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CLASSIFICATION STANDARD

**PHYSICAL SCIENCES**

**SCIENTIFIC AND PROFESSIONAL CATEGORY**

# CLASSIFICATION STANDARD

## PHYSICAL SCIENCES

### Scientific and Professional Category

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## INTRODUCTION

This standard describes the plan to be used to classify positions allocated to the Physical Sciences. Group. It consists of an introduction, definitions of the Scientific and Professional Category and the occupational group, a glossary of terms, factor definitions, characteristics and degree highlights, and bench-mark position descriptions.

The ultimate objective of job evaluation is the determination of the relative values of jobs in each occupational group. A classification plan of five levels, representing significant differences in the difficulty of the work, has been established for this group. Jobs assigned to a given level are regarded as being of equal difficulty.

### Factors

The evaluation of positions and their assignment to a classification level will be determined by the application of five factors:

- Kind of Assignments
- Complexity of Work
- Professional Responsibility
- Management Responsibility
- Impact of Recommendations and Activities

Each factor is described, and the descriptions designate the features of the work assigned to positions allocated to the group.

### Factor Characteristics

The factor characteristics are shown under each factor. The characteristics indicate the features of the work that are to be considered when evaluating a position under a particular factor.

Highlights which describe and distinguish the increasing difficulty of the work from the lowest to the highest degree, are provided for the five degrees of each factor characteristics. These highlights describe the features of the work that will be found in most positions.

### Bench-mark Positions

Bench-mark positions exemplify the degrees of the characteristics, the degrees of each factor and the levels of the classification plan. Each bench-mark consists of a descriptive title, a series of statements of the principal duties, and a set of specifications describing the features of the work of the position in terms of the characteristics of each of the five factors. The specifications exemplify the application of the evaluation plan to the duties and responsibilities of the bench-mark position and substantiate the degree assigned to the position for the characteristics and the factors. A classification level is assigned to each bench-mark position.

### Use of the Standard

There are six steps in the application of this classification standard.

1. The position description is studied to ensure understanding of the position as a whole and of the nature of the duties and responsibilities as they relate to the characteristics of each factor. The relationship of the position being studied to positions above and below it in the organization is also studied.

2. Allocation of the position to the category and group is confirmed by reference to the definitions and the descriptions of inclusions and exclusions.
3. A degree under each of the factor characteristics is tentatively assigned to the position being evaluated, by considering the duties and responsibilities of the position in relation to the degrees described for the factor characteristics, and attributing to the position the degree whose definition best reflects the conditions that are typical of the work of the position and most closely corresponds to its difficulty in terms of the characteristic. The degree tentatively assigned is confirmed by comparison with the bench-mark position descriptions and rating specifications for the characteristic.
4. A degree under each factor is assigned to the position. The degree to be assigned for a factor is determined by the degree which predominates for the factor's characteristics. When one degree does not predominate, the raters are to compare the overall intensity of the requirements of the position with respect to the various characteristics of the factor with the bench-mark positions, and attribute to the position the factor degree that best equates, on the whole, to the bench-mark positions.
5. The level of the position is determined by the degree that has been assigned to the position for at least three of the five factors. When one degree does not predominate, raters are to compare the total job with the bench-mark positions and determine the level that best corresponds, on the whole, with the duties and responsibilities of the position.
6. The position is compared with bench-mark positions that have been assigned to the same level, as a check on the validity of the level selected.

#### Guide

A Guide identifying a series of distinguishing features characterizing positions found typical of each level is included in the standard.

#### Organization Chart

A succinct linear organization chart completes the description of the position and shows the reporting/control relationships that are significant to the rating of the position.

CATEGORY DEFINITION

Occupational categories were repealed by the Public Service Reform Act (PSRA), effective April 1, 1993. Therefore, the occupational category definitions have been deleted from the classification standards.

GROUP DEFINITION

For occupational group allocation, it is recommended that you use the [Occupational Group Definition](#) and [the Occupational Sub-group Definition Maps](#), which provide the 2005 group and sub-group definition and their corresponding inclusion and exclusion statements. The maps explicitly link the relevant parts of the overall 2005 occupational sub-group definition to each classification standard.

GLOSSARY OF TERMS

For the purpose of this standard -

Behavior of Earth - Refers to the activities of earth and its properties to include plate tectonics, magnetism, volcanism, erosion, sedimentation and similar processes which result in the formation, transformation and change in behavior of the planet.

Behavior of Matter - Refers to the properties and interactions of matter and energy.

Behavior of Space - Refers to the activities of cosmic dust, gas and sub-atomic particles under the influence of magnetic, electro-magnetic and gravitational forces in space.

Conflicting Interests - Refers to different opinions or points of view that lead to a confrontation between individuals or organizations in respect of the advantageous or detrimental results of a contemplated action.

Continuing Operation - Refers to tasks or investigations, usually of an ongoing nature or occurring in a pattern or in repetitive cycles.

Contracts/Agreements (Evaluating of) - Refers to the critical examination of contract/agreement proposals or work done under contract for scientific merit or quality and the provision of a recommendation of acceptance with or without modifications or rejection.

Earth Sciences - Refers to a group of disciplines concerned with the study of Planet Earth, such as geology, mineralogy, hydrology, glaciology, seismology; physical geography, (physical) pedology, physical oceanography, (physical) limnology, geophysics, geochemistry and climatology.

Energy - Refers to the capacity to do work, kinetic, potential or radiant and includes forms such as: gravitational, thermal; chemical; electrical; nuclear; solar; wind; hydrolic.

Force - Refers to a physical entity causing or attempting to cause a change in the motion, velocity, configuration or the state of matter.

Implications of External Matters - Refers to the difficulty added to the work because of the need to recognize the interests of others, including those over whom little effective influence can be exercised.

Matter - Refers to substances in the form of solid, liquid, gas or plasma.

Organizational Control - Refers to the control over a staff and its work that is exercised through an established organizational structure by means of which levels of responsibility and authority are clearly identified.

Organizational Unit - In terms of size, refers to that which makes up or is understood to be encompassed by "normal span of supervisory control of professionals". - As illustrated by bench-mark positions, the number of staff is normally a function of the nature/complexity, conditions and requirements of the work as well as of the type of organizational structure applied.

Outside Assistance - Refers to temporary assistance needed for the work and which must be obtained from sources ranging from outside the immediate organizational unit to organizations outside the Public Service.

N.B. Some of the terms defined in this Glossary are not used in this standard. However, the definitions of such terms can help ensure consistency where their use may be indicated.

Physical Properties - Refers to those attributes of matter and energy which are studied in the Physical Sciences.

Physical Sciences - Refers to a collection of natural sciences excluding chemistry and biology but including other physical sciences disciplines pertinent to "physics", "earth sciences" and "planetary sciences".

Physics - Refers to the science which deals with the study of the properties and interactions of matter and energy, including the study of: the mechanics and dynamics of solids, liquids and gases; gravitation; electricity; magnetism; electro-magnetic waves; optics; acoustics; heat; radiation; atomic and nuclear phenomena. It also includes the application of the principles of physics to biological, chemical and geological systems.

Planetary Sciences - Refers to a group of disciplines concerned with the study of the structure, composition, and physical (and chemical) properties of planets including their atmosphere and immediate cosmic environment. Astronomy, astrophysics, and geology are disciplines included in that group of disciplines.

Policy - Refers to a declaration of aims and intent established by legislation or ministerial authority to guide future courses of action.

Program - Refers to the general plan designed to achieve the objectives determined by a department or agency to meet the aims and intent of policy.

Project - Refers to a unit of work for which objectives have been defined and which is circumscribed by budgetary controls, time limits and the availability of resources.

Related Fields - Refers to general or specialized fields that are pertinent to or associated with the work of professionals in the physical sciences.

Significant Program Activity - Refers to that portion of a scientific based program which is visible as an entity and is comparable to work at the senior management level but with emphasis on the scientific nature of the work.

Specialized Subject Area - Refers to a "subject area" in which there is a narrowing of scope and the work to be performed necessitates an enhanced development of knowledge and experience.

Standards - Refers to:

- (i) A recognized weight, measure or material of specified composition or characteristics, or experimental procedure used as a reference for uniform measurement, comparison or calibration;
- (ii) A set of recognized criteria (mandatory or voluntary) specifying a minimum level of quality, purity, uniformity, performance, or safety for the manufacture, use or handling of a material, product, or device.

Studies - Refers to an in-depth examination or investigation of an area of interest.

Subject areas - Refers to the facts, theories, ideas, techniques and related matters that are encompassed by a study, investigation, project or program, and include the application of one or more disciplines.

Supervisory Responsibility - Refers to the responsibility for scheduling and allocating work, instructing, training, controlling and assessing performance of other employees and for ensuring satisfactory completion of their work.

Survey - Refers to a general or broad examination of an area of interest.

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N. B. Some of the terms defined in this Glossary are not used in this standard. However, the definitions of such terms can help ensure consistency where their use may be indicated.

## FACTORS AND FACTOR CHARACTERISTICS

FACTOR	CHARACTERISTICS	FACTOR	CHARACTERISTICS
((KIND OF ASSIGNMENT»	<ul style="list-style-type: none"> <li>a) Objectives established by others for the work;</li> <li>b) Extent of the work;</li> <li>c) Variety of activities;</li> <li>d) Scope for planning and conducting work.</li> </ul>	((MANAGEMENT RESPONSIBILITY»	(Responsibility for:) <ul style="list-style-type: none"> <li>a) Control of staff;</li> <li>b) Control of physical resources;</li> <li>c) Committing departmental resources;</li> <li>d) Obtaining outside assistance;</li> <li>e) Administrative control of work;</li> <li>f) Co-ordination of work performed for, or in conjunction with other organizational units; implementing or developing administrative procedures,</li> <li>g) safety and management directives and guidelines.</li> </ul> (Impact - Governmental) On departmental work or other government program;
((COMPLEXITY OF WORK»	<ul style="list-style-type: none"> <li>a) Availability and problems involved in obtaining information and data;</li> <li>b) Validity of information and data;</li> <li>c) Number and variability of the variables and ambiguity of information and data;</li> <li>d) Relationships of the variables;</li> <li>e) Effect of activities of others on the work;</li> <li>f) Nature and purpose of contacts;</li> <li>g) Development of concepts and approaches, procedures, techniques and practices, their adaptation and application;</li> <li>h) Theoretical knowledge which must be applied.</li> </ul>	((IMPACT OF RECOMMENDATIONS AND ACTIVITIES»	(Impact - External) <ul style="list-style-type: none"> <li>a) (i) On an industrial or commercial process, operation or product;</li> <li>b) (ii) On the state of natural resources or the environment;</li> <li>      (iii) On public health and safety;</li> <li>      (iv) On other external areas.</li> <li>c) On development and understanding of a body of knowledge.</li> </ul>
((PROFESSIONAL RESPONSIBILITY»	<ul style="list-style-type: none"> <li>a) Extent work is checked by others;</li> <li>b) Professional guidance received;</li> <li>c) Initiative and judgment in defining objectives, dealing with problems and establishing scientific guidelines;</li> <li>d) Judgment in reviewing and assessing work of others;</li> <li>e) Judgment in interpreting results of work;</li> <li>f) Judgment in giving advice.</li> </ul>		

This factor is used to measure the difficulty of the work in terms of its objectives and extent, the variety of activities and the scope for planning and conducting work.

Notes to Raters

- i) When evaluating a position under this factor, raters are to consider the factor characteristics and their intensity ranging from degree 1 to degree 5, and attribute to the position, for each characteristic, the degree whose definition best reflects the conditions that are typical of the work of the position and most closely corresponds to the intensity of its requirements in terms of the characteristic.
- ii) For a same degree of intensity, all of the characteristics of the factor are considered equal.
- iii) The degree to be assigned to the position for the whole factor, is determined by the degree which predominates (i.e. the degree that has been assigned for at least three of the four characteristics - "A", "B", "C" and "D"). When one degree does not predominate, raters are to compare the overall intensity of the requirements of the position under the factor with that of the bench-mark positions, and determine and attribute to the position the degree which best equates to the bench-mark positions.

	DEGREE 1	DEGREE 2	DEGREE 3	DEGREE 4	DEGREE 5
Characteristic A: The objectives Objectives and instructions are provided for the work.		established by others for	the conduct of the work.		
Characteristic B: The extent Work normally consists of a part or phase of a project, study or continuing operation requiring limited investigation.	Objectives of the work are clearly defined.	Objectives of the work are defined in terms of activity or project goals.	Objectives of the work are stated in terms of operational goals.	Objectives of the work are stated in terms of goals for a significant program activity.	
Characteristic C: The variety Activities closely resemble one another in most aspects and consist of a limited number of straight-forward tasks performed successively.	Work normally consists of a number of discrete projects, studies or investigations.	Work involves comprehensive investigations, projects or studies within a specialized subject area.	Work involves the application of a number of scientific principles and theories to complex investigations or studies, within a specialized subject area; or the direction of work in diverse subject areas.	Work is performed within a number of related specialized subject areas and comprises a significant program activity.	
Characteristic D: The scope Scheduling and performing work using standardized procedures and techniques.	Activities differ from one another and consist of a variety of tasks such as: using a number of related scientific techniques for surveying, observing, analyzing and evaluating products, phenomena or processes; investigating the composition, performance or effect of substances; allocating work to support staff; providing advice.	Activities differ from one another and include using a wide variety of scientific techniques for investigating the composition, performance or effect of substances or systems; or supervising the work of staff engaged in the conduct of analyses or investigations; and providing advice.	Activities differ from one another in many aspects and include several of the following: conducting complete investigations; providing functional direction; coordinating the work with other activities; providing advice; organizing, controlling and supervising the work of staff engaged in the conduct of analyses or investigations; controlling the use of facilities, material and human resources.	Activities involving a broad spectrum of scientific and administrative duties which differ from one another in most aspects and include: evaluating and authorizing projects or studies; making recommendations or providing advice on policy or legislation; assessing the implications of work progress on program objectives; providing guidance on the determination of approaches to complex problems; and managing a significant program activity, or coordinating activities at the national and international levels.	
	for planning and conducting work.	Planning activities, determining approaches and selecting methods to ensure that the work meets clearly defined objectives.	Planning and performing a broad diversity of work within a subject area, or planning and assigning tasks for the ongoing work of an organizational unit, or a project or study team to ensure that the objectives are met within established guidelines.	Planning, organizing and delegating work of a number of organizational units, or planning and coordinating complex projects or studies to ensure that operational goals are achieved within resources limitations; or planning, organizing and conducting complex projects or studies within a specialized area with high degree of freedom and latitude.	Planning, coordinating and implementing a significant program activity or major scientific studies.

FACTOR: "COMPLEXITY OF WORK"

This factor is used to measure the difficulty of the work in terms of the nature of the information and data used; the influences external to the work; the nature and purpose of contacts with others; the requirement for the development of concepts and approaches, procedures, techniques and practices, their adaptation and application; and, the theoretical and practical knowledge which must be applied.

Notes to Raters

- (i) When evaluating positions under this factor, raters are to consider the factor characteristics and their intensity ranging from degree 1 to degree 5, and attribute to the position, for each characteristic, the degree; whose definition best reflects the conditions that are typical of the work of the position and most closely corresponds to the intensity of its requirements in terms of the characteristic.
- (ii) For a same degree of intensity, all of the characteristics of the factor are considered equal.
- (iii) The degree to be assigned to the position for the whole factor, is determined by the degree which predominates (i.e. the degree that has been assigned for at least five of the eight characteristics - "A", "B", "C", "D", "E", "F", "G" and "H"). When one degree does not predominate, raters are to compare the overall intensity of the requirements of the position under the factor, with that of the bench-mark positions, and determine and attribute to the position the degree which best equates to the bench-mark positions.

	DEGREE 1	DEGREE 2	DEGREE 3	DEGREE 4	DEGREE 5
Characteristic A: The availability of, and the problems involved in obtaining information and data.	The work requires obtaining or receiving information and data from easily accessible sources.	The work requires obtaining information and data by direct observation, collection or selection from established recognized sources.	The work requires obtaining, by investigation, information and data which are often difficult to obtain, interpret and select. Sources may be identified from past practices or guidelines.	The work requires obtaining, by intensive investigation, information and data which are often difficult to obtain, interpret and select. Sources are difficult to identify and to access.	The work requires coordinating the collection and selection of information and data which are usually obtained with great difficulty and require the conduct of intensive study and investigation. Sources are likely to be obscure or have to be developed.
Characteristic B: The validity of information and data.	Information and data of known validity are obtained from recognized reliable sources or by standardized procedures.	Information and data can normally be validated by known procedures or literature references.	Information and data can normally be validated by a combination of experimentation and detailed literature referencing or further field investigations.	Information and data can be validated only by difficult or complex investigations.	Information and data may not be completely validatable.
Characteristic C: The number and variability of the information and data.	Information and data are characterized by few variables, low variability, lack of ambiguity and are of known implications.	Information and data are characterized by several variables requiring interpretation, but of known implications and variability.	Information and data can be characterized by several variables requiring interpretation, poorly defined variability and some ambiguity.	Information and data can be characterized by variability, many variables, difficulty of interpretation, and the need for judgment to use the data.	Information and data are characterized by high variability, many variables, ambiguity, and require ingenuity and highly selective judgment to use.
Characteristic D: The relationships of the variables.	Relationships between the variables are simple and known.	Relationships between the variables can be established and inconsistencies resolved by straightforward investigation.	Relationships between variables are sometime conflicting and require investigation and interpretation.	Relationships between variables are complicated and require in-depth investigation to identify and resolve conflicts and interpretation problems.	Relationships between variables are often conflicting and difficult to define and measure.
Characteristic E: The effect of the activities of others on the work.	Limited effects from the activities of others within the organizational unit.	Work is normally affected by the activities of others within the organizational unit and occasionally by the activities of others outside the organizational unit.	Work is frequently affected by the activities of scientists and officials outside the organizational unit.	Work is normally affected by the activities of scientists and officials outside the organizational unit, and requires consideration of the implication of their activities on a project or the ongoing activity.	The work of a significant program activity is affected by the activities of other organizations or agencies and requires consideration of the implications of the activities of their senior scientists or officials.

FACTOR: COMPLEXITY OF WORK (CONT'D)

DEGREE 1	DEGREE 2	DEGREE 3	DEGREE 4	DEGREE 5
<p>Characteristic F: The nature of contacts are with others within own organizational unit for obtaining and discussing information.</p>	<p>and purpose of contacts with contacts are with others working in the same or closely related subject areas for obtaining and exchanging information and discussing problems. May provide information and facts to the public and the media.</p>	<p>others. contacts are with scientists and officials for obtaining and exchanging information, participating in cooperative projects, resolving problems, and providing advice. May explain on-going activities and objectives of the work and exchange information with the public and the media.</p>	<p>Contacts are with scientists and officials outside the organizational unit for arranging co-operative projects, negotiating terms of agreements, establishing standards, implementing regulations, and for providing advice based on recognized expertise. May provide scientific and technical information to the public and the media on contentious issues.</p>	<p>Contacts are with senior scientists and officials at the national and international levels at meetings where conflicting interest are represented, and agreement affecting a significant program activity are negotiated. May represent the department at public forums and with the media.</p>
<p>Characteristic G: requirement</p> <p>The work involves applying conventional practices, techniques and procedures. Minor adaptations may be required.</p>	<p>The for the development of concepts application. The work requires adapting practices, techniques, and procedures.</p>	<p>and approaches, procedures, techniques and practices, The work requires developing new techniques and procedures using known approaches and existing precedents.</p>	<p>Their adaptation and The work requires developing new procedures and techniques using novel approaches where precedents often do not exist.</p>	<p>their adaptation and The work requires approving or recommending new procedures and developing new concepts and approaches. Work is characterized by the absence of precedents.</p>
<p>Characteristic H: The theoretical</p> <p>The work requires the application of a sound knowledge of the principles and theories of a discipline and some familiarity with its practices.</p>	<p>The and practical knowledge The work requires the application of a sound knowledge of the principles, theories and practices of a discipline and some familiarity with the practices in related disciplines.</p>	<p>which must be applied. The work requires the application of a thorough knowledge of the principles, theories and practices of a subject area and its pertinent disciplines, and familiarity with the practices in related disciplines, subject areas or supervisory practices.</p>	<p>The work requires the application of a thorough knowledge of the principles, theories and practices of a specialized subject area, and a knowledge of related scientific disciplines, subject areas or of management practices.</p>	<p>The work requires the application of an advanced knowledge of the principles, theories and practices of a specialized subject area, and a good knowledge of related scientific disciplines, subject areas or of management practices.</p>

FACTOR: "PROFESSIONAL RESPONSIBILITY"

This factor is used to measure the difficulty of the work in terms of the checks and controls over the work and the professional leadership received. It is also used to measure the requirement to exercise initiative and professional judgment in defining objectives and dealing with problems, and in establishing scientific guidelines; and judgment in reviewing and assessing the work of others, interpreting results, findings and recommendations, and in providing advice.

Notes to Raters

- (1) When evaluating a position under this factor, raters are to consider the factor characteristics and their intensity ranging from degree 1 to degree 5, and attribute to the position, for each characteristic, the degree whose definition best reflects the conditions that are typical of the work of the position and most closely corresponds to the intensity of its requirements in terms of the characteristic.
- (ii) For a same degree of intensity, all of the characteristics of the factor are considered equal.
- (iii) The degree to be assigned to the position for the whole factor, is determined by the degree which predominates (i.e. the degree that has been assigned for at least four of the six characteristics - "A", "B", "C", "D", "E", "F"). When one degree does not predominate, raters are to compare the overall intensity of the requirements of the position under the factor, with that of the bench-mark positions, and determine and attribute to the position the degree which best equates to the bench-mark positions.

DEGREE 1	DEGREE 2	DEGREE 3	DEGREE 4	DEGREE 5
Characteristic A: The extent to which work is checked by others. Work is reviewed for consistency and accuracy while in progress and on completion.	Work is accepted as technically accurate. Work assignments and conclusions are reviewed for consistency and completeness.	Work approaches, recommendations and conclusions are reviewed for soundness of judgment in terms of the attainment of study or project objectives.	Key recommendations and conclusions are reviewed for effectiveness. Results are periodically reviewed in terms of the attainment of objectives.	Results are evaluated in terms of achievement of policy and program objectives.
Characteristic B: The professional guidance received. Professional guidance is received to assure correct use of methods and techniques.	Professional guidance is received on new aspects of the work.	Professional guidance is received on the resolution of difficult problems.	Professional guidance is received on the resolution of unusual and complex problems.	Guidance is received on policy intent and program implications. Professional guidance may be received from other scientific authorities.
Characteristic C: The requirement to exercise initiative and judgment in defining objectives and dealing with problems and establishing scientific guidelines. Work requires indicating problems and selecting methods, techniques according to established procedure manuals, guidelines or precedents.	Work requires identifying problems and determining approaches and suitable methods for their resolution.	Work requires defining objectives of studies, identifying problems and determining approaches for the resolution of difficult problems within own subject area.	Work requires establishing the limitations and defining the objectives of projects or studies and indicating likely approaches for the resolution of unusual and difficult problems within related subject areas.	Work requires defining objectives, developing conceptual approaches to complex problems and establishing scientific guidelines for a significant program activity.
Characteristic D: The requirement to exercise judgment in reviewing and assessing the work of others. Work of support staff is checked for correct application of procedures and consistency of results.	The work of subordinate staff is reviewed while in progress and on completion for technical accuracy. External submissions are reviewed for completeness and compliance with data requirements.	Work of subordinate staff or project team members is reviewed for completeness and compliance with standards and guidelines. Within own subject area, results and findings of other scientists are reviewed for validity or for applicability to own subject area.	Work approaches, recommendations and conclusions of subordinate staff or project team members, are reviewed for soundness of judgment. Other scientists' proposals and studies that are related to own specialized subject area, are reviewed for acceptability.	Recommendations and conclusions of staff are reviewed in term of validity and effectiveness with respect to established policy, directives, guidelines and resource limitations. Major studies or activities of other scientists are evaluated with respect to own program's objectives.
Characteristic E: The requirement to exercise judgment in interpreting results of work. Own observations are reviewed to ensure reliability and consistency.	Scientific observations and results are interpreted to produce meaningful information, conclusions, recommendations or reports.	Complex scientific data or results, conclusions and recommendations of subordinate staff or other scientists are interpreted to determine their meaning and implications on work activities.	Results of studies or projects are interpreted to determine the implications of conclusions and recommendations on the objectives of own work and significance to related scientific and other activities.	Results of major studies, conclusions and recommendations are interpreted to determine their broad implications on scientific or other related activities affecting a significant program activity.
Characteristic F: The requirement to exercise judgment in giving advice. Instructions and guidance may be provided to support staff on matters closely related to the work performed.	Advice is provided to colleagues and support staff on matters closely related to own area of work.	Specific technical advice within own subject area is provided to other scientists and officials and immediate superior. Guidance on scientific matters is provided to subordinate staff or to other scientists contributing to the work.	Advice based on a recognized expertise within a specialized subject area, is given to other scientists and officials.	Authoritative advice and recommendations in a number of related specialized subject areas affecting a significant program activity, are provided to other scientists and senior officials.

**FACTOR: "MANAGEMENT RESPONSIBILITY"**

This factor is used to measure the difficulty of the work in terms of the responsibility for committing, controlling and managing resources; obtaining outside assistance; controlling and coordinating work; and, for implementing or developing procedures, directives and guidelines.

**Notes to Raters**

- (i) When evaluating positions under this factor, raters are to consider the factor's characteristics and their intensity ranging from degree 1 to degree 5, and attribute to the position, for each characteristic, the degree whose definition best reflects the conditions that are typical of the work of the position and most closely corresponds to the intensity of its requirements in terms of the characteristic.
- (ii) For a same degree of intensity, all of the characteristics of the factor are considered equal.
- (iii) The degree to be assigned to the position for the whole factor, is determined by the degree which predominates (i.e. the degree that has been assigned for at least four of the seven characteristics - "A" "B" "C" "D", "E" "F", "G"). When one degree does not predominate, raters are to compare the overall intensity of the requirements of the position under the factor, with that of the bench-mark positions, and determine and attribute to the position the degree which best equates to the bench-mark positions.

	DEGREE 1	DEGREE 2	DEGREE 3	DEGREE 4	DEGREE 5
Characteristic A: Responsibility		for the control of staff.			
The work occasionally requires assigning work to non-subordinate support staff,		The work normally requires supervision of support staff.	The work requires the supervision of a unit normally including professional staff.	The work requires the operational management of professional staff including specialists or subordinate supervisors.	The work requires the management and human resources planning through subordinate supervisors of a large staff of professionals.
Characteristic B: Responsibility		for the control of physical	resources.		
Planning day-to-day use of equipment and supplies for own work.		Ensuring proper use of allocated equipment, supplies and facilities,	Controlling the use and the maintenance of allocated equipment, supplies and facilities,	Allocating the use of equipment, supplies and facilities.	Planning, directing and controlling the physical resources allocated for a significant program activity.
Characteristic C: Responsibility		for committing departmental	resources.		
Limited to the spending of own time and the use of materials and equipment for own work.		Identifying the requirement for equipment, material and services for assigned work.	Recommending the acquisition of specific equipment, material and services to meet work requirements,	Assessing requirements and developing and recommending plans for the acquisition and use of resources, and the expenditure of funds to meet work priorities and objectives.	Exercising delegated authority under the Financial Administration Act for the acquisition of resources and expenditure of funds; or, providing
Characteristic D: Responsibility		for obtaining outside assistance.			
Informing supervisor concerning the need for assistance.		Recommending on the need for assistance,	Substantiating the need for, defining specific requirements, and identifying suitable sources of assistance; and, arranging for readily available assistance.	Selecting and negotiating for suitable sources of assistance relating the probable costs and benefits; or, providing advice based on a recognized expertise within a specialized subject area, on requirements and selection of outside assistance.	Approving or recommending the expenditure of funds for outside assistance; or, providing authoritative advice on requirements and outside assistance for major commitments.
Characteristic E: Responsibility		for the administrative control	of work.		
Complying with procedures, directives and guidelines established for the work,		Ensuring that quality, quantity, safety and other standards for own responsibility are maintained,	Implementing quality assurance, performance measurement and safety procedures to meet unit's objectives.	Controlling and coordinating project schedules and establishing and implementing performance and safety standards and controls to meet priorities and objectives.	Preparing budgets and work plans, planning and implementing safety, quality and cost controls, and recommending objectives and priorities for a significant program
Characteristic F: Responsibility		for the co-ordination of work	performed for, or in conjunction	with other organizational	units.
Limited requirement for coordination of activities with those of others.		Occasionally coordinating related activities with those of others.	Coordinating related activities with those of others.	Coordinating differing activities with those of one or more organizational units.	Coordinating activities with several other organizational units with differing interests or conflicting priorities.
Characteristic G: Responsibility		for implementing or developing	administrative procedures,	safety and management directives	and guidelines.
Following straightforward office or field administrative procedures,		Implementing office or field administrative procedures.	Interpreting and implementing guidelines and directives,	Recommending and developing internal administrative, safety and management directives and guidelines,	Approving internal administrative, safety and management directives and guidelines, and ensuring correct and consistent application of department and central agency policy, directives and guidelines.

FACTOR: "IMPACT OF RECOMMENDATIONS AND ACTIVITIES"

This factor is used to measure the nature and the extent of the impact directly attributable to the recommendations and activities of the position, given its particular purpose or mission, on governmental work or programs; on industrial or commercial operations, natural resources or the environment, public health and safety, and other external areas directly affected by the position; and, on the development and understanding of a body of knowledge in a subject area.

Notes to Raters

- i) When evaluating a position under this factor, raters are to consider the factor characteristics and the extent of the impact ranging from degree 1 to degree 5, and attribute to the position, for each applicable characteristic, the degree whose definition best reflects or corresponds to the extent of the most likely impact of the position.
- ii) For a same degree of impact, all of the characteristics of the factor are considered equal.
- iii) The degree to be assigned to the position for the whole factor is determined by the degree which predominates (i.e. the degree that has been assigned for at least two of the three characteristics - "A"; the one "B" characteristics: i, ii, iii, or iv identified as the most pertinent to the purpose or mission of the position; and, "C"). When one degree does not predominate, raters are to compare the overall extent of the impact of the position under the factor with that of the bench-mark positions, and determine and attribute to the position the degree which best equate to the bench-mark positions.

(Impact - Governmental)

DEGREE 1	DEGREE 2	DEGREE 3	DEGREE 4	DEGREE 5
Characteristic A:				
The impact of recommendations and activities on departmental policies.	and activities on departmental work or other government programs	work or other government programs	in terms of changes to on-going activities, programs or	activities, programs or
Information and results of the work have limited effects on a continuing operation, project or study in own area of work.	Information and results of the work affect a continuing operation, projects or studies in own or closely related areas of work.	Recommendations, advice and results of the work affect a continuing operation, the formulation of guidelines, regulations, specifications or standards, and the development or conduct of projects or studies in own and related areas of work.	Recommendations, advice or consultations contribute to the development of policies and affect the development, conduct or modification of a significant program activity; or decisions affect the implementation of projects, studies, guidelines and directives.	Authoritative recommendations, advice or consultations affect the development of departmental policies and programs; decisions and activities affect the program(s) or activities of other government organizations; or decisions and recommendations affect the development, initiation, conduct or continuation of a significant program activity.

(Impact - External)

## Characteristics B:

(i) The impact of recommendations and activities on an industrial or commercial process, operation or product in terms of the contributory or regulatory effect.	and activities on an industrial or commercial process, operation or product in terms of the contributory or	industrial or commercial process, operation or product in terms of the contributory or	operation or product in terms of the contributory or	of the contributory or
Information and results of the work have limited effects on an industrial process or operation.	Information and results of the work have economic or technological effects on an industrial or commercial product, process or operation.	Recommendations, advice and results of the work have economic or technological effects on related industrial or commercial products, processes or operations.	Recommendations, advice, consultations or decisions have economic or technological effects on an industry or a broad range of products, processes or operations.	Authoritative recommendations, advice, consultations or decisions have a substantial effect on the development, initiation, modification or continuation of industrial or commercial enterprises.
(ii) The impact of recommendations and activities in terms of the contribution to or control of the state of natural resources or the environment.	and activities in terms of the contribution to or control of the state of natural resources or the	of the contribution to or control of the state of natural resources or the	of the state of natural resources or the	resources or the
Information and results of the work have limited effects on the state of a natural resource or the environment.	Information and results of the work contribute to improvements for developing, protecting, conserving or using natural resources or the environment.	Recommendations, advice and results of the work affect the state of natural resources and, natural resource and environmental management practices.	Recommendations, advice or consultations contribute to the development of environmental and natural resource policies; or decisions and recommendations affect the state of the environment or the conservation and use of natural resources within established policies.	Authoritative recommendations, advice or consultations have a substantial effect on the development of policies relating to natural resources or the environment; or decisions and recommendations substantially affect natural resources or the environment.
(iii) The impact of recommendations and activities in terms of the contribution to public health and the reduction or the control of health and safety hazards.	and activities in terms of the contribution to public health and the reduction or the control of health and	of the contribution to public health and the reduction or	health and the reduction or	the control of health and
Information and results of the work have limited effects on public health or safety.	Information and results of the work contribute to determining the efficacy and safety of the processing or use of foods, drugs or medical and radiation emitting devices or to the regulatory control of potentially hazardous products or substances.	Recommendations, advice and results of the work affect the approval and use of foods, drugs, or medical and radiation emitting or other devices with respect to efficacy and safety, or the regulatory control of potentially hazardous products or substances.	Recommendations, advice or consultations contribute to the development of policies; or decisions and recommendations affect the approval and use of foods, drugs or medical and radiation emitting or other potentially hazardous products or substances with respect to efficacy or safety.	Authoritative recommendations, advice or consultations have a substantial effect on the development of public health and safety policies; or decisions and recommendations substantially affect the control of potential hazards to public health or safety.

FACTOR: IMPACT OF  
RECOMMENDATIONS

## AND ACTIVITIES (CONT'D)

## DEGREE 1

## DEGREE 2

## DEGREE 3

## DEGREE 4

## DEGREE 5

## Characteristics B: (Cont'd)

(iv)The impact of recommendations areas directly affected

Information and results of the work have limited effects on the specifically identified area directly affected by the position.

and activities in terms by the position, given its

Information and results of the work have contributory effects on the specifically identified area directly affected by the position.

of the contributory or regulatory particular purpose or mission.

Recommendations, advice and results of the work have direct effects on the specifically identified area directly affected by the position.

effect on other specifically

Recommendations, advice or consultations contribute to the development of policies; or decisions and recommendations have wide ranging effects on the specifically identified area directly affected by the position.

identified external

Authoritative recommendations, advice or consultations have a substantial effect on the development of policies; or decisions and recommendations have substantial effects on the specifically identified area directly affected by the position.

## Characteristic C:

The impact of recommendations

Information and results of the work contribute to knowledge in own area of work.

and activities in terms of the

Information and results of the work contribute to improvements in methods and procedures in own area of work.

contribution to the development

Development of new methods and procedures and the investigation, analysis and interpretation of scientific information provide knowledge and improved understanding in own subject area.

and understanding of a body of

Development of new concepts and approaches; or, decisions or recommendations contribute to knowledge and improved understanding in a specialized subject area.

knowledge.

Decisions and recommendations affect the initiation, continuation or orientation of studies or projects for the development of concepts, methods, approaches and procedures to acquire new knowledge in one or more specialized subject areas.

POSITION LEVELS: TYPICAL DISTINGUISHING FEATURES  
±A GUIDE FOR OVERALL CONSISTENCY±

- Intent:** This Guide broadly aims at providing a consistent approach to a global perception or an orientation for a determination of the approximate classification level of a position, using a series of discernible main features characterizing positions identified as typical of each level.
- Provision:**
- i) Notwithstanding the above, the Guide is not intended nor shall be used as a substitute for the formal position classification process and the detailed analysis and rating of each position, as required in accordance with the provisions of the rating plan of the Classification Standard.
  - ii) The series of distinguishing features shown for the levels, characterizes, as a whole, universes of positions considered typical of each level. - The series of features for a level shall not be construed as all inclusive nor as relevant in its entirety, to all positions at that level.
- Advantages:** The use of the Guide can be of assistance in narrowing, at the outset, the range of possible levels indicated for a position and thus, contributes to a less erratic approach to the discussions for its subsequent detailed analysis and rating. Further, the distinguishing features shown for the various levels in the Guide, and which have been found typical of positions at those levels, provide a broad reference framework which can be of value and, contributes in achieving greater overall consistency in the classification of the positions at the various levels for the Group.

LEVEL 1	LEVEL 3	LEVEL 4
<p>(Positions at Recruiting/Familiarizing Developing Level as well as Positions conducting Work of Relatively Low Complexity)</p> <ul style="list-style-type: none"> <li>- Repetitive, Standardized work of relatively low Complexity</li> <li>- Work subjected to Detailed Review</li> <li>- Limited scope for Independent Actions</li> <li>- Carry out Scientific procedures under supervision</li> <li>- Indicate required Support Work to non-subordinate support staff</li> </ul>	<p>(Positions with Significant Specialization, Diversity/Complexity or with Significant Supervisory Responsibility)</p> <ul style="list-style-type: none"> <li>- Expertise in a specialized Subject Area</li> <li>- First Level of Scientific Advisory Responsibility</li> <li>- Liaison Work Responsibility</li> <li>- Diversity/Complexity               <ul style="list-style-type: none"> <li>- Provide Scientific Project Leadership</li> </ul> </li> <li>- Development of New Methods</li> <li>- Validations of: Procedures Techniques Methods Facilities</li> </ul>	<p>(Positions requiring a High Level of Scientific Expertise or Position comprising the First Level of Science Based Management Responsibility)</p> <ul style="list-style-type: none"> <li>- High Level of Expertise in a specialized subject area</li> <li>- Second Level of Scientific Advisory Responsibility</li> <li>- Recognized Authority in a Subject</li> <li>- Scientific Co-ordination Responsibility</li> <li>- First level of Management Responsibility</li> <li>- Project Objective Responsibility</li> <li>- Second Level Supervision</li> </ul>
<p style="text-align: center;">LEVEL 2</p> <p>(Positions Conducting Basic Professional Work of Moderate Complexity/Diversity)</p> <ul style="list-style-type: none"> <li>- Moderate Complexity/Diversity</li> <li>- Scope for Independent Actions               <ul style="list-style-type: none"> <li>- May Instruct Junior Scientists and Supervise Support Staff</li> </ul> </li> <li>- Work Reviewed at Critical Stages/Phases</li> </ul>	<p style="text-align: center;">LEVEL 5</p> <p>(Positions at the Highest Level of Scientific Management within the Group or Positions requiring the Highest level of Scientific Expertise within the Group)</p> <ul style="list-style-type: none"> <li>- First Supervisory Level:               <ul style="list-style-type: none"> <li>- Activities of a Unit</li> <li>- Lead a Group</li> <li>- Lead a Project Team</li> </ul> </li> </ul>	<p>(Positions at the Highest Level of Scientific Management within the Group or Positions requiring the Highest level of Scientific Expertise within the Group)</p> <ul style="list-style-type: none"> <li>- Highest Level of Expertise in a Specialized Subject Area</li> <li>- A Senior Departmental Scientific Advisor</li> <li>- High Level Co-ordination/Liaison               <ul style="list-style-type: none"> <li>- Broad scope for Independent Actions within Policy and Resources Framework</li> </ul> </li> <li>- Significant input in Policy Development</li> <li>- Management of a Science Based Significant Program Activity, a Significant Work Group or Large Complex Project</li> </ul>

LIST OF BENCH-MARK POSITIONS

#	TITLE	LEVEL
1	Physical Scientist - Precambrian Geology (Support Geologists Sect.) (EMR)	1
2	Climatological Analyst (EC)	1
3	Satellite Data Analyst (EC)	1
4	Area Soil Conservationist - (AGR - PFRA)	2
5	Environmental Assessment Officer (NEB)	2
6	Energy and Mineral Commodities Research Officer (EMR)	2
7	Physical Climatologist (EC)	2
8	Aquatic Scientist - Monitoring and Field Studies (EC)	2
9	Field Experiment Support Scientist (EC)	2
10	Scientific Evaluator - Medical Devices (HWC)	3
11	Standard Development Officer - Medical Devices (HWC)	3
12	Senior Isotopic Analyst - Mass Spectrometry (Geochronology) (EMR)	3
13	Physical Oceanographer (F&O)	3
14	Explosives Scientist (EMR)	3
15	Senior Physical Scientist and Risk Analyst (EC)	3
16	Senior Officer/Advisor - Physical Oceanography (F&O)	4
17	Superintendent, Climate Assessment and Impact Section (EC) (Applied Climatology Research and Development)	4
18	Resource Engineering (Marine) Geophysicist (EMR)	4
19	Senior Advisor - Metallurgical Technology (EMR)	5
20	Chief, Scientific Information (F&O)	5
21	Senior Science Advisor - Renewables and New Liquid Fuels (EMR)	5



BENCH-MARK POSITION DESCRIPTION

Bench-mark Position Number: 1

Level: 1

Descriptive-Title: Physical Scientist (Support Geologists Section) Precambrian Geology

Reporting to the Assistant to the Director of the Lithosphere and Canadian Shield Division:

Accumulates geological data by planning and performing field work involving the use of helicopters, airplanes, boats etc., and laboratory investigations. Compiles data from other sources to assist in the production of geological maps and the design of new geological exploration projects. Other sources of information include original field notes, existing stored data, air photos, and other reports and maps.

Using Scientific Laboratory equipment, such as petrographic microscopes, studies the physical, structural and mineralogical properties of rocks. Evaluates data and prepares it for computer processing; including writing simple data retrieval programs. Studies and evaluates air photos, aeromagnetic and other geophysical maps, remote sensing information and other computer programs to assist the research scientists.

Degree

Specifications

Kinds of Assignments

1

- A. Degree 1 - Work objectives are provided and the work is performed with the instructions and priorities set by the supervising scientists for each project.
- B. Degree 1 - The work normally consists of providing data for parts of projects or assisting a more senior person in a part of a project aimed at producing geological maps. Occasionally may be assigned to part of a sub-project for independent research.
- C. Degree 1 - The work **is** limited to obtaining information on rock samples using standard methods; entry and manipulation of the data obtained in a computer, and modification of simple computer programs.
- D. Degree 1 - Plans daily work according to established procedures using standard methods for implementation. Field and laboratory work **is** planned with the supervising scientist, and laboratory methods are selected from known acceptable methods.

Complexity of Work

1

- A. Degree 2 - Participates in field and laboratory work where data are obtained by direct observation. Other required data are available from recognized sources such as notes taken by field officers, from library research, and analytical results.
- B. Degree 1 - Data are normally accepted as valid. Any questionable data are evaluated by a supervising scientist.
- C. Degree 1 - The geological information, as received, **is** discrete and unambiguous.
- D. Degree 1 - Data relationships are simple and for the most part known and understood.
- E. Degree 1 - Changing objectives, priorities, projects and personnel have a limited impact on the daily work.
- F. Degree 1 - Contacts are with scientists of the immediate working group of field and laboratory geologist to obtain information used in preparing geological maps, project plans and for input to the computer.
- G. Degree 1 - The work generally involves using standard techniques to determine the mineralogical properties of rocks; simple computer programs have to be written from time to time.

Physical sciences  
B.M.P.D. No1

Degree

- H. Degree 1 - A sound knowledge of geology with supplementary knowledge and familiarity with laboratory and field techniques, and the use of computers in data manipulation and map production is required.

## Professional Responsibility

1

- A. Degree 1 - Work is generally reviewed by supervisor or other senior scientists, however, the data are expected to be verified and transcribed accurately and completely.
- B. Degree 1 - Professional guidance from senior scientists is available for the interpretation and compilation of geological field notes.
- C. Degree 1 - Suggestions for additional sources of data, new and improved techniques and indication of potential problems are expected.
- D. Degree 1 - Procedures used by laboratory and field staff in developing the data, and data processing methods followed by the computer staff are checked for correctness.
- E. Degree 1 - Own observations and work are reviewed for reliability and consistency and reported to the senior scientists.
- F. Degree 1 - Instructions may be given to non-subordinate support staff and information may be obtained for research scientists to assist them in attaining the objectives of their projects.

## Management Responsibility

1

- A. Degree 1 - The work requires occasionally giving instructions about the preparation of maps, charts and figures to non-subordinate technicians.
- B. Degree 1 - Responsible for the daily use planning and control of those resources used for own work.
- C. Degree 1 - Limited to the spending of own time and the use of equipment and supplies for own work.
- D. Degree 1 - Informs supervisor on the need for outside assistance for field and laboratory projects.
- E. Degree 1 - Complies with administrative procedures, directives, guidelines and quality assurance standards established for the work.
- F. Degree 1 - Limited to fitting own work into that of others in the same unit.
- C. Degree 1 - Follows established straightforward office, laboratory and field procedures.

## Impact of Recommendations and Activities

1

- A. Degree 1 - Information and results of the work contribute to the on-going project of the supervising research scientist and can have an effect on the project work. Work is carried out in close liaison with the supervising scientist. Impact on departmental activities attributable to the work of the position, would be indirect or limited.
- B. Degree 1 -
- (i) Degree 1 - The work of providing up-to-date maps of geological formations can have a limited effect on the exploration (mining) industry.
  - (ii) Degree 1 - The work has limited indirect effects on the status of a natural resource, by contributing to the promotion of the exploration for, and hence the ultimate exploitation of mineral resources.
  - (iii) No significant impact.
  - (iv) No other significant impacts.
- C. Degree 1 - The data generated and analyzed will add to the knowledge of Canadian geology by providing new, informative maps.

1.3

LINEAR ORGANIZATION CHART

Director, Lithosphere and Canadian Shield Division

Assistant to the Director

- Petrology Section
- Geochronology Section
- Technical Services (DD and CL)
- Support Geologists Section (PC-2)
- \* - Physical Scientist (Support Geologist) - Precambrian Geology (PC-1) -  
Support Geologists (PC-1)
  
- \* Bench-mark position

## 2.1

BENCH-MARK POSITION DESCRIPTION

Bench-mark Position Number: 2

Level: 1

Descriptive Title: Climatological Analyst

Reporting to the Head, Climate Technique Development and Transfer:

Participates in the preparation of climatic maps, atlases and other publications using data obtained from the National Climatological Archives. Collects, collates, evaluates and interprets climatological data from various other sources such as base maps, land use maps, topographical charts and bathymetric maps, to be used in the preparation of information concerning Canada's climate. Arranges task schedules with the cartographic units and printing shops and ensures that the final product meets the department's objectives for quality.

Provides a response service to enquiries about Canadian climatological data and maps to outside users and staff of other organizational units and ensures that quality and technical objectives are met.

Proposes areas for new climate studies where needs are indicated. Analyses, re-evaluates and reformats existing data to better serve the needs of the users. Reviews climatological publications for use in meeting the needs of the users and the objectives of the department, assesses need for and value of new serials, and recommends changes to enhance the effectiveness of the services.

Writes reports; follows safety and administrative practices; occasionally instructs non-subordinate support staff; arranges for translations; writes computer programs, and performs other related work as required.

Degree

**Specifications**

Kinds of Assignments

1

- A. Degree 1 - Work objectives are stated and instructions are given by the supervisor with direction as required from the Heads of the Climate Information Service and Publication Units.
- B. Degree 1 - Work consists of preparing maps as part of Atlas projects, responding to requests for climatological information, and manipulating and evaluating climatological data.
- C. Degree 1 - Activities are closely related and involve the manipulation and assessment of climatological data for information used in preparing maps and responding to requests.
- D. Degree 1 - Own work is planned according to established procedures and precedents for the preparation and printing of climatological data. Some negotiation with staff of cartography and printing units is required for task scheduling to meet deadlines.

Complexity of Work

1

- A. Degree 1 - Data are obtained from existing archives in a straight-forward fashion.
- B. Degree 1 - Data are of known quality, as validity is established prior to archiving.
- C. Degree 1 - Data are usually unambiguous and of known variability and implications.
- D. Degree 1 - Relationships between climatological variables are known and can be handled using routine techniques.

- E. Degree 2 - The flow of outside user requests and activities of other climatologists working within the group can effect own work scheduling.
- F. Degree 2 - Provides climatological information to outside users. Contacts are also with staff of other organizational units to obtain information and discuss work problems. May brief media representatives on important climate happenings.
- G. Degree 1 - The work involves applying standard statistical computing and analytical procedures used in climatology. There is an occasional need to adapt or propose improved methods.
- H. Degree 1 - A sound knowledge of physical geography, involving climatology, and a knowledge of cartography practices and Canada's climatic conditions, and a familiarity with the particular computer application software used to access the digital archives are required.

Professional Responsibility

1

- A. Degree 2 - Work assignments are reviewed by supervisor for completeness and quality on completion or at critical points. The data produced are expected to be technically correct.
- B. Degree 1 - Professional guidance is available on use of methods, precedents and data interpretations. Direction is received from supervisor on problem solution.
- C. Degree 1 - The work requires selecting the appropriate approaches for developing climatic maps and data according to established procedures; indicating problems and proposing modifications where required.
- D. Degree 1 - Work performed by non-subordinate support staff and students is checked for the correct selection and application of methods. Checks finished maps for legibility and accuracy and for compatibility with standards.
- E. Degree 2 - The work involves interpreting data output from digital archives so that the results are meaningful to users.
- F. Degree 1 - Guidance and explanations concerning data are given to support staff, and climatological event data and their interpretation are explained to colleagues in other groups.

Management Responsibility

1

- A. Degree 1 - The work requires assigning tasks to summer students and to other non-subordinate support staff as required.
- B. Degree 1 - Must plan the use of equipment and supplies for own work.
- C. Degree 1 - Allocates own time and the use of material supplies needed for own work.
- D. Degree 1 - Informs the supervisor of the need for outside assistance.
- E. Degree 1 - Complies with procedures, guidelines and directives established for the work.
- F. Degree 1 - Generally, there is a limited requirement for coordination w'th activities of others. Liaison with other groups is required for preparation and publication of climate data circulars and climate normals booklets.
- G. Degree 1 - Follows straightforward established administrative and safety procedures.

Impact of Recommendations and Activities

1

- A. Degree 2 - information and results of the work can have an impact on the credibility of the Climate Services, limited effects on the operation of the climatology section of Environment Canada and some effect on aspects of the Developmental Climatology and Customer Computing Services Sections.

Physical sciences  
B.M.P.D. No 2

Degree

B. Degree 1 -

(i) Degree 1 - Results of work can have limited effects on certain activities or operations of industrial or commercial users of climate data and information.

(ii) Degree 1 - The work does not normally impact on the state of the environment but can indirectly contribute to protecting or improving the environment through a better understanding of climatic conditions.

(iii) No significant impact.

(iv) No other significant impacts.

C. Degree 1 - The results contribute to and enhance current understanding of the climatology of Canada.

LINEAR ORGANIZATION CHART

- Chief Climate Services
  - Superintendent, Climate Information and Publication Section
    - Head, Publication and Micrographic Unit
    - Head, Information Service Unit
  - Superintendent, Marketing and Computer Information
  - Superintendent of Development - Climatology Section
    - Head, Climate Techniques Development and Transfer
      - \* - Climatological Analyst PC-1
      - Climatological Analyst PC-1
      - Data Analysis Clerk
      - Summer Student(s)
  - \* Bench-mark Position

Physical sciences  
B.M.P.D. No 3

BENCH-MARK POSITION DESCRIPTION

Bench-mark Position Number: 3

Level: 1

Descriptive Title: Satellite Data Analyst

Reporting to a Research Scientist, Remote Sensing Section Aerospace Meteorology Division:

Processes, reduces, analyses, assesses and integrates into regional wave amplitude and direction forecasting models, the atmospheric, surface land and marine scientific measurement data from remote satellite and balloon platform sensing instrumentation and remote sensing recording ground stations.

Performs evaluation studies on the use of satellite data, adapts or develops and tests new techniques and forecasting models pertaining to the distribution, temporal and spatial variability of ocean and atmosphere for the particular region.

Formulates and tests computer algorithms to investigate and process data in developing calibrations and forecasting models and making required modifications.

Utilizes computer graphics, micro-computer, micro-processor system and scientific application software. Evaluates the performance, and contributes to the development and enhancement of computer application software for the work and to the identification of new applications of satellite data, attending meetings, reading and researching scientific literature and publications. Writes reports and papers on study work and explains results and particular interpretations of the data. Prepares papers and seminars to disseminate the information obtained.

Degree

Specifications

Kinds of Assignments

2

- A. Degree 2 - The objectives of the work are clearly defined by the Supervising Research Scientist in terms of the specific contribution of the work to achieving the aims of the scientific research unit.
- B. Degree 1 - The work normally consists of part of a scientific project on stratospheric research or part of a continuing operation on the application of satellite remote sensing data to develop wave forecasting models.
- C. Degree 1 - While remote sensing data represents a wide variety of data types, the manipulation of this data can be performed by relatively straight-forward successive operations and using a limited number of numerical analysis techniques to analyze and develop models and test techniques.
- D. Degree 2 - Must plan tasks, determine and select methods in conducting work to meet set objectives. Planning and scheduling of algorithm/model development is done with the supervising scientist and techniques are developed.

Complexity of Work

2

- A. Degree 2 - Data obtained are in a semi-processed form and must be selected, reduced, evaluated and compared to other observed data and the results of mathematical predictions.
- B. Degree 2 - Information data is varied but can normally be validated by reference to the literature or by normal correlation procedures.
- C. Degree 2 - Remote sensing data gathered in remote sensing measurement programs to yield information about the distribution, temporal and spatial variability of ocean and atmosphere involves variables and requires interpretation but the implications and variability are known.

- D. Degree 2 - Relationships between variables can normally be established and inconsistencies resolved by straight-forward investigation using accepted modeling techniques.
- E. Degree 1 - Some rescheduling of work tasks may be required due to changed data demand and computer work priorities.
- F. Degree 1 - Contacts are normally with the unit's Supervising Scientist and the Computer Systems Specialist to discuss information and requirements. Contacts with other research personnel in other units to provide information on results may be required.
- C. Degree 2 - The work usually requires adapting practices, techniques and procedures to develop new models and computer algorithms for remote-sensing data reduction and wave model formulation.
- H. Degree 2 - The work requires the application of a sound knowledge of the principles and theories of physical oceanography complemented by familiarity with numerical analysis techniques and meteorology practices and some familiarity with computer scientific applications programming in the area of wave forecasting.

## Professional Responsibility

1

- A. Degree 1 - Algorithms/models and particular data evaluations and interpretations are reviewed by the Supervising Scientist while in progress and on completion for consistency and correctness.
- B. Degree 1 - Professional guidance is available from the Supervising Scientist and the Computer Systems Specialist for appropriateness and correct use of methods and techniques.
- C. Degree 1 - The work requires identifying and discussing problems with existing or new methods and prototype software to determine approaches. Selects work methods and techniques according to established procedures and precedents.
- D. Degree 1 - Requested data processing support work is reviewed for correctness as applicable.
- E. Degree 2 - Satellite data are analyzed, interpreted and evaluated to produce meaningful data using numerical analysis techniques, numerical filtering and polynomial regressions.
- F. Degree 1 - As necessary, explanations and details concerning the work are provided to colleagues for use in their own projects. Instructions are provided to non-subordinate support staff as required.

## Management Responsibility

1

- A. Degree 1 - The work occasionally requires assigning tasks such as data processing to non-subordinate support staff.
- B. Degree 1 - Plans the use of own equipment and supplies to process data from remote sensing programs.
- C. Degree 1 - Commits the use of own time, supplies and equipment to process data and produce wave forecasting models.
- D. Degree 1 - Informs Supervising Scientist whenever there is a need for external assistance.
- E. Degree 1 - Complies with procedures already established for the production of appropriate information on wave forecasting.
- F. Degree 1 - Limited requirement for coordination of activities with those of others to schedule algorithm/model development and to adapt plans to account for change in satellite data demand.
- C. Degree 1 - Follows straight-forward administrative procedures established for the work.

Degree

## Impact of Recommendations and Activities

1

- A. Degree 2 - Information generated and forecasting models produced support ongoing research projects or a continuing study in the field of wave forecasting.
- B. Degree 1 -
- (i) Degree 1 - Regional forecasting models of wave amplitude and direction and results of evaluation studies on the use of satellite data contribute to research projects for improved forecasting, and as research support, can have indirect economic effects on the operations and commercial activities of ocean-going vessels.
  - (ii) Degree 1 - Results of the work support research projects or study and can have some indirect or limited effects on the environment or state of natural resource.
  - (iii) No significant impact.
  - (iv) Degree 1 - Results of the work contribute to research projects for improved forecasting and, as research support, can have indirect effects on the safety of marine users.
- C. Degree 1 - Results of the work contribute additional knowledge in the area of meteorological forecasting and more particularly the forecasting of wave amplitude and direction using satellite data.

LINEAR ORGANIZATION CHART

Chief, Aerospace Meteorology

- Head, Wind Engineering Section
- Head, Satellite Data Lab
- Supervisor, Satellite Data Systems
- Head, Meteorological Satellite Section

Research Scientist, Remote Sensing

- \* - Satellite Data Analyst PC-1

- \* Bench-mark position

Physical sciences  
B.M.P.D. No 4

BENCH-MARK POSITION DESCRIPTION

Bench-mark Position Number: 4

Level: 2

Descriptive Title: Area Soil Conservationist (Manitoba)  
(Soil and Water Conservation Service - PFRA)

Reporting to the Area Manager, Field Operations Division

Plans investigations to determine the extent and severity of soil degradation and soil and water conservation problems, obtaining and analyzing current information, identifying and prioritizing problems through discussions with farmers, representatives of associations, contacts and visits at research establishments or agencies and conservation districts, and study of literature.

Determines soil parameters to be studied and arranges and conducts field surveys, selecting site, installing monitoring instruments, collecting, analyzing and evaluating data and identifying factors/effects and their relationships (e.g. snow melt, precipitation, slope, cropping practices and management, farming systems, groundwater movement, soil salinization, acidification, solonchic soil formation, erosion, loss of organic matter and decline in fertility) and generates field maps.

Determines soil and water conservation problems and develops management practices and plans on a watershed/conservation district and individual farm site basis.

Discusses results of studies and investigations with Soil Conservation Planning Unit, develops soil remedial practices in consultation with local agricultural extension representatives and the Planning Unit. Prepares reports and make recommendations on soil management proposals for approval and implementation.

Provides advice and assists in the implementation of conservation practices; assists watershed/conservation districts and the farmers in matters of financial assistance available with the Branch's policies; monitors conservation projects to assess effectiveness; and, report on findings.

Creates a public awareness and publicizes soil conservation issues, reclamation practices and implications of continued soil degradation. Arranges for demonstrations of soil and water conservation practices to farmers in the area, locating sites and cooperators, installing monitoring devices and collecting and recording the data, planning public field days at demonstration sites, and reports on observations and data collected to the Planning Unit for analysis.

Coordinates at field level, multi-agencies study projects in conservation conducted by the Soil Conservation Planning Unit.

Directs and supervises technical and support staff and reports on activities.

Degree

Specifications

Kinds of Assignments

2

- A. Degree 2 - Objectives are set by the Area Manager within established programs for soil and water conservation and financial assistance. Priorities are established by local watershed/conservation districts, consultations and the Soil Conservation Planning Unit.

- B. Degree 2 - The work normally consists of a number of discrete investigations of soil degradation and soil and water conservation management practices, to determine problems and remedial practices.
- C. Degree 2 - Activities include a variety of tasks allied to the surveying, investigating, evaluating, monitoring and reporting on soil degradation and conservation issues; allocating work and providing advice.
- D. Degree 2 - Surveys and investigations are planned, approached determined, methods selected and reports prepared to meet established objectives.

## Complexity of Work

2

- A. Degree 2 - Information in terms of soil and water conservation methods and techniques is usually readily available. Information and data on soil degradation are obtained by investigations, field surveys or studies, direct observations and using monitoring devices, air photos, remote sensing techniques and agrometeorological networks.
- B. Degree 2 - Information and data on soil degradation, farming practices, land use and soil and water conservation practices and issues can normally be validated by investigative methods, previous or repeated observations and referencing.
- C. Degree 2 - Soil and water conservation and soil degradation data are characterized by several variables which require interpretation but of known implications and variability.
- D. Degree 3 - Relationships between factors affecting conservation and degradation processes and other observed variables or those established for other geographical regions can be conflicting, requiring interpretation and investigation to resolve site-specific inconsistencies.
- E. Degree 3 - Work is frequently affected by the activities of other scientists within the organization and the requirements of the Planning Unit, the watershed/conservation districts and the individual farmers' practices. Conservation planning, drainage, land use changes and other remedial practices are effected by the activities of agricultural and production extension personnel, the farmers and provincial and municipal representatives or officials.
- F. Degree 3 - Contacts are with farmers, other scientists/professionals and representatives of the agriculture industry and agencies of governments and local agricultural extension personnel, to cooperatively resolve problems, explain issues, assess relevancy of their work to own studies and programs or provide technical information and advice.
- C. Degree 2 - The work requires using existing conservation practices and techniques, making modifications or adaptations as required.
- H. Degree 2 - The work requires the application of a sound knowledge of the principles and theories of pedology, involving soil capability classification, soil physical, chemical and degradation processes, land use and crop production. Knowledge of pertinent techniques and practices of hydrogeology, watershed management, agronomy and air photo interpretation and a familiarity with remote sensing techniques and public relation methods are also necessary.

## Professional Responsibility

2

- A. Degree 2 - Investigation plans, work progress, results and recommendations are reviewed by the manager and the Soil Conservation Planning Unit for effectiveness, consistency with guidelines and programs, and completeness. Data collected and interpretation of results are accepted as technically accurate.

- B. Degree 2 - Professional guidance is received from the Soil Conservation Planning Unit and the Service Soil Conservation specialist for new aspects of the work. Studies and directives are provided, scientific guidelines are established and administrative guidance is available.
- C. Degree 2 - Work requires identifying soil conservation problems, finding suitable methods to overcome them, and assisting in the implementation of remedial projects.
- D. Degree 2 - Work of subordinates is reviewed for accuracy, quality and effectiveness. Reviews literature in the field of soil and water conservation for applicability.
- E. Degree 2 - Results are evaluated and interpreted to provide recommendations and advice on conservation problems, and meaningful information and reports on conservation practices.
- F. Degree 3 - Specific technical advice is given to members or officials of the regional agricultural industry, as well as to immediate superior, colleagues and senior members of staff on the key soil conservation issues and on the need and type of remedial actions required.

Management Responsibility

2

- A. Degree 2 - Assigns work, trains and supervises technicians and casual employees.
- B. Degree 2 - Ensures proper maintenance and use of the equipment, supplies and facilities allocated for the work.
- C. Degree 2 - Identifies and estimates need for funds, equipment, facilities and services required for projected work, investigations and remedial action plans.
- D. Degree 2 - Recommends on the need for additional technical assistance to the Area Manager, for approval.
- E. Degree 2 - Ensures that quality, quantity, safety and other work standards for own responsibility are maintained.
- F. Degree 3 - Work requires, coordinating related activities with those of other contributing agencies at federal and provincial levels, municipal officials or representatives and production extension personnel involved in soil conservation, drainage and land use changes. Coordinates at field level, multi-agency projects conducted by the Conservation planning Unit.
- G. Degree 2 - Implements administrative procedures established for the work, attendance at exhibitions and in the processing of applications for financial assistance to watershed/conservation districts and individual farmers for implementation of conservation practices.

Impact of Recommendations and Activities

2

- A. Degree 2 - Results of the work contribute to the on-going monitoring of Prairie soil degradation and affect the initiation or continuation of departmental soil conservation projects, land use policies of municipal government and the drainage and flood control practices within watershed/conservation districts.
- B. Degree 2 -
  - (i) Degree 2 - Results of the work and recommendations affect the management and cropping practices and economic return from the farming operations of individual farmers with environmental and economic effects on the regional agricultural sector and on the attitude toward conservations practices.
  - (ii) Degree 2 - Results of the work contribute to the conservation and long term productivity of prairie soil resources.
  - (iii) No significant impact.
  - (iv) No other significant impacts.
- C. Degree 2 - Information and results contribute knowledge pertaining to the Prairie soil, soil degradation in the area, effectiveness of soil and water conservation practices within watershed/conservation districts and long-term productivity of the prairie soil.

LINEAR ORGANIZATION CHART

- Manager, Field Operations Division (Prairie Region)
  - Area Manager, Field Operations (Manitoba)
    - Assistant Area Manager, Land Use
    - Assistant Area Manager, Water Development
    - Coordinator, Construction and Services
  - \* - Area Soil Conservationists (3) PC-2
    - Technicians (up to 2) (EG),
    - Casual employee (1)
- Bench-mark position

BENCH-MARK POSITION DESCRIPTION

Bench-mark Position Number: 5

Level: 2

Descriptive Title: Environmental Assessment Officer

Reporting to the Chief, Environmental Assessment and Surveillance Division:

Assesses geotechnical aspects of applications for inter-provincial and international oil and gas pipelines and electric power lines construction: Reviews applicant's submission, analyses and recommendations for thoroughness and applicability of environmental information provided. Assess correctness of the environmental impact statements presented and identifies deficiencies. Identifies the environmental issues involved against the National Energy Board's environmental policies and requirements, assessing the potential impacts of a physical nature for soil erosion, terrain instability, physical soil assessment, soil losses as well as various impacts of a biological nature upon environmental components. Analyses the mitigative and rehabilitative measures and assesses adequacy of the physical environmental protection and mitigative measures against regulatory agency requirements, established practices, guidelines and recommendations.

Monitors and audits construction and company operational activities on pipeline and power line projects and conducts field studies to ensure conformance with requirements and approved environmental practices. Brings violations or omissions to the attention of the company and the appropriate authorities. Conducts operational audits on pipeline and power line right-of-ways and incident and spill sites and writes reports on finding for the Operation Division.

Provides professional advice to staff members, supervisors and National Energy Board Panel members, on the geographic, geomorphologic, petrologic and related biological impacts of the pipeline or power line application. At public hearings established by the National Energy Board (NEB), evaluates evidence and arguments and prepares reports for board members. Prepares responses for the public on the environmental requirements of the NEB.

Identifies the need for, develops and recommends guidelines and practices for the mitigation of unavailable environmental impacts and rehabilitation of disturbed lands after construction, reviewing terms and conditions to NEB certificates, orders and licenses, and investigating on site the effectiveness of the mitigative techniques used, for efficacy of the terms and conditions in promoting desired activities for achieving acceptable level of restoration of the right-of-ways to satisfy the NEB's responsibilities.

Reports to the Chief and the Project Manager on construction and operational activities, and makes recommendations for required corrective actions.

Degree

Specifications

Kinds of Assignments

2

- A. Degree 2 - Objectives of the work are clearly defined with the Chief and within regulations set by the National Energy Board.
- B. Degree 2 - Work normally consists of evaluating and monitoring a number of discrete applications for pipelines and power lines to assess potential impact and conformance to environmental practices.

- C. Degree 2 - Activities consist of a number of tasks, such as evaluating, reviewing, inspecting and reporting on the potential physical impact of pipeline and power line construction projects, bringing up violations, making recommendation and providing advice.
- D. Degree 2 - Work is planned and approaches determined so that conditions set at public hearings and need for appropriate timing and levels of surveillance to monitor construction activities are met.

Complexity of Work

2

- A. Degree 2 - Information is gathered from industry, interveners and applicant's submission, available technical reports or by direct inspection of pipelines/power line construction conditions and activities.
- B. Degree 2 - Data can normally be validated against previous experiences, engineering standards and similar references.
- C. Degree 2 - Information is characterized by several variables such as soil stability, meteorological conditions and ecological zone characteristics, with generally known implications but some of these are poorly defined.
- D. Degree 2 - Relationships between the physical nature of the terrain and the ecological zone are generally well established.
- E. Degree 3 - The work is affected by the operational activities of contractors, requirements of interveners, officials from industry, the provinces and others outside the organization unit.
- F. Degree 3 - Contacts are with others within the Environmental Assessment Division, experts in other government departments and agencies, industry and other outside organizations to exchange information, bring up violations, discuss mitigative and rehabilitative measures, problems and alternative methods concerning construction work.
- G. Degree 2 - Work requires adapting existing practices, techniques and procedures of environmental assessment, monitoring and audits to meet the requirements for the specific pipeline/power line application construction and area rehabilitation.
- H. Degree 2 - Work requires the application of a sound knowledge of the principles, theories and practices of pedology with emphasis on the physical characteristics of soils, and involving related biological characteristics, geography and geomorphology. Familiarity with civil engineering practices, area rehabilitation technologies and areas of legislation and regulation pertinent to pipeline/power line construction is also required.

Professional Responsibility

3

- A. Degree 3 - Work and recommendations are accepted as accurate and are reviewed by the Chief Environment Assessment and Surveillance Division for soundness of judgment, attainment of objectives and satisfaction of priorities.
- B. Degree 2 - Professional guidance is available from the supervisor and other specialists for new work or special technical problems.
- C. Degree 2 - Work requires identifying problems and violations in pipeline and power line construction submissions, construction and area rehabilitation, and recommending methods for resolution.
- D. Degree 3 - Submissions from industry are technically reviewed in detail for conformance with objectives and compliance with regulations.
- E. Degree 2 - Results of analysis, operation and construction activities and conditions are observed and scientific observations and results are interpreted to produce meaningful assessments, conclusions or recommendations and remedial actions.

- F. Degree 3 - Specific technical advice is provided to immediate supervisor, Board Panel members, counsel and other senior staff on environmental matters related to geotechnical aspects of applications for pipelines and power lines construction.

Management Responsibility

2

- A. Degree 1 - Work occasionally may require assigning tasks to non-subordinate staff as applicable.
- B. Degree 1 - Prepares trip itinerary and logistics and plans the use of equipment and resources for own inspection and evaluation work.
- C. Degree 1 - Usually limited to the spending of own time and use of equipment and supplies for own work.
- D. Degree 2 - Recommends on the need and source for outside assistance to the Chief, for particular assessment, monitoring and other work related to environment and resources management.
- E. Degree 2 - Ensures that relevant administrative procedure, standards and terms and conditions are maintained to ensure fulfillment and conformance to requirements and meet objectives.
- F. Degree 3 - Coordinates field monitoring, audit and study work with relevant activities of pipeline and electrical power line companies, other agencies and construction companies. Must co-ordinate the reporting work with the demands and requirements of regulatory agencies.
- G. Degree 2 - Implements office and field administrative procedures established for the work and as directed by the Board.

Impact of Recommendations and Activities

2

- A. Degree 2 - Results of the work affect the continuation of projects related to applications dealing with oil and gas pipelines and electrical power lines, and the level and frequency of inspection activities.
- B. Degree 2 -
  - (i) Degree 2 - Results have economical and technological impact on the pipeline and power line construction industries, especially if violations of the NEB regulations are involved.
  - (ii) Degree 2 - Results contribute to conserving the environment along power line and pipeline rights-of-way.
  - (iii) Degree 2 - Results contribute to the control of potentially hazardous substances (oil, gas and electrical power).
  - (iv) No other significant impacts.
- C. Degree 2 - Results contribute to knowledge of the environmental aspects and impacts of pipeline and power line constructions, area terrain stability and particularities, and to the knowledge and control of adverse environmental effects from the construction of pipelines and power lines.

LINEAR ORGANIZATION CHART

- Assistant Director, Environment Group
  - Chief, Environmental Assessment and Surveillance Division
    - Senior Environmental Advisor
    - Environmental Assessment Officers (4) PC-2
  - \* Bench-mark position

BENCH-MARK POSITION DESCRIPTION

Bench-mark Position Number: 6

Level: 2

Descriptive Title: Energy and Mineral Commodities Research Officer

Reporting to the Head of the Metallic Mineral Subsection:

Plans, organizes, conducts and evaluates research projects on mineral ore and coal processing aimed at improving knowledge and understanding of unit operations in minerals and coal beneficiation (e.g., communication, classification, gravity separation, froth flotation) for their application. Studies technical literature to determine the best line of attack; contacts other scientists and designs experiments to provide the necessary data, identifies required equipment and material and supervises the progress of experiments; secures mineralogical and chemical analyses, performs X-ray fluorescence analyses, evaluates results and simulates the performance of unit operations using mathematical models.

Plans, organizes and conducts process development projects aimed at improving the recovery of minerals from Canadian ores, e.g., iron ores, sulphide ores, and coals, or evaluating the potential for utilization or exploitation of currently unused resources. Reviews technological developments and applications, visits processing plants to identify shortcomings of present recovery methods and discusses process used in other areas of minerals beneficiation for developing new processes and equipment.

Implements laboratory and pilot-plan trials, supervises the implementation of field trials and instructs industrial personnel in methods and procedures, compiles performance data and formulates a basis for assessing the viability of new processes and equipment. Organizes and supervises the work of support technicians, scheduling, assigning tasks, instructing in experimental procedures, checking and reporting on work performance and maintaining safety standards.

Prepares and discusses with Supervisor technical reports and scientific papers based on experiments and project findings for presentation, publication of technology transfer purposes.

Assists in program development and provides technical information to industry and government, conducting literature surveys and developing research projects for submission, maintaining awareness and analyzing and reporting on problems in the minerals industry considering goals and objectives. Responds to work-related inquiries from industry and government.

Degree

Specifications

Kinds of Assignments

2

- A. Degree 2 - The objectives of the work are discussed with, and clearly defined by the Head of the Metallic Minerals Subsection and are influenced by related technological objectives of industry and other outside organizations.
- B. Degree 2 - The work normally involves a number of discrete medium- to long-term research projects and process development studies and investigations, for minerals recovery enhancement, process and unit operations improvements and exploitation of potential mineral resources.
- C. Degree 2 - The activities differ from one another and consist of a variety of tasks allied to the conduct of process development projects and development of processes and equipment by planned laboratory and pilot plant trials and experiments on the processing of mineral ores and beneficiation of coal; allocating work; producing technical reports; and, providing advice.

- D. Degree 2 - Projects are organized, experiments planned, approaches determined, methods selected and work assigned and carried out to ensure that defined objectives for new or improved recovery of minerals are met.

Complexity of Work

2

- A. Degree 2 - The work requires obtaining information by direct observation of laboratory experiments or pilot plant operations and by amassing data from other recognized sources and using existing or modified experimental techniques.
- B. Degree 2 - Information can normally be validated against standard reference materials, literature references and comparison with existing mineral recovery processes.
- C. Degree 2 - Information is characterized by several mineral and processing variables requiring knowledgeable interpretation and an understanding of pilot plant and full-sized plant correlations, but the implications of the outputs are generally known.
- D. Degree 2 - Relationships between the variables can normally be established by straight-forward laboratory investigations or literature surveys, and inconsistencies in the data can be resolved by repeat observations.
- E. Degree 2 - The work is affected by activities of other scientists within the organizational unit and occasionally by industry or other outside sources (such as the provincial regulatory agencies).
- F. Degree 2 - Contacts are normally with other scientists and engineers working in mineral processing, beneficiation of coal or closely related fields to exchange information, discuss problems and to transfer technology. Responds to inquiries from industry and government.
- G. Degree 3 - The work requires designing experiments, developing new techniques and industrial and experimental procedures, implementing laboratory and pilot plant trials, and establishing standards for X-Ray Fluorescence analysis and interpretation of X.R.F. assays.
- H. Degree 2 - Work requires a sound knowledge of mineralogy (mineral processing) and the investigational methods used to develop mineral recovery process and involving physics, mathematics and special knowledge of X-Ray Fluorescence methodology and applications. Familiarity with statistical tools and computers and their use in producing simulation models is necessary.

Professional Responsibility

2

- A. Degree 2 - Work is accepted as technically accurate. Evaluations and conclusions are reviewed for consistency and completeness prior to producing a final report.
- B. Degree 3 - Professional guidance is available from the Subsection Head to deal with difficult process developments problems or approaches.
- C. Degree 3 - The work requires identifying present recovery method shortcomings and mineral processing problems, adapting or devising methods and processes for their resolution, planning required investigations and evaluating the results. While objectives of the work are discussed with the Head, there is a requirement to define experiment objectives and to formulate a basis for assessing viability of new processes and equipment.
- D. Degree 2 - The work of subordinate staff is checked for the application of correct methods and procedures and ensure work meets objectives and is progressing towards the aims of the research experiment.
- E. Degree 2 - Scientific observations, results and findings of experiments are interpreted to produce meaningful reports, information and recommendations.

- F. Degree 2 - Advice is provided to support staff and colleagues within the group and the industry on mineral processing technology matters.

Management Responsibility

2

- A. Degree 2 - Supervises two technicians and one term employee performing pilot plant and laboratory experiments.
- B. Degree 2 - Ensures the proper use of equipment, facilities and supplies allocated to the support staff for medium- and long-term experiments.
- C. Degree 2 - Appropriate equipment, material and services are identified for the various research projects and, when allocated, their schedule of use is organized.
- D. Degree 2 - When required, recommends to the Head, on the need for outside contract or university assistance for supplementary or specialist services.
- E. Degree 2 - Ensures that safety, quality and quantity standards are maintained as work involves heavy equipment and results can imply industrial process modifications with their inherent hazards.
- F. Degree 3 - Coordinates project and experiment activities and scheduling with related work of other scientists and technologists within the organizational unit and with others collaborating from other laboratories, research organizations and the industry.
- G. Degree 2 - Implements office and laboratory administrative procedures established for the work.

Impact of Recommendations and Activities

2

- A. Degree 2 - The direction and continuing operations of the Subsection are affected by the recommendations and decisions made on the nature of experimental design, the use of equipment and the limited pilot-plant facilities and by the interpretation of the results generated.
- B. Degree 3 -
- (i) Degree 3 - Project findings and successful optimization of mineral recovery processes have technological and economic effects with commensurate savings to the mineral industry and, to the focus of the research.
  - (ii) Degree 2 - Results of the work can contribute to more efficient utilization and to the development of mineral resources and the exploitation of new mineral deposits.
  - (iii) No significant impact.
  - (iv) No other significant impact.
- C. Degree 2 - Information and results of the work contribute to the knowledge of, and improvement in methods, techniques and procedures in mineral processing and coal beneficiation, and efficient extraction processes.

LINEAR ORGANIZATION CHART

Head, Ore Dressing Section

- Head, Non-Metal Subsection
- Technician, Supervisory Technical Subsection
  
- Head, Research Technical Subsection
- Head, Metallic Minerals Subsection
  - Research Scientists (SE-RES-2, 3)
  - Engineer, Research and Development (EN-ENC)
  
  - Research Officers PC-1
  - \* - Energy and Mineral Commodities Research Officer PC-2
  
  - Technicians (up to 2) (EG)
  - Temporary employee (1)
  
- \* Bench-mark position

BENCH-MARK POSITION DESCRIPTION

Bench-mark Position Number: 7

Level: 2

Descriptive Title: Physical Climatologist

Reporting to the Head, Lakes Climatology Unit:

Carries out research studies into the climatic interaction between water bodies, the atmosphere and surrounding land areas and studies hydro-meteorological and climatological problems associated with lakes and reservoirs, particularly evaporation, precipitation and surface water temperature.

Plans, organizes, supervises, and conducts projects to gather hydro-meteorological and surface water temperature data related to lakes and coastal zones, particularly the Great Lakes, provided by satellite remote-sensing for resource management and the development of lake regulation policies and research activities or to meet various users needs and involving the collection, reduction, analysis and interpretation of remotely-sensed data. Determines survey procedure. Modifies existing techniques or develops new ones for data analysis, acquisition, processing and evaluation. Determines and recommends type of archival data required. Directs and supervises the work of technical support staff.

Prepares and reviews environmental impact assessments of the effects of human activities and industrial facilities on reservoirs and other large water bodies. Collects, collates, archives, analyses and evaluates data associated with these studies.

Advises managers within own field of specialization and provides specialized scientific advice and guidance to other climatologists and professionals and acts as representative at project meetings and on committees involved in satellite remote-sensing of water temperature, and lake climatology. Coordinates cooperative study activities and collaborates in research programs. Assists users in determining nature of the requirements and appropriate procedures to arrive at results.

Assists in climatic impact assessment to identify the nature and implications of climatic change for Canadian lakes and reservoirs, relating scientific knowledge of climate to socio-economic concerns, adapting and using methodology such as statistical and multi-disciplinary models for measuring impact, and evaluates the potential socio-economic effects of climate change. Writes reports and provides scientific information and illustrative material such as maps on study and project results or findings. Reviews literature, participates in various working groups and maintains required contacts with other specialists to keep current in climatological methods and techniques, photogrammetry and remote sensing, hydrology and Great Lakes environmental research.

Degree

Specifications

Kinds of Assignments

2

- A. Degree 3 - Study or project areas and objectives are identified in consultation with user representatives and discussed and agreed with the Unit Head. Objectives are in terms of requirements for scientific support or co-operative studies to provide scientific data and assessments for water resource management, lake level regulation and research studies.

- B. Degree 2 - Work normally consists of carrying out a number of climatological search and data-gathering projects, studying hydrometeorological and climatological problems and assisting in the assessments of the impact of climatic change and the environmental impact of the effects of facilities or industrial or commercial activities on lakes and reservoirs, interpreting and evaluating the data and producing reports.
- C. Degree 2 - The work involves undertaking projects or investigations related to land-air-water interactions on climatological time scales, studying hydro meteorological and climatological problems associated with lakes and reservoirs, gathering hydrometeorological and environmental data relating to lakes and coastal zones, interpreting data of environmental parameters and the output signals of sensors from satellite and airborne scientific equipment, allocating work and providing advice.
- D. Degree 2 - Projects, investigations or studies are planned and conducted; approaches, type of data and methods for the gathering, analyses and evaluation of the data are determined and tasks are assigned to ensure objectives are met.

Complexity of Work

2

- A. Degree 3 - The work requires obtaining, processing and interpreting data of environmental parameters as provided by various satellite and airborne scientific equipment in the form of sensor output signals and obtained from the Service, the Satellite Laboratory and a diversity of other sources. Ways must be devised to exploit available data to represent over-water conditions as there are few long-term institutional observations over the lakes and climatological land data. Data may be difficult to collect and select and must be blended and reduced using various adaptations of procedures.
- B. Degree 2 - Archived information and data are validated before being entered. Other data can usually be acceptably validated by comparison with other related analysis results or literature references.
- C. Degree 3 - Climatological information and data such as pertaining to interactions between water bodies and the atmosphere, the water bodies with surrounding land areas and the atmosphere with the land areas are characterized by several variables, variability, poorly defined variables and some ambiguity, and require interpretation.
- D. Degree 3 - The relationship between four dimensional environment variables (earth-air-water-time) are inter-related in complex ways, can be conflicting and require interpretation, interpolation or extrapolation.
- E. Degree 2 - Survey or study work conducted in cooperation with other scientists can be affected by their activities or by user demands.
- F. Degree 2 - Contacts are with others involved in satellite remote sensing, climatology and related disciplines to provide or exchange information and participate in the resolution of problems.
- G. Degree 2 - The work requires the adaptation or modification of analysis techniques and methods for non-standard situations. Changes in the methods, techniques, and algorithms used in satellite remote sensing due to innovations in the sensors, enhanced physical-spectral relationships or increased computer power must be assessed and incorporated into the present methodologies where appropriate.
- H. Degree 2 - The work requires the application of a sound knowledge of climatology, meteorology and remote sensing, complemented by a knowledge of the related fields of physical limnology, air - water interaction, geography and familiarity with the techniques of socio-economic data analysis and computer programming.

## Professional Responsibility

2

- A. Degree 2 - The work requires the completion of assignments, the interpretation of results and the preparation of the report. Work is reviewed by the Head on conclusion of the assignment.
- B. Degree 2 - Professional guidance is available on studies and assessment involving new satellite remote sensing methods, techniques and algorithms such as due to innovations in sensors enhanced physical-spectral relationships and greater computer power.
- C. Degree 2 - The work requires the use of judgment in recognizing problems, selecting approaches, interpreting analyses, adapting methodologies and resolving technical difficulties or to determine the corrections required to the radiation measurements for the effects of the atmosphere in the derivation of surface water temperature.
- D. Degree 2 - The work of support staff is reviewed in progress and on completion to determine effectiveness of methods and validity of conclusions. The results of analyses of contractor's work are evaluated for acceptability of results and the requirements to modify existing projects.
- E. Degree 2 - The scientific observations and the results of studies and analysis must be interpreted, blended or reduced for meaningful reporting and dissemination.
- F. Degree 2 - Advice is provided to climatologists, professionals within the Service and other government departments, universities and private industry on matters pertaining to physical climatology and within area of specialization.

## Management Responsibilities

2

- A. Degree 2 - The work requires the supervision of a support staff consisting of one technician, a clerk and seasonal or term employees.
- B. Degree 2 - Ensures proper use of the equipment and supplies allocated to particular survey, study or project.
- C. Degree 2 - Resources are identified for each assignment including the requirement for collaborative work from staff of another work unit when required for the work.
- D. Degree 3 - Substantiates the need and expenditures of funds for outside expertise and develops the specifications for work to be done under contract, identifies suitable sources and arranges for available assistance.
- E. Degree 2 - Monitors progress of contracted work and the work of support staff, and ensures that quality and quantity standards are met.
- F. Degree 2 - Coordinates cooperative study activities with other scientists in the Service and agencies such as when required to obtain the interdisciplinary information necessary for Great Lakes studies.
- G. Degree 2 - Implements office and field administrative procedures established for the work.

## Impact of Recommendations

2

- A. Degree 3 - Information and results of the work are used in the elaboration of, and can affect lake level regulation policies and influence conclusions and recommendations on Great Lakes observing networks and studies related to this research. Data and analyses support relevant ongoing work of units of the Federal and Provincial governments in Canada, U.S. Federal and State agencies, universities and private industry. Information and advice are considered as authoritative within the field of the work of the position.

- B. Degree 2 -
- (i) Degree 2 - Results of the work and their effect on regulation can impact on particular installation process using water as a resource.
  - (ii) Degree 2 - Results of the work contribute to the management of the water resources for protecting and conserving Canada's surface water resources.
  - (iii) No significant impact.
  - (iv) No other significant impact.
- C. Degree 2 - Effective exploitation of available data, meaningful interpretation of output signals of sensors, sound extrapolation and interpolation of data, and meaningful result presentation contribute to the knowledge in a field of work where few long term institutional observations exist, and to a greater understanding of climatology.

LINEAR ORGANIZATION CHART

Superintendent, Lakes and Marine Applications

- \* Head, Lakes Climatology Unit
  - Physical Climatologist (Networks and Surveys) PC-2
  - Technician
  - Clerk
  - Summer Student(s)
  - Term Employee(s)
  
- \* Bench-mark position

Physical sciences  
B.M.P.D. NO 8

8.1

BENCH-MARK POSITION DESCRIPTION

Bench-mark Position Number: 8

Level: 2

Descriptive Title: Aquatic Scientist, Monitoring and Field Studies

Reporting to the Head Monitoring and Surveys Division:

Plans, organizes and conducts aquatic ecosystem and environmental quality surveys, monitoring studies and projects in the Atlantic Region, to obtain and analyze information and scientific data on the state of the aquatic ecosystem, for water resource management, quality control and required reporting. Reviews and assesses impact on aquatic ecosystem of industrial development plans, water utilization and land-use proposals and effects of hydrologic dynamics, atmospheric, demography, geography and watershed geology. Reviews and interprets available multi-disciplinary data information and identifies and recommends on data requirements, required survey and trend monitoring studies and necessary equipment and resources to meet work objectives.

Determines the environmental parameters (e.g., physical, hydrological, chemical, biological) and matrices (e.g., sediment, surface/groundwater, precipitation and biota) to be measured; determines monitoring and survey locations considering such factors as geology, geomorphology, land use activities, basin size, stream flow and gradients; the sampling and measuring techniques, discussing the analytical method with staff of the Analytical Service Division, the parameter capabilities, the samples preservation and handling techniques for sediment, water and biota; develops optimum sampling frequencies considering the various factors and site specific information; and, directs the collection and ensures the preservation and integrity of the samples. Modifies, evaluates and ensures proper installation and maintenance of instruments and equipment used and recommends monitoring applications and testing of new sensing instruments.

Analyses, evaluates and interprets the data gathered on water, sediment, aquatic biota and precipitation and their relationships, relating data to water quality objectives and guidelines for determining the fate and pathways, dissipation rates and sinks of toxics, defining problems, reporting on level and tendencies of pollutants and forecasting potential danger trends; to provide scientific and technical evidences of baseline conditions, emerging issues, state of aquatic quality, spatial and temporal trends, effectiveness of water resource management compliance with aquatic quality objectives and monitoring agreements or for recommendations on future actions.

Consults scientists of other agencies on methods used for assembling, analyzing and interpreting the data and dissemination of the results. Selects and adapts computerized and statistical analysis techniques, consolidates and processes environmental data from various sources and data bases for developing models, describing environmental processes, seasonal patterns, and long term trends of Long Range Transported Air Pollutants (LRTAP) parameters or for assembling, analyzing and interpreting hydrological cycle data.

Determines field survey logistic support and establishes requirement time-schedule, coordinates activities with other agencies' scientists involved in joint or cooperative studies. Assigns work to support staff, supervises and provides instructions and guidance, and recommends on training needs.

Writes study reports and papers for presentation and prepares proposals for enhanced monitoring, specific studies, and cooperative projects. Participates on study groups, committees and joint projects with engineers and scientists of other disciplines for the planning of sediment, limnological, hydrological and precipitation studies.

Specifications

Kind of Assignments

2

- A. Degree 2 - The objective of the environmental survey, monitoring and assessment work performed are clearly defined by the Head.
- B. Degree 2 - The work involves organizing and carrying out a number of detailed field studies, surveys or project on the state of the aquatic resource and the effects of various factors or conditions on its quality and sustainability and participating on joint projects and cooperative studies of a multi-disciplinary nature.
- C. Degree 2 - The activities involve organizing, carrying out and supervising monitoring and survey activities and related sampling and measurement work in the field; gathering and assessing environmental data; preparing study reports and scientific papers on findings, problems and trends; allocating work and instructing support staff.
- D. Degree 2 - The work requires planning the monitoring and field survey activities, determining the environmental parameters and matrices to be measured, the locations, approaches and techniques for the measuring and the sampling, and the data analysis work to meet established objectives.

Complexity of Work

2

- A. Degree 2 - Information and data are usually obtained from field survey observations, monitoring devices and recording instruments, river, lake and groundwater water, sediment and biological samples, analytical results and, measurements of environmental parameters and matrices, as well as from other studies, scientific reports by other agencies or publications from recognized sources.
- B. Degree 2 - Information and data can normally be validated using known procedures for repeat measurements and confirmation sampling or by reference to related literature.
- C. Degree 3 - The information and data pertaining to the diversity of factors affecting aquatic quality and the sustainability of the water resource, the parameters and matrices to be measured, the measurement and sampling location and frequencies, and the toxic substances and their transformation are characterized by several variables involving interpretation, poorly defined variability and ambiguities.
- D. Degree 3 - The relationships between the diverse gathered data to be interpreted, the variables affecting the measurements, location, sampling, and the assessments required, the environmental parameters and matrices to be measured and the issues under investigation, can be conflicting and require investigation, synthesizing and interpretation.
- E. Degree 2 - Work is normally affected by the activities and requirements of others within the organizational unit and of other scientists outside the unit when participating on joint field surveys, projects or cooperative studies.
- F. Degree 3 - Contacts are with scientists and engineers on joint or related studies or projects for resolving problems, exchanging information and for participation on cooperative studies with scientists of other branches or departments, and agencies of other governments involved in the control of aquatic environmental quality.
- G. Degree 2 - The work requires adapting or modifying sampling and measuring techniques for the parameters to be measured, making modifications to monitoring devices, measuring and recording instruments and adapting data processing and statistical analysis methods for the work.
- H. Degree 2 - The work requires the application of a sound knowledge of physical geography involving hydrology, geology and limnology complemented by sufficient familiarity with theories and practices of work related disciplines such as climatology, biology and chemistry that are pertinent to the work. Familiarity with statistical analysis methods and computer application is also required.

DegreeProfessional Responsibility

3

- A. Degree 2 - Measurement, results of analysis and assessment work are accepted as technically correct. Recommendations and conclusions are discussed with other scientists and reviewed by the Head for consistency and completeness.
- B. Degree 3 - Professional guidance on the resolution of new and difficult studies or monitoring problems can be obtained from the Head, higher level scientists or from scientists in other disciplines related to the work.
- C. Degree 2 - The work requires identifying monitoring and survey problems, defining information and data needed, determining the environmental parameters and matrices to be measured, the monitoring and survey location and the sampling frequencies. Approaches and suitable techniques are identified to deal with measurement, data acquisition and analysis difficulties.
- D. Degree 3 - The work requires reviewing related scientific proposals, results and methods used in the field of water quality monitoring, surveillance and pollution control, from scientists of other organizations, to assess their applicability to current or planned studies. Reviews and assesses development plans and proposals of specific industries as to validity of data and completeness for assessment of impact on aquatic quality.
- E. Degree 2 - Own and subordinates scientific observations, monitoring and survey findings, sampling results and calculations must be synthesized and interpreted to provide meaningful conclusions, recommendations or reports.
- F. Degree 3 - Advice on data and findings interpretation and applied techniques is provided to other scientists and the superior. Provides technical advice to colleagues and guidance to support staff on monitoring and aquatic quality survey work, the measuring, testing and sampling equipment and the quality assurance techniques to be used.

Management Responsibility

2

- A. Degree 2 - Work requires supervision of support staff consisting of one scientist and one technician.
- B. Degree 2 - Ensures the proper installation and maintenance of monitoring devices, instruments and other equipment and supplies allocated for the work.
- C. Degree 2 - Determines the requirements for resources and recommends on the need for instrumentation and other equipment.
- D. Degree 3 - Substantiates the needs, defines specific requirements for consultant studies and the technical scope of contracted monitoring or survey work and services, and arrange for available assistance.
- E. Degree 2 - Ensures that work quality, quantity and safety standards and guidelines are maintained.
- F. Degree 3 - The work often requires coordinating related activities with those of other scientists or groups within the Branch, other departments or agencies of other governments participating in joint surveys and studies or using work results.
- G. Degree 2 - Implements field and other administrative and safety procedures and guidelines established for the work.

Impact of Recommendations and Activities

2

- A. Degree 2 - Information and results of the work and recommendations affect the intensity and direction of the monitoring, survey and required reporting activities and the water resource management practices in the region.

- B. Degree 3 -  
(i) Degree 2 - Results of the work and recommendation on industrial and urban development proposals can have technological or economic effects on the sector of industry that use water as a resource and influence decisions on expenditures to enhance or protect the aquatic environment.  
(ii) Degree 3 - Results of the work and recommendations affect the environmental quality, the state of the aquatic ecosystem and sustainability of the water resource.  
(iii) Degree 2 - Results of the work and recommendation contribute to the preservation of the availability and the enhancement of the quality of water used by urban community.  
(iv) No other significant impact.
- C. Degree 2 - Result of surveys, studies and monitoring work and assessments contribute knowledge on the state of the aquatic resource of the region, the factors affecting its quality and sustainability, and on effective water resource management practices.

LINEAR ORGANIZATION CHART

Chief, Water Quality Branch, Atlantic Region -

Head, Monitoring and Surveys

- \* - Aquatic Scientist, Monitoring and Field Studies PC-2
  - Aquatic Scientists PC-1 (Term)
  - Technician (EG)
- Aquatic Scientists, Assessment PC-2
  - Specialist, Toxic Assess. (CH-1)
- Instrument and Data System (EL-7)
  - Computer Programmer (CS-1)
  - Data Processor (DA-PRO-4)

\* Bench-mark position

BENCH-MARK POSITION DESCRIPTION

Bench-mark Position Number: 9

Level: 2

Descriptive Title: Field Experiment Support Scientist

Reporting to the Chief of the Experimental Studies Division, Atmospheric Research Directorate:

Plans, organizes and conducts activities pertaining to field experiments for the measurement of atmospheric trace gases and as part of the joint effort of the division's scientists, using stratospheric balloons launched from disparate and remote locations and a variety of instrumental techniques (e.g. spectrophotometry, interferometry, radiometry).

Develops new or improved techniques, space instrumentation and electronic and computer control systems. Designs and implements laboratory calibration procedures for flight instrumentation. Schedules the preparation of the instrumentation for field projects. Assesses the readiness and success probability of payload instrumentation for required logistical decision and launch planning. Directs the work of technical support staff and oversees the integration into, and the testing of the instrumentation in the balloon payload before flights, and monitors and reports on the operational status and effectiveness of the instruments during the mission.

Analyzes, interprets and evaluates the data gathered in the measurement programs for information on the distribution and temporal and spatial variability of stratospheric gases, developing analysis procedure, reducing data using computer and writing programs when required to integrate physical parameters measured, and process resulting data set, making critical assessments of the data and results of the analysis obtained, and developing models to show the source, movement and fate of atmospheric trace gases.

Designs and develops remote sensing instrumentation involving the application of optical design technique and microprocessor technology and the development of control software for experimental micro-computer operated instrumentation.

Advises and provides technical guidance in own field of specialization and on specialized software development for micro-computers to members of related projects and others within the Division. Recommends external support including the use and the acquisition of new equipment and software when appropriate.

Degree

Specifications

Kinds of Assignments

2

- A. Degree 2 - Objectives are defined by the chief and in consultation with the project scientists and are in terms of the instrumentation required and the particular experiments to be conducted for specific scientific measurements of stratospheric gases.
- B. Degree 2 - The work consists of a number of discrete projects or research studies involving the development and monitoring of instrumentation and the analysis, assessment and interpretation of measurement data concerning stratospheric gases as part of joint scientific efforts.
- C. Degree 2 - The work involves planning and conducting relevant phases of field experiments requiring the development of electro-optical instrumentation, the integration into, and the testing of the instrumentation in the balloon payload, the monitoring during the mission, the analysis of the measurement data gathered, the provision of advice and the allocation of work to technical support staff.

- D. Degree 2 - Plans, organizes and conducts the development, preparation, integration and testing of the instrumentation, determines the approaches, selects the measurement data gathering techniques and analysis method, and determine the type and content of study report to meet the particular experiment objective.

Complexity of Work

3

- A. Degree 3 - Data obtained from infrequent and difficult field ventures, and raw data need extensive refinement and require difficult evaluation to yield results.
- B. Degree 3 - Data can only be verified and this only over a period of time by inter comparing a large number of results, work published by other researchers and by comparison to internal measurements obtained by different techniques.
- C. Degree 3 - Information and data pertaining to the instrumental measurement and capture of, and the information data concerning the source, movement and distribution of stratospheric gases, their temporal and spatial variability and their fate are characterized by several variables, poorly defined variability and some ambiguities.
- D. Degree 3 - Relationships between variables affecting the success probability of payload instrumentation or the instrumental measurement of the distribution and temporal and spatial variability of stratospheric gases, their source, movement and fate can be conflicting and require careful analysis, interpretation and assessment.
- E. Degree 2 - Logistical decisions must be made and procedures arranged in concert with other scientists using the balloon gondola. Work is normally affected by others in the same group and to a lesser extent by external scientists involved in the balloon launch programs or collaborating in the research.
- F. Degree 2 - Contacts are with other scientists involved in the area of atmospheric gas research and with contractors, to exchange information on the work and discuss problems.
- G. Degree 3 - The work requires the development of analytical remote sensing techniques and instrumental techniques for the capture and the measurement of the scientific data required and of effective procedures for their analysis.
- H. Degree 2 - The work requires the appreciation of a sound knowledge of physics with particular emphasis on dynamics of gases, optics, solid state physics, electronic and meteorology, complemented by familiarity with pertinent practices of other disciplines, e.g. photometry, spectroscopy, chemistry and mechanics, engineering, computer science.

Professional Responsibility

3

- A. Degree 2 - Studies and reports summarizing results of research project are discussed with other scientists concerned with the results and publishing. Project work is reviewed by the Chief for consistency and completeness.
- B. Degree 3 - Little technical direction is provided. Professional advice on the resolution of the difficult problems can be obtained from the Division Chief or from other scientists in related fields or cooperating in the research.
- C. Degree 3 - The work requires identifying problems and new avenues for the capture of measurements data by remote sensing, devising effective instrumentation and control systems, and determining approaches to resolve problems.
- D. Degree 2 - The work of technical support staff is reviewed for quality and validity of testing results and conclusions. Project proposals pertaining to area of specialization are evaluated for feasibility and recommendations.
- E. Degree 2 - Scientific observations, measurements, data and results of research are interpreted to produce meaningful conclusions, reports and recommendations.
- F. Degree 3 - Specific advice pertaining to technological approaches and required instrumentation and control systems design and development within own field of specialization is provided to scientists working in the same or related field. Guidance on technical matters is provided to other scientists contributing to the work and to technical support staff.

Management Responsibility

- A. Degree 2 - Directs the work and trains a varying number of support staff in the specialized tasks required by the research, and oversees and monitors progress of work to ensure timely completion and meet the objectives.
- B. Degree 2 - Controls the use and maintenance of allocated scientific equipment.
- C. Degree 2 - Identifies requirements for equipment, the services required and the acquisition of scientific instrumentation and material for the design and construction of space remote sensing instrumentation, and recommends on technical resources allocation for the project.
- D. Degree 2 - Recommends the need for external support when required.
- E. Degree 2 - Monitors and insures that quality and quantity of the work meet standards and recommends changes to the daily routine in the lab and in the field to improve work efficiency and for successful and timely completion of project.
- F. Degree 2 - Coordinates activities with other scientists supporting the project within the division and with outside groups such as university and other government groups in completing project and the publication of joint study results.
- G. Degree 2 - Implements administrative and field procedures established for the work.

Impact of Recommendations and Activities

2

- A. Degree 2 - Results of the work and recommendations on technical matters related to the No<sub>x</sub> Balloon Measurement Program, impact on the design and purchase of the equipment for the stratospheric measurement data gathering and affect the schedule and number of balloon projects or the continuation of balloon launch experiments.
- B. Degree 2 -
  - (i) Degree 2 - Results of the work may lead to the regulatory control of stratospheric polluting products or industrial process technology.
  - (ii) Degree 2 - Results of the work contribute to the improvement of the protection and conservation of the environment.
  - (iii) Degree 2 - Results of the work contribute stratospheric pollution information needed for regulation aimed at safeguarding public health.
  - (iv) No other significant impact.
- C. Degree 3 - Development of new instrumental methods to measure stratospheric constituents and results of experiments affects the development and testing of hypothesis about the stratosphere by other scientists and contribute to the enhancement of basic scientific knowledge about the stratosphere and to a better understanding of stratospheric photochemistry, the source, movements and fate of atmospheric trace gases and the effects of anthropogenic alterations to the upper atmosphere.

LINEAR ORGANIZATION CHART

Director, Atmospheric Processes Research Branch

- \* Chief, Experimental Studies Division
    - Field Experiment Support Scientist PC-2
      - Technicians
    - Field Experiment Support Scientist PC-1
    - Satellite Data Scientist PC-2
    - Space Shuttle Scientist PC-2
    - Research Scientists (RES-3)
      - Project Physical Scientist PC-2
      - Radiometer Systems Technology (EG) \*
- Bench-mark position

BENCH-MARK POSITION DESCRIPTION

Bench-mark Position Number: 10

Level: 3

Descriptive Title: Scientific Evaluator, Medical Devices

Reporting to the Head, Pre-market Review Section:

Evaluates the physics data contained in medical device submissions subject to pre-market review, such as devices implanted for intimate contact with living tissue for long periods of time, to determine the acceptability of the device in meeting standards of safety and efficacy. Adapts the scientific approach and methodology in the evaluation process and conducts a scientific appraisal of the physics data to validate the claims of the manufacturer.

Evaluates the design theory, principles and modes of operation, physical performance parameters, safety factors, potential for failure and fragility and sensitivity to interferences by external effects and forces to arrive at sound scientific conclusions concerning the performance, safety and efficacy of the device.

Reviews all labeling requirements and manufacturer's claims to ensure compliance with the Medical Devices Regulations. Determines whether the proposed manufacturing and quality control standards for the medical device are acceptable to ensure the safety of operation and stability in the clinical performance of the device.

Plans, collaborates in, and conducts test systems to assess critical characteristics, analyses physical data, and carries out theoretical calculations to determine compliance with performance standards.

Prepares a detailed report summarizing the findings and judgments reached, identifies problem areas and deficiencies, informs the manufacturer of requirements and areas for further device or data development, formulates a comprehensive recommendation concerning acceptance or rejection of the submission and provides a scientific rationale for the conclusion.

Conducts a continual study and review of medical device design theory, manufacturing processes and modes of use affecting device safety, and provides advice on the identification of potential hazards and deficiencies associated with new or existing medical devices.

Develops and recommends guidelines and criteria of acceptance for new medical devices subject to pre-market review.

Assists in the development of research proposals in problem areas relating to test procedures, medical device standards and other physics problems identified during the evaluation of medical device submissions to ensure that timely and relevant research is carried out within the Branch, and that Canadian standards for medical devices are developed when required.

Specifications

Degree

Kind of Assignments

3

- A. Degree 3 - Objectives are defined by the Section Head in terms of assignments involving the scientific appraisal of the physics data of several evaluation submissions for medical devices subject to pre-market review.
- B. Degree 3 - The work involves the comprehensive evaluation and assessment of the physics data in medical device submissions to determine the acceptability of the device in meeting standards of safety and efficacy.
- C. Degree 3 - The work involves the evaluation and assessment of physical, biomechanical, engineering and electronic data, the review of manufacturing processes, clinical performance, potential for failure and sensitivity to interferences, a critical review of proposed standards and test procedures, and the provision of advice.
- D. Degree 3 - Adapts scientific approaches and methodologies, and plans, organizes and conducts a broad diversity of studies and evaluations of the physics data and submissions pertaining to the medical devices subject to pre-market review, their design theory, principles and mode of operation, performance safety, manufacturing process, and the identification of potential hazards and deficiencies of new or existing medical devices.

Complexity of Work

4

- A. Degree 4 - The work requires obtaining information from a critical review of submitted data, and requesting the development and submission of specific additional data for new medical devices for which there is often no information available in the scientific literature and no published standards. The only information available is that supplied by the device manufacturer in the submission and requires interpretation and selection to use.
- B. Degree 3 - The information and data supplied by medical device manufacturers can normally be validated by a critical review of the physics data, laboratory based investigations and detailed literature referencing.
- C. Degree 4 - The information and data contained in submissions relating to new medical devices and novel theories and modes of operation may include complicated and conflicting technical data and ambiguous information on physical characteristics, biocompatibility of materials and clinical performance. Judgments as to the acceptability of the data must be made.
- D. Degree 4 - Relationships between the physics data submitted, clinical performance, potential for failure and sensitivity to interference are complicated and require critical evaluation and review to resolve conflicts and interpretation problems.
- E. Degree 3 - The work is frequently affected by the activities of other scientists and evaluators providing or requesting additional information on the physics aspects of the submissions.
- F. Degree 3 - Contacts are with scientists and officials of the medical device industry and other agencies to exchange information, resolve differences or problems and provide advice.
- G. Degree 3 - The work requires adapting the scientific approach and methodologies in the evaluation process to suit the unique requirements, and each submission.
- H. Degree 4 - The work requires the application of a thorough knowledge of the principles, theories and practices of physics involving physical chemistry, engineering physics, bioengineering and electronics and a good knowledge of medical device manufacturing technologies.

	Degree
Professional Responsibility	3
<p>A. Degree 3 - Approaches to conducting scientific evaluations and final recommendations and conclusions are reviewed for soundness of judgment.</p> <p>B. Degree 3 - Professional guidance is received from the Section Head on the interpretation of ambiguous physics data or on the resolution of difficult problems.</p> <p>C. Degree 3 - The work requires identifying problems with medical device design, performance or manufacture, incomplete, missing or biased data, and conclusions, and adapting scientific approaches and methodologies for the evaluation of medical device submissions and the resolution of difficult problems.</p> <p>D. Degree 3 - The results and findings of other scientists in the area of medical device physics are reviewed for appropriateness in assessing medical device submissions.</p> <p>E. Degree 3 - Physics data, results and conclusions are interpreted to determine the validity and acceptability of data contained in medical device submissions.</p> <p>F. Degree 3 - Advice is given to other scientists on the interpretation of physical data and to officials in the medical device industry on the acceptability of proposed device standards.</p>	
Management Responsibility	1
<p>A. Degree 1 - As applicable, work is assigned to non-subordinate support staff.</p> <p>B. Degree 1 - Plans the use of equipment and supplies for own work.</p> <p>C. Degree 1 - Limited to the spending of own time and to the use of equipment and supplies for own work.</p> <p>D. Degree 1 - Outside assistance, when required, is requested from the Section Head.</p> <p>E. Degree 1 - Complies with administrative procedures, directives and guidelines established for the work.</p> <p>F. Degree 3 - Coordinates the collection of additional physics information from medical device manufacturers, and investigations and scientific appraisals with other scientists.</p> <p>G. Degree 1 - Follows administrative and safety procedures established for the work.</p>	
Impact of Recommendations and Activities	3
<p>A. Degree 3 - Results and decisions of scientific appraisals are used in the administration of the Food and Drugs Act and Regulations in general, and in the clearance of individual medical device submissions, as well as in the development of Canadian standards for medical devices.</p> <p>B. Degree 3 -</p> <p>(i) Degree 3 - Recommendations, advice and results of the work affect the regulatory approval and control of medical devices and may lead to economic or technological effects on the medical device industry.</p> <p>(ii) No significant impact.</p> <p>(iii) Degree 3 - Recommendations, advice, and results of the work affect the approval of medical devices in Canada and contribute to the establishment of standards which ensure the continued safety and efficacy of each device sold in Canada.</p> <p>(iv) No other significant impacts.</p> <p>C. Degree 3 - The evaluation of the submitted physics data and the development of research proposals provide knowledge and improved understanding of the physics of medical devices.</p>	

Linear Organization Chart

Chief, Pre-market Division

Head, Pre-market Review Section

\* - Scientific Evaluators, Medical Devices (3) PC-3 -

Scientific Evaluators, Medical Devices (4) (BI)

- Scientific Reviewers (2) (BI)

\* Bench-mark position

BENCH-MARK POSITION DESCRIPTION

Bench-mark Position Number: 11

Level: 3

Descriptive Title: Standards Development Officer, Medical Devices

Reporting to the Head, Standards and Testing Section:

Organizes and carries out projects to develop and establish new national and international safety, performance and labeling standards, either as mandatory requirements under the Food and Drugs Act, or as voluntary standards in cooperation with extra-governmental standards-writing organizations.

Assesses and interprets scientific information and data and resolves conflicting information concerning the safety and effectiveness of medical devices, such as anesthesia equipment, cardiac life support systems, infusion pumps, computer assisted monitoring equipment and prosthetic devices to assemble an accurate data base for standards development.

Establishes acceptable safety, physical performance and disclosure criteria for classes of medical devices, in consultation with other scientists, health profession user groups, manufacturers, professional associations, domestic, foreign and international standards-writing organizations in government and industry.

Organizes and coordinates work with outside advisory committees to provide advice to the Branch on the content of medical device standards, and represents the Branch as a scientific expert on independent standards development committees of organizations such as the Canadian Standards Association and International Organization for Standardization developing voluntary standards for use by the industry and for adoption by the Branch.

Drafts detailed and comprehensive standards for medical devices, and ensures the scientific and technical adequacy of the draft regulations through all stages of review, revision and approval. Develops test procedures and specifications and provides advice on their use for the monitoring and regulatory compliance programs in the Branch.

Designs and conducts theoretical studies and laboratory based physics experiments to evaluate risks and benefits of medical device classes, such as electro-surgery units, anesthetic gas-handling machines, infant incubators and micro-controlled infusion pumps to provide information for setting priorities, and to recommend appropriate solutions to identified problems. Develops theoretical models of the physical processes involved in device operation, malfunction and failure and tests the models through calculations, laboratory experiments or computer simulations to predict the behavior of devices under clinical conditions, misuse, or failure. Conducts studies and surveys to assess the scientific and economic feasibility of establishing standards for high-priority medical devices.

Conducts a continual study and review of medical device design theory, manufacturing processes and modes of use affecting device safety, and provides advice, based on a recognized expertise on the physics aspects of safety performance, effectiveness and reliability of complex medical devices to medical practitioners, standards-writing organizations, and scientists and officials in the medical device manufacturing industry, health care system and government agencies.

*Specifications*

*Kind of Assignments*

3

- A. Degree 3- Objectives are defined by the Section Head in terms of assignments involving the development of technical standards, the scientific appraisal of the physics data, and the conduct of laboratory based physics experiments to evaluate risks for several classes of medical devices.
- B. Degree 3- The work involves comprehensive studies to evaluate medical device risks and assess the requirement for standards, and the conduct of cooperative projects to develop technical standards.
- C. Degree 3- The work involves the evaluation and assessment of physical, biomechanical, engineering and electronic data, the conduct of theoretical and laboratory based studies, the identification of requirements and the development of technical standards, and the provision of advice.
- D. Degree 3- Plans, organizes, coordinates and performs a broad diversity of scientific evaluations and laboratory based studies to identify and evaluate medical device performance, health risks, establish safety and physical performance and disclosure criteria for classes of medical devices, and plans and conducts comprehensive projects to develop technical standards for classes of medical devices.

Complexity of Work

4

- A. Degree 3- The work requires obtaining information and data from a critical review of scientific data obtained from the manufacturer or in the scientific literature, or from the conduct of theoretical studies and laboratory based physics experiments.
- B. Degree 3 - The information and data supplied by medical device manufacturers can normally be validated by a critical review of the physics data, laboratory based investigations and detailed literature referencing.
- C. Degree 4 - The information and data used in the development of technical standards for medical devices may include complicated and conflicting technical data and ambiguous information on physical characteristics, biocompatibility of materials and clinical performance. Judgments as to the acceptability of the data must be made.
- D. Degree 4 - Relationships between the physics data submitted, clinical performance, potential for failure and sensitivity to interference are complicated and require critical evaluation and review to resolve conflicts and interpretation problems.
- E. Degree 3- The work is frequently affected by the activities of other scientists, health professionals, and international standards organizations providing information on the performance characteristics and health and safety risks of medical devices.
- F. Degree 3 - Contacts are with scientists and officials of the medical device industry, other government departments and agencies, such as Atomic Energy Control Board, Transport, Labor, Justice, Communications and National Research Council, national and international standards organizations, and with health professionals to exchange information, resolve differences or problems and provide advice.
- G. Degree 4- The work requires the design of theoretical studies and laboratory based physics experiments, and the development of theoretical models and test procedures for the identification and measurement of medical device hazards.
- H. Degree 4 - The work requires the application of a thorough knowledge of the principles, theories and practices of physics involving physical chemistry, bio-physics, engineering physics, bioengineering and electronics and a good knowledge of medical device manufacturing technologies.

## Degree

## Professional Responsibility

3

- A. Degree 3 - Approaches to identifying specific risks and requirements for standards development, and final recommendation and conclusions concerning medical device standards are reviewed for soundness of judgment.
- B. Degree 3 - Professional guidance is received from the Section Head on the interpretation of ambiguous physics data or on the resolution of difficult problems such as involving conflicting scientific information and relating to safety and effectiveness of sophisticated and complex devices, scientific and economic feasibility of establishing standards for particular high priority medical devices or to solve special problems concerning medical devices, compliance, violation, protocols and regulations.
- C. Degree 3 - The work requires identifying problems with medical device design, performance or manufacture, determining approaches for resolution including the development of standards, and organizing projects for the development of specific medical device technical standards.
- D. Degree 3 - The results and findings of other scientists, health professionals, and standards-writing organizations in the area of medical device physics are reviewed for appropriateness in assessing medical device hazards and technical standards.
- E. Degree 3 - Physics data, results and conclusions are interpreted to determine the validity and acceptability of data for use in the development of technical standards for medical devices.
- F. Degree 4- Advice based on a recognized expertise on the physics aspects of safety performance, effectiveness and reliability of complex medical devices is given to medical practitioners, standards-writing organizations, and scientists and officials in the medical device manufacturing industry, health care system and government agencies.

## Management Responsibility

1

- A. Degree 1 - As applicable, work is assigned to non-subordinate support staff.
- B. Degree 1 - Plans the use of equipment and supplies for own work.
- C. Degree 1 - Limited to the spending of own time and to the use of equipment and supplies for own work.
- D. Degree 3 - Organizes expert advisory committees to provide advice to the Branch on the content of medical device standards.
- E. Degree 1 - Complies with administrative procedures, directives and guidelines established for the work.
- F. Degree 3 - Coordinates the collection of additional physics information from medical device manufacturers, health profession users, international standards-writing organizations and outside advisory groups.
- G. Degree 1 - Follows administrative and safety procedures established for the work.

## Impact of Recommendations and Activities

3

- A. Degree 3 - Results and decisions of scientific assessments and projects are used in the identification of medical device hazards, the development of regulatory standards, and in the ongoing monitoring and regulatory compliance control of medical devices under the Food and Drugs Act.
- B. Degree 3 -
  - (i) Degree 3 - Recommendations, advice and results of the work affect the development of technical standards and the regulatory control of medical devices and may lead to economic or technological effects on the medical device industry.

- (ii) No significant impact.
  - (iii) Degree 3 - Recommendations, advice, and results of the work result in the establishment of standards which ensure the continued safety and efficacy of medical devices sold in Canada.
  - (iv) No other significant impacts.
- C. Degree 3 - The evaluation and assessment of the physics data associated with safety risks, and the development of performance and safety standards provide knowledge and improved understanding of the physics of medical devices.

Linear Organization Chart

Chief, Research and Standards Division

Head, Standards and Testing Section

- \* - Standards Development Officer, Med. Devices PC-3 (2)
- Test Methods Development Engineer (EN)
- Standards Development Officer, Med. Devices (BI)
- Standards Development Officer, Med. Devices (EN)

\* Bench-mark position

BENCH-MARK POSITION DESCRIPTION

Bench-mark Position Number: 12

Level: 3

Descriptive Title: Senior Isotopic Analyst, Mass Spectrometry

Reporting to the Head, Geochronology Section:

Plans, organizes, conducts and controls the isotopic measurement of elemental abundances of uranium, lead, rubidium, strontium, samarium, neodymium, etc. in geological samples for determining U-Pb, Rb-Sr, Sm-Nd, etc., and the geological ages and other related information for the Geochronology Section, a National Center providing age determinations to the various Divisions of the Geological Survey of Canada, provincial geological surveys, academics and other organizations.

Supervises the work of subordinate staff and the operation of state-of-the-art solid source mass spectrometers for the measurement of isotopic and elemental abundances in geological samples and the reduction of the mass spectrometric data to provide isotopic and elemental abundance of U-Pb, etc. Maintains quality control over the analytical results, defines and measures instrumental biases and provides compensatory corrections to results. Derives algorithms describing the properties of ion collectors and electrometers and adapts for precise correction of isotope ratios.

Determines geological ages of rocks and minerals, discussing age determination projects with field geologists, and using appropriate methods. Measures the isotopic composition of common lead, interprets results, develops and use mathematical models of common lead evolution and prepares reports, programming and using computer for calculations and graphics.

Interprets and discusses the results with other scientists and provides advises on problems and reliability concerning the isotopic data and their interpretation or to assist in the feasibility assessment and design of new exploration projects, and discusses matters of scientific concerns with other scientists from Canadian and foreign institutions.

Develops new methods of analysis, such as methods to reduce duration of analysis, develops, designs and implements new sample handling and measuring equipment to enhance the sensitivity of mass spectrographs to meet the requirements of level isotopic analysis, generating new developments and techniques contributing to advances in the physics of mass spectrometry and spectrometric analysis to optimize results, enhance accuracy or solve problems.

Works in conjunction with the analytical chemist to optimize the methods of chemical purification of material for mass spectrometric analysis, to specify and calibrate the concentration of separated isotopic and standard materials or to deal with problems concerning analytical preparation of unusual samples or other chemistry related problems affecting mass spectrometer operation and data.

Schedules and coordinates sample analyses and use of the equipment; diagnoses equipment malfunctions and ensure and arranges for required maintenance; assesses obsolescence in instrumentation; advises superior regarding modifications to equipment and devises and/or implements the modifications; supervises, when applicable, the installation of new spectrometric instrumentation and tests specifications; arranges for disposal of obsolescent equipment; and, orders uranium and other isotopic "spikes" and organizes with AECL disposal of obsolete radioactive material.

Ensures up-keep of required records and files of analytical results, indexes and statistics of sample analyzed. Compiles and scientifically edits an annual publication of the Geological Survey of Canada showing results of geochronology projects; prepares papers on developments and issues in mass spectrometry, and writes other related material for communication and record purposes.

Specifications

Kinds of Assignments

3

- A. Degree 3 - Objectives are defined by the Section Head in terms of the requirements for mass spectrometry analysis and geological age determinations required by geological survey crews for the Geological Survey and Mapping Programs of Canada, the Federal-Provincial Mineral Development Program, provincial geological surveys and universities concerned.
- B. Degree 3 - Work involves comprehensive analytical and assessment studies for the isotopic measurement of elemental abundances of various metals in geological samples and complex estimations of geological ages and other information. Accurate age dating underpins Canada's geological mapping program.
- C. Degree 3 - The work requires investigation into a series of isotopic ratios done by mass spectrometry on a range of complex geological matrices using: diverse methods for determining U-Pb, Rb-Sr, Sm-Nd, etc. and the geological ages of rocks and minerals; state-of-the-art solid mass spectrometric equipment, instruments and techniques for the isotopic measurement of the elemental abundances; mathematical modeling methods to develop models of common lead evolution; and, various scientific techniques for designing modifications to equipment and solving technical problems. Work also requires the supervision of staff and the provision of advice.
- D. Degree 3 - Plans and organizes the activities of the unit to provide required and timely laboratory services, plans and assigns tasks and schedules equipment use for the ongoing work and other use demands. Conducts analytical work and assessment studies, deals with technical problems, and modifies equipment and develops new techniques to meet objectives and quality or enhance precision of results.

Complexity of Work

3

- A. Degree 3 - Information and data in terms of the generation of new developments, modifications to equipment, new modes of analysis or the resolution of technical problems, are obtained through experimentations, tests, investigations, scientific literature references and inquiries or consultations with other scientists and specialists in various departments and outside institutions. Geological data and information for the isotopic measurement of elemental abundances are obtained from mass spectrometric analysis of samples, data reduction, interpretation and previous analysis, and may require developing new methods.
- B. Degree 3 - Information and data can normally be validated by a combination of analysis, tests and experimentations using alternative procedures, internal standards and cross-referencing with other known rock ages or work of other mass spectrometry specialists or scientists in related fields.
- C. Degree 3 - Information and data such as on the levels of various isotopic abundances vary and are very low, difficult to detect and measure and require interpretation which is complicated by the poor understanding of the geological matrix. Reduction of data requires defining and measuring instrumental biases, compensatory corrections to results and estimation of accuracy and precision degrees.
- D. Degree 3 - Relating data to age of rocks can be difficult as the physical, chemical and geological data can be conflicting and require careful interpretation. Experimental data derived from changes and development of modifications involve variables and relationships which can be conflicting and necessitate further investigation.
- E. Degree 3 - The work is frequently affected by the activities and requirements of geological survey and mapping program geologists, provincial geological survey groups, academics and others from organizations engaged in mining exploration and development work.

### 12.3

Degree

- F. Degree 2 - Contacts are with field geologists, other specialists or scientists for obtaining information, discussing problems or to provide and interpret analytical results and provide advice.
- G. Degree 4 - Work requires generating new developments in mass spectrometric analysis and techniques for optimizing results and enhancing accuracy or devising modifications to equipment to enhance precision and capability or to solve instrumental or technical problems. There is a requirement to use novel approaches and precedents often do not exist as work and equipment are at a state-of-the-art level.
- H. Degree 3 - The work requires the application of a thorough knowledge of the principles and theories of the physics of mass spectrometry and the practices of solid source mass spectrometry for the isotopic measurement of elemental abundances in geological samples and the determination of geological ages of rocks and minerals, and familiarity with the practices of geo-chemistry and geological surveys and with the use of computer application software.

#### Professional Responsibility

3

- A. Degree 3 - Work results and conclusions are reviewed by the Head for soundness of judgment and by other geologists to ensure work results contribute to project objectives and that conclusions about the age of rocks are compatible with other evidence.
- B. Degree 3 - While no direct guidance is received for method selection, development, mass spec. problem solving and contribution to advances in the physics of mass spectrometry, guidance is obtained for difficult interferences and other problems from other specialists in the field and from geologists and chemists as applicable.
- C. Degree 3 - Work requires defining objectives for equipment adaptations or modifications and generation of new developments in mass spectrometric analysis, defining rock dating required, resolving instrumental problems, determining the approach for dealing with difficult technical problems associated with particular rock matrices and the development of methods and techniques to optimize results.
- D. Degree 3 - The work of subordinate staff is reviewed for correctness of methods applied, accuracy and precision of results and compliance with quality control and safety standards. Work of other scientists is reviewed for applicability.
- E. Degree 3 - Complex mass spectrometry work data, measurements, compensatory corrections and accuracy estimate results of subordinate staff are interpreted to provide essential age dating. Scientific literature and information data concerning new developments in mass spectrometry, and results from exploration geologists and scientists in other organizations are evaluated for their impact on the work.
- F. Degree 3 - Specific technical advice is given to Section Head concerning equipment modifications and obsolescence and to colleagues, research scientists and senior staff on problems and reliability of isotopic data and interpretation, the age data obtained, its precision and relevance to the project. Advice is also given to chemists, geologists and mass spectrometrists on sampling, sample handling and preparation.

#### Management Responsibilities

3

- A. Degree 2 - Supervises the work of a technologist engaged in mass spectrometry work.
- B. Degree 3 - Controls the use and maintenance of the mass spectrometers and attendant equipment allocated for the work, and sets operational guidelines for their use.
- C. Degree 3 - Recommends the acquisition of new mass spectrometry equipment and instrumentation and writes required specifications for the equipment and its up-keep.

- D. Degree 2 - Recommends on the need and arranges for required equipment servicing and repairs. Other assistance, when required, is requested from the Section Head.
- E. Degree 3 - Implements precision and safety standards for required quality of results, safe operation of the equipment and disposal of radioactive material.
- F. Degree 3 - Coordinates mass spectrometry survey work schedule with others in the Section and the requirements of various geological survey groups, other geologists with Mineral Development Program and others from outside to ensure results are timed for required efficiency and that work by others using the equipment does not interfere with internal schedule.
- G. Degree 2 - Implements laboratory, safety and administrative procedures established for the work.

## Impact of Recommendations

3

- A. Degree 3 - Results of the work i.e., accurate geological age dating underpins the entire geological mapping program and affects the government field exploration program, geological survey and mineral development work.
- B. Degree 3 -
- (i) Degree 2 - Results of the work can have an economic or technological effect on mining explorations and industrial mineral development process.
  - (ii) Degree 3 - Results of the work have an effect on the knowledge and status of the geology of Canada and hence impact the potential uses and status of the mineral resources. Advice influences the course of exploration and affects the feasibility assessment of mineral developments and the future of Canadian mining resources.
  - (iii) No significant impact.
  - (iv) No other significant impact.
- C. Degree 3 - Development of new techniques for mass-spectrometric analysis and advances in the physics of mass spectrometry contribute to the knowledge of that discipline, while interpretation of complex data provide new knowledge and improved understanding of the age of rocks and thus the geology of Canada.

LINEAR ORGANIZATION CHART

Director, Precambrian Geology Division

Head, Geochronology Section

- Research Scientists

- Electronic Technologist (EL)

- Argon Extraction Technician (EG)

\* - Research Scientist

- Senior Isotopic Analyst Mass Spectrometry PC-3

- Isotope Technologist (EG)

- Isotope Analyst PC-1

- Isotope Chemist (CH-3)

- Assistant Geochronologist PC-1

- Chemical Technologists (EG)

- Chemical Technologists (EG)

- Chemical Technician (EG)

\* Bench-mark Position.

BENCH-MARK POSITION DESCRIPTION

Bench-mark Position Number: 13

Level: 3

Descriptive Title: Physical Oceanographer

Reporting to the Head, Ocean Circulation Division:

Organizes and carries out physical oceanographic studies to determine the motion and mixing processes of the sea. Plans and determines likely approaches to be used for collecting data such as temperature, density, currents and salinity, and directs support staff in the use of this data to produce current fields, charts and atlases. Develops hypothesis of physical oceanographic processes, using the data collected and evaluated and integrating this with work from other disciplines.

Acts as chief scientist and program organizer during voyages to gather oceanographic data. Coordinates the work of scientific staff in cooperation with the ship's captain. Allocates resources like cruise time and equipment to the individual scientists. Modifies plans to meet weather, navigational and time limitations. Advises other scientists so that the crew's time is used to the best advantage.

Evaluates new techniques and equipment such as satellite-tracked drifting buoys used in physical oceanography. Advises on the design of new equipment. Identifies, evaluates and recommends the acquisition and deployment of new equipment, and analyses the data collected for reporting to the scientific community.

Provides advice to senior laboratory staff, the scientific community and others on the data, equipment, results and theories used in physical oceanography.

Degree

Specifications

Kinds of Assignments

3

- A. Degree 3 - Objectives are set by the Head, Ocean Circulation Division in terms of departmental project goals for physical oceanography studies or in terms of objectives for a specific cruise, incorporating the projects of other scientists.
- B. Degree 3 - Work involves comprehensive studies to determine the motions and mixing processes of the seas, and acting as chief scientist on oceanographic voyages, planning, conducting and coordinating surveys.
- C. Degree 3 - Activities include using a variety of scientific techniques to measure the physical parameters of the ocean, including the development and evaluation of new techniques and equipment, and coordinating the work of multi disciplined scientific staff.
- D. Degree 4 - Work involves planning, organizing and coordinating the work of many scientists on a variety of interdisciplinary problems within the constraints imposed by an oceanographic cruise, and simultaneously organizing and conducting physical oceanographic studies to achieve departmental goals.

Complexity of Work

3

- A. Degree 3 - Data are normally difficult to obtain and frequently involve field trips under rigorous conditions. Methods are modeled on past practice but often have to be adapted to meet current conditions. New, innovative techniques are used to measure the physical characteristics of the ocean. Data must be interpreted and evaluated carefully to ensure the validity of the work.

- B. Degree 3 - Data is normally validated by comparing the easier-to-obtain monitoring results or by difficult and expensive ground proofing.
- C. Degree 4 - The size and changeability of the ocean make it difficult to interpret the multi-faceted, highly variable and oft-time ambiguous data required for the development of hypothesis for oceanic water movements.
- D. Degree 3 - Relationships amongst oceanic parameters are complex and difficult to define and require field work for proper interpretation.
- E. Degree 3 - Project activity coordination, priorities and scheduling of the work are frequently affected by the activities of others. Major projects normally have to be coordinated with international and national groups. Ocean cruises involve individuals outside the Canadian government, and some from outside Canada.
- F. Degree 3 - Contacts are with scientists from Canadian and foreign universities and research institutes and other government agencies to participate in cooperative projects, resolve scientific and scheduling difficulties, and exchange information that will lead to the resolution of oceanographic questions.
- G. Degree 3 - The work requires developing new procedures and equipment for oceanographic study and modifying the existing techniques to obtain higher quality data.
- H. Degree 3 - The work requires the application of a thorough knowledge of the principals of theories and practices of oceanography and a familiarity with fisheries, environmental and biological research and some knowledge of electronic data gathering equipment and computer data processing systems.

Professional Responsibility

3

- A. Degree 3 - Work is reviewed by the Head for soundness of judgment and to ensure that the objectives of in house projects have been met, and that the oceanographic research has been managed in a judicious and efficient manner.
- B. Degree 3 - Professional guidance is only received for the resolution of difficult technical problems or complex resource allocations.
- C. Degree 3 - The work requires identifying problems, designing approaches and organizing physical oceanographic studies to define the mass movement of water and deal with the coordination of multidisciplinary scientific research during ocean voyages.
- D. Degree 3 - The work of subordinate staff and project team members is reviewed to ensure it meets with the guidelines set for the project. The work of national and international scientists is reviewed to ensure proper coordination with own work.
- E. Degree 3 - Scientific data from oceanographic studies, both inside and outside the organizational unit, are interpreted to develop and modify new hypotheses about the movement of water masses in the ocean and to provide guidance for the development of new projects.
- F. Degree 3 - Represents Canada as a scientific adviser on international committees, provides advice to senior staff and colleagues on physical oceanography.

Management Responsibilities

3

- A. Degree 2 - Work requires the supervision of a support staff comprised of a varying number of technicians.
- B. Degree 3 - Controls the use and maintenance of allocated equipment both within the organizational unit and on board ship during ocean voyages.

Degree

- C. Degree 3 - Evaluates and recommends the acquisition of satellite-tracked drifting buoys and similar new designs of equipment to enhance the division's research data collection capability.
- D. Degree 3 - Determines the precise requirements for contracted research and arranges for the selection of suitable research institutions.
- E. Degree 3 - Ensures the quality of the work by comparing collected data with the results of other work. Ensures that safety procedures are followed, particularly during ocean voyages.
- F. Degree 3 - Coordinates research activities with scientists from other institutions to ensure scientific approaches are current, and coordinates cruise activities.
- G. Degree 3 - Interprets and implements guidelines and directives issued by the Head.

## Impact of Recommendations

3

- A. Degree 3 - Recommendations, advice and results of the work effect the continuing monitoring operation to collect oceanographic data, and influence the development and conduct of physical oceanographic projects as well as those of other scientists involved in related research.
- B. Degree 3 -
  - (i) Degree 2 - Information and results of the work have an economic impact on commercial fishing, and other ocean users.
  - (ii) Degree 3 - Recommendations, advice and results of the work affect the state of knowledge of the oceanographic environment and the resultant management practices, and affect the use of the ocean by shipping, fishing industrial and conservation interests.
  - (iii) No significant impact.
  - (iv) No other significant impact.
- C. Degree 3 - The development of new methods, procedures, and hypotheses which are interpreted and published provide new knowledge and improved understanding of physical oceanography.

LINEAR ORGANIZATION CHART

Director, Physical and Chemical Sciences (Bedford Institute of Oceanography)

- Head, Ocean Circulation Division -
  - Clerical staff
  - \* - Physical Oceanographers (3) PC-3
    - Technicians (up to 6)
  - Head, Software Systems
  - Oceanographic Applications Programmer
  - Senior Oceanographic Development Technicians
  - Senior Oceanographic Field Technicians
  - Senior Oceanographic Data Technicians
  - Assistant Oceanographic Data Technicians
- \* Bench-mark position.

BENCH MARK POSITION DESCRIPTION

Bench-mark Position Number: 14

Level: 3

Descriptive Title: Explosives Scientist, Explosive Authorization and Hazards Analysis Section

Reporting to the Manager, Canadian Explosives Research Laboratory:

Tests and evaluates the hazards and suitability of explosives for properties such as explosive force, projective impact and mechanical sensitivity, to be authorized under the Canada Explosives Act. Provides technical advice to the Chief Inspector of Explosives, various government departments and industry on the suitability and nature of explosives and the construction standards for transportation of explosives.

Supervises the activities of the Section, determining methods and extent of testing of explosives submitted for authorization, discussing and establishing priorities, scheduling and assigning work, ensuring observance of safety precautions and providing instructions and guidance to staff, checking correctness of techniques and procedures applied and accuracy of results. Reports on work progress for the Section and on staff performance, and makes recommendations.

Carries out laboratory analytical investigations in cases such as where unusual behavior patterns in explosives has been revealed by the testing and reports unusual reactions uncovered during investigations for inclusion in the recommendation for authorization.

Prepares reports on test and evaluation results and formulates recommendations to the manager on the suitability of explosives to be authorized by the Laboratory.

Provides scientific support or authoritative advice to investigators from the Explosives Branch, Transport Canada, Police Forces, and from industry and to prosecuting attorneys or Counsels in the determination of the causes of accidental explosions, studying and discussing investigator's report, determining extent of Section involvement in consultation with the manager and the testing techniques to be used, conducting required study and testing work, verifying laboratory results through field testing, underground trials, explosion simulation and performance tests on explosives using various machines, instruments and material for determining likely causes of explosion, gathering evidence for testimony before a court of law and for presenting professional opinion, advice and recommendations to prevent re-occurrence.

Discusses new developments in explosives technology with officials and scientists from industry and governments and other scientists within the department and identifies, investigates and recommends suitable projects to manager for developing new or enhancing existing techniques and procedures to evaluate or elucidate hazards associated with explosives such as posed by propellants, fire works, etc.

Conducts studies and develops standards for explosives such as fireworks standards for the Explosives Branch and other organizations; conducts and assigns to staff required technique and procedures development work, devising and discussing modifications to existing laboratory equipment or specifies new equipment requirements to assist in testing and for reviewing results; and, prepares reports and recommendations for adoption or for information to concerned groups in own department, laboratories of other governments and the explosives industry.

Determine, in consultation with the manager, if request for technical advice concerning particular explosives, industrial materials or construction standards for transportation of explosives falls within the mandate of the Explosives Authorization and Hazards Analysis Section, the regulation or provisions of the Canada Explosive Act.

Provides consulting services to other government departments, outside agencies, industry and universities on the nature of explosives material through investigations or analysis, and supplies information on the analytical techniques used or developed by the Section.

Writes special reports on tests, findings and quality of results, problems, techniques and procedures used or developed for the technical investigations and evaluations carried out in the Section for management information or for information to other departments or outside agencies or groups such as the UN Group of Expert on Explosives, industry and universities for standardization or advice.

#### Degree

#### Specifications

#### Kinds of Assignments

3

- A. Degree 3 - Objectives are defined by the manager, in terms of the scientific testing and evaluation of the hazards and properties of explosives to determine their suitability for authorization under the Canada Explosives Act, and in terms of study and standards development goal or extent and type of scientific investigation support or advice to be provided.
- B. Degree 3 - The work involves comprehensive testing and evaluation to determine the suitability of explosives for authorization and to provide scientific support in the gathering of evidence for determining causes of explosives accidents, and presenting professional opinion, advice and recommendation to prevent re-occurrence.
- C. Degree 2 - The activities consist of a variety of tasks such as analyzing and investigating explosives and explosives accidents, developing new techniques, providing advice and expert testimony, and supervising the support staff.
- D. Degree 3 - The work requires planning, conducting and assigning work to test and evaluate the characteristics of explosives and similar hazardous materials to determine their suitability as explosives under the Canada Explosives Act, and ensuring that set objectives are met.

#### Complexity of Work

3

- A. Degree 3 - The work requires obtaining the characteristics of explosives by a variety of testing techniques or explosion simulation, often involving method adaptation which may require extensive and difficult interpretation, especially in legal dispute cases. Sources may be identified from past practice or involve difficulties when supplied data are incomplete to support evaluated performance of explosives.
- B. Degree 3 - Information and data can normally be validated by investigation and literature referencing or through the eventual unique simulation of an accidental explosion. Supplied data are frequently incomplete and there are conflicts with the performance of explosives submitted and supporting data provided.
- C. Degree 3 - Information and data pertaining to properties and hazards of explosives are characterized by several parameters or variables that require careful interpretation of any ambiguities, especially when legal action and different sets of data are involved.
- D. Degree 3 - Investigating the relationships and the divergent characteristics associated with explosives and an explosion, especially an accidental explosion, requires investigation and careful interpretation of the data before presenting a professional opinion.
- E. Degree 3 - The work is frequently affected by the activities of inspectors, scientists and officials from own and other government departments and private industry involved in explosives, and investigators from Transport Canada and police departments.

- F. Degree 3 - Contacts are with scientists and officials from other government departments, industry, and police departments to exchange information, provide advice and resolve problems associated with evaluation results, the applicable standards and the routine use or incidents involving explosives.
- G. Degree 3 - Work requires developing new techniques for evaluating hazards associated with explosives, adapting procedures for the investigation of planned events from existing methods.
- H. Degree 3 - The work requires the application of a thorough knowledge of the physical and chemical properties, manufacture and use of explosives, and of the principles, theories and practices of physics as it relates to testing and use of explosives, and familiarity with the standards and the law as it applies to explosives use.

## Professional Responsibility

3

- A. Degree 3 - Work approaches, test and evaluation results, recommendations and conclusions and progress reports on the work of the section are reviewed by the Manager for soundness of judgment and in terms of the attainment of the section's objectives and the provisions of Canada Explosives Act.
- B. Degree 3 - The work requires the resolution of technical problems associated with the testing and hazard evaluation of explosives, with minimal guidance. Scientific or professional guidance is available from Manager and other scientists in the resolution of difficult testing method development, explosion simulation, or to determine extent of laboratory involvement in investigation of accidental explosions.
- C. Degree 3 - The work requires determining methods and extent of testing for the evaluation of explosives and for the investigation of accidental explosions, identifying problems and determining approaches for their resolution.
- D. Degree 3 - The work of support staff is reviewed and checked for accuracy. Results and findings of other explosives scientists from industry and government are reviewed for applicability and suitable projects to be recommended to the Manager, such as to elucidate the hazards posed by explosives, propellants and fireworks.
- E. Degree 3 - Complex scientific data, results and conclusions of other explosives scientists and subordinate staff are interpreted for implication on the work or the determination of the cause of accidental explosions or assessment of new techniques for evaluating hazards.
- F. Degree 4 - Advice based on a recognized expertise within the specialized subject area of the testing and use of explosives is provided to other scientists, senior staff, attorneys and other officials both inside and outside the government.

## Management Responsibilities

3

- A. Degree 2 - The work requires the supervision of a technical support staff of four technicians.
- B. Degree 3 - The work requires the control, the use and maintenance of physical and chemical testing equipment and the proper use of the facilities of the Canadian Explosives Research Laboratory allocated for the work.
- C. Degree 3 - Evaluates requirements, prepares specifications and evaluation criteria for, and recommends acquisition of laboratory equipment and facilities to the manager.
- D. Degree 3 - Substantiates the need for, writes statements of work, and identifies suitable sources of scientific assistance for particular research work. Acts as scientific authority.

- E. Degree 3 - Implements quality assurance procedures and develops and implements safety procedures to meet the Laboratory's objectives.
- F. Degree 3 - Coordinates the testing and hazard evaluation of explosives and the investigation scientific support work required with others in federal, provincial agencies (including the police) and industry.
- G. Degree 3 - Interprets and implements special safety directives and procedures developed for the work. Implements straight forward administrative procedures.

Impact of Recommendations

3

- A. Degree 3 - Recommendations, advice and results of the work affect the continuing operation of the Explosives Authorization and Hazards Analysis section and impact on the development and conduct of projects, both inside the government and in industry, and influence the outcome of investigations into accidental explosions.
- B. Degree 3 -
  - (i) Degree 3 - Recommendations, advice and results of the work have economic or technological effects on the producers and users of explosive products.
  - (ii) No significant impact.
  - (iii) Degree 3 - Recommendations, advice and results of the work affect the approval and use of explosives, propellants and fireworks with regard to safety and regulatory control.
  - (iv) Degree 3 - While results contribute to the process of law as it relates to the accidental and deliberate misuse of explosives, the work of the position impacts on occupational safety. Recommendations, advice and results affect the use of explosive in the workplace.
- C. Degree 3 - Development of new methods and procedures and the investigation, analysis and interpretation of information involved in the examination of explosives materials provide new knowledge and improved understanding.

LINEAR ORGANIZATION CHART

Director, Mining Research Laboratory

- Manager, Canadian Explosives Atmospheres Laboratory
- Manager, Canadian Explosives Research Laboratory
  - Explosives Research Section (SE-RES; CH)
  - Explosives Application and Methodology Section (PC; EG; EL)
- \* - Explosives Scientist, Explosives Authorization and Hazards Analysis Section PC-3
  - Technical Support Staff (4) (EC's)
- Clerical Staff
- \* Bench Mark Position

BENCH-MARK POSITION DESCRIPTION

Bench-mark Position Number: 15

Level: 3

Descriptive Title: Senior Physical Scientist and Risk Analyst

Reporting to the Manager, Environmental/Impact Assessment Program

Identifies, investigates and assesses problems related to environmental issues pertaining to the protection of air, land and water and to effects of developments on the conservation and utilization of these resources in the Pacific and Yukon region inherent to geographic siting of industrial installations, routing or siting of linear transportation or trans-shipment facilities, impact of mishaps involving contaminant substances or dangerous goods and to issues leading to conflicts in resource utilization between/among users.

Plans scientific assessments of proposals for industrial and resources development projects and the geographic siting for major installations or facilities, trans-shipment activities or linear transportation routing with potential environmental quality implications for air, land or water resources and the rational utilization of these resources in the region. Solicits task force participation for assessments or studies involving various departments and government levels, other agencies, universities and public interest groups to assess impact of major projects proposals (e.g. Western Liquefied Natural Gas; West Coast Transmission Amonia Proposal.)

Determines approaches, develops proposals and organizes and conducts or leads and coordinates multi-disciplinary scientific investigation and evaluation studies and inter-agencies assessment and survey activities to prevent, mitigate or resolve multi-disciplinary problems related to the protection/prevention/utilization of land, air and water resources.. Develops proposals concerning Department's position in terms of program and policy objectives for the quality, protection, conservation or utilization of those resources in the region, the resolution of related conflicts and the implementation of measures or enhancement of guidelines, policies, strategies or priorities to meet objectives.

Defines siting problems, develops, recommends and applies terms of reference and geographic siting analysis systems, and proposal evaluation protocols or procedures and techniques through involvement of specialists engaged in comprehensive siting and routing studies and transport of dangerous goods. Initiates and conducts studies to identify and propose new areas of endeavors, guidelines and environmental protection and damage mitigation, or to develop, recommend and implement scientific procedures or guidelines for geographic site selection, zoning and planning, enhanced environmental and public safety standards or practices, and air, land and water preservation measures for facilities to be located on Crown's and agencies' lands and waters.

Identifies and researches topics and major study requirements and proposes tasks for assignments to other scientists. Researches, reviews and studies new developments and maintains liaisons with other specialists involved in development and application of risk analysis, mathematical modeling techniques and related computer applications for applicability in such task as the assessment of offshore exploration oil spill probabilities, or to ascertain opportunities for an interdisciplinary modeling approach such as for oil and chemicals spill dispersion modeling or to address conflicts in land, air and water uses.

Develops models or leads and coordinates risk analysis assessment and modeling project activities and application of computer modeling techniques, such as to evaluate alternative transport corridors, assess risk, portray air dispersion process, resolve resources related conflicts, analyze management strategy issues or determine inter-relationships of variables. Researches historical results of pollution control measures in the region, indicators and trends, formulate concepts for trend analysis, and prepare summary publication.

Analyzes and consolidates multi-disciplinary inputs and study results into final report, (e.g. the Ocelot Methanol plant; the Kitimat Oil Terminal) presents findings to senior management and conducts briefing sessions. Prepares and presents briefs to committees and hearing panels, and represents the Department at public hearings, interveners and public interest group meetings. Contributes proposals to task forces or scientific committees concerning regional programs and priorities or for intervention in, and participates at Project Certification Hearings and explains study findings and conclusions. Acts as program representative on regional committees for environmental protection, resource conservation and utilization, marine traffic, trans-shipment activities, linear transportation, contaminants and hazardous substances, and provides authoritative advice on matters relevant to the field of expertise.

Degree

Specifications

Kinds of Assignments

3

- A. Degree 3 - Objectives are specified by the Manager in terms of particular project goals and program requirements. Particular objectives or projects terms of references stem from discussions of study, proposal evaluation and assessment work.
- B. Degree 4 - The work involves comprehensive studies and investigations to identify and define multi-disciplinary problems pertaining to the protection and use of air water and land resources in the region; the prevention or mitigation of environmental damage; detailed evaluations of proposals on geographic siting of installations and environmental risks analysis and assessment for acceptability and certification; investigations into potential conflicts between users; research studies into risks analysis and modeling methods and applications; the presentation of proposals and briefs, and the provision of authoritative advice.
- C. Degree 3 - The work includes the conduct of multi-disciplinary studies, investigation and evaluation projects into the identification and definition of environmental problems pertaining to the quality, preservation and use of air, land and water resources and the mitigation of contaminant damages; the scientific evaluation of geographic siting proposals for major installations; pollution trends and environmental risk analysis and impact assessment, simulation modeling and adaptation of techniques; the allocation and coordination of project activities; the preparation of total study reports; and, the provision of scientific advice.
- D. Degree 3 - Initiates, plans, organizes and performs or assigns tasks and leads multi disciplinary projects or scientific investigational studies into problems definition, proposals evaluation and resources utilization conflicts, and the preservation of air, land and water as a resource or a medium, and into environmental risks analysis, impact assessments and method applications development, to ensure program objectives are met within guidelines and participation constraints of other organizations' staff.

Degree/  
Points

Complexity of Work

- A. Degree 3 - Multi-disciplinary information and data must be obtained on the physical characteristics and the temporal and spatial specifics of geographic sites, installations, substances, process technology or operations, state and particularities of air, land and water resources, their preservation, development and utilization requirements. Information in siting proposals is often incomplete and that from other studies or sources can be remotely relevant or difficult to obtain. Interpretation, comparison, selection and further investigations are required.

4

Degree/  
Points

- B. Degree 3 - Information and data available from various sources are often incomplete and those supplied by the proponent and other interest groups often are incomplete, biased or subjective. Generally the information can be validated or confirmed by a combination of further investigations, comparisons and detailed studies or scientific literature referencing and interpretation.
- C. Degree 3 - Information and data used to evaluate siting/routing proposals for acceptability or used in risk analysis and assessment and in modeling impact of mishaps and mitigative measures or to develop trends in state of resources pollution and effectiveness of measures, are characterized by several variables, temporal and spatial factors, poorly defined variability, ambiguity and require interpretation and consultations.
- D. Degree 4 - Relationships between the multi-disciplinary variables affecting the acceptability of routing/siting proposals or involved in resources utilization conflicts, risk analysis, mishap impact assessment and mitigation of environmental damage, or in identification of indicators and deterioration trends are complicated and require multi-disciplinary investigation to deal with conflicts and interpretation problems.
- E. Degree 4 - The work, inter-agency projects or multi-disciplinary evaluation studies and the preparation of total study report are affected by the nature, extent and objectives of the contribution of other scientists or representatives of own and other organizations, agencies of other levels of government involved, proponent industries and public interest groups and implication on work must be considered.
- F. Degree 4 - Contacts are with scientists of own departments and outside agencies to solicit participation, investigate problems, discuss results and formulate recommendations; with officials and scientists of proponent industries to discuss findings; with the public and interest groups to exchange information; and, with officials of public hearing boards or panels to explain findings and conclusions and provide authoritative advice.
- G. Degree 3 - The work requires developing new application systems and techniques for scientific evaluation of geographic siting proposals, risk analysis and assessment, modeling of environmental impacts, trends projection or modeling of effects of mishaps on the resources and effectiveness of mitigative measures.
- H. Degree 4 - The work requires the application of a thorough knowledge of physical geography including the principles, theories and practices of those fields of physics pertinent to the required application of physics principles to biological, chemical and geological environmental systems, complemented by a knowledge of other work related earth sciences disciplines (e.g. geology, hydrology, physical oceanography, climatology, ecology) and some familiarity with practices of chemistry and biology pertinent to the work, and practices of engineering of large projects (e.g. pipelines, port facilities and chemical plants) is also necessary. A thorough knowledge of the use of risk assessment, computer modeling and statistical analysis applied in the disciplines must also be applied.

## Professional Responsibility

4

- A. Degree 3 - Approach to conducting siting or routing proposal evaluation or investigation of user conflicts, and study conclusions, briefs and recommendations are discussed with other scientists and reviewed by the Manager and Branch Director for thoroughness, soundness of judgment and consistency with program objectives.

- B. Degree 3 - Professional guidance is received on the resolution of particularly difficult problems involving highly sensitive issues, program goals and multi jurisdictions or difficult resources utilization conflicts among major users. Advice can be obtained from specialists in developing indicators and trend analysis concepts, difficult risk analysis, modeling and specialized computer applications.
- C. Degree 3 - The work involves a requirement to define multi-disciplinary project terms of references and to identify and determine approaches to resolve evaluation/assessment and investigation problems, conflicts among resources users, difficulties due to absence or incomplete data and conflicting, subjective or biased information and conclusions to determine acceptability of proposals and to identify potential topics and objectives for new studies and methodologies, develop proposals and evaluation protocols and guidelines for preventing or mitigating environmental impact of mishaps on resources quality and the population.
- D. Degree 4 - Within multi-disciplinary subject area, the results, findings and conclusions of other scientists and task force or team members are reviewed for validity and appropriateness in assessing acceptability of proposals, conformance to program objectives or effectiveness in resolution of resources related conflicts. New developments by other scientists/specialists in the study of geographic site, evaluation of installations sitting proposals, risk analysis and environmental impact determination, prevision, modeling and prevention/mitigation of mishap effects are reviewed and assessed for applicability.
- E. Degree 4 - Results of studies or conclusions and recommendations by scientists of diverse organizations, task force or team members and own study/investigation and analysis results are interpreted to determine their significance, completeness, and their meaning and implications on the acceptability of sitting/routing proposals or alternatives, and on the applicability and effectiveness of proposed measures, guidelines and protocols.
- F. Degree 4 - Advice based on recognized expertise in geographic sitting/routing and assessment of environmental impact and acceptability of proposals, the state, and preservation requirements of, and risks to, air/land/water quality and mitigation of environmental impact of mishaps associated with resources development or utilization, is provided to senior management, officials and scientists of the department, other agencies, industry and members of boards or panels.

## Management Responsibility

2

- A. Degree 1 - As applicable, assigns tasks and provides advice and instructions to project team or task force members and to non-subordinate support staff.
- B. Degree 1 - Usually limited to planning the use of equipment and supplies for own work.
- C. Degree 3 - Specifies terms of reference and recommends and provides expertise on consultant contracts. Recommends the acquisition of computer equipment and specialized application software to meet work objectives and requirements.
- D. Degree 3 - Substantiates the need and arranges for consultant services and contractor work in the field. Defines requirements, solicits and arranges for the participation by other organizations within and outside own department, including of other levels of government and private sector organizations.
- E. Degree 2 - Ensures that contract work meets specified requirements as to quality, quantity and timeliness and other standards pertaining to own responsibilities.

- F. Degree 3 - Coordinates work of project team members and other activities related to multi-disciplinary or multi-jurisdictional assessments and scientific evaluations or studies involving other scientists, professionals or staff members of various organizations. Coordinates own activities with those of others in data gathering, compilation of results and preparation and presentation of total study report.
- G. Degree 1 - Follows office and field administrative and safety procedures established for the work.

## Impact of Recommendations and Activities

3

- A. Degree 3 - Recommendations, advice and results of the work affect resource management practices and the formulations of air, land and water resources protection measures, guidelines and regulation, the orientation and conduct of the program studies in the Region and the formulation of proposals for policy and program objectives and priority.
- B. Degree 3 -
- (i) Degree 3 - Recommendations and advice on geographic siting or routing have economic and technological effects on industrial installations or linear transport system facilities and operations.
  - (ii) Degree 3 - Recommendations and advice affect the state of air, land and water resources.
    - (iii) Degree 3 - Recommendations and advice affect the safety regulatory controls of contaminating processes and practices, the routing of potentially hazardous products or substances and the mitigation effects of mishaps to the public.
  - (iv) No significant impact.
- C. Degree 3 - Information and results of the work contribute greater knowledge of geographic sites, industrial siting and effects on particular environment of industrial processes and trans-shipment routings. Work also contributes new or enhanced knowledge of pollution trends and methodologies and techniques in risk analysis and modeling of impact.

LINEAR ORGANIZATION CHART

- Regional Director, Environmental Protection, Pacific and Yukon
  - Director, Contaminants and Assessment Branch
    - Environment Emergency Coordinator, CEPA Sr. Investigator
    - Manager, Environmental Impact Assessment Program
      - \* - Senior Physical Scientist and Risk Analyst PC-3
- Environmental Assessment Officer PC-2 Coordinator, Federal Referrals & FREMP Project Review Process (EN-ENG-04)
  - Environmental Assessment Registrar (CR-04)
  - Referral Clerk (CR-03)

\* Bench-mark position.

## 16.1

BENCH-MARK POSITION DESCRIPTION

Bench-mark Position Number: 16

Level: 4

Descriptive Title: Senior Officer/Advisor, Physical Oceanography

Reporting to the Assistant Director and Chief, National Programs Division:

Analyses, interprets and assesses the impact of national and international developments and proposals for coastal development and offshore activities (e.g. resources exploration, transportation, power generation and harbor facilities) with respect to physical aspects of the marine environment i.e. waves, currents, subsurface temperature, sea ice movement, etc., and the relationship of these variables to the use of the ocean for a wide range of clients and purposes (e.g. marine transportation, offshore oil and gas exploration and development, fisheries, defense, tourism and recreation) and to develop, recommend or advise on departmental position or policies, strategies and programs pertaining to the management and protection of the marine environment.

Establishes priorities and long-term plans for oceanographic research to provide an understanding of the physical characteristics of the ocean, in terms of circulation, density, heat content and gaseous absorption, etc. such that predictive models can be developed to show the effect of the ocean on heat distribution within the global and regional climate, the movement of CO and other green-house gases by absorption, chemical and biological reactions and their mass transfer by ocean currents; the movement and effects of ice on marine operations; the forecasting of marine environmental conditions and the potential trajectories and dispersion of spills such as oil, through the ocean and to land. Ensures such research will also meet the needs of other engineering and science disciplines such as chemistry and biology, and that the programs are properly integrated. Identifies areas of conflicts concerning policies between departments and service within the Department, and recommends methods for resolution. Evaluates research programs and their effects on national and international initiatives for their impact on the management of the marine environment and recommends changes.

Maintains close liaison with marine operators and senior research scientists, acting as departmental representative on committees concerning energy in the marine environment, ocean services and real-time oceanography, ecology, weather and climate, and hydro-acoustics.

Assesses and reviews other policies and programs that have socioeconomic, transportation, industrial, environmental, safety, foreign affairs and other impacts on the marine environment. Drafts proposals to establish the departmental position on these issues. Ensures that policies of other bodies are compatible with departmental policies. Ensures effective transfer of scientific and technical information between the affected groups. Coordinates and maintains cooperation and liaison between the Service and environmental agencies and industrial groups concerned with the effects of resource exploration, transportation, power generation and the use of port facilities in the marine environment.

Advises senior management on the scientific aspects of marine policies. Proposes programs to provide scientific input and negotiates agreements for interdepartmental issues. Develops work plans and directs working groups to study and deal with specific issues such as pertaining to new demands for scientific information, special policy program strategy studies or follow-up action to national and international commitments. Provides advice and policy papers to the senior department officials.

Assists in drafting legislation and government policy responses and arranges bilateral scientific exchanges. Assesses national and international developments in marine affairs. Formulates amendments proposals to statutes and regulations covering the marine environment in consultation with legal advisors and others in departments or agencies concerned and involving briefing and discussions with political and diplomatic representatives, scientists and other foreign government officials, concerning international implications and national positions.

## Specifications

## Kinds of Assignments

4

- A. Degree 4 - Objectives are set by the Asst. Director/Chief in terms of the research studies, development impact assessments and scientific advice required in support to the achievement of departmental objectives for efficient policies, strategies and programs pertaining to the management and protection of the marine environment.
- B. Degree 4 - The work is specifically related to the development of policy for the marine environment and involves establishing a number of complex research projects which, while principally dealing with the physical attributes of the ocean, also encompass several other scientific and engineering disciplines.
- C. Degree 4 - The work involves establishing priorities and plans and organizing marine research projects, coordinating the work of others in research in the marine and commercial sectors and users of the information generated, obtaining cooperation between groups involved in resources exploration, transportation, power generation and use of port facilities, providing advice and developing policy, evaluating national and international programs and ensuring that the needs of other scientific groups are met.
- D. Degree 4 - High degree of freedom and latitude for planning, organizing and coordinating complex research studies including negotiating with other federal agencies to ensure compatibility with Service and Departmental policies and for coordinating, maintaining liaison and cooperation between groups involved in resource exploration and use of facilities or in arranging required bilateral scientific exchanges.

## Complexity of Work

4

- A. Degree 4 - Data pertaining to marine environment and activities are widely different and are drawn from hard to access sources such as foreign governments, or are generated by intricate investigations in a harsh environment and their use, such as for developing predictive models and policies involves difficult interpretation and selection.
- B. Degree 4 - Information and data are often difficult to validate as they comes from divergent sources that are difficult to access or for which the original data bank is not available or would require expensive and laborious repetitions of research study and investigation work.
- C. Degree 4 - Data represent a complex set of variables, often of unknown precision and sometimes only as estimates, that must be reviewed from a broad global perspective; difficult interpretations are involved and data have to be integrated with data from other disciplines. Careful judgment must be exercised in the use of the data.
- D. Degree 4 - Relationships amongst the variables themselves are complex and must also be related to other sciences, socioeconomic, transportation, environmental and foreign affairs perspectives and require long-term, detailed investigations to identify and resolve conflicts and interpretation problems, and to develop a clear understanding of the role and influence of each parameter on changes in the marine environment.
- E. Degree 4 - Work is affected by the activities of industry, other departments, other Canadian and foreign governments or national and international scientific bodies, and requires consideration and often negotiations, to assess or modify their impact on the work.
- F. Degree 4 - Contacts are interdepartmental to negotiate terms of agreements and develop programs; with scientists to plan and conduct joint investigations; and, with other governmental agencies, scientists and officials of industry to provide advice based on a recognized expertise in the area.

Degree

- G. Degree 4 - The work requires developing new approaches to research designed to provide an understanding of the complex functions and relations of the ocean, an area which is poorly understood. Work also requires using innovative methods to integrate all the various inputs in developing new policy or ensuring the existence of policy and research activities which can contribute to meet the objectives of the Department.
- H. Degree 4 - The work requires the application of a thorough knowledge of physical oceanography and related marine sciences complemented by an understanding of related theories, methods and practices of chemistry, ecology, biology, geology, coastal engineering and of marine and atmospheric pollution, and environment protection. A knowledge of legal and political implications of marine policy is also applied.

## Professional Responsibility

5

- A. Degree 4 - Key recommendations and conclusions are reviewed as they affect policy and the overall attainment of objectives but advice is normally taken as authoritative.
- B. Degree 5 - Guidance is received from the supervisor and other senior management on policy intent and issues which are difficult or involve conflicts. Professional guidance may be obtained from other scientific authorities.
- C. Degree 4 - The work requires developing objectives for the research and ensuring integration with other disciplines; establishing priorities and long-term plans for oceanographic research studies within the department; coordinating work with various other groups; and, indicating likely solutions to resolve unusual and complex problems pertaining to the areas of the work.
- D. Degree 5 - Proposals or results and recommendations from other scientists and statements from national and foreign governments are reviewed to assess their contribution to Canada's federal marine policies, and their acceptability in terms of the strategies to be followed for related scientific projects.
- E. Degree 5 - The results of Canadian and foreign studies and documents are interpreted to determine their broad implications on, and their relationship to Canada's own initiatives, marine policies and long-term oceanographic research plans.
- F. Degree 5 - Authoritative advice and recommendations based on a recognized expertise in physical oceanography, in particular the movement and modeling of waves, tides, ice and various physical parameters, along with a broad understanding of the role of chemistry and biology, are provided to scientists, senior department and other government officials on marine science policy and research and on marine environment management and protection.

## Management Responsibilities

3

- A. Degree 1 - As a senior advisor the work does not usually require supervising staff. May assign or allocate work to project or task force members when applicable.
- B. Degree 1 - Usually limited to planning the use of equipment and supplies for own work.
- C. Degree 3 - Recommends the acquisition of expertise and equipment and the need for specific projects to meet research priorities and objectives and satisfy national and international commitments.
- D. Degree 4 - Selects, approves, negotiates and arranges for suitable external research groups to be funded, or provides advice based on recognized expertise on the requirements and selection through membership on several committees.

Physical Sciences

B. M. P. D. No. 16

16.4

Degree

- E. Degree 3 - Develops and recommends effective science program evaluation methods and performance measurement criteria.
- F. Degree 4 - Coordinates differing related research projects done by various organizations and coordinates the transfer of the outputs to other groups. Coordinates the input of divergent sources, including industrial, university, provincial and federal agencies, and international information into the policy planning process.
- G. Degree 2 - Implements effective procedures for the transfer of scientific and technical information, and other administrative procedures established for the work.

Impact of Recommendations

4

- A. Degree 5 - Results of work, recommendations, advice or consultations influence the conduct of departmental policies and programs, contribute to the marine science policies and the establishment of objectives and affect the implementation and conduct of research studies, projects that have national and international connotations.
- B. Degree 4
  - (i) Recommendations, advice and consultations contributes to policies or controls such as concerning site of industrial concerns or developments and have economic and technological impacts on industries associated with the marine environment. Results of the work, advice and recommendation on ice, wave and current movement can have economic effects on those concerns that rely on accurate forecasts for their operations.
  - (ii) Degree 4 - Recommendations and advice contribute to the development of the marine environmental resources while maintaining the quality of that environment.
  - (iii) No significant impact.
  - (iv) Degree 3 - Recommendations, advice and results of the work have a direct effect on the safety of marine users like fisherman, drilling rig operators and coastal communities.
- C. Degree 4 - Development of new understandings of the marine environment through organized and coordinated research projects, results in an improved knowledge of the role played by the ocean on the environment, the safety, the energy and the source implications.

LINEAR ORGANIZATION CHART

Director, Oceanography and Contaminant Branch  
Scientific Advisor  
Chief, Ocean Tech. Division  
Coord., Satellite and Remote Sensing Project  
Chief, Intergovernmental Ocean Science and Survey Division  
Asst. Director/Chief, National Programs Division  
\* Senior Officer/Advisor, Physical Oceanography PC-4  
Senior Aquatic Science Affairs Officer (B1-4)  
Ocean Science Affairs Officer (PC-3)

## 17.1

BENCH-MARK POSITION DESCRIPTION

Bench-mark Position Number: 17

Level: 4

Descriptive Title: Superintendent, Climate Assessment and  
Impact Section (Applied Climatology Research and Development)

Reporting to the Chief, Applications Analysis and Impact Division:

Acts as authority in climate analysis, assessment and impacts, and as scientific advisor on the developmental applications of the principles and methods of climatology, palae-, topo- and synoptic climatology, and developmental applied and meso-scale meteorology in fields relevant to user programs or activities and within the scope of the Canadian Climate Program and the mandate of the Division.

Defines objectives, determines analytic and investigative studies or projects, approaches, procedures and resources, recommends approval of undertaking or develops, plans and makes arrangements for implementation. Allocates resources, assigns work, adjusts plans and work priorities and ensures that effective scientific support is provided and objectives are met. Plans, directs and controls the activities of the Section engaged in applied climatology development, analysis, investigations and assessment of impact of climate, trends and fluctuations, conducting studies and field observations, investigative and analytical projects for users and providing consultation services, technical leadership and support or direction for applied studies in the regions, satisfying climate data and assessment requirements of scientists, other users in own and other departments/agencies, industrial or other organizations and environmental interests engaged in programs or activities related or sensitive to the climate, and to meet Canada Climate program and Division's objectives and commitment requirements within the Atmospheric Environment Services (AES).

Supervises, administers and ensures effective use of the Section's resources; provides professional guidance; reviews work progress and achievement of objectives; controls the expenditures of funds and utilization of resources made available by client organizations for studies by the section or through contractual undertakings for other departments/agencies such as National Parks; administers and controls work of contractual scientists for acceptability; reviews and reports on performance, identifies staff development needs and participates to the personnel management process.

Discusses developmental applications research with groups concerned, identifies support required, problems and areas requiring studies and the use of in-house and/or outside resources. Determines feasibility of projects, Section's resource capability, resources and support required for studies undertaken outside the Services or within the Regions considering mandate, policy, directives and guidelines. Determines appropriate approach, suitability of referral, collaborative action and in-house or contractual undertaking arrangements to satisfy new or emerging demands for climatological data and climate assessment. Negotiates terms and condition of studies undertaken for client organizations or contracts for outside scientific assistance work, ensuring contractual arrangements, conduct and control of studies and results conform to requirements.

Initiates, recommends to users, assigns resources and directs or provides technical leadership and coordinates and controls consultative investigations and analytical projects in applied climatology and meteorology. Reviews the preparation of studies and assessments in support to activities or programs of the AES, other departments, governments' agencies and user organizations or in support of, and in cooperation with university and other research and industrial teams for resolving climatic problems. Directs the preparation of papers, reports, handbooks, maps and atlases for national and international or restricted distribution.

Participate to Climate Centre planning and policy work and to the review of Division's programs, strategy and objectives. Recommends on modifications and Section contribution. Participates in the work of national and international committees, task forces and panels to resolve climate-related problems, to assess users requirements or for recommending changes in policy, new initiatives and studies. Contributes to the review and formulation of proposals and recommendations 'pertaining to program activity policies, plans, objectives and related matters as representative on departmental and inter-departmental committees. Participates to inter-service and inter-agency planning conferences, and assists in coordinating, supervising or conducting related work, providing advice on applications, strategy and approaches, making recommendations on support and resources requirement and reporting on divisional assignments. Conducts special studies such as to evaluate the representativeness of existing observation networks for establishing requirements and advisability for additional stations. Contributes or prepare position papers related to proposals or submissions for senior management consideration.

Establishes liaisons and develops cooperation between Canada and other countries' scientists engaged in related climate programs, and organizes and implements workshops and conferences to address a variety of climatological themes under the Canadian Climate Program and other mandates.

Develops capability of the Section to deal with emerging requirements, maintains contacts with the users to identify requirements and responses, and with universities, research and industrial teams and specialists to identify and assess applicability of new developments. Reviews scientific and technological advances and papers in areas of interest and discusses merit with other scientists or professionals. Prepares reports for own and other departments/agencies and presents findings at professional meetings.

Reports on Section's activities and on applications, priorities, and support requirements.

Degree

Specifications

Kinds of Assignments

4

- A. Degree 4 - Objectives and Section's operational goals are established with the Division Chief and in consultations with users and are in terms of the scientific support to be provided to the Services and the users, and the required supportive related investigations and consultations within the scope of the Services' program objectives, strategy and Directorate's directives and policy statements.
- B. Degree 4 - The work involves the provision of consultation services and authoritative advice, the direction and supervision of the activities and resources of the Section in the applications of physical climatology, palae-, synoptic and topo-climatology and applied and meso-scale meteorology within such application areas as climate assessment and impacts on the environment, regional planning, land use, ecology, pollution, urbanization, and resources management planning and policy, and other areas of climatological influences on, or of impact of human activities on the atmospheric environment.
- C. Degree 4 - Activities include serving as authority on climate analysis, assessment and impacts; providing expert advice, technical leadership and consultations to various organizations; organizing, controlling, coordinating and supervising the activities and resources of the Section and cooperative studies; negotiating terms and conditions with client organization and administering and controlling allocated resources and contractual scientists; acting as representatives on committees and making recommendations; reviewing work results; developing cooperative programs and approaches; writing scientific papers and organizing conferences and workshops.

## Degree

- D. Degree 4 - The work requires planning, organizing and coordinating the Section's activities, climatological projects, original applications, assessments and cooperative program and studies; planning, negotiating and organizing resources and support to be provided and planning the development of the Section's capability, with commensurate freedom and latitude to meet its goals within allocated resources limitations, achievable cooperation from other organizations, and the conditions, funds and resources negotiated for studies/projects.

## Complexity of Work

4

- A. Degree 3 - The work requires obtaining, by investigation and archival data search, information and data pertaining to a new field comprised of merged disciplines relevant to applied climatology and meteorology. In areas of sparse data, field observations or extrapolations are required. Normally, sources may be identified from past practices or studies.
- B. Degree 4 - Information and data in areas of sparse data are frequently impeded by gaps in knowledge or must be founded on extrapolation and merged discipline data interpretation. Validation calls for extensive and difficult or complex field investigation.
- C. Degree 4 - Information and data and the climatological parameters associated with the merged disciplines and the circumstances of their application are characterized by variability, many variables and present difficulty of interpretation. Sound professional judgment is required in the use of the data due to the particular constants and their variable values used as referant for determining variables as implied in climate assessment and impact analysis or to use extrapolated data in areas of sparse data.
- D. Degree 4 - Relationships amongst the climatic variables and the environmental, eco-systems, human activities, pollution, land use and resources development and management variables are complicate and the relationship complex to establish and not fully understood. In-depth investigative studies and analysis are required to deal with inherent conflicting relationships and interpretation problems.
- E. Degree 4 - Consultative and investigative work and methods are normally affected by other scientist and user activities and demands. Results and proposal papers are affected by user's activities and requirements; negotiations and conduct of multi-jurisdictional program projects are affected by activities of representatives and officials of other organizations. Implications on the work must be considered.
- F. Degree 4 - Contacts are with scientists and professionals of own and other departments and other levels of government, officials of private enterprises and universities to discuss problems, service's programs and cooperative projects and to negotiate funds, resources and terms of agreement for studies undertaken.
- G. Degree 4 - The work pertains to a new field comprised of merged disciplines. Climatological investigation methods and original approaches to observing techniques and equipment are required to resolve climate related problems; custom topoclimatic survey techniques and procedures are developed and original approaches to data reduction/application theory are devised to interpret climate in terms such as pollution, ecology, land use, resources management, and for novel applications and enhanced scientific support. Precedents often do not exist.
- H. Degree 4 - Work requires a thorough knowledge of physical climatology involving palae-, topo- and synoptic climatology, climatography, applied and meso-scale meteorology. A good knowledge of statistics, climatological archiving, instrumentation and hydrology. A knowledge of fields of impact such as pollution, eco-systems, land use, regional planning, resources management is also necessary.

Professional Responsibility

4

- A. Degree 4 - Overall accomplishment, key recommendations and conclusions are reviewed by the Division Chief against goals and established general objectives. Scientific papers and reports are reviewed by other senior scientists for constructive criticism.
- B. Degree 4 - As an authority in the area, little professional guidance can usually be obtained within the organization. On the resolution of unusual and complex impact assessment problems, guidance can be obtained from scientific establishments and other authorities elsewhere. Guidance is provided by the Division Chief in matter involving difficult negotiations, Division's objectives and new programs.
- C. Degree 4 - The work requires defining specific objectives for the Section's units, determining approaches, requirements and limitations pertaining to scientific support services, terms and objectives of cooperative projects, dealing with problems encountered by the Section's units and establishing scientific guidelines and procedures for the work and the use of the scientific resources.
- D. Degree 4 - Work and recommendations of subordinate staff are reviewed for soundness of judgment. Reports, conclusions and recommendations of consultants are reviewed for acceptability and technical merit against requirements. Results of studies and proposals of other scientists related to specialized area are reviewed for applicability.
- E. Degree 4 - Result of climatological studies, investigations, climate and impact assessment and of cooperative and contracted undertakings are interpreted to determine the significance and the implications of conclusions and recommendations on the effectiveness of the support provided and the achievement of program goals and Section's objectives.
- F. Degree 4 - Advice based on a recognized expertise in climatological applications, climate assessment and impact is provided to other scientists, management and officials in own organization and other departments, scientists or officials of other levels of government, and agencies and to industry on climate, trends, changes and impact, new areas of application of findings and on effects of human activities on the atmospheric environment.

Management Responsibilities

4

- A. Degree 4 - The work requires the operational management and supervision of a group of professional climatologists, senior technicians, computer application system specialist and a subordinate supervisor plus additional staff as applicable on seasonal and project work.
- B. Degree 4 - Allocates the use of equipment, supplies and facilities for the on-going work of the Section, field observations, investigative projects and analytical studies.
- C. Degree 4 - Forecasts and assesses requirements, plans and develops projects, including estimations of the financial, equipment and human resources required to meet the Section's objective and work priorities and for the budget cycle and multi-year operational plans. Conducts special studies such as to establish needs for, and advises on additional observation network stations.
- D. Degree 4 - Seeks support or collaboration of other government services and private corporations and negotiates for required outside assistance, services and resources with principals of outside organizations, universities and other governmental sources and negotiates funds and person-years from other related government departments, to provide climatological research and assessment data and information.

Degree

- E. Degree 4 - Controls and coordinates project schedules and operational work plans and performance, follows-up and takes necessary actions to ensure negotiated contract work requirements and standards as to quality, cost and effectiveness are met.
- F. Degree 4 - Coordinates the various analytical and data services provided by the Section and the different simultaneous special projects, field observations, investigations and consultation/advisory work with those of users and collaborating organizations.
- G. Degree 3 - Interprets and implements administrative procedures and management directives and guidelines for the utilization of the resources, the negotiation, control and monitoring of contracted projects, and the negotiation or agreement and control procedures concerning outside service contracts or cooperative support.

## Impact of Recommendations

4

- A. Degree 4 - Results of the work, recommendations, advice and consultations contribute to the development of policies, instigation of major projects and the conduct of other scientific work using the services. Decisions also affect the participation in collaborative applied developmental research and the use of external sources for contract studies.
- B. Degree 4 -
  - (i) Degree 4 - Recommendations, advice and consultations have both economic and technological effects on a wide variety of industries, ranging from urban development, recreation and tourism, to industrial expansion, hydro projects, agriculture, mining and forestry.
  - (ii) Degree 4 - Recommendations, advice or consultations affect the conservation and long term planning of uses of natural resources that are impacted by changes in climate.
  - (iii) No significant impact.
  - (iv) No significant impact.
- C. Degree 4 - The development of new concepts and approaches and work results or findings contribute to the overall understanding of the impact of climatic changes in the long-term and their effect on climate-sensitive sectors and eco-systems.

LINEAR ORGANIZATION CHART

Director, Climatological Applications Branch  
 Chief, Applications and Impact Division -  
 Superintendent, Arctic Meteorology

- Head, Energy and Industrial Applications
- Superintendent, Bioclimate
- Head, Biometeorology Research

\* - Superintendent, Climate Assessment and Impact Section PC-4  
 - Land Use Climatologist (2) PC-3

- Topoclimatologist (1) PC-1
- Impact Monitoring and Analysis (MT-6)
  - Computing Specialist (CS-2)
  - Biometeorology Technician (EG)
  - Field Surveys Technician (EG)

\* Bench-Mark Position

18.1

BENCH-MARK POSITION DESCRIPTION

Bench-mark Position Number: 18

Level: 4

Descriptive Title: Resource Engineering (Marine) Geophysicist (Western Arctic)

Reporting to the Head, Environmental Marine Geology Subdivision:

Plans, coordinates and conducts near surface marine geological, geophysical, geotechnical and engineering research in the Arctic regions of Canada, particularly the Beaufort Sea and which includes investigations of the erosion and sediment accumulation on the sea floor, from both a modern and an historical perspective, and the stability of seabed sediments.

Establishes, in cooperation with oil companies and other departments and agencies, the long-term objectives and priorities for Arctic seabed research. Prepares and solicits research proposals and reviews, evaluates and selects proposals for scientific content and applicability for funding; allocates funds and evaluates the performance of funded research.

Manages external research contracts with universities and industry, relating to short-term geotechnical research. Plans, coordinates and executes joint industry and government research projects, and directs and supervises group's staff.

Proposes the methodologies and technology required to conduct studies in the laboratory or in the field, evaluates new methodologies and technologies, and initiates the development or modification of instrumentation to collect data.

Plans, organizes and conducts scientific field operations which includes negotiating ship time; arranging for logistical support, supplies and services; scientific coordination; and controlling expenditures and the use of equipment, facilities and supplies.

Integrates and synthesizes multi-disciplinary research information and formulates models to explain the evolution and history of Arctic continental shelves and ocean basin and to evaluate the nature and severity of seabed instability in these regions. Publishes findings in scientific journals and in internal reports and presents to national and international conferences.

Provides advice on near-surface marine geology and seabed stability to federal regulatory, engineering and environmental agencies and industry for the establishment of safe structures, procedures and practices for the exploration and production of offshore oil and gas.

Acts as departmental advisor to other federal departments on the assessment of environmental impact statements, and represents the department before panels and at public hearings.

specifications

Degree

Kinds of Assignments

4

- A. Degree 4 - Objectives of the work are discussed with, and are stated by the Head in terms of Branch policies and research project goals, and long-term objectives and priorities established in cooperation with industry and other government agencies concerned.

- B. Degree 4 - Work involves geological, geophysical and geotechnical research for the Arctic seabed, and including sediment process studies, the definition of lithology, stratigraphy and structure and the evaluation of sediment stability.
- C. Degree 4 - Activities differ from one another and include conducting near-surface marine research; coordinating cooperative industry/government research projects; controlling scientific field operations' expenditures, the use of equipment, facilities and supplies, and organizing scientific and technical support; supervising research staff; and providing scientific and technical advice.
- D. Degree 4 - Plans, organizes and delegates work for complex research projects within the marine environment which must be carried out under difficult Arctic environmental and logistical conditions. Ensures that the programs of diverse groups are coordinated including work on a research vessel, to achieve the maximum efficiency while making scientific progress.

Complexity of Work

4

- A. Degree 4 - The work requires obtaining multi-disciplinary information and data by independent or joint detailed research projects in difficult to access marine offshore and Arctic locations. The information is also supplied by other public and government organizations and from research contracts and this material must be integrated and synthesized into evolutionary Arctic geological models in a particularly complex region. Collected data must be also suitable for use by scientists in different disciplines.
- B. Degree 4 - Information and data often pertain to new areas of information. Validating the information and the data calls for innovative and intensive investigations under tough Arctic and offshore conditions. Data can only be verified with great difficulty and at great expense.
- C. Degree 4 - Information and data concern those parameters which define such subjects as permafrost, hydrates, slumping, faulting, ice scour, soil properties, pingos and mud volcanoes that establish nature of the seabed. These data can be highly variable, difficult to interpret and require sound professional judgement to use.
- D. Degree 4 - The data collected from near surface marine geological research represent a complex array of variables connected by relationships that require considerable ingenuity to interpret, resolve conflicts, and formulate into evolutionary models.
- E. Degree 4 - The work is normally being affected by the activities of officials and scientist from oil companies and other federal and provincial government agencies, as well as universities. Consideration of such activities and their implications are required when preparing project plans and long-term proposals and performing work.
- F. Degree 4 - Contacts are with scientists and officials in the oil, industry, other federal departments, boards of enquiry and universities for providing expert witness and technical advice, exchanging information, negotiating joint research programs, conducting work, allocating resources and dealing with problems.
- G. Degree 4 - Work requires proposing and evaluating new technologies and methodologies and initiating the development of new instrumentation to meet requirements for the collection of new types of information often in a difficult-to-define environment and where precedents often do not exist.
- H. Degree 4 - The work requires the application of a thorough knowledge of the principles, theory and practices of geology involving marine geophysical and geotechnology and a knowledge of petroleum and safety engineering, environmental science and advanced instrumentation.

Professional Responsibility

4

- A. Degree 4 - The evaluation and the selection of research proposals for scientific content and applicability to program objectives is accepted, with the resultant outputs being reviewed against the directives of the division and the attainment of established objectives.
- B. Degree 4 - Professional guidance is received from Senior staff for problems of a difficult administrative or complex scientific nature. Approaches to unusually difficult and hazardous problems are often resolved in cooperation with other scientists.
- C. Degree 4 - The work requires reviewing, evaluating and selecting research proposals for scientific content and applicability to program objectives and acceptability for funding and to recommend options for complex scientific and difficult problems posed by operating under difficult Arctic environmental and physical conditions.
- D. Degree 4 - Other scientist's proposals for research projects in the Canadian Arctic related to oil and gas exploration are reviewed for acceptability and selected for funding. The results of the work of other Scientists is reviewed for applicability to departmental seabed studies.
- E. Degree 4 - Results of own and other peoples studies are interpreted to determine the implications for Canada's research work in the Arctic environment and are evaluated for their impact on the ongoing oil and gas exploration in the Arctic region.
- F. Degree 5 - Authoritative advice and recommendations for scientific research, seabed evolution stability, geologic hazards and constraints to offshore development and safety of offshore engineering facilities, oil and gas exploration in the Arctic environment, and on the appropriate equipment and technology to be used, are given to senior scientists and officials in industry and government.

Management Responsibilities

4

- A. Degree 3 - The work normally includes the supervision of one technician and one professional but may include others when appropriate.
- B. Degree 4 - Allocates funds, person years, equipment, and ship time to projects according to priority.
- C. Degree 4 - Evaluates, prioritizes and selects the research programs and proposals relating to seabed geology and engineering and environmental requirements in the Arctic. Develops, recommends and implements plans for in-house research projects and for the acquisition and use of required resources and expenditure of funds.
- D. Degree 4 - Selects, negotiates, advises on, and administers research contracts performed by non-government groups for arctic seabed research.
- E. Degree 4 - Controls and coordinates project schedules with industry and universities, and evaluates industry development proposals in terms of stability and safety of offshore engineering facilities to ensure they meet the priorities and objectives of the offshore geotechnical and Beaufort Sea programs.
- F. Degree 4 - Coordinates environmental, safety and exploration activities between departments, industry and universities for research programs relating to Arctic seabed studies.
- G. Degree 3 - Interprets and implements administrative, safety and management directives and guidelines established for the work.

Impact of Recommendations

4

- A. Degree 4 - Recommendations and advice control the direction of near-surface marine geological research in the Canadian Arctic and contribute to the development of governmental policy and affect the implementation of projects done by governmental organizations, and joint industry-government, universities and research contractors. Study results and information provided, contribute to the formulation of policies regarding regulation, allocation and revenue to be derived from exploitation.
- B. Degree 4 -
  - (i) Degree 4 - Recommendations, advice and consultations, and decisions have both economic and technological effects on Arctic oil and gas exploration and affect the direction of Arctic research and the safe engineering structure design procedures and practices of offshore oil and gas exploration and production facilities.
  - (ii) Degree 4 - Recommendations, advice and consultations contribute to the development of oil and gas reserves and affect Canada's position as a producer of these raw materials and contribute to minimize environmental risk.
  - (iii) No significant impact.
  - (iv) Degree 3 - Recommendations and advice affect the use and procedures of offshore oil and gas facilities to minimize the safety risk to the workers associated with their development.
- C. Degree 4 - Developments of new concepts and approaches improve the understanding of the sedimentary and geomorphic processes active on the shelf and slope of the Beaufort Sea and other areas of the Arctic and contribute to the knowledge of geologic hazards and constraints on offshore oil and gas exploration and production. Results of scientific investigation lead to the development of new technology and methodology.

LINEAR ORGANIZATION CHART

- Director, Atlantic Geoscience Centre
  - Head, Environmental Marine Geology
    - Seismo Stratigrapher (South East Canadian margin)
    - Seismo Stratigrapher (Eastern Arctic to Labrador)
    - Research Geochemist (Geochemistry)
    - Palaeoecologist Sedimentologist (Inlets and Deltas)
    - Coastal Geologist/Sedimentologist (Coastal Zones)
    - \* - Resource Engineering (Marine) Geophysicist (Western Arctic) PC-4
      - Beaufort Sea Engineer EN-ENG-3 (Term)
      - Geological Technician (EG)

\* Bench-mark Position

physical sciences

B.M.P.D. No 19

## 19.1

### BENCH-MARK POSITION DESCRIPTION

Bench-mark Position Number: 19

Level: 5

Descriptive Title: Senior Advisor, Metallurgical Technology

Reporting to the Director, Mineral Sciences Laboratories:

Carries out technical and economic assessments of the smelter modernization,  $SO^2$  control and metallurgical technology development and capital assistance proposals submitted by the metallurgical industry for government financial support. Develops criteria and evaluates technological proposals, assesses alternatives to determine technically and economically sound options, ensuring project feasibility within prescribed timeframe, resources capability and improvements to proposals, defining and organizing for required assistance to develop capital and operating cost of unit operation and whole process, working in consultation with senior industry, government and contractor personnel. Ensures acceptability and project priority ranking considering relative cost and long term benefit in liaison with industry and federal and provincial government personnel. Evaluates and recommends on proposals for Canada Centre for Mineral and Energy Technology (CANMET) contract research. Carries out techno-economic assessments of off-shore technologies to ensure competitiveness, by world standards, of technologies promoted in Canada. Ensures complementary approach to research and coordination of technology development initiatives through liaison and communication with personnel of CANMET, own and other federal and provincial government departments/agencies.

Advises senior management of own and other Department on the technical matters related to the evaluation and implementation of the proposals and makes authoritative recommendations to federal and provincial government departments on action choices, negotiation of proposals and on warranted government support of the projects.

Serves in an advisory capacity to industry and government in the development of strategies for commercial implementation and/or technology transfer related to metallurgical technology development and as technical consultant to other departments involved, federal/provincial management and other committees on the pilot scale testing and commercialization of particular processes. Serves in a consulting capacity to CANMET and to own and other departments/agencies concerned on the development of new metallurgical technologies (foreign and domestic), and as the technological/scientific authority on federal/provincial, interdepartmental and industry Technical Advisory and Coordinating Committees concerned with projects related to non-ferrous smelter modernization and  $SO^2$  control to recommend related strategies to Ministers. Serves in a consulting capacity to members of own and other departments/agencies and to departmental executives, industry and federal and provincial government departments in those matters related to non-ferrous smelter modernization and  $SO^2$  control in Canada. Chairs/co-chairs federal/provincial technical advisory committee meetings concerning government/industry shared cost smelter modernization projects in various provinces.

Prepares, in cooperation with scientific and other personnel of own and other departments concerned and industrial contractors, technical and economic evaluation of metallurgical technology development projects initiated or carried out by industry with government financial support and of technologies developed by CANMET, makes recommendations for further studies and/or commercial implementation or reviews, provides authoritative recommendations and advice on the final evaluation of projects and participates in the development of technology transfer strategy. Assists, as scientific authority, in the initiation of, and monitors, projects related to non-ferrous smelter modernization and  $SO^2$  control, preparing work statements for project initiation and providing assistance to departments involved for approval and implementation.

physical sciences

B.M.P.D. No 19

19.2

Provides reports and documentation to management committees and to management of departments concerned on the progress and evaluation of smelter modernization projects and makes recommendations on priority areas for CANMET participation in complementary R&D and on continuation of the projects, based on technological progress, economic assessments and financial management. Acts as main contact in the non-ferrous metal smelters study and as recognized CANMET expert in metallurgical processing technologies.

Makes recommendations to own and other departments and provincial government on various relevant programs, projects and proposals, and provides detailed rationale for their support, rejection or modification. Prepares papers for presentation and publication on the evaluation and potential of new metallurgical technologies for application in Canada and elsewhere and contributes to the initiation and evaluation of cooperative projects with Economic European Community bodies and participates in technology transfer missions to promote Canadian developed technologies and/or evaluate competitive options.

Degree

Specifications

Kinds of Assignments

5

- A. Degree 5 - The objectives of the work are set by senior management in terms of the current policy for the deployment of government funds from various program sources to promote the growth of Canada's metal industry and to reduce SO<sub>2</sub> emissions through smelter modernization, smelting technological development and more efficient and economical processes and new extraction techniques.
- B. Degree 5 - Work involves the provision of authoritative advice and recommendations on a diversity of major projects for improving smelter technologies, developing new processes for SO<sub>2</sub> capture and reducing or eliminating sulphur in smelter feed, new pyro - and hydro-metallurgical processes and new extraction techniques.
- C. Degree 5 - Activities include technical and economic assessments of technology developments, capital assistance proposals by industry and of the impact on Canada's overall ability to be competitive by world standards; recommending and advising on changes in policy to maintain Canada's market position; evaluating and recommending acceptance or continuation of projects or studies, providing authoritative advice on smelter modernization technology; identifying and recommending methods to deal with complex related problems; evaluating technological development options, economic feasibility and impact; and, acting as a liaison with industry and other governments.
- D. Degree 5 - The work requires planning, coordinating and implementing a diversity of major technical studies and coordinating the federal and provincial governments role and funding in non-ferrous smelter modernization.

Complexity of Work

5

- A. Degree 5 - The work requires coordinating and collecting data from a broad range of major metallurgical processes and comprising up to 30 unit operations. The data supplied, the information in the proposals and the technological alternatives to be evaluated must often be complemented requiring involved investigations or studies and careful scrutiny. Sources often must be developed or can be reluctant to provide technological sensitive information or data. Extensive correlation with existing information for accurate assessment is required.
- B. Degree 5 - Information and data may not be completely validatable due to absence of comparable data or where feasibility or opportunity for required lengthy and costly investigation, must be viewed within resources limitation and other constraints. Selection, acceptance and use of data require sound professional judgement.

## Degree

- C. Degree 5 - Information data on smelter modernization, development of complex new metallurgical technologies, process plans and extraction techniques involve a wide range of highly variable data, present sizeable ambiguities and often are poorly understood due to complexity. Ingenuity, highly selective and knowledgeable professional judgment must be exercised for their evaluation and use.
- D. Degree 5 - Relationships between the many variables involved in a major metallurgical process are complex and there are often conflicting opinions on their interpretation and use. Evaluation, in addition to the technological dimension, must include consideration of the market conditions for mineral commodities, their relationships between economics related variables and metallurgical industry accounting practices conflicts. Data from these sources are often difficult or impossible to reconcile with the primary technical evaluation.
- E. Degree 5 - The work undertaken for this government program activity and initiatives is significantly affected by the activities of mining and metallurgy companies, other federal and provincial governments as well as by the work of research scientists or officials, both in Canada and elsewhere.
- F. Degree 4 - Contacts are with industry senior scientists, engineers and mining company executives, senior government personnel and officials to negotiate federal government involvement in major or new technological improvements to Canada's smelter and metallurgical operations. Work also involves contacts with engineering consulting firms officials or senior personnel in Canada and in other countries as well as with national and international research organizations.
- G. Degree 5 - Work requires approving or recommending new methods for mineral extraction and metallurgical processes that will maintain Canada's position in the world market. Advises on the feasibility and use of untried technologies.
- H. Degree 5 - The work requires the application of an advanced knowledge of the principles, theories and practices pertaining to the production of ferrous, non-ferrous, metallic and non-metallic mineral commodities and involving the physics and chemistry, thermodynamics, chemical engineering, engineering design and economics of hydro-metallurgical and pyro-metallurgical extraction processes and mineral beneficiation systems. A good knowledge of related fields such as the mining, utilization and marketing of mineral commodities and conditions affecting competitiveness of Canada's mineral industry, and of government funding mechanisms is also necessary.

## Professional Responsibility

5

- A. Degree 5 - Results are evaluated in terms of Canada's attainment of its policy and objectives of reducing  $SO_2$  emissions and maintaining a competitive minerals industry through the use of government supported technology development projects.
- B. Degree 5 - Guidance is received from Senior staff on program implications and progress made towards achieving federal government objectives. Professional guidance may be obtained by discussions with other senior scientists. The field of work is highly complex with relatively few top ranking private consultants.
- C. Degree 5 - The work requires assessing major technological proposals and alternatives, defining scientific objectives, establishing funding and resources requirements and approaches to major project proposal problems and appropriate scheduling for those that meet the criteria for inclusion in the government program.
- D. Degree 5 - Major studies and projects submitted by other scientists and engineers from industry and proposed technological alternatives are evaluated for acceptance or rejection, modification and continuation as part of the program and in terms of their validity and effectiveness with respect to policy and resources limitations. Studies by other scientist are evaluated for their impact on smelter design, metallurgical process improvement and objectives.

- E. Degree 5 - Results of the work are interpreted to determine their implications on the continuation of the federal government's initiative on smelter modernization and metallurgical process development.
- F. Degree 5 - Authoritative advice and recommendations are given as recognized government expert on mineral extraction and non-ferrous smelter modernization, design and operation and SO<sup>2</sup> control, to senior members of other government departments, company executives senior industry personnel and senior consultants.

Management Responsibilities

4

- A. Degree 1 - As a senior advisory position the work does not involve continuing responsibility for staff, but may require assigning evaluation and monitoring assistance tasks and instructing assisting scientists as necessary.
- B. Degree 1 - Devises long- and short-form plans for use of own time.
- C. Degree 4 - Assesses requirements and develops plans for the acquisition and use of resources and expenditure of funds from a range of government sources to evaluate development proposals for financial support and meet the objectives of smelters modernization for SO<sub>2</sub> abatement and metallurgical technology development programs.
- D. Degree 5 - Approves or recommends suitable proposals and the expenditure of funds, assessing, selecting and negotiating federal-industry agreements for research and pilot-plant projects or full scale trials such as for SO<sup>2</sup> emission reduction, and arranging for their funding through the appropriate government mechanism. Provides authoritative advice on the selection of contractors and sub-contractors and on technology research and development on the laboratory and plant scales.
- E. Degree 4 - Controls and coordinates major projects to assist industry and meet federal environment protection objectives. Evaluates progress to ensure it meets federal requirements for performances, efficiency and economy.
- F. Degree 5 - Coordinates technology development initiatives, proposals assessment studies and projects (about 10 major and 50 smaller project per year) with industry executives, federal and provincial officials and contractors who have divergent and often conflicting priorities. Arranges and coordinates expert support within the government for a complementary research approach and projects evaluation.
- G. Degree 1 - Follows office and field administrative procedures established for the work.

Impact of Recommendations

5

- A. Degree 5 - Results of the work and authoritative recommendations and advice affect the departmental development policies and programs to modernize Canadian smelter and metallurgical operations. Decisions affect which projects are funded and to what extent, and affect the functions provided by other government departments in terms of technical help and funding. Evaluates all projects in field of expertise for the entire Federal Government.
- B. Degree 5 -
  - (i) Degree 5 - Authoritative recommendations and advice have a substantial impact on the Canadian minerals industry both in terms of technological change, efficiency and economic viability and environmental emission.
  - (ii) Degree 5 - Authoritative recommendations and advice have a substantial effect on the exploitation of Canadian mineral resources in terms of increased or improved recovery, and reduction of waste and pollutants and directly contributes to resources conservation and use and to environment protection.
  - (iii) No significant impact.
  - (iv) No other significant impact.

Degree

- C. Degree 5 - Decisions, authoritative advice and recommendations, evaluation and results of the work contribute new insights for improved design, installation and operation of smelter and mineral processing technology, enhanced ability to competitively exploit mineral resources and improved environmental protection knowledge.

LINEAR ORGANIZATION CHART

Director General, Technology CANMET.

Director, Mineral Science Laboratories

- \* - Senior Advisor, Metallurgical Technology PC 5 R&D  
Program Coordinator (SE-RES) Senior Industrial  
Research Officer PC-4 Manager, Chemical Laboratory  
Manager, National Uranium Tailings Program  
Manager, Mineral Processing Laboratory Manager,  
Extractive Metallurgy Laboratory Technical Support  
Section (EL-6), (EL-4) Administrative Officer  
Secretary

\* Bench Mark Position

BENCH-MARK POSITION DESCRIPTION

Bench-mark Position Number: 20

Level: 5

Descriptive Title: Chief, Scientific Information,  
(Analysis and Assessments Services Division)

Reporting to the Regional Director, Science: Pacific Region

Acts as the scientific authority and advisor to scientists, senior management and officials in own and other departments, provincial government departments and industry in matters pertaining to the evaluation of marine resource development proposals and environmental assessment and the provision, analysis and interpretation of oceanographic, climatological and marine resource and environmental data and information for the management and exploitation of the resources and protection of the marine environment.

Plans, directs and controls the activities and resources of the Services responsible for: the implementation of the Marine Environmental Services Program for marine environmental assessments and responses for scientific aspects of environmental reviews and assessments; the appraisal of industrial development proposals and environmental impact statements; the establishment and operation of a marine climatological data and oceanographic information and climate prediction service for the Pacific Region and of a comprehensive Regional Oceanographic Data Service for the gathering, interpretation, assessment, synthesizing, archiving and dissemination of scientific multi-disciplinary data and information for the Pacific and Western Arctic; the establishment of an inventory of marine scientific data of the region and of an institute technical record unit of marine environmental data and departmental reports for scientific support; the preparation, marketing and communication of scientific information products to governments, resource industry and other clients; the provision of advice, analyses, scientific interpretation and the liaison between scientists, management and officials of organizations concerned.

Recommends divisional scientific information policy objectives and strategies to the Director, and implements scientific information, analyses, assessment and data service programs to meet intent of policies. Defines Services detailed program work, evaluation criteria and budget requirements, sets priorities ensuring balanced program emphasis to satisfy marine clients urgent demands, fisheries and environmental protection long-term objective and requirements, and national/international scientific data concerns. Determines areas of staff responsibility and allocates work and resources. Carries out staff supervisory, administrative and management duties, providing guidance to subordinates and reviewing performance; enhances the capability of the Services to meet requirements, and fosters cooperative services. Coordinates the activities with the Regional Science sectors and other federal, provincial, university and international programs. Approves or recommends the expenditure of resources, reviews Services' work progress, controls expenditure of funds allocated for research contracts and assess reports for fulfillment of terms and conditions.

Implements data management policy, standards and procedures consistent with those of the Marine Environmental Data Service and recognized international oceanographic data services, and in keeping with data storage and communication technology. Establishes controls and procedures for data appraisal and the handling of data of a proprietary or regulatory nature and data services available from the Division. Ensures compatibility of the data program activities and objectives with regional scientists' projects, Fisheries Operations systems, Atmospheric Environment Service, global data systems and international data centres. Determines the need and directs the preparation of information products such as atlases. Promotes internal and outside awareness of the Region's scientific output.

Provides authoritative scientific advice on matters related to Arctic Water and Ocean Dumping Control Acts, development of marine environmental legislation, industrial operating regulation, conditions, strategies and on Ocean Dumping research applications to resolve problems and for future planning.

Represents the Region in scientific, planning and program matters. Conducts the Annual appraisal and Priority selection of research proposals for Ocean Dumping in conjunction with Environment Canada and initiates studies, reviews and assessments of problems in pollution or recommends research. Appraises research proposals for scientific validity and assesses scientific reports. Contributes with Fisheries Operations sector, other departments and the Province to the planning for environmental reviews and public hearings. Represents the department or the branch on various advisory or development committees for regulation of activities in the marine environment, reviewing proposals, assessments and advising.

Carries out managerial assignments to assist the Director and senior management of the Regional Science Sector in areas such as regional policy and program analysis and evaluation, planning, coordination, control and reporting systems for relevant and integrated/coordinated or multi-services/disciplines programs, research or surveys, bilateral agreements, program activity structure development, revenue recovery and conflicts resolution concerning inter/intra departmental submissions and marine environment, resources exploitation and exploration guidelines. Establishes required liaison with regional headquarters management and program authorities, senior officials of industry and representatives of provincial, federal, university and international organizations concerning integrated/ coordinated programs, bilateral agreements and marine sciences related problems. Assesses and makes recommendations to the Director on programs effectiveness, progress, and impact on departmental priorities, fisheries and habitat management objectives, science integration initiatives and planning process.

Deals with or advises on conflicting or incompatible environmental assessments of proposals and responses to difficult technical enquiries from industry. Develops proposals and makes recommendations on environmental legislations. Writes scientific papers and reports.

Degree

Specifications

Kinds of Assignments

5

- A. Degree 5 - Objectives of the Division are established by the Regional Director in terms of overall goals, policy and priorities for the management of the marine resources and the protection of the marine environment in the Pacific and Western Arctic Region.
- B. Degree 5 - The work is performed within the multi-disciplinary areas comprising the Region Science-sector and Science-Pacific Research for the development and management of the marine resources and environment protection program.
- C. Degree 5 - Activities involve the provision of authoritative scientific advice and recommendations on multi-disciplinary aspects of marine resources management, development and exploitation and protection of the marine environment, on the provision, assessment and interpretation of scientific data/information and on policy, legislation and regulation; the direction of specialized Services and the performance of managerial and administrative functions; the assessment of, and advise on marine development proposals and impact, research proposals and application; the evaluation of work progress and implication on Regional and Division program objectives; the liaison with other organizations for co-ordination and compatibility of objectives; the provision of guidance on approaches to resolve conflicts and incompatible environmental assessments of proposals or difficult technical inquiries from industry.
- D. Degree 5 - The work requires planning, coordinating, and implementing the Division services; advising on marine environmental legislation, resources development regulation and ocean dumping research planning and strategy; developing financial multi-year plans for marine physical, biological and chemical sciences, and hydrography, program activity structure and revenue recovery plans; and, formulating changes to programs, policies and strategies.





## Complexity of Work

5

- A. Degree 5 - The work requires identifying or developing sources and means of obtaining the information, coordinating the collection and selection of multi disciplinary information and data on marine resources, climate, environment and activities in the marine environment over a wide and difficult geographic area (ranging from B.C. coastal fjords and open ocean to Western Arctic ice-laden waters) and the gathering, deriving from, and the synthesizing of a diversity of multi-disciplinary studies and findings related to off-shore oil, gas and mineral exploration, fisheries and environmental protection. Raw data obtained with great difficulty, are complex, often incomplete or cannot be repeated.
- B. Degree 5 - Information and data often must be accepted as obtained or derived and/or reviewed based on former research information. Given the geographic area, inherent constraints or changing conditions the data usually may not be completely validatable.
- C. Degree 5 - Most of the many variables involved in climatological and oceanographic (physical, biological and chemical) resources exploration, development and marine environment data are characterized by high variability and ambiguity. Ingenuity and highly selective professional judgment for using data/information derived by/from studies/projects of other scientists of various disciplines are required.
- D. Degree 5 - Marine environmental and development proposal assessment and the industry practices, pollution and the multi-disciplinary parameters measured and appraised and their significance to marine resources often result in conflicting viewpoints calling for scientific compromises, trade-offs and recommendations for new regulations, research priorities, or changes to existing policy or legislation. Relationships between many variables are conflicting and difficult to define.
- E. Degree 5 - The work is affected by the activities of industrial concerns, provincial governments and other federal government departments officials and scientists working in the marine environment. Implications of these activities must be considered in providing authoritative advice, determining services strategies, requirements and long-term priorities.
- F. Degree 5 - Contacts are with senior scientists and officials of federal, provincial governments and industry at the regional, national and international levels where conflicting interest or objectives are represented in situations such as conflicting/incompatible proposal assessments, mitigative measures and environmental trade-offs, ocean dumping, offshore development and operating condition regulation; and bilateral agreements.
- G. Degree 4 - Work requires developing procedures and techniques for implementing and enhancing the services and applications to novel situations, the accumulation, dissemination and marketing of scientific information or the control, and handling of data of special nature. New techniques using novel approaches are developed to resolve conflicts related to assessment and proposals, bilateral agreements and integrated program or to deal with difficult technical inquiries. Precedents often do not exist.
- H. Degree 5 - The work requires the application of an advanced knowledge of the principles, theories and practices of physical oceanography with a strong emphasis on the inter-influences of human activities, marine resources and oceanic processes complemented by a good knowledge of marine development, resources exploration and environmental assessment, marine biology, chemistry, climatology and hydrography, and of managerial functions, computerized scientific information system and applications to the field of work.

Professional Responsibility

5

- A. Degree 5 - Results of the work are reviewed with the Regional Director to ensure intent of policies and program objectives are met.
- B. Degree 5 - Guidance is received on policy intent and formulation from senior management and on scientific issues by discussions with other scientific authorities.
- C. Degree 5 - The work requires defining overall divisional policies, goals and priorities, developing conceptual approaches for resolving complex assessments, establishing coordinated multi-disciplinary research programs and scientific guidelines for information/data effectiveness.
- D. Degree 5 - Recommendations and conclusions of staff specialists are reviewed for their ability to meet policy directives and Division's program objectives and priorities. Environmental impact statements are evaluated for compatibility with policies. Major studies by contractors and other scientists are evaluated for their impact on programs and objectives, and research proposals are appraised for scientific validity and opportunity.
- E. Degree 5 - Results of marine multi-disciplinary studies and recommendations, conclusion or assessment and impact of major development proposals are interpreted to determine their broad implications on the strategy and effectiveness of other program activities of the Science-Sector and the marine environment protection and resources management.
- F. Degree 5 - Provides authoritative scientific advice and recommendations to senior management and officials on matters related to Arctic Water and Ocean Dumping Control Acts, development of marine environmental legislation and the setting of industrial operating regulations, conditions and strategies, and on ocean dumping research and applications to resolve marine environmental problems. Authoritative advice and recommendations are also provided to other scientists on marine development proposals and environmental assessments, response to difficult enquiries from industry, mitigative measures and acceptable environmental trade-offs and on programs, policy, objectives, priorities and services provided by the Division.

Management Responsibilities

5

- A. Degree 3 - The work normally requires the supervision of the Divisional Services comprised of a scientific, advisory and support staff.
- B. Degree 4 - Establishes the requirements and allocates and controls the use of equipment, supplies and facilities of the division.
- C. Degree 5 - Approves the expenditure of resources for own budget exercising delegated authority. Determines and provides authoritative advice on integrated multi-disciplinary marine research projects to be performed, long-term service commitments or resource commitment for new systems or products.
- D. Degree 5 - Approves contract research and other outside assistance work using internal or other funds for which authority has been delegated.
- E. Degree 5 - Forecasts requirements, prepares budget and establishes detailed work plans. Recommends overall divisional goals, objectives and priorities. Develops and implements uniform planning progress reporting and program evaluation tools for relevant and integrated/coordinated programs and multi-lateral agreements.
- F. Degree 5 - Coordinates the activities of the Services with those of several other elements of the Regional Science Sector, various relevant programs activities of other departments, provincial government, university and international organizations concerned and with requirements of industry and other users and where differing interests and priorities are involved.

- G. Degree 4 - Develops and recommends uniform planning and reporting tools for use within the Regional Science Sector and internal administrative procedures and service guidelines for the Services Division.

Impact of Recommendations

5

- A. Degree 5 - Authoritative recommendations and advice affect the formulation of marine resources development and environment protection legislation, regulation of human activities within the marine environment and departmental policies, plans and programs. Decisions and recommendations affect the initiation or conduct of regional multi-disciplinary research or survey programs, oceanographic and sub-surface marine climatological projects or the orientation and work of major scientific advisory and development committees for marine resources management, environment protection and development regulation.
- B. Degree 5 -
- (i) Degree 5 - Authoritative recommendations and advice have a substantial long and short-term effect on policies pertaining to fisheries and habitat management, ocean dumping, offshore oil and gas exploration and development, and other industrial/commercial enterprises within the marine environment.
  - (ii) Degree 4 - Recommendations and advice contribute to the protection and sustainable development and exploitation of marine resources such as fish, oil, gas and minerals.
  - (iii) No significant impact.
  - (iv) No other significant impacts.
- C. Degree 5 - Decisions and recommendations affect the development strategies and initiation of long- and short-term research and survey programs to acquire scientific data and information leading to a new and better understanding of marine science, more particularly, physical oceanography, marine climate and predictions, marine environment and resources and the effects of human activities.

LINEAR ORGANIZATION CHART

- Regional Director General, Fisheries and Oceans, Pacific
  - Regional Director, Science
    - Director, Physical and Chemical Sciences
    - Director, Hydrography
    - Director, Biological Sciences
  - \* - Chief, Scientific Information (Analysis and Assessment Svcs.) Div. PC-5 - Senior Marine Advisor BI-3
    - Scientist, Physical Oceanography RES-2 -  
Clerical SCY-2
    - Term or other temporary Scientific Support staff as applicable
- \* Bench-Mark Position

21.1  
BENCH-MARK POSITION DESCRIPTION

Bench-mark Position Number: 21

Level : 5

Descriptive Title: Senior Science Advisor, Renewables and New Liquid Fuels

Reporting to the Director General, Office of Energy Research and Development:

Advises, provides assessments and make authoritative recommendations to the interdepartmental Panel on Energy Research and Development on federal Research and Development (R & D) programs and plans and on effective dispersion of funds, future funding and other resource allocation pertaining to renewable sources of energy and new liquid fuels. Proposes research work, evaluates R & D projects and proposals and makes recommendations for approval or rejection of projects in such energy sources as active solar energy, wind, geothermal and alcohol-fuel energy and coal liquification, heavy oil extraction and upgrading, diesel engine emissions, the use and production of hydrogen as a fuel and higher energy density new batteries.

Plans, organizes and conducts studies, information searches, analysis and assessments of the research works and technological developments pertaining to renewable sources of energy and new liquid fuels, and directs and supervises subordinate science advisors. Develops reporting schedules and requirements for the control and monitoring of projects, reviews expenditures and budget, prepares reports and makes recommendations to the Director General. Organizes and conducts internal reviews of activities for the energy areas, assesses effectiveness, and proposes changes to program content, strategy proposals and funding. Conducts studies into technology transfer, project results and benefit-cost analyses. Ensures the development and maintenance of a comprehensive information base for assessing R & D proposals, policy analysis and development.

Participates in the development of energy R & D policies, strategies and goals and review of the detailed plans for the program pertaining to the relevant energy areas and involving federal, provincial and industrial agencies under various agreements. Invites provincial energy departments to develop and submit strategies, provides advice or assistance, and reviews and conducts discussions on strategies proposed by federal and provincial agencies for common understanding and priorities. Assesses proposed R & D plans and provides advice to senior officials to maintaining an effective federal program. Monitors technological advances, status of innovations, field trials, demonstrations, pilot tests, problems associated with technologies being developed; assesses existing, developing and latent technologies and identifies R & D, technical, industrial and commercial opportunities, capabilities and needs, and opportunities for technology transfer or preliminary R & D work.

Acts as a technical advisor to the interdepartmental Panel, ministers and senior officials on issues related to energy R & D and other allied scientific activities, represents the Office on committees developing programs and provides assistance and interpretations concerning technological developments, projects and documentation to energy policy analysts in the policy formulation process and for effective drafting of policy initiatives for the energy areas.

Writes reports and scientific papers for policy development proposals, supporting further R & D and demonstrations or for publication and communication to scientific community. Organizes and assists in the preparation of the Office's submission documents and prepares briefing materials, presentations, memoranda and discussions papers on energy research and development programs.

Develops and maintains consultations with scientists, policy analysts and other professionals in a national and international context, and maintains leading-edge technology awareness of developments, issues and organizations involved in new initiatives. Represents the Office in Canada's activities in the International Energy Agency, and provides information on Canada's R & D programs. Monitors parliamentary and senate committees' proceedings on energy-related matters.

Specifications

Kinds of Assignments

5

- A. Degree 5 - The objectives are stated by the Director General in terms of the goals and program objectives for the department with respect to the federal program on Energy Research and Development of new liquid fuels and renewable sources of energy.
- B. Degree 5 - Work is performed within the several specialized subject areas of the Energy Research and Development Program, and encompasses a wide range of disciplines and involves defining the federal position on R & D in a diversity of renewable sources of energy and new liquid fuels.
- C. Degree 5 - Activities involve a broad spectrum of scientific and policy formulation duties and include evaluating and recommending major energy R & D projects, providing advice on policy, establishing priorities for scientific work, recommending allocation of funds, planning, assessing and monitoring projects, supervising staff engaged in scientific investigation, and coordinating relevant energy R & D research studies between the federal and provincial governments, industry and universities.
- D. Degree 5 - The work requires planning, coordinating, monitoring and assessing the R & D activities related to new liquid fuels and renewable sources of energy and the federal program on energy R & D, identifying opportunities for the energy areas, industrial and commercial capabilities, interests and requirements and developing from the results, new policies and strategies to meet Canada's energy R & D requirements.

Complexity of Work

5

- A. Degree 5 - The work requires developing sources, organizing and coordinating the collection and selection of information and data from a variety of projects that are developing new and innovative techniques. Intensive investigations are required and data produced are difficult to evaluate due to lack of precedents. Latest research information is not usually available in the published literature and must be sought.
- B. Degree 5 - Information and data which are obtained from a diversity of projects and sources are often not completely validatable. The work involves being at the forefront of R & D for renewable energy sources and new liquid fuels.
- C. Degree 5 - Information and data are obtained from many energy-related studies and projects conducted by various government departments and agencies, industrial and scientific organizations, and other government funded or independent R & D work. The information and data are characterized by high variability, ambiguities and many variables given the diversity of sources, different objectives, interests and priorities, environmental and economic particularities, new and changing technology, R & D opportunities and potential. Highly selective and sound professional judgment must be exercised in using the information to provide objective assessments of proposals and authoritative advice and recommendations for effective and efficient R & D strategies, policies, allocation and use of R & D funds.
- D. Degree 5 - Results of energy R & D work, proposal assessments, resources potential estimations, opportunity studies, strategy and benefit-cost analysis involve complex relationships between many variables which are difficult to define and/or measure and often conflicting as to the scientific theories, changing or new technologies, particular roles, perceptions and interests involved and the most effective use of resources.
- E. Degree 5 - The work is affected by the energy-related activities of senior scientists in industry, universities and research organizations, other government departments and officials. Implications of those activities must be considered in relation to energy R & D policy and direction of the Canadian efforts.

## Degree

- F. Degree 5 - Contacts are necessary with senior scientists as the latest research information is not usually available in published literature, and with senior officials from industry, universities and other governments at both national and international levels. Perception of the needs and directions for energy R & D may differ among scientists and officials of various government departments and industry and views must be harmonized to arrive at final recommendations for the federal government's role in R & D projects and funding.
- G. Degree 5 - Work requires establishing new precedents for energy R & D in areas where new concepts and novel approaches are required in studies and where theories and data are incomplete or lacking.
- H. Degree 5 - The work requires the application of an advanced knowledge of the principles, theories and practices of physics: heat transfer, heat storage, combustion and emissions, with a strong emphasis on energy research and development of renewable energy sources and new liquid fuels. A sound understanding of environmental economics, occupational health and safety issues and environment protection is also required.

## Professional Responsibility

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- A. Degree 5 - Results of research studies, recommendations and advice are evaluated in terms of their effectiveness toward the progress and achievements of the policy and program objectives set by the Director General for the federal role in the areas of R & D in new liquid fuels and renewable sources of energy, and the scientific support to be provided to the Interdepartmental Panel on Energy R & D for its recommendation to the Minister on policies, strategies, programs and funding.
- B. Degree 5 - Guidance is received from the Director General largely on policy matters and on general R & D strategy options and program implications. Scientific guidance can be obtained by discussions with senior researchers in the energy sector.
- C. Degree 5 - The work requires defining objectives, strategies, developing conceptual approaches, methods and guidelines in the establishment and enhancement of the government's energy R & D program, and in the conduct of activities pertaining to new liquid fuels and renewable energy sources.
- D. Degree 5 - Assessments, recommendations and conclusions of staff are reviewed for their validity and effectiveness with respect to established policies and the resource limitations. Proposals, project results and study findings or reports are evaluated for effective contribution toward achievement of program objectives.
- E. Degree 5 - Major studies by other scientists are continually reviewed for their broad implications on the orientation of current R & D and technologies in the energy areas and their application to the overall federal energy R & D program.
- F. Degree 5 - Authoritative advice and recommendations on technologies and associated R & D problems pertaining to new liquid fuels and renewable sources of energy are given to officials and scientists in federal and provincial governments, industry and universities; and, to the Director General and the interdepartmental Panel on programs, plans, strategies and policy and on R & D proposals, project effectiveness, technological developments, technical and industrial opportunities, capabilities, initiatives and requirements and on effective dispersion of funds. Serves as an advisor to international and national committees.

## Management Responsibilities

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- A. Degree 3 - The work requires the direction and supervision of a scientific staff of subordinate advisors engaged in monitoring investigations, studies and assessments of R & D proposals, new technologies, and project progress and effectiveness.

- B. Degree 1 - Limited to the planning of the day to day use of the office equipment and supplies for own work.
- C. Degree 4 - Evaluates proposals for, and recommends the expenditure of energy R & D funds to meet program objectives for a wide spectrum of activities related to energy R & D. Assesses requirements, develops plans and recommends research projects to be done with allocated funds.
- D. Degree 4 - Selects and negotiates for specialized assistance as required for studies and assessments process (e.g., other scientists, government researchers or contractors).
- E. Degree 4 - Coordinates and controls a diverse series of R & D projects and schedules, monitors progress and evaluates performance against standards and makes recommendations for modifications or termination to meet program objectives.
- F. Degree 5 - The work requires the co-ordination through the conduct of investigation and assessment studies and the monitoring of the progress of energy-related R & D activities or projects, in own and several other departments or agencies involved and where interest, purpose or objectives are different and priorities conflicting.
- G. Degree 4 - Develops, advises and recommends on reporting schedules and requirements for the administrative control and monitoring of the projects, the effectiveness and expenditures for implementation.

#### Impact of Recommendations

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- A. Degree 5 - Authoritative recommendations and advice affect the development of the federal energy R & D program. Decisions, advice, appraisals and recommendations concerning current state of development of new technologies, projects and proposals affect the initiation, continuation and conduct of major energy related R & D activities by the department, other departments and agencies.
- B. Degree 5 -
  - (i) Degree 5 - Authoritative recommendations, advice and consultations concerning R & D programs can have substantial contributory economic and technological effects on the activities and progress of energy-related industrial and commercial enterprises. New technologies spawn new enterprises and change the operation of existing ones.
  - (ii) Degree 5 - Results of assessments and investigations or projects, and authoritative advice and recommendations on R & D projects, resource estimation and development potential, affect the development of new liquid fuels and renewable sources of energy. Rate of advances or exploitation is affected by the results achieved by federally funded R & D.
    - (iii) Degree 2 - Information and result of assessment work can contribute to the regulatory control of potentially hazardous substances related to new liquid fuels.
  - (iv) Degree 4 - As part of the total assessment of energy technologies, results of the work can have a significant impact on occupational health and safety aspects of energy technologies directly related to the safety hazards inherent to the production of new liquid fuels such as alcohol, methanol.
- C. Degree 5 - Decisions, advice and recommendations on R & D proposals and projects affect the initiation, continuation or orientation of energy-related R & D work and the current state of development of new technologies, and shape the course of research strategy and the rate of advancement of knowledge in the areas concerned.

LINEAR ORGANIZATION CHART

Assistant Deputy Minister, Mineral and Energy Technology Sector  
Director General, Office of Energy Research and Development -

Senior Science Advisor, Fossil Fuels  
- Science Advisor, Fossil Fuels

- Senior Science Advisor, Conservation & Fusion  
- Science Advisor, Conservation and Fusion

\* - Senior Science Advisor, Renewables and New Liquid Fuels PC-5  
- Science Advisor Renewables PC-3

- Science Advisor, New Liquid Fuels PC-3

\* Bench Mark Position