



# WATER QUALITY AND FLUSHING ASSESSMENT FOR MARINAS

## PROPOSED TECHNICAL WORKING GROUP

### TERMS OF REFERENCE

#### 1. Historical Background Definition of the Problem

In 2008 PIANC published the document the Working Group Report 98 "Protecting water quality in marinas".

This document contains a compilation of water quality standards from various regulatory agencies, analytical methods to assess water quality in terms of exchange (flushing), and recommendations for improvement of water quality by design improvement.

The general analysis of geometrical characteristics that result in improved circulation is educational in general terms, but practical implementation guidance is not up to date regarding available numerical modelling tools.

The report includes the definition of various parameters that may be used to assess flushing, but not all are related to acceptability guidance recognised by regulators or validated by experience. Its recommendations for flushing analysis thresholds have been cited by numerous practitioners since publication, but sometimes in a manner that is not compatible with the sources analysed by the WG. The good, moderate, and poor flushing times need additional context, for example to address different interpretations for river vs estuarine and open ocean environments and sources of pollution.

The report can also benefit from a better discussion on the pollutant contribution by boats vs other sources. For example, it will be beneficial to address the linkage or understanding of the boat overall contribution to water quality in marinas managed with modern standards.

While this report was a major contribution when it was published, an update is considered convenient to achieve its goals.

#### 2. Objectives

The objective of this working group is to revise and update the report of WG 98 to provide improved practical guidance for quantitative metrics for flushing modelling studies and more comprehensive qualitative recommendations for water quality protection in marinas.

Recent publications of PIANC Working with Nature (WwN) guidelines and Marina Design guidelines, as well as PIANC and ICOMIA efforts relative to Water Quality, AIS (invasive species) and anti-fouling (gloflouling) should also be referenced in the updated document.

#### 3. Earlier Reports to be Reviewed

- **PIANC RecCom WG 98** "Protecting water quality in marinas".
- **PIANC RecCom WG 148** "Guidelines for Sustainable Recreational Navigation Infrastructure - A Guide for Applying Working with Nature to Recreational Navigation Infrastructure".



- **PIANC RecCom WG 176** "Guide for Applying Working with Nature to Navigation Infrastructure Projects"
- **PIANC RecCom WG 149** "Guidelines for Marina Design".
- **PIANC** contributions to international efforts regarding water quality regulations, such as EU Water Framework Directive, IMO Glofouling, and others

## 4. Scope of Work

The suggested scope of work is primarily divided in 2 areas: flushing modelling studies and qualitative recommendations for design.

As part of the overview, the WG should:

- Review international regulatory requirements for water quality in marinas

The reproduction of water quality standards may be considered (as included in WG 98), but may be addressed by a summary overview and a list of references, or included in an Appendix.

As it relates to flushing modelling studies, the scope of work includes:

- Research regulatory requirements and non-regulatory recommendations for marina flushing studies, including methodologies and acceptance criteria
- Investigate available research for the validation of flushing recommendations, including analyses that evaluate flushing parameters correlation with biological or chemical performance in field studies (compliance with water quality standards, sediment contamination, biodiversity, algae blooms, etc)
- Review and discuss the fundamentals of the marina flushing assessment as an indirect measure for water quality
- Identify methodologies and corresponding acceptance criteria that have regulatory weight or acceptable use
- Assess hydrodynamic and water quality modelling tools and consider providing recommendations on modelling
- As part of this analysis, the WG should evaluate the relationship between flushing and contamination, for example as flushing performance relates to accumulation of toxic chemicals leached by anti-fouling paint. Consideration should be included of the bioavailability of these chemicals.
- Recommend flushing study practical guidance for design

As it relates to general recommendations for design, the scope of work includes:

- Review of regulatory requirements and non-regulatory recommendations for marina design criteria aimed and water quality
- Identifying approach and objectives of design features that can improve water quality in marinas, referencing WwN references as appropriate
- Expanded classification and description of types of design features that can improve water quality and ecological outcomes in marinas, including habitat creation
- Illustration and case studies of marina design features
- Provide qualitative recommendations for marina design

There are guidelines that address marina operations to avoid pollution sources and discharges, which should be referenced, and summarized as appropriate, to provide a more comprehensive context to achieving water quality goals in a marina. Operational issues to be addressed may include:



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- Environmental management plans
- Best management practices
- Clean marina certification system requirements (so that compliance or certification can be factored in the analysis)
- Water quality and ecological monitoring systems

## 5. Intended Product

A practical guidance for water quality assessment in marinas, including:

- Methodology for flushing modelling studies and quantitative recommendations for evaluation of results
- Design recommendations and qualitative guidance of marina design features to achieve higher water quality and ecological outcomes

## 6. Working Group Membership

Desirable disciplines and experience amongst WG membership may include:

- Marina designers, planners
- Coastal and marine engineers
- Hydrodynamic numerical modelers (consultants, academic, researchers)
- Environmental scientists (consultants, academic, researchers)
- Environmental and planning regulators
- Marina owners and operators

This WG requires the collaboration with ICOMIA and other boating and marina industry associations.

This WG must have adequate international representation to ensure its applicability in different parts of the world, with different geographical/climate conditions, and different regulatory frameworks.

## 7. Target Audience

The target audience for this WG report are marina designers, engineers, environmental consultants, regulators, planners, and policy makers.

## 8. Relevance

### 8.1. Relevance to Countries in Transition and Small Island Developing States (SIDS)

This report will be extremely useful in jurisdictions that do not have adequate regulatory requirements to comply with water quality.

### 8.2. Climate Change and Adaptation

This report should be useful to incorporate better guidance for water quality protection in climate change adaptation works in waterfront projects.

The report should include an assessment on how the recommended design features will need to adapt to continue achieving the intended goals.

The report should also assess if its recommendations may need to evolve after Climate Change



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impacts become more significant, for example, if any of the underlying assumptions for the recommendations will not be valid under future conditions.

### 8.3. Working with Nature

This report is intended to provide a more comprehensive alignment with WwN, as its purpose – water quality - is specifically related to a targeted outcome of the WwN process.

### 8.4. UN Sustainable Development Goals

This report will contribute to Goal 14: Life below water - "Conserve and sustainably use the oceans, seas and marine resources for sustainable development."

## 9. References

EPA documents on water quality in marinas

ROM 5.1-13 Quality of Coastal Waters in Port Areas