Western Bay of Plenty District Council

Consent Notice Pursuant to Section 221 Resource Management Act 1991

File Ref: S/B 8508

IN THE MATTER OF: 1-70, 73-84, and 123-124 of Deposited Plan 367979

AND

IN THE MATTER OF: Subdivision Consent pursuant to Sections 108, 220 and 221 of the Resource Management Act 1991.

PURSUANT to Section 252(1)(a) of the Local Government Act 1974, I, STEVE HILL, Authorised Officer of the Western Bay of Plenty District Council, hereby certify that the following conditions of consent were imposed on the subdivision consent for Pt Allotments 52, 52A, 53, 53A, 54, 54A, 55 and 91, 91A Te Puna Parish, Part DP 3254 and Pt Lot 6 DP 12835.

1. **Building Line Restrictions and Geotechnical Recommendations**

The following building line and geotech conditions apply to Lots 1-7, 12, 30-45, 54, 57-61, 65-70, 73-78, 83 - 84, and 123.

A10.3 *THAT a building line restriction be determined in accordance with the recommendations of the geotechnical report prepared by Foundation Engineering dated 16 December 1999 or subsequent geotechnical reports prepared by a registered engineer suitably experienced to the satisfaction of the Principal Administrative Officer and be shown on the Land Transfer plan and registered against the certificates of title of the relevant lots.*

A10.4 *THAT a consent notice pursuant to Section 221 of the Resource Management Act 1991 be issued against the titles of allotments that are subject to building restriction lines or any other geotechnical constraints. Those allotments shall be specified in the Geotechnical completion report to be submitted with the Section 224 application.*

[Note: The final geotechnical completion report and information are provided in the Tonkin and Taylor letters and attachments dated 12 May 2006 and 12 April 2006 (Ref 60619), the *Amended Covenant Schedule* date stamped 9 May 2006, and the Tonkin and Taylor Report for *Lynley Park Subdivision, Omokoroa Stage 1A – Geotechnical Report* dated February 2006 (Ref 60619)]

The following geotech condition applies to all residential lots created on DP 367979 and forms part of the 'Statement of Professional Opinion as to the Geotechnical Suitability of Land for Building' prepared by Tonkin and Taylor and dated 22 February 2006.

The areas shown in my report dated February 2006 of each new allotment or on the development site are suitable for erection thereon of the building types appropriate to the zoning of the land, provided that: foundation inspections by the regulatory authorities and a suitably qualified engineer should be carried out during construction, and construction is in accordance with NZS 3604:1999 and related documents; building restriction lines indicate those areas where specific design is required.

2. Landscaping and Amenity Planting

The following landscaping condition applies to Lots 30-45 and Lot 54 and is shown on the DPS plan 'C1 to C17'.

A4.3 *THAT any surplus land not required to satisfy the foregoing conditions 4.1 and 4.2 shall be incorporated into the adjoining lots and be subject to covenants registered on the certificates of titles of such lots restricting and preserving the land for landscape and amenity planting in accordance with the recommendation contained in the CGC Ltd report dated 30 November 2000 and in the evidence presented at the hearing by David Clayton-Greene.*

[Note: The landscaping plan approved for the escarpment is the CGC Plan dated 31 August 2005 Sheet 1 and 2 as amended to include the 'General Notes'. The planting as shown on this plan must be maintained by the landowner at all times unless prior written approval is obtained from Western Bay of Plenty District Council to modify or remove the planting. Any planting will not however be permitted which is in conflict with condition A15.7 of consent (refer clause 6 below).]

3. Reserve Fencing Restrictions

The following fencing condition applies to Lots 30-45, 54-56, 15-16, and 18-20.

A4.8 *THAT a consent notice pursuant to Section 221 of the Resource Management Act 1991 be issued against the titles of all lots adjoining Council reserves to the effect that the construction of the fences on the common boundary are at the expense of the respective landowners or occupiers.*

4. Buttress Drains

The following buttress drain condition applies to Lots 30-31, 34- 35, 39, 40, 42-45, 54 ~~and 124~~.

A15.7 *THAT no trees be planted within a horizontal distance of 5.0 metres from the centre line of the buttress drains as shown on the attached CKL drawing Subsoil Drainage (Ref D1176 Rev AB1) Pages 2 –5, unless prior written approval from the Western Bay of Plenty District Council is obtained. Trees will only be permitted which have a shallow root structure so as to avoid any detrimental affect on the Buttress Drains. The landscaping measures as required by conditions A4.3 of consent are to be maintained at all times.*

5. Reserve Linkage Lot

A4.9 THAT Lot 123 be sold to the Council and a consent notice registered on the certificate of title for the lot restricting the use of the land to the provision of a linkage to other land on the southern side of the railway line unless alternative provision is made for such linkage.

Dated at Tauranga this 21st day of June 2006

Authorised Officer

Tonkin & Taylor

T&T job no: 60619
12 May 2006

Durham Property Investments
PO Box 15197
Dynsdale
Hamilton

Attention: Philip Palmer

Dear Philip

Lynley Park Subdivision, Omokoroa
Lot 123 Geotechnical Completion Report

Lot 123 has now been included as part of the Stage 1a completion of Lynley Park. This letter is the geotechnical completion report for Lot 123 on the above subdivision and should be considered an addendum to the completion report for Stage 1a. Detail of the background on the earthworks for this subdivision are included in the Tonkin & Taylor Ltd report *Lynley Park Subdivision, Omokoroa – Stage 1a Completion Report and dated February 2006.*

This letter also includes the Section 224 Certification Statement from the Western Bay of Plenty District Council Proposed Code of Practice for Subdivision Development, as requested by WBOPDC.

Enclosed with this letter are;

- Summary Lot table for Lot 123
- Site test location plan Figure 3 rev1 showing lot location and cut/fill depths
- Statement of Professional Opinion for Lot 123
- Section 224 Certification Statement

Please contact the undersigned if you have any queries regarding this report.

Yours sincerely

Chris Bauld
Group Manager - Tauranga

12-May-06
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"I hereby certify that the following works comply with the District Plan and Subdivision and Development Code of Practice:

Signed

Dated

OR

"As an independent professional I, or other personnel under my control, have carried out periodic reviews of the subdivision work appropriate as to the nature of the work. Based upon these reviews, on information supplied by independent professionals engaged in the work and by the contractor during the course of the subdivisional works [optional: and the contractor's certification upon completion of the subdivisional works - copy attached], I hereby certify on the basis of reasonable and appropriate enquiry, that the following subdivisional works

(1) Bulk earthworks as described in the Tonkin & Taylor Ltd report "Lynley Park Subdivision, Omokoroa - Stage 1a Geotechnical Completion Report" and dated February 2006.
(2) Bulk earthworks as described in the Tonkin & Taylor Ltd report "Lynley Park Subdivision, Omokoroa - Lot 123 Geotechnical Completion Report" and dated May 2006.
(3) Pavement construction as described in the Tonkin & Taylor Ltd report "Lynley Park Subdivision, Omokoroa - Stage 1a Pavement Completion Report" and dated April 2006.

and subject to the limitations of those reports,

comply with the conditions of this consent and that the development work required by the conditions of consent has been undertaken in accordance with sound engineering design and construction practice and complies with the ~~District Plan and~~ Subdivision and Development Code of Practice."

Signed

Dated 12 May 2006

	SECTION 224 CERTIFICATION STATEMENT	1 - 1b
	WESTERN BAY OF PLENTY DISTRICT COUNCIL	March 2005

To: The Western Bay of Plenty District Council

STATEMENT OF PROFESSIONAL OPINION AS TO THE GEOTECHNICAL SUITABILITY OF LAND FOR BUILDING

DEVELOPMENT: Lynley Park Subdivision – Stage 1a

OWNER: Durham Properties Ltd

LOCATION: Omokoroa Road, Omokoroa Peninsula

I, Christopher John Bauld of Tonkin & Taylor Ltd, 12 Elizabeth Street, Tauranga, hereby confirm that:

1) I am a professional person, appropriately qualified with experience in geotechnical engineering to ascertain the suitability of the land for building development and was retained as the Soils Engineer for the above development.

2) An appropriate level of site investigation and construction supervision has been carried out under my direction and is described in the development evaluation report dated March 2004 (Stage 1, Lynley Park Omokoroa, Geotechnical Issues Report, Tonkin & Taylor Ltd).

3) In my professional opinion, not to be construed as a guarantee, I consider that:

   a) The area shown in my letter dated 12 May 2006 of allotment 123 is suitable for the erection thereon of the building types appropriate to the zoning of the land,, provided that: normal foundation inspections by the regulatory authorities and a suitably qualified engineer should be carried out during construction, and construction is in accordance with NZS 3604:1999 and related documents; building restriction lines indicate those areas where specific design is required.

   b) The completed works give due regard to land slope and foundation stability considerations.

   c) The earth fills shown on the attached plan (T&T Figure 3, rev 1), have been placed in accordance with the Subdivision and Development Code of Practice of the Western Bay of Plenty District Council.

   d) The filled ground is suitable for the erection thereon of residential buildings not requiring specific design in terms of NZS 3604:1999 and related documents providing that

      (i) normal foundation inspections by the regulatory authorities and a suitably qualified engineer should be carried out during construction

      (ii) construction is inside of the designated building restriction lines.

      (iii) The ground outside of the designated building restriction lines should be suitable for the erection thereon of residential buildings subject to specific engineering investigation and design.

      (iv) Inspections are especially important where concrete blockwork and/or brick veneer or stucco plaster buildings are sited partly on fill or partly on natural ground, or where they are entirely sited on filling whose depth changes significantly across the building platform. Any variations in soil conditions from those described in our report, should be reported to Tonkin & Taylor Ltd

   e) The original ground not affected by filling should be suitable for the erection thereon of residential buildings not requiring specific design in terms of NZS 3604:1999 and related documents provided that normal foundation inspections by the regulatory authorities and a suitably qualified engineer should be carried out during construction.

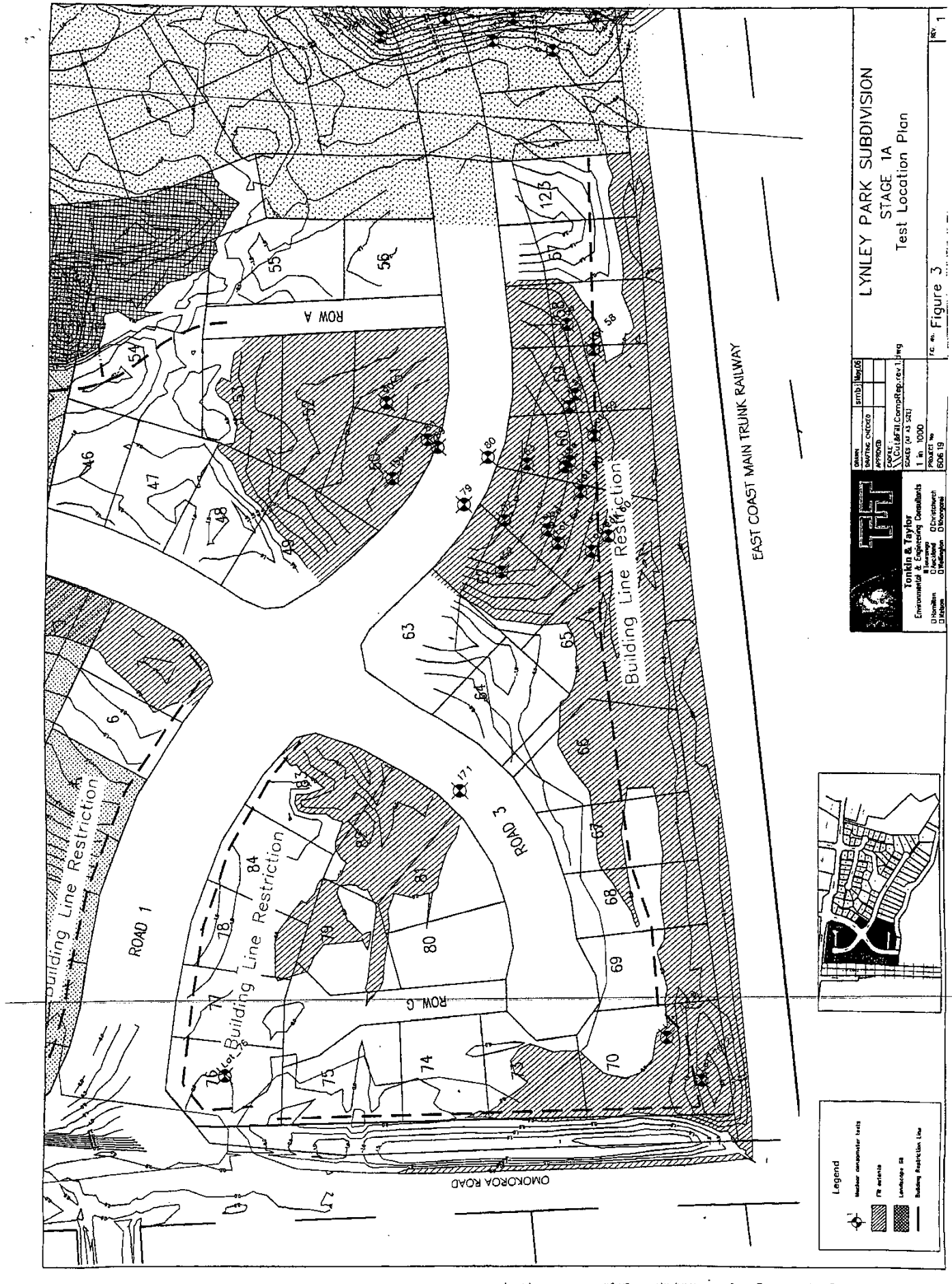
4) This professional opinion is furnished to the Council and the owner for their purpose alone, on the express condition that it will not be relied upon by any other person and does not remove the necessity for the normal inspection of foundation conditions at the time of erection for any dwelling.

Signed: ..... Date: 12 May 2006

Lynley Park Residential Subdivision - Stage 1a, Omokoroa

Summary of Geotechnical Data/Recommendations/Requirements for Individual Lots

Lot #	Area (m^2)	Subsurface Data				Foundations		Building line restriction? Y/N	Recommendations/restrictions
		Subdivision filling (TOTAL FILL)		Natural topography earthworked? (TOTAL CUT)		Conventional shallow foundation to NZS 3604:1999	Specific design?		
		Y/N	Average Depth (m)	Y/N	Average Depth (m)	Y/N/NA	Y/N/NA		
73	839	Y	<0.5	N		Y	N	Y	Foundation inspection during construction
74	884	Y	<0.5	N		Y	N	Y	Foundation inspection during construction
75	913	N		N		Y	N	Y	Foundation inspection during construction
76	890	N		Y	0.5	Y	N	Y	Foundation inspection during construction
77	764	N		Y	0	Y	N	Y	Foundation inspection during construction
78	794	Y	<0.5	Y	1.5	Y	N	Y	Foundation inspection during construction
79	783	Y	<0.5	N		Y	N	N	Foundation inspection during construction
80	768	N		N		Y	N	N	Foundation inspection during construction
81	779	Y	<0.5	N		Y	N	N	Foundation inspection during construction
82	870	Y	1.0	N		Y	N	N	Foundation inspection during construction
83	988	Y	1.5	Y	0.5	Y	N	Y	Foundation inspection during construction
84	922	Y	<0.5	Y	1.5	Y	N	Y	Foundation inspection during construction
123	867	Y	<0.5	Y	2.0	Y	N	Y	Foundation inspection during construction



Tonkin & Taylor

DBE
13/4/06

T&T job no: 60619
12 April 2006

Durham Property Investments Ltd
PO Box 15197
Dynsdale
Hamilton

Attention: Phillip Palmer

Dear Phillip

Lynley Park - Earthworks Completion Report

Introduction

This letter provides responses to the Western Bay of Plenty District Council (WBOPDC) letter of 07 March 2006 that requests clarifications to the Tonkin & Taylor report *Durham Properties Ltd, Lynley Park Subdivision, Omokoroa, Stage 1a – Geotechnical Completion Report* dated February 2006.

The points are as referred to in the WBOPDC letter.

4.3 – Maximum Cut Depth

This section was extracted form the design report and the intent of it should be clarified.

The design intent of this was to overlay any sensitive soils **if they were encountered.** Construction observation did not reveal any sensitive soils at grade in these areas and hence the undercut and fill overlay was not carried out.

We do not consider that 900mm deep pile would be at risk in a 1.5m deep fill layer. Such piles are generally required for uplift loads. In the event that the critical load is downwards, a pile would need to be greater than 600mm in diameter for the 1B depth of influence to extend below the fill.

4.6 Fill Induced Settlement

The areas of significant fill depth mentioned in this section are not in the Stage 1a area.

Monitoring of the fill settlement has not been undertaken at this point. Please confirm if you wish this to be carried out for release of the Stage 1b certification.

Tonkin & Taylor Ltd - Environmental & Engineering Consultants, Level 1, 12 Elizabeth St, Tauranga, New Zealand
PO Box 317, Tauranga, Ph: 64-7-571 3570, Fax: 64-7-571 5508, Email: tga@tonkin.co.nz, Website: www.tonkin.co.nz

Table 2 – Soil Testing Requirements

Section 7.4.2.4 of NZS 4431:1989 states; *For many cohesive soils it is found that an acceptable minimum shear strength is 150 kPa and a maximum air voids is 10%. For particular soil types, and for reserve areas or road subgrades some variations from the above values may be appropriate.*

This standard allows for variation from the 150kPa stated as a typical acceptable value. We have specified a target shear strength for the fill materials that we consider is appropriate for the soils encountered on site. This shear strength is expected to provide fills that perform adequately and allow deign of foundations in accordance with NZS 3604. In particular the high water content soils that are typical of the area mean that a high target shear strength may be difficult to achieve.

4 ### Suitability for Development

We have not identified any areas where a restriction on piled foundations would be required.

5 ### Sensitive Soil

The limitation on this lot is partially historical and is included on the original title for the lot. This was based on the fact that there was some potential for sub-horizontal, sensitive, soil layers in the ridge to daylight out of the natural slopes. Lot 12 was identified as one with potential for this.

Lots 9, 10 and 13 are entirely in areas of cut and were able to be inspected during construction Lot 12 has areas at natural ground level and there was a slightly higher risk that sensitive soils might not be revealed on this lot if they exist. We also note that Lot 12 is relatively steep and will require more extensive cutting for building platforms, hence increasing the potential for construction difficulties if sensitive soils were encountered.

Because of the above factors it was considered prudent to continue the approach with this lot only. However, the risk is not considered high.

6 ### Appendix B – Plans

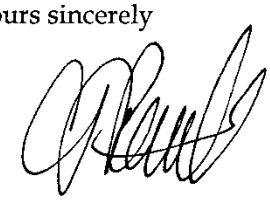
The dotted areas on the plans indicate area not included in Stage 1a

7 ### Appendix C – Test Results

Lot 30 was not retested as this was considered to be a minor variation with sufficient additional shear strength over the specification to ensure the fill still performed adequately. The pond bund (dam) testing is provided in the dam completion report.

Please do not hesitate to contact the undersigned if you have any further queries on this matter.

Yours sincerely



Chris Bauld
Group Manager - Tauranga

12-Apr-06
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AMENDED

LYNLEY PARK STAGE 1A

SCHEDULE OF COVENANTED AREAS

Label	Lot Number	Purpose
B1/AK	1	Building Restriction
B2	2	Building Restriction
B3	3	Building Restriction
B4	4	Building Restriction
B5	5	Building Restriction
B6	6	Building Restriction
B7	7	Building Restriction
B8	83	Building Restriction
B9	84	Building Restriction
B10	78	Building Restriction
B11	77	Building Restriction
B12	76	Building Restriction
B13	75	Building Restriction
B14	74	Building Restriction
B15/AM	73	Building Restriction
B16	70	Building Restriction
B17	69	Building Restriction
B18	68	Building Restriction
B19	67	Building Restriction
B20	66	Building Restriction
B21	65	Building Restriction
B22	61	Building Restriction
B23	60	Building Restriction
B24	59	Building Restriction
B25	58	Building Restriction
B26	57	Building Restriction
B27	54	Building Restriction
B28	45	Building Restriction
B29	44	Building Restriction
B30	43	Building Restriction
B31	42	Building Restriction

AMENDED

Label	Lot Number	Purpose
B32	41	Building Restriction
B33	40	Building Restriction
B34	39	Building Restriction
B35	38	Building Restriction
B36	37	Building Restriction
B37	36	Building Restriction
B38	35	Building Restriction
B39	34	Building Restriction
B40	33	Building Restriction
B41	32	Building Restriction
B42/AL	31	Building Restriction
B43	30	Building Restriction
B44	123	Building Restriction
C1	30	Building Restriction, Landscape (As per condition A2.2), monitoring and maintenance of buttress drains (condition A15.7)
C2/AH	31	Building Restriction, Landscape (As per condition A2.2), monitoring and maintenance of buttress drains (condition A15.7)
C3	32	Building Restriction, Landscape (As per condition A2.2)
C4	33	Building Restriction, Landscape (As per condition A2.2)
C5	34	Building Restriction, Landscape (As per condition A2.2), monitoring and maintenance of buttress drains (condition A15.7)
C6	35	Building Restriction, Landscape (As per condition A2.2), monitoring and maintenance of buttress drains (condition A15.7)
C7	36	Building Restriction, Landscape (As per condition A2.2)

AMENDED

Label	Lot Number	Purpose
C8	37	Building Restriction, Landscape (As per condition A2.2)
C9	38	Building Restriction, Landscape (As per condition A2.2), monitoring and maintenance of buttress drains (condition A15.7)
C10	39	Building Restriction, Landscape (As per condition A2.2), monitoring and maintenance of buttress drains (condition A15.7)
C11	40	Building Restriction, Landscape (As per condition A2.2), monitoring and maintenance of buttress drains (condition A15.7)
C12	41	Building Restriction, Landscape (As per condition A2.2)
C13	42	Building Restriction, Landscape (As per condition A2.2), monitoring and maintenance of buttress drains (condition A15.7)
C14	43	Building Restriction, Landscape (As per condition A2.2), monitoring and maintenance of buttress drains (condition A15.7)
C15	44	Building Restriction, Landscape (As per condition A2.2), monitoring and maintenance of buttress drains (condition A15.7)
C16	45	Building Restriction, Landscape (As per condition A2.2), monitoring and maintenance of buttress drains (condition A15.7)
C17	54	Building Restriction, Landscape (As per condition A2.2)

REPORT

DURHAM PROPERTIES LTD

Lynley Park Subdivision, Omokoroa
Stage 1a - Geotechnical
Completion Report

Report prepared for:
DURHAM PROPERTIES LTD

Report prepared by:
TONKIN & TAYLOR LTD

Distribution:

DURHAM PROPERTIES LTD	5 copies
TONKIN & TAYLOR LTD (FILE)	1 copy

February 2006

Job no: 60619

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1. Introduction

Tonkin & Taylor Ltd was engaged by Durham Properties Ltd to review Stage 1a earthworks for the Lynley Park subdivision at Omokoroa. Stage 1a of this subdivision includes development of 82 residential lots (being lots 1 to 70 inclusive and lots 73 to 84).

The work undertaken by Tonkin and Taylor comprised:

- An inspection of the site and the surrounding area by a senior geotechnical engineer prior to commencement of works;
- Design investigations, analysis and reporting;
- Regular site visits by geotechnical engineering staff to observe the cut-to-fill earthworks. Field density testing of the compacted fill was carried out by the contractor using a nuclear densometer along with shear vane testing of soils for strength;

The above work has been carried out to support the attached "Statement of Professional Opinion as to the Suitability of Land for Building Development" (Appendix A).

This engagement was specific to earthworks and geotechnical matter only on this development. Overall completion reporting for the development is reported elsewhere by CKL Ltd. This report does not include certification of retaining walls on the site. This is to be provided by others.

2. Available Site Data

Several geotechnical reports have been prepared for the subdivision area. These have included factual reporting of geotechnical investigation data and design recommendations. The applicable reports are as follows;

Reference Report 1

"Geotechnical Investigation Report on Lynley Park residential subdivision at Omokoroa Road, Omokoroa Peninsula", report prepared by Foundation Engineering Ltd for Durham Property Investments Ltd, dated the 16th of December 1999, project number 8425.

Reference Report 2

"Supplementary Geotechnical Investigation Report on Lynley Park residential subdivision Stage 1 at Omokoroa Road, Omokoroa", report prepared by Foundation Engineering Ltd for Durham Property Investments Ltd, dated the 15th of April 2002, project number 8425.

Reference Report 3

"Durham Investment Properties Ltd – Stage 1, Lynley Park Omokoroa Geotechnical Issues Report", prepared by Tonkin & Taylor Ltd and dated March 2004.

Reference Report 4

"Durham Investment Properties Ltd –Lynley Park Subdivision Omokoroa, Tauranga Geotechnical Geotechnical Investigations for Northerm Boundary", prepared by Tonkin & Taylor Ltd and dated January 2004.

This report must be read in conjunction with the data included in these reports. We note that design concepts for the works have changed since preparation of the reports by Foundation Engineering. Because of this the Foundation Engineering reports may be considered to be a source of factual data only.

Design details of the overall development are included in completion reporting by CKL Ltd.

3. Site Conditions

3.1. Development Details

Stage 1a is accessed along Omokoroa Road with the general layout of this stage being shown on the drawing T&T Ref. Figure 1, Figure 2 and Figure 3, in Appendix B. This is the first separable portion of the works.

Design details of the overall development are included in completion reporting by CKL Ltd.

3.2. Site Description

The original site topography was dominated by a north-east to south-west trending ridge and gully which run parallel to each other towards the coastal flank of the site. The top of the ridge has a predominantly gentle rolling slope towards the north-east of the block, however the sidling slopes grade sharply down a moderate to steep (25 to 40°) slope to the north-east and south-east of the ridge and down less inclined, moderately steep (15 to 20°) slope to the north-west to Omokoroa Road below.

To the south of the ridge system is an incised, scrub clad gully that provides a drainage path for run-off within the area to the estuarine harbour and a section of undulating terrain which is encompassed in Stage II of the proposed development. There are several geotechnical issues that surround the development of these two features, however they are not within the area covered by this report and will be addressed separately.

The East Coast Main Trunk railway crosses beneath Omokoroa Road and traverses the south-western boundary of the site. This section of the railway has been formed within a near vertical, unsupported box cut at approximately 10m below the existing site ground level.

Much the current geomorphology of the site, particularly on the north-eastern and south-eastern flanks of the ridge, can be attributed to landslippage, the mechanism of which will be discussed in the following sections.

3.3. Geological Setting

The geological strata forming the Omokoroa Peninsula and underlying the majority of the site can be broadly divided into three main units that overlie the ignimbrite

basement, which is inferred to underlie the basin into which these units were deposited.

The older of the three units is known as the Matua Subgroup, an assemblage of terrestrial and estuarine sediments and interbedded ashes that formed within an ancient river/estuary system. Sedimentary deposits comprise well sorted gravel and sand deposits, carbonaceous silts and muds together with peat horizons. Many of these deposits are inter-fingered with volcanic breccias and ashes derived from Rotorua - Taupo volcanism.

Directly overlying these is the deeply weathered clay-rich Hamilton Ash, which blankets much of the Waikato and northern Bay of Plenty Region.

The Rotoehu Ash and other young less weathered ashes constitute the youngest unit. These comprise a sequence of young rhyolitic air fall ashes between 2 and 4m thick that covers much of the Omokoroa Peninsula.

This data was based on information available from published geological maps of the area (IGNS 1:50,000 series) and the Tonkin & Taylor geotechnical database. Construction works on site have confirmed this inferred geology.

A detailed description of the geological model, engineering design and recommendations is included in Reference Report 3.

4. Summary of Design Recommendations

4.1. Introduction

This section is intended to provide the design recommendations contained in Reference Report 3. Any detailed assessment will require reference to that report.

4.2. Slope Stability

As highlighted in previous sections of this report there was geomorphic evidence of past instability within the site, in particular within the south-eastern sidling slope and the north-eastern point of the main ridge. Analysis indicates that ridge slopes originally existed with a factor of safety between 1.5 and 2.5 which is considered 'stable' for slopes under long term static conditions. Analysis also shows that earthworks should generally improve the long term FOS under drained slope conditions. However, a reduction in the FOS for slopes results from pore water pressure increases within the underlying Pahoia Tephra layer when modelling both existing and post-earthwork conditions.

A Building Restriction Line (BRL) was identified during design for the proposed lots adjacent to the south-eastern sidling slope and the north-eastern point, the areas which are of most concern. The BRL is a setback from existing slip scarps and from the inferred regression line of the intact spurs between arcuate slip features. This line has been modified following construction to fit better with actual conditions on site. The final location of the BRL is shown on the figures in Appendix B

In order to minimise the affects of instability or the potential for it to occur the pore water pressures within the Pahoia Ash will need to be controlled and minimised to reduce the risk of instability. This has been undertaken by buttress drains cut into the subsoil in the upper part of the slope and back-filled with free draining

aggregate to control pore water pressure within the Ash. Final locations of the buttress drains have been assessed based on selecting areas of obvious high regression rates. As built locations of the buttress drains are included on the figures in Appendix B.

A further building restriction lines have been defined along the boundary with the existing railway cutting and along the Omokoroa Road frontage slope to ensure that building platforms are located away from these slopes. The lines are also shown on the figures in Appendix B

4.3. Maximum Cut Depth

The subsurface profile established for the site indicated that the main ridge area is mantled by between 3 to 6m of unweathered to slightly weathered sandy and silty ash overlying up to 5m thick silt (Pahoia Ash). Laboratory results and field observations showed that the Pahoia Ash is highly sensitive to disturbance and has a high water content well in excess of optimum and close to or above its liquid limit. In considering these two properties of the Pahoia Ash it was considered unlikely that this material could be practically utilised for engineered fill since handling the material will encounter great difficulties due to drying times and traffickability of cut surfaces.

The overlying ash units have lower moisture contents and lower sensitivity and would be, subject to conditioning, ideal for the use as engineered fill. However to satisfy the site requirements for NZS3604;1999 *Timber Framed Structures* we recommended that a minimum of 1.5m of the upper Ash material remain over the underlying highly sensitive Ash. Final cut levels were based on this recommendation.

The north-western ridge, which extends from the south-western end of the main ridge towards Omokoroa Road, was lowered up to 7.0m to establish the main access road into the area. Sections within this area have also been recontoured to slope northwards. To achieve this, localised cuts have extended into the underlying sensitive soils. For localised cuts extending below the stiff ash profile, undercutting of the underlying softer soil was undertaken and desired ground levels established with a minimum of 1.5m of engineered fill

4.4. Fill Suitability

The earthworks operation involved up to 4.5m of cut from the main ridge on site and subsequent filling of the northern low lying area. Other cut and fill operations involved the lowering of the north-western ridge to provide an accessway to the development. The soils encountered were generally expected to comprise clayey silts, sandy silts and pumiceous silty sands. These materials should, with appropriate conditioning, be suitable for handling and compaction by conventional earthmoving plant.

Where localised undercutting of soft ground has taken place the cut material often had high moisture contents and was either spread to be dried (if to be used for fill) or cut to waste.

An earthworks specification was prepared for the cut and fill operation undertaken on-site. This is included in Appendix D.

4.5. Preparation of Fill Areas

Subsurface investigations undertaken within the proposed fill areas indicated the presence of either soft compressible soil or colluvial debris derived from landslippage in the area. The fill subgrade was inspected and approved by the Engineer following the stripping of topsoil from the fill area and prior to placement of fill. Any identified unsuitable material was undercut and disposed of to an approved disposal area.

Earthworks was carried out in accordance with NZS 4404:1981 *Code of practice for Urban Land Subdivision,* including benching of slopes prior to the placement and compaction of fill. This should ensure that the fill is keyed into the underlying natural ground.

4.6. Fill Induced Settlement

The majority of the fill has taken place in the main depression that runs between the main ridge and Omokoroa Road, in which between 2 to 4m of engineered fill was placed. Due to the presence of soft and compressible natural soil which underlies this area it is expected that there will be some fill induced settlement. The majority of the settlement is expected to occur during fill placement and settlements within building platforms are expected to be minimal.

5. Construction

The earthworks were carried out by A&R Earthmovers Ltd in 2004 to 2006, with final cut-fill contours shown on the attached plan T&T Ref. Figure 1, 2 & 3. The cut-fill contours show the maximum depth of cut or fill from final ground contours. The earthworks included the following:

i. Topsoil stripping and removal of unsuitable organic material from existing ground and surplus quantities removed off site.
ii. Cutting high ridge areas to reduce ground height and provide fill materials. This included undercutting in areas where filling was required over sensitive soils.
iii. Placement of on site fill to contours as shown on the final fill plan.
iv. Road excavation and services installation.
v. Construction of retaining walls adjacent to Road 1.
vi. Placement of Landscape fill on Lots 30-45 and Lot 54 to form buttressing, catch benches and access tracks.
vii. Construction of buttress drains
viii. Topsoil replaced over the proposed lots to a maximum depth of 300mm.

Fill was placed in accordance with the project earthworks specification, which complies with the Western Bay of Plenty District Council (WBoPDC) requirements for subdivisional earthworks. Compaction of the fill in open areas was carried out by trafficking of a fully laden scraper in a systematic manner over the fill areas or

using a sheeps foot roller where further compactive effort was required to meet the specification.

Tests were carried out by the Contractor as the earthworks progressed and on completion of the earthworks, indicating various passing and failing tests as summarised in Appendix C. The fill was removed in the areas found to be failing, replaced in layers, conditioned and recompacted. All failing areas were subsequently retested.

The as-built drawings attached in Figure 1, 2 & 3, Appendix B, show the extent of cut and fill for the earthworks. A maximum cut depth of 6.0m is shown in Lots 2 & 3. The areas of maximum fill, up to 4.0m depth, were located in Lot 26.

A producer statement construction (PS3) has been supplied by the Contractor and is included in Appendix A.

Construction observation did not include observation of the retaining walls constructed on site.

6. Field Testing

6.1. Inspections

Regular engineering inspections were carried out during the earthworks to confirm that organic and unsuitable material were identified and removed before filling commenced.

6.2. Fill Testing

Fill control was undertaken using shear strength and maximum air voids ratios to confirm adequacy of compaction. The following criteria are taken from the earthworks specification that is included in Appendix D.

TABLE 1 : Compaction Testing

Test	Method	Notes
Vane Shear	NZ Geotechnical Society Guidelines for Hand-held Shear Vane (2002)	The result shall be taken as the mean of at least 4 No. readings within a area of ≧ 0.5m², located within representative zones of the material being tested.
Water Content	NZS4402	
Dry Density	NZS4402	
Air Voids	NZS4402	
Solid Density	NZS4402	1 test per material type, subject to Geotechnical Engineer's written approval, and provided the nature of the fill remains consistent.

Notes:

Additional tests should be carried out if the nature of the fill changes, or at the direction of the Engineer.

Tests shall be accordance with NZS4402 *Methods of Testing Soils for Civil Engineering Purposes*, as appropriate.

TABLE 2 : Fill Testing Requirements

Fill Type	Test	Min. frequency	Criteria
Structural Fill more than 1.0 m below finished level	Water Content	1 per 2,000 m^3	Minimum = 35 % Maximum = 60 %
	Air Voids	1 per 2,000 m^3	Maximum = 10.0 %
	Undrained Shear Strength	1 per 500 m^3, reducible to 1 per 1000 m^3	Average result ≧115 kPa Any single reading ≧110 kPa
Structural Fill less than 1.0 m below finished level	Water Content	1 per 2,000 m^3	Minimum = 35 % Maximum = 60 %
	Air Voids	1 per 1,000 m^3 1 per 1,000 m^2 for filling less than <500 mm thick	Maximum = 8.0 %
	Undrained Shear Strength	1 per 500 m^3	Average result ≧125 kPa Any single reading ≧115 kPa
Non-structural Fill	Air Voids	1 per 3,000 m^3 provided <1000 mm lifts	Maximum = 14 %
	Undrained Shear Strength	1 per 1,000 m^3, reducible to 1 per 2000 m^3	Average result ≧60 kPa Any single reading ≧60 kPa

Notes:

The frequency of testing will depend on the consistency of fill operations and materials used, and may be varied by the Engineer to obtain sufficient spatial coverage through the depth and extent of the filling.

Additional tests should be carried out if the nature of the fill changes, or at the direction of the Engineer.

The Engineer and Contractor shall continue to monitor earthworks operations. Once materials are consistent and work is being carried out in a systematic and consistent manner, the Engineer may vary the frequency of testing.

Earthworks testing results are included in Appendix C.

7. Suitability for Development

7.1. General Observations

Based on our site observations, the method of fill placement, and the results of compaction control tests carried out during earthworks, we are of the opinion that the developed lots (being Lots 1 to 70 and lots 73 - 84) of Stage 1a of the Lynley Park Subdivision, are generally suitable for residential development in accordance with NZS 3604:1999 "Timber Framed Buildings". Some specific locations will require additional consideration and are described in Section 7.2.

All foundations should be founded in competent fill and/or natural ground below the topsoil layer. Settlement of buildings constructed in accordance with NZS 3604:1999 is expected to be less than 20 mm. Due to the presence of sensitive soils on the site it is necessary for foundations to be inspected by a suitably qualified professional to ensure that there are no specific hazards at the foundation locations. If sensitive soils are encountered then some alterations will be required to foundation construction. These should be undertaken by a suitably qualified professional.

For buildings which do not meet the requirements of NZS 3604:1999, we recommend a site specific investigation and design by a suitably qualified professional.

This opinion does not remove the requirement for foundation inspection as would normally be carried out during construction by the relevant regulatory authorities. Any local soft spots identified shall be excavated and replaced with compacted hardfill. If actual conditions encountered are different from those described in this report, we should be notified.

7.2. Specific Issues

7.2.1. Sensitive Soils

A projection of soil layers indicates that there is some risk that sensitive soils encountered on site may be found at the surface along the north eastern face of the main ridge. This may effect Lot 12 in Stage 1a of the development.

Because of this, and the sloping ground, we consider that any development of these sites should be reviewed by a geotechnical professional. This may include investigations, design or design review along with observation of soils during construction to confirm soil conditions.

7.2.2. Landscape Fill

7.2.2.1. Description of Fill

Landscape fill has been placed along the south eastern face of the main ridge. This generally covers the lower sloping areas of Lots 30 - 45 and Lot 54, along with the Reserve vested below these properties. This fill has been placed to achieve three purposes;

- To form a track along the reserve area
- To provide buttressing to lower areas of the main slopes

- To provide a debris catch bench below the upper slopes of the ridge.

This fill was compacted by track rolling and consists of a mixture of higher water content ash soils and organic rich surface soils. Control testing was not undertaken for this filling.

The fill on the reserve land has been constructed to form a 3m wide track shown on the sub-division design drawings. The maximum slope for this fill is 3 horizontal to 1 vertical and is flatter than this in many areas. Additional fill was also placed in upper areas of the slopes above the walkway to provide shaping of the natural contours. The slope of this fill is steeper than 3:1 in areas.

None of the fill has been placed within building platform areas on Stage 1a for the subdivision. Fill is either included within the reserve area or outside building restriction lines on building Lots.

7.2.2.2. Engineering Assessment

Landscape fill has not been engineered and would not be expected to meet normal engineering criteria for stability or foundation construction. However, the specific application of this fill is within areas isolated from building platforms.

There is expected to be a moderate risk of shallow slumping in the fill above the track where the slopes are relatively steep. This would be likely to happen in periods of high rainfall. We would expect that debris from this slumping would be mostly trapped by the formed track and would not present a significant risk lower on the slope.

We expect that the relatively flat slopes of the landscape fill below the track location will mean the risk of significant failure is low. Any slumping would be expected to be surficial with little or no run-out.

This fill is not expected to provide additional risk to building platforms identified for lots. However, consideration should be taken of this fill when constructing any structures across the BRL.

7.2.3. Reserve Walkway

The reserve walkway has been constructed from formed Landscape filling as described above. This walkway is not considered to be a structure in terms of the Building Act. However, some consideration is required to ensure that the track retains utility and does not require excessive maintenance.

Two hazards may be considered for the walkway. Slumping of the fill forming the track may occur and require re-shaping of the track. In addition there is the risk of debris slumping from slopes above the track that would require clearance.

Slumping of the fill below the track is expected to be a relatively low risk as fill slopes are shallow. In addition there are surface water collection systems installed on the track to ensure that ponding of water does not result in saturation of the slope.

Slumping from above the track is considered a moderate risk that would be unacceptable for a building structure. However, we expect that slumping will be relatively rare (ie several years between incidents) and generally of relatively low volume.

We consider that the stability issues associated with the track are consistent with those that may be expected from a non-engineered access in a reserve.

7.2.4. Building Restriction Lines

Proposed buildings that extend beyond the specified building restriction lines will need to address the instability issue with suitably engineered retention and drainage. We expect that these issues will generally be feasible to address but may require careful consideration to confirm that the proposed works are economic.

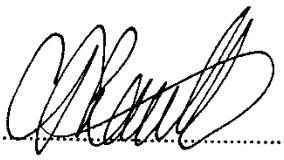
A building restriction line has also been defined by others to ensure construction remains clear of retaining walls on site. Any structures located within this line are to be subject to specific design to ensure additional load is not placed on these retaining walls. These lines are also shown on the figures in Appendix B.

8. Applicability

This report has been prepared solely for the benefit of Durham Properties Ltd with respect to the particular brief given to us, and it may not be released to third parties, other than Western Bay of Plenty District Council, for any purpose without our prior review and written agreement.

TONKIN & TAYLOR LTD
Environmental and Engineering Consultants

Report prepared by:



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C. J. Bauld
Senior Geotechnical Engineer
Office Manager - Tauranga

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Appendix A: Certification

To: The Western Bay of Plenty District Council

STATEMENT OF PROFESSIONAL OPINION AS TO THE GEOTECHNICAL SUITABILITY OF LAND FOR BUILDING

DEVELOPMENT: Lynley Park Subdivision – Stage 1a

OWNER: Durham Properties Ltd

LOCATION: Omokoroa Road, Omokoroa Peninsula

I, Christopher John Bauld of Tonkin & Taylor Ltd, 12 Elizabeth Street, Tauranga, hereby confirm that:

1) I am a professional person, appropriately qualified with experience in geotechnical engineering to ascertain the suitability of the land for building development and was retained as the Soils Engineer for the above development.

2) An appropriate level of site investigation and construction supervision has been carried out under my direction and is described in the development evaluation report dated March 2004 (Stage 1, Lynley Park Omokoroa, Geotechnical Issues Report, Tonkin & Taylor Ltd).

3) In my professional opinion, not to be construed as a guarantee, I consider that:

   a) The areas shown in my report dated February 2006 of each new allotment or on the development site are suitable for the erection thereon of the building types appropriate to the zoning of the land,, provided that: normal foundation inspections by the regulatory authorities and a suitably qualified engineer should be carried out during construction, and construction is in accordance with NZS 3604:1999 and related documents; building restriction lines indicate those areas where specific design is required.

   b) The completed works give due regard to land slope and foundation stability considerations.

   c) The earth fills shown on the attached plan (T&T Figures 1, 2 & 3), have been placed in accordance with the Subdivision and Development Code of Practice of the Western Bay of Plenty District Council.

   d) The filled ground is suitable for the erection thereon of residential buildings not requiring specific design in terms of NZS 3604:1999 and related documents providing that

      (i) normal foundation inspections by the regulatory authorities and a suitably qualified engineer should be carried out during construction

      (ii) construction is inside of the designated building restriction lines.

      (iii) The ground outside of the designated building restriction lines should be suitable for the erection thereon of residential buildings subject to specific engineering investigation and design.

      (iv) Inspections are especially important where concrete blockwork and/or brick veneer or stucco plaster buildings are sited partly on fill or partly on natural ground, or where they are entirely sited on filling whose depth changes significantly across the building platform. Any variations in soil conditions from those described in our report, should be reported to Tonkin & Taylor Ltd

   e) The original ground not affected by filling should be suitable for the erection thereon of residential buildings not requiring specific design in terms of NZS 3604:1999 and related documents provided that normal foundation inspections by the regulatory authorities and a suitably qualified engineer should be carried out during construction.

4) This professional opinion is furnished to the Council and the owner for their purpose alone, on the express condition that it will not be relied upon by any other person and does not remove the necessity for the normal inspection of foundation conditions at the time of erection for any dwelling.

Signed: ..... Date: 22/02/06

Lynley Park Residential Subdivision - Stage 1a, Omokoroa

Summary of Geotechnical Data/Recommendations/Requirements for Individual Lots

Lot #	Area (m^2)	Subsurface Data				Foundations		Building line restriction? Y/N	Recommendations/restrictions
		Subdivision filling (TOTAL FILL)		Natural topography earthworked? (TOTAL CUT)		Conventional shallow foundation to NZS 3604:1999	Specific design?		
		Y/N	Average Depth (m)	Y/N	Average Depth (m)	Y/N/NA	Y/N/NA		
1	800	N	-	Y	4.5	Y	N	Y	Foundation inspection during construction
2	751	N	-	Y	6.0	Y	N	Y	Foundation inspection during construction
3	773	N	-	Y	6.0	Y	N	Y	Foundation inspection during construction
4	721	N	-	Y	5.5	Y	N	Y	Foundation inspection during construction
5	703	N	-	Y	2.5	Y	N	Y	Foundation inspection during construction
6	737	N	-	Y	1.5	Y	N	Y	Foundation inspection during construction
7	869	Y	<0.5	Y	0.5	Y	N	Y	Foundation inspection during construction
8	626	Y	<0.5	Y	1.5	Y	N	N	Foundation inspection during construction
9	746	Y	<0.5-	Y	2.0	Y	N	N	Foundation inspection during construction
10	884	N	-	Y	3.0	Y	N	N	Foundation inspection during construction
11	1351	N	-	Y	4.0	Y	N	N	Foundation inspection during construction
12	1886	Y	0.5	Y	2.5	N	Y	N	Specific design required
13	699	N	-	Y	2.0	Y	N	N	Foundation inspection during construction
14	699	N	-	Y	3.5	Y	N	N	Foundation inspection during construction

Lynley Park Residential Subdivision - Stage 1a, Omokoroa

Summary of Geotechnical Data/Recommendations/Requirements for Individual Lots

Lot #	Area (m^2)	Subsurface Data				Foundations		Building line restriction? Y/N	Recommendations/restrictions
		Subdivision filling (TOTAL FILL)		Natural topography earthworked? (TOTAL CUT)		Conventional shallow foundation to NZS 3604:1999	Specific design?		
		Y/N	Average Depth (m)	Y/N	Average Depth (m)	Y/N/NA	Y/N/NA		
15	759	N	-	Y	4.5	Y	N	N	Foundation inspection during construction
16	734	N	-	Y	3.5	Y	N	N	Foundation inspection during construction
17	753	N	-	Y	3.5	Y	N	N	Foundation inspection during construction
18	783	Y	2.0	Y	2.0	Y	N	N	Foundation inspection during construction
19	743	Y	0.5	Y	2.5	Y	N	N	Foundation inspection during construction
20	1266	Y	<0.5-	Y	3.0	Y	N	N	Foundation inspection during construction
21	804	N	-	Y	3.5	Y	N	N	Foundation inspection during construction
22	821	N	-	Y	3.0	Y	N	N	Foundation inspection during construction
23	842	Y	<0.5	Y	3.0	Y	N	N	Foundation inspection during construction
24	1464	Y	<0.5	Y	2.5	Y	N	N	Foundation inspection during construction
25	891	N	-	Y	2.5	Y	N	N	Foundation inspection during construction
26	2274	Y	4.0	Y	2.0	Y	N	N	Foundation inspection during construction
27	2123	Y	3.0	Y	3.0	Y	N	N	Foundation inspection during construction
28	1376	Y	1.5	Y	3.0	Y	N	N	Foundation inspection during construction

Lynley Park Residential Subdivision - Stage 1a, Omokoroa

Summary of Geotechnical Data/Recommendations/Requirements for Individual Lots

Lot #	Area (m^2)	Subsurface Data				Foundations		Building line restriction? Y/N	Recommendations/restrictions
		Subdivision filling (TOTAL FILL)		Natural topography earthworked? (TOTAL CUT)		Conventional shallow foundation to NZS 3604:1999	Specific design?		
		Y/N	Average Depth (m)	Y/N	Average Depth (m)	Y/N/NA	Y/N/NA		
29	952	Y	<0.5-	Y	2.5	Y	N	N	Foundation inspection during construction
30	3373	N	-	Y	2.5	Y	N	Y	Foundation inspection during construction
31	2404	Y	0.5	Y	3.0	Y	N	Y	Foundation inspection during construction
32	1631	Y	1.5	Y	3.0	Y	N	Y	Foundation inspection during construction
33	1931	Y	1.5	Y	3.0	Y	N	Y	Foundation inspection during construction
34	1746	Y	1.0	Y	3.5	Y	N	Y	Foundation inspection during construction
35	1659	Y	1.5	Y	3.5	Y	N	Y	Foundation inspection during construction
36	1882	Y	0.5	Y	3.5	Y	N	Y	Foundation inspection during construction
37	1794	Y	0.5	Y	3.5	Y	N	Y	Foundation inspection during construction
38	1462	Y	0.5	Y	3.5	Y	N	Y	Foundation inspection during construction
39	1490	Y	1.5	Y	4.0	Y	N	Y	Foundation inspection during construction
40	1612	Y	0.5	Y	4.0	Y	N	Y	Foundation inspection during construction
41	1697	Y	1.0	Y	4.5	Y	N	Y	Foundation inspection during construction
42	1507	Y	1.5	Y	4.5	Y	N	Y	Foundation inspection during construction

Lynley Park Residential Subdivision - Stage 1a, Omokoroa

Summary of Geotechnical Data/Recommendations/Requirements for Individual Lots

Lot #	Area (m^2)	Subsurface Data				Foundations		Building line restriction? Y/N	Recommendations/restrictions
		Subdivision filling (TOTAL FILL)		Natural topography earthworked? (TOTAL CUT)		Conventional shallow foundation to NZS 3604:1999	Specific design?		
		Y/N	Average Depth (m)	Y/N	Average Depth (m)	Y/N/NA	Y/N/NA		
43	1575	Y	2.0	Y	4.5	Y	N	Y	Foundation inspection during construction
44	1486	Y	1.5	Y	4.0	Y	N	Y	Foundation inspection during construction
45	1495	Y	2.5	Y	3.0	Y	N	Y	Foundation inspection during construction
46	753	N	-	Y	1.5	Y	N	N	Foundation inspection during construction
47	837	N	-	Y	1.0	Y	N	N	Foundation inspection during construction
48	883	Y	1.0	Y	1.5	Y	N	N	Foundation inspection during construction
49	1073	Y	2.0	Y	1.5	Y	N	N	Foundation inspection during construction
50	882	Y	3.0	N	-	Y	N	N	Foundation inspection during construction
51	797	Y	3.0	N	-	Y	N	N	Foundation inspection during construction
52	937	Y	1.5	N	-	Y	N	N	Foundation inspection during construction
53	896	Y	1.0	Y	0.5	Y	N	N	Foundation inspection during construction
54	1975	Y	2.0	Y	2.0	Y	N	Y	Foundation inspection during construction
55	1073	Y	<0.5	Y	1.0	Y	N	N	Foundation inspection during construction
56	719	N	-	Y	2.0	Y	N	N	Foundation inspection during construction

Lynley Park Residential Subdivision - Stage 1a, Omokoroa

Summary of Geotechnical Data/Recommendations/Requirements for Individual Lots

Lot #	Area (m^2)	Subsurface Data				Foundations		Building line restriction? Y/N	Recommendations/restrictions
		Subdivision filling (TOTAL FILL)		Natural topography earthworked? (TOTAL CUT)		Conventional shallow foundation to NZS 3604:1999	Specific design?		
		Y/N	Average Depth (m)	Y/N	Average Depth (m)	Y/N/NA	Y/N/NA		
57	845	Y	<0.5	Y	2.0	Y	N	Y	Foundation inspection during construction
58	848	Y	2.0	Y	<0.5	Y	N	Y	Foundation inspection during construction
59	888	Y	2.5	Y	<0.5	Y	N	Y	Foundation inspection during construction
60	1060	Y	3.0	N	-	Y	N	Y	Foundation inspection during construction
61	1274	Y	3.0	N	-	Y	N	Y	Foundation inspection during construction
62	944	Y	3.0	Y	0.5	Y	N	N	Foundation inspection during construction
63	1140	Y	<0.5	Y	1.0	Y	N	N	Foundation inspection during construction
64	853	N	-	Y	1.0	Y	N	N	Foundation inspection during construction
65	1697	Y	0.5	Y	0.5	Y	N	Y	Foundation inspection during construction
66	1355	Y	0.5	Y	0.5	Y	N	Y	Foundation inspection during construction
67	921	Y	0.5	Y	0.5	Y	N	Y	Foundation inspection during construction
68	842	Y	0.5	N	-	Y	N	Y	Foundation inspection during construction
69	888	Y	0.5	N	-	Y	N	Y	Foundation inspection during construction
70	1530	Y	2.0	N	-	Y	N	Y	Foundation inspection during construction

Lynley Park Residential Subdivision - Stage 1a, Omokoroa

Summary of Geotechnical Data/Recommendations/Requirements for Individual Lots

Lot #	Area (m^2)	Subsurface Data				Foundations		Building line restriction? Y/N	Recommendations/restrictions
		Subdivision filling (TOTAL FILL)		Natural topography earthworked? (TOTAL CUT)		Conventional shallow foundation to NZS 3604:1999	Specific design?		
		Y/N	Average Depth (m)	Y/N	Average Depth (m)	Y/N/NA	Y/N/NA		
73	849	Y	<0.5	N	-	Y	N	Y	Foundation inspection during construction
74	834	Y	<0.5	N	-	Y	N	Y	Foundation inspection during construction
75	949	N	-	N	-	Y	N	Y	Foundation inspection during construction
76	880	N	-	Y	0.5	Y	N	Y	Foundation inspection during construction
77	754	N	-	Y	1.0	Y	N	Y	Foundation inspection during construction
78	794	Y	<0.5	Y	1.5	Y	N	Y	Foundation inspection during construction
79	783	Y	<0.5	N	-	Y	N	N	Foundation inspection during construction
80	768	N	-	N	-	Y	N	N	Foundation inspection during construction
81	779	Y	<0.5	N	-	Y	N	N	Foundation inspection during construction
82	870	Y	1.0	N	-	Y	N	N	Foundation inspection during construction
83	988	Y	1.5	Y	0.5	Y	N	Y	Foundation inspection during construction
84	822	Y	<0.5	Y	1.5	Y	N	Y	Foundation inspection during construction

PRODUCER STATEMENT – CONSTRUCTION

CONTRACTOR'S CERTIFICATE UPON COMPLETION OF SUBDIVISIONAL WORK

ISSUE BY : A & R (B.H.) Ltd
(Contractor)

TO : Durham Property Investments Ltd
(Principal)

TO BE SUPPLIED TO: Western Bays District Council
(Territorial Authority)

IN RESPECT OF : Earthworks and Butress drains for stage 1 a as difined in CKls final Report
(Description of subdivisional work)

AT : 313 Omokoroa Road
(Address)

A & R (BH) Ltd *(Contractor)* has contracted to Durham Property Investments Ltd *(Principal)*

to carry out and complete certain subdivisional works in accordance with a contract, titled Lynley Park

Reference No: D1176 (CKL Survey) ("Lynley Park")

I D Rasmussen a duly authorised representative of : A & R (B.H.) Ltd
(Duly Authorised Agent) *(Contractor)*

hereby certify that A & R (B.H.) Ltd has carried out and completed the Subdivisional works, other than those outstanding works listed below, in accordance with the contract. subject to Clients instruction. to place landscape fill in reserve & embankment areas of lots 81 – 85 Date Friday, 25 November 2005
(Signature of Authorised Agent on behalf of)

D A Rasmussen
(Contractor)

P.O. Box 5161

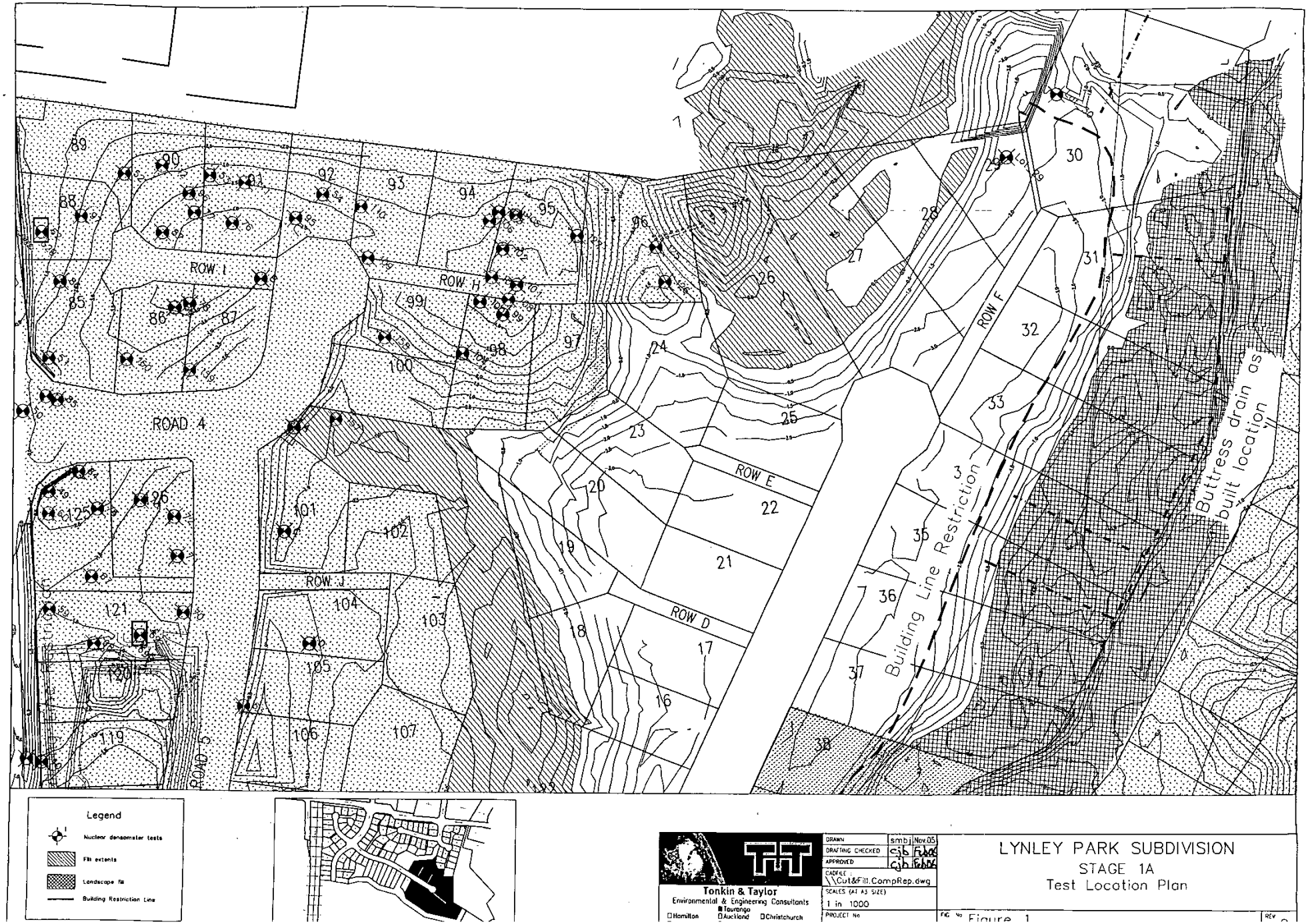
Hamilton

Outstanding Works

Permanent Road & associated Stormwater
Rear Retail backfill

Appendix B: Figures

- Figure 1
- Figure 2
- Figure 3



Tonkin & Taylor
Environmental & Engineering Consultants
Tauranga
Hamilton Auckland Christchurch

DRAWN	smbj	Nov.05
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APPROVED	cjb	
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SCALES (AT A3 SIZE)	1 in 1000	
PROJECT No		
FIG No	Figure 1	REV

LYNLEY PARK SUBDIVISION
STAGE 1A
Test Location Plan

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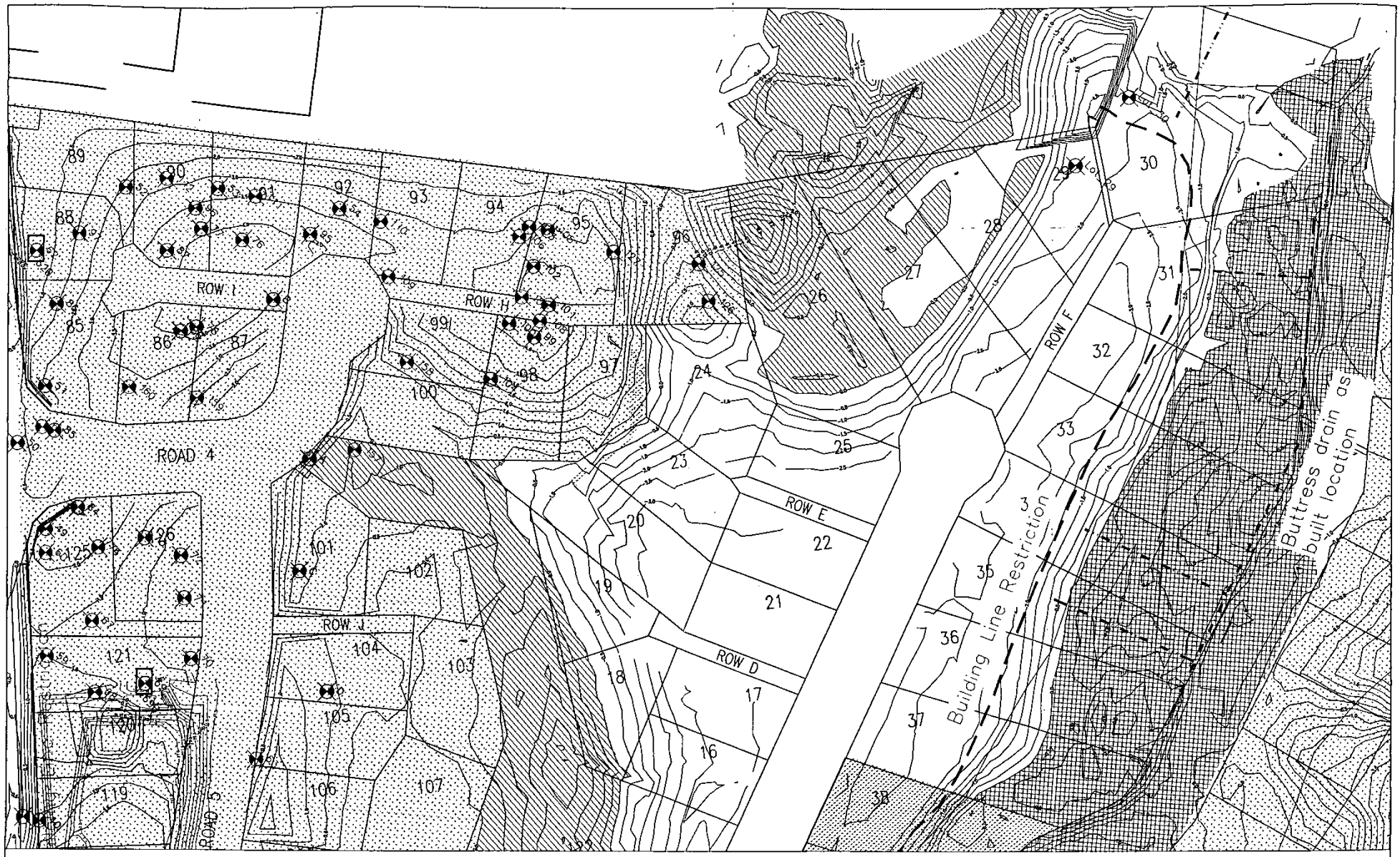

Tonkin & Taylor
Environmental & Engineering Consultants
Tauranga
Hamilton
Auckland
Christchurch

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DRAFTING CHECKED	cjb	Feb 06
APPROVED	cjb	Feb 06
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SCALES (AT A3 SIZE)	1 in 1000	
PROJECT No.	60619	

LYNLEY PARK SUBDIVISION
STAGE 1A
Test Location Plan

FIG No Figure 1

REV 0

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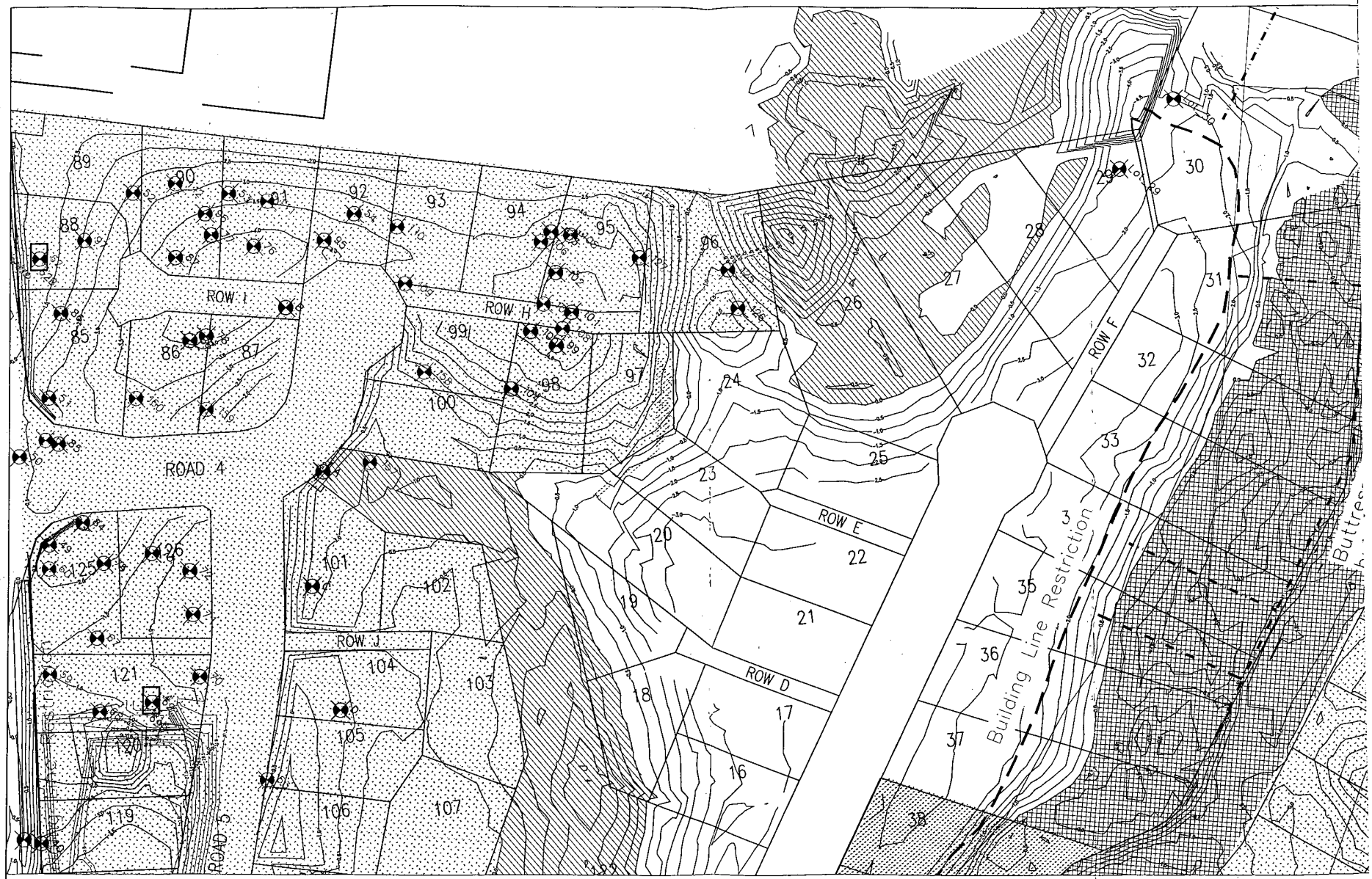

L:\T&T Hamilton jobs\60619_Lynley Park\Current_drawings\Cut&Fill.CompRep.dwg, Fig1, 22/02/2006 9:57:43 a., smbj

Tonkin & Taylor
Environmental & Engineering Consultants
Tauranga
Hamilton, Auckland, Christchurch
Nelson, Wellington, Whangarei

DRAWN	smbj	Nov.05
DRAFTING CHECKED	cjb	Feb06
APPROVED	cjb	Feb06
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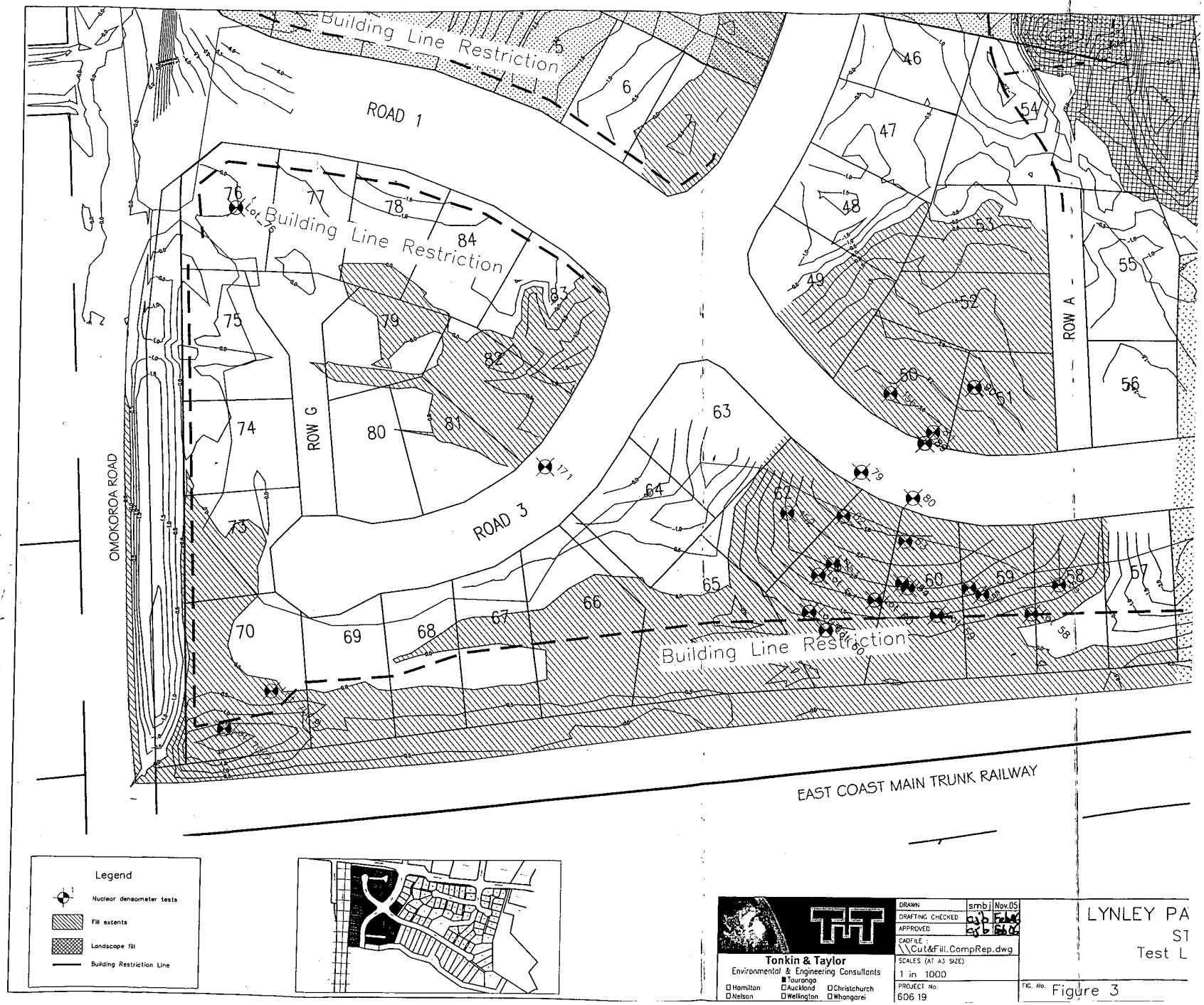
SCALES (AT A3 SIZE)	1 in 1000	
PROJECT No.	606 19	

LYNLEY PARK SUBDIVISION
STAGE 1A
Test Location Plan

FIG No Figure 1

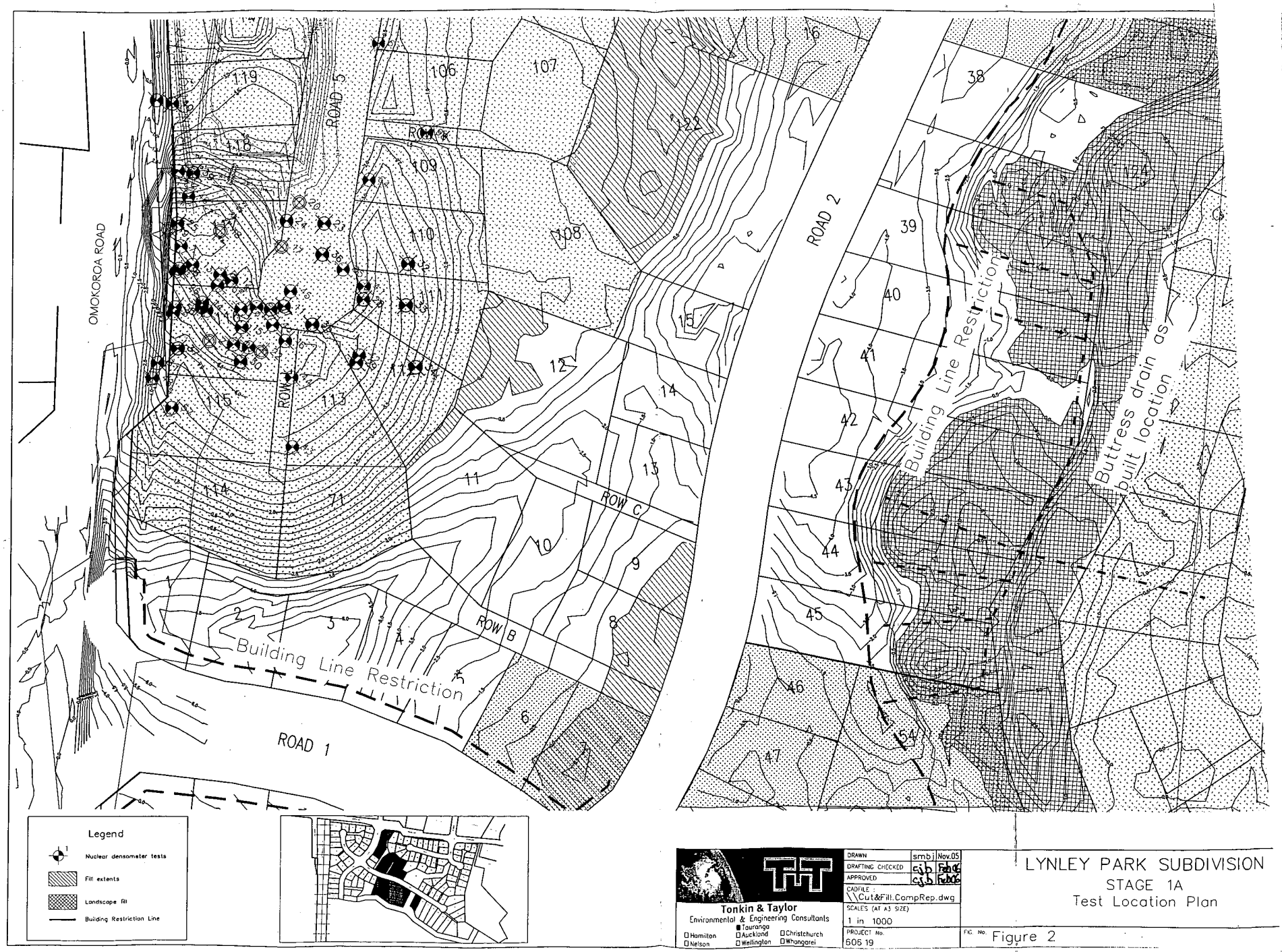


Tonkin & Taylor
Environmental & Engineering Consultants
Tauranga
Hamilton Auckland Christchurch
Nelson Wellington Whangarei

DRAWN	smbj	Nov.05
DRAFTING CHECKED		
APPROVED		
CADFILE : \\Cut&Fill.CompRep.dwg		
SCALES (AT A3 SIZE)	1 in 1000	
PROJECT No.	606 19	

LYNLEY PA
ST
Test L

FIG. No. Figure 3



Tonkin & Taylor	DRAWN	smbj Nov.05
Environmental & Engineering Consultants	DRAFTING CHECKED	cjb Feb06
☐ Hamilton ■ Tauranga ☐ Christchurch ☐ Nelson ☐ Auckland ☐ Wellington ☐ Whangarei	APPROVED	cjb Feb06
	CADFILE : \\Cut&Fill.CompRep.dwg	
	SCALES (AT A3 SIZE) 1 in 1000	
	PROJECT No. 605 19	FIG. No. Figure 2

LYNLEY PARK SUBDIVISION
STAGE 1A
Test Location Plan

Appendix C: Field Density Tests

ECES Evans Civil Engineering Services Ltd

14 Atkins Way
Ohauiti Rd
Tauranga

Telephone: (07) 544-4418
Facsimile: (07) 544-5568

Brett Harland
A & R Contractors Ltd
P O Box 3004 Greerton
Tauranga

Attention: Mr B Harland

RE :
Contract Name: Lynley Park
Sample Source On Site
Contract / No.: Unknown
Quality Control Testing: Bulk Fill

Test Completion Date:	31/01/06
Lab Reference:	TGA0007.14 34TL
Report No:	01/06/94/A
Order / Tender No:	N/A
Tested By:	R McGee & G Khokhlov
Sample By:	Richard McGee
Sample Method:	N/A
Sample No.:	2548
Date Sampled:	27/01/06
Date Received:	27/01/06
Date Reported:	31/01/06
Sample Condition:	Natural
Page:	1 of 2

Client Request

To carry out in-situ density tests using Nuclear surface moisture-density gauge, shear stress and laboratory water content determinations on the bulk fill material at Lynley Park

Test Standards

NZS 4407 : 1991	Method of testing and sampling road aggregates
Test 4.2.1	Method using a Nuclear Surface Moisture - Density Gauge-Direct Transmission Mode
NZS 4402 : 1986	Method of testing soils for Civil Engineering purposes
Test 2.1	Determination of the water content
In House:	Operating procedures for the uses of Geotechnics Torque Head

Test Results

Re-Test No.	Location Northing	Location Easting	Depth Of Fill	N.D.M Wet Density t/m³	N.D.M Dry Density t/m³	N.D.M Water Content %	Oven Water Content %	Corrected Dry Density t/m³	Total Voids %	Air Voids %	Shear Stress (Kpa)
LOT 30	6390158	2777927	Finshed Level	1.53	0.95	61.5	50.1	1.02	61.4	10.3	153, 167, 175
LOT 29	6390154	2777903	Finshed Level	1.63	1.07	52.5	45.1	1.12	57.6	6.9	198, 173, 172
Pond 1	6389929	2777986	RL9.00	1.63	1.07	52.5	42.9	1.14	57.0	8.1	205, 185, 189
Pond 2	6389913	2777996	RL9.00	1.61	1.01	59.5	40.6	1.14	56.9	10.5	198, 203, 216
LOT 60	6389860	2777449	Finshed Level	1.74	1.05	66.0	38.7	1.25	52.7	4.2	>228, >228, >228
LOT 61	6389873	2777458	Finshed Level	1.73	1.07	61.5	38.0	1.25	52.8	5.3	>228, >228, >228

Notes

1 N.D.M = Nuclear Densometer Measurement t/m³
2 Oven = Standard oven method
3 Air Voids & Total Voids are calculated using oven water contents & the corrected dry density
4 Solid Density is assumed to be = 2.65 t/m³
5 All Nuclear Densometer Measurements are at the depth of 300mm
6 All test locations were chosen by Richard McGee.

Checked By: Richard McGee, Laboratory Supervisor Date: 31-1-06

Approved Signatory: Hayden Evans, Laboratory Manager Date: 31-01-06

Date 08/11/05
Version : 2
File Name: Test 4.2.1 Method using a Nuclear Surface Moisture - Density Gauge-Direct Transmission Mode

ECES Evans Civil Engineering Services Ltd

14 Atkins Way
Ohauiti Rd
Tauranga

Telephone: (07) 544-4418
Facsimile: (07) 544-5568

Dolph Rassmussen
A & R Contractors Ltd
P O Box 3004 Greerton
Tauranga

Attention: Mr D Rassmussen

RE :
Contract Name: Lynley Park
Sample Source On Site
Contract / No.: Unknown
Quality Control Testing: Bulk Fill

Test Completion Date:	20/01/06
Lab Reference:	TGA0007.14 33TL
Report No:	01/06/64/A
Order / Tender No:	N/A
Tested By:	Richard McGee
Sample By:	Richard McGee
Sample Method:	N/A
Sample No.:	2523
Date Sampled:	16/01/06
Date Received:	16/01/06
Date Reported:	20/01/06
Sample Condition:	Natural
Page:	1 of 2

Client Request

To carry out in-situ density tests using Nuclear surface moisture-density gauge, shear stress and laboratory water content determinations on the bulk fill material at Lynley Park

Test Standards

NZS 4407 : 1991	Method of testing and sampling road aggregates
Test 4.2.1	Method using a Nuclear Surface Moisture - Density Gauge-Direct Transmission Mode
NZS 4402 : 1986	Method of testing soils for Civil Engineering purposes
Test 2.1	Determination of the water content
In House:	Operating procedures for the uses of Geotechnics Torque Head

Test Results

Test No.	Location Northing	Location Easting	Depth Of Fill	N.D.M Wet Density t/m³	N.D.M Dry Density t/m³	N.D.M Water Content %	Oven Water Content %	Corrected Dry Density t/m³	Total Voids %	Air Voids %	Shear Stress (Kpa)
Lot 58	6389824	2777495	Finish Level	1.71	1.26	35.5	33.3	1.28	51.7	9.0	Refusal
Lot 59	6389842	2777475	Finish Level	1.70	1.24	37.0	33.7	1.27	52.0	9.1	Refusal
Lot 60	6389857	2777465	Finish Level	1.61	1.16	39.0	29.5	1.25	53.0	16.2	Refusal
Lot 61	6389867	2777449	Finish Level	1.60	1.24	29.5	29.7	1.24	53.4	16.7	Refusal
Pond Bund (1)	6389929	2777986	RL9.00	1.61	0.99	63.5	33.3	1.21	54.3	14.0	Refusal
Pond Bund (2)	6389913	2777996	RL9.00	1.63	0.99	64.5	33.0	1.22	53.9	13.5	Refusal

Notes

1 N.D.M = Nuclear Densometer Measurement t/m³
2 Oven = Standard oven method
3 Air Voids & Total Voids are calculated using oven water contents & the corrected dry density
4 Solid Density is assumed to be = 2.65 t/m³
5 All Nuclear Densometer Measurements are at the depth of 300mm
6 All test locations were chosen by Richard McGee.

Checked By: Date: 20-1-06
Richard McGee
Laboratory Supervisor

Approved Signatory: Date: 20-1-06
Hayden Evans
Laboratory Manager

Date 08/11/05
Version : 2
File Name: Test 4.2.1 Method using a Nuclear Surface Moisture - Density Gauge-Direct Transmission Mode

ECES Evans Civil Engineering Services Ltd

14 Atkins Way
Ohauiti Rd
Tauranga

Telephone: (07) 544-4418
Facsimile: (07) 544-5568

Russell Pemberton
Pemberton Group
P O Box 5161
Hamilton

Attention: Mr R Pemberton

RE : **Contract Name:** Lynley Park
Sample Source On Site
Contract / No.: Unknown
Quality Control Testing: Bulk Fill

Test Completion Date: 18/11/05
Lab Reference: TGA0067.01 32TL
Report No: 11/05/40/A
Order / Tender No: N/A
Tested By: R McGee & T Barnes
Sample By: Richard McGee
Sample Method: N/A
Sample No.: 2344
Date Sampled: 15/11/05
Date Received: 15/11/05
Date Reported: 18/11/05
Sample Condition: Natural
Page: 1 of 1

Client Request
To carry out in-situ density tests using Nuclear surface moisture-density gauge, shear stress and laboratory water content determinations on the bulk fill material at Lynley Park

Test Standards

NZS 4407 : 1991	Method of testing and sampling road aggregates
Test 4.2.1	Method using a Nuclear Surface Moisture - Density Gauge-Direct Transmission Mode
NZS 4402 : 1986	Method of testing soils for Civil Engineering purposes
Test 2.1	Determination of the water content
In House:	Operating procedures for the uses of Geotechnics Torque Head

Test Results

Test No.	Location Northing	Location Easting	Depth Of Fill	N.D.M Wet Density t/m³	N.D.M Dry Density t/m³	N.D.M Water Content %	Oven Water Content %	Corrected Dry Density t/m³	Total Voids %	Air Voids %	Shear Stress (Kpa)
1A	Pond Bund	Pond Bund	1.0 metres	1.66	1.15	44.0	34.0	1.24	53.3	11.1	219, >228, >228
2A	Pond Bund	Pond Bund	500mm	1.73	1.19	44.5	40.8	1.23	53.7	3.7	>228, >228, >228
3A	Pond Bund	Pond Bund	1.2 metres	1.71	1.19	44.6	38.9	1.23	53.4	5.4	>228, >228, >228
4A	See Notes	See Notes	See Notes	1.69	1.06	59.0	36.8	1.21	54.2	7.0	173, 175, 190
5A	See Notes	See Notes	See Notes	1.68	1.02	64.0	39.2	1.21	54.5	7.2	172, 190, 188
6A	See Notes	See Notes	See Notes	1.69	1.06	60.0	40.5	1.20	54.7	6.1	208, 182, 189

Notes
1 N.D.M = Nuclear Densometer Measurement t/m³
2 Oven = Standard oven method
3 Air Voids & Total Voids are calculated using oven water contents & the corrected dry density
4 Solid Density is assumed to be = 2.65 t/m³
5 All Nuclear Densometer Measurements are at the depth of 300mm
6 All test locations were chosen by Richard McGee.
7 Test No.s 1A,2A,3A waiting for the co-ordinates from Russell Pemberton
8 Test No. 4A 14m from road boundary and 10m from boundary of Lots 59/60 Shear Vanes In Lot 60
9 Test No. 5A 13m from road boundary and 11m from boundary of Lots 59/60 Shear Vanes in Lot 59
10 Test No. 6A 12m from road boundary and 12m from boundary of Lots 58/59 Shear Vanes in Lot 58

Checked By: Richard McGee Date: 18-11-05
Laboratory Supervisor

Approved Signatory: Date: 18-11-05
Hayden Evans
Laboratory Manager

Date 08/11/05
Version : 2
File Name: Test 4.2.1 Method using a Nuclear Surface Moisture - Density Gauge-Direct Transmission Mode

All tests reported herein have been performed in accordance with the laboratory's scope of accreditation

ECES Evans Civil Engineering Services Ltd

14 Atkins Way
Ohauiti Rd
Tauranga

Telephone: (07) 544-4418
Facsimile: (07) 544-5568

Dolph Rassmussen
A & R Contractors Ltd
P O Box 3004 Greerton
Tauranga

Attention: Mr D Rassmussen

RE : **Contract Name:** Lynley Park
Sample Source Pond Bund
Contract / No.: Unknown
Quality Control Testing: Bulk Fill

Test Completion Date:	05/12/05
Lab Reference:	TGA0007.14 29TL
Report No:	12/05/03/A
Order / Tender No:	N/A
Tested By:	R McGee & T Barnes
Sample By:	Richard McGee
Sample Method:	N/A
Sample No.:	2405
Date Sampled:	30/11/05
Date Received:	30/11/05
Date Reported:	07/12/05
Sample Condition:	Natural
Page:	1 of 1

Client Request

To carry out in-situ density tests using Nuclear surface moisture-density gauge, shear stress and laboratory water content determinations on the bulk fill material at Lynley Park

Test Standards

NZS 4407 : 1991	Method of testing and sampling road aggregates
Test 4.2.1	Method using a Nuclear Surface Moisture - Density Gauge-Direct Transmission Mode
NZS 4402 : 1986	Method of testing soils for Civil Engineering purposes
Test 2.1	Determination of the water content
In House:	Operating procedures for the uses of Geotechnics Torque Head

Test Results

Test No.	Location Northing	Location Easting	Depth Of Fill	N.D.M Wet Density t/m³	N.D.M Dry Density t/m³	N.D.M Water Content %	Oven Water Content %	Corrected Dry Density t/m³	Total Voids %	Air Voids %	Shear Stress (Kpa)
4A	6389926	2777993	RL4.00	1.78	1.26	40.5	39.6	1.27	52.0	1.6	164, 190, 172, 182
5A	6389922	2777988	RL3.1	1.84	1.31	40.5	39.7	1.32	50.4	0.0	198, Refusal x2, 211
6A	6389916	2777986	RL3.55	1.78	1.25	42.5	36.0	1.31	50.5	3.3	159, 167, 175, 185
7A	6389921	2778002	RL4.12	1.75	1.26	39.0	38.4	1.26	52.3	3.9	192, 199, 175, 205
8A	6389920	2778002	RL4.62	1.73	1.19	46.0	38.8	1.25	52.9	4.4	Refusal x3, 219
9A	6389916	2777944	RL5.13	1.71	1.18	45.0	40.7	1.21	54.2	4.9	Refusal x2, 205, 222
LOT 76	6390062	2777407	Finished Level	1.75	1.25	40.2	37.2	1.28	51.8	4.3	199, 183, 219

Notes

1 N.D.M = Nuclear Densometer Measurement t/m³
2 Oven = Standard oven method
3 Air Voids & Total Voids are calculated using oven water contents & the corrected dry density
4 Solid Density is assumed to be = 2.65 t/m³
5 All Nuclear Densometer Measurements are at the depth of 300mm
6 All test locations were chosen by Richard McGee.
7 Test 4A to 9A are in the Pond Bund

Checked By: Richard McGee Date: 7-12-05
Laboratory Supervisor

Approved Signatory: Date: 07-12-05
Hayden Evans
Laboratory Manager

Date 08/11/05
Version : 2
File Name: Test 4.2.1 Method using a Nuclear Surface Moisture - Density Gauge-Direct Transmission Mode

ECES Evans Civil Engineering Services Ltd

14 Atkins Way
Ohauiti Rd
Tauranga

Telephone: (07) 544-4418
Facsimile: (07) 544-5568
E-mail: hcevans@bop.quik.co.nz

olph Rasmussen
& R Contractors Ltd
PO Box 253
aeroa

Attention: Mr D Rasmussen

E : Contract Name: Lynley Park
Sample Source Insitu
Contract / No.: Unknown
uality Control Testing: Bulk Fill

Test Completion Date:	18/10/2004
Lab Reference:	TGA0007.14 14TL
Report No:	10/04/08/A
Order / Tender No:	Nil
Tested By:	Hayden Evans
Sample By:	Hayden Evans
Sample Method:	N/A
Sample No.:	1583
Date Sampled:	14/10/2004
Date Received:	14/10/2004
Date Reported:	18/10/2004
Sample Condition:	Natural
Page:	1 of 1

Client Request

carry out in-situ density tests using Nuclear surface moisture-density gauge, shear stress and laboratory water ontent determinations on the bulk fill material at Lynley Park

Test Standards

S 4407 : 1991	Method of testing and sampling road aggregates
st 2.1	Method using a Nuclear Surface Moisture - Density Gauge-Direct Transmission Mode
NZS 02 : 1986	Method of testing soils for Civil Engineering purposes
	Determination of the water content
	Operating procedures for the uses of Geotechnics Torque Head

Test Results

Test	Location Easting	Location Northing	RL	N.D.M Wet Density t/m³	N.D.M Dry Density t/m³	N.D.M Water Content %	Oven Water Content %	Corrected Dry Density t/m³	Total Voids %	Air Voids %	Shear Stress (Kpa)
79A	261431.976	711730.322	35.432	1.62	1.02	59.0	65.6	0.98	63.2	-0.8	156, 179, 165
A	261438.381	711715.158	34.875	1.65	1.11	49.5	53.8	1.07	59.5	1.8	205, 193, 176
A	261454.72	711725.876	33.335	1.63	1.02	59.5	69.0	0.96	63.7	-2.8	162, 170, 162
82A	261420.065	711723.96	34.4	1.56	0.96	62.0	54.8	1.01	62.0	6.8	225, 182, 185
83A	261428.87	711707.288	33.26	1.65	1.05	57.0	59.7	1.03	61.1	-0.5	170, 170, 156

1 M = Nuclear Densometer Measurement t/m³
2 m = Standard oven method
Air Voids & Total Voids are calculated using oven water contents & the corrected dry density
Solid Density is assumed to be = 2.65 t/m³
5 All Nuclear Densometer Measurements are at the depth of 300mm
All test locations were chosen by the contractor.

All tests reported herein have been performed in accordance with the laboratory's scope of accreditation

ecked By: Richard McGee Date: 18-10-04
Laboratory Supervisor
23/10/01

Approved Signatory: Date: 18-10-04
Hayden Evans
Laboratory Manager

sion : 1
me: Test 4.2.1 Method using a Nuclear Surface Moisture - Density Gauge-Direct Transmission Mode

ECES Evans Civil Engineering Services Ltd

14 Atkins Way
Ohauiti Rd
Tauranga

Telephone: (07) 544-4418
Facsimile: (07) 544-5568
E-mail: hcevans@bop.quik.co.nz

Dolph Rasmussen
A & R Contractors Ltd
PO Box 253
Paeroa

Attention: Mr D Rasmussen

RE : Contract Name: Lynley Park
Sample Source Insitu
Contract / No.: Unknown
Quality Control Testing: Bulk Fill

Test Completion Date: 28/10/2004
Lab Reference: TGA0007.14 15TL
Report No: 10/04/24/A
Order / Tender No: Nil
Tested By: Hayden Evans
Sample By: Hayden Evans
Sample Method: N/A
Sample No.: 1598
Date Sampled: 21/10/2004
Date Received: 21/10/2004
Date Reported: 28/10/2004
Sample Condition: Natural
Page: 1 of 1

Client Request

To carry out in-situ density tests using Nuclear surface moisture-density gauge, shear stress and laboratory water content determinations on the bulk fill material at Lynley Park

Test Standards

NZS 4407 : 1991	Method of testing and sampling road aggregates
Test 4.2.1	Method using a Nuclear Surface Moisture - Density Gauge-Direct Transmission Mode
NZS 4402 : 1986	Method of testing soils for Civil Engineering purposes
Test 2.1	Determination of the water content
In House:	Operating procedures for the uses of Geotechnics Torque Head

Test Results

Test No.	Location Northing	Location Easting	Depth Of Fill	N.D.M Wet Density t/m³	N.D.M Dry Density t/m³	N.D.M Water Content %	Oven Water Content %	Corrected Dry Density t/m³	Total Voids %	Air Voids %	Shear Stress (Kpa)
84A	261559	712126	28.392	1.68	1.10	52.0	50.2	1.12	57.8	1.6	167, 170, 185
85A	261568	712147	28.162	1.67	1.15	45.5	43.4	1.17	55.9	5.3	130, 144, 173
86A	261592	712174	28.696	1.65	1.05	56.0	57.6	1.04	60.6	0.4	205, 216, 208
87A	261626	712165	29.027	1.74	1.18	47.5	40.1	1.24	53.3	3.6	133, 166, 173
88A	261614	712145	29.94	1.79	1.32	35.5	34.0	1.34	49.5	4.1	165, 144, 139
89A	261451	711725	34.761	1.64	1.03	59.0	62.8	1.00	62.1	-1.0	147, 147, 211
90A	261472	711728	34.927	1.64	1.12	46.5	39.9	1.17	55.9	9.3	141, 170, 150

1 N.D.M = Nuclear Densometer Measurement t/m³
2 Oven = Standard oven method
3 Air Voids & Total Voids are calculated using oven water contents & the corrected dry density
4 Solid Density is assumed to be = 2.65 t/m³
5 All Nuclear Densometer Measurements are at the depth of 300mm
6 All test locations were chosen by the contractor.

All tests reported herein have been performed in accordance with the laboratory's scope of accreditation

Checked By: Richard McGee Date: 28-10-04
Richard McGee
Laboratory Supervisor

Approved Signatory: Date: 28-10-04
Hayden Evans
Laboratory Manager

ECES Evans Civil Engineering Services Ltd

14 Atkins Way
Ohauiti Rd
Tauranga

Telephone: (07) 544-4418
Facsimile: (07) 544-5568
mail: hcevans@bop.quik.co.nz

Dolph Rassmussen
A & R Contractors
PO Box 253
Paeroa

Attention: Mr D Rassmussen

Test Completion Date:	1/02/2005
Lab Reference:	TGA0007.14 22TL
Report No:	01/05/57/A
Order / Tender No:	Nil
Tested By:	R McGee/T Barnes
Sample By:	Richard McGee
Sample Method:	N/A
Sample No.:	1795
Date Sampled:	26/01/2005
Date Received:	26/01/2005
Date Reported:	2/02/2005
Sample Condition:	Natural
Page:	1 of 1

RE : Contract Name: Lynley Park
Sample Source On Site
Contract / No.: Unknown
Quality Control Testing: Bulk Fill

Client Request

To carry out in-situ density tests using Nuclear surface moisture-density gauge, shear stress and laboratory water content determinations on the bulk fill material at Lynley Park

Test Standards

NZS 4407 : 1991 Method of testing and sampling road aggregates
Test 4.2.1 Method using a Nuclear Surface Moisture - Density Gauge-Direct Transmission Mode
NZS 4402 : 1986 Method of testing soils for Civil Engineering purposes
Test Determination of the water content
Note: Operating procedures for the uses of Geotechnics Torque Head

Test Results

Test	Location Northing	Location Easting	Depth Of Fill	N.D.M Wet Density t/m³	N.D.M Dry Density t/m³	N.D.M Water Content %	Oven Water Content %	Corrected Dry Density t/m³	Total Voids %	Air Voids %	Shear Stress (Kpa)
152A	711734.984	261408.54	RL37.305	1.79	1.32	35.5	40.3	1.27	51.9	0.6	Refusal
153A	711715.59	261409.018	RL34.949	1.72	1.30	32.5	34.0	1.28	51.5	7.8	Refusal
155A	711698.711	261420.495	RL33.485	1.69	1.15	47.5	49.8	1.13	57.4	1.2	179, 196, 188
156A	711685.474	261434.099	RL32.408	1.69	1.19	41.5	47.2	1.15	56.8	2.7	Refusal
[illegible]	711742.041	261452.724	RL36.793	1.82	1.32	38.0	43.4	1.27	52.3	0.0	Refusal
[illegible]	712087.101	261629.543	RL34.174	1.70	1.26	35.5	47.9	1.15	56.6	1.4	Refusal
[illegible]	712096.264	261657.1	RL33.954	1.71	1.18	44.9	49.9	1.14	56.9	0.0	156, 175, 167
159A	712127.56	261604.976	RL32.013	1.64	1.01	61.6	63.5	1.00	62.2	0.0	Refusal
[illegible]	712142.461	261592.348	RL30.551	1.61	0.99	63.2	49.2	1.08	59.3	6.2	138, 144, 101

1 N.D.M = Nuclear Densometer Measurement t/m³
2 On = Standard oven method
3 Air Voids & Total Voids are calculated using oven water contents & the corrected dry density
4 Solid Density is assumed to be = 2.65 t/m³
5 All Nuclear Densometer Measurements are at the depth of 300mm
6 All test locations were chosen by the contractor.

Checked By: Richard McGee
Laboratory Supervisor
Date: 2-2-05

Approved Signatory: Hayden Evans
Laboratory Manager
Date: 02-02-05

Revision : 23/10/01 1
Name: Test 4.2.1 Method using a Nuclear Surface Moisture - Density Gauge-Direct Transmission Mode

All tests reported herein have been performed in accordance

ECES Evans Civil Engineering Services Ltd

14 Atkins Way
Ohauiti Rd
Tauranga

Telephone: (07) 544-4418
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Brett Harland
A & R Contractors Ltd
P O Box 3004 Greerton
Tauranga

Attention: Mr B Harland

RE :
Contract Name: Lynley Park
Sample Source On Site
Contract / No.: Unknown
Quality Control Testing: Bulk Fill

Test Completion Date: 22/02/2006
Lab Reference: TGA0007.14 36TL
Report No: 02/06/44/A
Order / Tender No: N/A
Tested By: Richard McGee
Sample By: Richard McGee
Sample Method: N/A
Sample No.: 2608
Date Sampled: 21/02/2006
Date Received: 21/02/2006
Date Reported: 22/02/2006
Sample Condition: Natural
Page: 1 of 2

Client Request
To carry out in-situ density tests using Nuclear surface moisture-density gauge, shear stress and laboratory water content determinations on the bulk fill material at Lynley Park

Test Standards

NZS 4407 : 1991 Test 4.2.1	Method of testing and sampling road aggregates Method using a Nuclear Surface Moisture - Density Gauge-Direct Transmission Mode
NZS 4402 : 1986 Test 2.1	Method of testing soils for Civil Engineering purposes Determination of the water content
In House:	Operating procedures for the uses of Geotechnics Torque Head

Test Results

Test No.	Location Northing	Location Easting	Depth Of Fill	N.D.M Wet Density t/m³	N.D.M Dry Density t/m³	N.D.M Water Content %	Oven Water Content %	Corrected Dry Density t/m³	Total Voids %	Air Voids %	Shear Stress (Kpa)
Lot 70 (1)	6389953	2777322	Finished Level	1.57	1.06	48.5	45.9	1.08	59.3	9.8	Refusal
Lot 70 (2)	6389954	2777305	200mm below	1.63	1.09	49.0	49.0	1.09	58.8	5.2	>233, >233, >233

otes
1 N.D.M = Nuclear Densometer Measurement t/m³
2 Oven = Standard oven method
3 Air Voids & Total Voids are calculated using oven water contents & the corrected dry density
4 Solid Density is assumed to be = 2.65 t/m³
5 All Nuclear Densometer Measurements are at the depth of 300mm
6 All test locations were chosen by Richard McGee.

Checked By: Richard McGee, Laboratory Supervisor Date: 22-2-06

Approved Signatory: Hayden Evans, Laboratory Manager Date: 22-2-06

e 1/02/2006
Version : 3
File Name: Test 4.2.1 Method using a Nuclear Surface Moisture - Density Gauge-Direct Transmission Mode

Appendix D: Earthworks Specification

DURHAM PROPERTY INVESTMENTS LTD

LYNLEY PARK SUBDIVISION

SPECIFICATIONS

Ref: 60619
March 2004

Prepared for: DURHAM PROPERTY INVESTMENTS LTD
Prepared by: Tonkin & Taylor Ltd

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1.0 GENERAL

1.1 Location

The work included in this Contract and to which the Specification and Drawings refer is located at Lynley Park Subdivision, Omokoroa Road, Omokoroa.

1.2 Extent of Contract

The extent of the contract is as shown on the drawings prepared by CKL Ltd.

1.3 Definitions

The following definitions shall apply to this section of the specification only:

Engineer : The owner's representative, Russell Pemberton of Pemberton Group.

Geotechnical Engineer : Tonkin & Taylor Ltd

2.0 BULK EARTHWORKS

2.1 Scope

This Section sets out the requirements for the completion of bulk earthworks. All work shall be carried out in accordance with Transit New Zealand specification F/1 (1997), except where amended by this specification.

In addition, work shall comply with the requirements of the Environment Bay of Plenty Erosion and Sediment Control Guidelines for Earthworks and the conditions of consent for this project in Volume IV of the contract documents.

2.2 General Requirements

2.2.1 Hold Points and Response Times

The Contractor shall give notice to the Engineer for specific points in construction for the purposes of inspection, with the requirements as follows:

- After stripping and prior to placement of fill: minimum of 24 hours notice
- Prior to construction of buried services: a minimum of 24 hours notice
- Backfilling over subsoil drainage: not without written approval of the Engineer

2.2.2 Haul Roads

The Contractor shall construct and maintain all temporary haul roads required to carry out the works. All haul roads shall be located within the site of works. At the completion of the project the Contractor shall rehabilitate haul road areas.

The Contractor shall submit to the Engineer, for his approval, the proposed methodology to gain access to various sections of the site, including any cutting or filling. Temporary haul roads within Structural Fill zones other than those shown on the drawings shall be to the prior approval of the Geotechnical Engineer.

2.3 Topsoil Stripping

All turf and organic topsoil shall be stripped from the areas subject to earthworks before other operations commence in these areas. All topsoil shall be stockpiled for future re-use in the locations shown on the Drawings or areas otherwise approved on site by the Engineer. The stockpiles shall have slopes not steeper than 1V:2H and be rounded to conform generally with the surrounding landscape.

The depth of topsoil stripping shall be sufficient to remove all organic material, turf and significant plant roots. Except where limited by boundaries, existing works or other limiting features, stripping shall extend 2 m beyond the limits of areas subject to earthworks or construction. The Contractor shall co-operate with the Engineer ahead of, and during, stripping operations to determine the stripping depth and shall avoid unnecessary over-excavation.

2.4 Cut Operations

2.4.1 Undercut and Replace

Where shown on the Drawings or where directed by the Geotechnical Engineer, unsuitable material within the fill subgrade shall be undercut to waste and replaced with structural grade filling.

2.4.2 Cut to Waste

If the Contractor deems material not fit for the purposes of cut to fill he is to advise the Engineer. At the Engineers discretion the Contractor shall either, condition then place material as fill or remove material off site.

If instructed by the Engineer, cut material (other than topsoil and that required for fill or backfill) shall be carted to the Principal's nominated dump or removed from site and disposed of. The dumped material shall be track rolled and levelled to the level of the surrounding ground, or as directed.

2.4.3 Cut to Fill

All excavated soils (except organic material) is to be placed as fill within the reclamation.

Prior to compaction, all fill material shall be broken into fragments of less than 100 mm. The material shall be spread uniformly in layers of less than 200 mm thickness, and conditioned to an appropriate water content.

The Contractor shall carry out the cut to fill operation so as to optimise drying of wet cut materials.

Fill shall not be spread over surfaces, which have deteriorated from their specified condition. Where necessary, the old surface shall be scarified, conditioned and re-compacted before placing fill. The Contractor shall exclude all organic matter from fills.

2.5 Fill Placement

2.5.1 General

Prior to compaction, all fill material shall be broken into fragments of less than 100 mm size. The material shall be spread uniformly in layers of less than 200 mm thickness, and conditioned to a water content suitable to achieve the earthfill criteria.

Trafficking and reworking of the fill material shall be minimised at all times, in order to limit strength loss within the sensitive volcanic ash soils.

New fill shall not be spread over surfaces that have deteriorated from their specified condition. Where necessary, the old surface shall be scarified and conditioned and re-compacted before placing new fill. The Contractor shall exclude all organic matter from fills.

2.5.2 Equipment

The Contractor shall employ sufficient compaction equipment to achieve the specified compaction. The number and type of plant necessary shall be confirmed by trials. No subsequent changes shall be introduced without the prior approval of the Engineer.

2.5.3 Control of Water Content

When soil is to be dried the Contractor shall disc the soil and allow it to dry uniformly to its full depth.

When the soil is to be wetted, this shall be done with sprinkling equipment, ensuring uniform and controlled distribution of water in conjunction with blading and discing. Any costs of drying or wetting will be deemed to be included in the fill rate or other scheduled items. No extra payments will be made.

2.6 Fill Operations

The earthworks shall be scheduled to optimise the borrow materials as they become available.

No fill shall be placed on new foundation areas prior to the inspection and approval by the Geotechnical Engineer.

Temporary fill slopes within the fill should be avoided, except at changes in material zoning. The fill should be thoroughly mixed and compacted to ensure the overall fill achieves specified requirements.

If the surface of the existing fill becomes too smooth or too dry to bond to the next lift properly, the fill surface shall be roughened to a depth of at least 75 mm and conditioned for water content as necessary.

Fill shall not be placed over a previous lift that has not achieved specification, or has become contaminated.

Compaction of all material shall be carried out using specialised compaction equipment separate to that used for transportation and spreading.

Fill shall be topsoiled and grassed as soon as possible after reaching the required levels to minimise erosion risk. Repair of any erosion damage shall be to the Engineer's instructions and at no cost to the Principal.

2.7 Compaction Testing

Compaction of non-granular (cohesive) fill obtained from project area cuts shall be measured by the Undrained Shear Strength and Maximum Air Voids.

Compacted fill shall meet the requirements given in Tables 2.6.1 and 2.6.2 before any further filling or topsoil is placed on it.

The testing frequency shall be as defined in Table 2.6.2 below, unless confirmed otherwise in writing by the Engineer.

The specific gravity of solid particles to be used in the air voids test shall be determined at the frequency given in Table 2.6.1. Any adjustment to the fill density/air voids test results shall be subject to prior agreement from the Engineer.

In-situ densities and moisture content measures shall be made with a Nuclear Densometer in accordance with NZS 4407:1991 and the manufacturer's instructions. The Contractor shall adjust moisture content values obtained from the Nuclear Densometer to agree as closely as possible with results obtained from oven dried laboratory samples. All reporting of moisture content shall use laboratory test results.

TABLE 2.6.1 : Compaction Testing		
Test	**Method**	**Notes**
Vane Shear	NZ Geotechnical Society Guidelines for Hand-held Shear Vane (2002)	The result shall be taken as the mean of at least 4 No. readings within a area of ≧ 0.5m^2, located within representative zones of the material being tested.
Water Content	NZS4402	
Dry Density	NZS4402	
Air Voids	NZS4402	
Solid Density	NZS4402	1 test per material type, subject to Geotechnical Engineer's written approval, and provided the nature of the fill remains consistent.

Notes:
- Additional tests should be carried out if the nature of the fill changes, or at the direction of the Engineer.
- Tests shall be accordance with NZS4402 *Methods of Testing Soils for Civil Engineering Purposes*, as appropriate.

TABLE 2.6.2 : Fill Testing Requirements			
Fill Type	**Test**	**Min. frequency**	**Criteria**
Structural Fill more than 1.0 m below finished level	Water Content	1 per 2,000 m^3	Minimum = 35 % Maximum = 60 %
	Air Voids	1 per 2,000 m^3	Maximum = 10.0 %
	Undrained Shear Strength	1 per 500 m^3, reducible to 1 per 1000 m^3	Average result ≧115 kPa Any single reading ≧110 kPa
Structural Fill less than 1.0 m below finished level	Water Content	1 per 2,000 m^3	Minimum = 35 % Maximum = 60 %
	Air Voids	1 per 1,000 m^3 1 per 1,000 m^2 for filling less than <500 mm thick	Maximum = 8.0 %
	Undrained Shear Strength	1 per 500 m^3	Average result ≧125 kPa Any single reading ≧115 kPa
Non-structural Fill	Air Voids	1 per 3,000 m^3 provided <1000 mm lifts	Maximum = 14 %
	Undrained Shear Strength	1 per 1,000 m^3, reducible to 1 per 2000 m^3	Average result ≧60 kPa Any single reading ≧60 kPa

Notes:
- The frequency of testing will depend on the consistency of fill operations and materials used, and may be varied by the Engineer to obtain sufficient spatial coverage through the depth and extent of the filling.
- Additional tests should be carried out if the nature of the fill changes, or at the direction of the Engineer.
- The Engineer and Contractor shall continue to monitor earthworks operations. Once materials are consistent and work is being carried out in a systematic and consistent manner, the Engineer may vary the frequency of testing.

3.0 SUBSOIL DRAINAGE

3.1 Scope

This Section sets out the requirements for subsoil drainage, including underfill drains.

All work shall be carried out in accordance with Transit New Zealand specification F/6 (2003) "Specification for geotextile wrapped aggregate subsoil drain construction", except where amended by this specification.

3.2 Materials

Subsoil Drainpipes : perforated high density polyethylene (HDPE) pipe of corrugated profile ("Novaflo" or approved equivalent) covered with Filtersok or wrapped in a filter cloth approved by the Engineer. Connection from the subsoil drainage pipe to the specified outlet position shall consist of high density polyethylene (HDPE) pipe of corrugated profile ("Novacoil" or approved equivalent).

Geotextile : Non-woven geotextile fabric of type Bidim A24 or equivalent approved, complying with Transit NZ F/7 specification. No geotextile exhibiting tears, rips, or holes shall be used.

Granular Backfill : shall comprise be clean durable aggregate, nominally GAP40 or an approved equivalent approved by the Engineer. Random checks on the material may be undertaken by the Engineer to ensure the requirements of the grading envelope are being met. Material with more than 5% silt or clay fines will not be accepted. and when wet sieved in accordance with NZS 4402 Part 1: Test 9B, shall comply with the following grading:

Standard Sieve Aperture Size	Percentage Passing
40	100
26.5 mm	90 - 100
13.2 mm	85 - 100
9.3 mm	80 - 95
2.36 mm	50 - 70
1.18 mm	35 - 55
600 µm	18 - 40
300 µm	3 - 25
150 µm	0 - 8
75 µm	0

Materials not specified are to be of the best quality.

All materials shall be stored and handled in accordance with the manufacturer's specifications, and in a manner that fully minimises the risk of damage.

3.3 Trenching and Other Open Excavations

Excavated material shall be stacked at least 600 mm from the edge of the trench. The size of the spoil bank shall be such that there is no danger to the stability of the trench. Avoid blocking any road or footpath.

Surplus material shall be disposed of to the onsite disposal area as directed by the Engineer. Surplus material not cleared by the Contractor may be removed by others at the Contractor's expense to the satisfaction of the Engineer.

The maximum length of open trench may not normally exceed 10 m ahead of pipe laying or such lesser distance as may be determined in view of the nature of the ground. Lengths greater than 10 m may only be open with the approval of the Engineer.

The Contractor shall direct his operations to avoid excavating beyond designated profiles. Any over-excavation beyond these profiles carried out without the direction of the Engineer shall be made good, to the direction of the Engineer, with compacted fill of equal quality to that designated to cover the original excavated profile, at no cost to the Principal.

3.4 Subsoil Drainage Pipe Installation

The Contractor shall not commence laying or bedding until the foundation in the trench has been inspected and approved by the Engineer.

Subsoil drains shall be installed in the location and at the levels shown on the drawings. Trenches shall be trimmed true to grade and line to a width of at least that shown on the drawings and the gradient of the bottom of the trench shall be not less than 1:60. The minimum depth of granular backfilling shall be in accordance with the drawings.

The geotextile shall be placed in the trench so as to conform loosely to the shape of the trench. Care shall be taken to avoid projections which could stretch and damage the geotextile. Longitudinal joints shall be limited to one overlap. Transverse joints shall comprise a splice length of at least 500 mm.

At the uphill end of a subsoil drain the perforated pipe shall be brought up the end of the trench and terminated 1.0 m below ground level. The end of the pipe shall be folded back on itself and tied together.

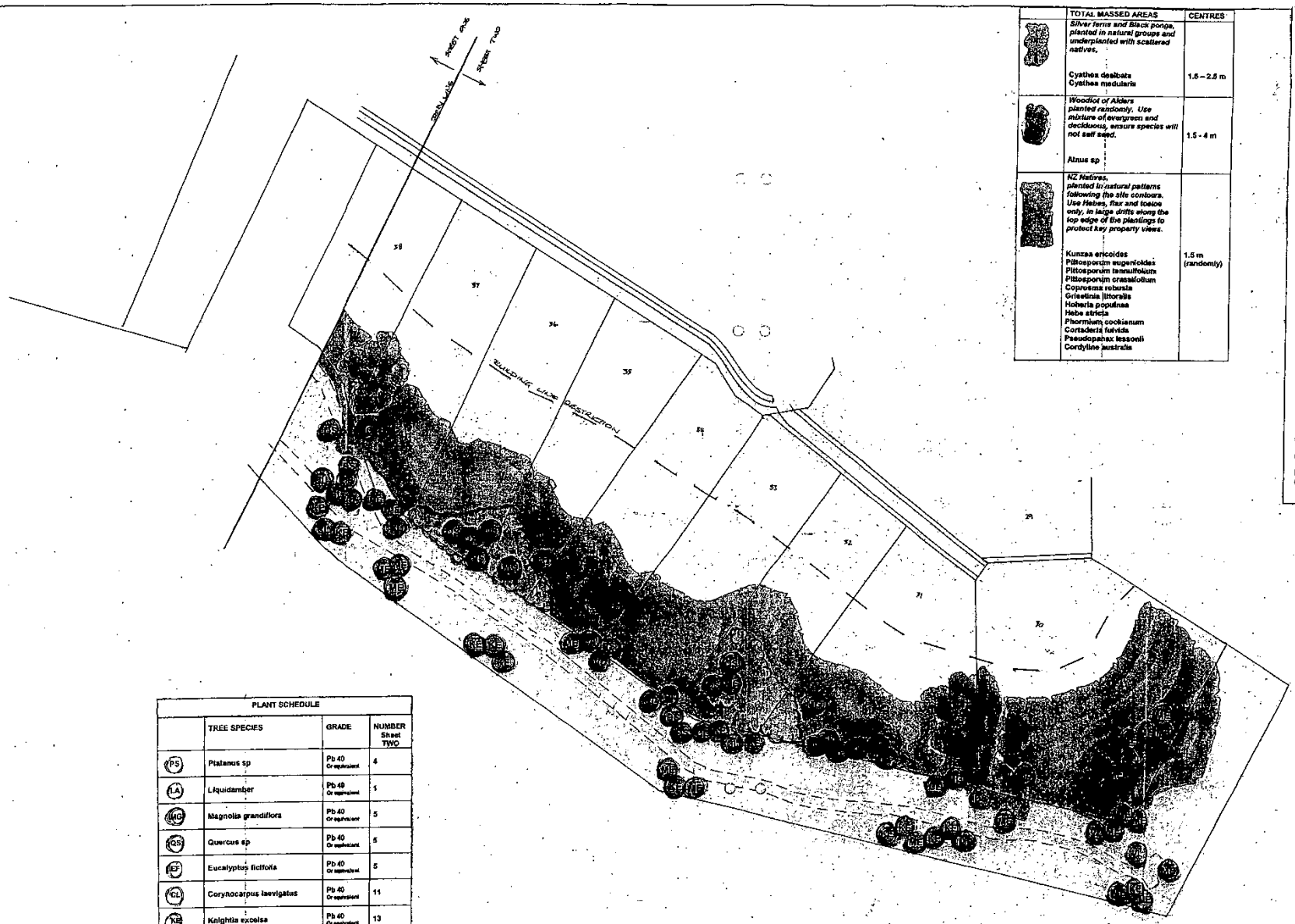
3.5 Backfilling

Subsoil drains shall be backfilled using GAP40 or an approved equivalent. The upper 0.5 m of each trench shall be backfilled with compacted silt-clay soil from the trench excavation to form a seal against the ingress of surface water. Compaction of the clay seal is to be by tamping with the bucket of the excavation machine and track-rolling with a traxcavator or similar plant. Care shall be taken to not crush the subsoil pipe.

Beneath road carriageways, backfill shall be placed up to the proposed subgrade level. Over the carriageway width the backfill shall be compacted to a depth of 0.5 m below subgrade level using a mechanical wacker or approved equivalent.

3.6 Inspections and Approvals

Before any trench excavation is commenced or fill is placed in any area, the Engineer shall be given sufficient notice prior to commencement so that he or his representative can inspect the excavation material to see that the work undertaken meets the Specification requirements. No excavation or backfilling shall be undertaken in the area until the inspections have been made and the Engineer, after further work has been undertaken by the Contractor as necessary, has approved the commencement of excavation or backfilling works. Periodic inspection may be undertaken by the Engineer or his representative at random intervals during the period of the Contract.



	TOTAL MASSED AREAS	CENTRES
	Silver ferns and Black pongs, planted in natural groups and underplanted with scattered natives. Cyathea dealbata Cyathea medullaris	1.5 – 2.5 m
	Woodlot of Alders planted randomly. Use mixture of evergreen and deciduous, ensure species will not self seed. Alnus sp	1.5 - 4 m
	NZ Natives, planted in natural patterns following the site contours. Use Hebes, flax and toetoe only, in large drifts along the top edge of the plantings to protect key property views. Kunzea ericoides Pittosporum eugenioides Pittosporum tenuifolium Pittosporum crassifolium Coprosma robusta Griselinia littoralis Hoheria populnea Hebe stricta Phormium cookianum Cortaderia fulvida Pseudopanax lessonii Cordyline australis	1.5 m (randomly)

PLANT SCHEDULE			
	TREE SPECIES	GRADE	NUMBER Sheet TWO
PS	Platanus sp	Pb 40 Or equivalent	4
LA	Liquidamber	Pb 40 Or equivalent	1
MG	Magnolia grandiflora	Pb 40 Or equivalent	5
QS	Quercus sp	Pb 40 Or equivalent	5
EF	Eucalyptus ficifolia	Pb 40 Or equivalent	5
CL	Corynocarpus laevigatus	Pb 40 Or equivalent	11
KE	Knightia excelsa	Pb 40 Or equivalent	13
ME	Metrosideros excelsa	Pb 40 Or equivalent	27
VL	Vitex lucens	Pb 40 Or equivalent	3
DS	Dysoxylum spectabile	Pb 40 Or equivalent	6

GENERAL NOTES

This Planting Plan has been prepared as a resource consent requirement to help mitigate the visual impact of this development.

Final planting layout will be determined on site to fit with site contours.

Ensure that the final placement of specimen trees provides for a 2 met set back from reserve boundary

Planting patterns should follow natural groupings and wrap around the escarpment. It is important the view shafts from the reserve are retain and that the reserve retains areas of open space.

Ensure that all open grassed areas on the reserve are mowable. Any areas that are unable to be mowed are to be planted with natives. These areas can be identified after earthworks completed.

SITE PREPARATION

All planting area excavations shall be shaped and finished and any drainage required and soil mix supplied and placed, if necessary, to ensure the continual good health of the trees and plants.
All compacted ground in the planting area to be loosened prior to planting.
Ensure all existing grass, weeds and exotic shrubs are removed.

PLANTING

All trees and plants shall be of best nursery stock, healthy and vigorous with well developed root systems, free from pests and diseases and physical damage.
All trees and plants shall be planted to the same height in the soil as they were when nursery grown. Trees and plants shall be thoroughly watered in immediate following planting.

All trees and plants shall be planted with a controlled release NPK fertiliser tablet, quantities to manufacturer's recommendations.

All specimen trees shall be staked with two 180 x 50 x 50 stakes driven 500 mm into firm ground following planting of tree and tied using approved horticultural tree ties.

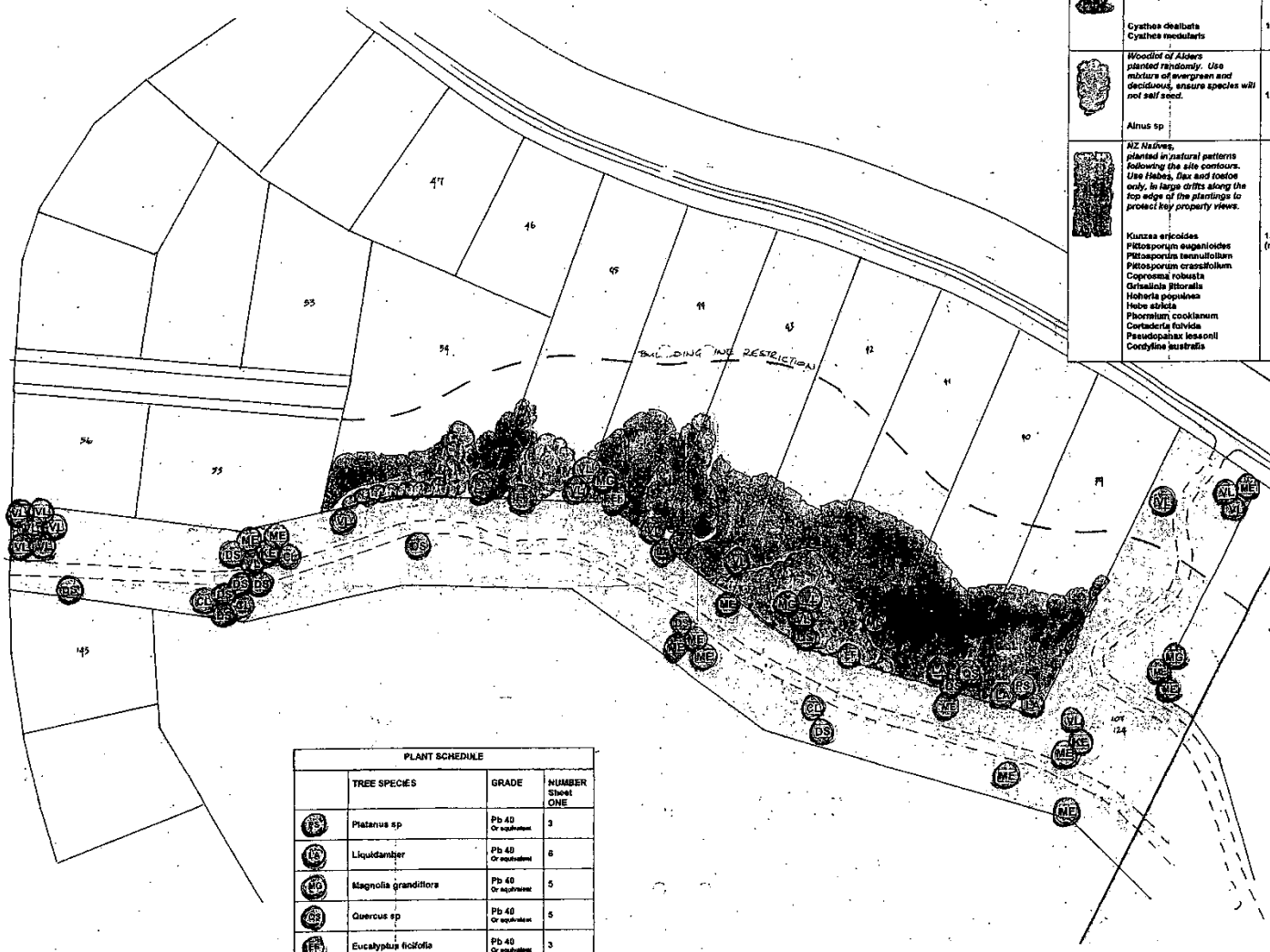
MAINTENANCE

Following the completion of planting, the planted areas are to be monitored and protected from damage by pests and diseases, and weeds and grass species removed for a period of 12 months or until plants are successfully established.
Weed and grass species shall either be removed by hand or by spot spraying of herbicides Glyphosate and / or Metsulfuron.
Herbicides must be used with caution and in strict accordance with manufacturer's instructions.

No trees or plants shall experience stress from lack of water and / or nitrogen deficiencies throughout the maintenance period.

CGC LANDSCAPE COMPANY LIMITED

LYNLEY PARK SUBDIVISION, OMOKOROA
LANDSCAPE MITIGATION PLAN—AMMENDED PLAN
FOR
SOUTHERN ESCARPMENT AND RESERVE AREA, LOT 24
31 AUGUST 2005 SCALE: 1: 500 at A1 SHEET TWO



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CL	Corynocarpus laevigatus Karaka	Pb 40 Or equivalent	4
KE	Knightia excelsa	Pb 40 Or equivalent	12
ME	Metrosideros excelsa	Pb 40 Or equivalent	13
VL	Vitex lucens	Pb 40 Or equivalent	16
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FOR
SOUTHERN ESCARPMENT AND RESERVE AREA, LOT 24
31 AUGUST 2005 SCALE: 1: 500 at A1 SHEET ONE

CKL
Surveying and Planning
Setting New Boundaries

AUCKLAND 8 Manukau Rd, New Market 09 524 7029
HAMILTON 310 Tristram St 07 839 2051
TE AWAMUTU 88 Teasdale St 07 871 6144
WANAKA Cnr Brownston & Dungarvon Sts 03 443 5577

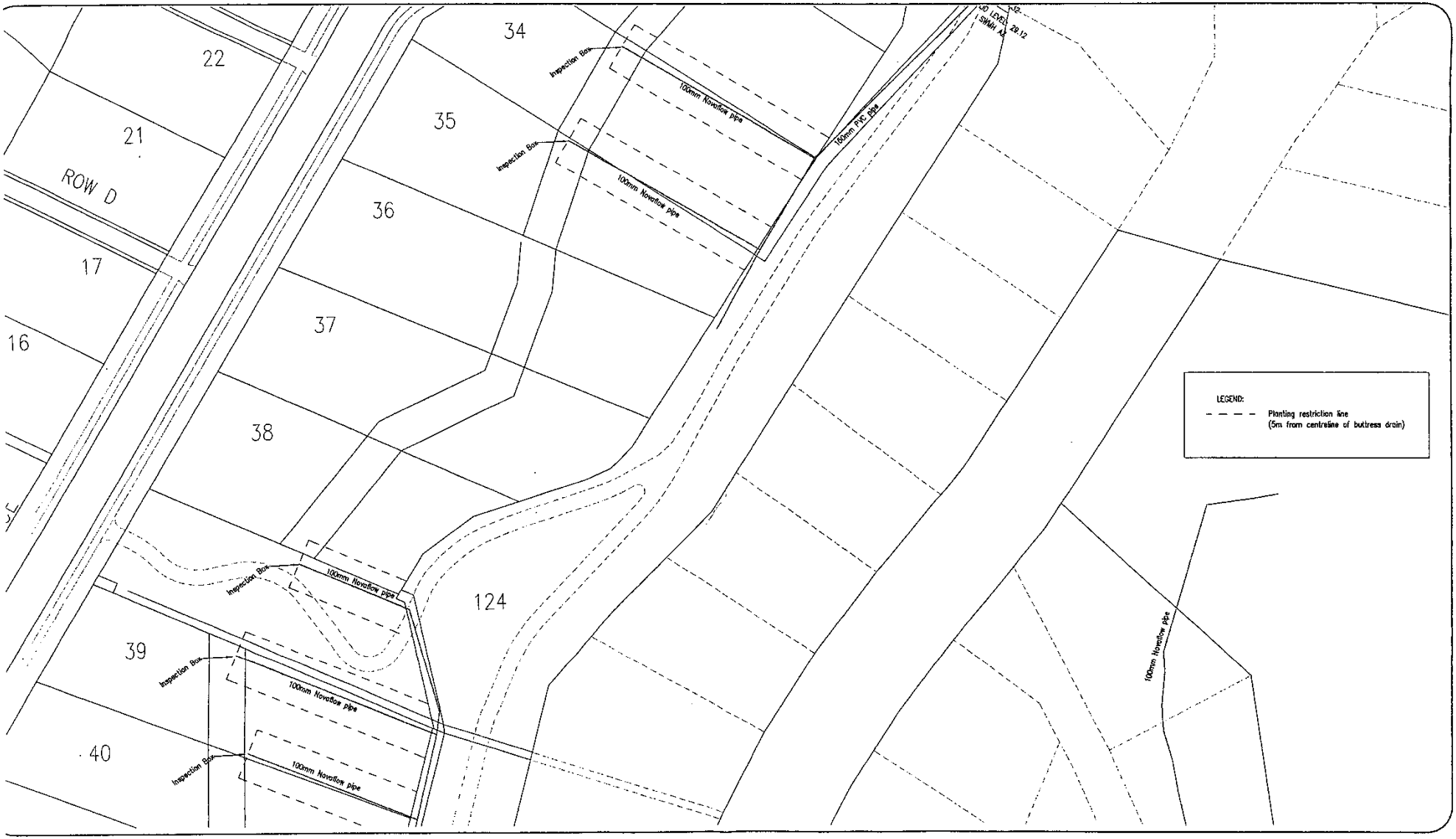
Lynley Park Development
SUBSOIL DRAINAGE

Durham Properties Ltd

Issue	Description	Date
AB	AS-BUILT	03/2006
AB1	Added planting restriction line	04/2006

	Checked	Date
Designed		
Drawn		

Scale:	Date:	
1:500	03/2006	
Job No: D1176	Page No: 2 of 5	Rev: AB1



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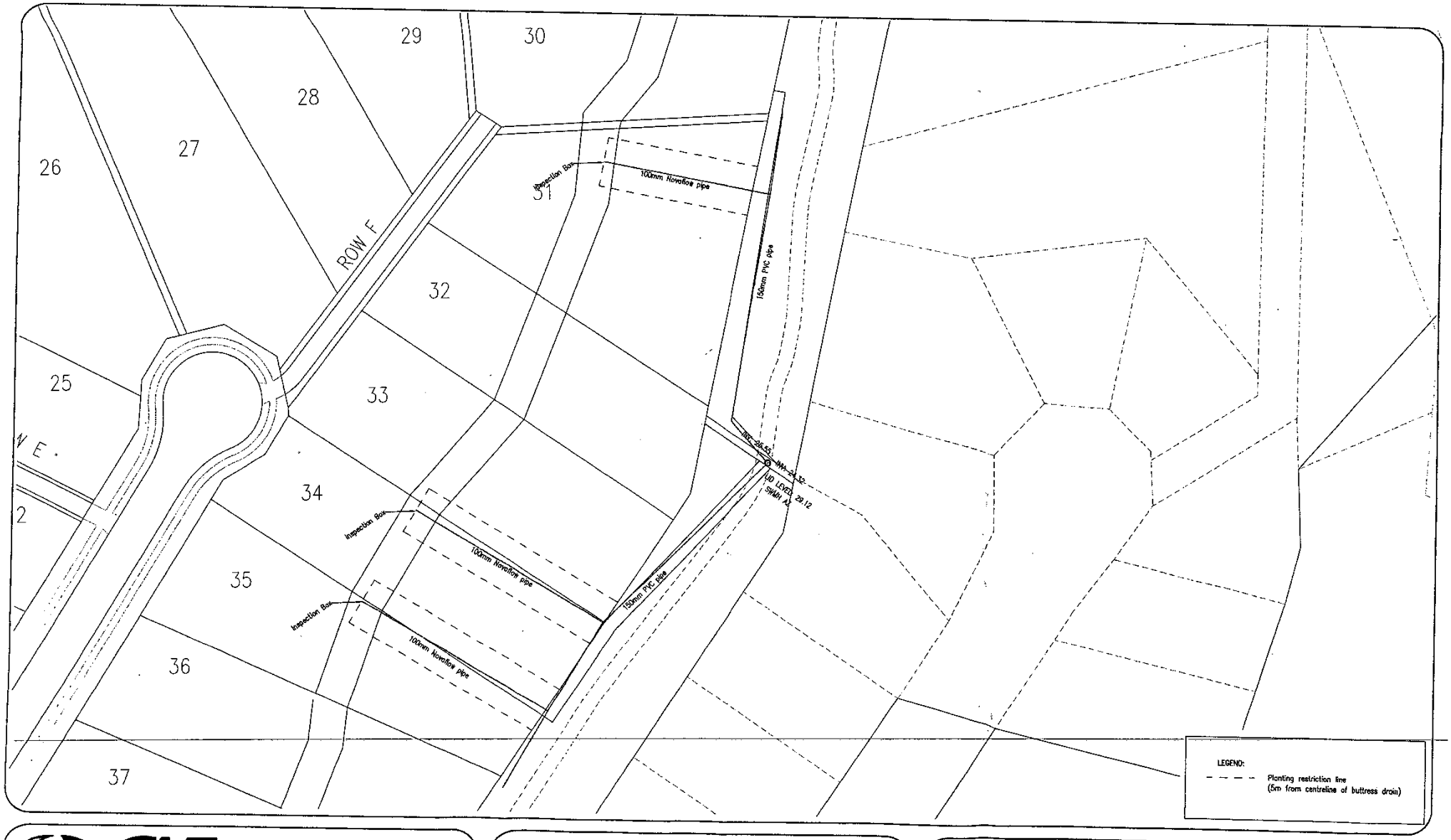

CKL
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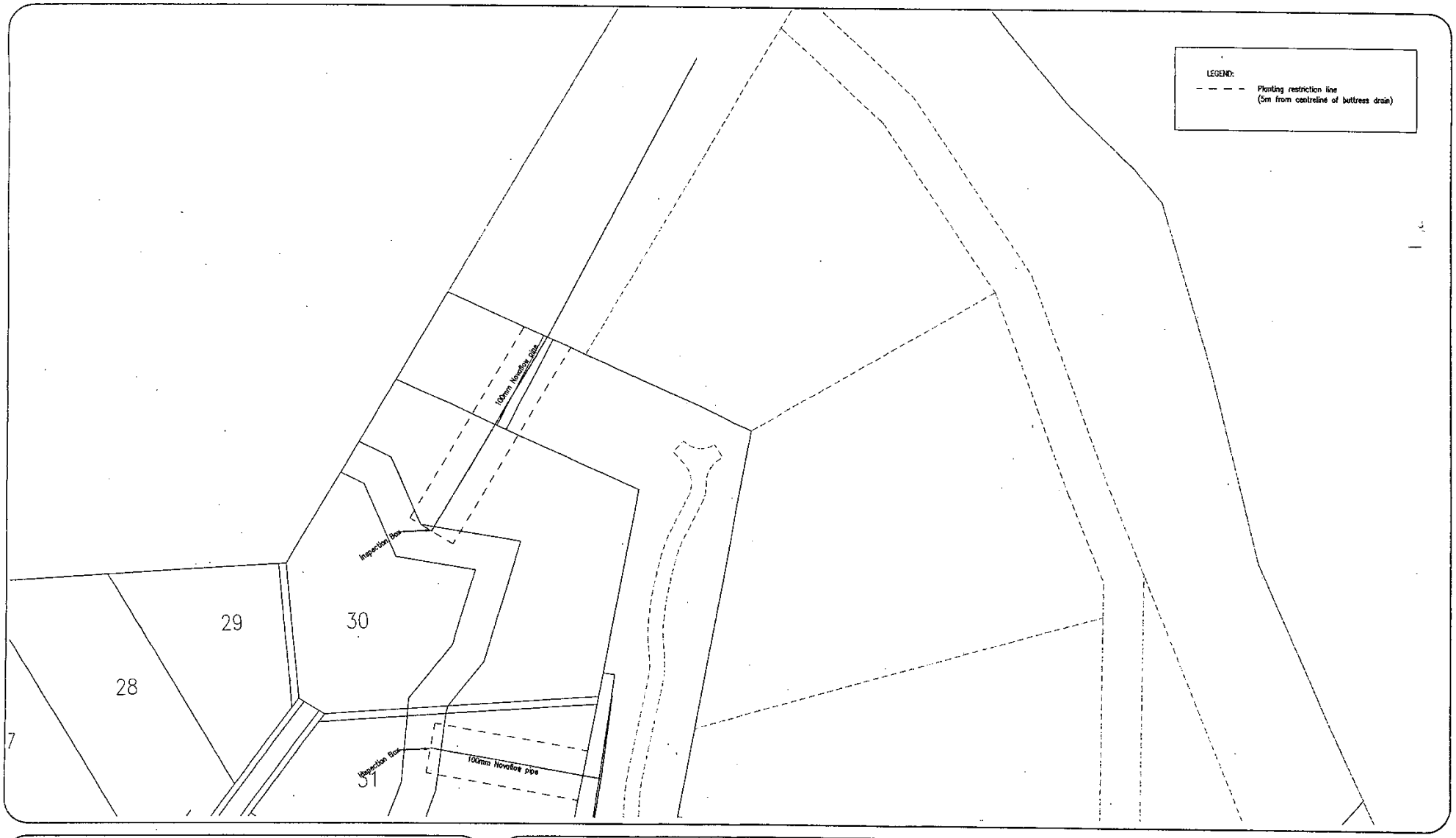

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Surveying and Planning
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Job No: D1176	Page No: 5 of 5	Rev: AB1