Assessment of Environmental Effects for Upgrading of the Blenheim Sewage Treatment Plant

Volume One: Report

▪ report

Assessment of Environmental Effects for the Upgraded Blenheim Sewage Treatment Plant

▪ report

Assessment of Environmental Effects for the Upgraded Blenheim Sewage Treatment Plant

Prepared for Marlborough District Council

By
CH2M Beca Ltd

November 2007

Revision History

Revision N°	Prepared By	Description	Date
A	Graeme Jenner and Amy Clarkson	Draft for Client Review	4 September 2007
B	Graeme Jenner and Amy Clarkson	Final	22 November 2007

Document Acceptance

Action	Name	Signed	Date
Prepared by	Graeme Jenner and Amy Clarkson		19 November 2007
Reviewed by	Humphrey Archer		20 November 2007
Approved by	Humphrey Archer		22 November 2007
on behalf of	**CH2M Beca Ltd**		

Resource Consent Applications and Notice of Requirement for Designation

Form 9

Application for Resource Consent Under Section 88 of the Resource Management Act 1991

To: **Marlborough District Council, P O Box 443, Blenheim**

From: **Marlborough District Council**
P O Box 443
BLENHEIM

1. **I, Marlborough District Council, apply for the following type of resource consent(s):** Resource consents sought are described in Section 1 of the attached AEE. In summary, they are for:

   - Freshwater abstraction
   - Land use consent for indigenous vegetation removal
   - Land use consent for vegetation clearance
   - Land use consent for land disturbance
   - Discharge of contaminants to air.
   - Discharge to the Coastal Marine Area
   - Discharge of liquid wastes to land.
   - Disturbance of the seabed or foreshore.
   - Establishment of a structure in the Coastal Marine Area.
   - Occupation of the Coastal Marine Area.
   - Establishment of wastewater treatment ponds, facilities, associated plant, outfall structures and land irrigation systems.

2. **A description of the activity to which the application relates is included in Section 6 of the attached AEE. In summary, this is:**

   Upgrading and operation of the Blenheim Sewage Treatment Plant and land application systems as well as construction and operation of a wetland and outfall pipe to the Wairau Estuary.

3. **The names and addresses of the owner and occupier of any land to which the application relates are as follows:**

   Marlborough District Council, PO Box 443, Blenheim

4. **The location of the proposed activity is as follows:**

   An area of land at the eastern end of Hardings Road. The legal description of the Blenheim Sewage Treatment Plant Site is as follows (see also Appendix A):

- Lot 1 DP 8186
- Lot 2 DP 8186
- Pt Sec 24 Blk 2 Wairau District
- Pt Sec 28 District Opawa
- Pt Sec 25 District Opawa
- Lot 1 DP 3199
- Sec 5 Blk 1 Clifford Bay SD

- Pt Sec 2 Blk 1 Clifford Bay SD
- Pt Sec 8 District Opawa
- Pt Sec 8 District Wairau

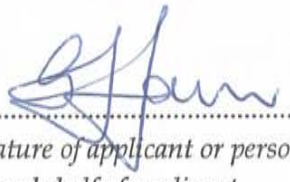
5. **The following additional resource consents are needed for the proposed activity and have been applied for:**

   - Notice of Requirement to designate land for upgrading, operation, maintenance and repair of sewage treatment plant and associated activities.

6. **I attach, in accordance with the Fourth Schedule of the Resource Management Act 1991, an assessment of environmental effects in detail that corresponds with the scale and significance of the effects that the proposed activity may have on the environment.**

7. **I attach any information required to be included in this application by the district plan, the regional plan, the New Zealand Coastal Management Statement 1994, the Resource Management Act 1991, or any regulations made under that Act.**

   Applications for Resource Consents, Notice of Requirement and Assessment of Environmental Effects for the Upgraded Blenheim Sewage Treatment Plant.



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Signature of applicant or person authorised to sign on behalf of applicant.

22/11/2007

.....

Date

Address for service of applicant:

CH2M Beca
Level 3
119 Armagh Street
Christchurch
New Zealand

Telephone N° **+64 03 366 3521**
Fax N° **+64 03 366 3188**

Attention: Graeme Jenner

Form 18

Notice of Requirement by Minister, local authority, or requiring authority for designation or alteration of designation

To: **Marlborough District Council**

From **Marlborough District Council**
P O Box 443
BLENHEIM

Marlborough District Council gives notice of requirement for a designation for a public work.

1. The site to which the requirement applies is as follows:

The land, to which this requirement applies, is located at the eastern end of Hardings Road and is shown on Drawing 6513042-C-622 (see Appendix B of Volume 2 of Assessment of Environmental Effects Report). Legal descriptions of the subject land are as follows (see also Appendix A):

- Lot 1 DP 8186
- Lot 2 DP 8186
- Pt Sec 24 Blk 2 Wairau District
- Pt Sec 28 District Opawa
- Pt Sec 25 District Opawa
- Lot 1 DP 3199
- Sec 5 Blk 1 Clifford Bay SD
- Pt Sec 2 Blk 1 Clifford Bay SD
- Pt Sec 8 District Opawa
- Pt Sec 8 District Wairau

2. The nature of the proposed public work is:

The construction, upgrade, operation, maintenance and repair of an upgraded sewage treatment plant including treatment ponds and associated buildings, rapid infiltration basins (including irrigation infrastructure) wetland, underground reticulation and ancillary works and activities. Specifically:

- Construction, operation, maintenance and repair of an upgraded sewage treatment plant and ancillary buildings and facilities (including lime silo, screens, utility buildings, generator enclosures, settling basins and sludge drying beds).
- Construction, operation, maintenance and repair of rapid infiltration basins (including the application of treated effluent outside vintage for grass maintenance).

- Construction, operation, maintenance and repair of a wetland between the existing treatment ponds and the Wairau Estuary, including excavation of soil, clearance of vegetation and wetland plantings.

It is proposed that the existing designation, which is over part of the site, will be removed pursuant to Section 182 of the Act and subsequent to the confirmation of the new designation.

3. **The nature of the proposed restrictions that would apply is:**

   Wastewater Treatment and Disposal Purposes

4. **The effects that the public work will have on the environment, and the ways in which any adverse effects will be mitigated, are:**

   A detailed assessment of the effects that the proposed work will have on the environment and proposed mitigation measures is given in Section 7 of the attached AEE.

5. **Alternative sites, routes, and methods have been considered to the following extent:**

   Alternatives are described and discussed in Section 4 of the attached AEE.

6. **The public work and designation are reasonably necessary for achieving the objectives of the requiring authority because:**

   These reasons are detailed in the Assessment of Environmental Effects ("AEE") attached and more particularly in Sections 1 and 8 of that document. In summary, the reasons are:

   - A designation would allow Marlborough District Council (MDC) to undertake the Project or Work in accordance with the designation, notwithstanding anything to the contrary in the Proposed Wairau/Awatere Resource Management Plan;
   - A designation would allow land required for the Project or Work to be identified in the Proposed Wairau/Awatere Resource Management Plan (which already includes land shown as designated), to give a clear indication of the intended use of the land;
   - A designation, would restrain land uses and/or development that would otherwise prevent or hinder the Project or Work, including its safe or efficient functioning or operation.

7. **The following resource consents are needed for the proposed activity and have been applied for:**

   A description is given in Section 1 of the attached AEE. In summary, these are consents for:

   - Freshwater abstraction
   - Land use consent for indigenous vegetation removal
   - Land use consent for vegetation clearance

- Land use consent for land disturbance
- Discharge of contaminants to air
- Discharge to the coastal Marine Area
- Discharge of liquid wastes to land.
- Disturbance of the seabed or foreshore.
- Establishment of a structure in the Coastal Marine Area.
- Occupation of the Coastal Marine Area.
- Establishment of sewage treatment ponds, facilities, associated plant, outfall structures and land irrigation systems.

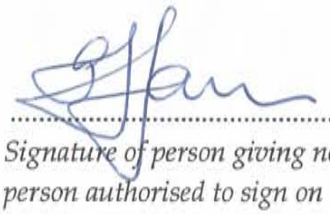
8. **The following consultation has been undertaken with parties that are likely to be affected:**

   Consultation undertaken is discussed in Section 5 of the attached AEE.

9. **Marlborough District Council attaches the following information required to be included in the notice by the district plan, regional plan, or any regulations make under the Resource Management Act 1991.**

   Applications for Resource Consents, Notice of Requirement and Assessment of Environmental Effects for the upgraded Blenheim Sewage Treatment Plant

10. **Notice is given of Marlborough District Council's requirements for designations to provide for "Wastewater Treatment and Disposal Purposes".**



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Signature of person giving notice or person authorised to sign on behalf person giving notice.

22/11/2007

.....

Date

Address for service of applicant:

CH2M Beca
Level 3, 119 Armagh Street
P O Box 13 960
Christchurch
New Zealand

Telephone N° **+64 03 366 3521**
Fax N° **+64 03 366 3188**

Attention: Graeme Jenner

Assessment of Environmental Effects

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1 Introduction

1.1 Purpose of this Report

Marlborough District Council (MDC) is making application for resource consents for the construction and operation of the upgraded Blenheim Sewage Treatment Plant (BSTP), and for the designation of additional land for "Sewage Treatment Plant Purposes".

The Resource Management Act 1991 (RMA) requires that the environmental effects of proposed activities be assessed, as part of the resource consent process. The primary purpose of the Assessment of Environmental Effects (AEE) process is to give consideration to the actual and potential effects of the proposed activities.

Volume One of the AEE explains the nature of the proposed activities and identifies the measures, which would be undertaken to avoid, remedy or mitigate any potential adverse effects. The report has been prepared to satisfy section 88 (4), section 168 (A) and the Fourth Schedule to the RMA. A Notice of Requirement (NoR) for designation has been prepared in accordance with Form 18 of the RMA Regulations.

A number of attachments and technical reports have been referenced and, where appropriate, these are appended in Volume Two of this report.

1.2 Background and Review of Upgrade Options

The MDC owns and operates the BSTP, which treats wastewater from Blenheim residential and commercial premises (termed domestic flows), as well as industrial flows and tankered wastes. Figure 1.1 shows a simplified diagram of the existing BSTP wastewater collection and treatment system.

The existing STP consists of two separate treatment systems. A fine screen, as well as facultative and maturation ponds, is used to treat domestic flows while the industrial stream is treated using fine screening and mechanically aerated and facultative ponds. Treated domestic effluent is continuously discharged to the Opawa River. Treated industrial flows are discharged to the Wairau Estuary on the ebb tide.

The BSTP will require upgrading to accommodate predicted increases in both residential population and industrial development in the area. CH2M Beca Ltd (Beca) was engaged by MDC to investigate cost effective wastewater treatment and disposal options, which would allow for the sustainable management of current and future flows. The draft *Report on Issues and Options for Upgrading of Blenheim Sewage Treatment Plant* (Beca, 2006) provided the basis for consultation and the development of a preferred scheme upgrade. Draft technical reports were also prepared by consultants, Pattle Delamore Partners Ltd (PDP) on discharge to land (see *Investigation of Options for Land Application of Treated Effluent from Blenheim Sewage Treatment Plant* in Appendix C) and Cawthron Institute on discharge to water, as part of the disposal options assessment (see *Ecological Investigations into Discharge Options to Water for the MDC Sewage Treatment Plant, Blenheim)* in Appendix D.

Disposal/reuse options were identified and their technical feasibility, possible environmental impact and estimated costs were assessed. These options included domestic and industrial reuse opportunities, application onto and into land, and discharge to the

Wairau Estuary, Opawa River and Cloudy Bay. Both piped and wetland conveyance options for conveying treated effluent to the Wairau Estuary were also assessed. Following this assessment, a shortlist of disposal options was developed.

Several pond-based and in-tank type treatment upgrade options were identified, which could achieve the effluent quality likely to be required for the short-listed disposal options. The technical feasibility and estimated costs of these treatment options were assessed and a short-list then identified. Based on the outcomes of the assessment of the treatment and disposal options, a shortlist of three upgrade scheme options was then developed. Further discussion on the assessment of the upgrade options is contained in Section 4.

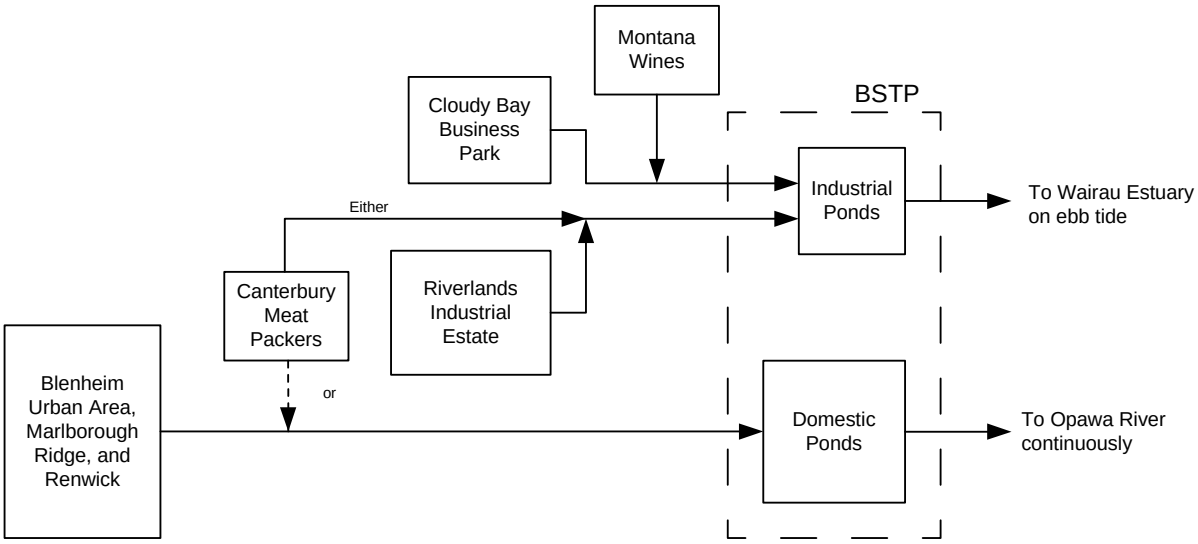

Figure 1.1 - Simplified Flow Diagram of Existing BSTP Wastewater Collection and Treatment System

1.3 Proposed Staged Upgrading Strategy

MDC has carried out a comprehensive consultation process as part of the development of the upgrading strategy. This included regular meetings with a Consultative Working Group (CWG), as well as individual meetings with iwi and other key stakeholders. The consultative process is discussed in more detail in Section 5.

The short-listed scheme upgrade options for the BSTP were presented to the CWG on 2 April 2007. The CWG recommended that the staged upgrade scheme summarised in Table 1.1 be adopted and this decision was ratified by MDC on 26 April 2007.

MDC is only applying for resource consents for the Stage 1 upgrade scheme. Separate applications would be required for resource consents for discharge of effluent to other land areas at a future time.

Table 1.1 - BSTP Upgrade Scheme

Stage 1	■ Application of combined domestic and industrial treated effluent to MDC land around the STP mainly during summer ■ Decommissioning of the existing Opawa River outfall with discharge of the balance of treated effluent through new constructed wetlands to an upgraded outfall in the Wairau Estuary on the ebb tide.
Stage 2	■ Investigation of opportunities for application of treated effluent to land on the lower slopes of Vernon Station and other land areas.

1.4 Treatment of Predominantly Winery Wastewater During Vintage

MDC upgraded the industrial ponds to aerated ponds in series, in time to treat the 2006/2007 vintage. The combined industrial wastewater is screened and then flows into treatment ponds, where mechanical aerators provide for BOD removal and for full mixing. Despite having increased the number of aerators in Pond I1 in early 2007, higher than expected increases in the waste loading from wineries resulted in Ponds I1 and I2 having marginal aeration during the 2007 vintage.

Because of the high costs associated with the mechanical aeration required to cope with winery BOD loads, MDC is considering the option of separating the winery and meat industry flows during vintage. Under this scenario, meat industry flows would be diverted to the BSTP domestic treatment ponds during this period. Winery wastewater, which represent a significant portion of the total industrial BOD loading during vintage, together with other minor discharges from within the Riverlands area (e.g. Marlborough Seafoods), plus the small domestic flows from these sites, would be treated in the BSTP industrial ponds or applied to land via rapid infiltration basins (RIBs).

MDC is therefore including the construction and operation of RIBs for the treatment of predominantly winery wastewater during vintage, in the Stage 1 upgrade strategy. Additional technical assessment of RIBs has been carried out and the concept has been discussed with neighbours and the CWG. However, before RIBs can be confirmed as a cost effective and sustainable, a pilot trial is required. As the long-term consents may not be granted before the commencement of the 2008 vintage, MDC is applying separately for short-term consents (maximum of 5 years) to construct and operate the RIB pilot trial.

1.5 Existing STP Consents

MDC holds a number of resource consents for the operation of the domestic and industrial ponds (see Table 1.2). Copies of these consents are contained in Appendix A.

The consent for discharge of effluent from the domestic ponds expires on 28th February 2008. Resource consents for discharge of effluent from the industrial treatment ponds expire on 1st October 2011. However, because the industrial and domestic streams will be combined in future (and will increase), the discharge flow rate will exceed the consented value. Thus, MDC will also be applying for new consents for discharges from both the domestic and industrial ponds at the same time.

Table 1.2 - Existing Resource Consents

Treatment Plant	Consent Number	Activity
Domestic ponds	U961050.1	Landuse -Activity
	U961050.2	Bore Construction
	U961050.3	Landuse-River Surface or Bed Activity
	U961050.4	Landuse-Land Disturbance
	U961050.5	Discharge Permit-To Air
	U961050.6	Discharge Permit-To Water
Industrial Ponds	U950167.1	Discharge Permit-To Water
	U950167.2	Discharge Permit-To Air
	U950167.3	Restricted Coastal Activity-Coastal Permit for Outfall Structure
	U950167.4	Water Permit-To take Underground Water
	U971206	Discharge Permit- To Land

1.6 Resource Consents Sought for Upgraded BSTP

A number of consents will be required for both construction and operation of the Stage 1 upgrade.

1.6.1 General Rules

Freshwater Abstractions

Rule 1.2.1 specifies circumstances in which the taking of fresh water is a permitted activity. MDC proposes to abstract the seepage from the discharge of predominantly winery wastewater from RIBs, via cut-off drains and pump back into the STP. A resource consent is required for a non-complying activity in accordance with rule 1.2.4.

1.6.2 Rural 3 and 4 Zone Rules

Indigenous Forest Removal

Rule 1.6.1 of the PWARMP restricts the total area of indigenous vegetation that may be removed from any Certificate of Title to 200m² per 12 month period. MDC propose to clear approximately 20 ha of modified saltmarsh vegetation from an area that is technically considered to be a wetland. Therefore, a limited discretionary activity resource consent would be required in accordance with rule 3.1.

Land Disturbance – Vegetation Clearance

Rule 1.7.1 allows the clearance of vegetation on a site as a permitted activity subject to compliance with conditions. Condition 1.7.1.7 limits the depth of topsoil to be removed to 20 mm over 15% of the vegetation clearance site. As MDC propose to remove all topsoil to a depth of greater than 20mm over a 20 ha area for the proposed wetland, a limited discretionary activity resource consent would be required in accordance with rule 3.1.

Condition 1.7.1.5 limits the use of heavy machinery for vegetation clearance within 8 metres of any permanently flowing river or the margin of any wetland, lake or coast. As

MDC may use heavy machinery for the clearance of vegetation within a wetland area and adjacent to the Opawa River and Wairau Estuary coastline for the construction of an outfall pipe, a limited discretionary activity resource consent would be required in accordance with rule 3.1.

Land Disturbance – Excavation and Tracking

Rule 1.7.3 allows the excavation of land as a permitted activity subject to compliance with a number of conditions. Condition 1.7.3.1 limits excavation within 8 metres of any permanently flowing river, lake or the sea. MDC may undertake excavations within 8m of the Opawa River and the sea for the construction of an outfall pipe and filling and piping of existing drainage channels, as such a limited discretionary activity resource consent would be required in accordance with rule 3.1.

Condition 1.7.3.2 prevents excavation within 8 metres of the landward toe of a stopbank and the depth of excavation to 15% of the distance from the stopbank. MDC propose to undertake excavations adjacent to an existing stopbank near Pond 6, as part of the construction of the wetland, furthermore, excavations may take place in proximity of the stopbanks as part of the filling and piping of the existing informal drainage channels throughout the site, as such, a limited discretionary activity resource consent would be required in accordance with rule 3.1.

Liquid Waste

Rule 1.8.9 allows the discharge of liquid waste from the processing of fruit, vegetable, shellfish, fish or animal products onto land as a permitted activity subject to compliance with conditions. Condition 1.8.9.1 requires that faecal coliforms do not exceed 100/100mL. As MDC propose to discharge predominantly winery wastewater, with faecal coliform concentrations which may exceed this limit, a discretionary activity resource consent is required in accordance with rule 4.1.

Odour

Rule 1.8.12 requires that no person discharges contaminants into the air that results in an offensive or objectionable odour beyond the boundary of the property. While MDC will take all reasonable steps to control the generation of odour from the STP, it cannot guarantee 100% compliance with this rule. Therefore a discretionary activity resource consent is required in accordance with rule 4.1.

Discharge of Liquid Wastes and Animal Effluent

Rule 2.5.1 requires that the discharge of liquid waste or animal effluent onto land is a controlled activity subject to compliance with a number of conditions. Condition 2.5.1.1 requires that faecal coliform levels do not exceed 1×10^6/100mL. While it is anticipated that this will be complied with in respect of treated effluent, full compliance cannot be guaranteed, in respect of the discharge of winery wastewater during vintage. Accordingly a resource consent is required. Condition 2.5.1.1 also requires that no objectionable odours can be detected at or beyond the legal boundary of the site. As previously noted

compliance with this condition cannot be guaranteed and a discretionary activity resource consent is therefore required in accordance with rule 4.1.

Discretionary Activities

Rule 4.1 requires that an application must be made for a resource consent for a discretionary activity for specific activities including effluent treatment ponds, facilities, associated plant, outfall structures and land irrigation systems.

1.6.3 Coastal Marine Zone Rules

Discretionary Activities

Rule 3.1 requires that discretionary activity resource consent be obtained for certain activities. The list of activities includes structures in the coastal marine area oblique or perpendicular to mean high water springs, disturbance of the foreshore and seabed and any removal of sand, shell or shingle, discharges to water and occupation of the coastal marine area.

Rule 3.3.4 states that any activity involving the erection of a structure oblique or perpendicular to mean high water springs which exceeds 100 metres in length is both a discretionary activity and a restricted coastal activity. MDC propose to construct an outfall from the wetlands into the Estuary that is approximately 400m in length. Accordingly discretionary and restricted coastal activity consents are required.

Rule 3.3.6 specifies the relevant conditions for the disturbance of the seabed and foreshore. In this instance the proposed outfall will meet these conditions and as such a discretionary activity resource consent is required.

Rule 3.3.8 sets out the conditions for discharges to water. Condition 3.3.8.2 states that any discharge of human sewage to the coastal marine area, which has not passed through soil or a wetland is a discretionary activity that is a restricted coastal activity. MDC propose to discharge human sewage to the coastal marine area through a constructed wetland. Discretionary activity consent is therefore required for this discharge.

MDC propose to construct an outfall that will be perpendicular to mean high water springs. As part of the construction of this structure, the foreshore and seabed will be disturbed. Furthermore, once construction is complete treated effluent will be discharged to water and the coastal marine area will be occupied by the outfall pipe. Accordingly discretionary activity resource consents are required for these matters.

Table 1.3 summarises the resource consents, for which MDC is making application.

Table 1.3 - Resource Consents Required for Stage 1 Upgrade

Proposed Activity	Construction	Operation
General Rules		
Rule 1.2.4 Freshwater Abstractions		■ Abstraction of groundwater for an activity not specified in rule 1.2.1. Non Complying Activity.
Rural 3 & 4 Zones		
Rule 1.6.1 Indigenous Forest Removal	■ Removal of indigenous vegetation in a natural wetland larger than 200m² in any 12 month period. Limited Discretionary Activity	
Rule 1.7.1 Vegetation Clearance	■ Removal of topsoil to a depth greater than 20mm over more than 15% of the vegetation clearance site. Limited Discretionary Activity ■ Operation of heavy machinery within 8 metres of a permanently flowing river, wetland, lake or coast. Limited Discretionary Activity	
Rule 1.7.3 Excavation and Tracking	■ Excavation within 8m of a permanently flowing river, lake or the sea. Limited Discretionary Activity ■ Excavation within 8m of the landward toe of a stopbank. Limited Discretionary Activity	
Rule 1.8.9 Liquid Waste		■ Discharge of liquid waste to land with faecal coliform levels in excess of 100/100mL. Discretionary Activity
Rule 1.8.12 General Rules Relating to Odour		■ Discharge of contaminants to air resulting in objectionable odour beyond the site boundary. Discretionary Activity
Rule 2.5.1 Discharge of Liquid Wastes and Animal Effluent		■ Discharge of liquid waste to land with faecal coliform levels in excess of 1 x 10^6/100mL. Discretionary Activity ■ Discharge of contaminants to air resulting in objectionable odour beyond the site boundary. Discretionary Activity.
4.1 Discretionary Activities		■ Effluent treatment ponds, facilities, associated plant, outfall structures and land irrigation systems.

Proposed Activity	Construction	Operation
Coastal Marine Zone		
Rule 3.1 Discretionary Activities	▪ Disturbance of the foreshore or seabed. Discretionary Activity.	▪ Structures oblique or perpendicular to mean high water springs. Discretionary Activity and Restricted Coastal Activity ▪ Occupation of the Coastal Marine Area. Discretionary Activity ▪ Discharges to water. Discretionary Activity

1.7 Notice of Requirement for Designation

Only the land on which the existing domestic treatment ponds are situated, is currently designated for "Sewage Treatment Purposes" in the Proposed Wairau/Awatere Resource Management Plan (PWARMP). MDC is therefore submitting a Notice of Requirement (NoR) for a designation over land required for upgrading, operating and maintaining the STP domestic and industrial treatment processes. The proposed designation would also include land that will be needed for future upgrading work, sludge drying and location of RIBs. The land over which the designation is proposed is shown in Drawing 6513042-C-620 in Appendix B.

The designation process is only available to local and central government or Network Utility Operators and the provisions of the RMA allow more flexibility to local authorities to develop long term projects in stages, according to an Outline Plan, with the capability of modifying later stages to suit changing circumstances or technology improvements.

It is proposed to uplift the existing designation on the site under section 182 of the RMA, when the proposed NoR is confirmed.

The details for an Outline Plan (section 176A of the RMA) are incorporated into this AEE and therefore no separate plan will need to be submitted to MDC.

A designation over the upgraded STP is considered necessary because:

- It will allow land required for the project to be identified in the relevant plan (which already includes part of the land that will be designated), to give a clear intention of the intended use of the land, and
- It will allow MDC to do anything in accordance with the designation, notwithstanding anything contrary in the PWARMP.

2 Description of Existing Wastewater Treatment and Disposal System

2.1 Historical Perspective

2.1.1 Blenheim Municipal STP

The Blenheim sewerage system was constructed in the early 1930s to serve a population of about 6,000 persons. Ten pumping stations were installed to overcome difficulties with topography and high groundwater conditions. Collected sewage was treated in septic tanks and discharged to the Opawa River until the 1960s. The system was extended to the Springlands town boundary in 1962. A total of about 14,000 persons were connected to the system, with the extension of the sewer to the Woodbourne Air Base in 1962-63.

Investigations for a new oxidation pond on Hardings Road, about 6 km southeast of Blenheim (see Drawing 6513042-C-621 in Appendix B) were undertaken in 1965. This pond, which had an area of 16.4 ha, was constructed in 1968-69 for a design population of 20,000 persons. A number of further connections to the pond followed including;

- All area south of the Taylor-Opawa River (an additional 10,500 persons) in 1970.
- The Borough Abattoir (Riverlands Meat) in 1971.
- The Riverlands Industrial Estate by 1980.
- The north side of the Borough connected via the Opawa River system in 1980 (adding another 5,000 persons).
- Renwick in 2004 (adding another 1,800 persons).

The treatment pond was supplemented with an upstream aeration lagoon in 1992. By 1995, it was evident that increased capacity was required to cater for the domestic population growth, as well as increased industrial loads. New consent conditions required an improved effluent quality, particularly for reduced faecal coliforms. Beca Consultants was asked to review the upgrade option of additional aerated lagoons proposed by others. Additional primary ponds were proposed by Beca, with part of the existing pond to be subdivided into three maturation ponds. This option was favoured by the CWG and MDC and was coupled with the possible development of future wetlands downstream of the ponds.

The upgrading was undertaken in stages over two summers in 1999/00 and 2000/01. The first stage comprised the construction of: a new 3 mm gap inlet step screen and biofilter odour treatment system, as well as two new primary ponds (total area of 22 ha). Stage Two involved the desludging of the original 16.4 ha pond. The sludge was air dried and carted to a landfill at the end of the pond.

The general location of the BSTP is shown on Drawing 6513042-C-621 in Appendix B.

2.1.2 Industrial (Ex PPCS) Ponds

Prior to 2002, the BSTP consisted of a number of treatment ponds used to treat domestic wastewater from Blenheim and industrial flows from Canterbury Meat Packers and the Riverlands Industrial Estate. The industrial STP ponds were formerly owned by the PPCS

Meat Processing Plant, but were purchased by MDC in 2002, after the PPCS operation closed. The former PPCS factory site has now been subdivided and is now known as Cloudy Bay Business Park. Various new industries, including a winery, have moved onto this site and the number of wineries in the Riverlands Industrial Estate has also increased.

In 2003/04, the domestic treatment ponds were overloaded in terms of oxygen demand and their performance had deteriorated. This overloading occurred mainly during the wine vintage, and was exacerbated by smaller volumes of high BOD wastewater. As a result of this overloading, MDC decided to separate the major industrial flows from the domestic portion. Wastewater from the Riverlands Industrial Estate was recently separated from the domestic stream, with the Canterbury Meat Packers flows to be diverted to the Industrial STP by the end of 2007. Small trade waste discharges in Blenheim will continue to contribute about 15% of the domestic flow.

The centralised wineries south-east of Blenheim, have been increasing processing capacity by 15% per year. Upgrade options to cope with this increased loading were evaluated in the *Blenheim Sewage Treatment Plant – Industrial Wastewater Treatment Process Design Report* (CH2M Beca, 2006). Both aerobic and anaerobic pond upgrade options were considered, with the aerobic option preferred. Aerated pond treatment is commonly used for winery and other food processing wastewaters in New Zealand and elsewhere and offers:

- Significantly lower capital cost than anaerobic treatment,
- Significantly lower Net Present Value (NPV) cost compared to anaerobic treatment despite higher electricity usage (but for only four months per year), and
- Relatively simple operation with less operator input.

MDC upgraded the industrial ponds to aerated ponds in series, in time to treat the 2006/2007 vintage. This upgrade included screening of the combined industrial wastewater, before discharge into the treatment ponds, and mechanical aeration to provide for BOD removal and for full mixing.

Despite the provision of additional aeration, there was a higher than expected increase in wastewater loading from the wineries. This resulted in the industrial treatment ponds not having sufficient aeration to meet treatment requirements. MDC are now making provision for additional aeration prior to the 2008 vintage, as well as changes to the operation of the industrial ponds. As noted earlier, consideration is also being given to the separation of meat industry wastewater from the industrial flows during vintage. Meat industry flows would be directed to the domestic treatment ponds with the winery wastewater discharged into the industrial pond or applied to RIBs. The proposed upgrading of the industrial ponds and the operation of the RIBs is discussed further in Section 6.

2.2 Key Elements of BSTP

2.2.1 Treatment

The key elements of the current treatment of domestic and industrial wastewater at the BSTP are summarised in Figure 2.1. The domestic treatment train consist of an inlet screen followed by an aerated lagoon (Pond 1), then three primary ponds in parallel and finally

three maturation ponds in series. The total area of the domestic treatment ponds is approximately 38 ha. The industrial treatment train (denoted by the prefix I -as in Pond I) consists of a fine screen followed by three ponds in series. The total pond area of the industrial treatment train is about 22 ha.

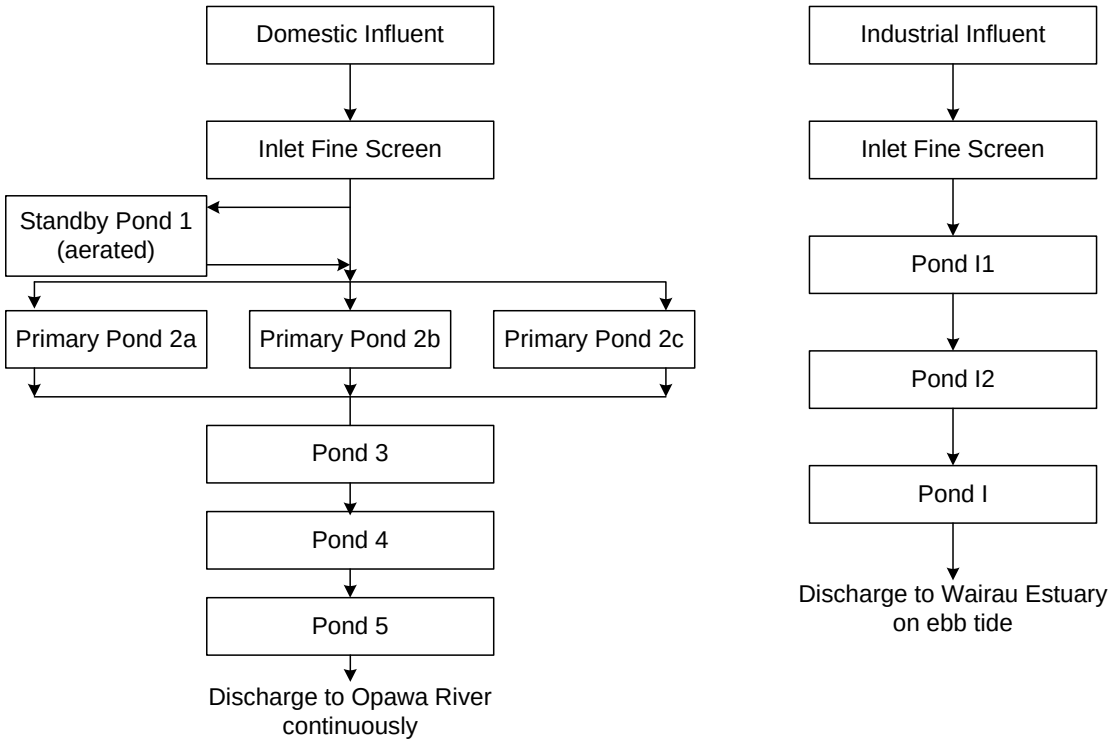

Figure 2.1 - Schematic of Current BSTP Treatment Processes

2.2.2 Disposal of Effluent

Treated effluent from the domestic treatment ponds currently discharges continuously by gravity to the Opawa River through an 825 mm diameter concrete pipeline. The industrial treatment ponds discharge, over 4 hours on the ebb tide, through a 375 diameter AC Class A pipeline to the Wairau Estuary. This flow is pumped because of the length of the pipeline.

2.2.3 Screenings

The following volumes of screenings are currently generated at the BSTP:

- Industrial Ponds- about 1 m^3 per day during vintage; about 1 m^3 every one to two weeks outside vintage
- Domestic Ponds-1 m^3 once or twice weekly.

These screenings are bagged and trucked to the Bluegums Landfill for disposal.

2.3 Current Flows and BOD Loads to STP

The major sources of flows to the domestic ponds are from residential dwellings and commercial establishments in the Blenheim urban area. This area has a current population of about 26,470 persons. Grovetown may also be sewered in the near future and an option

is to pipe wastewater flows to the BSTP, together with those from Spring Creek and possibly Tuamarina. This would add about 800 people to the BSTP connected population.

The major contributors to the industrial ponds can be split into the following categories:

- **Riverlands Industrial Estate (RIE)**
  - Marlborough Seafoods
  - Master Butchers (Marlborough) (discontinued at the end of 2005)
  - Various Wineries
- **Cloudy Bay Business Park (CBBP)**
  - Biocorp (New Zealand)
  - Parklyn Holdings
- **Pernod Ricard New Zealand Ltd (formerly Montana)**
- **Canterbury Meat Packers (CMP) (to be** connected by end of 2007)

Table 2.1 summarises the existing flows and BOD loads to both the domestic and industrial ponds. When separation of the main industrial flows is complete, the loads entering the domestic and industrial ponds will be reviewed for future design purposes.

Table 2.1 – Current Flows and BOD Loads to BSTP

	Domestic Ponds	Industrial Ponds (peak period)
Flows m^3/d	12,150	4,000
Biochemical Oxygen Demand kg/d	2,380	11,000

2.4 Design Capacity of Existing STP

The domestic ponds currently receive about 2,380 kg BOD /day. Using a design basis of 100 kg BOD/ha/d (Mara, D et al, 1998), these ponds have a capacity to treat approximately 3,800 kg BOD/d. without supplementary aeration.

Without supplementary aeration, the capacity of the industrial ponds is approximately 1,800 kg/ d of BOD. These ponds currently receive about 11,000 kg/d of BOD at peak period. MDC upgraded the industrial ponds in 2006 with additional mechanical aeration to cater for the peak loading to the industrial ponds during vintage. This provided for a total mechanical aeration capacity of 308 kW on Pond I1 and 88kW on Pond I2, using the revised forecast industrial BOD loading for 2008 and 2009, substantial additional aeration will be required (see Section 6).

2.5 Existing Effluent Quality from Treatment Ponds

MDC regularly monitor effluent quality from the separate domestic and industrial ponds. A summary of 2006/07 effluent quality monitoring results is set out in Table 2.2.

Table 2.2 - Existing Effluent Quality from Separate Domestic and Industrial Ponds (2006/2007)

Parameter	Unit	Domestic Ponds		Industrial Ponds	
		median	90th percentile	median	90th percentile
Biochemical Oxygen Demand	g/m³	28	69	36	65
Suspended Solids	g/m³	48	103	98	174
pH		7.9	8	8.6	9.4
Total Nitrogen	g/m³	19	27	-	-
Dissolved Inorganic Nitrogen	g/m³	-	-	1.1	3.3
Ammonia Nitrogen	g/m³	9.6	19.4	-	-
Total Phosphorus	g/m³	5.5	6.1	-	-
Dissolved Reactive Phosphorus	g/m³	4.8	5.2	5.7	6.4
Faecal Coliforms	MPN/100ml	1,100	13,480	3,900	177,000
Enterococci	MPN/100ml	235	2,376	400	3,550

Source: MDC (2007)

3 Description of Existing Environment

3.1 General Setting

The BSTP ponds are located on approximately 370 ha of MDC land on Hardings Road. MDC own land to the west of the ponds, beyond which is rural residential development. To the northwest is the Opawa River, which drains into the Wairau Estuary. Several rural residential properties lie beyond the river. MDC owns the land to the north between the ponds and the Wairau Estuary. Immediately to the east of the ponds, lies MDC and Department of Conservation land (which includes the Vernon Lagoons). MDC owns the land to the south, between the ponds and SH1.

Drawing 6513042-C-622 (see Appendix B) shows the extent of MDC land and land ownership around the site.

3.2 Description of STP Site

3.2.1 Climatic Conditions

Rainfall and Evapo-transpiration

The application of effluent to land using either deficit or non-deficit irrigation requires long-term data on site rainfall and evapo-transporation characteristics. Pattle Delamore Partners Ltd (PDP) in "*Investigations of Options for Land Application of Treated Effluent from Blenheim Sewage Treatment Plant*" (2007) lists the location of the nearest rain gauges to the site that are contained in the NIWA database (refer Appendix C). Using a combination of the relationships between these sites, an assessment has been made of the likely daily rainfall at the STP from 1984.

The sources of evapo-transpiration (ET) data in the NIWA database, as well as information supplied by MDC, were also obtained. As ET tends to be more consistent over a wider area than rainfall, the data from the Blenheim Research Centre is considered to be most appropriate for the site.

Wind Conditions

An annual wind rose (see Figure 3.1) has been generated from average hourly readings taken by MDC, at the STP, over the period 1998-2007. This information allows a determination of when stronger winds (i.e. >15 km /hr) may cause droplets (aerosols) from spray irrigation systems to be transported towards residential properties. Generally, winds from the west/northwest and southeast are predominant. Winds from the northeast and southwest occur less frequently. Calm conditions only occur about 1% of the time.

An analysis of wind data shows that about 18% of all winds recorded at the BSTP are from a northeast to southeast direction (i.e. towards neighbours). Winds blow from this quarter at > 15 km/hr for about 7% of the year.

A wind rose (see Figure 3.2) has also been generated from 1998-2007 data covering the period March to May (i.e. the period when predominantly winery wastewater would be applied to RIBs). Low wind speed (i.e. < 5km/hr) provides the conditions most conducive

to the generation of odour nuisance. The data shows that winds blow from the north to southeast quarter (i.e. towards neighbours) about 16% of the time. About 4% of these winds, during March to May, blow from the northeast to southeast at < 5km /hr.

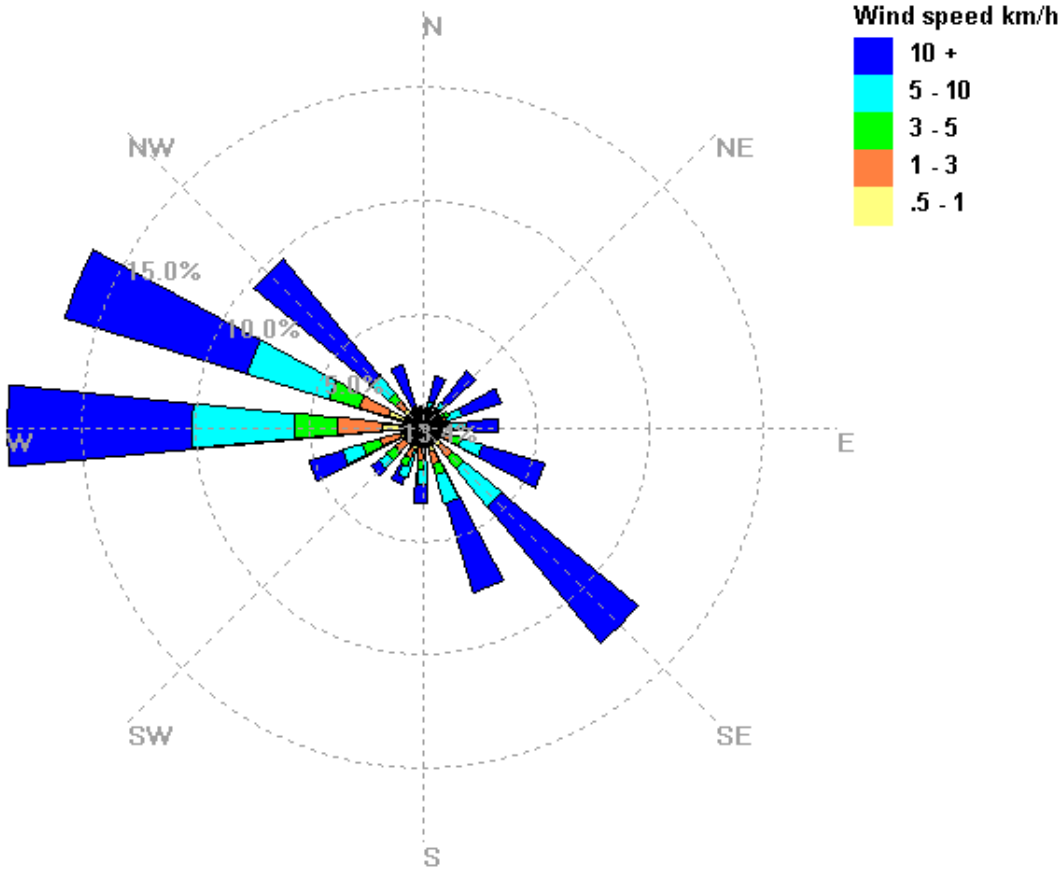

Figure 3.1 – Annual Wind Rose for BSTP (1998 – 2007)

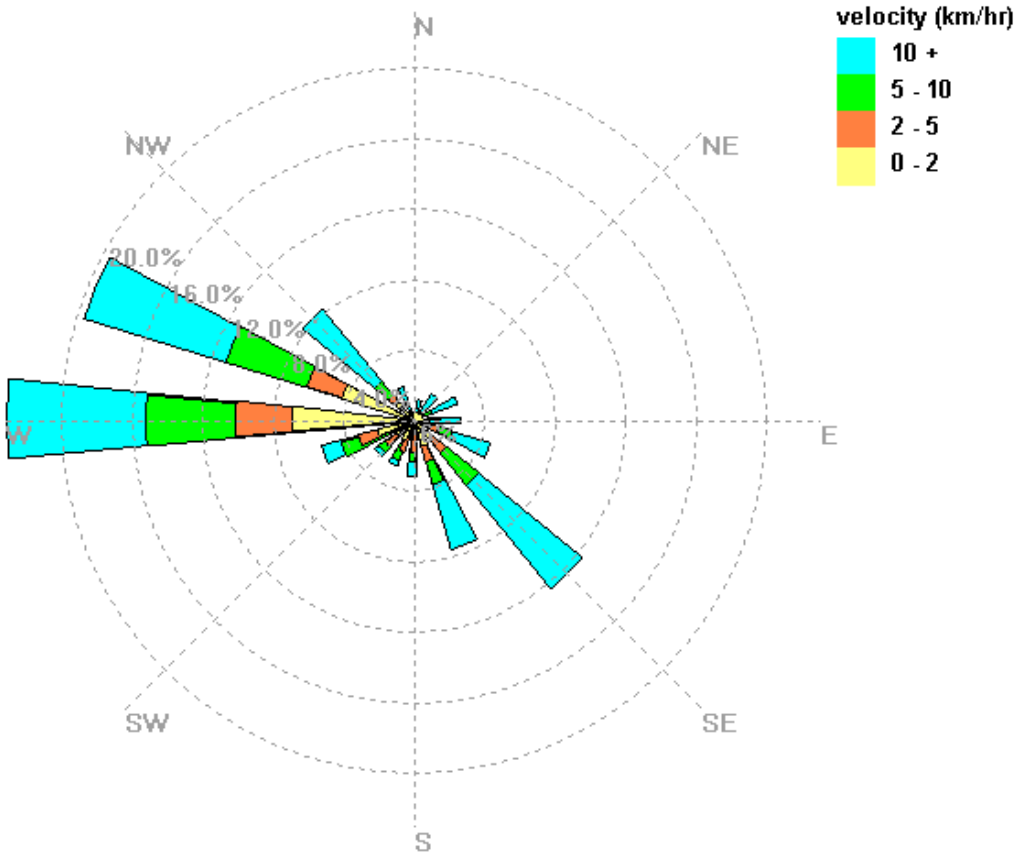

Figure 3.2 - Wind Rose for BSTP (March – May)

3.2.2 Terrestrial Vegetation

The terrestrial vegetation of land to the east of the BSTP is dominated by glasswort saltmarsh (*Sarcocornia quinqueflora*) with associated herbs and introduced grasses scattered throughout (Kingett Mitchell, 1997). This vegetation is considered typical of saltmarsh communities occurring through the lower half of the North Island and the South Island (Knox, 1990).

Land to the south of the ponds is highly modified and has been grazed by cattle, to the extent that glasswort is absent or only sparsely present. Introduced grass species such as salt barley grass, Yorkshire fog and tall fescue are dominant. Open water areas have been created by the removal of soil for stopbanks around the treatment ponds. This land is considered to have little conservation value.

The vegetation, on land to the west of the ponds (including the proposed site of the RIBs), consists of mainly glasswort salt marsh interspersed with bare land, introduced grasses and weed species (see Photo 3.1 showing typical view). Introduced grasses have been oversown, where previous wastewater irrigation has occurred and predominate over salt marsh species.

Vegetation on the land between the ponds and the Wairau Estuary to the north, (i.e. future wetlands location), is dominated by glasswort, interspersed with sea rush (*Juncus* sp) and other small grasses (Cawthron, 2007). Outcrops of gorse and other invasive vegetation are

common. The land has been heavily modified by grazing and walking tracks and is considered to have relatively low conservation value. No species of special scientific or ecological significance have been noted.

Introduced weed species are also prevalent along the margins of walking and vehicle tracks throughout the area around the STP.

Photo 3.1 - Typical Vegetation on Proposed RIB Site

3.2.3 Soils

The site soils have been assessed by PDP for land application of effluent in the *Concept Design of Wastewater Discharges to Land from the Blenheim Sewage Treatment Plant* (refer Appendix C). The soils can generally be described as silty loam, or silt with organics to a depth of about 200 mm on various layers of generally sand, with some silts and clays to a depth of between 2 and 3 m.

The DSIR (1967) describe the STP site as being underlain by Motukarara Soils which are sandy loams to clay loams. Their description includes: "*Can be reclaimed where drainage is possible, but salt must be leached from the soil before pasture or crops are sown, and drainage must prevent upward movement of saline groundwaters through porous subsoils*". The soils are noted to have a very good response to the addition of phosphorus, no response to the addition of sulphur and moderate response to the addition of lime.

PDP note that there was very positive pasture response on the land around the STP that was previously irrigated by PPCS Ltd. From testing carried out by PDP, it can be seen that the soils have medium to high levels of nitrogen and available phosphorus (most sites tested) and high to very high levels of potassium. These nutrient levels are acceptable for general pasture. The soils have very high sodium levels, which probably reflects inundation by the seawater in the recent past. Heavy metal concentrations are considered

typical of what can be expected from marine and freshwater sediments and well below recommended maximum guideline levels.

PDP has assessed infiltration rates on land adjacent to the existing Pond 2A that would be used for the proposed RIBs. Results of double ring infiltrometer testing show average infiltration rates of 80mm /hour.

3.2.4 Surface Drainage

The MDC land contains a number of minor surface drains and depressions that can collect site surface water. The Riverlands Industrial Drain traverses the site (immediately to the south of Pond 1) and carries stormwater east from the Riverlands area to the Vernon lagoons. Another major drain (known as the Riverlands Coop Drain) is located to the south, outside MDC land near SH1.

3.2.5 Groundwater

Groundwater levels have been measured at the site. The results (see PDP report *Concept Design of Wastewater Discharges to Land from the Blenheim Sewage Treatment Plant* in Appendix C) show that groundwater levels are relatively shallow and rise to at or near ground level over winter (depths of ~250 mm). Groundwater depth beneath the site fluctuated by as much as 1.7m over 15 months of monitoring (March to May 2007). Groundwater levels are also influenced by tides with a variation of 60 mm recorded in wells. PDP note that with groundwater depths of less 300 mm, it would not be advisable to irrigate, even in soil moisture deficit conditions.

Shallow groundwater flow direction is expected to be towards the east, consistent with the surface drainage pattern. However, localised variations will occur based on the variation in the water table relative to the water level in the Opawa River.

No sampling has been undertaken in the shallow unconfined groundwater beneath the site. This shallow groundwater occurs within the surface confining strata that overlies a deeper productive aquifer. The shallow groundwater is not abstracted.

3.3 Opawa River

3.3.1 Physical Characteristics

The Opawa and Wairau Rivers drains a predominantly rural catchment discharging to the Wairau Estuary about 2 km to the north of the BSTP. Many of the tributaries to the Opawa run dry for much of the year and groundwater contributes a large proportion of flow. The river has a median freshwater flow in the vicinity of the BSTP of about 4 m^3 per second (net of tidal flows) and a worst-case low flow of about 1.9 m^3 per second. The river is tidal for over 3 km upstream of the BSTP outfall.

3.3.2 Water Quality

A number of water quality studies undertaken in the past 20 years show that the river has very limited capacity to accept effluent discharges from the BSTP. Monitoring shows significant background (above tidal limit) nutrient concentrations due to runoff from

farmland, recycling from soft organic-rich substrate, on-site sewage systems and discharges from groundwater. The existing STP discharge increases the concentrations of ammonia nitrogen, total nitrogen and total phosphorus in the river by between 1.5 and 4 fold.

Background microbiological concentrations in the river (measured as faecal coliforms and enterococci) are also high, as a result of farming practices, urban sources (such as stormwater discharges and onsite sewerage systems) and birdlife. These concentrations are increased by the presence of the STP discharge and are often in excess of guidelines for recreational bathing and shellfish gathering. The relatively small size of the Opawa means that it has limited capacity to assimilate effluent before discernable water quality impacts would be expected. Previous investigations have indicated that its poor upstream quality has, in the past, possibly masked the effects from the effluent discharge.

The results of the 2006/007 summer season bathing water monitoring shows that recreational water quality is poor. On several occasions, upstream sites (Elizabeth Street and Malthouse Reserve) both exceeded the action value of 550 E. coli/100ml (MfE *Bathing Water Guidelines*, 2003).

3.3.3 Environmental Values

The Opawa River is used for a variety of recreational purposes including boating, kayaking swimming, whitebaiting, fishing and bird watching. However, the modified nature of the catchment has degraded water quality and ecological values.

3.4 Wairau Estuary

3.4.1 Physical Characteristics

For the purposes of this report, the term "Wairau Estuary" refers to the confluence of the tidal reaches of the Opawa and Wairau Rivers and the entrance to the Vernon Lagoons. The Estuary narrows at its north-eastern end for approximately 500m in the channel of the Wairau River, where water flows across the Wairau Bar into Cloudy Bay between a constructed guidebank and the naturally–formed Boulder Bank. The Boulder Bank is noted in the Proposed Wairau/Awatere Resource Management Plan (PWARMP) as a "*nationally important landform, which has extremely high historical and Maori spiritual values*". The bank acts as a buffer during storm events protecting the estuary from coastal wave action and inundation. It could act as a future buffer in the event of sea-level rise.

The Wairau River, with a median flow of 71 m^3 per second (Roberts, 1993) , provides the major freshwater inflow to the Estuary. During floods, flushing is dominated by river discharge and a decreased tidal range is observed. During dry periods, ebb tide discharge at the bar is typically 10 – 15 times that of the freshwater input and flows within the system are dominated by tides and wind. On the flood tide, saline waters intrude into the Estuary as a wedge below the outgoing freshwater. The saline water is gradually displaced during the ebb tide, mainly by flow from the Wairau, but pockets remain trapped at points in the upper parts of the estuary (including the Opawa River mouth).

The intertidal areas around the Estuary and upper portion of the Vernon Lagoons are dominated by red algae (*Gracileria chilensis*) and soft mud/sand (see Cawthron Report

"*Ecological Investigations into Discharge Options to Water for the MDC Sewage Treatment Plant, Blenheim*" in Appendix D). Several other substrate types are also present in small areas including cobble fields, firm mud and sand and vegetation such as green algae (*Enteromorpha* sp), and searush (*Juncus krausii*). Figure 4 of the Cawthron Report in Appendix D shows a broad-scale habitat map of the Estuary.

The terrestrial vegetation around the estuarine margins is mostly gorse, grasses (such as tall fescue) and grasswort-dominated saltmarsh species.

3.4.2 Water Quality

There are a number of human influences, which are potential sources of contamination in the Estuary. These were summarised by Roberts and Roan (1992) as follows:

- Inputs to the Opawa River from the BSTP, emergency sewer discharges, urban stormwater from Blenheim and run-off from pastoral farming, and
- Inputs to the Wairau River from the Spring Creek STP, dairy factory effluent and runoff from pastoral farming.

Several investigations have been carried out on estuarine water quality (see Cawthron Report in Appendix D). Testing during 2005/006 summer season showed that sites monitored were generally acceptable for recreation use, with the exception of the Wairau Rowing Club that experienced two exceedances of the MfE (2003) action value of 550 E.coli/100ml. Historical studies show that the water quality is generally not suitable for shellfish consumption. Removal of the STP discharges from the Estuary is unlikely to remove the public health risks associated with shellfish gathering.

No organic enrichment of sediments has been observed downstream of the discharge. This is considered to be mainly due to the high currents in the lower Estuary, which are strong enough to prevent significant deposition of solids. Forrest (2001) concluded: "*….the discharge has no discernable effect on sediment quality or the seabed dwelling macrofaunal community. Sediments downstream of the discharge were primarily clean sands and were not enriched by organic matter or nutrients relative to sites immediately upstream*".

3.4.3 Environmental Values

The Estuary is described in the Coastal Resource Inventory (DoC, 1990) as being a site of national significance, in part, because of several species of threatened birds that transit the area. A description of some bird species of note is contained in the appended Cawthron Report.

The Estuary is a popular area for both recreational and commercial fishers and a variety of permanent, transitory and seasonal estuarine and marine fish are present. The PWARMP notes the area as an important breeding ground and nursery ground for many fish species found in Cloudy Bay. Salmon, brown trout and kahawai angling is popular along the banks of the Wairau Bar and the south bank, north of the Opawa River. Recreational fishing for eel and mullet is also common, with flounder netting inside the Estuary and along the bar towards the Opawa River. The lower Wairau has the largest whitebait fishery in Marlborough, with the season operating between 15 August and 30 November. A list of fish species recorded in the Estuary is contained in the Cawthron report (Appendix D).

Other uses of the Estuary include boating and windsurfing, with duckshooting permitted in the western two thirds of the Vernon Lagoon (accessed by about 80% of local hunters).

3.4.4 Cultural and Historic Values

The BSTP and the surrounding area lies within the traditional rohe of Rangitane, Ngati Rarua and Ngati Toa iwi. The cultural significance of the area including the Wairau Estuary and Vernon Lagoons is described in the "*Proposed MDC Blenheim Wastewater Treatment Plant Upgrade and Resource Consent Renewal Project-Cultural Impact Statement*" (CIA) prepared by Buddy Mikaere and Associates (see Appendix E). The CIA describes the high cultural and spiritual importance that iwi place on Te Pokohiwa O Kupe (the Boulder Bank), Te Wahanga a Tangaroa (the Wairau Estuary complex) and the land bordering the lower reaches of the Wairau River and out to the mouth. These areas were used extensively for food gathering (birds, fish and shellfish) and also contain important sites (wahi tapu).

The PWARMP notes that the Boulder Bank and Wairau Estuary…" *is a very special area with rich historical associations for both Maori and Pakeha*".

3.5 Vernon Lagoons

The Vernon Lagoons are the largest most significant tidal wetland between the Waimea Inlet in Nelson and the Waituna Lagoon in Southland (DoC, 1993). The lagoons lie to the south of the Wairau Estuary and consist of a large expanse of shallow water (an area of about 2,300 ha), which is estuarine in nature.

Despite their location, adjoining the Wairau River, the lagoons only receive limited freshwater flows. Extensive drainage and channel modification has reduced the extent of the wetland area Depths of water vary between 0.1 –0.3 m (away from the main channel). A more detailed review of lagoon hydrology is contained in the appended Cawthron report.

About 1800 ha is held in Crown ownership as a Government Purpose Reserve (Wetland Management), with 40% designated as a Wildlife Refuge (Hansford, 2004). The lagoon is designated as a nationally important bird habitat.

3.6 Cloudy Bay

The Wairau Estuary discharges into Cloudy Bay about approximately 2.5 km east of the BSTP. The Bay is dominated in the north and centre by the marine gravel ridges of Rarangi and the 7 km long Boulder Bank. To the south of the Boulder Bank, are the White Bluffs and steep shingle/gravel beaches.

The PWARMP describes the current water quality of these open coastal waters as very high.

The main offshore commercial activity is trawling for fish species such as tarakihi. Commercial surf clam dredging operates along the beach, north of the Wairau Bar. Recreational whitebaiting and surf fishing are popular along the shoreline. There is a documented surfbreak on the seaward side on the northern end of the Bar.

4 Consideration of Alternatives

4.1 Effluent Reuse and Disposal Options

4.1.1 Overview

The Fourth Schedule of the RMA (1991) requires that alternative methods and locations be assessed. For this consent application, alternative methods for reuse and disposal of effluent, as well as relevant treatment methods and locations, have been assessed.

Currently, treated domestic effluent from the STP is continuously discharged to the Opawa River, while treated industrial flows are discharged to the Wairau Estuary on the ebb tide. The location of these existing discharges is shown on Drawing 6513042-C-623 (see Appendix B).

The possible effluent reuse and disposal options that were identified during the Issues and Options assessment phase for the upgraded BSTP are set out in Table 4.1.

Table 4.1 - Possible Effluent Reuse and Disposal Options

Effluent Reuse/Disposal Options	Description
Domestic/ Industrial reuse	Effluent reuse (e.g. dual reticulation systems)
Application into land by rapid infiltration	Discharge of combined flows to soakage beds adjacent to the BSTP, with under-drainage and discharge of collected percolate to Opawa River/Wairau Estuary.
Aquifer recharge	Discharge of combined flows by injection via bores into aquifers at appropriate points under the Wairau Plain to the northeast of the BSTP
Application to land by irrigation	Discharge of combined flows to suitable land on: ■ MDC land surrounding the BSTP ■ Low areas of Vernon Station to southeast of BSTP ■ Hill areas to the south of BSTP ■ Vineyards near to BSTP
Disposal to water	Discharge of combined flows to one, or a combination of: ■ Opawa River ■ Wairau Estuary ■ Vernon Lagoon ■ Cloudy Bay
Disposal to combination of land and water	Discharge of combined flows to above land areas (summer), with balance of flows discharged to water

4.1.2 Domestic Reuse

Wastewater can be treated to a high quality and used for household uses such as toilet flushing, garden watering and car washing. The ultimate reuse is to make it available for bathing and drinking. While there are no household effluent reuse schemes in New Zealand, the Rouse Hill development northwest of Sydney has operated for a number of

years. This scheme, which now has about 25,000 connections, involves a dual pipe system supplying recycled water for non-potable household uses. The scheme has reduced the demand for potable water by 35%. Wastewater treatment includes micro-filtration and further disinfection by chlorination. There are similar systems in Canberra and other overseas water-scarce areas such as Spain and California. Dual-pipe systems are best employed in new developments, within fast growing urban areas, as the cost of retrofitting the pipework is high.

The BSTP is relatively remote from intensive residential development and the costs of a household reuse scheme would be very high. For this reason, household reuse is not foreseen within the planning period for this consent application.

4.1.3 Industrial Reuse

A number of large industries are located within several kilometres of the BSTP. Several of these industries (e.g. Canterbury Meat Packers and Pernod-Ricard NZ Ltd) are high water users. Generally, they require potable quality water (although some lower grade water could possibly be used for such tasks as yard wash-down and landscape irrigation). However, the demand for this quality water would be seasonal and relatively small in the context of the effluent flow generated at the BSTP. The costs of providing conveyance pipework and pumping to neighbouring industry would be high. Treating BSTP wastewater to potable quality would be feasible, but would be costly and may still be unacceptable from a market perception perspective. While future supply and demand conditions for water in Marlborough may make the reuse of effluent more viable, industrial reuse is not foreseen in the near future.

4.1.4 Rapid Infiltration into Land

Year-round Discharge

Year-round disposal of treated effluent by rapid infiltration onto MDC land has been assessed by Pattle Delamore Partners (see "*Investigations of Options for Land Application of Treated Effluent from Blenheim Sewage Treatment Plant* in Appendix C). Disposal of effluent by rapid infiltration involves discharging wastewater to beds of high permeability soils. The effluent is filtered as it passes through the bed and biological processes breakdown organic material. The beds are rested between doses to allow for aerobic conditions to be maintained.

Rapid infiltration is not a suitable method to use in areas that are subject to ponding, where the existing groundwater levels are already high or where the permeability of the strata is low. The MDC land has high ground water levels in winter, when it is also subject to ponding. Hence, this option is not considered to be feasible on a year-round basis, unless developed in combination with under-drainage and collection of the percolate, which would then be returned to the ponds or discharged to water.

Discharge of Predominantly Winery Flows During Vintage

Application of winery wastewater into land via RIBs would help reduce the peak organic loading on the industrial ponds and provide significant cost savings to MDC and industry due to the need for less mechanical aeration. The application of predominantly winery flows to RIBs, should be considered part of the treatment process rather than as a sustainable disposal option, as the discharge of most of the percolate from under the basins would be collected in cut-off drains and then be pumped back into the treatment ponds. Initial field measurements show reasonable infiltration rates of about 80 mm /hr. Groundwater levels are lowest during the late summer/autumn period and would not likely be a limiting factor (see PDP report "*Conceptual Design of Wastewater discharge to Land from the Blenheim Sewage Treatment Plant*" in Appendix C).

4.1.5 Aquifer Recharge

Treated effluent can be disposed of by pumping directly into an underground aquifer. This would require treating the effluent to a higher standard, than currently achieved at the BSTP, to prevent potential adverse effects on groundwater users. Membrane filtration would be a potential tertiary treatment method, suited to this option, because it would remove solids, which could clog sub-strata, as well as most of the disease-causing microorganisms.

If the aquifer is overused, seawater could move far enough inland to affect users. Aquifer recharge near the BSTP (down-gradient of current groundwater users) could be used to reduce potential inflow of seawater into the aquifer. This is not currently a problem, but may occur if demand for water from the aquifer continues to increase. The injection of treated effluent into the aquifer close to the coast, may enable an increase in groundwater abstraction without increased infiltration of seawater. If water becomes a more valuable resource in the future, this may become a viable option.

A number of aquifer recharge schemes are operating overseas (e.g. Belgium, Spain and the USA), where high quality water is produced using a combination of Ultrafiltration and Reverse Osmosis treatment.

4.1.6 Land Application by Irrigation

The opportunities for land disposal of BSTP effluent by irrigation have been assessed by Pattle Delamore Partners (see "*Investigations of Options for Land Application of Treated Effluent from Blenheim Sewage Treatment Plan*" in Appendix C*).*

MDC-Owned Land Around the STP

Effluent could be applied to MDC land around the BSTP using either deficit or non-deficit irrigation. Deficit irrigation involves supplying water to the soil to replace water that is lost by evaporation or transpiration from plants. This type of irrigation minimises the drainage of additional water, and possibly contaminants to groundwater. Non-deficit irrigation is the application of water to the soil at rates greater than that lost by evaporation or transpiration. This type of irrigation presents a greater risk to the quality of groundwater due to the higher volume of drainage, and less potential for treatment in the unsaturated soil zone.

Non-deficit irrigation would be difficult because of shallow groundwater under the MDC land, which makes irrigation over the winter period difficult and increases the potential for rapid migration of contaminants into the groundwater and possibly runoff to surface water.

There is not sufficient MDC land area around the BSTP to sustainably irrigate all the effluent currently generated by the BSTP, on a year-round basis. However, over summer (November-February), a significant proportion of the effluent could be irrigated (depending on weather and soil conditions). There would be opportunity to apply a lesser effluent volume in April, May and September but little or none of the effluent could be irrigated over the winter period (June-August). With future flows from the STP expected to increase from around 16,000 to 24,000 m^3 per day, the percentage that could be sustainably irrigated to MDC land would reduce. More land and/or storage would be required to maintain or increase the percentage of effluent applied to land.

Options for the management of the irrigation system include stock grazing, "cut and carry" of pasture for silage or hay and tree crops. The large flat nature of the MDC land favours the use of centre pivot or lateral move-type irrigators. Where there are irregular shapes, methods such as k-lines or fixed sprinklers would be appropriate.

Lower Slopes of Vernon Station

Other potential land application areas adjacent to the BSTP have also been assessed by PDP. About 90 ha on the lower slopes of the Vernon Station, approximately 1.5 km to the south of the plant, have potentially impeded drainage but could be utilised for deficit irrigation during summer. It has been estimated that an additional 20-25% of BSTP effluent could be applied to this area in summer. MDC will continue to investigate this opportunity with the landowners after the implementation of the Stage 1 upgrade.

Year-round Application to Hill Areas

Hill areas on Vernon Station and further to the south, have also been investigated using non-deficit irrigation of trees, on a year-round basis (see Figure 1 in the appended PDP Options Report). It is estimated that net areas of about 1,120 and 1,680 ha respectively, would be required to irrigate all of the existing and predicted future flows from the BSTP. As irrigation would be restricted to land with less than a 35-degree slope, the gross land areas required may be greater.

Year-round application to land is not favoured, because of the very high capital and operating costs of the option. The capital costs of conveyance pipework and pumps, as well as and onsite irrigation infrastructure, for a year-round hill country land disposal scheme is estimated at greater than $46 million. Other costs, such as land purchase/leasing and consenting, would be additional. Annual operating costs such as pumping effluent to this area and cutting and removal of trees would be very high.

Consideration would also need to be given to the potential market limitations for the wood from the trees irrigated with effluent.

An alternative to year-round irrigation would be to store the effluent during the winter months. This would necessitate the construction of a pond for up to 2.5 million m^3 of treated effluent, based on predicted future effluent flow rates, plus rainwater. A net area of

at least 1,060 ha would still be required to apply all the effluent to land during the 9-month period from September to May. Extra land would also be required to allow for buffer zones around property boundaries and watercourses.

Summer Irrigation of Vineyards

Treated effluent could be used to irrigate grapevines over the summer months. Based on current flows, an estimated 1,740 ha of vines would be required (based on 2,250 vines per ha and a 6 l/vine/day water requirement). However, irrigating grapes with water containing relatively high levels of nutrients (especially nitrogen) can promote unwanted vegetative growth. This problem could be overcome by reducing nitrogen to low levels in the effluent through further treatment, at significant additional cost.

It is unlikely that grape irrigation would become a standalone system, but there is potential for growers to use effluent in the future as the price of water from other sources increases. However, issues such as any consumer resistance to wine produced from vines irrigated with effluent, Occupational Safety and Health (OSH) requirements in regard to the use of effluent and the cost/benefits of further nitrogen reduction at the BSTP would all need to be addressed. Philip Manson, Science and Innovations Manager with the NZ Wine Growers comments as follows:

"*I am not aware of any schemes currently in operation where vineyards or horticultural crops are irrigated directly with treated sewage. From memory, such a scheme was proposed in West Auckland in the late 90s. The issues of water quality and safety, I imagine, are relatively easy to get empirical data on, the emotional and possibly marketing issues are less simple. Concerns about safety of using the water can be addressed, however, the mental image to consumers of drinking wine made from effluent might be more difficult…*"

4.1.7 Discharge to Opawa River (Status Quo)

Currently, treated domestic effluent from the BSTP is continuously discharged to the Opawa River via a 825 mm diameter pipe. However, there are community concerns about the environmental effects of the BSTP and other discharges to the river.

While no specific study has been carried out on the dilution of the BSTP discharge, the assumed worst-case STP discharge scenario is under low flow conditions (the 10 percentile flow is 1.9 m^3/s). If a mixing zone of 33% of the width of the river is assumed (PWARMP), then there is 0.63 m^3/s available for initial mixing. However, this assumes that full instantaneous mixing will occur within that flow which, with narrow tidal waterways like the lower Opawa, is not likely to occur for some considerable distance up and downstream of the discharge. It is also unlikely that much significant additional dilution will occur within a mixing zone under the PWARMP requirements (i.e. maximum of 200 m downstream and 100 m upstream). A more conservative estimate of river flow at the outfall, which is available for initial mixing with the discharge, is considered to be about 0.5 m^3/s.

The future average flows from the STP (domestic and industrial) are predicted to increase from the current 16,000 to a future 24,000 m^3/day (i.e. 185 to 277 l/s). For the future BSTP flow, the initial dilution in the river at the outfall would be about 1.8 times. However, this estimate does not take into account background contaminant concentrations, which are

already close to the future receiving water standards that are likely to be required. The results of monitoring by Cawthron in 1999-2000 in the Blenheim urban area (see Cawthron report in Appendix D) show that background faecal coliform and enterococci concentrations are already relatively high. On this basis, there will be little or no dilution available for a future BSTP discharge, during low river flow conditions.

It is also likely that some BSTP effluent in the Opawa River near low tide, is conveyed into the Vernon Lagoons on incoming tides.

Because of the existing poor water quality and the limited capacity of the river to accept predicted future BSTP flows, there is no MDC or stakeholder support for this option.

4.1.8 Discharge to Wairau Estuary

Treated industrial flows are discharged using pumps through a 375 mm diameter pipe to the Wairau Estuary over 4 hours on the ebb tide.

Cawthron has assessed the environmental effects of the existing industrial pond discharge to the Wairau Estuary and predicted the potential impacts of future STP discharge options (see "*Ecological Investigations into Discharge Options to Water for The MDC Sewage Treatment Plant, Blenheim*" in Appendix D). As discussed in Section 3.4.2, the existing estuarine outfall is having no more than a localised downstream effect on water quality and benthic ecology. The well-flushed nature of the area of the outfall mitigates any significant adverse effects.

Drogue and dye studies carried out by Cawthron show that the flow direction in the Estuary changes about two hours into the flood tide, but almost immediately on the ebb tide, yielding about eight hours of ebb and four hours of flood during each cycle. The effluent forms a very narrow plume (30 – 40 m wide). During the normal discharge period, the plume is always detected at least 1 metre below the surface, trapped under the freshwater layer.

The lowest dilution of 15:1, based on a discharge rate on the day of the study of 115l/s occurs within 40 m of the existing outfall (see Figure 4.1). A dilutions of 50:1 is generally confined to within 300 m of the diffuser, with dilution in the bar channel, generally between 100:1 and 200:1. It can be concluded that a minimum dilution of 50:1 is achieved at a distance of just over 300 m from the outfall, while the average dilution at 300 m is approximately 100:1.

Figure 4.2 shows a series of aerial photographs taken during the dye test and demonstrates that the plume is split into two streams, one travelling northwest along the coast and a second, that disperses offshore and to the south. The north-westerly stream was the largest and tended to stay close to shore for approximately 500 m. The southern plume moved offshore and to the south and did not appear to make bank contact.

A computer model (USEPA CORMIX-GI) was used to predict the mixing processes under current and predicted future flows. Results of the predicted dilutions at distances from the outfall, are shown in Figure 4.3. A dilution of 50:1 is considered a reasonable "worst case" value, at the end of a 300 m mixing zone, under existing BSTP flows. The results of modelling indicate that a dilution of 25:1 would be a reasonable "worst case" under future

BSTP flows. It would be feasible to discharge up to 900 L/s on the ebb tide without the effluent plume rising to the surface.

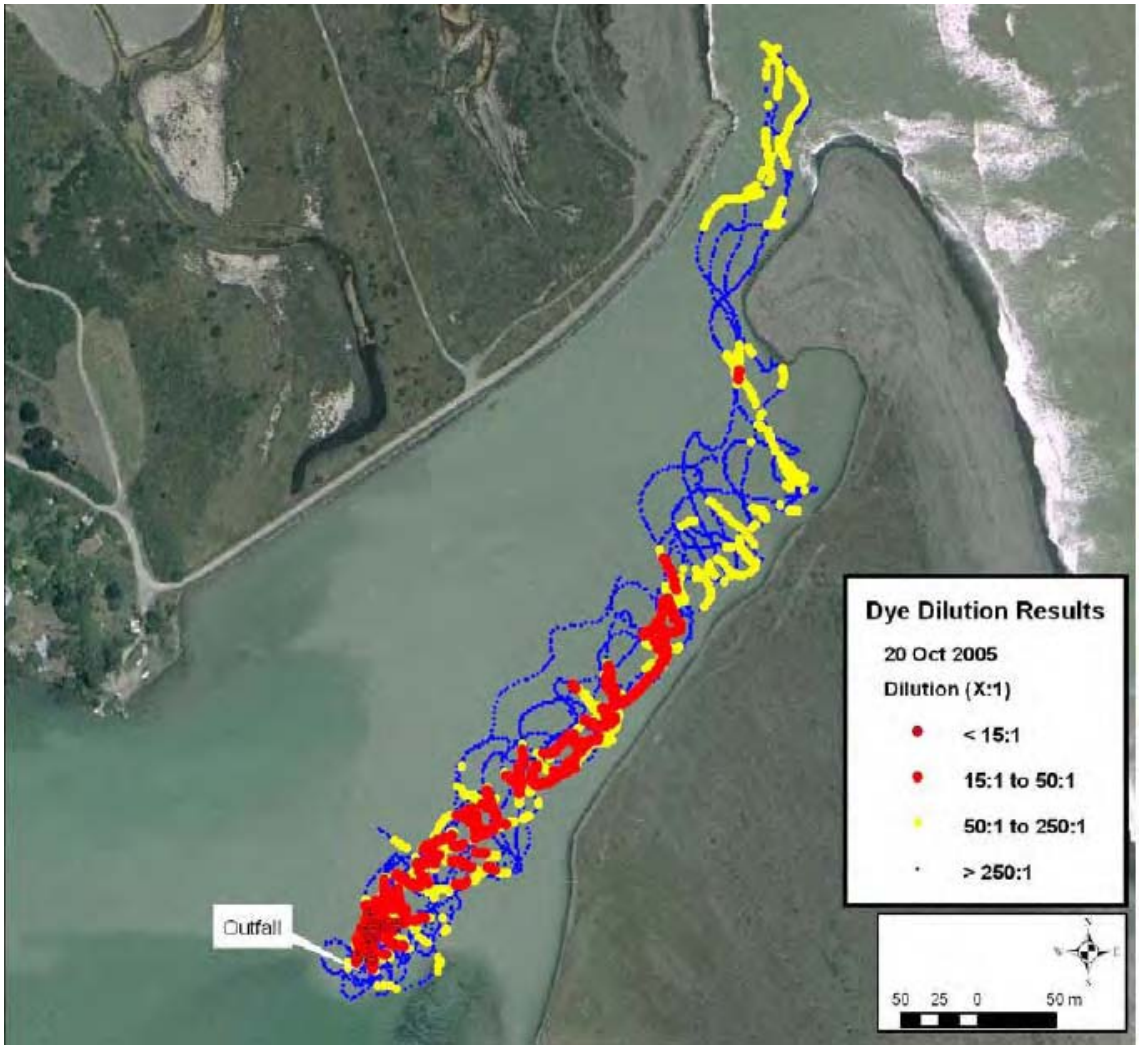

Figure 4.1 - Dye Dilution Study Results for Existing Outfall Discharge of 115l/s

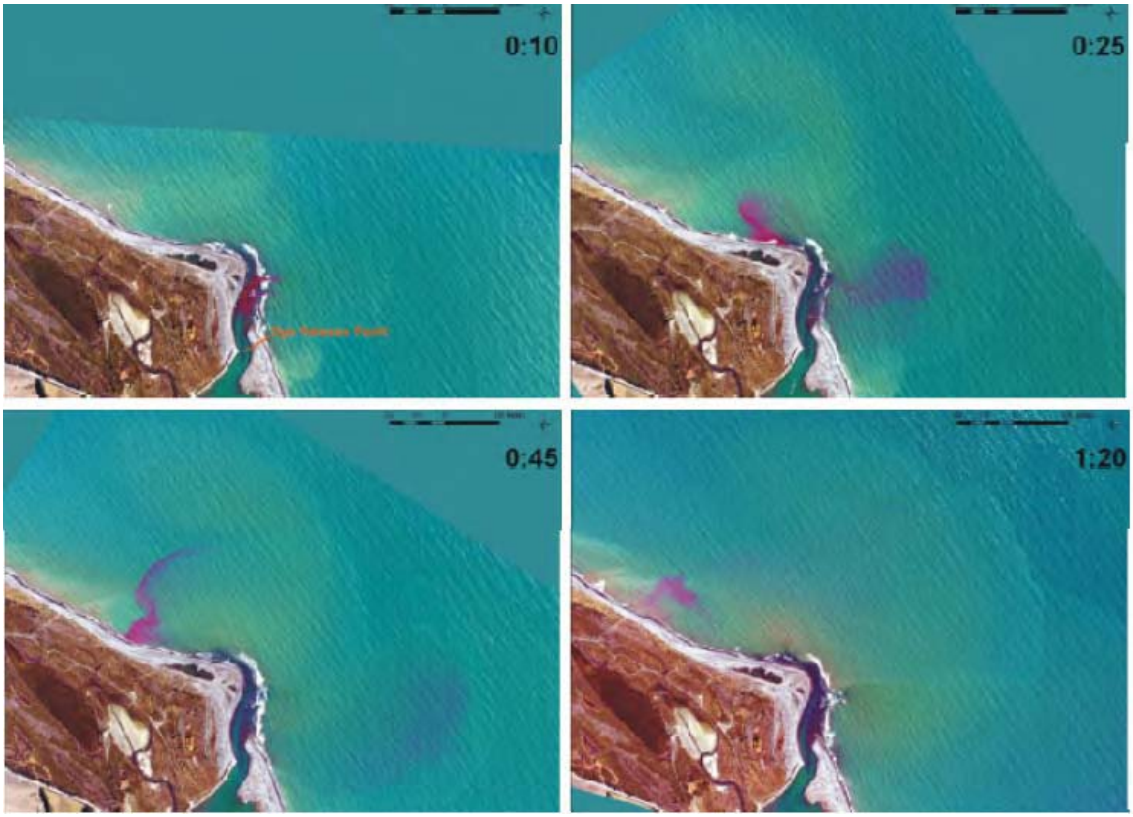

Figure 4.2 - Results of Coastal Dye Studies

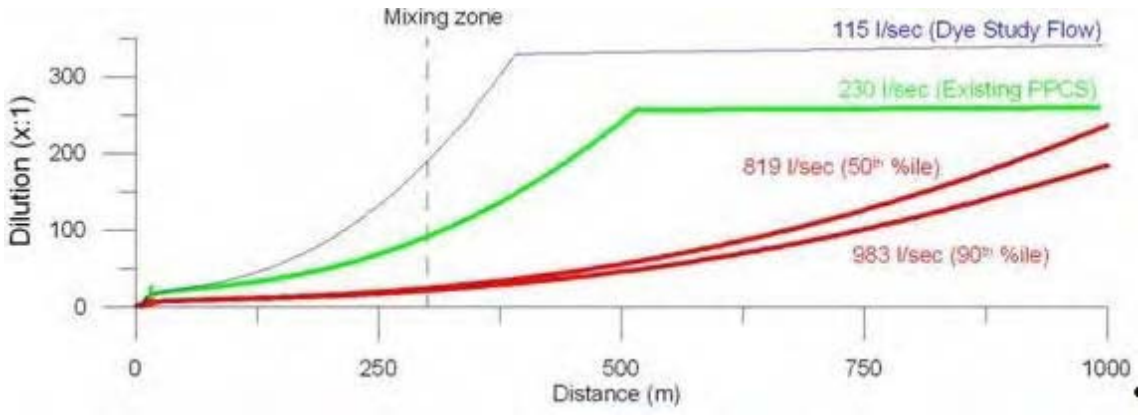

Figure 4.3 - Predicted Dilutions At Distance from Outfall for Existing and Future STP Flows

The options for conveying the existing and future flows to the Estuary have been assessed (see Beca Technical Memorandum on options for flow conveyance in Appendix F). This report concluded that the existing pipe discharge capacity for the outfall cannot pass the PWWF of 103,700 m^3/d as an ebb tide discharge. If the PWWF is to be discharged to the Estuary, duplicating the pipeline with a 1050 ∅ pipe (approximately 2.3 km) will be an expensive option, (at about $4.4 M) due to the dewatering required and the difficult access required for heavy vehicles.

Previous consultation by MDC has indicated that wetlands are favoured for polishing treatment and habitat creation reasons. A long wetland (in at least three cells) to the Estuary would eliminate the need for a duplicate conveyance pipe and could be constructed for less than the large diameter pipeline. The wetland would act as a holding pond for ebb tide discharge through a discharge pipeline (about 400 m) with a new pump and diffuser outfall. Provision may be needed to discharge continuously from the wetland when storage capacity is exceeded under prolonged wet weather events. River flows are expected to be high during such events.

4.1.9 Discharge to Cloudy Bay Via New Marine Outfall

The option of discharging BSTP effluent to Cloudy Bay, via a new marine outfall, would offer a favourable outcome in ecological terms and would allow a continuous discharge of all flows from the BSTP. While a specific location for an outfall has not been identified, it would likely be sited at the nearest offshore point that offers sufficient depth. Due to the shallow depth of Cloudy Bay, a coastal outfall would need to be at least 1000 m long (see Drawing 6513042-C-623 in Appendix B), such that a minimum initial dilution of about 100:1 and adequate separation with the shoreline is achieved. A landline of about 1,000 m would be required to a surge chamber located on the seaward side of the Boulder Bank. This landform is identified as having important cultural and heritage values.

It is noted that local iwi support the concept of an ocean outfall (see Cultural Impact Assessment in Appendix E).

Based on recent experience with other ocean outfalls in the South Island, the capital cost of a new marine outfall is estimated to be about $20 million. Because of the high costs and likely consenting implications of constructing a pipeline through the Boulder Bank, a marine outfall option is not preferred.

4.1.10 Discharge to Vernon Lagoons via Riverlands Drain

While the discharge of effluent to the Vernon Lagoons, possibly through the Riverlands Drain, is possible, proximity to the BSTP is the primary reason for consideration of this option. The Lagoons are relatively enclosed and poorly flushed, and discharging BSTP effluent to them would significantly alter their nutrient status. While this may have a positive effect on bird numbers, by increasing available natural food (as happened in the Avon Heathcote Estuary following commissioning of the Christchurch WWTP ponds in 1962), other cultural and ecological values could be adversely affected by the presence of the discharge. The potential for excessive algae growth (eutrophication) from the additional nutrient loading cannot be readily assessed and the costs of reducing effluent nitrogen and phosphorus concentrations to low levels in the BSTP, would be high.

The disposal of effluent to the Lagoons is not favoured for environmental and cost reasons.

4.1.11 Summary of Short-listed Effluent Disposal Options

Table 4.2 summarises the advantages and disadvantages of the effluent disposal options.

Table 4.2 - Summary of Advantages and Disadvantages of Effluent Disposal Options

Option	Advantages	Disadvantages
Industrial/domestic reuse	■ Water is an important resource in Marlborough	■ Requires costly further treatment ■ Possible community resistance to reuse
Application to land by irrigation	■ Has significant community support ■ Some existing infrastructure in place around STP ■ Good source of supplementary irrigation water and nutrients ■ Meets requirements of iwi and NZ Coastal Policy Statement	■ Significant application only during summer period ■ Year-round system would be costly and require large land areas
Application into land by rapid infiltration	■ Meets requirements of iwi and NZ Coastal Policy Statement ■ Small area required with little potential for odour or aerosol creation ■ Relatively low cost ■ Could be used for seasonal (March-May) application of predominantly winery flows	■ Limited by high groundwater levels in winter ■ Would require extensive system of under-drainage for year-round operation
Aquifer recharge	■ May assist in future protection of aquifer for upstream users	■ Would require very high quality effluent ■ Would require extensive fieldwork to understand local groundwater conditions
Disposal to Opawa River (continuous)	■ Existing consented discharge ■ Could be retained for wet weather discharge	■ Existing discharge is having adverse effects on water quality of river ■ Not supported by any stakeholders
Disposal to Wairau Estuary (ebb tide)	■ Existing consented discharge with low environmental effects ■ Relatively low cost	■ Discharge into area of with recognised conservation and recreational values ■ Not supported by iwi
Disposal to Vernon Lagoon	■ Relatively low cost ■ Additional flows may increase bird habitat	■ Discharge into area of with recognised conservation and recreational values ■ Would require high quality discharge to avoid eutrophication of lagoon

Option	Advantages	Disadvantages
Disposal to Cloudy Bay	■ Low environmental effects with discharge into area of significant dilution and dispersion away from areas of high conservation and recreational values ■ Supported by iwi	■ High costs (~$20m) ■ Possible consenting issues for landline across Boulder Bank (although iwi indicate that this could be possible)

4.2 Wastewater Treatment

4.2.1 Pond-based Systems

Overview

Waste stabilisation ponds (WSP) are common in New Zealand for treatment of domestic sewage. The commonly used term "oxidation ponds", is one type of pond in the overall grouping termed WSP. They are cost-effective treatment systems that are simple to maintain and operate using natural processes, plus solar and wind energy. Algae in this upper aerobic layer produce oxygen by photosynthesis, which is then utilised by bacteria in the water column to oxidise the organic material for energy, and in turn produce carbon dioxide which is used by the algae. Mechanical aeration can provide additional oxygen and mixing.

Pond treatment systems regularly achieve 75-85% BOD (unfiltered) removal (Walmsley et al, 2005). The inclusion of maturation ponds increases the BOD removal efficiency to 85-90%. Suspended solids are normally removed with an efficiency of 65-90% and the effluent consists mainly of algae and zooplankton. Nutrient removal varies greatly, both seasonally, and between pond systems of similar design. Nitrogen removal can range between 9-95%, ammonia nitrogen between 0-95% and phosphorus 20-40% (Craggs, 2005). Ponds are an efficient means of removing potentially pathogenic microorganisms (see Section 4.2.5-**Disinfection**).

Once constructed, ponds have the advantage of low operational costs, though the initial capital cost can be relatively high, if land purchase is required (which is not applicable for the BSTP). Ponds also offer inherent buffering and attenuation of peak flows, allowing subsequent processes to be sized using a lower peak flow factor.

Overloaded and/or poorly managed ponds can be a source of nuisance odour. The use of appropriate buffers to neighbours, together with best practice design and operation (including using supplementary mechanical aeration) can mitigate the potential for odour generation and adverse offsite effects.

New Zealand experience suggests that primary ponds generally require desludging every 15 to 25 years. Sludge can be dredged from the pond while it is in operation and dewatered, or the pond drained and the sludge dried in-situ. Dewatered biosolids can then be taken to an approved disposal/reuse site.

Upgrading of Ponds at BSTP

While the existing BSTP treatment ponds generally perform well, opportunities exist for further improvement. Because of the increasing winery BOD loads, the industrial ponds will be provided with additional aeration and reconfigured to operate in Sequence Batch Reactor (SBR) mode, prior to the 2008 vintage. While opportunities also exist to further subdivide Pond 6 to reduce microbiological organisms, the need for this upgrading would be balanced against future requirements for BOD removal and disinfection.

It can be noted that if both the domestic and industrial wastewaters were to be treated by conventional oxidation ponds, the primary pond area would need to be increased from the existing 29.6 ha to approximately 130 ha, or a net increase in pond area of approximately 90 ha. The total pond area at present is approximately 60 ha, so the overall pond area would increase substantially to 150 ha. An expanded pond area would need to encroach close to existing residential development. While this option would have low energy costs, the loss of buffer distance to houses and the low loading during non-grape processing periods are disadvantages. In addition, irrigation of treated effluent onto land around the STP would be constrained.

4.2.2 Ponds-Based Biodiesel Production

Commercial biodiesel production from recycled vegetable oils, animal fats and soyabean oil is now occurring at a number of overseas locations. Biodiesel can be distributed using existing infrastructure and its use and production is increasing overseas. As the cost of petroleum-based fuel continues to increase, so will the viability of biodiesel as an alternative fuel.

New shallow high-rate ponds could be constructed at the BSTP, adjacent to the existing Domestic Ponds (1 – 5), for enhanced growth of algae that can produce biodiesel.

Unlike the existing oxidation and maturation ponds which are 1.3 to 1.7 m deep, the shallow ponds would be about 0.5 m deep to ensure high sunlight contact occurs to the wastewater, which will promote the growth of the algae. The algae would be harvested and processed to produce biodiesel. If algae are harvested from most of the flow, suspended solids in the effluent would be reduced.

An expanded pond area would need to encroach close to existing residential development. While this option would have low energy costs, the loss of buffer distance to houses and the low loading during non-grape processing periods are disadvantages. In addition, irrigation of treated effluent onto land around the STP would be constrained.

Aquaflow Bionomic Corporation is currently investigating the feasibility of algal growth for biodiesel at BSTP.

4.2.3 Constructed Wetlands

Constructed wetlands are a means of treatment rather than disposal, as a similar flow enters and exits the system. Surface and subsurface-type systems are used, both in New Zealand and overseas, to "polish" effluent from secondary treatment processes (ponds and in-tank).

Surface flow wetlands use a combination of relatively shallow open water areas (effectively ponds) as well as planted sections. The open water sections optimise hydraulic flow through the system and maximise the exposure of microorganisms to sunlight (disinfection). The planted sections provide for additional treatment of contaminants through the processes of sedimentation, filtration, adsorption and precipitation.

Subsurface flow wetlands use a bed of soil or gravel as a substrate for the growth of rooted plants. Effluent flows by horizontally through the substrate where it contacts micro-organisms living in association with the substrate and roots. Bed depth is typically less than 0.6m.

Wetlands have low operational costs and have been found to be effective at further reducing BOD, suspended solids, nutrients, metals and micro-organisms (Kadlec, 1996). Because they resemble natural wetlands, constructed systems also attract a range of wildlife.

The most common difficulties relate to organic overloading or operating excessive water depth, which can reduce contaminant removal efficiencies.

4.2.4 In-tank Systems

In-tank treatment systems could be used to provide additional treatment capacity to that already provided by the ponds ("in-tank" refers to either deeper earth-banked or concrete structures). These systems have the advantage that they can be designed to better treat specific wastewater constituents, such as ammonia, which can be difficult to treat in pond based systems, particularly in winter.

In-tank treatment options such as primary sedimentation and trickling filters have been considered for application at the BSTP, either as alternatives, or in addition to upgrading the existing pond-based system. However, in-tank systems are more complex and have higher capital and operating costs than pond-based systems. Sludge is generated continuously and must be treated and removed.

4.2.5 Disinfection of Effluent

Treatment ponds, as well as chemical and mechanical systems such as UV irradiation, chlorination or membrane filtration are commonly used for disinfection of wastewater. Ponds are currently used for disinfection at the BSTP.

UV is an effective means of disinfection but has relatively high operating costs. Chlorine is losing favour due to the possible formation of chlorinated by-products, which are potentially toxic and persistent within the receiving environment. Membrane filtration is not cost-effective, given the higher than normal effluent flow rates due to infiltration and direct rainfall on the ponds. However, this technology could be considered in the future if either effluent re-use or aquifer recharge became viable options.

The most applicable option at the BSTP, for disinfection of wastewater, is considered to be maturation ponds and constructed wetlands with open-water sections. Treatment ponds are very efficient at removing micro-organisms. Removal of all four main categories of potentially pathogenic organisms (bacteria, viruses, protozoan parasites and helminth parasites) is generally high (Davies-Colley, 2005). Disinfection occurs through

combinations of complex processes including sedimentation (particularly of helminth ova and possibly protozoan oocysts), predation of bacteria and viruses (by native protozoans and flagellates) and exposure to sunlight interacting with high dissolved oxygen and pH. Sunlight exposure appears to be the most important mechanism for removal of bacteria and viruses (Davis-Colley et al, 2000). Relatively shallow ponds and open-water sections (~0.4m) in wetlands allow maximum sunlight contact with the effluent.

Experience in New Zealand has shown that maturation ponds are an effective means of reducing micro-organisms to satisfactory levels. For example, Christchurch Wastewater Treatment Plant (CWTP) uses a series of ponds with a total retention time of approximately 20 days. This configuration is achieving good levels of disinfection in the final effluent (i.e. median faecal coliform concentration of 210 cfu/100 ml). Similarly, the Leeston WWTP consists of eight ponds and reduces faecal coliform concentrations to low levels (median of ~350 cfu/100ml).

The use of surface–type constructed wetlands following ponds can enhance micro-organism removal prior to discharge. The combination of open water and planted sections appears to optimise disinfection, although this is balanced to some extent by the introduction of an additional load of avian faecal micro-organisms. Natural removal mechanisms in the wetland will reduce these numbers.

4.2.6 Sludge and Biosolids Management

The sludge and biosolids resulting from treatment operations and processes are usually in the form of a liquid or slurry, which typically contain from 0.25 to 7 percent solids by weight (Metcalf and Eddy, 2003).

At present, sludge is stabilised at the BSTP by being anaerobically digested in a layer on the base of the ponds. Approximately half of the dry weight of solids is converted to biogas, which discharges to the atmosphere. The original 16 ha domestic pond was desludged in 2000/01 by draining and drying in situ, with the dried solids landfilled at the west end of Pond 2A. Odours were not noticeable beyond the BSTP boundary during the desludging.

Sludge treatment options including processes for thickening, dewatering, drying, digestion, composting and incineration have been assessed. Because of the favourable local climate and successful previous experience at the Blenheim and Picton STPs, biosolids stabilisation by anaerobic digestion in lagoons and solar/air drying in shallow basins or lagoons, is the preferred method. This option has the lowest operating costs.

4.3 Location Options for STP

It is common practice to assume that STP sites continue to be used, when upgrading is proposed, on the basis of "existing use" rights. For example, the recent consenting of pond-based STPs at Rangiora, Leeston, Fairlie, Tekapo, Geraldine and Invercargill was based on the use of the existing site for treatment. Alternative sites would require substantial additional costs for diversion of trunk mains. In addition, the costs of new land purchase and STP reconstruction would be substantial.

Section 171 (c) of the RMA also requires that consideration be given in a Notice of Requirement for a Designation to whether the use of alternative sites, routes or methods

would be reasonable. The continued use of the Hardings Road site is considered reasonable as it is an expansion of an existing facility and is therefore an efficient use of an existing resource.

4.4 Summary of Advantages and Disadvantages of Treatment Upgrade Options

The advantages and disadvantages of the treatment upgrade options are summarised in Table 4.3.

Table 4.3 - Summary of Advantages and Disadvantages of Treatment Upgrade Options

Option	Advantages	Disadvantages
Pond-Based Upgrade Options	■ Simple to construct and operate ■ Robust and able to cope with hydraulic and loading peaks ■ Lower capital and operating costs than in-tank options ■ Generally good effluent quality in combination with constructed wetland before discharge ■ Sludge management inherent and delayed for decades	■ Large land requirements (including buffers) ■ Potential for odour if overloaded ■ Risk of inconsistent effluent quality if pond is upset
In-tank Upgrade Options	■ Small land requirements with high capacity for treatment ■ Consistently high effluent quality ■ Easier odour control	■ Higher capital and operating costs than pond options. ■ Ongoing requirement for sludge/biosolids management at significant costs ■ More complex operation ■ Risks from power and mechanical failure

5 Consultation with Key Stakeholders

5.1 Introduction

The Fourth Schedule of the RMA indicates that an AEE should identify: "*those persons interested in or affected by the proposal, the consultation undertaken and any response to the views of those consulted*".

MDC has consulted with potentially affected and interested parties throughout the development of the BSTP upgrade strategy. The consultation process is set out in Figure 5.1. Key consultation documentation is attached as Appendix G.

5.2 BSTP Upgrade Consultation Strategy During Issues and Options Phase

5.2.1 Consultative Working Group and Individual Meetings

A Consultative Working Group (CWG) was set up in May 2006 with representatives from a number of interest groups. The list of representatives is provided in Appendix G. This group met with representatives from MDC and its consultants on a number of occasions. Individual discussions were also had, during 2006/007, with representatives of the three local iwi (Ngati Rarua, Ngati Toa and Rangitane), business groups, residents and government agencies (MfE, Public Health and Fisheries).

A public meeting was held in February 2007, which also included MDC Councillors, CWG representatives and the local media. A media release, discussing the upgrading proposal, was published in the Marlborough Express.

The CWG continued to meet during the early part of 2007, including a site visit and a demonstration at the STP by Aquaflow Bionomic Corporation (ABC) on field trials to grow algae for biodiesel production.

At a meeting on 2 April 2007, the CWG voted to support the following upgrading strategy for the BSTP (known as the "A+ strategy"):

Stage 1	■ Application of combined domestic and industrial effluent to MDC land around the STP during summer ■ Decommissioning of the existing Opawa River outfall with discharge of the balance of effluent, through new constructed wetlands, to an upgraded outfall in the Wairau Estuary on the ebb tide.
Stage 2	■ Investigation of opportunities for application of effluent to land on the lower slopes of Vernon Station.

The A+ upgrading strategy was ratified by MDC's Assets and Services Committee on 26 April 2007.

5.2.2 Further Iwi Consultation and Cultural Impact Assessment

MDC met with iwi groups in early July 2007 to carry out a site visit and further discuss the proposed upgrading strategy. A hui was held later in July among the iwi groups to share ideas and formulate a position on the upgrading strategy.

A Cultural Impact Assessment (CIA) has been prepared by iwi consultant Mr Buddy Mikaere and this report is attached (see "*Proposed MDC Blenheim Wastewater Treatment Plant Upgrade and Resource Consent Renewal Project Cultural Impact Statement*" in Appendix E). The CIA was prepared following initial briefings with local iwi and MDC representatives, followed by interviews with kaumatua and kuia. The position of local iwi, in respect of the proposed upgrading of the BSTP is discussed further in Section 7.3.4 **Effects on Cultural Values.**

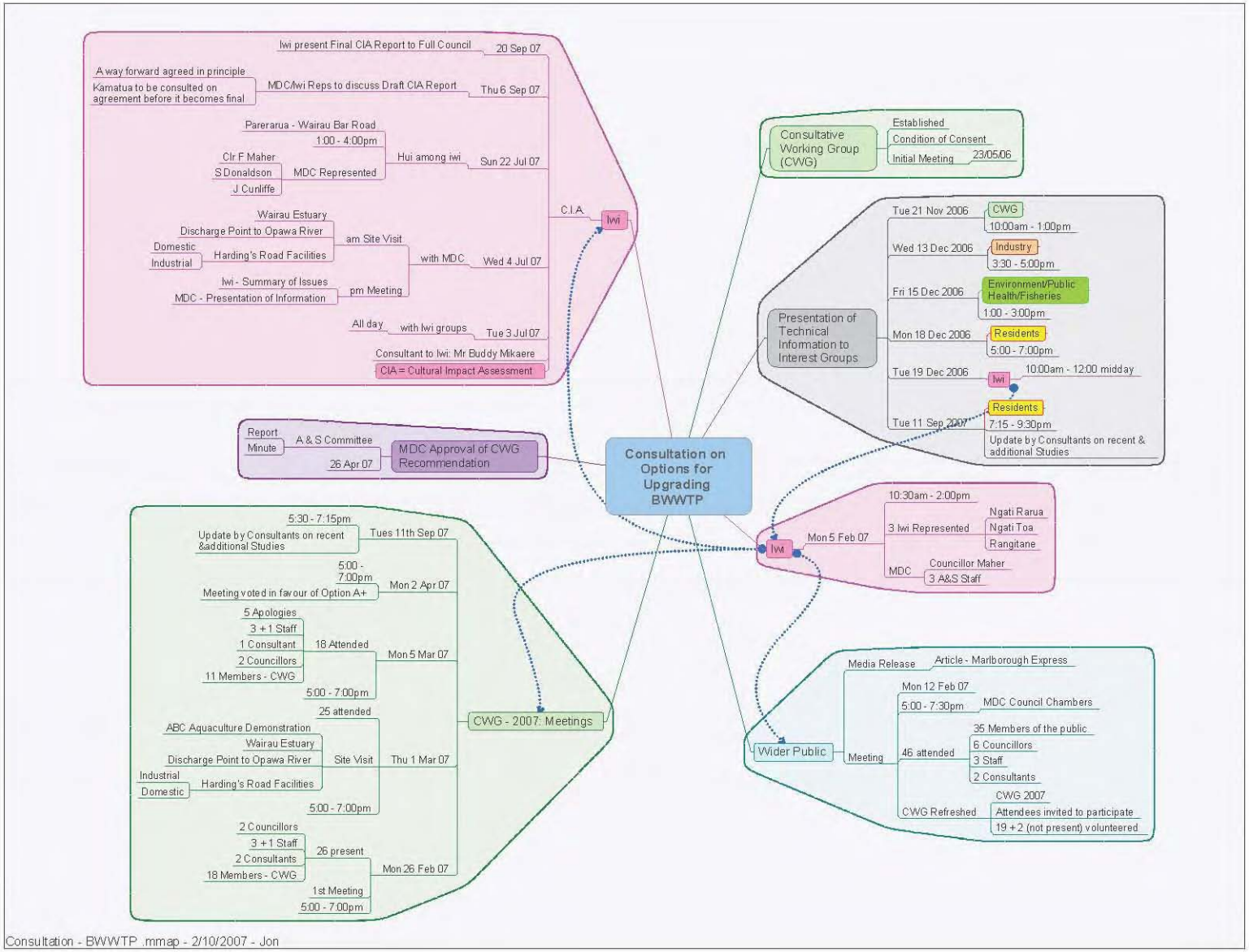

Figure 5.1 - Consultation Process

5.3 Consultation on Draft Assessment of Environmental Effects Report

A meeting were held with residents from neighbouring properties, along the western boundary with MDC land, on 11 September 2007 to discuss the draft AEE report. Meeting notes from this meeting are attached in Appendix G.

The main issues arising from the meeting related to the proposed effluent irrigation system. The neighbours expressed concerns about the potential for spray drift from irrigators and the height of some of the irrigators, which would be a constant reminder that effluent was being applied to nearby land. However, there was also general agreement that the visual appearance of the land would be improved. Residents also expressed concern at the effect of the proposed effluent irrigation system on their property values. It was suggested that a wider area adjacent to the western boundary should be irrigated using driplines, rather than spray irrigators.

A meeting was also held with the CWG on the 11 September 2007. Meeting notes are attached in Appendix G.

The main issue arising from the meeting related to the public health effects of the proposed upgraded outfall to the Wairau Estuary. This included proving more information in the AEE on the acceptable infection risk from the discharge, as a result of contact recreation and shellfish consumption in the Estuary and Cloudy Bay. It was noted that the AEE would be made available on MDC's website and at Council offices. Copies would also be sent to DoC.

6 Description of Proposed STP Upgrade Strategy

6.1 Introduction

The options for upgrading the treatment and disposal of wastewater from the BSTP were considered by the CWG. The following proposed staged strategy (the "A+ Strategy") was recommended by the CWG and subsequently adopted by the MDC.

Stage 1	■ Application of combined treated domestic and industrial effluent to MDC land around the BSTP during summer ■ Application of screened-only winery wastewater to MDC land during vintage (March to June). ■ Decommissioning of the existing Opawa River outfall with discharge of the balance of treated effluent, through new constructed wetlands, to an upgraded outfall in the Wairau Estuary on the ebb tide.
Stage 2	■ Investigation of opportunities for application of treated effluent to land on the lower slopes of Vernon Station and other land areas.

Since the A+ strategy was confirmed in April, 2007, it was determined that, despite the provision of additional aeration on the industrial ponds, there was a higher than expected increase in wastewater loading from the wineries in the 2007 vintage. This resulted in the industrial treatment ponds not having sufficient aeration to meet treatment requirements. MDC is now making provision for additional aeration prior to the 2008 vintage, as well as changes to the operation of the industrial ponds for more effective treatment. In addition RIBs will be trialled to treat a proportion of the predominantly winery wastewater during vintage. This would reduce the peak BOD loading on the industrial ponds and thereby reduce the total additional mechanical aeration required during this period. There would be significant cost savings as a result of the lower energy costs.

6.2 Design Flows

Table 6.1 shows the predicted average daily and peak wet weather design inflows for the BSTP (see Beca Technical Memorandum, 2006 in Appendix F*)* with updates for recent experience of industrial flows.

Table 6.1 - Future BSTP Design Flows

Inflow Component	Future ADF	Future PWWF
Domestic Inflow	17,000 m³/d (200 l/s)	64,800 m³/d (750 l/s)
Industrial Inflow	6,600 m³/d (76 l/s)	28,500 m³/d (330 l/s)
Subtotal Inflow	23,600 m³/d (a) (276 l/s)	93,300 m³/d (1080 l/s)
Total (with margins) for Discharge	**28,500 m³/d (b) (330 l/s)**	**103,700 m³/d (c) (1,200 l/s)**

Notes:

(a) The 50 percentile ADF discharge rate is this value also.

(b) Includes additional 20% margin to account for seasonal flows that can be sustained for weeks or months, effectively the 90 percentile discharge flow.

(c) Includes additional 10% margin so that direct rainfall on the ponds can be discharged. It is very unlikely that peak industrial flow will coincide with peak domestic flows, giving a greater allowance for direct rainfall discharge.

(d) Evaporation and seepage rates assumed negligible, relative to inflows.

6.3 Design Contaminant Loads

6.3.1 Basis of Domestic Load Prediction

The predicted BOD load for the BSTP domestic ponds is 3,400 kg/day from a population of approximately 37,000 which includes allowances for growth until 2026 and connection of presently unsewered communities around Blenheim – refer to Issues and Options Report. This has been estimated using 0.09 kg BOD/person/day, which reflects some usage of kitchen sink grinders and allows for normal commercial activity and small industrial premises in an urban centre of this size.

The average unit BOD loading of 97 to 113 kg/ha/day on the primary ponds is in the range recommended by Mara, D et al (1998). Aerator assistance on the primary ponds will allow such loads to be handled by the primary ponds. If there are higher loads, or one pond is upset or out of service, Pond 1 (fully aerated) can be used to reduce overall BOD loading on the primary ponds by about 40%.

The loads entering the domestic ponds will be re-evaluated to assess future design capacities after separation of the main industrial flows.

6.3.2 Basis of Industrial Load Prediction

There is some uncertainty about industrial wastewater load increases at the BSTP in the coming years. Unlike domestic sewage loads, which can be forecast with reasonable accuracy, based on demographic changes within the catchment, industrial loads can increase significantly from one year to the next, based on changes in industrial plant throughput and processing capability.

The key influence on industrial load at the BSTP over the next 5 years is expected to be winery production. While some wineries have traditionally treated their own wastes on-site, this is not feasible at the Riverlands Industrial Estate (RIE) because of land constraints

and the potential for adverse environmental effects (especially odour). Total grape crush in the RIE is forecast to increase substantially between 2006 and 2009, after which, it is expected to level out (consistent with predicted grape plantings). This will have a significant effect on peak BOD loadings at the BSTP. There was a substantial increase in BOD loadings on the BSTP industrial ponds between the 2006 and 2007 vintage. The actual and predicted BOD industrial loadings are shown in Table 6.2.

The CMP flows can be diverted from the domestic to the industrial ponds if required to reduce BOD load on the domestic ponds and provide nitrogen and other nutrients for treatment of high carbon load winery wastes. However, if RIBs are used for industrial wastewater, the CMP flow will need to be treated by Dissolved Air Floatation to remove fat, or be fed to the domestic system. The fat would clog the soil in the RIBs and create odour.

Table 6.2 - Actual and Predicted Industrial BOD Loads

	2007 Predicted	2007 Actual	2008/009 Predicted	Maximum Pond Capacity
Peak BOD Load (kg/d)	7,300	11,000	15,400	20,200

6.4 Existing Treatment Ponds

As noted earlier, there were higher than expected increases in wastewater production at the RIE wineries in 2007. This resulted in Industrial Ponds I1 and I2 having insufficient aeration to cope with peak BOD loading. A review carried out by Beca showed that the BOD loading on Pond I1 was in excess of what is recommended. A reconfiguration of the pond operation philosophy is therefore considered necessary prior to the 2008 vintage. Sequence Batch Reactor (SBR) is a treatment process involving the following steps: filling, mechanical aeration/ settling, decant and quiescent period. Because of the relatively long retention times in the industrial ponds, an initial cycle with the flow fed to Pond I1 for about 11 hours and Pond I2 for 13 hours is proposed. When the ponds are operating at maximum SBR capacity, the daily cycle will reflect the volumes of the ponds (i.e. 8 hours Pond I1 and 16 hours Pond I2). Total mechanical aeration in the two ponds will need to be increased from 396 kW in 2007 to an estimated 741 kW in 2008/009 (with a future maximum of 816 kW estimated based on current winery peak load predictions).

Treated wastewater from the final domestic pond (Pond 5), together with treated industrial flows from Ponds I1 and I2 will be discharged into Pond 6. These combined flows will then be either irrigated to land (after Pond 6), or conveyed to the wetland via a new 900 mm pipeline (see Drawing 6513042-C-624 in Appendix B).

Opportunities also exist to further subdivide Pond 6 to reduce microbiological organisms, prior to discharge to the Estuary. However, it is expected that similar improvements in effluent quality will be achieved by constructing the new wetland (see **Constructed Wetland** below). The need for any additional upgrading of Pond 6 would need to be

balanced against the future requirements for BOD removal, as well as the performance of the proposed wetland.

6.5 Ancillary Structures

It is proposed to construct a new utility building adjacent to the existing treatment ponds and within the designated area. The building, which will provide for storage of mechanical equipment and chemicals, will have a floor area of about 16 x 12 m and be about RL 5 m. It is also proposed to construct a silo which will provide for storage of lime that will be used for pH correction of wastewater. The silo would have an approximate volume of 20 m^3 and the top will be about RL 6 m. It will be located within the designation.

Enclosures (likely container-type) to house one, possibly two, 500 kVA on-site diesel generators will also be constructed within the designated area.

6.6 Land Application

6.6.1 Treated Industrial and Domestic Wastewater

The BSTP produces a good quality effluent that is characterised by relatively low nutrients, metals and microorganisms. With appropriate mitigation measures, this effluent is considered suitable for application to MDC land around the BSTP on a deficit irrigation basis. PDP has prepared a report that discusses concept design considerations for the application of treated effluent and winery wastewater to land (see *Concept Design of Wastewater Discharge to Land from the Blenheim Sewage Treatment Plant* in Appendix C).

It is estimated that there is 220 ha of potentially irrigable MDC land with about 190 ha available when allowances made for buffers to surface water. Three distinct areas have been identified: Area 1, to the west of the ponds, is currently grazed and has distribution piping in place to begin irrigation immediately; Area 2 to the north of the treatment ponds, is low lying, consists of generally poor quality saltmarsh and pasture and would require the installation of new irrigation piping; Area 3, to the south of the ponds contains small shallow drains and is bounded by several larger drains. It is currently grazed with cattle. The area also contains a small forestry block, a MDC-owned house and an access track for MDC staff and septic tank trucks. Area 3 would require the installation of new irrigation piping and require modification of onsite drainage.

The irrigation of treated effluent can cause risks to public health, if not properly managed. The proposed approach at the BSTP will be to use application methods appropriate to the land area being irrigated. Irrigation is proposed on two zones as follows (see Figure 6.1):

- Land immediately inside the boundaries of MDC land (or land accessed by the public on MDC land) would be irrigated by surface or subsurface drip systems. No spray irrigation would occur in this zone. The width of this zone, where MDC land does not directly border neighbouring rural properties, is 25 m. However, where MDC land borders neighbouring rural properties, it is proposed to use drip irrigation up to 80 m from the boundary.

- Greater than 25 m from the MDC property boundary (or 80 m for the MDC land bordering neighbouring properties), application with travelling irrigators (such as the existing Briggs Rotorainers, centre pivots or linears) would occur.

The average daily application depths will vary but will typically be 5 mm in summer, reducing to less than 1 mm in winter, depending on rainfall, soil and groundwater depth. A summary of application depths for different application methods is provided in the appended PDP Concept Design Report.

The annual volume that could be applied to land will depend on the area irrigated and weather conditions. Because of the good quality of the treated effluent, it is proposed to limit irrigation to when the groundwater depth is greater than 0.3 m below ground level. Median monthly applications are estimated to range between zero in June, July and August to more than 230,000 m^3 in December and January, (see Table 9 in the appended PDP Concept Design Report).

6.6.2 Predominantly Winery Wastewater During Vintage

The winery wastewater during vintage is characterised by high concentrations of BOD, low concentrations of nutrients and fats and a low (acidic) pH. While the wastewater only contains small quantities of human wastes, monitoring shows relatively high concentrations of indicator bacteria (faecal coliforms and enterococci). However, it is noted that there are a number of micro-organisms that can give false positive readings of faecal contamination. Because of this uncertainty, it is not considered appropriate to apply this effluent to land by spray irrigation.

Depending on the results of pilot trials proposed for 2008, it is proposed to discharge a portion of winery wastewater to land by rapid infiltration during the vintage. This would reduce the peak organic (BOD) loading on the industrial ponds, thereby reducing the high costs associated with mechanical aeration. The wastewater would be screened and dosed with lime (or similar) to increase pH, before being discharged to the RIBs. The proposed location of the rapid infiltration basins (RIBs) is shown in Figure 6.1.

RIBs are typically operated on a rotational basis that allows for filling followed by several days to allow drainage and drying. Approximately 28 basins operated on a seven day rotation are proposed at the BSTP. Each basin would be about 0.25 ha in area (i.e. total area of 7 ha). The criteria for determining the loading rate in the RIBs are based on USEPA (2006). Because of the high organic loading, the loading rate will be determined by the BOD concentration in the wastewater. The daily dosing volume will range from 500 m^3 to 2500 m^3 (200 kg BOD/ha/day to 1000 kg BOD/ha/day). While BOD loading rates in this range have been reported in the USA, the generally accepted maximum loading rate is 600 kg BOD/ha/day (Whitehouse, 2000). Based on this loading BOD rate, the likely maximum daily application volume to the RIBs is 1,500 m^3.

Double ring infiltrometer measurements at the proposed RIB site show that the underlying soils have an infiltration rate averaging about 80 mm/hour. The USEPA (2006) recommend an annual loading rate of 2-4% of the measured infiltration. This equates to 36,600 m^3 per day, over a 7 ha area which is significantly greater than the allowable

application volume based on BOD loading. The design loading will be confirmed during pilot trials in the 2008 vintage.

Subsoil cut-off drains would be constructed around the RIBs to intercept a large proportion of the discharged wastewater, thus avoiding mounding of groundwater due to the applied wastewater. These intercepted flows, which would have significantly lower BOD than the winery wastewater, would then be pumped back to the treatment ponds.

Pasture plants would be retained on basin beds to promote the further treatment and infiltration of effluent (through the development of root systems) but will need to be periodically cut. Wastewater pH correction will avoid toxicity effects on plants and to help maintain appropriate soil conditions for infiltration of wastewater.

Photo 6.1 shows typical RIBs in operation at the Leeston WWTP near Christchurch.

Photo 6.1 - Typical RIB Operating at Leeston WWTP near Christchurch

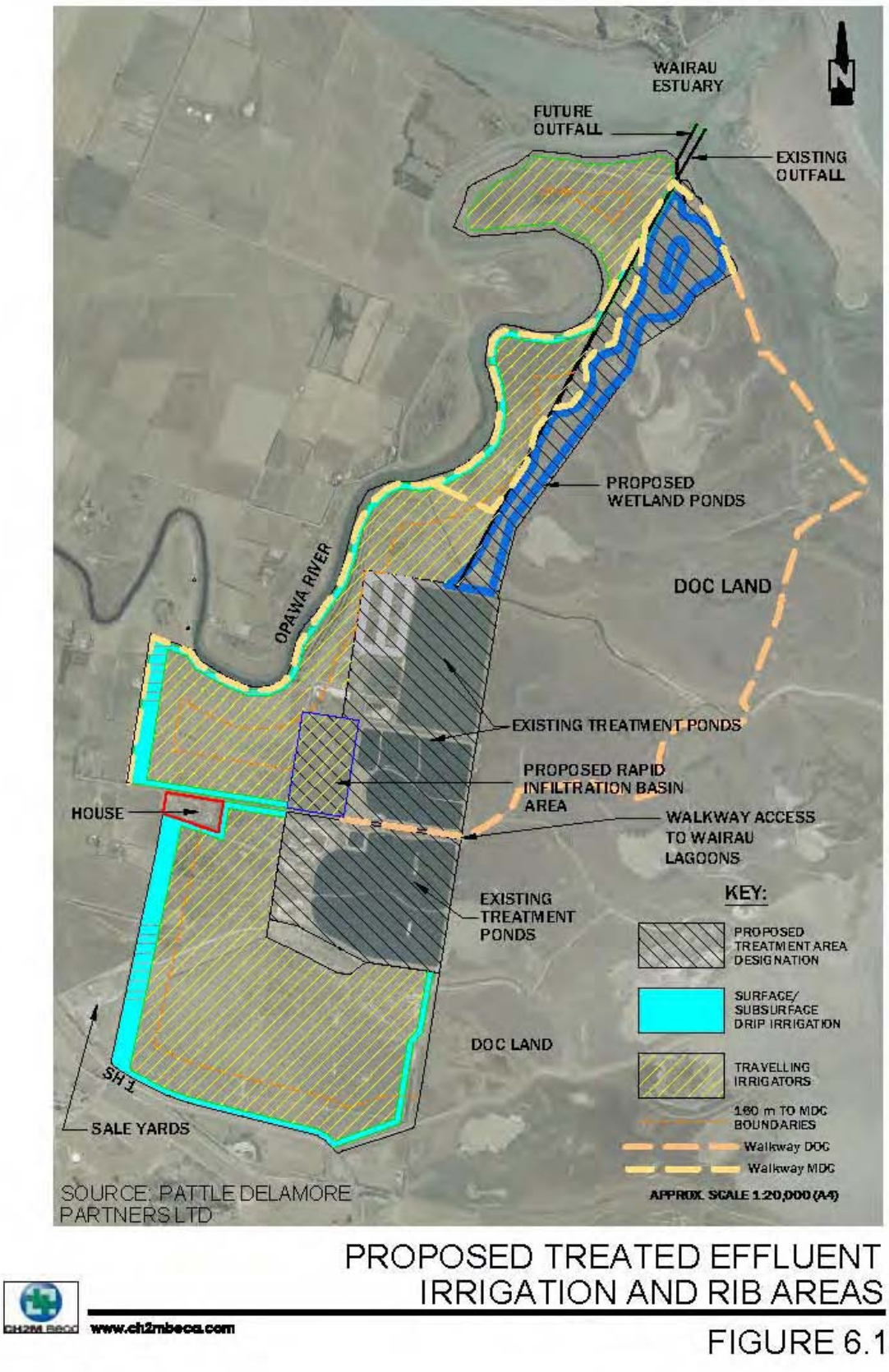

Figure 6.1 - Proposed Treated Effluent Irrigation and Rib Areas

6.7 Constructed Wetland

It is proposed to discharge treated combined domestic and industrial flows that are not applied to land, via a new long wetland to the deep channel in Wairau Estuary, near to the existing outfall location. The wetland would provide sufficient storage for an ebb tide discharge.

Figure 6.2 shows a schematic of the proposed wetlands. A proposed layout and longitudinal section for the wetland are shown on Drawings 6513042-C-624 and 625 in Appendix B.

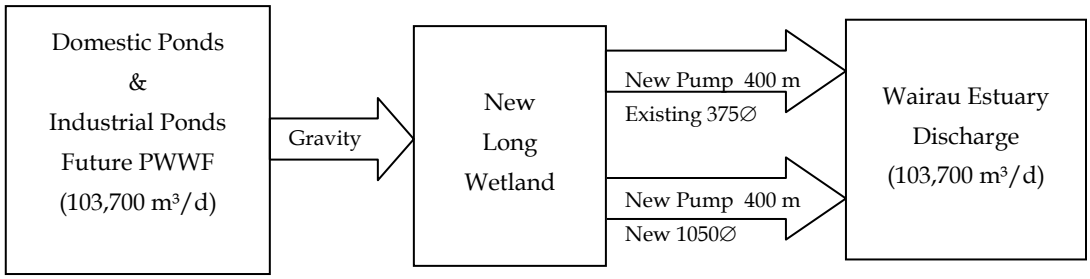

Figure 6.2 - Wetland Flow Schematic

The proposed wetland would have a minimum area of about 10 ha and consists of a series of planted and open water sections (effectively maturation ponds and numbered Ponds 7-10 in Drawing 6513042-C-624), which are the best configuration for hydraulic efficiency, wastewater polishing and natural habitat creation. This layout conforms with the latest recommendations published in the USEPA Design Manual "*Constructed Wetlands Treatment of Municipal Wastewaters*" (2000).

Ponds 7-9 have an average operating depth of 0.8 m, while Pond 10 will be about 1m deep. The wetland will have a retention time of >5 days at future average daily flows. Open water areas will allow for sunlight penetration and re-oxygenation through algal activity. Suitable vegetation in the planted section promotes the transfer of oxygen through their roots and also provides a sub-surface medium for the attachment of the microorganisms that assist in the treatment process. Regular harvesting of the wetland vegetation may be required to maintain free flow conditions and prevent channelling. The wetland would also have perimeter planting for bank stabilisation. The plantings will be based on local native species such as flaxes, reeds and sedges. Rushes such as *raupo* will be avoided due to their invasive growth habit and potential for dieoff in winter. Die-off can lead to decomposing vegetation accumulating in the wetland and possible odour nuisance, as well as the potential for reduced treatment performance.

The wetland will attract additional birdlife, given its proximity to the Vernon Lagoons.

6.8 Outfall to Wairau Estuary

6.8.1 General Design Features

A new 400 m long 1050 mm diameter outfall pipe and diffuser will be constructed from the final wetland pond (Pond 10), parallel to the existing 375 mm diameter pipeline, to the

Wairau Estuary (see Drawing 6513042-C-624 in Appendix B). The new pipe will handle initial average flows by gravity, but wastewater will need to be pumped from the wetland under predicted future average flows, or when the Wairau River level is high due to floods (not necessarily coincident with peak BSTP flows). Wet weather flows will require low-head pumping. The existing 375 mm diameter pipeline will be retained as an emergency backup (e.g. for wetland maintenance) but will not be used during normal operation.

It is proposed to discharge effluent under all but extreme wet weather conditions (represented as 90%ile worst case effluent flows) for 4 hours per tidal cycle, commencing about 1 hour after high tide. This discharge scenario has been shown by modelling (DHI, 2007) to be the most effective for transport of effluent from the Estuary into Cloudy Bay.

The ponds/wetlands will be designed with available storage of approximately 50,000 m^3, which will be adequate to store up to the 90 percentile effluent flow case, between each tidal cycle. However, under prolonged wet weather conditions, peak effluent flows (including rainfall on the ponds and wetlands), will substantially increase. When the storage capacity of the wetland is exceeded, it will be necessary to extend the discharge period for longer than 4 hours on each ebb tide. Provision for storage of effluent plus rainfall under all weather conditions will not be practicable. This increase in discharge period will be coincident with high flows through the Estuary and not have a significant adverse effect. The 4 hour ebb tide regime will be resumed as soon as peak effluent flows are discharged and wetland storage capacity is available.

The new outfall pipeline will be buried under the bed of the Estuary to an approximate depth of 2 m before emerging in the channel. Likely pipe materials will be concrete, polyethylene or fibreglass.

Discharge of domestic pond effluent to the Opawa River will need to continue until the STP upgrade work is commissioned.

6.8.2 Construction Methods

The construction of the new outfall pipe could be carried out by several different methods. The preferred methods will be determined by the Contractor, in agreement with MDC at the time of tendering. Confirmation of the geotechnical conditions along the pipe route would be required before the method was agreed. Possible construction methods include:

Excavated Trench with Sheet Piling

An access/working platform would be constructed from the edge of the estuary following the pipeline route to the endpoint. The pipeline trench would be sheet piled to prevent collapse, to minimise the width of the excavation and to enable construction in dry conditions.

The estimated width of the platform and trench would be 25 m. The trench would be excavated using a digging or suction method. The excavated material from the top half of the trench would be removed to a temporary stockpile on adjacent land and mixed with other material, prior to reuse as cover over the pipe. The remaining excavated material would be reused around the site.

The pipe would be laid in bedding material for support and the trench filled to just below existing levels to allow surrounding sediments to infill.

The sheet pile and working platform would be removed once the pipe was laid.

Horizontal Directional Drilling

A tunnel could be drilled under the Estuary and steered to the target point with a remote-controlled drill. A small borehole is initially opened and the hole injected with bentonite (a natural clay) to prevent collapse. A winch is set up at the tunnel outlet in the Estuary and the hole progressively widened by passing reamers back and forth. The pipeline would be about 2m below the Estuary bed until it emerged in the channel and works at ground level would be limited to the area at each end of the tunnel. Excavated material would be reused on site.

There is equipment available in New Zealand to drill a hole to fit a 1,350 mm diameter pipe (URS, 2004).

Micro-tunnelling

Micro-tunnelling involves the use of a remote cutting shield (boring machine) which is fitted to the front of a lead pipe. The machine is advanced along the pipe route by jacking the pipe forward. Pipe sections are coupled onto the lead pipe in the jacking pit before they are moved forward. The pipeline would be about 2m below the Estuary bed until it emerged in the channel.

Excavated material is pumped back through the pipe using internal lines. This material would be reused onsite.

Tunnels up to 2.1 m in diameter can be bored over distances up to 1,000 m (URS, 2004).

6.9 Design Effluent Quality

6.9.1 Land Application of Screened Winery Wastewater During Vintage

During vintage, effluent from Pernod Ricard and the wineries in the Riverlands Industrial Estate would be passed through a 3 mm screen at the BSTP, pH-corrected and then applied to land via RIBs. The quality set out in Table 6.3 is based on an assessment of available monitoring data and growth predictions.

Table 6.3 - Quality of Screened Winery Wastewater During Vintage

Parameter	Units	Median[a]	90 percentile [a]
pH [b]`		4.5	7
Total COD	g/m^3	5,300	7,690
Total BOD	g/m^3	1,990	4,520
Total Suspended Solids	g/m^3	590	1,270
Total Fats	g/m^3	Negligible	Negligible
Total Nitrogen	g/m^3	45	120
Ammonia-Nitrogen	g/m^3	2	8
Sodium	g/m^3	165	320
Faecal Coliforms	cfu/ 100 ml	6.7×10^5	1.3×10^7

[a] Numbers rounded as appropriate

[b] Prior to pH correction

6.9.2 Land Application of Treated Wastewater

The combined treated domestic and industrial effluent will be pumped from the outlet of Pond 6 to land around the BSTP, when weather and soil conditions allow (i.e. under a deficit irrigation scenario). Provision will also be made for wetland-treated effluent to be applied to MDC land to the north of the Pond 6 (i.e. between the east and north of the wetland and the river and Estuary). The existing BSTP effluent quality shown in Tables 6.5, 6.6 and 6.7 (i.e. after Pond 6 without wetland polishing) has been conservatively assumed for land application.

6.9.3 Discharge to Estuary

When land application is not possible, the combined treated domestic and industrial effluent will be pumped from the outlet of Pond 10, at the end of the wetland, and discharged into the Wairau Estuary for 4 hours on the ebb tide. The predicted effluent quality, as shown in Tables 6.4, 6.5 and 6.6, has been assumed for the Estuary discharge. This predicted effluent quality reflects the additional "polishing" provided by the wetland and allows margins for the variability inherent in natural systems.

It should be noted that algal blooms can occur from time to time in the ponds or wetlands and these blooms will increase SS, and BOD associated with SS. The BOD, derived from algae decomposition during the standard laboratory test in a "dark incubator" over five days, is not representative of actual field conditions wherein the algae continue to produce oxygen during daylight and are dispersed over a very wide area during a five day travel period. Thus, algae-derived SS and BOD should not be used as limits in consent conditions.

Table 6.4 - Predicted BSTP Treated Effluent Composition (year-round)

		Existing		Future	
Parameter	**Units**	**Median**	**90%ile**	**Median**	**90%ile**
Total BOD	g/m^3	32	70	25	50
Suspended solids	g/m^3	60	110	45	80
Total P	g/m^3	6	7	6	7

Table 6.5 - BSTP Treated Effluent Composition (Seasonal)

			Existing		Future	
Parameter	**Units**	**Season (a)**	**Median**	**90%ile**	**Median**	**90%ile**
Total N	g/m^3	Summer	14	22	12	20
		Winter	28	34	24	30
Ammonia-N (b)	g/m^3	Summer	0.7	3.2	0.5	3
		Winter	19	24	15	20
Nitrate/Nitrite	g/m^3	Summer	2.2	6.5	2	5
		Winter	0.5	1.1	0.5	1
Faecal Coliforms	cfu/ 100 ml	Summer	500	2,000	200	700
		Winter	500	16,000	250	1000
Enterococci	cfu/ 100 ml	Summer	100	1,000	50	500
		Winter	300	3,000	100	600

Notes:

(a) Summer = 6 months from November – April inclusive; winter May to October inclusive

(b) Due to some samples having very low ammonia-N concentration, only the median values have been used.

Table 6.6 - BSTP Maximum Effluent Metals Concentrations

	Zinc	Copper	Arsenic	Chromium	Nickel	Lead	Mercury	Chromium
Concentration (µg/l) (a)	43	12	10	6	5	3	1	0.5

(a) Based on existing BSTP monitoring data (i.e. no provision made for further metals removal in wetland).

6.10 Target Upgrade Implementation Programme

It is proposed to implement the Stage 1 upgrade works as soon as resource consents are granted. Assuming consents are granted by end of June 2008 and there are no appeals, the target implementation programme is as follows:

Item	Target Implementation by
Design of New Wetlands and Irrigation System	September 2008
Preparation of Contract Documentation	September 2008
Tendering and Contract Award	November 2008
Construction Completion	Autumn 2010 (allow two summers for construction)
Wetland Planting	Spring 2010

7 Effects on the Environment and Proposed Mitigation

7.1 Introduction

This section provides an assessment of the potential effects on the environment from the construction and operation of the proposed Stage 1 upgrade of the BSTP, taking into account the provisions of the Fourth Schedule of the RMA. This schedule includes matters that must be considered when assessing effects on the environment. Where adverse effects have been identified, mitigation measures are proposed.

7.2 Construction Effects

7.2.1 Introduction

The Stage 1 upgrade includes the construction of a long wetland and outfall pipe (over two summers to allow for unforeseen adverse weather). The excavation of significant quantities of soil to create the wetland has the potential to cause nuisance to surrounding landowners and short-term adverse environmental effects, unless properly managed. Construction of other components of the upgrade, including the new irrigation infrastructure and estuarine outfall involve the removal of smaller quantities of soil and the potential for adverse effects is considered to be less than for the wetlands.

The mitigation of the effects of projects that involve significant quantities of earthworks is well understood by MDC, Beca and the civil contractors who are likely to be selected. Recent experience with similar projects at the BSTP, as well as at the Oamaru, Leeston, Waimate and Temuka treatment plants, shows that these projects can be constructed with minimal temporary effects on neighbours and the environment. MDC will facilitate a pre-registration process of contractors who have the experience and resources to undertake the work in an environmentally sustainable manner.

Prior to construction, the Contractor would be required to complete a Construction Management Plan (CMP) that identifies procedures for minimising potential construction effects on the environment. The CMP approach is standard industry practice and was a feature of consent conditions imposed by Environment Canterbury on wastewater treatment projects at Leeston, Tekapo and Waimate. The main issues associated with large earthworks usually include the generation of dust, noise and vibration, increased traffic movements, sediment runoff and the handling and storage of hazardous material such as diesel. The Contractor would be required to prepare a draft CMP containing a description of the works, the construction programme, a Consents/Permits Register, a list of key personnel and communications protocols, measures to mitigate potential adverse effects, proposed staff induction and training, a Complaints Register, and an appropriate monitoring and audit programme. Subordinate plans addressing specific issues (e.g. erosion and sediment control) would also be prepared. The CMP draft would be submitted to MDC and the Engineer for approval, at least one month prior to construction commencing. This draft would be reviewed and comments given to the Contractor for inclusion in the final CMP. The final document would be signed off by MDC and the Engineer before construction commenced.

It is usual to place a bond on Contractors to ensure that remediation is carried out according to the expectations set out in the contract.

7.2.2 Traffic

Vehicle movements along SH1 and Hardings Road would increase marginally during the construction period. During the first few weeks of the contract, the Contractor would establish the site facilities (including huts, workshop, construction equipment etc). These facilities and construction equipment would be removed at the end of the contract.

Increased traffic in the morning and evening would also occur as a result of workforce and supply vehicle movements.

Material needed for wetland construction would be mainly sourced from MDC land, thus minimising bulk cartage from offsite, but rock protection for banks will need to be carted to the BSTP.

7.2.3 Noise and Vibration

There are several houses that are located about 500 m to the west of the wetland construction site. Although likely to be intermittent and of relatively short duration, the wetland construction activity could result in some vibration and noise nuisance from the use of heavy machinery at the site. Heavy machinery will be required for the removal of material within the wetland. If the outfall pipe is trenched, some noise would be generated as sheet piles are driven into the Estuary bed. Minimal noise would be generated at jacking or drilling points, if directional drilling or micro-tunnelling were used.

The Contractor would be responsible for the selection of machinery, which would likely include light commercial vehicles, off-road trucks, bulldozers, excavators, motor scrapers, rollers. A vibrating pile hammer would be used to construct the sheet piling if trenching is the preferred method for laying the pipeline.

Best practice measures include:

- Restricting construction activities to daylight hours between Monday and Saturday, and not working on public holidays (except in an emergency).
- Adequate muffling of all machinery used on site.
- Locating the machinery warm-up areas and site facilities well away from neighbours.
- Complying with the following noise requirements at the notional boundary of any dwelling, as set out in the PWARMP:

55 dBA L_{10}	0700 hours to 2200 hours Monday to Saturday and 0900 hours to 1900 hours Sunday
45 dBA L_{10}	At all other times
75 dBA l_{max}	On any day between 2200 hours and 0700 hours

Note: Notional boundary is defined as the boundary of a 20m zone created around a dwelling for the purposes of measuring noise intrusion.

7.2.4 Dust

Dust may be generated at the site, particularly during dry, windy conditions, as a result of earthworks associated with the construction activity and increased vehicle movements

within the site. Finer portions of the sandy/clay loams could be transported by brisk onshore breezes to neighbouring properties, during dry conditions.

Stronger winds from the west can occur, but there are no residential properties downwind of the site that would be affected.

Best practice measures include:

- Regular watering of exposed surfaces within the site, particularly during dry windy conditions (and ceasing operation if necessary until the site is sufficiently wetted to suppress dust.
- Restricting traffic speeds within the site.
- Where possible, covering loads of excavated soil when conditions dictate.
- Locating stockpiles of soil on the eastern portion of the construction site and at least 50m from boundaries.
- Revegetation of exposed land areas as soon as possible after work is completed.

7.2.5 Land Disturbance and Vegetation Clearance

Subject to confirmation of the final design, around 60,000 m^3 of material could be excavated during the construction of the new wetland. About half of this material would be used to construct the wetland bunds and island in Pond 10. The balance would be used for fill around the site.

This work will also involve the removal of up to 20 ha of existing modified saltmarsh vegetation dominated by glasswort, and interspersed with herbs and introduced grasses. The actual area removed will depend on the final layout of the wetland. The vegetation on the wetland site is of similar quality to the adjoining Department of Conservation areas and the net loss from construction of the wetland will be minor. There is no vegetation of special scientific or ecological importance on the site.

There is also the potential for some indirect effects on surrounding vegetation due to the location of temporary stockpiles of soil and the operation of heavy machinery. Again, this will have no significant effects on land that is already highly modified.

There will also be a need to remove up to about 9ha of vegetation (modified saltmarsh) from the site of the proposed RIBs. The exact area to be removed will be finalised after the results of pilot trials are known. This vegetation has little conservation value. It may also be necessary to divert or modify onsite drainage during construction. This will not affect any major flowing waterways, but could involve redirection of small shallow drains or the construction of subsurface pipes (e.g. using Novaflo). There will be no upstream or downstream effects as a result of this work.

The Contractor will be required to consider measures to minimise vegetation disturbance, as well as rehabilitation as part of an Erosion and Sediment Control Plan (see Section 7.2.6).

7.2.6 Sediment Runoff Control

Sediment-laden stormwater runoff can be generated as a result of earthworks and groundwater control associated with construction. Any runoff from the wetland site would discharge to the Estuary. However, the potential for sediment runoff would be

mitigated to a large extent by natural factors including a relatively low summer/autumn rainfall with infrequent high intensity events, and a relatively flat terrain.

The Contractor will be required to prepare an Erosion and Sediment Control Plan, using standard best practice techniques and submit this to MDC for engineering approval prior to commencement of construction.

Best practice measures include:

- Construction of temporary bunds to contain any stormwater runoff to the Estuary.
- Use of sediment traps and other appropriate stormwater treatment devices.
- Maintaining a vegetated buffer between works and the highest tide level in the Estuary.
- Locating soil stockpiles outside the vegetated buffer.
- Avoiding earthworks during wetter periods.
- Techniques for minimising disturbance of existing vegetation as well as weed control.
- Rehabilitation of site after construction is complete.

It is worth noting that the wetland will cover a significant area of the construction site and any rainfall will be effectively contained within the banks of the wetland.

7.2.7 Estuarine Ecology and Tidal Movement

The construction of the new 400 m long 1050 mm diameter outfall pipe could be carried out by several different methods. The preferred method will be determined during the tendering process by the Contractor, in agreement with MDC. As noted in Section 6.7.2, these could include: excavated trench with sheet piling, horizontal directional drilling and micro-tunnelling methods.

Excavated Trench and Sheet Piling

Laying the pipeline by excavated trench and sheet piling would have a temporary (~ 12 weeks) adverse direct and indirect effect on estuarine benthic ecology within the footprint of the trench and sheet piling (an estimated area 400m long and 25 m wide would need to be excavated). The excavation would also cause localised suspension of sediments as the trench is dug and fill materials replaced. The total width of disturbance is estimated at 45-50m, allowing for an additional 10m each side of this excavation for the indirect effects of turbulence and temporary covering by sediment. The potential for large-scale mobilisation of sediments would be avoided by sheet piling along the trench alignment, which would occur before trench excavation begins.

The sheet piling would not have a significant effect on tidal flows during construction, although some temporary scouring could occur around the sheet piling.

Horizontal Directional Drilling

Laying the pipeline by horizontal directional drilling would have no significant direct ecological effects, as there would be no need to excavate an open trench. However, a jacking pit on the bank would be required and excavated material would need to be dewatered. Directional drilling would have no effects on tidal flows.

Micro-tunnelling

As with directional drilling, laying the pipeline using micro-tunnelling would not involve the excavation of an open trench. Although tunnelling from the bank would be required, there would be no significant direct effects on the Estuary. Material excavated from the tunnel would need to be dewatered. Micro-tunnelling would have no effects on tidal flows.

7.2.8 Hazardous Substances and Construction Wastes

The transport, storage and use of hazardous substances and the generation of wastes during construction could have potential adverse public health and environmental effects. Best practice measures include:

- Bulk fuel storage (i.e. petrol, diesel, oil), if required on site, would be limited to one location and would need to be sited at least 20 m from a watercourse or external boundary. The fuel/oil storage area would be provided with an impervious bund with a volume of 120% of the largest container.
- Sealed waste bins would be provided for the collection of oil rags, oil filters, etc. Waste drums would be transported offsite to an appropriate receiving facility.
- The storage of hazardous substances would comply with the requirements of the Hazardous Substances and New Organisms Act and the requirements of the Proposed Wairau/Awatere Resource Management Plan.
- A Spill Emergency Response Plan would be prepared by the Contractor prior to the commencement of construction.
- Covered rubbish and recycling bins would be provided for general refuse. These bins would be regularly emptied and moved offsite to an approved facility. No burning of waste materials would be permitted.
- Portable toilet facilities would be located away from traffic areas and further than 10 m from a watercourse and external site boundaries.

7.2.9 Archaeological Artefacts

No items of cultural or historic significance have been noted, during consultation or in the CIA, that could be directly affected by the construction of the wetland. However, an archaeological survey of the proposed route is yet to be carried out and the results (when received) will form part of the supporting documentation for this consents application.

The Contractor will be required to provide for the accidental discovery of *taonga* and *koiwi* in the CMP.

7.2.10 Public Access and Safety

MDC propose to close several existing paper roads that currently provide public access over the site to the Opawa River and the Estuary. The effects of these closures and the proposed mitigation are discussed in Section 7.3.6.

The wetland and outfall construction would occur on MDC-owned land and, because of the danger associated with the use of heavy machinery, access would be restricted to authorised personnel. Suitable signage will be erected and maintained at all access points warning of the presence of construction hazards.

7.2.11 Visual and Aesthetics

At times, construction activities can be visually unattractive, although in general, people accept this as inevitable consequence of this activity. Often construction sites can also be areas of interest, in their own right.

During construction, the existing landscape will be altered by the presence of large construction machinery, temporary buildings and stockpiles of soil. For the nearest residents, who are more than 500 m to the west of the site, across the Opawa River, the visual impacts are unlikely to be significant. For the public accessing the banks of the Opawa River and the saltmarsh areas to the west for recreational purposes, there will be temporary but more significant changes to the visual and aesthetic values of the area. The Contractor will be required to minimise the footprint of the works, as far as possible, including identifying already-disturbed ground for vehicle parking and turning, temporary stockpiling and material storage and pipe laydown.

Once the wetland is completed, all the machinery, temporary buildings and other construction-related material will be removed. Any remaining stockpiles of soil will be either incorporated into the wetland or surrounding areas-or removed. All waste or construction debris will be removed (see also Section 7.2.7).

There would be potential for introduction of additional invasive weed species to the wetland embankments and general construction area. Appropriate weed management by the Contractor during construction (e.g. ensuring machinery entering site is weed free) will be required.

7.3 Operation Effects

7.3.1 Positive Effects of Upgrade

The proposed upgraded BSTP will have a number of environmental and community benefits. These are:

- A cost-effective and efficient STP that can cater for the growth needs of the district for the foreseeable future.
- A sustainable effluent disposal strategy that seeks to maximise the application of effluent to MDC land, without significant risks to public health or the environment.
- A new wetland that will have enhanced habitat values, particularly for birds.
- A net improvement in the water quality of the Opawa River and Vernon Lagoons with the decommissioning of the existing outfall.
- A net improvement in the water quality of the Wairau Estuary and Cloudy Bay with no significant risks to public health or adverse effects on the ecological or aesthetic values of the area.

7.3.2 Operations Manual

A key component for the sustainable operation of the upgraded BSTP will be the preparation of an Operations Manual. The Manual would provide the basis for instruction of MDC staff and the day-to-day operation of the plant to meet performance and consents requirements. It is usual practice for a consent condition to be agreed that requires the

preparation of an Operations Manual within a specified time (e.g. 3 months) after the commissioning of the new and upgraded works.

An Operations Manual for the BSTP will generally have the following organisation:

- General background, STP overview and list of resource consents
- Design basis for the STP, treatment and disposal processes, performance requirements of consents, key performance indicators (KPIs)
- Contact details for key staff, security, entry and exit procedures
- Operation of STP (including photos and diagrams of key process units and tasks, operational and maintenance requirements for each process component
- Operation of the effluent disposal system(s) including a management plan for the application of treated effluent and winery wastewater to land
- Consent monitoring requirements (location, frequency and reporting)
- Operation of automated system controls and alarms
- Health and safety management

7.3.3 Effects of Discharges to Land

Soils and Vegetation

a. <u>Rapid Infiltration of Predominantly Winery Wastewater</u>

The winery wastewater contains relatively high concentrations of BOD and sodium, but has negligible amounts of fats and grease or heavy metals.

It is unlikely that the proposed maximum daily BOD loading of 600kg/ha will cause any significant effects on soils as the proposed seven-day rotation of the RIBs will allow the breakdown of organic material under aerobic conditions. The relatively short-term duration of the application (i.e. during vintage) will also mitigate any long-term build-up of organic material. Application of low BOD, treated effluent to the RIB area, during the remainder of the year, for the maintenance of grass growth, will not have a significant adverse effect on soils.

Monitoring of the sodium absorption ratio (SAR) will be required to ensure that there is no significant reduction in the infiltration characteristics as a result of a change in soil structure. The SAR is the ratio of sodium, calcium and magnesium ions in soil. When the SAR is greater than 12-15, potential soil drainage problems can arise. Maintaining a SAR of <12 is desirable.

At times, the pH of the winery wastewater will be less than 5. Dosing of the wastewater with lime, or equivalent to increase the pH, will also have the added benefit of reducing the SAR. A low (acidic) pH could also have an adverse effect on grass growth in the RIBs, and result in the mobilisation of heavy metals so that they leach into groundwater or are taken up by plants.

b. <u>Irrigation of Treated Effluent</u>

Previous areas around the BSTP that have been irrigated with treated effluent have showed a positive grass growth response. This is likely to be a result of increased leaching of salt

from the soils and the addition of nutrients. This positive effect is expected when irrigation of effluent is resumed.

High effluent concentrations of contaminants such as BOD, fats and grease and sodium can reduce the infiltration characteristics of the soil. High levels of heavy metals such as copper, chromium and lead can build in soils and leach to groundwater. The BSTP effluent has relatively low concentrations of these contaminants and will not cause any significant adverse effects on soils, over the large area to be irrigated. PDP has estimated (see Appendix C) that it would take from hundreds to thousands of years for metals concentrations to reach the limits set by the *NZ Biosolids Guidelines* (NZWWA, 2002).

Groundwater

The discharge of effluent to land containing contaminants such as microorganisms and nitrate nitrogen can adversely affect down-gradient groundwater quality and create a potential public health risk. Other substances such as heavy metals are less likely to pose a risk as they are removed by absorption and direct precipitation onto soils (even in rapid infiltration systems).

The shallow groundwater, beneath the BSTP site, occurs within the surface confining strata that overlies a deeper productive aquifer and is not used for potable supply or irrigation. Because of the low permeability confining layer and the upward gradient in the aquifer, there is no risk to potable supplies from land application of effluent around the BSTP.

c. Seepage from Ponds and Wetlands

The potential for significant seepage of contaminants from the existing treatment ponds and new wetlands is low. The ponds effectively have a low permeability liner, formed by the underlying silt layers, which will also occur in the new wetlands. Significant natural self-sealing then occurs in the months after commissioning as a result of physical clogging of soil pores by settled solids, chemical clogging of soil pores by ionic exchange and organic clogging by microbial growth (USEPA, 1983).

The expected reduction in seepage in ponds is illustrated by the results of a study of an unlined treatment pond, constructed in silty soils in California (USEPA, 1983). The study showed that an initial seepage rate of 11.2 cm/d dropped to 0.56 cm/d after 3 months and 0.30 cm/d after 6 months (a reduction in seepage of >95%).

Any seepage from the pond base undergoes further treatment in the silty/sand underlying soils. Micro-organism reduction in soils is well documented and occurs through the processes of filtration, dessication, adsorption and die-off. Filtration is the main mechanism for bacterial reduction while adsorption is more significant for virus attenuation. Crane and Moore (1984) found that 92-97% of bacteria in wastewater were removed in the first 10 mm of soil. Gunn (1997) concluded from a series of septic tank studies that bacteria and viruses were removed after passing through 600 mm unsaturated soil. Once any seepage reaches the groundwater, attenuation will continue through the processes of dilution, dispersion, and dieoff.

The low potential for seepage and further treatment available in underlying soils means additional contaminant loads to groundwater from the BSTP ponds and wetlands will be very low.

d. Rapid Infiltration of Predominantly Winery Wastewater

The winery wastewater contains high concentrations of nitrogen and microorganisms, compared with the treated effluent. While the unsaturated soils under the RIBs will provide some treatment, there is a risk that some contaminants will enter shallow groundwater. While there will be no effects on the deep aquifer, some microorganisms and nutrients could reach surface waters, such as the adjacent Opawa River, or the shallow drains within the BSTP site that discharge to the Vernon Lagoons.

There is also the potential for groundwater mounding to occur under the RIBs.

To mitigate the potential effects of groundwater contamination and mounding, it is proposed to construct a subsurface cut-off drain, at a depth of 1.2-1.5m around the RIBs that would intercept seepage. The seepage would be pumped back to the treatment ponds. When groundwater was lower than 1.5 m, the cut-off drains would not operate. Cut-off drains would also provide MDC with the flexibility of using the RIBs during periods of prolonged wet weather.

e. Irrigation of Treated Effluent

Consent conditions for land application systems typically limit the nitrogen loadings, to minimise the potential for leaching (especially of nitrate nitrogen) to groundwater. High concentrations of nitrate nitrogen in water can have adverse health effects if used for potable or stockwatering purposes. It is expected that the management regime for irrigation of treated effluent around the BSTP will involve the production of "grass for pasture" or possibly a "cut and carry" system. The BSTP effluent contains relatively low concentrations of nitrogen, particularly in the nitrate form. Based on the predicted effluent quality, available land area and typical application rates of 5 mm/day in summer and less than 1 mm/day in winter, the estimated nitrogen loading at the BSTP is 103 kg/ha /yr. As this loading is well below the typical nitrogen uptake for grass to pasture (200 kg/ha/yr) and cut and carry (350 kg/ha/yr) schemes, the likelihood for significant leaching to groundwater is low.

The potential for microorganisms to be transported to groundwater depends on effluent quality, hydraulic loading, soil type, and depth to groundwater. The BSTP effluent has relatively low concentrations of microorganisms (median faecal coliform concentration of 500 cfu/100ml). As noted above, microorganisms are also removed by a number of mechanisms in the soil and will therefore be reduced to low concentrations before reaching groundwater. To maximise further treatment in the underlying unsaturated soil, no irrigation will be carried out if groundwater levels are closer than 300 mm below ground level.

The decay rate for faecal coliforms (as indicators of faecal contamination) in groundwater is a half-life of about 60 hours. Thus, in 2.5 days, the concentration of faecal coliforms that reach groundwater (after further treatment in the soil) will be halved through die-off alone (NZLTC, 2000). At this rate, it is not expected that any significant concentrations of microorganisms associated with the discharge, will be detected beyond the site boundary.

The irrigation of effluent can cause local groundwater levels to rise, if subsurface drainage is poor. This is not anticipated at the BSTP where a deficit irrigation regime is proposed.

Ongoing monitoring of existing site wells will indicate whether significant mounding is occurring.

Surface Waters

f. Seepage from Ponds and Wetlands

As seepage from the existing lined ponds will be minimal, there will be no significant adverse effects on adjacent surface waters. The concentration of microorganisms entering the new wetland from Pond 6 will be low. These wetlands will be lined with in-situ silt material and any seepage will also quickly reduce, such that there will be no significant effects on surface waters from a public health perspective.

g. Rapid Infiltration of Predominantly Winery Wastewater

As noted, RIBs can cause potential adverse effects on groundwater, which can then discharge to nearby surface waters. The proposed cut-off drains will effectively remove the potential for most contaminants to enter groundwater and be transported to either the Opawa River or other major surface drains, following discharge to the RIBs. Significant further attenuation of any contaminants that reach groundwater, would occur between the RIBs and the nearest major waterways-the Opawa (a distance of at least 200m to the west) and the Vernon Lagoons (significantly further to the east).

h. Irrigation of Treated Effluent

As discussed, the application of effluent will be on a deficit irrigation basis, with loadings of nitrogen and microorganisms well within accepted guidelines for pasture of cut and carry-type systems. As a result, concentrations of contaminants in the groundwater will be at low levels. Regular monitoring of groundwater quality will be carried out as part of the irrigation management process.

It is noted that during summer, when most irrigation occurs, groundwater levels are below the water level of the Opawa River. The likely groundwater flow direction will therefore be away from the river.

7.3.4 Effects of Discharges to Air

Odour

Ongoing odours experienced by a community, affect amenity values and can result in health effects such as nausea, headaches, depression and stress in individuals. Odour is a subjective issue and can be difficult to assess and to measure. Complaints can be monitored, but because of the subjective aspects of odour, it can be difficult to determine the significance of individual complaints. In the absence of other criteria, the guidance given in the MfE (2003) document "*Good Practice Guide for Assessing and Managing Odour in New Zealand*" can be taken into account. The guideline refers to the "FIDOL" factors (i.e. frequency, intensity, duration, offensiveness, location) where there is potential for significant odour nuisance. The document provides guidance on the use of air quality modelling techniques to assess odour nuisance from a proposed activity.

Wind strength, direction, temperature and the amount of mixing in the atmosphere all affect how far downwind an odour remains detectable. The atmospheric conditions in

early mornings and evenings when the air is calm and cool, can result in very little mixing of an odour plume with the ambient air. This results in the odour plume being able to travel considerable distances downwind with little dilution. These are the conditions that are most often associated with complaints about odours. Hot humid conditions can also be unfavourable.

Buffer areas are often provided around sewage treatment plants. These are intended to prevent sensitive activities locating close to an odour source in the area where odours are most likely to cause a problem. People located beyond the buffer zone may still experience odours, from time to time, but the frequency and duration of the episodes should be less and the intensity of the odours reduced. This reduces the risk of the odours causing adverse effects.

a. Results of Odour Survey

During the late autumn and winter of 2005, the MDC received 11 complaints about odours from the ponds. Some additional calls from neighbours were also received at the start of the 2006 vintage. This problem was due to low dissolved oxygen (DO) concentrations in Pond I and was resolved with additional aeration.

The majority of houses near to the STP are to the west of the plant with a lesser number to the north and south. The prevailing wind direction in the area of the BSTP is from the west, which blows odours away from the closest houses towards Cloudy Bay.

As part of the STP upgrade process, MDC has carried out consultation with the local community regarding odour problems. An Odour Survey was carried out in December 2005 and 89 people, who live and work within two kilometres of the STP, were asked to respond. Of the 28 people who responded, some noticed odours from the ponds while others noted that the odours adversely affect their lifestyles. People reported that the odour sometimes lasts for "weeks at a time". Odours most frequently occur in southeasterly wind conditions and they may be worst during vintage.

From the comments made by respondents to the survey and the MDC complaints data, it appears that odours from the ponds have, on occasions, been offensive and objectionable to people living and working within two km of the STP.

A report on the results of the survey is attached (see Appendix H).

b. Primary Treatment Ponds

Primary treatment ponds require little odour control if they are designed and operated properly. However, ponds that are organically overloaded can be a source of odour nuisance to nearby residents.

Oxidation ponds such as those at the BSTP have an aerobic surface layer, and an anaerobic bottom layer. Maintenance of an adequate concentration of oxygen in the surface layer will generally ensure that odour nuisance is not experienced beyond the site boundary. The use of adequate mechanical aeration increases the normal amount of oxygen that would be circulating in this layer.

Shock loads may result from unusually high strength wastewater, such as may occur during vintage. Upsets in the biological processes in the pond can also be due to die -off in the algal populations caused by parasitic fungal attack, by higher life forms eating large

numbers of algae very quickly, or a slow-down in algal activity due to lack of sunlight and oxygen in the pond.

The treatment ponds are in an exposed coastal environment, which generally allows for good wind mixing of ponds and subsequent dilution and dispersion of any odours. The worst-case wind conditions at the BSTP are calm conditions and light breezes from the southeast and northeast (i.e. where nearby houses are downwind). Based on wind measurements at the plant (see Section 3.2.1), calm conditions occur about 1% of the time. Light breezes from the southeast and northeast occur about 8% of the time.

The nearest house to the BSTP is at least 500 m from the existing BSTP ponds. The proposed designation will only cover land that may be required for future treatment upgrading. The edge of this future designated area will be about 350m from the nearest residence. The *Guideline for Design, Construction and Operation of Oxidation Ponds* (Ministry of Works and Development, 1974) recommends a 300 m separation distance between oxidation ponds and urban areas, and a 150 m separation distance to isolated dwellings. These buffer distance are now a well-established industry standard in New Zealand that is supported by the results of modelling and practice (e.g. at North Shore, Christchurch and Oamaru WWTPs). Additional modelling of the likely effects of the proposed upgraded BSTP on air quality would not have little to the assessment of effects process and was not carried out.

The provision of additional mechanical aeration in the industrial ponds, to cater for the projected peak loading periods in 2008 and beyond, will minimise the potential for future odour problems, by maintaining adequate concentrations of dissolved oxygen in the wastewater. The proposed discharge of some vintage wastewater into land will also reduce the peak organic loading on the industrial ponds that could otherwise contribute to the creation of odour.

Appropriate pond management requires MDC operators to proactively minimise the risk of nuisance odour releases or in extreme cases, a pond "crash". This would require the regular measurement of dissolved oxygen (DO) concentrations and chlorophlyll a (as measures of deteriorating pond performance) as well as visual inspection on a daily basis. From this information, an "index of pond health" can be derived. Regular updating of trend plots can identify abnormal changes such that potential problems can be resolved before nuisance odour is created. An appropriate odour complaint response strategy is an important component of the management process.

Recommended key pond operational parameters for the BSTP are (Campbell and Archer, 2006):

- chlorophyll a should normally be > 500g/m^3 and nearly always > 300g/m^3 as an indicator of adequate algae numbers.
- DO should be normally > 4 g/m^3 and always > 2 g/m^3, when measured between 1100 and 1400 hours.
- DO be allowed to reduce to close to zero overnight, in primary ponds, to prevent grazer growth, which can consume the oxygen-producing algae.
- Mechanical aerators would be used during periods of peak organic loading, when DO is low or during calm, cloudy periods.

Pond management would be an integral part of the BSTP Operations Manual (see Section 7.3.2). The use of appropriate pond management techniques, coupled with the maintenance of an appropriate buffer to neighbours should ensure that the treatment ponds are not a significant source of odour nuisance. The separation distance between the edge of the future designated treatment area and the nearest neighbours is greater than recommended buffers from pond systems in urban or rural locations.

c. Maturation Ponds and Wetlands

Maturation ponds and wetlands are not usually significant sources of odour. Measurements taken at the Christchurch WWTP show that maturation ponds generate about 10% of the odour created at the inlet of the primary ponds. Odour-producing compounds, such as high BOD and ammonia nitrogen associated with high organic loading and anaerobic conditions will be low in the proposed wetland.

All wetlands have a characteristic "musty" odour associated with biological processes and vegetation. As the wetlands will be located at least 500m from the nearest residence at its closest point, they will not cause significant odour nuisance.

d. Application of Effluent to Land

The disposal of treated effluent to land will not be a significant source of odour. The treated effluent will have a low concentration of potentially odorous compounds and will be distributed over a large area at relatively low application rates. The closer the application is sprayed to the ground, the lower the potential for odour creation.

e. Application of Predominantly Wastewater to RIBs

As noted, calm or low-wind conditions are the most conducive for the creation of odour nuisance. From an assessment of wind measurements at the BSTP during vintage, i.e. generally March to May (see Figure 3.2), it was concluded that wind blows towards the west (i.e. towards neighbouring houses) at less than 5km/hr for only about 4% of the time.

The application of predominantly winery wastewater to land by rapid infiltration, during vintage, will occur on a relatively small land area and close to the treatment ponds. While this application will have high organic loading, the potential for the creation of significant odour nuisance is expected to be low. The potential for odour creation will be determined by the organic (BOD) loading on the RIBs. The maximum BOD application rate will be 600 kg/ha/d which is based on the requirements of the *New Zealand Guidelines for Utilisation of Sewage Effluent on Land*. A pilot trial will be carried out in 2008 using this application rate and potential for odour will be monitored.

Infiltration basins will be flooded on seven-day rotation to allow basins to drain completely and to help maintain aerobic conditions in the soil. There will be a 400 m buffer between the infiltration basins and the nearest residence.

Aerosols

Aerosols are spray droplets that can contain potentially pathogenic microorganisms. Downwind transport is dependent on wind strength.

f. Treatment Ponds

While windy conditions and excessive aeration of treatment ponds increases the turbulence on the surface and may also increase aerosol formation, aerosols from oxidation ponds are not generally of public health concern. It can also be noted that thousands of commuters drive (or ride) through the Christchurch and North Shore oxidation pond systems, during high wind conditions when aerosols could be formed by wave action. The Christchurch situation is not considered a significant risk to public health, even though the separation distance to a public road is less than 20 m.

g. Application of Effluent to Land

The application of wastewater using spray-type irrigation methods can form small particles of water or "aerosols". These particles can contain potentially pathogenic organisms. The downwind drift of aerosols) is often perceived to be a risk to public health. Windy conditions are the most conducive to the transport of aerosols. From an assessment of annual wind measurements at the BSTP (see Figure 3.1), it was concluded that wind blows towards the west (i.e. towards houses) at greater than 15km/hr about 7% of the time.

Noonan et al (2002) investigated the possible effects of the effluent spray irrigation system at Rolleston (near Christchurch). It was concluded that *"If the effluent contains 10,000 of a particular microbe/100 ml, then there is a 0.005% chance of a 100 μm diameter particle having one or more of that microbe*". Trials were carried out at Lincoln University to establish this probability. These trials used high and medium pressure sprays and aerosol samples were collected at the distances shown in the table below. The sampling distances were set in relation to the greater carry distances of finer droplets produced by the higher-pressure sprays (larger droplets fall to the ground at shorter distances).

From the results (shown in the table below), it can be seen that a spray droplet is unlikely to carry more than 100 m, when medium pressure spray systems are used. The concentrations of pathogens (actual disease causing organisms) in the BSTP effluent will also be lower than in the Noonan example, which would result in a very low chance that an aerosol would contain a pathogen.

Spray Type	Pressure kPa	Sampling Distances (m)
Lincoln high pressure ceramic nozzle - maximum droplet size of 200 μm	1,400	100, 150, 200
Lincoln medium pressure hammerhead rotary with 5.5 mm diameter nozzles (as used at Rolleston)	300	25, 50, 75, 100

Noonan et al noted that "*If the measured parameters (in the effluent) were satisfactory then there would be an assurance that the levels of pathogenic microbes would be at such a low level that the likelihood of a person contracting a disease, by taking in a viable microbe in an aerosol droplet/particle, would also be very low. End point, i.e. aerosol sampling, would not need to be carried out*".

It can be concluded from the results of Noonan's work, that any health risk from spray drift from land application at the BSTP is low. The risks will be further mitigated by:

- using dripline irrigation around the perimeter of the site and near land inside MDC land where the public may access,
- Maintenance of existing shelter belt vegetation and the provision of new plantings (two tree depth to a minimum height of 2m) along the boundaries with neighbouring residential land and public roads, and
- Stopping spraying within 160m of the western boundary when wind speed exceeds 15 km/hr from the east, northeast or southeast.

PPCS has successfully spray-irrigated land around the BSTP, in the past, with no adverse effects on neighbours.

Noise

The general noise environment, in the vicinity of the ponds/wetlands sites, is that typical of the rural/industrial fringe of any medium-sized New Zealand city. At present, the noise generated on site, mainly from the mechanical aerators, is minimal. The addition of spray-type irrigators will not significantly affect overall noise levels. The STP and irrigation equipment will be operated to comply with the following noise requirements at the notional boundary of any dwelling, as set out in the PWARMP:

55 dBA L_{10}	0700 hours to 2200 hours Monday to Saturday and 0900 hours to 1900 hours Sunday
45 dBA L_{10}	At all other times
75 dBA l_{max}	On any day between 2200 hours and 0700 hours

Note: Notional boundary is defined as the boundary of a 20m zone created around a dwelling for the purposes of measuring noise intrusion.

Public Access and Recreational Values

There are several existing paper roads that currently traverse MDC land allowing public access from Hardings Road, east of the ponds and from DoC land, west of the proposed wetland, to the Opawa River (see Drawing 6513042-C-626 in Appendix B). As the A+ upgrading strategy is based on maximising the use of available land for effluent application, continued public access along these paper roads, during irrigation, could increase the risk to public health. MDC therefore propose to close these paper roads.

To mitigate the loss of public access, as a result of these closures, MDC proposes to construct a walkway from a new carpark off Hardings Road, along the western boundary of MDC to the Opawa River. The track would then go north along the riverbank to the Wairau Estuary, where it would link with the existing walkway, that extends from the end of Hardings Road across the saltmarsh, on DoC land to the east of the existing treatment ponds. The track could divert along the western embankment of the wetland before linking with the existing walkway across DoC land (see Drawing 6513042-C-626 in Appendix B).

The proposed land application of effluent means that existing recreational uses, such as the Marlborough Associated Modellers (Aero Sub Group) will no longer be able to use land around the BSTP for their activities.

Visual Effects of New STP Structures

It is proposed to construct several ancillary structures adjacent to the treatment ponds and with the designation. These structures will range up to about 6m RL in height. There will be little height difference compared with the existing step screen (at 5.5m RL) and the pond embankments (at 3.2m RL). On this basis, there will be little adverse effect on visual values when these additional structures are viewed from neighbouring properties.

7.3.5 Effects of Wetlands on Public Health

Mosquitoes and midge nuisance are often perceived to be a consequence of constructing open water ponds near to residential development. In fact, properly loaded ponds do not have insect problems (Archer et al, 2006). For example, the Oamaru pond system, which has operated successfully for over 10 years, has not generated an insect nuisance and special control measures have not been required. The same situation applies to treatment ponds at Geraldine and Temuka.

Appropriate pond design and other insect management techniques include:

- Low organic loading in the maturation ponds/wetlands which would help maintain aerobic conditions (mosquitoes breed in anaerobic conditions).
- Maintenance of DO levels >2 g/m^3 in the primary ponds (by mechanical aeration and natural wind mixing) which would help maintain surface aerobic conditions.
- Gently sloping embankments and shallow areas would be minimised in pond design (shallow areas enhance midge habitat).
- A high diversity of plants would be encouraged in the wetland to attract a variety of insectivorous birds.

The introduction of fish to treatment ponds has no effect on controlling midges.

The construction of the wetland will include additional open water areas. However, these areas are not significant in the context of the environment, in which they will be located.

7.3.6 Effects of Wetlands on Visual and Aesthetic Values

There will be some long-term alteration to the existing character of the area, following the construction of the wetland. Up to about 20 ha of flat, mainly saltmarsh vegetation will be replaced with a series of open water areas with low planted embankments (about 0.5 m high).

While there will be less saltmarsh, much of that to be removed is already modified with diminished ecological values. The new wetland will provide an opportunity for significant enhancement of local environmental values, which are in keeping with the adjacent natural wetlands. The proposed open water system and planted areas will provide a new habitat for wildfowl and it is expected that this will become an attraction for visitors in its own right. An island is proposed for Pond 10 which will provide additional roosting areas for wildfowl.

A mix of wetland and embankment plantings will be included to encourage the development of a natural ecosystem. This will also assist with the management of nuisance insects such as mosquitoes and midges (see also Section 7.3.9). The *New Zealand Constructed Wetland Planting Guidelines* (Tanner C et al, 2006) provides guidance for the

planting and ongoing maintenance of constructed wetlands and will be consulted during design and construction.

The low nature of the wetland bunds will not significantly alter existing views of the area from the houses to the west across the Opawa River.

7.3.7 Effects of Wetlands on Public Access and Recreational Values

The effects of the proposed closure of several paper roads which currently allow public access across MDC land, as well as the proposed mitigation, is discussed in Section 7.3.3.

7.3.8 Effects of Discharge to Wairau Estuary

Framework for Assessment of Effects

The assessment of effects on water quality carried out by Cawthron (see Appendix D) is based on the predicted effects of the upgraded BSTP discharge, after reasonable mixing, in relation to accepted regional, national and international standards and guidelines and on knowledge of the effects of similar discharges elsewhere.

The key references are MDC's Proposed Wairau/Awatere Resource Management Plan (PWARMP, 1998), the RMA (1991) and the *Australian and New Zealand Guidelines for Fresh and Marine Water Quality* (ANZECC, 2000). Guidance has also been taken from United States Environmental Protection Agency (USEPA) documents, where information gaps in the regional and national documents exist.

Reasonable Mixing

The PWARMP and RMA provide for a mixing zone (or zone of non-compliance) following the discharge of effluent to water. While mixing zones are not explicitly defined, the general requirements are outlined in "*Resource Management Ideas No.10-A discussion on reasonable mixing in water quality management*" (MFE, 1994). These include:

- The size of the mixing zone should be minimised.
- Any adverse effect should be confined to within the mixing zone.
- Any adverse effects with the mixing zone should be no more than minor.

While the determination of the zone is often subjective, where possible, it should be based on the assimilative capacity of the receiving water and the expected discharge regime. For river systems, mixing zones are often based on channel, flow, length and width. For coastal outfalls, depth, distance from shore and current speed are often used.

In rivers, the maximum mixing zone width is generally set between 25-33% of total channel width and the length between 7-12 times the channel width. Other arbitrary zones between 50-200m downstream of an outfall are also common. The PWARMP uses a combination of these approaches for rivers.

The PWARMP recognises that there are many different environmental conditions existing in these waters, and does not prescribe a mixing zone criteria for coastal or estuarine outfalls.

While the BSTP discharge is estuarine and within the Coastal Marine Area (CMA), it has river-like characteristics. The precedent set for other river outfalls is therefore worthy of

consideration. Of particular importance, is a limit on the width of the zone to avoid bank contact and allow a minimum fish passage. The USEPA (Water Quality Criteria for Water) notes that limiting a river mixing to one third of the channel width is "*good practice*".

The channel ranges between 200 and 350 m in the vicinity of the BSTP outfall. Using the more restrictive criterion of 25% of width, results in a mixing zone width between 50-88 m. However, results from dye and drogue studies (see Section 4.1.7), show that the effluent plume is consistently narrow and rarely exceeds 40m width at any point.

The existing consent (U950167) sets the mixing zone as "*a central zone no greater than half the width of the receiving water body at a distance of 100 m downstream form the point of discharge*". Since the channel width is 300 m at the point of 100 m downstream, the consented mixing zone is wider than it is long (i.e. 150 m wide by 100 m long) with a total area of 1.5 ha. As this is not consistent with the actual plume characteristics, a mixing zone of 300 m long by 50 m wide is recommended. The overall size of the mixing zone (i.e. 1.5 ha), would be retained.

Dilutions under Existing and Future Flows

The predicted dilutions available after reasonable mixing under existing and predicted future effluent flows are discussed in Section 4.1.7. A dilution of 50:1 is considered a reasonable "worst case" value, at the end of a 300 m mixing zone, under existing BSTP flows. The results of modelling indicate that a dilution of 25:1 would be a reasonable "worst case" under future BSTP flows.

It was noted in Section 6.7.1, that there may be a need to discharge effluent for longer than a 4 hour period under extreme wet weather conditions. During flood events, flows from the Estuary are dominated by significant freshwater discharges from the Opawa and Wairau Rivers (Hume and Williams, 1981) and available dilution is very large. For example, the 2 year return interval flood flow on the Wairau River at Tuamarina is 2,100 cumecs, about half of which (i.e. 1,050 cumecs), flows to the Lower Wairau and into the Estuary. The peak wet weather effluent flow from the BSTP, set by the hydraulic capacity of future pipelines, is 1.2cumecs (i.e. 1200 l/s). There are also other flows from the Opawa River and Vernon Lagoons that will add to the volume of fresh water being discharged into Cloudy Bay. While there will not be full instantaneous mixing of the effluent, the initial dilution after discharge from the outfall will be significant.

State of Wairau Bar

Sediment accumulation can result in semi-closure of the Wairau Bar. A semi-closed Bar reduces the volume of water that enters on the flood tide and therefore the dilution available for effluent discharge on the ebb tide. It also affects the ebb flow over the Bar and the dispersal of the effluent plume into Cloudy Bay. The state of the Bar in October 2005 represented the most restrictive flow conditions and is considered typical of a worst case situation.

DHI (see report "*Blenheim Sewage Treatment Plant Wairau Estuary Effluent Dispersion Modelling*" in Appendix I) has modelled the affects of the movement and dispersal of a conservative tracer (representing faecal coliforms in the discharge) under a variety of hydrodynamic and meteorological conditions. The model results have been used to predict

the relative dilutions of the tracer, at selected sites in the Estuary and Cloudy Bay, that are considered to be important from a public health risk perspective.

The modelling shows that the extended guide bank proposed by MDC, to maintain the Bar entrance, is the best option to efficiently transport the effluent plume into the open coastal area and reduce the faecal coliform concentrations and visitation frequency at the five sites. To maximise the efficiency of the extended guide, it will be necessary to keep the area around the entrance clear of sediment accumulation.

Organic Enrichment

The discharge of organic-rich effluent can cause sediments near the outfall to become increasingly "enriched" or anoxic, with consequent adverse effects on macrofaunal communities and other benthic organisms. Enriched sediments typically result in a reduction in overall species richness and diversity, with the proliferation of pollutant-tolerant species.

The characteristics of the subtidal sediments in the Wairau Estuary have a low organic content indicating a well-flushed system. Conclusions drawn by Forrest (2001) with regard to the effects of the ex-PPCS outfall were that: "…*the discharge has no discernable effect on sediment quality or the sea-bed dwelling community. Sediments downstream of the discharge were primarily clean sands and were not enriched in terms of organic matter or nutrients relative to sites immediately upstream".*

The loading from the PPCS discharge and the upgraded BSTP outfall are high enough to manifest effects in poorly flushed systems. However, in the Estuary, high flows, sediment re-suspension and bed movement mitigate against any significant adverse effects occurring. The water movement also causes significant re-oxygenation, so that the potential for the creation of anoxic sediments is low.

As the predicted upgraded BSTP effluent will have lower concentrations of BOD and suspended solids, than the existing effluent, no significant adverse effects are expected. Regular monitoring of the benthic environment around the outfall will be carried out. The predicted effluent quality in Tables 6.5 and 6.6 should serve as a guideline to treatment performance.

Nutrients

Excessive concentrations of nutrients, particularly nitrogen in nitrate and ammonia forms (together termed dissolved inorganic nitrogen), is capable of causing increased plant growth (algal blooms) in poorly flushed environments.

While available guidelines (e.g. ANZECC, 2000) are useful in assessing open water environments, they are not considered appropriate for estuarine systems. Previous studies of the Estuary have attempted to assess potential nutrient effects by calculating the total nutrient load from different sources and the relative contribution of the BSTP discharge. Forrest (1995) concluded that adverse effects were unlikely from the BSTP (Opawa River) and PPCS discharges. This conclusion is supported by many years of monitoring of both outfalls. It therefore follows that the re-positioning of the BSTP discharge from the Opawa River, to an area of the Estuary that promotes rapid flushing, and the proposed reduced

nutrient concentrations in the upgraded BSTP effluent, will result in even less potential for adverse effects.

The ebb tide discharge regime is an important factor. Not only does it avoid entrainment of the plume into less well-flushed parts of the system, it also allows downstream areas to be regularly flushed by strong flood flows.

Recent survey work by Cawthron (2006) showed no evidence of sewage fungus or other heterotrophic growths indicating enrichment in the Estuary.

Based on the evidence available, no specific effluent nutrient limits are considered necessary. The predicted effluent concentrations (see Tables 6.5 and 6.6) serve as performance guidelines to monitor treatment efficiency.

Toxic Contaminants

Toxicity is the inherent capacity of a material to cause adverse effects in a living organism. Toxicity in effluent can be measured in terms of individual contaminants (e.g. ammonia) or as a whole (termed whole effluent toxicity or WET). Toxic effects can be short-term (acute) or long-term (chronic). The known toxicants in the upgraded BSTP effluent are trace (heavy) metals and ammonia.

a. Trace metals

Both the domestic and industry flows to the BSTP (e.g. mainly food processing such as wineries and meat processing without rendering) have low concentrations of trace metals. A significant proportion of these metals are then settled out in the sludge at the bottom of the treatment ponds.

The predicted BSTP effluent will have low concentrations of trace metals (see Table 6.7). Table 7.1 shows the predicted maximum concentrations of metals in the treated effluent compared with ANZECC (2000) Guidelines. With the exception of copper, the effluent requires less than 3:1 dilution to meet ANZECC (2000 marine receiving water trigger levels (for 95% protection of aquatic biota). Copper requires a 10:1 dilution to meet the ANZECC trigger level. These dilutions are well below those predicted for BSTP discharge under existing and future flows.

Effluent limits and monitoring of effluent metals concentrations are proposed.

Table 7.1 - Predicted Maximum Concentration of Metals in Treated Effluent Compared to ANZECC (2000) Guideline Values

	Zinc	Copper	Arsenic	Chromium	Nickel	Lead	Mercury	Cadmium
Predicted max effluent concentration (µg/l)	43	12	10	6	5	3	1	0.5
ANZECC 95 %ile guideline (µg/l)	15	1.3	13	4.4	70	4.4	0.4	5.5
ANZECC 99 %ile guideline (µg/l)	7	0.3	0.8	0.14	7	2.2	0.1	0.7
Dilution required to meet 95 %ile	2.9	9.2	0.8	1.4	0.100	0.7	2.5	0.1
Dilution required to meet 99%ile	6.1	40	12.5	42.9	0.7	1.4	10	0.7

Note: µ/l = microgram per litre or parts per million

b. Ammonia

Aquatic organisms, particularly cold-water salmonids, are especially sensitive to ammonia. The toxicity of ammonia nitrogen is highly dependent on pH, temperature and salinity. The concentration of ammonia increases with increasing temperature and pH and decreases with increasing salinity.

It is considered that ANZECC (2000) provides more appropriate guidance than, for example USEPA (1999), when considering the concentration of ammonia in the BSTP effluent. The ANZECC guideline takes into account the joint temperature/pH dependency of unionised ammonia but bases the recommended criteria solely on receiving water pH. The ANZECC limits are based on both USEPA and NZ toxicity tests and include tests on native NZ species (some native species have been shown to be more sensitive to toxicants than test species commonly used overseas). It is inappropriate to use a guideline value without consideration of the underlying rationale. The USEPA ammonia guidelines are promulgated under the National Pollutant Discharge Elimination System (NPDES) which commonly requires a whole effluent toxicity testing programme. This type of approach is not recommended for the BSTP discharge.

In determining water quality-based effluent limits for ammonia, the simplest and most conservative approach is to base the maximum limit on the highest background pH for the receiving waters, using a dilution factor from the edge of the mixing zone. Under the ANZECC (2000) approach, the use of a conservative maximum (i.e. 90 percentile) limit based on a dilution factor and maximum receiving water pH is favoured. Although, very conservative, this chronic toxicity limit will help ensure that acute toxicity limits are also met. It is also much more easily applied, since no receiving water sampling is required. Therefore, in applying the ANZECC (2000) ammonia receiving water guidelines, the

factors that need consideration are the effluent ammonia concentration, the receiving water pH, and the predicted dilution factor.

ANZECC recommends a marine trigger value (based on 95% protection) of 510 mg/m^3 at a pH of 8.3. The concentration of ammonia in the discharge from the BSTP ponds varies seasonally with pond performance. Summer concentrations are quite low with a mean of 0.5 and a 90 percentile of 3 g/m^3. Highest concentrations occur in winter with a mean of 15 and a 90 percentile of 20 g/m^3. At a 90 percentile winter concentration of ammonia, the expected edge of mixing zone concentration, under current flows, would be approximately 400 mg/m^3, which is less than the ANZECC 95 percentile marine trigger value of 510 mg/m^3. Furthermore, the discharge occurs for 8 hours per day, which would further mitigate any ecological effects

Under future predicted flow rates, the winter 90 percentile effluent ammonia values (20 g/m^3), at a predicted dilution of 25:1, would give an edge of mixing zone concentration of 800 mg/m^3, which exceeds the 510 mg/m^3 ANZECC trigger. Under the requirements of this guideline, either dilution would need to be increased to 39:1 in the mixing zone or winter 90th percentile effluent ammonia concentrations reduced to 12.75 g/m^3.

Table 7.3 shows a matrix of required dilution factors under a variety of receiving water pH values and effluent ammonia concentrations. The table uses a "stoplight" format where dilutions less than 25:1 are presented in green, dilutions between 25:1 and 30:1 are in amber (i.e. those dilutions close to the predicted dilution at the edge of the mixing zone), and dilutions in excess of 30:1 are highlighted in red.

It can be seen from Table 7.3 that under all but the most extreme circumstances (i.e. high pH coupled with high effluent concentrations), the ANZECC (2000) ammonia guidelines will be met at the edge of the mixing zone. Under the predicted effluent 90 percentile concentration of 20 mg/l and receiving water pH (8.0), a dilution factor of 22:1 is required to meet the guideline value of 0.91 mg/l.

Effluent limits and monitoring of ammonia concentrations are proposed.

Table 7.2 - Effluent Dilution Factor (x:1) Required to Meet the ANZECC (2000) Ammonia Guideline Under a Range of Different Effluent Concentrations and Receiving Water pH Values

Receiving Water		Effluent NH3 (mg/L)							
pH	NH3 limit	3.0 [1]	5.0	7.5	10.0	12.5	15.0 [2]	17.5	20.0[3]
7.5	2.15	1.40	2.33	3.49	4.65	5.81	6.98	8.14	9.30
7.6	1.85	1.62	2.70	4.05	5.41	6.76	8.11	9.46	10.81
7.7	1.56	1.92	3.21	4.81	6.41	8.01	9.62	11.22	12.82
7.8	1.32	2.27	3.79	5.68	7.58	9.47	11.36	13.26	15.15
7.9	1.1	2.73	4.55	6.82	9.09	11.36	13.64	15.91	18.18
8.0	0.91	3.30	5.49	8.24	10.99	13.74	16.48	19.23	21.98
8.1	0.75	4.00	6.67	10.00	13.33	16.67	20.00	23.33	26.67
8.2	0.62	4.84	8.06	12.10	16.13	20.16	24.19	28.23	32.26
8.3	0.51	5.88	9.80	14.71	19.61	24.51	29.41	34.31	39.22

[1] Predicted summer effluent maximum (90 percentile) = 3 mg/l;

[2] Predicted winter effluent median (50 percentile) = 15 mg/l

[3] Predicted winter effluent maximum (90 percentile) = 20 mg/l

Bacterial Indicators

Treated effluent from domestic sources can contain high concentrations of potentially pathogenic microorganisms (bacteria, viruses and protozoa). Health risks arise from ingestion of contaminated water during recreation and from consumption of shellfish that have accumulated bacteria and other pathogens in their tissue. Organisms (e.g. faecal coliforms and enterococci) are commonly used in guideline documents as indicators of faecal contamination.

The existing and predicted microbiological concentrations in the BSTP effluent are summarised in Table 7.3.

Table 7.3 - Existing and Predicted Microbiological Indicator Concentrations in BSTP Effluent

			Existing		Future	
Parameter	**Units**	**Season**	**Median/ Geometric Mean**	**90%ile**	**Median/ Geometric Mean**	**90%ile**
Faecal Coliforms	cfu/ 100 ml	Summer	500	2,000	200	700
		Winter	500	16,000	250	1,000
Enterococci	cfu/ 100 ml	Summer	100	1,000	50	500
		Winter	300	3,000	100	600

The "*Bacteriological Water Quality Guidelines for Marine and Freshwater Recreational Areas*" (MfE, 2003) provide guidance on the suitability of sites for contact recreation, based on "alert" and "action" levels. Little contact recreation occurs within the Wairau Estuary, although surfing is popular about 1 km to the northwest of the Wairau Bar in Cloudy Bay. Monitoring over summer, carried out by MDC, shows that the water quality is at most times suitable for contact recreation. From 19 samplings, the MFE (2003) alert level (enterococci concentration of 140 MPN) was exceeded on only two occasions and the action level (enterococci concentration of 280 MPN/100ml) on one occasion.

For shellfish gathering waters, the MFE (2003) guidelines require that faecal coliform concentrations in water samples, taken over the shellfish gathering season not exceed 14 MPN/100ml and not more than 10% exceed 43 MPN/100ml. The results of previous studies (e.g. Knox, 1983, Roberts and Roan, 1992 and Roberts, 1993), indicate that the water quality in the Estuary is unsuitable for shellfish consumption. As upstream results from the Opawa and Wairau Rivers are similar to those in the Estuary, it can be concluded that contamination from a variety of sources within the catchment, including farming runoff, stormwater discharges, on-site wastewater treatment systems, as well as the BSTP are responsible. The concentrations of microorganisms in shellfish in the Estuary would be remain elevated and variable, regardless of the presence of the BSTP outfall.

To meet the MFE (2003) limits, under a worst case dilution for current flows of 50:1 at the end of a 300 m mixing zone, a median effluent faecal coliform concentration of 700 cfu/100ml and a 90 percentile concentration of 2,150 cfu/100 ml would be required.

At the predicted future flows, modelling has shown that worst-case dilution would be in the order of 25:1. In this case, the effluent would need to meet median and 90 percentile concentrations of 350 and 1,075 cfu/100ml. These limits are considered conservative because the outfall discharge is intermittent and sub-tidal shellfish beds within the Estuary are not typically harvested.

Flounder is one of the most popular recreation fish species in the estuary and consumed in much higher proportions that shellfish. There is limited data on the concentrations of bacteria associated with recreational fish species in the region, but the risk to humans is expected to be lower than for shellfish consumption. This is because unlike shellfish, only fish muscle tissue is consumed. It is expected that limits related to shellfish gathering would provide a conservative basis for finfish consumption.

Public Health Risks

c. Quantitative Microbial Risk Assessment

A quantitative microbial risk assessment (QMRA) has been performed for recreational and shellfish gathering activities that may be affected by future discharges from the BSTP (see Report by NIWA " *Calculating Risks for Recreational Water Users and Consumers of Raw Shellfish Associated With the Future Discharge of Treated Sewage from the Blenheim Sewage Treatment Plant*, (2007) and *Summary Letter of Microbial Risk Assessment* (2007) by Cawthron in Appendix J).

The QMRA was a focussed study on the incremental risks of virus infection and used the "Monte Carlo" statistical modelling approach. This approach uses a variety of inputs (i.e. viral concentration, STP treatment efficiency, effluent dilution/dispersion, swim/contact recreation duration and shellfish meal size) and takes a random sample (i.e. as a roll of dice, hence the name "Monte Carlo") from each of 100 people on 100 different "visits". From each of these 10,000 simulated events, a random sample is taken from each of the variable inputs and the subsequent risk is calculated yielding a full risk profile, once all of the 10,000 events have been simulated. This risk profile represents a percentage of time that a given number of infections may occur. This can also be represented as the Individual Infection Risk (IIR) which is calculated as the number of total cases divided by the number of exposures.

Initial risk calculations were carried out for five sites in Cloudy Bay. After receipt of feedback from consultation, two additional sites were included. These sites are shown as Figure 1 in the DHI report and Cawthron letter and include, the Bar Entrance, Gorse Surf Break, Hayshed Shellfish Sanitation Sampling Point, Commercial Shellfish site, Mussel Reef, Commercial Shellfish 2m from Bar, Boat Launching Wharf and edge of the outfall mixing zone. Both normal and extreme virus (Rotavirus) concentrations were assumed. Rotavirus is used as model for all pathogens, especially *Norovirus*, which has been implicated in water borne illnesses, but for which clinical trial data has not been published. *Rotovirus* is considered the most appropriate pathogen for the assessment, because of the

pond-based treatment system at the BSTP and its similarities with the Christchurch treatment plant (for which recent data is available).

Table 1 in the appended Cawthron letter shows the summary IIR values for both contact recreation and shellfish consumption under the four flow scenarios in comparison with World Health Organisation (WHO) (2003) Guidelines. The results show that for normal influent virus concentrations, the risks of viral infection to recreational users is essentially absent. Even under extreme viral concentrations, the contact recreation risk is not exceeded at the sites used for contact recreation (i.e. Gorse Break or Boat Launching Point).

Under normal viral loads, only the edge of the outfall mixing zone fails to meet the shellfish IIR. This is not considered a major risk as shellfish gathering is not known to occur at this location. Regardless, shellfish gathering in the lower reaches of the Estuary is not encouraged by the Public Health Unit due to the other sources of microbiological contamination from with the catchment. For the extreme influent virus concentrations, elevated risks can occur at some sites and these would need to be managed. Under extreme viral loads, the long retention time in the ponds/wetlands would be more than sufficient to implement restrictions on shellfish gathering.

The NIWA report notes that these risks are probably overestimated because the bioaccumulation factors used in the assessment assume continuous uptake (however, the BSTP discharge is only for 4 hours each ebb tide). The extreme virus case is considered plausible but would be a very unusual event. The Blenheim community is relatively small and an outbreak of a disease (notifiable or not) would most likely be quickly picked up by the local medical community.

Wastewater will undergo significant disinfection in the ponds and wetland. Given the results of the QMRA, additional disinfection (such as UV) at the STP is not considered warranted given the high costs and likely minimal reduction in viruses that would result.

d. <u>Effects of Birds on Ponds and Wetlands</u>

The most common avian zoonose (i.e. animal disease that could be transferred to humans) is Campylobacter. While there is a possibility that this could be introduced into the effluent from birds, the incremental risk is considered very low. There are already very large numbers of birds in the Estuary/Vernon Lagoons area and the new wetlands would not attract a significantly greater number.

Cultural Values

The cultural and spiritual importance of the Estuary and surrounding area to local iwi, is discussed in Section 3.4.4 (see also Cultural Impact Assessment (CIA) in Appendix E).

The CIA acknowledges from the outset that "*there is a pragmatic acceptance by iwi of the need for a properly functioning treatment plant to meet present and future needs*". *However, there is an equally strong desire to ensure that the operation of such a plant is culturally acceptable and environmentally sustainable*".

The preferred *iwi* option is for the restoration of the *mauri* of the project area through the elimination of the estuarine discharge and the construction of an ocean outfall. This is based on the premise that fish passage through the estuary would be restored without the need to contact the effluent plume with its ammonia content. It is stated that an ocean

outfall would allow a continuous discharge with greater capacity for assimilation of contaminants. In proposing this option, there is a stated recognition by *iwi* that a discharge to water will be required (in a pristine area) with possible interference to the *wahi tapu* of the Boulder Bank. In return for an ocean outfall, the *iwi* would (subject to confirmation from the wider Marlborough constituency and a number of qualifications and mitigation proposals) be prepared to support a 35 year consent term.

As discussed in this AEE, the existing STP discharge to the Opawa River is considered to be unsustainable and will be decommissioned as a part of the upgrading process. In addition, the Stage 1, Option A+ upgrading strategy that seeks to maximise the discharge of effluent to MDC land around the BSTP (and will consider other land areas outside MDC land as part of Stage 2) is considered consistent with the stated *iwi* belief that "*disposal to land is the first preference*". However, the A+ Strategy also recognises that sustainable year-round land disposal cannot be achieved immediately.

The CWG has considered a marine outfall for the BSTP and understands that some benefits could accrue from this option. However, there are a number of reasons why it was decided to pursue the A+ Strategy and upgrade the BSTP, maximise land disposal and retain the estuarine outfall. The existing ponds produce a good quality effluent that will be enhanced by the addition of a wetland. The effects of the existing discharge are well known and have been monitored over a long period. It can be shown from the results of scientific study that there are no significant adverse effects on the quality of water or sediments, or on the ecology of the Estuary. Modelling and fieldwork shows that the ebb tide discharge undergoes significant dilution downstream of the outfall, does not touch the bank and is sufficiently narrow to allow fish passage over the greater part of the Estuary. The public health risk assessment has concluded that for normal influent virus concentrations, the risks of viral infection to recreational users is essentially absent. Even under extreme viral concentrations, the contact recreation risk is not exceeded at the sites used for contact recreation (i.e. Gorse Break or Boat Launching Point).

Under normal viral loads, only the edge of the outfall mixing zone fails to meet the shellfish IIR. This is not considered a major risk as shellfish gathering is not known to occur at this location. Regardless, shellfish gathering in the lower reaches of the Estuary is not encouraged by the Public Health Unit due to the other sources of microbiological contamination from with the catchment. For the extreme influent virus concentrations, elevated risks can occur at some sites and these would need to be managed. Under extreme viral loads, the long retention time in the ponds/wetlands would be more than sufficient to implement restrictions on shellfish gathering.

There has been little work carried out on the feasibility of constructing an ocean outfall and the costs of consenting, design and construction would be high. These high costs to the community (preliminary estimate of $20 million) are unlikely to be justified in terms of the environmental effects of the existing discharge on the Estuary. A discharge through a long outfall would also need to be pumped and have significant annual power costs. While the A+ strategy of maximising land disposal, in conjunction with the wetland and estuarine discharge would be economically sustainable for the community, there would be little economic benefit for the overall community in constructing an ocean outfall. There would be less incentive to maximise land disposal because of the high capital cost of the outfall

and the need to continuously discharge (to avoid sediment build-up in the pipeline). As noted earlier, there is a strong *iwi* preference for land discharge of effluent and the A+ Strategy is considered the most appropriate means of ensuring that discharges to water are minimised.

Visual and Aesthetic Values

Effluent discharges have the potential to reduce visual clarity in the receiving water, with an associated change in colour. These effects can be conspicuous when viewed from the shoreline or the air and can also reduce light penetration in the water column. The existing BSTP effluent is a cloudy, greenish colour, which results primarily from the presence of dead algal cells (see Cawthron Report in Appendix D).

There are a number of guidelines that provide criteria that if met, will avoid "conspicuous" changes in clarity and colour after reasonable mixing. These include:

- Proposed Wairau/Awatere Resource Management Plan.
- ANZECC (2000) *Guidelines for Slight to Moderately Disturbed Ecosystems*.
- MfE (1994) *Water Quality Guidelines No. 2.*

A description of the relevant criteria contained in these documents is provided in the appended Cawthron report.

It is not considered necessary to quantify changes in clarity arising from the new BSTP discharge. Firstly, previous studies (e.g. Forrest, 1995) show that the plume is trapped under the halocline (salinity gradient) and does not rise to the surface. Secondly, any minor changes will be less obvious than natural changes in colour and clarity that regularly occur in shallow estuarine areas. Thirdly, the plume is unlikely to be judged "conspicuous" since it would only be visible to an observer positioned directly above it in high clarity conditions.

Modelling has shown that under future flow conditions the plume will remain under the halocline. The new wetland will provide an improved effluent quality, in terms of solids concentration, that will further mitigate any adverse effects in the Estuary.

7.3.9 Estuarine Ecology

The existing BSTP discharge is not having a significant effect on the estuarine ecology in the water column or sediments (fish, shellfish as well as other benthic organisms). Monitoring shows that neither the visual clarity nor the nutrient status of the water column is adversely affected. The effluent does not contain significant concentrations of toxic substance such as trace metals. The potential for ammonia toxicity effects is greatest in summer when water temperatures are highest and aquatic biota most abundant in the Estuary. However, as pond treatment systems are very efficient at removing ammonia in summer, the potential for toxic effects in the Estuary is also low. While effluent ammonia concentrations can be higher in winter, the potential for toxicity effects is low because of the effects of cooler water temperatures. Regardless, there is sufficient initial dilution, as well as flushing under the ebb tide discharge regime, to mitigate any toxic effects on aquatic life.

Field studies and modelling shows that the effluent plume remains in a narrow stream, does not contact the banks and is unlikely to significantly hinder fish passage.

The upgrading of the BSTP will include the removal of the existing Opawa River outfall, and improve the quality of the discharge to the Estuary. While future flows will increase, (reducing the initial dilution available after discharge), the upgraded outfall will be located in a highly flushed portion of the Estuary. The proposed mixing zone configuration of 300m long by 50m wide has been determined on the basis of maximum allowance of fish passage. The conclusion reached by Forrest (2001) that "*discharge has no discernable effect on sediment quality or the sea-bed dwelling community*" is expected to also be relevant to the upgraded discharge. It can therefore be concluded, that there will no be significant effects on estuarine ecology for the upgraded outfall.

Recreational Values

The Estuary is popular for active pursuits such as recreational boating and fishing and game bird hunting. There is a popular surf break on the northern end of the Wairau Bar. More passive recreation such as walking and bird watching are also common in the area. The removal of the Opawa River outfall will have a positive, if unquantifiable effect on river water quality and aquatic ecology, with improved recreational values.

The upgraded effluent quality will be improved by the upgrading of the BSTP. This is expected to results in an improvement in the overall water quality of the Estuary and coastal waters of Cloudy Bay. As noted in earlier discussions, important contact recreational parameters such as water clarity and colour will not be significantly adversely affected. There will therefore be no significant affects on aquatic ecology or on the visual appearance of the Estuary.

As the upgraded discharge is not expected to adversely affect key water quality parameters (such as nutrient status or toxicity), recreational fishing such as white baiting and floundering will also not be significantly affected.

The public health risks associated with the upgraded discharge have been assessed (see **Public Health Risks**).

7.3.10 Discharge to Estuary During Prolonged Wet Weather

It was noted in Section 6.7.1, that under high peak flows and rainfall, there may be a need to discharge effluent for longer than the 90%ile case of a 4 hour on each ebb tide. While significant storage will be available in the new wetlands (about 50,000 m^3) it is not practicable to provide for storage of wastewater under very wet weather conditions. An extended period discharge would occur after prolonged wet weather in the region had increased effluent flows (through infiltration and inflow), and as a result of rainfall on the ponds and wetlands.

There will be no significant effects on the receiving water, as a result of this extended discharge period. During flood events, flows from the Estuary are dominated by significant freshwater discharges from the Opawa and Wairau Rivers (Hume and Williams, 1981), as well as the Vernon Lagoons and available dilution is therefore very large. For example, the 2 year average return interval (ARI) flood flow on the Wairau River at Tuamarina is 2,100

cumecs, about half of which (i.e. 1,050 cumecs), flows to the Lower Wairau and into the Estuary. The peak wet weather effluent flow from the BSTP, set by the hydraulic capacity of future pipelines, is 1.2 cumecs (i.e. 1,200 l/s). There are also other flows from the Opawa River and Vernon Lagoons that will add to the volume of fresh water being discharged into Cloudy Bay. While there will not be full instantaneous mixing of the effluent, the initial dilution after discharge from the outfall will be significant.

Contaminants loadings from diffuse sources within the catchment will be significantly higher than those discharged through the outfall. During this type of extreme event, contaminants from all sources will be subjected to very large dilution and will be quickly transported out of the Estuary and dispersed into Cloudy Bay. Any temporary adverse effects (e.g. on colour/clarity and aquatic ecology) will be as a result of the transport and deposition of sediment from land runoff. The relative effects of the extended period outfall discharge on receiving water quality or aquatic ecology, during these events, will be therefore be minimal.

7.3.11 Continued Short Term Discharge to Opawa River

It will be necessary to continue to discharge treated domestic effluent through the existing Opawa River outfall until the proposed BSTP upgrading work is completed. As noted in Section 3.3.2, the water quality of the river is relatively poor as a result of the presence of the STP discharge, as well as other sources of contamination within the catchment. Effluent quality will be similar to that currently discharged and the effects on water quality and aquatic ecology will be similar.

7.3.12 Effects of Natural Hazards and Other Risks

Although having a low occurrence risk, natural hazards can have adverse public health and safety, as well as environmental consequences. Other risks such as power failure can also have potentially adverse effects.

Seismicity

The pond embankments installed around Ponds 2B and 2C (excluding the stopbank and Pond 1 embankments) were designed for lateral spreading and it is expected that there could be some deformation of the bund system. However, a pond breach is not expected due to construction materials, bund geometry and expected lateral spreading distances. No analysis has been undertaken on the remainder of the site.

Although there is potential for liquefaction to occur at the site, it is expected to be quite low. Any damage to the banks could be repaired relatively quickly using standard equipment.

Flooding from Wairau and Opawa Rivers

The proposed wetlands will be located in a low-lying coastal area, which can be vulnerable to flooding from the Wairau and Opawa Rivers during extreme rainfall events.

The 1:100 year flood levels generated by a Wairau River flood flowing into the Estuary is 14.10 m (MDC Services Datum). This level will be at peak for about 6 hours and at about

0.5m below peak, for a further 18 hours. Peak levels in the Opawa River (with lesser flows) will be lower.

The wetland's external banks will be constructed at about 14.2 m, and would therefore not likely be overtopped in a flood event with a return interval of less than 1:100 years. This will be a significant event district-wide, with large flows causing substantial dilution of any discharges and no significant environmental effects.

The future external treatment pond banks will be at 14.80 m and will not be susceptible to overtopping from flood waters during a 1:100 year event.

Storm Surge and Tsunami

The Wairau Estuary and surrounding land is well protected from the effects of storms or tsunamis by the presence of the Boulder Bank. The potential effects of such events on the upgraded STP, wetlands and outfall is not expected to be significant.

Sea level Rise

The prediction of sea level changes, in the medium to long timeframe, is the subject of ongoing scientific debate. The latest assessment for the Intergovernmental Panel on Climate Change is that likely rise in global sea level will be in the order of 160mm ± 20mm by 2050 (average rate of 3.2 mm/year) and 400mm ± 90mm by 2100 (average rate of 4.8 mm/year for the second 50 years). Should sea level rise occur and affect the ponds and wetland sites, then it would probably also affect neighbouring domestic and industrial development. In such an event, dyking and raising of stop banks would presumably be considered on a larger scale. However, there is no justification, at present, for extensive provisions specifically being made for sea level rise.

Power Supply Failure

The upgraded treatment system will rely on the maintenance of an electrical power supply. Standby power is installed at the plant which would ensure that pumps, screens and alarms would be kept operational-except in true emergencies.

The major mitigation measure in pond-based systems would be the provision of sufficient storage of the domestic stream to ensure that poorly treated wastewater would not be discharged, except under extreme climatic conditions.

Electrical/Mechanical Plant Failure

The upgraded ponds will rely on pumps, mechanical screens and aeration to operate. The potential for plant failure is therefore confined to relatively few process units. The underlying objective would be to ensure that the required effluent standards are maintained at all times except during a true emergency.

Principal mitigation measures for reducing the possibility of plant breakdown will include:

- Continuous automatic control and monitoring of the BSTP and main pumping stations at all times.
- Immediate availability of a range of key spare parts and the implementation of a soundly based and executed preventive maintenance system.

- Selection of well proven, reliable and where possible, commonly known and used types of mechanical and electrical plant.

Toxic Slug Entering the Wastewater System

Biological in-tank treatment systems (such as activated sludge processes) are susceptible to upset and, in extreme situations, collapse caused by a slug of toxic material entering the treatment plant system via the reticulation system. Such an effect has the potential to measurably reduce the quality of the final effluent leaving a plant and in some cases cause increased odour potential. However, a pond-based system is less susceptible to an upset because of the large storage and the large initial dilution available.

The primary method of control is by preventing the materials from entering the wastewater system. MDC has an effective (liquid) trade waste control and management system, including by-laws, to limit and control at source potentially toxic and corrosive discharges into the wastewater collection system.

True emergencies cannot be entirely anticipated and such events as, for example, an accidental spill entering the sewer from a road vehicle involved in an accident, may still occur.

Mitigation and risk management procedures to avoid and minimise the potential adverse effects against toxic slugs entering the conveyance and treatment system include:

- Treatment plant selection and operation, including robustness of the biological treatment operations themselves.
- Material and equipment selection.
- Liquid trade waste management systems, including on-going risk assessment.
- Monitoring and alarm systems.

Hazardous Substances

Hazardous substances such as fuel, oils and lime will be stored on site in a secure building. These substances will be used, and stored, with waste containers disposed of according to the requirements of the Hazardous Substances and New Organisms Act 1996.

7.3.13 Conclusions

The likely environmental effects of the construction and operation of the BSTP upgrade are expected to be generally no more than minor. Where any potential effects are noted, the methods by which these effects can be avoided, remedied or mitigated have been proposed.

Proposed consent conditions including monitoring are included in Section 9.

8 Statutory and Planning Requirements

8.1 Introduction

The current statutory and planning documents that should be considered are as follows:

National statutes and documents:

- Resource Management Act, 1991(RMA)
- Historic Places Act 1993 (HPA)
- New Zealand Coastal Policy Statement, 1994 (NZCPS)

Regional documents:

- Marlborough Regional Policy Statement
- Proposed Wairau Awatere Resource Management Plan (PWARMP)

District planning documents:

- Proposed Wairau Awatere Resource Management Plan (PWARMP)

Each of these is addressed separately below.

8.2 Resource Management Act 1991(RMA)

8.2.1 Legislation Outline

The RMA is the primary legislation for managing the effects of activities on the environment. Applications for resource consents need to be assessed against the requirements of this Act.

Part II of the RMA sets out the purpose and principles of the Act (sections 5 to 8). The purpose of the RMA is defined in section 5 as the sustainable management of natural and physical resources, namely:

> *"managing the use, development, and protection of natural and physical resources in a way, or at a rate, which enables people and communities to provide for their social, economic, and cultural well-being and for their health and safety while:*

(a) sustaining the potential of natural and physical resources (excluding minerals) to meet the reasonably foreseeable needs of future generations;

(b) safeguarding the life-supporting capacity of air, water, soil, and ecosystems; and

(c) avoiding, remedying, or mitigating any adverse effects of activities on the environment."

Section 6 of the RMA sets out a number of matters of national importance, which must be recognised and provided for in the subdivision, use and development of natural and physical resources. The relevant matters in this context are:

(a) The preservation of the natural character of the coastal environment (including the coastal marine area), wetlands, and lakes and rivers and their margins, and the protection of them from inappropriate subdivision, use and development.

(b) The protection of outstanding natural features and landscapes from inappropriate subdivision, use and development.

(d) The maintenance and enhancement of public access to and along the coastal marine area, lakes and rivers.

(e) The relationship of Maori and their culture and traditions with their ancestral lands, water sites, waahi tapu and other taonga.

(f) The protection of recognised customary activities.

Section 7 of the RMA establishes a number of other matters, to which, particular regard should be had in making resource management decisions. The relevant matters, to this proposal are:

(a) Kaitiakitanga

(aa) The ethic of stewardship

(b) The efficient use and development of natural and physical resources

(c) The maintenance and enhancement of amenity values

(d) Intrinsic values of ecosystems

(f) Maintenance and enhancement of the quality of the environment

(g) Any finite characteristics of natural and physical resources

(i) The effects of climate change

Section 8 requires that account be taken of the principles of the Treaty of Waitangi.

Under section 104 of the RMA, when considering an application for resource consent, the consent authority is directed to have regard to the various matters listed in section 104, subject to Part II of the RMA. Relevant matters include actual or potential effects on the environment, relevant planning instruments and any other matters the consent authority considers relevant and reasonably necessary to determine the application.

In terms of coastal or discharge permits, section 105 requires the consent authority to have particular regard to:

(a) The nature of the discharge and the sensitivity of the proposed receiving environment to adverse effect; and

(b) The applicant's reasons for the proposed choice; and

(c) Any possible alternative methods of discharge, including discharge into any other receiving environment.

Furthermore, in relation to the discharge and coastal permits sought, section 107(1) has more specific direction to the consent authority, as follows:

(1) Except as provided in subsection (2) a consent authority shall not grant a discharge permit or a coastal permit to do something that would otherwise contravene section 15 (or section 15A) allowing -

(a) The discharge of a contaminant or water into water; or

(b) A discharge of a contaminant onto or into land in circumstances which may result in that contaminant (or any other contaminant emanating as a result of natural processes from that contaminant) entering water; or -

(ba) (not relevant in this context)

If after reasonable mixing, the contaminant or water discharged (either by itself or in combination with the same, similar or other contaminants or water) is likely to give rise to all or any of the following effects in the receiving waters:

(c) The production of any conspicuous oil or grease films, scums or foams, or floatable or suspended materials:
(d) Any conspicuous change in the colour or visual clarity:
(e) Any emission of objectionable odour:
(f) The rendering of fresh water unsuitable for consumption by farm animals:
(g) Any significant adverse effects on aquatic life.

(2) A consent authority may grant a discharge permit or a coastal permit to do something that would otherwise contravene section 15 (or section 15A) that may allow any of the effects described in subsection (1) if it is satisfied -
(a) That exceptional circumstances justify the granting of the permit; or
(b) That the discharge is of a temporary nature; or
(c) That the discharge is associated with necessary maintenance work -
and that it is consistent with the purpose of this Act to do so.

(3) In addition to any other conditions imposed under this Act, a discharge permit or coastal permit may include conditions requiring the holder of the permit to undertake such works in such stages throughout the term of the permit as will ensure that upon the expiry of the permit the holder can meet the requirements of subsection (1) and of any relevant regional rules.

8.2.2 Assessment of the Proposal in regards to Part II of the RMA

Section 5 of the RMA states that the purpose of the Act is to promote sustainable management of natural and physical resources. The proposed upgrading of the Blenheim Sewage Treatment Plant (BSTP) will result in a greater level of treatment of wastewater and improved effluent quality. Furthermore, the proposed land disposal system will reduce the overall volume of discharge to the estuary while ensuring that the life supporting capacity of the land is not compromised. Overall, it is considered that the proposal is consistent with the expressed purpose of the RMA, in that it will enable the community to provide for their social, economic and cultural well-being and health, while in particular safeguarding the life supporting capacity of air, water, soil and ecosystems.

Section 6 of the RMA requires recognition and provision for certain matters of national importance. This includes, of relevance to this project, the preservation of the natural character of the coastal environment. The coastal environment in this instance is characterised by the Wairau Estuary and nearby Vernon Lagoons. The proposed wetlands of the BSTP will be in keeping with the character of the surrounding coastal environment. The proposed land disposal system is located on the landward side of the site adjacent to a modified environment of existing farmland. It is therefore sufficiently separated from the

coastal environment to ensure that the character of the coastal environment is not significantly affected.

Public access to and along the coastal marine area will not be affected by the proposed upgrading. Improved public access to the Opawa River and Estuary from a carparking area is proposed to be provided at the western end of the site on Hardings Road.

Consultation has been undertaken with representative iwi during the preparation of this AEE. The matters set out in section 7 of the RMA have also been considered during the AEE process, as have the requirements of section 8 in regard to the Treaty of Waitangi. The consultation process is described in Section 5 of this AEE.

8.2.3 Assessment of the Proposal in regards to Sections 104, 105 and 107 of the RMA

Consideration has been given to sections 104, 105 and 107 of the RMA. The AEE provides details of the effects of the proposed upgrade on the environment in Section 7.

Section 107 requires that any discharge of contaminants to water should not result in certain specified effects. The effects of discharges from the proposed Stage I upgrading are described in Section 7, and demonstrate that section 107 requirements are complied with.

8.2.4 Assessment of Proposal in Regards to Sections 168, 168A, 171, 176, 176A and 182 of the RMA – Notices of Requirement (NoRs) and Designations

Section 171(1)(c) of the RMA specifies that one of the matters to which particular regard must be given, when considering a NoR for a designation is *"whether the work and designation are reasonably necessary for achieving the objectives of the requiring authority for which the designation is sought"*.

Identification in a District Plan

The designation is a means, provided for in the RMA, by which land required for a project or work (by a requiring authority) can be identified in a district plan to give a clear indication of the intended use of the land, or any restriction needed for the safe function or operation of the public work. In this instance, the designation identifies the land required to provide for the upgrade, operation, maintenance and repair of an efficient wastewater treatment system including rapid infiltration basins and a bio-solids drying bed.

Should the designation be confirmed, it will identify the land required for the wastewater treatment ponds and associated wetland. For the purposes of providing a clear indication of the intended use of the land, or any restriction that may apply to it, MDC suggests that the notation on the district plan maps should be shown as "Wastewater Treatment and Disposal Purposes".

Provide for the Designated Project or Work

The proposed new designation would allow the project to be implemented. The current designation, which covers some of the existing treatment ponds will be replaced by the new designation which allows for the wastewater treatment upgrade works and ancillary activities as described in the NoR.

The designation is able to provide for the project or work consistently over property boundaries and across zones within the district, where otherwise one or several resource consents may be required. It would not be practicable to consider a land use consent for a project of this scale and type.

Providing for the works by way of zoning (via a plan change) would not provide the mechanisms for restricting land use.

The designation does not extend to regional plans and therefore regional resource consents have been sought for activities as required.

The RMA (section 184) allows for a period of five years to give effect to a designation, although a longer period may be specified. The five year period enables the requiring authority time to undertake negotiations for the acquisition of land where necessary, and to construct, operate, maintain and repair the work or project as and when required. It would not be practicable for MDC to continuously seek or renew resource consents for such work.

Outline Plan

Section 176A of the RMA states that an outline plan must be submitted by the requiring authority to the territorial authority prior to construction. Given the details submitted with this application, it is considered there is no requirement for an outline plan to be prepared, in accordance with section 176A(2)(b) of the Act.

Removal of Designation

Section 182 of the RMA provides the opportunity for the removal of designations when they are no longer required. Part of this NoR identifies that the existing designation on the site for "Sewage Treatment Purposes" will be removed, subsequent to the confirmation of the new designation. The removal of a designation is a comparatively simple process, whereby the requiring authority gives notice to the consent authority of its intention to remove the designation. The consent authority may either accept or refuse the request, based upon the potential for adverse environmental effects. The provisions of section 357 apply in respect of any refusal to remove a designation, in which the requiring authority can object to the consent authority's decision.

8.3 Historic Places Act 1993

Archaeological sites are protected by two pieces of legislation, the *Historic Places Act 1993* and the RMA.

The *Historic Places Act 1993* provides for the protection of archaeological sites and is administered by the New Zealand Historic Places Trust. Under section 2 of the HPA an archaeological site is defined as:

"…any place in New Zealand that –

(a) Either –

(i) Was associated with human activity that occurred before 1900; or

(ii) Is the site of the wreck of any vessel where the wreck occurred before 1900; and

(b) Is or may be able through investigation by archaeological methods to provide evidence relating to the history of New Zealand."

Under the HPA anyone who wishes to destroy, damage or modify an archaeological site requires an authority to do so under section 11 or 12 of the Act. It is illegal to destroy damage or modify an archaeological site without an authority from the Historic Places Trust (HPT). The Act allows for up to 3 months to make a decision on the authority, after the authority application has been lodged (the authority application will be lodged within 10 working days of being received, if all the required information is present). If granted, an authority has a life of up to five years. An authority may be granted with conditions such as archaeological survey, monitoring and/or excavation. Any archaeologist carrying out work as a condition of the authority must be approved by the Trust under section 17 of the HPA. Once the authority has been granted, there is a statutory 15 working day stand-down period before earthworks can begin. This is one of the standard conditions of an archaeological authority.

In this instance local iwi have identified a historic relationship with the site. It is therefore accepted that the site was associated with human activity before 1900 and as such is considered to be an archaeological site under the definition of the Act. Accordingly MDC are carrying out a pre-construction survey and if necessary, will seek the authority of the HPT prior to commencing work on the site.

8.4 New Zealand Coastal Policy Statement

The New Zealand Coastal Policy Statement (NZCPS), which became operative in May 1994 establishes policies to achieve the purpose of the RMA in relation to the coastal environment. As previously discussed, the existing outfall from the treatment facility extends into the coastal marine area. As part of the proposed upgrade, a new outfall will be constructed parallel to the existing outfall. Therefore, in accordance with section 104(1) of the RMA, regard must be had to the relevant provisions of the NZCPS.

It is noted that the NZCPS is currently being reviewed with a new draft document likely to be available for public consultation in 2007. To date, the draft document has not been released. Notwithstanding this, it is unlikely that a new NZCPS would be gazetted before mid 2008.

The purpose of the NZCPS is set out in section 56 of the RMA which states:

> *The purpose of a New Zealand Coastal Policy Statement is to state policies in order to achieve the purpose of this Act in relation to the coastal environment of New Zealand.*

Chapter 1 of the NZCPS identifies national priorities for the preservation of the natural character of the coastal environment including protection from inappropriate subdivision, use and development. Policy 1.1.1 of this chapter identifies that it is a national priority to preserve the natural character of the coastal environment by the following means:

(a) encouraging appropriate subdivision, use or development in areas where the natural character has already been compromised and avoiding sprawling or sporadic subdivision, use or development in the coastal environment;

(b) taking into account the potential effects of subdivision, use, or development on the values relating to the natural character of the coastal environment, both within and outside the immediate location; and

(c) avoiding adverse effects of subdivision, use and development in the coastal environment.

Policy 1.1.4 identifies that it is a national priority for the preservation of natural character of the coastal environment to protect the integrity, functioning, and resilience of the coastal environment in terms of:

(a) the dynamic processes and features arising from the natural movement of sediments, water and air;

(b) natural movement of biota;

(c) natural substrate composition;

(d) natural water and air quality;

(e) natural bio diversity, productivity and biotic patterns; and

(f) intrinsic values of ecosystems.

As demonstrated in Section 7 of this report, the proposed upgrade of the BSTP and the proposed establishment of the land disposal system will assist in the preservation of the natural character of the coastal environment. Specifically, the establishment of the land disposal system will decrease the volume of treated effluent that is discharged into the coastal environment. Furthermore, the proposed upgrade of the existing pond facilities and construction of the wetland will improve the quality of any discharge to the coastal marine area. The proposed activity is not considered to be an inappropriate development.

The construction of the wetland will further enhance the character of the coastal environment through establishment of native plantings and habitat enhancement.

Overall, it is considered that the proposed upgrade is consistent with the objectives and policies contained in Chapter 1 of the NSCPS.

Chapter 2 of the NZCPS relates to the protection of the characteristics of the coastal environment of special value to the tangata whenua including waahi tapu, tauranga waka, mahinga maataitai, and taonga rarangi. Policy 2.1.1 identifies that provision should be made for the identification of the characteristics of the coastal environment of special value to the tangata whenua in accordance with tikanga Maori. Policy 2.1.2 provides for the protection of the characteristics of the coastal environment of special value to the tangata whenua in accordance with tikanga Maori. Furthermore, it states that provision should be made to determine, in accordance with tikanga Maori, the means whereby the characteristics are protected.

As outlined in Section 6 of this report, consultation has been undertaken with local tangata whenua regarding the proposed discharge. Further consultation will continue to be undertaken throughout the design of the proposed upgrade to ensure that the characteristics of the coastal environment that are of special value to the tangata whenua are appropriately protected. Overall, it is considered that the proposed upgrade is consistent with the objectives and policies of Chapter 2 of the NZCPS.

Chapter 3 of the NZCPS relates to activities involving the subdivision, use or development of areas of the coastal environment. The following policies contained within Chapter 3 are considered to be relevant to the proposed BSTP upgrade:

Maintenance and Enhancement of Amenity Values

Policy 3.1.3

> *Policy statements and plans should recognise the contribution that open space makes to the amenity values found in the coastal environment and should seek to maintain and enhance those values by giving appropriate protection to areas of open space.*

Providing for the Appropriate Subdivision, Use and Development of the Coastal Environment

Policy 3.2.2

> *Adverse effects of subdivision, use or development in the coastal environment should as far as practicable be avoided. Where complete avoidance is not practicable, the adverse effects should be mitigated and provision made for remedying those effects, to the extent practicable.*

Policy 3.2.4

> *Provision should be made to ensure that the cumulative effects of activities, collectively, in the coastal environment are not adverse to a significant degree.*

Policy 3.2.7

> *Policy statements and plans should identify any practicable ways whereby the quality of water in the coastal environment can be improved by altered land management practices and should encourage the adoption of those practices.*

Maintenance and Enhancement of Public Access to and along the Coastal Marine Area

Policy 3.5.2

> *In order to recognise the national importance of enhancing public access to and along the coastal marine area, provision should be made to identify as far as practicable:*
>
> *(i) the location and extent of places where public have the right of access to and along the coastal marine area;*
>
> *(ii) those places where it is desirable that physical access to and along the coastal marine area by the public should be enhanced; and*
>
> *(iii) those places where it is desirable that access to the coastal marine area usable by people with disabilities be provided.*

Policy 3.5.4

> *Policy statements and plans should as far as practicable identify the access which Maori people have to sites of cultural value to them, according to tikanga Maori.*

It is noted that there are currently several existing paper roads that traverse MDC land, allowing public access from Hardings Road and from DOC land, west of the proposed wetland to the Opawa River. As previously discussed, MDC seeks to maximise the land area that is available for application of treated effluent. Continued public access along

these paper roads, during irrigation would increase the risk to public health. As such it is proposed to close those roads that traverse the site. To mitigate the loss and improve public access as a result of these closures, MDC propose to construct a walkway from a new carpark off Hardings Road along the western boundary of the MDC site to the Opawa River. The track would then go north along the river bank (or along the wetland bank) to the Wairau Estuary, where it would link with the existing walkway that extends from the end of Hardings Road across the salt marsh to the east of the existing treatment ponds.

It is therefore considered that the proposed BSTP upgrade will appropriately provide for public access to the coastal marine area and will provide a safe effective means for the public to access this area of the coastline, without traversing the proposed land disposal area. Overall, the proposed upgrade is considered to be consistent with the objectives and policies contained in Chapter 3 of the NZCPS.

Schedule 1 of the NZCPS sets out the circumstances in which activities that will have a significant or irreversible adverse effect on the coastal marine area will be made restricted coastal activities. The following matters are relevant to the proposed BSTP upgrade:

S1.4 Structures in the coastal marine area oblique or perpendicular to mean high water springs

> *(c) Except as provided for in S1.4(a) and (b) above, any activity which includes erecting a structure or structures in the coastal marine area which is:*
>
> *(i) solid (or presents a significant barrier to water or sediment movement);*
>
> *(ii) is sited obliquely or perpendicular in horizontal projection to the line of mean high water springs in the coastal marine area; and*
>
> *(iii) is in horizontal projection 100 metres or more in length; is a restricted coastal activity.*

As previously discussed, it is proposed to construct a new 400 m long 1050 mm diameter outfall pipe from the final wetland pond. This will be located parallel to the existing 375 mm diameter pipeline to the Wairau Estuary which will no longer be used (but not removed). Accordingly, the proposed outfall does not comply with this requirement and requires consent as a restricted coastal activity.

8.5 Regional Planning Documents

8.5.1 Regional Policy Statement

In accordance with section 104(1) of the RMA, regard must be had to the relevant objectives and policies of the Regional Policy Statement for Marlborough (RPS). It is noted that MDC is currently in the process of reviewing its RPS. As a result of public consultation Council is preparing 12 discussion papers on the key issues that were identified by both Council officers and the public. Council anticipate that these discussion papers will be available for public comment in mid 2007. To date, these papers have not been released.

The protection of wetlands, lakes and rivers is addressed in Part 5, Section 5.1 of the RPS and includes the following:

5.1.13 Objective – Natural Character and Amenity Values: The preservation of the natural character of wetlands, lakes and rivers and their margins and the maintenance and enhancement of amenity values.

5.1.13 Policy – Natural Character and Amenity Values: Preserve the natural character of wetlands, lakes and rivers and their margins.

Treated effluent from the existing domestic treatment ponds currently discharges continuously to the Opawa River through an 825mm diameter concrete pipeline. As part of the proposed BSTP upgrade, this pipeline will be decommissioned and MDC will cease to discharge directly to the Opawa River. The decommissioning of this pipeline will improve the quality of the Opawa River and, in doing so, will enhance the amenity values associated with it. The proposed BSTP upgrade is therefore considered to be consistent with this objective and policy.

The protection of ground water is considered in Part 5, Section 5.2 of the RPS as follows:

5.2.2 Objective – Groundwater Quality: The quality of groundwater be maintained at a standard which is safe for use and consumption by communities and ecosystems.

5.2.3 Policy – Contaminants: Avoid, remedy or mitigate the reduction of groundwater quality from contaminants entering the groundwater systems from contaminated river water or infiltration through contaminated land.

The proposed discharge to land will occur over shallow groundwater that is not currently used due to its contaminated state, which has occurred as a result of surrounding land uses. As discussed in the assessment of environmental effects, the deeper aquifer that is used by the local community is located below a confining layer and has a net upward pressure, which means that the opportunity for contaminants to enter this aquifer are de minimis. Furthermore, it is noted that cut-off drains will be installed around the rapid infiltration basins to pump any excess seepage from the proposed basins into the treatment ponds. It is considered that the proposed discharge will be managed in such a way that any adverse effects on the groundwater systems will be appropriately avoided, remedied or mitigated.

The need for the continued protection of the coastal marine area is identified in Part 5, Section 5.3 of the RPS as follows:

5.3.2 Objective – Coastal Marine Water Quality: That water quality in the coastal marine area be maintained at a level which provides for the sustainable management of the marine ecosystem.

5.3.3 Policy – Runoff from Land: Avoid, remedy or mitigate the reduction of water quality in the coastal marine area caused by sediment and contaminated runoff water from land entering the marine ecosystem.

5.3.7 Policy – Point Source Discharges: (a) Improve coastal water quality where present 'point source' discharges from land limits the safe consumption of plants and fish from the water.

(b) Existing discharge permits will not be replaced unless the amount and concentration of contaminants in the discharge will be reduced where necessary.

As demonstrated in Section 7 of this report, the proposed BSTP will result in an improved level of treatment for domestic and industrial effluent. Specifically, the establishment of

the wetland and the decommissioning of the existing Opawa River outfall will decrease the level of contamination within the Wairau Estuary area. Due to the influences of other sources of contamination in the catchment, these improvements are unlikely to enhance the water quality to the extent that it would enable the safe consumption of shellfish from the Estuary. However it will reduce any risks with respect to contact recreation.

It is noted that there will be some sedimentation effects during the construction of the new pipeline. The potential extent of these effects will depend on the construction methods that are used during the construction process. It is likely that construction will either be done by way of trenching, horizontal directional drilling or micro-tunnelling. Confirmation of the geotechnical conditions along the pipeline route is required before the method is finalised. Notwithstanding this, a Construction Management Plan will be submitted to Council for approval prior to construction commencing. Part of this plan will demonstrate how any adverse effects associated with the construction of the pipeline will be mitigated.

The protection of land ecosystems is identified in Part 6 of the RPS as follows:

6.1.2 Objective – Indigenous Land Ecosystems: The integrity and diversity of indigenous land ecosystems (including soils) is to be maintained and where reasonably necessary enhanced while so far as possible also enabling the community to provide for its wellbeing.

6.1.3 Policy – Indigenous Ecosystem Disruption: Avoid, remedy or mitigate indigenous land and water ecosystem disruption arising from physical disturbance, reduction in river flows, contamination, overgrazing, burning and animal and plant pests.

As was seen with the previous PPCS irrigation scheme, the proposed discharge of effluent to land will have the effect of flushing out the salt in the soil and improving its nutrient status. This will result in existing salt marsh being replaced with productive pasture.

Part 7 of the RPS deals with issues associated with community wellbeing. Specifically, the following:

7.1.2 Objective – Quality of Life: To maintain and enhance the quality of life of people of Marlborough while ensuring that activities do not adversely affect the environment.

7.1.3 Policy – Air Quality Management: Maintain and enhance the quality of the air resource in Marlborough.

7.1.14 Objective – Community Infrastructure: Provide for the safe and efficient operation of community infrastructure in a sustainable way.

7.1.21 Policy – Network Utilities and Public Works: Enable the maintenance, enhancement and operation of utility networks needed by the community to ensure their health, safety and wellbeing.

7.2.7 Objective – Subdivision, Use and Development of the Coastal Environment: The subdivision, use and development of the coastal environment in a sustainable way.

7.2.10 Policies – Allocation of Coastal Space: (a) Public access and recreation will be considered when assessing all proposals for development of the coastal marine area...(c) Developments proposed in the coastal marine area may be allowed where they provide for public use/benefit.

As outlined in Section 2 of this report, the need for the BSTP upgrade has arisen from an increase in both domestic population within the Wairau/Awatere area and also from industry growth. The proposed upgrade is considered necessary to provide for the health,

safety and wellbeing of the Marlborough community. The proposed system has been designed to provide for anticipated future flows, while mitigating any adverse effects on the environment. Specifically, the upgrade will improve the quality of water in the Opawa River and will result in improved public access to this area of the coastline.

The proposed BSTP upgrade is therefore considered to be consistent with the objectives and policies contained in Part 7 of the RPS.

The control of waste is addressed in Part 9 of the RPS. Specifically, this section deals with the following:

9.1.2 Objective – Control of Waste Effects: To avoid, remedy or mitigate the effects of waste and contamination on the environment.

As previously discussed, the proposed BSTP upgrade will improve the existing level of treatment of both domestic and industrial effluent. This improved treatment will reduce contaminant levels within the surrounding environment and will result in a more sustainable treatment facility. The proposed BSTP upgrade is considered to be consistent with the objectives and policies of Part 9 of the RPS.

8.5.2 The Status of the Proposed Resource Management Plan

As a Unitary Authority the Marlborough District Council has the powers, functions and responsibilities of both a regional and district council. Under the Resource Management Act 1991, it has an obligation to prepare a Regional Policy Statement, a Regional Coastal Plan, a District Plan and other such Regional Plans as are necessary. With its dual responsibilities Council opted to integrate the management of the Wairau/Awatere area by preparing a combined Regional, District and Coastal Plan known as the "Wairau/Awatere Resource Management Plan". This plan replaces the previous District and Regional Schemes prepared under the Town and Country Planning Act 1977.

The Proposed Wairau/Awatere Resource Management Plan (PWARMP) was publicly notified on 6 November 1997. The Plan is not yet operative, however Council officers have advised that the rules relevant to this application are beyond the point of challenge or of a nature that would not have any significant impact on this application. In accordance with section 19 of the Resource Management Act 1991, all weighting must therefore be placed on the PWARMP provisions and no further analysis of the Transitional Plan provisions has been undertaken.

8.5.3 The Proposed Wairau/Awatere Resource Management Plan

As previously discussed, the PWARMP is not yet operative, however Council officers have advised that the rules relevant to this application are beyond the point of challenge or of a nature that would not have any significant impact on this application. In accordance with section 19 of the Resource Management Act 1991, all weighting must therefore be placed on the PWARMP.

Section 28 of the RMA requires the Minister of Conservation to approve a Regional Coastal Plan(RCP). In this instance, the RCP matters are incorporated into the PWARMP, specifically in Chapters 9, 10 and 17.4 of Volume 1 and in various sections of Volume 2 rather than being a separate document.

8.5.4 PWARMP Objectives and Policies

Chapter 2 of the PWARMP outlines issues, objectives and policies relating to Tangata Whenua. The following objective and policies are considered to be relevant to the proposed upgrade of the BSTP.

Objective 1: Recognition and provision for the relationship of Maori to their culture and traditions with their ancestral lands, waters, sites, waahi tapu and other taonga.

Policy 1.3: Recognise the role of tangata whenua as kaitiaki in the coastal marine area.

Policy 1.4 Recognise and provide for continued tangata whenua access to, and use of, traditional coastal resources such as maataitai and taonga raranga.

As outlined in the cultural impact assessment which is included in Appendix E of this report, consultation has been undertaken with local iwi during the development of the proposed upgrade strategy. Consultation will continue as part of the detailed design process to ensure that the proposed upgrade recognises the role of tangata whenua with respect to the coastal marine area. The proposed BSTP upgrade is not considered to be inconsistent with the objectives and policies contained in Chapter 2 of the PWARMP.

Chapter 4 of the PWARMP considers the issues, objectives and policies relating to indigenous flora and fauna and their habitats. The following objectives and policies are considered to be relevant to the proposed upgrade of the BSTP.

Part 4.3.2

Objective 1 The protection and enhancement of freshwater and riparian ecosystems.

Policy 1.3 Maintain and enhance wetlands, lakes and rivers as natural corridors where water and riparian margins can act as links along which fauna can move and flora can spread.

Policy 1.7 Promote environmental enhancement of particularly valued river environments, especially on Council owned land.

The proposed BSTP upgrade involves the clearance of an area of existing vegetation that contains a mix of native and introduced species and the construction of a wetland that will be planted with primarily local native species. The final mix of species will be discussed with the Department of Conservation and local iwi prior to planting commencing. The proposed wetland will attract additional birdlife to the area and will provide an opportunity for significant enhancement of environmental values. The proposed open water system and planted areas will provide a new habitat for wildfowl and it is expected that this will become an attraction in its own right. A mix of wetland and embankment plantings will be included to encourage the development of a natural ecosystem.

Overall, the proposed BSTP upgrade is considered to be consistent with the objectives and policies contained in Chapter 4 of the PWARMP.

Chapter 5 of the PWARMP includes issues, objectives and policies related to the protection of existing landscapes within the Wairau/Awatere area. The following are considered to be relevant to the proposed BSTP upgrade.

Objective 1 Management of the visual quality of the Wairau/Awatere plan area and the protection of outstanding natural features and landscapes from inappropriate subdivision, use and development.

Policy 1.1 Recognise and provide for the following natural features and landscapes as outstanding in the regional context:…

- *Boulder Bank and Wairau Estuary…*

Policy 1.4 Ensure that structures associated with activities in the coastal marine area do not compromise the outstanding landscape values of the Plan area.

The majority of the proposed upgrade works will take place outside the coastal marine area. The works within the coastal marine area are primarily limited to the construction of the 400m long outfall. Any adverse visual effects associated with the outfall structure will be limited to its construction which will occur over a three month period. Once the upgrade is complete the proposed wetland will enhance the existing natural character of the surrounding coastal environment and the quality of local ecosystems. The proposed BSTP upgrade is therefore considered to be consistent with the objectives and policies contained in Chapter 5 of the PWARMP.

Chapter 7 addresses Councils responsibilities relating to air quality throughout the Wairau/Awatere area. The following objectives and policies are considered to be relevant to the proposed BSTP upgrade:

Part 7.3

Objective 1 To maintain or improve where appropriate existing air quality.

Policy 1.1 The establishment of air quality indicators and the monitoring of the air resource, to indicate the cumulative effects of activities on ambient air quality.

Part 7.6

Objective 1 The adverse effects of discharging contaminants into air are avoided, remedied or mitigated, including adverse effects on local ambient air quality, community wellbeing, amenity values, resources or values of significance to tangata whenua, ecosystems and water and soil.

Policy 1.1 Ensure that all persons discharging contaminants into air, avoid, remedy or mitigate adverse effects arising from that discharge. This includes all effects likely to be noxious, dangerous, offensive or objectionable to such an extent that there is an adverse effect on the environment.

It is noted that dust may be generated during construction, particularly during dry, windy conditions as a result of earthworks associated with the construction activity and increased vehicle movements within the site. The finer portions of the sandy/clay loams at the site could be transported by brisk north easterly breezes to neighbouring properties during dry conditions. Stronger winds from the north west can occur but there are no residential properties located downwind that would be affected. Best practicable measures such as watering of exposed surfaces, restrictions on traffic speeds, and revegetation of exposed land areas as soon as possible will be implemented in order to ensure that existing air quality is maintained.

Given the nature of the proposed activity some odour emissions as part of the operation of the facility beyond the site boundaries are unavoidable during certain weather conditions. All practicable measures will be undertaken to contain any offensive or objectionable odours within site boundaries. Furthermore, it is proposed to keep a complaints register that identifies the source of the complaint and the weather conditions at the time of the complaint. This will enable Council to modify odour control measures and land disposal regimes should specific issues arise.

Chapter 8 sets out Council's expectations and aims with respect to public access to and use of the coastal marine area, lakes and rivers. The following objectives and policies are considered to be relevant to the proposed BSTP upgrade:

Objective 1 That public access to and along the coastal marine area, lakes and rivers be maintained and enhanced.

Policy 1.1 Avoid, remedy or mitigate the adverse effects on public access caused by the erection of structures, works or activities in or alongside lakes and rivers.

Policy 1.2 Adverse effects on public access caused by the erection of structures, marine farms, works or activities in or along the coastal marine area should as far as practicable be avoided. Where complete avoidance is not practicable, the adverse effects should be mitigated and provision made for remedying those effects to the extent practicable.

Policy 1.6 To facilitate public access on Council owned or managed floodway land.

Objective 2 That public access to and within publicly owned land, be maintained and enhanced.

Policy 2.1 To facilitate public access and recreational use of Council owned land.

As previously noted, there are several existing paper roads that traverse MDC land allowing public access from Hardings Road and from DOC land, west of the proposed wetland to the Opawa River. MDC seeks to maximise the land area that is available for the application of treated effluent. Continued public access along these paper roads, during irrigation would increase the risk to public health, accordingly, it is proposed to close those roads that traverse the site. To mitigate the loss of and enhance public access, as a result of these closures, MDC propose to construct a walkway from a new carpark off Hardings Road along the western boundary of the MDC site to the Opawa River. The track would then go north along the river bank or via the new wetland to the Wairau Estuary, where it would link with the existing walkway that extends from the end of Hardings Road across the salt marsh to the east of the existing treatment ponds.

It is therefore considered that the proposed BSTP upgrade will appropriately provide for public access to the Opawa River and the coastal marine area and will provide a safe effective means for the public to access this area of the coastline without traversing the proposed land disposal area. Overall, the proposed upgrade is considered to be consistent with the objectives and policies contained in Chapter 8 of the PWARMP.

Chapter 9 of the PWARMP outlines the issues, objectives and policies related to the protection of the Coastal Marine Area. The following objectives and policies are considered to be relevant to the proposed BSTP upgrade:

Part 9.3

Objective 1 Management of the effects of activities so that water quality in the costal marine area, is maintained or enhanced to a quality, which enables the gathering or cultivating of shellfish for human consumption.

Policy 1.1 Avoid the introduction of new point source discharges that adversely affect the environment of the coastal marine area.

Policy 1.2 No existing or proposed discharge, after reasonable mixing (either by itself or in combination with other discharges) should prevent the safe consumption of seafood from the coastal marine area.

Policy 1.7 Encourage a buffer zone between the coastal marine area and land use activities.

Policy 1.8 Avoid, as far as practicable, then remedy or mitigate the adverse effects of discharges in the coastal marine areas.

The proposed BSTP upgrade will improve the quality of industrial and domestic effluent being discharged into the Wairau Estuary. However, it is noted that as a result of a number of human influences such as urban stormwater, runoff from pastoral farming, and farm effluent discharges, the water quality in the Estuary is at most times suitable for contact recreation, but generally not for shellfish consumption. While the improvement of discharge quality from the BSTP will improve water quality within the Estuary, it is unlikely to totally remove the public health risks associated with shellfish gathering. The public health assessment that has been carried out in conjunction with this report concludes that it would not be safe to eat raw shellfish from the area even if the discharge was completely removed.

Part 9.9

Objective 1 *That public access to and along the coastal marine area be maintained and enhanced*

Policy 1.1 *Adverse effects on public access caused by the erection of structures, marine farms, works or activities, in or along the coastal marine area should be as far as practicable be avoided. Where complete avoidance is not practicable, the adverse effects should be mitigated and provision made for remedying those effects, to the extent practicable.*

Policy 1.2 *Public access to the coastal marine area will be enhanced where possible*

Policy 1.5 *Acknowledge that public access to and along the coastal marine area may be restricted to:*

- *Provide for the operational requirements of any lawful structure or activity*
- *Protect areas of significant indigenous vegetation and/or significant habitats of indigenous fauna*
- *Protect Maori cultural values;*
- *Protect public health and safety;*
- *Ensure a level of security consistent with the purpose of a resource consent; or*
- *In other exceptional circumstances sufficient to justify the restriction notwithstanding the national importance of maintaining the access*

As previously discussed, MDC propose to establish a new walkway from Hardings Road, along the right bank of the Opawa River to the Wairau Estuary. This will improve public access to the area while ensuring that public health is not compromised through indirect contact with discharges. Furthermore, it is noted that signage will be erected around the treatment and disposal areas identifying the risks associated with direct contact with the wetland and disposal areas.

Part 9.15 *Objectives and Policies*

Objective 1 *To avoid as far as practicable then remedy or mitigate adverse effects from activities and/or occupation of space and the erection of structures in the coastal marine area.*

Policy 1.1 *To manage the adverse effects of occupation of space structures and activities in the CMA in respect to their impact on the following:*

- *Cultural and iwi values.*
- *The natural character of the coastal environment*
- *Coastal processes.*
- *Heritage and amenity values.*
- *Recreation values.*
- *Public health, safety (including navigational safety) and enjoyment.*
- *Water quality.*
- *Conservation and ecological values.*
- *Marine Habitats and sustainability.*
- *Landscape, seascape and aesthetic values.*

The proposed BSTP upgrade has been specifically designed to mitigate adverse effects on the coastal marine area. The final construction method will be determined once detailed design has been finalised, however the possible methods include trenching, horizontal directional drilling or micro-tunnelling. Horizontal directional drilling would have no significant direct effects on the Estuary, as there would be no need to excavate an open trench. However, a jacking pit on the bank would be required and the resulting excavated material would need to be dewatered.

As with directional drilling, micro-tunnelling would not involve the excavation of an open trench. Although drilling from the bank would be required, there would be no significant effects on the Estuary. Material excavated from the tunnel would need to be dewatered.

Overall, it is considered that the proposed construction of a new pipeline and consequential occupation of the coastal marine area will, as far as practicable, avoid, remedy or mitigate any adverse effects on the coastal marine area.

Part 9.21 *Objectives and policies*

Objective 1 *Protection of the coastal environment from the adverse effects of activities that disturb or alter the foreshore or seabed*

Policy 1.4 *Avoid as far as practicable then remedy or mitigate the adverse effects of activities that disturb or alter the foreshore and/or seabed on any of the following:*

a. Conservation and ecological values;

b. Cultural and iwi values;

c. Heritage and amenity values

d. Landscape, seascape and aesthetic values;

e. Maine habitats and sustainability

f. Natural character of the coastal environment:

g. Navigational safety;

h. Other activities, including those no land

i. Public access to and along the coastal area;

j. Public health and safety;

k. Recreation values; and

l. Water quality

As outlined above, the proposed construction methods have been specifically determined in order to avoid, remedy or mitigate any adverse effects on the coastal marine area. Furthermore, it is considered that once constructed, the proposed wetland will enhance the natural character of the coastal environment. It is noted that as the proposed outfall will be buried beneath the seabed, once constructed, it will not have any adverse effects on tidal flows.

Chapter 10 of the PWARMP outlines the issues, objectives and policies associated with the protection of the natural character of the coastline. The following objectives and policies are considered to be relevant to the proposed BSTP upgrade:

Part 10.2 *Objectives and Policies*

Objective 1 *The preservation of the natural character of the coastal environment, wetlands, lakes and rivers and their margins and the protection of them from inappropriate subdivision, use and development.*

Policy 1.1 *Discourage subdivision, use or development within those areas of the coastal environment and freshwater bodies which are predominantly in their natural state and have natural character which has not been compromised.*

Policy 1.3 *To consider the effects on those qualities, elements and features, which contribute to natural character, including:*

- *Coastal and freshwater landforms.*
- *Indigenous flora and fauna, and their habitats.*
- *Water and water quality.*
- *Scenic or landscape values.*
- *Cultural heritage values, including historic places, sites of early settlements and sites of significance to iwi.*
- *Habitat of trout and salmon.*
- *Natural movements of sediments, water, air and biota*
- *Natural productivity*
- *Other dynamic processes*

Policy 1.5 *Promote an integrated approach to the preservation of the natural character of the coastal and freshwater environments of the Wairau/Awatere areas*

Most of the proposed BSTP upgrade works will take place on MDC owned land adjacent to the coastal marine area. The proposed wetland will replace approximately 20 ha of existing modified salt marsh vegetation. This area is already modified with diminished ecological values. The proposed wetland will therefore enhance the natural character of the coastal marine area and will provide a new habitat for wildfowl. The piping of drainage channels within the site will also enhance the natural character of the environment. The proposed outfall within the CMA will be buried for most of its length and, as such, will not visually impact on the natural character of the coastal marine environment. Overall, it is considered

that the proposed BSTP upgrade will have minimal adverse effects on the natural character of the coastal marine area and that any adverse effects will be appropriately mitigated through the establishment of the wetland.

Chapter 12 looks at the sustainable management issues of the Wairau/Awatere rural environment. As much of the BSTP site is located within the Rural 3 and 4 zones, it is appropriate to consider the objectives and policies contained within this chapter.

Part 12.2.2 Objectives and Policies

Objective 1 To maintain or enhance the life supporting capacity of the versatile soils of the Rural 3 Zone (Wairau Plain).

Policy 1.5 To promote environmentally sound land management practices.

As previously discussed, the proposed land disposal system will have the effect of flushing salt from the soil and improving its nutrient status. This will enhance the productivity of the soil. Furthermore, the filling and piping of subsidiary drainage channels throughout the site will assist in the promotion of environmentally sound land management practices.

Objective 2 To protect rural amenity values of the Rural 3 Zone by encouraging the establishment of a range of activities, which do not create unacceptably unpleasant living or working conditions for the residents and visitors, nor a significant deterioration of the quality of the rural environment.

Policy 2.2 To ensure that a wide range of rural land uses and land management practices can be undertaken in the rural areas without increased potential for the loss of rural amenity values or for conflict.

Most of the infrastructure associated with the proposed upgrade will be located towards the centre of the site away from the adjoining Rural 3 zone. The proposed land disposal system will be constructed such that spray irrigation occurs towards the centre of the site and that the areas adjacent to the site boundaries are irrigated by way of drip irrigators, to mitigate any potential adverse effects on the adjoining neighbours. Furthermore, it is noted that appropriate site management practices will be implemented on site to ensure that any dust and odour generated by the proposed activity is contained within the site boundaries. Overall, it is considered that any adverse effects associated with the rural amenity of the surrounding Rural 3 zone will be appropriately mitigated.

Objective 3 To maintain or enhance the life supporting capacity of soils and the quality of surface and groundwater.

Policy 3.2 To avoid, remedy or mitigate the adverse effects of discharge on soil and water quality. The Deferred Township Residential Zone at Rarangi will only develop when a permanent potable water supply has been installed and service connection made to all properties in both the deferred Township Residential Zone and the Township Residential Zone.

Policy 3.3 To safeguard the natural character and nature conservation values of riparian margins, and associated ecosystems.

As previously discussed, the subject site is underlain by a comparatively shallow groundwater that is currently contaminated as a result of surrounding land uses and is not

used by local communities. A deeper aquifer, that is used, is located below several confining layers and has a net upward pressure thus preventing contaminants from reaching the aquifer. Furthermore, it is noted that the proposed land disposal system will improve nutrient levels in the soil and as such improve their life supporting capacity. Overall it is considered that the natural character and life supporting capacity of the area will be retained.

Chapter 14 of the PWARMP outlines the issues, objectives and policies associated with land disturbance throughout the Wairau/Awatere Plains area. The following objectives and policies are considered to be relevant to the proposed BSTP upgrade:

Part 14.3	*Objectives and Policies*
Objective 1	*The avoidance, remediation or mitigation of the adverse effects of inappropriate land use practices, including those which give rise to loss of those desirable physical, chemical and biological characteristics of soils which enable them to retain their life supporting capacity and to sustain plant growth increased sedimentation of surface and coastal waters increased risk of erosion and damage to natural and/or iwi values.*
Policy 1.1	*Encourage wise land use practices that will avoid, or mitigate the adverse effects of land disturbances and soil erosion.*
Policy 1.2	*Avoid land use practices that increase the potential for accelerated stormwater runoff.*
Policy 1.3	*Avoid, remedy or mitigate contaminated run-off arising from land disturbance activities entering the marine ecosystem or wetlands, lakes and rivers.*
Policy 1.10	*Ensure consultation with relevant iwi before carrying out land disturbance requiring resource consent.*

Sediment-laden stormwater runoff can be generated as a result of earthworks and groundwater control associated with construction. Any runoff from the wetland site would discharge to the Estuary. However, the potential for sediment runoff would be mitigated to a large extent by natural factors including a relatively low summer/autumn rainfall with infrequent high intensity events and a relatively flat terrain. Any potential adverse effects associated with sediment-laden runoff will be appropriately mitigated by way of an Erosion and Sediment Control Plan that will be submitted to Council for approval prior to commencement of construction. It is therefore considered that the proposed BSTP upgrade will be managed in a manner that ensures that any adverse effects associated with increased sedimentation of coastal waters are appropriately mitigated.

Chapter 15 of the PWARMP relates to the discharge of contaminants to land. The following objectives and policies are considered to be relevant to the proposed BSTP upgrade.

Part 15.3	
Objective 1	*To avoid, remedy or mitigate adverse environmental effects arising from the discharge of solid and liquid contaminants onto or into land.*

Policy 1.1 *To control activities on the basis of the environmental effects arising from the discharge of contaminants to land.*

Policy 1.4 *To undertake targeted monitoring and research to determine the effect of non-point source discharges on surface water quality in water bodies which require enhancement or are highly valued.*

Part 15.4

Objective 2 *To significantly reduce the quantity of contaminants discharged to land.*

Policy 2.1 *To encourage all organisations and individuals who discharge contaminants to land to adopt principles of waste minimisation and cleaner production by:*

- *Reducing the quantity or toxicity of the discharge by using resources more efficiently.*
- *Reusing, recycling and recovering materials from the waste stream.*

Policy 2.3 *To ensure that any adverse environmental effects associated with composting are avoided by subjecting the activity to appropriate land use and discharge controls.*

While the proposed upgrade will increase the quantity of contaminants discharged to land, it will substantially decrease the quantity of contaminants discharged to water. The proposed land disposal system will involve the discharge of high quality effluent to land when rainfall is such that there is a net moisture deficit. Treated effluent will be discharged on a sustainable basis in specific areas at rates that are determined based on soil type and distance from the site boundary.

Rapid infiltration basins (RIBs) will be constructed to discharge screened predominantly winery wastewater during vintage in specific areas away from site boundaries. These RIBs will be managed in a sustainable manner with seepage being extracted and pumped back into the treatment ponds. Overall, it is considered that any adverse effects associated with the proposed discharge of contaminants to land will be appropriately mitigated through appropriate site management practices.

8.5.5 PWARMP – Rules

The subject site is located within the Rural 3 and 4 zones in the PWARMP. These zones seek to provide for activities on the basis of their effects on the sustainable management of the lower Wairau Plain as an area for intensive rural development. The proposed BSTP upgrade has been assessed against the relevant rules contained within Volume 2 of the PWARMP. The following rules are considered to be relevant to the proposed upgrade:

General Rules

1.2.1 Fresh Water Abstractions

This rule specifies circumstances in which the abstraction of freshwater is a permitted activity. As part of the activity, it is proposed to discharge effluent to land through a number of disposal methods. One of these methods is through rapid infiltration basins (RIBs). The use of these basins will include the abstraction of seepage via cutoff drains which will then be pumped back into the treatment ponds. Given the nature of the

discharge it is considered that its subsequent abstraction constitutes a groundwater take and as such requires consent. Rule 1.2.4 states that any fresh water abstraction not provided for as a permitted, controlled, discretionary or prohibited activity is deemed to be a non-complying activity. The proposed abstraction is not provided for as a permitted, controlled or discretionary activity and as such requires consent as a non-complying activity.

1.8.2 Permitted Activities other than River Control Works

Unless expressly limited elsewhere the following activities are permitted within rivers, riverbeds and floodways where together with any relevant definition they conform to the conditions set out below:

- *Alteration or repair of an existing structure for maintenance purposes.*
- *Protection works for existing structures.*
- *Erection or placement of a temporary maimai or whitebait stand.*
- *Recreational activity.*
- *Installation of culverts.*
- *New structures in, under or over the riverbeds of less than 3 metres in width.*

The piping of various drainage channels throughout the site will be undertaken in a manner that ensures that the conditions are met, specifically, the installations will not raise water levels upstream by more than 100mm in a 1 in 20 year return period flood.

1.10.1.4 Stormwater from Vegetation Clearance Sites

The discharge of stormwater from any vegetation clearance site is a permitted activity subject to the following conditions:

i. The natural clarity of the classified waters referred to in this Rule shall not be conspicuously changed due to sediment or sediment laden discharge originating from the site of a vegetation clearance operation. Conspicuously changed shall have the following meaning:

- *There shall be no greater than 33% reduction in the visual clarity of the receiving water as measured by the horizontal sighting of a black disk; and/or*
- *There shall be no greater than 15% increase in the turbidity of the receiving water as measured in NTU.*
- *Measurements are to be made immediately above or upstream of the discharge and below the discharge after reasonable mixing*

Note:

For a description of the two methods refer to the Ministry for the Environment Water Quality Guidelines No. 2, Guidelines for the Management of Water Colour and Clarity, June 1994.

See the Definition Section for the definition of Reasonable Mixing.

ii. The vegetation cover of a vegetation clearance site shall be restored within 24 months of the end of the operation, to a level where the amount of bare ground is more than 20% greater than prior to the land disturbance-taking place.

The preparation and implementation of appropriate sediment runoff controls, as part of the Construction Management Plan, will ensure that (i) above is complied with.

Rural 3 and 4 Zones

1.6 Indigenous Forest Removal

1.6.1 No person or activity may clear or remove on any Certificate of Title more than 0.1 hectare of indigenous forest or remove any indigenous vegetation in a natural wetland larger than 200m², in any 12 month period.

The proposed wetland construction will involve the clearance of approximately 20 ha of modified salt marsh vegetation. The area of the proposed vegetation clearance has high water levels and despite its low ecological values, is technically considered to be a wetland in its current form. The proposed BSTP upgrade will therefore result in the removal of indigenous vegetation in a natural wetland larger than 200m² in any 12 month period and as such this rule is not able to be complied with.

1.7 Land Disturbance

1.7.1 Vegetation Clearance

1.7.1.1 Subject to 1.6.1.1 above the clearance by hand or mechanical means is a Permitted Activity provided that:

- *Blading or root-raking by bulldozer shall not be used to clear vegetation on slopes of more than 20°:*

1.7.1.2 Woody vegetation (except for plantation trees and noxious plants under the Noxious Plants Act) shall not be removed by chemical, fire or mechanical means within 8 metres of any permanently flowing river, or any lake, wetland or the sea.

1.7.1.3 Plantation trees within 8 metres of any permanently flowing river, or the margins of any wetland, lake or the coast shall be directly felled away from the water body, except plantation trees leaning over a water body, which may be felled in accordance with safety practices.

1.7.1.4 Except as above no logs may be dragged through the bed of any flowing river, or through any lake or wetland.

1.7.1.5 Except for direct approaches to bridges, crossings and fords, no heavy machinery may be operated for the purpose of vegetation clearance within 8 metres of any permanently flowing river, or the margin of any wetland, lake or coast.

1.7.1.6 On completion of a vegetation clearance operation, a suitable vegetative cover that will mitigate soil loss, is to be restored on the site so that, within 24 months the amount of bare ground is to be no more than 20% greater than prior to the vegetation clearance taking place.

1.7.1.7 *The depth of topsoil removed shall not exceed more than 20 mm over more than 15% of any vegetation clearance site.*

As part of the proposed upgrade, heavy machinery may be used for vegetation clearance within 8m of a permanently flowing river or the margin of any wetland, lake or coast, accordingly part 1.7.1.5 of this rule cannot be complied with. Furthermore, all topsoil will be removed from the 20 ha wetland area, accordingly part 1.7.1.7 of this rule may not be complied with.

1.7.3 Evacuation and tracking:

The evacuation of land is a permitted activity provided that:

1.7.3.1 Except for direct approaches to bridges crossings and fords, no evacuation shall take place within 8.0 metres of any permanently flowing river or lake or the sea.

1.7.3.2 No evacuation may take place within 8 metres of the landward toe of a stopbank and the depth of any evacuation beyond that may not exceed 15% of the distance from the stopbank.

1.7.3.3 On land greater than 20° slope no more than 1,000m³ may be evacuated in any two year period

1.7.3.4 The gradient of any side cut evacuation must not exceed an average of 9.5° (1:6) and must not exceed 11.3° (1:5) along any length of more than 20 meters

1.7.3.5 Storm water controls, water table cut offs, and culverts are to be installed to ensure that erosion does not occur on the inside edge of the cut. No culvert size less than 300mm may be used to drain any side-cut evacuation.

1.7.3.6 Batters and side casting are to be stabilised by appropriate measures such as seeding, compacting, drainage and /or other methods of re-vegetation.

1.7.3.7 Run-off from water tables or surface of side cut evacuations is to be directed to stable land areas.

1.7.3.8 Stream crossings are to be stable and suitable for fish passage.

As part of the proposed upgrade, MDC may undertake excavation within 8m of the Opawa River and the Estuary, specifically for the construction of the wetland, outfall and piping of drainage channels throughout the site, accordingly part 1.7.3.1 of this rule may not be complied with. Furthermore, MDC propose to undertake excavations adjacent to an existing stopbank and as such will not be able to comply with part 1.7.3.2 of this rule.

1.7.5 General Conditions Applicable to all Land Disturbance

1.7.5.1 No woody material of greater than 100 mm diameter shall be left in any permanently flowing river, lake, wetland or sea as a result of the land disposal operation.

1.7.5.2 All land disturbance sites are to be stable when subject to a storm event of return frequency of 1 in 10 years or less.

1.7.5.3 No land disturbance activity shall take place as a Permitted Activity on land of land use capability Class 8.

The preparation and implementation of appropriate land disposal controls as part of a Construction Management Plan will ensure that these conditions are complied with during the construction of the proposed wetland, outfall and during the filling of the existing drainage channels throughout the site.

1.8.9 Liquid Waste

The discharge of liquid waste from the processing of fruit, vegetable, shellfish, fish or animal products onto or into land is a permitted activity subject to the following conditions:

1.8.9.1 The characteristics of the waste shall be such that:

- *BOD -5,000g/m³*
- *Faecal coliforms -100/100 mL,*
- *Free available chlorine <1 g/m³*
- *Other contaminations shall not exceed the toxicant limits for irrigation water quality, which are set out in Appendix P. These limits are derived from the Australian Guidelines for Fresh and Marine Waters (Australian and New Zealand Environment and Conservation Council {ANZECC} 1992)*
- *No objectionable odours can be detected at or beyond the legal boundary of the area which the liquid waste is discharged.*

1.8.9.2 The total nitrogen loading on the land to be used for the discharge shall not exceed 200kg N/ha/yr.

1.8.9.3 The discharges shall be applied evenly over the disposal area at a rate not exceeding 10mm/day.

1.8.9.4 The discharge shall not be within 20 meters of any surface water body

1.8.9.5 There shall be no runoff of the waste into any surface water body

1.8.9.6 A buffer zone of a minimum of 10 metres width shall be maintained between the area of discharge and the legal boundary of the land on which the liquid waste is discharged.

1.8.9.7 The discharge shall not be within any class NS catchment defined in Appendix J.

The proposed BSTP upgrade will improve the quality of wastewater that is discharged into the Wairau Estuary and will enable a portion of the industrial and domestic waste to be discharged to land. It is anticipated that the proposed treatment of this waste will result in faecal coliform concentrations with a summer median /geometric mean of 500 cfu/100mL and a summer/winter 90 percentile range of 2000-16000 cfu/100mL. This fails to meet part 1.8.9.1 of this rule and as such resource consent is required for this discharge.

It is also proposed to discharge screened predominantly winery wastewater to land via rapid infiltration basins. This wastewater has faecal coliform levels of about 10^5/cfu/100mL

1.8.12 General Rules Relating to Odour

- *Any person undertaking an activity resulting in the discharge of odorous or potentially odorous contaminants into air, shall adopt best practicable option to avoid, remedy or mitigate any adverse effects resulting from the discharge of odour.*
- *Notwithstanding the generality of the above condition, no person shall discharge contaminants into air that results in odour beyond the boundary of the property or premises that, in the opinion of an officer of the Council is offensive or objectionable. For the purposes of assessing whether an odour is objectionable or offensive, the opinion shall be sought from an officer of the Council who is responsible for monitoring air quality.*

While it is not anticipated that the proposed upgrade and land disposal system will result in the discharge of odours beyond the site boundary, total compliance with this rule cannot be guaranteed. Resource consent is therefore sought to occasionally discharge odours beyond the boundary of the site.

1.8.13 General Rules Relating to Dust Emissions

1.8.13.1 Any person undertaking an activity resulting in the emission of dust shall adopt the best practicable option to avoid adverse effects resulting from objectionable dust emissions on the receiving environment.

1.8.13.2 The discharge of dust from any process vent or stack shall be subject to the following conditions:

- *They shall not contain toxic substances.*
- *Any air pollution control equipment and dust collection system shall be designed to achieve a particulate discharge rate of 125 mg/m³ (corrected to 0 degrees Celsius, 1 atmospheric pressure, dry gas basis) and at no time shall emissions exceed 250 mg/m³ (corrected to 0 degrees Celsius, 1 atmosphere pressure, dry gas basis).*
- *No particles in the emission shall be larger than 0.05 millimetres in any direction.*

Best practicable measures will be adopted during the construction of the wetland and associated infrastructure in order to avoid adverse effects from objectionable dust. These measures may include regular watering of exposed surfaces within the site, restricting traffic speeds, covering loads of excavated soil where necessary, locating stockpiles of soil on the eastern portion of the site at least 50 m from site boundaries and revegetation of exposed land areas as soon as possible after work is completed. On this basis, it is considered that the construction activities will comply with this rule. Furthermore, it is noted that once construction is complete, there will only be limited areas of unvegetated surfaces on the subject site, as such it is not anticipated that the ongoing operation of the BSTP will result in dust emissions beyond the site boundary.

2.5 Discharge of Liquid Wastes and Animal Effluent

2.5.1 Subject to rule 1.8.9 the discharge of any liquid waste or animal effluent onto or into land is a controlled activity subject to compliance with the following standards and terms:

2.5.1.1 The characteristics of the waste or effluent shall be such that:

- *BOD_5 – 10,000g/m³*
- *Faecal coliforms – 1 x 10^6/100mL (median of at least 6 samples taken at monthly intervals),*
- *Free available chlorine < 2g/m³,*
- *Other contaminants shall not exceed the toxicant limits for irrigation water quality which are set out in Appendix P. These limits are derived from the Australian Guidelines for Fresh and Marine Waters (Australian and New Zealand Environment and Conservation Council (ANZECC) 1992),*
- *No objectionable odours can be detected at or beyond the legal boundary of the area on which the liquid waste is discharged.*

For the purposes of assessing whether an odour is objectionable or offensive, the opinion shall be sought from an officer of the Council who is responsible for monitoring air quality.

2.5.1.2 *The discharge is not within 20m of any surface water body.*

2.5.1.3 *The discharge shall not be within any class NS catchments defined in Appendix J.*

2.5.1.4 *The total nitrogen loading on the area of land to be used for the discharge shall not exceed 200kgN/ha/yr.*

2.5.1.5 *There is a buffer zone of 10m width between any point of discharge and the legal boundary of the area of land on which the treated animal waste is discharged.*

While it is anticipated that condition 2.5.1.1 will be complied with in respect of faecal coliform levels for treated effluent, full compliance with this condition cannot be guaranteed, with respect to the discharge of winery wastewater during vintage. Accordingly consent is sought for non-compliance with this condition. Furthermore, it is noted that this condition also requires that no objectionable odours be detected beyond the boundary of the site. As previously noted, total compliance with this condition cannot be guaranteed and consent is sought.

2.5.2 Matters over which the Marlborough District Council reserves its control are:

- *The location of the area over which the waste is discharged,*
- *The volume of discharge and application rate,*
- *The actual and potential effect the discharge may have on surface water bodies,*
- *The duration of the consent,*
- *Monitoring requirements."*

With respect to the matters over which Council reserves it's control, it is noted that a condition of consent is proposed requiring the consent holder to keep a record of any complaints relating to odours beyond the site boundary.

3 Limited Discretionary Activities

Non-compliance with the conditions for Permitted Activities may be allowed to the extent specified below. Application must be made for a resource consent for a Limited Discretionary Activity for the following:…

- *Land disturbance activities that do not meet either permitted or controlled activity standards.*

On this basis, limited discretionary consent is required for the non compliances with rules 1.6.1, 1.7.1 and 1.7.3 above.

3.5 Matters to which the Council has Restricted the Exercise of its Discretion – Land Disturbance

The Council reserves discretion over and may impose conditions in regard to:

- *Natural clarity of any permanently flowing river, lake, wetland or the sea and the levels of suspended sediment in any discharge from a land disturbance site;*
- *Entry of any wood organic material into any permanently flowing river, lake, wetland or the sea;*
- *Restoration of vegetative cover on any excavation, cultivation or vegetation clearance site;*
- *Removal of topsoil on any vegetation clearance site;*

- *Need for protection of any historical, cultural or archaeological artefact or site; and*
- *Stability of any excavation site when subject to storm events.*

The preparation and implementation of a Construction Management Plan will specifically address these matters.

4 Discretionary Activities

4.1 Application must be made for a resource consent for a Discretionary Activity for the following:

- *Activities listed as Permitted or Controlled Activities, which do not comply with the standards and/or conditions or with the provisions for non-compliance shall be dealt with as Limited Discretionary Activities. Except that this provision shall not apply to activities listed as Non-Complying or Prohibited Activities.*
- *Trees and fences of greater than 1.5 metres in height, within 8 metres of a river, a publicly owned or maintained drainage channel or the landward toe of any designated stopbank in the Rural 3 zone.*
- *Effluent treatment ponds, facilities, associated plant, outfall structures, land irrigation systems.*
- *Any discharge not complying with Section 2.5 above.*

The proposed BSTP upgrade may not comply with the standards for permitted or controlled activities, involving the establishment of trees and fences within 8 metres of a river or stopbank. Discretionary activity consent is therefore required for these non-compliances. Furthermore, it is noted that the proposed activity "effluent treatment ponds, facilities, associated plant, outfall structures and land irrigation systems" is specifically identified as a discretionary activity.

The following general assessment criteria are considered to be applicable to the proposed BSTP upgrade:

4.2 General Assessment Criteria

Any application for a Discretionary or Non-Complying Activity shall generally comply with the conditions for Permitted Activities. In addition they shall be considered in terms of the following assessment criteria. For some activities specific standards and criteria also apply.

4.2.1.1 Any relevant objectives, policies and rules of this Plan.

The proposed BSTP upgrade has been assessed against the relevant objectives, policies and rules of this plan in the preceding sections of this chapter.

4.2.1.2 Any relevant policies of the New Zealand Coastal Policy Statement.

The proposed BSTP upgrade has been assessed against the relevant policies of the NZCPS in the preceding sections of this chapter.

4.2.1.3 Any relevant objectives, policies and methods of the Marlborough Regional Policy Statement.

The proposed BSTP upgrade has been assessed against the relevant objectives, policies of the Marlborough Regional Policy Statement in the preceding sections of this chapter.

4.2.1.4 The likely effects of the proposal on the locality and wider community and in particular:

- *Whether the proposal will enhance or maintain the amenity values of the surrounding area;*
- *Whether the proposal will inhibit or disadvantage existing activities;*
- *Whether the proposal creates any demand for services or infrastructure at a cost to the wider community;*
- *Whether the proposal contributes to the character of the surrounding area and helps maintain the cultural values of the community;*
- *Whether the proposal has or may have any adverse effects on roading, traffic movement or road safety.*

As previously discussed, the need for the proposed upgrade has been generated by growth in the residential population of the Marlborough region and also by strong growth in wineries. The proposed upgrade will maintain and enhance the amenity values of the surrounding area through the construction of the proposed wetland and the establishment of a walkway adjacent to the Opawa River.

4.2.1.5 The likely effects of the proposal on areas of landscape importance:

- *Any adverse effects of earthworks or tree planting,*
- *The extent to which the activity is likely to have adverse effects on the character of indigenous ecosystems which contribute to natural landscape patterns.*
- *The extent to which tree or shrub species to be planted will ameliorate any landscape effects.*

The proposed wetland will enhance the natural character of the area and create a new habitat for indigenous species. Furthermore, it is noted that all earthworks will be undertaken in a manner that ensures any adverse effects on the surrounding environment are appropriately mitigated.

4.2.1.6 The likely effects of the proposal on significant nature conservation values, indigenous vegetation and habitats of indigenous fauna:

- *The degree of significance of a species or community of indigenous plants and animals at the specific locality of the proposed activity.*
- *The extent to which the activity threatens the indigenous plants or animals/birds identified at the site.*
- *The extent to which the tree or shrub species have the potential for weed/wilding spread.*
- *The extent to which the environment in and adjoining the site is sensitive to modification.*
- *The degree to which the activity will adversely affect natural features geomorphological or geological sites.*
- *The extent to which the vegetation is an integral part of, or enhances the landscape values and natural character of the locality.*
- *The degree to which river, lake or wetland habitat is adversely affected through run-off and sedimentation caused by earthworks.*
- *The degree to which fresh water habitat may be compromised by a decline in water yields due to tree plantings.*
- *The extent to which alteration of a wetland and the subsequent loss of habitat.*
- *The degree to which any increased nutrient levels of a lake or wetland may occur.*

- *Possible alternative locations or methods for undertaking the activity.*

As outlined previously, it is proposed to remove some existing vegetation in order to construct the proposed wetland. This vegetation will subsequently be replaced primarily by indigenous species through the establishment of the proposed wetland. While the construction of this wetland will modify the surrounding environment, it will also result in enhanced environmental values associated with the site. The disestablishment of the existing outfall to the Opawa River will result in an improved fresh water habitat.

4.2.1.7 The likely effects of the proposal on the beds of and within rivers, lakes and wetlands and drainage channels:

- *The extent to which the activity may affect birdlife and the degree of significance a particular bird species has to the District.*
- *The degree to which trout or salmon are adversely affected by disturbance to a riverbed, including the clearance of vegetation.*
- *The degree to which public access would be restricted.*
- *The degree to which access for channel maintenance would be restricted.*
- *The extent to which the activity will result in a loss of natural character and any recreational values associated with the waterbody.*
- *The degree to which any possible alternative locations or methods for undertaking the activity could occur.*
- *The degree to which water quality is adversely affected.*

4.2.1.8 The likely effects of the proposal on riparian areas:

- *The degree to which the activity will restrict public access and enjoyment of the waterbody margin.*
- *The degree to which the activity threatens indigenous plants or animals or their habitat identified in the waterbody beds and margins.*
- *The degree of significances of indigenous plant or animal communities.*
- *The degree to which nutrient levels of a lake or wetland may be increased.*
- *The extent to which fresh-water habitat, amenity, quality, or recreational values may be adversely affected through increased nutrient or sediment run-off.*
- *The extent to which the natural character of the waterbody margin will be retained.*
- *The extent to which the activity may impact on recreational values associated with the waterbody, including the amenity of that part of the river, stream, lake or wetland.*

The proposed wetland will provide an additional habitat for birdlife in the District and, as such, will have a positive effect on bird populations. As previously discussed, the existing paper roads that traverse the site will be closed as part of the development. In order to mitigate any adverse effects associated with these closures it is proposed to establish a new carpark and public track around the perimeter of the site. This carpark and track will enhance public access to the area and ensure that the recreational values associated with the Opawa River are retained.

Overall, it is considered that the proposed activity is consistent with the relevant assessment criteria outlined in section 4.2.1 of the PWARMP.

The following specific assessment criteria apply to Effluent Treatment Ponds, Facilities, Associated Plant, Outfall Structures and Land Irrigation Systems.

4.3.5.1 Assessment Criteria

- *The nature of the contaminants entering the sewerage system and being discharged from the system.*
- *Whether trade wastes are present in the system and any steps undertaken or required in order to:*
    - *Monitor industrial and trade wastes entering the system.*
    - *Minimise the adverse effects of industrial and trade wastes on the treatment of the effluent, including any steps to encourage cleaner production practises in industries discharging wastes to the system.*

A breakdown of the likely contaminants entering into and being discharged from the BSTP is contained in the assessment of environmental effects section of this report. It is noted that there will be some trade wastes present in the system. MDC already have monitoring mechanisms in place to ensure that trade waste levels comply with current standards.

- *The extent to which stormwater is able to enter the system, and any steps taken to avoid, remedy or mitigate the effects of system overload by stormwater.*

The treatment ponds contain sufficient capacity to ensure that any overload by stormwater is appropriately mitigated.

- *Any steps taken or required to avoid accidental discharges from the system and the potential effects of any accidental discharges that may occur.*

Given the capacity of the existing ponds, the potential for accidental discharges is considered to be minimal. Furthermore, analysis indicates that the ponds are unlikely to be overtopped under a 1:100 year flood event.

- *The extent to which the effluent is treated prior to the discharge entering any water.*

As outlined in earlier sections of this report, effluent will be treated through the pond system prior to being discharged through the wetland into the coastal marine area.

- *Any actual or potential effects of the discharge on surface water, coastal water and ground water.*

As previously noted, effluent will be treated to a high standard prior to being discharged into the Estuary. The chances of contamination affecting groundwater are minimal given the depth of the aquifers and the confining layer that exists above them.

- *Any effects of any odour or other contaminant discharged to air, as the result of the discharge.*

Appropriate site management practices will be put in place to mitigate any adverse effects associated with odour and dust discharges associated with the proposed activity on the site.

- *Any actual or potential effect of the discharge on human health or amenity and on the health and functioning of plants, animal or ecosystems.*

The potential effects on human health are discussed in the Public Health Assessment which is attached as Appendix J.

- *Any other uses or values of the discharge site and surrounding area, including any values placed on the site by Tangata Whenua.*

The values placed on the site by Tangata Whenua are discussed in the attached Cultural Impact Assessment. (Appendix E)

- *The Ministry of Health Guidelines for the Safe Use of Sewage Effluent and Sewage Sludge on land."*

Coastal Marine Zone

The works to be undertaken in the Coastal Marine Zone primarily involve the construction of the proposed new outfall structure.

"3 Discretionary Activities

3.1 Application must be made for a resource consent for a Discretionary Activity and where indicated a Restricted Coastal Activity, for the following:

- *Activities listed as Permitted or Controlled Activities, which do not comply with standards and/or conditions. Except that this provision shall not apply to activities listed as Non-Complying or Prohibited Activities.*
- *Structures, which impound or effectively contain the coastal marine area.*
- *Structures in the coastal marine area oblique or perpendicular to mean high water springs.*
- *Disturbance of foreshore and seabed any removal of sand, shell or shingle.*
- *Discharges to water.*
- *Depositing material on the foreshore and/or seabed.*
- *Occupation of the coastal marine area."*

The proposed activity involves a structure in the coastal marine area oblique to or perpendicular to the mean high water springs, disturbance of the foreshore and seabed, removal of sand, shell or shingle, and discharges to water and occupation of the coastal marine area.

The following general assessment criteria are applicable to any Discretionary, Restricted Coastal or Non-Complying Activity in the Coastal Marine Zone:

3.2.1 Matters the Subject of Assessment

3.2.1.1 Any relevant objectives, policies and rules of this Plan.

The proposed activity has been assessed against the relevant objectives, policies and rules of the Plan in the preceding sections of this chapter.

3.2.1.2 Any relevant policies of the New Zealand Coastal Policy Statement.

The proposed activity has been assessed against the relevant policies of the NZCPS in the preceding sections of this chapter.

3.2.1.3 Any relevant objectives, policies and methods of the Marlborough Regional Policy Statement.

The proposed activity has been assessed against the relevant objectives, policies and methods of the Marlborough Regional Policy Statement in the preceding sections of this chapter.

3.2.1.4 The likely effects of the proposal on the natural character of the coastal environment.

The proposed new ocean pipeline will be located immediately adjacent to the existing pipeline and will be buried beneath the surface of the foreshore, as such it will not affect the natural character of the coastal environment. While the proposed wetland will be located outside the coastal marine area, it will have the effect of enhancing the natural character of the coastline by attracting additional wildlife to the area.

3.2.1.5 The necessity for the proposed use or development to be within the coastal marine area and the extent to which alternative options to a location within the within the coastal marine area have been considered.

The existing sewage treatment ponds have been established on this site for a considerable period of time. Extensive infrastructure has been established both within the site and within the immediately surrounding environment. As such it is considered impracticable to relocate the treatment ponds to an alternative location.

3.2.1.6 The extent to which existing facilities of a similar scale and nature to the proposed use or development are:

- *located in the vicinity of the site of the proposed use or development especially on land; and*

The proposed pipeline within the coastal marine area will be located immediately adjacent to the existing pipeline. While it is of a slightly larger diameter, it will largely be in keeping with the scale and nature of the existing pipeline. While the existing pipe is not proposed to be removed it will be decommissioned.

3.2.1.7 The extent which the proposal will add to the cumulative adverse effects of use and development on the coastal environment, including those associated with similar existing uses or developments nearby.

The overall proposal including the land disposal area will result in a reduction in the volume of effluent discharged into the coastal marine area and an overall improvement in the quality of the discharge. These factors will ensure that there are limited cumulative adverse effects associated with the proposed activity.

3.2.1.8 The extent to which the proposed use or development will maintain or enhance public access to the coastal marine area without compromising the natural character of the coast.

As previously noted, there are several existing paper roads that traverse MDC land allowing public access from Hardings Road and from DOC land, west of the proposed wetland to the Opawa River. MDC seeks to maximise the land area that is available for application of treated effluent, continued public access along these paper roads, during irrigation could increase the risk to public health. To mitigate the loss of public access as a result of these closures MDC propose to construct a walkway from a new carpark off Hardings Road along the western boundary of the MDC site to the Opawa River. The track would then go north along the river bank to the Wairau Estuary or via the proposed wetland, where it would link with the existing walkway that extends from the end of Hardings Road across the salt marsh to the east of the existing treatment ponds.

3.2.1.9 The extent to which the proposed activity will maintain or enhance amenity values and/or recreational opportunities in the coastal marine area, without compromising the natural character of the coast.

The proposed carpark and walkway outlined above will assist in the provision of enhanced recreational opportunities within the Wairau Estuary and Opawa River. Furthermore, it is noted that the improved discharge will improve the quality of water within the river and estuary and as such improve the opportunities for contact recreation within these areas. Given the passive nature of the walkway and the location of the proposed carpark away from the coastal marine area, it is not considered that these features will compromise the natural character of the coast.

3.2.1.11 The likely effect of the proposal on physical coastal processes, in particular:

- *avoiding activities which aggravate or interfere with natural coastal processes; and*
- *avoiding activities which are adversely affected by the presence of coastal hazards and extreme storm events.*

As noted previously, the proposed outfall structure will be buried below the seabed and as such will not interfere with coastal processes.

3.2.1.12 Any effects of the proposed activity on those in the neighbourhood and where relevant on the wider community including socio-economic and cultural effects.

As outlined in section 6 of this report, consultation has been undertaken with surrounding land owners and local iwi regarding the nature and location of the proposed upgrade. Generally, it is considered that the proposed upgrade will have a beneficial effect on the local community by providing increased capacity for residential and industrial growth within the region. Furthermore, it is considered that any adverse effects on the immediately surrounding properties will be largely internalised through sound site management practices.

3.2.1.13 Where the proposed activity is situated within or near an outstanding natural feature or landscape, the extent to which the activity will damage, compromise or otherwise adversely affect the feature or particular landscape values of that area.

While the proposed pipeline will extend into the Wairau Estuary, the proposed construction methods and location beneath the seabed will ensure that the landscape values associated with the area are not compromised. Furthermore, it is noted that the improved treatment of effluent will improve the amenity values associated with the estuary.

3.2.1.14 The extent to which the proposed activity will damage or otherwise modify an area of indigenous flora or the habitat of indigenous fauna within the site or area, the integrity and functioning of coastal marine ecosystems, including effects resulting from enhanced public access and the likely effectiveness of any proposed measures to avoid, remedy or mitigate adverse effects.

The proposed activity will not result in damage to indigenous flora or fauna within the coastal marine zone. The proposed construction methods are such that any adverse effects associated with the construction of the pipeline will be appropriately mitigated through construction management techniques. Furthermore, it is noted that construction will take place over a comparatively short period of time, thus further mitigating any adverse effects on any coastal ecosystems.

3.2.1.15 The effect of the proposed activity on an area of significant conservation value identified in Appendix D.

While a discharge will occur into the Wairau Estuary, given existing ebb tidal flows and the nature of the proposed discharge, it is not considered that the proposed activity will result in any adverse effects on the nearby Wairau Lagoons.

3.2.1.16 The extent to which the proposed activity will restrict public access and the likely effectiveness of any proposed measures to avoid or mitigate adverse effects, including the provision of alternative routes or points of public access.

As previously noted, there are several existing paper roads that traverse MDC land allowing public access from Hardings Road and from DOC land, west of the proposed wetland to the Opawa River. To mitigate the loss of public access as a result of these closures MDC propose to construct a walkway from a new carpark off Hardings Road along the western boundary of the MDC site to the Opawa River. The track would then go north along the river bank to the Wairau Estuary, where it would link with the existing walkway that extends from the end of Hardings Road across the salt marsh to the east of the existing treatment ponds.

3.2.1.17 The extent to which the proposed activity will adversely affect any site or area of cultural heritage value, and the likely effectiveness of any proposed measures to avoid or mitigate adverse effects.

The proposed BSTP upgrade will improve the overall water quality within the immediately surrounding environment and as such will improve opportunities for contact recreation and fishing. Furthermore, the construction of the proposed wetland will enhance local flora and fauna habitats. These aspects will have the effect of improving the quality of the surrounding environment and as such the cultural values associated with it.

3.2.1.19 The extent to which provision is made to maintain or enhance water quality.

The proposed upgrade will result in improved treatment of effluent passing through the site and as such will improve the quality of water within the coastal marine area. Furthermore, the disestablishment of the existing outfall to the Opawa River will further improve the quality of water within the Estuary.

3.3.4 Structures in the Coastal Marine Area Oblique or Perpendicular to Mean High Water Springs

3.3.4.1 Any activity involving the erection of a structure or structures which is:

- *Solid (or presents a significant barrier to water or sediment movement), and is sited obliquely or perpendicular in horizontal projection to the line of mean high water springs in the coastal marine area, and is in horizontal projection less than 100 metres; or*
- *Is a submarine or sub-aqueous cable;*

Is a Discretionary Activity

3.3.4.2 Any activity which includes erecting a structure or structures in the coastal marine area which:

- *Solid (or presents a significant barrier to water or sediment movement); and*
- *Sited obliquely or perpendicular in horizontal projection to the line of mean high water springs in the coastal marine area; and*

- *In horizontal projection 100 metres or more in length;*

Is a Discretionary Activity that is a Restricted Coastal Activity"

The proposed outfall from the wetlands to the Estuary will be approximately 400 m in length. Accordingly, consent is required as both a discretionary activity and a restricted coastal activity.

The relevant assessment criteria associated with this rule are as follows:

- *Size and structure and area potentially affected.*
- *The degree to which the similar structure in the area could serve the same purpose.*
- *Effect on water and sediment movement.*
- *Effects on the natural character of the area*
- *Effects on landscape and amenity values.*
- *Ecological effects.*
- *Extent to which structure could compromise navigational safety.*
- *The stability and structural integrity of the structure with respect to wave action.*
- *Any actual or potential effects the structure may have on people and communities.*

While the proposed pipeline will be approximately 400 m in length, it will be buried approximately 2 m below the surface of the seabed. Once constructed, it will have negligible adverse effects on the landscape and amenity values of the area. Furthermore, it will not result in any adverse effects associated with water and sediment movement or on the ecological values associated with the area.

3.3.6 Disturbances of Foreshore and Seabed Including any Removal of Sand, Shell or Shingle

3.3.6.1 Any activity involving, in any 12 month period, disturbance of foreshore and seabed for specific purposes, including any removal of sand, shell or shingle or other material which is:

- *Maintenance dredging.*
- *In volume not greater than 50.000 cubic, meters; and*
- *Extracted from areas less than 4 hectares; and*
- *Extending less than 1,000 metres over foreshore and seabed;*

Is a Discretionary Activity

3.3.6.2 Except as provided for in Rule 3.3.6.1 any activity involving, in any 12-month period, disturbance of foreshore and seabed for specific purposes, including any removal of sand, shell or shingle is a Discretionary Activity that is a Restricted Coastal Activity."

The construction of the proposed outfall will involve the disturbance of the foreshore and seabed, however it is noted that this disturbance will meet the criteria set out in part 3.3.6.1 of this rule and as such the proposed activity must be assessed as a discretionary activity.

The relevant assessment criteria associated with this rule are as follows:

- *Extent of disturbance and area potentially affected.*

- *Water quality effects.*
- *Physical effects including erosion, scouring and deposition.*
- *Effect on the natural character of the area.*
- *Effects on landscape and amenity values.*
- *Ecological effects including effects on the benthic environment.*
- *Any actual or potential effects the disturbance may have on people and communities.*

Any adverse effects associated with the construction of the proposed outfall will be dependant on the final construction method that is used. Notwithstanding this, it is noted that any adverse effects will be limited to an approximately 3 month construction period and will be managed through the implementation of a Construction Management Plan which will be submitted to Council for approval prior to construction commencing.

3.3.8 Discharge to Water

3.3.8.1 Any discharge of treated human sewage to the coastal marine area which has passed though soil or a wetland shall be a Discretionary Activity.

3.3.8.2 Any discharge of human sewage to the coastal marine area, which has not passed through soil or wetland, is a Discretionary Activity that is a Restricted Coastal Activity.

3.3.8.3 Any discharge to the coastal marine area in respect of which the applicant may desire to rely on section 107(2)(a) is Discretionary Activity that is a Restricted Coastal Activity.

3.3.8.4 Any discharge to water that is not covered by Rules 3.3.8.1-3.8.3 is a Discretionary Activity

3.3.8.5 Standards

- *The discharge shall not inhibit the gathering of shellfish for human consumption.*
- *The natural temperature of the water shall not be changed by more than 3 degrees Celsius.*
- *Any pH change shall not have any significant adverse effect on aquatic life.*
- *Any increase in the deposition of matter on the foreshore or seabed shall not have any significant adverse effect on aquatic life.*
- *The concentration of dissolved oxygen shall exceed 80% of the saturation concentration.*
- *Any discharge of a contaminant into the water shall not have any significant adverse effect on aquatic life.*
- *There shall be no undesirable biological growths as a result of any discharge of a contaminant into the water.*
- *Aquatic organisms shall not be rendered unsuitable for human consumption by the presence of contaminants.*
- *The visual clarity of the water shall not be so low as to be unsuitable for bathing.*

The proposed discharge from the new outfall will have passed through a wetland and as such will comply with part 3.3.8.1 of this requirement. Discretionary activity resource consent is therefore required for this discharge.

The relevant assessment criteria associated with this rule are as follows:

- *Any mixing zone will be established in accordance with the relevant provisions elsewhere in this plan.*
- *The impact of the discharge having regard to inter alia the effect of; currents, tides, waves, and winds, on horizontal transport and vertical mixing of the contaminant.*
- *The impact of the discharge having regard to inter alia, temperature, BOD5, nutrients, pathogens/bacteria, suspended solids, and pH.*
- *The chemical content of the discharge, including any heavy metals or other toxic substances.*
- *The effectiveness of any mitigation measures.*
- *As assessment of the benefits and costs of the methods of disposal.*
- *An assessment of the risk to the environment in the event of equipment or other infrastructural failure.*

The proposed discharge to the coastal marine area will be treated through the existing pond system and through the proposed new wetland prior to discharge into the coastal marine area. Accordingly, the quality of effluent discharged will be high and as such any adverse effects on the coastal environment will be mitigated. Furthermore, it is noted that the discharge will only occur on the ebb tide and as such the potential for adverse effects on the Estuary environment are also mitigated.

3.3.9 Occupation of the Coastal Marine Area

3.3.9.1 Any activity involving occupation of the coastal marine area which:

- *Would exclude or effectively exclude public access from areas of the coastal marine zone over 10 hectares (except where such exclusion is required for reasons of public safety or security).*
- *Would exclude or effectively exclude the public from more than 316 metres along the length of the foreshore; or*
- *Would involve occupation or use of areas greater than 50 hectares of the coastal marine zone and such occupation or use would restrict public access to or through such areas.*

Is a Discretionary and Restricted Coastal Activity

3.3.9.2 Any activity involving exclusive occupation of the coastal marine area not covered by Rule 3.3.9.1 and above shall be a Discretionary Activity.

The proposed activity involves the exclusive use of the coastal marine area and as such requires discretionary activity consent in accordance with part 3.3.9.2 of this rule.

The relevant assessment criteria associated with this rule are as follows:

- *The impact on other users of the coastal environment.*

- *The impact on cultural and landscape values.*
- *Any effects on the ecology, fauna and flora of the surrounding environment.*
- *Alienation of public space.*

As previously discussed, the outfall structure will be buried beneath the seabed and foreshore and as such will not impact on other users of the coastal environment except during the period of construction. Furthermore, the outfall will not be visible by users of the area and as such will not adversely impact on landscape values.

8.5.6 Assessment of Proposal with Regards to the Proposed Wairau Awatere Resource Management Plan

The location of the proposed works is predicated by operational and locational requirements. The works (particularly a pond-based upgrade) would occupy versatile land but would be of overall benefit to the community and future generations.

With the mitigation measures proposed, potential effects on the natural environment would be avoided or mitigated such that the proposal is in accordance with the objectives and policies of the plan.

8.6 Instruments

The proposed mitigation measures, in regard to the preservation of the natural character of the coastal environment, are set out in Section 8. The most practicable means to mitigate the adverse effects that may be generated by this project, have been adopted.

Consultation with tangata whenua is an ongoing commitment of MDC and any concerns would be addressed as part of the total mitigation package. Cumulative effects have been addressed and upgrading the BSTP would reduce the overall contaminant load of Marlborough's wastewater, with a consequent improvement in coastal water quality. This would, in turn, provide added protection of adjacent marine habitats.

The passing of wastewater through a series of treatment ponds and then a wetland, prior to discharge via an ocean outfall, would be consistent with the requirements of the NZCPS and the RMA, in terms of the sustainable management of natural resources in this locality. The proposed upgrade would be consistent with the policy direction detailed in the objectives of the RPS and PWARMP, reducing existing effects on areas of significant conservation values and mitigating effects on areas of natural value.

9 Proposed Consent Conditions

9.1 Introduction

A summary of the resource consents required for the construction and operation of the upgraded BSTP is provided in Table 9.1. Where appropriate, proposed consent conditions are provided in this section.

MDC is also applying for a Notice of Requirement to designate the area of the treatment ponds, including some adjacent land likely to be necessary for future expansion of the STP. No conditions are proposed for the Notice of Requirement.

Table 9.1 - Resource Consents Required for Stage 1 Upgrade

Proposed Activity	Construction	Operation
General Rules		
Rule 1.2.4 Freshwater Abstractions		■ Abstraction of groundwater for an activity not specified in rule 1.2.1. Non Complying Activity.
Rural 3 & 4 Zones		
Rule 1.6.1 Indigenous Forest Removal	■ Removal of indigenous vegetation in a natural wetland larger than 200m² in any 12 month period. Limited Discretionary Activity	
Rule 1.7.1 Vegetation Clearance	■ Removal of topsoil to a depth greater than 20mm over more than 15% of the vegetation clearance site. Limited Discretionary Activity ■ Operation of heavy machinery within 8 metres of a permanently flowing river, wetland, lake or coast. Limited Discretionary Activity	
Rule 1.7.3 Excavation	■ Excavation within 8m of a permanently flowing river, lake or the sea. Limited Discretionary Activity ■ Excavation within 8m of the landward toe of a stopbank. Limited Discretionary Activity	
Rule 1.8.9 Liquid Waste		■ Discharge of liquid waste to land with faecal coliform levels in excess of 100/100mL. Discretionary Activity
Rule 1.8.12 General Rules Relating to Odour		■ Discharge of contaminants to air resulting in objectionable odour beyond the site boundary. Discretionary Activity

Proposed Activity	Construction	Operation
Rule 2.5.1 Discharge of Liquid Wastes and Animal Effluent		■ Discharge of liquid waste to land with faecal coliform levels in excess of 1 x 10^6/100mL. Discretionary Activity ■ Discharge of contaminants to air resulting in objectionable odour beyond the site boundary. Discretionary Activity.
4.1 Discretionary Activities		■ Effluent treatment ponds, facilities, associated plant, outfall structures and land irrigation systems.
Coastal Marine Zone		
Rule 3.1 Discretionary Activities	■ Disturbance of the foreshore or seabed. Discretionary Activity.	■ Structures oblique or perpendicular to mean high water springs. Discretionary Activity and Restricted Coastal Activity ■ Occupation of the Coastal Marine Area. Discretionary Activity ■ Discharges to water. Discretionary Activity

9.2 Construction Phase

9.2.1 Consents for Removal of Indigenous Vegetation, Removal or Topsoil, Excavation and Disturbance of the Foreshore

The proposed consent conditions for the removal of indigenous vegetation, removal of topsoil, excavation and disturbance of the foreshore, for a period of up to 5 years from the granting of consent, are:

1. The consent holder shall submit to the consent authority, at least one month prior to the commencement of works, a draft Construction Management Plan outlining the construction practices and procedures to be adopted such that compliance with consent conditions are achieved and the effects of construction are minimised. The plan shall include, but not be limited to:
    - Construction methods to be adopted
    - Construction Programme (including expected sequence of events and duration)
    - Hours of work on week days and weekends
    - Details of all consents and approvals
    - Key contact details
    - An assessment of the risks associated with construction activities
    - Mitigation measures to be adopted for:
        - Dust, noise and vibration control
        - Erosion and sediment runoff control (including modifications to onsite drainage)

  - Land disturbance and vegetation clearance
  - Storage and use of hazardous chemicals
  - Spill contingency planning
  - Storage and removal of construction and hazardous wastes
  - Public access and safety
- Emergency procedures
- Discovery Protocol for ko iwi, taonga or artefacts,
- Measures to reinstate the area, and
- A Complaints Register.

2. The consent holder may, at any time, submit to the consent authority an amended Construction Management Plan, provided it is for the purpose of improving efficiency and/or quality of the construction works, or to remove or reduce an adverse effect.
3. The consent holder shall notify the consent authority in writing of the proposed date of commencement of the construction works, at least 1 week prior to the start date of the works.
4. The consent holder shall undertake an archaeological survey prior to commencement of construction of the wetland.
5. In the event that any historical, cultural or archaeological material (including any artefact) of Maori origin, or likely to have significance to Maori, or of heritage or scientific value is found or uncovered during the performance of work authorised by this consent, the following will be complied with:
    - Works shall cease immediately;
    - Advice of the discovery shall be given, as soon as possible to all appropriate local iwi and Marlborough District Council; and
    - No work shall recommence within 100m of the discovery, until 72 hours after advice has been given to the above parties or agreement reached between the parties, regarding appropriate protection measures, whichever, is sooner.

9.3 Operation Phase

9.3.1 Abstraction of Water from Beneath Infiltration Basins

No conditions are proposed at this stage relating to abstraction of water from beneath the rapid infiltration basins. This rate at which water is abstracted will be based on the daily volume of predominantly winery wastewater discharged to the infiltration basins. This will be determined by pilot trials to be carried out during vintage, as soon as practicable after resource consents are granted (the subject of a separate consents application). A term of 35 years is proposed.

9.3.2 Discharges of Treated Effluent to Land

The proposed conditions for the discharge of treated effluent to land, for a period of 35 years from the granting of the consent, are:

1. The discharge shall only be treated effluent from the Blenheim Sewage Treatment Plant (BSTP) taken from the outlet of Pond 6, or from any point between Pond 6 and the outlet of Pond 10.
2. The discharge of treated effluent shall be to land via surface or subsurface drip irrigation within 25 metres of the BSTP site boundaries and public walking tracks within the BSTP site, except that on the western boundary to neighbouring land, drip irrigation shall be used up to 80m from the boundary, as shown in Figure 6.1 in the *Assessment of Environmental Effects for the Upgraded Blenheim Sewage Treatment Plant* (November, 2007). For all other areas of the BSTP site, identified for irrigation on Figure 6.1, spray irrigation may be used. Irrigation of treated effluent shall not be permitted on land not identified for that purpose in Figure 6.1.
3. The treated effluent shall be applied to the land using a deficit irrigation management regime. Deficit irrigation shall be defined as irrigation of a depth of effluent that does not exceed the soil moisture deficit at the time of application. The soil moisture deficit shall be calculated from rainfall and evapotranspiration measured at the site.
4. A double row of shelter trees shall be planted and maintained on boundaries of the BSTP site, at the locations shown in Figure 10 of the *Conceptual Design of Wastewater Discharge to Land from the Blenheim Sewage Treatment Plant"* in Appendix C of the AEE), where this land is adjacent to rural property not owned or leased by the consent holder.
5. Spray irrigation of effluent shall not occur within 10 metres of flowing surface water.
6. The consent holder shall prepare a management plan for the discharge of effluent to land and exercise this consent in accordance with the management plan. The management plan shall form part of the plant Operations Manual (as per Condition 15) and provide, but is not limited to, details of:
    - Shelter trees planting and maintenance;
    - Types of crops to be grown and their location in each discharge area;
    - Methods of discharge to be used and location of discharge equipment;
    - Methods to monitor and control spray drift and odour onto neighbouring properties, including defining the maximum allowable wind speed and direction for discharge to occur in each discharge area;
    - Management of any stock that may be present on the discharge areas from time to time;
    - Methods to prevent runoff and pooling of discharged effluent;
    - Monitoring of the discharge volume, flow and effluent quality;
    - Groundwater monitoring;
    - Procedures for identifying potentially affected parties in the event of problems arising from the discharge; and
    - Emergency response plan that details procedures for management of abnormal conditions such as pump failure.

7. The management plan shall be submitted to the consent authority prior to the first occasion that the discharge commences. The management plan shall be reviewed at least annually by the consent holder and consider the results of any monitoring required by conditions of this resource consent. The results of the review and copy of the revised plan shall be submitted to the consent authority on or before the anniversary of the granting of the consent.
8. Records shall be maintained of; the area of land used in each discharge event, the date, time and duration of the event, the wind speed and direction and the effluent application rate. A copy of these records shall be made available to the consent authority on request. A summary of this data shall be provided in the annual monitoring report required by Condition 16.
9. Groundwater shall be sampled monthly for a minimum of six months prior to irrigation commencing. Groundwater shall be sampled from Wells PZ14, PPCS3 and PZ12, as shown in Figure 3 of *Conceptual Design of Wastewater Discharge to Land from the Blenheim Sewage Treatment Plant"* in Appendix C of the AEE) . The samples shall be analysed for:
   - Ammonia nitrogen,
   - Nitrate nitrogen,
   - Conductivity,
   - E-coli.

   The water level in each bore shall be measured and recorded at the time the sample is taken.
10. Groundwater shall be sampled monthly while irrigation is occurring in each Area identified in Figure 3 of *Conceptual Design of Wastewater Discharge to Land from the Blenheim Sewage Treatment Plant"* in Appendix C of the AEE). For Area 1, Wells PPCS 1, PPCS 2, and PPCS 3 shall be sampled. For Area 2, Well PZ14 shall be sampled. For Area 3, Wells PZ12 and PZ10 shall be sampled. The samples shall be analysed for:
    - Ammonia nitrogen
    - Nitrate nitrogen,
    - Conductivity
    - E-coli.

    The water level in each bore shall be measured and recorded at the time the sample is taken.
11. If the groundwater level measured in any monitoring well is closer than 0.3 m from the ground surface, irrigation shall cease in that area. Irrigation shall not recommence until the groundwater level is greater than 0.3 m below the ground surface.
12. A weather station shall be installed at a location where the data collected is representative of the weather at the BSTP site, prior to commencing discharge to land on the first occasion. The weather station shall monitor continuously and

record sufficient information to allow the calculation of rainfall, evapotranspiration, wind speed and direction.

13. Irrigation using spray irrigation shall cease within 160 m of the boundary of the property in the direction of wind movement when the wind speed exceeds 15 km/hr.
14. The consent holder shall maintain a register of any complaints received relating to any aspect of the land discharge system. The record shall include the date and time of complaint, cause of the complaint, weather conditions at the time of complaint and action taken in response to the complaint. The register shall be made available to the Consent Authority on request.
15. Prior to commissioning the upgrade works, the Consent Holder shall prepare an updated BSTP Operations Manual for treatment and disposal of wastewater from the Blenheim Sewage Treatment Plant and submit it to the Consent Authority. The Manual shall generally follow the draft Table of Contents provided in Section 7.3.2 of the *Assessment of Environmental Effects for the Upgraded Blenheim Sewage Treatment Plant* (November, 2007) and show how the treatment plant will be operated and maintained to achieve expected performance standards and compliance with consent conditions.
16. The consent holder shall provide to the consent authority, an annual monitoring report on or before the anniversary of the date of the issue of the consent. The monitoring report shall:
    - Identify the volume of effluent applied to each irrigation area in the previous 12 months;
    - Summarise and interpret (including graphical presentation and statistical analysis) data collected as required by conditions of this consent and analyse the information in terms of compliance with this consent;
    - Identify and discuss any important environmental trends in the results;
    - Compare results obtained over the reporting period with the results obtained from previous reporting periods;
    - Report and discuss any operational difficulties, changes or improvements made to the effluent treatment or operating processes, which would result in a notable variation of effluent quality or volume discharged;
    - List any significant maintenance works needed, proposed or undertaken to ensure compliance with the conditions of this consent;
    - Report and discuss any complaints received regarding the discharge to land or air and any action taken to address the complaint; and
    - Provide an analysis and interpretation of the effects on the environment of the discharge to land and air.
17. All water and effluent samples required under this consent shall be analysed in accordance with "*Standard Methods for the Examination of Water and Wastewater*" prepared and published by the American Public Health Association, the American Waterworks Association and the Water Environment Federation - the current edition - or any other suitable methodology acceptable to the consent authority.

18. The laboratory carrying out analyses required under this consent shall be accredited for those analyses to NZS/ISO/IEC/17025 or equivalent, as agreed with the consent authority.
19. The consent authority may review the conditions of this consent by serving notice within one month, commencing on the anniversary of the date of the issue of the consent, for any of the following purposes:
    - To deal with any adverse effects on the environment which may arise from the exercise of this consent;
    - To require the consent holder to adopt the best practicable option to remove or reduce any adverse effect on the environment resulting from the discharge; or
    - To comply with the relevant requirements of a regional plan.

9.3.3 Discharges of Winery Wastewater to Land

The proposed conditions for the discharge of predominantly winery wastewater to land, for a period of 35 years, are:

1. The rapid infiltration basins shall be used for the application of predominantly winery wastewater during the vintage period.
2. A sub surface drain shall be installed around the rapid infiltration basins. Water collected in this drain, shall be pumped into the BSTP. The volume of water pumped from the drain each day is unknown but is likely to be a similar volume to that applied to the infiltration basins on that day.
3. The rapid infiltration basins shall only be used when the groundwater is 0.3 m or more below ground level as measured in Well PPCS3 shown on the attached Figure 3 in *Conceptual Design of Wastewater Discharge to Land from the Blenheim Sewage Treatment Plant"* in Appendix C of the AEE). The water level in this well shall be measured and recorded daily when the RIBs are in use.
4. Groundwater from Well PPCS3 shall be monitored at monthly intervals for 6 months prior to the commencement of operation of the rapid infiltration basins for:
    - Depth to groundwater
    - pH
    - Ammonia nitrogen
    - Nitrate nitrogen
    - Sodium
    - E. coli
5. Well PPCS3 shall be monitored at weekly intervals through the vintage, whenever a discharge to the rapid infiltration basin occurs for:
    - Depth to groundwater
    - pH
    - Ammonia nitrogen
    - Nitrate nitrogen

- Sodium
- E. coli

6. The volumes of wastewater discharged to the rapid infiltration basins shall be recorded on a daily basis. This information shall be made available to the consent authority annually on the anniversary of the granting of the consent, along with the groundwater quality results.
7. A management plan shall be prepared and submitted to the consent authority at least 2 weeks prior to the commencement of the operation of the rapid infiltration basins. The management plan shall form part of the plant Operations Manual (as per Condition 8) and will demonstrate how the conditions of this consent shall be complied with and include measures to be used to mitigate any adverse effects identified.
8. Prior to commissioning the upgrade works, the Consent Holder shall prepare an updated BSTP Operations Manual for treatment and disposal of wastewater from the Blenheim Sewage Treatment Plant and submit it to the Consent Authority. The Manual shall generally follow the draft Table of Contents provided in Section 7.3.2 of the *Assessment of Environmental Effects for the Upgraded Blenheim Sewage Treatment Plant* (November, 2007) and show how the treatment plant will be operated and maintained to achieve expected performance standards and compliance with consent conditions.
9. The consent holder shall provide to the consent authority an annual monitoring report on or before the anniversary of the date of the issue of the consent. The monitoring report shall:
    - Summarise the volume of effluent applied to the rapid infiltration basin in the previous 12 months;
    - Summarise and interpret (including graphical presentation and statistical analysis) all data collected as required by conditions of this consent and analyse the information in terms of compliance with this consent;
    - Identify and discuss any important environmental trends in the results;
    - Compare results obtained over the reporting period with the results obtained from previous reporting periods;
    - Report and discuss any operational difficulties, which resulted in a notable variation of the volume discharged;
    - A list of any significant maintenance works needed, proposed or undertaken to ensure compliance with the conditions of this consent;
    - Report and discuss any complaints received regarding the discharge to land or air and any action taken to address the complaint; and
    - An analysis and interpretation of the effects on the environment of the discharge to land and air.
10. All water and effluent samples required under this consent shall be analysed in accordance with "*Standard Methods for the Examination of Water and Wastewater*" prepared and published by the American Public Health Association, the American Waterworks Association and the Water Environment Federation - the current edition - or any other suitable methodology acceptable to the consent authority.

11. The laboratory carrying out analyses required under this consent shall be accredited for those analyses to NZS/ISO/IEC/17025 or equivalent, as agreed with the consent authority.
12. The consent authority may review the conditions of this consent by serving notice within one month, commencing on the anniversary of the date of the issue of the consent, for any of the following purposes:
    - To deal with any adverse effect on the environment which may arise from the exercise of this consent;
    - To require the consent holder to adopt the best practicable option to remove or reduce any adverse effect on the environment; or
    - To comply with the relevant requirements of a regional plan.

9.3.4 Discharges to Air

Proposed Consent Conditions

The proposed conditions for the discharge of contaminants (odour) to the air, for a period of 35 years from the granting of the consent, are:

1. The consent holder shall take all practicable steps to minimise the potential for generation of objectionable or offensive odour from the treatment plant that causes an adverse effect at the legal boundary of any neighbouring property. An adverse effect would be determined by an assessment of the FIDOL factors.
2. The consent holder shall measure the Dissolved Oxygen (DO) concentrations near the outlet of Ponds 2A, 2B, 2C and 6 on one occasion per week. The DO measurements from this monitoring will be taken between 11am and 2pm and shall not be less than 2 grams per cubic metre, on a rolling 10 percentile weekly measurement basis. The DO in Ponds I1 and I2 shall be measured daily during peak loading periods, with DO concentrations maintained at not less than 0.5 grams per cubic metre on a 50 percentile (median) basis.
3. The maximum Biochemical Oxygen Demand (BOD) loading on the rapid infiltration basins, as a result of the application of predominantly winery wastewater, shall not be greater than 600 kg/ha/day.
4. The consent holder shall respond as quickly as practicable, to any complaints about odour and shall take all practicable measures to minimise the odour and prevent it happening again.
5. Any complaints received in regard to odour, shall be recorded in a Complaints Register and a summary of these complaints provided to the Consent Authority as part of the Annual Monitoring Report.
6. Should an event occur, which results in an objectionable or offensive odour at the boundary of any neighbouring property, to the extent that it causes an adverse effect, the Consent Authority may request the consent holder to provide a written report within 15 days of the request being made, specifying:

- The cause or likely cause of the event and any factors which influenced its severity;
- The nature and timing of any measures implemented by the consent holder to avoid, remedy or mitigate any adverse effects; and
- The steps to be taken, if any, in the future to prevent a recurrence of similar events.

7. For the purpose of monitoring compliance with Condition 1, the consent holder will consider an objectionable or offensive odour to have occurred, to the extent that it has caused an adverse effect, if the Consents Compliance Manager of the Consent Authority deems it so, having regard to the frequency, intensity, duration, offensiveness and location of the odour and whether other sources in the area could have contributed to the odour.
8. The consent holder shall set up a Community Liaison Group, consisting of representatives from residents around the BSTP, who will meet every six months with the consent holder, for the first two years (and thereafter by agreement), to review the STP odour complaints record and discuss any other matters of concern.
9. Prior to commissioning the upgrade works, the Consent Holder shall prepare an updated BSTP Operations Manual for treatment and disposal of wastewater from the Blenheim Sewage Treatment Plant and submit it to the Consent Authority. The Manual shall generally follow the draft Table of Contents provided in Section 7.3.2 of the *Assessment of Environmental Effects for the Upgraded Blenheim Sewage Treatment Plant* (November, 2007) and show how the treatment plant will be operated and maintained to achieve expected performance standards and compliance with consent conditions.
10. The consent authority may review the conditions of this consent by serving notice within one month, commencing on the anniversary of the date of the issue of the consent, for any of the following purposes:
    - To deal with any adverse effect on the environment which may arise from the exercise of this consent;
    - To require the consent holder to adopt the best practicable option to remove or reduce any adverse effect on the environment; or
    - To comply with the relevant requirements of a regional plan.

9.3.5 Discharges to Water

Basis of Proposed Consent Conditions for Discharge to Water

The basis for the development of conditions relating to the discharge to water is as follows:

- In deriving effluent limits for the upgraded BSTP, guidelines relevant to receiving waters have been considered. However, it is well-recognised that as well as being more costly, direct monitoring of receiving waters (particularly estuarine waters) offers only a "snapshot" of the water quality at the time of sampling or measurement. Therefore the proposed approach for the BSTP is to base discharge limits on the maximum concentration that would meet the relevant receiving water guidelines using an appropriate dilution factor at the edge of the recommended mixing zone. In terms of

the current effluent flows, a conservative dilution factor is 1:50. Modelling indicates a dilution factor of 1:25 under predicted future effluent flows.

- It is common for consent conditions to take account of the natural variability of pond and wetland-based treatment systems by monitoring the STP's "middle" performance. In terms of discharges that can either be toxic or pose a public health risk, the frequency and extent of deviation of contaminant concentrations away from the "middle" (i.e. the median performance) are important. Medians (50 percentiles) and 90 percentiles are typically used for pond-based discharges. Fixed upper limits (i.e. "never to be exceeded") are used when there is a real possibility of a toxic discharge that will cause significant ecological or public health risk. Such limits are not appropriate for the BSTP discharge where such risks are considered low. Likewise, limits on the total mass of a contaminant are sometimes used where accumulative effects (such as the accumulation of heavy metals into sediments) could become an issue. As the potential for such an accumulation to occur in the Estuary, as a result of discharge from the outfall, is very low, conditions based on mass loadings are not appropriate.
- As the contaminant concentrations from pond-based treatment systems will not vary significantly over time, due to long retention times and mixing, grab sampling will provide a fair representative of typical effluent quality. Continuous monitoring of effluent is not appropriate or necessary.
- Weekly effluent monitoring is suggested for routine analyses and for variable parameters where the potential for some acute effects is higher. Monthly monitoring is applicable for more stable parameters and where the concern is the capacity of the receiving environment to assimilate a sustained loading. Some environmental monitoring is considered prudent. Benthic monitoring in the vicinity of the discharge is suitable because benthic sediments and biota are more stable than the estuarine water column and tend to reflect an incremental increase in contaminant loads. The frequency of monitoring can be relatively low (e.g. 5 yearly) for a consistent effluent into a dispersive environment such as the Estuary.
- Water quality criteria specified in section 107 of the RMA and the Proposed Wairau/Awatere Resource Management Plan (PWARMP) provide some guidance but are often limited in detail and require reference to other national (and sometimes international) sources e.g. ANZECC and USEPA documents.

Proposed Consent Conditions

The proposed conditions for the discharge of treated effluent to water, for a period of 25 years from the granting of the consent, are:

1. The Consent Holder shall provide for the discharge from the upgraded BSTP, as authorised by the consent, generally in accordance with the information and drawings supplied by the Consent Holder in the *Assessment of Environmental Effects for the Upgraded Blenheim Sewage Treatment Plant* (November, 2007).
2. The total discharge of treated effluent from the upgraded BSTP shall not exceed an average daily volume of 28,500 m3 (330 l/s), where the average volume is calculated on a continuous basis over a period of 365 consecutive days. The maximum daily discharge shall not exceed 103,700 m3 (1,200 l/s).

3. The discharge of treated effluent from the upgraded BSTP, shall be via an outfall structure located in the Wairau Estuary at or about Grid Reference NZMG N 5966,320 and E 2598,337. The discharge shall normally take place over about a four hour period, commencing one hour after high tide, except that longer discharge periods may be used after a prolonged wet weather event when peak wastewater flows and high rainfall, causes the storage capacity of the ponds/wetland to be exceeded.
4. Treated effluent from the BSTP will continue to be discharged to the existing Opawa River and Wairau Estuary outfalls until the BSTP upgrading works are commissioned.
5. The proposed mixing zone for the discharge to the Wairau Estuary from the upgraded BSTP, is a rectangular area 50m wide and 300m long, immediately downstream of the outfall and with the middle of the upstream edge centred over the outfall (see Figure 29 of *Ecological Investigations into Discharge Options to Water for the MDC Sewage Treatment Plant, Blenheim* in Appendix D of the AEE).
6. All water and effluent samples required under this consent shall be analysed in accordance with "*Standard Methods for the Examination of Water and Wastewater*" prepared and published by the American Public Health Association, the American Waterworks Association and the Water Environment Federation - the current edition - or any other suitable methodology acceptable to the consent authority.
7. The laboratory carrying out analyses required under this consent shall be accredited for those analyses to NZS/ISO/IEC/17025 or equivalent, as agreed with the consent authority.
8. The discharge of treated effluent from the upgraded BSTP, shall not cause any of the following effects outside the mixing zone described in Condition 5:
    - The natural temperature of the receiving water shall not be changed by more than 3 degrees Celsius.
    - Any conspicuous change in colour or clarity
    - Any significant adverse effects on aquatic life.
    - The concentration of dissolved oxygen of the receiving water shall be greater than 80 percent of the saturation content.
9. There shall be no undesirable biological growths as a result of the discharge.
10. The effluent discharged to the Estuary from the upgraded BSTP shall meet the following standards:

		Median	**90 percentile**
Ammonia Nitrogen	g/m^3	15	20
Faecal Coliforms	cfu/100ml	350	1,075

It should be noted that these effluent quality limits have been back-calculated from future design flows and that when lower flows are being discharged, the concentration limits can be increased. In assessing compliance with these limits, the Annual Report would evaluate these factors.

11. The Consent holder shall carry out following effluent monitoring at the outlet of Pond 10 based on grab samples following commissioning of the upgrade works (grab samples are acceptable because of the averaging effect due to long retention in the pond and wetlands):

Parameter	Frequency
Carbonaceous Biochemical Oxygen Demand	Monthly
Suspended Solids	Monthly
Faecal Coliforms and Enterococci	Monthly
Ammonia Nitrogen	Monthly
Total Nitrogen	Monthly
Dissolved Inorganic Nitrogen	Monthly
Dissolved Reactive Phosphorus	Monthly
Total Phosphorus	Monthly
pH, temperature	Monthly
Trace metals including arsenic, cadmium, chromium, copper, lead, mercury, nickel, zinc	Annually

12. The consent holder shall carry out a survey of benthic sediments and ecology in the vicinity and downstream of the outfall at one and three years after commissioning of the new Wairau Estuary Outfall, changing to five yearly, if the effects are shown to be no more than minor. The surveys shall be such that the results can be compared with the results of the benthic survey of the outfall site carried out by Cawthron Institute (see Appendix D of *Assessment of Environmental Effects for the Upgraded Blenheim Sewage Treatment Plant*, November 2007).
13. The discharges shall be carried out in general accordance with the details contained in the consent application submitted to the Consent Authority. Any change or cancellation of consent conditions shall be done in accordance with section 127 of the Resource Management Act 1991.
14. Prior to commissioning the upgrade, the Consent Holder shall prepare an updated BSTP Operations Manual for treatment and disposal of wastewater from the BSTP and submit it to the Consent Authority. The Manual shall generally follow the draft Table

of Contents provided in Section 7.3.2 of the *Assessment of Environmental Effects for the Upgraded Blenheim Sewage Treatment Plant* (November, 2007) and show how the treatment plant will be operated and maintained to achieve expected performance standards and compliance with consent conditions.

15. The Consent Holder shall prepare and submit an annual monitoring report to the Consent Authority on or before the anniversary of the date of issue of the consent. The report shall include:
    - A summary of all the monitoring data collected as a requirement of the consent in the previous 12 months.
    - An analysis of the data in terms of consent compliance and environmental effects.
    - A discussion of any relevant operational changes or improvements carried out during the year.
    - A comparison of results with previous years and a discussion of any trends.
    - A list of complaints received in regard to the operation of the BSTP and the action(s) taken to address each complaint.
16. Notwithstanding any other conditions, the Consent Holder shall notify the Consent Authority immediately, of any breaches of these conditions. The Consent Holder shall:
    - Immediately take any actions necessary to remedy the breach and to prevent any further breach of conditions.
    - If required by the Consent Authority, provide within 48 hours a written report detailing the manner and cause of the breach of these conditions and the steps taken, or being taken, to remedy and prevent a recurrence of the breach.
17. The consent holder shall make a senior Marlborough District Council representative available to meet with Ngati Toa, Ngati Rarua and Rangitane at six monthly intervals throughout the duration of the consent, to review treatment plant performance including the results of monitoring.
18. The consent holder shall, after 20 years of the granting of this resource consent, carry out a review of the treatment plant performance, taking into account industry best practice, and develop a process for determining the proposed upgrading to occur at the expiry of the consent.
19. The Consent Authority may review the conditions of this consent by serving notice within a period of one month, commencing on each anniversary of the date of issue of this consent for any of the following purposes:
    - To deal with any adverse effect on the environment which may arise from the exercise of these consents, which was not foreseen at the time of the granting of the consents.
    - To require the consent holder to adopt the best practicable option to remove or reduce any adverse effect on the environment.
    - To comply with the relevant requirements of a regional plan.

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11 Abbreviations and Glossary

Aerobic	Process requiring the presence of oxygen.
Aerosol	Particle suspended in air
Anaerobic	Process from which oxygen is excluded.
ANZECC	Australia and New Zealand Environment and Conservation Council
Benthic	Relating to the bed of a body of water
Biosolids	Treated and/or stabilised sewage sludge that can be applied to land
BOD_5	Five day biochemical oxygen demand; a measure of the organic content of water or wastewater by the quantity of oxygen consumed in five days.
BSTP	Blenheim Sewage Treatment Plant
CFU or cfu	Colony Forming Units, a measure of the number of bacteria (such as faecal coliforms or enterococci).
CMA	Coastal Marine Area
Coppicing	Regular cutting of young tree stems to a low level
CORMIX	Water quality model for assessment of mixing zones
Cumec	Cubic metre per second
Disinfection	A process designed to reduce micro-organism numbers.
DoC	Department of Conservation
Effluent	Final liquid from a wastewater treatment process.
Environment	Includes ecosystem and their constituent parts (including people and communities), all natural and physical resources and amenity values, as well as social, economic and cultural conditions that affect or are affected by the other matters noted (as defined in the RMA).
Estuary	Semi-enclosed embayment with free connection to the sea and with a freshwater supply
Faecal coliforms (FCs)	A group of bacteria which are normally abundant in the intestinal tracts of warm blooded animals and are indicators of faecal contamination.
g/m^3	Grams per cubic metre (same as mg/l)
Guideline	Non mandatory values established for guidance (e.g. as trigger, intervention or maximum acceptable levels of a contaminant)
ha	Hectare
Heavy metal	Metal with higher atomic number e.g. lead
ISQG	ANZECC Interim Sediment Quality Guideline
Iwi	Tribe
kg	Kilogram
K-line	Flexible hose low pressure line sprinkler system
km	Kilometre
l/s (or L/s)	Litres per second
m	Metre
mm	Millimetre
Mean	Single value that typifies the average of set of values (e.g. arithmetic or geometric mean).
Mean High Water Springs	The average line of spring high tide.
Median	Single value in a data set that has equal number of greater and lesser magnitude (i.e., 50th percentile).
MOPS	Main Outfall Pump Station

Mixing Zone	Zone of non-compliance in which initial dilution occurs
MPN	Most Probable Number, a measure of the number of bacteria (such as faecal coliforms or enterococci)
MDC	Marlborough District Council
µg/L	Micrograms per litre.
mg/L	Milligrams per litre (same as g/m^3)
MFE	Ministry for Environment
MOH	Ministry of Health
N	Nitrogen
NIWA	National Institute of Water and Atmosphere
NM	Nanometre
NZCPS	New Zealand Coastal Policy Statement
NZWWA	New Zealand Water and Wastes Association
O & G	Oil and grease
Organic	Containing or combined with carbon
OSH	Occupational Safety and Health
Outfall	A pipe on or under the sea bed through which wastewater is pumped for discharge
P	Phosphorus
Pathogen	An organism which is capable of eliciting disease symptoms in another organism.
PDP	Pattle Delamore Partners
Percentile	Value on a scale of 100 that indicates the percent of a distribution that is equal to or below it.
pH	Measure of the acidity or basicity of a solution on a logarithmic scale of 0 to 14
PWARMP	Proposed Wairau/Awatere Resource Management Plan
Redox	Reduction/oxidation reaction
RL	Reduced level (e.g. in terms of mean sea level)
RMA	Resource Management Act 1991
Sewage	Toilet and other waterborne wastes derived from domestic dwellings and non-industrial sources (e.g., office buildings).
Sewerage systems	The network of pumps and pipes carrying wastewater.
Sludge	Untreated sewage solids
SS	Suspended Solids
Standard	Statutory requirement
STP	Sewage Treatment Plant
TN	Total nitrogen
Toxicity	The inherent potential or capacity of material to cause adverse effects in a living organism.
TP	Total Phosphorus
Trade wastes	Liquid wastes discharged by industry.
Treatment	The processing of wastewater to help remove constituents that may have a harmful effect on public health or the environment at the point of discharge.
UV	Ultra-violet irradiation (i.e. as used for disinfection of wastewaters)
USEPA	United States Environmental Protection Agency
Wastewater	The mixture of sewage and trade wastes.
Water quality	An indication of the extent to which the condition of water is considered suitable, or meets the expectations that people may have of it, for any

	particular use.
Wetland	A pond or estuarine area, with variable water levels and containing biota specially adapted to alternating dry and wet conditions.
WHO	World Health Organisation
WWTP	Wastewater treatment plant.
yr	Year