SUMMARY

RESULTS OF INVESTIGATIONS FOR

MOA POINT INTERIM CONSENT APPLICATION

Prepared for

Wellington City Council

Prepared by

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1 INTRODUCTION

1.1 The Existing Consent

Wellington City Council has a discharge consent for the Moa Point long outfall which expires in year 2008 and which authorises the Council:

- to continuously discharge disinfected secondary treated effluent
- from a submarine outfall located 1800 metres off shore, south of Lyall Bay (refer Appendix A)
- at an average rate of 3,300m3 per hour (nominally 900 litres per second) up to a maximum rate of 14,500m3 per hour (nominally 4000 litres per second).

This consent is subject to a number of conditions, including water quality standards that must be met.

1.2 The Consent – WGN04203 [23309]

The Moa Point wastewater treatment plant can receive and treat the wastewater flows piped through the network under almost all conditions. No change has been sought to the existing consent.

However there are infrequent events when the peak wet weather flows arriving at the Plant can exceed for short periods the secondary treatment capacity of 3,000 litres per second. This has been recorded on 7 occasions during the past 4 years with an average duration of 4 hours and 13 minutes (i.e. the actual duration of the events ranging from 45 seconds to 10 hours and 18 minutes).

When this happens all wastewater arriving at the treatment plant is milliscreened. However the volume of wastewater in excess of 3000 litres per second bypasses the disinfected secondary treatment process. Therefore the discharge from the long outfall during a bypass event is a mixture of milliscreened and disinfected secondary treated effluent.

The research undertaken indicates that the mixed discharge complies with the conditions on the existing consent. However the existing consent for the long outfall provides only for the discharge of disinfected secondary treated effluent.

An additional consent WGN 040203 [23309] was granted for a coastal permit to infrequently discharge up to 4,000 litres per second of a mixture of milliscreened and disinfected secondary treated effluent from the Moa Point wastewater treatment plant to Cook Strait via the existing long outfall. The consent has the same expiry date as the existing consent (i.e. 2008). By this time a comprehensive review (currently underway) of the performance of the sewerage network will have been completed and new consents will be sought as appropriate.

1.3 Operation of the Moa Point Wastewater Treatment plant

The maximum capacity of the Moa Point pump station (which lifts the wastewater up to the treatment plant) is 4000 litres per second.

The maximum capacity of the primary treatment process (milliscreening and grit removal) at Moa Point treatment plant is 4000 litres per second. However the maximum capacity of the secondary treatment process (including UV disinfection) is 3000 litres per second.

The operation of any sewerage system typically involves a substantial difference between dry weather flows and wet weather flows and this is acknowledged in industry design standards.

At the Moa Point wastewater treatment plant, the average dry weather flow (ADWF) is of the order of 730 litres per second. In contrast the highest recorded peak wet weather flow arriving at the wastewater treatment plant is 3800 litres per second.

During some of the extreme wet weather events the secondary treatment capacity of the plant is exceeded. During these periods all the wastewater arriving at the plant is milliscreened and the grit removed. Most of the wastewater then receives disinfected secondary treatment. However any excess flow over 3000 litres /second bypasses the secondary treatment process and is then mixed with the disinfected secondary treated effluent and discharged through the long outfall.

The maximum volume of wastewater arriving at the Moa Point treatment plant does not exceed 4000 litres per second because of a weir built into the main sewer pipe. The greatest volume received to date is 3800 litres/second. Therefore the "worst case" bypass scenario would be a mixed discharge of 1 part partially treated effluent to 3 parts fully treated disinfected effluent.

These extreme wet weather bypass events are:

- infrequent (i.e. they have been recorded on 7 occasions over the past 4 years),
- of short duration, and
- comprise a small proportion of the total daily discharge from the outfall (i.e. the maximum volume of mixed effluent discharged to date was 6.6% of the daily discharge from the long outfall).

1.4 Background

Design Capacity of Moa Point Treatment Plant

The design capacity of the Moa Point Treatment Plant was based on flow projections contained in the 1988 and 1990 environmental impact statements. AnglianWater International designed the treatment plant to provide secondary treatment and UV disinfection for a nominal flow of 3,000 litres per second of wastewater, with provision for future augmentation of the secondary treatment and UV process in the event that wet weather flows increased.

The 3000 litres per second of wastewater approximated the capacity of the then existing sewer main (Kilbirnie Interceptor) conveying wastewater to Moa Point. At that stage there were no plans to increase interceptor capacity in Kilbirnie (although this has since been done as noted below). The 3000 litres per second design flow was equivalent to approximately 4 times the predicted (25 year horizon) ADWF. This provided more treatment capacity than the industry standard (2.5 to 3 times the ADWF) generally used for the design of wastewater treatment plants.

The peak wet weather flows arriving at the Moa Point treatment plant are a function of

- the production of wastewater (domestic and tradewaste)
- the amount of stormwater entering the system
- the capacity of the system to deliver these flows to the treatment plant.

Sewage Pollution Elimination Project

The Wellington City sewerage network is subject to ongoing investigations, maintenance and improvements. This programme was formalised in 1993 by way of Council's Sewage Pollution Elimination Project. The project runs to 2008 and involves a programme of works, investigations and monitoring activities aimed at eliminating sewage pollution from the harbour, coastal waters and streams of Wellington City. The priorities and the timetable set out in the project are driven among other things by the requirements of the 12 sewage-contaminated stormwater discharge consents granted to Council in 1993.

2 MITIGATION

There are two dimensions to the sewage pollution elimination project as follows:

- Reduce inflow and infiltration of stormwater to the sewerage system by replacing leaky pipes and fittings and progressively eliminating cross-connections between the stormwater and sewerage systems; and

- Prevent leaks and overflow out of the sewerage system into stormwater and hence into near shore waters in the city and the south coast. This work includes grouting, upsizing under-capacity pipes, pump station overflow prevention, and sealing off overflows between sewerage and stormwater networks.

While the work undertaken to eliminate stormwater inflow to the sewerage system reduces flows within the sewerage network, the work preventing leaks and overflows out of the sewerage system has the effect of increasing flows within the network.

Initially it was anticipated that works to reduce the inflow/infiltration of stormwater into the sewerage system would free capacity in the network and that this would accommodate the increased flows resulting from the works to prevent leaks and overflows out from the sewerage system.

It is now apparent that the combined effect of these initiatives has been:

- an overall increase in the volume of wastewater treated at Moa Point,
- some wet weather flows which exceed the 3000 litres per second capacity of the disinfected secondary treatment process,
- a significant improvement in water quality both along the south coast and within the harbour.

Work on the Kilbirnie Interceptor provides an illustration of the complexity of the issues. Prior to 1999, the dual Kilbirnie Interceptor (thought to have a capacity of about 2,800 litres per second) had acted as a "choke" on flow to Moa Point. This had caused backup and wastewater overflows to stormwater drains at several locations as well as discharge of raw sewage into the sea at Owhiro Bay. The Kilbirnie Interceptor was triplicated in 1999 (capacity now nominally 4500 litres per second). It seems likely that this has been a significant factor in the infrequent, higher than anticipated peak wet weather flows arriving at Moa Point.

Considering the overall result to date of the implementation of the Sewage Pollution Elimination Project there has been a substantial reduction in the overflow of raw sewage to near shore waters. However this has also resulted in infrequent and low volume discharges from the long outfall of milliscreened sewage effluent mixed with disinfected secondary treated effluent.

3 ALTERNATIVES

A number of alternatives to bypassing the secondary treatment process at Moa Point wastewater treatment plant during extreme wet weather conditions are being investigated.

These include increasing the treatment capacity of the plant and/or increasing storage capacity in the system (i.e. modifying the network to better utilise existing storage capacity, constructing additional storage capacity at various locations) and so forth.

Works undertaken in one part of the system have the potential to create problems in another part of the system. Environmental and cultural issues and significant cost benefit trade-offs are involved with the various options. The investigations under way include developing a hydrological and an hydraulic model of the network to better understand the effects of specific works on the overall system. It is likely that the optimum strategy will be a combination of measures.

As noted previously the proposed expiry date of the consent is 2008 to coincide with the date that the existing Moa Point discharge consent comes up for renewal. At that time new consents will be sought as appropriate. Meanwhile Council has the opportunity to address the related wastewater and stormwater management problems in an integrated and holistic manner.

4 QUALITY OF THE MIXED EFFLUENT

The indicators of water quality relevant to this application are Biochemical Oxygen Demand, Total Suspended Solids and Faecal Coliforms. The existing consent for the long outfall includes conditions which set standards for these characteristics for both 90 day geometric mean and 10% exceedance values.

These characteristics of the mixed effluent discharged under bypass conditions cannot be directly measured. There are no sampling points downstream of the location where the disinfected secondary treated effluent and milliscreened bypass effluent are combined for discharge through the long outfall.

However, the characteristics of a mixture of milliscreened effluent with disinfected secondary treated effluent under the worst case scenario (i.e. one part milliscreened to three parts disinfected secondary treated) can be estimated using the following procedure:

- The disinfected secondary treated effluent from Moa Point is sampled during a bypass storm event.
- Typical values for milli-screened effluent as established in an independent study of milli-screened effluent in New Zealand (Williams 1985) are adopted.
- The characteristics of a mixed discharge based on one part typical milli-screened effluent to 3 parts disinfected secondary treated effluent (worst case scenario) are calculated.

Wellington City Council commissioned the Cawthron Institute to undertake a dilution and dispersion study to evaluate the environmental impact of the infrequent wet weather discharges of milliscreened effluent diluted with disinfected secondary-treated effluent. The above procedure was applied by Cawthron to assess the characteristics of a worst case scenario bypass discharge.

Cawthron used a computer model (CORMIX) in conjunction with on-site investigations (during fair weather) to assess the impacts of the infrequent wet weather bypass flows. This approach was necessary because of the infrequency of wet weather events and for safety reasons.

The on-site investigations involved a dye dispersion study to verify the model and a spot dive inspection of the outfall.

Cawthron concluded that under bypass conditions neither the biochemical oxygen demand nor total suspended solids would be appreciably elevated in the combined effluent immediately above the point of discharge. However faecal coliforms would be substantially elevated in a bypass event within 250 metres of the outfall discharge. Despite this elevation, these infrequent discharges are expected to comply with both the Regional Plan guidelines and the existing resource consent conditions.

5 ENVIRONMENTAL EFFECTS

The environmental risk from the bypass discharge arises from

- the level of contaminants,
- the frequency and duration of the discharge and
- the characteristics of the receiving environment.

Under the Wellington Regional Coastal Plan, a discharge to be considered acceptable, should not breach receiving water criteria after reasonable mixing.

5.1 The Receiving Environment

The Moa Point outfall location was originally chosen as an area experiencing strong tidal and coastal currents that rapidly dilute and disperse any contaminants even during fine weather. Storm conditions further accelerate the dilution and dispersion of contaminants.

At the time of the initial investigations for the long outfall a "circulation zone" was identified which conveyed water into Lyall Bay. Consequently the minimum length of the long outfall was set at 1800 metres to avoid the return of discharged effluent into Lyall Bay.

5.2 Public Health Issues

Cawthron assessed the overall public health risk (including risk to shellfish gathering) arising from the discharge of the mixed effluent during a bypass event as low. The main reasons for this are:

- the low frequency and limited duration of the discharge,
- the likely strong dilution of the effluent field under storm conditions,
- the positioning of the outfall outside the Lyall Bay circulation zone,
- the separation distance from the end of the outfall to the nearest bathing beach in Lyall Bay (almost 2 km),
- the closest near shore areas managed for shellfish gathering approximately 700 metres away in the vicinity of Te Raikaihau and Moa Point, and
- the short term exposure of shellfish to any elevation of bacteria levels.

Receiving Water Quality in the Vicinity of the Long Outfall

For the existing consented activity (the continuous discharge of disinfected secondary treated effluent) Cawthron estimates that the receiving water concentrations of faecal coliforms would likely be below detection limits under most conditions.

This compares with a "worst case" bypass event in storm conditions during which Cawthron estimates that the receiving water concentrations of faecal coliforms could be in the order of 250cfu/100ml within several hundred metres of the outfall.

Water Quality Criteria

The Wellington Regional Coastal Plan expresses the relevant contact recreation water standards in terms of a median of 5 samples not exceeding 150 faecal coliforms per 100 millilitres. The 5 samples are to be taken over the bathing season at regular intervals (not exceeding one month) with 4 out of 5 samples to contain less than 600 faecal coliforms per 100ml.

The Regional Council relevant standards for shellfish gathering are expressed as:

"The median bacterial content in samples of water taken over the gathering season shall not exceed 14MPN faecal coliforms per 100mls (with 9 out of 10 samples containing less than 42 MPN faecal coliforms per 100mls)."

The nearest shellfish gathering waters so classified in the Wellington Regional Coastal Plan are approximately 700m to the north of the outfall in the vicinity of Te Raikaihau and Moa Point – (refer Appendix A).

The contact recreation and shellfish gathering water quality standards are based on the median values of samples taken over an extended period rather than an individual sample. Cawthron concludes that the bypass events (given that they are of short term duration and occur infrequently) will not cause a breach of the standards.

As noted in section 1.4, the combined discharge during bypass events complies with the effluent quality conditions on the existing consent.

The following mitigating factors are of particular relevance in assessing the scale and intensity of the environmental effects:

- There are no bathing beaches in the Moa Point area and the other types of contact recreation that could take place (e.g. snorkelling, SCUBA diving off Moa Point) are unlikely to occur during the types of storm events that would trigger a bypass event. Although surfing and windsurfing are often undertaken during or immediately after storms, the closest prominent surfing/windsurfing area is at the head of Lyall Bay, almost 2km away. The outfall was located to place it well outside the Lyall Bay circulation zone.

- The Cawthron, report notes that such intermittent "pulse events" (average duration 4 hours 12 minutes for recorded events to date) are far less likely to cause elevated body burdens of bacteria/pathogens in resident shellfish than chronic and continuous inputs which are more commonly associated with wastewater outfalls. The duration of the discharge is short enough that receiving water levels will quickly return to background concentrations once the bypass has stopped. Once levels have returned to background concentrations, shellfish will quickly depurate any body burden.

5.3 Other Environmental Issues

The Cawthron investigations conclude that the bypass discharge is unlikely to cause any of the visual/aesthetic/amenity effects referred to in section 107 of the RMA.

Dive survey results indicate that the existing discharge (including the existing mixed bypass flows which have occurred in the past) is not having an adverse effect on the benthic environment in the vicinity of the outfall.

The worst case bypass is extremely unlikely to have an adverse effect on marine ecology or fisheries values by way of nutrient enrichment, oxygen depletion or toxic effects.

5.4 Cultural Effects

WCC acknowledge that the discharge of treated and untreated sewage into water is of particular concern to Maori and consultation with iwi is underway.