

0 200 m

1:7,500 @ A4

Data Sources:
Designation sourced from DCC 2GP online
Landfill design sourced from GHD

Projection: NZGD 2000 New Zealand Transverse
Mercator

LEGEND

- Artificial Cover Object
- Smooth Hill Designation (2GP)
- Access Road
- Landfill Footprint
- Operations Area
- Stockpile

SMOOTH HILL LANDFILL

Location of Artificial Cover Objects

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Figure 1

2.3 Lizard habitats

2.3.1 Key habitats within the site

The native southern grass skink (*Oligosoma* aff. *polychroma* Clade 5), which has been observed within eight kilometres of the proposed site within the past 20 years (Table 1), may be within the designation site, particularly in rank grassland habitats, along grass margins and in wood and debris piles scattered throughout the site, as well as in grasslands along McLaren Gully and Big Stone roads. The habitat types of particular interest for this species are (Yorkshire fog) - cocksfoot grassland (within the designation site, and along roads), [large leaved pohuehue] / (Himalayan honeysuckle) – gorse scrub and kānuka forest habitats found within West Gully 2 and 3 (Figure 2). The southern grass skink is classified as At Risk – Declining.

The korero gecko (*Woodworthia* “Otago/Southland Large”) have been observed more recently (2019), along Taieri Ferry Road, and may be within the designation site, particularly in habitats where there is woody debris scattered throughout the site, however this species prefer rocky substrates and scrub environments. The habitat types of particular interest for this species are (Yorkshire fog) - cocksfoot grassland (within the designation site, and along roads), [large leaved pohuehue] / (Himalayan honeysuckle) – gorse scrub and kānuka forest habitats found within West Gully 2 and 3 (Figure 2). Korero gecko is classified as At Risk – Declining.

Based on species distribution in the wider area, McCann’s skink (*Oligosoma maccannii*) might also be present and, if so, would be found along grass margins and in wood and debris piles scattered throughout the site. However, McCann’s skink habitat preference is rockier substrate than what is found in the site, so is less likely to be present than the southern grass skink. The habitat type of particular interest for this species is radiata pine - gorse / cocksfoot - Yorkshire fog shrubland / treeland (Figure 2). McCann’s skink is classified as Not Threatened.

The jewelled gecko (*Naultinus gemmeus*), which may have been recorded within 16 km of the site, might be present on site. Although considered less likely, the presence of this species is still possible and remnant populations of a small number of individuals could be persisting within the remnant native scrublands within the designation site. The habitat type of particular interest for this species is kānuka forest (specifically West Gully 3) (Figure 2). The jewelled gecko is classified as At Risk – Declining and is not locally abundant within the south Dunedin area.

Based on species distribution, there is a very low likelihood that cryptic skink (*Oligosoma inconspicuum*) could be present within the designation, preferring damper habitats, scrub and rock outcrops (which are not present within the designation site). However, although a low likelihood, this species could be present and should not be ruled out. Cryptic skink is classified as At Risk – Declining.

2.3.2 Extent of lizard habitats within the development site

For the purposes of this plan, lizard habitat has been identified by vegetation type and zone within the designation. With respect to impact type, this is regarding permanent loss, or potential ongoing degradation. Habitat type pertains to the vegetation type found within the area to be impacted. For example, the habitat surrounding West Gully 3 is comprised of kānuka forest with some areas bordered by regenerating treeland, scrub, grassland and wetland. These habitats are not going to be permanently altered, are found outside of the landfill site, and are to be enhanced as described in the Vegetation Restoration Management Plan (Boffa Miskell 2021b).

Without implementation of the Vegetation Restoration Management Plan, these areas are likely to be impacted by long term disturbance and edge effects during plantation forestry cycles.

Much of the cutover pine / forestry area is likely to be retained but some will be impacted, which provides low quality habitat for southern grass skinks (especially in weedy areas). In addition, a small amount of grassland will be permanently lost through the creation of the landfill. The larger sections of grassland will be lost where McLaren Gully Road and Big Stone Road are to be widened.

Table 3 summarises this below.

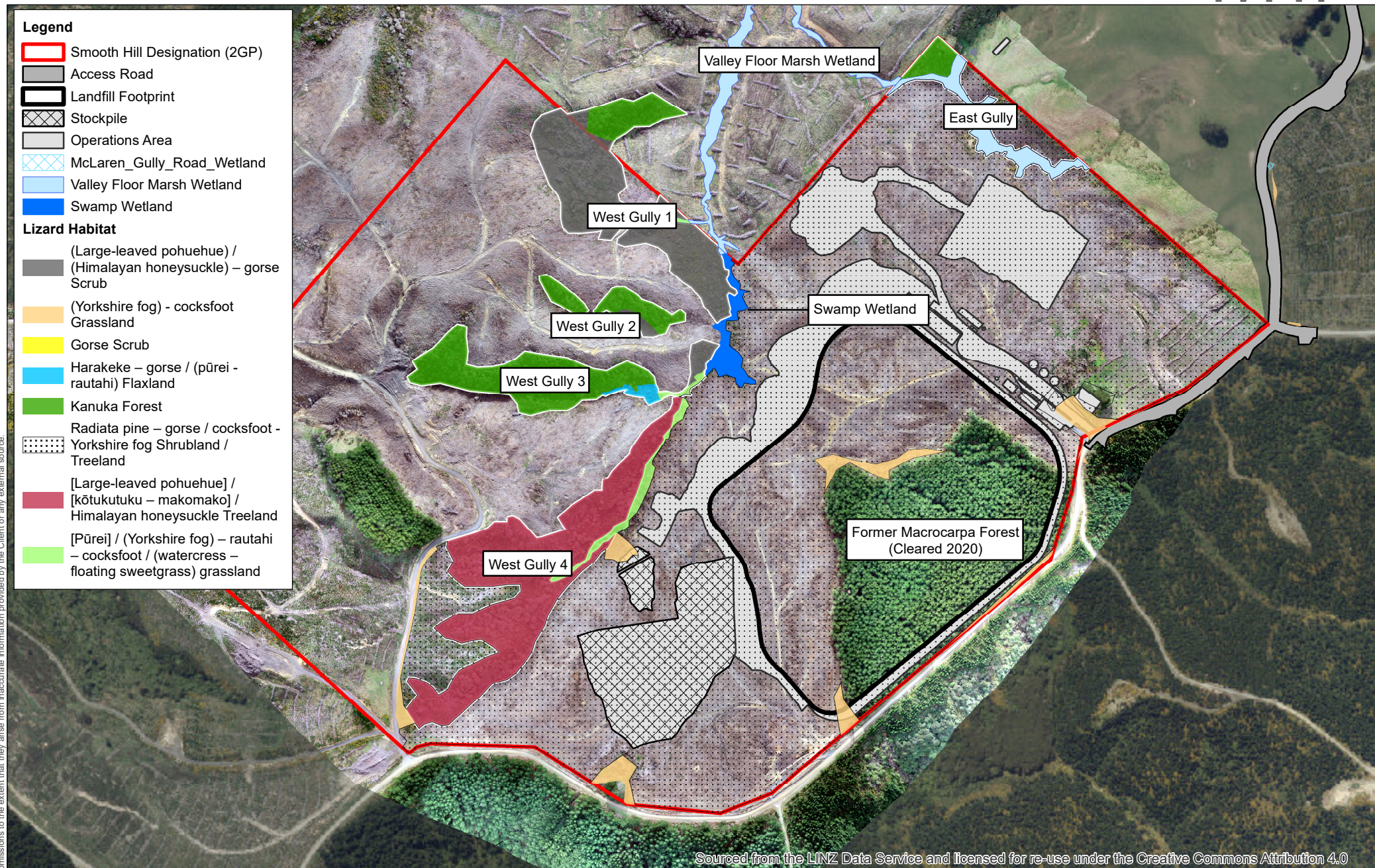


Table 3. Summary of habitat types, extent, area to be lost and species present within the designation site and adjacent to McLaren Gully and Big Stone roads.

Habitat type	Location	Approximate extent of habitat	Amount of habitat lost	Species likely to be present	Management required
Cutover pine and macrocarpa forest area (Radiata pine / gorse / cocksfoot – Yorkshire fog treeland) (within landfill construction footprint)	Designation site, McLaren Gully and Big Stone roads, Landfill footprint (impact site)	> 90 ha (within designation site)	33.88 ha	Southern grass skink, McCanns skink	Progressive salvage in identified likely locations, habitat clearance
Kānuka forest, and surrounding regenerating scrub and treeland in West Gully 1, 2, 3 and 4, and surrounding [large-leaved pohuehue] / [kōtukutuku–makomako] / Himalayan honeysuckle tree land, sedgeland and flaxland in swamp wetland (outside landfill, within designation site)	Designation site	2.5 ha kānuka forest, 3.48 ha regenerating scrub, 4.6 ha regenerating treeland, 1.7 ha wetland (within designation site)	0 ha (within designation site). 0.0017 ha sedgeland / rushland cleared during road upgrade)	Jewelled gecko, McCanns skink, cryptic skink, southern grass skink and korero gecko	Protection from disturbance / sedimentation.
Rank grassland area (Yorkshire fog) - cocksfoot grassland (along roads)	Designation site, McLaren Gully and Big Stone roads, Landfill footprint (impact site)	1.06 ha (within designation site), >4 ha (along roads)	3.15 ha	Southern grass skink	Progressive salvage, habitat clearance

2.3.3 McLaren Gully and Big Stone roads

Access to the designation site is from State Highway 1 via the existing McLaren Gully Road to the junction with Big Stone Road (4.3 km approx.). Traffic then turns right onto the existing Big Stone Road for 350 m to a proposed landfill access road junction. A new access will be constructed from the junction to the site facilities and landfill (200 m approx.). McLaren Gully and Big Stone roads will be widened resulting in a direct loss of vegetation including potential

lizard habitat (rank grassland – Figure 4). It is understood that the road will be sealed, resulting in a reduction of dust accumulation along the road edge.

	
Rank grass along the roadside edge (Big Stone Road)	Rank grass along either side McLaren Gully Road
	
Rank grass along McLaren Gully Road	State Highway 1 road intersection with rank grass

Figure 3. Potential lizard habitat along McLaren Gully and Big Stone roads

2.3.4 Smooth Hill Landfill

The landfill will be 18.6 ha in area, with a construction footprint of c.34 ha, within the wider c.113 ha designation and affect potential lizard habitat (rank grassland and generally weed infested areas of the cutover pine forest) both within this landfill footprint and along the margins of McLaren Gully and Big Stone roads (Table 3).

The landfill area is currently under forestry management, which changes the vegetation composition and habitat type and quality every forestry harvest cycle (25-30 years). We consider that lizards may occupy the rank grass edges of these plantations, and potentially occupy the forest when it is at an early stage of growth (Figure 5). It is assumed that the plantation forestry cycle will continue with / after the construction of the landfill. Given the time scale of pine plantation, it is feasible that lizards make use of these habitats as they change if lizards are present in low populations.



Rank grassland within the landfill footprint



Rank grassland below the landfill extent

Figure 4. Rank grass habitat within the landfill extent.

2.3.5 Smooth Hill designation

Within the wider designation, kanuka scrub vegetation is found within several gully fragments. This vegetation has the potential to be affected by residual effects of the landfill such as pest / predator influxes and increased sedimentation or dust deposition over time.

Lizards are more likely to be persisting within these native remnants as they are large fragments of vegetation with potentially higher loads of resource and more complex vegetation with a

variety of refugia, compared to marginal habitats such as rank grass. As such, they are likely to contain a wider variety of species.

2.4 Lizard values summary

Although no specific lizard species were confirmed to be present within the site, scat was confirmed additional to the potential habitat for the following species to be present. We consider that there is a very low likelihood that cryptic skink (M. Tocher pers. comm. 2020), korero gecko and jewelled gecko are present within the designation. However, we cannot rule out that they are present, given limited surveys and the cryptic nature of these lizard species. A summary of the species possibly present within the designation site and adjacent to McLaren Gully and Big Stone roads and their ecological values is provided in Table 4.

This ecological values assessment takes into account the limited probability of cryptic skink, korero gecko and jewelled gecko presence within the designation site and habitat adjacent to McLaren Gully and Big Stone roads. However, it is more likely given the modified nature of the habitat that the southern grass skink and, less likely, the McCann's skink are the only lizard species likely to be present within the designation site and along the roads.

The potential lizard habitats within the designation site and adjacent to McLaren Gully and Big Stone roads are of generally low quality and are expected to have low abundance of lizards as a result.

Table 4: Ecological values of lizards potentially present within the designation site and adjacent to McLaren Gully and Big Stone roads (ecological value is based on the criteria in Table 5 of Roper-Lindsay et al. (2018)).

Common name	Species	Threat class	Ecological Value
McCann's skink	<i>Oligosoma mccannii</i>	Not Threatened	Low
Southern grass skink	<i>Oligosoma</i> aff. <i>polychroma</i> Clade 5	At Risk - Declining	High
Korero gecko	<i>Woodworthia</i> "Otago/Southland Large"	At Risk - Declining	High
Jewelled gecko	<i>Naultinus gemmeus</i>	At Risk - Declining	High
Cryptic skink	<i>Oligosoma inconspicuum</i>	At Risk - Declining	High

3.0 Effects on lizards

3.1 Actual and Potential effects

Effects on lizards have been assessed at a **local population scale**, although we note that where species have limited distributions, loss of animals will have national population scale effects. Actual and potential effects on lizards resulting from the proposed development are detailed below.

The landfill and associated works (excluding road widening) is likely to be permanent in nature and 18.6 ha in size. Therefore, lizards are likely to have habitat connectivity reduced and fragmented in nature, permanently. The vegetation within the landfill footprint and wider designation site is highly modified and not high quality habitat for native lizards, therefore, populations that may be present within the designation site and along the road edge are likely to be reduced to sparse or less than reproductively viable.

Based on a **High** ecological value and with an appropriate management plan and habitat enhancement, the magnitude of effect on the wider populations is likely to be **Low** (*having a minor effect on the known population or range of the element / feature*) and, therefore, a **Low** level of ecological effect.

3.1.1 Injury/death

Lizard fauna are mobile over short distances but may not be able to escape during site preparation and construction, particularly if carried out during colder months when lizards are less active. Activities that may result in injury or death to lizards include vegetation clearance and earthworks. Lizards are particularly susceptible to injury and mortality during vegetation clearance because they are visually and behaviourally cryptic (hiding under cover when disturbed), have low mobility and are inactive for parts of the year.

Effects of injury or death will be minimised as much as possible with salvage and translocation.

3.1.2 Disturbance

Disturbance and sub-lethal stress to lizards is difficult to quantify, but is likely that noise, dust and vibrations during construction may impact lizards that are vocal (i.e. some green gecko species) and / or predominantly ground-dwelling species (i.e. southern grass skink). The increase in both vehicle movements, and increased lighting will increase the potential for disturbance to nocturnal lizards (such as korero gecko).

3.1.3 Habitat loss and displacement

The majority of the landfill development is located away from indigenous vegetation and habitats likely to be occupied by native lizards. Where lizards are present, works associated with the development will result in direct, permanent habitat loss within the construction footprint and temporary occupation areas (e.g. lay down areas).

Unmanaged clearance of vegetation and other lizard habitat (including feeding and refuge habitats, such as debris piles) may result in significant sub-lethal effects to lizards by the following mechanisms:

- displacement into unsuitable neighbouring habitat;
- increased competition for resources and consequent reduction in breeding success;
- loss of mature food and refugia (i.e. vegetation with suitable crevices); and
- high stress resulting from the loss of refuge habitats and increased exposure to predators.

We consider that the existing lizard population size is likely constrained by predation pressure and availability of suitable refuges and food. As such, displacement of lizards into surrounding habitat, if present, may have a moderate adverse population-level effect where lizards are unable to survive or breed.

3.1.4 Habitat fragmentation

Habitat fragmentation disproportionately affects animals with low dispersal ability by effectively constraining the extent of available habitat. This may result in breeding suppression as a result of limited habitat and reduced mate choice.

Key areas where habitat fragmentation may result from the proposed development include existing native scrub remnants, separation from these with uninhabitable areas, encroachment of plant and animal pests into the fragmented habitats.

3.1.5 Increased predation

Increased levels of activity at the Site have the potential to create additional interest and visitation of mammalian pests and predators, especially rodents. Increased predation may have population level effects on native lizards. The creation of the landfill will also increase the residual effects of predators within the habitat. There is currently no pest control within the site, which may be keeping lizards suppressed. Predator control will aim to reduce the risk of increased predation within the habitats to remain at the site (see predator control section in the Landfill Management Plan, Boffa Miskell 2021a).

3.1.6 Habitat quality reduction / dust sediment deposition

Habitat remnants within the site are particularly vulnerable to encroachment from dust deposition, sediment runoff and debris deposition. These remnants could likely hold higher numbers of lizards within them compared to the site that is to be modified, due to their higher quality habitat. These effects would likely reduce populations further and leave the remnant populations at risk of predation and reduction of food resource.

Given the habitat along McLaren Gully and Big Stone roads is already affected by dust deposition, we consider that the proposed sealing of these roads² will significantly reduce and potentially eliminate the effects of dust in these areas, which will be a **positive effect**.

² We understand that access roads are to be sealed.

3.1.7 Translocation

Potential effects on lizards resulting from salvage and subsequent translocation may include injury, death, competition, displacement, overheating and overcrowding. These effects will be minimised by using experienced handlers. An evaluation of the risk of these effects is provided in Section 4.2.

3.2 Significance of effects

At Risk - Declining species (*Oligosoma* aff *polychroma* "Clade 5") have high conservation value meaning that any predicted impact of moderate or higher magnitude on these species defaults to a High level of effect. For this assessment, effects are considered at a local population scale. Not threatened species such as McCann's skink have a **Low** level of effect (Table 5).

Table 5: Potential significance of ecological effects on native lizards (ecological value, magnitude of effect, level of effect are based on the criteria in Table 5 of Roper-Lindsay et al. (2018)).

Adverse effect	Threat class	Ecological Value	Magnitude of Effect	Level of Effect
Accidental injury / death	Not Threatened	Low	Low	Very Low
	At Risk - Declining	High	Moderate	High
Habitat loss / displacement	Not Threatened	Low	Low	Very Low
	At Risk - Declining	High	Moderate	High
Disturbance during construction	Not Threatened	Low	Moderate	Low
	At Risk - Declining	High	Moderate	High
Habitat fragmentation	Not Threatened	Low	Low	Very Low
	At Risk - Declining	High	Moderate	High
Breeding failure / avoidance	Not Threatened	Low	Negligible	Very Low
	At Risk - Declining	High	Low	Low
Habitat quality reduction / Dust sediment deposition	Not Threatened	Low	Negligible	Very Low
	At Risk - Declining	High	Low	Low

Although the level of effect is high in some instances, given the expected low densities of some of the potential species (e.g., southern grass skink), there is a chance of only encountering a few animals per hectare. As such, the level of effect may be high, but the likelihood of that effect being realised with the proposed management in place, is **low**.

3.3 Management of effects

3.3.1 Avoidance

At Risk lizard species may be present within the site and all native lizards are protected under the Wildlife Act. As such, where practicable, clearance of areas of lizard habitat (particularly regenerating native treeland (large-leaved pohuehue) / (Himalayan honeysuckle) – gorse scrub community); and areas of (Yorkshire fog) - cocksfoot grassland (within or surrounding radiata pine / gorse / cocksfoot – Yorkshire fog treeland) will be avoided.

Where the removal of lizard habitat cannot be avoided, measures are recommended to avoid and minimise the potential effects on resident lizard populations.

3.3.2 Remediation

Because some areas of habitat will be lost, rather than temporarily impacted, it is unlikely that lizard habitats directly impacted by landfill construction and road widening can be practically remediated.

3.3.3 Minimisation: Lizard salvage as a management action

We recognise that there are inherent risks associated with lizard capture and salvage as a management tool for mitigation purposes. In particular, there is high risk of poor capture rates for lizards during pre-survey capture and salvage activities. This will be managed by maximising lead-in time for pre-clearance capture and using a range of tools suitable to the species in question. We further recognise that communication with machinery contractors is key to ensuring that lizard salvage is carried out in such a way as to minimise risk to lizards (i.e. gradual habitat clearance, using appropriate machinery).

3.3.4 Mitigation

As a requirement of consent conditions^{3,4}, we consider that buffer planting of the potential release site, stock fencing (at a minimum) of vegetation remnant West Gully 3 (see Section 3.1.4 of the Vegetation Restoration Management Plan, Boffa Miskell, 2021b) and landscape scale predator control will mitigate for adverse effects of the landfill and road widening.

As landfill activities and disturbance will be ongoing for many years, salvaged lizards will need to be relocated to prepared areas well outside of the landfill footprint. Site preparation includes habitat enhancement (e.g. plantings of native grasses and shrubs) prior to release of salvaged lizards.

The DCC Landfill Concept Design Report⁵ states that landfill perimeter tree planting is proposed to provide visual screening along the exterior of the landfill footprint and will also intercept dust generated from site operations. A minimum 10 m wide vegetation buffer strip has been proposed, including a mixture of exotic and indigenous tree species along the site

³ Draft consent conditions to be finalised upon lodgement of consent

⁴ Areas of suitable lizard habitat within the site are maintained in accordance with a Lizard Management Plan.

⁵ Dunedin City Council Waste Futures Phase 2 - Workstream 3 Smooth Hill Landfill. Landfill Concept Design Report (2021)

boundary with Big Stone Road and along the north eastern ridge within the site (see the Vegetation Restoration Management Plan, Boffa Miskell 2021b).

All sections of the proposed vegetation screen can be planted at (or prior to) the commencement of the landfill development project. The planting will consist of double staggered rows of pine adjoining the site boundary combined with a mixture of kānuka and totara within the site.

These plantings will assist in the reduction of dust deposition for native fauna that may be inhabiting the wider vegetation, and assist with habitat enhancement for the rank grassland corridors that are present along the edge of Big Stone Road (Figure 5).