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PREFACE

The Reticulated Stormwater Quality Improvement Plan is a requirement of the Nelson Resource Management Plan (Nelson RM Plan) if discharges from Council's stormwater infrastructure is to be considered as a controlled activity. The relevant Plan rule, FWr.22 states:

> *"Nelson City Council's point source stormwater discharges to water are a controlled activity if a reticulated stormwater quality improvement plan is provided in the discharge application which outlines how best practicable options will be used to control discharges to the Council's stormwater infrastructure."*

This Plan discusses the best practicable options available to control discharges into Council's stormwater infrastructure and will facilitate the establishment of new Levels of Service.

LIST OF ABBREVIATIONS

ANZECC	Australia and New Zealand Environment and Conservation Council
High MW PAH	High Molecular Weight Polycyclic Aromatic Hydrocarbon
ISQG	Interim Sediment Quality Guideline
Low MW PAH	Low Molecular Weight Polycyclic Aromatic Hydrocarbon
mg/kg	Milligrams per kilogram
NCC	Nelson City Council
PAH	Polycyclic Aromatic Hydrocarbon
SOE	State of the Environment
SVOC	Semi Volatile Organic Compound
VOC	Volatile Aromatic Compounds (e.g. Benzene, Toluene, Xylene)

1.0 INTRODUCTION

Stormwater is rainwater that falls to earth, runs off the surface into rivers and streams or underground aquifers, and eventually finds its way to the sea. In urban areas, stormwater is generally collected and channelled into public reticulated drainage systems, which transfer it from a catchment into a receiving environment. Nelson's stormwater receiving environments include rivers and streams and the Waimea Inlet, Tasman Bay and Nelson Haven.

Urban areas generate a variety of contaminants that are flushed into the receiving environment when it rains. Some of these contaminants come from vehicles and are deposited on the surfaces of roads and car parks. Others come from spills and poor site management in industrial and other commercial areas, building and construction activities, unsatisfactory disposal of contaminating substances around the home, and sewerage systems, which can overflow when capacity is exceeded or equipment, power or sewer pipe failure occurs.

If a stormwater drainage system exists the contaminants are collected and concentrated at the points of discharge of the pipes. Many of the contaminants are toxic and do not readily break down. The four major contaminants are:

- Sediments
- Heavy metals (e.g. zinc, copper and lead)
- Oils and greases (Polynuclear Aromatic Hydrocarbons (PAHs))
- Excess nutrients and bacteria

A high standard of water quality is needed to maintain the health of aquatic ecosystems and for the following purposes:

- Domestic water use
- Commercial water use in industry, aquaculture and fishing
- Recreational water uses such as swimming, shellfish gathering and fishing
- Scenic and tourism activities
- To protect, manage and nurture ngá taonga tuku iho (the treasured resources) for the benefit of present and future generations

2.0 NELSON IWI MANAGEMENT PLAN

Ngā Taonga Tuku Iho ki Whakatū Management Plan (The Nelson Iwi Management Plan) provides an introduction to tangata whenua beliefs, values and practices associated with the natural environment. It also provides examples of ngā taonga tuku iho (treasured resources), emphasises the legal and moral importance of Te Tiriti ō Waitangi (The Treaty of Waitangi), and explains the duty, responsibility and accountability facing tangata whenua in the present-day management of natural resources.

Ngā Taonga Tuku Iho ki Whakatū Management Plan (The Nelson Iwi Management Plan) explains that waahi tapu (including those located in freshwater) are places that provide tangata whenua with a physical and spiritual link to their ancestors. Activities or management approaches that lead to the contamination, damage or destruction of waahi tapu results in both spiritual and physical loss to tangata whenua.

Ngā Taonga Tuku Iho ki Whakatū Management Plan (The Nelson Iwi Management Plan) explains that every water body has its own mauri (life force). Only a water body with an intact mauri can sustain healthy ecosystems. Activities that reduce water quality also reduce the mauri of the water body.

Ngā Taonga Tuku Iho ki Whakatū Management Plan states:

Tangata whenua consider the maintenance of water quality to be vitally important to all life. Activities which reduce the water quality also reduce the mauri of that waterbody – the life force that sustains life and many associated values. Key concerns relate to point and non-point discharges to water such as:

- Contaminated stormwater entering water bodies
- Sedimentation of waterways that result in the loss of indigenous vegetation on river margins
- Activities that reduce water quality to the extent that a water body is unable to flush out contaminants

3.0 NELSON RESOURCE MANAGEMENT PLAN

3.1 OBJECTIVES

The Freshwater Plan change to the Nelson Resource Management Plan became operative on 1 September 2006. The Freshwater objective (DO19.1) states:

"All surface water bodies contain the highest practicable water quality."

3.2 POLICIES

The corresponding Freshwater Policies are shown in the following Table 3.1:

Table 3.1 Freshwater Plan Policies

DO19.1.1	Classification	*To classify Nelson's water bodies based on water quality standards.*
DO19.1.2	Class A freshwater-natural state	*Preserve Class A water bodies in their current state.*
DO19.1.3	Class B freshwater-slightly disturbed	*Maintain Class B water bodies in their current state.*
DO19.1.4	Class C freshwater-moderately affected	*Upgrade Class C water bodies to Class B where practicable.*
DO19.1.5	Minimum quality	*No water bodies which are of a quality less than Class C. Top priority for improvement will be those waterbodies listed as first priority in Appendix 28.4.*
DO19.1.6	Enhancing water quality	*To identify and take opportunities to enhance existing water quality.*
DO19.1.7	Effect of land use activities on surface water bodies	*To control land use activities which have potential to adversely affect surface water quality and to encourage land use activities that minimise and filter contaminants entering water bodies.*
DO19.1.8	Stormwater discharges	*The level of contaminants in point source stormwater discharges to water bodies will be avoided or remedied.*
DO19.1.9	Improvements to stormwater discharges	*When further work has been carried out to assess the quality of stormwater discharges, and practicable options for improvement have been identified by the Council, a plan change, requiring more specific water quality standards to be met, will be considered.*
DO19.1.10	New development	*Maintain existing water quality by requiring use of techniques to limit both nonpoint discharges and control point source stormwater discharges caused by land disturbing activities such as forestry, subdivisions and land development, increased impervious surfaces, and commercial and industrial activities.*

See Appendix 28.4 and 28.5 of the Nelson RM Plan for the classification of Nelson water bodies and freshwater quality standards. Note that DO19.1.4 and DO19.1.10 are subject to appeal.

3.3 EXPLANATIONS AND REASONS

Policies DO19.1.8 and DO19.1.9 relate specifically to stormwater discharges.

Policy DO19.1.8

This policy and corresponding rule for discharges to water bodies requires the best practicable option to be used to minimise the level of contaminants in stormwater discharges. This means using the best method for preventing or minimising the adverse effects on the environment having regard, among other things, to:

- *The nature of the discharge and the sensitivity of the receiving environment to adverse effects*
- *The financial implications, and the effects on the environment, of that option when compared with other options*
- *The current state of technical knowledge and the likelihood that the option can be successfully applied*

Policy DO19.1.9

- *It is expected that the prime means of improving stormwater discharges in the long term will be through adopting best management practices and/or best practicable options to prevent contaminants entering the stormwater system*
- *Specific water quality standards have not been set for stormwater discharges in recognition of the complexity of diffuse and wide-ranging sources of stormwater contamination. By April 2006 the Reticulated Stormwater Quality Improvement Plan will be completed. This plan will include proposals and procedures to reduce contamination of stormwater discharges from:*
  - *i) Council owned pipes*
  - *ii) Existing industrial and commercial activities*
  - *iii) From residential properties, controlled through the development of the NCC Stormwater Bylaw 2006*
- *Bylaws are considered an effective way to control diffuse discharges to the Council's stormwater system. By the time those diffusely collected stormwater discharges reach natural water, the opportunity to control the source contamination is lost*

3.4 RULES

The corresponding rules are FWr. 22 and FWr. 25.

Rule FWr.22 – Point source stormwater discharges to water

- *Nelson City Council's point source stormwater discharges to water are a controlled activity if a reticulated stormwater quality improvement*

plan is provided in the discharge application which outlines how best practicable options will be used to control discharges to the Council's stormwater infrastructure

Rule FWr.25 – General discharges to land where it may enter water

- *Discharges into the Council's stormwater infrastructure are permitted if they comply with:*
  - *i) The conditions in the NCC Stormwater Bylaw 2006, and*
  - *ii) Section XI: erosion and sedimentation control, in the NCC Engineering Standards 2003*
  - *iii) All other stormwater management requirements in the Plan.*

4.0 CONTAMINANTS AND THEIR ENVIRONMENTAL EFFECTS

Where a stormwater drainage system exists contaminants are collected and concentrated at the point of discharge. Many of the contaminants transported from the land are toxic and do not readily break down. The four major contaminants are:

Table 4.1 Major Contaminants

Contaminants	Sources	Potential impacts
Sediments	· Clay, silt and sand wash down from exposed earthworks on construction sites, stream bank erosion and unsealed roads · Airborne deposits from exhausts and chimneys, road surface deterioration, vehicle transported debris, degrading surfaces of buildings and vehicles, tyre wear	· Settled sediments smother habitats of bottom dwelling creatures, and spawning areas of some fish, reducing species' diversity and abundance · Reduce the amount of light entering the water making it difficult for animals to breathe and find food, and for plants to photosynthesise · Build up of sediments in the coastal environment · Leads to the build up of sediments in stormwater infrastructure, reducing flow capacity
Heavy metals	· Vehicles via tyre and brake linings wear, oils and greases or exhaust fumes · Air pollutants and leaching of exposed surfaces · Poorly maintained industrial storage areas · Industrial and trade processes · Paints, inks and dyes · Deteriorating roof material	· Heavy metals adhere to fine sediments and can stay in the river system, and estuaries for long periods · Organisms such as snails and worms living in/on sediments can accumulate heavy metals and pass them onto animals which feed on them · If concentrations are high enough, aquatic ecosystem health can be adversely affected i.e. inhibition of growth, resistance to disease/parasites, interference with reproduction and metabolism

Oils, greases and petroleum compounds	· Petrochemicals which accumulate on roads and parking lots come from vehicles losing lubricants from engines, differentials and other moving parts · From the incomplete combustion of organic materials such as fossil fuels · Fuel / oil and grease spills, leaks or illegal discharges	· PAHs can cause toxic effects in aquatic environments · Some compounds are carcinogenic at low levels · Oils form a film on the water surface preventing oxygen and sunlight entering the water, making it difficult for animals to breathe and find food, and for plants to photosynthesise · Major spills can affect aquatic species
Nutrients and bacteria	· Leaves and lawn cuttings · Organic debris, i.e. paper, food and cigarettes, animal faecal waste · Sewer overflows during storm events · Air fall deposits, i.e. pollens and fertilisers · Illegally dumped rubbish · Aquatic bird excrement · Poorly maintained industrial storage areas · Industrial and trade processes	Excess nutrient levels can lead to: · the uncontrolled growth of aquatic weeds and micro-organisms · deplete the oxygen supply · create water quality problems in streams and estuaries and for the creatures that inhabit them · Bacteria counts in bathing waters and seafood can be a human health risk

Other types of contaminants include:

- Cement and concrete. Lime is a major component of cement. When cement slurry is dissolved in water the lime produces an alkaline solution that burns and kills any animals or plants that it comes in contact with
- Pesticides, chlorine, detergents and other cleaning agents. These destroy fish membranes and remove oxygen from the water
- Acids and other corrosives change the pH of the water, harming aquatic life by killing or burning

These contaminants can become attached to the sediments in the stormwater run-off, then accumulate in areas where the sediments settle, such as river gravel banks and the semi-enclosed Nelson Haven. When sufficient contaminants accumulate in a receiving environment the flora and fauna are adversely affected. Where there is sufficient river or tidal flow, the sediments are transported to the sea.

5.0 POLLUTING ACTIVITIES

5.1 SUBDIVISION AND DEVELOPMENT

Subdivision and development generally results in an increase in impervious surfaces (i.e. increased roof, driveway, and road areas). In addition, subdivisions often results in earthworks, the removal of vegetation and changes in the natural drainage systems.

When impervious areas are constructed the stormwater runoff from land intensifies which has the potential to cause flooding and erosion.

Demolition activities associated with development also have the potential to generate increased sediment loads and poor site management can lead to chemical spillages.

5.2 RESIDENTIAL ACTIVITIES

Household and garden activities use solvents, fertilisers, pesticides, oil cleaners and paints which can enter stormwater drains.

Older residential areas may leach copper, lead and zinc from the deterioration of old paints and other coatings.

Residential areas also generate semi volatile organic compounds (SVOCs) during winter, due to the burning of wood, coal and other fuel for home heating. These SVOCs attach to sediments which then enter watercourses via stormwater drains.

Old and poorly maintained roofs contribute a major proportion of the stormwater zinc load in some catchments. Unpainted, galvanised roofs and old painted roofs that are in a poor condition can leach around sixteen times more zinc than modern Zincalume roofs or roofs that are painted with non-zinc paint.

Both urban and rural stormwater are often high in faecal bacteria and it is not unusual for runoff from well-developed urban areas to exceed the safety margins in guidelines for recreational water quality [Jagals (1997); Davies-Colley and Nagels (2001)]. The high levels of bacteria in residential areas of Nelson possibly reflect the density of mature trees supporting a significant bird population, a significant number of household pets and deteriorating sewer laterals in older residential areas.

5.3 TRANSPORT ACTIVITIES

Vehicle contaminants have been identified as coming from six key sources. These are:

- Vehicle fuel
- Vehicle exhaust emissions
- Vehicle lubricating losses

- Vehicle tyre wear
- Vehicle brake lining wear
- Road surface wear

Contaminants such as petrochemicals and heavy metals are deposited onto roads, car parks and vehicle servicing areas from motor vehicles' exhaust emissions. Generally, these contaminants are transported by runoff into drainage systems.

Copper is one of the more common metallic contaminants emitted by motor vehicles. The predominant source of copper is from the wearing of brake linings.

Zinc is released from vehicle tyres in particulate form in dry weather and during wet weather in particulate and dissolved forms.

Lead concentrations have generally decreased in urban stormwater since sales of leaded petrol were discontinued in 1996.

5.4 COMMERCIAL AND INDUSTRIAL

The main causes of pollution from industrial and trade activities are poor management practices, accidental spills, unsuitable infrastructure for the activity, inappropriate storage, and inappropriate disposal methods of industrial waste.

Chromium contamination found in sediments is an indication of specific industries discharging contaminants within a catchment, such as timber preservatives or painting.

5.5 SEWERAGE RETICULATION

Sewage can enter the stormwater system from sewerage pump station overflows, or sewerage pipe system failure or sewerage lateral cross connections.

The negative effects of sewage spills are the potential for health impacts in water used for recreation shellfish gathering areas and confined waters with poor dilution or dispersion, and a reduction in the Mauri of the water body.

5.6 SOLID WASTE DISPOSAL

Leachate and stormwater controls are mandatory requirements for new landfills. The York Valley Landfill, while not being provided with a leachate liner at the time of construction, has been constructed on relatively impermeable clay, and has had additional clay layers installed to capture leachates. It also has an extensive leachate collection system which drains to Council's sewerage network. Liquid and hazardous wastes have not been permitted to be disposed of to this landfill since 1995, and this has also reduced leachate volumes.

6.0 RECEIVING WATER PROCESSES

A range of physical, chemical and biological characteristics of waterways can be measured or assessed to tell us about various aspects of stream health.

Water quality measurements such as temperature, pH, nutrient load, clarity, and bacteria levels provide an instantaneous assessment of water quality.

Microinvertebrate surveys of mayflies, worms and snails are useful for assessing river health because their occurrence and abundance are determined by water quality, with some kinds thriving in polluted waters and others only inhabiting pristine waters.

A significant proportion of the contaminants present in stormwater settle in depositional areas within estuaries, harbours and the nearshore coastal zone. When incorporated into sediment, the contaminant can be ingested by sediment feeding biota. Sediment contaminant surveys provide a long term indication of the build up of contaminants in the water body and enable a comparison with sediment quality guidelines. The current New Zealand guidelines (ANZECC 2000) have two threshold levels above which biological effects are predicted. The lower threshold (ISQG-low) indicates **possible** biological effect, whereas the upper threshold (ISQG-high) indicates a **probable** biological effect.

The fate of contaminants in stormwater discharged to receiving environments is dependent upon whether the receiving water is fresh, estuarine or coastal and whether the contaminant is associated with particulate matter or is in a dissolved state.

6.1 FRESHWATER

Following entry into a freshwater environment, stormwater contaminants are subject to a range of physical, biological and chemical (hydrolysis, photolysis) processes. The two key processes which influence stormwater in the receiving water are dispersion (and dilution) and settlement of particulate matter.

Dilution and dispersion result in a decrease in the concentration of contaminants in the stormwater. The degree of dilution is a function of the stormwater flow and the size and flow of the receiving water.

Settlement occurs in two phases. The first is the deposit of large particles (sand and gravel etc.) by gravity immediately adjacent to the discharge location. The second is the settlement of finer particles in downstream locations such as river mouths and slow-flowing areas.

6.2 ESTUARINE AND COASTAL WATERS

Stormwater discharged into the estuarine or coastal environment is subject to similar processes to those described for freshwater. Dispersion and dilution are site-specific factors that are determined by tides, currents and by coastal geomorphology.

Settlement processes in estuarine and coastal environments comprise:

- Settlement of larger particulate material immediately adjacent to the discharge point
- Flocculation of aggregated fine particles as a result of the entry of freshwater into saline waters
- Dispersion of fine particulate matter with tides and currents

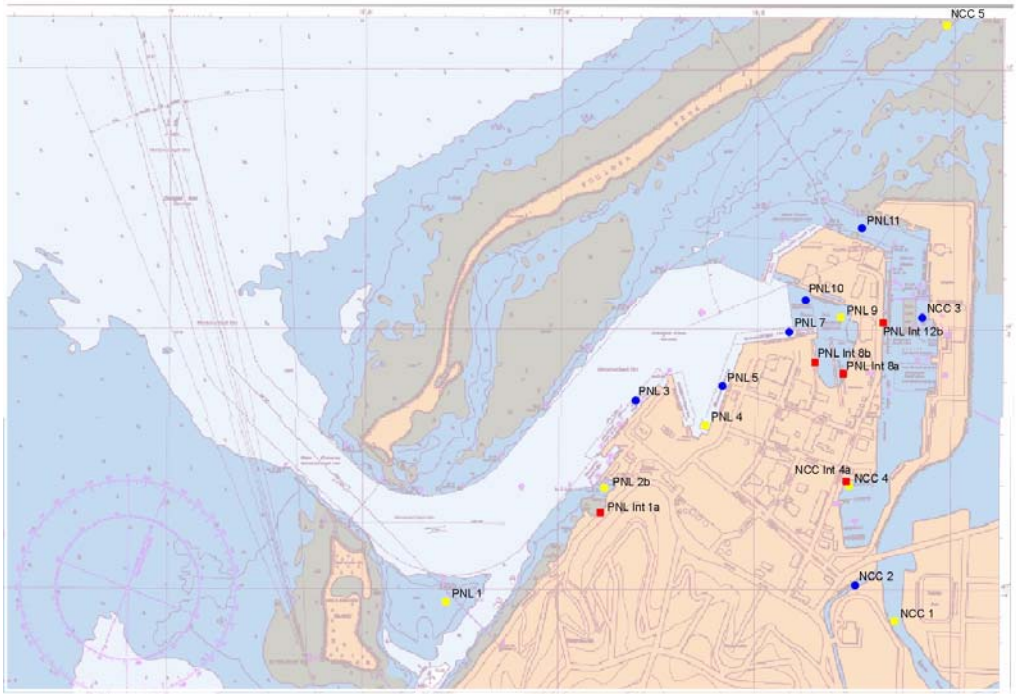
As a consequence of these processes, there tends to be halo of sediment at stormwater outfalls and river mouths.

7.0 POLLUTION MONITORING

7.1 MARINE WATERS

NCC and Port Nelson have a long term water quality monitoring programme, focussing on chemical contamination in sediments from sites within the Port and the lower Maitai River. This programme was established in 1996. Figure 7.1 below shows the location of the monitoring sites.

Figure 7.1 Monitoring Locations



The 2005 Sediment Survey found:

- Nickel concentrations exceeded the ISQG-high value (52mg/kg) at most sites, with the lower Maitai (NCC-1) having the highest concentration (210 mg/kg)
- The old boat harbour slipway (NCC-4) contained levels of zinc and copper exceeding the ISQG – high value and lead and chromium exceeding the ISQG – low value
- Lead and Zinc concentrations were generally low, apart from at the old boat harbour slipway (NCC-4) and Saltwater Creek (NCC-2), where they exceeded ISQG-low values

The 2005 assessment of organotins, PAHs and SVOCs found:

- Saltwater creek (NCC-2) sediments contains PAHs exceeding ISQG-low concentrations

- Di-(2-ethylhexyl)phthalate(DEHP), a colourless liquid used as a plasticizer to soften plastics and PVC resins was found in the Saltwater Creek (NCC-2) sediments

The programme also assesses bioaccumulation of contaminants in shellfish and show:

- Saltwater Creek (NCC-2) oysters contained copper (160mg/kg vs. MIS acceptable value of 20), zinc (952mg/kg vs. MIS acceptable value of 70) and arsenic (1.4mg/kg vs. MIS acceptable value of 1) in concentrations exceeding the international MIS levels for safe shellfish consumption

Councils State of the Environment report, "Coast 2003", identified that Nelson's bathing areas at Monaco and Tahunanui were classified Good using the "Suitability for recreation grade" (SFRG). Good is defined as "Satisfactory" for swimming most of the time. Exceptions may include following rainfall. Such beaches are monitored regularly throughout the summer season and warning signs will be erected if water quality deteriorates. Atawhai was classified as poor and Cable Bay as fair, although the exact reasons for these results have not been identified.

7.1.1. Marine Assessment

From the monitoring that has been carried out it appears that heavy metals, PAHs and SVOC levels indicate "**possible** biological effects", but that the levels are below "**probable** biological effects". The exception to this is the occurrence of elevated nickel levels. Background concentrations of nickel and chromium in the sediments of the Waimea Estuary and its tributaries are naturally elevated, due to the Nelson Mineral Belt within the catchment.

7.2 FRESHWATER

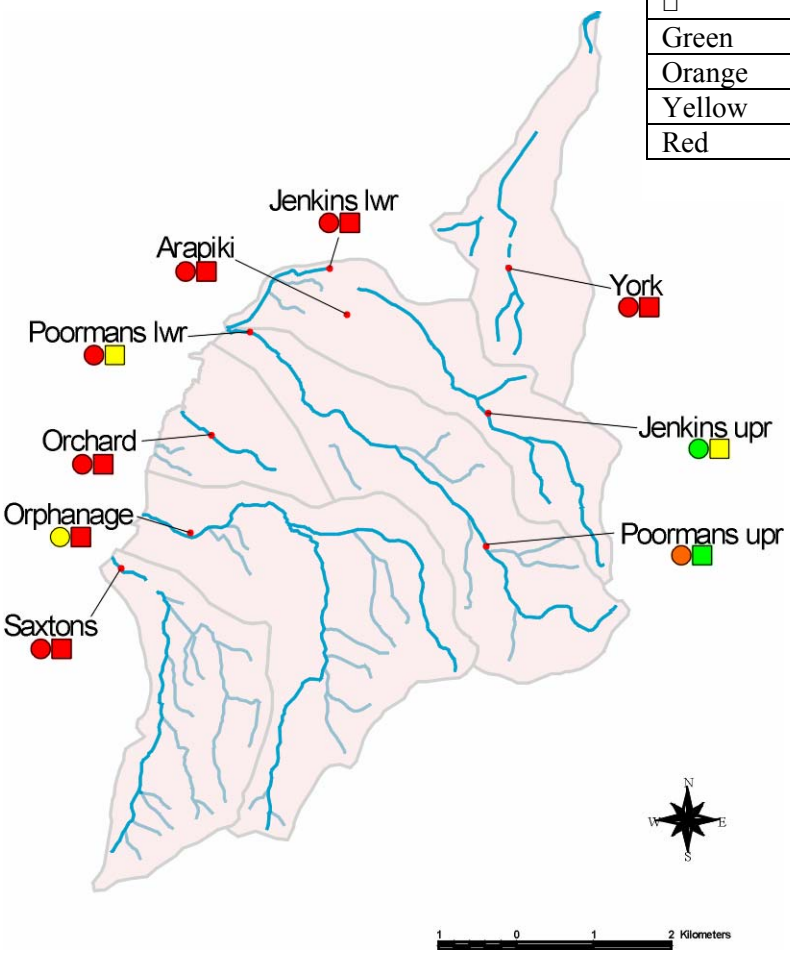
Cawthron has been commissioned to carry out three studies on Nelson's rivers in recent years and these provide an indication of the levels of stormwater contamination:

- Surface Water Quality in the Nelson Region 2000/2001, May 2002, (No. 685)
- The current state of the Maitai River, September 2004, (No. 857)
- Sediment contaminant levels in Nelson area catchments, October 2003, (No. 848)

The first of these reports found that the Stoke streams (Saxton, Orphanage, Orchard, Poormans and Jenkins) and York Stream constituted a highly impacted, poor quality group of waterways. See Figure 7.2 below.

Figure 7.2 Summary diagram of macroinvertebrate indices and water quality in the Stoke fan and York streams

Legend	
○	Macroinvertebrate indices
□	Water quality
Green	Good
Orange	Slightly impacted
Yellow	Moderately impacted
Red	Severely impacted



Physical stressors, such as deposition of fine sediments in the stream bed and lack of shade in the lower reaches of streams, combine with chemical stressors, such as high conductivities, low dissolved oxygen, low water clarity and high temperatures to have severe impacts on the biological communities that live there. Levels of contamination by bacteria are extremely high in many streams and high nutrient levels allow abundant growth of algae in unshaded streams.

The least impacted stream was the Poormans Valley Stream, the headwaters of which flow through the Marsden Valley reserve. Physical habitat, water quality and biological communities at the upper site were excellent.

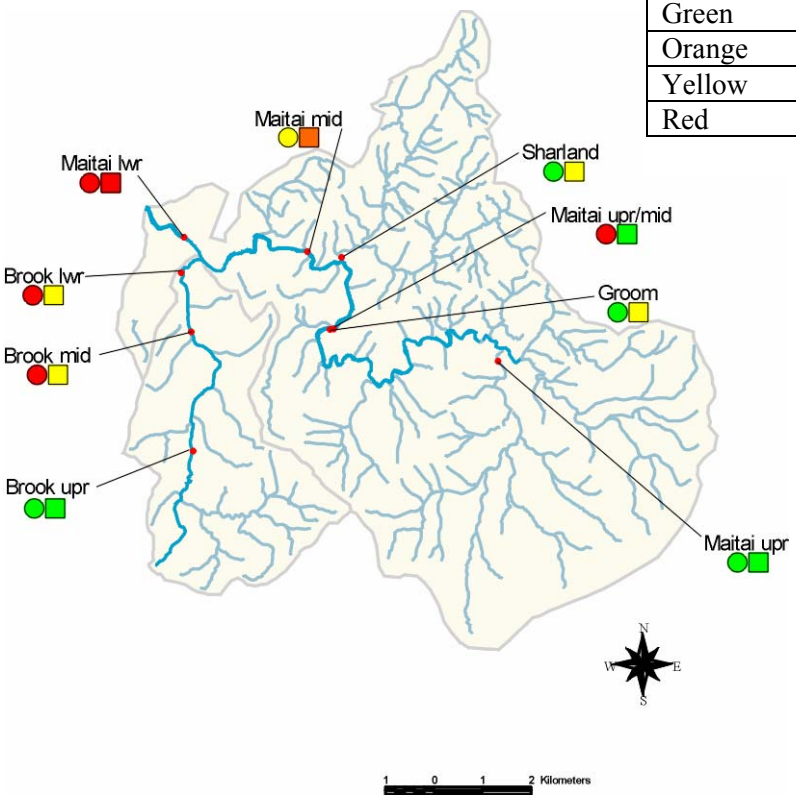
The lower reaches of Saxton Creek, Orphanage Stream, Orchard Creek and Arapiki Stream were all severely impacted.

Water quality samples in the Maitai River were generally good at the upper survey sites, with well vegetated riparian zones, little sand and silt in the riverbed, satisfactory dissolved oxygen, nutrient and bacteria concentrations and relatively good water clarity. However, the lower survey site exhibited a decline in quality, with increased levels of bacterial contamination (in some cases well above the trigger level for contact recreation), decreased water clarity and high summer temperatures.

The three tributaries of the Maitai River which were monitored (Brook, Sharland and Groom) varied in quality but generally were in poorer condition than the main river. Bacterial contamination commonly exceeded trigger levels for contact recreation in all three waterways and increased markedly between the Brook upper and the two downstream sites. Similar patterns were seen for some other parameters in the Brook with water clarity decreasing, nitrate concentrations increasing and quality of microinvertebrate communities decreasing downstream.

Figure 7.3 Summary diagram of macroinvertebrate indices and water quality in the Maitai catchment

Legend	
○	Macroinvertebrate indices
□	Water quality
Green	Good
Orange	Slightly impacted
Yellow	Moderately impacted
Red	Severely impacted

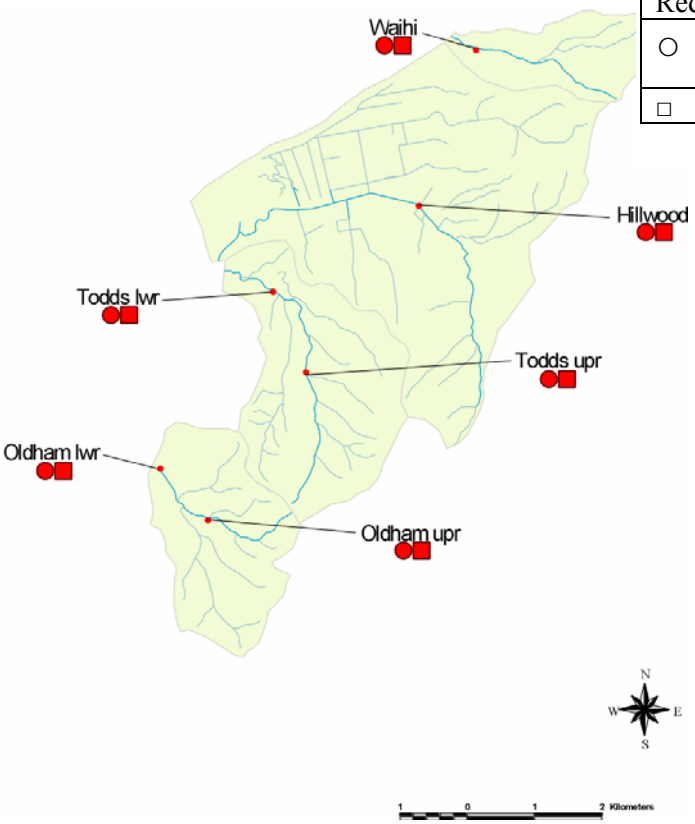


Other findings were that Oldham Creek is in poor condition, with occasional high E.coli concentrations at the upper site and regular high E.coli concentrations, high nutrient concentrations, fine grained beds and poor macrovertebrate communities at the lower site.

Todd's Valley Stream is also in poor condition, with little shading of the channel, predominantly fine grained and mobile sediments and occasionally low dissolved oxygen levels. In addition high E.coli and nutrient levels were evident, particularly at the lower sites.

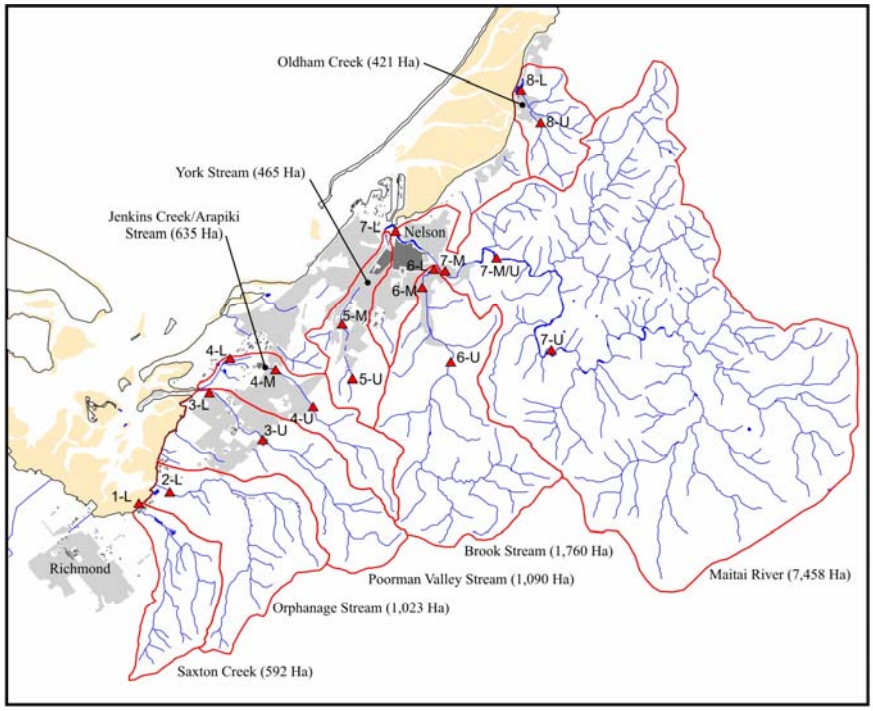
Figure 7.4 Summary diagram of macroinvertebrate indices and water quality in the Atawhai and Glenduan streams

Legend	
Red	Severely impacted
○	Macroinvertebrate indices
□	Water quality



Over the last twenty years Nelson City Council has conducted a variety of studies into sediment quality at various locations throughout the city. Figure 7.5 shows the location of the sampling sites and their respective catchments.

Figure 7.5 Sediment Monitoring Locations



The majority of sites contained low levels of cadmium, copper and lead that were below the ISQG-low values; however, there was a trend evident of an accumulation of copper, lead and zinc within the lower catchment areas.

The lower Jenkins lower Maitai and mid York sites exceeded the ISQG-low value for lead (50 mg/kg), and copper concentrations exceeded the ISQG – low value (65 mg/kg) at the lower Jenkins site, mid York Streams and zinc concentrations exceeded the ISQG – low value (200 mg/kg) at all rivers and streams except Oldham Stream. Zinc levels exceeded the ISQG – high value (410 mg/kg) at Orchard Creek, Maire Stream and the lower Jenkins Stream (although this has since been remediated).

The lower Maitai River site contained very high levels of some SVOCs, a number of which were above the ANZECC (2000) ISQG-high guidelines, indicating probable adverse ecological effects. Of particular concern are the levels of some high MW PAHs, which significantly exceed the guideline values. Additionally, the sum of the low MW PAHs and the sum of the high MW PAHs both exceeded the ANZECC ISQG-high guidelines (in the latter case, by three times the guideline value).

7.2.1. Freshwater Assessment

PAHs are ubiquitous stormwater and industrial-related contaminants produced mainly by incomplete combustion of organic materials, petroleum-based materials and vehicle exhausts. SVOCs typically associate with the organic carbon fraction of the sediments (and concentrate in the fine, muddy sediments).

The lower Maitai River contained very high levels of SVOCs. The contamination of the lower Maitai reflects long-term accumulation of contaminants from stormwater runoff from central Nelson and the residential areas (Maitai River and Brook Stream catchments), as well as lower Saltwater Creek.

The mid Brook and the upper Jenkins monitoring sites both featured elevated levels of some PAHs and SVOCs, many of which exceeded the ISQG-low criteria. These areas are both predominantly residential areas settled for over 100 years, and have very little or no industrial activity contributing to the local catchment. It is likely that vehicles and the use of open fires and wood burners for home heating in these areas contributes significantly to the PAH input into the waterways.

7.3 STORMWATER

The Council appointed Cawthron to carry out a survey of stormwater discharges from various Nelson City catchments. The results of this survey are contained in the Cawthron report Stormwater Monitoring for Nelson City 2004, July 2005 (No. 917).

The catchments chosen were:

- Kingsford Dr - new residential
- Bronte St - old residential
- Songer St – Undeveloped
- Bolt Rd – light industrial

The survey generally found high levels of faecal coliforms at each site. Bolt Rd had the lowest levels of faecal coliforms but the highest levels of suspended solids, nitrogens, dissolved reactive phosphorous, zinc, copper and lead. All the other sites had these contaminants, but to a lesser extent. Oils, greases, SVOCs and VOCs were only found in very low levels.

Comparing zinc loads from the two residential catchments, it appears likely that the older roof surfaces in Bronte St contribute significantly more zinc to stormwater than do the newer roof surfaces in Kingsford Dr.

The stormwater discharge survey found that the industrial and older residential catchments contributed significantly greater amounts of heavy metal contaminants than those of undeveloped, less built-up residential areas, or newer residential areas.

Council also commissioned Cawthron to carry out an assessment of sediments at the Collingwood Street stormwater outfall. The levels of metals in the sediment collected from outside the stormwater outfall pipe were consistently elevated, with the exception of cadmium. Lead and zinc concentrations exceeded their corresponding ISQG-low trigger values, and copper and nickel exceeded the ISQG-high criteria, for example, nickel was found to be 720 mg/kg (compared to the ISQG-high level of 52 mg/kg).

In September 2005 Council commissioned the Lawless Edge Ltd to carry out the Tahunanui Stream Care Project. The project provides an explanation why contaminant levels appear greater below the industrial and commercial areas. The associated report states:

"Only four of thirty sites inspected had entirely adequate stormwater management practices. These sites were Works Infrastructure, TNL, Fulton Hogan and Allied Concrete. All other sites visited could have useful improvements.

The most common issues were:

- *Vehicle wash down with no treatment or inadequate treatment before discharge to stormwater*
- *Unsealed sites with high volume run-off of sediment laden water to stormwater and streams*
- *Oil, grease and diesel reaching stormwater due to lack of oil traps, or poor management and maintenance practices*

In some cases persistent toxic substances such as heavy metals were being handled in areas from which stormwater flowed.

Other issues identified in the report were:

- *Lack of esplanade strip*
- *Poor rubbish and dust management*
- *Poor hazardous waste storage practices*
- *Poorly maintained and construction sumps, sediment traps, oil traps and wash down facilities*
- *Lack of awareness of the potential effects on the environment*

7.4 LANDFILL MONITORING

Council has a comprehensive annual monitoring programme for the York Valley Landfill to comply with its resource consent conditions. The monitoring carried out includes:

- Leachate
- Ground water
- Stormwater

Captured leachate is collected and disposed of to the Council's sewerage infrastructure. Ground water monitoring is carried out to determine if leachate is evident.

The 2005 Tonkin and Taylor monitoring report states:

> *"The continuing absence of key leachate indicators (chloride, boron, ammonia – N, high conductivity) in groundwater indicates that leachate is not migrating to groundwater."*

The resource consent limits suspended solids discharges to 100mg/l.

The 2005 Tonkin and Taylor monitoring report states:

> *"The suspended solids content at the stormwater discharge point (location iii) frequently exceeds 100mg/l. However, the most recent result (September 2005) indicates a suspended solids concentration of 68mg/l. Suspended solids concentrations in excess of 100mg/l represent an exceedance of Resource Consent Condition RM055044. A review has been undertaken of the operation of the sediment pond and as a result, a number of operational changes are being made. In particular, the area of disturbed or unvegetated land is being significantly reduced. In addition, a variation to the resource consent conditions is to be sought that covers the operation of the sediment pond."*

8.0 ASSESSMENT OF EFFECTS

Freshwater organisms below stormwater outfalls are exposed to pulses of contaminants following rainfall events. They are generally exposed to a "first flush" containing significant concentration of some contaminants. This may be followed by prolonged exposure at lower levels.

The pulse nature of stormwater flows and the large range of factors influencing its quality make the determination of probable environmental impacts very difficult. For example, the effects of high metal concentrations on toxicity in the environment vary significantly with other parameters such as pH, reduction and oxidation (redox) potential and temperature. Complications may also arise from the effects of interactions that occur between some contaminants. The effects of short and intermittent runoff events cannot be easily compared to the criteria or standards for impacts from steady-state water quality in Appendix 28.5 (Freshwater Quality Standards of the Nelson RM Plan). The high contaminant levels typically associated with urban stormwater represent decreases in water quality of relatively short duration.

Stormwater runoff is often diluted by the higher quality water of the receiving environment. For these reasons, surface water quality guidelines developed for other purposes should be used as points of comparison but are of limited use in direct application to stormwater.

Sediment accumulation of contaminants will ultimately affect water quality even during baseflows and may have significant and lasting effects upon benthic communities.

Urban stormwater is possibly the largest and least easily managed source of contaminants to the coastal environment and is particularly relevant to the Nelson region where most urban stormwater flows into the Nelson Haven and the Waimea Estuary.

The revised ANZECC (2000) guidelines recognize that there are appropriate levels of protection based on the type of aquatic ecosystem. There are guidelines for three main types of ecosystems:

i. High conservation/ecological value systems – effectively unmodified or other highly-valued ecosystems, typically (but not always) occurring in national parks, conservation reserves or in remote and/or inaccessible locations. While there are no aquatic ecosystems in Australia and New Zealand that are entirely without some human influence, the ecological integrity of high conservation /ecological value systems is regarded as intact.

ii. Slightly to moderately disturbed systems – ecosystems in which aquatic biological diversity may have been adversely affected to a relatively small but measurable degree by human activity. The biological communities remain in a healthy condition and ecosystem integrity is largely retained. Typically, freshwater systems would have slightly to moderately cleared catchments

and/or reasonably intact riparian vegetation; marine systems would have largely intact habitats and associated biological communities. Slightly moderately disturbed systems could include rural streams receiving runoff from land disturbed to varying degrees by grazing or pastoralism, or marine ecosystems lying immediately adjacent to metropolitan areas

iii. Highly disturbed systems – these are measurably degraded ecosystems of lower ecological value. Examples of highly disturbed systems would be some shipping ports and sections of harbours serving coastal cities, urban streams receiving road and stormwater runoff, or rural streams receiving runoff from intensive horticulture

The studies indicate significant degradation of water quality in the urban areas of Nelson City which could be classified as moderately to severely disturbed ecosystems. This degradation is consistent with that expected for an urban environment.

To date there have been no studies into the effect of this degradation on the greater estuarine and marine environment.

9.0 CATCHMENT ANALYSIS

Individual catchment plans are available for the city's stormwater infrastructure. The collation of these plans requires further work before they can be published. Additional work is also required to extend the catchment plans to all rivers and coastal stormwater discharges.

9.1 STORM WATER OUTFALLS

From the plans the number and size of stormwater discharge pipes to Nelson's rivers can be ascertained. These are shown in Table 9.1 below.

Table 9.1 Pipes Discharging Stormwater to Nelson's Urban Rivers by Pipe Diameter Categories

	Pipe Diameter (millimetres)				
	0 to 299	**300 – 699**	**700 - 1299**	**1300 +**	**Total**
Orphanage	12	9	6	0	27
Orchard	6	15	9	1	31
Poormans	12	9	4	0	25
Arapiki	3	15	4	1	23
Jenkins	4	9	7	0	20
York	15	16	4	7	42
Brook	12	28	8	0	48
Maitai	15	15	5	2	37

The catchment plans also identify 24 stormwater pipes greater than 800mm diameter which discharge directly to the coastal environment.

9.2 STORMWATER CATCHMENT ZONES

The plans also enable an assessment of the zoning of the area draining into each river to be carried out. Note that the catchments only include drainage from stormwater infrastructure and do not include the areas that directly discharge to streams, i.e. upstream rural land. The area of each zone is shown in Table 9.2 below.

Table 9.2 Land Zone Area

	Stormwater infrastructure catchment area (Ha)	**Residential %**	**Inner city, commercial or industrial %**	**Rural %**	**Open space recreational %**	**Roads and Footpaths %**
Orphanage	175	47	4	23	18	8
Orchard	140	74	3	3	4	16
Poormans	98	72	1	0	17	10
Arapiki	179	63	19	0	1	17
Jenkins	188	53	13	19	1	14
York	715	60	7	4	15	14
Brook	269	35	0	39	16	10
Maitai	254	37	11	24	12	16
TOTAL (Ha)	2,018	54% (1,087Ha)	7% (148Ha)	14% (275Ha)	12% (239Ha)	13% (270Ha)

Just over half of the city's stormwater catchment is Residential, 13% is roads and footpaths and 7% is Inner City, Commercial or Industrial land.

9.3 STORMWATER SUMPS

An assessment of the number of stormwater sumps has also been carried out. There is a total of 9,555 sumps in the urban area of Nelson City. The table below identifies the number of sumps by ownership and zoning.

Table 9.3 Number of Sumps by Ownership and Zoning

		Private	**NCC Roading**	**NCC Stormwater**	**NCC Reserves**	**Port Nelson**	**Nelson Airport**	**Transit NZ**
Residential		2,025	4,466	333	23			178
Suburban commercial		98	143	10	1	4		
Inner city		254	376	12	3			
Industrial	Vanguard	61	42	19				4
	Port	20	141	6	1	149		
	Tahunanui	165	143	11			61	22
	Nayland South	44	45	8				11
	Wakatu	2	15					3
Open Space recreation		63	204	55	227		5	8
Other, i.e. rural		26	37	10	3			18
TOTAL		2,758	5,612	464	258	153	66	244

10.0 STORMWATER QUALITY IMPROVEMENT METHODS

10.1 STREET CLEANING

City street cleaning is carried out under Council's road maintenance contract. Arterial and principal streets in the CBD are swept twice a week. Local CBD streets are swept three times a week; arterial roads are swept weekly, principal roads every two weeks and collector and sub-collector roads monthly.

CBD footpaths and car parks are swept twice a week and Stoke car parks once a week. In addition CBD central asphalt footpaths are washed once every two weeks.

Until July 2006 footpath wash water and street sweepings on wet days were disposed to a city sump in Montgomery Square. Dry material is now disposed of to landfill and liquid material is now disposed to the sewerage infrastructure as trade waste.

10.2 SUMP MAINTENANCE

Between the street surface and the stormwater system are sumps. The sump function is to trap particulate debris and prevent it from entering the stormwater system. The base of the sump usually remains filled with water sediment and pollutants between storm events.

The quality of the sump water has the potential to influence the quality of the initial volume of stormwater discharged to the receiving water.

Nelson City Council owns approximately 5,612 sumps in roads and car parks. Council's road maintenance contract requires every Council owned sump and Transit NZ owned sump in the urban area be cleaned out annually and all sumps and associated pipework to be 95% clear of debris at all times. Until July 2006 sump cleanings were decanted back into the stormwater system and the settled contaminants were disposed to landfill. Since July 2006 all liquid cleanings are disposed to the sewerage infrastructure as trade waste.

NCC records indicate that there are an additional:

- 2,758 private sumps
- 153 sumps owned by Port Nelson
- 66 sumps owned by Nelson Airport

There is no regulatory requirement to carry out regular maintenance on these sumps.

10.3 SUMP FILTERS

Sump filters are fine mesh filters (although materials such as wool are also available) which are inserted into the sump to trap suspended solids when stormwater passes through them, thereby also trapping attached contaminants

such as heavy metals, oils and greases. Filters are available in differing mesh sizes depending on the particle size requiring containment, from 100 to 4000 microns. Mesh size choice depends on:

- Contaminant generation loads
- Particle capture requirements
- Anticipated cleaning frequency

Maintenance is carried out by replacing the filters or emptying them using a sump cleaning truck.

Council has installed these filters at the Wakefield Quay car park. From inspection it would appear that they will require emptying once a year. This may be due to the small catchment area involved.

10.4 GROSS POLLUTANT TRAPS

Gross pollutant traps may be nets that attach to the stormwater outfall pipe and catch large particles and litter. The gauze size is usually around 3mm. Although these only capture larger particles, they also capture contaminants which attach themselves to these larger particles, i.e. capture of leaf litter also captures oils and particles that attach to leaves. In a storm event, if the net becomes full or prevents the stormwater flow discharging, it detaches from the pipe and tethers itself, making retrieval simple.

There are several types of gross pollutant traps available depending on the situation; another example is a mechanical litter trap which could be placed across Saltwater Creek to trap floatable litter and vegetation.

Another type of trap, a hydrodynamic separator, induces a vortex in a specially designed stormwater manhole, thereby permitting separation of suspended solids. These solids can then be trapped and the stormwater allowed to pass through.

10.5 OIL AND WATER INTERCEPTORS

Oil and water interceptors remove oil from contaminated stormwater. There are several proprietary interceptors available depending on the flow and standard of oil removal required. Interceptors can be designed to treat all stormwater or just the first flush water. Interceptors are not designed to trap sediments or any other forms of pollutants. Interceptors cost around $3,000 to install and $200-300/yr to maintain.

10.6 FILTER SYSTEMS

Filter systems using sand, topsoil, compost or synthetically manufactured material remove sediment particles and contaminants. Filter material is generally placed in large underground concrete chambers.

10.7 INFILTRATION SYSTEMS

Infiltration of stormwater to the ground is a method of removing contaminants from stormwater. Stormwater is encouraged to soak into the groundwater table thereby being filtered as it flows through the ground. There are several methods of achieving infiltration, such as specially constructed trenches, swales, soakage pits, porous roads and pavers and rain gardens. Comprehensive guidelines to construction methods have been developed in New Zealand in recent years. Infiltration has the potential to contaminate groundwater.

Excavation and disposal of contaminated ground surface will be required every five to ten years.

Infiltration is not permitted in the NCC Engineering Standards except in certain parts of Stoke and The Wood area.

10.8 COLLECTED CONTAMINANTS

The characteristics of collected contaminants depend upon the catchment and the method of collection. Council's York Valley Landfill has strict waste disposal requirements as a condition of its resource consent. Materials that are suspected of containing hazardous material require testing to ensure that compliance with the consent conditions is achieved prior to disposal. If a test shows that they do not meet the requirements they have to be disposed of to a registered hazardous waste operator for specific processing. Nelson's nearest hazardous waste operator is based in Blenheim. No testing has been carried out to date to determine if the captured contaminants in ground through which stormwater has been infiltrated would comply with landfill disposal requirements.

11.0 RECOMMENDATIONS

11.1 GENERAL

Defining a stormwater discharge standard is theoretically feasible, but establishing an appropriate standard that relates to the water quality standards identified in the Nelson RM Plan, taking into account the permitted reasonable mixing zone for stormwater discharges which is 30 times the receiving water channel's width, and the cumulative effects of contaminated discharges is extremely difficult. A best practicable options approach to minimise the level of contaminants from stormwater discharges is considered more appropriate for addressing stormwater discharges because of the:

- Impracticality and expense of carrying out detailed site specific assessments to set allowable concentrations for site specific stormwater discharges
- Difficulty of representative sampling of runoff events to ensure compliance with concentration limits
- Difficulty of assessing if specific proposals will comply with environmental controls in all storm events

The Nelson RM Plan recognises this in Policy DO19.1.8.iii (see section 3.3):

The corresponding rule FWr.25 (see section 3.4) classifies discharges to Council's stormwater infrastructure as a discharge to land and states that this discharge is permitted if it complies with:

- *The conditions in the NCC Stormwater Bylaw 2006*
- *Section XI: erosion and sedimentation control, in the NCC Engineering Standards 2003*
- *All other stormwater management requirements in the Plan*

The Nelson RM Plan has therefore identified that a stormwater bylaw is necessary to control diffuse discharges to the Council's stormwater system if the discharge is to be considered a controlled activity, because, without such control *"by the time those diffusely collected stormwater discharges reach natural water, the opportunity to control the source of the contamination is lost"*.

Different land use activities generate different types of contaminants, in different quantities at different locations, depending on the process which generates them. As such, best practicable options need to be considered for differing land use activities and specific strategies developed on an activity basis.

Appendix A provides a schematic summary of the recommendations from this Reticulated Stormwater Quality Improvement Plan. The recommendations are based on Option 2 of Appendix B.

Appendix B identifies three options which address contaminants from critical commercial and in industrial activities, and Council's critical roads and car parks, stormwater outfalls and rivers and education and enforcement strategies.

Appendix C provides a cost benefit analysis of the three options identified in Appendix B.

Appendix D is the proposed Stormwater Bylaw.

Appendix E is the proposed Pollution Prevention Guide.

11.2 MINIMUM STANDARD

Council's Freshwater Plan change rule FWr.22.2 specifies that point source stormwater discharges directly to a river are controlled activities if:

a) They do not:

i) Contain any chemicals, paint, oil, grease, pesticides, fertiliser, tannins, detergent, grass clippings, rubbish, litter, or heavy metals that are, or are likely to be, toxic to the aquatic ecosystem

ii) Cause the production of conspicuous oil or grease films, scums or foams, or floatable material

iii) Cause a conspicuous change of colour or visual clarity

iv) Cause an emission of objectionable odour

v) Cause adverse effects on aquatic life

vi) Contain suspended solid concentrations in excess of 100mg/litre

vii) Contain any hazardous substances, waste water or trade wastes, or

b) The best practicable option (e.g. oil separation, screening, filtering or settlement devices, or diversion to the sewerage system or a combination of these options) is taken at source to ensure that contamination of stormwater is minimised.

Compliance with the NCC Stormwater Bylaw 2006 will be deemed to be complying with condition b) of this rule, with the exception that the bylaw will be administered as a guide, and approval will be through the Consents process rather than through authorisation by the Manager Infrastructural Assets.

Control reserved over:

i) The volume and level of contamination, and

ii) The method of discharge and effects arising from the method chosen, and

iii) The provision and adequacy of equipment for the collection, treatment and disposal of any discharge

Note: Shaded areas are subject to Freshwater Plan Change Appeal

Rule FWr22 in effect requires that a minimum standard and best practicable options are adopted to ensure that contamination is minimised. It is considered that a minimum standard is required for discharges into Council's stormwater infrastructure so that, as far as is practicable, the requirements for a discharge to Councils stormwater infrastructure match that required for discharge directly to a river.

It is acknowledged that most discharges that do not comply with the minimum standards will be undetected and that also it is often difficult to identify the source of any non-complying discharge that is detected. This is an inherent problem with trying to control stormwater discharge quality. It will be possible, where the environmental effects are obvious and immediately identifiable, or where evidence is provided by the public, to trace the source of the non-complying discharge. Examples are:

- The discharge of high concentrations of suspended solids from earthworks sites
- The discharge of large quantities of oils and greases
- The discharge of chemicals which have a visual effect in water and which do not disperse rapidly

The benefit of this minimum water quality standard is to improve receiving water quality which, with adequate resources and information, can be enforced.

Exclusions to the minimum standard are proposed for:

- Critical industrial and trade processes (addressed in 11.3 below)
- Activities for which best practicable options are already in place
- Non stormwater discharges that are permitted to freshwater by rule FWr.20.1 of the Freshwater Plan change
- Discharges that do not comply with the Stormwater Bylaw, but which operate pursuant to a specific consent to discharge as a discretionary activity

11.3 CRITICAL COMMERCIAL AND INDUSTRIAL ACTIVITY

Some industrial and trade processes produce higher levels of contaminants in stormwater and/or present a higher potential risk for spills, leaks or illicit discharges. The adoption of minimum standards is not considered appropriate for these activities as it is likely that at some unknown point in the future the standard would be exceeded.

These activities usually have processes that generate contaminants, or use materials that would be classified as contaminants if they were accidentally discharged into the stormwater system. It is recognised that it is impractical to expect all these activities to comply with the minimum stormwater quality standards at all times but in most cases improvements could be made to reduce the risk of such discharges occurring.

The monitoring that has been carried out indicates that heavy metals, PAHs and specific industry generated chemicals are being discharged to the environment from industrial and commercial zoned land at greater levels than from other areas, and that the extent of this occurrence indicates **probable** biological effects. An assessment of industrial sites in the Tahunanui catchment found that generally the stormwater management practice was inadequate.

Controls to improve management practices are relatively simple and widely recognised throughout the world. These include:

- Identification of site drainage, to ensure there are no cross connections
- Ensuring that trade wastes are disposed of correctly
- Ensuring that suspended solids are not generated, or are contained on site and suitably disposed
- Ensuring that materials are stored correctly to prevent leakage and spillage
- Ensuring that refuelling and car wash areas are drained to the sewer and covered or mechanical devices installed to ensure contamination of stormwater does not occur
- Ensuring that waste disposal is adequately managed
- Ensuring that large industrial, galvanised roofing materials are painted with non-zinc paint in a good condition and do not leach metals
- Ensuring that oil interceptors are installed where necessary
- Ensuring that spill prevention plans and spill response procedures are developed, implemented and maintained
- Ensuring that stormwater sumps are regularly maintained
- Ensuring that Infrastructure is maintained to good standards

Implementation of these practices will be via the Stormwater Bylaw which will require pollution prevention plans to be developed and implemented.

Another option would be to facilitate an industry led approach to implementation of these controls, although it's considered that industries may be reluctant to commit to the required investment without backup regulation.

Another option is to require these sites to comply with minimum discharge standards. For industry to comply with this option stormwater treatment devices would be required, at a significantly greater expense to industry. It is considered that the level of contamination occurring in Nelson does not warrant such measures.

11.4 NELSON CITY COUNCIL ROADS AND CARPARKS

Roads and carparks are impervious surfaces where contaminants fall and are flushed into stormwater infrastructure during rainfall. Vehicle emissions and airborne contaminants are considered to make up a large proportion of the

contaminants that accumulate in the receiving environment. Typical contaminants from these sources are zinc, lead and PAHs. Monitoring indicates that lead levels, are high but reducing, but that levels of zinc and PAHs are significant enough to cause **probable** biological effects.

It is difficult to correlate the direct effect of traffic with the environmental monitoring results but it does appear from monitoring that high traffic areas and large parking areas generate more contaminants than lower trafficked areas.

The monitoring results show a significant problem with PAHs in the lower Maitai River, but not in other rivers. It is proposed that measures to address this type of contamination should focus on this area only. Such measures proposed are:

- Continue regular street sweeping of the city's streets
- Increase the frequency of sump cleaning from annually to quarterly
- Install gross pollutant traps at critical stormwater falls

Existing traditional treatment provides the removal of contaminants from the City's car parks and roads through sump cleaning and street sweeping. This form of treatment may be more effective than the monitoring implies. Unfortunately collected contaminants have, until recently, been discharged back into the receiving environment. This procedure has now been stopped so that contaminants are discharged to the landfill, or to sewerage as trade waste. It is considered that this in itself will lead to improvement in the downstream environments.

Another measure is to increase the frequency of sump cleaning in the CBD. A brief inspection of the sumps in the CBD indicates that they are successful in capturing leaves (which contaminants attach to), gross pollutants, and some oils and greases. When it rains the sumps are stirred up and some of the collected contaminants are flushed downstream. If these critical sumps were cleaned out more frequently then less of these contaminants would be released.

Another measure is to provide stormwater treatment. The costing provided in Appendix B is for the installation of sump socks.

The recommendation is that sump cleaning frequency is increased and monitoring continued as this method is cost effective. An advantage of this option is that it does not rely on new technology and innovation for which maintenance issues may arise in the future.

11.5 NCC STORMWATER OUTFALLS

Gross pollutants are larger sized inert pollutants. Typical gross pollutants include cigarette butts and small plastic drink bottles. Net traps can be installed to capture these types of pollutants at the outfalls of critical stormwater pipes.

11.6 NCC URBAN RIVERS AND STREAMS

Wetland type treatment ponds, when correctly constructed and maintained, have proved to be successful in the Auckland region at removing contaminants provided around 10% of the constructed cost is provided for maintenance each year. In Nelson there are a limited number of locations where these could be installed. However, it is proposed that these opportunities where improvements can be made in water quality should be taken.

11.7 EDUCATION

For residential and non critical commercial premises an education strategy will be developed, aimed at raising awareness to the Stormwater Bylaw minimum standards and focusing on:

- Residential car wash discharges to the stormwater system
- Residential discharge to the stormwater system of building waste water, garden pesticides, detergents and other cleaning agents
- Commercial discharge to the stormwater system of shop wash water
- Condition of galvanised roofs and zinc based painted roofs and encouragement towards Zincalume roofing materials and non-zinc paints

For construction activities education will be provided on the Erosion Sedimentation Control Standard.

11.8 IMPLEMENTED BEST PRACTICABLE OPTIONS

11.8.1. Air Quality Plan

Sediment contaminant monitoring has clearly identified elevated levels of some PAHs, exceeding ISQG-low, in residential, low trafficked catchments. The freshwater assessment identified open fires and wood burners as sources of PAHs, that, when released into the atmosphere, attach to particles, come to rest on impervious surfaces and enter the freshwater environment, via stormwater infrastructure. Implementation of the NCC Air Quality Plan could therefore be expected to reduce the levels of these contaminants in stormwater.

11.8.2. Erosion and Sedimentation Control Plan

Sedimentation of Nelson's rivers, streams and stormwater reticulation systems, over and above natural sedimentation levels, has led to:

- A reduction of the stormwater system flood flow capacity
- Additional capital and maintenance expenditure to maintain capacity
- A reduction in river, stream and coastal water quality

The erosion and sedimentation control standards, adopted by Council in June 2005 and published in the Engineering Standards revision issued March 2006 apply to all land disturbing activities except general farming and forestry. The

standards are enforced by the Infrastructural Assets Division, except for residential dwelling construction sites where the standards are enforced by the Building Inspectors. Erosion and Sedimentation control standards specific to the Forestry Industry are being developed by Council's Policy Division.

11.9 BEST PRACTICABLE OPTIONS FOR FUTURE CONSIDERATION

Low impact design techniques such as reducing the amount of impervious surface allowed in developments, reducing road widths, reducing kerb and channel requirements, requiring rainwater storage tanks, and other infrastructural design techniques have the potential to improve stormwater quality, but also have potential to conflict with other outcomes sought by the Community ie. road widths. The RM Plan states that any change in approach needs to be consistently addressed in the Long Term Council Community Plan, Asset Management Plans, Engineering Standards and the Nelson Resource Management Plan and involve active consultation with the community, particularly developers.

Landcare Research was commissioned to advise Council on practical options that could be used in Nelson to implement low impact design. In addition to minimising site disturbance during construction, Landcare's report also identifies the following methods:

- Identifying and retaining natural features and soil properties
- Reducing imperviousness
- Lot clustering
- Vegetated infiltration devices, alternative media filters and wetlands.
- Topsoil management
- Rainwater tanks

Method DO19.1.9 of the Freshwater Plan states:

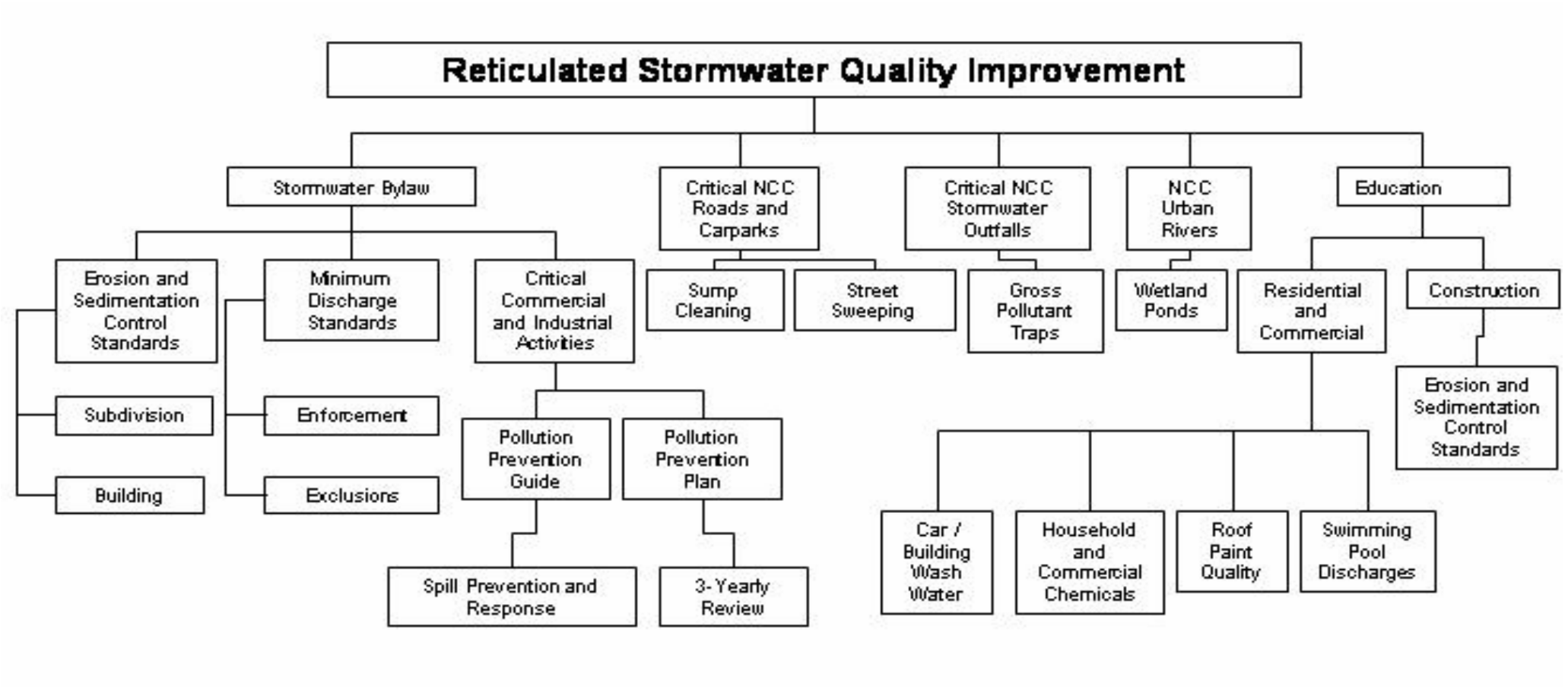
a) Seek advice on the practicable options for changes in the Council's land use provisions in order to work towards stormwater infiltration to pre-development levels while maintaining secondary stormwater system with Q15 capacity and a tertiary stormwater overland flow with Q100 capacity.

b) Assess the costs and benefits of those options.

c) If conclusive information is available that such methods are practicable in Nelson, consider amending Council planning documents to provide for the low impact stormwater management approach in the Long Term Council Community Plan, relevant Asset Management Plans, the NCC Engineering Standards and the Nelson Resource Management Plan in consultation with developers and the community."

A report is being prepared to address this Freshwater method. This report will discuss the principals of low impact design in terms of stormwater management, reserves and roading standards and safety and energy planning.

APPENDIX A – SUMMARY OF RECOMMENDATIONS



APPENDIX B – TREATMENT OPTIONS

	Option 1 (low level treatment)	**Option 2 (medium level treatment)**	**Option 3 (high level treatment)**
Critical Commercial and Industrial	Facilitate "industry-led" strategies for the voluntary development and implementation of best practical options to improve stormwater discharge quality Facilitation costs $10,000	Require the development and implementation of pollution prevention plans, as part of the stormwater by-law that requires minimisation of contaminants in stormwater through non-treatment best practicable options, i.e. surface sealing to reduce sediment discharges, tank bunding to prevent spills, roof quality improvements, and pollution and spill prevention plans Processing costs - approx $ 50k/yr	Require the development and implementation of pollution prevention plans, as part of the stormwater by-law, that requires minimisation of contaminants in stormwater through installation of treatment devices and non-treatment best practicable options identified in option 2.
NCC City Car Parks	No additional treatment Existing treatment consists of extensive street sweeping programme, costing $100,000/yr Sump cleaning frequency once/yr, costs approximately $5,000/yr	Increase sump cleaning frequency to four times / year, City - 71 sumps, Stoke - 12 sumps, at $15/clean, costs increase by approximately $4,000/yr	Install sump sock or equivalent treatment device – 83 sumps at $800ea plus $25/clean out (estimate 4 times/yr) Total capital cost - $66,400. Total O & M cost - $8,300/yr
NCC Critical Roads	No additional treatment Existing treatment consists of extensive street and footpath sweeping programme, costing $ 160,000/yr Sump cleaning frequency once/yr, costs approx $35,000/yr	Increase sump cleaning frequency to four times/year, Inner city – 391 sumps, Suburban commercial – 154 sumps, Industrial – 431 sumps, At $15/clean, costs increase by approximately $44,000/yr	Install sump sock or equivalent treatment device – 391 at $260/yr, capital $312,800, O&M $39,100/yr 154 at $260/yr, capital $123,200, O&M $15,400/yr 431 at $260/yr, capital $344,800, O&M $43,100/yr
NCC Critical Stormwater Outfalls	No treatment	Gross pollutant (net) traps on critical outfalls, i.e. Collingwood St outfall, Trafalgar St outfall, Rutherford St outfall, (capital cost - $13,000 ea, O&M costs $333/yr) installed in 2007/08 Bund/trap across Saltwater creek (capital cost - $40,000 ea, O&M costs $1,000/yr) installed in 2008/09	Install gross pollutant (net) traps on other critical outfalls, i.e. Bolt Rd, Maire Stream, etc. and install bund/trap across Saltwater Creek
NCC Critical Rivers	No treatment	Install wetland type treatment ponds at the following locations:- Orchard Creek – budget $40,000 in 07/08, then Oldham Creek – budget $15,000 in 09/10 York Stream – budgeted as part of river upgrade in 11/12 Arapiki Stream – budget $40,000 in 13/14 Allow $5,000 per pond per year maintenance	As for option 2 but identify programme to install one pond each year. Oldham Creek York Stream Arapiki Stream – in subsequent years
Education	Budget $5,000 per year to develop and implement education strategy identified in Section 11.7	Budget $5,000 per year to develop and implement education strategy identified in Section 11.7	Budget $20,000 per year to develop and implement education strategy identified in Section 11.7
Enforcement	Budget $10,000 per year to enforce the Stormwater By-law minimum standards	Budget $25,000 per year to enforce the Stormwater Bylaw minimum standards and pollution prevention plans	Budget $35,000 per year to enforce the Stormwater Bylaw minimum standards and pollution prevention plans

Total Cost for each treatment option												
		07/08	08/09	09/10		07/08	08/09	09/10		07/08	08/09	09/10
	Capital	$0	$0	$0	Capital	$79k	$40k	$15k	Capital	$926k	$106k	$15k
	O & M	$25k	$15k	$15k	O & M	$130½ k	$134k	$135k	O & M	$258k	$264k	$275k

APPENDIX C – COST BENEFIT ANALYSIS

Activity	***Practicable Option***	***How effective will the option be in improving the discharge quality?*** ***1 – Not effective*** ***2 – Medium effective*** ***3 – Very effective***	***Identify the costs to implement this option for 07/08*** ***1 – Low*** ***2 – Medium*** ***3 – High***	***Officer's assessment of appropriateness*** ***1 – considered appropriate*** ***2 – not appropriate, costs outweigh benefits*** ***3 – not appropriate, lacks effectiveness and/or efficiency***
Critical commercial and individual activities, and Councils critical roads and car parks, stormwater outfalls and rivers and education and enforcement strategies	Option 1 (Low Level Treatment)	1 – Business is likely to argue that any improvement they commit to should be matched by Council. As no additional treatment is proposed for Council assets it is considered unlikely any improvement will result	1 – Facilitation costs to Council are low; implementation costs to industry may be significant but implementation may not occur Capital $0 O&M approx $20k/yr	3 – A best practical option that shows no improvement in environmental outcomes will probably lead to a rejection of Councils point source stormwater discharge resource consent application
	Option 2 (Medium Level Treatment)	2 – NCC commitment and an enforced requirement for industry to develop and implement pollution prevention plans will reduce contaminants from critical locations	2 – Cost estimates Capital $134 in first 3 years O&M $approx $130k/yr Plus industry compliance costs	1 – The level of Council commitment and requirements of industry is considered a suitable best practicable option
	Option 3 (High Level Treatment)	3 – NCC commitment and an enforced requirement for industry to develop and implement pollution prevention plans, incorporating stormwater treatment, will reduce contaminants from critical locations	3 – Cost Estimates Capital approx $1M in first 3 years O&M approx $260k/yr Plus significantly greater industry compliance costs than option 2	2 – The costs to Council and industry are considered too great for the level of environmental benefit considering the current environmental monitoring results

APPENDIX D STORMWATER BYLAW 2006

This bylaw is made by Nelson City Council pursuant to the provisions of Section 146 of the Local Government Act 2002.

1. INTERPRETATION

a. In this bylaw:

i. "Best practicable option" (BPO) means the best method for preventing or minimising the adverse effects of any stormwater discharge on the environment having regard to:

a. the nature of the discharge or emission and the sensitivity of the receiving environment to adverse effects; and

b. the financial implications of an option compared with other options; and

c. the effects on the environment; and

d. the current state of technical knowledge and the likelihood that the option can be successfully applied.

ii. "Council" means the Nelson City Council.

iii. "Construction activities" means any activities involving the disturbance of the surface of any land but excludes farming and forestry activities.

iv. "Contaminant" includes any substance (including gases, odorous compounds, liquids, solids, and micro-organisms) or energy (excluding noise) or heat, that either by itself or in combination with the same, similar, or other substances, energy or heat:

a. when discharged into water, changes, or is likely to change the physical, chemical, or biological condition of the water into which it is discharged, or

b. when discharged on to or into land or into air, changes or is likely to change the physical, chemical or biological condition of the land or air on to or into which it is discharged.

v. "Industrial or trade process" are business included in Schedule 1.

vi. "Manager Infrastructural Assets" means the person employed as the Manager Infrastructural Assets by the Council or any person authorised to exercise the powers and duties of the said person.

vii. "Nelson RM Plan" means the Nelson Resource Management Plan.

viii. "Public drain" means any passage, channel, or pipe on, over, or under the ground by which stormwater is conveyed and which is under the control of the Council, as defined by the Stormwater Drains Ownership Policy. For the purposes of this bylaw, drains within Transit New Zealand owned land are deemed to be Public drains.

ix. "Stormwater" means water (excluding water in a river) when it is diverted through any passage, channel or pipe for discharge to water.

x. "Sensitive area" means any land within 5m of the banks of any river, or within any proposed esplanade strip (identified in Appendix

6 of the Nelson RM Plan), or within 20m of the coastal marine area, or any land where the slope is greater than 1 in 2.14 (47%).

xi. "The Act" means the Local Government Act 2002 and its amendments.

b. Terms and expressions defined in the Act shall, when used in this by-law, have the same meanings unless they are alternatively defined in this bylaw.

2. OPERATION OF BYLAW

2.1. This bylaw shall apply throughout the City and to any premises which, although located outside the City, discharge, or will discharge stormwater into a public drain within the City.

3. CONSTRUCTION ACTIVITIES

3.1 Any person who carries out a construction activity where the total area of land likely to be disturbed is greater than 3,000m^2, or where the land to be disturbed is located within a sensitive area, shall prepare an erosion and sedimentation control plan. Such plan is to be in accordance with section XI of the NCC Engineering Standards 2006 and shall be approved by the Manager Infrastructural Assets prior to commencement of the activity.

3.2. Any person who carries out any construction activity other than that under 3.1 above, shall ensure that no less than the minimum level of erosion and sedimentation control identified in Section XI of the NCC Engineering Standards 2006 is undertaken in relation to that activity.

4. MINIMUM STORMWATER QUALITY STANDARD

4.1. The owner or occupier of any land from which any stormwater discharges to a public drain, including any discharge to a private drain or private common drain that in turn discharges to a public drain, shall ensure that it does not;

a. contain any chemicals, paint, oil, grease, pesticides, fertiliser, tannins, detergent, grass clippings, rubbish, litter, or heavy metals that are, or likely to be, toxic to the aquatic ecosystem.

b. cause the production of conspicuous oil or grease films, scums or foams, or floatable material,

c. cause a conspicuous change of colour or visual clarity, at that point which is 30 times the receiving water channel's width downstream from the point of the public drain discharge,

d. cause an emission of objectionable odour,

e. cause adverse effects on aquatic life,

f. contain suspended solid concentrations in excess of 100mg/litre at that point which is 30 times the receiving water channel's width downstream from the point of the public drain discharge,

g. contain any hazardous substances, waste water or trade wastes.

Except where the discharge:

h. is a discharge of dye or tracer material for investigative purposes, or

i. is a discharge of water from the testing or emptying of pipelines, tanks or bunds if no welding residues or other contaminants contained within the pipeline will be discharged to the receiving water body

j. is a discharge of overflow bore water to surface water bodies, if the rate of discharge is no more than five litres per second and the discharge has not been contaminated prior to discharge

k. is a discharge from a swimming pool (excluding swimming pool filter backwash water) which is free of chemicals, algae, leaves, dirt or other debris. (Any discharge with these contaminants must be discharged to the sewerage system.) Swimming pool water is considered free of chemical contaminants when a pool has been left open to sunlight for 14 days, the level of chlorine does not register on any home testing kit, and no smell of chlorine remains

l. is a specific discharge which is authorised to be permitted under specific resource consent.

m. is from an activity for which the best practicable option is already in place, i.e. chimney discharges

n. is from a high risk industrial or trade process where a pollution prevention plan has been approved

5 POLLUTION PREVENTION PLANS

5.1 The operator of any high risk industrial or trade processes shall prepare a site or operation specific pollution prevention plan and submit this plan for approval to the Manager Infrastructural Assets no later than 30th June 2008, or such later date as the Manager Infrastructural Asset might agree.

5.2 The pollution prevention plan, required under 5.1 above, shall include:-

a. A site assessment identifying all actual and potential sources of stormwater pollution,

b. Suitably scaled plans showing the site layout, boundaries, all stormwater and sewer drainage, and relevant buildings and outdoor spaces (including identification of their use),

c. Identification and installation requirements of the best practicable options proposed to ensure that potential contamination of stormwater discharges are minimised,

d. Site specific spill prevention and spill response procedures,

e. A description of the maintenance procedures proposed, actions to be taken and/or infrastructure to be developed.

6 REVIEW OF POLLUTION PREVENTION PLANS

6.1 Any pollution prevention plan prepared in pursuance of clause 5 shall be reviewed no less than three years after implementation and thereafter at three yearly intervals.

6.2 Not withstanding clause 6.1 above, the Manager Infrastructural Assets may require that any pollution prevention plan shall be revised where he considers that there have been significant changes in the facility concerned or its operational procedures.

7 MONITORING OF STORMWATER DISCHARGES

7.1 Council may independently monitor, sample and analyse discharged stormwater and recover costs from the property occupier, where failure to comply with the pollution prevention plan is evidenced.

8 OFFENCES

8.1 Every person who discharges or causes the discharge of stormwater to a public drain in contravention of Clause 4 hereof, or who fails to adhere to or comply with an approved pollution prevention plan, or any occupier of a high risk facility or operator of high risk operations who fails to submit a pollution prevention plan for approval before 30 June 2008, or such later date as the Manager Infrastructural Assets might have set, commits an offence against this bylaw and on summary conviction is liable to a fine not exceeding $20,000.

SCHEDULE 1 – HIGH RISK INDUSTRIAL OR TRADE PROCESSES

High risk industrial and trade processes includes

a. aggregate and material storage/stockpiled yards which are subject to erosion and/or leaching of contaminants,
b. boat building and repair facilities,
c. construction and maintenance depots,
d. demolition activities,
e. facilities for the production, use, storage or disposal of hazardous substances and/or trade waste occurs,
f. facilities where vehicle and plant wash water is generated
g. food and beverage manufacturers,
h. landfills and quarries,
i. laundries and dry cleaners,
j. liquid waste removal contractors,
k. manufacture, storage or handling of products derived from animal slaughter
l. metal processing works, metal recyclers and foundries,
m. operations where water used to wash buildings uses detergents and chemicals and liquid waste removal contractors,
n. printers,
o. retail service stations, truck stops, oil terminals and depots and lubricating oil blending and grease manufacturing plants,
p. recycling and waste centres,
q. spray painting, panel beaters and sign writers workshops,
r. timber treatment, preservation and timber storage plants,
s. transport depots,
t. vehicle and mechanical engineering workshops,
u. vehicle recyclers,
v. wood and paper product and furniture manufacturers,
w. any other facility which the Manager Infrastructural Assets considers to have the potential to discharge stormwater which does not meet the minimum stormwater quality standard.
x. any other operation, which the Manager Infrastructural Assets deems to have the potential to discharge stormwater which does not meet the minimum stormwater quality standard.

APPENDIX E POLLUTION PREVENTION GUIDE

I. Introduction

a. This guide is to assist the managers of industrial and trade processes identified in the Stormwater Bylaw to prepare site or operational specific pollution prevention plans.

b. Pollution prevention plans, to be submitted to the Manager Infrastructural Assets for approval, should contain:

- A site assessment identifying all actual and potential sources of stormwater pollution
- Suitably scaled plans showing the site layout, boundaries, all stormwater and sewer drainage, and relevant buildings and outdoor spaces (including identification of their use)
- Identification and installation requirements of the best practicable options proposed to ensure that potential contamination of stormwater discharges are minimised
- Site specific spill prevention and spill response procedures
- A description of the maintenance procedures proposed, actions to be taken and/or infrastructure to be developed.
- A contract for the cleaning out of sumps and oil traps.

II. Environmental Site Assessment

a. An environmental site assessment should describe the facility and all operational activities, and identify all actual and potential sources of stormwater pollution.

b. Specify whether your stormwater system discharges to a Council stormwater system (including discharges to a Council stormwater system via a private or private common drain), or directly to a waterway. If your discharge is to a Council stormwater system, you are required to comply with the NCC Stormwater Bylaw. If your discharge is direct to a water course, you will comply with rule FWr. 21 of the Nelson RM Plan.

III. Site Plans

a. On a suitably scaled plan show:

- Stormwater pipes, marked in green
- wastewater pipes marked in red
- Manholes, down-pipes, gully traps, interceptors
- The direction of flow in the pipes and any nearby streams
- The uses of any buildings, storage areas and tanks (above and below ground) on your site
- Allocated parking spaces

- Unused systems, i.e. underground storage tanks
- Site boundaries
- Existing pollution prevention infrastructure
- Proposed pollution prevention infrastructure, if any

b. Ensure there are no cross connections of sewer and stormwater drains

c. Ensure no waste discharges to the stormwater system. Wastes at industrial sites often wrongly disposed of to the stormwater system include – sewage, sink waste, basin waste, compressor condensate, trade waste and wash water

d. Note that if you discharge any trade wastes to a Council sewerage system you will need to obtain a trade waste consent from the Council

IV. Identification of Best Practicable Options.

a. Identify if compliance with the minimum stormwater discharge standard will, at all times, be achieved. Where compliance cannot be achieved Best Practicable Options should be identified and installed to ensure that potential contamination of stormwater discharges are minimised, having regard to the following;

b. Suspended Solids

Where the permitted suspended solid concentrations are, or are likely to be, exceeded, sediment control measures will be required. This could include sealing of exposed surfaces, installation of sediment retention ponds, installation of a drainage system, relocation and protection of stockpiled materials, and such other measures considered appropriate so that suspended solid concentrations do not exceed 100mg/ltr.

c. Heavy metals and chemicals

Where technology is available to prevent this discharge, it will not be permitted to discharge water from industrial or trade processes to stormwater if it contains concentrations of heavy metals and chemicals that are or are likely to be toxic to the aquatic ecosystem. Contaminated run-off that cannot be treated on site may need to be discharged to the sewer (requiring a trade waste permit) or to be taken away by a specialist disposal company.

d. Material Storage

Poor storage of materials on industrial sites often leads to pollution, while proper storage of materials can dramatically reduce pollution. Ideally all materials should be stored indoors or in a covered, bunded area.

e. Stockpiles of materials such as soil, sawdust, gravel and compost can contaminate stormwater and cause an illegal discharge.

Stockpiled materials that have the potential to erode must:

i) be located at least 2m from downward sloping land, areas of concentrated stormwater flows, driveways and access ways, footpaths, riparian strips and tree drip lines, and

ii) have sediment fencing installed to capture sediment laden runoff from the stockpile(s), or

iii) be permanently covered to prevent contamination of runoff.

f. Waste skips should be stored in a covered bunded area to prevent stormwater falling into them, collecting contaminants and then leaking into the stormwater system.

g. Bunds are an excellent way to trap and control leaks. If the bund is roofed, it will not collect stormwater that otherwise might become contaminated by any leaked material and require treatment. It is often cheaper in the long run, therefore, to roof a bund. An un-roofed bund requires careful management in order to release uncontaminated stormwater but to contain leaks and contaminated stormwater. The drain valve should be kept closed and locked at all times except when draining uncontaminated stormwater.

h. A tank bund should be able to contain 100% of the largest tank + 10% of the second largest tank + 175mm of rain water (unless roofed) plus the volume taken up by any pumps pipes etc. within the bund. A bund for drums should be large enough to contain 25% of volume up to 10,000 litres + 10% of additional volume + 175mm of rain (unless roofed).

i. Hazardous Substances must be stored according to Hazardous Substances and New Organisms regulations (contact Occupational Safety and Health Service (OSH)) and the specific requirement of the Nelson RM Plan. Check all materials regularly for leakage and deterioration. Reasonable care must also be taken to prevent vandalism (e.g. by securing the site and installing locks on tank valves).

j. Loading and unloading areas

Loading and unloading areas also should be designed to prevent contamination of stormwater. Where possible, loading and unloading areas should be isolated from the stormwater system and should be roofed. All deliveries and despatches should be supervised and loading and unloading activities should take place well away from stormwater sumps.

k. Run-off from oil storage and refuelling areas should be passed through an interceptor to remove oil. All stormwater discharged from this area shall be directed to an API (American Petroleum Institute) coalescing collection plate separator, or similar approved interceptor, with a minimum holding capacity of 2,500 litres, designed, installed and maintained to remove nominal size 150 micrometer oil globules so as to ensure that the total volume of petroleum hydrocarbons in the discharge water, averaged over a 10mm/hr design rainfall event, is less than 15mg/l. Flows

exceeding the separator design storm event should by-pass the interceptor. An interceptor maintenance contract shall be established to ensure that:

i) inspections are carried out monthly, and during and immediately after a large storm event (greater than 25mm depth of rainfall over a 24 hour period),

ii) the oil which collects in the separator is removed before the oil layer exceeds 3mm depth, and that oil removal is carried out in accordance with "Liquid and Hazardous Waste Code of Practice" 2003, published by NZWWA,

iii) sludge deposits are removed when the thickness exceeds 150mm.

l. All vehicles including forklifts should be properly maintained to prevent engine and hydraulic oil leaks.

m. Other

i) Ensure that all wash down disposal complies with Section III-8 of the NCC Engineering Standards 2006,

ii) Ensure all galvanised roofs are replaced with Zincalume roofing materials or similar approved, or painted with non-zinc paint.

iii) Ensure all iron roofs are replaced or painted with non-zinc paint

iv) Ensure all zinc based painted galvanised roofs are in good condition, if they are not, the roofs should be replaced or painted with non-zinc paint

v) Alternative low impact designs will be considered provided they are applied across the whole site and do not conflict with other regulatory requirements.

vi) Retail service stations, truck stops, oil terminals and depots and lubricating oil blending and grease manufacturing plants shall comply with the "Environmental guidelines for water discharge from petroleum industry sites in New Zealand", Dec 1998, published by the Ministry of the Environment,

vii) The "Guidelines for the management and handling of used oil", Dec 2000, (Ref. ME355), published by the Ministry of the Environment.

V. Spill Prevention Plan and Spill Response Procedures

a. A site specific Spill Prevention Plan and Spill Response Procedures is required

b. If not cleaned up straight away, spills can enter the stormwater system and pollute streams and beaches. Never try to wash away a spill.

c. Instead, the procedure to follow is:

i) Be safe – put on the correct personal protective equipment

ii) Stop the cause

iii) Contain the spilt material – protect stormwater

iv) Notify your supervisor and other agencies

v) Clean up the spill – Fire Service in an emergency or waste management contractor if beyond site resources

vi) Dispose of contaminated materials

vii) Re-stock, investigate and review to prevent reoccurrence

Prevention Plan

a. To prevent spills from happening, first assess the risk of spills on your site and then take action to minimise those risks. Begin by identifying the areas where spills are most likely to occur, e.g. areas of storage, high traffic, loading and unloading.

b. Prepare an inventory of all substances stored on your site and keep material safety data sheets (MSDS) for all hazardous substances. Appoint someone to be responsible for updating the inventory and the MSDS.

c. Look at the design of your site and your operating procedures to see if there are any changes you can make to minimise the risk of spills. You should identify on the submitted plans, and put in place good housekeeping, inspection and maintenance practices. Contact your industry association for advice on good practice.

Spill Response Procedure

a. Ensure that you are ready if a spill should occur. Assemble a spill kit containing the appropriate materials for cleaning up any likely spills at your site (large sites may require several kits). Kits should contain equipment such as brooms, shovels, drain-covers, booms and absorbent materials. They should also include personal protective equipment and containers for collecting the contained or absorbed waste.

b. Display a contact list and spill procedure in prominent and high risk areas around your site. Assign responsibilities and carry out regular training in relation to your spill procedures.

c. Thoroughly investigate any spills that occur and adopt preventive measures. "Near-misses" should also be reported, investigated and recorded.

VI. An Action Plan

a. Should list the installations required and the date they will be completed.

b. Should identify a maintenance, inspection, monitoring and record keeping procedure.