STORMWATER : MANAGEMENT OF ROAD RUN - OFF

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ABSTRACT

The Roading Controlling Authorities Forum (RCAF) is a national body representing New Zealand wide interests across a broad number of common issues that confront the roading sector today. One such issue is that of stormwater road run-off.

The RCAF established a Stormwater Group in late 1999 to investigate the needs of its member authorities in the stormwater area, and to provide links to best practice of managing, controlling and treatment of road run-off. A key initial approach to this was a Roading and Stormwater Technical workshop held in May 2001 where an attendance of 100 Scientists, Engineers, Planners and Asset Managers were able to exchange thoughts, put forward research work and predict future needs of the roading sector. NZWWA and Ministry of Transport were also key facilitators in this workshop.

The Stormwater Group has also played key roles in Land Transport NZ (previously Transfund NZ) research projects that have a focus on stormwater and the roading sector. This research confirms the essential need for all parties to get together on stormwater issues that have many commonalities.

This paper outlines the work of the RCAF Stormwater group to date and sets outs purposes and mandates the Forum has set up to follow. Included in this are results from a 2006 survey/questionnaire completed by many Roading Authorities on just where they 'are at' with road stormwater management.

The paper concludes with some thoughts for discussion on how a more appropriate liaison needs to be set up between roading managers and drainage managers to deal with the many common interests in stormwater, and to ensure that issues are being dealt with to the benefit of all parties.

KEYWORDS

Stormwater, roads, roading, RCAF, run-off, contaminants, treatment.

1. INTRODUCTION

Establishment of RCAF

In early 1996, discussion between territorial local authorities (TLA's) and Transit NZ (Transit) established that in many cases individual authorities and Transit regions were working in isolation when it came to management of their networks. This included in many cases 're-inventing the wheel" on a wide scale. There was a real need to combine efforts in policy, consultancy, construction, operational and asset management activities which would better utilise the funds available.

From this, the Roading Controlling Authorities Forum (RCAF) was established in mid 1996, with the very clear purpose of sharing resources and information between the authorities and Government agencies, such as Transit.

Current RCAF

Current membership of the RCAF consists of all 74 TLA's, Transit, Land Transport New Zealand (Land Transport) and Department of Conservation (DOC). The Forum meets three times a year for reporting by focused sub-groups, assessment of reports, directing for further group work or giving advice/direction to the membership on many aspects of the management of the New Zealand road asset.

The Forum also allows for regular presentations by contractors, consultants, other Government agencies such as Ministry of Transport (MOT), Ministry of Environment (MfE), transport related bodies, and rail owners and operators.

The major part of the Forum's funding comes from levies paid by TLA's and Transit.

There is also a strong function within the Forum on utilities. The Forum was the initial driver in getting the NZ Utilities Advisory Group set up so that all 'users' of the road corridor have a common focus.

RCAF Stormwater Group

In 1999 the Stormwater sub-group was established following Forum member request that there was a growing need for roading to come to grips with the management of stormwater and to address both minor and major issues. Road run-off was fast becoming a concern for those that look after the environment and there was a responsibility for road asset managers to act.

The Stormwater Group draws its membership from TLA and Transit road asset managers, especially people who have worked closely in roading design involving stormwater and project management associated with stormwater. Transit personnel have come mainly from their policy sections but more recently this has been extended to regional representation. Major funder of roading, Land Transport, is now also represented on the group, not only for advice on funding but because of the extensive research projects into road stormwater that Land Transport has promoted both in the past and currently.

Through 2000-2002 the group set up a liaison with New Zealand Water and Waste Association (NZWWA) Stormwater sub-group and New Zealand Water Environment Research Foundation (NZWERF). This was an endeavour to co-ordinate issues and needs common to all. This liaison stalled at that time due mainly over funding issues.

The group has also had close relationships with NIWA and other research organizations that have interests in stormwater.

Membership make up of the group over the years and liaison with other organization outlined obove has allowed the RCAF Stormwater Group to establish a good understanding of the requirements of roading stormwater and to provide advice to roading asset managers as they are confronted with the ever developing issues pertaining to stormwater management.

Current and past membership of the group is recognised in the acknowledgement section of this paper.

2. STORMWATER GROUP ACHIEVEMENTS TO DATE

2.1 GROUP TASKS

The main tasks of the Stormwater Group since 1999 have been to establish a knowledge base of those working within the stormwater/roading environment and to provide advice and direction to road asset managers. While this work has been roading orientated, much of its fits into an essential part of the management of total stormwater that finds its way into the roading corridor, from whatever source.

One of the major concerns to road network managers is the matter of who is going to pay for the management and, if necessary, treatment of roading stormwater. It has been stated from various sources that only 60% of all contaminated stormwater actually originates in the roadway, with others stating that this could be as low as 40%. In the mid 1990's the national road costing exercise undertaken by the MOT indicated that stormwater costs were something that would have to be addressed by network operators. To date this has not been done and is a future task that the RCAF will endeavour to address with other key stake holders such as MOT and Land Transport.

The following briefly details key tasks that have been carried out by the RCAF Stormwater Group, or work that the Group has assisted with, that is available to all interested in the management of stormwater.

- **RCAF Roading and Stormwater Workshop May 2002**

The RCAF, MOT and NZWWA (2002) facilitated this workshop. It was the first such workshop ever held with a roading focus and bought together roading asset managers, roading designers, consultants, planners, scientists, researchers and those working in environmental stormwater areas of TLA's and TNZ.

- **Transfund Research Project No 260**

Transfund NZ (2004) research report entitled 'Integrated Stormwater Management Guidelines for the New Zealand Roading Network', was published in 2004. It has provided a much-needed reference on a range of issues relating to the management of stormwater run-off from all sources, not just roads.

The research project comprehensively documents up to date information on the following:

- Legal framework within which stormwater management takes place
- Management framework (agency responsibilities and management tools)
- Gaining of resource consents for stormwater management activities
- Environmental effects and mitigation measures
- Best practice engineering methods including life-cycle costings

This project has been widely heralded as an essential document in the management of stormwater, and is available on the Land Transport NZ (LTNZ) website.

The project has provided asset managers with good direction in the approaches they may need to take in addressing their stormwater problems. It is not a design manual, but directs users to what action might be appropriate for a particular problem, and is particularly helpful in understanding the legal framework for stormwater management and its practical application.

- **Transfund NZ Research Report No 264**

Transfund NZ (2005) research report entitled 'Development of a Benefit Evaluation Technique Applicable to Treatment of Road Run-off', was published in 2005.

With roads being generally recognised as one of the key contributors of contaminants to stormwater, the installation of stormwater treatment devices on new projects is becoming an established part of new road construction works.

This project investigates the potential to define a cost-benefit ratio based on the reduction of contaminants provided by a treatment device. The project also explores the potential for benefit definition based on linking a reduction in contaminants discharged in stormwater to the 'willingness to pay' for environmental improvement and community acceptance.

- **Ministry of Transport releases 2005**

For a number of years now the MOT, in conjunction with their consultants and Waitakere City Council, have been extensively analysing contaminants deposited on the road. These are the contaminants that accumulate in the stormwater systems when it rains, including contaminants that have come from 'beyond' the roading corridor. Unless appropriate management and treatment

devices are put in place to intercept the contaminants, they will ultimately find their way into the eco-systems and other receiving environments.

Ministry of Transport (2005) released a series of papers covering the research and analysis of road contaminants and road run-off. It is not the intention of this paper to discuss all the scientific data and comments included in these papers, but to bring this work to the attention of stormwater managers for future reference.

The research work by MOT encompasses studies dating back to 1973 and culminates with some very detailed analysis to align deposition of contaminants on the road with traffic conditions, atmospheric conditions and road surface conditions using a traffic model based on Waitakere City.

It is the receiving environments that will govern the control and levels of allowable contaminants. Stormwater managers will need to consider in all cases how they may control contaminants.

In addition to identifying the contaminants and their composition in stormwater the research by MOT identified the levels of contaminants in road run-off that can be attributed to the road and those from road surrounds. There was caution voiced though, as more assessment work is needed to give confidence in road versus 'other' contributors to the road contamination problem. The range across contaminants appears to be 40-60% from traffic for the prominent contaminants such as Cu, Zn, Pb and PAH's. These findings provide useful information to for managers to gauge initial consideration of stormwater effects.

While the above is a broad summary of eight papers published by MOT in February 2005, it is essential that managers and their consultants fully familiarise themselves with the general aspects and emphasis of these papers. Particular attention should be paid to the following three papers:

- *"Road Report Finals"*
- *"Transport Effects"*
- *"Waitakere City – Contaminant loadings"*

At the 2003 INGENIUM conference Peter Reid et al (2003), Ecowater Systems, Waitakere City Council, presented a paper entitled "*Managing the Environmental Impacts of Land Transport - A Waitakere City case study"*. This paper provides excellent background material to the relationship between road contaminants/ road run-off/ traffic/ stormwater collection/ receiving environments.

- **NIWA**

Research and analysis work by NIWA (various dates), has mainly been in the Auckland area and has focussed on stream catchments and controls within that environment. In assessing contaminants in stream discharges, they have carried out some study work on some representative roadways in the Auckland urban area. Full details are available on NIWA's web site.

- **NZ Water Environment Research Foundation (NZWERF)**

NZWERF (2004) carried out considerable research work in conjunction with the NZ Water and Waste Association. In October 2004 NZWERF published "Onsite Stormwater Management Guidelines". While this document is not specifically aligned to roading, it is a very useful document for asset managers.

These guidelines advise caution on ensuring the appropriate use of control devices and on the need to fully assess all situations. Very useful information is included for devices and their design, contamination recognition, ongoing device maintenance and life cycle costing. While the guideline aims to clarify the capabilities of the many devices, there is still a lot to be learned about the actual effectiveness and efficiency of management devices.

(NZWERF has now been absorbed into NZWWA)

- **Transit New Zealand (Transit)**

  The considerable work to date is associated with new projects, mainly undertaken in the Auckland area but there is also a scattering of stormwater activities across the rest of the country. Transit are currently preparing "Stormwater Management Guidelines", for use on State Highways. These guidelines will include some of the more recent issues raised through the RCAF Stormwater Group concerning maintenance of control structures and disposal of contaminated materials. The guidelines will also include some worked examples and cover environmental issues. Transit is a member of AUSTROADS and has a commitment to work with that body, a connection that can only be of advantage to New Zealand due to the extent of Australian research into stormwater issues. No date has been set for the completion of these guidelines.

- **Auckland Regional Council (ARC) publication TP 10**

  This ARC publication in 2003 sets environmental and technical guidelines for the management of stormwater across authorities in the Greater Auckland region. The RCAF submitted to the draft consultation on TP10 in 2002, at the same time endorsing the document for use by roading authorities where appropriate. The RCAF cautioned Road Asset Managers outside the Auckland Region to monitor TP 10's adoption by other Regional Councils. The author of this paper is aware of two lower North Island Regional Councils that were looking at its adoption. The document is specifically focused on the Auckland region, although some parts may be applicable to other regions.

- **Other research work and analysis work associated with roading**

  There are a number of other organisations such as Landcare, Cawthron Institute, and consultants, that have put considerable effort into the research of stormwater. While much of this has not been directly related to roading, it is relevant. Some local authorities are well advanced along the path of stormwater management and control.

- **2005 Ingenium Conference paper published**

  Watton (2005) presented a paper to this conference entitled 'Management of Stormwater Contaminants from Roads and who pays'. This paper discusses research work to that time, contaminants associated with roading, a insight into treatment devices, whole of life costing and the very big issue of who pays when the road is used as a conduit for stormwater.

3 PRACTICAL APPLICATION OF STORMWATER MANAGEMENT

Road asset managers have been very active in the stormwater management areas, especially in or adjacent to some of our main metropolitan areas. While new projects, through the Resource Management Act processes, are picking up on state of art and best practice methods, it is the existing networks that pose the greatest problems for TLA's and Transit.

Should environmental requirements be applied to roads in existing networks, then RCAs will have to be ready to act, including defining where costs are incurred.

Some very good and practical work has already be done especially in the Auckland area by TLA's and Transit. Other territorial authorities now need to build on this. The RCAF Stormwater Group is currently working to build on its previous work by seeking information on what authorities consider stormwater problems, and how to address them, as well as assisting with ongoing research work to ensure that there is practical application of research work into projects.

Two such areas of work are:

(a) A questionnaire circulated to all authorities in late 2005 sought information on where authorities are at with road stormwater run-off management and treatment. Results of the questionnaire along with an analysis and future directions by RCAF are the subject of a presentation by the RCAF at this conference.

(b) The RCAF has been represented on a Land Transport research project titled 'Ranking Sensitive Receiving Environments at Risks from Road Runoff'. The work is currently being undertaken by Montgomery Watson Harza (MWH) Wellington office and is the subject of a paper to be presented at this conference.

4 FUTURE ACTIVITIES OF THE RCAF STORMWATER GROUP

Future activities of the Group will focus on the following:

- **Outcomes of the 2006 questionnaire**

  When all the analysis of the questionnaire has been completed the Group will assess what further actions need to be taken and information provided to interested parties. Any environmental concerns raised will need careful consideration and before any advice is given or other actions undertaken.

- **Providing assistance and guidance to road asset managers**

  In line with the purpose of the group it will continue to provide appropriate assistance and advice to road asset managers and other parties that work in the roading infrastructure disciplines.

- **Progressing work on the "who pays?" situation**

  This is unfinished work in the roading sector, having been first highlighted in mid 1990's, and has always end up in the 'too hard basket'. It will not go away, and RCAs do not want to be saddled with the full costs of future management/treatment of the runoff from the existing network. The group has no direction on this at this stage, but do recognise that it may take legislation to sort it out.

- **Disposal of contaminated materials removed from treatment control devices**

  From a practical view point, all devices used to manage and treat stormwater before it enters a receiving environment, will accumulate a residue of contaminants. This will occur whether these devices are the common swale/filter strip or sophisticated methods such as ponds, rain gardens or filter pits.

  To date the author has not been able to find any definitive research or studies which address the disposal of the contaminated materials. Research has passed over the issue by making the statement, **"materials may be contaminated and special consideration may have to be given to their disposal"**. There appears to be no doubt in the minds of researchers that material in these control devices will need replacing at some future date. It could become a very costly problem if care and consideration of this is not given to disposal at time of installation.

  Can this material go to the local landfill? One only has to think of the concerns that are raised in the community when contaminated soils from old gas works sites, timber treatment sites or petrol stations needs to be disposed of. If the local landfill's resource consent does not allow the acceptance of this material then the whole exercise could become very expensive.

  Further research is needed into the ongoing maintenance of all devices that are being used.

- **Roadshow**

  It is the intention of the Forum to hold a series of workshops around New Zealand in early 2007, so that the work of the Stormwater Group can be conveyed directly to asset managers and consultants.

5 LIASON WITH NEW ZEALAND WATER AND WASTE ASSOCIATION

There is much common ground between the NZWWA Drainage and Stormwater Groups and the RCAF Stormwater Group. Other than some cohesion at the time of the 2002 Roading Stormwater Conference, and a meeting between some RCAF Stormwater Group members and top management of NZWWA in mid 2005, there has been very little liaison between the groups.

Stormwater is common to all the parties named above and in many instances funding of activities of all the groups has common clients. It cannot continue to compete for the same dollar to achieve the probable same end result.

The meeting between NZWWA and the RCAF Stormwater Group in 2005 agreed that more cooperation and closer collaboration was needed, and that when NZWWA had complete a review of their structure and activities it would be the opportune time to move towards closer relations and some common funded projects. The Forum looks forward to this time and the establishing of closer ties across stormwater activities.

The RCAF presence at this 2006 Stormwater Conference is a start to these closer ties and the opportunity for the RCAF to let NZWWA and its associates know the stormwater issues facing RCAs and to highlight some common areas of work.

4 CONCLUSIONS

The RCAF Stormwater Group has put a high profile on the management of stormwater and has extended the knowledge base of those involved in roading in order to prepare them to meet the full environmental impact when needed.

There is still much to be done though, whether it be actual road run-off or stormwater from other sources that has to be managed by road asset managers.

To deal with the problems and issues ahead a unilateral front by all parties is essential.

The establishing of closer ties between the RCAF Stormwater group and appropriate groups of NZWAA is a must.

ACKNOWLEDGEMENTS

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The RCAF Stormwater Group acknowledges input to the group and roading as a whole from the following personnel:

1999	Alan Watton*	Hastings District Council/Consultant
	Peter Bielby	Hamilton City Council/Consultant
	Gary Main*	WBOP District Council
	Peter Marks	Central Otago District Council
	David Darwin	Wellington City Council
	Carolyn McCallig	Transit New Zealand
	Ian McGowan	Wanganui District Council
	Fiona Knight*	Secretary
2002	Paul Hambleton	Tansit New Zealand
2003	Peter Bailey*	Porirua City Council
	Joanna Towler	Transit New Zealand
2004	Debbie Firestone*	Transit New Zealand
2005	Graham Tong*	Palmerston North CC
	Balt Gregorius*	Land Transport NZ
	Richard Green*	Transit NzZ Region

* denotes current members of group.

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