

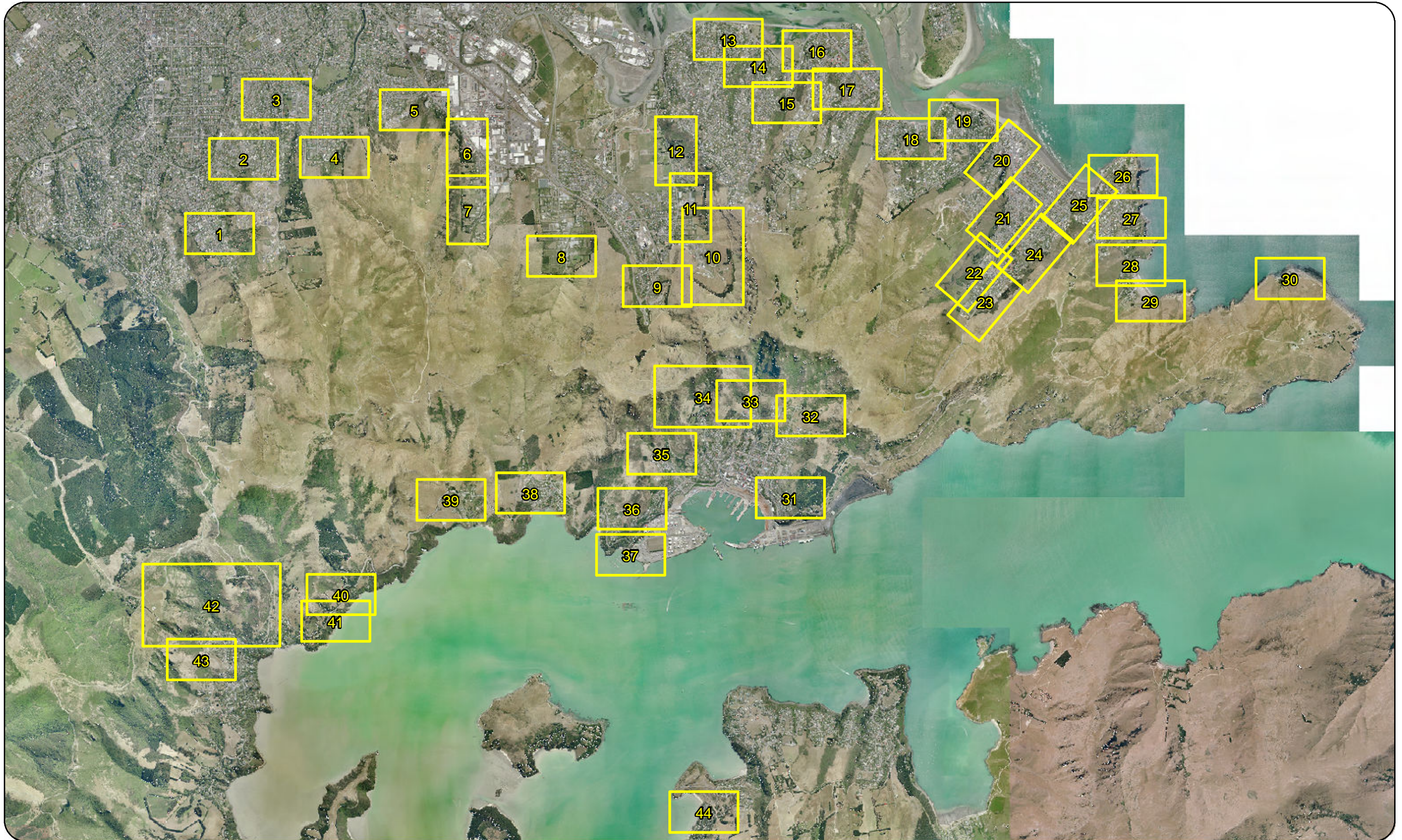
Port Hills zoning review



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Port Hills Zoning Review: Zoning Changes

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Site specific considerations relating to the GNS model for Map 1

Expert advice provided to the Port Hills Zoning Review Advisory Group indicated that there are site specific considerations relating to the GNS risk model around the following area:

- Properties on the eastern side of the valley at 101G and 101H Bowenvale Avenue:

The model overstates the life safety risk to these properties because:

- There is a limited rockfall source; and
- The presence of the road/pathway provides additional protection which is not reflected in the model. (In most circumstances the presence of a flat area such as a road carriageway or building platform tends to reduce the rockfall risk for properties located below the flat area.)



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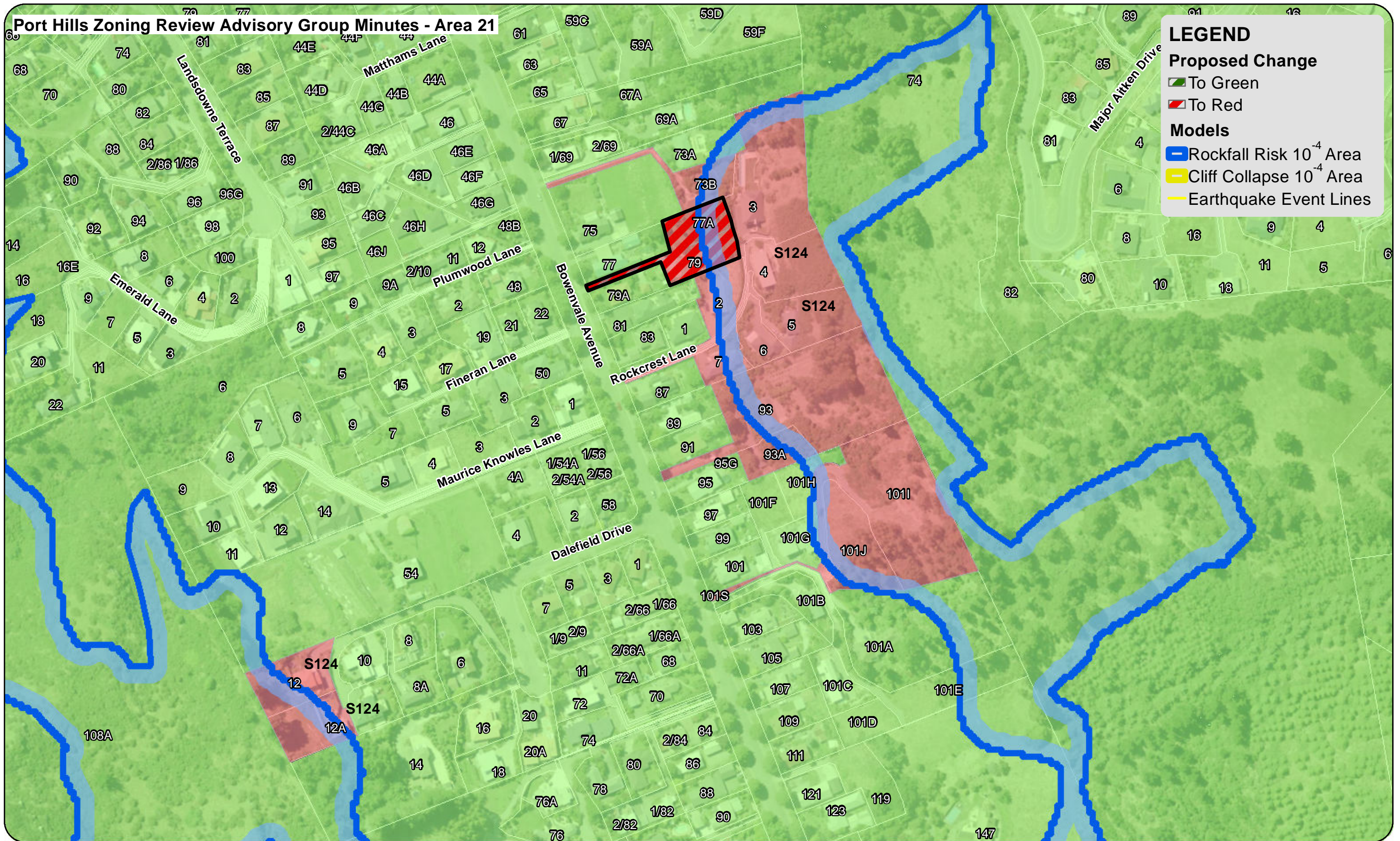
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Port Hills Zoning Review: Zoning Changes

Map 1: Bowenvale

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Port Hills Zoning Review Advisory Group Minutes - Area 21



LEGEND

Proposed Change

- To Green
- To Red

Models

- Rockfall Risk 10^{-4} Area
- Cliff Collapse 10^{-4} Area
- Earthquake Event Lines

Site specific considerations relating to the GNS model for Map 2

None identified by the Port Hills Zoning Review Advisory Group that had an effect on zoning recommendations.



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@A3

Port Hills Zoning Review: Zoning Changes

Map 2: Woodlau Rise

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Port Hills Zoning Review Advisory Group Minutes - Area 21



LEGEND

Proposed Change

- To Green
- To Red

Models

- Rockfall Risk 10^{-4} Area
- Cliff Collapse 10^{-4} Area
- Earthquake Event Lines

Site specific considerations relating to the GNS model for Map 3

Expert advice provided to the Port Hills Zoning Review Advisory Group indicated that there are site specific considerations relating to the GNS risk model around the following area:

- Properties in the View Terrace / Centaurus Road area (e.g. 2, 2F, 4, 6, 8, 10 View Terrace and 216 Centaurus Road)

There is a model boundary effect within the GNS model which tends to overstate the life safety risk to these properties. This is because the GNS model, like all numerical models, becomes less certain around the edges of the modelled area due to inherent model assumptions and mathematical constraints. There is no immediate risk to life associated with these properties.



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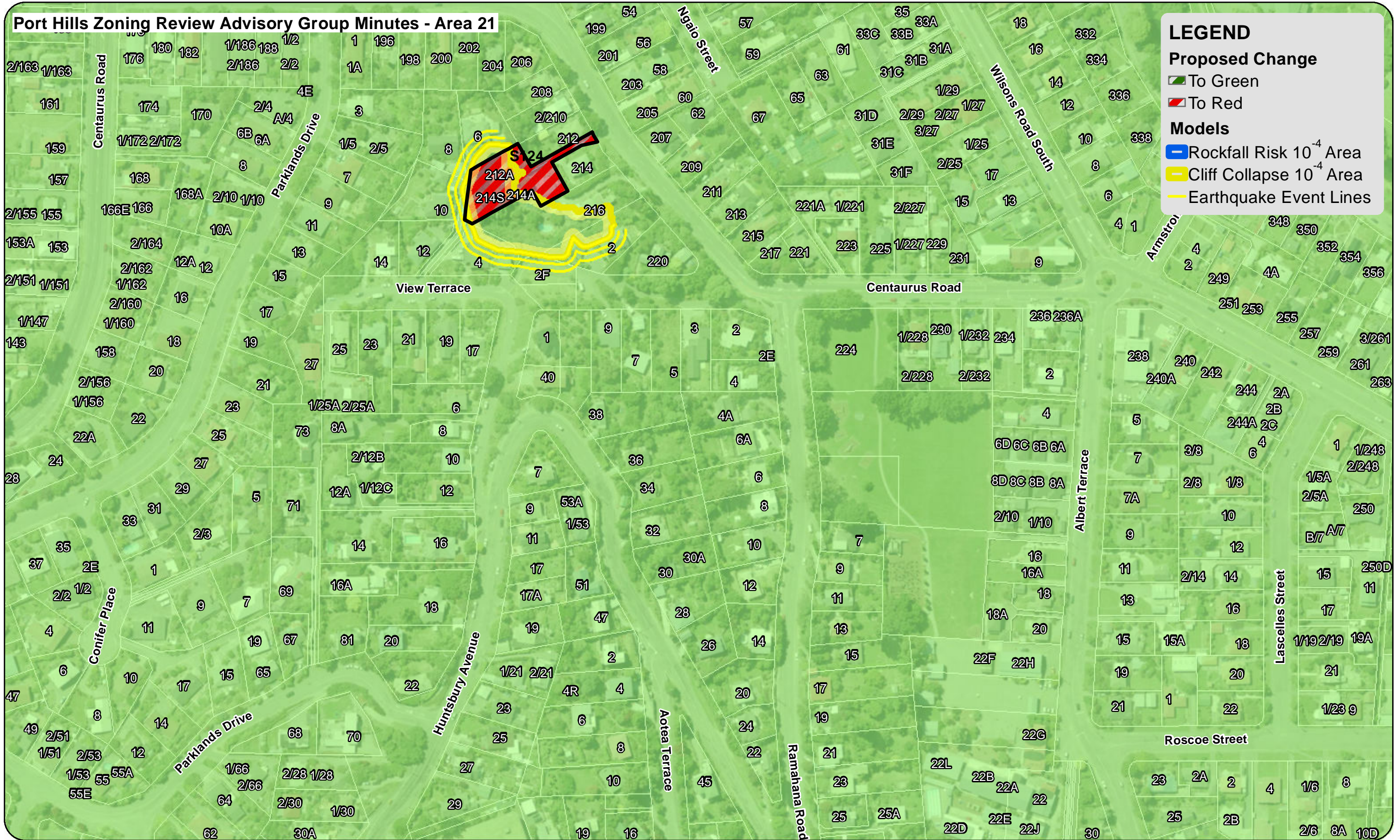
Port Hills Zoning Review: Zoning Changes

Map 3: Centaurus Road

Produced By
Data Sources
Projection
Datum
Compiled

CERA (U)
CERA, CCC
New Zealand Transverse Mercator
Geodetic Datum of New Zealand 2000
27/08/2013

Port Hills Zoning Review Advisory Group Minutes - Area 21



LEGEND

Proposed Change

- To Green
- To Red

Models

- Rockfall Risk 10⁻⁴ Area
- Cliff Collapse 10⁻⁴ Area
- Earthquake Event Lines

Site specific considerations relating to the GNS model for Map 4

None identified by the Port Hills Zoning Review Advisory Group that had an effect on zoning recommendations.

A further site specific consideration was taken by the Minister for Canterbury Earthquake Recovery prior to zoning decisions by Cabinet:

- Properties at 14 and 16 The Crescent

The rockfall source posing a risk to these properties has been removed and it is considered that there is no longer a life safety risk associated with these properties. The Cabinet agreed that these properties should be zoned green.



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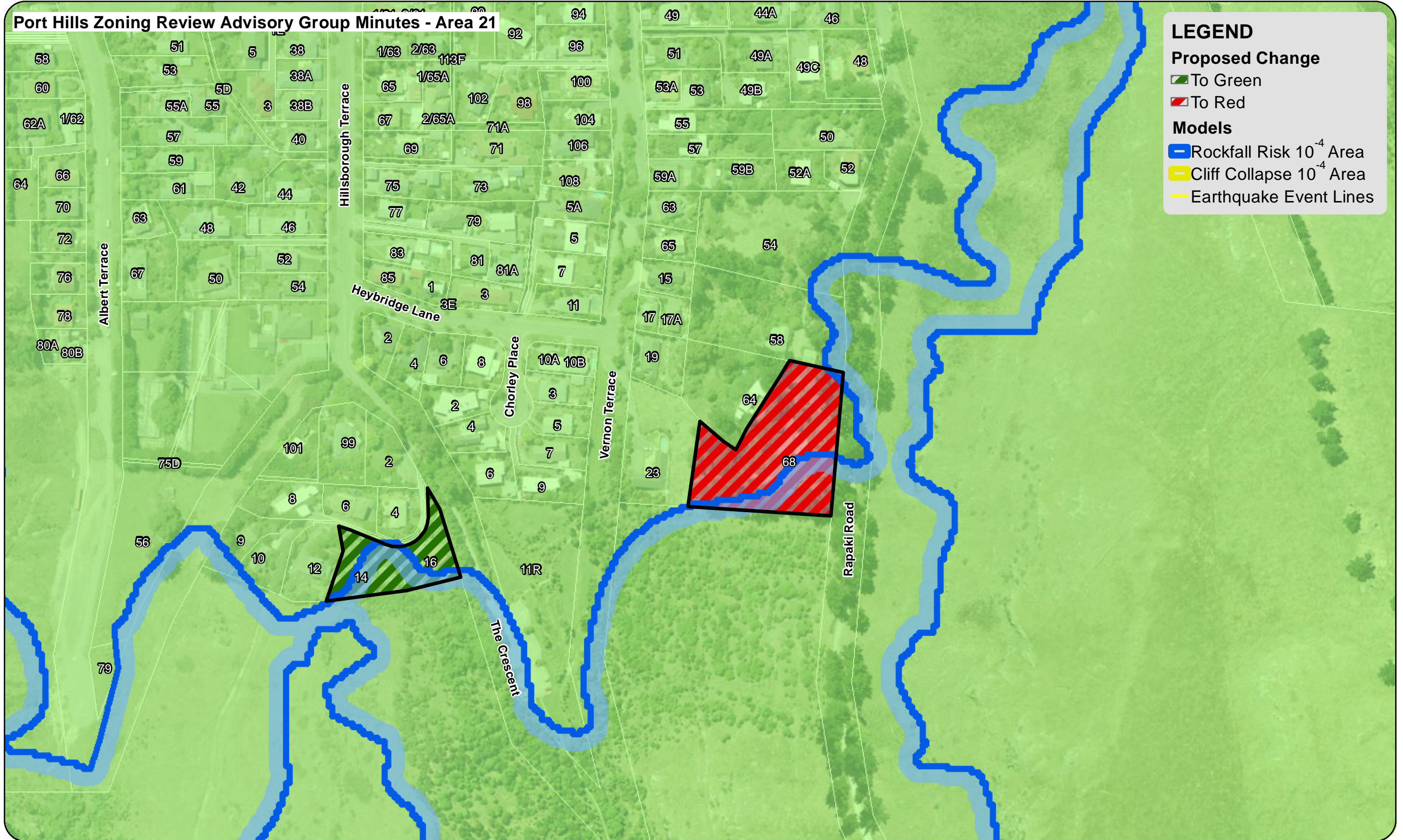
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Port Hills Zoning Review: Zoning Changes

Map 4: Rapaki Road

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Port Hills Zoning Review Advisory Group Minutes - Area 21



LEGEND

Proposed Change

- To Green
- To Red

Models

- Rockfall Risk 10⁻⁴ Area
- Cliff Collapse 10⁻⁴ Area
- Earthquake Event Lines

Site specific considerations relating to the GNS model for Map 5

Expert advice provided to the Port Hills Zoning Review Advisory Group indicated that there are site specific considerations relating to the GNS risk model around the following area:

- Properties near the intersection of Port Hills Road and Opawa Road (e.g. 375, 373, 371, 369 Port Hills Road):

The GNS model tends to overstate the life safety risk to these properties because there is a diminished rockfall source located on the property.

(‘Diminished rockfall source’ is one of a number of technical terms used by GNS and relates to the ability of the rockfall source to generate fewer rocks than the neighbouring rock sources.)



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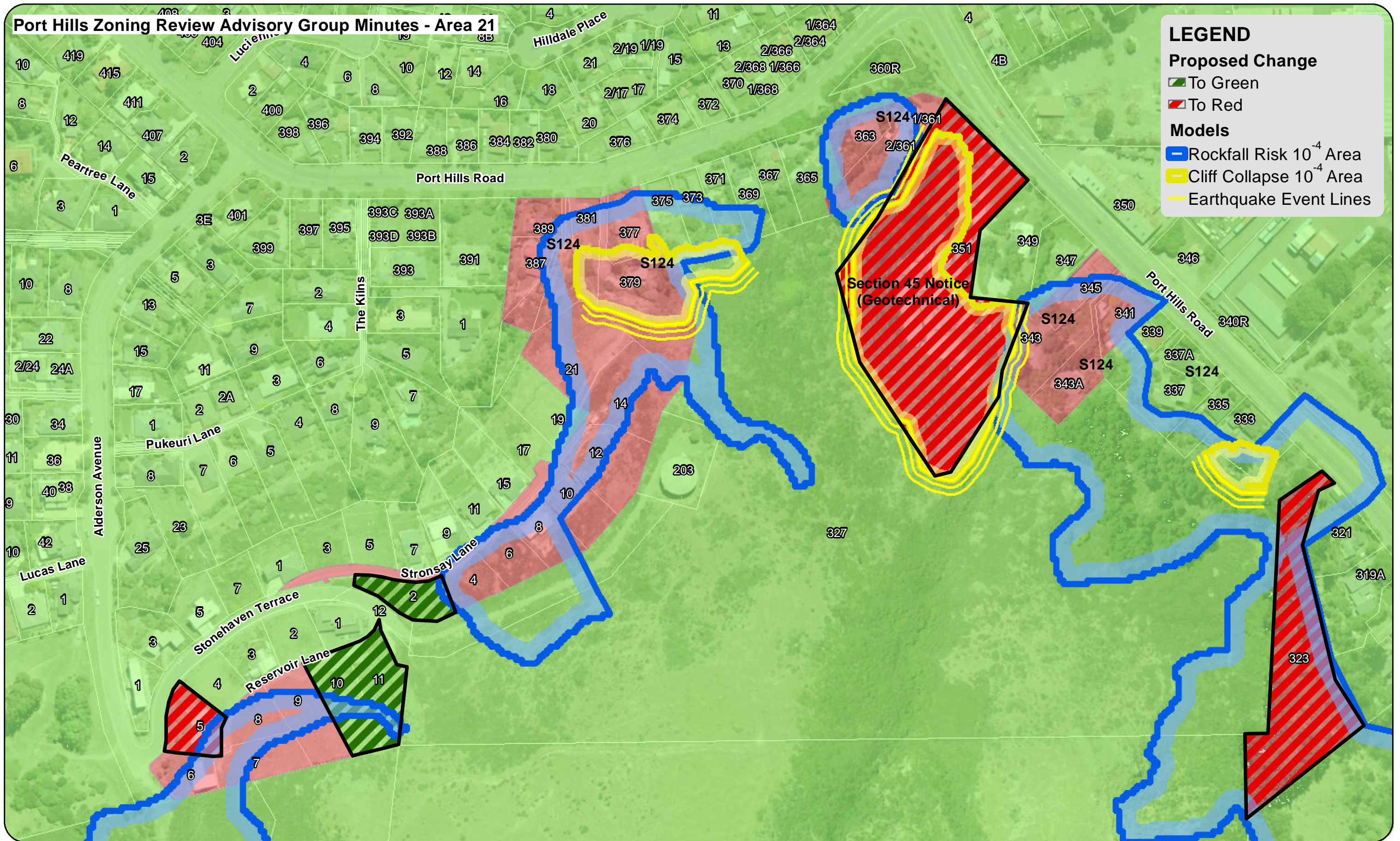
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Port Hills Zoning Review: Zoning Changes

Map 5: Stronsay

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Port Hills Zoning Review Advisory Group Minutes - Area 21



LEGEND

Proposed Change

- To Green
- To Red

Models

- Rockfall Risk 10^{-4} Area
- Cliff Collapse 10^{-4} Area
- Earthquake Event Lines

Site specific considerations relating to the GNS model for Map 6

Expert advice provided to the Port Hills Zoning Review Advisory Group indicated that there are site specific considerations relating to the GNS risk model around the following areas:

- Properties on the north eastern side of Avoca Valley Road (e.g. 1-31 Avoca Valley Road [odd numbers only] and 8 Gilders Grove):

The GNS rock roll risk model tends to overstate the risk to these properties as it does not take into account the presence of Avoca Valley Road. (In this instance the presence of the flat area formed by the road carriageway tends to reduce the rockfall run out.)

- Properties on the north eastern side of Port Hills Road (e.g. 308 and 310 Port Hills Road):

The GNS rock roll risk model tends to overstate the risk to these properties as it does not take account for the benching effect provided by Port Hills Road. (In this instance the presence of the flat area formed by the road carriageway tends to reduce the rockfall run out.)

- Properties on the western side of Avoca Valley Road, near the intersection with Port Hills Road (4A, 4B and 6 Avoca Valley Road):

Expert advice indicated that the rock roll risk model tends to understate the life safety risk to these properties, and that these properties are in an elevated risk area. Following ground truthing and a close examination of the model, it was determined that these dwellings are exposed to an Annual Individual Fatality Risk of 1 in 10,000 or greater in 2016.



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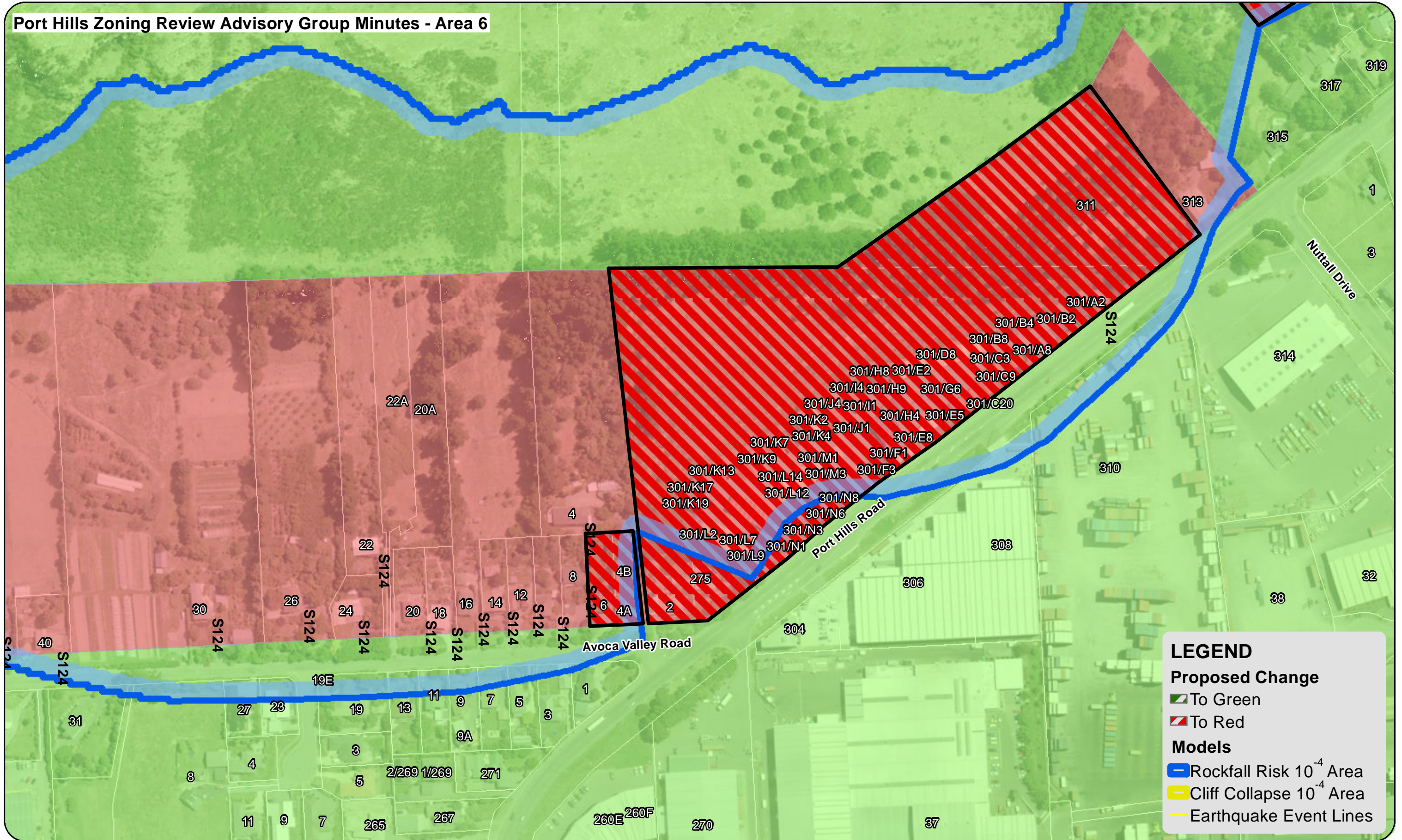
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Port Hills Zoning Review: Zoning Changes

Map 6: Port Hills Road

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Port Hills Zoning Review Advisory Group Minutes - Area 6



LEGEND

Proposed Change

- To Green
- To Red

Models

- Rockfall Risk 10⁻⁴ Area
- Cliff Collapse 10⁻⁴ Area
- Earthquake Event Lines

Site specific considerations relating to the GNS model for Map 7

None identified by the Port Hills Zoning Review Advisory Group that had an effect on zoning recommendations (other than areas that overlap with Map 6 – see Map 6).



1:2,000
20 10 0 20 40 m

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Port Hills Zoning Review: Zoning Changes

Map 7: Avoca Valley

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Port Hills Zoning Review Advisory Group Minutes - Area 5

LEGEND

Proposed Change

To Green

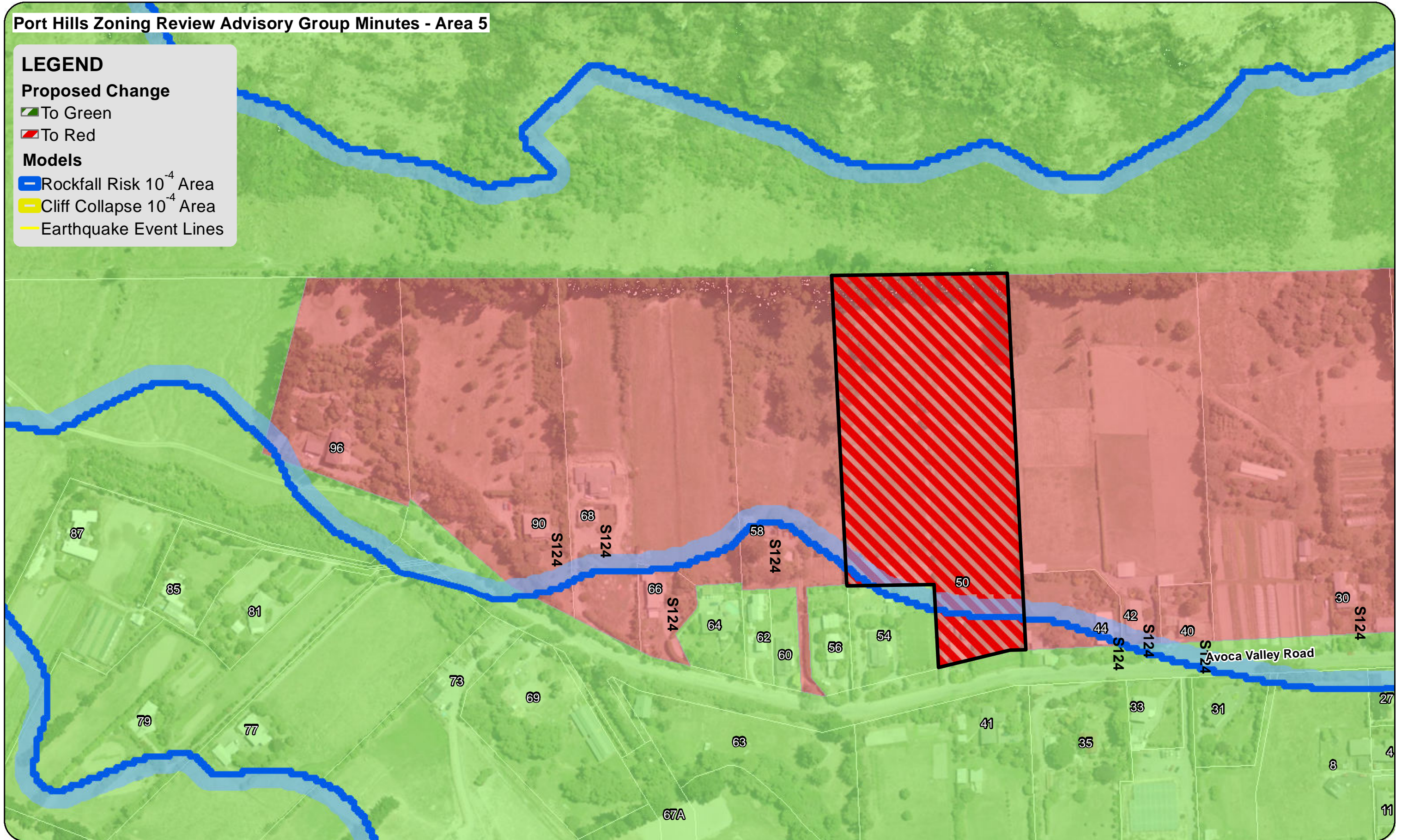
To Red

Models

Rockfall Risk 10^{-4} Area

Cliff Collapse 10^{-4} Area

Earthquake Event Lines



Site specific considerations relating to the GNS model for Map 8

None identified by the Port Hills Zoning Review Advisory Group that had an effect on zoning recommendations.



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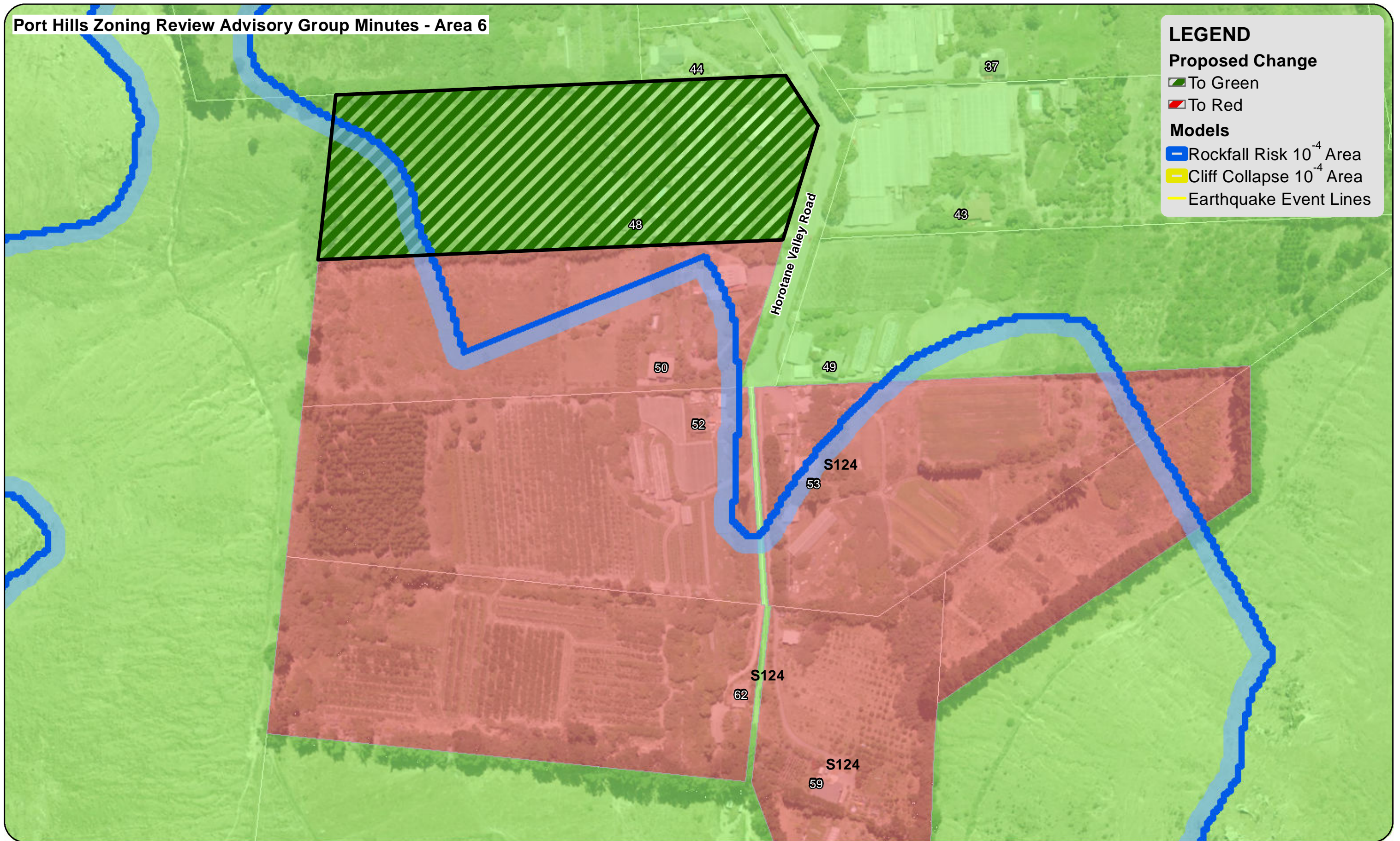
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Port Hills Zoning Review: Zoning Changes

Map 8: Horotane Valley

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Port Hills Zoning Review Advisory Group Minutes - Area 6



LEGEND

Proposed Change

- To Green
- To Red

Models

- Rockfall Risk 10^{-4} Area
- Cliff Collapse 10^{-4} Area
- Earthquake Event Lines

Site specific considerations relating to the GNS model for Map 9

Expert advice provided to the Port Hills Zoning Review Advisory Group indicated that there are site specific considerations relating to the GNS risk model around the following area:

- Properties on the south western side of Flinders Road (e.g. 66, 68, 74, 76 Flinders Road):

The GNS rock roll risk model tends to overstate the risk to these properties as it does not account for the benching effect provided by State Highway 74. (In this instance the presence of the flat area formed by the road carriageway tends to reduce the rockfall run out.)



1:2,000
20 10 0 20 40 m

@A3

Port Hills Zoning Review: Zoning Changes

Map 9: Bridle Path Road 1

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Port Hills Zoning Review Advisory Group Minutes - Area 7



Site specific considerations relating to the GNS model for Map 10

Expert advice provided to the Port Hills Zoning Review Advisory Group indicated that there are site specific considerations relating to the GNS risk model around the following areas:

- Property at 52 Morgans Valley:

The GNS rock roll risk model tends to overstate the risk to this property due to local topographical effects in combination with proximity to model boundaries. (The GNS model, like all numerical models, becomes less certain around the edges of the modelled area due to inherent model assumptions and mathematical constraints.)

- Properties at the southern end of the valley (e.g. 56 and 58 Morgans Valley):

The GNS rock roll risk model tends to understate the risk to these properties due to:

- Local topographical effects – in this particular instance the model is significantly influenced by the presence of a gully; and
- Proximity to model boundary effects – the GNS model, like all numerical models, becomes less certain at the edges of the modelled area due to inherent model assumptions and mathematical constraints.

- Properties at the northern end of the valley (e.g. 17, 19, 21 Morgans Valley):

The GNS rock roll risk model tends to overstate the risk to these properties as it does not account for the benching effect provided by the road. (In this instance the presence of the flat area formed by the road carriageway tends to reduce the rockfall run out.)

- Property at 75 Morgans Valley:

The model does not account for the local topographical effect of a gully that runs beside the property. This gully provides the dwelling with protection from rock roll.



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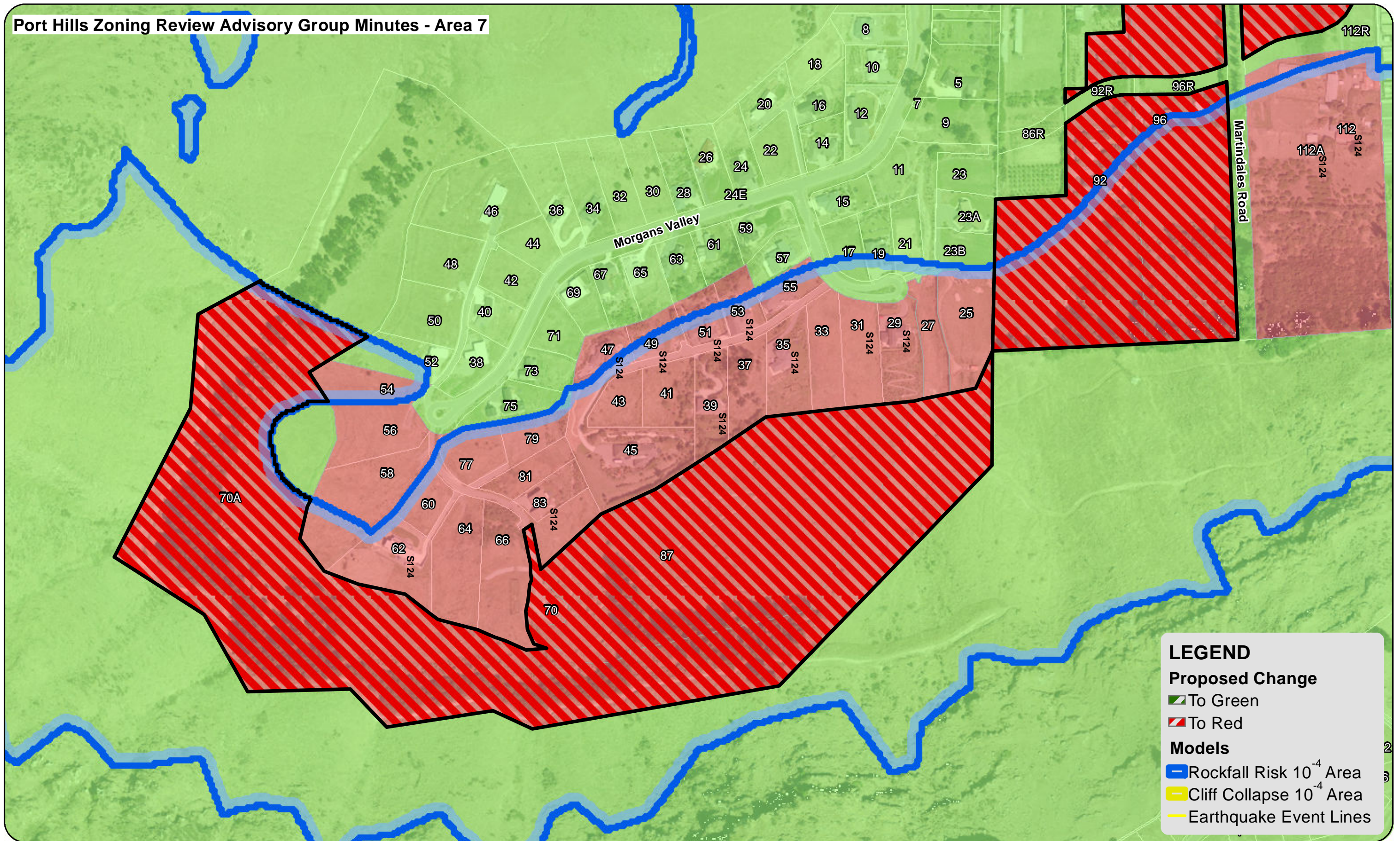
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Port Hills Zoning Review: Zoning Changes

Map 10: Morgans Valley

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Port Hills Zoning Review Advisory Group Minutes - Area 7



LEGEND

Proposed Change

- To Green
- To Red

Models

- Rockfall Risk 10^{-4} Area
- Cliff Collapse 10^{-4} Area
- Earthquake Event Lines

Site specific considerations relating to the GNS model for Map 11

None identified by the Port Hills Zoning Review Advisory Group that had an effect on zoning recommendations.



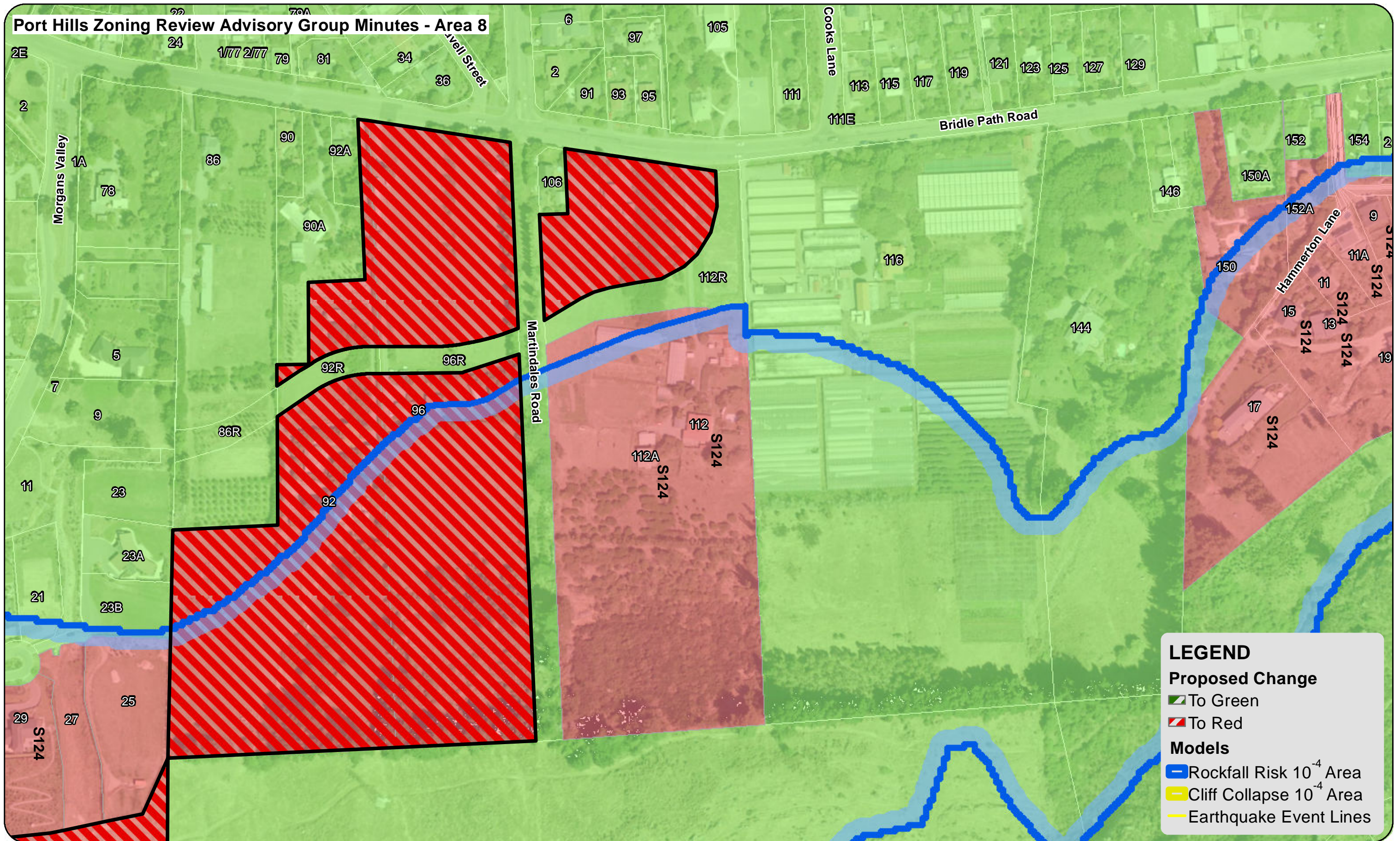
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20 10 0 20 40 m

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Port Hills Zoning Review: Zoning Changes

Map 11: Bridle Path Road 2

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LEGEND

Proposed Change

- To Green
- To Red

Models

- Rockfall Risk 10^{-4} Area
- Cliff Collapse 10^{-4} Area
- Earthquake Event Lines

Site specific considerations relating to the GNS model for Map 12:

Expert advice provided to the Port Hills Zoning Review Advisory Group indicated that there are site specific considerations relating to the GNS risk model around the following areas:

- Properties at 230, 242 and 238 Bridle Path Road:

The GNS rock roll risk model tends to overstate the risk to these properties. Expert advice provided to the Advisory Group indicated that the majority of the rock roll source above these properties was removed during the Civil Defence Emergency period immediately after the 22 February 2011 earthquake as it impacted directly on the road below.

- Properties on the western side of Bridle Path Road (e.g. 201, 221 and 225 Bridle Path Road):

The GNS rock roll risk model tends to overstate the risk to these properties as it does not take account for the benching effect provided by Bridle Path Road. (In this instance the presence of the flat area formed by the road carriageway tends to reduce the rockfall run out.)



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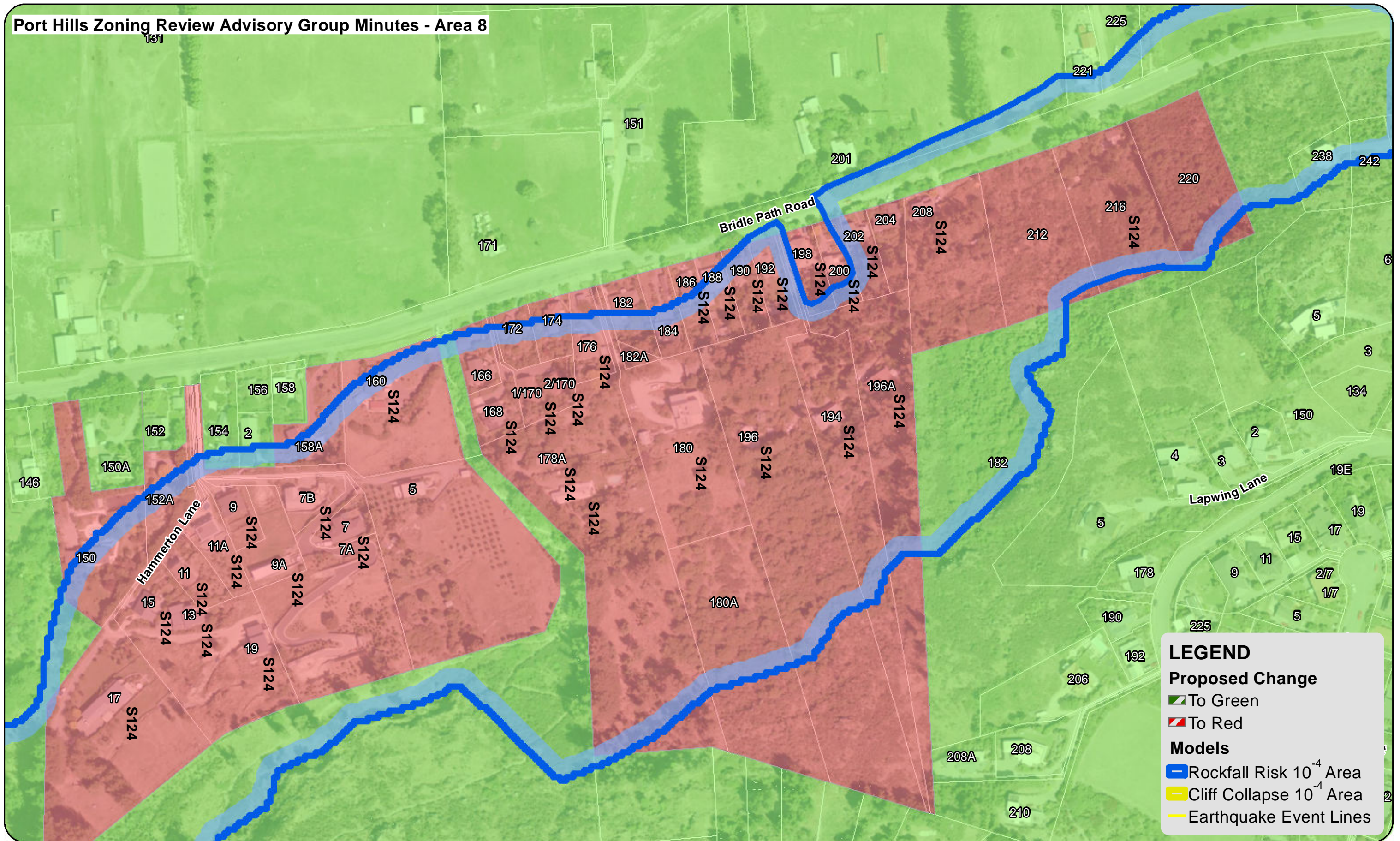
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Port Hills Zoning Review: Zoning Changes

Map 12: Bridle Path Road 3

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Port Hills Zoning Review Advisory Group Minutes - Area 8



LEGEND

Proposed Change

- To Green
- To Red

Models

- Rockfall Risk 10⁻⁴ Area
- Cliff Collapse 10⁻⁴ Area
- Earthquake Event Lines

Site specific considerations relating to the GNS model for Map 13:

Expert advice provided to the Port Hills Zoning Review Advisory Group indicated that there are site specific considerations relating to the GNS risk model around the following areas:

- 10 Quarry Road, and 2/51A and 51C St Andrews Hill Road:

Expert advice provided to the Group indicated that these properties are exposed to the potential for immediate land damage with an associated risk to life as a result of the earthquakes. The properties are affected by cliff recession and debris inundation. The cliff was not included in the GNS cliff collapse model but is exhibiting significant instability.

- Properties bordering Main Road (e.g. 3 and 7 Quarry Road):

Based on expert advice the GNS cliff collapse model tends to overstate the risk to these properties and there is no evidence that there is an immediate risk to life.

- Properties on McCormacks Bay Road, below Mt Pleasant Road (e.g. 18, 1/20 and 2/20 McCormacks Bay Road) and 57 Mt Pleasant Road:

The GNS cliff collapse risk model tends to overstate the risk to these properties as they are located at the end of the cliff (where it turns into a steep slope) and this creates a model boundary effect in the GNS model. (The GNS model, like all numerical models, becomes less certain at the edges of the modelled area due to inherent model assumptions and mathematical constraints.)

- Property at 28 Aratoro Place:

The GNS cliff collapse risk model tends to overstate the risk to this property as it is located on a steep slope, rather than a cliff, and this creates a model boundary effect in the GNS model. (The GNS model, like all numerical models, becomes less certain at the edges of the modelled area due to inherent model assumptions and mathematical constraints.)



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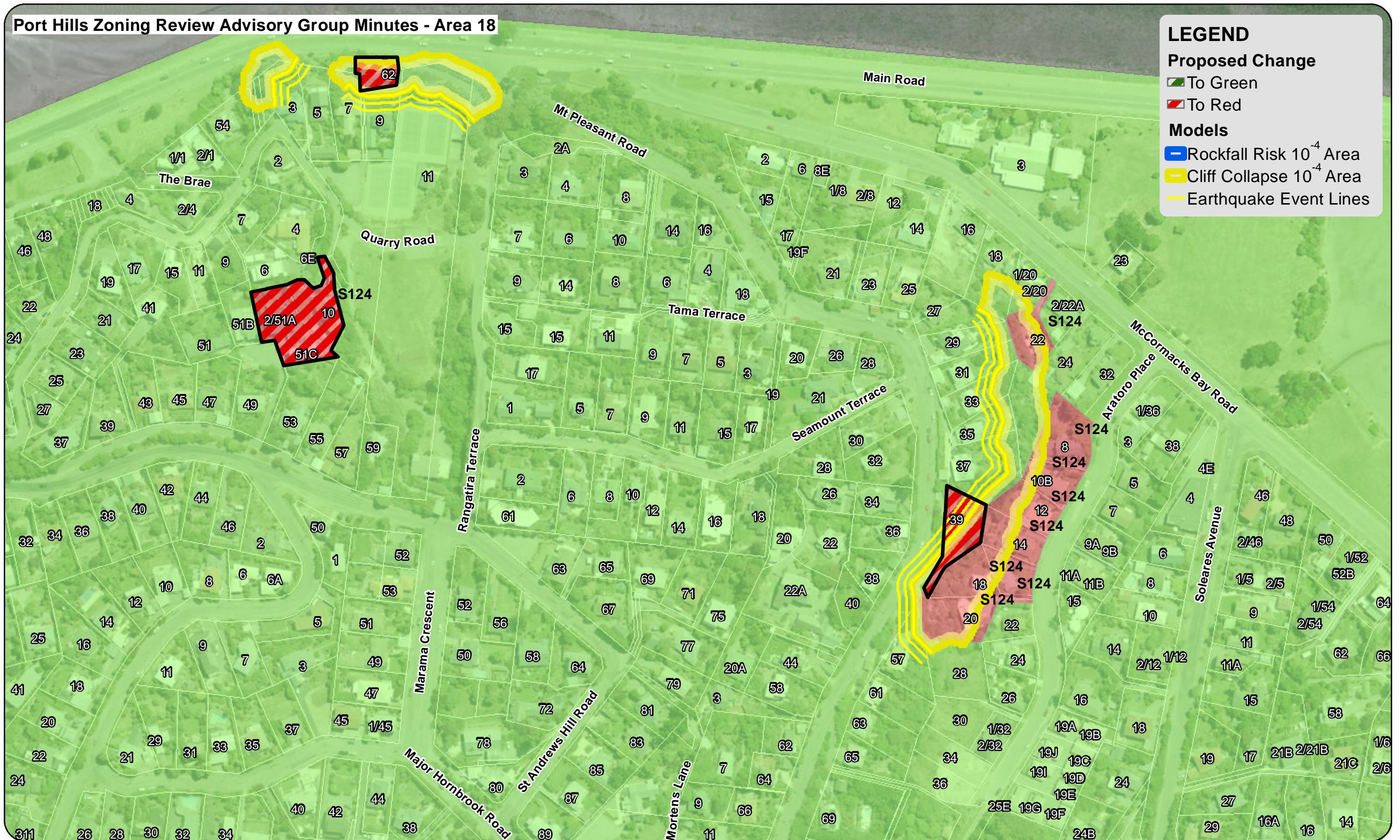
@A3

Port Hills Zoning Review: Zoning Changes

Map 13: Mt Pleasant

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Port Hills Zoning Review Advisory Group Minutes - Area 18



Site specific considerations relating to the GNS model for Map 14:

Expert advice provided to the Port Hills Zoning Review Advisory Group indicated that there are site specific considerations relating to the GNS risk model in the following area:

- 76 McCormacks Bay Road:

This property is exposed to the potential for immediate land damage with an associated risk to life. The sub-vertical loess (soil) slope bank immediately upslope of this property shows signs of ongoing distress (as evidenced by ground cracking), suggestive of ongoing ground movement. There is a high possibility of collapse which is considered to pose a direct life safety risk to occupants. Ground damage is earthquake exacerbated, though not necessarily earthquake caused, and mitigation options are unclear.



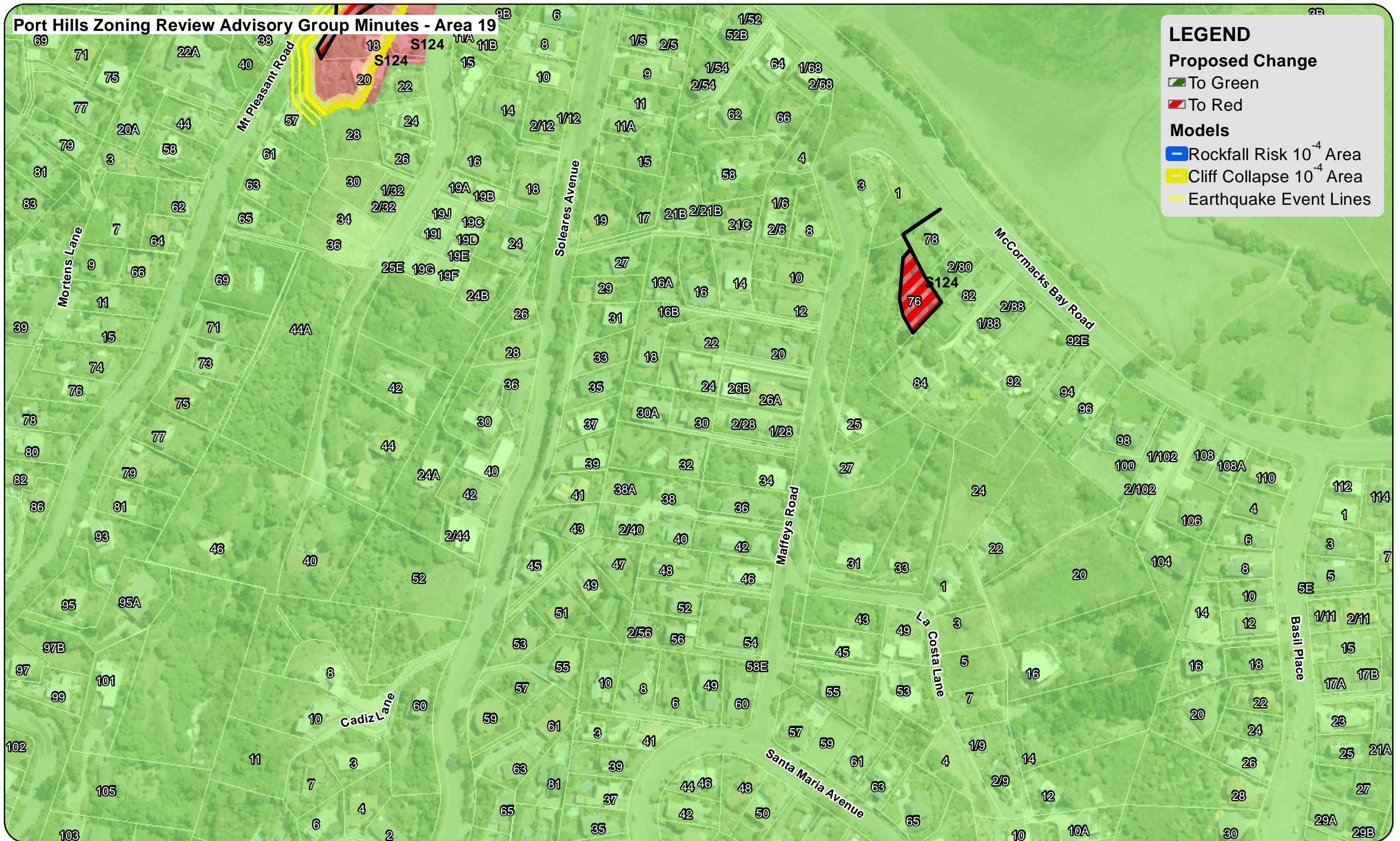
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Port Hills Zoning Review: Zoning Changes

Map 14: Maffeys Road

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Site specific considerations relating to the GNS model for Map 15

None identified by the Port Hills Zoning Review Advisory Group that had an effect on zoning recommendations.



1:2,000
20 10 0 20 40 m

@A3

Port Hills Zoning Review: Zoning Changes

Map 15: Virginia Lane

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Compiled 27/08/2013

Port Hills Zoning Review Advisory Group Minutes - Area 19



LEGEND

Proposed Change

- To Green
- To Red

Models

- Rockfall Risk 10^{-4} Area
- Cliff Collapse 10^{-4} Area
- Earthquake Event Lines

Site specific considerations relating to the GNS model for Map 16:

Expert advice provided to the Port Hills Zoning Review Advisory Group indicated that there are site specific considerations relating to the GNS risk model around the following areas:

- Properties on McCormacks Bay Road below Balmoral Lane (e.g. 150 and 154 McCormacks Bay Road) and the property at 19 Glenstrae Road:

The GNS rock roll risk model tends to overstate the risk to these properties due to a model boundary effect. (The GNS model, like all numerical models, becomes less certain at the edges of the modelled area due to inherent model assumptions and mathematical constraints.) There is no immediate risk to life associated with these properties.

- Property at 29 Glenstrae Road:

Expert advice indicated that the GNS rock roll risk model tends to overstate the risk to this property. The property is located above a bench in an old man made quarry. This and the local geology mean that there is no immediate risk to life associated with this property.

- Property at 6 Balmoral Lane

The GNS rock roll risk model tends to underestimate the risk to this property, as it does not accurately reflect the cliff line. The property carries an immediate risk to life.

- Property at 10 Balmoral Lane:

The GNS cliff collapse model tends to overstate the life safety risk to this area in terms of earthquake event lines, as the cliff is lower in this area. There is also a model boundary effect, as this property is at the edge of the model. (The GNS model, like all numerical models, becomes less certain at the edges of the modelled area due to inherent model assumptions and mathematical constraints.)

- Properties between Glendever Terrace and Balmoral Lane (e.g. 27, 27A and 31 Glendever Terrace, 48 Balmoral Lane):

These properties are located in an area of cliff deformation and mass movement. The cracking continues well beyond the retreat lines and there is the potential for immediate cliff collapse or land movement with an associated risk to life.

- Property at 32A Raekura Place:

The GNS cliff collapse risk model tends to overstate the risk to this property.



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20 10 0 20 40 m

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Port Hills Zoning Review: Zoning Changes



Map 16: Redcliffs 1

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Port Hills Zoning Review Advisory Group Minutes - Areas 4 and 19

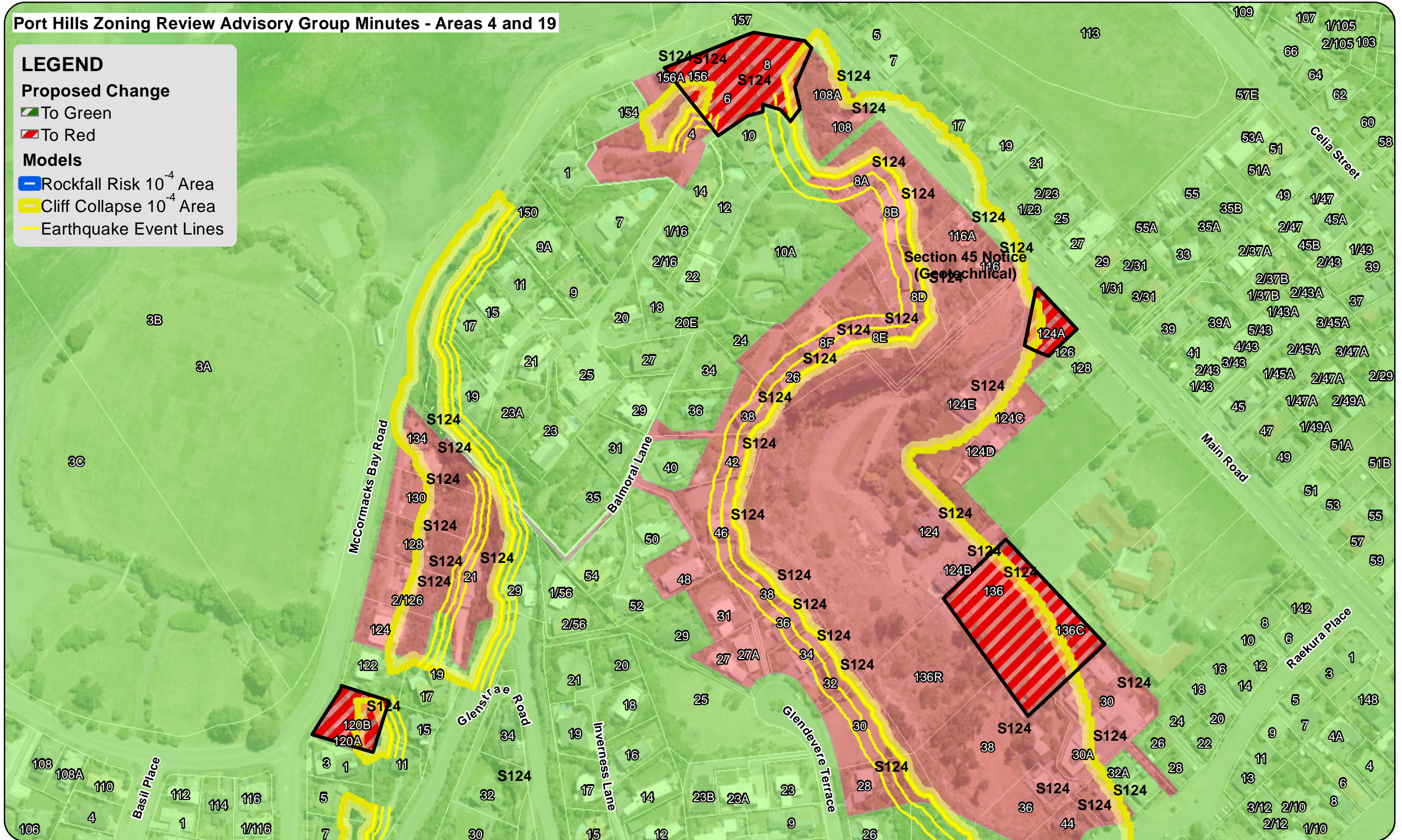
LEGEND

Proposed Change

-  To Green
-  To Red

Models

-  Rockfall Risk 10^{-4} Area
-  Cliff Collapse 10^{-4} Area
-  Earthquake Event Lines



Site specific considerations relating to the GNS model for Map 17:

Expert advice provided to the Port Hills Zoning Review Advisory Group indicated that there are site specific considerations relating to the GNS risk model around the following areas:

- Property at 2 Moncks Spur Road:

The GNS cliff collapse risk model tends to overstate the risk to this property because it does not accurately reflect the location of the cliff edge and the height of the cliff face.

- Property at 200 Main Road:

The GNS cliff collapse risk model tends to overstate the risk to this property as the property is located by a steep slope, not a former sea cut cliff.

- Properties near the start of Moncks Spur Road (e.g. 4 and 8 Moncks Spur Road):

These properties are adjacent to a high near-vertical loess cliff (soil cliff), which was not included in the GNS model as it generally included sea cut rock cliffs only. Expert advice indicated that the loess cliff presented an immediate life safety hazard, caused or accentuated by the earthquakes. In localised areas the cliff has already failed and impacted the dwellings. As a result the Advisory Group considered the properties are exposed to the potential for immediate land damage with an associated risk to life.

- Properties to the north east of Defender Lane (e.g. 10, 12 and 14 Defender Lane):

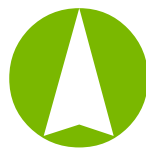
Expert advice indicated that the GNS cliff collapse risk model tends to significantly understate the life safety risk to these properties. Mass movement and concentration of cracking was observed around 10 and 12 Defender Lane. Below the properties are steep to very steep slopes and they form distinct benches. The GNS model appears to pick up the lower bench of the cliff only. Expert advice is that there is the potential for cliff recession in a future earthquake affecting 10 and 12 Defender Lane. 14 Defender Lane (which sits below 12) has the potential to be inundated, and the risk on balance is similar to other properties to the south along Defender Lane.

- Properties at the southernmost extension of the Redcliffs cliff area (in particular, 16 Egnot Heights):

The model appears to stop before it reaches the property at 16 Egnot Heights. However, expert advice indicated that there is a model boundary effect in the model which causes the risk to life at this location to be underestimated. (The GNS model, like all numerical models, becomes less certain at the edges of the modelled area due to inherent model assumptions and mathematical constraints.)

The ground cracking and ground truthing in the area is evidence for ground instability with the potential to give rise to sudden cliff collapse with associated risk to life. This area is affected by cliff collapse and land movement. Extensive land cracking was observed nearby.

The model appears to be skewed due to the presence of the access road to the south of the property. The very steep slope is bisected by the road but there is evidence of land cracking and property damage indicating that land has moved in past events. There is a steep to very steep slope present and expert advice is that on balance the risk on this property is similar to the properties to the north and north east along Egnot Heights and Defender Lane that feature very similar topographical and geological settings.



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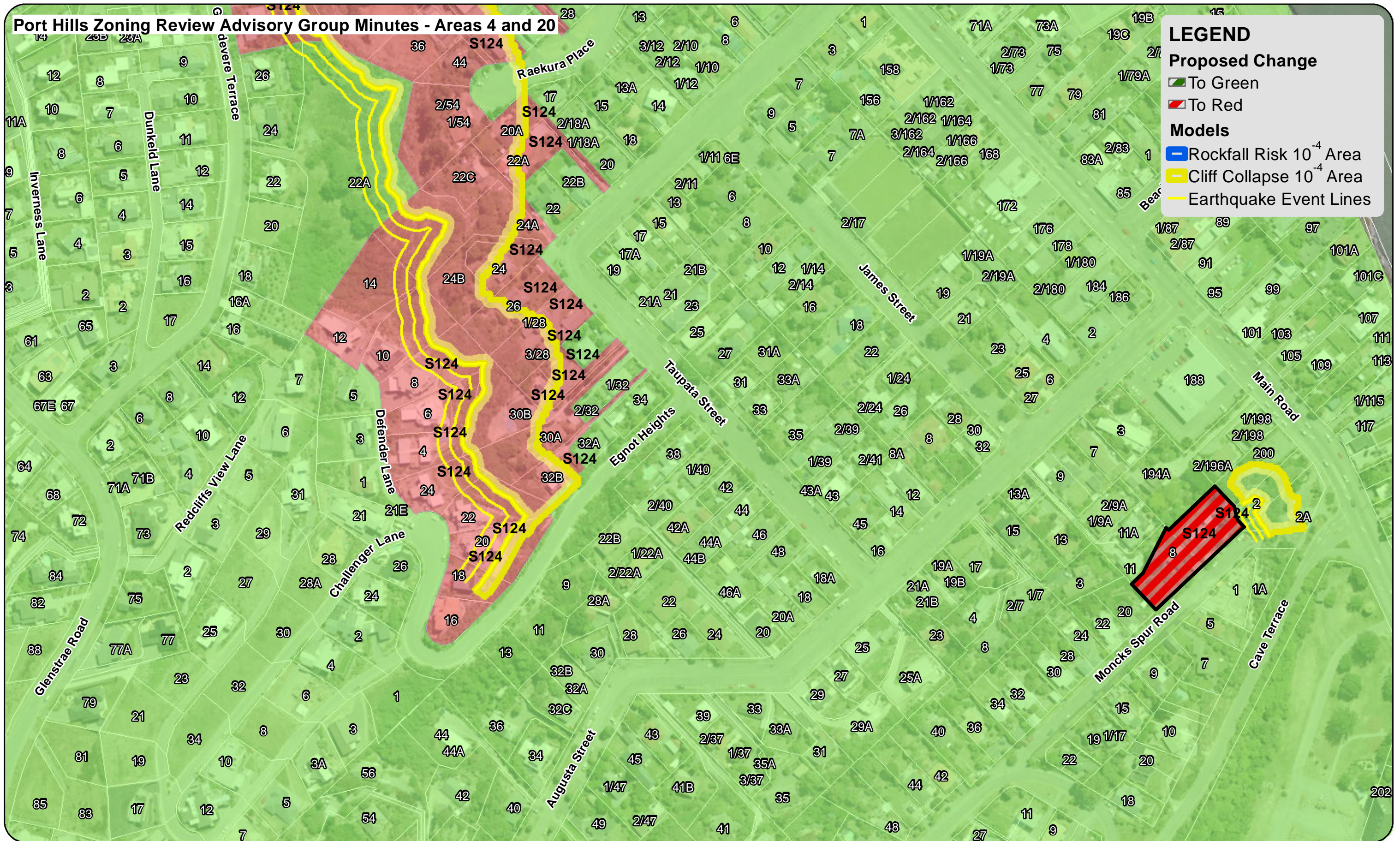
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Port Hills Zoning Review: Zoning Changes

Map 17: Redcliffs 2

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Port Hills Zoning Review Advisory Group Minutes - Areas 4 and 20



Site specific considerations relating to the GNS model for Map 18:

Expert advice provided to the Port Hills Zoning Review Advisory Group indicated that there are site specific considerations relating to the GNS risk model around the following areas:

- Properties in the Bay View Road and Main Road area (e.g. 19A Bay View Road and 242 Main Road):

The GNS cliff collapse model tends to overstate the risk to these properties, which are located by a small sea-cut cliff where no damage has been noted.

- Properties in the Bay View Road and Red Rock Lane area (e.g. 31, 67A, 69A, 71 Bay View Road, and 4, 9, 10 Red Rock Lane):

Expert advice provided to the Advisory Group indicates that rockfall hazard to these properties tends to be overstated in the GNS model. The rockfall source behind 9 Red Rock Lane and the gully behind 67A Bay View Road has been treated.



1:2,000
20 10 0 20 40 m

@A3

Port Hills Zoning Review: Zoning Changes



Map 18: Moncks Bay

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Port Hills Zoning Review Advisory Group Minutes - Area 20

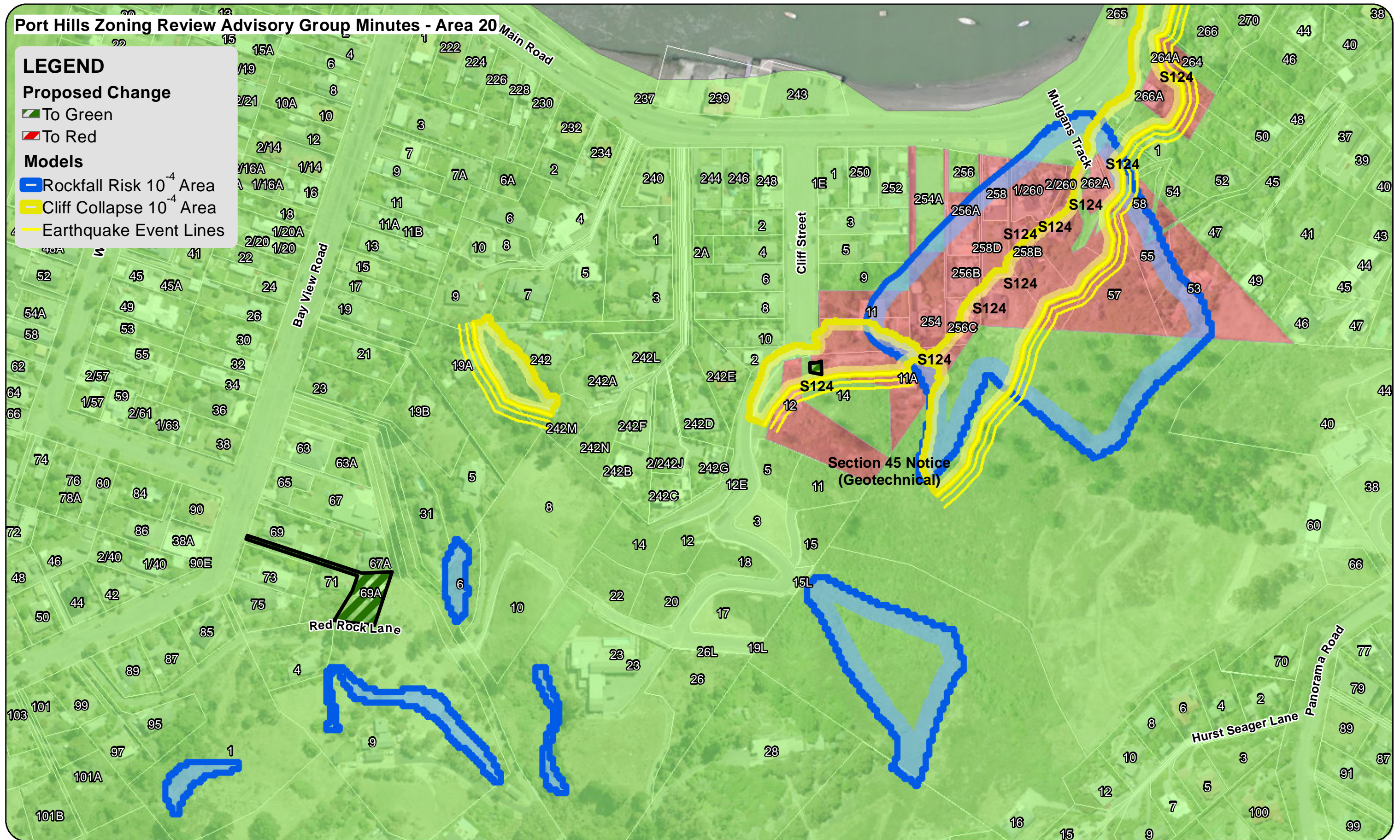
LEGEND

Proposed Change

-  To Green
-  To Red

Models

-  Rockfall Risk 10⁻⁴ Area
-  Cliff Collapse 10⁻⁴ Area
-  Earthquake Event Lines



Site specific considerations relating to the GNS model for Map 19:

Expert advice provided to the Port Hills Zoning Review Advisory Group indicated that there are site specific considerations relating to the GNS risk model, or no modelling, around the following areas:

- Properties in the area between The Spur and Nayland Street (e.g. 5 and 6 The Spur):

The GNS cliff collapse risk model tends to overstate the life safety risk to these properties, as it does not take into account localised treatment of the cliff pre-dating the earthquake events.

- Property at 1 Clifton Bay:

The GNS model tends to overstate the risk to life at this property, as there is a large flat area between the cliff and the dwelling.

- Properties around the intersection of Kinsey and Clifton Terraces (e.g. 1 and 2 Kinsey Terrace and 50, 51, 49, 48, 39 Clifton Terrace):

While risk to life has not been quantified for this area, significant ground displacement was observed at the eastern end of the cliff (Peacock's Gallop). Expert advisers and GNS have advised that the eastern mass movement area around the intersection of Kinsey and Clifton Terraces has moved approximately 1 metre laterally and 300 to 500mm vertically over three earthquake events. Given the mass movement and relatively high elevation, there is thought to be an immediate risk to life associated with these properties.

- Properties in the Deans Head area (e.g. 280A Main Road):

Significant ground displacement was observed at the western end of the cliff, as evidenced by ground cracking, accentuated by earthquakes and rainfall.

- Property at 26 Kinsey Terrace:

This property has significant cracking associated with land movement and has an associated risk to life.

- Properties in the Main Road area (e.g. 274 and 276 Main Road):

The GNS cliff collapse risk model tends to overstate the risk to these properties, as the cliff is a man-made slope. (Man-made slopes in the Port Hills in general were less likely to suffer from shaking damage.) The dwellings are set back from the recession line and there is no immediate risk of failure causing risk to life.

- Property at 272 Main Road:

The cliff location near 272 Main Road is not accurately represented by the model. There is no evidence of cracking and experts believe there is no immediate risk to life. The cliff to the north does not affect this particular area – the life safety risk lines are the result of a boundary effect on the model. (The GNS model, like all numerical models, becomes less certain around the edges of the modelled area due to inherent model assumptions and mathematical constraints.)



1:2,000
20 10 0 20 40 m

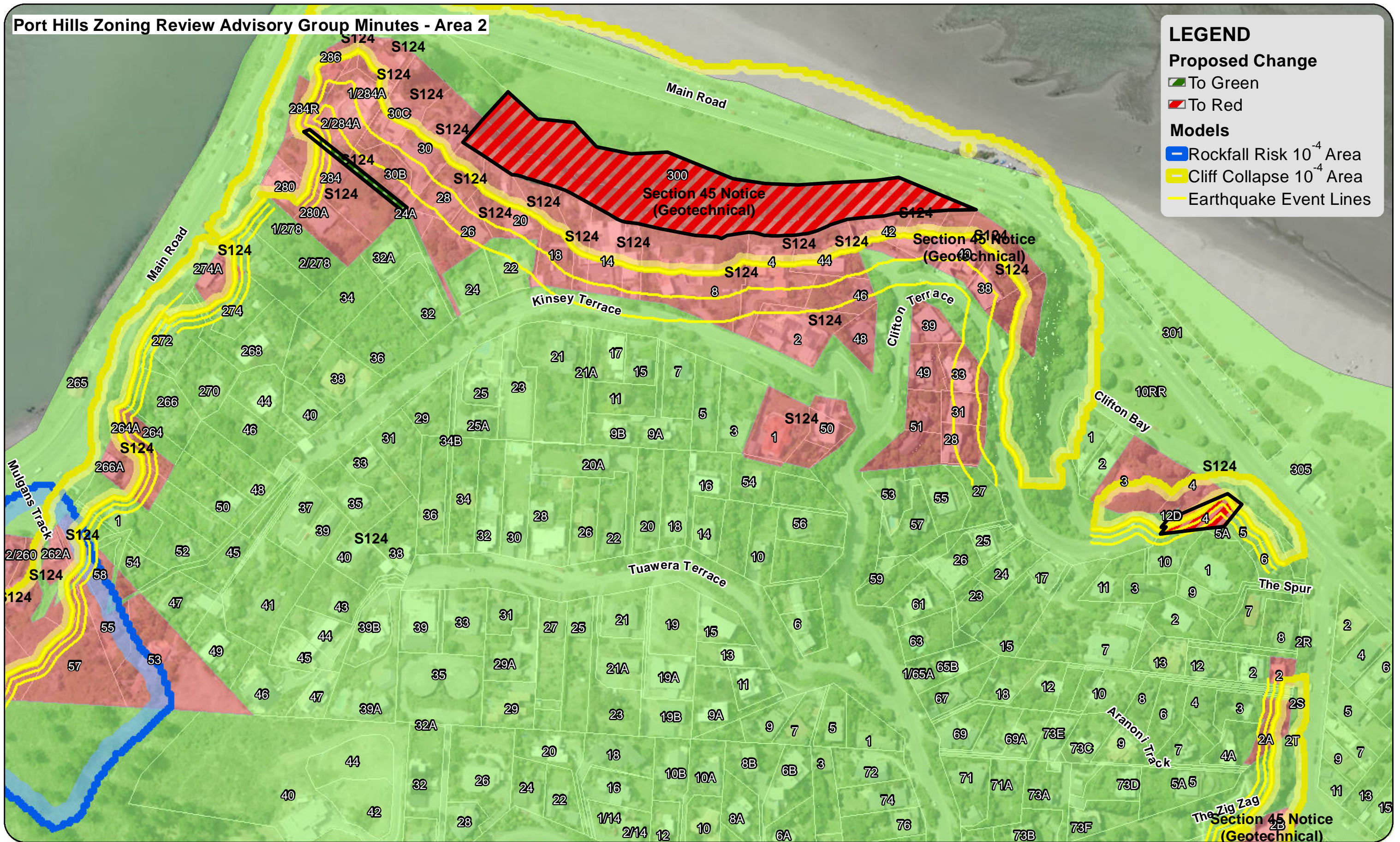
@A3

Port Hills Zoning Review: Zoning Changes

Map 19: Kinsey Terrace

Produced By CERA (U)
Data Sources CERA, CCC
Projection New Zealand Transverse Mercator
Datum Geodetic Datum of New Zealand 2000
Compiled 27/08/2013

Port Hills Zoning Review Advisory Group Minutes - Area 2



LEGEND

Proposed Change

- To Green
- To Red

Models

- Rockfall Risk 10^{-4} Area
- Cliff Collapse 10^{-4} Area
- Earthquake Event Lines

Site specific considerations relating to the GNS model for Map 20:

Expert advice provided to the Port Hills Zoning Review Advisory Group indicated that there are site specific considerations relating to the GNS risk model around the following areas:

- Property at 10 Richmond Hill Road:

The model overstates the risk to this property due to the geometry of the cliff and topographical effects.

- Property at 98 Richmond Hill Road:

Expert advice to the Advisory Panel indicates that although the property is outside the earthquake event lines the evidence of cracking signals that there is a high risk of sudden cliff failure.



1:2,000
20 10 0 20 40 m

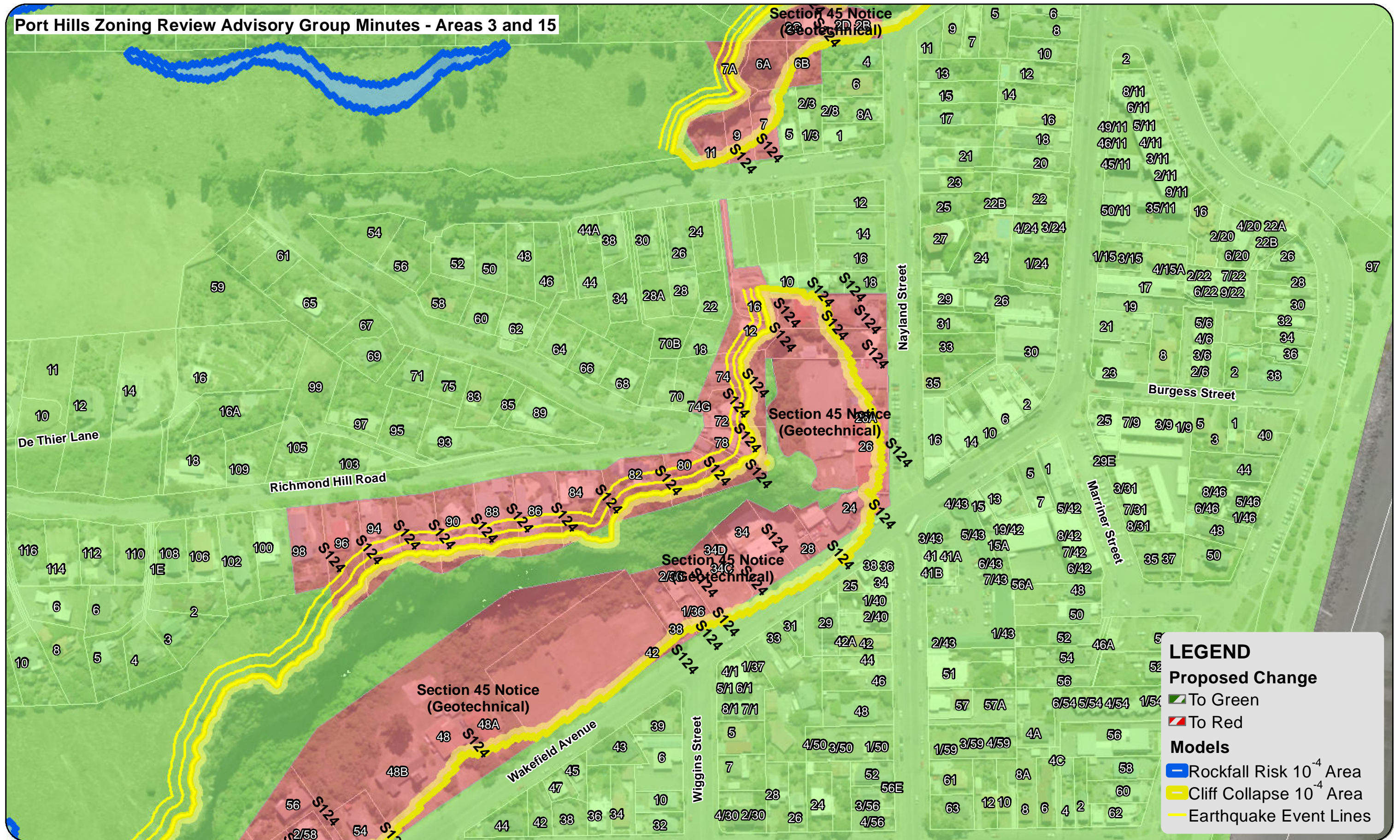
@A3

Port Hills Zoning Review: Zoning Changes

Map 20: Richmond Hill Road

Produced By CERA (U)
Data Sources CERA, CCC
Projection New Zealand Transverse Mercator
Datum Geodetic Datum of New Zealand 2000
Compiled 27/08/2013

Port Hills Zoning Review Advisory Group Minutes - Areas 3 and 15



LEGEND

Proposed Change

- To Green
- To Red

Models

- Rockfall Risk 10^{-4} Area
- Cliff Collapse 10^{-4} Area
- Earthquake Event Lines

Site specific considerations relating to the GNS model for Map 21:

Expert advice provided to the Port Hills Zoning Review Advisory Group indicated that there are site specific considerations relating to the GNS risk model around the following areas:

- Properties along Wakefield Avenue between Arnold and Campbell Streets (e.g. odd numbers such as 67, 69, 81, 83, 1/91, 93 Wakefield Ave and 2 Denman St):

The GNS rockfall risk model tends to overstate the risk in this particular area. Rockfall source areas in this area are less significant (diminished) than the suburb average used in the model. Additionally, there is a benching effect provided by Wakefield Avenue that will reduce the rockfall run out. (In most circumstances the presence of a flat area such as a road carriageway or building platform tends to reduce the rockfall risk for properties located below the flat area.)

- Properties around the intersection between Campbell St and Wakefield Ave (e.g. 4 Campbell St and 97 Wakefield Ave):

The GNS rockfall risk model tends to overstate the risk to this area as there is a benching effect provided by Wakefield Avenue that will reduce the rockfall run out. (In most circumstances the presence of a flat area such as a road carriageway or building platform tends to reduce the rockfall risk for properties located below the flat area.)



1:2,000
20 10 0 20 40 m

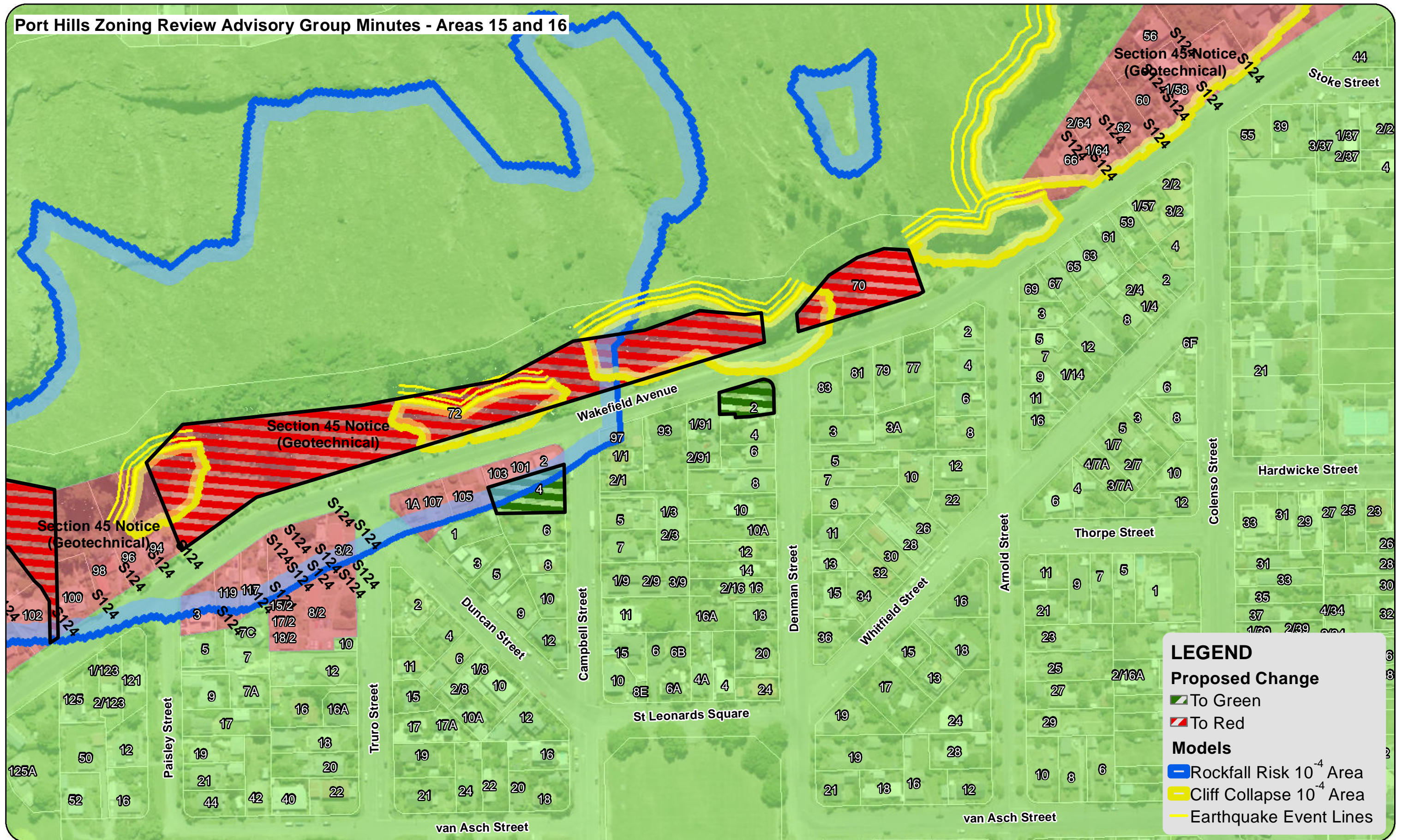
@A3

Port Hills Zoning Review: Zoning Changes

Map 21: Wakefield 1

Produced By CERA (U)
Data Sources CERA, CCC
Projection New Zealand Transverse Mercator
Datum Geodetic Datum of New Zealand 2000
Compiled 27/08/2013

Port Hills Zoning Review Advisory Group Minutes - Areas 15 and 16



LEGEND

Proposed Change

- To Green
- To Red

Models

- Rockfall Risk 10^{-4} Area
- Cliff Collapse 10^{-4} Area
- Earthquake Event Lines

Site specific considerations relating to the GNS model for Map 22:

Expert advice provided to the Port Hills Zoning Review Advisory Group indicated that there are site specific considerations relating to the GNS risk model around the following areas:

- Properties on the eastern side of Finnsarby Place (e.g. 6, 8, 10, 1/12, 14 Finnsarby Place):

The GNS rockfall model tends to overstate the life safety risk to these properties due to the presence of the road. (In most circumstances the presence of a flat area such as a road carriageway or building platform tends to reduce the rockfall risk for properties located below the flat area.)

- Property at 44 Sumnervale Drive:

Expert advice to the Advisory Panel indicates that the risk modelling is affected by local topography.



1:2,000
20 10 0 20 40 m

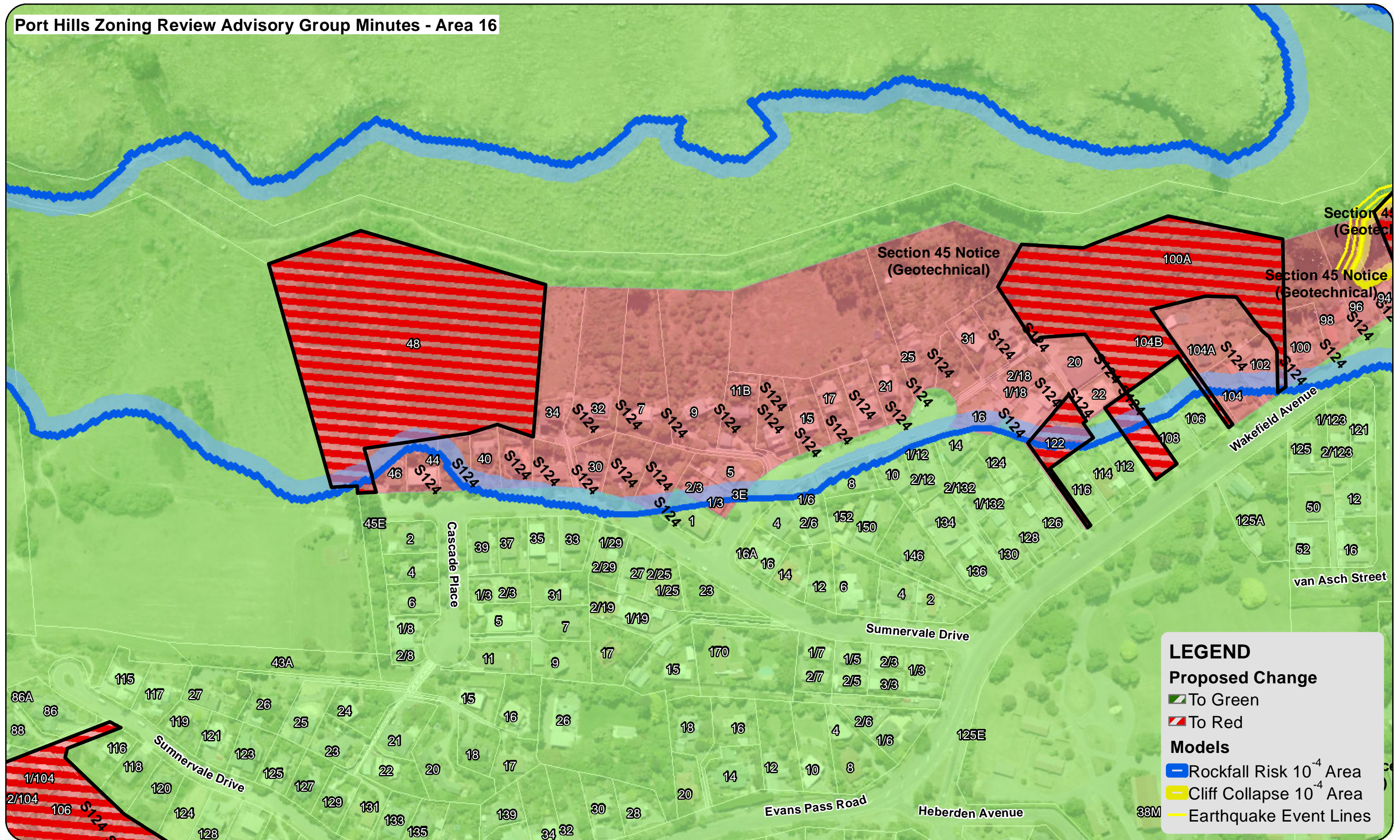
@A3

Port Hills Zoning Review: Zoning Changes

Map 22: Wakefield 2

Produced By CERA (U)
Data Sources CERA, CCC
Projection New Zealand Transverse Mercator
Datum Geodetic Datum of New Zealand 2000
Compiled 27/08/2013

Port Hills Zoning Review Advisory Group Minutes - Area 16



LEGEND

Proposed Change

- To Green
- To Red

Models

- Rockfall Risk 10^{-4} Area
- Cliff Collapse 10^{-4} Area
- Earthquake Event Lines