APPENDIX 2

Partial species list of vascular plants in area which may be affected by construction of proposed wastewater treatment plant near Te Onepoto Bay, Porirua Harbour

* denotes adventive species.

Botanical Name	Common Name (or Group)
*Agrostis stolonifera	creeping bent
Alectryon excelsus	titoki
Apium australe	
Azolla rubra	azolla (fern)
*Bellis perennis	daisy
Blechnum sp. (B. capense agg., bog form)	(fern)
Callitriche stagnalis	starwort
Carex coriacea	(sedge)
C. flagellifera	(sedge)
C. lessoniana	(sedge)
C. virgata	(sedge)
Carmichaelia arborea var. (presently included in C. flagellisformis)	native broom
Cassinia leptophylla	tauhinu
Centella uniflora	
Coprosma areolate	
C. crassifolia	
C. propinqua	
C. propinqua X. C. robusta	
C. rhamnoides	
Cortaderia sp.	toe-toe
Cotula dioica subsp. monoica	
C. dispersa subsp. dispersa	
*Crataegus monogyna	hawthorn
Cyathea dealbata	silver tree fern
Cyathodes juniperina	mingimingi
Cyperus ustulatus	(sedge)
*Dactylis glomerata	cocksfoot
Geniostoma ligustrifolium	hangehange
Gnaphalium limosum	
Helichrysum aggregatum	
Hydrocotyle moschata	
Juncus australis	(rush)
J. gregiflorus	(rush)
Juncus maritimus var. australiensis	sea rush
Leptocarpus similis	oioi, jointed rush
Leptospermum scoparium	manuka
Lobelia anceps	shore lobelia
*Lotus pedunculatus	
Macropiper excelsum	kawakawa
Melicytus ramiflorus	mahoe
Metrosideros perforata	aka
Muehlenbeckia complexa	pohuehue
Olearia paniculata	golden akeake
O. solandri	
*Osteospermum moniliferum	

Paesia scaberula	hard fern
Pellaea rotundfolia	(fern)
Pennantia corymbosa	kaikomako
Phormium cookianum	mountain flax
Phymatodes diversifolium	climbing polypody (fern)
Plagianthus divaricatus	salt-marsh ribbonwood
*Plantago coronopus	buck's horn plantain
Poa laevis var. (P. caespitosa in Cheesemen, 1925)	silver tussock
Polystichum richardii	Richard's shield fern
Pteridium aquilinum var. esculentum	bracken fern
Puccinellia stricta var. suborbicularis	salt grass
Pyrrosia serpens	(fern)
*Ranunculus repens	
*Rubus fruticosus agg.	Blackberry
Salifornia australis	glasswort
Samolus repens	sea primrose
Scirpus cernuus	(sedge)
S. lacustris	(sedge)
S. nodosus	(sedge)
S. prolifer	(sedge)
Selliera radicans	
*Taraxacum officinale	dandelion
Typha orientalis	raupo
*Ulex europaeus	gorse

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ENVIRONMENTAL IMPACT ASSESSMENT and FEASIBILITY STUDY of ALTERNATIVE WASTEWATER TREATMENT PLANT SITES for the PORIRUA BASIN

Prepared for the

MAIN OUTFALL SEWER MANAGEMENT COMMITTEE

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2. TERRESTRIAL VEGETATION AND VASCULAR FLORA

2.1 General

The construction of a wastewater treatment plant at any of the alternative sites will involve considerable earthworks, and the present vegetation, not only of the treatment plant site itself, but also of any associated borrow or fill areas, will be destroyed. In order to ascertain if any plant communities (or species) of botanical interest are present, visits were made to each site in July 1976. Descriptions of the present vegetation, based on notes taken during these visits, are given below. Partial species lists, with emphasis on the native flora, are appended to this report.

2.2 Kaumanga No.2 and Kaumanga No. 3

The vegetation of the hills, coastal escarpment and shore platform in the vicinity of Kaumanga Point has been burned in the past, much of it repeatedly, particularly since European settlement. None of the original coastal forest and scrub communities likely to have once occupied the site survive today, although many of the native plant species which would have been present in them are still to be found, associated with adventive species, in the present pattern of communities. The predominant soils of the area (Titahi hill soils) are moderately fertile and will support fair quality pasture, but their low moisture retention, poor structure and compacted subsoil place a limit on productivity. The area has been farmed for many years and the vegetation, including that of the coastal escarpment and shore platform, subjected to regular grazing by both sheep and cattle.

Near the high water mark a few plants of glasswort (Salicornia australis) sea primrose (Samolus repens) and ice-plant (Disphyma australe)occur on the scattered rock outcrops, while similar situations further up the beach are occupied by stunted specimens of pohuehue (Muehlenbeckia complexa), Coprosma propinqua and Rhagodia triandra. The vegetation of the boulder beach is sparse and consists almost exclusively of the horned poppy (*Glaucium flavum), although plants of other species such as the shore sow-thistle (Sonchus littoralis), variegated thistle (*Silybum marianum), shore groundsel (Senecio lautus), and all-seed (*Polycarpon tetraphyllum) are present in a few places. At the rear of the boulder beach is a nearly continuous low vegetation consisting principally of three species of clover (*Medicago arabica, *Trifolium dubium and *T.subterraneum), chickweed (*Stellaria media), variegated thistle, Scotch thistle, (*Cirsium vulgare), sheep's sorrel (*Rumex acetosella), soft geranium (*Geranium molle) and various adventive grasses. Small depressed shrubs of Coprosma Propinqua are scattered throughout this community, which generally continues uninterrupted across the shore platform to the foot of the escarpment. However, along a short section of the platform, a slightly elevated ridge covered with bushes of Coprosma propinqua runs through the grassland, and this probably represents an earlier storm beach now some distance above the high tide mark as a result of land movements.

The vegetation of the coastal escarpment is variable. In some places there is a grassland (mainly of adventive species) with occasional shrubs of boxthorn (*Lycium ferocissimum), tauhinu (Cassinia leptophylla) and Coprosma propinqua; in other places a dense Coprosma propinqua shrubland, the bushes thickly interlaced with the lianes Clematis forsteri, Muehlenbeckia complexa and Tetragonia trigyna. A shrub-grassland intermediate between these two extremes is also present. Other species common in one or more of these communities include sheep's sorrel, shore convolvulus (Calystegia soldanella), shore groundsel, silver tussock (Poa laevis var.) soft geranium, Rhagodia triandra, the native grasses Notodanthonia racemosa and Dichelachne crinita, the sedge Scirpus nodosus, and the fern Polystichum richardii. Small areas of mountain flax (Phormium cookianum) occur on rock outcrops, and there is a stand of manuka (Leptospermum scoparium) - Coprosma propinqua shrubland on part of the escarpment facing Open Bay. Here also, adjacent to a small stream which emerges through the escarpment, grow a number of species not recorded elsewhere on the sites, including aka (Metrosideros perforata) kawakawa (Macropiper excelsum), puka (Griselinia lucida), rangiora (Brachyglottis repanda), karamu (Coprosma lucida) Craspedia uniflora va. maritima, Phymatodes diversifolium and Hebe stricta var. macroura.

Most of the rolling land behind the escarpment is covered in pasture, although in a few places this is reverting to scrub. Scattered plants to dense thickets of coprosmas (Coprosma propinqua and C. rhamnoides), tauhinu, and occasionally olearia (Olearia solandri) or juvenile kaikomaka (Pennantia corymbosa), are present where this is occurring. A few trees occur in the pasture land: a group of old karakas (Corynocarpus laevigatus) on the lower slopes near the stream, a single totara (Podocarpus totara) just below the crest of the spur leading to Kaumanga Point, and several pines on the edge of the escarpment overlooking Open Bay. Occasional seepage areas on the hillsides, and also the wetter areas along the floors of the valleys, are dominated by the sedge Cyperus ustulatus or two species of rush (Juncus australis and J.sarophorus). Variegated thistle forms conspicuous patches in a few places.

Summary

The vegetation of the area which may be affected by the construction of a wastewater treatment plant near Kaumanga Point has been burned, much of it repeatedly, and it has also been grazed by sheep and cattle for a considerable time. Today the principal cover is pasture, although on some hillsides and over parts of the coastal escarpment this has reverted, or is in the process of reverting, to a coastal scrub dominated by Coprosma propinqua, C. rhamnoides, tauhinu and manuka growing either alone or in combination.

The communities present are all types which are currently widespread along Wellington's western coastline, and are of no special interest botanically. No rare or endangered species of native plants have been recorded in the area which may be affected by the proposed works.

2.3 Onepoto

The vegetation in the vicinity of Te Onepoto Bay has been burned in the past, some of it repeatedly, and most of the native coastal plant communities which once would have occupied the site have been destroyed. The possible exceptions to this are those in areas of salt marsh along the shore. Adventive species dominate in most of the present communities, while native species, particularly sedges and rushes, are of local importance. The soils of the district (Paremata hill soils) are moderately fertile and will support fair quality pasture, but their low moisture retention, poor structure and compacted subsoil place a limit on productivity. Much of the site has been farmed for many years, and the vegetation subjected to regular grazing both by sheep and cattle.

Around the shore of Te Onepoto Bay is a narrow belt of salt marsh vegetation which consists of scattered plants to nearly continuous herbfield of sea primrose (Samolus repens), glasswort (Salicornia australis), salt grass (Puccinellia stricta var. suborbicularis) and the small sedge Scirpus cernuus growing from just below to just above the mean high water mark, and then a zone of rushland dominated by sea rush (Juncus maritimus var. australiensis) and jointed rush (Leptocarpus similis). Apium australe, Cotula dioica subsp. monoica, *Plantago coronopus, Samolus repens, Scirpus cernuus and Selliera radicans grow amongst the bases of the rushes, and in the occasional open places form a dense short turf. Often there are plants of the salt-marsh ribbonwood (Plagianthus divaricatus) growing behind the rush zone, and along the eastern shoreline in particular these are thickly interlaced with pohuehue (Meuhlenbeckia complexa).

At the head of the bay the salt marsh around the mount of the stream grades into a freshwater swamp, the transition being marked by a belt of tall Scirpus lacustris. Behind this, a community dominated by large tussocks of Carex coriacea and an occasional Cyperus ustulatus occupies most of the valley floor, being directly contiguous with a gorse shrubland on one side and with pasture on the other. Along the path of the stream, the margins of which are rather ill-defined, many rooted aquatic plants such as starwort (Callitriche stagnalis) and Scirpus prolifer grow in the slow flowing water.

Further inland, where the stream is more actively down-cutting and flows in a narrow, well-defined channel, the Carex coriacea community is replaced by one of Carex virgata, Cyperus ustulatus and Juncus gregiflorus growing alongside the stream and occasionally spreading across small terraces adjacent to it. Lobelia anceps and a form of Blechnum capense are among the species present on damp overhanging banks along the stream.

West of the bay, and for some distance inland along the western side of the valley at its head, the hillsides are covered, for the most part, by a dense shrubland of gorse (*Ulex europaeus). Another shrub, *Osteospermum moniliferum, grows as scattered plants among the gorse, and in some places forms pure stands. Occasional groups and single trees of mahoe (melicytus ramiflorus) are present also, particularly at lower

elevations in the valley, and beneath one such group are several plants of silver tree fern (Cyathea dealbata). A few small boggy clearings near the shore are occupied by rushes (Juncus australis), sedges (Carex flagellifera, C. lessoniana, Cyperus ustulatus and Scirpus prolifer) and adventive grasses, e.g. cocksfoot (*Dactylis glomerata), and there is one large area of shrub-grassland where the gorse is resprouting after a recent fire but has not yet had time to produce a continuous canopy. Adventive grasses dominate the ground layer in this area.

The shrubland is contiguous with the rushland community of the salt marsh along most of the western shoreline of the bay, but at one point a small area of raupo (Typha orientalis) swamp and bracken (Pteridium aquilinum var. esculentum) fernland has developed between them. Inland the shrubland gives way to pasture containing frequent clumps of a Carex sp. (?C. flagellifera) and, at higher elevations, of silver tussock (Poa laevis var.), while swampy areas in the gullies are dominated by sedges (Carex spp.) and rushes (Juncus spp.)

East of the bay, pasture covers the ridge crests and some slopes, and in places extends almost down to the shore. However, many of the steeper hillsides are occupied by shrubland, shrub-grassland or shrub-bracken fernland in which gorse, coprosmas (C.propinqua and C.rhamnoides), helichrysum (Helichrysum aggregatum), manuka (Leptospermum scoparium), tauhinu (Cassinia leptophylla), blackberry (*Rubus fruticosus agg.), hawthorn (*Crataegus monogyna) and a native broom (Carmichaelia arborea var.) are all important components of the shrub layer in one place or another. Occasional small plants of most of these species are also present in the adjacent pasture, along with scattered tangled masses of pohuehue (Muehlenbeckia complexa) and a few clumps of a Carex sp. and Scirpus nodosus.

A narrow belt of sedges (Carex flagellifera, C. virgata, Cyperus ustulatus) and rushes (Juncus australis) occurs along the eastern shoreline between the salt marsh and the other communities, reaching its greatest extent in swampy ground around the mouth of a small creek which flows into the sea on this side of the bay. The wet turf in this latter area includes such species as Centella uniflora, Cotula dispersa subsp. dispersa, Gnaphalium limosum and Hydrocotyle moschata.

A group of trees, including an old titako (Alectryon excelsus), a ngaio (Myoporum laetum), a mahoe, and several kaikomako (Pennantia corymbosa) and hawthorn, also occurs near the eastern shoreline. The shrubs Coprosma areolata, C. crassifolia, and Geniostoma ligustrifolium, and the ferns Pyrrosia serpens (epiphytic on the trees) and Pellaea rotundifolia, are among the other species present here.

Proceeding inland, this time on the eastern side of the valley at the head of the bay, pasture covers the hillsides except for a few places where Carex virgata, Cyperus ustulatus, Juncus gregiflorus and an occasional toetoe (Cortaderia sp.) occur on seepages. A few shrubs of gorse, coprosma (mainly C.rhamnoides) and tauhinu are present in the pasture, mostly on the lower slopes. With increasing altitude the shrubs decrease

in number and plants of silver tussock appear, and these latter become quite common on the rolling higher ground.

Summary

The vegetation of the area which may be affected by the construction of a wastewater treatment plant near Te Onepoto Bay has been burned, some of it probably several times. Parts of it have also been grazed by sheep and cattle for many years. Today the principal cover of the hillsides is either gorse shrubland or pasture, although on some steeper sites near the coast the latter is in the process of reverting to a shrubland of gorse, coprosmas, manuka, tauhinu, blackberry, hawthorn and a native broom growing either alone or in combination. Clumps of silver tussock are a feature of the pasture on higher ground. Swampy areas in gullies and along the valley floor are occuped by several different plant communities in which native sedges and rushes are dominant, while salt marshes occur along the shore of the bay and contain both saline herbfield and rushland plant communities.

The communities present on the hillsides are all types which are currently widespread around the Wellington coastline and are of no special interest botanically. The wetland communities, however, and in particular those of the salt marshes, are not so common. The only major areas of salt marsh remaining in the Wellington Region are situated at the Waikanae River estuary and in the Porirua Harbour. In the latter area they are now largely confined to the eastern end of the Pauatahanui Inlet, although they were once extensive elsewhere in the harbour. Reclamations for industrial land and road and rail links have been the principal cause of their destruction, with the result that Te Onepoto Bay is one of only two areas where examples of salt marsh vegetation remain in the southern arm of the harbour.

The fact that in the course of this study two species of native wetland plants (Cotula dispersa subsp. dispersa and Scirpus lacustris) were found at Te Onepoto Bay that have not previously been recorded from the Wellington coastal area (i.e. Turakirae Head to Paekakariki and within two kilometres of the sea) perhaps highlights the restricted extent and often unique nature of the wetland communities of the region. Located close to Porirua City and its schools, and with easy access, the Te Onepoto Bay wetlands also have some educational value.

No rare or endangered species of native plants have been recorded in the area which may be affected by the proposed works.

2.4 Mohuia Crescent

During its development most of the Elsdon area, which includes the site at Mohuia Crescent, was subjected to major earthworks. These stripped off all the vegetation. Most of the area has now been built on, but the Mohuia site is vacant and is occupied by a variety of plants which either have been deliberately sown or planted by man, or which have arrived as wind-blown seed or as seed transported through the agency of other animals, particularly birds.

Along the northern and western boundaries of the site are a row of trees - gums (*Eucalyptus leuxocylon), wattles (*Acacia melanoxylon) and a few pines. Tall grasses, occasional gorse and manuka bushes, and a few ornamental shrubs such as *Banksia ericifolia, grow between the trees. The central portion of the site is superficially a white clover-grassland, but young gorse, growing prostrate as the result of repeated mowing, is also an important component of this community in most places. One small area where the ground is considerably wetter has been left untended, and here the grass is longer and contains clumps of rushes (Juncus sp.). The remainder of the site is a wasteland of weeds and bare ground. Species present here include gorse, fennel (*Foeniculum vulgare), broom (*Cytisus scoparius) and plantain (*Plantago lanceolata).

Summary

The former vegetation of the proposed wastewater treatment plant site at Mohuia Crescent was totally destroyed by major earthworks in the area some years ago. Planted trees and shrubs, a sown white clover-grassland, and a wasteland plant community now occupy the area, and the flora is made up almost entirely of adventive species. The site is of no special interest botancially No rare or endagered spcies of native plants have been recorded in the area which may be affected by the proposed works.