

HAINES

PLANNING

■ **ATLAS CONCRETE LIMITED**

Plan Change Request
for the Proposed
Business 9 Rezoning of
land at 7-11 Wairau
Road & 8-12 Thornton
Road, Takapuna

Specialist Annexures

Document 4 of 4

■ **JUNE 2012**

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HAINES

PLANNING

■ ANNEXURE 1

Integrated Transport
Assessment

Atlas Concrete, Wairau Road

Proposed Plan Change

Integrated Transport Assessment Report

November 2011

Traffic Design Group



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Atlas Concrete, Wairau Road

Proposed Plan Change

Integrated Transport Assessment Report Quality Assurance Statement

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Status: Final Report (updated)

Date: 1 November 2011

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1. Introduction

Traffic Design Group Limited (TDG) has been commissioned by Atlas Concrete to provide an Integrated Transportation Assessment (ITA) for a proposed change to the North Shore City Council (NSCC) District Plan 2002 (District Plan) in support of rezoning of lots at 7, 9 and 11 Wairau Road, and 8, 10 and 12 Thornton Road (Plan Change area) from Residential 4A and Residential 7 to Business 9. This report addresses the potential traffic effects associated with the change from Residential 4A/7 to Business 9 zoning.

The key traffic planning matters that will be addressed in this assessment are:

- the existing traffic environment on Wairau Road
- the suitability of the proposed vehicle access location
- the traffic effects associated with a change from a Residential zone to a Business zone
- whether Wairau Road can accommodate the expected trips generated by commercial activity at the newly zoned lots.

These and other matters will be addressed in detail in the following report.

By way of summary however, it is considered that the hypothetical increase in vehicle movements brought about by a Business 9 rezoning can be accommodated in such a way that the effects on the function, capacity and safety of the surrounding road network will be acceptable.

2. Site Description

2.1 Site Location

The Plan Change area encompasses the existing residential lots at 7, 9 and 11 Wairau Road as well as 8, 10 and 12 Thornton Road. **Figure 1** is an aerial view of the proposed Plan Change area.

The broad relationship of the site to the surrounding features includes:

- Wairau Road to the southwest with Westlake Girls High School opposite and State Highway 1 Northern Motorway further southwest.
- Thornton Road and Residential 4A zoning to the northeast.
- Residential 4A to the southeast with Shakespeare Road and North Shore Hospital further southeast.
- Atlas Concrete batching plant and the Wairau Stream to the northwest with Forrest Hill Road further northwest.

The Plan Change area is currently zoned Residential 4A and Residential 7 in the District Plan.

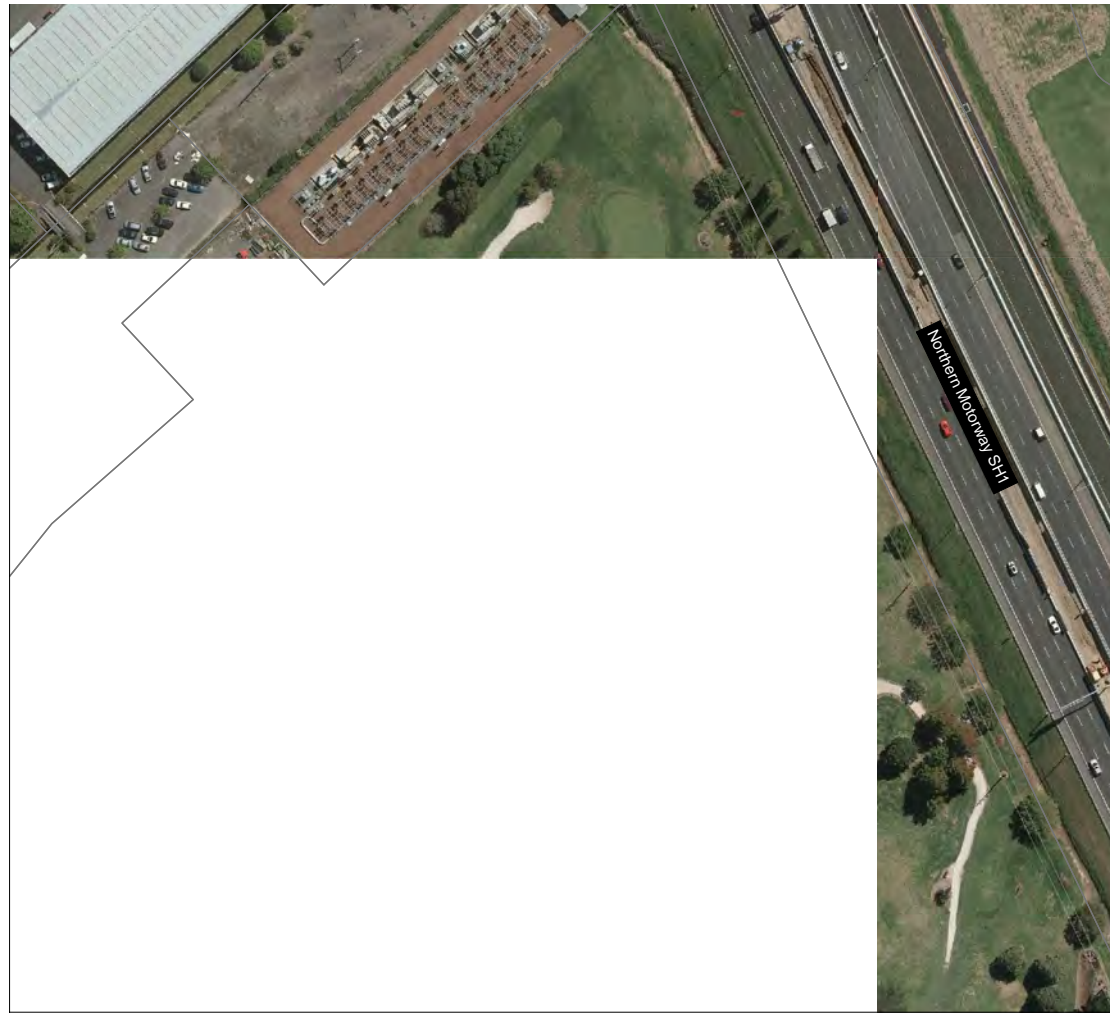
2.2 Future Network Improvements

Over the past five years NSCC has been progressing with the Wairau Road – Taharoto Road Corridor Upgrade (Corridor Upgrade). This eight stage corridor upgrading project is partially completed.

2.2.1 Works Complete

Stages 1, 2 and 4 of the Corridor Upgrade were completed in January 2010. These Stages include:

- Stage 1 – Widening of Wairau Road on the southern side (outside Westlake Girls High School). It includes wider footpaths and landscaping, an additional southbound traffic lane, flush median for better safety between the opposing traffic lanes and a new bus lane. Provision has also been made for on-road cycle lanes to be installed as part of the Stage 3, 6 and 8 works.
- Stage 2 – upgrade of the Shakespeare Road / Taharoto Road / Wairau Road intersection to include bus priority lanes, wider traffic islands for pedestrians and on-road cycle lanes.
- Stage 4 – widening of Taharoto Road between Shakespeare Road and Shea Terrace. These works also include a new paved footpath, on-road cycle lane, additional southbound traffic lane, undergrounding of services, road resealing and a recessed bus bay, and
- Stage 7 – Upgrade of Shakespeare Road. This has been carried out by a private developer as part of their consent conditions.



Friday, 21 May 2010

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Atlas Concrete, Wairau Road
Aerial of Site

2.2.2 Works Commenced

The relocation of services and associated construction work is to commence for the following stages in early 2012:

- Stage 6 – Forrest Hill Road / Nile Road intersection improvements including bus priority lanes, pedestrian crossings, and additional traffic lanes, and
- Stage 8 – upgrade of Forrest Hill Road / Wairau Road intersection including the upgrade of the existing traffic bridge, bus priority lanes, pedestrian crossing facilities and on-road cycle lanes.

2.2.3 Upcoming Work

Upcoming work within the Corridor Upgrade includes Stages 3 and 5. Stage 3 is currently at the initial design phase. These Stages include the following works:

- Stage 3 – Widening of Wairau Road on the northern side (outside of the subject site), and
- Stage 5 – Safety improvements for the Taharoto Road / Northcote Road intersection

The improvements of the Corridor Upgrade are designed to ease levels of traffic congestion along this corridor during the peak periods as well as improve public transport facilities.

3. Existing Transportation Environment

3.1 Site Access

The lots at 7, 9 and 11 Wairau Road included in the Plan Change area each have a formed vehicle crossing, only one of which is currently in operation. Similarly, 8, 10 and 12 Thornton Road each have vehicle crossings servicing the residential dwellings located there.

3.2 Road Network

Figure 2 shows the road hierarchy of the surrounding streets as set out in the District Plan.

Wairau Road to the southwest of the site is classified as a Regional Arterial. Regional arterials serve a function of strategic importance between regions or within districts. These roads generally provide access to significant areas of population and provide significant inter-urban links. Access to and from properties is allowed but may be restricted. Wairau Road provides access to the Glenfield business area for surrounding suburbs and the Northern Motorway, and links to other business areas to the south. A number of businesses currently have vehicle access from Wairau Road.

The carriageway currently has two traffic lanes in each direction of travel and a sealed width of approximately 16.5m. The traffic lanes are separated by a flush median that has a maximum width of approximately 3m. The central median is used as a bus lane for a portion of the route fronting the site. To the north of the site, one of the northbound lanes is used as an exclusive right-turn lane into Forrest Hill Road.

Photograph 1 below shows a typical section of Wairau Road fronting the site.



Photograph 1: Wairau Road, looking southeast from the Westlake Girl High School access traffic signals

Forrest Hill Road, which intersects with Wairau Road to the north of the site, is defined as a Regional Arterial. As an arterial route, Forrest Hill Road provides access from the eastern suburbs of North Shore City to Wairau Road which links to the Northern Motorway, the Glenfield business area, and other business areas to the south.

Forrest Hill Road has one traffic lane in each direction of travel with a sealed width of approximately 12.5m. Beyond the intersections with Wairau Road and Nile Road there is parking on both sides of the road.

Photograph 2 below shows the Forrest Hill Road at the intersection with Wairau Road.



Photograph 2: Forrest Hill Road at the Wairau Road intersection, looking north

Shakespeare Road, which intersects with Wairau Road to the south of the site, is defined as a District Arterial. These are roads which cater primarily for traffic movement between major areas of the city and are of strategic importance, a function which is shared with primary arterials. District arterials provide important links between residential, business, or recreational land use activities. Shakespeare Road provides links between residential suburbs to the east of North Shore City and the business areas to the north and south.

Shakespeare Road has one traffic lane in each direction of travel with a sealed width of approximately 12m. Shakespeare Road widens significantly at its southern end to provide for bus priority lanes, wider traffic islands for pedestrians and on-road cycle lanes (as part of the already completed Stage 2 of the Corridor Upgrade).

Photograph 3 below shows Shakespeare Road at the intersection with Wairau Road. Shakespeare Road is the left leg of the intersection in this image.



Photograph 3: Artist's impression of the Wairau Road / Shakespeare Road / Taharoto Road intersection

The intersections of Wairau Road with Forrest Hill Road to the north of the site and Shakespeare Road to the south of the site are both signal-controlled.

3.3 Traffic Flows

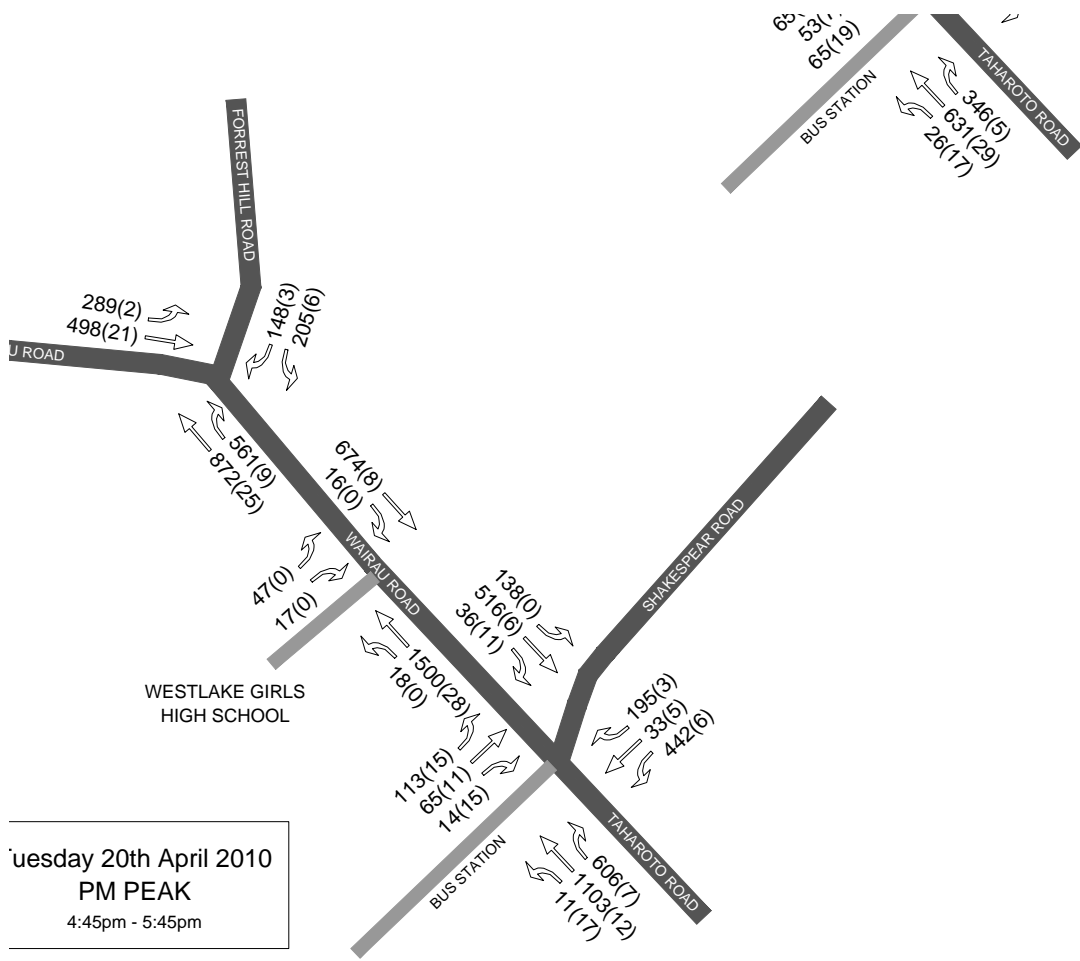
Turning and through traffic movements through the intersections of Wairau Road / Forrest Hill Road and Wairau Road / Shakespeare Road were surveyed on Tuesday 20 April 2010 from 7:00am – 9:00am and from 2:45pm – 6:00pm.

Whilst this data is now a little over 12 months old there have been no significant changes to the local traffic environment since the counts were undertaken. Thus this data is considered to still be representative of the existing traffic conditions.

The weekday morning and afternoon peak hours of the intersections were found to be 7:45am – 8:45am and 4:30pm – 5:30pm, respectively.

Figure 3 shows the surveyed volumes for the weekday AM and PM peak hours.

In addition to this, daily traffic volumes for Wairau Road were collected over the entire course of Tuesday, 20 April 2010 using pneumatic tube counts. The two-way daily traffic volume was found to be approximately 26,600 vehicles per day.



Tuesday 20th April 2010
 PM PEAK
 4:45pm - 5:45pm

crete, Wairau Road
 Intersection Traffic Volumes



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Chart 1 below shows the profile of traffic volumes in 15 minute intervals over the entire day on Tuesday, 20 April 2010.

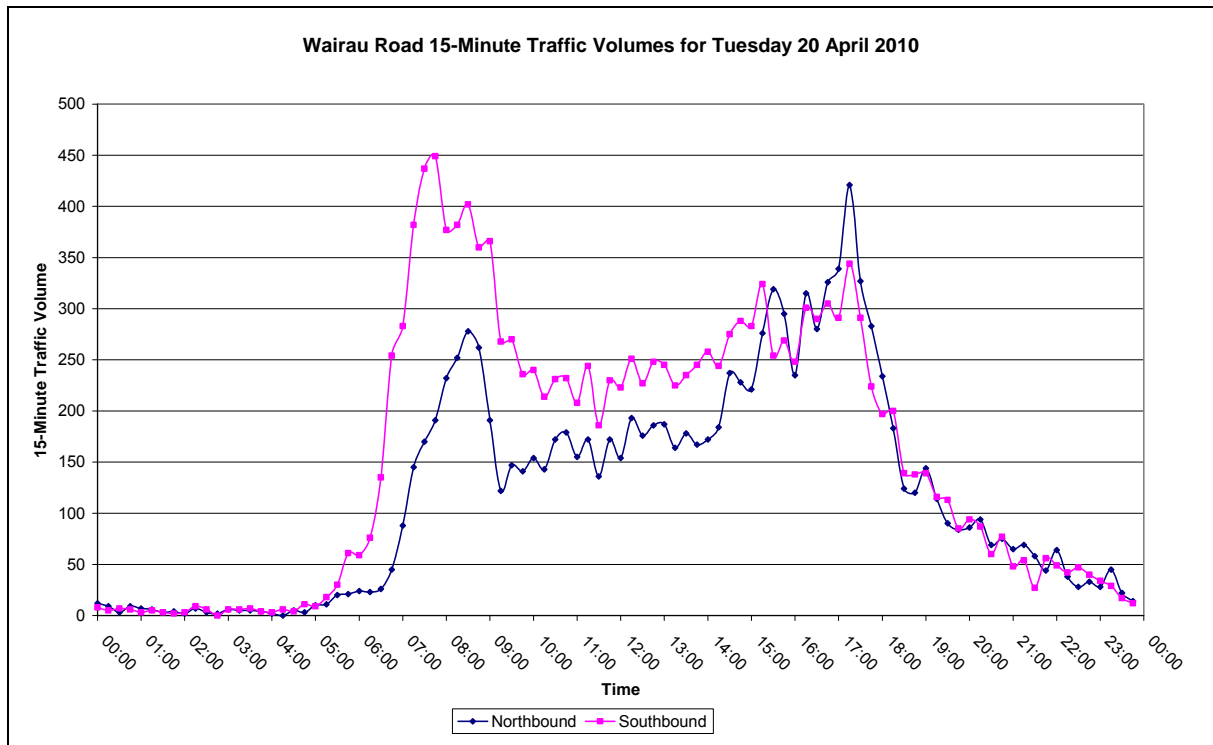


Chart 1: Wairau Road Traffic Volumes

Chart 1 shows that southbound flows are highest in the morning peak and this is reversed in the evening with northbound flows being highest.

The automatic traffic count on 20 April 2010 also classifies vehicles into 13 vehicle classes based on axles, which are grouped into 'light' vehicles and 'heavy' vehicles. The split between light and heavy vehicles is shown in Table 1 below.

Direction	All Vehicles	Light Vehicles		Heavy Vehicles	
	Vehicles	Vehicles	%	Vehicles	%
Northbound	11,566	9,824	84.9	1,742	15.1
Southbound	15,026	14,198	94.5	828	5.5
Two-way	26,592	24,022	90.3	2,570	9.7

Table 1: Existing Vehicle Composition, Wairau Road

The above table demonstrates that the two-way traffic has approximately 10% heavy vehicles. Given the proposed road widening described in Section 2.3, it is considered that the level of traffic overall is likely to increase.

3.4 Road Safety

A crash analysis of the roads surrounding the site was undertaken to understand the current road safety in the area. Crash data was extracted from the New Zealand Transport Agency Crash Analysis System over the last five years from 2006 to 2010, with available data from 2011

included. The search covered a 50m radius of the intersections of Wairau Road with Forrest Hill Road and Shakespeare Road, a 20m radius of the intersection of Wairau Road with the Westlake Girls High School, as well as midblock Wairau Road between these intersections.

Diagram 1 below shows the CAS search area.

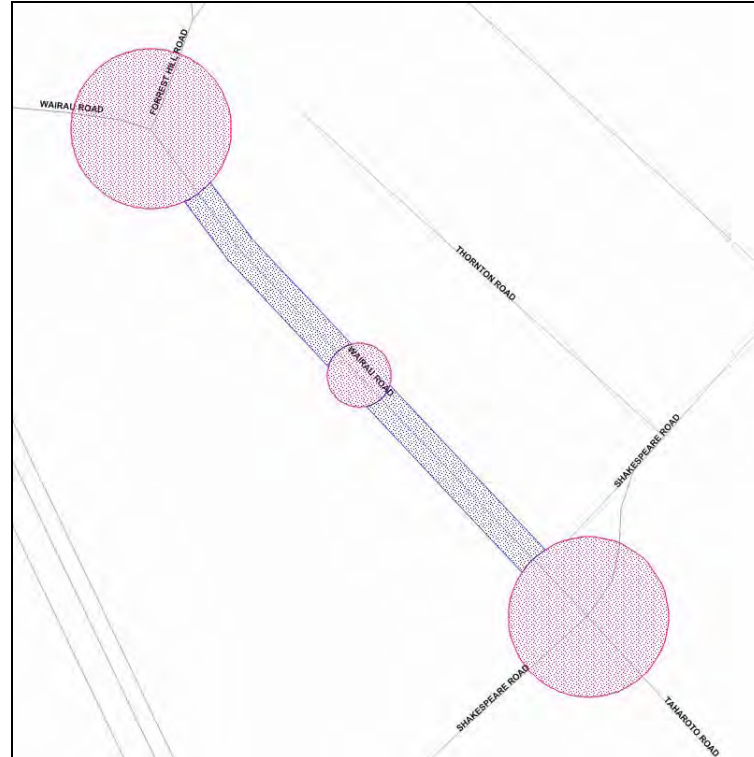


Diagram 1: CAS search area

The crash data obtained from the search revealed the following:

3.4.1 Wairau Road / Shakespeare Road Intersection

There were 24 crashes reported at the Wairau Road / Shakespeare Road intersection, six were minor injury crashes and 18 were non-injury crashes. Of the 24 reported crashes, 11 (46%) were related to rear-end/obstruction crashes and the remaining 13 (54%) were related to crossing/turning crashes.

Of the six minor injury crashes, four involved crossing/turning manoeuvres and two were rear-end/obstruction crashes.

3.4.2 Wairau Road / Forrest Hill Road Intersection

There were 23 crashes reported at the Wairau Road / Forrest Hill Road intersection, six were minor injury crashes and 17 were non-injury crashes. Of the 23 reported crashes, ten (43%) were related to crossing/turning crashes (all of which were vehicles turning right onto Forrest Hill Road), six (26%) were related to rear-end/obstruction crashes and six (26%) were related to lost control/head-on crashes. These three crash types accounted for the majority of the 23 reported crashes.

Of the six minor injury crashes, three were the result of crossing/turning conflicts; three were due to loss of control/head-on conflicts.

3.4.3 Wairau Road / Westlake Girls School Access

There were three crashes reported at the Wairau Road / Westlake Girls High School access, two were minor injury crashes and one was a non-injury crash. Of the three reported crashes, one was a rear-end/obstruction crash and two were a crossing/turning crash. The minor injury crashes were both crossing/turning crashes.

3.4.4 Wairau Road from Forrest Hill Road to Westlake Girls School Access

There were five reported crashes mid-block on Wairau Road north of the Westlake Girls High School access, two were minor injury crashes and three were non-injury crashes. Of the five reported crashes, two were turning / manoeuvring crashes, one was a rear-end crash and two involved a cyclist.

Both of the two minor injury crashes were those involving cyclists.

3.4.5 Wairau Road from Shakespeare Road to Westlake Girls School Access

There were three reported crashes mid-block on Wairau Road south of the Westlake Girls High School access, one was a fatal injury crash and two were non-injury crashes. Of the three reported crashes, one involved a vehicle changing lanes, one involved a rear-end collision and one was related to a pedestrian conflict. The fatal crash involved a pedestrian attempting to cross Wairau Road who failed to look right before crossing the bus priority lane within the central median.

3.4.6 Road Safety Summary

In total, there were 58 crashes reported in the crash study area in the vicinity of the site, from 2006 to 2010 with 2011 inclusive. Of these crashes, one caused a fatality and 16 caused minor injuries. There were no serious injury crashes.

The above search results are typical crash statistics for busy urban corridors with high traffic volumes. Therefore, it is concluded that the surrounding road network is operating with an acceptable degree of safety and that there are no inherent safety issues that will be exacerbated by the proposed activities.

Of the two cycle crashes that occurred within the CAS search area, one occurred in 2006, prior to Corridor Upgrade, whilst the other cycle crash occurred in 2009 but it involved a cyclist on the footpath being struck by an opening car door.

The incidence of crashes does not seem to be greatly affected by the periods of construction along the corridor as part of the Corridor Upgrade.

4. Future Transportation Environment

4.1 Public Transport Improvements

Public Transport improvements in the vicinity include the upcoming works contained within the Corridor Upgrade. Public Transport upgrading includes improvements to the Wairau Road / Forrest Hill Road intersection as well as Forrest Hill Road / Nile Road intersection including bus priority lanes and additional traffic lanes and upgrade of the existing traffic bridge over the Wairau Stream.

These planned public transportation improvements will enhance the already completed improvements of the Corridor Upgrade. These improvements make Wairau Road a very favourable public transportation corridor.

4.2 Walking and Cycling Improvements

Walking and cycling improvements in the vicinity include the upcoming works of the Corridor Upgrade. Walking and cycling upgrading includes improvements to the footpath on the northern side of Wairau Road with landscaping enhancements, installation of on-road cycle lanes on the north and south side of Wairau Road, and intersection improvements to the Forrest Hill Road / Wairau Road intersection and Forrest Hill Road / Nile Road intersection pedestrian crossings, and on-road cycle lanes.

These upcoming walking and cycling provision improvements will enhance the already completed improvements of the Corridor Upgrade. These improvements will help make Wairau Road a safer and more aesthetic walking and cycling corridor.

4.3 Overall Corridor Improvements

Overall the improvements of the Corridor Upgrade include the already completed works mentioned in Sections 2.2.1 and the upcoming works mentioned in Sections 2.2.2 and 2.2.3.

Photograph 3 shown previously is an artist impression of the fully completed Corridor Upgrade. The image is of the Wairau Road / Shakespeare Road / Taharoto Road intersection looking north from Taharoto Road into Wairau Road.

The fully completed Corridor Upgrade will create a transportation environment along Wairau Road which provides efficient movement of private cars, heavy commercial vehicles and buses with additional lanes and bus priority, as well as safer and more aesthetic facilities for walking and cycling with on-road cycle lanes and landscape enhancements.

5. Proposed Development

5.1 Existing Use

Currently the properties at 8, 10 and 12 Thornton Road are occupied by a total of four residential dwellings; with two being located at 12 Thornton Road. Number 11 Wairau Road, as affected by the Plan Change, currently serves as the Atlas Concrete headquarters building, providing on-site offices and retail facilities. Numbers 7 and 9 Wairau Road are currently vacant, except for some small storage buildings.

The sites at 7 and 9 Wairau Road and 8, 10 and 12 Thornton Road are currently zoned Residential 4A while 11 Wairau Road is zoned Residential 7.

5.2 Proposed Plan Change

The proposal is for a Plan Change to rezone 7 - 11 Wairau Road as well as 8 - 12 Thornton Road from Residential 4A and Residential 7 to Business 9. The area of the land subject to the proposed Plan Change is approximately 6,000sqm.

It is expected that vehicle access to the Plan Change area will be provided via a vehicle crossing(s) on Wairau Road.

6. Effect of Plan Change

6.1 Access Location

It is expected that a vehicle crossing/s will provide vehicle access to the Plan Change area from Wairau Road. It is considered that vehicle access from Wairau Road is preferable to the other potential location, from Thornton Road. This is because a commercial activity would be better served by having a well-designed and well-located access to the commuter and freight route provided by Wairau Road as a regional arterial and would avoid the adverse effects of such activity permeating into a residential neighbourhood such as Thornton Road. On this basis, the assessment below considers the traffic effects of the Plan Change on Wairau Road only.

6.2 Trip Generation

For the avoidance of doubt, under the District Plan terminology a vehicle “manoeuvre” means a one-way trip i.e. into or out of an activity. A vehicle “movement” is a two-way trip i.e. in and out of an activity.

6.2.1 Existing Trip Generation

Trips generated by the existing site have been assessed. Specifically, these activities are four residences at 8, 10 and 12 Thornton Road and approximately 350sqm of offices for Atlas Concrete at 11 Wairau Road. The sites at 7 and 9 Wairau Road have been assumed to generate no trips.

The RTA Guide to Traffic Generating Developments (RTA Guide) is a widely adopted professional guideline frequently used by transportation engineers throughout New Zealand. It has been used to assess the number of trips generated from the existing site uses. For office and commercial developments the RTA Guide recommends a daily trip rate of 10vpd/100sqm of gross floor area (GFA), and a peak hour trip rate of 2 vehicles per hour (vph)/100sqm GFA. For “dwelling houses” the RTA Guide recommends a daily trip rate of nine vehicles per day (vpd)/dwelling and 0.85vph/dwelling in the peak hour. These rates have been applied to the activities above to give a total estimate of the existing trip generation, which is shown in the table below.

ACTIVITY	UNITS	TRIP RATE		TRIP GENERATION	
		Peak Hour	Daily	Peak Hour (vph)	Daily (vpd)
Residential *	4 dwellings	0.85vph/dwelling	9vpd/dwelling	3	36
Offices	350sqm GFA	2vph/100sqm GFA	10vpd/100sqm GFA	7	35
Total	-	-	-	10	71

Table 2: Existing Trip Generation

* Note: As of right the Plan Change site could be developed with up to 15 residential units on it, which would give an even higher volume of existing traffic. (15 dwellings equals 135 vpd or 68 vehicle movements).

It is estimated that the existing site activities generate around 10vph during the peak hour and some 71vpd daily.

6.2.2 Plan Change Trip Generation

Any permitted or controlled activity in the proposed Business 9 zone that generates in excess of 100 vehicle movements per day i.e. 200 vehicle manoeuvres per day (vpd) requires resource consent under the District Plan Rule 12.4.1.2. Therefore, any traffic effects occurring due to trip generation of over 200 vehicle manoeuvres per day by the particular activity will be considered at that time.

For this reason, the following analysis of effects of the potential trip generation of the Plan Change area assesses the difference in traffic effects produced by the current activities and that generated by commercial activities with trip generation up to 200 vehicle manoeuvres per day. It is expected that around 20% of the daily trips generated by a commercial activity may occur during the peak hour; therefore the peak hour trip generation has been assessed as 40 vehicle manoeuvres in the peak hour. Compared to the existing trip generation in Table 2, this represents an increase in trip generation of 129 (or 65 if you take into account the potential for 15 residential units on the Plan Change site) vehicle manoeuvres per day (vpd) and 30 vehicle manoeuvres per hour (vph).

Comment is also made as to the effect of a greater level of traffic generation in the future, although this has not been quantitatively assessed here.

6.2.3 Effect of Trip Generation

The existing daily traffic volume on Wairau Road was recorded in April 2010 as being some 26,660vpd. The increase in trips expected from the Plan Change area is some 129vpd, which represents some 0.5% of the existing traffic (or 0.2%, taking into account the potential for 15 residential units on the Plan Change site). The daily effect of the Plan Change area on the operation and safety of the existing traffic on Wairau Road will be negligible.

During the peak hours, traffic counts on Wairau Road in the vicinity of the site showed that the peak hour two-way traffic volume was in the range of some 2,170 to 3,320vph. The additional 30vph compared with the existing activities generated by the Plan Change area represents some 0.9-1.4% of the existing traffic on Wairau Road. Again, this very small proportional increase will have a negligible effect on the operation and safety of existing traffic in the vicinity of the site.

In the event that the future development in the Plan Change area generates more than 200vpd, resource consent would be required and would require assessment of the effects associated with the anticipated traffic generation.

For sensitivity testing purposes, a higher trip generation has been briefly examined. If the Plan Change area generated three times more traffic than a permitted activity (say 600vpd and 120vph during the peak hour), the proportional increase would still represent a small proportion of existing traffic on Wairau Road (2.3% and 3.6-5.5% for the daily and peak hour flows respectively). Although this is much higher than the traffic generation anticipated for a permitted activity, it is still of a level which is likely to have negligible adverse effects on the operation of existing traffic. The effects at the vehicle accesses may need to be further assessed at resource consent stage.

7. Accessibility

7.1 Accessibility for Employment

The connectivity of the site in terms of population resources for employment is good. The following sections of the report describe how residential areas are connected to the site via use of private car, public transport, walking and cycling.

7.1.1 Private Car

Generally, the site has good access for private cars.

The SH1 Northern Motorway system is close to the site. The motorway can be accessed in two nearby locations; either via the Northcote Road interchange located approximately 1km south of the site or alternatively the Tristram interchange located approximately 1.5km north of the site.

In addition to the motorway network, the site is also connected to the Regional and District Arterial network. The site fronts Wairau Road (Regional Arterial) to the south which connects to Forrest Hill Road (Regional Arterial) to the north and Shakespeare Road (District Arterial) to the south. There is a T2 priority lane on Shakespeare Road for southbound traffic which encourages car sharing.

7.1.2 Public Transport

The site has excellent connectivity to the public transport network, especially considering the completed and upcoming works of the Corridor Upgrade.

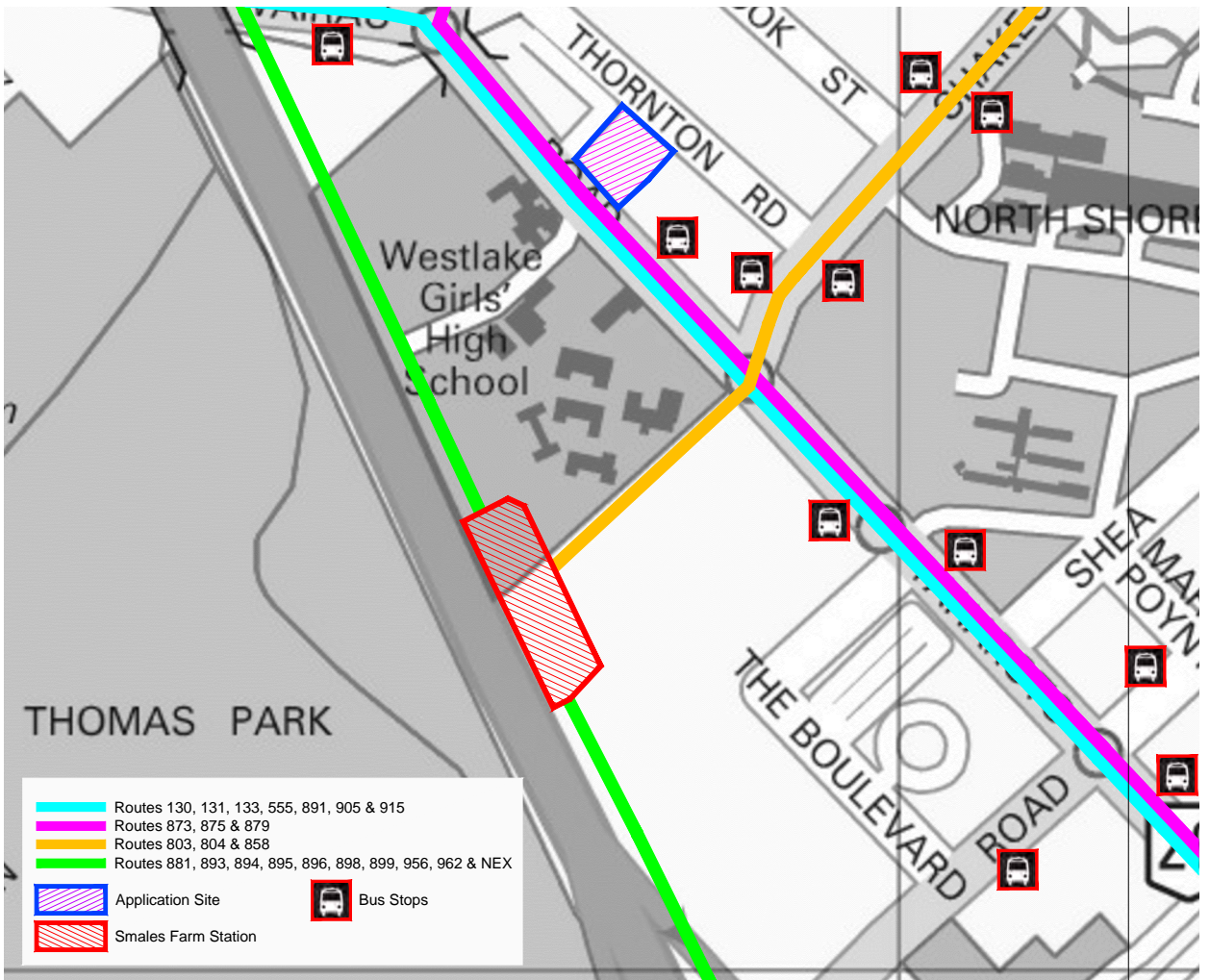
The completed works of the Corridor Upgrade which have already improved the public transport provisions in the vicinity of the site include an improved bus stop directly opposite the site on Wairau Road, central median bus priority lane on Wairau Road and upgrading to the Shakespeare Road / Taharoto Road / Wairau Road intersection to include bus priority lanes.

There are eight bus stops within approximately 300m of the site (including a bus stop directly opposite the site as well as approximately 100m from the site on Wairau Road) which are located on three bus route corridors. In addition to this, the site is located within approximately 450m from the Smales Farm Station along the Northern Bus-way.

Figure 4 shows the location of the bus stops as well as the primary bus routes in the vicinity of the site.

Bus routes travelling past the site serve many areas such as Beach Haven, Birkdale, Glenfield, Takapuna, Bayswater, East Coast Bays, Albany, Greenhithe, Westgate, Henderson and New Lynn. In addition, they serve areas over the Harbour Bridge such as Britomart, Midtown and Newmarket.

The site has excellent connectivity to bus services with these servicing a wide variety of areas. In addition to this, the buses have good service frequencies, running from once every 10-30 minutes during the peak hours to hourly during off-peak hours.



crete, Wairau Road
 ansport - Bus Stops and Routes

7.1.3 Walking and Cycling

Wairau Road experiences high pedestrian flows during peak times, which are predominantly related to Westlake Girls High School.

The site currently has good provision for walking and cycling. However, with the completed and upcoming works of the Corridor Upgrade, the site will have improved walking and cycling provisions.

The completed works of the Corridor Upgrade which have improved the walking and cycling provision in the vicinity of the site, include improvements to the footpath on the southern side of Wairau Road with landscaping enhancements including provisions for on-road cycle lanes to be installed at a later date. The Corridor Upgrade also included the upgrading of the Shakespeare Road / Taharoto Road / Wairau Road intersection to include wider traffic islands for pedestrians and on-road cycle lanes.

In addition to the walking and cycling provisions on Wairau Road, Shakespeare Road has a shared walking and cycling path along its length as well as a T2 priority lane (starting north of Brook Street) on the east side of the road. The T2 priority lane can also be used by cyclists and is usually less busy than the general traffic lanes.

7.2 Accessibility for Distribution and Servicing

As mentioned in Section 5.1.1, the site is well connected to the SH1 Northern Motorway accessed via the Northcote Road interchange to the south or the Tristram Avenue interchange to the north. The site is also well connected to the Regional and District Arterial network, with Wairau Road (Regional Arterial), Forrest Hill Road (Regional Arterial) and Shakespeare Road (District Arterial) all within 250m of the site. The site will therefore enjoy excellent regional transport access for the distribution of goods associated with a commercial activity.

8. Conclusion

On the basis of this integrated transport assessment, it is concluded that the theoretical permitted development potential associated with the Plan Change from Residential 4A and Residential 7 zoning to Business 9 zoning will result in acceptable effects on the function, capacity and safety of the existing local traffic environment.

The allowable traffic generation from a permitted activity at the Plan Change site is some 100 vehicle movements per day, or 200 vehicle manoeuvres per day (vpd), which represents a very small proportion of the existing traffic volume on Wairau Road and is therefore considered to have a negligible effect on the surrounding traffic environment. The increase in traffic flows on Wairau Road would vary between 0.5-1.4%. Such increases would not be noticeable to other road users and as such the adverse traffic effects would be acceptable. Further, a level of traffic generation three times higher than this (600vpd) is likely to have a similarly negligible adverse effect on the operation of existing traffic on Wairau Road; although resource consent would nevertheless be required for traffic reasons in that case.

It is therefore considered that there are no traffic engineering reasons to preclude the approval of a Plan Change to rezone the subject site to Business 9 as presented.

Traffic Design Group Ltd
1 November 2011

HAINES

PLANNING

■ ANNEXURE 2

Infrastructure Report



MSC Consulting Group Ltd.

civil & structural engineers

***ENGINEERING INFRASTRUCTURE REPORT
FOR PRIVATE PLAN CHANGE
AT 7-11 WAIRAU ROAD AND 8-12
THORNTON ROAD, TAKAPUNA
FOR ATLAS CONCRETE***

JOB No | 31175
DATE | November 2011

ENGINEERING REPORT



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Document History and Status

Issue	Rev.	Issued To		Qty	Date	Reviewed	Approved
1	Draft	Haines Consultants Ltd	Planning	1	25.05.2010	Kevin Wyborn	
2	Final	Haines Consultants Ltd	Planning	1	26.05.2010	Kevin Wyborn	
3	Rev. Final	Haines Consultants Ltd	Planning	1	7.11.2011		

File Name BDOC0003587453.docx
Project Manager Kevin Wyborn
Name of Client Alasdair Scott
Name of Company Haines Planning Consultants Limited
Name of Job Proposed Plan Change for Atlas Concrete
Location of Job Wairau Road, North Shore
Name of Document Private Plan Change Supporting Infrastructure Assessment
Document Version Rev. Final
MSC Reference 31175

1. Introduction

MSC Consulting Group Limited (MSC) has been engaged by Atlas Concrete to prepare a “high level” Engineering Infrastructure Assessment Report in support of a Private Plan Change request for the Atlas Concrete land on Wairau Road, Takapuna.

1.1 Background

Atlas Concrete own land situated between Wairau Road and Thornton Road. The land being 7-11 Wairau Road as well as 8 - 12 Thornton Road, Takapuna. The site is shown on the site plan in Appendix A.

Atlas Concrete’s is seeking a Private Plan Change to rezone these properties from Residential 4a and Residential 7 to Business 9. The Business 9 zone provides for a wide range of commercial activities of moderate intensity.

1.2 Infrastructure Assessment

To assist Council to undertake a comprehensive assessment of the Private Plan Change request, MSC has undertaken an assessment of the existing public infrastructure servicing this site.

The purpose of this report is to provide an assessment of the serviceability of the subject site with respect to:

- Stormwater drainage disposal
- Wastewater drainage disposal
- Water supply

2. Site Description and Proposed Development

2.1 Site Description

The subject site is situated between Wairau Road and Thornton Road, Takapuna. The site is square in shape and is bounded by the Atlas Concrete batching plant on the north western side, Wairau Road on the south western side, Thornton Road on the north eastern side and residential properties on the south eastern side. Refer to Figure 1 in Appendix A.

The total area of the Private Plan Change zone being considered is 0.60ha. The site is shown in Figure 1 below.

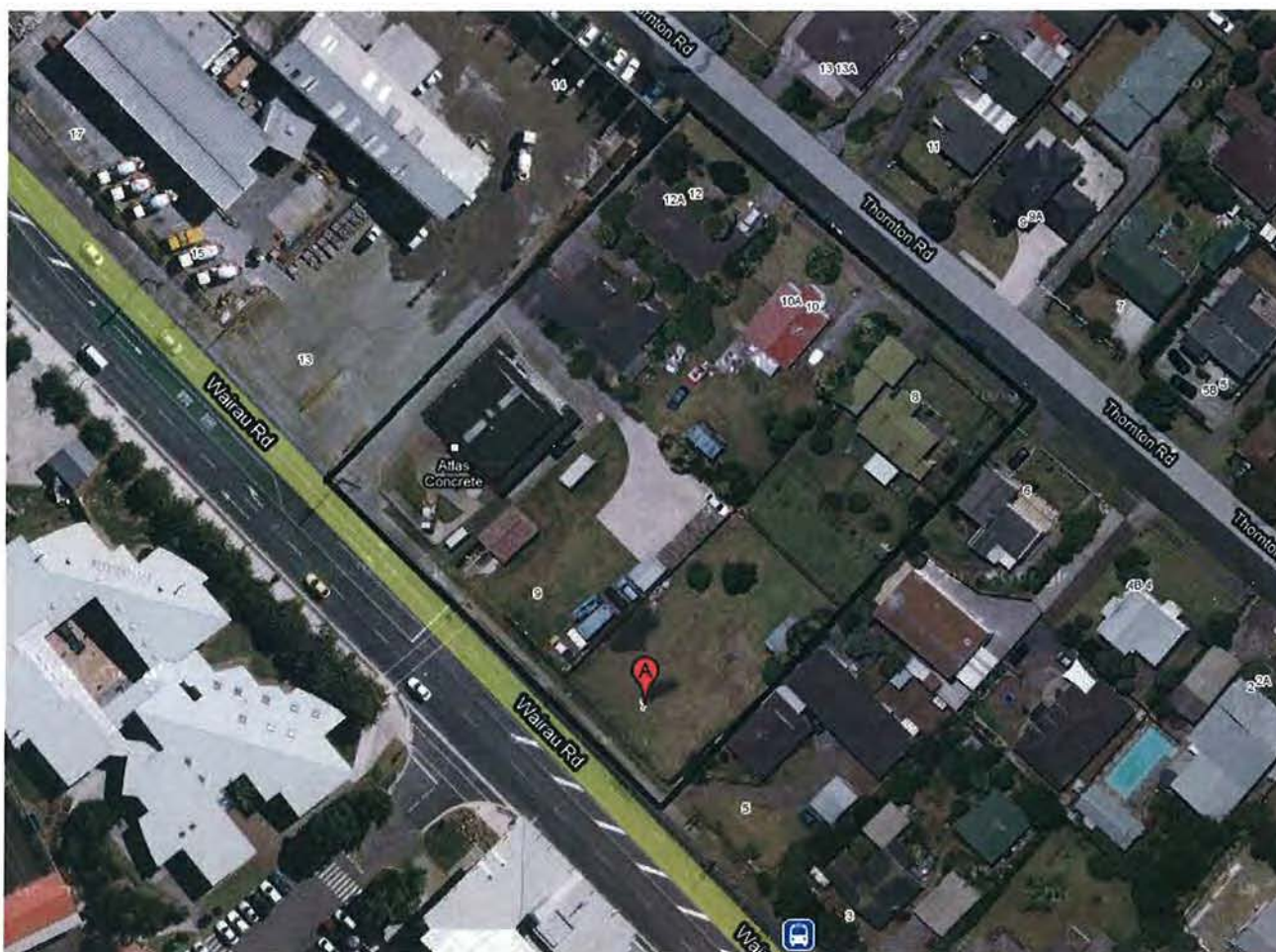


Figure 1 – Site Location Plan

The topography of the site is gently sloping with existing grades typically of 4.0 – 5.0%. The contours of the site fall from south east to the north west. The site is currently occupied by existing houses with associated paved and landscape areas.

2.2 Proposed Development

As noted in paragraph 2.1 of this report, Atlas Concrete is proposing a Private Plan Change to rezone the site from Residential 4a and Residential 7 to Business 9. The Business 9 zone provides for a wide range of

commercial activities of moderate intensity.

Under the Residential zoning, the maximum site coverage is 35% of the total site area whereas under the proposed Business 9 zoning, the maximum site coverage is essentially 85% (minimum 15% of site area is for landscaping).

The Private Plan Change will allow maximum site coverage of 0.51ha and approximately 0.09ha of landscape area to occur on the site.

To support the Private Plan Change request, the adequacy of the existing public infrastructure network (stormwater, wastewater and water) has been assessed to determine if development associated with the provisions of the plan change can be accommodated by the existing stormwater, wastewater and water networks.

3. Existing Site Services

3.1 Stormwater Drainage

A search of the former North Shore City Council (NSCC) GIS maps has indicated that there is an existing 300mm diameter public stormwater pipe running along Wairau Road which starts at a public manhole on the north western corner of the site (NSCC ID 188445). The GIS also shows that there is an existing 225mm diameter stormwater pipe that is located on the north western side of the site (within the Atlas Concrete batching plant yard) which starts at a public manhole (NSCC ID 241093).

The upper catchment for the 300mm diameter pipe is approximately half of the subject site (Wairau Road frontage) plus approximately 0.16ha of the Wairau Road carriageway while the upper catchment of the 225mm diameter pipe is the other half of the site (Thornton Road frontage). Refer to the attached NSCC GIS map – Appendix B

The NSCC GIS map indicates that there are two overland flow paths located within the north western side of the site. The map shows that the site is clear from any flood plains in the area. NSCC stormwater modelling engineer Mr Jahangir Islam has been contacted to establish the 1% AEP flows for the overland flow paths. Mr Islam has advised that the maximum 1% AEP overland flow that enters the north western side of the site is approximately 500 l/s. This overland flow flows from the Wairau Road carriageway. Refer to the attached NSCC flow rate – Appendix B

The current stormwater management category for the site is SMA5. Developments within an SMA5 area do not require any stormwater mitigation as they can discharge directly into the existing piped network. Refer to the attached SMA plan – Appendix B

NSCC stormwater engineer Mr Peter Nagels has advised that the site is within the Wairau Road Stormwater Catchment.

Auckland Regional Council (ARC) engineer Mrs Nicola Watson has advised that the NSCC has applied for a Comprehensive Stormwater Management Plan for the area but it has not been granted yet by ARC.

A desktop pipe capacity analysis has been undertaken to determine the capacity of the existing 300mm diameter and 225mm diameter stormwater pipes. The capacity of the 300mm pipe is approximately 128 l/s (pipe grade is 1.71%) while the capacity of the 225mm pipe is 64.6 l/s (pipe grade is approximately 2%). Refer to stormwater calculation sheets – Appendix C.

3.2 Wastewater Drainage

A search of the North Shore City Council (NSCC) GIS maps has indicated that there is an existing 150mm diameter public wastewater pipe running across the site from the south eastern side to the north western side. Refer to the attached GIS map – Appendix B

A desktop pipe analysis has been undertaken to determine the gradient and capacity of the existing 150mm diameter sewer pipe. The gradient of the pipe is approximately 3.9% (pipe capacity is 30.6 l/s).

A desktop catchment analysis has been undertaken to determine the sewer flow from the catchment of the existing 150mm diameter pipe. The catchment comprises residential lots and the catchment size is approximately 1.7ha. The Peak Wet Weather Flow is 1.05 l/s. Refer to the calculations sheet – Appendix C.

3.3 Water Supply

The NSCC GIS map in Appendix B shows that there is an existing 300mm diameter watermain running along the site's boundary with Wairau Road. The GIS map also shows that there is an existing 50mm diameter ridermain running along the site's boundary with Thornton Road.

There are three fire hydrants on the existing 300mm diameter watermain pipe which are located within a maximum radius of 130m.

4. Future Development Works

4.1 Stormwater Flows

The description or layout of the future development on the site is unknown at this stage. However, for the purpose of the Plan Change request, the maximum coverage area (85%) will be considered for the determination of the stormwater discharge from the site.

Stormwater runoff from the site shall be managed in accordance with the North Shore City Council requirements and the Standards for Engineering Design and Construction. The proposed stormwater system shall include a reticulated piped system designed for the 10 year storm event.

The peak flows and discharge volumes from the pre-developed and post developed site have been assessed for the 2, 10 and 100 year storm events in accordance with TP108. The flows and volumes are given in the table below.

Location	2 Year Storm		10 Year Storm		100 Year Storm	
	Flow (m ³ /s)	Volume (m ³)	Flow (m ³ /s)	Volume (m ³)	Flow (m ³ /s)	Volume (m ³)
Entire Site – Pre Development	0.058	292	0.130	618	0.212	1020
Entire Site – Post Development	0.082	400	0.149	754	0.226	1171

The combined existing pipes capacity (300mm and 225mm diameter pipes) is approximately 193l/s. The combined stormwater flow from the Wairau Road carriageway catchment (approximately 43l/s) and the 10% AEP stormwater flow from the developed site (149l/s) is approximately 192l/s. This means the existing piped network has enough capacity to cater for the anticipated flow from the developed site without being surcharged.

However, stormwater harvesting may be used for any proposed development to mitigate the stormwater runoff from the site.

All the existing overland flow paths within the site shall be incorporated in the final design of the site and they will be contained and controlled within well defined paths or channels.

All finished ground levels shall be set in accordance with New Zealand Building Code requirements to ensure any secondary overland flows are directed away from the buildings.

Floor levels for habitable and non-habitable buildings will be set in accordance with the building code and freeboard requirements.

Full design and detailing of the stormwater disposal system for the site shall be provided at Building Consent stage of any development works.

We consider that stormwater runoff from the future development of the zone can be adequately controlled in accordance with the North Shore City Infrastructure Design Standards for Engineering Design and Construction and the New Zealand Building Code.

4.2 Wastewater

The wastewater disposal from the developed site shall be connected to the existing public wastewater drainage that serves the zone. New private drainage shall be extended to serve development within the site in accordance with the North Shore City Council Standards for Engineering Design and Construction.

The existing public wastewater drainage system serving the site has capacity to accommodate the flows from the maximum potential flows from the developed site. The capacity of the existing 150mm diameter public wastewater pipe is 30.60 l/s.

The maximum potential Peak Wet Weather Flow from the developed site is calculated to be 0.70 l/s. This flow is based on the maximum potential occupancy based on the maximum development density in the Business 9 zone as outlined in section 6.6.7.1 in the NSCC IDS (table 6.5).

The total Peak Wet Weather Flow discharging to the existing 150mm diameter pipe is 1.75l/s (1.05 l/s existing upper catchment plus 0.70 l/s from the site). Refer to calculation in Appendix C. The wastewater flows from the developed site will consist of domestic and light retail waste only.

Full design and detailing of the sanitary disposal system for the site shall be provided at Building Consent stage of any development works.

We consider that wastewater from the future development of the zone can be adequately controlled in accordance with the North Shore City Council Infrastructure Design Standards for Engineering Design and Construction and the New Zealand Building Code.

4.3 Water Supply

4.3.1 Domestic Supply

Provision of water supply for the proposed zone shall be from the existing public 300mm diameter watermain in Wairau Road. New water meter connections will be applied for at Building Consent stage.

All water supply reticulation shall be designed and constructed in accordance with North Shore City Council Standards for Engineering Design and Construction, New Zealand Building Code and the New Zealand Fire Service Fire Fighting Water Supplies Code of Practice SNZ PAS 4509:2003.

On-site stormwater harvesting could be utilised to mitigate stormwater events and provide an alternative supply for irrigation or non-potable water reuse. On-site stormwater harvesting shall be further considered during the design phase for any redevelopment of the site.

We consider that water supply for the future development of the zone can be adequately controlled in accordance with the North Shore City Council Standards for Engineering Design and Construction and the New Zealand Building Code.

4.3.2 Fire Fighting Supply

The three existing fire hydrants close to the proposed zone (within 130m radius) will be able to provide the required flow for fire fighting purposes.

Full design and detailing of the fire fighting system for the site shall be provided at Building Consent stage of any development works.

We consider that fire fighting water supply for the future development of the zone can be adequately controlled in accordance with the North Shore City Council Standards for Engineering Design and Construction and the New Zealand Building Code.

5. Conclusions

The calculations and investigations confirm that a commercial redevelopment of the site under a Business 9 zoning can be adequately serviced by the existing stormwater, wastewater, and water supply in or adjacent to the zone.

The site has existing stormwater, wastewater and water utility service connections on or adjacent to the zone that will allow commercial development in the zone.

Wastewater and water have capacity to service any commercial development in the zone and will connect to the existing reticulation or to new extended public reticulation.

The stormwater is likely to be adequately controlled and mitigated on site prior to being discharged into the existing public network. The proposed stormwater mitigation works will ensure that pre and post development flows from the zone are kept the same to avoid any potential downstream effects including flooding, stormwater quality or erosion.

Our recommendations shall be included in the design of any future development within the zone and any Engineering Approval applications to ensure compliance with North Shore City Council and Standards for Engineering Design and Construction and the New Zealand Building Code.

Appendix A – Existing Site Location Plan



Site Plan



Atlas Takapuna Plan Change Area



The information provided in this plan is intended to be general information only

This plan is provided on the sole basis that the Council accepts no liability or responsibility whatsoever to any party for its content or any error or omission in it, and excludes all responsibility and liability with relation to any claim whatsoever (including without limitation for contributory negligence by the Council) arising from the use of this plan.

Actual locations of any pipes or services shown on this plan should be physically verified on site prior to design or construction

Any damage to any of the pipes or services specified in this plan is the sole responsibility of the person damaging the pipes or services, whether or not the Council's plans are accurate, and the Council will seek to recover the cost of repairing any such damage to pipes or services from any such person.



Appendix B – North Shore City Council GIS Maps



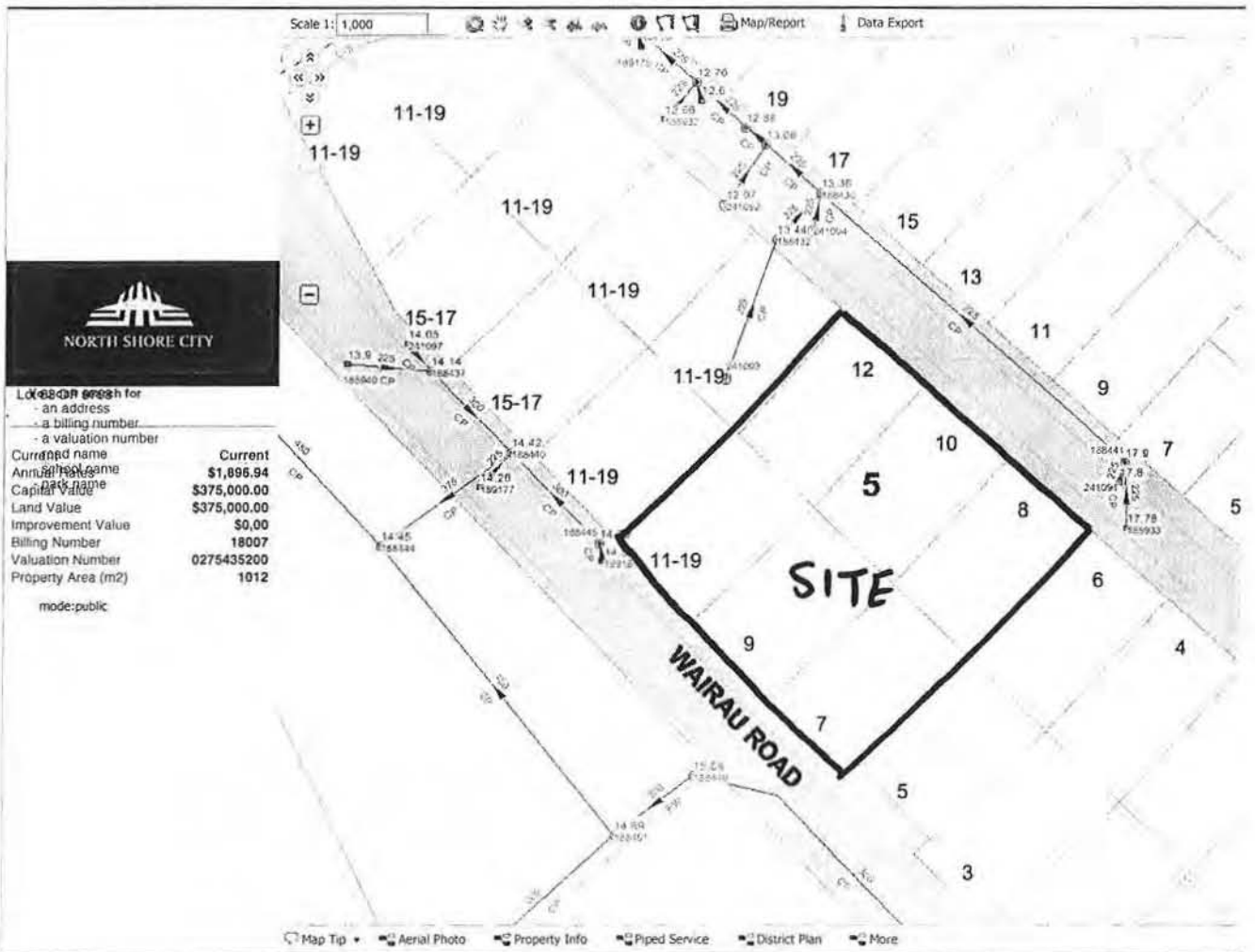
Site Plan



Atlas Takapuna Plan Change Area



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 This plan is provided on the sole basis that the Council accepts no liability or responsibility whatsoever to any party for its content or any error or omission in it, and excludes all responsibility and liability with relation to any claim whatsoever (including without limitation for contributory negligence by the Council) arising from the use of this plan.
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Legend

- 100yr ARIMPD Floodplain
- Flood Sensitive Area
- Overland Flow Path

Sam Jirjis

From: Jahangir Islam [Jahangir.Islam@northshorecity.govt.nz]
Sent: Wednesday, 19 May 2010 2:41 p.m.
To: Sam Jirjis
Subject: RE: 31175: Atlas Concrete, Wairau Rd
Attachments: 7-11 Wairua Rd 100yr MPD Floodplain.jpg

Hi Sam,

The predicted 100yr ARI MPD flood plain and flood sensitive area map is attached.

Some part of 11-19 Wairau Road is within the floodplain and flood sensitive area, but it seems this is outside of your development site area.

The predicted 10yr and 100yr ARI flows (for maximum probable development land use and future rainfall scenario) are provided below for the overland flow paths going through the site based on ARC TP108 graphical method.

You need to estimate the 10yr and 100yr ARI flood levels based on the flows and site contours information.

The magnitude of predicted 10yr and 100yr ARI peak flows are given below and the locations on the overland flow paths are shown in the map.

Predicted 10yr & 100yr ARI flows at overland flow path crossing the north-western boundary of 8 Thornton Road are 48 L/s and 82 L/s respectively.

Predicted 10yr & 100yr ARI flows at overland flow path crossing the north-western boundary of 10 Thornton Road are 53 L/s and 90 L/s respectively.

Predicted 10yr & 100yr ARI flows at overland flow path crossing the south-western boundary of 12 Thornton Road are 64 L/s and 108 L/s respectively.

Predicted 10yr & 100yr ARI flows at overland flow path crossing the north-western boundary of 7 Wairau Road are 57 L/s and 98 L/s respectively.

Predicted 10yr & 100yr ARI flows at overland flow path crossing the south-western boundary of 9 Wairau Road are 63 L/s and 108 L/s respectively.

Predicted 10yr & 100yr ARI flows at overland flow path crossing the north-western boundary of 11 Wairau Road (left side of the building) are 300 L/s and 500 L/s respectively.

Predicted 10yr & 100yr ARI flows at overland flow path crossing the north-western boundary of 11 Wairau Road (right side of the building) are 112 L/s and 190 L/s respectively.

Regards

Jahangir Islam PhD, MIPENZ, CPEng, IntPE(NZ)

Senior Planning Engineer - Hydraulic Modelling

Infrastructure Planning

North Shore City Council

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New Zealand

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jahangir.islam@northshorecity.govt.nz

www.northshorecity.govt.nz

From: Sam Jirjis [mailto:Sam.J@msc.co.nz]

19/05/2010

Sent: Wednesday, May 19, 2010 11:31 AM
To: Jahangir Islam
Subject: 31175: Atlas Concrete, Wairau Rd

Hi Jahangir,

We are looking to develop the site at 7, 9 & 11-19 Wairau Rd and 8-12 Thornton Rd (see the attached plan).

We noticed that there are few overland flow paths within the site. Could you please confirm the 10 & 100 yrs flow rates and the flood levels?

Is the site within any flood plain area?

We kindly require this info by today as we need to complete our report by Friday. We appreciate so much your prompt response

Regards

Sam Jirjis | Senior Civil Engineer

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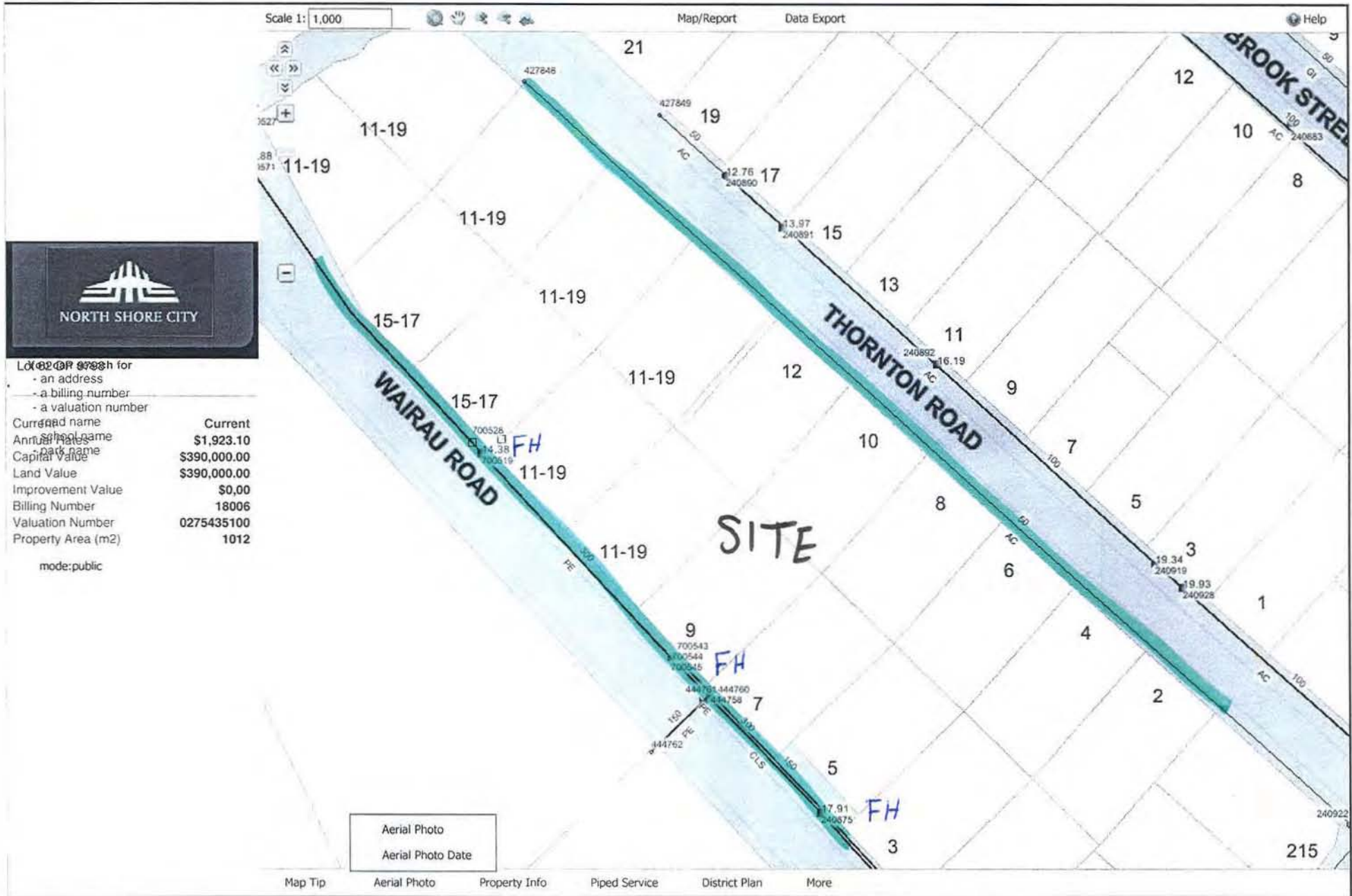
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Appendix C – Supporting Calculations

STORMWATER PIPE DESIGN

7/11/2011

By: SJ

Reference No: 31175

Project: Atlas Concrete - Wairau Road

Assumptions:

c=0.9 for roof

design rainfall: 113.7mm/hr to reflect NSCC 10% AEP standard

c=0.85 for driveway

c=0.6 for paved surfaces

c=0.3 for permeable surfaces

Existing 225mm sw pipe

Roughness Factor	Pipe size(mm)	Grade(1 in)	%
1.5	225	50.00	2

VELOCITY (m/sec)

1.62

CAPACITY (Q = VA)

64.59

STORMWATER PIPE DESIGN

7/11/2011

By: SJ

Reference No: 31175

Project: Atlas Concrete - Wairau Road

Assumptions:

c=0.9 for roof

design rainfall: 113.7mm/hr to reflect NSCC 10% AEP standard

c=0.85 for driveway

c=0.6 for paved surfaces

c=0.3 for permeable surfaces

Existing 300mm sw pipe

Roughness Factor	Pipe size(mm)	Grade(1 in)	%
1.5	300	58.48	1.71

VELOCITY (m/sec)

1.81

CAPACITY (Q = VA)

128.23



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Runoff Parameters & Time of Concentration

20.5.2010

By: Sam J.

Reference No:

Project: Atlas Concrete - Wairau Rd

PROPOSED SITUATION

References to ARC TP108, April 1999

Location: Atlas Concrete yard 0.6

(Sheet 1)

Circle one: Present Developed For Entire Catchment

1. Runoff Curve Number (CN) and initial Abstraction (Ia)

Cover Type / Treatment	Soil Group	Curve number CN*	Area (ha)	Product of CN x area
PASTURE	C	74	0.330	24.42
SEALED	C	98	0.270	26.46
* from Appendix B		Totals	0.600	50.88

$$CN_{(weighted)} = \text{total product/total area} = 85$$

$$Ia_{(weighted)} = 5 \times \text{pervious area/total area} = 0.330 \quad 2.8 \quad \text{mm}$$

2. Time of Concentration

Channelisation factor $C = 1.0$ (from table 4.2, TP. 108)
 Catchment length $L = 0.078 \text{ km}$ km (along drainage path)
 Catchment slope $S_c = 0.045 \text{ m/m}$ m/m (by equal area method) (m^3/s)

$$\text{Runoff factor, } CN/200-CN = 0.74$$

$$t_c = 0.14 \times C \times L^{0.66} (CN/200-CN)^{-0.55} S_c^{-3} = 0.078 \text{ hrs}$$

10mins (0.17 hrs)

$$\text{SCS Lag for } t_p = 2/3t_c = 0.052 \text{ hrs}$$



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Graphical Peak Flow Rate

20.5.2010

By: Sam J.

Reference No: 31175

Project: Atlas Concrete - Wairau Rd

References to ARC TP108, April 1999

(Sheet 2)

Location: Atlas Concrete yard

Circle one:

Present

~~Developed~~

1. Data:

Catchment area	A =	0.00600 km ²	Note: Km ²
Runoff curve number	CN =	85	(from sheet 1)
Initial abstraction	Ia =	2.8 mm	(from sheet 1)
Time of concentration	T _c =	0.078 hrs	(from sheet 1)

2. Calculation Storage:

$$S = (1000/CN - 10)25.4 = 45.5 \text{ mm}$$

3. Average recurrence interval: ARI (yr)

4. 24 hour rainfall depth: P₂₄ (mm)

5. Compute $c^* = P_{24} - 2Ia/P_{24} - 2Ia + 2S$

Time Of Concentration (in hours)

6. Specific peak flow rate, q*

7. Peak flow rate, $q_p = q^* AP_{24}$ (m³/s)

8. Runoff depth, $Q_{24} = (P_{24} - Ia)^2 / (P_{24} - Ia) + S$ (mm)

9. Runoff volume, V₂₄ = 1000xQ₂₄A (m³)

Storm #1	Storm #2	Storm #3
2	10	100
80	140	210
0.45	0.60	0.69
0.08		
0.120	0.155	0.168
0.058	0.130	0.212
49	103	170
292	618	1020

(Figs. A1, A3, A6)

(rounded to 1 d.p.)

(Fig 6.1 - Specific Peak Flow Rate)

(m³/s)



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Hydraulic Neutrality

20.5.2010

By: Sam J.

Reference No: 31175

Project: Atlas Concrete - Wairau Rd

*References to ARC TP108, April 1999
(Sheet 5)*

Total development flow, volume and time of concentration

	Total Flow (m ³ /s)	Total Volume (m ³)	Increased Time of Concentration (hrs)
2 yr Storm	0.058	292	NIL
10yr Storm	0.130	618	
100yr Storm	0.212	1020	



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Runoff Parameters & Time of Concentration

20.5.2010

By: Sam J.

Reference No:31175

Project: Atlas Concrete - Wairau Road

PROPOSED SITUATION

References to ARC TP108, April 1999

Location: Atlas Concrete yard 0.6

(Sheet 1)

Circle one: Present

Developed

For Entire catchment

1. Runoff Curve Number (CN) and initial Abstraction (Ia)

Cover Type / Treatment	Soil Group	Curve number CN*	Area (ha)	Product of CN x area
PASTURE	C	74	0.090	6.66
SEALED	C	98	0.510	49.98
* from Appendix B		Totals	0.60	56.64

Maximum 85% cover:

$$CN_{(weighted)} = \text{total product}/\text{total area} = 94$$

$$Ia_{(weighted)} = 5 \times \text{pervious area}/\text{total area} = 0.090 \quad 0.8 \text{ mm}$$

2. Time of Concentration

Channelisation factor C = 1.0 (from table 4.2, TP. 108)

Catchment length L = 0.078 km km (along drainage path)

Catchment slope S_c = 0.045 m/m m/m (by equal area method) (m³/s)

$$\text{Runoff factor, } CN/200-CN = 0.89$$

$$t_c = 0.14 \times C \times L^{0.66} (CN/200-CN)^{-0.55} S_c^{-3} = 0.070 \text{ hrs}$$

10mins (0.17 hrs)

$$\text{SCS Lag for } t_p = 2/3t_c = 0.047 \text{ hrs}$$



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Graphical Peak Flow Rate

20.5.2010

By: Sam J.

Reference No: 31062

Project: Atlas Concrete - Wairau Road

References to ARC TP108, April 1999
(Sheet 2)

Location: Atlas Concrete yard

Circle one: Present

Developed

1. Data:

Catchment area $A = 0.00600 \text{ km}^2$ **Note: Km^2**

Runoff curve number $CN = 94$ 2.88

Initial abstraction $I_a = 0.8 \text{ mm}$ (from sheet 1)

Time of concentration $T_c = 0.070 \text{ hrs}$ 0.0323

2. Calculation Storage:

$$S = (1000/CN - 10)25.4 = 15.1 \text{ mm}$$

3. Average recurrence interval: ARI (yr)

4. 24 hour rainfall depth: P_{24} (mm)

5. Compute $c^* = P_{24} - 2I_a / P_{24} - 2I_a + 2S$

Time Of Concentration (in hours)

6. Specific peak flow rate, q^*

7. Peak flow rate, $q_p = q^* AP_{24}$ (m^3/s)

8. Runoff depth, $Q_{24} = (P_{24} - I_a)^2 / (P_{24} - I_a) + S$ (mm)

9. Runoff volume, $V_{24} = 1000 \times Q_{24} A$ (m^3)

Storm #1	Storm #2	Storm #3
2	10	100
80	140	210
0.72	0.82	0.87
0.070		
0.170	0.177	0.179
0.08	0.15	0.23
67	126	195
400	754	1171

(Figs. A1, A3, A6)

(rounded to 1 d.p.)

(Fig 6.1 - Specific Peak Flow Rate)

(m^3/s)



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Hydraulic Neutrality

20.5.2010

By: Sam J.

Reference No: 31175

Project: Atlas Concrete - Wairau Road

*References to ARC TP108, April 1999
(Sheet 5)*

Total development flow, volume and time of concentration

	Total Flow (m ³ /s)	Total Volume (m ³)	Increased Time of Concentration (hrs)
2 yr Storm	0.082	400	NIL
10yr Storm	0.149	754	
100yr Storm	0.226	1171	



**McGUIGAN SYME CHILCOTT
LIMITED**

CONSULTING ENGINEERS • CIVIL • STRUCTURAL

Wastewater Flow Design

7/11/2011

By: SJ

Reference No: 31175

Project: Atlas Concrete - Wairau Road

Assumptions: Catchment flow into the existing 150mm pipe

Residential Lots =	14	design flows=	225	l/person/day
No. of persons per unit =	6	peak factor =	3	
No. of persons in commercial =	50			

Average Dry Weather Flow = 0.35 l/s

Peak Wet Weather Flow = 1.05 l/s

Roughness Factor	Pipe size(mm)	Grade(1 in)	%
1.5	150	25.64	3.9

VELOCITY (m/sec) 1.73

CAPACITY (Q = VA) 30.64



**McGUIGAN SYME CHILCOTT
LIMITED**

CONSULTING ENGINEERS • CIVIL • STRUCTURAL

Wastewater Flow Design

7/11/2011

By: SJ

Reference No: 31175

Project: Atlas Concrete - Wairau Road

Assumptions: Sewer flow from the proposed site

Area = 0.6 design flows= 225 l/person/day

EP = 150 peak factor = 3

Average Dry Weather Flow = 0.23 l/s

Peak Wet Weather Flow = 0.70 l/s