Annexure Three: Assessment Against Planning Provisions

Canterbury Regional Policy Statement (Operative 2013)

The Regional Policy Statement (RPS) was made operative in January 2013. Chapter 6 of the RPS was not included.

The Land Use Recovery Plan (LURP) is a response to changes in land use patterns and needs since the 2010-11 earthquakes and the includes the insertion of a new Chapter 6 to the RPS. Consideration of the provisions of Chapter 6 proposed as part of LURP have been made in Table 2 below.

Table 1: Relevant Objectives and Policies of the Canterbury Regional Policy Statement

Canterbury Regional Policy Statement	Assessment
Objective 5.2.1: Location Design and Function of Development (Entire Region) Development is located and designed so that it functions in a way that: achieves consolidated, well designed and sustainable growth in and around existing urban areas as the primary focus for accommodating the region's growth; and enables people and communities, including future generations, to provide for their social, economic and cultural well-being and health and safety; and which: maintains, and where appropriate, enhances the overall quality of the natural environment of the Canterbury region, including its coastal environment, outstanding natural features and landscapes, and natural values; provides sufficient housing choice to meet the region's housing needs; encourages sustainable economic development by enabling business activities in appropriate locations;	The proposed plan change will be designed using good urban design principles, and is adjoining an existing township. The proposed plan change provides housing choice which contributes towards meeting the region's housing needs. The proposed layout of the road network within the Site will ensure alternative forms of transport are available, which will help to minimise energy use. Through good infrastructure design, and subdivision design adverse effects on significant natural and physical resources can be avoided. The proposed plan change is in general accordance with Objective 5.2.1.

minimises energy use and/or improves energy efficiency; enables rural activities that support the rural environment including primary production; is compatible with, and will result in the continued safe, efficient and effective use of regionally significant infrastructure; avoids adverse effects on significant natural and physical resources including regionally significant infrastructure, and where avoidance is impracticable, remedies or mitigates those effects on those resources and infrastructure; facilitates the establishment of papakāinga and marae; and avoids conflicts between incompatible activities. Policy 5.3.7 Strategic land transport network and arterial roads (Entire Region) In relation to strategic land transport network and arterial roads, the avoidance of development which: adversely affects the safe efficient and effective functioning of this network and these roads, including the ability of this infrastructure to support freight and passenger transport services; and in relation to the strategic land transport network and arterial roads, to avoid development which forecloses the opportunity for the development of this network and these roads to meet future strategic transport requirements.	As has been discussed in the Transport Assessment attached in **Annexure 5**, the proposed road layout in the ODP provides for the safe and efficient functioning of the road network. The reliance on the use of local, neighborhood and arterial roads rather than SH1 for access ensure no adverse effects to this nationally important physical resource.
Objective 11.2.1 – Avoid new subdivision, use and development of land that increases risks	

associated with natural hazards New subdivision, use and development of land which increases the risk of natural hazards to people, property and infrastructure is avoided or, where avoidance is not possible, mitigation measures minimise such risks. Policy 11.3.1 – Avoidance of inappropriate development in high hazard areas To avoid new subdivision, use and development (except as provided for in Policy 11.3.4) of land in high hazard areas, unless the subdivision, use or development: is not likely to result in loss of life or serious injuries in the event of a natural hazard occurrence; and is not likely to suffer significant damage or loss in the event of a natural hazard occurrence; and is not likely to require new or upgraded hazard mitigation works to mitigate or avoid the natural hazard; and is not likely to exacerbate the effects of the natural hazard; or is proposed to be located in an area zoned or identified in a district plan or Chapter 6 of the CRPS for urban residential, industrial or commercial use, at the date of notification of the CRPS, in which case the effects of the natural hazard must be mitigated. Policy 11.3.3 – Earthquake Hazards New subdivision, use and development of land on or close to an active earthquake fault trace, or in areas susceptible to liquefaction and lateral spreading, shall be managed in order to avoid or	The proposed rezoning of the Site from a rural zone to a rural residential zone will not increase the risks associated with natural hazards. The Geotechnical report provided in **Annexure 8** considers the land is suitable for approval under s106 of the Act (which considers natural hazard risks associated with slippage, subsidence, inundation, erosion or falling debris) and that there is no risk of lateral spread, and any potential liquefaction risk is at below 10m depth and not significant. . Therefore the proposal is in general accordance with Objective 11.2.1 and Policy 11.3.1.

mitigate the adverse effects of fault rupture, liquefaction and lateral spreading.	

Table 2: Relevant Objectives and Policies, of the Land Use Recovery Plan, Chapter 6 to the RPS.

Definition: Rural Residential activities – means residential units outside the identified priority areas at an average density of between 1 and 2 households per hectare.	The proposal is outside the areas identified as priority areas and has an average density of between 1.75 households per ha . The proposal is therefore considered as a rural residential activity.
Objective 6.2.1 – Recovery Framework Recovery, Rebuilding and development is enabled within Greater Christchurh through a land use and infrastructure framework that: … 7) Maintains the character and amenity to rural areas and settlements 9) Intergrates strategic and other infrastructure and services with land use development; 10) achieves development that does not adversely affect the efficient operation, use, development, and appropriate upgrade, and future planning of strategic infrastructure and freight hubs; 11) optimizes use of existing infrastructure; and	The proposal seeks to maintain and enhance the sense of rural space by providing large sections and wide streets containing trees. The proposal includes a separation from the strategic road network of the State Highway to ensure the development does not adversely affect the efficient operation of the current or proposed future use of this nationally significant infrastructure. The proposal makes use of existing water supply, and wastewater disposal systems for Rolleston township.
Objective 6.2.2 - Urban form and settlement pattern The urban form and settlement pattern in Greater Christchurch is managed to provide sufficient land for rebuilding and recovery needs and set a foundation for future growth, with an urban form that achieves consolidation and intensification of urban areas, and avoids	The proposed plan change provides for the growth of Rolleston in a manner that ensures residents have ease of access to the services in Rolleston, while providing a eastern extent to the township living zones, clearly defined by the adjoining proposed rural residential zone. The plan change is in general accordance with

unplanned expansion of urban areas, by: ...6) Encourage sustainable and self-sufficient growth of the towns of Rangiora, Kaiapoi, Woodend, Lincoln, Rolleston Prebbleton and consolidation of the existing settlement of West Melton; 7) Managing rural residential development outside of existing urban and priority areas: and...	Objective 6.2.1. The proposed rural residential is planned, integrated and 'managed' development, with a design integrated with the adjoining urban area, and in accordance with an ODP.
Objective 6.2.3 - Sustainability Recovery and rebuilding is undertaken in Greater Christchurch that: provides for quality living environments incorporating good urban design; retains identified areas of special amenity and heritage value; retains values of importance to tangata whenua; provides a range of densities and uses; and is healthy, environmentally sustainable, functionally efficient and prosperous	The ODP has been designed using good urban design principles to create a quality living environment and to ensure that the rural amenity of the area is maintained as discussed in the Landscape report in **Annexure 4**. The Site provides for a range of rural residential sized allotments and provides a healthy, environmentally sustainable environment.
Objective 6.2.4 – Integration of transport infrastructure and land use Prioritise the planning of transport infrastructure so that it maximises integration with the priority areas and new settlement patterns and facilitates the movement of people and goods and provision of services in Greater Christchurch, while: managing network congestion; reducing dependency on private motor	The ODP for the Site outlines the proposed road network layout. This does not include a connection to SH1. The Site has been designed to promote walking and cycling into Rolleston and to ensure that infrastructure can be integrated with existing developments to the west. Provision has been made for the widening of the State Highway to provide for the needs of regional transport networks.

vehicles; reducing emission of contaminants to air and energy use; and promoting the use of active transport modes. Optimizing use of existing capacity within the network: and Enhancing transport safety.	The proposal is therefore in general accordance with Objective 6.2.4.
Policy 6.3.2 – Development form and urban design Business development, residential development (including rural residential development) and the establishment of public space is to give effect to the principles of good urban design, and those of the NZ Urban Design Protocol 2005, through the design, assessment and development process: Tūrangawaewae – the sense of place and belonging – recognition and incorporation of the identity of the place, the context and the core elements that comprise the place. Through context and site analysis, the following elements should be used to reflect the appropriateness of the development to its location: landmarks and features, historic heritage, the character and quality of the existing built and natural environment, historical and cultural markers and local stories. Integration – recognition of the need for well-integrated places, infrastructure, movement routes and networks, spaces, land uses and the natural and built environment. These elements should be overlaid to provide an appropriate form and pattern of use and development. Connectivity – the provision of efficient and safe high quality, barrier free, multimodal	The ODP has been designed using good urban design principles to ensure that the area has a sense of 'openness' in order to retain the rural nature of the surrounding area to the east and south, and a semi-rural character for the proposed subdivision. This is achieved through a low yield across the Site, large road and internal boundary setbacks, wide roads with berms and street trees and plenty of opportunity for garden plantings. A proposed pedestrian/cycle link from the internal road to and along the SH1 landscape buffer area will provide an attractive 'off road' link to the adjoining SH1 buffer area to the west. This will be an attractive 'unique' feature of this part of Rolleston, adding to 'sense of place'. The use of the proposed road network to link the Site to the existing development to the west will ensure that a sense of integration occurs between the Site and the urban area of Rolleston. The wide streets incorporating wide berms, swales and tree plantings, along with opportunities to provide for garden plantings will ensure integration with the surrounding rural area. Although the Site does not contain street

connections within a development, to surrounding areas, and to local facilities and services, with emphasis at a local level placed on walking, cycling and public transport as more sustainable forms of transport. Safety – recognition and incorporation of Crime Prevention Through Urban Design (CPTED) principles in the layout and design of developments, networks and spaces to ensure safe, comfortable and attractive places. Choice and diversity – ensuring developments provide choice and diversity in their layout, built from, land use housing type and density to adapt to the changing needs and circumstances of the population. Environmentally sustainable design – ensuring that the process of design and development minimizes water and resource use, restores ecosystems, safeguards mauri and maximizes passive solar gain. Creativity and innovation – supporting opportunities for exemplar approaches to infrastructure and urban form to lift the benchmark in the development of new urban areas in the Christchurch region.	lighting to provide additional security at night, wide streets and the sense of openness created by the road network will ensure that a sense of community is developed that will help to prevent crime. Limitations as to fencing style will also assist with this. The Site is located only 1 – 2 Km from the center of Rolleston which is a reasonable distance to facilitate walking and cycling modes of transport. The use of the Site for rural residential activities will not adversely impact on the environmental quality of the area, given the large section sizes and the opportunity for garden spaces within sections. The proposed rural residential development will provide for a wider choice of housing environments in this part of Rolleston which does not include any existing low density rural residential style development.
Policy 6.3.3 – Development in accordance with outline development plans Development in greenfields areas, including rural residential development, is to occur in accordance with the provisions set out in an outline development plan or other rules for the area. Subdivision cannot proceed ahead of the incorporation of an outline development plan in a district plan. Outline development plans and associated rules will: 1) Be prepared as: a) a single plan for the whole of the priority	An ODP is proposed which shows: • the principal roads and connections to adjoining site to the west. • Potential infrastructure connections with the adjoining site to the west. • Swale areas within the road width for stormwater treatment and drainage. • Land set aside to provide a landscaped

area; or b) where an integrated plan adopted by the Territorial Authority exists for the whole of the priority area and the Outline Development Plan is consistent with the integrated plan, part of that integrated area; or C) as a single plan for the whole of a rural residential area; and 2) Be prepared in accordance with the matters set out in Policy 6.3.2; 3) Show proposed land uses including: Principal through roads, connections with surrounding road networks, relevant infrastructure services and areas for possible future development; Land required for community facilities or schools; Parks and other land for recreation; Land to be used for business activities; The distribution of different residential densities, in accordance with Policy 6.3.7; Land required for stormwater treatment, retention and drainage paths Land reserved or otherwise set aside from development for environmental, historic heritage, or landscape protection or enhancement; Land reserved or otherwise set aside from development for any other reason, and the reasons for its protection from development; Pedestrian walkways, cycleways, bus routes both within and adjoining the area to be	setback from SH1 to protect the physical resource from reverse sensitivity. • Potential pedestrian walkways and cycleways should they be deemed necessary by Council. • Areas for a variety of densities, ensuring higher densities nearer to existing development and lower densities nearer the adjoining rural environment and State Highway. In combination with the information contained within the plan change application, it is considered that the ODP fulfills all of the relevant requirements of this policy.

developed; 4) Demonstrate how Policy 6.3.7 will be achieved for residential areas within the area that is the subject of the outline development plan, including staging; 5) Identify significant cultural, natural or historic heritage features and values, and show how they are to be protected and/or enhanced; 6) Document the infrastructure required, when it will be required and how it will be funded; 7) Set out the staging and co-ordination of subdivision and development between landowners; 8) Demonstrate how effective provision is made for a range of transport options including public transport options and integration between transport modes, including pedestrian, cycling public transport , freight, and private motor vehicles; 9) Show how other potential adverse effects on and/or from nearby existing or designated strategic infrastructure (including requirements for designations, or planned infrastructure) will be avoided, remedied or appropriately mitigated; 10) Show how other potential adverse effects on the environment, including the protection and enhancement of surface and groundwater quality, are to be avoided, remedied or mitigated; 11) Show how the adverse effects associated with natural hazards are to be avoided, remedied or mitigated as appropriate and in accordance with chapter 11 and any relevant guidelines; and 12) Include any other information that is	

relevant to an understanding of the development and its proposed zoning.	
Policy 6.3.4 – Transport effectiveness Ensure that an efficient and effective transport network that supports business and residential recovery is restored, protected and enhanced so that it maintains and improves movement of people and goods around Greater Christchurch by: (1) Avoiding development that will overload strategic freight routes; (2) providing patterns of development that optimise use of existing network capacity and ensuring that, where possible, new building projects support increased uptake of active and public transport, and provide opportunities for modal choice; (3) providing opportunities for travel demand management; (4) requiring integrated transport assessment for substantial developments; and (5) improving road user safety.	The proposal includes road, and pedestrian linkages towards the west, rather than towards the state highway to the north. This will ensure that the development will not overload or compromise the strategic network at this point. The linkages proposed enable future residents to make use of the full range of transport modes, by providing pedestrian linkages as well as wide road to enable on street cycling in a safe manner.
Policy 6.3.5 – Integration of landuse and infrastructure Recovery of Greater Christchurch is to be assisted by the integration of land use development with infrastructure by: Identifying priority areas for development to enable reliable forward planning for infrastructure development and delivery; Ensuring that the nature, timing and sequencing of new development is co-ordinated with the development, funding, implementation and operation of transport and	The report in **Annexure 6** identifies the existing infrastructure which can easily and cost effectively be extended to accommodate the proposed 36 allotments.

other infrastructure in order to; optimise the efficient and affordable provision of both the development and the infrastructure; maintain or enhance the operational effectiveness, viability and safety of existing and planned infrastructure; protect investment in existing infrastructure; and ensure new development does not occur until provision for appropriate infrastructure is in place; Providing that the efficient and effective functioning of infrastructure, including transport corridors, is maintained, and the ability to maintain and upgrade that infrastructure is retained; Only providing for new development that does not affect the continued operation, use, development, appropriate upgrading and safety of existing strategic infrastructure, including by avoiding noise sensitive activities within the 50dBA Ldn noise contour for Christchurch International Airport, unless the activity is within an existing residentially zoned urban area, priority area identified for Kaiapoi, or greenfield residential area identified in Map A; and Management of the effects of land-use activities on infrastructure, including avoiding activities that have potential to limit the efficient and effective, provision, operation, maintenance or upgrade of strategic infrastructure and freight hubs.	The Transport Assessment in **Annexure 5** shows that the proposed roading layout provides an efficient use of transport infrastructure to accommodate demand for rural residential growth. The Site is not located within the 50dBA Ldn noise contour for Christchurch International Airport and therefore will not affect the continued function of this physical resource. The proposal makes specific provision for the proposed widening of the southern motorway by providing a reserve area adjoining the northern boundary of the site. Therefore the proposed plan change is in accordance with policy 6.3.5.
Policy 6.3.9 – Rural residential development In Greater Christchurch, rural residential	SDC does not currently have an adopted rural residential development plan, but does have a Rural Residential Background Report,

development further to areas already zoned in district plans as at 1st January 2013 can only be provided for by territorial authorities in accordance with adopted rural residential development plans prepared in accordance with the Local Government Act 2002, subject to the following: In the case of Christchurch City, no further rural residential activity is to be provided for within the Christchurch City Plan area; The location must be outside the priority areas for development and existing urban areas; All subdivision and development must be located so that it can be economically provided with a reticulated sewer and water supply integrated with a publicly owned system, and appropriate stormwater treatment and disposal; Legal and physical access is provided to a sealed road, but not directly to a road defined in the relevant district plan as a Strategic or Arterial Road, or as a State highway under the Government Roading Powers Act; The location of any proposed rural residential development shall: avoid noise sensitive activities occurring within the 50 dBA Ldn air noise contour surrounding Christchurch International Airport so as not to compromise the future efficient operation of Christchurch International Airport or the health, well-being and amenity of people; avoid the groundwater recharge zone for Christchurch City's drinking water; avoid land between the primary and secondary stop banks south of the Waimakariri River; avoid land required to protect the landscape	prepared under the Local Government Act and which informed PC17 (withdrawn) and PC32. The East Rolleston PC is in accordance with the RRBR criteria for rural residential development. The applicant made a submission on the LURP requesting that CERA make a statutory direction to SDC to prepare a rural residential development plan as required by this policy. It is understood that this process is already underway. The East Rolleston PC meets all of Policy 6.3.8 criteria 1) to 6) for the reasons set out below: The Site is located outside the priority areas for development and existing urban areas. The Site can economically be provided with water supply and sewer connections to the publically owned system in the development to the west. Access will be made to the existing roads to the west of the Site and no access will be made to SH1. The proposal is not within the 50 dBA Lnd noise contour. The Site is not within the groundwater recharge zone for Christchurch City's drinking water. The Site is not between the primary and secondary stop banks south of the Waimakariri River. The Site does not contain land to protect the landscape character of the Port Hills. The Site is not located near any of the military training facilities. The Site provides for good access to

character of the Port Hills; not compromise the operational capacity of the Burnham Military Camp, West Melton Military Training Area or Rangiora Airfield; support existing or upgraded community infrastructure and provide for good access to emergency services; avoid significant reverse sensitivity effects with adjacent rural activities, including quarrying and agricultural research farms, or strategic infrastructure; avoid significant natural hazard areas including steep or unstable land; avoid significant adverse ecological effects and support the protection and enhancement of ecological values; Support the protection and enhancement of ancestral land, water sites, wāhi tapu and wāhi taonga of Ngāi Tahu; where adjacent to or in close proximity to an existing urban or rural residential area, be able to be integrated into or consolidated with the existing settlement; and avoid adverse effects on existing surface water quality. 6) An outline development plan is prepared which sets out an integrated design for subdivision and land use, and provides for the long-term maintenance of rural residential character. 7) A rural residential development area shall not be regarded as in transition to full urban development.	emergency services and community infrastructure in Rolleston. The low yield of the Site will ensure reverse sensitivity effects are avoided. There are no known intensive farming activities in the immediate locality. The Site does not include any areas of potential natural hazard. The Site does not contain any ancestral land, water sites, wahi tapu or wahi taonga or Ngai Tahu. The Site development will integrate with proposed residential development to the west. The Site does not contain or affect existing surface water. An Outline Development Plan has been provided and the rural residential area is intended to provide for an appropriate interface with the rural land beyond, rather than become a transition to a full urban development. The proposal complies with this policy.

Regional Land Transport Strategy 2008 – 2018

The relevant targets and vision for Greater Christchurch are identified below. The Transport Assessment attached as **Annexure 5** also includes an assessment.

Table 3: Regional Land Transport Strategy 2008 - 2018

Regional Land Transport Strategy	Assessment
Providing Transport Options	The strategy has a target of increasing trips using a wider range of transport modes through cycling, walking, public passenger transport. The Site will cater for all transport modes, with good linkages from the Site to the existing Rolleston urban area. The site is within close proximity to bus services, and the road network layout can accommodate bus services.
Roads: Safety Public Health Environmental Sustainability and Infrastructure	All roads will be developed to appropriate Council standards. The Site provides for sustainable transport options, with access to public transport. Strategic roading infrastructure as part of CRETs is planned which supports the proposed site.
Land Use	The strategy seeks integration of land use with transport provision to contribute to improvements in the affordability, integration, safety, responsiveness and sustainability of the land transport system. Urban growth at the proposed Site has been considered in future upgrades of the wider Rolleston roading network.

Assessment against Selwyn District Plan Objectives

The Selwyn District plan policy framework sets the strategic scene for how Council will manage growth and the environmental outcomes sought. Plan Change 32 proposes a number of changes to some of these objectives and policies and these changes have been considered in this assessment, although it is noted that Plan Change 32 is on hold. Where objectives or policies have been modified or inserted as a result of PC32 an indication of the inserted parts is give with an underline in the text, proposed deletions are indicated with a ~~strikethrough~~ and the note "[PC32]" indicates the origin of the changes. Where subsequent plan changes have altered the objective or policy numbers since PC32 was drafted, the new amended numbering has been

adopted, however the changes to the relevant objective or policy as per PC32 has been retained. The relevant objectives and policies and assessments are outlined below in Table 5.

Table 5: Relevant Objectives and Policies, Selwyn District Plan

District Plan – Townships Volume Chapter B1 Natural Resources	Assessment
Objective B1.1.2 New residential or business activities do not create shortages of land or soil resources for other activities in the future. Policy B1.1.3 Avoid adverse effects on people's health or well-being from exposure to contaminated soil. Policy B1.1.8 Avoid rezoning land which contains versatile soils for new residential or business development if: The land is appropriate for other activities; and There are other areas adjoining the township which are appropriate for new residential or business development which do not contain versatile soils.	The Site does not have access to SH1 and is adjacent to existing residential zoned land creating the potential for reverse sensitivity effects with farming activities. It is most appropriate to rezone this land to enable rural residential activities. The Site has been assessed and the report provided in **Annexure 7.** No contaminated soils found in the areas where new development is to occur. Any contaminated soils in the vicinity of the existing farm fuel tanks can be removed in necessary. This can be dealt with the time of subdivision. The Site soils comprise Templeton silt loam and Templeton silt loam on sand which are versatile soils. Most of the area surrounding Rolleston (i.e other than land to the west, which already includes PC 8 & 9)) contains soils which are considered to be versatile, therefore most new development adjoining Rolleston will contain versatile soils. However given that the Site is adjacent to existing urban development it is considered to be appropriate for rural residential development. It is also not appropriate for continued agricultural use as the existing farm is now partly within the Urban Limits, including the existing access from Levi Road. As a farm block, the Site will be uneconomic, Avoidance of versatile is not a factor for

	consideration under other key policy documents, including PC1 and the LURP. However the proposal site represents an appropriate location for rural residential development adjoining existing residential activities. The site provides for efficiencies with respect to transport connections, water and wastewater supply and the ability to integrate a development with existing township services.
Objective B1.2.1 [PC32] Expansion of townships in Selwyn District and rural residential activities maintains and enhances the quality of ground or surface water resources. Policy B1.2.2 Ensure land rezoned to a Living or Business zone can be serviced with a water supply and effluent and stormwater disposal without adversely affecting ground water or surface waterbodies Policy B1.2.3 [PC32] Require the water supply to any allotments or building in any township and the Living 3 Zone to comply with the current New Zealand Drinking Water Standards and to be reticulated in all townships and the Living 3 Zone, except for sites in the existing Living 1 Zone in Doyleston. Policy B1.2.5 [PC32] Require any sewage treatment and disposal to be reticulated in the Living 3 Zone and in the townships	As shown in the Engineering and Servicing Report, it is possible to efficiently provide water supply and effluent and stormwater disposal to the Site without adversely affecting waterbodies. Please refer to **Annexure 6** for further details. In accordance with Policy B1.2.3 it is possible to provide water supply to the allotments with the appropriate drinking standard. This is discussed in detail in the engineering and servicing report in **Annexure 6** In accordance with Policy B1.2.5, it is possible to provide sewage treatment and disposal to Rolleston's reticulated system, and further detail of this can be found in the engineering and servicing report in **Annexure 6**

of Castle Hill, Doyleston, Lake Coleridge Village, Leeston, Linclon, Prebbleton, Rolleston, Southbridge, Springston, Tai Tapu and West Melton.	
Chapter B2 Physical Resources	
Objective B2.1.1 [PC32] An integrated approach to land use and transport planning to ensure the safe and efficient operation of the District's roads, pathways, railway lines and airfields is not compromised by adverse effects from activities on surrounding land or by residential and rural residential growth. Objective B2.1.2 An integrated approach to land use and transport planning to manage and minimise adverse effects of transport networks on adjoining land uses and to avoid "reverse sensitivity" effects on the operation of transport networks. **Policy B2.1.2** Manage effects of activities on the safe and efficient operation of the District's existing and planned road network, considering the classification and function of each road in the hierarchy. Policy B2.1.5 Ensure the development of new roads is: Integrated with existing and future transport networks and landuses; and Is designed and located to maximize permeability and accessibility; Through achieving a high level of connectivity within	The Outline Development Plan indicates the proposed roading layout for the Site, which shows connections to the development occurring on the adjoining site to the west. This will provide connections into the urban area of Rolleston. There are no direct vehicle access points onto SH1. The Transport Assessment (attached in **Annexure 5**) indicates that the proposed growth can be accommodated in this area in an integrated manner and in accordance with the following objectives and policies: objectives B2.1.1, and B2.1.2, and Policies B2.1.2, B2.1.5 and B2.1.12. Proposed amendments to the District Plan as part of this Plan Change Request include a 20m setback from roads, which will ensure good visibility is maintained. No access is provided onto SH1, with the Site being connected to the adjoining development to the west of the Site. This will avoid reverse sensitivity effects with SH1 in terms of traffic effects.

and through new developments to encourage use of public and active transport; whilst having regard to the road hierarchy. Policy B2.1.9 Ensure buildings are set back a sufficient distance from road boundaries to maintain good visibility for all road users including motorist, cyclists and pedestrians, and to allow safe access and egress and to mitigate reverse sensitivity effects on land adjoining the State Highway. Policy B2.1.12 [PC32] Address the impact of new residential, rural residential or business activities on both the local roads around the site and the District's road network, particularly Arterial Road links with Christchurch City. Policy B2.1.13 Minimise the effects of increasing transport demand associated with areas identified for urban growth by promoting efficient and consolidated land use patterns that will reduce the demand for transport. Policy B2.1.15 [PC32] Require pedestrian and cycle links in new and redeveloped residential, rural residential or business areas where such links are likely to provide a safe, attractive and accessible alternative route for pedestrians and cyclists, to surrounding residential areas, business or community facilities. Policy B2.1.22 [PC32]	The Site adjoins an existing development and makes transport connections to this development, thus promoting and efficient and consolidated land use pattern. The ODP includes an option for cycle and pedestrian links along the SH1 landscape buffer. The layout of the road network will enable a safe route for pedestrians and cyclists to access services in Rolleston. The Site is located on the same side of SH1 as the of Rolleston living areas, thus the proposal is consistent with this policy.

Confine residential or business development in a township and rural residential activities to one side of any Strategic Road or railway line where the township is already wholly or largely located on one side of the Strategic Road or railway line, unless that area is not suitable for further township expansion or to be intensified to Living 3 Zone rural residential densities.	
Policy B2.2.1 [PC32] Require that the need to supply utilities and the feasibility of undertaking, is identified at the time a plan change request is made to rezone land for residential, rural residential or business development.	The Engineering and Servicing Report attached in **Annexure 6** indicates that servicing of the Site is possible and appropriate. Connections for water supply and sewer disposal will be made to reticulated services located in the adjoining development to the west.
Policy B2.3.1 Encourage co-ordination between the provision of community facilities, and new residential and business development.	The Proposed Outline Development Plan provides for transport links into Rolleston where there are sufficient community facilities to accommodate future residents of the Site.
Policy B2.4.4 Ensure land rezoned for new residential or business development has a regular solid waste collection and disposal service available to residents.	Solid waste disposal services from the development to the west of the Site can be extended into to accommodate future residents. Please refer to the Engineering and Servicing Report attached in **Annexure 6**.
Chapter B3 Peoples Health Safety and Values	
Objective B3.4.1 The District's townships are pleasant places to live and work in.	The Site will be designed using good urban design principles and the existing controls for a Living 3 Zone in the District Plan. This will ensure Rolleston continues to be a pleasant place to live and work in. The proposed rezoning of the Site to a Living 3 zone will enable rural residential

Objective B3.4.2 A variety of activities are provided for in townships, while maintaining the character and amenity values of each zone. Objective B3.4.3 "Reverse sensitivity" effects between activities are avoided. Objective B3.4.4 Growth of existing townships has both a compact urban form and provides a variety of living environments and housing choices for residents, including medium density housing typologies located within areas identified in and Outline Development Plan.	activities in the area. Rural residential activities, including a sense of openness due to larger allotment sizes will ensure the character and amenity values of the area are maintained. Reverse sensitivity effects between rural residential activities on the site and SH1 are avoided through proposed building setbacks from SH1 and through proposed landscaping. The potential effects of rural residential and activities on adjoining rural zoned land, are mitigated by the large section sizes, retention of existing shelter belts and the internal boundary setback requirements. The location of the Site provides a logical and compact extension to the eastern boundary of Rolleston while providing larger sections which make a barrier and defensible boundary against further development along SH1 to the east. Provisions are made for connections from the Site to the center of Rolleston through the road network outline in the Outline Development Plan (**Annexure 2**). This new objective has been proposed by Plan Change 32. This objective limits the number of rural residential households to 200 between 2007 – 2016, and is consistent with the limits specified in PC1 - refer to Table 2, Policy 6 above. The policy then goes on to set out the goals of limiting rural residential development. It should be noted that PC32 has been put on hold pending decisions on the LURP, which no longer sets an allocation 'limit' for rural residential households. . The applicant has made submissions in opposition to the limited number of

Objective B3.4.5 Urban growth within and adjoining townships will provide a high level of connectivity both within the development and with adjoining land areas (where these have been or are likely to be development for urban activities or public reserves) and will provide suitable access to a variety of forms of transport. Objective B3.4.6 [PC32] To manage rural residential activities by facilitating a maximum of 200 households in each of the periods to 2016, 2017 to 2026 and 2027 to 2041 through the Living 3 Zone, which are to be located outside the Urban Limits but adjoining Townships in the Greater Christchurch Urban Development Strategy area to: Facilitate the provision of housing choice and diverse living environments outside the Urban Limits prescribed in the Regional Policy Statement. Avoid significant adverse landscape and visual effects on rural character and amenity. Avoid the cumulative loss of productive rural land and rural character that will result from the incremental rural residential development and to ensure that a consolidated pattern of urban growth is achieved across the Greater Christchurch Urban Development Strategy area of the District. Be integrated with existing settlements to promote efficiencies in the provision of cost effective infrastructure, including the requirement to connect to reticulated wastewater and water services. Ensure that rural residential expansion occurs in a way that encourages the sustainable expansion of infrastructure, and provides for a choice of travel modes. Assist in achieving concentric and consolidated	households that can be established on the basis of a known demand for rural residential houses in this area, and the need to provide housing choice to meet earthquake related housing needs.. The proposed rezoning of the Site to Living 3 will provide for a choice of housing in the area. Landscape assessment attached in **Annexure 4** indicates that there will not be any significant adverse landscape or visual effects on rural character and amenity from development of the Site. The Site adjoins existing urban development and will provide an eastern boundary to Rolleston, thus preventing further loss of productive rural land, and it is noted that the Site if left as Rural Inner plains zoning that farming activities would be hampered by a lack of access and potential reverse sensitivity issues with urban expansion to the west and the uneconomic size of this balance farm block (half of the existing farm, to the west, is now zoned Living Z). The proposed ODP ensures integrated infrastructure and modes of transport with developments to the west, thus integrating with existing settlements. Reverse sensitivity issues have been discussed elsewhere are considered to be minor. The proposed rezoning therefore meets all of the criteria proposed by Objective B3.4.6 despite potentially not meeting the limited household numbers set by this policy (if considered in combination with the 142 rural residential households zoned in west Rolleston (PCs 8 & 9) and the 115

townships and to retain the distinctiveness between rural and urban environments. Avoid incompatible amenity expectations between different land uses, particularly between rural residential living environments and the sensitive boundary interfaces of the Living 3 Zone with Townships and Rural zoned land. Avoid significant reverse sensitivity effects with strategic infrastructure, including quarrying activities, Transpower High Voltage Transmission Lines and associated infrastructure, Burnham Military Camp, Council's Rolleston Resource Recovery Park and wastewater treatment plants in Rolleston and Lincoln, West Melton Military Training Area, agricultural research farms associated with Crown Research Institutes and Lincoln University. Policy B3.4.3(b)[PC32] To facilitate rural residential living environments through the Living 3 Zone. Where new Living 3 Zone areas are proposed, such areas are to adjoin the Urban Limits identified in the Regional Policy Statement and are to meet the following strategic outcomes: Avoid identified constraints, including strategic and nationally important facilities operating within the eastern area of the District, such as agricultural research farms associated with Crown Research Institutes and Lincoln University, Council's Rolleston Resource Recovery Park and wastewater treatment plants in Lincoln and Rolleston, Transpower High Voltage Transmission lines and associated infrastructure, Burnham Military Camp and West Melton Military Training Area. Avoid land that contains sites of significance to tangata whenua or where development would result in significant adverse effects on ecological values or indigenous biodiversity.	proposed rural residential households under PC28 (Denwood)). The Policy B3.4.3(b) matters are addressed in the AEE and under Objective B3.46 above. Additionally the Site does not contain any sites of significance to tangata whenua, or create significant adverse effects on ecological values or indigenous biodiversity. The Site is not unreasonably susceptible to liquefaction or lateral displacement, nor does it contain any soil contamination or identified natural hazards in accordance with the reports attached in **Annexure 7 and 8**. The ODP and proposed rules (including relating to setbacks, planting, minimum and average lot sizes and road design, in combination with the existing Living 3 zone rules will ensure the desired amenity outcomes and levels of service for rural residential living environments.

Avoid land that is unreasonably susceptible to liquefaction and lateral displacement during large earthquake events, soil contamination and identified natural hazards. Are efficiently serviced with network infrastructure, particularly water, waste water and roading. Does not significantly undermine the consolidated management of urban growth or result in the loss of a clear separation between Townships and the rural environment. Are integrated with townships to facilitate access to public transport, health care and emergency services, schools, community facilities, employment and services. Are adjacent to the urban edge of Townships on at least one boundary, while avoiding future urban growth areas identified in Township Structure Plans , currently zoned Living Z or the Regional Policy Statement. Are developed in accordance with an Outline Development Plan contained within the District Plan that sets out the key features, household density, infrastructure and integration of the rural residential area with the adjoining Township. Rural residential living environments are expected to deliver the following amenity outcomes and levels of service: Appropriate subdivision layouts and household numbers that allow easy and safe movement through and between neighbourhoods, achieve the necessary degree of openness and rural character and avoid the collective effects of high densities of build form. Public reserves, parks and peripheral walkways are avoided unless it is appropriate to secure access to significant open space opportunities that benefit the wider community.	The proposed plan change includes a 20m setback from roads and a 40m setback from SH1 which is sufficient to maintain privacy and outlook for residents.

Suburban forms of services are avoided, such as kerb and channel road treatments, paved footpaths, large entrance features, ornate street furniture and street lighting (unless at intersections). Fencing that is reflective of a rural vernacular, in particular fencing that is transparent in construction or comprised of shelterbelts and hedging (see Appendix 41 for examples of such fencing). Policy B3.4.25 Ensure buildings are setback an appropriate distance from road boundaries to maintain privacy and outlook for residents and to maintain the character of the area in which they are located.	
Chapter B4 Growth of Townships	
Objective B4.1.1 A range of living environments is provided for in townships, while maintaining the overall 'spacious' character of Living zones,.... Objective B4.1.2 New residential areas are pleasant places to live and add to the character and amenity values of townships.	The Living 3 Zone is designed to provide considerably lower densities than other living zones and therefore it is considered that the overall 'spacious character' of the living zones will be maintained. The Site can be developed to be a pleasant place to live and add to the character and amenity values of Rolleston. Average allotment sizes of 5000m² (4600m² if walkway access to the SH1 buffer is included as shown on the ODP), will ensure that residential density is appropriate to the Living 3 Zone. The proposed ODP will ensure that development of the Site will lead to an eastern boundary to Rolleston, thus ensuring that a compact town shape is

Policy B4.1.2 Maintain Living 2 and 3 Zones as areas with residential density which is considerably lower than that in Living 1 Zones. Policy B4.1.3 [PC32] To prevent low density living environments and rural residential activities from establishing outside the Urban Limits of Townships within the Greater Christchurch Urban Development Strategy area unless through the Living 3 zone and to allow, where appropriate, the development of low density living environments in locations in and around the edge of townships outside the Greater Christchurch Urban Development Strategy area, where they will achieve the following: A compact township shape; Consistent with preferred growth options for townships; Maintains the distinction between rural areas and townships; Maintains a separation between townships and Christchurch City boundary; Avoid the coalescence of townships with each other; Reduce the exposure to reverse sensitivity effects; Maintain the sustainability of the land, soil and water resource; Efficient and cost-effective operation and provision of infrastructure. Policy B4.1.11	maintained, and a distinct boundary between rural areas and townships occurs. The use of larger sections on the eastern boundary of Rolleston Township, and the retention of shelter belts will ensure there are not any reverse sensitivity issues with adjoining rural land. The ability to provide reticulated services from the development to the west of the Site ensure efficient and cost-effective operation and provision of infrastructure. It is proposed to retain some of the shelter belts on the Site and some of the Poplar trees within the Site for amenity purposes. Additionally trees are proposed as a requirement in the streets within the Site and along the boundary with SH1. Framework planting on private lots will be undertaken by the developer at subdivision stage. Landscaping is proposed along the boundary with SH1 to ensure continuous fencing does not occur. The L3 zone rules requiring transparent boundary fences will apply.

Encourage new residential areas to be designed to maintain or enhance the aesthetic values of the township, including (but not limited to): Retaining existing trees, bush, or other natural features on sites; and Landscaping public places. Policy B4.1.12 Discourage high and continuous fences or screening of sites in Living zones that have frontage but no access on to Strategic Roads or Arterial Roads	
Objective B4.3.1 The expansion of townships does not adversely affect: Natural or physical resources; Other activities; Amenity values of the township or the rural area; or– Sites with special ecological, cultural, heritage or landscape values. Objective B4.3.4 New areas for residential or business development support the timely, efficient and integrated provision of infrastructure, including appropriate transport and movement networks through a coordinated development approach. Objective B4.3.7	Refer above assessment. The amenity values of the township and rural area will be sensitively interfaced and maintained. Roading and infrastructure links to development to the west of this Site will ensure that objective B4.3.4 is achieved. As discussed about the proposed rezoning of the Site will achieve Objective B4.3.7 It is proposed to rezone this land to Living 3 to accommodate rural residential development and therefore the plan

Ensure that any rural residential development occurs outside the urban limits identified in the Regional Policy Statement and such development occurs in general accordance with an operative Outline Development Plan, supports the timely, efficient and integrated provision of infrastructure, and provides for the long-term maintenance of rural residential character. Policy B4.3.1 Ensure new residential or business development either: Complies with the Plan policies for the Rural Zone; or The land is rezoned to an appropriate Living Zone that provides for rural-residential development (as defined within the Regional Policy Statement) in accordance with an Outline Development Plan incorporated into the District Plan; or The land is rezoned to an appropriate Living or Business zone and, where within the Greater Christchurch area, is contained within the Urban Limit identified in the Regional Policy Statement and developed in accordance with an Outline Development Plan incorporated into the District Plan. Policy B4.3.6 Encourage townships to expand in a compact shape where practical. Policy B4.3.8 Each Outline Development Plan shall include: Principal through roads, connection and integration with the surrounding road network and strategic	change is in accordance with Policy B4.3.1 The expansion of the town towards the east is considered an expansion in a compact shape. Please refer to the proposed ODP in **Annexure 2**, which provides the relevant information as set out by Policy B4.3.8. A minimum density of 10 households per ha is not applicable for the Living 3 zone.

infrastructure; Any land to be set aside for: community facilities or schools; parks and land required for recreation or reserves; any land to be set aside for business activities; the distribution of different residential densities; land required for the integrated management of water systems, including stormwater treatment, secondary flow paths, retention and drainage paths; and land reserved or otherwise set aside from development for any other reason, and the reasons for its protection. Demonstrate generally how each ODP area will achieve a minimum density of at least 10 lots or household units per hectare; Identify any cultural (including tangata whenua values), natural, and historic or heritage features and values and show how they are to be enhanced or maintained; Indicate how required infrastructure will be provided; Set out the phasing and co-ordination of subdivision and development in line with the phasing shown on the Planning Maps and Appendices;	

Demonstrate how effective provision is made for a range of transport options, including public transport systems, pedestrian walkways and cycleways, both within and adjoining the ODP area; Include any other information which is relevant to an understanding of the development and its proposed zoning; Demonstrate that the design will minimise any reverse sensitivity effects.	
District Plan - Rural Volume	Assessment
Policy B3.4.21 [PC32] Preclude the establishment of rural residential activities within the Greater Christchurch Urban Development Strategy area unless it is through the Living 3 Zone to reduce the risk of potentially adverse reverse sensitivity effects on the productive function of rural zoned land.	It is proposed to rezone the Site as a Living 3 Zone in accordance with this policy.
Policy B4.1.4 (b) [PC32] Within the Greater Christchurch Urban Development Strategy area any new residential development at densities higher than those provided for in Policy B4.1.1 shall only be provided for in the Living 3 Zone.	It is proposed to rezone the Site as a Living 3 Zone in accordance with this policy.

Annexure Eight: Geotechnical Report

RILEY CONSULTANTS

COLES PROPERTY PARK LANE: ROLLESTON

GEOTECHNICAL ASSESSMENT FOR SUBDIVISION PLAN CHANGE AND RESOURCE CONSENT

Engineers and Geologists

RILEY CONSULTANTS

Engineers and Geologists

COLES PROPERTY PARK LANE: ROLLESTON GEOTECHNICAL ASSESSMENT FOR SUBDIVISION RESOURCE CONSENT AND PLAN CHANGE

Report prepared for: Nimbus Group

Report prepared by: Emma Turner, Civil Engineer

E. Turner

Report reviewed by: pp. Don Tate, Director, CPEng

Report Reference: 12891-A

Date: 18 December 2012

Copies to:

Client	2 copies
Riley Consultants Ltd	1 copy

Revision:	Details:	Date:
1.0	Geotechnical Assessment	18 December 2012

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Contents

Appendices

COLES PROPERTY LAKE PARK: ROLLESTON GEOTECHNICAL ASSESSMENT FOR SUBDIVISION PLAN CHANGE AND RESOURCE CONSENT

1.0 Introduction

Riley Consultants Ltd (RILEY) has been engaged to undertake a geotechnical investigation at Coles Subdivision, Rolleston, Lots 3 and 4 of DP74253, as outlined in the initial desktop study and proposal dated 2 November 2012 (RILEY ref: R18468-A).

This report details our geotechnical investigations and outlines the level of geotechnical hazard at the site in accordance with "Guidelines for the Geotechnical Investigation and Assessment of Subdivisions in the Canterbury Region" released by the Ministry of Business, Innovation and Employment (MoBIE) September 2012.

This report will be used in support of application for a Resource Consent for Lot 3 and a plan change and subsequent Resource Consent for Lot 4 by the Selwyn District Council (SDC). We understand Lot 3 is to be divided into approximately 170 residential lots and Lot 4 is to be changed to rural residential with 36 lots of approximately 5,000 m^2.

2.0 Regional Geology

The published geological map of the area, (Geology of the Christchurch Area 1:250,000, Brown and Weeber, 1992) indicates that the site is underlain by grey river alluvium.

A review of the Environmental Canterbury (ECan) Wells database showed multiple wells located within 1 km of the proposed subdivision. Material logs available for two of these wells located with the two lots indicates that subsurface materials comprise layers of surficial topsoil and clay to 1.8 m depth underlain by gravel dominated material to at least 30 m depth.

Groundwater information provided in the well logs indicates that groundwater level in the area varies between 10 m and 85 m depth.

A Preliminary Site Investigation Report for the adjacent Park Lane Subdivision (west) was undertaken by E2 Environmental in December 2011. The purpose of this report was to estimate the ground soakage potential of the soils underlying the site. In order to undertake the soakage testing E2 Environmental dug four test pits on the site, two towards the north and two towards the south. The depth of these test pits ranged from 2.2 m to 4.75 m depth, the logs of which were included in the appendices. In summary these test pits encountered 0.2 – 0.4 m of topsoil overlying sandy silt to 1.9 to 2.0 m depth. Sandy gravel was then present to 2.3 to 2.4 m depth overlying gravel and cobbles to the maximum depth of the test pits.

The recommendation that soil characterisation be carried out to 15 m depth recognises that generally liquefaction will not occur below this depth, or if it does is unlikely to be observable at the ground surface. The soil investigation therefore seeks to quantify the liquefaction hazard of the upper 15 m of the soil profile. For this site, this quantification is made largely on the basis of site geology and available borehole data in the area and confirmatory investigations of soil composition via test pits. Available borehole logs in the area indicate dense granular alluvial soils to at least 15 m depth.

5.0 Subsurface Investigations

Subsurface geotechnical investigations were undertaken by RILEY staff (with the assistance of an excavator provided by the Nimbus Group) on 20 November 2012 and comprised:

- Nine test pits (TP1 to TP9) to a maximum depth of 5.2 m
- 15 Scala Penetrometer tests undertaken adjacent to the testpits and at consistent spacing over Lots 3 and 4

The testpits were logged in accordance with the NZGS guidelines (December 2005) and the location of the geotechnical investigations is shown in Appendix A.

The material encountered in the test pit investigations comprised between 200 and 600 mm organic sands (topsoil) underlain by sandy silts and silty sands to a depth of between 0.75 to 2.2 m. Gravels were located below the sand and silt layers to the extent of testing (a maximum of 5.2 m in TP5).

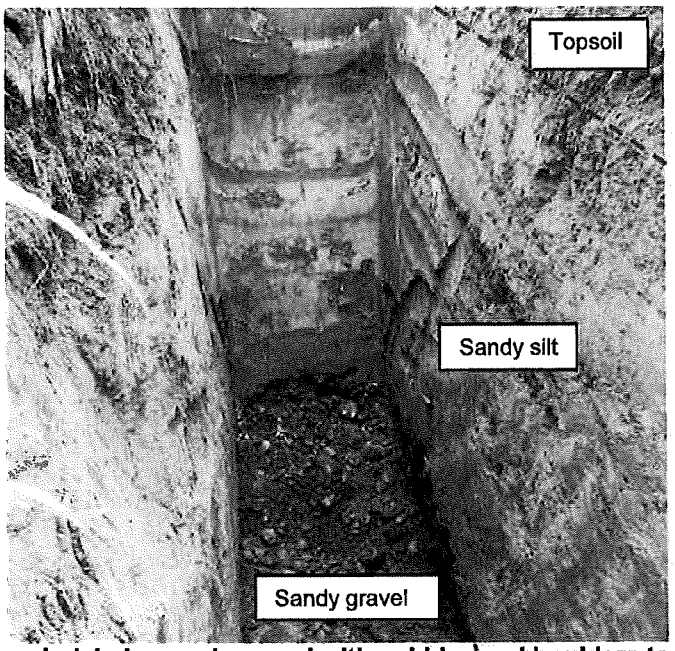

Photo 1: Sandy silt underlain by sandy gravel with cobbles and boulders to 2.0 m depth (TP3)

Groundwater was not encountered in any of the test pits during our investigations. Based on ECAN well logs, groundwater varies between 10 and 85 m depth.

A total of nine Scala penetrometer tests were undertaken at or near existing ground level adjacent to each of the testpits, with an additional six Scala tests undertaken at varied locations across site, to confirm consistency of soil strength.

Soft to firm soils were encountered in the natural soils over the site to approximately 1.8 m depth. Dense to very dense gravels were encountered below this depth to the extent of testing.

The presence of silts and sands in the upper 2.2 m of soil strata underlain by dense gravels is consistent with the geological data for this area and confirmed the expected ground conditions. Regional geological maps indicate the presence of predominantly gravelly soils such as those encountered in the test pits to at least 30 m depth.

6.0 Suitability of Ground for Development

It is desirable for new subdivisions on flat or gently sloping ground to provide building platforms that meet the NZS3604:2011 definition of "good ground", as such building platforms do not require specific engineering design of foundations for residential development. NZS3604:2011 defines the criteria for "good ground" as that which has an ultimate bearing capacity of 300 kPa, and excludes:

- Potentially compressible ground
- Expansive soils
- Ground which could foreseeably experience movement of 25 mm or greater for any reason.

In recent months the Department of Building and Housing (DBH) have included liquefiable soils in the ground conditions for which NZS3604 is not applicable.

On the basis of regional geology, and testpit investigations, the soils on site are considered unlikely to be expansive or compressible. The other criteria for good ground are considered in the following paragraphs.

6.1 Bearing Capacity

NZS3604:2011 provides a Scala penetrometer test criteria whereby if a certain blow count over a measured depth is met, an ultimate bearing capacity of 300 kPa may be assumed (5 blows per 100 mm).

Scala penetrometer (SP) results indicate that moderate to high strength soils exist beneath the topsoil to the extent of testing. The materials have a geotechnical ultimate bearing capacity of above 200 kPa immediately below the topsoil. A geotechnical ultimate bearing capacity of 300 kPa is available at and below approximately 1.8 m consistently across site.

The sands and silts above 1.8 m across site do not meet the bearing capacity criteria for "good ground" according to NZS3604:2011.

6.2 Ground Movement/Liquefaction

The key consideration for ground movement is the potential for seismically induced liquefaction resulting in settlement or lateral movement. Liquefaction may occur in loose silts and sands beneath groundwater level. The susceptibility of such soils to liquefy depends on their density and particle size distribution.

Dense granular soils are not liquefiable (Youd et al, 1996 & 1998), and the density of the granular soils (below the sandy silt layer) within the test pits has been confirmed to be high via Scala penetrometer testing. Similar soils in Canterbury have generally performed well under recent seismic loading. No land damage is observable, and no ejected sands or lateral spreading was reported across the site as a result of the recent Christchurch earthquakes.

A deeper groundwater profile of 10 to 85 m was indicated by the regional well logs, therefore at least a 10 m thick non-liquefiable cap exists over any potentially liquefiable sand or silt strata, and therefore these shallow layers are not considered a significant risk to the development. Furthermore, if liquefiable lenses exist below this depth, it is unlikely that any evidence of liquefaction induced densification of the lenses would be observed at ground surface.

The Department of Building and Housing (DBH) has provided a guidance document whereby land is placed into one of three technical categories with the following liquefaction deformation limits. These limits are reproduced in Table 2.

Table 2: Liquefaction Deformation Limits and House Foundation Implications

Technical Category	Liquefaction Deformation Limits				Likely Implications for House Foundations (subject to individual assessment)
	Vertical		Lateral Spread		
	SLS	ULS	SLS	ULS	
TC1	15 mm	25 mm	Nil	Nil	Standard 3604-like foundations[1] with tied slabs[2]
TC2	50 mm	100 mm	50 mm	100 mm	DBH enhanced foundation solutions (Section 5.2)
TC3	>50 mm	>100 mm	>50 mm	>100 mm	Site specific measures – piles or ground improvement

1. Provided the shallow investigation determines the site is 'good ground' (As defined by NZS 3604:2011)
2. Note that certain foundation details included in NZS 3604 are precluded from use in Canterbury (refer to: http://www.dbh.govt.nz/information-sheet-seismicity-changes)

Based on the 1.0 m non-liquefiable cap, site geology and past ECAN boreholes in the area the risk of surface manifestation of liquefaction in a SLS event is considered to be low.

In terms of the DBH guidelines, we consider that the subject site is likely to be similar to those sites that fall into the technical category TC1.

7.0 Foundation Development Options

The subsurface data obtained at the site to date indicates that the subsoils do not meet the bearing capacity requirements for 'good ground', (as defined by NZS 3604:2011).Therefore any proposed houses developed at this site will require specifically designed foundations as part of the building consent, once the subdivision is formed.

In terms of the DBH guidelines, where the ultimate bearing capacity meets the 200 kPa requirement either enhanced slab TC2 solutions or other specific engineering design is applicable. At a conceptual level, enhanced house foundation solutions could comprise the following:

- A concrete slab foundation built over a compacted granular fill raft;
- Shallow driven timber piles;
- A thickened slab foundation over the existing site soils.

Further investigations will be required at the time of individual building development as outlined in the DBH guidelines. It is noted that test pits create weaker areas in the ground and foundations should be located clear of test zones or should take this into consideration during design.

Alternatively, wide scale soil improvement of the upper soil profile (subject to design) could be undertaken to allow for the construction of standard foundations in accordance with NZS 3604:2011, (with the modifications outlined in Building Code Acceptable Solutions B1/VM1, B1/AS1 and B1/AS3).

7.1 Further Development Considerations

Roads

Roads are not subject to the same design criteria as foundations; however subgrade layers are required to provide appropriate strength and stiffness for pavement design. Following removal of the topsoil (200 - 600 mm), the representative CBR value for the silty soils encountered on site (derived from Scala penetrometer testing) is 2.0.

Earthworks

During development of the site, RILEY recommends that appropriate stormwater and erosion controls be implemented. These are likely to involve the use of silt fences, hay bales and similar devices to intercept soil runoff and improve the quality of the stormwater discharged. Any exposed surfaces shall be topsoiled and grassed as soon as practicable to limit soil erosion.

8.0 RMA Considerations

Section 106 of the RMA states that a "consent authority may refuse to grant subdivision consent, or may grant a subdivision consent subject to conditions, if it considers that:

a) *the land in respect of which a consent is sought, or any structure on the land, is or is likely to be subject to material damage by erosion, falling debris, subsidence, slippage, or inundation from any source; or*

b) *any subsequent use that is likely to be made of the land is likely to accelerate, worsen, or result in material damage to the land, other land, or structure by erosion, falling debris, subsidence, slippage, or inundation from any source; or*

c) *sufficient provision has not been made for legal and physical access to each allotment to be created by the subdivision.*

No evidence of erosion, falling debris, or slippage was observed during our site visit walkover for this site based on its relatively flat topography. Due to the uniform nature of the soils encountered in our testpit excavations, and the absence of any noticeable surface expressions, subsidence is not considered to be a geotechnical risk. Based on the topographical setting, the lack of evidence of overland flows and the dry soils encountered, the site is unlikely to be subject to inundation.

Any future development of this site will likely involve the removal of the surface vegetation and topsoil for extended periods of time. Exposure of the stripped ground surface to rainfall will potentially cause erosion and rilling of the site soils. Damage can be minimised by staging the earthworks (to retain vegetated areas) and the use of appropriate mitigation measures as described in section 7.1.

Access to the site is presently off Main South Road (SH 1) and is likely to be enhanced with the development of adjacent subdivisions.

9.0 Conclusions

1. Geotechnical investigations have been completed and a typical soil profile for the site identified, which corresponds well to the regional geological setting from published data.
2. Ground conditions in the test locations do not meet the minimum requirements of NZS3604:2011 for standard shallow foundations and therefore house foundations require specific investigation and design. Indications based on investigations to date are that enhanced slab TC2 solutions or other specific design is applicable.
3. The potential for seismically induced liquefaction has been assessed from the test pit investigations.
   - Liquefaction is a negligible risk in soils to 10.0 m depth above the water table.
   - Liquefaction in soils below 10 m depth may potentially occur within saturated sand or silt lenses that may be present over this depth. However, it is unlikely that liquefaction of these lenses will cause any surface disruption or observable settlement and therefore they are not considered a significant risk to the development.
4. In terms of the DBH guidelines, we consider that the subject site is likely to be similar to those sites that fall into the technical category, TC1.
5. The proposed development will generally comply with the intent of section 106 of the RMA provided that appropriate engineering measures are undertaken to protect the existing site soils during subdivision development.
6. Inspections of ground conditions during the construction phase should be undertaken in accordance with accepted practice. RILEY shall be informed if there are any changes from the conditions described in this report.

10.0 Limitation

This report has been prepared solely for the benefit of the Nimbus Group as our client with respect to the brief, and the Selwyn District Council in processing the subdivision consent for the land area. The reliance by other parties on the information or opinions contained in the report shall, without our prior review and agreement in writing, be at such parties' sole risk.

Recommendations and opinions in this report are based on data from limited test positions. The nature and continuity of subsoil conditions away from the test positions are inferred, and it must be appreciated that actual conditions could vary considerably from the assumed model.

11.0 References

Youd, T.L. et al, 1996 and 1998, *Liquefaction Resistance of Soils: Summary Report from the 1996 NCEER and 1998 NCEER/NSF Workshops on Evaluation of Liquefaction resistance of soils.* Journal of Geotechnical and Geoenvironmental Engineering, October 2001.

APPENDIX A

Site Plan

LEGEND

SP1 — SCALA PENETROMETER TEST LOCATION

TP1 — TEST PIT LOCATION

SCALE 1:5000

0 50 100 150 200 300 (m)

NOTES:-

1. PHOTO SOURCED FROM GOOGLE EARTH (7th FEB 2011).
2. ORIGINAL SCALE A3

REV	DESCRIPTION	BY	DATE
1	CPT ADDED	HN	17.12.12
0	FIRST ISSUE		

DESIGN: ET | CHECKED
DRAWN: HN | CHECKED
DATE DRAWN: 18 DEC 2012

APPROVED FOR ISSUE:
DATE: / /

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TITLE
NIMBUS GROUP
COLES PROPERTY, PARK LANE
GEOTECHNICAL INVESTIGATION SITE LOCATION PLAN

CADFILE: 12891-01
SCALES (A3): AS SHOWN
DRAWING No.: 12891-01
REV.: 1

APPENDIX B

Test Pit Logs

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TEST PIT LOG

Project:	Location:	Hole position:	No.:
Coles Property - Park Lane	Rolleston, Canterbury	Refer to site plan	TP1

Job No.:	Start Date: / Finish Date:	Ground Level (m LINZ):	Co-Ordinates (NZTM2000):
12891	20-11-12 / 20-11-12	50.00	

Client:	Hole Depth:	Sheet:
Nimbus Group	4.20 m	1 of 1

Elevation (m LINZ)	Depth (m)	Geological Description (refer to separate Geotechnical and Geological Information sheet for further information)	Legend	Weathering	Field Strength (Soil / Rock)	Defect Description (type, orientation, spacing, roughness, persistence aperture, infilling etc)	Groundwater	Samples	Tests
+50.00									
+49.75	0.25	Fine to medium SAND with some silt, dark brown with trace roollets. Loose; moist. (TOPSOIL)							
	1	Fine to medium SAND with trace to minor silt, grading to greyish brown SILT with some sand at 0.6 m., trace roots and local clay-rich lenses, light yellowish brown. Loose to medium dense; moist; clay rich lenses light greyish brown with pale orange spotting. (Q1a ALLUVIUM)							
+48.15	1.85								
	2	Fine to coarse GRAVEL with minor sand and silt and trace cobbles and boulders at depth, brown. Very dense; moist. Gravel, subangular to subrounded, strong, slighily weathered greywacke sandstone. (Q1a ALLUVIUM)							
	3								
	4								
+45.80	4.20								
	5	EOH @ 4.20 m							

No. 1
1, 1, 2,
1, 1, 1,
2, 1, 1,
1, 1, 1,
2, 2, 1,
1, 1, 1,
1, 1, 1,
1, 2, 1,
2, 1, 1,
1, 1, 2,
2, 2, 1,
2, 1, 1,
2, 14, 15

SKETCH:

MAP

0 m
10 m
20 m
1:1,000

Shoring/Support: None
Stability:

3.0
A
D
B 1.0
C

- Small Disturbed Sample
- Large Disturbed Sample
- U100 Undisturbed Sample
- Permeability Test
- Clegg Hammer; test repetitions (IV)
- Insitu Vane Shear Strength (kPa) P=Peak, R=Residual, UTP=Unable to penetrate
- Scala Penetrometer - blows/50mm

GROUNDWATER [X] None
[ ] Slow Seep (depth)
[ ] Rapid Inflow (depth)

PIT TERMINATED DUE TO:
[X] Target depth [ ] Collapse
[ ] Refusal [ ] Machine limit

Remarks

1. Ground level and coordinates are approximate and subject to survey confirmation.

All dimensions in metres Scale 1:50	Contractor:	Rig/Plant Used: Machine Excavator (14 tonne)	Logged by: 39	Checked by: AvD

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TEST PIT LOG

Project:	Location:	Hole position:	No.:
Coles Property - Park Lane	Rolleston, Canterbury	Refer to site plan	TP2

Job No.:	Start Date: 20-11-12 Finish Date: 20-11-12	Ground Level (m LINZ):	Co-Ordinates (NZTM2000):
12891		50.00	

Client:	Hole Depth:	Sheet:
Nimbus Group	2.20 m	1 of 1

Elevation (m LINZ)	Depth (m)	Geological Description (refer to separate Geotechnical and Geological Information sheet for further information)	Legend	Weathering	Field Strength Soil / Rock	Defect Description (type, orientation, spacing, roughness, persistence aperture, infilling etc)	Groundwater	Samples	Tests
+50.00									
+49.70	0.30	Fine to medium silty SAND, dark brown with trace rootlets and roots. Loose; moist. (TOPSOIL)							
	1	Fine to medium silty SAND and sandy SILT thinly bedded with trace roots, light yellowish brown. Loose to medium dense; moist. (Q1a ALLUVIUM)							
+48.45	1.55								
	2	Fine to coarse sandy GRAVEL with minor cobbles and boulders at depth, brown. Very dense; moist; gravel, subangular to subrounded, strong, slightly weathered greywacke sandstone. (Q1a ALLUVIUM)							
+47.80	2.20								
		EOH @ 2.20 m							
	3								
	4								
	5								

Tests — No. 1
1, 1, 1,
1, 1, 1,
1, 1, 1,
1, 2, 2,
2, 1, 1,
1, 1, 1,
2, 2, 2,
1, 1, 3,
4, 2, 2,
1, 1, 1,
2, 4, 7,
15

SKETCH:

MAP

0 m
10 m
20 m
1:1,000

Shoring/Support: None
Stability:

5.0
A
D
B 1.0
C

- Small Disturbed Sample
- Large Disturbed Sample
- U100 Undisturbed Sample
- Permeability Test
- Clegg Hammer; test repetitions (IV)
- Insitu Vane Shear Strength (kPa) P=Peak, R=Residual, UTP=Unable to penetrate
- Scala Penetrometer - blows/50mm

GROUNDWATER [X] None
[ ] Slow Seep (depth)
[ ] Rapid Inflow (depth)

PIT TERMINATED DUE TO:
[X] Target depth [ ] Collapse
[ ] Refusal [ ] Machine limit

Remarks

1. Ground level and coordinates are approximate and subject to survey confirmation.

All dimensions in metres Scale 1:50	Contractor:	Rig/Plant Used: Machine Excavator (14 tonne)	Logged by: 39	Checked by: AvD

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TEST PIT LOG

Project:	Location:	Hole position:	No.:
Coles Property - Park Lane	Rolleston, Canterbury	Refer to site plan	TP3

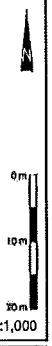
Job No.:	Start Date: / Finish Date:	Ground Level (m LINZ):	Co-Ordinates (NZTM2000):
12891	20-11-12 / 20-11-12	50.00	

Client:	Hole Depth:	Sheet:
Nimbus Group	2.00 m	1 of 1

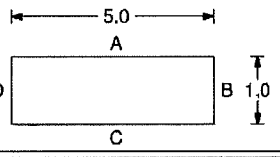
Elevation (m LINZ)	Depth (m)	Geological Description (refer to separate Geotechnical and Geological Information sheet for further information)	Legend	Weathering	Field Strength (Soil | Rock)	Defect Description (type, orientation, spacing, roughness, persistence aperture, infilling etc)	Groundwater	Samples	Tests
+50.00									
+49.80	0.20	Fine to medium silty SAND, dark brown with trace rootlets. Loose; moist (TOPSOIL)							No. 1 1, 1, 1, 2, 1, 1, 1, 2, 2, 3, 2, 3, 2, 1, 1, 2, 2, 3, 1, 1, 2, 1, 1, 1, 1, 1, 1, 2, 2, 2, 2, 2, 3, 5, 15
	1	Fine to medium sandy SILT thinly bedded with trace roots and local clay-rich lenses, light yellowish brown. Loose to medium dense; moist (Q1a ALLUVIUM)							
+48.35	1.65								
+48.00	2 2.00	Fine to coarse sandy GRAVEL with trace cobbles and boulders at depth, brown. Gravel, subangular to subrounded, strong, slightly weathered greywacke sandstone (Q1a ALLUVIUM)							
		EOH @ 2.00 m							
	3								
	4								
	5								

SKETCH:

MAP



Shoring/Support: None
Stability:



- Small Disturbed Sample
- Large Disturbed Sample
- U100 Undisturbed Sample
- Permeability Test
- Clegg Hammer; test repetitions (IV)
- Insitu Vane Shear Strength (kPa) P=Peak, R=Residual, UTP=Unable to penetrate
- Scala Penetrometer - blows/50mm

GROUNDWATER [X] None
- [ ] Slow Seep (depth)
- [ ] Rapid Inflow (depth)

PIT TERMINATED DUE TO:
- [X] Target depth
- [ ] Collapse
- [ ] Refusal
- [ ] Machine limit

Remarks

1. Ground level and coordinates are approximate and subject to survey confirmation.

All dimensions in metres Scale 1:50	Contractor:	Rig/Plant Used: Machine Excavator (14 tonne)	Logged by: 39	Checked by: AvD

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TEST PIT LOG

Project:	Location:	Hole position:	No.:
Coles Property - Park Lane	Rolleston, Canterbury	Refer to site plan	TP4

Job No.:	Start Date: 20-11-12 Finish Date: 20-11-12	Ground Level (m LINZ):	Co-Ordinates (NZTM2000):
12891		50.00	

Client:	Hole Depth:	Sheet:
Nimbus Group	5.00 m	1 of 1

Elevation (m LINZ)	Depth (m)	Geological Description (refer to separate Geotechnical and Geological Information sheet for further information)	Legend	Weathering	Field Strength (Soil / Rock)	Defect Description (type, orientation, spacing, roughness, persistence aperture, infilling etc)	Groundwater	Samples	Tests
+50.00									
+49.80	0.20	Fine to medium silty SAND, dark brown with trace rootlets, Loose; moist. (TOPSOIL)							
	1	Fine to medium sandy SILT thinly bedded with trace roots and local clay-rich lenses, light yellowish brown, Loose to medium dense; moist (Q1a ALLUVIUM)							
+48.35	1.65								
+48.00	2 2.00	Fine to coarse sandy GRAVEL with trace cobbles and boulders at depth, brown. Gravel, subangular to subrounded, strong, slightly weathered greywacke sandstone. (Q1a ALLUVIUM)							
	3								
	4								
	5	EOH @ 5.00 m							

No. 1
1, 2, 1,
2, 1, 2,
1, 1, 1,
2, 2, 4,
3, 3, 2,
2, 3, 3,
3, 2, 2,
1, 1, 1,
1, 2, 2,
2, 3, 2,
1, 1, 1,
1, 2, 2,
3, 3, 6,
15

SKETCH:

MAP

0 m
10 m
20 m
1:1,000

Shoring/Support: None
Stability:

5.0
A
D
B 1.0
C

- Small Disturbed Sample
- Large Disturbed Sample
- U100 Undisturbed Sample
- Permeability Test
- Clegg Hammer; test repetitions (IV)
- Insitu Vane Shear Strength (kPa) P=Peak, R=Residual, UTP=Unable to penetrate
- Scala Penetromotor - blows/50mm

GROUNDWATER [X] None
[ ] Slow Seep (depth)
[ ] Rapid Inflow (depth)

PIT TERMINATED DUE TO:
[X] Target depth [ ] Collapse
[ ] Refusal [ ] Machine limit

Remarks

1. Ground level and coordinates are approximate and subject to survey confirmation.

All dimensions in metres Scale 1:50	Contractor:	Rig/Plant Used: Machine Excavator (14 tonne)	Logged by: 39	Checked by: AvD

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TEST PIT LOG

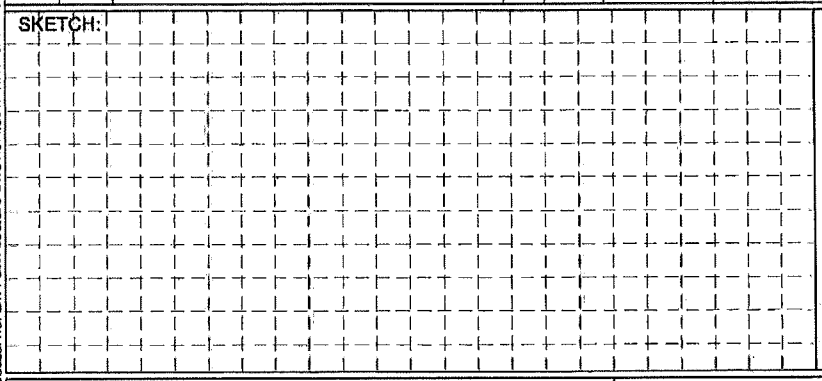
Project:	Location:	Hole position:	No.:
Coles Property - Park Lane	Rolleston, Canterbury	Refer to site plan	TP5

Job No.:	Start Date: / Finish Date:	Ground Level (m LINZ):	Co-Ordinates (NZTM2000):
12891	20-11-12 / 20-11-12	50.00	

Client:	Hole Depth:	Sheet:
Nimbus Group	1.45 m	1 of 1

Elevation (m LINZ)	Depth (m)	Geological Description (refer to separate Geotechnical and Geological information sheet for further information)	Legend	Weathering	Field Strength (Soil / Rock)	Defect Description (type, orientation, spacing, roughness, persistence aperture, infilling etc)	Groundwater	Samples	Tests
+50.00									No, 1
+49.60	0.40	Fine to medium silty SAND, dark brown with trace rootlets. Loose; moist. (TOPSOIL)							1, 1, 2,
+49.25	0.75	Fine to medium sandy SILT thinly bedded with trace roots and local clay-rich lenses, light yellowish brown. CClay rich lenses light greyish brown with pale orange spotting. Loose to medium dense; moist (Q1a ALLUVIUM)							2, 2, 3,
	1	0.45 m Grades to contain no roots.							2, 2, 2,
		Fine to coarse GRAVEL with minor sand and silt and trace cobbles and boulders at depth, brown. Gravel, subangular to subrounded, strong, slightly weathered greywacke sandstone. (Q1a ALLUVIUM)							3, 2, 3,
	2								3, 5, 3,
									2, 2, 2,
	3								2, 1, 2,
									2, 4, 3,
	4								3, 3, 2,
									1, 3, 15
	5								
+44.80	5.20	EOH @ 1.45 m							

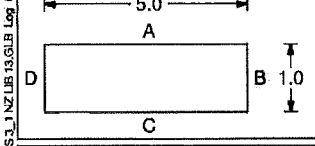
SKETCH:



MAP

1:1,000

Shoring/Support: None
Stability:



- Small Disturbed Sample
- Large Disturbed Sample
- U100 Undisturbed Sample
- Permeability Test
- Clegg Hammer; test repetitions (IV)
- Insitu Vane Shear Strength (kPa) P=Peak, R=Residual, UTP=Unable to penetrate
- Scala Penetrometer - blows/50mm

GROUNDWATER [X] None
[ ] Slow Seep (depth)
[ ] Rapid Inflow (depth)

PIT TERMINATED DUE TO:
[X] Target depth [ ] Collapse
[ ] Refusal [ ] Machine limit

Remarks

1, Ground level and coordinates are approximate and subject to survey confirmation.

All dimensions in metres Scale 1:50	Contractor:	Rig/Plant Used: Machine Excavator (14 tonne)	Logged by: 39	Checked by: AvD

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TEST PIT LOG

Project: Coles Property - Park Lane	Location: Rolleston, Canterbury	Hole position: Refer to site plan	No.: TP6
Job No.: 12891	Start Date: 20-11-12 Finish Date: 20-11-12	Ground Level (m LINZ): 50.00	Co-Ordinates (NZTM2000):
Client: Nimbus Group	Hole Depth: 5.00 m		Sheet: 1 of 1

Elevation (m LINZ)	Depth (m)	Geological Description (refer to separate Geotechnical and Geological Information sheet for further information)	Legend	Weathering	Field Strength Soil / Rock	Defect Description (type, orientation, spacing, roughness, persistence aperture, infilling etc)	Groundwater	Samples	Tests
+50.00									
+49.70	0.30	Fine to medium SAND with some silt, dark brown with trace roollets. Loose; moist (TOPSOIL)							
	1	Fine to medium silty SAND with local clay-rich lenses, light yellowish brown. Clay rich lenses light greyish brown with pale orange spotting. Loose to medium dense; moist. (Q1a ALLUVIUM)							
	2								
+47.80	2.20								
	3	Fine to coarse GRAVEL with minor sand and silt and trace cobbles and boulders at depth, brown. Gravel, subangular to subrounded, strong, slightly weathered greywacke sandstone. (Q1a ALLUVIUM)							
	4								
+45.00	5.00								
	5	EOH @ 5.00 m							

No. 1:
1, 1, 2,
1, 2, 1,
1, 1, 1,
1, 1, 1,
1, 1, 1,
1, 1, 1,
1, 1, 1,
1, 2, 1,
2, 2, 1,
1, 2, 2,
1, 2, 2,
2, 2, 2, 3

SKETCH:

MAP

0 m
10 m
20 m
1:1,000

Shoring/Support: None
Stability:

5.0
A
D
B 1.0
C

- Small Disturbed Sample
- Large Disturbed Sample
- U100 Undisturbed Sample
- Permeability Test
- Clegg Hammer; test repetitions (IV)
- Insitu Vane Shear Strength (kPa) P=Peak, R=Residual, UTP=Unable to penetrate
- Scala Penetrometer - blows/50mm

GROUNDWATER [X] None
[ ] Slow Seep (depth)
[ ] Rapid Inflow (depth)

PIT TERMINATED DUE TO:
[X] Target depth [ ] Collapse
[ ] Refusal [ ] Machine limit

Remarks
1. Ground level and coordinates are approximate and subject to survey confirmation.

All dimensions in metres Scale 1:50	Contractor:	Rig/Plant Used: Machine Excavator (14 tonne)	Logged by: 39	Checked by: AvD

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TEST PIT LOG

Project:	Location:	Hole position:	No.:
Coles Property - Park Lane	Rolleston, Canterbury	Refer to site plan	TP7

Job No.:	Start Date: 20-11-12 Finish Date: 20-11-12	Ground Level (m LINZ):	Co-Ordinates (NZTM2000):
12891		50.00	

Client:	Hole Depth:	Sheet:
Nimbus Group	4.50 m	1 of 1

Elevation (m LINZ)	Depth (m)	Geological Description (refer to separate Geotechnical and Geological Information sheet for further information)	Legend	Weathering	Field Strength (Soil / Rock)	Defect Description (type, orientation, spacing, roughness, persistence aperture, infilling etc)	Groundwater	Samples	Tests
+50.00									
+49.40	0.60	Fine to medium silty SAND, dark brown with trace medium subrounded gravel, rootlets and roots. Loose; moist. (TOPSOIL)							
	1	Fine to medium SAND with minor silt and trace roots, light brown. Deeper at North end of pit, local gravel lens at 1.1 m. Loose to medium dense; moist. (Q1a ALLUVIUM)							
+47.90	2 2.10								
	3	Fine to coarse sandy GRAVEL with minor cobbles, brown. Gravel, subangular to subrounded, strong, slightly weathered greywacke sandstone. Contains obvolus layering and local gravelly sand lenses. (Q1a ALLUVIUM)							
	4								
+45.00	5 5.00								
		EOH @ 4.50 m							

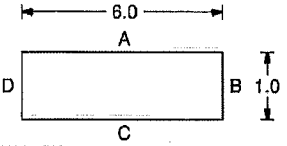
Tests — No.
1, 2, 1,
1, 1, 1,
1, 1, 2,
2, 1, 2,
2, 3, 1,
2, 2, 2,
2, 2, 3,
6, 3, 7,
12, 5, 7,
15

SKETCH:

MAP

1:1,000

Shoring/Support: None
Stability:



- Small Disturbed Sample
- Large Disturbed Sample
- U100 Undisturbed Sample
- Permeability Test
- Clegg Hammer; test repetitions (IV)
- Insitu Vane Shear Strength (kPa) P=Peak, R=Residual, UTP=Unable to penetrate
- Scala Penetrometer - blows/50mm

GROUNDWATER [X] None
[ ] Slow Seep (depth)
[ ] Rapid Inflow (depth)

PIT TERMINATED DUE TO:
[X] Target depth [ ] Collapse
[ ] Refusal [ ] Machine limit

Remarks

1. Ground level and coordinates are approximate and subject to survey confirmation.

All dimensions in metres Scale 1:50	Contractor:	Rig/Plant Used: Machine Excavator (14 tonne)	Logged by: 39	Checked by: AvD

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TEST PIT LOG

Project:	Location:	Hole position:	No.:
Coles Property - Park Lane	Rolleston, Canterbury	Refer to site plan	TP8

Job No.:	Start Date: / Finish Date:	Ground Level (m LINZ):	Co-Ordinates (NZTM2000):
12891	20-11-12 / 20-11-12	50.00	

Client:	Hole Depth:	Sheet:
Nimbus Group	5.00 m	1 of 1

Elevation (m LINZ)	Depth (m)	Geological Description (refer to separate Geotechnical and Geological Information sheet for further information)	Legend	Weathering	Field Strength (Soil | Rock)	Defect Description (type, orientation, spacing, roughness, persistence aperture, infilling etc)	Groundwater	Samples	Tests
+50.00									
+49.75	0.25	Fine to medium silty SAND, dark brown with trace rootlets and roots. Loose; moist. (TOPSOIL)							
		Fine to medium SAND with minor silt and trace roots, light brown. Loose to medium dense; moist (Q1a ALLUVIUM)							
+49.00	1.00	Fine to coarse sandy GRAVEL with minor cobbles, brown, Gravel, subangular to subrounded, strong, slightly weathered greywacke sandstone. Contains obvolus layering and some sand lenses. Loose; moist. (Q1a ALLUVIUM)							No. | 2, 2, 3, 3, 2, 2, 1, 4, 6, 8, 7, 5, 4, 5, 6, 5, 4, 3, 2, 4, 6, 5, 4, 5, 16
+45.00	5.00	EOH @ 5.00 m							

SKETCH:

MAP

1:1,000

Shoring/Support: None
Stability:

5.5 A, B 1.0, C, D

- Small Disturbed Sample
- Large Disturbed Sample
- U100 Undisturbed Sample
- Permeability Test
- Clegg Hammer; test repetitions (IV)
- Insitu Vane Shear Strength (kPa) P=Peak, R=Residual, UTP=Unable to penetrate
- Scala Penetrometer - blows/50mm

GROUNDWATER [X] None
[ ] Slow Seep (depth)
[ ] Rapid Inflow (depth)

PIT TERMINATED DUE TO:
[X] Target depth [ ] Collapse
[ ] Refusal [ ] Machine limit

Remarks

1. Ground level and coordinates are approximate and subject to survey confirmation.

All dimensions in metres Scale 1:50	Contractor:	Rig/Plant Used: Machine Excavator (14 tonne)	Logged by: 39	Checked by: AvD

RILEY AGS 3_1 NZ LIB 13.GLB Log RILEY TP COLESPROPERTY GINT LOG.GPJ DWG 41574.GDW 1/12/2012 13:10 Produced by gINT Professional

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TEST PIT LOG

Project:	Location:	Hole position:	No.:
Coles Property - Park Lane	Rolleston, Canterbury	Refer to site plan	TP9

Job No.:	Start Date:	Finish Date:	Ground Level (m LINZ):	Co-Ordinates (NZTM2000):
12891	20-11-12	20-11-12	50.00	

Client:	Hole Depth:	Sheet:
Nimbus Group	1.70 m	1 of 1

Elevation (m LINZ)	Depth (m)	Geological Description (refer to separate Geotechnical and Geological Information sheet for further information)	Legend	Weathering	Field Strength Soil / Rock	Defect Description (type, orientation, spacing, roughness, persistence aperture, infilling etc)	Groundwater	Samples	Tests
+50.00									
+49.80	0.20	Fine to medium silty SAND, dark brown with trace rootlets and roots. Loose; moist. (TOPSOIL)							No. 1 2, 2, 3, 2, 2, 3, 2, 2, 3, 2, 2, 2, 2, 1, 1, 2, 2, 2, 2, 2, 1, 2, 2, 1, 2, 3, 1, 2, 2, 2, 3, 2, 10, 15
	1	Fine to medium silty SAND silt and trace roots, light brown. Loose to medium dense; moist (Q1a ALLUVIUM)							
+48.40	1.60								
+48.20	1.80	Fine to coarse sandy GRAVEL with minor cobbles, brown. Gravel, subangular to subrounded, strong, slightly weathered greywacke sandstone. Loose to medium dense; moist. (Q1a ALLUVIUM)							
	2	EOH @ 1.70 m							
	3								
	4								
	5								

SKETCH:

MAP

1:1,000

Shoring/Support: None
Stability:

6.0
A
D
B 1.0
C

- Small Disturbed Sample
- Large Disturbed Sample
- U100 Undisturbed Sample
- Permeability Test
- Clegg Hammer; test repetitions (IV)
- Insitu Vane Shear Strength (kPa) P=Peak, R=Residual, UTP=Unable to penetrate
- Scala Penetrometer - blows/50mm

GROUNDWATER [X] None
[ ] Slow Seep (depth)
[ ] Rapid Inflow (depth)

PIT TERMINATED DUE TO:
[X] Target depth [ ] Collapse
[ ] Refusal [ ] Machine limit

Remarks

1. Ground level and coordinates are approximate and subject to survey confirmation.

All dimensions in metres Scale 1:50	Contractor:	Rig/Plant Used: Machine Excavator (14 tonne)	Logged by: 39	Checked by: AvD

RILEY AGS 3_1 NZ LIB 13.GLB Log RILEY TP COLESPROPERTY GINT LOG.GPJ DWG 41574.GDW 11/12/2012 13:10 Produced by gINT Professional

APPENDIX C

Scala Penetrometer Logs

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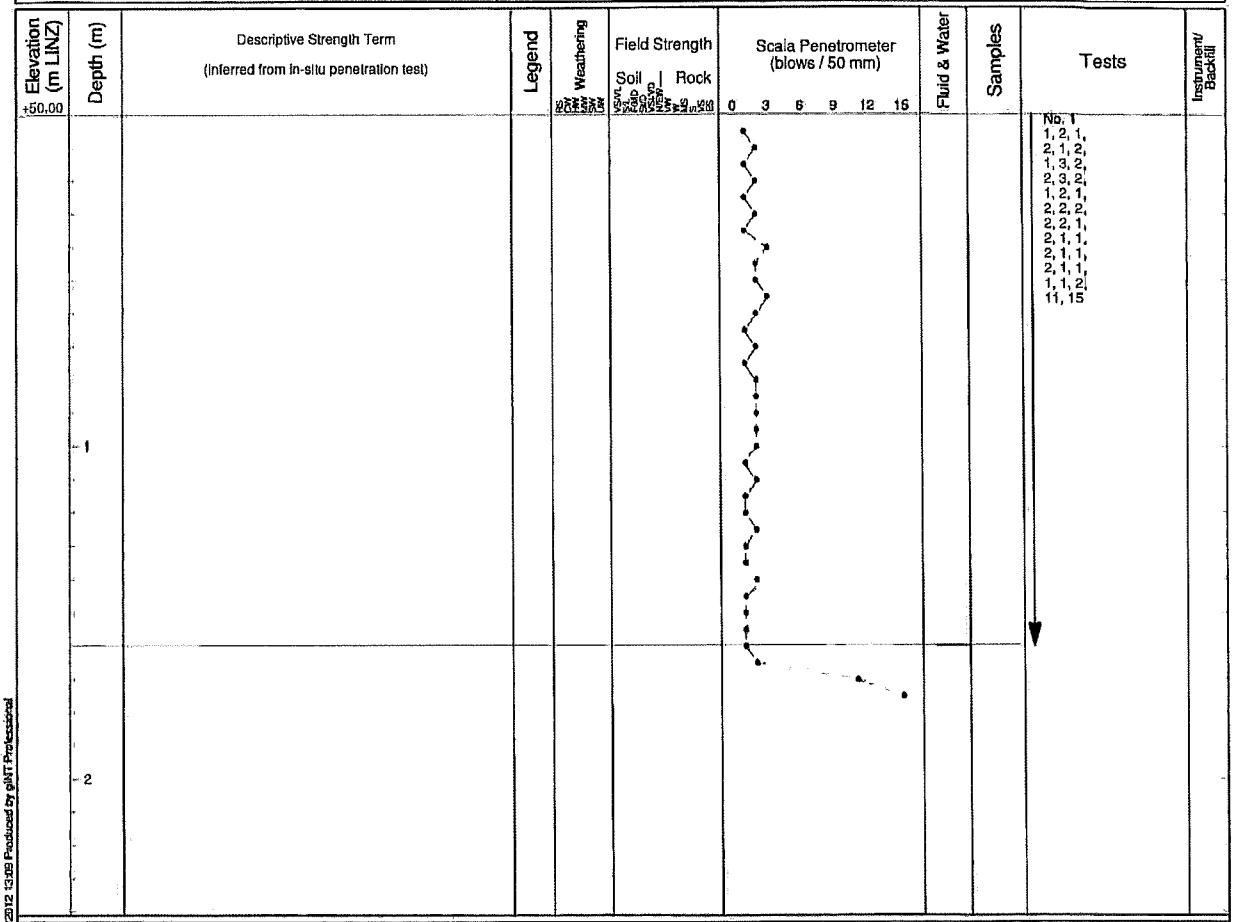
SCALA LOG

Project:	Location:	Hole position:	No.:
Coles Property - Park Lane	Rolleston, Canterbury	Refer to site plan	SP1

Job No.:	Start Date: / Finish Date:	Ground Level (m LINZ):	Co-Ordinates (NZTM2000):
12891	20-11-12 / 20-11-12	50.00	

Client:	Test Depth:	Sheet:
Nimbus Group	1.60 m	1 of 1



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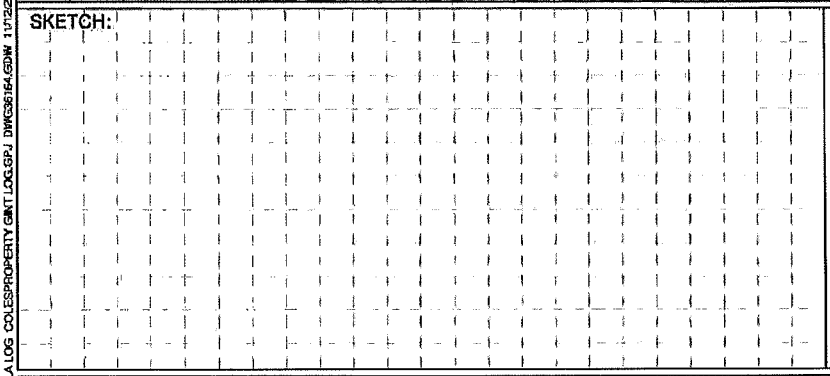
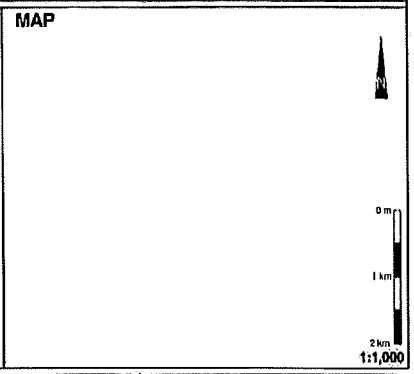


MAP



Explanations:

Rock Mass Weathering - unweathered, slightly weathered, moderately weathered, highly weathered, completely weathered, residually weathered

Relative soil Strength - very soft/very loose, soft/loose, firm/medium dense, stiff/dense, very stiff/very dense

- Small Disturbed Sample
- Large Disturbed Sample
- U100 Undisturbed Sample
- Scala Penetrometer: blows/50mm
- Permeability Test
- Clegg Hammer: impact value (test repetitions)
- Insitu Vane Shear Strength (kPa) P=Peak, R=Residual, UTP=Unable to penetrate
- Water Strike (1st, 2nd ...)
- Water Rise (1st, 2nd ..) & Rise Time (min's.)

Groundwater:

[X] None
[ ] Rods wet below

HOLE TERMINATED DUE TO:
[ ] Target depth [X] Refusal

Remarks

1. Ground level and coordinates are approximate and subject to survey confirmation.

All dimensions in metres Scale 1:20	Contractor:	Rig/Plant Used: Scala Penetrometer	Logged by: 39	Checked by: AvD

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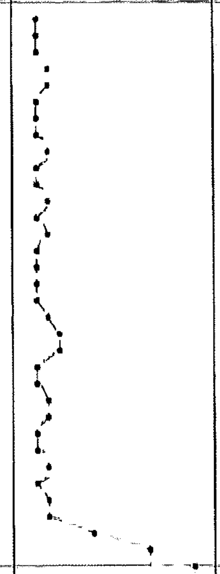
SCALA LOG

Project: Coles Property - Park Lane	Location: Rolleston, Canterbury	Hole position: Refer to site plan	No.: **SP2**
Job No.: 12891	Start Date: 20-11-12 Finish Date: 20-11-12	Ground Level (m LINZ): 50.00	Co-Ordinates (NZTM2000):
Client: Nimbus Group	Test Depth: 1.70 m		Sheet: 1 of 1

Elevation (m LINZ)	Depth (m)	Descriptive Strength Term (inferred from in-situ penetration test)	Legend	Weathering	Field Strength Soil / Rock	Scala Penetrometer (blows / 50 mm) 0 3 6 9 12 15	Fluid & Water	Samples	Tests	Instrument/ Backfill
+50.00	1 2								No, 1 1, 1, 1, 2, 2, 1, 1, 1, 2, 1, 1, 2, 1, 2, 1, 1, 1, 1, 2, 3, 3, 1, 1, 2, 2, 1, 1, 2, 1, 2, 2, 6, 11, 15	

SKETCH:

MAP

1:1,000

Explanations:
Rock Mass Weathering - unweathered, slightly weathered, moderately weathered, highly weathered, completely weathered, residually weathered
Relative soil Strength - very soft/very loose, soft/loose, firm/medium dense, stiff/dense, very stiff/very dense
● Small Disturbed Sample
☐ Large Disturbed Sample
■ U100 Undisturbed Sample

Scala Penetrometer: blows/50mm
Permeability Test
Clegg Hammer: impact value (test repetitions)
Insitu Vane Shear Strength (kPa) P=Peak, R=Residual, UTP=Unable to penetrate
Water Strike (1st, 2nd ...)
Water Rise (1st, 2nd ..) & Rise Time (min's.)

Groundwater:
[X] None
[ ] Rods wet below

HOLE TERMINATED DUE TO:
[ ] Target depth [X] Refusal

Remarks
1. Ground level and coordinates are approximate and subject to survey confirmation.

All dimensions in metres Scale 1:20	Contractor:	Rig/Plant Used: Scala Penetrometer	Logged by: 39	Checked by: AvD

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SCALA LOG

Project:	Location:	Hole position:	No.:
Coles Property - Park Lane	Rolleston, Canterbury	Refer to site plan	**SP3**

Job No.:	Start Date: / Finish Date:	Ground Level (m LINZ):	Co-Ordinates (NZTM2000):
12891	20-11-12 / 20-11-12	50.00	

Client:	Test Depth:	Sheet:
Nimbus Group	1.10 m	1 of 1

Elevation (m LINZ)	Depth (m)	Descriptive Strength Term (Inferred from in-situ penetration test)	Legend	Weathering	Field Strength (Soil / Rock)	Scala Penetrometer (blows / 50 mm)	Fluid & Water	Samples	Tests	Instrument/ Backfill
+50.00	1 2					0 3 6 9 12 15			No. 1 1, 2, 2, 2, 2, 1, 2, 1, 2, 1, 2, 2, 2, 1, 1, 1, 2, 2, 5, 4, 8, 15	

SKETCH:

MAP

0m
1 km
2 km
1:1,000

Explanations:

Rock Mass Weathering - unweathered, slightly weathered, moderately weathered, highly weathered, completely weathered, residually weathered

Relative soil Strength - very soft/very loose, soft/loose, firm/medium dense, stiff/dense, very stiff/very dense

- Small Disturbed Sample
- Large Disturbed Sample
- U100 Undisturbed Sample

- Scala Penetrometer: blows/50mm
- Permeability Test
- Clegg Hammer: impact value (test repetitions)
- Insitu Vane Shear Strength (kPa) P=Peak, R=Residual, UTP=Unable to penetrate
- Water Strike (1st, 2nd ,..)
- Water Rise (1st, 2nd ..) & Rise Time (min's.)

Groundwater:

[X] None
[ ] Rods wet below

HOLE TERMINATED DUE TO:
[ ] Target depth [X] Refusal

Remarks

1. Ground level and coordinates are approximate and subject to survey confirmation.

All dimensions in metres Scale 1:20	Contractor:	Rig/Plant Used: Scala Penetrometer	Logged by: 39	Checked by: AvD

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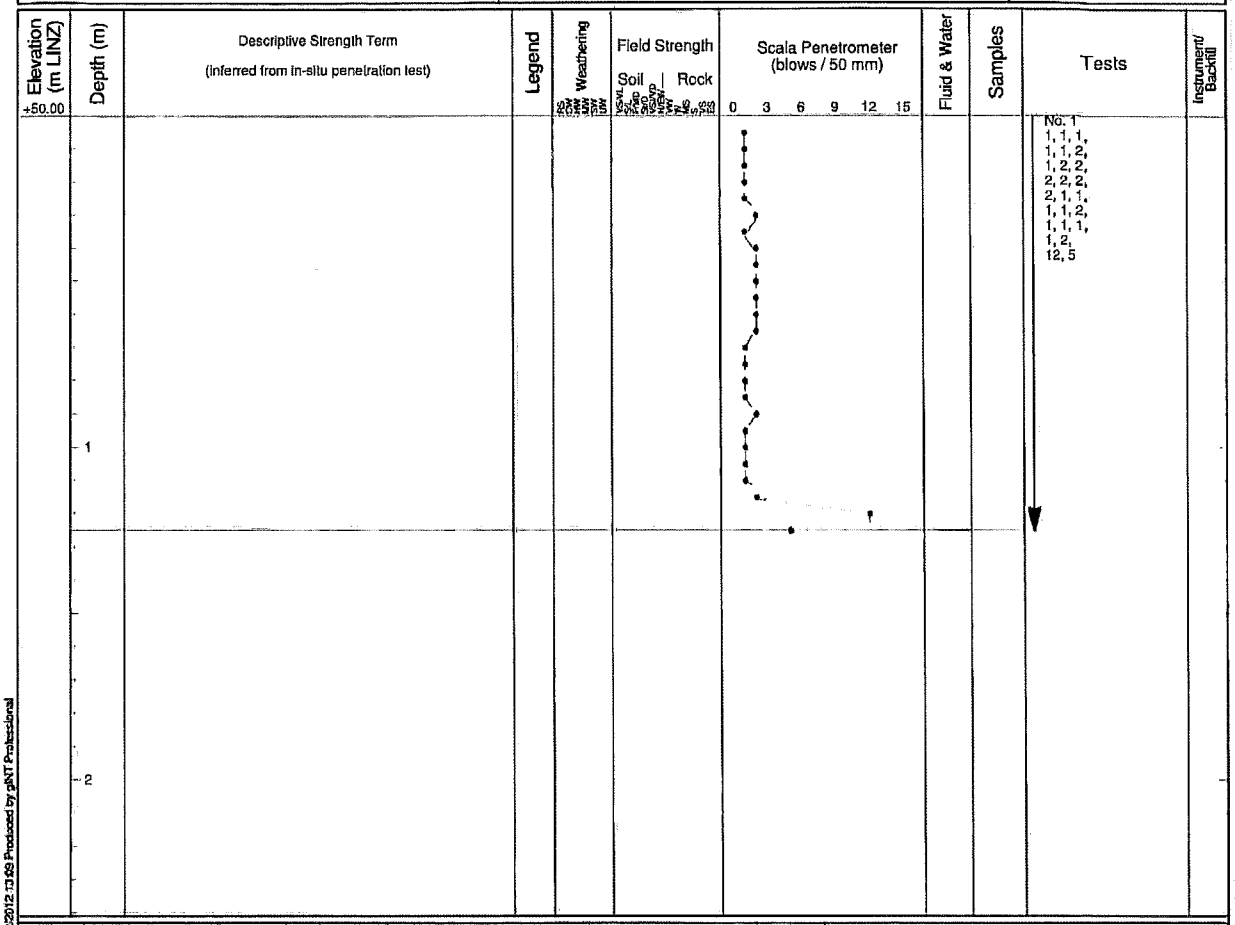
SCALA LOG

Project:	Location:	Hole position:	No.:
Coles Property - Park Lane	Rolleston, Canterbury	Refer to site plan	**SP4**

Job No.:	Start Date: / Finish Date:	Ground Level (m LINZ):	Co-Ordinates (NZTM2000):
12891	20-11-12 / 20-11-12	50.00	

Client:	Test Depth:	Sheet:
Nimbus Group	1.25 m	1 of 1



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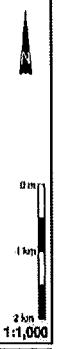
MAP



Explanations:

Rock Mass Weathering - unweathered, slightly weathered, moderately weathered, highly weathered, completely weathered, residually weathered

Relative soil Strength - very soft/very loose, soft/loose, firm/medium dense, stiff/dense, very stiff/very dense

- Small Disturbed Sample
- Large Disturbed Sample
- U100 Undisturbed Sample
- Scala Penetrometer: blows/50mm
- Permeability Test
- Clegg Hammer: impact value (test repetitions)
- Insitu Vane Shear Strength (kPa) P=Peak, R=Residual, UTP=Unable to penetrate
- Water Strike (1st, 2nd ..)
- Water Rise (1st, 2nd ..) & Rise Time (min's.)

Groundwater:

[X] None

[ ] Rods wet below

HOLE TERMINATED DUE TO:

[ ] Target depth [X] Refusal

Remarks

1. Ground level and coordinates are approximate and subject to survey confirmation.

All dimensions in metres Scale 1:20	Contractor:	Rig/Plant Used: Scala Penetrometer	Logged by: 39	Checked by: AvD

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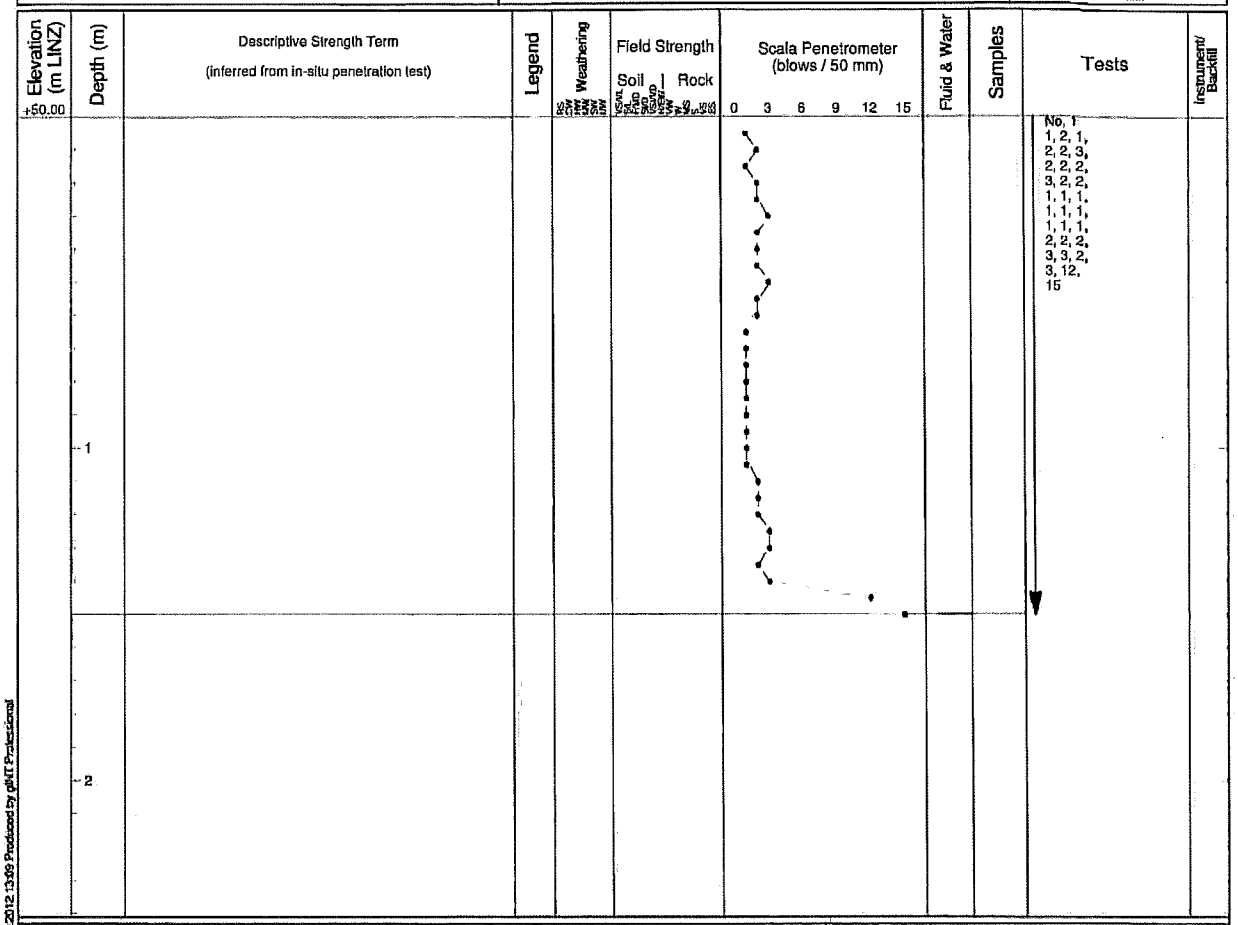
SCALA LOG

Project:	Location:	Hole position:	No.:
Coles Property - Park Lane	Rolleston, Canterbury	Refer to site plan	SP5

Job No.:	Start Date: / Finish Date:	Ground Level (m LINZ):	Co-Ordinates (NZTM2000):
12891	20-11-12 / 20-11-12	50.00	

Client:	Test Depth:	Sheet:
Nimbus Group	1.50 m	1 of 1



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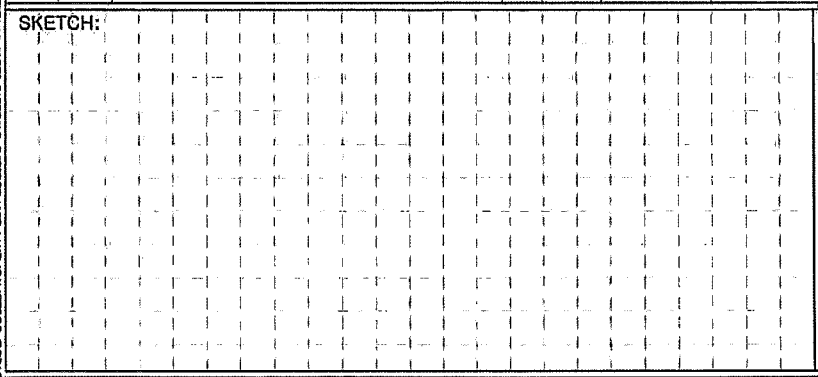

MAP

Explanations:

Rock Mass Weathering - unweathered, slightly weathered, moderately weathered, highly weathered, completely weathered, residually weathered

Relative soil Strength - very soft/very loose, soft/loose, firm/medium dense, stiff/dense, very stiff/very dense

- Small Disturbed Sample
- Large Disturbed Sample
- U100 Undisturbed Sample
- Scala Penetrometer: blows/50mm
- Permeability Test
- Clegg Hammer: Impact value (test repetitions)
- Insitu Vane Shear Strength (kPa) P=Peak, R=Residual, UTP=Unable to penetrate
- Water Strike (1st, 2nd ...)
- Water Rise (1st, 2nd ..) & Rise Time (min's)

Groundwater:

- [X] None
- [ ] Rods wet below

HOLE TERMINATED DUE TO:

- [ ] Target depth
- [X] Refusal

Remarks

1. Ground level and coordinates are approximate and subject to survey confirmation.

All dimensions in metres Scale 1:20	Contractor:	Rig/Plant Used: Scala Penetrometer	Logged by: 39	Checked by: AvD

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SCALA LOG

Project:	Location:	Hole position:	No.:
Coles Property - Park Lane	Rolleston, Canterbury	Refer to site plan	SP6

Job No.:	Start Date: 20-11-12 Finish Date: 20-11-12	Ground Level (m LINZ):	Co-Ordinates (NZTM2000):
12891		50.00	

Client:	Test Depth:	Sheet:
Nimbus Group	1.40 m	1 of 1

Elevation (m LINZ) +50.00 | Depth (m) | Descriptive Strength Term (Inferred from in-situ penetration test) | Legend | Weathering | Field Strength Soil / Rock | Scala Penetrometer (blows / 50 mm) 0 3 6 9 12 15 | Fluid & Water | Samples | Tests | Instrument/ Backfill

Tests: No. 1
1, 1, 1,
1, 1, 1,
1, 2, 2,
2, 1, 1,
1, 2, 1,
2, 3, 2,
2, 1, 1,
2, 2, 4,
3, 2, 6,
15

SKETCH:

MAP
N
0 m
1 km
2 km
1:1,000

Explanations:

Rock Mass Weathering - unweathered, slightly weathered, moderately weathered, highly weathered, completely weathered, residually weathered

Relative soil Strength - very soft/very loose, soft/loose, firm/medium dense, stiff/dense, very stiff/very dense

- Small Disturbed Sample
- Large Disturbed Sample
- U100 Undisturbed Sample
- Scala Penetrometer: blows/50mm
- Permeability Test
- Clegg Hammer: impact value (test repetitions)
- Insitu Vane Shear Strength (kPa) P=Peak, R=Residual, UTP=Unable to penetrate
- Water Strike (1st, 2nd ...)
- Water Rise (1st, 2nd ..) & Rise Time (min's.)

Groundwater:

- [X] None
- [ ] Rods wet below

HOLE TERMINATED DUE TO:
- [ ] Target depth [X] Refusal

Remarks

1. Ground level and coordinates are approximate and subject to survey confirmation.

All dimensions in metres Scale 1:20	Contractor:	Rig/Plant Used: Scala Penetrometer	Logged by: 39	Checked by: AvD

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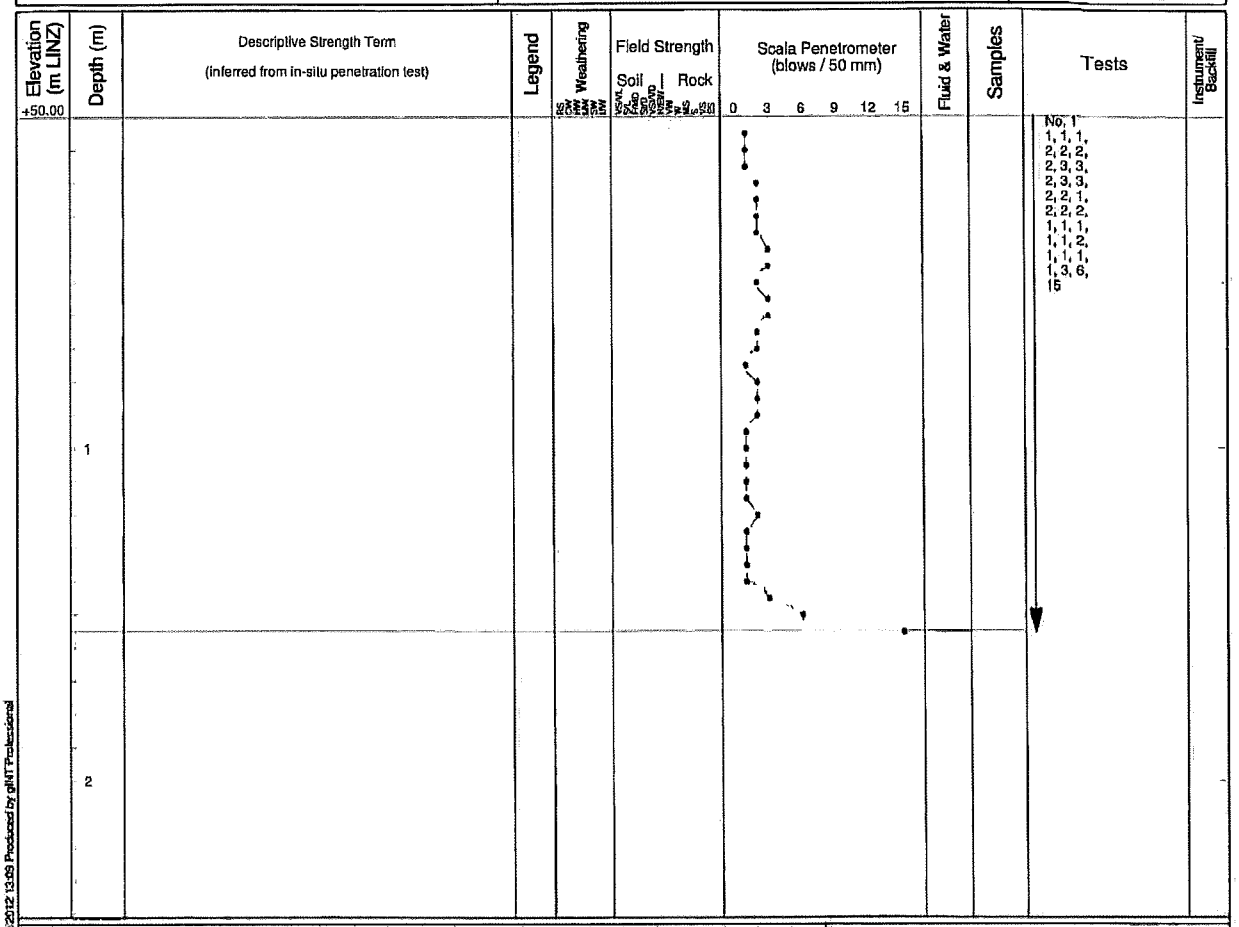
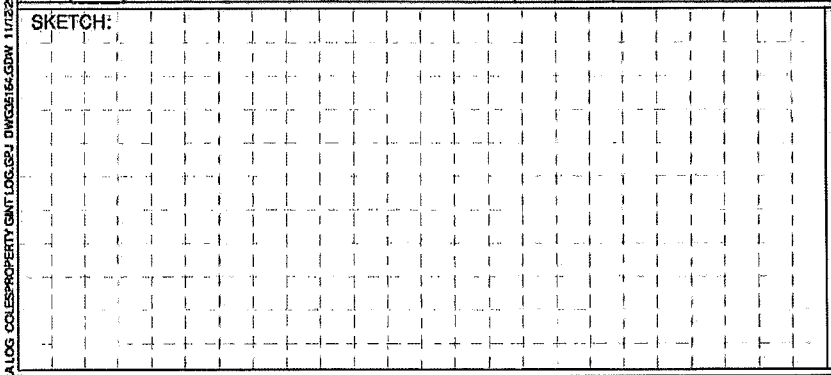
SCALA LOG

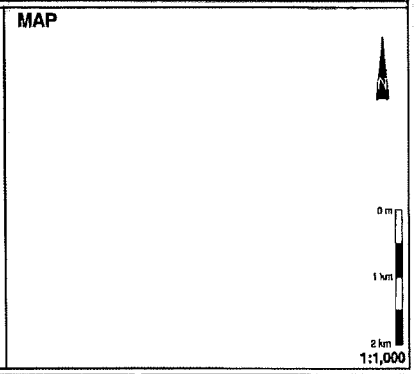
Project:	Location:	Hole position:	No.:
Coles Property - Park Lane	Rolleston, Canterbury	Refer to site plan	SP7

Job No.:	Start Date: 20-11-12 Finish Date: 20-11-12	Ground Level (m LINZ):	Co-Ordinates (NZTM2000):
12891		50.00	

Client:	Test Depth:	Sheet:
Nimbus Group	1.55 m	1 of 1







Explanations:

Rock Mass Weathering - unweathered, slightly weathered, moderately weathered, highly weathered, completely weathered, residually weathered

Relative soil Strength - very soft/very loose, soft/loose, firm/medium dense, stiff/dense, very stiff/very dense

- Small Disturbed Sample
- Large Disturbed Sample
- U100 Undisturbed Sample

- Scala Penetrometer: blows/50mm
- Permeability Test
- Clegg Hammer: impact value (test repetitions)
- Insitu Vane Shear Strength (kPa) P=Peak, R=Residual, UTP=Unable to penetrate
- Water Strike (1st, 2nd ,..)
- Water Rise (1st, 2nd ..) & Rise Time (min's.)

Groundwater:

- [X] None
- [ ] Rods wet below

HOLE TERMINATED DUE TO:

- [ ] Target depth
- [X] Refusal

Remarks

1. Ground level and coordinates are approximate and subject to survey confirmation.

All dimensions in metres Scale 1:20	Contractor:	Rig/Plant Used: Scala Penetrometer	Logged by: 39	Checked by: AvD

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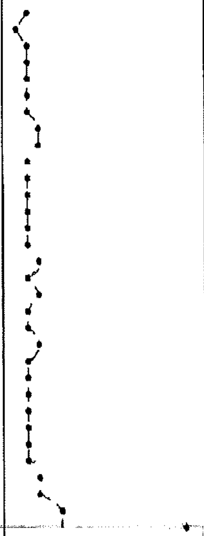
SCALA LOG

Project: Coles Property - Park Lane	Location: Rolleston, Canterbury	Hole position: Refer to site plan	No.: SP8
Job No.: 12891	Start Date: 20-11-12 Finish Date: 20-11-12	Ground Level (m LINZ): 50.00	Co-Ordinates (NZTM2000):
Client: Nimbus Group	Test Depth: 1.60 m		Sheet: 1 of 1

Elevation (m LINZ)	Depth (m)	Descriptive Strength Term (inferred from in-situ penetration test)	Legend	Weathering	Field Strength Soil / Rock	Scala Penetrometer (blows / 50 mm) 0 3 6 9 12 15	Fluid & Water	Samples	Tests	Instrument/ Backfill
+50.00	1 2								No. 1 1, 0, 1, 1, 1, 1, 1, 2, 2, 1, 1, 1, 1, 1, 1, 2, 1, 2, 1, 1, 2, 1, 1, 1, 1, 1, 1, 1, 2, 2, 4, 15	

SKETCH:

MAP

1:1,000

Explanations:
Rock Mass Weathering - unweathered, slightly weathered, moderately weathered, highly weathered, completely weathered, residually weathered
Relative soil Strength - very soft/very loose, soft/loose, firm/medium dense, stiff/dense, very stiff/very dense
- Small Disturbed Sample
- Large Disturbed Sample
- U100 Undisturbed Sample

- Scala Penetrometer: blows/50mm
- Permeability Test
- Clegg Hammer: impact value (test repetitions)
- Insitu Vane Shear Strength (kPa) P=Peak, R=Residual, UTP=Unable to penetrate
- Water Strike (1st, 2nd ...)
- Water Rise (1st, 2nd ..) & Rise Time (min's.)

Groundwater:
[X] None
[ ] Rods wet below

HOLE TERMINATED DUE TO:
[ ] Target depth [X] Refusal

Remarks
1. Ground level and coordinates are approximate and subject to survey confirmation.

All dimensions in metres Scale 1:20	Contractor:	Rig/Plant Used: Scala Penetrometer	Logged by: 39	Checked by: AvD

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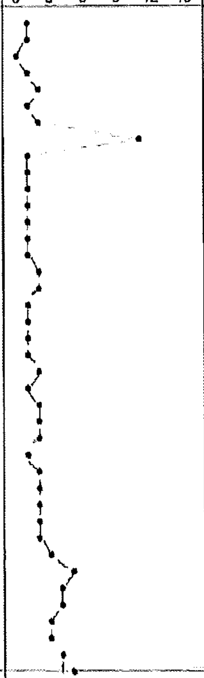
SCALA LOG

Project: Coles Property - Park Lane	Location: Rolleston, Canterbury	Hole position: Refer to site plan	No.: SP9
Job No.: 12891	Start Date: 20-11-12 Finish Date: 20-11-12	Ground Level (m LINZ): 50.00	Co-Ordinates (NZTM2000):
Client: Nimbus Group	Test Depth: 2.00 m		Sheet: 1 of 1

Elevation (m LINZ)	Depth (m)	Descriptive Strength Term (inferred from in-situ penetration test)	Legend	Weathering	Field Strength Soil / Rock	Scala Penetrometer (blows / 50 mm) 0 3 6 9 12 15	Fluid & Water	Samples	Tests	Instrument/ Backfill
+50.00	1 2								No. 1: 1, 1, 0, 1, 2, 1, 2, 11, 1, 1, 1, 1, 1, 1, 1, 2, 2, 1, 1, 1, 1, 2, 1, 2, 2, 2, 1, 2, 2, 2, 2, 2, 3, 5, 4, 4, 3, 3, 4, 5	

SKETCH:

MAP

Explanations:
Rock Mass Weathering - unweathered, slightly weathered, moderately weathered, highly weathered, completely weathered, residually weathered
Relative soil Strength - very soft/very loose, soft/loose, firm/medium dense, stiff/dense, very stiff/very dense

- Small Disturbed Sample
- Large Disturbed Sample
- U100 Undisturbed Sample

- Scala Penetrometer: blows/50mm
- Permeability Test
- Clegg Hammer: impact value (test repetitions)
- Insitu Vane Shear Strength (kPa) P=Peak, R=Residual, UTP=Unable to penetrate
- Water Strike (1st, 2nd ...)
- Water Rise (1st, 2nd ..) & Rise Time (min's.)

Groundwater:
[X] None
[ ] Rods wet below

HOLE TERMINATED DUE TO:
[X] Target depth [ ] Refusal

Remarks
1. Ground level and coordinates are approximate and subject to survey confirmation.

All dimensions in metres Scale 1:20	Contractor:	Rig/Plant Used: Scala Penetrometer	Logged by: 39	Checked by: AvD

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SCALA LOG

Project:	Location:	Hole position:	No.:
Coles Property - Park Lane	Rolleston, Canterbury	Refer to site plan	**SP10**

Job No.:	Start Date: 20-11-12 Finish Date: 20-11-12	Ground Level (m LINZ):	Co-Ordinates (NZTM2000):
12891		50.00	

Client:	Test Depth:	Sheet:
Nimbus Group	0.55 m	1 of 1

Elevation (m LINZ) +50.00 | Depth (m) | Descriptive Strength Term (Inferred from in-situ penetration test) | Legend | Weathering | Field Strength Soil / Rock | Scala Penetrometer (blows / 50 mm) 0 3 6 9 12 15 | Fluid & Water | Samples | Tests | Instrument/ Backfill

1
2

Tests: No. 1 1, 0, 1, 2, 2, 2, 2, 2, 3, 7, 15

SKETCH:

MAP

0 m
1 km
2 km
1:1,000

Explanations:

Rock Mass Weathering - unweathered, slightly weathered, moderately weathered, highly weathered, completely weathered, residually weathered

Relative soil Strength - very soft/very loose, soft/loose, firm/medium dense, stiff/dense, very stiff/very dense

- Small Disturbed Sample
- Large Disturbed Sample
- U100 Undisturbed Sample
- Scala Penetrometer: blows/50mm
- Permeability Test
- Clegg Hammer: impact value (test repetitions)
- Insitu Vane Shear Strength (kPa) P=Peak, R=Residual, UTP=Unable to penetrate
- Water Strike (1st, 2nd ...)
- Water Rise (1st, 2nd ..) & Rise Time (min's.)

Groundwater:

[X] None
[ ] Rods wet below

HOLE TERMINATED DUE TO:
[ ] Target depth [X] Refusal

Remarks

1. Ground level and coordinates are approximate and subject to survey confirmation.

All dimensions in metres Scale 1:20	Contractor:	Rig/Plant Used: Scala Penetrometer	Logged by: 39	Checked by: AvD

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SCALA LOG

Project:	Location:	Hole position:	No.:
Coles Property - Park Lane	Rolleston, Canterbury	Refer to site plan	SP11

Job No.:	Start Date: / Finish Date:	Ground Level (m LINZ):	Co-Ordinates (NZTM2000):
12891	20-11-12 / 20-11-12	50.00	

Client:	Test Depth:	Sheet:
Nimbus Group	2.00 m	1 of 1

Elevation (m LINZ) | Depth (m) | Descriptive Strength Term (inferred from in-situ penetration test) | Legend | Weathering | Field Strength (Soil / Rock) | Scala Penetrometer (blows / 50 mm) | Fluid & Water | Samples | Tests | Instrument/ Backfill

+50.00

Scala Penetrometer (blows / 50 mm): 0 3 6 9 12 15

Depth (m): 1, 2

Tests — No. 1:
1, 0, 1,
1, 2, 2,
1, 1, 2,
1, 1, 1,
2, 2, 2,
2, 1, 1,
1, 1, 1,
2, 2, 1,
1, 2, 1,
2, 1, 2,
2, 2, 2,
2, 2, 4,
3, 4,
10, 15

SKETCH:

MAP

N

0 m
1 km
2 km
1:1,000

Explanations:

Rock Mass Weathering - unweathered, slightly weathered, moderately weathered, highly weathered, completely weathered, residually weathered

Relative soil Strength - very soft/very loose, soft/loose, firm/medium dense, stiff/dense, very stiff/very dense

- Small Disturbed Sample
- Large Disturbed Sample
- U100 Undisturbed Sample
- Scala Penetrometer: blows/50mm
- Permeability Test
- Clegg Hammer: impact value (test repetitions)
- Insitu Vane Shear Strength (kPa) P=Peak, R=Residual, UTP=Unable to penetrate
- Water Strike (1st, 2nd ...)
- Water Rise (1st, 2nd ..) & Rise Time (min's.)

Groundwater:

[X] None
[ ] Rods wet below

HOLE TERMINATED DUE TO:
[X] Target depth [ ] Refusal

Remarks

1. Ground level and coordinates are approximate and subject to survey confirmation.

All dimensions in metres Scale 1:20	Contractor:	Rig/Plant Used: Scala Penetrometer	Logged by: 39	Checked by: AvD

RILEY AGS3_1 NZ LIB 13.GLB Log: RILEY SCALA LOG COLESPROPERTY GINT LOG.GPJ DWG36184.GDW 11/12/2012 13:09 Produced by gINT Professional

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SCALA LOG

Project:	Location:	Hole position:	No.:
Coles Property - Park Lane	Rolleston, Canterbury	Refer to site plan	SP12

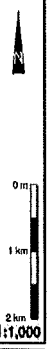
Job No.:	Start Date: 20-11-12 Finish Date: 20-11-12	Ground Level (m LINZ):	Co-Ordinates (NZTM2000):
12891		50.00	

Client:	Test Depth:	Sheet:
Nimbus Group	1.45 m	1 of 1

Elevation (m LINZ)	Depth (m)	Descriptive Strength Term (inferred from in-situ penetration test)	Legend	Weathering	Field Strength (Soil / Rock)	Scala Penetrometer (blows / 50 mm) 0 3 6 9 12 15	Fluid & Water	Samples	Tests	Instrument/ Backfill
+50.00	1 2								No. 1 1, 2, 1, 2, 2, 2, 2, 2, 2, 2, 1, 2, 1, 1, 2, 2, 1, 2, 1, 1, 1, 2, 2, 1, 3, 2, 2, 1, 2, 10, 15	

SKETCH:

MAP



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- Water Strike (1st, 2nd ...)
- Water Rise (1st, 2nd ,.) & Rise Time (min's.)

Groundwater:

- [X] None
- [ ] Rods wet below

HOLE TERMINATED DUE TO:

- [ ] Target depth [X] Refusal

Remarks

1. Ground level and coordinates are approximate and subject to survey confirmation.

All dimensions in metres Scale 1:20	Contractor:	Rig/Plant Used: Scala Penetrometer	Logged by: 39	Checked by: AvD

RILEY AGS3_1 NZ LIB 13.GLB Log: RILEY SCALA LOG COLESPROPERTY GINT LOG.GPJ DWG 66164.GDW 11/12/2012 13:09 Produced by gINT Professional

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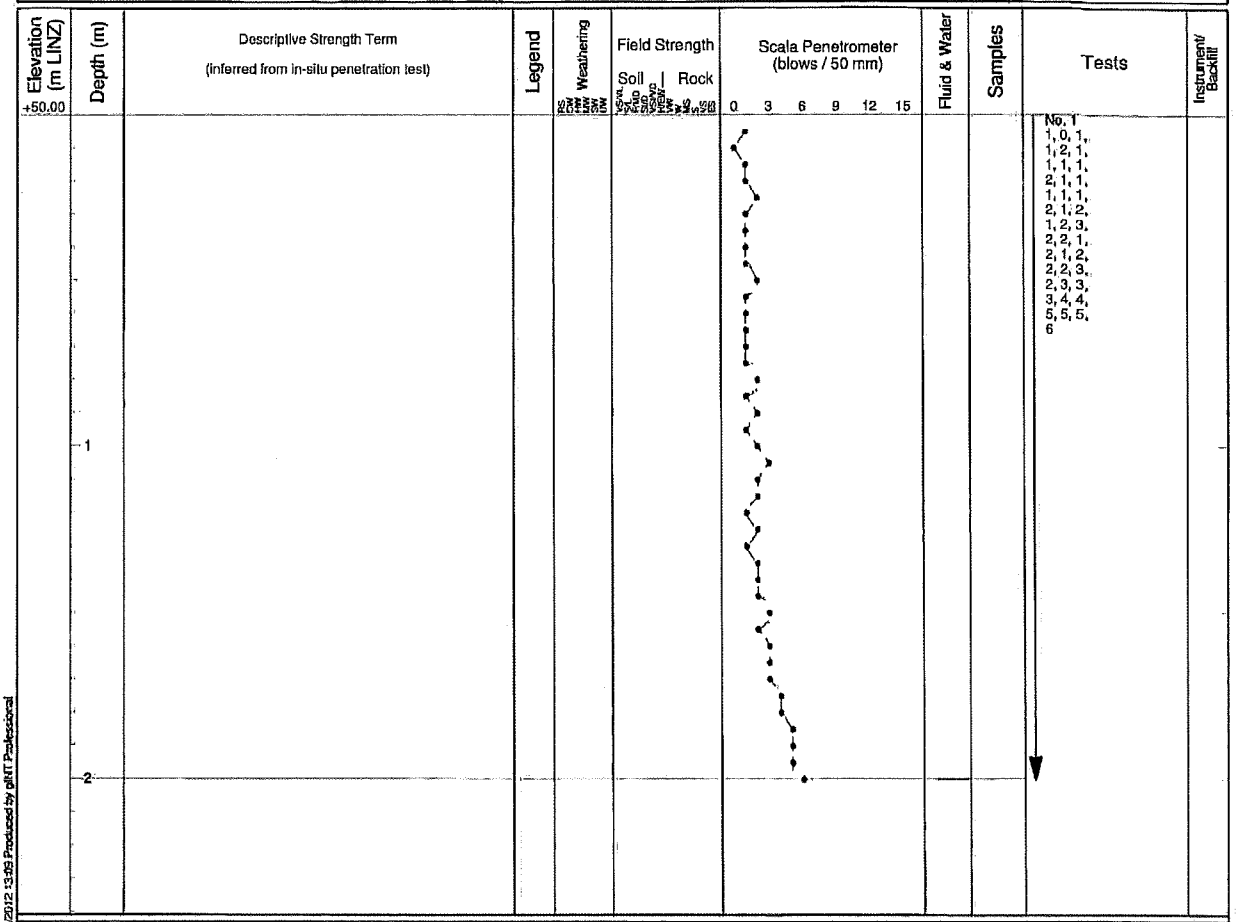
Fax: +643 3794403

SCALA LOG

Project:	Location:	Hole position:	No.:
Coles Property - Park Lane	Rolleston, Canterbury	Refer to site plan	SP13

Job No.:	Start Date: / Finish Date:	Ground Level (m LINZ):	Co-Ordinates (NZTM2000):
12891	20-11-12 / 20-11-12	50.00	

Client:	Test Depth:	Sheet:
Nimbus Group	2.00 m	1 of 1



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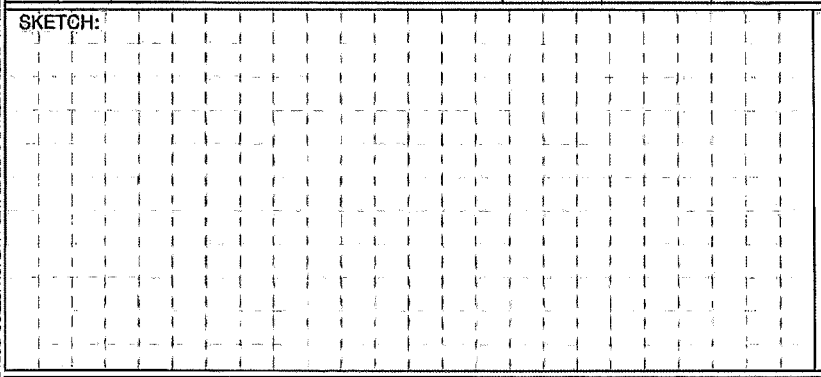
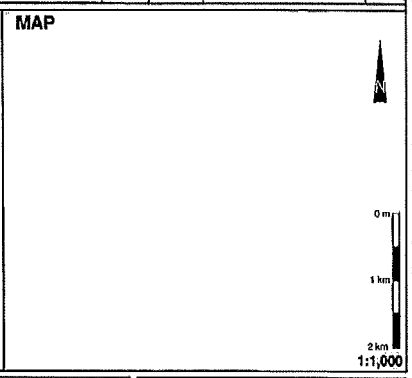


MAP



Explanations:

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- Water Strike (1st, 2nd ...)
- Water Rise (1st, 2nd ..) & Rise Time (min's.)

Groundwater:

[X] None
[ ] Rods wet below

HOLE TERMINATED DUE TO:
[X] Target depth [ ] Refusal

Remarks

1. Ground level and coordinates are approximate and subject to survey confirmation.

All dimensions in metres Scale 1:20	Contractor:	Rig/Plant Used: Scala Penetrometer	Logged by: 39	Checked by: AvD

RILEY AGS 3_1 NZ LIB 13.GLB Log RILEY SCALA LOG COLESPROPERTY GINT LOG.GPJ DWG36164.GDW 11/12/2012 13:59 Produced by gINT Professional

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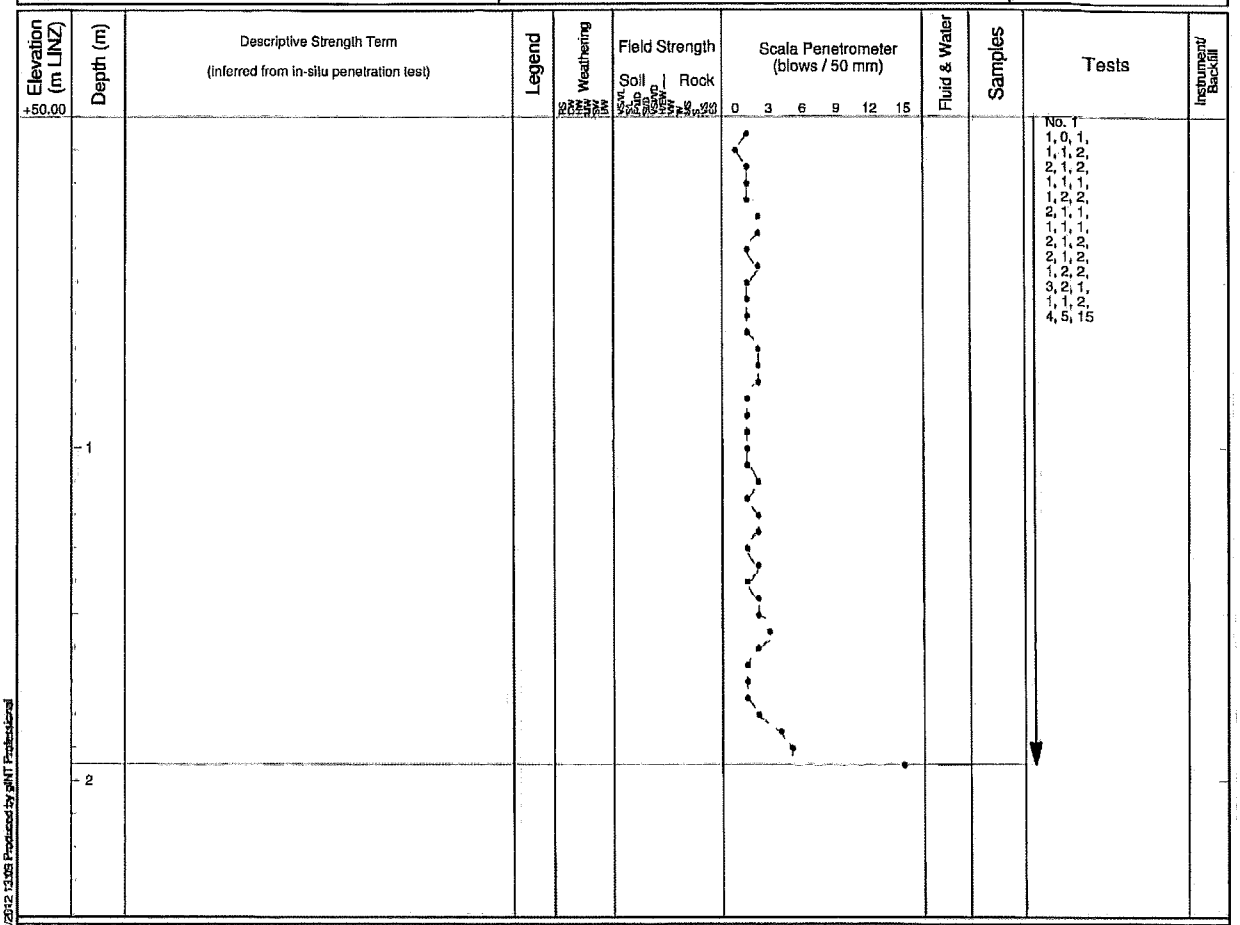
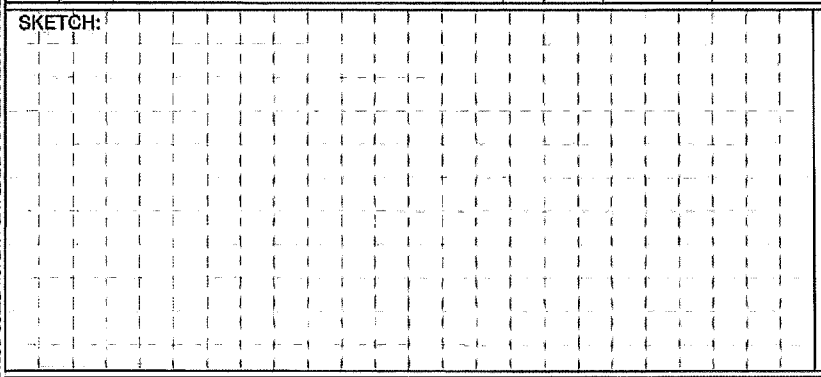
SCALA LOG

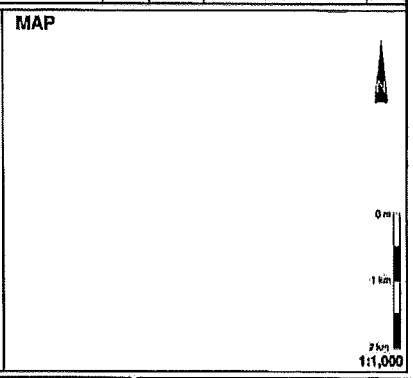
Project:	Location:	Hole position:	No.:
Coles Property - Park Lane	Rolleston, Canterbury	Refer to site plan	**SP14**

Job No.:	Start Date: / Finish Date:	Ground Level (m LINZ):	Co-Ordinates (NZTM2000):
12891	20-11-12 / 20-11-12	50.00	

Client:	Test Depth:	Sheet:
Nimbus Group	1.95 m	1 of 1







Explanations:

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- Water Strike (1st, 2nd ...)
- Water Rise (1st, 2nd ..) & Rise Time (min's.)

Groundwater:

- [X] None
- [ ] Rods wet below

HOLE TERMINATED DUE TO:

- [ ] Target depth
- [X] Refusal

Remarks

1. Ground level and coordinates are approximate and subject to survey confirmation.

All dimensions in metres Scale 1:20	Contractor:	Rig/Plant Used: Scala Penetrometer	Logged by: 39	Checked by: AvD

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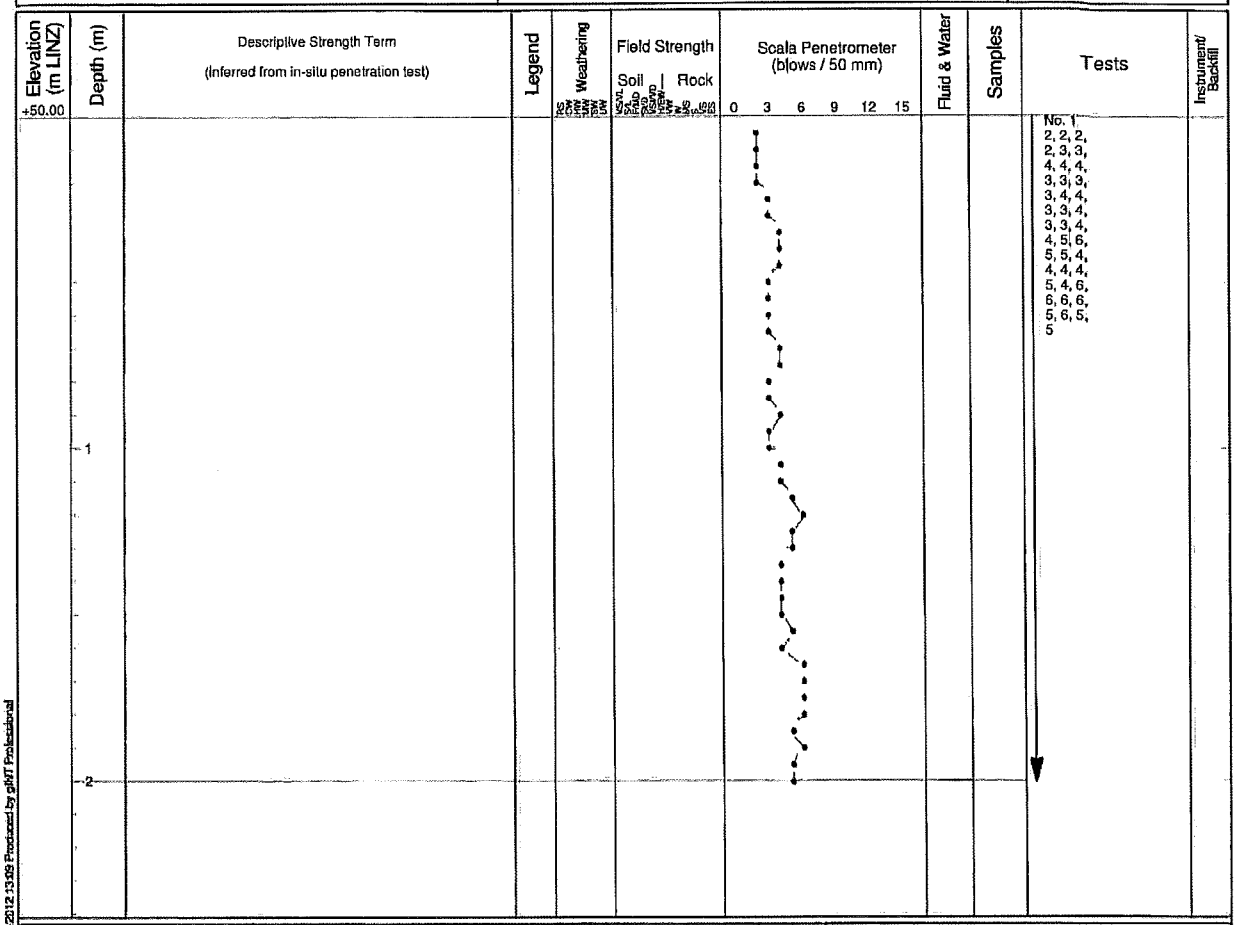
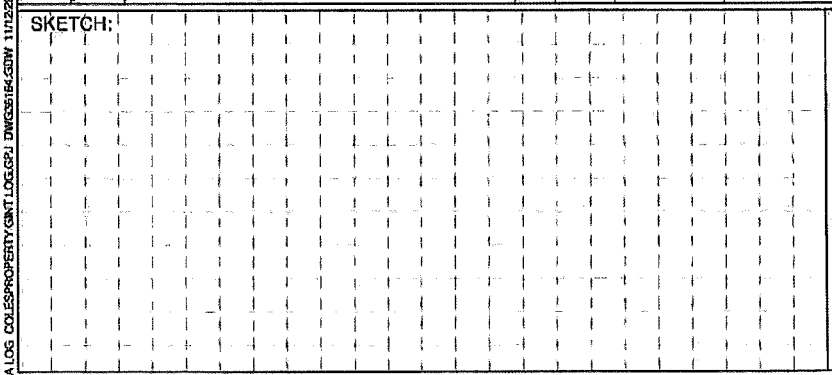
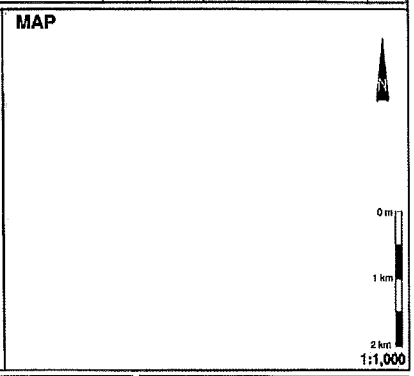
SCALA LOG

Project: Coles Property - Park Lane	Location: Rolleston, Canterbury	Hole position: Refer to site plan	No.: SP15
Job No.: 12891	Start Date: 20-11-12 Finish Date: 20-11-12	Ground Level (m LINZ): 50.00	Co-Ordinates (NZTM2000):
Client: Nimbus Group	Test Depth: 2.00 m		Sheet: 1 of 1







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Groundwater:

[X] None

[ ] Rods wet below

HOLE TERMINATED DUE TO:

[X] Target depth [ ] Refusal

Remarks

1. Ground level and coordinates are approximate and subject to survey confirmation.

All dimensions in metres Scale 1:20	Contractor:	Rig/Plant Used: Scala Penetrometer	Logged by: 39	Checked by: AvD

RILEY AGS 3_1 NZ UB 13.GLB Log RILEY SCALA LOG COLESPROPERTY.GINT LOG.GPJ DWG35164.SDW 11/12/2012 13:59 Produced by gINT Professional

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