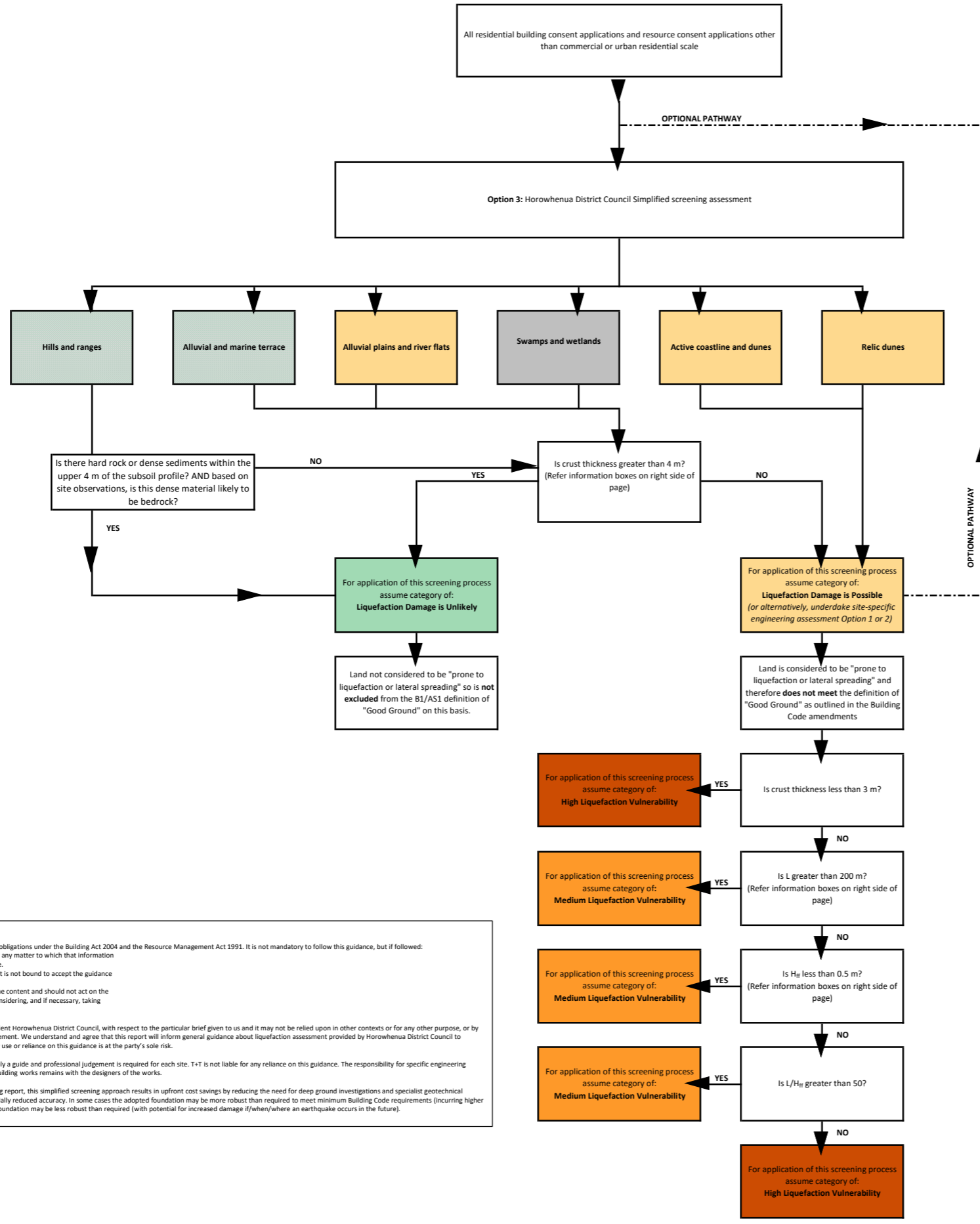


**Simplified liquefaction vulnerability screening tool for Horowhenua District**

This flow chart must be read alongside the June 2023 report "Options for Liquefaction Assessment for Resource and Building Consent" v2 prepared by Tonkin + Taylor for Horowhenua District Council

- STEP 1**  
What type of development is proposed?
- STEP 2**  
Which liquefaction assessment option will be adopted?
- STEP 3**  
What geomorphic terrain is the site within?
- STEP 4**  
Apply simplified screening criteria to choose assumed liquefaction vulnerability category.



**Confirmation of geomorphic terrain:**  
The liquefaction vulnerability of each terrain in the study area was based on the available base information and uncertainty assessment undertaken as part of the Horowhenua District Liquefaction Vulnerability Assessment (2023). Due to the uncertainties associated with the geomorphic mapping (as detailed in the Liquefaction Vulnerability Report, 2023), the geomorphic terrain should be confirmed during site-specific assessment. Descriptions of geomorphic terrains are available in the 2023 Horowhenua District Liquefaction Vulnerability Assessment report.

**Simplified assessment of non-liquefiable crust thickness:**  
A thick non-liquefiable crust will help to suppress the surface manifestations of liquefaction, reducing ground damage and settlement. Where this crust is sufficiently thick, a site is unlikely to have **High Liquefaction Vulnerability**.  
For the purposes of this simplified screening assessment, the crust thickness (CT) is measured as the depth below the proposed building foundation to the first liquefaction-susceptible soil layer (e.g., non-plastic silt, sand or loose gravel) which is below the expected long-term average groundwater level.

**Simplified assessment of lateral spreading:**  
Where a site is sufficiently distant from a free face, the lateral spread hazard can be considered likely to be minor. MBIE/MfE (2017) indicate that as a starting point for simplified lateral spread screening, particular attention should be given to liquefaction-susceptible land that is within 200 m of a free-face greater than 2 m high; or within 100 m of a free-face less than 2 m high.  
The free-face height (H<sub>f</sub>) is measured as the difference in height between the lowest point (bottom of a riverbed or base of terrace) and the highest point (e.g., top of riverbank/terrace). For the purposes of this simplified screening assessment, the lateral spread hazard can be considered likely to be minor if the free face height is less than 0.5 m.  
The distance to the free face (L) is measured as the distance between the top of the bank/terrace and the closest part of the proposed building.  
The ratio between the distance to and height of the free face (L/H<sub>f</sub>) is used as a normalised parameter to evaluate the relative proximity of the site to the free face.

**Key:**

- Liquefaction Damage is Possible - further categorisation required to determine foundation design
- Liquefaction Damage is Unlikely - Foundation design in accordance with B1/AS1 and NZS3604:2011
- Liquefaction Damage is Undetermined - further categorisation required to determine foundation design
- Liquefaction Damage is Unlikely or Undetermined - further categorisation required to determine foundation design
- Medium liquefaction vulnerability = Adopt TC2-type foundations
- High liquefaction vulnerability = Adopt TC3-type foundations

**Document status and limitations**

This report is intended to assist parties to comply with their obligations under the Building Act 2004 and the Resource Management Act 1991. It is not mandatory to follow this guidance, but if followed:

- \* It does not relieve any person of the obligation to consider any matter to which that information relates according to the circumstance of the particular case.
- \* The consent authority may have regard to the guidance but is not bound to accept the guidance as demonstrating compliance.
- \* All users should satisfy themselves to the applicability of the content and should not act on the basis of any matter contained in this document without considering, and if necessary, taking appropriate professional advice.

This report has been prepared for the exclusive use of our client Horowhenua District Council, with respect to the particular brief given to us and it may not be relied upon in other contexts or for any other purpose, or by any person other than our client, without prior written agreement. We understand and agree that this report will inform general guidance about liquefaction assessment provided by Horowhenua District Council to consent applicants and their designers, on the basis that any use or reliance on this guidance is at the party's sole risk.

While T+T has taken care in preparing this document, it is only a guide and professional judgement is required for each site. T+T is not liable for any reliance on this guidance. The responsibility for specific engineering design and construction review for land development and building works remains with the designers of the works.

As discussed within Sections 4.2 and 4.3 of the accompanying report, this simplified screening approach results in upfront cost savings by reducing the need for deep ground investigations and specialist geotechnical engineering input. However, this is offset against the potentially reduced accuracy. In some cases the adopted foundation may be more robust than required to meet minimum Building Code requirements (incurring higher up-front construction costs), or in some cases the adopted foundation may be less robust than required (with potential for increased damage if/when/where an earthquake occurs in the future).