MOOREBANK INTERCHANGE

REVIEW OF ENVIRONMENTAL FACTORS - VOLUME 2

APPENDICES

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Appendix A

VALUE MANAGEMENT STUDY REPORT

M 5 / Moorebank Avenue Interchange

Value Management Study Report

December 2001

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Executive Summary

The State Government recently announced that the Moorebank Avenue Intersection with the M5 Motorway would be significantly improved and that the Government is committed to removing the last set of traffic signals on the main road between Sydney and Albury or Canberra. The importance of these proposed works is heightened by the opening of the M5 East which improves travel time and safety between Sydney and Liverpool and will generate greatly increased traffic at the Moorebank intersection over the next few years.

The current intersection is heavily trafficked and is unable to efficiently cater for traffic on either the M5 or Moorebank Avenue. Congestion and accidents are common at the intersection and their effect spills back into the local road network causing further inefficiencies and problems.

The Roads and Traffic Authority together with Interlink Roads the operator of the M5 Motorway, have carried out studies and design investigations on potential improvements that could be made at the intersection.

Previous reviews of the options have resulted in the adoption of a current concept scheme which involves a fully grade separated overpass of the M5 by Moorebank Avenue. Dual turning movements, catering for B Double Trucks, and removal of the traffic signals on the Motorway are features of the current concept.

On and off load ramps providing vehicles with the ability to enter or exit the Motorway, outside the tolled area, and a continuation of the ramps along the M5 to link with the Heathcote Road ramps is expected to enhance local traffic freedom and provide a local main road link between the two roads with improvements to heavy vehicular safety and access to industry.

Provision for future growth and development of the adjacent area has been included in the sizing of the interchange which is expected to be constructed by the Motorway operator on behalf of the RTA.

John Bushell Value Management Pty. Ltd. was appointed by Brown & Root Services Asia Pacific Pty. Ltd. to conduct the value management study (VMS) on the proposed grade separated M5 / Moorebank Avenue Interchange. The overall objective of the study is to receive community input on the project and to ensure that this input is taken into account in the design and implementation of the interchange.

The VMS was held on 20th December 2001 at Hunts Motel & Function Centre, Crossroads, Hume Highway, Liverpool.

Participants from the following sectors of the community and business participated in the VMS:

- Community representatives, including landowners
- Department of Defence
- Interlink Roads
- Liverpool City Council
- Roads and Traffic Authority (RTA)
- Transportation consultants to Defence and the RTA
- Utility providers.

John Bushell of John Bushell Value Management Pty. Ltd. conducted the VMS

The value management study group agreed the following Project Objectives:

- Improve safety – reduce the incidence and severity of accidents;
- Improve pedestrian safety;
- Reduce traffic noise;
- Improve air quality;
- Improve traffic flow locally, particularly in respect of industrial traffic;
- Eliminate the last set off traffic lights between the City of Sydney and Canberra or Albury by March 2003;
- Provide adequate capacity to handle traffic generated by future development of the Department of Defence land and other projects to the south of the interchange;
- Provide an opportunity to add bus lanes on Moorebank Avenue in future;

- Complete the whole project by the end of September 2003.

During the value management study a number of **significant factors** became apparent;

- *The present at-grade junction between the M5 Motorway and Moorebank Avenue is the only remaining signalised intersection between the Sydney CBD and Canberra and Albury to the southwest;*
- *The junction is the cause of significant traffic congestion and delays to industrial, business and residential traffic and congestion has worsened since the opening in mid December of the M5 East;*
- *The junction is used by a high percentage of heavy vehicles and is the source of many accidents;*
- *Moorebank Avenue is currently heavily congested at peak periods;*
- *There are problems with heavy vehicles accessing industrial premises on Moorebank Avenue, particularly those making right turns into properties;*
- *The proposed grade separated M5 / Moorebank Avenue intersection plan has been the subject of significant options development and traffic modelling in conjunction with the proposed Sydney Orbital road and Liverpool City Council's current transport and urban planning proposals;*
- *Commencement of preparatory work for the grade separated interchange is planned to commence in late February 2002 and construction of the whole interchange is due to be completed in late September 2003;*
- *Land acquisitions for the project including the construction worksite are yet to commence;*
- *A financial arrangement has been made between the RTA and Interlink Roads to provide the funding for the project.*

The **outcomes** of the value management study were that the participants:

- *Agreed the M5 / Moorebank Avenue intersection plan proposed by the RTA and consultants (Appendix 2);*
- *Agreed that significant benefits will flow to the community of the Liverpool area through the resolution of this bottleneck in the road system*
- *Demonstrated strong community support and a willingness to cooperate to ensure that the grade separated intersection is achieved at the earliest practical time;*
- *Agreed that land acquisitions are critical and noted that the RTA has a plan in place to purchase land and lease the construction worksite as a matter of urgency;*
- *Identified the critical ongoing communication needs to keep Liverpool City Council and the community advised of the project and its fast-track implementation;*

- *Agreed on the need for urgent and continued communication between the RTA and Liverpool City Council on detailed matters of transport and urban planning and agreed a time frame for this;*
- *Agreed that, in addition to the improvements proposed for the intersection of the M5 and Moorebank Avenue, that congestion and traffic maneuvering on Moorebank Avenue requires short term initiatives to mitigate current problems. The RTA and Liverpool City Council would separately confer on these issues;*
- *Agreed that additional access from the M5 to the Liverpool area to cater for traffic growth in the longer term future should be provided at a site to be determined on transport and urban planning requirements and that further augmentation of this intersection would not be expected to serve these needs;*
- *Agreed the need to plan and coordinate utilities now to cater for future Moorebank Avenue widening and development of the Department of Defence land to the south.*

The value management study group agreed an Action Plan, Section 6 to further progress the project.

1 Introduction

1.1 Project Background

The State Government recently announced that the Moorebank Avenue Intersection with the M5 Motorway would be significantly improved and that the Government is committed to removing the last set of traffic signals on the main road between Sydney and Albury or Canberra. The importance of these proposed works is heightened by the opening of the M5 East which improves travel time and safety between Sydney and Liverpool and will generate greatly increased traffic at the Moorebank intersection over the next few years.

The current intersection is heavily trafficked and is unable to efficiently cater for traffic on either the M5 or Moorebank Avenue. Congestion and accidents are common at the intersection and their effect spills back into the local road network causing further inefficiencies and problems.

The Roads and Traffic Authority together with Interlink Roads the operator of the M5 Motorway, have carried out studies and design investigations on potential improvements that could be made at the intersection.

Previous reviews of the options have resulted in the adoption of a current concept scheme which involves a fully grade separated overpass of the M5 by Moorebank Avenue. Dual turning movements, catering for B Double Trucks, and removal of the traffic signals on the Motorway are features of the current concept.

On and off load ramps providing vehicles with the ability to enter or exit the Motorway, outside the tolled area, and a continuation of the ramps along the M5 to link with the Heathcote Road ramps is expected to enhance local traffic freedom and provide a local main road link between the two roads with improvements to heavy vehicular safety and access to industry.

Provision for future growth and development of the adjacent area has been included in the sizing of the interchange which is expected to be constructed by the Motorway operator on behalf of the RTA.

1.2 Study Background

John Bushell Value Management Pty. Ltd. was appointed by Brown & Root Services Asia Pacific Pty. Ltd. to conduct the value management study (VMS) on the proposed grade separated M5 / Moorebank Avenue Interchange. The overall objective of the study is to receive community input on the project and to ensure that this input is taken into account in the design and implementation of the interchange.

The VMS was held on 20th December 2001 at Hunts Motel & Function Centre, Crossroads, Hume Highway, Liverpool.

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- Interlink Roads
- Liverpool City Council
- Roads and Traffic Authority (RTA)
- Transportation consultants to Defence and the RTA
- Utility providers.

John Bushell of John Bushell Value Management Pty. Ltd. conducted the VMS. A list of participants and their team affiliations is included in **Appendix 1**.

1.3 Project Objectives

The value management study group agreed the following Project Objectives.

- Improve safety – reduce the incidence and severity of accidents;
- Improve pedestrian safety;
- Reduce traffic noise;
- Improve air quality;
- Improve traffic flow locally, particularly in respect of industrial traffic;
- Eliminate the last set off traffic lights between the City of Sydney and Canberra or Albury by March 2003;
- Provide adequate capacity to handle traffic generated by future development of the Department of Defence land and other projects to the south of the interchange;
- Provide an opportunity to add bus lanes on Moorebank Avenue in future;

- Complete the whole project by the end of September 2003.

1.4 Study Objectives

The following Study Objectives had been proposed and they were endorsed by the VMS group.

- Identify any issues that any participants have in relation to the design, construction and operation of the interchange;
- Resolve issues where possible, or set up a course of action to resolve them;
- Identify any items which will add value to the project;
- Agree the action plan.

1.5 Introduction to Value Management

John Bushell gave an overview of value management which is defined in the Australian / New Zealand Standard (AS / NZS 4188:1994) as:

A structured and analytical process which seeks to achieve value for money by providing all the necessary functions at the lowest total cost consistent with required levels of quality and performance.

The purpose of value management on this project is to ensure that all stakeholders in the project have been consulted and to ensure that the community achieves value for money.

Value management was originally developed as "value engineering" by the General Electric Corporation in the late 1940's in response to post war privations and the demands of reconstruction. Its use has been mandatory on all capital works projects in excess of $5 million requiring the approval of US Congress, and the City of New York Office of Management and Budget since the mid 1980's. It is currently a requirement to apply value management to capital works projects in excess of $5 million in NSW, WA, the ACT and Tasmania with a view to maximising the value to be obtained from scarce capital works funds.

A VMS follows a structured process that specifically encourages questioning and innovation. In order to ensure that we maximise the benefit from this study participants were asked to participate in and contribute to the study. In a VMS all participants have equal status – so rank needs to be left at the door.

No one will be asked to defend a previous decision, everything will be up for consideration.

Participants were encouraged to use this study as a vehicle both to generate ideas and to ask questions, there's no such thing as a silly question, particularly with the project in its development stage. To assist the process the VMS group were divided into four teams of participants with a variety of professional / experience backgrounds.

1.6 Study Report

This report has been compiled by John Bushell Value Management Pty. Ltd. The report seeks to provide an independent, objective overview of the project and the VMS outcomes.

The report records the process and results of the VMS and incorporates information gathered in the VMS. The report is intended to record the agreement reached and actions agreed during the study to further progress the project.

2 Study Background

2.1 Roads & Traffic Authority Overview

Mr. Don Arasakumar, Manager, Private Motorways, RTA, provided an overview of the project to date.

The M5 / Moorebank Avenue junction has the only remaining traffic signals now on the M5 and the only traffic signals between Sydney CBD and Canberra or Albury to the southwest. It serves the Liverpool business district and is used by substantial numbers of large commercial vehicles, including B-doubles.

In peak periods the M5 / Moorebank Avenue junction experiences significant delays particularly with eastbound traffic on the M5 in the morning, and south and westbound traffic on Moorebank Avenue and the M5 respectively in the afternoon peak. Overall the current performance of the junction has been evaluated as Level of Service (LOS) "F" – a high level of congestion.

Provision of a grade separated M5 / Moorebank Avenue Interchange is therefore a key junction improvement needed in south-western Sydney. The currently proposed interchange (plan in **Appendix 2**) has been the result of extended development to select the optimum configuration to suit the current and predicted future traffic patterns. Traffic modelling carried out for the proposed major Sydney Orbital road has incorporated this completed grade separated interchange in its traffic flow predictions.

The RTA has been appreciative of the efforts of Interlink Roads who, through a commercial agreement are providing the funding for the construction of this interchange thus preserving scarce Government funding for other purposes.

There has been significant cooperation between the RTA, Interlink Roads and their respective technical consultants to ensure the interchange project proceeds in as short a time frame as practical.

2.2 Interlink Roads Overview

Mr. John Gardiner, General Manager, Interlink Roads Pty. Ltd. gave an overview of the company's current operation of the M5. Interlink is strongly aligned with the Community of southwest and southeast Sydney.

Afternoon delays on the M5 caused by the Moorebank Avenue junction bottleneck used to cause a back-up of traffic through the toll plaza on the M5 Motorway on one or two occasions a week. Now with the M5 east open this problem is exacerbated and traffic queues through the toll plaza on virtually every weekday afternoon and sometimes the tailback reaches to Fairford Road.

There are plans to increase the use of E-way toll payments and increase the number of toll booths to cater for increased traffic once the Moorebank Avenue intersection is completed and to cater for traffic growth generally. Once the Moorebank Avenue intersection is completed it is anticipated that there will be no major queues at the toll booths with the exception of peak holiday periods when a higher percentage of motorists make cash payments than on normal business days and weekends.

The current proposal is to achieve free-flow along the M5 at its junction with Moorebank Avenue in March 2003 and to have the whole new intersection complete by September 2003. It is therefore important that land acquisitions and approvals proceed quickly and with the full acceptance of those affected. Interlink Roads will make every effort to bring these dates forward and deliver the benefits to the community earlier if at all possible.

2.3 Intersection Design Overview

Mr. Michael Gray, Project Manager, Brown & Root Services Asia Pacific Pty. Ltd. gave an overview of the current design of the intersection.

The completed grade separated M5 / Moorebank Avenue Interchange will comprise a large concrete bridge above the M5 Motorway on which Moorebank Avenue will pass (two lanes in each direction with provision for three lanes in each direction in future). The alignment of Moorebank Avenue on the bridge will also provide potential for any widening of the whole length of the road (north and south of the intersection) to three lanes in each direction. Signalised right and left turns will be available in all directions to and from the M5 Motorway with all signalling occurring on the bridge thus leaving the M5 free flowing.

All planned right turns are two lanes, except M5 westbound to Moorebank Avenue northbound which is one lane. All left turns are one lane with the exception of the M5 eastbound to Moorebank Avenue northbound which will comprise two lanes.

Signalised pedestrian and cyclist crossings of the east facing ramps are provided to the north of the elevated intersection.

The M5 between the Moorebank Avenue and Heathcote Road ramps will be widened by an additional lane effectively providing a free link for the high numbers of vehicles using these two nearby main roads.

It is proposed that construction will commence at the end of February 2002. Some earlier works including repair of damaged slabs on the M5, services relocations, and a widening of the M5 near its junction with Moorebank Avenue will commence in January 2002. This widening will permit the M5 to be maintained at three lanes width while construction of the central bridge supports proceeds and will immediately provide a fourth lane in each direction to temporarily improve vehicle storage capacity on the M5 thus improving traffic signal efficiency.

The bridge deck will be constructed in two sections with Moorebank Avenue being transferred to the eastern section once it has been completed and the M5 being "traffic light free" shortly after the western section is completed, currently expected in March 2003.

Completion of the whole grade separated intersection is planned for September 2003.

There are no major environmental factors to be addressed in this urban industrial area and the road layout avoids nearby heritage constructions. Accordingly, Brown and Root will prepare a review of environmental factors (REF) and submit it to the RTA for approval.

3 Value Management Study

3.1 Assumptions

The four value study teams identified the assumptions they have regarding the project as shown on **Tables 1** to **4** inclusive.

Categories in which the teams identified their assumptions were as follows:

- **Project**
- **Implementation**
- **Operation**

Each team read out its assumptions and the RTA and the project design consultants advised which assumptions were reasonable and which needed to be questioned Assumptions the group believed should be questioned are identified by a **??** and are addressed in the Idea Generation section of the study.

Table 1: Team A – Assumptions

No.	Assumptions

	Project
1	The project will separate traffic on Moorebank Avenue and M5 and adequate turning movements between the two will be catered for.
2	Local traffic and M5 toll evasion will be effectively managed.
3	Should facilitate land development and will open land to development.
4	Property access arrangements will be catered for.
5	The design caters for all road users including cyclists and buses.
6	There will be minimal property impacts as a consequence of the improved interchange.
7	The concept design process has taken into account all utility assets.
8	The roads will meet high road design standards eg: design speed etc.
9	M5 Speed will be upgraded to 110 kph once the project is competed. **??**
10	The Design Speed for Moorebank Avenue will be resolved. **??**
11	There will be no impact on heritage items, eg: Kitchener House.
12	B-double routes will be catered for in the intersection, or alternative B double routes will be identified.
13	A landscaped gateway to Liverpool City Council area will be provided.
14	Noise for residents between Moorebank Avenue and Heathcote Road will be minimised.
	Implementation
15	A Traffic Management Plan with the necessary approvals will be in place.
16	Dust and noise control will occur.
	Operation
17	A better level of service and improved traffic flow will be achieved.
18	There will be improved air quality as a result of the project.
19	Reduce traffic noise will result from the project.
20	Lane marking on Moorebank Avenue approaching M5, needs to be resolved. **??**

Table 2: Team B – Assumptions

No.	Assumptions
1	Removal of traffic lights.

2	Increase traffic confusion during the works.
3	Assume the traffic improves.
4	Assume funding is approved.
5	Assume acquisition is timely.
6	Assume utilities issues will be resolved in time.
7	Assume efficacy of design.
8	Assume the project is determined to proceed, (Political, RTA, Interlink).
9	Assume it will correct / improve traffic in Moorebank Avenue.
10	Assume the M5 traffic flow at the toll plaza improves.
11	Assume the people building have interest in improving other than the M5.
12	Improve intersection phasing.
13	Assume the intersection improvements are tied into a broader picture and strategy.
14	Assuming that a lot of westbound traffic will exit at Moorebank Avenue in lieu of the Hume Highway.
15	Assuming maintenance of existing traffic movements during construction.
16	Assuming that the REF and environmental requirements will be satisfied.
17	Assume Councils will further look at local traffic management. **??**

Table 3: Team C – Assumptions

No.	Assumptions
1	That it can be built in time.
2	No EIS is required.

3	Money / funding will be available.
4	This design – concept is optimal.
5	Could actually be underpass. ??
6	Can the overpass be upgraded?
7	That the interchange has adequate capacity.
8	That traffic flow will be improved.
9	The proposed road system will perform safely.
10	That the structure will last.
11	That public will be happy with the improved value.
12	That construction impact on residents will be minimal.
13	Toll will not increase as a result of construction of this project.
14	Pedestrians and cyclists will be catered for.
15	That there will be no significant impact on the environment.
16	That the Commonwealth will allow acquisition of Department of Defence land.
17	That there will be no significant impact on heritage.
18	That M5 will be open at peak periods.
19	That the proposed bridge can cater for heavy load platforms.
20	That there will be 5.5 m clearance. ??
21	That drainage design will be adequate.
22	That the M5 level will remain the same.
23	There will be no adverse reaction on nearby roads. ??
24	Lighting and urban design will be adequate.
25	The project will start on time.

Table 4: Team D - Assumptions

No.	Assumptions
	Project
1	The project is under part 5 of the EPA Act.
2	The project is warranted.

3	This design is better than a clover leaf junction.
4	That all turning movements are permissible and that all movements are free flow. **??**
5	Can cater for heavy and long loads, (including B double and B triples).
6	Kitchener House will not be affected.
7	This project caters for 6 lanes in Moorebank Ave.
8	The structure can be easily adapted to provide 6 lanes.
9	M5 has free flow.
10	Designed for safety for all road users, including cyclists and pedestrians.
11	Ramps are designed so that queuing does not occur back onto the Motorway.
12	Clearance under the structure allows for strengthening of the pavement.
13	Heritage gates at Youlong can be moved.
14	The design will cater for up to 25,000 additional residents on the Defence land. **??**
15	Stormwater will not cause local flooding.
16	Good landscaping will be provided.
17	Good directorial signal posting will be provided.
18	That the community strongly supports the project.
	Implementation
19	Construction will not cause traffic to be diverted onto local roads.
20	An off–load ramp will be built in the future at the Hume Highway.
21	Defence and RTA can move heavy and large loads during construction.
22	Traffic disruption to Motorway and Moorebank Avenue traffic is minimal.
23	Land acquisitions will occur smoothly.
24	There will be no significant environmental impacts.
25	Construction lease will be available from Defence in a timely fashion.
	Operation
26	Landscape will be well maintained.
27	Moorebank Avenue capacity is constrained until Defence land is developed.
28	Stormwater systems operate correctly.
29	The interchange operates efficiently and safely with minimal delay for all users.

3.2 Issues and Concerns

The value study group identified the issues and concerns that it had regarding the proposed intersection as show on **Tables 5** to **8** inclusive.

Table 5: Team A – Issues and Concerns

No.	Issues and Concerns
1	Timely land acquisition requirements to meet commitments needs to be resolved.
2	Access to utility assets during construction.
3	Access to industrial properties during construction.
4	Question of contaminated land in Defence property.

Table 6: Team B – Issues and Concerns

No.	Issues and Concerns
1	Commitment of RTA to facilitate land access or construction licences.
2	Timely upgrading of Moorebank Avenue generally.
3	"Rob Peter to pay Paul" - solve one problem may cause another.

4	Safety along M5 from queuing back of ramps.
5	Future full area development; will it catered for by this size of junction?
6	Capacity of interchange may reach saturation due to outer area through traffic prior to see receipt of approval for local development and rezonings.
7	Local traffic issues will alter due to the construction of interchange and will these be planned for at appropriate Government level: eg "T-map". Examples: • Anzac Road / Cambridge, • Turning lanes and factory access on Moorebank Avenue.
8	Future ownership and maintenance of current Department of Defence roads.
9	Who will maintain the intersection?
10	Timing of approvals.
11	Conflict of industrial with residential traffic.
12	Local traffic planning along Moorebank Avenue after development of Defence land.
13	Management of traffic during construction of the intersection.
14	Capacity for future upgrading of the intersection.

Table 7: Team C – Issues and Concerns

No.	Issues and Concerns
1	That the Department of Defence will allow land acquisition.
2	That intersection capacity will be adequate.
3	Those impacts on local roads will be dealt with.
4	That the M5 may have to be closed during construction.

5	That adverse off-line conditions may occur.
6	That the interchange design is a constraint.
7	That this is fast tracked because of time issues.
8	That this fast tracking has an adverse impact on alternative option generation.
9	That environmental issues may affect the time scale.
10	That SIS will trigger an EIS for the fourth lane widening on the M5.
11	That the project takes focus away from alternative transports to the motor vehicle.
12	That adequate provision will be made for utilities.
13	That utilities will have enough time to relocate in line with the program.
14	Proper community consultation is difficult to perform in the short time frame.

Table 8: Team D – Issues and Concerns

No.	Issues and Concerns
1	Project is delayed or does not occur.
2	M5 off-load ramps to Hume Highway is not included (Liverpool City Council).
3	Future ownership of road and land south of Bapaume Road.
4	Construction hours, (noise).
5	May hinder the modal shift to public transport.

6	This intersection will still have traffic lights on it.
7	By 2016, the level of service is predicted to be F (based on maybe numbers).

3.3 Opportunities

The value management study group identified the opportunities it saw the road upgrading project presents to the area as shown on **Tables 9** to **12** inclusive.

Table 9: Team A - Opportunities

No.	Opportunities
1	Public transport.
2	Future development of Department of Defence property.
3	Provide more space for future utility assets and demands.
4	Increased employment opportunities through high level access.
5	Industrial development in area would redistribute freight generating activities.
6	Consultation with utilities prior to finalisation of detail design.
7	Consultation with stakeholders prior to finalisation of detail design.
8	In conjunction with the proposed Sydney Orbital road there are opportunities for reduced travel time.
9	Minimising truck movements on local roads.
10	To reduce current level of accidents.
11	To address local traffic issues - traffic management initiatives.
12	To upgrade drainage pipes eg: opportunities for the Department of Defence
13	Provide a gateway to Liverpool City Council - landscaping and urban design.

Table 10: Team B - Opportunities

No.	Opportunities
1	Optimise public transport: - local and network.
2	Improved business prospects for Liverpool, affecting employment, reduced transport costs, (increased interfacing).
3	Less pollution.
4	Fewer accidents.

5	Increase in high-density "high tech" employment opportunities.
6	Improve perception that the southwestern region is part of Sydney.
7	Improve tourism.
8	Part of Sydney Orbital.
9	Transiting opportunities for future by planning now.
10	Increased land value.
11	Reduced inter-capital travelling time.
12	Facilitate improvements to Liverpool CBD, including retail shopping.

Table 11: Team C - Opportunities

No.	Opportunities
1	Getting rid of the last set of traffic lights.
2	Better traffic flow between Sydney City and the South West.
3	Get rid of traffic lights on Moorebank Avenue.
4	Improve pedestrian and cyclist access.
5	Improve utility asset potential.
6	Make the bridge a gateway to Liverpool (enhanced urban design).
7	To improve public transport opportunities.

8	To improve car-pooling: - park and ride.
9	Could enhance transit-way opportunity.
10	To improve safety.
11	To reduce air and noise pollution.
12	Allow development of Department of Defence lands.
13	Improve land values in the area.
14	To improve M5 customer satisfaction.
15	Reduce maintenance costs at the intersection.
16	Higher Benefit Cost Ratio.
17	Improve interim performance of the intersection.

Table 12: Team D - Opportunities

No.	Opportunities
1	Improve safety.
2	Provide an entrance / gateway to Liverpool.
3	Ensure that urban design and landscaping is a priority (eg: Department of Defence has urban design criteria for its industrial developments).
4	There is a lot of vacant land around the intersection.
5	Opportunity for Liverpool CBD to grow commercially and residentially.

3.4 Idea Generation and Judgement

The value management teams then generated ideas to address the previously identified **assumptions questioned** (**section 3.1**), the **issues and concerns** identified (**section 3.2**) and the **opportunities** identified (**section 3.3**).

Once the teams had generated all ideas each team read out its ideas to the whole group and the group judged the ideas using the rating system below. The facilitator emphasised that this is the first stage of the development process in which ideas are converted into specific proposals. It is also important to judge the ideas **only** after all the ideas have been identified, and certainly not during Idea Generation phase of the study.

Idea Rating

1 = Must Do.

2 = Investigate now (further discussion during the study)

3 = Investigate later.

4 = Not used.

The results of the **Idea Generation** and **Judgement** phases are included in **Tables 13** to **16** inclusive. The Idea Rating is show in the right hand column of **Tables 13** to **16** inclusive.

The **Action Plan, section 6,** addresses the follow up actions required to the ideas rated "3". Ideas noted "1" are within the sphere of responsibility of the key participants on this project, the RTA, Interlink Roads, Liverpool City Council and Brown and Root. The Ideas Generation (**Tables 13** to **16**) act as a checklist which should be monitored by these parties to ensure the ideas are actioned during the normal course of project development.

Table 13: Team A – Idea Generation

No.	Idea Generation	Rate.
1	Provision of a utilities corridor to be used by all authorities.	1
2	Interact with Council and provide adequate sign posting to address local traffic.	1
3	Consultation with property owners to address access and other issues.	1
4	North East and North West corners of the intersection to be used as a "gateway" to Liverpool.	3
5	Use practical noise mitigation to minimise noise impacts, including open grade asphalt on critical areas;	1
6	Inform the community of night works.	1

7	M5 westbound to Moorebank Avenue southbound ramp should be marked for 2 lanes.	3
8	Quick resolution of property issues.	1
9	Communication between contractors / developers and utilities.	1
10	Plan and achieve a fast track planning approvals process.	1
11	Permanent access to the work site to be resolved.	1

Table 14: Team B – Idea Generation

No.	Idea Generation	Rate.
1	RTA and Council to interface / liaise to: • coordinate local development, • exchange data, • incorporate Council's vision, • include the Transitway strategy.	1
2	Improve local Moorebank safety by extending the median strip past Helles Avenue - or idea 3:	3
3	Widen Moorebank Avenue to allow safe right hand turns to the industrial properties to overcome current industrial / residential traffic conflicts.	3
4	Project Report / Recommendation should be issued to the NSW Premier's Department in respect of network and local planning (T-	1

	map).	
5	Initiate a Local Traffic Scheme to provide turn bays into Helles Avenue.	3
6	Investigate the provision of U-turn facilities in Moorebank Avenue, both north and south of the interchange, eg: roundabouts suitable for B-doubles.	3
7	Investigate opportunities to screw down the new capacity to restrict usage in order to maintain the future expansion capacity to be progressively released to allow progressive additional local development.	3
8	Investigate potential for Urban Design in the corridor between Heathcote and Moorebank to promote the "Liverpool Gateway".	3

Table 15: Team C – Idea Generation

No.	Idea Generation	Rate.
1	Develop a Local Area Traffic Management Plan.	1
2	Negotiate with Department of Defence for land.	1
3	Decision / consultation / finalisation in depth regarding Department of Defence land.	1
4	Link T-maps with this intersection project.	1
5	Allow transit lanes on Moorebank Avenue.	3
6	Develop a Pedestrian / Cyclist Management Plan.	1
7	Plan for urban design / gateway.	3
8	Provide park and ride facility.	3
9	Link to the bus Transitway system.	3
10	Improve tolling to reduce bottlenecks	4

11	Provide a design that removes traffic lights from Moorebank Avenue totally and further increase intersection capacity.	3

Table 16: Team D – Idea Generation

No.	Idea Generation	Rate.
1	Look to upgrade the interchange in 2031.	4
2	Incorporate urban design in finishes.	1
3	Restrict traffic flows at the south end of Moorebank Avenue.	3
4	Look at constructing a separate interchange in future to achieve increased capacity.	1

4 Development Stage

A number of questions were raised during the study and the comments and answers provided are recorded in this section.

4.1 Traffic Modelling

Liverpool City Council expressed concern that Council's most recent traffic and urban planning data may not have been used in the traffic modelling undertaken by the RTA for the proposed Sydney Orbital road and the M5 / Moorebank Avenue interchange.

Advice received from the RTA modellers during the study was that they had been in contact with the relevant departments in Council and that the latest information has

been used in the modelling. It was resolved that the RTA would list the information used in the modelling to Council as a matter of urgency for confirmation. In addition to this further meetings as needed are to be established between Council and the RTA to confirm the details of the traffic modelling and its relationship with urban planning (**Section 6, Actions 1 and 4**).

It was noted however that whilst the proposed M5 / Moorebank Intersection provided full access facilities to Moorebank Avenue south the nature of the proposed development on the Department of Defence land is yet to be finalised.

4.2 Junction Layout and Future System Expansion

Two strategic questions were raised regarding the proposed M5 / Moorebank Intersection:

- Does the proposed intersection layout meet the required functionality or would a better solution be one that eliminates traffic lights on Moorebank Avenue completely?
- Will the intersection have adequate capacity in the long term or should the present design be modified to permit future augmentation to cater for increased traffic?

Advice presented at the study was that the capacity and functionality of the M5 / Moorebank Intersection is the result of extensive development and testing of options by the RTA and consultants. The following points were made:

- The proposed intersection provides full right and left turn facilities (2 right turn facilities are not available currently), and three of the right turn and one of the left turn facilities are 2 lanes wide.
- Moorebank Avenue combines the functions of a sub-arterial road with local access road providing direct access to industrial and other premises and therefore is of itself restricted in respect of long-term capacity.
- The M5 / Moorebank Intersection as currently proposed is matched to the long-term capabilities of Moorebank Avenue (including widening to a total of 6 lanes with the kerbside lanes used primarily for buses and turning vehicles).
- Completely removing traffic lights in Moorebank Avenue would increase the traffic to the extent that manoeuvring in and out of property entrances would be more difficult and dangerous than it is now as, at busy times, the breaks in traffic would be less frequent, and of shorter duration.
- There are a number of constraints to the current operation of Moorebank Avenue that need to be addressed in the short term (see **section 4.4**).

It was agreed that, subject to the checks referred to in **section 4.1**, the intersection should remain as the currently presented plan (**Appendix 2**). Provision of increased capacity and access from the M5 to the Liverpool area can be achieved by the provision of another access in the longer term, the location and design of which can be optimised to suit Council's urban and traffic management plans.

4.3 Intersection Capability

The M5 / Moorebank Intersection as currently proposed has the capacity for B-doubles to travel through all parts of it.

The height of the Moorebank Avenue bridge will be the standard 5.3 metres above the Motorway including having the provision for resurfacing the motorway and consequent raising of the Motorway surface level.

4.4 Moorebank Avenue Upgrade

The group noted that Moorebank Avenue is intensively used and heavily congested for increasing hours of the day – particularly north of the M5, northbound in the morning and southbound in the afternoon. Recently traffic lights have been installed on Moorebank Avenue to control access to the Toll IPEC freight forwarding site. Of particular concern are trucks and articulated vehicles making right turns into and out of premises along the Avenue as they can cause a considerable back up of traffic when turning into a private entrance.

It was agreed that the traffic operation of Moorebank Avenue needs to be studied with a view to improving its functionality and safety as follows:

- In association with traffic management initiatives being implemented in order to construct the grade separated interchange,
- to be able to cater for the anticipated increase in traffic when the grade separated intersection is operational,
- solutions to the above two points need to be a component of a medium – long term plan to manage traffic and upgrade the Avenue as required to accommodate future traffic growth and urban development.

4.5 Traffic Speeds on Moorebank Avenue and the M5

Moorebank Avenue will be designed for a traffic speed of 70 kph but signposted at 60 kph to accommodate the current lower rated sections north of the M5.

The M5 now has a number of different speed zones as a consequence of its junction with Moorebank Avenue and a decision on the final signposting of the M5 has yet to be made. The RTA advised that variable speed signage from 90 to 110 kph may be considered as this would optimise the use of the Motorway during busy periods.

4.6 Community Support

The community, landowners, Department of Defence and Council representatives at the VMS expressed strong support for the quick implementation of the grade separated interchange at the M5 / Moorebank Avenue intersection. It was recognised that, particularly in respect of the "fast-tracking" of the project, there is still ongoing consultation required so the community generally can learn about and understand the details of the proposal.

A critical factor is the quick acquisition of the land for construction and completion of leasing arrangements for the temporary worksite. Landowners, including the Department of Defence expressed a willingness to cooperate with land acquisitions so that the safety and economic benefits of the project can be delivered to the community in the shortest practical timeframe.

Concern regarding the possible closure of the M5 during construction was mentioned by some study participants and the advice given was that, whilst the road will need to be diverted and restricted at certain times during construction, total closure of the M5 during construction is not envisaged.

4.7 Utilities Coordination and Future Planning

Utility organisations at the VMS stressed the need to maintain the required safe access to all services in the intersection area both during and after construction of the interchange.

This project was also identified as a catalyst to promote the long term coordination of services locations planning to suit the eventual widening of Moorebank Avenue to six lanes plus other planned traffic control improvements (**section 4.4**) and the eventual servicing of the development of the Department of Defence land to the south of the M5 / Moorebank Avenue intersection.

4.8 Construction Worksite - Department of Defence

A construction worksite is to be leased from the Department of Defence on land to the south–east of the M5 / Moorebank Avenue junction.

It has become apparent that some of the land has become contaminated by previous activities. The contamination is not thought to be major but will be further investigated prior to a clean-up process being instigated by the Department. This work was noted as being urgent as the worksite will be required early in the construction process.

5 Study Outcomes

During the value management study a number of **significant factors** became apparent;

- The present at-grade junction between the M5 Motorway and Moorebank Avenue is the only remaining signalised intersection between the Sydney CBD and Canberra and Albury to the southwest;
- The junction is the cause of significant traffic congestion and delays to industrial, business and residential traffic and congestion has worsened since the opening in mid December of the M5 East;
- The junction is used by a high percentage of heavy vehicles and is the source of many accidents;
- Moorebank Avenue is currently heavily congested at peak periods;
- There are problems with heavy vehicles accessing industrial premises on Moorebank Avenue, particularly those making right turns into properties;

- The proposed grade separated M5 / Moorebank Avenue intersection plan has been the subject of significant options development and traffic modelling in conjunction with the proposed Sydney Orbital road and Liverpool City Council's current transport and urban planning proposals;
- Commencement of preparatory work for the grade separated interchange is planned to commence in late February 2002 and construction of the whole interchange is due to be completed in late September 2003;
- Land acquisitions for the project including the construction worksite are yet to commence;
- A financial arrangement has been made between the RTA and Interlink Roads to provide the funding for the project.

The **outcomes** of the value management study were that the participants:

- Agreed the M5 / Moorebank Avenue intersection plan proposed by the RTA and consultants (**Appendix 2**);
- Agreed that significant benefits will flow to the community of the Liverpool area through the resolution of this bottleneck in the road system
- Demonstrated strong community support and a willingness to cooperate to ensure that the grade separated intersection is achieved at the earliest practical time;
- Agreed that land acquisitions are critical and noted that the RTA has a plan in place to purchase land and lease the construction worksite as a matter of urgency;
- Identified the critical ongoing communication needs to keep Liverpool City Council and the community advised of the project and its fast-track implementation;
- Agreed on the need for urgent and continued communication between the RTA and Liverpool City Council on detailed matters of transport and urban planning and agreed a time frame for this;
- Agreed that, in addition to the improvements proposed for the intersection of the M5 and Moorebank Avenue, that congestion and traffic manoeuvring on Moorebank Avenue requires short term initiatives to mitigate current problems. The RTA and Liverpool City Council would separately confer on these issues;
- Agreed that additional access from the M5 to the Liverpool area to cater for traffic growth in the longer term future should be provided at a site to be determined on transport and urban planning requirements and that further augmentation of this intersection would not be expected to serve these needs;
- Agreed the need to plan and coordinate utilities now to cater for future Moorebank Avenue widening and development of the Department of Defence land to the south.

The value management study group agreed an **Action Plan**, **Section 6** to further progress the project.

6 Action Plan

The following Action Plan was agreed in the study. To maintain the progress of the project action plan nominees were asked to ensure that the tasks are completed by the agreed dates and the results communicated to the Action Plan Coordinator, Michael Gray at email: michael.gray@halliburton.com.

No.	Action Plan	By Whom	To be Completed by
1	Issue a report from Chris Wilson detailing the background data and assumptions used in the Network Modelling related to the grade separated M5 / Moorebank Avenue Interchange to Liverpool City Council.	Don Arasakumar / Chris Wilson	28 / 12 / 01
2	Issue letters to all landowners from whom land is to be purchased.	Don Arasakumar	28 / 12 / 01

3	Commence the process to determine the nature and extent of contamination on the Worksite land.	Mathew Begg	2 / 01 / 02 (commence)
4	RTA and Liverpool City Council conduct discussions on the Network Modelling conducted by the RTA, in respect of coordination with Council's Urban Planning, and the T-map (transport map).	Don Arasakumar	7 / 01 / 02
5	Issue the initial land purchase contracts to the affected landowners.	Don Arasakumar	7 / 01 / 02
6	Meeting with Massey, Wilson and Twinney regarding the coordination of Liverpool City Council's traffic planning with RTA Network Modelling.	Don Arasakumar / Phil Tolhurst	9 / 01 / 02
7	RTA meting with Council to resolve any Network Modelling / Urban Planning / T-map inconsistencies.	Don Arasakumar / Chris Wilson / Phil Tolhurst	28 / 01 / 02
8	Complete the determination process regarding the nature of the Worksite contamination. (Action 3)	Matthew Begg	31 / 01 / 02
9	RTA to present the T-map for the Liverpool area to the Premier's Department Transport Project Control Group meeting.	Don Arasakumar / Brian Watters	7 / 02 / 02
10	Obtain approval in principle to establishment of a coordinated Utilities Corridor on Moorebank Avenue south of the M5 / Moorebank Avenue Intersection.	Matthew Begg	29 / 03 / 02
11	Validate the RTA Network Model in relation to Liverpool City Council's Urban Planning and T-map. (Actions 1, 4. 7, & 9 relate)	Don Arasakumar / Phil Tolhurst	28 / 06 / 02
12	Develop a Long Term plan and related Short Term plan to improve the operation of Moorebank Avenue both before and after the grade separated M5 / Moorebank Interchange is operational. Refers particularly to heavy goods vehicles accessing properties off Moorebank Avenue. Implement any capital works initiatives required to improve operations.	Don Arasakumar / Brian Watters / Phil Tolhurst / Matthew Begg	28 / 06 / 02

	(Responsibilities: North of M5 - RTA, South of M5 to Bapaum Road - Liverpool City Council, South of Bapaum Road – Department of Defence)		
13	Develop demand management options and a preferred solution for Moorebank Avenue and implement as needed.	Don Arasakumar / Phil Tolhurst / Matthew Begg	28 / 06 / 02
14	Continue the coordination of utilities within the grade separated M5 / Moorebank Interchange project.	Michael Gray	On-going

Appendix 1 — Study Participants

A	Don Arasakumar	Manager, Private Motorways	Roads & Traffic Authority
C	John Bailey	Project Manager	Integral Energy
B	Matthew Begg	Major Property Disposal	Department of Defence
A	Fred Dagandan	Project Engineer	Network Integrity Services
B	Doug Darlington	Project Design Services	Roads & Traffic Authority
D	John Gardiner	General Manager	Interlink Roads Pty Ltd
B	Michael Gray	Project Manager	Brown & Root Services
A	John Hodgkinson	Internal Project Manager	Interlink Roads Pty Ltd
B	Brian Hume	Divisional Manager	Crown Scientific Pty Ltd
A	Raj Karthigeyan	Project Manager	Network Integrity Services
A	James Maldon	Senior Land Services Officer	Agilty Services
C	Les McCluskey	Environmental Planner	Roads & Traffic Authority
A	Bernie Mills	Senior Acquisition Officer	Roads & Traffic Authority
C	Murray Pelham	Civil Designer	Brown & Root Services
C	Sol Proops	Associate Technical Engineer	Brown & Root Services
D	Peter Rigg	Operations Manager	Roads & Traffic Authority
C	Tim Rogers	Director, Traffic Engineer	Colston Budd Hunt & Kafes
A	Katie Shammas	Environmental Officer	Roads & Traffic Authority
C	Voytek Szczepanik	Assistant Project Manager	Interlink Roads Pty Ltd
B	Pamela Taylor	Marketing & Membership Manager	Liverpool Chamber of Commerce
D	Phil Tolhurst	Manager Transport Planning	Liverpool City Council
D	Denis Watson	Manager Road Design	Brown & Root Services
D	Deanna Wong	Senior Environment Planner	Brown & Root Services
D	Ross Woodward	Planning Manager, Defence	Egis Consulting
	John Bushell	Study Facilitator	John Bushell Value Mgmt.
	Annie Damelet	Study Assistant	John Bushell Value Mgmt.

Appendix 2 Background Information

- Interchange and M5 Widening Concept Design

Appendix B

TRANSPORT MODELLING

MODELLING REPORT

M5 - Moorebank Avenue Interchange

August 2001

Prepared for
Roads and Traffic Authority

MWT Transport Modelling

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1. Introduction

The Roads and Traffic Authority is proposing to replace the existing at grade intersection at Moorebank Avenue and the M5 with a single point interchange along with other possible improvements on the M5 between Camden Valley Way and Heathcote Road.

Several network improvement scenarios were tested in NETANAL and an economic evaluation performed on the preferred scenarios.

To assist with the design and operation of the proposed interchange at Moorebank Avenue, the Roads and Traffic Authority commissioned MWT Transport Modelling to undertake modelling of the existing intersection and proposed interchange. Several models were used in this process:

- INTANAL model of the existing intersection for 1999 and 2016
- SCATES modelling of the proposed interchange design for 2016 (this also included a comparison of a single point and double point interchange)
- PARAMICS modelling of the existing situation and proposed interchange to view the effects of weaving and queuing on the M5.

Section 2 shows the outcomes of the NETANAL network scenarios and the results of the economic evaluation undertaken for the preferred scenarios on the M5 between Camden Valley Way and Heathcote Road.

Section 3 outlines the intersection modelling undertaken in INTANAL and SCATES.

Section 4 describes the PARAMICS model, including its calibration and results. This section also outlines the effects of the Western Sydney Orbital on the operation of the M5 and modelled by PARAMICS.

Section 5 discusses the impacts of the proposed Department of Defence developments to the south of the M5.

Section 6 includes a review of the RTA designs for the Single Point interchange.

2. Strategic Network Modelling

2.1 Traffic Flows

Using MWT Transport Modelling's NETANAL Sydney Strategic Road Network model, several network scenarios were developed in conjunction with the RTA and tested to determine their likely impacts on traffic flow. The network scenarios tested were:

- Model 1 – Base Case
- Model 2 – Moorebank Interchange
- Model 3 – Model 2 + Hume Highway Eastbound off ramp from M5
- Model 4 – Model 3 + Widen eastbound M5 between Camden Valley Way and Hume Highway to 3 lanes
- Model 5 – Model 4 + Widen eastbound M5 between Moorebank Avenue and Heathcote Road
- Model 6 – Model 5 + Widen eastbound M5 between Heathcote Road and Toll Plaza
- Model 8 – Base Case + Hume Highway Ramp + Casula Link Eastbound Widening to 3 lanes

Tables 2.1 to 2.4 show M5 traffic flows for each of the model runs.

Table 2.1 AM Peak Hour Peak Direction Flows 1999

Model No.	1	2	3	4	5	6	8
	Base Case	Base + Interchange	2 + Hume Ramp	3 + Widen to Hume	4 + Widen to Heathcote	5 + Widen to Toll Plaza	Base + Hume Ramp + Casula
West of Hume Hwy	3340	3280	3660	4310	4340	4430	4270
West of M'bank Ave	5200	5200	4520	4490	4650	4740	4230
West of Heathcote Rd	3380	3710	3660	3650	4090	4350	3250
At Toll Plaza	3140	3210	3200	3210	3280	4040	3130

Table 2.2 AM Peak Hour Peak Direction Flows 2016

Model No.	1	2	3	4	5	6	8
	Base Case	Base + Interchange	2 + Hume Ramp	3 + Widen to Hume	4 + Widen to Heathcote	5 + Widen to Toll Plaza	Base + Hume Ramp + Casula
West of Hume Hwy	4390	4510	4860	6040	6070	6170	5640
West of M'bank Ave	6360	6810	6360	6580	6750	6970	5810
West of Heathcote Rd	4290	4590	4510	4600	4860	5400	4170
At Toll Plaza	3670	3750	3800	3740	3820	4690	3560

Table 2.3 AADT Two Way Flows 1999

Model No.	1	2	3	4	5	6	8
	Base Case	Base + Interchange	2 + Hume Ramp	3 + Widen to Hume	4 + Widen to Heathcote	5 + Widen to Toll Plaza	Base + Hume Ramp + Casula
West of Hume Hwy	55600	54800	65500	67900	68000	68200	65900
West of M'bank Ave	90400	89500	81400	81600	81900	82300	75700
West of Heathcote Rd	65600	71600	69500	69500	70500	71400	63300
At Toll Plaza	65000	66900	66300	66400	66600	68700	64900

Table 2.4 AADT Two Way Flows 2016

Model No.	1	2	3	4	5	6	8
	Base Case	Base + Interchange	2 + Hume Ramp	3 + Widen to Hume	4 + Widen to Heathcote	5 + Widen to Toll Plaza	Base + Hume Ramp + Casula
West of Hume Hwy	80800	81700	90900	98800	98900	99200	95100
West of M'bank Ave	119600	122600	112100	114000	114700	116100	105700
West of Heathcote Rd	93000	95200	93300	93900	96200	99200	85700
At Toll Plaza	83500	87200	86500	86700	87200	92500	83300

The tables show that maximum throughput along the M5 is achieved with model 6.

Plots of NETANAL volumes for models 1, 2, and 4 are shown in Appendix A.

2.2 Economic Evaluation

The economic analysis of the Moorebank Interchange has been based on modelling undertaken in NETANAL for the years 1999 and 2016.

Three models have been used for the economic analysis:

- Model 1 – Base Case
- Model 2 – Base Case + Moorebank Interchange
- Model 8 – Base Case + Hume Highway Ramp + Casula Link Eastbound Widening to 3 lanes

The Benefit Cost Ratio (BCR) for each of the Models has been compared to a base case model (Model 1) without the package of works described in the model under consideration.

Inputs to the BCR analysis are capital costs as supplied by RTA and road user benefits as calculated by NETANAL

RTA provided an estimate of the nett maintenance cost for the Moorebank Interchange ($50,000 per annum in 1999 dollars). Maintenance costs have not been provided by the RTA for the Hume Highway ramp and widening of the Casula Link at this stage however they have been assumed to be zero for the purposes of this analysis. This implies there are no nett savings in maintenance resulting from the construction of the ramp and the widening of the motorway.

Project Costs for the economic analysis are:

- Model 2 $35 Million
- Model 8 $13 Million

As the base case model is for 1999, the analysis has been undertaken assuming the projects are started in 1999, completed in 2000 and open to traffic in 2001. The economic model also assumes a 'straight line' benefits stream between 1999 and 2016 which in reality is not strictly correct.

The results of the economic analysis are shown in Table 2.5.

Table 2.5 Results of Economic Analysis (Discount Rate = 7%)

	Model 2 Moorebank Interchange only	Model 8 Hume Hwy Ramp and Widen Casula Link Eastbound only (No Interchange)
Present Value ($'000)		
Capital Costs	31,640	11,752
Benefits: savings in		
Travel Time Costs	505,448	42,270
Vehicle Operating Costs	240,833	(39,392)
Accident Costs	35,737	10,555
Maintenance	(530)	0
Total Benefits	781,488	13,406
Economic Return Measures		
Net Present Value ($'000)	749,848	1,654
NPV/Capital Cost	>10:1	7:1
Benefit Cost Ratio	>10:1	1.1:1
First Year Rate of Return	119.97%	40.39%

The large benefits and hence high benefit cost ratio for Model 2 are a result of increasing delays at the M5/Moorebank Avenue at grade intersection being alleviated by the construction of the Moorebank Interchange. The travel times and number of stops required reduce substantially when the interchange is introduced to the network.

Note that the travel time savings do not take into account the possible effects of weaving between the Hume Highway and Moorebank Avenue in the AM Peak. As these delays will only occur over a small part of the day it has been assumed that this weave area will not substantially effect the total benefits of the project.

The Hume Highway ramp (Model 8) shows a large benefit initially, with the benefit decreasing as congestion levels increase over time. While travel time and accident savings are positive, over the 30 years of the project the increasing delay at the Hume Highway/M5 Ramps will cause an increase in vehicle operating costs.

The analysis raises questions regarding the value of providing an additional leg to the existing intersection on the Hume Highway.

3. Intersection Modelling

The intersection of the M5 and Moorebank Avenue has been modelled using:

- INTANAL for the base case at grade intersection, and
- SCATES for the grade separated interchange.

The use of SCATES for the modelling of the interchange allows the comparison of a single and double point interchange.

3.1 At Grade Intersection

The existing at grade intersection at Moorebank Avenue is the only signalised intersection on the M5 Motorway. With the opening of the M5 East next year the intersection will be the only traffic signals between Sydney and Canberra. As well as providing this important regional link, the M5 also carries large volumes of commuter traffic in the morning and evening peak periods. Existing turning movements at this intersection are shown in Figure 3.1.

Site inspections show existing delays on the eastbound approach in the morning peak hour, and on the westbound and southbound approaches in the evening peak hour. The site inspections confirm the results of the INTANAL analysis of the intersection that are shown in Table 3.1.

Table 3.1 Existing Intersection Performance

	Morning Peak Hour	Evening Peak Hour
Degree of Saturation	1.06	1.37
Average Delays (secs)	102	>140
Level of Service	F	F
Critical Movement	Through from West	Through from East

Using MWT Transport Modelling's NETANAL model, 2016 turning movements at the M5 Moorebank Avenue intersection were determined. These turning movements are shown in Figure 3.1. These turning movements were input into INTANAL to determine the intersection performance in 2016 if the interchange was not built. The results are shown in Table 3.2.

Table 3.2 2016 Intersection Performance

	Morning Peak Hour	Evening Peak Hour
Degree of Saturation	1.40	2.06
Average Delays (secs)	>140	>140
Level of Service	F	F
Critical Movement	Through from West	Through from East

The results of the INTANAL analysis show the intersection is significantly over capacity in 2016 causing substantial delays. These delays would be unacceptable to the community and significantly impact the operation of the M5 motorway.

3.2 Moorebank Avenue Interchange

It is proposed that a single point interchange be constructed at this intersection. The single point interchange has several advantages over double point interchanges including:

- Single set of traffic control signals
- Improved performance under heavy traffic conditions (as queues do not block the operation of the non-saturated movements)

An analysis has been undertaken in SCATES to compare the performance of the Moorebank Interchange as a single or double point interchange. The analysis is based on modelled NETANAL turning movements for 1999 with Moorebank Avenue interchange and 2016 with Moorebank Avenue interchange (the turning movements are shown in Figure 3.2 and include the development of the Amiens and Yulong sites). The results are shown in Table 3.3.

Table 3.1 SCATES Analysis of Single and Double Point Interchange

	Critical Degree of Saturation (Level of Service)	
	Morning Peak Hour	Evening Peak Hour
1999 Double Point Interchange	0.81 (A)	1.08 (B)
1999 Single Point Interchange	0.70 (A)	0.71 (C)
2016 Double Point Interchange	1.01 (D)	1.38 (F)
2016 Single Point Interchange	1.01 (C)	0.90 (C)

Table 3.3 shows that the single point interchange has marginally better performance than the double point interchange in 1999. Under heavier traffic demands in 2016, the single point interchange has significantly better performance.

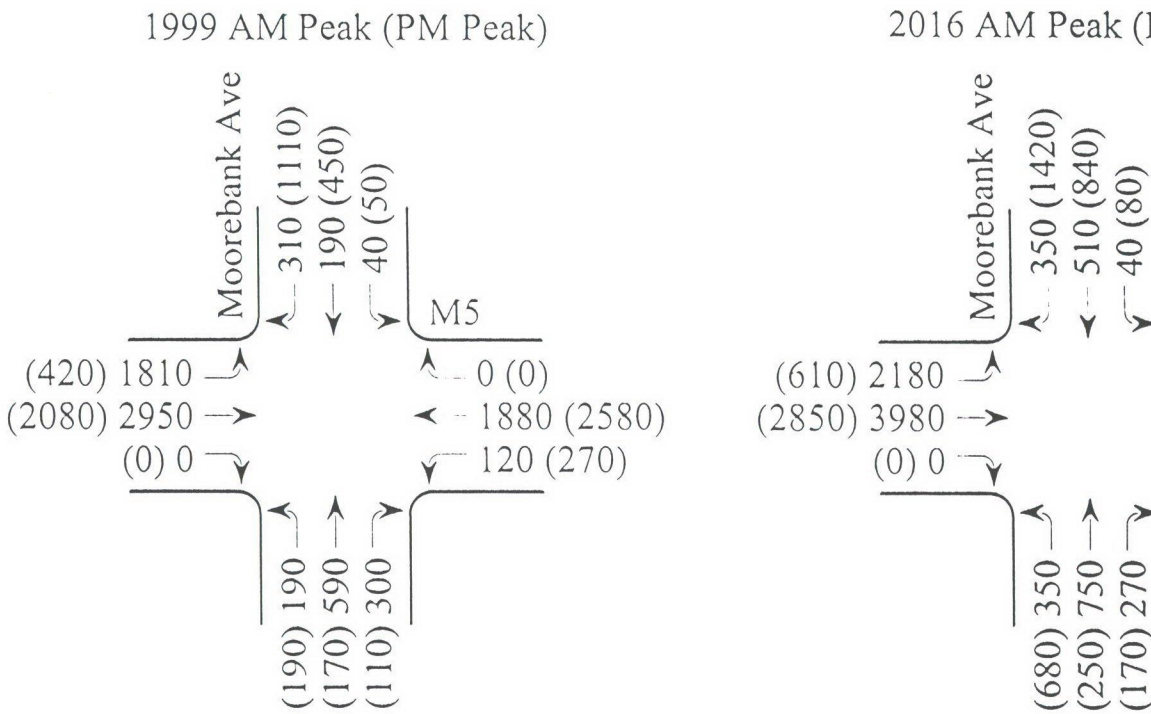
The single point interchange can be further improved in 2016 with the addition of an extra through lane southbound. The results of the SCATES analysis for this option are shown in Table 3.4.

Table 3.4 SCATES Analysis of Single Point Interchange with Extra Southbound Lane

	Critical Degree of Saturation (Level of Service)	
	Morning Peak Hour	Evening Peak Hour
2016 Single Point Interchange	1.01 (B)	0.90 (B)
2016 Single Point Interchange with extra southbound lane	0.91 (B)	0.90 (B)

With the extra southbound lane the average delay for a vehicle at the interchange falls from 25 to 14 seconds in the morning peak hour and from 24 to 23 seconds in the evening peak hour.

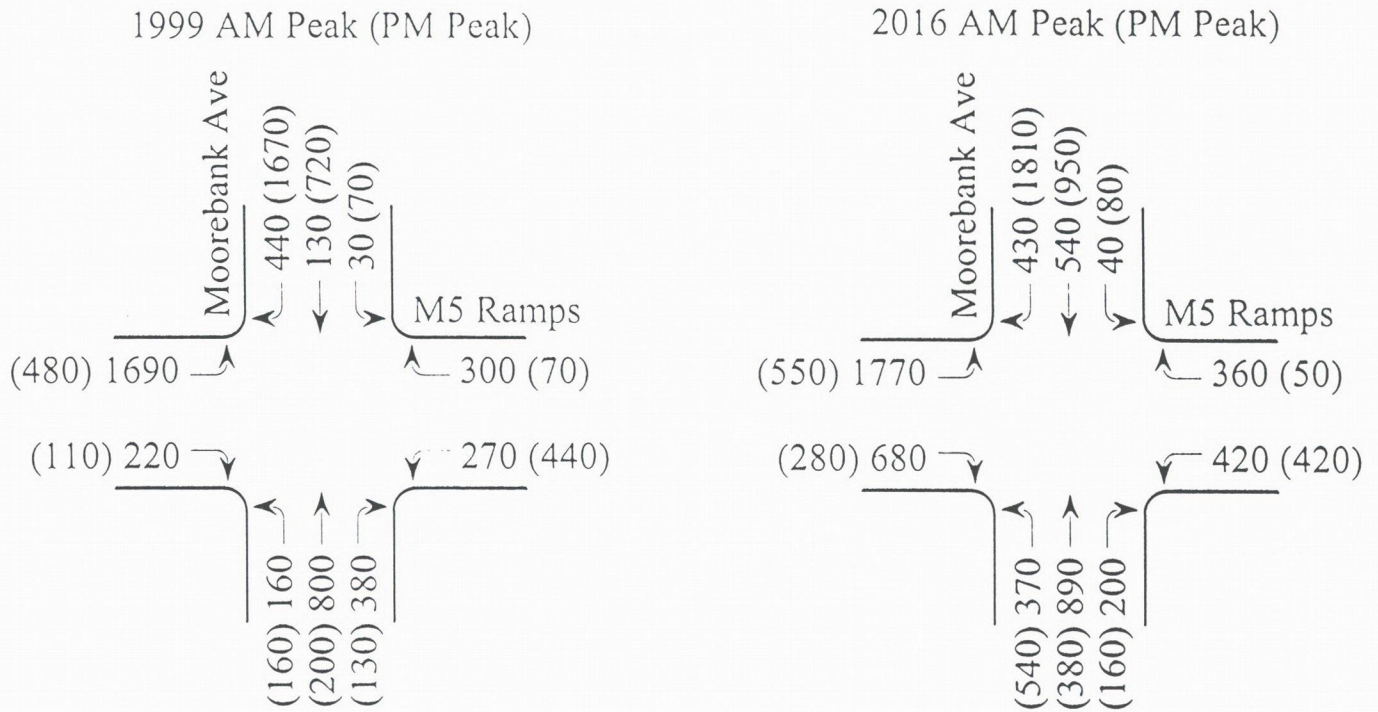
SCATES output files are shown in Appendix B. A summary of all of the intersection modelling results is found in Appendix E.



MWT Transport Modelling

File: tm0029d05 Date: 26/10/00

Figure 3.1
1999 Observed and 2016 Assigned Turning Movements at M5 Moorebank Avenue Intersection



MWT Transport Modelling

File: tm0029d06 Date: 26/10/00

Figure 3.2
1999 Assigned and 2016 Assigned Turning Movements at M5 Moorebank Avenue Interchange

4. PARAMICS Modelling

PARAMICS modelling has been undertaken to check the operation of the Moorebank Avenue interchange and to check the effects that the introduction of the interchange will have on the weave area between the Hume Highway and Moorebank Avenue. The PARAMICS modelling is for the morning peak period only.

4.1 Base Model

4.1.1 Model Creation

The Base Paramics model was developed using:

- Existing design drawings provided by RTA
- Existing phase timings from SCATS and site observations
- Traffic volumes and distributions from NETANAL

The base network for the Paramics model is shown in Figure 4.1.

A base trip matrix was derived from MWT Transport Modelling's NETANAL model for 1999.

4.1.2 Model Calibration

To ensure model validity it was necessary to calibrate the model using existing information. The information provided by the RTA for calibration was

- Observed Peak Hour Traffic Counts at Moorebank Avenue and the M5
- ANTTS Travel Time information on the M5

The volumes from the NETANAL model were calibrated against observed traffic counts made available from the RTA. Figure 4.2 shows a comparison between the observed volumes provided by RTA and the calibrated model volumes.

Travel times from the ANTTS database have also been used to calibrate the model. Adjustments to speed, driver aggressiveness, driver awareness, driver familiarity, average headway and reaction time were made to calibrate the model against travel times.

Table 4.1 compares the observed and calibrated model travel times for the AM peak period. Two times are given for citybound traffic to account for the differences in citybound flow that occur over the modelled period.

Table 4.1 Travel Times (AM Peak Period)

	ANTTS Travel Time (mm:ss)	Modelled Travel Time (mm:ss)
Camden Valley Way to Hume Hwy	02:41	02:42
Hume Hwy to Moorebank Ave	01:01	01:01
Moorebank Ave to Hume Hwy	00:52	00:43
Hume Hwy to Camden Valley Way	02:28	02:23

The assumptions made to reach these travel times were:

- Speed 90km/h citybound, 100 km/h outbound on Casula Link
- Aggressiveness Paramics Default Distribution B (Aggressive Drivers)
- Awareness Paramics Default Distribution B (Aware Drivers)
- Familiarity 98% familiar drivers
- Mean Headway 2 seconds
- Mean Reaction Time 0.5 seconds

The traffic counts and travel times show a good calibration of the base model when compared to existing conditions. The model is therefore considered suitable for scenario testing.

4.1.3 Base Case Results

Results from the Base Case model are used to determine the effects network scenarios will have on travel times and average delays.

Selected origins and destinations have been used for the reporting of travel times. Table 4.2 shows the results of the model for the Base Case.

Table 4.2 Model Results for 7:30-8:30am (Base Case)

From	To	Average Trip Time
M5 South of Camden Valley Way	M5 East of Moorebank Ave	4:06
M5 South of Camden Valley Way	Moorebank Ave North of M5	4:00
Hume Hwy South of M5	M5 East of Moorebank Ave	3:50
Hume Hwy South of M5	Moorebank Ave North of M5	3:34
M5 East of Moorebank Ave	M5 South of Camden Valley Way	3:36
M5 East of Moorebank Ave	Hume Hwy North of M5	2:45
Moorebank Ave North of M5	M5 South of Camden Valley Way	4:31
Moorebank Ave South of M5	M5 South of Camden Valley Way	4:23

Two level of service measurements have been undertaken for this analysis. The weave area on the M5 between the Hume Highway and Moorebank Avenue eastbound has had its level of service calculated based on speeds from Paramics. Austroads *Guide to Traffic Engineering Practice Part 2* shows the following levels of service for weave areas.

Table 4.3 Levels of Service for Weave Areas

	Minimum Average Speed (km/h)	
Level of Service	Weaving	Non-Weaving
A	88	96
B	80	86
C	72	77
D	64	67
E	48	48
F	<48	<48

Source: Austroads Guide to Traffic Engineering Practice Part 2 Table 5.4

Note that these speeds are based on a 100km/h speed limited area.

The second level of service measurement is for the intersection of the M5 (or its ramps) and Moorebank Avenue. This level of service is obtained from INTANAL (or SCATES) modelling of the intersection using the flows from the NETANAL model.

The two levels of service for the Base Case model are:

- Weave Area - NA (as not a freeway segment)
- M5/Moorebank Avenue intersection - F

4.1.4 Base Case Model 2016

A base case model for 2016 has also been created to show how the intersection of Moorebank Avenue and the M5 will operate if it remains as an at grade intersection. The model includes the Western Sydney Orbital but does not include widening of the M5 Casula Link or the addition of the Hume Highway eastbound off ramp. The demands used for 2016 also include the development of the Amiens and Yulong sites.

PARAMICS modelling confirms the results of the INTANAL analysis which show extensive delays on the M5 eastbound and on Moorebank Avenue in the morning peak period.

Travel times for the 2016 base case network are shown in Table 4.4.

Table 4.4 Model Results for 7:30-8:30am (2016 Base Case)

From	To	Average Trip Time
M5 South of Camden Valley Way	M5 East of Moorebank Ave	14:40
M5 South of Camden Valley Way	Moorebank Ave North of M5	14:18
Hume Hwy South of M5	M5 East of Moorebank Ave	5:47
Hume Hwy South of M5	Moorebank Ave North of M5	5:18
M5 East of Moorebank Ave	M5 South of Camden Valley Way	3:57
M5 East of Moorebank Ave	Hume Hwy North of M5	2:52
Moorebank Ave North of M5	M5 South of Camden Valley Way	8:29
Moorebank Ave South of M5	M5 South of Camden Valley Way	6:02

Table 4.4 shows significantly longer trip times in 2016 compared to the trip times for 1999.

The two levels of service for the Base Case model are:

- Weave Area - NA (as not a freeway segment)
- M5/Moorebank Avenue intersection - F

4.2 Moorebank Avenue Interchange

With the base case calibrated to existing conditions, the proposed single point interchange at Moorebank Avenue and the M5 was introduced to the network. The Moorebank Avenue interchange used in the model is shown in Figure 4.3.

4.2.1 1999 with Moorebank Avenue Interchange

The initial test with the Moorebank Avenue interchange was for 1999. The NETANAL forecasts were re-run allowing right turns from the M5 at Moorebank Avenue. The modelled traffic volumes for the 1999 with Moorebank Avenue interchange scenario are shown in Figure 4.4.

The travel time and delay results for this scenario are shown in Table 4.5.

Table 4.5 Model Results for 7:30-8:30am (1999 with Moorebank Interchange)

From	To	Average Trip Time	Base Case Trip Time
M5 South of Camden Valley Way	M5 East of Moorebank Ave	3:45	4:06
M5 South of Camden Valley Way	Moorebank Ave North of M5	3:54	4:00
Hume Hwy South of M5	M5 East of Moorebank Ave	3:10	3:50
Hume Hwy South of M5	Moorebank Ave North of M5	3:16	3:34
M5 East of Moorebank Ave	M5 South of Camden Valley Way	3:09	3:36
M5 East of Moorebank Ave	Hume Hwy North of M5	2:28	2:45
Moorebank Ave North of M5	M5 South of Camden Valley Way	3:59	4:31
Moorebank Ave South of M5	M5 South of Camden Valley Way	3:20	4:23

The majority of trips shown in Table 4.5 have a reduced travel time when compared with the base case travel times. Trips on the M5 have substantial travel time savings, while trips using Moorebank Avenue have some small increases in travel time.

The two measured levels of service for this scenario are:

- Weave Area - D (64-66 km/h)
- M5 Ramps/Moorebank Avenue Interchange - A

4.2.2 2016 with Moorebank Interchange

The 2016 with Moorebank Interchange model also includes the Western Sydney Orbital (but not the widening of the M5 Casula Link or Hume Highway Eastbound off ramp). This section of the report only discusses the impacts of the Moorebank Interchange. A discussion on the impacts of the Western Sydney Orbital is found in Section 4.3. Also note that the demands used assume the development of the Amiens and Yulong sites.

2016 traffic volumes were obtained from MWT Transport Modelling's NETANAL model for 2016. This model used the new S031 land use forecasts that include large amount of development in Sydney's South West. The traffic volumes for 2016 are shown in Figure 4.4.

Trip times and average delays for 2016 are shown in Table 4.6.

Table 4.6 Model Results for 7:30-8:30am (2016 with Moorebank Interchange and WSO)

From	To	Average Trip Time
M5 South of Camden Valley Way	M5 East of Moorebank Ave	10:13
M5 South of Camden Valley Way	Moorebank Ave North of M5	10:59
Hume Hwy South of M5	M5 East of Moorebank Ave	4:04
Hume Hwy South of M5	Moorebank Ave North of M5	4:38
M5 East of Moorebank Ave	M5 South of Camden Valley Way	3:09
M5 East of Moorebank Ave	Hume Hwy North of M5	2:22
Moorebank Ave North of M5	M5 South of Camden Valley Way	4:10
Moorebank Ave South of M5	M5 South of Camden Valley Way	3:36

The two measured levels of service for this scenario are:

- Weave Area - F (23-30 km/h)
- M5 Ramps/Moorebank Avenue Interchange - B

The intersection of Moorebank Avenue and the M5 Ramps is approaching capacity by 2016. Delays are expected at the intersection and queuing on the eastbound off ramp may effect traffic in the weaving area on the motorway, however as weaving traffic will already be slowed it is not anticipated that this will cause major problems. The single lane southbound on Moorebank Avenue will also be experiencing significant queuing in 2016.

As mentioned in the SCTAES modelling of the Moorebank Avenue interchange, introducing a second southbound through lane can reduce delays at the interchange. The eastbound offload ramp has also been widened to allow two lanes to offload from the M5.

Trip times and average delays for this scenario are shown in Table 4.7.

Table 4.7 Model Results for 7:30-8:30am (2016 with Improved Moorebank Interchange and WSO)

From	To	Average Trip Time
M5 South of Camden Valley Way	M5 East of Moorebank Ave	9:13
M5 South of Camden Valley Way	Moorebank Ave North of M5	9:43
Hume Hwy South of M5	M5 East of Moorebank Ave	3:14
Hume Hwy South of M5	Moorebank Ave North of M5	3:42
M5 East of Moorebank Ave	M5 South of Camden Valley Way	3:10
M5 East of Moorebank Ave	Hume Hwy North of M5	2:24
Moorebank Ave North of M5	M5 South of Camden Valley Way	3:48
Moorebank Ave South of M5	M5 South of Camden Valley Way	3:27

Table 4.7 shows improvements in peak direction travel times when compared to the travel times in Table 4.6.

The two measured levels of service for this scenario are:

- Weave Area - F (31-36 km/h)
- M5 Ramps/Moorebank Avenue Interchange - B

4.3 Western Sydney Orbital

The Western Sydney Orbital (WSO) is expected to be completed by 2016 and has been included in the Paramics model for 2016.

The Western Sydney Orbital / M5 Interchange is shown in Figure 4.5. Other works associated with the construction of the Western Sydney Orbital included in the model are:

- Widening of M5 Casula Link Eastbound to 4 lanes between WSO and Hume Hwy
- Widening of M5 Casula Link Westbound to 3 lanes between Hume Hwy and WSO
- Off ramp from M5 to Hume Hwy Eastbound (3 lanes left turn only)

Table 4.8 shows travel times for vehicles using the Western Sydney Orbital (assuming the RTA design of the Moorebank interchange).

Table 4.8 Model Results for 7:30-8:30am - 2016

From	To	Average Trip Time	Average Trip Time
		No Widening or Hume Hwy Ramp	With Widening and Hume Hwy Ramp
M5 South of Camden Valley Way	M5 East of Moorebank Ave	10:13	4:56
M5 South of Camden Valley Way	Moorebank Ave North of M5	10:59	5:17
WSO North of M5 Interchange	M5 East of Moorebank Ave	9:09	6:10
WSO North of M5 Interchange	Moorebank Ave North of M5	9:44	6:30
WSO North of M5 Interchange	Hume Hwy North of M5	NA	6:18
M5 East of Moorebank Ave	WSO North of M5 Interchange	3:51	3:47

The PARAMICS model shows that the Western Sydney Orbital interchange performs satisfactorily both with and without the widening works in 2016. Traffic flows on the M5 in 2016 are however high enough to cause significant delays to vehicles travelling northeast from the Western Sydney Orbital (or M5) to Liverpool and the M5 East.

The delays to traffic entering the M5 from the Western Sydney Orbital occur as weaving occurs between traffic entering from the WSO and traffic wanting to exit at the Hume Highway.

Travel speed plots from PARAMICS are shown in Appendix C.

5. Department of Defence Developments

Three Department of Defence developments were considered as part of the modelling process:

- Amiens Site
- Yuong Site
- Full Department of Defence land development

5.1 Amiens and Yulong Sites

The proposed developments of the Amiens and Yulong sites have been included in the 2016 model runs outlined previously. The traffic generation forecasts used are from Christopher Hallam and Associates.

The assumed traffic generation for these developments is 300 two way vehicle trips in the peak hour for the Amiens site and 1,090 vehicles for the Yulong site (a total generation of approximately 1,400 two way vehicle trips in the peak hour). The majority of this traffic would be entering the sites via the Moorebank Avenue interchange.

The turning movements at the M5/Moorebank Avenue interchange generated by the sites and their percentage of the total turning movements are shown in Figure 5.1.

5.2 Full Department of Defence Land Development

Colston Budd Hunt and Kafes have determined traffic generation figures using the assumption that all Department of Defence land is redeveloped. A summary of the land use and trip generation assumed is shown in Table 5.1.

Table 5.1 Summary of Land Use and Trip Generation

			Traffic Generation (veh/h) 2-way	
Component	**Size**	**Rate* (Conventional Dev.)**	**Conventional**	**Increased Public Transport**
Employment	1,123,200m^2 GFA	1.1 trips/100m^2	12,355	10,500
Residential	2,920 lots	0.85 trips/lot	2,480	2,110
Total			14,835	12,610

* Base on RTA Guide Rates
Source: Colston Budd Hunt and Kafes

This traffic flow does not include the Amiens and Yulong sites. Including these gives a total site generation of 14,000 two way vehicle trips in the peak hour.

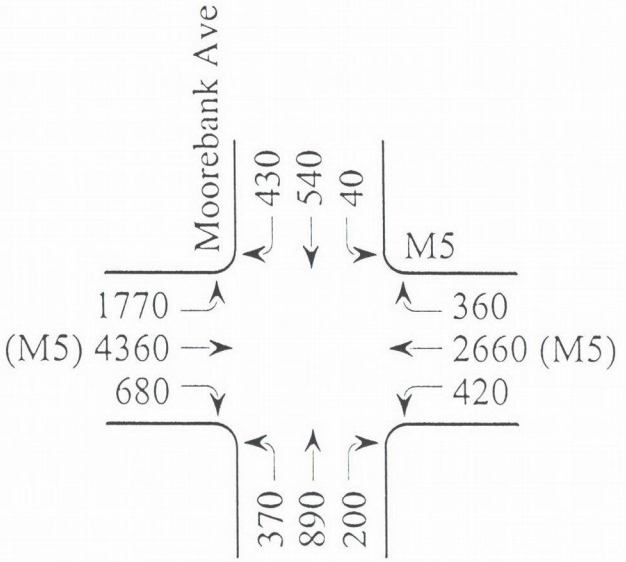
These trips have been assigned to the NETANAL network including the Moorebank Avenue interchange assuming the following traffic generation:

- AM Peak 11,613 inbound, 2,886 outbound
- PM Peak 2,922 inbound, 7,430 outbound

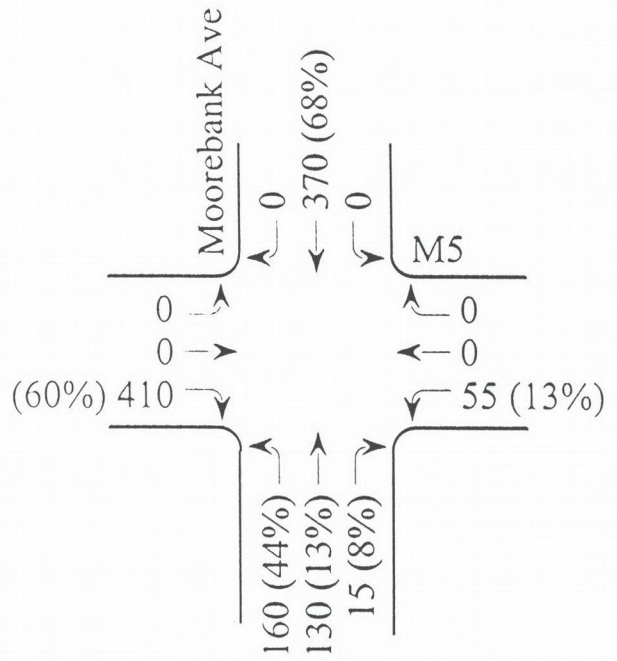
The turn movements from NETANAL for this development option are shown in Figure 5.2.

These turn movements were input to the SCATES model for the single point interchange. The results show delays of >5000 seconds (> 83 minutes) in both the AM and PM peak periods with a level of service F. The interchange requires large amounts of widening (to eight lanes north and southbound including turn bays) to improve the level of service. This is not feasible and alternative access arrangement would be required if a development of this size is approved.

2016 Modelled AM Peak Hour



2016 AM Peak Hour using Moorebank Avenue Interchange
to/from Department of Defence Developments



Figures in brackets represent the proportion
of vehicles from Department of Defence Developments
in that turn movement

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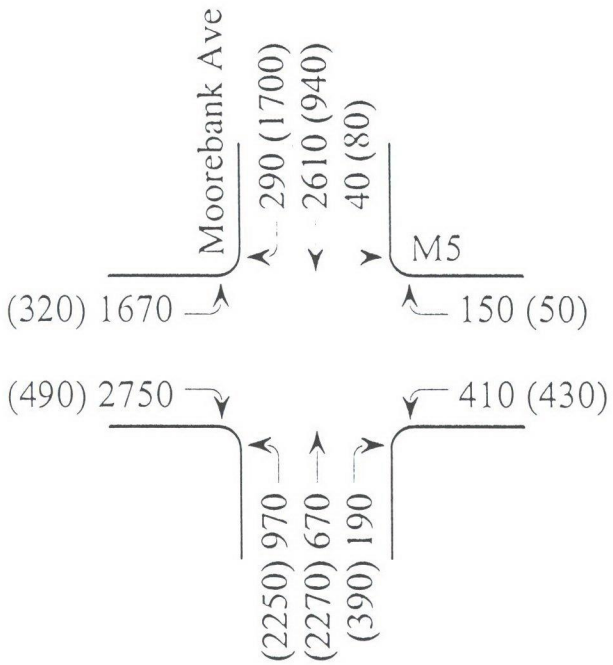
Figure 5.1
2016 Modelled AM Peak Hour

2016 Modelled AM (PM) Peak Hour



MWT Transport Modelling

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Figure 5.2
2016 with Full Department of Defence Development

6. Review of RTA Interchange Designs

The RTA has provided a number of designs for the single point Moorebank Avenue interchange:

- Option 4b - original design
- Short Term Option - with extra right turn bays
- Long Term Option - for full development of Department of Defence land

6.1 Option 4b

Option 4b is the design used for all previous SCATES analysis of the interchange. It allows for single right turns from all approaches except the northern approach where a double right turn is designed.

In this configuration the northern approach can only allow for a single through lane. This is due to the diamond phasing operation at the intersection. With diamond phasing, their can be no shared through/right lanes as shown in the current design. As tested previously, the addition of a second through lane from the north would improve intersection performance.

6.2 Short Term Option

The short term option is similar to Option 4b but allows for double right turns from the west and south. These provide extra capacity required for some development of the Department of Defence land. As for Option 4b, the interchange could be further improved with the addition of an extra southbound lane.

No SCATES analysis has been carried out on this design.

6.3 Long Term Option

The long term option is designed for the full development of the Department of Defence land. The difference between this option and the Short Term Option in the addition of an extra lane north and southbound through the interchange. This will improve the capacity of the interchange but will not improve it to meet the requirements of the full development of the Department of Defence land.

Preliminary SCATES analysis has been undertaken to determine what level of defence development could be accommodated by this interchange. The transit lane has been assumed to be a T2 for this analysis. The results are shown in Table 6.1.

Table 6.1 SCATES Analysis of Long Term Option

	Critical Degree of Saturation (Level of Service)	
	Morning Peak Hour	Evening Peak Hour
2016 Single Point Interchange with no defence development	0.67 (B)	0.82 (C)
2016 Single Point Interchange with 25% defence development	0.77 (A)	1.19 (F)
2016 Single Point Interchange with 50% defence development	1.23 (F)	1.47 (F)
2016 Single Point Interchange with full defence development	2.34 (F)	2.07 (F)

The results show that only a small percentage of the development (up to 25% of the total Department of Defence development, approximately 3000 two way vehicles per hour) can be accommodated in the interchange design.

The SCATES outputs are shown in Appendix D. A summary of all of the intersection modelling results is found in Appendix E.

7. Conclusions

Analysis has shown that the intersection of the M5 and Moorebank Avenue is at capacity during the morning and afternoon peak periods under existing flows. Under predicted flows for 2016 delays will increase significantly at the intersection.

The introduction of the Moorebank Avenue interchange will significantly reduce the delays especially to peak direction traffic on the M5. SCTAES analysis has shown that a single point interchange performs substantially better than a double point interchange at this location.

The introduction of the Moorebank Avenue interchange does cause some delay to peak direction traffic on the M5 between the Hume Highway and Moorebank Avenue. This delay is caused by the weave area between the two interchanges. It is expected that this weave area will be operating at a level of service F in 2016. The delays caused by this weave area are significantly less than the delays if the interchange is not constructed.

Adding a second offload lane from the M5 eastbound to the Moorebank Avenue interchange will reduce the effects that the weave area has on speed while the addition of an extra southbound lane on Moorebank Avenue will improve the performance of the interchange.

The addition of the Western Sydney Orbital will add traffic to the M5 Casula Link and widening of the Casula Link is necessary to accommodate the predicted traffic flow. The Hume Highway eastbound off ramp will reduce travel time from the M5 to Liverpool however this ramp has significant impacts on the performance of the signalised intersection at the M5 and Hume Highway.

The proposed developments on the Department of Defence land will have significant impact on the operation of the Moorebank Avenue interchange. The long term interchange design can only accommodate 25% of this development. Alternative access arrangements will be required if the full development of this land is to proceed.

The designs for Option 4b and the Short Term Option only allow for diamond phasing operation if a single southbound lane is provided. To improve intersection performance a second southbound through lane is required. The Long Term Option provides good levels of service for base 2016 traffic flows (without the Department of Defence development)

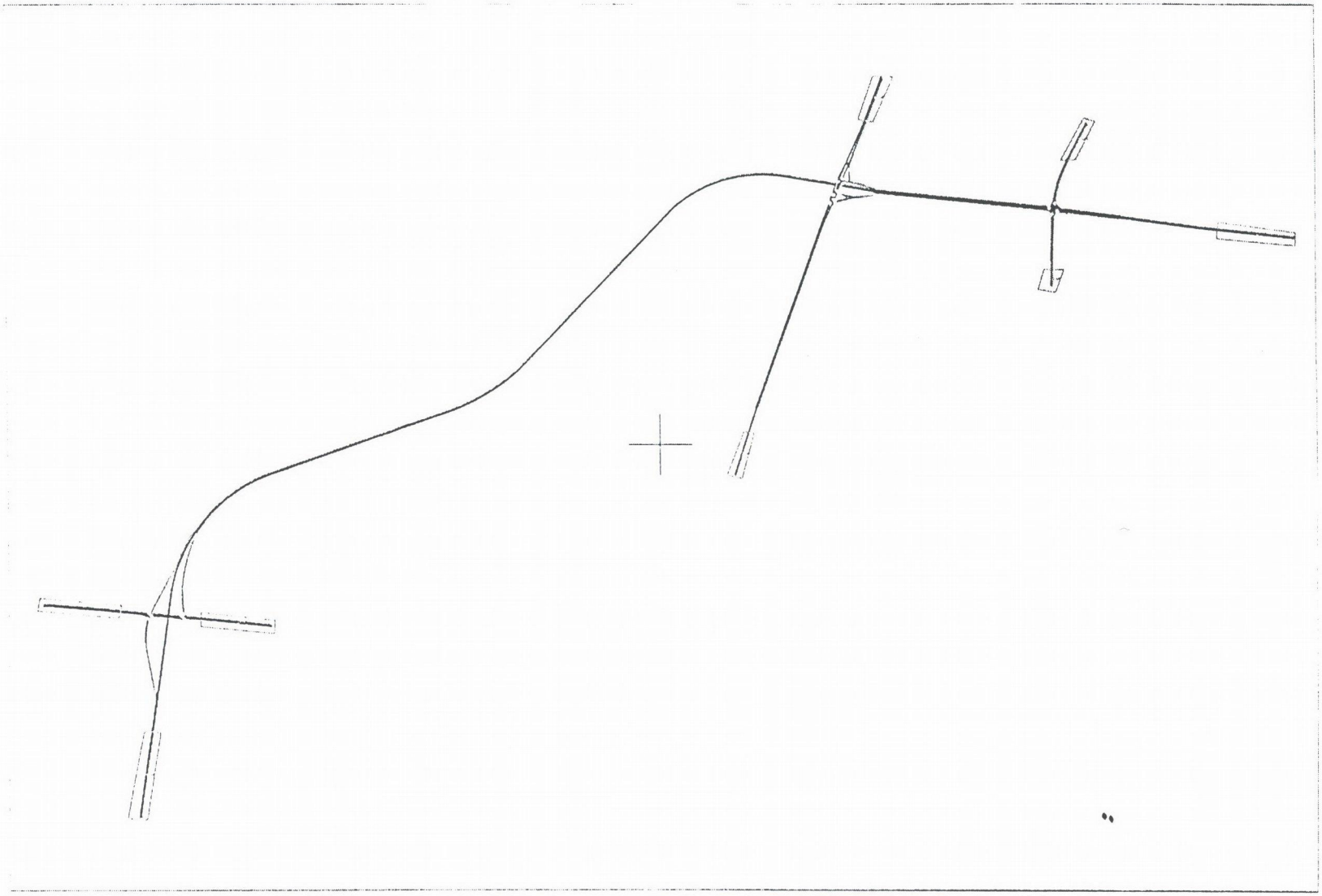
Appendix A - NETANAL Outputs

99WSO_B1 99AMWS05 14:45:09 28-MAR-01 Scale = 1 Plot = 99AM-B1

1999 ROAD NETWORK - NO LANE COVE TUNNEL OR EDT

1999 AM Peak AADT Model - Roof AM = 100

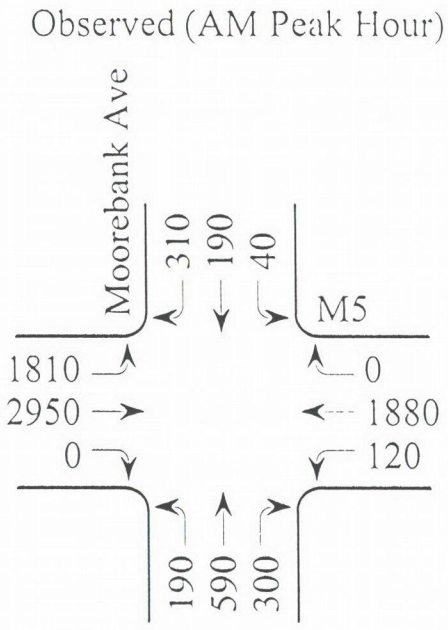
Ver = 1.17.11CORDON FILE = MDOM03COR

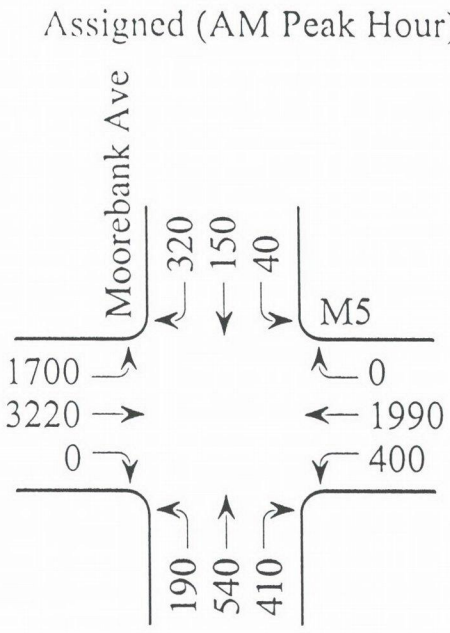


MWT Transport Modelling

File: tm0029d08 Date: 26/10/00

Figure 4.1
Base PARAMICS Model





MWT Transport Modelling

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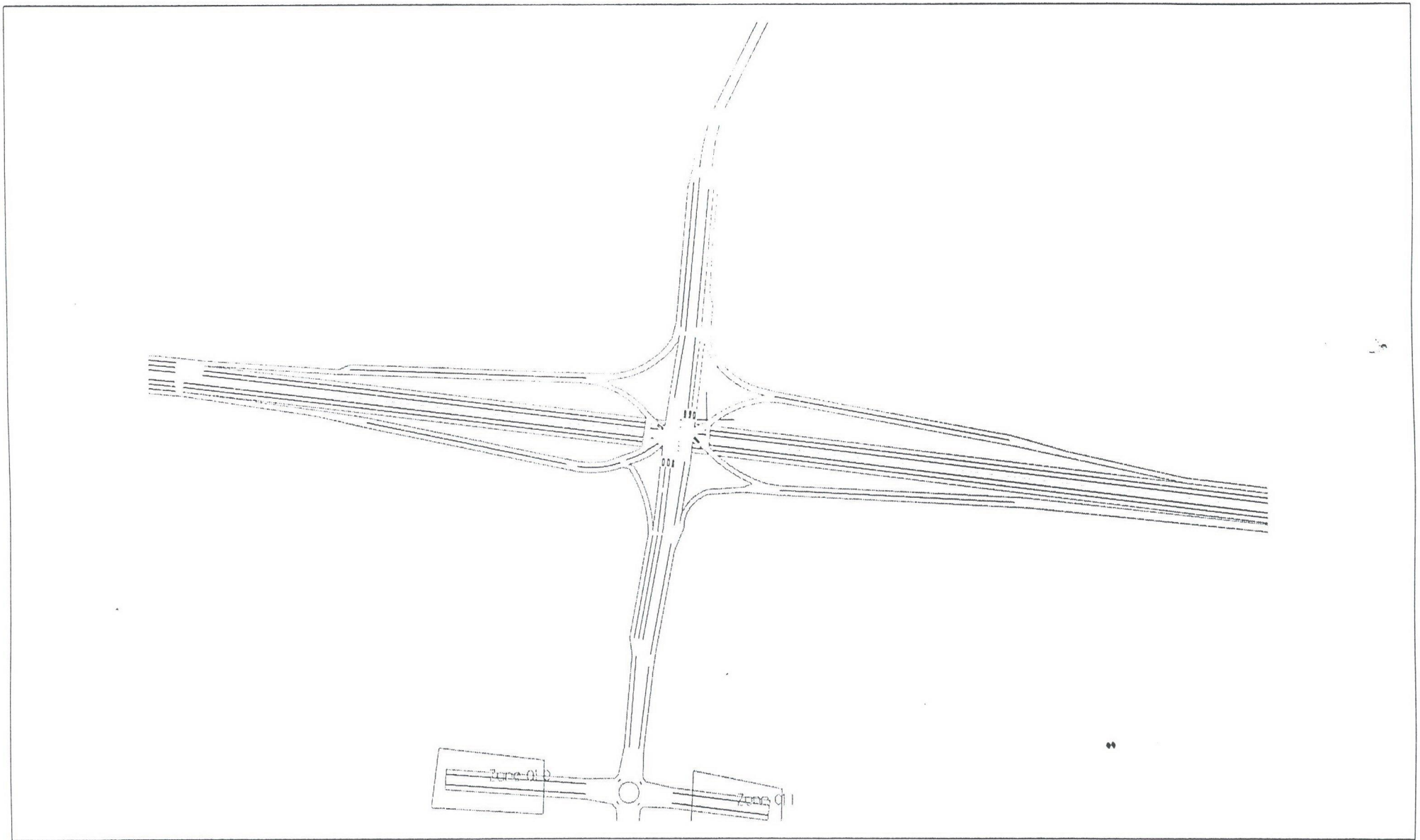
Figure 4.2
1999 Observed and Assigned Turning Movements at M5 Moorebank Avenue Intersection



MWT Transport Modelling

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Figure 4.3
Moorebank Avenue Interchange

MWT Transport Modelling

File: tm0029d10 Date: 26/10/00

Figure 4.4
Western Sydney Orbital Interchange

99WSO_B2 99AMWS05 14:45:27 28-MAR-01 Scale = 1 Plot = 99AM-B2

1999 ROAD NETWORK - NO LANE COVE TUNNEL OR EDT

1999 AM Peak AADT Model - 99of AM = 100

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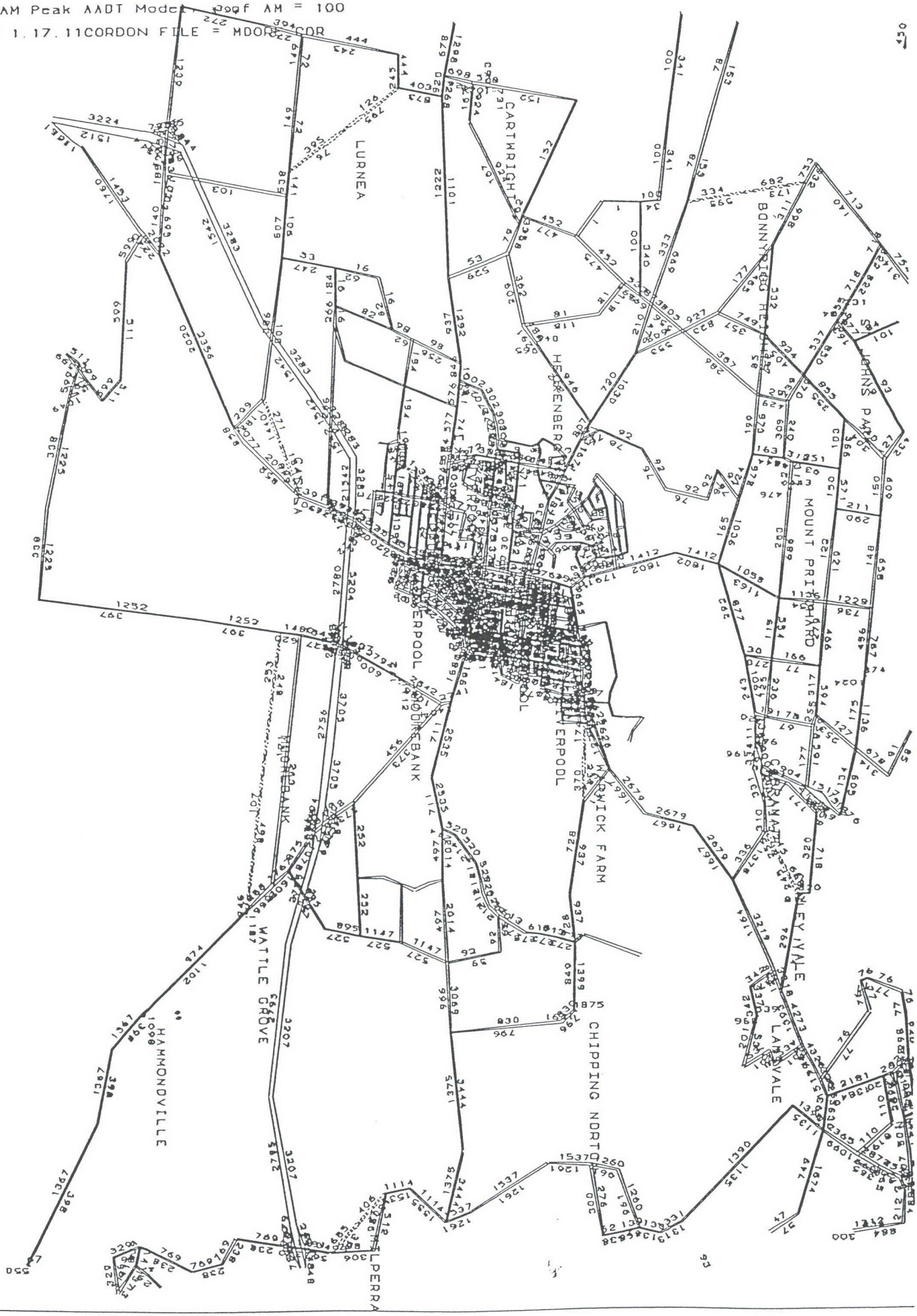
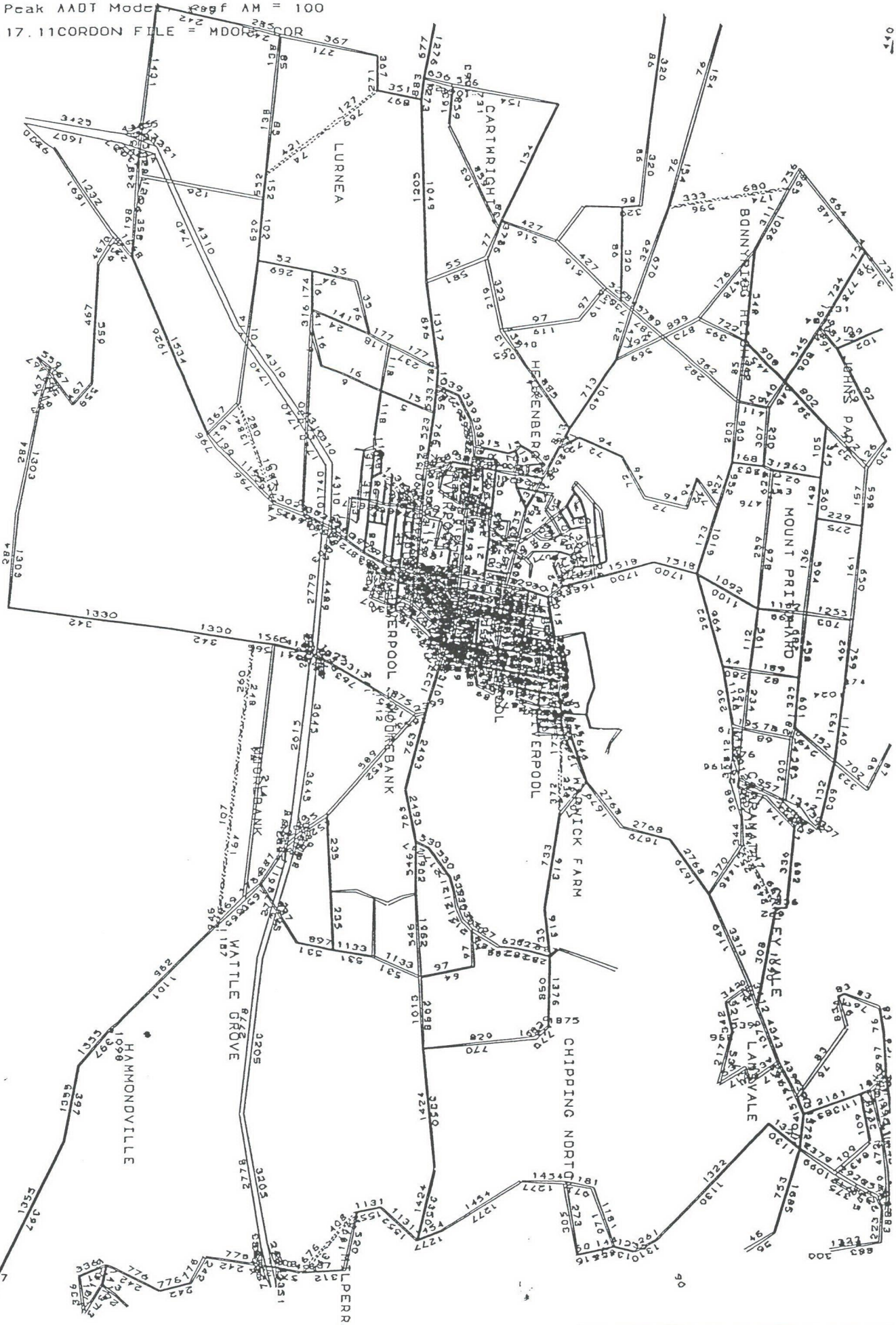


99WSO_B4 99AMWSD5 14:45:38 28-MAR-01 Scale = 1 Plot = 99AM-B4

1999 ROAD NETWORK - NO LANE COVE TUNNEL OR EDT

1999 AM Peak AADT Model [illegible] of AM = 100

Ver = 1.17.11CORDON FILE = MDOR_COR



99WSO_B1 99PMWSD4 14:45:52 28-MAR-01 Scale = 1 Plot = 99PM-B1

1999 ROAD NETWORK - NO LANE COVE TUNNEL OR EDT

1999 PM Peak AADT Model - 20% of AM = 100

Ver = 1.17.11CORDON FILE = MDOR03COR

99WSO_B2 99PMWSD4 14:46:02 28-MAR-01 Scale = 1 Plot = 99PM-B2

1999 ROAD NETWORK - NO LANE COVE TUNNEL OR EDT

1999 PM Peak AADT Model - Weekof AM = 100

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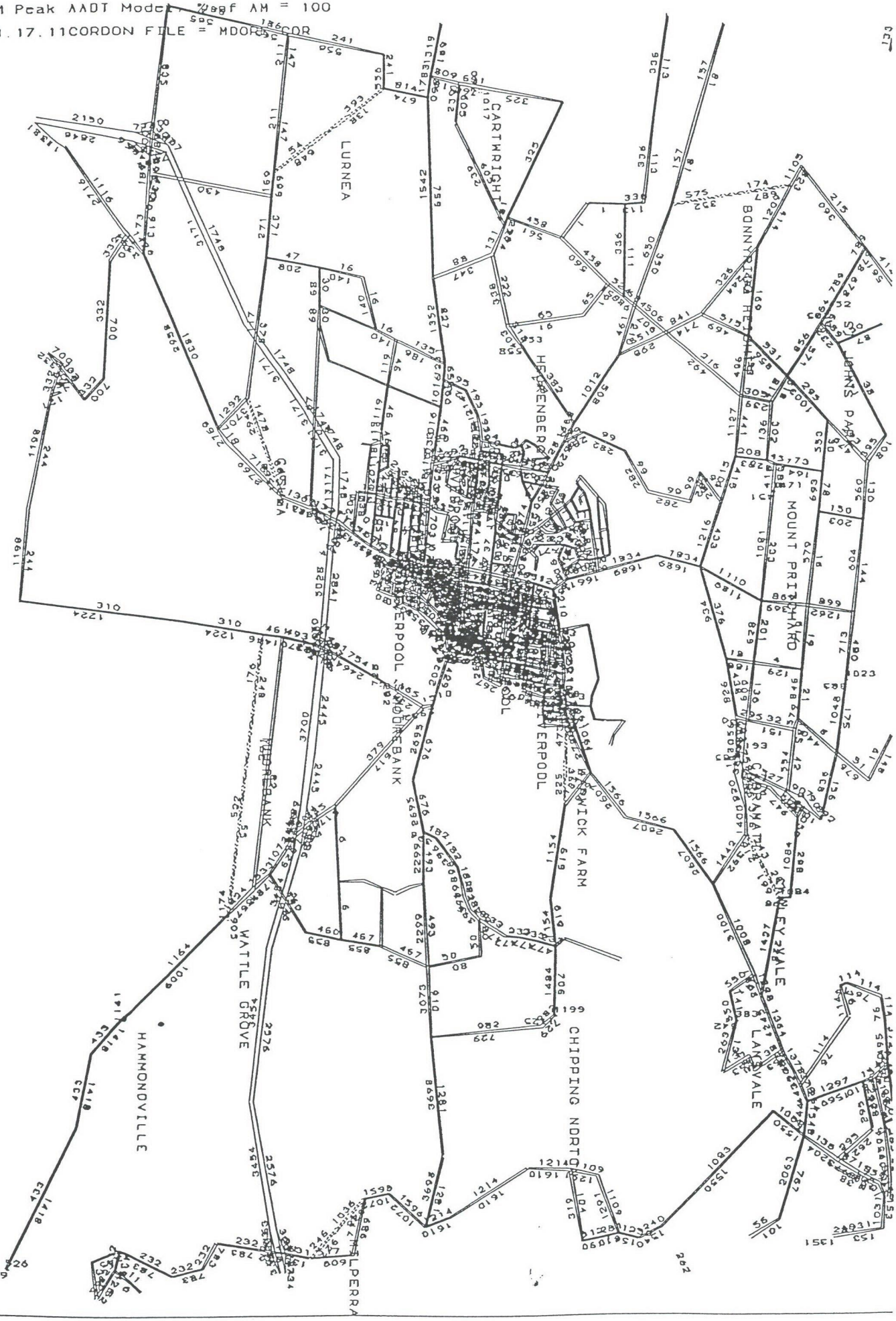
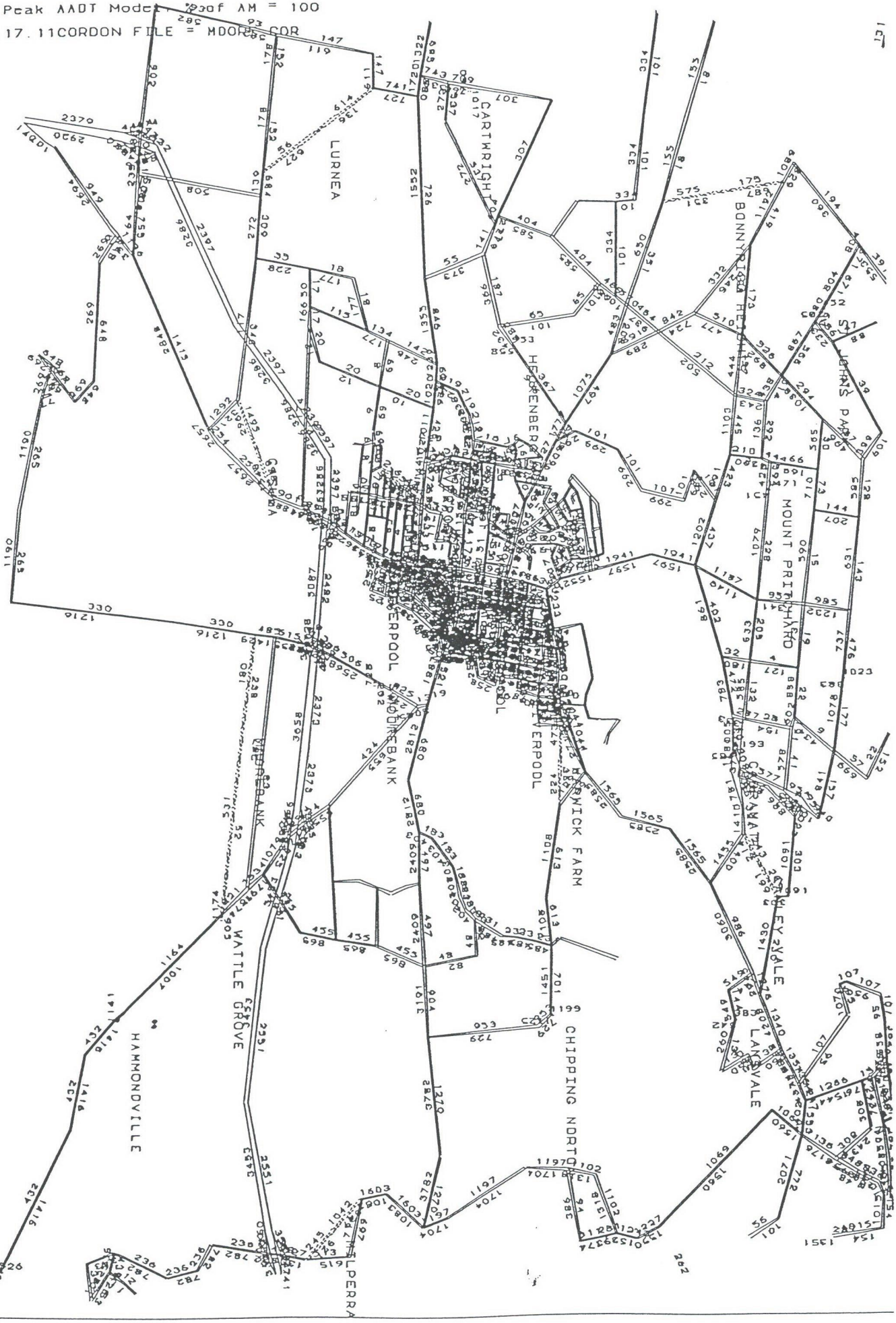

LURNEA
CARTWRIGHT
HOLSWORTHY
BONNYRIGG HEIGHTS
ST JOHNS PARK
MOUNT PRITCHARD
CABRAMATTA
LIVERPOOL
LIVERPOOL
LIVERPOOL
GOSPORT
GOSPORT
GOSPORT

99WSO_B4 99PMWSD4 14:46:13 28-MAR-01 Scale = 1 Plot = 99PM-B4

1999 ROAD NETWORK - NO LANE COVE TUNNEL OR EDT

1999 PM Peak AADT Model % of AM = 100

Ver = 1.17.11CORDON FILE = MDOR99COR

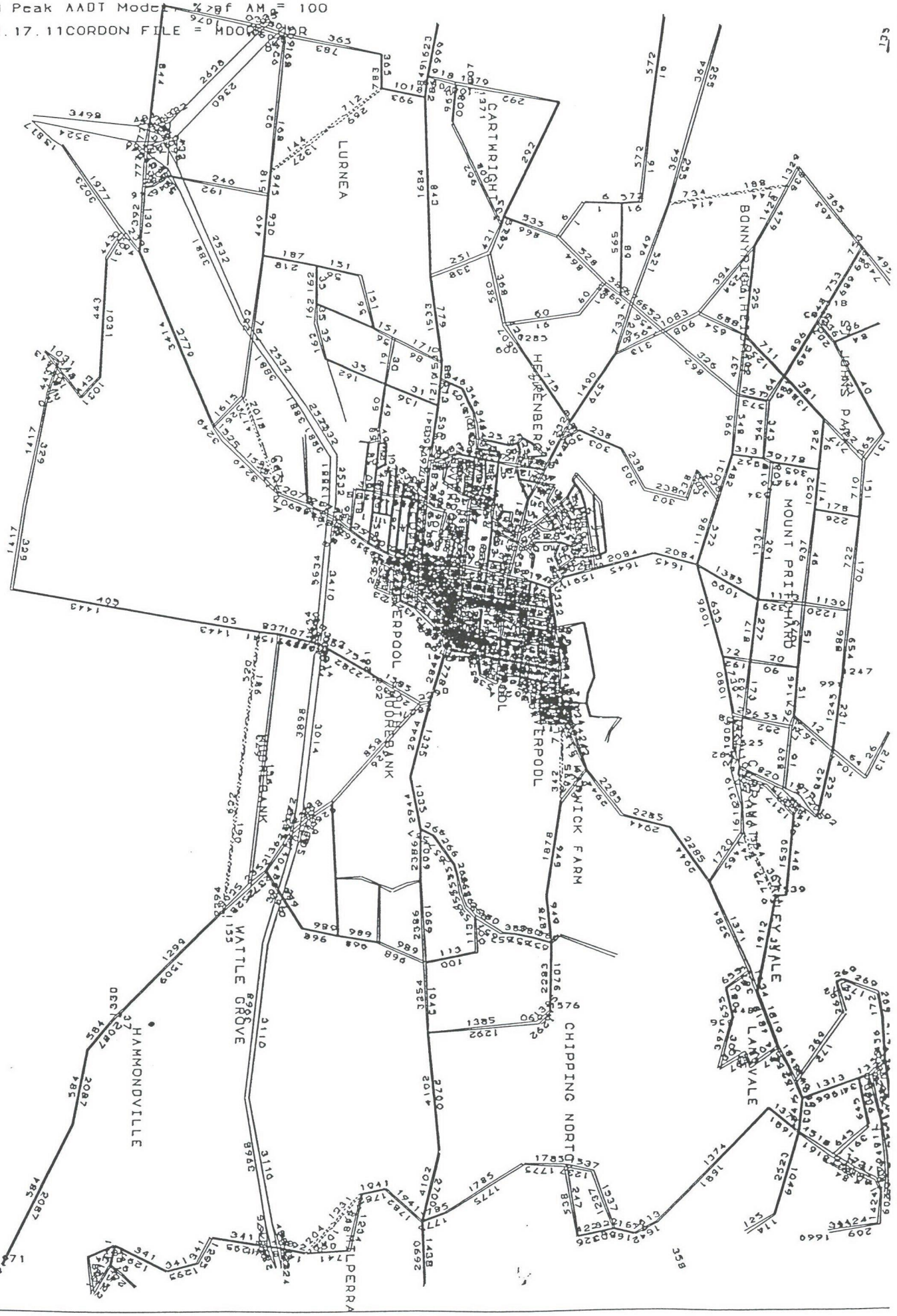


16WSO_B1 16PMWSD3 14:55:34 28-MAR-01 Scale = 1 Plot = 16PM-B1

2016 ROAD NETWORK WITH WESTERN SYDNEY ORBITAL

2016 PM Peak AADT Model - %7Bf AM = 100

Ver = 1.17.11CORDON FILE = MDOR_ORR

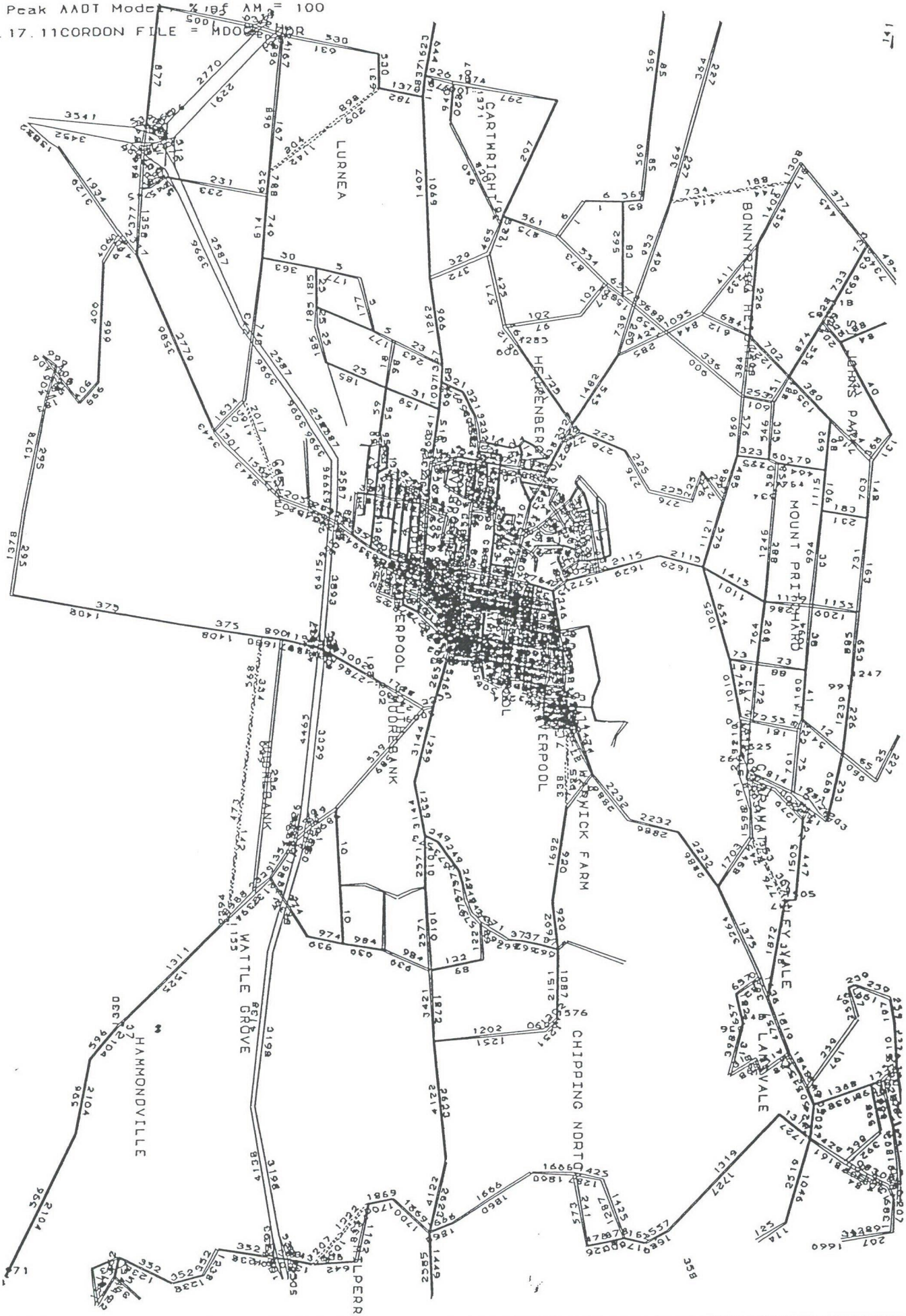


16WS0_B2 16PMWS03 14:55:45 28-MAR-01 Scale = 1 Plot = 16PM-B2

2016 ROAD NETWORK WITH WESTERN SYDNEY ORBITAL

2016 PM Peak AADT Model - % of AM = 100

Ver = 1.17.11CORDON FILE = MDOORDR

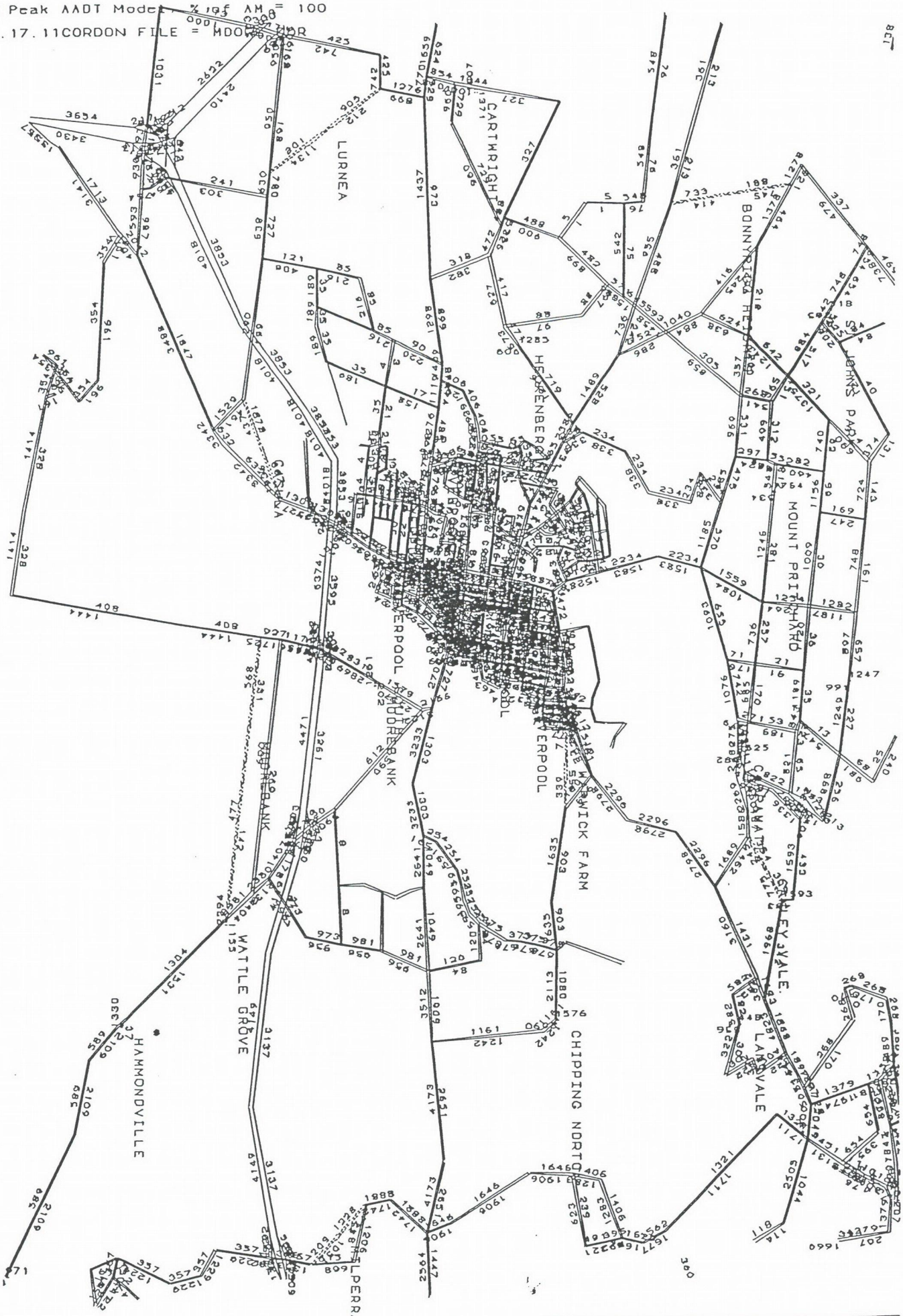


16WSO_B4 16PMWSD3 14:55:56 28-MAR-01 Scale = 1 Plot = 16PM-B4

2016 ROAD NETWORK WITH WESTERN SYDNEY ORBITAL

2016 PM Peak AADT Model % of AM = 100

Ver = 1.17.11CORDON FILE = MDOR


LURNEA
CARTWRIGHT
HOLSWORTHY
BONNYRIGG HEIGHTS
BONNYRIGG
MOUNT PRITCHARD
CABRAMATTA
CABRAMATTA WEST
LIVERPOOL
LIVERPOOL
LIVERPOOL

Ver = 1.17.11CORDON FILE = MDOME
2016 AM Peak AADT Model
2016 ROAD NETWORK WITH WESTERN SYDNEY ORBITAL
16WSO_B1 16AMWSD3 14:54:58 28-MAR-01 Scale = 1 Plot = 16AM-B1
MOUNT PRITCHARD
BONNYRIGG HEIGHTS
CARTHRIGHT
LURNEA
MOOREBANK
WATTLE GROVE
HAMMONDVILLE
CHIPPING NORTON

16WS0_B2 16AMWSD3 14:55:09 28-MAR-01 Scale = 1 Plot = 16AM-B2

2016 ROAD NETWORK WITH WESTERN SYDNEY ORBITAL

2016 AM Peak AADT Model * 38% AM = 100

Ver = 1.17.11CORDON FILE = MDOR

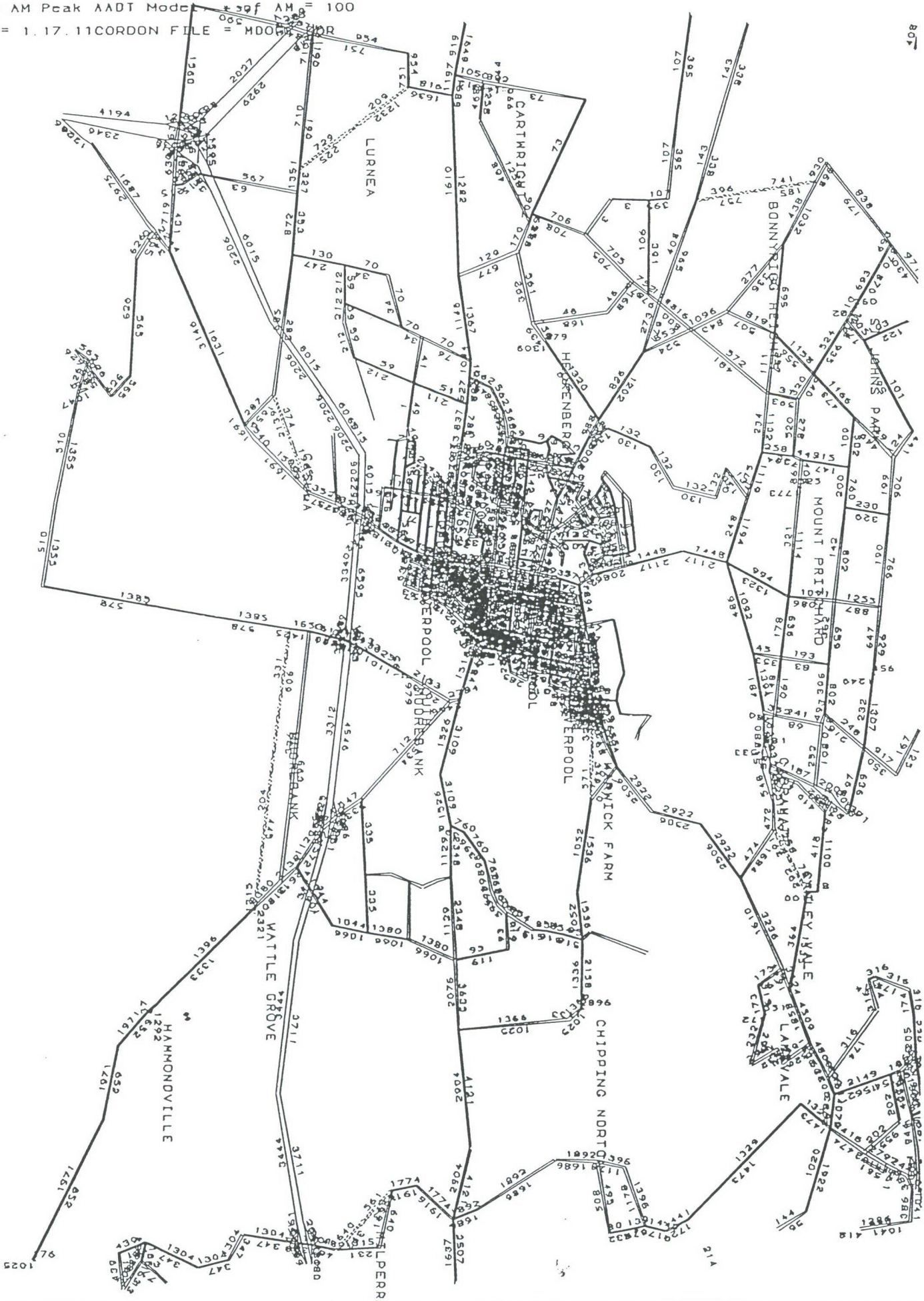
LURNEA
CARTWRIGHT
HEINEMBERG
BONNYRIGG HEIGHTS
ST JOHNS PARK
MOUNT PRITCHARD
LIVERPOOL
LIVERPOOL
LIVERPOOL
CABRAMATTA
GREENFIELD PARK
BANKSTOWN
BANKSTOWN
BANKSTOWN

16WS0_B4 16AMWSD3 14:55:24 28-MAR-01 Scale = 1 Plot = 16AM-B4

2016 ROAD NETWORK WITH WESTERN SYDNEY ORBITAL

2016 AM Peak AADT Model - 30% of AM = 100

Ver = 1.17.11CORDON FILE = MDOMAIN.CDR



Appendix B - SCATES Outputs

1999 Double Point Interchange

SCATES Program Version: S_R_2.00 Date: 20-NOV-00 Time: 14:11:32
Registered User Name. - MASSON WILSON & TWINEY
Registered User No. - 1003
Data File: C:\SCATES\DATA\TM0029\DP-MI-99
MOOREBANK AVENUE
M5 RAMPS

The coordinated delays shown here are the calculated delays to be expected under SCATS control. The coordinated delays in the Splits Screen will normally be higher as they are calculated there for isolated operation and do not reflect the benefits of coordination.

The isolated delay rate shown here for the main road is calculated to reflect the interaction of adjacent intersections.
The isolated main road and total delay rates will therefore differ to those shown in the Splits and Movement DS Screens which are calculated with no interaction. The Level of Service (L/S) is for co-ordinated operation for all movements.

INTERSECTION DELAY PERFORMANCE for BUSINESS PEAK for FILE DP-MI-99

TCS No. & L/S	Main Road Isol dlay Rate Pc/h	Main Road Cord dlay Rate Pc/h	Main Road Cord Sec per Pcu	Main Road Pcu per Hour	Main Road Cord DS	Side Road Isol dlay Rate Pc/h	Side Road Cord dlay Rate Pc/h	Side Road Cord Sec per Pcu	Side Road Pcu per Hour	Side Road Cord DS	Total Isol dlay Rate Pc/h	Total Cord dlay Rate Pc/h	Total Cord Sec per Pcu	Total Pcu per Hour	Total Cord DS
1A	9	1	3	1870	0.51	2	2	7	946	0.51	11	3	4	2816	0.51
2A	35	4	7	1941	0.66	2	2	20	408	0.66	37	6	9	2349	0.66
TOT	43	5	5			4	4	11			47	9	6	L/S = A	
HIGHEST DS					0.66					0.66					0.66

INTERSECTION DELAY PERFORMANCE for PM PEAK for FILE DP-MI-99

TCS No. & L/S	Main Road Isol dlay Rate Pc/h	Main Road Cord dlay Rate Pc/h	Main Road Cord Sec per Pcu	Main Road Pcu per Hour	Main Road Cord DS	Side Road Isol dlay Rate Pc/h	Side Road Cord dlay Rate Pc/h	Side Road Cord Sec per Pcu	Side Road Pcu per Hour	Side Road Cord DS	Total Isol dlay Rate Pc/h	Total Cord dlay Rate Pc/h	Total Cord Sec per Pcu	Total Pcu per Hour	Total Cord DS
1A	11	3	3	3088	0.90	4	4	24	643	0.90	15	7	7	3731	0.90
2C	626	28	32	3235	1.08	8	8	52	544	1.08	634	36	35	3779	1.08
TOT	637	31	18			12	12	37			649	43	21	L/S = B	
HIGHEST DS					1.08					1.08					1.08

INTERSECTION DELAY PERFORMANCE for AM PEAK for FILE DP-MI-99

TCS No. & L/S	Main Road Isol dlay Rate Pc/h	Main Road Cord dlay Rate Pc/h	Main Road Cord Sec per Pcu	Main Road Pcu per Hour	Main Road Cord DS	Side Road Isol dlay Rate Pc/h	Side Road Cord dlay Rate Pc/h	Side Road Cord Sec per Pcu	Side Road Pcu per Hour	Side Road Cord DS	Total Isol dlay Rate Pc/h	Total Cord dlay Rate Pc/h	Total Cord Sec per Pcu	Total Pcu per Hour	Total Cord DS
1A	30	3	4	2252	0.56	10	10	17	2060	0.56	39	12	10	4312	0.56
2B	38	6	10	2308	0.81	5	5	31	621	0.81	43	12	14	2929	0.81
TOT	67	9	7			15	15	20			82	24	12	L/S = A	
HIGHEST DS					0.81					0.81					0.81

END OF FILE

2016 Double Point Interchange

SCATES Program Version: S_R_2.00 Date: 20-NOV-00 Time: 14:12:45
Registered User Name. - MASSON WILSON & TWINEY
Registered User No. - 1003
Data File: C:\SCATES\DATA\TM0029\DP-MI-16
MOOREBANK AVENUE
M5 RAMPS

The coordinated delays shown here are the calculated delays to be expected under SCATS control. The coordinated delays in the Splits Screen will normally be higher as they are calculated there for isolated operation and do not reflect the benefits of coordination.

The isolated delay rate shown here for the main road is calculated to reflect the interaction of adjacent intersections.
The isolated main road and total delay rates will therefore differ to those shown in the Splits and Movement DS Screens which are calculated with no interaction. The Level of Service (L/S) is for co-ordinated operation for all movements.

INTERSECTION DELAY PERFORMANCE for BUSINESS PEAK for FILE DP-MI-16

TCS No. & L/S	Main Road Isol dlay Rate Pc/h	Main Road Cord dlay Rate Pc/h	Main Road Cord Sec per Pcu	Main Road Pcu per Hour	Main Road Cord DS	Side Road Isol dlay Rate Pc/h	Side Road Cord dlay Rate Pc/h	Side Road Cord Sec per Pcu	Side Road Pcu per Hour	Side Road Cord DS	Total Isol dlay Rate Pc/h	Total Cord dlay Rate Pc/h	Total Cord Sec per Pcu	Total Pcu per Hour	Total Cord DS
1A	17	2	4	2227	0.70	4	4	13	1240	0.70	22	7	7	3467	0.70
2A	60	6	9	2732	0.81	3	3	25	470	0.81	63	10	11	3202	0.81
TOT	77	9	6			8	8	16			85	16	9	L/S = A	
HIGHEST DS					0.81					0.81					0.81

INTERSECTION DELAY PERFORMANCE for PM PEAK for FILE DP-MI-16

TCS No. & L/S	Main Road Isol dlay Rate Pc/h	Main Road Cord dlay Rate Pc/h	Main Road Cord Sec per Pcu	Main Road Pcu per Hour	Main Road Cord DS	Side Road Isol dlay Rate Pc/h	Side Road Cord dlay Rate Pc/h	Side Road Cord Sec per Pcu	Side Road Pcu per Hour	Side Road Cord DS	Total Isol dlay Rate Pc/h	Total Cord dlay Rate Pc/h	Total Cord Sec per Pcu	Total Pcu per Hour	Total Cord DS
1F	242	240	233	3717	1.14	30	30	122	890	1.14	272	271	211	4607	1.14
2E	456	75	61	4451	1.38	2	2	14	503	0.83	458	77	56	4954	1.38
TOT	697	316	139			32	32	83			730	348	131	L/S = F	
HIGHEST DS					1.38					1.14					1.38

INTERSECTION DELAY PERFORMANCE for AM PEAK for FILE DP-MI-16

TCS No. & L/S	Main Road Isol dlay Rate Pc/h	Main Road Cord dlay Rate Pc/h	Main Road Cord Sec per Pcu	Main Road Pcu per Hour	Main Road Cord DS	Side Road Isol dlay Rate Pc/h	Side Road Cord dlay Rate Pc/h	Side Road Cord Sec per Pcu	Side Road Pcu per Hour	Side Road Cord DS	Total Isol dlay Rate Pc/h	Total Cord dlay Rate Pc/h	Total Cord Sec per Pcu	Total Pcu per Hour	Total Cord DS
1C	230	23	31	2647	1.01	31	31	42	2651	1.00	262	54	37	5298	1.01
2D	108	47	50	3356	0.96	10	10	45	840	0.95	118	57	49	4196	0.96
TOT	338	70	42			42	42	43			380	111	42	L/S = D	
HIGHEST DS					1.01					1.00					1.01

END OF FILE

1999 Single Point Interchange

SCATES Program Version: S_R_2.00 Date: 08-NOV-00 Time: 15:23:17
Registered User Name. - MASSON WILSON & TWINEY
Registered User No. - 1003
Data File: C:\SCATES\DATA\TM0029\SP-MI-99
MOOREBANK AVENUE
M5 RAMPS

The coordinated delays shown here are the calculated delays to be expected under SCATS control. The coordinated delays in the Splits Screen will normally be higher as they are calculated there for isolated operation and do not reflect the benefits of coordination.

The isolated delay rate shown here for the main road is calculated to reflect the interaction of adjacent intersections.
The isolated main road and total delay rates will therefore differ to those shown in the Splits and Movement DS Screens which are calculated with no interaction. The Level of Service (L/S) is for co-ordinated operation for all movements.

INTERSECTION DELAY PERFORMANCE for BUSINESS PEAK for FILE SP-MI-99

TCS No. & L/S	Main Road Isol dlay Rate Pc/h	Main Road Cord dlay Rate Pc/h	Main Road Cord Sec per Pcu	Main Road Pcu per Hour	Main Road Cord DS	Side Road Isol dlay Rate Pc/h	Side Road Cord dlay Rate Pc/h	Side Road Cord Sec per Pcu	Side Road Pcu per Hour	Side Road Cord DS	Total Isol dlay Rate Pc/h	Total Cord dlay Rate Pc/h	Total Cord Sec per Pcu	Total Pcu per Hour	Total Cord DS
1A	0	0	0	2498	0.24	0	0	0	0	0.00	0	0	0	2498	0.24
2B	15	17	33	1853	0.45	4	4	10	1354	0.45	18	21	23	3207	0.45
TOT	15	17	14			4	4	10			18	21	13		L/S = A
HIGHEST DS					0.45					0.45					0.45

INTERSECTION DELAY PERFORMANCE for PM PEAK for FILE SP-MI-99

TCS No. & L/S	Main Road Isol dlay Rate Pc/h	Main Road Cord dlay Rate Pc/h	Main Road Cord Sec per Pcu	Main Road Pcu per Hour	Main Road Cord DS	Side Road Isol dlay Rate Pc/h	Side Road Cord dlay Rate Pc/h	Side Road Cord Sec per Pcu	Side Road Pcu per Hour	Side Road Cord DS	Total Isol dlay Rate Pc/h	Total Cord dlay Rate Pc/h	Total Cord Sec per Pcu	Total Pcu per Hour	Total Cord DS
1A	0	0	0	3474	0.36	0	0	0	0	0.00	0	0	0	3474	0.36
2C	16	37	41	3192	0.71	3	3	10	1187	0.71	20	40	33	4379	0.71
TOT	16	37	20			3	3	10			20	40	18		L/S = B
HIGHEST DS					0.71					0.71					0.71

INTERSECTION DELAY PERFORMANCE for AM PEAK for FILE SP-MI-99

TCS No. & L/S	Main Road Isol dlay Rate Pc/h	Main Road Cord dlay Rate Pc/h	Main Road Cord Sec per Pcu	Main Road Pcu per Hour	Main Road Cord DS	Side Road Isol dlay Rate Pc/h	Side Road Cord dlay Rate Pc/h	Side Road Cord Sec per Pcu	Side Road Pcu per Hour	Side Road Cord DS	Total Isol dlay Rate Pc/h	Total Cord dlay Rate Pc/h	Total Cord Sec per Pcu	Total Pcu per Hour	Total Cord DS
1A	0	0	0	3662	0.55	0	0	0	0	0.00	0	0	0	3662	0.55
2A	19	2	3	2099	0.70	14	14	19	2681	0.70	33	16	12	4780	0.70
TOT	19	2	1			14	14	19			33	16	7		L/S = A
HIGHEST DS					0.70					0.70					0.70

END OF FILE

2016 Single Point Interchange

SCATES Program Version: S_R_2.00 Date: 08-NOV-00 Time: 15:29:32
Registered User Name. - MASSON WILSON & TWINEY
Registered User No. - 1003
Data File: C:\SCATES\DATA\TM0029\SP-MI-16
MOOREBANK AVENUE
MS RAMPS

The coordinated delays shown here are the calculated delays to be expected under SCATS control. The coordinated delays in the Splits Screen will normally be higher as they are calculated there for isolated operation and do not reflect the benefits of coordination.

The isolated delay rate shown here for the main road is calculated to reflect the interaction of adjacent intersections.
The isolated main road and total delay rates will therefore differ to those shown in the Splits and Movement DS Screens which are calculated with no interaction. The Level of Service (L/S) is for co-ordinated operation for all movements.

INTERSECTION DELAY PERFORMANCE for BUSINESS PEAK for FILE SP-MI-16

TCS No. & L/S	Main Road Isol dlay Rate Pc/h	Cord dlay Rate Pc/h	Cord Sec per Pcu	Pcu per Hour	Cord DS	Side Road Isol dlay Rate Pc/h	Cord dlay Rate Pc/h	Cord Sec per Pcu	Pcu per Hour	Cord DS	Total Isol dlay Rate Pc/h	Cord dlay Rate Pc/h	Cord Sec per Pcu	Pcu per Hour	Cord DS
1A	0	0	0	2498	0.24	0	0	0	0	0.00	0	0	0	2498	0.24
2B	21	19	29	2415	0.71	6	6	13	1710	0.71	27	25	22	4125	0.71
TOT	21	19	14			6	6	13			27	25	14	L/S = A	
HIGHEST DS					0.71					0.71					0.71

INTERSECTION DELAY PERFORMANCE for PM PEAK for FILE SP-MI-16

TCS No. & L/S	Main Road Isol dlay Rate Pc/h	Cord dlay Rate Pc/h	Cord Sec per Pcu	Pcu per Hour	Cord DS	Side Road Isol dlay Rate Pc/h	Cord dlay Rate Pc/h	Cord Sec per Pcu	Pcu per Hour	Cord DS	Total Isol dlay Rate Pc/h	Cord dlay Rate Pc/h	Cord Sec per Pcu	Pcu per Hour	Cord DS
1A	0	0	0	3474	0.36	0	0	0	0	0.00	0	0	0	3474	0.36
2C	46	52	44	4240	0.90	8	8	20	1393	0.90	54	59	38	5633	0.90
TOT	46	52	24			8	8	20			54	59	24	L/S = B	
HIGHEST DS					0.90					0.90					0.90

INTERSECTION DELAY PERFORMANCE for AM PEAK for FILE SP-MI-16

TCS No. & L/S	Main Road Isol dlay Rate Pc/h	Cord dlay Rate Pc/h	Cord Sec per Pcu	Pcu per Hour	Cord DS	Side Road Isol dlay Rate Pc/h	Cord dlay Rate Pc/h	Cord Sec per Pcu	Pcu per Hour	Cord DS	Total Isol dlay Rate Pc/h	Cord dlay Rate Pc/h	Cord Sec per Pcu	Pcu per Hour	Cord DS
1A	0	0	0	3662	0.54	0	0	0	0	0.00	0	0	0	3662	0.54
2C	56	31	42	2656	1.01	38	38	39	3491	1.01	93	69	40	6147	1.01
TOT	56	31	18			38	38	39			93	69	25	L/S = B	
HIGHEST DS					1.01					1.01					1.01

END OF FILE

2016 Improved Single Point Interchange

SCATES Program Version: S_R_2.00 Date: 21-NOV-00 Time: 09:51:42
Registered User Name. - MASSON WILSON & TWINEY
Registered User No. - 1003
Data File: C:\SCATES\DATA\TM0029\SP-IA-16
MOOREBANK AVENUE
M5 RAMPS

The coordinated delays shown here are the calculated delays to be expected under SCATS control. The coordinated delays in the Splits Screen will normally be higher as they are calculated there for isolated operation and do not reflect the benefits of coordination.

The isolated delay rate shown here for the main road is calculated to reflect the interaction of adjacent intersections.
The isolated main road and total delay rates will therefore differ to those shown in the Splits and Movement DS Screens which are calculated with no interaction. The Level of Service (L/S) is for co-ordinated operation for all movements.

INTERSECTION DELAY PERFORMANCE for BUSINESS PEAK for FILE SP-IA-16

TCS No. & L/S	Main Road Isol dlay Rate Pc/h	Main Road Cord dlay Rate Pc/h	Main Road Cord Sec per Pcu	Main Road Pcu per Hour	Main Road Cord DS	Side Road Isol dlay Rate Pc/h	Side Road Cord dlay Rate Pc/h	Side Road Cord Sec per Pcu	Side Road Pcu per Hour	Side Road Cord DS	Total Isol dlay Rate Pc/h	Total Cord dlay Rate Pc/h	Total Cord Sec per Pcu	Total Pcu per Hour	Total Cord DS
1A	0	0	0	2498	0.24	0	0	0	0	0.00	0	0	0	2498	0.24
2B	22	19	29	2415	0.63	5	5	12	1710	0.63	27	25	21	4125	0.63
TOT	22	19	14			5	5	12			27	25	13	L/S = A	
HIGHEST DS					0.63					0.63					0.63

INTERSECTION DELAY PERFORMANCE for PM PEAK for FILE SP-IA-16

TCS No. & L/S	Main Road Isol dlay Rate Pc/h	Main Road Cord dlay Rate Pc/h	Main Road Cord Sec per Pcu	Main Road Pcu per Hour	Main Road Cord DS	Side Road Isol dlay Rate Pc/h	Side Road Cord dlay Rate Pc/h	Side Road Cord Sec per Pcu	Side Road Pcu per Hour	Side Road Cord DS	Total Isol dlay Rate Pc/h	Total Cord dlay Rate Pc/h	Total Cord Sec per Pcu	Total Pcu per Hour	Total Cord DS
1A	0	0	0	3474	0.36	0	0	0	0	0.00	0	0	0	3474	0.36
2C	43	50	43	4240	0.90	8	8	20	1393	0.90	51	58	37	5633	0.90
TOT	43	50	23			8	8	20			51	58	23	L/S = B	
HIGHEST DS					0.90					0.90					0.90

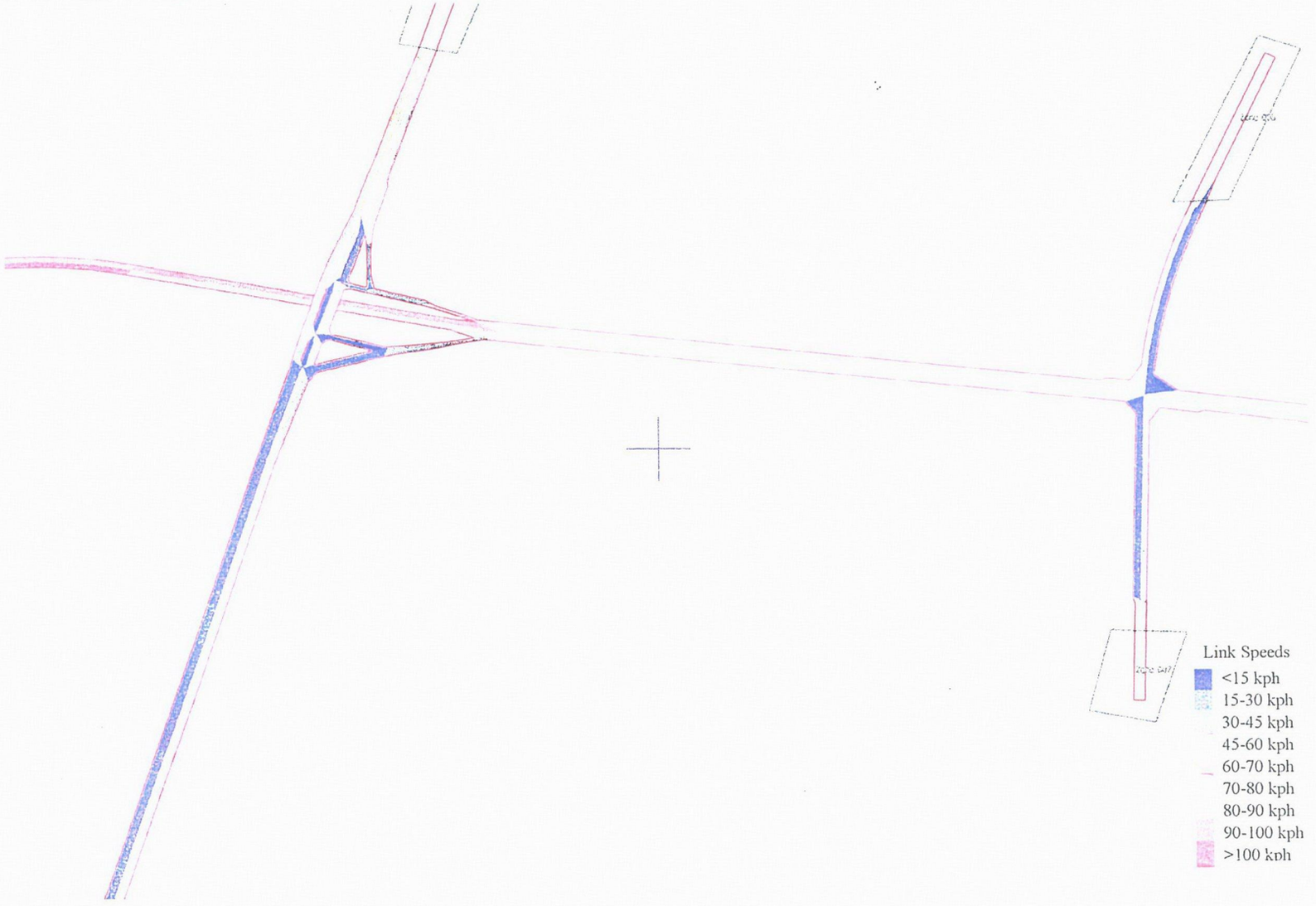
INTERSECTION DELAY PERFORMANCE for AM PEAK for FILE SP-IA-16

TCS No. & L/S	Main Road Isol dlay Rate Pc/h	Main Road Cord dlay Rate Pc/h	Main Road Cord Sec per Pcu	Main Road Pcu per Hour	Main Road Cord DS	Side Road Isol dlay Rate Pc/h	Side Road Cord dlay Rate Pc/h	Side Road Cord Sec per Pcu	Side Road Pcu per Hour	Side Road Cord DS	Total Isol dlay Rate Pc/h	Total Cord dlay Rate Pc/h	Total Cord Sec per Pcu	Total Pcu per Hour	Total Cord DS
1A	0	0	0	3662	0.54	0	0	0	0	0.00	0	0	0	3662	0.54
2B	35	15	21	2656	0.91	24	24	24	3491	0.91	59	39	23	6147	0.91
TOT	35	15	9			24	24	24			59	39	14	L/S = B	
HIGHEST DS					0.91					0.91					0.91

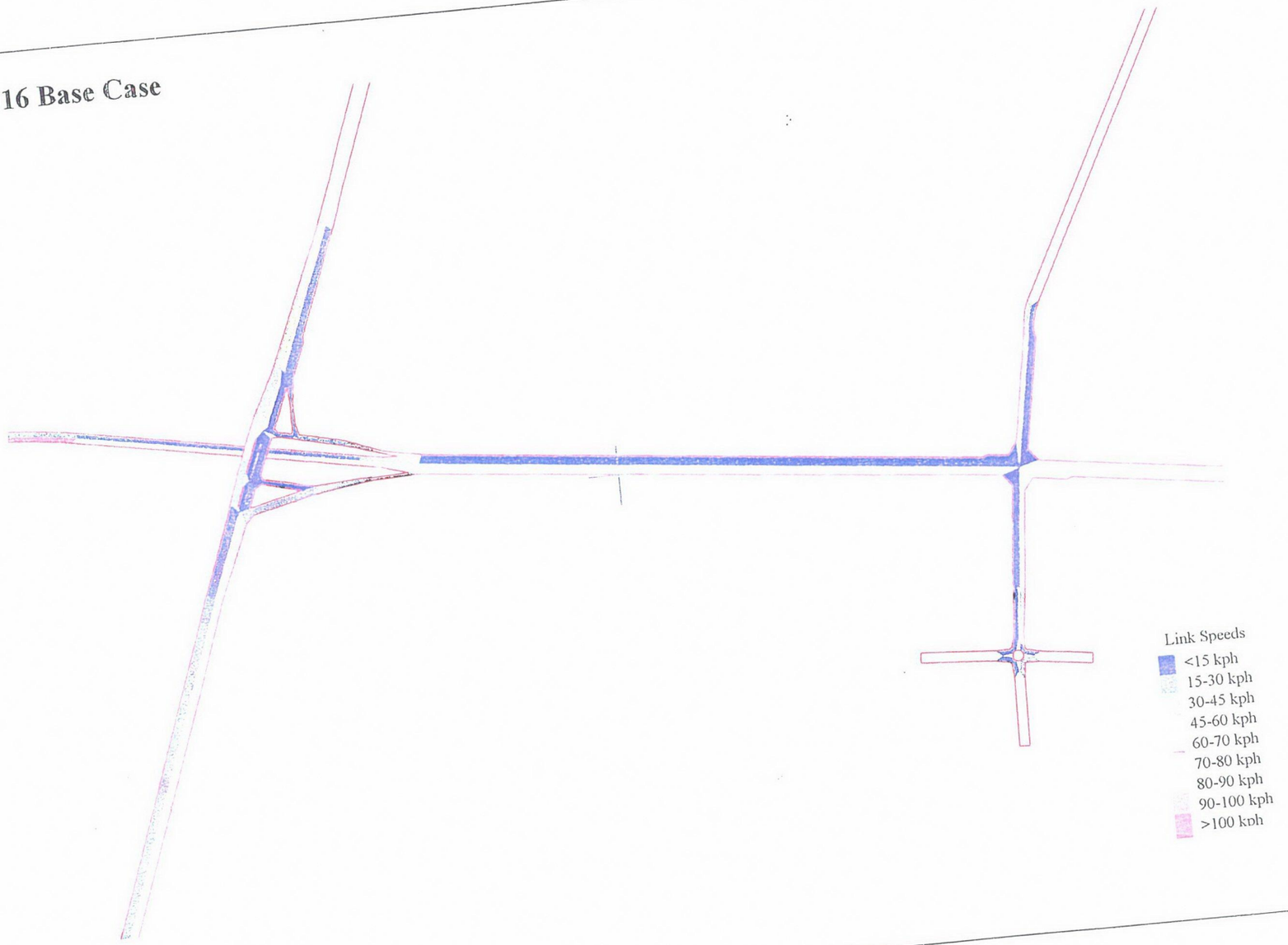
END OF FILE

Appendix C - PARAMICS Outputs

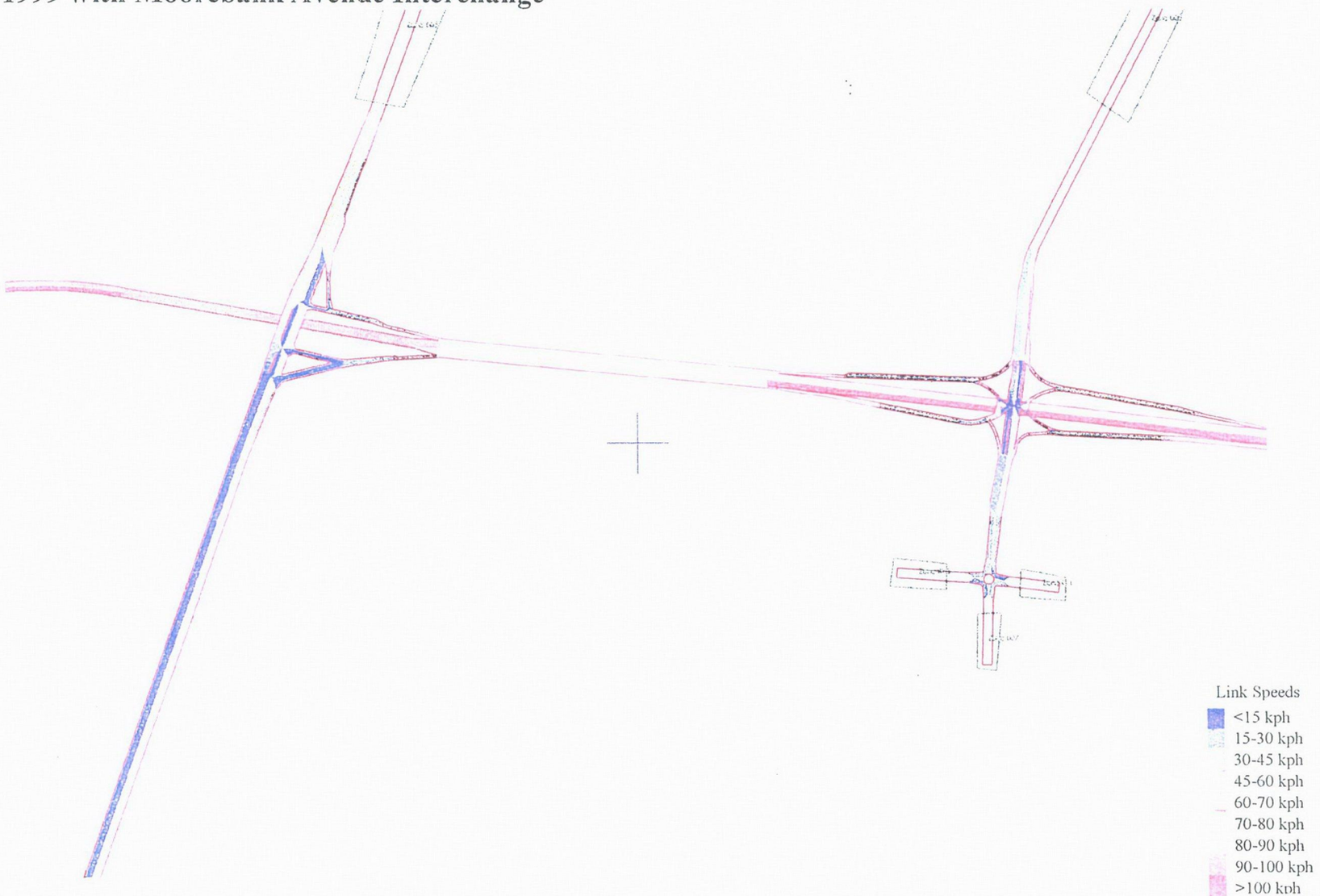
1999 Base Case



2016 Base Case

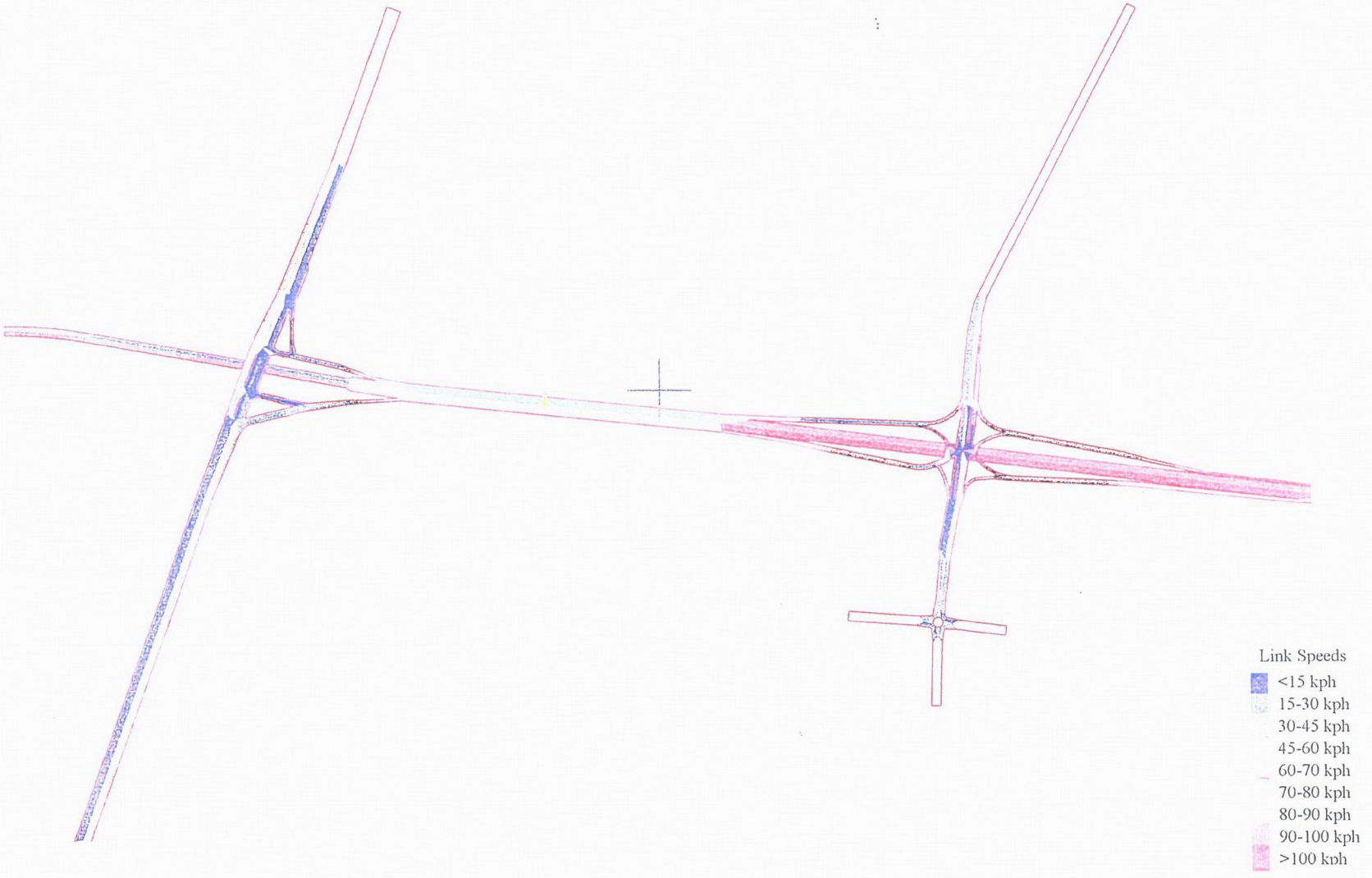


1999 with Moorebank Avenue Interchange

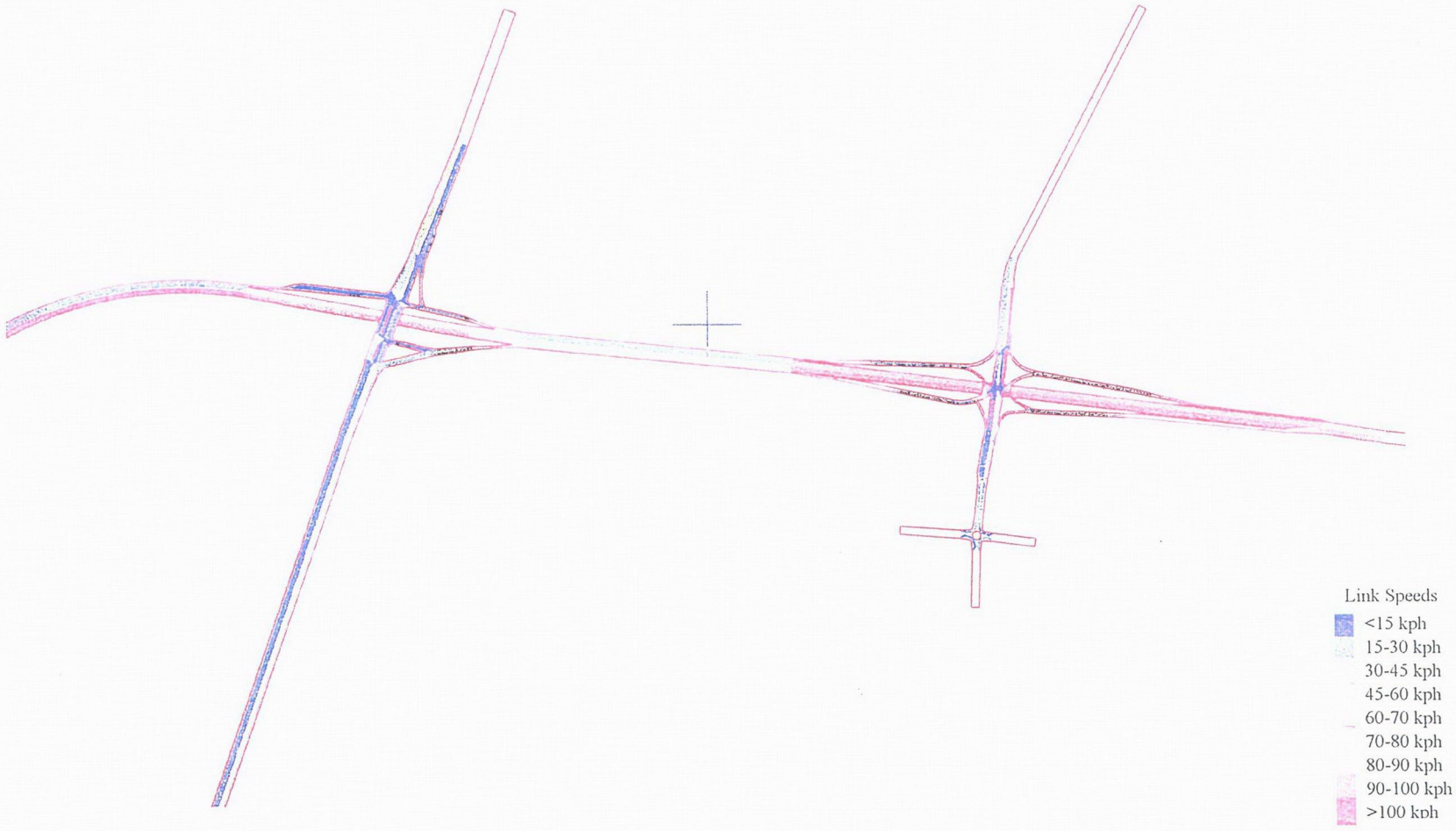


2016 with Moorebank Avenue Interchange

2016 with improved Moorebank Avenue Interchange



2016 with Hume Highway Ramp + Casula Link Widening + Moorebank Avenue Interchange



Appendix D - SCATES Outputs – Long Term Option

2016 Single Point Interchange No Defence Development

SCATES Program Version: S_R_2.00 Date: 28-MAR-01 Time: 11:23:24
Registered User Name. - MASSON WILSON & TWINEY
Registered User No. - 1003
Data File: C:\SCATES\DATA\TM0029\SP-LT-16
MOOREBANK AVENUE
M5 RAMPS

The coordinated delays shown here are the calculated delays to be expected under SCATS control. The coordinated delays in the Splits Screen will normally be higher as they are calculated there for isolated operation and do not reflect the benefits of coordination.

The isolated delay rate shown here for the main road is calculated to reflect the interaction of adjacent intersections.
The isolated main road and total delay rates will therefore differ to those shown in the Splits and Movement DS Screens which are calculated with no interaction. The Level of Service (L/S) is for co-ordinated operation for all movements.

INTERSECTION DELAY PERFORMANCE for BUSINESS PEAK for FILE SP-LT-16

TCS No. & L/S	Main Road Isol dlay Rate Pc/h	Main Road Cord dlay Rate Pc/h	Main Road Cord Sec per Pcu	Main Road Pcu per Hour	Main Road Cord DS	Side Road Isol dlay Rate Pc/h	Side Road Cord dlay Rate Pc/h	Side Road Cord Sec per Pcu	Side Road Pcu per Hour	Side Road Cord DS	Total Isol dlay Rate Pc/h	Total Cord dlay Rate Pc/h	Total Cord Sec per Pcu	Total Pcu per Hour	Total Cord DS
1A	0	0	0	2498	0.18	0	0	0	0	0.00	0	0	0	2498	0.18
2B	18	18	27	2415	0.52	7	7	15	1710	0.52	25	25	22	4125	0.52
TOT	18	18	13			7	7	15			25	25	14	L/S = A	
HIGHEST DS					0.52					0.52					0.52

INTERSECTION DELAY PERFORMANCE for PM PEAK for FILE SP-LT-16

TCS No. & L/S	Main Road Isol dlay Rate Pc/h	Main Road Cord dlay Rate Pc/h	Main Road Cord Sec per Pcu	Main Road Pcu per Hour	Main Road Cord DS	Side Road Isol dlay Rate Pc/h	Side Road Cord dlay Rate Pc/h	Side Road Cord Sec per Pcu	Side Road Pcu per Hour	Side Road Cord DS	Total Isol dlay Rate Pc/h	Total Cord dlay Rate Pc/h	Total Cord Sec per Pcu	Total Pcu per Hour	Total Cord DS
1A	0	0	0	3474	0.29	0	0	0	0	0.00	0	0	0	3474	0.29
2C	50	40	34	4240	0.82	7	7	19	1393	0.82	58	48	30	5633	0.82
TOT	50	40	19			7	7	19			58	48	19	L/S = B	
HIGHEST DS					0.82					0.82					0.82

INTERSECTION DELAY PERFORMANCE for AM PEAK for FILE SP-LT-16

TCS No. & L/S	Main Road Isol dlay Rate Pc/h	Main Road Cord dlay Rate Pc/h	Main Road Cord Sec per Pcu	Main Road Pcu per Hour	Main Road Cord DS	Side Road Isol dlay Rate Pc/h	Side Road Cord dlay Rate Pc/h	Side Road Cord Sec per Pcu	Side Road Pcu per Hour	Side Road Cord DS	Total Isol dlay Rate Pc/h	Total Cord dlay Rate Pc/h	Total Cord Sec per Pcu	Total Pcu per Hour	Total Cord DS
1A	0	0	0	3662	0.41	0	0	0	0	0.00	0	0	0	3662	0.41
2B	23	2	3	2656	0.67	24	24	24	3491	0.67	46	25	15	6147	0.67
TOT	23	2	1			24	24	24			47	25	9	L/S = A	
HIGHEST DS					0.67					0.67					0.67

END OF FILE

2016 Single Point Interchange Quarter Defence Development

SCATES Program Version: S_R_2.00 Date: 28-MAR-01 Time: 11:36:49
Registered User Name. - MASSON WILSON & TWINEY
Registered User No. - 1003
Data File: C:\SCATES\DATA\TM0029\SP-LT-DQ
MOOREBANK AVENUE
M5 RAMPS

The coordinated delays shown here are the calculated delays to be expected under SCATS control. The coordinated delays in the Splits Screen will normally be higher as they are calculated there for isolated operation and do not reflect the benefits of coordination.

The isolated delay rate shown here for the main road is calculated to reflect the interaction of adjacent intersections.
The isolated main road and total delay rates will therefore differ to those shown in the Splits and Movement DS Screens which are calculated with no interaction. The Level of Service (L/S) is for co-ordinated operation for all movements.

INTERSECTION DELAY PERFORMANCE for BUSINESS PEAK for FILE SP-LT-DQ

TCS No. & L/S	Main Road Isol dlay Rate Pc/h	Cord dlay Rate Pc/h	Cord Sec per Pcu	Pcu per Hour	Cord DS	Side Road Isol dlay Rate Pc/h	Cord dlay Rate Pc/h	Cord Sec per Pcu	Pcu per Hour	Cord DS	Total Isol dlay Rate Pc/h	Cord dlay Rate Pc/h	Cord Sec per Pcu	Pcu per Hour	Cord DS
1A	0	0	0	2861	0.18	0	0	0	0	0.00	0	0	0	2861	0.18
2B	22	17	22	2769	0.56	8	8	16	1736	0.56	30	25	20	4505	0.56
TOT	22	17	11			8	8	16			30	25	12	L/S = A	
HIGHEST DS					0.56					0.56					0.56

INTERSECTION DELAY PERFORMANCE for PM PEAK for FILE SP-LT-DQ

TCS No. & L/S	Main Road Isol dlay Rate Pc/h	Cord dlay Rate Pc/h	Cord Sec per Pcu	Pcu per Hour	Cord DS	Side Road Isol dlay Rate Pc/h	Cord dlay Rate Pc/h	Cord Sec per Pcu	Pcu per Hour	Cord DS	Total Isol dlay Rate Pc/h	Cord dlay Rate Pc/h	Cord Sec per Pcu	Pcu per Hour	Cord DS
1A	0	0	0	4212	0.32	0	0	0	0	0.00	0	0	0	4212	0.32
2F	558	90	63	5123	1.19	97	97	272	1283	1.19	655	187	105	6406	1.19
TOT	558	90	35			97	97	272			655	187	63	L/S = E	
HIGHEST DS					1.19					1.19					1.19

INTERSECTION DELAY PERFORMANCE for AM PEAK for FILE SP-LT-DQ

TCS No. & L/S	Main Road Isol dlay Rate Pc/h	Cord dlay Rate Pc/h	Cord Sec per Pcu	Pcu per Hour	Cord DS	Side Road Isol dlay Rate Pc/h	Cord dlay Rate Pc/h	Cord Sec per Pcu	Pcu per Hour	Cord DS	Total Isol dlay Rate Pc/h	Cord dlay Rate Pc/h	Cord Sec per Pcu	Pcu per Hour	Cord DS
1A	0	0	0	3963	0.34	0	0	0	0	0.00	0	0	0	3963	0.34
2A	28	1	2	2788	0.77	22	22	21	3679	0.76	50	23	13	6467	0.77
TOT	28	1	1			22	22	21			50	23	8	L/S = A	
HIGHEST DS					0.77					0.76					0.77

END OF FILE

2016 Single Point Interchange Half Defence Development

SCATES Program Version: S_R_2.00 Date: 28-MAR-01 Time: 11:31:29
Registered User Name. - MASSON WILSON & TWINEY
Registered User No. - 1003
Data File: C:\SCATES\DATA\TM0029\SP-LT-DH
MOOREBANK AVENUE
M5 RAMPS

The coordinated delays shown here are the calculated delays to be expected under SCATS control. The coordinated delays in the Splits Screen will normally be higher as they are calculated there for isolated operation and do not reflect the benefits of coordination.

The isolated delay rate shown here for the main road is calculated to reflect the interaction of adjacent intersections.
The isolated main road and total delay rates will therefore differ to those shown in the Splits and Movement DS Screens which are calculated with no interaction. The Level of Service (L/S) is for co-ordinated operation for all movements.

INTERSECTION DELAY PERFORMANCE for BUSINESS PEAK for FILE SP-LT-DH

TCS No. & L/S	Main Road Isol dlay Rate Pc/h	Main Road Cord dlay Rate Pc/h	Main Road Cord Sec per Pcu	Main Road Pcu per Hour	Main Road Cord DS	Side Road Isol dlay Rate Pc/h	Side Road Cord dlay Rate Pc/h	Side Road Cord Sec per Pcu	Side Road Pcu per Hour	Side Road Cord DS	Total Isol dlay Rate Pc/h	Total Cord dlay Rate Pc/h	Total Cord Sec per Pcu	Total Pcu per Hour	Total Cord DS
1A	0	0	0	3275	0.21	0	0	0	0	0.00	0	0	0	3275	0.21
2B	33	18	19	3406	0.87	14	14	26	1935	0.87	47	32	21	5341	0.87
TOT	33	18	10			14	14	26			47	32	13		L/S = A
HIGHEST DS					0.87					0.87					0.87

INTERSECTION DELAY PERFORMANCE for PM PEAK for FILE SP-LT-DH

TCS No. & L/S	Main Road Isol dlay Rate Pc/h	Main Road Cord dlay Rate Pc/h	Main Road Cord Sec per Pcu	Main Road Pcu per Hour	Main Road Cord DS	Side Road Isol dlay Rate Pc/h	Side Road Cord dlay Rate Pc/h	Side Road Cord Sec per Pcu	Side Road Pcu per Hour	Side Road Cord DS	Total Isol dlay Rate Pc/h	Total Cord dlay Rate Pc/h	Total Cord Sec per Pcu	Total Pcu per Hour	Total Cord DS
1A	0	0	0	4752	0.32	0	0	0	0	0.00	0	0	0	4752	0.32
2F	1568	232	136	6160	1.47	214	214	602	1283	1.47	1783	447	216	7443	1.47
TOT	1568	232	77			214	214	602			1783	447	132		L/S = F
HIGHEST DS					1.47					1.47					1.47

INTERSECTION DELAY PERFORMANCE for AM PEAK for FILE SP-LT-DH

TCS No. & L/S	Main Road Isol dlay Rate Pc/h	Main Road Cord dlay Rate Pc/h	Main Road Cord Sec per Pcu	Main Road Pcu per Hour	Main Road Cord DS	Side Road Isol dlay Rate Pc/h	Side Road Cord dlay Rate Pc/h	Side Road Cord Sec per Pcu	Side Road Pcu per Hour	Side Road Cord DS	Total Isol dlay Rate Pc/h	Total Cord dlay Rate Pc/h	Total Cord Sec per Pcu	Total Pcu per Hour	Total Cord DS
1A	0	0	0	4606	0.35	0	0	0	0	0.00	0	0	0	4606	0.35
2F	285	2	2	3571	1.23	309	309	262	4246	1.18	594	311	143	7817	1.23
TOT	285	2	1			309	309	262			594	311	90		L/S = F
HIGHEST DS					1.23					1.18					1.23

END OF FILE

2016 Single Point Interchange Full Defence Development

SCATES Program Version: S_R_2.00 Date: 28-MAR-01 Time: 11:28:44
Registered User Name. - MASSON WILSON & TWINEY
Registered User No. - 1003
Data File: C:\SCATES\DATA\TM0029\SP-LT-DF
MOOREBANK AVENUE
M5 RAMPS

The coordinated delays shown here are the calculated delays to be expected under SCATS control. The coordinated delays in the Splits Screen will normally be higher as they are calculated there for isolated operation and do not reflect the benefits of coordination.

The isolated delay rate shown here for the main road is calculated to reflect the interaction of adjacent intersections.
The isolated main road and total delay rates will therefore differ to those shown in the Splits and Movement DS Screens which are calculated with no interaction. The Level of Service (L/S) is for co-ordinated operation for all movements.

INTERSECTION DELAY PERFORMANCE for BUSINESS PEAK for FILE SP-LT-DF

TCS No. & L/S	Main Road Isol dlay Rate Pc/h	Main Road Cord dlay Rate Pc/h	Main Road Cord Sec per Pcu	Main Road Pcu per Hour	Main Road Cord DS	Side Road Isol dlay Rate Pc/h	Side Road Cord dlay Rate Pc/h	Side Road Cord Sec per Pcu	Side Road Pcu per Hour	Side Road Cord DS	Total Isol dlay Rate Pc/h	Total Cord dlay Rate Pc/h	Total Cord Sec per Pcu	Total Pcu per Hour	Total Cord DS
1A	0	0	0	4075	0.26	0	0	0	0	0.00	0	0	0	4075	0.26
2F	334	95	73	4679	1.22	292	292	444	2370	1.22	626	387	198	7049	1.22
TOT	334	95	39			292	292	444			626	387	125	L/S = F	
HIGHEST DS					1.22					1.22					1.22

INTERSECTION DELAY PERFORMANCE for PM PEAK for FILE SP-LT-DF

TCS No. & L/S	Main Road Isol dlay Rate Pc/h	Main Road Cord dlay Rate Pc/h	Main Road Cord Sec per Pcu	Main Road Pcu per Hour	Main Road Cord DS	Side Road Isol dlay Rate Pc/h	Side Road Cord dlay Rate Pc/h	Side Road Cord Sec per Pcu	Side Road Pcu per Hour	Side Road Cord DS	Total Isol dlay Rate Pc/h	Total Cord dlay Rate Pc/h	Total Cord Sec per Pcu	Total Pcu per Hour	Total Cord DS
1A	0	0	0	5778	0.39	0	0	0	0	0.00	0	0	0	5778	0.39
2F	4222	1008	441	8228	2.07	584	584	1512	1391	2.07	4806	1593	596	9619	2.07
TOT	4222	1008	259			584	584	1512			4806	1593	372	L/S = F	
HIGHEST DS					2.07					2.07					2.07

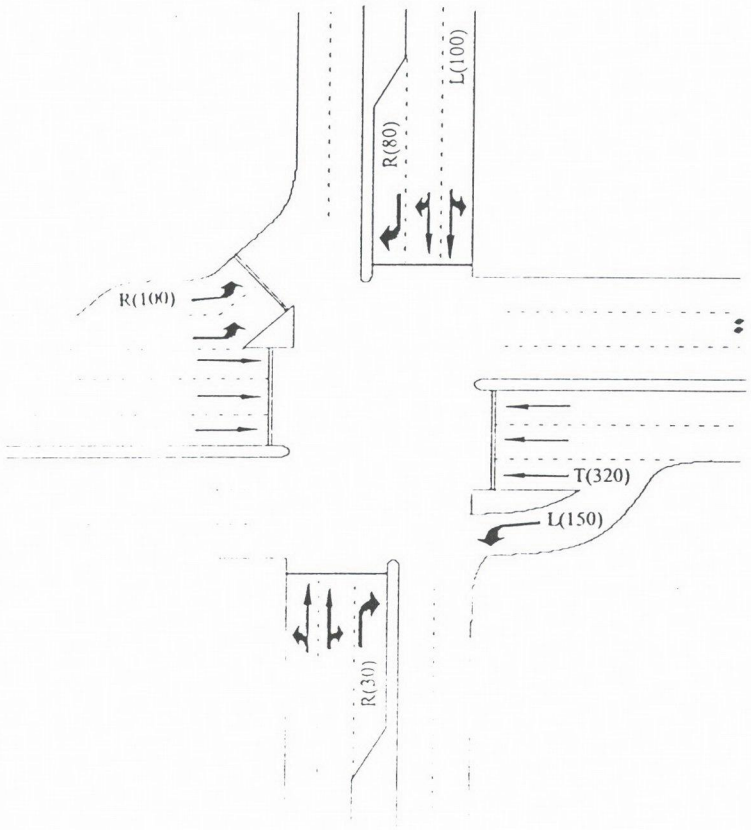
INTERSECTION DELAY PERFORMANCE for AM PEAK for FILE SP-LT-DF

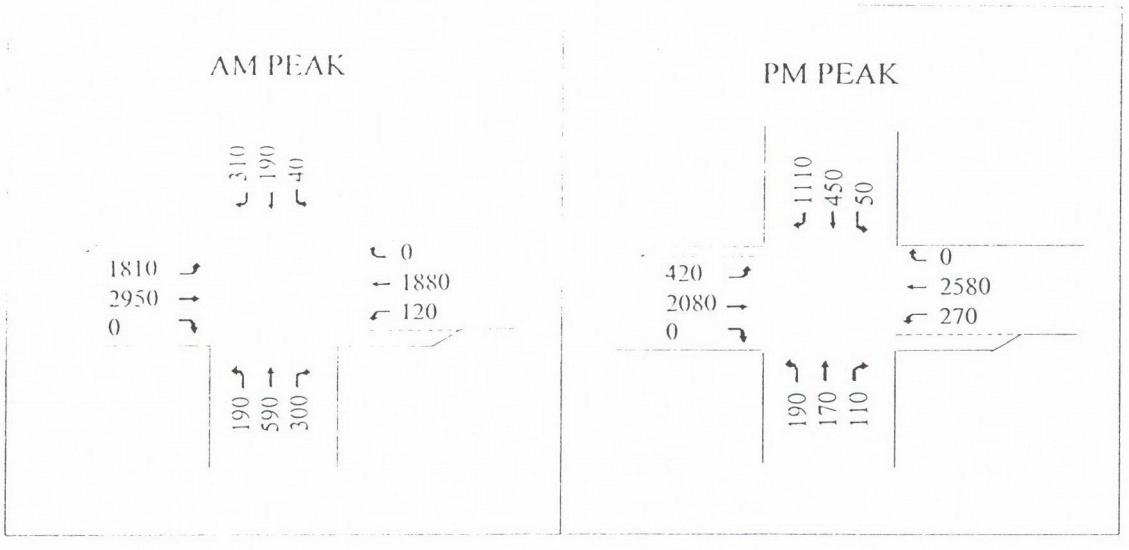
TCS No. & L/S	Main Road Isol dlay Rate Pc/h	Main Road Cord dlay Rate Pc/h	Main Road Cord Sec per Pcu	Main Road Pcu per Hour	Main Road Cord DS	Side Road Isol dlay Rate Pc/h	Side Road Cord dlay Rate Pc/h	Side Road Cord Sec per Pcu	Side Road Pcu per Hour	Side Road Cord DS	Total Isol dlay Rate Pc/h	Total Cord dlay Rate Pc/h	Total Cord Sec per Pcu	Total Pcu per Hour	Total Cord DS
1A	0	0	0	5864	0.37	0	0	0	0	0.00	0	0	0	5864	0.37
2F	2137	27	19	5137	2.34	2517	2517	1684	5380	2.06	4654	2544	871	10517	2.34
TOT	2137	27	9			2517	2517	1684			4654	2544	559	L/S = F	
HIGHEST DS					2.34					2.06					2.34

END OF FILE

Appendix E - Summary of Intersection Performance

Existing Intersection Existing Volumes

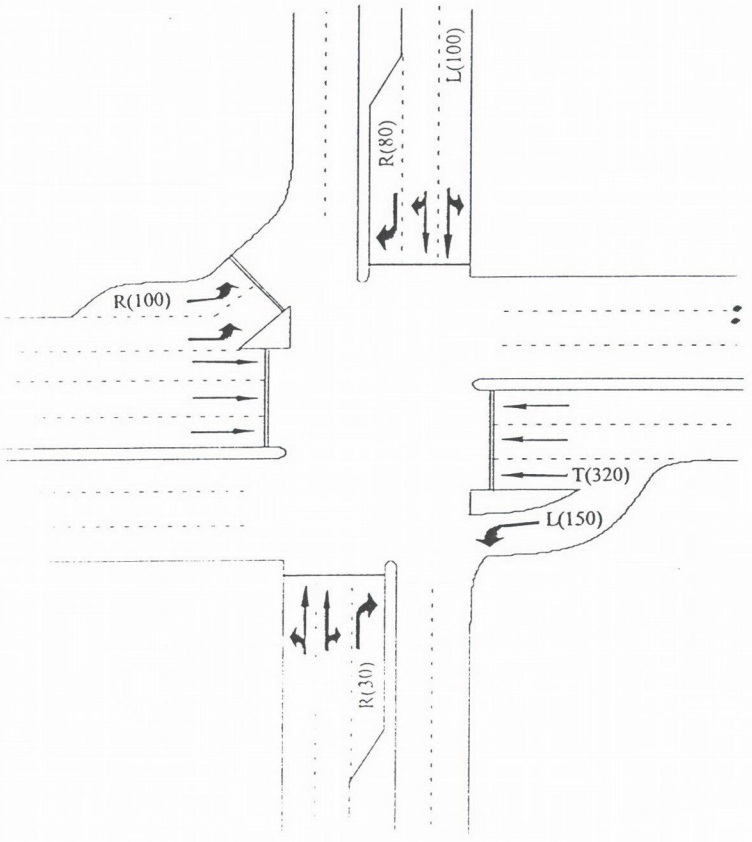


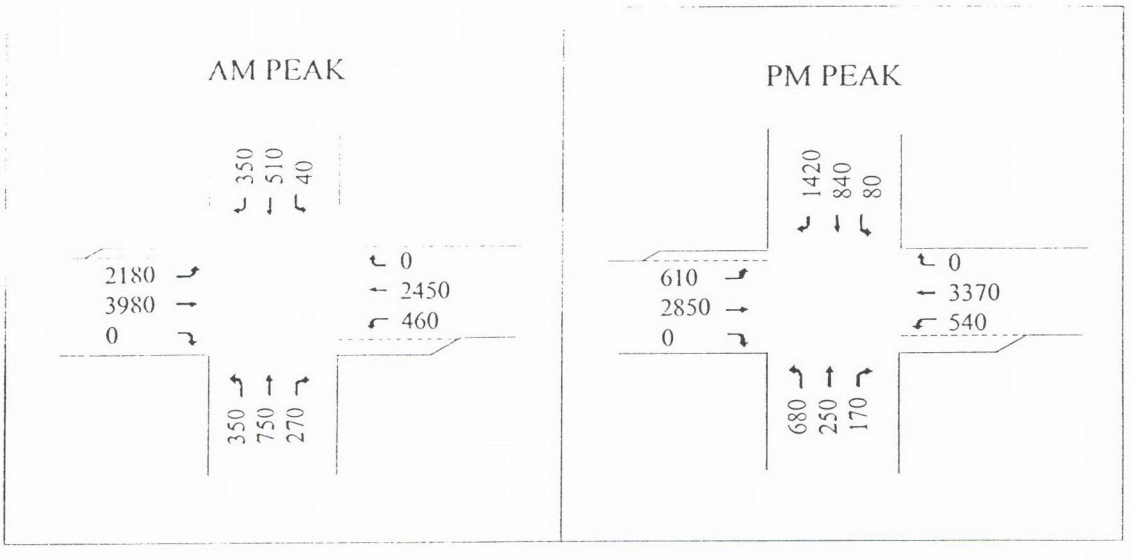


Intersection Performance Measures

Criteria	AM Peak Hour	PM Peak Hour
Degree of Saturation	1.06	1.37
Average Delay per Vehicle (secs)	102	>140
Level of Service	F	F
Total Delay Hours	237.4	>250

Existing Intersection 2016 Volumes

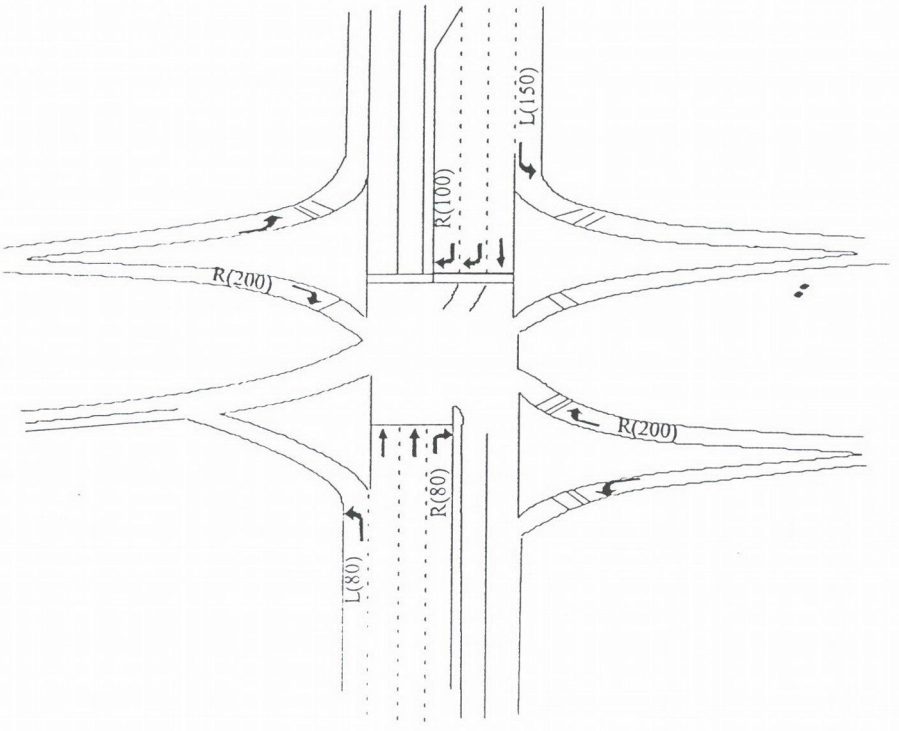


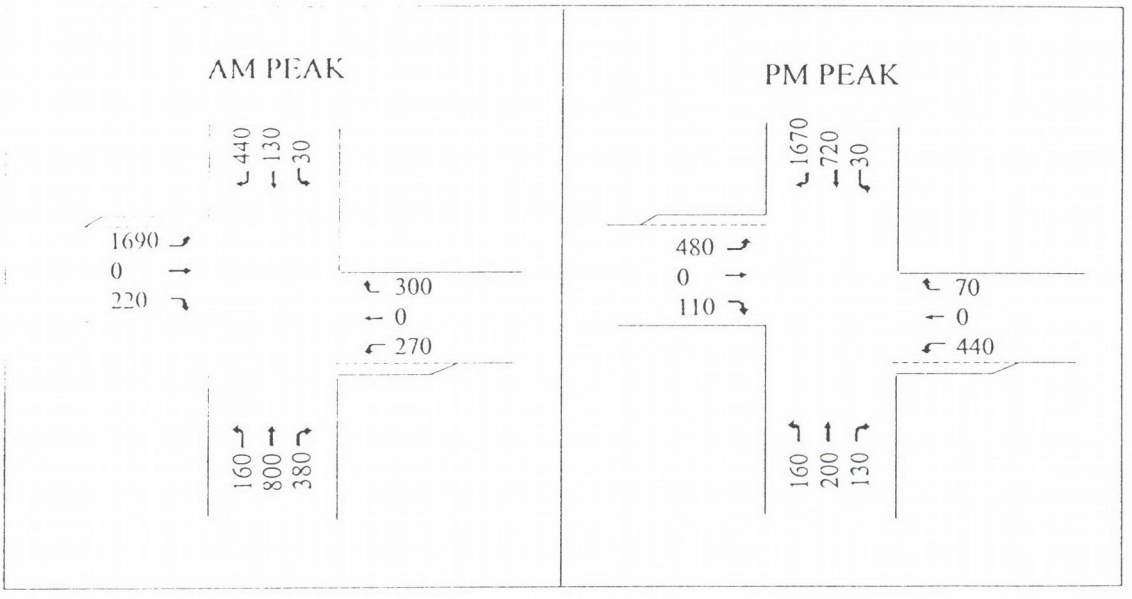


Intersection Performance Measures

Criteria	AM Peak Hour	PM Peak Hour
Degree of Saturation	1.40	2.06
Average Delay per Vehicle (secs)	>140	>140
Level of Service	F	F
Total Delay Hours	>250	>250

Single Point Interchange Existing Volumes

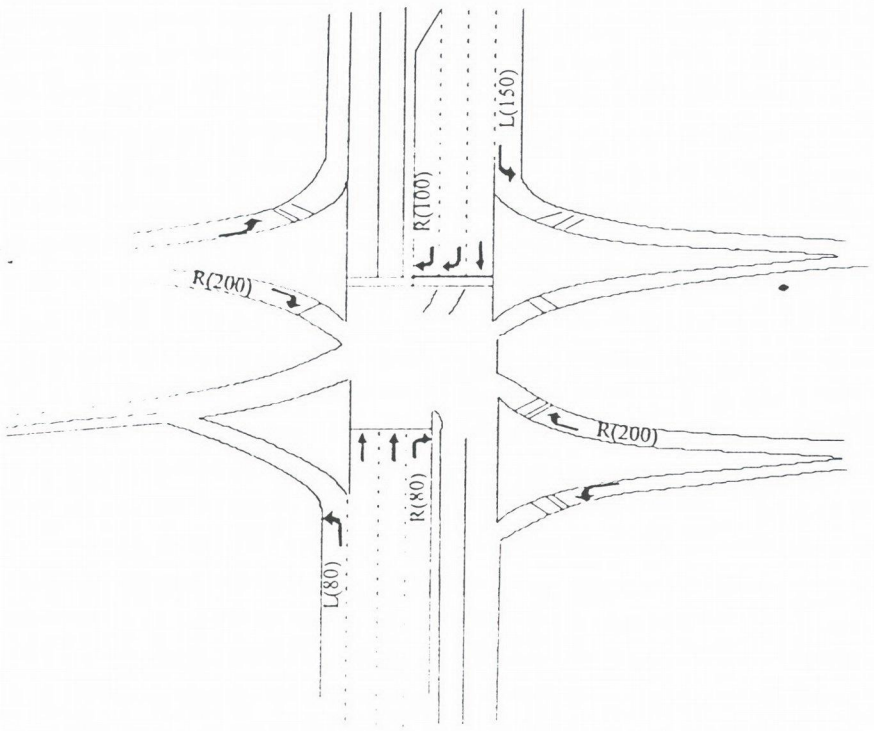


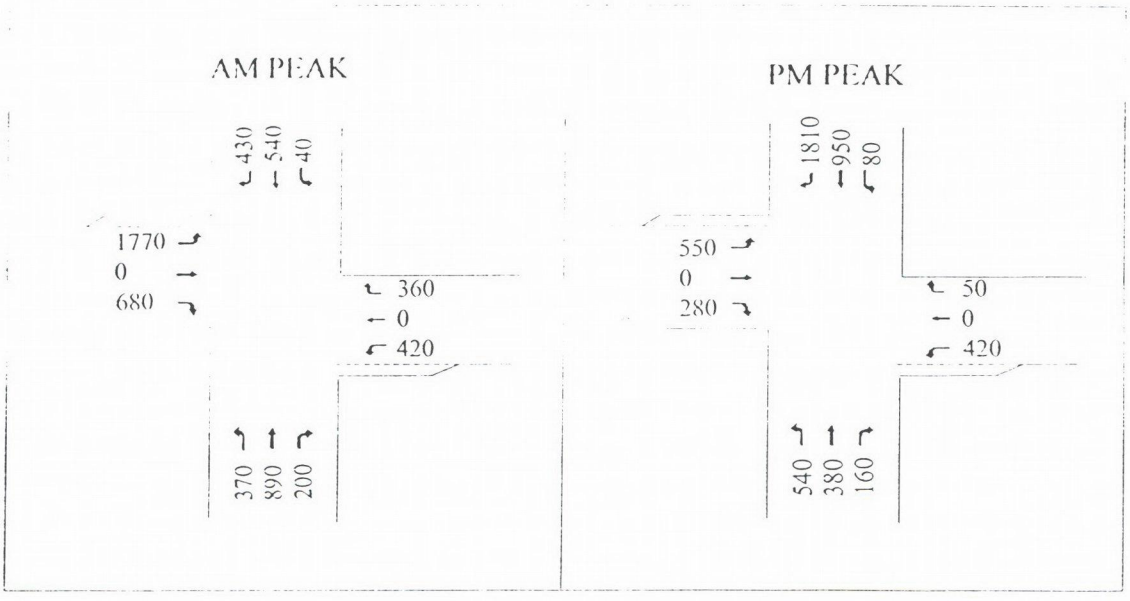


Intersection Performance Measures

Criteria	AM Peak Hour	PM Peak Hour
Degree of Saturation	0.70	0.71
Average Delay per Vehicle (secs)	12	33
Level of Service	A	C
Total Delay Hours	15.9	40.1

Single Point Interchange 2016 Volumes

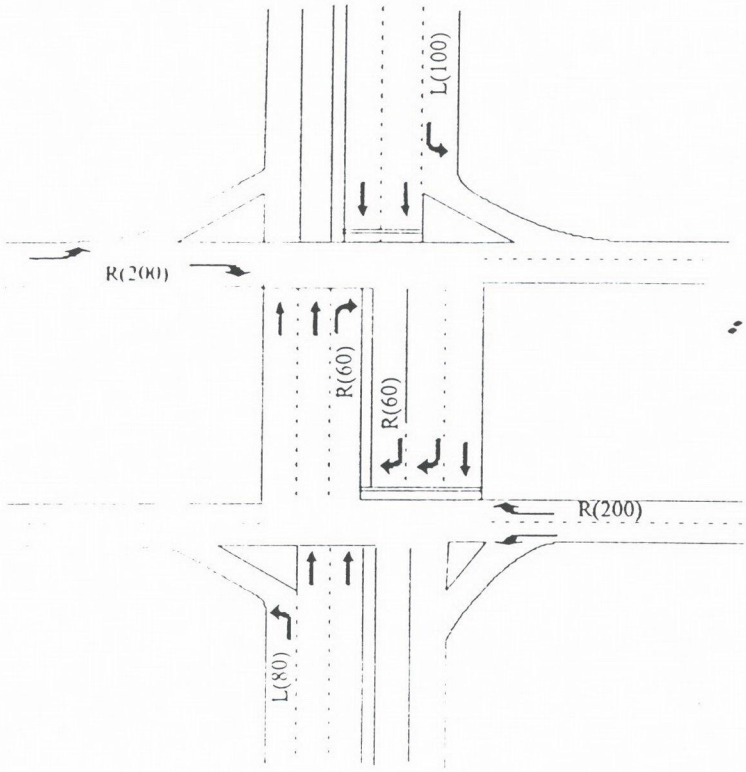


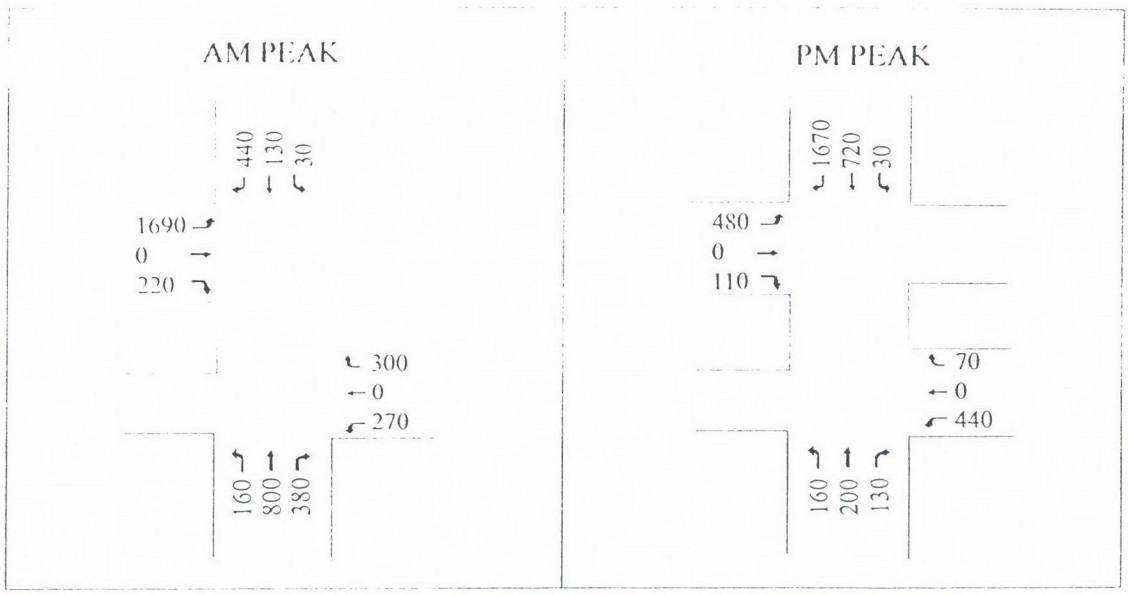


Intersection Performance Measures

Criteria	AM Peak Hour	PM Peak Hour
Degree of Saturation	1.01	0.90
Average Delay per Vehicle (secs)	40	38
Level of Service	C	C
Total Delay Hours	68.3	59.5

Double Point Interchange Existing Volumes

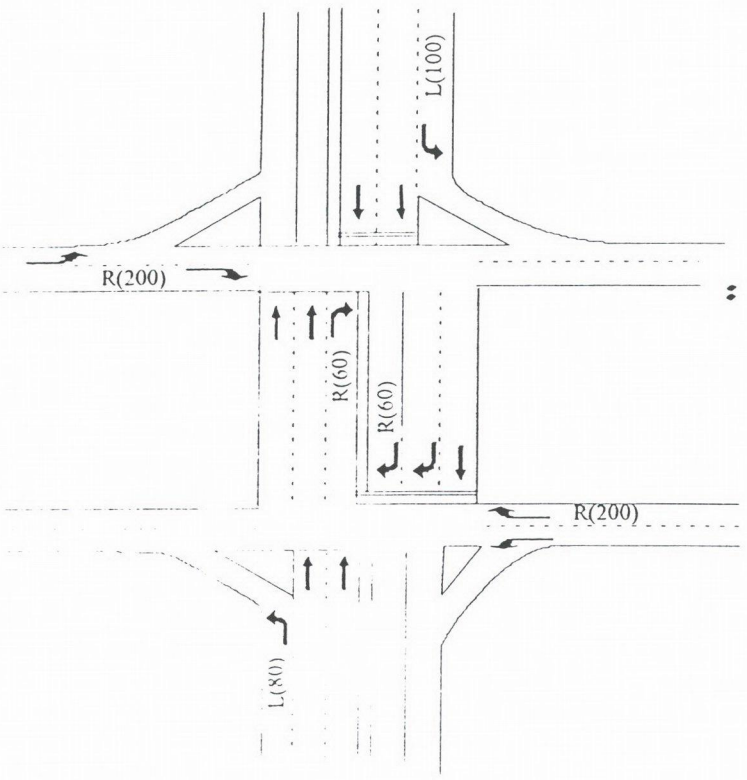


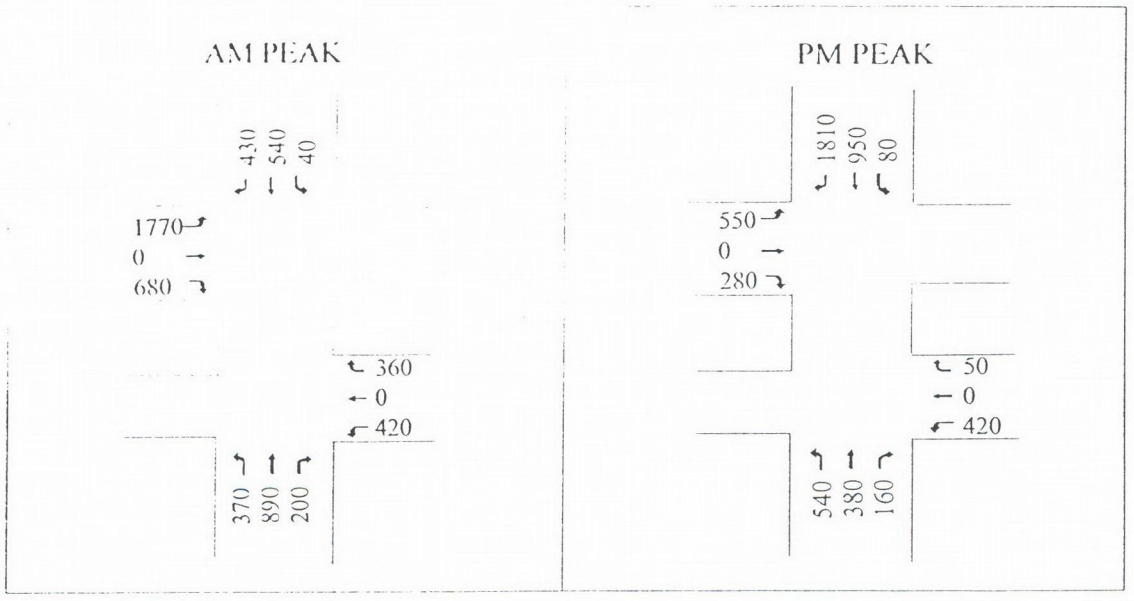


Intersection Performance Measures

Criteria	AM Peak Hour	PM Peak Hour
Degree of Saturation	0.81	1.08
Average Delay per Vehicle (secs)	12	21
Level of Service	A	B
Total Delay Hours	12.6	44.0

Double Point Interchange 2016 Volumes

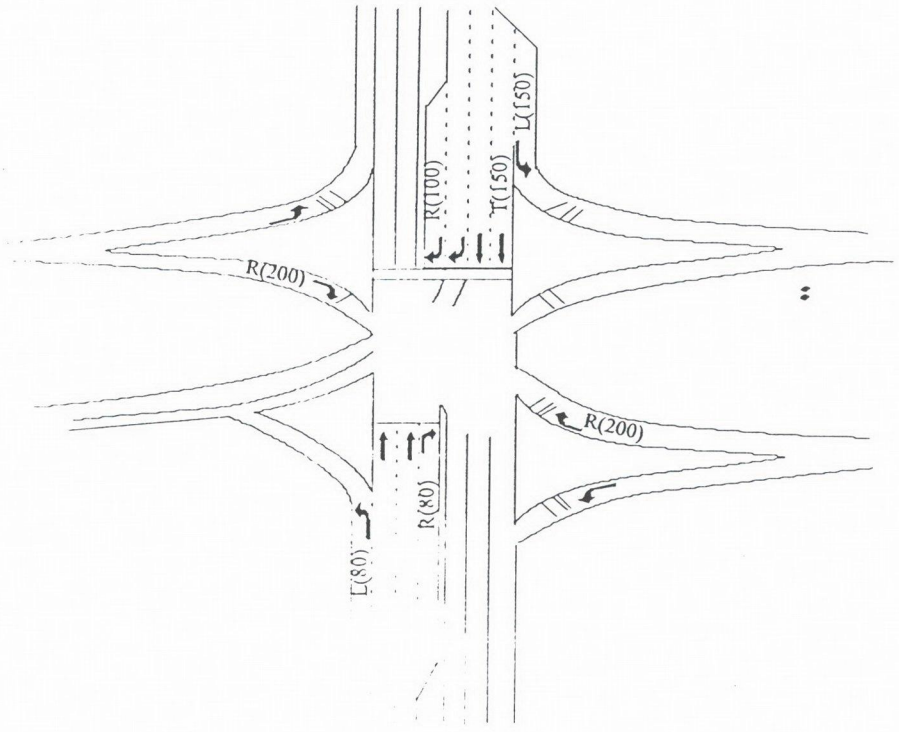


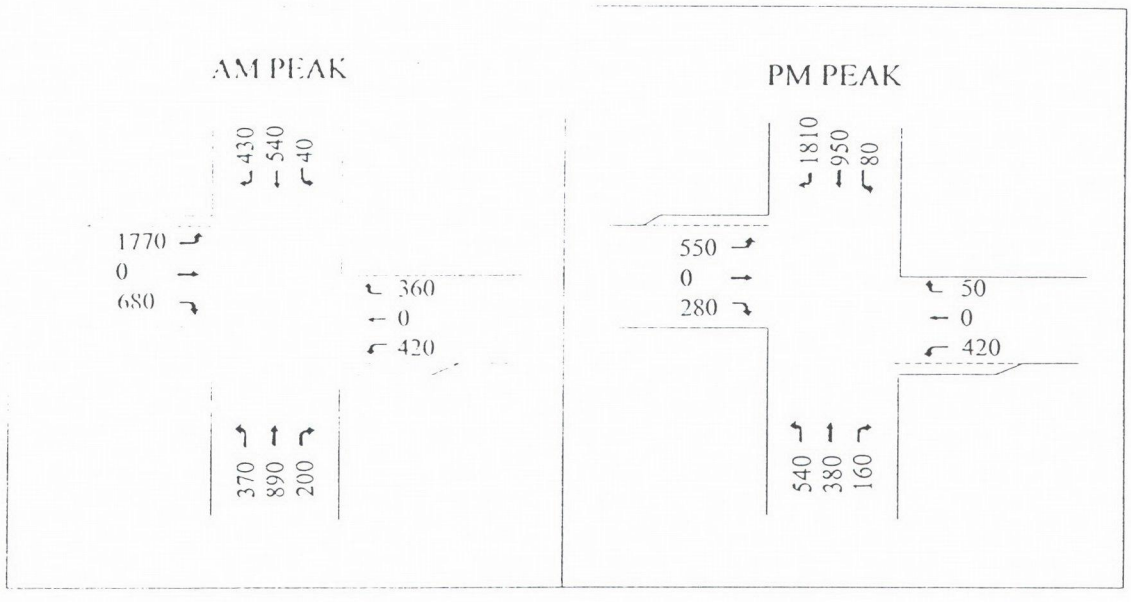


Intersection Performance Measures

Criteria	AM Peak Hour	PM Peak Hour
Degree of Saturation	1.01	1.38
Average Delay per Vehicle (secs)	42	131
Level of Service	D	F
Total Delay Hours	111.6	347.1

Extra Lane Southbound Single Point Interchange 2016 Volumes

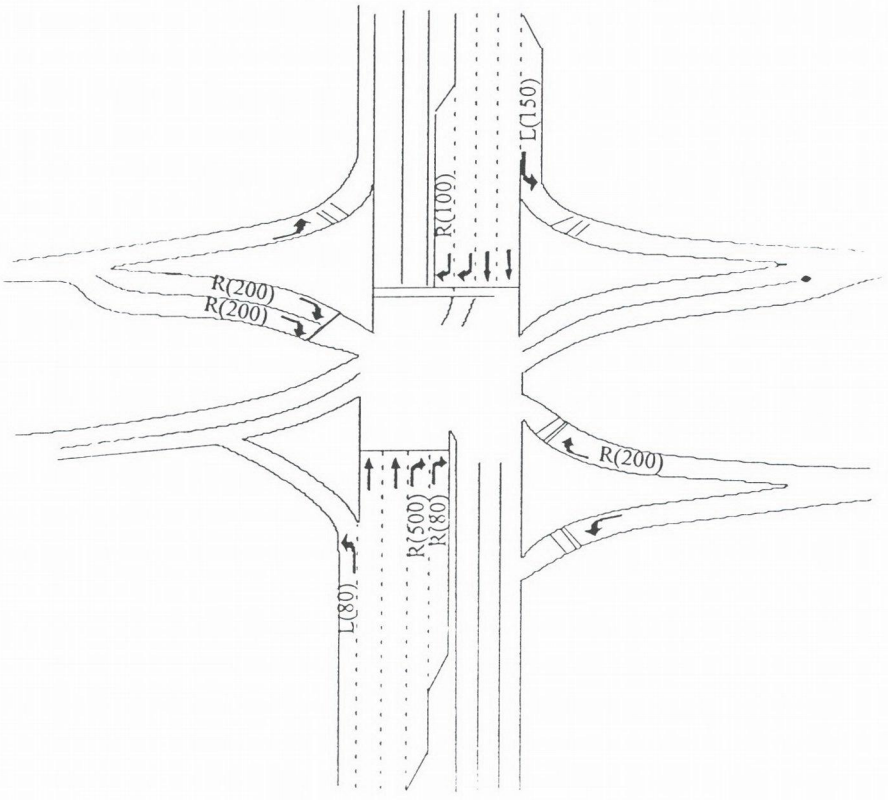


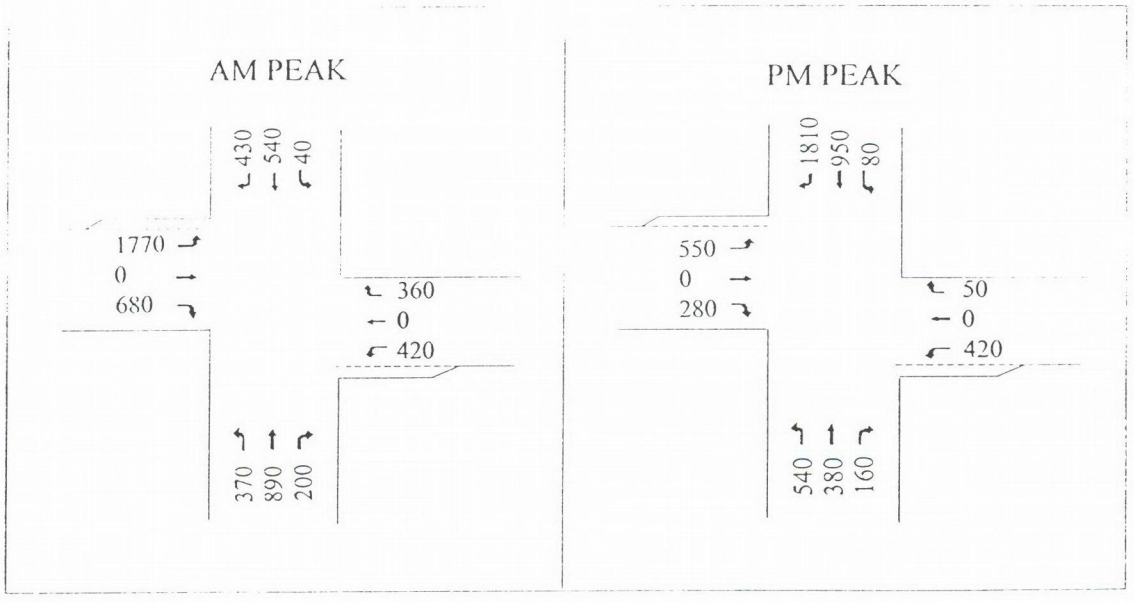


Intersection Performance Measures

Criteria	AM Peak Hour	PM Peak Hour
Degree of Saturation	0.91	0.90
Average Delay per Vehicle (secs)	23	37
Level of Service	B	C
Total Delay Hours	39.3	57.9

RTA Long Term Option Single Point Interchange 2016 Volumes No Defence Development (Except Ameins and Yulong)

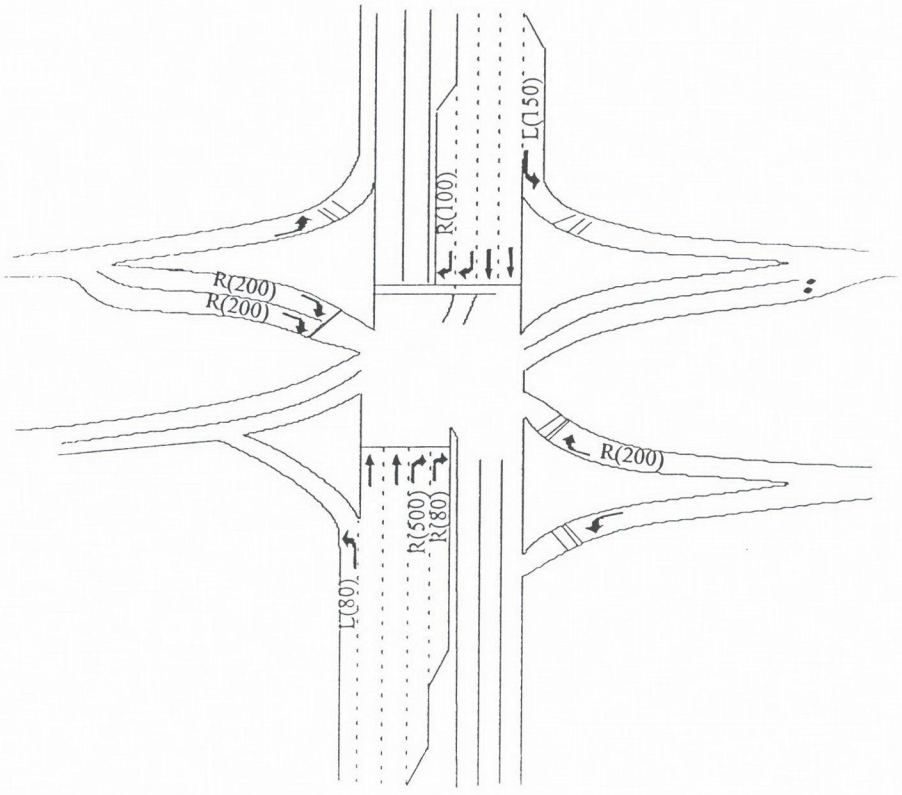


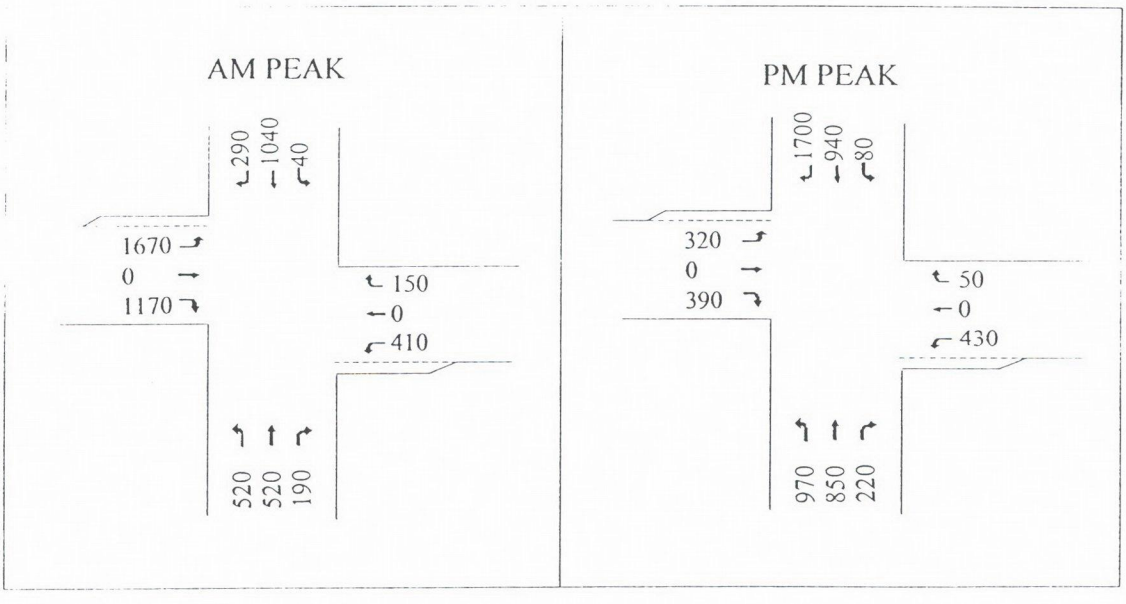


Intersection Performance Measures

Criteria	AM Peak Hour	PM Peak Hour
Degree of Saturation	0.67	0.83
Average Delay per Vehicle (secs)	15	30
Level of Service	B	C
Total Delay Hours	25.6	46.9

RTA Long Term Option Single Point Interchange 2016 Volumes Quarter of Defence Development

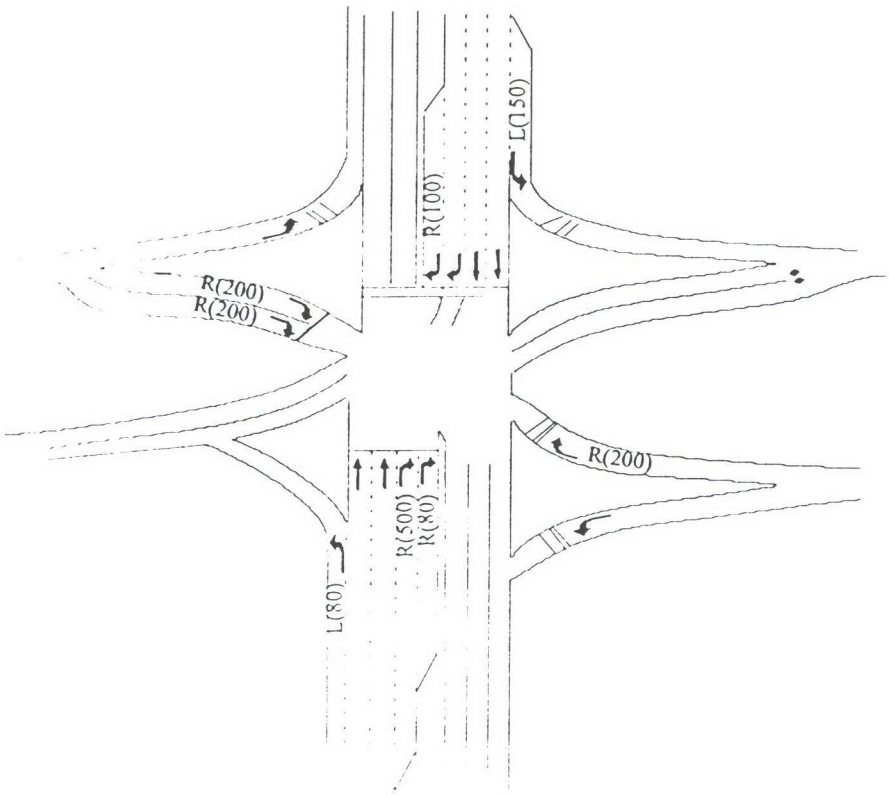


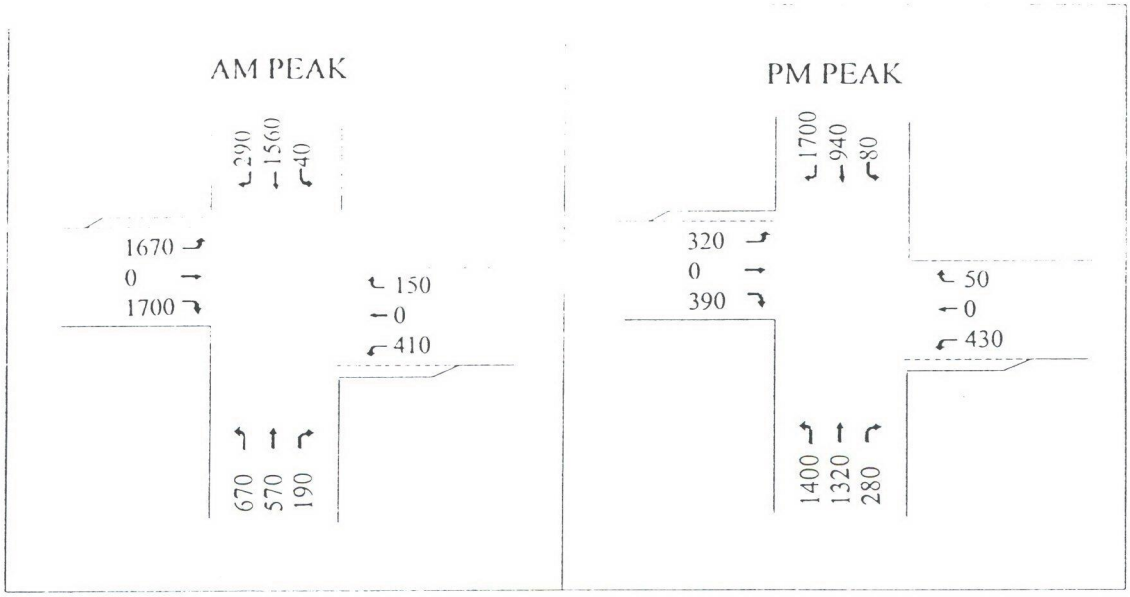


Intersection Performance Measures

Criteria	AM Peak Hour	PM Peak Hour
Degree of Saturation	0.77	1.19
Average Delay per Vehicle (secs)	13	105
Level of Service	A	F
Total Delay Hours	23.4	186.8

RTA Long Term Option Single Point Interchange 2016 Volumes Half of Defence Development

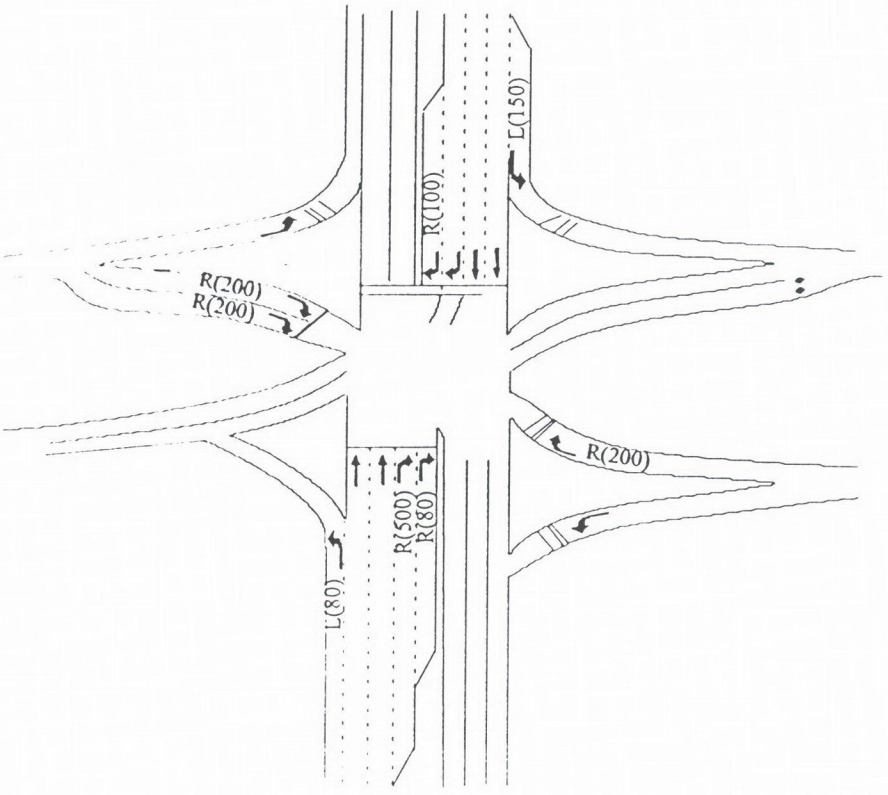


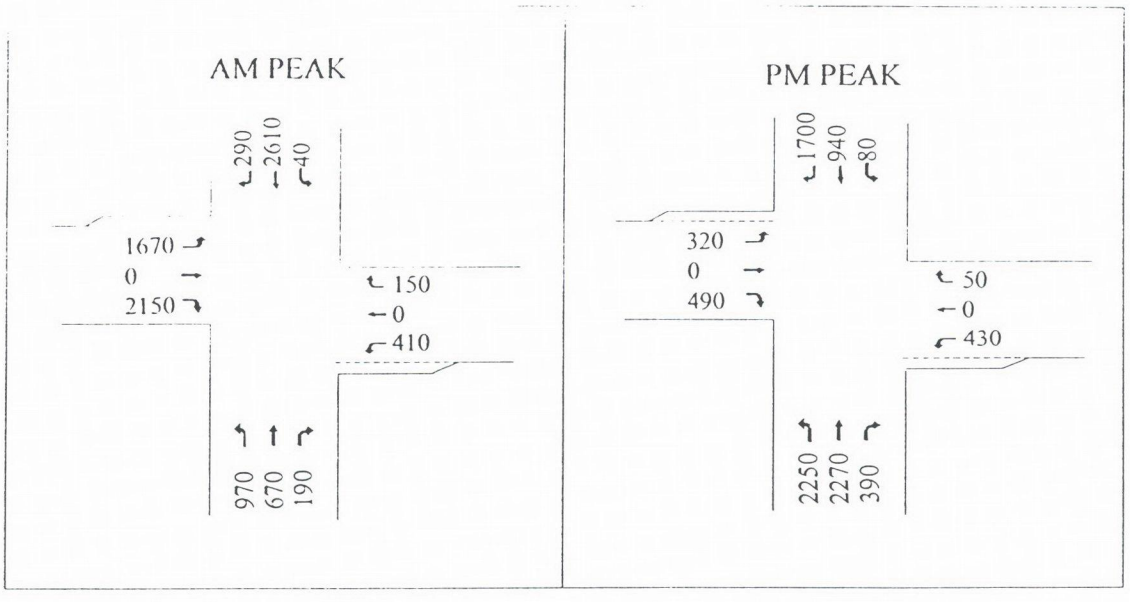


Intersection Performance Measures

Criteria	AM Peak Hour	PM Peak Hour
Degree of Saturation	1.23	1.47
Average Delay per Vehicle (secs)	>140	>140
Level of Service	F	F
Total Delay Hours	>250	>250

RTA Long Term Option Single Point Interchange 2016 Volumes Full Defence Development





Intersection Performance Measures

Criteria	AM Peak Hour	PM Peak Hour
Degree of Saturation	2.34	2.07
Average Delay per Vehicle (secs)	>140	>140
Level of Service	F	F
Total Delay Hours	>250	>250

Appendix C

ENVIRONMENTAL MANAGEMENT PLAN

MOOREBANK INTERCHANGE

Master Environmental Management Plan

Prepared for:

ROADS AND TRAFFIC AUTHORITY
New South Wales

Prepared by:

Brown & Root Services Asia Pacific Pty Ltd
ACN 007 660 317
Maritime Trade Towers
Level 9, 201 Kent Street
Sydney, NSW, 2000
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The sole purpose of this report and the associated services performed by Brown & Root Services Asia Pacific Pty Ltd (Brown & Root) is to prepare an Environmental Management Plan in accordance with the scope of services set out in the contract between Brown & Root and the Roads and Traffic Authority ('the Client'). That scope of services was defined by the requests of the Client, by the time and budgetary constraints imposed by the Client, and by the availability of access to the site.

Brown & Root derived the data in this report primarily from: visual inspections, examination of records in the public domain, and a limited amount of specialist advice. The passage of time, manifestation of latent conditions or impacts of future events may require further exploration at the site and subsequent data analysis, and re-evaluation of the findings, observations and conclusions expressed in this report.

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1 Introduction

1.1 OBJECTIVES OF THE PLAN

This Master Environmental Management Plan (EMP) has been prepared for use by personnel involved in the management of construction works for the Moorebank Interchange and associated works. It applies to all activities associated with the construction and future maintenance of the Moorebank Interchange and Motorway ramp lanes between Moorebank Ave and Heathcote Road.

The objective of the Master EMP is to ensure that all potential environmental impacts that could reasonably be expected to occur during the construction works fall within acceptable and agreed limits. This will be achieved through pro-active environmental management planning prior to carrying out particular elements of work.

The EMP is a plan developed to ensure that all contractors and sub-contractors comply with environmental conditions of approval for the project and that the environmental risks are properly managed. This Master EMP has outlined generic rather than specific environmental work methods, which will be further identified in the individual Contractor's EMPs.

To assist personnel involved in the project to identify potential site-specific impacts and apply appropriate measures, environmental strategies have been outlined in Chapter 2 - Environmental Strategies. These strategies have been detailed under appropriate headings depending on the nature of the impacts.

Construction contractors will be required to prepare individual specific EMPs. These will then be reviewed, approved and checked off according to the protocol detailed in this Master EMP prior to work commencing.

The requirements of this plan are applicable to all on-site work carried out at the Moorebank Interchange. Accordingly, all subcontractors and suppliers will be bound to comply with the requirements of this plan, in so far as they are applicable to the nature and scope of their work.

In order to assess the effectiveness of the environmental management process, it is necessary to overlay the operations with a systematic environmental monitoring program. This EMP also addresses the means by which this control will be provided.

1.2 PROJECT OVERVIEW

1.2.1 Project Description

The proposed overpass of the Motorway is typical of other interchanges along the route, principally the Fairford Road interchange built in 1991. It would be a fairly

expansive structure in a relatively flat landscape. The proposed works comprise the construction of a full diamond interchange approximately 7 m above the existing Motorway. A two-span reinforced concrete bridge with retained earth abutments would be spanned by Super T girders over the Motorway. On and off-ramps would be located opposite each other with a pair of coordinated traffic signals providing for all traffic movements.

The new Moorebank Ave overpass would be sited just to the east of the existing intersection so as to allow the continued use of the existing intersection during construction. The existing traffic light controlled at-grade intersection would continue to operate during construction and the existing surface levels of the Motorway would not be changed. Some traffic movement modifications would be required during the works, however the Motorway would remain operational.

1.2.2 Site Location

The Moorebank Avenue Intersection is located within the Motorway corridor in Sydney's western suburbs and lies between the Hume Highway Interchange to the west and the Heathcote Road Interchange to the east. The surrounding area to the proposed works is a combination of industrial and residential land. There are varying degrees of industry in the area from light/service industry to heavy machinery and industrial activity. The Moorebank Defence sector adjoins the Motorway to the South. The Georges River is the significant natural feature in the study area and includes open space for recreation.

1.2.3 Description of Works

Bridge Design

The overpass design proposes to create a bridge platform for vehicles to pass over the Motorway without the need to close the Motorway during the construction phases. This would be achieved through construction staging using a system of central piers and reinforced soil walls to support a system of concrete girders and a bridge deck. In cross-section, the Moorebank Ave approaches would have suitable grades, 3.5% approaching from the south and 6.5% approaching from the north.

The bridge has been sized to provide:

- Moorebank Ave with 2 lanes in each direction with the bridge constructed wide enough to provide a future third lane or alternate mass transport corridor;
- two turning lanes on most movements;
- three lanes of through traffic on the Motorway in the vicinity of the interchange.

Large areas of landscaped banks would be constructed from filling to create the ramps to the bridge. Significant areas on the bridge deck would be created by the proposed alignment and are seen as potential areas for landscape treatment.

As part of the safety requirements for bridges over motorways with pedestrian and bicycle access, fencing would be installed on both sides of the bridge.

Ramp Extensions

The east facing ramps will extend between the Heathcote Road overpass and the Moorebank Interchange along the M5 Motorway. This will provide a facility for local traffic to travel between the Moorebank and Heathcote areas on a toll free section of the Motorway and allow such traffic to use the local minor road network both north and south of the Motorway.

The ramp extensions will be constructed to high speed Motorway standards compatible with the existing roadway and will also provide improved safety by facilitation of traffic weave manoeuvres. Three trafficable lanes in both directions will therefore be provided between Moorebank Interchange and Heathcote Overpass.

1.3 KEY RESPONSIBILITIES AND REPORTING

1.3.1 Responsibilities

Roads and Traffic Authority

The Proponent for the works is the Roads and Traffic Authority (RTA), which has contracted Interlink Roads to arrange design and construction of the Interchange and associated works. The RTA, as proponent and owner, has responsibilities to ensure that the works are carried out in compliance with lawful and public expectations.

Interlink Roads

Interlink Roads have contracted to the RTA for design and delivery of the Interchange and associated works and have commissioned Halliburton KBR to carry out the design and construction management.

Halliburton KBR - Project Manager

Halliburton KBR are designers and construction managers for the work and will utilise project specific EMPs for the contract and auditing of the works.

Construction Contractor

It shall be the responsibility of the Construction Contractor to:

- Ensure compliance with all matters specified in conditions of approval in the REF, and control procedures identified in the contract specific EMP as approved by Halliburton KBR.
- Report environmental issues to the auditor.
- Maintain liaison with relevant regulatory authorities as required.
- Ensure contract personnel involved in the project are aware of the environmental issues specific to the project and the site.
- Identify and report to Halliburton KBR regarding:
  - activities with an environmental impact that are not adequately addressed by this EMP;

- environmental safeguards that are not adequately covered by this EMP;
- non-compliance;
- instances where complying with this EMP is impracticable.

- Keep a copy of the Master EMP accessible at all times.

1.3.2 Environmental Audits

Environmental audits are a valuable and essential management tool. Audits help determine the compliance status of environmental management and protection programs, and help to establish and improve such programs. Environmental risks will be identified through environmental audits, along with appropriate methods to address these risks.

The appointed auditor shall submit to the Project Manager (Halliburton KBR), reports in respect of the environmental performance of the construction works and compliance with the Master EMP and any other relevant requirements.

The reports will be based on a minimum of one audit per month and shall include but not be limited to information on the following:

- implementation and effectiveness of environmental controls and conditions relating to the work undertaken;
- identification of construction impact predictions made in any supplementary studies and details of the extent to which actual impacts reflected the predictions;
- details and analysis of results of environmental monitoring;
- number and details of any complaints, including summary of main areas of complaint, action taken, response given and intended strategies to reduce complaints of a similar nature;
- any other matter relating to the compliance with any other conditions including those identified in these audits.

1.3.3 Environmental Incident Reporting

The new *Protection of the Environment Operations Act 1997* requires that the EPA be notified when certain types of pollution incidents occur.

The types of incidents that require notification depend on the extent of harm or the potential damage to the environment. To ensure that there is a consistent approach to incident reporting, Halliburton KBR is to be contacted immediately after the site has been made safe. Halliburton KBR will take responsibility for deciding if EPA notification is required and for formally notifying the EPA.

It is the contractor's responsibility, after a person causes, or becomes aware of, a pollution incident, to act as follows:

- Ensure the scene is safe, prevent any further pollution and act in accordance with all relevant Emergency Response Plans.
- Notify Halliburton KBR immediately after the site is safe so that all the necessary information can be forwarded to the EPA if necessary.

Under the Act, if pollution goes unreported, then the people who carried out the activity that caused the pollution, and/or those who knew of the pollution incident, are guilty of an offence and may be fined up to $120,000 and a further $60,000 for each day the offence goes unreported.

2 Environmental Strategies

This section provides a range of strategies and audit parameters for construction works regarding both environmental and safety issues. Discussions regarding each issue identify objectives, construction issues, post construction issues, and actions.

Issues identified in this section include:

Landscaping and Revegetation

Flora and Fauna

Erosion and Sedimentation

Topsoil Management and Stockpiles

Asbestos Management

Air Quality

Waste Management

Water Quality

Noise

Construction Compounds and Site Working Area

Construction Equipment

Incident Management

Access and Traffic Management

Heritage Issues

Other Requirements

2.1 LANDSCAPING AND REVEGETATION

Commitment	Recommended Action or Notation of Compliance	Responsibility/Implementation Phase			Final Sign Off and Date
		Prior to Construction	During Construction	Post Construction	
1. Verify the existence of local plant species or otherwise establish a seed bank of local native species for replanting purposes. Indigenous endemic species of vegetation will be selected (where possible) to create a natural appearance, increase habitat, reinstate cleared indigenous vegetation and reinforce local character.	Upon completion, the works area to be landscaped and planted with native plant species derived from stock local to the area.	Contractor	Contractor	Interlink	
2. Noxious weeds control during construction.	All existing weeds disposed of, and spray controls used to inhibit further weed growth.		Contractor	Interlink	
3. Trees to be retained shall be protected.	All trees and shrubs outside excavation to be preserved.		Contractor		
4. Native and non-weed exotic vegetation cleared from the site shall be recycled.	To be included in design and progressively implemented.		Contractor	Interlink	
5. Ensure no stockpiling or parking of equipment in the areas where vegetation is protected.	To be included in design and progressively implemented.		Contractor		
6. Cleared areas will be stabilised and revegetated.	To be included in design and progressively implemented.		Contractor	Interlink	
7. Integration of earthworks landscape and fencing design with existing adjacent land uses.	To be included in design and progressively implemented.	Halliburton KBR	Contractor	Interlink	
8. Use fast growing species of plants in landscape treatment.	To be included in design and progressively implemented.	Halliburton KBR	Contractor	Interlink	

2.1 LANDSCAPING AND REVEGETATION

Commitment	Recommended Action or Notation of Compliance	Responsibility/Implementation Phase			Final Sign Off and Date
		Prior to Construction	During Construction	Post Construction	
9. Tree and vegetation clearing will be limited to that only required for construction.	Areas to be cleared identified and limited to construction areas only.	Halliburton KBR	Contractor	Interlink	
10. No vehicular access will be permitted on vegetated areas outside the construction compound area.	Areas of no access to be clearly identified.	Halliburton KBR	Contractor	Interlink	
11. Areas available for landscape treatment shall be stabilised until planting can be undertaken.	Install appropriate erosion controls.		Contractor	Interlink	
12. Landscape maintenance will be undertaken following completion of construction and contract responsibilities.	To be included in Landscape Plan and Contact Documentation.	Halliburton KBR	Contractor	Interlink	
13. As far as possible, spoil material shall not be dumped in areas containing native vegetation to avoid any significant effect on threatened species, populations, ecological communities or their habitats.	All spoil is removed from site in accordance with spoil management plans.		Contractor		

2.2 FLORA AND FAUNA

Commitment	Recommended Action or Notation of Compliance	Responsibility/Implementation Phase			Final Sign Off and Date
		Prior to Construction	During Construction	Post Construction	
14. The area of Shale Plains Woodland within the new M5 Motorway road reserve that would be impacted by the proposal would be rehabilitated.	Rehabilitate with species native to Shale Plains Woodland and remove introduced species. The level of rehabilitation to be determined in consultation with an appropriately qualified bush regeneration contractor.	Contractor	Contractor	Interlink	
15. The area of land within the new M5 Motorway road reserve adjacent to the section of Shale Plains Woodland that would be impacted by the proposal would be planted with species native to Shale Plains Woodland.	Species should be identified from the report *Native Vegetation Maps of the Cumberland Plain Western Sydney - Interpretation Guidelines*, and should include upper and mid-stratum and ground cover species derived from local stock.		Contractor	Interlink	
16. Identify any trees with significant hollows and relocate.	The limb that supports the hollow is to be removed prior to felling the tree and re-affixed to a nearby tree that will be retained.	Contractor	Contractor	Interlink	
17. Protection measures adopted to prevent potential construction impacts on water quality of the wetland areas.	Protection measures such as silt fences, sand bags etc to prevent sedimentation and measures to prevent/minimise the risk of chemical spills.	Contractor	Contractor	Interlink	

2.3 EROSION AND SEDIMENTATION

Commitment	Recommended Action or Notation of Compliance	Responsibility/Implementation Phase			Final Sign Off and Date
		Prior to Construction	During Construction	Post Construction	
18. An Erosion and Sedimentation Control Plan (ESCP) will be prepared and incorporated in the Contractors EMP.	Halliburton KBR to prepare draft for Contractor finalisation.	Halliburton KBR	Contractor		
19. Erosion and sediment controls will be developed for the ESCP in accordance with the requirements of Section 8 - Erosion and Sedimentation of RTA's Road Design Guide, 1989 and referencing Dept. of Housing *Soil and Water Management for Urban Development* and EPA's draft *Managing Urban Stormwater* publications.	Prepared ESCP and progressively implement.	Halliburton KBR	Contractor		
20. The ESCP will provide for minimal disturbance of natural vegetation cover, particularly in and adjacent to drainage lines.	Catch drains and bunds will be constructed on the up-slope side of disturbed areas to divert clean run-off away from the construction works. Hay bale and filter fencing will be used to filter sediment from site runoff before discharge to the Motorway drainage system.	Halliburton KBR	Contractor		
21. Disturbed areas will be confined to the areas covered by the work.	Areas of no disturbance to be clearly identified.	Halliburton KBR	Contractor		

2.3 EROSION AND SEDIMENTATION

Commitment	Recommended Action or Notation of Compliance	Responsibility/Implementation Phase			Final Sign Off and Date
		Prior to Construction	During Construction	Post Construction	
22. Erosion and sedimentation controls will be maintained to an optimum efficiency during the whole of the construction period.	Erosion and sedimentation controls will be monitored on a weekly basis or immediately following a rainfall event. Sediment will be cleared when traps have collected 60% of capacity and the residue disposed of in an appropriate manner.		Contractor		
23. Maintenance of erosion and sedimentation controls will be undertaken when they have deteriorated or are in need of replacing.	Regular inspections and monitoring by Construction Manager - Halliburton KBR and Contractors.		Contractor Halliburton KBR		
24. Denuded areas will be revegetated to avoid sediment loss or, if needed for ongoing work areas, will be subject to sediment runoff control structures placed to minimise damage.	Progressively being complied with through work.		Contractor		

2.4 TOPSOIL MANAGEMENT AND STOCKPILES

Commitment	Recommended Action or Notation of Compliance	Responsibility/Implementation Phase			Final Sign Off and Date
		Prior to Construction	During Construction	Post Construction	
25. Spoil generated from construction to be reused or disposed of in an appropriate manner.	Spoil generated from construction activities is to be recycled or reused wherever possible. Spoil unable to be used in the construction would be disposed of in accordance with Legislative requirements at appropriate licenced facilities.	Halliburton KBR	Contractor		
26. Vehicular access will be limited to clearly marked access points.	Detailed plans for the routes and access points to be used by main or significant construction traffic must be provided to the relevant Councils. These must not be varied unless otherwise agreed to by the relevant local Council traffic management committees. Preference is for access along the Motorway or arterial roads.		Contractor		

2.5 ASBESTOS MANAGEMENT

Commitment	Recommended Action or Notation of Compliance	Responsibility/Implementation Phase			Final Sign Off and Date
		Prior to Construction	During Construction	Post Construction	
27. An Asbestos Management Plan will be required for those areas of Defence land identified as contaminated.	A thorough examination of work practices is an essential preliminary action. Procedures will be adopted to protect employees from exposure to asbestos to ensure that the work site poses no danger to their health.	Contractor	Contractor		
28. Should contaminated land require extraction and removal of asbestos, a licensed asbestos removal company will be commissioned and seven days notice will be given, as per the requirements of WorkCover.	A licensed asbestos removal truck and a licensed landfill will be sought so that disposal can be arranged under the guidelines of the EPA.	Contractor	Contractor		
29. If contamination is deemed minimal, the soil may be contained on-site, in which case treatment of the area would need to satisfy the requirements of the Commonwealth Government.	Depending on the concentration of asbestos, appropriate safety clothing and respirators will need to be worn by employees during containment of the site; according to work safety guidelines set out by ComCare.	Contractor	Contractor		

2.6 AIR QUALITY

Commitment	Recommended Action or Notation of Compliance	Responsibility/Implementation Phase			Final Sign Off and Date
		Prior to Construction	During Construction	Post Construction	
30. Stockpiles of windblown susceptible material will be kept damp or covered.	Complied with during construction.		Contractor		
31. The tailgates of all vehicles transporting material from the construction site will be securely fixed prior to loading and immediately after unloading. All vehicles loaded with soil or spoil will have their loads covered by tarpaulins to suppress dust.	Complied with during construction.		Contractor		
32. Exhaust systems and engines of construction plant and vehicles will be properly maintained to minimise exhaust emissions and adverse impacts on air quality.	Contractors inspect and verify exhaust systems.		Contractor		
33. All haul roads, areas of excavation, construction or other earthworks disturbance, will be watered regularly to suppress dust.	Complied with during construction.		Contractor		
34. Wheel shakers will be provided (where appropriate) for all vehicles leaving muddy construction zones.	Provide shakers at areas of major egress. Maintenance and clean-up of local run-on areas adjacent to site is also carried out by road washing/scrubbing/ sweeping as required.		Contractor		
35. Mud deposited on the current road network due to truck movements to and from the site compound, is to be either prevented or cleaned immediately. When cleared the runoff is to be directed into suitable sediment structures.	Complied with during construction.		Contractor		
36. No open burning or incineration shall be permitted on site.	No burning permitted or carried out.		Contractor		

2.7 WASTE MANAGEMENT

Commitment	Recommended Action or Notation of Compliance	Responsibility/Implementation Phase			Final Sign Off and Date
		Prior to Construction	During Construction	Post Construction	
37. All employees will be informed of the need to maintain a clean work site.	Site Induction Procedures.	Halliburton KBR	Contractor		
38. Litter traps will be installed at runoff sites.	Existing drainage in place and being used will be augmented.		Contractor		
39. All waste materials found or produced on site will be handled in a responsible manner and in accordance with relevant legislation and/or codes of practice.	Comply with *Waste Minimisation and Management Act, 1995.*		Contractor		
40. Recycling of materials will be undertaken wherever possible.	Recyclable materials including waste oils would be recycled in accordance with the *Waste Minimisation and Management Act, 1995.*		Contractor		
41. Except where a sewer is available, site amenities would discharge all sewage to holding tanks for regular removal by tanker.	To be approved by Halliburton KBR.	Halliburton KBR	Contractor		
42. Rubbish skips would be provided at all site compounds and regularly emptied or removed.	A daily inspection will be carried out to ensure the work site is left in a rubbish free state.		Contractor		
43. Putrescible waste and other non-recyclable waste would be disposed of at a licensed landfill site in the area.	Identify approved EPA disposal sites.		Contractor		
44. The demand for water for construction purposes must be kept to a minimum. The project must include reuse of water and recycling wherever possible.	Monitor and inspect water use.	Halliburton KBR	Contractor		

2.8 WATER QUALITY

Commitment	Recommended Action or Notation of Compliance	Responsibility/Implementation Phase			Final Sign Off and Date
		Prior to Construction	During Construction	Post Construction	
45. All plant/equipment will be washed out in an appropriately protected area to prevent erosion and pollution to existing drains.	Complied with during construction.		Contractor		
46. Hay bales rapped in geotextile, and sediment fences will be installed at the following locations; • at intervals along the edge of embankments or at the intersection of embankments and cuttings where required; • on the downstream side of site office compounds or other areas used to refuel or service construction machinery.	ESCP has been prepared and is being complied with.	Halliburton KBR	Contractor		
47. Grass cuttings and tree loppings from future landscape maintenance will be disposed of to avoid deterioration of water quality through direct toxicity.	Complied with during construction.		Contractor	Interlink	
48. An effective runoff monitoring program will be conducted during and after construction for 12 months.	Logbook to be kept onsite at all times.		Contractor	Interlink	
49. Effective soil conservation measures, particularly during construction, will be employed to reduce sediment loads on wetlands adjacent to the Motorway.	Sediment traps where construction is above ground will be constructed to function up to 60% full of collected material. Sediment traps will (where appropriate), be designed to operate in conjunction with mini gross pollutant traps.		Contractor		
50. The stormwater drainage system will be screened.	Existing drainage system for Motorway with screens that are being progressively upgraded.	Halliburton KBR	Contractor	Interlink	

2.8 WATER QUALITY

Commitment	Recommended Action or Notation of Compliance	Responsibility/Implementation Phase			Final Sign Off and Date
		Prior to Construction	During Construction	Post Construction	
51. All soil and erosion and sediment control works are completed and in place prior to the commencement of any works that may have the potential to generate soil erosion or sediment. Erosion and sediment protection measures shall also be in place before the commencement of any stockpiling activities.	Halliburton KBR, as construction managers inspect regularly for compliance.		Contractor Halliburton KBR		

2.9 NOISE

Commitment	Recommended Action or Notation of Compliance	Responsibility/Implementation Phase			Final Sign Off and Date
		Prior to Construction	During Construction	Post Construction	
52. Construction hours in the industrial environment surrounding the interchange will be limited to between 6.30 am - 6.00 pm Monday to Friday and 6.30 am - 3.00 pm on Saturdays, wherever practicable.	Some night time work will be carried out on the bridge deck and on the Motorway for the safer management of traffic and workers.		Contractor		
53. The background noise levels will be used to set criteria for construction noise levels.	Comply with Noise Level criteria. Halliburton KBR to define baseline during design.	Halliburton KBR	Contractor		
54. The quietest construction equipment would be preferred for use and where possible residential class mufflers would be used.	Construction equipment to be approved prior to use.	Halliburton KBR	Contractor		
55. All plant and equipment would be inspected to ensure that it is in ideal running order, regularly maintained and free of defective components to minimise noise emissions.	Plant and equipment to be approved prior to use.	Halliburton KBR	Contractor		

2.10 CONSTRUCTION COMPOUNDS AND SITE WORKING AREA

Commitment	Recommended Action or Notation of Compliance	Responsibility/Implementation Phase			Final Sign Off and Date
		Prior to Construction	During Construction	Post Construction	
56. Site compounds will be located to minimise adverse impacts on neighbours.	Compound location to the approval of Halliburton KBR.	Halliburton KBR	Contractor		
57. Only a minimum amount of vegetation will be cleared for the establishment of a works compound.	To the approval of Halliburton KBR. No identified significant vegetation such as Cumberland Plain Woodland will be cleared.		Contractor		
58. The boundary of the works site would be fenced, and access beyond this boundary will not be permitted.	No areas outside the construction compound will be used to stockpile or store materials without specific approval of Halliburton KBR.	Halliburton KBR	Contractor		
59. Storage of fuel, oil and other chemicals will be securely stored on site.	A secure, lockable, imperviously bunded and floored area will be provided for storage of fuel, oil and other chemicals on site. The capacity of the bunded area shall be at least 110% of all containers.		Contractor		
60. All spillage of materials onto sealed areas as a result of delivery or handling must be cleaned up as quickly as practicable and placed into suitable receptacles for reclamation of disposal.	A 50 litre container of spill absorbent will be retained within the site working area to be used for emergency spills of fuel, oil or other chemicals.		Contractor		
61. Emergency procedures will be clearly displayed within the site working area.	All staff will be made aware of emergency procedures during site induction.		Contractor		
62. Any contaminated material (empty drums, rags, contaminated soil etc) will be removed immediately from the site and disposed of in accordance with EPA regulations.	Comply with EPA criteria.		Contractor		

2.10 CONSTRUCTION COMPOUNDS AND SITE WORKING AREA

Commitment	Recommended Action or Notation of Compliance	Responsibility/Implementation Phase			Final Sign Off and Date
		Prior to Construction	During Construction	Post Construction	
63. Upon completion of construction, the site working area will be removed, and the area reinstated by landscaping works.	Comply with Specification.		Contractor	Interlink	

2.11 CONSTRUCTION EQUIPMENT

Commitment	Recommended Action or Notation of Compliance	Responsibility/Implementation Phase			Final Sign Off and Date
		Prior to Construction	During Construction	Post Construction	
64. All equipment operators and employees will be instructed to confine operations to within the clearly marked area of site operations.	Site induction will identify areas of operation.		Contractor		
65. Parking of equipment will not be permitted within 3 metres of vegetation to be retained.	Areas to be retained will be fenced or signage provided.		Contractor		
66. All equipment will be inspected regularly to avoid leakage of fuel, oil or hydraulic fluid to the work site. Machinery found to be leaking would be repaired or replaced.	Contractors to undertake regular inspections.		Contractor		
67. All machinery will be secured against vandalism outside working hours.	Provision of secured, locked areas for equipment.		Contractor		
68. All equipment will be washed out in an appropriately protected area to prevent erosion and pollution to existing drains and channels, and stem weed infestation.	Any wastewater is to be diverted to existing sediment basins.		Contractor		
69. All false work, formwork or surplus material used during construction and not forming part of the permanent works will be completely removed from the site.	Disposal sites to be approved.		Contractor		

2.12 INCIDENT MANAGEMENT					
Commitment	**Recommended Action or Notation of Compliance**	**Responsibility/Implementation Phase**			**Final Sign Off and Date**
		Prior to Construction	**During Construction**	**Post Construction**	
70. An Incident Management Plan will be produced by the Contractors.	Incident Management Plan to be kept on site at all times.	Halliburton KBR	Contractor		
71. At least two persons on site will be nominated by the Contractors to be available to the EPA on a 24 hour basis and have authority to take any action to mitigate pollution on the site as directed by an authorised EPA Officer.	24 hour contact median to be established.		Contractor		
72. If the Contractor identifies or receives a complaint regarding any pollution caused by the work, a written report will be prepared and supplied to the Construction Manager - Halliburton KBR within one working day of receipt of the complaint or identification of pollution.	Complaints register is to be in place at the site office. Report will include details of the pollution, action taken to correct the problem and proposed measures to prevent the occurrence of a similar incident.		Contractor		
73. Two general purpose fire extinguishers and two fire extinguishers suitable for control of oil/petrol fire will be available at each construction compound at all times.	Site induction will include instruction to all staff on the use of extinguishers.		Contractor		
74. All flammable materials will be kept in a locked area within the construction compounds.	Site induction will provide instructions for storage of materials.		Contractor		
75. A minimum of one person will be familiar or trained in the use of fire-fighting equipment at each construction compound.	Persons will be nominated and training organised.		Contractor		

2.13 ACCESS AND TRAFFIC MANAGEMENT

Commitment	Recommended Action or Notation of Compliance	Responsibility/Implementation Phase			Final Sign Off and Date
		Prior to Construction	During Construction	Post Construction	
76. Temporary advisory traffic signs will be erected to inform road users prior to implementation of changes	The local community will be informed of temporary vehicle and pedestrian access arrangements.	Halliburton KBR	Contractor		
77. Access will be maintained at all times to any affected private properties and businesses.	Residents/businesses shall be advised of any access changes to properties and their concurrence obtained.	Halliburton KBR	Contractor		
78. Traffic management measures to be implemented to ensure minimum delays.		Halliburton KBR	Contractor		
79. Construction vehicle movements will be along the main roads surrounding the Motorway to access the construction sites where possible. Local streets will only be used when necessary and night time impact is to be minimised.			Contractor		
80. A road dilapidation report will be prepared for areas adjacent to the work site to be used by construction traffic prior to their use by construction traffic and then after construction is complete. Copies of the report shall be provided to all relevant Councils. Any road/footpath damage, aside from that resulting from normal wear and tear, shall be repaired to a standard at least equivalent to that existing prior to any disturbance at the cost of the Proponent or as otherwise agreed with the relevant local Council(s).	Prepare road dilapidation report and make available for Council. Issue copy to Halliburton KBR.		Contractor		

2.13 ACCESS AND TRAFFIC MANAGEMENT

Commitment	Recommended Action or Notation of Compliance	Responsibility/Implementation Phase			Final Sign Off and Date
		Prior to Construction	During Construction	Post Construction	
81. Monitoring of any local roads affected by the proposal to be used by heavy vehicle traffic shall be undertaken in consultation with the relevant Council(s) to develop measures to minimise and/or restrict the use of local roads by heavy vehicle traffic.	Monitoring of local roads occurs at regular intervals to be compared with dilapidation report.		Contractor		
82. Safe pedestrian and cyclist access must be continuously provided, without undue inconvenience to pedestrians and cyclists, at all times during the construction stage unless otherwise agreed to by the relevant local Councils.	Traffic and pedestrian management plan will be prepared and complied with. Cycle access on Motorway will be restricted during construction due to temporary limited width of roadways.		Contractor		

3 Implementation

To ensure that the Environmental Strategies outlined in Section 2 of this EMP are implemented and that environmental performance is monitored following completion of construction, a number of processes have been put into place.

3.1 COMPLAINT HANDLING PROCEDURE

The phone contact of the worksite shall be publically posted and all complaints registered and actioned by Interlink's Construction Managers. Significant issues shall immediately be referred to the RTAs nominated project officer for information. All complaints received by the applicant or its Contractor must be recorded with the following details:

- date of complaint
- name, address, telephone number of complainant
- nature of complaint
- date and nature of response action.

The complaint record must be retained at the applicant's nominated office for at least two years, and be produced for inspection when requested by any authorised officer of the EPA. The applicant must report to the EPAs Regional Manager Planning Section complaints regarding pollution caused by the construction works.

3.2 EMERGENCY MEASURES

Emergency procedures on-site will cover actions to be taken if major events occur. The first priority must always be the safety of any persons, either workers or visitors involved in the events.

In order to ensure that both human safety and environmental impacts of unavoidable major events are minimised, emergency procedures are to be followed. These shall be documented as part of the Project Health and Safety Plan.

3.3 AUDITS AND REPORTING

3.3.1 Records

Environmental Management records will include the following:

- Master EMP (this document);
- Document Control Record (changes to the EMP);
- Internal Audit Report (results of audits);

- Specific Contractors EMPs for construction and operation;
- inspection and maintenance reports;
- non-conformances and corrective action implemented;
- complaints;
- approvals, certification and licences issued by statutory authorities (if required).

3.3.2 Audit Records

Internal audits shall be carried out to verify compliance with the environmental management strategies defined in this plan and to ensure that the desired environmental outcomes are achieved. The results of such audits will provide the base information necessary for annual environmental reporting.

The audit program is to be managed by Halliburton KBR's Mr M Lazki, who shall:

- maintain a forward schedule of audits planned
- undertake the audits or make arrangements for the audits to be carried out
- maintain records of all audits
- ensure that corrective actions are promptly implemented.

3.3.3 Non-Conformance and Corrective Action

Immediately upon the detection of any environmental impact exceeding specified limits, or not being carried out, the auditor will investigate the incident to determine the extent of possible non-conformance. The non-conformance will then be corrected as soon as possible with necessary action taken to prevent recurrence. The auditor will document the nature and date of corrective action.

3.3.4 Final Closeout

At the completion of the Project, Halliburton KBR and Interlink will review all reports and audits and provide an environmental closeout report to the Proponent.

Appendix D

GEOTECHNICAL INVESTIGATIONS

BROWN AND ROOT SERVICES ASIA PACIFIC PTY LTD

PROPOSED BRIDGE OVER M5 MOTORWAY

INTERSECTION OF MOOREBANK AVENUE AND M5 MOTORWAY, MOOREBANK

GEOTECHNICAL REPORT

S20616/1 - AD

12 October 2000

Coffey

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Important Information About Your Coffey Report

FIGURES

Figure 1 – Site Plan

Figure 2 – Geotechnical Section A-A'

APPENDICES

Appendix A – Engineering Borehole Logs

Appendix B – Laboratory Test Result Sheets

1. INTRODUCTION

This report describes geotechnical studies carried out by Coffey Geosciences Pty Ltd (Coffey) for Brown and Root Services Asia Pacific Pty Ltd (Brown and Root) for a proposed bridge over the M5 Motorway at Moorebank. The work was verbally commissioned by Mr Denis Watson of Brown and Root following our proposal, (Ref. S20616/1P-AA, dated 30 August 2000). The work was undertaken broadly in accordance with our proposal.

2. PROJECT APPRECIATION

We understand that the project will involve:

- The construction of a 55 m wide and 40 m long concrete bridge for Moorebank Avenue over the M5 Motorway. Moorebank Avenue will be realigned approximately 45 m to the east;
- Approach roads for the bridge, and on/off access ramps providing motorway access to and from Moorebank Avenue. The approach roads and on/off ramps will be constructed on earthfill embankments up to about 7 m in height. Batter slopes for the ramp and approach road embankments will be constructed at 2H:1V.
- Where the approach road embankments and on/off ramps are adjacent to the motorway, vertical reinforced soil walls (RSW) will be adopted. The RSW's will comprise concrete facing panels.
- The loads at the abutments from the bridge structure are to be founded on cast-in-place concrete piles. A row of columns will also be provided at the centre of the bridge structure, between the east and west bound lanes of the motorway, to support the bridge. The drawings indicate that the loads from the central row of columns are to be supported by pad footings founded at shallow depth, and pairs of adjacent columns will be connected to single pad footings.

The relevant geotechnical issues for the project include:

- Likely founding materials, depths and for the concrete bridge, including allowable bearing pressures and likely settlements for both shallow foundations and piled foundations;
- Stability of the earth embankments, including the batter slopes and the reinforced soil walls;
- Pavement design parameters for the 'on grade' sections of Moorebank Avenue; and,
- Site preparation for the construction of the earthfill and reinforced soil embankments.

3. FIELD WORK

Field work was carried out over a four day period between the 4 September 2000 and 7 September 2000. The field work comprised the drilling of four boreholes to depths of between 18.42 m and 20.45 m using a truck mounted drilling rig. The boreholes were drilled at accessible areas at the four corners of the existing Moorebank Avenue / M5 Motorway intersection, as shown on Figure 1. The boreholes were drilled using continuous spiral flight augers and wash boring techniques through the alluvial materials, and diamond coring in the shale bedrock. Standard penetration tests were undertaken at regular intervals in each borehole, and undisturbed tube samples were taken where appropriate.

Two bulk samples of potential subgrade materials were also collected from hand excavated test pits located

near the 'on grade' section of the realigned Moorebank Avenue, for the purpose of Laboratory California Bearing Ratio (CBR) testing. Sample A was collected from a shallow pit excavated on the western side of Moorebank Avenue, approximately 100 m north of the Moorebank Avenue / M5 Motorway intersection. Sample B was collected from a shallow pit excavated approximately 120 m south of the Moorebank Avenue / M5 Motorway intersection.

All field investigations were carried out in the full time presence of a Geotechnical Engineer from our Sydney Office, who located and logged the boreholes, and nominated the sampling and testing. Reduced levels of ground elevations at the borehole locations were obtained using simple survey techniques, relative to a nearby permanent survey mark (PM25374), with a ground surface elevation of 10.472 m AHD.

Engineering logs of the boreholes are presented in Appendix A, together with explanation sheets describing the terms and symbols used in their preparation. A summary of the ground conditions encountered in the boreholes is presented in Section 5.2. The results of the CBR testing are summarised in Section 4, while the test result sheets are presented in Appendix B.

4. LABORATORY TESTING

Two CBR tests were undertaken on the samples collected near the 'on grade' sections of the realigned Moorebank Avenue. Samples were compacted to 100% of maximum dry density, based on Standard compaction, and then soaked for 10 days with a 4.5 kg surcharge. The test results are summarised in Table 1.

TABLE 1: CBR TEST RESULTS

Sample	Laboratory CBR (%)
A	20
B	30

5. SITE CONDITIONS

5.1 Surface Conditions

The site is located in generally flat topography, approximately 500 m east of the Georges River. Between the River and the site, the ground surface increases in elevation by about 10 m. The area surrounding the site incorporates areas of undeveloped land adjacent to the motorway on the north-eastern and south western sides, and commercial development on the north-western and south-eastern sides. Setback distances of about 100 m exist between the motorway and the nearby commercial developments. A shallow drainage channel runs parallel to the motorway to the south of the site. Site traffickability at the time of the investigation was good.

5.2 Subsurface Conditions

Reference to the Penrith 1:100,000 Geological Series sheet indicates that the site lies close to the boundary of a Quaternary fluvial deposit comprising medium grained sand, clay and silt, and a Tertiary fluvial deposit comprising clayey quartzose sand and clay.

The generalised subsurface profile encountered in the boreholes is summarised in Table 2. A geotechnical section through the site is included in Figure 2, showing the interpreted geotechnical units.

TABLE 2: GENERALISED SUBSURFACE PROFILE

Unit	Depth to Base of Unit* (m)	Description
SAND 1	1 to 2	SAND: Fine to medium grained, pale orange-brown to pale brown, with a trace of silt and clay, loose to medium dense, dry.
CLAY 1	3 to 4 (not encountered in BH4)	CLAY: High plasticity, mixed red-brown, grey and brown, with a trace of fine grained sand, stiff to very stiff, dry to moist.
SANDY CLAY / CLAYEY SAND 1	6.5 to 8 (not encountered in BH4)	SANDY CLAY / CLAYEY SAND: Clay is of low to medium plasticity, sand is fine grained, orange-brown, red-brown, grey and brown, moist, stiff to very stiff / medium dense.
SAND 2	8 to 13.5	SAND: Fine to medium grained, becoming medium to coarse grained with depth, red-brown, orange-brown and brown, with a trace of fines, moist to wet, dense to very dense.
SANDY CLAY / CLAYEY SAND 2	15.5 to 18.5	SANDY CLAY / CLAYEY SAND: Clay is of medium to high plasticity, sand is fine grained, pale grey and brown, with some zones of red-brown and orange-brown, stiff to very stiff and dense to very dense.
SHALY CLAY / EW SHALE	16.5 to 19.5	SHALY CLAY / EXTREMELY WEATHERED SHALE: Grey to dark grey, comprises clay and shale fragments, with some sand, moist, hard.
DW SHALE	17.5 to 20 (not encountered in BH4)	DISTINCTLY WEATHERED SHALE: Dark grey to black, laminated, very low to low strength, occasional thin fine grained sandstone laminations.
SW / FR SHALE	>18.5 to >20.5	SLIGHTLY WEATHERED TO FRESH SHALE: Dark grey to black, laminated, medium to high strength, occasional thin fine grained sandstone laminations.

* - Rounded off to nearest 0.5 m.

Groundwater was observed during the drilling of BH4 only, at a depth of 4.6 m. It would be expected that groundwater would be encountered at similar depths in the other boreholes. Water is required to be introduced into the boreholes during rotary drilling, and therefore groundwater levels could not be obtained below the depth of augering.

6. DISCUSSION AND RECOMMENDATIONS

6.1 Bridge Abutment Foundations

Alternative foundation systems for the bridge abutments include:

- Piled Foundations;
- Shallow Pad or Strip Foundations; and,
- Founding the Bridge Abutments on the Reinforced Soil Walls (RSW).

Discussion and design parameters for the piled and shallow footing options are provided below. Discussion regarding the use of the RSW can be provided once further details of their construction are known.

6.1.1 Piled Foundations

The conceptual drawings proposed cast in place concrete piles to support bridge loads at the abutments, and shallow footings to support the loads at the mid-span point of the bridge. No loading information is available for the abutment or mid-span sections of the bridge.

Piling options considered feasible for the bridge abutments include:

- Driven precast concrete piles;
- CFA grout injected piles (non-displacement piles); or,
- Grouted screw piles (displacement piles);

Bored piles are considered feasible for the development, however they may not be economical. The installation of bored piles would be difficult due to the presence of sandy materials over much of the subsurface profile, which would likely result in the collapse of the pile hole wall during the construction. Bored pile construction would therefore require the use of bentonite mud or sacrificial casing to provide pile hole wall support during the drilling.

Table 2 presents a summary of the soil parameters that may be used for the preliminary design of driven precast, non-displacement grout piles (e.g Continuous Flight Auger piles), and displacement grout piles. The 'Grouted Screw Piles' referred to in Table 2 are displacement grout piles, such as the Frankipile "Atlas" piles, or Vibropile "Omega" piles.

A geotechnical strength reduction factor of $\phi_g = 0.5$ for the soil units and $\phi_g = 0.75$ for the rock units should be applied to the values provided in Table 2, when calculating design ultimate pile loads. It is considered that a simplified subsurface profile based on borehole BH3 may be adopted for the preliminary foundation design, which would be confirmed by monitoring of the pile driving resistance / subsurface profile encountered during pile installation. Allowance should be made for variations in rock quality and levels.

End bearing parameters have been provided for the lower alluvial units. However, the subsurface investigation indicates that the alluvial units are variable in terms of thickness across the site, which may affect founding depths for piles should the piles be founded within the alluvium.

Note that the ultimate bearing capacity of 30 MPa for the driven piles assumes that the piles are driven to refusal. In this case the pile capacity may also be governed by the allowable driving stresses imposed on the pile during installation, or the allowable pile capacity determined by a dynamic analysis, depending on the pile

driving equipment adopted. In particular, for driven piles founded below the Sand 2 unit, driving stresses generated within the piles must be considered as the pile is driven through the denser sand into the underlying Sandy Clay / Clayey Sand unit.

Where dynamic or static pile load testing is carried out, the use of higher geotechnical strength reduction factors may be possible.

Although the soil units are reasonably stiff / dense, the expected settlements due to the placement of the earthfill embankment may generate negative skin friction and/or lateral loadings on the abutment piles. However, the majority of settlement due to the placement of the embankment is expected to occur during the construction, with little ongoing settlement anticipated. Therefore where piles are installed prior to the construction of the earthfill embankments, the effect of negative skin friction and/or lateral loads on piles should be considered. Where piles are installed after the embankment construction, it is expected that the majority of settlement would have already taken place, and therefore negative skin friction and/or lateral loads are unlikely to be of concern.

TABLE 3

SUMMARISED PILE FOUNDATION DESIGN PARAMETERS

Unit	Pile Type					
	Driven Precast Concrete		CFA Piles		Grouted Screw Piles	
	Ultimate Skin Friction f_s (kPa)	Ultimate Bearing Pressure f_b (MPa)	Ultimate Skin Friction f_s (kPa)	Ultimate Bearing Pressure f_b (MPa)	Ultimate Skin Friction f_s (kPa)	Ultimate Bearing Pressure f_b (MPa)
1 – SAND 1	25	-	15	-	25	-
2 – CLAY 1	45	-	35	-	55	-
3 – SANDY CLAY / CLAYEY SAND 1	50	-	40	-	65	
4 – SAND 2	75	8.0	65	2.0	100	3.0
5 – SANDY CLAY / CLAYEY SAND 2	50	4.5	40	1.3	65	1.9
6 – EW and DW SHALE	100	5.0	75	5.0	100	5.0
7 - SW and FR SHALE	-	30.0	-	10.0	-	10.0

Assessment of pile settlements may be undertaken using the deformation parameters provided in Table 4.

TABLE 4: DEFORMATION PARAMETERS

Unit	Drained Young's Modulus, E' (MPa)			Poisson's Ratio, ν
	Shallow Footings	Bored Piles	Displacement Piles	
1 – SAND 1	15	20	30	0.30
2 – CLAY 1	20	30	40	0.35
3 – SANDY CLAY / CLAYEY SAND 1	30	45	60	0.30
4 – SAND 2	40	60	80	0.25
5 – SANDY CLAY / CLAYEY SAND 2	25	35	50	0.30
6 – EW and DW SHALE	50	75	100	0.25
7 - SW and FR SHALE	750	1000	1000	0.25

For piles founded on the SW / FR shale unit and with a serviceability end bearing pressure of say less than 5 MPa, settlements may be expected to be less than 1% of the pile diameter.

6.1.2 Shallow Pad Footings

The drawings indicated that the footings are to be founded at depths of 1 m to 1.5 m below the existing level of the motorway pavement. For such footings, an allowable bearing pressure for pad and strip footings of 200 kPa is recommended. This allowable bearing pressure assumes that a minimum embedment to the base of the footing of 1.0 m below the finished surface level is maintained. The following ranges of minimum footing dimension, B, are recommended to limit settlement to 25 mm under a bearing pressure of 200 kPa.

- Strip Footings: $0.40\ m \leq B \leq 1.0\ m$;
- Pad Footings: $0.40\ m \leq B \leq 1.5\ m$.

As a guide, footing settlement is approximately proportional to footing width and bearing pressure.

Where shallow footings are adopted, following excavation to the proposed foundation level, it is recommended that the proposed founding materials be checked by a suitably qualified engineering practitioner. We recommend that at least one DCP test be conducted from the base of the footing excavation in each footings to assess the adequacy of the materials encountered.

6.1.3 Reinforced Soil Wall Foundations

An allowable bearing pressure of 350 kPa is recommended for the design of foundations for the RSW's to support the earth embankments at the bridge abutments. This allowable bearing pressure assumes that the

walls are flexible, and the site preparation procedures outlined below are carried out prior to the wall construction.

Site preparation beneath the reinforced earth wall would comprise:

- Excavation of at least the upper 0.2 m of soil beneath the footprint of the proposed reinforced earth wall;
- Proof rolling comprising at least 6 passes of a smooth drum roller, of not less than 8 tonnes static weight;
- Where the proof rolling exposes areas of soft materials, or where the exposed materials are deforming excessively under the proof rolling, those materials shall be excavated to a depth of at least 0.75 m, and replaced with suitable selected fill materials. Replaced materials should be compacted in accordance with the recommendations provided in Section 6.2.1 for embankment construction.

The base of all RSW's should be founded at least 0.3 m below the finished ground level outside the wall.

6.2 Embankments

6.2.1 Embankment Construction

We understand that the project involves the construction of earthfill embankments up to about 7 m in height. No details of the materials proposed for use in the earthfill embankments are currently available. However, we recommend that the embankments should be constructed of a selected fill material, compacted to at least 98% of maximum dry density, based on Standard compaction. The moisture content at compaction should be within ± 2% of the optimum moisture content. Fill layer thicknesses should typically not exceed 250 mm thickness after compaction with heavy compaction plant, but should be chosen depending on the size of the compaction plant to be used, to ensure that the whole layer will be effectively compacted to the required density ratio specified above.

Site preparation for the placement of the first layer of earthfill would comprise:

- Excavation of topsoil materials to a depth of at least the 0.2 m beneath the footprint of the proposed embankment, and the removal of any root affected zone;
- Proof rolling of the excavated area by at least 4 passes of a smooth drum roller, of not less than 8 tonnes static weight;
- Where the proof rolling exposes areas of soft materials, or where the exposed materials are deforming excessively under the proof rolling, those materials shall be excavated to a depth of at least 0.5 m, and replaced with suitable selected fill materials. Replaced materials should be compacted in accordance with the recommendations for fill placement for the embankment construction.

Foundation settlements for a 7 m high earthfill embankment are expected to be of the order of 80 mm within the embankment, and of the order of 40 mm at the edge of the embankment. The majority of the settlement due to the embankment loading is expected to occur during construction. At the detailed design stage, settlement may be assessed using the 'Shallow Footing' drained Young's Modulus and Poisson's Ratio parameters presented in Table 4.

6.2.2 Batter Slopes

The conceptual drawings provided indicate proposed batter slopes for the earthfill embankments of 2H:1V. It

is considered that where embankments are constructed in accordance with the recommendations provided in Section 6.2.1, the factor of safety against instability will be in excess of 1.5. This assessment assumes that the site preparation described in Section 6.2.1 is undertaken prior to the construction of the embankments.

6.3 Pavements

Although the CBR samples tested showed high CBR values of 20% to 30%, allowance must be made for variability in fines content and the fact that the *in situ* subgrade materials are likely to be at a lower density ratio compared to the prepared laboratory samples.

For pavements constructed 'on-grade', a CBR of 10% is recommended for design. The design CBR assumes the site preparation recommended in Section 6.2.1 is carried out, and the upper 150 mm of the subgrade materials below the pavement are compacted to at least 100% of maximum dry density, based on Standard compaction. A CBR of 15% may be adopted provided the upper 0.5 m of subgrade materials below the pavement layer are excavated, the exposed surface treated as above, the excavation backfilled with approved material having a minimum CBR value of 20%, and compacted to at least 100% of maximum dry density based on Standard compaction.

Design data for the pavements constructed on the embankments should be evaluated following the nomination of potential borrow materials.

For and on behalf of

COFFEY GEOSCIENCES PTY LTD

P.K. WONG C.P.Eng.

Senior Principal

Information

Important information about your **Coffey** Report

As a client of Coffey you should know that site subsurface conditions cause more construction problems than any other factor. These notes have been prepared by Coffey to help you interpret and understand the limitations of your report.

Your report is based on project specific criteria

Your report has been developed on the basis of your unique project specific requirements as understood by Coffey and applies only to the site investigated. Project criteria typically include the general nature of the project; its size and configuration; the location of any structures on the site; other site improvements; the presence of underground utilities; and the additional risk imposed by scope-of-service limitations imposed by the client. Your report should not be used if there are any changes to the project without first asking Coffey to assess how factors that changed subsequent to the date of the report affect the report's recommendations. Coffey cannot accept responsibility for problems that may occur due to changed factors if they are not consulted.

Subsurface conditions can change

Subsurface conditions are created by natural processes and the activity of man. For example, water levels can vary with time, fill may be placed on a site and pollutants may migrate with time. Because a report is based on conditions which existed at the time of the subsurface exploration, decisions should not be based on a report whose adequacy may have been affected by time. Consult Coffey to be advised how time may have impacted on the project.

Interpretation of factual data

Site assessment identifies actual subsurface conditions only at those points where samples are taken and when they are taken. Data derived from literature and external data source review, sampling and subsequent laboratory testing are interpreted by geologists, engineers or scientists to provide an opinion about overall site conditions, their likely impact on the proposed development and recommended actions. Actual conditions may differ from those inferred to exist, because no professional, no matter how qualified, can reveal what is hidden by earth, rock and time. The actual interface between materials may be far more gradual or abrupt than assumed based on the facts obtained. Nothing can be done to change the actual site conditions which exist, but steps can be taken to reduce the impact of unexpected conditions. For this reason, owners should retain the services of Coffey through the development stage, to identify variances, conduct additional tests if required, and recommend solutions to problems encountered on site.

Your report will only give preliminary recommendations

Your report is based on the assumption that the site conditions as revealed through selective point sampling are indicative of actual conditions throughout an area. This assumption cannot be substantiated until project implementation has commenced and therefore your report recommendations can only be regarded as preliminary. Only Coffey, who prepared the report, is fully familiar with the background information needed to assess whether or not the report's recommendations are valid and whether or not changes should be considered as the project develops. If another party undertakes the implementation of the recommendations of this report there is a risk that the report will be misinterpreted and Coffey cannot be held responsible for such misinterpretation.

Your report is prepared for specific purposes and persons

To avoid misuse of the information contained in your report it is recommended that you confer with Coffey before passing your report on to another party who may not be familiar with the background and the purpose of the report. Your report should not be applied to any project other than that originally specified at the time the report was issued.

Important information about your **Coffey** Report

Interpretation by other design professionals

Costly problems can occur when other design professionals develop their plans based on misinterpretations of a report. To help avoid misinterpretations, retain Coffey to work with other project design professionals who are affected by the report. Have Coffey explain the report implications to design professionals affected by them and then review plans and specifications produced to see how they have incorporated the report findings.

Data should not be separated from the report*

The report as a whole presents the findings of the site assessment and the report should not be copied in part or altered in any way.

Logs, figures, drawings etc. are customarily included in our reports and are developed by scientists, engineers or geologists based on their interpretation of field logs (assembled by field personnel) and laboratory evaluation of field samples. These logs etc. should not under any circumstances be redrawn for inclusion in other documents or separated from the report in any way.

Geoenvironmental concerns are not at issue

Your report is not likely to relate any findings, conclusions, or recommendations about the potential for hazardous materials existing at the site unless specifically required to do so by the client. Specialist equipment, techniques, and personnel are used to perform a geoenvironmental assessment. Contamination can create major health, safety and environmental risks. If you have no information about the potential for your site to be contaminated or create an environmental hazard, you are advised to contact Coffey for information relating to geoenvironmental issues.

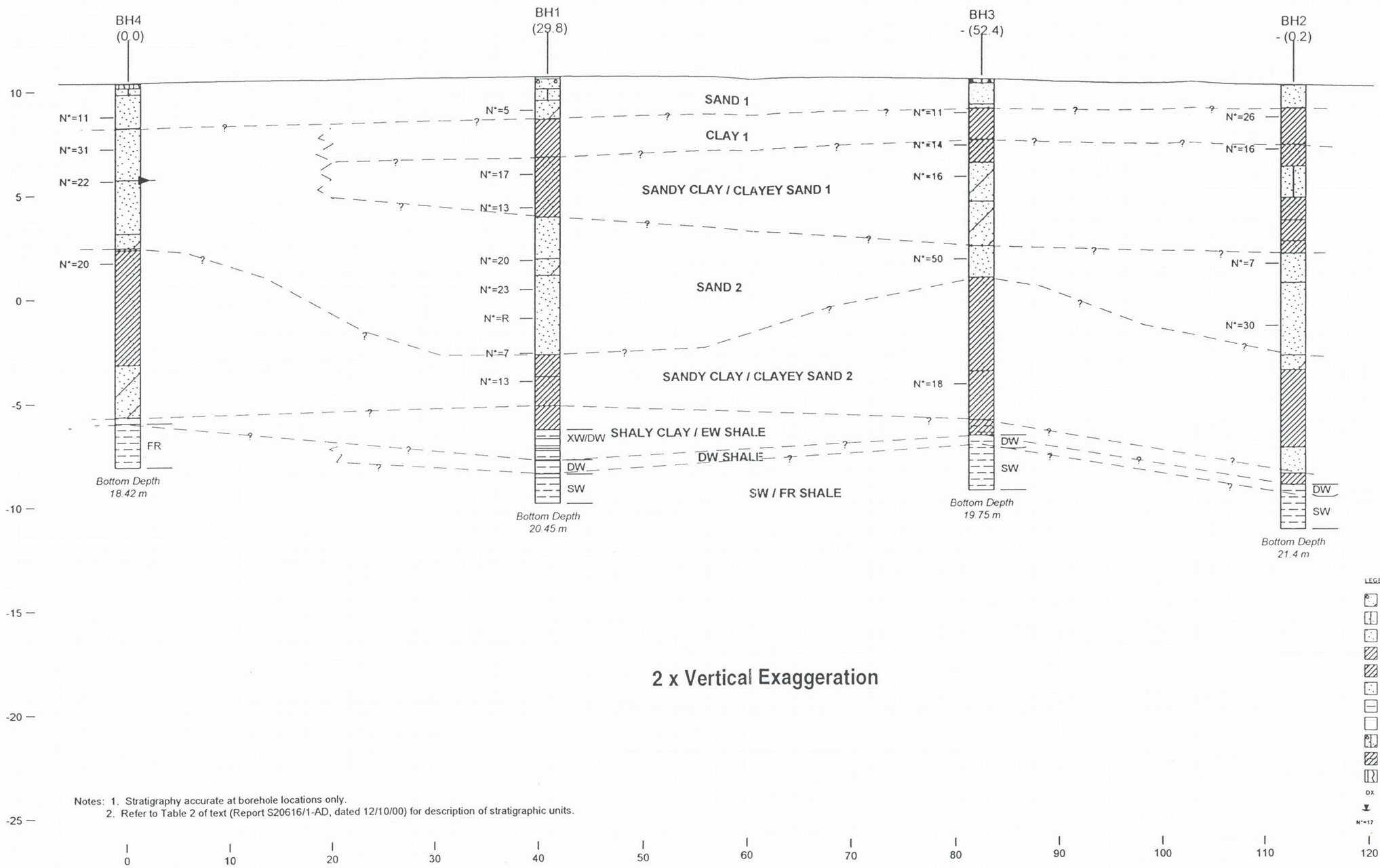
Rely on Coffey for additional assistance

Coffey is familiar with a variety of techniques and approaches that can be used to help reduce risks for all parties to a project, from design to construction. It is common that not all approaches will be necessarily dealt with in your site assessment report due to concepts proposed at that time. As the project progresses through design toward construction, speak with Coffey to develop alternative approaches to problems that may be of genuine benefit both in time and cost.

Responsibility

Reporting relies on interpretation of factual information based on judgement and opinion and has a level of uncertainty attached to it, which is far less exact than the design disciplines. This has often resulted in claims being lodged against consultants, which are unfounded. To help prevent this problem, a number of clauses have been developed for use in contracts, reports and other documents. Responsibility clauses do not transfer appropriate liabilities from Coffey to other parties but are included to identify where Coffey's responsibilities begin and end. Their use is intended to help all parties involved to recognise their individual responsibilities. Read all documents from Coffey closely and do not hesitate to ask any questions you may have.

** For further information on this aspect reference should be made to "Guidelines for the Provision of Geotechnical Information in Construction Contracts" published by the Institution of Engineers Australia, National Headquarters, Canberra, 1987.*



Notes: 1. Stratigraphy accurate at borehole locations only.
2. Refer to Table 2 of text (Report S20616/1-AD, dated 12/10/00) for description of stratigraphic units.

Coffey

Coffey Geosciences Pty Ltd ACN 056 335 516 | Geotechnical | **Resources** | Environmental | **Technical** | Project Management

Horizontal Scale (metres)
4 0 4 8 12 16 20
Vertical Scale (metres)
2 0 2 4 6 8 10

Revision	Description	Drawn	Approved	Date

Drawn	GAH
Checked	
Date	12/10/00

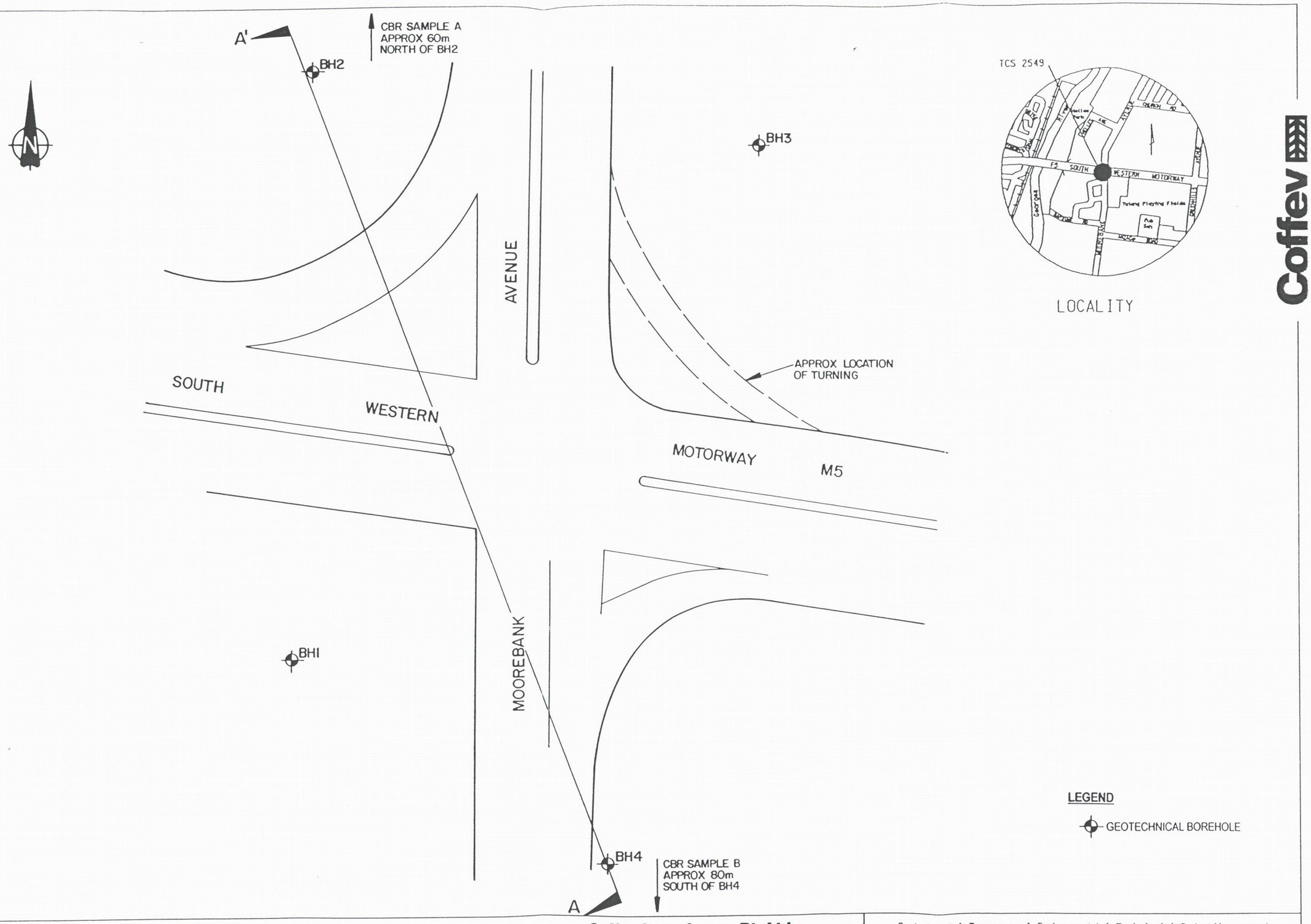
BROWN & ROOT SERVICES ASIA PACIFIC
BRIDGE OVER M5 MOTORWAY
INTERSECTION OF MOOREBANK AVE AND M5 MOTORWAY
MOOREBANK
GEOTECHNICAL SECTION A-A'

Drawing No.
FIGURE 2

Job No.
S20616/1

A3LANDSCAPE S20616I.GPJ COFFEY.GDT 10.10.00

Revision A



LOCALITY

LEGEND

GEOTECHNICAL BOREHOLE

Coffey

Coffey Geosciences Pty Ltd ACN 056 335 516

Geotechnical | **Resources** | Environmental | **Technical** | Project Management

0 10 20 30

Scale (metres)

Revision	Description	Drawn	Approved	Date

Drawn	GAH/SW
Checked	
Date	12/10/00

BROWN & ROOT SERVICES ASIA PACIFIC PTY LTD
BRIDGE OVER M5 MOTORWAY
INTERSECTION OF MOOREBANK AVE
AND M5 MOTORWAY, MOOREBANK
SITE PLAN

FIGURE 1

Job no: **S20616/1**

S20616/1 - AD
12 October 2000

Coffey

APPENDIX A

ENGINEERING BOREHOLE LOGS

Soil Description

Explanation Sheet

Coffey

DEFINITION:

In engineering terms soil includes every type of uncemented or partially cemented inorganic material found in the ground. In practice, if the material can be remoulded or disintegrated by hand in its field condition or in water it is described as a soil.

Other materials are described using rock description terms.

AS1726-1993

The descriptive terms used by Coffey are given below. They are broadly consistent with AS1726-1993.

UCS & SOIL NAME

Soils are described in accordance with the Unified Soil Classification (UCS) as shown in the table on the following page.

MOISTURE CONDITION

Dry Looks and feels dry. Cohesive and cemented soils hard, friable or powdery. Uncemented granular soils run freely through hands.

Moist Soil feels cool and darkened in colour. Cohesive soils can be moulded. Granular soils tend to cohere.

Wet As for moist but with free water forming on hands when handled.

CONSISTENCY OF COHESIVE SOILS

TERM	UNDRAINED STRENGTH Sμ (kPa)	FIELD GUIDE
Very Soft	<12	A finger can be pushed well into the soil with little effort.
Soft	12 - 25	A finger can be pushed into the soil to about 25mm depth.
Firm	25 - 50	The soil can be indented about 5mm with the thumb, but not penetrated.
Stiff	50 - 100	The surface of the soil can be indented with the thumb, but not penetrated.
Very Stiff	100 - 200	The surface of the soil can be marked, but not indented with thumb pressure.
Hard	>200	The surface of the soil can be marked only with the thumbnail.
Friable	-	Crumbles or powders when scraped by thumbnail.

DENSITY OF GRANULAR SOILS

TERM	DENSITY INDEX (%)
Very loose	9 - 15
Loose	15 - 35
Medium Dense	35 - 65
Dense	65 — 85
Very Dense	85 - 100

PARTICLE SIZE DESCRIPTIVE TERMS

NAME	SUBDIVISION	SIZE
Boulders		>200 mm
Cobbles		63 mm to 200 mm
Gravel	coarse	20 mm to 63 mm
	medium	6 mm to 20 mm
	fine	2.36 mm to 6 mm
Sand	coarse	600 μm to 2.36 mm
	medium	200 μm to 600μm
	fine	75 μm to 200 μm

MINOR COMPONENTS

TERM	ASSESSMENT GUIDE	PROPORTION
Trace of ...	Presence just detectable by feel or eye, but soil properties little or no different to general properties of primary component.	Coarse grained soils: ≤ 5% Fine grained soils: ≤ 15%
With some ...	Presence easily detected by feel or eye, soil properties little different to general properties of primary component.	Coarse grained soils: 5 - 12% Fine grained soils: 15 - 30%

SOIL STRUCTURE

ZONING		CEMENTING	
Layers	Continuous exposure or sample	Weakly cemented	Easily broken up by hand in air or water
Lenses	Discontinuous layers of lenticular shape	Moderately cemented	Effort is required to break up the soil by hand in air or water
Pockets	Irregular inclusions of differential material		

SOIL STRUCTURE

WEATHERED IN PLACE SOILS

Extremely weathered material — Structure and fabric of parent rock visible.

Residual soil — Structure and fabric of parent rock not visible.

TRANSPORTED SOILS

Aeolian soil — Deposited by wind

Alluvial soil — Deposited by streams and rivers

Colluvial soil — Deposited on slopes (transported downslope by gravity)

Fill — Man made deposit. Fill may be significantly more variable between tested locations than naturally occurring soils.

Lacustrine soil — Deposited by lakes

Marine soil — Deposited in ocean basins, bays, beaches and estuaries

Form No. GEO5.6 Issue 3. Rev. 1.

SOIL CLASSIFICATION INCLUDING IDENTIFICATION AND DESCRIPTION

			FIELD IDENTIFICATION PROCEDURES (Excluding particles larger than 63 mm and basing fractions on estimated mass)			GROUP SYMBOLS	TYPICAL NAMES
COARSE GRAINED SOILS More than 50% of material less than 60 mm is larger than 0.075 mm	(About the smallest particle visible to the naked eye)	GRAVELS More than half of coarse fraction is larger than 2.36 mm	CLEAN GRAVELS (Little or no fines)	Wide range in grain size and substantial amounts of all intermediate particle sizes.		GW	Well graded gravels, gravel-sand mixtures, little or no fines.
				Predominantly one size or a range of sizes with some intermediate sizes missing.		GP	Poorly graded gravels, gravel-sand mixtures, little or no fines, uniform gravels.
			GRAVELS WITH FINES (Appreciable amount of fines)	Non-plastic fines (for identification procedures see ML below)		GM	Silty gravels, poorly graded gravel-sand silt mixtures.
				Plastic fines (for identification procedures see CL below)		GC	Clayey gravels, poorly graded gravel-sand-clay mixtures.
		SANDS More than half of coarse fraction is smaller than 2.36 mm	CLEAN SANDS (Little or no fines)	Wide range in grain sizes and substantial amounts of all intermediate sizes		SW	Well graded sands and gravelly sands, little or no fines, uniform gravels.
				Predominantly one size or a range of sizes with some intermediate sizes missing.		SP	Poorly graded sands, gravelly sands, little or no fines, uniform gravels.
			SANDS WITH FINES (Appreciable amount of fines)	Non-plastic fines (for identification procedures see ML below).		SM	Silty sands, poorly graded sand-silt mixtures.
				Plastic fines (for identification procedures see CL below).		SC	Clayey sands, poorly graded sand-clay mixture.
FINE GRAINED SOILS More than 50% of material less than 60 mm is smaller than 0.075 mm	(The 0.075 mm particle is	IDENTIFICATION PROCEDURES ON FRACTIONS <0.2 mm.					
			DRY STRENGTH	DILATANCY	TOUGHNESS		
		SILTS & CLAYS Liquid limit less than 50	None to Low	Quick to slow	None	ML	Inorganic silts and very fine sands, rock flour, silty or clayey fine sands with low plasticity. Silts of low to medium Liquid Limit.*
			Medium to High	None to very slow	Medium	CL	Inorganic clays of low to medium plasticity, gravelly clays, sandy clays, silty clays.*
			Low to medium	Slow	Low	OL	Organic silts and organic silt – clays of low to medium plasticity.*
		SILTS & CLAYS Liquid limit greater than 50	Low to medium	Slow to none	Low to medium	MH	Inorganic silts, micaceous or diatomaceous fine sandy or silty soils, silts of high Liquid Limit.*
			High to very high	None	High	CH	Inorganic clays of high plasticity.*
			Medium to high	None to very slow	Low to medium	OH	Organic clays of high plasticity.*
HIGHLY ORGANIC SOILS		Readily identified by colour, odour, spongy feel and frequently by fibrous texture.				Pt	Peat and other highly organic soils.

• Low plasticity – Liquid Limit W_L less than 35%. Medium plasticity – W_L between 35% and 50%.

DEFECTS

TERM	DEFINITION	DIAGRAM
PARTING	A surface or crack across which the soil has little or no tensile strength. Parallel or sub parallel to layering (eg bedding). May be open or closed.	
JOINT	A surface or crack across which the soil has little or no tensile strength but which is not parallel or sub parallel to layering. May be open or closed.	
SHEARED ZONE	Zone in clayey soil with roughly parallel almost planar boundaries containing closely spaced, smooth or slickensided, curved intersecting joints which divide the mass into lenticular or wedge shaped blocks	
SHEARED SURFACE	A near planar smooth, polished or slickensided surface in clayey soil. The polished or slickensided surface indicates that movement (in many cases very little) has occurred along the defect.	

TERM	DEFINITION	DIAGRAM
SOFTENED ZONE	A zone in clayey soil, usually adjacent to a defect in which the soil has a higher moisture content than elsewhere.	
TUBE	Tubular cavity. May occur singly or as one or a large number of separate or inter-connected tubes. Walls often coated with clay or strengthened by denser packing or grains. May contain organic matter	
DYKE	Sheet or wall like body of soil substance or mass with roughly planer to irregular near parallel boundaries which cuts through a soil mass. Some dykes are formed by infilling of open joints.	
TUBE CAST	Roughly cylindrical elongated body of soil different from the soil mass in which it occurs. In some cases the soil which makes up the tube cast is cemented.	

CH2517

Rock Description

Explanation Sheet

Coffey

AS1726-1993 – The descriptive terms used by Coffey are given below. They are broadly consistent with Australian Standard AS1726-1993.

DEFINITIONS: Rock substance, defect and mass are defined as follows:

Substance Effectively homogeneous material, may be isotropic or anisotropic

Defect Discontinuity or break in the continuity of a substance or substances

Mass Any body of material which is not effectively homogeneous. It can consist of two or more substances without defects, or one or more substances with one or more defects.
In engineering terms rock substance is any naturally occurring aggregate of minerals and organic material which cannot be disintegrated or remoulded by hand in air or in water. Other material is described using soil descriptive terms.

SUBSTANCE DESCRIPTIVE TERMS:

ROCK NAME – Simple rock names are used rather than precise geological classification.

PARTICLE SIZE – Grain size terms for sandstone are:

Coarse grained	0.6mm to 2mm
Medium grained	0.2mm to 0.6mm
Fine grained	0.6mm (just visible) to 0.2mm

FABRIC – Terms for layering or penetrative fabric (eg bedding, cleavage) are:

Massive	No layering or penetrative fabric.
Poorly developed	Layering or fabric just visible. Little effect on properties.
Well developed	Layering or fabric distinct. Rock breaks more easily parallel to layering or fabric.

CLASSIFICATION OF WEATHERING PRODUCTS

Term	Abbreviation	Definition
Residual Soil	RS	Soil derived from the weathering of rock the mass structure and substance fabric are no longer evident; there is a large change in volume but the soil has not been significantly transported.
Extremely Weathered	XW	Material is weathered to such an extent that it has soil properties, ie, it either disintegrates or can be remoulded, in water. Fabric of original rock still visible.
Distinctly Weathered	DW	Rock strength usually changed by weathering. The rock may be highly discoloured, usually by iron staining. Porosity may be increased by leaching, or may be decreased due to deposition of weathering products in pores.
Slightly Weathered	SW	Rock is slightly discoloured but shows little or no change of strength from fresh rock.
Fresh	FR	Rock shows no sign of decomposition or staining.

Note: *Where physical and chemical changes were caused by hot gases and liquids associated with igneous rocks the terms slightly altered (SA), distinctly altered (DA) and extremely altered (XA) may be used.*

ROCK SUBSTANCE STRENGTH TERMS

Term	Abbreviation	Point Load Index, I_S50 (MPa)	Field Guide to Strength
Very Low	VL	Less than 0.1	Material crumbles under firm blows with sharp end of pick; can be peeled with knife; too hard to cut a triaxial sample by hand. Pieces up to 30mm thick can be broken by finger pressure.
Low	L	0.1 to 0.3	Easily scored with a knife; indentations 1mm to 3mm show in the specimen with firm blows of the pick point; has dull sound under hammer. A piece of core 150mm long by 50mm diameter may be broken by hand. Sharp edges of core may be friable and break during handling.
Medium	M	0.3 to 1	Readily scored with a knife; a piece of core 150mm long by 50mm diameter can be broken by hand with difficulty.
High	H	1 to 3	A piece of core 150mm long by 50mm diameter can not be broken by hand but can be broken by a pick with a single firm blow; rock rings under hammer.
Very High	VH	3 to 10	Hand specimen breaks with pick after more than one blow; rock rings under hammer.
Extremely High	EH	More than 10	Specimen requires many blows with geological pick to break through intact material; rock rings under hammer.

Notes:

1. *In anisotropic rocks the field guide to strength applies to the strength perpendicular to the anisotropy. High strength anisotropic rocks may break readily parallel to the planar anisotropy.*
2. *The term extremely low is not used as a rock substance strength term. The term is used in AS1726-1993 but the field guide to strength makes it clear that it is a soil in engineering terms.*
3. *The unconfined compressive strength to isotropic rocks and anisotropic rocks which do not fail parallel to the planar anisotropy is typically 10 to 25 times the point load index. The ratio may vary for different rock types and lower strength rocks often have lower ratios than higher strength rocks.*

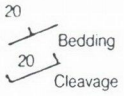
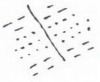
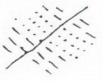
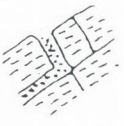
Form No. GEO5.8 Issue 3 Rev. 1.

Coffey

Rock Description Explanation Sheet

DEFECT DESCRIPTIVE TERMS

COMMON DEFECTS IN ROCK MASSES

Term	Definition	Diagram	Map Symbol	Graphic Log (Note 1)
Parting	A surface or crack across which the rock has little or no tensile strength. Parallel or sub parallel to layering (eg bedding) or a planar anisotropy in the rock substance (eg, cleavage). May be open or closed.			(Note 2)
Joint	A surface or crack across which the rock has little or no tensile strength but which is not parallel or sub parallel to layering or planar anisotropy in the rock substance. May be open or closed			(Note 2)
Sheared Zone (Note 3)	Zone of rock substance with roughly parallel near planar, curved or undulating boundaries cut by closely spaced joints, sheared surfaces or other defects. Some of the defects are usually curved and intersect to divide the mass into lenticular or wedge shaped blocks.			
Sheared Surface (Note 3)	A near planar, curved or undulating surface along which movement has occurred. The surface is usually smooth, polished or slickensided			
Crushed Seam (Note 3)	Seam with roughly parallel near planar, curved or undulating boundaries, composed of disoriented, usually angular fragments of the host rock substance which may be more weathered than the host rock. The seam has soil properties.			
Infilled Seam	Seam of soil substance usually with distinct roughly parallel boundaries formed by the migration of soil into an open cavity or joint. Infilled seams less than 1mm thick may be described as veneer or coating on joint surface.			
Extremely Weathered Seam	Seam of soil substance, often with gradational boundaries. Formed by weathering of the rock substance in place.			

BLOCK SHAPE TERMS

Block shape may be described as follows:

Blocky	Equidimensional
Tabular	Thickness much less than length or width
Columnar	Height much greater than cross section

DEFECT SHAPE TERMS

Planar	The defect does not vary in orientation
Curved	The defect has a gradual change in orientation
Undulating	The defect has a wavy surface
Stepped	The defect has one or more well defined steps
Irregular	The defect has many sharp changes of orientation

Note: *The assessment of defect shape is partly influenced by the scale of the observation.*

ROUGHNESS TERMS

Slickensided	Grooved or striated surface, usually polished
Polished	Shiny smooth surface
Smooth	Smooth to touch. Few or no surface irregularities
Rough	Many small surface irregularities (amplitude generally less than 1mm). Feels like fine to coarse sand paper.
Very Rough	Many large surface irregularities (amplitude generally more than 1mm). Feels like, or coarser than very coarse sand paper.

COATING TERMS

Clean	No visible coating
Stained	No visible coating but surfaces are discoloured
Veneer	A visible coating of soil or mineral, too thin to measure; may be patchy
Coating	A visible coating up to 1mm thick. Thicker soil material is usually described using appropriate defect terms (eg, infilled seam). Thicker rock strength material is usually described as a vein.

Notes:

1. If graphic log symbols are used it is usual practice to show the true dip of defects on borehole logs and the apparent dip on face sketches and sections.

2. Partings and joints are not usually shown on the graphic log.

3. Sheared zones, sheared surfaces and crushed seams are faults in geological terms

Coffey Geosciences Pty Ltd ACN 056 335 516

Borehole No. **BH1**

Sheet 1 of 4

Office Job No.: **S20616/1**

Engineering Log - Borehole

Client: *BROWN & ROOT SERVICES ASIA PACIFIC*

Date started: *4.9.2000*

Principal:

Date completed: *4.9.2000*

Project: *BRIDGE OVER M5 MOTORWAY*

Logged by: *JK*

Borehole Location: *MOOREBANK*

Checked by:

Coffey

drill model and mounting: EDSON 3000 TRUCK | Easting: | slope: -90° | R.L. Surface: 10.55

hole diameter: 100 mm | Northing | bearing: - | datum: AHD

drilling information | **material substance**

method	penetration 1 2 3	support	water	notes samples, tests, etc	RL	depth metres	graphic log	classification symbol	material: soil type: plasticity or particle characteristics, colour, secondary and minor components.	moisture condition	consistency/ density index	hand penetrometer kPa 100 200 300 400	structure and additional observations
ADT		C			10			GP	Bitumen Pavement. SANDY GRAVEL: Gravel up to 15 mm, sand is fine to medium grained.	D	MD		PAVEMENT ROAD BASE
						1		SM	SILTY SAND: Fine to medium grained sand, dark brown.		St/VSt		ALLUVIAL
				SPT 3,2,3 N*=5	9			SC	CLAYEY SAND: Fine to medium grained, mixed brown, grey and orange-brown	M			
						2		CH	CLAY: High plasticity, grey and dark red-brown, some fine grained gravel to 3mm in size.				
					8								
				U_{50}		3							
					7								
						4		CL	SANDY CLAY: Low to medium plasticity, mixed brown, grey and orange-brown, sand is fine grained.		VSt		
				SPT 5,7,10 N*=17	6								
W						5							
					5								
				SPT 2,5,8 N*=13		6							
					4								
						7		SP	SAND: Fine to medium grained, mixed grey and orange-brown, some clay of low plasticity.		D		
					3								
						8							

BOREHOLE S206161.GPJ COFFEY.GDT 10.10.00

Form GEO 5.3 Issue 3 Rev.2

method

AS	auger screwing*
AD	auger drilling*
RR	roller/tricone
W	washbore
CT	cable tool
HA	hand auger
DT	diatube
B	blank bit
V	V bit
T	TC bit

*bit shown by suffix e.g. ADT

support

M mud N nil

C casing

penetration

1 2 3 4 — no resistance ranging to refusal

water

10/1/98 water level on date shown

water inflow

water outflow

notes, samples, tests

U_{50}	undisturbed sample 50mm diameter
U_{63}	undisturbed sample 63mm diameter
D	disturbed sample
N	standard penetration test (SPT)
N*	SPT - sample recovered
Nc	SPT with solid cone
V	vane shear (kPa)
P	pressuremeter
Bs	bulk sample
E	environmental sample
R	refusal

classification symbols and soil description

based on unified classification system

moisture

D	dry
M	moist
W	wet
Wp	plastic limit
W_L	liquid limit

consistency/density index

VS	very soft
S	soft
F	firm
St	stiff
VSt	very stiff
H	hard
Fb	friable
VL	very loose
L	loose
MD	medium dense
D	dense
VD	very dense

Coffey Geosciences Pty Ltd ACN 056 335 516

Borehole No. *BH1*

Sheet 2 of 4

Office Job No.: *S20616/1*

Engineering Log - Borehole

Client: *BROWN & ROOT SERVICES ASIA PACIFIC*

Date started: *4.9.2000*

Principal:

Date completed: *4.9.2000*

Project: *BRIDGE OVER M5 MOTORWAY*

Logged by: *JK*

Borehole Location: *MOOREBANK*

Checked by:

drill model and mounting: EDSON 3000 TRUCK | Easting | slope: -90° | R.L. Surface: 10.55

hole diameter: 100 mm | Northing | bearing: - | datum: AHD

drilling information | **material substance**

method	penetration 1 2 3	support	water	notes samples, tests, etc	RL	depth metres	graphic log	classification symbol	material: soil type: plasticity or particle characteristics, colour, secondary and minor components.	moisture condition	consistency/ density index	hand penetrometer kPa 100 200 300 400	structure and additional observations
W			▽					SP	SAND: Fine to medium grained, mixed grey and orange-brown, some clay of low plasticity. *(continued)*	M	D		
				SPT 4,10,10 N*=20	2	9		SC	CLAYEY SAND: medium grained, light grey, some gravel up to 20 mm.				
					1			SP	SAND: medium to coarse grained, brown, with a trace of non-plastic fines and a trace of fine gravel.				
				SPT 7,11,12 N*=23	0	10							
						11			Becoming pale grey from 11.4 m.				
				SPT 15,26,R N*=R	-1	12							
					-2	13							
				SPT 3,3,4 N*=7	-3			CL-CH	SANDY CLAY: Medium plasticity, light grey, sand is fine to medium grained.		F/St		
						14							
				SPT 2,5,8 N*=13	-4			CH	SANDY CLAY: High plasticity, dark red-brown, with some mottled grey, sand is fine grained.		VSt		
					-5	15							
						16		CH	CLAY: Clay and shale fragments.				RESIDUAL

method

AS	auger screwing*
AD	auger drilling*
RR	roller/tricone
W	washbore
CT	cable tool
HA	hand auger
DT	diatube
B	blank bit
V	V bit
T	TC bit

*bit shown by suffix e.g. ADT

support

M mud N nil

C casing

penetration 1 2 3 4 — no resistance ranging to refusal

water

10/1/98 water level on date shown

water inflow

water outflow

notes, samples, tests

U_{50}	undisturbed sample 50mm diameter
U_{63}	undisturbed sample 63mm diameter
D	disturbed sample
N	standard penetration test (SPT)
N*	SPT - sample recovered
Nc	SPT with solid cone
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Coffey Geosciences Pty Ltd ACN 056 335 516

Borehole No. **BH1**

Sheet 3 of 4

Office Job No.: **S20616/1**

Engineering Log - Borehole

Client: *BROWN & ROOT SERVICES ASIA PACIFIC*

Principal:

Project: *BRIDGE OVER M5 MOTORWAY*

Borehole Location: *MOOREBANK*

Date started: **4.9.2000**

Date completed: **4.9.2000**

Logged by: **JK**

Checked by:

Coffey

drill model and mounting: EDSON 3000 TRUCK | Easting: | slope: -90° | R L Surface 10 55

hole diameter: 100 mm | Northing | bearing: - | datum AHD

drilling information							material substance						
method	penetration 1 2 3	support	water	notes samples, tests, etc	RL	depth metres	graphic log	classification symbol	material soil type: plasticity or particle characteristics, colour, secondary and minor components.	moisture condition	consistency/ density index	hand penetrometer kPa 100 200 300 400	structure and additional observations
W					-6	17		CH	CLAY: Clay and shale fragments. *(continued)*	M	VSt		
					-7	18			Borehole BH1 continued as cored hole				
					-8	19							
					-9	20							
					-10	21							
					-11	22							
					-12	23							
					-13	24							

method

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*bit shown by suffix e.g. ADT

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penetration

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10/1/98 water level on date shown

water inflow

water outflow

notes, samples, tests

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U_{63}	undisturbed sample 63mm diameter
D	disturbed sample
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classification symbols and soil description

based on unified classification system

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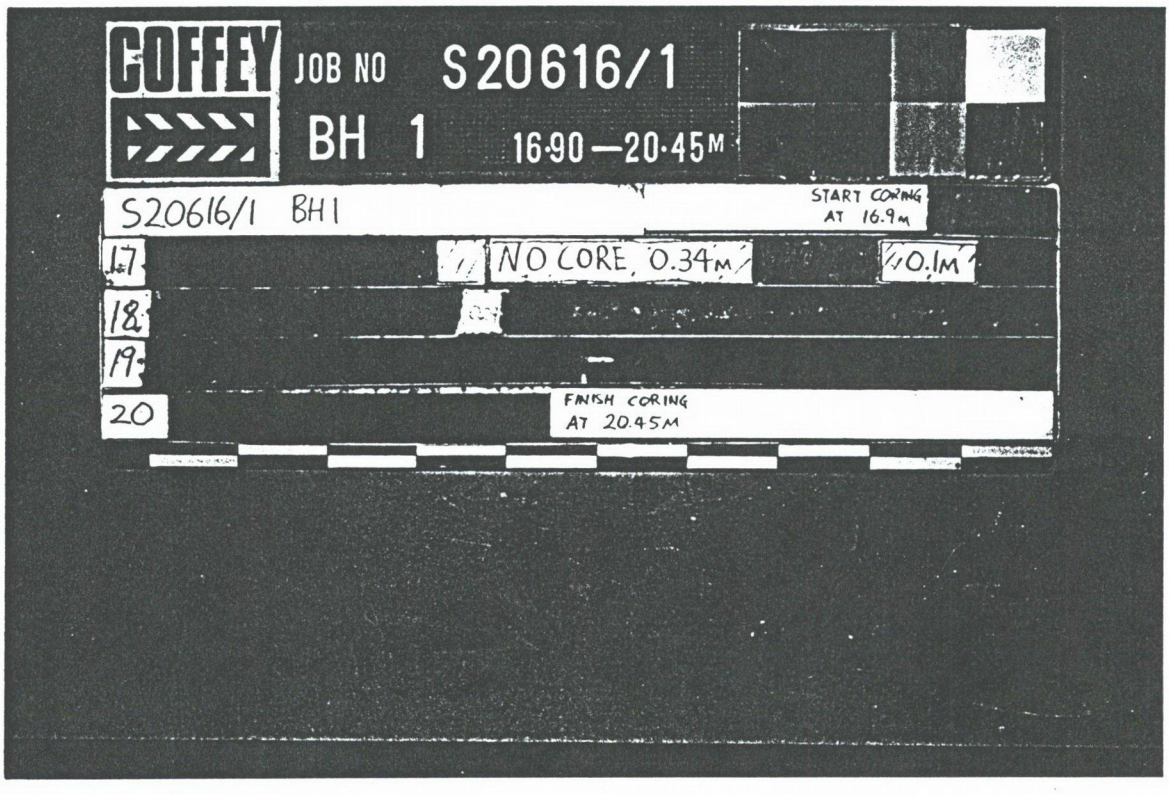
S	soft
F	firm
St	stiff
VSt	very stiff
H	hard
Fb	friable
VL	very loose
L	loose
MD	medium dense
D	dense
VD	very dense


COFFEY
JOB NO S20616/1
BH 1
16·90—20·45M
S20616/1 BH1
START CORING AT 16.9M
17
NO CORE, 0.34M
0.1M
18
19
20
FINISH CORING AT 20.45M

Coffey Geosciences Pty Ltd ACN 056 335 516

Borehole No. **BH1**

Sheet 4 of 4

Engineering Log - Cored bórehole

Office Job No.: **S20616/1**

Client: *BROWN & ROOT SERVICES ASIA PACIFIC*

Date started: **4.9.2000**

Principal:

Date completed: **4.9.2000**

Project: *BRIDGE OVER M5 MOTORWAY*

Logged by: **JK**

Borehole Location: *MOOREBANK*

Checked by: Gdy

drill model & mounting: EDSON 3000 TRUCK | Easting: | slope: -90° | R.L. Surface: 10.55

hole diameter: 100 mm Drilling fluid: | Northing: | bearing: - | datum: AHD

drilling information					material substance						rock mass defects		
method	core-lift	water	RL	depth metres	graphic log / core recovery	material: rock type; grain characteristics, colour, structure, minor components	weathering / alteration	estimated strength VL L M H VH EH	$Is_{(50)}$ MPa D- diametral A- axial	RQD %	defect spacing mm (30 100 300 1000 3000)	defect description: type, inclination, planarity, roughness, coating, thickness — particular / general
			-6									
				17		SHALE:Grey to dark grey, becoming dark grey to black from 17 m, indistinct bedding.	XW			0		PT, 0°, PL, SO, CN Fractured Zone, 17.1 to 17.33 PT, 0°, PL, SO, CN
			-7			NO CORE:(0.34 m)	-			0		
						SHALE:Grey, indistinct bedding, highly fractured.	XW					Fractured Zone, 16.67 to 17.8
				18		NO CORE:(0.1 m)	-					
						SHALE:Grey to dark grey, shaly clay, indistinct bedding.	DW			18		pp = 270 kPa PT, 0°, PL, SO JT, 15°, PL, RO
						NO CORE:(0.05 m)	-					JT, 15°, PL, RO
			-8			SHALE:Grey to dark grey, shaly clay, indistinct bedding.	XW					PT, 0°, PL, SO Fractured zone with clay 18.47 to 19.0 pp = 80 kPa
				19					D A 0.14			pp = 120 kPa
						SHALE:dark grey, indistinct bedding	SW		D A 0.69			
			-9			SHALE:dark grey to black, indistinct bedding.				24		PT, 0°, PL, SO, CN PT, 0°, PL, SO, CN
				20		Becoming with occasional fine grained sandstone laminations from 19.86 m.			D A 0.62 1.61			PT, 0°, PL, SO, CN
									D A 0.87			
			-10			BH1 terminated at 20.45m						
				21								
			-11									
				22								
			-12									
				23								
			-13									
				24								

CORED BOREHOLE S20616.GPJ COFFEY.GDT 10.10.00

Form GEO 5.5 Issue 3 Rev.2

method
DT diatube
AS auger screwing
AD auger drilling
RR roller/tricone
CB claw or blade bit
NMLC NMLC core
NQ, HQ, PQ wireline core

core-lift
casing used
barrel withdrawn

graphic log/core recovery
core recovered - graphic symbols indicate material
no core recovered

water
10/1/98 water level on date shown
water inflow
partial drill fluid loss
complete drill fluid loss
25 water pressure test result (lugeons) for depth interval shown

weathering/alteration
FR fresh
SW slightly weathered
DW distinctly weathered
XW extremely weathered
SA slightly altered
DA distinctly altered
XA extremely altered

strength
VL very low
L low
M medium
H high
VH very high
EH extremely high

defect type
JT joint
PT parting
SM seam
SZ sheared zone
SS sheared surface
CS crushed seam

planarity
PL planar
CU curved
UN undulating
ST stepped
IR irregular

roughness
VR very rough
RO rough
SO smooth
SL slickensided

coating
CN clean
SN stained
VN veneer
CO coating

Coffey Geosciences Pty Ltd ACN 056 335 516

Borehole No. **BH2**

Engineering Log - Borehole

Sheet 1 of 4

Office Job No.: **S20616/1**

Client: *BROWN & ROOT SERVICES ASIA PACIFIC*

Date started: **5.9.2000**

Principal:

Date completed: **5.9.2000**

Project: *BRIDGE OVER M5 MOTORWAY*

Logged by: **JK**

Borehole Location: *MOOREBANK*

Checked by:

drill model and mounting: EDSON 3000 TRUCK | Easting: | slope: -90° | R.L. Surface: 10.09

hole diameter: 100 mm | Northing | bearing: - | datum: AHD

drilling information							material substance						
method	penetration 1 2 3	support	water	notes samples, tests, etc	RL	depth metres	graphic log	classification symbol	material: soil type: plasticity or particle characteristics, colour, secondary and minor components.	moisture condition	consistency/ density index	hand penetrometer kPa 100 200 300 400	structure and additional observations
ADT		N	None observed		10	1		SP	SAND: Fine to medium grained, pale orange-brown, grass roots in upper 200 mm.	D	L		ALLUVIAL
					9			CH	CLAY: High plasticity, dark red-brown and mottled grey-brown, with a trace of fine sand.		St/VSt		
				SPT 9,11,15 N*=26		2							
					8								
				SPT 5,7,9 N*=16	7	3		CL	SANDY CLAY: Low to medium plasticity, mixed grey and brown, sand is fine grained, with a trace of medium to coarse grained.	M			
W				U_{50}	6	4		SP	SILTY SAND: Fine grained, orange brown and brown		MD		
					5	5							
					4	6		CH	SANDY CLAY: High plasticity, pale grey, sand is fine to medium grained.		St?		
					3	7		CH	CLAY: High plasticity clay, orange-brown.				
						8		CH	SANDY CLAY: High plasticity, dark brown-grey, sand is fine to medium grained.				

method

AS	auger screwing*
AD	auger drilling*
RR	roller/tricone
W	washbore
CT	cable tool
HA	hand auger
DT	diatube
B	blank bit
V	V bit
T	TC bit

*bit shown by suffix e.g. ADT

support

M mud N nil

C casing

penetration 1 2 3 4 — no resistance ranging to refusal

water

10/1/98 water level on date shown

water inflow

water outflow

notes, samples, tests

U_{50}	undisturbed sample 50mm diameter
U_{63}	undisturbed sample 63mm diameter
D	disturbed sample
N	standard penetration test (SPT)
N*	SPT - sample recovered
Nc	SPT with solid cone
V	vane shear (kPa)
P	pressuremeter
Bs	bulk sample
E	environmental sample
R	refusal

classification symbols and soil description

based on unified classification system

moisture

D	dry
M	moist
W	wet
Wp	plastic limit
W_L	liquid limit

consistency/density index

VS	very soft
S	soft
F	firm
St	stiff
VSt	very stiff
H	hard
Fb	friable
VL	very loose
L	loose
MD	medium dense
D	dense
VD	very dense

BOREHOLE S206161.GPJ COFFEY.GDT 10.10.00

Form GEO 5.3 Issue 3 Rev.2

Coffey Geosciences Pty Ltd ACN 056 335 516

Borehole No. **BH2**

Sheet 2 of 4

Engineering Log - Borehole

Office Job No.: **S20616/1**

Client: *BROWN & ROOT SERVICES ASIA PACIFIC*

Date started: **5.9.2000**

Principal:

Date completed: **5.9.2000**

Project: *BRIDGE OVER M5 MOTORWAY*

Logged by: **JK**

Borehole Location: *MOOREBANK*

Checked by: GOM

drill model and mounting: EDSON 3000 TRUCK | Easting: | slope: -90° | R.L. Surface: 10.09

hole diameter: 100 mm | Northing | bearing: - | datum: AHD

drilling information | **material substance**

method	penetration 1 2 3	support	water	notes samples, tests, etc	RL	depth metres	graphic log	classification symbol	material: soil type: plasticity or particle characteristics, colour, secondary and minor components.	moisture condition	consistency/ density index	hand penetrometer kPa 100 200 300 400	structure and additional observations
W		N	None observed	SPT 2,3,4 N*=7	2	9		SP	SAND: Fine to medium grained, grey, with a trace of silt.	M	St?		
					1			SP	SAND: Medium to coarse grained, pale orange, with a trace of silt and a trace of fine grained gravel.		D		
				SPT 9,14,16 N*=30	0	10							
					-1	11							
					-2	12							
					-3	13		SC	CLAYEY SAND: Medium to coarse grained, orange-brown, clay is of high plasticity.				
					-4	14		CH	CLAY: High plasticity, dark grey and red-brown, with some fine to medium grained sand.		St		
					-5	15							
						16							

BOREHOLE S206161.GPJ COFFEY.GDT 10.10.00

Form GEO 5.3 Issue 3 Rev.2

method

AS	auger screwing*
AD	auger drilling*
RR	roller/tricone
W	washbore
CT	cable tool
HA	hand auger
DT	diatube
B	blank bit
V	V bit
T	TC bit

*bit shown by suffix e.g. ADT

support

M mud N nil

C casing

penetration 1 2 3 4 — no resistance ranging to refusal

water

10/1/98 water level on date shown

water inflow

water outflow

notes, samples, tests

U_{50}	undisturbed sample 50mm diameter
U_{63}	undisturbed sample 63mm diameter
D	disturbed sample
N	standard penetration test (SPT)
N*	SPT - sample recovered
Nc	SPT with solid cone
V	vane shear (kPa)
P	pressuremeter
Bs	bulk sample
E	environmental sample
R	refusal

classification symbols and soil description

based on unified classification system

moisture

D	dry
M	moist
W	wet
Wp	plastic limit
W_L	liquid limit

consistency/density index

VS	very soft
S	soft
F	firm
St	stiff
VSt	very stiff
H	hard
Fb	friable
VL	very loose
L	loose
MD	medium dense
D	dense
VD	very dense

Coffey Geosciences Pty Ltd ACN 056 335 516

Borehole No. **BH2**

Sheet 3 of 4

Office Job No.: **S20616/1**

Engineering Log - Borehole

Client: *BROWN & ROOT SERVICES ASIA PACIFIC*

Principal:

Project: *BRIDGE OVER M5 MOTORWAY*

Borehole Location: *MOOREBANK*

Date started: **5.9.2000**

Date completed: **5.9.2000**

Logged by: **JK**

Checked by:

drill model and mounting: EDSON 3000 TRUCK | Easting: | slope: -90° | R.L. Surface: 10.09

hole diameter: 100 mm | Northing | bearing: - | datum: AHD

drilling information							material substance						
method	penetration 1 2 3	support	water	notes samples, tests, etc	RL	depth metres	graphic log	classification symbol	material: soil type: plasticity or particle characteristics, colour, secondary and minor components.	moisture condition	consistency/ density index	hand penetrometer kPa 100 200 300 400	structure and additional observations
W		N	None observed	SPT 25, 20 for 90mm, N*=R.	-6	17		CH	CLAY: High plasticity, dark grey and red-brown, with some fine to medium grained sand. *(continued)*	M	St		
					-7			SP	SAND: Fine to medium grained, pale grey, with some silt.		VD		
					-8	18							
					-9	19		CH	CLAY: Clay and extremely weathered shale, with some sand.		H		RESIDUAL
					-10	20			Borehole BH2 continued as cored hole				
					-11	21							
					-12	22							
					-13	23							
						24							

method

AS	auger screwing*
AD	auger drilling*
RR	roller/tricone
W	washbore
CT	cable tool
HA	hand auger
DT	diatube
B	blank bit
V	V bit
T	TC bit

*bit shown by suffix e.g. ADT

support

M mud N nil

C casing

penetration 1 2 3 4 — no resistance ranging to refusal

water

10/1/98 water level on date shown

water inflow

water outflow

notes, samples, tests

U_{50}	undisturbed sample 50mm diameter
U_{63}	undisturbed sample 63mm diameter
D	disturbed sample
N	standard penetration test (SPT)
N*	SPT - sample recovered
Nc	SPT with solid cone
V	vane shear (kPa)
P	pressuremeter
Bs	bulk sample
E	environmental sample
R	refusal

classification symbols and soil description

based on unified classification system

moisture

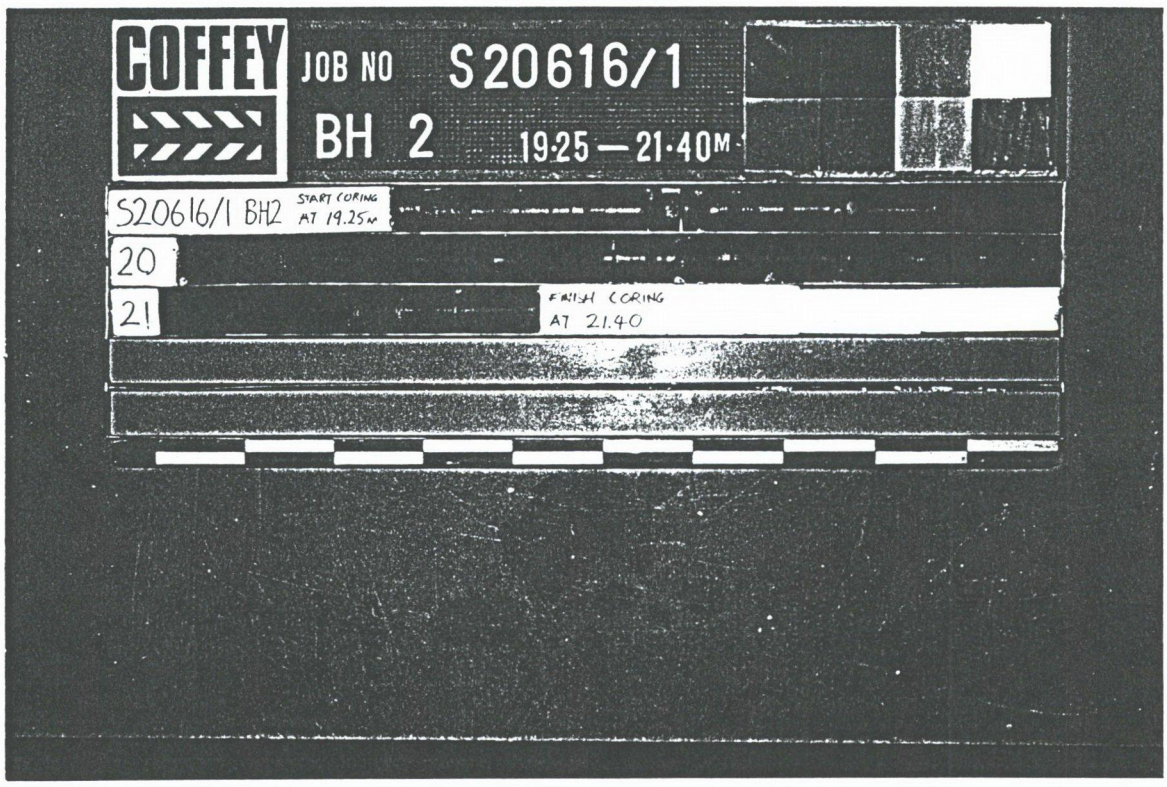
D	dry
M	moist
W	wet
Wp	plastic limit
W_L	liquid limit

consistency/density index

VS	very soft
S	soft
F	firm
St	stiff
VSt	very stiff
H	hard
Fb	friable
VL	very loose
L	loose
MD	medium dense
D	dense
VD	very dense

BOREHOLE S206161.GPJ COFFEY.GDT 10.10.00

Form GEO 5.3 Issue 3 Rev.2


COFFEY
JOB NO S20616/1
BH 2
19·25 — 21·40M
S20616/1 BH2 START CORING AT 19.25M
20
21
FINISH CORING AT 21.40

Coffey Geosciences Pty Ltd ACN 056 335 516

Borehole No. *BH2*

Sheet 4 of 4

Engineering Log - Cored bórehole

Office Job No.: *S20616/1*

Client: *BROWN & ROOT SERVICES ASIA PACIFIC*

Date started: *5.9.2000*

Principal:

Date completed: *5.9.2000*

Project: *BRIDGE OVER M5 MOTORWAY*

Logged by: *JK*

Borehole Location: *MOOREBANK*

Checked by:

drill model & mounting: EDSON 3000 TRUCK | Easting: | slope: -90° | R.L. Surface: 10.09

hole diameter: 100 mm Drilling fluid: | Northing: | bearing: - | datum: AHD

drilling information | **material substance** | **rock mass defects**

method	core-lift	water	RL	depth metres	graphic log core recovery	material: rock type; grain characteristics, colour, structure, minor components	weathering alteration	estimated strength (VL L M H VH EH)	$Is_{(50)}$ MPa D- diametral A- axial	RQD %	defect spacing mm (30 100 300 1000 3000)	defect description: type, inclination, planarity, roughness, coating, thickness (particular / general)
		None observed	-6	17								
			-7									
			-8	18								
			-9	19								
			-10	20		SHALE: Dark grey to black, laminated, with occasional fine grained sandstone lenses.	DW		D A 0.46			
							SW		D A 0.78 0.98			
									D A 0.74 0.79	18		2 x clay sms, 3 mm
			-11	21					D A 0.69 0.73			clay sm, 3 mm clay sm, 3 mm 2 x clay sms, 1 mm
			-12	22		BH2 terminated at 21.4m						
			-13	23								
				24								

PT, 0°, PL, SO, CN

CORED BOREHOLE S206161.GPJ COFFEY.GDT 10.10.00

Form GEO 5.5 Issue 3 Rev.2

method

DT	diatube
AS	auger screwing
AD	auger drilling
RR	roller/tricone
CB	claw or blade bit
NMLC	NMLC core
NQ, HQ, PQ	wireline core

core-lift

- casing used
- barrel withdrawn

graphic log/core recovery

- core recovered - graphic symbols indicate material
- no core recovered

water

- 10/1/98 water level on date shown
- water inflow
- partial drill fluid loss
- complete drill fluid loss
- 25 water pressure test result (lugeons) for depth interval shown

weathering/alteration

FR	fresh
SW	slightly weathered
DW	distinctly weathered
XW	extremely weathered
SA	slightly altered
DA	distinctly altered
XA	extremely altered

strength

VL	very low
L	low
M	medium
H	high
VH	very high
EH	extremely high

defect type

JT	joint
PT	parting
SM	seam
SZ	sheared zone
SS	sheared surface
CS	crushed seam

planarity

PL	planar
CU	curved
UN	undulating
ST	stepped
IR	irregular

roughness

VR	very rough
RO	rough
SO	smooth
SL	slickensided

coating

CN	clean
SN	stained
VN	veneer
CO	coating

Coffey Geosciences Pty Ltd ACN 056 335 516

Borehole No. **BH3**

Sheet 1 of 4

Office Job No.: **S20616/1**

Engineering Log - Borehole

Client: *BROWN & ROOT SERVICES ASIA PACIFIC*

Date started: **6.9.2000**

Principal:

Date completed: **6.9.2000**

Project: *BRIDGE OVER M5 MOTORWAY*

Logged by: **JK**

Borehole Location: *MOOREBANK*

Checked by:

drill model and mounting: EDSON 3000 TRUCK | Easting: | slope: -90° | R.L. Surface: 10.39

hole diameter: 100 mm | Northing: | bearing: - | datum: AHD

drilling information							material substance						
method	penetration 1 2 3	support	water	notes samples, tests, etc	RL	depth metres	graphic log	classification symbol	material: soil type: plasticity or particle characteristics, colour, secondary and minor components.	moisture condition	consistency/ density index	hand penetrometer kPa 100 200 300 400	structure and additional observations
ADT		N	None observed		10	0		GM	SANDY SILTY GRAVEL: Up to 20 mm in size, grass roots.	D	D		FILL
								SP	SAND: Fine to medium grained, pale brown, traces of silt.				ALLUVIAL
					9	1		SC	CLAYEY SAND: Fine to medium grained, pale yellow, clay is of high plasticity.		MD		
				SPT 8,5,6 N*=11				CL-CH	CLAY: Medium plasticity, grey with mixed orange-brown.		St		
					8	2							
				SPT 4,6,8 N*=14	7	3		CL	SANDY CLAY: low plasticity, grey with some orange-brown zones, sand is fine grained.				
						4		SC	CLAYEY SAND: Fine to medium grained, mixed red-brown, grey and orange-brown, clay is of low plasticity.	M	MD		
W				SPT 5,7,9 N*=16	6	5							
					5	6		SC	CLAYEY SAND: Fine to medium grained, orange-brown, clay is of high plasticity.				
					4	7							
					3	8							

method

AS	auger screwing*
AD	auger drilling*
RR	roller/tricone
W	washbore
CT	cable tool
HA	hand auger
DT	diatube
B	blank bit
V	V bit
T	TC bit

*bit shown by suffix e.g. ADT

support

M mud N nil

C casing

penetration

1 2 3 4 — no resistance ranging to refusal

water

10/1/98 water level on date shown

water inflow

water outflow

notes, samples, tests

U_{50}	undisturbed sample 50mm diameter
U_{63}	undisturbed sample 63mm diameter
D	disturbed sample
N	standard penetration test (SPT)
N*	SPT - sample recovered
Nc	SPT with solid cone
V	vane shear (kPa)
P	pressuremeter
Bs	bulk sample
E	environmental sample
R	refusal

classification symbols and soil description

based on unified classification system

moisture

D	dry
M	moist
W	wet
Wp	plastic limit
W_L	liquid limit

consistency/density index

VS	very soft
S	soft
F	firm
St	stiff
VSt	very stiff
H	hard
Fb	friable
VL	very loose
L	loose
MD	medium dense
D	dense
VD	very dense

BOREHOLE S206161.GPJ COFFEY.GDT 10.10.00

Form GEO 5.3 Issue 3 Rev.2

Coffey Geosciences Pty Ltd ACN 056 335 516

Borehole No. **BH3**

Sheet 2 of 4

Engineering Log - Borehole

Office Job No.: **S20616/1**

Client: *BROWN & ROOT SERVICES ASIA PACIFIC*

Date started: **6.9.2000**

Principal:

Date completed: **6.9.2000**

Project: *BRIDGE OVER M5 MOTORWAY*

Logged by: **JK**

Borehole Location: *MOOREBANK*

Checked by:

drill model and mounting: EDSON 3000 TRUCK | Easting: | slope: -90° | R.L. Surface: 10.39

hole diameter: 100 mm | Northing | bearing: - | datum: AHD

drilling information | **material substance**

method	penetration 1 2 3	support	water	notes samples, tests, etc	RL	depth metres	graphic log	classification symbol	material: soil type: plasticity or particle characteristics, colour, secondary and minor components.	moisture condition	consistency/ density index	✓hand penetrometer kPa 100 200 300 400	structure and additional observations
W		N	None observed	SPT 11,20,30 N*=50	2	9		SP	SAND: Fine to medium grained, brown-orange, with a trace of silt.	M	VD		
					1			CH	SANDY CLAY: High plasticity, pale brown to yellow-brown, sand is fine to medium grained.		St/VSt		
						10							
					0				Becoming pale grey from 10.3 m.				
									Becoming dark red-brown from 10.5 m.				
						11							
					-1								
						12			Increasing sand content from 12 m.				
					-2								
						13							
					-3								
						14							
					-4			CH	SANDY CLAY: High plasticity, mixed yellow-brown and pale grey, sand is fine grained.				
				SPT 4,8,10 N*=18									
					-5	15							
						16							

BOREHOLE S206161.GPJ COFFEY.GDT 10.10.00

Form GEO 5.3 Issue 3 Rev.2

method

AS	auger screwing*
AD	auger drilling*
RR	roller/tricone
W	washbore
CT	cable tool
HA	hand auger
DT	diatube
B	blank bit
V	V bit
T	TC bit

*bit shown by suffix e.g. ADT

support

M mud N nil

C casing

penetration 1 2 3 4 — no resistance ranging to refusal

water

10/1/98 water level on date shown

water inflow

water outflow

notes, samples, tests

U_{50}	undisturbed sample 50mm diameter
U_{63}	undisturbed sample 63mm diameter
D	disturbed sample
N	standard penetration test (SPT)
N*	SPT - sample recovered
Nc	SPT with solid cone
V	vane shear (kPa)
P	pressuremeter
Bs	bulk sample
E	environmental sample
R	refusal

classification symbols and soil description

based on unified classification system

moisture

D	dry
M	moist
W	wet
Wp	plastic limit
W_L	liquid limit

consistency/density index

VS	very soft
S	soft
F	firm
St	stiff
VSt	very stiff
H	hard
Fb	friable
VL	very loose
L	loose
MD	medium dense
D	dense
VD	very dense

Coffey Geosciences Pty Ltd ACN 056 335 516

Borehole No. **BH3**

Sheet 3 of 4

Office Job No.: **S20616/1**

Engineering Log - Borehole

Client: *BROWN & ROOT SERVICES ASIA PACIFIC*

Date started: **6.9.2000**

Principal:

Date completed: **6.9.2000**

Project: *BRIDGE OVER M5 MOTORWAY*

Logged by: **JK**

Borehole Location: *MOOREBANK*

Checked by:

Coffey

drill model and mounting: EDSON 3000 TRUCK | Easting: 98 7 | slope: -90° | R.L. Surface: 10.39

hole diameter: 100 mm | Northing 80 | bearing: - | datum: AHD

drilling information							material substance						
method	penetration 1 2 3	support	water	notes samples, tests, etc	RL	depth metres	graphic log	classification symbol	material soil type: plasticity or particle characteristics, colour, secondary and minor components.	moisture condition	consistency/ density index	hand penetro-meter kPa 100 200 300 400	structure and additional observations
W		N			-6	17		CH	SANDY CLAY: High plasticity, mixed yellow-brown and pale grey, sand is fine grained. *(continued)*	M	St/VSt		
								CH	SHALY CLAY: Extremely weathered shale and clay.		H		RESIDUAL
					-7	18			Borehole BH3 continued as cored hole				
					-8	19							
					-9	20							
					-10	21							
					-11	22							
					-12	23							
					-13	24							

method

AS	auger screwing*
AD	auger drilling*
RR	roller/tricone
W	washbore
CT	cable tool
HA	hand auger
DT	diatube
B	blank bit
V	V bit
T	TC bit

*bit shown by suffix e.g. ADT

support

M mud N nil

C casing

penetration

1 2 3 4 — no resistance ranging to refusal

water

10/1/98 water level on date shown

water inflow

water outflow

notes, samples, tests

U_{50}	undisturbed sample 50mm diameter
U_{63}	undisturbed sample 63mm diameter
D	disturbed sample
N	standard penetration test (SPT)
N*	SPT - sample recovered
Nc	SPT with solid cone
V	vane shear (kPa)
P	pressuremeter
Bs	bulk sample
E	environmental sample
R	refusal

classification symbols and soil description

based on unified classification system

moisture

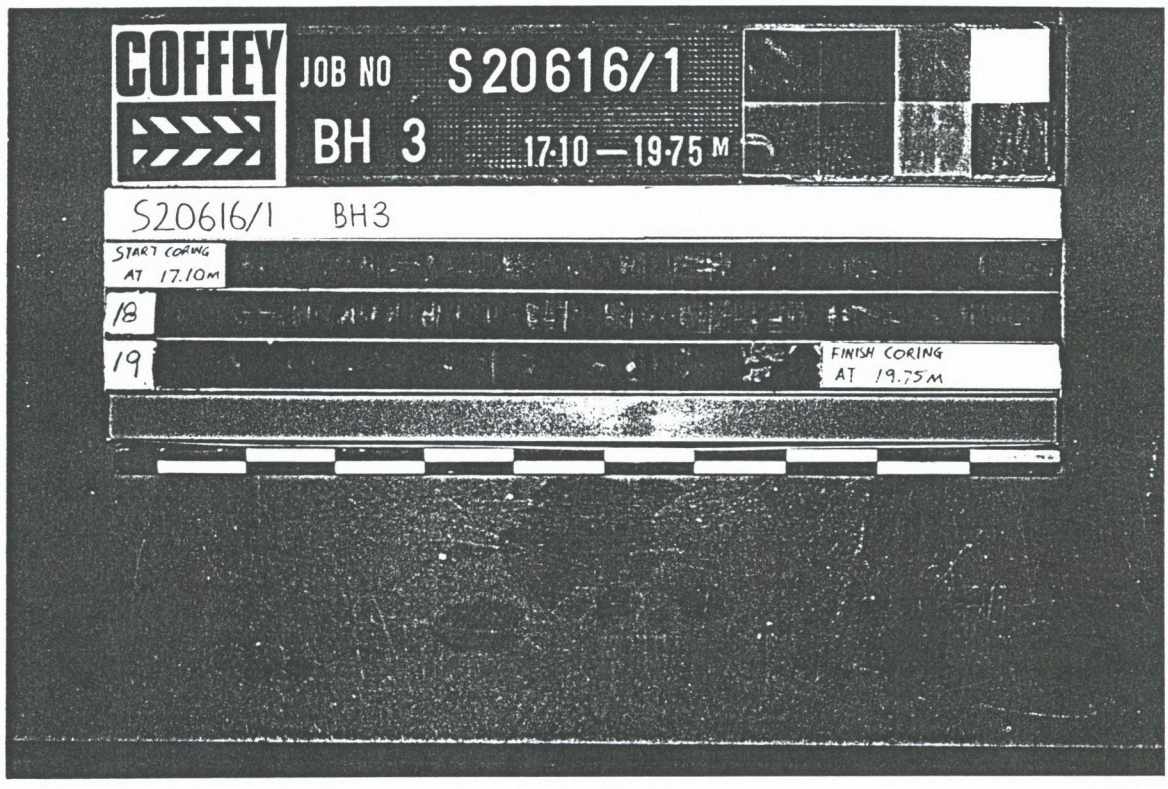
D	dry
M	moist
W	wet
Wp	plastic limit
W_L	liquid limit

consistency/density index

VS	very soft
S	soft
F	firm
St	stiff
VSt	very stiff
H	hard
Fb	friable
VL	very loose
L	loose
MD	medium dense
D	dense
VD	very dense

BOREHOLE S20616.GPJ COFFEY.GDT 12.10.00

Form GEO 5.3 Issue 3 Rev.2


COFFEY
JOB NO S20616/1
BH 3
17·10 — 19·75 M
S20616/1 BH3
START CORING AT 17.10M
18
19
FINISH CORING AT 19.75M

Coffey Geosciences Pty Ltd ACN 056 335 516

Borehole No. **BH3**

Sheet 4 of 4

Office Job No.: **S20616/1**

Engineering Log - Cored borehole

Client: *BROWN & ROOT SERVICES ASIA PACIFIC*

Date started: **6.9.2000**

Principal:

Date completed: **6.9.2000**

Project: *BRIDGE OVER M5 MOTORWAY*

Logged by: **JK**

Borehole Location: *MOOREBANK*

Checked by:

drill model & mounting: EDSON 3000 TRUCK | Easting: | slope: -90° | R.L. Surface: 10.39

hole diameter: 100 mm Drilling fluid: | Northing: | bearing: - | datum: AHD

drilling information					material substance					rock mass defects		
method	core-lift	water	RL	depth metres	graphic log core recovery	material: rock type; grain characteristics, colour, structure, minor components	weathering alteration	estimated strength VL L M H VH EH	$Is_{(50)}$ MPa D- diametral A- axial	RQD %	defect spacing mm 30 100 300 1000 3000	defect description: type, inclination, planarity, roughness, coating, thickness (particular / genera)
			-6									
				17								
		None observed	-7			SHALE:Black to dark grey, distinct bedding observed.	DW		D A 0.35			SM, 0°, clay and shale fragment 50mm PT, 0°, PL, SO, CN PT, 0°, PL, SO, CN JT, 30°, PL, SO, CN PT
				18			SW					SM, 0°, clay and shale fragment 50mm
			-8						D A 0.76			
				19								SM, 15 mm, 0°, clay and fractured shale
			-9						D A 0.28			
												SM, 5 mm, 0°, clay and shale fragment
				20		BH3 terminated at 19.75m						
			-10									
				21								
			-11									
				22								
			-12									
				23								
			-13									
				24								

PT, 0°, PL, SO, CN

CORED BOREHOLE S206161.GPJ COFFEY.GDT 10.10.00

Form GEO 5.5 Issue 3 Rev.2

method

DT	diatube
AS	auger screwing
AD	auger drilling
RR	roller/tricone
CB	claw or blade bit
NMLC	NMLC core
NQ, HQ, PQ	wireline core

core-lift

- casing used
- barrel withdrawn

graphic log/core recovery

- core recovered - graphic symbols indicate material
- no core recovered

water

- 10/1/98 water level on date shown
- water inflow
- partial drill fluid loss
- complete drill fluid loss
- 25 water pressure test result (lugeons) for depth interval shown

weathering/alteration

FR	fresh
SW	slightly weathered
DW	distinctly weathered
XW	extremely weathered
SA	slightly altered
DA	distinctly altered
XA	extremely altered

strength

VL	very low
L	low
M	medium
H	high
VH	very high
EH	extremely high

defect type

JT	joint
PT	parting
SM	seam
SZ	sheared zone
SS	sheared surface
CS	crushed seam

planarity

PL	planar
CU	curved
UN	undulating
ST	stepped
IR	irregular

roughness

VR	very rough
RO	rough
SO	smooth
SL	slickensided

coating

CN	clean
SN	stained
VN	veneer
CO	coating

Coffey Geosciences Pty Ltd ACN 056 335 516

Borehole No. **BH4**

Sheet 1 of 4

Office Job No.: **S20616/1**

Engineering Log - Borehole

Client: *BROWN & ROOT SERVICES ASIA PACIFIC*

Date started: *7.9.2000*

Principal:

Date completed: *7.9.2000*

Project: *BRIDGE OVER M5 MOTORWAY*

Logged by: *JK*

Borehole Location: *MOOREBANK*

Checked by:

drill model and mounting: EDSON 3000 TRUCK | Easting: | slope: -90° | R.L. Surface: 10.36

hole diameter: 100 mm | Northing | bearing: - | datum: AHD

drilling information							material substance						
method	penetration 1 2 3	support	water	notes samples, tests, etc	RL	depth metres	graphic log	classification symbol	material: soil type: plasticity or particle characteristics, colour, secondary and minor components.	moisture condition	consistency/ density index	Hand penetrometer kPa 100 200 300 400	structure and additional observations
ADT		C			10				**TOPSOIL:** Grass and roots.	D	L		FILL
								SP	**SILTY SAND:** Fine to medium grained, dark brown.				ALLUVIAL
						1		SP	**SAND:** Fine grained, pale yellow brown, with pockets of silty clay and fine grained gravel, brown to dark brown.		MD		
				SPT 5,6,5 N*=11	9								
						2		SP	**SAND:** Fine to medium grained, red-brown with some orange-brown and grey, and some clay of low plasticity.		D		
				SPT 9,14,17 N*=31	8								
					7	3				M			
					6	4							
W			▶	SPT 10,11,11 N*=22				SP	**SAND:** Medium grained with some fine grained, mixed orange-brown, grey and red brown, with some silt.	W			
					5	5							
					4	6							
					3	7							
						8		SC	**CLAYEY SAND:** Medium to coarse grained, orange red, clay is of high plasticity.				

BOREHOLE S206161.GPJ COFFEY.GDT 10.10.00

Form GEO 5.3 Issue 3 Rev.2

method

AS	auger screwing*
AD	auger drilling*
RR	roller/tricone
W	washbore
CT	cable tool
HA	hand auger
DT	diatube
B	blank bit
V	V bit
T	TC bit

*bit shown by suffix e.g. ADT

support

M mud N nil

C casing

penetration

1 2 3 4 — no resistance ranging to refusal

water

10/1/98 water level on date shown

water inflow

water outflow

notes, samples, tests

U_{50}	undisturbed sample 50mm diameter
U_{63}	undisturbed sample 63mm diameter
D	disturbed sample
N	standard penetration test (SPT)
N*	SPT - sample recovered
Nc	SPT with solid cone
V	vane shear (kPa)
P	pressuremeter
Bs	bulk sample
E	environmental sample
R	refusal

classification symbols and soil description

based on unified classification system

moisture

D	dry
M	moist
W	wet
Wp	plastic limit
W_L	liquid limit

consistency/density index

VS	very soft
S	soft
F	firm
St	stiff
VSt	very stiff
H	hard
Fb	friable
VL	very loose
L	loose
MD	medium dense
D	dense
VD	very dense

Coffey Geosciences Pty Ltd ACN 056 335 516

Borehole No. **BH4**

Sheet 2 of 4

Engineering Log - Borehole

Office Job No.: **S20616/1**

Client: *BROWN & ROOT SERVICES ASIA PACIFIC*

Date started: **7.9.2000**

Principal:

Date completed: **7.9.2000**

Project: *BRIDGE OVER M5 MOTORWAY*

Logged by: **JK**

Borehole Location: *MOOREBANK*

Checked by:

drill model and mounting: EDSON 3000 TRUCK | Easting | slope: -90° | R.L. Surface: 10.36

hole diameter: 100 mm | Northing | bearing: - | datum: AHD

drilling information							material substance					
method	penetration 1 2 3	support	water	notes samples, tests, etc	RL	depth metres	graphic log	classification symbol	material: soil type: plasticity or particle characteristics, colour, secondary and minor components.	moisture condition	consistency/ density index	hand penetrometer kPa 100 200 300 400	structure and additional observations
W		C						CL-CH	SANDY CLAY: Medium plasticity, orange, fine grained sand.	W	F		
								CH	SANDY CLAY: High plasticity, pale grey, sand is fine grained.		VSt		
				SPT 4,9,11 N*=20	2	9							
					1	10							
					0	11							
					-1	12							
					-2	13							
					-3			SC	CLAYEY SAND: Fine grained, pale orange, clay of of high plasticity.		D		
					-4	14							
					-5	15							
						16							

BOREHOLE S20616.GPJ COFFEY.GDT 10.10.00

Form GEO 5.3 Issue 3 Rev.2

method

AS	auger screwing*
AD	auger drilling*
RR	roller/tricone
W	washbore
CT	cable tool
HA	hand auger
DT	diatube
B	blank bit
V	V bit
T	TC bit
*bit shown by suffix e.g.	ADT

support

M mud N nil

C casing

penetration

1 2 3 4 — no resistance ranging to refusal

water

10/1/98 water level on date shown

water inflow

water outflow

notes, samples, tests

U_{50}	undisturbed sample 50mm diameter
U_{63}	undisturbed sample 63mm diameter
D	disturbed sample
N	standard penetration test (SPT)
N*	SPT - sample recovered
Nc	SPT with solid cone
V	vane shear (kPa)
P	pressuremeter
Bs	bulk sample
E	environmental sample
R	refusal

classification symbols and soil description

based on unified classification system

moisture

D	dry
M	moist
W	wet
Wp	plastic limit
W_L	liquid limit

consistency/density index

VS	very soft
S	soft
F	firm
St	stiff
VSt	very stiff
H	hard
Fb	friable
VL	very loose
L	loose
MD	medium dense
D	dense
VD	very dense

Coffey Geosciences Pty Ltd ACN 056 335 516

Engineering Log - Borehole

Client: *BROWN & ROOT SERVICES ASIA PACIFIC*

Principal:

Project: *BRIDGE OVER M5 MOTORWAY*

Borehole Location: *MOOREBANK*

Borehole No. *BH4*

Sheet 3 of 4

Office Job No.: *S20616/1*

Date started: *7.9.2000*

Date completed: *7.9.2000*

Logged by: *JK*

Checked by:

Coffey

drill model and mounting: EDSON 3000 TRUCK | Easting: | slope: -90° | R.L. Surface: 10.36

hole diameter: 100 mm | Northing | bearing: - | datum: AHD

drilling information | **material substance**

method	penetration 1 2 3	support	water	notes samples, tests, etc	RL	depth metres	graphic log	classification symbol	material: soil type: plasticity or particle characteristics, colour, secondary and minor components.	moisture condition	consistency/ density index	hand penetrometer kPa 100 200 300 400	structure and additional observations
W		C						CH	Sand becoming coarser grained from 15.95 m. SHALY CLAY: Extremely weathered shale and clay.	W	D		RESIDUAL
					-6	17			Borehole BH4 continued as cored hole				
					-7	18							
					-8	19							
					-9	20							
					-10	21							
					-11	22							
					-12	23							
					-13	24							

method

AS	auger screwing*
AD	auger drilling*
RR	roller/tricone
W	washbore
CT	cable tool
HA	hand auger
DT	diatube
B	blank bit
V	V bit
T	TC bit

*bit shown by suffix e.g. ADT

support

M mud N nil

C casing

penetration 1 2 3 4 — no resistance ranging to refusal

water

10/1/98 water level on date shown

water inflow

water outflow

notes, samples, tests

U_{50}	undisturbed sample 50mm diameter
U_{63}	undisturbed sample 63mm diameter
D	disturbed sample
N	standard penetration test (SPT)
N*	SPT - sample recovered
Nc	SPT with solid cone
V	vane shear (kPa)
P	pressuremeter
Bs	bulk sample
E	environmental sample
R	refusal

classification symbols and soil description

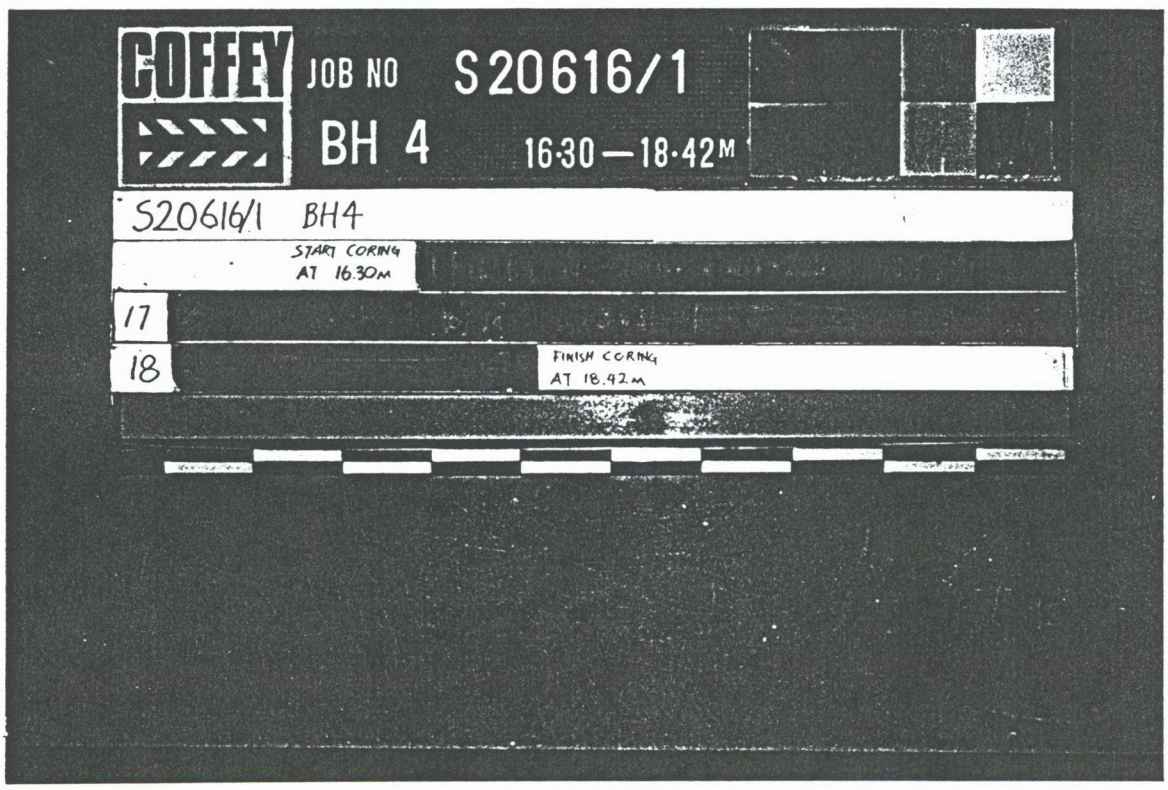
based on unified classification system

moisture

D	dry
M	moist
W	wet
Wp	plastic limit
W_L	liquid limit

consistency/density index

VS	very soft
S	soft
F	firm
St	stiff
VSt	very stiff
H	hard
Fb	friable
VL	very loose
L	loose
MD	medium dense
D	dense
VD	very dense


COFFEY
JOB NO S20616/1
BH 4
16·30 — 18·42M
S20616/1 BH4
START CORING
AT 16.30M
17
18
FINISH CORING
AT 18.42M

Coffey Geosciences Pty Ltd ACN 056 335 516

Borehole No. **BH4**

Sheet 4 of 4

Engineering Log - Cored borehole

Office Job No.: **S20616/1**

Client: *BROWN & ROOT SERVICES ASIA PACIFIC*

Date started: **7.9.2000**

Principal:

Date completed: **7.9.2000**

Project: *BRIDGE OVER M5 MOTORWAY*

Logged by: **JK**

Borehole Location: *MOOREBANK*

Checked by:

drill model & mounting: EDSON 3000 TRUCK | Easting: | slope: -90° | R.L. Surface: 10.36

hole diameter: 100 mm | Drilling fluid: | Northing: | bearing: - | datum: AHD

drilling information | **material substance** | **rock mass defects**

method	core-lift	water	RL	depth metres	graphic log core recovery	material: rock type; grain characteristics, colour, structure, minor components	weathering alteration	estimated strength VL L M H VH EH	$Is_{(50)}$ MPa D- diametral A- axial	RQD %	defect spacing mm 30 100 300 1000 3000	defect description: type, inclination, planarity, roughness, coating, thickness — particular	general
			-0			SHALE: dark grey, laminated, occasional fine grained sandstone lenses.	FR						
				17					D A 0.18 1.15			JT, 80°, PL, SO, CN	
												JT, 45°, PL, SO, CN	
												JT, 45°, PL, SO, CN	
			-7							59			PT, 0°, PL, SO, CN
												JT, 80°, PL, SO, CN	
									D A 0.61 0.66				
				18								JT, 80°, PL, SO, CN	
									D A 0.23 0.62				
			-8										
						BH4 terminated at 18.42m							
				19									
			-9										
				20									
			-10										
				21									
			-11										
				22									
			-12										
				23									
			-13										
				24									

method
DT diatube
AS auger screwing
AD auger drilling
RR roller/tricone
CB claw or blade bit
NMLC NMLC core
NQ, HQ, PQ wireline core

core-lift
casing used
barrel withdrawn

graphic log/core recovery
core recovered
- graphic symbols indicate material
no core recovered

water
10/1/98 water level on date shown
water inflow
partial drill fluid loss
complete drill fluid loss
25 water pressure test result (lugeons) for depth interval shown

weathering/alteration
FR fresh
SW slightly weathered
DW distinctly weathered
XW extremely weathered
SA slightly altered
DA distinctly altered
XA extremely altered

strength
VL very low
L low
M medium
H high
VH very high
EH extremely high

defect type
JT joint
PT parting
SM seam
SZ sheared zone
SS sheared surface
CS crushed seam

planarity
PL planar
CU curved
UN undulating
ST stepped
IR irregular

roughness
VR very rough
RO rough
SO smooth
SL slickensided

coating
CN clean
SN stained
VN veneer
CO coating

CORED BOREHOLE S206161.GPJ COFFEY.GDT 10.10.00

Form GEO 5.5 Issue 3 Rev.2

S20616/1 - AD
12 October 2000

APPENDIX B

LABORATORY TEST RESULT SHEETS

Coffey Geosciences Pty Ltd A.C.N. 056 335 516

Geotechnical | Resources | Environmental | Technical | Project Management

142 Wicks Road, North Ryde, NSW, 2113
Ph: (61 2) 9888 7444, Fax: (61 2) 9878 8155

california bearing ratio test results

client : *BROWN & ROOTS PTY LTD*
principal :
project : *BRIDGE OVER M5 MOTORWAY*
location : *MOOREBANK*

job no : *S20616/1*
laboratory : *SYDNEY*
report date : *September 29, 2000*
test report :

test procedure : *RTA T117a*
laboratory compaction method : *RTA T111*

sample number :				*A*	*B*	
depth:			m	*0.15-0.35*	*0.1-0.3*	
location:				-	-	
date sampled:				-	-	
date tested:				*28/9/00*	*28/9/00*	
material description:				*(SC) CLAYEY SAND-fine to coarse,brown.*	*(SC) CLAYEY SAND-fine to coarse,brown.*	
maximum dry density:			t/m^3	*1.97*	*1.95*	
optimum moisture content:			%	*10.5*	*10.5*	
retained on 19mm AS sieve:			%	*0*	*0*	
+ 19mm material included:				*No*	*No*	
C.B.R. test	before soaking	dry density	t/m^3	*1.97*	*1.95*	
		density ratio	%	*100.0*	*100.0*	
		moisture content	%	*10.1*	*10.4*	
		moisture ratio	%	*96*	*99*	
	after soaking	dry density	t/m^3	*1.98*	*1.95*	
		density ratio	%	*100.5*	*100.0*	
		moisture content	%	*11.8*	*12.6*	
	number of days soaked:			*10*	*10*	
	surcharge:		kg	*4.5*	*4*	
	moisture content after test	top 30 mm	%	*12.9*	*14.3*	
		remaining sample	%	*11.6*	*12.5*	
	swell after soaking:		%	*-0.3*	*-0.2*	
	penetration:		mm	*2.5/5*	*2.5/5*	
	C.B.R. value:		%	*20/25*	*30/30*	

remarks :

This laboratory is accredited by the National Association of Testing Authorities, Australia. The test(s) reported herein have been performed in accordance with its terms of accreditation. This document shall not be reproduced except in full without the prior approval of the laboratory.

J. P...
Authorised Signature
NATA No 431

29/9/00
James Russell

Australia

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  Suite 2207-9, Tower Two, Lippo Centre
  89 Queensway, Hong Kong
  Telephone +852 **2530 8816**
  Facsimile +852 2530 8116

Appendix E

TRAFFIC NOISE MONITORING

KOIKAS ACOUSTICS PTY LTD

KOIKAS ACOUSTICS PTY LTD

CONSULTANTS IN NOISE AND VIBRATION

MEMBER FIRM OF THE ASSOCIATION OF AUSTRALIAN ACOUSTICAL CONSULTANTS

ACN 058 524 771
ABN 12 058 524 771

60 GLENFARNE STREET, BEXLEY NSW 2207 AUSTRALIA

eMAIL : nick_koikas@mail2me.com.au **FAX:** 02 9587 5337 **PH:** 02 9587 9702

TRAFFIC NOISE MONITORING AT MOOREBANK AVENUE INTERCHANGE, MOOREBANK

Date: 17 November 2000

Project No.: 744

Report Reference: R17110a1.d63

Prepared for:
Mr Michael Gray
Project Supervisor
Brown & Root Services Asia Pacific Pty Ltd
GPO Box 1618
Sydney NSW 2001

Prepared by:
Koikas Acoustics Pty Ltd
Member Firm of the Association of Australian Acoustical Consultants

Nicholas G. Koikas
Principal Consultant

TRAFFIC NOISE MONITORING AT MOOREBANK AVENUE INTERCHANGE, MOOREBANK

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3.0 MEASURED RESULTS 4

APPENDIX A MAP

APPENDIX B CALIBRATION CERTIFICATES

APPENDIX C PHOTOS SHOWING LOCATION OF SOUND LEVEL METERS

APPENDIX D MONITORING SURVEY RESULTS

TRAFFIC NOISE MONITORING AT MOOREBANK AVENUE INTERCHANGE, MOOREBANK

1.0 INTRODUCTION

A traffic noise assessment was completed by Koikas Acoustics Pty Ltd on behalf of Brown & Root Services Asia Pacific Pty Ltd in order to determine current traffic noise levels at the Moorebank Avenue Interchange, Moorebank.

2.0 MEASUREMENT SITES, METHODOLOGY AND INSTRUMENTATION

Koikas Acoustics conducted a traffic noise survey at the following two residential sites:

- No. 208 Moorebank Avenue, Moorebank (Kitchener House) and
- No. 88 Moorebank Avenue, Moorebank.

Traffic noise monitoring was undertaken between Wednesday 8 and Tuesday 14 November, 2000. Refer to **Appendix A** for a map showing the location of the assessment site.

Two Type 2 sound level meter data loggers RT&A S/N 65 and 81 were used to monitor traffic noise levels. All sound level meters were field calibrated before and after the measurements with a Rion Sound Level Meter Calibrator NC-73 S/N 10702593. Calibration drifts of less than 0.2 dB(A) were recorded for these instruments. These drifts are within the accuracy limits of this type of sound level meter.

All equipment used carry NATA certification. Refer to **Appendix B** for calibration certificates.

All instrumentation used comply with the requirements of Australian Standard 2702-1984 "Acoustics - Methods for the Measurement of Road Traffic Noise".

The sound level meter installed at No. 208 Moorebank Avenue, Moorebank was placed on the front verandah, 1 metre from the most noise sensitive building facade and 29 metres from the nearest carriageway of Moorebank Avenue.

The sound level meter installed at No. 88 Moorebank Avenue, Moorebank was placed 1 metre from the most noise sensitive building facade and 17 metres from the nearest carriageway of Moorebank Avenue. Refer to **Appendix C** for photos showing the location of the sound level meters.

All noise level measurements were A-frequency and Fast-time weighted. Statistical exceedances L_x and equivalent L_{eq} levels were calculated over fifteen minute intervals for seven days of monitoring.

3.0 MEASURED RESULTS

During the traffic noise monitoring survey, rainfall occurred on Tuesday 14th November 2000. Refer to **Appendix D** for details of the noise level trends. Tables 1 and 2 provide a summary of the traffic noise levels measured at each assessment site, and Table 3 provides a summary for both sites.

Table 1 Traffic noise levels at No. 208 Moorebank Avenue, Moorebank.

	NOISE LEVELS [dB(A)]							
Date / Descriptor	Wednesday 8-11-00	Thursday 9-11-00	Friday 10-11-00	Saturday 11-11-00	Sunday 12-11-00	Monday 13-11-00	Tuesday 14-11-00	Average
L_{eq}, 24 hours (00:00 to 24:00 hrs)	55.5	56.9	56.0	55.4	53.9	55.7	56.6	**56.1**
L_{eq}, 8 hours (22:00 to 06:00 hrs)	52.1	55.0	54.2	52.3	51.0	52.2	51.7	**53.0**
L_{eq}, 15 hours (07:00 to 22:00 hrs)	56.0	57.3	56.7	56.4	55.0	56.4	57.8	**56.8**
L_{eq}, 9 hours (22:00 to 07:00 hrs)	53.8	55.9	54.9	53.0	51.4	54.0	53.1	**54.3**
L_{10}, 18 hours (06:00 to 24:00 hrs)	58.4	59.2	58.4	58.1	57.0	58.3	59.5	**58.8**

NOTE: Rain affected results in table.

Table 2 Traffic noise levels at No. 88 Moorebank Avenue, Moorebank.

	NOISE LEVELS [dB(A)]							
Date / Descriptor	Wednesday 8-11-00	Thursday 9-11-00	Friday 10-11-00	Saturday 11-11-00	Sunday 12-11-00	Monday 13-11-00	Tuesday 14-11-00	Average
L_{eq}, 24 hours (00:00 to 24:00 hrs)	67.2	67.5	67.5	64.8	64.2	67.6	68.7	**67.7**
L_{eq}, 8 hours (22:00 to 06:00 hrs)	64.2	64.5	64.5	62.3	60.8	64.3	65.3	**64.6**
L_{eq}, 15 hours (07:00 to 22:00 hrs)	68.0	68.3	68.3	65.6	65.1	68.5	69.7	**68.6**
L_{eq}, 9 hours (22:00 to 07:00 hrs)	65.6	65.9	65.9	63.3	61.3	65.5	66.3	**65.8**
L_{10}, 18 hours (06:00 to 24:00 hrs)	70.8	71.1	70.9	68.5	68.1	71.1	72.2	**71.2**

NOTE: Rain affected results in table.

Table 4 Traffic noise levels at the two assessment sites.

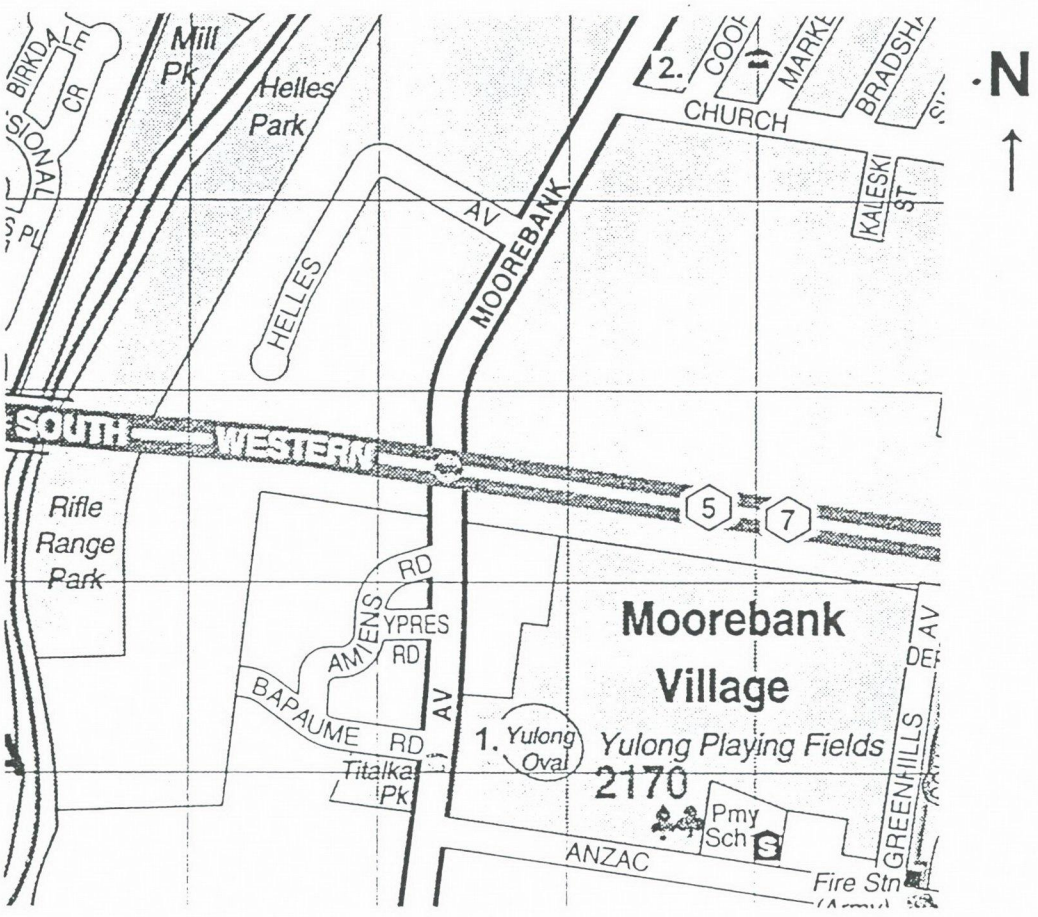
	NOISE LEVELS [dB(A)]	
Site / Descriptor	No. 208 Moorebank Avenue, Moorebank	No. 88 Moorebank Avenue, Moorebank
L_{eq}, 24 hours (00:00 to 24:00 hrs)	56.1	67.7
L_{eq}, 8 hours (22:00 to 06:00 hrs)	53.0	64.6
L_{eq}, 15 hours (07:00 to 22:00 hrs)	56.8	68.6
L_{eq}, 9 hours (22:00 to 07:00 hrs)	54.3	65.8
L_{10}, 18 hours (06:00 to 24:00 hrs)	58.8	71.2

It is noted, that noise level results at No. 88 Moorebank Avenue, Moorebank are high. This is attributed to traffic carrying a high percentage of heavy vehicles and the industrial premises located on the opposite side of Church Road.

APPENDIX A

ASSESSMENT SITES

Map 1 **Location of monitoring sites**



Scale: 1 ~ 10,000
Source: UBD Sydney Street Directory, 32nd Edition1996

Monitoring Sites:

1. 208 Moorebank Ave, Moorebank (Kitchener House)
2. 88 Moorebank Ave, Moorebank.

APPENDIX B

CERTIFICATE OF CALIBRATION

CERTIFICATE NO: 3272

EQUIPMENT TESTED:	Sound Level Calibrator
	Rion
Type No:	NC-73 Serial No: 10702593
Owner:	Koikas Acoustics Pty.Ltd. 60 Glenfarne St. Bexley NSW 2207
Tests Performed:	Output sound pressure level corrected to 1013 hecto Pascals was found to be: 93.93 dB re 20 uPa at 973.4 Hz. Distortion:<1% THD, Uncertainty: +/- 0.1dB

CONDITION OF TEST:

Ambient Pressure:	1002 mbar	Relative Humidity:	53 %
Temperature:	21 °C		
Date of Calibration:	19.07.2000	Calibration Due Date:	19.07.2001

Test Method: IEC 942 - 1988 Clauses 3.1.2, 3.2.2 and ACU-VIB No.:3

CHECKED BY: TJ AUTHORISED SIGNATORY: ..... Jack Kiolt

An endorsed Certificate of Calibration may not be published or reproduced except in full without the written permission of this testing Laboratory

Instruments used in these tests are traceable to Australian Physical Standards held at C.S.I.R.O. N.M.L (National Measurement Laboratory) Sydney. Australia.

NATA

Reg. Lab. No. 9262
Acoustic and Vibration Measurements

ACU-VIB Electronics
Acoustic and Vibration Electronics
HEAD OFFICE
Unit 3. 10 Salisbury Rd. Castle Hill NSW 2154
Tel: (02) 9894 2377 Fax: (02)9894 2386
Mobile: 0408 470 179

National Association of Testing Authorities, Australia
NATA Endorsed Calibration Certificate
This document may not be reproduced except in full.

CERTIFICATE OF CALIBRATION

CERTIFICATE NO.: SLM01007

Equipment Description:	Sound Logging Meter		
Manufacturer:	RTA		
Model No:	Version 4.0	**Serial No:**	065
Microphone Type:	Electret	**Serial No:**	065
Filter Type:	-	**Serial No:**	-
Comments:	All tests passed for type 2.		

Ambient Pressure:	1008		
Temperature:	21	**Relative Humidity:**	57%
Date of Calibration:	23.11.98	**Calibration Due Date:**	23.11.2000

CHECKED BY: TJ **AUTHORISED SIGNATORY:** .....

Jack Kiett

The equipment listed above has been calibrated in this laboratory. The equipment performed satisfactorily in all the tests conducted.

This certificate is effective for 24 months from the date of calibration.

Reg. Lab. No. 9262
Acoustic and Vibration Measurements

ACU-VIB Electronics
Acoustic and Vibration Electronics
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PO Box 535 Mundaring WA 6073
Tel: (08) 9295 2552 Fax: (08) 9295 2594
Mobile: 015 994 121

National Association of Testing Authorities, Australia

NATA Endorsed Calibration Certificate
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CERTIFICATE OF CALIBRATION

CERTIFICATE NO.: SLM01008

Equipment Description: Sound Logging Meter

Manufacturer:	RTA		
Model No:	Version 4.0	**Serial No:**	081
Microphone Type:	Electret	**Serial No:**	081
Filter Type:	-	**Serial No:**	-
Comments:	All tests passed for type 2.		

Ambient Pressure:	1008		
Temperature:	21	**Relative Humidity:**	57%
Date of Calibration:	23.11.98	**Calibration Due Date:**	23.11.2000

CHECKED BY: TJ **AUTHORISED SIGNATORY:** .....

Jack Kiely

The equipment listed above has been calibrated in this laboratory. The equipment performed satisfactorily in all the tests conducted.

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APPENDIX C

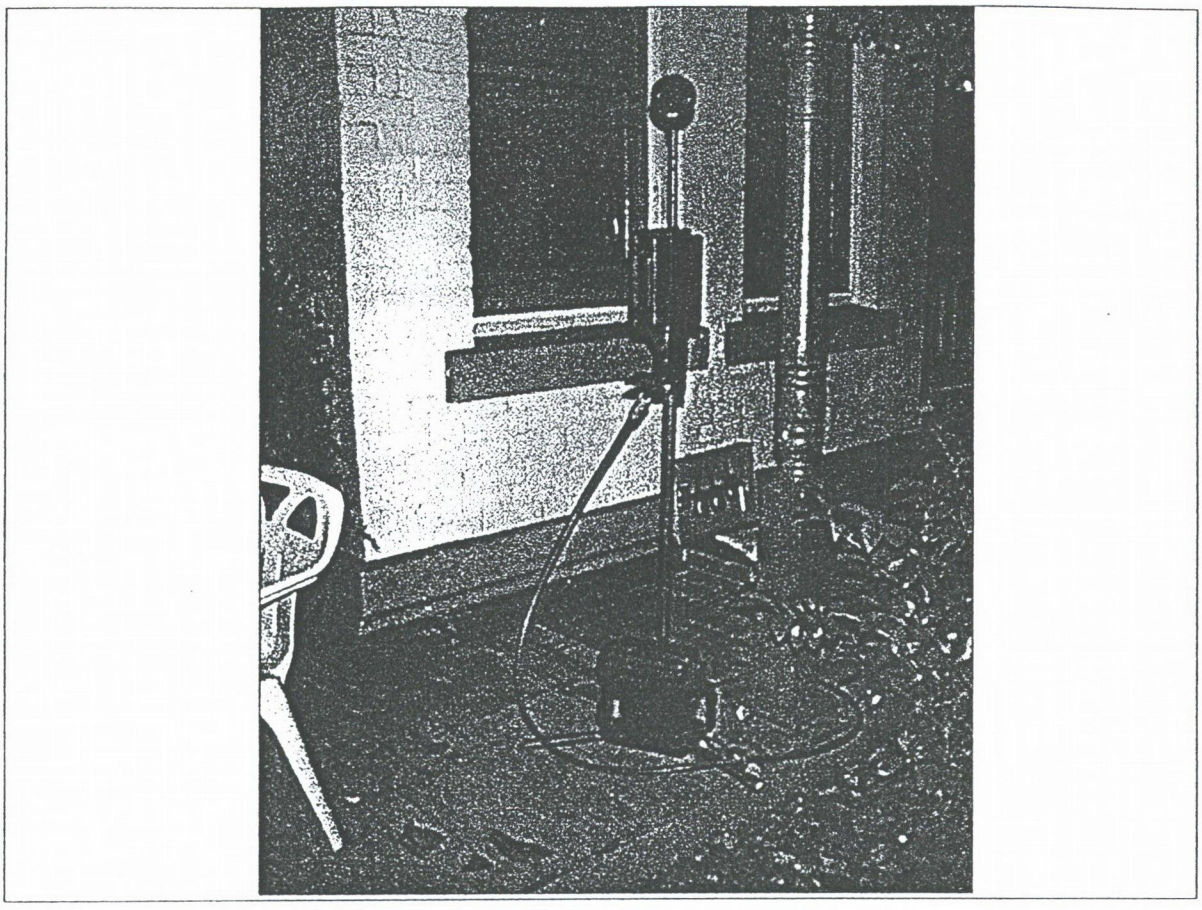


Photo 1 View of sound level meter at No. 208 Moorebank Ave, Moorebank (29 metres from carriageway)

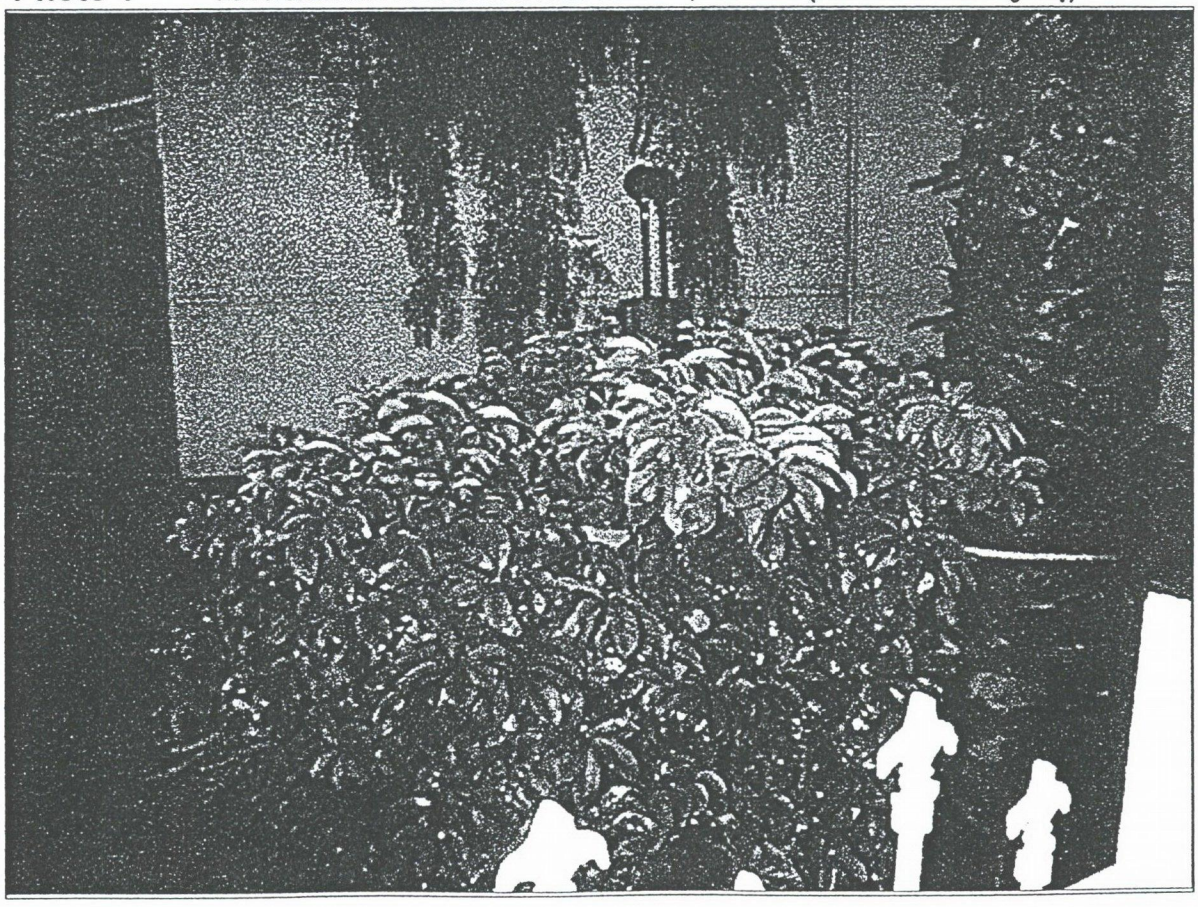
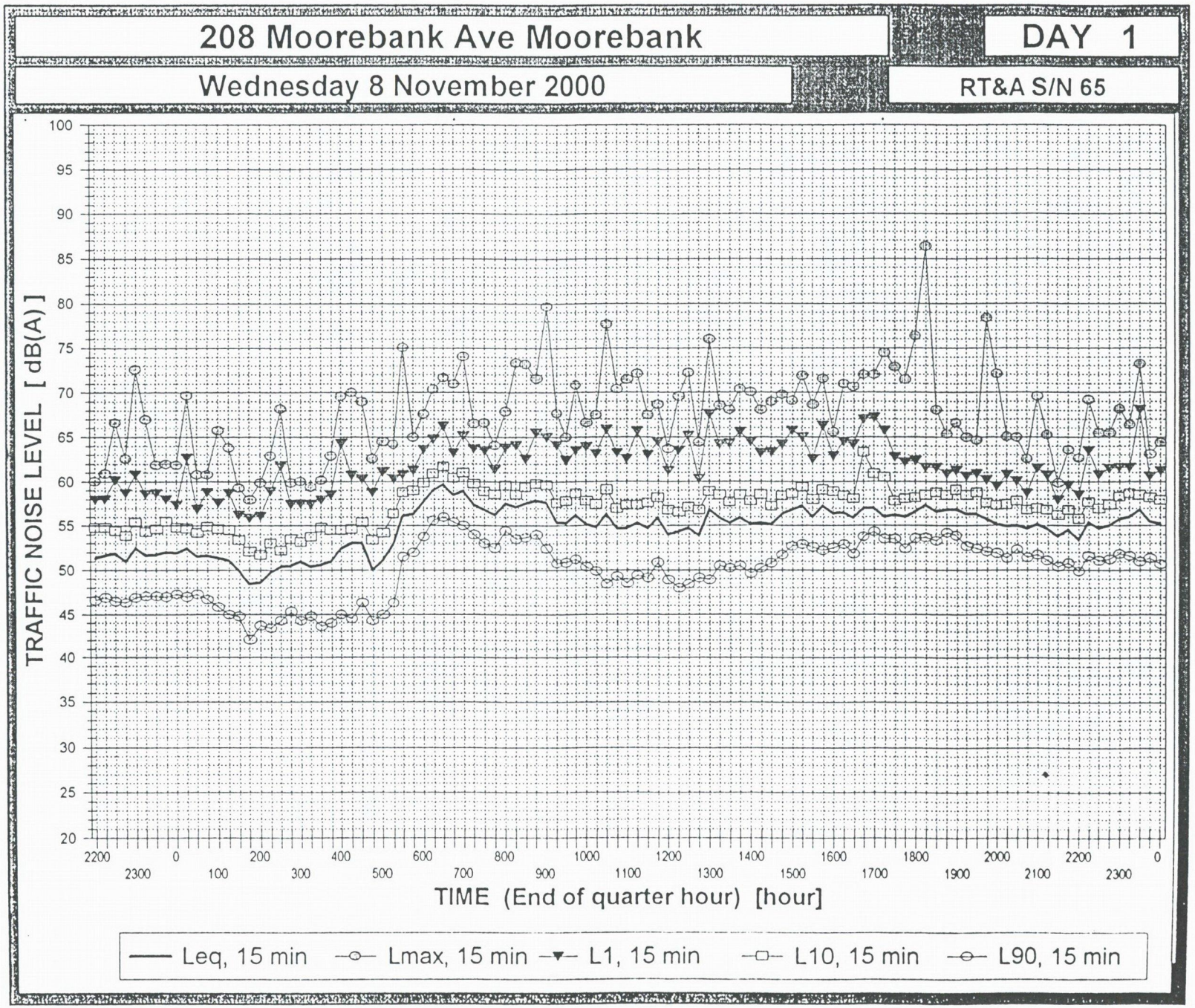
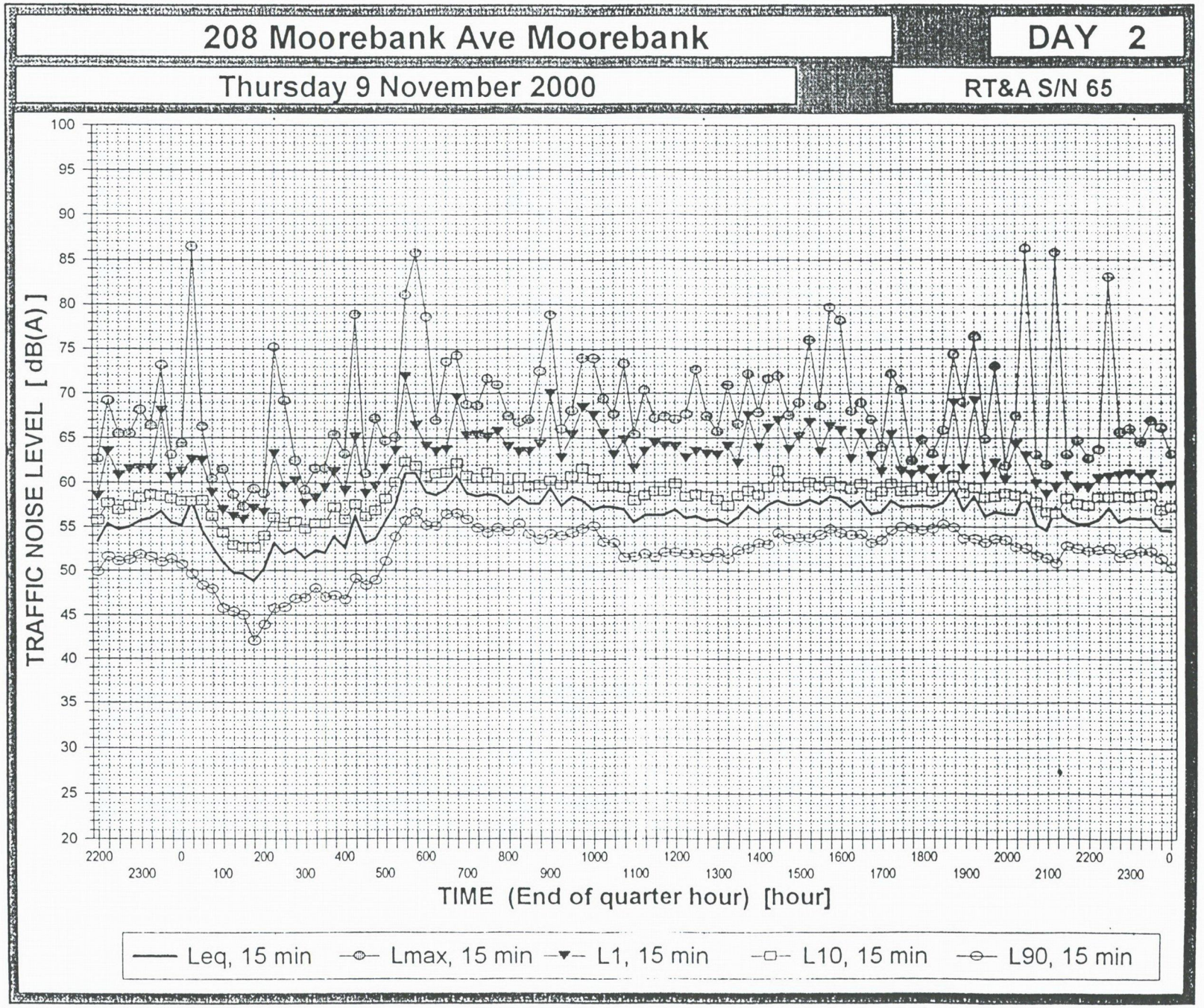
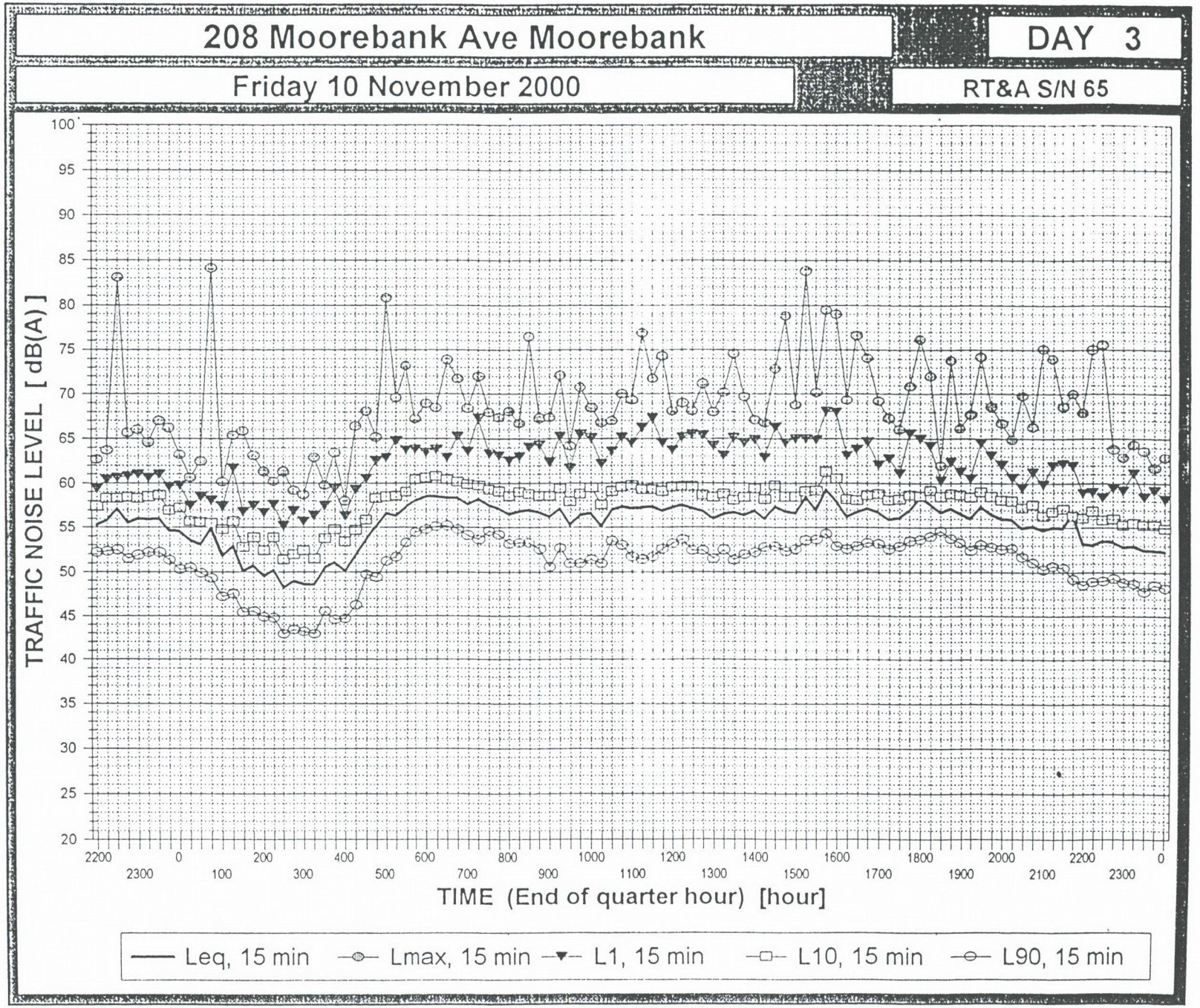


Photo 2 View of sound level meter at No. 88 Moorebank Ave, Moorebank (17 metres from carriageway)

APPENDIX D


208 Moorebank Ave Moorebank
DAY 1
Wednesday 8 November 2000
RT&A S/N 65
TRAFFIC NOISE LEVEL [dB(A)]
100
95
90
85
80
75
70
65
60
55
50
45
40
35
30
25
20
2200
0
200
400
600
800
1000
1200
1400
1600
1800
2000
2200
0
2300
100
300
500
700
900
1100
1300
1500
1700
1900
2100
2300
TIME (End of quarter hour) [hour]
Leq, 15 min
Lmax, 15 min
L1, 15 min
L10, 15 min
L90, 15 min


208 Moorebank Ave Moorebank
DAY 2
Thursday 9 November 2000
RT&A S/N 65
TRAFFIC NOISE LEVEL [dB(A)]
100
95
90
85
80
75
70
65
60
55
50
45
40
35
30
25
20
2200
0
200
400
600
800
1000
1200
1400
1600
1800
2000
2200
0
2300
100
300
500
700
900
1100
1300
1500
1700
1900
2100
2300
TIME (End of quarter hour) [hour]
Leq, 15 min
Lmax, 15 min
L1, 15 min
L10, 15 min
L90, 15 min

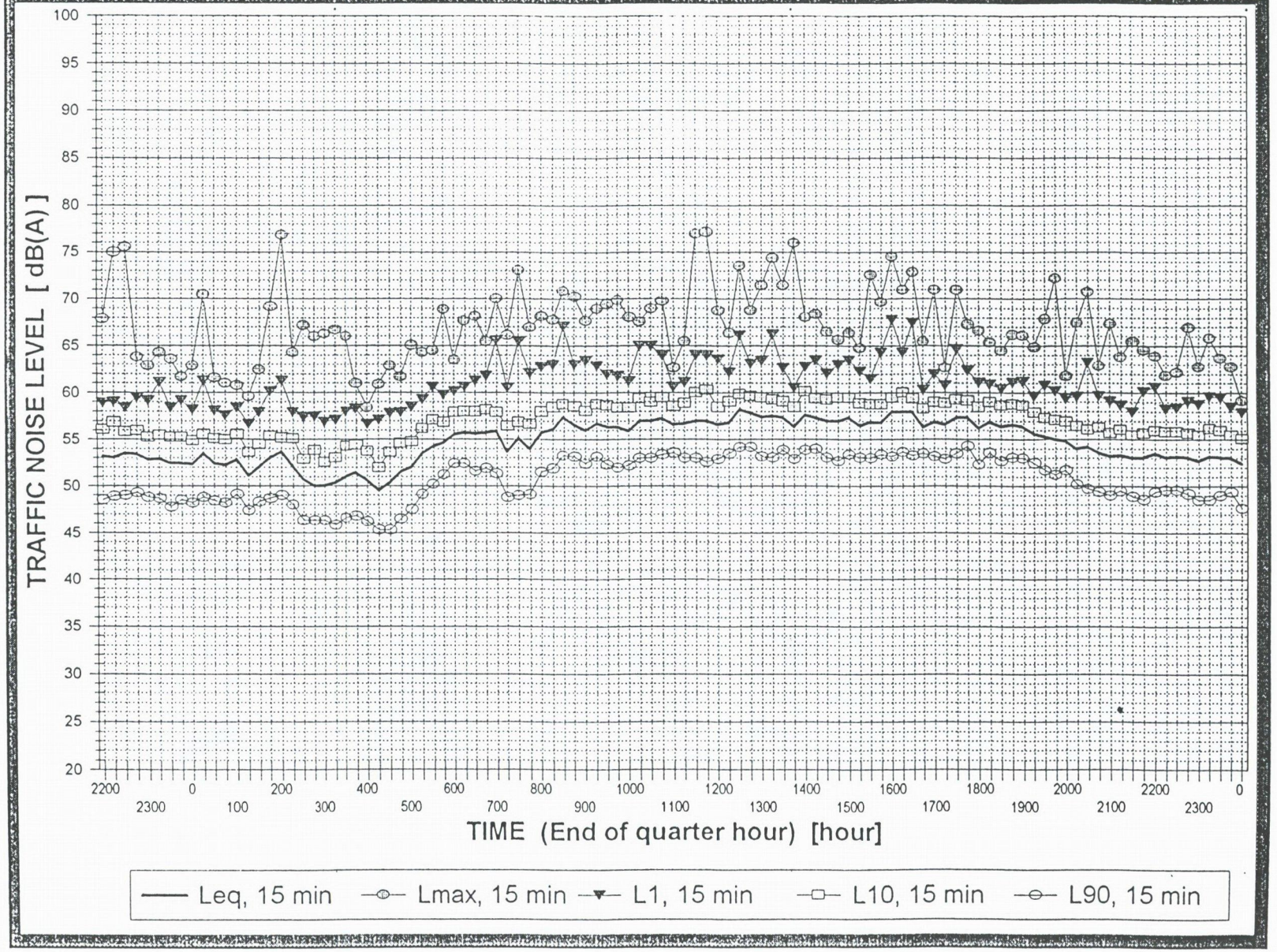

208 Moorebank Ave Moorebank
DAY 3
Friday 10 November 2000
RT&A S/N 65
TRAFFIC NOISE LEVEL [dB(A)]
100
95
90
85
80
75
70
65
60
55
50
45
40
35
30
25
20
2200
2300
0
100
200
300
400
500
600
700
800
900
1000
1100
1200
1300
1400
1500
1600
1700
1800
1900
2000
2100
2200
2300
0
TIME (End of quarter hour) [hour]
Leq, 15 min
Lmax, 15 min
L1, 15 min
L10, 15 min
L90, 15 min

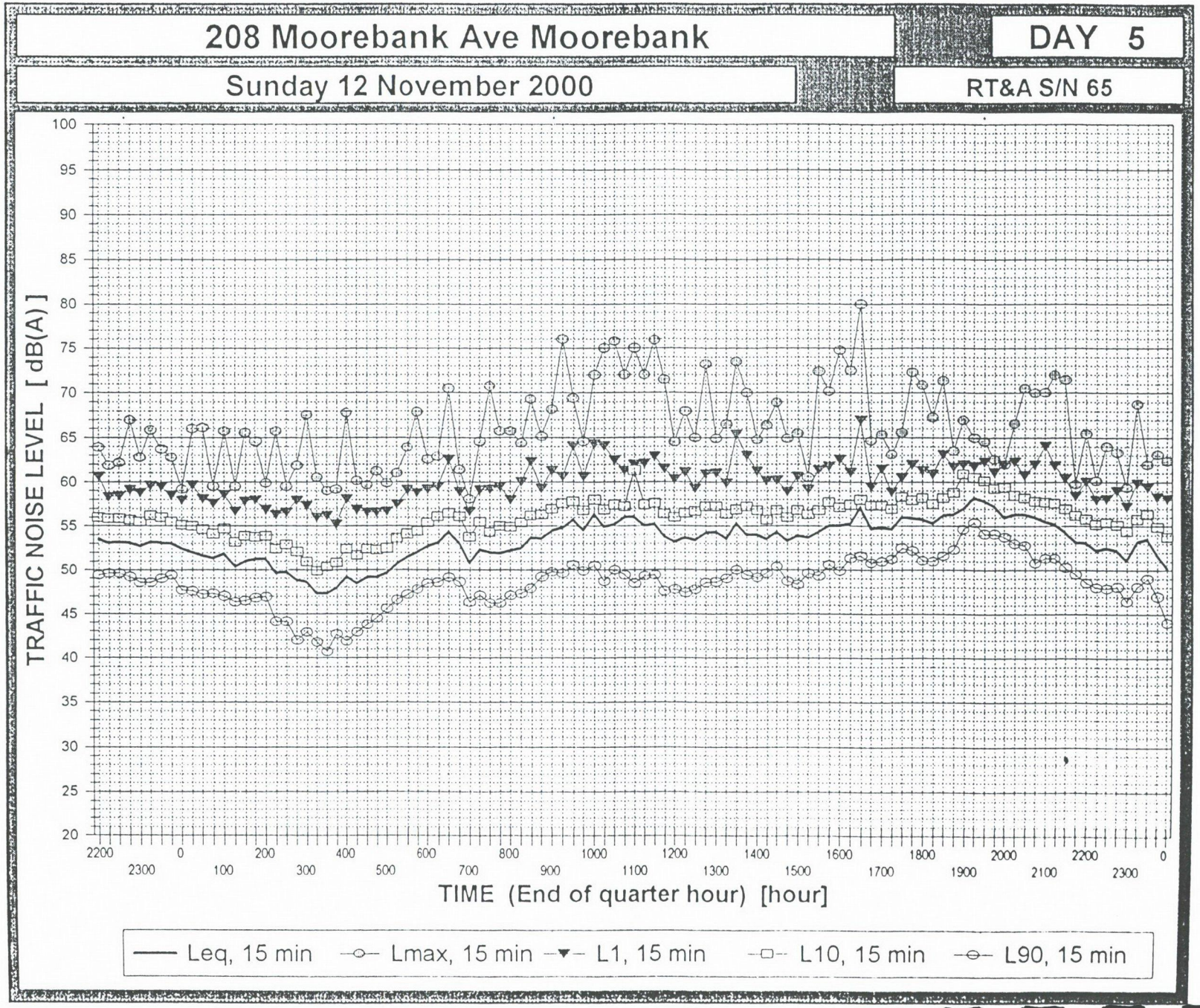
208 Moorebank Ave Moorebank

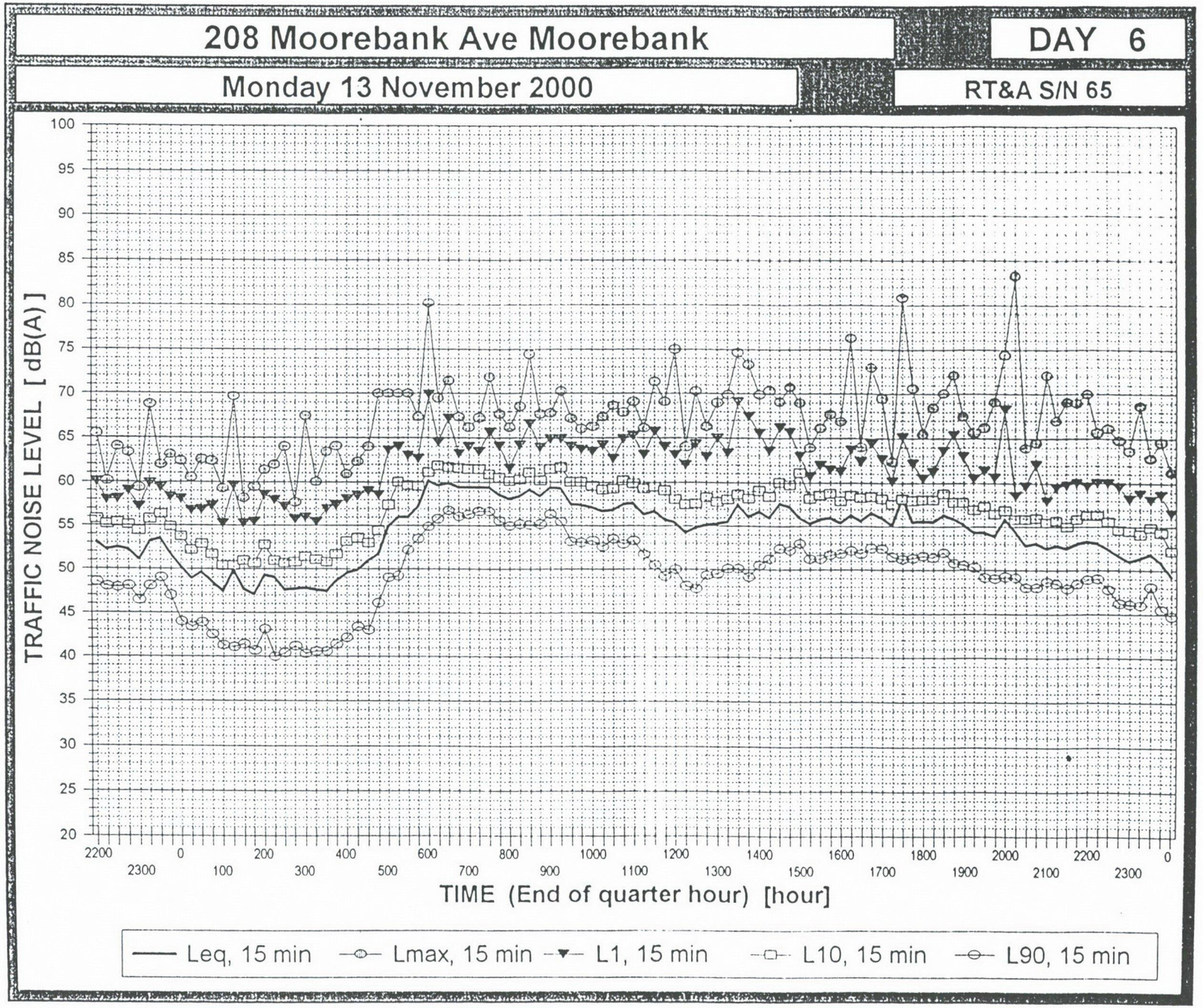
DAY 4

Saturday 11 November 2000

RT&A S/N 65




208 Moorebank Ave Moorebank
DAY 5
Sunday 12 November 2000
RT&A S/N 65
TRAFFIC NOISE LEVEL [dB(A)]
100
95
90
85
80
75
70
65
60
55
50
45
40
35
30
25
20
2200
2300
0
100
200
300
400
500
600
700
800
900
1000
1100
1200
1300
1400
1500
1600
1700
1800
1900
2000
2100
2200
2300
0
TIME (End of quarter hour) [hour]
Leq, 15 min
Lmax, 15 min
L1, 15 min
L10, 15 min
L90, 15 min

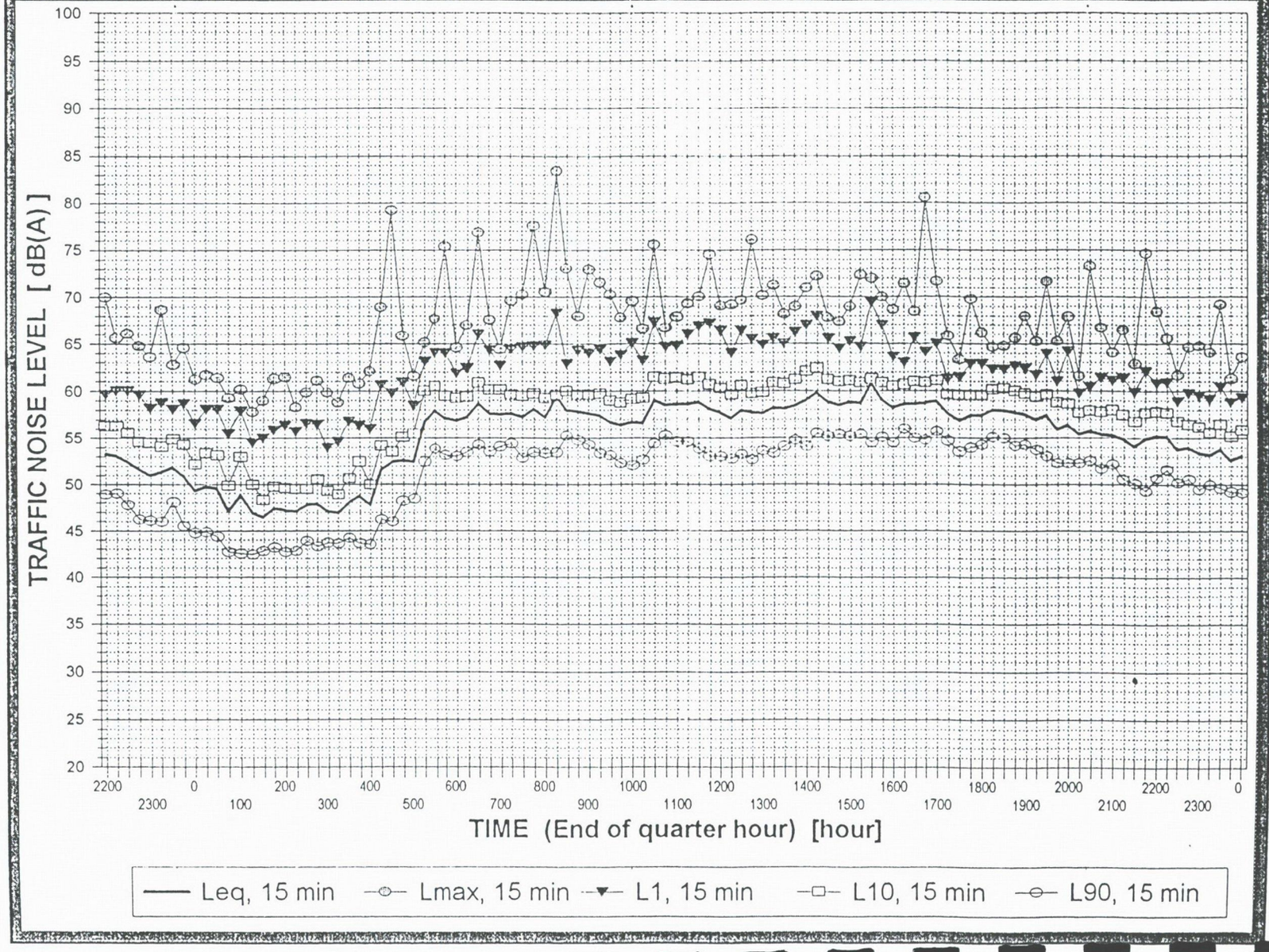

208 Moorebank Ave Moorebank
DAY 6
Monday 13 November 2000
RT&A S/N 65
TRAFFIC NOISE LEVEL [dB(A)]
100
95
90
85
80
75
70
65
60
55
50
45
40
35
30
25
20
2200
2300
0
100
200
300
400
500
600
700
800
900
1000
1100
1200
1300
1400
1500
1600
1700
1800
1900
2000
2100
2200
2300
0
TIME (End of quarter hour) [hour]
Leq, 15 min
Lmax, 15 min
L1, 15 min
L10, 15 min
L90, 15 min

208 Moorebank Ave Moorebank

DAY 7

Tuesday 14 November 2000

RT&A S/N 65



208 Moorebank Ave Moorebank											DAY 1
Wednesday 8 November 2000											RT&A S/N 65
YEAR	MoDy	TIME	Leq	Lmax	L1	L5	L10	L50	L90	Lmin	Lmax - Leq
2000	1107	2215	51.6	60.9	58.0	56.0	54.8	50.4	46.9	43.9	9.3
2000	1107	2230	51.8	66.6	60.1	55.8	54.4	49.7	46.5	43.1	14.8
2000	1107	2245	51.0	62.6	58.7	55.3	53.9	49.7	46.3	43.3	11.6
2000	1107	2300	52.5	72.6	60.8	56.9	55.4	50.3	46.9	44.1	20.1
2000	1107	2315	51.6	67.0	58.6	55.6	54.3	50.3	47.1	42.7	15.4
2000	1107	2330	51.7	61.9	58.7	55.9	54.6	50.6	47.1	44.2	10.2
2000	1107	2345	52.0	62.0	58.0	57.3	55.5	50.8	47.0	43.8	10.0
2000	1108	0	51.9	61.9	57.3	55.7	54.8	51.1	47.3	44.7	10.0
2000	1108	15	52.4	69.7	62.7	56.7	54.7	50.4	47.0	42.6	17.3
2000	1108	30	51.5	60.8	56.9	55.1	54.2	50.9	47.3	44.6	9.3
2000	1108	45	51.6	60.8	58.8	56.2	54.9	50.0	46.7	43.8	9.2
2000	1108	100	51.3	65.8	57.6	55.8	54.6	50.2	45.8	43.5	14.5
2000	1108	115	51.1	63.8	58.7	55.8	54.5	49.3	45.0	42.9	12.7
2000	1108	130	50.0	59.3	56.2	54.5	53.4	48.7	44.8	40.7	9.3
2000	1108	145	48.4	57.9	55.9	53.9	52.1	45.8	42.1	39.4	9.5
2000	1108	200	48.6	59.9	56.1	53.3	51.7	46.7	43.7	39.4	11.3
2000	1108	215	49.7	62.9	58.9	55.0	53.0	47.2	43.4	41.5	13.2
2000	1108	230	50.4	68.2	61.8	54.9	52.2	47.1	44.3	41.5	17.8
2000	1108	245	50.5	59.9	57.4	55.0	53.5	49.5	45.3	40.8	9.4
2000	1108	300	51.0	60.0	57.5	55.1	53.2	47.9	44.3	40.6	9.0
2000	1108	315	50.4	59.4	57.4	55.2	53.8	48.9	44.8	41.2	9.0
2000	1108	330	50.6	60.1	57.9	56.0	54.8	48.5	43.6	40.6	9.5
2000	1108	345	51.0	62.9	58.5	56.4	54.5	48.8	44.0	39.8	11.9
2000	1108	400	52.4	69.6	64.3	55.8	54.5	49.0	45.0	41.1	17.2
2000	1108	415	53.0	70.0	60.7	56.1	54.6	49.2	44.5	39.4	17.0
2000	1108	430	53.0	69.0	60.3	56.8	55.4	50.2	46.3	42.6	16.0
2000	1108	445	50.0	62.6	58.8	55.4	53.4	47.8	44.3	41.3	12.6
2000	1108	500	51.1	64.5	61.1	56.3	54.2	48.3	45.0	41.8	13.4
2000	1108	515	53.1	64.2	60.3	57.5	56.4	51.7	46.3	40.9	11.1
2000	1108	530	56.1	75.1	60.8	59.5	58.8	55.1	51.5	46.5	19.0
2000	1108	545	56.3	65.0	61.3	59.8	59.0	55.6	52.0	47.6	8.7
2000	1108	600	57.7	67.6	63.6	60.5	59.9	57.3	53.8	49.9	9.9
2000	1108	615	59.0	70.4	64.8	61.8	60.9	58.6	55.6	51.8	11.4
2000	1108	630	59.7	71.7	66.2	62.8	61.7	59.2	56.0	52.1	12.0
2000	1108	645	58.5	71.0	63.2	61.1	60.4	58.2	55.4	48.0	12.5
2000	1108	700	58.9	74.1	65.2	62.5	61.0	58.1	55.0	52.3	15.2
2000	1108	715	57.4	66.5	63.7	60.7	59.8	56.8	54.0	49.6	9.1
2000	1108	730	56.8	66.6	63.5	59.8	58.9	56.4	53.0	48.8	9.8
2000	1108	745	56.2	64.1	61.4	59.5	58.6	55.8	52.5	49.2	7.9
2000	1108	800	57.5	67.9	63.8	60.7	59.6	56.9	54.4	50.6	10.4
2000	1108	815	57.1	73.4	64.1	60.2	58.6	56.0	53.5	51.6	16.3
2000	1108	830	57.5	73.2	62.6	60.2	59.4	57.1	53.7	49.9	15.7
2000	1108	845	57.8	71.6	65.5	61.4	59.8	57.0	54.0	50.2	13.8
2000	1108	900	57.6	79.7	65.0	61.6	59.7	56.1	52.4	47.3	22.1
2000	1108	915	55.4	67.7	64.1	59.0	57.6	54.3	50.8	46.3	12.3
2000	1108	930	55.3	65.0	62.4	59.1	57.8	54.5	50.9	45.9	9.7
2000	1108	945	56.2	70.9	63.5	60.5	58.7	55.1	51.2	46.6	14.7
2000	1108	1000	55.2	66.6	63.9	59.5	57.8	53.7	50.4	47.0	11.4
2000	1108	1015	54.8	67.5	63.1	58.8	57.4	53.5	49.9	46.1	12.7
2000	1108	1030	56.3	77.7	65.9	61.5	59.1	53.2	48.4	42.3	21.4
2000	1108	1045	54.6	70.4	63.2	58.3	57.0	53.1	49.3	43.8	15.8
2000	1108	1100	54.7	71.5	62.6	59.2	57.3	52.5	48.5	45.7	16.8
2000	1108	1115	55.3	72.1	65.7	59.5	57.3	52.6	49.4	45.9	16.8
2000	1108	1130	54.7	67.5	63.0	59.0	57.6	53.3	49.1	44.3	12.8
2000	1108	1145	55.9	68.7	64.5	60.1	58.2	54.4	50.9	47.3	12.8
2000	1108	1200	54.0	63.7	61.2	58.4	56.8	52.8	48.9	46.4	9.7
2000	1108	1215	54.3	69.6	63.5	58.2	56.6	52.7	48.0	43.8	15.3
2000	1108	1230	54.7	72.2	65.2	58.6	57.1	52.5	48.4	44.1	17.5
2000	1108	1245	53.9	64.4	60.3	58.1	56.8	52.8	49.1	45.3	10.5
2000	1108	1300	56.8	76.0	67.6	61.8	58.9	53.2	48.9	44.9	19.2
2000	1108	1315	55.9	68.6	64.2	60.6	58.5	54.3	50.5	46.8	12.7
2000	1108	1330	55.3	68.1	64.3	59.4	57.7	53.8	50.2	47.2	12.8
2000	1108	1345	55.9	70.4	65.6	61.2	58.5	53.3	50.5	46.5	14.5
2000	1108	1400	55.2	70.1	64.5	60.0	57.8	53.0	49.6	46.0	14.9
2000	1108	1415	55.3	68.1	63.2	60.0	58.6	53.4	50.2	47.8	12.8
2000	1108	1430	55.1	69.0	63.3	58.9	57.2	53.7	50.8	47.7	13.9
2000	1108	1445	56.3	69.8	64.2	60.6	58.4	54.9	51.7	47.9	13.5
2000	1108	1500	56.8	69.1	65.8	61.0	58.7	55.4	52.7	49.2	12.3
2000	1108	1515	57.2	71.9	65.0	61.2	59.4	56.0	52.9	49.2	14.7
2000	1108	1530	56.0	68.7	62.6	59.0	58.0	55.3	52.6	47.9	12.7
2000	1108	1545	57.2	71.6	66.3	61.1	59.1	55.7	52.2	48.5	14.4
2000	1108	1600	56.4	65.6	62.9	60.2	58.9	55.7	52.5	49.4	9.2
2000	1108	1615	56.5	71.0	64.5	60.1	58.4	55.4	52.9	50.5	14.5
2000	1108	1630	55.9	70.7	64.2	59.7	58.1	54.6	51.8	48.6	14.8
2000	1108	1645	57.0	72.0	67.0	65.5	63.3	56.9	53.8	49.7	15.0
2000	1108	1700	57.0	72.0	67.2	62.3	60.9	57.5	54.3	51.3	15.0
2000	1108	1715	56.0	74.5	65.8	62.2	60.5	56.4	53.5	49.8	18.5
2000	1108	1730	56.2	72.9	62.8	58.8	57.8	55.5	53.5	50.6	16.7
2000	1108	1745	56.0	71.5	62.2	59.1	58.1	55.4	52.4	49.3	15.5
2000	1108	1800	56.6	76.4	62.4	59.1	58.2	55.8	53.6	50.1	19.8
2000	1108	1815	57.3	86.4	61.6	59.2	58.5	56.0	53.7	50.1	29.1
2000	1108	1830	56.6	68.1	61.6	59.7	58.8	56.1	53.3	48.8	11.5
2000	1108	1845	56.8	65.4	60.9	59.3	58.5	56.7	54.2	51.2	8.6
2000	1108	1900	56.9	66.6	61.3	59.8	59.1	56.6	53.9	50.4	9.7
2000	1108	1915	56.3	65.0	60.6	59.3	58.5	56.1	52.7	49.8	8.7
2000	1108	1930	56.3	64.7	60.9	59.5	58.8	55.8	52.4	49.1	8.4
2000	1108	1945	55.7	78.4	60.2	58.6	57.6	55.2	52.1	49.5	22.7
2000	1108	2000	55.2	72.1	59.5	58.0	57.3	54.9	51.9	49.8	16.9
2000	1108	2015	54.9	65.1	60.8	58.2	57.4	54.2	51.3	47.5	10.2
2000	1108	2030	55.0	65.0	60.0	59.8	57.8	54.8	52.3	48.8	10.0
2000	1108	2045	54.6	62.6	58.7	57.5	56.8	54.3	51.4	49.2	8.0
2000	1108	2100	55.1	69.6	61.5	57.9	57.0	54.6	51.7	48.9	14.5
2000	1108	2115	54.6	65.3	60.7	57.7	56.8	54.1	51.1	48.6	10.7
2000	1108	2130	53.8	59.9	57.9	56.8	56.2	53.3	50.4	47.6	6.1
2000	1108	2145	54.5	63.6	59.6	57.7	56.8	54.1	50.8	48.4	9.1
2000	1108	2200	53.4	62.7	58.5	56.7	55.8	53.0	49.9	47.2	9.3
2000	1108	2215	55.4	69.2	63.5	58.9	57.7	54.4	51.6	48.7	13.8
2000	1108	2230	54.7	65.5	60.8	57.8	57.0	54.0	51.1	48.1	10.8
2000	1108	2245	55.0	65.5	61.5	58.4	57.4	54.3	51.2	47.7	10.5
2000	1108	2300	55.7	68.2	61.6	59.1	58.3	55.0	51.8	47.3	12.5
2000	1108	2315	56.0	66.4	61.6	59.6	58.7	55.3	51.6	47.6	10.4
2000	1108	2330	56.8	73.2	68.1	59.7	58.5	54.7	51.0	47.5	16.4
2000	1108	2345	55.5	63.1	60.6	59.1	58.2	54.9	51.3	47.7	7.6
2000	1109	0	55.2	64.4	61.2	59.1	57.9	54.5	50.7	46.8	9.2

DAY 1	DESCRIPTOR	PERIOD	LEVEL	UNIT
Full Day	Leq, 24 hours	between 00:00 and 24:00 hours	55.5	dB(A)
Night Time	Leq, 8 hours	between 22:00 and 06:00 hours	52.1	dB(A)
Daytime	Leq, 15 hours	between 07:00 and 22:00 hours	56.0	dB(A)
Night Time	Leq, 9 hours	between 22:00 and 07:00 hours	53.8	dB(A)
Daytime	L10, 18 hours	between 06:00 and 24:00 hours	58.4	dB(A)
Daytime	minimum L90, 15 min	between 07:00 and 18:00 hours	48.0	dB(A)

208 Moorebank Ave Moorebank — DAY 2

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YEAR	MoDy	TIME	Leq	Lmax	L1	L5	L10	L50	L90	Lmin	Lmax - Leq
2000	1108	2200	53.4	62.7	58.5	56.7	55.6	53.0	49.9	47.2	9.3
2000	1108	2215	55.4	69.2	63.5	58.9	57.7	54.4	51.6	48.7	13.8
2000	1108	2230	54.7	65.5	60.8	57.8	57.0	54.0	51.1	48.1	10.8
2000	1108	2245	55.0	65.5	61.5	58.4	57.4	54.3	51.2	47.7	10.5
2000	1108	2300	55.7	68.2	61.6	58.1	58.3	55.0	51.8	47.3	12.5
2000	1108	2315	56.0	66.4	61.6	58.6	58.7	55.3	51.6	47.6	10.4
2000	1108	2330	56.8	73.2	68.1	59.7	58.5	54.7	51.0	47.5	16.4
2000	1108	2345	55.5	63.1	60.6	59.1	58.2	54.9	51.3	47.7	7.6
2000	1109	0	55.2	64.4	61.2	58.1	57.8	54.5	50.7	46.8	9.2
2000	1109	15	58.0	86.5	62.6	58.3	57.8	53.4	49.6	45.8	28.5
2000	1109	30	54.7	66.3	62.5	58.6	58.0	52.8	48.3	42.9	11.6
2000	1109	45	52.8	60.4	58.9	57.1	56.2	51.6	47.8	43.8	7.6
2000	1109	100	51.0	61.5	57.0	55.4	54.3	48.9	45.7	42.2	10.5
2000	1109	115	49.7	58.7	56.2	54.1	52.8	48.5	45.3	42.5	9.0
2000	1109	130	49.6	57.3	55.9	54.1	52.7	48.4	45.0	41.8	7.7
2000	1109	145	48.8	59.3	57.1	54.4	52.7	48.2	42.1	37.7	10.5
2000	1109	200	50.2	58.8	56.7	55.1	54.0	48.6	43.8	39.4	8.6
2000	1109	215	53.2	75.2	63.2	57.8	56.1	49.9	45.7	43.1	22.0
2000	1109	230	51.9	69.2	59.6	56.4	55.0	50.0	45.8	41.8	17.3
2000	1109	245	52.5	62.5	60.2	57.8	55.6	50.9	46.8	42.6	10.0
2000	1109	300	51.4	59.2	57.7	56.1	54.8	50.0	46.9	43.9	7.8
2000	1109	315	52.3	61.6	58.3	56.4	55.4	51.4	48.0	44.5	9.3
2000	1109	330	52.0	61.6	59.4	56.8	55.4	50.4	47.0	44.5	9.6
2000	1109	345	53.9	65.4	61.2	58.5	57.2	52.3	47.2	43.6	11.5
2000	1109	400	52.6	63.2	59.1	57.0	55.8	51.4	46.7	43.3	10.6
2000	1109	415	56.3	78.9	65.1	59.3	57.6	53.2	49.1	46.0	22.6
2000	1109	430	53.2	61.0	58.8	57.2	56.2	52.5	48.3	44.8	7.8
2000	1109	445	53.7	67.2	59.6	57.8	56.8	52.6	48.9	45.1	13.5
2000	1109	500	55.6	64.7	61.6	59.3	58.2	54.9	51.1	47.3	9.1
2000	1109	515	57.5	65.1	63.6	61.2	60.0	56.9	53.9	49.5	7.6
2000	1109	530	61.0	81.1	71.9	64.6	62.3	58.6	55.7	51.8	20.1
2000	1109	545	61.0	85.8	66.4	62.7	61.9	59.3	56.7	53.8	24.8
2000	1109	600	58.9	78.6	64.1	61.7	60.7	58.2	55.2	52.0	19.7
2000	1109	615	58.6	67.0	63.5	61.6	61.0	58.2	55.1	52.6	8.4
2000	1109	630	59.3	73.6	63.7	61.7	61.1	58.9	56.5	52.2	14.3
2000	1109	645	60.8	74.3	69.6	63.5	62.2	59.8	56.6	52.1	13.5
2000	1109	700	58.8	68.8	65.3	61.5	60.8	58.4	55.9	52.1	10.0
2000	1109	715	58.5	68.7	65.4	62.1	60.5	57.9	54.9	49.4	10.2
2000	1109	730	58.7	71.7	65.1	62.3	61.1	58.0	54.3	47.4	13.0
2000	1109	745	58.5	71.0	65.8	61.7	60.5	57.7	54.9	51.0	12.5
2000	1109	800	57.5	67.5	64.0	60.4	59.3	57.1	54.5	50.6	10.0
2000	1109	815	58.4	66.8	63.4	61.4	60.5	58.1	55.4	49.6	8.4
2000	1109	830	57.6	67.1	63.5	60.7	59.7	57.2	54.2	50.0	9.5
2000	1109	845	57.6	72.5	64.3	60.7	59.8	57.1	53.6	48.8	14.9
2000	1109	900	59.4	78.8	70.0	61.8	60.2	57.4	54.2	50.3	19.4
2000	1109	915	57.4	66.0	62.8	60.9	59.8	56.8	54.0	50.6	8.6
2000	1109	930	58.4	68.1	65.4	62.0	60.7	57.7	54.3	50.2	9.7
2000	1109	945	58.0	74.0	68.5	63.0	61.6	58.1	54.8	51.1	16.0
2000	1109	1000	57.0	74.0	67.6	62.3	60.4	57.8	55.1	51.1	17.0
2000	1109	1015	57.3	69.4	65.5	60.9	59.6	56.2	53.3	50.2	12.1
2000	1109	1030	57.2	67.7	63.1	60.4	59.6	56.6	53.2	49.7	10.5
2000	1109	1045	57.0	73.4	64.8	61.0	59.4	55.4	51.5	47.1	16.4
2000	1109	1100	55.5	65.4	61.6	58.9	58.0	54.9	51.6	48.4	9.9
2000	1109	1115	56.3	70.4	63.5	60.4	58.8	55.1	51.9	46.5	14.1
2000	1109	1130	56.3	67.2	64.4	60.8	59.0	55.0	51.5	48.5	10.9
2000	1109	1145	56.4	67.4	64.1	61.1	59.0	55.2	52.1	49.5	11.0
2000	1109	1200	57.0	67.1	64.0	61.7	59.9	56.0	52.1	47.2	10.1
2000	1109	1215	56.0	67.7	62.8	60.2	58.4	55.0	51.9	48.7	11.7
2000	1109	1230	56.2	72.7	63.5	59.8	58.7	55.1	52.0	48.6	16.5
2000	1109	1245	55.7	67.5	63.2	60.2	58.5	54.3	51.5	46.5	11.8
2000	1109	1300	55.9	65.8	63.1	59.9	58.1	55.1	52.1	48.3	9.9
2000	1109	1315	55.3	71.0	64.1	58.5	57.4	54.1	51.3	48.8	15.7
2000	1109	1330	56.1	66.6	62.2	59.8	58.6	55.3	52.3	48.5	10.5
2000	1109	1345	57.4	72.2	67.6	61.2	59.1	55.6	52.6	49.7	14.8
2000	1109	1400	56.8	67.9	63.9	59.9	58.7	55.8	53.2	50.2	11.3
2000	1109	1415	57.5	71.7	66.1	61.4	59.5	56.3	53.0	48.4	14.2
2000	1109	1430	58.0	72.0	67.0	64.1	61.3	57.1	54.3	51.6	14.0
2000	1109	1445	57.5	67.6	63.7	60.5	59.6	57.0	53.7	51.3	10.1
2000	1109	1500	57.5	69.0	65.2	61.7	59.6	56.4	53.8	50.8	11.5
2000	1109	1515	58.1	76.0	66.8	62.0	60.0	56.5	53.8	50.7	17.9
2000	1109	1530	57.6	68.7	63.4	60.7	59.7	57.2	54.1	51.3	11.1
2000	1109	1545	58.5	79.7	66.3	61.8	60.1	57.1	54.8	52.2	21.2
2000	1109	1600	58.2	78.2	65.9	61.1	59.7	57.0	54.3	51.3	20.0
2000	1109	1615	57.2	68.1	62.7	60.3	59.3	56.8	54.1	49.7	10.9
2000	1109	1630	58.0	69.0	65.6	61.5	59.9	56.7	54.2	50.9	11.0
2000	1109	1645	56.5	67.1	63.0	60.0	58.6	55.8	53.2	49.7	10.6
2000	1109	1700	56.7	64.0	61.2	59.6	59.0	56.5	53.5	50.3	7.3
2000	1109	1715	58.0	72.2	65.4	61.2	59.9	57.1	54.6	50.5	14.2
2000	1109	1730	57.2	70.4	61.3	59.6	59.0	56.9	55.0	51.2	13.2
2000	1109	1745	57.3	62.5	60.9	59.7	59.1	57.2	54.8	52.0	5.2
2000	1109	1800	57.4	64.8	61.4	60.2	59.5	57.1	54.6	51.4	7.4
2000	1109	1815	57.2	63.2	60.4	59.5	59.0	57.2	54.8	51.9	6.0
2000	1109	1830	57.7	65.9	61.5	60.0	59.5	57.6	55.3	52.1	8.2
2000	1109	1845	59.3	74.4	68.9	63.7	60.7	57.6	54.9	51.5	15.1
2000	1109	1900	56.9	69.0	61.6	59.4	58.8	56.7	53.7	50.8	12.1
2000	1109	1915	58.5	76.4	69.2	60.9	59.4	56.7	53.7	50.4	17.9
2000	1109	1930	56.2	64.9	60.7	59.1	58.3	55.9	53.2	50.4	8.7
2000	1109	1945	56.7	73.1	62.2	59.3	58.4	56.3	53.7	50.6	16.4
2000	1109	2000	56.5	61.9	60.3	59.4	58.8	56.3	53.5	50.6	5.4
2000	1109	2015	56.4	67.5	64.3	59.5	58.6	55.6	52.7	50.4	11.1
2000	1109	2030	59.0	86.3	63.0	59.0	58.3	55.6	52.6	48.5	27.3
2000	1109	2045	55.3	63.1	59.9	58.5	57.8	54.9	51.7	48.5	7.8
2000	1109	2100	54.5	62.0	58.7	57.4	56.7	54.3	51.4	48.7	7.5
2000	1109	2115	57.2	85.8	59.5	57.3	56.5	53.8	50.8	48.5	28.6
2000	1109	2130	55.9	63.1	60.7	59.2	58.2	55.5	52.8	50.1	7.2
2000	1109	2145	55.3	64.7	59.4	58.2	57.6	55.0	52.5	49.2	9.4
2000	1109	2200	55.3	62.7	59.4	58.0	57.4	55.1	52.2	49.3	7.4
2000	1109	2215	55.8	63.7	60.4	58.9	58.3	55.5	52.3	49.2	7.9
2000	1109	2230	57.1	83.1	60.6	59.0	58.3	55.7	52.5	48.4	26.0
2000	1109	2245	55.5	65.7	60.8	59.0	58.4	54.8	51.5	47.0	10.2
2000	1109	2300	56.0	66.0	61.0	60.0	58.3	55.1	51.9	49.0	10.0
2000	1109	2315	55.9	64.6	60.6	59.2	58.5	55.4	52.2	49.3	8.7
2000	1109	2330	56.0	67.0	61.0	59.7	58.7	55.6	52.2	49.1	11.0
2000	1109	2345	54.6	66.2	59.6	57.9	57.0	54.1	51.3	48.5	11.6

DAY 2	DESCRIPTOR	PERIOD	LEVEL	UNIT
Full Day	Leq, 24 hours	between 00:00 and 24:00 hours	56.9	dB(A)
Night Time	Leq, 8 hours	between 22:00 and 06:00 hours	55.0	dB(A)
Daytime	Leq, 15 hours	between 07:00 and 22:00 hours	57.3	dB(A)
Night Time	Leq, 9 hours	between 22:00 and 07:00 hours	55.9	dB(A)
Daytime	L10, 18 hours	between 06:00 and 24:00 hours	59.2	dB(A)
Daytime	minimum L90, 15 min	between 07:00 and 18:00 hours	51.3	dB(A)

208 Moorebank Ave Moorebank											DAY 3
Friday 10 November 2000											RT&A S/N 65
YEAR	MoDy	TIME	Leq	Lmax	L1	L5	L10	L50	L90	Lmin	Lmax - Leq
2000	1109	2215	55.8	63.7	60.4	58.9	58.3	55.5	52.3	49.2	7.9
2000	1109	2230	57.1	83.1	60.6	59.0	58.3	55.7	52.5	48.4	26.0
2000	1109	2245	55.5	65.7	60.8	59.0	58.4	54.8	51.5	47.0	10.2
2000	1109	2300	56.0	66.0	61.0	60.0	58.3	55.1	51.9	49.0	10.0
2000	1109	2315	55.9	64.6	60.6	59.2	58.5	55.4	52.2	49.3	8.7
2000	1109	2330	56.0	67.0	61.0	59.7	58.7	55.6	52.2	49.1	11.0
2000	1109	2345	54.6	66.2	59.6	57.9	57.0	54.1	51.3	48.5	11.6
2000	1110	0	54.5	63.2	59.8	58.0	57.2	53.9	50.3	47.1	8.7
2000	1110	15	53.5	60.6	57.5	56.3	55.7	53.2	50.5	47.2	7.1
2000	1110	30	53.1	62.5	58.5	56.6	55.6	52.3	49.9	47.4	9.4
2000	1110	45	54.9	84.1	58.1	56.5	55.5	52.1	49.3	45.4	29.2
2000	1110	100	51.8	60.1	57.4	55.8	54.8	51.0	47.2	43.5	8.3
2000	1110	115	52.9	65.4	61.7	58.0	55.7	50.8	47.5	44.1	12.5
2000	1110	130	50.1	65.9	56.8	54.0	52.8	48.6	45.4	42.7	15.8
2000	1110	145	50.7	63.1	57.5	55.3	53.9	49.3	45.5	41.6	12.4
2000	1110	200	49.5	61.3	56.7	53.9	52.4	48.3	44.9	40.7	11.8
2000	1110	215	50.2	60.2	57.6	55.6	53.9	48.3	44.8	41.8	10.0
2000	1110	230	48.2	61.3	55.2	52.7	51.4	46.7	42.9	40.1	13.1
2000	1110	245	48.9	59.2	56.9	53.9	52.0	47.1	43.4	41.1	10.3
2000	1110	300	48.6	58.7	55.7	53.5	52.4	46.6	43.2	40.5	10.1
2000	1110	315	48.5	62.9	56.4	53.5	51.5	46.8	42.9	40.6	14.4
2000	1110	330	50.5	59.8	57.5	55.2	53.8	49.1	45.5	43.1	9.3
2000	1110	345	51.1	63.4	59.4	56.2	54.8	48.6	44.6	40.7	12.3
2000	1110	400	50.1	58.0	56.3	54.4	53.4	48.9	44.7	40.7	7.9
2000	1110	415	51.9	68.4	59.3	55.9	54.7	50.5	46.2	42.0	14.5
2000	1110	430	53.7	68.1	60.5	57.0	55.9	52.7	49.7	45.7	14.4
2000	1110	445	55.1	65.2	62.6	60.1	58.3	53.6	49.4	44.4	10.1
2000	1110	500	56.6	80.8	62.9	59.6	58.5	54.8	51.2	47.1	24.2
2000	1110	515	56.3	69.6	64.8	60.4	58.6	54.9	51.7	48.1	13.3
2000	1110	530	57.3	73.2	63.7	59.9	59.0	56.1	53.3	49.3	15.9
2000	1110	545	58.0	67.2	63.8	61.2	60.4	57.4	54.4	49.9	9.2
2000	1110	600	58.5	68.9	63.4	61.5	60.6	58.2	54.8	51.7	10.4
2000	1110	615	58.5	68.5	63.8	61.7	60.8	57.9	55.1	52.3	10.0
2000	1110	630	58.3	73.9	62.9	61.1	60.4	57.9	55.2	50.6	15.6
2000	1110	645	58.3	71.8	65.3	61.1	60.1	57.8	54.8	51.4	13.5
2000	1110	700	57.6	68.4	63.6	60.9	59.9	57.1	54.1	50.0	10.8
2000	1110	715	58.2	72.0	67.3	61.7	59.8	57.1	53.7	49.6	13.8
2000	1110	730	57.5	68.0	63.3	60.3	59.3	57.1	54.6	50.7	10.5
2000	1110	745	57.1	67.4	63.1	60.3	59.1	56.6	54.2	49.4	10.3
2000	1110	800	56.5	68.1	62.6	59.9	58.6	56.0	53.2	48.6	11.6
2000	1110	815	56.8	66.7	63.0	60.1	59.0	56.2	53.3	49.6	9.9
2000	1110	830	57.0	76.5	64.1	60.0	58.8	56.4	53.3	48.6	19.5
2000	1110	845	56.7	67.3	64.3	59.3	58.6	56.3	52.6	48.5	10.6
2000	1110	900	56.2	67.4	62.4	59.5	58.6	55.7	50.6	46.5	11.2
2000	1110	915	57.1	72.1	65.3	60.8	59.4	55.9	52.7	48.9	15.0
2000	1110	930	55.3	64.2	61.7	59.3	57.9	54.6	51.0	46.1	8.9
2000	1110	945	56.4	70.8	65.5	60.4	58.8	55.0	51.0	46.6	14.4
2000	1110	1000	56.6	68.5	65.1	61.8	59.5	54.8	51.4	48.8	11.9
2000	1110	1015	55.1	66.8	62.2	58.8	57.6	53.9	51.0	46.8	11.7
2000	1110	1030	57.0	67.0	63.6	60.2	59.1	56.2	53.5	50.6	10.0
2000	1110	1045	57.3	70.0	65.2	60.7	59.6	56.4	53.0	49.1	12.7
2000	1110	1100	57.1	69.3	64.6	61.1	59.8	56.0	51.7	47.9	12.2
2000	1110	1115	57.2	76.9	66.2	61.3	59.3	54.8	51.4	47.3	19.7
2000	1110	1130	57.3	71.8	67.3	61.7	59.3	55.4	51.7	47.7	14.5
2000	1110	1145	56.9	74.3	64.6	60.8	59.1	55.6	52.6	48.7	17.4
2000	1110	1200	57.2	68.1	63.7	60.9	59.6	56.5	53.2	50.4	10.9
2000	1110	1215	57.5	69.0	65.2	61.0	59.7	56.6	53.7	49.7	11.5
2000	1110	1230	57.1	68.1	65.5	62.1	59.7	55.4	52.4	49.3	11.0
2000	1110	1245	56.8	71.2	65.4	60.1	58.7	55.6	52.4	49.1	14.4
2000	1110	1300	56.0	68.0	64.2	60.6	58.4	54.4	51.5	48.7	12.0
2000	1110	1315	56.5	70.2	63.1	59.7	58.8	55.5	52.5	49.9	13.7
2000	1110	1330	56.7	74.6	65.1	60.2	58.1	54.6	51.3	48.2	17.9
2000	1110	1345	56.4	69.7	64.6	60.0	58.4	55.1	52.0	48.3	13.3
2000	1110	1400	56.9	67.1	64.9	61.4	59.4	55.5	52.2	49.6	10.2
2000	1110	1415	56.0	66.8	62.9	59.6	58.2	55.3	52.8	49.6	10.8
2000	1110	1430	57.3	72.9	66.3	61.0	59.8	55.6	52.9	49.4	15.6
2000	1110	1445	56.8	78.8	64.6	60.4	58.5	55.2	52.3	48.2	22.0
2000	1110	1500	56.6	68.8	65.0	60.0	58.5	55.7	52.6	49.0	12.2
2000	1110	1515	58.4	83.8	65.0	61.2	59.1	55.9	53.6	49.7	25.4
2000	1110	1530	57.0	70.2	64.9	60.9	59.2	55.9	53.7	51.0	13.2
2000	1110	1545	59.3	79.5	68.1	63.2	61.3	57.0	54.3	51.5	20.2
2000	1110	1600	58.0	79.0	68.0	65.9	60.5	55.7	52.9	48.1	21.0
2000	1110	1615	56.2	69.3	63.1	59.5	58.2	55.4	52.6	49.1	13.1
2000	1110	1630	56.7	76.6	63.8	59.3	58.1	55.5	52.9	49.2	19.9
2000	1110	1645	57.1	74.1	64.7	60.6	58.7	55.8	53.3	49.9	17.0
2000	1110	1700	56.7	69.2	62.1	59.7	58.8	56.1	53.2	49.2	12.5
2000	1110	1715	55.9	67.3	62.8	59.0	58.1	55.4	52.6	48.9	11.4
2000	1110	1730	56.1	66.0	61.1	59.0	58.2	55.7	52.9	49.1	9.9
2000	1110	1745	57.0	70.9	65.6	60.4	58.7	55.7	53.5	49.8	13.9
2000	1110	1800	58.4	76.2	65.0	60.4	58.6	56.2	53.7	50.1	17.8
2000	1110	1815	57.6	72.0	64.2	60.5	59.2	56.5	54.0	51.5	14.4
2000	1110	1830	56.7	62.0	60.3	59.1	58.5	56.6	54.6	51.6	5.3
2000	1110	1845	57.1	73.8	62.4	59.5	58.8	56.5	53.8	51.1	16.7
2000	1110	1900	56.6	66.1	61.3	59.4	58.7	56.4	53.3	50.0	9.5
2000	1110	1915	56.0	67.7	60.5	59.0	58.4	55.7	52.4	48.8	11.7
2000	1110	1930	57.3	74.2	64.5	59.8	59.0	56.3	53.1	50.3	16.9
2000	1110	1945	56.5	68.6	63.1	59.6	58.5	55.9	52.8	49.6	12.1
2000	1110	2000	56.0	66.7	62.1	59.1	58.1	55.7	52.6	50.2	10.7
2000	1110	2015	55.9	64.9	60.6	58.6	58.0	55.8	52.7	49.5	9.0
2000	1110	2030	54.9	69.8	59.5	57.9	57.2	54.4	51.7	49.0	14.9
2000	1110	2045	55.1	66.3	61.2	58.4	57.6	54.3	51.1	48.6	11.2
2000	1110	2100	54.7	75.1	59.9	57.2	56.3	53.6	50.3	47.3	20.4
2000	1110	2115	55.0	74.0	62.0	57.9	56.8	53.8	50.7	48.1	19.0
2000	1110	2130	54.9	68.6	62.2	58.2	57.1	53.9	50.5	47.5	13.7
2000	1110	2145	56.6	70.0	62.0	58.0	56.3	52.8	49.2	45.6	13.4
2000	1110	2200	53.2	67.9	58.9	57.0	56.1	52.0	48.5	45.0	14.7
2000	1110	2215	53.0	75.0	59.0	59.7	56.9	52.5	48.9	44.5	22.0
2000	1110	2230	53.5	75.6	58.4	56.8	55.9	52.2	49.0	46.7	22.1
2000	1110	2245	53.4	63.8	59.5	57.0	56.0	52.6	49.3	45.8	10.4
2000	1110	2300	52.8	62.9	59.2	56.4	55.3	52.0	48.8	46.2	10.1
2000	1110	2315	52.9	64.3	61.1	56.7	55.5	51.6	48.7	45.2	11.4
2000	1110	2330	52.4	63.6	58.4	56.3	55.3	51.6	47.8	45.0	11.2
2000	1110	2345	52.4	61.7	59.2	56.9	55.3	51.3	48.5	45.8	9.3
2000	1111	0	52.3	62.9	58.2	56.0	54.9	51.3	48.2	44.8	10.6

DAY 3	DESCRIPTOR	PERIOD	LEVEL	UNIT
Full Day	Leq, 24 hours	between 00:00 and 24:00 hours	56.0	dB(A)
Night Time	Leq, 8 hours	between 22:00 and 06:00 hours	54.2	dB(A)
Daytime	Leq, 15 hours	between 07:00 and 22:00 hours	56.7	dB(A)
Night Time	Leq, 9 hours	between 22:00 and 07:00 hours	54.9	dB(A)
Daytime	L10, 18 hours	between 06:00 and 24:00 hours	58.4	dB(A)
Daytime	minimum L90, 15 min	between 07:00 and 18:00 hours	50.6	dB(A)

208 Moorebank Ave Moorebank											DAY 4
Saturday 11 November 2000											RT&A S/N 65
YEAR	MoDy	TIME	Leq	Lmax	L1	L5	L10	L50	L90	Lmin	Lmax - Leq
2000	1110	2215	53.0	75.0	59.0	59.7	56.9	52.5	48.9	44.5	22.0
2000	1110	2230	53.5	75.6	58.4	56.8	55.9	52.2	49.0	46.7	22.1
2000	1110	2245	53.4	63.8	59.5	57.0	56.0	52.6	49.3	45.8	10.4
2000	1110	2300	52.8	62.9	59.2	56.4	55.3	52.0	48.8	46.2	10.1
2000	1110	2315	52.9	64.3	61.1	56.7	55.5	51.6	48.7	45.2	11.4
2000	1110	2330	52.4	63.6	58.4	56.3	55.3	51.6	47.8	45.0	11.2
2000	1110	2345	52.4	61.7	59.2	56.9	55.3	51.3	48.5	45.8	9.3
2000	1111	0	52.3	62.9	58.2	56.0	54.9	51.3	48.2	44.8	10.6
2000	1111	15	53.5	70.5	61.3	56.7	55.6	52.2	48.8	46.3	17.0
2000	1111	30	52.4	61.6	58.1	56.3	55.1	51.7	48.4	46.1	9.2
2000	1111	45	52.2	61.0	57.6	56.0	55.0	51.4	48.2	45.3	8.8
2000	1111	100	52.8	60.8	58.4	56.5	55.6	52.0	49.1	46.1	8.0
2000	1111	115	51.1	59.6	56.7	54.8	53.7	50.4	47.4	44.6	8.5
2000	1111	130	52.0	62.5	57.9	55.8	54.5	51.1	48.3	46.1	10.5
2000	1111	145	53.0	69.2	60.1	56.5	55.4	51.7	48.7	46.6	16.2
2000	1111	200	53.7	76.9	61.3	56.4	55.2	51.8	49.0	47.0	23.2
2000	1111	215	52.1	64.3	57.9	56.1	55.1	50.9	48.0	44.9	12.2
2000	1111	230	50.7	67.2	57.4	54.7	52.9	49.1	46.3	43.8	16.5
2000	1111	245	50.0	66.0	57.5	55.1	53.9	49.7	46.3	43.9	16.0
2000	1111	300	50.0	66.3	56.9	54.0	52.6	48.7	46.3	43.6	16.3
2000	1111	315	50.4	66.7	57.1	54.6	53.1	48.9	45.8	43.8	16.3
2000	1111	330	51.0	66.0	58.0	56.3	54.3	49.7	46.6	43.7	15.0
2000	1111	345	51.4	61.0	58.3	55.9	54.4	50.2	46.8	44.2	9.6
2000	1111	400	50.6	58.4	56.7	55.1	53.8	49.3	46.2	43.7	7.8
2000	1111	415	49.5	60.9	57.1	53.8	52.0	48.0	45.3	43.1	11.4
2000	1111	430	50.4	62.9	57.8	55.1	53.7	48.5	45.3	42.6	12.5
2000	1111	445	51.5	61.7	57.9	56.1	54.6	50.3	46.5	42.8	10.2
2000	1111	500	52.0	65.1	58.5	56.2	54.8	50.7	47.5	44.8	13.1
2000	1111	515	53.5	64.3	59.3	57.2	56.2	52.7	49.1	45.3	10.8
2000	1111	530	54.2	64.5	60.6	58.4	57.1	53.3	50.2	46.6	10.3
2000	1111	545	54.6	68.9	59.8	57.6	56.9	54.1	51.2	48.2	14.3
2000	1111	600	55.5	63.5	60.1	58.8	57.9	55.0	52.4	48.8	8.0
2000	1111	615	55.7	67.7	60.6	58.7	58.0	55.3	52.4	47.9	12.0
2000	1111	630	55.6	68.2	61.3	59.0	58.0	54.9	51.6	48.2	12.6
2000	1111	645	55.7	65.5	61.8	58.9	58.2	55.1	51.9	47.0	9.8
2000	1111	700	55.9	70.1	65.6	59.5	57.9	54.5	51.3	47.3	14.2
2000	1111	715	53.7	66.1	60.5	57.9	56.5	52.5	48.8	44.6	12.4
2000	1111	730	55.1	73.1	65.5	58.5	56.9	52.9	49.0	46.1	18.0
2000	1111	745	54.0	67.0	62.1	57.5	56.7	53.0	49.1	44.7	13.0
2000	1111	800	55.7	68.2	62.8	59.2	58.0	55.0	51.5	46.6	12.5
2000	1111	815	56.1	67.8	63.0	59.4	58.5	55.5	51.9	48.9	11.7
2000	1111	830	57.4	70.9	67.1	60.4	58.8	56.1	53.3	50.3	13.5
2000	1111	845	56.6	70.3	63.0	59.5	58.6	55.9	53.2	50.1	13.7
2000	1111	900	56.0	67.7	63.4	59.1	58.1	55.3	52.4	48.6	11.7
2000	1111	915	56.7	69.0	62.9	59.8	58.8	56.3	53.2	49.4	12.3
2000	1111	930	56.4	69.5	62.0	59.6	58.7	55.6	52.3	47.7	13.1
2000	1111	945	56.3	69.9	61.8	59.1	58.4	55.8	52.0	49.5	13.6
2000	1111	1000	55.9	68.1	61.2	59.2	58.4	55.3	52.2	48.2	12.2
2000	1111	1015	57.0	67.6	65.0	60.5	59.4	56.2	53.0	50.3	10.6
2000	1111	1030	57.0	69.0	65.0	71.3	59.0	59.8	53.0	52.8	12.0
2000	1111	1045	57.2	69.8	64.0	60.6	59.5	56.3	53.4	50.5	12.6
2000	1111	1100	56.6	62.7	60.6	59.3	58.6	56.6	53.6	49.8	6.1
2000	1111	1115	56.7	65.5	61.1	59.7	58.9	56.6	53.0	50.0	8.8
2000	1111	1130	57.0	77.0	64.0	64.6	60.0	59.8	53.0	51.3	20.0
2000	1111	1145	57.0	77.2	64.0	64.7	60.3	55.7	52.6	49.8	20.2
2000	1111	1200	56.6	68.8	63.6	59.7	58.5	56.0	52.9	49.1	12.2
2000	1111	1215	56.8	66.4	62.2	60.2	59.1	56.2	53.5	50.8	9.6
2000	1111	1230	58.2	73.6	66.1	61.0	59.9	57.3	54.2	49.5	15.4
2000	1111	1245	57.8	68.8	63.1	60.3	59.7	57.6	54.2	49.9	11.0
2000	1111	1300	57.4	71.5	63.4	60.2	59.5	57.1	53.2	50.1	14.1
2000	1111	1315	57.5	74.4	66.2	60.5	59.3	56.3	53.1	50.3	16.9
2000	1111	1330	57.3	71.5	62.7	59.9	59.1	56.7	53.9	49.2	14.2
2000	1111	1345	56.4	76.0	60.5	59.2	58.5	56.1	52.9	49.5	19.6
2000	1111	1400	57.6	68.1	62.8	60.9	60.1	57.2	53.9	50.8	10.5
2000	1111	1415	57.3	68.4	63.5	60.0	59.4	56.9	54.0	50.7	11.1
2000	1111	1430	57.0	66.5	62.1	60.0	59.3	56.7	53.1	48.6	9.5
2000	1111	1445	57.0	65.7	63.0	60.3	59.5	56.4	52.7	50.0	8.7
2000	1111	1500	57.3	66.4	63.5	60.3	59.5	57.0	53.4	50.1	9.1
2000	1111	1515	56.5	64.8	62.3	60.0	58.9	55.9	53.1	49.9	8.3
2000	1111	1530	56.9	72.6	61.5	59.7	58.8	56.2	53.0	50.3	15.7
2000	1111	1545	56.8	69.7	64.3	59.9	58.8	56.0	53.4	49.6	12.9
2000	1111	1600	58.0	74.6	67.8	60.6	59.5	56.4	53.2	50.2	16.6
2000	1111	1615	57.9	71.0	64.3	61.0	60.0	57.4	53.7	50.0	13.1
2000	1111	1630	57.9	72.9	67.5	61.1	59.4	56.4	53.3	49.3	15.0
2000	1111	1645	56.3	65.5	60.3	59.0	58.3	56.0	53.5	50.1	9.2
2000	1111	1700	56.9	71.0	62.0	59.7	59.0	56.6	53.2	49.1	14.1
2000	1111	1715	56.6	62.7	60.8	59.6	58.9	56.5	52.9	49.4	6.1
2000	1111	1730	57.3	71.0	64.7	60.2	59.3	56.4	53.5	50.2	13.7
2000	1111	1745	57.4	67.3	62.4	59.9	59.2	57.2	54.3	51.5	9.9
2000	1111	1800	56.2	66.6	61.1	59.3	58.5	55.9	52.3	49.5	10.4
2000	1111	1815	56.9	65.4	60.9	59.7	59.0	56.7	53.6	50.8	8.5
2000	1111	1830	56.4	64.5	60.4	59.3	58.7	56.2	52.7	48.7	8.1
2000	1111	1845	56.6	66.2	61.1	59.5	58.8	56.3	53.1	49.8	9.6
2000	1111	1900	56.4	66.1	61.2	59.2	58.7	55.9	53.0	49.7	9.7
2000	1111	1915	55.6	64.9	59.7	58.7	57.9	55.2	52.5	49.8	9.3
2000	1111	1930	55.3	67.9	60.8	58.1	57.3	54.9	51.7	49.2	12.6
2000	1111	1945	55.0	72.2	60.2	57.9	57.1	54.5	51.2	48.3	17.2
2000	1111	2000	54.8	61.8	59.4	57.7	57.0	54.5	51.7	48.4	7.0
2000	1111	2015	54.0	67.5	59.6	57.5	56.5	53.2	50.2	47.3	13.5
2000	1111	2030	54.2	70.8	63.2	57.2	56.1	53.1	49.7	45.4	16.6
2000	1111	2045	53.6	62.9	59.7	57.3	56.3	52.9	49.4	46.0	9.3
2000	1111	2100	53.2	67.4	59.1	56.7	55.7	52.4	49.0	47.1	14.2
2000	1111	2115	53.3	63.8	58.7	56.9	56.1	52.2	49.5	47.5	10.5
2000	1111	2130	53.0	65.5	58.0	56.4	55.5	52.3	48.9	46.6	12.5
2000	1111	2145	53.1	64.6	60.1	56.8	55.7	52.1	48.6	44.1	11.5
2000	1111	2200	53.5	63.9	60.6	57.6	56.0	52.5	49.4	46.5	10.4
2000	1111	2215	53.1	61.9	58.3	56.7	55.9	52.5	49.6	47.0	8.8
2000	1111	2230	53.2	62.2	58.4	56.8	55.9	52.4	49.6	46.6	9.0
2000	1111	2245	53.1	67.0	59.1	56.7	55.7	52.2	49.2	46.1	13.9
2000	1111	2300	52.7	62.8	58.8	56.8	55.5	51.8	48.5	45.9	10.1
2000	1111	2315	53.2	65.9	59.6	57.2	56.2	52.1	48.5	45.3	12.7
2000	1111	2330	53.1	63.7	59.5	57.1	56.0	52.0	49.0	45.6	10.6
2000	1111	2345	53.0	62.8	58.5	56.3	55.5	52.4	49.4	46.9	9.8
2000	1112	0	52.4	59.2	57.9	56.2	55.1	51.6	47.7	43.7	6.8

DAY 4	DESCRIPTOR	PERIOD	LEVEL	UNIT
Full Day	Leq, 24 hours	between 00:00 and 24:00 hours	55.4	dB(A)
Night Time	Leq, 8 hours	between 22:00 and 06:00 hours	52.3	dB(A)
Daytime	Leq, 15 hours	between 07:00 and 22:00 hours	56.4	dB(A)
Night Time	Leq, 9 hours	between 22:00 and 07:00 hours	53.0	dB(A)
Daytime	L10, 18 hours	between 06:00 and 24:00 hours	58.1	dB(A)
Daytime	minimum L90, 15 min	between 07:00 and 18:00 hours	48.8	dB(A)

208 Moorebank Ave Moorebank											DAY 5
Sunday 12 November 2000											RT&A S/N 65
YEAR	MoDy	TIME	Leq	Lmax	L1	L5	L10	L50	L90	Lmin	Lmax - Leq
2000	1111	2215	53.1	61.9	58.3	56.7	55.9	52.5	49.6	47.0	8.8
2000	1111	2230	53.2	62.2	58.4	56.8	55.9	52.4	49.6	46.6	9.0
2000	1111	2245	53.1	67.0	59.1	56.7	55.7	52.2	49.2	46.1	13.9
2000	1111	2300	52.7	62.8	58.8	56.8	55.5	51.8	48.5	45.9	10.1
2000	1111	2315	53.2	65.9	59.6	57.2	56.2	52.1	48.5	45.3	12.7
2000	1111	2330	53.1	63.7	59.5	57.1	56.0	52.0	49.0	45.6	10.6
2000	1111	2345	53.0	62.8	58.5	56.3	55.5	52.4	49.4	46.9	9.8
2000	1112	0	52.4	59.2	57.9	56.2	55.1	51.6	47.7	43.7	6.8
2000	1112	15	52.0	66.0	59.7	56.2	55.0	51.2	47.6	43.9	14.0
2000	1112	30	51.6	66.1	58.1	55.8	54.6	50.2	47.2	43.9	14.5
2000	1112	45	51.3	59.5	57.6	55.4	54.1	50.3	47.3	44.6	8.2
2000	1112	100	51.8	65.8	58.6	55.9	54.7	50.6	47.0	43.0	14.0
2000	1112	115	50.4	59.5	56.7	54.3	53.2	49.4	46.3	43.6	9.1
2000	1112	130	51.0	65.6	57.8	55.3	53.9	49.6	46.5	43.6	14.6
2000	1112	145	51.2	64.6	58.0	55.3	53.8	49.7	46.8	44.4	13.4
2000	1112	200	51.2	59.9	56.9	54.8	53.9	50.6	46.9	42.3	8.7
2000	1112	215	49.6	65.8	56.3	53.9	52.4	47.8	44.1	40.5	16.2
2000	1112	230	49.7	59.5	56.6	54.6	52.9	48.2	44.1	40.2	9.8
2000	1112	245	48.8	61.9	57.9	53.8	52.1	46.5	42.0	39.5	13.1
2000	1112	300	48.6	67.6	57.3	52.9	51.0	46.6	42.9	39.4	19.0
2000	1112	315	47.3	60.5	56.0	52.0	49.9	45.7	41.8	38.8	13.2
2000	1112	330	47.3	59.0	56.2	52.4	50.4	45.1	40.7	38.1	11.7
2000	1112	345	47.9	59.2	55.2	52.9	50.9	46.4	42.7	38.7	11.3
2000	1112	400	49.2	67.8	58.1	54.3	52.4	45.0	41.9	40.2	18.6
2000	1112	415	48.4	60.1	56.9	53.8	51.7	46.0	42.9	40.0	11.7
2000	1112	430	49.1	59.7	56.6	53.8	52.4	47.5	43.8	40.5	10.6
2000	1112	445	49.1	61.2	56.6	53.6	52.3	47.6	44.5	41.7	12.1
2000	1112	500	49.6	59.9	56.7	53.8	52.5	48.3	45.6	42.4	10.3
2000	1112	515	50.7	61.0	57.5	55.1	53.7	49.6	46.6	44.5	10.3
2000	1112	530	51.5	63.9	59.1	55.4	54.1	50.3	47.2	44.3	12.4
2000	1112	545	52.0	67.9	58.8	55.5	54.4	50.7	47.8	44.3	15.9
2000	1112	600	52.7	62.6	59.2	56.5	55.4	51.9	48.4	45.1	9.9
2000	1112	615	53.1	62.9	59.5	57.1	56.1	52.0	48.5	45.2	9.8
2000	1112	630	54.3	70.5	62.6	57.5	56.5	52.9	49.1	44.8	16.2
2000	1112	645	53.0	61.4	58.9	57.1	56.1	52.1	48.6	44.2	8.4
2000	1112	700	50.8	58.1	56.7	55.0	53.8	49.8	46.3	42.5	7.3
2000	1112	715	52.3	64.6	59.1	56.5	55.5	51.0	47.1	42.6	12.3
2000	1112	730	52.0	70.8	59.2	55.9	54.3	50.6	46.2	41.8	18.8
2000	1112	745	51.9	65.8	59.5	56.2	55.0	50.2	46.2	41.5	13.9
2000	1112	800	52.2	65.8	58.0	56.0	54.9	51.2	47.1	44.0	13.6
2000	1112	815	52.5	64.4	60.0	56.7	55.4	51.1	47.3	41.9	11.9
2000	1112	830	53.7	69.3	62.3	57.7	56.2	51.8	47.9	43.0	15.6
2000	1112	845	53.6	65.2	59.3	57.3	56.3	52.9	49.2	44.8	11.6
2000	1112	900	54.4	68.2	61.3	58.3	57.0	53.3	49.8	46.0	13.8
2000	1112	915	54.8	76.0	60.6	58.5	57.6	53.3	49.6	46.0	21.2
2000	1112	930	55.7	69.4	64.1	59.1	57.8	54.3	50.6	46.0	13.7
2000	1112	945	54.5	64.6	60.6	57.6	56.8	53.9	49.9	45.1	10.1
2000	1112	1000	56.4	72.0	64.3	59.1	58.0	54.9	50.5	45.2	15.6
2000	1112	1015	54.9	75.0	64.1	58.1	56.9	53.0	48.7	42.3	20.1
2000	1112	1030	55.2	75.8	62.5	58.8	57.4	53.9	50.0	46.0	20.6
2000	1112	1045	56.0	72.0	61.3	58.2	57.2	53.6	49.4	44.8	16.0
2000	1112	1100	56.0	75.0	62.0	66.4	61.3	53.2	48.4	45.2	19.0
2000	1112	1115	55.0	72.0	62.1	58.6	57.4	53.3	49.3	45.1	17.0
2000	1112	1130	55.2	75.9	62.9	58.9	57.6	53.7	49.4	45.5	20.7
2000	1112	1145	53.8	71.5	61.5	57.8	56.4	52.2	47.6	43.6	17.7
2000	1112	1200	53.2	64.5	60.3	57.2	56.0	52.2	47.8	44.1	11.3
2000	1112	1215	53.7	68.0	61.1	57.2	56.5	52.6	47.4	43.4	14.3
2000	1112	1230	53.4	65.0	59.3	57.6	56.7	52.2	47.8	44.5	11.6
2000	1112	1245	54.2	73.2	60.9	58.5	57.2	53.0	48.5	44.0	19.0
2000	1112	1300	54.3	64.9	61.0	58.4	57.2	53.3	48.6	45.5	10.6
2000	1112	1315	53.6	66.5	59.9	57.4	56.4	52.4	49.0	45.5	12.9
2000	1112	1330	55.3	73.5	65.4	58.9	56.9	53.6	50.0	45.9	18.2
2000	1112	1345	54.0	70.0	63.0	59.0	57.2	53.0	49.4	46.6	16.0
2000	1112	1400	54.0	64.8	61.2	57.9	56.8	52.9	49.1	44.6	10.8
2000	1112	1415	53.5	66.4	60.1	56.8	55.7	52.4	49.6	47.0	12.9
2000	1112	1430	54.3	68.9	60.2	57.8	56.8	53.2	50.4	47.5	14.6
2000	1112	1445	53.3	64.9	58.9	56.9	56.0	52.6	48.7	45.5	11.6
2000	1112	1500	53.9	65.5	60.6	57.9	56.8	53.0	48.3	45.1	11.6
2000	1112	1515	53.7	60.5	59.2	57.5	56.3	53.2	49.6	46.5	6.8
2000	1112	1530	54.3	72.4	61.4	57.8	56.8	52.9	49.3	46.0	18.1
2000	1112	1545	55.0	70.2	61.8	59.5	57.7	53.9	50.6	47.6	15.2
2000	1112	1600	55.0	74.8	62.6	58.0	57.1	53.5	49.9	46.4	19.8
2000	1112	1615	55.3	72.5	61.1	58.2	57.4	54.4	51.3	48.7	17.2
2000	1112	1630	57.1	80.0	67.0	59.8	58.0	54.4	51.6	47.8	22.9
2000	1112	1645	54.7	64.7	59.5	58.1	57.3	54.3	50.8	45.3	10.0
2000	1112	1700	54.8	65.4	61.5	58.1	57.3	53.9	51.0	47.2	10.6
2000	1112	1715	54.6	63.1	58.9	57.6	57.0	54.3	51.2	48.4	8.5
2000	1112	1730	56.0	65.6	60.5	59.2	58.3	55.7	52.5	50.0	9.6
2000	1112	1745	55.9	72.3	62.0	59.0	57.9	55.3	52.2	48.4	16.4
2000	1112	1800	55.7	70.9	61.3	58.8	58.2	55.1	51.1	47.5	15.2
2000	1112	1815	55.3	67.3	60.9	58.2	57.5	55.0	51.0	46.8	12.0
2000	1112	1830	56.2	71.4	63.1	59.0	58.2	55.5	51.6	47.3	15.2
2000	1112	1845	56.3	63.5	61.7	60.0	58.8	55.7	52.3	48.4	7.2
2000	1112	1900	57.0	67.0	62.0	61.8	60.9	58.1	54.6	50.8	10.0
2000	1112	1915	58.2	65.0	61.8	60.9	60.5	57.9	55.4	51.9	6.8
2000	1112	1930	57.8	64.6	62.3	60.8	60.1	57.5	54.1	50.3	6.8
2000	1112	1945	57.2	62.6	61.1	59.9	59.3	57.2	54.1	49.9	5.4
2000	1112	2000	56.0	62.0	62.0	60.7	59.4	56.5	53.8	50.7	6.0
2000	1112	2015	56.3	66.6	62.3	59.4	58.5	55.7	53.0	49.4	10.3
2000	1112	2030	56.3	70.5	60.8	58.8	58.2	55.8	52.8	49.8	14.2
2000	1112	2045	56.0	70.0	62.0	59.0	57.8	54.2	50.8	47.4	14.0
2000	1112	2100	55.5	70.1	64.1	58.9	57.7	54.4	51.3	48.5	14.6
2000	1112	2115	55.2	72.0	61.9	58.7	57.6	54.0	51.3	47.7	16.8
2000	1112	2130	54.3	71.5	60.4	57.9	57.0	52.9	50.3	47.3	17.2
2000	1112	2145	53.2	59.8	58.4	56.9	56.2	52.1	49.5	46.7	6.6
2000	1112	2200	53.1	65.5	60.0	57.3	55.8	51.9	48.5	44.2	12.4
2000	1112	2215	52.2	60.1	58.0	56.2	55.2	51.1	48.0	45.2	7.9
2000	1112	2230	52.5	64.0	58.1	56.4	55.4	51.6	47.9	43.7	11.5
2000	1112	2245	52.2	63.3	59.0	56.2	55.1	51.0	48.1	45.0	11.1
2000	1112	2300	51.1	59.4	57.2	55.6	54.4	50.1	46.4	43.9	8.3
2000	1112	2315	53.2	68.8	59.9	56.9	55.8	52.4	48.1	44.1	15.6
2000	1112	2330	53.5	62.0	59.4	57.5	56.4	52.6	49.0	46.2	8.5
2000	1112	2345	51.7	63.1	58.3	56.1	54.9	50.4	47.0	43.9	11.4
2000	1113	0	50.2	62.4	58.1	55.0	53.8	48.8	44.0	39.3	12.2

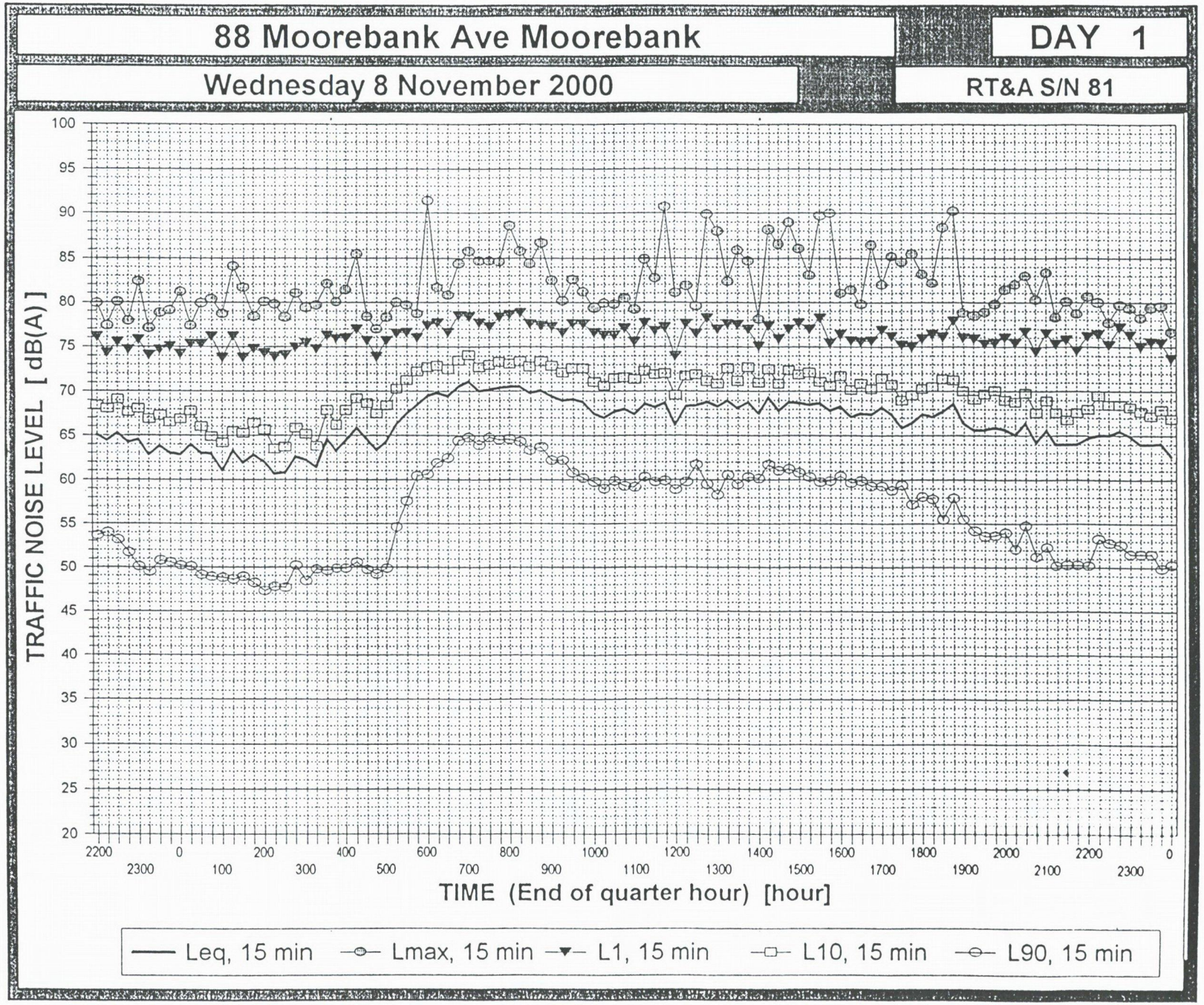
DAY 5	DESCRIPTOR	PERIOD	LEVEL	UNIT
Full Day	Leq, 24 hours	between 00:00 and 24:00 hours	53.9	dB(A)
Night Time	Leq, 8 hours	between 22:00 and 06:00 hours	51.0	dB(A)
Daytime	Leq, 15 hours	between 07:00 and 22:00 hours	55.0	dB(A)
Night Time	Leq, 9 hours	between 22:00 and 07:00 hours	51.4	dB(A)
Daytime	L10, 18 hours	between 06:00 and 24:00 hours	57.0	dB(A)
Daytime	minimum L90, 15 min	between 07:00 and 18:00 hours	46.2	dB(A)

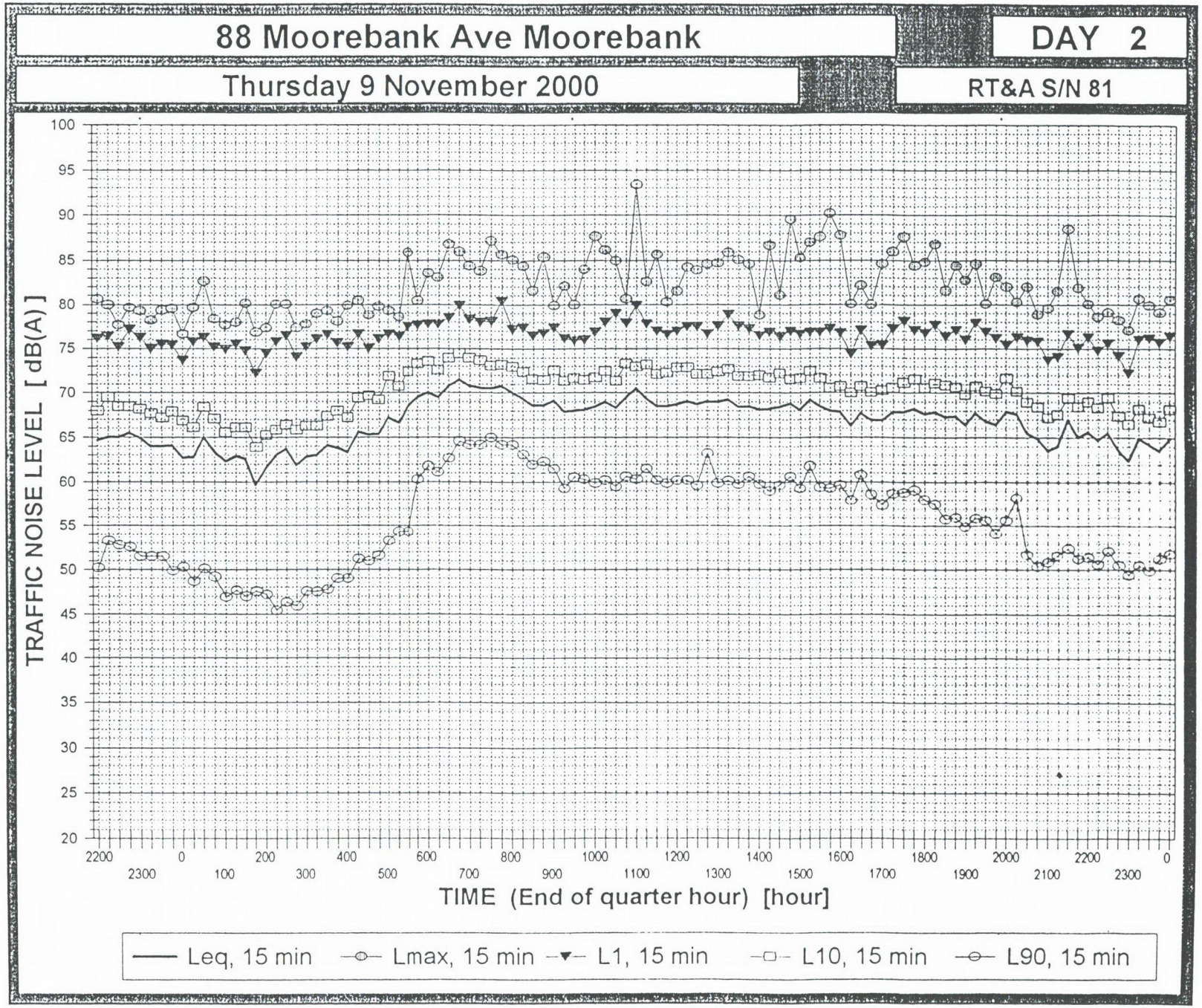
208 Moorebank Ave Moorebank											DAY 6
Monday 13 November 2000											RT&A S/N 65
YEAR	MoDy	TIME	Leq	Lmax	L1	L5	L10	L50	L90	Lmin	Lmax - Leq
2000	1112	2215	52.2	60.1	58.0	56.2	55.2	51.1	48.0	45.2	7.9
2000	1112	2230	52.5	64.0	58.1	56.4	55.4	51.6	47.9	43.7	11.5
2000	1112	2245	52.2	63.3	59.0	56.2	55.1	51.0	48.1	45.0	11.1
2000	1112	2300	51.1	58.4	57.2	55.6	54.4	50.1	46.4	43.9	8.3
2000	1112	2315	53.2	68.8	59.9	56.9	55.8	52.4	48.1	44.1	15.6
2000	1112	2330	53.5	62.0	59.4	57.5	56.4	52.6	49.0	46.2	8.5
2000	1112	2345	51.7	63.1	58.3	56.1	54.9	50.4	47.0	43.9	11.4
2000	1113	0	50.2	62.4	58.1	55.0	53.8	48.8	44.0	39.3	12.2
2000	1113	15	48.9	60.5	56.8	54.3	52.2	47.2	43.4	39.4	11.6
2000	1113	30	49.6	62.6	56.9	54.4	52.9	47.6	43.9	40.5	13.0
2000	1113	45	48.5	62.4	57.3	53.8	51.7	45.8	42.5	39.2	13.9
2000	1113	100	47.4	58.3	55.3	51.8	50.4	45.8	41.3	38.3	11.9
2000	1113	115	49.8	68.7	58.6	53.0	50.4	45.5	41.1	38.8	19.8
2000	1113	130	47.7	58.2	55.3	52.8	51.0	45.9	41.4	38.1	10.5
2000	1113	145	47.1	58.5	55.5	52.5	50.7	44.8	40.7	39.1	12.4
2000	1113	200	49.3	61.4	58.6	55.4	52.8	46.4	43.1	40.4	12.1
2000	1113	215	48.0	62.0	58.0	56.4	51.0	45.2	40.0	37.5	13.0
2000	1113	230	47.6	64.0	57.2	52.7	50.7	44.8	40.4	37.4	16.4
2000	1113	245	47.7	57.7	55.8	52.8	50.8	46.0	41.2	38.6	10.0
2000	1113	300	47.8	67.5	56.0	53.1	51.4	45.1	40.3	38.2	19.7
2000	1113	315	47.6	60.0	55.5	52.7	51.1	45.7	40.6	36.7	12.4
2000	1113	330	47.4	63.4	57.0	53.4	50.8	44.3	40.6	37.6	16.0
2000	1113	345	48.6	64.1	57.4	53.2	51.7	46.6	41.4	38.2	15.5
2000	1113	400	49.5	60.8	58.1	54.9	53.2	47.3	42.2	38.7	11.4
2000	1113	415	49.8	62.3	58.5	54.9	53.6	47.8	43.4	39.4	12.4
2000	1113	430	51.0	64.0	59.0	60.5	53.0	48.5	43.0	38.8	13.0
2000	1113	445	51.7	70.0	58.6	55.8	54.4	49.7	46.1	42.0	18.3
2000	1113	500	54.9	70.0	63.6	59.3	57.4	53.0	49.0	44.1	15.1
2000	1113	515	56.0	70.0	64.0	68.3	60.0	53.5	49.2	44.3	14.0
2000	1113	530	56.0	70.0	63.0	63.1	59.7	55.6	52.2	48.0	14.0
2000	1113	545	57.2	67.4	62.7	60.3	59.6	56.6	53.5	50.5	10.2
2000	1113	600	60.1	80.2	69.9	62.5	61.1	58.4	54.9	51.5	20.1
2000	1113	615	59.6	69.5	64.6	62.6	61.9	59.3	55.8	52.0	9.9
2000	1113	630	59.9	71.5	67.2	63.0	61.7	59.2	56.8	51.5	11.6
2000	1113	645	59.4	67.4	63.2	62.1	61.6	59.2	56.1	52.0	8.0
2000	1113	700	59.4	66.2	64.0	62.2	61.5	59.2	56.3	52.4	6.8
2000	1113	715	59.4	67.3	63.5	62.1	61.5	59.2	56.7	53.4	7.9
2000	1113	730	59.4	71.9	65.7	62.2	60.9	58.9	56.7	53.0	12.5
2000	1113	745	58.6	67.7	64.1	61.3	60.5	58.4	55.6	50.7	9.1
2000	1113	800	58.1	66.2	61.6	60.5	60.1	58.0	55.0	50.8	8.1
2000	1113	815	58.4	68.6	64.2	61.0	60.3	58.1	55.2	51.5	10.2
2000	1113	830	59.2	74.5	66.6	62.5	61.1	57.9	55.1	51.5	15.3
2000	1113	845	58.4	67.7	63.9	60.7	60.2	58.2	55.2	51.4	9.3
2000	1113	900	59.4	67.8	64.9	62.6	61.5	59.0	56.4	51.6	8.4
2000	1113	915	59.3	70.3	64.9	62.3	61.7	58.8	55.5	51.8	11.0
2000	1113	930	57.5	67.2	64.0	61.2	60.0	56.6	53.2	50.7	9.7
2000	1113	945	57.4	66.0	63.7	61.2	60.0	56.6	53.1	49.3	8.6
2000	1113	1000	57.1	66.3	63.5	60.7	59.6	56.4	53.3	49.5	9.2
2000	1113	1015	56.7	67.4	64.2	60.8	59.2	55.5	52.6	49.8	10.7
2000	1113	1030	56.9	68.7	62.7	60.3	59.3	56.2	53.5	48.6	11.8
2000	1113	1045	57.5	67.9	64.9	61.6	60.2	56.4	52.9	46.9	10.4
2000	1113	1100	57.6	69.1	65.3	62.2	59.9	56.4	53.3	48.4	11.5
2000	1113	1115	56.3	66.1	63.1	60.9	59.3	55.2	51.7	46.1	9.8
2000	1113	1130	56.7	71.4	65.8	61.4	59.5	54.5	50.5	45.8	14.7
2000	1113	1145	55.7	69.1	64.0	60.7	59.1	53.6	49.2	43.8	13.4
2000	1113	1200	55.4	75.0	63.1	59.7	58.1	53.9	50.0	45.1	19.6
2000	1113	1215	54.2	64.0	62.0	58.8	57.5	52.9	48.1	42.7	9.8
2000	1113	1230	54.8	70.3	64.3	59.5	57.6	52.2	47.8	41.5	15.5
2000	1113	1245	55.1	66.3	62.9	59.7	58.3	53.5	49.3	44.1	11.2
2000	1113	1300	55.3	69.0	65.0	60.4	57.8	53.1	49.5	44.3	13.7
2000	1113	1315	55.5	69.9	63.3	59.7	58.1	54.1	50.1	44.8	14.4
2000	1113	1330	57.5	74.7	69.1	62.0	58.7	54.2	50.1	46.2	17.2
2000	1113	1345	56.1	73.3	67.5	60.2	58.2	52.9	49.1	44.5	17.2
2000	1113	1400	56.7	69.9	65.6	61.6	59.1	54.9	50.5	45.2	13.2
2000	1113	1415	56.0	70.4	63.6	59.3	58.4	55.0	51.2	46.2	14.4
2000	1113	1430	57.6	69.1	66.2	62.3	60.0	56.0	52.4	47.9	11.5
2000	1113	1445	57.2	70.8	65.7	61.2	59.8	55.9	52.2	48.3	13.6
2000	1113	1500	56.0	69.0	63.0	63.7	61.1	56.2	53.0	48.5	13.0
2000	1113	1515	55.3	63.9	60.7	59.0	58.2	54.6	51.2	47.2	8.6
2000	1113	1530	55.8	66.1	62.0	59.5	58.6	54.9	51.2	47.0	10.3
2000	1113	1545	56.0	67.7	61.5	59.8	58.8	55.4	51.7	47.8	11.7
2000	1113	1600	55.4	66.9	61.3	58.8	57.9	54.5	51.8	47.5	11.5
2000	1113	1615	56.3	76.3	63.7	60.0	58.6	55.3	52.2	47.5	20.0
2000	1113	1630	55.6	64.0	62.4	59.6	58.3	54.6	51.8	47.9	8.4
2000	1113	1645	56.6	73.0	64.4	60.0	58.4	55.3	52.5	48.5	16.4
2000	1113	1700	56.0	69.5	62.7	59.3	58.2	55.3	52.4	48.7	13.5
2000	1113	1715	55.1	62.4	60.2	58.4	57.6	54.6	51.5	47.7	7.3
2000	1113	1730	58.4	80.8	65.2	59.6	58.2	54.7	51.2	47.4	22.4
2000	1113	1745	55.5	70.7	62.2	59.1	58.0	54.4	51.3	47.4	15.2
2000	1113	1800	55.6	65.5	60.5	58.9	58.1	55.0	51.6	47.4	9.9
2000	1113	1815	55.5	68.5	61.2	59.1	58.1	54.6	51.4	47.8	13.0
2000	1113	1830	56.3	70.1	63.6	60.2	58.8	54.9	52.0	47.6	13.8
2000	1113	1845	55.9	72.1	65.4	58.9	57.8	54.2	50.6	47.9	16.2
2000	1113	1900	55.3	67.5	63.0	59.2	57.8	54.1	50.6	47.1	12.2
2000	1113	1915	54.3	65.7	60.5	58.3	57.0	53.4	50.3	46.4	11.4
2000	1113	1930	54.3	66.2	61.4	58.4	57.3	53.0	49.1	45.8	11.9
2000	1113	1945	53.9	69.1	60.6	57.8	56.5	52.6	49.0	44.4	15.2
2000	1113	2000	55.9	74.4	68.3	58.8	56.9	52.4	49.2	46.1	18.5
2000	1113	2015	54.4	83.3	58.6	56.8	55.9	52.4	49.1	46.1	28.9
2000	1113	2030	52.8	63.9	59.7	57.2	55.9	51.3	48.0	45.2	11.1
2000	1113	2045	53.1	64.5	62.1	57.5	56.0	51.3	48.0	45.5	11.4
2000	1113	2100	52.5	72.1	58.0	56.2	55.5	51.4	48.7	45.9	19.6
2000	1113	2115	52.8	67.0	59.5	57.1	55.7	51.3	48.4	45.6	14.2
2000	1113	2130	52.5	69.1	59.8	56.4	55.0	50.8	47.9	45.1	16.6
2000	1113	2145	53.0	69.0	60.0	59.0	55.9	51.2	48.4	45.9	16.0
2000	1113	2200	53.3	70.0	59.7	57.4	56.3	51.6	48.9	46.3	16.7
2000	1113	2215	53.1	65.7	60.0	57.2	56.3	51.4	49.0	45.8	12.6
2000	1113	2230	52.4	66.1	60.0	56.7	55.6	50.7	47.8	45.2	13.7
2000	1113	2245	51.6	64.8	59.6	56.1	54.6	49.8	46.2	43.7	13.2
2000	1113	2300	51.0	63.6	58.2	55.8	54.5	49.2	46.1	43.8	12.6
2000	1113	2315	51.3	68.7	58.8	55.7	54.1	49.7	46.0	43.3	17.4
2000	1113	2330	51.8	62.8	58.1	56.0	54.9	50.5	48.1	45.4	11.0
2000	1113	2345	50.9	64.6	58.7	56.0	54.3	48.8	45.5	43.1	13.7
2000	1114	0	49.3	61.2	56.6	54.0	52.2	47.8	44.8	42.6	11.9

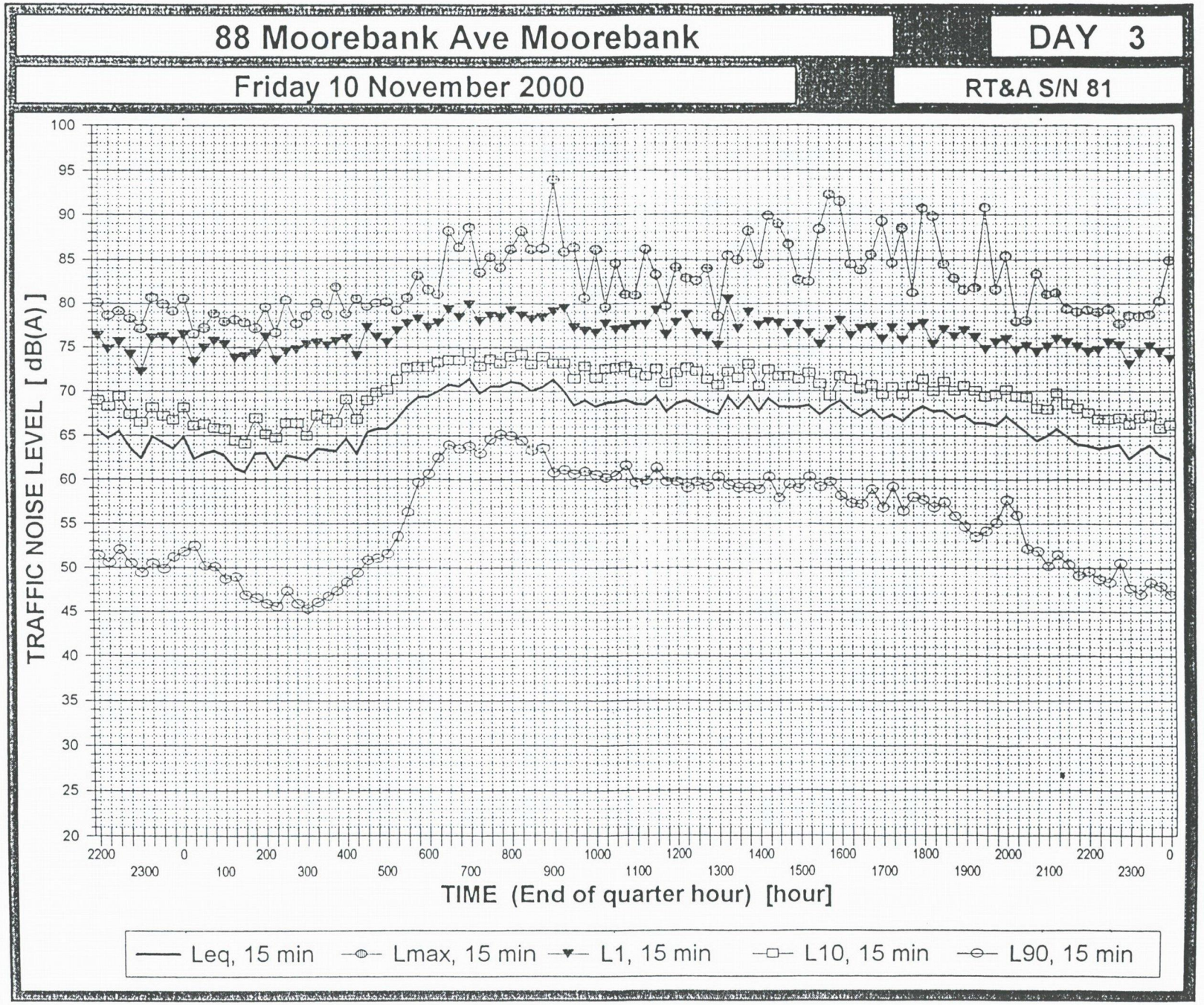
DAY 6	DESCRIPTOR	PERIOD	LEVEL	UNIT
Full Day	Leq, 24 hours	between 00:00 and 24:00 hours	55.7	dB(A)
Night Time	Leq, 8 hours	between 22:00 and 06:00 hours	52.2	dB(A)
Daytime	Leq, 15 hours	between 07:00 and 22:00 hours	56.4	dB(A)
Night Time	Leq, 9 hours	between 22:00 and 07:00 hours	54.0	dB(A)
Daytime	L10, 18 hours	between 06:00 and 24:00 hours	58.3	dB(A)
Daytime	minimum L90, 15 min	between 07:00 and 18:00 hours	47.8	dB(A)

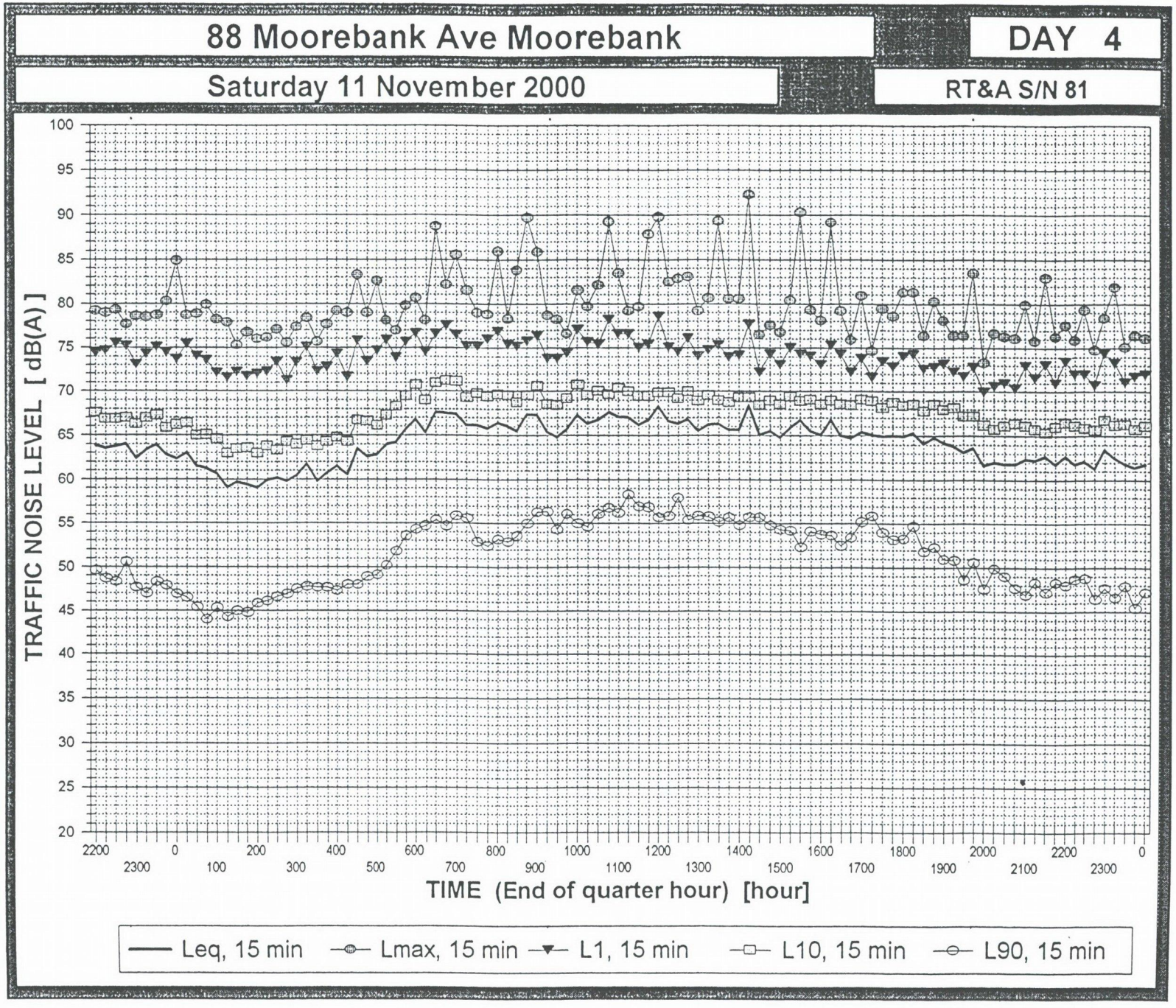
208 Moorebank Ave Moorebank											DAY 7
Tuesday 14 November 2000											RT&A S/N 65
YEAR	MoDy	TIME	Leq	Lmax	L1	L5	L10	L50	L90	Lmin	Lmax - Leq
2000	1113	2215	53.1	65.7	60.0	57.2	56.3	51.4	49.0	45.8	12.6
2000	1113	2230	52.4	66.1	60.0	56.7	55.6	50.7	47.8	45.2	13.7
2000	1113	2245	51.6	64.8	59.6	56.1	54.6	49.8	46.2	43.7	13.2
2000	1113	2300	51.0	63.6	58.2	55.8	54.5	49.2	46.1	43.8	12.6
2000	1113	2315	51.3	68.7	58.8	55.7	54.1	49.7	46.0	43.3	17.4
2000	1113	2330	51.8	62.8	58.1	56.0	54.9	50.5	48.1	45.4	11.0
2000	1113	2345	50.9	64.6	58.7	56.0	54.3	48.8	45.5	43.1	13.7
2000	1114	0	49.3	61.2	56.6	54.0	52.2	47.8	44.8	42.6	11.9
2000	1114	15	49.7	61.7	58.1	55.4	53.4	47.3	44.9	43.0	12.0
2000	1114	30	49.5	61.4	58.1	55.0	53.2	47.0	44.4	42.4	11.9
2000	1114	45	47.1	59.3	55.5	52.6	49.9	45.1	42.7	41.0	12.2
2000	1114	100	48.8	60.2	57.9	55.4	53.0	45.4	42.5	40.3	11.4
2000	1114	115	46.9	57.8	54.5	51.8	50.0	45.4	42.4	40.3	10.9
2000	1114	130	46.4	59.0	55.0	49.6	48.3	45.1	42.8	40.6	12.6
2000	1114	145	47.4	61.3	55.9	51.3	49.8	46.1	43.2	40.5	13.9
2000	1114	200	47.2	61.5	56.4	51.8	49.6	45.2	42.7	40.7	14.3
2000	1114	215	47.1	58.3	55.7	51.1	49.5	45.7	42.8	40.8	11.2
2000	1114	230	47.8	59.9	56.6	51.9	49.5	46.4	43.9	40.9	12.1
2000	1114	245	47.9	61.1	56.5	52.6	50.6	46.2	43.3	40.7	13.2
2000	1114	300	47.1	59.9	54.0	50.7	49.3	46.1	43.7	41.0	12.8
2000	1114	315	46.9	58.8	54.6	50.8	48.9	45.7	43.6	41.3	11.9
2000	1114	330	48.1	61.4	56.8	53.1	50.7	46.2	44.2	41.4	13.3
2000	1114	345	48.7	60.8	56.4	54.3	52.5	46.5	43.6	40.4	12.1
2000	1114	400	47.8	62.1	56.0	52.1	50.0	46.2	43.5	40.2	14.3
2000	1114	415	51.6	68.9	60.6	56.2	54.2	49.2	46.2	43.4	17.3
2000	1114	430	52.4	79.2	59.8	55.0	53.6	49.0	46.0	43.0	26.8
2000	1114	445	52.6	65.9	60.9	56.8	55.1	50.9	48.2	46.3	13.3
2000	1114	500	52.4	61.6	58.4	56.6	55.5	51.1	48.4	45.5	9.2
2000	1114	515	56.8	65.2	63.1	60.8	60.0	55.4	52.5	49.6	8.4
2000	1114	530	57.9	67.7	64.0	61.4	60.5	57.1	53.9	51.1	9.8
2000	1114	545	57.1	75.4	64.0	60.7	59.5	55.9	53.2	50.2	18.3
2000	1114	600	56.9	64.6	61.9	60.1	59.3	56.5	53.1	49.2	7.7
2000	1114	615	57.2	67.0	62.4	60.1	59.4	57.0	53.5	51.4	9.8
2000	1114	630	58.7	76.9	66.0	62.1	60.9	57.4	54.3	50.8	18.2
2000	1114	645	57.6	67.6	64.3	61.2	60.1	57.0	53.6	49.8	10.0
2000	1114	700	57.5	64.4	62.7	61.0	60.1	57.0	54.1	50.4	6.9
2000	1114	715	57.6	69.6	64.4	61.0	59.7	56.9	54.4	51.7	12.0
2000	1114	730	57.2	70.3	64.7	60.9	59.5	56.4	52.9	50.4	13.1
2000	1114	745	58.1	77.6	64.8	61.1	59.8	57.1	53.5	50.3	19.5
2000	1114	800	57.2	70.6	64.9	60.2	59.3	56.4	53.4	49.9	13.4
2000	1114	815	59.5	83.5	66.3	60.8	59.7	56.8	53.5	48.7	24.0
2000	1114	830	58.0	73.1	62.9	60.7	60.0	57.6	55.3	50.7	15.1
2000	1114	845	57.8	68.0	64.3	60.6	59.7	57.1	54.8	50.4	10.2
2000	1114	900	57.6	73.0	64.0	60.7	59.7	56.8	54.3	51.3	15.4
2000	1114	915	57.4	71.6	64.4	60.9	59.8	56.5	53.4	50.4	14.2
2000	1114	930	56.7	70.3	63.1	59.9	59.0	55.8	53.2	50.5	13.6
2000	1114	945	56.4	67.8	63.8	59.9	58.8	55.6	52.3	49.1	11.4
2000	1114	1000	56.7	69.6	65.1	60.5	59.2	55.3	52.1	49.5	12.9
2000	1114	1015	56.6	66.6	63.2	60.6	59.3	55.4	52.7	49.8	10.0
2000	1114	1030	59.0	75.6	67.3	63.0	61.5	57.5	54.4	51.8	16.6
2000	1114	1045	58.5	66.7	64.7	62.3	61.3	57.5	55.3	53.5	8.2
2000	1114	1100	58.6	67.9	64.8	62.6	61.4	57.4	54.6	52.7	9.3
2000	1114	1115	58.6	69.3	66.0	63.2	61.2	57.2	54.6	52.0	10.7
2000	1114	1130	58.8	70.1	66.9	63.5	61.5	57.2	53.9	51.5	11.3
2000	1114	1145	58.1	74.6	67.2	62.9	60.7	56.0	53.1	50.3	16.5
2000	1114	1200	57.7	69.1	66.4	62.4	60.3	55.8	53.1	50.4	11.4
2000	1114	1215	57.1	69.2	64.0	60.9	59.7	56.3	52.8	49.4	12.1
2000	1114	1230	57.9	69.7	66.4	62.3	60.6	56.4	53.3	50.0	11.8
2000	1114	1245	57.7	76.1	65.5	61.6	59.8	56.2	52.7	49.4	18.4
2000	1114	1300	57.6	70.2	64.9	61.3	59.9	56.5	53.7	50.3	12.6
2000	1114	1315	58.2	71.3	65.6	61.9	60.9	56.6	53.4	50.9	13.1
2000	1114	1330	58.1	68.2	65.0	62.0	60.8	56.8	54.1	51.9	10.1
2000	1114	1345	58.4	69.0	66.2	62.2	61.2	57.1	54.8	52.1	10.6
2000	1114	1400	59.0	71.0	67.0	64.1	62.1	57.5	54.1	52.2	12.0
2000	1114	1415	59.8	72.2	68.0	63.9	62.4	58.4	55.5	53.1	12.4
2000	1114	1430	58.8	67.8	65.6	62.4	61.2	57.8	55.2	52.8	9.0
2000	1114	1445	58.5	67.4	64.5	61.7	61.0	57.8	55.4	53.1	8.9
2000	1114	1500	58.8	69.0	65.3	62.3	61.1	58.0	55.2	51.9	10.2
2000	1114	1515	58.7	72.4	64.7	61.8	60.9	58.1	55.4	51.7	13.7
2000	1114	1530	60.8	72.0	69.4	63.3	61.3	57.9	54.5	49.3	11.2
2000	1114	1545	59.0	70.0	67.0	62.3	60.9	58.2	55.1	51.6	11.0
2000	1114	1600	58.2	68.7	63.6	61.4	60.5	57.7	54.5	51.3	10.5
2000	1114	1615	58.6	71.5	63.0	61.5	60.7	58.3	56.0	52.6	12.9
2000	1114	1630	58.6	68.5	65.7	62.2	61.0	57.6	55.0	51.4	9.9
2000	1114	1645	58.7	80.6	64.1	61.8	60.9	57.7	54.8	50.4	21.9
2000	1114	1700	58.9	71.7	65.0	61.9	61.1	58.1	55.7	52.6	12.8
2000	1114	1715	57.6	65.9	61.3	60.2	59.7	57.4	54.7	51.7	8.3
2000	1114	1730	56.9	63.3	61.5	60.2	59.6	56.4	53.6	50.5	6.4
2000	1114	1745	57.4	69.8	62.9	60.4	59.6	56.7	54.0	50.3	12.4
2000	1114	1800	57.4	66.2	62.9	60.7	59.6	56.9	54.3	51.8	8.8
2000	1114	1815	58.0	64.7	62.3	60.9	60.2	57.6	55.1	52.1	6.7
2000	1114	1830	57.9	64.8	62.3	60.8	60.3	57.5	55.0	51.6	6.9
2000	1114	1845	57.7	65.7	62.7	60.7	60.0	57.2	54.2	51.1	8.0
2000	1114	1900	57.5	68.0	62.4	60.5	59.8	57.1	54.3	50.6	10.5
2000	1114	1915	57.0	65.3	61.7	60.3	59.4	56.5	53.8	50.7	8.3
2000	1114	1930	57.4	71.7	63.9	60.7	59.7	56.1	53.1	50.3	14.3
2000	1114	1945	55.9	65.3	61.0	59.7	58.8	55.0	52.3	49.5	9.4
2000	1114	2000	56.4	67.9	64.2	60.6	58.7	55.2	52.3	49.1	11.5
2000	1114	2015	55.4	61.6	59.8	58.5	57.7	55.1	52.3	49.7	6.2
2000	1114	2030	55.7	73.3	60.4	58.7	57.9	55.4	52.6	50.7	17.6
2000	1114	2045	55.4	66.7	61.4	58.6	57.8	54.7	51.7	48.7	11.3
2000	1114	2100	55.3	64.1	61.1	58.9	58.0	54.4	52.2	50.0	8.8
2000	1114	2115	54.9	66.5	61.4	58.6	57.5	54.0	50.6	48.2	11.6
2000	1114	2130	54.1	62.9	59.9	57.9	56.8	53.3	50.1	47.4	8.8
2000	1114	2145	54.9	74.7	62.1	58.9	57.7	52.8	49.3	45.9	19.8
2000	1114	2200	55.2	68.5	60.8	58.9	57.8	54.6	50.7	46.1	13.3
2000	1114	2215	55.1	65.6	60.9	58.8	57.7	54.3	51.6	48.8	10.5
2000	1114	2230	53.8	61.7	58.9	57.6	56.8	52.9	50.2	47.5	7.9
2000	1114	2245	54.0	64.7	59.8	57.5	56.5	53.2	50.6	47.8	10.7
2000	1114	2300	53.4	64.8	59.5	57.4	56.2	52.4	49.5	47.2	11.4
2000	1114	2315	53.2	64.1	59.1	56.7	55.6	52.2	50.0	46.5	10.9
2000	1114	2330	53.8	69.2	60.4	57.9	56.5	52.6	49.6	46.5	15.4
2000	1114	2345	52.6	61.3	58.8	56.6	55.2	51.8	49.2	46.9	8.7
2000	1115	0	53.1	63.6	59.3	56.8	55.9	52.1	49.1	46.7	10.5

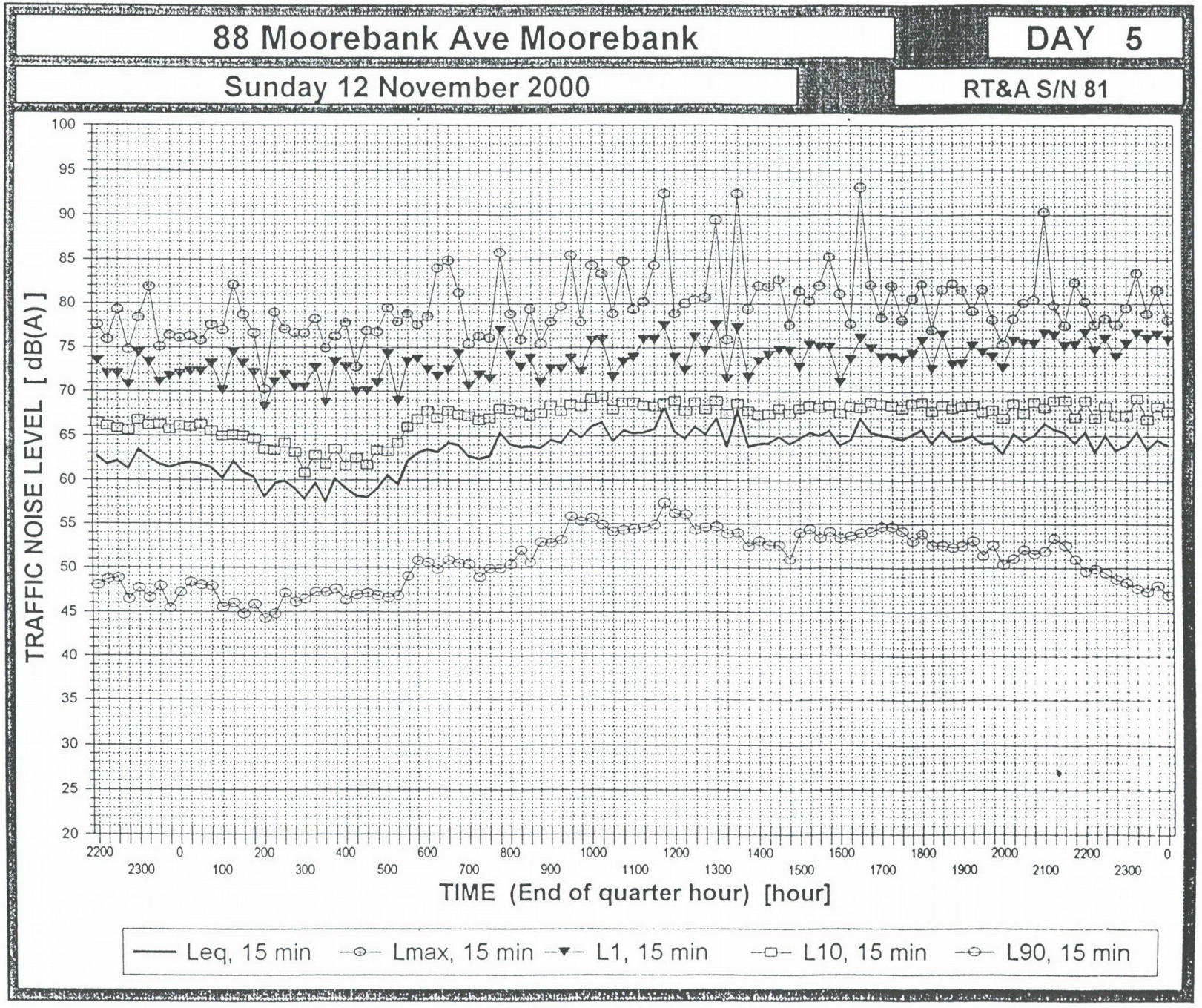
DAY 7	DESCRIPTOR	PERIOD	LEVEL	UNIT
Full Day	Leq, 24 hours	between 00:00 and 24:00 hours	56.6	dB(A)
Night Time	Leq, 8 hours	between 22:00 and 06:00 hours	51.7	dB(A)
Daytime	Leq, 15 hours	between 07:00 and 22:00 hours	57.8	dB(A)
Night Time	Leq, 9 hours	between 22:00 and 07:00 hours	53.1	dB(A)
Daytime	L10, 18 hours	between 06:00 and 24:00 hours	59.5	dB(A)
Daytime	minimum L90, 15 min	between 07:00 and 18:00 hours	52.1	dB(A)

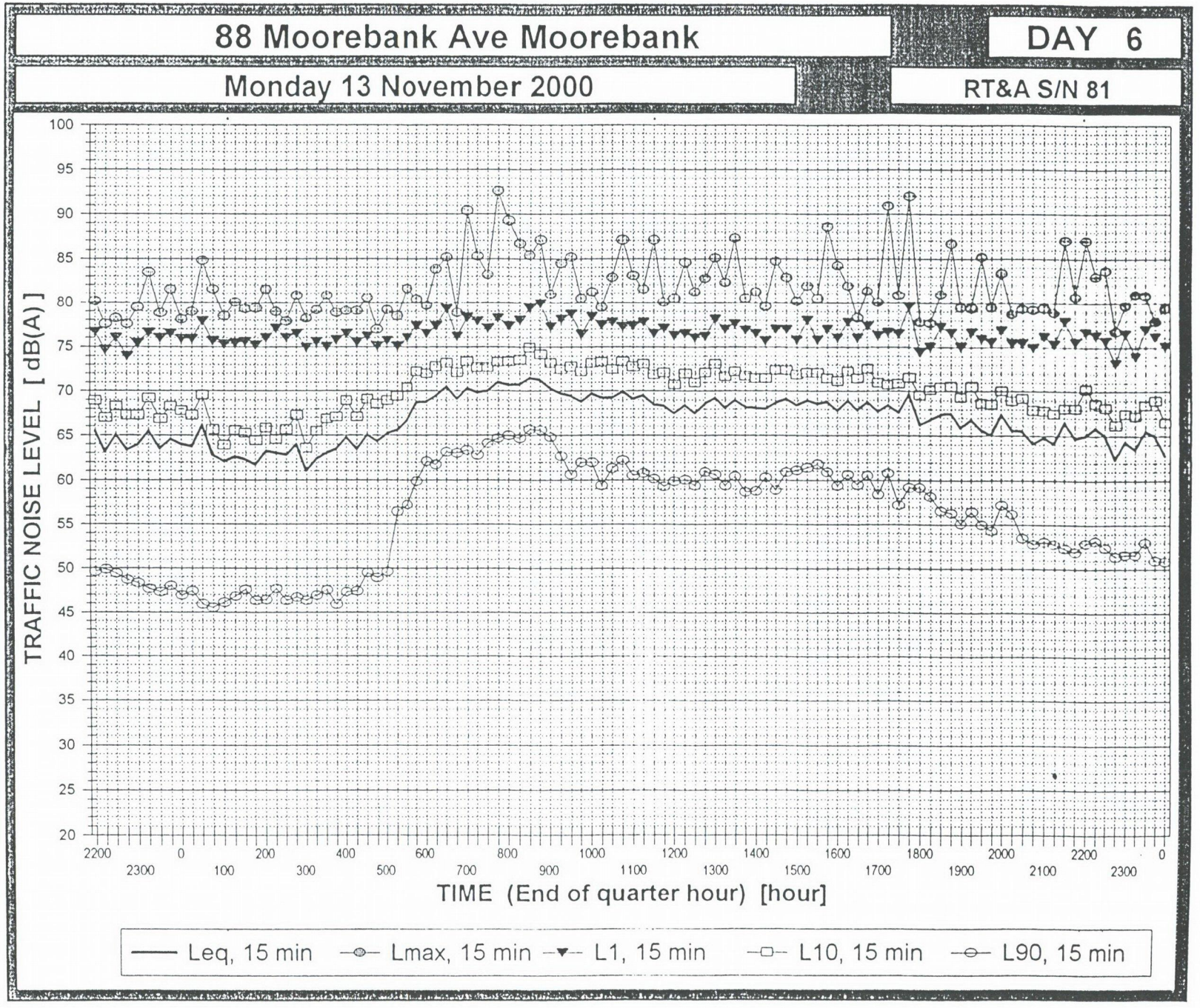

88 Moorebank Ave Moorebank
DAY 1
Wednesday 8 November 2000
RT&A S/N 81
TRAFFIC NOISE LEVEL [dB(A)]
100
95
90
85
80
75
70
65
60
55
50
45
40
35
30
25
20
2200
2300
0
100
200
300
400
500
600
700
800
900
1000
1100
1200
1300
1400
1500
1600
1700
1800
1900
2000
2100
2200
2300
0
TIME (End of quarter hour) [hour]
Leq, 15 min
Lmax, 15 min
L1, 15 min
L10, 15 min
L90, 15 min

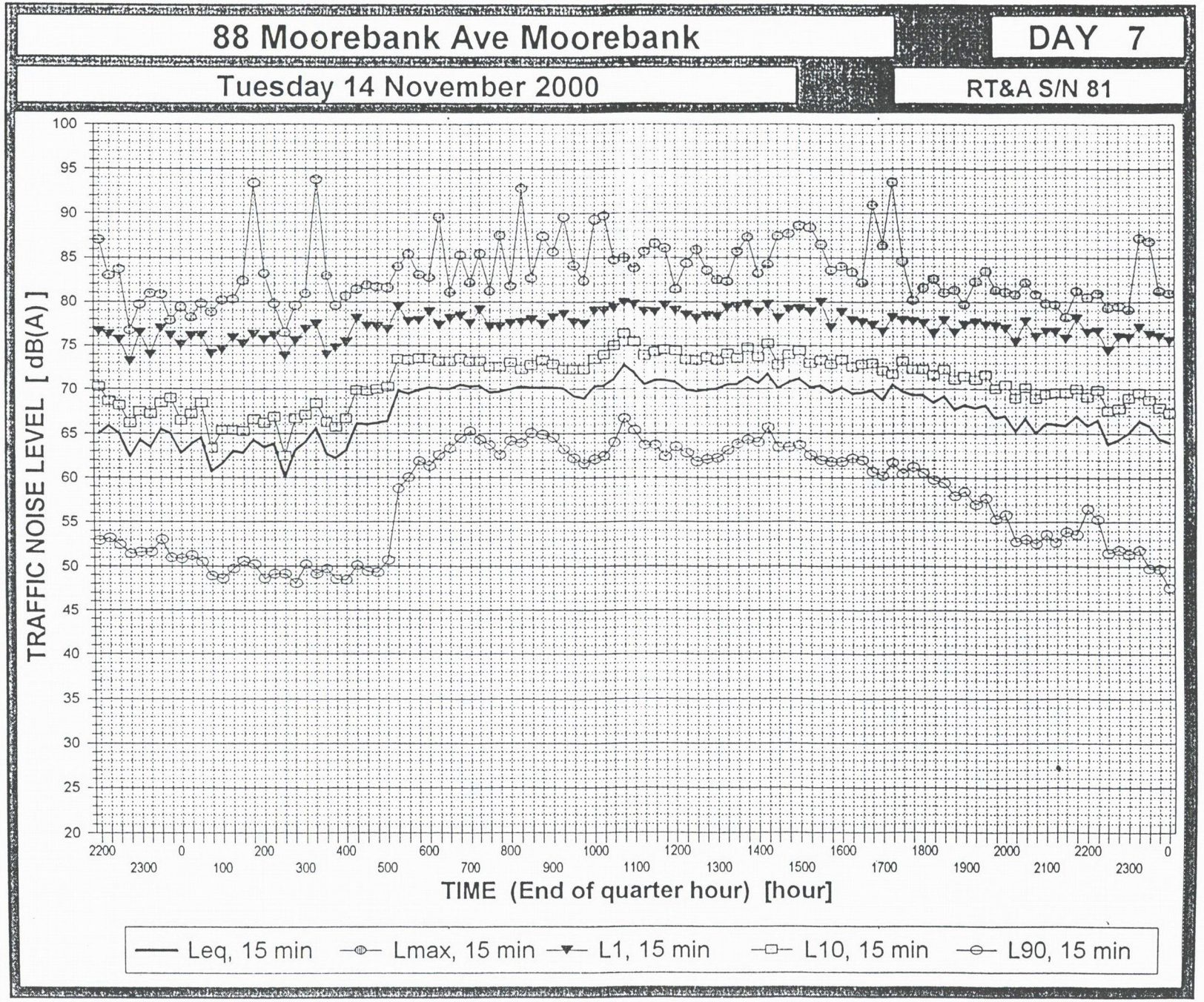

88 Moorebank Ave Moorebank
DAY 2
Thursday 9 November 2000
RT&A S/N 81
TRAFFIC NOISE LEVEL [dB(A)]
100
95
90
85
80
75
70
65
60
55
50
45
40
35
30
25
20
2200
2300
0
100
200
300
400
500
600
700
800
900
1000
1100
1200
1300
1400
1500
1600
1700
1800
1900
2000
2100
2200
2300
0
TIME (End of quarter hour) [hour]
Leq, 15 min
Lmax, 15 min
L1, 15 min
L10, 15 min
L90, 15 min


88 Moorebank Ave Moorebank
DAY 3
Friday 10 November 2000
RT&A S/N 81
TRAFFIC NOISE LEVEL [dB(A)]
100
95
90
85
80
75
70
65
60
55
50
45
40
35
30
25
20
2200
2300
0
100
200
300
400
500
600
700
800
900
1000
1100
1200
1300
1400
1500
1600
1700
1800
1900
2000
2100
2200
2300
0
TIME (End of quarter hour) [hour]
Leq, 15 min
Lmax, 15 min
L1, 15 min
L10, 15 min
L90, 15 min


88 Moorebank Ave Moorebank
DAY 4
Saturday 11 November 2000
RT&A S/N 81
TRAFFIC NOISE LEVEL [dB(A)]
100
95
90
85
80
75
70
65
60
55
50
45
40
35
30
25
20
2200
2300
0
100
200
300
400
500
600
700
800
900
1000
1100
1200
1300
1400
1500
1600
1700
1800
1900
2000
2100
2200
2300
0
TIME (End of quarter hour) [hour]
Leq, 15 min
Lmax, 15 min
L1, 15 min
L10, 15 min
L90, 15 min


88 Moorebank Ave Moorebank
DAY 5
Sunday 12 November 2000
RT&A S/N 81
TRAFFIC NOISE LEVEL [dB(A)]
100
95
90
85
80
75
70
65
60
55
50
45
40
35
30
25
20
2200
2300
0
100
200
300
400
500
600
700
800
900
1000
1100
1200
1300
1400
1500
1600
1700
1800
1900
2000
2100
2200
2300
0
TIME (End of quarter hour) [hour]
Leq, 15 min
Lmax, 15 min
L1, 15 min
L10, 15 min
L90, 15 min


88 Moorebank Ave Moorebank
DAY 6
Monday 13 November 2000
RT&A S/N 81
TRAFFIC NOISE LEVEL [dB(A)]
100
95
90
85
80
75
70
65
60
55
50
45
40
35
30
25
20
2200
0
200
400
600
800
1000
1200
1400
1600
1800
2000
2200
0
2300
100
300
500
700
900
1100
1300
1500
1700
1900
2100
2300
TIME (End of quarter hour) [hour]
Leq, 15 min
Lmax, 15 min
L1, 15 min
L10, 15 min
L90, 15 min


88 Moorebank Ave Moorebank
DAY 7
Tuesday 14 November 2000
RT&A S/N 81
TRAFFIC NOISE LEVEL [dB(A)]
100
95
90
85
80
75
70
65
60
55
50
45
40
35
30
25
20
2200
2300
0
100
200
300
400
500
600
700
800
900
1000
1100
1200
1300
1400
1500
1600
1700
1800
1900
2000
2100
2200
2300
0
TIME (End of quarter hour) [hour]
Leq, 15 min
Lmax, 15 min
L1, 15 min
L10, 15 min
L90, 15 min

88 Moorebank Ave Moorebank										DAY 1	
Wednesday 8 November 2000										RT&A S/N 81	
YEAR	MoDy	TIME	Leq	Lmax	L1	L5	L10	L50	L90	Lmin	Lmax - Leq
2000	1107	2215	64.4	77.4	74.3	70.8	68.1	59.8	54.0	51.2	13.0
2000	1107	2230	65.3	80.1	75.5	71.7	69.1	60.8	53.2	50.1	14.8
2000	1107	2245	64.2	77.9	74.7	70.0	67.7	59.8	51.7	49.0	13.7
2000	1107	2300	64.5	82.4	75.8	71.0	68.1	56.7	50.1	48.2	17.9
2000	1107	2315	62.8	77.1	74.1	68.9	66.9	56.0	49.5	47.4	14.3
2000	1107	2330	63.8	78.8	74.7	70.6	67.3	57.1	50.8	48.2	15.0
2000	1107	2345	63.0	79.1	75.0	68.4	66.5	57.3	50.6	47.9	16.1
2000	1108	0	62.8	81.2	74.2	69.2	66.9	55.3	50.2	47.3	18.4
2000	1108	15	64.0	77.4	75.3	71.9	67.8	55.5	50.1	48.0	13.4
2000	1108	30	63.0	79.9	75.3	69.2	66.0	53.9	49.1	46.8	16.9
2000	1108	45	62.9	80.4	76.2	69.2	64.9	52.3	48.9	46.4	17.5
2000	1108	100	61.0	78.7	73.8	67.3	64.2	53.1	48.8	45.9	17.7
2000	1108	115	63.3	84.1	76.2	68.6	65.5	54.2	48.6	45.2	20.8
2000	1108	130	61.9	81.7	73.8	68.0	65.3	53.8	48.9	46.7	19.8
2000	1108	145	62.8	78.4	74.8	70.4	66.4	53.3	48.2	45.1	15.6
2000	1108	200	62.0	80.1	74.3	69.1	65.7	51.5	47.3	44.9	18.1
2000	1108	215	60.6	79.8	73.9	66.6	63.5	51.1	47.8	45.5	19.2
2000	1108	230	60.8	78.3	74.1	67.4	63.7	50.5	47.7	45.9	17.5
2000	1108	245	62.6	81.0	74.9	69.0	65.9	53.7	50.2	47.6	18.4
2000	1108	300	62.2	79.4	75.4	68.4	65.2	51.5	48.4	46.6	17.2
2000	1108	315	61.4	79.7	74.8	67.0	63.8	52.7	49.8	47.5	18.3
2000	1108	330	64.6	82.1	76.3	71.9	67.9	55.1	49.6	46.8	17.5
2000	1108	345	63.2	80.1	75.9	69.3	66.2	54.6	49.9	47.4	16.9
2000	1108	400	64.4	81.4	76.0	71.5	67.9	56.3	49.9	47.2	17.0
2000	1108	415	65.9	85.5	77.0	72.7	69.2	57.2	50.6	47.8	19.6
2000	1108	430	64.6	78.4	75.7	71.8	68.7	56.7	49.7	46.7	13.8
2000	1108	445	63.3	77.0	73.9	70.0	67.5	56.5	49.2	45.2	13.7
2000	1108	500	64.3	78.3	75.7	71.3	68.4	57.1	49.9	47.7	14.0
2000	1108	515	66.3	80.0	76.5	72.6	70.3	61.8	54.6	49.9	13.7
2000	1108	530	67.5	79.7	76.6	73.6	71.3	64.9	57.6	52.1	12.2
2000	1108	545	68.5	78.7	76.0	73.6	72.2	66.9	60.4	52.9	10.2
2000	1108	600	69.5	91.4	77.4	74.6	72.7	67.1	60.6	56.3	21.9
2000	1108	615	69.8	81.7	77.7	75.1	72.9	68.0	61.9	56.1	11.9
2000	1108	630	69.4	80.8	76.6	73.7	72.5	68.2	62.5	55.9	11.4
2000	1108	645	70.6	84.4	78.5	75.0	73.5	69.3	64.4	58.4	13.8
2000	1108	700	71.1	85.8	78.4	75.6	74.1	69.6	64.8	58.8	14.7
2000	1108	715	70.0	84.7	77.7	74.4	72.7	68.8	63.9	57.5	14.7
2000	1108	730	70.2	84.7	77.3	74.5	73.0	69.1	64.8	57.5	14.5
2000	1108	745	70.4	84.6	78.3	74.9	73.3	68.9	64.5	59.9	14.2
2000	1108	800	70.5	88.6	78.6	74.8	73.1	68.9	64.6	59.4	18.1
2000	1108	815	70.5	85.8	78.8	75.2	73.4	68.6	64.3	56.9	15.3
2000	1108	830	69.8	84.4	77.6	74.4	72.8	68.2	63.3	57.4	14.6
2000	1108	845	70.1	86.7	77.4	74.9	73.4	68.6	63.7	58.7	16.6
2000	1108	900	69.4	82.5	77.3	74.5	72.9	67.7	62.2	55.6	13.1
2000	1108	915	68.9	80.2	76.6	74.2	72.1	67.4	62.2	57.0	11.3
2000	1108	930	69.1	82.6	77.6	74.7	72.6	66.9	60.8	55.3	13.5
2000	1108	945	68.8	81.2	77.6	74.3	72.6	66.4	60.2	55.4	12.4
2000	1108	1000	67.5	79.4	76.6	72.8	71.1	65.2	59.8	55.4	11.9
2000	1108	1015	67.0	79.9	76.3	72.7	70.7	64.3	59.0	54.7	12.9
2000	1108	1030	67.7	79.8	76.3	73.6	71.5	65.3	59.9	54.2	12.1
2000	1108	1045	68.0	80.5	77.1	74.0	71.6	65.3	59.3	53.4	12.5
2000	1108	1100	67.4	79.2	75.6	73.3	71.4	64.9	59.2	55.1	11.8
2000	1108	1115	68.6	84.9	77.7	74.2	72.3	65.5	60.3	55.5	16.3
2000	1108	1130	68.2	82.8	76.8	73.6	71.9	65.7	59.8	55.8	14.6
2000	1108	1145	68.7	90.7	77.2	74.1	72.0	65.4	59.9	54.6	22.0
2000	1108	1200	66.2	81.1	74.0	71.4	69.6	64.1	58.9	54.5	14.9
2000	1108	1215	68.3	81.9	77.6	73.7	71.8	65.6	59.8	55.6	13.6
2000	1108	1230	68.4	79.6	76.5	73.6	71.9	66.4	61.7	56.6	11.2
2000	1108	1245	68.8	89.9	78.2	73.6	71.2	65.3	59.5	55.8	21.1
2000	1108	1300	68.3	88.0	77.0	73.4	70.9	64.9	58.3	54.4	19.7
2000	1108	1315	68.9	82.4	77.6	74.5	72.6	66.4	60.5	55.5	13.5
2000	1108	1330	68.1	85.9	77.5	73.4	71.2	65.3	59.5	54.2	17.8
2000	1108	1345	68.8	84.7	77.0	74.3	72.7	66.2	60.3	55.8	15.9
2000	1108	1400	67.5	78.1	75.1	72.7	71.0	65.7	60.1	55.3	10.6
2000	1108	1415	69.3	88.2	77.4	74.3	72.5	66.8	61.7	56.1	18.9
2000	1108	1430	67.8	86.6	75.9	72.6	70.9	65.9	61.0	55.7	18.8
2000	1108	1445	68.8	89.0	77.0	74.3	72.4	66.3	61.2	57.1	20.2
2000	1108	1500	68.7	86.1	77.7	73.9	71.9	66.4	60.8	56.5	17.4
2000	1108	1515	68.5	83.1	77.0	73.5	72.1	66.3	60.3	53.3	14.6
2000	1108	1530	68.7	89.7	78.2	72.7	71.1	65.8	59.8	52.6	21.0
2000	1108	1545	67.8	90.0	75.4	72.3	70.7	65.9	59.9	53.3	22.2
2000	1108	1600	68.3	81.0	76.4	73.6	71.8	66.3	60.4	53.7	12.7
2000	1108	1615	67.1	81.4	75.7	72.0	70.2	65.2	59.7	54.3	14.3
2000	1108	1630	67.5	79.8	75.6	72.5	70.9	65.6	59.9	53.5	12.3
2000	1108	1645	67.4	86.5	75.7	71.7	70.3	65.0	59.3	52.4	19.1
2000	1108	1700	68.2	82.0	76.9	73.7	71.5	66.0	59.3	51.3	13.8
2000	1108	1715	67.4	85.2	76.2	72.6	70.8	65.0	58.8	53.9	17.8
2000	1108	1730	65.9	84.6	75.2	71.5	69.0	63.3	59.4	56.2	18.7
2000	1108	1745	66.4	85.5	75.0	71.3	69.6	64.2	57.2	52.4	19.1
2000	1108	1800	67.4	83.2	75.9	72.0	70.3	65.9	58.1	51.5	15.8
2000	1108	1815	67.1	82.2	76.4	72.1	70.5	64.7	57.8	52.1	15.1
2000	1108	1830	67.7	88.4	76.1	73.2	71.4	65.0	55.5	50.9	20.7
2000	1108	1845	68.6	90.2	77.9	74.0	71.3	65.3	57.9	50.4	21.6
2000	1108	1900	66.4	78.8	76.0	72.0	70.0	63.5	55.5	51.3	12.4
2000	1108	1915	65.6	78.5	75.9	70.6	69.1	62.5	54.2	49.9	12.9
2000	1108	1930	65.7	78.9	75.3	71.6	69.7	61.7	53.6	49.5	13.2
2000	1108	1945	65.9	79.8	75.4	71.9	70.1	62.1	53.7	49.5	13.9
2000	1108	2000	65.7	81.4	76.0	71.5	69.0	62.2	54.0	48.7	15.7
2000	1108	2015	65.1	82.0	75.4	71.0	68.8	60.7	52.1	48.1	16.9
2000	1108	2030	66.4	83.0	76.7	73.2	69.8	62.3	54.8	48.6	16.6
2000	1108	2045	64.2	80.3	74.5	69.6	67.6	59.6	51.2	48.0	16.1
2000	1108	2100	65.6	83.4	76.5	71.6	68.9	60.7	52.3	48.4	17.8
2000	1108	2115	64.0	78.3	75.3	69.6	67.6	58.9	50.2	47.4	14.3
2000	1108	2130	64.0	80.1	75.8	68.7	66.8	58.8	50.3	48.3	16.1
2000	1108	2145	64.0	78.7	74.6	69.4	67.6	59.6	50.3	47.8	14.7
2000	1108	2200	64.7	80.7	76.2	70.4	68.0	58.7	50.2	47.7	16.0
2000	1108	2215	65.0	80.0	76.4	72.3	69.5	61.9	53.3	48.5	15.0
2000	1108	2230	65.0	77.7	75.2	71.4	68.5	60.7	52.8	48.6	12.7
2000	1108	2245	65.5	79.7	77.2	72.3	68.5	59.9	52.6	48.2	14.2
2000	1108	2300	64.9	79.3	76.3	71.7	68.2	58.5	51.5	48.8	14.4
2000	1108	2315	64.0	78.2	75.0	69.9	67.7	58.1	51.5	48.2	14.2
2000	1108	2330	64.0	79.4	75.5	70.7	67.2	57.4	51.5	49.1	15.4
2000	1108	2345	64.1	79.6	75.4	70.9	67.9	56.8	49.9	47.4	15.5
2000	1109	0	62.7	76.7	73.7	69.3	66.9	55.5	50.3	46.0	14.0

DAY 1	DESCRIPTOR	PERIOD	LEVEL	UNIT
Full Day	Leq, 24 hours	between 00:00 and 24:00 hours	67.2	dB(A)
Night Time	Leq, 8 hours	between 22:00 and 06:00 hours	64.2	dB(A)
Daytime	Leq, 15 hours	between 07:00 and 22:00 hours	68.0	dB(A)
Night Time	Leq, 9 hours	between 22:00 and 07:00 hours	65.6	dB(A)
Daytime	L10, 18 hours	between 06:00 and 24:00 hours	70.8	dB(A)
Daytime	minimum L90, 15 min	between 07:00 and 18:00 hours	57.2	dB(A)

88 Moorebank Ave Moorebank										DAY 2	
Thursday 9 November 2000										RT&A S/N 81	
YEAR	MoDy	TIME	Leq	Lmax	L1	L5	L10	L50	L90	Lmin	Lmax - Leq
2000	1108	2200	64.7	80.7	76.2	70.4	68.0	58.7	50.2	47.7	16.0
2000	1108	2215	65.0	80.0	76.4	72.3	69.5	61.9	53.3	48.5	15.0
2000	1108	2230	65.0	77.7	75.2	71.4	68.5	60.7	52.8	48.6	12.7
2000	1108	2245	65.5	79.7	77.2	72.3	68.5	59.9	52.6	48.2	14.2
2000	1108	2300	64.9	79.3	76.3	71.7	68.2	58.5	51.5	48.8	14.4
2000	1108	2315	64.0	78.2	75.0	69.9	67.7	58.1	51.5	48.2	14.2
2000	1108	2330	64.0	79.4	75.5	70.7	67.2	57.4	51.5	49.1	15.4
2000	1108	2345	64.1	79.6	75.4	70.9	67.9	56.8	49.9	47.4	15.5
2000	1109	0	62.7	76.7	73.7	69.3	66.9	55.5	50.3	46.0	14.0
2000	1109	15	62.8	79.7	75.8	69.2	66.1	52.6	48.7	46.1	16.9
2000	1109	30	65.0	82.7	76.3	72.9	68.4	56.5	50.1	47.0	17.7
2000	1109	45	63.4	78.4	75.2	71.5	67.1	53.7	49.2	47.0	15.0
2000	1109	100	62.3	77.7	74.9	69.2	65.6	52.7	48.9	44.5	15.4
2000	1109	115	62.9	78.0	75.5	69.8	66.1	52.0	47.7	45.5	15.1
2000	1109	130	62.6	80.2	74.8	69.8	66.1	50.8	47.0	44.5	17.6
2000	1109	145	59.7	76.9	72.2	66.9	63.8	50.1	47.6	46.0	17.2
2000	1109	200	61.6	77.4	74.5	68.1	65.3	51.3	47.2	43.0	15.8
2000	1109	215	63.0	80.1	75.8	70.2	65.9	50.7	45.4	43.0	17.1
2000	1109	230	63.7	80.1	76.5	71.1	66.4	51.8	46.3	43.1	16.4
2000	1109	245	61.9	77.4	74.1	69.5	65.8	51.3	45.9	43.4	15.5
2000	1109	300	62.8	77.8	75.2	70.4	66.3	52.8	47.6	44.6	15.0
2000	1109	315	63.0	79.0	76.1	69.8	66.3	51.7	47.5	44.9	16.0
2000	1109	330	64.1	79.3	76.6	71.8	67.4	52.6	47.8	45.6	15.2
2000	1109	345	63.8	78.1	75.7	71.6	66.0	52.6	49.0	46.6	14.3
2000	1109	400	63.3	79.9	75.2	70.3	67.2	54.3	49.0	47.0	16.6
2000	1109	415	65.6	80.5	76.7	72.8	69.4	58.1	51.2	48.7	14.9
2000	1109	430	65.3	78.8	75.0	72.6	69.7	58.5	51.0	48.5	13.5
2000	1109	445	65.4	79.8	76.1	72.5	69.2	58.5	51.6	48.7	14.4
2000	1109	500	67.2	79.3	76.7	74.3	71.9	61.9	53.3	50.3	12.1
2000	1109	515	66.6	78.6	76.4	73.3	70.6	62.4	54.3	51.5	12.0
2000	1109	530	68.4	85.9	77.5	75.1	72.4	64.5	54.3	49.6	17.5
2000	1109	545	69.5	80.5	77.7	75.2	73.3	67.3	60.3	56.8	11.0
2000	1109	600	70.0	83.6	77.8	75.2	73.6	68.2	61.8	56.4	13.6
2000	1109	615	69.5	83.1	77.8	74.4	72.6	68.1	61.1	56.5	13.6
2000	1109	630	70.8	86.8	78.5	75.6	74.0	69.3	62.7	57.6	16.0
2000	1109	645	71.5	86.0	79.9	76.2	74.5	69.7	64.6	59.0	14.5
2000	1109	700	70.8	84.4	78.3	75.6	74.0	69.2	64.2	56.5	13.6
2000	1109	715	70.6	83.8	78.0	75.2	73.7	69.3	64.2	57.1	13.2
2000	1109	730	70.5	87.2	78.1	74.7	73.1	69.3	65.0	57.8	16.7
2000	1109	745	70.8	85.7	80.4	75.2	73.2	69.0	64.2	56.5	14.9
2000	1109	800	70.0	85.1	77.2	74.4	73.0	68.4	64.2	58.7	15.1
2000	1109	815	69.3	84.4	77.4	74.2	72.4	67.7	63.1	56.1	15.1
2000	1109	830	68.6	81.6	76.5	73.5	71.6	67.1	62.0	56.3	13.0
2000	1109	845	68.6	85.4	76.8	73.6	71.5	66.8	62.3	56.2	16.8
2000	1109	900	69.1	79.9	77.4	74.4	72.6	67.2	61.5	55.6	10.8
2000	1109	915	67.9	82.1	76.2	73.1	71.4	65.9	59.3	53.3	14.2
2000	1109	930	68.0	80.0	75.9	73.4	71.7	65.8	60.5	54.6	12.0
2000	1109	945	68.1	84.0	76.0	73.3	71.5	66.1	60.3	54.2	15.9
2000	1109	1000	68.4	87.7	76.9	73.8	71.8	65.8	59.9	54.6	19.3
2000	1109	1015	68.9	86.2	78.0	74.6	72.5	65.7	60.2	56.1	17.3
2000	1109	1030	68.3	85.0	79.0	73.6	71.4	64.9	59.5	53.9	16.7
2000	1109	1045	69.5	80.7	77.9	74.8	73.3	67.1	60.6	55.2	11.2
2000	1109	1100	70.5	93.4	79.9	74.8	73.0	66.0	60.3	54.6	22.9
2000	1109	1115	69.3	82.6	77.8	75.1	73.2	66.7	61.5	57.4	13.3
2000	1109	1130	68.5	85.7	77.0	74.1	72.1	66.2	60.2	54.9	17.2
2000	1109	1145	68.5	80.3	76.6	73.9	72.3	66.3	59.9	55.4	11.8
2000	1109	1200	68.7	81.5	77.0	74.4	72.9	66.1	60.2	55.4	12.8
2000	1109	1215	69.0	84.2	77.5	74.6	72.9	66.5	60.2	54.8	15.2
2000	1109	1230	68.7	83.9	77.5	73.9	72.1	66.3	59.6	54.9	15.2
2000	1109	1245	69.0	84.6	76.7	74.0	72.1	67.5	63.2	58.1	15.6
2000	1109	1300	68.9	84.7	77.6	73.9	72.4	66.7	59.9	54.0	15.8
2000	1109	1315	69.2	85.9	78.9	75.0	72.7	66.3	60.1	54.2	16.7
2000	1109	1330	68.4	85.1	77.6	73.9	71.9	65.7	59.8	54.4	16.7
2000	1109	1345	68.5	84.6	77.3	74.0	71.9	66.0	60.6	55.2	16.1
2000	1109	1400	68.1	78.8	76.5	74.0	72.0	65.7	59.8	54.8	10.7
2000	1109	1415	68.2	86.7	76.9	74.0	71.8	65.5	59.0	55.1	18.5
2000	1109	1430	68.4	81.1	76.4	74.0	72.2	66.0	59.7	55.1	12.7
2000	1109	1445	68.8	89.6	77.0	73.3	71.6	66.6	60.6	54.4	20.8
2000	1109	1500	68.1	85.3	76.7	73.6	71.7	66.0	59.3	55.2	17.2
2000	1109	1515	69.2	87.0	76.9	74.0	72.5	67.5	61.8	57.2	17.8
2000	1109	1530	68.5	87.6	76.9	73.7	71.7	66.0	59.4	55.1	19.1
2000	1109	1545	68.0	90.2	77.3	73.1	70.6	64.3	59.3	54.7	22.2
2000	1109	1600	67.8	87.8	76.8	72.6	70.8	64.8	59.7	53.0	20.0
2000	1109	1615	66.3	80.1	74.4	71.6	70.0	64.2	57.9	53.7	13.8
2000	1109	1630	67.7	82.2	77.1	73.1	70.8	65.3	60.8	56.4	14.5
2000	1109	1645	66.9	80.0	75.3	71.5	70.1	65.3	58.6	50.7	13.1
2000	1109	1700	66.9	84.6	75.4	72.3	70.3	64.7	57.4	51.8	17.7
2000	1109	1715	67.8	86.0	77.3	72.6	70.6	65.0	58.7	53.3	18.2
2000	1109	1730	67.9	87.6	78.1	74.3	71.2	64.1	58.8	55.7	19.7
2000	1109	1745	68.2	84.4	77.1	73.8	71.6	65.5	59.1	53.3	16.2
2000	1109	1800	67.6	84.8	76.8	73.0	70.6	65.3	58.0	52.2	17.2
2000	1109	1815	67.8	86.8	77.7	73.4	71.1	64.9	57.5	50.6	19.0
2000	1109	1830	67.3	81.6	76.4	73.0	70.9	64.5	55.8	51.2	14.3
2000	1109	1845	67.4	84.4	77.1	72.8	70.7	64.7	56.0	51.2	17.0
2000	1109	1900	66.4	82.8	76.0	71.8	69.8	63.2	54.9	50.3	16.4
2000	1109	1915	67.7	84.6	77.9	73.2	70.8	64.2	55.9	50.6	16.9
2000	1109	1930	66.8	80.1	76.9	72.5	70.2	63.8	55.6	50.5	13.3
2000	1109	1945	66.4	83.1	76.2	72.6	69.9	62.9	54.1	49.5	16.7
2000	1109	2000	67.9	82.0	75.4	73.4	71.7	66.3	55.6	49.2	14.1
2000	1109	2015	67.6	80.3	76.3	72.5	70.2	66.3	58.2	51.5	12.7
2000	1109	2030	65.5	82.0	75.9	71.8	68.9	60.9	51.7	48.5	16.5
2000	1109	2045	64.9	78.9	75.8	71.1	68.4	59.3	50.4	47.7	14.0
2000	1109	2100	63.5	79.6	73.7	69.2	67.2	58.6	50.9	47.4	16.1
2000	1109	2115	64.0	81.5	74.1	69.6	67.6	59.8	51.6	48.8	17.5
2000	1109	2130	67.0	88.5	76.7	72.7	69.4	61.5	52.4	47.9	21.5
2000	1109	2145	65.0	81.9	75.1	71.3	68.5	60.3	51.2	47.8	16.9
2000	1109	2200	65.6	80.1	76.3	71.9	69.0	60.7	51.4	48.9	14.5
2000	1109	2215	64.7	78.6	74.8	71.4	68.3	59.7	50.6	47.0	13.9
2000	1109	2230	65.5	79.1	75.6	72.2	69.4	61.3	52.1	48.5	13.6
2000	1109	2245	63.6	78.2	74.2	69.6	67.4	58.8	50.5	47.1	14.6
2000	1109	2300	62.4	77.1	72.2	68.1	66.5	58.2	49.4	46.3	14.7
2000	1109	2315	64.9	80.7	76.0	71.4	68.2	59.6	50.5	46.6	15.8
2000	1109	2330	64.2	79.9	76.2	69.9	67.2	57.8	49.9	47.4	15.7
2000	1109	2345	63.5	79.1	75.7	69.7	66.8	56.2	51.2	49.6	15.6

DAY 2	DESCRIPTOR	PERIOD	LEVEL	UNIT
Full Day	Leq, 24 hours	between 00:00 and 24:00 hours	67.5	dB(A)
Night Time	Leq, 8 hours	between 22:00 and 06:00 hours	64.5	dB(A)
Daytime	Leq, 15 hours	between 07:00 and 22:00 hours	68.3	dB(A)
Night Time	Leq, 9 hours	between 22:00 and 07:00 hours	65.9	dB(A)
Daytime	L10, 18 hours	between 06:00 and 24:00 hours	71.1	dB(A)
Daytime	minimum L90, 15 min	between 07:00 and 18:00 hours	57.4	dB(A)

88 Moorebank Ave Moorebank											DAY 3
Friday 10 November 2000											RT&A S/N 81
YEAR	MoDy	TIME	Leq	Lmax	L1	L5	L10	L50	L90	Lmin	Lmax - Leq
2000	1109	2215	64.7	78.6	74.8	71.4	68.3	59.7	50.6	47.0	13.9
2000	1109	2230	65.5	79.1	75.6	72.2	69.4	61.3	52.1	48.5	13.6
2000	1109	2245	63.6	78.2	74.2	69.6	67.4	58.8	50.5	47.1	14.6
2000	1109	2300	62.4	77.1	72.2	68.1	66.5	58.2	49.4	46.3	14.7
2000	1109	2315	64.9	80.7	76.0	71.4	68.2	59.6	50.5	46.6	15.8
2000	1109	2330	64.2	79.9	76.2	69.9	67.2	57.8	49.9	47.4	15.7
2000	1109	2345	63.5	79.1	75.7	69.7	66.8	56.2	51.2	49.6	15.6
2000	1110	0	64.9	80.6	76.4	72.3	68.2	56.8	51.8	49.8	15.7
2000	1110	15	62.3	76.5	73.4	68.4	66.1	56.1	52.5	51.0	14.2
2000	1110	30	62.9	77.2	74.9	70.0	66.3	54.4	50.2	47.4	14.3
2000	1110	45	63.2	78.8	75.7	69.7	65.9	55.1	50.1	47.0	15.6
2000	1110	100	62.7	77.9	75.3	69.2	65.8	53.8	48.7	45.9	15.2
2000	1110	115	61.2	78.1	73.8	67.2	64.4	53.4	48.9	45.3	16.9
2000	1110	130	60.8	77.8	74.0	67.0	64.1	51.5	46.8	45.0	17.0
2000	1110	145	62.9	77.2	74.3	70.5	67.0	53.0	46.5	44.3	14.3
2000	1110	200	63.0	79.6	76.2	70.3	65.2	50.3	45.8	43.3	16.6
2000	1110	215	61.1	76.7	73.6	68.3	64.8	50.1	45.5	43.2	15.6
2000	1110	230	62.7	80.4	74.6	69.9	66.4	51.9	47.3	44.6	17.7
2000	1110	245	62.5	77.7	74.8	70.5	66.4	50.9	45.8	43.0	15.2
2000	1110	300	62.2	78.6	75.3	69.0	65.0	50.9	45.2	42.6	16.4
2000	1110	315	63.5	80.1	75.5	70.8	67.3	52.0	46.0	42.5	16.6
2000	1110	330	63.3	78.7	75.2	70.8	66.9	53.4	46.7	43.0	15.4
2000	1110	345	63.2	81.9	75.7	69.9	66.5	52.9	47.3	43.9	18.7
2000	1110	400	64.7	78.8	76.0	72.7	69.1	55.0	48.3	44.7	14.1
2000	1110	415	62.9	80.6	74.1	69.5	66.9	55.6	49.4	46.3	17.7
2000	1110	430	65.4	79.7	77.3	72.8	69.0	57.5	50.9	45.9	14.3
2000	1110	445	65.8	80.1	76.2	72.9	69.9	60.1	51.1	47.3	14.3
2000	1110	500	65.8	80.2	75.5	72.7	70.2	60.8	51.6	47.6	14.4
2000	1110	515	66.9	79.2	76.9	74.1	71.4	61.8	53.6	49.2	12.3
2000	1110	530	68.3	80.7	77.7	75.3	72.7	64.6	56.3	50.1	12.4
2000	1110	545	69.3	83.2	78.2	74.5	72.8	67.1	59.7	52.2	13.9
2000	1110	600	69.4	81.6	77.3	74.9	72.8	67.6	60.6	56.1	12.2
2000	1110	615	70.0	81.0	77.8	74.7	73.3	68.5	62.5	56.2	11.0
2000	1110	630	70.8	88.2	79.3	75.5	73.6	68.9	63.9	57.8	17.4
2000	1110	645	70.6	86.4	78.4	75.0	73.6	69.3	63.5	56.2	15.8
2000	1110	700	71.5	86.6	79.9	76.1	74.5	69.5	63.8	57.1	17.1
2000	1110	715	69.8	83.6	78.0	74.5	72.9	68.4	63.0	57.0	13.8
2000	1110	730	70.6	85.3	78.6	75.2	73.7	68.9	64.6	58.7	14.7
2000	1110	745	70.6	84.1	78.4	74.8	73.2	69.4	65.2	57.2	13.5
2000	1110	800	71.1	86.2	79.2	75.8	74.0	69.4	65.0	56.5	15.1
2000	1110	815	70.9	88.2	78.6	76.0	74.2	69.0	64.4	56.5	17.3
2000	1110	830	70.1	86.2	78.2	74.7	73.1	68.6	63.3	56.4	16.1
2000	1110	845	70.5	86.3	78.4	75.5	74.0	68.6	63.6	56.5	15.8
2000	1110	900	71.4	94.0	79.1	75.3	73.2	67.6	60.8	53.9	22.6
2000	1110	915	70.0	85.9	79.5	75.3	73.2	67.2	61.1	55.0	15.9
2000	1110	930	68.4	86.4	77.3	73.6	71.5	66.0	60.6	55.4	18.0
2000	1110	945	69.0	80.7	76.9	74.4	72.9	66.5	60.9	55.4	11.7
2000	1110	1000	68.3	86.2	76.7	73.7	71.6	65.6	60.5	55.3	17.9
2000	1110	1015	68.7	79.6	77.7	74.8	72.6	65.8	60.2	55.7	10.9
2000	1110	1030	68.8	84.6	77.0	74.6	72.7	66.6	60.4	55.4	15.8
2000	1110	1045	69.0	81.0	77.1	74.7	72.8	66.7	61.6	55.6	12.0
2000	1110	1100	68.6	80.9	77.6	74.0	72.1	66.0	59.7	54.1	12.3
2000	1110	1115	68.5	86.2	77.6	73.8	71.8	66.0	59.9	55.1	17.7
2000	1110	1130	69.4	83.3	79.2	74.4	72.6	66.9	61.3	55.0	13.9
2000	1110	1145	67.7	79.7	76.4	73.4	71.0	65.6	59.8	54.4	12.0
2000	1110	1200	68.6	84.1	77.8	74.1	72.1	65.9	59.8	55.4	15.5
2000	1110	1215	68.9	82.9	78.7	75.1	72.7	65.5	59.1	55.6	14.0
2000	1110	1230	68.4	82.6	76.6	74.3	72.3	65.9	59.8	55.3	14.2
2000	1110	1245	67.8	84.0	76.3	73.6	71.4	65.4	59.2	55.0	16.2
2000	1110	1300	67.4	78.5	75.2	72.4	70.8	65.7	60.3	54.8	11.1
2000	1110	1315	69.4	85.5	80.5	74.7	72.2	65.9	59.4	54.7	16.1
2000	1110	1330	68.1	85.0	77.1	73.5	71.6	65.4	59.1	52.3	16.9
2000	1110	1345	69.5	88.2	79.0	75.3	73.1	65.9	59.1	52.7	18.7
2000	1110	1400	67.8	84.5	77.5	72.8	70.7	65.3	58.9	50.9	16.7
2000	1110	1415	69.2	89.9	77.9	74.3	72.5	66.4	60.3	50.4	20.7
2000	1110	1430	68.3	89.0	77.7	74.0	71.8	65.2	57.9	53.2	20.7
2000	1110	1445	68.2	86.7	76.6	73.7	71.8	65.3	59.5	53.4	18.5
2000	1110	1500	68.2	82.7	77.6	73.5	71.4	65.9	59.0	50.8	14.5
2000	1110	1515	68.4	82.5	76.6	73.8	72.1	66.4	60.3	53.4	14.1
2000	1110	1530	67.4	88.4	75.3	72.8	70.9	65.0	59.2	53.3	21.0
2000	1110	1545	68.3	92.3	77.0	72.2	69.5	64.7	59.8	51.6	24.0
2000	1110	1600	68.9	91.5	78.0	73.9	71.8	65.5	58.2	51.7	22.6
2000	1110	1615	67.9	84.5	76.3	73.0	71.4	65.9	57.3	49.1	16.6
2000	1110	1630	67.2	83.8	77.1	72.7	70.3	64.6	57.2	50.9	16.6
2000	1110	1645	68.0	85.6	77.3	72.8	70.8	65.6	58.9	52.0	17.6
2000	1110	1700	66.9	89.3	75.9	71.5	69.7	64.2	56.9	50.5	22.4
2000	1110	1715	67.4	84.6	77.2	72.8	70.5	64.9	59.2	51.7	17.2
2000	1110	1730	66.6	88.5	75.8	71.6	69.7	64.0	56.5	51.2	21.9
2000	1110	1745	67.7	81.2	77.3	73.3	70.7	65.3	58.0	51.3	13.5
2000	1110	1800	68.3	90.7	77.7	73.2	71.4	65.2	57.7	50.4	22.4
2000	1110	1815	67.7	89.8	75.3	72.1	70.0	65.3	56.9	51.6	22.1
2000	1110	1830	67.8	84.5	77.0	73.6	71.1	65.1	57.4	49.9	16.7
2000	1110	1845	66.9	82.9	76.2	71.9	70.1	64.2	55.9	51.0	16.0
2000	1110	1900	67.3	81.5	76.9	73.4	70.7	64.5	54.7	49.0	14.2
2000	1110	1915	66.4	81.8	76.1	72.0	70.1	63.5	53.6	48.5	15.4
2000	1110	1930	66.4	90.8	74.8	71.0	69.4	63.2	54.2	49.3	24.4
2000	1110	1945	66.1	81.6	75.5	71.7	69.7	62.6	55.1	48.7	15.5
2000	1110	2000	67.2	85.4	75.9	72.0	70.2	64.9	57.7	50.8	18.2
2000	1110	2015	66.3	77.9	74.7	71.4	69.4	64.5	56.0	49.5	11.6
2000	1110	2030	65.4	78.0	75.1	71.8	69.3	61.6	52.2	47.6	12.6
2000	1110	2045	64.4	83.4	74.4	70.4	68.1	60.1	51.9	47.1	19.0
2000	1110	2100	65.0	81.0	75.0	71.5	68.0	59.6	50.2	46.7	16.0
2000	1110	2115	65.8	81.2	75.9	72.6	69.8	60.8	51.5	46.5	15.4
2000	1110	2130	64.9	79.3	75.5	71.1	68.6	59.7	50.4	45.8	14.4
2000	1110	2145	64.0	79.0	75.0	71.1	68.1	59.0	49.1	45.1	15.0
2000	1110	2200	63.8	79.2	74.4	70.1	67.6	58.3	49.6	45.4	15.4
2000	1110	2215	63.5	79.0	74.7	69.2	66.9	58.0	48.7	43.9	15.5
2000	1110	2230	63.7	79.3	75.5	69.3	66.9	58.6	48.3	45.5	15.6
2000	1110	2245	64.0	77.7	75.2	69.3	67.0	59.8	50.6	45.9	13.7
2000	1110	2300	62.4	78.6	73.1	68.0	66.3	58.2	47.7	44.9	16.2
2000	1110	2315	63.3	78.5	74.3	69.4	67.0	57.2	47.0	45.1	15.2
2000	1110	2330	63.9	78.7	75.1	69.6	67.3	58.5	48.3	45.3	14.8
2000	1110	2345	62.8	80.3	74.5	68.0	65.9	57.5	47.9	44.9	17.5
2000	1111	0	62.3	84.9	73.7	68.0	66.2	55.6	46.9	44.1	22.6

DAY 3	DESCRIPTOR	PERIOD	LEVEL	UNIT
Full Day	Leq, 24 hours	between 00:00 and 24:00 hours	67.5	dB(A)
Night Time	Leq, 8 hours	between 22:00 and 06:00 hours	64.5	dB(A)
Daytime	Leq, 15 hours	between 07:00 and 22:00 hours	68.3	dB(A)
Night Time	Leq, 9 hours	between 22:00 and 07:00 hours	65.9	dB(A)
Daytime	L10, 18 hours	between 06:00 and 24:00 hours	70.9	dB(A)
Daytime	minimum L90, 15 min	between 07:00 and 18:00 hours	56.5	dB(A)

88 Moorebank Ave Moorebank											DAY 4
Saturday 11 November 2000											RT&A S/N 81
YEAR	MoDy	TIME	Leq	Lmax	L1	L5	L10	L50	L90	Lmin	Lmax - Leq
2000	1110	2215	63.5	79.0	74.7	69.2	66.9	58.0	48.7	43.9	15.5
2000	1110	2230	63.7	79.3	75.5	69.3	66.9	58.6	48.3	45.5	15.6
2000	1110	2245	64.0	77.7	75.2	69.3	67.0	59.8	50.6	45.9	13.7
2000	1110	2300	62.4	78.6	73.1	68.0	66.3	56.2	47.7	44.9	16.2
2000	1110	2315	63.3	78.5	74.3	69.4	67.0	57.2	47.0	45.1	15.2
2000	1110	2330	63.9	78.7	75.1	69.6	67.3	58.5	48.3	45.3	14.8
2000	1110	2345	62.8	80.3	74.5	68.0	65.9	57.5	47.9	44.9	17.5
2000	1111	0	62.3	84.9	73.7	68.0	66.2	55.6	46.9	44.1	22.6
2000	1111	15	63.0	78.7	75.4	68.9	66.4	54.8	46.5	44.2	15.7
2000	1111	30	61.5	78.9	74.1	67.5	65.0	52.2	45.4	43.3	17.4
2000	1111	45	61.2	79.9	73.6	67.3	65.1	51.0	44.0	42.2	18.7
2000	1111	100	60.6	78.2	72.1	66.8	64.6	51.0	45.3	43.6	17.6
2000	1111	115	59.1	77.9	71.6	65.2	63.0	49.1	44.3	42.4	18.8
2000	1111	130	58.7	75.3	72.2	65.9	63.5	50.0	45.0	42.8	15.6
2000	1111	145	59.4	76.8	71.8	65.8	63.6	49.0	44.8	43.5	17.4
2000	1111	200	59.0	76.0	72.0	66.9	63.0	51.9	45.8	43.4	17.0
2000	1111	215	59.9	76.2	72.3	66.1	63.8	50.7	46.1	44.0	16.3
2000	1111	230	60.1	77.1	73.4	66.3	63.3	50.0	46.6	44.6	17.0
2000	1111	245	59.8	75.6	71.3	67.1	64.3	50.2	46.9	45.1	15.8
2000	1111	300	60.4	77.4	73.3	67.3	64.0	49.9	47.5	46.1	17.0
2000	1111	315	61.7	78.4	75.1	67.7	64.4	50.5	47.8	45.3	16.7
2000	1111	330	59.8	75.7	72.3	66.5	63.8	51.3	47.7	45.5	15.9
2000	1111	345	60.7	77.7	72.8	67.3	64.3	51.3	47.7	45.4	17.0
2000	1111	400	61.5	79.2	74.3	67.4	64.8	50.8	47.3	45.8	17.7
2000	1111	415	60.5	79.0	71.7	66.5	64.3	50.4	48.0	46.3	18.5
2000	1111	430	63.5	83.3	75.8	69.5	66.7	53.2	48.0	46.2	19.8
2000	1111	445	62.6	79.0	73.5	68.9	66.6	55.7	48.9	46.2	16.4
2000	1111	500	62.8	82.6	74.7	68.2	66.1	55.2	49.1	46.1	19.8
2000	1111	515	63.9	78.1	75.9	70.0	67.3	56.6	50.2	46.3	14.2
2000	1111	530	64.2	77.0	73.9	70.4	68.3	59.6	51.8	48.7	12.8
2000	1111	545	65.7	79.8	75.7	71.2	69.5	62.6	53.6	48.1	14.1
2000	1111	600	66.8	80.7	76.7	72.9	70.8	62.9	54.3	48.6	13.9
2000	1111	615	65.3	78.1	74.6	70.4	69.0	62.7	54.7	51.3	12.8
2000	1111	630	67.6	88.8	76.6	73.3	71.0	64.3	55.4	51.4	21.2
2000	1111	645	67.5	82.2	77.6	73.8	71.3	63.7	54.7	49.8	14.7
2000	1111	700	67.4	85.6	76.5	73.4	71.2	64.3	55.9	50.2	18.2
2000	1111	715	66.1	81.5	75.2	71.3	69.3	63.6	55.6	50.4	15.4
2000	1111	730	66.1	79.0	75.2	71.9	69.8	63.6	52.9	48.0	12.9
2000	1111	745	65.8	78.8	76.0	71.3	69.4	62.7	52.4	47.9	13.0
2000	1111	800	66.4	86.0	76.9	72.0	69.7	62.4	53.2	47.7	19.6
2000	1111	815	66.0	78.3	75.4	72.1	69.6	62.8	52.9	47.6	12.3
2000	1111	830	65.5	83.8	75.2	70.8	68.8	62.7	53.6	48.9	18.3
2000	1111	845	67.4	89.7	75.8	72.0	69.6	63.7	55.0	47.8	22.3
2000	1111	900	67.3	85.9	76.4	72.6	70.7	64.5	56.3	51.0	18.6
2000	1111	915	65.4	78.7	73.8	70.3	68.6	63.6	56.4	49.9	13.3
2000	1111	930	64.8	78.2	73.8	70.1	68.5	62.1	54.3	49.6	13.4
2000	1111	945	65.7	76.6	74.4	71.3	69.2	63.8	56.1	49.9	10.9
2000	1111	1000	67.3	81.5	77.1	73.3	70.8	64.3	55.0	49.4	14.2
2000	1111	1015	66.3	79.7	75.7	71.6	69.6	64.3	54.6	49.7	13.4
2000	1111	1030	66.7	82.1	75.4	71.9	70.1	64.7	56.1	49.6	15.4
2000	1111	1045	67.6	89.3	78.2	71.9	69.7	64.3	56.8	50.7	21.7
2000	1111	1100	67.1	83.5	76.6	72.7	70.4	64.4	56.2	49.9	16.4
2000	1111	1115	67.0	79.2	76.6	72.0	70.0	65.0	58.3	52.1	12.2
2000	1111	1130	66.2	79.7	75.0	71.1	69.5	64.5	57.0	50.0	13.5
2000	1111	1145	66.7	87.9	75.4	71.2	69.5	64.4	56.9	50.9	21.2
2000	1111	1200	68.3	89.8	78.6	71.9	69.9	64.0	55.7	50.7	21.5
2000	1111	1215	66.6	82.5	75.1	71.3	69.9	64.3	55.9	49.4	15.9
2000	1111	1230	66.3	82.9	74.6	70.7	69.2	64.6	57.9	50.9	16.6
2000	1111	1245	66.8	83.1	76.1	71.9	70.0	64.7	55.4	49.2	16.3
2000	1111	1300	65.5	79.2	74.1	70.2	68.9	63.6	55.9	49.6	13.7
2000	1111	1315	66.2	80.7	74.8	71.3	69.6	64.0	55.8	50.1	14.5
2000	1111	1330	66.3	89.4	75.3	70.9	69.0	63.6	55.2	51.0	23.1
2000	1111	1345	65.6	80.6	74.0	70.5	68.8	63.8	55.7	49.4	15.0
2000	1111	1400	65.7	80.6	74.2	70.7	69.3	63.7	54.8	48.7	14.9
2000	1111	1415	68.4	92.3	77.7	71.8	69.3	64.1	55.7	49.5	23.9
2000	1111	1430	65.1	76.5	72.2	69.5	68.5	63.9	55.7	50.5	11.4
2000	1111	1445	65.5	77.6	74.3	70.5	69.0	63.5	54.8	49.7	12.1
2000	1111	1500	64.8	76.8	73.1	69.9	68.6	62.8	54.3	49.0	12.0
2000	1111	1515	65.9	80.4	75.0	71.2	69.4	63.6	54.2	49.1	14.5
2000	1111	1530	66.7	90.3	74.3	70.2	68.9	62.1	52.3	47.5	23.6
2000	1111	1545	65.5	79.3	74.1	70.4	69.1	63.7	54.1	49.7	13.8
2000	1111	1600	65.1	78.1	73.1	69.8	68.6	63.3	53.8	47.6	13.0
2000	1111	1615	66.8	89.2	75.3	70.5	69.0	63.4	53.7	46.7	22.4
2000	1111	1630	65.0	79.2	74.3	69.7	68.6	62.2	52.5	48.9	14.2
2000	1111	1645	64.7	75.9	72.2	69.6	68.5	62.9	53.4	47.8	11.2
2000	1111	1700	65.4	80.9	73.8	70.6	69.1	63.3	55.2	50.1	15.5
2000	1111	1715	65.1	74.7	71.7	69.9	68.9	63.8	55.9	50.4	9.6
2000	1111	1730	64.9	79.5	73.5	69.4	68.2	63.2	54.0	49.1	14.6
2000	1111	1745	65.0	78.6	72.9	70.3	68.8	62.7	53.2	47.6	13.6
2000	1111	1800	64.9	81.3	74.1	69.9	68.4	62.1	53.3	48.5	16.4
2000	1111	1815	65.3	81.3	74.3	70.3	68.6	63.1	54.7	48.7	16.0
2000	1111	1830	64.1	76.4	72.6	69.5	67.8	61.9	51.8	46.8	12.3
2000	1111	1845	64.8	80.3	72.8	69.8	68.6	62.5	52.3	47.5	15.5
2000	1111	1900	64.2	78.1	73.2	69.4	68.0	61.5	51.0	46.5	13.9
2000	1111	1915	63.8	76.4	72.3	69.5	68.2	60.2	50.9	46.9	12.6
2000	1111	1930	63.1	76.4	71.8	68.8	67.2	59.8	48.6	44.9	13.3
2000	1111	1945	63.6	83.5	72.8	68.8	67.2	59.7	50.6	45.6	19.9
2000	1111	2000	61.6	73.3	70.0	67.7	66.2	57.4	47.6	44.1	11.7
2000	1111	2015	62.0	76.7	70.7	67.2	65.8	58.6	49.9	43.4	14.7
2000	1111	2030	61.8	76.3	71.0	68.1	66.1	56.8	49.0	45.8	14.5
2000	1111	2045	61.8	76.1	70.4	67.9	66.4	56.8	47.7	43.0	14.3
2000	1111	2100	62.4	79.9	73.0	67.5	66.1	56.9	46.9	43.9	17.5
2000	1111	2115	62.2	75.8	71.6	67.6	65.8	58.8	48.3	44.3	13.6
2000	1111	2130	62.7	83.0	73.1	67.4	65.4	56.4	47.2	43.3	20.3
2000	1111	2145	61.8	76.3	71.0	67.5	66.0	57.1	48.3	44.2	14.5
2000	1111	2200	62.7	77.6	73.5	68.1	66.5	57.1	48.0	45.6	14.9
2000	1111	2215	61.8	75.9	72.0	67.8	66.1	56.7	48.7	46.2	14.1
2000	1111	2230	62.1	79.3	72.0	67.5	65.9	56.0	48.8	45.6	17.2
2000	1111	2245	61.3	74.8	70.8	67.3	65.7	55.8	46.4	43.9	13.5
2000	1111	2300	63.4	78.4	74.4	68.7	66.8	58.9	47.7	43.9	15.0
2000	1111	2315	62.5	81.9	73.3	67.6	66.2	57.1	46.6	44.1	19.4
2000	1111	2330	61.8	75.1	71.1	67.6	66.3	56.9	47.9	44.6	13.3
2000	1111	2345	61.4	76.4	71.8	67.6	65.8	55.1	45.4	43.1	15.0
2000	1112	0	61.8	76.1	72.0	67.7	66.1	55.8	47.2	44.5	14.3

DAY 4	DESCRIPTOR	PERIOD	LEVEL	UNIT
Full Day	Leq, 24 hours	between 00:00 and 24:00 hours	64.8	dB(A)
Night Time	Leq, 8 hours	between 22:00 and 06:00 hours	62.3	dB(A)
Daytime	Leq, 15 hours	between 07:00 and 22:00 hours	65.6	dB(A)
Night Time	Leq, 9 hours	between 22:00 and 07:00 hours	63.3	dB(A)
Daytime	L10, 18 hours	between 06:00 and 24:00 hours	68.5	dB(A)
Daytime	minimum L90, 15 min	between 07:00 and 18:00 hours	52.3	dB(A)

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YEAR	MoDy	TIME	Leq	Lmax	L1	L5	L10	L50	L90	Lmin	Lmax - Leq
2000	1111	2215	61.8	75.9	72.0	67.8	66.1	56.7	48.7	46.2	14.1
2000	1111	2230	62.1	79.3	72.0	67.5	65.9	56.0	48.8	45.6	17.2
2000	1111	2245	61.3	74.8	70.8	67.3	65.7	55.8	46.4	43.9	13.5
2000	1111	2300	63.4	78.4	74.4	68.7	66.8	58.9	47.7	43.9	15.0
2000	1111	2315	62.5	81.9	73.3	67.6	66.2	57.1	46.6	44.1	19.4
2000	1111	2330	61.8	75.1	71.1	67.6	66.3	56.9	47.9	44.6	13.3
2000	1111	2345	61.4	76.4	71.8	67.6	65.8	55.1	45.4	43.1	15.0
2000	1112	0	61.8	76.1	72.0	67.7	66.1	55.8	47.2	44.5	14.3
2000	1112	15	62.0	76.3	72.3	67.6	66.0	57.1	48.3	45.5	14.3
2000	1112	30	61.8	75.8	72.3	67.6	66.3	55.7	48.0	45.3	14.0
2000	1112	45	61.4	77.6	73.2	67.4	65.6	54.0	47.9	45.3	16.2
2000	1112	100	60.2	77.0	70.2	66.8	65.0	51.9	45.5	43.4	16.8
2000	1112	115	62.1	82.1	74.5	67.3	65.1	51.1	46.0	43.8	20.0
2000	1112	130	60.9	78.7	73.2	67.5	65.0	50.6	44.8	43.1	17.8
2000	1112	145	60.3	76.7	72.1	66.9	64.7	51.4	45.8	43.6	16.4
2000	1112	200	58.1	70.3	68.3	65.7	63.4	49.2	44.3	42.3	12.2
2000	1112	215	59.6	79.0	71.1	65.5	63.3	48.5	44.8	42.8	19.4
2000	1112	230	59.9	77.1	71.9	66.3	64.2	51.2	47.1	45.1	17.2
2000	1112	245	59.0	76.7	70.5	65.9	63.1	48.9	46.1	44.6	17.7
2000	1112	300	57.8	76.6	70.5	64.5	60.8	48.8	46.4	44.5	18.8
2000	1112	315	59.7	78.2	72.7	66.3	62.8	49.7	47.2	45.9	18.5
2000	1112	330	57.5	74.9	68.8	64.5	61.8	48.9	47.2	45.9	17.4
2000	1112	345	60.1	76.3	73.4	66.7	63.5	50.1	47.6	45.9	16.2
2000	1112	400	59.1	77.8	72.8	65.1	61.6	48.4	46.3	44.9	18.7
2000	1112	415	58.2	72.8	70.0	65.3	62.5	49.6	46.9	45.0	14.6
2000	1112	430	58.0	76.9	70.1	64.7	61.7	49.5	47.1	45.1	18.9
2000	1112	445	59.1	76.8	71.0	65.8	63.3	49.0	46.8	45.4	17.7
2000	1112	500	60.5	79.5	74.3	66.6	63.2	49.7	46.6	45.3	19.0
2000	1112	515	59.5	77.9	69.0	66.1	64.2	51.7	46.8	45.4	18.4
2000	1112	530	62.1	78.8	73.4	67.8	66.0	55.3	49.0	46.6	16.7
2000	1112	545	63.0	77.6	73.7	69.1	66.9	57.7	50.8	47.0	14.6
2000	1112	600	63.4	78.5	72.5	69.4	67.8	58.6	50.6	47.2	15.1
2000	1112	615	63.1	84.0	71.8	68.4	67.0	58.1	49.8	47.0	20.9
2000	1112	630	64.2	84.9	72.5	69.7	67.8	59.0	50.9	47.1	20.7
2000	1112	645	63.9	81.2	74.3	68.9	67.4	58.6	50.5	46.3	17.3
2000	1112	700	62.7	75.4	70.7	68.6	67.2	59.0	50.4	45.7	12.7
2000	1112	715	62.4	76.3	71.9	68.5	66.8	57.1	48.9	45.7	13.9
2000	1112	730	62.7	76.1	71.5	68.8	67.0	58.8	49.9	45.7	13.4
2000	1112	745	65.4	85.8	77.0	70.0	68.1	59.8	49.9	46.2	20.4
2000	1112	800	64.1	78.8	74.2	69.3	68.0	60.3	50.4	47.2	14.7
2000	1112	815	63.7	75.9	72.8	69.3	67.7	60.5	52.0	47.9	12.2
2000	1112	830	63.8	79.4	73.8	68.7	67.3	59.7	50.6	46.6	15.6
2000	1112	845	63.6	75.4	71.1	69.0	67.6	61.1	52.9	47.8	11.8
2000	1112	900	64.5	77.9	72.6	69.8	68.5	61.7	52.8	48.4	13.4
2000	1112	915	64.2	79.7	72.6	69.1	67.8	61.7	53.2	48.9	15.5
2000	1112	930	65.7	85.5	73.8	69.9	68.6	63.5	55.9	49.1	19.8
2000	1112	945	64.8	77.9	72.3	69.5	68.3	63.3	55.3	48.7	13.1
2000	1112	1000	66.0	84.3	75.8	70.8	69.2	63.8	55.7	48.0	18.3
2000	1112	1015	66.5	83.4	75.9	71.8	69.5	63.7	54.9	49.5	16.9
2000	1112	1030	64.4	78.8	71.7	69.2	68.0	62.7	54.1	48.0	14.4
2000	1112	1045	65.6	84.8	73.4	70.2	68.8	63.6	54.3	49.7	19.2
2000	1112	1100	65.3	79.3	73.9	70.4	68.8	63.2	54.4	48.0	14.0
2000	1112	1115	65.4	80.2	75.9	69.9	68.4	63.0	54.6	49.2	14.8
2000	1112	1130	65.8	84.3	75.9	69.8	68.3	63.6	54.9	49.6	18.5
2000	1112	1145	68.3	92.4	77.5	70.8	68.7	64.0	57.4	50.1	24.1
2000	1112	1200	65.5	78.8	73.9	70.4	68.9	63.8	56.2	47.9	13.3
2000	1112	1215	64.7	80.0	72.4	69.3	67.8	63.2	56.1	49.9	15.3
2000	1112	1230	66.0	80.4	76.2	71.1	68.8	63.7	54.3	49.8	14.4
2000	1112	1245	65.2	80.7	74.7	69.9	68.0	63.3	54.6	47.7	15.5
2000	1112	1300	67.0	89.5	77.6	70.8	68.9	63.2	54.7	49.9	22.5
2000	1112	1315	63.8	75.9	71.5	68.8	67.5	61.8	53.9	49.3	12.1
2000	1112	1330	67.9	92.4	77.3	70.7	68.7	62.7	54.0	49.0	24.5
2000	1112	1345	63.8	79.4	71.7	69.1	67.8	61.1	52.4	48.6	15.6
2000	1112	1400	64.1	82.0	73.5	68.9	67.4	61.3	53.1	49.0	17.9
2000	1112	1415	64.2	81.9	74.2	69.1	67.5	60.9	52.6	47.9	17.7
2000	1112	1430	64.9	82.8	74.8	70.0	68.1	61.9	52.6	48.7	17.9
2000	1112	1445	64.1	77.6	74.7	69.2	67.6	60.6	51.0	48.1	13.5
2000	1112	1500	64.7	81.4	72.8	69.5	68.1	62.8	54.0	48.5	16.7
2000	1112	1515	65.4	80.3	75.3	69.9	68.4	63.0	54.4	50.1	14.9
2000	1112	1530	65.0	82.0	75.1	69.9	68.2	61.9	53.4	50.0	17.0
2000	1112	1545	65.6	85.3	75.0	69.8	68.4	62.8	54.1	49.3	19.7
2000	1112	1600	63.9	81.1	71.1	68.7	67.6	62.2	53.4	48.5	17.2
2000	1112	1615	64.6	77.7	73.7	70.0	68.3	62.0	53.7	48.4	13.1
2000	1112	1630	67.0	93.1	76.1	69.9	68.2	62.9	54.0	49.6	26.1
2000	1112	1645	65.4	82.1	74.9	70.6	68.8	63.0	54.1	50.5	16.7
2000	1112	1700	65.1	78.4	73.9	69.9	68.6	63.3	54.7	49.4	13.3
2000	1112	1715	64.9	82.0	74.0	69.6	68.4	62.8	54.7	50.6	17.1
2000	1112	1730	64.6	78.1	73.7	69.7	68.1	62.3	54.2	49.3	13.5
2000	1112	1745	65.2	80.6	74.3	70.4	68.7	62.5	53.1	49.4	15.4
2000	1112	1800	65.8	82.2	75.8	70.4	68.8	63.5	53.9	48.7	16.4
2000	1112	1815	64.2	77.0	72.6	69.0	67.8	62.4	52.6	49.0	12.8
2000	1112	1830	65.6	81.6	76.5	69.8	68.5	62.9	52.6	48.3	16.0
2000	1112	1845	64.4	82.3	73.1	69.4	68.1	61.4	52.3	47.8	17.9
2000	1112	1900	64.5	81.5	73.2	69.9	68.3	61.6	52.5	49.0	17.0
2000	1112	1915	65.0	79.1	75.2	70.4	68.4	61.8	53.1	49.4	14.1
2000	1112	1930	64.1	81.6	74.5	69.4	67.7	59.8	51.4	48.4	17.5
2000	1112	1945	64.2	78.1	74.0	69.5	67.9	61.4	52.6	48.5	13.9
2000	1112	2000	63.0	75.3	72.7	68.6	67.0	59.2	50.4	46.9	12.3
2000	1112	2015	65.3	78.2	75.8	72.1	68.7	60.7	51.1	47.3	12.9
2000	1112	2030	64.4	80.1	75.5	69.6	67.6	60.6	52.1	48.8	15.7
2000	1112	2045	65.1	80.4	75.4	71.0	68.8	61.0	51.6	48.0	15.3
2000	1112	2100	66.4	90.3	76.6	70.9	68.2	60.6	51.9	48.0	23.9
2000	1112	2115	65.8	79.8	76.4	71.6	68.9	61.9	53.4	50.3	14.0
2000	1112	2130	65.4	77.5	75.2	71.7	69.0	61.9	52.6	48.5	12.1
2000	1112	2145	64.2	82.4	75.3	69.1	67.1	58.9	51.0	48.4	18.2
2000	1112	2200	65.5	80.2	76.7	72.5	68.9	59.4	49.6	47.2	14.7
2000	1112	2215	63.1	77.6	74.7	68.5	67.0	57.2	49.9	46.7	14.5
2000	1112	2230	65.1	78.2	76.0	71.6	68.3	59.1	49.4	46.0	13.1
2000	1112	2245	63.3	77.6	74.0	69.3	67.3	57.7	48.7	45.7	14.3
2000	1112	2300	63.9	79.5	75.4	70.1	67.3	56.5	48.3	46.6	15.6
2000	1112	2315	65.5	83.5	76.6	73.4	69.2	56.1	47.7	45.4	18.0
2000	1112	2330	63.5	78.8	76.0	69.6	66.9	54.5	47.3	44.5	15.3
2000	1112	2345	64.6	81.5	76.5	71.7	68.3	54.5	48.0	45.5	16.9
2000	1113	0	64.0	78.1	75.9	71.2	67.8	53.6	46.9	45.2	14.1

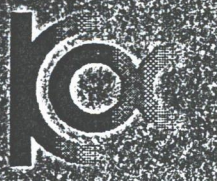
DAY 5	DESCRIPTOR	PERIOD	LEVEL	UNIT
Full Day	Leq, 24 hours	between 00:00 and 24:00 hours	64.2	dB(A)
Night Time	Leq, 8 hours	between 22:00 and 06:00 hours	60.8	dB(A)
Daytime	Leq, 15 hours	between 07:00 and 22:00 hours	65.1	dB(A)
Night Time	Leq, 9 hours	between 22:00 and 07:00 hours	61.3	dB(A)
Daytime	L10, 18 hours	between 06:00 and 24:00 hours	68.1	dB(A)
Daytime	minimum L90, 15 min	between 07:00 and 18:00 hours	48.9	dB(A)

88 Moorebank Ave Moorebank											DAY 6
Monday 13 November 2000											RT&A S/N 81
YEAR	MoDy	TIME	Leq	Lmax	L1	L5	L10	L50	L90	Lmin	Lmax - Leq
2000	1112	2215	63.1	77.6	74.7	68.5	67.0	57.2	49.9	46.7	14.5
2000	1112	2230	65.1	78.2	76.0	71.6	68.3	59.1	49.4	46.0	13.1
2000	1112	2245	63.3	77.6	74.0	69.3	67.3	57.7	48.7	45.7	14.3
2000	1112	2300	63.9	79.5	75.4	70.1	67.3	56.5	48.3	46.6	15.6
2000	1112	2315	65.5	83.5	76.6	73.4	69.2	56.1	47.7	45.4	18.0
2000	1112	2330	63.5	78.8	76.0	69.6	66.9	54.5	47.3	44.5	15.3
2000	1112	2345	64.6	81.5	76.5	71.7	68.3	54.5	48.0	45.5	16.9
2000	1113	0	64.0	78.1	75.9	71.2	67.8	53.6	46.9	45.2	14.1
2000	1113	15	63.7	79.0	75.9	71.5	67.3	52.5	47.4	44.6	15.3
2000	1113	30	66.2	84.8	77.9	74.5	69.6	52.2	45.9	43.5	18.6
2000	1113	45	62.8	81.5	75.7	69.7	65.7	51.3	45.5	43.3	18.7
2000	1113	100	62.1	78.5	75.3	68.8	63.9	48.6	46.1	44.2	16.4
2000	1113	115	62.6	80.1	75.4	70.2	65.6	50.1	46.8	44.2	17.5
2000	1113	130	62.3	79.3	75.6	69.2	65.3	51.1	47.6	45.6	17.0
2000	1113	145	61.7	79.4	75.2	68.3	64.4	49.0	46.3	44.0	17.7
2000	1113	200	63.2	81.5	76.0	70.2	65.9	50.6	46.4	44.2	18.3
2000	1113	215	63.0	79.0	77.1	68.9	64.6	49.3	47.7	45.5	16.0
2000	1113	230	62.8	77.9	76.0	70.4	65.7	50.6	46.3	43.7	15.1
2000	1113	245	64.0	80.8	76.5	71.9	67.3	50.2	46.7	44.3	16.8
2000	1113	300	61.0	78.2	74.8	66.8	63.6	49.3	46.3	44.2	17.2
2000	1113	315	62.4	79.2	75.6	69.5	65.5	50.7	46.8	44.6	16.8
2000	1113	330	63.0	80.8	75.0	70.3	66.8	52.5	47.5	45.5	17.8
2000	1113	345	63.4	78.9	75.8	70.8	67.1	50.5	45.9	42.9	15.5
2000	1113	400	64.8	79.1	76.5	72.0	68.9	55.2	47.3	43.5	14.3
2000	1113	415	63.4	79.1	75.5	70.7	67.1	52.8	47.4	44.7	15.7
2000	1113	430	65.1	80.6	76.2	72.4	69.1	56.7	49.5	46.7	15.5
2000	1113	445	64.3	77.0	75.1	71.1	68.6	57.3	48.9	45.7	12.7
2000	1113	500	65.2	79.2	75.7	71.5	68.9	59.8	49.6	46.7	14.0
2000	1113	515	65.6	78.5	75.1	72.1	69.4	61.4	56.5	54.6	12.9
2000	1113	530	66.7	81.6	76.0	72.5	70.4	63.9	57.2	54.8	14.9
2000	1113	545	68.7	80.4	77.4	74.5	72.2	66.7	59.9	54.8	11.7
2000	1113	600	68.8	79.7	76.5	73.7	72.0	67.3	62.1	55.8	10.9
2000	1113	615	69.4	83.8	77.4	74.6	72.8	67.6	61.7	55.8	14.4
2000	1113	630	70.5	85.2	79.3	75.0	73.2	68.7	63.1	58.0	14.7
2000	1113	645	69.1	78.9	76.2	73.6	72.1	68.0	63.0	57.1	9.8
2000	1113	700	70.3	90.4	78.3	75.2	73.4	68.5	63.3	56.7	20.1
2000	1113	715	69.8	85.3	77.9	74.4	72.7	68.0	62.8	54.8	15.5
2000	1113	730	70.0	83.2	77.1	74.2	72.7	69.0	64.1	58.0	13.2
2000	1113	745	71.0	92.6	78.2	75.0	73.3	69.0	64.7	57.2	21.6
2000	1113	800	70.7	89.3	77.4	74.7	73.4	69.2	65.0	59.7	18.6
2000	1113	815	70.8	86.7	78.0	75.2	73.6	69.5	64.7	58.4	15.9
2000	1113	830	71.5	85.4	79.4	76.4	74.9	69.7	65.7	56.7	13.9
2000	1113	845	71.3	87.1	79.9	75.9	74.2	69.4	65.6	57.4	15.8
2000	1113	900	70.3	80.9	77.3	75.0	73.2	69.2	64.8	57.9	10.6
2000	1113	915	69.7	84.5	78.1	74.3	72.5	68.2	62.7	56.9	14.8
2000	1113	930	69.4	85.2	78.7	74.4	72.8	67.3	60.6	55.6	15.8
2000	1113	945	68.8	80.5	76.4	73.8	72.2	67.3	62.0	57.2	11.7
2000	1113	1000	69.7	81.2	78.4	75.3	73.2	67.6	62.0	56.2	11.5
2000	1113	1015	69.2	79.5	77.5	75.1	73.3	66.8	59.4	55.4	10.3
2000	1113	1030	69.2	82.9	77.8	74.9	72.5	66.9	61.3	56.6	13.7
2000	1113	1045	69.9	87.1	77.3	75.1	73.4	67.8	62.2	57.5	17.2
2000	1113	1100	69.1	83.1	77.4	74.5	72.8	66.8	60.5	55.1	14.0
2000	1113	1115	69.5	81.5	77.8	75.4	73.1	67.0	60.8	56.0	12.0
2000	1113	1130	68.5	87.1	76.5	73.9	71.9	66.4	60.1	55.7	18.6
2000	1113	1145	68.3	80.1	77.1	74.0	72.1	65.6	59.3	55.5	11.8
2000	1113	1200	67.5	80.5	76.3	72.9	70.8	65.3	59.9	54.6	13.0
2000	1113	1215	68.4	84.6	76.5	73.5	72.0	66.3	60.0	55.1	16.2
2000	1113	1230	67.5	81.2	76.0	73.0	71.0	65.1	59.4	54.9	13.7
2000	1113	1245	68.6	82.8	76.2	73.7	72.1	66.6	60.9	56.1	14.2
2000	1113	1300	69.2	85.1	78.1	74.8	73.1	66.0	60.6	56.0	15.9
2000	1113	1315	68.1	82.3	77.0	73.7	71.7	65.5	59.4	55.0	14.2
2000	1113	1330	68.9	87.3	77.6	74.3	72.2	66.1	60.4	55.3	18.4
2000	1113	1345	68.2	80.5	76.9	74.0	71.8	65.6	58.7	52.1	12.3
2000	1113	1400	68.1	81.2	76.5	73.5	71.5	65.9	58.8	51.9	13.1
2000	1113	1415	68.0	79.6	75.7	73.3	71.5	66.2	60.3	52.9	11.6
2000	1113	1430	68.7	84.7	77.0	74.3	72.4	66.4	58.9	52.0	16.0
2000	1113	1445	69.1	82.9	77.0	74.0	72.4	67.3	60.9	54.7	13.8
2000	1113	1500	68.4	80.2	75.8	73.5	71.9	66.7	61.1	55.0	11.8
2000	1113	1515	68.9	81.9	78.0	74.1	72.1	67.0	61.4	55.5	13.0
2000	1113	1530	68.6	80.5	75.8	73.6	72.1	67.1	61.8	55.0	11.9
2000	1113	1545	68.8	88.6	77.0	73.1	71.5	66.5	60.9	55.0	19.8
2000	1113	1600	67.8	84.2	76.0	72.7	71.2	66.0	59.4	51.1	16.4
2000	1113	1615	68.9	81.9	77.8	74.5	72.3	66.8	60.6	53.1	13.0
2000	1113	1630	67.9	78.3	76.0	73.7	71.5	65.9	59.5	53.9	10.4
2000	1113	1645	68.8	81.3	77.4	74.5	72.6	66.4	60.5	54.6	12.5
2000	1113	1700	67.7	80.1	76.3	73.3	71.0	65.6	58.4	52.5	12.4
2000	1113	1715	68.4	90.9	76.7	72.7	70.8	66.5	60.8	54.8	22.5
2000	1113	1730	67.6	80.8	76.5	72.7	70.9	65.3	57.2	52.6	13.2
2000	1113	1745	69.7	92.0	79.6	74.3	71.6	65.6	59.2	53.5	22.3
2000	1113	1800	66.2	77.8	74.4	71.3	69.6	64.4	59.2	53.5	11.6
2000	1113	1815	66.8	77.7	75.0	71.8	70.2	65.1	58.2	52.5	10.9
2000	1113	1830	67.4	80.9	77.3	72.7	70.5	64.6	56.6	51.2	13.5
2000	1113	1845	67.5	86.7	76.6	73.3	70.6	64.3	56.3	52.2	19.2
2000	1113	1900	65.9	79.5	75.0	71.1	69.3	63.6	55.1	51.1	13.6
2000	1113	1915	66.8	79.4	76.7	72.9	70.6	63.2	56.5	52.4	12.6
2000	1113	1930	65.6	85.2	75.9	70.4	68.7	62.0	55.0	51.7	19.6
2000	1113	1945	65.1	79.5	75.5	71.3	68.6	60.7	54.3	51.6	14.4
2000	1113	2000	67.4	83.4	76.9	72.6	70.1	65.0	57.2	53.5	16.0
2000	1113	2015	65.6	78.7	75.4	71.3	68.9	62.5	56.2	53.1	13.1
2000	1113	2030	65.5	79.3	75.4	72.2	69.2	61.0	53.5	50.2	13.8
2000	1113	2045	64.1	79.2	74.9	70.0	67.9	59.2	52.8	50.2	15.1
2000	1113	2100	64.8	79.4	76.2	70.5	67.8	59.6	53.1	50.5	14.6
2000	1113	2115	64.1	78.9	75.3	69.4	67.5	59.2	52.8	50.3	14.8
2000	1113	2130	66.5	87.0	77.9	71.6	68.1	59.4	52.3	49.1	20.5
2000	1113	2145	64.7	80.7	75.5	70.0	68.1	60.0	51.9	49.3	16.0
2000	1113	2200	65.0	87.0	76.7	74.0	70.3	61.0	52.9	49.4	22.0
2000	1113	2215	65.9	83.0	76.3	71.0	68.7	60.4	53.2	49.2	17.1
2000	1113	2230	65.0	83.7	75.7	70.5	68.2	59.7	52.4	48.9	18.7
2000	1113	2245	62.4	76.8	73.2	68.0	66.2	57.4	51.4	48.5	14.4
2000	1113	2300	64.3	79.7	76.5	70.1	67.5	58.0	51.6	48.9	15.4
2000	1113	2315	63.4	80.9	74.0	69.5	67.2	57.1	51.6	48.8	17.5
2000	1113	2330	65.5	80.8	77.0	72.1	68.5	59.3	53.0	49.0	15.3
2000	1113	2345	65.0	77.9	76.2	72.4	69.0	57.4	51.0	48.4	12.9
2000	1114	0	62.8	79.4	75.1	68.3	66.5	54.5	50.9	47.8	16.6

DAY 6	DESCRIPTOR	PERIOD	LEVEL	UNIT
Full Day	Leq, 24 hours	between 00:00 and 24:00 hours	67.6	dB(A)
Night Time	Leq, 8 hours	between 22:00 and 06:00 hours	64.3	dB(A)
Daytime	Leq, 15 hours	between 07:00 and 22:00 hours	68.5	dB(A)
Night Time	Leq, 9 hours	between 22:00 and 07:00 hours	65.5	dB(A)
Daytime	L10, 18 hours	between 06:00 and 24:00 hours	71.1	dB(A)
Daytime	minimum L90, 15 min	between 07:00 and 18:00 hours	57.2	dB(A)

88 Moorebank Ave Moorebank											DAY 7
Tuesday 14 November 2000										RT&A S/N 81	
YEAR	MoDy	TIME	Leq	Lmax	L1	L5	L10	L50	L90	Lmin	Lmax - Leq
2000	1113	2215	65.9	83.0	76.3	71.0	68.7	60.4	53.2	49.2	17.1
2000	1113	2230	65.0	83.7	75.7	70.5	68.2	59.7	52.4	48.9	18.7
2000	1113	2245	62.4	76.8	73.2	68.0	66.2	57.4	51.4	48.5	14.4
2000	1113	2300	64.3	79.7	76.5	70.1	67.5	58.0	51.6	48.9	15.4
2000	1113	2315	63.4	80.9	74.0	69.5	67.2	57.1	51.6	48.8	17.5
2000	1113	2330	65.5	80.8	77.0	72.1	68.5	59.3	53.0	49.0	15.3
2000	1113	2345	65.0	77.9	76.2	72.4	69.0	57.4	51.0	48.4	12.9
2000	1114	0	62.8	79.4	75.1	68.3	66.5	54.5	50.9	47.8	16.6
2000	1114	15	63.8	78.2	76.1	70.5	67.2	54.6	51.2	48.8	14.4
2000	1114	30	64.6	79.8	76.2	71.9	68.5	56.0	50.5	48.5	15.2
2000	1114	45	60.7	78.8	74.1	67.0	63.3	51.3	48.9	46.9	18.1
2000	1114	100	61.6	80.2	74.6	68.2	65.4	51.5	48.6	46.6	18.6
2000	1114	115	63.0	80.3	75.9	69.4	65.4	53.5	49.7	46.7	17.3
2000	1114	130	62.8	82.4	75.2	69.9	65.3	53.9	50.6	48.3	19.6
2000	1114	145	64.3	93.4	76.3	71.0	66.6	54.0	50.2	47.6	29.1
2000	1114	200	63.4	83.2	75.7	70.9	66.2	52.6	48.6	46.2	19.8
2000	1114	215	63.8	79.8	76.2	71.7	66.9	52.7	49.1	46.4	16.0
2000	1114	230	60.0	76.5	73.8	66.1	62.5	52.2	49.1	46.7	16.5
2000	1114	245	63.1	79.6	75.6	70.3	66.7	51.7	48.1	46.1	16.5
2000	1114	300	64.1	80.9	76.9	71.2	67.1	54.2	50.2	47.3	16.8
2000	1114	315	65.6	93.8	77.5	72.5	68.4	54.8	49.1	46.3	28.2
2000	1114	330	62.7	83.0	74.0	68.6	66.3	55.6	49.7	46.9	20.3
2000	1114	345	62.2	79.6	74.8	68.0	65.8	52.5	48.5	46.8	17.4
2000	1114	400	63.1	80.7	75.4	69.4	66.7	53.8	48.4	46.2	17.6
2000	1114	415	66.1	81.4	78.1	73.7	69.9	56.7	50.1	47.9	15.3
2000	1114	430	66.0	81.9	77.3	73.5	69.8	56.8	49.4	46.7	15.9
2000	1114	445	66.2	81.7	77.2	73.5	70.0	58.5	49.3	46.1	15.5
2000	1114	500	66.4	81.6	76.9	73.8	70.3	60.1	50.7	47.6	15.2
2000	1114	515	69.8	84.0	79.5	75.9	73.5	66.5	58.8	53.9	14.2
2000	1114	530	69.5	85.4	77.8	75.4	73.4	67.3	60.0	54.1	15.9
2000	1114	545	69.9	83.1	77.9	75.0	73.6	67.9	61.9	56.3	13.2
2000	1114	600	70.2	82.8	78.9	75.7	73.6	68.1	61.3	55.8	12.6
2000	1114	615	70.1	89.6	77.4	74.8	73.2	68.6	62.6	56.5	19.5
2000	1114	630	70.0	81.1	78.1	75.0	73.2	68.5	63.3	57.4	11.1
2000	1114	645	70.5	85.3	78.4	75.1	73.6	69.1	64.5	58.1	14.8
2000	1114	700	70.3	82.2	77.6	74.8	73.2	69.0	65.3	58.9	11.9
2000	1114	715	70.4	85.5	79.1	74.9	73.2	68.7	64.3	58.4	15.1
2000	1114	730	69.6	81.2	77.2	74.0	72.6	68.1	63.7	58.8	11.6
2000	1114	745	69.7	87.5	77.2	74.3	72.6	68.3	62.6	58.0	17.8
2000	1114	800	70.0	81.8	77.6	74.9	73.1	68.3	64.2	57.7	11.8
2000	1114	815	70.3	92.8	77.7	74.0	72.3	68.3	63.9	57.8	22.5
2000	1114	830	70.2	82.7	78.0	74.4	72.8	69.0	65.1	60.7	12.5
2000	1114	845	70.2	87.4	77.5	74.9	73.3	68.6	64.9	59.4	17.2
2000	1114	900	70.2	85.7	78.2	74.7	72.9	68.5	64.6	60.3	15.5
2000	1114	915	70.1	89.6	78.6	74.2	72.3	68.1	63.2	57.7	19.5
2000	1114	930	69.2	84.1	77.7	74.4	72.3	67.3	62.2	57.4	14.9
2000	1114	945	68.9	82.4	77.5	73.9	72.3	67.0	61.6	57.5	13.5
2000	1114	1000	70.3	89.3	79.0	75.2	73.5	67.8	62.1	57.3	19.0
2000	1114	1015	70.4	89.7	79.0	75.9	74.0	68.1	62.5	58.3	19.3
2000	1114	1030	71.2	84.7	79.3	76.8	75.0	68.7	64.0	58.6	13.5
2000	1114	1045	72.8	85.0	79.9	77.8	76.4	70.9	66.7	60.2	12.2
2000	1114	1100	71.9	83.8	79.7	77.1	75.4	70.0	65.4	61.2	11.9
2000	1114	1115	70.5	85.7	78.9	75.5	73.9	68.4	63.7	59.2	15.2
2000	1114	1130	71.0	86.6	78.8	76.3	74.3	69.2	63.7	58.8	15.6
2000	1114	1145	71.0	86.1	79.6	76.3	74.6	68.7	62.4	58.0	15.1
2000	1114	1200	70.8	81.4	79.0	76.3	74.4	68.6	63.5	58.8	10.6
2000	1114	1215	69.9	84.3	78.5	75.3	73.4	67.8	62.8	58.1	14.4
2000	1114	1230	69.7	85.9	78.1	75.5	73.3	67.2	61.8	58.5	16.2
2000	1114	1245	69.9	83.6	78.4	75.4	73.7	67.6	62.1	57.4	13.7
2000	1114	1300	70.0	82.5	78.3	75.6	73.3	68.0	62.2	57.3	12.5
2000	1114	1315	70.5	82.3	79.3	75.8	74.1	68.2	63.1	58.3	11.8
2000	1114	1330	70.6	85.7	79.4	75.9	73.6	68.7	63.8	58.3	15.1
2000	1114	1345	71.4	87.3	79.7	76.4	74.8	69.6	64.3	58.6	15.9
2000	1114	1400	70.7	83.2	78.8	75.5	73.7	69.2	64.0	59.5	12.5
2000	1114	1415	71.8	84.2	79.7	76.7	75.2	70.1	65.7	60.8	12.4
2000	1114	1430	70.1	87.4	78.1	74.7	72.8	68.3	63.4	58.4	17.3
2000	1114	1445	70.8	87.7	79.1	75.8	74.0	68.7	63.4	57.6	16.9
2000	1114	1500	71.2	88.6	79.2	76.0	74.4	69.3	63.7	58.2	17.4
2000	1114	1515	70.2	88.4	78.9	75.2	73.0	68.1	62.6	56.4	18.2
2000	1114	1530	70.4	86.5	80.0	75.2	73.3	68.1	62.0	56.3	16.1
2000	1114	1545	69.6	83.6	77.1	74.3	72.9	68.2	61.8	54.9	14.0
2000	1114	1600	70.2	84.0	78.8	75.3	73.4	68.3	61.8	55.6	13.8
2000	1114	1615	69.5	83.4	77.9	74.5	72.6	67.8	62.2	54.9	13.9
2000	1114	1630	69.6	82.2	77.7	74.9	72.9	67.7	62.0	56.1	12.6
2000	1114	1645	69.8	91.0	77.4	74.8	73.0	67.6	60.7	53.7	21.2
2000	1114	1700	68.8	86.4	76.6	73.5	72.1	67.1	60.2	54.3	17.6
2000	1114	1715	70.6	93.5	78.2	73.6	71.8	67.5	61.7	55.4	22.9
2000	1114	1730	69.7	84.6	77.9	75.1	73.2	67.9	60.4	52.7	14.9
2000	1114	1745	69.3	80.2	77.8	74.3	72.3	67.7	61.2	55.0	10.9
2000	1114	1800	69.3	81.6	77.6	74.5	72.3	67.6	60.5	54.8	12.3
2000	1114	1815	68.5	82.6	76.4	73.9	71.7	66.6	59.8	54.6	14.1
2000	1114	1830	69.2	81.0	77.9	74.3	72.3	67.3	59.4	52.8	11.8
2000	1114	1845	67.7	81.3	76.5	73.0	71.1	65.5	57.9	52.6	13.6
2000	1114	1900	68.2	79.7	77.4	74.1	71.5	65.8	58.4	52.8	11.5
2000	1114	1915	67.9	82.3	77.7	73.1	71.1	65.2	57.0	51.8	14.4
2000	1114	1930	68.2	83.5	77.4	73.8	71.7	65.5	57.7	52.9	15.3
2000	1114	1945	66.7	81.3	77.3	72.3	70.1	63.2	55.3	51.8	14.6
2000	1114	2000	67.0	81.1	77.0	73.6	70.5	62.4	55.8	51.0	14.1
2000	1114	2015	65.3	80.8	75.4	71.5	69.0	60.4	52.8	49.3	15.5
2000	1114	2030	66.7	82.2	77.8	73.3	70.2	61.3	53.1	48.9	15.5
2000	1114	2045	65.1	80.8	76.0	70.9	68.9	59.5	52.6	50.0	15.7
2000	1114	2100	66.1	79.8	76.6	72.1	69.4	61.7	53.6	50.5	13.7
2000	1114	2115	66.0	79.7	76.6	72.6	69.6	60.4	52.7	50.9	13.7
2000	1114	2130	65.9	78.2	75.8	73.0	69.6	61.5	53.9	50.8	12.3
2000	1114	2145	67.0	81.2	78.1	73.3	70.0	62.7	53.6	50.4	14.2
2000	1114	2200	65.9	80.5	76.5	71.3	69.1	62.1	56.5	52.2	14.6
2000	1114	2215	66.5	80.9	76.7	72.4	69.9	62.5	55.3	50.9	14.4
2000	1114	2230	63.8	79.3	74.4	70.1	67.6	58.1	51.5	48.4	15.5
2000	1114	2245	64.3	79.5	76.0	70.0	67.8	58.8	51.8	48.4	15.2
2000	1114	2300	65.1	79.1	75.9	71.6	69.0	59.4	51.3	47.1	14.0
2000	1114	2315	66.4	87.2	77.1	73.2	69.6	59.5	51.8	48.2	20.8
2000	1114	2330	65.9	86.8	76.3	71.7	68.8	58.4	49.8	46.3	20.9
2000	1114	2345	64.4	81.2	76.0	70.5	67.9	57.6	49.7	47.7	16.8
2000	1115	0	64.0	80.9	75.6	70.4	67.3	55.4	47.6	45.5	16.9

DAY 7	DESCRIPTOR	PERIOD	LEVEL	UNIT
Full Day	Leq, 24 hours	between 00:00 and 24:00 hours	68.7	dB(A)
Night Time	Leq, 8 hours	between 22:00 and 06:00 hours	65.3	dB(A)
Daytime	Leq, 15 hours	between 07:00 and 22:00 hours	69.7	dB(A)
Night Time	Leq, 9 hours	between 22:00 and 07:00 hours	66.3	dB(A)
Daytime	L10, 18 hours	between 06:00 and 24:00 hours	72.2	dB(A)
Daytime	minimum L90, 15 min	between 07:00 and 18:00 hours	60.2	dB(A)



KOIKAS ACOUSTICS PTY LTD

KOIKAS ACOUSTICS PTY LTD

CONSULTANTS IN NOISE AND VIBRATION

ACN 058 524 771
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TRAFFIC NOISE MONITORING AT No. 22 BARWON CT, WATTLE GROVE, SOUTH OF THE M5 MOTORWAY

Date: 09 January 2002

Project No.: 892

Report Reference: R09012a1.nk

Prepared for:
Ms Diane Fajmon
Project Supervisor
Haliburton KBR
GPO Box 1618
Sydney NSW 2001

Prepared by:
Koikas Acoustics Pty Ltd
Member Firm of the Association of Australian Acoustical Consultants

Nicholas G. Koikas
Principal Consultant

TRAFFIC NOISE MONITORING AT No. 22 BARWON CT, WATTLE GROVE, SOUTH OF THE M5 MOTORWAY

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APPENDIX B PHOTOGRAPHS OF THE MONITORING SITE
APPENDIX C CALIBRATION CERTIFICATES
APPENDIX D MONITORING SURVEY RESULTS

TRAFFIC NOISE MONITORING AT No. 22 BARWON CT, WATTLE GROVE, SOUTH OF THE M5 MOTORWAY

1.0 INTRODUCTION

A traffic noise assessment was completed by Koikas Acoustics Pty Ltd on behalf of Halliburton KBR in order to determine current traffic noise levels in the vicinity between Greenhills Avenue and Colo Court, Wattle Grove adjacent to the M5 Motorway.

2.0 MEASUREMENT SITES, METHODOLOGY AND INSTRUMENTATION

2.1 NOISE MONITORING LOCATION

Koikas Acoustics conducted a traffic noise survey at the rear of No. 22 Barwon Court, Wattle Grove. Refer to **Appendix A** for a map showing the location of the assessment site. The sound level meter installed at the rear of No. 22 Barwon Court, Wattle Grove was placed at the rear of the property, 1 metre from the most noise sensitive building facade, and 1.3 metres from the ground. **Appendix B** includes terrestrial photographs showing the location of the sound level meter.

2.2 DURATION OF TRAFFIC NOISE MONITORING

Traffic noise monitoring was undertaken between Wednesday 12 December and Thursday 20 December 2001.

2.3 NOISE MONITORING EQUIPMENT

One Class 1 sound level meter data loggers Rion NL14 S/N 1043074 was used to monitor traffic noise levels. All sound level meters were field calibrated before and after the measurements with a Rion Sound Level Meter Calibrator NC-73 S/N 10702593.

Calibration drifts of less than 0.2 dB(A) were recorded for these instruments. These drifts are within the accuracy limits of this type of sound level meter.

All equipment used carry recent NATA certification. Refer to **Appendix C** for a copy of the recent calibration certificate.

All instrumentation used comply with the requirements of Australian Standard 2702-1984 "Acoustics - Methods for the Measurement of Road Traffic Noise".

All noise level measurements were A-frequency and Fast-time weighted. Statistical exceedances L_x and equivalent L_{eq} levels were calculated over fifteen minute intervals for seven days of monitoring.

3.0 MEASURED RESULTS

Appendix D contains graphical and tabular summary of traffic noise levels.

Tables 1 provides a summary of the traffic noise levels measured at the assessment site.

Table 1 Traffic noise levels at No. 222 Barwon Court Wattle Grove.

	NOISE LEVELS [dB(A)]							
Date Descriptor	Thursday 13-12-2001	Friday 14-12-2001	Saturday 15-12-2001	Sunday 16-12-2001	Monday 17-12-2001	Tuesday 18-12-2001	Wednesday 19-12-2001	Average
L_{eq}, 24 hours (00:00 to 24.00 hrs)	59.3	58.8	57.5	58.3	59.0	59.5	58.8	**58.7**
L_{eq}, 8 hours (22:00 to 06.00 hrs)	54.5	54.9	54.2	53.8	53.8	54.4	54.8	**54.3**
L_{eq}, 15 hours (07:00 to 22.00 hrs)	60.5	60.1	58.7	59.6	60.3	60.8	59.9	**60.0**
L_{eq}, 9 hours (22:00 to 07:00 hrs)	55.4	55.4	54.6	54.5	55.0	55.5	55.7	**55.2**
L_{10}, 18 hours (06.00 to 24.00 hrs)	62.2	61.4	60.1	60.6	61.9	62.2	61.4	**61.4**

APPENDIX A

Source : Universal Press Pty Ltd

APPENDIX B

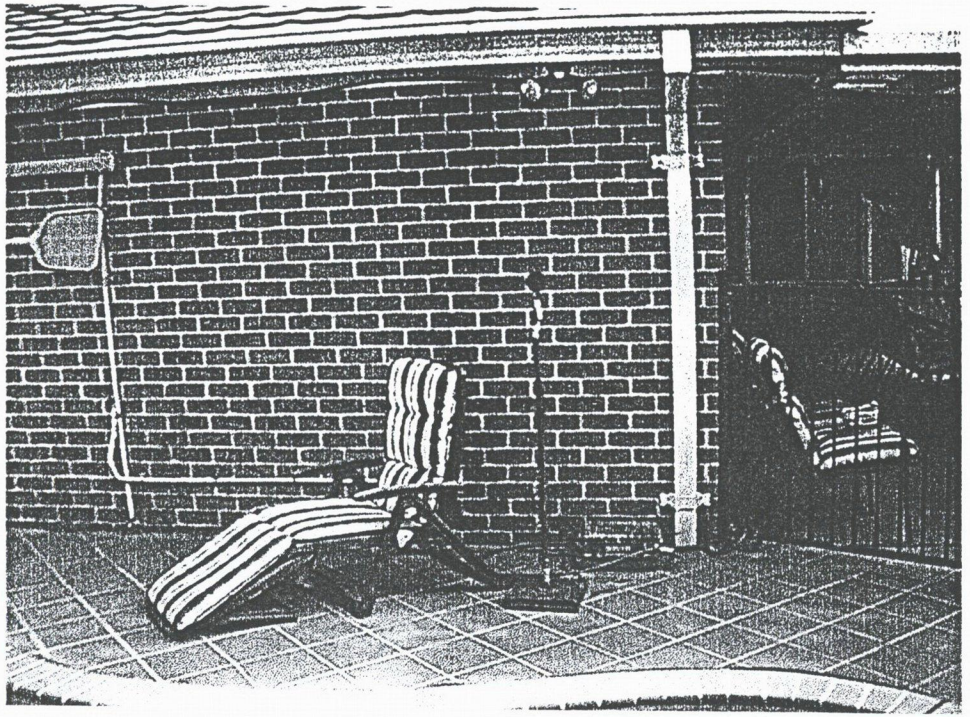

Photo 1. View of sound level meter at rear of 22 Barwon Court, Wattle Gove

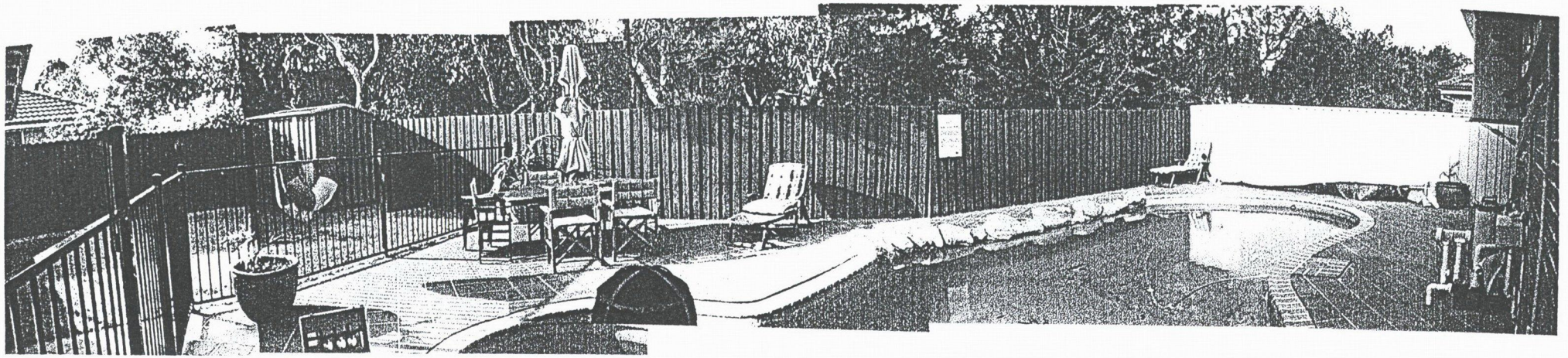

Photo 2. View of M5 noise barrrier from the sound level meter microphone.

APPENDIX C

CERTIFICATE OF CALIBRATION

CERTIFICATE NO: 3967

EQUIPMENT TESTED: Sound Level Calibrator
Rion

Type No: NC-73 **Serial No:** 10702593

Owner: Koikas Acoustics
60 Glenfarne Street
Bexley NSW 2207

Tests Performed: Output sound pressure level corrected to 1013 hecto Pascals was found to be:
93.93 dB re 20 uPa at 972.0 Hz.
Distortion: < 1% THD, Uncertainty: +/- 0.1 dB

CONDITION OF TEST:

Ambient Pressure: 1015 mbar **Relative Humidity:** 54 %
Temperature: 21 °C
Date of Calibration: 25.07.2001 **Calibration Due Date:** 25.07.2002

Test Method: IEC 60942 -1988 Clauses 3.1.2, 3.2.2 and ACU-VIB No:3

CHECKED BY: TJ **AUTHORISED SIGNATORY:** .....
Jack Kielt

An endorsed Certificate of Calibration may not be published or reproduced except in full without the written permission of this testing Laboratory.

Instruments used in these tests are traceable to Australian Physical Standards held at C.S.I.R.O. N.M.L (National Measurement Laboratory) Sydney, Australia.

NATA

Reg. Lab. No. 9262
Acoustic and Vibration Measurements

ACU-VIB Electronics
Acoustic and Vibration Electronics
HEAD OFFICE
Unit 3, 10 Salisbury Rd. Castle Hill NSW 2154
Tel: (02) 9894 2377 Fax: (02)9894 2386
Mobile: 0408 470 179

NATA Accredited Laboratory Number:

NATA ENDORSED CALIBRATION CERTIFICATE
This document shall not be reproduced, except in full.

CERTIFICATE OF CALIBRATION

CERTIFICATE NO.: **SLM01657**

Equipment Description:	Precision Integrating Sound Level Meter		
Manufacturer:	Rion		
Model No:	NL-14	**Serial No:**	10430749
Microphone Type:	UC-53	**Serial No:**	13765
Filter Type:	-	**Serial No:**	-
Comments:	All tests passed for type 1. -		
Owner:	Koikas Acoustics Pty.Ltd. 60 Glenfarne Street Bexley NSW 2207		
Ambient Pressure:	1004 mbar		
Temperature:	21 °C	**Relative Humidity:**	62 %
Date of Calibration:	23.11.2000	**Calibration Due Date:**	23.11.2002

CHECKED BY: JK **AUTHORISED SIGNATORY:** ..... Jack Kiel

The equipment listed above has been calibrated in this laboratory. The equipment performed satisfactorily in all the tests conducted.

This certificate is effective for 24 months from the date of calibration.

NATA

Reg. Lab. No. 9262
Acoustic and Vibration Measurements

ACU-VIB Electronics
Acoustic and Vibration Electronics
HEAD OFFICE
Unit 3, 10 Salisbury Rd. Castle Hill NSW 2154
Tel: (02) 9894 2377 Fax: (02)9894 2386
Mobile: 0408 470 179

NATA
National Association of Testing Authorities, Australia

NATA Endorsed Calibration Certificate

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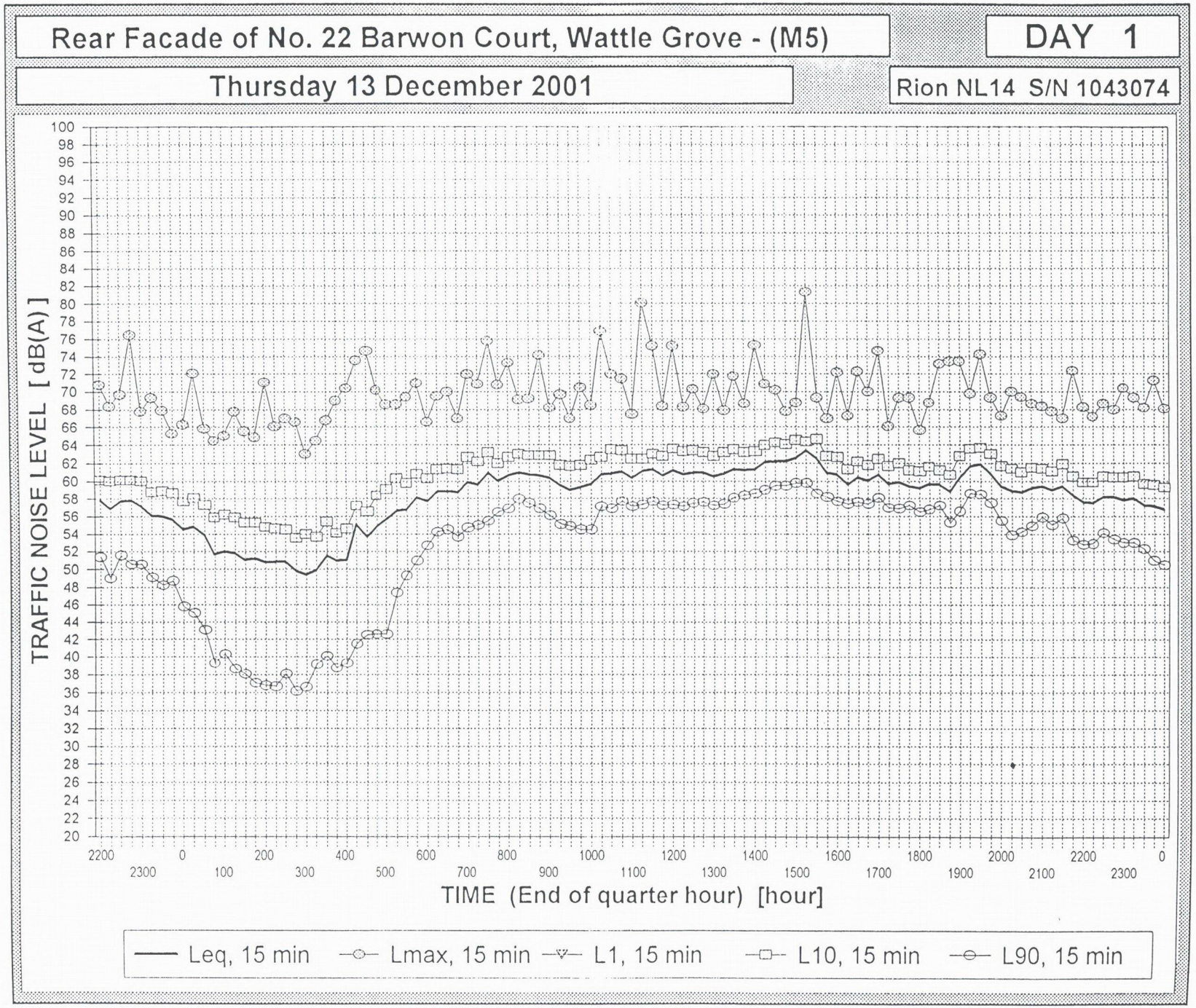
APPENDIX D

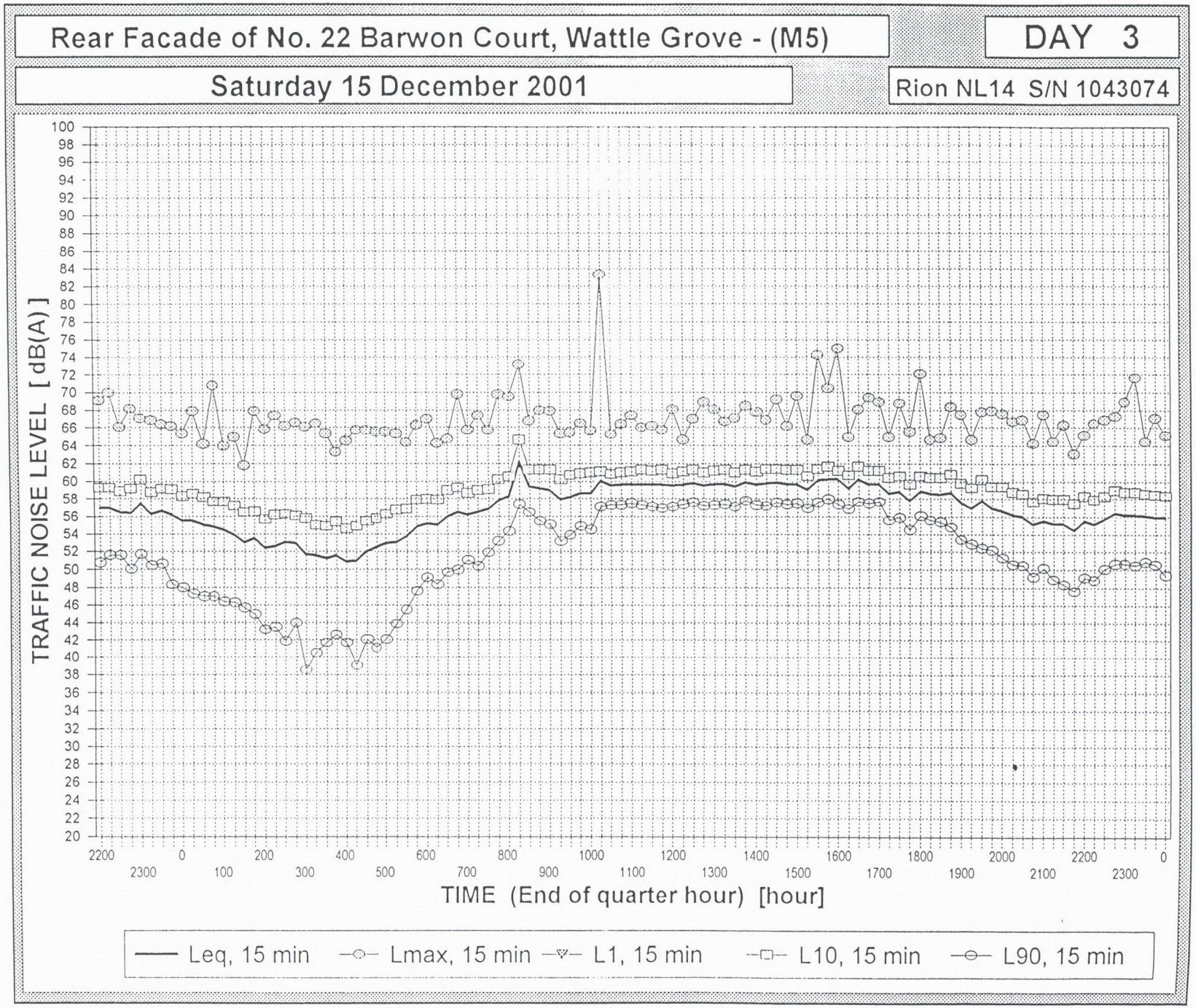

Rear Facade of No. 22 Barwon Court, Wattle Grove - (M5)
DAY 1
Thursday 13 December 2001
Rion NL14 S/N 1043074
TRAFFIC NOISE LEVEL [dB(A)]
100
98
96
94
92
90
88
86
84
82
80
78
76
74
72
70
68
66
64
62
60
58
56
54
52
50
48
46
44
42
40
38
36
34
32
30
28
26
24
22
20
2200
2300
0
100
200
300
400
500
600
700
800
900
1000
1100
1200
1300
1400
1500
1600
1700
1800
1900
2000
2100
2200
2300
0
TIME (End of quarter hour) [hour]
Leq, 15 min
Lmax, 15 min
L1, 15 min
L10, 15 min
L90, 15 min

Rear Facade of No. 22 Barwon Court, Wattle Grove - (M5)

DAY 2

Friday 14 December 2001

Rion NL14 S/N 1043074


Rear Facade of No. 22 Barwon Court, Wattle Grove - (M5)
DAY 3
Saturday 15 December 2001
Rion NL14 S/N 1043074
TRAFFIC NOISE LEVEL [dB(A)]
100
98
96
94
92
90
88
86
84
82
80
78
76
74
72
70
68
66
64
62
60
58
56
54
52
50
48
46
44
42
40
38
36
34
32
30
28
26
24
22
20
2200
2300
0
100
200
300
400
500
600
700
800
900
1000
1100
1200
1300
1400
1500
1600
1700
1800
1900
2000
2100
2200
2300
0
TIME (End of quarter hour) [hour]
Leq, 15 min
Lmax, 15 min
L1, 15 min
L10, 15 min
L90, 15 min

Rear Facade of No. 22 Barwon Court, Wattle Grove - (M5)

DAY 4

Sunday 16 December 2001

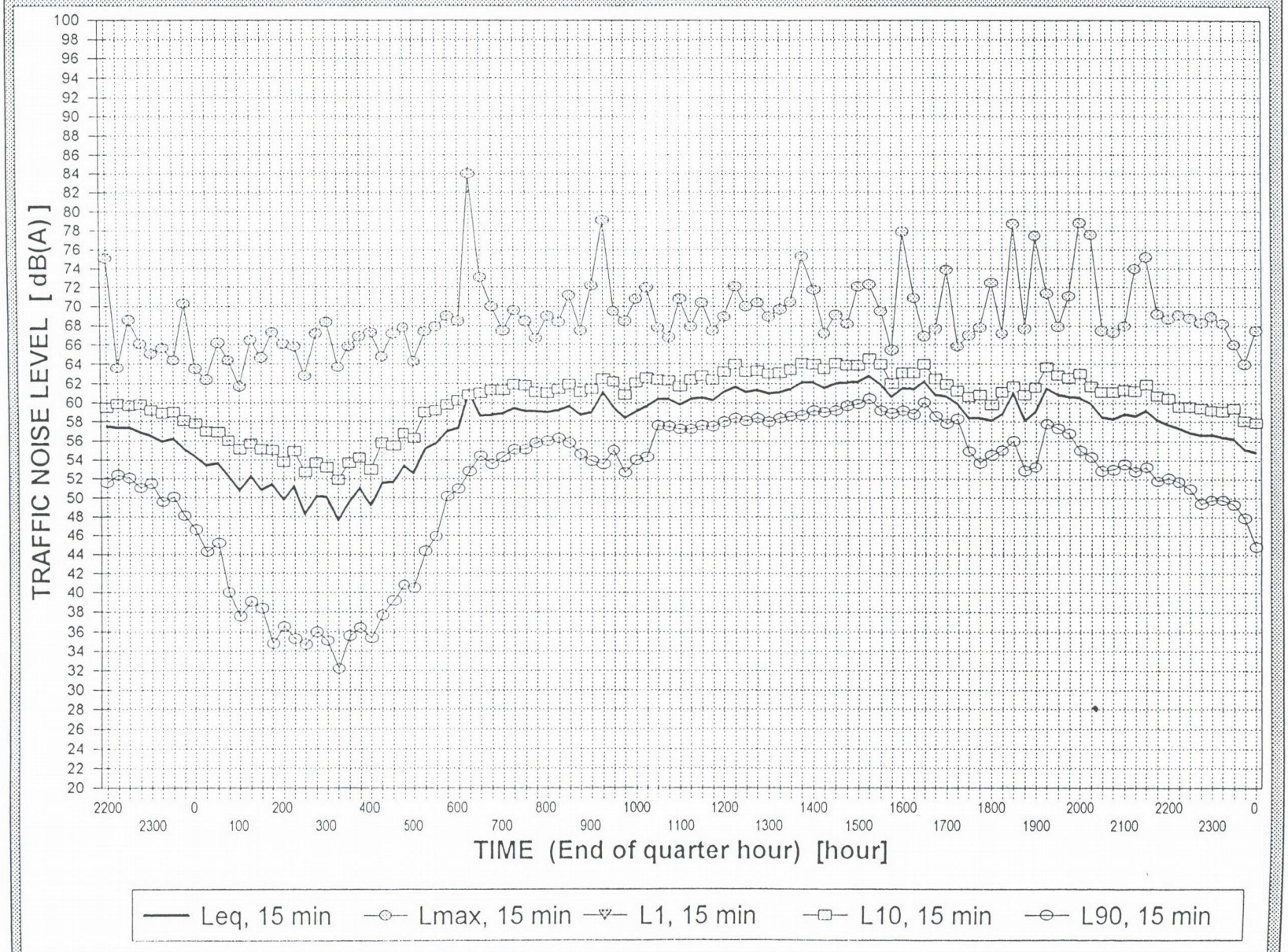
Rion NL14 S/N 1043074

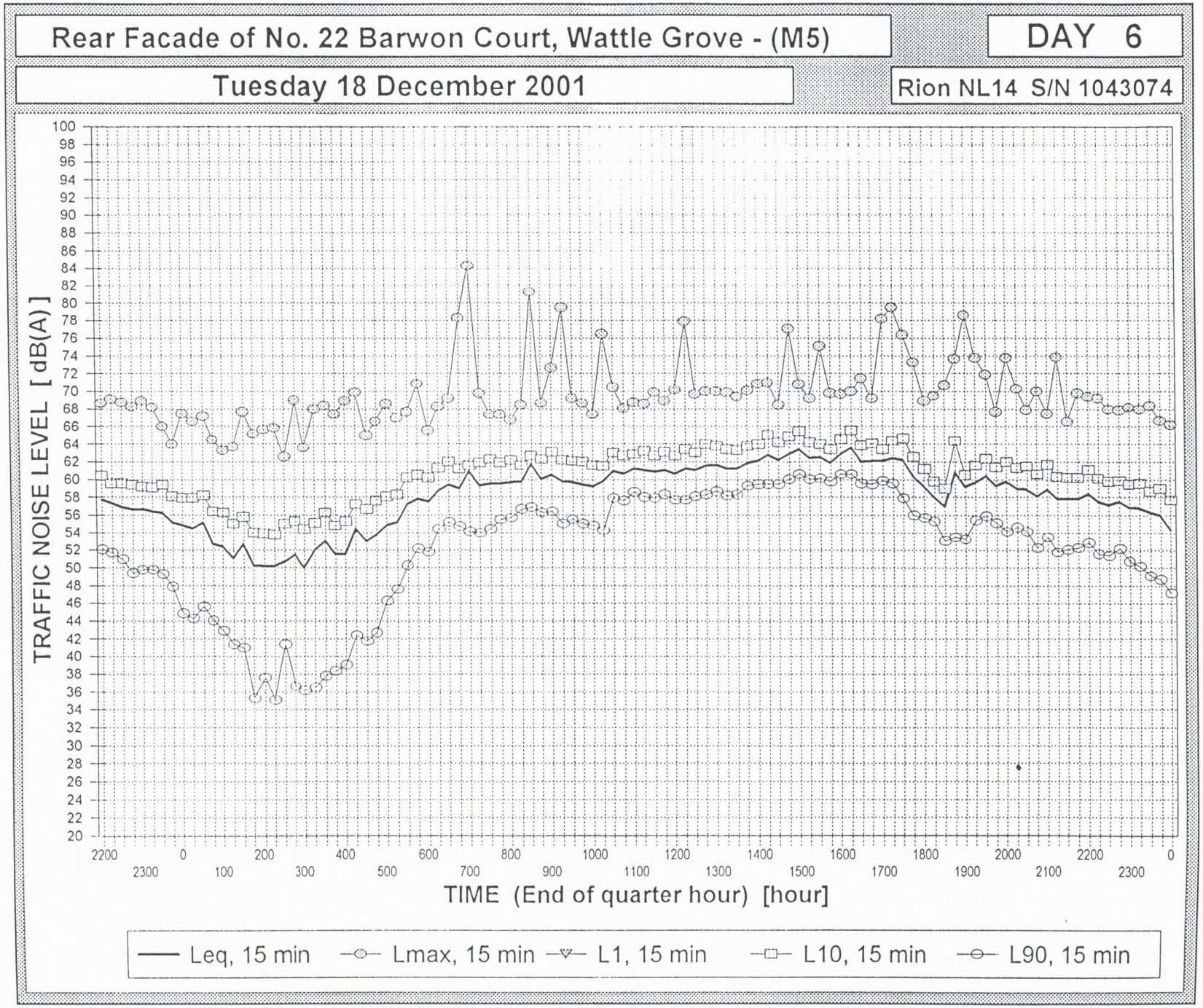
Rear Facade of No. 22 Barwon Court, Wattle Grove - (M5)

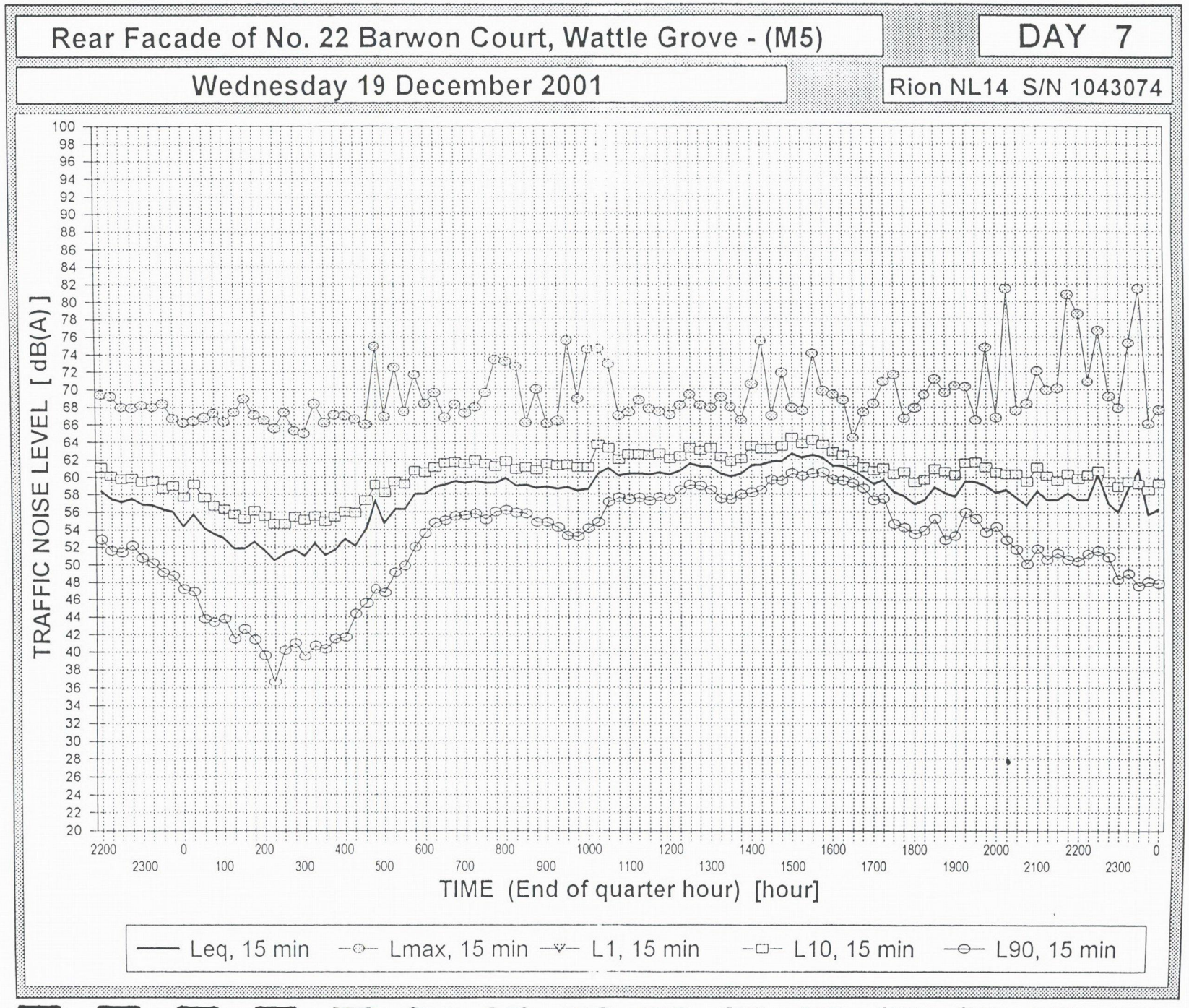
DAY 5

Monday 17 December 2001

Rion NL14 S/N 1043074




Rear Facade of No. 22 Barwon Court, Wattle Grove - (M5)
DAY 6
Tuesday 18 December 2001
Rion NL14 S/N 1043074
TRAFFIC NOISE LEVEL [dB(A)]
100
98
96
94
92
90
88
86
84
82
80
78
76
74
72
70
68
66
64
62
60
58
56
54
52
50
48
46
44
42
40
38
36
34
32
30
28
26
24
22
20
2200
2300
0
100
200
300
400
500
600
700
800
900
1000
1100
1200
1300
1400
1500
1600
1700
1800
1900
2000
2100
2200
2300
0
TIME (End of quarter hour) [hour]
Leq, 15 min
Lmax, 15 min
L1, 15 min
L10, 15 min
L90, 15 min


Rear Facade of No. 22 Barwon Court, Wattle Grove - (M5)
DAY 7
Wednesday 19 December 2001
Rion NL14 S/N 1043074
TRAFFIC NOISE LEVEL [dB(A)]
100
98
96
94
92
90
88
86
84
82
80
78
76
74
72
70
68
66
64
62
60
58
56
54
52
50
48
46
44
42
40
38
36
34
32
30
28
26
24
22
20
2200
2300
0
100
200
300
400
500
600
700
800
900
1000
1100
1200
1300
1400
1500
1600
1700
1800
1900
2000
2100
2200
2300
0
TIME (End of quarter hour) [hour]
Leq, 15 min
Lmax, 15 min
L1, 15 min
L10, 15 min
L90, 15 min

Rear Facade of No. 22 Barwon Court, Wattle Grove - (M5)											DAY 1
Thursday 13 December 2001											Rion NL14 S/N 1043074
YEAR	MoDy	TIME	Leq	Lmax	L1	L5	L10	L50	L90	L95	Lmax - Leq
2000	829	2215	56.9	68.4	0.0	61.7	60.0	55.0	49.0	47.2	11.5
2000	829	2230	57.7	69.7	0.0	61.3	60.1	56.5	51.6	49.7	12.0
2000	829	2245	57.8	76.5	0.0	61.6	60.1	56.0	50.6	49.0	18.7
2000	829	2300	57.1	67.8	0.0	61.1	60.0	55.9	50.6	48.4	10.7
2000	829	2315	56.1	69.3	0.0	59.6	58.8	54.9	49.1	47.4	13.2
2000	829	2330	56.0	67.9	0.0	59.8	58.9	54.8	48.2	46.2	11.9
2000	829	2345	55.6	65.3	0.0	59.8	58.7	54.3	48.7	46.8	9.7
2000	830	0	54.5	66.3	0.0	58.9	57.7	52.7	45.8	44.5	11.8
2000	830	15	54.8	72.1	0.0	59.6	58.1	51.9	45.1	43.9	17.3
2000	830	30	53.9	65.9	0.0	58.8	57.3	50.7	43.1	40.7	12.0
2000	830	45	51.7	64.5	0.0	57.4	55.9	47.9	39.3	38.0	12.8
2000	830	100	52.0	65.1	0.0	57.2	56.2	48.5	40.3	38.8	13.1
2000	830	115	51.8	67.8	0.0	57.8	55.9	46.7	38.7	37.6	16.0
2000	830	130	51.1	65.6	0.0	57.0	55.3	45.0	38.1	36.7	14.5
2000	830	145	51.2	64.9	0.0	57.3	55.3	45.4	37.1	35.9	13.7
2000	830	200	50.8	71.1	0.0	56.9	54.8	44.0	36.8	35.2	20.3
2000	830	215	50.9	66.1	0.0	57.2	54.6	44.2	36.7	35.5	15.2
2000	830	230	50.9	67.0	0.0	56.6	54.5	46.1	38.1	37.1	16.1
2000	830	245	49.8	66.6	0.0	56.2	53.6	43.6	36.2	34.7	16.8
2000	830	300	49.4	63.0	0.0	55.8	54.0	43.3	36.6	35.2	13.6
2000	830	315	49.9	64.5	0.0	55.9	53.7	44.8	39.2	37.9	14.6
2000	830	330	51.5	66.8	0.0	57.7	55.4	45.7	40.1	38.6	15.3
2000	830	345	51.0	69.0	0.0	56.4	54.1	45.7	38.8	37.7	18.0
2000	830	400	51.1	70.4	0.0	56.7	54.6	46.2	39.3	38.1	19.3
2000	830	415	55.1	73.6	0.0	61.8	57.2	48.6	41.5	39.7	18.5
2000	830	430	53.7	74.7	0.0	59.1	56.6	50.2	42.5	40.0	21.0
2000	830	445	54.8	70.2	0.0	61.1	58.4	50.5	42.6	40.9	15.4
2000	830	500	55.6	68.6	0.0	61.0	59.1	52.8	42.6	40.3	13.0
2000	830	515	56.6	68.6	0.0	62.0	60.3	54.0	47.4	45.9	12.0
2000	830	530	56.8	69.4	0.0	61.5	59.8	54.8	49.3	46.6	12.6
2000	830	545	58.1	71.0	0.0	62.6	60.8	56.7	51.0	50.2	12.9
2000	830	600	57.7	66.6	0.0	61.5	60.3	56.8	52.7	50.8	8.9
2000	830	615	58.8	69.5	0.0	62.3	61.3	58.1	54.2	53.1	10.7
2000	830	630	58.9	70.0	0.0	62.6	61.4	58.1	54.5	53.6	11.1
2000	830	645	58.7	67.0	0.0	62.2	61.3	57.9	53.7	52.4	8.3
2000	830	700	59.9	72.0	0.0	64.5	62.7	58.6	54.7	53.2	12.1
2000	830	715	59.6	70.9	0.0	63.4	62.2	58.6	55.0	53.9	11.3
2000	830	730	60.9	75.8	0.0	64.6	63.2	59.5	55.5	53.8	14.9
2000	830	745	60.0	70.8	0.0	62.9	62.0	59.5	56.5	55.5	10.8
2000	830	800	60.6	73.3	0.0	63.8	62.7	59.9	56.9	56.0	12.7
2000	830	815	60.9	69.1	0.0	63.8	63.0	60.4	58.0	57.2	8.2
2000	830	830	60.7	69.2	0.0	64.1	62.9	60.0	57.5	56.6	8.5
2000	830	845	60.6	74.2	0.0	63.8	62.9	59.9	56.9	55.8	13.6
2000	830	900	60.3	68.2	0.0	63.9	62.9	59.5	56.1	55.1	7.9
2000	830	915	59.5	69.7	0.0	62.7	61.8	58.9	55.1	54.0	10.2
2000	830	930	59.0	67.0	0.0	62.9	61.7	58.1	54.9	53.5	8.0
2000	830	945	59.3	70.5	0.0	62.8	61.8	58.5	54.5	53.4	11.2
2000	830	1000	59.7	68.5	0.0	63.7	62.4	58.7	54.5	53.4	8.8
2000	830	1015	60.7	76.9	0.0	64.2	62.7	59.6	57.1	56.3	16.2
2000	830	1030	60.8	72.0	0.0	64.6	63.5	59.8	56.9	56.1	11.2
2000	830	1045	61.0	71.5	0.0	64.8	63.4	59.9	57.7	57.2	10.5
2000	830	1100	60.3	67.5	0.0	63.5	62.5	59.6	57.1	56.4	7.2
2000	830	1115	61.1	80.1	0.0	63.7	62.5	59.9	57.3	56.7	19.0
2000	830	1130	61.3	75.2	0.0	64.2	63.0	60.4	57.7	56.7	13.9
2000	830	1145	60.6	68.4	0.0	63.8	62.8	59.9	57.2	56.4	7.8
2000	830	1200	61.2	75.2	0.0	65.0	63.6	59.8	57.3	56.8	14.0
2000	830	1215	60.7	68.3	0.0	64.2	63.3	59.7	57.1	56.4	7.6
2000	830	1230	60.9	70.3	0.0	64.4	63.4	59.9	57.5	57.0	9.4
2000	830	1245	60.9	68.1	0.0	64.0	63.2	60.3	57.6	57.1	7.2
2000	830	1300	60.5	72.0	0.0	63.6	62.8	59.8	57.2	56.7	11.5
2000	830	1315	60.8	67.9	0.0	64.1	63.2	60.0	57.4	56.9	7.1
2000	830	1330	61.3	71.8	0.0	64.5	63.5	60.6	58.1	57.3	10.5
2000	830	1345	61.2	68.7	0.0	64.2	63.2	60.7	58.4	57.7	7.5
2000	830	1400	61.3	75.3	0.0	64.2	63.3	60.5	58.6	58.0	14.0
2000	830	1415	62.1	70.9	0.0	65.0	64.0	61.6	59.0	58.4	8.8
2000	830	1430	62.2	70.2	0.0	65.0	64.3	61.6	59.5	58.8	8.0
2000	830	1445	62.2	67.8	0.0	64.9	64.1	61.8	59.5	58.9	5.6
2000	830	1500	62.6	68.8	0.0	65.5	64.6	62.0	59.8	59.2	6.2
2000	830	1515	63.4	81.3	0.0	65.4	64.4	62.0	59.8	59.3	17.9
2000	830	1530	62.5	69.3	0.0	65.4	64.7	62.2	58.6	57.2	6.8
2000	830	1545	60.9	67.0	0.0	63.5	62.8	60.5	58.2	57.4	6.1
2000	830	1600	60.7	72.2	0.0	63.4	62.7	60.0	57.7	57.3	11.5
2000	830	1615	59.6	67.3	0.0	62.0	61.3	59.1	57.4	56.9	7.7
2000	830	1630	60.4	72.3	0.0	63.0	62.2	59.7	57.6	57.3	11.9
2000	830	1645	60.0	70.0	0.0	62.5	61.8	59.4	57.4	56.9	10.0
2000	830	1700	60.7	74.7	0.0	63.6	62.5	59.9	58.1	57.6	14.0
2000	830	1715	59.7	66.1	0.0	62.4	61.7	59.3	57.0	56.1	6.4
2000	830	1730	59.9	69.3	0.0	62.8	62.0	59.1	56.9	56.5	9.4
2000	830	1745	59.4	69.3	0.0	61.9	61.2	58.8	57.2	56.9	9.9
2000	830	1800	59.2	65.7	0.0	61.7	61.1	58.9	56.5	56.1	6.5
2000	830	1815	59.7	68.8	0.0	62.2	61.6	59.2	56.8	56.4	9.1
2000	830	1830	59.6	73.2	0.0	62.5	61.2	58.9	57.2	56.7	13.6
2000	830	1845	58.8	73.5	0.0	61.7	60.7	58.0	55.3	55.0	14.7
2000	830	1900	60.4	73.5	0.0	63.8	62.8	59.4	56.6	56.0	13.1
2000	830	1915	61.6	69.8	0.0	64.4	63.6	61.1	58.6	57.7	8.2
2000	830	1930	61.9	74.3	0.0	65.0	63.7	60.8	58.5	57.8	12.4
2000	830	1945	60.8	69.3	0.0	63.9	63.0	60.3	57.5	56.6	8.5
2000	830	2000	59.4	67.3	0.0	62.7	61.7	58.9	55.5	54.6	7.9
2000	830	2015	58.9	70.0	0.0	63.0	61.4	57.8	53.9	52.2	11.1
2000	830	2030	58.7	69.4	0.0	62.4	61.0	57.7	54.2	53.2	10.7
2000	830	2045	59.2	68.7	0.0	62.9	61.5	58.4	54.9	53.2	9.5
2000	830	2100	59.4	68.4	0.0	63.1	61.4	58.6	55.9	55.2	9.0
2000	830	2115	59.0	67.8	0.0	62.2	61.1	58.3	55.0	54.3	8.8
2000	830	2130	59.4	67.0	0.0	63.1	61.9	58.7	55.8	55.0	7.6
2000	830	2145	58.4	72.4	0.0	61.8	60.5	57.3	53.3	51.6	14.0
2000	830	2200	57.6	68.3	0.0	60.9	59.9	57.0	52.8	51.7	10.7
2000	830	2215	57.5	67.2	0.0	60.8	59.9	56.7	52.9	51.6	9.7
2000	830	2230	58.2	68.7	0.0	61.3	60.5	57.6	54.1	53.0	10.5
2000	830	2245	58.2	68.0	0.0	61.4	60.4	57.5	53.4	51.9	9.8
2000	830	2300	57.8	70.4	0.0	61.5	60.4	56.9	53.0	52.1	12.6
2000	830	2315	58.0	69.3	0.0	61.6	60.5	57.1	53.0	52.1	11.3
2000	830	2330	57.2	68.2	0.0	60.7	59.7	56.4	52.3	50.7	11.0
2000	830	2345	57.1	71.3	0.0	61.0	59.6	55.5	51.0	49.7	14.2
2000	831	0	56.8	68.1	0.0	60.6	59.3	55.8	50.5	48.0	11.3

DAY 1	DESCRIPTOR	PERIOD	LEVEL	UNIT
Daytime	max Leq, 1 hour outdoor	between 07:00 and 22:00 hours	62.7	dB(A)
Daytime	max Leq, 1 hour indoor	between 07:00 and 22:00 hours	40.7	dB(A)
Full Day	Leq, 24 hours	between 00:00 and 24:00 hours	59.3	dB(A)
Night Time	Leq, 8 hours	between 22:00 and 06:00 hours	54.5	dB(A)
Daytime	Leq, 15 hours	between 07:00 and 22:00 hours	60.5	dB(A)
Night Time	Leq, 9 hours	between 22:00 and 07:00 hours	55.4	dB(A)
Daytime	L10, 18 hours	between 06:00 and 24:00 hours	62.2	dB(A)
Daytime	minimum L90, 15 min	between 07:00 and 18:00 hours	54.5	dB(A)

Rear Facade of No. 22 Barwon Court, Wattle Grove - (M5)											DAY 2
Friday 14 December 2001										Rion NL14 S/N 1043074	
YEAR	MoDy	TIME	Leq	Lmax	L1	L5	L10	L50	L90	L95	Lmax - Leq
2000	830	2200	57.6	68.3	0.0	60.9	59.9	57.0	52.8	51.7	10.7
2000	830	2215	57.5	67.2	0.0	60.8	59.9	56.7	52.9	51.6	9.7
2000	830	2230	58.2	68.7	0.0	61.3	60.5	57.6	54.1	53.0	10.5
2000	830	2245	58.2	68.0	0.0	61.4	60.4	57.5	53.4	51.9	9.8
2000	830	2300	57.8	70.4	0.0	61.5	60.4	56.9	53.0	52.1	12.6
2000	830	2315	58.0	69.3	0.0	61.6	60.5	57.1	53.0	52.1	11.3
2000	830	2330	57.2	68.2	0.0	60.7	59.7	56.4	52.3	50.7	11.0
2000	830	2345	57.1	71.3	0.0	61.0	59.6	55.5	51.0	49.7	14.2
2000	831	0	56.8	68.1	0.0	60.6	59.3	55.8	50.5	48.0	11.3
2000	831	15	55.8	66.9	0.0	60.1	59.0	54.3	46.7	44.6	11.1
2000	831	30	54.4	65.0	0.0	58.9	57.7	52.6	46.6	44.7	10.6
2000	831	45	53.8	67.2	0.0	58.7	57.3	51.7	45.5	44.1	13.4
2000	831	100	52.6	62.1	0.0	57.6	56.5	50.6	44.3	42.8	9.5
2000	831	115	52.5	66.3	0.0	57.6	56.3	48.8	41.1	39.4	13.8
2000	831	130	51.5	65.2	0.0	57.2	55.5	46.2	35.8	34.9	13.7
2000	831	145	50.7	64.8	0.0	56.6	55.0	45.4	36.6	35.2	14.1
2000	831	200	50.9	65.5	0.0	56.4	54.4	45.2	36.4	35.2	14.6
2000	831	215	50.9	66.8	0.0	56.7	54.7	43.4	35.1	34.5	15.9
2000	831	230	50.2	66.3	0.0	56.6	54.5	44.4	36.8	35.5	16.1
2000	831	245	50.7	67.0	0.0	56.4	54.7	45.3	35.5	33.6	16.3
2000	831	300	49.4	64.6	0.0	55.0	53.3	44.8	37.4	35.7	15.2
2000	831	315	52.0	67.7	0.0	57.4	55.5	48.5	39.7	36.0	15.7
2000	831	330	53.7	68.1	0.0	60.1	56.8	48.7	41.4	38.0	14.4
2000	831	345	53.0	66.2	0.0	59.2	56.6	47.9	40.3	39.0	13.2
2000	831	400	52.1	67.0	0.0	57.6	55.7	48.5	41.3	38.7	14.9
2000	831	415	53.0	66.3	0.0	58.8	56.7	49.2	42.7	40.9	13.3
2000	831	430	53.3	66.8	0.0	58.7	56.8	49.9	43.9	41.6	13.5
2000	831	445	53.8	66.5	0.0	59.3	57.5	50.2	42.7	40.9	12.7
2000	831	500	54.2	66.7	0.0	60.3	57.9	50.2	43.1	41.5	12.5
2000	831	515	54.8	65.3	0.0	59.7	58.3	52.8	47.6	46.5	10.5
2000	831	530	56.6	71.1	0.0	61.8	59.7	54.5	48.2	46.0	14.5
2000	831	545	56.8	67.0	0.0	61.5	59.8	55.3	50.4	49.2	10.2
2000	831	600	56.6	67.5	0.0	60.4	59.3	55.4	50.5	49.2	10.9
2000	831	615	57.9	67.1	0.0	62.3	60.7	56.7	52.6	51.6	9.2
2000	831	630	57.6	66.9	0.0	61.8	60.3	56.6	52.2	51.1	9.3
2000	831	645	58.1	67.4	0.0	61.7	60.5	57.3	53.5	52.7	9.3
2000	831	700	58.9	71.3	0.0	62.7	61.3	58.1	54.4	53.1	12.4
2000	831	715	59.5	71.0	0.0	62.9	61.7	58.7	55.2	53.9	11.5
2000	831	730	59.6	66.7	0.0	63.1	62.1	58.9	55.6	54.3	7.1
2000	831	745	60.2	72.2	0.0	63.3	62.1	59.3	56.5	55.8	12.0
2000	831	800	60.4	66.1	0.0	63.4	62.4	59.8	57.6	57.0	5.7
2000	831	815	60.1	68.6	0.0	62.7	61.9	59.6	57.3	56.4	8.5
2000	831	830	60.5	69.5	0.0	63.3	62.4	60.1	57.4	56.3	9.0
2000	831	845	61.0	68.6	0.0	64.5	63.5	60.2	57.4	56.7	7.6
2000	831	900	60.4	68.3	0.0	63.4	62.3	59.9	57.2	56.1	7.9
2000	831	915	60.3	68.1	0.0	63.8	62.7	59.4	56.5	55.1	7.8
2000	831	930	60.0	67.5	0.0	63.6	62.6	59.2	56.2	55.2	7.5
2000	831	945	59.5	69.7	0.0	62.9	62.0	58.9	55.4	54.2	10.2
2000	831	1000	59.4	66.1	0.0	62.9	62.0	58.7	55.3	53.9	6.7
2000	831	1015	61.3	73.1	0.0	64.5	63.3	60.6	58.1	57.5	11.8
2000	831	1030	61.6	67.4	0.0	64.6	63.6	61.0	58.9	58.3	5.8
2000	831	1045	61.1	73.5	0.0	64.2	63.1	60.5	58.0	57.2	12.4
2000	831	1100	61.6	71.3	0.0	64.6	63.7	60.8	58.7	58.1	9.7
2000	831	1115	61.7	73.5	0.0	64.8	63.6	61.0	58.5	58.0	11.8
2000	831	1130	61.9	71.4	0.0	64.4	63.7	61.3	59.5	59.1	9.5
2000	831	1145	62.0	69.4	0.0	65.0	64.0	61.2	59.7	59.3	7.4
2000	831	1200	62.1	68.7	0.0	65.0	64.0	61.5	59.4	58.8	6.6
2000	831	1215	61.7	69.2	0.0	64.1	63.3	61.3	59.5	59.0	7.5
2000	831	1230	61.8	68.4	0.0	64.6	63.7	61.3	59.1	58.6	6.6
2000	831	1245	62.2	68.8	0.0	64.8	64.1	61.7	59.6	59.0	6.6
2000	831	1300	61.6	70.6	0.0	64.4	63.6	61.1	58.9	58.5	9.0
2000	831	1315	60.9	70.6	0.0	64.0	63.0	60.2	58.1	57.6	9.7
2000	831	1330	60.5	68.0	0.0	63.1	62.3	60.0	58.3	57.8	7.5
2000	831	1345	61.3	72.2	0.0	64.0	63.2	60.8	58.6	58.0	10.9
2000	831	1400	61.3	69.6	0.0	64.4	63.5	60.5	58.4	57.5	8.3
2000	831	1415	61.7	68.0	0.0	64.7	63.8	61.1	59.5	59.0	6.3
2000	831	1430	63.3	73.6	0.0	65.9	65.2	62.8	60.8	60.3	10.3
2000	831	1445	62.6	69.6	0.0	65.1	64.4	62.1	60.3	60.0	7.0
2000	831	1500	63.0	76.1	0.0	65.9	64.9	62.0	60.4	60.0	13.1
2000	831	1515	62.0	70.4	0.0	64.1	63.5	61.5	60.0	59.6	8.4
2000	831	1530	60.9	72.6	0.0	63.3	62.5	60.0	58.3	58.1	11.7
2000	831	1545	61.2	75.0	0.0	64.2	63.0	60.5	59.0	58.3	13.8
2000	831	1600	59.6	76.2	0.0	61.7	61.1	59.2	57.1	56.5	16.6
2000	831	1615	58.7	69.0	0.0	60.9	60.2	58.3	56.6	56.1	10.3
2000	831	1630	59.4	71.2	0.0	61.9	61.0	58.6	56.7	56.2	11.8
2000	831	1645	58.4	67.9	0.0	60.2	59.5	58.1	56.4	56.0	9.5
2000	831	1700	59.3	69.1	0.0	62.6	61.3	58.3	56.4	55.9	9.8
2000	831	1715	56.4	68.6	0.0	59.5	58.2	55.6	52.9	52.2	12.2
2000	831	1730	55.8	66.2	0.0	59.1	57.9	55.1	52.3	51.5	10.4
2000	831	1745	56.7	71.6	0.0	59.6	58.3	55.9	53.2	52.5	14.9
2000	831	1800	55.9	67.6	0.0	59.5	58.5	54.8	51.8	51.0	11.7
2000	831	1815	57.7	67.3	0.0	61.6	60.3	56.7	53.4	52.6	9.6
2000	831	1830	56.2	69.5	0.0	60.5	58.9	54.9	52.1	51.3	13.3
2000	831	1845	55.0	65.0	0.0	58.9	57.6	54.0	50.0	49.2	10.0
2000	831	1900	55.9	67.8	0.0	59.4	58.3	54.7	52.3	51.4	11.9
2000	831	1915	58.1	65.6	0.0	61.2	60.4	57.5	54.1	52.7	7.5
2000	831	1930	58.9	71.7	0.0	62.6	60.9	58.1	54.3	52.8	12.8
2000	831	1945	57.5	69.7	0.0	60.5	59.7	56.9	53.2	51.7	12.2
2000	831	2000	58.3	72.2	0.0	62.9	60.7	56.8	52.0	50.2	13.9
2000	831	2015	57.4	66.3	0.0	61.0	59.7	56.6	51.7	50.3	8.9
2000	831	2030	57.6	73.4	0.0	61.7	60.2	56.3	51.5	49.8	15.8
2000	831	2045	56.8	67.5	0.0	60.6	59.5	55.7	50.8	49.5	10.7
2000	831	2100	57.0	72.1	0.0	61.1	59.6	55.8	51.3	50.1	15.1
2000	831	2115	57.4	69.8	0.0	61.7	59.8	56.2	51.7	50.4	12.4
2000	831	2130	57.3	66.5	0.0	61.2	59.8	56.3	51.5	50.3	9.2
2000	831	2145	57.1	65.4	0.0	60.9	59.6	56.3	52.5	50.4	8.3
2000	831	2200	57.0	69.1	0.0	60.7	59.3	55.4	50.8	49.9	12.1
2000	831	2215	57.0	70.0	0.0	60.4	59.3	56.2	51.6	50.6	13.0
2000	831	2230	56.5	66.1	0.0	59.7	58.9	55.9	51.6	50.1	9.6
2000	831	2245	56.4	68.2	0.0	60.4	59.2	55.3	50.1	49.0	11.8
2000	831	2300	57.5	67.1	0.0	62.0	60.2	56.3	51.7	50.5	9.6
2000	831	2315	56.3	66.9	0.0	59.7	58.8	55.7	50.5	48.9	10.6
2000	831	2330	56.7	66.4	0.0	60.1	59.2	56.0	50.7	49.1	9.7
2000	831	2345	56.2	66.2	0.0	60.2	59.1	55.1	48.3	46.7	10.0

DAY 2	DESCRIPTOR	PERIOD	LEVEL	UNIT
Daytime	max Leq, 1 hour outdoor	between 07:00 and 22:00 hours	62.8	dB(A)
Daytime	max Leq, 1 hour indoor	between 07:00 and 22:00 hours	40.8	dB(A)
Full Day	Leq, 24 hours	between 00:00 and 24:00 hours	58.8	dB(A)
Night Time	Leq, 8 hours	between 22:00 and 06:00 hours	54.9	dB(A)
Daytime	Leq, 15 hours	between 07:00 and 22:00 hours	60.1	dB(A)
Night Time	Leq, 9 hours	between 22:00 and 07:00 hours	55.4	dB(A)
Daytime	L10, 18 hours	between 06:00 and 24:00 hours	61.4	dB(A)
Daytime	minimum L90, 15 min	between 07:00 and 18:00 hours	52.3	dB(A)

Rear Facade of No. 22 Barwon Court, Wattle Grove - (M5)											DAY 3
Saturday 15 December 2001											Rion NL14 S/N 1043074
YEAR	MoDy	TIME	Leq	Lmax	L1	L5	L10	L50	L90	L95	Lmax - Leq
2000	831	2215	57.0	70.0	0.0	60.4	59.3	56.2	51.6	50.6	13.0
2000	831	2230	56.5	66.1	0.0	59.7	58.9	55.9	51.6	50.1	9.6
2000	831	2245	56.4	68.2	0.0	60.4	59.2	55.3	50.1	49.0	11.8
2000	831	2300	57.5	67.1	0.0	62.0	60.2	56.3	51.7	50.5	9.6
2000	831	2315	56.3	66.9	0.0	59.7	58.8	55.7	50.5	48.9	10.6
2000	831	2330	56.7	66.4	0.0	60.1	59.2	56.0	50.7	49.1	9.7
2000	831	2345	56.2	66.2	0.0	60.2	59.1	55.1	48.3	46.7	10.0
2000	901	0	55.5	65.4	0.0	59.2	58.3	54.5	48.0	45.6	9.9
2000	901	15	55.5	67.9	0.0	59.5	58.6	54.2	47.3	45.1	12.4
2000	901	30	55.0	64.2	0.0	59.1	58.2	53.9	47.0	45.9	9.2
2000	901	45	54.8	70.8	0.0	58.6	57.7	53.3	47.0	45.4	16.0
2000	901	100	54.4	64.0	0.0	58.9	57.7	53.0	46.4	45.0	9.6
2000	901	115	53.9	65.0	0.0	58.2	57.2	52.6	46.3	44.9	11.1
2000	901	130	53.0	61.8	0.0	57.5	56.5	51.4	45.7	43.5	8.8
2000	901	145	53.5	67.9	0.0	58.0	56.6	50.9	45.0	43.5	14.4
2000	901	200	52.4	65.9	0.0	57.1	55.7	49.6	43.2	42.1	13.5
2000	901	215	52.6	67.4	0.0	57.5	56.2	49.4	43.5	41.8	14.8
2000	901	230	53.1	66.2	0.0	58.9	56.3	48.7	41.9	39.4	13.1
2000	901	245	52.9	66.6	0.0	57.1	56.1	49.8	44.0	42.2	13.7
2000	901	300	51.7	66.1	0.0	56.8	55.8	47.9	38.6	36.1	14.4
2000	901	315	51.5	66.5	0.0	56.8	55.0	47.1	40.5	39.0	15.0
2000	901	330	51.2	65.4	0.0	56.5	54.9	47.8	41.7	39.9	14.2
2000	901	345	51.5	63.3	0.0	56.8	55.4	48.6	42.6	40.3	11.8
2000	901	400	50.9	64.6	0.0	56.7	54.6	47.0	41.7	40.2	13.7
2000	901	415	51.0	65.8	0.0	56.4	54.9	46.9	39.1	36.8	14.8
2000	901	430	52.0	65.8	0.0	56.8	55.5	48.3	42.1	40.5	13.8
2000	901	445	52.5	65.6	0.0	58.6	55.8	47.5	41.1	39.5	13.1
2000	901	500	52.9	65.6	0.0	58.9	56.3	48.8	42.1	39.5	12.7
2000	901	515	53.1	65.4	0.0	58.2	56.8	50.2	43.9	42.6	12.3
2000	901	530	53.7	64.4	0.0	58.8	56.9	51.6	45.5	43.8	10.7
2000	901	545	54.8	66.3	0.0	59.3	57.9	53.6	47.6	46.3	11.5
2000	901	600	55.2	67.0	0.0	59.7	58.0	53.5	49.1	47.5	11.8
2000	901	615	55.0	64.3	0.0	58.8	57.9	54.1	48.3	47.1	9.3
2000	901	630	56.0	64.8	0.0	60.4	59.0	54.7	49.7	48.0	8.8
2000	901	645	56.5	69.8	0.0	60.5	59.3	55.2	50.0	48.7	13.3
2000	901	700	56.2	65.8	0.0	59.8	58.7	55.4	51.1	49.9	9.6
2000	901	715	56.5	67.4	0.0	59.8	59.0	55.6	50.4	49.0	10.9
2000	901	730	56.9	65.8	0.0	61.2	59.1	56.0	51.9	50.9	8.9
2000	901	745	57.8	69.8	0.0	61.1	60.2	57.1	53.2	52.0	12.0
2000	901	800	58.3	69.5	0.0	61.8	60.5	57.4	54.3	53.2	11.2
2000	901	815	58.0	73.2	0.0	61.8	60.9	59.3	55.2	54.1	15.2
2000	901	830	59.4	66.8	0.0	61.8	61.3	59.0	56.5	55.7	7.4
2000	901	845	59.2	68.0	0.0	62.5	61.3	58.6	55.5	54.4	8.8
2000	901	900	59.0	67.9	0.0	62.5	61.3	58.2	55.1	54.3	8.9
2000	901	915	57.9	65.4	0.0	60.9	60.2	57.5	53.2	51.5	7.5
2000	901	930	58.2	65.5	0.0	61.6	60.7	57.5	53.9	52.6	7.3
2000	901	945	58.6	66.5	0.0	61.8	60.9	58.0	54.9	54.1	7.9
2000	901	1000	58.6	65.7	0.0	62.0	61.0	58.0	54.5	53.6	7.1
2000	901	1015	60.0	83.4	0.0	61.8	61.1	59.3	57.1	56.3	23.4
2000	901	1030	59.5	65.3	0.0	61.5	60.8	59.3	57.3	56.6	5.8
2000	901	1045	59.6	66.4	0.0	61.8	61.0	59.3	57.3	56.8	6.8
2000	901	1100	59.7	67.4	0.0	61.8	61.1	59.3	57.5	56.9	7.7
2000	901	1115	59.6	66.0	0.0	62.0	61.3	59.2	57.3	56.7	6.4
2000	901	1130	59.6	66.2	0.0	61.9	61.2	59.3	57.1	56.5	6.6
2000	901	1145	59.6	65.8	0.0	61.9	61.3	59.2	57.0	56.3	6.2
2000	901	1200	59.5	68.1	0.0	61.6	60.9	59.1	57.1	56.4	8.6
2000	901	1215	59.6	64.7	0.0	61.7	61.1	59.3	57.4	56.9	5.1
2000	901	1230	59.8	67.0	0.0	62.1	61.3	59.5	57.6	57.0	7.2
2000	901	1245	59.5	68.9	0.0	61.6	61.0	59.2	57.2	56.6	9.4
2000	901	1300	59.7	68.1	0.0	61.9	61.2	59.3	57.3	56.5	8.4
2000	901	1315	59.7	66.7	0.0	62.1	61.3	59.3	57.4	56.8	7.0
2000	901	1330	59.4	67.1	0.0	61.5	61.0	59.1	57.1	56.5	7.7
2000	901	1345	59.9	68.5	0.0	62.0	61.3	59.6	57.8	57.2	8.6
2000	901	1400	59.6	67.8	0.0	61.7	61.1	59.3	57.3	56.9	8.2
2000	901	1415	59.8	66.9	0.0	62.1	61.4	59.4	57.2	56.8	7.1
2000	901	1430	59.9	69.2	0.0	62.1	61.4	59.5	57.6	57.1	9.3
2000	901	1445	59.7	66.2	0.0	61.9	61.3	59.4	57.4	56.9	6.5
2000	901	1500	59.7	69.6	0.0	61.8	61.3	59.4	57.5	57.0	9.9
2000	901	1515	59.1	64.7	0.0	61.1	60.6	58.9	57.0	56.5	5.6
2000	901	1530	60.1	74.3	0.0	62.1	61.4	59.7	57.6	57.0	14.2
2000	901	1545	60.2	70.5	0.0	62.3	61.7	59.9	58.0	57.4	10.3
2000	901	1600	60.2	75.0	0.0	62.1	61.2	59.3	57.4	56.9	14.8
2000	901	1615	59.2	65.0	0.0	61.3	60.7	59.1	56.9	56.2	5.8
2000	901	1630	60.2	68.1	0.0	62.8	61.7	59.7	57.7	57.2	7.9
2000	901	1645	59.7	69.4	0.0	61.8	61.2	59.4	57.5	57.0	9.7
2000	901	1700	59.7	68.9	0.0	61.7	61.2	59.5	57.7	57.2	9.2
2000	901	1715	58.6	65.0	0.0	61.1	60.4	58.4	55.6	54.7	6.4
2000	901	1730	58.8	68.8	0.0	61.3	60.6	58.4	55.9	55.2	10.0
2000	901	1745	57.8	65.6	0.0	60.4	59.7	57.6	54.5	53.8	7.8
2000	901	1800	58.9	72.1	0.0	61.2	60.6	58.6	56.1	55.4	13.2
2000	901	1815	58.6	64.7	0.0	61.1	60.4	58.2	55.6	54.7	6.1
2000	901	1830	58.5	64.9	0.0	60.9	60.4	58.2	55.4	54.6	6.4
2000	901	1845	58.7	68.4	0.0	61.8	60.8	58.1	54.8	53.7	9.7
2000	901	1900	57.6	67.5	0.0	60.6	59.8	57.1	53.4	52.5	9.9
2000	901	1915	57.0	64.7	0.0	60.0	59.3	56.7	52.9	51.3	7.7
2000	901	1930	57.8	67.8	0.0	61.5	60.2	56.8	52.4	51.1	10.0
2000	901	1945	57.0	67.9	0.0	60.3	59.4	56.4	52.2	51.1	10.9
2000	901	2000	56.7	67.6	0.0	60.0	59.4	56.1	51.3	49.8	10.9
2000	901	2015	56.2	66.7	0.0	59.8	58.8	55.6	50.6	49.4	10.5
2000	901	2030	56.0	66.9	0.0	59.6	58.6	55.0	50.5	49.2	10.9
2000	901	2045	55.1	64.3	0.0	58.5	57.7	54.4	49.2	48.1	9.2
2000	901	2100	55.5	67.5	0.0	59.0	58.1	54.5	50.2	49.0	12.0
2000	901	2115	55.2	64.5	0.0	59.0	58.0	54.4	48.9	47.0	9.3
2000	901	2130	55.2	66.3	0.0	59.1	58.0	54.2	48.3	46.5	11.1
2000	901	2145	54.4	63.1	0.0	58.4	57.5	53.4	47.6	46.5	8.7
2000	901	2200	55.5	65.2	0.0	59.3	58.3	54.9	49.1	47.9	9.7
2000	901	2215	55.1	66.5	0.0	58.7	57.9	54.4	48.8	46.8	11.4
2000	901	2230	55.7	66.9	0.0	59.1	58.3	55.0	50.1	49.0	11.2
2000	901	2245	56.4	67.3	0.0	60.4	59.0	55.5	50.7	49.5	10.9
2000	901	2300	56.2	68.9	0.0	59.5	58.8	55.6	50.7	49.5	12.7
2000	901	2315	56.2	71.7	0.0	59.7	58.8	55.1	50.5	48.7	15.5
2000	901	2330	56.1	64.5	0.0	59.3	58.6	55.6	50.9	48.7	8.4
2000	901	2345	55.9	67.1	0.0	59.2	58.5	55.4	50.6	49.3	11.2
2000	902	0	55.9	65.2	0.0	59.4	58.4	55.1	49.4	47.9	9.3

DAY 3	DESCRIPTOR	PERIOD	LEVEL	UNIT
Daytime	max Leq, 1 hour outdoor	between 07:00 and 22:00 hours	60.0	dB(A)
Daytime	max Leq, 1 hour indoor	between 07:00 and 22:00 hours	38.0	dB(A)
Full Day	Leq, 24 hours	between 00:00 and 24:00 hours	57.5	dB(A)
Night Time	Leq, 8 hours	between 22:00 and 06:00 hours	54.2	dB(A)
Daytime	Leq, 15 hours	between 07:00 and 22:00 hours	58.7	dB(A)
Night Time	Leq, 9 hours	between 22:00 and 07:00 hours	54.6	dB(A)
Daytime	L10, 18 hours	between 06:00 and 24:00 hours	60.1	dB(A)
Daytime	minimum L90, 15 min	between 07:00 and 18:00 hours	50.4	dB(A)

Rear Facade of No. 22 Barwon Court, Wattle Grove - (M5)											DAY 4
Sunday 16 December 2001											Rion NL14 S/N 1043074
YEAR	MoDy	TIME	Leq	Lmax	L1	L5	L10	L50	L90	L95	Lmax - Leq
2000	901	2215	55.1	66.5	0.0	58.7	57.9	54.4	48.8	46.8	11.4
2000	901	2230	55.7	66.9	0.0	59.1	58.3	55.0	50.1	49.0	11.2
2000	901	2245	56.4	67.3	0.0	60.4	59.0	55.5	50.7	49.5	10.9
2000	901	2300	56.2	68.9	0.0	59.5	58.8	55.6	50.7	49.5	12.7
2000	901	2315	56.2	71.7	0.0	59.7	58.8	55.1	50.5	48.7	15.5
2000	901	2330	56.1	64.5	0.0	59.3	58.6	55.6	50.9	48.7	8.4
2000	901	2345	55.9	67.1	0.0	59.2	58.5	55.4	50.6	49.3	11.2
2000	902	0	55.9	65.2	0.0	59.4	58.4	55.1	49.4	47.9	9.3
2000	902	15	56.0	67.9	0.0	59.4	58.5	55.3	50.4	49.1	11.9
2000	902	30	55.7	63.1	0.0	59.1	58.4	55.2	49.7	47.9	7.4
2000	902	45	55.8	67.5	0.0	59.4	58.5	54.8	49.3	47.8	11.7
2000	902	100	54.9	63.0	0.0	58.8	57.9	54.1	47.2	45.7	8.1
2000	902	115	55.2	65.9	0.0	59.3	58.3	54.1	47.5	45.7	10.7
2000	902	130	54.5	62.3	0.0	58.6	57.6	53.6	47.8	46.6	7.8
2000	902	145	53.1	61.3	0.0	57.6	56.8	51.5	45.3	43.4	8.2
2000	902	200	53.5	68.0	0.0	58.2	56.9	51.2	45.2	43.7	14.5
2000	902	215	53.3	66.5	0.0	57.9	56.9	51.7	45.4	43.9	13.2
2000	902	230	52.4	66.0	0.0	57.1	56.0	50.4	43.5	41.5	13.6
2000	902	245	51.9	65.6	0.0	56.6	55.5	49.3	42.2	40.2	13.7
2000	902	300	51.3	63.1	0.0	56.7	55.4	48.2	41.0	39.8	11.8
2000	902	315	50.7	62.0	0.0	56.0	54.8	47.6	40.5	38.5	11.3
2000	902	330	51.9	65.8	0.0	56.8	55.5	48.9	41.9	40.3	13.9
2000	902	345	50.1	59.2	0.0	55.9	54.5	46.5	36.9	34.3	9.1
2000	902	400	50.7	66.2	0.0	56.9	55.0	45.7	38.1	36.5	15.5
2000	902	415	51.6	67.8	0.0	57.1	55.2	47.6	39.7	37.9	16.2
2000	902	430	49.7	62.3	0.0	55.5	53.8	45.5	37.4	36.1	12.6
2000	902	445	49.7	60.8	0.0	55.7	54.3	45.3	36.9	35.5	11.1
2000	902	500	50.2	65.7	0.0	56.2	54.2	45.1	37.5	36.0	15.5
2000	902	515	51.9	67.8	0.0	57.0	55.8	47.9	39.5	37.7	15.9
2000	902	530	52.1	71.1	0.0	57.3	55.8	48.9	41.4	39.7	19.0
2000	902	545	51.8	62.5	0.0	56.9	55.5	49.7	42.8	41.1	10.7
2000	902	600	51.7	62.6	0.0	56.8	55.7	49.0	41.6	39.2	10.9
2000	902	615	61.3	92.8	0.0	57.9	56.7	50.9	43.2	41.2	31.5
2000	902	630	53.5	65.1	0.0	57.9	56.8	51.7	46.7	45.0	11.6
2000	902	645	54.2	67.6	0.0	58.8	57.4	52.2	45.4	43.7	13.4
2000	902	700	55.6	82.4	0.0	59.0	57.4	52.2	43.7	42.4	26.8
2000	902	715	53.3	62.6	0.0	57.9	56.7	51.6	45.4	44.0	9.3
2000	902	730	54.4	66.8	0.0	58.6	57.3	52.5	45.5	44.2	12.4
2000	902	745	54.6	65.0	0.0	58.5	57.6	53.8	47.3	46.0	10.4
2000	902	800	54.6	62.2	0.0	59.0	58.0	53.5	46.3	44.0	7.6
2000	902	815	54.9	63.6	0.0	58.9	58.0	54.1	47.4	45.7	8.7
2000	902	830	55.7	66.4	0.0	60.0	58.5	54.4	49.2	47.5	10.7
2000	902	845	55.9	64.8	0.0	59.0	58.3	55.5	50.5	48.5	8.9
2000	902	900	56.0	65.8	0.0	59.5	58.8	55.2	50.3	48.8	9.8
2000	902	915	56.3	66.2	0.0	59.7	58.8	55.6	50.9	49.2	9.9
2000	902	930	59.8	89.1	0.0	61.1	59.9	57.0	52.8	51.4	29.3
2000	902	945	61.0	86.4	0.0	62.0	61.2	58.8	56.2	55.5	25.4
2000	902	1000	59.0	78.9	0.0	61.6	60.9	58.5	55.5	54.5	19.9
2000	902	1015	59.1	69.5	0.0	61.2	60.7	58.7	56.6	55.9	10.4
2000	902	1030	59.7	75.2	0.0	61.8	61.1	59.1	57.0	56.4	15.5
2000	902	1045	59.6	73.3	0.0	61.4	60.8	59.2	57.4	56.9	13.7
2000	902	1100	59.4	68.0	0.0	61.6	61.0	59.2	57.1	56.6	8.6
2000	902	1115	59.3	66.5	0.0	61.3	60.7	59.1	57.0	56.3	7.2
2000	902	1130	59.8	68.0	0.0	61.8	61.3	59.5	57.4	56.7	8.2
2000	902	1145	59.6	68.2	0.0	61.8	61.1	59.3	57.2	56.5	8.6
2000	902	1200	59.5	67.1	0.0	61.8	61.2	59.1	57.1	56.5	7.6
2000	902	1215	59.8	71.6	0.0	62.0	61.5	59.6	57.2	56.6	11.8
2000	902	1230	59.8	66.4	0.0	62.2	61.5	59.5	57.1	56.4	6.6
2000	902	1245	60.1	71.2	0.0	62.2	61.6	59.7	57.9	57.5	11.1
2000	902	1300	60.3	68.9	0.0	62.6	61.9	59.9	57.9	57.3	8.6
2000	902	1315	59.7	65.9	0.0	61.9	61.4	59.4	57.4	57.0	6.2
2000	902	1330	61.4	81.6	0.0	62.9	61.8	59.6	57.6	57.1	20.2
2000	902	1345	59.8	65.0	0.0	62.0	61.6	59.6	57.5	57.0	5.2
2000	902	1400	60.5	73.5	0.0	62.7	62.0	60.1	58.1	57.3	13.0
2000	902	1415	59.7	67.5	0.0	62.0	61.5	59.4	57.3	56.8	7.8
2000	902	1430	59.8	67.8	0.0	62.0	61.4	59.5	57.5	57.0	8.0
2000	902	1445	60.0	71.7	0.0	62.3	61.5	59.4	57.4	56.9	11.7
2000	902	1500	61.5	76.8	0.0	65.7	64.1	60.0	56.5	55.1	15.3
2000	902	1515	60.7	76.1	0.0	63.6	62.7	60.0	57.2	56.3	15.4
2000	902	1530	59.8	80.2	0.0	62.6	61.4	58.8	55.8	54.7	20.4
2000	902	1545	64.6	84.1	0.0	69.3	65.8	61.4	59.1	58.3	19.5
2000	902	1600	61.8	85.7	0.0	64.2	63.1	60.6	58.4	57.3	23.9
2000	902	1615	61.2	68.6	0.0	63.2	62.7	60.9	59.1	58.4	7.4
2000	902	1630	61.6	75.0	0.0	63.4	62.9	61.3	59.4	59.0	13.4
2000	902	1645	61.6	73.1	0.0	63.9	63.1	61.1	59.5	59.1	11.5
2000	902	1700	62.8	67.9	0.0	65.1	64.5	62.4	60.5	59.9	5.1
2000	902	1715	62.6	76.7	0.0	65.9	64.7	61.6	59.8	59.3	14.1
2000	902	1730	60.7	69.6	0.0	64.1	62.8	59.9	57.3	56.5	8.9
2000	902	1745	60.6	66.1	0.0	62.8	62.2	60.3	58.1	57.4	5.5
2000	902	1800	60.5	66.0	0.0	62.8	62.2	60.2	57.9	57.1	5.5
2000	902	1815	59.7	83.4	0.0	61.8	61.2	59.1	56.7	55.9	23.7
2000	902	1830	59.8	75.7	0.0	62.7	61.9	59.2	56.7	55.8	15.9
2000	902	1845	60.1	76.8	0.0	62.3	61.7	59.6	57.0	56.1	16.7
2000	902	1900	58.9	65.9	0.0	61.8	61.0	58.5	55.0	54.1	7.0
2000	902	1915	59.0	73.5	0.0	61.7	61.0	58.6	55.5	54.3	14.5
2000	902	1930	58.6	67.9	0.0	61.5	60.6	58.0	55.1	54.4	9.3
2000	902	1945	58.4	70.4	0.0	61.3	60.6	57.9	54.7	53.9	12.0
2000	902	2000	59.4	79.6	0.0	62.4	61.6	58.8	55.1	53.7	20.2
2000	902	2015	58.4	69.3	0.0	61.8	60.7	57.7	54.0	52.8	10.9
2000	902	2030	58.2	66.0	0.0	61.0	60.3	57.8	54.7	53.9	7.8
2000	902	2045	58.0	69.8	0.0	61.0	60.1	57.4	53.8	52.6	11.8
2000	902	2100	57.9	71.4	0.0	60.9	60.2	57.4	54.2	53.2	13.5
2000	902	2115	57.4	65.8	0.0	60.8	60.0	56.7	52.0	51.0	8.4
2000	902	2130	57.6	67.8	0.0	60.6	59.8	56.8	53.0	51.6	10.2
2000	902	2145	57.2	65.4	0.0	60.9	59.8	56.4	51.6	50.0	8.2
2000	902	2200	57.5	75.1	0.0	60.7	59.5	56.0	51.6	50.2	17.6
2000	902	2215	57.3	63.6	0.0	60.6	59.9	56.7	52.4	51.3	6.3
2000	902	2230	57.4	68.6	0.0	60.5	59.7	56.7	52.1	51.0	11.2
2000	902	2245	56.9	66.1	0.0	60.5	59.8	56.0	51.1	49.4	9.2
2000	902	2300	56.5	65.1	0.0	60.2	59.2	55.7	51.5	50.1	8.6
2000	902	2315	55.9	65.7	0.0	60.0	58.9	54.8	49.6	48.3	9.8
2000	902	2330	56.2	64.4	0.0	59.8	59.0	55.5	50.1	49.1	8.2
2000	902	2345	55.1	70.3	0.0	58.9	58.1	53.9	48.1	46.9	15.2
2000	903	0	54.3	63.5	0.0	59.0	57.8	52.7	46.6	44.4	9.2

DAY 4	DESCRIPTOR	PERIOD	LEVEL	UNIT
Daytime	max Leq, 1 hour outdoor	between 07:00 and 22:00 hours	62.5	dB(A)
Daytime	max Leq, 1 hour indoor	between 07:00 and 22:00 hours	40.5	dB(A)
Full Day	Leq, 24 hours	between 00:00 and 24:00 hours	58.3	dB(A)
Night Time	Leq, 8 hours	between 22:00 and 06:00 hours	53.8	dB(A)
Daytime	Leq, 15 hours	between 07:00 and 22:00 hours	59.6	dB(A)
Night Time	Leq, 9 hours	between 22:00 and 07:00 hours	54.5	dB(A)
Daytime	L10, 18 hours	between 06:00 and 24:00 hours	60.6	dB(A)
Daytime	minimum L90, 15 min	between 07:00 and 18:00 hours	45.4	dB(A)

Rear Facade of No. 22 Barwon Court, Wattle Grove - (M5)											DAY 5
Monday 17 December 2001									Rion NL14 S/N 1043074		
YEAR	MoDy	TIME	Leq	Lmax	L1	L5	L10	L50	L90	L95	Lmax - Leq
2000	902	2215	57.3	63.6	0.0	60.6	59.9	56.7	52.4	51.3	6.3
2000	902	2230	57.4	68.6	0.0	60.5	59.7	56.7	52.1	51.0	11.2
2000	902	2245	56.9	66.1	0.0	60.5	59.8	56.0	51.1	49.4	9.2
2000	902	2300	56.5	65.1	0.0	60.2	59.2	55.7	51.5	50.1	8.6
2000	902	2315	55.9	65.7	0.0	60.0	58.9	54.8	49.6	48.3	9.8
2000	902	2330	56.2	64.4	0.0	59.8	59.0	55.5	50.1	49.1	8.2
2000	902	2345	55.1	70.3	0.0	58.9	58.1	53.9	48.1	46.9	15.2
2000	903	0	54.3	63.5	0.0	59.0	57.8	52.7	46.6	44.4	9.2
2000	903	15	53.4	62.4	0.0	58.1	57.0	51.5	44.3	41.6	9.0
2000	903	30	53.6	66.2	0.0	58.3	56.9	51.4	45.2	43.7	12.6
2000	903	45	52.3	64.4	0.0	57.3	56.0	50.1	40.0	35.0	12.1
2000	903	100	50.8	61.7	0.0	56.6	55.1	47.3	37.6	35.5	10.9
2000	903	115	52.3	66.5	0.0	57.5	55.7	48.0	39.1	34.8	14.2
2000	903	130	50.9	64.7	0.0	57.0	55.1	46.9	38.4	36.9	13.8
2000	903	145	51.4	67.3	0.0	57.2	55.0	45.3	34.8	33.2	15.9
2000	903	200	49.8	66.1	0.0	55.5	53.8	45.4	36.5	34.2	16.3
2000	903	215	51.2	65.9	0.0	57.4	54.9	45.3	35.3	34.2	14.7
2000	903	230	48.2	62.8	0.0	54.9	52.7	42.0	34.7	34.0	14.6
2000	903	245	50.2	67.2	0.0	56.2	53.7	43.9	36.0	34.6	17.0
2000	903	300	50.1	68.4	0.0	55.9	53.2	42.7	35.1	31.5	18.3
2000	903	315	47.6	63.7	0.0	54.2	51.9	41.0	32.2	30.0	16.1
2000	903	330	49.6	65.9	0.0	55.6	53.7	44.8	35.6	34.1	16.3
2000	903	345	51.1	66.9	0.0	57.3	54.2	45.4	36.4	34.7	15.8
2000	903	400	49.2	67.3	0.0	55.2	53.0	43.2	35.4	33.3	18.1
2000	903	415	51.5	64.8	0.0	57.2	55.8	47.0	37.7	35.0	13.3
2000	903	430	51.7	67.2	0.0	57.2	55.5	46.6	39.2	37.7	15.5
2000	903	445	53.4	67.8	0.0	58.5	56.8	49.2	40.8	38.1	14.4
2000	903	500	52.6	64.3	0.0	58.0	56.3	49.4	40.5	38.0	11.7
2000	903	515	55.2	67.4	0.0	61.5	59.0	51.9	44.4	42.5	12.2
2000	903	530	55.7	67.9	0.0	60.8	59.2	53.2	45.9	43.3	12.2
2000	903	545	57.0	69.0	0.0	62.2	59.8	55.0	50.2	48.8	12.0
2000	903	600	57.3	68.5	0.0	61.6	60.2	55.9	51.0	49.5	11.2
2000	903	615	61.2	84.0	0.0	62.4	60.8	56.6	52.8	51.3	22.8
2000	903	630	58.6	73.1	0.0	62.1	61.0	57.8	54.4	53.5	14.5
2000	903	645	58.7	70.0	0.0	62.5	61.3	57.9	53.6	52.4	11.3
2000	903	700	58.9	67.5	0.0	62.2	61.3	58.3	54.3	53.2	8.6
2000	903	715	59.4	69.6	0.0	63.5	61.9	58.2	55.1	54.1	10.2
2000	903	730	59.1	68.5	0.0	63.0	61.8	58.3	55.1	54.1	9.4
2000	903	745	59.1	66.7	0.0	62.0	61.1	58.6	55.8	54.9	7.6
2000	903	800	59.0	69.0	0.0	62.1	61.0	58.5	56.0	55.0	10.0
2000	903	815	59.2	68.4	0.0	62.4	61.4	58.4	56.3	55.3	9.2
2000	903	830	59.6	71.2	0.0	63.0	61.9	58.9	55.8	54.3	11.6
2000	903	845	58.7	67.5	0.0	62.3	61.1	57.9	54.6	53.7	8.8
2000	903	900	59.0	72.2	0.0	62.6	61.4	57.8	53.9	52.3	13.2
2000	903	915	61.1	79.1	0.0	64.3	62.5	58.2	53.6	52.3	18.0
2000	903	930	59.5	69.5	0.0	63.6	62.2	58.5	55.0	53.9	10.0
2000	903	945	58.4	68.5	0.0	62.2	60.8	57.5	52.7	51.3	10.1
2000	903	1000	59.1	70.8	0.0	63.3	62.1	57.8	54.0	52.6	11.7
2000	903	1015	59.6	72.0	0.0	63.9	62.6	58.4	54.3	52.4	12.4
2000	903	1030	60.3	67.8	0.0	63.5	62.4	59.7	57.6	56.4	7.5
2000	903	1045	60.3	66.8	0.0	63.4	62.3	59.6	57.5	56.9	6.5
2000	903	1100	59.8	70.8	0.0	62.9	61.7	59.2	57.2	56.7	11.0
2000	903	1115	60.3	67.9	0.0	63.7	62.4	59.5	57.2	56.5	7.6
2000	903	1130	60.5	70.4	0.0	63.9	62.8	59.8	57.6	57.1	9.9
2000	903	1145	60.2	67.5	0.0	63.4	62.4	59.5	57.5	57.0	7.3
2000	903	1200	61.1	68.9	0.0	64.2	63.2	60.4	58.0	57.4	7.8
2000	903	1215	61.6	72.1	0.0	65.0	64.0	60.7	58.4	57.7	10.5
2000	903	1230	61.1	70.0	0.0	64.3	63.2	60.3	58.1	57.7	8.9
2000	903	1245	61.3	70.4	0.0	64.4	63.3	60.6	58.4	57.7	9.1
2000	903	1300	60.9	68.9	0.0	63.8	63.0	60.3	58.0	57.4	8.0
2000	903	1315	61.1	69.7	0.0	64.1	63.1	60.4	58.4	57.6	8.6
2000	903	1330	61.4	70.5	0.0	64.3	63.4	60.8	58.6	58.0	9.1
2000	903	1345	62.1	75.3	0.0	65.2	64.1	61.1	58.7	58.1	13.2
2000	903	1400	62.1	71.8	0.0	64.9	64.0	61.4	59.2	58.5	9.7
2000	903	1415	61.5	67.2	0.0	64.3	63.5	61.0	59.0	58.5	5.7
2000	903	1430	62.0	69.1	0.0	65.0	64.1	61.4	59.2	58.6	7.1
2000	903	1445	62.1	68.2	0.0	64.6	63.9	61.6	59.7	59.2	6.1
2000	903	1500	62.2	72.1	0.0	64.6	63.9	61.7	59.9	59.4	9.9
2000	903	1515	62.8	72.3	0.0	65.5	64.6	62.3	60.4	59.9	9.5
2000	903	1530	61.9	69.5	0.0	64.7	64.0	61.3	59.2	58.9	7.6
2000	903	1545	60.6	65.5	0.0	62.6	62.0	60.4	58.9	58.4	4.9
2000	903	1600	61.5	77.9	0.0	63.7	63.1	60.9	59.2	58.8	16.4
2000	903	1615	61.4	70.9	0.0	63.8	63.1	61.0	58.8	58.4	9.5
2000	903	1630	62.2	66.9	0.0	64.5	64.0	61.8	60.0	59.2	4.7
2000	903	1645	60.8	67.7	0.0	63.1	62.5	60.3	58.6	58.2	6.9
2000	903	1700	60.6	73.9	0.0	63.2	61.9	59.6	57.8	57.5	13.3
2000	903	1715	59.9	65.9	0.0	62.0	61.2	59.5	58.3	58.0	6.0
2000	903	1730	58.4	67.0	0.0	61.6	60.6	57.8	54.9	54.5	8.6
2000	903	1745	58.4	67.8	0.0	61.6	60.8	57.6	53.7	52.9	9.4
2000	903	1800	58.1	72.5	0.0	61.6	59.8	57.0	54.5	53.7	14.4
2000	903	1815	58.8	67.2	0.0	62.2	61.1	58.3	55.0	54.3	8.4
2000	903	1830	61.0	78.7	0.0	63.1	61.7	58.7	56.0	55.4	17.7
2000	903	1845	58.1	67.7	0.0	61.7	60.8	57.2	52.9	52.1	9.6
2000	903	1900	59.1	77.5	0.0	62.8	61.6	58.4	53.3	52.1	18.4
2000	903	1915	61.5	71.4	0.0	64.7	63.7	60.9	57.8	57.0	9.9
2000	903	1930	60.8	67.9	0.0	63.9	62.9	60.4	57.3	56.4	7.1
2000	903	1945	60.6	71.1	0.0	64.0	62.6	59.5	56.8	56.0	10.5
2000	903	2000	60.5	78.8	0.0	64.0	63.0	59.3	55.0	53.8	18.3
2000	903	2015	59.9	77.6	0.0	63.0	61.7	58.5	54.3	53.2	17.7
2000	903	2030	58.5	67.5	0.0	62.9	61.1	57.3	52.9	51.6	9.0
2000	903	2045	58.3	67.3	0.0	62.6	61.1	57.2	53.0	51.7	9.0
2000	903	2100	58.8	68.0	0.0	63.0	61.3	57.6	53.6	52.4	9.2
2000	903	2115	58.6	74.0	0.0	62.5	61.2	57.2	52.8	52.0	15.4
2000	903	2130	59.2	75.2	0.0	63.5	61.9	57.6	53.3	51.9	16.0
2000	903	2145	58.2	69.2	0.0	62.6	60.7	56.9	51.8	50.4	11.0
2000	903	2200	57.7	68.7	0.0	62.1	60.4	56.4	52.1	51.1	11.0
2000	903	2215	57.3	69.1	0.0	60.6	59.6	56.5	51.7	50.4	11.8
2000	903	2230	56.9	68.8	0.0	60.6	59.6	56.0	51.0	49.5	11.9
2000	903	2245	56.6	68.3	0.0	60.6	59.4	55.0	49.4	47.6	11.7
2000	903	2300	56.7	68.9	0.0	60.6	59.2	55.3	49.8	48.0	12.2
2000	903	2315	56.4	68.2	0.0	60.5	59.1	55.2	49.8	48.4	11.8
2000	903	2330	56.2	66.0	0.0	60.4	59.4	55.1	49.3	47.7	9.8
2000	903	2345	55.1	64.0	0.0	59.4	58.1	54.0	47.9	46.4	8.9
2000	904	0	54.8	67.5	0.0	59.4	57.9	52.2	44.9	42.9	12.7

DAY 5	DESCRIPTOR	PERIOD	LEVEL	UNIT
Daytime	max Leq, 1 hour outdoor	between 07:00 and 22:00 hours	62.3	dB(A)
Daytime	max Leq, 1 hour indoor	between 07:00 and 22:00 hours	40.3	dB(A)
Full Day	Leq, 24 hours	between 00:00 and 24:00 hours	59.0	dB(A)
Night Time	Leq, 8 hours	between 22:00 and 06:00 hours	53.8	dB(A)
Daytime	Leq, 15 hours	between 07:00 and 22:00 hours	60.3	dB(A)
Night Time	Leq, 9 hours	between 22:00 and 07:00 hours	55.0	dB(A)
Daytime	L10, 18 hours	between 06:00 and 24:00 hours	61.9	dB(A)
Daytime	minimum L90, 15 min	between 07:00 and 18:00 hours	52.7	dB(A)

Rear Facade of No. 22 Barwon Court, Wattle Grove - (M5)										DAY 6	
Tuesday 18 December 2001									Rion NL14 S/N 1043074		
YEAR	MoDy	TIME	Leq	Lmax	L1	L5	L10	L50	L90	L95	Lmax - Leq
2000	903	2215	57.3	69.1	0.0	60.6	59.6	56.5	51.7	50.4	11.8
2000	903	2230	56.9	68.8	0.0	60.6	59.6	56.0	51.0	49.5	11.9
2000	903	2245	56.6	68.3	0.0	60.6	59.4	55.0	49.4	47.6	11.7
2000	903	2300	56.7	68.9	0.0	60.6	59.2	55.3	49.8	48.0	12.2
2000	903	2315	56.4	68.2	0.0	60.5	59.1	55.2	49.8	48.4	11.8
2000	903	2330	56.2	66.0	0.0	60.4	59.4	55.1	49.3	47.7	9.8
2000	903	2345	55.1	64.0	0.0	59.4	58.1	54.0	47.9	46.4	8.9
2000	904	0	54.8	67.5	0.0	59.4	57.9	52.2	44.9	42.9	12.7
2000	904	15	54.4	66.6	0.0	59.6	57.9	51.7	44.3	42.1	12.2
2000	904	30	55.1	67.2	0.0	60.2	58.2	52.5	45.6	43.7	12.1
2000	904	45	52.7	64.5	0.0	57.6	56.4	50.2	44.1	42.5	11.8
2000	904	100	52.4	63.3	0.0	57.8	56.3	49.8	42.9	41.0	10.9
2000	904	115	51.1	63.7	0.0	56.5	55.0	47.5	41.4	39.0	12.6
2000	904	130	52.7	67.7	0.0	57.9	55.8	48.1	41.0	35.4	15.0
2000	904	145	50.3	65.2	0.0	56.0	54.0	44.7	35.3	33.2	14.9
2000	904	200	50.2	65.7	0.0	55.9	53.9	45.0	37.6	34.8	15.5
2000	904	215	50.2	65.9	0.0	55.5	53.8	43.9	35.1	31.8	15.7
2000	904	230	50.7	62.6	0.0	56.5	55.0	47.0	41.4	38.6	11.9
2000	904	245	51.5	69.0	0.0	56.9	55.3	46.8	36.6	33.8	17.5
2000	904	300	50.0	63.6	0.0	56.6	54.4	44.8	36.2	33.6	13.6
2000	904	315	52.0	68.0	0.0	57.3	55.1	45.8	36.5	33.7	16.0
2000	904	330	53.1	68.4	0.0	58.9	56.3	46.8	37.8	35.6	15.3
2000	904	345	51.5	67.4	0.0	57.5	54.8	45.5	38.4	35.9	15.9
2000	904	400	51.6	68.9	0.0	57.5	55.3	46.1	39.1	37.0	17.3
2000	904	415	54.4	69.9	0.0	60.2	57.2	48.3	42.4	40.5	15.5
2000	904	430	53.0	65.0	0.0	59.0	56.7	49.2	41.8	38.4	12.0
2000	904	445	53.8	66.6	0.0	59.3	57.6	49.8	42.7	40.1	12.8
2000	904	500	54.8	68.6	0.0	59.8	58.1	52.3	46.3	43.9	13.8
2000	904	515	55.2	67.0	0.0	60.3	58.3	52.9	47.6	46.6	11.8
2000	904	530	57.2	67.7	0.0	61.6	60.2	55.5	50.3	49.1	10.5
2000	904	545	57.8	70.9	0.0	61.8	60.5	56.5	52.2	50.6	13.1
2000	904	600	57.5	65.6	0.0	61.3	60.2	56.7	51.8	50.5	8.1
2000	904	615	58.7	68.3	0.0	62.2	61.3	58.0	54.4	53.4	9.6
2000	904	630	59.4	69.2	0.0	63.0	62.0	58.4	55.2	54.4	9.8
2000	904	645	59.0	78.3	0.0	62.3	61.2	58.1	54.7	53.5	19.3
2000	904	700	60.9	84.3	0.0	62.8	61.6	58.2	54.1	52.5	23.4
2000	904	715	59.3	69.8	0.0	63.2	61.9	58.2	54.0	52.3	10.5
2000	904	730	59.5	67.4	0.0	63.4	62.3	58.6	54.4	53.1	7.9
2000	904	745	59.5	67.4	0.0	62.8	61.9	58.8	55.5	54.0	7.9
2000	904	800	59.7	66.8	0.0	63.3	62.2	59.1	55.7	54.6	7.1
2000	904	815	59.8	68.5	0.0	62.8	61.6	59.5	56.7	55.4	8.7
2000	904	830	61.7	81.3	0.0	64.1	62.7	59.5	56.9	55.9	19.6
2000	904	845	60.0	68.7	0.0	63.2	62.3	59.4	56.3	55.4	8.7
2000	904	900	60.5	72.7	0.0	64.2	63.1	59.3	56.4	55.3	12.2
2000	904	915	59.8	79.5	0.0	63.7	62.2	58.5	55.0	53.8	19.7
2000	904	930	59.7	69.2	0.0	63.5	62.1	58.8	55.5	54.7	9.5
2000	904	945	59.4	68.7	0.0	63.3	62.0	58.4	55.0	53.8	9.3
2000	904	1000	59.2	67.4	0.0	62.6	61.6	58.5	54.8	53.5	8.2
2000	904	1015	59.8	76.5	0.0	62.9	61.5	57.8	54.2	52.9	16.7
2000	904	1030	60.9	70.5	0.0	64.1	63.0	60.2	57.9	57.3	9.6
2000	904	1045	60.6	68.1	0.0	63.5	62.7	60.0	57.6	57.2	7.5
2000	904	1100	61.2	68.8	0.0	63.8	62.9	60.7	58.6	58.1	7.6
2000	904	1115	61.0	68.6	0.0	64.2	63.2	60.3	58.0	57.4	7.5
2000	904	1130	60.8	69.9	0.0	64.0	62.7	60.1	57.9	57.2	9.1
2000	904	1145	61.0	68.9	0.0	64.0	63.1	60.3	58.3	57.8	7.9
2000	904	1200	60.6	70.2	0.0	63.6	62.7	59.9	57.7	57.1	9.6
2000	904	1215	61.2	77.9	0.0	64.4	63.4	60.1	57.7	57.3	16.7
2000	904	1230	61.0	69.7	0.0	63.8	63.0	60.4	58.1	57.4	8.7
2000	904	1245	61.5	70.0	0.0	64.8	64.0	60.6	58.3	57.7	8.5
2000	904	1300	61.6	70.0	0.0	64.5	63.8	61.0	58.7	58.1	8.4
2000	904	1315	61.2	69.9	0.0	64.1	63.4	60.5	58.2	57.6	8.7
2000	904	1330	61.2	69.4	0.0	64.2	63.3	60.6	58.3	57.7	8.2
2000	904	1345	61.8	70.1	0.0	64.7	63.8	61.3	59.3	58.6	8.3
2000	904	1400	62.1	70.9	0.0	64.8	64.0	61.6	59.5	58.9	8.8
2000	904	1415	62.8	71.0	0.0	65.9	65.1	62.0	59.5	58.6	8.2
2000	904	1430	62.2	68.5	0.0	64.8	64.2	61.8	59.5	58.9	6.3
2000	904	1445	62.9	77.1	0.0	65.8	64.9	62.2	60.0	59.3	14.2
2000	904	1500	63.4	70.8	0.0	66.4	65.5	62.8	60.6	60.0	7.4
2000	904	1515	62.4	69.2	0.0	65.0	64.2	61.9	60.0	59.3	6.8
2000	904	1530	62.5	75.1	0.0	65.1	64.0	61.8	60.1	59.6	12.6
2000	904	1545	61.9	69.8	0.0	64.0	63.4	61.6	59.8	59.3	7.9
2000	904	1600	62.9	69.7	0.0	65.4	64.6	62.4	60.6	60.0	6.8
2000	904	1615	63.6	70.0	0.0	66.4	65.6	63.2	60.6	59.8	6.4
2000	904	1630	62.0	71.5	0.0	65.1	63.9	61.3	59.6	59.2	9.5
2000	904	1645	62.1	69.2	0.0	64.8	64.1	61.5	59.5	59.1	7.1
2000	904	1700	62.1	78.2	0.0	64.1	63.4	61.5	59.9	59.6	16.1
2000	904	1715	62.4	79.5	0.0	65.1	64.4	61.8	59.6	59.3	17.1
2000	904	1730	62.2	76.4	0.0	65.2	64.7	61.5	57.9	56.7	14.2
2000	904	1745	60.3	73.3	0.0	63.2	62.6	59.4	56.0	55.2	13.0
2000	904	1800	59.2	68.9	0.0	61.9	61.2	58.8	55.7	54.6	9.7
2000	904	1815	58.0	69.5	0.0	60.6	59.8	57.5	55.3	54.8	11.5
2000	904	1830	57.0	70.7	0.0	60.9	59.0	55.9	53.1	52.4	13.7
2000	904	1845	60.8	73.7	0.0	65.6	64.4	59.1	53.5	52.3	12.9
2000	904	1900	59.2	78.6	0.0	61.4	60.5	56.5	53.3	52.3	19.4
2000	904	1915	59.7	73.8	0.0	62.8	61.6	57.0	55.4	54.8	14.1
2000	904	1930	60.4	71.9	0.0	64.4	62.4	59.2	55.9	54.9	11.5
2000	904	1945	59.3	67.7	0.0	62.7	61.4	58.7	55.1	53.6	8.4
2000	904	2000	59.8	73.8	0.0	63.4	62.0	58.2	54.1	52.7	14.0
2000	904	2015	59.0	70.3	0.0	62.6	61.3	58.3	54.6	53.4	11.3
2000	904	2030	58.9	67.9	0.0	63.1	61.5	57.9	54.1	52.8	9.0
2000	904	2045	58.1	70.0	0.0	61.7	60.6	57.0	52.3	50.8	11.9
2000	904	2100	58.9	67.5	0.0	63.2	61.7	57.8	53.5	52.1	8.6
2000	904	2115	57.8	73.9	0.0	62.0	60.3	56.2	51.8	50.5	16.1
2000	904	2130	57.8	66.6	0.0	62.0	60.2	56.7	52.1	50.9	8.8
2000	904	2145	57.8	69.8	0.0	62.6	60.2	56.3	52.3	51.2	12.0
2000	904	2200	58.4	69.4	0.0	62.7	61.1	57.1	52.9	51.7	11.0
2000	904	2215	57.5	69.2	0.0	61.6	60.1	56.3	51.6	49.6	11.7
2000	904	2230	57.1	68.0	0.0	61.4	59.8	55.9	51.4	50.5	10.9
2000	904	2245	57.5	67.9	0.0	61.4	59.9	56.3	52.2	51.1	10.4
2000	904	2300	56.9	68.2	0.0	61.2	59.5	55.6	50.8	49.4	11.3
2000	904	2315	56.8	68.0	0.0	60.9	59.6	55.7	50.2	48.9	11.2
2000	904	2330	56.3	68.4	0.0	60.1	58.7	54.8	49.1	48.0	12.1
2000	904	2345	56.0	66.7	0.0	60.2	59.0	54.5	48.7	47.7	10.7
2000	905	0	54.3	66.2	0.0	58.6	57.7	52.8	47.2	45.7	11.9

DAY 6	DESCRIPTOR	PERIOD	LEVEL	UNIT
Daytime	max Leq, 1 hour outdoor	between 07:00 and 22:00 hours	62.8	dB(A)
Daytime	max Leq, 1 hour indoor	between 07:00 and 22:00 hours	40.8	dB(A)
Full Day	Leq, 24 hours	between 00:00 and 24:00 hours	59.5	dB(A)
Night Time	Leq, 8 hours	between 22:00 and 06:00 hours	54.4	dB(A)
Daytime	Leq, 15 hours	between 07:00 and 22:00 hours	60.8	dB(A)
Night Time	Leq, 9 hours	between 22:00 and 07:00 hours	55.5	dB(A)
Daytime	L10, 18 hours	between 06:00 and 24:00 hours	62.2	dB(A)
Daytime	minimum L90, 15 min	between 07:00 and 18:00 hours	54.0	dB(A)

Rear Facade of No. 22 Barwon Court, Wattle Grove - (M5)											DAY 7
Wednesday 19 December 2001											Rion NL14 S/N 1043074
YEAR	MoDy	TIME	Leq	Lmax	L1	L5	L10	L50	L90	L95	Lmax - Leq
2000	904	2215	57.5	69.2	0.0	61.6	60.1	56.3	51.6	49.6	11.7
2000	904	2230	57.1	68.0	0.0	61.4	59.8	55.9	51.4	50.5	10.9
2000	904	2245	57.5	67.9	0.0	61.4	59.9	56.3	52.2	51.1	10.4
2000	904	2300	56.9	68.2	0.0	61.2	59.5	55.6	50.8	49.4	11.3
2000	904	2315	56.8	68.0	0.0	60.9	59.6	55.7	50.2	48.9	11.2
2000	904	2330	56.3	68.4	0.0	60.1	58.7	54.8	49.1	48.0	12.1
2000	904	2345	56.0	66.7	0.0	60.2	59.0	54.5	48.7	47.7	10.7
2000	905	0	54.3	66.2	0.0	58.6	57.7	52.8	47.2	45.7	11.9
2000	905	15	55.7	66.4	0.0	60.9	59.2	53.3	46.9	45.3	10.7
2000	905	30	54.1	66.8	0.0	59.1	57.6	51.5	43.8	41.8	12.7
2000	905	45	53.5	67.3	0.0	58.7	56.7	50.2	43.4	41.7	13.8
2000	905	100	53.0	66.3	0.0	57.9	56.3	49.2	43.8	42.4	13.3
2000	905	115	51.8	67.4	0.0	57.5	55.7	47.4	41.5	40.4	15.6
2000	905	130	51.8	68.9	0.0	56.8	55.2	47.8	42.6	41.5	17.1
2000	905	145	52.6	67.1	0.0	58.3	56.1	47.9	41.4	39.3	14.5
2000	905	200	51.6	66.5	0.0	57.0	55.5	47.2	39.6	37.7	14.9
2000	905	215	50.5	65.6	0.0	56.2	54.6	46.2	36.6	33.7	15.1
2000	905	230	51.2	67.4	0.0	56.4	54.6	46.9	40.2	36.8	16.2
2000	905	245	51.7	65.3	0.0	57.4	55.4	48.0	41.0	38.7	13.6
2000	905	300	51.0	65.0	0.0	57.0	55.1	45.3	39.5	36.9	14.0
2000	905	315	52.5	68.4	0.0	58.8	55.5	46.1	40.7	39.2	15.9
2000	905	330	51.1	66.2	0.0	57.2	54.9	46.2	40.3	38.4	15.1
2000	905	345	51.7	67.1	0.0	57.3	55.4	47.7	41.5	39.6	15.4
2000	905	400	52.9	67.0	0.0	58.1	56.0	48.8	41.7	37.8	14.1
2000	905	415	52.1	66.6	0.0	57.2	55.9	49.4	44.4	43.0	14.5
2000	905	430	54.0	66.0	0.0	59.3	57.3	51.2	45.6	44.5	12.0
2000	905	445	57.3	74.9	0.0	62.7	59.1	52.8	47.2	45.5	17.6
2000	905	500	54.7	66.9	0.0	60.3	58.2	51.9	46.8	45.1	12.2
2000	905	515	56.3	72.5	0.0	61.2	59.5	54.2	49.1	47.6	16.2
2000	905	530	56.3	67.5	0.0	60.6	59.2	55.0	49.9	48.6	11.2
2000	905	545	58.0	71.7	0.0	62.1	60.7	56.5	52.0	50.6	13.7
2000	905	600	58.0	68.4	0.0	61.7	60.5	56.9	53.6	52.4	10.4
2000	905	615	58.8	69.6	0.0	62.5	61.1	58.0	54.7	53.9	10.8
2000	905	630	59.1	66.8	0.0	62.7	61.6	58.3	55.0	54.0	7.7
2000	905	645	59.5	68.3	0.0	62.7	61.7	59.0	55.5	54.7	8.8
2000	905	700	59.3	67.3	0.0	62.6	61.5	58.7	55.6	54.5	8.0
2000	905	715	59.5	68.0	0.0	62.9	61.9	58.8	55.8	54.6	8.5
2000	905	730	59.3	69.6	0.0	62.7	61.5	58.5	55.1	54.0	10.3
2000	905	745	59.3	73.4	0.0	62.3	61.2	58.7	56.0	55.1	14.1
2000	905	800	59.9	73.2	0.0	62.7	61.8	58.9	56.2	55.3	13.3
2000	905	815	59.0	72.6	0.0	61.7	60.9	58.5	55.9	55.0	13.6
2000	905	830	59.1	66.2	0.0	62.1	61.1	58.7	55.8	54.8	7.1
2000	905	845	58.7	70.0	0.0	61.9	60.8	58.0	54.8	53.9	11.3
2000	905	900	58.9	66.1	0.0	62.7	61.5	58.0	54.8	53.6	7.2
2000	905	915	58.6	66.4	0.0	62.5	61.3	57.7	54.2	53.4	7.8
2000	905	930	58.8	75.6	0.0	62.7	61.4	57.6	53.3	52.2	16.8
2000	905	945	58.4	68.9	0.0	62.4	61.1	57.4	53.2	51.9	10.5
2000	905	1000	58.6	74.6	0.0	62.2	61.1	57.7	54.1	52.5	16.0
2000	905	1015	60.3	74.7	0.0	62.8	63.7	58.7	54.8	52.9	14.4
2000	905	1030	61.0	72.9	0.0	64.7	63.3	59.8	57.1	56.4	11.9
2000	905	1045	60.1	67.0	0.0	63.1	62.0	59.5	57.6	57.1	6.9
2000	905	1100	60.3	67.4	0.0	63.6	62.6	59.6	57.4	56.9	7.1
2000	905	1115	60.4	68.8	0.0	63.6	62.6	59.7	57.6	57.0	8.4
2000	905	1130	60.2	67.8	0.0	63.7	62.5	59.4	57.2	56.7	7.6
2000	905	1145	60.5	67.5	0.0	63.6	62.7	59.8	57.7	57.3	7.0
2000	905	1200	60.2	67.1	0.0	63.6	62.1	59.6	57.4	56.7	6.9
2000	905	1215	60.7	68.2	0.0	63.5	62.4	60.2	58.5	58.1	7.5
2000	905	1230	61.5	69.4	0.0	64.1	63.3	61.0	59.1	58.7	7.9
2000	905	1245	61.2	68.2	0.0	63.8	63.0	60.6	59.0	58.6	7.0
2000	905	1300	61.1	67.9	0.0	64.0	63.3	60.5	58.5	57.9	6.8
2000	905	1315	60.3	69.1	0.0	63.4	62.3	59.4	57.5	57.1	8.8
2000	905	1330	60.0	68.0	0.0	62.8	61.8	59.5	57.4	57.0	8.0
2000	905	1345	60.3	66.5	0.0	63.0	62.1	59.7	58.0	57.5	6.2
2000	905	1400	61.3	70.6	0.0	64.7	63.5	60.6	58.2	57.6	9.3
2000	905	1415	61.4	75.5	0.0	64.4	63.2	60.4	58.5	58.0	14.1
2000	905	1430	61.7	67.0	0.0	64.0	63.2	61.3	59.7	59.2	5.3
2000	905	1445	61.8	71.9	0.0	64.5	63.5	61.1	59.6	59.2	10.1
2000	905	1500	62.7	67.9	0.0	65.1	64.5	62.3	60.4	59.9	5.2
2000	905	1515	62.2	67.6	0.0	64.3	63.8	61.9	60.1	59.5	5.4
2000	905	1530	62.5	74.1	0.0	65.2	64.2	62.0	60.4	59.9	11.6
2000	905	1545	62.2	69.8	0.0	64.4	63.7	61.8	60.5	60.1	7.6
2000	905	1600	61.3	69.4	0.0	63.5	62.9	60.9	59.7	59.4	8.1
2000	905	1615	61.2	68.8	0.0	63.1	62.5	60.8	59.6	59.2	7.6
2000	905	1630	60.7	64.5	0.0	62.4	61.8	60.5	59.3	59.1	3.8
2000	905	1645	60.0	67.4	0.0	61.8	61.1	59.8	58.7	58.4	7.4
2000	905	1700	59.2	68.4	0.0	61.4	60.7	58.6	57.3	57.0	9.2
2000	905	1715	59.7	70.9	0.0	62.6	61.0	58.7	57.5	57.2	11.2
2000	905	1730	58.3	71.7	0.0	61.5	60.3	57.1	54.6	54.0	13.4
2000	905	1745	57.8	66.7	0.0	61.5	60.6	56.5	54.2	53.6	8.9
2000	905	1800	56.9	67.9	0.0	60.6	59.4	55.7	53.5	52.9	11.0
2000	905	1815	57.3	69.4	0.0	60.6	59.7	56.6	53.9	53.4	12.1
2000	905	1830	58.8	71.2	0.0	61.6	60.9	58.1	55.2	54.6	12.4
2000	905	1845	58.1	69.6	0.0	61.6	60.6	57.4	52.8	51.6	11.5
2000	905	1900	57.7	70.4	0.0	61.2	60.2	56.7	53.3	52.4	12.7
2000	905	1915	59.5	70.3	0.0	62.6	61.6	58.9	55.9	55.0	10.8
2000	905	1930	59.4	66.5	0.0	62.6	61.7	58.9	55.2	54.0	7.1
2000	905	1945	59.0	74.8	0.0	63.0	61.1	57.7	53.7	52.3	15.8
2000	905	2000	58.2	66.8	0.0	61.9	60.5	57.3	54.3	53.3	8.6
2000	905	2015	58.5	81.5	0.0	62.0	60.3	57.0	52.8	51.8	23.0
2000	905	2030	57.6	67.6	0.0	61.9	60.3	56.5	51.7	50.7	10.0
2000	905	2045	56.8	68.4	0.0	60.5	59.5	55.6	50.1	48.1	11.6
2000	905	2100	58.4	72.1	0.0	62.9	61.1	57.1	51.8	50.1	13.7
2000	905	2115	57.3	69.9	0.0	62.3	60.1	56.0	50.6	48.8	12.6
2000	905	2130	57.3	70.1	0.0	61.4	59.6	56.1	51.3	50.0	12.8
2000	905	2145	58.1	80.8	0.0	62.2	60.3	56.7	50.6	49.1	22.7
2000	905	2200	57.3	78.6	0.0	61.4	59.8	55.7	50.4	48.9	21.3
2000	905	2215	57.3	70.9	0.0	61.5	60.2	55.9	51.2	50.0	13.6
2000	905	2230	60.3	76.7	0.0	63.6	60.7	56.2	51.6	49.8	16.4
2000	905	2245	57.0	69.2	0.0	61.0	59.5	55.6	50.9	49.4	12.2
2000	905	2300	56.0	67.9	0.0	60.1	58.9	54.7	48.3	45.5	11.9
2000	905	2315	58.6	75.3	0.0	62.5	59.5	54.9	49.0	47.7	16.7
2000	905	2330	60.8	81.5	0.0	62.1	59.2	54.7	47.6	44.9	20.7
2000	905	2345	55.7	66.1	0.0	59.5	58.5	54.6	48.1	46.3	10.4
2000	906	0	56.3	67.7	0.0	61.0	59.3	54.7	47.9	46.5	11.4

DAY 7	DESCRIPTOR	PERIOD	LEVEL	UNIT
Daytime	max Leq, 1 hour outdoor	between 07:00 and 22:00 hours	62.4	dB(A)
Daytime	max Leq, 1 hour indoor	between 07:00 and 22:00 hours	40.4	dB(A)
Full Day	Leq, 24 hours	between 00:00 and 24:00 hours	58.8	dB(A)
Night Time	Leq, 8 hours	between 22:00 and 06:00 hours	54.8	dB(A)
Daytime	Leq, 15 hours	between 07:00 and 22:00 hours	59.9	dB(A)
Night Time	Leq, 9 hours	between 22:00 and 07:00 hours	55.7	dB(A)
Daytime	L10, 18 hours	between 06:00 and 24:00 hours	61.4	dB(A)
Daytime	minimum L90, 15 min	between 07:00 and 18:00 hours	53.2	dB(A)

KOIKAS ACOUSTICS PTY LTD

CONSULTANTS IN NOISE AND VIBRATION **ACN 058 524 771**

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Project No.: **892**

Date: 29 January 2002

Our Reference: A29012A1.nk

Prepared For: Diane Fajmon
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Sydney NSW 2001

ADDENDUM - TRAFFIC NOISE ASSESSMENT BARWON Ct. WATTLE GROVE RESIDENTIAL PROPERTIES ADJACENT TO THE M5 MOTORWAY

This Letter

This letter is an addendum to our report entitled *"Traffic Noise Monitoring at No. 22 Barwon Ct, Wattle Grove, South of the M5 Motorway"*, our reference number R09012A1.nk and dated 9 January 2001.

Previous Report

In the above mentioned report, the scope of work entailed undertaking a traffic noise survey at a representative site for a duration of one week. Measurements were undertaken between Thursday 13 and Wednesday 19 December 2001.

Results of Traffic Noise Survey

The results indicate that based on the RTA's Interim Traffic Policy traffic noise level objectives, current traffic noise levels are met. Based on the current EPA Criteria for Road Traffic Noise Policy, noise levels are also currently being achieved.

M5 Upgrade Proposal

The M5 currently accommodates two lanes in each direction. It is understood that there is a proposal to widen the M5 to accommodate three lanes in each direction.

Traffic Noise Impact of Proposed Upgrade

The implications of this proposal are as follows:

- X the EPA criteria would apply for this road upgrade;
- X traffic volumes pertaining 10 years after the completion of the road works would be considered for assessment. This is based on the EPA's Technical notes page 12 item (vi), which states *"for all developments, the criteria should apply on the basis of the traffic volumes projected for 10 years time. The noise criteria should also apply immediately after the road opens...."*
- X as a result of widening the Motorway, it is highly likely that this would encourage more motorists to use the road especially during peak traffic, traffic speeds would increase, and as a result, increase traffic noise.

Traffic Noise Increases
Calculated traffic noise increases are based on the following:

- X it is estimated that if a 1% compound increase in traffic occurs, traffic noise would increase by 0.4 dB(A);
- X if a 2% compound increase in traffic occurs, traffic noise would increase by 0.9 dB(A).

Further,

- X if traffic containing say 10% heavy vehicles, was to increase in speed from say 90 km/hr to 100 km/hr, traffic noise would increase by 0.9 dB(A);
- X if traffic containing say 10% heavy vehicles, was to increase in speed from say 80 km/hr to 100 km/hr, traffic noise would increase by 1.9 dB(A).

Assuming that the road boundaries are unlikely to encroach further in the direction of residential premises, it is expected that traffic noise levels will further increase as the logarithm average of the traffic noise source will be closer. As a result, this will further increase traffic noise by 1.7 dB(A).

Resultant Traffic Noise Increase
For the worse case noise increase scenario a 4.4 dB(A) projected traffic noise increase would occur.

- X daytime 64.4 dB(A) $L_{Aeq,\ 15\ hours}$ between 07:00 and 22:00 hours, and
- X night time 59.6 dB(A) $L_{Aeq,\ 15\ hours}$ between 22:00 and 07:00 hours,

This is an exceedance of the EPA's traffic noise goal of 4.6 dB(A).

For the minimum noise increase scenario, the expected traffic noise increase that would occur is 3 dB(A). This would result in:

- X daytime 63.3 dB(A) $L_{Aeq,\ 15\ hours}$ between 07:00 and 22:00 hours, and
- X night time 58.2 dB(A) $L_{Aeq,\ 15\ hours}$ between 22:00 and 07:00 hours,

Traffic Noise Barriers
For the worse case scenario, if the barrier was increased by an additional 2.5 metres, this would provide a further 4.4 dB(A) traffic noise attenuation and therefore meet the EPA goals for day and night time periods.

For the minimum case scenario, if the barrier was increased by an additional 1.8 metres, this would provide a further 3 dB(A) traffic noise attenuation and therefore meet the EPA goals for day and night time periods.

It is noted, that the above results are based on predictions undertaken with the CORTN method amended for Australian road conditions.

Construction Noise Impacts

During the retrofitting of these noise barriers and road upgrades, some plant and equipment is expected to generate intrusive and therefore offensive construction noise levels for some residents. It is noted however, that the existing traffic noise barriers will provide substantial noise attenuation. There will however, be some periods when the EPA's construction noise criteria levels will be exceeded. The EPA recognises that it is often quite difficult to achieve construction noise criteria outlined in the EPA's Environmental Noise Control Manual. All practical noise mitigation measures should therefore be implemented at all times during the construction periods. These measures would include:

- X installing all engine cowlings on all plant and equipment;
- X operating noisy plant and equipment during periods typical of higher background noise, and
- X notifying residents of proposed noisy construction periods so that they can plan their noise sensitive domestic activities appropriately.

Currently background noise levels are generally around 56 dB(A). The maximum permissible construction noise levels based on that construction activities take less than 4 weeks is 76 dB(A). If construction noise activities are to take less than 26 months but more than 4 weeks the maximum permissible construction noise level would be 66 dB(A). Most noisy earth moving plant and general equipment used for road upgrades would generate noise levels between 70 and 55 dB(A) to the nearest residential premises.

Yours Sincerely
KOIKAS ACOUSTICS PTY LTD
Member Firm of the AAAC

Nicholas G. Koikas
Principal Consultant

Appendix F

FLORA AND FAUNA SPECIES LISTS

Atlas of New South Wales - Wildlife Database - FAUNA

Sighting Key	Scientific Name	Common Name	Legal Status
112672-035	Burhinus grallarius	Bush Stone-curlew	E1
114057-035	Ephippiorhynchus asiaticus	Black-necked Stork	E1
SJKP9805080U	Hoplocephalus bungaroides	Broad-headed Snake	E1
WD20471	Lathamus discolor	Swift Parrot	E1
40190-HO	Litoria aurea	Green and Golden Bell Frog	E1
SDMP99062502	Meridolum corneovirens		E1
SDMPI0000095	Xanthomyza phrygia	Regent Honeyeater	E1
107843-035	Neochmia ruficauda	Star Finch	E4
SDMP9909090B	Mormopterus norfolkensis	East Coast Freetail Bat	V
108491-035	Botaurus poiciloptilus	Australasian Bittern	V
107220-035	Cacatua leadbeateri	Major Mitchell's Cockatoo	V
WD18536	Calyptorhynchus lathami	Glossy Black-Cockatoo	V
38713-HO	Cercartetus nanus	Eastern Pygmy-possum	V
SSGH9606192P	Chalinolobus dwyeri	Large-eared Pied Bat	V
SCJP98051905	Dasyurus maculatus	Spotted-tailed Quoll	V
SSGH9909300H	Falsistrellus tasmaniensis	Eastern False Pipistrelle	V
107811-035	Grantiella picta	Painted Honeyeater	V
WD11924	Heleioporus australiacus	Giant Burrowing Frog	V
114040-035	Irediparra gallinacea	Comb-crested Jacana	V
WD40494	Ixobrychus flavicollis	Black Bittern	V
105219-035	Limosa limosa	Black-tailed Godwit	V
SMCE9703210Z	Lophoictinia isura	Square-tailed Kite	V
SMCE97040103	Miniopterus schreibersii	Common Bent-wing Bat	V
38613-HO	Myotis adversus	Large-footed Myotis	V
107271-035	Neophema pulchella	Turquoise Parrot	V
SJXK0005311F	Ninox connivens	Barking Owl	V
109192-035	Ninox strenua	Powerful Owl	V
95032-035	Oxyura australis	Blue-billed Duck	V
SDMP96072268	Petaurus australis	Yellow-bellied Glider	V
WD41495	Petaurus norfolcensis	Squirrel Glider	V
WD6707	Petrogale penicillata	Brush-tailed Rock-wallaby	V
110159-035	Petroica rodinogaster	Pink Robin	V
SSYK0102150T	Phascolarctos cinereus	Koala	V
102813-035	Polytelis swainsonii	Superb Parrot	V
WD30033	Pseudophryne australis	Red-crowned Toadlet	V
SDMP9607160P	Pteropus poliocephalus	Grey-headed Flying-fox	V
119230-035	Pyrrholaemus sagittatus	Speckled Warbler	V
108718-035	Rostratula benghalensis	Painted Snipe	V
SSGH9909300J	Saccolaimus flaviventris	Yellow-bellied Sheathtail Bat	V
38610-HO	Scoteanax rueppellii	Greater Broad-nosed Bat	V
100080-035	Stagonopleura guttata	Diamond Firetail	V
92536-035	Sterna fuscata	Sooty Tern	V
108527-035	Stictonetta naevosa	Freckled Duck	V
92839-035	Tyto novaehollandiae	Masked Owl	V
99747-035	Tyto tenebricosa	Sooty Owl	V

The Atlas of New South Wales Wildlife contains data from sources including government agencies, non-government organisations and private individuals.
These data are only indicative and cannot be considered as a comprehensive inventory, and may contain errors and omissions.

The Atlas of New South Wales - Wildlife Database - FLORA

Sighting Key	Family Name	Scientific Name	Legal Status
580	Fabaceae (Mimosoideae)	Acacia bynoeana	E1
SDMP9708140K	Fabaceae (Mimosoideae)	Acacia gordonii	E1
741	Casuarinaceae	Allocasuarina glareicola	E1
8394-HOR	Asclepiadaceae	Cynanchum elegans	E1
SPXEI0279686	Myrtaceae	Eucalyptus sp. Cattai	E1
SJALI0007118	Proteaceae	Grevillea parviflora subsp supplicans	E1
SDMP00073100	Epacridaceae	Leucopogon fletcheri ssp fletcheri	E1
7912	Proteaceae	Persoonia hirsuta	E1
279	Proteaceae	Persoonia nutans	E1
230R	Thymelaeaceae	Pimelea spicata	E1
SPXEI0144929	Orchidaceae	Pterostylis saxicola	E1
1172R	Fabaceae (Faboideae)	Pultenaea parviflora	E1
SDMP00083100	Fabaceae (Faboideae)	Pultenaea pedunculata	E1
702	Fabaceae (Mimosoideae)	Acacia pubescens	V
2402R	Cunoniaceae	Acrophyllum australe	V
SJALI0007126	Poaceae	Ancistrachne maidenii	V
1318R	Myrtaceae	Darwinia biflora	V
8791-HOR	Fabaceae (Faboideae)	Dillwynia tenuifolia	V
8745-HOR	Epacridaceae	Epacris purpurascens var purpurascens	V
8703-HOR	Epacridaceae	Epacris sparsa	V
SDMP00072101	Proteaceae	Grevillea juniperina subsp juniperina	V
SDMP99111107	Proteaceae	Grevillea parviflora	V
8061-HOR	Myrtaceae	Kunzea rupestris	V
8307-HOR	Myrtaceae	Melaleuca deanei	V
8749-HOR	Myrtaceae	Micromyrtus blakelyi	V
2022R	Myrtaceae	Micromyrtus minutiflora	V
1826R	Proteaceae	Persoonia acerosa	V
SJBL9604230C	Thymelaeaceae	Pimelea curviflora var curviflora	V
1970R	Tremandraceae	Tetratheca glandulosa	V
1831	Rutaceae	Zieria involucrata	V

The Atlas of New South Wales Wildlife contains data from sources including government agencies, non-government organisations and private individuals. These data are only indicative and cannot be considered as a comprehensive inventory, and may contain errors and omissions.

Appendix G

CUMBERLAND PLAIN WOODLAND - EIGHT PART TEST

8 part test
Cumberland Plain Woodland

Description: Two forms of Cumberland Plain Woodland occur at the proposal site. These are Spotted Gum Forest (after Benson 1992) and Shale Plains Woodland (after NPWS 2000). All references to Cumberland Plain Woodland in this eight part test refer to both forms of Cumberland Plain Woodland.

Shale Plains Woodland is the most widely distributed form of Cumberland Plain Woodland. Dominant upper stratum species are grey box (*Eucalyptus moluccana*), forest red gum (*E. tereticornis*), spotted gum (*Corymbia maculata*) and thin leaved stringybark (*E. eugenioides*). *Bursaria spinosa* is the dominant species in the mid-stratum. Other commonly occurring understorey species include grasses such as *Themeda australis* , *Microlaena stipoides* and herbs such as *Dichondra repens*, *Brunoniella australis* and *Desmodium varians* (NPWS 2001).

Conservation status: Cumberland Plain Woodland is listed as an Endangered Ecological Community on Part 3 of Schedule 1 of the *Threatened Species Conservation Act 1995* and under the *Environmental Protection and Biodiversity Conservation Act 1999* (Commonwealth).

Occurrence on site: Spotted Gum Forest occurs at Area 4 and 5, and Shale Plains Woodland occurs at Area 7 (Figure ?).

EIGHT PART-TEST FOR CUMBERLAND PLAIN WOODLAND PRESENT ON THE SITE

1. In the case of a threatened species, whether the life cycle of the species is likely to be disrupted such that a viable local population of the species is likely to be placed at risk of extinction;

N/A

2. In the case of an endangered population, whether the life cycle of the species that constitutes the endangered population is likely to be disrupted such that the viability of the population is likely to be significantly compromised;

N/A

3. In relation to the regional distribution of the habitat of a threatened species, population or ecological community, whether a significant area of known habitat is to be modified or removed;

NPWS (2000) have estimated that pre 1750, Cumberland Plain Woodland occupied 122 000 hectares of the Cumberland Plain. Currently, it is estimated that approximately 8% remains, with a further 13% remaining as scattered trees across the landscape. NPWS (2000) have estimated that 7.6% of Shale Plains Woodland remains. Pre- 1750, it occupied 84 667 hectares of the Cumberland Plain and in 1997, it occupied an area of 6470 hectares.

The proposal would result in the removal of < 0.1 hectares of Spotted Gum Woodland and < 0.2 hectares of Shale Plains Woodland. This represents approximately 0.002% of the remaining area of Cumberland Plain Woodland (and 0.003 % of the remaining area of Shale Plains Woodland). The amount of Cumberland Plain Woodland that would be removed as a result of the proposal is not considered significant in relation to the amount that remains.

4. Whether an area of known habitat is likely to become isolated from currently interconnecting or proximate areas of habitat for a threatened species, population or ecological community;

The Cumberland Plain Woodland that occurs at the proposal site does not occur within the vicinity of other patches of Cumberland Plain Woodland. Rather, it occurs as three small patches of vegetation (Area 4, Area 5 and Area 7) isolated by considerable distances from other patches of Cumberland Plain Woodland by urban development.

The proposal would result in the removal of most of the Spotted Gum Woodland within Areas 4 and 5.

The proposal would also result in the removal of the western edge of the section of Shale Plains Woodland at Area 7. This would not result in this area of Cumberland Plain Woodland becoming dissected, nor would it result in the woodland becoming isolated from interconnecting or proximate areas of habitat.

5. Whether critical habitat will be affected;

No critical habitat as listed under the *TSC Act 1995* has been mapped as occurring within the vicinity of the proposal site (only one area of critical habitat has been identified in NSW; this occurs at Stotts Island Nature Reserve).

6. Whether a threatened species, population or ecological community, or their habitats are adequately represented in conservation reserves (or other similar protected areas in the region);

Cumberland Plain Woodland is not adequately represented in conservation reserves (or other similar protected areas in the region). NPWS (2000) have estimated that only 2.02% of Cumberland Plain Woodland is protected in National Parks, while an additional 6.29% occurs within 'Environmental Protection' zones. This is in comparison to an estimated 57.06% that occurs in 'Rural' zones, 17.44% that occurs in 'Special Uses' zones and 10.4% that occurs within 'Open Space' zones.

7. Whether the development or activity proposed is of a class of development or activity that is recognised as a threatening process;

The proposal is a class of development or activity that is recognised as a key threatening process. This key threatening process is listed on Schedule 3 of the *TSC Act 1995* as 'Clearing of Native Vegetation'. Under the *TSC Act 1995*, NPWS are required to prepare a Threat Abatement Plan, which would identify measures to manage and reduce the impacts of the clearing of native vegetation on the long-term survival of a threatened ecological community. Currently, no Threat Abatement Plan exists for the 'Clearing of Native Vegetation'. Therefore, consideration of the key threatening process in relation to Cumberland Plain Woodland relates solely to consideration of this eight part test. As discussed in the conclusion of this eight part test, the proposal would not result in a significant impact on the conservation status of Cumberland Plain Woodland.

8. Whether any threatened species, population or ecological community is at the limit of its known distribution;

Cumberland Plain Woodland has been recorded as occurring in the local government areas of Auburn, Bankstown, Baulkham Hills, Blacktown, Camden, Campbelltown, Fairfield, Hawkesbury, Holroyd, Liverpool, Parramatta, Penrth and Wollondilly. Therefore, the Cumberland Plain Woodland that occurs at the proposal site is located toward the center of the known distribution of the community.

CONCLUSION

The proposal would not result in a significant impact on Cumberland Plain Woodland, for the following reasons:

- the proposal would result in the removal of only a small proportion (approximately 25%) of the area of Cumberland Plain Woodland that occurs at the proposal site;
- the proposal would result in the removal of only a very small proportion (approximately 0.002%) of the Cumberland Plain Woodland that remains within the Cumberland Plain region (and approximately 0.003 % of the remaining area of Shale Plains Woodland); and
- the proposal would not result in the dissection or further isolation of the area of Cumberland Plain Woodland at the proposal site from interconnecting or proximate areas of habitat. Cumberland Plain Woodland in Areas 4, 5 and 7 is already isolated from other areas of Cumberland Plain Woodland by urban development. In addition, the section of Cumberland Plain Woodland that would be removed in Area 7 occurs on the western edge of the community.

Therefore it is considered that a Species Impact Statement for Cumberland Plain Woodland is not required.

Appendix H

ENDANGERED LAND SNAIL REPORT

INVERTEBRATE IDENTIFICATION AUSTRALASIA
• Identifications • Surveys • Environmental Interpretations
PO Box 418 Summer Hill NSW 2130 Australia

16 January 2002

A survey of the proposed modifications at the intersection of the M5 Motorway and Moorebank Avenue, for the endangered land snail *Meridolum corneovirens* (Pfeiffer, 1851)

Introduction

The author was asked by Halliburton KBR to undertake a targeted search of the area surrounding the intersection of the M5 Motorway and Moorebank Avenue, Liverpool for the endangered land snail *Meridolum corneovirens* to determine if a population may be present within the study area. The study area consists four patches of vegetation on each side of the intersection with the largest fragment found along the southern side of the M5 Motorway between Moorebank Avenue and Greenhills Avenue (see Figure 1).

The land snail *Meridolum corneovirens* (Pfeiffer, 1851) is restricted to the Cumberland Plain region of western Sydney. It is closely associated with the Cumberland Plain Woodland, particularly those areas with Wianamatta Shale based soils. It typically occurs in eucalypt woodland under logs and other debris and amongst leaf and bark accumulations, especially around bases of trees. Where possible it will burrow into loose soil. Its current known distribution is in an area roughly bounded by Cattai (to the north), Picton (to the south), Prospect Reservoir (to the east) and Yarramundi (to the west).

Very little is currently known about the biology and life history of the species. It is hermaphroditic and lays clutches consisting of approximately 20-25 small, round white eggs. Recent observations suggest that *Meridolum corneovirens* probably reproduces most of the year (if conditions are suitable). It is a fungal feeder and generally active at night. Nothing is currently known about rates of fecundity, length of life span, dispersal patterns, what levels of inbreeding may be present and what sort of distances over which individuals can move. The species has been recorded from a number of sites throughout western Sydney but the vast majority of these sites are small, fragmented and isolated due to clearing.

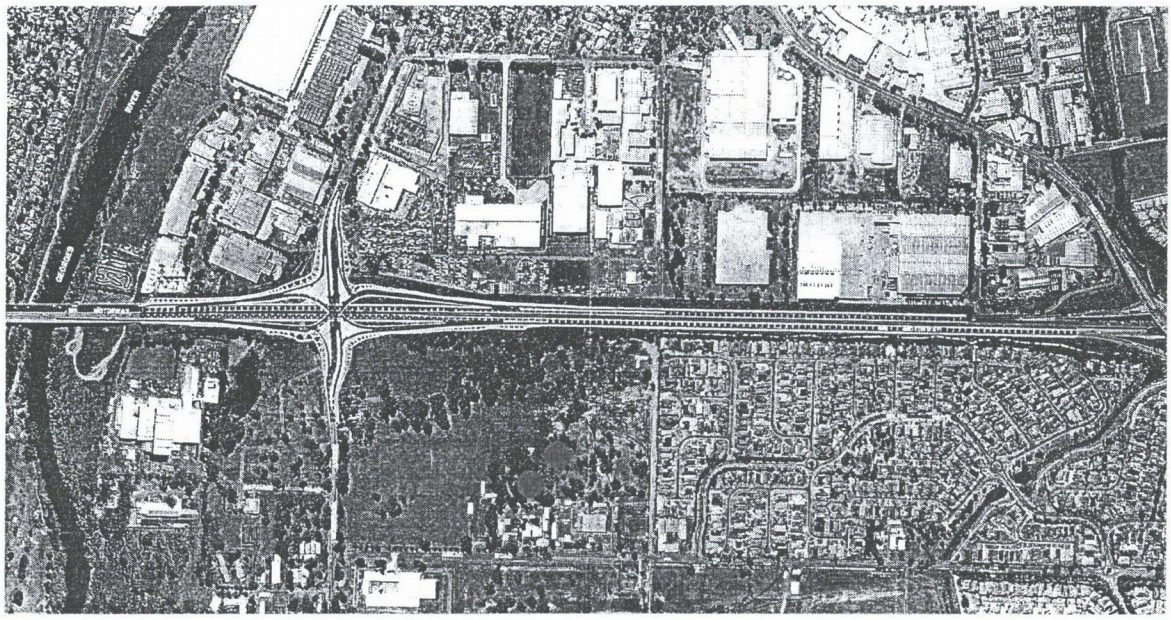

Figure 1. The red lines indicate the proposed modifications to the M5 Motorway and the two red dots roughly indicated where the author has previously recorded *Meridolum corneovirens* in 1998.

Methods

A search was conducted of suitable habitat throughout the site and included turning all types of ground cover whether natural or man-made (e.g. bark and rubbish) and raking accumulations of bark and leaf litter near and around trees.

Results

The study area was visited on the 15th January 2002 and no specimens of *Meridolum corneovirens* were observed. However, the species has been previously recorded very nearby behind where Moorebank Primary School used to exist (see figure 1). The area where the snails were found has been considerably modified since then with virtually all the ground cover and understorey layers removed leaving basically only the large trees now present on the site.

The other vegetation remnants that are located on the other three corners of the intersection appear to be essentially replanted landscaped areas using native plants some of which are not native to the area. These patches also contained a number of exotic species of plant and were not considered to provide much potential suitable habitat for the snails.

Eight Part Test

A. In the case of a threatened species, whether the life cycle of the species is likely to be disrupted such that a viable local population of the species is likely to be places at risk of extinction.

No evidence for *Meridolum corneovirens* was found within the study area. Therefore it is not considered likely that a viable local population is present within the study area.

B. In the case of an endangered population, whether the life cycle of the species that constitutes the endangered population is likely to be disrupted such that the viability of the population is likely to be significantly compromised.

No population of *Meridolum corneovirens* has to date been listed; therefore this point is not applicable.

C. In relation to the regional distribution of the habitat of a threatened species, population or ecological community, whether a significant area of a known habitat is to be modified or removed.

The area of known habitat for the snail within the study area is not significant.

D. Whether an area of known habitat is likely to become isolated from currently interconnecting or proximate areas of habitat for a threatened species, population or ecological community.

As no evidence for the snail was found in the current survey and the area of habitat where the species had previously been recorded has been almost entirely removed this point is not applicable.

E. Whether critical habitat will be affected.

No critical habitat has been declared for this species.

F. Whether a threatened species, population or ecological community, or their habitats are adequately represented in conservation reserves (or other similar protected areas) in the region.

This species is not considered to be adequately conserved in conservation reserves in western Sydney or in the Sydney district. Of the known populations of this species the bulk of them are found outside conservation reserves.

G. Whether the development or activity proposed is of a class of development or activity that is recognised as a threatening process.

Two threatening process have recently been listed in Schedule 3 of the *Threatened Species Conservation Act 1995*, that can have a direct impact on *Meridolum corneovirens*. The most important of these is clearing of native vegetation (as defined and described in the final determination of the Scientific Committee to list the key threatening process) and high frequency fire. However, as no evidence for *Meridolum corneovirens* was found this point is not applicable.

H. Whether any threatened species, population or ecological community is at the limits of its known distribution.

This species is known only from western Sydney and if a population of *Meridolum corneovirens* was present within the study area it would be roughly near the south eastern boundary of its distribution.

Conclusion

As no evidence was found for *Meridolum corneovirens* within the study area it is considered that the proposal in its current form will have little impact on any populations of *Meridolum corneovirens* that maybe present nearby.

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Appendix I

SITE PHOTOS

GENERAL SITE PHOTOS

1. Existing Motorway Configuration

2. Existing Motorway Configuration

3. Existing Moorebank Avenue / M5 Motorway Intersection

4. Existing 'Illegal' Rubbish Dump South West of Moorebank Avenue Intersection

5. Existing Earth Mound North East of Existing Moorebank Avenue Intersection

6. North West Corner of Moorebank Avenue Intersection

7. Existing Residential Noise Wall

8. Existing Residential Noise Wall

VEGETATION PHOTOS

Vegetation in road reserve to be cleared

Vegetation at Moorebank Ave / M5 Motorway intersection

Vegetation at noise wall, and between residential area and Motorway

HERITAGE PHOTOS

Kitchener House

Yulong Gates and surrounds

Yulong Playing Fields / behind Kitchener House

Parramatta
Ryde
Willoughby
Lane Cove
Mosman
North Sydney
SYDNEY
Sydney Harbour
PORT JACKSON
Auburn
Concord
Drummoyne
Strathfield
Burwood
Ashfield
Leichhardt
Woollahra
Fairfield
Kemps Creek
Hoxton Park Aerodrome
Liverpool
Bankstown
Bankstown Airport
Canterbury
Marrickville
South Sydney
Waverley
Randwick
Austral
Prestons
Sydney Kingsford Smith Airport
Botany
Bexley
Rockdale
Hurstville
Kogarah
BOTANY BAY
Kurnell
Kurnell Peninsula
Doughboy Head
Woolooware
Gymea
Caringbah
Sutherland
Menai
Woronora
Cronulla
Port Hacking Point
Burraneer
Maianbar
Heathcote
Engadine
CAMPBELLTOWN
Ambarvale
Glenalpine
Bradbury
Rosemeadow
Eagle Vale
Leumeah
Minto
Denham Court
Harris Creek
Williams Creek
Georges River
Woronora River
Waterfall
HEATHCOTE NATIONAL PARK
Lake Woronora
ROYAL NATIONAL PARK
THE WATERRUN
Marley Head
Marley Beach
Providential Head
Boy Martin Point
CURRACURRANG
CURRACURRONG
Garie Beach
SOUTH ERA
BULGO HILL
HELENSBURGH
APPIN
O'Hares Creek
Stokes Creek
DARKES FOREST
COALCLIFF
TANWELL PARK
BULGO
Scarborough
Wombarra
Coledale
Austinmer
Lake Cataract
TASMAN SEA

Appendix J

CUBBITCH BARTA NATIONAL ESTATE AREA

Register of the National Estate Database

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Cubbitch Barta National Estate Area, Holsworthy NSW

Class: Indigenous
Legal Status: Registered (27/10/1998)

Database Number: 100633
File Number: 1/15/023/0016

Statement of Significance : Cubbitch Barta National Estate Area is a large area with outstanding cultural and natural values. It is very significant as a cultural and natural landscape which demonstrates relationships between the environment and human occupation through time. Its significance is emphasised by its proximity to Sydney, the Nation's largest metropolitan centre. Cubbitch Barta National Estate Area is an integral component of the Woronora Ramp area, stretching south-west from Sydney, together with Royal National Park, Heathcote National Park, the Woronora catchment and O'Hare's Creek Catchment. Major parts of the Woronora Ramp region are included in the Register of the National Estate. This region, together with the other tracts of undeveloped areas to the west and north of the metropolitan area, are essential in defining the character of the broader Sydney region. In the network of gullies which criss-cross the area, many of the natural values remain undisturbed and the Indigenous heritage is impressively retained. Over 500 Aboriginal sites provide a glimpse of the relationship between people and the land prior to 1788. The sites and the area's long term and more recent connections with Aboriginal people, combine to form a landscape of great significance for its Indigenous heritage. The landscape also provides important illustrations of European settlement, agriculture and Australia's military history. It is unusual to find landscapes in this region so intact. This provides a rare opportunity to understand both the natural and cultural history of the region. It is remarkable that this landscape has survived on the margins of the Nation's earliest and largest urban centre.
Indigenous values:
The Cubbitch Barta National Estate Area is highly valued by members of the Tharawal Local Aboriginal Land Council and the Dharawal people for its symbolic, cultural, educational and social associations (Criterion G.1). The Aboriginal cultural landscape of the area reflects the past lifestyle of Aboriginal people in this region and its preservation enables Aboriginal people to maintain cultural links to the area. These connections with the past are particularly important, because Aboriginal people in this part of Australia were among the earliest impacted by European settlement of this continent and their culture has since been disrupted by war, disease and urban development. Throughout the environments of the area the Dharawal see evidence of the relationship between their people and the land. The Tharawal Local Aboriginal Land Council is also concerned about maintaining the area's natural environment. The area contains a large and diverse collection of Aboriginal sites, which represent a complex Aboriginal cultural landscape (Criterion A.3). Over 530 sites are known from the area and a further 509 potential archaeological sites have been documented. It is highly likely that the area contains many hundreds more sites. Sites include rock paintings and drawings, engravings, open scatters of artefacts, grinding grooves and scarred trees. The survival of a significant number of scarred trees within the area is important as this is a rare type of site within the Sydney Basin (Criterion B.2). While rock art sites are well represented in the Sydney Basin, other types of sites are less so. The preservation within the area

of scarred trees, open artefact scatters and archaeological sites in particular, offer considerable potential for further developing a picture of day to day activities of Aboriginal people in the Sydney Basin prior to 1788 (Criterion C.2). This large number of sites and the stories they may tell form a landscape in which Aboriginal life prior to 1788 is recorded without the large scale impact of European settlement. There is also a high density of sites in the area. This is particularly important because sites are found in groups or clusters with their relationship to one another largely intact. By examining where they are located in the landscape and their relationship to other types of sites, a more complete picture of the lifestyle of Aboriginal people could be established (Criterion C.2). The Georges River, which bounds the National Estate area on the west and is close to the north, has been identified as an important north-south Aboriginal cultural boundary within the Sydney Basin. The cultural landscape of the National Estate area is representative of the southern social unit of the Sydney Basin (Criterion D.2). This unit has been characterised by the presence of a number of distinctive traits within the art and by complex analyses which show that the art sites of this region are significantly different from those north of the Georges River. The large number of sites, the relatively high site density, the condition of sites and the preservation of the landscape as a whole makes the area important in terms of the further definition of this southern unit. The area also offers considerable research potential in terms of the analysis and interpretation of small scale groups (Criterion C.2). There is evidence to suggest that this area formed the cultural landscape of a single residence group whose territory extended over the Georges River and Williams/Mill Creek drainage basins. In this region, it is uncommon to have such a landscape preserved in this way and particularly important, as knowledge of local groups from enthnohistory is often incomplete and problematic. The rich collection of more than 300 rock art sites within the area is regionally significant as a group in the Sydney Basin and representative of rock art south of the Georges River (Criterion D.2). The rock art sites are diverse in terms of technique (paintings, drawings and engravings) and motifs depicted (Criterion A.3). The art in the area contains a number of motifs which are rare within the Sydney region, such as the engraving of a pregnant woman. The site where this occurs is considered important, as female motifs and gender specific evidence of this kind are relatively rare (Criterion B.2). The long history of recording the rock art sites by voluntary groups and individuals indicates that they are aesthetically important to groups within the broader community (Criteria E.1). The aesthetic value of these sites is enhanced by their excellent condition and lack of graffiti. The Cubbitch Barta National Estate Area is important as an illustration of a landscape in which changes in the relationship between Aboriginal people and early settlers took place (Criterion A.4). This is a phase in the cultural history of Australia for which traditional documentation is often poor. The area is associated with Governor Macquarie's war against the Aboriginal people of the Liverpool, Campbelltown and Appin areas from April to November 1816. Despite efforts to move Indigenous people away from this country, documentation indicates Aboriginal people were still visiting sites within the area in the 1830s. Within the area, it is the evidence of the strong Aboriginal presence combined with the nineteenth century history and land use without much twentieth century development, which makes this area unusual for the way it can illustrate this period of history. Potential exists for further research to shed light on this era through research relating to exploration, settlements within the area and information about the adjacent Aboriginal reserve (Criterion C.2).

Natural values:

This area contains a diversity of natural landscapes and vegetation types in a relatively unmodified condition, in an area otherwise greatly altered by urban development. Vegetation communities include plateau forest (covering forest and woodland on both tertiary alluvium soils and on shale), gully forest, woodland/heath complex, riparian forest, sedgeland, heath/swamp complex and melaleuca thickets. The laterite ridgetops are almost entirely intact and are significant reference sites which demonstrate the formation of laterite caps and the occupying vegetation communities (Criterion A.2). Diversity of plant species is high, with more than 400 species recorded in the area. At least seven different plant communities have been distinguished in the area, indicating high community diversity (Criterion A.3). At least eight plant species considered rare nationally occur here: DARWINIA DIMINUTA, D GRANDIFLORA, EUCALYPTUS LUEHMANNIANA, GREVILLEA LONGIFOLIA, HIBBERTIA NITIDA, LOMANDRA FLUVIATILIS, MELALEUCA DEANEI and TETRATHECA NEGLECTA. A rare and undescribed species of greenhood orchid (PTEROSTYLIS sp E) has also been recorded here. The area contains a substantial remnant of Cumberland Plain woodlands, a vegetation type growing mainly on Wianamatta shale. Only 6% of the original area of Cumberland Plain woodlands remains. This community has been listed as an endangered ecological community under the NSW Threatened Species Conservation Act 1995. LEUCOPOGON EXOLASIUS,

found here, is listed as vulnerable under the Commonwealth Endangered Species Protection Act 1992. Regionally significant plants include E SQUAMOSA, GREVILLEA DIFFUSA and ZORNIA DYCTIOCARPA (Criterion B.1). The broad headed snake (HOPLOCEPHALUS BUNGAROIDES), found in this area, is listed under the Commonwealth Endangered Species Protection Act 1992. The koala (PHASCOLARCTOS CINEREUS) population found locally is considered one of the few remaining viable populations in southern NSW. The area also contains a significant population of the spotted tailed quoll (DASYURUS MACULATUS). Both the koala and quoll are listed as vulnerable under the NSW Threatened Species Conservation Act, together with the giant burrowing frog (HELEIOPORUS AUSTRALIACUS), red crowned toadlet (PSEUDOPHRYNE AUSTRALIS), powerful owl (NINOX STRENUA) and greater broad nosed bat (SCOTEANAX RUEPPELLII), all of which are recorded in the area. The New Holland mouse (PSEUDOMYS NOVAEHOLLANDIAE), considered to be regionally rare, is also found here together with a number of other fauna species of regional or State conservation significance (Criterion B.1). The area has areas of significant aesthetic values, particularly the forested creek gorges (Criterion E.1).
Historic values:
The settlement sites and transport routes in the area are associated with the history of nineteenth century European settlement and the development of agriculture in the Liverpool region, including the wine industry and subsistence farming in a bushland setting. The Grodno Settlement site is associated with the activities of migrants in the Liverpool region. The Cubbitch Barta National Estate Area also provides evidence of transport routes for settlers in the Liverpool, Holsworthy and Campbelltown areas. These demonstrate the transport linkages that connected the nineteenth century settlements, industry and farms to more established regions of Sydney. Holsworthy is also significant for its military associations. It was a training site for Australian troops and horses engaged in World War One battles, including Gallipoli. The Holsworthy Military Training Area is also significant for the training activities of the Australian Army after World War Two (Criterion A.4). The Old Army Internment Camp Group was used to inter Germans and other Europeans, from 1914-19. The internment of migrants in Australia followed Britain's foreign nationals policy during World War One and this site reflects Australia's strong defence links with Britain. It also demonstrates Australia's fear of European immigrants during World War One and reflects concerns that Australia's war effort and National security were threatened by spies and invasion. The Old Army Internment Camp Group also indicates the impact of World War One on Australia's home front when men were interned and their families left to fend for themselves (Criterion A.4). The Old Army Internment Camp Group is associated with the history of Federation. The acquisition of its remaining buildings in 1913 was part of the Commonwealth Government's major program of defence construction for Australia (Criterion A.4). The Old Army Internment Camp Group survives as evidence of the largest internment camp in Australia during World War One. The guard buildings and structures are rare in demonstrating the guards' section of a World War One internment camp in Australia and are also significant because they were constructed by German and other European internees (Criterion B.2). This Group has important associations for those who trained there during World War Two and who more recently undertook National Service Training or permanent Army service there during its use as a military camp. It has similar associations for members of the World War One Light Horse Regiments and their families and descendants. It has strong associations for former internees. It also has important associations for Australians as a reminder of a period of conflict and troubled National identity, involving a deep suspicion of non-British immigrants at that time (Criterion G.1).

Description : The Cubbitch Barta National Estate Area is commonly known as the Holsworthy Military Training Area. Cubbitch Barta means 'people of the river' in the Aboriginal Gurgur language and was chosen as the name for this National Estate place by the nominator. Holsworthy has been a military training area since the late nineteenth century. It has since become known as the Holsworthy Military Training Area, the Holsworthy Field Firing Range, the Holsworthy Range, or simply The Range. The Cubbitch Barta National Estate Area is a large tract of bushland covering plateaux, ridges and rocky creek valleys immediately adjacent to the dense urban development of Sydney's south-west. The bushland has been largely protected from development and public use, due to the area being set aside as a Commonwealth military training area in 1913. The bushland contains hundreds and possibly well over a thousand Aboriginal sites, which reflect a substantial history of Aboriginal occupation. This represents an extensive landscape where Aboriginal life in this region prior to 1788 is recorded without large scale impact of European

settlement. A number of European nineteenth century sites in the area are associated with the history of European settlement and the development of agriculture in the Liverpool region. The Holsworthy area was used as a training area for Australian Defence personnel in the late nineteenth century and throughout the twentieth century. The Range comprises the southern area of the National Estate area and is an extensive tract of open countryside, in parts very undulating and not fully accessible to the public, dominated by a thickly wooded incised plateau. Due to the area being used as a firing range by the army, Defence personnel were settled in the area known as the Old Army Internment Camp, on the northern part of the Range. During World War One, there was an internment camp for migrants and prisoners of war here. The Old Army Internment Camp Group is entered in the Interim list for the Register of the National Estate as a place of individual significance (refer to file RR 014223).

The landscape:

The Cubbitch Barta National Estate Area occupies 18, 000ha of the Woronora Plateau, approximately 30km south-west of inner Sydney. It adjoins Heathcote National Park to the south-east and Dharawal State Recreation Area to the south, forming part of an extensive tract of bushland stretching southwards from the Sydney metropolitan area. It also contains part of the Woronora and O'Hare's Creek catchments. The area has soils derived from the interbedded shale and fine to medium grained quartz sandstone of the Mittagong Formation. The landscape is one of crests, ridges, valleys and plateau remnants. The original plateau surface has been eroded by creeks including Harris, Williams and Deadman's Creeks, flowing northwards to join the Georges River, which discharges into Botany Bay. In the southern part, two further creeks, Punchbowl and O'Hares, join the Georges River. The creeks have formed deeply dissected valleys where the underlying Hawkesbury sandstone is revealed and where there are scenic waterfalls and waterholes surrounded by she oaks and tall eucalypts. In other valleys, clear water seeps from wet heaths and collects in the pools on flat sandstone platforms. On these flat rocks are occasionally found Aboriginal engravings. On the sides of many valleys are sandstone overhangs and rock shelters which provide cool, sheltered sites for banks of ferns, mosses and lichens. Aboriginal art such as hand stencils, charcoal sketches and ochre paintings are located in these overhangs. Remnant ridges capped with laterite occur in the area, important as most other laterite caps in the region have been extensively disturbed by mining or suburban development. These elevated areas provide views across the Sydney basin and toward the distant Sydney city skyline. The area contains a wide range of vegetation, varying from dry woodland/heath complex, to plateau forest and woodland, gully forest, riparian forest, sedgeland, heath/swamp complex and melaleuca thickets. The major vegetation types are dry woodland (approximately 50% of the vegetation cover) and gully forest. The southern ridge tops support a dry open woodland similar to that found in nearby Royal National Park, Heathcote National Park and the O'Hares Creek catchment area, with the most common tree species being red bloodwood (E GUMMIFERA), yertchuk (E CONSIDENIANA) and narrow leaved stringybark (E OBLONGA). The ridge tops towards the north of the area consist of sandstone or laterite over sandstone and support woodland dominated by Sydney red gum (ANGOPHORA COSTATA), scribbly gum (E HAEMASTOMA/E RACEMOSA) and red blood wood (E GUMMIFERA). Plateau forest and woodland fall into two main subgroups: tertiary alluvium dominated by ironbarks (E CREBRA and E FIBROSA); and shale dominated by Sydney red gum (ANGOPHORA COSTATA, E PUNCTATA, E SPARSIFOLIA and E GUMMIFERA). Both subgroups have a grassy understorey with THEMEDA AUSTRALIS, ENTOLASIA STRICTA and LOMANDRA sp among the common plant species encountered. A substantial remnant (approximately 1,650ha) of Cumberland Plain woodland, consisting mainly of grey box (E MOLUCCANA) and forest red gum (E TERETICORNIS), is located between the Georges River and Harris Creek in the north-west. Only 6% of the original area of this woodland is thought to survive in the Sydney Basin and it is listed as an endangered community under NSW Threatened Species Conservation Act. Gully forest covers about 40% of the area, with dominant trees including Sydney red gum (ANGOPHORA COSTATA), Sydney peppermint (E PIPERITA), red blood wood (E GUMMIFERA) and blackbutt (E PILULARIS). The shrub layer includes saw tooth banksia (BANKSIA SERRATA) and Christmas bush (CERATOPETALUM GUMMIFERUM). The spectacular gymea lily (DORANTHES EXCELSA) nears its southern limit here. Small sections of river fringing forest in the area are dominated by coach wood (CERATOPETALUM APETALUM) and river gum (TRISTANIOPSIS LAURINA). Patches of sedgeland and wet heaths are restricted mainly to the southern part around perched swamps on the Woronora Plateau. The sedgelands differ from the heath/swamp complex in lacking a shrub layer. Common species are LEPTOCARPUS TENAX, SCHOENUS BREVIFOLIUS and SPRENGELIA INCARNATA. In the heath/swamp complex, dominant shrubs are fern leaved banksia (BANKSIA

OBLONGIFOLIA), heath leaved banksia (B ERICIFOLIA) and dagger bush (HAKEA TERETIFOLIA). Ground cover plants include PTILOTHRIX DEUSTA, LEPYRODIA SCARIOSA, LEPTOCARPUS TENAX and CYATHOCHAETA DIANDRA. Very small areas of melaleuca thickets occur in the north and are dominated by snow in summer (MELALEUCA LINARIFOLIA), together with bangalay (E BOTRYOIDES) and Sydney blue gum (E SALIGNA). Many of the vegetation types within the area contain rare plant species. Cubbitch Barta National Estate Area contains a population of spotted tailed quolls (DASYURUS MACULATUS), a cat sized carnivorous marsupial considered uncommon to rare on mainland Australia and which has declined dramatically this century. It has significant populations of koalas (PHASCOLARCTOS CINEREUS) and is considered prime koala habitat. Evidence suggests that the area provides a connecting corridor between the Campbelltown area and Heathcote and Royal National Parks, along which koalas may have been moving for thousands of years. More than ninety bird species have been recorded here, including some usually found much further west. Species recorded include the turquoise parrot NEOPHEMA PULCHELLA and the powerful owl NINOX STRENUA. Common reptiles include the bearded dragon (POGONA BARBATA), blind snake (RAMPHOTYPHLOPS NIGRESCENS), Lesueur's velvet gecko (OEDURA LESUEURII) and yellow faced whip snake (DEMANSIA PSAMMOPHIS). Thirty-six reptiles and amphibians are known to occur here. Freycinet's frog (LITORIA FREYCINETI), the giant burrowing frog (HELEIOPORUS AUSTRALIACUS) and Haswell's frog (PARACRINIA HASWELLI), are some of the amphibians noted from the area.

The Aboriginal landscape:

The Cubbitch Barta National Estate Area contains more than 530 Aboriginal sites spread throughout the plateaux and Rocky Creek valley terrain. These include rock shelters with painted and drawn art, engravings on open rock platforms, camping places, grinding grooves and scarred trees on the older trees of the forests and woodlands. The area contains an important collection of sites which are relatively undisturbed in their landscape setting. While many Aboriginal sites have been recorded within the area, only a portion of the area has been systematically surveyed and there are likely to be many hundreds more sites to be recognised and documented. According to most sources, the area falls mostly or wholly within the boundaries of the Dharawal people. The Dharawal's boundary with their northern neighbours is generally considered to be the Georges River and in the north-west they shared a boundary with the Dharug which may have taken in a small part of the western side of the National Estate area. In the nineteenth century, Aboriginal sites were first noted within the boundaries of this area by R Etheridge. Etheridge's informant stated that his father visited rock art sites around Harris Creek with Aboriginal people around 1838. Many of the sites within the area were recorded during the 1970s, through the activity of the Sydney Prehistory Group. Additional sites were recorded by Corporal Robert Thompson in the 1980s. These recordings were reassessed in 1995 within the Holsworthy Training Area Environmental Audit. Up to this point, 295 sites had been recorded in the area, with recordings heavily biased toward sites containing rock art (235) and grinding grooves (sixty-nine). In late 1996, a systematic archaeological survey of parts of the area was conducted as part of an Environmental Impact Statement (EIS) for two options proposed for the Second Sydney Airport. This survey recorded a further 240 sites and revealed a broader range of sites than previously known. These included: 128 rockshelters with drawn or painted rock art, sixteen sites with engraved art, sixty-four sites with grinding grooves, forty-seven scarred trees, thirty-seven isolated finds and eighteen open scatters of artefacts. Currently more than 530 sites are recorded within the area. This includes over 300 rock art sites. The EIS study also documented 509 potential archaeological deposits. These are places (usually rockshelters) where it is highly likely that archaeological material will be found under the surface. No archaeological excavations have taken place within the area and the length of association of Aboriginal people and the Cubbitch Barta National Estate area is unknown. The recent survey work indicates considerable potential for future archaeological investigations. The rock art found within the area represents a significant collection of Aboriginal imagery, created using a diverse range of techniques (engravings, pigment applied wet, pigment applied dry) and reflecting a wide variety of subject matter. This collection of art is distinct in its combination of features from other bodies of rock art in the Sydney basin. Dominant motifs in the painted and drawn area include macropods, hand stencils, fish and eels, with emus, wombats, echidnas and koalas. The colour most frequently used is black (charcoal) with red and white also common. A combination of colours was used in a small proportion of sites. Many sites contain ten figures or less and the largest site has more than sixty figures. Fewer engraving sites exist within the area compared with other areas in the Sydney Basin and the number of figures per site is generally small (not more than six). They do however contain different motifs and appear to form compositions. Engraved motifs include large

footprints, emu tracks, eels, fish, macropods, koalas, human like figures and one engraving apparently of a pregnant female. This last motif appears to be unique in this area. Small engraved channels have also been found on flat rocks within creeks and in association with engraving sites. These grooves may have been used to channel water from the surrounding spongy heath into deeper rock pools. Archaeological work in the Sydney basin has confirmed north-south differences in the art of the basin, with the Georges River most often identified as the boundary between the two regions. Differences between these regions have been established by complex analyses of the art (both pigment and engraving sites). Fewer engraving sites exist south of the Georges River and there are also a number of differences in the way motifs are depicted. This large body of sites has been generally protected from the impact of the surrounding urban development and remains in excellent condition. It represents a large and important sample of Aboriginal sites in the southern Sydney basin. In many comparable areas, sites have been flooded behind dams, such as the adjacent Woronora dam and the Cataract, Cordeaux and Avon catchments further to the south. Similarly, as coal mining has not occurred under the area, the rockshelters here have not been affected by subsidence which has been documented affecting sites in catchments to the south. The area has also not been commercially logged since the turn of the century, an important factor in the survival of a significant number of scarred trees. The nineteenth century European settlement sites in the area illustrate the story of settlement in the Liverpool region and the way it affected Aboriginal people. Early colonial farms were established to the north and west of the area from 1800-20 and some of the conflicts that occurred within the first half of the nineteenth century, most notably Governor Macquarie's proclaimed war on Aborigines in 1816, were played out in and around the area. The Aboriginal landscape of this historic period is well represented by the landscapes of the area, containing isolated homesteads, roads, farms and a small town settlement. Etheridge's account indicates that Aboriginal people were still visiting sites within the area in the 1830s. One of the earliest Aboriginal reserves in the Sydney area is thought to have been located immediately adjacent to the area in the north east, around Sandy Point on the Georges River. This reserve was occupied at a time in the late nineteenth century when the settlement of Eckersley was established within the area, along with a number of farms and vineyards. While the relationship between Aboriginal people on the reserve and the area is not currently known, they may have visited the area to obtain bush foods or to maintain other social or spiritual connections. Since the establishment of the military facility in 1913, Aboriginal people have had only limited access to the area. Connections have been maintained, to some extent, through Aboriginal people in the Army. More recently, the Tharawal Local Aboriginal Land Council has assumed a custodial role for the Training Area and in 1993, negotiated with the Army to look after the area's cultural heritage sites. In late 1996, Tharawal representatives visited many of the sites in the area as part of their role in the cultural heritage surveys associated with the Sydney second airport environmental impact statement. The Australian Army has been cooperating with the Tharawal Local Aboriginal Land Council to protect Aboriginal sites in the area by providing access for Aboriginal people, assisting in documenting places and taking steps to avoid sites during military activities.

European settlement and agriculture:

From 1798 to 1805 the NSW Colonial Government issued land grants to early settlers in the Liverpool region including Thomas Moore, Captain Thomas Rowley and Thomas Laycock. The first land grants for European settlement were made in the Holsworthy area from 1805-13. In 1835, the rugged sandstone gorges of the area were surveyed and proclaimed as the Parish of Eckersley. The Old Coach Road, Old Illawarra Road and New Illawarra Road provided transport routes for settlers in the Liverpool, Holsworthy and Campbelltown regions. Evidence suggests that the Old Illawarra Road and the Old Coach Road were constructed earlier than attributed and this warrants further investigation. During the 1880s the land south of the Georges River in Eckersley was opened to farmers. Many European vignerons grew olives, almonds and grapes and experimented with wine production in the sandy soils. The first settlers to take up an official selection with the parish were Frank and Harry Etchells in 1889. They built a stone cottage, grew fruit and vegetables, raised poultry and bees and distilled rum inside the rock ledges at waterfalls along the river. They transported their rum by pack horse to Bulli and sold it to miners. Other settlers included Nathanial George Bull, a one time Mayor of Liverpool, who also built a dwelling. The Freres brothers established a vineyard in the area in association with Charles Kelso. By 1891, the Eckersley area supported over thirty small farms and a post office was built providing a mail service to Liverpool twice a week. Isaac Himmelhoch established the substantial Grodno vineyard with the intention of producing high quality wines. By 1901 the 640 acre selection grew Hermitage and Malbec grapes. By 1911 Eckersley had declined after settlers encountered difficulties growing vines in the sandy soil. Most of the vines were affected by

phylloxera. The selections were abandoned to make way for the proposed military reserve and the Grodno vineyard was destroyed following the Army's arrival.
Military history:
In the late 1880s the NSW Volunteer Soldiers conducted training exercises and manoeuvres between the Royal National Park and the Georges River at Liverpool. The Army held manoeuvres in the Holsworthy Range in 1906, 1907 and 1910. As part of the new Commonwealth Government's major program of defence construction, it acquired 833 acres to establish a remount depot and veterinary hospital in 1912 and in 1913 a further 16,868 acres at the site now known as Old Army Camp. Eighty thousand acres of land were finally acquired for a military barracks, a training area and an artillery range. At the time of acquisition, the land contained both large and small holdings, many of which were still undeveloped. The site chosen for the barracks was a large orchard surrounded by thick bush and scrub. The remount depot located here was used to prepare 47,000 horses for overseas service in World War One and various Light Horse Divisions trained here before embarking for Gallipoli and other theatres of war. During World War One, Holsworthy Barracks was used as an Internment Camp. Those interned included German, Austrian, Hungarian, Croatian, Czech, Bulgarian and Turkish people from Australia, as well as internees from the South Pacific and Asia. The main compound housed German and Australian civilians. However, there were some prisoners of war including survivors of the German cruiser Emden which was beached at Cocos on 9 November, 1914. A further three compounds held other prisoners. This was the largest internment camp in Australia during World War One, holding over 6 000 internees. At its peak there were more than 210 buildings on site. The German section was closed in mid-1919 with the last man leaving on 5 May, 1920. It appears that almost all of the buildings associated with the World War One internees were razed when hostilities ceased. The only evidence of the camp exists in the three stone buildings (sergeants' mess/corporals' club, burnt-out recreation hall and jail/powder magazine) in the former guards' camp, north of Artillery Road, in the railway siding and its associated permanent way and in some of the road and kerbing surrounding the former parade ground, a flat grassed area. All other existing fabric on the site dates from the period after 1930. After World War One, the former internment camp was used for militia camps and a new ordnance depot was built. The stone buildings erected by the internees were used for permanent army units. (For more information about the internment camp area, see related file: Old Army Internment Camp Group, Holsworthy, RR 014223). In 1938 a further 33,860 acres were added to the Holsworthy Range. From 1939 a prisoner of war camp was established and 6,780 Australians, mostly of Italian origin, were interned. It is unknown if any structures remain from this phase. In 1942 an armoured fighting vehicle school replaced the remount depot. In 1950 the remount site was taken over for National Service personnel. In 1958 the Holsworthy Range became the home of the 1st Infantry Brigade Group. The Range has been used extensively for training soldiers in the use of small firearms, tanks and artillery. Although the Range has been used for military training, the natural features of the landscape remain relatively undisturbed. With the exception of the Holsworthy Barracks, the airfield and small weapons ranges, there have been a limited number of other developments over the area, mainly the small network of roads, demolition areas and vehicle staging areas. After World War Two, the consolidation of military bases increased the demand for housing to accommodate its personnel. Holsworthy Village, established in 1952, exemplifies this process. The village featured rows of modest fibro-cement cottages of similar architectural form set in wide, tree lined streets. The houses have recently been comprehensively refurbished with modern cladding and aluminium windows, effectively destroying their significance as a post war housing group.
The Cubbitch Barta National Estate Area comprises the following historic elements which are significant in the Liverpool region and are important elements in the cultural landscape : old Illawarra Road, c 1850s. This gravel road linked Liverpool to Darkes Forest; old Coach Road, c 1880s. This gravel road links with the old Illawarra Road near Darkes Forest and features stone culverts; new Illawarra Road, c 1870s. This is a gravel road linking the Liverpool/old Illawarra Road at Eckersley; Grodno settlement site, c 1890s. This includes cleared former vineyard grounds, cellar remains, wells, irrigation channels, stone culverts and a long dry stone wall of stones; Eckersley Post Office site, c 1890s. This site includes the remains of structures covered by overgrowth; Eckersley House site, c 1890s. This includes the remains of a stone and mud dwelling, with cellar; other homestead remains, c 1890s. The site features several other unidentified homestead remains, some with wells and some with chimneys, which are likely to relate to the Grodno and Eckersley settlements.
The recent past and area today:
The area continues to be used as a Military Training Area for small arms training, navigation, unit manoeuvres and demolition training. Training has taken place here for both National Service and

regular units which have seen active service in Korea, Malaya and Vietnam. Units which continue to have a strong presence at Holsworthy include military engineers and Battalions of the Royal Australian Regiment.
There is increasingly widespread community recognition of the existence of a diverse range of heritage values within the area, encompassing natural, indigenous and historic values. In March 1997, the Liverpool Regional Museum put together an exhibition of the Aboriginal, European, military and environmental heritage of Holsworthy area. In 1997 the community has shown considerable interest in the heritage of the area, largely as a response to suggestions the area could be used as a location for the second Sydney Airport.

Condition and Integrity : The Cubbitch Barta National Estate Area is a large undeveloped area of bushland, surrounded on the north and west by major growth areas of south-west Sydney. Since the turn of the century, public access to the area has been restricted through its use for Commonwealth military activities, mostly training exercises. It is largely because of its military status and the Australian Army's management regime, that the National Estate area has remained in a relatively natural condition and that National Estate values have been maintained. Much of the bushland, valleys and waterways remained undisturbed, despite military activity. Impacts from military activities have included localised infrastructure construction (airfields, roads, bridges and small buildings), localised ground disturbance and impact damage from ordinance, concentrated impacts within army demolition and target areas, increased bushfire rates caused by exploding ordinance and impacts from vehicle and troop movements. Most of this military activity has been restricted to ridge tops and to a large extent, the topography of the area has played a role in protecting sensitive areas and Aboriginal sites. Target and demolition areas, where the highest impacts occur, are relatively small, defined areas on ridge tops which are repeatedly used. A large number of Aboriginal sites, in particular rock art sites and rock shelters, occur within valleys where they are relatively sheltered from direct impacts. Most Aboriginal sites appear to have escaped significant damage. Specific impacts of military operations on Aboriginal sites have been discussed in the Army's environmental audit. Identified impacts include: 1) damage to art sites from artillery fire (either from ricochet or direct hit); 2) the impact of exploding mortars on sandstone expanses on which engravings are found (although no engravings have been damaged to date); 3) the impact of heavy vehicles whose tracks have been found on sandstone expanses which contain engravings (although again no engravings appear to have been directly affected to date); 4) the potential threat to at least one archaeological deposit from the presence of a live mortar bomb located within the floor area. Obviously other shelters may be similarly at risk; 5) graffiti on art sites, although this was not frequently observed; 6) the encroachment of sediments on the largest set of axe grinding grooves which may be partly caused by increased siltation due to firing. The environmental audit considered the body of sites within the Military Training Area to have considerable integrity and that their protection should be a high priority.
Some Aboriginal sites have been affected by public visitation, particularly those located near the boundary of the area along the Georges River; however most sites in the restricted access areas are in excellent condition. The presence of unexploded ordinance including bullets, hand grenades, mortars and rockets continues to restrict public movement in the area. The majority of the landscape and vegetation communities in the area are in remarkably good condition. There are few weeds in much of the bushland, although clumps of pampas grass occur along the roads and patches of prickly pear are found near the Grodno settlement site. The area has not been farmed or logged since the 1900s and the creeks and rivers have high water quality. Introduced animals recorded from the area including the fox (VULPES VULPES), dog (CANIS FAMILIARIS), cat (FELIS CATUS), hare (LEPUS CAPENSIS), rabbit (ORYCTOLAGUS CUNICULUS), house mouse (MUS DOMESTICUS) and black rat (RATTUS RATTUS). The high frequency of fire in the area, induced by the military's live firing activity, may lead to a loss of native species diversity in the plateau forest areas. In 1997, the known condition of historic elements within the Cubbitch Barta National Estate area is as follows: the gravel roads; old Illawarra Road; the Old Coach Road; and New Illawarra Road. are in good condition. The Grodno settlement site, Eckersley Post Office Site, Eckersley House Site and other homestead sites have low level remains above the ground and building fragments. The sites are reported as having been cleared by the Department of Defence in 1913. The archaeological potential of these sites has not been assessed. The condition of the Old Army Internment Camp Group's elements is as follows: the former powder magazine/gaol is generally in good condition and is still being used. The mess (former corporals' club) is externally in good condition having recently been renovated by the Army, but the interior

is somewhat dilapidated. The recreation hall comprises burnt out remains of wall footings but with a small portion of the lower storey of the main wing substantially intact. Much of the pedestrian bridge's original fabric has been removed, but concrete piers and iron fixings remain. The former parade ground and some tree plantings survive from the internment period. While the area currently receives protection from its military status (and associated public safety concerns), the area is under increasing pressure from new urban developments occurring around its margins. The area is surrounded by natural buffer zones of protected areas in the south and east and by its western boundary along the Georges River. The Australian Army is still, however, concerned about unauthorised public access into the area, as evidenced by warnings advertised in the press. (July 1997)

Location : About 18,000ha, at Holsworthy, comprising the following areas: 1) the Holsworthy Range area as shown on the Holsworthy Range Special map published in the Holsworthy Training Area Environmental Audit Main Report for the Department of Defence (AXIS Environmental/AMBS Consulting, 1995); and 2) an area bounded by the easterly alignment of Kota Bahru Road in the north, Illawarra Road in the west and the Holsworthy Range boundary in the south and east. Excluded are Lot 1 DP817692 and Lot 6a DP752034.

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The Register of the National Estate has been compiled since 1976. The Commission is in the process of developing

and/or upgrading official statements of significance for places listed prior to 1991.

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