



Development Contribution Policy – Stormwater

Brownfield Stormwater Methodology

August 2024, Version 1.0



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Introduction

This document describes the process and methodologies used to develop a list of costed stormwater projects required to enable full build out of an existing urban environment over a 30-year growth horizon.

This methodology has been developed for the Auckland Housing Programme growth areas and has been applied to Tāmaki as a test case for applying to other Auckland Housing Programme areas and other brownfield growth areas. The results of each step have been used to produce the Development Contribution policy for Stormwater.

The process has involved multiple steps, each with its own methodology, that has been developed by relevant specialists.

A high-level summary of the process is in Figure 1 below.

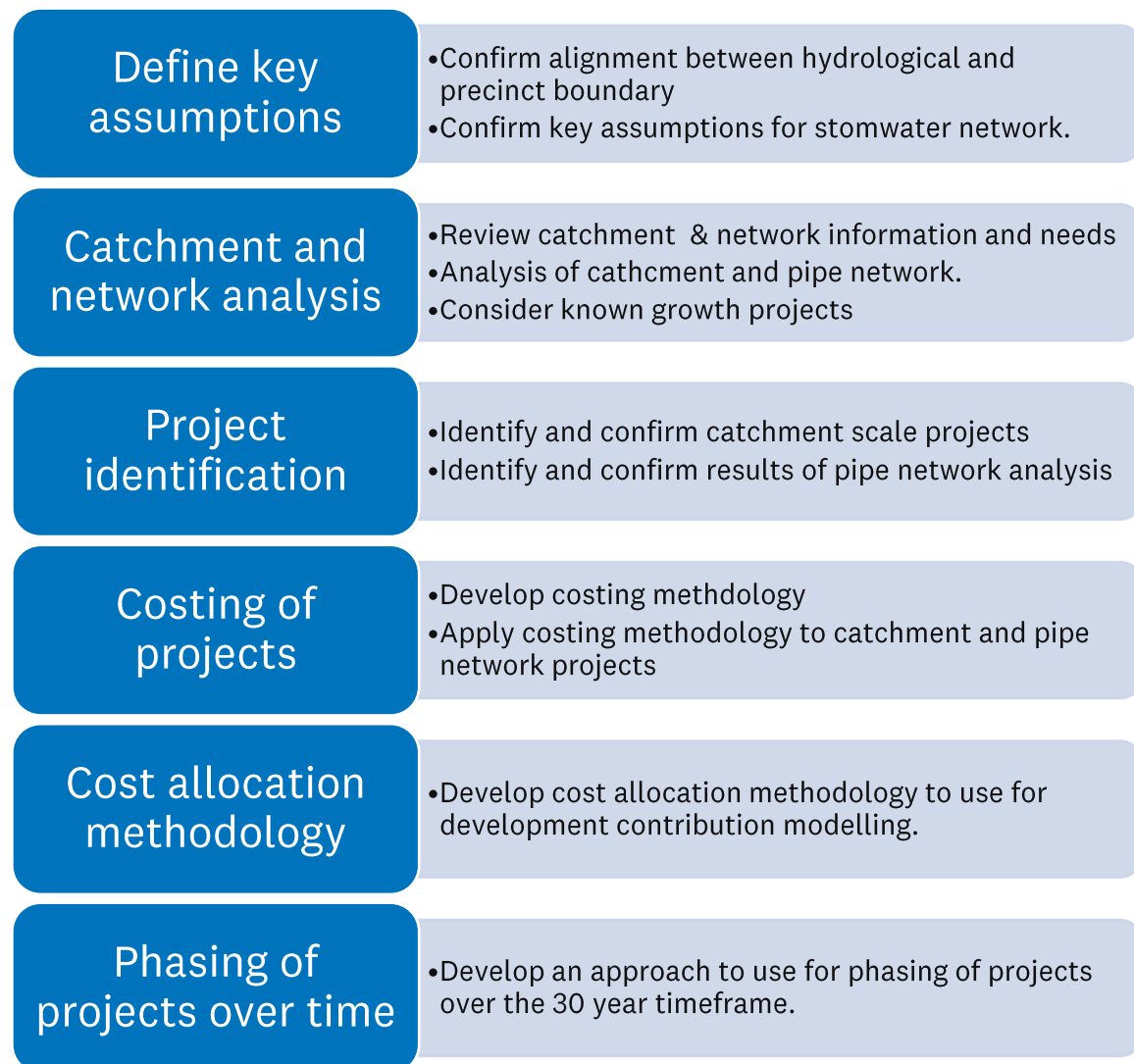


Figure 1. Brownfield Stormwater Methodology process

Before work could begin on the project identification, key assumptions needed to be identified for a future scenario to design a stormwater system to.

Extensive discussion with Healthy Waters specialists and interrogation of available information led to the following key assumptions:

- 90% Impervious Surface Area would be reached in a full build out scenario.
- Climate change allowance of 2.1 degrees used for the primary network design.
- A reduction in overland flows from network surcharge around buildings in 10-year storm event
- Ground soakage will not be a feasible method of stormwater disposal of the additional runoff created by infill growth as the infiltration capacity of the ground is limited and site areas will decrease with subdivision.

90% Impervious Surface Area was chosen because:

- more high-density zoning has been or will applied to growth areas to encourage growth;
- consents currently being lodged in growth areas are often above the existing 70% impervious surface area permitted by the Auckland Unitary Plan zones;
- investigations by Healthy Waters on lot sizes and impervious surface area show that smaller lots are closer to 80% and proportionately this will lead to an increase in impervious surface area across the catchment as most properties become smaller lots and business/industrial land is taken into account.

An adjustment was made to pipe sizing to account for the fact that existing hydraulic models use a 70% Impervious Surface Area.

The current stormwater Code of Practice guideline for the capacity of the primary stormwater network is to convey a 1 in 10-year or 10% annual exceedance probability storm event with a 2.1 climate change allowance.

There is no legislated specific level of service requirements for a stormwater network.

Developer mitigation of stormwater effects is usually required in development however there are significant barriers to this being a feasible approach to manage the increase of stormwater in a brownfield area including:

- The smaller lot sizes and more constrained development sites meaning it would be difficult to fit sufficient stormwater volume on site.
- Highly dispersed land ownership meaning any onsite mitigation would not be cumulatively applied across the catchment and therefore not be effective.
- Lack of a regulatory framework to require the level of on-site mitigation needed and, importantly, lack of compliance mechanisms.

Funding Boundary for Tāmaki growth area

Existing stormwater Development contribution policies use hydrological catchment boundaries as the funding boundary as far as practicable. There is good alignment between the Tāmaki North hydrological catchment with the Tāmaki Auckland Housing Programme area.

MSM zones are used in the Auckland Council Growth Model and growth in each MSM zone has been modelled to predict the pace and location of growth within the Tāmaki AHP area.

The Tāmaki North hydrological boundary was compared with the precinct boundary and MSM zones and it was agreed to use the same boundary as for Transport but with a modification to MSM zone 368 to bisect the boundary along West Tāmaki Drive as this is a natural ridgeline which forms a natural break in the hydrological catchment.

Some

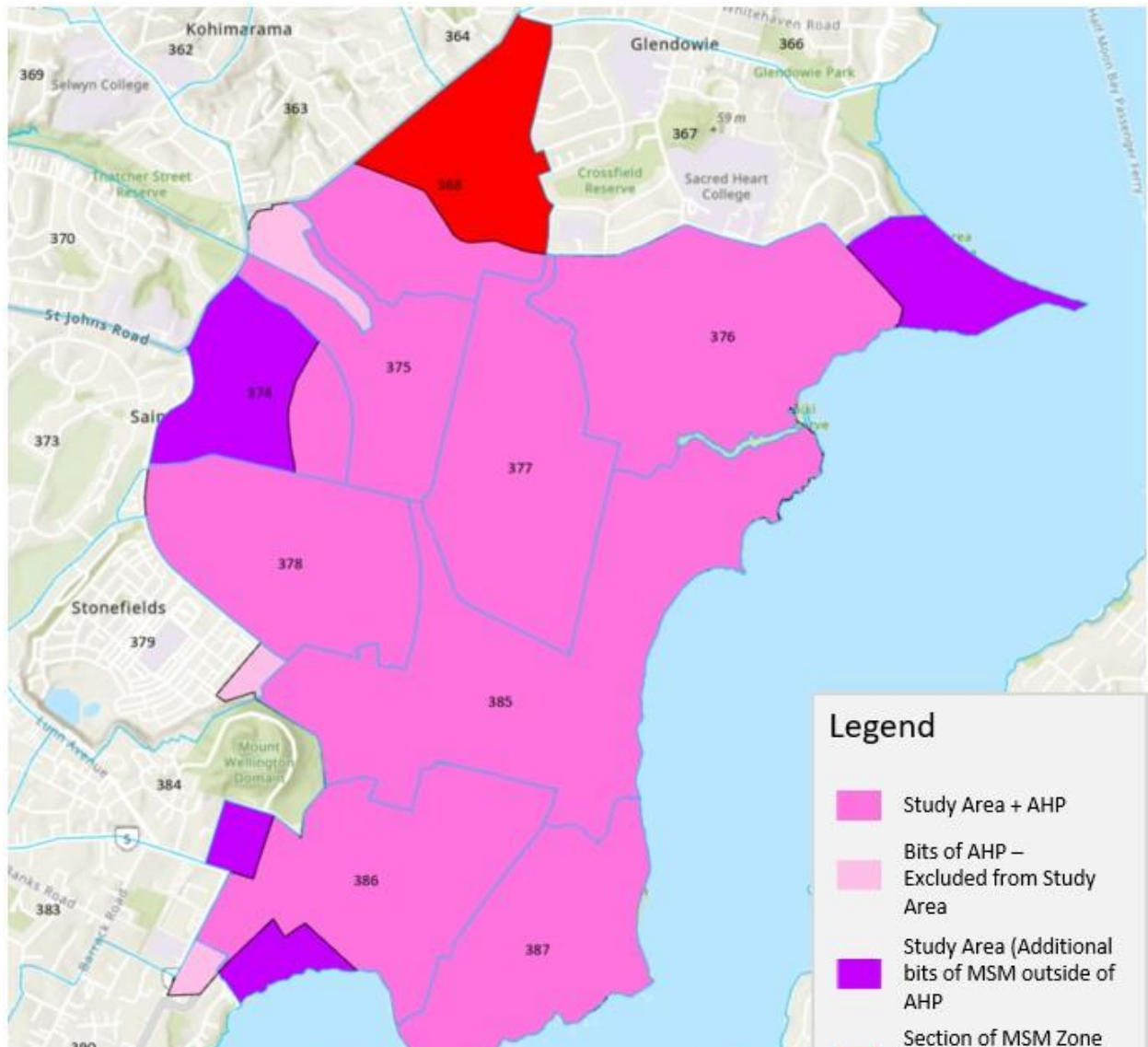


Figure 2. Tāmaki Funding Boundary

sections of the funding area are outside of the AHP Tāmaki boundary but are within the hydrological catchment so are included and these boundaries align to the MSM zones as noted in the table below.

Growth scenarios

The Auckland Growth model predicts growth over the next 30 years starting in 2024 running through to 2054. The development of impervious surface area is the biggest driver of stormwater and it considered that the anticipated that a maximum of 90% impervious surface area will be reached by the end of the 30 years development therefore the Auckland Growth Model is an appropriate model to use for stormwater.

The Auckland Growth Model predicts the amount of growth, by household increase, per year for each MSM zone. Table 1 shows the percentage of growth modelled for each MSM zone that is being used for the modelling of the Stormwater Development Contributions.

Table 1. MSM zones and % growth used

MSM zone	AGS model %	Comments
368	41	Percentage adjustment reflects the exclusion of land in the MSM zone that is outside of the Tāmaki North hydrological catchment.
363	0	Excluded from funding area as part of AMETI designation.
374	100	Full MSM included as it aligns with catchment boundary.
375	100	Full MSM included as it aligns with catchment boundary.
376	100	Full MSM included as it aligns with catchment boundary.
377	100	Full MSM included as it aligns with catchment boundary.
378	100	Full MSM included as it aligns with catchment boundary.
379	0	Excluded as part of Stonefields which drains to a different catchment.
385	100	Full MSM included as it aligns with catchment boundary.
386	100	Full MSM included as it aligns with catchment boundary.
387	100	Full MSM included as it aligns with catchment boundary.
390	0	Excluded from funding area. While in Tāmaki North hydrological catchment this portion of the catchment is not expected to intensify and a large portion is fully impervious existing business land.

Identification of projects

The sources of information to determine the projects needed in Tāmaki were the:

- Healthy Waters stormwater catchment models
- Healthy Waters pipe criticality surveys
- Stormwater Management Plans (SMP)
 - Healthy Water's Panmure North SMP (2019); Prepared by WSP Opus
 - Healthy Water's Omaru Creek SMP (2016); prepared by Harrison Grierson
 - Kainga Ora Neighbourhood SMPs
 - Point England and Panmure North SMP (Neighbourhood 4&5) (2024)
 - Glen Innes North West SMP (Neighbourhood 1) (2024)
- Healthy Waters stormwater projects identified in previous AMPs / LTPs
- Developer's servicing plans and development schedules
 - Kainga Ora Neighbourhoods 1, 4 and 5

The network analysis identified what pipe network upgrades would be required to reduce flooding around buildings in a 10% AEP event.

The Stormwater Management Plans prepared for Healthy Waters were reviewed and compared with projects in the Long-Term Plan to identify and cross reference non-pipe catchment scale projects that are needed over the next 30 years. These include stream daylighting projects to improve conveyance, improve water quality and manage flooding. The timing of these projects has been informed by the catchment managers and when projects are required to support known development planned by Tāmaki Regeneration Company and Kāinga Ora.

Project costing

Alta was commissioned to provide cost estimates for projects identified in the Tamaki growth area. These projects are in different stages of planning and design, with some at a feasibility stage and some more advanced at a concept design phase.

Alta provided cost estimates for the following:

- Pipe network upgrades – upsizing of underground stormwater pipes
- Catchment scale projects – wetlands, stream widening and treatment devices

Alta used a mixture of historic rates from similar projects, and cost build-ups using first principles to arrive at the direct cost estimate. In line with the Auckland Council cost manual for stormwater projects, Alta has applied an allowance for internal costs and contingency to calculate the final expected estimate. Escalation has not been allowed for in the estimates as this will be calculated and applied by the Development Contributions team.

Pipe Network Estimates

Details on pipe assets that require upsizing based on expected development and climate change were provided to Alta. The information provided on the spreadsheet document is as follows:

- Upgrade/Extension – some assets are upgrades of existing pipes and some extensions
- WSP ID – WSP provided an assessment of the catchment and grouped assets
- SAP ID – the asset ID off Auckland Council GIS
- Length of upgrade or extension
- Number of manholes
- Manhole depth
- Minimum cover
- Pipe invert depth
- Existing diameter
- Pipe diameter (45% IMP + 2.1mm)
- Pipe diameter (90% + 2.1mm)

Assumptions made for the pipe network upgrades to achieve a consistent costing approach across all listed assets are listed below:

- All pipes installed by open cut/trenching method
- All reinstatement in the road carriageway
- Number of manholes assumed based on length of asset (information provided by Council)
- Cover on the pipe set at 1 metre (information provided by Council)
- Manhole depth generally considered to be 2 metres (information provided by Council)

A model was used that provides a high-level estimate for stormwater works in the early stages of a project. The model uses known costs from suppliers and subcontractors in the Auckland area, as well as industry production rates and overheads costs to provide the direct works cost for the pipe upgrade. Figure 1 below shows the flowchart for developing the costs in the model.

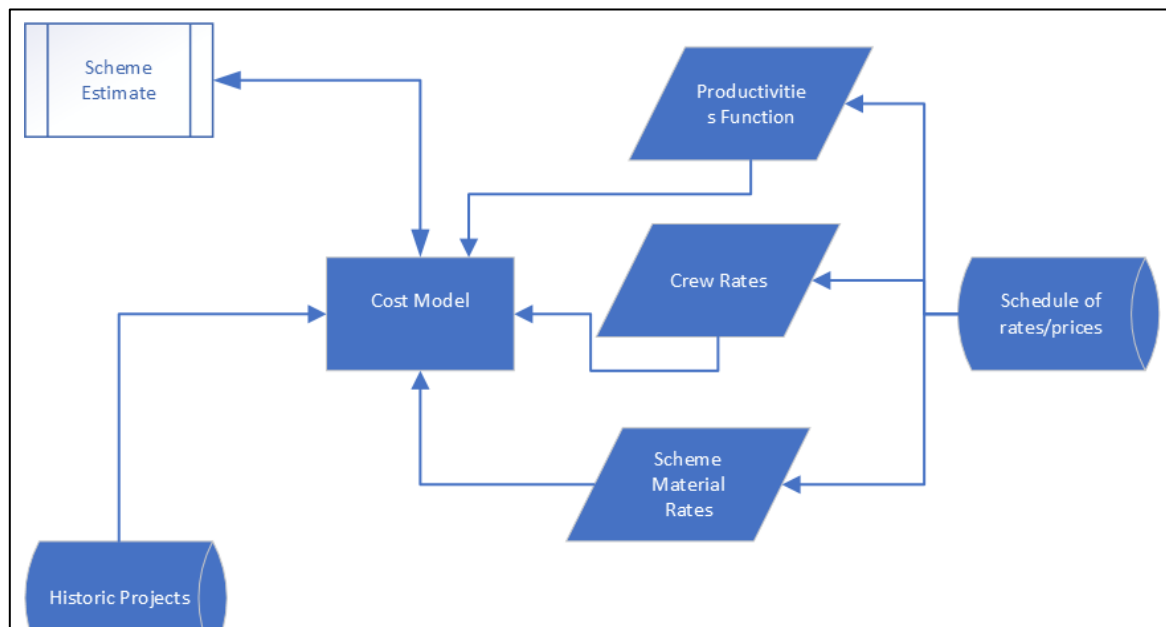


Figure 3. Flowchart of cost model

While the model provides a reasonable and fair assessment of the direct works cost for pipe upgrades, there are some assumptions/considerations within the model that are listed below:

- Production rates are calculated by metre cubed (m³) of trench excavated per hour, as the pipe diameter increases the linear metre production decreases, and therefore the cost per linear metre increase.
- Production rates are impacted by the expected utilities in the line of the trench, the number of utilities is assumed based on trench location and no specific utility assessment is part of the estimate.
- Production rates are impacted by the location of the trench, and therefore the reinstatement required. This is assumed as road reinstatement for all pipes.
- Drainage crew rates are split into small, medium or large with a greater cost as crew size increases. A large drainage crew has been assumed for all pipe network upgrades.
- Traffic management crew rates are split into small, medium and large with a greater cost as crew size increases. A large traffic management crew has been assumed for all pipe network upgrades due to all works being in the road.
- Material costs for all drainage products are known from suppliers in Auckland, and the factored cost includes delivery to site.
- Backfill material costs for all aggregates are known from suppliers in Auckland, and the factored cost includes delivery to site.
- Reinstatement costs are based on trench width and the location of trench. All pipe estimates have assumed asphalt reinstatement is required.
- An on-site overhead allowance of 20% is applied to all estimates.
- An off-site overhead allowance of 15% is applied to all estimates.

The above list provides the assumptions and factors that are applied to the calculation of the direct works cost for pipe upgrades. There are also exclusions in the model, which are listed below:

- Land purchase
- Escalation
- Service relocations
- Excavation in rock
- Excavation in contaminated material
- Archaeological discoveries

With the above considerations, the information that is provided to Alta by Auckland Council can be entered into the spreadsheet and the direct works cost is calculated.

The Auckland Council Healthy Waters cost estimation manual provides guidance around the internal fee costs that should be applied to estimates. This includes, but isn't limited to, costs for designer fees, consenting, PM costs; and should be applied as a percentage of the direct works costs. The recommended range is between 22 – 46%. For these estimates a 34% allowance for internal fee costs has been applied.

The estimation manual provides guidance on the project contingency allowance to be applied at each phase of a project. Contingency is to cover unexpected events and changes during a project lifecycle, this could be to cover potential project risks and any changes during design development. The pipe network estimates are being completed at the Strategic Assessment phase, and Alta have applied a 40% contingency to all project costs.

The P50 expected estimate is the sum of the direct works cost, internal fees and contingency.

The P50 expected estimate is the value that is provided to Auckland Council for the Long-Term Plan.

Specialist Estimates – for catchment scale projects

Alta was provided with relevant design information for the project that is to be priced. This could be in the form of design drawings, design reports, sketches and design memos.

The estimates are calculated using known historic rates from similar projects, or by building up the costs using first principles. The cost build-up calculates the direct works cost as above in the pipe network estimates, but the following variables are specifically addressed based on the location, size and scope of the project.

- Preliminary and General
- Traffic management
- Temporary Works
- Service protection and relocation
- Contractors risk
- Time related On-site overheads
- Off-site overheads & Profit

The above items are calculated by estimating the individual components within each category, or by applying them as a percentage of the physical works cost.

The physical works component of the estimate is calculated as accurately as possible from the provided information and categorised into a relevant sub-category of the estimate. These sub-categories could include, but not be limited to, Stormwater works, Earthworks, Landscaping and Structures.

The internal fee costs and contingency are applied in the same manner as with the pipe network estimates, adhering to the cost estimation manual and falling within the recommended ranges. Where necessary additional costs will be added to the internal fee projected cost for items such as land purchase.

The P50 expected estimate is the sum of the direct works cost, internal fees and contingency.

The P50 expected estimate is the value that is provided to Auckland Council for the Long-Term Plan.

Where projects were already costed for inclusion in the Long Term Plan these costs were used for the Development Contribution model.

Cost Validation Process and Review

When estimates are completed, they go through a review process and are compared against pricing in recent tenders for similar work.

This allowed Alta to provide a fair market value to the estimates and ensure the costs are within an expected range from across the industry.

Phasing of projects

How the projects are phased or timed across the 30 years is important in calculating the cost escalations and other factors in modelling the final development contribution cost.

A significant amount of money is committed in the 2024 LTP for non-pipe projects that enable intensification of the Tāmaki project or will mitigate the effects of growth. In phasing projects it is acknowledged that there is the potential for variance in when and how growth occurs. Stormwater projects have been identified that will be required for growth, however the actual location of growth is uncertain.

To phase the pipe network projects it was agreed that the projects be aggregated and then spread by cost based on the % growth per year over the 30 years. This gives a degree of flexibility in delivering the pipe network projects. The larger scale projects including the Pilkington Rd upgrade, stream daylighting and stream works are generally scoped at a high level and an approximate timing known as shown on the Tāmaki Projects – Costed spreadsheet.

A key assumption in allocating projects is that there will be no money to deliver any of the 30-year projects until 2027 which is the date of the next LTP. It is also assumed that network extension projects are unable to be funded in the first decade.

A significant number of the network extension projects are needed to enable the Kainga Ora neighbourhoods. Central government financing through the Housing Acceleration fund may enable council to deliver some of the enabling works for Kainga Ora neighbourhoods in the first decade. Should this happen our DC policy will be amended to reflect the new project timing and cost at the next Development Contribution policy update.

The process for phasing of projects is set out below:

Step #	Step
1	Identify the projects covered by the HW LTP budget and the date for these projects - these will be timed based on the timing year in the LTP
2	Total up the costs for all other projects (so all projects less the HW LTP Projects)
3	Estimate the amount of growth per year from Start Year (2027 earliest year that projects can start) to End Year
4	Multiply total costs of projects x %age growth per year = \$'s per year
5	Estimate the timing of the \$'s based on the growth from Start Year (2027 earliest year that projects could be delivered) to end year, proportioned
	Timing will be the completion Year of the project
6	Costs spread over the completion year and the prior 2 years (total of 3 years of spend in total)
7	Escalate costs
8	Overlay what budget is available. If budget is not available, then move projects out to 2035 onwards
	Finance to coordinate with HW/DPO to ensure right projects are moved out

Cost allocation

This document is a draft framework on how costs may be allocated for stormwater projects in brownfield areas.

The Auckland Housing Programme in Roskill, Tāmaki and Mangere have been identified by Auckland Council as a priority for intensification (growth) for a number of years (and LTP cycles). In addition to the development anticipated through the Tāmaki Regeneration Company, Kainga Ora and other large scale public housing providers it is anticipated there will be a significant amount of growth from intensification of privately owned lots.

Key principles:

- The cost of the infrastructure should be fairly apportioned between those that create the need for the infrastructure and those that benefit from the infrastructure.
- The expected life span of the existing infrastructure influences the proportion of renewals.
- The growth component of any upsizing of the network is the difference between the size of the network required to service the existing drainage catchment (in relation to current design standards) and the size required to convey the maximum build out scenario to meet the same design standard.
- The cost allocation methodology needs to be fair, equitable and transparent.

Renewals

Renewals refers to the replacement of an existing asset due to either age or (more commonly) failure. The proportion of cost assigned to renewals is related to the remaining useful life of a pipe which is based on the age, material and condition of a pipe. The design guidance in the Stormwater Code of Practice (v3, January 2022) states that the network should have a design life of 100 years. In practice stormwater and manholes can be assumed to have a much longer life provided there are no external factors (such as saltwater intrusion, high velocities or drops).

Auckland Council's Asset Management Plan uses a pipe deterioration model to estimate the percentage of pipe network that will need renewing over different time forecasts. This model uses the age and material of the pipe information as well as any condition assessment of the pipe which may have been done through operational works. The model is updated annually and is audited by Audit New Zealand.

Critical assets (criticality 4 and 5) of poor condition (condition rating 4 and 5) are replaced proactively within five to 10 years of inspection. Assets with medium or low criticality (criticality less than 3) are replaced when they fail (run to failure mode) unless their performance endangers public health and safety (e.g., habitable floor flooding, road obstruction, etc).

The pipe deterioration model, updated with the most recent information for Tamaki North catchment, has been used to estimate the renewal % over the 30-year time period. The approach to identifying the renewal component has been to take the estimated % of pipes in different condition classes and multiple it by 70%. The 70% was derived from taking the difference between the original pipe size and future required pipe size and dividing it by the future pipe size. Testing this formula against a sample of the critical pipes this resulted in a 30% increase in pipe size therefore the pipe renewal percentage is 70%.

For critical pipes with a current condition rating of 4 or 5 these are 100% renewals – 30% increase in pipe size so is 70% total. For critical pipes currently in condition 3 it can be expected that 30% of these pipes will deteriorate over the 30-year period and become condition 4 and 5 pipes which will need replacing. Pipes in condition 1 & 2 are recently installed so are not expected to need replacing at all unless in response to growth therefore no renewals will be charged for critical pipes in condition 1 or 2.

Critical pipes that have not been surveyed have had the average % of pipes in conditions 3, 4 & 5 applied to get an estimate.

Non-critical pipes (critical 1, 2 & 3) are run to failure and so only a much smaller % is expected to be replaced as reactive renewals.

The full list of renewal percentages is set out below.

Table 2. Renewal percentage applied to pipe type in cost modelling

Project Type	Pipe Criticality	Pipe Condition	Expected rate of renewal over period	Replacement cost as % of total upgrade cost	Renewal share to be applied	Comment
Upgrade	4 or 5	4 or 5	100.0%	70.0%	70.0%	100% of condition 4 and 5 critical pipes to be replaced within next 5-10 years
Upgrade	4 or 5	3	30.0%	70.0%	21.0%	30% of condition 3 critical pipes expected to degrade to condition 4 or 5 and require replacement within 30 years
Upgrade	4 or 5	1 or 2	0.0%	70.0%	0.0%	Newer pipes, no renewal expected over 30 years.
Upgrade	4 or 5	Not Surveyed	16.7%	70.0%	11.7%	Condition unknown, applied average rate of renewal across all critical pipes, see table below
Upgrade	1,2 or 3	All	3.8%	70.0%	2.7%	Reactive replacement only, where pipe has failed. Expect to replace 3.8% of non-critical pipes over 30 years
Extension	N/A	N/A	0.0%	0.0%	0.0%	New asset, no renewal
Renewal only	All	All	100.0%	0.0%	100.0%	Renewal only projects e.g. same size pipe, like for like replacement.

Level of service

In stormwater Level of Service improvements refers to:

- Risk reduction to habitable floor flooding, or
- A reduction in floodplain extent, or
- An improvement in public safety from impacts of stormwater; or
- Amenity additions to a project.
- Hydrology improvements and contaminant reduction that results from existing community. Impacts on hydrology and water quality resulting from growth are included in the growth component.

These level of service improvements often benefit the existing community though may also benefit new growth too.

Growth

Growth created by the existing community is called inherent growth and results from modifications to existing homes and lots and not through subdivision or the creation of new dwellings. For stormwater this would be an increase in impervious surface area in the form of paved surfaces, sheds etc added to existing lots by homeowners. The impact of this form of growth is captured in the allocation of cost to Level of Service improvements and the existing community has both contributed to the need for and derive a benefit from the projects. Development Contributions are not charged for this form of growth.

The creation of new buildings and impervious surface area through the intensification and redevelopment of existing brownfield land is new growth and this is the form of growth that is captured and charged through a Development Contribution policy.

As dwellings can build up without changing the impervious surface area the anticipated total impervious surface area has been the focus in the development of stormwater methodology as this has the greatest impact on peak flow and size of the stormwater network.

Cost allocation methodology for pipe network projects

A methodology that could easily and consistently be applied to the large number of pipe network projects was needed. The methodology below sets out the approach that has been applied in the development contribution modelling and incorporates the methodology above.

Stormwater Cost Allocation for Pipe Network projects																				
Step 1: Determine the funding boundary.	Align to the relevant hydrological boundary. The Tamaki North hydrological catchment aligns well to the precinct and this forms the basis of the funding boundary.																			
Step 2: Estimate growth in the Funding Area.	Estimate change in total impervious surface area in the hydrological catchment(s) from existing to full build out. In Tamaki existing impervious surface area s 45% and anticipated full build out is 90%.																			
Step 3: Determine the Renewal component.	Will the project be replacing an existing asset? • If no, (e.g. new pipe network/extensions), then there will be no renewal component. • If yes, then determine the renewal component from the table below: <table><tr><th>Pipe criticality</th><th>Pipe condition</th><th>Renewal component</th></tr><tr><td>4 or 5</td><td>4 or 5</td><td>70.0 %</td></tr><tr><td>4 or 5</td><td>3</td><td>21.0 %</td></tr><tr><td>4 or 5</td><td>1 or 2</td><td>0.0 %</td></tr><tr><td>4 or 5</td><td>Not surveyed</td><td>11.7%</td></tr><tr><td>1, 2 or 3</td><td>All</td><td>2.7 %</td></tr></table>		Pipe criticality	Pipe condition	Renewal component	4 or 5	4 or 5	70.0 %	4 or 5	3	21.0 %	4 or 5	1 or 2	0.0 %	4 or 5	Not surveyed	11.7%	1, 2 or 3	All	2.7 %
Pipe criticality	Pipe condition	Renewal component																		
4 or 5	4 or 5	70.0 %																		
4 or 5	3	21.0 %																		
4 or 5	1 or 2	0.0 %																		
4 or 5	Not surveyed	11.7%																		
1, 2 or 3	All	2.7 %																		
Step 4: Determine the residual amount to be allocated between the existing community and the growth community.	Residual amount = (Project cost – renewal)																			
Step 5: Determine the extent to which growth causes the need for the investment.	Would some or all of the project be delivered in the absence of growth? • If no, then 100% to growth • If yes, then growth share = <u>Future ISA – Existing ISA</u> * Residual amount																			
Step 6: Determine the amount that benefits the existing community.	Does project provide an increased LOS for existing residents at end of growth period? If yes, then Benefit growth share = <u>future ISA - existing ISA</u> future ISA • If no, then 100% growth																			
Step 7: Calculate final growth community share.	Average the results of Step 5 and 6 and multiply by Step 4 to get the proportion of costs attributable to the growth community.																			

Cost allocation for catchment scale non-pipe projects

The process for allocating costs for the non-pipe catchment scale projects is different. Generally, there is already an existing asset in place that is serving some function but the existing asset may no longer be fit for purpose or unsuitable for an intensified environment. There may also be changed expectations on what that asset provides given its catchment scale and the intensified environment it will be serving in the future.

Another factor that alters the approach is that as these projects are catchment scale, they are often cornerstone projects and so it is often appropriate to do these projects ahead of significant development occurring in a catchment.

For these reasons the non-pipe catchment scale projects in Tamaki have been recognised as needed for a number of years and therefore most of them are also in the 2024 Long-Term Plan. Projects in the Long-Term Plan have usually undergone a more in-depth scoping and design process so there is more detail available on the drivers of the project and design and therefore a more refined process of allocating costs between the renewals, level of service and growth is applied.

Allocations to each driver are based on the driver for the project, the existing asset and expert judgement from the relevant specialists. Allocations made for projects in the 2024 Long Term Plan have not been changed and have been reflected in the Development Contribution policy.

The splits for the non-pipe catchment projects are in the table below:

Table 3. Cost allocation splits for catchment projects

Project Name	Growth	Level of Service	Renewal	DC growth
Maybury Reserve	95%	5%	0%	95%
Johnson Reserve daylighting	60%	40%	0%	60%
Point England Reserve Wetland renewal	30%	10%	60%	30%
Pilkington Rd stormwater upgrade	60%	30%	10%	60%
Howard Hunter Tributary Erosion	50%	40%	10%	50%

