ECO CANADA

Competencies for Meteorologists & Meteorological Technicians

NATIONAL OCCUPATIONAL STANDARDS

March 2011

ECO CANADA

ECO Canada develops programs that help individuals build meaningful environmental careers, provides employers with resources to find and keep the best environmental practitioners, and informs educators and governments of employment trends to ensure the ongoing prosperity of this growing sector.

ACKNOWLEDGMENTS

ECO Canada wishes to express its appreciation to all the organizations and individuals who contributed their time and effort to the development of this study. In particular, we would like to thank the National Steering Committee members who provided valuable insights throughout the study.

Canada

The study was funded by the Government of Canada's Sector Council Program, whose continuous support is much appreciated.

Special thanks are extended to Entegrys Incorporated for carrying out the research for this study, including data analysis. Finally, thanks are due for support from ECO Canada staff members who were directly and indirectly involved in this study.

WHAT IS ECO CANADA?

ECO Canada (Environmental Careers Organization) develops programs that help individuals build meaningful environmental careers, provides employers with resources to find and keep the best environmental practitioners, and informs educators and governments of employment trends to ensure the ongoing prosperity of the Canadian environment sector.

The organization offers a suite of resources designed to meet the professional needs of this rapidly growing, including the largest environmental online job board in Canada, certification for environmental practitioners, and a wage-subsidy internship program.

Since 1992, ECO Canada has established itself as the national, industry-initiated and led group for the resolution of the human resource issues faced by the Canadian environment sector.

ECO Canada is one of approximately thirty national sector councils established in 1992 with federal start-up funding to bring employers, workers, educators and governments together to address human resource challenges in Canada. The key objectives of ECO Canada are to:

- Implement national occupational standards for skills and training;
- Promote employment opportunities via a highly-skilled workforce;
- Meet industry's requirements for qualified new entrants into the labour force;
- Provide labour market projections and information on trends for governments, educators, youth and industry planners;
- Facilitate and develop social/economic alliances between business and labour;
- Improve the dialogue between industry and the academic community; and
- Address the labour market entry problems and school-to-work transition difficulties encountered by youth.

ECO Canada is now an autonomous organization that is directed by the stakeholders it serves. Its mission is:

> "To ensure an adequate supply of people with the demonstrated skills and knowledge required to meet the environmental human resource needs of the public and private sectors."

ECO Canada acknowledges the work of our National Steering Committee (NS) who guided this study by providing feedback at various stages throughout the project. Their profound commitment to the meteorological industry and to this project has been deeply appreciated.

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The following National Occupational Standards (NOS) were developed by ECO Canada in collaboration with industry professionals. They illustrate the skills, knowledge and abilities required to perform the duties of meteorologists and meteorological technicians in Canada.

CONTENTS

1.0 NATIONAL OCCUPATIONAL STANDARDS FOR METEOROLOGY.....1

2.0 BUILDING NATIONAL OCCUPATIONAL STANDARDS.....3

3.0 MAKING SENSE OF NATIONAL OCCUPATIONAL STANDARDS.....4

3.1 What are National Occupational Standards?.....4

3.2 How are National Occupational Standards used?.....5

4.0 WHAT DO NATIONAL OCCUPATIONAL STANDARDS CONSIST OF?.....6

5.0 DEFINING METEOROLOGICAL OCCUPATIONS.....8

5.1 Professional Meteorologist.....9

5.2 Meteorological Technician.....11

6.0 PROFILING METEOROLOGICAL OCCUPATIONS.....13

7.0 CONCLUSION.....14

APPENDIX A: NATIONAL OCCUPATIONAL STANDARDS FOR METEOROLOGY.....I

APPENDIX B: SAMPLE OCCUPATIONAL PROFILE.....VII

APPENDIX C: METHODOLOGY.....XV

APPENDIX D: ACKNOWLEDGEMENTS.....XVIII

1.0 NATIONAL OCCUPATIONAL STANDARDS FOR METEOROLOGY

Societal awareness of weather events and their impact on population and economy has grown in recent years. The provision of accurate and precise meteorological services offer tremendous cost savings to the Canadian economy every year. It is therefore imperative that we understand the human resource needs of the meteorological sector in order to ensure its ongoing growth.

The Canadian meteorological industry is in need of human resource support that establishes the parameters of meteorological employment and defines the unique competencies needed to perform this kind of work. To this end, ECO Canada partnered with the Canadian Meteorological and Oceanographic Society (CMOS), the Meteorological Service of Canada (MSC) and industry professionals to expand its human resource strategy to include meteorological and weather-related occupations, to establish the boundaries of meteorological work, and to compile the National Occupational Standards (NOS) for Meteorology.

ECO Canada's National Occupational Standards (NOS) for Meteorology map out the competency requirements for meteorologists and meteorological technicians working in Canada. The NOS consist of the technical and transferable (or enabling) competencies, as well as the core knowledge requirements of professionals in any given field of employment. These competencies are used as benchmarks for training and successful performance in the workplace.

PRIMARY OBJECTIVES OF THE 2011 NOS FOR METEOROLOGY

- Creating and validating an NOS dictionary for meteorologists and meteorological technicians;
- Compiling occupational profiles that are reflective of the complexity of work involved;
- Incorporating the certification of meteorologists in ECO Canada's Environmental Employment framework.

ECO Canada engaged in consultation with over 200 meteorological professional across Canada, of varying levels of experience, to achieve the 2011 objectives.

TYPES OF CONSULTATION INCLUDED

1. The formation of a National Steering Committee (NSC) to guide the direction of the project;
2. Initial consultation with Senior Advisors for the purpose of creating an NOS dictionary for meteorological occupations;
3. A national online survey giving practitioners a chance to review competencies and rate their relevance;
4. Online and onsite focus sessions to discuss and validate the NOS and other outcomes of the survey.

Using rigorous methodology that is designed to engage practitioner input at every stage of the development process, the 2011 NOS for Meteorology was created. Given the complexity and broad scope of the meteorological industry, the NOS for Meteorology were divided into several competency profiles that describe the requirements of meteorologists and meteorological technicians in al major areas of specialization. These are - Meteorologists: a) Operational Meteorologist, b) Research Meteorologist and c) Applied Meteorologist; and Meteorological Technicians: a) Meteorological Inspector and b) Operational Meteorological Technician

MONTREAL, QC (MAY 2010)

WINNIPEG, MB (DEC 2010)

EDMONTON, AB (JUNE 2010)

2.0 BUILDING NATIONAL OCCUPATIONAL STANDARDS

Building relevant National Occupational Standards requires a trusted methodology that is industry guided. ECO Canada's NOS development follows a rigorous process that is designed to engage professionals of all sectors, levels of experience and areas of expertise. This process is complimented by the high-level guidance of a National Steering Committee (NSC) composed of select senior meteorological professionals in every major sub-sector. ECO Canada's methodology combines primary and secondary research initiatives:

DEFINING THE OCCUPATIONAL SCOPE

In consultation with several Senior Advisors who possess 10 or more years of experience in the meteorological sector, the scope of meteorological occupations as well as the parameters for work id defined. This process is supplemented by extensive secondary research and international models, including those outlined by the World Meteorological Organization (WMO) and the International Organization for Standardization (ISO).

SKILL SET DOCUMENTATION

Through extensive secondary research and consultation with senior professionals, skill sets were mapped for meteorological occupations. This was enhanced by a DACUM (*Developing-A-Curriculum*) style workshop in which professionals helped to brainstorm skill, competency and knowledge requirements. The output of this full-day workshop was a draft NOS which was then validated in a series of national focus groups.

SKILL SET FOCUS GROUPS AND OCCUPATIONAL SURVEY

Following analysis of focus group data, a national occupational survey was conducted. Respondents were asked to rate competencies in order of importance and relevance to their area(s) of expertise. In addition to examining the NOS, survey respondents were also asked to scrutinize occupational definitions created in collaboration with Senior Advisors, providing another layer of authentication. Statistical analysis of survey data was then conducted to produce occupational profiles for meteorology.

VALIDATION OF STANDARDS

The NOS were submitted to another payer of validation through national focus groups to test the appropriateness of rankings assigned to individual competency statement in the survey. Following this final validation, the NOS for Meteorology and occupational profiles were produced.

3.0 MAKING SENSE OF THE NATIONAL OCCUPATIONAL STANDARDS

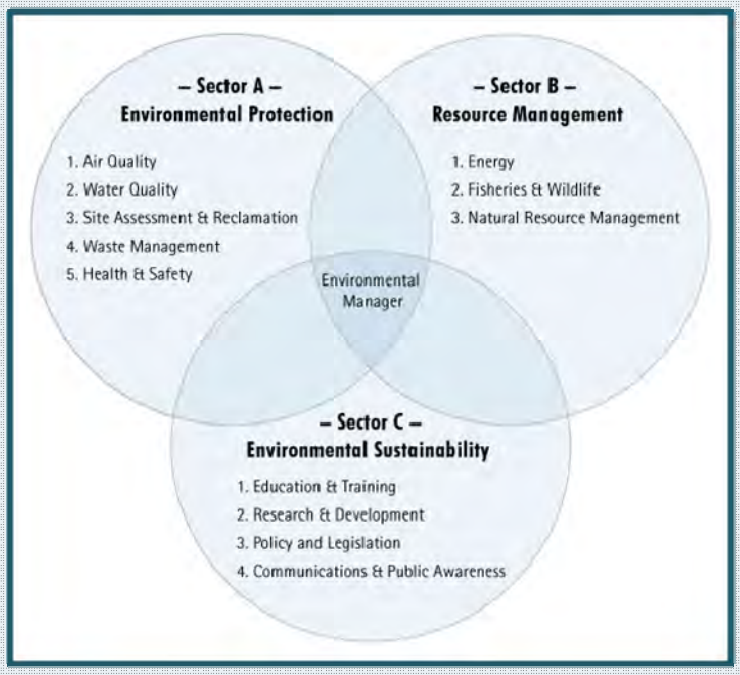
ECO Canada's National Occupational Standards (NOS) illustrate the skills, knowledge and abilities required to perform environmental work, such as meteorology. They are the basis from which we can articulate labour market supply and demand.

3.1 WHAT ARE NATIONAL OCCUPATIONAL STANDARDS?

National Occupational Standards (NOS) form the foundation for many of ECO Canada's industry support structures, such as certification, accreditation, training, and curriculum development. These standards are the benchmarks against which people of a particular profession measure their level of performance and competency, and form the basis for much of ECO Canada's project work.

In 1997, ECO Canada developed the first NOS for Environmental Employment, its primary competency framework designed to capture the full gambit of environmental work. Updated every 5 years since then (most recently in 2010), the NOS for Environmental Employment have become a vehicle for the industry's evolution and maturity, identifying emerging areas on a regular cycle. Given the size and complexity of the environmental sector, the NOS for Environmental Employment is articulated in a sector model, consisting of 3 Sectors and 13 Sub-Sectors:

2010 Environmental Sector Model
Environmental Employment in Canada



There are some occupations in the environmental industry that are unique enough to warrant their own competency dictionary. In these instances, ECO Canada has developed occupation-specific NOS to compliment the overall environmental employment umbrella and to provide a greater layer of depth to our understanding of the industry. Meteorology is one such occupation, situating the discipline of meteorology in an environmental framework. In addition to meteorology, ECO Canada has also developed occupation-specific NOS for Environmental Auditing and Greenhouse Gas Professionals.

All of ECO Canada's NOS are updated approximately every 5 years to ensure they remain reflective of emerging areas in ever-changing industries.

To view all of ECO Canada's NOS, please visit www.eco.ca/nos.

3.2 HOW ARE THE NATIONAL OCCUPATIONAL STANDARDS USED?

National Occupational Standards are used by professionals, employers, educators, and students for a variety of purposes:

- As a guide for hiring practices;
- To increase career awareness;
- As a self-assessment tool for employers and professionals;
- As a program development tool for guiding curriculum development in post-secondary programs and training courses;
- To assist in career development initiatives for students considering environmental work;
- To promote labour market mobility and a globally competitive workforce;
- As a guide for articulating emerging areas and labour market issues; and
- To promote ECO Canada as a leader in the building of a knowledgeable and highly skilled environmental workforce.

Most notably, National Occupational Standards are used to form the basis for all certification and accreditation programs offered through ECO Canada.

For more information on certification, please visit www.eco.ca/certification.

4.0 WHAT DO THE NATIONAL OCCUPATIONAL STANDARDS CONSIST OF?

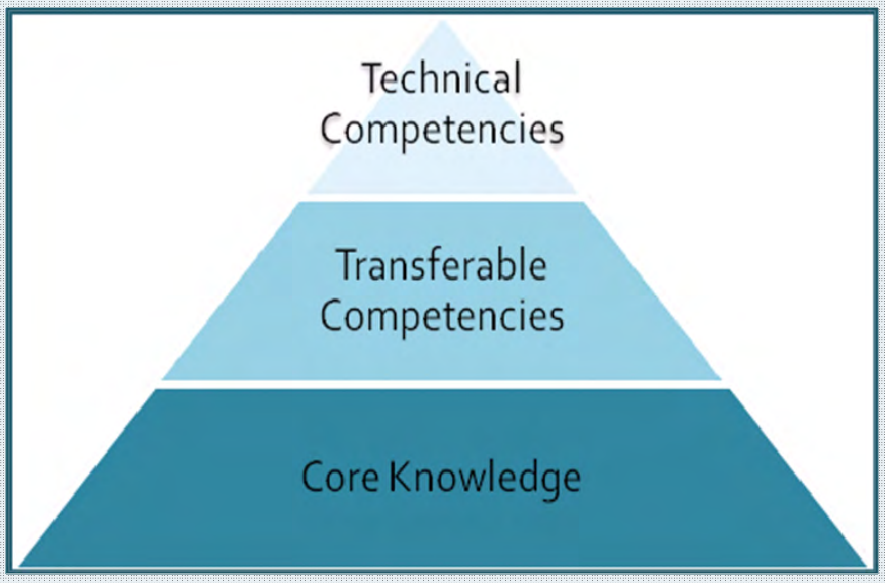
National Occupational Standards consist of competencies that group related behaviours originating from the application of an individual's knowledge, skills and attributes. Competencies are presented as demonstrated behaviours which are specifically designed to illustrate what a professional must *consistently* do to produce *positive* results, even when under pressure.

THERE ARE THEE TYPES OF COMPETENCIES FOUND IN THE NOS

- **Core Knowledge** describes the body of knowledge that a professional need to have in order to function successfully in his or her workplace. Referring to the below diagram, core knowledge forms the basis for overall competency in meteorological work.
- **Transferable Competencies** build off core knowledge and describe behaviours or 'soft skills' that contribute to the successful performance of technical work; and
- **Technical Competencies** are statements describing the ability to perform a task of series of tasks that together produce a measurable result.

Hierarchy of Competencies

National Occupational Standards



The NOS for Meteorology consist of 21 core knowledge, 47 transferable and 69 technical competency statements, some describing the requirements of meteorologists and others for meteorological technicians.

For some competencies, the statements are categorized into areas of similarity, allowing a professional to easily identify which competencies are individually applicable. Transferable competencies are divided into the following:

- Professionalism
- Oral & Written Communications
- Teamwork
- Planning & Organizing
- Critical Thinking
- Continuous Learning
- Mentoring
- Quality Management

Technical competencies are categorized as:

- Consulting Services
- Equipment & Instrumentation Maintenance
- Maintenance of a Continuous Weather Watch
- Preparation of Weather Forecasts
- Quality Management
- Scientific Studies
- Meteorological Measurement

For very broad areas of employment such as meteorology, an occupational profile is a tool that will link NOS to the requirements of a specific area of expertise, providing a further layer of detail to describe what competencies are critical for some professionals and less so for others. *Section 6.0 Profiling Meteorological Occupations* describes occupational profiles in further detail.

To view the full list of competency statements under the NOS for Meteorology, please refer to *Appendix A—National Occupational Standards for Meteorology.*

5.0 DEFINING METEOROLOGICAL OCCUPATIONS

ECO Canada is committed to the advancement of meteorological occupations as an extension of its mandate to promote human resources for the environmental industry. As an important part of this commitment, ECO Canada has strived to establish parameters for meteorological work that are consistent with domestic and international standards, such as those outlined by the WMO. The following definitions are not meant to be viewed as exhaustive but rather as broad outlines that establish the domain of employment.

Courtesy of CMOS Photo Contest

Courtesy of CMOS Photo Contest

5.1 PROFESSIONAL METEOROLOGIST

The following definition of a professional meteorologist was developed in consultation with our Senior Advisors and other professionals in the field:

> A **Professional Meteorologist** is an individual who is involved in the field of meteorology at a specialized or conceptual level. This individual may be engaged in, or managing, the research of atmospheric phenomena for the advancement of such knowledge; the development and application of models, templates and algorithms for weather forecasting or other areas of specialization; the collection, analysis and diagnosis of meteorological data for commercial or other purposes; the training of other meteorological practitioners; or the provision of advice, forecasts, risk estimates, impact estimates, interpretation or other services for the protection of life and property, the advancement of the economy, the protection of the environment, or the enhancement of the quality of life.
>
> A Professional Meteorologist may be employed in a variety of specializations such as, but not limited to, weather forecasting; aviation, marine, urban, broadcasting, agricultural, air quality or forensic meteorology; climatology; energy; or transportation.

In order to better define the full scope of meteorological occupations, ECO Canada has categorized the work of meteorologists into three main areas of specialization. The following are meant to be a representation of the different types of meteorological work and each area encompasses many different types of expertise.

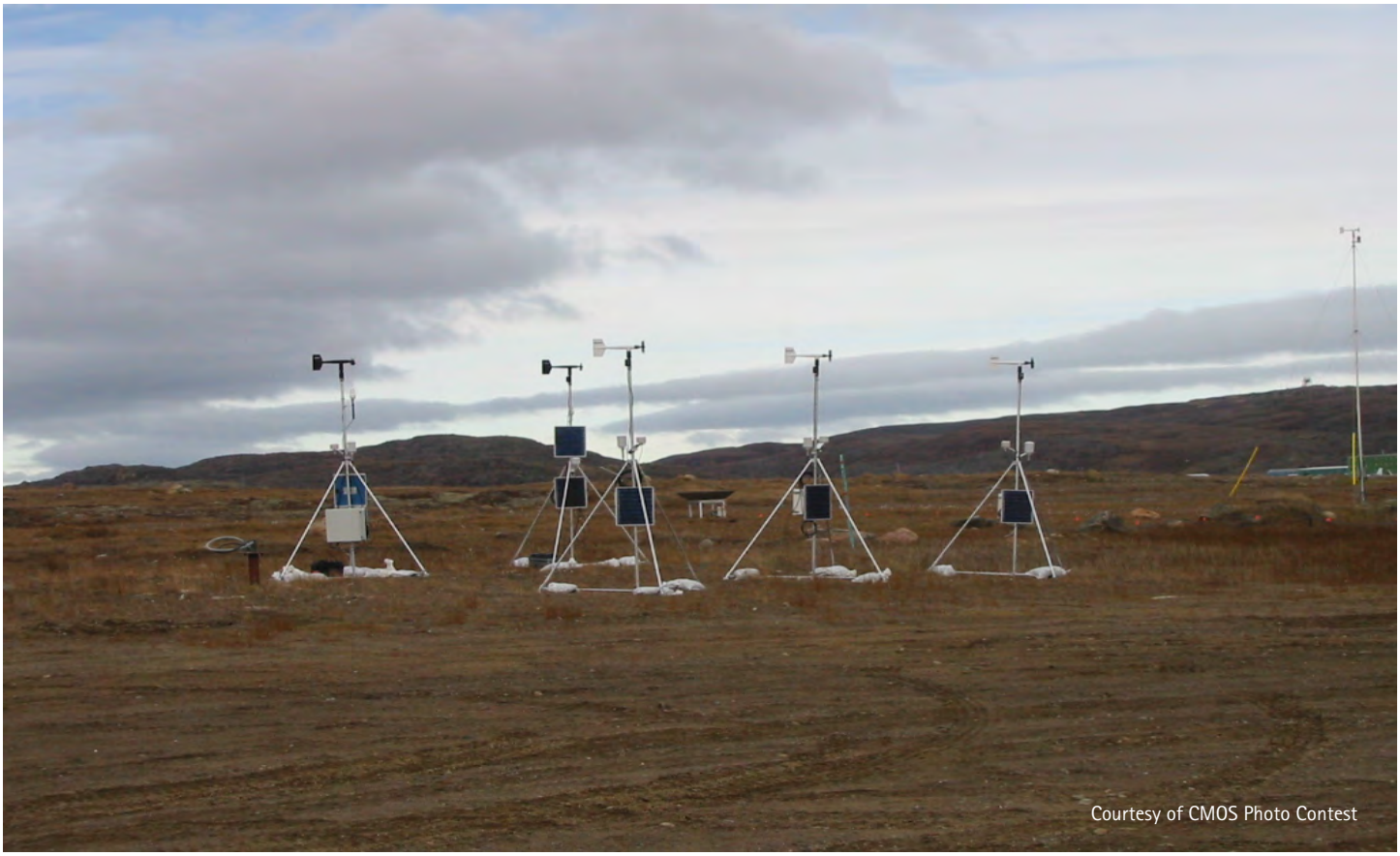
For meteorologists, three areas of specialization have been identified in consultation with industry: a) operational meteorology, b) research meteorology and c) applied meteorology. Each deals with meteorological products and services in unique ways:

The following definition of a professional meteorologist was developed in consultation with our Senior Advisors and other professionals in the field:

> **Operational Meteorologists** are Professional Meteorologists whose core responsibility is the development of weather forecast products for various users and distribution mediums. Operational Meteorologists may work in a variety of industries such as broadcasting, government or aviation. The NOS profile for Operational Meteorologists highlights the level of core meteorological competence necessary to successfully perform the multiple facets of data interpretation, forecast development, and communication of meteorological information and forecast products.

> **Research Meteorologists** are Professional Meteorologists involved in the study of climate, weather and the atmosphere. The purpose of such study is the advancement of meteorological knowledge in that field and/or the development of models and tools to facilitate the work of other meteorologists. The NOS profile for Research Meteorologists highlights the level of core meteorological competence necessary to successfully complete such studies and development work.

> **Applied Meteorologists** are Professional Meteorologists whose core responsibility is the application, interpretation, and/or oversight of climatological and meteorological principles, or of various weather forecast products. Their common focus is the transfer of knowledge and advice to internal or external clients or staff. The NOS profile for Applied Meteorologists highlights the level of core meteorological competence necessary to successfully facilitate education and training programs, interpret meteorological information and models for clients in a wide variety of applications, or manage meteorological work and projects.


Courtesy of CMOS Photo Contest

5.2 METEOROLOGICAL TECHNICIAN

The following definition describes the role of a meteorological technician:

> A **Meteorological Technician** is an individual who is involved in applied aspects of meteorology. This individual may be engaged in observing meteorological conditions; collecting data, disseminating meteorological information to various users, briefing users on such information, or installing, maintaining, and/or operating a variety of meteorological instruments and equipment. Those with further meteorological training may also be engaged in developing primarily short range weather forecast products for various users, or in the training and/or supervision of other Meteorological Technicians.
>
> A Meteorological Technician may be engaged as a specialist in a variety of jobs, such as, but not limited to, aviation and marine weather observers and briefers, upper air technicians, combined weather observers and flight service specialists, meteorological instrument technicians and inspectors, weather forecasting technicians, meteorological instructors, aviation program officers, sea ice observers, or briefers for sectors such as offshore oil and gas.

For meteorological technicians, two major areas of specialization have been identified: a) meteorological inspector and b) operational meteorological technician. These areas group similar domains of expertise together:

Meteorological Inspectors are Meteorological Technicians working in meteorological instrumentation and inspection. Their work involves the installation, maintenance and/or inspection of weather data collection and observation instruments and related equipment. The NOS profile for Meteorological Inspectors highlights the level of core meteorological competence necessary to successfully execute and/or train others in these instrumentation and equipment responsibilities.

Operational Meteorological Technicians are Meteorological Technicians involved in the observation, recording and reporting of weather and atmospheric conditions. Those with further training may also be interpreting meteorological data and developing weather forecast products for specific localized applications. The NOS profile for Operational Meteorological Technicians highlights the level of core meteorological competence necessary to successfully observe weather conditions, brief users and develop forecasts, or to train others in these functions.

Courtesy of CMOS Photo Contest

6.0 PROFILING METEOROLOGICAL OCCUPATIONS

The NOS for Meteorology is not only used independently as a competency map for meteorologists and meteorological technicians but also to build occupational profiles that link competencies to a particular area of specialization. Occupational profiles are useful for such things as certification because they allow a candidate to measure his/her skills against the national standard.

The NOS for Meteorology was used to derive occupational profiles for several different areas of specialization. These profiles identify the competencies most critical to successful performance in a particular area. For meteorologists, the following specializations were profiled: operational meteorologist, research meteorologist and applied meteorologist. For meteorological technicians, profiles were documented for meteorological inspector and operational meteorological technician.

Depending on the type of competency that is being considered, there is a unique scale of measurement attached to it:

- **Core Knowledge** is measured by the **Level of Understanding** one must demonstrate to perform successfully in a given area of specialization or expertise. This is categorized as basic, working, comprehensive, or advanced;
- **Transferable Competencies** are measured by their **Level of Importance** to a given area of specialization on a scale ranging from low to moderate to high to critical; and
- **Technical Competencies** are measured by the **Level of Proficiency** required to perform successfully in a given area of specialization. This scale ranged from low to moderate to high to exceptional level of proficiency.

A sample occupational profile for *Operational Meteorologist* can be viewed in *Appendix B*.

To view all of the occupational profiles under the NOS for Meteorology and to find out how they are used for certification, please visit www.eco.ca/meteorology.

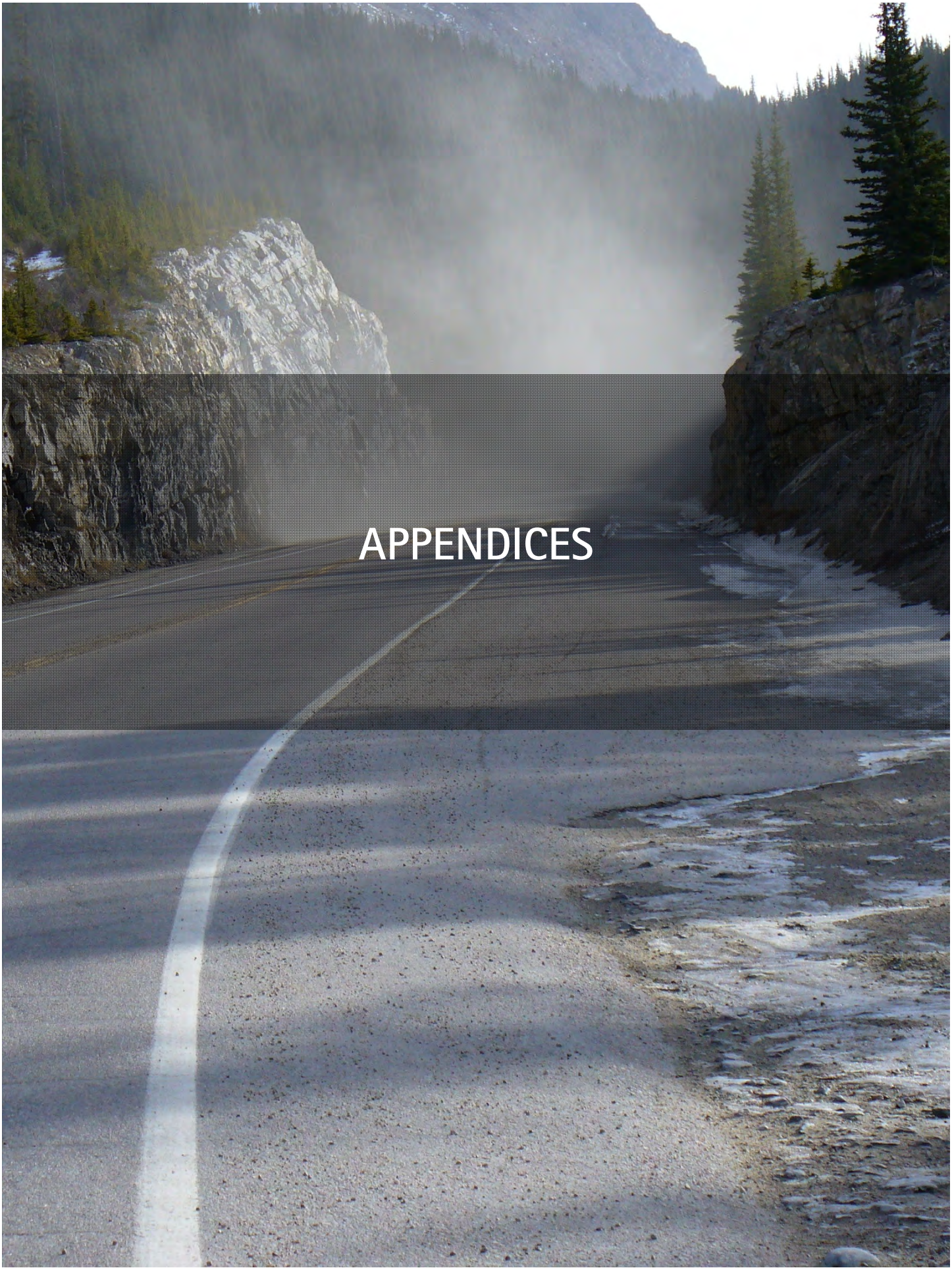
7.0 CONCLUSION

It remains ECO Canada's most important mandate to ensure a ready supply of qualified individuals to the environmental sector. Consistent with this fundamental goal, ECO Canada strives to produce occupational standards that are relevant and leading edge. The 2011 NOS for Meteorology is one of many projects that uphold ECO Canada's commitment to the industry. As a result of rigorous research and time committed by a great many professionals across Canada, National Occupational Standards continue to be used by professionals, employers, and students as a foundation for excellence in environmental work.

DID YOU KNOW?

ECO Canada has published two previous reports on the meteorological sector: *2005 Changing Climate: Canadian Meteorological Employment* and the *2007 Meteorological Certification Feasibility Study*. Both are available for viewing at www.eco.ca/publications.

Courtesy of CMOS Photo Contest



APPENDICES

APPENDIX A

NATIONAL OCCUPATIONAL STANDARDS FOR METEOROLOGY

TRANSFERABLE COMPETENCIES

Professionalism

1 Demonstrates professional, ethical conduct, such as trust, integrity, consideration of client needs, timeliness, confidentiality and discretion in all work activities, etc.
2 Demonstrates objectivity in the interpretation of information and development of meteorological information.
3 Demonstrates dependability by consistently following through to meet commitments.
4 Deals calmly and effectively with high-stress situations.
5 Demonstrates respect for differences in approach and values.
6 Takes the initiative to react appropriately to new or changing situations and circumstances.
7 Demonstrates resilience by persevering after failure.
8 Demonstrates the self-discipline and mental and physical stamina necessary to work shifts as required.
9 Follows sound scientific principles in the development and monitoring of all meteorological products.
10 Applies approved safety practices at all times.

Oral & Written Communication

11 Presents information in a logical and structured fashion.
12 Listens attentively to the enquiry, asking questions if necessary to identify the underlying concern.
13 Tailors information to users, taking their concerns and their level of meteorological expertise into consideration.
14 Ensures that the information conveyed is understood and useful.

Teamwork

15 Actively engages clients in the consultative process.
16 Works cooperatively with groups, teams and stakeholders.
17 Collaborates with other experts to achieve a common goal.
18 Navigates effectively through organizational complexities to avoid or overcome barriers to successful completion of the work.
19 Deals effectively with confrontational situations, demonstrating diplomacy, tact, empathy and consideration for differing points of view.

Planning & Organizing

20 Makes sound decisions under the pressure of fixed deadlines and varying workloads.
21 Processes information quickly and logically.
22 Plans activities such as contracting, procurement, provisions of services, etc. related to major projects.
23 Coordinates major project activities.
24 Works effectively within organizational structures and processes.

Critical Thinking

25 Distinguishes appropriately between significant and superfluous information.
26 Applies suitable theoretical concepts in the analysis of large volumes of information.
27 Applies structured reasoning to synthesize information into meaningful patterns.
28 Investigates conflicting information to reconcile the information or to determine which information to use.
29 Demonstrates tenacity and ingenuity to solve problems in a rapidly changing environment.
30 Generates creative approaches in solving problems, where appropriate.
31 Visualizes/conceptualizes information in multiple dimensions (horizontal, vertical and temporal).

Continuous Learning

32 Readily grasps the implications of new information.
33 Evaluates the outcomes of a problem's solution to identify lessons learned or redirect efforts.
34 Pursues opportunities for personal learning and development to stay current and to maintain and acquire new competencies.
35 Assesses own performance realistically and objectively.
36 Willingly assimilates training, new information and feedback.
37 Uses available technology with demonstrable ease.

Mentoring

38 Acts as a resource by sharing information with others.
39 Identifies others' strengths and development needs.
40 Facilitates the resources/opportunities others need to advance their professional development.
41 Helps others to network effectively in the organization by introducing them to key players, etc.
42 Facilitates others' personal development through listening, encouraging, supportive communications and help in setting realistic goals.
43 Serves as a role model through consistent demonstration of integrity and professional values.
44 Holds others accountable for their professional obligations.

Quality Management

45 Makes effective use of computer systems and software.
46 Demonstrates attention to detail to ensure the accuracy of the data collected and reported.
47 Shares information to participate appropriately in a continuous improvement feedback loop.

CORE KNOWLEDGE

1 Demonstrates an understanding of synoptic, dynamic, physical, boundary-layer and meso-scale meteorology.
2 Demonstrates an understanding of practical and applied meteorology.
3 Demonstrates an understanding of the relationship between the solar cycle, the atmosphere and the climate, including space weather.
4 Demonstrates an understanding of the impact of topography on weather.
5 Demonstrates an understanding of the application of meteorology to earth and environmental systems.
6 Demonstrates an understanding of the application of meteorology to human activities.
7 Demonstrates familiarity with the relationship between meteorology and environmental issues such as acid rain, volcanic ash, air quality, transportation meteorology, etc.
8 Demonstrates an understanding of earth systems and their relationship to meteorology in dealing with both short-term environmental phenomena such as tornados and dust storms, and long -term phenomena such as El Nino, La Nina, ocean currents, etc.
9 Demonstrates an understanding of the theory, methods and practices of meteorological analysis, diagnosis and prediction.
10 Demonstrates knowledge in the acquisition, processing and assimilation of meteorological data, including their quality control.
11 Demonstrates knowledge of numerical and other specialized models and statistical and empirical techniques, including their limitations and the basic physical principles that underpin them.
12 Demonstrates the knowledge required to use, interpret and adjust the output from numerical weather models and techniques.
13 Demonstrates knowledge of a wide variety of meteorological methods, principles and processes necessary to assess meteorological situations and associated data.
14 Demonstrates an understanding of user's needs for and use of meteorological information.
15 Demonstrates familiarity with the computer systems and tools used in the meteorological field.
16 Demonstrates knowledge of diagnostic and troubleshooting procedures for software, hardware and telecommunication systems.
17 Demonstrates an understanding of the operation of meteorological sensors and instruments, i.e., physical principles, limitations and synergies.
18 Demonstrates an understanding of the technical language and methodology necessary to work in a multi-disciplinary team.
19 Demonstrates knowledge of appropriate statistical techniques and objective performance measures in order to analyze statistical meteorological data and prepare interpretations.
20 Demonstrates an understanding of the applicable legislative responsibility.
21 Demonstrates an understanding of the data and quality assurance processes.

TECHNICAL COMPETENCIES

Consulting Services

1 Takes action to understand clients' objectives and critical priorities.
2 Clarifies clients' meteorological requirements.
3 Identifies which data is relevant to clients and where it can be located.
4 Assesses the quality of the available data.
5 Clearly communicates meteorological information to clients.
6 Acts as a liaison to interpret meteorological information/requirements between non-meteorological users and technical colleagues.
7 Helps clients make effective use of meteorological information in their decision-making process.
8 Advises others on the use of meteorological products and services.
9 Ensures clients are informed of the limitations of the data/forecasts/models.
10 Distributes atmospheric information, forecasts and warnings using appropriate technology.
11 Utilizes prognostic and diagnostic models as input into industrial applications.
12 Uses meteorological data to determine potential causes/reasons for a given activity, incident or event.
13 Prepares/modifies atmospheric models and tools to assess impacts of past activities or potential issues from proposed/forecasted activities in order to enable end users to make informed decisions.

Equipment/Instrumentation Maintenance

14 Installs meteorological equipment and related infrastructure at observation sites based on standards, site realities and logistical considerations.
15 Inspects data acquisition equipment and instruments used in atmospheric monitoring, recording and reporting in order to ensure it meets accepted standards.
16 Monitors the performance of instruments or apparatus to determine data validity.
17 Provides the initial response in the investigation of software, hardware and telecommunication system failures.
18 Recalibrates instruments or apparatus as required, or takes other appropriate action to fix malfunctioning equipment.
19 Carries out routine maintenance in accordance with standard operating procedures, keeping an accurate log and reporting recurring problems to the relevant authority.
20 Troubleshoots meteorological sensor errors, determining the level of maintenance required.

Maintenance of a Continuous Weather Watch

21 Reviews the weather to maintain the validity of the forecast, identifying critical parameters of the forecast, relevant trends, risk assessments and warnings.
22 Conducts routine and/or non-routine surface-based and upper air observations as appropriate to the situation.
23 Evaluates routine and/or non-routine surface-based and upper air observations as appropriate to the situation.
24 Analyzes a variety of weather-related data obtained from meteorological stations, radars, satellites, computer model outputs, etc.
25 Keeps abreast of changes to forecasts, models and other guidance.

Preparation of Meteorological Forecast

26 Identifies the areas of uncertainty in the current and ongoing meteorological situation and which weather elements are likely to vary during the period of the forecast.
27 Estimates values of meteorological parameters, including their degree of uncertainty, using local knowledge to add value to automated products, direct model outputs and other guidance.
28 Validates estimated meteorological parameters through comparisons to analyzed real-time data, resolving gaps or inconsistencies between predictions, similar previous situations and current derived data.
29 Revises estimations based on own comparisons and view of the evolving weather situation, taking implications of revised view into account when diagnosing the wider meteorological situation.
30 Diagnoses physical meteorological processes to produce clear and concise explanations and reasoning.

Preparation of Weather Forecasts

31 Develops a prognosis of associated weather elements based on the prepared meteorological forecast data.
32 Issues warnings, watches and/or alerts when deemed appropriate to current and forecast conditions, taking user requirements into consideration.
33 Prepares weather forecasts and information that comply with standard operating procedures, highlighting the elements of most interest to users.
34 Structures weather forecasts and information logically, using clear, unambiguous language appropriate to users.
35 Ensures that the meteorological information used in the forecast is comprehensive and is an accurate representation of the current conditions and forecast data.
36 Ensures that the forecast, guidance, or charts and images are submitted according to schedule using the prescribed medium/media.
37 Prepares routine, site-specific forecasts and nowcasts of meteorological parameters appropriate to the application to aid in a variety of activities.
38 Prepares forecasts and nowcasts in response to threats to public safety such as toxic spills; airborne release of chemical, biological, radioactive or radiological products; fires resulting in the release of toxic fumes; forest fires; etc.
39 Prepares area-specific displacement/dispersion model-based forecasts and nowcasts of chemical, biological, radioactive or radiological contaminants for industry or in consultation with emergency responders/planners.

Quality Management

40 Develops standard operating procedures for meteorological activities.
41 Manages meteorological databases and archives as per standard operating procedures, suggesting enhancements as appropriate.
42 Validates data in a timely manner in accordance with standard operating procedures.
43 Disseminates the corrected data to users in a timely manner using the appropriate medium.
44 Makes practical use of all relevant sources of information to verify meteorological information, identifying inconsistencies between factual data and the forecast.
45 Identifies needs and opportunities to continually develop or improve meteorological procedures, tools and/or facilities.
46 Employs performance measurement to validate the quality of services being provided and to identify service delivery issues.
47 Implements continuous improvement in the delivery of services.

47 Implements continuous improvement in the delivery of services.
48 Conducts formal training activities, including the development, implementation and validation of course content.
49 Audits weather stations/offices for compliance with regulations and national standards.
50 Provides verification reports in appropriate formats to various audiences in order to support the quality management process.

Scientific Studies

51 Selects estimation methods suited to the meteorological elements for studies, research or other applications.
52 Develops/tests meteorological computer models for regulatory, experimental or operational use.
53 Develops custom-tailored weather or climate-related information for better long-term economic, social, operational and other planning.
54 Conducts research/participates in studies in weather-related areas such as the processes and determinants of atmospheric phenomena and weather conditions, and the effect of meteorology or weather on the environment.
55 Prepares/publishes reports and studies on weather-related phenomena and conditions.
56 Presents scientific reports and studies on weather-related phenomena and conditions to various audiences such as specialists, users or the general public.
57 Studies the dynamic, physical or chemical processes of the atmosphere and their interactions with the biosphere and the oceanic environment.
58 Participates in the design, development and testing of new techniques, products and services for meteorological data collection, remote sensing or other related applications.
59 Participates in concept designs for data developments in meteorological and related applications, such as transportation meteorology, biometeorology, and air quality.
60 Participates as a meteorological subject matter expert in the technology design process for new data (fields/parameters/variables) and data processing applications.
61 Uses appropriate methods of data collection and analysis in order to conduct meteorological research, investigations and applications.

Meteorological Measurement

62 Recommends appropriate instrumentation.
63 Recommends an appropriate monitoring program.
64 Identifies client/job needs for meteorological and applied meteorological data.
65 Manages the data acquisition program.
66 Specifies equipment for data acquisition.
67 Designs data collection protocols and associated quality control measures.
68 Installs equipment in appropriate measurement platforms, including calibration of equipment.
69 Deploys/commissions the measurement platforms.

APPENDIX B
SAMPLE OCCUPATIONAL PROFILE

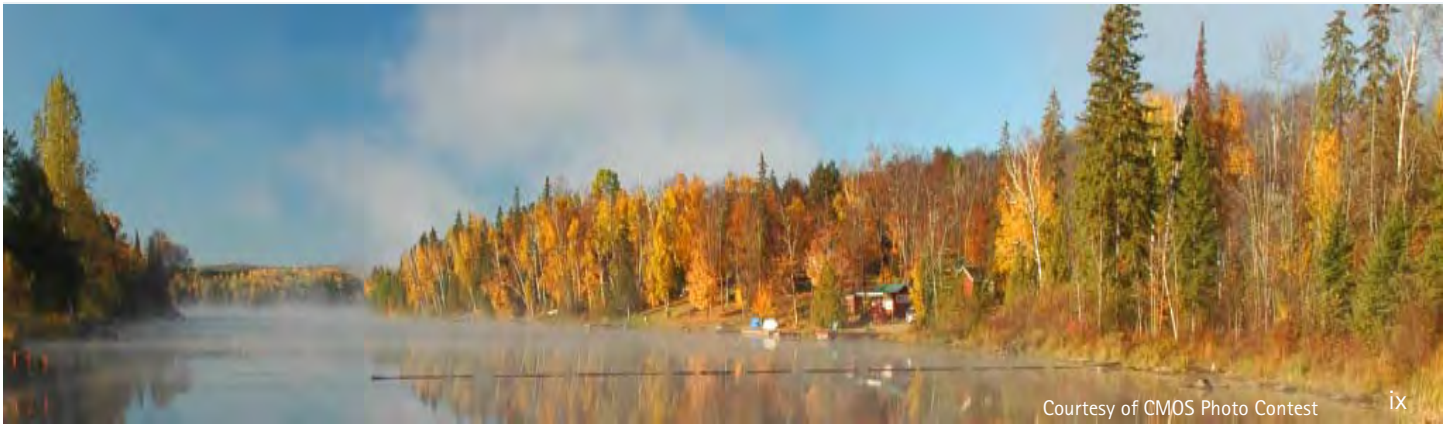
OPERATIONAL METEOROLOGIST

Professional Meteorologist

Category	ID	Transferable Competency Statement	Desired Proficiency
Professionalism	1	Demonstrates professional, ethical conduct, such as trust, integrity, consideration of client needs, timeliness, confidentiality and discretion in all work activities, etc.	Exceptional
Professionalism	2	Demonstrates objectivity in the interpretation of information and development of meteorological information.	Exceptional
Professionalism	3	Demonstrates dependability by consistently following through to meet commitments.	Exceptional
Professionalism	4	Deals calmly and effectively with high-stress situations.	Exceptional
Professionalism	5	Demonstrates respect for differences in approach and values.	High
Professionalism	6	Takes the initiative to react appropriately to new or changing situations and circumstances.	Exceptional
Professionalism	7	Demonstrates resilience by persevering after failure.	Exceptional
Professionalism	8	Demonstrates the self-discipline and mental and physical stamina necessary to work shifts as required.	Exceptional
Professionalism	9	Follows sound scientific principles in the development and monitoring of all meteorological products.	Exceptional
Professionalism	10	Applies approved safety practices at all times.	High
Oral & Written Communications	11	Presents information in a logical and structured fashion.	Exceptional
Oral & Written Communications	12	Listens attentively to the enquiry, asking questions if necessary to identify the underlying concern.	High
Oral & Written Communications	13	Tailors information to users, taking their concerns and their level of meteorological expertise into consideration.	Exceptional
Oral & Written Communications	14	Ensures that the information conveyed is understood and useful.	Exceptional

Teamwork	15	Actively engages clients in the consultative process.	High
Teamwork	16	Works cooperatively with groups, teams and stakeholders.	Exceptional
Teamwork	17	Collaborates with other experts to achieve a common goal.	High
Teamwork	18	Navigates effectively through organizational complexities to avoid or overcome barriers to successful completion of the work.	High
Teamwork	19	Deals effectively with confrontational situations, demonstrating diplomacy, tact, empathy and consideration for differing points of view.	High
Planning & Organizing	20	Makes sound decisions under the pressure of fixed deadlines and varying workloads.	Exceptional
Planning & Organizing	21	Processes information quickly and logically.	Exceptional
Planning & Organizing	22	Plans activities such as contracting, procurement, provisions of services, etc. related to major projects.	Low
Planning & Organizing	23	Coordinates major project activities.	Moderate
Planning & Organizing	24	Works effectively within organizational structures and processes.	High
Critical Thinking	25	Distinguishes appropriately between significant and superfluous information.	Exceptional
Critical Thinking	26	Applies suitable theoretical concepts in the analysis of large volumes of information.	Exceptional
Critical Thinking	27	Applies structured reasoning to synthesize information into meaningful patterns.	Exceptional
Critical Thinking	28	Investigates conflicting information to reconcile the information or to determine which information to use.	Exceptional
Critical Thinking	29	Demonstrates tenacity and ingenuity to solve problems in a rapidly changing environment.	Exceptional
Critical Thinking	30	Generates creative approaches in solving problems, where appropriate.	High
Critical Thinking	31	Visualizes/conceptualizes information in multiple dimensions (horizontal, vertical and temporal).	Exceptional
Continuous Learning	32	Readily grasps the implications of new information.	High
Continuous Learning	33	Evaluates the outcomes of a problem's solution to identify lessons learned or redirect efforts.	High

Continuous Learning	34	Pursues opportunities for personal learning and development to stay current and to maintain and acquire new competencies.	High
Continuous Learning	35	Assesses own performance realistically and objectively.	High
Continuous Learning	36	Willingly assimilates training, new information and feedback.	High
Continuous Learning	37	Uses available technology with demonstrable ease.	High
Mentoring	38	Acts as a resource by sharing information with others.	High
Mentoring	39	Identifies others' strengths and development needs.	High
Mentoring	40	Facilitates the resources/opportunities others need to advance their professional development.	High
Mentoring	41	Helps others to network effectively in the organization by introducing them to key players, etc.	Moderate
Mentoring	42	Facilitates others' personal development through listening, encouraging, supportive communications and help in setting realistic goals.	High
Mentoring	43	Serves as a role model through consistent demonstration of integrity and professional values.	High
Mentoring	44	Holds others accountable for their professional obligations.	High
Quality Management	45	Makes effective use of computer systems and software.	Exceptional
Quality Management	46	Demonstrates attention to detail to ensure the accuracy of the data collected and reported.	High
Quality Management	47	Shares information to participate appropriately in a continuous improvement feedback loop.	High


Courtesy of CMOS Photo Contest

ID	Core Knowledge Statement	Recommended Level
1	Demonstrates an understanding of synoptic, dynamic, physical, boundary-layer and meso-scale meteorology.	Comprehensive
2	Demonstrates an understanding of practical and applied meteorology.	Comprehensive
3	Demonstrates an understanding of the relationship between the solar cycle, the atmosphere and the climate, including space weather.	Working
4	Demonstrates an understanding of the impact of topography on weather.	Comprehensive
5	Demonstrates an understanding of the application of meteorology to earth and environmental systems.	Working
6	Demonstrates an understanding of the application of meteorology to human activities.	Comprehensive
7	Demonstrates familiarity with the relationship between meteorology and environmental issues such as acid rain, volcanic ash, air quality, transportation meteorology, etc.	Working
8	Demonstrates an understanding of earth systems and their relationship to meteorology in dealing with both short- term environmental phenomena such as tornados and dust storms, and long-term phenomena such as El Nino, La Nina, ocean currents, etc.	Working
9	Demonstrates an understanding of the theory, methods and practices of meteorological analysis, diagnosis and prediction.	Comprehensive
10	Demonstrates knowledge in the acquisition, processing and assimilation of meteorological data, including their quality control.	Working
11	Demonstrates knowledge of numerical and other specialized models and statistical and empirical techniques, including their limitations and the basic physical principles that underpin them.	Comprehensive
12	Demonstrates the knowledge required to use, interpret and adjust the output from numerical weather models and techniques.	Comprehensive
13	Demonstrates knowledge of a wide variety of meteorological methods, principles and processes necessary to assess meteorological situations and associated data.	Comprehensive
14	Demonstrates an understanding of user's needs for and use of meteorological information.	Comprehensive
15	Demonstrates familiarity with the computer systems and tools used in the meteorological field.	Working
16	Demonstrates knowledge of diagnostic and troubleshooting procedures for software, hardware and telecommunication systems.	Working
17	Demonstrates an understanding of the operation of meteorological sensors and instruments, i.e., physical principles, limitations and synergies.	Working
18	Demonstrates an understanding of the technical language and methodology necessary to work in a multi-disciplinary team.	Working
19	Demonstrates knowledge of appropriate statistical techniques and objective performance measures in order to analyze statistical meteorological data and prepare interpretations.	Working
20	Demonstrates an understanding of the applicable legislative responsibility.	Basic
21	Demonstrates an understanding of the data and quality assurance processes.	Working

Category	ID	Technical Competency Statement	Im-portance
Consulting Services	1	Takes action to understand clients' objectives and critical priorities.	Critical
Consulting Services	2	Clarifies clients' meteorological requirements.	Critical
Consulting Services	3	Identifies which data is relevant to clients and where it can be located.	High
Consulting Services	4	Assesses the quality of the available data.	Critical
Consulting Services	5	Clearly communicates meteorological information to clients.	Critical
Consulting Services	6	Acts as a liaison to interpret meteorological information/requirements between non-meteorological users and technical colleagues.	High
Consulting Services	7	Helps clients make effective use of meteorological information in their decision-making process.	High
Consulting Services	8	Advises others on the use of meteorological products and services.	High
Consulting Services	9	Ensures clients are informed of the limitations of the data/forecasts/models.	High
Consulting Services	10	Distributes atmospheric information, forecasts and warnings using appropriate technology.	Critical
Consulting Services	11	Utilizes prognostic and diagnostic models as input into industrial applications.	Moderate
Consulting Services	12	Uses meteorological data to determine potential causes/reasons for a given activity, incident or event.	High
Consulting Services	13	Prepares/modifies atmospheric models and tools to assess impacts of past activities or potential issues from proposed/forecasted activities in order to enable end users to make informed decisions.	Moderate
Equipment/ Instrumentation Maintenance	14	Installs meteorological equipment and related infrastructure at observation sites based on standards, site realities and logistical considerations.	Low
Equipment/ Instrumentation Maintenance	15	Inspects data acquisition equipment and instruments used in atmospheric monitoring, recording and reporting in order to ensure it meets accepted standards.	Low
Equipment/ Instrumentation Maintenance	16	Monitors the performance of instruments or apparatus to determine data validity.	Moderate
Equipment/ Instrumentation Maintenance	17	Provides the initial response in the investigation of software, hardware and telecommunication system failures.	Moderate
Equipment/ Instrumentation Maintenance	18	Recalibrates instruments or apparatus as required, or takes other appropriate action to fix malfunctioning equipment.	Low

Equipment/ Instrumentation Maintenance	19	Carries out routine maintenance in accordance with standard operating procedures, keeping an accurate log and reporting recurring problems to the relevant authority.	Low
Maintenance Equipment/ Instrumentation	20	Troubleshoots meteorological sensor errors, determining the level of maintenance required.	Low
Maintenance of a Continuous Weather Watch	21	Reviews the weather to maintain the validity of the forecast, identifying critical parameters of the forecast, relevant trends, risk assessments and warnings.	Critical
Maintenance of a Continuous Weather Watch	22	Conducts routine and/or non-routine surface-based and upper air observations as appropriate to the situation.	Moderate
Maintenance of a Continuous Weather Watch	23	Evaluates routine and/or non-routine surface-based and upper air observations as appropriate to the situation.	High
Maintenance of a Continuous Weather Watch	24	Analyzes a variety of weather-related data obtained from meteorological stations, radars, satellites, computer model outputs, etc.	Critical
Maintenance of a Continuous Weather Watch	25	Keeps abreast of changes to forecasts, models and other guidance.	Critical
Preparation of Meteorological Forecast Data	26	Identifies the areas of uncertainty in the current and ongoing meteorological situation and which weather elements are likely to vary during the period of the forecast.	Critical
Preparation of Meteorological Forecast Data	27	Estimates values of meteorological parameters, including their degree of uncertainty, using local knowledge to add value to automated products, direct model outputs and other guidance.	Critical
Preparation of Meteorological Forecast Data	28	Validates estimated meteorological parameters through comparisons to analyzed real-time data, resolving gaps or inconsistencies between predictions, similar previous situations and current derived data.	Critical
Preparation of Meteorological Forecast Data	29	Revises estimations based on own comparisons and view of the evolving weather situation, taking implications of revised view into account when diagnosing the wider meteorological situation.	Critical
Preparation of Meteorological Forecast Data	30	Diagnoses physical meteorological processes to produce clear and concise explanations and reasoning.	Critical
Preparation of Weather Forecasts	31	Develops a prognosis of associated weather elements based on the prepared meteorological forecast data.	Critical
Preparation of Weather Forecasts	32	Issues warnings, watches and/or alerts when deemed appropriate to current and forecast conditions, taking user requirements into consideration.	Critical
Preparation of Weather Forecasts	33	Prepares weather forecasts and information that comply with standard operating procedures, highlighting the elements of most interest to users.	Critical
Preparation of Weather Forecasts	34	Structures weather forecasts and information logically, using clear, unambiguous language appropriate to users.	Critical
Preparation of Weather Forecasts	35	Ensures that the meteorological information used in the forecast is comprehensive and is an accurate representation of the current conditions and forecast data.	Critical

Preparation of Weather Forecasts	36	Ensures that the forecast, guidance, or charts and images are submitted according to schedule using the prescribed medium/media.	Critical
Preparation of Weather Forecasts	37	Prepares routine, site-specific forecasts and nowcasts of meteorological parameters appropriate to the application to aid in a variety of activities.	Critical
Preparation of Weather Forecasts	38	Prepares forecasts and nowcasts in response to threats to public safety such as toxic spills; airborne release of chemical, biological, radioactive or radiological products; fires resulting in the release of toxic fumes; forest fires; etc.	Critical
Preparation of Weather Forecasts	39	Prepares area-specific displacement/dispersion model-based forecasts and nowcasts of chemical, biological, radioactive or radiological contaminants for industry or in consultation with emergency responders/planners.	Critical
Quality Management	40	Develops standard operating procedures for meteorological activities.	High
Quality Management	41	Manages meteorological databases and archives as per standard operating procedures, suggesting enhancements as appropriate.	Moderate
Quality Management	42	Validates data in a timely manner in accordance with standard operating procedures.	High
Quality Management	43	Disseminates the corrected data to users in a timely manner using the appropriate medium.	High
Quality Management	44	Makes practical use of all relevant sources of information to verify meteorological information, identifying inconsistencies between factual data and the forecast.	Critical
Quality Management	45	Identifies needs and opportunities to continually develop or improve meteorological procedures, tools and/or facilities.	High
Quality Management	46	Employs performance measurement to validate the quality of services being provided and to identify service delivery issues.	High
Quality Management	47	Implements continuous improvement in the delivery of services.	High
Quality Management	48	Conducts formal training activities, including the development, implementation and validation of course content.	Moderate
Quality Management	49	Audits weather stations/offices for compliance with regulations and national standards.	Low
Quality Management	50	Provides verification reports in appropriate formats to various audiences in order to support the quality management process.	Moderate
Scientific Studies	51	Selects estimation methods suited to the meteorological elements for studies, research or other applications.	Moderate
Scientific Studies	52	Develops/tests meteorological computer models for regulatory, experimental or operational use.	Low
Scientific Studies	53	Develops custom-tailored weather or climate -related information for better long-term economic, social, operational and other planning.	Low
Scientific Studies	54	Conducts research/participates in studies in weather-related areas such as the processes and determinants of atmospheric phenomena and weather conditions, and the effect of meteorology or weather on the environment.	Moderate
Scientific Studies	55	Prepares/publishes reports and studies on weather-related phenomena and conditions.	Moderate

Scientific Studies	56	Presents scientific reports and studies on weather-related phenomena and conditions to various audiences such as specialists, users or the general public.	Moderate
Scientific Studies	57	Studies the dynamic, physical or chemical processes of the atmosphere and their interactions with the biosphere and the oceanic environment.	Low
Scientific Studies	58	Participates in the design, development and testing of new techniques, products and services for meteorological data collection, remote sensing or other related applications.	Low
Scientific Studies	59	Participates in concept designs for data developments in meteorological and related applications, such as transportation meteorology, biometeorology, and air quality.	Low
Scientific Studies	60	Participates as a meteorological subject matter expert in the technology design process for new data (fields/parameters/variables) and data processing applications.	Low
Scientific Studies	61	Uses appropriate methods of data collection and analysis in order to conduct meteorological research, investigations and applications.	Moderate
Meteorological Measurement	62	Recommends appropriate instrumentation.	Low
Meteorological Measurement	63	Recommends an appropriate monitoring program.	Moderate
Meteorological Measurement	64	Identifies client/job needs for meteorological and applied meteorological data.	Moderate
Meteorological Measurement	65	Manages the data acquisition program.	Low
Meteorological Measurement	66	Specifies equipment for data acquisition.	Low
Meteorological Measurement	67	Designs data collection protocols and associated quality control measures.	Low
Meteorological Measurement	68	Installs equipment in appropriate measurement platforms, including calibration of equipment.	Low
Meteorological Measurement	69	Deploys/commissions the measurement platforms.	Low

APPENDIX C
METHODOLOGY

A research project of this breadth requires several different methods of data collection and analysis to ensure the outcomes accurately reflect the meteorological labour market and are statistically rigorous and thoroughly validated.

All of ECO Canada's NOS development projects follow the same general process to ensure that research is consistent, accurate and industry-guided. Generally, NOS development follows four steps: a) definition of occupational scope; b) skill set documentation; c) skill set focus groups and occupational survey; and d) validation. Please refer to the section 2.*0 Building National Occupational Standards* for a broad description of these processes. The following describes sources of data used for this study, basic procedures and response rates and methods used for sample development:

SOURCES OF DATA

Secondary Research

For initial documentation of meteorological competencies and occupational definitions, ECO Canada consulted a variety of literature on the subject of meteorological employment, which included in in-depth examination of training documents from all major Canadian employers of meteorologists and meteorological technicians. In order to ensure this study remained consistent with similar international endeavors, ECO Canada also consulted records from the American Meteorological Society, the Royal Meteorological Society, the Australian Bureau of Meteorology, and the World Meteorological Organization (WMO), among others,

ECO Canada closely following the update of WMO #258: *Guidelines for the Education and Training of Personnel in Meteorology and Operational Hydrology; Volume 1: Meteorology* and all supplementary literature. As a baseline document for the training of meteorologists and meteorological technicians, especially in reference to aviation meteorology, ECO Canada has strived to ensure the NOS for Meteorology remain consistent.

Primary Research

Once an initial skill set map was documented using secondary data, the research team turned to meteorological professionals across Canada for further development and validation of the standards. Throughout the process of NOS development, over 300 meteorologists and meteorological technicians were engaged in consultation.

SAMPLE DEVELOPMENT

The 'practitioner sample' was developed from a variety of sources. The *Roster of Meteorological Professionals & Technicians* was used as a primary means of engaging focus groups and survey participants. The *Roster* was created using a website, enabling individuals to submit their contact information directly to ECO Canada for the purpose of this project. The website link was forwarded through many different networks, including CMOS and Environment Canada. Advertisements for the *Roster* were also posted on select industry forums. Finally, a number of contacts were added to the *Roster* at the 2010 CMOS Congress in Ottawa, ON. As a result of these efforts, ECO Canada had direct access to about 200 professionals and technicians. Participants for the NOS Validation Focus Groups (see below) were recruited exclusively from this sample.

Survey invitations were distributed to professionals on the *Roster*. As well, specific invitations were forwarded to members of CMOS and employees of Environment Canada. NSC members were also asked to distribute the survey to colleagues in their networks. Advertisements were taken in various industry newsletters and websites to promote the survey. Due to these varied methods of distribution, it is difficult to know the exact sample size for the online survey, though it is estimated at about 1,000. Participants for the Survey Validation Focus Groups (see below) were recruited from a final list of survey respondents who have their consent to be contacted.

WORKSHOPS & FOCUS GROUPS

The NOS Development Session was a full day DACUM (*Developing-A-Curriculum*) style workshop held in Toronto, ON on April 20, 2010 with 24 participants in attendance. Representation by occupation and sector of employment reflected actual labour market distributions (i.e., 70% meteorologists and 20% meteorological technicians; 60% public sector and 40% private/academic sector).

Five NOS Validation Focus Groups were conducted in May and June 2010. In addition to an online webinar session, focus groups were held in the following cities: Toronto, ON, Montreal, QC, Dorval, QC, and Edmonton, AB. Locations for these sessions were chosen based on labour market distribution as identified in the 2005 ECO Canada report *Changing Climate*. Roughly 10 to 12 individuals contributed to each session, with a total of 45 participants in all. Representation by occupation and sector reflected actual labour market distribution as identified above.

Following the online survey, Survey Validation Focus Groups were conducted in November and December of 2010 in Toronto, ON, Ottawa, ON, Winnipeg, MN, and Victoria, BC as well as through online webinar. Participants for these sessions were recruited from a final list of survey respondents and locations were chosen based on their distribution. In all, 47 individuals participated in these focus groups. In January 2011, feedback was sought from 18 additional individuals, most of whom participated in the Survey Validation Focus Groups, for the purpose of validating specialized profiles.

SURVEY DEVELOPMENT & RESPONSE RATES

The Meteorological NOS Survey was developed by ECO Canada and designed for consistency with other NOS development surveys as well as past ECO Canada studies of the meteorological sector. The survey was primarily distributed by e-mail invitations linking respondents to an online questionnaire run through *Survey Select* software, which was customized by an IT specialist at *Lantech Computing* to meet specific project requirements. The survey remained in the field from September 7, 2010 to October 25, 2010 and was open to all meteorologists and meteorological technicians with 3 or more years of experience that are working in Canada. In total, survey data consisted of 341 respondents, combined from 284 completed survey records and 57 incomplete survey records.

The data was coded and imported into MS Access for analysis. Though all data was kept for the purpose of identifying demographics, competency data was filtered by occupation and on a section-by-section basis to identify and exclude outliers in each section. In all, there were 299 valid records for technical competency data, 294 for core knowledge and 176 for transferable competency data. Agreement and various correlation measures were used to assess appropriate ratings for each area of specialization that make up the occupational profiles.

It is difficult to discern exact response rates since there is no way to know the actual survey sample size, though it is likely close to about 35% based on estimated totals.

OCCUPATIONAL DEFINITIONS

A definitional framework for meteorological occupations was developed in tandem with the NOS for Meteorology. The occupational definitions (*meteorologist; meteorological technician*) were first documented with the help of senior advisors and subject matter experts in a one-month process allowing consultants to contribute revisions to draft definitions. They were then tested in the online survey where specific questions gauged satisfaction with definitional scope and respondents were asked to make suggestions for alternate wording. Overall satisfaction was high and suggestions were incorporated into the definitions, validated at the Survey Validation Focus Groups and finalized with subject matter experts and the NSC.

Definitions for specific specializations (*operational meteorologist; applied meteorologist; etc.*) were developed after the Survey Validation Focus Groups and were validated by 18 meteorological professionals via email correspondence in January of 2011 and finalized with subject matter experts and the NSC.


Courtesy of CMOS Photo Contest

For more information on data collection and analysis for this study, please contact meteorology@eco.ca.

APPENDIX D
ACKNOWLEDGEMENTS

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Courtesy of CMOS Photo Contest

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