SUBMISSION TO INFRASTRUCTURE AUSTRALIA

THE USE OF REAL TIME MARINE NAVIGATION AIDS TO HELP ADDRESS PORT AND SEAWAY INFRASTRUCTURE BOTTLENECKS

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Background:

OMC is recognised as the world authority in the development and operation of real-time under keel clearance (UKC) Systems as used by the commercial shipping industry in all major ports and waterways. The OMC system is the only fully validated real time UKC system which has allowed large bulk and container ships to achieve higher cargo capacity, to be more efficient, to be operated more safely, and to achieve higher environmental assurance levels for each voyage.

The terms “Dynamic UKC®” and DUKC® are both registered trademarks of the OMC. Group (which includes OMC International Pty Ltd, DUKC Pty Ltd and Dynamic Under keel Clearance Systems Pty Ltd – collectively "OMC").

Description of Infrastructure:

The DUKC® System is an Australian Invention of a unique maritime engineering software system which has been developed for more efficient and safer navigation of large ships in shallow restricted waterways. In real time, the DUKC® calculates wave, tide, current and vessel dynamics to produce the safest and most efficient transit of ships in and out of ports and along managed waterways.

Melbourne based OMC has developed and installed fourteen (14) DUKC® systems around Australia and New Zealand since 1993 as well as one system in the port at Lisbon in Portugal, directly generating in excess of A$10 billion to users and stakeholders in this time. Additionally, OMC is currently in the final stages of the installation of new systems at four ports along the Weser River in Northern Germany.

DUKC® methodology can be beneficially applied to any waterway where sailing drafts or times may be restricted by under keel clearance requirements. DUKC® can allow vessels previously restricted to sail at less than maximum draft to increase their draft, and vessels already sailing at maximum draft to widen their sailing windows.

Traditionally, ports and specified waterways operate under fixed or static rules for under-keel clearance which must be conservative to cover the broad range of conditions that a vessel may be exposed to in transiting a channel.

OMC Systems:

The DUKC® system comprises a suite of three integrated products for the management of vessel under keel clearance. OMC has continued the development of its DUKC® systems to maintain its position as the world leader in provision of UKC management tools.

The latest development is the DUKC® VTS, a unique tool which provides port and waterway operators of Vessel Traffic Systems (VTS) with real-time under keel clearance management advice.

(i) the shore-based DUKC® System which operates from 48 hours up until a transit begins, using real-time environmental data, vessel data and proven ship motion models to safely maximise draft or tidal windows;

(ii) an on-board DUKC® PPU (Portable Pilot Unit) which enables marine pilots to optimise a vessel's speed to provide minimum transit times through port channels, consistent with requirements for maintenance of adequate UKC; and,

(iii) a shore-based DUKC® Vessel Traffic System (VTS) system which enables VTS operators to monitor the safety of deep-draft vessels in the vertical dimension (and therefore augment existing VTS capabilities for management of vessel safety in the horizontal dimension). This is particularly relevant for the Torres Straits and the Great Barrier Reef. The DUKC® VTS suite assists to shorten transit times through port channels to the minimum possible without exceeding acceptable risks of grounding.

Why are OMC Systems Important?

There are three areas of benefit as a result of installed and operating DUKC® infrastructure as supplied and supported by OMC. These are described as follows:

Economic Benefits:

The DUKC® has generated economic benefits in the order of hundreds of millions of dollars per annum by allowing ships to sail with deeper draughts than was previously possible and by widening the tidal windows of vessels sailing with less than maximum draught for the tide. These benefits are obtained at a fraction of the dredging costs that would be required to gain equivalent productivity increases, and with no environmental cost.

Three major Australian bulk ports have estimated the benefits generated by the DUKC® systems installed in their ports over the past decade as follows:

- Hay Point, Qld $60,000,000 p.a. over 10 years equating to approximately $600,000,000
- Port Hedland, WA $240,000,000 p.a. over 8 years equating to approximately $1,920,000,000
- Dampier, WA $50,000,000 p.a. over 8 years equating to approximately $400,000,000

Safety Benefits

This economic benefit to Australian ports and shippers using DUKC® has been achieved whilst improving the certainty, and therefore the safety, of shipping transits. There have now been over 40,000 DUKC® sailings at all the DUKC® ports without incident. In addition, the DUKC® predictions have been validated through full scale measurements using dual-frequency DGPS equipment on over 230 vessels in ports around Australia, New Zealand and Europe.

This full scale validation of UKC predictions is unparalleled by any other system anywhere in the world. It has placed OMC as leaders in the field of vessel motion

measurement and prediction. This knowledge is integrated with the DUKC® System to provide DUKC® users with the upmost confidence in the systems.

Wide spread recognition of the validity of DUKC® predictions has been highlighted in New Zealand. Following two groundings of oil tankers near Marsden Point in 2003, the Maritime Safety Authority in New Zealand (MSA) imposed significant draft limits on the port until they implemented a DUKC® System. An OMC developed system was supplied and commissioned in April 2004.

Endorsement of the safety benefits obtained through the DUKC® System can be found in the MSA's report into the grounding of the first tanker in New Zealand, the "Capella Voyager" Report No: 03:3117. The first recommendation in this report (No. 5.1.Page 33) states that "North Tugz Pty Ltd fully implements, trains and documents a formal DUKC® assessment system for the Port of Whangarei and its approaches".

Environmental Benefits

In addition to safety benefits from reducing the risk of marine incidents, DUKC® modelling can reduce the costs and adverse effects on the environment associated with dredging by enabling bed depths to be optimised in accordance with UKC requirements (i.e. targeted dredging effort).

In the Port of Taranaki, New Zealand, OMC was able to reduce the port's planned dredging costs by approximately 50% through the introduction of the DUKC®. Similar savings following DUKC® modelling have been achieved in Dampier, Port Hedland, Fremantle and Geraldton, Western Australia.

What are the Problems?

For the purpose of this submission to Infrastructure Australia, OMC has identified two areas where existing problems are significant. The DUKC® systems represent a low cost solution to these existing problems that will not only achieve significant improvements in export productivity but also assure much safer shipping operation and actively promote best practice environmental management of our ports and seaways. These two problem areas can be summarised as supply chain and shipping bottlenecks that frequently occur

(i) In the Torres Straits, and

(ii) In some Australian Ports.

Torres Strait – The Problem and its Impact

Torres Strait is located above the northern tip of Queensland. The Strait consists of a navigable waterway used by all vessel traffic transiting to and from the east coast of Australia and to New Zealand.

At present shipping operations in the Great Barrier Reef and Torres Strait region are jointly managed by the Australian Maritime Safety Authority (AMSA), the Great Barrier Reef Marine Park Authority (GBRMPA) and Maritime Safety Queensland (MSQ).

The regulatory restraint in Torres Strait comes in the form of a restricted vessel draft to 12.2 metres as established in the late 1980's by AMSA.

This "static" (i.e. unchanged regardless of the situation of the day) rule on maximum vessel draft is under most circumstances conservative as it does not consider actual conditions.

The maximum draft limit of 12.2m relates to the lowest daily high water level which occurs during the year at critical points such as Booby Island (Varzin Passage), Goods Island, Turtle Island and Ince Point. However, these levels have a marked seasonal variation. For example the daily high water level at Booby Island (western entrance of Torres Strait) varies from a maximum of 4.2m in February to a minimum of 3.0m in August. On a monthly basis, mean high water level varies from 3.8m in February to 3.2m in August.

By considering actual conditions, not only can safety be increased but the opportunity also exists to significantly increase cargo throughput by reducing the "cargo capacity and cargo flow" impact of any possible bottleneck at Torres Strait. Currently and at best case, this represents less than optimum shipping use of the Straits.

This bottle neck restriction imposes significant cost penalties on a wide range of commercial shipping. Examples include:

- Panamax bulk carriers carrying coal from the Queensland ports of Hay Point, Dalrymple Bay, Gladstone, Abbot Point and Brisbane to Asia and Europe;
- Panamax bulk carriers carrying sugar, grain and silica sands from Queensland ports to Asia and Europe;
- Aframax and Suezmax tankers carrying crude to Australian and New Zealand refineries;
- Post-Panamax bulk carriers carrying bauxite from Weipa to Gladstone
- Container vessels from the Port of Brisbane and regional Queensland ports to Asian and European ports.

Torres Straits – Addressing the Problem:

It is feasible to increase the allowable draft above 12.2 metres in Torres Strait through the introduction of proven technology for UKC management which is widely recognised as world best practice in this field. DUKC® can reduce the impact of this bottleneck in a manner that will not only significantly increase shipping productivity but will also ensure that safety in terms of underkeel clearance is maintained at all times through these environmentally sensitive waterways.

The fixed limit of 12.2m must be sufficient to provide adequate under keel clearance for vessels during the smallest neap tides in August, as well as account for negative tidal residuals (tides less than predicted) caused by adverse meteorological effects. It follows that there is significant potential to increase maximum draft during periods other than the smallest neap tides in August or at times of positive tidal residuals.

It is important to highlight that a DUKC® System does not reduce a vessel's under keel clearance. Rather it maintains a known safe under keel clearance

limit at all times through consideration of all real time factors influencing a vessel's under keel clearance on a given day. Using the existing static rule at Torres Straits, the under keel clearance cannot be known precisely. Whilst it is usually conservative, there is the potential that it may at times be unsafe. The DUKC® system will enhance confidence levels and provide significant improvements in available vessel draft on most occasions, and safety on all occasions.

The complexity of the tidal regime and associated tidal streams through Torres Strait, combined with the variations in predicted tides due to wind and barometric effect, the seasonal swell wave climate and other factors which affect UKC requirements, would require a properly designed and maintained DUKC® System to make full and safe use of the potential available increase in draught and tidal windows discussed above.

The DUKC® System will provide a validated and proven process for Under Keel Clearance management, rather than the conservative and traditionally based approach currently in place. *It will also significantly increase the uplift through Torres Straits in a transparent and controlled manner.*

Export and Financial Impact

Initial studies indicate that, based on current shipping volumes through the Torres Straits, installation and use of *a* ***DUKC® System could increase annual tonnage throughput by an estimated 3-5 millions tonnes, equating to many hundreds of millions of dollars in increased annual revenue to exporters for essentially similar shipping costs.***

The removal of this bottleneck will have further flow on effects through Australian ports noting the port and transport infrastructure expansions that have been recently completed or are planned for the near future.

Torres Straits - Resolution

It is not expected that the current static rule at Torres Straits will be reviewed in the near future without a paradigm shift in UKC determination and management.

A DUKC® system, which offers recognised world's best practice methodology for Under Keel Clearance management is a low cost solution for reducing the impact of this bottleneck. The only other option is dredging through Torres Straits which would have enormous economic and environmental impacts.

Whilst early indications are that industry will be extremely supportive of the introduction of the DUKC® through Torres Straits, ultimately the introduction will require approval from the Australian Federal Government body AMSA. AMSA is currently reviewing a Proposed Governance Arrangement for UKC through Torres Strait. ***OMC's position is that AMSA should implement a common user proven real-time UKC System that has been rigorously tested and validated. This System should be operated as an aid to navigation and integrated into the existing REEFVTS in place for the Great Barrier Reef, as part discharge of AMSA's ongoing safety management obligations in Torres Strait.***

The Maritime Safety Authority in New Zealand (MSA) has already recognised that UKC management can no longer be acceptably managed by static rules. Their report on Environmental Factors Affecting Safe Access and Operations, October

2004 instructs ports to investigate DUKC® technology in satisfying their regulatory risk mitigation requirements:

> *No report on environmental factors affecting ship access to ports would be complete without a mention of dynamic under-keel clearance (DUKC®). This is a real-time under-keel clearance prediction system that takes into account the major factors affecting under-keel clearance using real-time environmental monitoring data, as well as ship motion and response, and wave and tidal modelling. The data are used to provide forecasting information to aid decision making for shipping movements. The DUKC® system has to be individually installed and customised for each specific port. Pilots and other users undergo DUKC® awareness and training as part of the installation process. DUKC® has the commercial application (which justifies its cost) of maximising drafts for departing vessels, and of determining the earliest and latest time of entry and exit into and out of the port-approach channel.*
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> *The system (DUKC®) was developed by an Australian company (OMC International) and is in successful operation in Australia, Europe and New Zealand (Port Taranaki, Port of Napier and Marsden Point have some OMC systems installed).*

Australian Ports – The problem and its Impact

Channel approaches to ports are often not able to keep pace with the growth in vessel size and traffic demand in today's market, and the potential volume carried in and out of ports by these larger vessels is not being realised. The economic and environmental costs associated with dredging to meet this increased demand may be an obstacle to achieving volume increases as a result of this bottleneck in the logistic chain.

As previously outlined, the DUKC® is now or will soon be in operation at nineteen Australian and Overseas Ports (12 Australian Ports) providing direct economic benefits totalling billions of dollars to the users of these systems at a fraction of the cost and implementation time required for comparable dredging projects. The longer lead time required for design and environmental studies and approval of major dredging projects, together with the actual construction time involved, is also an issue often taking up to 10 years from initial inception to completion, assuming that it ultimately is approved.

DUKC® is widely regarded as world best practice for port and specific waterway under keel clearance management. In addition to providing operational improvements in productivity, DUKC® technology has also been used for the optimisation of channel deepening at the ports of Fremantle, Adelaide, Newcastle, Geelong and Taranaki (NZ). Similar studies have been completed during the past five years for the ports of Dampier, Geraldton, Auckland, Felixstowe (UK's largest container port) and New York/New Jersey. Such studies enable the intended aim of

increasing allowable sailing drafts and tidal windows to be delivered at a greatly reduced cost, up to 50% in some cases, and with minimum environmental effects.

There still remain a number of large ports in Australia that have not taken up DUKC® Systems but rather utilise conservative, traditional and potentially unsafe systems.

In particular, OMC has identified the following major ports as potential locations where introduction of a DUKC® System could significantly increase the port productivity:

- Gladstone, Queensland
- Abbot Point, Queensland
- Cape Lambert (Robe River), Western Australia – highest priority because of port expansion
- Darwin, Northern Territory
- Esperance and Albany in Western Australia, and
- Finders Ports in South Australia for Whyalla and Thevenard.

Australian Ports – Addressing the Problem

DUKC® methodology can be beneficially applied to any port where sailing drafts or times are restricted by UKC requirements to allow vessels restricted to sail at less than maximum draft to increase their draught, and vessels already sailing at maximum draught to widen their sailing windows.

Impediments to implementation of DUKC® at selected Ports include:

(i) Political issues;

(ii) Lack of recognition of DUKC® from government and industry;

(iii) Liability and insurance issues;

(iv) Perceived costs associated with implementation and operation of a DUKC® System;

(v) Conservatism and reluctance to embrace new technology associated with the maritime industry;

(vi) Lack of understanding of the DUKC® concept;

1.1.1 Export and Financial Impact

OMC analyses, based on considerable experience, show that the introduction of a DUKC® System would significantly improve the productivity of all ports by amounts which are of orders of magnitude greater than the costs of implementing and maintaining a DUKC® System. **In essence, DUKC® is a real value added system**.

The economic benefit above the cost of the DUKC® that would be obtained at each of these ports is estimated to range from $50 million to $400 million dollars annually, depending on the particular port.

Australian Ports – Resolution

OMC believe that Commonwealth Government assistance and recognition could assist in overcoming a number of the above barriers and would welcome an opportunity to meet with the Infrastructure Australia Taskforce or discuss these in detail.

Incorporation of OMC DUKC® products and services into the major export and operational ports and waterways around Australia will, based on results to date, have significant and tangible safety and environmental benefits as well as add economic value to Australian Industry for relatively small capital outlay and ongoing support costs.

OMC Track Record

OMC systems have been installed or are currently being considered for the following ports worldwide

- Hay Point, Qld (1993) – contract renewed in 2003
- Fremantle, W.A. (1994)
- Port Hedland, W.A. (1995)
- Dampier, W.A. – Rio Tinto Iron (1995)
- Brisbane, Qld (1996)
- Bunbury, W.A. (1996)
- Geraldton, W.A. (1999)
- Taranaki, N.Z. (2001)
- Napier, N.Z. (2003)
- Marsden Point, N.Z. (2004)
- Newcastle, N.S.W. (2004)
- Lisbon, Portugal (2007)
- Port Kembla, N.S.W. (2008)
- Weipa, Qld (2008)
- Torres Strait (Undergoing internal OMC trials - 2008)
- Melbourne, Vic (operational mid-2008)
- Bremerhaven, Germany (operational late 2008)
- Nordenheim, Germany (operational late 2008)
- Brake, Germany (operational late 2008)
- Bremen, Germany (operational late 2008)

International Recognition

The experience of developing and operating DUKC® systems is currently being provided as input to the following international authorities - Working Group 54 for the Permanent International Association of Navigation Congress (PIANC) and the International Association for Lighthouses and Aids to Navigation (IALA). The objective of both these bodies is the development of guidelines for the incorporation of real-time under keel clearance management into VTS systems.

In recognition of OMC's international standing:

(a) OMC's founder, Dr. Terry O'Brien, is Chair of PIANC Working Group 54 which is tasked to develop guidelines for the use of hydrographic and oceanographic data to optimise safe waterway access and determine the operational limits of navigational channels.

(b) OMC is the only non-European consultant to participate in the European Commission project, MarNIS (Maritime Navigational Information Services). OMC was sole-sourced by the European Commission to provide its DUKC® technology for Vessel Traffic Systems (VTS) and Portable Pilot Units (PPU) as key components of two Work Packages in the MarNIS project.

(c) Dr O'Brien, through the experience of developing and operating DUKC® systems is currently providing input to IALA for the development of guidelines for the incorporation of real-time under keel clearance management into VTS systems