NEW YORK CITY
DEPARTMENT OF SANITATION

MARINE TRANSFER STATION CONVERSION

Conceptual Design Development

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Greeley and Hansen LLC
Klein and Hoffman, Inc., P.C.
AMSEC LLC

September 2002

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DEPARTMENT OF SANITATION

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Executive Summary

Greeley and Hansen LLC
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The New York City Department of Sanitation (DSNY) has historically used a network of eight marine transfer stations (MTS's) as destinations where Department collection vehicles deliver municipal solid waste. These MTS's are unique to New York City and were developed to provide efficient waterborne transport of solid waste. The stations provide local destinations for collection vehicles serving the boroughs of the Bronx, Manhattan, Queens and Brooklyn and contribute to the efficiency and reliability of the Department's waste management operations**.** Each MTS is permitted by the NYS Department of Environmental Conservation as a solid waste transfer facility (Part 360 Permit).

Collectively the MTS's are capable of transferring approximately 14,000 tons per day (TPD) of municipal solid waste from land based collection vehicles to barges for waterborne transport. Each MTS barge eliminates the need for 30 truck transfer trailers that would otherwise move over the City's roadways.

Since the closure of the Fresh Kills landfill, previously the ultimate destination for NYC municipal solid waste, the DSNY has utilized a series of land-based transfer stations for overland export of Department managed waste to remote out-of-city disposal facilities. This mode of disposal has added to air and noise pollution within the City limits, has increased maintenance and operating costs of collection vehicles and has contributed to increased deterioration of City streets and highways. In order to mitigate these increased costs and pollution issues, DSNY retained Greeley and Hansen LLC to conduct a feasibility study to determine if the existing MTS network could be upgraded and modified to provide a system where the waste could be received at the MTS's, placed into sealed containers, loaded onto barges and transported to an inner-harbor port facility where the containers could be off-loaded onto rail, ship or truck for transport to remote out-of-city disposal facilities.

Greeley and Hansen presented the findings of its feasibility study to the DSNY Commissioner on July 12, 2002 and August 2, 2002. As a result of those presentations the Department authorized Greeley and Hansen to prepare this conceptual design report. The scope of the feasibility study included the development of the selected concept for five (5) of the eight existing marine transfer station sites as listed below:

- East 91st Street Marine Transfer Station (Manhattan)
- West 135th Street Marine Transfer Station (Manhattan)
- West 59th Street Marine Transfer Station (Manhattan)
- Greenpoint Marine Transfer Station (Brooklyn)
- North Shore Marine Transfer Station (Queens)

The feasibility study and subsequent conceptual design development were conducted under the following Department imposed constraints and guidelines:

- That the modified MTS's design not trigger a New York City Uniform Land Use Review Procedure (ULURP) action. ULURP action is required when property is acquired; site selections, zoning, and demapping actions or changes in the City Map are needed.
- That existing MTS wastesheds be maintained. That is, that waste delivered from a particular sanitation district to a particular MTS in the past would not be diverted to a different MTS in the future.
- That existing MTS throughput be maintained. That is, that a modified MTS must have the same capacity as indicated by the historical data provided by the Department.
- That containers be sealed prior to off-loading
- That containers be off-loaded at an intermodal facility.

The developed concept presented in this report complies with and adheres to the above stated constraints and guidelines. The concept presents a plan whereby collection vehicles deliver NYC municipal solid waste to the modified MTS facilities, where the waste is then sorted for objectionable materials, processed for volume reduction, containerized and ultimately loaded onto barges for waterborne transport to an intermodal facility.

Developing the modified MTS concept for the five selected sites required developing three basic facility layouts. Three of the five existing MTS sites, West 135th Street, North Shore and Greenpoint, have similar lot dimensions and allowed the development of a typical modified MTS design for these sites. The lot dimensions at the two remaining sites required development of two additional layouts to accommodate the modified MTS concept to the individual sites. The typical modified Marine Transfer Station consists of three levels housing three main process areas, personnel areas and an access ramp. A plan view and section of the typical modified MTS are shown in Figures 2-1 and 2-2. The physical layout of the facility and the elevations of each floor are determined by the requirements for receiving, handling and processing the incoming stream of municipal solid waste.

The entrance to the typical modified MTS is located at the tipping floor level and provides access for collection vehicles to the tipping floor. A weigh station, consisting of incoming and outgoing truck scales along with a weighing office are located at the immediate entrance to the building. Radiation detection equipment to monitor incoming vehicles for radioactive material is located ahead of the incoming scales.

The major portion of the tipping floor consists of the collection vehicle maneuvering area and the truck bays. Enough open space has been provided to allow a collection vehicle to enter the tipping floor, maneuver and back into position against a backing log at one of the truck bays while two other bays are occupied.

The loading floor on the typical modified MTS is located at an elevation 12 feet below the tipping floor to provide sufficient height to comfortably perform the tipping operation. The loader level will consist primarily of areas for material handling, with areas segregated for four operations. The tipping area directly below the tipping bays will receive the material brought in by the collection vehicles. Immediately beyond the tipping area are smaller areas designated for the incoming waste to be sorted for the removal of objectionable materials not amenable to compaction. To either side of the main floor are areas for temporary storage of the waste material. Piles of the incoming solid waste will be created at these locations to handle diurnal variations in the rate of incoming vehicles. At the end of the floor opposite the tipping area are the floor openings that allow loading of the compactor hoppers located in the lower level. The floor openings are designed to allow scrapers to push the solid waste across the floor and directly into the hoppers.

The Pier level contains the compaction equipment and the equipment for maneuvering containers and loading them onto barges. The main body of the compactors are located directly beneath the loader level within the enclosed structure. The containers, maneuvering equipment and primary and standby gantry cranes are located on the open area of the pier level. A portion of the open pier area is allocated for maneuvering and staging of containers during the compaction and loading operations.

Personnel areas are located in one level directly below the tipping floor. The floor elevation of the personnel areas is the same as that of the pier level.

The areas below the tipping floor will include mechanical rooms, electrical rooms, offices, restrooms and other personnel facilities.

The quantities of solid waste to be handled and the methods of operation to be employed establish the necessary capacities of the material handling equipment and the requirements for the necessary support elements, such as the maintenance facilities and the site layouts. The bases of design for the concept developed in this report are described below:

The New York City Department of Sanitation (DSNY) provided two-week holiday and post holiday tonnage data and delivery rate data from four different holidays in 1997 and 1998 for each station (Appendix A). Table ES-1 presents a summary of the throughput data.

Table ES-1
MTS Throughput and Barge Summary

MTS Location	Avg. Day Throughput	Peak Day Throughput	No. of Barges/day Avg.	No. of Barges/Day Peak
E. 91st St.	620	927	1	2
W. 59th St.	1,000	1,500	2	3
W. 135th St.	1,145	2,570	2	4
Greenpoint	2,200	3,200	4	5
North Shore	2,365	3,065	4	5
Total	**7,330**	**11,262**	**13**	**19**

The design of the typical modified MTS is based on the peak day throughput in the data provided for all five stations. The peak day throughput for all five stations is 3200 tons of solid waste delivered to the Greenpoint MTS. The size and capacity of the typical facility was based on this peak. The designs of the 59th Street and 91st Street stations were based on each station's corresponding peak day throughput.

To load 3200 tons of waste onto barges in one day, five barges will be required with an average of about 640 tons of trash on each. In order to fill five barges in 24 hours, each barge must take less than 4 hours and 45 minutes to fill. A barge shift is estimated to take an average of 45 minutes. This leaves 4 hours to remove the empty containers from a barge and replace them with full containers.

The size of the containers that will hold the compacted waste will be 20 feet long, 9 ½ feet tall, and 8 ½ feet wide. They are capable of holding approximately 44 cubic yards of refuse. The density of the waste entering the compactor is approximately 450 pounds per cubic yard. The compactor is expected to compact the waste to about 800 to 1000 pounds per cubic yard. On average, it is estimated that each container will contain 19 tons of trash.

With 34 containers of 19 tons each, the average weight of the compacted refuse on a barge is 646 tons. This is approximately equal to the rated capacity of a barge. On Greenpoint station's peak day of 3200 tons of waste, the station will need to fill 169 containers of about 19 tons of trash each. This corresponds to a maximum of five barges required on a peak day. North Shore may also require five barges on peak days. Table ES-2 presents the number of containers that each of the modified MTS's will handle on average and peak days.

Table ES-2
Containers Required on Average and Peak Days at Each Station

MTS Location	Number of Containers Average Day	Number of Containers Peak Day
E. 91st St.	33	49
W. 59th St.	53	79
W. 135th St.	61	136
Greenpoint	116	169
North Shore	125	162
Total	388	595

The compactors must be capable of supplying 34 full containers to be loaded onto a barge in 4 hours. Manufacturers data indicates that compaction equipment is capable of a continuous throughput of 90 to 100 tons per hour, or 4 to 5 containers per hour. At that rate, only 16 to 20 full containers could be produced in 4 hours. Consequently, the stations at 135th Street, North Shore and Greenpoint will require two compactors in order to meet their peak day throughput demands.

For design purposes each compactor will operate at an average rate of 4 containers per hour, or about 75 tons per hour, assuming 19 tons per container. With two compactors operating, the stations at 135th, North Shore, and Greenpoint will operate at a rate of 150 tons per hour, or 8 containers per hour. The stations at 59th Street and 91st Street only require one compactor thus their design processing capacity will be 75 tons per hour.

The loader levels of the marine transfer stations are equipped with storage areas to handle peak inflows to the facility. Analysis of the data provided by the Department indicated that the stations have a peak inflow of greater than 300 tons per hour. As described above the processing rates at the stations are 150 tons per hour and 75 tons per hour. Therefore, waste is stored in the designated storage areas until the incoming flow of waste is less than the processing rate. At that time, the stored waste is processed by the compactors at a rate up to 150 tons per hour.

Each station will be equipped with two wheel loaders in each loader level that were chosen to provide a sufficient capacity to maintain the desired output of the stations. A front-end wheel loader with a 7.5 cubic yard refuse bucket will maneuver the waste into storage piles 12 feet high. The smaller wheel loader will be outfitted with a blade that will allow the unit to move waste from the storage piles, sort the waste for objectionable material, and push the waste into the chargers of the compactors.

The barge loading and unloading process at a dual compactor station will require 74 movements of containers in 4 hours to maintain the rate of 150 tons per hour, or 8 containers per hour. Each incoming barge will contain 34 empty containers that must be removed before full containers can be loaded onto the barge. The crane will initially stage 6 containers on the pier level to create an empty area on the barge to load full containers. Thirty-four full containers must be loaded onto the barge. In order to complete the 74 container movements in 4 hours, each movement must take less than 3 minutes and 14 seconds. The gantry crane's average time for moving a container is less than the required time and can therefore maintain the rate of 8 containers per hour.

The schedule for moving the conceptual designs for the five marine transfer stations through the regulatory, design and construction phases of the overall program is estimated to take 53 months from the project start date.

For the purposes of this report it has been assumed that the program proceeds concurrently for all five of the marine transfer stations.

The Regulatory Compliance phase of the program with an estimated duration of 18 months drives the start of demolition and construction of the modified marine transfer station facilities. It has been assumed that during this 18 month period the data collection, preliminary design, demolition design, value engineering and final design tasks for each of the five modified marine transfer station facilities can be completed. Additionally, it has been assumed that advertising, bidding, awarding and issuing of the notice to proceed of demolition contracts can run concurrently with the regulatory process.

Construction of the modified marine transfer station facilities is shown as taking 24 months for actual construction with an additional 3 months allocated for start-up and testing of the waste processing and container handling equipment. Factors which could affect these time frames include the availability of quality marine contractors to work concurrently on five different sites and the production capacity of compactor manufacturers to fabricate and deliver the equipment to meet the construction schedules. As the program develops the Department may wish to consider meeting with the contracting community to build interest in the program and learn of obstacles that the Department may have with this community that may hinder the progress of the program. The Department may also wish to consider pre-purchasing the compactor equipment. This will enable the Department to standardize on one manufacturer for this equipment and ensure that the equipment will be available for delivery as the construction of each facility is advanced.

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MARINE TRANSFER STATION CONVERSION

Conceptual Design Development

Section 1
Introduction

Greeley and Hansen LLC
Klein and Hoffman, Inc., P.C.
AMSEC LLC

September 2002

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Greeley and Hansen presented the findings of its feasibility study to the DSNY Commissioner on July 12, 2002 and August 2, 2002. As a result of those presentations the Department authorized Greeley and Hansen to prepare this conceptual design report. The scope of the feasibility study included the development of the selected concept for five (5) of the eight existing marine transfer station sites as listed below:

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- That existing MTS throughput be maintained. That is, that a modified MTS must have the same capacity as indicated by the historical data provided by the Department.
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- That containers be off-loaded at an intermodal facility.

The developed concept presented in this report complies with and adheres to the above stated constraints and guidelines. The concept presents a plan whereby collection vehicles deliver NYC municipal solid waste to the modified MTS facilities, where the waste is then sorted for objectionable materials, processed for volume reduction, containerized and ultimately loaded onto barges for waterborne transport to an intermodal facility.

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MARINE TRANSFER STATION CONVERSION

Conceptual Design Development

Section 2
Description of Conceptual Plans

Greeley and Hansen LLC
Klein and Hoffman, Inc., P.C.
AMSEC LLC

September 2002

2.1 INTRODUCTION

The purpose of the conceptual plan for the modified marine transfer stations is, in effect, to convert the existing stations into intermodal facilites allowing the efficient transfer of Department managed waste to other intermodal facilites and from there to ultimate disposal. One of the requirements of the plan is the use of intermodal containers, which are containers standardized for this purpose and allow movement by highway, rail and vessel. Another key element of the conceptual plan is the use of compaction equipment to maximize the use of the containers and barges and to provide sufficient capacities to handle the average and peak solid waste throughputs of the existing stations.

Development of the modified MTS concept, required the development of facilities that allowed the efficient implementation of four key operations, tipping, handling (maneuvering the waste for storage, sorting and compactor charging), compaction and barge loading.

Developing the modified MTS concept for the five selected sites required developing three basic facility layouts. Three of the five existing MTS sites, West 135th Street, North Shore and Greenpoint, have similar lot dimensions and allowed the development of a typical modified MTS layout for these sites. The lot dimensions at the two remaining sites are dissimilar to the other three and dissimilar to each other and required development of two additional layouts to accommodate the modified MTS concept to the individual sites. The physical layouts themselves, the necessary capacities of the material handling facilities and the requirements for the necessary support elements, such as the maintenance facilities and personnel areas, were established by the quantities of solid waste to be handled and the methods and operations to be used.

2.2 BASES OF DESIGN

The bases of design for the modified marine transfer stations are described below.

2.2.1 Waste Quantities at Transfer Stations

Up to near the time of the closing of the Fresh Kills Sanitary Landfill, the New York City Department of Sanitation (DNSY) maintained records of the quantities of solid waste received at each of its Marine Transfer Station locations. Peak days for solid waste collection normally occurred following a holiday in which collection is suspended. Table 2.1 presents a summary of two-week holiday and post holiday tonnage and delivery rate data from four different holidays in 1997 and 1998 for each station (also see Appendix A).

The design of the typical modified MTS is based on the peak day throughput in the data provided for all five stations. The peak day throughput for all five stations is 3200 tons of solid waste delivered to the Greenpoint MTS. The size and capacity of the typical facility was based on this peak. The designs of the 59th Street and 91st Street stations were based on each station's corresponding peak day throughput.

Table 2-1
MTS Throughput and Barge Summary

MTS Location	Avg. Day Throughput TPD	Peak Day Throughput TPD	No. of Barges/day Avg.	No. of Barges/Day Peak
E. 91st St.	620	927	1	2
W. 59th St.	1,000	1500	2	3
W. 135th St.	1,145	2570	2	4
Greenpoint	2,200	3200	4	5
North Shore	2,365	3065	4	5
Total	**7,330**	**11,262**	**13**	**19**

2.2.2 Container and Barge Capacities

The standard width of intermodal containers is 8 feet. Typical lengths are 20 ft, 28 ft, 40 ft and 48 ft. Typical container height is 8 ft-6 inches, and so called high-cube containers are 9 ft-6 inches high. The dimensions of the containers to be used at the modified MTS's will be 20 ft L x 9 ft-6 inches H x 8 ft-6 inches wide, with a net holding capacity of 44 cubic yards.

The density of the waste entering the compactors will be approximately 450 pounds per cubic yard. The compactors are expected to increase the waste density to the range of 800 to 1000 pounds per cubic yard. Using that density range, it is estimated that each container will hold approximately 19 tons of solid waste. At this capacity, 169 containers will be needed to hold the peak day throughput of 3200 TPD for a typical modified MTS (see Table 2-2).

The optimum placement of containers on a typical MTS barge allows for a capacity of 34 containers per barge stacked in two levels. To transport the peak day throughput of 3200 tons of waste in 169 containers will require five barges. Each barge will be required to carry an average of approximately 646 tons of trash.

Table 2-2
Containers Required on Average and Peak Days at Each Station

MTS Location	Number of Containers Average Day	Number of Containers Peak Day
E. 91st St.	33	49
W. 59th St.	53	79
W. 135th St.	61	136
Greenpoint	116	169
North Shore	125	162
Total	388	595

2.2.3 Compactor Bases of Design

In order to load the five barges required on a peak day within twenty-four hours, each barge must take less than 4 hours and 45 minutes to load to capacity. A barge shift, maneuvering a loaded barge away from the station and an unloaded barge into place, is estimated to take an average of 45 minutes. This leaves a maximum of 4 hours to remove the empty containers from a barge and replace them with full containers.

To conform to the required peak loading time limit of four hours per barge, the compactors must have the ability to fill the 34 containers to be loaded onto a barge within that time. The required compactor proccessing rate for peak throughput for the typical stations is 162 tons per hour. The average processing rate of a compactor is estimated to be in the range of 90 to 100 tons per hour, which corresponds approximately to 4 to 5 containers per hour. At that rate, 16 to 20 containers can be filled by a single compactor in 4 hours. Consequently, the typical modified MTS will need to operate two compactors during peak day throughputs. Based on the foregoing, the typical modified MTS will be provided with three compactors, two operating and one standby. For the East 91st and 59th Street Stations, the required processing rate for peak day throughputs are 40 tons per hour and 67 Tons per hour respectively, well within the capacity of a single compactor. These two stations will each be provided with two compactors, one operating and one standby.

2.2.4 Loading Floor Storage Capacity and Material Handling

The solid waste processing rates for dual and single operating compactor stations will be respectively 150 tons per hour and 75 tons per hour. The typical stations have a peak hourly inflow of greater than 300 tons per hour. In order to handle incoming waste in excess of the stations' hourly processing capacities, the loader levels of the modified marine transfer stations have been provided with designated storage areas. The storage areas will be used to hold the excess waste and equalize the flow to the compactors. The DSNY two week holiday and post-holiday inflow data were utilized to determine appropriate storage areas at each facility.

Each station will be equipped with two types of wheel loaders in the loader level to maneuver the solid waste through the storage, sorting and compactor charging operations. Two loaders were chosen to provide a sufficient capacity to maintain the desired output of the stations. Each station will be provided with one front-end wheel loader with a 7.5 cubic yard refuse bucket that will maneuver the waste from the tipping area into the storage areas and form piles up to 12 feet high. A smaller wheel loader, also referred to as a scraper, will be provided for each station. The scraper will be outfitted with a blade that will allow the unit to move waste away from the storage piles, sort the waste for objectionable material, and push the waste over the loader level floor openings into the compactors' chargers. The smaller wheel loader will have 20 seconds while the compactor charger is open to load 16.7 cubic yards of trash into the 10 foot by 6 foot openings.

2.2.5 Barge Loading and Unloading

The barge loading and unloading process at a dual operating compactor station will require 74 movements of containers in 4 hours to maintain the rate of 150 tons per hour, or 8 containers per hour. Each incoming barge will contain 34 empty containers to be removed before 34 full containers can be loaded onto the barge. The gantry crane that will be used to maneuver the containers will initially remove six empty containers from the barge and stage them on the pier level to create a vacant area on the barge on which to begin loading full containers. In order to complete the 74 container movements in 4 hours, each container movement will need to take less than 3 minutes and 14 seconds. The gantry crane's average time for moving a container is less than the required time and can therefore maintain the rate of 8 containers per hour.

2.3 FACILITY DESCRIPTION

2.3.1 W. 135th Street, North Shore and Greenpoint Marine Transfer Stations

The typical modified Marine Transfer Station consists of three levels housing three main process areas, personnel areas and an access ramp. A plan view and section of the typical modified MTS are shown in Figures 2-1 and 2-2. An administration and operations building will house two of the process areas, a portion of the pier level above the compactors and the personnel areas. The remaining portion of the pier level where container handling and barge loading will take place will be uncovered. The physical layout of the facility and the elevations of each floor are determined by the requirements for receiving, handling and processing the incoming stream of municipal solid waste. Three dimensional renderings in Figures 2-3 and 2-4 show the typical modified MTS without roof structure and provide a good view of the three levels of the facility.

Entrance

The entrance to the typical modified MTS is located at the tipping floor level and provides access for collection vehicles to the tipping floor. A weigh station, consisting of incoming and outgoing truck scales along with a weighing office are located at the immediate entrance to the building. Radiation detection equipment to monitor incoming vehicles for radioactive material is located ahead of the incoming scales.

Tipping Floor

The major portion of the tipping floor consists of the collection vehicle maneuvering area and the truck bays. Enough open space has been provided to allow a collection vehicle to enter the tipping floor, maneuver into position and back into one of the truck bays while two other bays are occupied. Along with the weighing office, a portion of the personnel areas are located near the entrance to the tipping floor. Also located at the tipping floor level are stairway and elevator access to the personnel areas immediately below.

Loading Floor

The loading floor on the typical modified MTS is located at an elevation 12 feet below the tipping floor to provide sufficient height to comfortably perform the tipping operation.

The loading floor will consist primarily of areas for material handling, with areas segregated for four operations. The tipping area directly below the tipping bays will receive the material brought in by the collection vehicles. Immediately beyond the tipping area are smaller areas designated for the incoming waste to be sorted for the removal of objectionable materials not amenable to compaction. To either side of the main floor are areas for temporary storage of the waste material. Piles of the incoming solid waste will be created at these locations to handle diurnal variations in the rate of incoming vehicles. At the end of the floor opposite the tipping area are the floor openings that allow loading of the compactor hoppers located in the lower level. The floor openings are designed to allow scrapers to push the solid waste across the floor and directly into the hoppers.

Pier Level

The Pier level contains the compaction equipment and the equipment for maneuvering containers and loading them onto barges. The main body of the compactors are located directly beneath the Loading floor within the enclosed structure. The containers, maneuvering equipment and primary and standby gantry cranes are located on the open area of the pier level. A portion of the open pier area is allocated for maneuvering and staging of containers during the compaction and loading operations.

Personnel Areas

A portion of the personnel areas is located, as previously described, at the tipping floor level. All other personnel areas are located in one level directly below the tipping floor. The floor elevation of the personnel areas is the same as that of the pier level.

The areas below the tipping floor will include mechanical rooms, electrical rooms, offices, restrooms and other personnel facilities.

2.3.2 East 91st Street

At the East 91st Street site, the variations from the typical layout consist primarily of a smaller height between tipping floor and loading floor, an internal ramp for accessing the elevated tipping floor. A top plan and a section for the East 91st Street modified MTS are shown in Figures 2-5 and 2-6. The elevation of the existing access ramp, relative to the required pier deck elevation, did not provide enough of a difference in elevation to allow the placement of the tipping floor at the access ramp level as in the typical layout. The tipping floor needed to be elevated above the access ramp level to allow the tipping operation to take place. To provide vehicle access to the elevated tipping floor, an internal access ramp had to be incorporated into the facility. Limited space on the site and the requirement of a 6 percent maximum incline on the ramp, restricted the elevation of the tipping floor and resulted in an 8 foot difference in elevation between the tipping floor and the Loading floor, as opposed to the 12 feet provided in the typical station layout. Other variations from the typical layout include provision of a single gantry crane for barge loading and location of the weighing station on the access ramp, immediately outside of the facility. All other aspects of the facility layout were developed as in the typical layout.

2.3.3 West 59th Street

The 59th Street MTS is located within a long, narrow lot of restrictive dimensions. The elevation available on the site was not sufficient for the location of the stations facilites on three levels. Only two levels were possible to develop at this site. The layout for the site is also segregated to provide space for an existing paper recycling operation. A top plan and a section of the 59th Street modified MTS are shown in Figures 2-7 and 2-8.

An access ramp into the elevated tipping floor and the tipping floor itself area located along one entire side of the station, with the tipping floor segregated to serve both the paper recycling and the solid waste transfer operations. The weighing station is located on the access road, prior to the tipping floor access ramp. Below the tipping floor, the loading floor and the pier share a common level. At the lower level, the layout turns the flow of material back in the direction of the entrance with the storage and handling area, the compactors and the barge loading dock aligned in a straight line.

A single gantry crane is provided for this site and is located above the loading dock. To permit single level operation for handling and compaction, belt conveyors and feed hoppers are provided. Instead of loading the waste through floor openings directly into the compactor chargers as in the typical layout, in this layout, the scrapers will feed waste into the conveyor loading pits. Because of the limited space available at this site, no personnel areas are provided in this layout. The barge loading operation will take place in a similar manner to the other station layouts.

2.4. PROCESS DESCRIPTION

2.4.1 Tipping Floor

Trucks entering the tipping floor will first pass through radiation detection equipment which will alert station personnel of the presence of radioactive materials in the waste carried by the incoming vehicle. Following that the vehicles will enter the weighing station where the full loaded weight of the vehicle will be recorded.

Once on the tipping floor, vehicles will maneuver in the space provided and back into position against a stopping log at one of the truck bays. Photocells located in the truck bays will detect the entry of the vehicle and trigger operation of the dust suppression system for that truck bay. Independent headers for each of the truck bays, located below the vehicle wheels and above, a short distance into the tipping area, will provide dust suppressing fog for a pre-determined cycle time. The cycle time will be set to correspond to the timing of the tipping operation. After tipping their load of waste, the vehicles will exit the facility and enter the weighing station a second time, where the unloaded vehicle weight will be recorded.

2.4.2 Loading Floor

At the 135th Street, North Shore, and Greenpoint stations the refuse from the trucks is dumped onto the loading level, 12 feet below the tipping floor. The waste is stored, sorted, and loaded into compactors on this level.

Storage Requirements

During peak waste inflow hours, the inflow may exceed the capacity of the compactors. At these times, the waste must be stored until off-peak hours when the inflow drops below the capacity of the compactors. The front-end loaders at the Loading floor will maneuver the waste to the storage areas and then into the compactors.

The sizes of the storage areas were determined by analyzing the provided DSNY two-week holiday and post-holiday data for 1997 and 1998 (see Appendix A). Step functions for the stations' average and peak days of inflow were created to calculate the required storage. At the peaks, the waste inflow is greater than the compactor processing rate. The inflows above the compactor processing rate are summed until the inflow drops below the rate of compaction. A common step function was used to determine the storages for the stations at 135th Street, North Shore, and Greenpoint. Independent step-functions were used for 59th Street and 91st Street. A summary of the storage requirements is presented in Table 2.3.

Table 2-3
Summary of storage requirements

MTS Location	Storage Required (Tons)		Storage Area Required* (square feet)	
	Average	Peak	Average	Peak
E. 91st St.	212	285	2120	2850
W. 59th St.	489	635	4890	6350
W. 135th St.	50	620	500	6200
Greenpoint	50	620	500	6200
North Shore	50	620	500	6200

*Assume density of waste is 450 pounds per cubic yards on the Loading floor and 12 foot high piles

A station's storage requirements depend on the quantity of solid waste processed at a station, the compaction rate, and hours that waste is delivered to the station. On an average day, waste is delivered to the 59th Street and 91st Street stations during an 8 to 12 hour period. High peaks of storage occur as a result. Conversely, the other three stations have steady inflows on average days spread over 22 to 24 hours with two compactors operating. The inflow at these stations is rarely higher than the compaction rate of 150 tons per hour on average days. On peak days, however, the storage requirements increase considerably because the inflow may be greater than the compaction rate for many hours.

Front-end Loaders

Two wheel loaders provided on each loading floor will maneuver the waste into storage, sort the waste for objectionable material, and load the waste into the compactor chargers. The loaders were chosen by bucket size and maneuverability of the machines.

The larger loader, a Caterpillar 950G, will have a 7.5 cubic yard bucket. It will maintain the loading floor by moving the waste from the tipping area to the 12-foot storage piles. The tipping area is maintained to prevent interference with the dumping of the trucks on the tipping floor.

The smaller loader, a Caterpillar 914G, will be equipped with a scraping blade and will be responsible for sorting out the waste and pushing the waste across the floor and into the compactor openings in the floor. This loader is about 20 feet long and has a turning radius of 15 feet 7 inches, which will allow it to maneuver easily through the various piles of waste that will be present on the loading floor.

2.4.3 Pier Level

The pier level contains the equipment associated with compaction and barge loading. After the waste is pushed from the loading floor into the compactor chambers below, the waste is compacted. Once the compactor forms a complete bale, the load is ejected into a container. Once the container is full, it is disengaged from the compactor and a gantry crane lifts the container onto a barge. An empty container is then again placed in position for the compactor to fill.

Compactor Capacity and Cycle Time

Pre-load compaction equipment will be provided at each station to compact the waste. Waste enters the compactor from a hole in the loading floor floor. The waste falls directly into a compactor's charger. The charger remains open for 20 seconds while it is filled with waste. When it is full, a hydraulic ram pushes the load to the front of the compaction chamber and compresses it against a guillotine gate in the down position at the end of the chamber. The compaction unit sits on load cells that accumulate the weight of waste fed to the unit. This compaction cycle is repeated until the compressed load meets preset limits for weight or until six charges of the waste has occurred. At this point, the guillotine gate is raised and the ram is activated, moving forward to push the compressed waste into a steel container. The container then pulls away from the compactor and the rear door is closed to provide a water-tight, leak-proof seal.

The volume of the waste is reduced by approximately 50 percent in the compactor. The density of the waste at the loading floor is about 450 pounds per cubic yard. The density of the compacted waste is between 800 and 900 pounds per cubic yard. Three compactors will be provided at the stations located at 135th Street, North Shore, and Greenpoint. Two compactors will be provided at the 59th Street and 91st stations.

Each compactor will fill 4 19-ton containers per hour as discussed in Section 2.1.3. This will result in a rate of about 75 tons per hour for each compactor. Stations with two compactors will be capable of filling 8 containers an hour or 150 tons per hour.

The time to fill a container, close the doors, and have it ready to be loaded onto a barge is 7.5 minutes. The compaction of a bale is about 3 minutes 30 seconds. It then takes 3 minutes 30 seconds to eject a 19-ton bale into a container. Moreover, 30 seconds for the closure of the container doors was included. Table 2.4 illustrates the breakdown of the compactor cycle time.

TABLE 2-4
COMPACTOR CYCLE TIME

Load per Container (Bale)	=	19 tons
Volume per Bale (before compaction)	=	100 cubic yards
Number of Charges per Bale	=	6 charges
Volume per Ram Charge (Bale)	= 100/6 =	16.7 cubic yards
Time for Loading Charge	=	.33 minutes
Average Time to Wait for Charge	=	.25 minutes
Total Time per Charge	=	.58 minutes
Total Compactor Time per Bale	= 6*.58 =	3.5 minutes
Time to Eject Bale	=	3.5 minutes
Time to fill container	=	7 minutes
Time for Operator to close doors	=	0.5 minutes
Total Time to Fill Container	=	7.5 minutes

In the dual compactor operating stations, one crane will be managing both compactors. Although the crane will be handling 8 containers per hour, it will only handle 4 containers per hour per compactor. Assuming the crane movements are about 7.5 minutes, there will be a 15-minute turnover at each compactor. This will allow extra time for closing the container doors and positioning the container away from the compactor for crane access.

Gantry Crane Capacity and Cycle Time

Overhead Bridge Crane/s or Gantry Crane/s were considered as a potential option for container handling for barge/compactor loading/unloading operations. Due to the layout configuration of the MTS, it was determined that the overhead bridge crane design will not be feasible for use and it was decided to investigate a Container Gantry Crane (CGC). The CGC investigated is similar to the cranes used at the marine terminals for moving containers to and from container ships. The cranes will be provided with all of the characteristics of a marine terminal container crane except that they will handle only 20 ft containers at a smaller load capacity (46,000 lbs). The cranes will also be configured to rotate the containers for loading/unloading at the compactors.

Since reliability is essential for continuous service, container crane manufacturers were contacted and asked to provide to provide state of the art technology, which will produce a high reliability factor to withstand the severe service required. For increased reliability, spare parts and redundant components were offered to reduce down time, since the crane will be required to operate on three shifts at certain MTS facilities. However, to essentially eliminate risk, it was decided that a second crane be installed at each facility where practicable. Due to limitations at the 59th Street and 91st Street MTS facilities, only one crane will be installed. These facilities will operate for two shifts each day, with maintenance performed on the third shift. For all other facilities, only a single crane operation will be required to satisfy the load out time cycle of the compactors. The other crane will be in stand-by mode, with the ability to alternate cranes daily or weekly.

At MTS facilities where two cranes will be installed, the cranes will be rated for severe duty cycles (Class E) to reduce down time. Redundant components, adequate spare parts kept on site and preventative maintenance performed by third shift personnel will provide high reliability.

For the 59th Street and 91st Street facilities, where only one crane will be installed, the cranes will be designed for extra severe duty cycles (Class F). Further attention will be given to fully redundant electrical and electronic systems designed to Class F standards.

Rugged, redundant designs combined with on-site spares and preventative maintenance, will assure high reliability of performance and minimum down-time for the cranes.

Operating Time Cycle

An operating time study was developed to determine the crane's operating speeds to satisfy the load-out cycles with two compactors operating simultaneously. A summary of the study is presented in Table 2-5. Each compactor has the capability of loading and releasing a container in less than 7.5 minutes. The operating speeds of the crane selected for the time study were discussed with the representatives from both crane manufacturers and are considered conservative and safe for operations. The speeds selected for the study are considerably less than the speeds normally used for container cranes at the marine terminals.

As a result of the study it was determined that one crane could load containers to and from each compactor (one complete cycle) in less than 7.5 minutes. The study was developed with the crane conducting only one movement (operation) at a time. Under normal conditions, the crane operator can perform simultaneous multiple movements of the crane to increase efficiency and reduce time. The resulting throughput is 192 containers or 3,840 tons, or more than five barges per day.

Moreover, a gantry crane has the reach needed to load and unload barges in both high and low water conditions. In high water conditions, a container needs to be lifted to 15.5 feet above the pier level to reach over the edge of a barge (see Figure 2-9). In low water, the crane must reach down 16.05 feet below the pier level (see Figure 2-10).

The study concluded that the Gantry Crane appeared to be a viable alternative for MTS marine operations for the following reasons:

- All container operators can be accommodated on the desired pier width.
- Cycle time provides sufficient throughput of refuse for all scenarios.
- Structural requirements for the pier floor are minimized.
- Hopper barges with cell guides, the cheaper conversion option, are suitable.
- Similar cranes have been built and have proven reliable in the marine industry, thus reducing risk for the MTS conversions.
- Providing a second crane as a spare essentially eliminates risk in facilities.
- Providing Class F duty cycles for facilities with one crane greatly reduces risk due to redundancy of components.
- Reach of crane is sufficient to load barges in both high and low water levels.

Table 2-5
Maximum Gantry Crane Cycle Time

Gantry Crane Travel Speed	=	120 feet per minute
Crane Bridge Trolley Speed	=	100 feet per minute
		75 feet per minute
Crane Hoisting Speed	=	25 feet per minute (movement 3 feet or less)
Furthest Barge Position from Compactor	=	84 feet
Gantry lowers hook to empty container*	=	0.41 minutes
Hook up and lift	=	0.41 minutes
Rotate container	=	0.25 minutes
Gantry to compactor	=	0.28 minutes
Trolley to compactor	=	0.56 minutes
Lower Container	=	0.12 minutes
Disconnect and lift hook	=	0.12 minutes
Total time to unload empty container and place in front of compactor	=	**2.15 minutes**
Gantry to second compactor (full container)	=	0.32 minutes
Lower hook	=	0.12 minutes
Hook up and lift	=	0.12 minutes
Trolley to barge	=	0.56 minutes
Gantry to barge	=	0.28 minutes
Rotate container	=	0.25 minutes
Lower container	=	0.41 minutes
Disconnect and lift hook	=	0.41 minutes
Total time to load full container onto barge	=	**2.47 minutes**
Total cycle time	=	**4.62 minutes**
Extra time remaining	=	**2.88 minutes**

***Begin above furthest empty container on barge**

***Summary of AMSEC Compactor Service by Crane, Time Study**

2.5 BARGE MANEUVERING

Previously, the MTS facilities had two loading ships and were able to maneuver (hand shift) one barge while the second barge was being loaded. This maneuvering reduced the need for tugboats to shift barges at the facilities. To allow the modified MTS facilities to operate with only one loading ship while requiring approximately the previous level of tugboat service, barge maneuvering has been studied for each MTS.

The MTS facilities at 135th Street, Greenpoint and North Shore will have essentially the same plan and will be treated as one facility. The 59th Street MTS has a very different plan and will be considered separately. Because of the strong currents in the East River, hand shifting of barges was never performed at the 91st Street MTS. It is assumed that all barge movements at this facility will require tugboats and the 91st Street MTS was not considered in the maneuvering studies.

2.5.1 West 135th Street, Greenpoint and North Shore

Two hopper barges modified for container stowage will be brought to each MTS facility via tugboat service. Both barges will be moored breasted inboard and outboard of each other (stacked) to the pier, Reference 13. Maneuvering of the barges will be performed with DOS personnel to reduce barge maneuvering by the tugs. Once the inboard barge is loaded and the other one is needed at the pier, maneuvering will be accomplished utilizing electric capstans and mooring fittings strategically positioned on the pier.

The innermost (inboard) barge will be moored with breast lines to the pier. Two spring lines will be led out to prevent forward and aft movements to the barge due to wave action, etc. The outermost (outboard) barge will also be moored with breast lines to the pier, separate from the inboard barge. Spring lines for the outboard barge will be attached to the outboard cleats of the inner barge, preventing forward and aft movement due to wave action. It is anticipated that four persons will be required to maneuver the barges.

Prior to barge maneuvering, both Container Gantry Cranes will be parked at the shore end of the pier, away from the maneuvering area.

2.5.2 Loaded Barge Maneuvering

Once the inboard barge is fully loaded, the barge must be moved clear of the pier to make way for movement of the outboard barge to the crane loading area.

The aft (river end) breast lines and spring lines of the empty barge are released and one spring line is led to the outboard side of the loaded barge. This will restrict the empty barge from shifting as the loaded barge is moved.

The spring lines on the loaded barge are released. The aft breast lines is removed, walked and secured to the inboard cleat. The bitter end of the line is wrapped to the electric capstan at the end of the pier and the loaded barge is maneuvered toward the river. As the loaded barge starts moving, lines are tended to maintain tension and hold the barge fast to the pier. Simultaneously, the lines holding the empty barge to the loaded barge are hand tended to restrict the movement of the empty barge.

As the loaded barge clears the empty barge, the loaded barge is rotated 90 degrees against the pier fendering using the capstans. The loaded barge is moored to the pier on the river side and the empty barge is breasted to the pier with capstans and the forward and aft breast lines. The spring lines are used to position the barge into the crane loading area.

2.5.3 Maneuvering Time Study

A time study was developed to access barge maneuvering by DOS personnel when tugboat service is not available. For the barge movements described, the study indicates that approximately 45 minutes will be required to manually shift the barges. The time study is provided below:

Table 2-6
BARGE MANEUVERING TIME STUDY
DOS MTS FACILITY

Operation	Description	Time
	Loaded (Inbd) barge	
1	Change fwd spring line on loaded barge to capstan @ river end of pier and take up on line.	3 min
2	Change aft spring line on loaded barge to capstan @ far river side of MST	3 min
3	Release aft breast line on empty barge	(2 min*)
4	Release spring lines from empty barge and take up excess line and fake out on deck. (to hold empty barge fast to loaded barge when loaded barge is moved)	3 min
5	Move loaded barge along pier with capstan at river side of MTS	8 min
6	Hold barge @ end of pier and change lines from capstan at river side to capstan at far river side.	5 min
7	Rotate barge against river side of MTS	5 min
8	Moor barge to river side of MTS	8 min
	Total time (full barge)	**35 min**
	Empty (outboard) barge	
1	Attach breast lines from empty barge to capstans on pier side of MTS	5 min **
2	Maneuver empty barge to pier with capstans	5 min **
3	Moor empty barge to side of pier	8 min
	Total time (Empty barge)	**8 min**
	Total Time both Barges	**43 min**

* This Operation can be performed simultaneously while the loaded barge is readied for maneuvering.

**Operations that can be performed simultaneously while the loaded barge is being moored to river side of the MTS

2.5.4 West 59th Street MTS

The arrangement of the converted 59th Street MTS will allow two empty barges to be brought to the facility and tied up in tandem along the south side of the pier. The shore end barge will be secured near the bulkhead while the river end barge is loaded. Once the first barge is loaded, it will be shifted along the pier toward the river using capstans and tied to the pier. The empty barge will be shifted to the unloading area by using capstans to move it along the pier. This operation will take approximately 10 minutes for each barge, for a total of 22.5 minutes. These maneuvers will not significantly affect the loading operation at this facility. The maneuvering arrangement is shown in Reference 13. The time study is provided below:

Table 2-7
BARGE MANEUVERING TIME STUDY
DOS MTS FACILITY 59th ST

Operation	Description	Time
	MANEUVERING LOADED BARGE (RIVER END IS FWD SIDE OF BARGE)	
1	Remove aft spring line on pier and walk line to capstan @ river end of pier, Take up slack in line.	3 min
2	Remove fwd spring and breast lines.	(2 min*)
3	With capstan @ river end, move barge toward river to clear crane handling area. Hand tend and walk aft breast line along pier until barge is positioned for mooring	(5 min)
4	Moor barge to pier @ new position.	5 min
	Total time (full barge)	**12.5 min**
	MANEUVERING EMPTY BARGE INTO CRANE LOADING AREA.	
5	Remove aft spring line on pier and walk line to capstan @ crane loading area. Take up slack in line.	(3 min*)
6	Remove fwd spring and breast lines.	(2 min*)
7	With capstan @ crane loading area, move barge toward river to clear crane loading area. Hand tend and walk aft breast line along pier until barge is positioned for mooring	(5min)

8	Moor barge to pier @ new position.	5 min
	Total time (empty barge)	**10 min**
	Total Time both Barges	**22.5 min**

***** This Operation can be performed simultaneously while the full barge is readied for maneuvering in step 1.

*Operations that can be performed simultaneously while the full barge is being moored to west side of the MTS

NEW YORK CITY
DEPARTMENT OF SANITATION

MARINE TRANSFER STATION CONVERSION

Conceptual Design Development

Section 3
Barge Modifications

Greeley and Hansen LLC
Klein and Hoffman, Inc., P.C.
AMSEC LLC

September 2002

3.1 INTRODUCTION

The ability of the existing fleet of barges to carry 8.5 ft wide by 9.5 ft high 20 ft containers and the modifications necessary to permit loading at the marine transfer stations using overhead cranes for container handling are described below and shown on the conceptual plans. It is noted that containers of this width are not standard ISO and, while they are acceptable for carriage by road or rail, they will not be directly transportable in conventional container cargo vessels.

3.2 BASES OF DESIGN

The following basic data was used for this study:

Table 3-1
Barge Modifications Bases of Design

Description	Bases of Design
Barge Container Capacity, total	36
Number of Tiers	2
Container Dimensions	8'-6" wide by 9'-0" high by 20'-0" long
Container Weight, empty	3.6 tons
Container Weight, full	23.0 tons
Loading Level Height	7.5 ft above MHW
Tidal Range (MHW to MLW)	11.17 ft at North Shore 4.58 ft elsewhere
High Water Design (MHHW)	0.30 ft above MHW
Low Water Design Point (MLLW)	0.23 ft below MLW

Description	Bases of Design
Height of Cell Guides	15.0 ft
Container Removed	All from the same row. Maximum of six.
Barge Container Configuration A B	 Lowest Tier Placed on Hopper Bottom (2.50 ft above bottom liner) Lowest Tier Placed on "New" Deck (12.75 ft above bottom liner)

3.3 ANALYSIS

Initial calculations determined that the barges of either configuration possess more than adequate stability characteristics when loaded with either full or empty containers.

Considering the unloading/loading evolution, it was determined that the greatest upward reach would be at high high tide when removing the 6th container over the top of the cell guides from an end row of a barge loaded with empty containers. Likewise, the maximum downreach would be at low low tide when placing the 33rd container in a midships row of a barge loaded with full containers. In both cases, tide, draft trim and list combine to give the most unfavorable result.

Calculations were then made to determine the extent of the barge lift envelope relative to the barge waterline for the deck loaded and hopper loaded configurations.

Combining the barge lift and tide envelopes produced the following results:

	Tidal Range		**Height from ground level to Container Top**				
	MHW	MHHW	Deck Loading		Hopper Loading (0' - 0" Stools)		
	MLW	MLLW	Upreach	Downreach	Upreach	Downreach	Range
	ft	ft	ft	ft	ft	ft	ft
North Shore	11.17	11.70	25.08	-5.61	15.56	-15.21	30.77
Other Sites	4.60	5.13	25.08	0.95	15.56	-8.59	24.15

From the above, the conceptual design plan was developed showing the modifications of existing DSNY barges to carry 36 containers in cell guides installed in the hoppers.

3.4 BARGE MODIFICATIONS

To convert the existing DOS barges to from the carriage of loose waste to the carriage of 36 containers in the hopper, cell guides will be installed to facilitate loading and restrain the containers during transit. The individual cell guides consist of four vertical 6" x 6"x ¾" steel angles, one at each corner of the container, which restrain the container in the horizontal direction against the motions of the barge.

The cells are sized to provide ½ inch clearance on each side of the container to facilitate loading. An ISO standard container cone fitting is located at the bottom corners of the cell to engage the ISO corner castings on the container and align the container clear of the cell guides. The second container in each stack is placed on top of the first and restrained by the cell guides. To facilitate loading, each cell guide is fitted with an entry guide, or gather, which flares outward, increasing the width of the cell by approximately 7.5 inches. The gathers will be fabricated from 1 inch steel plate.

Barge modifications will begin with removal of the existing asphalt wear surface and retaining rails at the hopper bottom. The cell guides will be supported by 8"x 6"x 1" steel angles welded longitudinally along the bottom. The angles will span at least three bottom frames to spread the container corner loads into the bottom structure. The vertical cell guides will land on the angles. The cell guides will be installed to form a grid in the hopper that will be three containers wide and six containers long. Single cell guides will be installed at the corners of the hopper, double cell guides will be installed along the periphery, and quadruple cell guides will be installed in the middle of the grid where four container corners meet. The cell guides will be braced against roll motions by horizontal transverse structure installed at the level of the existing deck. They will be braced against pitch motions by longitudinal members that will run diagonally from the deck level to the exiting barge bottom.

The barge modifications can be accomplished without dry docking the barges. However, the modification of the barges will undoubtedly be combined with a comprehensive repair and renewal program, the cost of which is not included in the estimated barge conversion cost.

NEW YORK CITY
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MARINE TRANSFER STATION CONVERSION

Conceptual Design Development

Section 4
Structural Design

Greeley and Hansen LLC
Klein and Hoffman, Inc., P.C.
AMSEC LLC

September 2002

4.1 INTRODUCTION

This section addresses the design of structural and foundation systems associated with the proposed conversion of the five existing Marine Transfer Stations located at West 59th Street, West 135th Street and East 91st Street in Manhattan, North Shore in Queens and Greenpoint in Brooklyn. These structural components will be constructed at each MTS site to support the process and auxiliary areas of the preferred conversion design concept, as described earlier in this report. The proposed concept will convert each water-based MTS from its former function as a truck-to-barge waste transfer facility to a containerized waste processing facility for marine export.

The purpose of this structural basis of design is to provide a description of the proposed structural framing systems and materials to be incorporated into the planned waste processing facilities. In addition, this section provides recommended design criteria and guidelines that will govern the structural design process through completion. Structural engineering, design and contract documentation of proposed building and access ramp structures, foundations and equipment supports will be governed by the applicable structural design criteria and guidelines presented in this document.

4.2 STRUCTURE DESCRIPTIONS

4.2.1 West 135th Street, North Shore and Greenpoint Marine Transfer Stations

The proposed conversion of the existing Marine Transfer Stations at West 135th Street, North Shore and Greenpoint share a common configuration and structural support system. The only apparent difference among these three proposed facilities is the alignment and incline of the access ramps and the height of the foundation pile caps to account for tidal range variations at their respective locations. Conceptual structural framing plans and sections of each proposed structure are provided along with this report for reference.

Each of these three existing MTS structures and adjoining ramps will need to be demolished down to the foundation level to accommodate the expanded function, size and configuration of the proposed facilities. Reconstruction rather than rehabilitation of each facility is necessary for the following reasons:

- The converted MTS will require a tipping floor structure at a substantially higher elevation than the existing structure due to the addition of a separate loader floor level. Consequently, the existing tipping floor structure and adjoining access ramps cannot be reused in the construction of the containerization facility.
- The existing pier level structure at each MTS must be raised to meet the 100-year flood elevation and enlarged to accommodate the container handling equipment.
- The existing timber and steel pile foundations do not have the structural capacity to support the substantially heavier loads imposed by the planned construction.

Therefore, the existing structural building components and materials that comprise each MTS must be demolished in their entirety to accommodate the construction of a new facility on the same site.

Existing structures and foundations to be demolished that are situated in or over navigable waters will be removed down to the final dredge line elevation to accommodate barge and tugboat movements. Existing structures and foundations that are located in or over non-navigable waters or confined within the new structure footprint will be demolished to the extent required to accommodate new construction but not less than one foot below mean low water. Demolition of existing ramp structures and other structures located on land will extend to a minimum of four feet below existing grade.

The structural design of the proposed replacement structure will accommodate the physical and operational challenges of a heavy industrial facility in a harsh marine environment. The proposed structure will be framed in structural steel to accommodate the heavy floor loads and long spans in the waste dumping, processing and container handling areas. All structural steel framing at and below the tipping floor level will be epoxy coated and encased in concrete for fire protection and added corrosion protection against exposure to airborne saltwater spray and soluble chlorides. Dense, low water-cement ratio concrete with epoxy-coated reinforcing steel will be used throughout the facility. In addition, a fiberglass-reinforced concrete topping will be applied to concrete floor slabs in the vehicle and processing areas and the access ramps for long-term resistance to abrasion and chloride ion penetration.

Long-span steel roof trusses or joist girders will be used to cover the tipping floor and loader floor levels of each facility in order to maximize open space for improved accessibility and operational flexibility. Exposed steel roof framing will be coated with a three-coat, epoxy/polyurethane paint system. A grid of catwalks supported at the bottom level of the roof trusses will provide access to ventilation and dust/odor control equipment housed above the waste dumping and process areas. Roof structure heights will provide adequate vertical clearance to accommodate the proposed front-end loaders at the loader level and all of the Department's large, dump-type collection vehicles at the tipping floor.

Building columns at the tipping floor will be encased in concrete to the roof line for fire protection and protection against vehicle impact. Columns supporting the loader level roof will be incorporated into the reinforced concrete push walls that will line the perimeter of the loader floor to a height of 17'-0" above the floor level. Vertical diagonal bracing along exterior and divider walls will serve to laterally brace the structure against imposed wind and seismic forces.

New access ramps constructed of reinforced concrete will provide two-lane access to the tipping floor and single-lane access to the loader floor level. The reconstructed ramps will need to be realigned and lengthened from their present configuration to achieve a maximum 6% grade between existing grade and the higher tipping floor elevation.

The tipping floor and access ramps will be designed to accommodate the heaviest vehicles in the Department's inventory. The tipping floor bays adjacent to the backing logs will be designed to resist the loads imposed by the Department's critical vehicle dumping its contents onto the loader floor. The ramp structures will be designed to permit queuing along their lengths. The loader floor framing will be sized to support a 16-foot maximum depth of solid municipal waste over the floor or the specified front-end loaders positioned anywhere on the floor.

The entire pier deck area serviced by the gantry cranes will be designed to resist the weight of filled containers stacked two high. The pier deck framing will also be designed for the vertical and horizontal operating loads imposed by the gantry cranes and the compactors. Since one leg of the gantry crane will need to be raised above the floor level to clear the compactors, a steel-framed support system will be erected to support one of the crane runways. The compactors and auxiliary power units will be located within heavily framed floor pits. The remainder of the pier deck level will be designed for a minimum live load of 200 psf except the Personnel Area will be designed to accommodate the intended use of the various spaces in accordance with the provisions of the NYC Building Code.

The main structure and access ramps will be supported on high-capacity foundation piles driven into rock or the dense subsurface soil stratum depending on the results of the geotechnical investigations. Consideration will be given to the selection of concrete-filled steel pipe piles which offer better corrosion resistance than steel H-piles in the tidal zone. A cathodic protection system will also be installed to offer enhanced protection for steel elements directly in contact with the river water.

Due to the high concentrated loads of the compactor equipment and the gantry cranes, individual pile foundations with batter-driven piles to resist horizontal operating loads will be required directly beneath each of these elements. Additionally, batter piles will be required along the perimeter of the concrete pier deck to resist docking and mooring impact forces imposed by tugboats and barges. Fendering panels manufactured of ultra high molecular weight (UHMW) polyethylene will be bolted to the exterior face of the pier deck to protect the concrete surface from impact and abrasion.

4.2.2 East 91st Street Marine Transfer Station

Although the conceptual layout of the converted East 91st MTS is different than the three common stations discussed above, the proposed structural components and construction materials are identical. Similar to the typical facilities, the entire MTS structure will be demolished to an elevation below the waterline. However, the existing access ramp to this facility will be salvaged and reused in its present alignment to avoid the costly and complicated construction that would be involved in rebuilding the access ramp over FDR Drive.

To accommodate the higher tipping floor elevation required for the containerization operation, an internal access ramp will be constructed within the modified MTS from the existing access ramp to the new tipping floor level. A second internal ramp will be constructed to provide vehicle access from the tipping floor to the loader level. Long-span roof trusses with spans of approximately 111’-6” and 108’-0”, respectively, will be required to maintain the open floor plan required at the enlarged tipping/ramp level and loader level at this facility. All other structural features are consistent with those of the typical facilities.

4.2.3 West 59th Street Marine Transfer Station

Unlike the extensive demolition required at the other marine transfer stations, the barge slip, tipping floor, and long-span roof trusses of the existing West 59th Street MTS will be retained in the modified facility to accommodate an existing paper recycling operation toward the outshore end. The remaining portion of the elongated structure will be transformed into a solid waste transfer facility. Due to the limited tipping floor elevation, however, the waste handling, compaction, and container handling operations will need to be consolidated on a single level at this station. These operations will occupy a new pier deck level constructed at the 100-year flood elevation.

Construction of a waste storage pit within the eastern half of the existing barge slip will create a dedicated area to receive solid waste dumped from the tipping floor level. To construct the storage pit within the confines of the existing structure, it is anticipated that the aluminum roof panels of the MTS will first need to be removed temporarily to facilitate the driving of new foundation piles within the existing barge slip. The floor slab of the pit will be framed in epoxy-coated structural steel and encased in concrete for corrosion protection. Reinforced concrete push walls will be constructed along three sides of the storage pit and extend to the tipping floor level.

The existing access ramp and gable roof east of the existing tipping floor will be partially demolished and reconstructed to a narrower roadway width. The ramp will provide vehicle access to the tipping bays of both the solid waste transfer and paper recycling operation areas. The existing Operations Building will also be demolished to allow the pier deck level to be widened and extended from the new waste storage pit to the inshore end of the pier. This will provide the necessary operating space to handle, compact, containerize and transfer solid waste into barges.

The new access ramp roadway and pier deck structures will be framed in concrete-encased structural steel supported on pile foundations. Long-span steel roof trusses and metal roof deck will be used to cover the waste handling and compactor operation areas. Similar to the other transfer stations, the container handling, gantry crane and barge loading operations will remain open to the elements. A proposed two-story structure located near the bulkhead line to house personnel functions will be constructed of structural steel framing and composite floor deck.

4.3 APPLICABLE CODES AND STANDARDS

Design, fabrication, installation and inspection and testing of structural elements will comply with the applicable provisions and requirements of the following organizations and publications:

- Governing Building Code: Building Code of the City of New York, Local Law No. 76, 1968, with amendments to date.
- United States Department of Labor Occupational Safety and Health Act of 1970 (OSHA), as amended to date.
- Americans with Disabilities Act (ADA), 1990, as amended to date.
- International Code Council, Inc., International Building Code 2000 (IBC 2000), will govern seismic design requirements for the project.
- American Institute of Steel Construction (AISC), Manual of Steel Construction – Allowable Stress Design (ASD), 1989, Ninth Edition, with Commentary, Supplements and Code of Standard of Standard Practice will govern the design, fabrication and erection of structural steel.
- American Concrete Institute (ACI), Building Code Requirements for Structural Concrete, 1999, ACI 318-99, with Commentary, ACI 318R-99, Supplements and related ACI design publications will govern the design and construction of reinforced concrete.
- American Welding Society (AWS), Structural Welding Code - Steel, AWS D1.1, 1996, will govern the design, fabrication and quality control of welded shop and field structural steel connections.
- American Association of State Highway and Transportation Officials (AASHTO), Standard Specifications for Highway Bridges, 1996, Sixteenth Edition, will govern the design of structures subject to highway vehicle loading.
- Building Code Requirements for Masonry Structures, ACI 530-95/ASCE 5-95/ TMS 402-95 and Specification for Masonry Structures, ACI 530.1-95/ASCE 6-95/TMS 602-95 with Commentaries will govern the design of concrete masonry walls.
- National Forest Products Association (NFPA), National Design Specifications for Wood Construction, 1986, with Supplements, will govern the design of timber structures.
- Steel Deck Institute (SDI), Design Manual for Composite Decks, Form Decks and Roof Decks, 1996 Edition, and Diaphragm Design Manual, Second Edition, will govern the design, fabrication and installation of steel decks.
- Steel Joist Institute (SJI), Standard Specifications, Load Tables and Weight Tables for Steel Joists and Joist Girders, 1994 Edition, (SJI Manual), will govern the design, fabrication and erection of steel joists and joist girders.
- ASTM International (ASTM), Standards in Building Codes, 2000, 37th Edition, will be referenced in the design documents where appropriate.

- American National Standards Institute (ANSI)/American Society of Civil Engineers (ASCE), Minimum Design Loads For Buildings and Other Structures, ANSI/ASCE 7-98, will be consulted and used where appropriate.
- Factory Mutual System, Loss Prevention Data, Section 1-28, Wind Loads to Roof Systems (Factory Mutual 1-28).
- Applicable statutes and regulations of the various Federal, State, and local jurisdictional authorities.
- City of New York Department of Sanitation (DSNY), Design Standards and Guidelines, including structural design criteria, DSNY collection vehicle data and CADD drafting standards and specification requirements, including DSNY General Specifications.

4.4 GENERAL SERVICE LOADS

4.4.1 General

Structures will be designed to safely support the anticipated dead, live, wind and seismic loads determined from the applicable codes, regulations, design guidelines, consensus standards and weights (furnished by the vendors) of incorporated equipment or material. The live and dead loads used for the purpose of design will be developed to represent the stipulated (actual intended) use or occupancy on this project.

4.4.2 Dead Loads

The weight of material and fixed or mobile equipment used in the design will be the weights furnished by the equipment vendors or by DSNY. In the absence of such information, the weight will be conservatively determined.

Uniform blanket loading for electrical, mechanical, miscellaneous equipment, piping, conduits, suspended ceilings and lighting fixtures will be 10 psf applied directly to the structural framing system.

4.4.3 Roof Live Loads

Roofs will be designed to accommodate a minimum live load of 30 psf of horizontal projection. Working roofs will be designed for a minimum live load of 100 psf. Non-working roof loads will conform to the applicable requirements of New York City Building Code, Section 27-561 – Roof Loads, including provisions for wind, snow, concentrated and special loads.

4.4.4 Floor Live Loads

Personnel Areas:

- Offices and personnel facilities: 80 psf + 20 psf allowance for partition walls
- Electrical rooms: 250 psf
- HVAC rooms 150 psf
- Heavy storage rooms 300 psf
- Light storage rooms 150 psf
- Walkways, platforms, stairs, and all other floors: 100 psf
- Elevators: Loading shall be per ASME A 17.1.

Tipping Floor Level: Appropriate DSNY critical truck axle loadings for moving vehicle in vehicle access areas or vehicle in dumping position adjacent to backing log.

Loader Floor Level: Uniform load of 270 psf anywhere on the floor based on maximum 16-foot depth of municipal solid waste (MSW) at 450 lbs/CY or critical wheel loads of specified front-end loaders based on manufacturer's data with loaded bucket in raised position to achieve maximum load condition, whichever produces the most critical stress condition.

Pier Deck Level:

- General uniform live load of 200 psf on floor and perimeter pier deck surface unless otherwise noted.
- Uniform load of 540 psf representing two (2) filled containers double stacked anywhere on the deck surface area serviced by the gantry cranes.
- Compactors: Actual vertical and horizontal longitudinal loads imposed on the structure based on specified compactor manufacturer's data.
- Gantry Cranes: Actual vertical, lateral and longitudinal loads imposed on the structure based on specified crane manufacturer's data.
- Barge/Tugboat Mooring and Impact Loads: To be determined based on structural analysis of actual equipment used.

Access Ramps: DSNY critical truck axle loadings for moving vehicle or AASHTO H-20 loading requirements, whichever produces the most critical stress condition.

At all floor levels, the live load option that creates the highest stress condition will be used. The weight of equipment components, which could be placed on or transported across the floor, will be located to create maximum stress conditions.

4.4.5 Wind Loads

Wind load design will be in accordance with NYC Building Code, Reference Standard RS9-5.

4.4.6 Seismic Loads

Seismic design will be in accordance with the provisions of the International Building Code (IBC 2000). Although IBC 2000 seismic design provisions have not been adopted by the City of New York, New York State adopted the IBC 2000 code for seismic design of new structures in July 2002 and New York City is expected to follow suit by late 2003. Specific seismic factors and coefficients will be determined from the recommendations in the geotechnical report.

4.5 MATERIALS OF CONSTRUCTION - STRUCTURAL

4.5.1 Cast-in-Place Concrete

Cast-in-place concrete for structural applications shall be normal weight, air-entrained, and conform to Class 40 with a minimum ultimate compressive strength of 4,000 psi at 28 days. Design of reinforced concrete structures will be in accordance with the ACI 318 Strength Design Method utilizing appropriate load factors and strength reduction factors.

4.5.2 Concrete Reinforcement

Reinforcing steel bars shall be epoxy coated and specified to conform to ASTM A615, Grade 60, or ASTM A706 where reinforcement is to be welded. Welded wire fabric shall be galvanized and conform to ASTM A185.

4.5.3 Structural Metals

Structural Steel:

- Wide flange (W) rolled sections: ASTM A992 or ASTM A572, Grade 50 (Fy = 50 ksi) with special provisions.
- All other shapes and plate: ASTM A36 (Fy = 36 ksi) or ASTM A572, Grade 50 (Fy = 50 ksi).
- Structural tubing: ASTM A500, Grade B (Fy = 46 ksi).
- Structural pipe: ASTM A53, Grade B (Fy = 35 ksi).
- Bolted connections: A 325-SC.

- Standard and anchor bolts: ASTM A307 or A36.
- Welded connections: E70XX (AWS A5.1 or A5.5). Use low hydrogen electrodes for field welding.

Stainless Steel:

- Type 316L (304L for architectural uses only).

Aluminum:

- Alloy 6061-T6 or 6063-T6.

Steel Floor and Roof Decking:

- ASTM A653, galvanized, G90 coating.

4.5.4 Pile Foundations

All structures over water will be supported on deep foundations. Structures situated on or above land will be supported on deep or shallow foundations depending on the suitability of the subsurface soil conditions encountered. Foundation designs will be based on design parameters and geotechnical recommendations to be determined from the subsurface soils investigation program and geotechnical report. Subsurface investigations will include soil test borings and soil sampling at appropriate locations within and around the planned structures, including rock coring to establish the rock quality designation (RQD) of the substrate. The recommendations of the geotechnical report will be evaluated to determine the most effective foundation system or systems to support new structures and equipment against imposed gravity and lateral forces with respect to constructibility, serviceability and capital cost.

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MARINE TRANSFER STATION CONVERSION

Conceptual Design Development

Section 5
Architectural Requirements

Greeley and Hansen LLC
Klein and Hoffman, Inc., P.C.
AMSEC LLC

September 2002

5.1 INTRODUCTION

The architectural design of the proposed waste containerization and marine transfer stations will suit the physical, operational, and regulatory requirements established for these buildings. Each facility will be designed to accommodate three distinct operational areas – the tipping area, waste storage and loading area, and barge loading area. Additional operational support areas will be required to house personnel and maintenance facilities.

5.2 CODES AND STANDARDS

The architectural design of the marine transfer stations will conform to the following codes and standards:

- New York City Building Code;
- Occupational Safety and Health Act; and,
- American with Disabilities Act.

5.3 FACILITY REQUIREMENTS

The requirements of the converted marine transfer stations include the functional needs of the following operations:

- Collection vehicle receiving and weighing;
- Collection vehicle maneuvering and tipping;
- Waste storage;
- Compactor loading and waste containerization; and
- Barge loading.

The stations will also house the personnel and equipment maintenance facilities necessary to support the above operations. Administrative offices, lunchroom with kitchen, and men's and women's restrooms, shower and locker rooms will be sized to accommodate the number of persons anticipated to utilize the facilities during a shift. Lockers will be of sufficient number to accommodate the total number of workers from all three shifts plus auxiliary staff. Additional restrooms will be provided at the tipping floor and loading floor for operators and collection vehicle drivers.

Shops will be provided for machining, welding, wood working, and servicing of motors and other electrical equipment.

Storage areas and rooms will be provided for machine parts, electrical equipment, janitorial, and miscellaneous supplies.

A control area will be provided in the weighing office at the tipping floor to direct the movement of collection vehicles.

5.4 FINISHES

The finish material of the proposed stations will be selected to minimize the calendar time needed for construction while maintaining the general architectural character of the existing sites. It is anticipated that the exterior will be constructed mainly of translucent or metal panels walls, un-insulated except for the areas adjoining the personnel facilities. Workers will be spending a full day in the buildings performing tasks that require a large amount of light and particular emphasis will be paid to both natural and artificial lighting. Translucent wall panel systems, such as that manufactured by Kalwall, Inc., will be considered.

A metal roofing system will be provided and the interior steel framing will be painted except where encased for fire protection. The interior walls of the personnel and maintenance areas will be painted gypsum wall board.

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Conceptual Design Development

Section 6
Heating, Ventilating, Air Conditioning, Plumbing and Fire Protection

Greeley and Hansen LLC
Klein and Hoffman, Inc., P.C.
AMSEC LLC

September 2002

6.1 INTRODUCTION

This section addresses the design of the heating, cooling and ventilating systems and their controls, and the plumbing and fire protection systems to be installed as part of the conversion of existing Marine Transfer Stations at West 59th Street, West 135th Street, East 91st Street, North Shore and Greenpoint from direct barge loading to containerization facilities. Heating, cooling and ventilation are required to create an adequate environment for operating personnel, waste storage and processing, and to control air quality in the space.

6.2 CODES AND STANDARDS

The regulations, standards, codes, and recommended practices of the following appropriate regulatory bodies and organizations will govern the design, installation, inspection and testing of heating, cooling, ventilation, plumbing and fire protection work and materials:

- Building Code of the City of New York
- Building Code of the State of New York
- City of New York Department of Sanitation
- American National Standards Institute (ANSI)
- National Fire Protection Association (NFPA)
- American Society of Heating, Refrigerating and Air Conditioning Engineers (ASHRAE) Standards
- Sheet Metal and Air Conditioning Contractors' National Association (SMACNA)
- New York State Environmental Protection Agency Regulations
- United States Department of Labor Occupational Safety and Health Administration (OSHA)
- Underwriters Laboratories (UL)

- Americans with Disabilities Act (ADA)
- American Gas Association (AGA)

6.3 CLIMATIC DATA

The heating, cooling and ventilating systems will be designed for the following outdoor air temperatures.

	Dry Bulb	**Wet Bulb**
Winter	5^0F	--
Summer	92^0F	74^0F

6.4 SYSTEM DESCRIPTIONS

6.4.1 General

Mechanical ventilation will be provided for all process areas. These areas will be supplied with 100 percent outdoor air.

Mechanical ventilation, heating and cooling will be provided for the Personnel Areas. Air conditioning units for those areas will have the capability of supplying 100 percent of outdoor air to conserve energy when outdoor conditions are favorable.

Stairwells and vestibules will be heated with hot water or electric cabinet heaters.

6.4.2 Mechanical Ventilation

Centrifugal supply fans interlocked with associated in-line and propeller exhaust fans will provide continuous mechanical ventilation for the Process Areas. The fans will be designed to supply 100 percent outdoor air.

6.4.3 Mechanical Ventilation, Heating and Cooling

Indoor type, central air-conditioning units will provide mechanical ventilation, heating and cooling. Dedicated in-line return/exhaust fans will be interlocked to their respective air-conditioning units. These units will normally recirculate conditioned air and will have the capability of supplying 100 percent outdoor air. Outdoor air will be preheated by hot water or electric heating coils integral with the air-conditioning units. Cooling will be thermostatically controlled by chilled water or refrigerant coils integral with the air-conditioning units. Hot water or electric reheat coils will be installed in duct branches to serve dedicated zones and individual spaces, as required for temperature control.

6.4.4 Heating System

New gas fired hot water boilers are the preferred option to supply heat to personnel areas. Electric heating would be considerably more expensive to operate. Associated equipment, including pumps, will be provided to distribute hot water to air-conditioning units and other unitary heating equipment such as cabinets.

6.4.5 Cooling System

Two alternatives should be considered in the cooling system design.

Alternative 1

Two new chillers will be provided. Each chiller will be sized for 80 percent cooling load capacity. Chillers will alternate their run time and one will serve as backup. Chillers will be of an air-cooled design or will use river water to reject heat. Primary and secondary pumps will distribute chilled water to cooling coils integral with air-conditioning units.

Alternative 2

Individual roof or grade mounted condensing units will be provided to serve their respective air-conditioning units. Refrigeration piping will distribute cooling to DX coils integral with air-conditioning units.

6.4.6 Controls

Ventilating, heating and cooling systems will feature either PLC or DDC controls with the capability of monitoring and controlling from a remote location.

6.4.7 Plumbing

Plumbing systems in the converted marine transfer stations will consist of potable water supply from City water mains to the personnel areas, the fire protection system, washdown hose locations, dust control system; storm drainage; and sanitary drainage systems. If necessary to increase City water pressure for the domestic and service water systems, a service water pump will be provided.

Domestic water service will be extended into each facility from the nearest water main and will be distributed to each plumbing fixture. Domestic water will be heated using gas fired (preferred) or electric heaters. All hot and cold water pipes will be insulated.

A piping system will be installed throughout each station to provide water for cleaning, washdown, and maintenance operations.

Sanitary drainage from each facility will discharge to an oil water separator and pumped to nearest sanitary sewer. Each facility will be provided with separate roof drainage and pier deck storm drainage systems. Roof drainage will be directed to the river. Runoff from the open pier deck areas will be collected and discharged to the oil water separator of the sanitary drainage system.

6.4.8 Fire Protection

Automatic sprinkler systems will be provided for each facility. Process areas will be served by dry type systems and wet type (standard) systems will be used in personnel areas. If necessary, fire pumps will be provided to increase City water pressure. Standpipes and siamese connections will be provided as required by applicable codes or the authority having jurisdiction.

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MARINE TRANSFER STATION CONVERSION

Conceptual Design Development

Section 7
Electrical

Greeley and Hansen LLC
Klein and Hoffman, Inc., P.C.
AMSEC LLC

September 2002

7.1 INTRODUCTION

In this section, the objectives and criteria for the design of electrical power and related systems are addressed.

7.2 CODES AND STANDARDS

The regulations, standards, codes, and recommended practices of the following regulatory bodies and authorities governing the design, installation, inspection and testing of the electrical power, lighting, communications, and related systems will include:

- Electrical Code of the City of New York
- Building Code of the City of New York
- National Fire Protection Association (NFPA)
- Building Code of the State of New York
- National Electrical Manufacturers Association (NEMA)
- Underwriters Laboratories Inc. (UL)
- Americans With Disabilities Act (ADA)
- New York State Energy Conservation Construction Code
- USDL Occupational Safety and Health Administration (OSHA)

7.3 SYSTEM DESCRIPTIONS

7.3.1 Utility Service

The increased electrical loads represented by the addition of Compaction and Container Handling Systems to the basic material transfer functions of the existing Transfer Stations will require substantial increases in the capacity and reliability of the existing electric utility service. The necessary increase in service capacity will be accompanied by a duplication of incoming electrical service, to enhance the reliability of power to the facility. Details of

Utility-provided second electrical service will be negotiated with the Utility, Consolidated Edison Company of New York Inc., and utility charges for the "Excess Facility" costs will be included as a pass-through cost in the Contract Documents. It is desirable that the service voltage be 480 V., but this is subject to the utility system network and may not be available at all locations, and must be confirmed with the utility.

7.3.2 Service Equipment

Redundant power supply capability will be extended underground from the points of service entrance to the facility to a set of service equipment, then to a duplex Main Distribution Switchboard, and then to the intermediate bus level represented by the Motor Control Centers. The Service Equipment will be constructed of two utility approved metering compartments, and two service switch assemblies. The Service Equipment will utilize drawout type air circuit breakers. The Service Switchgear metering and protection equipment will comply with the requirements of the electric utility.

Fire Pump Power Supply: Fire pumps for the facilities will be provided with redundant electric feeders tapped from the incoming service equipment ahead of all other facility loads, in accordance with Applicable Codes. Each Fire Pump will be furnished with an integral approved transfer switch and controller.

Main Power Distribution Switchboard: A duplex Main Distribution Switchboard, with the ability to manually serve facility loads from either incoming service, will be utilized. The Distribution Switchboard sections of the Main Switchboard will be composed of two main bus sections with equipment feeder circuit breakers, connected by a normally open bus tie circuit breaker which will be key interlocked with the two normally closed main circuit breakers, to permit feeding the main bus sections from either service, or splitting the facility loads between the services. The Cranes and Compactors will be supplied directly from the Distribution Switchboard.

Motor Control Centers: The various smaller motor and panel loads will be supplied from Motor Control Centers. Each MCC will be configured with two main bus sections, two normally closed main circuit breakers, and a normally open bus tie circuit breaker, similar to the arrangement utilized for the main Distribution Switchboard. The main and tie circuit breakers will be key interlocked to allow manually selectable source redundancy without permitting cross-connection.

Service Outlets and Miscellaneous power: Small lighting, motor, and receptacle loads will be supplied from circuit breaker panelboards located to suit areas where load is concentrated.

Backup Power: In service of certain selected Computer, Security, or SCADA System loads, that must be capable of operating through a power outage, small individual battery back-up UPS units will be furnished with the particular equipment. Emergency and Exit lighting will utilize fixtures with their own self-contained internal battery backup units.

Power Conditioning and Protection: Lightning and surge protection provisions will be provided as an integrated system from the Main Switchboard, to the MCC, Panelboard, and where required, to the individual load or receptacle level. Power conditioning for computer equipment will be specified as part of the UPS units.

7.3.3 Lighting

Tipping Floor and Loading Floor: High bay metal halide, pulse start, color corrected; 30 FC, coordinated with daylight availability from skylights and Kalwall panels.

Offices and Shops: High efficiency fluorescent, occupancy detection; 50 FC

Roadway and Vehicle Approach Ramps: Pole-mount Metal Halide, shielded if necessary, graduated to allow safe daylight to interior transition if possible, coordinated with traffic signals; 5 FC.

Exterior Façade: Facade and signage lighting will be developed in conjunction with the Architectural development of the site and building aesthetics to comply with the recommendations of the Art Commission.

Perimeter Security: Security lighting will be developed in conjunction with perimeter fencing and barrier design to protect the site without creating nuisance conditions.

7.3.4 Telephone and Other Voice and Data Communications Systems

Telephone service will be brought to the Building underground from the utility street network. Individual telephone equipment, suitable for the environment in which they are located, will be provided throughout the facility to allow personnel communications. A master intercom system will be provided for paging and notification over ambient noise levels.

7.3.5 Fire Alarm

A simple coded tone automatic fire alarm notification system will be provided in compliance with local code requirements, zoned as required. Manual stations, and automatic detection devices suitable for discriminating between fire conditions and vehicle emissions, will be provided.

NEW YORK CITY
DEPARTMENT OF SANITATION

MARINE TRANSFER STATION CONVERSION

Conceptual Design Development

Section 8
Regulatory Compliance

Greeley and Hansen LLC
Klein and Hoffman, Inc., P.C.
AMSEC LLC

September 2002

8.1 INTRODUCTION

The permits required for the marine transfer station conversion project are identified below. An evaluation of the time frame required to obtain the necessary permits is also provided. The regulatory compliance requirements are divided into two groups – planning approvals and building and construction permits.

8.2 PLANNING APPROVALS

8.2.1 ULURP Procedure

Of the potential permits required to modify the facilities, the New York City Uniform Land Use Review Procedure (ULURP) is the most time-extensive procedure undertaken in the City. This procedure is utilized when property is acquired, zoning is changed, and demapping actions or changes in the City Map are needed. To ascertain if ULURP is required an evaluation of lot ownership is needed. Once this is done then the permitting process can be readily outlined.

Lot Ownership

A definitive determination regarding the property included in a city lot and ownership of that lot can only be obtained via the services of a Title Search Company. In lieu of that a reasonable understanding of a property's boundary limits can be obtained by reviewing City records; specifically the City Tax Assessment Maps. The Tax Assessment Maps are the City's vehicles for assessing and calculating property taxes. All City properties are included in the rolls regardless of their status as city-owned or otherwise tax-exempt. The maps present the dimensions of the property and the extent of property ownership.

W. 135th Street MTS

The W. 135th Street Marine transfer Station is located in the Borough of Manhattan immediately south of the North River Water Pollution Control Plant (WPCP). The Station is identified as Tax Block 2101, Lot 120 and is zoned M1-1 as shown on Zoning Map 5c.

The Tax Assessment Map (see Figure 1 of Appendix B) indicates that Block 2101, Lot 120 is roughly a square shaped parcel approximately 419 feet wide by about 506-533 feet long. Nomenclature utilized in the City's mapping protocol indicates that Lot 120 is bounded by the northerly curbline of W. 135th Street as extended westwardly from the U.S. Bulkhead Line on the southern boundary of the lot, the U.S. Pierhead Line on the west boundary, Lot 117 (North River WPCP) on the northern side, and the U.S. Bulkhead Line on the eastern boundary. As such, Lot 120 includes the Station, the ramp leading to it and the land under water within the boundaries described above. The Lot does not include the short section of roadway used to cross from the end of the DSNY ramp to W. 135th Street. This area is included in Block 2101, Lot 117 that is the location of the North River WPCP.

W. 59th Street MTS

The W. 59th Street Marine Transfer Station is located in the Borough of Manhattan in the vicinity of W. 59th Street and 12th Avenue. The property is identified as Block 1109, Lot City-99. The area is zoned M2-3 as shown on Zoning Map 8c.

The Tax Maps (See Figure 2 of Appendix B) indicate that the MTS is situated on a pier extending into the Hudson River. The lot itself is a rectangular parcel extending westward from the Marginal Street, Wharf or Place into the Hudson River. The lot is approximately 116 feet wide. Mapping nomenclature indicates that the lot is bounded by the Marginal Street, Wharf or Place on its east boundary, Lot City-25 on its southern boundary, the U.S. Pierhead line serves as it west boundary and Lot City-100 of Block 1171 is on its northern boundary. As such the area within these boundaries is owned by the DSNY.

E. 91st Street MTS

The E. 91st Street MTS is located in the Borough of Manhattan parallel to The Franklin D. Roosevelt Drive between Avenue B and York Avenue. The property is identified as Block 1587, Lot City-27. The area is zoned M1-4 as shown on Zoning Map 9a.

The Tax Assessment Map (See Figure 3 of Appendix B) indicates that the lot is a narrow and long irregularly shaped parcel extending along the shoreline with the FDR Drive forming its western boundary and the East River its eastern boundary. As shown on the map the DSNY has ownership of the area within the described boundaries. In addition, records maintained by the Tax Assessor's Office specifically indicates that the Lot does include "Land Under Water".

North Shore MTS

The North Shore Marine Transfer Station is located in the Borough of Queens at 30-04 121st Street. It is located adjacent to Flushing Bay east of the LaGuardia Airport. The property is identified as Block 4346, Lot 75. The area is zoned as M1-1 as shown on Zoning Map 10a.

The Tax Assessment Map (See Figure 4 of Appendix B) indicates that Lot 75 consists of land and land under water. The westerly curb line of 122nd Street forms the eastern boundary of the lot, 31st Avenue constitutes the southern side, and the U.S. Pierhead Line is the western boundary. The southerly line of Lot 10 and the centerline of 30th Avenue form the northern boundary.

Greenpoint MTS

The Greenpoint Marine Transfer Station is located in the Borough of Brooklyn and is identified as Tax Block 2508, Lot 1. The area the lot is located in is zoned M3-1 as shown on Zoning Map 13a.

The Tax Assessment Map (See Figure 5 of Appendix B) for the Greenpoint MTS indicates that Tax Block 2508, Lot 1 is an irregularly shaped parcel bounded by N. Henry Street (paper street) to the east, Kingsland Avenue (paper street) to the south, Whale Creek Canal to the west and the U.S. Pierhead and Bulkhead Line, situated in Newtown Creek, to the north.

The Brooklyn Borough Topographic Maps indicate that N. Henry Street on the eastern boundary of Lot 1 and Kingsland Avenue on the southern boundary are unimproved streets owned by the City of New York. A permanent sewer easement, approximately 50 feet wide, is located on the eastern half of North Henry Street. A previous ULURP action (No. 960402 MMK) completed for actions by others in the area demapped the Pier Line, running parallel to Whale Creek Canal, along the western boundary of Lot 1.

Zoning

The five marine transfer stations are located in districts zoned as manufacturing (M) areas. Zoning and pertinent information for each of the stations is as follows:

Location	Zone	Floor Area Ration (FAR)	Parking
W. 135th Street MTS	M1-1	1.0	Required
W. 59th Street MTS	M2-3	2.0	Not Required
E. 91st Street MTS	M1-4	2.0	Not Required
North Shore MTS	M1-1	1.0	Required
Greenpoint MTS	M3-1	2.0	Required

The zoning classification presented above consists of three parts. The letter "M" signifies that the area is zoned for manufacturing. The first number after the letter M refers to the specific range of permitted uses in the district. The additional number indicates bulk and parking controls. "Bulk" refers to the size of the building in relationship to the size of the lot and is expressed as the "floor area ratio" (FAR). The FAR is calculated by dividing the total floor area on a specific zoning lot by the total area of that same zoning lot.

M1 Districts are Light Manufacturing Districts (High Performance). They are planned for a wide range of manufacturing and related uses that can conform to a high level of performance standards. The establishments within this districts are within completely enclosed buildings, therefore, the businesses provide a buffer between residential and/or commercial areas and other industrial users that may be associated with more objectionable influences to the surrounding area. Of these districts, M1-1 districts are located adjacent to low-density residential areas. M1-4 districts are located mainly in Manhattan Community Board District (CBD).

M2 Districts are Medium Manufacturing Districts (Medium Performance). This district is intended for establishments that fall between light industrial users and heavy industrial users. The required performance standards are lower in M2 districts than in M1 districts. Therefore, except when bordering residential districts, more noise and vibration is permitted, smoke is permitted and industrial activities do not need to be entirely enclosed. Of these districts M2-3 is located only in the Manhattan CBD.

M3 Districts are Heavy Manufacturing Districts (Low Performance). These districts are designed to accommodate essential heavy industrial uses that typically involve more objectionable influences and hazards such as traffic, noise and pollutants. Therefore, the uses cannot be reasonably expected to conform to performance standards considered appropriate for other classifications. M3 Districts are usually located near the waterfront and are buffered from residential areas. M3-1 is a heavy manufacturing use area and differs from the other M3 district by parking requirements. M3-1 requires establishments to provide parking.

ULURP Determination

Based on the information shown on the Tax Assessment Maps it appears that the lots on which the Marine Transfer Stations are located includes the structures, land and lands under water. As such a ULURP action should not be required.

Modification of the facilities also appears to be consistent with the area's current zoning classification. As such, it is not expected that a zoning change will be required under the ULURP procedure. As design progresses, however, zoning rules pertaining to building heights, set-backs etc will need to be reviewed to assure compliance with the rules of each of the districts.

8.2.2 Permitting Procedure

The permits required during the planning stage are presented in Table 8-1. Permits are required from the U.S. Army Corps of Engineers, the New York State Department of Environmental Conservation (NYSDEC) and the City of New York. Since similar permits are required from more than one regulatory agency, joint applications can be prepared. If a project requires more than one NYSDEC permit, the applications are to be submitted simultaneously. If related permits are needed from other agencies or governing bodies, the application submitted to the NYSDEC must also include a list of the required permits. The list should also include the status of approval for each permit and the State Environmental Quality Review (SEQR) status for each permit.

The U.S. Army Corps of Engineers has a joint application process with the State of New York. The State has also implemented the Uniform Procedures Act to address the multiple

Conceptual Design Development

Table 8-1
List of Required Permits During Planning

September 2002

Permit	Administering Agency	Inclusion In Joint Application or Uniform Procedures Act (UPA) Permit
Section 10 – Rivers and Harbors Act	U.S. Army Corps of Engineers	U.S. Army Corps of Engineers Joint Application for Permit
Section 404 – Clean Water Act	U.S. Army Corps of Engineers	
Section 103 – Marine Protection, Research and Sanctuaries Act	U.S. Environmental Protection Agency	
6 NYCRR Part 608- Protection of the Waters	New York State Department of Environmental Conservation	NYSDEC UPA Permit
Section 401 – Clean Water Act	New York State Department of Environmental Conservation	
40 CFR Part 122 – Storm Water Permit	New York State Department of Environmental Conservation	
7 NYCRR PART 360 – Solid Waste Management Facilities	New York State Department of Environmental Conservation	
6 NYCRR Parts 200, 201, & 202 - Air Cleaning Installation, Process Emission Source Construction, and Certificate to Operate	New York State Department of Environmental Conservation	
6 NYCRR Part 661 – Tidal Wetlands	New York State Department of Environmental Conservation	
6 NYCRR Part 596 – Hazardous Substance Storage	New York State Department of Environmental Conservation	
6 NYCRR Parts 612-614 – Petroleum Storage	New York State Department of Environmental Conservation	
Architectural Design	New York City Art Commission	
Waterfront Revitalization Program	New York City Department of City Planning	Included in the CEQR review
6 NYCRR Part 600 – Coastal Policy Consistency	New York State Department of State	Included in with The U.S. Army Corps of Engineer's Joint Application
State Environmental Quality Review	New York State Department of	The State will accept the City

Table 8-1
List of Permits Required During Planning
(Continued)

Permit	Administering Agency	Inclusion In Joint Application or Uniform Procedures Act (UPA) Permit
Act (SEQRA)	Environmental Conservation	CEQR process.
City Environmental Quality Review Procedures (CEQR)	Mayor's Office of Environmental Coordination	City CEQR process
Subchapter 6 – Air Pollution Control Permit	New York City Department of Environmental Protection	

permit issues. In addition, the City environmental review process has also included coordination with five other city programs in its environmental review process.

U.S. Army Corps of Engineers Joint Application For Permit

The U.S. Army Corps of Engineers is involved in issuing permits related to surface waters of the United States, wetlands adjacent to these waters and impoundments of these waters. Any activity involving work or the placement of any structure into or affecting navigable waters, or the placement of dredged or fill material into the waters of the United States requires authorization from the Corps before the work can begin.

Since similar permits are also required from the State of New York, a Joint Application is prepared. Three specific permits are included in the Joint Application. These include Section 10 of the Rivers and Harbors Act, Section 404 of the Clean Water Act and Section 103 of the Marine Protection, Research and Sanctuaries Act.

The U.S. Army Corps of Engineers and New York State joint permit application consists of the following steps:

- Attend a pre-application conference
- Prepare Joint Application for Permit form, environmental questionnaire, Federal Consistency Assessment Form and required photographs. Since the project will be considered to be a "major" project the Part 1 of a Structural Archeological Assessment Form will need to be completed.
- Submit completed form and copies to the NYSDEC with one copy clearly marked as "For Corps of Engineers". Mail copy of completed Federal Consistency Assessment Form to NYS Department of State.
- Permit decision requires 60-120 days unless a public hearing or environmental statement is required. Since the City CEQR process will be undertaken and a hearing is associated with CEQR, it is expected that the decision clock will start when CEQR is completed.

New York State Department of Environmental Conservation (NYSDEC) Permit

Most environmental protection permits from the NYSDEC are administered under the Uniform Procedures Act (UPA). This program established uniform review procedures for major programs and established time periods for the State to act on the applications. The UPA permits include, among others: tidal wetlands, protection of waters, solid waste permits and air pollution permits. For the project all of the required permits are submitted simultaneously. Permits required from other agencies or regulatory bodies are compiled in a list along with the permit's approval and SEQR status. The list is submitted with the application package.

The permitting procedure under the UPA is as follows:

- Attend a pre-application conference
- Submit a Complete Application – A complete application includes the application form, location map, plans, reports AND SEQR
- NYSDEC notifies applicant that applicant is complete within 15 days of receiving application
- NYSDEC published Notice of Completeness in ENB; applicant publishes Notice in a local newspaper
- Public Comment Period remains open 15 days after Notice is published
- Applicant responds to any comments received. NYSDEC also determines if a public hearing is required. Since one will be held as part of the SEQR process (CEQR in this case) it is expected that an additional hearing will not be required.
- With no additional hearing, the NYSDEC will make its final decision to grant the permits within 90 days after the Agency determined that the application was complete

New York City - City Environmental Quality Review (CEQR)

The City Environmental Quality Review (CEQR) is the process utilized by New York City agencies to identify the impacts a particular action will have on the environment. There are two broad categories of actions (projects. The work being considered for the marine transfer stations would constitute a site-specific action. In addition, for actions that may result in significant adverse impacts CEQR will typically require that an environmental impact statement (EIS) be prepared.

The documents prepared in the CEQR process consists of an environmental assessment statement (EAS), a scoping document, a DEIS and a Final EIS (FEIS). When all are completed, the four documents constitute a "complete" document and are submitted to the designated lead agency for findings. The process typically begins during the planning stage or when a permit is submitted for review.

The CEQR review typically requires coordination with other City procedures. Of these, the Waterfront Revitalization program and the Fair Share Criteria program are included in the CEQR process. A separate chapter in the EIS is devoted to each of the topics.

The CEQR process consists of a series of steps that ensure adequate review and consideration of public comments and concerns. Time limits are typically associated with each step although the times can be extended should it be deemed necessary to provide a full assessment of the proposed project. The steps and time limits for CEQR are as follows:

- Establish a lead agency – agency is established typically 30 days following an agency's notice of its intent to be the lead agency.
- Determine Significance – (Filing of Notice of Determination) – for the MTS project this would consist of the EAS. Since it is expected that the proposed project will be considered a major project, the EAS need include only the project description. Maximum of 15 days following submission.
- Draft Scope is to be published within 15 days of the determination of significance.
- The Draft Scope is distributed, a notice of availability is published in the Environmental Notice Bulletin (ENB) and local newspapers, and the date of a Public Scoping Meeting is advertised. The advertisement must be published at least 30 but not more than 45 days prior to the Scoping Meeting. A written public comment period remains open 10 days following the Hearing.
- Within 30 calendar days after the Public Scoping Meeting, the lead agency issues the Final Scope.
- Prepare the Draft Environmental Impact Statement (DEIS) and submit to lead agency for review.
- Lead agency determines completeness of the DEIS. The City's rules do not have a specified period. The lead agency can, if it so elects to do so, follow SEQRA rules. These rules allow for 45 days to determine completeness and adequacy.
- Conduct a Public Hearing no less than 15 days and no more than 60 days after filing the DEIS. The written comment period is to remain open 10 days following the hearing. Furthermore, the total period of public comment time must be at least 30 days (includes time before and after hearing).
- Prepare Final EIS (FEIS), determine completeness and file Notice of Completion – maximum of 30 days from the close of the public hearing
- Consider completed FEIS before making findings and taking action – minimum of 10 days from filing of the Notice of Completion. No maximum period is specified although the lead agency can follow the SEQRA rule of 30 days.

8.2.3 Estimated Schedule

The approximate schedule for the permitting and CEQR process is presented in Figure 8-1. As shown, it will require approximately 18 months to complete the permitting and CEQR process. Much of this time is devoted to the calendar dates dictated by the regulations for specific activities like public meetings and periods for receiving public comments. Some dates, while dictated by regulation, identify the maximum number of days a regulatory agency has to review a document. It is conceivable that the period could be shortened if the reviewing agency were able to dedicate its efforts on this project. For instance for the Joint Application, the State and Corps of Engineers has between 60 and 120 days to review the application. For scheduling purposes 90 days was shown, the average amount of time the agencies have for the review.

Some time periods are within the control of the DSNY. These would include the time allocated to preparing the draft environmental impact statement. The time period could be shortened depending upon the extent of the work included in the document. This would be known following discussions in the pre-application meetings. It is also possible that the Draft EIS will require a longer time to prepare and a longer time than the 45 calendar days for agency review since the public has input in the scope of the document. Depending upon the issues voiced at the Public Scoping Meeting and the Lead Agency's decision on the most appropriate manner in which to address those concerns, the time required to both prepare the document and the Lead Agency to review the document could be increased.

8.3 BUILDING AND CONSTRUCTION PERMITS

Numerous building and construction permits will be required as the project progresses through final design and construction. Table 8.2 summarizes the building and construction permits identified for the project to date. The permit requirements will be updated as the design progresses.

Table 8-2
List of Required Building and Construction Permits

Permit	Administering Agency	Activity Triggering Permit
Building Permit	NYC Department of Business Services	Construction of buildings and structures on water front property
Sewer Use Permit	NYC Department of Environmental Protection	Sanitary sewer and storm drain connections
Backflow Prevention Permit	NYC Department of Environmental Protection	Water service connections.
Water Service Connection Permit	NYC Department of Environmental Protection	Water service connections.
Plan Approval	NYC Bureau of Electric Control	Installation of electrical service.
Fire Department Permits and Certificates	NYC Fire Department	Fire Alarm, Fire Protection and Electrical Systems
Street Construction Permits	NYC DOT	Potential blocking of road or sidewalk
Gas Service Connection	Utility Company	Additional gas service connections.
Electrical Service Connection	Consolidated Edison	Additional electrical service
Demolition Permits	NYC Department of Buildings	Demolition of structures
Dewatering Permits	NY State Department of Environmental Conservation	Installation and operation of dewatering systems
Mobile Radio License	Federal Communication Commission	Use of hand-held two way radios on site

NEW YORK CITY
DEPARTMENT OF SANITATION

MARINE TRANSFER STATION CONVERSION

Conceptual Design Development

Section 9
Implementation Schedule

Greeley and Hansen LLC
Klein and Hoffman, Inc., P.C.
AMSEC LLC

September 2002

This section summarizes the schedule for moving the conceptual designs for the five marine transfer stations through the regulatory, design and construction phases of the overall program. As presented in the bar chart included in this section the implementation schedule shows the overall completion of the program in 53 months from the project start date.

For the purposes of this report it has been assumed that the program proceeds concurrently for all five of the marine transfer stations.

As can be seen in the bar chart the Regulatory Compliance task with a duration of 18 months drives the start of the demolition and construction tasks of the modified marine transfer station facilities. We have assumed that during this 18 month period the data collection, preliminary design, demolition design, value engineering and final design tasks for each of the five modified marine transfer station facilities can be completed. Additionally, it has been assumed that advertising, bidding, awarding and issuing of the notice to proceed of demolition contracts can run concurrently with the regulatory process.

Several assumptions have been made to accelerate the time frames presented in this schedule which the Department should be aware of. We have indicated the durations for Bid Award/Notice to Proceed for both the demolition and construction contracts to be 6 months. Our experience with the City of New York has shown that this period usually averages 9 months, so the Department, in order to achieve this schedule will have to modify and improve upon its usual procedures. In addition, as discussed in the Regulatory Compliance section of the report we have developed a schedule showing that the regulatory process can be completed in 18 months. This is an aggressive schedule that will require cooperation from the regulatory agencies and expedited preparation of environmental assessment reports and environmental impact reviews.

Construction of the modified marine transfer station facilities is shown as taking 24 months for actual construction with an additional 3 months allocated for start-up and testing of the waste processing and container handling equipment. Factors which could affect these time frames include the availability of quality marine contractors to work concurrently on five different sites and the production capacity of compactor manufacturers to fabricate and deliver the equipment to meet the construction schedules. As the program develops the Department may wish to consider meeting with the contracting community to build interest in the program and learn of obstacles that the Department may have with this community that may hinder the progress of the program. The Department may also wish to consider pre-purchasing the compactor equipment. This will enable the Department to standardize on one manufacturer for this equipment and ensure that the equipment will be available for delivery as the construction of each facility is advanced.

NEW YORK CITY
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MARINE TRANSFER STATION CONVERSION

Conceptual Design Development

Section 10
Construction Cost Estimates

Greeley and Hansen LLC
Klein and Hoffman, Inc., P.C.
AMSEC LLC

September 2002

Construction Costs for the conceptual designs of the 5 modified marine transfer stations have been estimated as shown. The estimates are presented as an itemized breakdown of elements as listed below:

- Demolition
- Sitework and Utilities
- Pile Foundations
- Ramps w/ Foundations
- Reinforced Concrete
- Structural Steel
- Fendering System
- Marine Hardware
- Dolphins
- Fire Proofing
- Architectural Work
- Dust and Odor Control Systems
- Compactors
- Front End Loaders
- Gantry Cranes
- Scales
- Radiation Detection System
- Heating and Ventilitation
- Plumbing and Fire Protection
- Electrical
- Traffic Signals and Controls

The estimated cost for the necessary Barge Modifications is also presented. The estimate is based on modifying 75 of the Departments existing barge fleet, and converting them into compartmentalized container hauling barges.

The values used throughout this estimate are based on the Conceptual Design developed under this Task, and are shown and described elsewhere in this Report. A contingency factor of 35 percent was used due to the conceptual nature of the design.

The costs for each Marine Transfer Station were escalated to the mid-point of construction at 3.5 percent per year. Construction time for each station is estimated at 24 Months, with the start of construction in 2 years from September 2002.

The total estimated construction cost for each station and barge modifications is as follows:

E. 91st Street	$43.9 million
W. 59th Street	$32.0 million
W. 135th Street	$58.0 million
Greenpoint	$57.4 million
North Shore	$58.4 million
Barge Modifications	$30.0 million
Total Construction Cost for 5 Stations	$280 million

Table 10-1
East 91st Street Marine Transfer Station Conversion

Description	Quantity	Estimated Cost
Demolition	L.S.	$3,700,000
Sitework and Utilities	L.S.	$745,000
Pile Foundations	L.S.	$4,082,000
Ramps w/ Foundations	L.S.	$0
Reinforced Concrete	L.S.	$5,158,000
Structural Steel	L.S.	$5,169,000
Fendering System	L.S.	$300,000
Marine Hardware	L.S.	$220,000
Dolphins	-	N/A
Fire Proofing	6878 S.F.	$14,000
Architectural Work	L.S.	$1,500,000
Dust and Odor Control Systems	L.S.	$50,000
Compactors	2 Ea.	$1,600,000
Front End Loaders	2 Ea.	$440,000
Gantry Cranes	2 Ea.	$2,300,000
Scales	2 Ea.	$125,000
Radiation Detection System	L.S.	$7,000
Heating and Ventilitation	L.S.	$1,085,000
Plumbing and Fire Protection	L.S.	$456,000
Electrical	L.S.	$2,325,000
Traffic Signals and Controls	L.S.	$50,000
Sub Totals:		$29,326,000
Miscellaneous and Contingencies (35%)		$10,264,000
Sub Totals:		$39,590,000
Escalation @ 3.5%/Yr.		$4,303,000
Grand Total:		**$43,893,000**

Table 10-2
West 59th Street Marine Transfer Station Conversion

Description	Quantity	Estimated Cost
Demolition	L.S.	$1,600,000
Sitework and Utilities	L.S.	$740,000
Pile Foundations	L.S.	$2,657,000
Ramps w/ Foundations	L.S.	$100,000
Reinforced Concrete	L.S.	3,551,000
Structural Steel	L.S.	$1,880,000
Fendering System	L.S.	$81,000
Marine Hardware	L.S.	$110,000
Dolphins	-	N/A
Fire Proofing	544 S.F.	$2,000
Architectural Work	L.S.	$1,000,000
Dust and Odor Control Systems	L.S.	$50,000
Compactors	2 Ea.	$2,000,000
Front End Loaders	2 Ea.	$440,000
Gantry Cranes	1 Ea.	$4,100,000
Scales	2 Ea.	$125,000
Radiation Detection System	L.S.	$7,000
Heating and Ventilitation	L.S.	$837,000
Plumbing and Fire Protection	L.S.	$352,000
Electrical	L.S.	$1,793,000
Traffic Signals and Controls	L.S.	$50,000
Sub Totals:		$21,475,000
Miscellaneous and Contingencies (35%)		$7,516,000
Sub Totals:		$28,991,000
Escalation @ 3.5%/Yr.		$3,044,000
Grand Total:		$32,035,000

Table 10-3
West 135th Street Marine Transfer Station Conversion

Description	Quantity	Estimated Cost
Demolition	L.S.	$4,800,000
Sitework and Utilities	L.S.	$1,000,000
Pile Foundations	L.S.	$3,230,000
Ramps w/ Foundations	L.S.	$3,024,000
Reinforced Concrete	L.S.	$6,119,000
Structural Steel	L.S.	$4,900,000
Fendering System	L.S.	$300,000
Marine Hardware	L.S.	$220,000
Dolphins	-	N/A
Fire Proofing	10,000 S.F.	$20,000
Architectural Work	L.S.	$2,800,000
Dust and Odor Control Systems	L.S.	$50,000
Compactors	3 Ea.	$2,400,000
Front End Loaders	2 Ea.	$440,000
Gantry Cranes	2 Ea.	$4,100,000
Scales	2 Ea.	$125,000
Radiation Detection System	L.S.	$7,000
Heating and Ventilitation	L.S.	$1,437,000
Plumbing and Fire Protection	L.S.	$603,000
Electrical	L.S.	$3,078,000
Traffic Signals and Controls	L.S.	$70,000
Sub Totals:		$38,723,000
Miscellaneous and Contingencies (35%)		$13,553,000
Sub Totals:		$52,276,000
Escalation @ 3.5%/Yr.		$5,698,000
Grand Total:		$57,974,000

Table 10-4
Greenpoint Marine Transfer Station Conversion

Description	Quantity	Estimated Cost
Demolition	L.S.	$4,800,000
Sitework and Utilities	L.S.	$1,000,000
Pile Foundations	L.S.	$3,230,000
Ramps w/ Foundations	L.S.	$2,723,000
Reinforced Concrete	L.S.	$6,119,000
Structural Steel	L.S.	$4,900,000
Fendering System	L.S.	$300,000
Marine Hardware	L.S.	$220,000
Dolphins	-	N/A
Fire Proofing	10,000 S.F.	$20,000
Architectural Work	L.S.	$2,800,000
Dust and Odor Control Systems	L.S.	$50,000
Compactors	3 Ea.	$2,400,000
Front End Loaders	2 Ea.	$440,000
Gantry Cranes	2 Ea.	$4,100,000
Scales	2 Ea.	$125,000
Radiation Detection System	L.S.	$7,000
Heating and Ventilitation	L.S.	$1,422,000
Plumbing and Fire Protection	L.S.	$597,000
Electrical	L.S.	$3,045,000
Traffic Signals and Controls	L.S.	$70,000
Sub Totals:		$38,368,000
Miscellaneous and Contingencies (35%)		$13,429,000
Sub Totals:		$51,797,000
Escalation @ 3.5%/Yr.		$5,646,000
Grand Total:		$57,443,000

Table 10-5
North Shore Marine Transfer Station Conversion

Description	Quantity	Estimated Cost
Demolition	L.S.	$4,800,000
Sitework and Utilities	L.S.	$1,200,000
Pile Foundations	L.S.	$2,751,000
Ramps w/ Foundations	L.S.	$3,142,000
Reinforced Concrete	L.S.	$6,204,000
Structural Steel	L.S.	$5,221,000
Fendering System	L.S.	$300,000
Marine Hardware	L.S.	$220,000
Dolphins	-	N/A
Fire Proofing	10,000 S.F.	$20,000
Architectural Work	L.S.	$2,800,000
Dust and Odor Control Systems	L.S.	$50,000
Compactors	3 Ea.	$2,400,000
Front End Loaders	2 Ea.	$440,000
Gantry Cranes	2 Ea.	$4,100,000
Scales	2 Ea.	$125,000
Radiation Detection System	L.S.	$7,000
Heating and Ventilitation	L.S.	$1,449,000
Plumbing and Fire Protection	L.S.	$609,000
Electrical	L.S.	$3,104,000
Traffic Signals and Controls	L.S.	$70,000
Sub Totals:		$39,012,000
Miscellaneous and Contingencies (35%)		$13,654,000
Sub Totals:		$52,666,000
Escalation @ 3.5%/Yr.		$5,741,000
Grand Total:		$58,407,000

Table 10-6
Barge Modifications

Description	Quantity	Estimated Cost
Barge Modifications - (Hopper Barge	75 Ea.	$20,038,000
Conversion to Container Barge)		
Sub Totals:		$20,038,000
Miscellaneous and Contingencies (35%)		$7,013,000
Sub Totals:		$27,051,000
Escalation @ 3.5%/Yr.		$2,949,000
Grand Total:		$30,000,000