REPORT

Assessment of Effects on the Environment Existing Sewer Outfall Discharges at Moa Point, Owhiro Bay and Karori Stream Mouth

Prepared for

WELLINGTON CITY COUNCIL

By

BECA STEVEN

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CONTENTS

2 DESCRIPTION OF DISCHARGES

2.1 PROPOSAL

The Wellington City Council wishes to apply for Coastal Permits to authorise the continuing discharge of sewage into Cook Strait from three outfalls on the south coast. During the next five years, the Council plans to construct sewage treatment plants to treat all of Wellington's sewage. When the sewage treatment plants at the south of golf course site (Moa Point) and South Karori Road (Western Treatment Plant) have been commissioned, the need for continuing discharge of milliscreened sewage at Moa Point and raw sewage at Karori Stream mouth will cease.

The discharge of raw sewage at the Owhiro Bay outfall will cease in approximately two years' time when the Island Bay pump station is commissioned. Sewage presently being discharged at Owhiro Bay will be pumped to the Moa Point milliscreening plant. Infrequent short term overflows will continue during periods of heavy rain. This is described in Section 4.2.3 of this report.

The waters of Wellington's south coast have been classified, as shown on Figure 1. The general classification out to a line between Tongue Point and Baring Head is SB (bathing quality). Significant sections of the shoreline have the higher SA (shell fishing) classification. Note that an SA classification applies at the Sirens Rocks (where the Owhiro Bay outfall discharges) and at Lavender Bay (the main city discharge).

The classification and the definition of the SA and SB standards is described in Section 3 of this report.

2.2 LOCATION OF OUTFALLS

The map references in terms of NZMS 260 are:

Moa Point (Lavender Bay)	R27.615 833
Owhiro Bay (eastern side)	R27.573 828
Karori Stream	R27.504 836

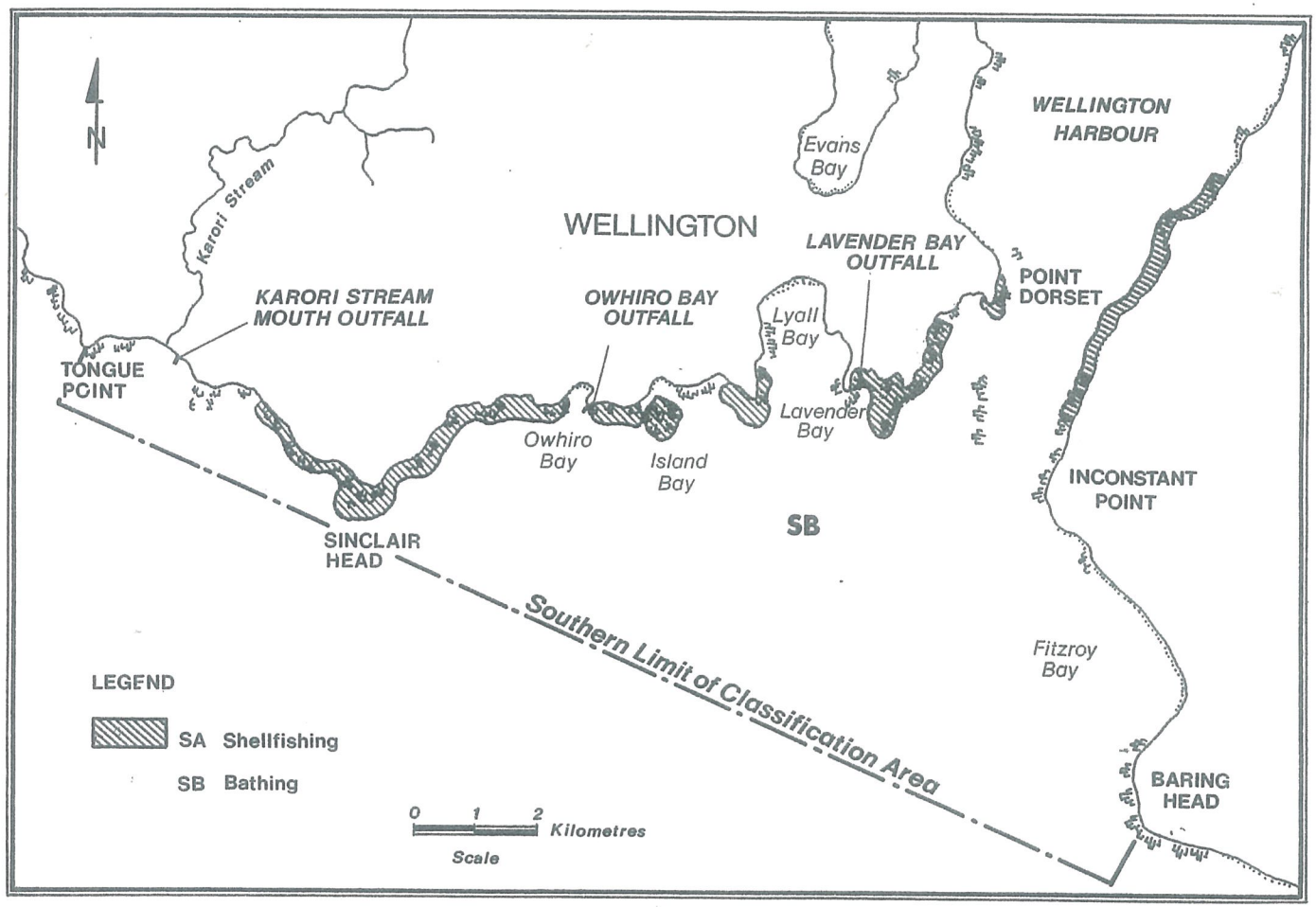


Figure 1: Indicative Water Classification South Coast Tribunal Order 23.2.93

2.3 FLOWS

2.3.1 MOA POINT

The present average dry weather flow at Moa Point is 670 ℓps. This will increase to some 755 ℓps when the Owhiro Bay outfall is closed and flow from the Brooklyn/Happy Valley/Island Bay catchments is pumped to Moa Point.

Depending on weather conditions, the daily discharge volume will vary from around 65,300 m^3 (dry weather) to 260,000 m^3 (wet weather). These figures allow for the inclusion of the Owhiro Bay discharge.

2.3.2 OWHIRO BAY

The present average dry weather flow being discharged at the Sirens Rocks on the eastern side of Owhiro Bay is some 85 ℓps.

The daily discharge volume varies from around 7,350 m^3 (dry weather) to 47,500 m^3 (wet weather).

2.3.3 KARORI STREAM MOUTH

The present average dry weather flow through the Karori outfall is some 50 ℓps, with a maximum wet weather discharge of some 200 ℓps. The daily discharge volume varies from around 4,300 m^3 (dry weather) to 17,280 m^3 (wet weather).

2.4 SEWAGE CHARACTERISTICS

2.4.1 MOA POINT

Sewage presently being discharged at Moa Point is first passed through fine screens (1 mm aperture) at the airport milliscreening facility. This screening reduces the BOD_5 and suspended solids concentrations from around 280/265 g/m^3 to 250/240 g/m^3 respectively. For an average dry weather flow of 755 ℓps (ie including the Owhiro Bay flow) this will amount to a daily BOD of 16,300 kg and a daily suspended solids of around 15,600 kg.

A more detailed set of data was collected in 1990 for Contract N° 1 "Process Design of Equipment"; Tender Document for Wellington Sewage Treatment Plant (October 1990) Wellington City Council.

The tests were made on milliscreened sewage adjacent to the flow measurement weir. Three types of laboratory investigations were:

Type I: Total and Soluble BOD_5, total and soluble COD, alkalinity, volatile and suspended solids. These tests were undertaken on a ten out of fourteen day sampling programme which included some weekend days.

Type II: Total oil and grease, floatable oil and grease, total Kjeldahl nitrogen, ammonia nitrogen, settleable solids, total phosphorus, sulphate, sulphide, phenols, and cyanide.

Type III: Metals analysis including arsenic, cadmium, chromium, copper, iron, lead, manganese, mercury, nickel, zinc. These tests were undertaken on frozen samples in batches.

The results of the analyses are shown below:

Type 1 Analysis 24 hour, Monday to Friday, Averaged.

Parameter	BOD	SOL BOD	COD	SOL COD	SS	VOL SS	ALKALNTY
Concentration, mg/ℓ	263	82	684	316	254	169	135
Mass Flow, kg/day	17,356	5,142	41,795	20,141	16,221	9,421	8,478

Type 2 Analysis 24 hour, Monday to Friday, Averaged.

Parameter	Grease		TKN	NH3-H	SET	Total P	S04=	S-	Phenols	CN-
	Total	Float								
Concentration, mg/ℓ	39	29	33	30	7	8	120	1.21	0.47	0.29
Mass Flow, kg/day	2,664	2,128	1,862	1,920	486	537	6,707	78.4	28.1	14.42

Type 3 Analysis 24 hour, Monday to Friday, Averaged.

Parameter	As	Cd	Cr	Cu	Fe	Pb	Mn	Hg	Ni	Zn
Concentration, mg/ℓ	<0.01-	<0.05	<0.1	0.20	1.20	<0.1	0.084	<0.001-	<0.1	0.19
Mass Flow, kg/day	-	-	-	12.9	70.8	-	4.7	-	-	11.2

pH and temperature vary diurnally and seasonally ranging between pH 6.5 to 7.6, with temperature between 12°C (July) to 21°C (February). For details see the 30 July 1992 applications.

2.4.2 OWHIRO BAY

The nature of the discharge has not been analysed, but can be assumed to be typical domestic sewage. It is believed to be similar to sewage currently being discharged at Karori Stream Mouth, which is also of almost 100% domestic origin. Data for the Karori outfall are available and a summary is included in the next section. It is likely that the Island Bay sewage is stronger than Karori sewage with BOD_5 and suspended solids concentrations of around 200 and 220 g/m^3 respectively. (This is because the Karori catchment has a persistent infiltration problem.)

The Owhiro Bay flow passes through a septic tank before discharge. The tank was built in the early 1900s and is too small to have a significant effect on the effluent quality, therefore the discharge is effectively untreated.

2.4.3 KARORI OUTFALL

Measurements have been carried out since February 1990. Concentrations have been lower than typical domestic sewage, probably due to infiltration. The sewage is discharged untreated at the coastline.

A summary of average results from WCC records is as follows:

Type 1 Analysis All hours, all weeks (81 readings)

Parameter	BOD	SOL BOD	COD	SOL COD	SS	VOL SS	ALKALNTY
Concentration, mg/ℓ	118	47	276	103	139	124	121
Mass Flow, kg/day	604	237	1,360	487	710	621	593

Type 2 Analysis

Parameter	Grease		TKN	NH3-N	SET	Total P	S04=	S-	Phenols	CN-
	TTL	Float								
Concentration, mg/ℓ	14	6	22	20	5	4	23	1.19	0.19	0.19
Mass Flow, kg/day	65	37	115	105	18	19	104	6.2	1.0	1.14

Type 3 Analysis

Parameter	As	Cd	Cr	Cu	Fe	Pb	Mn	Hg	Ni	Zn
Concentration, mg/ℓ	<0.001	0.002	0.018	0.11	0.41	0.028	0.065	0.001	0.08	0.15
Mass Flow, kg/day	-	0.01	0.08	0.49	1.93	0.13	0.30	0.01	0.36	0.70

Tidal movements within Cook Strait can reach 3 or 4 knots at some headlands and are generally in excess of 2 knots at the height of each tidal cycle. There is a net flow to the west beyond Sinclair Head (about 7 to 10 km per day at Karori Stream Mouth).

Overall, the waters of Cook Strait are almost always in a continuous state of agitation and mixing. From the viewpoint of effluent disposal, the net currents in Cook Strait are very favourable to Wellington.

Sea Water Quality: Because of the fast tidal currents, considerable water depth and the low natural level of nutrients, water quality in the Cook Strait area is very good.

However, the influence of a large urban environment has caused a marked degradation of water quality at points of sewage and some stormwater discharges affected by sewage overflows.

5.2 USES AND VALUES OF THE ENVIRONMENT

5.2.1 RECREATIONAL

The rugged south coastline and adjacent waters of Cook Strait have many values to the urban population. Passive uses, such as walking, observing nature and picnicking and active uses, such as windsurfing, swimming, recreational fishing and boating can be provided at a range of sites along the coast.

Discharge of sewage has been a long term feature at Moa Point, Owhiro Bay and Karori Stream mouth and the public avoids close contact with the contaminated areas. Away from those points, the major activities are similar but vary in intensity and kind depending on access points accessibility and distance, and exposure.

Moa Point

Shore-based activities include viewing the rugged coastline from vehicles, bikes and by walkers, with bird watching and elementary biological and nature studies conducted by individuals and groups, eg schools.

Wind surfing, surfing and swimming focus in the larger bays such as Lyall Bay and other points away from outfall sites.

Kuku: green lipped mussel (Perna canaliculus).

Kuku para: small species of mussel.

Pupu: a variety of gastropods including Cooks turban, (Cookia sulcata), dark rock shell (Haustrum haustorium), white rock shell (Thais orbita), cats eye (Turbo smaragdus), speckled top shell (Melagraphia aethiops) and Maurea species.

Mitimiti: limpets, including Cellana species.

Papaka: crabs, e.g. hard shell crab (Hemigrapsus edwardsi), purple rock crab (Leptograpsus variegatus), red rock crab (Plagusia capense) and paddle crab (Ovalipes punctatus).

Wheke: Octopus and squid.

Koura: Rock lobster.

Karengo: Porphyra columbina, an edible seaweed.

Karinga: sea lettuce - green algae such as Ulva species, and Letterstedtia species.

Pipi: a name applied to several bivalve shellfish, e.g. Paphis australis, in more sheltered harbour environments and Protothacca crassicosta, in a gravel habitat on a boulder shore.

Kotoretore: large sea anemones (Isocradactis magna).

5.3 MAORI CULTURAL VALUES

There are cultural sensitivities to parts of the coastline based on earlier occupation by people now displaced by dominant tribes entering and occupying the area some 170-180 years ago. An important pa - Rangitatau - existed on the heights west of Palmer Head and a small village site (with a midden of shell and food refuse) was on the shore of Tarakina Bay.

Te Atiawa and Ngati Toa respectively have standing in the Wellington region, as recognised Tangata Whenua, with the former being pre-eminent in the Wellington Harbour locality. In planning for the proposed sewage treatment plants, WCC had extensive discussions with Maori people, in addition to Tangata Whenua; being

- Te Runanganui O Taurahere O Te Whanganui A Tara, a grouping of other iwi,

- Te Runanganui O Te Upoko Te Ika, an incorporated Society, and

- The Wellington District Maori Council, who supported the view that traditional values can be associated with Moa Point, going back to pre-Treaty of Waitangi occupation by Ngati Kahungunu as one of the Ngati Ira or Ngatara, Ngati Mamoe and Ngai Tahu Iwi which moved through Te Whanganui a Tara in pre-European times. Those traditional values are recognised by Te Atiawa.

The main issue concerning Maori people relates to ensuring that good quality effluent is discharged clear of shoreline areas and important food sources, using currents and dispersion to prevent any pollution occurring.

5.4 MAORI CONSULTATION

The existing discharge consent applications were referred to Mr Morris Love of Raukura Consultants to undertake consultation with the Tangata Whenua.

Following on from his discussions with Tangata Whenua a letter was received from the Wellington Tenths Trust (copy included in Appendix 2). The letter has acknowledged that the application is "procedural in nature" to allow for continuance of the existing discharge at Moa Point until such time as the new treatment facility becomes operative. The Trust made a point that any such consent should be severely limited to ensure the timetable for the construction and implementation of the treatment process for Wellington City is built into any consent given, along with appropriate conditions to ensure that the present operations continue without further deterioration.

They further advise that it is appropriate to advertise the present applications for public submission and the Trust would reserve the right to make submission on such an application.

Mr Love advises that he doesn't expect other groups to write at the present time but some are likely to take advantage of the opportunity to put in a submission when it is advertised.

6 ASSESSMENT OF THE EFFECTS ON THE ENVIRONMENT

6.1 INTRODUCTION

A common factor applying to the present situation and in the future when treated sewage is discharged off-shore - or eliminated as in the case of Owhiro Bay - is the water of Cook Strait. It is characterised by fast tidal currents and rips, where dispersion of effluent is rapid and the waters provide a natural aeration system of high capacity.

These favourable disposal circumstances have helped to alleviate potential effects from the discharge of raw sewage. The flushing provided by tidal currents has limited the extent of the effects caused by the outfalls.

However on calm days significant pollution is clearly visible from each of the outfalls. This takes the form of discolouration and a surface slick, with the size of the effected area a function of the flow being discharged. For example, in certain weather conditions, the effect of the Moa Point outfall extends over much of the Lavendar Bay/Taraki Bay area. The visible effects of the other outfalls are proportionately much smaller.

6.2 WATER QUALITY PARAMETERS

In developing water quality criteria, it is necessary to consider the relationship between (1) various water quality parameters and (2) recreational activities and beneficial uses. These relationships are illustrated in Table 5.1. Solid circles indicate the beneficial use upon which a given parameter has a primary influence and open circles show secondary influences.

As examples, faecal coliform density or concentration, which is used as an indicator of microbiological quality, has a primary influence on both swimming and fishing (ie. collection of shellfish such as mussels). Floatables, grease, colour and suspended solids are parameters which relate to physical appearance and their primary influence is on both swimming and aesthetic enjoyment. The parameters which describe the chemical composition of the receiving waters have greatest influence on the marine ecosystem.

Table 6.1: RELATIONSHIP BETWEEN RECREATIONAL ACTIVITIES OR BENEFICIAL USES AND WATER QUALITY PARAMETERS FOR MOA POINT OUTFALL

Water Quality Parameter	Swimming	Fishing	Aesthetic Enjoyment	Marine Ecosystems
Faecal coliforms	•	•		
Floatables	•		•	
Grease	•		•	o
Colour	o		•	
Suspended solids	o		•	o
Odour	•		•	o
Nutrients			o	•
Dissolved oxygen				•
pH				•
Temperature				•
Salinity				•
Toxic substances		o		•

- • Parameter has a primary influence on recreational activity or beneficial use.
- o Parameter has a secondary influence on recreational activity or beneficial use.

The discharge of raw sewage through the existing outfalls affects all the above water quality parameters, to a greater or lesser extent. In the case of the Moa Point discharge the commissioning of 1 mm aperture milliscreening in September 1989 has largely corrected the problem of floatables, including the discharge of greaseballs. Fine screening has also stopped the discharge of neutral buoyancy items such as condoms and panty shields.

Heavy metal levels in marine biota were studied during investigations for the 1980 report "Moa Point Wastewater Treatment Plant and Outfall Study." The studies showed that there appears to be no significant accumulation of cobalt, vanadium and zinc in biota collected at Moa Point compared with biota at Sinclair head. On the other hand, chromium, iron and nickel concentrations seem to be consistently higher in organisms living near the outfall. The concentrations of other metals varied from animal to animal with no trends obvious from the limited data.

The report concluded that the results of the preliminary survey of heavy metals in marine biota indicates that the metal content of edible biota in the study area is below the maximum concentrations specified in the Food and Drug Regulations and therefore does not constitute a health risk to humans.

Nutrients in the effluent discharged causes localised enrichment and the growth of sea lettuce. This effect is balanced by the flushing and washing effect of the tide and waves. In sheltered water, such as the boat launching ramps of Taraki Bay, the enrichment effect is most noticeable.

6.3 MICROBIOLOGICAL WATER QUALITY

The Wellington Regional and Wellington City Councils routinely monitor water quality along the South Coast.

The following discussion and tables of faecal coliform concentrations in south coast waters follow a progression of data from Karori Stream eastwards to Palmer Head near the entrance to Wellington Harbour.

6.3.1 KARORI STREAM TO OWHIRO BAY

During 1984/85 WRC carried out water sampling at 15 stations between Karori Rock and the quarry west of Owhiro Bay. (Ref 11)

Faecal coliform median measurements were consistently low, except for stations centred on Karori Stream mouth, ie sites 1-4, where water quality exceeded the 200/100 ml f.c. SB classification, reaching 1200 f.c./100 ml at the stream's mouth. (See Figure 2 for location of sampling sites and a diagrammatic portrayal of faecal coliform concentrations, and Table 6.2 showing faecal coliforms and turbidity at the respective sites.)

When considering the graph on Figure 2 and the data given in Table 6.2 it is important to keep in mind the definition of microbiological quality given for the SB standard. Schedule Five in the Water and Soil Conservation Act refers to the median of five faecal coliform samples taken over not more than 30 days being less than 200 per 100 millilitres. This means that two of the samples can be over the 200 limit, i.e. outlier values are permitted and the 200 figure is not a maximum.

The following summary table shows relevant data from the eight sites shown in Figure 2.

Table 6.2: KARORI ROCK TO OWHIRO BAY

	FAECAL COLIFORMS / 100 ML					TURBIDITY
	5 Runs Nov-Dec 1984			2 Runs		
Site Nº:	Min	Med	Max	29.04.85	06.05.85	21.11.84
1	< 10	10	100	4800	30	6.2
2	410	1200	4200	-	-	2.3
3	310	1270	4000	488	16000	7.6
4	< 2	512	570	174	494	8.0
5	< 2	< 2	12	Nil	34	12.0
6	< 2	4	570	11	22	2.8
7	Nil	8	54	20	16	5.2
8	< 2	7	50	46	16	-

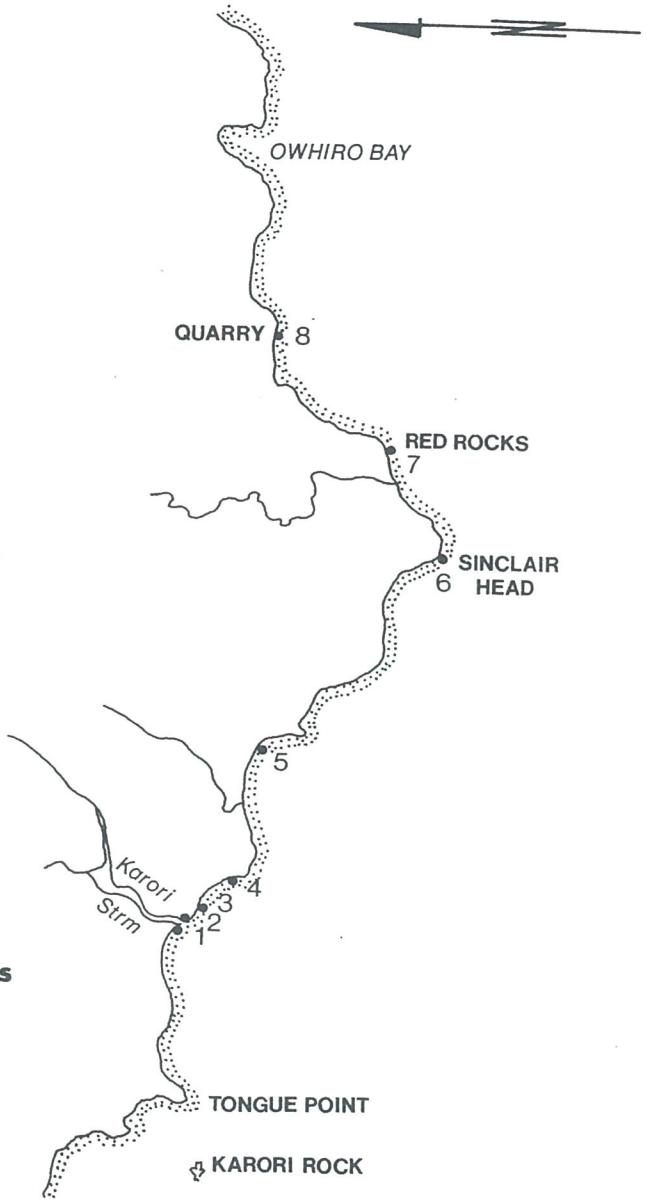
The zone of effect of the Karori sewer outfall discharge varied with wind and tide conditions, with a shoreline effect normally limited to 500 m west and 600 m east. Offshore at 500 m from the outfall f.c. ranged from 2-80/100 ml while at 2000 m the maximum recorded f.c. figure was 1/100 ml.

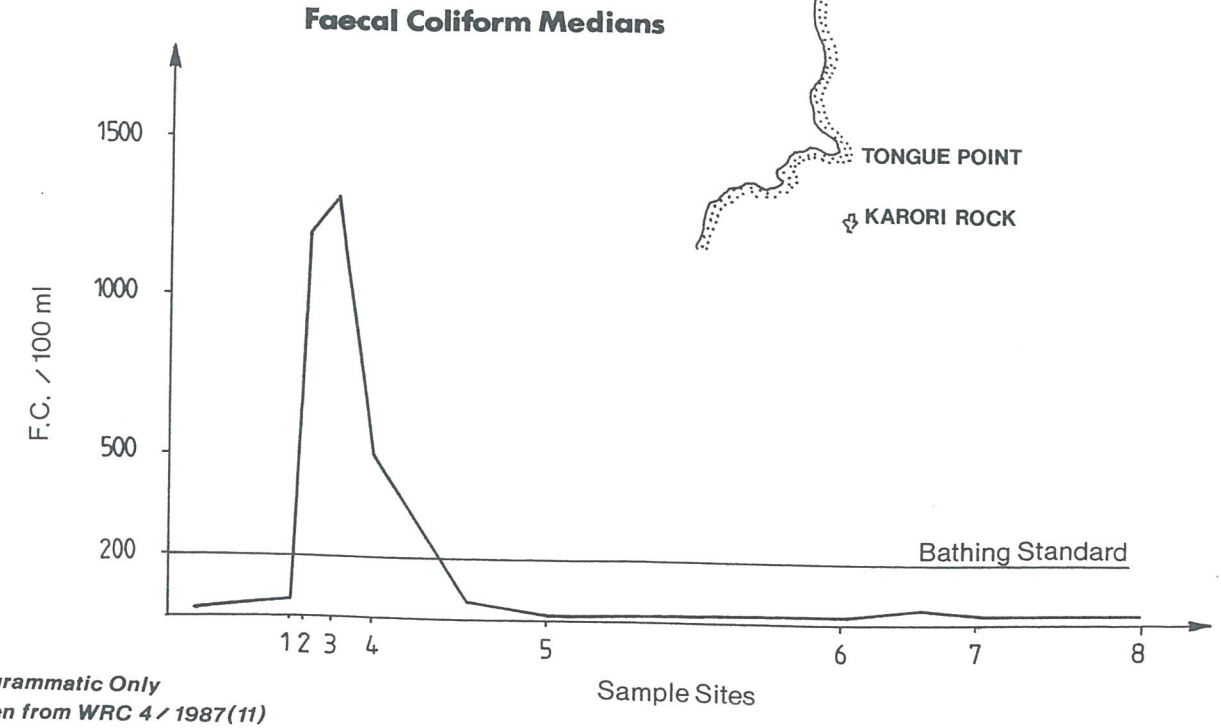
WRC reports annually, (see Faecal Coliforms in the Coastal Water of the Wellington Harbour, 1991" (12)) as part of its monitoring of the effects of consents of given for discharges. The most easterly station is at the quarry entrance west of Owhiro Bay. Hence there are no data available to make comparisons with the earlier data for Karori Stream nor to establish trends. However, it is likely that the water quality information obtained in 1984-85 is representative of current conditions.

South Coast Water Quality Survey Sampling Sites

- Karori – Owhiro Bay Shoreline

SITE Nº	LOCATION
1	100 m WEST OF KARORI OUTFALL
2	KARORI STREAM MOUTH
3	100m EAST OF KARORI OUTFALL
4	400m EAST OF KARORI OUTFALL
5	UN - NAMED BAY
6	SINCLAIR HEAD
7	RED ROCKS
8	QUARRY





Diagrammatic Only
Taken from WRC 4 / 1987 (11)
Figures 7 & 8

Figure 2

6.3.2 OWHIRO BAY EASTWARDS

Southcoast samples were taken during 1984/85 from 25 sites, extending from the quarry (N° 1) to Karaka Bay in the inner harbour. Fifteen sites extending eastwards to Gilbralta rock - close to Palmer Head are relevant to understanding water quality along the south coast in respect of sewage discharges. (11)

The summary table below shows the concentrations of faecal coliforms at the 15 sampling sites shown on Figure 3.

Table 6.3: OWHIRO BAY TO PALMER HEAD

Site Nº	FAECAL COLIFORMS / 100 ml						TURBIDITY	
	5 Runs Apr-July 1984			5 Runs Nov-Dec 1984			2 Runs	
	Min	Med	Max	Min	Med	Max		
1	6	22	405	< 2	4	442	4.3	2.5
2	300	1,400	20,500	2,540	3,430	34,000	8.7	7.0
3	20	188	850	16	42	1,120	7.2	2.4
4	10	70	300	4	6	244	2.9	2.8
5	10	125	340	8	34	980	5.1	5.4
6	26	87	358	< 2	25	720	9.0	8.1
7	4	27	1,030	< 2	2	111	5.1	2.4
8	1	26	118	< 2	2	346	8.5	6.1
9	4	23	520	2	10	870	6.0	3.3
10	< 2	15	275	< 2	4	401	5.4	15.0
11	< 2	30	2,500	10	24	704	4.6	2.5
12	30	1,605	19,200	16	30	306	5.2	3.2
13	20	279	1,970	2	10	345	7.2	2.4
14	9	63	930	1	4	1,080	2.8	1.6
15	4	21	472	Nil	10	156	3.7	1.3

The 1991 "Consents Investigation" (12) data contains 5 year summaries of water quality records from 1987 to 1991. The information in this more recent work is generally consistent with the intensive 1984/85 carried out to support the classification.

6.4 BIOLOGICAL CHANGES

6.4.1 MOA POINT

Introduction

Untreated sewage has been discharged into Lavender Bay for over 90 years through a mid-tide outfall. Since September 1989 the sewage has been milliscreened; hence, less floatables and large fat particles have been discharged with the effluent. The outfall is in an embayment between West Ledge and Hue Te Taka. This confines the initial mixing zone and ensures that adverse effects on biota are restricted to this area.

Intertidal Biology

Marine Consultants Ltd reported on inter-tidal flora and fauna in 1979(7). The findings were incorporated in the Moa Point Wastewater Treatment Plant Outfall Study; Beca-Caldwell, 1980(4).

Close to the outfall, flora and fauna were impoverished with sewage frequently entrapped to the west of the outfall. The few species of invertebrates and two algae present near the outfall were typical of depleted marine conditions, being tolerant of high concentrations of sewage.

Species frequency and density increased with distance from the outfall. At 700 m the intertidal fauna and flora associations were reasonably typical of the south Wellington coast which has a range of physical habitats and exposure. Superimposed on that range of habitats is a varying concentration of sewage. The field evidence indicated some direct influence from sewage on species presence and density, but a considerable number of common intertidal species occur, even relatively close to the outfall.

Since milliscreening took place (1989) the earlier visible evidence of stringy material, sewage derived litter and scum or oil has largely disappeared, although some surface oily film is still evident. Apart from that evidence, more distant marine communities and species around the shore appeared reasonably complete and healthy away from the outfall.

Marine Biology

A number of technical studies has been carried out to provide marine biological information relevant to discharging treated sewage off-shore from a proposed treatment plant at the south end of the aerodrome. Findings have been incorporated in a series of reports designed to cover all aspects of building and operating a sewage treatment plant and outfall at Moa Point (4, 7, 8, 9).

That background information was brought together in a Technical Report, N° 5, titled Environmental Values and Issues prepared to accompany the Wellington City Council's Environmental impact Statement Stage II, Wellington Sewage Treatment and Disposal, April 1990(10).

The following summaries are excerpts from that technical report.

Wellington City Corporation: Environmental Impact Assessment February 1976 (1)

Flora and Fauna: Lavender Bay

In the rocky areas towards the end of the bay into which the existing outfall discharges, the survey showed that the marine life was of a normal south coast variety with areas of "prolific" life on pinnacles - many species of seaweed, schools of tarakihi, blue moki and butterfly perch. Butterfish were also present along with other reef fish and crayfish. Extensive pollution was noted close to the outfall with poorer quality marine life present.

Aquatic Plants: Lyall Bay July 1975 (5)

Lyall Bay is an extremely important locality for marine algae (seaweeds) with early researchers in New Zealand carrying out comprehensive studies of the area leading to Lyall Bay being the type locality for at least 6 species. There are also a number of rare species found in Lyall Bay but no survey has been carried out in recent years to determine the effect of sewage from Lavender Bay or of the 1973 extension of the airport and whether any of these rare species are present in the proposed construction area to the south of it.

Benthic Communities - Lavender Bay (6)

A series of dives was carried out in 1975 in Lavender Bay to sample the benthic communities on the rock/boulder margins of the bay and the sandy, middle bay.

The conclusion reached from this series of dives was that the biota in-shore in the bay between Hue te Take Peninsula and West Ledge showed all the common symptoms of having been subject to quite heavy and prolonged pollution. That obvious conclusion was however, balanced by observations which showed a high degree of adaptability and tolerance to pollution by many faunal and floral species, albeit there were some shifts in species presence, size and numbers depending on their individual ability to survive in a deteriorated environment. Despite the long period of sewage discharge, the degree and extent of physical deterioration to bottom sediments and rocky habitats was surprisingly low, especially considering the relatively enclosed nature of the bay not having exposure to constant, sweeping currents.

Biologically, the associations in Lavender Bay are capable of quite rapid natural regeneration to return to the normal south coast situations when the present sewage field is removed.

Vertical Transects on Rock Reefs - Lavender Bay

Nine vertical transect lines were studied in 1979 up vertical rock faces around the bay from West Ledge to Hue te Take Peninsula; transect depths ranged from 3 m to 14 m; average depth around 5.5 m (7).

A depth related species list of algae was prepared and some changes in "normal" distribution were observed which could possibly be related to proximity to sewage discharge. A range of site factors affect species distribution (number and productivity) and the provisional base-line description is not considered to represent a complete scientific treatise.

The data are sufficiently comprehensive to indicate that outside the influence of the sewage field, the rock ledges of West Ledge and Hue te Take Peninsula are ecologically similar to comparable sites along the south coast to the west; eg Karori Stream locality; see Technical Report 5 Oceanographic; Treatment and Disposal of Wellington's Sewage: Wellington City Council, March 1988 (3) (5).

No rare species were identified; a few specialised algae which occurred sporadically at the furthest off-shore and deeper localities were of limited occurrence and thus "rare" in Lavender Bay, but they are common elsewhere along the coast, eg Durvillaea. Sewage contamination effects were thought to have affected that species' distribution.

Lavender Bay Conclusion

Some major faunal and floral changes observed can be related to the high concentration of sewage. Within some 120 m of the outfall there is low diversity of species but a relatively high abundance of species that can tolerate pollution. A small abiotic zone is inferred within about 50 m of the outfall, surprisingly small considering the embayed nature of Lavender Bay. One vertical transect was sampled where biotic changes can be related with some confidence to sewage presence. A few algal and epifaunal species; eg Macrocystis (seaweed) and Scutus (polychaeta), appear to be affected.

The effects of the outfall on macro-marine life are indetectable beyond a distance of 600-800 m from the outfall. The wide range of species making up the biota in Lavender Bay - largely typical of south coast embayments and rocky areas - which exist now outside the contaminated area will ensure rapid recovery to a "normal" stage when the source of effluent is removed from the bay.

6.4.2 KARORI STREAM MOUTH

Introduction

Untreated sewage has been discharged at the inter-tidal area at the mouth of the Karori stream for 55 years. The site is on the south coast, half way between Wellington Harbour entrance and Cape Terawhiti. The coastline is exposed, subject to storms and strong tidal currents.

Studies And Summary Results

In 1987 the New Zealand Oceanographic Institute was commissioned to investigate outfall options for Wellington at Karori Stream mouth. The studies comprised bathometry, sea bed, seismic, current flows and an initial survey of benthic biology. (Karori Stream Waste Water Outfall Study; Phase 1 Oceanographic and Associated Studies, 1987 (2-5)).

Results of tidal current studies indicated quite high tidal flow rates, increasing with distance off-shore; eg maxima of 45 cm/s 500 m offshore - 15 m depth - and 63 cm/s 750 m offshore - 18 m depth. Currents were found to be predominantly tidal, being strongly long-shore with ebb tides flowing westwards having a stronger influence.

Apart from a local embayment of water near-shore, there is a very positive current flow mixing coastal waters and diluting rapidly any sewage discharged.

Seventeen sites were sampled to investigate biological communities in habitat zones differentiated by substrate type and depth, extending for 2 kilometres along the shore and 1.5 kilometres out to a depth of 25 m.

Medium Sand Habitat In Shallow Water

This substrate is continually moved by wave action, even on relatively calm days. This causes an extremely hostile habitat for most species and the only organisms found were hermit crabs in various gastropod shells, and mantis shrimps, Heterosquilla armata. No algae were recorded in this habitat. It is not possible to determine the effect of sewage discharge on the very limited fauna present.

Pebble/Gravel Habitat, 8 to 25 M deep

Only fast growing, adaptable species are able to colonise the boulder surface, and the biological communities would probably change seasonally, depending on spores and larvae available to colonise storm scoured surfaces. Most pebbles have a covering of calcareous algal "paint" and those which have been stable for some months support a distinctive algae community dominated by a very large, broad bladed Gigartina species and several other broad-bladed red algae.

Animals were common in the relative shelter under rocks and were dominated by chitons and brittle stars. The larger pebbles supported small specimens of the ball sponges and colonies of bryozoans. The only mobile invertebrates recorded on the sediment surface were starfish. Wandering sea anemones were common on the algal fronds and buried in the gravel were molluscs. Fish were not abundant; the only species seen were blue cod and common triplefins.

Rock and Reef Habitat

The reefs and rocky areas support the most diverse biological communities within the study area. The communities are dominated by particularly lush forests of seaweeds and kelps.

The animals in this habitat include a variety of sessile as well as mobile species. The dominant sessile species included sponges, anemones and acidiens.

The dominant mobile animals included rock lobster, crabs, paua, chitons, starfish and kina.

A variety of fish live in this habitat, the most conspicuous being blue cod, common triplefin, marblefish, spotty, butterfish, banded wrasse, scarlet wrasse, blue moki, and oblique swimming blennies.

Deep (> 25 M) Current Scoured Gravel Habitat

This substrate is continually moved by tidal currents and megaripples up to 50 cm high are formed, with wavelengths of approximately 1 m. The gravel is coarse, rounded, and polished from continual abrasion and as such appears unable to be colonised by animals. The occasional larger boulders had small colonies of catenicelled bryozoans. The only fish seen were juvenile blue cod.

Karori Stream Mouth Conclusion

The exposed coastal locality of the discharge point provides a naturally robust marine environment whereby a lower degree of sensitivity to sewage can be expected compared with discharge into an enclosed bay; Lavender Bay. In addition, the diluting effect of the adjacent Karori Stream flow has a mitigating effect.

Because of the strong tidal currents, open nature of the coastline and the effect of stream flows combining with sewage flows, the overall effect on the biology is reduced, and masked, especially considering that the near-shore habitats are largely inimicable to the main flora and fauna species which can be used as indicator species to show adverse effects.

6.4.3 OWHIRO BAY

In the absence of any biological studies showing sewage effects, as influencing species present and density, it is possible only to make assumptions based on evidence at the Moa Point discharge and in Lavender Bay.

Owhiro Bay is polluted and has been for many years, with the incidence of sewage loading increasing as more urban development spreads over the contributing catchments. The presence of floatable litter is more evident to observers than the actual effects of pollution, apart from an oily sheen and scum seen during calm periods.

The South Eastern News of 13 April 1993 reports "The bay is exposed to southerly storms. Periodically sewage derived litter together with seaweed accumulates along the shore. WCC has a programme of collecting the flotsam on a weekly basis; much rubbish is caught up in a sand/seaweed matrix".

The inner bay's condition can be expected to be similar to that at the Moa Point discharge; ie for approximately 50 m around the point where sewage enters Owhiro Bay a near abiotic zone will be present, varying in size depending on tide, wind and flows from the Happy Valley Stream.

Natural dispersion and mixing of sewage laden water with the active movement often turbulent Cook Strait waters minimises the zone of influence.

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APPENDIX 2

WELLINGTON TENTHS TRUST

Address all correspondence to:

THE SECRETARY
WELLINGTON TENTHS TRUST
PO Box 913
WELLINGTON
Phone 495 7900/Fax 472 3593

1 September, 1993

Mr Peter Marks
Cityworks
Wellington City Council
PO Box 2199
WELLINGTON

Tena koe Peter

Resource Consents - Applications for Consents for the Existing Use Situation for the disposal of milliscreened raw sewage at Moa Point.

Consultation with Tangata Whenua

The Wellington Tenths Trust and a meeting of beneficial owners have considered this situation in general terms only. The meeting would reiterate the position that our people have consistently held both at Te Upoko o Te Ika (Wellington Region) and in Taranaki with respect to the discharge of sewage to water and in this case to te Moana o Raukawa (Cook Strait). It is acknowledged that this application is procedural in nature, to provide the proper consent situation for the continuance of the existing facility at Moa Point until such time as the new treatment facility becomes operative.

We recognise that point, but would require that any such consent is severely limited to ensure that the timetable for the construction and implementation of the treatment process for Wellington City, is built in to any consent along with appropriate conditions to ensure that the present operations continue without any further deterioration.

Te Atiawa/Taranaki people as represented by the Wellington Tenths Trust, would urge Council to reconsider the proposal to site the treatment works in Karori Stream valley area (with certain provisos as to the site). Any scheme anywhere in Wellington would have to meet certain minimum standards, given that any discharge to the sea, is already a compromise for our people.

The Wellington Tenths Trust are prepared to report to Council on the likely and potential environmental and cultural effects of significance to tangata whenua of proposals for treatment and discharge of sewage at both Moa Point and Karori Valley. We would be happy to discuss a brief for such a piece of work which we consider is essential for progressing this matter. We do consider such a report is vital to assist Council in its decision making process, as well as clarifying matters regarding sites of significance to tangata whenua in relation to the Karori Valley Scheme.

In relation to the application for resource consents, for the continuation of the present discharge at Moa Point, we consider that it is appropriate to advertise these for public submission. The Trust reserves the right to make submission on such an application. We would need to assure ourselves that any consent granted would provide the correct incentives for the best practicable solution to the long drawn out situation at Moa point.

We would ask to be kept informed of progress and that our proposal for a detailed report on matters of resource management significance to tangata whenua in regard to the treatment and disposal of Wellington Sewage be carefully considered.

Dr Ngatata Love

Chairperson,
Wellington Tenths Trust