Data, Modelling and Resilience

Development of the National Stormwater Modelling Guide

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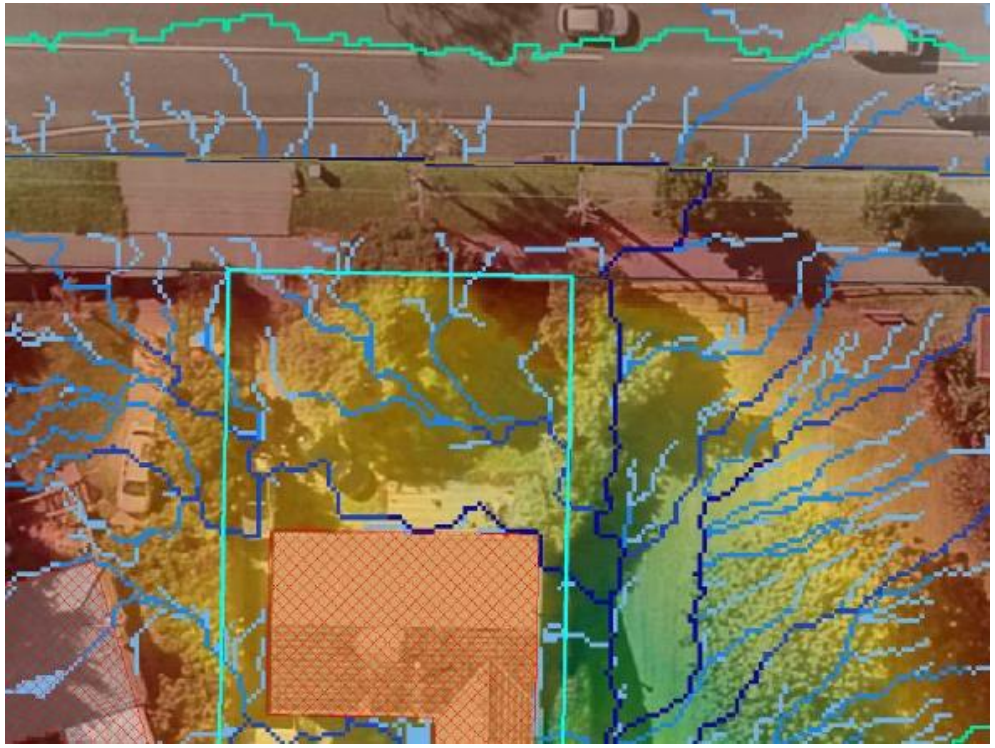
Overview

- Acknowledgements
- Summary of the guide
- Workshops – An effective tool for testing content
- and gaining buy-in
- The importance of model planning
- Model types and links with purpose
- Accessibility – guide or specification?
- Next steps



Acknowledgements

Delivery Team:

- Rathika Jebamony – Modelling Lead – Awa Environmental
- Carl Johnson – Director – Submergent

WaterNZ:

- Nicci Wood – Project Manager
- Modelling SIG members (past and current)
- Stormwater SIG members

Advisory Group:

- Alistair Osbourne - Wellington Water
- Cheryl Bai - Auckland Council
- Emily Lane - NIWA
- Mazza Aziz – Whangarei District Council
- Nadia Nitsche - Wellington Water
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- Victor Su - Tauranga City Council
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Acknowledgements

You! (if you attended one of these events…..)

- Industry Survey – July / August 2020
- Water New Zealand – National Conference Workshop – November 2020
- Water New Zealand – Modelling Symposium Workshop – June 2021
- Water New Zealand - Modelling Symposium Workshop – March 2023
- Water New Zealand – Online Workshop – April 2023
- Industry Survey – April / May 2023
- Water New Zealand – Stormwater Conference Workshop – May 2023
- Interviews with council staff and consultants in the industry – April to May 2023
- Water New Zealand – Conference and Expo - Workshop – October 2023
- Water New Zealand – Online Workshop – October 2023

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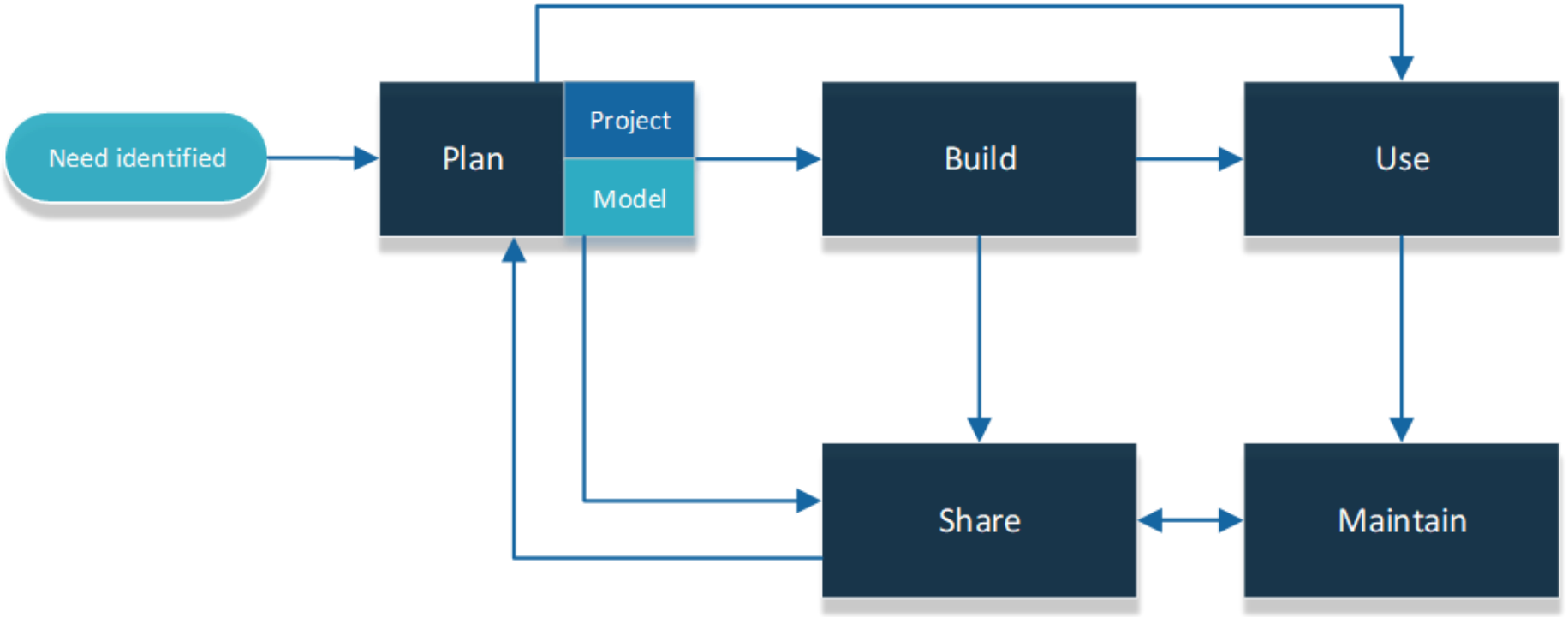
Summary of guide



Summary of guide

Introduction: Guideline purpose and guiding principles

Plan – Project: Define model purpose, engage with stakeholders, review background information and plan quality assurance

Plan – Model: Define success criteria, identify phenomena, confirm approach & methodology, select software, set model management practices and commence data collection

Build - Prepare hydrological inputs, build hydraulic model, set boundary conditions, complete quality assurance, define limitations & assumptions, assess model confidence and prepare reporting

Use - Test and compare current and future scenarios by varying model boundary conditions, hydrology and hydraulics (including blockage assessment)

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Summary of Guide

Maintain: Best practice approaches for archiving and updating model assets

Share: Managing intellectual property rights, metadata and data formats

Appendices:

Metadata Standard: Models and result files

Model Review Checklist: Basic checklist for reviewing models

Workshops – An effective tool for testing content and gaining buy-in

Early in project:	Middle of project:	Near end of project:
• What is needed in the guide? • What is available now? • What works well / not so well?	• Have we missed anything important? • What are the key gaps in current guidance? • Does the draft structure look OK? • What format should the guide be delivered in?	• Do these key concepts / content make sense? • What are the barriers to achieving these things?

The importance of model planning…

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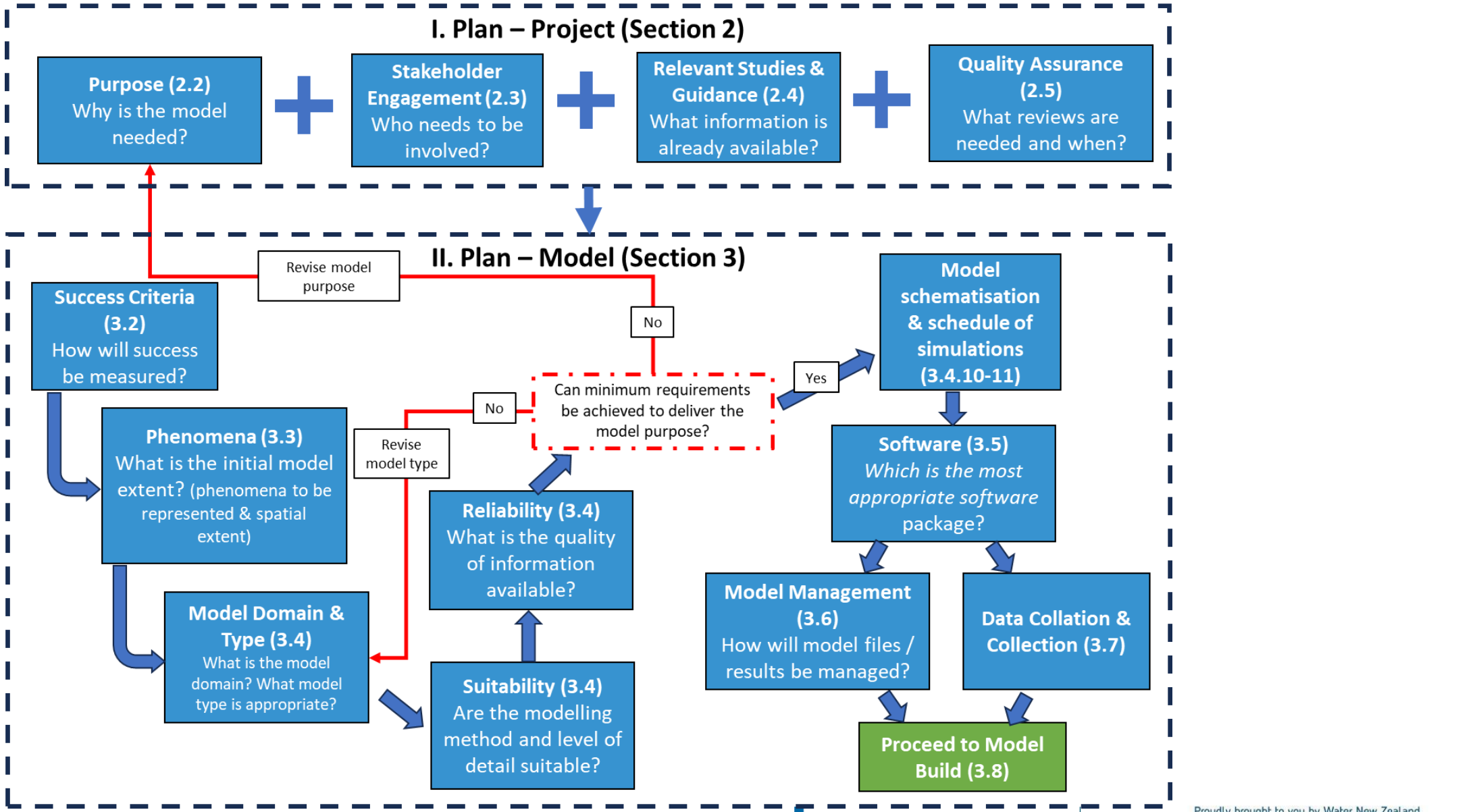

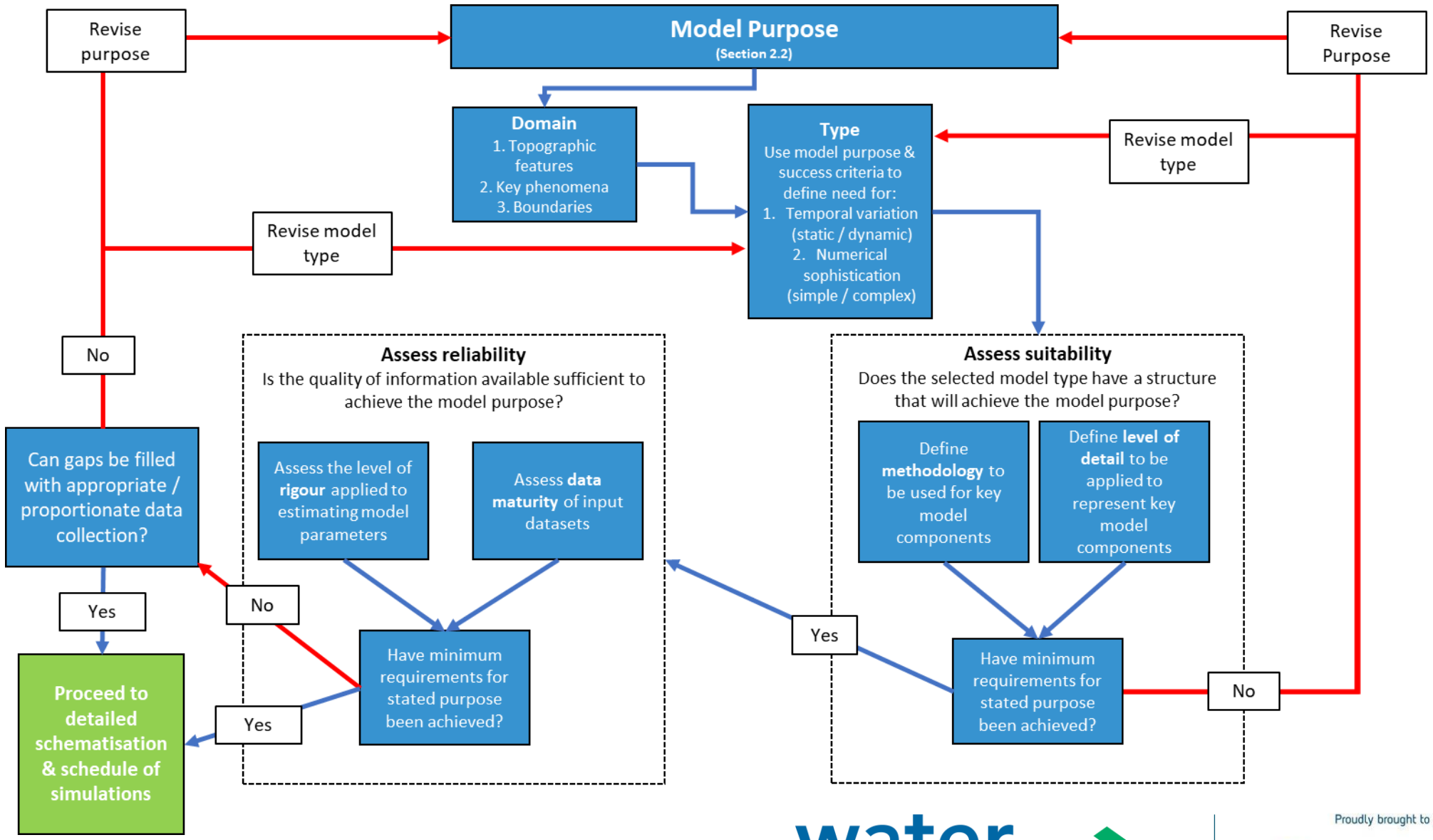

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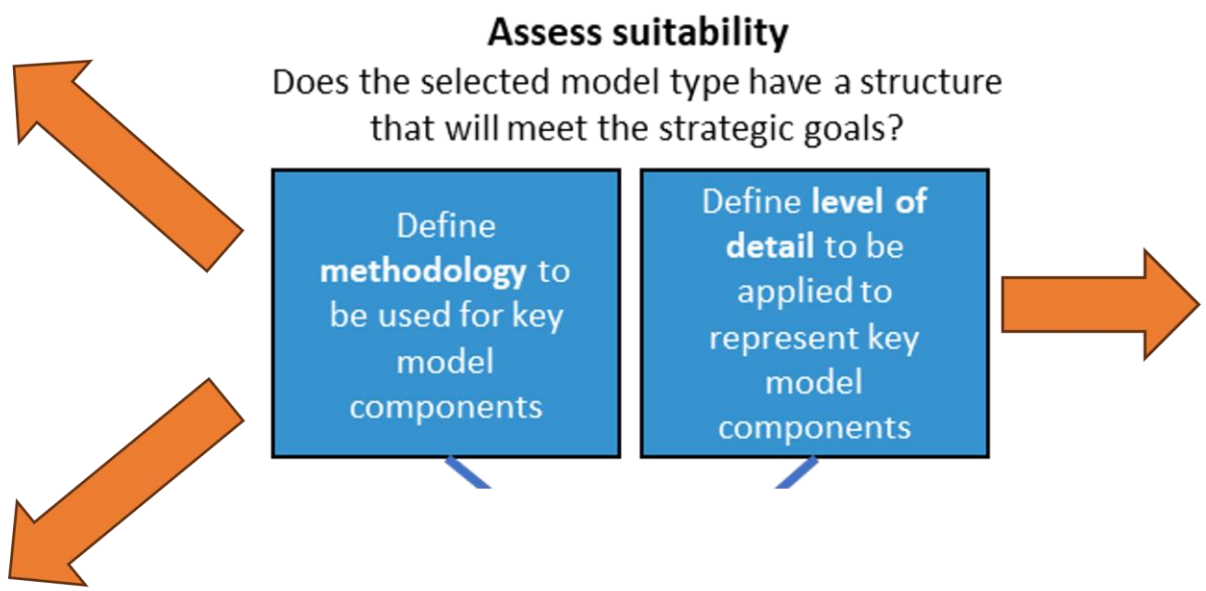
Model types and links with purpose

Component
Pipe network
2D surface
Open channels
Hydrological parameters
Upstream catchments

Term	Description
Excluded	Features are not represented explicitly.
Simple	Simple calculations or static analysis.
Data driven	Non-physics-based models.
Hydrological	Lumped hydrological model.
1D hydraulics	Free surface, St Venant hydrodynamic model.
2D hydraulics	Shallow-water-wave hydrodynamic model.
3D hydraulics	Navier-Stokes hydrodynamic model.



Term	Resolution	Description
Averaged	**Low**	Parameters estimated for entire domain.
	High	Parameters estimated at detailed level and averaged.
Grouped	**Low**	Parameters estimated for subdomains.
	High	Parameters estimated at detailed level and averaged for each subdomain.
Discrete	**Low**	Coarse resolution with respect to physical features.
	Medium	Resolution sufficient to resolve effects of features.
	High	At the resolution of the real-world features of interest.

Model types and links with purpose

Term	Description
Unconsidered	No effort is expended in representing features. Interpolated or default values are used.
Conceptual	No information is available so estimates are used, design requirements may be known.
Simple	Basic representation of features of interest, requirements are well-defined.
Detailed	Finely-resolved data for design is available but does not capture full detail of an as-built survey.
Detailed / mature	Mixture of as-built survey and designed geometry used in estimating parameters/geometry/behaviour.
Mature	Model parameters / geometry / behaviour is based on field survey (topographical, LiDAR, remote sensing/aerial photos, etc.).

Assess reliability

Is the quality of information available sufficient to meet the strategic goals?

Assess the level of **rigour** applied to estimating model parameters

Assess **data maturity** of input datasets

Term	Description
Theoretical	Based solely on intuition of modeller.
Literature	Published methods or parameters.
Verified	Indirect corroborating evidence or data.
Validated	Sparse direct evidence based on historic event.
Calibrated	Comprehensive direct evidence based on historic events.

Model type	Details	Examples	Specific application	Model Component (Table 3-12)	Methodology (Table 3-13)	Level of detail (Table 3-14)	Rigour (Table 3-15)	Data maturity (Table 3-16)
Dynamic/simple	Models built using comprehensive datasets, such as LiDAR, with coarse assumptions used in the representation of hydrologic or hydraulic phenomena. To be used for developing approximate flood extents with some distinction between shallow and deep flooding for used in broadly identifying flood risks and impacts.	2D domain model with direct rainfall, excluding hydrological losses or pipe network. No editing of DEM to represent channel conveyance.	Evacuation planning. Lifeline planning.	Flood plain Large open channels Small open channels Upstream catchments Flood plain hydrology	2D hydraulics 2D hydraulics 2D hydraulics Hydrological Excluded	Distributed, low-resolution Averaged, low-resolution Averaged, low-resolution Lumped, low-resolution NA	Theoretical Literature Theoretical Verified NA	Mature Unconsidered Unconsidered Mature NA
		2D domain model with direct rainfall and hydrological losses, but no pipe network. DEM modified at significant structures on large open channels (culverts, bridges, etc.) to ensure flow continuity, if not accurate afflux.	Strategic planning. Programme prioritisation.	Flood plain Large open channels Small open channels Upstream catchments Flood plain hydrology	2D hydraulics 2D hydraulics 2D hydraulics Hydrological Hydrological	Distributed, low-resolution Lumped, low-resolution Lumped, low-resolution Lumped, low-resolution Lumped, low-resolution	Theoretical Literature Theoretical Verified Literature	Mature Simple Unconsidered Mature Unconsidered
		2D domain model with direct rainfall and hydrological losses, but no pipe network. Detail is added at significant structures on large open channels to determine accurate afflux. Soakage losses are incorporated into infiltration loss.	Spatial planning. District Plan development. Plan changes. Long Term Plan development. Multiple lot stormwater design with known existing risk (to site or downstream).	Flood plain Large open channels Small open channels Pipe network Upstream catchments Flood plain hydrology	2D hydraulics 1D hydraulics 2D hydraulics 1D hydraulics Hydrological Hydrological	Distributed-medium-resolution Lumped, high-resolution Lumped, low-resolution Distributed, low-resolution Lumped, low-resolution Distributed, low-resolution	Literature Literature Theoretical Theoretical Validated Literature	Mature Mature Conceptual Detailed Mature Detailed / mature

Model types and links with purpose

Examples	Specific application	Model Component (Table 3-12)	Methodology (Table 3-13)	Level of detail (Table 3-14)	Rigour (Table 3-15)	Data maturity (Table 3-16)
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Accessibility - Guide or Specification?

Level of detail

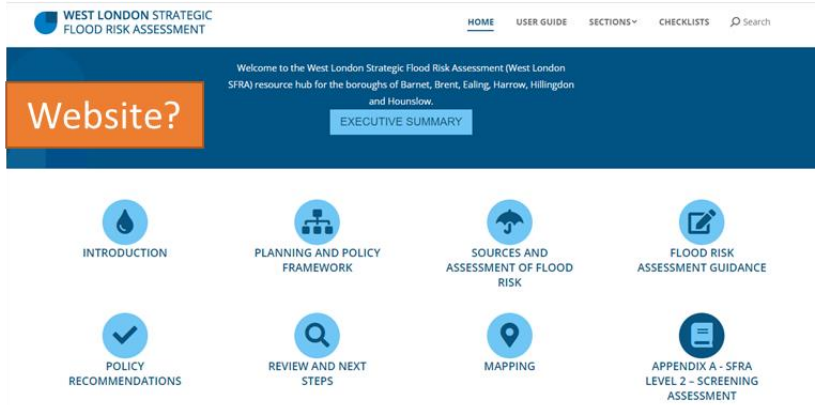
- Detailed enough to be useful to expert & non-expert audiences….
- But not so detailed it becomes difficult to apply at a local scale….

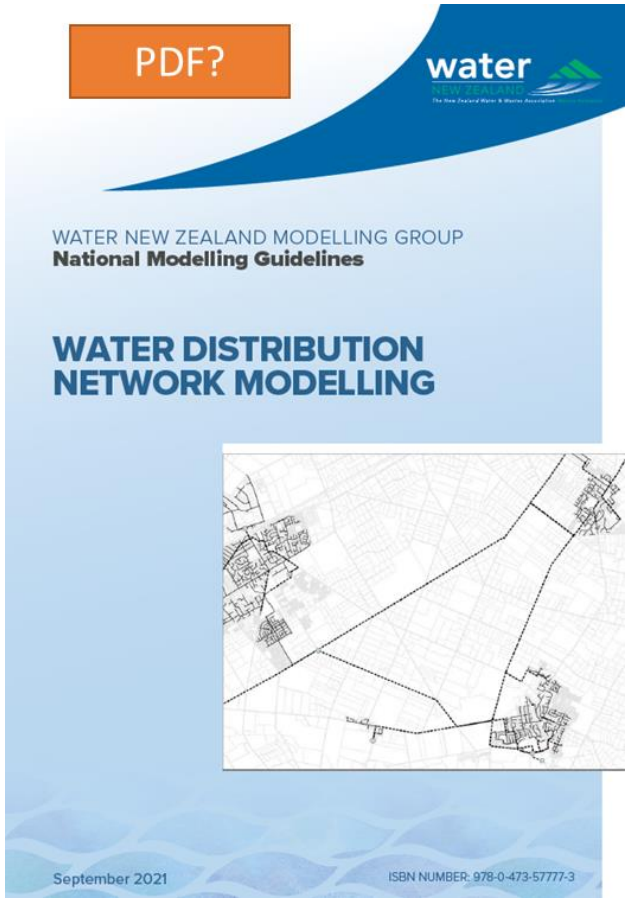
Format

- PDF
- Website
- Both?!

Keeping it relevant

- Ease of update
- Enabling innovation





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Next Steps

In scope:

- Publish – Any day now!

Out of scope:

- Update & maintain guide – WaterNZ with support of SIGs?
- National rainfall / runoff guidance
- Address issues around inconsistent language and poor understanding of common technical terms

Next Steps

Out of scope:

- Determine the need for developing national water quality modelling guidance
- Develop a framework for training and recognising professionals
- Definition and interpretation of flood hazard based

Thank you!
Questions? Patai?

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