

**Transpower New Zealand Limited**  
**Transmission Line Relocation Project**  
Addendum to Technical Report 16A: Land  
Contamination Assessment and Investigation Report

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Document prepared by:


Aurecon New Zealand Limited  
Old Bank Chambers  
102 Customhouse Quay  
Wellington 6011 New Zealand

**T:** +64 4 472 9589

**F:** +64 4 472 9922

**E:** wellington@ap.aurecongroup.com

**W:** aurecongroup.com

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## Appendix A

# 1. Introduction

The NZ Transport Agency (NZTA) has identified the need for a new inland state highway from Linden in Wellington City to MacKays Crossing in the Kapiti Coast District. This is known as the Transmission Gully Project and is part of the Wellington Northern Corridor Roads of National Significance (RoNS). The NZTA are progressing notices of requirement for designations and applications for resource consents for the Transmission Gully Project as a project of national significance under the Resource Management Act 1991 (RMA). NZTA's documentation that supports the notices of requirement for designations and applications for resource consents is contained in Volumes 1 to 5. These volumes contain a substantive description of the Transmission Gully Project.

In order to allow for the construction and operation of the Transmission Gully Project, parts of the existing electricity transmission line between the Pauatahanui substation at State Highway 58 and MacKays Crossing will need to be relocated. The Paekakariki-Takapu Road A (PKK-TKR A) 110kV transmission line is part of the National Grid and is owned and operated by Transpower New Zealand Limited (Transpower). This Line Relocation Project involves the relocation of sections of the PKK-TKR A between the Paekakariki and Pauatahanui Substations from Tower 1 to 49A. The line route generally follows the existing transmission line with the route design generally governed by the need to minimise crossings of the Transmission Gully Project cognisant of environmental, cultural, engineering and other factors.

Transpower is seeking the majority of the resource consents to enable the line relocation to occur under the regulations included in the Resource Management (National Environmental Standards for Electricity Transmission Activities) Regulations 2009 (NESETA). These resource consents are set out in detail in the AEE and in summary are:

- Restricted discretionary land use consent for the relocation of 6 towers in Kapiti Coast District in accordance with the NESETA; and
- Restricted discretionary land use consent for the relocation of 18 towers in Porirua City in accordance with the NESETA.

No transmission lines will be relocated in Upper Hutt City or in Wellington City.

Regional consents for related works including earthworks and construction of culverts are not being applied for at this time. Where consents are required for these activities they will be applied for during detailed design.

This *Addendum to Technical Report 16A: Land Contamination Assessment and Investigation Report* addresses the contaminated land effects associated with the Transmission Gully Line Relocation Project (hereafter referred to as 'the Line Relocation Project').

## 2. Project Description

The Assessment of Environmental Effects report (AEE) accompanying the application for resource consent describes the Line Relocation Project in detail. This section is a summary of the Project.

### 2.1 Line Route

The PKK-TKR A line between the Paekakariki and Pauatahanui Substations is approximately 15 km long. The existing line is a 110 kV double circuit line consisting of lattice steel towers. There are 50 existing towers along this section of the line.

For assessment purposes, the line route is split into six route sections. The following summarises the relocation works for each section.

#### Route Section 1– MacKays Crossing

This route section covers the line route between Tower 1 and Tower 4. In order to accommodate the Transmission Gully Project, two existing towers will be relocated, one to the west and the other slightly to the east of the existing line. No alterations are required to towers or lines located north of the existing state highway.

#### Section 2 and 3 - Wainui Saddle

This section covers the line route between Tower 5 and 15. Through this route section, the line route runs to west of the proposed road and then roughly two thirds of the way up the Te Puka valley at Tower 8, the line is proposed to be relocated to the west of the Saddle. This is required in order to navigate around the Wainui Saddle, which will be occupied by the Transmission Gully Project. Towers will be erected halfway up the main spur to the west of the Saddle and will skirt round the high point of the saddle and then crossing the Transmission Gully Project between Towers 11 and 12, before dropping back into the Horokiri Valley of the Saddle at roughly Tower 13. Minor relocations will be required to the remaining towers (including tower 13) in this section (as compared with current positions) in order to accommodate the proposed Transmission Gully Project with the line aligned roughly parallel and to the east of the existing line.

#### Route Section 3 - Horokiri Stream

This section covers the line route between Tower 15 and 25. Minor relocations of towers (as compared with current positions) are required to accommodate the proposed Transmission Gully Project with the proposed line aligned roughly parallel and to the east of the existing line. Tower 23 is to be removed.

#### Section 4 - Battle Hill

This route section covers the line route between Tower 26 and 33. Relocations of towers is required to accommodate the proposed Transmission Gully Project with the proposed line aligned roughly parallel and to the east of the existing line. The proposed line crosses the Transmission Gully Project between Towers 32 and 33.

#### Section 5 – Golf Course

This route section covers the line route between Tower 34 and 42. Relocation of towers is required in order to accommodate the proposed Transmission Gully Project with the proposed line aligned roughly parallel and to the west of the existing line.

## Section 6 - State Highway 58

This route section covers the line route between Tower 43 and 49A. Tower 43 is relocated to the west of the existing tower. No other tower relocations are needed in this section.

### 2.2 Tower Design and Access Tracks

The proposal is to relocate 24 existing tower structures, to strengthen 10 towers, entirely remove an existing tower. Table 1 summarises the changes to each of the towers.

Table 1 – PKK-TKR A Line Towers

Description	Towers	Quantity
Replaced structures	2A, 3A, 8A, 9A, 10A, 11A, 12A, 13A, 14A, 15A, 16A, 17A, 18A, 22A, 24A, 25A, 26A, 31A, 32A, 33A, 40A, 41A, 42A, 43A	24
Structures to be strengthened*	1, 4, 7, 19, 21, 27, 30, 34, 39, 44	10
Structures to be removed entirely	23	1
Unaffected Structures (not moving or being strengthened)	5, 6, 20, 28, 29, 35, 36, 37, 38, 45, 46, 47, 48, 49, 49a	15
<b>Total</b>		<b>50</b>

\* Involves foundation and/or tower strengthening.

The "A" in the tower reference denotes relocated/replaced tower.

**Table A-1, Appendix A**, contains details of each of the towers including co-ordinates and indicative expected heights of each tower. The replacement towers are expected to range in height from approximately 29 m through to 39 m.

The towers will be steel lattice design, similar to existing towers.

Tower foundations will be approximately 9m x 9m for a strain tower and for construction, an additional clearance buffer of approximately 3 m around each tower. In addition, generally an area of approximately 20 m x 25 m will be required to one side of each proposed tower for construction crane assembly purposes. This construction area will be able to reinstated following use.

Transpower has an existing access track along the line for maintenance purposes. This track is shown on the drawings contained in Volume 4: Plan Set. This existing access track and other existing tracks (including farm and forestry tracks) will be used for construction access to provide four wheel drive access to each tower. The tracks will be approximately 3.5m to 4.5m wide. At the Wainui Saddle, for the towers located outside the extent of works for the NZTA's Transmission Gully Main Alignment (i.e. for towers 9A, 10A and 11A), access is likely to be taken off the existing access track that currently serves the farm and the gas pipeline owned by Vector. New tracks will be constructed off this to gain access to Towers 9A and 10A.

### 3. Scope and methodology

As described in Technical Report 16 prepared for the NZTA Transmission Gully Project, the land contamination study included a Stage 1 environmental assessment and Stage 2 environmental investigation of properties within and adjacent to the NZTA Transmission Gully Project road designation.

The Stage 1 environmental site assessment (ESA) was conducted in accordance with New Zealand Ministry for the Environment (MfE) Contaminated Land Management Guidelines (CLMG) (see **Section 8, References**). The assessment included:

- Review of historic aerial photos
- Review of current and historic title records
- Review of relevant Council records
- Interviews with persons knowledgeable of the route and specific sites along the route
- Detailed site inspections where potentially contaminating activities were identified
- Development of a qualitative risk assessment
- Development of a report of findings with recommendations for additional investigation

The Stage 1 assessment also included a site reconnaissance of the route and more detailed inspections of sites suspected of past contaminating activities. The Stage 1 assessment was conducted from July 2009 through February 2010.

The sites along the majority of the NZTA Transmission Gully Project route are greenfields sites, comprised primarily of livestock grazing areas, native and non-native bush, and plantation forest. There was no evidence from the review of historic aerials, title records, or relevant Council records that contamination was likely in the greenfields areas, except at a former livestock yard near Tower 25A. Therefore, with the exception of the former livestock yard, the greenfields sites were considered low risk and no intrusive investigation was conducted.

Based on the information gathered during the Stage 1 environmental site assessment, several areas were identified where past and/or current activities were suspected of causing contamination. These areas were:

- Sang Sue Market Garden
- Former Golden Coast Nurseries
- Car Haulways site
- Porirua Gun Club
- Pauatahanui Inlet Garden Supplies site
- Mana Coach facility
- Greater Wellington Regional Council (GWRC) former sheep dip site (near the Takapu Road substation)
- Former livestock yard (near Battle Hill Farm Forest Park)

At the sites listed above, soil samples were collected at these sites and analysed for contaminants of concern identified during the Stage 1 environmental site assessment. The laboratory analytical results were compared with guideline values for protection of human health and the environment. A report of findings (NZTA Transmission Gully Project Technical Report 16) was prepared.

Of the sites investigated, only the former Golden Coast Nurseries and former livestock yard are relevant to the Line Relocation Project.

At the former Golden Coast Nurseries site. One sample returned arsenic at a concentration above the human health risk-based guideline value and several samples returned metals concentrations above ecological risk-based guideline values. The former Golden Coast Nurseries is located just to the south of Tower 1, which is to be strengthened; however, it is not expected that contamination will be encountered during the strengthening works.

At the former livestock yard, Dichlorodiphenyltrichloroethane (DDT) was detected at concentrations above ecological risk-based guideline values in 7 of the 16 surface soil samples collected. Zinc was detected slightly above the ecological risk-based guideline value in one surface soil sample, which was next to a galvanised structure, the likely source.

The remaining sites investigated are situated well away from the Line Relocation Project sites and are not considered relevant to the Line Relocation Project.

In support of the Line Relocation Project, drawings were reviewed to evaluate the new locations and literature was reviewed to determine whether transmission towers typically contribute to soil contamination. In addition, data from sites in proximity to the Line Relocation Project was reviewed to evaluate whether the transmission towers contributed to site contamination.



## 4. Existing environment/context

The site conditions documented in Technical Report 16 are representative of conditions at the time the land contamination study was conducted. However, over time conditions may change and a visual site inspection should be conducted before start of construction to verify that conditions have not changed.

Because the NZTA Transmission Gully Project land contamination study was conducted within and adjacent to the designation, the majority of the proposed Transmission Line Relocation project route was also evaluated as part of the Stage 1 environmental assessment. Therefore, the original report remains applicable except as detailed below. Note that the limitations and assumptions documented in Technical Report 16 remain applicable.

None of the Line Relocation Project sites was listed in any Council records obtained for purposes of evaluating potential contamination.

Materials which contain contaminants, particularly zinc and lead, are used in construction and maintenance of transmission towers. The same is true for any structure where galvanised structures or lead-based paints are utilised. It is possible that through cleaning activities and rainwater runoff that contaminants may leach from the towers and enter the soil. Zinc and lead are not highly mobile in the soil and contamination (if any) around structures is typically found in surface soils directly adjacent to the structure.

This was demonstrated in a study conducted in Germany (Herms and Peterson, 1990). This study evaluated contamination around transmission towers and found elevated zinc levels in surface soils beneath transmission towers. The highest levels of zinc and lead detected in the study were 370 mg/kg and 400 mg/kg, respectively. These concentrations are below New Zealand human health guideline values but above ecological risk-based concentrations for recreational/parkland sites. However, the concentrations dropped off rapidly with depth and distance and that within 10 metres of the tower the concentrations were at background levels.

Another study (Jones, et. al., 1988) evaluated corn grown beneath transmission towers. Elevated concentrations of zinc were detected in the soil and in the plants. The study also found that concentrations dropped off rapidly with distance from the towers.

At sites investigated for the NZTA Transmission Gully Project, as well as at other investigations conducted around New Zealand, surface soil samples collected from sites which are near galvanised structures (fence posts, sheds) typically show slightly elevated zinc concentrations directly adjacent to the structure. The zinc concentrations fall off rapidly with distance from the structure and are usually present only in surface soil samples. Surface soil samples collected adjacent to structures painted with lead-based paints also typically show elevated lead concentrations. As with zinc, the lead concentrations typically decline rapidly with depth and distance.

A risk matrix was developed for the NZTA Transmission Gully Project. Using the definitions presented in Technical Report 16, the likelihood of contamination at tower sites is judged to be possible and the consequences minor. Therefore, the overall risk is ranked as low.

With two exceptions, the land contamination risk is classified as low (per the risk matrix developed for the Project) at sites investigated for the NZTA Transmission Gully Project. These two exceptions are the former Golden Coast Nurseries site, just south of Tower 1, and the former livestock yard, east of Tower 25A. Concentrations of heavy metals at the former nursery site and metals and pesticides (DDT) at the former livestock site are present above ecological risk-based guideline values as detailed in Technical Report 16.

At the former nursery, metals were detected above ecological risk-based guideline values, particularly on the northern side of the site. However, concentrations of pesticides and metals are present above background values across the site and asbestos is present in building materials. Therefore, the risk is believed to be minor to moderate for the overall site and low for the Tower 1 strengthening as it is located to the south of the site.

At the former livestock yard, DDT and zinc were detected above ecological risk-based guideline values for parkland/recreational sites. The concentrations were below ecological risk-based guideline values for commercial/industrial areas and also below human health guideline values. Therefore, the risk is minor at the site and is low to minor near the location of Tower 25A.

At both the former nursery site and the former livestock yard, zinc was detected above ecological risk-based concentrations. However, the zinc appears to be directly related to an on-site structure rather than a transmission tower. At the former nursery site, the elevated zinc concentrations were on the northern portion of the site, well away from Tower 1, and inside nursery buildings. The samples collected closest to Tower 1 had zinc at or slightly above background values. Lead concentrations were at or slightly above background values across the site. At the former stockyard site, the elevated zinc concentrations were from samples collected adjacent to galvanised fence posts. Lead values were within typical background ranges.

In both instances, the nearby transmission towers do not appear to have contributed to contamination found during the NZTA Transmission Gully Project investigation of these sites.

## 5. Assessment of Effects

The primary effects expected with regard to land contamination involve disturbance of soil which is defined as “contaminated” as defined in Section 2 of the Resource Management Act (RMA) as:

“land that has a hazardous substance in or on it that –

(a) has significant adverse effects on the environment; or

(b) is reasonably likely to have significant adverse effects on the environment.”

Greater Wellington Regional Council (GWRC) defines contaminated land as land which has contaminants present above background or risk-based values.

The Stage 1 environmental assessment and associated qualitative risk evaluation indicated that the risk of contamination along the route is low in the greenfields areas. The potential risk with regard to contamination for each of the towers is presented in **Table A-2, Appendix A**.

The primary potential effects during land disturbance at the two areas identified as contaminated during the NZTA Transmission Gully Project investigation include discharge of contaminants through stormwater runoff and discharge of contaminants to air. The same is true if contamination is present beneath and directly adjacent to the transmission towers. However, these effects are expected to be no more than minor, particularly if construction is undertaken in accordance with general good practice which calls for dust and erosion control. Note that changed conditions may warrant additional investigation.

## 6. Monitoring and mitigation

As part of the land contamination study, a Contaminated Land Management Plan (CLMP) was developed for the NZTA Transmission Gully Project. The CLMP provides an overview of site conditions and precautions to be taken at contaminated sites. The CLMP also includes a protocol for accidental discovery of contaminants, such as offal pits, rubbish pits, effluent ponds, and livestock dips. As described in Technical Report 16, the majority of the route is considered low risk for contamination as it is primarily comprised of greenfields sites.

A visual site inspection should be conducted prior to construction to verify that site conditions have not changed. If conditions have changed, additional investigation may be warranted.

At the former livestock site, DDT and zinc were found above ecological risk-based guideline values in surface soils. Therefore, soil should not be placed in pristine or ecologically sensitive areas.

The Tower 1 strengthening is not expected to result in significant disturbance of potentially contaminated soils at the former Golden Coast Nurseries; however, workers should be made aware of the potential contamination at the site.

As indicated in Technical Report #16 and the CLMP, anthropogenic activities tend to result in the presence of contaminants of concern at concentrations above background values. Therefore, the CLMP should be utilised to guide activities associated with tower relocation; i.e., dust and erosion/stormwater controls should be in place. If soil is to be taken off-site, it should be tested to evaluate whether it meets cleanfill criteria or requires landfill disposal. Surface soil from directly beneath the towers should not be placed in ecologically sensitive areas as it may contain contaminants above ecological risk-based guideline values. In addition, the National Environmental Standards for Electricity Transmission Activities should be utilised to guide tower relocation, particularly as described in Section 9 of the *Guidance on National Environmental Standards for Electricity Transmission Activities* document.

## 7. Summary and conclusions

A land contamination study was conducted of the NZTA Transmission Gully Project route which included site reconnaissance, review of historic aerial photographs, review of current and historic titles, review of applicable Council records, and sampling and analysis at select sites.

The NZTA Transmission Gully Project route is comprised primarily of greenfields sites, including areas for grazing, native and non-native bush, and plantation forest. Sampling and analysis was not conducted at the greenfields areas because of the relatively low risk of contamination.

Technical Report 16 prepared for the NZTA Transmission Gully Project is applicable to the Line Relocation Project insofar as the line route generally matches the highway route. Relevant records did not indicate the presence of contaminating activities in relevant areas; however, DDT and zinc were present above ecological risk-based guideline values at the former livestock yard and metals were present above ecological risk-based guideline values at the former nursery. Therefore, appropriate dust and erosion control measures as described in the CLMP should be implemented. In addition, while records reviewed did not indicate the presence of contaminating activities, it is possible that features such as offal pits or rubbish pits could be present. Therefore, the protocol for accidental discovery of contamination should be followed.

Based on the qualitative evaluation of risk undertaken, contaminants are unlikely to be found in quantities or concentrations that would result in adverse effects and the risk is judged to be low along the majority of the Line Relocation Project route. Standard construction procedures can be applied with appropriate dust and erosion control. Soil should be managed in accordance with the CLMP and surface soil beneath the towers should be assumed to contain heavy metal concentrations above ecological risk-based guideline values unless sampling and analysis demonstrates otherwise. Therefore, soil excavated from beneath and around the existing towers should not be placed in ecologically sensitive areas and should be sampled and analysed if it is to be taken off-site.

In addition, it should be noted that the limitations and assumptions contained in the Technical Report are applicable and that site conditions documented in the Technical Report were representative at the time of the investigation and should be verified prior to construction.

## 8. References

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**Appendix A**  
**Tower Location and Potential  
Contamination Risk Information**

**Table A-1 Transmission Gully Line Relocation - Schedule of Changes to Transmission Line Support Structures<sup>a</sup>**

Existing tower	Proposed tower	Existing/proposed	Strengthening	Existing		Proposed		Type	Span (m)	Existing height (m)	Proposed Height (m)	Height difference (m)
				Northing (m)	Easting (m)	Northing (m)	Easting (m)					
1	-	Existing	Yes	5461376	1765624			Strain	308	17.3	No change	-
2	2A	Proposed		5461117	1765471	5461122	1765451	Strain	361	23.4	33.0	9.6
3	3A	Proposed		5460749	1765416	5460764	1765405	Strain	440	30.7	33.0	2.3
4	-	Existing	Yes	5460327	1765353			Suspension	421	41.5	No change	-
5	-	Existing		5459909	1765300			Suspension	273	31.3	No change	-
6	-	Existing		5459638	1765266			Suspension	337	24.2	No change	-
7	-	Existing	Yes	5459304	1765223			Strain	252	17.5	No change	-
8	8A	Proposed		5459058	1765145	5459057	1765172	Strain	381	24.8	30.0	5.2
9	9A	Proposed		5458709	1765030	5458899	1764826	Strain	239	28.8	30.0	1.2
10	10A	Proposed		5458518	1764925	5458714	1764675	Strain	280	28.0	30.0	2.0
11	11A	Proposed		5458294	1764805	5458436	1764713	Strain	401	28.8	30.0	1.2
12	12A	Proposed		5458142	1764748	5458038	1764762	Strain	234	15.7	32.0	16.3
13	13A	Proposed		5457906	1764660	5457817	1764687	Strain	355	23.5	32.0	8.5
14	14A	Proposed		5457575	1764615	5457466	1764633	Suspension	349	21.9	36.0	14.1
15	15A	Proposed		5457260	1764571	5457121	1764580	Suspension	319	28.0	36.0	8.0
16	16A	Proposed		5456923	1764525	5456807	1764528	Strain	229	17.3	32.0	14.7
17	17A	Proposed		5456694	1764449	5456590	1764455	Suspension	253	18.7	36.0	17.3
18	18A	Proposed		5456488	1764380	5456350	1764374	Strain	307	17.6	30.0	12.4
19	-	Existing	Yes	5456049	1764316			Suspension	387	28.2	No change	-
20	-	Existing		5455666	1764260			Suspension	213	28.2	No change	-
21	-	Existing	Yes	5455455	1764229			Suspension	405	18.6	No change	-
22	22A	Proposed		5455113	1764178	5455051	1764195	Strain	503	28.2	35.0	6.8
23	-	Removed		5454783	1764131					24.8	Removed	-
24	24A	Proposed		5454478	1764087	5454548	1764211	Strain	324	22.0	33.0	11.0
25	25A	Proposed		5454158	1764040	5454234	1764131	Suspension	314	24.7	39.0	14.3
26	26A	Proposed		5453834	1763993	5453929	1764056	Suspension	445	28.2	40.0	11.8
27	-	Existing	Yes	5453498	1763943			Strain	367	23.5	No change	-
28	-	Existing		5453164	1763794			Suspension	280	28.1	No change	-
29	-	Existing		5452909	1763678			Suspension	387	22.0	No change	-
30	-	Existing	Yes	5452555	1763521			Suspension	369	28.1	No change	-
31	31A	Proposed		5452218	1763370	5452213	1763384	Strain	399	16.0	30.0	14.0
32	32A	Proposed		5451893	1763216	5451828	1763278	Strain	347	23.3	30.0	6.7
33	33A	Proposed		5451516	1763106	5451525	1763100	Strain	490	31.0	29.0	-2.0
34	-	Existing	Yes	5451045	1762969			Suspension	197	21.9	No change	-
35	-	Existing		5450856	1762915			Suspension	267	15.8	No change	-
36	-	Existing		5450600	1762842			Suspension	344	16.2	No change	-



Existing tower	Proposed tower	Existing/proposed	Strengthening	Existing		Proposed		Type	Span (m)	Existing height (m)	Proposed Height (m)	Height difference (m)
				Northing (m)	Easting (m)	Northing (m)	Easting (m)					
37	-	Existing		5450269	1762748			Suspension	355	28.0	No change	-
38	-	Existing		5449927	1762650			Suspension	290	21.9	No change	-
39	-	Existing	Yes	5449651	1762561			Suspension	270	21.8	No change	
40	40A	Proposed		5449368	1762479	5448396	1762474	Strain	317	15.7	31.0	15.3
41	41A	Proposed		5449067	1762392	5449113	1762328	Strain	224	15.7	30.0	14.3
42	42A	Proposed		5448798	1762311	5448900	1762259	Suspension	400	17.2	37.0	19.8
43	43A	Proposed		5448514	1762166	5448518	1762140	Strain	469	21.7	33.0	11.3
44	-	Existing	Yes			5448089	1761949	Strain	291	21.9	No change	
45	-	Existing				5447829	1761820	Suspension	323	27.7	No change	
46	-	Existing				5447540	1761675	Strain	299	17.1	No change	
47	-	Existing				5447416	1761404	Suspension	199	18.4	No change	
48	-	Existing				5447336	1761221	Suspension	130	15.7	No change	
49	-	Existing				5447325	1761099	Strain	25	18.5	No change	
49a	-	Existing				5447256	1761118	Strain	21	16.5	No change	

<sup>a</sup>Data provided by Beca, 05 August 2011

**Table A-2: Listing of towers, site setting, and associated potential contamination risk<sup>a</sup>**

Tower Number	Activity <sup>b</sup>	In / Out <sup>c</sup>	Description of Tower Location <sup>d</sup>	Site setting <sup>d</sup>	Contamination risk
1	S	I	Adjacent SH1 and former Golden Coast Nurseries	Commercial site (sealed with adjacent gravel/ asphalt at former nursery site)	Minor to moderate risk from past chemical use and asbestos in building materials at adjacent former Golden Coast Nurseries
2A	R	I	Broad elevated river terrace above Te Puka Stream	Improved pasture	Low
3A	R	I	Broad elevated river terrace above Te Puka Stream	Rough pasture	Low
4	S	I	Narrow elevated river terrace above Te Puka Stream	Improved pasture	Low
5 & 6	NA	-	-	-	-
7	S	I	Steep spur above Te Puka Stream	Improved pasture	Low
8AW	R	I	Steep eastern slopes above Te Puka Stream	Crosses Te Puka stream to western slopes. Improved pasture with some scrub in valley floor.	Low
9AW	R	O	High spurs on western side of Te Puka	Improved pasture	Low
10AW	R	O	High spurs on western side of Te Puka	Improved pasture	Low
11AW	R	O	High spurs on western side of Te Puka	Crosses slopes and gullies with tauhinu shrubland and scrub	Low
12AW	R	I	Moderately steep slopes to east of Horokiri Stream.	Mostly improved pasture. Will cross some gullies in secondary native mahoe forest	Low
13AW	R	I	Moderately steep slopes to east of Horokiri Stream.	Mostly improved pasture and some rough pasture with shrubs	Low
14AW	R	I	River terrace adjacent to Horokiri Stream (eastern side)	Mostly improved pasture. Will cross Horokiri Stream - stony stream bed in pasture	Low
15AW	R	I	High river terrace adjacent to Horokiri Stream (western side)	Mostly improved pasture Will cross Horokiri Stream in area of secondary native mahoe forest	Low
15BW	R	I	River terrace adjacent to Horokiri Stream (eastern side)	Improved and rough pasture, greenfields. Will cross Horokiri Stream in area of secondary native mahoe forest	Low
16AW	R	I	Spur on eastern slopes above Horokiri Stream	Gorse dominated scrub, greenfields	Low
17A	R	I	Low terrace above Horokiri stream (eastern side)	Predominantly over improved pasture and rough pasture with some stony streambed and gorse scrub	Low
18A	R	I	Low terrace above Horokiri stream (western side)	Predominantly over improved pasture and rough pasture with some stony streambed and gorse scrub	Low

Tower Number	Activity <sup>b</sup>	In / Out <sup>c</sup>	Description of Tower Location <sup>d</sup>	Site setting <sup>d</sup>	Contamination risk
19	S	I	River terrace to east of Horokiri Stream	Improved pasture	Low
20	NA	-	-	-	-
21	S	I	Moderately steep slope above stream (east)	Predominantly dense gorse scrub, and scrub and regenerating forest in gullies	Low
22A	R	I	Broad river terrace above to Horokiri Stream (eastern side)	Improved pasture	Low
23	Removed	I	Broad river terrace above to Horokiri Stream (eastern side)	Improved pasture	Low
24A	R	I	Eastern slopes above Horokiri Stream.	Across plantation pine with some gorse scrub and improved pasture (greenfields)	Low
25A	R	I	Broad river terrace above to Horokiri Stream (eastern side). In general vicinity of former livestock yard.	Predominantly improved pasture with a crossing of Horokiri Stream with riparian scrub and stony streambed in pasture (greenfields)	Minor ecological risk from past DDT usage.
26A	R	I	On low river terrace above Horokiri Stream (East side)	Improved pasture, traverses a section of meanders of Horokiri stream. Typically stony stream bed in pasture and boggy rushland (greenfields)	Low
27	S	O	On low river terrace above Horokiri Stream (West side)	Improved pasture	Low
28, 29	NA	-	-	-	
30	S	O	On low river terrace above Horokiri Stream (West side)	Improved pasture	Low
31A	R	I	Spur above Horokiri Stream (west side)	Improved pasture. Mix of improved pasture, plantation pine, exotic treeland over streambed and a small stream with regenerating mahoe forest	Low
32A	R	O	High terrace above Horokiri Stream (west side)	Half improved pasture, and half plantation pine.	Low
33A	R	O	Rolling downlands on eastern side Horokiri stream	Improved pasture and damp gullies with rushland	Low
34	S	O	Rolling downland in Ration stream catchment	Improved pasture	Low
35, 36, 37, 38	NA	-	-	-	
39	S	O	Rolling downland in Ration stream catchment	Predominantly improved pasture, with some shrubland and regenerating native bush including and area of Transmission Gully planting	Low
40A	R	I	Rolling downland in Ration stream catchment	Most improved pasture with some damp gullies in rushland and an area of Transmission Gully planting	Low
41A	R	I	Rolling downland in Ration stream catchment	Most improved pasture with some damp gullies in rushland	Low
42A	R	I	Rolling downland in Ration stream catchment	Mix of improved pasture and plantation pine (6.01) with	Low

Tower Number	Activity <sup>b</sup>	In / Out <sup>c</sup>	Description of Tower Location <sup>d</sup>	Site setting <sup>d</sup>	Contamination risk
				some gullies containing regenerating bush	
43A	R	I	Rolling downland in Ration stream catchment	Predominantly plantation pine, with some gorse and improved pasture	Low
44	S	O	Rolling downland in Ration stream catchment	Improved pasture	Low
45 – 49a	NA	-	-	-	

<sup>a</sup>Tower locations require future verification

<sup>b</sup>R = Relocated, S = strengthen, NA = not affected

<sup>c</sup>I = within designation, O = located outside designation

<sup>d</sup>From Boffa Miskell, 2011. **ADDENDUM TO TECHNICAL REPORT 11A, ASSESSMENT OF ECOLOGICAL EFFECTS**