

Environmental Management Plans

AND NOISE

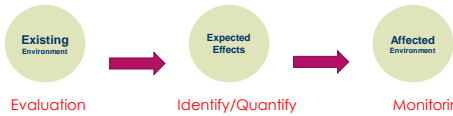
What are EMPs?

- ▶ Developed under RMA to manage environmental effects.
- ▶ Based on initial understanding of what the effects might be for a particular site or project.
- ▶ Practical application of AEE and more...
- ▶ Set up to monitor and inform management decisions on site



Waterview Tunnel, photo kindly shared by Ray Chang, 2020

Managing Environmental Effects



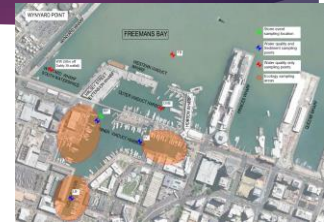
- Evaluation**
 - What is there at the moment?
 - What is the quality of this resource?
- Identify/Quantify**
 - What are the effects likely to be?
 - What is nature/timescale of effects?
- Monitoring**
 - Check what has changed?
 - Further action required?

Step 1 - Evaluation

36th America's Cup

Works planned included consenting, design and construction of the infrastructure, sediment dredging, installation of breakwaters and pontoons, Hobson Wharf extension, Halsey Wharf extension, Halsey Wharf conversion to house Emirates Team New Zealand.

Transforming waterfront, e.g extension to Silo Park & new waka-inspired shade structure, Te Nukuao



America's Cup Assessment – image kindly shared by Ray Chang, 2020

AC36 Plans

Air Quality – Design Standards

- ▶ MFE – Good Practice Guide for Assessing and Managing the Environmental Effects of Dust Emissions (2001)
- ▶ AS/NZ 3580.1.1: 2007 Method for sampling and analysis of ambient air – Guide to siting air monitoring equipment
- ▶ National Environmental Standard for Air Quality (AQNES)

Sub-Plan	Technical Assessment Report
Construction Noise and Vibration Management Plan	G.5: Assessment of Construction Noise Effects G.10: Assessment of Vibration Effects G.31: Technical Addendum Report
Construction Air Quality Management Plan	G.1: Assessment of Air Quality Effects G.29: Technical Addendum Report
Erosion and Sediment Control Plan	G.22: Erosion and Sediment Control Plan (duplicated) G.30: Assessment of Associated Sediment and Contaminant Loads
Temporary Stormwater Management Plan	G.15: Assessment of Stormwater and Stormworks Effects G.27: Stormwater Design Philosophy Statement G.8: Assessment of Herpetofauna Ecological Effects G.9: Assessment of Avian Ecological Effects G.17: Assessment of Terrestrial Vegetation Effects G.31: Technical Addendum Report
Ecological Management Plan	G.11: Assessment of Marine Ecological Effects G.19: Technical Addendum Report G.6: Assessment of Freshwater Ecological Effects G.31: Technical Addendum Report
Groundwater Management Plan	G.7: Assessment of Groundwater Effects G.31: Technical Addendum Report
Settlement Effects Management Plan	G.13: Assessment of Ground Settlement Effects G.31: Technical Addendum Report
Contaminated Soils Management Plan	G.5: Assessment of Land and Groundwater Contamination G.31: Technical Addendum Report
Archaeological Site Management Plan	G.2: Assessment of Archaeological Effects G.31: Technical Addendum Report
Construction Traffic Management Plan	G.36: Assessment of Temporary Traffic Effects

Step 2 - Quantifying Effects

- ▶ Experts provide their opinion on each of the effects considered relevant
- ▶ WWT project produced 30+ technical reports with one or two experts from applicant and Council presenting evidence to committee



Waterview tunnel plan

Construction Environmental Management Plans (CEMP)

1.4.2. CEMP

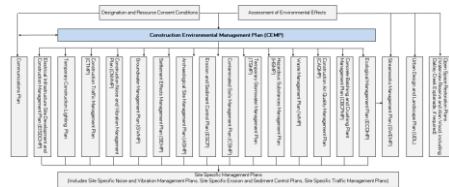
The CEMP defines details of who, what, where and when environmental management and mitigation measures are to be implemented. The CEMP covers the anticipated construction elements for the stage of work and presents a framework of principles, environmental policy, objectives and performance standards as well as processes for implementing good environmental management.

Identify the likely hazards and risks on the site during construction in terms of potential environmental damage

1.4.3. Environmental Sub Plans

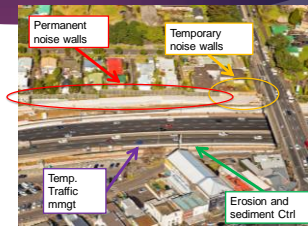
Detailed environmental management plans (sub-plans) required to manage specific effects (e.g. construction air quality, noise, vibration etc.) of the proposed work are provided as appendices to this CEMP. Contained within each of the sub-plans are the associated monitoring and reporting requirements and "site specific" plans (e.g. noise, vibration, traffic and erosion and sediment control). The suite of management plans required by the consent conditions under condition CEMP.3 is shown on Figure 2 and Table 2.

CEMP overarching document



Special Effects Management Plans

- ▶ Certain effects need even more specificity to provide comfort
- ▶ **Site-Specific Noise Management Plans**
- ▶ Managed by the overarching Construction Environmental Management Plan and sub plans



WVT- application docs !

- 1. Application documents**
- Assessment of environmental effects**
- ▶ Part A, B and C (PDF, 6.8 MB, 278 pages)
 - ▶ Part D (PDF, 15.9B, 565 pages)
- Technical reports**
- ▶ G.1 Assessment of Air Quality Effects (PDF, 7.7 MB)
 - ▶ G.2 Assessment of Archaeological Effects (PDF, 4.4 MB)
 - ▶ G.3 Assessment of Avian Ecological Effects (PDF, 5.4 MB)
 - ▶ G.4 Assessment of Coastal Processes (PDF, 7.3 MB)
 - ▶ G.5 Assessment of Construction Noise Effects (PDF, 2.1 MB)
 - ▶ G.6 Assessment of Freshwater Effects (PDF, 2.4 MB)
 - ▶ G.7 Assessment of Groundwater Effects (PDF, 42.8 KB)
 - ▶ G.8 Assessment of Habitats Effects (PDF, 1.13 MB)
 - ▶ G.9 Assessment of Land and Groundwater Contamination (PDF, 1.1 MB)
 - ▶ G.10 Assessment of Lighting Effects report (PDF, 465 KB)
 - ▶ G.11 Assessment Marine Ecological Effects report (PDF, 5.3 MB)
 - ▶ G.12 Assessment of Operational Noise Effects (PDF, 1.2 MB)
 - ▶ G.13 Assessment of Groundwater Effects (PDF, 1.1 MB)
 - ▶ G.14 Assessment of Social Effects (PDF, 4.3 MB)
 - ▶ G.15 Assessment of Stormwater and Stormwater Effects (PDF, 1.3 MB)
 - ▶ G.16 Assessment of Temporary Traffic Effects (PDF, 4.8 MB)
 - ▶ G.17 Assessment of Terrestrial Vegetation Effects (PDF, 1.2 MB)
 - ▶ G.18 Assessment of Transport Effects (PDF, 7.3 MB)
 - ▶ G.19 Assessment of Vibration Effects (PDF, 348 KB)
 - ▶ G.20 Assessment of Landmark and Visual Effects (PDF, 1.3 MB)
 - ▶ G.21 Construction Environmental Management Plan (PDF, 4.1 MB)
 - ▶ G.22 Erosion and Sediment Control Plan Report (PDF, 1.1 MB)
 - ▶ G.23 General Works Report (PDF, 2.2 MB)
 - ▶ G.24 Geotechnical Investigation Report (PDF, 504 KB)
 - ▶ G.25 Traffic Modelling Report (PDF, 2.7 MB)
 - ▶ G.26 Operational Model Validation Report (PDF, 565 KB)
 - ▶ G.27 Stormwater and Stormwater Drainage Philosophy Statement (PDF, 103 KB)
 - ▶ G.28 Assessment of Associated Inland Contaminant Loads (PDF, 406 KB)
 - ▶ G.29 Technical Addendum Report (PDF, 228 KB)

Construction effects vs. Operational effects

- Noise**
 - Beeping
 - Conveyor belt operation
 - General site works
- Air Quality**
 - Dust
- Water quality**
 - Sedimentation
 - pH, nutrients, metals, etc.
- Disturbance of soils**
 - Exposure of contaminated soils

Construction effects may include:



Step 3 - Monitoring

- Construction Phase Requirements for AC36 incl:
- ▶ Monthly monitoring of water quality
 - ▶ Monitoring of water quality in response to storm events
 - ▶ Review of ecological assembly within the Inner Viaduct Harbour
 - ▶ Baseline samples
 - ▶ Post-construction samples (Monitor potential change in water quality / ecology as a result of new structures in the CMA)
 - ▶ Technical report evaluating changes



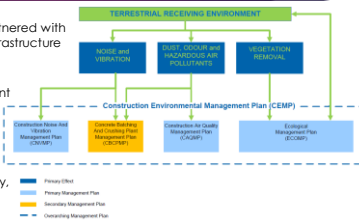
America's Cup Venue pre-construction - image kindly shared by Ray Chang, 2020

Partnership with Mana Whenua

Wynyard Edge Alliance (WEA) partnered with mana whenua to construct the infrastructure for AC36.

19 iwi/hapū invited to establish the America's Cup Kaitiaki Engagement Plan (ACKEP) and had a major contribution to project's environmental management principles

Principles of partnership, reciprocity, active protection, and equity honoured



Activities affecting cultural values

Of particular concern

- ▶ Managing water quality
- ▶ Managing underwater noise as to protect marine animals
- ▶ Protecting the waters of the area from biosecurity risks
- ▶ Providing cultural markers within the infrastructure that recognise the historical associations of mana whenua with the whenua and moana.
- ▶ Enabling the use of infrastructure for cultural activities.

Mana whenua were involved in the preparation and implementation in a range of management plans

Benefits of EMPs

- ▶ Outcomes based solution
- ▶ Promise to achieve a certain result (might require time)
- ▶ Allows flexibility in how you achieve compliance with a parameter
- ▶ Can be altered depending on circumstances



Proposed mitigation plan - image kindly share by Roy Chang, 2020

Noise is...?

Unwanted sound

The environmental and social definitions of noise take account of the effect of the sound rather than its technical nature

The results of national surveys of typical exposure to noise show that

- ▶ >50% of the population are exposed to day-time noise levels that exceed the World Health Organisation (WHO) ratings for significant community annoyance.
- ▶ Other surveys report that around 50% of people find their home in some way unsatisfactory because of noise.

Noise Problems

- ▶ **Hearing damage** - many people are exposed to work and leisure noise levels that slowly but relentlessly cause deafness
- ▶ The construction industry has high levels of noise that can damage workers hearing and health
- ▶ Aim of NZ building regulations for sound insulation: safeguard people from illness or lack of amenity as a result of undue noise transmission
- ▶ On a positive note: room acoustics – good quality sound helps communication - and gives pleasure.



Other Problems

- **Quality of life**
Busy roads or airports are considered unpleasant and undesirable as places to live.
- **Interference**
Disruption of speech or music can be annoying and, in some situations, dangerous.
- **Distraction**
from a particular task can cause inefficiency and inattention – and may be dangerous.
- **Expense**
Control of noise is expensive. Businesses can suffer loss of revenue in a noisy environment.

Hearing Loss

Excessive exposure to noise causes loss of hearing.

The most damaging type affects the Inner Ear – the Cochlea which contains nerve endings that connect to the brain and provide our sense of ‘hearing’.

- ▶ **Temporary Hearing Loss** - allow 48 hours for recovery
- ▶ **Permanent Hearing Loss**- from exposure every day. Eg bar staff, construction staff?

All hearing losses are added to the continuous hearing loss that accumulates with age – from the time of birth!

Noise Factors to measure

Energy level

- ▶ The hearing system reacts to the Sound Pressure Level (SPL) usually measured in decibels (dB)

Frequency structure

- ▶ Some frequencies are more annoying or harmful than others Eg: high whining frequencies

Time Duration

- ▶ Short periods of noise are less likely to annoy than prolonged exposure

Decibel scale

- Decibel (dB) scale used to –
- give a manageable scale of numbers.
- match the non-linear response of human hearing

The decibel is a logarithmic ratio of two quantities

Usually measured in terms of pressure

$$SPL = 20 \log_{10} \left[\frac{P}{P_0} \right]$$

Pressure of the sound (Pa)
Pressure of threshold of hearing (Pa)

Typical sound levels

Sound pressure in Pa	Sound level in dB	Typical environment
20000	140	Threshold of pain
1000	130	Aircraft take-off
200	120	Loud discotheque
100	110	Noisy factory
50	100	Heavy factory
10	90	High street corner
2	80	Vacuum cleaner
0.5	70	Normal conversation
0.1	60	Suburban living room
0.03	50	Quiet countryside
0.003	40	Threshold of hearing

Sound level change	Effect on hearing
+/- 1 dB	negligible
+/- 3 dB	just noticeable
+10 dB	twice as loud
-10 dB	half as loud
+20 dB	four times as loud
-20 dB	one-quarter as loud

Hearing Risks from Construction

- ▶ The risk of damage to hearing is dependent on the total energy reaching the ear in a given period
- ▶ $L_{A,eq}$ is the basis of safe exposure to noise during an 8 hour working day.
- ▶ Current Noise Dose Limit in NZ:

$$L_{Aeq,8hr} = 85 \text{ dB}$$

Sound Energy

The equivalent continuous sound level compares a varying sound level to a theoretical constant sound which gives an equivalent amount of sound energy.

Equivalent continuous sound level, $L_{Aeq,T}$ is that constant sound level which, over the same period of time T, provides the same total sound energy as the varying sound.

Unit: dB(A)

Although human hearing does not judge loudness in terms of energy, the L_{Aeq} measurement of accumulated sound energy is found to correlate well to – the annoyance caused by noise and also to damage to hearing.

Remember: A sound level increase of just 3 dB may not be noticed but:

- the sound energy received doubles
- the hearing damage doubles

Energy Equivalents

- ▶ 3 dB increase corresponds to double the energy
- ▶ By reducing time to half = equivalent ‘dose’ of energy over an 8 hour period.
- ▶ Assumptions include a continuous noise output from machinery
- ▶ In situations where noise varies – use integrating sound level meters which sample regularly

90 dB(A) for 8 hours
or
93 dB(A) for 4 hours
or
99 dB(A) for 1 hour

All give the same value of $L_{Aeq,8hr} = 90 \text{ dB}$

