ALBERTA INSTITUTE OF AGROLOGISTS

2018

Environmental Monitoring Practice Standard

Approved by the Competence Committee

Endorsed by AIA Council

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Preface

This practice standard is part of the continuing effort by the Alberta Institute of Agrologists (AIA) to meet its mandate as outlined in the *Agrology Profession Act*. The *Act* specifies that the Institute must establish, maintain and enforce standards of practice as part of the profession's obligation to protect the public in matters related to agrology.

This document was created by a Practice Area Expert Committee (PAEC) consisting of five regulated members of the AIA. Members were selected for their expertise and long-standing practice in environmental monitoring.

This practice standard is the basis upon which practice reviews will be conducted by the AIA. This document will assist members in ensuring that their professional practice meets the standards for education, work experience, skills and performance required for professionals practicing in environmental monitoring.

This document will be reviewed periodically to ensure it is up-to-date with current standards and state of knowledge for the practice area.

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1. INTRODUCTION

This practice standard applies to regulated members of the Alberta Institute of Agrologists (AIA) who practice or intend to practice in the Environmental Monitoring practice area. It defines expectations and outlines requirements regarding professional practice within this area of practice. Documentation of these requirements provides necessary assurance to the public that the Agrology profession has identified requirements for professional practice. This practice standard provides members with a benchmark from which to assess their practice and identify potential learning needs in their continuing competence program. In addition, this standard provides information to employers to assist them in selecting employees qualified to work within the Environmental Monitoring practice area.

This practice standard forms the basis for implementation of a practice review protocol for this practice area. Members working within this practice area will be able to request a review of their professional practice based on this practice standard. Such a review will provide valuable input for areas of improvement.

1.1. Objectives

The objectives of this practice standard include the following:

- To clearly define the scope of the Environmental Monitoring practice area;
- To identify and to define the education, experience, skills and performance requirements for professional practice within the practice area.
- To provide documentation of these requirements so regulated members of AIA may assess their practice against this standard and identify learning needs to ensure they meet the standard.
- To provide a standard against which member's professional practices may be reviewed by a peer review committee to assist members in identifying areas where they need professional development, and
- To provide a mechanism whereby AIA can demonstrate that the profession is managed in a manner that protects the interests of the public in matters related to environmental monitoring work conducted by regulated members of the AIA.

1.2. Definitions

Agrologist: A registered member of the Agrology profession who is regulated by the Alberta Institute of Agrologists and who is actively practicing Agrology as defined in the *Agrology Profession Act*.

Competence: The ability to perform certain tasks in a professional practice based on educational training, skills and work experience in a manner that meets performance objectives as defined in a practice standard.

Core Knowledge Area: A general area of knowledge consisting of one or more specialized subject matter areas that are required for practice within a practice area (e.g. soils, vegetation and water).

Direct Supervision: Guidance and direction provided by a competent professional who accepts responsibility for work conducted by a less experienced professional.

Environmental Monitoring: The activities involved in developing a scientifically defensible sampling program and the collection of credible data for the purposes of meeting approval conditions and/or informing decision-making regarding environmental quality.

Experience: Knowledge or practical wisdom gained from observation or doing.

Performance: The exercise of knowledge in a professional practice that demonstrates the required ethical conduct and wise judgment as specified within a practice standard.

Practice Area: A unique functional area of professional practice within the agrology profession that requires specialized knowledge, based on education, work experience and skill sets.

Practice Area Expert Committee: A committee of experts who have demonstrated through their professional practice that they have a comprehensive understanding of the requirements for professional practice in a practice area.

Practice Review: A process whereby a peer review panel examines a regulated member's professional practice against a practice standard, to provide input on practice improvement.

Practice Standard: A document that outlines requirements and expectations for professional practice within a practice area.

Professional Practice: The competent and ethical provision of specialized knowledge, recommendations and assessments based on education, work experience and skill sets while being accountable to peers as a regulated member of a professional regulatory organization.

Regulated Member: A member in good standing with the Alberta Institute of Agrologists who holds one of the following designations: PAg (Professional Agrologist) RT(Ag) (Registered Technologist in Agrology), AIT (Agrologist in Training) or ATT (Agrology Technologist in Training).

Skill: An ability developed over multiple years of work experience in a professional practice.

Subject Matter Area: A specialized area of knowledge required for professional practice within a practice area (e.g. soil chemistry, plant physiology, hydrology).

2. SCOPE OF THE PRACTICE AREA

The Environmental Monitoring practice area of the Agrology profession focuses on evaluating environmental media and conditions while working toward compliance of human activities with environmental standards and guidelines.

Professional Agrologists and Registered Technologists in Agrology bring their knowledge of environmental media (soils, vegetation, water, and air) and the interaction of these to the practice of environmental monitoring. The work conducted by Agrologists involves managing and monitoring the effect of industrial activities to minimize environmental impacts. This includes the development and implementation of scientifically defensible processes and protocols for evaluating environmental media to establish conditions prior to, during and after development.

Agrologists provide interpretation of data from, and direction to, projects to derive mitigation strategies and suggest appropriate courses of action for various types of development. The work involves safely collecting and handling representative samples; preparation of environmental data (e.g. soils, vegetation, water, air); data analysis and interpretation; accurate field reporting and field supervision, final report preparation, and defence of data in regulatory regimes or public forums.

The work involved in the Environmental Monitoring practice area consists primarily of the following core activities:

- Baseline Establishment
- Construction Monitoring

- Operations Monitoring
- Post-operations Monitoring
- Regulatory Review and Enforcement, and
- Other Monitoring

The work involved in these activities is often closely linked to but not limited to environmental legislation and operational approvals for several types of commercial and industrial developments. Agrologists who work within this practice area play a vital role in fulfilling the environmental monitoring requirements of development approvals as well as ensuring environmental protection plans are being followed. Agrologists may work for consulting companies, industry firms, government regulatory agencies (provincial, federal, municipal), non-governmental agencies, public organizations, private citizens (e.g. farmers or ranchers) or educational and research institutions.

2.1 Baseline Establishment

Baseline establishment involves developing a scientifically defensible sampling plan, collecting representative samples and/or field data, analyzing and interpreting data to accurately document the state of environmental media in an area prior to initiation of a human activity. This includes such activities as pre-disturbance assessments, soil mapping and soil salvage planning, vegetation identification and mapping, wetland delineation, hydrology monitoring (streams, rivers, lakes, groundwater), evaluation of slope stability and erosion potential, watercourse crossing monitoring, working with appropriate specialists to identify and account for environmentally sensitive areas such as wildlife habitat. The data collected are used for determining if any change occurs in the condition of environmental media and conditions during construction and operations of various developments. Data collected include both short-term baseline establishment that occurs immediately prior to initiation of a development and long-term baseline establishment to determine variability of conditions prior to future development activity.

The data provide for future analyses to evaluate change in environmental quality over time. For example, baseline soils data are used to determine the site-specific chemical and physical characteristics of the development area (including any potentially imported fill/pad material), and it is important to understand the baseline data in terms of any pre-existing naturally elevated parameters such as salts, metals and hydrocarbons. Baseline soil data are also used to determine the soil salvage and stripping plan, calculating soil volumes, and determining stockpile area. Baseline vegetation data are used to develop a reclamation plan, support weed management during construction and operations, and for rare plant mitigation and avoidance during construction. The environmental monitor works closely with various environmental specialists on an as-needed basis depending on the site-specific conditions and project objectives.

2.2 Construction Monitoring

Construction activities have the potential to directly affect the quality of environmental media (e.g. soil, water, vegetation, air.). The main function of environmental monitors is to support the construction/development activities. Their overall responsibility is to ensure that applicable development approval conditions and legislative requirements are being met while the activity is underway. This is accomplished by documentation and inspections, data collection, regular meetings and training with construction personnel, and regular project reporting.

Regulatory approvals generally contain clauses requiring the presence of a qualified environmental monitor on site to monitor the effectiveness of construction methods and advise of changes needed to effectively protect the environment. For example, soil salvage, handling and

storage are requirements of many development approvals where soil disturbance occurs. Regulatory documents such as the Master Schedule of Standards and Conditions[1] (which includes best management practices) provide direction to support construction monitoring programs and regulatory compliance. The environmental monitor is responsible to ensure that soil degradation is minimized due to soil salvage in wet or dry conditions so that closure land use goals and targets will be achieved. In some cases, the environmental monitor oversees both the salvage and the replacement of soil for reclamation purposes (e.g. pipeline construction). Other activities may include weed and/or stockpile management, monitoring of vegetation (including rare plants) salvage and re-planting as well as sampling of nearby water bodies and water courses and general water management on and off site (e.g. dewatering of trenches) during the construction phase of a development. The environmental monitor must ensure that appropriate environmental specialists are available on an as-needed basis depending on site-specific conditions. In addition, the environmental monitor is responsible to prepare, collect, organize and ensure correct dissemination of environment-related information and documentation as well as address any accidental releases of contaminants that arises during construction.

2.3 Operations Monitoring

Ongoing monitoring over the long-term on a periodic basis occurs following end of construction through the operational life of a facility. This monitoring is generally conducted to ensure compliance with *Environmental Protection and Enhancement Act* (EPEA) site-specific approval requirements. For example, regulatory documents such as the Soil Monitoring Directive[2] and the Canadian Council of Ministers of the Environment (CCME) Guidance Manual for Site Characterization[3] provide direction to development of environmental monitoring programs for regulatory compliance.

Operations Monitoring includes a wide variety of activities across Alberta that engages many practitioners. To manage and monitor an Approval site, the practitioner needs to be versed in regulatory documents, requirements, and updates. In addition, the practitioner must be able to identify specialists to develop Ground Water Monitoring systems (as per approval requirements) as well as to develop Ground Water monitoring programs. Managing waste on-site to meet approval conditions is a necessity. Storm water collection, management, testing, and reporting can be daily tasks that have to be directed by an Operations Monitoring professional.

Air monitoring is becoming an increasingly large part of Operations Monitoring. SGRR, MSAPR, SGER, NPRI, Fugitive Emissions, Methane emissions, etc. are directives and regulations that must be monitored and managed on an operating facility.

All these parameters are part of facilities work. An operations monitoring professional deals with site specific liability assessment, asset retirement obligations, historic impacts, contaminated site, ground water impacts, erosion control, storm water management, vegetation management, brushing, right-of-way subsidence, meeting post construction monitoring report requirements, site

[1] Government of Alberta, 2017. Master Schedule of Standards and Conditions. Alberta Environment and Parks, Edmonton, AB.
[2] Government of Alberta, 2009. Soil Monitoring Directive. Climate Change, Air and Land Policy Branch, Environmental Assurance Division, Alberta Environment, Edmonton, AB.
[3] Canadian Council of Ministers of the Environment (CCME). 2016. Volume 1 Guidance Manual. Guidance Manual for Environmental Site Characterization in Support of Environmental and Human Health Risk Assessment. PN 1551: ISBN 978-1-77202-0267 PDF

remediation, site reclamation, liability reduction programs, spill response and management, fugitive emissions, air emissions, stack testing and so on.

Operations monitoring involves establishing a credible sampling program where collected data can be compared to those obtained during baseline monitoring or compared to data collected during the life of a facility. The objective is to observe changes in parameters monitored over time to detect any potential impacts on environmental quality during the operational phase. In addition, ongoing spill or incident reporting and emergency response may be part of operations monitoring.

2.4 Post-operations Monitoring

Following cessation of operational activities at a facility, long-term monitoring may be required to document any changes in the state of environmental media over time and confirm that management strategies to contain or eliminate environmental contamination or degradation have been effective. This may include monitoring activities during the both the decommissioning stage and final closure stage once operations have ceased. These monitoring activities during decommissioning and closure are usually a requirement of regulatory approvals. These activities are an essential part of ensuring regulatory compliance for ultimately achieving reclamation certification. For example, post-operations monitoring for long-term exposure control of a contaminated site is typical of this activity. Environmental monitors often work closely with both contaminated land specialists during long-term monitoring of a contaminated site for exposure control and land reclamation specialists during the monitoring phase of the reclamation certification process.

2.5 Regulatory Review and Enforcement

Many Agrologists work for government agencies and are responsible for reviewing, assessing compliance and approving environmental monitoring reports received from various industrial facilities. Where compliance is not achieved these Agrologists may also be involved in enforcement activities. This may range from working with a facility to develop strategies to return to a state of compliance to recommending fines and penalties.

Agrologists working in government agencies may also be directly or indirectly involved in providing input to both legislation development and amendment, providing input on newly emerging or existing government policies and directives, and developing and writing permit conditions that address environmental quality. Many of the government directives that provide instruction on monitoring requirements (monitoring parameters, sampling protocols, monitoring frequency, statistical validity, etc.) have been developed through the work of Agrologists.

2.6 Other Monitoring

Agrologists are involved in several environmental monitoring activities which do not focus on facility monitoring related to a regulatory approval. Some of these activities include data gathering to assist in documenting the state of, and managing natural resources such as air, soils, water, vegetation, wetlands, biodiversity and so on. Such monitoring activities provide information that assists in developing legislation and government policy as well as informing Albertans about the state of their environment. This type of monitoring varies with respect to the monitoring time frame (short, medium, long term) the geographic scope (e.g., local, regional, provincial) and the overall monitoring objectives. Many Agrologists are also involved in environmental monitoring as part of a research program associated with either an educational institution or government agency.

Agrologists also contribute to other areas of environmental monitoring. These activities include waste monitoring for urban centers and municipal districts, monitoring of biosolid and effluent application to land, landfill monitoring, and confined feeding operations monitoring as just a few examples.

3. KNOWLEDGE REQUIREMENTS

Knowledge requirements are technical or scientific areas of knowledge essential to professional practice within the practice area. They consist of core knowledge areas comprised of one or more specialized subject matter areas that are foundational to the practice area.

3.1 Core Knowledge Areas

Several core knowledge areas have been identified as being foundational to practice within the PA (Table 1). These include core knowledge in air, contaminants; data, ecology; soils; vegetation and water.

3.1.1 Air

While air monitoring generally is led by air engineers and scientists, Agrologists, in some cases, are found working closely with air quality specialists to provide air monitoring services either in a consulting role or in a regulatory and policy role. In these roles it is important for Agrologists to understand air quality parameters, their measurement and sampling protocols as well as be well versed in the regulatory policies and directives related to air monitoring. Agrologists often provide support to air quality modelers to assess air deposition effects on soils, water and vegetation (e.g., NOx, SOx, potential acid input) and may be directly or indirectly involved in monitoring air quality as required in various industrial approvals or other land use activities.

3.1.2 Contaminants

A knowledge of the nature of contaminants and how they behave within environmental media is important to understand how to develop an appropriate sampling plan, collect and store samples, and interpret laboratory results. In addition, a knowledge of health and safety risks associated with contaminants is important to protect the health of the personnel handling the contaminated media and to develop appropriate hazard mitigation protocols.

3.1.3 Data

A knowledge of sampling methods and designs is essential to the environmental monitoring practitioner. Scientifically defensible sampling designs and well documented sampling protocols are essential to ensure that the data are credible and meet the objectives of the sampling program. Understanding sampling protocols for various environmental media and contaminants and ensuring the samples are handled in accordance with a chain of custody are vital elements of an effective monitoring program. In addition, data entry and storage is vital to ensure that data integrity is maintained and data are easily recalled from a data management system when needed.

3.1.4 Ecology

A knowledge of Ecology is essential to understand the interrelationships among ecosystem components (e.g. air, soil, vegetation, water, wildlife, etc.) and how these components act together as an integrated system. The environmental monitor must understand how the component to be sampled is affected by the other components and how the system reacts to disturbance to one or more components. System-level thinking is vital to understanding the need for an appropriate sampling program that provides credible data and provides the necessary context for data interpretation and reporting of potential or existing effects on an ecosystem.

3.1.5 Soils

A knowledge of the fundamental physical, biology, chemistry and fertility characteristics of soil is necessary to the understanding of plant growth potential and limitations and to understand the relationship of soils to ground and surface water resources. Understanding the effect of land use and soil management on soil chemical, physical and biological properties is necessary to assess effects on soil quality and land capability. An understanding of soil profile development,

morphology and classification is important to identify key limitations within the root zone of individual soil profiles and to inform appropriate sampling strategies for soils.

3.1.6 Vegetation

A general knowledge of plant science and the ability to identify vegetation species is important to identify the types of plant communities that are present and to understand how their growth indicates overall plant health and vigor. Understanding vegetation management strategies, plant succession and the interaction of native, non-native and invasive species are important considerations for vegetation. In addition, an understanding of plant growth habits is important to provide direction to plant tissue sampling for contaminant assessments.

3.1.7 Water

A knowledge of how hydrologic processes, both surface and subsurface, affect movement of substances within the landscape is necessary to develop an effective sampling program. Understanding water flow on-site is essential to manage sediment movement and development of an erosion abatement program. A knowledge of the parameters that define water quality is necessary to inform sampling plans, sampling handling and interpretation of laboratory results.

Each of the core knowledge areas listed above consist of one or more subject matter areas. Subject matter areas consist of both required and recommended subject matters (Table 1). Required subject matters represent the minimum credible knowledge required for the given core knowledge area. These subject matters are mandatory for members who wish to provide professional advice or services related to the core knowledge area.

Recommended subject matters represent knowledge that is not mandatory but provides increased depth of knowledge related to the core knowledge area. These subject matters are highly recommended and have been identified to provide members with direction for their continuing competence program.

The subject matters within each core knowledge area represent areas of study equivalent to a three-credit course in a post-secondary educational institution. Subject matter knowledge is normally obtained through education in a degree or diploma program; however, knowledge in certain subject matter areas may be obtained via industry courses, work experience self-study and mentorship. To assure the public that practitioners have acquired knowledge via work experience, self-study or mentorship, such knowledge needs to be validated through a challenge exam process implemented by the AIA.

It is the responsibility of members wishing to practice in this area to review Table 1, conduct self-assessments and identify how their knowledge and expertise aligns with the required subject matters. Members who do not meet a required subject matter within a core knowledge related to their professional practice will be required to address the deficiency before practicing unsupervised in relation to that core knowledge area. In such situations, members will be required to do one of the following:

1. Seek Advice and Direction: Members lacking specific knowledge in required subject matters must recognize the limits of their expertise and seek advice and direction from a qualified professional.
2. Complete Challenge Exam(s): To validate that subject matter knowledge has been gained through work experience, self-study or industry courses, a member may be required to either (i) write a professional practice examination supplied by the AIA; or, (ii) to appear before a panel of peers to complete an oral examination supplied by the AIA.
3. Pursue Formal Education and Training: Obtain credit in a formal course from an appropriate educational institution or from an industry course approved by the AIA. Such

courses must have an adjudicated examination to document knowledge attained.

Table 1. Knowledge Requirements for the Environmental Monitoring Practice Area

Core Knowledge Area	Required Knowledge	Recommended Knowledge
Air	• Air Quality	
Contaminants	• General Chemistry • Environmental Chemistry OR Soil Chemistry OR Water Chemistry OR Air Chemistry	• Contaminant Fate and Behavior • Geochemistry
Data	• Data Management • Sampling Methods and Design	• Statistical Analysis and Data Interpretation
Ecology	• Intro Ecology	• Population Ecology • Community Ecology • Terrestrial Ecology • Aquatic Ecology
Soils	• Introductory Soil Science • Soil Genesis and Classification • Soil Conservation and Management	• Soil Chemistry • Soil Physics • Soil Fertility • Geomorphology
Vegetation	• Introductory Plant Science • Vegetation Identification	• Biodiversity • Plant Ecology • Vegetation Communities and Wildlife Habitat • Weed Management
Water	• Water Quality • Hydrology OR Hydrogeology	• Climatology
Knowledge of a subject matter area may be based on an individual course, it may be based on portions of multiple courses, or be obtained through work experience and other professional development training.		

4. WORK EXPERIENCE

Work experience represents a source of knowledge gained through professional practice rather than through education. Such experience facilitates development of logistical and practical knowledge and skill sets needed to achieve competence within the practice area. Experiential knowledge and skill sets are developed in an environment where feedback is available. With

progressive experience comes a breadth of knowledge and perspective that facilities strategic thinking and problem solving.

4.1 Years of Experience

Three levels of work experience are recognized within this practice standard. It is important that practitioners recognize the limitations of their expertise and do not accept work duties and responsibilities that are beyond their experience level unless the work is conducted during training under supervision (Table 2).

Overall, practitioners at a junior level need to be proficient in the specific sampling and data collection methods and those at intermediate and senior levels are more directly involved in analyzing and interpreting data collected to derive mitigation strategies as required to minimize disturbance and maximize the potential for the return of ecosystems to equivalent capability of baseline conditions and an appropriate land use once the projects are completed.

Junior level (< 5 years of experience in environmental monitoring). The junior level of experience coincides with entry-level personnel who have recently graduated from an appropriate educational program and have up to 5 years of relevant work experience. This work experience is conducted under supervision of a qualified practitioner within the practice area. Practitioners at the junior level are considered to have insufficient experience to sign off on reports, maps and other work products. This is consistent with expectations of the Government of Alberta regarding professional sign-off on regulatory documents.

Intermediate level (5 to 10 years of experience in environmental monitoring). Intermediate practitioners no longer require direct supervision and have developed the necessary skills and obtained the necessary experiential knowledge to take responsibility for their work. They can sign off on reports, regulatory applications and other documents. They often act in a supervisory role for junior personnel, report to senior personnel and act as client liaisons.

Senior level (typically > 10 years of experience in environmental monitoring). Senior practitioners provide supervision and often act as mentors to intermediate and junior personnel. They are recognized as knowledge experts by their peers and act as key stakeholder representatives for their companies. They play a key role in business development, project management and in providing strategic direction. They are responsible for work quality in their companies and act as primary liaisons with regulators.

Members will ensure they have sufficient work experience to conduct the work and accept responsibility for the work they do. The time frames indicated in Table 2 are provided for guidance. Career progression and work experience may vary by individual.

Table 2. Work Experience

Experience Level	Years of Experience	Examples of Typical Job Level Duties and Key Responsibilities	Supervision and Professional Sign-off
Junior	< 5 years	• Conduct desktop work and literature review for projects. • Participate in project planning and project execution with intermediate and senior personnel. • Follow standard operating procedures: sampling, data entry, analysis and reporting under supervision.	• Require direct supervision. • Cannot exercise professional sign-off.

		• Collect field data. • Interpret data under supervision. • Develop personal understanding of their expertise limitations and seek advice from intermediate and senior professionals.	
Intermediate	5 to 10	• Plan and execute projects. • Develop work plans. • Make recommendations or decisions on project execution. • Review and recommend changes to standard operating procedures (e.g. scientifically defensible sampling protocols and methods). • Make decisions in field operations. • Collect field data. • Analyze and interpret data. • Develop mitigation strategies. • Write and deliver reports. • Manage projects, contractors and staff. • Engage with stakeholders including regulatory agencies. • Communicate and liaise with regulatory personnel and landowners. • Provide mentorship. • Aware of their expertise limitations and seek advice from other professionals.	• Supervise junior personnel. • Exercise professional sign-off on reports, regulatory applications and other work products. • Accountable to senior supervisors and managers.
Senior	> 10	• Collect and interpret data. • Develop mitigation strategies. • Write and deliver reports. • Act as technical advisor. • Develop, review and sign-off on standard operating procedures (e.g. scientifically defensible sampling protocols and methods). • Provide mentorship. • Sponsor projects. • Engage stakeholders including regulatory agencies. • Develop and manage project quality assurance and quality control. • Manage personnel. • Understand and represent stakeholder and public interests. • Act as a key representative for their company. • Accountable for overall project development, execution, completion and stakeholder satisfaction. • Provide strategic planning, business development and decision making. • Has financial decision-making responsibilities.	• Conduct senior review and sign-off on reports, regulatory applications and other work products. • Undertake supervisory and management roles.

		• Aware of their own expertise limitations and seek advice from other professionals.	

4.2 Skill Sets

Certain skill sets are required for a practitioner to be proficient within the Environmental Monitoring practice area. Application of scientific or technical knowledge requires skill sets identified within this practice standard. Skill sets are vital to effective functioning within the practice area and are usually developed during work experience, mentoring and/or professional development courses.

Table 3 provides a descriptive list of skill sets required for the practice of environmental monitoring. Members practicing in the Environmental Monitoring practice area are required to work towards developing these skill sets by undertaking continuing competence programs to address those that are lacking.

Table 3. Required Skill Sets for the Environmental Monitoring Practice Area

Required Skill Sets	Description
Regulatory understanding and application	It is important to understand the legal framework to ensure compliance with legislation, regulations, policies, guidelines, standards and any associated regulatory approvals.
Safety and hazard assessment	This is required to ensure necessary safeguards are in place to maintain the safety of people, infrastructure and the environment. Usually obtained through short courses on safety pertinent to hazards at the workplace or for activities being conducted.
Site interpretation	The ability to assess and interpret site temporal and spatial variability and the interaction among various ecosystem components (i.e. soils, terrain, vegetation, drainage, surface water and groundwater) is an essential skill set for environmental monitoring.
Project planning and management	This skill set involves several tasks such as proposal and budget preparation, project plan development and implementation, ongoing assessment and alignment of a project plan with objectives, cost tracking and management, project integration and completion, and safety management.
Sampling, data collection, management and validation	The use of documented scientifically defensible sampling protocols (e.g. sample collection and handling, chain of custody, data analysis, quality assurance and quality control) and data management protocols to ensure data meet quality standards.
Relationship building, management and communication with stakeholders and regulators	To establish and maintain relationships and communications with regulators, subcontractors, clients and other stakeholders to ensure drivers are accounted for and incorporated into project objectives and stakeholder expectations are understood and met or appropriately managed.
Understanding earth moving, soil handling activities, heavy and agricultural equipment capabilities	This skill set is usually developed through mentorship from other professionals, experience with field operations, and communication with contractors responsible for earth moving and soil handling. Working with contractors and understanding the sequence and logistics of site management activities along with equipment limitations and capabilities is critical.

Familiarity with wildlife and habitat considerations	It is important to be aware of wildlife issues (e.g. association of vegetation communities and habitat potential; species at risk, etc.) and to identify appropriate specialists who can provide the necessary guidance and direction.
Effective communication, documentation and reporting	Appropriate scientific interpretation of data, ability to write and communicate objectively and concisely based on the supporting data and findings as well as documenting rationale for decisions and conclusions is a key professional requirement. Expressing results, professional opinions and conclusions based on supporting data in an appropriate, clear and concise reporting format is important. Also, documentation of communication with contractors, other disciplines, etc. is important to demonstrate that communication has and is occurring with relevant parties.
Ethical practice	Members adhere to the Code of Ethics for the profession as they make recommendations to their clients. The Code of Ethics states, "*The Profession of Agrology demands integrity, competence and objectivity in the conduct of its members while fulfilling their professional responsibilities to the public, the employer or client, the profession and other members*." (See Appendix B)

5. PERFORMANCE REQUIREMENTS

In addition to the General Practice Standard that applies to all AIA members (see Appendix), specific performance requirements have been developed for this practice area. The following performance requirements outline the expectations of the professional working within the Environmental Monitoring practice area.

Regulated members stay current with environmental research, legislation, directives, guidelines, industry standards and other reference documentation related to environmental monitoring.

Regulated members:

- Regularly review the reference material used to support their practice and obtain most current versions when available.
- Attend conferences workshops and updates related to environmental monitoring.
- Communicate with regulators, research scientists, educators and other practitioners to ensure they remain current with current environmental monitoring knowledge and trends.

Regulated members understand the limits of their knowledge, skills and experience and seek the expertise of other professionals where necessary.

Regulated members:

- Make appropriate scientific, technical, practical and logistical decisions based on their education and experiential knowledge in environmental monitoring.
- Apply their skills and use sound judgement in an ethical manner.
- Seek advice and input from other professionals when their expertise is insufficient to make competent decisions and recommendations.

Regulated members clearly understand their role within the practice area.

Regulated members:

- Understand their role in an environmental monitoring project and do not exceed the boundaries of that role.
- Do not accept environmental monitoring work that is beyond their expertise and work experience level unless they conduct it under the direct supervision of a qualified regulated professional.

- Only accept responsibility for another professional's work when they are confident, through direct supervision or interaction, that the professional has completed the work in a competent manner.

Regulated members clearly understand a project's scope and terms of reference and ensures alignment with a project execution plan.
Regulated members:
- Understand the objectives, scope and deliverables for a project and work within the terms of reference for the project.
- Use a consistent and thorough process for management of a project.
- Regularly review the project execution plan and approved budget to ensure alignment with project goals and objectives.

Regulated members strive for continuous improvement.
Regulated members:
- Seek advice from other professionals to enhance their knowledge of environmental monitoring practices.
- Participate in knowledge sharing with other members to advance professional practice in environmental monitoring; participate in publishing papers and presenting at conferences.
- Document best management practices in environmental monitoring and implement these practices where feasible.

Regulated members review the requirements of this practice standard and address any practice deficiencies through their ongoing continuing competence program.
Regulated members:
- Conduct self-assessments based on education, work experience, skill set and performance requirements indicated within this practice standard.
- Review their self-assessment with a senior qualified professional.
- Identify any deficiencies and develop a plan to address them.
- Regularly participate in the AIA continuing competence program as required by the Agrology Profession Act.

6. REFERENCE MATERIAL

The following are some recommended references useful for practitioners in the Environmental Monitoring practice area. This list is not intended to be a complete list of references.

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7. SUMMARY

This document describes the educational requirements, work experience, skill set and performance expectations for professional practice within the Environmental Monitoring practice area for the Agrology profession. It provides direction to members of the Alberta Institute of Agrologists who are practicing or who wish to practice within this practice area to ensure they are qualified to conduct work in this area.

Members practicing within this practice area are required to review this document and assess their educational background, work experience, skill sets and performance against the requirements and expectations herein. Where deficiencies are noted members are expected to develop a plan to address these deficiencies through their individual continuing competence programs. Members are expected to understand the limits of their own knowledge and expertise and seek additional advice and professional support as required.

This practice standard will form the basis of ongoing practice reviews conducted by the Institute and the basis for review should a member be subject to a complaint. It is the responsibility of the member to be aware of the contents of this practice standard.

Appendix A

The following General Practice Standard applies to all registered members of the AIA. This General Practice Standard is to be adhered to as well as this detailed practice standard for the Environmental Monitoring practice area.

GENERAL PRACTICE STANDARD FOR ALL REGISTERED MEMBERS OF THE ALBERTA INSTITUTE OF AGROLOGISTS

The General Practice Standard applies to all registered members of the Alberta Institute of Agrologists. The purpose of the document is to describe the duties and responsibilities that are incumbent upon each member of the profession. It is the responsibility of each registered member to conduct themselves in accordance with these standards. Registered members will be measured against these standards by the Institute, the public, employers, clients and colleagues. The Standard describes the values of the Institute and the profession, and the expectation for each registered member.

PROFESSIONAL RESPONSIBILITY

Each registered member of the Alberta Institute of Agrologists (AIA) is required to uphold the standards and reputation of the agrology profession and professional principles.

Indicators

The registered member has a duty to protect the public and to conduct his or her work with an appropriate standard of care.

Standard of care: Standard of care is the legal duty to exercise the watchfulness, attention, caution and prudence that a reasonable professional in the same circumstances would exercise. If a professional's actions do not meet this standard the professional may be found negligent or to have committed unprofessional conduct.
The registered member is personally responsible and accountable for ensuring that his or her agrology practice and conduct meet the requirements of the practice area(s), practice standards, current legislation, regulations and policy.

The registered member will practice with honesty, integrity and respect, and comply with the AIA's Code of Ethics.

The registered member will sign or co-sign a report only if he or she is willing to accept full responsibility for the contents of the report.

The registered member may delegate portions of the work to competent practitioners under the registered member's direct supervision. The registered member will accept responsibility for that work and provide additional quality assurance/quality control to determine the sufficiency of that work. Registered members will not sign any document for which they will not take full responsibility for the contents of the document.

The registered member will hold the public interest paramount and endeavor to put service above gain and excellence above quantity.

COMPETENCY

The registered member will practice only in an area(s) where the member has demonstrated competence.

Indicators

The registered member will only practice unsupervised in the practice area(s) where the member's education, skills, and experience fulfill the practice area qualifications and the registered member believes he or she is competent. If a registered member's education, skills, and experience do not meet the requirements of the practice area, the member will practice *only* under the direct supervision of a qualified, registered professional who is competent to do the work and who will give appropriate direction to the registered member.

The registered member, if called upon by the profession, a judicial review or a court ordered request, must be able to clearly demonstrate the knowledge and skill sets gained to enable them to practice in any practice area(s) in which the member deems himself or herself competent to practice.

The registered member will undertake continuing professional development (CPD) with the majority of the CPD hours directly relevant to his or her practice area(s). The registered member commits to reporting his or her CPD activities on the member profile as activities are completed.

The registered member will continually update his or her scientific and standard industry practice knowledge related to the member's practice area(s).

The registered member will demonstrate critical thinking when planning, implementing and evaluating all aspects of the work and making any recommendations as a professional.

The registered member is able to show his or her reasoning in reaching decisions through accurate and clearly written documentation.

The registered member will advise the AIA of any changes to his or her practice area(s), particularly when a new practice area is chosen. The registered member will specify the knowledge and skills that have been acquired to support work in the new practice area.

PROVISION OF SERVICE TO THE PUBLIC, A CLIENT OR AN EMPLOYER

The registered member will promote the qualified, competent and ethical professional role and accountability of Agrologists to the public, other professionals, and themselves.

Indicators

The registered member will prepare accurate, concise and clearly written reports and correspondence that are appropriate for the intended audience.

The registered member will communicate clearly and respectfully with a variety of people, including his or her employer, colleagues, clients, members of the public and regulators.

The registered member will advise the client if the work is outside of his or her practice area(s) and if the member will be unable to fulfil the terms of reference for the work.

The registered member will make a referral to seek advice, and enter into collaborations with other professionals in situations which require expertise that extend beyond the member's competence.

The registered member will avoid situations where a conflict of interest exists or where the duties and loyalty owed by a member to one party likely will be, is, has been, or perceived to be, in conflict with the duties or loyalties the member owes to another party.

The registered member will extend public knowledge of their area of expertise whether it is in agriculture, the environment, food sciences or life sciences, and promote factual and accurate statements on matters regarding these areas.

STEWARDSHIP

The registered member will advocate and practice good stewardship of all agricultural and environmental resources based on sound scientific principles.

Indicators

A registered member will consider monetary issues, social values, rational application of sound science, lesson of valid experiences, economic impacts to the geographic region, and impacts on future generations when conducting his or her work.

A registered member will inform the client or employer of any action planned or undertaken by the client or employer that he or she believes is detrimental to good stewardship or in breach of known legislation, regulations or policies.

SAFETY

The registered member understands his or her obligation for promoting public and worker safety and considers the health of the environment, health of the consumer, industrial safety, construction safety and the general operational safety of projects.

Indicators

A registered member will demonstrate concern for the immediate and long-term direct effects of agricultural and environmental practices on the safety of workers by being aware of, and evaluating risks.

A registered member will balance the claims of producers and needs and wants of a consuming public against the potentially competing claims for safety of the environment and the interests of individuals and businesses affected by their proximity to agricultural operations. The registered member is aware that the public expects and demands a safe supply of food, not only for current use but also for future generations.

Appendix B

CODE OF ETHICS

"The Profession of Agrology demands integrity, competence and objectivity in the conduct of its members while fulfilling their professional responsibilities to the public, the employer or client, the profession and other members."

Members should be aware of any other laws and responsibilities in regard to other business and voluntary activities which may impact their ethical conduct.

Guidelines to the Ethical Responsibilities of Agrologists

The purpose of the following guideline is to clarify the intent of the Code of Ethics and the understanding of the nature of the professional obligations that arise out of the document. Throughout, it is recognized that membership is a right granted by the public to the regulated member (member) to practice Agrology in such a way that the public interest is served. It is also understood that, just as the individual member has an obligation to conduct business in an ethical and competent manner, colleagues and the Institute share the moral responsibility of protecting their Agrologists and the field of agrology against any unfounded and unjust criticisms.

1) Among the regulated member's professional obligations to the public are the responsibilities:

a) To practice only in those practice areas where the member's training, ability, and experience make him/her professionally qualified.

The public has given a right to the Professional with the trust and expectation that those activities are undertaken with competence. A member will not make misleading statements regarding his/her qualifications. A member will actively pursue professional knowledge upgrading specific to their practice area(s) in order to remain competent in his/her field of expertise. A member will make referrals to seek advice, and enter into collaborations with other professionals in situations which require expertise that extend beyond the individual member's competence.

b) To express a professional opinion only when it is founded on adequate knowledge and experience, and where the member has an understanding of the situation and context in which this opinion is being offered.

Members must clearly distinguish among facts, assumptions and opinions in their preparation of reports and professional statements. Professional opinions should be clearly stated and should include clear indications of the constraints that apply to the opinion, and the relevant qualifying circumstances, facts and assumptions.

Members should exercise care that work they conduct cannot in any way be seen to support or make possible any morally suspect or illegal purposes. In the extreme, this caution might cause a member to refrain from association with enterprises or individuals whose objectives and probity are subject to questions.

Members who act as expert witnesses and provide opinion evidence for the purpose of litigation should not take a partisan position. Agrologists must provide evidence as impartial experts and must not do so as advocates of their client or employer. While acting as an expert witness, a member's role is to assist the judge/jury/panel with technical matters which are beyond the expertise of the tribunal.

c) To advocate and practice good stewardship of all agricultural and environmental resources based on sound scientific principles(s).

Stewardship requires making complex choices based on a variety of relevant but not necessarily compatible factors. Good stewards must consider, but not necessarily be limited to: monetary matters, social values, the rational application of sound science, the lessons of valid experience, impacts on the economic health of the community at large, and the impacts on future generations. Because of the position of public trust, a member's duty is to uphold professional principles above and beyond the demands of employment.

Conflict may arise between a member's duty to uphold professional principles and the duty to serve the needs of an employer or a client. Members must distinguish between the role they play as Agrologists and the role management plays. Managers have prerogatives and privilege for making decisions based on a wider range of constraints than those that might be appropriate for an Agrologist. The member must not confuse the role of providing others with information upon which to base a decision with the role of being responsible for making the decision him or herself.

If a member believes there is a serious conflict between the requirements of employment and a member's professional principles, a member should inform/or consult the Registrar or any other appropriate persons about the conflict. Members may seek advice and support for the position from the Institute.

d) To extend public knowledge of agriculture and the environment and to promote truthful and accurate statements on sustainable agricultural systems and environmental matters.

Members should strive to develop appropriate involvement with schools, agencies and organizations insofar as such outreach activities can help ensure the dissemination and discovery of sound and appropriate agricultural environment knowledge. Members should attempt to correct misleading or erroneous statements on agricultural matters whenever and wherever such statements are encountered.

e) To have proper regard for the safety of others in all work.

Members must understand their obligation for promoting safety. Members should consider the impact the exercise of their professional duties will have upon the health of the environment, industrial safety, and health of the consumer, construction safety and the general operational safety of completed projects. Members must demonstrate concern for the immediate and long-term direct effects of agricultural and environmental practices on the safety of workers by being aware of and evaluating risks.

The public expects and demands a safe supply of food, not only for current but also for future generations. Members must balance the claims of producers and consuming public against the potentially competing claims for safety of the environment and the interests of individuals and businesses affected by their proximity to agricultural operations.

2) A member's responsibility to the client or Employer is:

a) To act conscientiously and diligently in providing professional services.

Members should endeavour to put service above gain and excellence above quantity. If a member becomes aware of errors or omissions in his/her work, he/she must report the same to his/her client or employer, and immediately work to remedy such errors or omissions.

Expect as required by law, to maintain the confidentiality of client and employer information unless given the explicit consent of the client or employer.

b) A member should consider all information received from a client or employer as confidential unless such information is in the public domain.

Information obtained during and specific to a professional contract situation is confidential and must not be disclosed to others or used by the members outside that contracted situation without the consent of the client or employer. However, technical expertise gained by a member through work may be used in subsequent projects without consent from other parties.

c) To obtain a clear understanding of the client's or employer's objectives.

Members must clearly understand the objectives of the client or employer. Members must make inquiries regarding such objectives to ensure that professional services are provided in the context of complete and accurate information. It is recommended that all oral communication that is material to the delivery of professional services be confirmed in writing.

d) To inform the client or employer of any action planned or undertaken by the client or employer that a member believes is detrimental to good stewardship or in breach of known laws or regulations.

It is a member's duty to advise a client or employer of the consequence of questionable actions and inform the client or employer of the facts that lead the member's belief that the action is detrimental to good stewardship.

e) To refuse any assignment that creates a conflict of interest.

A conflict of interest exists where the duties and loyalty owed by a member to one party are, are likely to become, or to a reasonable, informed and objective observer would appear to be in conflict with the duties or loyalties the member owes to another party.

A member should not accept an assignment in which he/she has a personal or business interest unless that interest is disclosed and approved by the client or employer.

Where a member is in a position of providing professional services to more than one party with different interests in the same or related matter, the member must explain the significance of acting for more than one party to each of the affected clients or employer(s) (the parties) and obtain the written consent of the parties to continue working for more than one party. If any of the parties fail to give their consent the member must then determine whether it is possible to act on behalf of a subset of the parties without conflict. If conflict cannot be eliminated by acting only on behalf some of the parties, then the member should advise all the parties that he/she cannot continue to act for any of them in the matter that generates the conflict of interest.

Members must also advise the parties that no information received in connection with the common matter from the one can be treated as confidential so far as any of the other parties are concerned.

f) To not accept compensation from more than one employer or client for the same work, without the consent of all.

Members need to distinguish between the data or product, which becomes the property of the client; and the process or technical experience, which remains the property of the member.

3) The Agrologist's Responsibility to the Profession is:

a) To inspire confidence in Agrology by maintaining high standards in conduct and work.

A member must keep in mind that the work of an Agrologist is continuously open for public scrutiny and it is the responsibility of each individual to build and maintain a positive image of the field and the profession. Not only must a member perform his/her duties of employment to a high level of excellence, but the conduct of that member must also be of high standard.

b) To support activities for the advancement of the profession.

Members have an obligation to participate in the activities of the Institute (i.e., meetings, elections, holding office, mentoring) as the individual members situation and opportunities allow.

Members need to be constantly aware they are Agrologists and should, by their conduct, provide a positive image of the profession. Each member must be prepared to personally promote Agrology in personal contacts and communications, and to participate in specific promotional initiatives organized by the professional organizations.

c) Where a member believes another individual may be guilty of infamous or unprofessional conduct, negligence or breach of the Agrology Profession Act or bylaws:

to raise the matter with that individual and

if not resolved or if otherwise deemed necessary to inform the Registrar of the Institute in writing.

A member should ensure that the facts and understanding of the misconduct are correct. Consultation with a colleague or Registrar is encouraged if it may help clarify the issue. Members should make every effort to raise and resolve the issue in a candid and professional manner. Agrologists should note that only in exceptional circumstances is it inappropriate to raise such a matter with the other member if done courteously and politely.

d) To state clearly on whose behalf professional statements or opinions are made.

A professional opinion or statement prepared by an Agrologist is for a specific situation and set of circumstances. The content of a professional opinion should include the context in which it is made.

e) To sign and seal only those plans, reports, and other documents for which the members are professionally responsible and which were prepared by or under the direction of the member.

Members who affix their seal and/or signature assume responsibility for and understand the document. The responsible professional must have exercised sufficient control and association with the document so he/she can sign and seal the document based on personal knowledge. Members will not associate themselves with documents, reports or statements that misrepresent, distort or omit material facts. Members should familiarize themselves with information that details the procedures and protocols that are associated with the use and practice of sealing professional works.

4) A member's professional responsibility to other members is:

a) To abstain from undignified or misrepresentative public communication with or about members.

Conduct between members should be characterized by respect, courtesy, honesty, and good faith. Direct and honest criticism between professionals is acceptable and professional debate is encouraged when characterized by fairness and propriety.

Members should be courteous when criticizing the work of another member and be as careful with a colleague's reputation as they would be with their own. Members will advise another regulated member in advance if they are reviewing/critiquing the other's work for a specific project. An individual member will not make statements or representations on behalf of the Institute without prior authorization.

b) To give credit for professional work to whom credit is due.

Members should always acknowledge the work and contributions of others when directly using that work in whole or in part. Members should clearly understand and appreciate that the unpaid use of marketable processes and technology developed by another member could jeopardise that other member's livelihood.

Members will follow the rules and law of copyright. Members will secure releases for any data, process (es), and publication(s) obtained from written or electronic sources.

c) To share knowledge and experience with other members.

Each member has a duty to new members and to the future of the Institute to be available as a mentor for new members. Individual members should offer and seek out constructive professional discussion and debates with colleagues to maintain a vibrant and progressive profession.

Code of Ethics, Revised September 2010