

20. Fire Safety Plan and Code Summary
Referencing NFPA 1 and Fire
Department Technical Standards

Summary of Fire Safety

(referencing Section 3 of the City's Technical Manual)

3.1 *Not Applicable*

3.2 Fire Hydrant Standards

- 3.2.1 There are two private fire hydrants located within 150 feet of where the project work will occur. See attached Existing Conditions Survey.
- 3.2.2 Hydrants meet the standards of city code Chapter 10 and Portland Water District Standards.
- 3.2.3 The private hydrant will be properly maintained by the Owner.

3.3 Not applicable

3.4 Site Access Standards

- 3.4.1 Not applicable
- 3.4.2 Not applicable
- 3.4.3 Not applicable
- 3.4.4 Not applicable
- 3.4.5 Site access will maintain minimum of 9' clearance height to accommodate ambulance access.
- 3.4.6 Not applicable
- 3.4.7 Not applicable

3.5 Standards for Emergency Access Lanes & Gates

- 3.5.1 Inside turning radii at Fire Dept. access roads will be 25' or greater.
- 3.5.2 Outside turning radii at Fire Dept. access roads will be 100' or greater.
- 3.5.3 Emergency access lanes will be greater than 20' in width.

3.5.4 Emergency access lanes will be engineered to handle the weight of emergency vehicles at all times of year.

3.5.5 Proper no parking signs will be posted where need at designated fire lanes.

3.5.6 Not applicable

3.5.7 Not applicable

3.5.8 Not applicable

3.5.9 Not applicable

3.5.10 Emergency lanes will be maintained at all times. The owner will complete a written access maintenance agreement with the city if required by the reviewing authority.

3.5.11 Not applicable

3.6 Subdivision Standards

Not applicable

3.7 Standards for Blasting and Regulation of Explosives

Reserved

NFPA 101 2006 Life Safety Code

Not applicable (no building constructed)

The following document addresses NFPA 1 and is brought forward from the existing fire safety plan at the IMT. Please note that by removing the existing Maintenance Building near the waterfront, this project will create a wide open space for access and clearer travel lanes to the wharf.



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Date: 28 October, 2011

Memo Report

From: W. Mark Cummings, P.E.
To: Mr. Patrick Arnold; Maine Port Authority
CC: Mr. John Henshaw; Maine Port Authority
Subject: **Fire Safety Assessment of the International Marine Terminal, Portland, ME.**

A review of the proposed site layout/construction for the new International Marine Terminal (IMT) in Portland, ME was conducted on 10 October, 2011. The purpose of this site review and discussions with personnel from the Maine Port Authority and both the design and construction firms, HNTB and Keville Enterprises, responsible for the ongoing upgrade to the IMT was to evaluate the proposed operations and assess the potential fire hazards that may be associated with the planned operations. A primary focus for this assessment is the fact that the IMT is currently handling and temporarily storing bulk containers of ethanol that are moving through the port.

Background

The Portland IMT site is currently being upgraded from its former operations as a (primarily) terminal in support of passenger ferry (Scotia Prince) operations. The site is now to be configured to primarily support the receipt, temporary storage, and shipment of bulk containers of a variety of cargo/materials. The site improvements are being designed by HNTB Corporation of Westbrook, ME, along with the Construction Management services of Keville Enterprises of Augusta, ME. This fire safety assessment is based on the design documents provided by HNTB and discussions with the Maine Port Authority personnel regarding the planned operations for the IMT.

Due to the fact that the IMT has recently been approved/certified (by the USCG) to handle bulk containers of flammable liquids (ethanol) it was determined that there was a need to address the overall fire safety requirements as part of the upgrades to the IMT. These requirements will address not only the planned (temporary) storage location for the flammable liquid containers, but also to ensure that adequate fire protection is provided throughout the IMT site.

The operations being performed at the Portland IMT are generally of an industrial nature, with only a limited number and type of potential fire hazards. This is primarily due to the fact that the port's primary operations consist of the loading and offloading of bulk storage containers; both for dry goods and liquids. Under normal operations, none of the contents of these containers are directly exposed to these operations or the ambient environment. As such, unless the containers themselves become damaged, the fire risk associated with any container is relatively low, regardless of the combustibility/flammability of the specific contents, since the contents are isolated from any potential, external ignition source. However, it is this potential for the containers to be damaged that results in the need to continue to consider and implement measures to mitigate any fire risks that may be associated with the materials being transported within the various containers.

The general fire protection requirements outlined by the National Fire Protection Association (NFPA) for facilities such as the Portland IMT are based on both the specific operations being conducted at the facility

and the expected types of materials that are being handled. Based on the information provided during discussions with the Maine Port Authority personnel, it is understood that no materials that would meet the NFPA's (or Department of Transportation's) definition of "hazardous materials" are being handled at the Portland IMT; at least at this point in time. Equally, it is understood that the only flammable liquid that is scheduled to pass through the IMT is ethanol. Should this change and other hazardous or flammable materials are to be handled at this site, it is likely that additional fire and life safety protection measures would need to be implemented.

Fire Hazards

In general, it is understood that the majority of shipping containers that are to be handled by the Portland IMT are of the "standard" bulk intermodal container type; the majority of which contain dry goods/materials or smaller, pre-packaged containers of liquids. The fire risk associated with these containers is typically considered to be low, due to the fact that even if the container itself is damaged and it does contain some combustible or flammable contents, these would not necessarily pose a significant fire threat due to the individual packaging of the contents; thereby minimizing the potential for involvement, at least initially, of all the material(s) being transported, even if a fire is initiated.

The likely worst-case fire event for the Portland IMT would be one involving a flammable liquid container. Ethanol is classified as a Class IB flammable liquid, as defined by NFPA 30, the *Flammable and Combustible Liquids Code*. This classification stems from the fact that ethanol has flash point of approximately 14°C (57°F), with a boiling point of approximately 78°C (172°F). Although flammable, ethanol is not considered to be a "hazardous" material as defined by the codes. This fact greatly improves the level of "flexibility" associated with how and where the containers can be stored, along with minimizing some of the protective measures needed.

In general, the greatest likelihood for fire risk involving the flammable liquid containers is not while they are at their stored location, but during the offloading/loading operations. Each flammable liquid container holds up to 6200 gallons of ethanol. The most significant fire event involving these containers would be one whereby the entire contents of one of the ethanol containers was released and ignited. This could occur during one of the offloading/loading operations whereby a failure occurs that causes a container to be dropped, resulting in the penetration of both the outer and inner shell. While this potential may be small, given the construction of the shipping containers, it should be considered as possible. If this occurred in the vicinity of an ignition source, the result could be a "pool" fire of a significant magnitude that could then represent a severe fire exposure to surrounding containers; whether other flammable liquid containers or the standard bulk containers.

Should the flammable liquids containers be exposed to the thermal insult from an adjacent fire, the ethanol would eventually begin to boil, thereby increasing the internal pressure of the container. Each container is provided with a pressure relief vent, which will maintain the internal pressure of the tanks to slightly above atmospheric. If the flammable vapors being released via the relief vents are exposed to the flaming regions of an adjacent fire, they would likely be ignited, resulting in "flares" at the exit point of the vent. As long as the vents can adequately maintain the internal tank pressures below that which might cause the tank to rupture, these flares would not likely pose an additional fire risk and once the tank(s) can be cooled, should be readily extinguished by manual firefighting operations. Equally, should such a fire scenario involve adjacent dry bulk containers that have quantities of flammable or combustible materials inside, there is the potential that these contents could become involved if they are not sufficiently cooled to prevent failure of the container's shell, thereby directly exposing the internal materials, or to prevent a sufficient transmission of heat through the container's shell that could result in the ignition of the materials within.

There are no other known activities or materials that are associated with the port's operations that are considered to pose any other notable fire risk. The site does include a Maintenance Building, which is ostensibly used to maintain the operational status of the various equipment that is used throughout the IMT.

It is possible that there will be maintenance activities within this facility that do pose a fire risk. However, these are likely to be relatively “local” in nature and of the type that are often extinguished using portable extinguishers. The building is known to have no (active) installed fire suppression system, but even if a fire occurs that is beyond the capabilities of a portable extinguisher or occurs when the building is unmanned, the building is adequately separated from the surrounding container storage areas such that it would not represent an exposure threat to any of the adjacent stored containers. The building is provided with an installed fire detection system and should a fire occur, fire department notification should occur within sufficient time to ensure early manual intervention.

Review and Assessment of Code & Standards Requirements

Although a number of sources have been used in support of the overall fire hazard assessment associated with the IMT operations, the primary fire protection requirements that are discussed below are those outlined by the applicable code requirements; including those contained in:

- The City of Portland Code of Ordinances, Chapter 10, *Fire Prevention and Protection*
- NFPA 1, *Fire Code*
- NFPA 30, *Flammable and Combustible Liquids Code*
- NFPA 307, *Standard for the Construction and Fire Protection of Marine Terminals, Piers, and Wharves*

The applicable chapters of NFPA 307 represent the primary source of most of the fire protection requirements for the Portland IMT site. However, since this standard does not specifically address fire protection requirements associated with the storage of flammable liquids, NFPA 30 was used to supplement any requirements specific to the presence of these materials. NFPA 1 was reviewed, but in general, the requirements within this code, applicable to the IMT, simply mirror those of NFPA 30 and 307. The Fire Prevention and Protection chapter of the City of Portland’s ordinances was also reviewed, but again, did not impose any additional requirements beyond those of NFPA 30 and 307. It should be noted that the City’s ordinances do currently include a restriction on the maximum size of flammable liquid storage containers. However, the sections cited by these ordinances are not applicable to Marine Terminals and the referenced requirements outlined in the ordinance are not applicable to the type of containers “stored” at the IMT site. The types of portable containers that are mostly addressed by these referenced requirements are not of the same design as those of the intermediate bulk shipping containers. Other sections of both NFPA 30 and NFPA 1 (chapter 66) are applicable to the types of containers used for shipping the ethanol and have been used as part of this assessment to determine the appropriate fire protection measures. The current requirements of the City Ordinances will need to be addressed in some fashion by the applicable officials and should be updated to reflect the types of operations that are occurring at the IMT, along with the citation of the applicable code requirements that ensure the appropriate fire safety measures are being implemented.

A significant aspect of the fire protective measures for a marine terminal is having access to adequate firefighting water. This fact is exhibited in the requirement that fire hydrants connected to an adequate water supply be installed throughout the marine terminal yard. Currently, the IMT is provided with only two fire hydrants. The current construction plan has a requirement to relocate these two hydrants, but this would still be inadequate to support the requirements outlined within NFPA 307, Chapter 7. This requires that a sufficient number of hydrants be located throughout the IMT site, such that the spacing between hydrants does not exceed 300 ft, nor that any “dead end” area be more than 150 ft from the nearest hydrant. Based on a review of the current plan for the IMT, it is anticipated that as a minimum, six (6) hydrants will need to be installed throughout the IMT yard area, along with crediting the fact that two (2) additional hydrants are available, immediately adjacent to the IMT on the west side of Commercial St.

Associated with the hydrant spacing requirements is the need to ensure adequate access to the entire yard area by firefighting equipment (trucks) is available. The standards require fire lanes of at least 20 ft in width that will provide access to all areas of the site. The planned design/layout of the storage yard at the IMT includes truck lanes (spacing between storage “groups”) that far exceed this requirement. Since the site is a

protected area, access into the yard area must be accomplished via the two security gates that are accessible from Commercial Street. During discussions with the Portland Fire Department, it was decided that Knox boxes would be provided at both gates, each of which would contain the necessary key card to facilitate the opening of the security gates.

NFPA 307 also has a requirement for ensuring fire department “notification” of an emergency. However, no specific means is mandated by which this must occur. The only restriction is that coin-operated telephones would not meet the standard’s requirements. Ultimately, the Maine Port Authority will need to determine, and should then proceduralize, the means to be used by IMT personnel to report an emergency. Although cell phones are prevalent, if it cannot be guaranteed that all personnel working on site will have these devices, then other means should be provided; including the use of radios to contact the IMT security or operations personnel, who could then relay to the fire department. Another option may be to install external manual pull stations that are connected to the Terminal Building’s fire alarm system.

Associated with the notification requirement, NFPA 307 also has a requirement for a “Fire Organization.” This is primarily having a program that is documented and includes the assignment of personnel that are trained to monitor the installed fire protection systems and equipment, thus ensuring that they are properly maintained and operational. This includes the requirement for the site to maintain an International Shore Connection that can be used to provide firefighting water to a ship that is alongside the Terminal’s pier. The site’s fire prevention program/regulations must also include restrictions on potential fire ignition sources. This includes restrictions on smoking and/or open flames within 50 ft of any areas that involve the handling and storage of any flammable or combustible materials. Equally, if any hot work may be performed within the Maintenance Building, or any other area within the IMT site, this too must be no closer than 100 feet of any operations (including storage) involving flammable or combustible materials. Currently, the planned design/layout of the storage groups is such that the closest point of storage is approximately 85 feet from the Maintenance Building. Any such storage areas that are within 100 ft of the Maintenance Building should be specifically designated for only containers that are known to contain no flammable or combustible materials.

NFPA 30 contains specific requirements on the separation of flammable liquids storage containers from adjacent buildings, public ways, and property lines. The actual separation distances are a function of both the classification of the flammable/combustible liquid and the capacity of the storage container. As outlined above, ethanol is classified as a Class IB flammable liquid. The ethanol shipping containers located at the Portland IMT have a capacity of 6200 gallons. Although it is anticipated that no more than 20 containers (124,000 gal.) will be on site at the IMT at any point in time, the codes do not have specific restrictions based on the total number of containers being stored. This quantity will primarily impact only the amount of storage area required to be designated to accommodate the storage of all flammable liquid containers. Given the size of the containers being used for the ethanol, the codes require that only a five (5) foot separation be maintained between these containers and any building on the site and a thirty (30) foot separation from any property line that could be built upon. It should be noted that the primary function of these codes is to provide the minimum requirements that are designed to protect the public and do not necessarily reflect what may be prudent to also protect property at the same location.

NFPA 30 also includes a requirement to provide protection against “spillage.” This section of the code is not really intended to address the temporary storage of shipping containers. Shipping containers such as those being used for the ethanol are approved by the Department of Transportation and have been specifically designed to meet requirements associated with safe transport, including reducing the potential for a spill, should the container be damaged. In this instance, the containers are of a double-wall design and are housed within a steel frame that accommodates their transport using standard intermodal systems. Both of these features provide a level of protection that is beyond the typical containers addressed within this section of NFPA 30. However, part of the protection scheme within NFPA 30 does include the use of a graded site that facilitates the flow of any spillage away from the storage container(s). This greatly reduces

the risk of fire exposure to all stored containers should one of the flammable liquids containers become damaged and release its contents, which are then ignited. Typically, this would be designed such that the liquid moves to a designated storage basin that contains the liquid from further spread until it is collected. However given that ethanol is not hazardous and will quickly be diluted, it is not really necessary that it be “contained” for future disposal. The IMT site plan includes a series of catch basins that are primarily designed to remove ground water from the storage area. This same grading plan can be used to improve the fire safety associated with storing the ethanol. The location that is designated for the ethanol storage should be such that should a spill occur, any ethanol will move away from the storage container(s), thereby minimizing any potential for a subsequent fire to expose other storage containers. Since ethanol is not a hazardous liquid and has no known environmental impacts, should a spill occur, this approach should not have any detrimental environmental impacts if the liquid enters the site’s drainage system. The ethanol will quickly be diluted by any other ground water to which it is exposed. This too will rapidly reduce its flammability/combustibility properties.

Summary and Recommendations:

In general, the overall plan for upgrades to the Portland IMT site appears to address many of the required physical attributes needed to support adequate fire protection. The two primary exceptions are the need to provide additional fire hydrants throughout the site and to provide a specific area to be designated for the ethanol storage. These and other recommended fire protection measures are addressed in the recommendations below to ensure that the Portland IMT adequately complies with all fire protection requirements associated with the operation of a Marine Terminal.

Based on the results of this assessment, including the site inspection, the following recommendations are provided:

1. Provide a designated area that is properly marked with signage for storing the flammable liquids containers. It is recommended that a location within the east storage/parking area that is immediately adjacent to the pier access point be designated; see attached drawing. This area would ensure that the ethanol is remote from any building, is relatively close to the pier area to reduce the transit distance from ship to storage location, and will also facilitate access to the storage container location by Portland’s Fire Boat, should the need exist to provide firefighting or cooling water from this venue. This area meets all separation requirements and provides the best access for the Fire Department, using all firefighting equipment available. This area appears to also provide the proper site to allow any spillage, should a container be damaged, to flow away from the storage area, but not directly toward the water, pier, building, or other storage areas. It is also recommended that this same (general) location be used to store empty flammable liquids containers. This will ensure that any potential for error for improperly storing a full container is minimized.
2. Install sufficient numbers of fire hydrants throughout the IMT site to provide adequate access to firefighting water for the Fire Department. The attached sketch shows proposed locations that generally meet the intent of NFPA 307; albeit there are some “gaps” in the specific spacing requirements outlined by the standard. However, these are minimal and are a function of the current operational and storage parameters associated with the IMT. These deviations from code requirements are considered minimal and should not have any notable detrimental impact on the ability of the Fire Department to conduct firefighting operations at this site.
3. Develop and proceduralize a means of providing rapid notification to the Fire Department of a fire emergency. This can, and should, make use of any current communication systems at the site that may be appropriate for this use. If no such means exists, then consideration should be given to adding external manual pull stations, connected to the Terminal Building fire alarm system, at several locations throughout the yard to accommodate this requirement.
4. Establish and document the requirements for a Fire Prevention Program/Organization. This can be as simple as assigning an employee as the “lead” for this requirement, along with providing the necessary training and understanding of the fire protection systems and regulations installed and promulgated at the IMT. This individual may also act as the primary interface with, and receive some training/guidance from, the Portland Fire Department and any contractors/personnel responsible for maintaining installed fire protection systems, thus ensuring that all installed systems are properly monitored and maintained. Equally, the International

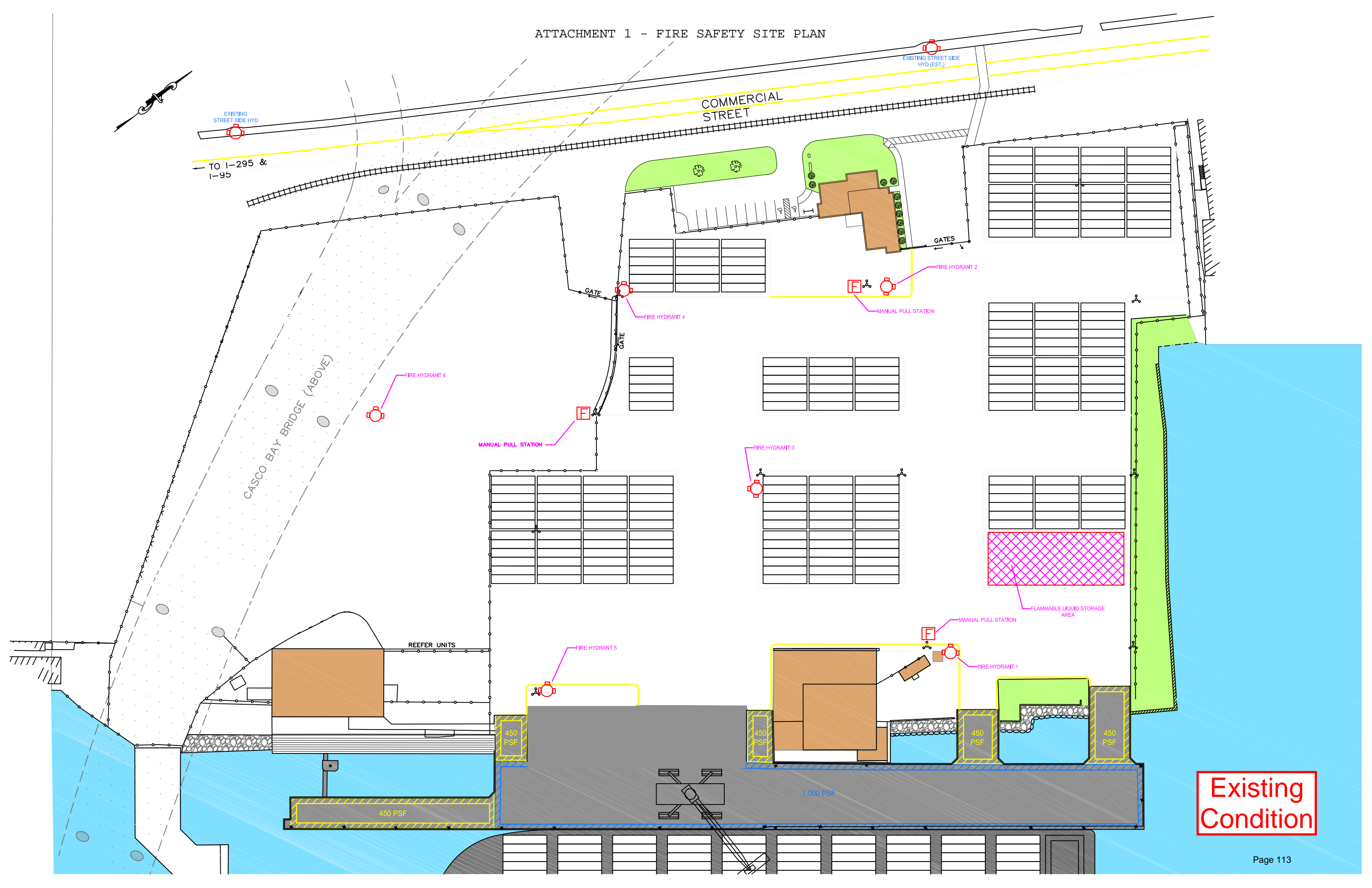
Shore Connection should be located in a designated area such that it can be readily retrieved when/if needed. This program should also be used to designate and document all areas where either smoking or hot work is allowed, as well as any areas where the storage of flammable or combustible materials, including shipping containers, is specifically forbidden due to proximity to those areas where an open flame may be present. The requisite separation distances must be maintained between areas where open flames exist and any flammable or combustible materials are handled/stored and each area should be clearly marked.

Should there be any questions regarding this assessment and the recommendations contained herein, please do not hesitate to contact me.



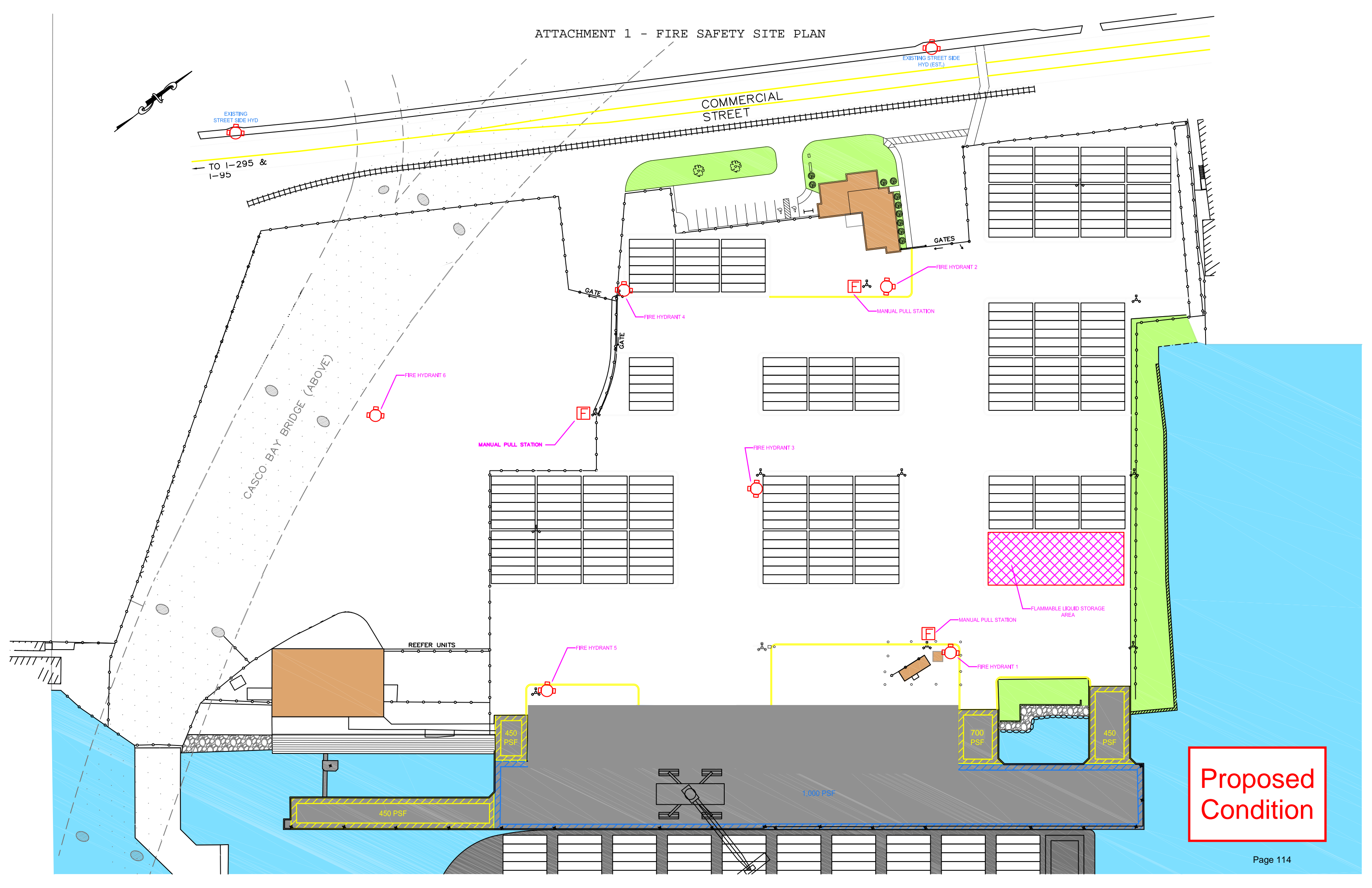
W. Mark Cummings, P.E.

ATTACHMENT 1 - FIRE SAFETY SITE PLAN



Existing Condition

ATTACHMENT 1 - FIRE SAFETY SITE PLAN



Proposed Condition