Final Report

to

STATE OF ALASKA
DEPARTMENT OF ENVIRONMENTAL CONSERVATION
DIVISION OF SPILL PREVENTION AND RESPONSE

TECHNICAL REVIEW OF SECONDARY CONTAINMENT SYSTEM TECHNOLOGY FOR ALASKA

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1. INTRODUCTION

This report is intended to be a reference document for performing technical reviews of external secondary containment systems for spill prevention at above ground oil storage tank facilities in Alaska. This report provides:

- ❑ A general review of the types of secondary containment systems that might be used or proposed at a particular facility, including pros and cons;
- ❑ A review of technical issues that are important for the design and construction of a secondary containment system in Alaska, including a detailed list of technical information for a variety of systems;
- ❑ A discussion of failure mechanisms, maintenance, inspection, and testing issues that are important for monitoring the performance of a system;
- ❑ A list of additional information that may be required to conduct a complete evaluation of a specific secondary containment system.

Regulators, operators, and other interested parties should find the report useful for several purposes. By studying this report, the reader will become familiar with the concept of secondary containment and the variety of materials and techniques that may be used, individually or in combinations, to contain a spill. The technical and performance information herein will allow regulators to determine if enough information is provided in an Oil Spill Contingency Plan to evaluate the sufficiency of the system, and if the operator has adequately planned to maintain a functional system. Operators will be able to identify a variety of alternatives that could be used to provide secondary containment, and the technical issues that need to be addressed during the design, construction, and operation of the system.

While useful for designing or evaluating secondary containment systems, this report is not intended to be a complete listing of all design, construction, or operation considerations that may need to be addressed, or lead to a specific conclusion regarding the acceptability of an existing or proposed system for meeting the intent of any regulations. The reader is advised to consult an experienced professional engineer, in cooperation with the appropriate regulatory agency familiar with the actual conditions at the proposed site, for specific designs or evaluations.

1.1 Background

Effective May 14, 1992, the Alaska Department of Environmental Conservation (ADEC) implemented comprehensively revised oil pollution prevention regulations under 18 AAC 75. These regulations required regulated industry operators to comply with secondary containment provisions as soon as possible, but no later than January 1, 1997. However, operators were allowed to pursue alternate compliance schedules if they could demonstrate substantial cause for the delay in implementation. Waivers of certain requirements were

offered if an operator could demonstrate that an equivalent level of protection could be achieved using a technology or procedure other than that required by the regulations.

18 AAC 75 requires secondary containment systems to be sufficiently impermeable to the substance being stored to protect groundwater from contamination and to contain a discharge until it can be detected and cleaned up. This performance based standard left some operators uncertain whether their existing system met the intent of the regulations, and left other operators faced with significant economic burdens in order to comply.

Consequently, a number of owners and operators chose to pursue alternate compliance schedules and attempted to demonstrate that their existing systems met the intent of the regulations. Others questioned the effectiveness of the regulations and lobbied for their repeal. Some owners argued that they would incur additional problems as a result of compliance.

In late 1993, the ADEC initiated an external workgroup that consisted of governmental agencies, industry owners and operators, and other interested parties. The purpose of the external workgroup was to discuss the issues surrounding the secondary containment requirements, and determine the best approach to resolving the problems that were identified. A result of this workgroup was an ADEC contract to develop a guidance document to assist the industry in complying with the secondary containment regulations. However, the contract was not satisfactorily completed and it was terminated in April of 1995.

The ADEC then assembled an internal workgroup that consisted of members of various programs within the agency that were interested in resolving the secondary containment issues. Consequently, the ADEC developed the "White Paper on Secondary Containment" dated March 11, 1996 (White Paper), to respond to concerns over the secondary containment requirements, examine alternative solutions, and present a recommended course of action for the Department. The White Paper concluded that the current regulations provide the desired level of environmental protection and provide sufficient flexibility to address the problems faced by the industry. It was recommended that the current regulations be retained and that guidance documents be prepared to address areas of confusion and clarify the options available for compliance.

The ADEC was then faced with performing technical evaluations of various alternatives proposed by operators to provide a sufficiently impermeable secondary containment system or an equivalent level of protection. To assist in this effort, the ADEC awarded a contract to Golder Associates Inc. (GAI), under which this report has been prepared, to conduct research and perform a technical review of secondary containment systems with an emphasis on impermeability and durability issues. The purpose of this review was to develop technical information about a variety of secondary containment systems at both existing facilities and at potential future facilities in order to provide the ADEC and storage tank owners and operators with a reference document on secondary containment systems. This report is the product of that review. A brief discussion of the major elements of this

report follows, including a guide on how to use this report, as well as a discussion on the scope and limitations of its use.

1.2 Elements of Report

Section 1, Introduction contains a preview of the report, a review of the background of issues surrounding secondary containment systems in Alaska, and the scope and limitations of this report.

Section 2, Types of Secondary Containment Systems presents a discussion of secondary containment systems used in Alaska, a description of typical and alternative materials used in key components of secondary containment systems, and a discussion of secondary containment systems that utilize a remote storage system.

Section 3, Technical Issues for Secondary Containment Systems in Alaska contains discussions about design, construction, operation and maintenance issues that are important or unique to Alaska.

Section 4, Performance Monitoring contains discussions about potential failure mechanisms, maintenance issues, inspections, and testing for secondary containment systems.

Section 5, Secondary Containment System Evaluation lists additional information that may be required to evaluate a secondary containment system for compliance with State of Alaska regulations.

Section 6, References contains a description of the research methodology and a listing of reference documents used in the development of this report.

Appendix A contains individual technical detail sheets (TDS) for each of the materials discussed in Section 2. These sheets provide a limited amount of specific information for issues discussed in Section 3 and 4.

Appendix B contains definitions of “impermeable” and “sufficiently impermeable” from State of Alaska regulations.

Appendix C contains a checklist for a visual inspection of a secondary containment system.

1.3 Guide to Use of This Report

Secondary containment systems often consist of several different types of materials that are assembled in various configurations to produce a system that is designed to contain a spill from a storage tank. Consequently, a variety of systems could be assembled to accomplish secondary containment. In order to conduct a limited technical review in an objective

manner, this report differentiates secondary containment systems based on categories of materials or methods used to provide the barrier to the migration of liquids that spill from the storage tanks or piping within the secondary containment area. If more than one type of material or method is used in a particular secondary containment system, the reader must assemble the various technical discussions contained in this report into a specific review of the particular system. This idea is discussed in additional detail in Section 2.

The categories of secondary containment system materials that are reviewed in this report are listed on Table 1. Section 2 contains a general discussion of each category of material, including a list of the pros and cons of using the material in a secondary containment system. Table 2 contains a matrix that indicates the technical and performance items that are especially important for each of the categories of secondary containment system materials that are listed on Table 1 and reviewed in Section 2. Appendix A contains a Technical Detail Sheet (TDS) for each of these materials.

The TDS for a particular category of material provides succinct information for the applicable technical and performance items indicated on Table 2. After reading the general discussion presented in Section 2, the reader can scan Table 2 to see which technical and performance items are critical for that material. Additional information can then be obtained by referring to the appropriate section of the particular TDS.

Detailed discussions of technical and performance considerations for secondary containment systems in Alaska are discussed in Sections 3 and 4, respectively. Other information that may be required in order to perform a complete evaluation or design is listed in Section 6.

1.4 Scope and Limitations of Report

The scope of this report involved the following three primary tasks:

- ❑ Conduct a technical review of the various secondary containment system technologies currently in use in Alaska, including a review of design, construction, operation, and maintenance issues for the system.
- ❑ Conduct research to find alternative secondary containment systems that have not yet been used in Alaska and conduct a technical review of the alternatives.
- ❑ Compile information that may be useful for monitoring the performance of secondary containment systems over the passage of time.

This scope of work was clarified by the ADEC after a preliminary report prepared by GAI that consisted of a review of the work completed to date by the ADEC regarding secondary containment system impermeability issues, and a summary of the work proposed to complete the contract. GAI and the ADEC worked closely together in several meetings as

the project developed in order to keep the development of this report in line with the expectations and needs of the ADEC.

Some limitations on the depth and applicability of this report became apparent as the project developed. Because of the large variety of materials used in the components of a secondary containment system, and the number of combinations of components that may be assembled, this report looks at the various secondary containment systems based on the unique attributes of the portion of the system used as a barrier to the migration of a spilled liquid.

Certain aspects of secondary containment systems for tank farms have been excluded from the review, either because the information is readily available and easily applied, or because the elements are sufficiently complex and technical to be beyond the scope of this report. Those aspects specifically excluded from the scope of work include the following:

- ❏ Tank farm secondary containment system configurations necessary to meet codes such as National Fire Protection Association (NFPA) 30, Uniform Fire Code or other regulations;
- ❏ Double walled or diked steel tanks;
- ❏ Double bottomed tanks, or internal or external tank coatings or linings;
- ❏ Secondary containment systems for underground storage tanks;
- ❏ Secondary containment systems for offshore facilities.

As previously mentioned, this report is intended to be a reference document to assist in performing technical reviews of external secondary containment systems for above ground oil storage tanks. While useful for designing or evaluating secondary containment systems, it is not intended to be a complete listing of all design, construction, or operation considerations that may need to be addressed, or lead to a specific conclusion regarding the acceptability of an existing or proposed system for meeting the intent of any regulations.

1.5 Disclaimer

This reported is not intended to endorse, recommend, or approve of any of the materials, methods, illustrations, or concepts for providing secondary containment at a storage tank facility that are represented herein. No warranty regarding suitability of purpose is expressed or implied.