

2018-2028 TRANSPORTATION ASSET MANAGEMENT PLAN
He Rautaki Whakahaere Rawa mō Ngā Ara Kawenga

STORMWATER DRAINAGE NGĀ WAIKARI

VOLUME FOUR | PUKAPUKA TUAWHĀ



Mountain to Sea
Te Kaunihera-ā-Rohe o Ngāmotu
NEW PLYMOUTH DISTRICT COUNCIL
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1. Introduction	5
2. Lifecycle Management Plan	8
2.1 Asset Description	8
2.2 Asset Condition and Performance	10
2.3 Asset Remaining Lives	11
2.4 Asset Valuation	12
2.5 Operations and Maintenance	12
2.6 Renewals Plan	14
2.7 Acquisition and Augmentation Plan	16
2.8 Disposal Plan	16
2.9 Annual Work Plan	16
3. Risk Management Plan	17
3.1 Critical Assets	17
3.2 Risk Assessment	17
3.3 Infrastructure Resilience Approach	17
4. Financial Summary	18
5. Improvement and Monitoring Plan	19

LIST OF TABLES

List of Tables

Table 1 Asset management document summary	5
Table 2 Stormwater drainage investment KPI summary	6
Table 3 Stormwater drainage O&M KPIs	6
Table 4 Stormwater drainage growth investment KPIs	7
Table 5 Kerb and channel types	8
Table 6 Culvert types by length	9
Table 7 Inlets and outlets by type	10
Table 8 Expected asset lives	11
Table 9 Asset valuation	12
Table 10 WC113 Routine drainage maintenance 2015-18 NLTP	13
Table 11 WC113 Routine drainage maintenance 2018-21 NLTP	13
Table 12 WC213 Drainage renewals 2015-18 NLTP	15
Table 13 WC213 Drainage renewals 2018-21 NLTP	15
Table 14 Expenditure forecast summary	18
Table 15 Subsidy forecast summary	18



This volume provides details of the asset lifecycle management for the Stormwater Drainage asset category of the Transportation AMP. The framework and key elements of the overall asset management plan are outlined in Table 1.

Table 1 Asset management document summary

No.	Document Name	Key Document Contents
1	Long Term Plan (LTP)	Infrastructure Strategy <ul style="list-style-type: none"> • Strategic Framework • Guiding Themes • High Level Information for Each Asset Class Council Services <ul style="list-style-type: none"> • High Level Information • Levels of Service • Financial Plan
2	Asset Management Strategy	General Asset Management Principles and Overview
3	Asset Class General Volumes	General Information and Glossary about each asset class <ul style="list-style-type: none"> • Executive Summary • Introduction • Levels of Service • Future Demand • Risk Management Plan • Financial Summary • Plan Improvement and Monitoring

4	Asset Category Lifecycle Management Volumes	Asset Life Cycle Management for each asset category within each asset class <ul style="list-style-type: none"> • Description • Condition • Remaining Lives • Valuation • Operations & Maintenance • Renewals • Acquisition and Augmentation • Disposals • Annual Work Plan • Risk Management • Financial Summary • Improvement Plan
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Purpose and Key Issues

The purpose of kerbs and channels and drainage facilities is to adequately protect the road structure from water related damage, restrict excess run-off onto adjacent properties, delineate the carriageway and provide some aesthetic and safety benefits.

Key issues relating to this asset group are:

- There is a programme in place to install kerbs and channels in some urban areas where there are currently none (e.g. Waitara, Inglewood).
- Other new works programmes (e.g. footpaths) depend on the kerb and channel programme.
- Installation of kerbs and channels is heavily dependent on the availability of a piped stormwater system, and therefore linked to any improvement programmes for that system, managed by our Water and Wastes Team.
- Maintaining effective rural roadside drainage is important to ensure pavements are well drained and to minimise lifecycle costs for pavements.
- Kerbs and Channels are installed mainly in urban areas and are easily damaged by cars and heavy vehicles.
- Ponding areas in the rural areas (culvert, inlets, outlets).

Levels of Service

The levels of service and investment KPIs for the operations, maintenance, renewals and minor improvement of the transportation system are included in Section 6 of the Transportation Strategic Case (General Volume). The investment KPIs are developed from the problem statements and benefits in the Programme Business Cases (PBCs) included in the Appendices of the Transportation Strategic Case (General Volume). The investment KPIs applicable to stormwater drainage are summarised in Table 2.

Table 2 Stormwater drainage investment KPI summary

Problems	Benefits	Investment KPIs (PBC for each one)
<ul style="list-style-type: none"> The changing expectations of the community requires a reprioritisation of investment to meet the agreed and future Level of Service for all transport modes Growth in the movement of people and goods on key corridors will result in increasing travel time unreliability during peak periods Geology, weather and climate activity plus some sub-standard assets results in a high level of full and partial closures of the network impacting lifelines and economic viability Driver behaviour, safe system approach and other factors are resulting in a high proportion of Death and Serious Injury crashes for vulnerable road users 	<ul style="list-style-type: none"> An easy to understand and efficient (economically viable) network for all transport modes A resilient network A safe network 	<ol style="list-style-type: none"> Network Availability Customer Satisfaction Maintain Travel Time Reliability with Increased Activity Value for Money Response Times Network Audit of Condition Crashes

The particular measures used to monitor the performance of the stormwater and drainage assets are shown in Table 3. More details about the measures are included in the Programme Business Cases found in the Appendices of the Transportation Strategic Case (General Volume).

Table 3 Stormwater drainage O&M KPIs

KPI No	KPI	Baseline Performance	Target Performance
2.1	Count of complaints recorded by Contact Centre	33 per annum average 2011/12 - 2016/17	<=40 per annum
5.1	LoS 5 - respond to requests in reasonable timeframe	Current performance is 95%	Maintain at 95%

Related Policies and Practices:

Polices and technical practices adopted by the Council are as follows:

Urban

- All urban streets are to have kerbs and channels on both sides where practicable.
- Kerb and channels must connect to a stormwater reticulation network. Stormwater assets are typically installed prior to kerb and channel construction for drainage reasons.

Rural

- Major roadside drain installation programme was substantially completed some years ago - maintenance of these reconstructed drains is critical.

1. INTRODUCTION

Future Demand

Future demand and growth in the district is addressed in our report [Keeping New Plymouth Moving and Growing](#). This report includes Investment Logic Maps (ILMs) and a series of problem statements, benefits and investment KPIs for growth. These are summarised in Table 4.

Table 4 Stormwater drainage growth investment KPIs

Problems	Benefits	Investment KPIs (PBC for each one)
<ul style="list-style-type: none"> Capacity limitations of key and strategic arterial routes do not meet current demand and will not support future growth. Natural landforms, arterial layout and poor alternative mode permeability are limiting city connectivity. Complex roads and a high number of modal conflict points are driving high actual and perceived personal and collective risk. A lack of viable alternative routes during a major event results in significant delays and risk of transport and utility severance. 	<ul style="list-style-type: none"> Improved transport network performance Improved safety outcomes Improved economic outcomes for the district More viable transport choices 	<ul style="list-style-type: none"> Effectiveness Network Availability Improved Infrastructure Quality Improved actual safety Improved safety perception Business investment Transport network supports future growth Increased use of alternative modes Improved community perception Improved alternative mode infrastructure

Note: All financial forecasts are shown in inflation adjusted dollar values.



2. LIFECYCLE MANAGEMENT PLAN

2.1 Asset Description

Storm water drainage assets consist of different types of open or piped facilities. We own approximately 577km of kerbs and channels located predominantly in the urban area, and approximately 60.65km of culverts predominantly in the rural environment. Although kerbs and channels are almost exclusively located in the urban network, they are sometimes used as an alternative to water tables in the rural areas where verge space is restricted, or to avoid cutting a batter.

Note: Storm water sumps, laterals and manholes are addressed in the Stormwater Asset Management Plan.

Open water channels/roadside drains in rural areas are defined as that area between the edge of the pavement shoulder metal courses and the bottom of the 'V' drain or water table. In order to maintain the effectiveness of the rural roadside drainage function this area must be maintained true to cross-section.

The culverts installed in rural areas (with cross sectional area < 3.4m²) and their associated drainage structures such as channels, sumps, headwalls, etc. provide drainage infrastructure for the rural road network. The majority of these culverts are 300mm to 375mm in diameter, but there are some pipes up to 1m in diameter.

Details of the different types of stormwater drainage assets are shown in Tables 5, 6 and 7.

Table 5 Kerb and channel types

Kerb & Channel Type	Length (m)
Dished Channel (Asphalt)	233
Dished Channel (Concrete)	2,780
Kerb & Channel (Concrete)	482,608
Kerb & Channel (Stone)	1,627
Kerb & Dished Channel (Concrete)	1,991
Kerb Only (Concrete)	9,049
Mountable Kerb & Channel (Concrete)	73,379
Mountable Kerb Only (Concrete)	546
Nib Kerb (Concrete)	4,529
Slot Channel (Concrete)	31
Total Length	576,773

2. LIFECYCLE MANAGEMENT PLAN

Table 6 Culvert types by length

Culverts - Length (m)		Materials									
Diam. (mm)	Al	Armco	AC	Concrete	GWE	HD PE	Ground	PVC	Steel	Timber	Total
<300	-	43	-	5,500	677	-	25	309	34	8	6,595
300-375	474	2,150	-	31,742	446	103	-	437	308	143	35,802
400-475	162	297	8	7,408	88	-	-	100	61	51	8,174
500-975	213	399	-	5,923	-	-	91	30	88	20	6,763
1000-1850	176	116	-	2,001	-	-	674	-	12	12	2,991
2000-3700	34	26	-	112	-	-	128	-	23	-	322
Total	1,059	3,030	8	52,685	1,211	103	917	876	525	233	60,647

Table 7 Inlets and outlets by type

Inlet/Outlet Type	Material	Number
Catch pit Type 1	Concrete	29
Erosion Control-Sandbags	Sandbags	14
Head/Wing wall - Concrete	Concrete	75
Head/Wing wall - Rock, cemented	Rock	12
Head/Wing wall - Rock, packed	Rock	54
Head/Wing wall - Sandbags	Sandbags	1,347
Head/Wing wall - Timber	Timber	113
Manhole, with cover	Concrete	41
Manhole, with grate	Concrete	88
Riser	Concrete	560
Drop Chamber	Concrete	69
Flume	Armco	44
Drop Chamber	Concrete	4
Flume down batter	Aluminium	4
Flume down batter	Armco	13
Flume down batter	HD Polyethylene	10
Flume down batter	PVC	2
Flume down batter	Steel	4
Flume down batter	Timber	2
Ford	Armco	1
Ford	Concrete	1
Total Number		2,487

The data on the quantity and type of the assets presented in this AMP is classed as grade **B - Reliable** due to the asset inventory being well maintained and updated in RAMM.

2.2 Asset Condition and Performance

Kerb and channel assets are inspected during our annual pavement ratings surveys. These surveys record the number and type of defects present in the kerb and channel, but do not assign a condition rating. We use the overall ratings for the whole pavement to derive the condition of kerbs and channels, based the information we use to select sections of pavement for renewal or rehabilitation.

We inspect culverts and inlets/outlets during planned and reactive maintenance and keep a record of our observations to assist or justify further repairs works or renewal.

We do not formally capture condition ratings on the RAMM asset inventory for kerb and channel assets or culvert and inlet/outlet assets.

Typical modes of failure for kerbs and channels are:

- Lack of waterproofing – this is the key failure mode as leakage of water into the pavement basecourse can accelerate pavement deterioration.
- Damage from heavy vehicles – kerbs can be subjected to heavy vehicle loads, particularly at changes in alignment (e.g. at intersections).
- Ponding – channels may not perform adequately due to inadequate grade. This can be caused by settlement of the sub grade or the adjacent pavement.
- Deterioration arising from weak materials and/or construction deficiencies – use of weak or non-compatible aggregates may result in reduced expected lives. Similarly, poorly constructed concrete kerbs and channels have typically shorter lives than well-constructed ones.
- Inappropriate shape – deep kerb and channels were built when there was no piped stormwater system. Their large size reflects their original purpose to collect, store and convey significant volumes of stormwater. Replacement of this older style of kerb and channel is currently being driven by subsequent development of a piped stormwater system, changes in vehicle design and safety concerns.

2. LIFECYCLE MANAGEMENT PLAN

For rural assets the primary modes of failure for other drainage facilities are:

- Blockage or material failure of culverts causing ponding of stormwater and overflow over land or roads, resulting in scour and other damage.
- Accumulation of vegetation, detritus and other material in water channels. A key challenge is the loss of depth affecting the ability to remove and keep water below the pavement sub-grade level.

The data on the condition of the assets presented in this AMP is classed as grade C – Uncertain. Although our data is based on sound records, procedures, and inspections, it is incomplete.

2.3 Asset Remaining Lives

Typically, kerbs and channels have long lives of 70 to 80 years. Only 5% of our kerb and channel assets have age data recorded in the RAMM asset inventory. Therefore, renewal is mainly based on reactive maintenance or included as part of pavement renewal.

The expected lives of culvert and inlet/outlet materials are shown in Table 8. The life expectancy of these assets is not recorded in the RAMM asset inventory and asset renewal is mainly based on reactive maintenance needs.

Table 8 Expected asset lives

Material	Expected life (years)
Aluminium	50
Armco	50
Asbestos cement	50
Concrete	80
Earthenware	70
H Density Polyethylene	80
Natural Ground	90
Poly Vinyl Chloride	80
Steel	40
Timber construction	40

The data presented on the remaining life of the assets in this AMP is classed as grade **D – Uncertain** due to data being based on unconfirmed verbal reports or cursory inspections, with most data estimated or extrapolated.



2.4 Asset Valuation

The value of our Transportation stormwater and drainage assets at 30 June 2016 is shown in Table 9.

Table 9 Asset valuation

Category	Gross Current Replacement Cost (GCRC) (\$)	Annual Depreciation (\$)	Optimised Depreciated Replacement Cost (ODRC) (\$)
Culverts	21,545,429	295,934	7,162,278
Inlets/Outlets	2,061,549	31,546	623,366
Surface Water Channels	38,457,562	480,787	19,228,781
Total	62,064,540	808,267	27,014,425

Values are from the 2016 statutory valuation. The data accuracy and confidence level is rated as **A**. Internal staff conducted a detailed valuation which was peer reviewed and endorsed by Beca Consultants.

2.5 Operations and Maintenance

Urban

In urban areas, maintenance of kerbs and channels, and sumps is part of the urban general maintenance contract. A separate contract covers cleaning. Cleaning schedules are defined depending on the function of the road. For example, CBD areas have a higher frequency of cleaning for aesthetic reasons.

Maintenance activity includes repairing minor breakages and defects, and replacing some short lengths of kerb and channel.

Rural

In rural areas, both culverts and water tables are maintained under the rural general maintenance contract. This includes checking and cleaning culverts, minor repairs, vegetation control and other activities to ensure that water tables are kept clear and function effectively.

Water Channels

In past years we have heavily invested in establishing effective rural roadside drains. With this work being substantially complete, we now need to ensure we protect the function of water channels through cost effective maintenance.

We have defined the maintenance needs of water channels in 'A Maintenance Strategy for Rural Roadside Drains - March 2000', recommending a method based approach. This involves mowing and total vegetation control using chemical spraying to the bottom of roadside drains on a cyclic basis, combined with targeted cleaning on a needs only basis.

2. LIFECYCLE MANAGEMENT PLAN

Stormwater Culverts

We maintain culverts as part of reactive maintenance. However, condition inspections as part of the rural general maintenance contract also allow us to plan maintenance items where necessary. The approved 15-18 NLTP values work category 113 – Routine drainage maintenance are shown in Table 10.

Table 10 WC113 Routine drainage maintenance 2015-18 NLTP

Year	Requested allocation			Approved allocation (NZTA only)			
	Street cleaning (\$)	Drainage maintenance (\$)	Total cost (\$)	Total cost for approval (\$)	FAR (%)	NZTA share (\$)	Funding source National (\$)
2015/16	132,000	295,000	427,000	366,295	52	190,473	190,473
2016/17	132,000	295,000	427,000	492,361	51	251,104	251,104
2017/18	132,000	295,000	427,000	427,000	51	217,770	217,770
Totals	396,000	885,000	1281,000	1285,656	51.28	659,347	659,347

To ensure the network condition is safe, fit-for-purpose and meets customer satisfaction targets, we will need to continue to maintain stormwater drainage at the same level as the approved 2015-18 NLTP budgets during the 2018-21 NLTP and beyond. The proposed 2018-21 NLTP values and the 10-year inflated forecast for expenditure on drainage maintenance are shown in the table below.

Table 11 WC113 Routine drainage maintenance 2018-21 NLTP

\$000	2018-21 NLTP									
	18/19	19/20	20/21	21/22	22/23	23/24	24/25	25/26	26/27	27/28
Street cleaning	151	154	158	161	165	169	172	177	181	186
Drainage maintenance	298	304	310	317	324	332	339	347	356	365
Total	449	458	468	478	489	500	512	524	537	550
NZTA Share FAR (51%)	229	234	239	244	249	255	261	267	274	281

The overall Opex forecast for Transportation activities including operations and maintenance is included in the Transportation Strategic Case (General Volume).

2. LIFECYCLE MANAGEMENT PLAN

2.6 Renewals Plan

Urban

Most kerb and channel renewals are coordinated with the resealing programme. Our kerbs and channels are relatively young (about 50 years) and most of the stock has not yet reached one cycle.

Approximately 2.0km of kerb and channel is renewed per year and we can make the following observations:

- Because the stock is relatively young, the length of kerb and channel failing per year is relatively low. As the stock ages we anticipate the lengths requiring replacement per year will increase.
- Our assumed effective lives for these assets may be too short. Some North Island areas assume effective lives of 100 years, which is longer than our 70 to 80 years. However, it is important we compare failure modes as well. We will continue to review our effective life assumptions as more data becomes available.

Rural

Until we have condition ratings for all culverts, it is difficult to give an accurate prediction of renewal requirements. Currently, we replace culverts that have deteriorated to such an extent that they will adversely affect the integrity of the road. To date only culverts larger than 1.2m diameter have been condition rated and we envisage several larger diameter culverts will need to be renewed up to 2019/20.

We re-form roadside drains when necessary, as identified through routine inspections.

As surface water channels and other drainage facilities continue to age, more investment in renewal may be required in order to maintain current reliability levels.



2. LIFECYCLE MANAGEMENT PLAN

The approved 15-18 NLTP values work category 213 – Drainage renewals are shown in the table below.

Table 12 WC213 Drainage renewals 2015-18 NLTP

Year	Requested allocation			Approved allocation (NZTA only)			
	Culverts renewals (\$)	Kerb and channel renewals (\$)	Total cost (\$)	Total cost for approval (\$)	FAR (%)	NZTA share (\$)	Funding source National (\$)
2015/16	619,000	235,000	854,000	753,465	52	391,802	391,802
2016/17	619,000	235,000	854,000	819,928	51	418,163	418,163
2017/18	619,000	235,000	854,000	854,000	51	435,540	435,540
Totals	1857,000	705,000	2562,000	2427,393	51.31	1245,505	1245,505

To keep up with the planned rate of pavement renewals and allow sufficient expenditure to keep culvert assets safe and fit for purpose, we will need to continue to renew culverts and kerb and channel assets at similar rates to the 2015-18 NLTP. This will allow sufficient expenditure for kerb and channel renewal.

The proposed 2018-21 NLTP values and the 10-year inflated forecast for expenditure on surface drainage renewals are shown in Table 13.

Table 13 WC213 Drainage renewals 2018-21 NLTP

\$000	2018-21 NLTP									
	18/19	19/20	20/21	21/22	22/23	23/24	24/25	25/26	26/27	27/28
Culvert renewals	626	638	652	666	681	697	713	730	748	767
Kerb and channel renewals	239	251	253	259	264	266	277	284	291	299
Total (RD1003)	865	889	905	925	945	963	990	1,014	1,039	1,066
NZTA Share FAR (51%)	441	453	461	472	482	491	505	517	530	544

2.7 Acquisition and Augmentation Plan

Acquisitions

New assets installed by developers to serve new domestic and non-domestic developments are usually vested in us. Assets are built to the NZS4404: 2010 – Land Development and Subdivision Standard. Our specific requirements are defined in the New Plymouth District Council (NPDC) and South Taranaki District Council (STDC) adopted standard for Land Development and Subdivision Infrastructure, which is based on NZS 4404:2010 with local amendments. We assume full responsibility for any assets vested with us, and include them included in our operations, maintenance and future renewal plans

Levels of Service

There are a number of urban roads in the district without kerbs and channels, particularly in Inglewood and Waitara. Generally we install new kerbs and channels in conjunction with footpaths. This reduces ongoing maintenance costs to repair damaged road edges and roadside shoulders. It also protects private property from flood damage resulting from surface water run-off from the sealed road. New stormwater drainage is installed as part of the provision for installing new footpaths detailed in Section 2.7 of Volume 3 - Footpaths and Cycle Ways.

TRC has recently indicated that culverts should be designed to meet 100 years AEP (annual exceedance probability) rainfall conditions. The effect of this has not yet been considered, but applying this requirement retrospectively would likely have significant financial impact. All new culverts, including existing culvert being replaced, will be designed to TRC requirements.

Growth

New stormwater drainage assets will be constructed as part of any new pavement construction described in the Volume 1 – Pavements.

2.8 Disposal Plan

Disposal is the retirement or sale of assets when they become surplus or superseded by new or improved systems. Assets may become surplus to requirements for any of the following reasons:

- Under-utilisation
- Obsolescence
- Provision exceeds required level of service
- Replacement before end of predicted economic life
- Uneconomic to upgrade or operate
- Policy changes
- Service provided by other means (e.g. private sector involvement)
- Potential risk of ownership (financial, environmental, legal, social)

No stormwater drainage asset disposals are planned over the 10 year AMP period.

2.9 Annual Work Plan

Our renewals programme has been produced based on the selection methods described in section 2.6 and is stored in ECM at [Transportation Renewals Programmes](#).

3. RISK MANAGEMENT PLAN

3.1 Critical Assets

Stormwater drainage assets are critical to the safe and reliable operation and reliability of the Transportation network. However we do not conduct formal criticality ratings as all stormwater drainage assets would have similar ratings and are subject to the same level of reactive and proactive maintenance and inspection.

3.2 Risk Assessment

Our Risk Management Framework and details of key risks for Transportation assets are included in Section 14 of the Transportation Strategic Case (General Volume) and section 7 of the Asset Management Strategy.

3.3 Infrastructure Resilience Approach

We have allocated budgets for reinstating stormwater assets adversely affected by minor events such as weather conditions, land instability or natural hazards. Any significant events causing major loss of access will be dealt with separately.



4. FINANCIAL SUMMARY

A summary of the expenditure forecasts included in this volume is shown in Table 14.

Table 14 Expenditure forecast summary

Stormwater Drainage Expenditure Forecast (\$000)											
Activity	18/19	19/20	20/21	21/22	22/23	23/24	24/25	25/26	26/27	27/28	Total
Maintenance	449	458	468	478	489	500	512	524	537	550	4,965
Renewals	865	889	905	925	945	963	990	1,014	1,039	1,066	9,601
Service Level	-	-	-	-	-	-	-	-	-	-	-
Growth	-	-	-	-	-	-	-	-	-	-	-
Total	1,314	1,347	1,373	1,403	1,434	1,463	1,502	1,538	1,576	1,616	14,566

A summary of the NZTA contribution forecasts included in this volume is shown in Table 15.

Table 15 Subsidy forecast summary

Stormwater Drainage Subsidy Forecast (\$000)											
Activity	18/19	19/20	20/21	21/22	22/23	23/24	24/25	25/26	26/27	27/28	Total
Maintenance	229	234	239	244	249	255	261	267	274	281	2,533
Renewals	441	453	461	472	482	491	505	517	530	544	4,896
Service Level	-	-	-	-	-	-	-	-	-	-	-
Growth	-	-	-	-	-	-	-	-	-	-	-
Total	670	687	700	716	731	746	766	784	804	825	7,429

Full details about overall transportation operational expenditure are included in the Transportation Strategic Case (General Volume).

5. IMPROVEMENT AND MONITORING PLAN

Our general Asset Management Maturity Improvement Plan is included in the Asset Management Strategy.

There are no specific areas of improvement identified for stormwater drainage assets.



2018-2028 TRANSPORTATION ASSET MANAGEMENT PLAN
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