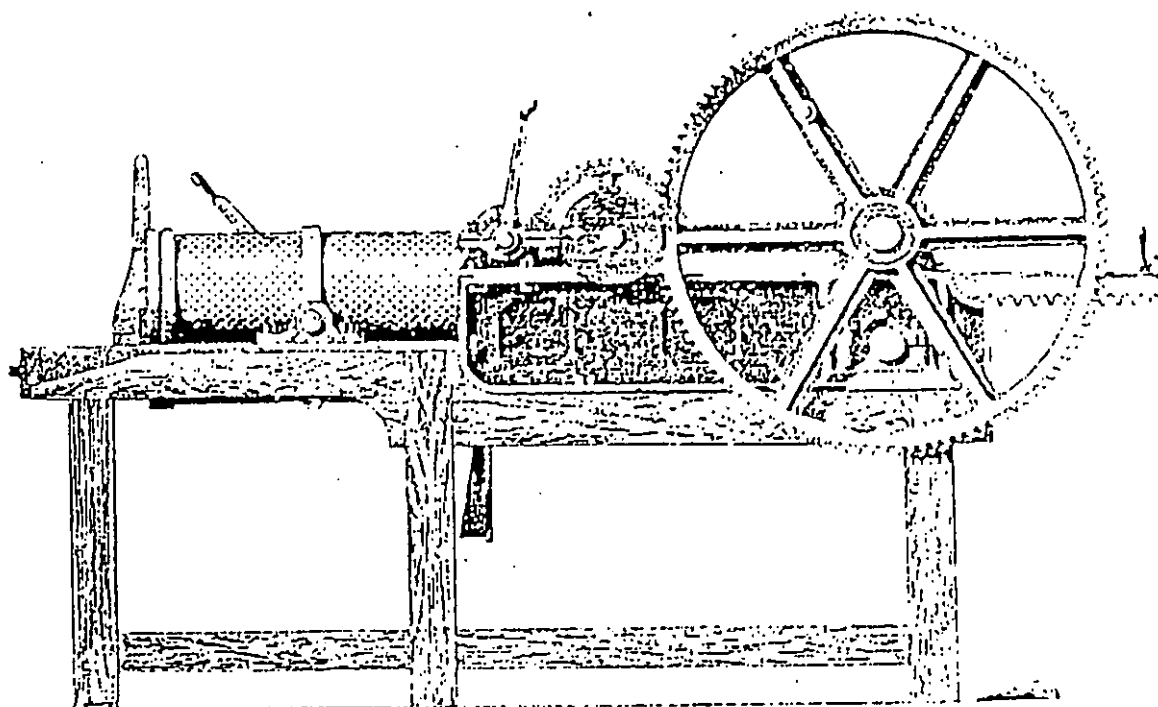


PLATE VI: An early clay seperator, c 1850.  
(Bourry E. 1926, P.78)

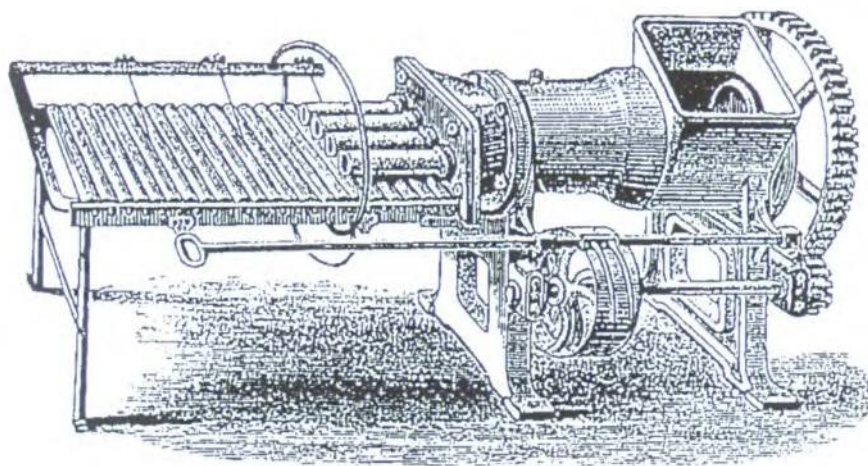


PLATE VII: The R.O. Clark ceramic pipe manufacturing machine patented  
by an Auckland brickmaker in 1863.  
(Scott D. 1979,P99)



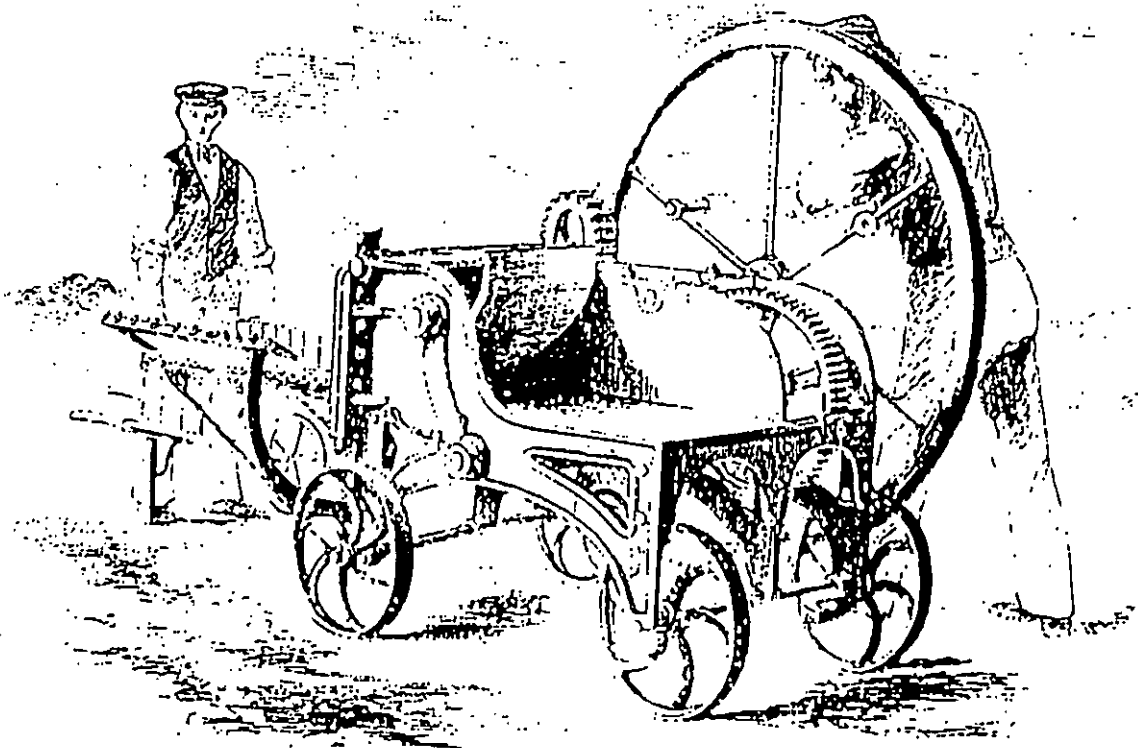


PLATE VIII: The Bulmer and Sharp man powered brickmaking machine,  
c 1850.  
(Woodforde J. 1976, P.113)

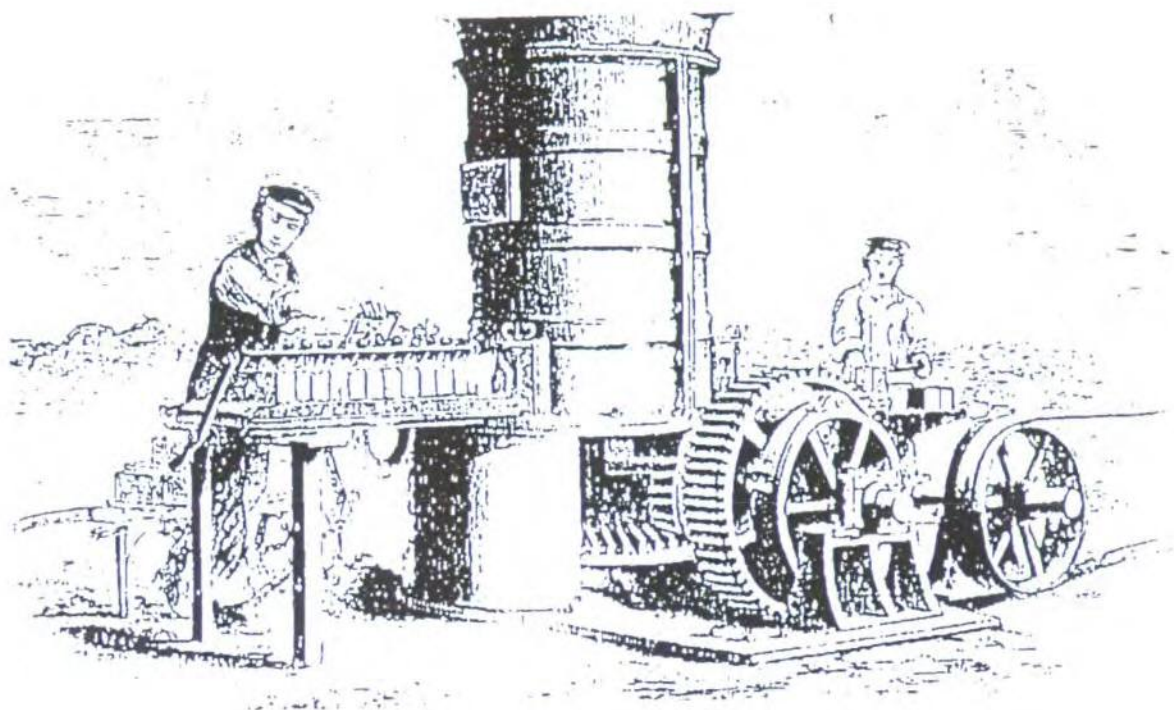


PLATE IX: Bulmer and Sharp steam powered brickmaking machine, 1861.  
(Woodforde J. 1976, P.120)

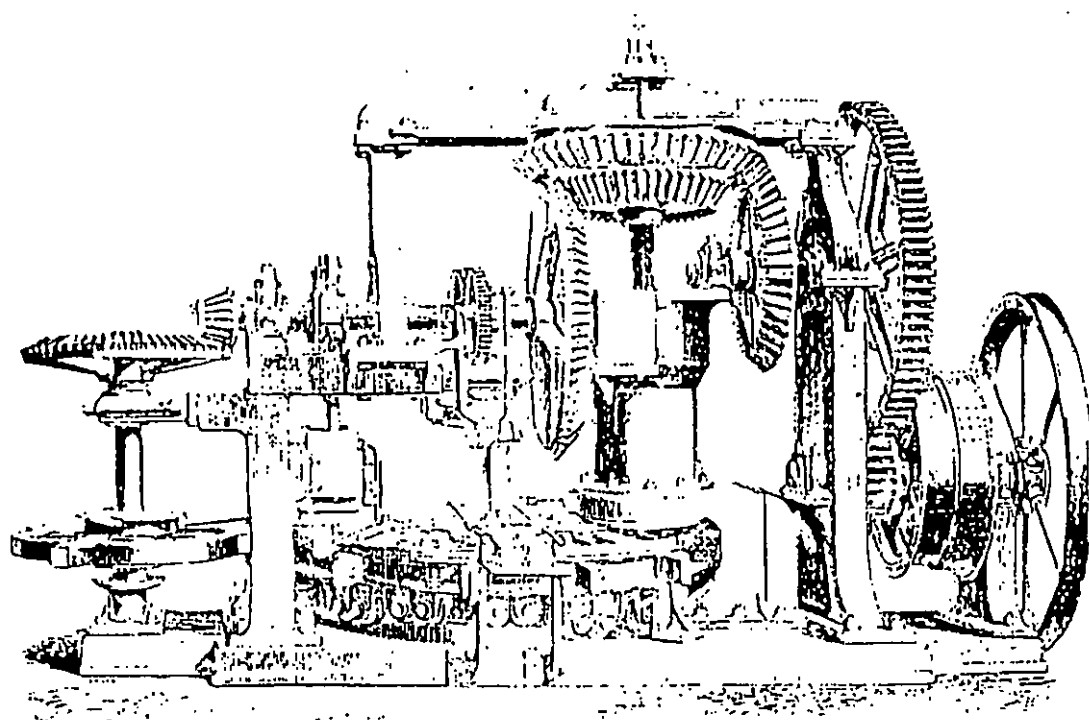


PLATE X: A Bradley and Craven brickmaking machine, c 1850.  
(Woodforde J. 1976, P.122)

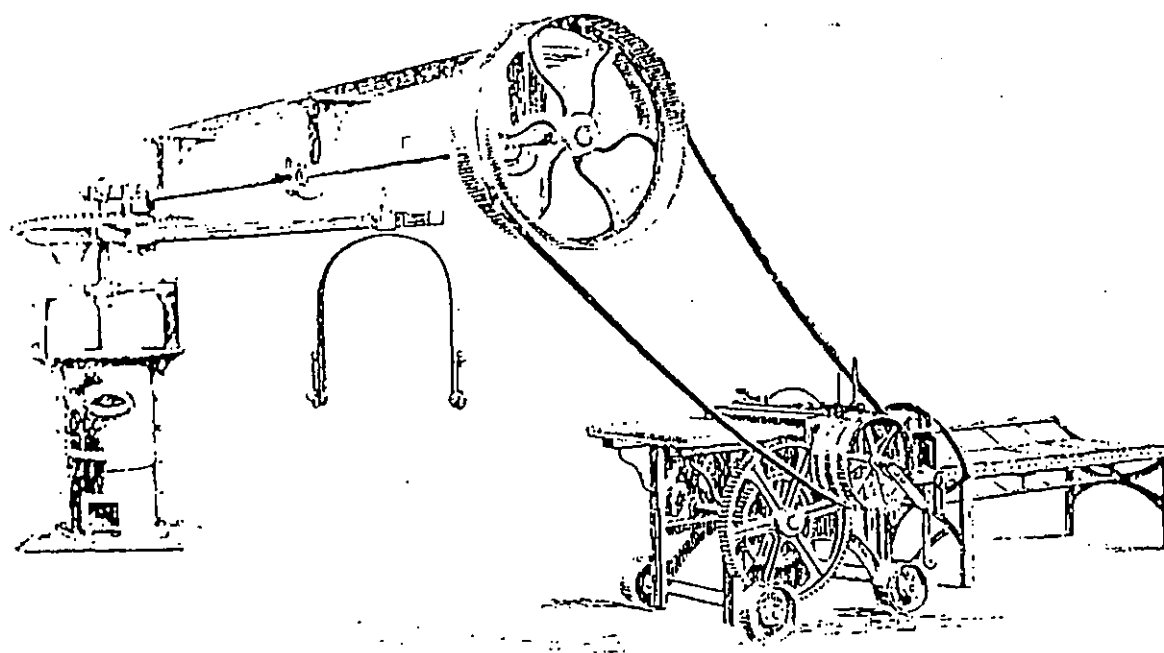


PLATE XI: Early nineteenth century wire-cut machine.  
(Woodforde J. 1976, P.115)

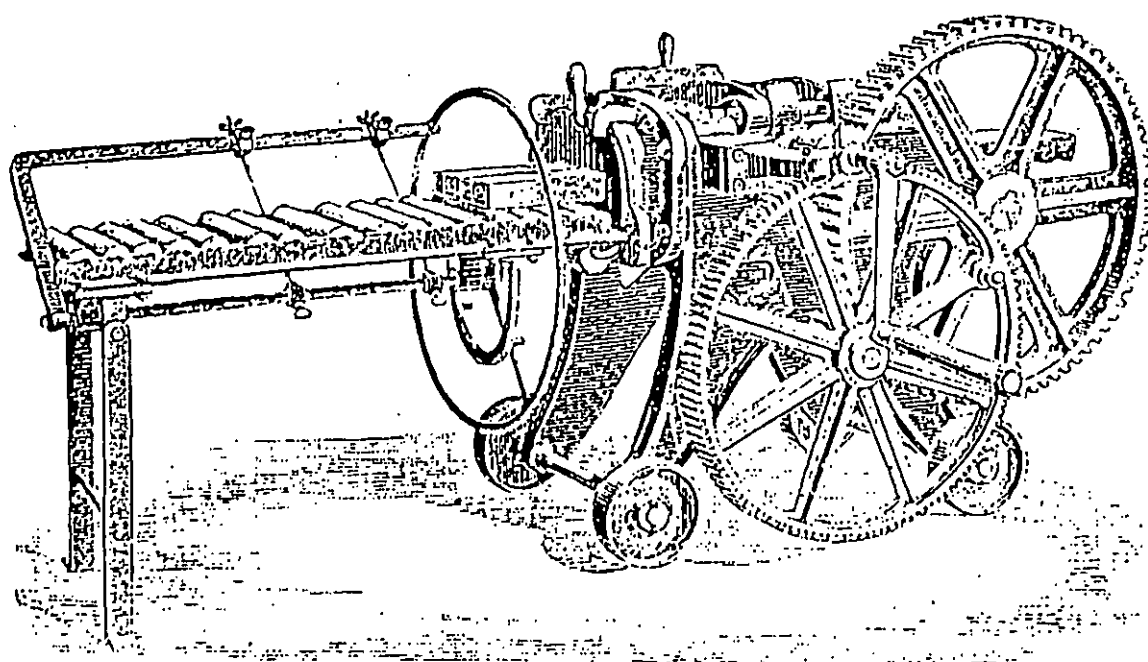


PLATE XII: A 'stupid', c 1850.  
(Bourry E. 1926, P.120)

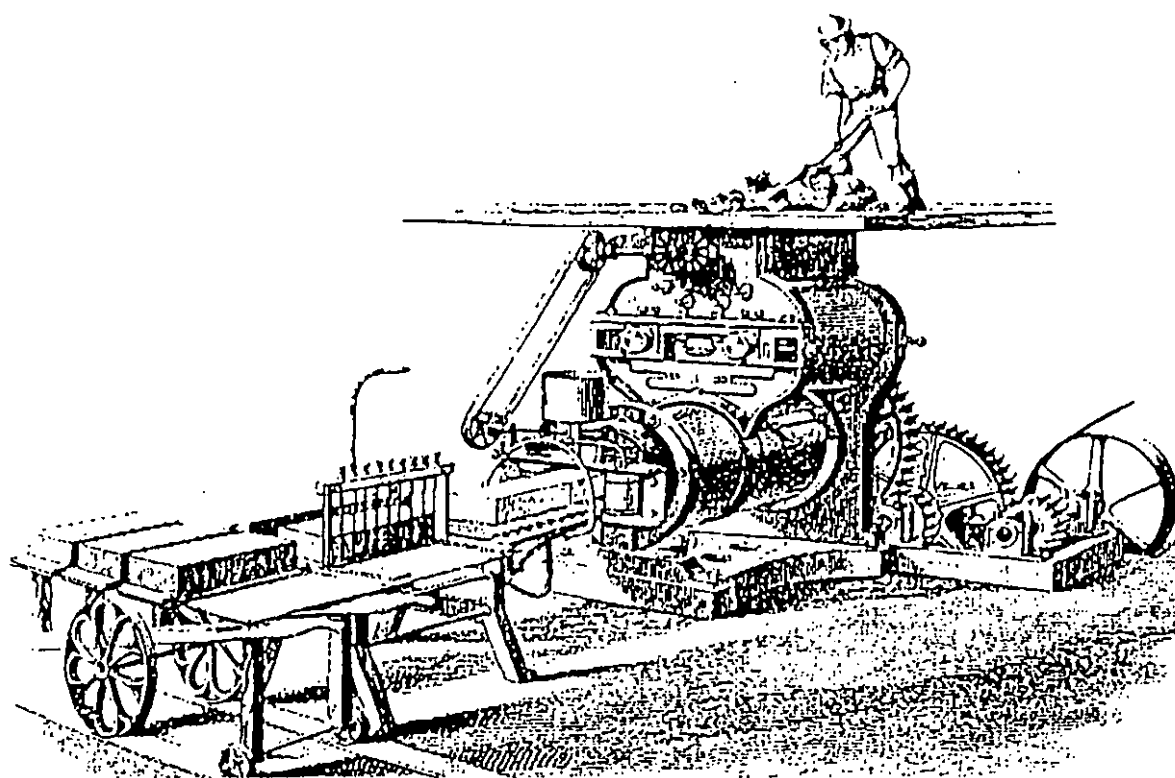


PLATE XIII: A Clayton combined process machine, 1860.  
(Woodforde J. 1979, P. 121)

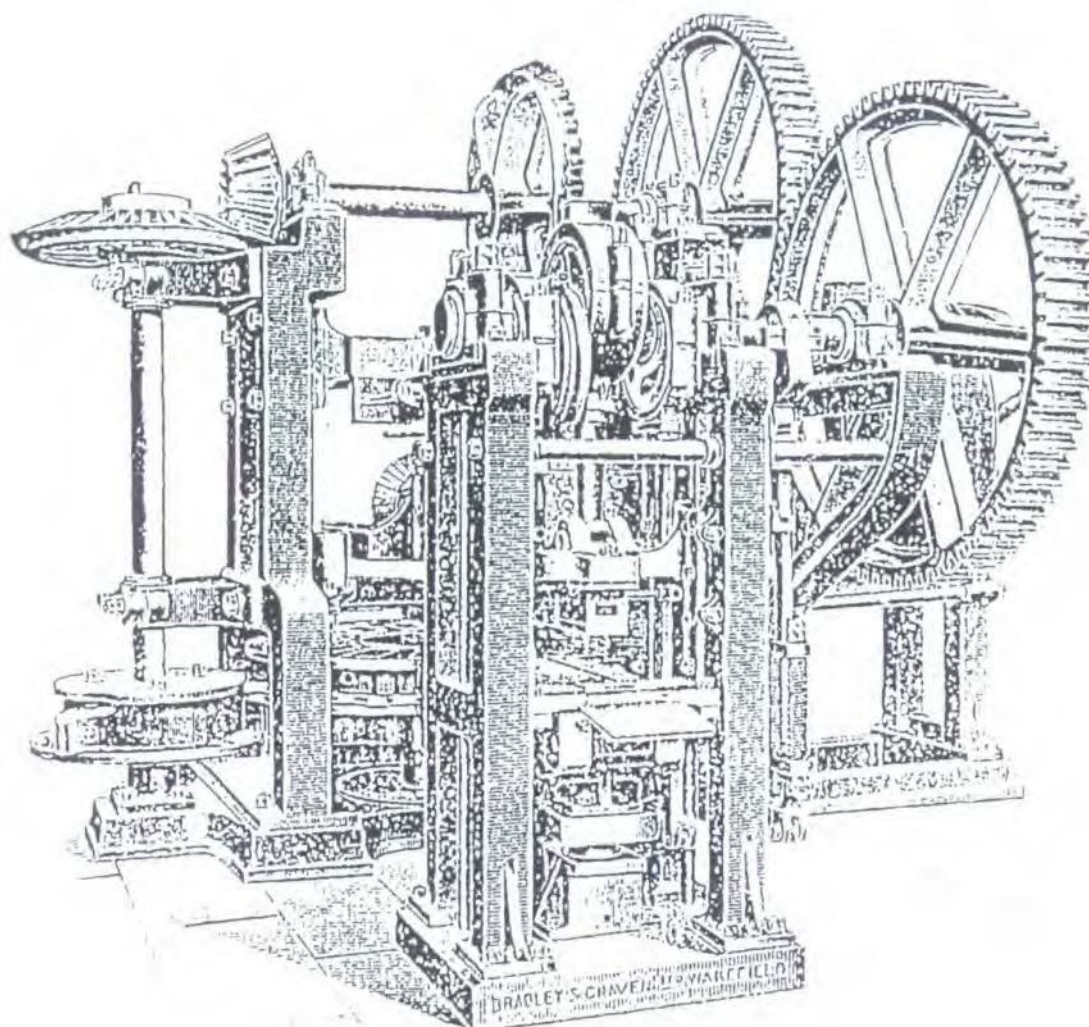


PLATE XIV: A Bradley and Craven stiff plastic machine with mixer, vertical pugmill, a rotating mold table, and press. This machine was patented in 1859. (Hammond M. 1981, P.18)



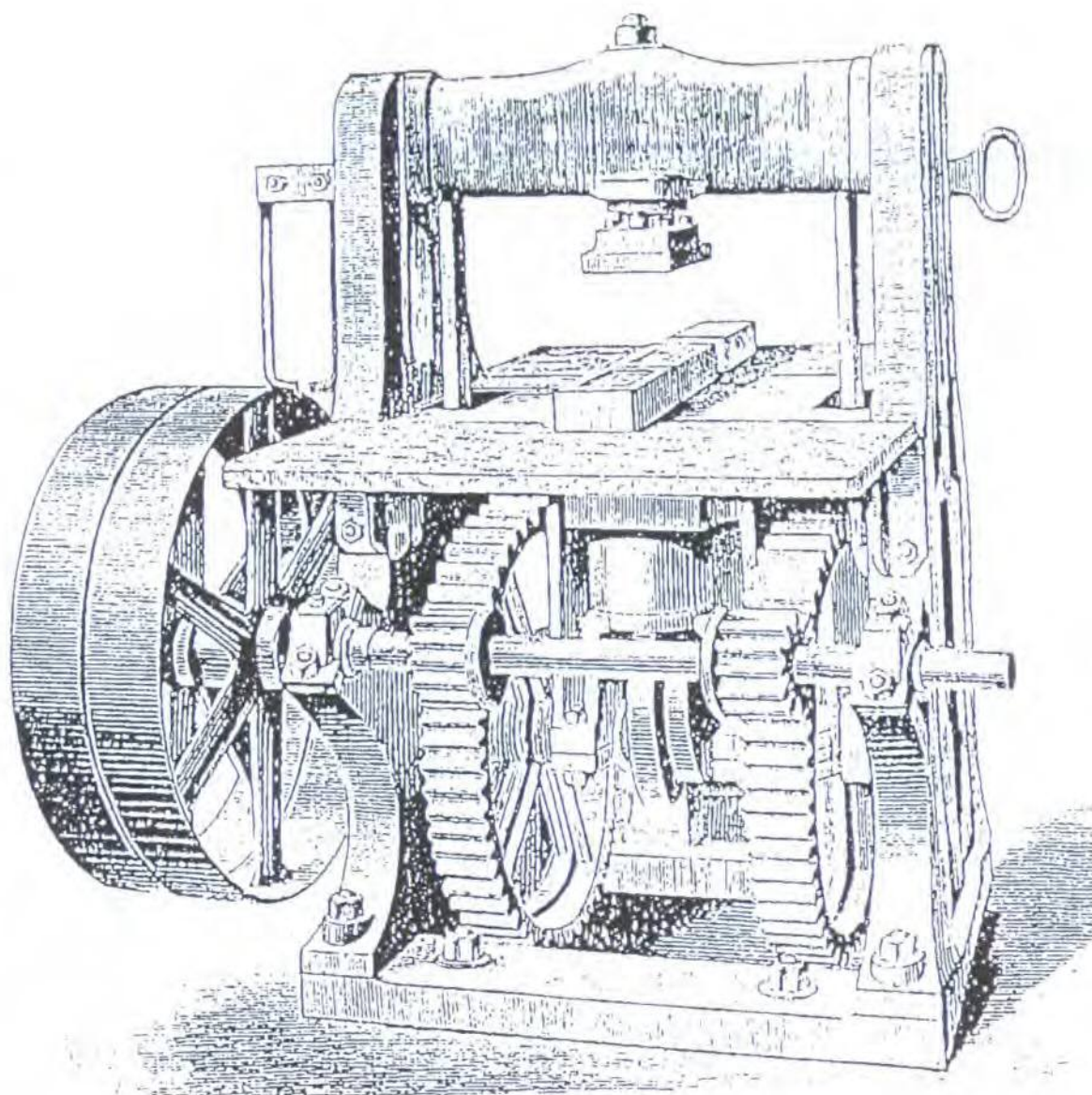


PLATE XV: A Clayton repress, c 1850.  
(Bourry E. 1926, P. 239)

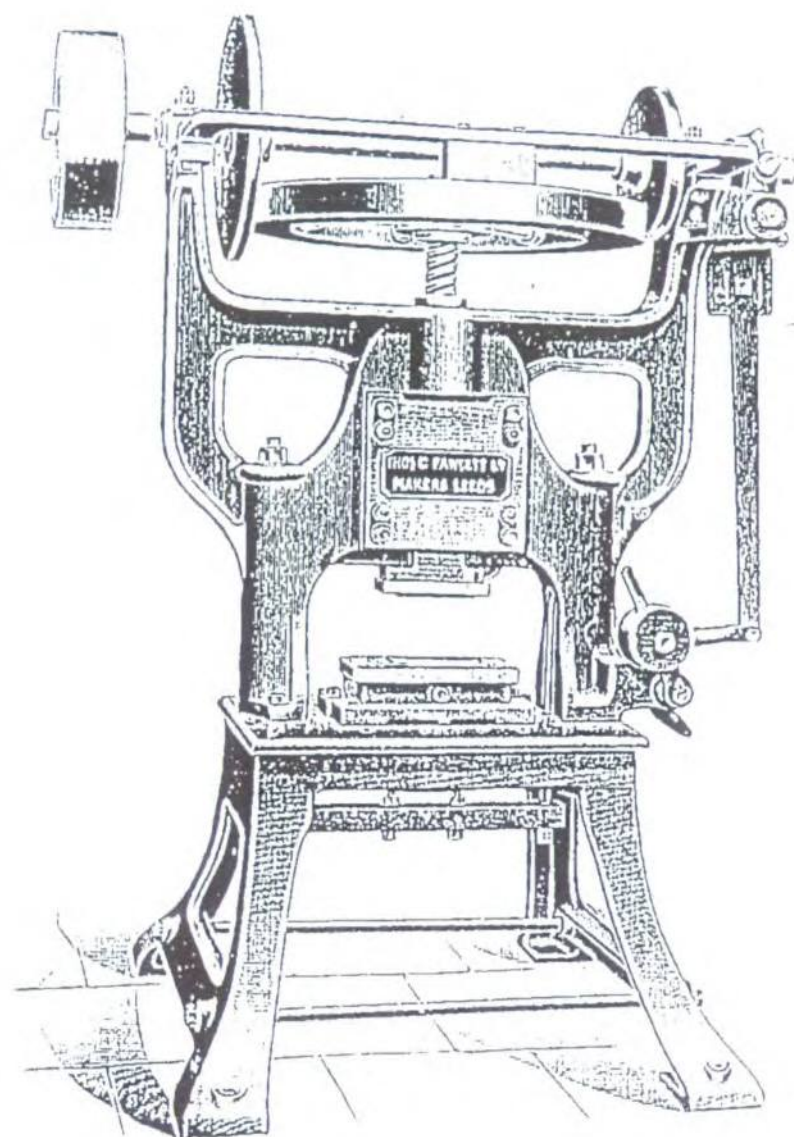


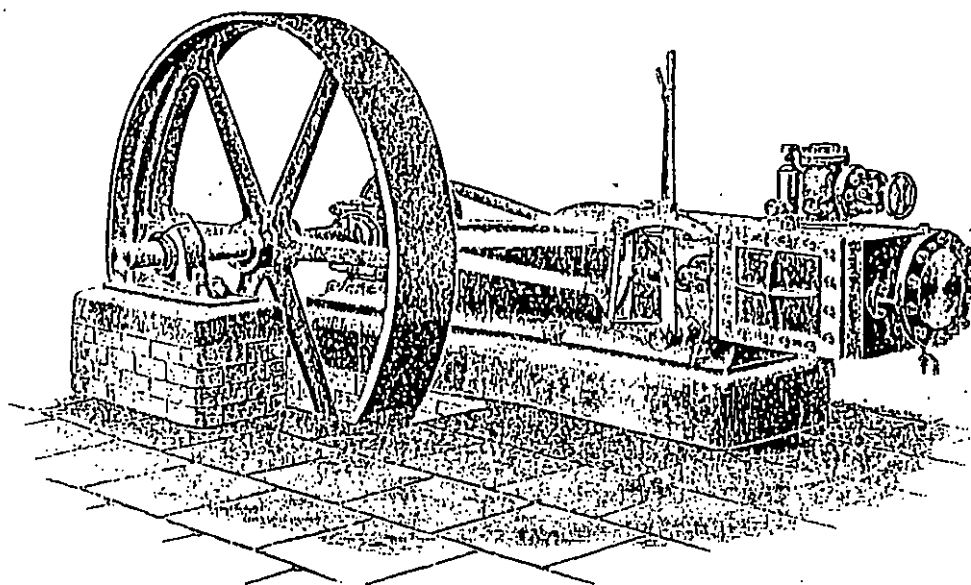
PLATE XVI: A Fawcett steam driven screw press, c 1850.  
(Bourry E. 1926, P.239)

REGISTERED TANGYES TRADE MARK

# HORIZONTAL REVERSING STEAM ENGINE

80 and 60 lbs. Series

A4



From a Drawing of the 10 x 20ins. size, right hand, for 80 lbs. steam pressure.

THE WHOLE OF THE MATTER OF THIS PAGE IS SUBJECT TO THE CONDITIONS SET FORTH BY PAGE VII

PAGE 188 - CODE-PIAGOSO

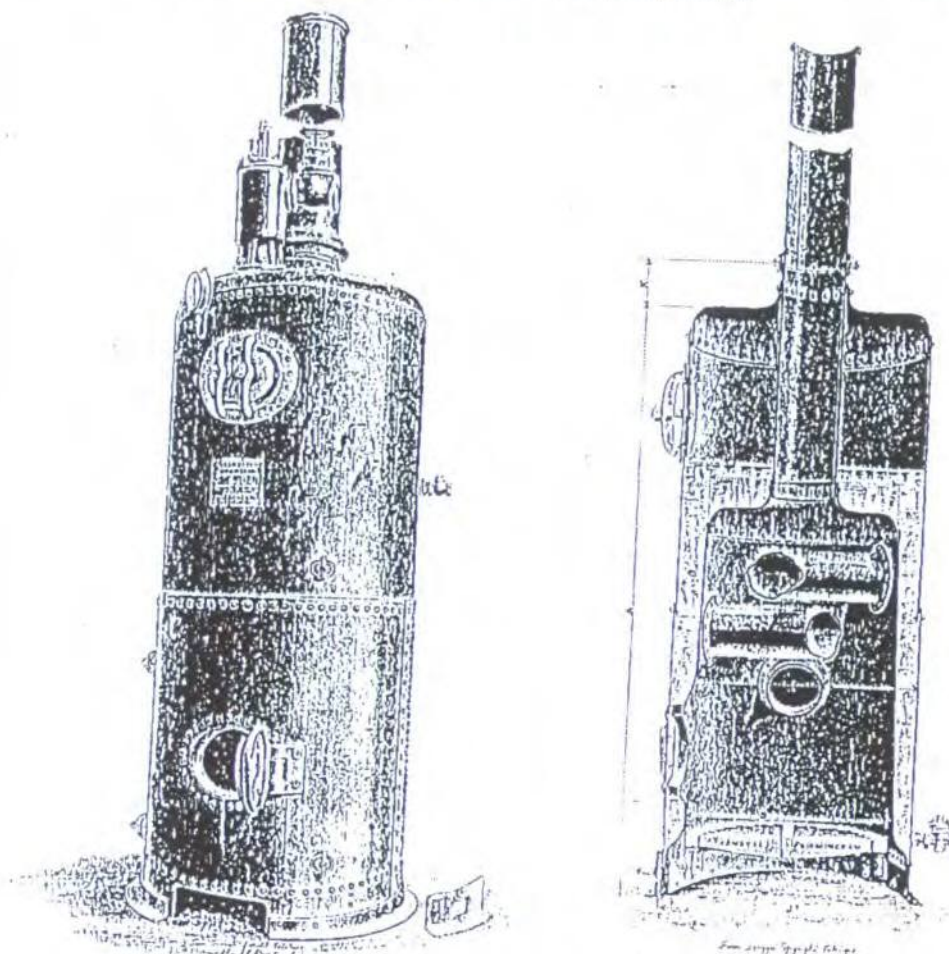
PLATE 1: 6hp Tangye steam engine, 1891.  
(Tangye 1891, P. 188)



REGISTERED TANGYES TRADE MARK

# STEEL VERTICAL BOILER

This Boiler is made for steam pressures not exceeding 70 lbs. per square inch, and, before leaving the Works, is tested by hydraulic pressure to 140 lbs. per square inch.



From a Drawing of the 8 HP. size.

THE MODELS OF THE MACHINES ON THIS PAGE ARE SUBJECT TO THE CONDITIONS SET FORTH ON PAGE VII.

PAGE 228 - CODE-PORJAVAM

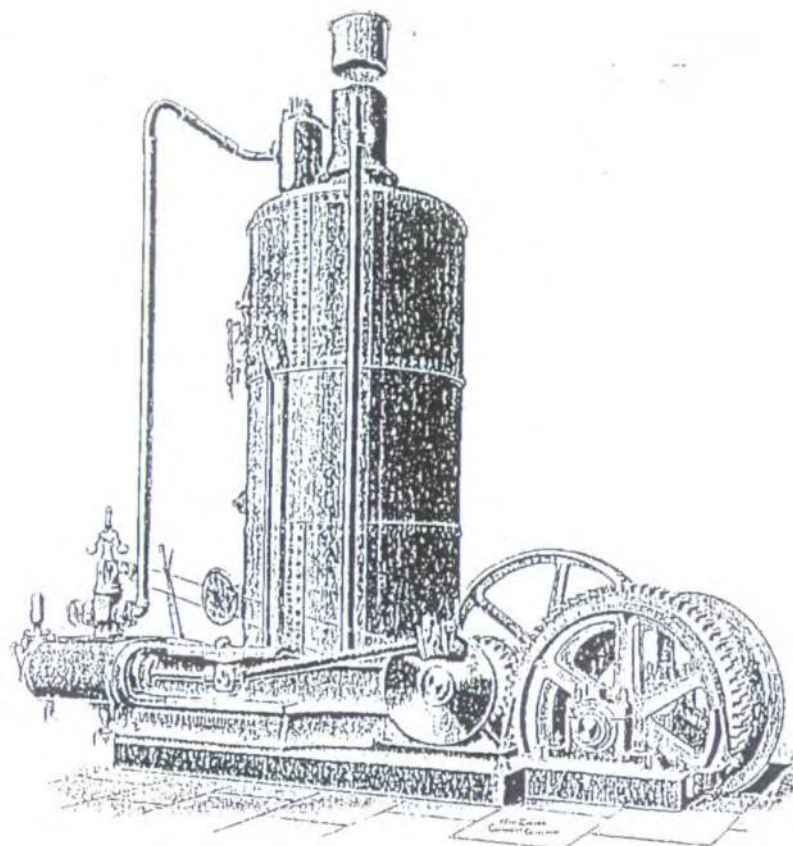
PLATE II: Tangye 60/70 lb per sq. in. boiler, 1891  
(Tangye 1891, P. 226)

REGISTERED TANGYES TRADE MARK

## STEAM HOISTING ENGINE

A4

This combination is made for steam pressures not exceeding 60 lbs. per square inch.



From a Drawing of the 9 x 16 ins. Engine with link motion reversing gear.

THE WHOLE OF THE MATTER ON THIS PAGE IS SUBJEC TO THE CONDITIONS SET FORTH ON PAGE XII.

PAGE 220 = CODE—PLUMBATURA

PLATE III: 60 lb. per sq. in. steam pressure combination probably installed at the R. and R. Duder brickworks in 1890.  
(Tangye 1891, P. 220)



PLATE I: General illustration of the hand manufacture of bricks in Britain during the nineteenth century, and is probably similar to the early (c 1875|1889) period of hand manufacture of bricks at the R. and R. Duder brickworks site. A brickmakers shed is seen in the foreground with a man moving bricks on a hack barrow behind. A large brick clamp is shown in the background. (Woodforde J. 1976, P.104)

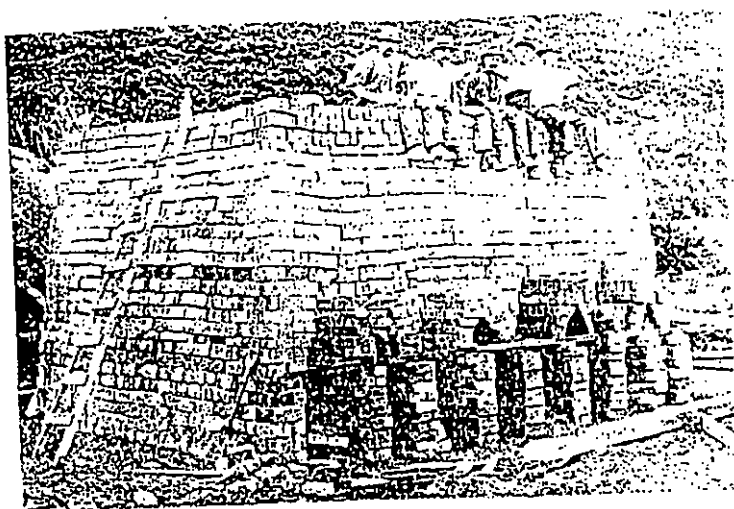


PLATE II: Ruatangata brickworks near Kamo, refreshments just before firing their first brick clamp, 1880's.  
(Scott D. 1979, P.93)



A4

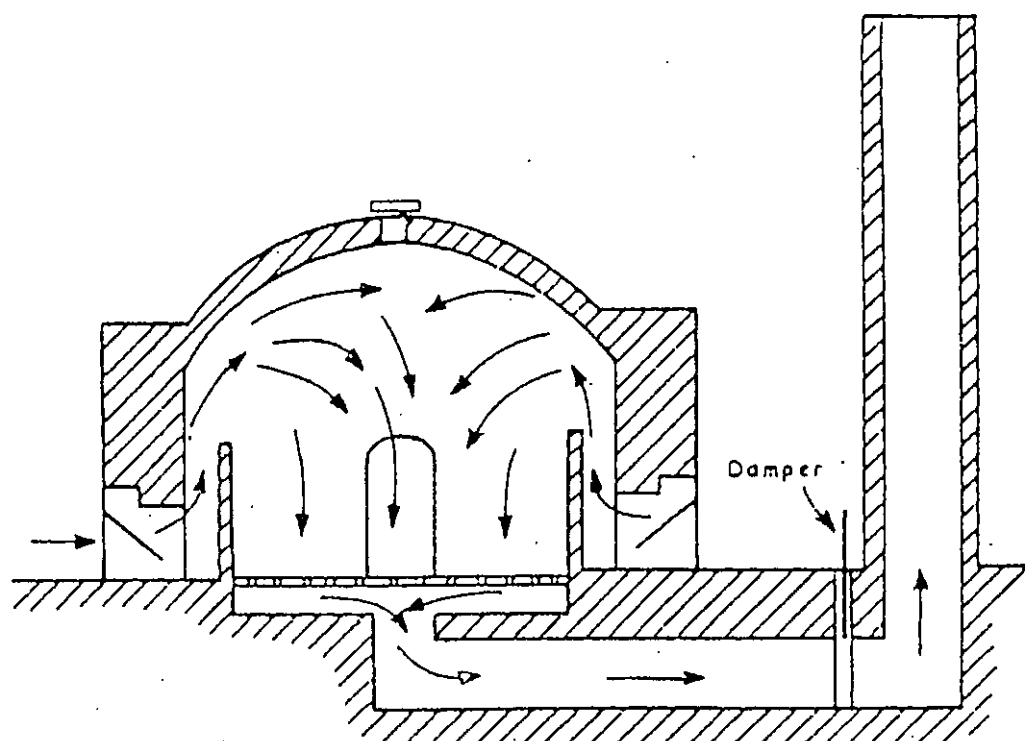


PLATE III: Circular 'beehive' down draught kiln.  
(Hammond M. 1981, P.22)

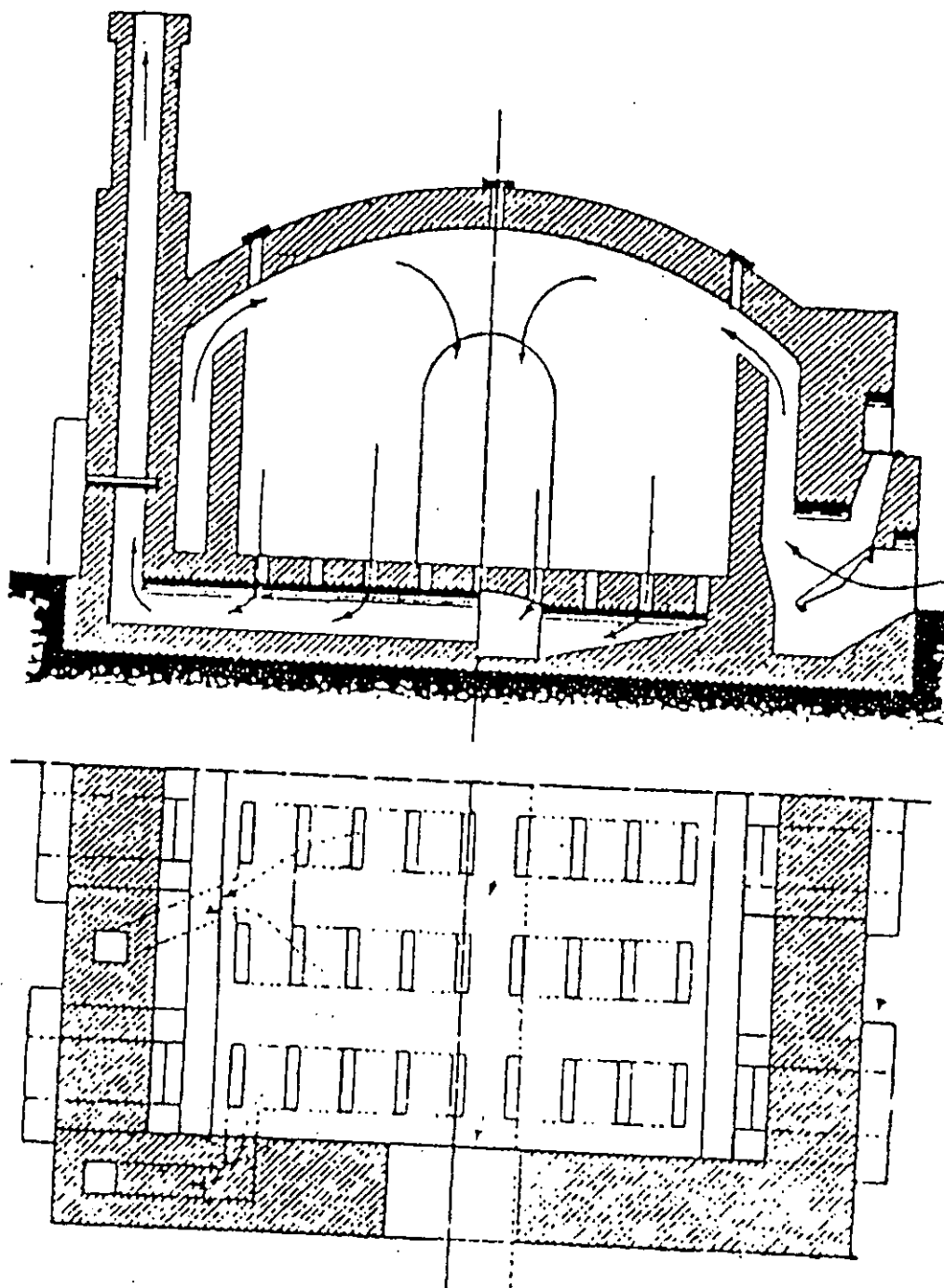


PLATE IV: Rectangular down draught kiln, a very similar type to the 'beehive' kiln.  
(Bourry E. 1926, P. 221)

APPENDIX K: Ancillary brickworks structures.

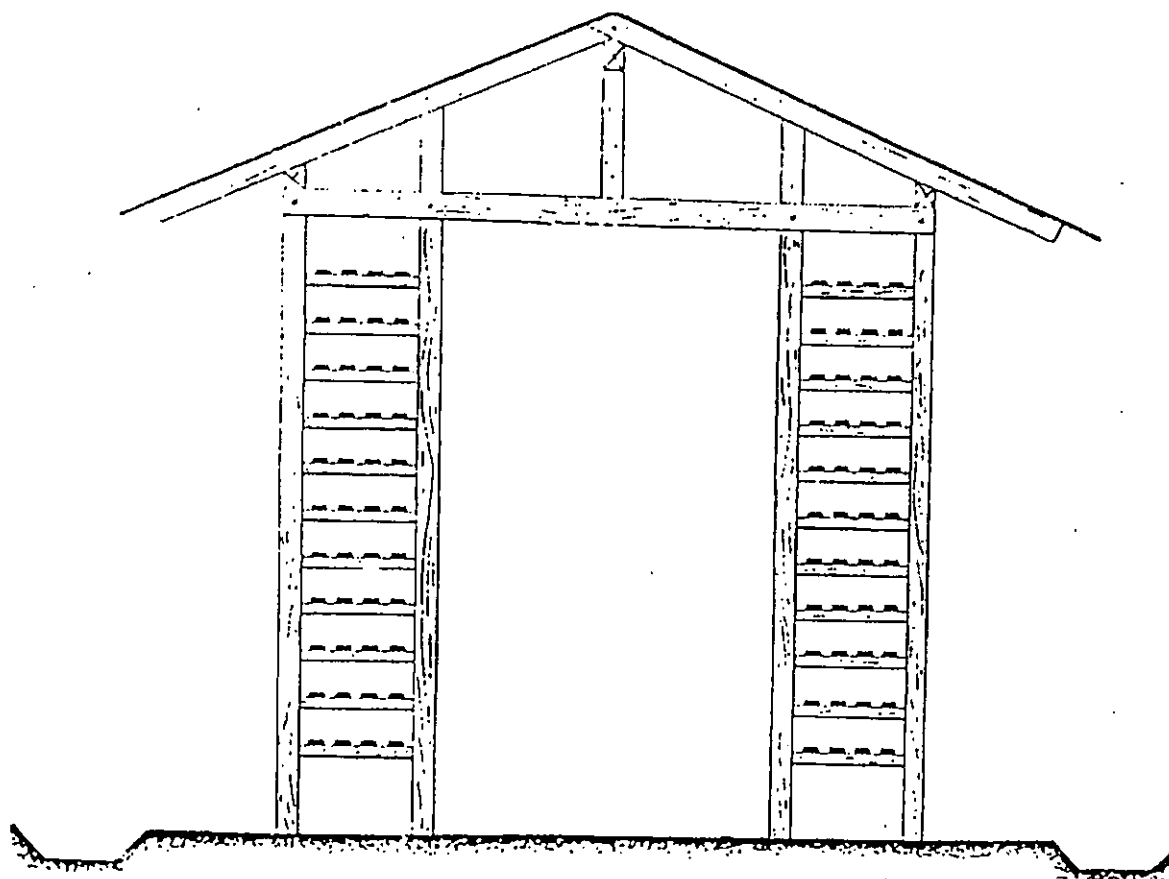


PLATE 1: Typical section through a brick drying shed.  
(Bourry E. 1926, P.157)

A4

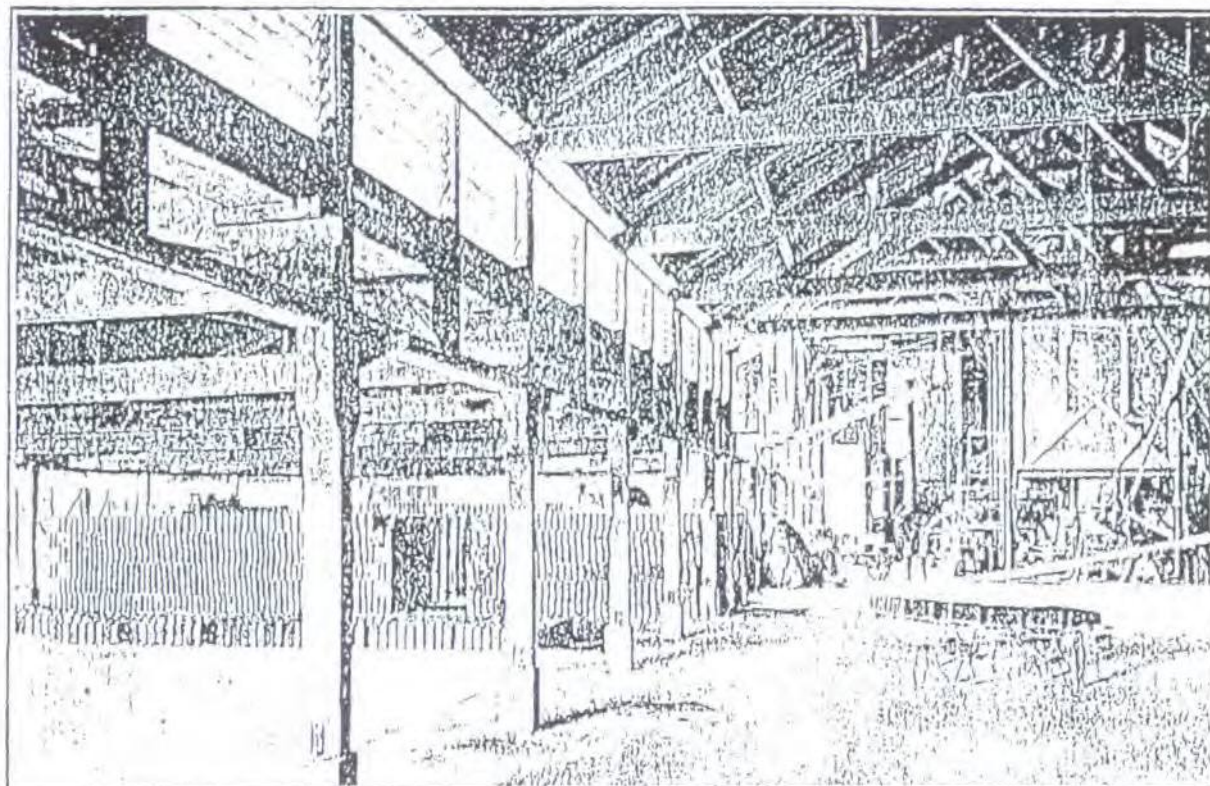


PLATE II: Auckland Gas Coy. brickworks, opposite R. and R. Duder's brickworks at Ngataranga Bay. The brick drying shed on the left of the photograph was constructed c 1885. (Auckland Gas Coy. 1923, p. 9)



# INTERNAL MEMORANDUM

To:

Date:

From:

Telephone Extension:

You have collected a  
great deal of material here  
and have presented it quite  
well. Was the contour map  
of the sensitivity values of no  
use? It would be appropriate  
to generate a plan with the  
sensitivity values indicated  
so it so one could evaluate  
your results in more detail.  
You should have indicated  
your sensitivity profiles  
on your final Plan.  
Good work. Pete Hyslop

A- . . .



## Appendix G: Analytical Results

### Summary of analytical results

	Acceptance Criteria					Maximum	Analytical Data																									
	Human Health	Environmental		Disposal			Local cleanfill (non-volcanic background)	S1	S2	S3	S4	S5	S6	S7	QC1	S8	S9	S10	S11	S12	S13	QC2	HA1	HA1	HA1	HA2	Dup 1	HA3	HA4	HA5	HA5	HA5
Location	NES SCS <sup>1</sup> for High Density Residential use	Regional Plan Permitted Activity	Unitary Plan Permitted Activity	Example Managed Fill Acceptance Criteria				0m	0m	0m	0m	0m	0m	0m	0m	0m	0m	0m	0m	0m	0m	0m	0m	0.25m	0.25m	0.5m	1m	0.25m	0.25m	0.5m	0.5m	1m
Depth (m bgl)		Soil Acceptance Criteria <sup>3</sup>	Soil Acceptance Criteria <sup>4</sup>					8/11/2013	8/11/2013	8/11/2013	8/11/2013	8/11/2013	8/11/2013	8/11/2013	8/11/2013	8/11/2013	8/11/2013	8/11/2013	8/11/2013	8/11/2013	8/11/2013	8/11/2013	8/11/2013	13/11/2013	13/11/2013	13/11/2013	13/11/2013	13/11/2013	13/11/2013	13/11/2013	13/11/2013	13/11/2013
Date Sampled						Topsoil	Topsoil	Topsoil	Topsoil	Topsoil	Topsoil	Topsoil	Topsoil	Topsoil	Topsoil	Topsoil	Topsoil	Topsoil	Topsoil	Topsoil	Topsoil	Fill	Fill	Natural	Fill		Fill	Fill	Fill	Fill	Natural	
Lithological unit																																
Metals and Metalloids (totals)																																
Arsenic	45	100	100	30	12	5	3	4	4	4	3	< 2	2	< 2	4	2	3	< 2	3	4	4	< 2	4	3	< 2	< 2	3	5	< 2	< 2	< 2	
Boron	>10,000	45	45	260	2.45	<20	< 20	< 20	< 20	< 20	< 20	< 20	< 20	< 20	< 20	< 20	< 20	< 20	< 20	< 20	< 20	< 20	< 20	< 20	< 20	< 20	< 20	< 20	< 20	< 20		
Cadmium	230	7.5	7.5	10	0.65	0.45	0.29	0.24	0.11	0.45	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	0.11	< 0.10	< 0.10	0.12	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	0.13	< 0.10	0.13	< 0.10	< 0.10	
Chromium	>10,000	400 <sup>5</sup>	400 <sup>5</sup>	400	55	51	45	29	23	35	21	17	12	13	21	23	51	12	19	27	29	28	20	18	13	10	22	21	11	14	17	
Copper	NL	325	325	325	45	68	27	30	27	68	14	16	10	9	16	21	26	11	17	18	18	18	13	13	5	3	25	17	13	9	5	
Mercury	1,000	0.75	0.75	0.75	<0.03-0.45	0.12	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.12	-	-	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	-	
Lead	500	250	250	250	65	270	50	66	80	41	33	25	17.8	17.4	270	54	38	28	59	29	29	19.5	-	-	4.5	2.8	60	35	72	18.3	-	
Nickel	1,200 <sup>8</sup>	105	105	320	35	58	58	21	30	44	18	30	5	5	30	30	41	10	17	31	34	34	21	18	6	4	26	26	14	6	5	
Zinc	60,000 <sup>9</sup>	400	400	1,160	180	250	114	102	135	86	58	55	27	28	43	62	80	31	65	62	64	37	28	40	10	5	77	49	74	15	10	
Polycyclic aromatic hydrocarbons																																
Acenaphthene	3,400 <sup>6</sup>	-	-	< LOR	< LOR	< 0.04	< 0.04	< 0.04	< 0.04	< 0.04	< 0.04	< 0.04	< 0.03	-	< 0.04	-	-	< 0.04	< 0.04	< 0.04	-	< 0.03	< 0.03	< 0.04	< 0.04	< 0.03	< 0.03	< 0.04	< 0.03	< 0.03	< 0.03	
Acenaphthylene	-	-	-	< LOR	< LOR	0	< 0.04	< 0.04	< 0.04	< 0.04	< 0.04	< 0.04	< 0.03	-	< 0.04	-	-	< 0.04	< 0.04	< 0.04	-	< 0.03	< 0.03	< 0.04	< 0.04	< 0.03	< 0.03	< 0.04	< 0.03	< 0.03	< 0.03	
Anthracene	17,000 <sup>6</sup>	-	-	< LOR	< LOR	0.05	< 0.04	< 0.04	< 0.04	< 0.04	0.04	< 0.03	-	0.05	-	-	< 0.04	< 0.04	< 0.04	-	< 0.03	< 0.03	< 0.04	< 0.04	< 0.03	< 0.03	< 0.04	< 0.03	< 0.03	< 0.03	< 0.03	
Benzo[a]anthracene	refer BAPEq	refer BAPEq	refer BAPEq	refer BAPEq	< LOR	0.15	< 0.04	< 0.04	< 0.04	0.07	< 0.04	0.09	< 0.03	-	0.15	-	-	0.04	0.04	0.09	-	0.05	< 0.03	< 0.04	< 0.04	< 0.03	0.16	< 0.04	0.07	< 0.03	< 0.03	
Benzo[a]pyrene (BAP)	refer BAPEq	refer BAPEq	refer BAPEq	refer BAPEq	< LOR	0.16	< 0.04	0.04	< 0.04	0.09	< 0.04	0.1	< 0.03	-	0.16	-	-	0.04	0.04	0.15	-	0.07	< 0.03	< 0.04	< 0.04	< 0.03	0.23	< 0.04	0.11	< 0.03	< 0.03	
Benzo[b]fluoranthene + Benzo[j]fluoranthene	refer BAPEq	refer BAPEq	refer BAPEq	refer BAPEq	< LOR	0.19	< 0.04	0.04	0.03	0.10	< 0.04	0.12	< 0.03	-	0.19	-	-	0.05	0.05	0.12	-	0.08	< 0.03	< 0.04	< 0.04	< 0.03	0.26	< 0.04	0.12	< 0.03	< 0.03	
Benzo[k]fluoranthene	-	-	-	< LOR	< LOR	0.13	< 0.04	0.05	< 0.04	0.07	< 0.04	0.09	< 0.03	-	0.13	-	-	0.04	0.04	0.1	-	0.07	< 0.03	< 0.04	< 0.04	< 0.03	0.22	< 0.04	0.1	< 0.03	< 0.03	
Benzo[k]fluoranthene	refer BAPEq	refer BAPEq	refer BAPEq	refer BAPEq	< LOR	0.09	< 0.04	< 0.04	< 0.04	0.05	< 0.04	0.06	< 0.03	-	0.09	-	-	< 0.04	< 0.04	0.06	-	0.03	< 0.03	< 0.04	< 0.04	< 0.03	0.1	< 0.04	0.05	< 0.03	< 0.03	
Chrysene	refer BAPEq	refer BAPEq	refer BAPEq	refer BAPEq	< LOR	0.16	< 0.04	< 0.04	< 0.04	0.08	< 0.04	0.11	< 0.03	-	0.16	-	-	0.05	0.04	0.1	-	0.05	< 0.03	< 0.04	< 0.04	< 0.03	0.16	< 0.04	0.07	< 0.03	< 0.03	
Dibenzof[a,h]anthracene	refer BAPEq	refer BAPEq	refer BAPEq	refer BAPEq	< LOR	0	< 0.04	< 0.04	< 0.04	< 0.04	< 0.04	< 0.04	< 0.03	-	< 0.04	-	-	< 0.04	< 0.04	< 0.04	-	< 0.03	< 0.03	< 0.04	< 0.04	< 0.03	0.03	< 0.04	< 0.03	< 0.03	< 0.03	
Fluoranthene	refer BAPEq	-	-	< LOR	< LOR	0.32	0.04	0.07	0.05	0.21	0.04	0.28	0.03	-	0.32	-	-	0.11	0.09	0.18	-	0.08	0.03	< 0.04	< 0.04	< 0.03	0.3	< 0.04	0.11	< 0.03	< 0.03	
Fluorene	-	-	-	< LOR	< LOR	< 0.04	< 0.04	< 0.04	< 0.04	< 0.04	< 0.04	< 0.04	< 0.03	-	< 0.04	-	-	< 0.04	< 0.04	< 0.04	-	< 0.03	< 0.03	< 0.04	< 0.04	< 0.03	< 0.03	< 0.04	< 0.03	< 0.03	< 0.03	
Indeno[1,2,3-c,d]pyrene	refer BAPEq	refer BAPEq	refer BAPEq	refer BAPEq	< LOR	0.13	< 0.04	< 0.04	< 0.04	0.08	< 0.04	0.09	< 0.03	-	0.13	-	-	0.04	0.04	0.09	-	0.07	< 0.03	< 0.04	< 0.04	< 0.03	0.22	< 0.04	0.11	< 0.03	< 0.03	
Naphthalene (69) <sup>7</sup>	69 <sup>3</sup>	0.047 <sup>3</sup>	< LOR	< LOR	< LOR	< 0.16	< 0.18	< 0.17	< 0.16	< 0.16	< 0.16	< 0.17	< 0.15	-	< 0.16	-	-	< 0.17	< 0.18	< 0.17	-	< 0.15	< 0.15	< 0.16	< 0.16	< 0.15	< 0.15	< 0.16	< 0.13	< 0.15	< 0.15	
Phenanthrene	-	-	-	< LOR	< LOR	0.18	< 0.04	0.04	< 0.04	0.11	< 0.04	0.17	< 0.03	-	0.18	-	-	0.06	0.05	0.06	-	< 0.03	< 0.03	< 0.04	< 0.04	< 0.03	0.12	< 0.04	0.04	< 0.03	< 0.03	
Pyrene	1,600 <sup>7</sup>	1,600 <sup>7</sup>	1.3 <sup>9</sup>	< LOR	< LOR	0.34	0.05	0.07	0.05	0.21	0.05	0.27	0.03	-	0.34	-	-	0.12	0.09	0.2	-	0.11	0.04	< 0.04	< 0.04	< 0.03	0.36	< 0.04	0.14	< 0.03	< 0.03	< 0.03
BAP equivalent	24	2.15 <sup>7</sup>	25	< LOR	< LOR	0.24	0.05	0.07	0.05	0.14	0.05	0.16	0.05	-	0.24	-	-	0.075	0.075	0.20	-	0.1	0.04	NC	NC	NC	0.34	NC	0.16	NC	NC	

Notes:

All units in mg/kg

- no recommended guideline / criteria and/or not analysed

< LOR indicates acceptance criteria is less than the laboratory level of reporting

<NC indicates 'Not Calculated' because all carcinogenic PAHs are below the laboratory limit of detection.

Acid Herbicides and Organochlorine Pesticides were all below detection.

<sup>2</sup> National Environmental Standard for Assessing and Managing Contaminants in Soil. Criteria for non-priority contaminants selected in accordance with MfE Hierarchy

<sup>3</sup> Regional Plan: Schedule 10 - Permitted activity soil acceptance criteria (Discharges)

<sup>4</sup> Unitary Plan: Chapter 4.5, Table 1: Permitted activity soil acceptance criteria

<sup>5</sup> Criteria for Cr<sup>3+</sup>

<sup>7</sup> MfE, 2011, Guidelines for Assessing and Managing Petroleum Hydrocarbon Contaminated Sites in New Zealand. Silty Clay soils at < 1 m depth under residential land use

<sup>8</sup> NEPC, 2013, Schedule B(1) Guideline on the Investigation Levels for Soil and Groundwater: Table 1A(1)

<sup>9</sup> MfE, 2011, Guidelines for Assessing and Managing Petroleum Hydrocarbon Contaminated Sites in New Zealand. Protection of Groundwater <2m, Silty Clay

	highlight denotes that value exceeds NES (Soil) criteria for residential use.
	highlight denotes that value exceeds Regional Plan Permitted Activity Criteria only
<b>Bold</b>	highlight denotes that value exceeds local clean fill (volcanic background) acceptance criteria
<b>Red</b>	highlight denotes that value exceeds example managed fill acceptance criteria

Summary of analytical results

	Acceptance Criteria																			
	Human Health	Environmental		Disposal		Maximum														
Location	NES SCSs <sup>2</sup> for High Density Residential use	Regional Plan Permitted Activity Soil Acceptance Criteria <sup>3</sup>	Unitary Plan Permitted Activity Soil Acceptance Criteria <sup>4</sup>	Example Managed Fill Acceptance Criteria	Local cleanfill (non-volcanic background)		HA6	HA7	HA8	HA9	Dup 2	HA9	HA10	HA10	HA11	HA12	BH05 (45)	BH05 (46)		
Depth (m bgl)							0.25m	0.25m	0.5m	0.25m		1m	0.25m	0.5m	0m	0m	0-0.6m	0-0.6m		
Date Sampled							13/11/2013	13/11/2013	13/11/2013	13/11/2013	13/11/2013	13/11/2013	13/11/2013	13/11/2013	13/11/2013	13/11/2013	13/11/2013	13/11/2013	13/11/2013	
Lithological unit							Fill	Fill	Natural	Fill	Natural	Fill	Natural	Topsoil	Topsoil	Fill	Fill			
Metals and Metalloids (totals)																				
Arsenic	45	100	100	30	12	5	4	4	3	4	3	2	2	2	4	3	3			
Boron	>10,000	45	45	260	2-45	<20	< 20	< 20	< 20	< 20	< 20	< 20	< 20	< 20	< 20	< 20	< 20			
Cadmium	230	7.5	7.5	10	0.65	0.45	0.1	< 0.10	< 0.10	0.14	0.14	0.12	< 0.10	< 0.10	0.11	0.12	0.25			
Chromium	>10,000	400 <sup>5</sup>	400 <sup>5</sup>	400	55	51	25	16	13	34	31	13	18	11	40	30	19			
Copper	NL	325	325	325	45	68	29	10	16	29	32	18	11	4	24	25	19			
Mercury	1,000	0.75	0.75	0.75	<0.03-0.45	0.12	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	-	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10			
Lead	500	250	250	250	65	270	115	12	8.8	63	40	-	15.5	19.5	61	55	49			
Nickel	1,200 <sup>8</sup>	105	105	320	35	58	37	4	4	48	57	27	27	5	54	39	30			
Zinc	60,000 <sup>8</sup>	400	400	1,160	180	250	90	11	39	186	136	109	23	20	77	89	197			
Polycyclic aromatic hydrocarbons																				
Acenaphthene	3,400 <sup>6</sup>	-	-	< LOR	< LOR	< 0.04	< 0.03	< 0.03	< 0.03	< 0.03	< 0.03	< 0.03	0.09	< 0.03	< 0.04	< 0.03	< 0.03			
Acenaphthylene	-	-	-	< LOR	< LOR	0	< 0.03	< 0.03	< 0.03	< 0.03	< 0.03	< 0.03	< 0.03	< 0.03	< 0.04	< 0.03	< 0.03			
Anthracene	17,000 <sup>6</sup>	-	-	< LOR	< LOR	0.05	< 0.03	< 0.03	< 0.03	< 0.03	< 0.03	< 0.03	0.17	< 0.03	0.03	0.04	< 0.03			
Benzo[a]anthracene	refer BAPeq	refer BAPeq	refer BAPeq	refer BAPeq	< LOR	0.15	0.04	< 0.03	< 0.03	< 0.03	< 0.03	< 0.03	0.2	< 0.03	0.18	0.11	0.05			
Benzo[a]pyrene (BAP)	refer BAPeq	refer BAPeq	refer BAPeq	refer BAPeq	< LOR	0.16	0.05	< 0.03	< 0.03	< 0.03	< 0.03	< 0.03	0.25	< 0.03	0.23	0.14	0.04			
Benzo[b]fluoranthene + Benzo[j]fluoranthene	refer BAPeq	refer BAPeq	refer BAPeq	refer BAPeq	< LOR	0.19	0.05	< 0.03	< 0.03	< 0.03	< 0.03	< 0.03	0.26	< 0.03	0.25	0.15	0.07			
Benzo[k]fluoranthene	-	-	-	< LOR	< LOR	0.13	0.05	< 0.03	< 0.03	< 0.03	< 0.03	< 0.03	0.26	< 0.03	0.22	0.12	0.03			
Benzo[e]fluoranthene	refer BAPeq	refer BAPeq	refer BAPeq	refer BAPeq	< LOR	0.09	< 0.03	< 0.03	< 0.03	< 0.03	< 0.03	< 0.03	0.11	< 0.03	0.12	0.07	< 0.03			
Chrysene	refer BAPeq	refer BAPeq	refer BAPeq	refer BAPeq	< LOR	0.16	0.04	< 0.03	< 0.03	< 0.03	< 0.03	< 0.03	0.2	< 0.03	0.19	0.12	0.06			
Dibenz[a,h]anthracene	refer BAPeq	refer BAPeq	refer BAPeq	refer BAPeq	< LOR	0	< 0.03	< 0.03	< 0.03	< 0.03	< 0.03	< 0.03	0.04	< 0.03	0.04	< 0.03	< 0.03			
Fluoranthene	refer BAPeq	-	-	< LOR	< LOR	0.32	0.09	< 0.03	< 0.03	< 0.03	< 0.03	< 0.03	0.54	< 0.03	0.37	0.24	0.05			
Fluorene	-	-	-	< LOR	< LOR	< 0.04	< 0.03	< 0.03	< 0.03	< 0.03	< 0.03	< 0.03	0.09	< 0.03	< 0.04	< 0.03	< 0.03			
Indeno[1,2,3-c,d]pyrene	refer BAPeq	refer BAPeq	refer BAPeq	refer BAPeq	< LOR	0.13	0.04	< 0.03	< 0.03	< 0.03	< 0.03	< 0.03	0.26	< 0.03	0.21	0.11	< 0.03			
Naphthalene	(69) <sup>7</sup>	69 <sup>9</sup>	0.047 <sup>9</sup>	< LOR	< LOR	< 0.16	< 0.15	< 0.15	< 0.15	< 0.15	< 0.14	< 0.14	0.21	< 0.15	< 0.16	< 0.15	< 0.14			
Phenanthrene	-	-	-	< LOR	< LOR	0.18	0.04	< 0.03	< 0.03	< 0.03	< 0.03	< 0.03	0.49	< 0.03	0.13	0.12	0.03			
Pyrene	1,600 <sup>7</sup>	1,600 <sup>7</sup>	1.3 <sup>9</sup>	< LOR	< LOR	0.34	0.1	< 0.03	< 0.03	< 0.03	< 0.03	< 0.03	0.5	< 0.03	0.42	0.26	0.06			
BAP equivalent	24	2.15	2.15 <sup>7</sup>	25	< LOR	0.24	0.08	NC	NC	NC	NC	NC	0.38	NC	0.35	0.20	0.07			

Notes:

All units in mg/kg

- no recommended guideline / criteria and/or not analysed

< LOR indicates acceptance criteria is less than the laboratory level of reporting

<NC indicates 'Not Calculated' because all carcinogenic PAHs are below the laboratory limit of detection.

Acid Herbicides and Organochlorine Pesticides were all below detection.

<sup>2</sup> National Environmental Standard for Assessing and Managing Contaminants in Soil. Criteria for non-priority contaminants selected in accordance with MfE Hierarchy

<sup>3</sup> Regional Plan: Schedule 10 - Permitted activity soil acceptance criteria (Discharges)

<sup>4</sup> Unitary Plan: Chapter 4.5, Table 1: Permitted activity soil acceptance criteria

<sup>5</sup> Criteria for Cr3+

<sup>7</sup> MfE, 2011, Guidelines for Assessing and Managing Petroleum Hydrocarbon Contaminated Sites in New Zealand. Silty Clay soils at < 1 m depth under residential land use

<sup>8</sup> NEPC, 2013, Schedule B(1) Guideline on the Investigation Levels for Soil and Groundwater: Table 1A(1)

<sup>9</sup> MfE, 2011, Guidelines for Assessing and Managing Petroleum Hydrocarbon Contaminated Sites in New Zealand. Protection of Groundwater <2m, Silty Clay

	highlight denotes that value exceeds NES (Soil) criteria for residential use.
	highlight denotes that value exceeds Regional Plan Permitted Activity Criteria only
<b>Bold</b>	highlight denotes that value exceeds local clean fill (volcanic background) acceptance criteria
<b>Red</b>	highlight denotes that value exceeds example managed fill acceptance criteria

## Appendix H: Laboratory Transcripts



# ANALYSIS REPORT

Page 1 of 3

<b>Client:</b>	Tonkin & Taylor	<b>Lab No:</b>	1201373	SPV1
<b>Contact:</b>	C Fagan	<b>Date Registered:</b>	09-Nov-2013	
	C/- Tonkin & Taylor	<b>Date Reported:</b>	13-Nov-2013	
	PO Box 5271	<b>Quote No:</b>	58051	
	AUCKLAND 1141	<b>Order No:</b>	29452.001	
		<b>Client Reference:</b>	29452.001	
		<b>Submitted By:</b>	C Fagan	

Sample Type: Soil						
Sample Name:	S1 08-Nov-2013	S2 08-Nov-2013	S3 08-Nov-2013	S4 08-Nov-2013	S5 08-Nov-2013	
Lab Number:	1201373.1	1201373.2	1201373.3	1201373.4	1201373.5	
Individual Tests						
Dry Matter g/100g as rcvd	64	65	66	67	67	
Qualitative Identification of Asbestos	See attached report	-	-	See attached report	-	
Total Recoverable Boron mg/kg dry wt	< 20	< 20	< 20	-	< 20	
Heavy metal screen level As,Cd,Cr,Cu,Ni,Pb,Zn						
Total Recoverable Arsenic mg/kg dry wt	3	4	4	4	3	
Total Recoverable Cadmium mg/kg dry wt	0.29	0.24	0.11	0.45	< 0.10	
Total Recoverable Chromium mg/kg dry wt	45	29	23	35	21	
Total Recoverable Copper mg/kg dry wt	27	30	27	68	14	
Total Recoverable Lead mg/kg dry wt	50	66	80	41	33	
Total Recoverable Nickel mg/kg dry wt	58	21	30	44	18	
Total Recoverable Zinc mg/kg dry wt	114	102	135	86	58	
Polycyclic Aromatic Hydrocarbons Screening in Soil						
Acenaphthene mg/kg dry wt	< 0.04	< 0.04	< 0.04	< 0.04	< 0.04	
Acenaphthylene mg/kg dry wt	< 0.04	< 0.04	< 0.04	< 0.04	< 0.04	
Anthracene mg/kg dry wt	< 0.04	< 0.04	< 0.04	< 0.04	< 0.04	
Benzo[a]anthracene mg/kg dry wt	< 0.04	< 0.04	< 0.04	0.07	< 0.04	
Benzo[a]pyrene (BAP) mg/kg dry wt	< 0.04	0.04	< 0.04	0.09	< 0.04	
Benzo[b]fluoranthene + Benzo[j]fluoranthene mg/kg dry wt	< 0.04	0.04	0.03	0.10	< 0.04	
Benzo[g,h,i]perylene mg/kg dry wt	< 0.04	0.05	< 0.04	0.07	< 0.04	
Benzo[k]fluoranthene mg/kg dry wt	< 0.04	< 0.04	< 0.04	0.05	< 0.04	
Chrysene mg/kg dry wt	< 0.04	< 0.04	< 0.04	0.08	< 0.04	
Dibenzo[a,h]anthracene mg/kg dry wt	< 0.04	< 0.04	< 0.04	< 0.04	< 0.04	
Fluoranthene mg/kg dry wt	0.04	0.07	0.05	0.21	0.04	
Fluorene mg/kg dry wt	< 0.04	< 0.04	< 0.04	< 0.04	< 0.04	
Indeno(1,2,3-c,d)pyrene mg/kg dry wt	< 0.04	< 0.04	< 0.04	0.08	< 0.04	
Naphthalene mg/kg dry wt	< 0.18	< 0.17	< 0.16	< 0.16	< 0.16	
Phenanthrene mg/kg dry wt	< 0.04	0.04	< 0.04	0.11	< 0.04	
Pyrene mg/kg dry wt	0.05	0.07	0.05	0.21	0.05	
Sample Name:	S6 08-Nov-2013	S7 08-Nov-2013	S8 08-Nov-2013	S9 08-Nov-2013	S10 08-Nov-2013	
Lab Number:	1201373.6	1201373.7	1201373.8	1201373.9	1201373.10	
Individual Tests						
Dry Matter g/100g as rcvd	67	74	70	-	-	
Qualitative Identification of Asbestos	-	-	See attached report	-	-	
Total Recoverable Boron mg/kg dry wt	< 20	< 20	< 20	< 20	< 20	
Heavy metal screen level As,Cd,Cr,Cu,Ni,Pb,Zn						



Sample Type: Soil						
Sample Name:	S6 08-Nov-2013	S7 08-Nov-2013	S8 08-Nov-2013	S9 08-Nov-2013	S10 08-Nov-2013	
Lab Number:	1201373.6	1201373.7	1201373.8	1201373.9	1201373.10	
Heavy metal screen level As,Cd,Cr,Cu,Ni,Pb,Zn						
Total Recoverable Arsenic	mg/kg dry wt	< 2	2	4	2	3
Total Recoverable Cadmium	mg/kg dry wt	< 0.10	< 0.10	< 0.10	< 0.10	0.11
Total Recoverable Chromium	mg/kg dry wt	17	12	21	23	51
Total Recoverable Copper	mg/kg dry wt	16	10	16	21	26
Total Recoverable Lead	mg/kg dry wt	25	17.8	270	54	38
Total Recoverable Nickel	mg/kg dry wt	30	5	30	30	41
Total Recoverable Zinc	mg/kg dry wt	55	27	43	62	80
Polycyclic Aromatic Hydrocarbons Screening in Soil						
Acenaphthene	mg/kg dry wt	< 0.04	< 0.03	< 0.04	-	-
Acenaphthylene	mg/kg dry wt	< 0.04	< 0.03	< 0.04	-	-
Anthracene	mg/kg dry wt	0.04	< 0.03	0.05	-	-
Benzo[a]anthracene	mg/kg dry wt	0.09	< 0.03	0.15	-	-
Benzo[a]pyrene (BAP)	mg/kg dry wt	0.10	< 0.03	0.16	-	-
Benzo[b]fluoranthene + Benzo[j]fluoranthene	mg/kg dry wt	0.12	< 0.03	0.19	-	-
Benzo[g,h,i]perylene	mg/kg dry wt	0.09	< 0.03	0.13	-	-
Benzo[k]fluoranthene	mg/kg dry wt	0.06	< 0.03	0.09	-	-
Chrysene	mg/kg dry wt	0.11	< 0.03	0.16	-	-
Dibenzo[a,h]anthracene	mg/kg dry wt	< 0.04	< 0.03	< 0.04	-	-
Fluoranthene	mg/kg dry wt	0.28	0.03	0.32	-	-
Fluorene	mg/kg dry wt	< 0.04	< 0.03	< 0.04	-	-
Indeno(1,2,3-c,d)pyrene	mg/kg dry wt	0.09	< 0.03	0.13	-	-
Naphthalene	mg/kg dry wt	< 0.17	< 0.15	< 0.16	-	-
Phenanthrene	mg/kg dry wt	0.17	< 0.03	0.18	-	-
Pyrene	mg/kg dry wt	0.27	0.03	0.34	-	-

Sample Name:	S11 08-Nov-2013	S12 08-Nov-2013	S13 08-Nov-2013	QC1 08-Nov-2013	QC2 08-Nov-2013	
Lab Number:	1201373.11	1201373.12	1201373.13	1201373.14	1201373.15	
Individual Tests						
Dry Matter	g/100g as rcvd	66	65	66	74	69
Qualitative Identification of Asbestos		-	-	See attached report	-	-
Total Recoverable Boron	mg/kg dry wt	< 20	< 20	< 20	< 20	< 20
Heavy metal screen level As,Cd,Cr,Cu,Ni,Pb,Zn						
Total Recoverable Arsenic	mg/kg dry wt	< 2	3	4	< 2	4
Total Recoverable Cadmium	mg/kg dry wt	< 0.10	< 0.10	0.12	< 0.10	< 0.10
Total Recoverable Chromium	mg/kg dry wt	12	19	27	13	29
Total Recoverable Copper	mg/kg dry wt	11	17	18	9	18
Total Recoverable Lead	mg/kg dry wt	28	59	29	17.4	29
Total Recoverable Nickel	mg/kg dry wt	10	17	31	5	34
Total Recoverable Zinc	mg/kg dry wt	31	65	62	28	64
Polycyclic Aromatic Hydrocarbons Screening in Soil						
Acenaphthene	mg/kg dry wt	< 0.04	< 0.04	< 0.04	-	-
Acenaphthylene	mg/kg dry wt	< 0.04	< 0.04	< 0.04	-	-
Anthracene	mg/kg dry wt	< 0.04	< 0.04	< 0.04	-	-
Benzo[a]anthracene	mg/kg dry wt	0.04	0.04	0.09	-	-
Benzo[a]pyrene (BAP)	mg/kg dry wt	0.04	0.04	0.15	-	-
Benzo[b]fluoranthene + Benzo[j]fluoranthene	mg/kg dry wt	0.05	0.05	0.12	-	-
Benzo[g,h,i]perylene	mg/kg dry wt	0.04	0.04	0.10	-	-
Benzo[k]fluoranthene	mg/kg dry wt	< 0.04	< 0.04	0.06	-	-
Chrysene	mg/kg dry wt	0.05	0.04	0.10	-	-
Dibenzo[a,h]anthracene	mg/kg dry wt	< 0.04	< 0.04	< 0.04	-	-
Fluoranthene	mg/kg dry wt	0.11	0.09	0.18	-	-
Fluorene	mg/kg dry wt	< 0.04	< 0.04	< 0.04	-	-
Indeno(1,2,3-c,d)pyrene	mg/kg dry wt	0.04	0.04	0.09	-	-

Sample Type: Soil						
<b>Sample Name:</b>		S11 08-Nov-2013	S12 08-Nov-2013	S13 08-Nov-2013	QC1 08-Nov-2013	QC2 08-Nov-2013
<b>Lab Number:</b>		1201373.11	1201373.12	1201373.13	1201373.14	1201373.15
Polycyclic Aromatic Hydrocarbons Screening in Soil						
Naphthalene	mg/kg dry wt	< 0.17	< 0.18	< 0.17	-	-
Phenanthrene	mg/kg dry wt	0.06	0.05	0.06	-	-
Pyrene	mg/kg dry wt	0.12	0.09	0.20	-	-

### Analyst's Comments

Appendix No.1 - Dowdell & Associates Laboratory Report

## SUMMARY OF METHODS

The following table(s) gives a brief description of the methods used to conduct the analyses for this job. The detection limits given below are those attainable in a relatively clean matrix. Detection limits may be higher for individual samples should insufficient sample be available, or if the matrix requires that dilutions be performed during analysis.

Sample Type: Soil			
Test	Method Description	Default Detection Limit	Samples
Environmental Solids Sample Preparation	Air dried at 35°C and sieved, <2mm fraction. Used for sample preparation. May contain a residual moisture content of 2-5%.	-	1-15
Heavy metal screen level As,Cd,Cr,Cu,Ni,Pb,Zn	Dried sample, <2mm fraction. Nitric/Hydrochloric acid digestion, ICP-MS, screen level.	-	1-15
Polycyclic Aromatic Hydrocarbons Screening in Soil	Sonication extraction, Dilution or SPE cleanup (if required), GC-MS SIM analysis (modified US EPA 8270). Tested on as received sample. [KBIs:5786,2805,2695]	-	1-8, 11-13
Dry Matter (Env)	Dried at 103°C for 4-22hr (removes 3-5% more water than air dry) , gravimetry. US EPA 3550. (Free water removed before analysis).	0.10 g/100g as rcvd	1-8, 11-15
Total Recoverable digestion	Nitric / hydrochloric acid digestion. US EPA 200.2.	-	1-15
Qualitative Identification of Asbestos	150-200g, sealed plastic bag. Polarised Light Microscopy and dispersion staining techniques. Subcontracted to Dowdell & Associates, 4 Cain Road, Penrose, Auckland. AS 4964 (2004) - Method for the Qualitative / Semi-Quantitative Identification of Asbestos in Bulk Samples.	-	1, 4, 8, 13
Total Recoverable Boron	Dried sample, sieved as specified (if required). Nitric/Hydrochloric acid digestion, ICP-MS, screen level. US EPA 200.2.	20 mg/kg dry wt	1-3, 5-15

These samples were collected by yourselves (or your agent) and analysed as received at the laboratory.

Samples are held at the laboratory after reporting for a length of time depending on the preservation used and the stability of the analytes being tested. Once the storage period is completed the samples are discarded unless otherwise advised by the client.

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Ara Heron BSc (Tech)  
Client Services Manager - Environmental Division



# DOWDELL & ASSOCIATES LTD

## OCCUPATIONAL HEALTH ANALYSTS & CONSULTANTS

4 Cain Rd, Penrose, PO Box 112-017 Auckland 1642, Phone (09) 5260-246. Fax (09) 5795-389.

12<sup>th</sup> November 2013

Hill Laboratories  
Private Bag 3205  
Waikato Mail Centre  
**Hamilton 3240**

Dear Sir/Madam

Re: **Bulk Fibre Analysis**  
Sampled by : Client  
Date received : 12<sup>th</sup> November 2013  
Laboratory no. : 50243  
Description : 4 x soil sample(s)  
Location : -  
Purchase order : 135998  
Method : AS 4964 (2004) - Method for the Qualitative Identification of Asbestos in Bulk Samples

We examined the following sample(s) using Low Powered Stereomicroscopy followed by 'Polarised Light Microscopy' including Dispersion Staining Techniques. The following result(s) relate(s) to the sample(s) as received:

**Reg no:** E9642 **Labelled as:** 1201373/1  
**Sample size:** 62.81 g wet / 38.48 g dry  
**Result:** Asbestos **NOT** detected.

**Reg no:** E9643 **Labelled as:** 1201373/4  
**Sample size:** 62.98 g wet / 40.03 g dry  
**Result:** Asbestos **NOT** detected.

**Reg no:** E9644 **Labelled as:** 1201373/8  
**Sample size:** 63.78 g wet / 42.94 g dry  
**Result:** Asbestos **NOT** detected.

**Reg no:** E9645 **Labelled as:** 1201373/13  
**Sample size:** 58.40 g wet / 37.64 g dry  
**Result:** Asbestos **NOT** detected.

Yours faithfully  
**DOWDELL & ASSOCIATES LTD**



E.Sheldon BSc (Hon)  
**Analyst**



Sally Thurgar BSc (Hon)  
**Analyst**



Imtiaz Damani MSc  
**Analyst**



Laura Sands  
**Occupational Hygienist**

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# ANALYSIS REPORT

Page 1 of 5

<b>Client:</b>	Tonkin & Taylor	<b>Lab No:</b>	1202868	SPv2
<b>Contact:</b>	C Fagan	<b>Date Registered:</b>	14-Nov-2013	
	C/- Tonkin & Taylor	<b>Date Reported:</b>	21-Nov-2013	
	PO Box 5271	<b>Quote No:</b>	58190	
	AUCKLAND 1141	<b>Order No:</b>	29452.001	
		<b>Client Reference:</b>	29452.001	
		<b>Submitted By:</b>	Kieran Miller	

Sample Type: Soil						
Sample Name:	HA1 - 0.25m 13-Nov-2013 9:20 am	HA1 - 0.5m 13-Nov-2013 9:20 am	HA1 - 1m 13-Nov-2013 9:20 am	HA2 - 0.25m 13-Nov-2013 9:50 am	HA3 - 0.25m 13-Nov-2013 10:20 am	
Lab Number:	1202868.2	1202868.3	1202868.4	1202868.6	1202868.10	
Individual Tests						
Dry Matter g/100g as rcvd	76	71	72	72	75	
Qualitative Identification of Asbestos	-	See attached report	-	-	-	
Total Recoverable Boron mg/kg dry wt	< 20	< 20	< 20	< 20	< 20	
Heavy metals, screen As,Cd,Cr,Cu,Ni,Pb,Zn,Hg						
Total Recoverable Arsenic mg/kg dry wt	< 2	-	-	< 2	3	
Total Recoverable Cadmium mg/kg dry wt	< 0.10	-	-	< 0.10	0.13	
Total Recoverable Chromium mg/kg dry wt	28	-	-	13	22	
Total Recoverable Copper mg/kg dry wt	18	-	-	5	25	
Total Recoverable Lead mg/kg dry wt	19.5	-	-	4.5	60	
Total Recoverable Mercury mg/kg dry wt	0.12	-	-	< 0.10	< 0.10	
Total Recoverable Nickel mg/kg dry wt	34	-	-	6	26	
Total Recoverable Zinc mg/kg dry wt	37	-	-	10	77	
Heavy metal screen level As,Cd,Cr,Cu,Ni,Pb,Zn						
Total Recoverable Arsenic mg/kg dry wt	-	4	3	-	-	
Total Recoverable Cadmium mg/kg dry wt	-	< 0.10	< 0.10	-	-	
Total Recoverable Chromium mg/kg dry wt	-	20	18	-	-	
Total Recoverable Copper mg/kg dry wt	-	13	13	-	-	
Total Recoverable Lead mg/kg dry wt	-	22	33	-	-	
Total Recoverable Nickel mg/kg dry wt	-	21	18	-	-	
Total Recoverable Zinc mg/kg dry wt	-	28	40	-	-	
Polycyclic Aromatic Hydrocarbons Screening in Soil						
Acenaphthene mg/kg dry wt	< 0.03	< 0.03	< 0.04	< 0.04	< 0.03	
Acenaphthylene mg/kg dry wt	< 0.03	< 0.03	< 0.04	< 0.04	< 0.03	
Anthracene mg/kg dry wt	< 0.03	< 0.03	< 0.04	< 0.04	< 0.03	
Benzo[a]anthracene mg/kg dry wt	0.05	< 0.03	< 0.04	< 0.04	0.16	
Benzo[a]pyrene (BAP) mg/kg dry wt	0.07	< 0.03	< 0.04	< 0.04	0.23	
Benzo[b]fluoranthene + Benzo[j]fluoranthene mg/kg dry wt	0.08	< 0.03	< 0.04	< 0.04	0.26	
Benzo[g,h,i]perylene mg/kg dry wt	0.07	< 0.03	< 0.04	< 0.04	0.22	
Benzo[k]fluoranthene mg/kg dry wt	0.03	< 0.03	< 0.04	< 0.04	0.10	
Chrysene mg/kg dry wt	0.05	< 0.03	< 0.04	< 0.04	0.16	
Dibenzo[a,h]anthracene mg/kg dry wt	< 0.03	< 0.03	< 0.04	< 0.04	0.03	
Fluoranthene mg/kg dry wt	0.08	0.03	< 0.04	< 0.04	0.30	
Fluorene mg/kg dry wt	< 0.03	< 0.03	< 0.04	< 0.04	< 0.03	
Indeno(1,2,3-c,d)pyrene mg/kg dry wt	0.07	< 0.03	< 0.04	< 0.04	0.22	
Naphthalene mg/kg dry wt	< 0.15	< 0.15	< 0.16	< 0.16	< 0.15	



This Laboratory is accredited by International Accreditation New Zealand (IANZ), which represents New Zealand in the International Laboratory Accreditation Cooperation (ILAC). Through the ILAC Mutual Recognition Arrangement (ILAC-MRA) this accreditation is internationally recognised.

The tests reported herein have been performed in accordance with the terms of accreditation, with the exception of tests marked \*, which are not accredited.

Sample Type: Soil						
<b>Sample Name:</b>		HA1 - 0.25m 13-Nov-2013 9:20 am	HA1 - 0.5m 13-Nov-2013 9:20 am	HA1 - 1m 13-Nov-2013 9:20 am	HA2 - 0.25m 13-Nov-2013 9:50 am	HA3 - 0.25m 13-Nov-2013 10:20 am
<b>Lab Number:</b>		1202868.2	1202868.3	1202868.4	1202868.6	1202868.10
Polycyclic Aromatic Hydrocarbons Screening in Soil						
Phenanthrene	mg/kg dry wt	< 0.03	< 0.03	< 0.04	< 0.04	0.12
Pyrene	mg/kg dry wt	0.11	0.04	< 0.04	< 0.04	0.36
<b>Sample Name:</b>		HA4 - 0.5m 13-Nov-2013 10:50 am	HA5 - 0.25m 13-Nov-2013 11:20 am	HA5 - 0.5m 13-Nov-2013 11:20 am	HA5 - 1m 13-Nov-2013 11:20 am	HA6 - 0.25m 13-Nov-2013 11:50 am
<b>Lab Number:</b>		1202868.15	1202868.18	1202868.19	1202868.20	1202868.22
Individual Tests						
Dry Matter	g/100g as rcvd	71	86	75	72	76
Qualitative Identification of Asbestos		-	See attached report	-	-	-
Total Recoverable Boron	mg/kg dry wt	< 20	< 20	< 20	< 20	< 20
Heavy metals, screen As,Cd,Cr,Cu,Ni,Pb,Zn,Hg						
Total Recoverable Arsenic	mg/kg dry wt	5	< 2	< 2	-	4
Total Recoverable Cadmium	mg/kg dry wt	< 0.10	0.13	< 0.10	-	0.10
Total Recoverable Chromium	mg/kg dry wt	21	11	14	-	25
Total Recoverable Copper	mg/kg dry wt	17	13	9	-	29
Total Recoverable Lead	mg/kg dry wt	35	72	18.3	-	115
Total Recoverable Mercury	mg/kg dry wt	< 0.10	< 0.10	< 0.10	-	< 0.10
Total Recoverable Nickel	mg/kg dry wt	26	14	6	-	37
Total Recoverable Zinc	mg/kg dry wt	49	74	15	-	90
Heavy metal screen level As,Cd,Cr,Cu,Ni,Pb,Zn						
Total Recoverable Arsenic	mg/kg dry wt	-	-	-	< 2	-
Total Recoverable Cadmium	mg/kg dry wt	-	-	-	< 0.10	-
Total Recoverable Chromium	mg/kg dry wt	-	-	-	17	-
Total Recoverable Copper	mg/kg dry wt	-	-	-	5	-
Total Recoverable Lead	mg/kg dry wt	-	-	-	6.8	-
Total Recoverable Nickel	mg/kg dry wt	-	-	-	5	-
Total Recoverable Zinc	mg/kg dry wt	-	-	-	10	-
Polycyclic Aromatic Hydrocarbons Screening in Soil						
Acenaphthene	mg/kg dry wt	< 0.04	< 0.03	< 0.03	< 0.03	< 0.03
Acenaphthylene	mg/kg dry wt	< 0.04	< 0.03	< 0.03	< 0.03	< 0.03
Anthracene	mg/kg dry wt	< 0.04	< 0.03	< 0.03	< 0.03	< 0.03
Benzo[a]anthracene	mg/kg dry wt	< 0.04	0.07	< 0.03	< 0.03	0.04
Benzo[a]pyrene (BAP)	mg/kg dry wt	< 0.04	0.11	< 0.03	< 0.03	0.05
Benzo[b]fluoranthene + Benzo[j] fluoranthene	mg/kg dry wt	< 0.04	0.12	< 0.03	< 0.03	0.05
Benzo[g,h,i]perylene	mg/kg dry wt	< 0.04	0.10	< 0.03	< 0.03	0.05
Benzo[k]fluoranthene	mg/kg dry wt	< 0.04	0.05	< 0.03	< 0.03	< 0.03
Chrysene	mg/kg dry wt	< 0.04	0.07	< 0.03	< 0.03	0.04
Dibenzo[a,h]anthracene	mg/kg dry wt	< 0.04	< 0.03	< 0.03	< 0.03	< 0.03
Fluoranthene	mg/kg dry wt	< 0.04	0.11	< 0.03	< 0.03	0.09
Fluorene	mg/kg dry wt	< 0.04	< 0.03	< 0.03	< 0.03	< 0.03
Indeno(1,2,3-c,d)pyrene	mg/kg dry wt	< 0.04	0.11	< 0.03	< 0.03	0.04
Naphthalene	mg/kg dry wt	< 0.16	< 0.13	< 0.15	< 0.15	< 0.15
Phenanthrene	mg/kg dry wt	< 0.04	0.04	< 0.03	< 0.03	0.04
Pyrene	mg/kg dry wt	< 0.04	0.14	< 0.03	< 0.03	0.10
<b>Sample Name:</b>		HA7 - 0.25m 13-Nov-2013 12:20 pm	HA8 - 0.5m 13-Nov-2013 12:40 pm	HA9 - 0.25m 13-Nov-2013 1:10 pm	HA9 - 1m 13-Nov-2013 1:10 pm	HA10 - 0.25m 13-Nov-2013 3:50 pm
<b>Lab Number:</b>		1202868.26	1202868.31	1202868.34	1202868.36	1202868.38
Individual Tests						
Dry Matter	g/100g as rcvd	77	78	74	81	80
Total Recoverable Boron	mg/kg dry wt	< 20	< 20	< 20	< 20	< 20
Heavy metals, screen As,Cd,Cr,Cu,Ni,Pb,Zn,Hg						
Total Recoverable Arsenic	mg/kg dry wt	4	3	4	-	2

Sample Type: Soil						
Sample Name:		HA7 - 0.25m 13-Nov-2013 12:20 pm	HA8 - 0.5m 13-Nov-2013 12:40 pm	HA9 - 0.25m 13-Nov-2013 1:10 pm	HA9 - 1m 13-Nov-2013 1:10 pm	HA10 - 0.25m 13-Nov-2013 3:50 pm
Lab Number:		1202868.26	1202868.31	1202868.34	1202868.36	1202868.38
Heavy metals, screen As,Cd,Cr,Cu,Ni,Pb,Zn,Hg						
Total Recoverable Cadmium	mg/kg dry wt	< 0.10	< 0.10	0.14	-	< 0.10
Total Recoverable Chromium	mg/kg dry wt	16	13	34	-	18
Total Recoverable Copper	mg/kg dry wt	10	16	29	-	11
Total Recoverable Lead	mg/kg dry wt	12.0	8.8	63	-	15.5
Total Recoverable Mercury	mg/kg dry wt	< 0.10	< 0.10	< 0.10	-	< 0.10
Total Recoverable Nickel	mg/kg dry wt	4	4	48	-	27
Total Recoverable Zinc	mg/kg dry wt	11	39	186	-	23
Heavy metal screen level As,Cd,Cr,Cu,Ni,Pb,Zn						
Total Recoverable Arsenic	mg/kg dry wt	-	-	-	2	-
Total Recoverable Cadmium	mg/kg dry wt	-	-	-	0.12	-
Total Recoverable Chromium	mg/kg dry wt	-	-	-	13	-
Total Recoverable Copper	mg/kg dry wt	-	-	-	18	-
Total Recoverable Lead	mg/kg dry wt	-	-	-	5.3	-
Total Recoverable Nickel	mg/kg dry wt	-	-	-	27	-
Total Recoverable Zinc	mg/kg dry wt	-	-	-	109	-
Polycyclic Aromatic Hydrocarbons Screening in Soil						
Acenaphthene	mg/kg dry wt	< 0.03	< 0.03	< 0.03	< 0.03	0.09
Acenaphthylene	mg/kg dry wt	< 0.03	< 0.03	< 0.03	< 0.03	< 0.03
Anthracene	mg/kg dry wt	< 0.03	< 0.03	< 0.03	< 0.03	0.17
Benzo[a]anthracene	mg/kg dry wt	< 0.03	< 0.03	< 0.03	< 0.03	0.20
Benzo[a]pyrene (BAP)	mg/kg dry wt	< 0.03	< 0.03	< 0.03	< 0.03	0.25
Benzo[b]fluoranthene + Benzo[j] fluoranthene	mg/kg dry wt	< 0.03	< 0.03	< 0.03	< 0.03	0.26
Benzo[g,h,i]perylene	mg/kg dry wt	< 0.03	< 0.03	< 0.03	< 0.03	0.26
Benzo[k]fluoranthene	mg/kg dry wt	< 0.03	< 0.03	< 0.03	< 0.03	0.11
Chrysene	mg/kg dry wt	< 0.03	< 0.03	< 0.03	< 0.03	0.20
Dibenzo[a,h]anthracene	mg/kg dry wt	< 0.03	< 0.03	< 0.03	< 0.03	0.04
Fluoranthene	mg/kg dry wt	< 0.03	< 0.03	< 0.03	< 0.03	0.54
Fluorene	mg/kg dry wt	< 0.03	< 0.03	< 0.03	< 0.03	0.09
Indeno(1,2,3-c,d)pyrene	mg/kg dry wt	< 0.03	< 0.03	< 0.03	< 0.03	0.26
Naphthalene	mg/kg dry wt	< 0.15	< 0.15	< 0.15	< 0.14	0.21
Phenanthrene	mg/kg dry wt	< 0.03	< 0.03	< 0.03	< 0.03	0.49
Pyrene	mg/kg dry wt	< 0.03	< 0.03	< 0.03	< 0.03	0.50
Sample Name:		HA10 - 0.5m 13-Nov-2013 3:50 pm	HA11 - 0m 13-Nov-2013 2:20 pm	HA12 - 0m 13-Nov-2013 2:40 pm	Dup 1 13-Nov-2013	Dup 2 13-Nov-2013
Lab Number:		1202868.39	1202868.41	1202868.42	1202868.43	1202868.44
Individual Tests						
Dry Matter	g/100g as rcvd	75	74	73	79	79
Total Recoverable Boron	mg/kg dry wt	< 20	< 20	< 20	< 20	< 20
Heavy metals, screen As,Cd,Cr,Cu,Ni,Pb,Zn,Hg						
Total Recoverable Arsenic	mg/kg dry wt	2	4	3	< 2	3
Total Recoverable Cadmium	mg/kg dry wt	< 0.10	0.11	0.12	< 0.10	0.14
Total Recoverable Chromium	mg/kg dry wt	11	40	30	10	31
Total Recoverable Copper	mg/kg dry wt	4	24	25	3	32
Total Recoverable Lead	mg/kg dry wt	19.5	61	55	2.8	40
Total Recoverable Mercury	mg/kg dry wt	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Total Recoverable Nickel	mg/kg dry wt	5	54	39	4	57
Total Recoverable Zinc	mg/kg dry wt	20	77	89	5	136
Polycyclic Aromatic Hydrocarbons Screening in Soil						
Acenaphthene	mg/kg dry wt	< 0.03	< 0.04	< 0.03	< 0.03	< 0.03
Acenaphthylene	mg/kg dry wt	< 0.03	< 0.04	< 0.03	< 0.03	< 0.03
Anthracene	mg/kg dry wt	< 0.03	0.03	0.04	< 0.03	< 0.03
Benzo[a]anthracene	mg/kg dry wt	< 0.03	0.18	0.11	< 0.03	< 0.03

Sample Type: Soil						
<b>Sample Name:</b>		HA10 - 0.5m 13-Nov-2013 3:50 pm	HA11 - 0m 13-Nov-2013 2:20 pm	HA12 - 0m 13-Nov-2013 2:40 pm	Dup 1 13-Nov-2013	Dup 2 13-Nov-2013
<b>Lab Number:</b>		1202868.39	1202868.41	1202868.42	1202868.43	1202868.44
Polycyclic Aromatic Hydrocarbons Screening in Soil						
Benzo[a]pyrene (BAP)	mg/kg dry wt	< 0.03	0.23	0.14	< 0.03	< 0.03
Benzo[b]fluoranthene + Benzo[j]fluoranthene	mg/kg dry wt	< 0.03	0.25	0.15	< 0.03	< 0.03
Benzo[g,h,i]perylene	mg/kg dry wt	< 0.03	0.22	0.12	< 0.03	< 0.03
Benzo[k]fluoranthene	mg/kg dry wt	< 0.03	0.12	0.07	< 0.03	< 0.03
Chrysene	mg/kg dry wt	< 0.03	0.19	0.12	< 0.03	< 0.03
Dibenzo[a,h]anthracene	mg/kg dry wt	< 0.03	0.04	< 0.03	< 0.03	< 0.03
Fluoranthene	mg/kg dry wt	< 0.03	0.37	0.24	< 0.03	< 0.03
Fluorene	mg/kg dry wt	< 0.03	< 0.04	< 0.03	< 0.03	< 0.03
Indeno(1,2,3-c,d)pyrene	mg/kg dry wt	< 0.03	0.21	0.11	< 0.03	< 0.03
Naphthalene	mg/kg dry wt	< 0.15	< 0.16	< 0.15	< 0.15	< 0.14
Phenanthrene	mg/kg dry wt	< 0.03	0.13	0.12	< 0.03	< 0.03
Pyrene	mg/kg dry wt	< 0.03	0.42	0.26	< 0.03	< 0.03
<b>Sample Name:</b>		BH05 0-0.6m (45) 13-Nov-2013	BH05 0-0.6m (46) 13-Nov-2013			
<b>Lab Number:</b>		1202868.45	1202868.46			
Individual Tests						
Dry Matter	g/100g as rcvd	79	83	-	-	-
Qualitative Identification of Asbestos		See attached report	-	-	-	-
Total Recoverable Boron	mg/kg dry wt	< 20	< 20	-	-	-
Heavy metals, screen As,Cd,Cr,Cu,Ni,Pb,Zn,Hg						
Total Recoverable Arsenic	mg/kg dry wt	3	3	-	-	-
Total Recoverable Cadmium	mg/kg dry wt	0.25	0.29	-	-	-
Total Recoverable Chromium	mg/kg dry wt	19	18	-	-	-
Total Recoverable Copper	mg/kg dry wt	19	22	-	-	-
Total Recoverable Lead	mg/kg dry wt	49	65	-	-	-
Total Recoverable Mercury	mg/kg dry wt	< 0.10	< 0.10	-	-	-
Total Recoverable Nickel	mg/kg dry wt	30	26	-	-	-
Total Recoverable Zinc	mg/kg dry wt	197	250	-	-	-
Polycyclic Aromatic Hydrocarbons Screening in Soil						
Acenaphthene	mg/kg dry wt	< 0.03	< 0.03	-	-	-
Acenaphthylene	mg/kg dry wt	< 0.03	< 0.03	-	-	-
Anthracene	mg/kg dry wt	< 0.03	< 0.03	-	-	-
Benzo[a]anthracene	mg/kg dry wt	0.05	< 0.03	-	-	-
Benzo[a]pyrene (BAP)	mg/kg dry wt	0.04	< 0.03	-	-	-
Benzo[b]fluoranthene + Benzo[j]fluoranthene	mg/kg dry wt	0.07	0.03	-	-	-
Benzo[g,h,i]perylene	mg/kg dry wt	0.03	< 0.03	-	-	-
Benzo[k]fluoranthene	mg/kg dry wt	< 0.03	< 0.03	-	-	-
Chrysene	mg/kg dry wt	0.06	< 0.03	-	-	-
Dibenzo[a,h]anthracene	mg/kg dry wt	< 0.03	< 0.03	-	-	-
Fluoranthene	mg/kg dry wt	0.05	0.04	-	-	-
Fluorene	mg/kg dry wt	< 0.03	< 0.03	-	-	-
Indeno(1,2,3-c,d)pyrene	mg/kg dry wt	< 0.03	< 0.03	-	-	-
Naphthalene	mg/kg dry wt	< 0.14	< 0.14	-	-	-
Phenanthrene	mg/kg dry wt	0.03	< 0.03	-	-	-
Pyrene	mg/kg dry wt	0.06	0.05	-	-	-
<b>Analyst's Comments</b>						
Appendix No.1 - Asbestos results						

# SUMMARY OF METHODS

The following table(s) gives a brief description of the methods used to conduct the analyses for this job. The detection limits given below are those attainable in a relatively clean matrix. Detection limits may be higher for individual samples should insufficient sample be available, or if the matrix requires that dilutions be performed during analysis.

Sample Type: Soil			
Test	Method Description	Default Detection Limit	Sample No
Environmental Solids Sample Preparation	Air dried at 35°C and sieved, <2mm fraction. Used for sample preparation. May contain a residual moisture content of 2-5%.	-	2-4, 6, 10, 15, 18-20, 22, 26, 31, 34, 36, 38-39, 41-46
Heavy metals, screen As,Cd,Cr,Cu,Ni,Pb,Zn,Hg	Dried sample, <2mm fraction. Nitric/Hydrochloric acid digestion, ICP-MS, screen level.	-	2, 6, 10, 15, 18-19, 22, 26, 31, 34, 38-39, 41-46
Heavy metal screen level As,Cd,Cr,Cu,Ni,Pb,Zn	Dried sample, <2mm fraction. Nitric/Hydrochloric acid digestion, ICP-MS, screen level.	-	3-4, 20, 36
Polycyclic Aromatic Hydrocarbons Screening in Soil	Sonication extraction, Dilution or SPE cleanup (if required), GC-MS SIM analysis (modified US EPA 8270). Tested on as received sample. [KBIs:5786,2805,2695]	-	2-4, 6, 10, 15, 18-20, 22, 26, 31, 34, 36, 38-39, 41-46
Dry Matter (Env)	Dried at 103°C for 4-22hr (removes 3-5% more water than air dry) , gravimetry. US EPA 3550. (Free water removed before analysis).	0.10 g/100g as rcvd	2-4, 6, 10, 15, 18-20, 22, 26, 31, 34, 36, 38-39, 41-46
Total Recoverable digestion	Nitric / hydrochloric acid digestion. US EPA 200.2.	-	2-4, 6, 10, 15, 18-20, 22, 26, 31, 34, 36, 38-39, 41-46
Qualitative Identification of Asbestos	150-200g, sealed plastic bag. Polarised Light Microscopy and dispersion staining techniques. Subcontracted to Dowdell & Associates, 4 Cain Road, Penrose, Auckland. AS 4964 (2004) - Method for the Qualitative / Semi-Quantitative Identification of Asbestos in Bulk Samples.	-	3, 18, 45
Total Recoverable Boron	Dried sample, sieved as specified (if required). Nitric/Hydrochloric acid digestion, ICP-MS, screen level. US EPA 200.2.	20 mg/kg dry wt	2-4, 6, 10, 15, 18-20, 22, 26, 31, 34, 36, 38-39, 41-46

These samples were collected by yourselves (or your agent) and analysed as received at the laboratory.

Samples are held at the laboratory after reporting for a length of time depending on the preservation used and the stability of the analytes being tested. Once the storage period is completed the samples are discarded unless otherwise advised by the client.

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Carole Rodgers-Carroll BA, NZCS  
Client Services Manager - Environmental Division



# DOWDELL & ASSOCIATES LTD

## OCCUPATIONAL HEALTH ANALYSTS & CONSULTANTS

4 Cain Rd., Penrose, PO Box 112-017 Auckland 1642, Phone (09) 5260-246. Fax (09) 5795-389.

20<sup>th</sup> November 2013

Hill Laboratories  
Private Bag 3205  
Waikato Mail Centre  
**Hamilton 3240**

Dear Sir/Madam

**Re: Bulk Fibre Analysis**

Sampled by	: Client
Date received	: 20 <sup>th</sup> November 2013
Laboratory no.	: 50488
Description	: 3 x soil sample(s)
Location	: -
Reference no.	: 136094
Method	: AS 4964 (2004) - Method for the Qualitative Identification of Asbestos in Bulk Samples

We examined the following sample(s) using Low Powered Stereomicroscopy followed by 'Polarised Light Microscopy' including Dispersion Staining Techniques. The following result(s) relate(s) to the sample(s) as received:

**Reg no:** F1129      **Labelled as:** 1202868/3  
**Sample size:** Wet weight 55.8 g/ Dry weight 39.9 g  
**Result:** Asbestos **NOT** detected.

**Reg no:** F1130      **Labelled as:** 1202868/18  
**Sample size:** Wet weight 71.5 g/ Dry weight 58.1 g  
**Result:** Asbestos **NOT** detected.

**Reg no:** F1131      **Labelled as:** 1202868/45  
**Sample size:** Wet weight 22.2 g/ Dry weight 19.3 g  
**Result:** Asbestos **NOT** detected.

Yours faithfully  
**DOWDELL & ASSOCIATES LTD**

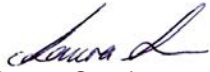


Imtiaz Damani MSc  
**Analyst**



E.Sheldon BSc (Hon)  
**Analyst**





Laura Sands

**Occupational Hygienist**

NOTE:

- This report must not be altered, or reproduced except in full.
- Sample weights are defined as;
  - a. (Wet Weight) - Weight of sample that has been analysed.
  - b. (Dry Basis) - Combusted dry weight of the analysed sample.
- New Zealand has no specific guidelines with regard to asbestos content in soils. However, we recommend that the Australian Government's enHealth Council's Document 'Management of Asbestos in the Non-Occupational Environment' – 2005 and the (DOH) WA's 'Guidelines for the Assessment, Remediation and Management of Asbestos Contaminated Sites in Western Australia – May 2009 be consulted.

## **APPENDIX G**

**Urban Design Review,  
Clinton Bird Urban Design Limited (2015)**

# **PROPOSED RYMAN HEALTHCARE RETIREMENT VILLAGE**

**NGATARINGA ROAD**

**NARROW NECK**

**AUCKLAND**



## **URBAN DESIGN REVIEW**

**Prepared for:** Ryman Healthcare Limited

**Prepared by:** Clinton Bird Urban Design Limited  
P O Box 37 231  
Parnell  
Auckland 1151  
New Zealand

Office: 0064 9 307 3735  
Mobile: 0064 21 307 374  
Email: [cabird@orcon.net.nz](mailto:cabird@orcon.net.nz)

**18 November 2015**

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## **1 INTRODUCTION**

- 1.1 This report has been prepared at the request of Ryman Healthcare Limited (**Ryman**).
- 1.2 The purpose of the report is to provide an urban design review of the environmental effects of the proposed retirement village at Ngataringa Road, Narrow Neck, Auckland, as part of the current resource consent application to the Auckland Council.
- 1.3 Clinton Bird Urban Design Limited (**CBUD**) has been involved in the proposed Ryman retirement village design since its inception and, as a result of that involvement, the progression of the design has been subject to a number of iterations.
- 1.4 I have visited the site and its surroundings on three occasions.
- 1.5 Except where otherwise stated, all photographs were taken by the author of this report, using a 35mm digital SLR lens, which is the equivalent of a 50mm non-digital lens. Panoramic photographs consist of two or more 35mm digital photographs joined together using HP Photosmart Stitch software.
- 1.6 This report is based upon drawings supplied to the author by Ryman Healthcare Limited. The drawing reference numbers are recorded in Annexure 1 to this report.

## **2 THE SITE CONTEXT**

### ***Location***

- 2.1 The 4.2515 hectare site is situated at Ngataringa Road, Narrow Neck, on Auckland's North Shore (see Figure 1).
- 2.2 The site is approximately 2 kilometres to the north of the Devonport shopping centre and its associated cross-harbour ferry terminal (see Figure 1).



**Figure 1: An Auckland Council GIS Viewer image of part of Auckland's North Shore, illustrating the 4.2515 hectare Ryman site (highlighted in red) in its regional context.**

***Character of existing context***

- 2.3 To the immediate north, east and west of the site are relatively mature, medium density residential areas, while to the south is Ngataringa Bay on the edge of the Waitemata Harbour.
- 2.4 Almost immediately to the south-east of the site is the Waitemata Golf Course, while directly across the Ngataringa Bay estuary is Ngataringa Park and Dacre Park. Further to the south-east is Mt Victoria. To the south and south-west of the site is the Navy Supply Depot, the Ngataringa Bay Sports Field and Te Taua Moana Marae (see Figures 1 and 2).





**Figure 2: An Auckland Council GIS Viewer image of the Ryman site (highlighted in red) illustrating its relationship to Ngataranga Park, Dacre Park, the Waitemata Golf Course, Mt Victoria, the Naval Supply Depot, the Ngataranga Bay Sports Field and Te Taua Moana Marae.**

- 2.5 The site lies at the interface of a mature, medium-density residential area and the eastern-most reach of Ngataranga Bay (see Figures 1, 2 and 3).





**Figure 3: An Auckland Council GIS Viewer image illustrating the Ryman site (highlighted in red) and its relationship to its immediate Narrow Neck context.**

- 2.6 The residential properties directly opposite the northern, Ngataranga Road, frontage of the site contain one and two storey high, typically suburban, detached houses, which vary widely in age, materials and architectural style. A similar situation applies to the houses opposite the eastern and western boundaries of the site (see Figures 4, 5 and 6).



**Figure 4: From top left to bottom right: Views of the residential properties at 4, 6, 8, 10, 12, 12A, 14 and 16 Ngataringa Road, directly opposite the site.**