

Memorandum

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Attention:	Dave Moule, Planner
Company:	Boffa Miskell Ltd
Date:	8 July 2022
From:	Gavin Mathews, Ecologist / Kathryn Reeve, Ecologist
Message Ref:	Waiterimu Solar Farm Project, Initial Ecological Assessment
Project No:	BM210126

Introduction

Boffa Miskell Limited (BML) has been engaged by Waikato Solar Farms Limited to undertake an Ecological Impact Assessment (EclA) for a proposed solar energy development (the Project) at 345 Waiterimu Road, Waiterimu, (otherwise referred to as the Site in this report). This memo provides an outline of the initial findings of the EclA and has been prepared for inclusion in an application for Ministerial referral of the project under the COVID-19 Recovery (Fast-track Consenting) Act 2020.

Summary of findings

The initial analysis outlined in this memo below indicates that the project will have, subject to the implementation of the recommended effects management methods, a Low level of ecological effect; with the potential for some Net Gain or enhancement of biodiversity/ecological values. Under the Resource Management Act 1991 (RMA) context, we conclude that there are no significant adverse effects.

The Site

The Site is a large 380 ha block of land situated in a low-lying area surrounded by steep hill country approximately 1.5km southeast of Lake Waikare in the Waikato District. The topography is typically flat to undulating, except for the northern and south-western areas where the terrain is steep. Currently, most of the site is used for agricultural and farming-related purposes. As a result, the majority of the area is dominated by low growing non-native species such as pasture grasses, with mature vegetation occasionally scattered throughout the project footprint.

The Site lies within two ecological districts: the western side is located in the Meremere ecological district, and the eastern side in the Hapuakohe Ecological District. The surrounding landscape is highly modified due to significant historic land use change and disturbance and is predominately farmland. Lake Waikare, a large shallow lake is located roughly 1.5 km north of the Site. A large pine forest plantation is located just north of the northern site boundary.

There are two Significant Natural Areas (SNA) within the Site¹: SNA 17038 and SNA 17224, which are both totara stands. SNA 17038 is located in the northern area of the site, just south of Waiterimu Road, and SNA 17224 is present within the south-eastern boundary of the project footprint. Only a small portion of SNA

¹ Proposed Waikato District Plan (Decisions Version) Maps / APP2

17224 is located within the Site as this SNA is located along Matahuru Stream which forms the Site's eastern boundary. These SNAs are identified on the vegetation map attached as **Appendix 1**.

Freshwater ecosystems present across the Site include numerous waterways, differing in size and degree of modification. There is a central modified waterway through the middle of the site which connects into the Matahuru Stream, which flows along the eastern extent of the Site boundary. Minimal native vegetation is present along the riparian margins of the waterways within the Site with vegetative cover predominated by non-native pasture species and wet adapted pest plants. The Matahuru Stream which has some isolated fragments of established riparian cover to the north of the Site boundary and scattered exotic vegetation along its length.

Proposed Development

The Project involves the construction, operation and maintenance of an approximately 140MW photovoltaic solar farm. It will consist of approximately 225,000 solar panels, associated infrastructure and a National Grid substation set across a 380 ha site.

The solar farm is anticipated to be constructed of bifacial monocrystalline panels mounted on a metal tracking system aligned in North-South rows and panels will rotate East-West (+/- 120°). While detailed design is ongoing, it is currently anticipated that:

- The central axis will be approximately 1.3 - 2.3m high and each panel when rotated to the maximum angle will reach approximately 2.5 - 3.5m high.
- The rows are located 5.0 - 6.5m (pitch pole to pole) apart, 2.5 – 4.0m (horizontal gap) when panels are positioned horizontally.
- Cabinets housing the inverters, transformer and associated equipment to convert DC energy produced by the solar panels into AC energy required by the national grid will be placed around the site and connected by buried cabling.
- The development will also include ancillary buildings, structures, access roads, cabling and infrastructure.

The site perimeter is anticipated to be made secure by the construction of 2.0m high deer fencing and CCTV camera mounted on 2.5m high poles will be placed at certain points around the site.

A new 220kV substation will be constructed adjacent to the national grid transmission line (tower HLY-DEVA0631) which runs across the Site. The solar farm will be connected to the National Grid by a new section of transmission line, including two supporting poles within the Site. The substation, which is to be approximately 6,000m² in area, will be accessed via nearby Waiu Road. The componentry within the new substation will generally be between 5 - 10m in height, with limited vertical infrastructure (gantries and telecommunications poles) being up to c.25 m in height. The Project will also contain an energy storage facility on an area adjacent to the substation, comprised of battery storage systems within storage cabinets. Both the substation and energy storage facility will be established upon impermeable platforms, which will generate stormwater runoff.

Methods

The method for assessing the ecological effects of the project has been based on the Environment Institute of Australia and New Zealand's (EIANZ) Ecological Impact Assessment Guidelines 2018. This method determines the level of ecological effect using an assessment matrix based on the assessed ecological value of the ecosystems or species assessed, and the assessed magnitude of effect. Based on the EIANZ guidelines, ecological effects are categorised from 'Net Gain' (positive) and 'Very Low' up to 'Very high'.

The initial analysis outlined within this memo has been informed by the following methods, assessments and surveys:

- Desktop reviews of terrestrial and freshwater ecology resources (including aerial imagery, Waikato Regional and District Council maps, New Zealand Freshwater Fish Database, the Department of Conservation (DOC) Herpetofauna Bioweb database and the New Zealand Bird Atlas database).
- Vegetation surveys/mapping, categorisation and qualitative assessment.
- Natural wetland identification and mapping following the wetland delineation protocols outlined by the Ministry for the Environment (2020) which is incorporated within the National Policy Statement for Freshwater Management (NPS-FW)².
- A bioacoustic survey for the long-tailed bat (*Chalinolobus tuberculatus*) involving over 30 automatic bat monitors³ (ABMs) manufactured by the DOC over a two-and-a-half-week period.
- Vegetation survey to determine bat roost potential.
- Riparian and in-stream habitat assessments (including fish surveys, Environmental DNA (eDNA) sampling, macroinvertebrate surveys, macrophyte and periphyton assessments, water quality measurements and sediment quality sampling).

Details of the full methodology will be outlined in the final EclA report.

Ecological Values

Vegetation

The vegetation composition is reflective of the rural farming landscape that surrounds the Site; with barberry hedges being the most common habitat. The vegetation habitats on Site are fragmented and generally dominated by exotic species, with the majority of native species encountered (with the exception of kanuka and kauri) not threatened and relatively common in the surrounding landscape (e.g. totara).

Although the SNA's on Site are of important ecological value, overall, given the fragmented nature of the vegetated habitats and the fact that the majority of native species encountered on Site are not threatened and relatively common in the surrounding landscape, the ecological value of the vegetation within the Project footprint is assessed as Low.

Wetlands

Due to the lack of species diversity and significant modification to the wetland vegetation community as a result of the existing agricultural land uses, the value of the wetlands within the Site is primarily in the ecosystem services they provide; such as the treatment and attenuation of inflows to the catchment and their buffering function to the adjoining waterways where present. Overall, the wetlands are assessed as being of Low - Moderate ecological value.

Bats

The survey results showed long-tailed bats (a species with a Threatened – Nationally Critical threat status) are commuting and occasionally foraging around habitat features within the Site. Bat activity levels were highest in the northernmost section of the Site; which may be associated with a large pine forest plantation to

² We land map attached as **Appendix 2**. The NPSFM does not provide guidance for differentiating between riparian vegetation and wetland vegetation. Mapping thin strips of drainage channels as 'natural inland wetland' on the bases of wetland indicator species isn't an appropriate use of the wetland delineation method. As a result, we have sought to discriminate between riparian vegetation and natural inland vegetation on the basis of the criteria below:

- Artificial drains or modified streams that contain a permanent watercourse with wet adapted vegetation primarily located on the banks are not considered to be natural wetlands. The vegetation present in these locations is considered to be riparian vegetation.
- Artificially modified areas (including channels or depression on the ground have been dug in paddocks, likely for water drainage purposes) that are subject to intermittent or ephemeral flow/pooling and dominated by wet adapted species are identified as induced wetlands. Induced wetlands are considered natural wetlands.

³ ABM map attached as **Appendix 3**.

the north of the Site. Bat activity levels were considerably lower in the rest of the Site. Overall, the survey overall found very low levels of activity throughout the Project footprint.

Throughout the Site, in the form of individual large exotic trees and shelterbelts there are several trees or patches of trees which have features such as loose bark, knothole cavities or epiphyte growth that could be used by long-tailed bats for roosting. As bioacoustic surveys only record activity through detecting ecolocation calls, we are not able to determine whether potential roost trees onsite are being used, at what frequency, or in what way (be it solitary, communal, night-time, or daytime roosting). However, the timing of calls detected can be indicative of roosting activity nearby (calls detected early evening and late morning as bat leave and/or return to roosts). Based on the presence of long-tailed bats and available roost habitats, there is a possibility for bat roosting to occur on the Site.

The Threatened – Nationally Critical threat status of long-tailed bats means this species has a Very-High ecological value; and based on the above findings and assumptions, the ecological value of the habitats on Site for long-tailed bats has been assessed as Moderate.

Herpetofauna

The lizard habitat value of the identified on the map attached as **Appendix 4**. It is likely that copper skinks are the only native lizard to be present on site. Taking into consideration the At Risk – Declining threat status of copper skinks, this species has a High ecological value.

Any copper skinks present in the area however are expected to be at very low densities and potentially below detectability limits due to predation by mammalian predators and the Site's long history of disturbance (including ongoing maintenance/modification of pastoral grazing and crop production land). For these reasons, the ecological value of habitats for native lizards on the Site has been assessed as Low.

Avifauna

The habitats available within the Site are unlikely to provide permanent habitat, or habitats of specific importance for any At Risk or Threatened avifauna. Overall, based on the available habitats and the low probability of At Risk or Threatened birds visiting the area, the avifauna value of the Site has been assessed as Low.

Freshwater

Freshwater values are variable across the Site, with the assessment undertaken based on the representativeness, rarity/distinctiveness, diversity/pattern, and ecological context of the evaluated watercourses and the ecological value of the species present within these habitats.

The central modified waterway within the Site is characterised by modified banks, poor water quality, the presence of pest fish species, limited riparian vegetation cover and a prevalence of exotic macrophyte abundance (i.e. a choking of the instream channel). These features all represent negligible or low values; with only the identified presence of longfin eels (a species with an At Risk – Declining threat status and as such a High ecological value for this species) lifting the overall ecological value of the central modified waterway to Moderate.

The Matahuru Stream by comparison supports multiple Threatened, At Risk or uncommon fauna species, has a high abundance and diversity of fish species, riparian cover, diverse aquatic habitats, hydrological variation and provides ecological linkages to Lake Waikare and the Waikato River. Following the EIANZ guidelines, the overall assessed ecological value of the Matahuru Stream is High.

Potential Project Effects on Ecological Values

A range of activities will be carried out on Site during the construction phase of the Project; including earthworks, the clearance of limited areas of vegetation (approximately 1,800m² in area across four locations in the central, western and eastern parts of the Site), constructing or upgrading vehicle access areas and

clearing the channel of the central modified waterway. However, no construction activities or solar farm infrastructure is proposed within the SNAs.

The potential effects on ecological values include:

- Vegetation loss
- Wetland habitat impact
- Bat mortality/injury from solar panel strike
- Bat mortality/injury from tree felling
- Bat habitat connectivity and foraging loss
- Bat roosting habitat loss
- Bat noise and light disturbance during construction phase
- Bat noise and light disturbance post construction
- Herpetofauna mortality/injury
- Herpetofauna habitat loss
- Herpetofauna disturbance during construction
- Avifauna mortality/injury from tree felling
- Avifauna habitat loss and degradation
- In-stream/channel works
- Loss of riparian vegetation
- Injury/mortality of native fish
- Sedimentation and runoff effects
- Change in impervious surfaces

Initial Assessment of Ecological Effects

Vegetation

Effects on terrestrial vegetation values are limited as the scale of the proposed non-pasture vegetation clearance is small and impacts mainly exotic species. While, as addressed in the sections below, planting is recommended to improve fauna values on Site, planting is not required to mitigate the effects of the proposed vegetation clearance.

To improve habitat connectivity and the overall ecological value of the Site, areas recommended for planting include within or adjacent to the two SNAs, the large kanuka and totara stand within the south-western edge of the Site and the north-western edge of the site where the highest levels of bat activity were detected.

The recommended planting for fauna will result in a positive impact on vegetation values on Site, consequently contributing to a Net Gain in terrestrial vegetation values on Site.

Wetlands

The Project design has specifically taken into account the presence of the natural wetlands within the Site, with no solar panel installation or ancillary activities proposed within these features. Consequently, direct impacts within the wetland extents identified on the Site are avoided. The design allows for water to flow off and under the solar panels and percolate into the soil, rather than being channelled into one area. This design means there is little to no changes in the hydrology of the Site and subsequently changes to the hydrology of the wetlands are avoided.

Temporary fencing around the wetlands is recommended during construction to avoid unintentional access and sedimentation, and permanent fencing to prevent stock entry (noting sheep will graze the Site once the project is operational) will help improve wetland health and the ecosystem service they provide. Establishing a planting buffer adjacent to wetlands will also minimise excess runoff and nutrient input.

Subject to the implementation of these recommendations, the potential effects on wetland habitat will be a Low magnitude of effect, resulting in an overall assessed level of ecological effect on wetland habitat impact of Very Low.

Bats

Where practicable, the Project design has sought to retain existing mature vegetation and avoid clearance. While the amount of vegetation clearance required on Site is limited, the four areas/stands of vegetation requiring clearance to accommodate the solar farm design has been identified as having potential as bat roost habitat⁴. Of the trees needing to be removed, the assessed roost potential is as follows; one is low value, ten are low – medium value, one is medium value, and is one high value. A tree fell protocol, in accordance with the Department of Conservation best practice standards, will therefore be implemented to manage the potential injury/mortality of long-tailed bats during tree clearance.

Planting is recommended to manage the loss of vegetation and the associated roost features and the commuting/foraging corridors (shelterbelt). While mitigation planting would ideally be of native species that are representative of the Meremere and Hapuakohe Ecological District, to reduce the time in which suitable roost habitats become available, faster growing large exotic trees such as blackwood, European oak, and poplars are recommended. Overall, the loss of habitat connectivity and foraging opportunities for bats on Site is expected to be minor when taking into consideration that the Site and surrounding landscape retains a relatively high level of connectedness, most potential roost features are avoided, and the land use change is minimal in the context of foraging and commuting opportunities.

The installation of artificial bat roost boxes is also recommended during the lag phase between removal of potential roost trees on Site and the growth and creation of roost features from planting of exotic trees⁵. In total 18 artificial roost boxes are proposed to be installed on Site, ideally in target areas of known bat activity or areas where bat activity is likely to occur; with all artificial roost boxes to be installed in such a way that protects them from predators (e.g. banding of trees or poles to prevent predator access).

Any lighting and noise disturbance associated with the construction will likely mainly impact bats during emergence/returning to roosts time. This is most likely going to be an issue during the winter months, when the time of the proposed works day overlaps with or is near to sunset and sunrise, and thus bat emergence/roosting behaviour. Therefore, no works should occur within 30 minutes of sunset and sunrise on Site. In addition, where practicable, a 10 – 20 m heavy machinery buffer should be implemented at all times in areas with higher levels of bat activity or higher value potential bat roosting habitats to minimise disturbance on potential roosting bats.

The specific details of all the recommended management measures for the project relating to bats will be documented in a Bat Management Plan (BMP). Subject to the implementation of the BMP, the ecological effects on bats have been assessed as Low; with the long-term ecological effect of the recommended planting to create a Net Gain.

In relation to operational impacts, a literature review has found no direct evidence of adverse effects from solar panels on bats. Notwithstanding this, research suggests that bats can mistake smooth vertical surfaces as flight paths; with bats observed colliding with these surfaces. We note the solar panels will be installed horizontally and the vertical structures proposed (e.g., the substation) are limited in the context of the Site and located in an area of little identified bat activity. We consider adverse effects arising from these concerns are unlikely.

Herpetofauna

To manage for the potential effects on copper skinks it is recommend a survey is carried out to confirm the presence of copper skinks within the Project footprint. If found to be present, a Lizard Management Plan (LMP) is to be prepared and implemented, involving the capture and translocation of copper skinks from site, the release site selection and protection, and enhancement and protection of lizard habitat to manage the effects of habitat loss. Undertaking pest animal control, both on Site and at any proposed lizard release site,

⁴ Roost potential map attached as **Appendix 5**.

⁵ A 5:1 artificial bat roost installation ratio for high-risk roost trees is recommended (i.e. 5 artificial roost boxes installed for every high roost potential tree/habitat cleared). A 3:1 artificial bat roost installation ratio is also recommended for the loss of medium bat risk roost trees, and a 1:1 artificial bat roost installation ratio recommended for loss of low – medium risk roost trees.

is also recommended as predation by pests such as rodents, mustelids, cats, and possums are a major threat to lizards.

Subject to the lizard survey and implementation of the LMP, if needed, the overall level of ecological effect on herpetofauna is assessed as Very Low.

Avifauna

Similar to the approach with bats, it is recommended that a tree fell protocol is adhered to during vegetation clearance. This protocol should require vegetation be surveyed prior to felling for nesting native birds. Vegetation found to contain native birds nesting should only be cleared once the chicks have fledged. Following the avifauna tree fell protocol, the potential effects on avifauna injury/mortality during construction will result in a level of ecological effect that is Very Low.

The removal of vegetation and modification of habitats on Site as a result project will have a Negligible magnitude of impact on avifauna (even without implementing management options). However, there is a potential to improve avifauna habitat values and increase habitat connectivity on Site via the proposed planting. Therefore, the level of ecological effect, post management, on avifauna habitat loss on Site is Very Low, with a potential for Net Gain in the long-term.

Freshwater

The Project design has specifically taken into account the presence of the various waterways within the Site, with no solar panel installation proposed within or across the beds/channels of these features.

The primary cause of potential effects on freshwater values from the Project however is through the sediment generation during earthworks, the modification and temporary in-channel sediment generation as a result of clearing the central modified waterway (where required – design and analysis pending), and the loss of aquatic habitat through any required instream works such as the installation of new/replacement culverts.

Best practise erosion and sediment control measures will be implemented in accordance with Waikato Regional Council's (WRC) Erosion and Sediment Control – Guidelines for Soil Disturbing Activities in order to minimise the potential for sediment loss from areas of earthworks into waterways.

Further, specific in-channel methods of capturing and settling sediment are also recommended to manage the temporary water quality effects from the mechanical clearance works along the central modified waterway. The salvage and relocation of native fish from within the sections of the waterway to be cleared is also proposed to avoid the injury and mortality of native fish from this activity. Management of these temporary effects will be carried out through the restoration and enhancement of the existing waterways to improve their ecological value when compare to baseline.

Where permanent physical modification to stream habitat is proposed, (for example, pending final design, the replacement or upgrade of culverts), it is recommended that mitigation is put in place at a ratio of 3:1 (i.e., for every 1m of modified linear stream habitat, 3m of existing stream habitat is enhanced) which involves an enhancement of hydrological, ecological and habitat heterogeneity.

Preliminary designs for the stormwater wetlands for the substation and energy storage facility have been prepared in accordance with WRC Stormwater Management Guideline (TR2020/07) in order to treat runoff from these impermeable surfaces prior to discharge into the central modified waterway; and subsequently the Matahuru Stream. In addition to attenuating flows back to pre-development rates to avoid hydraulic/scour effects, the wetlands' proposed banded bathymetric design will help to:

- Reduce water velocity promoting settlement of any remaining sediments.
- Provide natural organic materials which absorb organic and inorganic contaminates.
- Promote nitrification and denitrification resulting in removal of nitrogen.

- Increase organic bottom sediments that have high cation exchange rates for removal of metals.

In addition to the treatment methodologies discussed above, all catchpits within the substation platform are proposed to be installed with gross pollutant traps (e.g., Stormwater360's Enviropod filter) to prevent pollutants (leaves, debris, etc.) from reaching the constructed wetland downstream. In addition, to manage the risks from any accidental spillages, oil separators will be incorporated into the substation design, while the transformers will be surrounded by a bund capable of storing the full volume of the oil, allowing for a 10% contingency. This approach will ensure any contaminants are contained within the substation platform and will not pose a risk to the downstream receiving environment⁶.

Subject to the implementation of the recommended mitigation measures outlined above, the overall level of ecological effect on freshwater values is expected to be Low.

Ecological enhancement

As outlined above, the effects on ecological values from the Project, subject to the implementation of the recommended mitigation measures, has been assessed as having a Low level of ecological effect with the potential to have a Net Gain in the long-term. Additional to the recommended management there is potential for a Net Gain or enhancement of biodiversity/ecological values onsite due to the additional restoration and enhancement activities proposed by the client. The key ecological values on Site are centred around the freshwater and wetland features and the associated fauna habitat these provide. The clear priority for additional enhancement works will be the restoration and enhancement of these features and their habitat values. As such, the Project will include riparian, wetland, pond, and fauna habitat enhancement, including but not limited to fencing to exclude stock, pest plant control, planting, and maintenance including pest animal control additional to any required management of effects. Offsite enhancement and restoration opportunities are also being explored in conjunction or partnership with community, iwi or government initiatives, such as bush remnant enhancement opportunities.

Conclusion

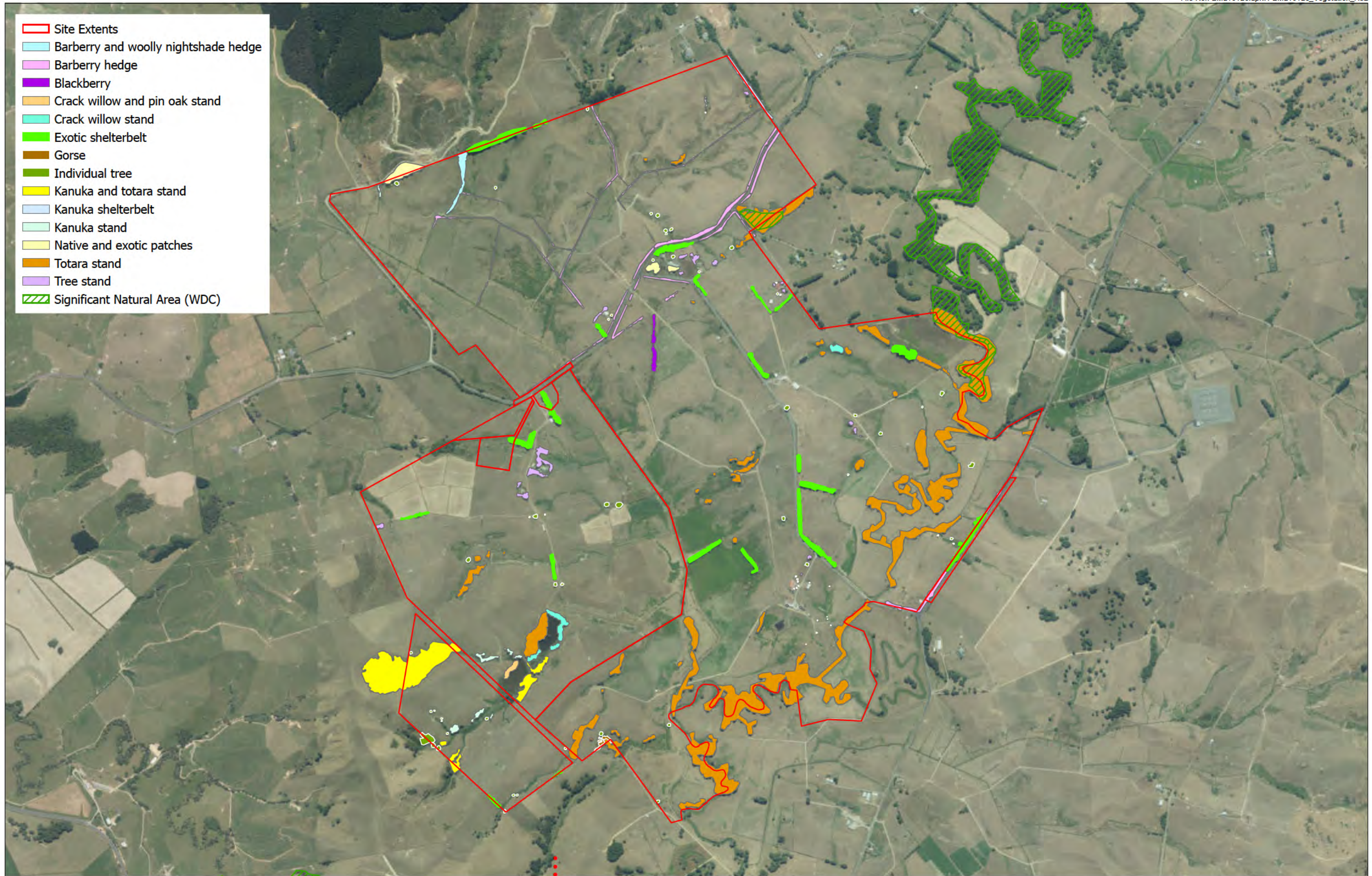
The various ecological values of the Site have been identified within this memo, with an assessment of the ecological effects as a result of the activities associated with the Waiterimu Solar Farm Project undertaken in accordance with EIANZ guidelines.

Overall, this initial analysis indicates that the effects on ecological values from the project, subject to the implementation of the recommended effects management, will be of a Low level of ecological effect; with the potential for some Net Gain or enhancement of biodiversity/ecological values.

In an RMA context this confirms that there are no significant adverse effects.

⁶ *Civil Servicing Report - Waiterimu Solar Farm, Lysaght, April 2022*

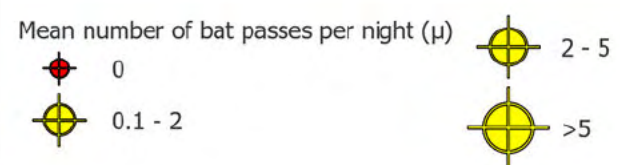
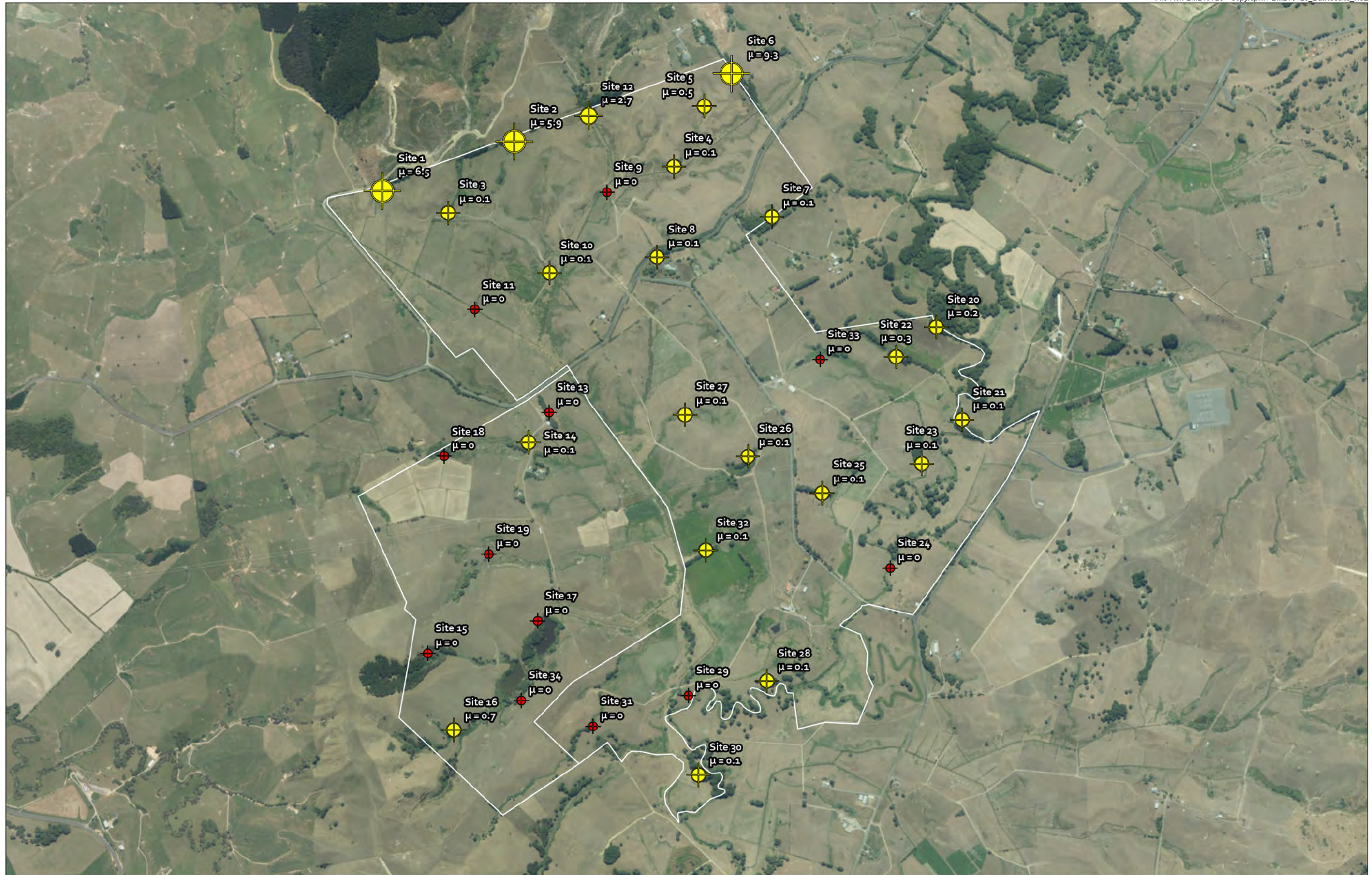
Appendix 1 – Site Vegetation Map



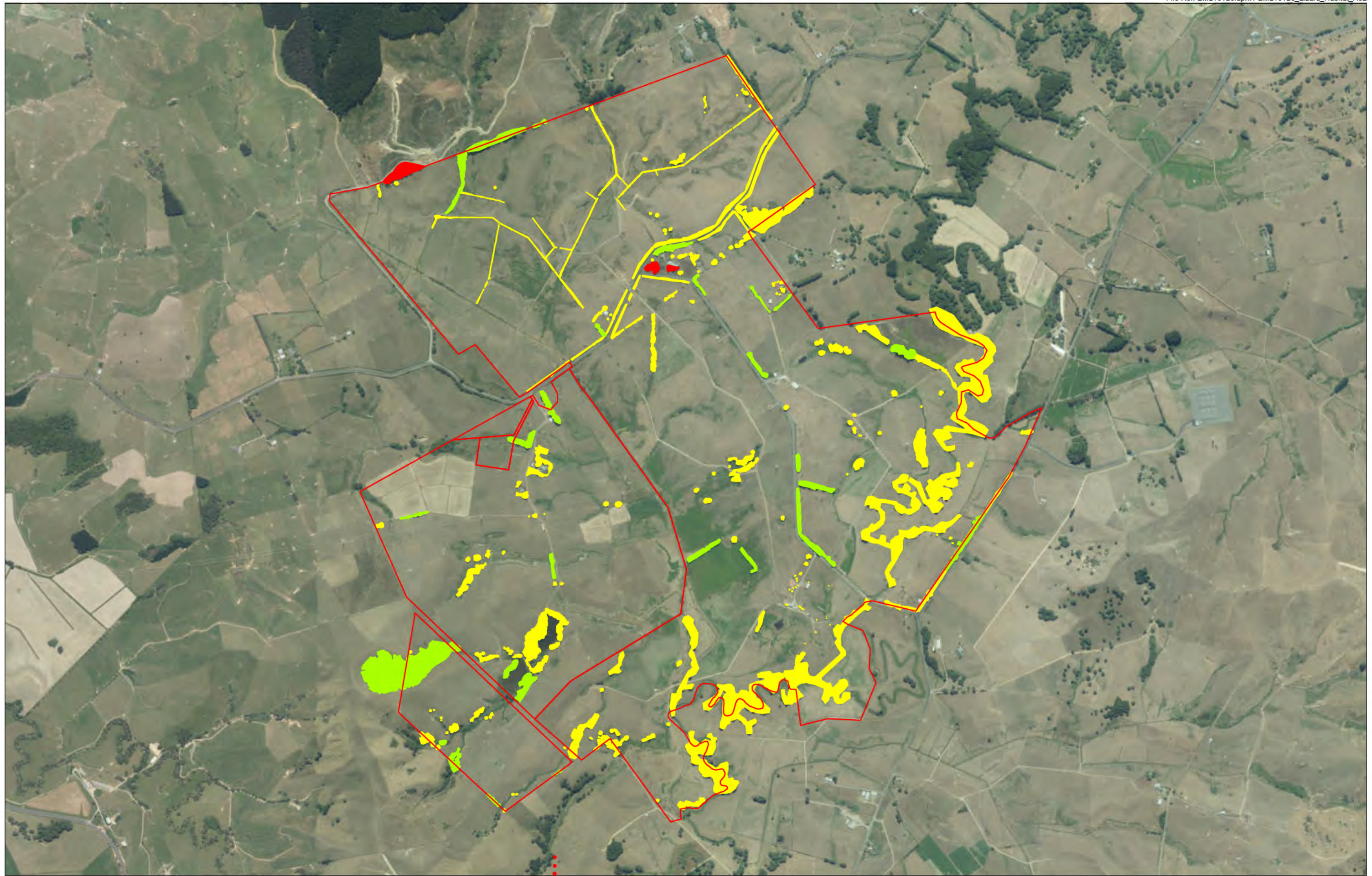
Appendix 2 – Site Wetland Map



Appendix 3 – Site ABM Map



Appendix 4 – Lizard Habitat Map



Appendix 5 – Site Bat Roost Potential Map

