# EXAMINATION GUIDE FOR EXAM CANDIDATES

## ROSTER OF APPROVED PROFESSIONAL EXAMINATION
## TECHNICAL –- RISK-BASED STANDARDS ASSESSMENT

### Roster Qualifications and Functions

The Roster of Approved Professionals (the Roster) is a roster of individuals who have proven, through examination and experience, their expert knowledge in contaminated site assessment, management, and remediation.

Members of the Roster are authorized, under section 49(1) of the Contaminated Sites Regulation (CSR), to recommend to the BC Ministry of Environment and Climate Change Strategy (BC ENV) issuance of Approvals in Principle, Certificates of Compliance, Determinations that a site is or is not contaminated, Contaminated Soil Relocation Agreements and approval of background release exemptions (as per Table 1 and Table 2 of Protocol 6 - Eligibility of Applications for Review by Approved Professionals).

There are two categories of Approved Professionals: Numerical Standards Assessment Specialists, whose recommendations are based on the application of the numerical standards of the CSR; and Risk-based Standards Assessment Specialists, whose recommendations are based on the application of the risk-based standards of the CSR.

The qualifying examination is offered in three parts: Technical – Standards Assessment, Technical – Risk Assessment, and Regulatory. To be appointed to the Roster, candidates must achieve a pass in both the regulatory part and the technical part associated with the category in which they seek appointment. Candidates must satisfy all minimum requirements in the year of appointment.

More information on the Roster is available at www.csapsociety.bc.ca.
Please email admin@csapsociety.bc.ca for the Approved Professional Roster Pack.

### Examination Format

In line with the mission of the Society of Contaminated Sites Approved Professionals (CSAP) of British Columbia "to serve government, the public and industry by evaluating and advancing the practice and quality of contaminated sites management within BC's regulatory framework" (CSAP, n.d.), the CSAP Society is designing and developing two oral assessments which will be used to measure the application of technical knowledge and decision-making in the areas of numerical standards and risk-based standards, respectively. Starting in September 2023, these oral assessments will replace the existing knowledge-based technical exams for numerical standards and risk-based standards, which were used to measure technical knowledge. The knowledge-based regulatory exam will still be active. To become an Approved Professional (AP), candidates are required to pass the knowledge-based regulatory exam and either or both the numerical-based and risk-based standards oral assessments, based on the designation for which they are eligible.

Oral assessments are performance-based assessments (Swanson, Norman, & Linn, 1995) or judge-mediated examinations (Stone, Beltyukova, & Fox, 2008) that have been successfully used to assess t application of knowledge and decision-making for over a century. The decision to replace the knowledge-

based written exams with performance-based oral assessments was informed by a comprehensive practice analysis. In general, the practice analysis provided explicit evidence of the alignment of the primary tasks of an Approved Professional with the most appropriate method of assessment.

Throughout the design and development process, the CSAP Society is committed to ensuring a valid, reliable, and fair assessment process that is based on rigorous psychometric testing standards as recommended by American and Canadian psychometric experts from the American Educational Research Association, American Psychological Association, and the National Council on Measurement in Education (AERA, APA, & NCME, 2014).

The design and development of the CSAP Oral Assessments were conducted by a committee of experienced Approved Professionals through the guidance of a psychometric consultant contracted by the CSAP Society, who ensured rigorous psychometric testing standards were met at every stage of the process. The Approved Professionals, who served as subject matter experts, provided assessment content expertise that informed the practice analysis, blueprint development, question writing, and standard-setting process. The psychometric consultant collected critical validity evidence throughout this process to ensure the oral assessment design and development process is valid, reliable, fair, and defensible.

The oral assessment for risk-based standards consists of up to 40 scenario-based questions. The duration of the assessment will be three hours. Each candidate will be assessed independently by a panel of two examiners. The examiners are carefully instructed to evaluate each candidate objectively; they will only be provided with the candidates' names and associated organizations/employers to determine if there exists a conflict of interest. The CSAP Society will make every effort to ensure there are no conflicts of interest between examiners and candidates and verifies that with candidates and examiners. The examiners will be using a structured and validated scoring guide that has been designed to minimize bias or any extraneous factors that are not related to what is being assessed. The examiners will be scoring your responses independently and will not be interacting with one another during the scoring process. The score assigned to each candidate for each question will be based on an agreement between the examiners and will be analyzed by the psychometric consultant to ensure a high level of scoring reliability and measurement precision.

In the first hour and a half, candidates will be given scenario-based questions to review and prepare their responses. A basic, non-programmable calculator (Texas Instruments TI-30Xa Solar), a #2 mechanical pencil, an eraser, and a package of page markers (e.g., Post-it Brand flags) will be provided to and retrieved from, candidates with their examination paper. Candidates will not be permitted to use their own calculators or writing instruments. A reference binder will NOT be supplied for the examination. Candidates will be provided with a list of reference materials (see Attachment 2) to help prepare for the examination. Candidates are expected to prepare their own printed reference materials which can be brought into and used during the examination. Laptops or electronic materials are NOT permitted. The examination is not limited to testing knowledge of only those materials in the reference list.

In the next hour and a half minutes, the oral assessment will be conducted, whereby the examiners will ask each question and the candidate will provide their responses orally.

After the oral assessment, the examiners will take 15 minutes to document findings, take a break, and then transition to the next candidate. This is a typical oral assessment administration process as recommended by psychometric experts (Swanson, Norman, & Linn, 1995). The oral assessment process will be audio recorded for quality control and training purposes.

The scenarios have been designed to reflect real-life situations encountered by Approved Professionals in practice. Please take the hour to carefully read over and formulate your responses to the scenario-based questions. Please make sure to answer each question carefully and to be prepared to discuss how you obtained the answer, including what references you consulted as well as the reasoning or rationale behind the process of arriving at your response to the question.

To get familiar with the oral assessment format, the CSAP Society will provide two sample question(s) 2-3 weeks before the assessment day.

The requested accommodation will be reviewed on a case-by-case basis. Accommodations that do not interfere with accurate and valid measurement of the construct of the oral assessment will likely be granted. The following accommodations will likely be provided to candidates after their documented need for the requested accommodation has been approved by the CSAP Society.

Upon entering the assessment site, the candidates will be asked to surrender their cell phones and other communication devices such as smartwatches. The candidates may be asked to wait before entering the prep room and later to the oral assessment room, two candidates at a time. As mentioned before, each candidate will be assessed independently by two examiners.

**Objectives of the Technical-Risk Assessment Part of the Exam**

The objectives of the Technical – Risk Assessment part of the examination include the testing of the understanding and application of combined aspects of ecology, toxicology, and environmental chemistry for the review of human health and ecological risk assessments. Candidates are also expected to have a general understanding of related areas such as for example, basic contaminant transport in various media.

**Examination Content and Guide to Preparation**

This Guide to Examination Candidates is intended to give candidates guidance in their preparation for the exam. The information contained in this document and its attachments is to assist only and is subject to change. Areas and materials not specifically mentioned may also be examined.

**Information useful in preparing for the exam is included in the following attachments.**

1. Syllabus
2. List of Reference Materials

## ATTACHMENT 1 – SYLLABUS

Candidates should read the Guide to Examination Candidates – Roster of Approved Professionals Examination – Technical – Risk Assessment before reading this syllabus. The percentage in brackets indicates the approximate percentage of the examination that will cover each major content area. While the ½ percentage weightings appear to be quite specific; they are, in fact, approximate only. Particularly important areas of knowledge include:

### ECOLOGICAL RISK ASSESSMENT

1. **Problem Formulation (15%)**
    a. Risk Assessment Planning
    b. Integration of Available Information
    c. Identification of stressors
    d. Potentially Exposed Receptors
        i. Complete and incomplete pathways
        ii. Risk controls
    e. Selecting Assessment and Measurement Endpoints
    f. Conceptual Models
    g. Data Gap Analysis
    h. Sampling and Analysis Plan

2. **Exposure Assessment (12.5%)**
    a. Characterization of Exposure
    b. Evaluating Data and Models for Analysis
        i. Strengths and Limitations of Different Types of Data
        ii. Literature Data – relevant species, study conditions
        iii. Site Data/Observations - measurement and assessment endpoints; species diversity, richness, abundance
    c. Measurement and/or Modeling Studies

3. **Effects Assessment (12.5%)**
    a. Quantitative and Qualitative Site Observations
        i. Terrestrial Receptors
        ii. Aquatic Receptors
    b. Bioassays
        i. Field studies
        ii. Laboratory toxicity tests
    c. Toxicity Reference Values
        i. Selection
        ii. Derivation
    d. Ecosystem – context of scale relative to contaminated sites
    e. Ecological Responses
        i. Stressor-Response Analysis
        ii. Establishing Cause-and-Effect Relationships
        iii. Linking Measures of Effect to Assessment Endpoints

4. **Risk Characterization, Uncertainty Analysis, Risk Management and Requirements (10%)**
    a. Quotient Method
    b. Observation Method
    c. Weight of Evidence
    d. Reporting Risks

e. Identifying Major Types of Uncertainty
f. Use of Uncertainty Factors
g. Sensitivity Analysis

h. Performance Verification Plans
i. Risk Management
j. Other Risk-based Submission Requirements

## HUMAN HEALTH RISK ASSESSMENT

1. **Problem Formulation (15%)**
    a. Data Collection
        i. Background Information Useful for Data Collection
        ii. Review of Available Site Information
        iii. Addressing Modeling Parameter Needs
        iv. Preliminary Identification of Potential Human Exposure
        v. Strategy for Sample Collection
        vi. QA/QC Measures
    b. Data Evaluation
        i. Combining Data Available from Site Investigations
        ii. Evaluation of Analytical Methods
        iii. Evaluation of Quantitation Limits
    c. Chemicals of Potential Concern
        i. Comparison of Samples with Criteria/Guidelines
        ii. Comparison of Samples with Standards
    d. Potentially Exposed Receptors
    e. Potential Exposure Pathways
        i. Complete and incomplete pathways
        ii. Risk controls
    f. Conceptual Model
    g. Data Gap Analysis

2. **Exposure Assessment (15%)**
    a. Characterization of Exposure Setting
        i. Characterize Physical Setting
        ii. Characterize Exposed Receptors
        iii. Identification of Exposure Routes
        iv. Identification of Reasonable Maximum Exposure
    b. Quantification of Exposure: Determining Exposure Concentrations
        i. Estimation of Chemical Intakes
        ii. Exposure Concentrations in Various Media
        iii. Combining Chemical Intakes Across Pathways

3. **Toxicity Assessment (10%)**
    a. Types of Toxicological Information Considered in Toxicity Assessment
    b. Toxicity Assessment for Noncarcinogenic Effects
    c. Toxicity Assessment for Carcinogenic Effects
    d. Identifying Appropriate Toxicity Values for Site Risk Assessment
    e. Evaluating Chemicals for which no Regulatory Toxicity Values are Available

**SYLLABUS CONT'D**

4. **Risk Characterization, Uncertainty Analysis, Risk Management and Requirements (10%)**
    a. Quantifying Risks
        i. Risks for Individual Substances
        ii. Risks for Multiple Substances
    b. Combining Risks Across Exposure Pathways
    c. Consideration of Site-Specific Human Studies
    d. Risk Characterization Results
    e. Risk controls

    f. Identifying Major Types of Uncertainty
    g. Use of Uncertainty Factors
    h. Sensitivity Analysis

    k. Performance Verification Plans
    l. Risk Management
    m. Other Risk-based Submission Requirements

## ATTACHMENT 2 – LIST OF REFERENCE MATERIALS

Candidates should read the **Guide to Examination Candidates – Roster of Approved Professionals Examination – Technical – Risk Assessment** before reading this attachment. This list of reference materials includes materials upon which some, but not all, of the exam questions have been developed. Other questions are drawn from the general principles to be tested and, in some instances, what is considered to be general knowledge. In addition to relevant portions of those materials listed here, candidates should study generally accepted, up-to-date texts in the subject matter to be tested. (Note: BC ENV = BC Ministry of Environment and Climate Change Strategy; USEPA = United States Environmental Protection Agency)

1. BC ENV. A Guidance Manual to Support the Assessment of Contaminated Sediments in Freshwater, Estuarine, and Marine Ecosystems in British Columbia Volume II – Design and Implementation of Sediment Quality Investigations in Freshwater Ecosystem. Prepared by MacDonald Environmental Sciences Ltd. November 2003. https://www2.gov.bc.ca/assets/gov/environment/air-land-water/site-remediation/docs/technical-guidance/x19_v2.pdf
2. BC ENV. Ambient Water Quality Criteria for Polycyclic Aromatic Hydrocarbons (PAHs). February 1993.
3. BC ENV. Procedure 3 Ministry Procedures for the Roster of Approved Professionals. November 12, 2009.
4. BC ENV. Procedure 8 Definitions for Contaminated Sites. April 1, 2021.
5. BC ENV. Questions & Answers (PDF), October 16, 2015.
6. BC ENV. Technical Guidance 15 Concentration Limits for Protection of the Aquatic Receiving Environments. Version 2.0, November 1, 2017.
7. BC ENV. Technical Guidance 4 Vapour Investigation and Remediation. Version 2, effective date: November 1, 2017.
8. BC ENV. Administrative Guidance on Contaminated Sites Documents. https://www2.gov.bc.ca/gov/content/environment/air-land-water/site-remediation/guidance-resources
9. BC ENV. CSR OMNIBUS UPDATING: Protocol Summary - Amendments to Schedule 5 Environmental Protection, Matrix Soil Standards. February, 2016
10. BC ENV. Performance Verification Plans. https://www2.gov.bc.ca/gov/content/environment/air-land-water/site-remediation/remediation-planning/remediation-plan-aip/performance-verification-plans
11. BC ENV. Policies and Standards Documents. https://www2.gov.bc.ca/gov/content/environment/air-land-water/site-remediation/guidance-resources
12. BC ENV. Procedure Documents. https://www2.gov.bc.ca/gov/content/environment/air-land-water/site-remediation/guidance-resources
13. BC ENV. Protocol 1 Detailed Risk Assessment.
14. BC ENV. Protocol 13 Screening Level Risk Assessment.
15. BC ENV. Protocol 20 Detailed Ecological Risk Assessment Requirements.
16. BC ENV. Protocol 22 Application of Vapour Attenuation Factors to Characterize Vapour Contamination
17. BC ENV. Protocol 28 2016 Standards Derivation Methods.
18. BC ENV. Protocol 30 Classifying Substances as Carcinogenic.
19. BC ENV. Protocol 4 Establishing Local Background Concentrations in Soil.
20. BC ENV. Protocol 6 Applications with Approved Professional Recommendations and Preapprovals.
21. BC ENV. Protocol for Contaminated Sites Documents.
22. BC ENV. Technical Guidance 1 Site Characterization and Confirmation Testing. Effective March 2023. https://www2.gov.bc.ca/gov/content/environment/air-land-water/site-remediation/guidance-resources/technical-guidance
23. BC ENV. Technical Guidance Documents
24. BC ENV. Technical Guidance on Contaminated Sites Documents.
25. CCME (Canadian Council of Ministers of Environment). 1996. A Framework for Ecological Risk Assessment: General Guidance. Prepared by the CCME Subcommittee on Environmental Quality for Contaminated Sites for the National Contaminated Sites Remediation Program. March 1996.
26. CCME (Canadian Council of Ministers of Environment). 1997. A Framework for Ecological Risk Assessment: Technical Appendices. Prepared by the CCME Subcommittee on Environmental Quality for Contaminated Sites for the National Contaminated Sites Remediation Program. March 1997.
27. CCME (Canadian Council of Ministers of Environment). 2006. A Protocol for the Derivation of Environmental and Human Health Soil Quality Guidelines.
28. CCME (Canadian Council of Ministers of Environment). 2020. Ecological Risk Assessment Guidance Document. PN1585.

29. Environment Canada. Biological Test Method: Test of Larval Growth and Survival Using Fathead Minnows. EPS 1/RM/22 Second Edition, February 2011. http://publications.gc.ca/collections/collection_2011/ec/En49-7-1-22-eng.pdf
30. Environment Canada. 2013. Federal Contaminated Sites Action Plan (FCSAP) Ecological Risk Assessment Guidance. March 2012. Prepared for Environment Canada by Azimuth Consulting Group.
31. Health Canada. 2010, Revised 2012. Federal Contaminated Site Risk Assessment in Canada. Part I: Guidance on Human Health Preliminary Quantitative Risk Assessment (PQRA), Version 2.0. Prepared by Contaminated Sites Division, Safe Environments Directorate, Health Canada.
32. Health Canada. 2010. Federal Contaminated Site Risk Assessment in Canada. Part II: Health Canada Toxicological Reference Values (TRVs) and Chemical-Specific Factors, Version 2.0. Prepared by Contaminated Sites Division, Safe Environments Directorate, Health Canada.
33. Health Canada. 2010. Federal Contaminated Site Risk Assessment in Canada. Part V: Guidance on Human Health Detailed Quantitative Risk Assessment ($DQRA_{CHEM}$). Prepared by Contaminated Sites Division, Safe Environments Directorate, Health Canada.
34. Health Canada. 2010. Federal Contaminated Site Risk Assessment in Canada. Part VII: Guidance for Soil Vapour Intrusion Assessment at Contaminated Sites. Prepared by Contaminated Sites Division, Safe Environments Directorate, Health Canada.
35. Health Canada. 2013. Federal Contaminated Sites Risk Assessment in Canada. Interim Guidance on Human Health Risk Assessment of Short-term Exposure to Carcinogens at Contaminated Sites.
36. Health Canada. 2017. Federal Contaminated Site Risk Assessment in Canada. Supplemental Guidance on Human Health Risk Assessment of Contaminated Sediments: Direct Contact Pathways. Prepared by Contaminated Sites Division, Safe Environments Directorate, Health Canada.
37. Health Canada. 2022. Guidelines for Canadian Drinking Water Quality. Water and Air Quality Bureau, Healthy Environments and Consumer Safety Branch, Health Canada, Ottawa, Ontario.
38. Health Canada. August 2017. Federal Contaminated Site Risk Assessment in Canada. Supplemental Guidance on Human Health Risk Assessment of Oral Bioavailability of Substances in Soil and Soil-Like Media).
39. Health Canada. March 2021. Federal Contaminated Site Risk Assessment in Canada. Preliminary Quantitative Risk Assessment (PQRA). Version 3.0.
40. Health Canada. March 2021. Federal Contaminated Site Risk Assessment in Canada. Toxicological Reference Values (TRVs). Version 3.0.
41. Province of BC. 2004. *Environmental Management Act* [SBC 2003] Chapter 53. Queen's Printer, Victoria BC.
42. Province of BC. Contaminated Sites Regulation. Queen's Printer, Victoria BC.
43. Science Advisory Board for Contaminated Sites (2010). Guidance for a Weight of Evidence Approach in Conducting Detailed Ecological Risk Assessments (DERA) in British Columbia.
44. Science Advisory Board for Contaminated Sites in British Columbia (2006). Guidance for Detailed Ecological Risk Assessment (DERA) in British Columbia.
45. Science Advisory Board for Contaminated Sites in British Columbia (2008). Detailed Ecological Risk Assessment (DERA) in British Columbia, Technical Guidance.
46. Society of Contaminated Sites Approved Professionals of British Columbia (CSAP). Practice Guidelines and Detailed Ecological Risk Assessment Policy Summary Documents.
47. Society of Contaminated Sites Approved Professionals of British Columbia (CSAP). Fall 2017 Members Update.
48. Society of Contaminated Sites Approved Professionals. 2016. Risk Management Decision Framework for BC Contaminated Sites Phase 2 – Guiding Principles for Applying Risk-based Standards to Ecological Receptors
49. Suter, G. W., II. 1993. Ecological Risk Assessment. Ann Arbor, MI: Lewis Publishers.
50. Suter, G.W. II. 2007. Ecological Risk Assessment, Second Edition. Boca Raton, FL. CRC Press,
51. Suter, G.W., II, R.A. Efroymson, B.E. Sample, and D.S. Jones. 2000. Ecological Risk Assessment for Contaminated Sites. Lewis Publishers.
52. USEPA (United States Environmental Protection Agency). April 1998. Guidelines for Ecological Risk Assessment. EPA/630/R-95/002F. EPA – You may look for Publication Number EPA 540-R-97-006

53. USEPA (United States Environmental Protection Agency). June 1997. Ecological Risk Assessment Guidance for Superfund: Process for Designing and Conducting Ecological Risk Assessments. Interim Final. EPA 540-R-97-006
54. USEPA (United States Environmental Protection Agency). March 2005. Guidelines for Carcinogen Risk Assessment. EPA/630/P-05/001F
55. USEPA (United States Environmental Protection Agency). January 2009. Risk Assessment Guidance for Superfund Volume I: Human Health Evaluation Manual (Part F, Supplemental Guidance for Inhalation Risk Assessment). EPA-540-R-070-002.
56. USEPA (United States Environmental Protection Agency). November 2003, revised March 2005. Guidance for Developing Ecological Screening Levels. OSWER Directive 9285.7-55.
57. USEPA December (1993) Wildlife Exposure Factors Handbook, EPA/600/R-93/187
58. USEPA Integrated Risk Information System (IRIS).
59. USEPA. 1999. Risk Assessment Guidance for Superfund, Volume 3 Process for Conducting Probabilistic Risk Assessment. EPA 540-R-02-002
60. USEPA. 1989. United States Environmental Protection Agency, Office of Emergency and Remedial Response, December 1989. Risk Assessment Guidance for Superfund, Volume I, Human Health Evaluation Manual (Part A), Interim Final. EPA/540/1-89/002.
61. USEPA. 1989. United States Environmental Protection Agency, Office of Emergency and Remedial Response, December 1989. Risk Assessment Guidance for Superfund, Volume I, Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment), Interim. EPA/540/R/99/005.
62. USEPA. 2002. USEPA Region 9 Biological Technical Assistance Group (BTAG) Recommended Toxicity Reference Values for Mammals.
63. USEPA. 2015. Determination of the Biologically Relevant Sampling Depth for Terrestrial and Aquatic Ecological Risk Assessments. EPA/600/R-15/176 ERASC-015F October 2015.
64. Washington State Department of Ecology.2021. Sediment Cleanup User's Manual SCUM.

NOTE:
Health Canada documents may be ordered by request to Health Canada at:
http://www.hc-sc.gc.ca/ewh-semt/contamsite/docs/index-eng.php

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