NORTH ISLAND STOCK TRUCK EFFLUENT STRATEGY STUDY

Network Modelling Results

NORTH ISLAND STOCK TRUCK EFFLUENT STRATEGY STUDY

Network Modelling Results

NORTH ISLAND STOCK TRUCK EFFLUENT STRATEGY STUDY

Network Modelling Results

Prepared By

Chris Davies
Environmental Engineer

Reviewed By

John Crawford
Senior Environmental Engineer

Opus International Consultants Limited
Environmental
Opus House
Princess Street, Private Bag 3057
Hamilton, New Zealand

Telephone: +64 7 838 9344
Facsimile: +64 7 838 9324

Date: October 2003
Reference: 3 37068.00
Status: Final

This document and its contents is the property of Opus International Consultants Limited.
Any unauthorised employment or reproduction, in full or part is forbidden

© Opus International Consultants Limited 2003

TABLE OF CONTENTS

Appendices

1) Typical Operator Spreadsheet
2) Operator Preferred Dumping Site Locations
3) Final Dumpsite Locations
4) Modelling Report By Lincoln University

1 EXECUTIVE SUMMARY

The North Island Stock Truck Effluent (NISTE) Strategy Study has been commissioned by Transit New Zealand to determine a strategic network (In-Transit / Destination) of Stock Truck Effluent Dumping Sites.

The purpose of this study is to determine, through the use of a Stock Truck Operator Surveys and Network Modelling, the optimum number of strategic sites for effluent dumping in such a way as to reduce 'Stock Truck Effluent Spillage', increase 'Road User Safety' and decrease 'Environmental Stress'.

To date there have been a number of Regional Studies into the issue of effluent dumping and this has resulted in a number of Regional Councils constructing In-transit Effluent Dumping Sites to deal with the problem. Currently there are four such operating sites in the North Island (Tapapa, Taupo, Stratford and Waverley).

In October 2001, Opus commissioned a survey questionnaire that was sent to all Stock Truck Operators in the North Island. The questionnaire was aimed at gathering valid statistical information to enable the formulation of a roading network model that predicts effluent spillage. This model was complied by Dr Jean-Paul Thull of Lincoln University and was based on the South Island Stock Truck Effluent Model.

Each Operator was allocated a specific model database spreadsheet that was compiled from the questionnaire results. The Operator information was collated and its feasibility was investigated using the 'Destination Site' information supplied by the Saleyards and Meatworks. The raw data was then adjusted to reflect reality before the future scenario model was run.

The Lincoln model was based on Environmental Systems Research Institute (ESRI)'s Arc-Info Geographical Information System (GIS). Lincoln was able to compile the North Island Network model and produce a series of geographical maps to represent the future busiest week effluent spillage pattern. These maps depict the exact location as to where spillage is likely to occur during this busiest week. Using a trial and error approach, locations for effluent dumpsites were tested and refined until the most efficient combination of effluent dumping sites were found.

The results of the model represent the busiest week of the year, and therefore represent the largest quantity of effluent that is likely to occur at any location at any one time. There were a number of assumptions that were required to formulate Lincoln's Arc-Info model.

The Lincoln model, as well as input from the Technical Sub-group of the North Island Stock Truck Effluent Study determined 16 optimal locations for the North Island Stock Truck Effluent Sites.

The following table summarises the proposed network (excludes existing) of In-transit effluent dumpsites to be established in the North Island:

Table 1:Proposed North Island Effluent Dumping Site Locations

	Town	Location
1	Whangarei	Kauri North of city
2	Wellsford	State Highway 1 North of town
3	Bombay	Bombay/Pukekohe interchange
4	Te Kuiti	Truck depot north town
5	Mt Messenger	SH 3
6	Wellington	SH1/SH2 bottom on Ngaranga Gorge
7	Woodville	SH2/SH3 Int.
8	Bayview	SH2/SH5 Int.
9	Waiouru	Various
10	Taumaranui	SH41/SH4 Int.
11	Opotiki	Various
12	Taupo	Junction with proposed Eastern Arterial
13	Putaruru	Various
14	Katikati	Various
15	Wairoa	Various
16	Te Ngae	Various

The above locations were determined using the following assumptions:

- 300L effluent holding tanks on all Operator Truck units.
- 25% of stock not stood, 75% of stock stood (Best practice).
- Future Saleyard configuration (Centralised Saleyards and Meatworks 2008).
- All 'Destination Sites' receive all contained effluent upon delivery.
- Topography has no effect on effluent spillage.

It is recommended that site investigations now be initiated to identify the exact locations and site-specific requirements at each location. Following site-specific investigations, the identified 'In-transit' sites shall move forward for implementation. This will involve obtaining consents, obtaining land or land use rights, confirming capital and operational funding commitments, design, legalisation and construction.

It is recommended that, in parallel to the 'In-transit' sites, all efforts be made to co-ordinate with destination sites for the establishment of their dumpsites, which are critical to the success of the network.

2 INTRODUCTION

2.1 Background

The North Island Stock Truck Effluent (NISTE) Strategy Study has been commissioned by Transit New Zealand to determine a strategic network (In-Transit / Destination) of Stock Truck Effluent Dumping Sites.

Previously there have been a number of Regional Studies into the issue of effluent dumping and this has resulted in a number of Regional Councils constructing In-transit Effluent Dumping Sites to deal with the problem. There are currently four operating Stock Truck Effluent Dumping sites in the North Island apart from truck washes at some depots and some destination sites.

It was considered that the issue of Stock Truck Effluent Spillage / Dumping would be better resolved as a wider North Island study rather than separate Regional studies due to the complex inter-regional nature of stock truck movements through out the North Island. A similar study for the South Island was completed by Lincoln University in 2001, and the Effluent Sites identified in the study were implemented into the South Island Network.

The only legislation to deal with the current problem is with the introduction of effluent holding tanks on all Stock Truck Carrier vehicles. This has resulted in varied success, reducing the volume of effluent being discharged directly onto the road, but has concentrated the effluent, which now has to be dealt with appropriately. There is not currently, a suitable network of dump facilities to allow the tanks to be used effectively.

It is common practise for Operators to dump stock effluent from their tanks at certain frequently used sites throughout the network of roads within the North Island. This untreated concentrated waste can cause a nuisance and potentially cause serious environmental harm. Another practice amongst some Operators is to discharge on the move to kerb or verge on slow, uphill crawler lanes. This practise and overflowing tanks can lead to serious harm and it is hoped that the installation of strategic Effluent Dumping Sites will alleviate as many problems as possible.

The opportunity has now arisen to establish a strategic network of dumping facilities to collect this concentrated waste and treat it and dispose of it in an appropriate manner. There is an obligation under the Resource Management Act 1991 to obtain the appropriate Discharge and land use consents for each Effluent Disposal Site chosen, and to ensure this concentrated waste is appropriately treated before it is released into the surrounding environment. Therefore there is still a further process to obtain consents for and design the actual sites at the locations identified in this study.

2.2 Survey Purpose

The purpose of this study is to determine through the use of a Stock Truck Operator Surveys and Network Modelling, the optimum number and location of strategic sites for

effluent dumping in such a way as to reduce 'Stock Truck Effluent Spillage', increase 'Road User Safety' and decrease 'Environmental Stress'.

Once the Effluent Dump Site locations are identified and confirmed, there will then be a more specific site investigation to determine an exact location for each facility within the area identified.

2.3 In-transit Effluent Dumping Sites

In-transit Stock Truck effluent dumping sites are proposed at certain strategic locations throughout the North Island. These sites are to be along main highways and their intersections with other main road networks that are frequently used by Stock Operators. In-transit dumping sites are required as many Operators are transporting stock large distances. From the moment stock are placed on the trucks, effluent is generated and collected in the Effluent Holding Tanks (currently typically 300 L total or less). In some circumstances the effluent storage facilities are exceeded resulting in effluent spillage on the road network during transportation. Factors such as topography also contribute to effluent spillage, as in some instances effluent holding tanks can overflow at steep road angles such as the Kaimai Ranges (SH29), Mt Messenger (SH3) or Taihape (SH1) where this problem occurs regularly. Steep roads effectively reduce the operating volume of some Effluent Tanks, and spillage is likely unless a dumpsite is located prior to the road climb. The design of under floor tanks can reduce gradient spillage issues.

2.4 Destination Effluent Dumping Sites

This Stock Truck Effluent Study would like to recognise the importance of the installation of effluent treatment facilities at all destinations sites. Many effluent-dumping sites can serve as both in-transit and destination sites (that is sale yards and meat processing plants). Establishing effluent dump facilities at all destination sites would contribute to a significant reduction in effluent spillage, as currently many destination sites do not allow the dumping of effluent upon arrival and trucks leave with full tanks. An advantage of some Destination locations is that they have existing treatment facilities that can be upgraded to treat the effluent at a fraction of the price that it would cost to build a brand new effluent treatment system. However, this advantage may cause non-compliance with Discharge Consents as discussed in 2.6.

2.5 Existing Dump Sites

There are four Effluent Dumping Sites within the North Island with another two currently under construction. The locations of the existing Effluent Dump Sites are as follows:

- Tapapa (SH5 between Tirau & Rotorua)
- Taupo (Pohipi Road)
- Stratford (SH3)

- Waverly (SH3)

It is very important that the proposed sites are placed in locations that are 'On Route' for Stock Truck Operators. Operators are not in favour of travelling too far from their proposed routes to dump Stock effluent, as essentially time is money and there is significant cost in doing so if the dumping facility is too far off their intended route. This phenomenon is observed at the Stratford site, which is currently not used to its full potential, as it is not in an ideal location for stock truck operators.

2.6 Effluent Dumping Site Facilities

Feedback at the September 2003 North Island Stock Truck working group indicated that the Waverly site is considered to be favourable amongst the Operators for its ease of use and location. Adequate turning/entry and exit facilities are imperative to obtain Operator participation with the dumping sites. Stock Truck Effluent Sites typically consist of an elevated Cattle Grate Platform to which the Stock Trucks drive directly above so that the Effluent Tank valves can be opened and the effluent discharged into a pit. The Effluent can then be biologically treated with the use of oxidation ponds or contained in storage tanks until such time they are pumped out to irrigation or disposed of by a Waste Disposal Operator. In some instances the Stock Effluent can be connected into existing wastewater treatment plants. However, each wastewater treatment plant would require a process review to determine if the additional Stock effluent could be sufficiently treated. Stock Effluent can be regarded as a 'strong' wastewater as it requires a significant amount of biological treatment before it can be released into a receiving body. Stock effluent also carries a high load of suspended solids. Some of this grit from hooves, and there is a large amount of solid matter from grass residual. This has the ability to choke screens and pumps not specifically designed or sized to cater for it. Existing wastewater treatment facilities at destination locations are often close to their discharge consent limits and the additional Stock effluent would not be acceptable as their discharge limits may be exceeded. In this case, a significant wastewater treatment plant upgrades may be required before the effluent can be appropriately treated and disposed.

3 STOCK TRUCK EFFLUENT QUESTIONNAIRE

3.1 Questionnaire Format

Questionnaires were sent out to a list of North Island Stock Truck Operators compiled with help from the Road Transport Association Area Managers. These questionnaires (Sent October 2001) were specifically designed to extract as much information as possible about the travel patterns of each Operator in the North Island.

The Survey Sheet consisted of 8 questions, all of which were constructed to obtain relevant information to determine the Operators individual stock transport patterns during their busiest week.

The following questions, tailored to obtain the operational information, were used:

1. The Number of Livestock Units (Truck and Trailer)

This question was important in determining the Operators carrying capacity, which can be crosschecked against the more detailed question 6 to evaluate the validity of the data.

2. Number of Units Fitted with Effluent Holding Tanks

This provides information on what percentage of trucks have the ability to store effluent.

3. Capacity of the Effluent Holding Tanks

The capacity of the Effluent Holding Tanks is a very important issue. This can define the point to which the effluent holding tanks start to over flow and spill onto the roads.

4. Percentage Sheep/Cattle that is Carried

It is known that cattle as opposed to sheep create far more effluent whilst in transit. Thus the effluent volume is directly proportional to the number of cattle on board the Stock Truck, and this must be identified to ensure accurate results.

5. Seasonal Pattern Identification

This question attempted to identify the seasonal trends that indicated an increase in Stock movement and hence peak period effluent volume to be intercepted, treated / stored.

6. Analytical information on destination points with associated detail

Lists of all known meat works and sale yards in the North Island were provided and operators identified typical and peak numbers of 'units' delivering to each destination each week.

This attempted to highlight individual trips associated with the Operators busiest week during the year. The data extracted from this question was the raw basis for the modelling.

7. Farm to Farm Allocation

Due to the difficulty in identifying all destinations, this question defined the many random farm-to-farm trips that do occur, and that cannot be identified by defined destinations (e.g. Meatworks, Saleyards). It includes many local trips but also some seasonal, inter-regional movements.

8. Suggested Effluent Dump Site Locations

This question gave the Operator an opportunity to identify specific sites where they considered there to be a need for effluent dump sites combined with the requirements of ease and safety of access.

3.2 Transport Operators

A total of approximately 115 Stock Truck Operators were part of the original survey sample. The modelling spreadsheets were compiled as the questionnaires were returned. It was considered that to produce a suitably comprehensive data set, a return of at least 80% was expected. Of the original Operator list, a data spreadsheet containing all the Stock Truck movements was compiled for 92 Operators (80% return). Some 'educated guess' trips were assigned to a few operators that were significant in size but who refused to complete a survey. These were based on the number of Stock Truck units they operate, and a comparison to other Operators in their region.

The remaining 23 Stock Truck operators were deleted from the survey because of one of the following reasons:

- The Operator had gone out of business
- The Operator carried deer / emu only
- After repeated attempts at obtaining the survey data, the Operator was eliminated from the study, as they were deemed too small to be of significance to the outcome of the modelling.

3.3 The Data Collection Phase

In the first instance the survey returns were directed to the RTA area representatives. They were then grouped together and forward onto Opus Hamilton for analysis.

It was found that the survey returns were extremely slow, and this consequently required the chasing up of the remaining surveys, which also took a considerable amount of time. In many cases, multiple follow up was required and, as discussed above, a few operators could not be bothered or refused to participate.

The follow up of the surveys involved substantial effort from both the RTA area representatives and Opus. The efforts were focused on telephone calls to all the remaining

'non- returnee's' simply asking for the survey to be completed as quickly as possible. A number of deadlines were met and lengthened to cater for the non-returnee's.

An Operator data allocation spreadsheet was compiled for each of the returned surveys containing the majority of the information provided in the questionnaire. This spreadsheet was then sent back to the Operators, and a phone call made to confirm the accuracy of the data. Data was compiled in a commercially sensitive manner so that a spreadsheet could only be linked to an operator by the survey team and not an outsider. Once in the model, all data is anonymous.

It was found that the majority of Operators agreed with the allocated data. Operator participation in this phase of the questionnaire process was low. There were only a few Operators that were able to pick up anomalies in their own data allocation after observing their data spreadsheet, however obvious mistakes in data allocation were identified by Opus and after questioning and confirmation were changed.

3.4 Saleyards

The sale yard industry is volatile and somewhat difficult to predict given the nature of the fluctuating meat market. For the purposes of this study, we have investigated the likely future changes of the North Island Sale yard industry with a focus on centralisation.

Information collected for the study was actual stock numbers and type sold at each sale yard within the North Island over the 2001 period. This information was collected from two separate sources with both being actively involved in the Stock Sales industry. The Sale yard information was processed and loaded into two spreadsheets depicting the current (50 aleyards) and likely future (29 Sale yards) sale yard location and throughput scenarios.

A difficulty was identified allocating the sale yard data so that it represented the busiest week. As many sales occur irregularly, we have assumed that all fortnightly / monthly sales occur in the same week. There seems to be no other valid statistical solution for modelling purposes. However, this indicates that the modelling results would represent a conservative spillage pattern.

3.5 Meatworks

Questionnaires were also sent out to each of the 38 Meat Works within the North Island. Because of commercial sensitivity, information was, at times, difficult to obtain.

All the Meat Works in the North Island were contacted and information on their animal throughput was obtained. The actual results of this aspect of the survey are highly confidential and will not be reported. The Meat Works data provided a crosscheck on the data received from individual operators.

The following information was obtained from each meat works:

- Cattle throughput (peak-average)

- Sheep throughput (peak-average)
- Number of killing chains for each of the above
- Seasonal variations to throughput

As with the sale yards, the meat works are in a continual state of flux with several opening and closing or changing focus, even through the data-gathering phase of the study.

3.6 Farm to Farm

The farm-to-farm trips completed by Stock Truck Operators are the hardest to predict and to incorporate into a model, as they follow no fixed pattern. From the data obtained from the operator survey, random departure and destinations points were allocated to each Operator where insufficient information was obtained.

In the survey we asked, "How many Farm to Farm trips do you make in your busiest week of the year? ". From this answer, if specific departure and destination points were not allocated, random Farm-to-Farm trips were allocated within a 30km radius of the Operators home base.

3.7 Survey Model Inputs

The information from the surveys was processed and collated in the form of individual excel spreadsheets which were used as the input format for the Network Model. The excel file consisted of 92 separate spreadsheets, each depicting a Stock Truck Operator.

An example of an Operator Spreadsheet can be found in appendix 1.

The name in the top left-hand corner was used as an identifier reference throughout the investigation. The horizontal row near the top of the spreadsheet depicts all the Destination points; the vertical column depicts all of the Departure points. Each cell containing a '1' indicates a single trip.

3.8 Operators Recommended In-Transit Dumping Sites

The Operator survey was also directed at obtaining the valuable Operator knowledge of the existing road network and the locations at which they feel would be best suit their individual needs.

Please refer to appendix 2 for a map of the Operator preferred dumping sites.

In considering operator preferences, these are based on current, real problem areas and current operational scenarios. Current operating scenarios include cattle pre-standing times that are regularly less than industry requirements and tanks that are often less than the 300 L (unit total) recommended by the code of practise. Operators are often unaware that the tanks supplied are not of the required volume.

3.9 Weather Allocation

The weather plays a significant role in the production of waste fluid within the Stock Trucks. Regional weather information was obtained from the National Institute of Weather and Atmosphere (NIWA) and incorporated into each Operator return spreadsheet used for the model input.

4 NETWORK MODELLING

4.1 Model Format

Lincoln University were commissioned by Transit New Zealand to model the collected survey data. The North Island model was based on the South Island Stock Truck Effluent Study and Dumping Site allocation. However, the model was changed in September 2002 from an 'address' based system to a 'GIS' based system part way through the process. Spreadsheets in excel format were used as the basis for the Arc-Info model input.

4.2 Modelling Assumptions

Modelling Stock Truck Effluent spillage involves a number of active parameters that all have an effect on the frequency and location of the effluent spillage. Changes in the parameters are likely to have an impact on the modelling results. For example, increasing the carrying capacity of the Effluent tanks to 400 litres will result in a completely different spillage pattern than to what is expected with a 300L tank. Similarly, 300L tanks produce a significantly different pattern to 200L tanks.

The model is based on a number of key assumptions that were as follows:

- Model represents busiest week of the year.
- Assumes 300 L Effluent Storage Tanks.
- Operators travel to the nearest State Highway, then on State Highways to the destination (Not necessarily the shortest route).
- Livestock handling was based on 'Best Practice' where the animals are stood for 4 hours before being transported. (80% Not Stood for existing scenario and 25% Not Stood for future scenario)
- Wet weather is modelled as random events during the peak week and was modelled differently according to each climatic region. Wet weather has been identified as having a significant impact on the effluent volume.
- All irregular Stock Sales were sequenced in the same week for the purposes of the modelling.

- All 'Destination Sites' receive all contained effluent upon delivery.
- Topography has no effect on effluent spillage.

The above assumptions are designed to produce modelling results that cater for the 'worst-case scenario' (peak week). Therefore it could be expected that during times outside of this 'peak period' the volume of Effluent Spillage would be considerably less. It is considered impractical to capture/collect every possible effluent spillage from a roading network as extensive as that of the North Island.

4.3 Existing and Future Scenarios

Existing Stock Truck movements throughout the North Island are likely to change in the near future due to sale yard and meat work closures, as well as a redistribution of sheep and cattle slaughter. This has been recognised and an investigation was undertaken to see what the likely situation would be in five years from now.

The centralisation of Stock Saleyards is likely to occur in the very near future. This would ultimately change the pattern to which Stock is transported throughout the country and the areas affected by effluent dumping. Information was made available (Commercially sensitive) that gave an indication as to the likely future scenario. Meat works and Saleyard Stock throughput were adjusted to accommodate the likely situation. This was then modelled to create the likely 'future scenario'.

By modelling the existing spillage pattern scenario, Opus was able to calibrate the model against the raw data.

4.4 Data/Model Quality Checking

Once the survey data was collected, Lincoln University compiled a 'Summary Spreadsheet' to assess the feasibility of the raw survey data. Comparing the summation of the raw survey data to each of the 'destination sites' throughput, analysis could be made to assess the accuracy of the existing model.

There was some adjustment of the raw data required so it expressed the existing situation and reality. Once this was achieved the future scenario was modelled.

4.5 Dumping Sites Modelled

Within a technical subgroup of the NISTE Steering Group a list of 41 proposed North Island In-Transit Sites was formulated using preferences expressed by operators and all other available information and experience (refer to Table 1).

It was this table that was then used as the basis for the modelling iterations to compute the most efficient Dumping Site Location scenario within the North Island.

Once initiated, the model takes approximately 24 hours to process all the input information for a single run. The model output consists of a map of all the points at which spilling occurred, together with a table providing statistical information as to the number of 'Dumped Effluent loads' at the site specific locations.

By a trial and error approach, the different locations for the effluent dumping sites were tested, analysed and eliminated or confirmed as appropriate.

Table 1: Modelling Locations of 41 'Possible' Dumping Sites

	Town	Location	Grid Reference	
			Northing	Easting
1	Kaikohe	Mangakahia Road junction with SH12	6643582.8	2583712.6
2	Dargaville	Richmond plant	6584848.9	2590099.5
3	Whangarei	Kauri North of city	6613724.9	2628270.1
4	Wellsford	State Highway 1 North of town	6545498	2646995.6
5	Greveille Road	Torbay interchange north of Albany	6495358.6	2664301.8
6	Ngaruawhaia/Horotiu	Various	6387259	2703629.6
7	Bombay/Pokeno	Bombay/Pukekohe interchange	6443709.3	2686428.1
8	Paeroa	Various	6420917.4	2746979.6
9	Morrinsville	Saleyards or West of town	6389967.8	2731357.3
10	Tatuanui	SH26/27 Int.	6394634.3	2739319.4
11	Mangateparu	Various	6398396.9	2731195.9
12	Whatawhata	SH23/SH30 Int.	6376113.8	2699862.8
13	Kaimai East	SH 29 at Tauriko	6380046.4	2783143.3
14	Kaimai West	SH29 at base of Kaimais or Te Poi	6366172.2	2760630.8
15	Opotiki	Various	6345368.5	2884993.2
16	Te Ngae	SH30/33 Int.	6341668.8	2801885.5
17	Te Kuiti	Truck depot north town	6317094.2	2698780.8
18	Otorohanga	Various	6331645.5	2703086.3
19	Piopio	8 Mile Junction SH 3/SH4 Int.	6307805	2694270.3
20	Taupo	Napier/Taupo Rd Truck Stop, junction with East Arterial	6273009.2	2780699.7
21	Turangi	Various	6241545.8	2753000.6
22	Taumaranui	SH41/SH4 Int.	6254188.1	2712401
23	South Mt Messenger	SH 3	6254346.4	2647524.1
24	Waitara	SH3a/SH3 Int	6241944.1	2613549.1
25	Waiouru	Various	6188146	2739609.4
26	Stratford	model existing site as an intransit site, SH3/SH43 Int	6206676.2	2620735.8
27	Waverly	SH 3 West end of town	6158746.8	2648750.8
28	Gisborne	North SH2/SH35 Int.	6271070.5	2940488.6
29	Wairoa	Various	6232444.6	2892541.4

30	Mahia	Various	6229475.9	2919734.7
31	Bayview	SH2/SH5 Int.	6191516.5	2843104.7
32	Wanganui	Various	6137334.8	2685742.8
33	Bulls	SH1/SH 3 Int	6111870.2	2713082
34	Ohakea	Weigh-Station SH1/SH 3	6108585	2714089.5
35	Takapau	Various	6126299	2793691.2
36	Dannevirke	Oringi meat works	6100315.9	2767322
37	Woodville	SH2/SH3 Int.	6092592.8	2753501.9
38	Masterton	Various	6026921.5	2734918
39	Fielding	Various	6107941.1	2732144.5
40	Foxton	Various	6077808.5	2703512
41	Wellington	SH1/SH2 bottom on Ngaranga Gorge	5993802.8	2661882.2

4.6 Modelling Report

Lincoln University have compiled a technical report detailing the modelling phase. A full copy of this report can be found in Appendix 2.

5 CONCLUSIONS

5.1 Modelling Results

After numerous modelling iterations of the locations listed in 4.5 and discussions involving the Technical Sub-Group of the North Island Stock Truck Effluent Study, the following list (Table 2) was identified by Lincoln University as the most efficient Network of Stock Truck Effluent Dumping Sites in the North Island.

Table 2: Proposed Locations for North Island Stock Truck Effluent Dumping Sites

	Town	Location	Grid Reference	
			Northing	Easting
1	Whangarei	Kauri North of city	6613724.9	2628270.1
2	Wellsford	State Highway 1 North of town/saleyards	6545498	2646995.6
3	Bombay	Bombay/Pukekohe interchange	6443709.3	2686428.1
4	Te Kuiti	Truck depot north town	6317094.2	2698780.8
5	Mt Messenger	SH 3 (South)	6254346.4	2647524.1
6	Wellington	SH1/SH2 bottom on Ngaranga Gorge	5993802.8	2661882.2
7	Woodville	SH2/SH3 Int.	6092592.8	2753501.9
8	Bayview	SH2/SH5 Int.	6191516.5	2843104.7
9	Waiouru	Various	6188146	2739609.4
10	Taumaranui	SH41/SH4 Int.	6254188.1	2712401
11	Opotiki	Various	6345368.5	2884993.2
12	Taupo	Truck Stop, junction with East Arterial	6273009.2	2780699.7
13	Putaruru	Various	6346843	2754214
14	Katikati	Various	6461754	2767682
15	Wairoa	Various	6231316	2892074
16	Te Ngae	Various	6341313	2801989

These modelling results represent the busiest week of the year.

The results were based on:

- 300L effluent tanks.
- 25% of stock not stood (Best Practice).
- Future configuration (Centralised Saleyards 2008).
- All 'Destination Sites' receive effluent upon delivery.

6 RECOMMENDATIONS

- That the recommended sites identified by the model be accepted.
- That site-specific investigations and evaluations be completed to identify site specific Effluent Dumping Sites at the locations identified in Table 2.
- That, following site-specific investigations, the identified 'In-transit' sites move forward for implementation. This will involve obtaining consents, obtaining land or land use rights, confirming capital and operational funding commitments, design, legalisation and construction.
- That, in parallel to the 'In-transit' sites, all efforts are made to co-ordinate with destination sites for the establishment of their dump sites which are critical to the success of the network.

7 ACKNOWLEDGEMENTS

Opus wishes to acknowledge the assistance and co-operation of the following, without whom the data gathering process would have been impossible:

- North Island R.T.A representatives, particularly Sherry Henwood and Charlene Kerr
- The 92 Stock Truck Operators who completed questionnaires
- The Saleyard representatives, particularly Peter Horrocks
- The meat processing companies who completed questionnaires, providing commercially sensitive information on trust.

Appendices

APPENDIX 1 TYPICAL OPERATOR SPREADSHEET

APPENDIX 2 OPERATOR PREFERED DUMPING SITE LOCATIONS

APPENDIX 2 LINCOLN MODELLING REPORT

APPENDIX 3 FINAL SPILLAGE MODEL OUTPUT

APPENDIX 1

TYPICAL OPERATOR SPREADSHEET

APPENDIX 2

LINCOLN MODELLING REPORT

APPENDIX 3

OPERATOR PREFFERD DUMPING SITE LOCATIONS

APPENDIX 4

FINAL SPILLAGE MODEL OUTPUT