Marine Resource Conservation Working Group
Asia Pacific Economic Cooperation

Water Quality Criteria / Standards Adopted in the Asia Pacific Region

Phase 1 report
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Environmental Protection Department
The Government of the Hong Kong Special Administrative Region
of the People's Republic of China

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1. Introduction

1.1 PURPOSE

This report presents the initial findings of the questionnaire-based survey on the water quality criteria (WQC) or standards (WQS) adopted in the Asia Pacific Economic Cooperation forum (APEC) and further programme for completion of the project.

1.2 SCOPE

Hong Kong (China) submitted a project proposal (in Appendix A) to the Marine Resource Conservation Working Group (MRCWG) of the APEC forum during its 15th meeting at Canberra, Australia (11-13 June 2002) with an aim to carry out a literature review on :

(i) the WQC/WQS adopted in the member economies for the protection of the aquatic resources and uses;

(ii) the approach/methodology and the scientific rationales for deriving the WQC/WQS in the member economies.

The project is divided into two phases and a report will be prepared at the end of each phase. This report, the first of the series, serves as an internal document to report the project progress and its content will be incorporated in the final report upon completion of the project.

1.3 STRUCTURE

This report contains the following sections and appendices :

Section 1 contains the introduction.

Section 2 summarizes the objectives, methodology and the reporting method.

Section 3 compiles the information collected from the two questionnaires sent to the member economies and initial information search.

Section 4 concludes the findings and sets out the way forward for the second phase of the project.

Appendix A	contains the project proposal, the two questionnaires that were sent to member economies and two summary tables of the responses received.
Appendix B	contains the list of contacts of the responsible departments/ agencies for acquiring information in this project.
Appendix C	contains the links for on-line access to WQC/WQS in different economies.
Appendix D	contains the list of reference documents used in this project.

2. Objectives, Methodology and Reporting

2.1 BACKGROUND AND OBJECTIVES

The Marine Resource Conservation (MRC) Working Group was established in 1990 to promote initiatives in the APEC region that will protect the marine environment and its resources and to ensure continuing socioeconomic benefits through maintenance of marine environmental quality.

Directed by the 1996 APEC Ministerial Meeting on Sustainable Development, MRC Working Group developed "A Strategy to Address Sustainability of the Marine Environment", which was endorsed in June 1997. The key objectives are :

- integrated approaches to coastal management;
- prevention, reduction and control of marine pollution; and
- sustainable management of marine resources.

To achieve these objectives, the Strategy has identified three central tools:

- research (including exchange of information, technology and expertise);
- capacity building (including training and education); and
- public / private sector participation and partnership.

The APEC economies are united by oceans and seas. The health of the marine environment is therefore critical to their continuing economic well-being and sustainable development. While it is recognized that regional prosperity depends on sustaining a healthy environment within its jurisdiction, cooperation and collaboration among member economies would contribute to global prosperity and sustainability in the Asia-Pacific region. Among the APEC economies, most members have established their own WQC/WQS to protect aquatic resources and uses. The values of these criteria or standards may vary among different economies because of the need to protect different resources or beneficial uses; or because of different ways these criteria or standards are derived. However, information on these WQC/WQS and the ways they are derived is usually not readily available or accessible.

Aiming to facilitate the attainment of an integrated approach to coastal management by means of research, exchange of information, technology and expertise, Hong Kong (China) has undertaken the project of compiling information on the WQC/WQS adopted in individual member economies and making available a reference guide for member economies to access the information.

This project will present a global review of the water management systems currently adopted in the APEC economies. It will also enable economies to more fully understand various approaches and tools used in the systems, which will in turn, help economies develop and integrate regional strategies for further sectoral and mutli-sectoral ocean management. Overall, this project will contribute to strengthening co-operation for building capacity, and sharing information and expertise for management of coastal waters in an integrated manner.

2.2 KEY ISSUES

The key issues for investigation are divided into four main subject headings :

(i) Categories of receiving waters/beneficial uses

- how are receiving waters classified?
- for what uses are the WQC/WQS developed?

(ii) WQC/WQS

- what parameters are specified and what are the "values"?
- does each economy have just one set of WQC/WQS for the entire jurisdiction or different sets of WQC/WQS for individual zones with particular uses?
- what is the framework of the WQC/WQS system?

(iii) Derivation of WQC/WQS

- what is the rationale for including a particular parameter in the list of WQC/WQS?
- what is the philosophy/approach for deriving the WQC/WQS?
- how is the ambient level of the relevant parameter applied in the derivation?

(iv) Application of WQC/WQS

- how to assess compliance with WQC/WQS?
- what indicators and methods are used in the water quality monitoring?

2.3 METHODOLOGY

A step-wise approach was used in this project to compile information on the water quality criteria/standards adopted in individual APEC member economies. First, two questionnaires were sent to the 20 participating member economies. The first questionnaire requested information of a technical nature and relating to the values of the WQC/WQS while the second requested details on the approach and scientific rationales for deriving these values and their application. The information requests focused on the general system of WQC/WQS and identification of the relevant documents (legislation, regulation, guidelines, standards, etc.).

Next, information search started with browsing the internet following the advice given in the questionnaire replies. Websites of the national/state/territory governments and the related links were visited. Relevant information was downloaded. Some economies were re-contacted for further information and advice. Summaries of the findings in the first phase are reported in this report.

The information search will continue in the second phase. After all relevant documents have been acquired, the information will be reviewed and collated with reference to the four key issues identified in Section 2.2. The WQC/WQS that are applicable to the aquatic environment will be incorporated into an electronic database. The database will be structured to show summaries of the WQC/WQS by media type (i.e. water, sediment and tissue), and water use (i.e. protection of aquatic life, recreation and aesthetics, fisheries, etc.).

In the event of non-English documents, assistance in interpretation and arrangement for translation may be required from the concerned economy, when necessary.

2.4 REPORTING

2.4.1 Economies to be reviewed -

15 APEC economies are covered in this project, namely, the 14 economies which have returned their responses to the questionnaires + Hong Kong (China). (*Text in italic shows the abbreviation of the economy used throughout this report)* :

Australia
Brunei Darussalam, ***Brunei***
Canada
Chile
People's Republic of China, ***China***
Hong Kong, China, ***Hong Kong***
Malaysia
New Zealand
Papua New Guinea
Peru
Republic of Philippines, ***Philippines***
Singapore
Chinese Taipei
Thailand
United States of America, ***USA***

2.4.2 Phases

The findings of the project are reported in two phases.

In the first phase, information collected from the questionnaires and the initial information search is summarized in this Phase 1 Report to provide an overview of the system of WQC/WQS in different economies.

In the second phase, the focus will be on close examination of the four key issues identified in Section 2.2. Comparison will be made among the various economies on (i) categories of receiving waters/beneficial uses; and (ii) reference values of WQC/WQS, particularly where the criteria/standards of an authority differ substantially from others. Appendices displaying the WQC/WQS adopted for protection of the water environment will also be compiled to provide a quick reference.

Key issues (iii) and (iv), i.e. derivation of WQC/WQS and their application, will be addressed with special attention to the general approach to the derivation of the criteria and the supporting rationale. However, the degree of detail reported will depend on the success of data acquisition.

Upon completion of the project, all findings will be documented in a final report comprising an account of the findings and a WQC/WQS database. The draft report will be sent to the economies concerned for comment before it is finalized. Copies of the report will be disseminated to all APEC economies for their reference. An electronic copy will be given to APEC for placing on the APEC website to facilitate access to the findings by the public and private/business sectors. Due to resource limitations, all reports for this project will be prepared in English only.

3. Findings in Phase 1

3.1 COLLECTION AND COLLATION OF INFORMATION

Initial information from the member economies was collected by way of a questionnaire-based survey. Two different questionnaires were sent to the following 20 member economies in September and December 2002 respectively.

Australia
Brunei Darussalam
Canada
Chile
People's Republic of China
Indonesia
Japan
Republic of Korea
Malaysia
Mexico
New Zealand
Papua New Guinea
Peru
Republic of Philippines
Singapore
Russia
Chinese Taipei
Thailand
Viet Nam
United States of America

13 economies provided replies to the first questionnaire and 11 economies to the second. An overall return rate of 60% was achieved. A copy of the two questionnaires and two summary tables of the responses provided by the member economies is provided at Appendix A.

Some economies provided supporting documents with their returns while some gave directions to gain access to the information needed (website, publication office, etc). A full listing of the WQC/WQS of some economies could be located on the internet and acquired under the directions given. However, for the derivation and application of the criteria/standards, often the quoted documents alone which are for general purposes, do not give the required level of details of the procedures or rationale. Reference is often made to local and other international studies/reports, which are not readily available from the initial document acquisition.

At the end of phase 1, the websites of each of the economies and the related links were searched. Any relevant information was downloaded and collated. The following observations were noted during the course of internet search. Web pages regarding water quality and marine quality of the Department of Environment of Malaysia were found under construction, and access into the Department of Environment and Conservation of Papua New Guinea was unsuccessful. The websites of the Chilean and Peruvian governments were not in English. Some water quality related documents of Thailand, Chinese Taipei and China were published in either Thai or Chinese.

The Canadian Environmental Guidelines (1999) and a new compendium of Chinese environmental law and standards have been released but they are not available for internet download. Orders have been placed for acquisition of these two books.

3.2 SUMMARY OF FINDINGS

3.2.1 Categories of Receiving Waters and Beneficial Uses

The classification of the receiving waters generally takes into account both the types of water (e.g. marine water, estuarine water, fresh water, drinking water) and the beneficial uses (e.g. protection of aquatic life, amenity, agriculture, irrigation). Furthermore, specific zones are established for the protection of the different uses and resources.

Each economy has its own regime for classifying receiving water bodies and beneficial uses, with due regard to the topography and the known uses of water in the region. The degree of detail employed and the extent of the classification vary considerably. The classification of receiving waters and beneficial uses of various economies is shown in Tables 3.1 and 3.2

The general differences in the classification of receiving water bodies and beneficial uses/resources are highlighted below.

- Australia, Canada, New Zealand and Thailand have relatively more categories of receiving water bodies, i.e. agriculture water, drinking water, estuarine water, fresh water, groundwater, marine water, recreation water, river, sediment, tissue residue and wetland.

- There is only one category (marine water) in Brunei and Singapore, and none in Peru (solely based on beneficial uses and resources protection).

- Previously, Australia and New Zealand had two classes of water bodies (fresh and marine). In view of the diversity of ecosystems and variation in water bodies and climates, the water management authority took a different approach starting in year 2000. The new approach considers protection of up to six types of ecosystem types tailoring the water quality criteria to the local conditions. The classification is hierarchical with different levels of detail applying to different categories of indicator (i.e. physical and chemical stressor, biological indicators, toxicants, sediment). For example, under the category of chemical and physical stressor, the six ecosystem types are estuarine, coastal & marine, lakes & reservoirs, wetlands, upland rivers & streams, lowland rivers & streams.

- Both Australia and New Zealand have recognized the cultural importance of water to indigenous people of the two nations. It is believed that water bodies are associated with sacred sites, and the well-being of a native tribe is linked to the condition of the water in its territory. Given the indigenous interest in water and the lack of water quality guidelines for such beneficial uses, in 1999 the New Zealand Ministry for the Environment proposed to develop guidelines to reflect the values of cultural beliefs and to incorporate manhinga Kai (food collected from marine and freshwater areas) values into the relevant ecosystem outcomes and actions. At this time, no WQC/WQS have been developed for this category in either Australia or New Zealand. These values are taken into account through the process of establishing the specific WQC/WQS for a particular water resource.

- Good water quality is essential for the livestock industry while poor quality water may reduce animal production and impair fertility. Groundwater and surface water are sources of drinking water for livestock. The quality of these water sources is affected by land uses in the catchment, e.g. agriculture, mining and other industries. Australia, Chile, Malaysia, New Zealand, and the Philippines have developed WQC/WQS for livestock drinking water, which have taken into account the need for an integrated approach to land and water management in the areas.

- Canada is the only economy that has WQC/WQS for protection of wildlife consumers of aquatic biota. A number of wildlife species depend on aquatic species as their primary source of food. When consuming the aquatic prey, the wildlife species will take up toxic substances that have accumulated into the tissues of the prey's body. Separate WQC/WQS are set as it is considered that water quality guidelines are not deemed appropriate for the target substances since they are more likely to partition into the tissues of aquatic organisms or sediments rather than stay in the water column. The USA has begun work on developing national wildlife criteria in 1987 and the work is now in progress.

- Recreational uses have been traditionally divided into primary contact and secondary contact recreation. Australia and New Zealand have added a third category, i.e. recreational with no human contact.

- In 1998, China reclassified the beneficial uses of marine water from 3 to 4 uses, namely, (I) fishing, conservation of natural resources and endangered species; (II) mariculture, recreational activities, human food consumption; (III) industry, seaside promenade and tourist spots; (IV) oceanic development. Different WQC/WQS are applied for different levels of protection or beneficial uses.

- Chile, China and Malaysia have WQC/WQS for different classes of irrigation water. Chile has two classes of irrigation water, which are differentiated by types of crops irrigated. China has three classes for watering (I) hydroponics crops; (II) crops under controlled irrigation; and (III) general vegetables. Malaysia has four, namely, (I) normal use; (II) semi-tolerant; (III) tolerant and (IV) fine texture soil.

- Aquaculture is the only beneficial use for which WQC/WQS have been developed in Singapore.

- Some special types of uses were noted : oceanic development in China; aquifer protection, navigation, hydroelectric power, groundwater recharge in the USA.

3.2.2 Development of WQC/WQS

The general differences in the framework of the system of WQC/WQS are highlighted below.

- Most economies have adopted several sets of WQC/WQS, related to different types of receiving waters and beneficial uses.

- Basically, there are three levels in the hierarchy of WQC/WQS. At the top, water quality "targets" are the numerical concentrations or narrative statements recommended to support and maintain a designated use. These "primary target values" are often derived from scientific information and are not site-specific. In the middle, the state/territory "targets" are used to protect and maintain the designated uses of water at the specific place/region. These "secondary target values" are derived from the primary target values according to the local needs and established protocols. Nested at the bottom are the target values for regulating the quality of the effluent discharged into the receiving water bodies.

- Different terminologies are used in describing the "target values" for achieving the goals in protecting the environment. For example at the top level of the hierarchy, "criteria" is used in Chile, Malaysia, Papua New Guinea, the USA; "guidelines" in Australia, Canada, New Zealand, Singapore, the Philippines; "objectives" in Hong Kong; and "standards" in China, Chinese Taipei, Thailand. A summary showing the different terminologies in WQC/WQS hierarchy is given in Table 3.3.

- Depending on the system adopted in the economies, the primary water quality targets are usually not legally binding. They are just reference values for the state/territory governments to work out their own target values. Whereas the secondary quality targets serve as the indicators for the local jurisdictions to measure performance in meeting management goals or attainment of environmental goals. This situation applies to Australia, Canada, Chile, China, New Zealand and the USA.

- The Canadian Water Quality Guidelines were developed in 1987 for the protection of different water resources such as drinking water and recreation water, agricultural irrigation water and livestock watering and freshwater life. In the 1990s, the Canadian Environmental Quality Guidelines were released to supersede the 1987 version and to include guidelines regarding other media such as marine waters, sediment, soil, air, and additionally, tissue residue guidelines for the protection of wildlife consumers of aquatic biota.

- National water quality criteria are applied across the country of Papua New Guinea. Since about 90% of the population live in the rural areas, it is considered appropriate that criteria for the protection of raw drinking water (fresh water) and aquatic life, recreational and aesthetic uses are relevant throughout the country for fresh and marine water. It is also considered that protection of water quality for other uses, e.g. agriculture, aquaculture, could be achieved through applying the established criteria for the protection of aquatic life. Whereas for the protection of other uses, it could be achieved by way of discharge permit which requires the trade or the industry to treat the wastewater effluent to the required quality.

- Water quality guidelines have been developed only for mariculture in Singapore. The water quality of other receiving water bodies is protected by way of controlling the quality of trade effluent discharges. Maximum allowable limits have been developed for discharges made into sewer, general watercourses (all inland and coastal waters) and controlled watercourses (for potable water abstraction).

- Under Section 304(a) of the Clean Water Act, the USA had published water quality criteria for 158 "priority" toxic pollutants by the year 2000. In the latest compilation of the nationally recommended water quality criteria, many criteria have been revised based on EPA's new methodology for deriving human health criteria. In addition to narrative and numeric form of water quality criteria for the protection of aquatic life, other forms of water quality criteria include : biological, human health, nutrient, sediment, wetland and wildlife.

The basis/rationale for including a parameter/substance in the list of WQC/WQS varies, for example :

- Inclusion of a certain parameter/substance in the list of WQC/WQS is mainly due to its effect on the local aquatic environment.

- Where the economy has a federal system of government, i.e. Australia, Canada, New Zealand and the USA, inclusion may depend on whether the parameter/substance is of local and national concern.

- In Canada, a parameter/substance may be included because there is a demand from society and sufficient scientific data are available for the derivation.

The general approaches in the derivation of WQC/WQS are :

- The primary water quality targets are values based on the scientific literature, field testing data and scientific judgment, and are nationally endorsed for derivation of the targets at state/territory level. The setting of secondary water quality targets is usually done through the use of local reference data and established derivation protocols.

- Australia, Canada, New Zealand and the USA are known to have developed guidelines to derive the primary and secondary water quality targets. The aim of these guidelines is to provide an objective, internally consistent, appropriate, and technically feasible way of deriving water quality targets. An outline of the framework of the derivation process in these four economies is given in section 3.3.

- Reference to other leading authorities or overseas experience is often made in the derivation of the WQC/WQS in other economies. Common references are United States Environmental Protection Agency (USEPA), Environment Canada (EC), Environment Agency of Japan (EAJ), World Health Organization (WHO), American Water Works Association (AWWA), Water Environment Federation (WEF), United Nations Environment Programme (UNEP), and the Organization for Economic Co-operation and Development (OECD).

- Common reasons for making reference to other counterparts are : similar topographical/climate conditions, similar uses or resources and more scientific information available.

3.2.3 Application

The following points are noted in the returns :

- Subject to the regulatory system of the economy, the local authority could modify the set of national WQC/WQS as appropriate to suit the local conditions as in Australia, Canada, Chile, China, New Zealand and the USA.

- The majority of the economies have monitoring programmes to assess compliance with the WQC/WQS. Depending on the data control of each economy, testing results are published for public inspection or provided upon request.

- Where a mixing zone/dilution zone is allowed, the specific requirement of limiting the zone size is mostly descriptive, e.g. as small as possible, or proven that with the best available technology the WQC/WQS could not be met. Chinese Taipei has a quantitative requirement of "within 2 kilometer from the discharge point".

- Measurement of compliance with WQC/WQS varies considerably among the member economies. For example, Australia uses median monthly data at a site to compare with a fixed percentile (mostly 80%ile) at a reference site or with default guideline values. Maximum limits are used for different types of parameters (i.e. microbiological, physical, chemical) in most of the other economies. The variety of measurement methods used in the member economies could be revealed from their responses to question no. 6 of the second questionnaire (in Appendix A).

3.3 FRAMEWORK OF WQC/WQS SYSTEMS

Australia and New Zealand

The Australian and New Zealand Environment and Conservation Council has developed many policies relating to national and international environmental and conservation issues. Building on the same foundation, both Australia and New Zealand adopt the same water quality criteria and many other environmental policies.

The National Water Quality Management Strategy sets out the national, strategic direction for water quality management in both nations. Responsibility for water management lies with the local jurisdictions. Guided by the strategy, the local governments develop area-specific water quality objectives taking account of national goals and obligations to other states and territories.

The concept of integrated catchment management (ICM) is adopted to achieve the goals in environmental protection. Within the ICM framework, all stakeholders will be involved in setting the water quality targets through negotiation between the government and the community.

The process of setting the water quality guidelines will first involve defining the environmental values (i.e. beneficial uses) for a particular water resource that the local community needs or wishes to protect. The regional water quality objectives and implementation plans will then be determined based on the national water quality guidelines. Relevant stakeholder groups will be involved in the whole process to build up community ownership of water management goals.

A "Risk-based decision framework" is used in the derivation of the regional water quality objectives. The framework guides the development of site-specific trigger values based on biological effects or reference data. Based on the local needs, the trigger values could vary depending on the level of protection the local jurisdiction wishes to achieve, i.e. protecting certain population (e.g. 99, 90 or 80%) of target species in the ecosystem in the water body.

An integrated approach using a mix of physical-chemical and biological indicators has been used in water quality monitoring and assessment. Biological indicators have a shorter history of use in Australia and New Zealand, yet there has been growing importance in their application.

A national framework has been developed in Australia for monitoring water quality and for reporting the outcomes, with the aim of improving water monitoring and helping the programmes to be more consistent with each other. Monitoring data can be compared across regions and over time, to save money and build up the "big picture". Monitoring programmes are run by state and local government bodies and various sectors in the community.

New Zealand has adopted the "Pressure-State-Response" system in defining national indicators. Indicators have been developed for 16 groups : air, marine, climate change, ozone, land, waste, freshwater, transport, amenity, pest/weeds, diseases, energy, biodiversity, contaminated sites and Maori.

Brunei

Brunei has yet to establish a comprehensive legislation that specifically addresses the protection of water quality. No single agency in the nation has the sole responsibility for environmental matters, including enforcement of environment-related laws. Three beneficial uses have been defined for marine waters. The water quality targets are based on those adopted in other jurisdictions. These water quality targets are statutory requirements but local governments could modify the values when necessary. At present, legally enforceable discharge standards have not been developed. Internationally accepted standards are used as references, e.g. WHO and ASEA member countries. Established in 1993, an inter-agency National Committee on Environment takes charge to develop policy and be responsible for regional and international liaison on environmental matters. The Committee is now in the progress of considering the proposed environmental policy objectives and strategies.

Canada

The Federal Water Policy sets out the Canadian federal government's philosophy and goals for management of the nation's water resources. The federal government commits to develop the primary values of water quality that sustain the health of ecosystems and the protection of the water resources. Under the Constitution Act, the provinces exercise direct control over many aspects of water management.

The federal government has endorsed an integrated approach to the planning and development of water resources in individual provinces. The approach takes into account all water uses and water-related activities, within a certain catchment/administrative region.

The Canadian Council of Ministers of the Environment (CCME) has developed several protocols for deriving the primary and secondary water quality target values for the different designated beneficial uses. Each protocol specifies the requirement and different procedures that could be used in the derivation. Taking derivation of numerical water quality guidelines for the protection of aquatic life as an example, the primary water quality target values are derived from the lowest-observed-effects level (LOEL) from chronic studies, for the most sensitive life-stage of the most sensitive species investigated. If chronic data are unavailable, the derivation is based on acute lethal effect concentrations (LC_{50}, EC_{50}).

Four distinct procedures could be used to derive the regional water quality objectives. These procedures are not prescribed methods that must be used. Rather they are intended to assist the responsible federal, provincial, and territorial authorities in the selection of methods that apply most directly to their jurisdiction. The procedures are :

- background concentration procedure;
- recalculation procedure;
- water effect ratio procedure;
- resident species procedure.

There is no national monitoring programme in place in Canada but many local or provincial governments carry out their own monitoring programmes for various different components of water quality.

A water quality index (WQI) is used in several jurisdictions, namely, Alberta, British Columbia, Manitoba, Newfoundland and Labrador, and Quebec, to report information on the state of the water bodies in attaining the water quality objectives. The quality index is a combination of three factors :

- scope (measures the number of objectives not met within a given time period);
- frequency (measures the number of times objectives were not met within the same period of time);
- amplitude (measures the maximum amount by which objectives were not met within the same period of time).

These factors are combined to produce a single value that describes water quality. The quality of a water body is ranked by relating the calculated index value to the five categories : excellent, good, fair, marginal and poor.

Relevant tools have been developed for evaluating the water quality index. They include a technical report describing how the index was developed, a user's manual outlining how to use the index and a user-friendly programme that calculates index values based on information entered by the user.

Chile

Water quality criteria have been developed which serve as recommendations for the local jurisdictions to work out the secondary water quality values.

The procedures of deriving secondary water quality standards are set out in a presidential instruction. The whole process will normally last for one year. At the outset, the National Commission for Environment (NEC) will disclose the information on the quality of the concerned water courses and water bodies. The NEC will co-ordinate the competent authorities to assign a water quality class to the concerned water body and to derive the secondary water quality standards taking into account the natural quality and uses/resources wished to be protected or the trophic level wished to be conserved.

Compliance with the secondary water quality standards is classified into three levels and remedial actions have also been specified in the event of non-compliance. The three levels are :

- When a controlled parameter is above the maximum standard, the concerned water body is declared as saturated and a decontamination programme should be established.

- When a controlled parameter is between 80% and 100% of the standard value, the concerned water body is declared latent and a prevention programme should be established.

- When a controlled parameter is under 80% of the standard value, an investigation and restoration programme should begin to resume the concerned water body to the establish standard.

China

The State Environmental Protection Administration is responsible for the environmental protection in the mainland of China while the State Oceanic Administration is responsible for the work in coastal and oceanic areas. Both administrations formulate the national standards for water quality and implement the national water management strategy.

For the marine environment, quality standards have been developed for marine water, sediment and tissue residue. Monitoring programmes have been developed for water bodies with respect to their beneficial uses or geographic location : global marine water, strategic coastal points, marine dumping zones, petroleum exploration zones, mariculture zones, bathing beaches and typical ecosystems. The ranking of marine water is categorized into 5 classes corresponding to the classification of the water quality standards. Assessment of the water quality in other aspects is measured by the rate of compliance with the water quality standards. The environmental protection departments of the coastal provinces, autonomous regions and municipalities are responsible for implementing the work and are required to regularly report to the State Oceanic Administration.

Hong Kong

The Environmental Protection Department undertakes the environmental protection work in Hong Kong. Under the Water Pollution Control Ordinance, ten water control zones have been established together with water quality objectives. The establishment of the water quality objectives is based on the assignment of beneficial uses to each of the water control zones. Associated with each of the beneficial uses are the water quality objectives which are a series of numerical values or descriptive statements for the water to meet the requirement of the beneficial use. Within the water control zones, discharges are regulated by means of a licensing system. Guidance has been established to set the physical, chemical and microbiological limits of the effluent acceptable into drainage and sewerage systems, inland and coastal waters.

The derivation of the water quality objectives are either based on those adopted in other countries for comparable water uses; or derived from published information taking into account the contaminants known to be discharged or likely to be present in the water.

Three types of water bodies are covered in water quality monitoring : beach water, marine water and river water. Beach water compliance is measured using a microbiological indicator (i.e. E. coli). Two ranking systems have been developed to assess the annual beach water quality and to provide weekly information on the beach water quality to the public during the bathing season. Marine water quality is assessed by looking at the annual compliance with the key water quality objectives (i.e. dissolved oxygen, ammonia, total inorganic nitrogen and E.coli).

River water quality assessment looks into more than 40 parameters including physico-chemical characteristics, organics, nutrients, toxic metals and coliform bacteria. In addition to the comparison with water quality objectives, a Water Quality Index (WQI), based on the level of dissolved oxygen, 5-day Biochemical Oxygen Demand and ammonia-nitrogen, is used to indicate the extent of organic contamination of the rivers. The WQI classifies the river water quality into five categories according to the level of organic pollution.

Malaysia

The Department of Environment (DOE) is responsible for the nation's environmental management after the enactment of the Environmental Quality Act in 1974. Water quality criteria and interim water quality standards have been established for protecting and conservating the natural resources. The department's website is now under reconstruction rendering information search not possible.

Papua New Guinea

The Department of Environment and Conservation (DEC) has formulated a new set of water quality criteria and will be introducing these criteria later this year with a view to ensuring compatibility with recent advances in water chemistry and toxicological effects of certain organic and inorganic chemicals. The national water quality criteria are applicable across the country and the criteria are also used without modification in the discharge permit issued to trades and industries.

Peru

The environmental agency in Peru is in the process of developing new water quality criteria and little information regarding the development process is available at this time. In principle, the development is based on local studies and the water quality criteria adopted by USEPA; United Nations, Educational, Scientific and Cultural Organization (UNESCO) and Environment Canada. A set of national criteria is available and the local government is not allowed to modify the set of national criteria. At present, no requirement has been laid down to assess compliance with the criteria.

Philippines

The Department of Environment and National Resources takes charge to develop policies on environment and natural resources. Nested within the department the Environment Management Bureau is responsible to administer control over water quality. Water quality criteria have been set for two types of water bodies : fresh and coastal/sea water. Each water body is further divided into 4 to 5 classes. Water quality criteria have been set for each class for different levels of protection or uses. The set of water quality criteria is nation-wide. Local jurisdictions could not modify the values.

Singapore

The Environmental Pollution Control Act provides a legislative framework for the control of environmental pollution. The target quality of marine water is set by making reference to the water quality guidelines for mariculture which are developed by the Agri-Food & Veterinary Authority. Protection of water resources falls within the ambit of the Pollution Control Department (PCD) through controlling the quality of effluent discharged into the sewerage system, water courses and uncontrolled water courses.

The water quality of both inland water bodies and coastal areas is regularly monitored. For inland water bodies, the parameters monitored include pH, dissolved oxygen, biochemical oxygen demand, total suspended solids, ammonia and sulphide. Coastal water samples are analyzed for metals, total organic carbon and other physical, chemical and bacteriological parameters.

Chinese Taipei

Protection of water quality lies with the Environmental Protection Administration (EPA) via the Marine Pollution Control Act and Water Pollution Control Act. Under the Marine Pollution Control Act, water quality standards have been developed for three classes of beneficial uses of marine water and for the protection of human health. Groundwater has recently been recognized as another domestic drinking water source, in addition to river water. Work is currently being undertaken to introduce legitimate control for the protection of the water source under the Water Pollution Act.

Monitoring programmes for river water and bathing beach water have been in place for many years in Chinese Taipei. Management of rivers focuses on the supply of water resources and pays little attention to the overall ecosystem quality on interaction with ecosystem diversity. In addition to the widely used physical and chemical indicators for rivers monitoring, the Taiwanese government has introduced sediment and aquatic organism indicators to supplement river water quality evaluation.

Thailand

Under the Enhancement and Conservation of the National Environment Quality Act B. E. 2535 (1992), the Pollution Control Department takes responsibility for water resources management in the nation. Thailand has a comprehensive system of WQC/WQS where numerical water quality standards have been developed for drinking water, groundwater, surface water, coastal water and fresh water aquatic resources. Surface water and coastal water are further categorized into 4 to 5 classes for different levels of protection or uses. The same set of water quality standards are applied across the nation. Many related documents posted on the internet are in Thai.

USA

Pursuant to section 304(a) of The Clean Water Act, USEPA is required to develop and publish, and from time to time revise, water quality criteria accurately reflecting the latest scientific knowledge. States are required to establish site-specific water quality standards following the procedures prescribed in section 303(c). Four options are available for the states or tribes to derive the water quality standards :

- adopt the recommended section 304(a) criteria;
- modify the section 304(a) criteria to reflect site-specific conditions;
- derive criteria using other scientifically defensible methods;
- establish narrative criteria where numeric criteria cannot be determined.

As regards priority toxic pollutants for which USEPA has not issued section 304(a) criteria, states could adopt criteria based on biological monitoring or assessment methods, which include, among others, whole-effluent toxicity control methods, and the biological criteria method.

States could adopt certain policies in the implementation of the water quality standards. Policies concern mixing zones, water quality standards variances and critical flows for water quality-based permit limits and antidegradation.

Mixing zone – specifies an area or volume of water where numeric water quality criteria can be exceeded but acutely toxic conditions are prevented.

Variance – a provision for states to temporarily relax a water quality standard and specify an interim one.

Low Flows – a provision for states to designate a critical low-flow value below which numerical water quality criteria do not apply.

Antidegradation – a three-tiered system to protect existing uses and to provide a means for assessing activities that may lower water quality in high quality water.

USEPA has released various documents providing guidelines on deriving primary and secondary water quality values. Acute and chronic toxicity data are used in deriving the water quality criteria. Three approaches are available for deriving site-specific water quality standards :

- recalculation procedures;
- indicator species procedures;
- resident species procedures.

Each state/territory government has its own monitoring programme to assess achievement of environmental goals. To enable global monitoring of the nation's water and sharing of information across local governments, the Intergovernmental Task Force on Monitoring Water Quality, succeeded in 1997 by the National Water Quality Monitoring Council, has proposed a national strategy for improving water quality monitoring in the nation and developed a model for monitoring different types of designated uses based on a combination of biological, physical and chemical monitoring. A work plan is now under development to implement the strategy at the national level.

4. Conclusion

At the end of phase 1, basic information on the system of water quality criteria/standards adopted in individual member economies has been identified and acquired according to the directions given by the economies in their returns to the two questionnaires. Many economies have posted the materials on the worldwide website of their environmental protection department/agencies. A full listing of the WQS/WQC for most of the economies could easily be found on the internet but only a few have posted the information on the derivation of protocols and the water quality monitoring regime.

By reviewing the acquired information, it is possible to identify that for some economies with a federal system of government, the federal environment protection agency takes the lead in formulating policies and strategies that apply nation-wide. Actual implementation lies with the state/territory governments. The adoption of national WQC/WQS provides a shared objective while allowing flexibility of response to different circumstances at regional and local levels. Guidance and tools are made available for the state/territory governments to develop their own water quality targets and report the trends in water quality. This allows an objective and consistent approach in water management in the economy.

Protection of aquatic life, domestic drinking water, livestock drinking water, recreational, agricultural and industrial uses are the common classifications of beneficial uses of the receiving water bodies. Some special beneficial uses have been developed with due regard to the topography and the needs of the region : protection of wildlife consumers of aquatic food, fisheries, oceanic development, navigation, hydroelectric power, etc.

A few economies have recognized that water management via microbiological, physical and chemical WQC/WQS cannot provide full protection to the aquatic ecosystems. Biological WQC/WQS have been introduced to fill the gap and have become an equal component of water quality management programmes along with the traditional ones. Integrated assessment comprising a balance of indicator types has been widely adopted. The biological message provides information on the integrated natural and human changes in physico-chemical conditions and the disturbance to ecosystems over time.

Information pertinent to the derivation of individual criteria, and the development of monitoring and assessment programmes often is not contained in a single document. In attempting to identify and search for as many sources of information as possible, browsing the internet and following the chain of references cited in the acquired information will continue in phase 2 of this project. As noted, information posted on the worldwide website of some of the economies is not in English, which makes it difficult to further review their WQC/WQS system in the second phase. Economies will be contacted again to clarify any misinterpretation and to obtain hard copies of the relevant documents (English version) if they are not readily available on the internet.

Derivation of the WQC/WQS is a complex process. It requires extensive information on the chemical, physical and biological properties of the water body as well as, the social and economic characteristics of the local area. Based on the acquired information, several economies are noted to have developed a relatively large amount of information in this field : Australia, Canada, New Zealand and the USA. However, these economies have applied different approaches and methodologies in the derivation.

There are more than 100 parameters for which WQC/WQS have been specified. In view of the large number of WQC/WQS specified, it is not practical to develop generic guidance for all of them at once. Recently, harmful algal blooms (HAB) issues have been given wide attention in the Asia-Pacific region because of the impacts HAB have on aquaculture development and the risk on public health. The MRC Working Group has endorsed three projects relating to HAB, namely, "Management of Red Tides and Harmful Algal Blooms in the APEC Region", "Management of Marine Algal Toxins in APEC Seafood Products" and "Application of Monitoring and Mitigation Technologies of Harmful Algal Blooms in APEC Economies". These projects have spurred further activities in the Asia-Pacific economies either on a domestic or an intergovernmental basis. To complement APEC activities, it is first intended for this project to look at factors relevant to eutrophication, namely, nutrients and dissolved oxygen. These two key parameters are selected for in-depth review in the second phase of this project. The two parameters are used as a tool to illustrate the rationale for their designation as WQC/WQS for the protection of aquatic life and the derivation methods adopted in the three groups of the economies : Australia & New Zealand, Canada and the USA. Other economies will be included when the required information has been obtained.

In the second phase, the 14 economies that have provided replies to the questionnaire-survey will be contacted again to obtain the required information which covers :

- comment on this report and clarification on any misinterpretation of the facts found;
- the most recent set of WQC/WQS values;
- the derivation method and the rationale in developing WQC/WQS for nutrients and dissolved oxygen;
- an English version of water quality-related documents.

Findings reported in phase 1 will be updated and supplemented as and when additional data are acquired during the course of information acquisition in phase 2. The degree of detail concerning these economies in the final report will depend on the success of the information acquisition.

Table 3.1 Classification of Receiving Water Systems

Receiving Water System \ APEC Economy	Australia	Brunei	Canada	Chile	China	Hong Kong	Malaysia	Papua New Guinea	New Zealand	Peru	Philippines	Singapore	Chinese Taipei	Thailand	USA
Agriculture water			✓												
Drinking water			✓					✓					✓	✓	
Estuarine water	✓			✓			✓		✓					✓	✓
Fresh/Surface water	✓		✓	✓	✓	✓		✓	✓		✓			✓	✓
Groundwater	✓													✓	
Marine water	✓	✓	✓	✓	✓	✓	✓	✓	✓		✓	✓	✓	✓	✓
Recreation water			✓												
River	✓								✓					✓	
Sediment			✓												
Tissue residue of aquatic organisms which are prey for wildlife species			✓												
Wetland	✓								✓						
Not specific [A]										✓					
Lacustrine bodies including bjork, channel, etc.				✓											

A Not specific, WQC/WQS developed solely based on water uses and resources protection.

Table 3.2 Types of Beneficial Uses/Resources

Beneficial Use/Resource \ APEC Economy	Australia	Brunei	Canada	Chile	China	Hong Kong	Malaysia	New Guinea	New Zealand	Peru	Philippines	Singapore	Taipei	Thailand	USA
Agriculture / Irrigation	✓		✓	✓	✓	✓	✓		✓	✓					✓
Aquaculture	✓	✓		✓	✓	✓	✓		✓	✓		✓	✓	✓	✓
Cultural and spiritual uses	✓								✓						
Domestic water/ Domestic water supply						✓	✓				✓		✓	✓	✓
Drinking water / Drinking water supply	✓		✓					✓	✓		✓		✓	✓	✓
Fisheries					✓		✓				✓				
Human consumers of aquatic foods	✓				✓				✓		✓				
Industrial use	✓ [A]				✓		✓		✓ [A]	✓	✓ [A]		✓ [A]	✓	✓ [A]
Livestock drinking water	✓			✓			✓		✓		✓				
Natural environment					✓		✓						✓	✓	
Protection of aquatic life	✓		✓	✓	✓ [B]		✓	✓	✓	✓				✓	✓
Protection of human health			✓												✓
Protection of wildlife consumers			✓												
Recreational activities (primary contact with water - swimming and other human contact activities)	✓		✓	✓	✓	✓	✓	✓	✓	✓	✓		✓	✓	✓
Recreational activities (secondary contact with water – general amenity) e.g. fishing canoeing etc	✓		✓	✓	✓	✓	✓	✓	✓	✓	✓		✓	✓	✓
Recreational activities (no human contact)	✓				✓				✓						
Others		✓ [C]			✓ [D]		✓ [E]							✓ [E]	✓ [F]

[A] Include cooling water.
[B] Include protection of endangered species.
[C] Include red tides and water quality.
[D] Include petroleum exploration and oceanic development.
[E] Include toilet flushing.
[F] Include navigation, hydroelectric power, aquifer protection and groundwater recharge.

Table 3.3 Terminologies used for WQC/WQS in APEC economies

Terminology / APEC Economy	National Level	State / Territory Level	Controlling Effluent Discharge
Australia	Water Quality Guidelines	Water Quality Objectives / Targets	Standards
Brunei	No information	No information	No information
Canada	Water Quality Guidelines	Water Quality Objectives	Standards
Chile	National Water Quality Criteria *	Secondary Water Quality Standards*	No information
China	National Water Quality Standards *	Water Quality Standards *	Discharge Standards *
Hong Kong	Water Quality Objectives	-	Effluent Standards
Malaysia	Water Quality Criteria	-	Discharge Standards
Papua New Guinea	Water Quality Criteria	No information	No information
New Zealand	Water Quality Guidelines	Water Quality Objectives / Targets	Standards
Peru	No information	No information	No information
Philippines	National Water Quality Criteria	-	Effluent Standards
Singapore	Water Quality Guidelines	-	Trade effluent discharge unit
Chinese Taipei	Water Quality Standards *	-	Effluent Standards *
Thailand	Water Quality Standards	-	Effluent Standards
USA	Water Quality Criteria	Water Quality Standards	Discharge Standards

* as per translation

NEW PROJECT PROPOSAL

Name of Committee / Working Group:

Marine Resource Conservation Working Group (MRC WG)

Title of Project:

Water quality criteria or standards adopted in the Asia Pacific region

Proposing APEC Member:

Hong Kong, China

Project Overseer:

Malcolm Broom

Principal Environmental Protection Officer
Water Policy and Planning Group
Environmental Protection Department
Hong Kong Special Administrative Region Government
24/F., Southorn Centre
130 Hennessy Road
Wanchai, Hong Kong
China

Tel: (852+) 2835 1234
Fax: (852+) 2834 9960
Email: MalBroom@epd.gov.hk

Financial Information:

TOTAL COST (US$): Undetermined

Amount being sought from APEC Central Fund

No fund will be sought from the APEC Central Fund for executing the project.

Proposed Project Start Date: 7/2002 – 6/2003

Project Purpose:

The objectives of the project are to collect and compile the water quality criteria (WQC) or standards (WQS) adopted in the APEC economies, and identify the ways these WQC/WQS are derived.

Amongst the APEC economies, most members have established their own WQC/WQS for the protection of aquatic resources and uses. The values of these criteria or standards may vary among different economies because of the need to protect different resources or beneficial uses or because of the different ways these criteria or standards are derived. However, information on these WQC/WQS and the ways they are derived is usually not readily available or accessible.

The APEC economies are united by the oceans and seas. The health of the marine environment is therefore critical to their continuing economic well-being and sustainable development. To enhance cooperation and collaborative effort amongst the member economies to achieve sustainability of the marine environment in the region, it would be beneficial to have accessible information on the WQC/WQS adopted in individual member economies.

The APEC's Strategy to Address Sustainability of the Marine Environment has identified three key objectives, namely, (a) integrated approaches to coastal management; (b) prevention, reduction and control of marine pollution; and (c) sustainable management of marine resources. To achieve these objectives, the Strategy also identifies three central tools: (a) research (including exchange of information, technology and expertise); (b) capacity building (including training and education); and (c) public / private sector participation and partnership. The proposed project, which is conducted through the identified tools, will help achieve the objectives of the Sustainability of the Marine Environment in the APEC region. Specifically, it will facilitate the attainment of an integrated approach to coastal management by use of the tool of research, exchange of information, technology and expertise.

A questionnaire-based survey will be carried out to collect the information from the member economies. Information required will be of technical nature and relating to the values of the WQC/WQS and the approach and scientific rationales for deriving these values. Follow-up with individual economies may be needed for clarification purposes or for additional information. The collected data will be assimilated and compiled. Findings will be presented in the format of report with tables summarizing the WQC/WQS used in different member economies.

Hong Kong, China will be responsible for implementing the project, from preparation of questionnaire, through compilation of collected data, to preparation of a report. Findings, in electronic format, will be given to APEC for placing on the APEC Website to facilitate public access.

Strategic Objective:

The objectives of the project are to collect and compile the WQC/WQS adopted in the APEC economies and identify the ways they are derived. The findings of the project will provide the APEC economies with a better understanding of the WQC/WQS adopted in other member economies and thus enhance better cooperation and collaborative work in the region. This will better allow member economies the opportunity to develop clear water quality targets aimed at protecting specific marine resource functions, in circumstances which allow those targets to be tailored to the particular needs of individual economies.

Specific Objectives:

- collect information from member economies concerning the WQC/WQS and how they are derived;
- review the collected information particularly the approach / methodology and the scientific rationales for deriving the WQC/WQS;
- summarize and compare the WQC/WQS adopted in different member economies and outline the approach and rationales for their derivation.

Suggested Review Outcomes:

- identify the WQC/WQS adopted in the member economies for the protection of the aquatic resources and uses;
- identify the approach / methodology and the scientific rationales for deriving the WQC/WQS in the member economies;
- summarize the review findings in the form of report.

Linkages:

The proposed project is to collect information on the WQC/WQS adopted in the APEC economies. A questionnaire-based survey will be conducted to collect the required information and individual member economies will be approached. Support from the APEC economies is essential for completion of this project. Since the required information will be of technical nature, it is suggested that a contact point be identified in each member economies to facilitate the collection of information and liaison.

Dissemination of Project Output:

The project output will be documented in the form of a report in paper format. Copies of the report will be disseminated to all APEC economies for their reference.

The report, in electronic format, will be given to APEC for placing on the APEC Website to facilitate access to the findings by the public and private/business sector.

Meeting APEC Project Criteria:

This proposal has been prepared in accordance with APEC Guidelines.

Malcolm Broom

Signature of Project Overseer

Date: 17/6/02

Signature of Committee / WG Lead Shepherd

Date: 18/6/02

APEC Marine Resource Conservation Working Group (MRC WG) Project
Water quality criteria adopted in the Asia Pacific region

Questionnaire on Water Quality Criteria

Introduction

As agreed at the 15th MRC WG, Hong Kong China has undertaken to conduct a desk-top assessment of the derivation and application of water quality criteria amongst APEC member economies. The purpose of this questionnaire is to collect some basic information from the member economies about their water quality criteria (WQC), standards (WQS) or objectives (WQO), and the ways these WQC/WQS/WQO are derived.

This is a simple questionnaire in which most questions only require putting a "✓" in the appropriate boxes below the question. After having analyzed the basic information provided, we may seek further details from individual member economies through additional targetted questionnaires.

Part A: General Particulars

APEC Member : _____

Contact Person / Organization : _____

Contact Details

Email : _____

Phone : _____

Fax : _____

Address : _____

_____

_____

_____

Part B: Information relating the WQC/WQS/WQO

Summary of the WQC/WQS/WQO

Q1. Does your economy have a set of WQC/WQS/WQO? (please ✓ the appropriate box below)

- ☐ Yes → Please answer the remaining parts of the questionnaire
- ☐ No → End of the questionnaire, thank you.

Q.2 What sorts of receiving water systems have the WQC/WQS/WQO been developed for? (please ✓ the appropriate box below, more than one choice is allowed)

- ☐ Marine water
- ☐ Estuarine water
- ☐ Others (please specify) _____
- ☐ Not specific, WQC/WQS/WQO developed solely based on water uses and resources protection

Q.3 What sorts of uses or resources have specific WQC/WQS/WQO been developed for? (please ✓ the appropriate box below, more than one choice is allowed)

- ☐ Protection of aquatic life
- ☐ Swimming and other human contact activities
- ☐ Agriculture / Irrigation
- ☐ Aquaculture
- ☐ Cooling
- ☐ Industrial use
- ☐ Toilet flushing
- ☐ Navigation
- ☐ General amenity
- ☐ Others (please specify) _____
- ☐ Not specific, WQC/WQS/WQO developed solely based on types of receiving water systems

Q4. Are the WQC/WQS/WQO specified qualitatively or quantitatively? (please ✓ the appropriate box below)

- ☐ All qualitatively
- ☐ All quantitatively
- ☐ Some qualitatively and some quantitatively

Q5. Could you provide us with a full listing of the WQC/WQS/WQO for different receiving water systems and/or protection for different uses and resources? (please ✓ the appropriate box below)

- ☐ Yes, a full listing of the WQC/WQS/WQO is attached
- ☐ Please visit our following website for the required information

  _____
- ☐ Others (please specify) _____

Derivation of the WQC/WQS/WQO

Q6. How have the existing WQC/WQS/WQO been developed? (please ✓ the appropriate box below, more than one choice is allowed)

- ☐ Based on local studies
- ☐ Based on WQC/WQS/WQO adopted in other countries / cities
- ☐ Others (please specify) _____

Q7. Is there any document available detailing the derivation of WQC/WQS/WQO in your economy? (please ✓ the appropriate box below)

- ☐ Yes
- ☐ No

Application of the WQC/WQS/WQO

Q8. Are the WQC/WQS/WQO statutory (that is, are they specified in a legal instrument)? (please ✓ the appropriate box below)

- ☐ Yes, they are statutory requirements.
- ☐ No, they are just guideline values.
- ☐ Others (please specify) _____

Q9. Is the WQC/WQS/WQO a set of national criteria? (please ✓ the appropriate box below)

- ☐ Yes
- ☐ No

Q10. Could the local government or enforcement agency modify the set of national WQC/WQS/WQO as appropriate to suit the local conditions? (please ✓ the appropriate box below)

- ☐ Yes
- ☐ No
- ☐ Others (please specify) _____

Q11. Are specific requirements set down (e.g. number of samples, period of sampling etc.) to assess compliance with the WQC/WQS/WQO? (please ✓ the appropriate box below)

- ☐ Yes
- ☐ No

End of questionnaire
Thank you !

Please return this questionnaire to fax number **(852) 2834 9960** or by mail to the following address on or before **21 October 2002**:

Water Policy and Planning Group
Environmental Protection Department
HKSAR Government
24/F., Southorn Centre
130 Hennessy Road
Wanchai
Hong Kong, China

Attn: Mr. Gary CHIU, E(WP)4

APEC Marine Resource Conservation Working Group (MRC WG) Project
Water quality criteria adopted in the Asia Pacific region

The 2nd Questionnaire on Water Quality Criteria

APEC Member : _____

Contact Person / Organization : _____

Part A: Introduction

Thank you for completing the first questionnaire for the project. To assist us to collect further and more in-depth information on the water quality criteria (WQC), standards (WQS) or objectives (WQO) adopted in the your economy, I should be grateful if you could help by filling in this second questionnaire. Similar to the first one, this is also a simple questionnaire in which most questions only require putting a "✓" in the appropriate boxes below the question.

Part B: Information relating to the WQC/WQS/WQO

Summary of the WQC/WQS/WQO

Q1. In the development of the WQC/WQS/WQO, how the protection of different uses and resources are achieved? (please ✓ the appropriate box below)

- ❑ Different WQC/WQS/WQO are set for the protection of different uses and resources
- ❑ The WQC/WQS/WQO are integrated, i.e. a single set of WQC/WQS/WQO is developed for the protection of all uses and resources
- ❑ Others (please specify) _____

Q1a. ***(For Singapore only)***

It is noted that the WQC/WQS/WQO for marine waters is only set for mariculture. Would you briefly list out below the reason(s) for not having WQC/WQS/WQO for other uses or resources protection (e.g. swimming, protection of aquatic life etc.)?

The reason(s) is/ are:

_____

_____

_____

_____

Q1b. ***(For Chinese Taipei only)***

It is noted that protection of aquatic life is not specified as one of the uses / resources being protected. Would you briefly list out below the reason(s) for not establishing WQC/WQS/WQO for the protection of aquatic life?

The reason(s) is/ are:

_____

_____

_____

Q2. Have your economy established specific zones within which particular uses (e.g. swimming, mariculture) are protected?

- ❑ Yes, specific zones are established for the protection of the following uses:

  _____
- ❑ No (skip Q.3, 4, 5 and go to Q.6)
- ❑ Others (please specify) _____

Q3. Is a different set of WQC/WQS/WQO (e.g. different parameters or different values or standards) applied to each individual zone?

- ❑ Yes, a different set of WQC/WQS/WQO is applied to individual zone.
- ❑ No, the same set of WQC/WQS/WQO applies throughout the economy.
- ❑ Others (please specify) _____

Q4. Is the WQC/WQS/WQO for the same parameter differ from zone to zone depending on the use and local characteristics?

- ❑ Yes
- ❑ No
- ❑ Others (please specify) _____

Q5. Are you able to provide us with additional information on how different zones are established in your economy as well as a full listing of the WQC/WQS/WQO for the established zones?

- ❑ Yes, additional information on how the zones are established and a full listing of the WQC/WQS/WQO for the established zones is attached
- ❑ Please visit our following website for the required information

  _____
- ❑ Others (please specify) _____

Q6. For those WQC/WQS/WQO specified quantitatively, how are they expressed? (please ✓ the appropriate box below, more than one choice is allowed)

(a) Physical parameters e.g. temperature, salinity, dissolved oxygen, pH

- ❑ Annual / monthly* arithmetic mean for the following parameters

  _____

- ❑ Annual / monthly* geometric mean for the following parameters

  _____

- ❑ Percentile basis for the following parameters (please specify percentile)

  _____

- ❑ Maximum (not to exceed) limit for the following parameters

  _____

- ❑ Minimum (not to go below) limit for the following parameters

  _____

- ❑ Others (please specify) _____

  _____

* Please delete as appropriate

(b) Non-toxic inorganic substances – e.g. nutrients (various form of nitrogen and phosphorus)

- ❑ Annual / monthly* arithmetic mean for the following parameters

  _____

- ❑ Annual / monthly* geometric mean for the following parameters

  _____

- ❑ Percentile basis for the following parameters (please specify percentile)

  _____

- ❑ Maximum (not to exceed) limit for the following parameters

  _____

- ❑ Others (please specify) _____

  _____

* Please delete as appropriate

(c) Toxic inorganic substances - Metals

- ❑ Annual / monthly* arithmetic mean for the following parameters

  _____

- ❑ Annual / monthly* geometric mean for the following parameters

  _____

❑ Percentile basis for the following parameters (please specify percentile)

_____

❑ Maximum (not to exceed) limit for the following parameters

_____

❑ Others (please specify) _____

_____

* Please delete as appropriate

(d) Pesticides and other toxic substances (e.g. PCBs and PAHs)

❑ Annual / monthly* arithmetic mean for the following parameters

_____

❑ Annual / monthly* geometric mean for the following parameters

_____

❑ Percentile basis for the following parameters (please specify percentile)

_____

❑ Maximum (not to exceed) limit for the following parameters

_____

❑ Others (please specify) _____

_____

* Please delete as appropriate

(e) Microbiological parameters (e.g. coliform, *E. coli*)

❑ Annual / monthly* arithmetic mean for the following parameters

_____

❑ Annual / monthly* geometric mean for the following parameters

_____

❑ Percentile basis for the following parameters (please specify percentile)

_____

❑ Maximum (not to exceed) limit for the following parameters

_____

❑ Others (please specify) _____

_____

* Please delete as appropriate

(f) Other chemicals of concern

(please state: _____)

❑ Annual / monthly* arithmetic mean for the following parameters

❑ Annual / monthly* geometric mean for the following parameters

_____

❑ Percentile basis for the following parameters (please specify percentile)

_____

❑ Maximum (not to exceed) limit for the following parameters

_____

❑ Others (please specify) _____

_____

* Please delete as appropriate

Q7. Are you able to provide us with relevant document which list out the expression (e.g. monthly arithmetic mean or maximum limit) of WQC/WQS/WQO? (please ✓ the appropriate box below)

❑ Yes, the document is attached.

❑ Please visit our following website for the required information

_____

❑ Not available

❑ Others (please specify) _____

Q8. What is the basis or rationale for including a particular parameter or substance in the list of the WQC/WQS/WQO? (please ✓ the appropriate box below, more than one choice is allowed)

❑ They are the critical parameters / substances affecting the uses or resources of the local aquatic environment

❑ They are substances of international concern

❑ They are substances of local concern

❑ They are commonly found in local discharges

❑ Others (please specify) _____

Derivation of the WQC/WQS/WQO

Q9. ***(For those economies that have made reference to others' WQO)***

It is noted that in the development of the existing WQC/WQS/WQO, experience from other places and/or international organizations (e.g. WHO, UNEP, OECD) have been referenced. Are you able to briefly list out the key references or source documents that you have made reference to:

(a) _____

(b) _____

(c) _____

(d) _____

(e) _____

Q10. ***(For those economies that have made reference to others' WQO)***

On what basis or for what reasons have these references been selected? (please ✓ the appropriate box below, more than 1 choice is allowed)

- ❑ Similar topographical / climatic condition
- ❑ Similar uses or resources
- ❑ More scientific information available
- ❑ Others (please specify) _____

Q11. ***(For those economies that have made reference to local studies)***

It is noted that reference has been made to in developing the WQC/WQS/WQO. What kinds of local studies have been referred to?

(please ✓ the appropriate box below, more than 1 choice is allowed)

(a) Physical parameters e.g. temperature, salinity, dissolved oxygen, pH

- ❑ Acute tests on the survival of aquatic species for the following parameters

  _____

- ❑ Chronic tests on the effect (e.g. growth, reproduction) on aquatic species for the following parameters

  _____

- ❑ Bioassay for the following parameters

  _____

- ❑ Others (please specify) _____

  _____

(b) Non-toxic inorganic substances – e.g. nutrients (various form of nitrogen and phosphorus)

- ❑ Bioassay for the following parameters

  _____

- ❑ Others (please specify) _____

  _____

(c) Toxic inorganic substances - Metals

- ❑ Acute tests on the survival of aquatic species for the following parameters

  _____

- ❑ Chronic tests on the effect (e.g. growth, reproduction) on aquatic species for the following parameters

  _____

- ❑ Bioassay for the following parameters

  _____

- ❑ Others (please specify) _____

  _____

(d) Pesticides and other toxic substances (e.g. PCBs and PAHs)

- ❑ Acute tests on the survival of aquatic species for the following parameters

  _____

- ❑ Chronic tests on the effect (e.g. growth, reproduction) on aquatic species for the following parameters

  _____

- ❑ Bioassay for the following parameters

  _____

- ❑ Others (please specify) _____

  _____

(e) Microbiological parameters (e.g. coliform, *E. coli*)

- ❑ Human health studies for the following parameters

  _____

- ❑ Epidemiological studies for the following parameters

  _____

- ❑ Others (please specify) _____

  _____

(f) Other chemicals of concerns

(please state: _____)

- ❑ Acute tests on the survival of aquatic species for the following parameters

  _____

- ❑ Chronic tests on the effect (e.g. growth, reproduction) on aquatic species for the following parameters

  _____

- ❑ Bioassay for the following parameters

  _____

- ❑ Others (please specify) _____

  _____

Q12. In the development of the existing WQC/WQS/WQO, has the ambient level of the relevant parameter in the local environment been considered?
(please ✓ the appropriate box below)

- ❑ Yes
- ❑ No (skip Q.13 and go to Q.14)

Q13. Would you briefly describe below how the ambient level of the relevant parameter was taken into consideration in developing the existing WQC/WQS/WQO?

_____

_____

_____

_____

_____

Q14. Are you able to provide us with information detailing the derivation / development of the existing WQC/WQS/WQO in your country?
(please ✓ the appropriate box below)

- ❑ Yes, relevant document is attached
- ❑ Please visit our following website for the required information

  _____

- ❑ Others (please specify) _____

Application of the WQC/WQS/WQO

Q15. ***(For those that have set down specific requirements to assess compliance with WQO)***

It is noted from your previous return that specific requirements (e.g. number of samples, period of sampling etc.) are set down to assess compliance with the WQC/WQS/WQO in your economy. Are you able to provide us with these specific requirements? (please ✓ the appropriate box below)

- ❑ Yes, the requirements are attached
- ❑ Yes, please visit the following website for the required information

  _____

- ❑ Not available

Q16. For an effluent discharge or a project activity, is an initial dilution zone or mixing zone allowed where non-compliance with the WQC/WQS/WQO is tolerated? (please ✓ the appropriate box below)

- ❑ Yes
- ❑ No

Q17. Is there any specific requirement limiting the size of the initial dilution zone or mixing zone? (please ✓ the appropriate box below)

- ❑ Yes, the requirements are:

  _____

  _____

- ❑ No

Q18. For public enquiry on the application or interpretation of the WQC/WQS/WQO, which would be the appropriate government department or organization to approach for information? (please ✓ the appropriate box below)

- ❑ the contact body is _____
- ❑ Others (please specify) _____

Q19. Is there a routine monitoring programme to assess the compliance with the WQC/WQS/WQO? (please ✓ the appropriate box below)

- ❑ Yes

❑ No ------- end of questionnaire

Q20. If the answer to Q.19 is "Yes", could the public access the monitoring results? (please ✓ the appropriate box below)

❑ Yes, the results are available through:

website : _____

report : _____

❑ Yes, upon specific request

❑ No

❑ Others (please specify) _____

End of questionnaire

Thank you !

Please return this questionnaire to fax number **(852) 2834 9960** or by mail to the following address on or before **30 January 2003**:

Water Policy and Planning Group
Environmental Protection Department
HKSAR Government
24/F., Southorn Centre
130 Hennessy Road
Wanchai
Hong Kong, China

Attn: Mr. Gary CHIU, E(WP)4

Appendix A : **Summary of Responses to the First Questionnaire**

Questions \ APEC Economy		Australia	Brunei	Canada	Chile	China	Malaysia	New Zealand	Peru	Philippines	Singapore [A]	Chinese Taipei	Thailand	USA
Summary of the WQC/WQS/WQO														
1. Does your economy have a set of WQC/WQS/WQO?	Yes /No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
2. What sorts of receiving water systems have the WQC/WQS/WQO been developed for?	• Marine water	✓	✓	✓	✓	✓	✓	✓			✓	✓	✓	✓
	• Estuarine water	✓			✓		✓	✓					✓	✓
	• Others (please specify)	• Wetlands • Rivers • Groundwater		• Fresh water • Sediment • Tissue residue • Drinking water • Recreational water • Agricultural water uses	• Surface freshwater		• Sewage & industrial effluent	• Freshwater		• Groundwater • Surface-spring water	• Coastal and inland waters (for trade effluent)	• Source water for drinking		• Freshwater
	• Not specific, WQC/WQS/WQO developed solely based on water uses and resources protection								✓					
3. What sorts of uses or resources have specific WQC/WQS/WQO been developed for?	• Protection of aquatic life	✓		✓	✓		✓	✓	✓		✓ (for trade effluent)		✓	✓
	• Swimming and other human contact activities	✓		✓	✓	✓	✓	✓	✓		✓ (for trade effluent)	✓	✓	✓
	• Agriculture / Irrigation	✓		✓	✓		✓		✓					✓
	• Aquaculture	✓	✓		✓	✓	✓		✓		✓	✓	✓	✓
	• Cooling													✓
	• Industrial use	✓				✓	✓		✓			✓		✓
	• Toilet flushing						✓							
	• General amenity	✓				✓		✓				✓	✓	
	• Others (please specify)	• Drinking water	• Red tides & water quality	• Tissue residue guidelines for the protection of wildlife consumers of aquatic biota • Drinking water	• Fishing activities		• Natural environment • Fisheries • Domestic water supply • Livestock			• Water supply potability				
4. Are the WQC/WQS/WQO specified qualitatively or quantitatively?	• All qualitatively													
	• All quantitatively				✓	✓	✓		✓	✓		✓		
	• Some qualitatively and some quantitatively	✓ (Mostly qualitative)	✓	✓				✓			✓ (for both)		✓	✓

•

Questions	APEC Economy	Australia	Brunei	Canada	Chile	China	Malaysia	New Zealand	Peru	Philippines	Singapore [A]	Chinese Taipei	Thailand	USA
5. Could you provide us with a full listing of the WQC/WQS/WQO for different receiving water systems and/or protection for different uses and resources?	• Yes, a full listing of the WQC/WQS/WQO is attached				• In Spanish		✓	✓			✓ (for both)			
	• Please visit our following website for the required information	• www.ea.gov.au/water/quality/targets		• www.ec.gc.ca/ceqg-rcqe • www.hc-sc.gc.ca/waterquality • www.ccme.ca		• www.soa.gov.cn		• www.mfe.govt.nx/issues/water/ANZECC/about.html • www.mfe.gov.nz/about/publications/water_quality/Water%20Guidelines%20FINAL.pdf				• www.epa.gov.tw/english/offices/g/index.htm • www.epa.gov.tw/english/office/j/es1.htm		• www.epa.gov/waterscience/
	• Other (please specify)		• Not available						• We are working to develop the new WQC/WQS/WQO	• Philippine National Standards for Drinking Water 1993 (not attached)	• Allowable Limits for Trade Effluent Discharge to Watercourse		• Aquaculture • Urban • Touri	
Derivation of the WQC/WQS WQO														
6. How have the existing WQC/WQS/WQO been developed?	• Based on local studies	✓		✓	✓	✓	✓	✓	✓	✓				✓
	• Based on WQC/WQS/WQO adopted in other countries/cities	✓	✓	✓	✓		✓	✓	✓	✓	✓ (for both)	✓		
	• Other (please specify)			• Following national science-based protocols	• A mix between the above two					• WHO guidelines			• Based on National Institution Studies	
7. Is there any document available detailing the derivation o WQC/WQS/WQO in your economy?	Yes / No	Yes	Yes	Yes	Yes	No	No	Yes	No	Yes	No (for both)	Yes	Yes	Yes
Application of the WQC/WQS/WQO														
8. Are the WQC/WQS/WQO statutory (that is, are they specified in a legal instrument)?	• Yes, they are statutory requirements		✓	✓	✓	✓	✓	✓			✓ (for trade effluent)	✓	✓	✓
	• No, they are just guideline values	✓						✓		✓	✓ (for mariculture)			
	• Other (please specify)	• But underpinned by economic reform requirements of states		• Most are voluntary, but some are statutory				• Both	• Until now, we are using the old General Water Law					
9. Is the WQC/WQS/WQO a set of national criteria?	Yes / No	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No (for mariculture) Yes (for trade effluent)	Yes	Yes	Yes
10. Could the local government or enforcement agency modify the set of national WQC/WQS/WQO as appropriate to suit the local conditions?	Yes / No	Yes	Yes	Yes		No	No	Yes	No	No	Yes (for mariculture) No (for trade effluent)	Yes	No	Yes
	• Other (please specify)	• Subject to QA/QC protocols	• If necessary		• The local agency can ask the modification to National Agency level									

APEC Economy / **Questions**		Australia	Brunei	Canada	Chile	China	Malaysia	New Zealand	Peru	Philippines	Singapore [A]	Chinese Taipei	Thailand	USA
11. Are specific requirements set down (e.g. number of samples, period of sampling etc.) to assess compliance with the WQC/WQS/WQO?	Yes / No	No (but there is a complementary monitoring & reporting framework)	Yes	No	Yes	Yes	Yes	Yes	No	Yes	Yes (for mariculture) No (for trade effluent)	Yes	No	No

[A] Singapore has submitted two returns in response to the first questionnaire. One return concerns WQC/WQS for mariculture. The other concerns standards for trade effluent discharge to watercourse.

Appendix A : **Summary of Response to the Second Questionnaire**

Questions \ APEC Economy		Australia	Brunei	Canada	Chile	China	Papua New Guinea	Peru	Philippines	Singapore	Chinese Taipei	Thailand
Summary of the WQC/WQS/WQO												
1. In the development of the WQC/WQS/WQO, how the protection of different uses and resources are achieved?	• Different WQC/WQS/WQO are set for the protection of different uses and resources	✓	✓	✓	✓	✓	✓	✓	✓	✓ Note [1]	✓ Note [2]	✓
	• The WQC/WQS/WQO are integrated, i.e.a single set of WQC/WQS/WQO is developed for the protection of all uses and resources					✓						
	• Others (please specify)			• In Canada, we develop WQG (guidelines) and WQO for different substances specific to the environmental media and the specific uses, for example we develop WQG for drinking water, for recreational water use (like swimming), and for the protection of aquatic life. We also develop sediment QG for the protection of aquatic life.	• The WQC/WQS/WQO are integrated in 4 sets of WQC/WQS/WQO for the protection of 4 integral uses.							

[1] Question only for Singapore : It is noted that the WQC/WQS/WQO for marine waters is only set for mariculture. Would you briefly list out below the reason(s) for not having WQC/WQS/WQO for other uses or resources protection (e.g. swimming, protection of aquatic life etc.)?
Reply from Singapore : Besides WQC for mariculture, standards for other uses/resources protection have also been submitted in our response to your first questionnaire via, WQS on 'Allowable Limits for Trade Effluent Discharge to Watercourse (for Coastal and Inland Waters)'. The latter has been developed for the protection of aquatic life and for swimming and other human contact activities.

[2] Question only for Chinese Taipei : It is noted that protection of aquatic life is not specified as one of the uses / resources being protected. Would you briefly list out below the reason(s) for not establishing WQC/WQS/WQO for the protection of aquatic life?
Reply from Chinese Taipei : We employed fishery and algae resource as parameters of aquatic life.

Questions	APEC Economy	Australia	Brunei	Canada	Chile	China	Papua New Guinea	Peru	Philippines	Singapore	Chinese Taipei	Thailand
2. Have your economy established specific zones within which particular uses (e.g. swimming, mariculture) are protected?	• Yes, specific zones are established for the protection of the following uses:	For some coastal waters- • Aquatic habitat • Recreation • Aquaculture	• Aquaculture	• Zones for source water for drinking water purposes • Zones for recreational uses (like swimming, boating etc.),fishing • Zones for environmental protection (wildlife/aquatic life) such as nature parts and marine parks	• Aquaculture	• Swimming • Mariculture	• Aesthetic and Recreational • Aquatic life (Ecosystem) Protection • (Raw) Drinking water	• Population recreation • Fishing and aquaculture species • Agriculture farming • Area for environmental protection	✓		We defined marine into 3 categories, such as Category A, B, C. They are set up for different kinds of usage, such as • aquaculture • swimming • industrial • environmental conservation	• Conservation of natural resources • Mariculture • Coral areas • Recreations • Industry and harbour • Urban
	• No (Skip Q.3, 4, 5)									✓		
	• Others (please specify)	• Environmental values have been determined for some waters					• The uses applies to both fresh & marine water with exception of raw drinking water – which does not apply in marine waters. • Even within one zone a number of WQS can be designated for protection, by applying a criteria that offers protection to all designated uses.					
3. Is a different set of WQC/WQS/WQO (e.g. different parameters or different values or standards) applied to each individual zone?	• Yes, a different set of WQC/WQS/WQO is applied to individual zone	✓	✓		✓			✓	✓	Not Applicable	✓	
	• No, the same set of WQC/WQS/WQO applies throughout the economy					✓	✓					✓
	• Others (please specify)			We have a combination • National WQG which can be applied to all zones, • but we also have the possibility to develop site-specific WQO objectives, which are then applied only to specific zone(s)								• But at a different values

Questions / APEC Economy		Australia	Brunei	Canada	Chile	China	Papua New Guinea	Peru	Philippines	Singapore	Chinese Taipei	Thailand
Derivation of the WQC/WQS/WQO												
4. Does the WQC/WQS/WQO for the same parameter differ from zone to zone depending on the use and local characteristics ?	Yes / No	Yes	No	Both Yes and No	Yes	Yes	Yes	Yes	Yes	Not Applicable	Yes	Yes
	• Others (please specify)			• The WQG is national, i.e. site / zone independent, while the WQO is site / zone specific. • In the development of a WQO, we usually use the WQG as the base/starting point, then consider local characteristics and protection goals to develop the WQO.								
5. Are you able to provide us with additional information on how different zones are established in your economy as well as a full listing of the WQC/WQS/WQO for the established zones?	• Yes, additional information on how the zones are established and a full listing of the WQC/WQS/WQO for the established zones is attached						✓		✓	Not Applicable	✓	
	• Please visit our following website for the required information	• Environmental Protection Agencies / Authorities in each state – for contacts see the Environment Portal • http://www.environment.gov.au/index.html	• www.fisheries.gov.bn			• www.jshb.gov.cn			• www.emb.gov.ph		• www.epa.gov.tw/epalaw/index.htm	
	• Other (please specify)	• Zones should be established using the National Water Quality Management Strategy (NWQMS) Management Framework in NWQMS Documents 3 Implementation Guidelines and 4 Australian and New Zealand Guidelines for Fresh and Marine Water Quality, see http://www.ea.gov.au/water/quality/nwqms/index.html and links to Agriculture, Fisheries and Forestry Australia		• We develop the national WQG, therefore information on them can be found on our web site (www.ec.gc.ca/ceqg-rcqe) and on the Canadian Council for Ministers of the Environment (CCME) web site (www.ccme.ca). • Unfortunately, no central locale exists for the WQO, as many of them are developed in the different provinces. • However, most of them post information on their respective web sites.	• In Chile still doesn't have establishment of specific zones with WQC/WQS/WQO.			• Now in study or evaluation process				• There are no revision for WQS, suppose to finish in the near future.

Questions / APEC Economy		Australia	Brunei	Canada	Chile	China	Papua New Guinea	Peru	Philippines	Singapore	Chinese Taipei	Thailand
6a. **For those WQC/WQS/WQO specified quantitatively, how are they expressed?** Physical parameters e.g. temperature, salinity, dissolved oxygen, pH	• Percentile basis for the following parameters (please specify percentile)	• Often 80%ile with values being in units such as mg/L or µg/L			• 66%ile							
	• Maximum (not to exceed) limit for the following parameters		• Temperature • Salinity • Dissolved oxygen • pH		• Temperature • pH • Suspended solids • Oil and grease • Detergents	• Temperature	✓	✓	• Color • Temperature • pH • Dissolved Oxygen • Solids • Oil	• For "WQC for Mariculture": as indicated in table on 'Water Quality Guidelines for Mariculture' • For WQS on 'Allowance Limits for Trade Effluent Discharge to Watercourse': • Temperature of discharge • Colour • pH	• pH • BOD	• pH • Temperature • Dissolved oxygen
	• Minimum (not to go below) limit for the following parameters				• Dissolved oxygen	• Temperature • Dissolved oxygen • pH, etc.				• For "WQC for Mariculture": as indicated in table on 'Water Quality Guidelines for Mariculture' • For WQS on 'Allowance Limits for Trade Effluent Discharge to Watercourse': • pH	• Dissolved oxygen	• Salinity
	• Other (please specify)	• Compliance with WQC/WQS/WQO can use median monthly data at a site compared with a fixed percentile at a reference site or with default guideline values.		• A range is generally specified with upper and lower limits. • For temperature, in addition of range, an acceptable level of temperature change is also given.							• The monitoring frequency of the listed physical parameters should be no less than once of a season.	

Questions	APEC Economy	Australia	Brunei	Canada	Chile	China	Papua New Guinea	Peru	Philippines	Singapore	Chinese Taipei	Thailand
6b. **For those WQC/WQS/WQO specified quantitatively, how are they expressed?** Non-toxic inorganic substances – e.g. nutrients (various form of nitrogen and phosphorus)	• Percentile basis for the following parameters (please specify percentile)	• Often 80% ile with values being in units such as mg/L or µg/L			• 66%ile							
	• Maximum (not to exceed) limit for the following parameters		• Nitrite • Ammonia • Sulphate • Sulphide • Potassium		• Total phosphorous • Dissolved orthophosphate • Total nitrogen • Ammonia	• Various form of nutrients and phosphorus, etc.	✓	✓	• Nitrate • Nitrite • Phosphates • Organophosphate	• For "WQC for Mariculture": as indicated in table on 'Water Quality Guidelines for Mariculture' • For WQS on 'Allowance Limits for Trade Effluent Discharge to Watercourse': • Phosphate • Sulphate • Chloride	• Ammonium nitrogen • Total phosphorus	• Ammonia • Nitrate • Phosphate
	• Other (please specify)	• Toxicant values based on toxicity tests are provided for different levels of protection e.g. 99, 95, 90 and 80% of species protected (some nutrients can be toxic e.g. ammonia and nitrate/nitrite) • Compliance with WQC/WQS/WQO can use median monthly data at a site compared with a fixed percentile at a reference site or with default guideline values		• We developed and are still developing frameworks for these parameters, as they are too complex to be properly regulated by simple methods. These frameworks are basically guidance documents on these issues.							• The monitoring frequency of the listed non-toxic inorganic parameters should be no less than once of a season.	

Questions \ APEC Economy		Australia	Brunei	Canada	Chile	China	Papua New Guinea	Peru	Philippines	Singapore	Chinese Taipei	Thailand
6c. **For those WQC/WQS/WQO specified quantitatively, how are they expressed?** Toxic inorganic substances – Metals	• Percentile basis for the following parameters (please specify percentile)	• Often 80% ile with values being in units such as mg/L or µg/L			• 66%ile							
	• Maximum (not to exceed) limit for the following parameters		• Iron • Manganese • Copper • Magnesium	• For all inorganics and metals, we specify acceptable upper limits (maximums). We try to incorporate the influence of toxicity-modifying parameters (like pH, temperature, hardness, counterion concentration, ..) into these values, which results in equations or matrices rather than numbers for the different metals. We feel that this gives the user more information and better protection	• Copper • Total chromium • Nickel • Selenium • Zinc • Aluminum • Cadmium • Chromium IV • Tin • Mercury • Lead	• Arsenic • Mercury • Cadmium • Lead, etc	✓	✓	• Iron • Manganese • Copper • Arsenic • Cadmium • Chromium • Lead • Mercury	• For “WQC for Mariculture”: as indicated in table on ‘Water Quality Guidelines for Mariculture’ • For WQS on ‘Allowance Limits for Trade Effluent Discharge to Watercourse’: • Arsenic • Barium • Tin • Iron • Beryllium • Boron • Manganese • Cadmium • Chromium • Copper • Lead • Mercury • Nickel • Selenium • Silver • Zinc • Calcium • Magnesium	• Cadmium • Chromium • Lead • Mercury • Copper • Manganese • Zinc • Silver	• Copper • Cadmium • Lead • Silver • Chromium • TBT • Zinc • Manganese • Iron
	• Other (please specify)	• Toxicant values based on toxicity tests are provided for different levels of protection e.g. 99, 95, 90 and 80% of species protected • Compliance with WQC/WQS/WQO can use median monthly data at a site compared with a fixed percentile at a reference site or with default guideline values									• The monitoring frequency of the listed toxic inorganic parameters should be no less than once of a season.	

Questions	APEC Economy	Australia	Brunei	Canada	Chile	China	Papua New Guinea	Peru	Philippines	Singapore	Chinese Taipei	Thailand
6d. **For those WQC/WQS/WQO specified quantitatively, how are they expressed?** Pesticides and other toxic substances (e.g. PCBs and PAHs)	• Percentile basis for the following parameters (please specify percentile)	• Often 80% ile with values being in units such as mg/L or µg/L			✓							
	• Maximum (not to exceed) limit for the following parameters			• As for inorganics and metals, see above. For organics, we specify acceptable upper limits (maximums). We try to incorporate the influence of toxicity-modifying parameters (like pH, temperature, hardness, counterion concentration, ..) into these values which results in equations or matrixes rather than single numbers for the different metals. We feel that this gives the user more information and better protection.	• PCB's • Aldrin • Chlordane • Malathion • Pentachlorophenol • DDT • Demethon • Dieldrin • Heptachlor • Lindane • Parathion • Total hydrocarbons • PAHs		✓	✓	• Cyanide • Aldrin • DDT • Dieldrin • Heptachlor	• For "WQC for Mariculture": not done/applicable.	• Total amount of organophosphorus and carbamate pesticides • Endrin • Lindane • Toxaphene • Heptachlor • Heptachlor epoxide • DDT • DDD • DDE • Aldrin • Pentachlorophene • 2,4-D	✓
	• Other (please specify)	• Toxicant values based on toxicity tests are provided for different levels of protection e.g. 99, 95, 90 and 80% of species protected • Compliance with WQC/WQS/WQO can use median monthly data at a site compared with a fixed percentile at a reference site or with default guideline values								• For WQS on 'Allowance Limits for Trade Effluent Discharge to Watercourse': The trade effluent discharged must not include • pesticides • fungicides • insecticides • herbicides • rodenticides • funigants	• The monitoring frequency of the listed pesticides and other substance parameters should be no less than once of a season.	

Questions	APEC Economy	Australia	Brunei	Canada	Chile	China	Papua New Guinea	Peru	Philippines	Singapore	Chinese Taipei	Thailand
6e. **For those WQC/WQS/WQO specified quantitatively, how are they expressed?** Microbiological parameters (e.g. coliform. *E.coli*)	• Percentile basis for the following parameters (please specify percentile)	• Often 80% ile with values being in units such as mg/L or µg/L			• 66%ile							
	• Maximum (not to exceed) limit for the following parameters		• Coliforms	✓	• Total coliform • Fecal coliform	• Coliform	✓	✓	• Coliform	• For "WQC for Mariculture": as indicated in table on 'Water Quality Guidelines for Mariculture' • For WQS on 'Allowance Limits for Trade Effluent Discharge to Watercourse': The trade effluent discharged must not include materials that may be ◦ a hazard to human life, ◦ a public nuisance. ◦ injurious to health. ◦ or otherwise objectionable.	• E.coli	• Coliform • Fecal coliform • Entericicci
	• Other (please specify)	• Toxicant values based on toxicity tests are provided for different levels of protection e.g. 99, 95, 90 and 80% of species protected • Compliance with WQC/WQS/WQO can use median monthly data at a site compared with a fixed percentile at a reference site or with default guideline values							• For treated waters coliform and E.coli must be absent.		• The monitoring frequency of the listed microbial parameters should be no less than once of a season.	

Questions \ APEC Economy		Australia	Brunei	Canada	Chile	China	Papua New Guinea	Peru	Philippines	Singapore	Chinese Taipei	Thailand
6f. **For those WQC/WQS/WQO specified quantitatively, how are they expressed?** Other chemicals of concern	• Percentile basis for the following parameters (please specify percentile)	• Often 80% ile with values being in units such as mg/L or µg/L			• 66%ile							
	• Maximum (not to exceed) limit for the following parameters				• Cyanide • Chlorine (free) • Phenols • Fluoride • Sulfur		✓	✓		• For WQS on 'Allowance Limits for Trade Effluent Discharge to Watercourse': • BOD • COD • TSS • Dissolved Solids • Sulphide • Detergents • Oil and Grease • Chlorine (Free)	• Selenium • Arsenic	
	• Other (please specify)	• Toxicant values based on toxicity tests are provided for different levels of protection e.g. 99, 95, 90 and 80% of species protected • Compliance with WQC/WQS/WQO can use median monthly data at a site compared with a fixed percentile at a reference site or with default guideline values				• Petroleum, etc.				• For WQC for Mariculture : nil.	• The monitoring frequency of the listed chemicals should be no less than once of a season.	
7. Are you able to provide us with relevant document which list out the expression (e.g. monthly arithmetic mean or maximum limit) of WQC/WQS/WQO?	• Yes, the document is attached.				✓		✓		• Phil. National standards for drinking water available at the Dept. of Health, Manila • www.emc.gov.ph	Specifications on • Water Quality Guidelines for Mariculture • Allowable Limits for Trade Effluent Discharge Watercourse	• Document attached is only available in Chinese.	
	• Please visit our following website for the require information	• Web site address www.ea.gov.au/water/quality/nwqms/index.html		• National CWQG : www.ec.gov.ca/ceqe-rcqe • Provincial WQG and WQO : www.ccme.ca • Drinking water : www.hcsc.gc.ca/waterquality		• Web site address www.jshb.gov.cn/						
	• Not available		✓					✓				✓
	• Other (please specify)			• A complete set of the CWQG can be purchased at http://www.ccme.ca				• In process				

Questions	APEC Economy	Australia	Brunei	Canada	Chile	China	Papua New Guinea	Peru	Philippines	Singapore	Chinese Taipei	Thailand
8. What is the basis or rationale for including a particular parameter or substance in the list of the WQC/WQS/WQO?	• They are the critical parameters / substances affecting the uses or resources of the local aquatic environment	✓	✓	✓	✓	✓	✓	✓	✓	✓		✓
	• They are substances of international concern	✓		✓			✓		✓		✓	
	• They are substances of local concern	✓	✓	✓			✓	✓	✓			
	• They are commonly found in local discharges	✓		✓			✓					
	• Other (please specify)	• Substances of national concern		• They are substances for which guidance is required and sufficient information existed in the scientific world to provide this guidance.								
Derivation of the WQC/WQS/WQO ***(For those economies that have made reference to others' WQO)***												
9. It is noted that in the development of the existing WQC/WQS/WQO, experiences from other places and/or international organizations (e.g. WHO, UNEP, OECD) have been referenced. Are you able to briefly list out the key references or source documents that you have made reference to?		• Too many to list, please see references in NWQMS Documents 4 Australian and New Zealand Guidelines for fresh and Marine Water, see www.ea.gov.au/water/quality/nwqms/index.html	• WHO • USEPA • Regional standards / criteria	• Documents like • WHO • UNEP • OECD • USEPA • German • Dutch • Australian • Science assessment • WQ assessment • Published scientific literature • Unpublished scientific literature • Industry-internal research	• From Canada • From EPA • From Europe	Not Applicable	Not Applicable	• USEPA – EPA National recommended water quality criteria • IMARPE • UNESCO Design and Implementation of some harmful algal monitoring system • Canadian Water Quality Guidelines	• APHA • AWWA • Water Environment Federation (WEF) • WHO	• For the WQC on Mariculture based on : • Japanese fisheries & environmental standards • AVA's own standards • For WQS on 'Allowable Limits for Trade Effluent to Watercourse' based on : • WHO • USEPA • other standards and guidelines from developed countries.	• USEPA • WHO • Japanese Ministry of the Environment	Not Applicable

Questions	APEC Economy	Australia	Brunei	Canada	Chile	China	Papua New Guinea	Peru	Philippines	Singapore	Chinese Taipei	Thailand
10. On what basis or for what reasons have these references been selected?	• Similar topographical / climatic condition		✓	✓	✓	Not Applicable	Not Applicable					Not Applicable
	• Similar uses or resources		✓	✓					✓	✓ (for WQC on mariculture)		
	• More scientific information available	✓	✓	✓				✓	✓	✓ (for both)	✓	
	• Other (please specify)	• General supporting information		• When we develop a guideline, we try to compile as much relevant information on the substance as possible in order to develop the scientifically most defensible assessment and use protection document (i.e. WQG). For this purpose, we normally develop a technical supporting document as well as the openly published WQG fact sheet.								
(For those economies that have made reference to local studies)												
11a. **It is noted that reference has been made to in developing the WQC/WQS/WQO. What kinds of local studies have been referred to?** Physical parameters e.g. temperature, salinity, dissolved oxygen, pH	• Acute tests on the survival of aquatic species for the following parameters	✓		✓			Not Applicable	✓		Not Applicable	Not Applicable	
	• Chronic tests on the effect (e.g. growth, reproduction) on aquatic species for the following parameters	✓		✓								
	• Bioassay for the following parameters	✓		✓					• Temperature • pH • Dissolved Oxygen • BOD • Suspended Solids • Surfactants • Oils			
	• Other (please specify)	• Percentile distribution		• While we have preferred chronic tests, we also examine the acute exposure tests in order to gain a thorough understanding of the toxicity of the substance. We use the terms acute and chronic with respect to time frame, and not respect to the intensity of effect.	• Local surveys studies							• Based on time series data

Questions \ APEC Economy		Australia	Brunei	Canada	Chile	China	Papua New Guinea	Peru	Philippines	Singapore	Chinese Taipei	Thailand
11b. **It is noted that reference has been made to in developing the WQC/WQS/WQO. What kinds of local studies have been referred to?** Non-toxic inorganic substances – e.g. nutrients (various form of nitrogen and phosphorus)	• Bioassay for the following parameters	• Ammonia • Nitrate/nitrite		✓			Not Applicable	✓	• Phenols	Not Applicable	Not Applicable	
	• Other (please specify)	• Percentile distribution		• As above								• Based on time series data
11c. **It is noted that reference has been made to in developing the WQC/WQS/WQO. What kinds of local studies have been referred to?** Toxic inorganic substances - Metals	• Acute tests on the survival of aquatic species for the following parameters	✓		✓	✓		Not Applicable	✓		Not Applicable	Not Applicable	• Zinc • Cadmium • Lead
	• Chronic tests on the effect (e.g. growth, reproduction) on aquatic species for the following parameters	✓		✓	✓							
	• Bioassay for the following parameters	✓		✓				✓				
	• Other (please specify)	• Percentile distribution		• As above					• Potential hazard to health; human toxicity considerations			• Literature review & time series data : • Iron • Manganese • Lead • Chromium • Silver
11d. **It is noted that reference has been made to in developing the WQC/WQS/WQO. What kinds of local studies have been referred to?** Pesticides and other toxic substances (e.g. PCBs and PAHs)	• Acute tests on the survival of aquatic species for the following parameters	✓		✓			Not Applicable	✓		Not Applicable	Not Applicable	
	• Chronic tests on the effect (e.g. growth, reproduction) on aquatic species for the following parameters	✓		✓								
	• Bioassay for the following parameters	✓		✓				✓				
	• Other (please specify)	• Percentile distribution		• As above					• Toxicology and carcinogenicity to human			• Time series data
11e. **It is noted that reference has been made to in developing the WQC/WQS/WQO. What kinds of local studies have been referred to?** Microbiological parameters (e.g. coliform, *E.coli*)	• Human health studies for the following parameters	✓		✓			Not Applicable	✓		Not Applicable	Not Applicable	
	• Epidemiological studies for the following parameters	✓		✓				✓	• Coliform			
	• Others (please specify)	• Percentile distribution		• Health Canada for better answer to these questions								• Literature review

Questions	APEC Economy	Australia	Brunei	Canada	Chile	China	Papua New Guinea	Peru	Philippines	Singapore	Chinese Taipei	Thailand
11f. **It is noted that reference has been made to in developing the WQC/WQS/WQO. What kinds of local studies have been referred to?** Other chemicals of concern	• Acute tests on the survival of aquatic species for the following parameters	✓		✓			Not Applicable	✓		Not Applicable	Not Applicable	
	• Chronic tests on the effect (e.g. growth, reproduction) on aquatic species for the following parameters	✓		✓								
	• Bioassay for the following parameters	✓		✓				✓				
	• Other (please specify)	• Percentile distribution		• As above								
12. In the development of the existing WQC/WQS/WQO, has the ambient level of the relevant parameter in the local environment been considered?	Yes / No	Yes		Yes	Yes	No	Yes	No	No	Yes	No	Yes
13. Would you briefly describe below how the ambient level of the relevant parameter was taken into consideration in developing the existing WQC/WQS/WQO?		• For physical / chemical and nutrient parameter use is made of a fixed percentile distribution as a reference or a default guidelines value. • For naturally occurring toxicants, where there is a high nature background level, a percentile figure can be used as a guideline if it is greater than the default guideline value derived from toxicity test data.		• Details are given in footnotes. [3]	• We don't have special consideration, but we expect for some of parameters in some places.	Not Applicable	• Baseline water quality data from forestry and other development activities were considered to ensure that standards adapted are reflective of PNG's local water environment. Provisions were also built in law (Regulation) to ensure that background water quality data are considered in setting local water quality for protection of beneficial uses e.g. where a background level of a water quality indicator is lower than the prescribed standard, the background level applies	Not Applicable	Not Applicable	• For WQC on mariculture : Ambient levels were determined from baseline surveys.	Not Applicable	
14 Are you able to provide us with information detailing the derivation / development of the existing WQC/WQS/WQO in your country?	• Yes, relevant document is attached	Not Applicable				Not Applicable	Not Applicable	Not Applicable		Not Applicable		
	• Please visit our following website for the required information			• www.ec.gc.ca/cepq-rcqe • www.hc.sc.gc.ca								
	• Others (please specify)				• Still we don't start the derivation in specific place.							

[3] Most often, it has been included in the report in order to gain an understanding of the ambient concentrations, thereby giving an indication of how high or low the ambient environment is already polluted. With respect to metals, we are now trying to incorporate the natural background concentrations for the metal in question across Canada into the guideline development process. This is done to avoid the recommendation of a WQG which is below the naturally occurring level at a specific site. This necessitates the development of a national applicable threshold value (first, general level) as well as equations / matrices indicating how this national level can change under the influence of e.g. pH, temperature, counter-ions, hardness, and guidance on how to develop more sit-specific values. This leds to the development of a new protocol for the development of WQG for the protection of aquatic life for metals (currently in the final stages of its development). In it we state that if the recommended WQG for the metal in question is below the naturally occurring concentration of the metal at the site in question (i.e. its site-specific natural background), then this natural background concentration shall be the site-specific WQO objective.

Questions / APEC Economy		Australia	Brunei	Canada	Chile	China	Papua New Guinea	Peru	Philippines	Singapore	Chinese Taipei	Thailand
Application of the WQC/WQS/WQO												
(For those that have set down specific requirements to assess compliance with WQO)												
15 It is noted from your previous return that specific requirements (e.g. number of samples, period of sampling etc.) are set down to assess compliance with the WQC/WQS/WQO in your economy. Are you able to provide us with these specific requirements?	• Yes, relevant document is attached	Not Applicable			✓			Not Applicable			✓	
	• Please visit our following website for the required information					• www.jshb.gov.cn			• www.emb.gov.ph			
	• Others (please specify)		• Not available							• Not available		• Please contact Pollution Control Department
16. For an effluent discharge or a project activity, is an initial dilution zone or mixing zone allowed where non-compliance with the WQC/WQS/WQO is tolerated?	Yes / No	Yes	Yes	Both Yes and No	Yes	No	Yes	Yes	No	No	Yes	Yes
17. Is there any specific requirement limiting the size of the initial dilution zone or mixing zone?	• Yes, the requirements are :	• To keep the mixing zone as small as possible		• The use of dilution zones is regulated by the specific provinces. Please contact them directly, as they have subtle differences in the establishment of dilution zones, and some provinces are not working with dilution zones.	• Still don't define		• Mixing zone is only allowed where it can be proved that even with the best available technology, the water quality standards can not be met at the point of discharge. Size of the mixing zone is specified to ensure that the discharge would meet the water quality criteria after a certain sacrificial zone.				• Within 2 km from the discharge point, the water quality could be downgraded to its following grade.	
	• No					✓		✓		✓		✓
18. For public enquiry on the application or interpretation of the WQC/WQS/WQO, which would be the appropriate government department or organization to approach for information?	• The contact body is	• Environment Australia for general enquiries, but for particular enquiries for specific waters and parameters contact the Environment Protection Agencies / Authorities in each state – see Environment Portal : www.environment.gov.au/index.html		• This depends on the WQG or WQO[4]	• National Commission for the Environment (CONAMA)	• State Oceanic Administration, National Environment Protection Agency	• Department of Environment & Conservation	• Environmental National Council (CONAM)	• Environmental Mgt. Bureau • Dept. of Environment & Natural Resources • Dept. of Health	• For WQC for Mariculture : The Agri-food & Veterinary Authority of Singapore • For WQS on 'Allowable Limits for Trade Effluent Discharge to Watercourse': National Environment Agency, Singapore	• Bureau of Water Quality Protection, EPA	• Pollution Control Department

[4] On the national / federal level, it is either Health Canada (for drinking water and recreational water uses) or Environment Canada for the protection of aquatic life, wildlife, or agricultural water uses; and on the provincial level it is either the provincial health or environmental department (or a combined department). Canada has national WQG and some provinces also develop their own provincial WQG. And then there are the WQ objectives, which are either national, federal, provincial, or municipal. Unfortunately, there is no central body which is overlooking or compiling all theses different values.

Questions \ APEC Economy		Australia	Brunei	Canada	Chile	China	Papua New Guinea	Peru	Philippines	Singapore	Chinese Taipei	Thailand
19. Is there a routine monitoring programme to assess the compliance with the WQC/WQS/WQO?	Yes / No	Yes	Yes		Yes	Yes	Yes	No	Yes	Yes	Yes	Yes
20. If the answer to Q19. is "Yes", could the public access the monitoring results?	• Yes, the results are available through:			✓		• www.soa.gov.cn		Not Applicable			• www.epa.gov.tw/monitoring/pa21.htm	• report of the Pollution control Department
	• Yes, upon specific request		✓	✓			✓					
	• No			✓						✓		
	• Other (please specify)	• Environment Australia for general enquiries, but for particular enquiries for specific waters and parameters contact the Environment Protection Agencies / Authorities in each state – see Environment Portal : www.environment.gov.au/index.html		• All of the above apply as the situation is very complex and complicated in Canada. There is currently no national program in place, however, there are many local or provincial monitoring programs for various different component of water quality.	• Until set the standards in specific zones we'll not have public results.				• www.emb.gov.ph			

Appendix B : **Information on Water Quality Criteria / Water Quality Standards**

Contact Person List

APEC Economy	Contact Person	Email Address	Authority	Phone No.	Fax No.
1. Australia	Mr. Charles Lewis	charles.lewis@ea.gov.au	**Environment Australia** Water Quality Section Water Branch Marine and Water Division Environment Australia GPO Box 787 Canberra Act 2601	02 – 6274 1413	02 – 6274 2268
2. Brunei	Mr. Sabri Hj mohd Taha	sabri_taha@fisheries.gov.bn	**Department of Fisheries** Ministry of Industry and Primary Resources	673 2 770234	673 2 770237
3. Canada	Mr. Uwe Schneider	uwe.schneider@ec.gc.ca	**Environment Canada** National Guidelines and Standards Office Environmental Quality Branch Environment Canada 351 St. Joseph Blvd., Hull PQ K1A 0H3 Canada	(819) 953-8599	(819) 953-0461
4. Chile	Ms. Pualina Abarca	pabarca@conama.cl	**National Commission for the Environment** Subdepartment of Control Hydric Pollution Obispo Donoso No.6 Providencia Santiago Chile	56-2-2405663	56-2-2443436
5. China	Ms. Chen Yue	zzh@soa.gov.cn	**State Oceanic Administration** 1 Fuxingmenwai Ave. Beijing, China 100860	86-10-68019791	86-10-68048051
6. Hong Kong	Dr. Malcolm Broom	MalBroom@epd.gov.hk	**Environmental Protection Department** 24/F Southorn Centre 130 Hennessy Road Wan Chai Hong Kong SAR	852-2835 1234	852-2834 9960

APEC Economy		Contact Person	Email Address	Authority	Phone No.	Fax No.
7.	Malaysia	Dr. Kamaruzaman Bin HJ Salim	hqhelp@dof.moa.my (General enquiry)	**Department of Fisheries Malaysia** Jabatan Perikanan Kementerian Pertanian Malaysia Tingkat 8 & 9, Wisma Tani Jalan Sultan Salahuddin 50628 Kuala Lumper Malaysia	60-03-2982011 (General enquiry)	60-03-2910305 (General enquiry)
8.	New Zealand	Mr. Robert Ogilivie	rob.ogilvie@mfe.govt.nz	**International Coordination,Ministry for the Environment** Grand Annexe, 84 Boulcott Street PO Box 10 362 Wellington, New Zealand	+64 4 917 7442	+64 4 917 7526
9.	Papua New Guinea	Mr. Kelly Gawi Mr. Luke Tanikrey	odir@daltron.com.pg	**Department of Environment & Conservation** Environment Impact Assessment Branch Level 6 Somare Foundation PO Box 6601 Boroko, NCD Papua New Guinea	(675) 3250194	(675) 3250182
10.	Peru	Mr. Sulma Carrasco Barrera	dinama@minproduce.gov.pe	**Ministry of Production** National Direction of Environment Calle Uno Oeste Nº60, Corpac San Isidro Peru	2243231	2243231
11.	Philippines	Mr. Jim Tito B. San Agustin	jbsanagustin@dfa.gov.ph	**Office of the Undersecretary for International Economic Relations** Department of Foreign Affairs 14/F Office of the Undersecretary for international Economic Relations 2330 Roxas Boulevard, Pasay City	834 3033	834 1451
12.	Singapore	Dr. Philip Chew Hong	chew_hong@ava.gov.sg	**Agri-food & Veterinary Authority of Singapore** 5 Maxwell Road #02/03-00 Tower Block MND Complex Singapore 069110	65 - 63257668	65 - 62206068

APEC Economy		Contact Person	Email Address	Authority	Phone No.	Fax No.
13.	Chinese Taipei	Ms. Sun Hone Ling	hlsun@epa.gov.tw	**Bureau of Water Quality Protection, Environmental Protection Administration** 41, Sec.1, Chung-Hwa Road, Taipei Taiwan 100 Chinese Taipei	+886-2-2311 7722 ext 2842	+886-2-2387 9860
14.	Thailand	Ms. Nipavan Bussarawit	ta_pmbc@yahoo.com	**Phuket Marine Biological Center** P.O. Box 60 Phuket 83000 Thailand	66-76-391128 66-76-391438	66-76-391127
15.	USA	Mr. Anthony Maciorowski	maciorowski.anthony@epa.gov	**U.S. Environmental Protection Agency** Health and Ecological Criteria Division Office of Water 1200 Pennsylvania Avenue Washington, D.C.20460	202-566-1113	202-566-1139 202-566-1140

Appendix C : On-line Access to WQC/WQS

APEC Economy	Listing of WQC/WQS can be found at :
Australia	Water Quality Guidelines : http://www.ea.gov.au/water/quality/nwqms/index.html#quality Microbiological Water Quality Guidelines : http://www.mfe.govt.nz/publications/water/microbiological-quality-jun03/ Water Quality Targets : http://www.ea.gov.au/water/quality/targets/ Monitoring Guidelines : http://www.ea.gov.au/water/quality/nwqms/index.html#quality
Brunei	Government of Brunei Darussalam: http://www.brunei.gov.bn/government/index.htm
Canada	Water Quality Guidelines : http://www.ec.gc.ca/CEQG-RCQE/English/default.cfm Drinking Water Quality Guidelines : http://www.hc-sc.gc.ca/hecs-sesc/water/index.htm Recreational Water Quality Guidelines : http://www.hc-sc.gc.ca/hecs-sesc/water/factsheets/recreational_water.htm
Chile	Government website : http://www.conama.cl/portal/1255/channel.html
China	Environmental Protection Standards : http://www.zhb.gov.cn/english/standard.php3
Hong Kong	Water Quality Objectives (Water Pollution Control Ordinance, Cap 258) : http://www.justice.gov.hk/home.htm Effluent Standards : http://www.epd.gov.hk/epd/english/environmentinhk/water/guide_ref/guide_wpc_wpco_1.html
Malaysia	Department of Environment : http://www.jas.sains.my/DOE/egfirst.htm
New Zealand	Water Quality Guidelines : http://www.ea.gov.au/water/quality/nwqms/index.html#quality Microbiological Water Quality Guidelines : http://www.mfe.govt.nz/publications/water/microbiological-quality-jun03/ Water Quality Targets : http://www.ea.gov.au/water/quality/targets/ Monitoring Guidelines : http://www.ea.gov.au/water/quality/nwqms/index.html#quality
Papua New Guinea	Government of Papua New Guinea : http://www.pngonline.gov.pg/government/entry.nsf
Peru	Website in Spanish.
Philippines	Water Quality Criteria : http://www.emb.gov.ph/water.html
Singapore	Effluent discharge standards : http://app10.internet.gov.sg/scripts/nea/cms/htdocs/article.asp?pid=963
Chinese Taipei	Effluent discharge standards : http://www.epa.gov.tw/english/offices/g/effluentstd.htm Drinking water standards : http://www.epa.gov.tw/j/drinkwater/index1.html
Thailand	Water Quality Standards : www.pcd.go.th/Information/Regulations/WaterQuality/WaterQualityStandards.cfm
USA	Quality Criteria for Water : www.epa.gov/waterscience/criteria Water Quality Standards : http://www.epa.gov/waterscience/standards/

Appendix D : References

Economy	Title/Description	Available on internet
Australia and New Zealand	ANZECC 1992, ***Australian Water Quality Guidelines for Fresh and Marine Waters***, National Water Quality Management Strategy Paper No. 4, Australian and New Zealand Environment and Conservation Council, Canberra.	Yes
	ANZECC & ARMCANZ 1994. ***Policies and principles: A reference document.*** National Water Quality Management Strategy Paper No. 2, Australian and New Zealand Environment and Conservation council & Agriculture and Resource Management Council of Australia and New Zealand, Canberra.	Yes
	ANZECC & ARMCANZ 2000a. ***Australian and New Zealand guidelines for fresh and marine water quality***: National Water Quality Management Strategy Paper No. 4, Australian and New Zealand Environment and Conservation Council & Agriculture and Resource Management Council of Australia and New Zealand, Canberra.	Yes
	ANZECC & ARMCANZ 2000b***. Australian guidelines for water quality monitoring and reporting.*** National Water Quality Management Strategy Paper no 7, Australian and New Zealand Environment and Conservation Council & Agriculture and Resource Management Council of Australian and New Zealand, Canberra.	Yes
	ANZFA 1996. ***Food standards code*** (including amendments to June 1996). Australia New Zealand Food Authority, Australian Government Publishing Service, Canberra.	Yes
	ARMCANZ & ANZECC 1998. ***Implementation guidelines***. National water Quality Management Strategy Paper No. 3, Agriculture and Resource Management Council of Australia and New Zealand & Australian and New Zealand Environment and Conservation Council, Canberra.	Yes
	New Zealand Ministry for the Environment 1999. ***Recreational water quality guidelines.*** New Zealand Ministry for the Environment, Wellington.	Yes
	New Zealand Ministry of Health 1995a. ***Drinking-water standards for New Zealand***. New Zealand Ministry of Health Wellington.	Yes
	New Zealand Ministry of Health 1995b. ***Guidelines for drinking-water quality management.*** New Zealand Ministry of Health Wellington.	Yes
	NHMRC & ARMCANZ 1996. ***Australian drinking water guidelines.*** National Water Quality Management Strategy Paper No. 6, National Health and Medical Research Council & Agricultural and Resource Management Council of Australia and New Zealand, Australian Government Publishing Service, Canberra.	Yes
Canada	CCME 1999. ***Canadian environmental quality guidelines.*** Canadian Council of Ministers of the Environment, Winnipeg.	Updated parts
	CCREM 1987. ***Canadian water quality guidelines.*** Task Force on Water Quality Guidelines, Canadian Council of Resource and Environment Ministers/	No
	Health Canada 1989. ***Guidelines for Canadian drinking water quality: Supporting documentation.*** Federal-Provincial Subcommittee on Drinking Water of the Federal-Provincial Committee on Environmental and Occupational Heath, Ottawa.	Yes

Economy	Title/Description	Available on internet
	CCME 1999. ***Protocol for the derivation of water quality guidelines for the protection of aquatic life.*** Task Force on Water Quality Guidelines, Canadian Council of Ministers of the Environment, Winnipeg.	Yes
	CCME 2003. ***Guidance on the site-specific application of water quality guidelines in Canada : Procedures for deriving numerical water quality objectives for the protection of aquatic life.*** Canadian Council of Ministers of the Environment, Winnipeg.	Yes
	CCME 1999. ***Protocols for deriving water quality guidelines for the protection of agricultural uses (irrigation and livestock water).*** Canadian Council of Ministers of the Environment, Winnipeg.	Yes
	CCME 1999. ***Guidance manual for developing site-specific soil quality remediation objectives for contaminated sites in Canada.*** Canadian Council of Ministers of the Environment, Winnipeg.	Yes
	CCME 1995. ***Protocol for the derivation of Canadian sediment quality guidelines for the protection of aquatic life, CCME EPC-98E.*** Environment Canada, Guidelines Division, Technical Secretariat of the CCME Task Force on Water Quality Guidelines, Canadian Council of Ministers of the Environment, Winnipeg.	Yes
	CCME 1999. ***Summary of a protocol for the derivation of environmental and human health soil quality guidelines, CCME 1996a.*** Canadian Council of Ministers of the Environment, Winnipeg.	Yes
	CCME 1998. ***Protocol for the derivation of Canadian tissue residue guidelines for the protection of wild life that consume aquatic biota.*** Canadian Council of Ministers of the Environment, Winnipeg.	Yes
	CCME Water Quality Index 1.0. ***Technical Report.*** Water Quality Index Technical Subcommittee of the CCME Water Quality Guidelines Task Group.	Yes
	CCME Water Quality Index 1.0. ***User's Manual.*** Water Quality Index Technical Subcommittee of the CCME Water Quality Guidelines Task Group.	Yes
	CCME Water Quality Index Formula (Version 1.0). ***Computing Program.*** Water Quality Index Technical Subcommittee of the CCME Water Quality Guidelines Task Group.	Yes
Chile	***Presidential instruction for establishing the secondary standards for environmental quality for superficial, continental and sea waters***. Secretariat general of the Presidency of the Republic.	No (in Spanish)
China	NEPA 2002. ***Quality standards for surface water.*** GB3838-2002. National Environmental Protection Agency.	Yes (in Chinese)
	SEPA 1993. ***Quality standard for ground water.*** GB/T14848-93. State Environmental Protection Administration of China	Yes (in Chinese)
	SEPA and SOA 1997. ***Sea water quality standard.*** GB3097-1997. State Environmental Protection Administration of China and State Oceanic Administration, National Environmental Protection Agency.	Yes (in Chinese)
	NEPA 1982. ***Sea water quality standard.*** GB3097-82. National Environmental Protection Agency.	No (in Chinese)

Economy	Title/Description	Available on internet
	SEPA 1989. ***Water quality standard for fisheries.*** GB1607-89. State Environmental Protection Administration of China.	Yes (in Chinese)
	SEPA 1992. ***Standards for irrigation water quality.*** GB5084-92. State Environmental Protection Administration of China.	Yes (in Chinese)
	SEPA 1995. ***Environmental quality standards for soils.*** GB15618-1995. State Environmental Protection Administration of China.	Yes (in Chinese)
	SEPA 1991. ***Water quality standards for scenery and recreation area.*** GB12941-91. State Environmental Protection Administration of China.	No (in Chinese)
	SEPA 1993. ***Principle for categories and grades of nature reserves.*** GB/T 14529-93. State Environmental Protection Administration of China.	No (in Chinese)
	SEPA 1983. ***Technological principle and methods for enactment of local water pollutant emission standard.*** GB 3839-83. State Environmental Protection Administration of China.	No (in Chinese)
Hong Kong	HKSAR 1980. ***Water Pollution Control Ordinance, Chapter 238.*** Government of the Hong Kong special Administration Region.	Yes
	EPD 1991. ***Technical Memorandum – Standards for effluents discharged into drainage and sewerage systems, inland and coastal waters.*** Environmental Protection Department.	Yes
Malaysia	***Recommended water quality criteria for Malaysia.*** Department of Environment, Malaysia.	No
	Interim water quality standards for Malaysia. Department of Environment, Malaysia.	No
Chinese Taipei	EPA. ***Classification of marine environment and water quality criteria for seawater.*** Environmental Protection Administration of the Republic of China on Taiwan.	No (in Chinese)
	EPA 86. ***Drinking water source standards.*** Environmental Protection Administration of the Republic of China on Taiwan.	Yes (in Chinese)
	EPA 87. ***Drinking water standards.*** Environmental Protection Administration of the Republic of China on Taiwan.	Yes (in Chinese)
	EPA 2000. ***Effluent standards.*** Environmental Protection Administration of the Republic of China on Taiwan.	Yes (in Chinese)
Thailand	Thailand, National Environment Board 1994. ***Surface water quality standards.*** Notification of the National Environment Board No.8 B.E. 2535 (1992) issued under the National Environmental Quality Act B.E. 2535 (1992).	Yes

Economy	Title/Description	Available on internet
	Thailand, Ministry of Industry 1978. ***Drinking water quality standards.*** Notification of the Ministry of Industry No. 332, B.E. 2521 (1978) issued under the Industrial Product Standards Act B.E. 2511 (1968).	Yes
	Thailand, Ministry of Public Health 1978. ***Bottled drinking water quality standards.*** Notification of the Ministry of Public Health No. 61, B.E. 2524 (1981) issued under the Food Act B.E. 2522 (1979).	Yes
	Thailand, Ministry of Industry 1978. ***Ground water quality standards for drinking purposes.*** Notification of the Ministry of Industry No.4, B.E. 2521 (1978) issued under the Groundwater Act B.E. 2520 (1977).	Yes
	Thailand, National Environment Board 1994. ***Coastal water quality standards.*** Notification of the National Environment Board No.7, B.E. 2535 (1992) issued under the National Environmental Quality Act B.E. 2535(1992).	Yes
	Thailand Fresh Water Fishery Institute. ***Appropriated water quality criteria for aquatic living.*** Issue 75/2530 Item.	Yes
	Thailand Fresh Water Fishery Institute. ***Maximum concentration allowance in the water.*** Issue 75/2530 Item.	Yes
	Thailand, National Environment Board 2000. ***Groundwater quality standards.*** Notification of the National Environment Board No.20, B.E. 2543 (2000) issued under the Enhancement & Conservation of National Environment Quality Act B.E. 2535(1992).	Yes
	Thailand, Ministry of Science, Technology and Environment 1996. ***Industrial effluent standards.*** Notification the Ministry of Science, Technology and Environment, No. 3, B.E.2539 (1996) issued under the Enhancement and Conservation of the National Environmental Quality Act B.E.2535 (1992).	Yes
	Thailand, Ministry of Science, Technology and Environment 1992. ***Industrial effluent standards.*** Notification the Ministry of Science, Technology and Environment, No. 4, B.E.2539 (1996) issued under the Enhancement and Conservation of the National Environmental Quality Act B.E.2535 (1992).	Yes
	Thailand, Ministry of Science, Technology and Environment 1996. ***Industrial effluent standards.*** Notification of the Pollution Control Committee, No. 3, B.E. 2539 (1996) dated August 20, B.E. 2539 (1996) issued under Factory Act B.E.2535 (1996).	Yes
	Thailand, Ministry of Industry 1977. ***Water characteristics discharged into deep wells.*** Notification of the Ministry of Industry, No. 5 B.E. 2521 (1978), issued under the Ground Water Act B.E. 2520 (1977).	Yes
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	USEPA 1986. ***Quality criteria for water 1986.*** EPA-440/5-86-001, May 1986. USEPA Office of Water Regulations and Standards, Washington.	Yes
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