World Meteorological Organization

A PRACTICAL GUIDE FOR THE IMPLEMENTATION OF A QUALITY MANAGEMENT SYSTEM FOR NATIONAL METEOROLOGICAL AND HYDROLOGICAL SERVICES

QMF **WMO/TD No.**

A Practical Guide for the Implementation of a Quality Management System for National Meteorological and Hydrological Services

VERSION 10

Lead Author:	Bryan Boase
Contributors:	Helen Tseros Geoff Gray Neal Moodie
Editorial:	C M Shun Herbert Puempel

DOCUMENT CONTROL

Version No.	Date	Comments
V1	28 Aug 2011	First Draft
V2	3 Sept 2011	Amendments post first draft proof read
V3	8 Sept 2011	Expansion of Sections 4 & 5
V4	8 Sept 2011	Amendments post proof read of V3
V5	9 Sept 2011	Amendments post proof read of V4
V6	19 Sept 2011	Editorial proof read amendments H Puempel
V7	4 Oct 2011	Addition of timeline figure 5 page 54
V8	2 Dec 2011	Amendments from Hong Kong Observatory and President of CAeM
V9	14 Dec 2011	Final editorial corrections in preparation for translation
V10	20 Dec 2011	Correction to Figure labelling

Contents

The Foreword to be provided by the WMO Secretary-General provided along the lines of:

Foreword to the Guide

The concept of quality is not new to WMO or its Members. In some cases for over 100 years we have and will continue to strive to deliver the highest quality products and services.

In today's world the users of meteorological and related data, products and services are increasingly requesting that quality management systems be in place to help provide a level of assurance on the quality of that data, products and services. As a result of this increasing demand, the WMO Congress has adopted Resolution 27 (Cg-XIV) and decided that WMO will work toward a Quality Management Framework (QMF) for National Meteorological or Hydrometeorological Services.

I highly recommend this Guide to all WMO Members who have, or are about to adopt a quality management approach to the delivery of their services.

Purpose of the Guide

The purpose of this document is to provide the guidance required to develop and implement a quality management system (QMS) to ensure and enhance the quality of NMHS products and services. As well as developing and implementing a QMS, it also details the steps that need to be taken to achieve certification of compliance of your organization's QMS, with the International Organization for Standardization (ISO) Standard, *ISO 9001:2008 Quality management system – Requirements* (ISO 9001).

The Guide is based on the significant practical experience gained during the development and implementation of QMSs from a variety of organizations. Combined with this is the collective wisdom of the resource material available from NMHSs with mature QMSs and organizations such as the International Organization for Standardization (ISO).

The guide will be provided in a hard copy version but the prime publishing format will be on-line as a foundation resource document on the WMO-QMF web site (hyperlink when URL known). Wherever possible, resources will be hyperlinked into the document to ensure as much as possible, the longevity of the document in terms of its currency and ongoing value.

The Guide is primarily a web-based living document and in line with the QM philosophy of continuous improvement, it will be reviewed, amended and updated on a regular and ad hoc basis. As such, input from our NMHS QM practitioners will always be welcomed and included on a consensus basis.

Terminology, vocabulary, abbreviations and definitions

The QMS technical terminology, vocabulary and definitions used throughout this document are those of the International Organization for Standardization (ISO) and in particular, those identified in *ISO 9000:2005 Quality management systems - Fundamentals and Vocabulary*. The meteorological and aviation terminology, vocabulary, abbreviations and definitions used throughout this document are those of the World Meteorological Organization (WMO), International Civil Aviation Organization (ICAO) and other organizations as appropriate.

As a starting point, there is merit in defining from WMO's perspective the difference between a guide, a manual and a technical regulation and provide some examples that the reader will be familiar with:

> *Guide:* a publication provided by an agency that contains a set of instructions to assist in interpreting and applying a regulatory requirement. Following a guide is not mandatory but users are encouraged to follow them. Examples of guides are the *Guidelines on Integrating Severe Weather Warnings into Disaster Risk Management (PWS-13), Guidelines on the role, operation and management of National Hydrological Services* and this guide;
>
> *Manual:* a technically orientated publication intended to provide assistance to people using a particular system or process. It is usually written by an individual with a strong technical background in the area being addressed. Following a manual is not mandatory but users are encouraged to follow them. Examples of manuals are *Manual on Flood Forecasting and Warning* and the *Manual on the Global Data-processing and Forecasting System;* and
>
> *Technical Regulations:* are determined by Congress and comprise of standard practices and procedures and recommended practices and procedures. The widest WMO known example of these are the *WMO – No. 49 Technical Regulations Volumes 1 – IV*.

Apart from the resources identified above, the following provides a brief description of the most common quality management terminology used throughout this Guide to provide clarity and greater understanding for the reader. These are not presented as absolute, as the definitions can have subtle differences between the various industry and community sectors.

> *certification and registration body:* dependent upon the region in which the NMHS is located the terms certification body and registration body are interchangeable. For the purpose of this Guide the term certification will be used.
>
> *customers:* the common terminology for clients and or customers within the WMO environment and publications is "users". However, the ISO family of standards exclusively uses the term "customer". The term customer will be used throughout this Guide to ensure consistency and clarity of understanding.
>
> *products and services:* for the purposes of the ISO 9000 family of standards, any reference to products also includes services.
>
> *quality:* there are many definitions and interpretations of quality throughout the community. One common element however, is that the quality of a product or service refers to the perception of the degree to which, they meet the customer's expectations. Importantly, quality has no explicit

meaning, unless it is related to a specific set of requirements. To highlight this, ISO defines quality as the "degree to which a set of inherent characteristics fulfils requirements."

quality management (QM): is focused not only on the quality of the product but also the means to achieve it. It does this by undertaking the following four activities: quality planning, quality control, quality assurance and quality improvement.

quality management system (QMS): is the organizational structure, procedures, processes and resources needed to develop and successfully implement management for the delivery of its products and services. NMHSs are encouraged to undergo third party certification of their QMS to achieve compliance with the ISO Standard, *ISO 9001:2008 Quality management - Requirements*. This is discussed later in this Guide.

quality control (QC): is focused on fulfilling quality requirements prior to the dissemination of a product or delivery of a service.

quality assurance (QA): is focused on providing confidence that quality requirements have been met. This involves the systematic monitoring and evaluation of the processes associated with the generation of a product or service.

stakeholder: any individual or organization that can impact positively or negatively, on the activities of the NMHS; or any individual or organization that the activities of the NMHS can impact on positively or negatively.

SECTION 1: Introduction

1.1 A brief history of quality management

1.1.1 The quality movement has its roots back in medieval Europe in the late 13th Century where craftsmen organized themselves into guilds. Up until the early 19th Century, manufacturing in the industrialized world in a broad sense continued to follow this "guild model". In the mid-1750s the "factory system", which had an emphasis on product inspection, started in Great Britain and grew into the Industrial Revolution in the early 1800s. The Industrial Revolution led to a system in which large groups of people that performed similar work were grouped together under the supervision of an individual who was appointed to control the quality of work being undertaken.

1.1.2 In the mid-1920's Walter Shewhart, a statistician with the Bell Laboratories, broadened the focus on quality to include not only the finished product but to incorporate the processes to achieve that quality. He recognized that the processes provided valuable data that could be analyzed using statistical techniques to ascertain whether or not a process was providing the optimum outcome or required refinement to deliver the expected level of quality. To this day that activity still plays a key role in any QMS."

1.1.3 W Edwards Deming, (referred to at times as the "Father of Quality Management") a statistician became an advocate of Shewhart's methods and in his own right, became a leader of the quality movement in both Japan and the United States. In fact, Deming caused a revolution through his approach to quality which produced a significant improvement in terms of product quality His influence in Japan through his quality management initiatives was a key driving force behind the nation's economic rise post World War II. In the 1970s, many major public and private sector organizations published their own quality management standards, which introduced the idea that confidence in a product could be gained from an approved quality management system and quality manuals.

1.1.4 An increase in international trade stimulated the development of internationally-recognized quality management standards. It was feared that a variety of national standards would emerge and become a barrier to international trade. As such, it was recognized that there was a need for an international standardization system and from this came the International Organization for Standardization (ISO) that we know today.

1.2 The primary drivers for adopting a QM approach for NMHSs

1.2.1 The adoption of a quality management approach to the delivery of NMHS products and services has been driven by a number of imperatives. A key imperative has been the ICAO requirements relative to the delivery of aviation weather services.

1.2.2 ICAO first introduced quality related Standards and Recommended Practices in their *Annex 15 – Aeronautical Information Services* in November 1997. It was also recognized that in the field of meteorological service for international air navigation, quality management had also become increasingly important and that there was a need for a properly organized quality system to ensure continued high quality of data and products provided by the aeronautical meteorological services.

1.2.3 Amendment 72 to International Civil Aviation Organization (ICAO) *Annex 3 – Meteorological Service for International Air Navigation* and World Meteorological Organization *(WMO) No. 49, Technical Regulations*, *C.3.1, Volume II Meteorological Service for International Air Navigation* became applicable in November 2001. It introduced Recommended Practices concerning quality control and management of meteorological information supplied to users and in the training of meteorological personnel. These provisions recommended the conformity with the International Organization for Standardization (ISO) 9000 series of quality assurance Standards. These Recommended Practices can be referenced in *Annex 3/WMO Technical*

Regulations (C.3.1), Section 2, 2.2.2 to 2.2.6. To assist the WMO Members/ICAO Contracting States in developing quality management systems of their own, the WMO and ICAO jointly developed and published WMO-No. 1001 *Guide on the Quality Management System for the Provision of Meteorological Service for International Air Navigation* in 2006 to provide guidance to facilitate the design, development and implementation of an ISO 9000-compliant quality management system by the aeronautical meteorological services.

1.2.4 The ICAO Council at its 189th Session considered Amendment 75 to *Annex 3* that included raising the Recommended Practice pertaining to quality management systems for aeronautical meteorological to a standard. It was recognized that many States were not ready to implement a QMS, so it was decided to set the applicability date of November 2012. This date is now a primary driver for NMHSs to develop and implement a QMS.

1.2.5 WMO first addressed the issue of QM in May 2003 at the Fourteenth World Meteorological Congress. The Congress adopted Resolution 27 (Cg-XIV) and decided that WMO should work towards a Quality Management Framework (WMO-QMF) for NMHSs, that would include the following elements to be addressed on a phased basis: (1) WMO technical standards; (2) quality management systems including quality control; and (3) certification procedures. Among other things, the Congress requests the Executive Council to guide the development of WMO-QMF, including the availability of broad guidelines for NMHSs on developing their quality management system.

1.2.6 In October 2004, a WMO Workshop on Quality Management was held in Malaysia. This workshop was called to develop the WMO Quality Management Framework aspects that were requested by the 56th Session of the WMO Executive Council in June 2004. In particular, the workshop addressed the recommendations of the 56th Executive Council that included the adoption of a WMO Quality Management Framework (WMO-QMF). The Inter-commission Task Team on the Quality Management Framework (ICTT-QMF) was established to oversee and coordinate the activities and monitor progress of the WMO-QMF as it was developed and implemented. In November 2005 a WMO QM Seminar with a focus on the provision of meteorological services to aviation was conducted in Hong Kong, China.

1.2.7 The first session of the Inter-Commission Task Team on Quality Management Framework (QMF) was held in April 2005. The meeting reviewed possible ways of developing closer working relations with ISO with a view of developing technical standards relevant to the Organization, which would broaden the application and recognition of WMO standards. The meeting recommended to work towards having WMO recognized as an international standardization body by ISO which was achieved in December 2007. This recognition aims to strengthen the development of International Standards and to avoid duplication of work on standards related to meteorological, climatological, hydrological, marine and related environmental data, products and services. WMO and ISO will develop, approve and publish common standards based on WMO technical regulations, manuals and guides which will clarify the authority of WMO documents and enhance their international recognition and dissemination.

1.2.8 WMO continues to recognize urgency associated with supporting the implementation of QMS by Members in their services for international civil aviation. It also recognizes the developments in other application areas where partner organizations are mandating the implementation of QMS for services to them. Overall WMO recognizes the high importance of having quality management systems underpinning many aspects of the work of WMO and its Members.

1.2.9 The adoption of a QMS should be a strategic decision of an NMHS. The development and implementation of which will be influenced by its specific needs, objectives, activities and size.

1.2.10 There is a misconception that the adoption of a QM approach to the delivery of NMHS products will be an expensive activity and will also add a significant workload and additional layers of bureaucracy. However, if it is well planned, appropriately resourced and efficiently implemented it will provide a cost-effective management system.

1.2.11 There are a comprehensive set of technical regulations and guidance documents provided by WMO that provide a sound foundation for the operation of an NMHS. In conjunction ISO 9001 provides a rigorous management framework that will assist in enabling an NMHS to identify and meet its customers requirements, monitor and measure its performance and identify opportunities to continually improve its service delivery.

SECTION 2: Quality Management and ISO

2.1 The International Organization for Standardization (ISO)

2.1.1 ISO began in 1906 with a focus on the electrotechnical field with the International Electrotechnical Commission (IEC). In 1926 the International Federation of the National Standardizing Associations (ISA) was formed and at the time it had a strong focus on mechanical engineering. However, in 1942 it was disbanded during the Second World War.

2.1.2 In 1946, delegates from 25 countries met in London and decided to create a new international organization, of which the object would be "to facilitate the international coordination and unification of industrial standards". The new organization - ISO, officially began operation on 23 February 1947.

2.1.3 ISO is the world largest standards developing organization and from 1947 it has published more than 18,500 International Standards, ranging from standards for activities such as agriculture and construction, mechanical engineering and medical devices, to the newest information technology developments.

2.1.4 At the time of publication of this guide there are 162 members of ISO which are divided into the following three categories: Member bodies, Correspondent members, and Subscriber members. Further information pertaining to these categories may be accessed using the hyperlink function associated with each category.

2.1.5 The acronym used for "International Organization for Standardization" would be different depending on the respective language ("IOS" in English, "OIN" in French for *Organisation internationale de normalisation*). Therefore its founders decided to give it a short, all-purpose name - "ISO" which is derived from the Greek *isos*, meaning "equal". As a result, whatever the country or language, the short form of the organization's name is always ISO.

2.1.6 For further information regarding ISO, the book *Friendship Among Equals* written by Jack Latimer is recommended reading. The ISO web site also offers a wealth of valuable information. The URL is: http://www.iso.org/iso/about.htm

2.2 The ISO 9000 family of Standards

2.2.1 In 1987, an ISO committee chaired by Canada, worked to produce an international quality standard. Inputs from many nations were considered and they produced a standard based on the then British Standard BS 5750 which was the first of the ISO 9000 series of standards. Since 1987 the ISO 9000 family of standards has grown and includes associated guidelines applicable to particular industries. At this time there is no guide available specific to the delivery NMHSs products and services.

2.2.2 ISO has two kinds of quality management standards: requirements and guidelines and together they make up what is known as the ISO 9000 family of standards. There are three standards in the ISO 9000 family of Standards and they represent an international consensus on good quality management practices:

a. *ISO 9000:2005 - Quality management systems - fundamentals and vocabulary (ISO 9000):* Describes fundamentals of quality management systems and specifies the terminology for quality management systems.

b. *ISO 9001:2008 - Quality management systems - requirements (ISO 9001):*
These requirements can be applied to all types of organizations both public or private sector, regardless of size or industry group. It can help both product and service organizations achieve standards of quality that are internationally recognized and respected throughout the world. It is the only standard in the family against which organizations can be certified (or registered) by a third party audit process.

c. *ISO 9004:2009 - Managing for the sustained success of an organization - a quality management approach (ISO 9004):*
Provides guidance to support the achievement of sustained success in today's complex, demanding, and ever-changing environment. It focuses on achieving sustainable success by meeting the needs and expectations of its customers and other stakeholders. An interesting facet of this standard is that it promotes self-assessment as an important tool that enables ongoing review of the maturity level of the QMS. However, it should be noted that the self assessment tool is not a substitute for a third party audit process that is applicable to ISO 9001.

2.3 The importance of the ISO family of standards

2.3.1 The ISO 9000 family of standards and in particular ISO 9001, are important because of their international orientation. It has the support of national standards bodies from more than 150 countries and as such, it's the logical choice for an organization such as WMO and its Members. WMO and its Members operate in an international environment and have customers who demand an international standard of excellence.

2.3.2 The adoption of a QM approach to the delivery of products and services may require a significant change management strategy for many NMHSs. ISO 9001 provides an appropriate framework within which to implement the required change management processes. The framework provides for the identification of the most appropriate policies, procedures, records, technologies, resources, and structures needed to achieve and enhance the quality of NMHS products and services. The development and successful implementation of a QMS throughout the NMHS, will imbed a quality attitude throughout all levels of the NMHS which in turn, will help to ensure the delivery of products and services of an international standard.

2.4 Corporate Governance and ISO 9001

2.4.1 In simple terms, governance relates to the processes and structures that ensure an organization is directed, controlled and held to account. It focuses on how an organization is managed, how risk is monitored and how value is added for the community, government and other stakeholders.

2.4.2 NMHSs predominately operate within a public sector environment and public sector governance covers a wide spectrum of activities in how an organization is managed to meet legislation and its government-determined outcomes, through to its organizational culture and values. It also includes the way an organization acquits its responsibilities of stewardship by being open, accountable and prudent in decision-making, in providing policy advice as required, and in managing the delivery of government programs.

2.4.3 Good public sector governance provides a foundation for high performance and strengthens community confidence in the organization and helps to ensure an organization's reputation is maintained and enhanced. The main components and activities of a sound corporate governance framework are:

a. Promoting and ensuring adherence to a code of conduct and values;
b. Risk Management;
c. Continuity of service;
d. Occupational Health and Safety;
e. The ongoing development of staff competencies;
f. Providing timely and accurate reports to senior/executive management;
g. A published Service Charter that sets out the standards of service to the community;
h. Contributing to the organizational annual reports; and
i. Contributing to the strategic and operational planning process.

2.4.4 An ISO 9001 QMS provides an excellent management tool to measure the ongoing performance of an organization's corporate governance activities. Four key sections of ISO 9001 enables the requirements articulated within them, to be aligned with key corporate governance functions. By doing this an NMHS will be able to measure the success or otherwise of their corporate governance activities. Figure 1 illustrates the alignment of key clauses of ISO 9001 and corporate governance functions and its value as a management tool.

Fig 1: Alignment of corporate governance functions and ISO 9001

2.5 ISO 9001 certification and registration

2.5.1 ISO notes that certification 'refers to the issuing of written assurance (the certificate) by an independent external body that it has audited a management system and verified that it conforms to the requirements specified in the standard. Registration means that the auditing body then records the certification in its client register. So, the organization's management system has been both certified and registered ... the difference between the two terms is not significant and both are acceptable for general use. "Certification" is the term most widely used worldwide, although registration is often preferred in North America, and the two are used interchangeably. On the contrary, using "accreditation" as an interchangeable

alternative for certification or registration is a mistake, because it means something different ... accreditation refers to the formal recognition by a specialized body – an accreditation body – that a certification body is competent to carry out ISO 9001 ... in specified business sectors. In simple terms, accreditation is like certification of the certification body. Certificates issued by accredited certification bodies may be perceived on the market as having increased credibility'.

2.5.2 The ISO web site states that 'certification process is expected to provide confidence that the organization has a quality management system that conforms to the applicable requirements of ISO 9001. In particular, it is to be expected that the organization:

a. has established a quality management system that is suitable for its products and processes, and appropriate for its certification scope;

b. analyzes and understands customer needs and expectations, as well as the relevant statutory and regulatory requirements related to its products;

c. ensures that product characteristics have been specified in order to meet customer and statutory/regulatory requirements;

d. has determined and is managing the processes needed to achieve the expected outcomes (conforming products and enhanced customer satisfaction);

e. has ensured the availability of resources necessary to support the operation and monitoring of these processes;

f. monitors and controls the defined product characteristics;

g. aims to prevent nonconformities, and has systematic improvement processes in place to:

   i. Correct any nonconformities that do occur (including product nonconformities that are detected after delivery);

   ii. Analyze the cause of nonconformities and take corrective action to avoid their recurrence

   iii. Address customer complaints; and

h. has implemented an effective internal audit and management review process; and is monitoring, measuring and continually improving the effectiveness of its quality management system.

2.6 What ISO 9001 certification does not mean

2.6.1 ISO 9001 defines the requirements for an organization's quality management system, not its products. Certification of compliance to ISO 9001 is meant to provide confidence in the organization's ability to consistently provide products that meet customer and applicable statutory and regulatory requirements. It is important to note that it does not necessarily mean that the organization will always achieve 100% product conformity.

2.7 Benefits of ISO 9001 Certification

2.7.1 There are significant benefits to implementing a QMS and achieving certification of compliance to ISO 9001. It can be demonstrated that the benefits an NMHS realizes far out-weigh the initial effort and associated resources required to develop and implement a QMS. The following are some key benefits that have been realized by organizations with mature QMSs. Please note that they are not listed in priority order:

a. Customer's needs identified, met, monitored and improved within a consistent management framework;

b. Improved management control and reporting;

c. Embeds a continuous improvement culture into the organization;

d. Clear processes are in place to address poor quality products;

e. Enhanced organization awareness about quality;

f. Marketing tool for promoting the organization - very important even in the public sector which can be a competitive environment to obtain resources;

g. External audit by 3rd party – a powerful tool to establish credibility and accountability;

h. Well defined procedures and processes - employees know what to do and how to do it. They don't waste time duplicating effort;

i. Enhanced teamwork and communication within the organization;

j. Improved clarity of job specifications;

k. Improved occupational health and safety practices;

l. Assures customers that they are being provided quality products and services;

m. Makes the organization stand out from their competitors;

n. Reassurance to customers that the organization considers their needs and expectations;

o. Follow-up on complaints to rectify a situation to ensure the customers' needs are met;

p. The organization functions in a disciplined way as a result of the systematic approach in the handling of its activities;

q. There are fewer problems with failures in service or product quality;

r. As the quality management matures, more time spent on improving rather than fixing and reacting to the demands of dissatisfied customers;

s. Significant decrease in time and money spent on recurring problems as many

are resolved permanently;

t. The organization builds the inner resources and skills to identify and resolve problems more expediently;

u. The Quality Manual provides an excellent "road map" as to how the organization operates as well as providing a valuable induction tool for new staff;

v Significantly improves documentation procedures;

w. Ensures competencies are gained and maintained through appropriate training;

x. Assists in capturing corporate knowledge as staff retire;

y. Job satisfaction of employees significantly improved; and

z. Powerful tool to ensure important issues are highlighted at the appropriate organizational level.

2.7.2 The adoption of a QM approach and certification of compliance with ISO 9001 can deliver a vast range of benefits but it should also be remembered that ISO 9001 certification is not an end in itself. ISO 9001 certification is an important component of the overall continuous improvement process and quality journey of an organization.

2.8 ISO Standards and Publications

2.8.1 It is essential that all NMHSs adopting a quality management approach to the delivery of its products purchases the current copies of *ISO 9000:2005 - Quality management systems - fundamentals and vocabulary* and *ISO 9001:2008 - Quality management systems - requirements* Standards. They may be purchased on-line via the ISO Store web page as a .pdf using their on-line catalogue search tool located at the following URL: http://www.iso.org/iso/store.htm
Note: the standards are updated at regular intervals, therefore check for the latest version.

2.8.2 For information pertaining to how ISO develop standards please refer to the ISO web site at the following URL: http://www.iso.org/iso/about/how_iso_develops_standards.htm

KEY POINTS:

1. The ISO 9000 family of standards and in particular ISO 9001, are important because of their international orientation. It has the support of national standards bodies from more than 150 countries.

2. ISO 9001 can be applied to all types of organizations both public or private sector, regardless of size or industry group. It can help both product and service orientated organizations achieve standards of quality that are recognized and respected throughout the world.

3. ISO 9001 QMS provides an excellent management tool to measure the ongoing performance and success of an organization's corporate governance activities.

4. It is essential that the current copies of *ISO 9000:2005 - Quality management systems - fundamentals and vocabulary* and *ISO 9001:2008 - Quality management systems - requirements* Standards be obtained.

5. There are significant benefits to be gained throughout the organization through the adoption of a QM approach and the certification of compliance with ISO 9001.

SECTION 3: The Eight Principles of Quality Management

3.1 Overview

3.1.1 There are Eight Principles of Quality Management that underpin the ISO 9000 Standards which also need to be embedded within the QMS to provide a sound foundation for achieving the NMHSs goals and objectives. These principles are derived from the collective experience and knowledge of the international experts who participate in the ISO Technical Committee that is responsible for developing and maintaining the ISO 9000 standards. Refer to *ISO 9000:2005 Quality Management Systems - Fundamentals and Vocabulary*. The Eight Principles are articulated below in terms of the activities of an NMHS:

3.2 The Eight Principles

Customer-focused organization: the very relevance of an NMHS relies on its customers and as such, it must understand and meet their needs. It should establish a sound working relationship with relevant community sectors through formal working groups and regular meetings. Strategies such as these will provide a clear understanding and appreciation of the needs, expectations, impact of specific products and the environment in which they operate. Ideally an NMHS will not only meet its customer's expectations but exceed them;

Leadership: sound leadership is fundamental to the success of an organization. The NMHS leadership should establish a vision or a desired future for the organization. The leadership must clearly demonstrate (in a practical manner) an ongoing commitment to the QMS. They must also create an environment that encourages people to achieve the NMHSs objectives;

Involvement of people: NMHSs rely of their people and it should ensure they are involved as is appropriate, in the delivery of its products. However, to ensure the quality of its products it should equip its people with the appropriate skills and knowledge to ensure this occurs. This should also ensure the ongoing professional development of the NMHS personnel;

Process approach: NMHSs will be more efficient and effective when they use a process approach to the delivery of its products. The processes should provide clearly defined accuracy standards and structured formats for all products and services. This enables the efficient management of resources and activities for the delivery of products and services.

System approach to management: NMHSs must use a systems approach which requires the identification, understanding and management of interrelated processes. For example, this could start with the collection of basic observations through to the systematic integration of appropriate information and data via various interrelated processes through to the provision of its suite of forecast and warning products. The systems approach to management is critical to the delivery of high quality NMHSs products;

Continual improvement: this should be an ongoing objective of all NMHSs that is achieved through the application of all the principles. ISO has emphasized that a key approach to continual improvement is through the development of a close working relationship with the NMHSs customers combined with an ongoing commitment to continually improve its overall performance;

Factual approach to decision-making: NMHSs will perform better when they make informed decisions based on facts. They should measure and evaluate their products, processes and performance. Analysis

of this data/information will enable informed decision-making and improvement in service delivery; and

Mutually beneficial supplier relationships: NMHSs have a number of mutually beneficial relationships with internal and external customers, partners, specific community sectors, international and national organizations and the various levels of government. These relationships should be appropriately managed and nurtured to ensure benefits to the NMHS.

KEY POINT:

1. It is important that NMHS ensures these eight principles form the foundation on which to build its QM approach to the delivery of its products and services. They should be visible elements that are interwoven into the processes, outcomes and overall culture of the NMHS.

SECTION 4: The Structure of ISO 9001

4.1 General

4.1.1 This section provides insight into the broad intent of each clause and greater clarity for the reader. However, reference must be made to the actual clauses in ISO 9001 standard, as the following are not a substitute for it.

4.1.2 ISO 9001 defines a set of QM requirements in parts 4, 5, 6, 7 and 8. The size and complexity of a QMS and how these requirements are met, will vary between NMHSs. These requirements will depend on many factors including, size and structure, operating environment, objectives, available resources, products and services and organizational processes.

4.1.3 The strong attraction of ISO 9001 is that it is designed for third party certification purposes. When it is considered that the QMS meets the ISO 9001 requirements (and the organization's needs), the NMHS can appoint an independent certification body (third party) to audit its QMS. If the audit demonstrates that the NMHS meets the requirements the NMHS will be issued with an official certificate of approval.

4.1.4 ISO 9001 has been specifically designed to be used for certification purposes. It should be noted that WMO does not currently require an NMHS QMS to be certified. However, national legislation, stakeholder/partner organizations may require certification of compliance with ISO 9001 for some or all of the NMHSs activities, in particular those NMHSs providing aeronautical meteorological service. Remember any claims of compliance with ISO 9001 will only attain international credibility if an independent certification body can substantiate the claim.

4.2 The ISO 9001 clauses

4.2.1 The first three clauses are introductory and set the stage for the requirements. The **shall** clauses that signify the actual requirements are articulated in Clauses 4 to 8. Clause 4 provides an overview of the four major groups of processes within a process-based QMS and are addressed in Clauses 5 to 8 under the headings of:

Clause 5. Management responsibility;
Clause 6. Resource management;
Clause 7. Product realization; and
Clause 8. Measurement, analysis and improvement.

4.2.2 PDCA (plan–do–check–act) cycle is an iterative four-step management process typically used in QM orientated organizations. It can be used to coordinate an NMHSs continuous improvement efforts. It emphasizes and demonstrates that improvement programs must start with careful planning, must result in effective action, and must move on again to careful planning in a continuous cycle. Figure 2 provides a view of a methodology known as "Plan-Do-Check-Act" (PDCA) that can be applied to all processes. PDCA can be presented as follows:

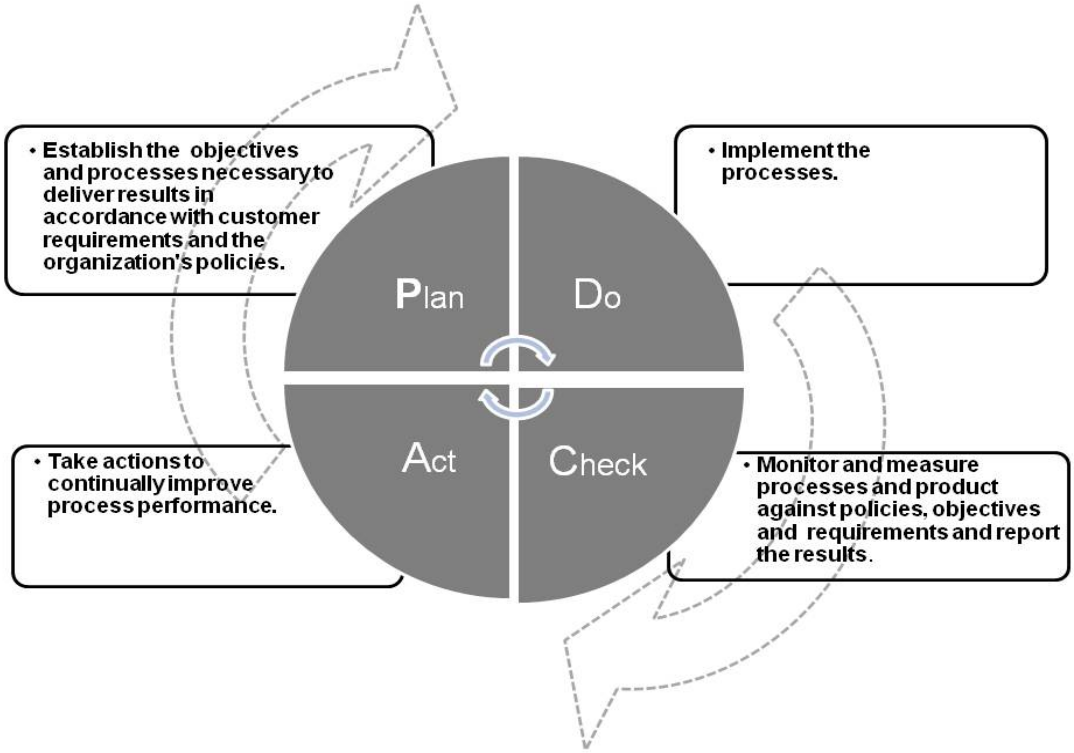

Fig 2: PDCA diagram

4.3 Explanatory notes on the clauses

4.3.1 The following provides explanatory notes and insights as to the intent of ISO 9001 on a clause by clause basis. The reader will be required to read this section in conjunction with ISO 9001 to ensure a full appreciation and understanding as each clause is addressed. **Note:** only the clause reference number is provided and not the actual clause.

Clause 1 — Scope	
Requirements	**Guidance notes**
Refer ISO 9001	This clause emphasizes the aim of enhancing customer satisfaction through the effective application of the quality management system, continual improvement of the system and the assurance of conformity to customer and applicable regulatory requirements. Where any requirement(s) cannot be applied owing to the nature of the organization and its products, this can be considered for exclusion. Exclusions are limited to requirements within Clause 7, and they must not affect the ability or responsibility of the organization to provide products that meet both customer requirements and applicable regulatory requirements.
Clause 2 — Normative references	
Requirements	**Guidance notes**
Refer ISO 9001	A normative reference specifies a document that must be read to fully understand or implement the subject matter. So in terms of this Standard it states that *ISO 9000:2005, Quality management systems — Fundamentals and vocabulary* is the indispensable for the application of this standard. As such, a copy will have to be obtained.

Clause 3 — Terms and definitions	
Requirements	**Guidance notes**
Refer ISO 9001	As per Clause 2, the primary source for all terms and definitions is *ISO 9000:2005, Quality management systems — Fundamentals and vocabulary*. It is also important to note that throughout the text of ISO 9001, wherever the term "product" occurs, it can also mean "service".
Clause 4 — Quality management system	
Requirements	**Guidance notes**
4.1 General requirements	The requirements begin here at a very high level. They state several requirements for the overall QMS rather than individual specific requirements that will be covered later. Points a) and b) of this part of the clause can be covered by developing a flow diagram of your process flows from start to finish. Points c) to f) are covered in specific detail within other clauses in the standard. There is a requirement at the end of this section that addresses issues in regard to control over outsourced processes. Examples of activities that an NMHS may outsource are training, maintenance, observations and IT. If the NMHS outsource processes that will directly affect its customers, then ensure controls are in place. For example, specifications, contracts, procedures, monitoring of compliance etc.
4.2 Documentation requirements	ISO 9001 specifically requires the organization to have as a minimum, "documented procedures" for activities under the following six clauses: - Clause 4.2.3 Control of documents - Clause 4.2.4 Control of records - Clause 8.2.2 Internal audit - Clause 8.3 Control of nonconforming product - Clause 8.5.2 Corrective action - Clause 8.5.3 Preventive action These documented procedures have to be controlled in accordance with the requirements of clause 4.2.3. Some organizations may find it convenient to combine the procedure for several activities into a single documented procedure (for example, corrective action and preventive action). Others may choose to document a given activity by using more than one documented procedure. Regardless, both are acceptable. Some NMHSs (particularly larger ones, or those with more complex processes) may require additional documented procedures (particularly those relating to product realization processes) in order to implement an effective QMS. It is important to note that some NMHSs may require additional procedures but the size and/or culture of the organization could enable these to be effectively implemented without necessarily being documented. However, in order to demonstrate compliance with ISO 9001, the organization has to be

	able to provide objective evidence (not necessarily documented) that its QMS has been effectively implemented. A comprehensive list of documents needed by the NMHS to ensure the effective planning, operation and control of its processes should be established. In order for an NMHS to demonstrate the effective implementation of its QMS, it may be necessary to develop documents other than documented procedures. It should also be noted that there are several requirements of ISO 9001 where an NMHS could add value to its QMS and demonstrate conformity by the preparation of other documents, even though the standard does not specifically require them. Examples may include: - Process maps, process flow charts and/or process descriptions - Organization charts - Specifications - Work and/or test instructions - Documents containing internal communications - Test and inspection plans - Quality plans All such documents have to be controlled in accordance with the requirements of clause 4.2.3 and/or 4.2.4, as applicable.
4.2.2 Quality Manual	It is now common for organizations to publish information about their QMS on an intranet site thereby meeting the standard requirement for a quality manual. Most organizations have a range of external obligations that have to be satisfied and a trend is developing whereby organizations are including information about Operational Health and Safety and other compliance systems in their quality manual. The minimum requirements for ISO 9001 is that the quality manual contains: - the scope of the quality system: a brief description of the processes in the organization included within your QMS. - details of and justification for any exclusions: a brief description of any requirement within section 7 of the standard that is not relevant to your NMHS. For example an NMHS may exclude clause 7.3 because design and development is not part of their activities. - procedures: all need to be included in the manual or if they are too numerous, then a reference as to where they may be found. For example as part of an Operations internal web site. - interaction of processes: similar to the system model shown in the standard, a description is needed that shows how the processes and/or systems of work flow interrelate with each other. An example might be a process map that shows all the steps in the process beginning from responding to a request from a customer for a forecast product through to

	its delivery via a web site or e-mail. A flow diagram or chart may be used that describes each step in the process that in turn refers to your document titles and/or numbers. In developing a quality manual it helps to look from the perspective of a new employee who would use the manual as an induction tool. It should provide them with a clear picture of how the NMHS operates and the processes associated with achieving its outcomes. The content of the quality manual must be laid out to give a clear description of how your NMHS operates. Although there is not a requirement to closely align with the standard clause numbering with the standard may be useful. Sample QM Manuals have been posted on the WMO-QMF Quality Management web page. The quality manual can also contain additional information about your NMHS such as policy, information about customer service, future strategies, past history, organizational structures and charts as required. It is important that this document is easy to read and understand and reflects the values that you wish to convey to the reader.
4.2.3 Control of documents	The standard requires that you have a procedure that describes your document control requirements. The content of this procedure needs to answer how you address the clauses (a) to (g) as follows: a) *What is the way that you authorize and approve documents that staff must follow?* It may be an authorizing signature or it may be via password control if the documents are computer based. If the document in question is externally authored, then a signature of approval is often inappropriate. In this case it may require a list of all currently used externally authored documents that are either signed off or password protected. b) *What is the way you ensure that documents are reviewed and/or updated as necessary?* It may be useful to use the internal audits to systematically review the documents in your system, or an expiry date in the footer is often a simple way to force a review of internally generated documents such as policies, procedures etc. c) *How do you identify to the reader that a change has been made? How do you know that you are reading the correct revision?* The standard is requesting that the QMS ensures that the current document is used at all times - especially in an operational forecast and warning environment. A simple way is to use the date just like a daily newspaper and have a master list of all current documents for reference. Changes can be advised via a minute in a meeting, a notice on a notice board, an email or similar. Careful thought in this area is required to ensure that simple methods are used. d) *How accessible is the system documentation?* The intent here is to ensure that staff know where to find the documents that they need (not necessarily the complete document suite). If you have a paper-based system, make sure that

	only a minimum number of copies are distributed. This helps when changes are required. e) *Are your documents easy to read?* Is the grammar appropriate for the reader? Do the staff know how to navigate their way through the documentation? Can they readily find the document that is required? Once again the use of computer based systems is gaining popularity as common practice for storing and archiving QMS documentation. This allows ready identification and location of relevant documents. f) *How are externally generated documents managed?* All NMHSs refer to external documents such as regulatory, statutory, acts and websites. They are often referenced within its own system documents. If they are referenced, where can they be found? Some NMHSs have a library where such documents are housed; other NMHSs will designate certain staff to be responsible for maintaining them. A method should be specified as to how you ensure that the relevant document is the appropriate issue or version. g) *What happens to obsolete documents?* If they are no longer needed then appropriately dispose of them. However, if old documents are kept it must be ensured that staff do not refer to them in error.
4.2.4 Control of records	As with Control of Documents, a procedure is required that clearly articulates how to control records generated by the NMHS. Records provide evidence of prior events and are referred to when there is a need to recall outcomes of these prior events. Examples are: forecasts and warnings records, climate records, meteorological observations, training records, financial transactions, inspections, customer agreements, contracts, purchase orders, audit records, accident/injury reports, maintenance records etc. Ensure that any records that are kept are appropriately archived. Within your procedure the following issues need to be addressed: a) *Identification* - are records readily identifiable? Does your filing system allow easy identification? b) *Storage* - ensure storage methods prevent damage and/or deterioration. Are electronic storage devices separated from magnetic sources? Are sensitive records maintained in accordance with confidentiality and privacy requirements? c) *Protection* - are electronic records prevented from easy erasure? Do archive mechanisms prevent deterioration? Are regular backups performed for electronic records? Are backup systems validated regularly? d) *Retrieval* - can records be accessed when required? Are appropriate hardware/software mechanisms maintained to allow access to old electronic records?

KEY POINTS

1. Although there is no current requirement for an NMHS to undergo certification of compliance with ISO 9001, international credibility can only be attained if an independent certification body can substantiate the claim.

2. Don't "over document" - Keep it simple and relevant to the NMHSs key activities.

3. Ensure there are documented procedures for the six clauses that are specifically required by ISO.

4. Ensure the quality manual meets the minimum requirements as articulated in ISO 9001.

5. Develop and use the quality manual as a valuable induction tool for new staff to assist them to gain a clear understanding of how the NMHS operates.

6. Carefully consider the layout of the quality manual to ensure it provides clarity on how the requirements of each clause are addressed.

7. The simpler the methods used for document control, the easier it will be to maintain your system. ISO 9001 does not specify how you should do it. It is up to each NMHS to determine their own methods for control.

8. Be careful not to create unnecessary paperwork. Only create what is needed to provide adequate guidance to prevent mistakes. Document control mechanisms should be simple. To control documents use an issue/version number plus the date. Alternatively you could keep them in softcopy format and use passwords as a means of protection.

9. A procedure is required that clearly articulates how to control records generated by the NMHS. Remember, records provide evidence of prior events and are referred to when there is a need to recall outcomes of these prior events.

Clause 5 Management responsibility	
Requirements	**Guidance notes**
5.1 Management commitment	This clause requires that management clearly demonstrate their commitment in a practical manner. This will involve performing the following tasks: - ensuring that necessary resources are provided - the internal promotion of QM and the implementation of the QMS throughout all levels of the NMHS - authorizing policy and the establishment of organizational objectives - chairing management meetings (reviews)
5.2 Customer focus	Management must ensure that the QMS is designed to ensure that its customers (and other key stakeholders) are satisfied with the services provided by the NMHS. It is important that management identify their customer's requirements prior to attempting to meet their needs - a common problem is making assumptions as to what the customer needs. There is also a need to establish the customer's level of satisfaction after delivery of product.
5.3 Quality policy	The standard requires that management publish a 'Quality Policy'. The quality policy is a powerful statement of intent by top management that should be clearly communicated, highly visible and signed off by the Director/CEO. Care should be taken when documenting a quality policy to ensure that any stated imperatives are fulfilled, measurable, meaningful, and relevant to the NMHS. In some NMHSs a customer charter, mission and/or vision statement may be used to meet this requirement. It is important to ensure that the policy is realistic and contains achievable goals.
5.4 Planning 5.4.1 Quality objectives	Objectives are required and should be directly related to how quality will be achieved. Objectives are measurable goals or targets that should have KPIs (Key Performance Indicators) that are agreed quantifiable measurements that reflect the critical success factors of the NMHS. Objectives should be established at different levels and functions within the NMHS. Consider establishing objectives for each unit, site or department within the NMHS. It is important to establish meaningful, realistic, measurable short and long-term objectives that are achievable rather than high-level static objectives that may not necessarily relate directly to your area of responsibility. It is important to note that this requirement can be a little confusing as it would appear that there are two types or sets of objectives: - the first being those objectives which are developed as part of the normal planning processes - the second set that are "quality objectives"

	which could infer that other objectives are not quality or perhaps "non-quality" objectives. However, this is not the case. All objectives are (or should be) quality objectives that assist in guiding the NMHS towards its overall organization goals and desired future. What is important is to ensure that all objectives are measureable and consistent with the quality policy.
5.4.2 Quality management system planning	If the NMHS is in the process of establishing a QMS it is important to ensure that it meets the requirements of clause 4.1. Section 4.1 deals with identifying processes, interaction of processes and criteria for control etc. It also covers the control of outsourced processes. NMHSs with existing QMSs who find that new or extra processes have been identified or outsourced, require careful planning to ensure that these changes are reflected, whilst maintaining the integrity of the QMS.
5.5 Responsibility, authority and communication 5.5.1 Responsibility and authority	Top management shall ensure that the responsibilities and authorities are defined and communicated within the organization. A large proportion of avoidable errors and waste in an organization can occur because employees are not clearly aware of what they are responsible for and what level of authority they have in terms of decisions making. Responsibilities and authorities for all personnel should be clearly defined and made known to each employee. It is highly desirable that an NMHS provides duty statements and or job/position descriptions that clearly articulate responsibilities. An organizational chart is an excellent tool for illustrating reporting lines within an NMHS. If it is decided to include responsibilities and authorities within procedures, care must be taken to ensure that they do not contradict the content of job/position descriptions.
5.5.2 Management representative	This clause requires that a person with management authority ensures that the QMS is maintained and promulgated throughout the organization - a Quality Manager (or similar title). Whoever performs the role of Quality Manager, care must be taken to ensure that their position description reflects their responsibilities and it is strongly recommended it is at a senior level within the NMHS. An added requirement is that this role has responsibility to be the "champion" of QM. That is, making sure that the QMS is running smoothly and communicating with top management on its overall performance. Section 5.1 of this guide addresses the importance of this role and selecting the appropriate person for the position in more detail. Appendix E provides a sample job description for those NMHSs developing a QM Manager position.
5.5.3 Internal communication	Lack of effective internal communication is a recognized major problem for organizations. Clear communication lines need to be formally established, documented and recognized within the NMHS to assist with developing good

	communication and to promote strong teamwork ethic and to ensure confusion and ambiguity are avoided.
5.6 Management review	This requirement ensures that management take time to focus on the efficiency and effectiveness of the QMS within a structured framework. It provides an opportunity to analyze the information and data pertaining to the performance of the system. Some of this information includes audit results, customer feedback, improvements, changes, complaints, training issues or address any areas of concern. As an outcome of this process, actions must be minuted and followed- up at the next review meeting. Top management should be involved in this process - it would be highly desirable if the meeting was chaired by a senior member of the top management. The frequency of such reviews is determined by for example the maturity and complexity of the QMS. A frequency of at least quarterly is recommended during the initial development and implementation of the QMS. This frequency provides an excellent tool for establishing and monitoring the "health" of the organization. Once the QMS matures the NMHS may decide to change the frequency of these review meetings to at least once or twice a year. Appendix J provides a generic Quality Management Review Meeting Agenda/Minutes template.

KEY POINTS

1. Ensure responsibilities and authorities for all personnel are clearly defined in duty statements and or job/position descriptions.

2. Ensure the NMHS objectives are appropriately resourced, achievable and realistic.

Clause 6 Resource Management	
Requirements	**Guidance notes**
6.1 Provision of resources 6.2.1 Provision of resources	Resources is used as a general term in the context of the ISO Standard, relating to finances, materials, staff, and other assets required by the NMHS to function, realize its objectives and deliver its products and services. ISO 9001 stipulates that the NMHS determine and provide the resources it requires to maintain and continually improve the effectiveness of the QMS to meet customer requirements. "Resources" includes the provision of human resources, infrastructure and the work environment. Financial resources although not specifically mentioned, are also included under the provision of resources There is increasing community pressure that organizations be held to account and manage their financial activities diligently, transparently and ethically It is difficult (if not impossible) from the NMHS perspective, to see how it could provide quality outputs without due regard for the provision of appropriate financial resources. Often however, there is conflict between those who are responsible for providing a quality output and those who are responsible for the allocation of financial support. However, ISO 9001 with its integrated management components provides a framework for well-documented sound management practices. This offers the opportunity for the NMHS to clearly demonstrate its need for the appropriate allocation of resources both human and financial. This in turn creates greater credibility if the NMHS has achieved certification of compliance with ISO 9001. As such, although ISO 9001 does not specifically identify financial management, it clearly makes sense to include it within the QMS.
6.2 Human Resources 6.2.1 General	In this part of the standard the word 'competent' has raised a few concerns because of its use in the vocational education sector. The subjective nature of this word means that there is a need to define the competencies required of NMHS employees that relate directly to their workplace environment. This could be in the form of a skills matrix, training record, certificate, or they may be defined within individual position descriptions. Note: Competency standards of meteorological personnel have been articulated by WMO and will be included in the next revision of WMO 49. A link will be provided to them at that time.
6.2.2 Competence, Awareness & Training	Once the competencies have been defined any deficiencies identified for new or existing employees need to be rectified. To ensure that the actions taken have been successful, an evaluation will need to be undertaken to determine that the competencies have been achieved. Methods that can be used to determine the achievement of the competency could be in the form of an examination, test or simply observation by a supervisor whilst the task is being performed. For

	example producing a forecast or warning in a real-time operational environment, or a fault finding procedure on instrument specific to their work. The WMO Aeronautical Meteorology Program competency assessment toolkit also provides a valuable resource to assist in addressing the requirements of this clause. The following URL provides access to the toolkit: http://forum.14.caem.wmo.int/post14web/tt_cat/ There is also a requirement that employees understand how their work contributes to the overall achievement of the NMHS objectives. This may be achieved by induction or awareness training or as part of regular update meetings. Records have to be maintained to prove that training has taken place. Evidence of this could be a certificate from an external provider, or a sign-off on an employee's record.
6.3 & 6.4 Infrastructure & Work Environment	One way of determining what is required under the clause, is to establish what policies and/or procedures are needed (or are already in place), to ensure that the appropriate infrastructure and work environment is maintained to support the NMHS and its activities. This can include but is not restricted to: IT backup, dropout of phone/email/internet server, maintenance of buildings, pest control, power/gas/water failure, software upgrades, air/dust/temperature control, ergonomic changes in the workplace, etc. Once the required infrastructure and work environment has been identified to support the NMHS activities (and policies and procedures), it should be formally documented as part of the QMS.

KEY POINTS

1. The application of this requirement will vary according to the products and level of service of the NMHS.

2. Use certification of compliance with ISO 9001 (and the QMS) as a "marketing tool" to those responsible for providing financial supports to strengthen the credibility of the NMHSs budget allocations.

Clause 7 Product Realization	
Requirements	**Guidance notes**
7.1 Planning of product realisation	Section 7 provides the opportunity to reflect on the terminology used within ISO 9001. It is difficult to obtain unanimous agreement within international organizations that have large memberships. ISO is no different and has Members from over 150 nations. One of their challenges has been to achieve agreement on generic terms for 'providing our service', 'product manufacture', 'adding value' 'controlling the business' or similar. However, "product realization" has been agreed to and is an amalgamation of all the resources within an organization required to produce a product or service that is required by customers. The title must convey what the NMHS does and how all facets of what is done is controlled. Product realization is a somewhat elaborate term used to describe how an NMHS brings to completion/fruition the delivery of its suite of products. It begins with planning and continues on with understanding and agreeing to customer requirements, design, purchasing, control and validation of processes, identification and care of products and control of monitoring and measuring devices. Sound planning is a fundamental requirement. Within the QMS there is a need to describe what activities are performed to ensure that adequate planning takes place. This will also ensure when an activity is implemented it will be a success and there will be no wasted effort. Appendices A and B of this guide provide a set of generic planning templates that can be applied to the development of all activities (including products, services and projects), performed by an NMHS. As an aside, these templates have been implemented extensively within an NMHS and subjected to numerous rigorous and successful ISO certification audits. The templates enable the NMHS to answer questions such as: What are we trying to achieve? What targets or objectives have been set? What resources will we need? When it's done how are we going to check it and against what? What records will we have to keep? How do we formally accept a new product or service? The following is important to note in terms of product realization for those NMHSs that apply for exclusion under Section 7. It must be remembered that inputs are not just relevant to design and development activities. To achieve product realization for its suite of standard products, the NMHS will still need to utilize the various inputs following international requirements.

7.2 Customer-related processes 7.2.1 Determination of requirements related to the product	It is imperative NMHSs clearly identify who are their key stakeholders and in particular, their customers. It is important to clearly establish and document the customer's requirements. This will ensure there is no misunderstanding between the NMHS and the customer and internally between NMHS staff. For example the number of forecasts that will be issued and at what times, validity times and whether or not an amendment service will be provided. If the requirements change it is important to ensure there is a mechanism for communicating these changes. It is acknowledged that establishing product requirements for the general public can offer some unique challenges. These challenges require innovative approaches by NMHSs that include for example: web-based surveys, development of focus groups, feedback from social-networking platforms etc ..and it is suggested that there would be merit in NMHSs sharing best practices and exchanging views.. The WMO QM Forum provides an ideal forum to do this. It is important for the NMHS to understand and appreciate the intended use of the product by the customer(s) and what impact the NMHS product may have on the customer's operations. An approach such as this will place the focus on those components of the product that will have the highest impact on the customer's operations. However, the objectivity of the process must not be compromised for example by trying to accommodate a customer's specific thresholds. Once this has been established the requirements must be reviewed prior to committing to provide the product. Refer to the guidance note in 7.2.2. It is also important to ensure any statutory or regulatory requirements that apply to the product are adhered to. These requirements may be national and international. For example in terms of aeronautical meteorology there normally is national civil aviation authority regulatory requirements, ICAO requirements at the international level. .
7.2.2 Review of requirements related to the product	All reviews and the actions taken should be appropriately recorded as they provide a valuable resource if there is any dispute over the product at a later date. They also provide an excellent source of 'evidence' for audits. After collecting all required information a decision needs to be made as to whether the NMHS has the capability to deliver. For example is there an appropriate observational, meteorological or hydrological data and information to support the provision of a product? If a product cannot be delivered wherever possible provide the customer with a viable alternative. To avoid internal conflict there needs to be a defined process established to show that your capability has been assessed. This could be a sign off by a senior member of the NMHS with responsibility, or a formal contract signed by all parties. Part of the process must include safeguards so that when an order or

	contract is received it still reflects what was proposed initially and/or any agreed changes have been captured. Note: for verbal orders, there must be some confirmation process with your customer.
7.2.3 Customer communication	Ensure there are effective customer communication mechanisms in place. A major problem in some organizations is that they fail to simply talk to their customers to attain a sound understanding of their needs. It must not be assumed by an NMHS that it knows what their customers' needs are priori, as this can lead to significant problems. Regular industry forums and major public fairs, events and shows (boats shows, air shows and agricultural show) provide excellent opportunities to communicate face-to-face with the NMHSs customer base. Ensure there are mechanisms in place where customer complaints can be lodged and handled by designated staff who have the necessary training and competence in this area to handle complaints.
7.3 Design and development: 7.3.1 Planning 7.3.2 Inputs 7.3.3 Outputs 7.3.4 Review 7.3.5 Verification 7.3.6 Validation 7.3.7 Control of changes	As discussed earlier, any clause in section 7 may be considered for exclusion. Design and development is one of the most popular sections that can be excluded. Note that design and development cannot be excluded if they are part of the NMHSs normal activities. If however the NMHS has a standard suite of products and new products are not designed and developed by the NMHS, then due consideration should be given to excluding this clause. Remember if any exclusion is claimed, it must be declared in the quality manual along with an explanation of the justification. The layout of 7.3 and its components is relatively easy to follow and it must be remembered that there is not a requirement to have a separately defined procedure or process that follows the exact sequence of the standard unless the NMHS decides to. In order to ensure that the desired output is achieved, it is advisable to have a procedure or a step by step process defined for the various steps for the design activities. It is crucial for long term success (and quality outcomes) that the design output is correct. Often design output is expressed in the form of a drawing, a plan, a project specification, or the finished article as a 'sample' of the proposed product. The standard begins with design planning (7.3.1) which covers areas such as resources required, design stages, allocation of responsibilities and the cross communication within the NMHS ensuring that all aspects are covered i.e. finance, customer, safety, marketing, regulatory and product characteristics. The next step involves collecting all information on the required input (7.3.2) so that design and product realization can occur. Information such as observational data - surface, upper air, ocean and space; forecast products such as nowcasting products, numerical weather prediction based forecasts, seasonal forecasts etc; forecasts and advisory information

	issued by global and regional centres; product usage, statutory and regulatory requirements, performance criteria, efficiency or similar must be collected and analyzed for ambiguity or conflict. When completed, the output (7.3.3) of the design process must meet the input criteria including conformance to any necessary safe operating requirements. Throughout the process there should be reviews (7.3.4) to ensure proper progress and to correct or improve the design where necessary. To ensure that output has met input, verification (7.3.5) must occur, which will establish in theory that the design will be successful. *Note on verification:* within the NMHS operational environment verification is traditionally used to ascertain the quality of a forecast and warning product post delivery of the product. However, within the ISO environment verification occurs prior to delivery and the quality of the products is validated post delivery. Regardless, the verification of a forecasts and warnings prior to delivery is not possible. However, the NMHS can ensure that prescribed procedures and inputs for producing the forecast or warning have been followed by appropriately competent staff. Refer 6.2 of these guidance notes. Validation (7.3.6) follows verification to prove that in practice that the design has worked. The greater the risk the more extensive this validation should be. If any changes (7.3.7) occur throughout or after the design process, then these changes must be recorded and maintained. If changes occur after completion (after producing a forecast or warning) there may have to be repeat verification and validations performed on products already in use.
7.4 Purchasing 7.4.1 Purchasing Process	In all QMSs controls must be in place to ensure that finances are not wasted by poor purchasing decisions. It is appropriate here to implement risk management practices to ascertain the impact of the purchased product may have on the final product or service. Any purchase (from internal or external supplier, and including services, cooperation or assistance provided by other WMO Members at no costs) that has operational implications should be made with due consideration to any international and national regulatory and/or statutory requirements. It may well be worth considering approaching suppliers that have established and maintained their own QMSs, preferably having ISO certification. Whatever controls or techniques that are used, records must be kept to establish that evaluations have taken place.
7.4.2 Purchasing Information	Staffs who are responsible for generating purchase orders or for supplying information to suppliers must ensure that clear, unambiguous information is provided to suppliers to permit the supply of correct products and services. Depending on the complexity of the purchase, purchasing documentation must clearly state what is required. This may

	involve a detailed specification or contract, or a simple quotation of a part number.
7.4.3 Verification of Purchased Product	In brief, the standard requires that verification must take place to ensure that what was purchased has been received. A risk management approach can be used to determine the extent of verification activities required. In some cases it may be a simple count, a sample provided prior to acceptance, or some detailed inspection process. Whatever the techniques used, staff must ensure that consistent practices are followed. This verification may occur at the supplier's premises under a contractual arrangement. If this is the case then the standard requires that this condition of purchase be documented within the purchasing information provided to the supplier.

7.5 Production and Service Provision 7.5.1 Control of production and service provision	This clause focuses on how the work of the NMHS is controlled. (7.5.1 & 7.5.2). The ISO Standard requires that an NMHS product or service is generated and provided in a controlled manner to ensure that whatever is produced or delivered is in accordance with the customer's requirements. The Standard provides an array of control mechanisms from which to choose. In short, it may be an instruction manual, a suite of instructions, a drawing, specification, a series of photographs or procedures for inspection and testing or similar.
7.5.2 Validation of processes for production and service provision	This clause focuses on how the NMHS validates the processes it uses. Refer to the note on verification in 7.3 of these guidance notes.
7.5.3 Identification & Traceability	The majority of NMHSs will meet this requirement without any difficulty. All forecasts and warnings have (or should have) a specific identifier, validity period and a date/time that is specific to when the product was issued. Some NMHSs have specific ID numbers for each product that is generated, disseminated and electronically archived. This means that they can be differentiated from each other, traced and retrieved at any given time.
7.5.4 Customer Property	If the NMHS uses customer property that adds value to the development of a product, such as instrumentation then the NMHS must have defined controls to protect and care for the customer supplied or owned goods.
7.5.5 Preservation of Product	The NMHS should have controls in place to ensure that any product at whatever stage is protected from damage or corruption up to the point of delivery.

	For example this would include damage from a software virus that could corrupt a forecast product. Appropriate virus protection software should be in place.
7.6 Control of Monitoring & Measuring Devices	Instrumentation or devices that ascertain whether or not a product has met specified requirements must be accurate. Control measures may be formal maintenance schedules, or calibration and traceability of equipment to national or international standards. Whatever controls are in place, these devices which can include software testing programs must be appropriately maintained and identified. There are a range of ISO Standards that are specific to testing and calibrating equipment that would assist in this area including *17123*, *17025* and *10012* all of which are useful references. Note: Lists of documentation used by some WMO Programs have been established and are available on their WMO web pages.

KEY POINTS

1. Sound planning is a fundamental requirement.

2. Do not undertake or commit to tasks without ensuring the NMHS has the capability to deliver - make an informed assessment prior to committing.

3. Clearly establish and document the customer's requirements to ensure there is no misunderstanding of what is required.

4. If product requirements change, ensure that the appropriate resources are in place to support the changes and that there is a mechanism for communicating these changes to all stakeholders.

5. Validation follows verification to prove that in practice that the design has worked. The greater the risk the more extensive this validation should be.

6. Whatever controls or techniques are used, records must be kept to establish that evaluations have taken place.

7. Exclusions must be declared in the quality manual with an explanation of the justification.

Clause 8 Measurement, analysis and improvement	
Requirements	**Guidance notes**
8.1 General	To effectively manage an NMHS appropriate measure of success need to be defined and implemented. As such, in order to determine the success of an organization it must monitor, measure and analyze its activities. This is also directly related to the effectiveness and efficiency of its QMS. There must be good monitoring systems in place to produce meaningful information and data that can demonstrate conformance and identify where improvements are required. The NMHS should choose appropriate methods and techniques to achieve this.
8.2 Monitoring and measurement 8.2.1 Customer satisfaction	The fundamental goal of any organization is to satisfy its stakeholders, primarily its customers. Arguably they are the very reason for an organization's existence. Satisfied customers will help to ensure the NMHS receives the appropriate level of funding. It is important therefore to gain a clear understanding of how satisfied they are with the NMHSs products or services. The ISO Standard does not specify which way an organization is to gain customer satisfaction information. It requires the monitoring of information relating to customer perception and whether their expectations have been met. The NMHS determines the method(s) best used to carry this out. Surveys are a commonly used tool for this purpose, however it is important that the correct questions are asked. There can be considerable effort involved into retrieving and analyzing completed surveys. This guide provides a generic template in Appendix C that has been successfully used. Whatever the NMHS decides to use to gauge customer satisfaction, it must ensure that staff are made aware of the methods and that there is consistent application.
8.2.2 Internal Audit	The audit process is the "glue" that keeps the QMS together. It is a primary tool that an NMHS can use to ensure that its QMS is kept up to date. A considerable amount of effort is involved into developing and implementing a QMS. A key aspect of the QMS from an audit perspective is procedures. Unfortunately however, there are not many volunteers offering to write procedures. However, as they are vital to the QMS and with that the audit process, they should be pursued. Section 5.7 provides guidance in this area.

	It is imperative that the NMHS selects appropriate and suitable staff to perform internal audits. The techniques used and the staff selected to perform internal audits are critical and inappropriate or poorly trained auditors, can do significant damage to the NMHS. As your QMS matures and your practices, procedures and techniques change so should the QMS. Auditing is a way to ensure that your systems match your processes and that new and improved techniques become normal practice. A good indicator that NMHS has embraced a QM approach is when employees welcome an internal audit on their processes. Unfortunately due to ignorance, some managers use the audit process as a policing tool rather than an information gathering exercise. This should be identified and rectified as soon as possible. All audits should be conducted in a positive and non-threatening manner, otherwise they will be a waste of time. Audits should be conducted to help the NMHS improve its QMS and should not be looked upon just to please a certification process. The ISO Standard does not specify the techniques to be used for conducting an internal audit. Unlike certification audits, internal audits can be less formal events scheduled according to the NMHS organizational demands, priorities, available resources and risks associated with its operations. To assist this process, a procedure that simply explains the way the NMHS organization wishes to conduct internal audits should be written as guidance for all staff including the internal auditors. A generic procedure is presented in Appendix K of this guide for consideration. All facets of the QMS will need to be audited. This can be conducted on a stage by stage process over several audits. The internal audit does not audit all facets of the QMS at once but rather a sample is undertaken on job descriptions, procedures, instructions, policies, plans, organisation charts, flow charts, etc including the linkage between these documents which will all need to undergo the audit process. It is important not to just audit procedures as separate entities. Ensure that several linked procedures are audited as a process to ensure no gaps or excessive overlaps exists between them. Establishing a flexible audit schedule is a critical component of the audit process. It is valuable to plan internal audits prior to planning and budget activities. For example (1-2 months) prior to the development of the NMHS annual operational plan, ensure any significant issues identified from the audit are addressed as part of the planning process. The same applies to the budgeting process. Outcomes of an audit can highlight areas that require an injection of funds to rectify a specific issue.

	Internal audits should also be planned (and performed) prior to external audits. However, they should not be performed only one or two weeks prior to an external audit to provide evidence to an auditor. They should be part of the "business as usual" activities of the NMHS. Internal audits should also as appropriate, be employed on an ad hoc basis when and as necessary to highlight a significant issue that may have arisen. The audit will or should be the catalyst to ensure remedial action is taken. Remember the results of audits are tabled at Management Review meetings (refer 5.6 of this guide) and as such, will be highlighted to the top management of the NMHS. If the audit process gets 'off track' from the established schedule, it is important not to do some hurried audits to get back on track. It is better to select the most important processes and audit them properly and re-schedule other audits for a later date. Further guidance on the overall auditing process and the selection and training of internal auditors is addressed in section 5.7 of this guide.
8.2.3 & 8.2.4 Monitoring and Measurement of Processes & Product	It is imperative that the process and products of the NMHS are monitored and measured. Processes – Consider the following questions: Is the NMHS maintaining its equipment/instrumentation at an appropriate level? Is there a documented maintenance schedule in place? Is the appropriate testing and maintenance equipment available? Is there an equipment depreciation table/schedule? It is important that documented records are kept as evidence of these activities. Product - Consider the following questions: Are there appropriate records maintained to show that the products provided by the NMHS conform to requirements prior to delivery? Again, it is important that documented records are kept as evidence of these activities
8.3 Control of nonconforming product	Regardless of how diligent an organization is often activities do not always go according to plan and "non-conforming" products will occur. It is the responsibility of each NMHS to have controls in place to ensure that any incorrect product or service that is provided is identified and controlled. The key to this clause is the way in which non-conformances are captured and recorded. It is appropriate to have a non-conformance log (or similar) that can provide a history and enable the easy identification of reoccurring problems. Within a shift working environment where there are numerous staff working through the one position this is a vital QMS tool. Internal problems are usually found by the employees as a result of real-time analysis, inspections, maintenance activities or audits, whereas external

	problems are identified in the NMHS environment as the result of post delivery verification or customer feedback. There must be a procedure that describes how the problem products are identified and captured, how they are dealt with, who is responsible for deciding what to do, what action should be taken and what records are to be kept. A generic non-conformance procedure is provided in Appendix D. It is important to not treat all problems the same. There may be a formal process for dealing with a major issue but it is just as appropriate to have a process that deals with what may be considered 'smaller' issues. What is considered a major or small problem needs to be established by the management (in close consultation with their staff) of each work area based on the established risk level and remedial actions documented.
8.4 Analysis of data	It is important that an NMHS undertakes a careful analysis of selected data in an effort to detect trends. This will provide the opportunity to implement actions that take advantage of positive trends. Conversely it will provide the opportunity to take preventive actions should negative trends be detected. Forecast verification is one example that applies here. The standard states there are four areas in which data should (shall) be analysed to obtain information on the performance and effectiveness of the QMS. Each of these areas will not only provide information on the effectiveness of the QMS but they also provide a good indication of the overall 'organizational health' of the NMHS. The result of this analysis provides valuable input into the management review process.

8.5 Improvement 8.5.1 Continual improvement	The intent here is to ensure that the NMHS is making progress with regard to the effectiveness of its QMS. It raises questions such as: Are outputs better this year than they were last year? Are we optimising the use of our resources? Are we making better use of our system indicators such as audits, management review and data analysis? To survive, all organizations must improve over time or face losing their integrity and with it, their credibility. It therefore makes sense to ensure that sound measures are in place to provide this information.
8.5.2 Corrective Action	This clause is similar to 8.3 in terms of its intent. It is inevitable problems will arise, and the processes required to capture the problem and correct it. Historically, a number of organizations have developed special forms but this is not always necessary. The very need to fill out a form is often a disincentive for solving a minor problem. So be aware of the potential for this to happen. The ISO Standard requires that appropriate actions are to be taken to address the effects of the problem. This may require a simple correction performed by the duty officer or, in a major event using significant levels of resources. A risk analysis can help to determine the appropriate actions that need to taken.

	A corrective action procedure is required that clearly defines the action to be taken to solve or rectify the problem.
8.5.3 Preventive Action	Preventive action is a better option as it involves taking action before a problem occurs. It can also save considerable time and money. Analysing trends (refer 8.4) and taking action prior to the occurrence of a non-conformance helps to prevent problems. As with corrective action, the standard requires a procedure for this process as well. Due consideration should be given to combining the preventive action with the corrective action process and thereby simplifying the process. Examples of preventive action are; staff training, maintenance, application of audit results, customer feedback, use of control charts and other statistical techniques.

KEY POINTS

1. A real key to a successful QMS is the availability of data to provide objective information as a measure of conformity to policies, objectives, goals, key performance indicators (KPIs), such as, customer satisfaction measures

2. The very existence of an organization is directly related to satisfying its stakeholders and the primary ones are its customers.

3. Corrective action is defined as action taken to eliminate the cause of an identified nonconformity. Preventive action is an action taken to eliminate the cause of a potential nonconformity.

4. Due consideration should be given to combining the preventive action with the corrective action process and thereby saving another procedure to manage.

SECTION 5: Steps for implementing a quality management system

5.1 Implementation overview

5.1.1 Figure 4 presents an overview of the broad steps that need to be taken to develop and implement a QMS. It is assumed that this broad overview would provide a foundation tool at an initial meeting to discuss whether or not a NMHS will adopt a QM approach to the delivery of its services. It is not possible to put a definitive time period that it takes to implement a QMS and achieve certification of compliance with ISO 9001. Many factors can impact the time that it takes, including the size of the organization; whether or not it is being assisted by a consultant; the maturity of the organization's processes and documentation; availability of resources and the commitment of the top management and the staff are but a few. Firsthand experience suggests that with due regard to the above factors, a time period of 18 - 24 months is a realistic and achievable time frame for a small-sized NMHS or specific sections of the NMHS, e.g. aviation weather service. Small sections or units (~20 staff) within an NMHS, could implement and achieve certification of compliance with ISO 9001 within an 18 month time period. Again it must be emphasized that many other factors come into play that can impact on the implementation of a QMS. An good approach is an incremental one where a QMS is developed and implemented for different sections or programme areas of the NHMS. Success in these individual areas could also bring confidence and staff buy-in to implement QMS for other areas of the NMHS. Figure 4 presents a timeline that takes into account the 12 basic steps presented in Figure 3 whilst incorporating additional internal audits and Quality Management Review Meetings

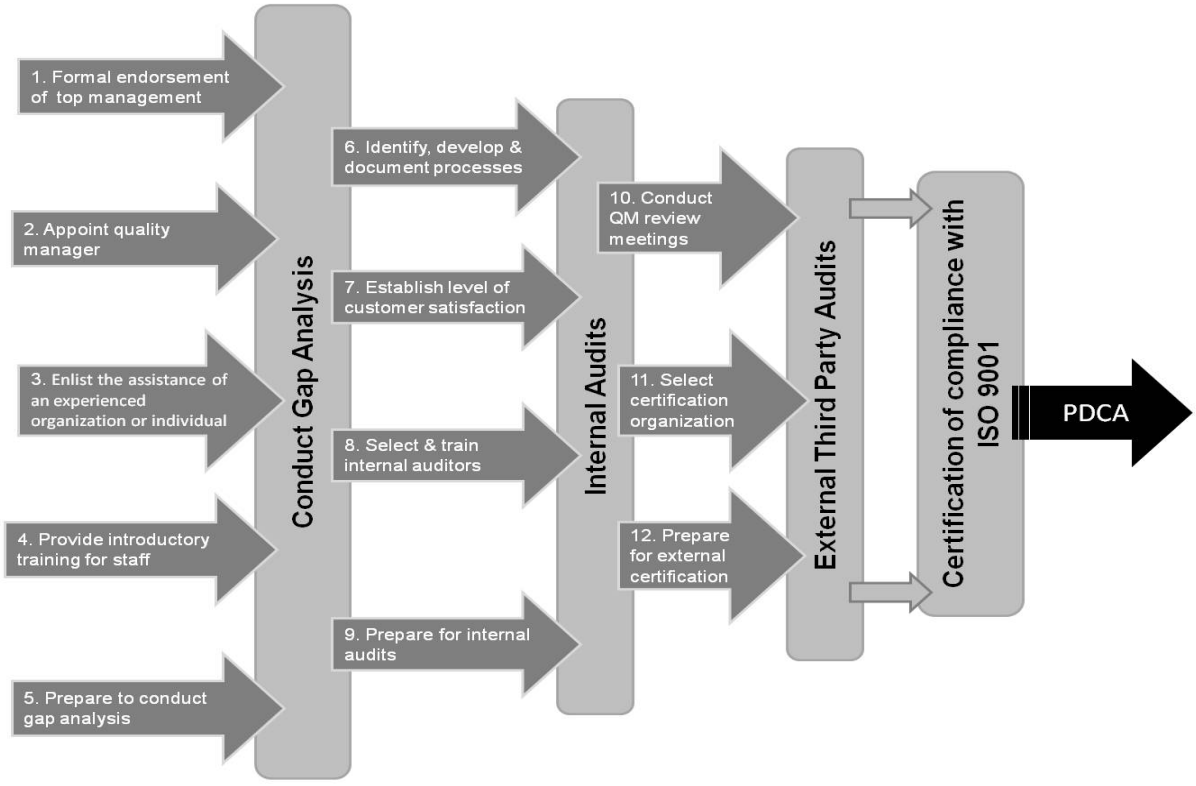

Fig 3: Primary steps to achieve compliance with ISO 9001 & enhance customer satisfaction

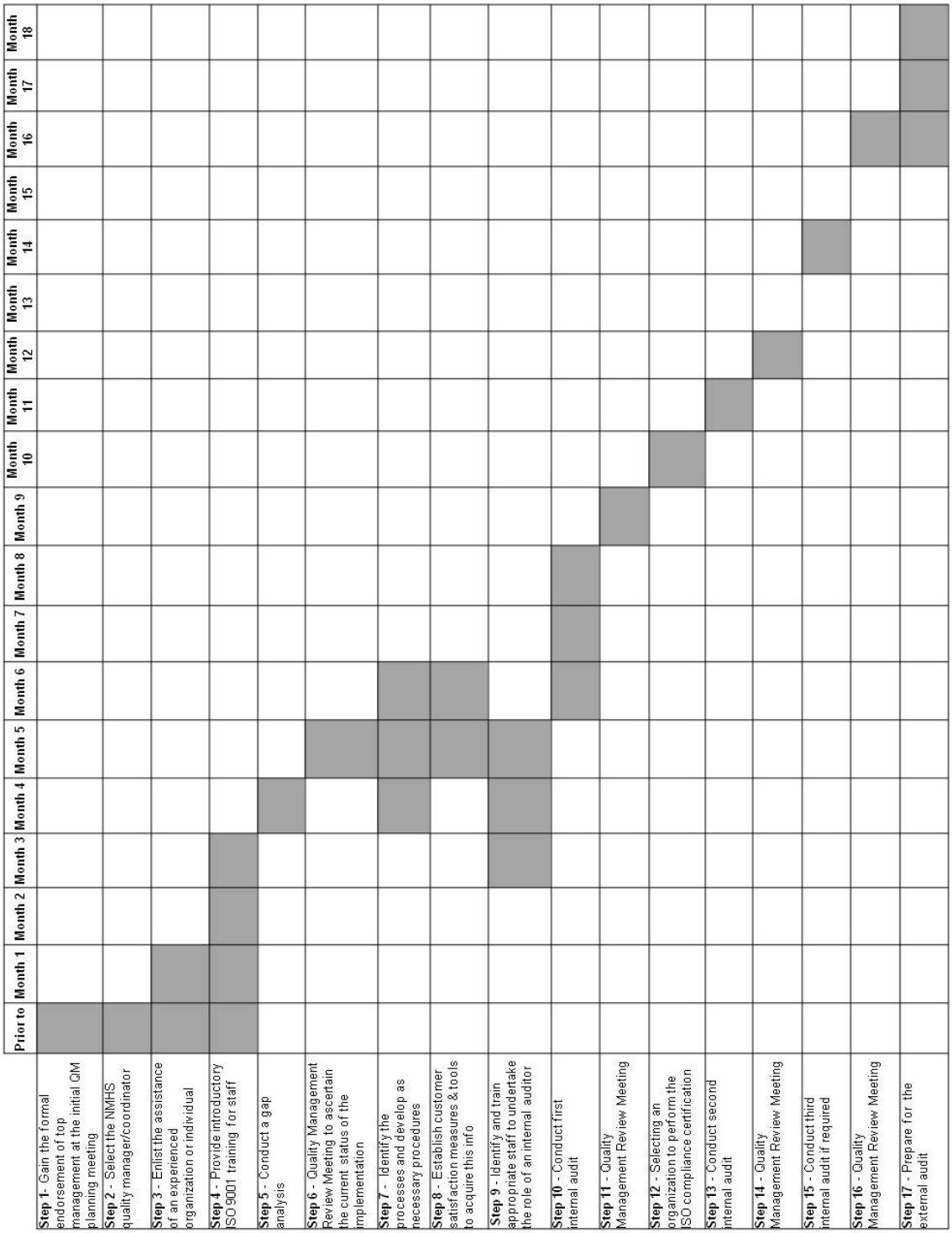

Fig 4: Broad timeline for the implementation of a QMS and certification of compliance with ISO 9001 for a small section or unit of an NMHS

5.2 Step 1 - Gain the formal endorsement of top management

5.2.1 Clause 5.1 of ISO 9001 has been addressed in 4.3 - Explanatory notes on the clauses of this guide. However, there is a need to emphasize the importance of this clause as it is the first step, to adopting a QM approach to the delivery of NMHS services. Clause 5.1 requires top management to demonstrate its commitment to development and implementation of a QMS. This demonstration of commitment should also involve a formal endorsement that is communicated to all staff.

5.2.2 The majority of NMHSs operate within a public sector framework and may not have complete control over their budget. However, it is imperative that the Director/CEO of the NMHS clearly establishes that the finances to support a QM initiative will be available. The proposed development and implementation of the QMS should be formally documented and include the proposed implementation strategies, a broad timeline and estimated budget.

5.2.3 It is not possible within the context of this guide to provide a definitive cost to implement a QMS. The scope of the QMS, costs of training, consultants and certification bodies will differ from region to region. However, this guide will raise some important questions that will need to be asked in later steps in this QMS implementation overview in terms of the financial commitment required. Although the answers to these questions will enable a fairly accurate budget to be developed it would also be prudent allocate a contingency fund to cover indirect costs that may not be initially identified. For example; an NMHS may decided to upgrade its instrumentation to enhance the quality of its observation network. Additional (and at times hidden costs), could be attributed to obtaining the certification from the manufacturer of the instruments.

5.2.4 A final but significant comment pertinent to this step; unless the formal endorsement and commitment of the top management can be obtained, it is a waste of time and resources to contemplate commencing. If the process does commence without this endorsement and fails, the impact to staff morale will result in significant problems. Ensure the commitment of top management and the appropriate level of resources are fully supported.

5.3 Step 2 - Selecting the NMHS quality manager/coordinator

5.3.1 The appointment of a quality manager or quality coordinator is a key factor in the success of a QMS. It is highly recommended that a full-time staff member is appointed at a senior level. It is imperative that the individual selected is committed to remain in service during the development, implementation and ongoing phases of the QMS.

5.3.2 The position will inevitably be the driving force behind the QMS and the primary focus for issues pertaining to the QMS. It requires an individual with a specific set of skills, knowledge and character traits that will attain the confidence of the NMHSs top management and as appropriate, allow direct access to them.

5.3.3 A generic job description and selection criteria for this key role is provided in Appendix E to provide guidance and a starting point for developing such a role in a NMHS.

5.3.4 It is imperative that the individual appointed has a strong desire and interest to undertake the challenges associated with developing and implementing a QMS – a forced or political appointment will potentially if not inevitably, undermine the QMS and lead to its failure.

5.4 Step 3 - Enlist the assistance of an experienced organization or individual

5.4.1 If the NMHS appoints a quality manager who has no experience in the development and implementation of a QMS but shows great potential, it would be well worth considering seeking the assistance of an NMHS with a mature QMS, WMO expert in the QM field or engaging a quality management consultant.

5.4.2 It is strongly suggested that several potential candidates (especially consultants) be interviewed to ascertain their knowledge and relevant experience and how well they will align with the NMHS organizational culture. An interview process also provides an opportunity to assess their commitment to working with your NMHS. This can be done by ascertaining the level of interest they have taken prior to interview to obtain information about the NMHSs activities and services that it provides.

5.4.3 A number of consultants will also provide a QM training service and it is important that their training credentials are assessed by their qualifications and course content. It is important that they are accredited trainers and can provide an introductory course that will "demystify ISO 9001" for all staff involved in the QMS.

5.4.4 A basic framework of questions for establishing the credentials and the suitability of potential experts is provided in Appendix F.

5.5 Step 4- Providing introductory ISO 9001 training for staff

5.5.1 Provide introductory training for all staff involved in the QMS – starting with the core QM team and especially the CEO/Director. A basic introductory ISO training course helps to ensure the successful implementation of a QMS by providing a sound understanding of the principles and practices pertaining to ISO 9001. You may be fortunate enough to find a quality management expert/consultant that is also a qualified training officer. Ideally this training should be provided by a registered training organization with expertise in this area (Refer Section 9). Although not ideal, if a staff member is to be used to provide the training, that individual must possess a sound and demonstrated background in the subject matter combined with wherever possible, formal training skills.

5.6 Step 5 - Conducting a gap analysis

5.6.1 A gap analysis is a technique for determining the steps to be taken in moving from a current state to a desired future-state. In terms of a QMS a gap analysis is undertaken to clearly identify which clauses of ISO 9001 are not currently being fully met (or not met at all) and develop remedial actions to rectify the situation. The gap analysis should be conducted by members of the QM team/section who have auditing qualifications. Refer 5.9 - *Identify and train appropriate staff to undertake the role of an internal auditor.*

5.6.2 Two gap analysis tools (Part A and Part B), have been developed and will assist by providing a structured framework within which to establish the current status of an NMHS in terms of meeting the ISO 9001 clauses. Note: The tools have been developed broadly based on the Praxiom Research Group Limited gap analysis tool.

5.6.3 *Part A: Gap Analysis* is aligned with the clauses of ISO 9001. A Gap Analysis template (refer Appendix G) provides comments and notes to assist in using this tool.

5.6.4 *Part B: Gap Analysis Findings* lists the remedial actions that are recommended to taken to close the identified gaps that exist between the ISO 9001 and the NMHSs current management system. A Gap Analysis Findings template (refer Appendix H) provides comments and notes to assist in using this tool.

5.6.5 An important consideration in using the gap analysis tools is that for majority of staff it will be their first introduction to an "audit-like" process and the practical aspects of a QMS. As such, it is important that it is a positive experience from all perspectives. Remember any gap analysis or audit should be focused on the processes and system overall - not the individuals who follow the practices and procedures provided.

5.7 Step 6 - Identifying processes and developing procedures

5.7.1 Developing and writing procedures and that are currently being undertaken within the QMS scope is a critical component of a QMS. It is imperative that they are developed in close consultation with the staff that perform the processes as part of their duties.
5.7.2 It is important to find a balance between "over documenting" and not providing a sufficient level of information whilst ensuring the processes are clearly articulated and not ambiguous. Further information pertaining to documentation may be accessed via the ISO web site titled: *Introduction and support package, Guidance on the documentation requirements of ISO 9001:2008* as per the following URL - http://www.iso.org/iso/iso_catalogue/management_standards/quality_management/iso_9001_2008/guidance_on_the_documentation_requirements_of_iso_9001_2008.htm

5.8 Step 7 - Establish appropriate customer satisfaction measures and tools to acquire this information

5.8.1 It is imperative that appropriate client satisfaction measuring tools are established from the outset so as to provide a baseline from which to measure improvement in service delivery. ISO 9001 notes that there are a number of ways in which the level of client satisfaction can be established.

5.8.2 Industry focus groups can be used as a viable measuring tool where the NMHS communicates face-to-face with representatives of a particular industry sector serviced by the NMHS. These are valuable because there is an opportunity to ask questions and to clarify the customer's feedback. It also offers the opportunity to develop strategies with the customer to rectify any issues. Focus groups also offer the opportunity to establish a core reference group. In turn, the core reference group will gain a greater degree of knowledge and understanding of the environment in which the NMHS operates. It is important that the actions arising and levels of customer satisfaction determined from these meetings are fully documented as per the control of records requirements of ISO 9001. The documented outcomes will enable the identification of trends in customer satisfaction over a period of time.

5.8.3 Customer survey tools have the potential to enable the NMHS to reach a larger audience. However, they are also notoriously difficult to get the customer to respond to. It takes a great deal of tenacity and patience to obtain a viable number of responses that provide credible and useable feedback on customer satisfaction. When conducting a customer satisfaction survey tool the following broad key points should be taken into account:

- Clearly establish why it is being conducted, who is it focused on and when is the most appropriate time to conduct it;
- Organize the contents of the survey;
- Establish a budget for the survey (mail costs etc if applicable);

- Develop the questions;
- Determine what method will be used for the survey, email, web-based, hard copy, telephone, focus group
- Establish how the results will be analyzed;
- Pre-test the questionnaire and finalize;
- Finalize dates for dispatch and return;
- Disseminate the survey;
- "Retrieve" the surveys - this can present some difficulties and it is when tenacity and patience are required by those conducting the survey;
- Implement the data analysis process;
- Interpret the findings;
- Develop actions to address issues raised;
- Write a survey report and disseminate to key stakeholders and most importantly NMHS staff

5.8.4 A generic Customer Satisfaction Survey Tool template is provided in Appendix C.

5.8.5 The provision of a web feedback facility on the NMHSs web page can also offer very valuable feedback. It is strongly suggested that the web feedback page be organized to enable the clear identification of what the feedback pertains to. This will maximize the usefulness of the feedback to the NMHS. A generic web feedback page layout is provided in Appendix I for consideration.

5.9 Step 8 - Identify and train appropriate staff to undertake the role of an internal auditor

5.9.1 It is critical that due care be taken in selecting staff to perform the role of an internal auditor role. Individuals who show potential as auditors should be provided with formal training from a registered training organization (refer Section 5.4).

5.9.2 Apart from appropriate training they should also possess the necessary personal qualities and attitude to enable them to act in accordance with the principles of auditing. There are six principles for auditing stated in *ISO 19011:2002 Guidelines for auditing quality management systems*. The principles stated in *Principles of auditing* are as follows:

a) Integrity: *the foundation of professionalism*

Auditors

- Perform their work with honesty, diligence, and responsibility.
- Will observe the law and make disclosures expected by the law and the profession.

b) Fair presentation: *the obligation to report truthfully and accurately*

Audit findings, audit conclusions and audit reports reflect truthfully and accurately the audit activities. Significant obstacles encountered during the audit and unresolved diverging opinions between the audit team and the auditee are reported.

c) Due professional care: *the application of diligence and judgment in auditing*

Auditors exercise care in accordance with the importance of the task they perform and the confidence placed in them by audit clients and other interested parties. Having the necessary competence is an important factor.

d) Confidentiality: *integrity and security of information*

Auditors should be prudent in the use and protection of information acquired in the course of their duties.

The auditors do not disclose information without appropriate authority unless there is a legal or professional obligation to do so.

The following two principles relate to the audit, which is by definition an independent and systematic activity.

e) Independence: *the basis for the impartiality of the audit and objectivity of the audit conclusions*

Auditors are independent of the activity being audited and are free from bias and conflict of interest, wherever practical. Auditors maintain an objective state of mind throughout the audit process to ensure that the audit findings and conclusions will be based only on the audit evidence.

f) Evidence-*based approach: the rational method for reaching reliable and reproducible audit conclusions in a systematic audit process*

Audit evidence is verifiable. It is based on samples of the information available, since an audit is conducted during a finite period of time and with finite resources. The appropriate use of sampling is closely related to the confidence that can be placed in the audit conclusions.

(ISO 19011:2002 Guidelines for auditing quality management systems p. 3 & 4)

5.9.2 There are a number of other factors that influence the outcome of an audit and Figure 5 provides an overview of the key components that apply to auditors to achieve a high quality audit outcome.

5.9.3 It is strongly suggested that the NMHS obtain a copy of *ISO 19011:2002* which provides excellent guidelines on auditing a QMS. A copy may be purchased via the ISO Online Store: http://www.iso.org/iso/publications_and_e-products.htm

Fig 5: Key factors for achieving a high quality audit outcome

5.10 Step 9 - Conducting internal audits

5.10.1 Conducting an audit and developing a robust internal audit schedule is another critical component of QMS. ISO 9001 states:

> 8.2.2 Internal audit
> The organization shall conduct internal audits at planned intervals to determine whether the quality management system:
> a) conforms to the planned arrangements (see 7.1), to the requirements of this International Standard and to the quality management system requirements established by the organization, and
> b) is effectively implemented and maintained.
> An audit programme shall be planned, taking into consideration the status and importance of the processes and areas to be audited, as well as the results of previous audits. The audit criteria, scope, frequency and methods shall be defined. The selection of auditors and conduct of audits shall ensure objectivity and impartiality of the audit process. A documented procedure shall be established to define the responsibilities and requirements for planning and conducting audits, establishing records and reporting results. Records of the audits and their results shall be maintained (see 4.2.4).

5.10.2 It is strongly suggested that NMHSs widely publish an audit schedule (plan) as it will be useful as a planning tool for key stakeholders.

5.10.3 The internal audit procedures should cover all facets of preparing for and conducting an audit that includes: Audit scope, References, Definitions, Audit Scheduling, Audit Performance, Follow-up Audits, Corrective Action / Follow-up Format, Audit Documentation, Audit Failure and Management Review. A generic internal audit procedure and an internal audit process chart summary that can be used as a quick reference and is provided in Appendix N.

5.10.4 Paragraph 5.9.2 of this Guide addressed in broad terms the highly desirable personal character traits of auditors. However, it is also important to note as per clause 8.2.2 of ISO 9001, that an auditor must be objective and impartial and "shall not audit their own work". This needs to be addressed from both the internal and external auditor perspective.

5.10.5 The situation can be relatively easily rectified within the NMHS internal audit environment. The QM Manager should ensure that any internal audits are conducted by staff who do not work in the area being audited.

5.10.6 In terms of external auditors the need for objectivity and impartiality is even more imperative. There are numerous organizations globally offering their services as consultants to assist in the development and implementation of a QMS. However, there are some that may also offer their services as the certification body and this is inappropriate. Again clause 8.2.2. of ISO 9001 clearly states that "auditors shall not audit their own work". Any NMHS contemplating engaging such an organization should give it considerable thought. Remember, the credibility of the NMHSs QMS and its certification of compliance with ISO 9001, is based on the objectivity and impartiality of the third party external audit process. If the certification body actually assisted in developing and implementing the QMS and then conducted the third party audit, it is clearly not objective or impartial. Nor does it meet the requirements of clause 8.2.2 of ISO 9001.

5.11 Step 10 - Quality Management Review Meetings

5.11.1 Although there are no specified time periods in ISO 9001, NMHSs are encouraged to conduct quarterly Quality Management Review Meetings at a frequency of at least quarterly during the initial development and implementation of the QMS, and once or more a year, after the QMS matures. Section 5.6 of ISO 9001 provides the detailed requirements applicable to management reviews of the QMS. Appendix J provides a generic template that may be used very effectively for the agenda and subsequent meeting minutes.

5.11.2 In terms of the participants at a Quality Management Review Meeting it is highly desirable if a senior member of the top management of the NMHS chairs the meetings. This will send a strong message to the NMHS staff in terms of the commitment of top management to the QMS. It will also assist top management demonstrate to auditors their tangible commitment to the QMS. The secretariat duties would nominally be undertaken by the QM Manager/Section. Other participants could include the senior officers from the area(s) within the scope, the internal auditors and other staff members from the area(s) within the scope of the QMS as is deemed appropriate..

5.12 Step 11 - Selecting an organization to perform the ISO compliance certification

5.12.1 Selecting an organization to perform the ISO 9001 compliance certification is an important task. It is imperative that the credibility of the certification body is established by determining in terms of its experience, relevance, knowledge and values through a formal selection process. When selecting a certification organization it is a worthwhile exercise to establish the following details pertinent to the organizations being considered.

a. Whether or not it complies with *ISO/EC 17021:2005 Conformity assessment - requirements for bodies providing audit and certification of management systems* and can demonstrate a positive track record in assisting Member NMHSs in developing and implementing QMS.

b. The profile and credibility of their “standard mark” from both a national and international perspective.

c. Whether or not they currently provide certification services for providers of weather services and or allied industries.

d. Their commitment to providing strict (hard) and thorough audits.

e. The availability of an audit team member who has a sound understanding and appreciation of the NMHSs activities, products and services.

g. Establish that they have a definitive fee structure for the three year certification period including any costs associated with travel.

h. Obtain testimonials from current and former clients as to the quality of their services.

5.12.2 To ascertain further credentials pertaining to potential certification bodies, it is highly recommended that the web site of your national accreditation organization is accessed and this will provide a list of national certification bodies. Access can be obtained through the International Accreditation Forum (IAF) web site via the following URL: http://www.iaf.nu/

5.12.3 Additional information on selecting a certification body may be accessed through the International Organization for Standardization (ISO) via the following URL: http://www.iso.org/iso/iso_catalogue/management_and_leadership_standards/certification/choosing_a_certification_body.htm

5.13 Step 12 - Preparing for an external audit

5.13.1 Preparing for a ISO 9001 certification (third party) audit can be a daunting experience for all concerned. However, some guidance pertaining to this process is as follows:

a. Embrace the audit process as a positive experience for the NMHS that will provide guidance on improving its processes, systems and the overall quality of its products;

b. Liaise closely with the certification body to establish dates for the audit that suits all concerned. Most importantly do not consider undergoing the certification audit unless there is a strong indication - based on the success of internal audits and your QM consultant's advice if you have one, that it will be successful;

c. Ensure all staff are provided with adequate lead time to prepare for the audit;

d. Provide a pre-briefing to the certification auditor on any potential safety issues relevant to the location they will visit;

e. Ensure there is ease of access to all documentation that may be required during the audit; and

f. Ensure staff do not attempt to hide or cover up any known problem areas. The certification costs money but it is an investment in the future of the organization and ongoing improvement.

SECTION 6: Appendices

A: Generic Product Development Planning Template

B: Generic Product Acceptance Template

C: Example of a generic Customer Satisfaction Survey

D: Example of a generic non-conformance procedure

E: Example of a job description, duty statement and selection criteria for QM Manager

F: Establishing the credentials and suitability of potential consultants

G: Part A: Gap Analysis

H: Part B: Gap Analysis Findings

I: Example of a generic web feedback template

J: Example of a generic Quality Management Review Meeting Agenda/Minutes

K: Examples of Internal Audit Procedure

L: Internal Audit Checklist

M: Internal Audit Report

N: Quality Management Internal Audit Process

APPENDIX A

A: Generic Product/Activity Development Planning Template

Governance

This plan incorporates all elements for appropriate governance including:

- An outline of the relationships between all internal and external groups involved and a clear assignment of roles and responsibilities;
- A mechanism to assess the compliance of the completed activity to its objectives;
- An agreed specification for the deliverables;
- A defined method of communication to each stakeholder and a system of accurate upward status- and progress-reporting;
- A process for the recording and communication of risks identified during the activity; and
- Required approvals and direction for the activity.

The term "product" is interchangeable with the term "service". In the context of maximizing the use of this planning template, it can also be substituted with the word "project" to cover specific projects that the NMHS undertakes.

Version Control

VERSION	AUTHOR	DATE	COMMENTS

1. PRODUCT/ACTIVITY DEFINITION				
Product/Activity Title				
NMHS Program				
Start Date / End Date				
Stakeholders	List the key stakeholders or stakeholder groups who will be affected by the initiative. Stakeholders provide or receive a service, to or from the initiative. They are critical to the success of the product.			
Related Activities	List any related activities that are dependent on this initiative or others that are interdependent on this initiative, or those upon which this initiative is dependent. These may share data, function, technology or staff with the project.			
Product Authority	Detail the lines of authority and responsibility.			
Product Funding	Identify the source of funding			
Officer Responsible	**Name**	**Position/Section**	**Phone**	**Email**
Sponsor				
Manager				

2. PRODUCT DESCRIPTION	
NMHS Objective	Include broad NMHS objective relevant to this product.
Product Objective	What is the objective of the product? Objectives need to be specific (addressing customer's requirements) and measurable.
Background	Introduction or background to the product including where appropriate identified customer requirements.
Product Description	
Scope	Identify the broad boundaries of the product and what it is designed to achieve with a specific focus on any customer requirements. It is also useful to consider what may be outside the scope of the product.
Deliverables	What are the product deliverables?

3. JUSTIFICATION	
Expertise	
Benefits	Provide an explanation as to why this initiative has been identified as a priority and associated desired benefits/outcomes. Include links to the NMHS objectives, priorities, strategic plans and meeting identified customer needs.
Impact	What are the consequences if this product is not developed?

4. COMMUNICATION STRATEGIES				
Description	**Target Audience**	**Delivery Method**	**Frequency**	**Responsibility**

How are details of the product going to be communicated to the stakeholders and in particular key customers? Include meetings, liaison and progress reports. Progress reports should occur at agreed predetermined time intervals or at key milestones. They shall include the actual progress against the planned schedule (including cost, time & performance).

5. EVALUATION METHODS			
Description	**Methodology**	**Target**	**Responsibility**

Clearly define the key performance indicators (measure(s) that will indicate that the initiative has been successfully completed).

6. MILESTONES			
Milestone	**Accountability**	**Dates**	**Status**
Milestone 1:			
Milestone 2:			
Milestone 3:			
Milestone 4:			
Milestone 5:			
Milestone 6:			

7. RISK SUMMARY			
Risk Description	**Likelihood**	**Mitigating strategies developed and implemented Yes/No?**	**Residual Risk**

8. BUDGET				
Description	*** 2012-11**	***2013-14**	***2014-2015**	**Ongoing**
Salaries				
Goods and Services				
Assets				
Overhead				
Total				

***** Or include months if it is to be completed within a specific financial year

APPENDIX B

B. Generic Product Acceptance Template

The term "product" is interchangeable with the term "service". In the context of maximizing the use of this planning template, it can also be substituted with the word "project" to cover specific projects that the NMHS undertakes.

1. PRODUCT OVERVIEW				
Product Title				
NMHS Program				
Start Date / End Date				
Product Team	**Name**	**Position/Section**	**Phone**	**Email**
Sponsor				
Manager				

2. PRODUCT DESCRIPTION	
Objective	What is the objective of the product? Objectives need to be specific (addressing customer requirements) and measurable.
Description	
Scope	Identify the broad boundaries and what the product is designed to achieve with a specific focus on any customer requirements. It is also useful to consider what may be outside the scope..
Deliverables	What are the deliverables?
3. ACCEPTANCE INFORMATION	
Method	Describe the mechanism used to obtain formal agreement for deployment. For example, the mechanism may involve a face-to-face meeting, teleconference, or some other formal approach to specifically obtain acceptance to deploy the product.
Representatives	Identify who was involved in acceptance, including which functional areas (e.g., program staff, vendor, finance, quality) were represented. Include name, role or title, section, organisation.
Documentation	Describe documents used as supporting material during acceptance, including whether the documents required a formal signature for approval.

4. ACCEPTANCE CHECKLIST		
Item	**Question**	**Functional Area**
4.1	Did you formally approve plan(s) that identify operational requirements, service readiness, training, knowledge transfer, rollout strategy, and other core activities/factors that are necessary to effectively move a technology-based product and/or service to an operational status? For example, did you approve a Deployment Plan, Training Plan, Operations and Maintenance Plan, and/or Product Release Plan?	Yes ☐ No ☐
4.2	Did you formally accept all test results?	Yes ☐ No ☐
4.3	Do you accept the product and/or service is ready to be operational?	Yes ☐ No ☐

4.4	Do you agree the product and/or service has sufficiently met the stated business goals and objectives?	Yes ☐ No ☐
4.5	Do you fully understand and agree to accept all operational requirements, operational risks, maintenance costs, and other limitations and/or constraints imposed as a result of making the product and/or service operational?	Yes ☐ No ☐

Respond to each question. For each "no" response, include an issue in the Open Issues section.

5. OPEN ISSUES	
Issue	**Planned Resolution**

Describe any open issues and plans for resolution within the context of formally accepting deployment of the product and/or service. Include an open issue for any "no" responses in the Acceptance to Deploy Checklist section.

6. PRODUCT ACCEPTANCE			
Approver	**Signature**	**Date**	**Comments**

Note: Approval of this Product Acceptance indicates an understanding and formal agreement that the product and/or service has been developed and implemented in accordance with the Plan and is now complete or operationally implemented

APPENDIX C

C: Example of a Customer Satisfaction Survey

NMHS
CUSTOMER SATISFACTION SURVEY

Please answer the following questions by ticking the appropriate box/es.

CUSTOMER INFORMATION

1. Please indicate your industry sector.
(Insert country industry sectors here – as per examples below).

- ☐ Commercial Shipping
- ☐ Commercial Fishing
- ☐ Marine Regulatory Organisation
- ☐ Emergency Services
- ☐ Recreational Maritime sector
- ☐ Search & Rescue Organisations
- ☐ Aviation
- ☐ Coastguard Organisation
- ☐ Port Authorities
- ☐ Offshore Industry Sector
- ☐ Defence Force
- ☐ Commercial Boating Industry
- ☐ Commerce
- ☐ Agriculture

PRODUCTS AND SERVICES

2. Which products and services do you use?
(Insert NMHS suite of products here as per examples below)

- ☐ Tsunami Warning
- ☐ Tropical Cyclone Warning
- ☐ Severe Thunderstorm Warning
- ☐ Search and Rescue
- ☐ Severe Weather Warning
- ☐ Coastal waters Warnings
- ☐ Metropolitan Waters Warning
- ☐ Metropolitan Waters Forecast
- ☐ Tropical Cyclone Advisory (TCA)
- ☐ High Seas Forecast
- ☐ Tropical Cyclone Outlook
- ☐ Land Waters Forecast
- ☐ Island Forecasts
- ☐ Observations products

☐ Ocean Waters Warning
☐ Flood Warnings
☐ Ditching Report
☐ Storm Tide Alerts
☐ Public Telephone Briefing
☐ Coastal Waters Forecast
☐ Tidal Services
☐ High Seas/Ocean Forecasts
☐ Other (please specify):

3. How would you rate the professionalism of the NMHS personnel?

☐ Highly professional ☐ Professional ☐ Unprofessional

4. How would you rate the responsiveness of the NMHS personnel?

☐ Always responsive ☐ Mostly responsive ☐ Unresponsive

5. How would you rate the overall accuracy of the products and services?

☐ Always accurate ☐ Usually accurate ☐ Inaccurate

6. How would you rate the overall timeliness of the NMHS products and services?

☐ Always on time ☐ Mostly on time ☐ Never on time

7. How would you rate the ease of use of the NMHS products and services?

☐ Very easy to use ☐ Mostly easy to use ☐ Not easy to use

8. How would you rate the accessibility of the NMHS products and services?

☐ Easy to access ☐ Mostly easy to access ☐ Not easy to access

9. Does the NMHS Services contribute to enhancing the economic viability of your operations?

☐ Always ☐ Mostly ☐ Rarely

10. Does the NMHS services contribute to enhancing the safety of your operations?

☐ Always ☐ Mostly ☐ Rarely

11. Does the services meet the needs of your organisation?

☐ Always ☐ Mostly ☐ Rarely

12. What impact do you believe the NMHS services are having on your operations?

☐ Always positive ☐ Mostly positive ☐ Negligible

13. What is your level of overall satisfaction with the NMHS services?

☐ Very satisfied ☐ Fairly satisfied ☐ Dissatisfied

14. Can you suggest ways that we could improve the NMHS services?

APPENDIX D

D: Example of a generic non-conformance procedure

PROCEDURE FOR RECTIFYING AND REPORTING NONCONFORMING PRODUCTS AND PREVENTIVE ACTION

1. Awareness of nonconforming products is normally identified:

a. Through recognition by the duty officer that a product is outside the set criteria articulated in the NMHS operational documentation.

b. Real-time feedback from the community and relevant industry sectors while the product is current;

c. Feedback from the community and relevant industry sectors post the operational currency of the product eg: at a consultative meeting or web feedback; and

d. A request from an official regulatory body or relevant police service.

2. Non-conformities that are identified in the following circumstances will be eliminated or rectified as expediently as possible when:

a. There is an operational version of the product currently available and the non-conformance is brought to the attention of the duty officer who will expediently issue an amendment to rectify the non-conformance;

b. There is an operational version of the product currently available and the non-conformance is identified by the duty officer who will expediently issue an amendment to rectify the non-conformance;

c. The non-conformance has been identified post the operational currency as the result of a request for an investigation. Investigation and preparation of reports in response to such requests should comply with all specified requirements including those which are Judicial and Coronial investigations or other procedures as specified by the investigating body;

d. A non-conformance is raised/tabled at an industry forum. Every endeavor shall be made to identify the product(s) in question and the officer responsible for issuing the product(s). Rectification will then be undertaken as expediently as possible; and

e. A non-conformance is identified post the operational currency through other (internal) means such as post-analysis or other investigation. The non-conformance should be brought to the attention of the officer responsible, and any corrective action expediently taken.

3. Outcomes pertaining to a non-conformance shall where appropriate be reported back to the individual or organization that notified the non-conformance.

4. All actions pertaining to correcting a non-conformance (other than amendments to operationally current products Refer 1a and 1b) shall be retained on an appropriate official NMHS incident file in the office concerned.
5. The preventive action(s) recommended are then addressed from a number of perspectives:

a. By identifying and assessing the competencies (refer 6.2.2) appropriate to the delivery of the service and providing the appropriate training as applicable;

b. In the event of an investigation by identifying preventive actions under the four sub headings: procedural, information/data, equipment/instrumentation, training and other in the investigation pro forma;

c. In the event of an investigation by identifying preventive actions and responding to recommendations, that arise out of the formal investigation report; and

d. The preventive actions from any maritime investigation are standing agenda items at the Quality Management Review meetings as identified in 5.6.2 Review Input.

APPENDIX E

E: Sample job description - Quality Manager

JOB DESCRIPTION - QUALITY MANAGER

JOB PROFILE

Role of the Quality Management Section:

The fundamental role of Quality Management Section is to deliver a comprehensive range of quality management services, skills and knowledge. These are to be provided on a cross-sectional basis to enable all sections to integrate a quality management system into all facets of their service delivery and achieve certification of compliance with the ISO 9001 quality management standard.

Role of the Position

The role of the Manager - Quality Management is to provide effective and efficient management of the Quality Management Section.

Functions of the Position

The occupant's prime responsibility, under broad policy control and direction from the Director of the NMHS is to manage and coordinate the Quality Management Section in its role of providing a cross-sectional, comprehensive range of quality management services, skills, knowledge and advice to enable the realization of ISO 9001certification for the NMHS.

The position requires a sound knowledge of the ISO 9001 Standard and competence as, or demonstrated ability to attain, a Lead Auditor of management systems in accordance with ISO 19011:2002.

The position requires a high level of leadership and management skills as the occupant will be required to manage the broad range of activities provided by the Quality Management Section. These will include development of quality manuals, analysis and assessment of service delivery and product realization procedures, planning, training, quality management system implementation and internal audits. It will also require strong leadership in assisting and mentoring colleagues through the ongoing audit process and continual improvement of procedures pre and post certification.

The position also requires a high level of strategic and change management skills. The occupant is required to build cross-program partnerships and communicate effectively with NMHS staff at all levels. They are required to possess a high standard of written and verbal communication skills, to be able to effectively manage change and to follow projects through to completion.

The occupant is also required to show independent judgement, initiative, maturity and a commitment to personal development.

DUTY STATEMENT

1. Plan and lead the development and implementation of quality management systems appropriate to the NMHS. This may include compliance with and certification to the ISO 9001 and its ongoing monitoring and maintenance. In particular prepare medium and long-term plans for the implementation of quality management systems across the Service.

2. Plan and conduct internal audits of the quality management systems to evaluate their efficiency and effectiveness for the continuous improvement of service delivery.

3. Plan and co-ordinate management reviews of the quality management initiatives to evaluate their efficiency and effectiveness for the continuous improvement of services.

4. Plan, organise and coordinate the activities of the Quality Management Section.

5. Represent the NMHS at inter-departmental, national, international and other conferences and committees relating to matters pertinent to quality management and the ISO 9000 Standards.

6. Manage the financial and physical resources of the Quality Management Section.

7. Ensure continuous personal development for staff through proactive liaison, education and training applicable to quality management and associated activities.

8. Provide support and advice to the NMHS on document control issues under the quality management system.

SELECTION CRITERIA

1. **Leadership and Management.** Demonstrated leadership and change management skills. The ability to carry initiatives through their entire life-cycle, including feasibility, planning, implementation, evaluation and review. The ability to think and plan strategically, marshal professional expertise, manage change and achieve intended results.

2. **Quality Management and Auditing.** A demonstrated extensive knowledge of quality management systems practices and principles and a sound appreciation of the requirements for third party Certification against the ISO 9001 Standard. The demonstrated experience and ability to conduct internal audits against the ISO 9001. The demonstrated ability to attain qualifications as a Lead Auditor of management systems in accordance with ISO 19011:2002.

3. **The Delivery of Weather Services.** A demonstrated knowledge of the roles and interactions of the various program and sections of the NMHS combined with demonstrated knowledge of and experience in the delivery of weather services at a national and international level.

4. **Customer Focus.** A demonstrated commitment to high quality client services and the ongoing improvement through a focussed approach to the quality management principles and practices whilst meeting identified customer needs.

5. **Communication Skills.** The demonstrated ability to communicate clearly at a senior level through both verbal and written means. The ability to negotiate persuasively and to listen, understand and adapt to different audiences at different levels throughout the NMHS and broad sectors of the national and international community.

6. **Drive and Commitment.** Demonstrated proactive, decision-making skills and the motivation to commit to action. Self-awareness, personal courage, resilience and the commitment to personal development.

APPENDIX F

F: Enlisting the assistance of an experienced organization or individual

Potential Questions

Q. Could they provide an overview of their QM background in the quality field?

Q. Does the NMHS present any unique challenges you have, or have not faced previously? If so what are they and how did you deal with them?

Q. Do they believe the "drivers" to adopt ISO 9001 Quality Management Standard are legitimate?

Q. What approach do they believe would be the most appropriate for NMHS to take to get ISO 9001?

Q. What would they need from the NMHS to initiate the Project?

Q. What strategies do they employ to maintain a close working relationship with the organisation and to ensure that the implementation is introduced smoothly whilst minimising time and costs?

Q. Can they provide examples of work they have done for previous organizations or NMHSs?

Q. If they are selected for, or accept the challenge for assisting the NMHS and it does not pass certification the first time, what action would they take to ensure that certification is achieved?

Q. Do they provide quality management training services and if so, are the staff qualified trainers and registered as an internationally recognized training organization?

Q. Do they guarantee their services?

Q. Can they provide a fixed schedule of charges if charges are applicable?

APPENDIX G

G: Part A: Gap Analysis

Part A: Gap Analysis	
QMS:	
Scope of Gap Analysis: (Area Being Analyzed)	
Gap Analysis Date:	
Gap Analysis Completion Date:	
Gap Analysis Conducted by:	

This *Gap Analysis Tool* is aligned with the ISO 9001 Quality management system – Requirements (Standard).

The *Gap Analysis Tool* is divided into five sections that reflect the contents of the ISO 9001.

A traffic light system is used to highlight the gaps that exist between the requirements of the Standard and the current management system.

The traffic light system indicates the level of compliance with the specific requirement of the standard:

	Green - minimum compliance
	Amber - partial compliance
	Red - no compliance

Notes:

1. This Gap Analysis must be conducted with due reference to clauses articulated with ISO 9001. This document only provides the specific clause numbers and not the content.

2. Throughout this gap analysis the term quality management system (QMS) includes the scope of all the activities of the NMHS. The term "QMS" and "NMHS activities" are interchangeable and can be interpreted to mean one and the same.

3. Any reference to NMHS procedures, documentation and resources etc, refers to those NMHS activities that have been identified as being within the scope of the QMS.

4. This tool is broadly based on a Gap Analysis Tool developed by Praxiom Research Group. It should be noted that Praxiom also provide other valuable QM information on their web site and the reader is encouraged to access this.

4. QUALITY MANAGEMENT SYSTEM			
4.1 GENERAL REQUIREMENTS			
Standard Clause (ISO 9001:2008 Reference)	**Gap Analysis Question**	**Status**	**Comments**
4.1 General requirements	1. Have you identified all the NMHSs processes and resources required to carry out its management activities, measure performance and realize its suite of products and make improvements?		
	2. Have you established methods, criteria and specific KPIs to ensure that each process is effective?		
	3. Where appropriate have you documented the interactions between your NMHSs processes and how they are managed and controlled?		
	4. Do you believe your processes have the appropriate level of resources?		
	5. Do you provide an appropriate level of information and instructions that the NMHS requires in terms of its operations and monitoring?		
	6. Do you control, monitor, measure and analyze process performance?		
4.2 DOCUMENTATION REQUIREMENTS			
4.2.1 GENERAL			
4.2.1 General	7. Do you have a list of all the documentation that the NMHS utilizes? Please provide this list.		
	8. Have developed and documented a quality policy?		
	9. Have you identified and established the required documentation and records that your NMHS requires? (eg such as filing/archiving of folios, email policy etc)		
	10. Do your NMHSs documents accurately reflect what you do and		

	how you do it?		
	11. Have you considered and established the interaction and hierarchy of QMS documentation?		
4.2.2 QUALITY MANUAL			
4.2.2 Quality manual	12. Has a quality manual been prepared for your QMS?		
	13. Does it accurately define the scope (boundary) of your QMS?		
	14. Does it justify all exclusions?		
	15. Are your NMHSs procedures well documented and/or referenced in the Quality Manual?		
	16. Does the Quality Manual describe or provide a diagram depicting how your NMHSs processes interact with one another?		
4.2.3 CONTROL OF DOCUMENTS			
4.2.3 Control of documents	17. Do you use the QM document control procedures for your NMHSs documents?		
	18. Are documents approved prior to distribution or reviewed and re-approved whenever they are updated or revised? If so who approves them?		
	19. Is there a schedule for the revision of documentation and is the status specified?		
	20. Do you identify and manage documents that come from external sources that are required for your NMHSs activities?		
	21. Do you ensure the provision of the correct version of QMS documents at points of use?		
	22. Do you prevent the accidental use of obsolete QMS documents?		
	23. Do you identify obsolete documents that are retained and if so how?		

4.2.4 CONTROL OF RECORDS			
4.2.4 Control of records	24. Are your NMHSs records useable?		
	25. Are your NMHSs records legible?		
	26. Are your NMHSs records identifiable?		
	27. Are your NMHSs records retrievable?		
	28. Can your NMHSs records be used as a reliable source of evidence?		
	29. Can your NMHSs records prove that requirements have been met?		
5.1 MANAGEMENT RESPONSIBILITY			
5.1 MANAGEMENT COMMITMENT			
Standard Clause (ISO 9001:2008 Reference)	**Gap Analysis Question**	**Status**	**Comments**
5.1 Management commitment	1. Do you believe the NMHSs top management fully supports the development and implementation of a QMS?		
	2. Do you believe they support the development of a quality policy?		
	3. Do you believe they support the development of quality objectives?		
	4. Do you believe they demonstrate their support by ensuring that resources are available for the QMS?		
	5. Do you believe they communicate how important it is to meet requirements?		
	6. Do you believe they explain why it's important to meet customer requirements?		
	7. Do you believe they explain why it's important to meet statutory and regulatory requirements?		

	8. Do you believe they support efforts to continually improve the effectiveness of your NMHSs activities?		
	9. Do they support continual improvement by conducting an adequate number of quality management reviews?		
5.2 CUSTOMERS FOCUS			
5.2 Customer focus	10. Has your NMHS identified its key stakeholders and in particular its customers?		
	11. Does your NMHS enhance customer satisfaction by ensuring that customer requirements are identified and met?		
	12. Does your NMHS periodically review its customer's requirements?		
	Does your NMHS conduct periodic customer satisfaction surveys to ensure that requirements are being met?		
5.3 QUALITY POLICY			
5.3 Quality policy	13. Does your quality policy serve your NMHSs overall purpose?		
	14. Does your quality policy make a commitment to continually improve the effectiveness of the QMS by meeting its objectives?		
	15. Is your quality policy communicated, discussed and understood throughout the NMHS?		
	16. Do you periodically review your quality policy to make sure that it is still suitable?		

5.4 PLANNING			
5.4.1 QUALITY OBJECTIVES			
5.4.1 Quality objectives	17. Do top managers support the establishment of quality objectives for your NMHS?		
	18. Do top managers support the establishment of quality objectives for your products?		
	19. If your NMHS has established specific NMHS objectives where they developed collaboratively within the staff?		
	20. Are your NMHSs objectives effective and if so how was this established?		
	21. Are your NMHSs objectives measurable?		
	22. Do NMHS objectives support your quality policy?		
	23. Do your objectives support the NMHS strategic and operation plan objectives/targets		
5.4.2 QUALITY MANAGEMENT SYSTEM PLANNING			
5.4.2 Quality management system planning	24. Have you planned for the ongoing maintenance of your QMS?		
	25. Have you planned for the continual improvement of your QMS?		
	26. Will you endeavourer to protect the integrity of your QMS whenever systemic changes are being planned and implemented?		
5.5 RESPONSIBILITY, AUTHORITY AND COMMUNCATION			
5.5.1 RESPONSIBILITY AND AUTHORITY			
5.5.1 Responsibility and authority	27. Have QMS responsibilities and authorities been defined?		
	28. Are QMS responsibilities and authorities communicated throughout your NMHS?		

5.5.3 INTERNAL COMMUNICATION			
5.5.3 Internal communication	29. Do your top managers ensure that communication processes are established and routinely occur within your NMHS?		
	30. Do they ensure that QMS effectiveness is formally and informally discussed?		
5.6 MANAGEMENT REVIEW			
5.6.1 GENERAL			
5.6.1 General	31. Do top managers review the QMS at planned intervals?		
	32. Do they review the ongoing suitability, adequacy and effectiveness of the QMS?		
	31. Do top managers evaluate improvement opportunities?		
	32. Do top managers formally assess the need to make changes to the QMS and quality policy?		
	33. Do they assess the need to change quality objectives?		
	34. Do top managers keep a record of management reviews?		
5.6.2 REVIEW INPUT			
5.6.2 Review input	35. Do they examine previous management reviews?		
	36. Do they examine the results of previous audits?		
	37. Do they examine feedback from customers?		
	38. Do they examine product conformity data?		
	39. Do they examine process performance information?		
	40. Do they examine the status of previous actions?		
	41. Do they examine the status of corrective actions?		

	42. Do they examine the status of preventive actions?		
	43. Do they examine opportunities for improvement?		
	44. Do they examine previous follow-up actions?		
5.6.3 REVIEW OUTPUT			
5.6.3 Review output	45. Do top managers generate management review decisions and actions (outputs) to improve the NMHS?		
	46. Do they generate decisions and actions to improve the suitability of the QMS?		
	47. Do they generate decisions and actions to improve the effectiveness of QMS processes?		
	48. Do they generate decisions and actions to improve the NMHSs products?		
	49. Do they generate management review decisions and actions to improve their product's ability to meet customer requirements?		
	50. Do they generate management review decisions and actions to change the quality policy as and when appropriate?		
	51. Do they generate management review decisions and actions as and when appropriate to change the quality objectives?		
	52. Do top managers generate management review decisions and actions to address resource needs?		

6. RESOURCE MANAGMENT			
6.1 PROVISION OF RESOURCES			
Standard Clause (ISO 9001 Reference)	**Gap Analysis Question**	**Status**	**Comments**
6.1 Provision of resources	1. Have you identified resources needed to implement, maintain and improve your NMHSs QMS?		
	2. Have you identified the resources needed to ensure the customer's needs are being met and to help enhance customer satisfaction?		
6.2 HUMAN RESOURCES			
6.2.1 GENERAL			
6.2.1 General	3. Have you clearly identified the qualifications, skills, knowledge and experience required by all the staff that work in your NMHS?		
	4. Do you ensure that all staff employed within your NMHS have the appropriate, qualifications, skills, knowledge and experience?		
6.2.2 COMPETENCE, TRAINING AND AWARENESS			
6.6.2 Competence, training and awareness	5. Do you identify the competence requirements of personnel within your QMS who perform work that could directly or indirectly affect your NMHSs ability to meet product requirements?		
	6. Do you provide training, or take other suitable steps, to meet your NMHSs unique competency requirements?		
	7. Do you make your personnel aware of how their activities can affect your NMHSs ability to meet product requirements and how important their efforts are?		
	8. Do you explain how personnel can help your NMHS to achieve its quality objectives?		
	9. Do you evaluate the effectiveness of your training and awareness activities?		

	10. Do you maintain suitable records which show that personnel within your NMHS are competent?		
	11. Do you maintain appropriate records of education, training, experience and skills?		
6.3 INFRASTRUCTURE			
6.3 Infrastructure	12. Have you identified the infrastructure that your NMHS needs in order to ensure that product requirements are met?		
	13. Have you identified and been provided with your workspace, equipment, hardware, software, communication and support service needs?		
	14. Are there appropriate levels of support services in terms of communication and information needed in order to ensure that products meet requirements?		
6.4 PROVIDE SUITABLE WORK ENVIRONMENT			
6.4 Work environment	15. Is it ensured that the work environment that your NMHS needs is appropriately managed and maintained?		
7.1 PRODUCT REALIZATION			
7.1 PLANING OF PRODUCT REALIZATION			
Standard Clause (ISO 9001:2008 Reference)	**Gap Analysis Question**	**Status**	**Comments**
7.1 Planning of product realization	1. Have you identified the resources that you will need to use in order to realise your products?		
	2. Do you use planning processes to plan the realization of your NMHSs products?		
	3. Do you use your product planning process to specify product/service quality objectives and requirements?		
	4. Have you identified the documents that are required in order to ensure the consistent realization of the suite of products?		

	5. Have you identified the records that are required in order to be able to prove that your processes and products meet requirements?		
	6. Have you identified the product acceptance criteria that you will need to use in order to decide whether or not products meet requirements?		
	7. Have you identified the monitoring, measurement and verification methods that you will need to use in order to control product quality?		
7.2 CUSTOMER-RELATED PROCESSES			
7.2.1 DETERMINATION OF REQUIREMENTS RELATED TO THE PRODUCT			
7.2.1 Determination of requirements related to the product	8. Have you identified your customer's product and delivery requirements?		
	9. if applicable, have you identified customers contractual requirements?		
	10. Have you identified the regulatory and or statutory requirements that are imposed on your products by external agencies?		
7.2.2 REVIEW OF REQUIREMENTS RELATED TO THE PRODUCT			
7.2.2 Review of requirements related to the product	11. Do you review your customer product requirements?		
	12. Do you consider your customer product requirements before you agree to supply products to them?		
	13. Do you amend relevant documents to reflect changes in your customer product requirements?		
	14. Do you record any follow-up actions that are taken in response to your product requirement reviews?		
	15. Do you maintain a record of your product requirement reviews?		
	16. Do you consider your customer product requirements before you accept contracts or contractual changes?		
	17. Do you verify that customer product requirements are specified before you agree to supply products to them?		
	18. If applicable, do you resolve differences between the original quote and the		

	final order before you agree to supply products to your customers?		
	19. Do you establish that your NMHS is able to meet customer product requirements before you agree to supply products to them?		
	20. Do you communicate changes in your customer product requirements to all relevant personnel and if so how?		
7.2.3 CUSTOMER COMMUNICATION			
7.2.3 Customer communication	21. Have you established an effective customer communication plan?		
	22. Have you established a process to handle customer enquiries, feedback and complaints?		
	23. Do you control how product information is provided to your customers?		
	24. Do you control how contracts are provided to your customers?		
	25. Do you control how amendments to contracts are performed?		
7.3 DESIGN AND DEVELOPMENT			
7.3.1 DESIGN AND DEVELOPMENTPLANNING			
	26. Do you plan and control the design and development of your NMHSs products?		
	27. Do you plan and control the assignment of product design and development authority and responsibility?		
	27. Do you plan and control the review activities for each stage?		
	29. Do you plan and control the verification activities for each stage?		
	30. Do you plan and control the interaction between groups who participate in the product design and development process?		
	31. Do you plan and control how groups will communicate with each other?		
	32. Do you ensure that group responsibilities are clearly defined and assigned?		

7.3.2 DESIGN AND DEVELOPMENT INPUTS			
7.3.2 Design and development inputs	33. Do you define product design and development inputs and performance requirements?		
	34. Do you define your product's functional, statutory and regulatory requirements?		
	35. Do you maintain a record of product design and development inputs?		
	36. Do you review product design and development inputs?		
	37. Do you ensure that input ambiguities and contradictions are eliminated and resolved?		

7.3.3 DESIGN AND DEVELOPMENT OUTPUTS			
7.3.3 Design and development outputs	38. Do you specify product characteristics that are crucial to the safe use of the product?		
	39. Do you provide appropriate information to support your production process?		
	40. Do you provide appropriate information to support your service provision process?		
	41. Do design and development outputs contain or refer to product acceptance criteria?		
	42. Do you approve product design and development outputs before they are formally released?		
	43. Do you verify that design and development outputs meet design and development input requirements?		
7.3.4 DESIGN AND DEVELOPMENT REVIEW			
7.3.4 Design and development review	44. Do you perform systematic design and development reviews at suitable stages throughout the design and development process?		

	45. Do staff participate in the review of the design and development stages that concern them?		
	46. Do you assess and evaluate how well design and development results are meeting requirements?		
	47. Do you identify design and development problems?		
	48. Do you propose follow-up actions and solutions?		
	49. Do you maintain a record of your design and development reviews?		
	50. Do you record the results of your design and development reviews?		
	51. Do you record the actions you take to follow-up on reviews?		
7.3.5 DESIGN AND DEVELOPMENT VERIFICATION			
7.3.5 Design and development verification	52. Do you perform design and development verifications?		
	53. Do design and development verifications follow planned arrangements?		
	54. Do you maintain records of your design and development verification activities?		
	55. Do you record actions taken to follow-up on verifications?		
7.3.6 DESIGN AND DEVELOPMENT VALIDATION			
7.3.6 Design and development validation	56. Do you perform design and development validations?		
	57. Do you confirm that a new product meets the requirements that define its intended use or application (if this is known)?		
	58. Do you conduct design and development validations before a new product is implemented or delivered ?		
	59. Do you maintain records of your design and development validation activities?		
	60. Do you record the results of design and development validations?		
	61. Do you record actions taken to follow-up on validations?		

7.3.7 CONTROL OF DESIGN AND DEVELOPMENT CHANGES			
7.3.7 Control of design and development changes	62. Do you identify and record changes in design and development?		
	63. Do you evaluate the impact of changes?		
	64. Do you evaluate the impact that changes will have on previously delivered products?		
	65. Do you maintain a record of your review of changes in design and development?		
	66. Do you approve changes in design and development before you implement those changes?		
7.4 PURCHASING			
7.4.1 PURCHASING PROCESS			
7.4.1 Purchasing process	67. Have you established criteria to *select* and evaluate suppliers?		
	68. Do you evaluate your suppliers' ability to supply products that meet your NMHSs?		
	69. Do you record supplier evaluations?		
	70. Do you ensure purchased products meet specified purchase requirements?		
7.4.2 PURCHASING INFORMATION			
7.4.2 Purchasing information	71. Do you ensure that purchasing requirements are adequately specified before you discuss them with suppliers?		
7.4.3 VERIFICATION OF PURCHASED PRODUCT			
7.4.3 Verification of purchased product	72. Have you established product verification or inspection methods in order to ensure that purchased products meet purchase requirements?		

7.5 PRODUCTION AND SERVICE PROVSION			
7.5.1 CONTROL OF PRODUCTION AND SERVICE PROVISION			
7.5.1 Control of production and service provision	73. Is production carried out under controlled conditions?		
	74. Have you established a plan for how production and service delivery will be monitored?		
	75. Do you plan how operational procedures will be used to monitor production and service delivery?		
	76. Do you plan how measurements will be used to monitor production and service delivery?		
	77. Do you plan how post-delivery activities will be used to monitor production?		
7.5.2 VALIDATION OF PROCESSES FOR PRODUCTION AND SERVICE PROVISION			
7.5.2 Validation of processes for production and service provision	78. Do you verify production and service provision processes whenever process outputs cannot be measured, monitored, or verified until after the product is in use or the service has been delivered?		
	79. Do you use criteria to help verify production processes?		
	80. Do you use procedures to help verify production processes?		
	81. Do you use qualification approvals to help control the competence of the NMHSs personnel?		
7.5.3 IDENTIFICATION AND TRACEBILITY			
7.5.3 Identification and traceability	82. Have you established and do you preserve the unique identity of your NMHSs products throughout the product realization process?		
	83. Do you maintain a record of the identity of your product whenever traceability is a requirement?		
	84. Do you maintain the monitoring and measurement status of your NMHSs products throughout the product realization process?		

7.5.4 CUSTOMER PROPERTY			
7.5.4 Customer property	85. Do you *identify* property supplied to you by customers?		
	86. Do you *verify* property supplied to you by customers?		
	87. Do you *protect* property supplied to you by customers?		
	88. Do you *safeguard* property supplied to you by customers?		
	89. Do you take care of customer supplied property while it is under your control?		
7.5.5 PRESERVATION OF PRODUCT			
7.5.5 Preservation of product	90. Do you preserve your NMHSs products and components during internal processing?		
	91. Do you use suitable identification methods to preserve products and components during processing and delivery to the intended destination?		
	92. Do you preserve your products and components during delivery?		

8.1 MEASUREMENT, ANALYSIS AND IMPROVEMENT			
8.1 GENERAL			
Standard Clause (ISO 9001:2008 Reference)	**Gap Analysis Question**	**Status**	**Comments**
8.1 General	1. Have you identified and implemented the monitoring, measurement, and analytical processes that your NMHS needs to have in order to be able to demonstrate conformity and make improvements?		
	2. Have you identified and implemented the monitoring and measurement processes that you need to have in order to be able to continually improve the effectiveness of your NMHS?		
	3. Have you identified and implemented the monitoring and measurement processes that you need to have in order to be able to continually improve the effectiveness of your NMHS?		
	4. Have you identified and implemented any statistical measurement methods that you need to have in order to be able to show that your products meet requirements?		
	5. Have you identified and implemented any analytical processes that your NMHS needs to have to ensure requirements are being met and continually improved?		
	6. Do you use your monitoring processes to continually improve the effectiveness of your NMHS?		
8.2 MONITORING AND MEASUREMENT			
8.2.1 CUSTOMER SATISFACTION			
8.2.1 Customer satisfaction	7. Have you established and implemented methods that you can use to monitor and measure customer satisfaction (perception)?		
	8. Are your methods capable of monitoring and measuring how well your NMHS meets customer requirements?		
	9. Have you established how you are going to use customer satisfaction (perception) information?		

	10. Do you use your customer satisfaction as a measure of your NMHSs performance?		
8.2.2 INTERNAL AUDIT			
8.2.2 Internal audit	11. Is there an established and implemented internal audit procedure?		
	12. Is your internal audit procedure documented?		
	13. Is it defined how audits should be planned?		
	14. Has it been defined how audit records should be established?		
	15. Is it specified how often internal audits should be performed?		
	16. Are internal audits scheduled at planned intervals?		
	17. Are the results of previous internal audits considered?		
	18. Is the scope of your internal audits stated?		
	19. Is it ensured auditors don't audit their own work?		
	20. Are audit records maintained?		
	21. Is a record maintained of *audit results*?		
	22. Are actions taken to address audit results?		
	23. Do managers take corrective action whenever nonconformities are found in their areas?		
	24. Do managers address causes?		
	25. Are actions taken in a timely manner?		
	26. Do you follow-up on the corrective actions taken by managers to address nonconformities?		
	27. Do you verify that corrective actions were taken?		
	28. Do you report the results of verification activities?		

8.2.3 MONITORING AND MEASUREMENT OF PROCESSES			
8.2.3 Monitoring and measurement of processes	29. Do you use your monitoring and measurement methods to demonstrate that your QMS processes are achieving planned results for you NMHS?		
	30. Do you take appropriate corrective action whenever your NMHSs processes fail to achieve planned results?		
8.2.4 MONITORING AND MEASURMENT OF PRODUCT			
8.2.4 Monitoring and measurement of product	31. Do you use your monitoring methods to verify that product characteristics have been met?		
	32. Can your product monitoring records prove that acceptance criteria were met?		
	33. Do your product monitoring records indicate who was responsible for authorizing the release of products for delivery to customers?		
	34. Do you perform planned monitoring and measuring activities before products are released or services are delivered?		
8.3 CONTROL OF NONCONFORMING PRODUCT			
8.3 Control of nonconforming product	35. Have you established and documented a nonconforming products procedure for your NMHS?		
	36. Does your procedure explain how you plan to identify and control nonconforming products?		
	37. Does your procedure specify how you plan to correct your NMHSs nonconforming products?		
	38. Does your procedure specify how you plan to prevent the unintended delivery or use of nonconforming products?		
	39. Does your procedure specify how you plan to address the effects and consequences that result from the delivery or use of nonconforming products?		
	40. Does your procedure define and allocate nonconforming product responsibilities?		

	41. Does your procedure describe how nonconforming product records will be managed and maintained?		
	42. Do you correct nonconforming products?		
	43. Do you re-verify nonconforming products to ensure that they meet product requirements?		
	44. Do you eliminate detected nonconformities?		
	45. Do you address the effects and consequences that result from the delivery or use of nonconforming products?		
	46. Do you maintain a record of product nonconformities?		
	47. Do you describe the actions taken to deal with nonconforming products?		
8.4 ANALYSIS OF DATA			
8.4 Analysis of data	48. Do you collect data about your NMHSs QMS to establish its suitability and effectiveness?		
	49. Is information about customer satisfaction provided to the NMHS staff?		
	50. Is information provided to the NMHS staff that shows how product nonconformities can be prevented?		
8. 5 IMPROVEMENT			
8.5.1 CONTINUAL IMPROVEMENT			
8.5.1 Continual improvement	51. Do you work towards continually improving the overall effectiveness of the NMHS?		
	52. Do you use data analysis and objectives to make improvements?		
	53. Do you use audit results to make improvements?		
	54. Do you use management reviews to make improvements?		
	55. Do you use corrective actions to make improvements?		
	56. Do you use preventive actions to make improvements?		

8.5.2 CORRECTIVE ACTION			
8.5.2 Corrective action	57. Have you established, documented and implemented a corrective action procedure?		
	58. Does your corrective action procedure expect you to deal with the impact of actual nonconformities?		
	59. Does your corrective action procedure expect you to eliminate the causes of actual nonconformities?		
	60. Have you described how corrective actions will be recorded?		
	61. Did you describe how the effectiveness of previous actions will be reviewed?		
8.5.3 PREVENTIVE ACTION			
8.5.3 Preventive action	62. Have you established, documented and implemented a preventive action procedure?		
	63. Does your preventive action procedure expect you to prevent the occurrence of potential nonconformities?		
	64. Does your preventive action procedure expect you to eliminate the causes of potential nonconformities?		
	65. 99Does your preventive action procedure expect you to deal with the effects of potential nonconformities?		

APPENDIX H

H: Part B: Gap Analysis Findings

Part B: Gap Analysis Findings (insert NMHS title here)	
QMS:	
Scope of Gap Analysis: (Area Being Analysed)	
Gap Analysis Date:	
Gap Analysis Completion Date:	
Gap Analysis Conducted by:	
Note: The Gap Analysis Findings lists the Remedial Actions that are recommended to be taken to rectify the identified gaps that exist between ISO 9001 and current management system. The Remedial Actions are cross referenced to the corresponding ISO Clause. A responsible officer should be assigned to each Remedial Action to ensure that the action is carried out. As actions are performed and the gaps are eliminated, record the date the gap was filled to indicate completion. The review date for Remedial Actions is (*insert date here*).	

Standard Clause (ISO 9001) The Gap Analysis Findings must be conducted with due reference to clauses articulated with ISO 9001. This document only provides the specific clause numbers - not the content.	Gap Identified Completion of this column will be a simple cut and paste from Part A.	Proposed Remedial Action Actions stated here will be developed in close consultation with staff who work in the area. Ensure actions to be taken are comprehensive, achievable and will meet the requirements of the ISO 9001 clause under consideration.	Officer Responsible Appoint a senior manager from the area being analyzed to be responsible for ensuring actions are implemented.	Date Gap Eliminated
4 QUALITY MANAGEMENT SYSTEM				
4.1 General requirements				
4.2 DOCUMENTATION REQUIREMENTS				
4.2.1 General				
4.2.2 Quality manual				
4.2.3 Control of documents				
4.2.4 Control of records				
5 MANAGEMENT RESPONSIBILITY				
5.1 Management commitment				
5.2 CUSTOMER FOCUS				
5.3 QUALITY POLICY				
5.4 PLANNING				
5.4.1 Quality objectives				
5.4.2 Quality management system planning				

5.5 RESPONISIBLITY, AUTHORITY AND COMMUNICATION				
5.5.1 Responsibility and authority				
5.5.2 Management representative				
5.5.3 Internal communication				
5.6 MANAGEMENT REVIEW				
5.6.1 General				
5.6.2 Review input				
5.6.3 Review output				
6. RESOURCE MANAGEMENT				
6.1 Provision of resources				
6.2 HUMAN RESOURCES				
6.2.1 General				
6.2.2 Competence, training and awareness				
6.3 INFRASTRUCTURE				
6.4 WORK ENVIRONMENT				
7 PRODUCT REALIZATION				
7.1 Planning of product realization				
7.2 CUSTOMER RELATED PROCESSES				
7.2.1 Determination of requirements related to the product				

7.2.2 Review of requirements related to the product				
7.2.3 Customer communication				
7.3 DESIGN AND DEVELOPMENT				
7.3.1 Design and development planning				
7.3.2 Design and development inputs				
7.3.3 Design and development outputs				
7.3.4 Design and development review				
7.3.5 Design and development verification				
7.3.6 Design and development validation				
7.4 PURCHASING				
7.4.1 Purchasing process				
7.4.2 Purchasing information				
7.4.3 Verification of purchased product				
7.5 PRODUCTION AND SERVICE PROVISON				
7.5.1 Control of production and service provision				
7.5.2 Validation of processes for production and service provision				
7.5.3 Identification and traceability				
7.5.4 Customer property				
7.5.5 Preservation of product				
7.6 CONTROL OF MONITORING AND MEASURING EQUIPMENT				

8 MEASUREMENT, ANALYSIS AND IMPROVEMENT				
8.1 General				
8.2 MONITORING AND MEASUREMENT				
8.2.1 Customer satisfaction				
8.2.2 Internal audit				
8.2.3 Monitoring and measurement of processes				
8.2.4 Monitoring and measurement of product				
8.3 CONTROL OF NONCONFORMING PRODUCT				
8.4 ANALYSIS OF DATA				
8.5 IMPROVEMENT				
8.5.1 Continual improvement				
8.5.2 Corrective action .				
8.5.3 Preventive action				

APPENDIX I

I: Generic web feedback template

What is your feedback regarding

- ☐ Agricultural Services
- ☐ Aviation Services
- ☐ Copyright
- ☐ Charges and Access Arrangements
- ☐ Climate & Historical Weather Information, please specify type [ ]
- ☐ Flood Warnings and River Height Services
- ☐ Forecasts & Current Weather
- ☐ Hydrometeorology
- ☐ Library
- ☐ Linking to NMHS web pages
- ☐ Marine Weather Services
- ☐ Ocean Services (ocean currents & temperatures)
- ☐ Public and Media Services
- ☐ Publications
- ☐ Radar
- ☐ Registered User Services
- ☐ Satellite Pictures
- ☐ Severe Weather (current) of type , specify type [ ]
- ☐ Severe Weather (historical data)
- ☐ Specific Web Content @ (fill in URL)

  If "Specific Web Content" specify URL http://www.xxxxxxxx/
- ☐ Storm Confirmation & Insurance Queries
- ☐ Tides
- ☐ Tsunami Warnings

- [ ] Volcanic Ash Advisory
- [ ] Web Structure and Design
- [ ] Weather By Fax or Telephone Voice Services
- [ ] Weather Maps (current)
- [ ] Weather Maps (historical)
- [ ] Other

What below best describes you?

- [ ] Aviation Industry
- [x] Marine Industry
- [ ] Education Institution
- [ ] Primary Industry
- [ ] General Public
- [ ] Student
- [ ] Government Organization
- [ ] Tourism Industry
- [ ] Hospitality Industry
- [ ] Other

What generally best describes the content of your message?

- [ ] Praise
- [ ] System Fault
- [ ] Suggestion
- [ ] Question
- [ ] Request for Data, Forecasts or other services (Note, emailed forecast service not available.)
- [ ] Criticism
- [ ] None of the above

Your message relates to?

- [ ] A specific location. Please select location
  - [ ] A
  - [ ] B
  - [ ] C
  - [ ] D
  - [ ] E
  - [ ] F
  - [ ] G
  - [ ] H
  - [ ] I
- [ ] No specific location.

To ensure that we can respond to you please provide a valid email address ...

Name:

email:

Confirm email:

Phone (optional):

Message (limited to 4000 characters):

APPENDIX J

J: Generic Quality Management Review Meeting Agenda/Minutes

Quality Management Review Meeting
AGENDA/MINUTES

Date :

Time (Max 90 mins) :

Venue :

Attendees :

Apologies :

Meeting Objectives: To review:	**Required Action(s)**	**Officer(s) Responsible**	**Target Date**
1. The action items from previous meetings.			
2. The Internal Audit Action items.			
3. The latest external audit and the progress on any identified non-conformances, requirements for correction or scope for improvement associated with the audit.			
4. Client feedback both positive and negative.			
5. Forecast verification results.			
6. The status of preventive and corrective actions.			
7. Organizational changes that could affect the QMS.			
8. Recommendations for improvement of product and or service delivery.			
9. The extent to which quality objectives have been achieved.			
10. The QMS resource status.			

Note: *The above template is forwarded prior to the meeting to all participants. During the meeting the blank format is completed as each agenda item is addressed and the resultant document becomes the minutes of that meeting. This has been found to be a very effective and efficient meeting tool.*

APPENDIX K

K: Internal Audit Procedure

Internal Audit Procedure

1 Introduction

This procedure describes the process for conducting internal quality audits. Internal audits are conducted at planned intervals to determine the effective implementation and maintenance of the quality management system (QMS) and to identify potential opportunities for improvement. An internal audit process flow chart summary is provided in Appendix N.

2 Audit Scope

This procedure will apply to all staff involved in planning, conducting and reporting outcomes of internal quality audits. The audit will be conducted to encompass the defined scope of the QMS.

3 References

1. ISO 19011:2002 – *Guidelines for quality and/or environment management systems auditing.*

4 Definitions

4.1 Suitably qualified auditor:
"Any company employee who has attended an Audit Skills course, and is independent of responsibility in the area or activity being audited".

5 Procedure

5.1 Audit Scheduling

5.1.1 The Management Review Team shall determine the broad schedule for conducting internal audits.

5.1.2 The frequency of audits is determined by the status and importance of the activities, data collected in past audits and from Action Items raised as a result of previous audits. As a minimum, an internal audit shall be conducted biannually.

5.2 Audit Performance

5.2.1 The Auditor shall prepare an internal audit checklist (refer appendix L), conduct the audit and shall be accompanied at all times by the auditee - an NMHS nominated representative.

5.2.2 Upon completion of the audit and where necessary, the auditor raises an Internal Audit Report (refer appendix M) containing the following information:

- all Action Items
- objective evidence (attach if necessary)
- any other conditions considered detrimental to normal practices
- any observations which in themselves, would not be classified as an Action Item
- opportunities for improvement

5.2.3 The auditor then reviews the audit report with the auditee and together establishes the:

- corrective action to be performed

- time frame for corrective action
- date of follow-up audit, if appropriate

5.2.4 The auditor and the auditee sign the Internal Audit Report (refer appendix M) and the auditee is given a copy if corrective action is required to be carried out.

5.2.5 Following completion of the audit and any further follow-up audits, the original reports and accompanying documentation are given to the relevant NMHS representative or auditee for retention and use at management review meetings.

Ensure that your auditors engage the auditee (process owner) to ensure that the audit process is a two way view of the situation in question. Use auditing as a communication and educational tool to enable staff to gain experience across the organization..

5.3 Follow-up Audits

5.3.1 When an auditor has identified an Action Item, a follow-up audit is conducted at an appropriate time to verify implementation of the agreed corrective action.

5.3.2 The results and acceptance status of the follow-up audit are noted on the original internal audit report (refer appendix M).

5.3.3 In cases where there is insufficient space on the original form, an attachment may be included with the report.

5.3.4 In cases where the follow-up is not satisfactory, repeat step 5.2.3 of this procedure.

5.4 Corrective Action / Follow-up Format

5.4.1 Time taken for corrective action is monitored via the management review process.

5.5 Audit Documentation

5.5.1 The auditor is responsible for maintaining all documents using appropriate records management practices for the storage of records.

5.5.2 Upon acceptance of completion of the audit, the checklists, audit reports and any attachments are forwarded to the relevant NMHS representative or auditee for review.

5.5.3 The Quality Manager is responsible for filing the completed audits.

5.6 Audit Failure

5.6.1 If, for whatever reason an audit is terminated prematurely, the reason is to be documented and discussed with the relevant NMHS representative or auditee.

5.6.2 The relevant NMHS representative or auditee will then re-schedule the audit.

5.7 Management Review

5.7.1 All audit reports are reviewed at a subsequent management review meeting.

APPENDIX L

L: Internal Audit Check List

INTERNAL QUALITY MANAGEMENT AUDIT CHECKLIST

SECTION/OFFICE:

DATE:

AUDIT NUMBER:

SCOPE	COMMENTS	RESULT

APPENDIX M

M: Internal Audit Report

INTERNAL QUALITY MANAGEMENT AUDIT REPORT

AUDIT NO:

AUDIT DATE:

AUDIT SCOPE:

AUDITOR:

AUDITEE:

Action Items and Observations Identified as Per Attached Audit List:

Number of Actions: _____ Number of Observations: _____

Corrective Action(s) were agreed to be completed by the following date: __ /__ / 20__

AUDITEE: _____ (Sign)

AUDITOR: _____ (Sign)

FOLLOW-UP COMMENTS:

All Action Items Completed: **YES** ☐ **NO** ☐

If no provide an explanation:

AUDITOR: _____ DATE: __ /__ / 20__

A: Action Required **O:** Observation for suggested improvement in service

N: Quality Management Internal Audit Process