NZ TRANSPORT AGENCY
WAKA KOTAHI

Auckland Harbour Bridge – Maintenance Works: Application for Resource Consent To Discharge Contaminants

Quality Assurance Statement

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Glossary and Acronyms

AC	Auckland Council
ACC	Auckland City Council
AEE	Assessment of Environmental Effects
AHB	Auckland Harbour Bridge
ARC	Auckland Regional Council
CMA	Coastal Marine Area
CPA	Coastal Protection Area (ARC Coastal Plan)
EMP	Environmental Management Plan
HSNO	Hazardous Substances and New Organisms Act 1996
NSCC	North Shore City Council
The NZTA	The New Zealand Transport Agency
RMA	Resource Management Act 1991
Receiving environment	The natural, cultural and social environments into which discharges from maintenance activities are released.
SRP	Spill Response Plan
Waahi Tapu	Places or things that are sacred or spiritually endowed to Maori. This includes, but is not limited to pa sites, battle sites and tauranga waka (canoe landings).

1. Introduction

The NZ Transport Agency (NZTA) has a statutory responsibility (under the Land Transport Management Act 2003) to manage the operation of the nation's State highways which includes the Auckland Harbour Bridge (AHB). Spanning the Waitemata Harbour the AHB ensures New Zealand's main State highway (State Highway 1) is continuous from Northland through Auckland south. Because the AHB plays this pivotal role in maintaining the functionality and efficiency of the Upper North Island transport system it is regarded as national asset and the most strategically important bridge in the country. The AHB is a significant contributor to the sustaining and fostering national and regional economic growth.

In the regional context the AHB's role in transport is critical to the growth and development of wider Auckland, primarily through maintaining the key conduit between Auckland and the North Shore. In this capacity the AHB currently carries an average of 170,000 vehicles per day (approximately 85,000 in each of the north and south bound directions) using it, with peak traffic volumes of 11,500 per hour. The AHB also provides a physical platform for key intra-regional utilities systems and lifelines such as fresh water, electrical power, gas and telecommunications. These services rely on the AHB functionality not only by providing a route for their infrastructure for normal supply needs but also in civil defence emergency situations.

Being a predominantly steel structure, the AHB requires continual maintenance activities over an area of 150,000m^2 at a rate of approximately ten percent of this area annually. These activities include water blasting, wet and dry abrasive blasting, application of coatings (primers, rust inhibitors and paints) and minor strengthening works such as metal welding and concreting. Discharge of various contaminants from these maintenance activities occurs to the air, marine waters and surrounding land. These discharges require resource consent authorisations under the Resource Management Act (RMA) via the Regional Plans.

The existing maintenance resource consents (permits 23956, 23954 and 23955) that the NZTA holds for the AHB were granted by the Auckland Regional Council (ARC) in October 2001 and are due to expire on 1 October 2011. New resource consents will be required from October 2011 to continue discharging these containments as part of the necessary ongoing AHB maintenance activities.

Under the current Auckland Regional Plans the continued maintenance of the AHB works require new resource consents the following activities:-

- Discharge of contaminants to the Coastal Marine Area
- Discharge of contaminants into air from dust generating activities
- Discharge of washwater, wastewater and dry wastes to land.

Since 2001 the NZTA has maintained the AHB in accordance with the existing resource consent provisions, which were authorised on the basis of environmental controls to minimise/mitigate the effects of discharges from bridge maintenance activities. The ARC acknowledged at the time that the maintenance was essential to ensure the integrity of the AHB given its national and regional importance. It was recognised that the works would potentially impact the waters of the Waitemata harbour and the soils at both the northern and southern ends of the bridge. However, the ARC accepted that the proposed environmental controls put forward by the NZTA at the time, and resource consent conditions they proposed were acceptable ways of reducing adverse effects from the maintenance activities.

In recent years the Council has changed its approach to contaminant discharge management in response to greater understanding of their impacts. Based on this and "good practice" undertaken on similar bridges overseas, the NZTA will undertake the following on the AHB to avoid as discharges as far as practicable: -

- Enhanced environmental controls as part of Quality Controls systems
- Scheduling of works to reduce risk
- Physical containment of discharges (Containment) based on risk.
- Close working relationship with Auckland Council (AC)

Combined these methods are considered the Best Practical Option (BPO) approach and the NZTA now seeks new resource consents (the Application) for continued maintenance activities for the AHB. The NZTA has also changed its approach to the environment and wishes to adopt good practice. All required aspects of the Assessment of Environmental Effects in support of the Applications to continue maintenance activities of the AHB are included in this report (AEE). An important aspect of the AEE is the length/duration of authorisation sought which is based on the certainty needed by the NZTA to be able to successfully implement the contaminant containment processes committed to.

The NZTA are seeking approval to implement a range of measures to reduce the environmental effects of discharges arising from its bridge maintenance activities. To implement the new maintenance procedures, that will result in a significant reduction of levels of discharges to the environment requires significant capital investment. To procure and implement the approved procedure means the NZTA requires a minimum consent period of 25 years.

The NZTA considers this AEE meets all the requirements of Section 88 of the RMA and includes all issues sought by the Auckland Council (the Council) Application Forms (See Appendix A).

For clarification Schedule 4 requirements of the RMA are contained in the following sections of the AEE:

Description	Report Section
Description of the proposal	4
Actual and potential environmental effects of the proposed activities	7
Description of the receiving environment	7
Alternative methods of discharge	7
Consultation and affected parties	7
Monitoring (EMP)	7.4.1

The structure of this AEE is set out below.

Section of report		Summary of content
2	Site Description	Brief site description of the areas surrounding the AHB along with an outline of Regional and District Plan zoning and special provisions.
3	Background	Brief history relating to the construction of the AHB along with details of the bridge construction and coatings materials.
4	Proposal and Maintenance Activities	Description of the proposal and identification of the maintenance activities undertaken and an outline of scale and frequency of works. A list of other relevant consents and authorisations.
5	Reason for Application	Summary of the relevant regional rules triggered by bridge maintenance activities and the overall activity status of the proposal.
6	Consultation	Consultation
7	Assessment of Environmental Effects	Outline of the receiving environments, contaminants of concern, quantification and fate. Summary of environmental management controls (with reference to the EMP) and conclusion regarding actual and potential effects.
8	Statutory Considerations	Evaluation of relevant statues and statutory documents (policy statements and plans), and identification of the specific regional assessment criteria.
19	Conclusion	Final conclusion with regard to application.

2. Site Description

The AHB spans the Waitemata Harbour (Harbour) with the southern abutment adjacent to Westhaven Marina (Westhaven) and the northern anchorage on and over Stokes Point, Northcote (also known as Te Onewa Reserve). The Harbour is Auckland's main commercial and recreational marine resource and the structure of the AHB ensures that there are limited impacts on navigational safety. Visually the bridge is an icon aspect of the Auckland regions visual landscape and is highly valued.

South of the AHB a range of marine activities occur in Westhaven, east to Wynyard Quarter and to the Ports of Auckland, with a backdrop of residential landuse at St Marys Bay. North of the AHB are the residential areas of Bayswater and Belmont Landuse directly adjacent to the northern and southern abutments of the bridge included residential, recreational, roading and commercial activities. Figure 2.1 shows the view of the bridge from Westhaven Marina.

Figure 2.1. Auckland Harbour Bridge (view from Westhaven Marina)

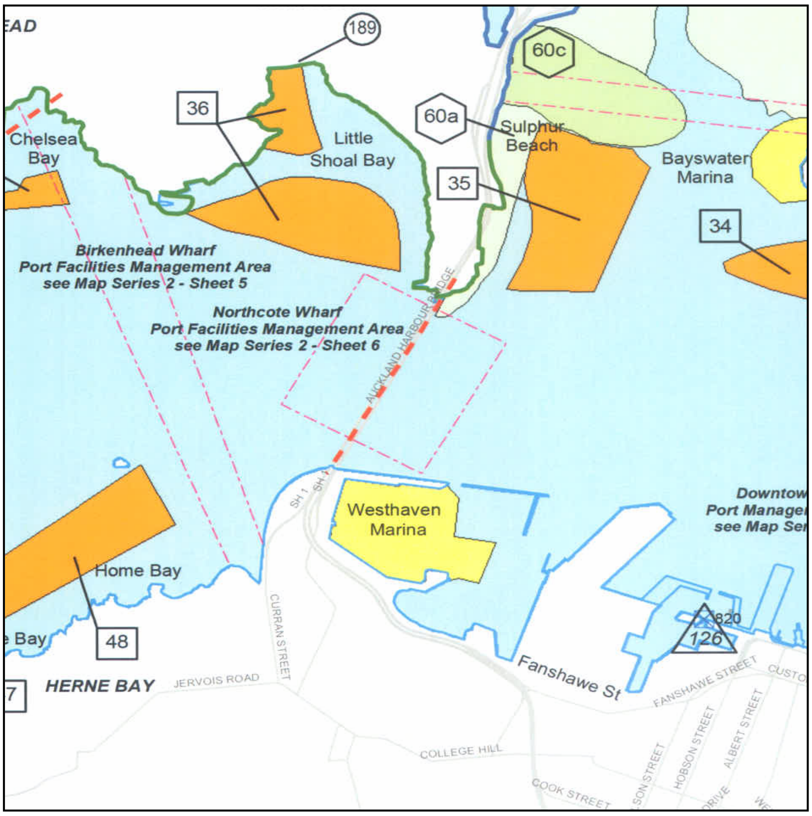
The relevant Regional and District plan provisions covering the terrestrial and marine areas adjacent to the AHB are detailed in Table 2.1 and shown of Figures 2.2, 2.3 and 2.4. Further detail regarding the ecological values and status of these area, as well as water quality and sediment quality is presented in with Section 7).

Table 2.1: Site Land Use and Zoning Refer figures overleaf

Document	Provisions / Zoning
Auckland Regional Plan: Coastal	Coastal Marine Area General Management Area Marina Management and Mooring Areas (Areas 34, 35, 36, 48) Coastal Protection Area 2 (Area 60a), Shoal Bay – Ngataringa Bay Coastal Protection Area 1 (Area 60c), Shoal Bay – Ngataringa Bay Landscape – Regionally Significant Landscape (rating 5), Stokes Point

Document	**Provisions / Zoning**
North Shore City District Plan	Designation 108 for the purpose of the North Anchorage: Auckland Harbour Bridge. Notable trees (388 – Morton Bay Figs, Pohutakawa and Oleander and 392 – Puriri, Totara and Acmena) Site of Special Wildlife Interest (SSWI 14) Coastal Conservation Area Historic Building, Object or Place (154 – Historic house, 88 – Northcote Point Flagpole, 86– Auckland Harbour Bridge Memorial) Archaeological Site (54 – Headland Pa).
Auckland City Operative District Plan: Isthmus Section	Designation A07-01 for the purpose of a motorway Maori Heritage Site (A07-04 – Te Korenga Oka) Additional Tree Protection (A07-03 – St. Mary's Bay to Cox's Bay Cliffline)

Areas of cultural significance including those with Maori values are listed in the Auckland Council Cultural Heritage Inventory.



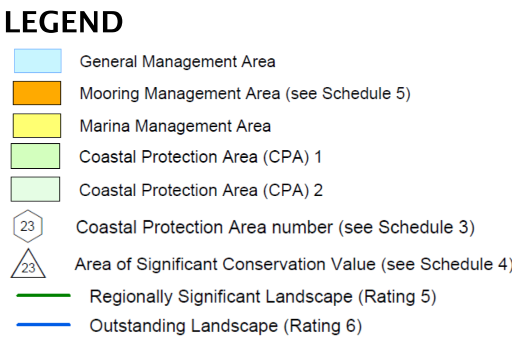


Figure 2.2: Auckland Regional Plan:

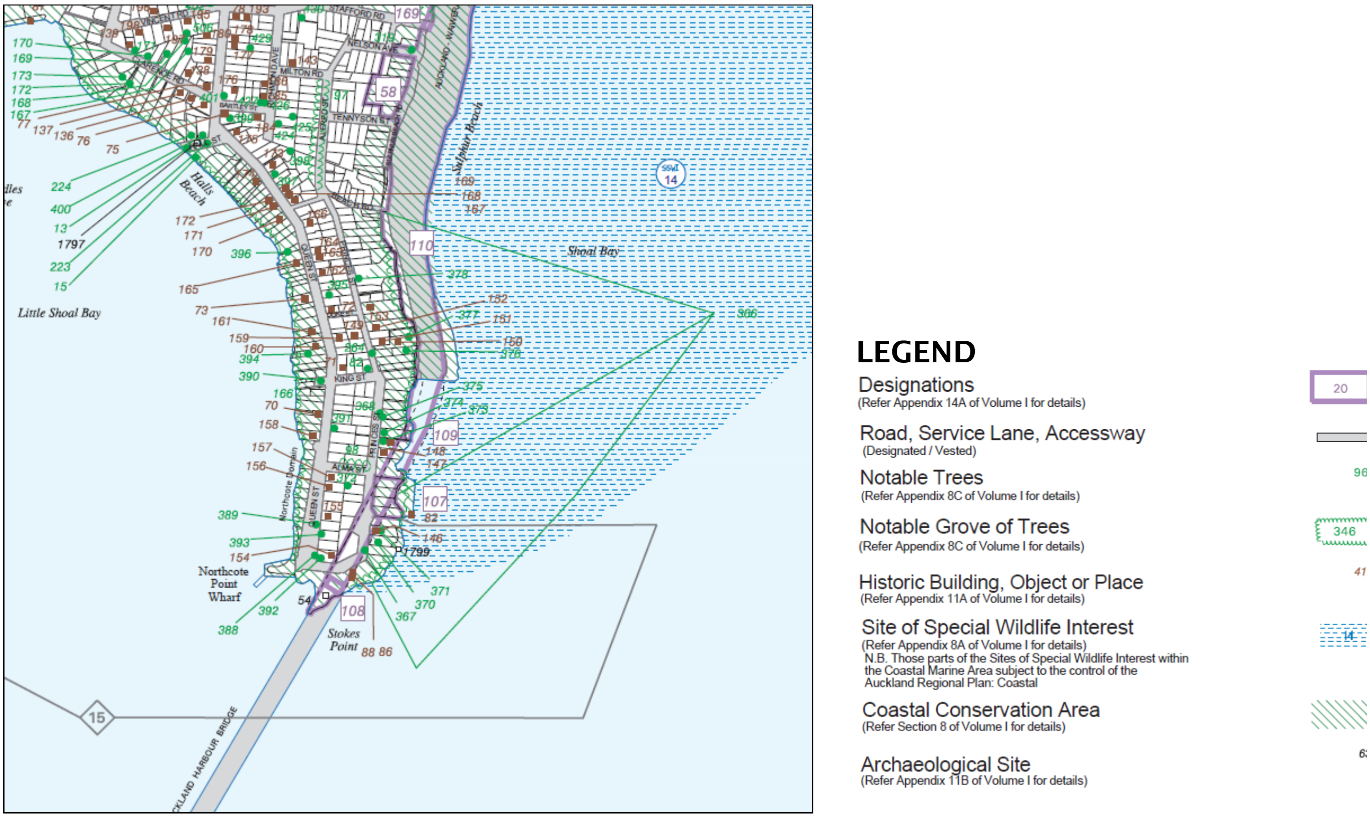


Figure 2.3: NSCC District Plan map showing Designations and Special Provisions

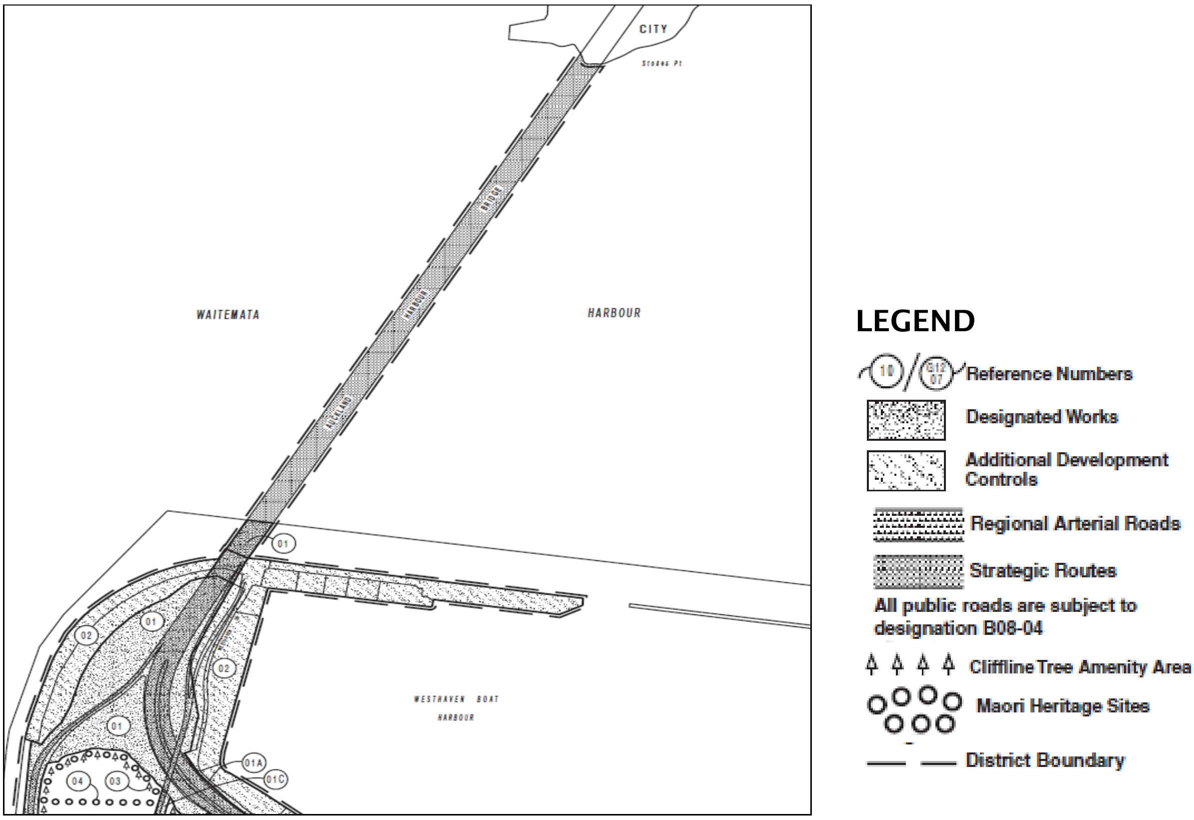


Figure 2.4: ACC District Plan Isthmus Section map showing Zoning and Planning Limitations

3. Background

3.1 Bridge History

In December 1951 the Auckland Harbour Bridge Act was passed which established the Auckland Harbour Bridge Authority (the Authority). The duties of the Authority were to construct, maintain, manage and control a bridge across the Waitemata Harbour from Point Erin to Stokes Point.

The Authority chose a steel structure for the bridge and construction began in 1956 with prefabricated sections being built on top of spans already in place and then floated into position in the harbour on barges. On the 30th May 1959 the bridge opened. Two extensions were put in place between 1968 and 1969 to address transport capacity needs.

Currently the Bridge is managed by the NZTA via a maintenance contract with Total Bridge Services (TBS).

3.2 Bridge Description

The AHB is made of different structural components detailed on Figure 3.1. The landward components of the bridge consist of three viaducts:

- South Steel Viaduct,
- North Steel Viaduct, and
- North Concrete Viaduct.

The seaward components of the AHB include steel spans and trusses, box girders and the south anchorage.

3.3 Bridge Surface

The surface area of the AHB is approximately 150,000m², with an average paint thickness of 800μm (0.8 mm). The current paint system used on the AHB comprises one primer coat, one intermediate coat and one topcoat. The primer coats are made up of a zinc pigment suspended in a urethane binder, and the intermediate and topcoats comprise an iron oxide pigment in a urethane binder. Historical paint coatings include zinc phosphate, zinc chromate and a lead primer paint, which has not been used on the bridge since the very limited applications in 1959.

Being in a marine environment the AHB is vulnerable to paint deterioration and steel corrosion requiring continual maintenance to ensure it is structurally safe and fit for the required use. Routine works primarily involve surface preparation and cleaning, abrasive blasting and then coating by a specifically designed paint system. In addition, maintenance works such as welding and concrete works are intermittently undertaken to address minor strength issues.

Table 3.1 summarises the AHB construction information and Figure 3.1 illustrates the various structural components.

Table 3.1: AHB Construction Information

Location	Waitemata Harbour between Point Erin/Westhaven and Stokes Point in Northcote
Size	Total AHB Length is approximately 1600 metres Span over water is approximately 1100 metres
Construction	Steel and Concrete
Coating(s)	Current (zinc based) 1959 – 1999 Zinc Chromate 1959 Lead based paint in Span 7, internal box girders and chords

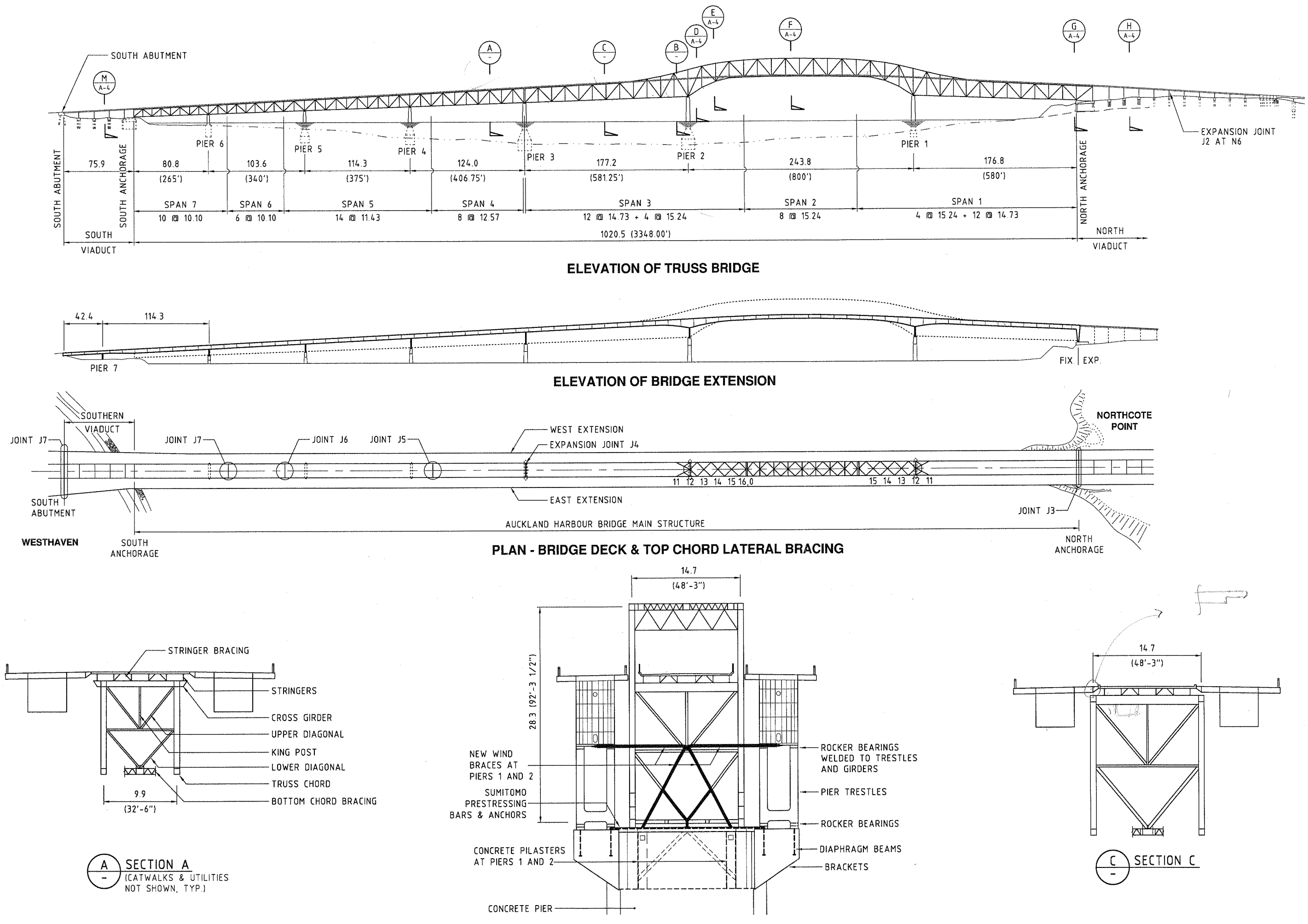


Figure 3.1: Auckland Harbour Bridge structural components
Source: NZTA Auckland Harbour Bridge – Structural Inspection Manual (2001)

4. Overview of proposal

4.1 Proposal

Ongoing maintenance of the bridge is required to maintain its structural integrity. Therefore the NZTA is seeking to obtain the required regional planning consents to enable ongoing maintenance works to continue.

The current consents have been in place since October 2001. The NZTA recognises that there is a need to put in place improved environmental practices that accord with good practice for maintenance of strategically important infrastructural assets.

The current proposal seeks resource consent approval to employ maintenance procedures and processes that are consider to be the best practicable option (the BPO). The BPO includes implementing improved environmental controls and scheduling of works in conjunction with the progressive implementation of containment systems. These containment systems will significantly reduce the release of contaminants to the environment.

Maintenance activities on the bridge are required for safety, structural and aesthetic (visual) issues and include:

- Washdowns
- Waterblasting
- Degreasing
- Dry abrasive blasting
- Wet abrasive blasting
- Mechanical and chemical paint stripping
- Control of lichens and moss
- Exterior steelwork painting (including priming, inhibitors, and paints)
- Internal box painting
- Concrete works
- Welding

The surface area of the bridge is approximately 150,000m^2 and approximately 10% is maintained yearly, the frequency and scale depending on corrosion issues that develop and need attention. Due to the NZTA's commitment to the environment, implementation requirements for containment systems are being considered and require substantial capital investment by the NZTA over several years. This must be reflected in the duration of consent authorised. Based on this, a maximum period of 25 years is being sought. To allow for any variation in maintenance activities due to industry changes in respect to paint systems, containment methods or environmental control processes tailored conditions are being sought.

4.2 Discharge Details

Table 4.1 details the various maintenance activities that have the potential to discharge contaminants, the substances / products used during each activity and an assessment of the scale and frequency of these works (number and size of crews and maintenance duration). Greater detail is provided in Section 7 and Appendix C including quantification of the amount of product used and lost to the various receiving environments.

4.3 Methods to avoid, mitigate or remedy

The NZTA proposes a Best Practical Option method to avoid, mitigate or remedy the effects of discharges on the environmental of the AHB maintenance activities based on:

- Enhanced environmental controls as part of Quality Controls systems
- Scheduling of works to reduce risk
- Physical containment of discharges (Containment) based on risk.

Generally these methods are as follows:

4.3.1 Environmental Management Plan

As part of the overall quality management system for the AHB a specific Environmental Management Plan (EMP) detailing work practices undertaken for all current and proposed maintenance works will be developed and implemented. These work practices have been developed aimed at

- Putting in place specific methods to manage those activities detailed in Table 4.1
- Scheduling works to reduce or avoid discharge impacts
- Recording and reporting implementation of controls
- Using continuous improvement processes to enhance the EMP performance
- Cross correlating with resource consent requirements
- Ensuring spill/emergency spill response processes are operational
- Engaging regularly with the Auckland Council to discuss benefits of systems and share new ways of containment.

The wider quality management system for the AHB maintenance activities also include sourcing abrasive and coating products that have lower toxicity to the environment where possible. Details of the EMP are discussed in Section 7 and a full copy is provided in Appendix G.

4.3.2 Containment of Discharges (Containment)

The NZTA proposes staged introduction of containment of discharges through physical control systems out to pier 1 and 5 by 2013 and the CMA within ten years. The systems being proposed typically enclose work areas capturing air borne particulates and manage fluids carrying this material. It is expected that up to 85% of particulate discharges will be captured through these systems in some areas. To implement the necessary containment systems, a series of enabling works must first be constructed. Details of these systems are within Section 7 and Appendix F.

4.4 Statutory Status

Assessment of the statutory planning documents and their provisions relevant to the proposed discharges from the AHB are detailed with Section 8 and Appendices B / H. A summary of the status of the maintenance activities and associated discharges is provided below:

4.4.1 Permitted Activities

Current maintenance activities, which are carried out as PERMITTED and will continue to be carried out, are covered by the following rules:

Auckland Regional Plan: Coastal (ARP: Coastal) Permitted Activities

- Rule 12.5.1: Maintenance, repair and reconstruction of existing lawful structure
- Rule 12.5.5: Temporary structures (e.g. scaffolding to enable maintenance)
- Rule 35.5.5(a): Noise generated in the CMA (e.g. when dry abrasive blasting over water)

Proposed Auckland Regional Plan: Air, Land and Water (ALWP) Permitted Activities

- Rule 4.5.1: Discharge of contaminants into air from historic and current bridge coatings during surface preparation (e.g. zinc released due to dry abrasive blasting); and from other maintenance activities (e.g. over spray during spray painting)

4.4.2 Regional Plan Rules – Activities Requiring Consent

Current maintenance activities, which are either CONTROLLED or RESTRICTED DISCRETIONARY are covered by the following rules:

Regional Plan: Coastal (2004)

- Rule 20.5.5: Discharge of contaminants to the Coastal Marine Area: (Controlled)

Regional Plan: Air, Land and Water Plan (2005)

- Rule 4.5.61: Discharge of contaminants into air from dust generating activities (Restricted Discretionary)
- Rule 5.5.63 and 5.5.64: Discharge of washwater, wastewater and dry wastes to land (Controlled)

4.4.3 Overall Status of the Proposal

The overall activity status of this proposal is determined as the most severe of those identified above, which is Restricted Discretionary Activity.

4.4.4 Related Consents and Authorisations

4.4.4.1 Existing Consents

The NZTA holds the following existing consents and authorisations relevant to the AHB
:

Auckland Regional Council	Occupation of the Coastal Marine Area (CMA) (Consent 31115)
	Stormwater Spill Tanks: Disturbance of the seabed/foreshore for the purpose of constructing stormwater outfall structures (Consent 30574), stormwater divert and discharge (Consent 30571) and Occupation of the CMA (Consent 30573).
North Shore City Council	Designation 108 for the purpose of the North Anchorage: Auckland Harbour Bridge.
	Tradewaste
Auckland City Council	Designation A07-01 for the purpose of a motorway
	Tradewaste

4.4.4.2 Future Consents

To implement physical containment systems to control discharges from the AHB maintenance activities placement of permanent and/or temporary structures over the Coastal Marine Area may necessitate a variation of the condition(s) of the existing consent to occupy the Coastal Marine Area (31115).

The NZTA is seeking resource consent specifically for discharge of contaminants to ground at Stokes Point and these are not part of the Application although the background information on the issue as discussed.

4.4.4.3 Utility Services on the AHB

A range of utility services exist on the AHB including:

Types	Owner
Trunk water supply main	Watercare Services Ltd
Gas pipeline	Vector
Overhead Antennas	Vodafone
Fibre-Optic Cable (F.O.C.)	TelstraClear
F.O.C.	Telecom (Chorus)
F.O.C.	Vector Communications

Each utility service operator has an issued service agreements (consents for installation, operation and maintenance). Service agreement are conditional upon the service owner complying "with all regional and District Plans and applicable statues, bylaws, regulations, approvals, permits" and obtaining "all necessary approvals, consents and permits from all statutory, public or other authorities" prior to commencing any work on the bridge".

Table 4.1: **Maintenance Activities Summary Table – Pre containment**
Greyed out text denotes activities where there are no discharge of contaminants, or discharges are consented under separate authorisations

Maintenance activity (type / aspect)	**Description (WIs) / Purpose**	**Part(s) of bridge / Risks** (subject to controls in EMP)	**Products and Substances used Refer to Product Fate Table in Appendix B**	**Potential Substances Released Refer to Assessment of Environmental Effects section**	**Extent (amount, time) / Frequency**
Washdowns	Washdowns of steelwork to prevent build up of salt and other deposits.	Carried out everywhere	Potable water	Washwater. Car pollutants such as sediment, metals and TPH.	Occurs on a continual basis as required.
Waterblasting NB: Non-degreasing	Waterblasting of steel surfaces to remove contaminants (e.g. salt) to ready for application of protective coatings.	Carried out everywhere subject to controls in the EMP	Water	Washwater from blasting. Car pollutants such as sediment, metals and TPH and bridge pollutants such as zinc from recent paint coatings.	Occurs on a daily basis (but not all day, every day) all year round. Currently 1 crew of 4-6 people
Degreasing	Biodegradable product used to break down grease to clean surface prior to coatings	Inside box girders	Detergent (e.g. Powerwash)	Detergent contains low proportion of silicates, sequestering agent and surfactants.	This is only used inside the box girders to clean the surfaces prior to painting.
Dry abrasive blasting	Abrasive blasting of steel components to remove corrosion prior to the application of protective coatings.	Carried out (when wet abrasive is not feasible) on all external steel surfaces between pier 1 and 5. Concrete is also blasted periodically to remove graffiti	Garnet Sand B Garnet Sand C	Garnet sand B & C. Car pollutants such as sediment, metals and TPH and bridge pollutants such as zinc chromate, lead and all other paint coatings dislodged during the blasting process.	Occurs on a daily basis all year round. Currently 1 crew of 4-6 people

Maintenance activity (type / aspect)	Description (WIs) / Purpose	Part(s) of bridge / Risks (subject to controls in EMP)	Products and Substances used Refer to Product Fate Table in Appendix B	Potential Substances Released Refer to Assessment of Environmental Effects section	Extent (amount, time) / Frequency
Wet abrasive blasting	TBD: The same process as dry blasting but with water added to abrasive to keep dust generation down.	Carried out north of pier 1 and south of pier 2.	Garnet Sand B Garnet Sand C	Garnet sand B & C. Car pollutants such as sediment, metals and TPH and bridge pollutants such as zinc chromate, lead and all other paint coatings dislodged during the blasting process.	Occurs infrequently. Not carried out annually. If activity was carried out continuously it would take 6 months every 12 – 15 years.
Mechanical and Chemical Paint Stripping	TBD: Application and removal of lead paint using chemical paint stripper.	Insider box girders	“Peel Away”	Activity is fully contained therefore nothing released.	Under normal operating conditions would only be for weld repairs (1–2 times per year) for small areas <1m^2.
Exterior Steelwork Painting	WI4: Application of protective coatings to surfaces of bridge using pressurised spray equipment.	Relates to external parts of the bridge only.	MC Zinc (primer) Miomastic (intermediate coat) Ferrox A (top coat) MC Thinners	MC Zinc, Miomastic, Ferrox A may be released during painting due to overspray. Thinners and coatings may be released in a spill or if a hose breaks.	Occurs on a daily basis all year (weather conditions permitting)
Internal Box Painting	WI23: Application of protective coatings inside the box girder, including the preparation of surfaces, mixing and application.	Inside the box girders	Altex HB Rust Barrier	Activity is fully contained therefore nothing released.	Not carried out annually. If the activity was carried out continuously it would take up 2 years out of 10.

5. Notification Requirement

Section 95A (1) provides that a consent authority has a discretion as to whether it may publicly notify a consent. However, 95A(2) requires that a consent authority must notify an application if:

(a) it decides (under section 95D) that the activity will have or is likely to have adverse effects on the environment that are more than minor; or
(b) the applicant requests public notification of the application; or
(c) a rule or national environmental standard requires public notification of the application;

The proposal satisfies Section 95A(1)(b) and (c) in that the applicant has not requested public notification and there are no rules in relevant national environment standards which require notification.

Section 95A(3) provides that despite Sections 95A(1) and (2)(a), where a rule or national environmental standard precludes public notification of the application, the consent authority must not publicly notify the application.

Section 95B(1) provides that, if a consent holder does not publicly notify an application for a resource consent, it must decide (under Sections 95E and 95F) if there are any affected persons or order holders. Section 95B(2) however allows that the consent authority does not need to provide written notice of an application if a rule in a plan or national environmental standard precludes notification. This exclusion does not affect order holders, however no order holders have been identified in this instance.

Section 95A(3) and Section 95B(2) are both considered to apply. There are rules in both the Proposed Auckland Regional Air Land Water Plan and Auckland Regional Coastal Plan which provide for processing without public notification or the need to serve notice on affected persons as long as special circumstances do not exist.

Auckland Regional Plan: Air, Land and Water : The ALWP Rules 4.5.24 and Rule 5.5.65 / 5.5.66 states that Restricted Discretionary Activities and Controlled Activities shall be considered without public notification or the need to serve notice of the application on affected persons in accordance with Sections 95A(3) and 95B(2) of the RMA, unless in the opinion of the ARC there are special circumstances justifying public notification in accordance with Section 95A(4) of the RMA.

Auckland Regional Plan: Coastal: The ARP: Coastal Clause 20.5.5.1 states that applications for controlled activities shall be considered without public notification or the need to serve notice of the application on affected persons in accordance with Sections 95A(3) and 95B(2) of the RMA, unless in the opinion of the ARC there are special circumstances justifying public notification in accordance with Section 95A(4) of the RMA.

An assessment has been made and there are not considered to special circumstances which warrant notification of the Application.

Overall; the Application is considered to meet the tests within Section 95A(3) and 95B(2) and is considered suitable to be processed without public notification or the need to serve notice of affected persons and therefore be able to progress on a non-notified basis.

6. Consultation

The NZTA has an ongoing process of engagement and communication with the owners and occupiers of dwellings and businesses at both the northern and southern abutments. The NZTA will continue this engagment process to minimise inconveniences which may be caused by bridge maintenance activities. These parties include:

- Harbourmaster
- Residents/commercial premises
- Iwi
- Department of Conservation
- Auckland Council
- Historic Places Trust

The NZTA will continue to engage with relevant parties when the granted is authorised and throughout the life of the consent to update them specifically of the issues relevant to them.

7. Assessment of Environmental Effects

7.1 Overview

The AHB spans one of Auckland's most important natural features, the Waitemata Harbour, performing a nationally and regionally significant role in terms of economic growth and landuse development. The harbour also performs a nationally and regionally significant role and the NZTA must ensure this is maintained also. To maintain the AHB's function, a range of maintenance activities is required that create discharges to the local air, land and water environs.

Discharges include a range of contaminants in particulate form derived mainly during air and water blasting of surface coatings and over spray during recoating. Current environmental practices undertaken on the AHB are limited in terms of mass discharge control of contaminants but through the Environmental Management Plan is proposed to maximise day to day efforts to at reducing this.

While the environmental effects of the contaminant discharges are indiscernible in terms of individual releases, in context with the harbour's biophysical characteristics they may contribute to the a much wider regional problem as these materials accumulate within marine sediments. Internationally controls of discharges from bridge maintenance are being enhanced to capture these types of contaminants which persist within waterways and their sediments. Controls are focused around encapsulation systems which require considerable investment and reflect a range of regulatory situations and receiving environment sensitivity.

The NZTA recognises the need to provide greater capture of contaminants from the AHB maintenance activities and is proposing a Containment system alongside existing controls. In line with good practice the proposed environmental management system is aimed at reducing contaminated discharges to address long-term environmental issues in the Auckland region, in particular the Waitemata Harbour environs.

The Containment system is based on the:

- Nature of the discharges from the AHB maintenance activities and the sensitivity of the receiving environment to adverse effects; and
- Financial implications, and the effects on the environment of an range of options; and
- Current technical knowledge, current environmental controls being used and that containment can be successfully applied;

The implementation of Containment will provide for control of discharges over land (Stokes Point and Westhaven) by the end of 2013 and over the CMA within 10 years of granting of the Application augmented by continuous improvement of environmental controls undertaken on a day to day basis. Contaminant discharges in these circumstances are considered to have no significant effects on aquatic life.

Overall the proposed system of environmental controls on day to day activities and Containment is considered the Good Practical Option and addresses the:

- Nature (including volume and level) of contamination ; and
- Methods of discharges and the effects arising from these; and

- Provision of adequate facilities for the collection, treatment, and disposal of any discharge;
- Duration of consent ; and
- Monitoring of the consent.

The following sections discuss the background to the Good Practical Option put forward,

7.2 Receiving Environment

Discharges from the AHB maintenance activities are to the air, land and water. Discharges to water are directly to the Waitemata Harbour as the majority of the structure is over the Coastal Marine Area (CMA). To land the discharges impact on residential areas and open space on Stokes Point and to the south local roads, Westhaven commercial facilities and open space areas. These receiving environments are described further in the table below and the following sections.

AHB Receiving Environment summary

RECEIVING ENVIRONMENT	DESCRIPTION / ASPECT
Coast – Waitemata Harbour and seabed sediments	Northern end of bridge is adjacent to an area identified as Coastal Protection Area 1 and 2 in the Auckland Regional Plan: Coastal (ARP:C).
Coast – land	Northern end of bridge joins a coastline rated 5 – 'regionally significant coastal landscape' in the ARP:C Native tree and shrub vegetation on the northern cliffs including pohutukawa, totara, puriri and others.
Air	The air surrounding the AHB is a mixture of urban and coastal air which is impacted by vehicle emissions and other urban activities.
Social – residents	Residential area (northern end of bridge) Recreational areas – Stokes Point Reserve, commercial area including a cafe (southern end of bridge), Mooring Management Area and Marina Management Area identified in ARP:C
Cultural / Iwi	Northern: Te Onewa Pa site, European heritage site – Quinton Villa Southern: Te Routu o Ureia (taniwha) – registered under Historic Place Act

7.2.1 Natural Receiving Environment

Coastal – Land and Water (including seabed sediments)

Spanning the Waitemata Harbour Coastal Marine Area (CMA) the AHB lies between two land points that constrict ebb and flood tidal flows. This high energy marine environment characterises the direct receiving environment for any discharges.

Adjacent to the area directly below the bridge are several aquatic zones described within the Auckland Regional Plan Coastal (Section 2, Fig 2.2). Coastal Protection Area 2 (60a) is located adjacent to the northern approach of the AHB to the east of Northcote Point and runs along to the northern end of Sulphur Beach. This area is defined in Schedule 3 of the ARC Coastal Plan as being:

> "an intertidal area which is an important wading bird feeding ground. Saltmarsh and mangrove communities grow on the margins of this area, protected by the shellbanks nearer the mouths of the bays. These areas of saline vegetation offer a good habitat to secretive coastal fringe birds."

Coastal Protection Area 2 area provides a buffer to a higher value Coastal Protection Area 1 (60c) from the northern end of Sulphur Beach to the Onewa Road interchange (see to Figure 3 in the 'Site Description' section). This area is used as a high tide roost by wading birds such as the endangered New Zealand dotterel and a variety of coastal birds. Coastal Protection Area 1 (60c) is located some distance from the AHB and bridge maintenance works.

The Regional Plan Coastal also identifies the coast along the northern abutment from Little Shoal Bay to Sulphur Beach as a Regionally Significant Landscape (Rating 5). The area from Sulphur Beach around the Takapuna Estuary is identified in the Coastal Plan as an Outstanding Landscape (Rating 6). These areas are recognised because of their visual appeal and although they are substantially modified with a mix of residential, commercial, transport and recreational uses, they are interspersed with areas of open space and native and exotic vegetation.

The Waitemata Harbour is subject to the flushing effects of the tide. Approximately 60% of the water in the Harbour (170, 000, 000 m3) is exchanged during each six-hour tidal cycle. The Auckland Regional Policy Statement (ARPS Map 5 – Sheet 1) shows the area under the bridge as an area of high flushing characteristics (refer to Figure 6.1 below). While there are no areas directly adjacent to the AHB which are classified as being susceptible to degradation, the wider catchment does have some low energy deposition areas. A number of sites have been identified to the north-east and south-west of the bridge which show localised contamination within sea sediments including Shoal Bay.

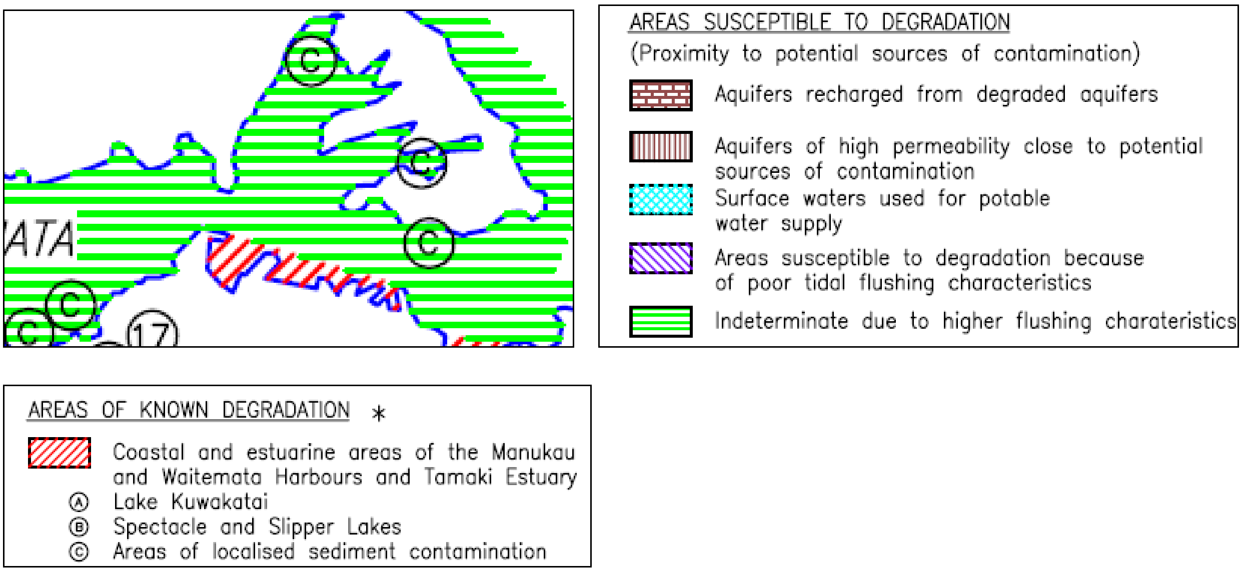


Figure 7.1: ARPS Map 5 – Sheet 1: Water Quality Degraded and Susceptible Areas

The 2009 State of the Auckland Region Report describes the water quality at nearby Chelsea Wharf as 'good' and the Chelsea monitoring site ranked fifth highest out of the 21 monitoring locations around Auckland.

Shellfish contaminant monitoring was carried out using mussels and the Benthic Health Model[1] was used to evaluate the ecological condition of the site. The results showed a moderate level of degradation which is consistent with the findings that heavy metals in the sediments are at slightly elevated levels. Zinc concentrations were generally at higher levels than copper or lead and the long term trend for all monitoring sites showed an increase in zinc levels and a decrease in lead levels. Changes in copper were variable over time.

The NSCC Stokes Point – Te Onewa Reserve Management Plan describes the cliffs along the northern boundary of the bridge comprise inter-bedded thick sandstone and thin siltstone layers of the East Coast Bays Formation (Part of the Waitemata Group). The cliffs are generally in good condition with few signs of faults and joints visible. Vegetation in the area is characterised by Pohutukawa on the cliff face and on the steeper slopes (Figure 6.2). The cliffs and slopes have also been colonised by a range of native species. NSCC District Plan identifies a number of notable trees such as Moreton Bay Figs, Pohutakawa and Oleander, Puriri and Totara.

[1] An index which defines the health of an ecological community, based on the range of ecological communities found along a gradient created by the concentration of metals in sediments

Figure 7.2: Coastal cliff formation and vegetation

Air Quality

The State of the Auckland Region Report 2009 states that the major sources of air pollution in the Auckland region include the combustion of fuels such as wood, gas, oil; diesel and petrol in vehicles, domestic fires and industrial processes. The Auckland Council monitors the main air pollutants, which are PM10 (particulate matter with a diameter of less than 10µm) and PM2.5 (a subset of PM10), nitrogen dioxide (NO2), carbon monoxide (CO) and ozone (O3). In relation to this application the pollutants of relevance are PM10 and PM2.5.

The Auckland Regional Plan: Air, Land and Water (ALWP) defines air quality management areas in the region as being either urban, rural or coastal management areas. The ALWP states that ambient air quality in the Auckland region is better in coastal and rural areas than in urban areas. The AHB is located in both an Urban and Coastal Air Quality Management Area due to part of the bridge being above urban land, while the other part is above the coast.

The National Environmental Standard for Ambient Air Quality (NES) sets out five ambient air quality standards for carbon monoxide, fine particles (PM10), nitrogen dioxide, sulphur dioxide and ozone. The NES contaminant relevant to this proposal is PM10 which must not exceed 50µg/m3 per 24 hours more than once per year.

In terms of the localised air quality, in relation to maintenance works, there is no ambient air quality sampling data available.

7.2.2 Social Receiving Environments

Northcote Point is a residential area and a number of dwellings are located adjacent to the northern end of the bridge. The Stokes Point – Te Onewa reserve is also located at the northern end of the AHB which provides residents with an area for recreation, community activities and visual amenity. There are a number of commercial facilities located at the southern end including a cafe, a retail outlet (for marine products) and a yacht club.

The Waitemata Harbour provides an area of recreation for many people living in and around Auckland. Three Mooring Management Areas (35, 36 and 48) are identified in the ARC Coastal Plan as being close to the northern end of the bridge. Westhaven Marina, a Marina Management Area identified in the ARC Coastal Plan, is located at the southern end of the bridge.

It is considered that the maintenance activity most likely to impact residents and/or people using the commercial facilities / recreational areas is dry abrasive blasting. This is due to the potential for dust or fine particulate (PM10[2]) to be generated which can cause nuisance issues and respiratory irritation when inhaled.

Wind direction and strength can influence the direction and distance that fine particulate can travel. The predominant wind direction in the greater Auckland area is in a south westerly direction and a wind funnelling affect can be observed over the Waitemata Harbour. Environmental controls are used to reduce the impact that PM10 may have on residents. Currently this includes measures such as only blasting when the wind speed is low and when the wind direction will not transport contaminants towards residents or commercial facilities.

7.2.3 Cultural Receiving Environments

Stokes Point – Te Onewa reserve has a significant Maori heritage and was a major headland pa – Te Onewa. Te Onewa is a significant pa in the region and the histories of a number of Iwi are associated with it. A large defensive trench (Figure 7.3) and part of a shell midden are still visible at the site today. The trench is located adjacent to the northern anchor of the bridge.

Figure 7.3: Defensive trench at Pa site

Figure 7.4: Old Trounson House

The reserve site also has significant European heritage and has been occupied since the 1840s. An ornate Edwardian style villa called Old Trounson House is located under the AHB facing into the reserve (Figure 6.4). The villa is reputed to have been constructed out of a single Kauri tree from Trounson forest in 1901. This form of house is rare and the villa is listed in the Cultural Heritage Inventory (CHI – 13031).

A memorial plaque, believed to have been erected in 1962 by the Auckland Harbour Bridge Authority, is another registered cultural heritage site (CHI – 12974) located adjacent to the AHB. The plaque was built to remember three contractors who died while constructing the bridge.

[2] Particulate matter with a diameter of less than 10 micrometres

A flagpole erected in 1908 on the newly created Domain at Northcote is also classified as a cultural heritage site (CHI -12975). The construction of the AHB necessitated its relocation and is believed to have resulted in its present appearance. The flagstaff is symbolic of an emerging civic consciousness in New Zealand at the turn of the 19th century.

The previous cultural heritage sites mentioned above are all recognised in the NSCC District Plan as either historic buildings, places or objects (see Figure 2.2 of the 'Site Description' section of this report).

A waahi tapu site is registered at the southern end of the bridge (HPT Ref 29015-192). Te Routo o Ureia waahi tapu is a reef that juts out from the Erin Point headland. The renowned Hauraki taniwha Ureia used to stop off at the headland to massage or scratch himself on his way to and from the Manukau Harbour or after patrolling his domain, Tikapa Moana (Hauraki Gulf). Te Routo o Ureia is the only landmark or place-name recorded on a readily available maps pertaining to the taniwha.

Another waahi tapu site at the southern end of the bridge named Te Koraenga (CHI 12768) also relates to an area of significance to Maori. This area is identified in the ACC District Plan (A07-03) and shown in Figure 2.3 of in the 'Site Description' section of this report.

7.3 Contaminants

To determine the likely level of effect of contaminant discharges from bridge maintenance activities on receiving environments, the information below characterises and quantifies the discharges and then summarises possible contaminant pathways and environmental fate. Receiving environments that are likely to be particularly sensitive to the contaminants are identified to allow mitigation measures to be appropriately targeted. The pathway diagrams appended to this application (Appendix D) represent maintenance activity inputs and potential effects in the receiving environments relevant to the draft resource consent application.

7.3.1 Contaminant Sources

The contaminants arising from AHB maintenance activities fall into three categories:

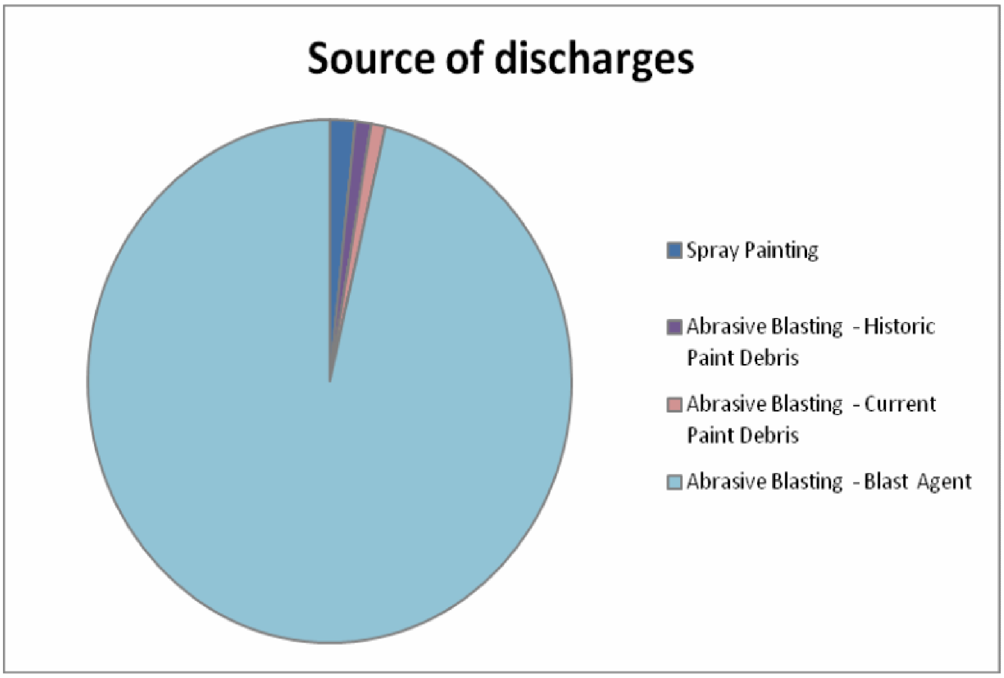
- Products used and released during maintenance activities (e.g. garnet from abrasive blasting and primers and other coatings)
- Historic and current coatings released during surface preparation – abrasive blasting can release historic layers (e.g. zinc chromate) and recent layers (e.g. MC Zinc and Ferrox A)
- Traffic residues that build up on the bridge such as TPH (including PAHs) and heavy metals

The contaminants enter the coastal marine area and settle in harbour sediments depending on factors such as particle size and type, and harbour hydrodynamics. Contaminants also enter local soils where they accumulate or wash into the harbour via stormwater runoff. Some contaminants are airborne for an interim phase but are expected to settle out rapidly due to particle size.

In terms of impacts on local residents, commercial premises and recreational users of reserve areas, dry blasting works can also create dust nuisance issues and a proportion of the particles are hazardous air pollutants (HAPs) and particulate matter less than 10micron (PM10).

The chart below (Figure 7.5) summarises the source of the various discharges to the environment. Proportionally, abrasive blasting creates the greatest quantity of contaminant discharges because of the use of garnet as an abrasive agent.

Figure 7.5 : Source of discharges – maintenance activities and contaminant type



7.3.2 Nature of Key Contaminants

The nature of contaminants determines how persistent and / or toxic contaminants are once they enter the receiving environment. The products, debris and traffic residues described in the previous section break down into a number of contaminants. The nature of the key contaminants and their effect on both humans and the environment is described in the Table 7.1 below and further details are included within Appendix C.

The particle size of contaminants released during works impacts the level of dust nuisance and also the adsorption of contaminants such as heavy metals and therefore the fate of contaminants in the harbour. Table 7.2 below summarises the particle size distribution and indicates that about 5% of particles from abrasive blasting (blast product and paint debris) are less than 10 μm (PM10); however at the time both garnet and basalt were used for blasting, and current operations only use garnet. In terms of particle size from paint overspray, all particles were identified as less than 60 μm.

Table 7.1: Key contaminants effects on natural environment and humans

CONTAMINANT	SOURCE			NATURE OF CONTAMINANT
	Product Used	Historic / current	Traffic Residues	
Zinc	✓	✓	✓	• Zinc can have high acute and chronic toxicity to aquatic life. Some fish bioaccumulate zinc within body tissues • In humans, irritation from zinc in dust can occur but zinc is not highly toxic except at very high levels
Chromium		✓		• Chromium compounds can be toxic and some aquatic species bioaccumulate chromium although fish do not appear to • Both forms of chromium, Cr(III) and Cr(IV), are hazardous to humans with Cr(VI) being classified as a known human carcinogen
Lead		✓		• Lead can build up in sediments to a point where it may become toxic and accumulate in the bodies of water organisms and soil organisms • At high concentrations lead is very toxic to both human and other organisms
Sediment – Suspended (water)			✓	• Suspended sediments can reduce the amount of light transmitted through water • Sediments smother organisms both in the water column and on the seabed and change habitats
Sediment – Particulate (water)	✓		✓	• Particulate sediment drops out of suspension very quickly – the sediment and contaminants which bind to sediment, then settle in deposition areas • Sediment can accumulate in harbours and affect ecological, recreational and amenity values

Table 7.2: Particle Size Distribution

	% of material	Particle Size
From blasting*	70	180 – 850μm
	25	10 – 180μm
	5%	<10μm
Paint over spray	100%	<60μm

*Over estimates small fraction as basalt no longer used; actual proportions unknown.

7.3.3 Semi-Quantitative Assessment of Contaminants

7.3.3.1.1 Annual Average Discharges Without Containment

The information below quantifies the amount of contaminants generated during maintenance over the past 10 years (2000-2010). The AHB is maintained on a continual rolling basis over a 10 year period and maintenance type, area and frequency changes significantly in any given year. Therefore the assessment below represents an average scenario (that is, average over the 10 years).

Due to limited information and variability in bridge characteristics the assessment has been based on a number of assumptions (identified below); the key being that contaminants settle out evenly to land and water based on 68% of the bridge being above water and 32% of the AHB being above land.

Note: The NZTA is currently managing the small fraction of airborne particulate including dust via environmental controls (such as avoiding works or wet blasting in areas in close proximity to residences) and future containment) whilst undertaking an assessment of the human health issues.

7.3.3.1.2 Products Used and Released

The products used and released during maintenance include:

- blast agent discharged during abrasive blasting
- bridge coatings lost during application – particularly through spray painting

Tables 7.3, 7.4 and 7.5 below summarise the average annual amount of blast agent and coating products released to land and water. This assessment is based on product use rates (total amount used in an average year) and expected / known loss. The amount of product lost during maintenance activities is based on the experience of bridge maintenance contractors (the assumptions are stated in the 'discharge scenarios' column in the Table 7.5 below).

Table 7.3: Total amount (annual average) of blast agent from abrasive blasting to land and water

Maintenance Activity	Product Type	Discharge Scenario	Total Amount Released (annual average)
Surface Preparation – dry and wet abrasive blasting (excluding mechanical and chemical)	Garnet Sand B	100% lost over water – from anchorage to anchorage	32.5 tonne over water 15.5 tonne over land
	Garnet Sand C	100% lost but 50% recovered over land (vacuum sweeper trucks used where practicable)	30 tonne over water 14 tonne over land

Table 7.4 below shows the total volume of the coating components released to land and water during spray painting. This has been converted to kilograms using specific gravity (density) from Material Safety Data Sheets (MDSD: sere Appendix C). Weight calculation is based on specific gravity multiplied by average volume to obtain weight. Where there is a range this reflects the range in concentration by weight (as per MSDS). Using the mid range the table shows the kilograms of 740 kgs of MC Zinc (primer), 682 kgs of Miomastic (intermediate) and 420 kgs of MC Ferrox (top).

Table 7.4: Total Amount (annual average) of Coatings Lost as Overspray to Land and Water

Contaminant source	Volume (L) (15% of total product used)	Contaminant Component	Concentration* (% by weight)	Total Litres released per year	Total Kilograms released per year	Kilograms per year over water (68%) and land (32%)
MC Zinc3 (Specific gravity* = 2.9 kg/l)	255	Zinc	62 – 100	158 – 255	458 – 740	311 – 503 water
						147 – 237 land
		Aromatic 100	7 – 20	18 – 51	52 – 148	35 – 101 water
						17 – 47 land
Wasser Miomastic (Specific gravity* = 2.2kg/l)	310	Zinc	30 – 60	93 – 186	205 – 409	139 – 278 water
						66 – 131 land
		High Flash Naptha	6	19	42	29 water
						13 land
		Ferric Oxide	10 – 30	31 – 93	68 – 205	43 – 139 water
						22 – 66 land
MC Ferrox A (Specific gravity* = 0.95kg/l)	442	Ferric Oxide	10 – 30	44 – 133	42 – 126	29 – 86 water
						13 – 40 land
		Xylenes	10 – 30	44 – 133	42 – 126	29 – 86 water
						13 – 40 land
		Methyl Oxypropyl-acetate	12	53	50	34 water
						16 land
		Aromatic 100	4	18	17	12 water
						5 land
		Ethylbenzene	2	9	9	6 water
						3 land
		1,2,4 Trimethyl benzene	1	4	4	3 water
						1 land

* Concentration by weight and Specific Gravity taken from MSDS

Total kilograms calculated: Mass (kg) = Volume (L) * density (kg/L)

[3] Other components of MC Zinc non – reactive urethanes

7.3.3.1.3 Historic and Current Coatings

The amount of current and historic coatings released during surface preparation (as debris / particles) is summarised in the Table 7.5 below. The average amounts have been calculated using information from bridge maintenance contractors. The discharge scenario assessed assumes that 100% of coatings are released 10% of the time – this is when blasting remove all coatings (i.e. blasting back to bare steel) and that 25% of the top coat is released for the remaining 90% of the time (i.e. sweep blasting to create a key for new paint).

Two scenarios have been assessed as follows:

- A 'worst case scenario' which estimated the coating thickness to be the coating specification plus some additional overspray, and
- A 'best case scenario' which estimated the coating thickness to be the minimum coating specification only (i.e. no overspray)
- the final column provides the total zinc (based on 'best case scenario) discharged from all components combined

7.3.3.1.4 Traffic Residues

The third source of contaminants is traffic residues which arise from (170,000 vehicles per day) traffic travelling over the bridge. Common traffic pollutants include:

- TPH (including PAHs) mainly from exhaust emissions and engine leaks
- Heavy metals such as copper from break pad linings and cadmium and zinc from tyres

Traffic residues build up on the bridge surface and are released to the environment during surface preparation activities such as water blasting and abrasive blasting. It is expected that the loading of these contaminants is consistent with that from other bridges and due to proposed containment these have not been quantified.

7.3.3.1.5 Overall Discharges from Blasting and Spray Painting

Based on the tables above for discharges to land and water from blasting and spray painting, Figure 7.2 and Figure 7.3 show the inputs in relation to contaminant type.

Figure 7.6 show the proportional inputs of garnet and contaminants from blasting and spray painting. Total garnet released is 92 tonnes per year and total contaminants is 3.5 tonnes per year.

Figure 7.7 shows the total zinc from the various sources (i.e. components of current coatings and historic and current paint debris). This figure excludes garnet due to its inert nature and focuses on zinc due to proportionally high inputs. The total zinc discharges (released from historic and current coatings during blasting and from spray painting overspray) is shown to be 1.4 tonnes per year.

Table 7.5: Total amount (annual average) of historic and current coatings released during abrasive blasting

Coating Type * denotes historic coatings (i.e. under current coatings	Worst Case: Average coating thickness (m) Source: 2001 AEE and Opus coatings specialists	Average surface area blasted per year (m2) Approximately 10% of total bridge surface area blasted each year	Total Volume Released (annual average) m3 100% released 10% of the time (i.e. bare steel blasting) 25% of top coat released 90% of the time (i.e. sweep blasting releases 25% of MC Ferrox coat)	Worst Case (annual average) kg Total kg released (based on the paint flakes having a density of 1200 – 1800 kg/m3)	Best Case: Minimum coating thickness (m) (using minimum spec requirements)	Total Volume Released (annual average) m3 100% released 10% of the time (i.e. bare steel blasting) 25% of top coat released 90% of the time (i.e. sweep blasting releases 25% of MC Ferrox coat)	Best Case (annual average) kg Total kg released (based on the paint flakes having a density of 1200 – 1800 kg/m3)	Total Zinc discharged (kg)
Lead Based Paint (Span 7 only) *	Unknown but assume 0.0001m	10 Based on current consent conditions	0.0001	0.12–0.18 kg		0.0001	0.12 – 0.18 kg over water	
Zinc Chromate (Entire bridge) *	0.000075m Assumes 50µm coat plus overspray	15,000	0.0765 over water 0.04275 over land	92 – 138 kg over water 51–77 kg over land	0.000050	0.051 over water 0.024 over land	61 – 92 kg over water 29 – 43 kg over land	Assume 1/3 zinc 20 – 31 over water 10 – 14 over land
Micaceous Iron Oxide (MIO) (Entire bridge) *	0.0002m to 0.0004m Four coat system of approx 50µm layers (up	15,000 Assumes 50% at 0.0002m and 50%	0.279 over water 0.171 over land	335–502 kg over water 205–308 kg over land	0.0002	0.204 over water 0.096 over land	245 – 367 kg over water 115 – 173 kg over land	No Zinc
Zinc Phosphate (Entire Bridge) *	0.0002m Four coat system of approximately 50µm	15,000	0.186 over water 0.114 over land	223–335 kg over water 137–205 kg over land	0.0002	0.204 over water 0.096 over land	245 – 367 kg over water 115 – 173 kg over land	Assume ½ zinc 123 – 184 over water 58 – 87 over land
MC Zinc (Entire bridge)	0.0001m Assumes 75µm coat minimum plus some	15,000 Assume 50% at 0.000075m and 50% at	0.093 over water 0.057 m3 over land	112–167 kg over water 68–103 kg over land	0.000075	0.0765 over water 0.04275 over land	92 – 138 kg over water 51–77 kg over land	Assume 100% zinc 92 – 138 over water 51–77 over land
Wasser Miomastic (Entire bridge)	0.0001m Assumes 75µm coat minimum plus some	15,000 Assume 50% at 0.000075m and 50% at	0.093 over water 0.057 over land	112–167 kg over water 68–103 kg over land	0.000075	0.0765 over water 0.04275 over land	92 – 138 kg over water 51–77 kg over land	30% zinc 28 – 41 over water 15 – 23 over land
MC Ferrox A (Entire bridge)	0.000225m Assumes 75µm coat minimum plus potential	15,000	0.6798 over water 0.4167 over land	816–1224 kg over water 500–750 kg over land	0.000075	0.2477 over water 0.1166 over land	297 – 446 kg over water 140 – 210 kg over land	No zinc
TOTALs							1,032 – 1,410 over water 501 – 753 over land	263 – 394 over water 134 – 216 over land

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Figure 7.6: Average Annual Discharges from Bridge Maintenance Activities without Containment

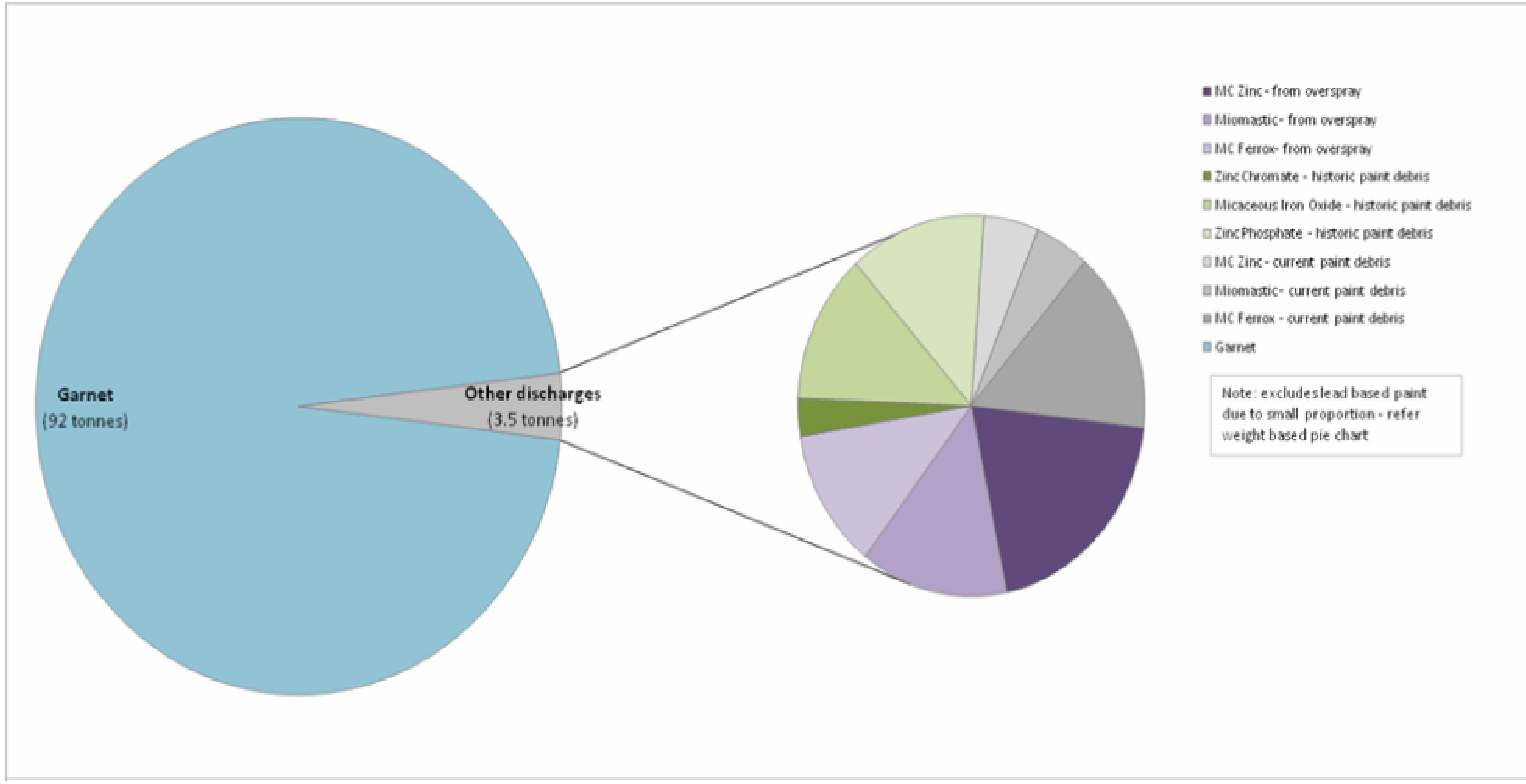
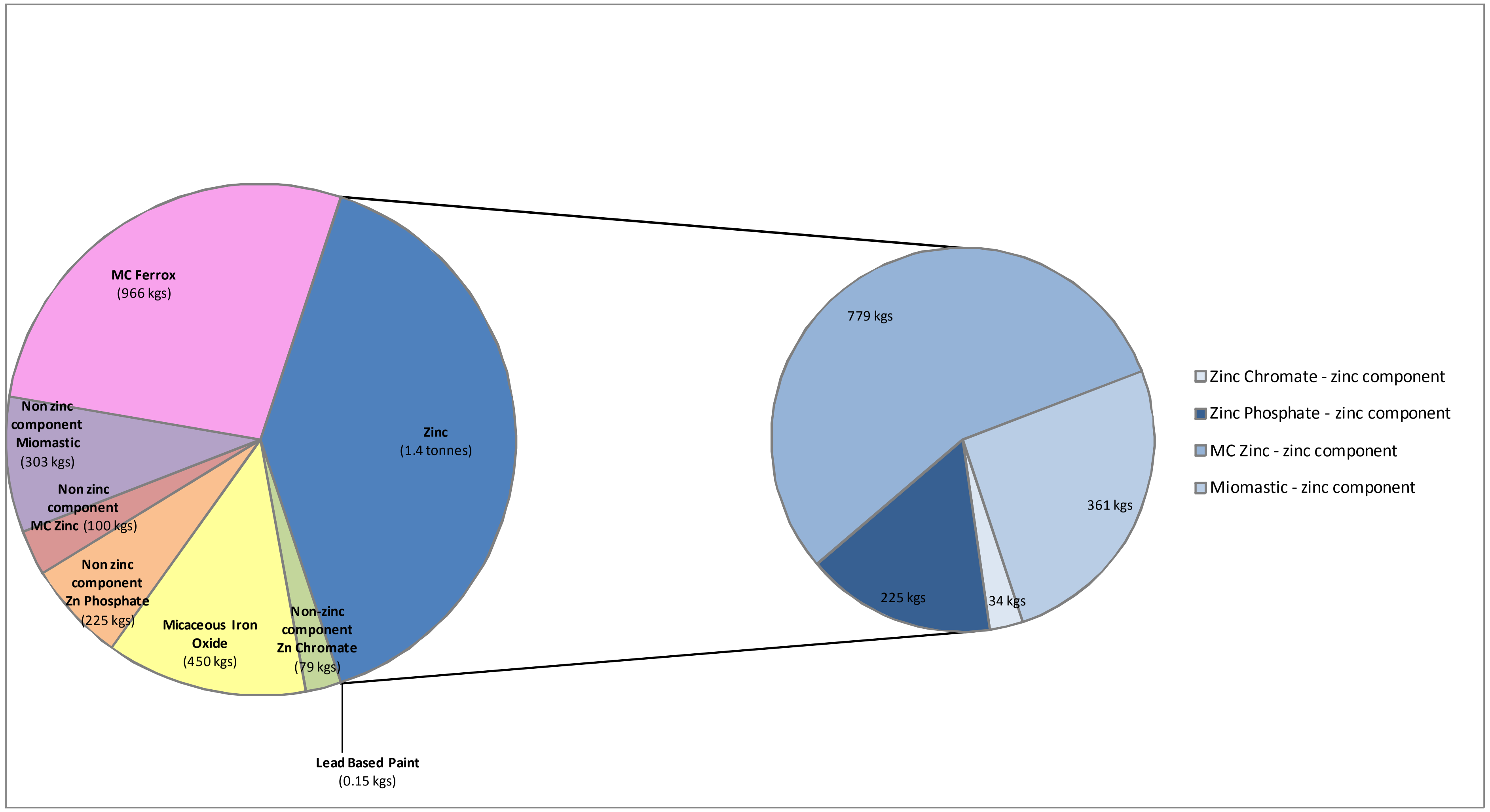


Figure 7.7 Zinc Component of Discharges from Bridge Maintenance Activities without Containment



7.4 Contaminant Fate

In order to assess the potential effects of the contaminants discharged (as quantified above), the likely distribution and settlement of particles in harbour waters and a local soil needs to be understood. Dust is being assessed currently. Until this assessment is finalised it is considered the use of garnet with less than 5% dry weight free silica and environmental controls in place (e.g. wet blasting or avoiding works in areas close to residences and commercial areas) mitigate air borne problems. Fate diagrams are included in Appendix D.

7.4.1 Potential Settlement Zones for Contaminants in the Waitemata Harbour

To assess the short term and longer term fates for contaminant discharges into the Waitemata Harbour from bridge maintenance activities, a literature review of harbour hydrodynamics and settlement zones has been undertaken. It is expected that the majority of contaminants discharged will be in particulate form. Some of the contaminants discharged as paint overspray may be in a dissolved state but it is anticipated that they will precipitate out of the water column quickly and settle in harbour sediments.

A contaminant distribution model produced by the Auckland Regional Council in 2008 suggests that Shoal Bay and the 'Central Basin' act as long-term sinks for fine sediments (<60μm) in the Waitemata Harbour[4] . Figure 7.8 below shows the expected settling zones for suspended sediments. The study suggests that intertidal flats and shallow sub-tidal flats may provide temporary sinks however no quantification of this is available to compare volumes or rates of AHB discharges with. The study is related to sediments generated from stormwater discharges and it can be assumed that the contaminant fate of discharges from the AHB may be similar.

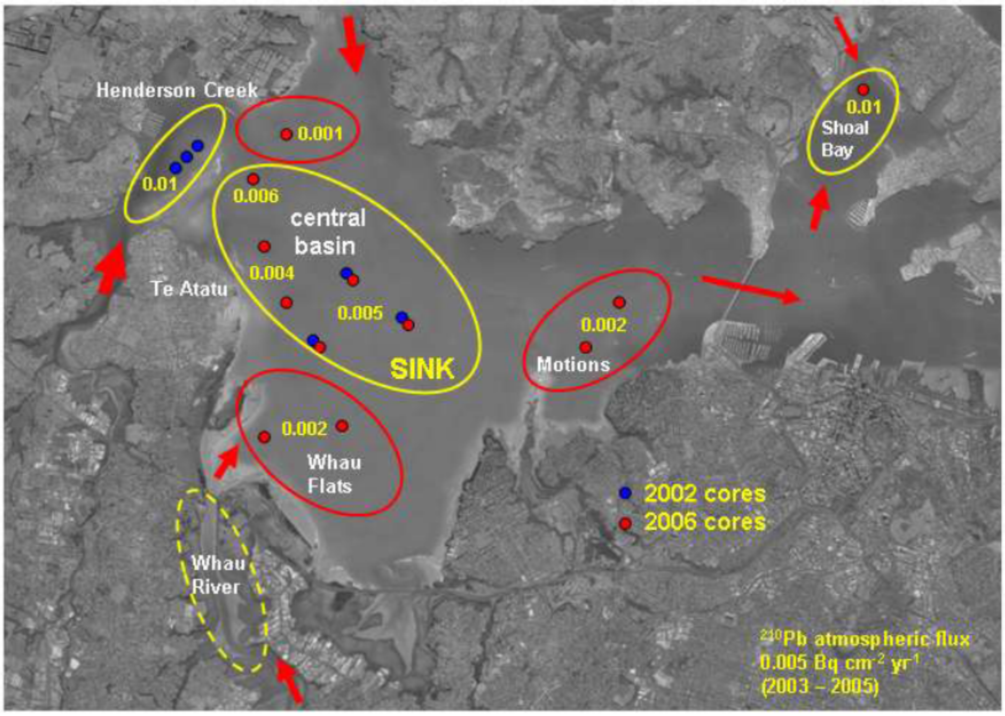


Figure 7.8: Conceptual Model of fine sediment fate in the Central Waitemata Harbour and Shoal Bay

Source: ARC TP 2008/034

4 Central Waitemata Harbour Contaminant Study – Harbour Sediments. ARC Technical Report 2008/034 Swales, A *et al*

Long term sediment sinks are shown by yellow ellipses. Temporary sinks are shown by red ellipses and relative size of sediment input and transfers shown by red arrows

A study by Williamson et al 2009 assessed the movements of sediment in the Waitemata Harbour and showed that Shoal Bay receives sediments and metals from much of the Waitemata water shed due to the impact of the Auckland Harbour Bridge embankments on currents and hydrodynamics. The study suggests that the embankments mix and steer contaminants into Shoal Bay on the ebb tide.

In terms of contaminant levels in the harbour, the study also predicted the Central Waitemata concentrations of contaminants commonly found in stormwater (zinc and copper). The findings suggest that Shoal Bay is at risk of reaching the 'Effect Range Low' for effects for zinc in the near future. 'Effects Range Low' represents the level of contamination in sediments where 10% of sediment samples showed toxic effects. Zinc levels in the harbour are of relevance to the assessment of effects for maintenance works due to zinc being a key contaminant discharged. Discharges of lead and chromium from maintenance works are not as significant as zinc, however, due to the toxicity of these contaminants there is potential for adverse effects to occur[5]. Lead levels in the Waitemata Harbour are known to be at levels of concern and Shoal Bay is an area that already exceeds the ANZECC ISQG-Low threshold for lead[6]. Chromium is not a typical contaminant of concern in the Waitemata Harbour and there is no specific data for settling zones such as Shoal Bay.

Taking into account the information from the above studies and the proximity of the AHB to Shoal Bay, it is possible that contaminants from the AHB maintenance works could distribute and deposit in specific areas of the harbour. Fine sediments (<60µm) discharged into the water column from the abrasive blasting and paint overspray are likely to be delivered to Shoal Bay by way of tidal action. Larger particles (>60µm) discharged during abrasive blasting are likely to sink through the water column to the sea bed and distribute throughout the wider harbour and the Gulf based on tide and current patterns. The dominant proportion of the AHB discharges is within the larger particle range.

7.4.2 Contaminants in Soils

The fate of contaminants discharged to the local soils (Stokes Point and at the southern end of the bridge) is influenced by many factors. These include soil pH (low or high pH means bound metals may become dissolved and leach further into the soil profile), local geology (Stokes Point 'Waitemata sandstone' cliffs may influence the transport of contaminants through the soils), groundwater flow, local rainfall, stormwater and overland flow paths, and site use (e.g. high volumes of wash water from maintenance works increasing the movement of contaminants through the soil profile and/or washing off into the harbour).

Generally particulates falling to impervious surfaces will mobilise where water flow (rainfall) occurs and be distributed to the wider environment via local stormwater management systems. Auckland Council systems currently deal with that for both abutment areas and are consented appropriately. In dry weather dust particles will be distributed based on wind velocity.

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5 The higher toxicity of lead and chromium (vs zinc) is reflected in the more stringent receiving environment guideline levels. For example for ANZECC ISQG-Low threshold (the level at which toxicity to aquatic organisms is very likely) the trigger value is 50 mg/kg for lead and 80 mg/kg for chromium (compared to 200 mg/kg for zinc).

6 Williamson, R.B., Mills, G.N. (2009) Sediment Quality Guidelines for the Regional Discharges Project – Prepared by Diffuse Sources Ltd for Auckland Regional Council. Auckland Regional Council Technical Report 2009/050

Material depositing on grass or soil surfaces will generally integrate into the soil matrix unless mobilised in extreme rainfall events where paths (natural or created) direct fluid discharge flow. To understand whether soil composition at Strokes Point includes contaminants an assessment was undertaken in 2010 the results of which are provided in Appendix E and discussed in following sections. Soils at the southern anchorage were not tested due to difficulty in discerning between various current and historic inputs.

7.5 Environmental Effects

The information provided in this section reflects where relevant includes the environmental controls including future containment outlined in the subsequent section.

7.5.1 Effects on Receiving Environment

Currently the AHB discharges enter the air and water, and fall to land; each environment with is own biophysical contexts. Land discharges are generally directly below the structures at the south and north ends and therefore has discrete footprints that are relatively stable. However, discharges to the air and coastal marine area enter very dynamic physical environments where due to turbulent air and water flow provide high levels of mixing. These are discussed separately below:

Contaminant Effects on Harbour

The volumes and nature of the contaminants currently discharged from the AHB during maintenance activities (as described and quantified in the above sections) when considered against receiving environment dynamics suggest an indiscernible effect. As detailed above the Waitemata Harbour tidal flows pass directly below the AHB foot print and depending on the grain size of particulates entering the water will be redistributed either within several hundred metres (coarse fractions) or over a wider area of kilometres(fine fractions).

To provide context to assimilation capacity for discharges below the AHB the following assumptions are made:

- Foot print volume = 35,000 cubic metres (based on previous applications estimates of dilution)
- Annual discharge weight is calculated 1.75 cubic metres converted to volumes from 3.5 tonnes at a specify gravity of 2 (removing garnet which is inert and non toxic)
- Assume daily discharge is 1.75 / 365 days = 0.0048 cubic metres
- Adjusted to 68% of the volume for that portion of discharges above the CMA = 0.0033 cubic metres

Based on this an instantaneous daily discharge would enter into a receiving environment with an assimilation capacity of one part discharge to over seven million parts of water: 1: 10,606,060. This ratio is the same for daily or yearly situations. The hydrodynamic character of the harbour must also be considered which has 170,000,000 cubic metres of water passing below the AHB each six-hour tidal cycle.

In terms of the water column, based on the delivery rate small discharges at day to day rates enter into environments with extremely large assimilation capacity (mixing) and impacts are considered indiscernible when matched against typical mixing that would occur. A proportion of the discharges drop out or precipitate when they contact marine waters.

Some context to the likely effects similar calculations were used and included within the 2001 applications (Appendix I) that cast scenarios for containments against guidelines at the time. While the AEE at that time used guidelines that are not applicable to the current environment they do illustrate that assimilation capacity for direct discharges to water column ensured they were meet.

In light of the assimilation capacity of the marine receiving environment the short term impact of AHB discharges is considered less than minor in terms of the water column with no likely significant effect on aquatic life.

In respect to long term impacts of AHB discharges to the Waitemata Harbour (hydrology, sea floor sediment and ecology) it is recognised that the central Waitemata and Shoal Bay are clearly impacted in terms of contamination including metals. These areas are affected by a wide range of types of contaminants and sources of inputs (urban stormwater, Central and Upper Waitemata catchments, Ports of Auckland, marine shipping activities). Regionally these inputs, effects and control systems are still being considered by regulatory agencies and comparison of the AHB information with published data can only be of a general nature.

In terms of coarse particulate material rapidly passing through the water column and entering the general channel sediments, robust estimates of dilution or gross movement direction are very difficult to prepare with any confidence. This is because the dynamic traction flow of existing marine surface sediments below the AHB is not known, either for individual tidal cycles or annual through flow. Further, no comprehensive sediment samples have been taken in this area to assess contamination. It is therefore not possible to confidently compare volumetrically in situ sediment dynamics to discharges so that dilution rates can be assessed. However, given the cross sectional area of the channel below the AHB and the nature general tidal flows that exist to it safe to assume particulate material will move beyond this footprint.

Finer material that will stay in the water column for periods of several minutes and greater is likely to be moved out of the general foot print. The fate of these materials from the available literature can be determined to include deposition within the Central Waitemata basin and Shoal Bay. However, estimates of the volume of this remains complicated due to the size of the direct receiving environment, contribution of other contaminants from other sources and hydrodynamics and therefore effects are not able to be confidently assessed.

The ARC's Environmental Response Criteria (ERC) for marine sediments set out in "Blueprint for monitoring urban receiving environments": Auckland Regional Council Technical Publication No. 168" defines Zinc concentrations in marine sediments (tidal or intertidal) in the order of 150 mg/kg and greater as high and the biology of a site with these characteristics is probably impacted. Given the assimilation ratios described above it is considered that the AHB discharges are unlikely to be able to raise Zinc concentrations in either the Central Waitemata or Shoal Bay to the levels of concern to the ARC, however this remains difficult to analysis or prove other than in general way. The NZTA accepts that the AHB discharges contribute to the sediments in these areas however the proportion of that attributable to the bridge activities is considered to be extremely low compared with natural movement of sediments from other sources.

Contaminant Effects on Local Soils

There is the potential for contaminants derived from maintenance works to build up in the soils under the AHB. Previous soil sampling carried out in 2001 in the grassed public reserve adjacent to the north end of the AHB (Stokes Point, Northcote) identified elevated levels of contaminants such as zinc and lead.

In order to evaluate the current level of contaminants in the soil, the Stokes Point area was sampled again on 5 August 2010. The investigation broadly followed the Ministry for the Environment (MfE) Contaminated Land Management Guidelines and included with Appendix E. The conclusions for this assessment are that soils beneath the north end of the AHB have elevated levels of contaminants which do not comply with the ALWP. The main findings of the 2010 soil sampling are:

- 15 out of 20 samples had zinc levels elevated above ALWP Permitted Activity guideline values for (Schedule 10)
- 8 out of 20 samples had lead levels elevated above ALWP Permitted Activity guideline values for (Schedule 10)
- Chromium levels were not elevated beyond ALWP Permitted Activity guideline levels at any of the sample locations – Note: zinc chromate is a historic layer of paint on the bridge and maintenance works only take the bridge back to bare steel (releasing zinc chromate) about 10% of the time.
- The highest levels of contaminants were found on the point of the Stokes Point reserve which is situated directly under the AHB
- In some cases the 2010 results showed an increase in contaminant levels for lead and zinc when compared to the 2001 results but in other cases the results showed a decrease in lead and zinc levels
- The highest levels of lead and hydrocarbons were in overland flowpaths / targeted sample locations (sample numbers 8, 12, 16, 18), although there were lead exceedences above ALWP Permitted Activity guideline levels in non-flowpath areas

Given this information the NZTA is undertaking a separate study to further characterize the contaminants found, identify the origin if possible and address all regulatory responsibilities. This Application does not cover that activity.

In terms of future effects on local soils from activities this will be managed by the controls set out in the EMP particularly the commitment to no further discharges to soils until containment is in place. Once containment is in place 15% of total annual discharges of areas over land may enter local soils. Based on this it is considered that future effects on soils are no more than minor effects.

Contaminant Effects on Air

There is the potential for discharges during dry abrasive blasting to create a dust nuisance for nearby residents and commercial premises, as well as recreational users of local areas including Stoke Point Reserve.

There is also the potential for fine particulate of less than 10 microns (PM10) to be generated. The majority of particles generated when dry abrasive blasting are larger than 10 microns. The 2001 maintenance consent application contained particle size data which showed a very low proportion (<5%) of the particles generated during blasting were of particle size PM10 or less. This particle size data included discharges of basalt which is no longer used as a blast agent on the AHB, therefore the data is likely to overstate the proportion of PM10 in dry abrasive blasting discharges.

The proposed controls to minimise potential effects on residents / people from dust and PM10 are set out in the EMP and include:

- Wet abrasive blasting only out to Pier 1 and 5 prior to containment
    - dry abrasive blasting will only be carried out when absolutely necessary for quality, or when there is limited access or visibility (and when dry blasting, wind direction controls and the use of screens, plus advising residents / premises of upcoming works)
- No discharges over Stokes Point prior to containment
    - no works will be carried out over Stokes Point or manual works only
- No dry abrasive blasting anywhere on the bridge when wind speed is greater than 7 m/s
- Containment system north of pier 1 and south of pier 5 by the end of 2013 to capture 85% of discharges from dry abrasive blasting

The commitment by NZTA to avoid dry abrasive blasting work north of pier 1 and south of pier 5 until containment is in place (or to undertake surface preparation by hand or by wet abrasive blasting), is considered to address the health risk and nuisance to people from PM10 and dust. Once containment is in place, the discharge of dust and PM10 during dry abrasive blasting will be significantly reduced. Overall it is considered that the discharge of dust and PM10 will give rise to no more than minor effects.

7.6 Proposed Management (Environmental Controls and Containment)

With the intention of understanding ways to reduce the quantum of contaminant discharge the NZTA has reviewed methods used internationally on similar bridges and the levels of control achieved in these circumstances. Without specific guidance from the Council planning documents on the standard or systems the NZTA has sought to determine the Best Practicable Option in line with provisions of the RMA, the statutory framework set out in the Regional Planning documents and examples of similar approaches taken elsewhere. This section establishes the basis of the Best Practical option the NZTA has developed to for the AHB Application which is based on the:

- Nature of the discharges from the AHB maintenance activities and the sensitivity of the receiving environment to adverse effects; and
- Financial implications, and the effects on the environment of an range of options; and
- Current technical knowledge, current environmental controls being used and the likelihood that Containment can be successfully applied;

7.6.1 Approach

7.6.1.1 AHB Structure and Maintenance Needs

Section 3 illustrates the structural elements of the AHB which in terms of maintenance activities are for the purpose of this Application described as nine areas (Area A – I). These areas are detailed in Appendix F and Figure 1 and 2 of this appendix combined illustrate the location and when maintenance was last completed. Each of these areas have a general frequency of maintenance from 7 – 12 years, 12 -15 years or longer based on the cyclic activities the AHB contractor follows, other than as required following any problems identified through regular condition surveys.

7.6.1.2 Existing Environmental controls

The AHB maintenance contractors in line with the current resource consent requirements use an environmental management plan to maximise controls available for day to day contaminant discharges. The controls will be used as the basis of work practices in the future upgraded for this Application. Details of these controls and the EMP are provided below.

7.6.1.2.1 Environmental Management Plan

The Environmental Management Plan (EMP), (included as a draft in this Application, see Appendix G), outlines how bridge maintenance activities are planned, implemented, monitored and reported; and how related aspects such as hazardous substance storage and spill response are managed. A key focus of the EMP is compliance with the resource consents for maintenance activities. To avoid duplicating information, the EMP cross-references to the current maintenance operators Operations Manual (OM) which contains the majority of 'instructional' information (such as Work Instructions and Job Safety and Environmental Analysis sheets).

The mitigation/controls put in place to manage environmental risks are reflected in the various components of the OM. The purpose of the EMP is therefore to:

i) introduce the environmental framework within which the mitigation/controls have been developed; and

ii) clarify which mitigation/controls meet which specific environmental requirements.

As such, the EMP provides a training tool for the NZTA and maintenance contractor personnel with environmental responsibilities (e.g. Project Managers and Maintenance Supervisors), and also demonstrates the intended management processes to the relevant regulatory authorities.

Included in the EMP are all the requirements to communicate with potentially impacted parties for maintenance activities. This follows the NZTA good neighbours' policy.

The EMP will be the primary day to day mechanism for controlling discharges from maintenance activities. Therefore the NZTA will focus their efforts on ensuring it is of a high standard and achieves the best practicable option for managing discharges.

7.6.1.2.2 Spill Response Plan

A Spill Response Plan (SRP) has also been put in place for the AHB maintenance and operational activities and this sets out the steps to be followed in the event of an incident involving the release of contaminants into the environment (See Appendix G). The SRP is a component of the Environmental Management Plan (EMP), which sets out mitigation measures aimed at avoiding and remediating potential adverse effects arising from AHB maintenance activities.

The current scope of the SRP covers:

- Maintenance activities undertaken on the AHB, including all storage and handling areas.

  This excludes spills on the top deck from transiting vehicles which is covered by a broader NZTA Standard Operating Procedure "Response to Spills Arising From Transport Incidents on the State Highway Network" March 2010.

- Non-emergency spills – spills that do not involve the emergency services and will not become life threatening or cause severe damage to AHB facilities, private property, or the environment.

  When a spill is an emergency the 'Emergency Spill Response Plan' shall be implemented.

7.6.1.3 Level of Containment and Ability to Implement Controls

Internationally a range of encapsulation processes are used which have seen a number of steel bridges of similar nature to the AHB, some built in the late 1800's and early 1900's, continue their operational life up to the present with expectations for this progressing well into the future. The maintenance of these structures has been driven by local circumstances and methods which often change over the years, in particular the coating systems used. Also local environmental regulations have changed with time and in many countries these activities are heavily regulated in respect to discharges.

The ability to contain discharges can be constrained by engineering capabilities reflecting age, initial design and use, enabling works in respect to access, performance needs in terms of the bridge function and health and safety factors for those undertaking the activities. To illustrate some of the considerations necessary for an analysis the NZTA has undertaken a broad risks and constraints assessment for containment for each Maintenance Area and details are provided in Appendix F: Tables 1 – 9.

Any encapsulation method will reduce the quantum of discharges to the environment and it appears that to place any containment would provide the opportunity to maximise controls as the costs lie predominantly in the set up activities for structures and enabling works. In other words the facilities/costs for capturing 50% of discharges would be similar for different (higher) capture rates. Practical experience does show that 100% capture of discharges may not be feasible due to operational needs of the encapsulation systems. Allowance must therefore be given for capture losses in containment assessments.

Overall the assessment have shown that one of the key drivers for the implementation of containment is the ability to role out the controls over time which is affected by funding availability and practicalities around ensuring works and processes are in place. Assessments to date indicated that primary factors affecting enabling works relate to structural engineering capacity and associated implementation controls (access / traffic management / health and safety).

Initial costs estimates indicate tens of million dollars are required. These estimates are preliminary but signal the scale of resourcing required for this type of project.

In light of the costs and processes required the NZTA considers it necessary to seek cost effective methods to implement any containment systems which include innovative procurement systems and realistic timeframes both for the role out and investment payback.

7.6.1.4 Direct and Wider Receiving Environment

As described previously the AHB discharges enter the air and water, and fall to land; each environment with is own biophysical contexts. Land discharges are generally directly below the structures at the southern and northern ends and therefore have discrete footprints that are relatively stable. Discharges to the air and coastal marine area enter very dynamic physical environments where due to turbulent air and water flow provides high levels of mixing.

The assimilation capacity of the direct and wider marine receiving environment for the range of grain sizes of containments, both short and long-term, are considered to be sufficiently high that they have less than minor effects and no significant effects on aquatic life within the water column. However, it is recognised that the central Waitemata and Shoal Bay are clearly impacted in terms of contamination including metals created by a wide range of sources (urban stormwater, Central and Upper Waitemata catchments, Ports of Auckland, marine shipping activities). Regionally these inputs, effects and control systems are still being considered by regulatory agencies and comparison of the AHB information with published data can only be of a general nature.

7.6.2 Containment Levels for AHB Discharges

Given the available environmental data on the Waitemata Harbour, the NZTA understands that one of the main issues to marine sediments quality is Zinc, which is also part of the AHB discharges. As presently understood, the main source of Zinc (other than natural release from soils) is zinc roofs and industrial activities. This enters the marine environment via stormwater systems and creek drainage. Presently controls on the activities are implemented through the regional planning documents which seek to effectively reduce the volume and rate of contaminant discharge in as practical way as possible.

In line with good practice the NZTA will follow the same approach undertaken in the Auckland region in respect to marine sediment management, in other words reduce discharges as far as practicable. The level of containment or capture rate for containment will be as high as can be demonstrated to be achievable and the implementation timing shall reflect the procurement process for controls

In respect to the practical levels of contaminant capture, assessments have been completed that establish the following rates can be achieved for different areas of the AHB. These are levels are detailed below and cross correlated through the tables and figures with Appendix F to provide an overall understanding of what and where containment will be achieved.

Capture levels for the purposes of this AEE are:

Airborne Discharges: Maximum Capture

This is proposed in Areas G (Street Furniture), H (Extension Internals) and I (Chord Internals). It will be achieved with fully sealed structures and/or manual use of hand tools.

Airborne Discharges: 85% Capture

This is proposed in Areas A (Upper Overarch), C (Truss Bridge AW), D (Truss Bridge BW), E (Extensions External) and F (Over Land).

It will be achieved by:-

a) Ongoing day to day operations

During normal operation dust filters designed to capture 99% of all hazardous particles (in excess of 0.5 microns). In windy conditions losses are expected due to the occurrence of negative external pressure on the leeward side of the enclosed area allowing small losses at the seams. Other small losses may occur as people move in and out of the encapsulated area. It is expected overall losses during normal operating conditions to be about 3%.

b) Shut-downs and Cleaning

Shut downs are required to allow for maintenance of containment systems (for example replacement of filters, emptying of catch trays) and for demobilisation along with reassembly during their movement from one area of the bridge to another. It is expected that up to 12% of total contaminants will be discharged during these activities, however be minimised via work practices detailed in the AHB EMP.

Airborne Discharges: 0% Capture

This is proposed in Area B (Lower Overarch).

Where the effect on operational aspects of the AHB is likely to be significant encapsulation systems will not be used. Only 2% of the total area of the AHB (4610m^2) will be dealt with in this manner. The NZTA will continue to assess the ability to implement traffic closures in these areas to allow containment to be achieved.

Water Discharges

Water blasting and wash water discharges will be managed by the same containment systems used for the air blasting and painting operations. Once contained these discharges will be treated (e.g. basic filter if contaminants loads are low and non-dissolved) or conveyed to trade waste as authorised.

The types of encapsulation systems applicable to the AHB situation are shown in Appendix. F.

The size of the systems chosen for containment and duration of their use will depend on the need and issues identified though condition inspections. The choice of blasting either by air or water will be important and there may also be changing in the paint systems and management that influence the scale and duration of this and encapsulation processes. All contaminants will be removed off site.

Prior to Contaminant, the Environmental Management Plan (EMP) attached in Appendix G will be used to reduce environmental effects. This will be adjusted as appropriate post Containment as required with the Auckland Council.

7.6.3 Timing of Containment

The NZTA recognises the need to manage the maintenance activities for the AHB in an environmentally appropriate way, but also ensure it is in a safe operational manner required for its purpose. The current resource consent provides for maintenance via environmental controls and these will continue to be used until containment is put in place.

Appendix F provides a matrix of the various issues that need to be addressed in developing a final structural and operational containment system. These have yet to be fully quantified in terms of true cost and enabling works prior to and as part of implementation. Preliminary estimates range from tens of millions of dollars to a hundred million dollars.

Through a procurement process that identifies levels of capture required for maintenance activities and the timing of these the NZTA wishes to appoint a maintenance contractor that undertakes a cost effective solution. As part of the awarded maintenance contract the costing and timing would be identified so that the NZTA can put in place the required funding streams. The NZTA also recognises that the Application must identify the commitment to the proposal in terms of level and timing.

In light the funding cycles required for the level of commitment to containment, the likely assessments necessary to maximise implementation (e.g. structure condition assessment and upgrade, procurement of plant, development of specific practices) the NZTA will aim to have in place an operational system out to pier 1 and 5 by the end of 2013 and the coastal marine area within ten years of authorisation of this Application.

The NZTA is committed to the implementation of a containment strategy. The implementation requires significant capital investment that is then recovered through the lifetime of the consents. Based on this investment and commitment, the NZTA therefore seeks to maximise the return through the length of authorisation of 25 years.

7.6.4 Discharges throughout Duration of Consent

The graph below (Figure 7.8) taken from Appendix C shows the proportional reduction in total discharges throughout the duration of consent (based on a 25 year duration consent). The graph reflects the following aspects of the application:

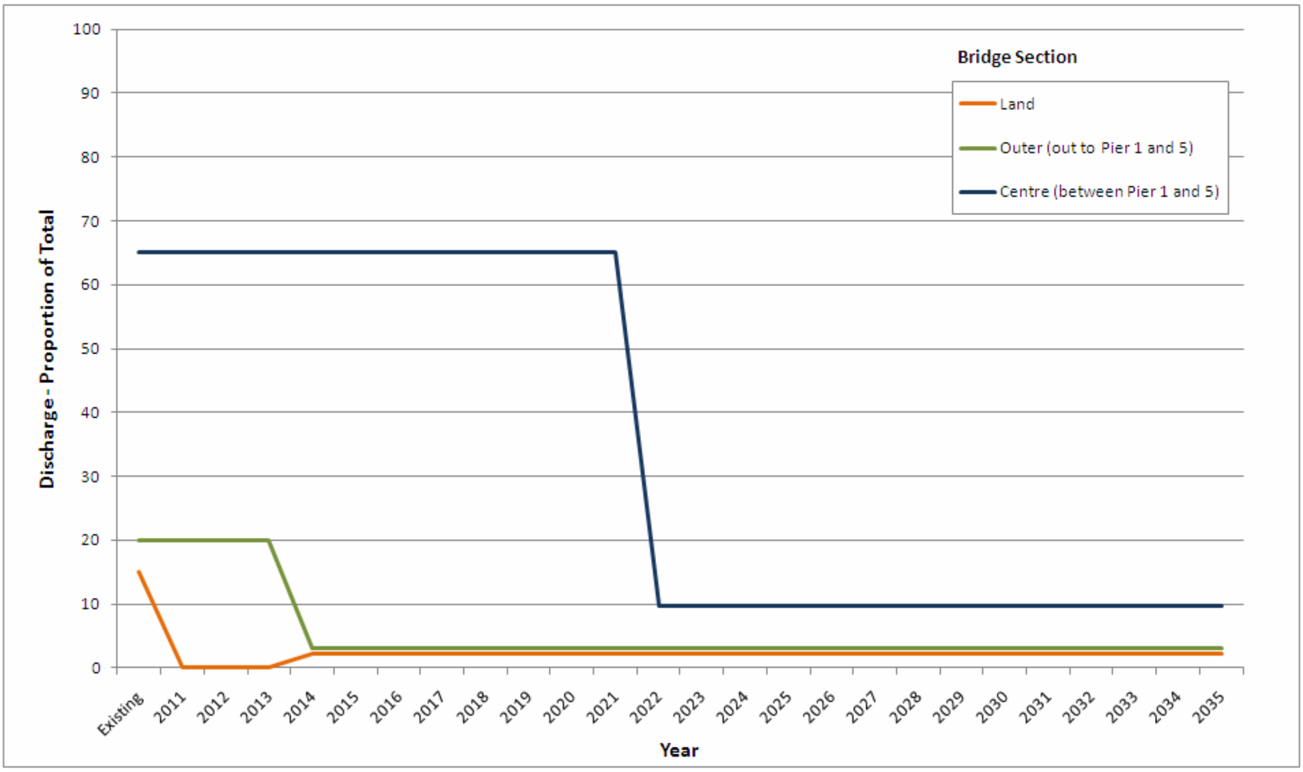
- contaminant discharges arising from abrasive blasting and spraypainting
- no discharges to land / soils at Stokes Point and southern anchorage
- implementation of containment over land and out to Pier 1 and 5 by 2013
- implementation of containment between Pier 1 and 5 by 2021
- discharges proportional to surface area of steelwork and staged implementation of containment (e.g. approximately 15% to land, 20% to water out to Pier 1 and 5, and 65% to water between Pier 1 and 5)
- 85% of contaminants captured once containment is in place
- the requested 25 year consent duration

The graph is indicative only and therefore does not reflect:

- actual frequency of works in different parts of the bridge (i.e. more frequent works in some areas)
- the likely date of next works relative to when containment will be implemented
- possible post-containment changes to maintenance types or frequency

The graph does not represent absolute amounts but rather proportional reduction from 100% discharges pre-containment, and partial containment phase and then full containment by 2021 (with a capture rate of 85%).

Figure 7.8: Proportional Discharges from Bridge Sections in relation to Containment Phases



Note: Existing denotes annual average discharges under existing consents

Table 7.6: Total amount (annual average) of garnet and contaminants with and without containment

The table below (Table 7.6) compares the annual average amount of garnet and contaminants discharged to land and water prior to containment and after containment. The graph in the previous section reflects discharges over the consent duration.

		Without Containment		**With Containment**	
Maintenance Activity	Contaminants Released	Total amount released to land (annual average)	Total amount released to water (annual average)	Total amount released to land (annual average)	Total amount released to water (annual average)
Surface Preparation – abrasive blasting	Garnet Sand B	15,500 kg	32,500 kg	2,325	4,875
	Garnet Sand C	14,000 kg	30,000 kg	2,100	4,500
	Lead Based Paint (Span 7 only) *	n/a	0.15 kg	n/a	0.02
	Zinc Chromate *	36 kg	77 kg	5	12
	Micaceous Iron Oxide (MIO) *	144 kg	306 kg	22	46
	Zinc Phosphate *	144 kg	306 kg	22	46
	MC Zinc	57 kg	122 kg	9	18
	Wasser Miomastic	57 kg	122 kg	9	18
	MC Ferrox A (Entire bridge)	175 kg	371 kg	26	57
Exterior Steelwork Painting – Spray Painting	MC Zinc (primer)	224 kg	476 kg	34	71
	Wasser Miomastic (intermediate)	155 kg	330 kg	23	50
	MC Ferrox A (top coat)	134 kg	286 kg	20	43

** Denotes historic coatings (released during abrasive blasting)*

7.7 Monitoring

The NZTA has considered a range of issues which could be monitored in respect to identifying impacts of AHB discharges. The conclusions are for the following issues:

7.7.1 Scale of Maintenance Activities

Currently through the EMP the AHB maintenance activities are recorded and available to access if required to quantify the quantum being undertaken.

7.7.2 Environmental conditions

- Marine

Consideration of discharge impacts as described in previous sections has identified that the hydrodynamic nature of the direct marine receiving environments is such that extreme dilution of particulates and redistribution is occurring. No monitoring is proposed because any assessment of the local water quality and marine sediments in these situations may not provide any information discernible in respect to the AHB discharges.

- Land

The NZTA is assessing the current issues related to soil quality on Stokes Point and the Westhaven Marina area. It is expected that monitoring requirements for this will be included within an authorisations that may be sought. As part of the current maintenance consent no discharges will occur prior to containment being in place.

7.7.3 Reporting

The NZTA considers annual update reports detailing the amount of work and any key issues that have developed over the period be provided to the Auckland Council based on a calendar cycle. Reports are to be presented within one month of the period end based on the EMP.

The NZTA does not consider that any special monitoring requirements are necessary other than those currently in place.

7.8 Measures to Avoid, Remedy or Mitigate

The management of potential environmental effects that arise from the discharge of contaminants during AHB are described in previous sections of the application and focus on avoiding these through a Best Practical Option that uses:-

a) Environmental controls for day to day activities and emergency situations

b) Containment system of area where activities are undertaken aimed at capturing discharges to the highest level possible.

7.9 Consideration of Alternatives

The NZTA has considered a range of alternatives to implement a containment system augmented by environmental management controls. These include:-

a) continuing the existing process as provided for by the current resource consent
b) maintaining the structure only as issues develop
c) controlling discharges at different rates
d) modifying the protective coating system to reduce discharge and containment levels.

The alternatives have not been chosen as they do not meet one or a combination of the following outcomes that reflect:

- good practice in respect to environmental discharge control
- good engineering practice in respect to steel bridging systems
- overall environmental issues existing within the Auckland region including long-term goals and needs
- the NZTA responsibilities to operate and manage a State highway system
- the AHB role in national and regional economic and social development planning and growth
- the health and safety of users of the AHB and those maintaining its functionality
- the bridges contribution to wider environmental cultural and social values.

The proposed environmental management system for the AHB is considered to meet all the issues above and its implementation process is considered the Best Practical Option in line with the RMA definition.

8. Statutory Considerations

8.1 Section 104 Assessment

8.1.1 Section 104(1) (a) Actual and Potential Adverse Effects on the Environment

The actual and potential adverse effects of the proposal have been identified assessed within Section 7 above. It is concluded that, over the duration of the consent that the effects of the proposal will not be significant for the following reasons:

- A graduated containment proposal is to be implemented to ensure an ongoing reduction in discharges from maintenance activities occurring on the AHB.
- The continued improvement of maintenance practices (implemented via the EMP) to reduce the frequency and volumes of discharges.

A number of positive effects will also result from the proposal. These are considered to include:

- The proposed bridge maintenance will help to ensure the AHB remains in a state of good repair and maintains its structural integrity to increase the lifespan of the bridge. This enables the bridge to play its vital role in the growth and development of Auckland.
- The bridge (and associated State highway network) is recognised as nationally significant infrastructure.
- The proposed bridge maintenance will continue to ensure that the bridge's visual and amenity value does not deteriorate due to peeling paint, rust, graffiti *etc*.
- Over time, a reduction in cumulative effects with regards to contaminant build up within sediments.

8.1.2 Section 104(1)(b)(i) and (ii) Relevant National Environmental Standards/Other Regulations

The only National Environmental Standard (NES) relevant to this proposal is the NES for Air Quality (NESAQ). This is a national standard which is a mandatory environmental regulation. The regulations place a requirement on the Auckland Council to monitor air quality and to report any exceedence of the standards to the public.

The Air Quality Standard of relevance to the Auckland Harbour Bridge Maintenance Works is:

- An ambient air quality concentration limit of 50μm/m^3 for the fine particles as a 24 hour average. The standard must be met every day of the year but one.

The NESAQ will be complied with as the EMP provides suitable management methods to ensure the particulate discharge is controlled.

8.1.3 Section 104(1)(b)(iii) National Policy Statements

There are no National Policy Statements in effect at time of writing.

8.1.4 Section 104(1)(b)(iv) New Zealand Coastal Policy Statements

The purpose of the New Zealand Coastal Policy Statement 2010 (CPS) is to achieve the purpose of the RMA in relation to the coastal environment.

The relevant objectives and policies are set out in Appendix H (a) of this report. The proposal is considered consistent with the relevant provisions in the NZCPS for the following key reasons:

- The maintenance of the bridge provides for the improved longevity of a piece of nationally significant infrastructure which enables people and communities to provide for their social and economic well being as well as ensuring health and safety.
- The proposal provides for a reduction in contaminant discharges into the coastal marine environment and corresponding reduction in effects on the ecology and habitat.
- The CPS recognises that some activities have a functional need to be located in the coastal area and recognises that some built infrastructure will need to both locate in and modify the coastal environment.

8.1.5 Section 104(1)(b)(v) Regional Policy Statement

The purpose of the Auckland Regional Policy Statement (RPS) 1999 is to set policy to promote the sustainable management of Auckland's resources. The RPS has been reviewed but progress of the review is currently on hold awaiting direction from the new Auckland Council. The 1999 RPS therefore remains current. Key principles of the existing RPS including setting a metropolitan urban limit and integration of transportation and land use.

The relevant objectives and policies are set out in Appendix H (b) of this report. The proposal is considered consistent with the relevant provisions in the NZCPS for the following key reasons:

- The proposal will provide for the ongoing maintenance of recognised regionally significant infrastructure which in turn provide a critical link for regional growth and social and economic well being.

- The proposal seeks also to provide a safe transport network whilst mitigating as far as practicable effects on water quality and coastal ecology.

8.1.6 Section 104(1)(b)(vi) Plan or Proposed Plan

The Auckland Regional Plan: Coastal (Coastal Plan) and Proposed Auckland Regional Plan: Air, Land and Water are the two relevant Plans under which consent is required.

8.1.6.1 Auckland Regional Plan: Coastal – Objectives and Policies

The Coastal Plan provides a framework to promote the integrated and sustainable management of Auckland's coastal environment. Chapter 20 contain provisions under which consent is required for this proposal.

The relevant objectives and policies of the Coastal Plan are set out in Appendix H (c) of this report. The proposal is considered consistent with the relevant objectives and policies in the Coastal Plan for the following key reasons:

- As described in Section 7.6 , the proposal adopts the best practicable option for avoiding, remedying or mitigating potential effects of the discharge on the environment.
- The volume and level of contaminants is being minimised (over time) to the greatest extent practicable.
- As described in Section 7, the receiving environment is able to assimilate the discharged contaminants and water.
- The discharges will not, after reasonable mixing, result in any oil, grease etc, there will be no change in colour or clarity, there will be no odour and there will be no significant effects on aquatic life. No effects on amenity or aesthetics are anticipated.

8.1.6.2 Auckland Regional Plan: Coastal – Rules

The relevant controlled activity rules for which consent is sought under the Coastal Plan are described in Section 4 of this report. Associated with those rules are a number of 'conditions' which must be met in order to fall within the parameters of a controlled activity. These are noted as follows:

Controlled Activities
20.5.5 Discharges of contaminants from the maintenance of existing lawful structures in the coastal marine area, excluding hazardous substances as defined in the Hazardous Substances and New Organisms Act 1996, which are not permitted by Rule 20.5.4, subject to the following standards and terms:

a) the discharge is not into any Coastal Protection Area 1 listed in Table 20.2A; and

b) the discharge will not, in the course of routine operation and after reasonable mixing, give rise to all or any of the following effects:
i the production of any conspicuous oil or grease films, scums or foams, or floatable or suspended materials; or
ii any conspicuous change in the colour or visual clarity water in the coastal marine area; or
iii any emission of objectionable odour; or
iv any significant adverse effects on aquatic life.

The proposal meets the controlled activity standards in the following way:

20.5.5: The discharge is from the maintenance of an existing lawful structure and does not include any hazardous substances.

(a) The discharge is not into a CPA 1

(b) The discharge will not, after reasonably mixing:

(i) result in any conspicuous oil or grease films, scums or foams, or floatable or suspended materials; or
(ii) cause any conspicuous change in the colour or visual clarity water; or
(iii) cause any emission of objectionable odour; or
(iv) for the reasons outlined in Section 7 of this report, result in any significant adverse effects on aquatic life.

There are no assessment criteria for consideration in relation to Rule 20.5.5.

8.1.6.3 Auckland Regional Plan: Air Land and Water – Objectives and Policies

The Auckland Regional Plan: Air, Land and Water (ALWP) contains provisions relating to the management of air, land and water resources in the Auckland region. Chapter 4 (Air Quality) and Chapter 5 (Discharges to Water) are relevant of primary relevance to this proposal.

The relevant objectives and policies of the ALWP are set out in Appendix H (d) this report. The proposal is considered consistent with the relevant objectives and policies in the Coastal Plan for the following key reasons:

- The proposal meets the NESAQ in regards to air discharges. Management methods (detailed within the EMP) are in place to minimise the potential for reverse sensitivity effects arising (refer to Section 7 of this report for Communications Plan and set out in the EMP (Appendix G)
- The proposed discharges to air and water are proposed to be managed by the implementation of the best practicable option (as detailed in Section 7).
- Wash water discharge will occur on a short term basis until mitigation (via containment) is implemented.

8.1.6.4 Auckland Regional Plan: Air Land and Water – Rules

Air Discharge

Aspects of the proposal fall within both the permitted activity and restricted discretionary activity rules. There are no assessment criteria for consideration in relation to Rule 4.5.61 (Restricted Discretionary Activities) and compliance with permitted activity standards is assessed under Section 7.

Water Discharge

Controlled activity rules (5.5.63 and 5.5.64) in the ALWP (for discharges to land as a result of wet or dry abrasive blasting activities) must meet the following standards:

i) The discharge is not permitted by Rule 5.5.54;

ii) The discharge does not enter any Wetland, Natural Lake or Natural Stream Management Area.

The discharges are consistent with the above standards and terms because they are not permitted under Rule 5.5.54 and they do not enter any Wetland, Natural Lake or Natural Stream Management Area.

There are no assessment criteria for consideration in relation to Rule 20.5.5.

8.1.7 Section 104(1)(c) Any Other Matters – section 104(1)(c)

Section 104(1)(c) requires that any other matter the consent authority considers relevant and reasonably necessary to determine the application be considered. In this case there are a number of other matters that are considered necessary to determine the application.

8.1.7.1 Part II Matters

The purpose of the RMA is stated in Section 5 as being to promote the sustainable management of natural and physical resources. The Act's purpose and principles (Part 2) are given practical expression through a hierarchy of documents ranging from National Policy Statements to Regional Plans. Section 6 of the Act provides for a specific list of Matters of National Importance. Key to this application is (a):

> *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.*

Section 7 of the Act (Other Matters) highlight additional matters for consideration. Of specific relevance are:

> *f) the maintenance and enhancement of amenity values*

The proposal is considered consistent with Section 7 of the RMA for the following reasons:

Section 8 of the Act provides that in considering the application for resource consent, Council shall take into account the principles of the Treaty of Waitangi.

The proposal is considered to be consistent with Part II of the Act for the following reasons:

- The ABH is considered to be nationally significant infrastructure which contributes to people and communities achieving social and economic well being. Maintenance provides for the ongoing safety of the infrastructure and therefore safety of the users and their communities.
- The proposed maintenance methods (including containment) will, over time provide for significant reductions in discharges and associated contaminants. This will provide for the reduction of cumulative effects on the coastal environment.
- Reducing discharges will be consistent with the principles of the Treaty O f Waitangi.

8.1.7.2 Hauraki Gulf Marine Park Act

The purpose of Hauraki Gulf Marine Park Act (HGMPA) Act is to integrate the management of the natural, historic, and physical resources of the Hauraki Gulf, its islands, and catchments. It also establishes the Hauraki Gulf Marine Park and the Hauraki Gulf Forum. The proposal is considered consistent with the statutory purpose of HGMPA for the following key reason:

- The proposal will, over time see a substantial reduction in the discharges generated by maintenance activities associated with the AHB.

8.2 Section 105 Assessment

The proposal is considered to be consistent with the relevant matters in Section 105(1)(a) to (c) as set out below:

Section 105(1)(a) The nature of the discharge and the sensitivity of the receiving environment to adverse effects

Section 7 describes the nature of the discharges and Section 7 describes the sensitivity of the receiving environment in relation to effects.

Section 105(1)(b) The applicant's reasons for the proposed choice;

Section 7 describes the reasons the NZTA considers the approach chosen represents the best practicable option.

Section 105()1)(c) Any possible alternative methods of discharge, including discharge into any other receiving environment.

Section 7 describes the reasons the NZTA considers the approach chosen represents the best practicable option.

Overall, it considered that the requirements of Section 105(1) have been met.

8.3 Section 107 Assessment

The proposal is considered to be consistent with Section 107 for the following reasons:

(a) there will be no conspicuous oil or grease films, scums or foams or floatable/ suspended materials generated as a result of the discharge

(b) no change in colour or visual clarity will be apparent

(c) none of the materials discharges will emit an objectionable odour

(d) as described in Section 7, effects on aquatic life are considered to be less than significant.

Overall, it considered that the requirements of Section 107 have been met.

9. Summary / Recommendations

The NZTA seeks to discharge contaminants to the environment (air, land and water) while maintaining the Auckland Harbour Bridge. Control of discharges will be through day to day environmental controls processes and physical containment systems which will be introduced in a stage manner, out to pier 1 and 5 by 2013 and within 10 years of grant of consent.

The proposed discharges are controlled and restricted discretionary activities as provided for within the Regional Plan: Air, Land and Water and Regional Plan: Coastal.

The application is suitable for non notification as the relevant Plans specifically provide for processing without public notification or service of notice. No special circumstances are considered to exist.

In summary, effects on the environment are noted as follows:

- Land: effects on land will be no more than minor
- Air: effects on the air are no more than minor
- Water column: effects will be no more than minor and not affect aquatic life.
- Marine sediments: long-term effects are difficult to quantify

Mitigation is proposed via Environmental controls demonstrated within the Environmental Management Plan (EMP) and work practices. Containment of discharges physical controls including encapsulation.

Monitoring will be undertaken of activities through the EMP and anticipated conditions of consent. The duration of consent sought is 25 years.

Sections 104, 105 and 107 are considered to be met by the proposal.

Appendices

A: Consent Application Forms

B: Statutory Flow charts

C: Nature of Key Contaminants

D: Contaminant Flow Paths

E: Stokes Point Soil Contaminants Sampling

F: Containment

G: Environmental Management Plan/ Spill Contingency Plan

H: Statutory Considerations