

Proposed Flood hazard mapping audit/review procedure

Minor changes – peer review of changes only

For minor changes to existing models, a peer review must be done of the modelling report and changes. (n.b. this does not need to be an independent audit). The peer review must be completed before the results are released for general use (although draft results with suitable caveats may be appropriate to use in some circumstances). The peer review must check:

1. That the changes are technically correct and follow good practice
2. That the model they are based on is fit for the purpose it's being used for and has been previously reviewed

This review of the changes is not a full review of the model and will rely on a previous peer review that's found the model to be sound. In some circumstances such as design or options scenarios, the peer review can be built into a more general design check.

Examples of minor changes include:

- Updates of existing hydrology, or new model runs for different climate change/Annual Exceedence Probability scenarios using existing hydrology
- Updates for a particular structure such as a new stopbank or bridge where this requires only local changes to the model that are within the existing model's ability to represent
- Updates to cross-sections where there haven't been major changes, floodplain terrain (LiDAR)

The Engineer-Modelling will recommend whether the proposed changes should be considered minor or major. The Team Leader-Investigations, Strategy and Planning will decide on this, and document the decision. It may be necessary to discuss this with stakeholders before making a decision.

For situations where multiple scenarios are being run to inform decision-making, the scenarios should be run on the basis of an existing model that has been peer reviewed or audited as necessary. Any changes to the model required by the packages of scenarios should also be peer reviewed before being used for final decision making. The modeller and project manager must work together to work out appropriate timeframes and milestones, and appropriate scale of review, for this. The need for model changes to be reviewed must be allowed for in project programmes.

The peer reviewer must be from a different organisation from the modeller. For example, a GWRC staff member could peer review the work done by a consultant but could not peer review work done by another GWRC staff member

The peer review must be documented, and a response must be provided by the modeller including any changes made to the modelling as a result.

Major changes or new models – peer review and independent audit

For new modelling or major changes/updates to existing modelling, a two-stage peer review and independent audit must take place.

Both the hydrology and the hydraulic modelling must be **peer reviewed**. These reviews will be detailed technical reviews of the inputs, assumptions, techniques and correctness of the approaches used. They must be documented in reports along with the response to the review. As discussed above, the peer reviewer must be from a different organisation from the modeller but there is no requirement that they be “independent” as described below.

The final mapping must be subject to an **independent audit**. The focus of the audit is on robustness and fitness for purpose. The auditor will draw on existing information including modelling reports, the peer reviews and conversations with technical staff. They will need to drill down to a level of technical detail sufficient to satisfy themselves that the work is robust. The independent audit must be completed before the results are released for general use (although draft results with suitable caveats may be appropriate to use in some circumstances)

Terms of Reference (ToR) must be developed for the independent audit and these should be consulted on at least with TAs and perhaps other stakeholders. The choice of auditor should also be agreed with these parties if possible as this can impact on how the outcomes are viewed.

The ToR should include a description of the purpose of the modelling/mapping so that the auditor can report on whether it’s fit for purpose. The audit report should be based on a completed checklist with a Green/Amber/Red traffic light system that answers the key questions on a topic by topic basis as to whether that particular aspect of the process used to develop the flood maps is fit for purpose. The most recent ToR that have been developed at the time of writing are for the Waiohine audit.

At minimum, the ToR should broadly include:

- The appropriateness of all methodologies/models/software used
- Assessment of all input data and assumptions
- Model calibration against observed events
- Climate change allowances
- Freeboard methodology, amount and how flood hazard is represented in the maps.

In a situation where concerns have been raised either in the community or by stakeholders in relation to the flood mapping, the auditor should meet with representatives of the community or stakeholders to determine the nature of the concerns and include these in the audit.

The independent auditor must be an individual external to GWRC and not have been personally involved in the modelling or flood maps in question. They must have sufficient expertise in hydrology and flood hazard mapping. Preferably, their organisation will have not been previously involved in the work in question although there may be situations where this is difficult to avoid and perceived conflicts of interest can be managed.

Application to existing projects

The procedure above should apply to existing projects that are underway where the flood maps have not yet been finalised. It will also apply when there are minor upgrades to existing models that have not been previously audited.

This procedure does not apply retrospectively to existing mapping. GWRC does not propose to carry out independent audits of existing mapping until such time as that mapping is updated, as that mapping was completed under the peer review processes that were in operation at that time. GWRC will continue to use and apply the most recent, finalised, flood hazard information that is available.

As time passes, modelling techniques and technology improve. GWRC will continue to promote and use the best available information on flood hazard in any given situation, and in some cases this will include information that is older or of a lesser quality than a detailed study carried out today. Nothing in this procedure should be taken to imply that older information is not “up to scratch” or needs to be revisited necessarily.

Implications

This process has cost and time implications. For minor changes (peer review) the implication is negligible since this procedure formalises what is normally current practice. For new models/significant upgrades, the procedure is estimated to add three to four months and about \$30-40k to a modelling project. However, the time and cost saving in a smoother process for finalising models, reaching agreement on flood hazards and implementing outcomes will hopefully outweigh this.