



NEED-TO-KNOW CRITERIA

Biosolids Land Application

A Need-to-Know Guide when preparing for the:

ABC Biosolids Land Application Certification Exam



The Associated Boards
of Certification

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Before You Dive In...

What is the Need-to-Know Criteria?

This **ABC Biosolids Land Application** Need-to-Know Criteria was developed to assist land appliers in understanding the content that will be covered in the ABC Biosolids Land Application exam. A methodical and comprehensive international investigation was conducted to determine the most significant job tasks performed by land appliers. The content covered on the exam represents the job tasks identified through this research as essential land applier competencies and is not limited to the practices of your site. The following pages organize these job tasks into Core Competency Job Areas and identify the amount of the test devoted to each area.

Is this Need-to-Know Criteria relevant to MY exam?

WPI offers a variety of standardized and customized exam services. This document is reflective only of the ABC Biosolids Land Application exam; older editions of the standardized exam and various customized exams are also administered by various certification programs. Please contact your certifying authority to determine whether they have implemented this exam for your program.

Exam Preparation Resources

Visit **gowpi.org** to access the formula/conversion table administered with this exam, a list of approved references, information on purchasing study guides available from partner organizations, and more.

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ABC Biosolids Land Application

Introduction

As part of the development of a biosolids land application certification program, Water Professionals International (WPI) conducted a national job analysis of land appliers in 2006. The purpose of the job analysis was to identify the essential job tasks performed by land appliers and the capabilities required to competently perform these job tasks. The results of this job analysis provided WPI with the foundation for the development of valid land application certification exams.

This **ABC Biosolids Land Application** *Need-to-Know Criteria* was developed from the results of WPI's national land appliers job analysis. The information in this document reflects the essential job tasks performed by land appliers and their requisite capabilities. This document is intended to be used by certification programs and trainers to help prepare land appliers for certification.

How the *Need-to-Know Criteria* Was Developed

Task Survey

WPI's Biosolids Task Force provided technical assistance throughout the job analysis process. This task force worked with WPI staff to develop the national job task survey. The task survey was sent to 381 land appliers throughout the United States and Canada; 203 of the surveys mailed were returned for a response rate of 53%.

In this survey, land appliers were asked to rate job tasks and required capabilities on rating scales for frequency of performance and seriousness of inadequate or incorrect performance. These two rating scales were used because they provide useful information (e.g., how critical each task is and how frequently each task is performed) pertaining to certification. The task survey also included a background information section where demographic data such as gender, age, ethnic origin, educational level attained, and work experience were collected. Space was provided at the end of the survey for appliers to list any important tasks performed on their job that were not included on the survey, and to make general comments.

Results

Survey respondents responsible for preparing the annual EPA Sludge Discharge Monitoring Report or who were responsible for calculating the biosolids agronomic loading rate were classified as Class II land appliers. All other survey respondents were classified as Class I. The mean, standard deviation, and the percentage of respondents performing each task statement at each class level were computed. The mean was used to determine the importance of items and the standard deviation was used to identify items with a wide variation in responses. The percentage of respondents performing each task statement was used to identify tasks and capabilities commonly performed by appliers throughout the United States and Canada.

A criticality value of 2 (mean seriousness rating) + mean frequency rating was calculated for each item on the survey. This formula gives extra weight to the seriousness rating in determining critical items and was appropriate because it emphasized the purpose of certification—to provide competent appliers.

ABC Biosolids Land Application

CORE COMPETENCY JOB AREAS

The WPI Biosolids Task Force reviewed the results of the task survey to identify the most important and commonly performed job tasks and capabilities for land appliers. Tasks and their requisite capabilities performed by at least 50% of the respondents and with a high criticality value were designated as core competencies. They were the most important and commonly performed job tasks and capabilities. The core competencies were considered the essential tasks and capabilities for land appliers.

The core competencies are clustered into the following job duties:



Communications and Outreach



Monitoring and Recordkeeping



New Site Evaluation



Equipment Operation



Nutrient Management System



Safety and Emergency Preparedness



Site Operation and Management

Two levels of certification are offered by WPI, with Class I being the lowest level and Class II the highest level. Class I covers material required for a field operator and Class II covers material required for a manager. The following pages list the core competencies for each class level of land applier. The level of knowledge (i.e., comprehension, application, analysis) required for each task is also identified in the following pages.

Comprehension is the most basic level of understanding and remembering. Items written at the comprehension level require examinees to recognize, remember, or identify important ideas.

Application level items require examinees to interpret, calculate, predict, use, or apply information and solve problems.

Analysis level items require examinees to compare, contrast, diagnose, examine, analyze, and relate important concepts.

The level of knowledge is a hierarchy from basic comprehension to analysis. The level of knowledge tested is cumulative. Therefore, tasks identified as application may include questions written at both the comprehension and application levels. Tasks identified as analysis may include questions written at the comprehension, application, and analysis levels.








ABC Biosolids Land Application Certification *Need-to-Know Criteria*

ABC Biosolids Land Application Certification Exams

The ABC Biosolids Land Application exams evaluate an applier’s knowledge of tasks required to be certified. The WPI Biosolids Task Force determined the content of each exam based on the results of the national job analysis. To pass an ABC Biosolids Land Application exam, an applier must demonstrate knowledge of these core competencies.

The specifications for the exams are based on a weighting of the job analysis results so that they reflect the criticality of tasks performed on the job. The specifications list the percentage of questions on the exam that fall under each job duty. For example, 8% of the Class I exam consists of questions relating to the job duty “Communications and Outreach” and its associated tasks and capabilities. For a list of tasks and capabilities associated with each job duty, please refer to the list of core competencies on the following pages.

EXAM SPECIFICATIONS

| CORE COMPETENCY JOB AREA | CLASS I | CLASS II |
|---|---------|----------|
|  COMMUNICATIONS AND OUTREACH | 8% | 16% |
|  NEW SITE EVALUATION | 13% | 17% |
|  NUTRIENT MANAGEMENT SYSTEM | 0% | 20% |
|  SITE OPERATION AND MANAGEMENT | 29% | 22% |
|  MONITORING AND RECORDKEEPING | 15% | 25% |
|  EQUIPMENT OPERATION | 22% | 0% |
|  SAFETY | 13% | 0% |



Communications and Outreach

| Job Tasks Required for Communications and Outreach | Class I | Class II |
|---|----------------------|----------------------|
| Communicate land application concepts to the public | Application | Analysis |
| Communicate responsibilities to the landowner/farmer | Comprehension | Analysis |
| Communicate with local officials and stakeholders | | Analysis |
| Communicate with media | | Comprehension |
| Communicate with regulatory agencies | Application | Analysis |
| Develop a complaint response plan | | Analysis |
| Develop public outreach and participation programs | | Comprehension |
| Obtain local support | | Analysis |
| Participate in local meetings | | Comprehension |
| Provide application report to landowner/farmer | | Analysis |
| Capabilities Required for Communications and Outreach | Class I | Class II |
| Ability to communicate in writing | | Required |
| Ability to communicate verbally | Required | Required |
| Ability to conduct meetings | | Required |
| Ability to interact constructively with others | Required | Required |
| Ability to translate technical language into common terminology | | Required |
| Knowledge of categories of beneficial use of biosolids | Required | Required |
| Knowledge of community groups affected by land application project | | Required |
| Knowledge of information available to increase public support and awareness | Required | Required |
| Knowledge of media relations | | Required |
| Knowledge of public relationship building techniques | | Required |
| Knowledge of stakeholders and contact information | Required | Required |



New Site Evaluation

| Job Tasks Required for New Site Evaluation | Class I | Class II |
|--|----------------|-----------------|
| Assess attitudes of landowner and neighbors | | Analysis |
| Assess nutrient requirements | | Analysis |
| Calculate acreage needed | | Analysis |
| Evaluate access to site | Comprehension | Analysis |
| Evaluate agricultural practices | | Analysis |
| Evaluate buffer zone requirements | Comprehension | Analysis |
| Evaluate compliance with regulations and permits | Comprehension | Analysis |
| Evaluate potential for odor impacts | Comprehension | Analysis |
| Evaluate site conditions | Comprehension | Analysis |
| Evaluate soil properties | | Analysis |
| Locate new application sites | | Analysis |
| Capabilities Required for New Site Evaluation | Class I | Class II |
| Ability to determine soil suitability for land application systems | | Required |
| Ability to express to others the benefits of biosolids application | Required | Required |
| Ability to interpret soils maps | | Required |
| Knowledge of conservation planning | | Required |
| Knowledge of effect seasonal high water table has on agricultural operations | | Required |
| Knowledge of information contained in soil survey | Required | Required |
| Knowledge of local area resident concerns | Required | Required |
| Knowledge of odor control techniques | | Required |
| Knowledge of odor sources and contributing conditions | Required | Required |
| Knowledge of regulatory and permit requirements | Required | Required |
| Knowledge of road and traffic constraints | Required | Required |
| Knowledge of types of soils and slope classes that would limit biosolids use | | Required |



Nutrient Management System

| Job Tasks Required for Nutrient Management System | Class I | Class II |
|---|----------------|--------------------|
| Collect Data to Develop Nutrient Management Plan | | |
| Biosolids nutrients | | Application |
| Calculation of available land application area | | Application |
| Crop rotations | | Application |
| Fertilizer recommendation for crops | | Application |
| Historic/projected crop yields | | Application |
| Nutrient credits from other sources | | Application |
| Precipitation and other water sources | | Application |
| Soils | | Application |
| Implement Nutrient Management Program | | |
| Determine agronomic rate of biosolids application | | Analysis |
| Develop a nutrient management plan | | Analysis |
| Develop maps (soils, topographic, site) | | Analysis |
| Estimate phosphorus in biosolids | | Analysis |
| Estimate plant available nitrogen in biosolids | | Analysis |
| Capabilities Required for Nutrient Management System | | |
| | Class I | Class II |
| Ability to calculate plant available nitrogen | | Required |
| Ability to determine realistic crop yield | | Required |
| Knowledge of available cooperative extension services | | Required |
| Knowledge of constituents that are easily leached through the soil | | Required |
| Knowledge of elements of a nutrient management program | | Required |
| Knowledge of forms of nitrogen found in biosolids and soils | | Required |
| Knowledge of impact of agricultural cropping practices on biosolids application | | Required |
| Knowledge of nitrogen cycle | | Required |
| Knowledge of nutrient movement in the environment | | Required |
| Knowledge of phosphorus management planning | | Required |
| Knowledge of role of vegetation in nutrient management | | Required |



Site Operation and Management

| Job Tasks Required for Site Operation and Management | Class I | Class II |
|--|----------------|-----------------|
| Calculate biosolids storage requirements | | Analysis |
| Clean up stockpile and staging areas | Application | Application |
| Comply with crop and grazing restrictions | Application | Application |
| Control off-site migration of biosolids | Application | Analysis |
| Coordinate operations with the landowner/farmer | Application | Analysis |
| Determine how to minimize odors | Application | Analysis |
| Determine method of application and application rates | | Analysis |
| Ensure compliance with site restrictions | Application | Analysis |
| Ensure even application of biosolids | Application | Application |
| Inspect site (pre, during, post) | Application | Analysis |
| Mark buffer zones and setbacks | Application | Application |
| Minimize field impact from vehicles | Application | Application |
| Monitor weather conditions | Application | Analysis |
| Obtain regulatory approval for land application site | | Analysis |
| Plan haul route | Comprehension | Analysis |
| Prepare annual land application plan | | Analysis |
| Prepare spill response plan | | Analysis |
| Restrict public access as required | Application | Analysis |
| Select stockpiling areas | | Analysis |
| Store biosolids after treatment and prior to land application | Application | Application |
| Treat sludge prior to land application | Comprehension | Application |
| Capabilities Required for Site Operation and Management | Class I | Class II |
| Ability to acquire meteorological data | Required | Required |
| Ability to calculate nutrient application rate | | Required |
| Ability to calibrate equipment | Required | Required |
| Ability to determine biosolids application rate | | Required |
| Ability to identify and correct uneven application | Required | Required |
| Ability to perform mathematical calculations and physical measurements | Required | Required |
| Ability to read and interpret maps | Required | Required |
| Knowledge of agronomy pertaining to soil management and crop production | | Required |
| Knowledge of application methods | Required | Required |
| Knowledge of best management practices | Required | Required |
| Knowledge of characteristics of biosolids that are suitable for land application | Required | Required |
| Knowledge of common nutrients found in biosolids | Required | Required |
| Knowledge of conservation practices | | Required |
| Knowledge of crops used in land application | Required | Required |
| Knowledge of effects of seasons, weather, and soil conditions on operations | Required | Required |
| Knowledge of materials that cannot be permitted for land application | Required | Required |

| Capabilities Required for Site Operation and Management | Class I | Class II |
|--|----------------|-----------------|
| Knowledge of odor sources and odor control techniques | Required | Required |
| Knowledge of pathogen reduction | | Required |
| Knowledge of permit requirements | Required | Required |
| Knowledge of pollutants that may be present in biosolids | Required | Required |
| Knowledge of regulatory approval process | | Required |
| Knowledge of soil compaction | Required | Required |
| Knowledge of sources of wastewater solids | Required | Required |
| Knowledge of spill response procedures | Required | Required |
| Knowledge of types of biosolids | | Required |
| Knowledge of requirements for temporary biosolids storage | Required | Required |
| Knowledge of site restrictions for Class A and B biosolids | Required | Required |
| Knowledge of vector attraction reduction | Required | Required |



Monitoring and Recordkeeping

| Job Tasks Required for Monitoring and Recordkeeping | Class I | Class II |
|--|---------------|-------------|
| Sampling | | |
| Prepare written sampling plan | | Analysis |
| Preserve and ship samples | Application | Application |
| Sample soil for nutrient status and pH analysis | Application | Application |
| Select laboratory to conduct analyses | | Analysis |
| Monitoring | | |
| Monitor crop response for nutrient status | | Application |
| Monitor land conditions for erosion | | Application |
| Monitor nutrient content in biosolids | | Application |
| Monitor pathogen concentrations in biosolids | | Application |
| Monitor pathogen reduction | | Application |
| Monitor pH in biosolids | | Application |
| Monitor pH in soils | | Analysis |
| Monitor pollutant concentration in biosolids and soils | | Application |
| Monitor vector attraction reduction | | Application |
| Prepare written monitoring procedure | | Analysis |
| Recordkeeping and Reporting | | |
| Develop a noncompliance reporting procedure | | Analysis |
| Maintain records | Comprehension | Analysis |
| Provide reports to regulatory authority | | Analysis |
| Record data | Application | Application |
| Report emergencies, spills, or failures | Application | Application |
| Capabilities Required for Monitoring and Recordkeeping | | |
| | Class I | Class II |
| Ability to interpret laboratory results | | Required |
| Ability to read charts and graphs | Required | Required |
| Ability to review reports | | Required |
| Ability to transcribe data | Required | Required |
| Knowledge of biosolids sampling procedures and handling requirements | | Required |
| Knowledge of biosolids testing requirements | | Required |
| Knowledge of chain of custody procedures | Required | Required |
| Knowledge of enforcement powers for violations of permits | Required | Required |
| Knowledge of EPA concentration limits for trace elements | | Required |
| Knowledge of federal sampling frequency requirements | | Required |
| Knowledge of general chemistry | | Required |
| Knowledge of local, state and federal biosolids regulations | Required | Required |
| Knowledge of recordkeeping purpose, procedures, and requirements | Required | Required |
| Knowledge of site life or maximum cumulative pollutant loading | Required | Required |
| Knowledge of soil sampling procedures and sample handling requirements | Required | Required |
| Knowledge of soil testing requirements | | Required |



Equipment Operation

| Job Tasks Required for Equipment Operation | Class I | Class II |
|---|----------------|-----------------|
| Calibrate land application equipment | Analysis | Analysis |
| Check field conditions | Analysis | Analysis |
| Clean equipment | Application | Application |
| Deliver biosolids to farm fields | Analysis | Analysis |
| Load biosolids into application vehicles | Application | Application |
| Modify application rate | Application | Analysis |
| Operate general farm implements and spreading equipment | Application | Application |
| Perform equipment preventive maintenance | Analysis | Analysis |
| Capabilities Required for Equipment Operations | Class I | Class II |
| Ability to adjust equipment | Required | Required |
| Ability to determine biosolids application rate | | Required |
| Ability to determine which application equipment to use | | Required |
| Ability to identify categories of land application equipment | Required | Required |
| Ability to identify best method of application for a site | Required | Required |
| Knowledge of effect of equipment on soil conditions | Required | Required |
| Knowledge of general mechanical/electrical principles | Required | Required |
| Knowledge of highway regulations | Required | Required |
| Knowledge of tillage equipment | Required | Required |
| Knowledge of unacceptable biosolids at surface after subsurface injection | Required | Required |



Safety

| Job Tasks Required for Safety | Class I | Class II |
|---|----------------|-----------------|
| Analyze safety conditions | Analysis | Analysis |
| Demonstrate safe work habits | Application | Application |
| Develop standard operating procedures | Comprehension | Analysis |
| Provide and maintain a safe workplace for employees | Analysis | Analysis |
| Provide safety training to employees | Comprehension | Analysis |
| Capabilities Required for Safety | Class I | Class II |
| Ability to identify and safely enter confined spaces | Required | Required |
| Ability to identify fire hazards | Required | Required |
| Ability to interpret Safety Data Sheets | Required | Required |
| Knowledge of applicable OSHA regulations | Required | Required |
| Knowledge of components of a site safety program | Required | Required |
| Knowledge of hazards and injuries associated with land application sites | Required | Required |
| Knowledge of personal hygiene practices | Required | Required |
| Knowledge of Personal Protective Equipment | Required | Required |
| Knowledge of risks and safety procedures regarding hydraulic systems | Required | Required |
| Knowledge of safety considerations associated with pressure/vacuum systems | Required | Required |
| Knowledge of safety precautions that must be used around application vehicles | Required | Required |
| Knowledge of spill prevention and cleanup | Required | Required |

References

The following are approved as reference sources for the ABC Biosolids Land Application examinations. Land appliers should use the latest editions of these reference sources to prepare for the exam.

Class I and II Exams

California State University, Sacramento (CSUS) Foundation, Office of Water Programs

- *Operation of Wastewater Treatment Plants, Volume II*

To order, contact: **Office of Water Programs**
California State University, Sacramento
6000 J Street
Sacramento, CA 95819-6025
Website: www.owp.csus.edu
Phone: (916) 278-6142
Fax: (916) 278-5959
E-mail: wateroffice@csus.edu

Code of Federal Regulations

- *Title 40, Part 503: Standards for the Use or Disposal of Sewage Sludge*

Available online at: <https://www.ecfr.gov/current/title-40/chapter-I/subchapter-O/part-503>

National Biosolids Partnership

- *National Manual of Good Practice for Biosolids*

Available online at: <https://www.wef.org/contentassets/d06e8efba3d14274ade7dfd3258188ed/manual-of-good-practice-for-biosolids-v2011.pdf>

U.S. Environmental Protection Agency

- *A Plain English Guide to the EPA Part 503 Biosolids Rule*

Available online at: <https://www.epa.gov/biosolids/plain-english-guide-epa-part-503-biosolids-rule>

- *Environmental Regulations and Technology: Control of Pathogens and Vector Attraction in Sewage Sludge*

Available online at: <https://www.epa.gov/biosolids/control-pathogens-and-vector-attraction-sewage-sludge>

- *Land Application of Sewage Sludge*

Available online at: <https://www3.epa.gov/npdes/pubs/sludge.pdf>

- *Process Design Manual – Land Application of Sewage Sludge and Domestic Septage*

Available online at: <https://www.epa.gov/biosolids/process-design-manual-land-application-sewage-sludge-and-domestic-septage>

References

Water Environment Federation

- *Design of Municipal Wastewater Treatment Plants – MOP 8, Volume 3: Solids Processing and Disposal*
- *Survival Guide: Public Communications for Water Professionals*

To order, contact: **Water Environment Federation**

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Alexandria, VA 22314-1994

Website: www.wef.org

Phone: (800) 666-0206

Fax: (703) 684-2492

E-mail: pubs@wef.org

Class II Exams Only

Washington State Department of Ecology

- *Managing Nitrogen from Biosolids*

Available online at: <https://apps.ecology.wa.gov/publications/documents/99508.pdf>

The Water Research Foundation

- *Estimating Plant-Available Nitrogen in Biosolids*

Available online at: <https://www.waterrf.org/resource/estimating-plant-available-nitrogen-biosolids-0>

- *Public Perception of Biosolids Recycling: Developing Public Participation and Earning Trust*

Available online at: <https://www.waterrf.org/research/projects/public-perception-biosolids-recycling-developing-public-participation-and-earning>

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