

INFRASTRUCTURE ENGINEERING REPORT

**Memorial Ave Investments Ltd (MAIL)
17215-001 R1**

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REPORT

CONTENTS

1.	GENERAL.....	5
1.1	Introduction	5
1.2	Scope and Purpose	5
1.3	Legal Description	6
1.4	Topography.....	6
1.5	Vegetation	6
1.6	Soils.....	6
1.7	Surface Water	6
1.8	Other Restrictions.....	7
2.	DEVELOPMENT PROPOSAL AND EARTHWORKS	8
3.	ROADING	9
3.1	General	9
3.2	Formation	9
3.3	Gradient	10
4.	WASTEWATER RETICULATION	11
4.1	Existing wastewater infrastructure	11
4.2	Servicing Constraints	11
4.3	Wastewater management.....	11
5.	STORMWATER.....	13
5.1	General	13
5.2	Christchurch City Council Requirements.....	14
5.3	Environment Canterbury Requirements	14
5.4	Stormwater off Roofs	15
5.5	Stormwater Hardstand Areas	15
5.6	Stormwater Control During Construction	17
6.	WATER RETICULATION	18
6.1	Existing water supply network	18
6.2	Proposed water supply network	18
7.	ELECTRICITY SUPPLY.....	19
8.	TELECOMMUNICATIONS	20
9.	CONCLUSION	21

APPENDICES

APPENDIX A – LOCATION PLAN

APPENDIX B – TOPOGRAPHICAL PLAN

APPENDIX C – STORMWATER CATCHMENT PLAN

APPENDIX D – STORMWATER CALCULATIONS

APPENDIX E – TREEPIT SPECIMEN DESIGN

1. GENERAL

1.1 Introduction

This infrastructure report addresses the servicing of the property located at 453, 455 and 475 Memorial Avenue, 400 Russley Road, 500, 520 and 540 Avonhead Road, Christchurch ("the site"). This report has been prepared for one of the sites owners, Memorial Avenue Investments Ltd, and is provided to Christchurch City Council to inform the District Plan Review process.

Please refer to the attached Location Plan in Appendix A.

Consultation has been undertaken with Christchurch City Council (CCC) staff in regard to the infrastructure requirements for the site. Please refer to Appendix D for the advice as received by email from the Council.

On-going consultation with service supply authorities has been maintained. The extents of those consultations, together with a preliminary design assessment, have been instrumental in compiling this report.

The proposed eventual subdivision infrastructure construction will comply with the requirements of Christchurch City Council's Standard Specification, CSS: Parts 1-7: 2013 and the Infrastructure Design Standards.

It is proposed that stormwater generated on the site will be disposed to ground. The discharge to ground is complicated, as the MAIL site is located over the City's groundwater recharge area. The recharge area is the zone of gravel aquifer between the Waimakariri River and the City that replenishes the City's water supply. As a result of this the City Council require specific treatment of the stormwater discharge.

The Regional Council also have specific standard requirements for the discharge of stormwater to ground. Under the current rules, the site may need to comply with two Environment Canterbury (Ecan) documents.

- The Natural Resources Regional Plan
- Land and Water Regional Plan (LWRP).

Under the LWRP, the site may still require a discharge consent. The LWRP is currently subject to appeals.

1.2 Scope and Purpose

The purpose of this report is to provide an assessment of options for servicing any future business development with wastewater, water supply, stormwater, power and telecommunications infrastructure and identify any issues that may prevent or substantially delay the efficient provision of this infrastructure. This report will form a supporting document to the District Plan Review of the zoning of the site.

The proposed development site encompasses 24.55 hectares of rural residential land. The site is

zoned Rural 5 under the Operative City Plan. The site is adjacent to existing businesses surrounding the airport, rural land, the Russley Golf Course, The Commodore Motor Inn and a small number of residential properties.

The land is inside the projected infrastructure boundary as described in the Land Use Recovery Plan and Canterbury Regional Policy Statement.

1.3 Legal Description

Pt Lot 1, Lot 2, Lot 4, Lot 5 and Lot 6 DP 28780, Lot 1 and Lot 2 DP 74459.

1.4 Topography

The site has a generally consistent fall towards the south-east, with an approximate 3.5m elevation difference between the north-west corner and the south-east corner.

The majority of the site is generally considered to be flat. However, there is a sharp drainage feature at the north end of the site. This is believed to be part of the historical Wairarapa Stream upper catchment. In effect this drainage feature creates a lower terrace along Memorial Avenue.

Please refer to Topographical Plan in Appendix B for levels across the majority of the site.

1.5 Vegetation

The vacant land is principally farmland being used for grazing with some vegetation in the form of treed shelter belts along the western and the eastern boundaries. There are also a number of trees planted as landscaping throughout the site.

Lot 6 DP 28780 and Lot 2 DP 74459, have substantial areas of landscaped gardens.

The majority of the trees and buildings would be removed from site as part of any construction operation. The treed windbreaks may also be removed from site.

Our investigations have not found any trees designated for protection under the Operative City Plan.

1.6 Soils

Please refer to the Aurecon Report appending the Plan Change Application.

1.7 Surface Water

There is no prolonged surface water such as streams or ponds on the property. The natural contour of the land will drain freely to the south and east and soakage to ground is relatively easy.

Consultations have been undertaken with Environment Canterbury regarding potential flooding in the event of a breach in the Waimakariri River.

ECan has not modelled Waimakariri River flood overflows on this part of the floodplain and is therefore not in a position to provide flood depths and associated return periods or Annual

Exceedance Probabilities for this site.

Please refer to the plan in Appendix I showing the flood plains in this general area.

The Draft Waimakariri River Floodplain Management Plan (CRC Report R91/9, July 1991), which was principally a technical document, identified that this area of the Waimakariri River floodplain is considered to be at risk from Waimakariri River overflows. This property was mapped as predominantly Flood Category C of five flood categories A to E where A has the greatest flooding risk and E the lowest. Flood Category A generally covers defined flood channels, Category B – areas where water will pond, usually at the lower reaches of the system, Categories C and D are areas extending out of defined flood channels onto broader areas of the floodplain or fringes of Category B areas and Category E are localised high areas where the risk of flooding is low.

The Waimakariri River flood control scheme is designed to contain a flow of 4730m³/sec with 1 metre of freeboard. The return period of this flow used in the Draft Waimakariri River Floodplain Management Plan, and based on 58 years of flow records to 1987, is approximately 450 years. The standard of the scheme is relatively high, however, it should be noted that there is a probability of river breakouts occurring at flows less than the design flood through the failure of the stopbanking system. In addition, aggradation or erosion can result in localised changes in bed levels which can affect the design capacity.

There is an area of the site that is partially affected by Category A flooding. This area encompasses the natural water channels and is shown as grey on the Services Concept Plan. Part of this flood area will be filled by approximately 1m to provide a building site but the secondary flooding flow channel will be maintained around the filling and through the site via the road network or dedicated corridors.

There is also a water race that flows through the centre of the site from Russley Road towards the south-east. This water race has been abandoned and will be filled as part of the site works. This water race is distinctive on the topographical plan.

1.8 Other Restrictions

High voltage overhead transmission lines: There are no high voltage power lines or any other significant utility services located on this site.

Flight Paths: The site is under the standard Christchurch International Airport flight paths. The issues attached to the flight paths are dealt with in the Planning Reports and are not commented on further here.

Emergency Services: The site is within the Christchurch City boundary and is therefore located within a reasonable response time for emergency services.

Site Contamination: Please refer to the Aurecon Report attached to the application.

2. DEVELOPMENT PROPOSAL AND EARTHWORKS

The Council proposes to rezone the site as an Industrial Park Zone to enable a range of business activities, primarily industrial but also including a hotel, commercial services and limited offices and retail. MAIL intends to seek provision for a wider range of commercial activities.

Once the zoning of the site is confirmed, the first stage of development will be a subdivision application to create roads, reserves and development areas.

The general approach will be to make the development areas as large and flat as possible to allow for as many potential development outcomes as might be expected. All lots will be sloped towards the road network or drainage swales at a minimum grade of 1 in 500.

Earthworks on the site will be required for the creation of the lots, building sites, road excavation & the respective berms, stormwater basins, filling of the water race, landscape shaping and swales. The earthworks operation will generally follow a process of topsoil stripping, removal of unsuitable material, cut to engineered fill, respreading of topsoil and grassing. It is expected that there will be a balance of materials on the site.

The shaping of the site earthworks will be carried out to ensure that the majority of the site drains towards Avonhead Road and a large primary stormwater system. The remainder of the site will drain towards Memorial Ave and a smaller, landscaped stormwater system.

Generally the site is covered with 250mm of topsoil over silts and sands and with gravel at depth.

Sediment and Dust Control will be in accordance with Environment Canterbury standards. A sediment control management plan will be compiled and presented to Council for approval as part of the potential subdivision consent application.

All earthworks will be completed to NZS4431:1989 standard. All testing of the earthworks will be carried out by an independent testing company, certified by the project engineer and presented to Council as part of the application for s224c certification.

The site and underlying soils are considered to be conducive to a simple earthworks operation involving motor scrapers and some finishing with excavators. This method of earthworks will be clean and efficient as a priority will be to have the soils disturbed for as short a time as possible.

3. ROADING

3.1 General

The proposed internal roading network for the development will utilise carriageway widths as described in the traffic assessment. All new roads will be vested in Council.

Two intersections to Memorial Avenue will be constructed and the new road alignment will connect directly through to two new intersections on Avonhead Road. Access to internal sites will be enhanced by an internal road network with potential for a lesser network of private ways and vehicular access. Should the development concept require these private accesses, their design parameters will be assessed at a later stage of subdivision.

Standard kerb and channel will contain the carriageway formation on most roads and direct stormwater runoff to kerb line sumps. The proposed road widths will generally facilitate two-way traffic with sufficient room for parking on both sides. Some minor roads and access will be one-way.

Footpaths to service the General Business Area are anticipated on both sides of the roading network.

There will be no new access from Russley Road onto the development site.

Existing farm crossings will be removed and the roadside swale reinstated.

The formation of Avonhead Road is currently to a rural standard with no kerb and channel or drainage. The berms have a gravel shoulder and are otherwise grassed with no table drainage. The existing kerb and channel on the northeastern side of Avonhead Road stops at the southern corner of the site. As part of the development of this site, the north-eastern side of Avonhead Road will be upgraded to an urban standard with kerb and channelling, footpath and drainage. The location of any new kerbing will be agreed with the City Council at the time of Engineering Approval.

The upgrading of Avonhead Road would occur in coordination with the construction of the proposed intersections onto Avonhead Road.

Streetlight design within the site and at the intersections onto Memorial Avenue and Avonhead Road will be to Christchurch City Council standards. Any additional street lighting on Avonhead Road will be the responsibility of the Christchurch City Council.

Additional details regarding the intersections onto Memorial Avenue and Avonhead Drive and other traffic related matters, are dealt with in the Traffic Assessment

3.2 Formation

Five scala penetrometer tests have been carried out on the site with varied results.

Please refer to Appendix J for the test results.

These results show a lowest soil bearing capacity of approximately 50kPa. This can be converted to an approximate California Bearing Ratio of 4. This in turn can estimate the depth of pavement

required for a heavy-duty street. It has been approximated that the depth of the pavement on this site will be 500-600mm.

Additional tests will be undertaken prior to any detailed design to ensure that the soil conditions are fully understood. Any soft or unsuitable material found in the subgrade will be removed and replaced with compacted granular fill.

It is intended that the road will be as much as possible 'Cut in' to source excavation volume and to allow the lots to be elevated.

All roads are to be surfaced with industrial standard Asphaltic Concrete to meet CCC standards. Some areas of the road surface may be paved with alternative wearing courses such as cobbles but these alternatives will be confirmed at the time of detailed design and approved under the engineering process.

The finished roading will be tested with a Benkleman Beam with a minimum requirement of 95% of all readings to be below 1.6mm maximum deflection and all deflection readings to be below 2mm.

3.3 Gradient

The road gradient will generally follow the existing ground contours, resulting in a low point south and east of the proposed subdivision. The existing ground has a gentle gradient to the south east that will allow an appropriate design to a minimum road gradient of 1 in 500.

The gradients of the roads will dictate the flow of primary and secondary stormwater safely around the proposed building sites to swales that will lead to the stormwater storage, treatment and disposal areas.

Exact road levels and gradients will be subject to more detailed design in accordance to CCC Infrastructure Design Standard and Council Standard Specification Part 6, 2013.

4. WASTEWATER RETICULATION

4.1 Existing wastewater infrastructure

The closest existing Council sewer network utilities, are located to the south of the site. A 300mm reinforced concrete gravity sewer constructed in 1994, is located in Avonhead Road. The pipe is offset from the MAIL site boundary by approximately 12.5m and is under the sealed road construction.

There are three manholes outside the site at a depth of approximately 4.0m below the road surface. The MAIL site has two existing domestic connections to this sewer. These connections service the two existing houses that access off Avonhead Road. The McVicar property also has a sewer connection, as has the International Motor Inn site.

The other properties within the MAIL ownership do not have connections and are not specifically allocated connections due to their rural status.

4.2 Servicing Constraints

Following analysis of the greater Christchurch sewage networks it appears that there is temporarily insufficient capacity in the network to meet this development's demand. This lack of capacity stems from the inadequate size the Southern Relief Sewer and the Riccarton Interceptor Sewer. The sewer upgrades currently being undertaken by Council will provide the required capacity by 2019 at the earliest.

An investigation has begun into ways in which this connection delay can be avoided. The potential for storage of the sewer flows for release at night has been discussed with Council. Council are now investigating this potential outcome through its modelling of the system to determine the optimum time of release and at what flow rate.

This is not a new methodology. Council have previously approved a similar system at an industrial subdivision in Hornby. It should also be noted that such an arrangement would be temporary until the downstream system was upgraded. This proposal will allow development to continue without unnecessary flooding of the sewer system.

4.3 Wastewater management

All business development areas within this site can fully gravitate sewage to the existing Council sewage infrastructure. No pump station is required.

Connection to the Council sewer main could be obtained by constructing a single manhole on the line of the existing pipe in Avonhead Road. The excavation of the road will be managed in terms of traffic and the road surface fully reinstated. To reduce traffic disruption as much as possible it is proposed that only one connection be made out onto the existing sewer in Avonhead Road.

The gravity sewers proposed within the proposed subdivision, will be 225mm PE pipes with associated manholes. The ground levels of the designed roads and the gradients of the pipes will

dictate the depth of the proposed manholes but our initial investigations show that sufficient cover to the proposed system will not be an issue.

Connections to individual properties within the proposed development will be detailed at the time of Subdivision Consent Application but these connections will be constructed in accordance with City Council and New Zealand Building Code standards.

Potential land uses include industrial, offices, retail, visitor accommodation, and other commercial services. However, the extent of each individual land use will be dictated by the decision on the zone rules and by the market.

We have adopted the CCC IDS for the existing B2 zone to estimate flows from the site. We have considered the land uses in B2 zone and think that it is the best estimate for the zoning proposed given that this will incorporate low flow producers (industrial) and some relatively high flow producers (hotel). From the CCC IDS, the B2 zone would provide a maximum sewer flow of around 18.2 l/s off the MAIL site. The total capacity of the existing 300mm sewer in Avonhead Road is over 50 l/s.

Council will use this flow rate in their calculations and modelling. This may alter as we progress through the planning process and gain a better understanding of the eventual land-uses, but the current estimate is suitable for determining capacity requirements at the rezoning stage.

Should the Council consider that the storage of flow and release during the night is acceptable, the storage volume will need to be established. An off line tank may need to be incorporated into the system but initially at least the storage can be provided by the pipes and manholes of the proposed system.

While it is acknowledged that trade waste discharges may occur from a development of this nature, it is not possible to determine the exact type or quantity of discharge at this stage.

Trade waste discharge approvals will need to be obtained from Council, in relation to each specific activity, as part of the building consent application process and accordingly matters as to quality and quantity will be addressed at that time.

5. STORMWATER

5.1 General

There is no formal City Council stormwater reticulation in the area to service this site.

Some preliminary geotechnical testing and investigations have been carried out on site and these show that the underlying soils are conducive to good soakage conditions.

The natural fall of the site is to the southeast to two low points. One in the southernmost corner of the site and the other in the natural flow channel adjacent to Memorial Avenue.

The site can be earthworked to ensure that the majority of the potential development will fall to the southern corner of the site. A single large stormwater disposal facility will be constructed in this location. The smaller remaining northern catchment will have some roof area that will go directly to ground, and an amount of road surface that we would expect to drain onto a specifically landscaped treatment and disposal area alongside Memorial Avenue. Any landscaped areas will drain directly to ground.

Due to the sites proximity to the airport, it is important to ensure that standing water is avoided. Water left standing for a prolonged period will attract birdlife and this in turn elevates the risk of birdstrike with aircraft. For this reason the use of swales and basins need to be restricted. We will only propose options here that recognise the airports requirements.

The proposed drainage network layout, and pipe size requirements, will be designed in accordance with Councils standard assessment criteria for the Business (industrial/commercial) zone. The stormwater design will also comply with the requirements of Christchurch City Council's Standard Specification, CSS: Parts 3: 2013, CCC IDS and the CCC Waterways, Wetland and Drainage Guide. The design will be approved by both Regional and City Councils and also the Airport Authority.

All pipes to be adopted by the City Council will be designed for a 1 in 5 year storm event. For all flows greater than this event a secondary flow path will be incorporated into the site. The secondary flow path will direct flows to the proposed road networks and onto the proposed stormwater disposal/storage areas.

The storage areas will take the shape of basins and will be designed in association with soakage structures, to contain up to a 1 in 50 year event. The storage basins will be fitted with soakage facilities to ensure that water from the 1 in 50 year event, is not standing in the basin for any period greater than 24 hours.

Should an event exceed the basin capacity, then the flows will be directed to safe overland flowpaths agreed in consultation with the Local Authorities. These flow paths will potentially be Memorial Avenue and Avonhead Road.

It is expected that the developer will maintain the constructed stormwater facilities for a period of two years after they are constructed. At the end of this period the Discharge Consent and all associated maintenance will be transferred to the City Council. Transfer will only take place once an inspection of the site has been accepted by the City Council and a fully complying monitoring report

has been obtained from Environment Canterbury.

Please refer to Stormwater Catchment Plan in Appendix C.

5.2 Christchurch City Council Requirements

Consultations have been carried out with Christchurch City Council (CCC) Engineer – Mr Brian Norton.

Mr Norton has provided the following advice:

- The site is too large to be considered under the CCC global consent.
- There is no suitable Council stormwater infrastructure available, so the development will need to investigate discharge to ground.
- The stormwater off roads and carparks will need to be treated, but proprietary devices such as Humeceptors, 360 Stormfilters and Hynds Upflow filters are not permitted in areas to be vested in Council.
- CCC would prefer the stormwater system for the site to be fully integrated. By this they mean that the stormwater should be collected to a single area for treatment and disposal.
- Typically the CCC would like to see a soil adsorption basin for the first flush treatment with some detention and rapid soakage to ground for larger events.
- The minimum storage volume required above ground is the runoff from a 10 year, 18 hour storm event. The storage required for the first flush volume can be included in this volume.
- The minimum depth of rainfall for the first flush volume will be 25mm.

Further consultation has been undertaken with Council Officer Mr Ken Couling with specific regards to the underlying Avon Global Consent held by the City Council. Mr Couling has asked that the project consider treepit raingardens as a potential method of treating and storing stormwater.

Please refer to Appendix F for a potential treepit concept.

All methods and levels of stormwater management referred to above can be achieved on the site, as discussed further below.

5.3 Environment Canterbury Requirements

Discharge of stormwater is currently governed by the operative Natural Resources Regional Plan (NRRP) and the proposed Land and Water Regional Plan (LWRP). While both plans currently apply, it is likely that the LWRP will be operative by the time development commences and accordingly consent will only be required under that plan.

Under the LWRP, applications to discharge from reticulated stormwater systems will be assessed as a restricted discretionary activity provided that conditions relating to preparation of a stormwater management plan and compliance with water quality limits can be met. The discharge of stormwater via private onsite treatment devices will be assessed as a discretionary activity.

However, it is our understanding that the interpretations of the LWRP rules are under review and that there may be some plan changes pending.

It is not anticipated that there will be any impediment to obtaining the required consents for the stormwater facilities proposed.

5.4 Stormwater off Roofs

Roof stormwater flows will be discharged directly to ground via a separate sealed system. It is expected that each eventual building will deal with its own consenting issues for roof stormwater disposal. However, an overriding consent can be obtained by the applicant and then applied to each new site by way of transfer.

5.5 Stormwater Hardstand Areas

The City Councils general stormwater requirements vary from the specific requirements in the vicinity of the airport. The key difference evolves from the need to avoid standing water near the airport because of potential for birdstrike. This differs from the preference for swales, basins and ponds promoted in the councils fundamental approach to stormwater treatment and attenuation. That general approach is based on treatment requirements as stormwater discharges into the city's groundwater recharge zone and essentially the city's drinking water.

In simple terms the developer will need a stormwater discharge consent approval from Environment Canterbury that is acceptable to the City Council's treatment requirements as they will eventually maintain the consent and also acceptable in the vicinity of the airport in regards to birdstrike.

The Airport avoids the use of storage/treatment systems such as swales and ponds by using a treatment device such as an Enviropod prior to discharging directly to ground via large soakholes. Currently, the City Council does not accept treatment devices such as Enviropods as part of its network due to maintenance concerns.

The Airport undertakes the maintenance of the treatment devices themselves and has kept the roads around the airport in private ownership.

This arrangement appears to suit both the City Council and the Airport and proprietary devices such as Enviropods may be able to be used in the treatment of the stormwater on the MAIL proposed development area but only within the context of private drainage. CCC will not consider these devices for the land to be vested.

We have formulated two options for the disposal of stormwater off hardstanding areas. These two options can be loosely referred to as:

a) The Public Option

b) The Public/Private Option

The **Public Option** involves the collection of all stormwater from hardstanding within the catchment, including both public roads and private carparks etc. All stormwater will be conveyed to an integrated stormwater facility that will eventually be vested in Council as a Public Asset.

Although consultation may need to be undertaken with the Airport, our experience with similar situations on developments near the airport has led us to recommending a stormwater infiltration soakage system that allows the 1 in 50 year critical storm event to be ponded for no longer than 24 hours.

In terms of stormwater treatment, the stormwater from roads, and on-site hardstanding areas, will be collected via trapped roadside sumps and piped through the site. These flows will be directed onto infiltration basins where soakage to ground will occur via a layer of sand/soil/mulch mix before dispersing into the underlying gravels.

The infiltration basins will be designed to meet specific industry standard treatment guidelines.

The stormwater basin will be grassed and landscaped to provide easy maintenance. All embankments will not exceed grades of 1 in 4. There will be an average width of 5m between the top of the embankments and neighbouring private land boundaries. All traps and sumps will be readily accessible by truck for the purposes of cleaning and maintenance.

Please refer to Option 1 in our preliminary calculations as provided in Appendix E. The estimated volume required to be stored on site exceeds 11,000cu.m. This volume will result in an excessive amount of land dedicated to stormwater management and is MAIL's least favoured option.

The **Public/Private Option** is slightly different. This Option requires each private development site to install its own treatment and disposal structure similar to the Airport. A proprietary treatment device and soakhole can be designed on each site to suit the area of hardstanding and meet the 1 in 10 year critical storm flow. The treatment device would be a Stormfilter or similar approved.

All flows greater than the 1 in 10 year event would be discharged off the private sites into the public drainage system.

The private systems would be maintained under individual discharge consents held by the private owners or otherwise by a Body Corporate. A Body Corporate will be created for the development to deal with a number of other coordination and management issues.

Public integrated stormwater systems with disposal facility and storage would still be required to deal with roads and reserves. However, under this option the public system would be scaled down to meet the reduced catchment size being the vested land only. Please refer to the catchment plan in Appendix E.

The estimated volume from the vested land and required to be stored on site amounts to approximately 3800cu.m. This volume is able to be stored within the landscape and allocated basin areas in the urban design. The main basin will be installed on a large central reserve at the southern end of the site.

Specific landscape design will be carried out to Council approval as part of the detailed design.

As discussed previously, the Council may also consider treepit raingardens as an option for the treatment and storage of stormwater off roads. The use of the treepits would reduce the amount of pipework in the development and would also reduce the amount of storage required. This option would need to be considered closer to detailed design but should be included at the time of this

application as a potential outcome.

The Public/Private option is preferred and is the basis for identification of the stormwater management areas in the Outliner Development Plan.

5.6 Stormwater Control During Construction

There will be a discharge consent required from Environment Canterbury for the stormwater runoff during construction. It is expected that the construction runoff will be dealt with on a far smaller scale with each individual development stage or building site dealing with their own stormwater. It is our expectation that consent be obtained for the whole site describing a basic methodology in compliance with the Environment Canterbury, Erosion and Sediment Control Guidelines. Following this, each site will need to compile a Sediment Control Management Plan and present it to the Local Authorities prior to works commencing.

6. WATER RETICULATION

6.1 Existing water supply network

For the purposes of future water connections to the site, there is an existing City Council water supply pipe in both Memorial Avenue and Avonhead Road. The pipe in Memorial Avenue is a 100mm dia pipe and the pipe in Avonhead Road is 150mm dia. Both pipes originate from the city as opposed to the airport and terminate part way along the site frontage.

The closest CCC primary water pumping station is in the nearby Burnside Park.

6.2 Proposed water supply network

Subject to final Council modelling, it is proposed that the site will be serviced from connections to the existing infrastructure. The existing watermains on Avonhead Road and Memorial Avenue will provide inadequate flows and pressure. It is currently intended that a pipe will be laid from Roydvale Ave, along Memorial Ave to the site, through the site to Avonhead Road and finally along Avonhead Road to a main in Hawthorndon Road. This connection will provide a loop to two existing pipes. This connection will improve the reliability of service to the area

The internal network of the site will be designed to the City Council's business standard (industrial/commercial). This will include standards for pipe sizes, residual water pressures and flows.

If it is determined, following the CCC modelling of the greater area, that there is an actual shortfall in water supply and pressure in the vicinity of the site, supply can be improved by a number of means, including the provision of booster pump stations, upgrading pipe sizes, upgrading the existing pumps and additional public water supply bores.

A more in-depth modelling exercise of the site network will be undertaken prior to any detailed water supply design and this would likely incorporate the other potential business development land in the area. This would be done in conjunction with a better understanding of the site's potential demand following confirmation of the zone provisions. At this stage, we have tested credible development scenarios and conclude that it is likely that sufficient groundwater is available should on-site water be required.

In addition to this, reference will be made to SNZ PAS 4509:2008 New Zealand Fire Service Firefighting Water Supplies Code of Practice. This code of practice distinguishes between sprinklered and non-sprinklered buildings and also the size of fire cells. These features will have an effect on actual fire fighting water demand.

7. ELECTRICITY SUPPLY

A request has been forwarded to Orion for confirmation that their network can provide 200 commercial connections to the Proposed Plan Change proposal. This number of connections is an estimate and will require refining as the project evolves.

The 200 connections have been confirmed but it is difficult for Orion to gauge the capacity required to supply the proposal and therefore the exact nature of the Electricity Supply solution is difficult to determine at this stage. The timing of this development relative to other developments in the area could also affect the detailed design.

In general, capacity to this site will be from Orions Hawthornden substation in Hawthornden Road with a back-up supply from their Bishopdale switching station. Initially Orion would utilise the existing cable capacity in Avonhead Road and as load grows, this would be reinforced with a new cable supply from Hawthornden substation.

To provide a back-up supply from Bishopdale, Orion would also require cable access to Memorial Avenue at both the west and east ends of the Proposed Plan Change development area. Roading plans should take this into account.

The number of kiosks and LV boundary pillars will be determined when the number of Lots have been realised.

All cabling will be placed underground.

All works would be completed in compliance with Orion's Electricity Network Design Standards.

8. TELECOMMUNICATIONS

As with the electricity supply, the demand for telecommunications connections is still yet to be determined. In the absence of definitive demands, a request has been made to Chorus (Telecom) for 200 connections.

Chorus have returned to us with confirmation that they have the ability to extend their network to provide these 200 connections.

9. CONCLUSION

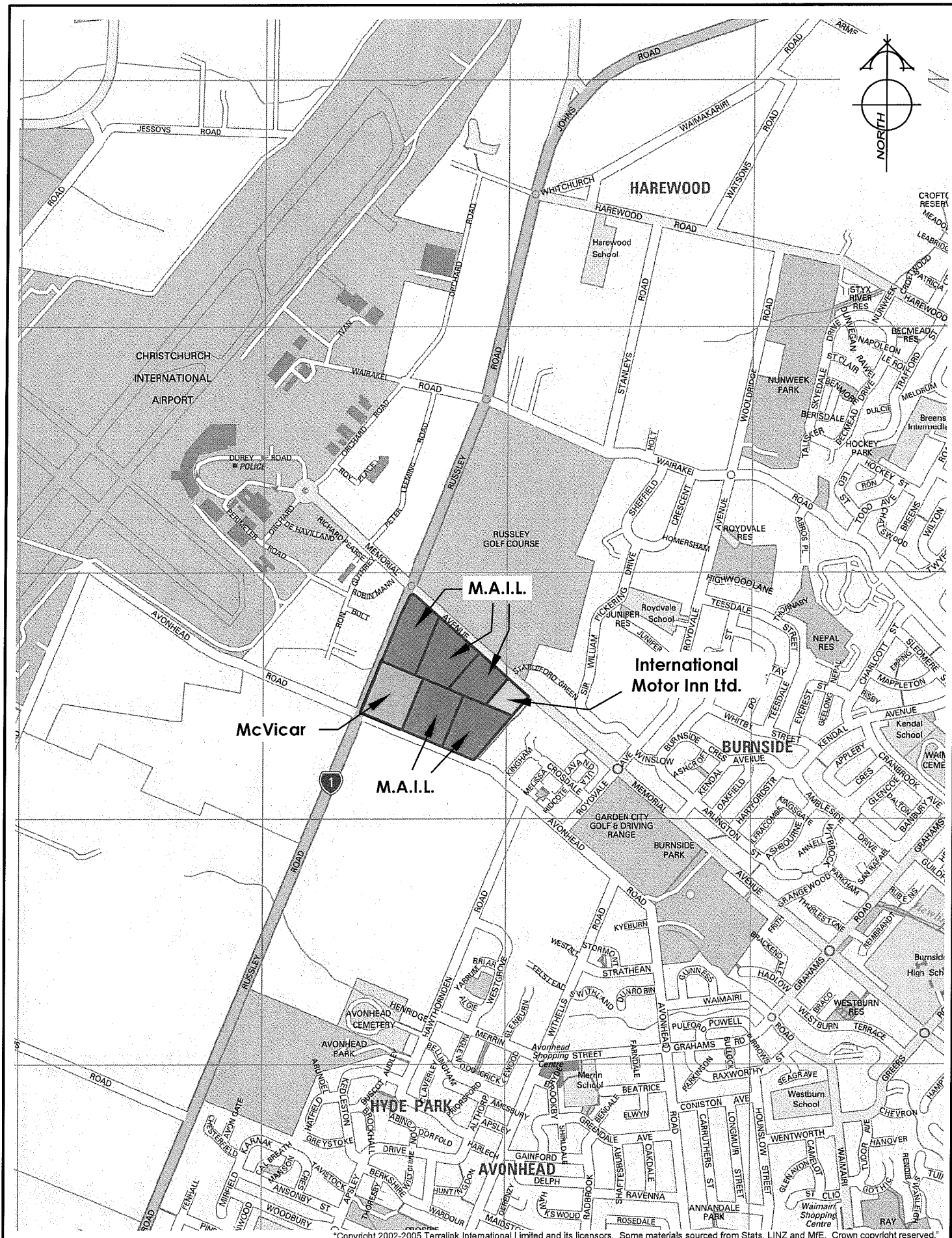
Our investigations and consultation with the City Council have led us to an agreed understanding that the land described in this Report can be partially serviced with infrastructure immediately and fully serviced once the Council's sewage upgrades are completed.

The discharge of stormwater will be to ground and it is not expected that there will be any difficulties in obtaining discharge consents from Environment Canterbury. The methods of discharge will also be agreed with the City Council.

The water supply will reticulate between Memorial Ave and Avonhead Road. This will improve the pressure and supply in the area. Council are in the process of completing modelling in the area but are confident a solution can be found.

The availability of infrastructure is not an issue that prevents this subject land being re-zoned.

APPENDIX A – Location Plan



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DAVIE LOVELL • SMITH
PLANNING SURVEYING ENGINEERING

79 Cambridge Terrace
PO Box 679 Christchurch 8140,
New Zealand
Tele 0-3-3790 793
Fax 0-3-3795 664
E-mail: office@dls.co.nz

Location Plan Memorial Avenue Christchurch

Scale: 1:20000@A4

Date: May 09

Drawing No: S.17215

J:\17215\Location Plan.dwg

APPENDIX B – Topographical Plan

AMENDMENTS:	
AMENDMENT	DESCRIPTION

NOTES:

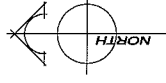
- 1) This plan has been prepared for topographic purposes only. No liability is accepted if the plan is used for any other purposes.
- 2) Any measurements taken from information which is not dimensioned on the electronic copy are at the risk of the recipient.

Origin of Levels:
Bench Mark 3028 R.L.35.403 Located corner of Rusley Road and Memorial Avenue.

Site Benchmark Iron Tube 1 R.L.35.825

Levels in terms of Christchurch Drainage Datum.

Contour Interval 0.20 metres.



Sheet 2

Sheet 3

Inset Sheet 3

Sheet 4

Sheet 5

- Legend
- KERB
 - BOUNDARY LINE
 - EDGE OF SEAL
 - FENCE LINE
 - TOP OF BANK
 - BOTTOM OF BANK
 - ground level
 - top of kerb level
 - sewer manhole
 - stormwater manhole
 - edge of metal
 - edge of seal
 - power pole
 - water meter
 - sump



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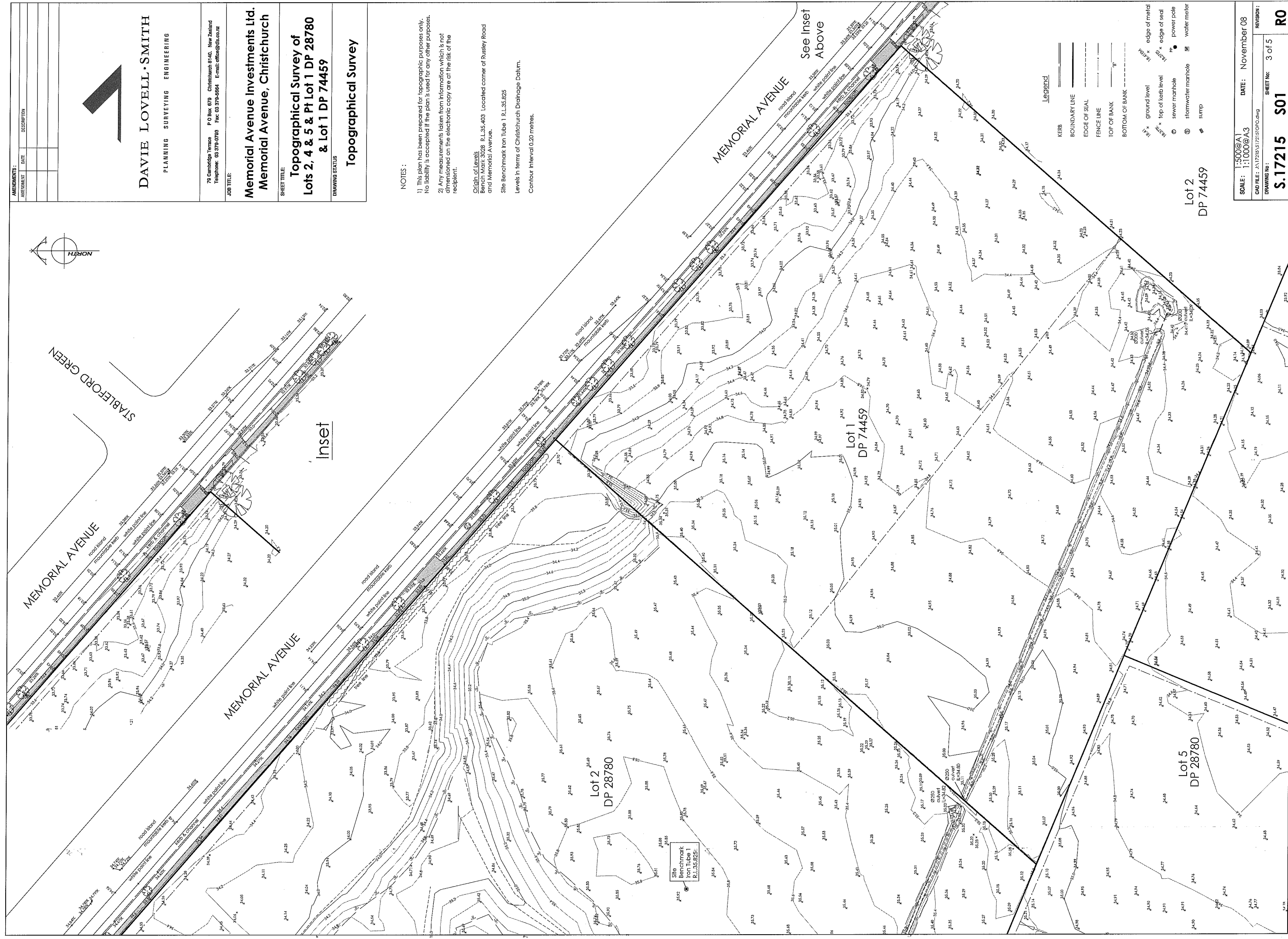
79 Cambridge Terrace P O Box 679 Christchurch 8140, New Zealand
Telephone: 03 379-0763 Fax: 03 379-6964 E-mail: office@ds.co.nz

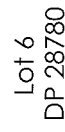
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**Memorial Avenue Investments Ltd.
Memorial Avenue, Christchurch**

SHEET TITLE:
**Topographical Survey of
Lots 2, 4 & 5 & Pt Lot 1 DP 28780
& Lot 1 DP 74459**

DRAWING STATUS
Topographical Survey

SCALE: 1:1250@A1 1:2500@A3	DATE: November 08	REVISION: SHEET No: 1 of 5 S.17215 S01 R0
CAD FILE: J17215\17215TOP.dwg DRAWING No:		





Lot 6
DP 28780



- 1) This plan has been prepared for topographic purposes only. No liability is accepted if the plan is used for any other purposes.
- 2) Any measurements taken from information which is not dimensioned on the electronic copy are at the risk of the recipient.

Origin of Levels
Bench Mark 3028 R.L.35.403 Located corner of Rustley Road and Memorial Avenue.

Site Benchmark Iron Tube 1 R.L.35.825

Levels in Terms of Christchurch Drainage Datum.

Contour Interval 0.20 metres.

Legend

KERB		edge of metal kerb
BOUNDARY LINE		edge of road
EDGE OF SEAL		power pole
FENCE LINE		water meter
TOP OF BANK		
BOTTOM OF BANK		
ground level		
top of kerb level		
sewer manhole		
stormwater manhole		
stump		


SCALE: 1:500@A1
1:1000@A3

DATE: November 08

CAD FILE: J:\17215\17215TOPO.dwg	REVISION:
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DRAWING No: **S.17215 S01** SHEET No: **4 of 5** **R0**

AMENDMENTS:		DATE		DESCRIPTION	



DAVIE LOVELL • SMITH

PLANNING SURVEYING ENGINEERING

78 Cambridge Terrace
 Telephone: 03 379-0793
 P O Box 679 Christchurch 8140, New Zealand
 Fax: 03 379-5564 E-mail: office@dls.co.nz

JOB TITLE:

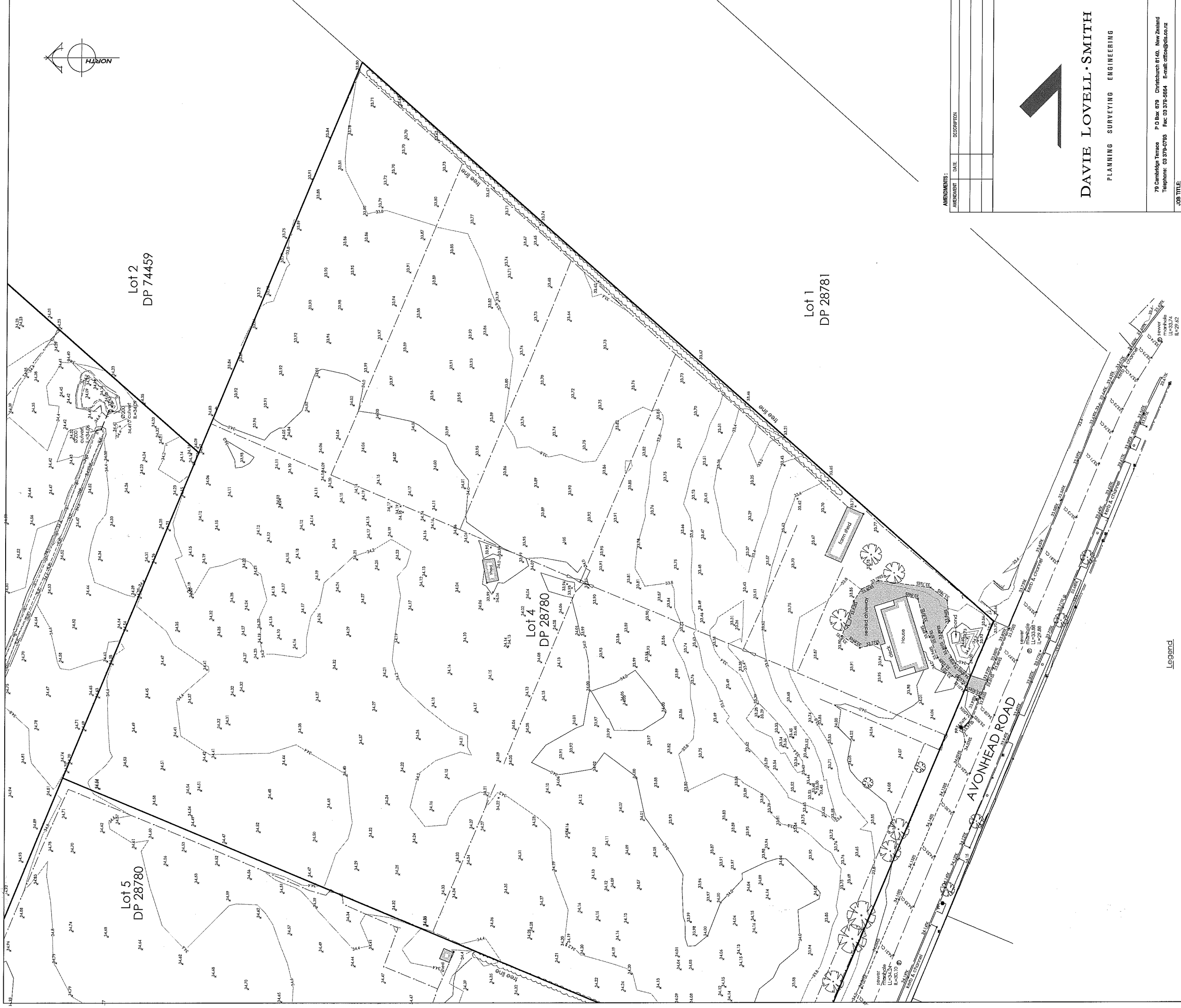
**Memorial Avenue Investments Ltd.
 Memorial Avenue, Christchurch**

SHEET TITLE:

**Topographical Survey of
 Lots 2, 4 & 5 & Pt Lot 1 DP 28780
 & Lot 1 DP 74459**

DRAWING STATUS

Topographical Survey



AMENDMENTS:	
AMENDMENT	DATE



DAVIE LOVELL-SMITH

PLANNING SURVEYING ENGINEERING

79 Cambridge Terrace P O Box 679 Christchurch 8140, New Zealand
Telephone: 03 375-0795 Fax: 03 375-5864 E-mail: dms@dsl.co.nz

JOB TITLE:

Memorial Avenue Investments Ltd.
Memorial Avenue, Christchurch

Topographical Survey of
Lots 2, 4 & 5 & Pt Lot 1 DP 28780
& Lot 1 DP 74459

Topographical Survey

SCALE: 1:500@A1
1:1000@A3

DATE: November 08

REVISION:
DRAWING No.: S.17215
SHEET No: 5 of 5

R0

- Legend
- KERB
 - BOUNDARY LINE
 - EDGE OF SEAL
 - FENCE LINE
 - TOP OF BANK
 - BOTTOM OF BANK
 - 1st x ground level
 - 1st x top of kerb level
 - sewer manhole
 - stormwater manhole
 - sump
 - 1st x edge of metal
 - 1st x edge of seal
 - power pole
 - water meter

NOTES:

1) This plan has been prepared for topographic purposes only.
No liability is accepted if the plan is used for any other purposes.

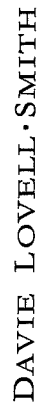
2) Any measurements taken from information which is not
dimensioned on the electronic copy are at the risk of the
recipient.

Origin of Levels
Bench Mark 3028 R.L.35.403 Located corner of Rusley Road
and Memorial Avenue.

Site Benchmark Iron Tube 1 R.L.35.825

Levels in terms of Christchurch Drainage Datum.

Contour Interval 0.20 metres.



PLANNING SURVEYING ENGINEERING

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**Memorial Avenue Investments Ltd.
Memorial Avenue, Christchurch**

SHEET TITLE:
**Topographical Survey of
Lots 2, 4 & 5 & Pt Lot 1 DP 28780
& Lot 1 DP 74459**

Topographical Survey



NOTES:

- 1) This plan has been prepared for topographic purposes only. No liability is accepted if the plan is used for any other purposes.
- 2) Any measurements taken from information which is not dimensioned on the electronic copy are at the risk of the recipient.

Origin of Levels
Bench Mark 3028 R.L.35.403 Located corner of Russley Road and Memorial Avenue.

Site Benchmark Iron Tube 1 R.L.35.825

Levels in terms of Christchurch Drainage Datum.

Contour Interval 0.20 metres.

SCALE: 1:500@A1
1:1000@A3

DATE: November 08

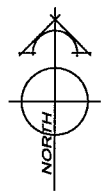
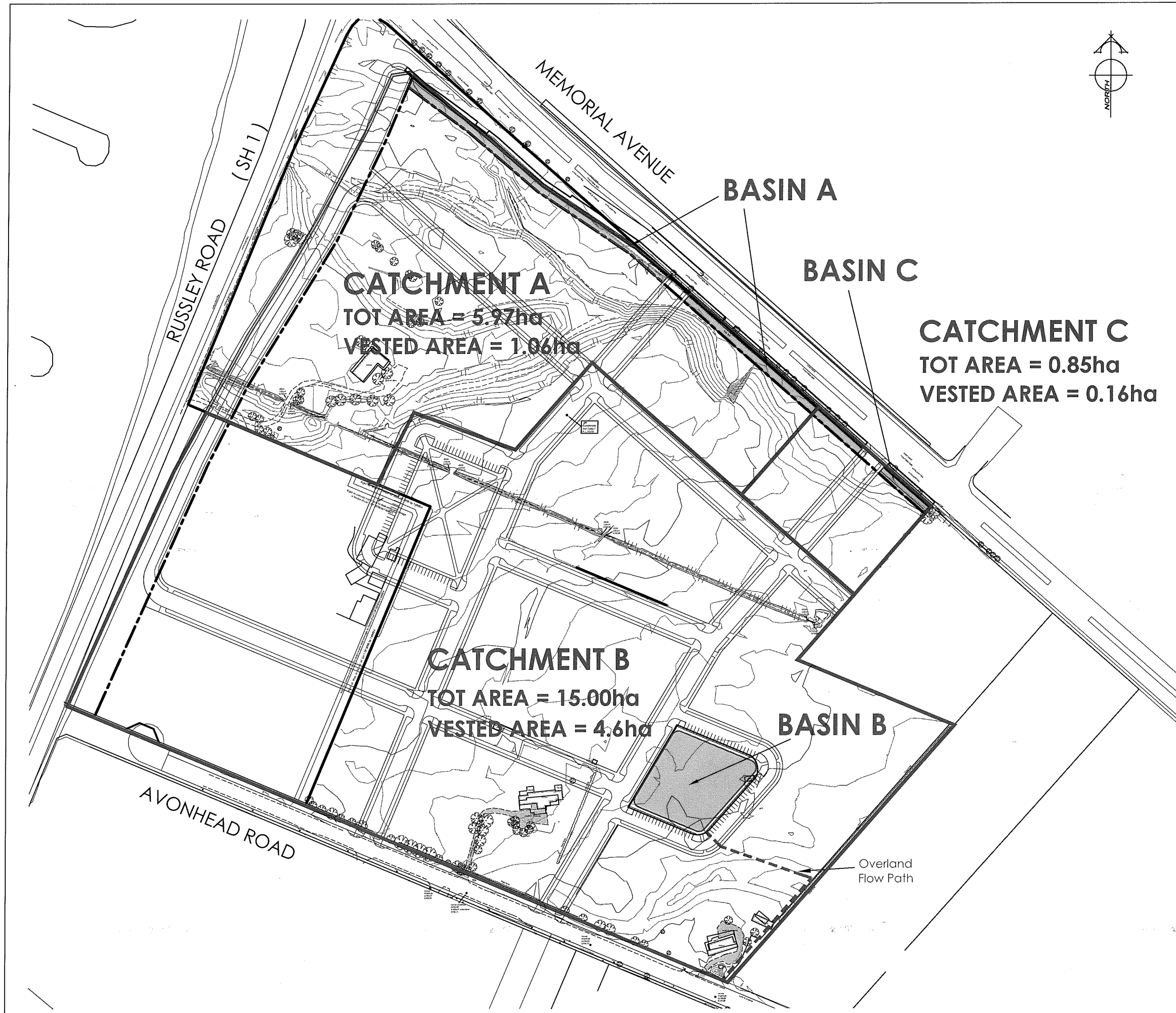
CAD FILE: J:\17215\17215TOPO.dwg

DRAWING No : S.17215 S01

REVISION :	
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SHEET No: 2 of 5

APPENDIX C – Stormwater Catchment Plan



AMENDMENTS :		
AMENDMENT	DATE	DESCRIPTION
R1	13/12	BASIN A AMENDED

NOTES :

1) This plan has been prepared for conceptual engineering design purposes only. No liability is accepted if the plan is used for any other purposes.

2) Any measurements taken from information which is not dimensioned on the electronic copy are at the risk of the recipient.

3) All proposed sewer pipes to be 225Ø.

Origin of Levels
Bench Mark 3028 R.L.35.403 Located corner of Russley Road and Memorial Avenue.

Site Benchmark Iron Tube 1 R.L.35.825

Levels in terms of Christchurch Drainage Datum.

Contour Interval 0.20 metres.



DAVIE LOVELL-SMITH
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Telephone: 03 379-0793 Fax: 03 379-5664 E-mail: office@dls.co.nz

JOB TITLE :
Memorial Avenue Investments Ltd.
Memorial Avenue, Christchurch

SHEET TITLE :
STORMWATER CONCEPT PLAN

DRAWING STATUS
INFORMATION

SCALE: 1:2500@A3	DATE: December 2013
CAD FILE: J:\17215\17215 SW CONCEPT R1.dwg	REVISION:
DRAWING No: S17215	SHEET No: S.01
	R1

APPENDIX D – Stormwater Calculations

MAIL Stormwater Calculation

17215

20/12/2013

AJEH

Ref Brian Norton Email 12-8-13

Minimum storage volume of basins is to be the runoff from a 10 year 18 hour storm.

First Flush to be 25mm depth

Soakhole to contain for the 50 year event

Roof water can go directly to ground

Please also refer to the catchment plan.

2 Options

OPTION 1 - All of the catchment is to be treated in integrated basins and soakholes

OPTION 2 - Vested land only is to be treated in integrated basins and soakholes

OPTION 1

Catchment A

Area of Catchment A = 5.97 ha

Estimate 20% of site in roofs = 1.194 ha

Area to be used for treatment calculations = 4.776 ha

First flush volume required = 1074.6 cu.m Ref: WWDG

Storage required for a 10 year 18 hour event

Once again ignore roof area

Intensity = 4.69 mm/hr

0.001303 mm/s Ref: WWDG

C = 0.77 Ref: WWDG

Q = 47.90991 l/s

Vol over 18 hours = **3104.562 cu.m**

Catchment B

Area of Catchment B = 15 ha

Estimate 20% of site in roofs = 3 ha

Area to be used for treatment calculations = 12 ha

First flush volume required = 2700 cu.m Ref: WWDG

Storage required for a 10 year 18 hour event

Once again ignore roof area

Intensity = 4.69 mm/hr

0.001303 mm/s Ref: WWDG

C = 0.77 Ref: WWDG

Q = 120.3767 l/s

Vol over 18 hours = **7800.408 cu.m**

Catchment C

Area of Catchment B = 0.85 ha

Estimate 20% of site in roofs = 0.17 ha

Area to be used for treatment calculations = 0.68 ha

First flush volume required = 153 cu.m Ref: WWDG

Storage required for a 10 year 18 hour event

Once again ignore roof area

Intensity = 4.69 mm/hr

0.001303 mm/s Ref: WWDG

C = 0.77 Ref: WWDG

Q = 6.821344 l/s

Vol over 18 hours = **442.0231 cu.m**

OPTION 2 (vested land only)

Catchment A

Area of Catchment A = 1.06 ha
Estimate 20% of site in roofs = 0 ha
Area to be used for treatment calculations = 1.06 ha

First flush volume required = 238.5 cu.m Ref: WWDG

Storage required for a 10 year 18 hour event

Once again ignore roof area

Intensity = 4.69 mm/hr
0.001303 mm/s

Ref: WWDG

C = 0.77

Ref: WWDG

Q = 10.63327 l/s

Vol over 18 hours = **689.036 cu.m**

Catchment B

Area of Catchment B = 4.6 ha
Estimate 20% of site in roofs = 0 ha
Area to be used for treatment calculations = 4.6 ha

First flush volume required = 1035 cu.m Ref: WWDG

Storage required for a 10 year 18 hour event

Once again ignore roof area

Intensity = 4.69 mm/hr
0.001303 mm/s

Ref: WWDG

C = 0.77

Ref: WWDG

Q = 46.14439 l/s

Vol over 18 hours = **2990.156 cu.m**

Catchment C

Area of Catchment B = 0.16 ha
Estimate 20% of site in roofs = 0 ha
Area to be used for treatment calculations = 0.16 ha

First flush volume required = 36 cu.m Ref: WWDG

Storage required for a 10 year 18 hour event

Once again ignore roof area

Intensity = 4.69 mm/hr
0.001303 mm/s

Ref: WWDG

C = 0.77

Ref: WWDG

Q = 1.605022 l/s

Vol over 18 hours = **104.0054 cu.m**

APPENDIE E – Treepit Specimen Design

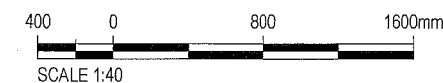


1:40

1. MINIMUM FILTER MEDIA SOIL DEPTH TO SUSTAIN A HEALTHY TREE WHEN SELECTED TREE SPECIES SUITABLE FOR DRY SOIL MEDIA. IF A SHALLOWER FILTER MEDIA IS REQUIRED (DUE TO DEPTH OF RECEIVING STORMWATER PIPE) THEN THE TREE SPECIES MUST BE CAREFULLY SELECTED TO GROW IN THESE CONDITIONS. MINIMUM FILTER MEDIA DEPTH IS 300
2. ALL DIMENSIONS IN MILLIMETRES UNLESS SHOWN OTHERWISE.



NTS



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[illegible]

SCALE	SIZE
1:40	A3
DRAWN	
D.NICHOLSON	
DESIGNED	
M.STONE	
CHECKED	
P.CHRISTENSEN	

PRELIMINARY
NOT FOR CONSTRUCTION

APPROVED

DATE
06/12/13

D. Alderton

D. ALDERTON

PROJECT	AVON SMP BLUEPRINT					
TITLE	TREE PIT SPECIMEN DESIGN OPTIMAL LAYOUT					
DRAWING No.	PROJECT No.	VRB	TYPE	DES	NUMBER	REV
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