NEW HAMPSHIRE HISTORIC PROPERTY DOCUMENTATION

PORTSMOUTH WASTEWATER TREATMENT FACILITY
SLUDGE PROCESSING BUILDING

NH State No. 743

LOCATION: Peirce Island Wastewater Treatment Facility, Portsmouth
Rockingham County, New Hampshire.
USGS Kittery ME Quadrangle, 1995
UTM Coordinates: 19.358319.4770418
State Plane Coordinates (NAD 83 feet): x 1,231,770.82 y 210,289.96

DATE BUILT: 1965

BUILDER: City of Portsmouth, NH

ENGINEER: Metcalf & Eddy Engineers, Boston, MA

CONTRACTOR: Harvey Construction Company, Inc., Bedford, NH

OWNER/USE: City of Portsmouth, NH / Wastewater Treatment Plant

SIGNIFICANCE: The Sludge Processing Building was built in 1965 as the Operations Building of Portsmouth's new Peirce Island Sewage Treatment Plant. Although nearly all original equipment has been replaced inside the building in its upgrade in 1993 to the Sludge Processing Building, the exterior retains most original design elements and the interior floor plan remains. It retains the necessary integrity of setting, design and use to convey its association with the development of Portsmouth's primary sewage treatment system following enactment of the Federal Water Pollution Control Act of 1948. It retains the necessary integrity of design, materials and use to convey the Modern architectural style as applied to an industrial building type. In 2016, the building was determined to be a contributing property within the potentially eligible Portsmouth Downtown Historic District.

PROJECT INFORMATION: The Sludge Processing Building was documented in accordance with the standards of the Historic American Engineering Record in January 2017 by Historic Documentation Company Inc. (HDC), Portsmouth, RI, for the City of Portsmouth, NH. The documentation fulfills Stipulation A of the project Memorandum of Agreement, signed 30 September 2016. The report was written and compiled by Richard M. Casella, Engineering Historian, Historic Documentation Company. Rob Tucher Photographic Documentation, High Bridge, NJ, conducted the large-format black and white film photography.

DESCRIPTION:

The Sludge Processing Building is a one-story with basement, reinforced concrete and masonry industrial building with a flat roof. It is located within Portsmouth's Peirce Island Wastewater Treatment Facility, a roughly 4 acre complex of buildings and structures at the south end of Peirce Island (Figures 1-4). The building is rectangular in plan (40'-8" x 87'-10") with the long axis oriented east-west. The west end of the building is the primary façade, with the main pedestrian entrance centered on it.

The Sludge Processing Building was built in 1965 as the Operations Building of the Portsmouth Sewage Treatment Plant. Two flanking structures comprised the entire facility: the small Grit Chamber on the north side is no longer extant, replaced with a process chemical tanks building in 1993; the Sedimentation Tanks on the south side, were converted to Chlorine Contact Tanks in 1993 (Figures 4, 5). In 1993 a new Operations Building was constructed and the original building converted into a dedicated sludge processing facility.

The building is built into a hillside with the front (west) half of the basement buried and the rear half exposed. The first floor opens via the centered pedestrian entrance to a paved parking area in front of the building; the basement opens via overhead vehicle doors and other service doors to a paved access road at the rear of the building.

The architectural style of the building is Industrial Modern, defined by the exterior-exposed structural concrete column and beam members infilled with brick panels, tall, narrow window openings with fixed glazing, and the flat roof. Stylization can also be found in the precast concrete window frames with their deeply beveled jambs, headers and oversized sills. The placement and grouping of the window openings – none on the front, three per wall panel on the north and south sides, and paired off-center and double stacked on the rear – is a function of the floor plan and not of an intent to impart the Modernistic asymmetric styling that it happens to give the building. In other words, its form follows its function.

For specific details regarding the design, dimensions, materials and plan of the building, please refer to portions of the original plans presented in Figures 6-10; however, a few features of the building will be noted here. The exposed concrete columns and roof beams are referred to on the plans as "plastic coated." The coating product was not specified on the plans but it is assumed to have been a water-based acrylic masonry sealer with a white pigment to match the pre-cast window frames which were made naturally white by using a white cement and aggregate. The brick walls are facing brick bonded to cement masonry units (CMUs, a.k.a., concrete blocks). The front entrance consists of a pair of aluminum flush panel doors 5' wide and recessed 32" into the building. A large fixed single-light insulated glass transom light is mounted above the doors. The stoop and approach walk is cast concrete. A thin flat concrete slab hood projects 4' out beyond the side walls to shelter the entrance.

The original layout of the first floor and basement are shown in Figures 8 & 9. The uses of the first floor have remained the same for the most part with the exception of changes in the equipment in the large open area in the rear known as the dewatering room. The dewatering room was originally fitted with two rotary drum vacuum filters that extracted solids from the wastewater. In 1993 the drum filters were replaced with newer more efficient belt filter presses (Photos 8, 9). Both the old

drum filters and the newer filter presses discharged the sludge onto a conveyor belt that transports it to the back of the room and dumps it into a steel hopper. The sludge is discharged out the bottom of the hopper into bins or trucks in the basement for transport to a landfill. The belt conveyor was replaced or rebuilt in 1993 and perhaps again since then. The hopper appears to be original equipment (Photo 9). A pedestrian door on the south wall of the dewatering room opens out onto a catwalk above the adjoining Chlorine Contact Tanks to allow plant operators to take required water samples (Photo 4).

The basement area is largely open. All of the original piping, valves and pumps were replaced in 1993 upgrade of the building. Two roll-up overhead doors are located on the north and south sides of the basement to allow truck access for the removal of the processed sludge.

A description of the operation of the sewage treatment process was prepared for the city by Metcalf & Eddy Engineers upon completion of the plant in 1965 and is included in the Supplemental Information at the back of this documentation.

HISTORICAL BACKGROUND:

Peirce Island is a 27 acre island located in the Piscataqua River inside the Portsmouth city limits. Fort Washington was established on the highpoint of the island in 1775 and saw action that year when its men seized the British ship *Prince George* that sailed into the harbor, disoriented, thinking it was Boston harbor. The island was used for ship building and military encampments during the nineteenth century. The city of Portsmouth purchased the island in 1923 and built a bridge to it from Mechanic Street. A public swimming pool was built by the city in 1937 and recreational trails and facilities later added.

Prior to World War II, all of Portsmouth's sewage was discharged raw directly into Portsmouth Harbor and the Piscataqua River resulting in a "serious pollution problem along the entire waterfront."[1] During the war years several Defense Housing projects were built in Portsmouth and Kittery to provide housing for the surge in defense workers at the Portsmouth Naval Shipyard. The third government housing project to be built was Wentworth Acres, an 800 unit complex built in north Portsmouth between April 1941 and February 1942. The location prevented connection of the housing complex to any of the city's existing gravity sewer lines. The city conducted studies and hearings regarding the sewerage problem and in October 1941 approved construction of its first sewer treatment plant to serve Wentworth Acres. The federal government contributed $57,000 toward the $150,000 cost of the modern plant, which utilized "Imhoff tanks" (the German-designed predecessor of modern sedimentation tanks) and chlorination prior to discharge into the Piscataqua River.

The Federal Water Pollution Control Act of 1948 brought attention to the need to eliminate the discharge of untreated sewerage into rivers and coastal waters. Although the subject of much hand-wringing through the 1950s, by 1960 the vast majority of Portsmouth's raw sewage continued to pour into the Piscataqua from eleven outfalls. The city hired the engineering firm of Metcalf & Eddy of Boston, leaders in the field of sewer treatment facilities design, to study the problem and determine the best location for a treatment plant. It was soon concluded that Peirce Island was the

[1] Vivian Hodges Brown. "War and the Economy of Portsmouth, NH." 1949, p. 179.

best location from both the engineering and cost perspectives. A bitter two year battle ensued over siting the plant on the historic city-owned island that was zoned for recreational purposes only.

In 1962 the State Water Pollution Commission gave the city two years in which to erect a sewage treatment plant and cease dumping raw sewage into the Piscataqua River. Newly elected city council members tried to pass a motion to study Nobles Island and the former gas-works property at the foot of Marcy Street as alternative locations. David Duncan, a project engineer with Metcalf & Eddy, told the council that his company would require a new contract to study other locations and that up to $20,000 in planning costs would "go down the drain" if the Peirce Island site was to be abandoned.[2]

The Peirce Island site was finally approved March 29, 1962 in an acrimonious 5-4 vote of the city council. In June 1963, when a rendering of the treatment plant Operation Building (the subject Sludge Processing Building) was published in the *Portsmouth Herald*, the Directors of Strawberry Banke, Inc. responded with a letter to the City Council, in which they "deplored the building's design and would like to see it revised to be of colonial type architecture…in keeping with its historic site alongside the old breastworks of Fort Washington."[3] With the opening of bids for construction of the plant only weeks away, the Council responded to Strawberry Banke that redesign was "almost an impossibility" and ultimately no changes were made.

Construction of the plant began in August 27, 1963 and the plant was officially opened March 22, 1965 when Mayor Timothy J. Connors threw the main operating switch. A bronze plaque commemorating the project still hangs in the hallway of the Sludge Processing Building (Figure 11). Metcalf & Eddy Engineers produced a short synopsis of the purpose, cost and operation of the plant which is presented in full at the end of this documentation.

In 1972 the largely ineffectual Pollution Control Act was amended and became known as the Clean Water Act. The amendments specified the means for regulating pollutant discharges into the waters of the United States and gave the EPA the authority to implement pollution control programs. It made it unlawful to discharge pollutants into navigable waters without a permit, but also provided funding for the construction of sewage treatment plants.

Following the Clean Water Act, Portsmouth was ordered by the EPA to separate its sewer and storm water system and begin planning the construction of a larger and more efficient treatment plant on Peirce Island. Planning, approvals, securing grants and other means to finance the improvements stretched into the 1980s. The firm of Whitman & Howard, Inc., of Wellesley Massachusetts, another leader in the field of sewage treatment facility design, was hired by the City to design the major upgrade of the Peirce Island plant. The firm initially designed a treatment facility that could meet secondary level treatment. This was later replaced with a design that included primary treatment and primary effluent filtration at the request of the State of New Hampshire. The State of New Hampshire assisted the City with obtaining a 301(h) waiver from secondary treatment. Plans for the new "Wastewater Treatment Facility" (primary treatment and primary effluent filtration) were completed in 1985 but underwent revisions for years until finalized in 1989. Construction of the new plant was completed in 1993. The work required

[2] *Portsmouth Herald*, March 6, 1962, p. 1
[3] *Portsmouth Herald*, July 8, 1963, p. 1.

conversion of the Operations Building into the Sludge Processing Building, conversion of the Sedimentation Tanks into Chlorine Contact Tanks and demolition of the Grit Chamber.

The Portsmouth Wastewater Facility was upgraded again in 2002. New piping and controls were installed in the basement of the sludge process building. In 2016 the City of Portsmouth approved and began construction of the Peirce Island Wastewater Treatment Facility Upgrade Project, a $75 million project to add secondary treatment process equipment to the plant. The work requires modification and partial demolition of the Sludge Processing Building, including removal and reconstruction of the upper level and renovation of the lower level. In 2016, the Sludge Processing Building was determined to be a contributing property within the Portsmouth Downtown Historic District and the proposed alterations to the building determined to constitute an adverse effect to a historic property. This documentation fulfills one of the mitigation requirements specified in the project Memorandum of Agreement, signed 30 September 2016.

BIBLIOGRAPHY:

Brown, Vivian Hodges. "War and the Economy of Portsmouth, NH." Thesis 39262, February 15, 1949, Boston College of Business Administration.

EPA. "History of the Clean Water Act." Web article at: https://www.epa.gov/laws-regulations/history-clean-water-act.

Hanssmann, Caren. "The Changing Faces of Peirce Island." 2008. Web article at: http://www.cityofportsmouth.com/peirce-island/history.html.

Metcalf & Eddy Engineers. "Sewage Treatment Plant, Pumping Stations and Appurtenant Work. Contract Drawings, Contract 1963-1." Metcalf & Eddy, Engineers, Boston, Mass. Original drawings on file at Portsmouth NH Public Works Department.

Portsmouth Herald

———. "Pierce Island Gets Final Stamp as Site for Treatment Plant." June, 20, 1961 p. 1.

———. "New Council Meets to Face New Problem." January 2, 1962, p. 1.

———. "Council Again Postpones Action on Sewer treatment Plant Site." March 6, 1962, p. 1.

———. "Sewage Treatment Plant Going on Pierce Island. March 30, 1962, p. 1.

———. "Sentiment Evenly Divided." April 16, 1962, p. 1.

———. "Strawberry Banke Ask for New Design for Sewage Plant." July 8, 1963, p. 1.

———. "Construction Site. Work Started at Site of Pierce Island Site of Portsmouth's New Sewage Treatment Plant." August 28, 1963, p. 1.

———. "Treatment Plant Enters Most Important Phase." December 23, 1963, p. 1.

———. "New Plant …Nearing Completion." November 14, 1964, p. 1.

———. "Plant Ready." January 23, 1965, p. 4.

———. "City Sewer Plant Now in Business." March 22, 1965 pp 1, 3.

———. "Portsmouth is Stuck with $20M Sewer Job." August 16, 1976, p. 1.

Whitman & Howard, Inc. "Wastewater Treatment Facility, Portsmouth, New Hampshire." Whitman & Howard, Inc., Wellesley, Mass. September 1985, Revised September 1989. Original drawings on file at Portsmouth NH Public Works Department.

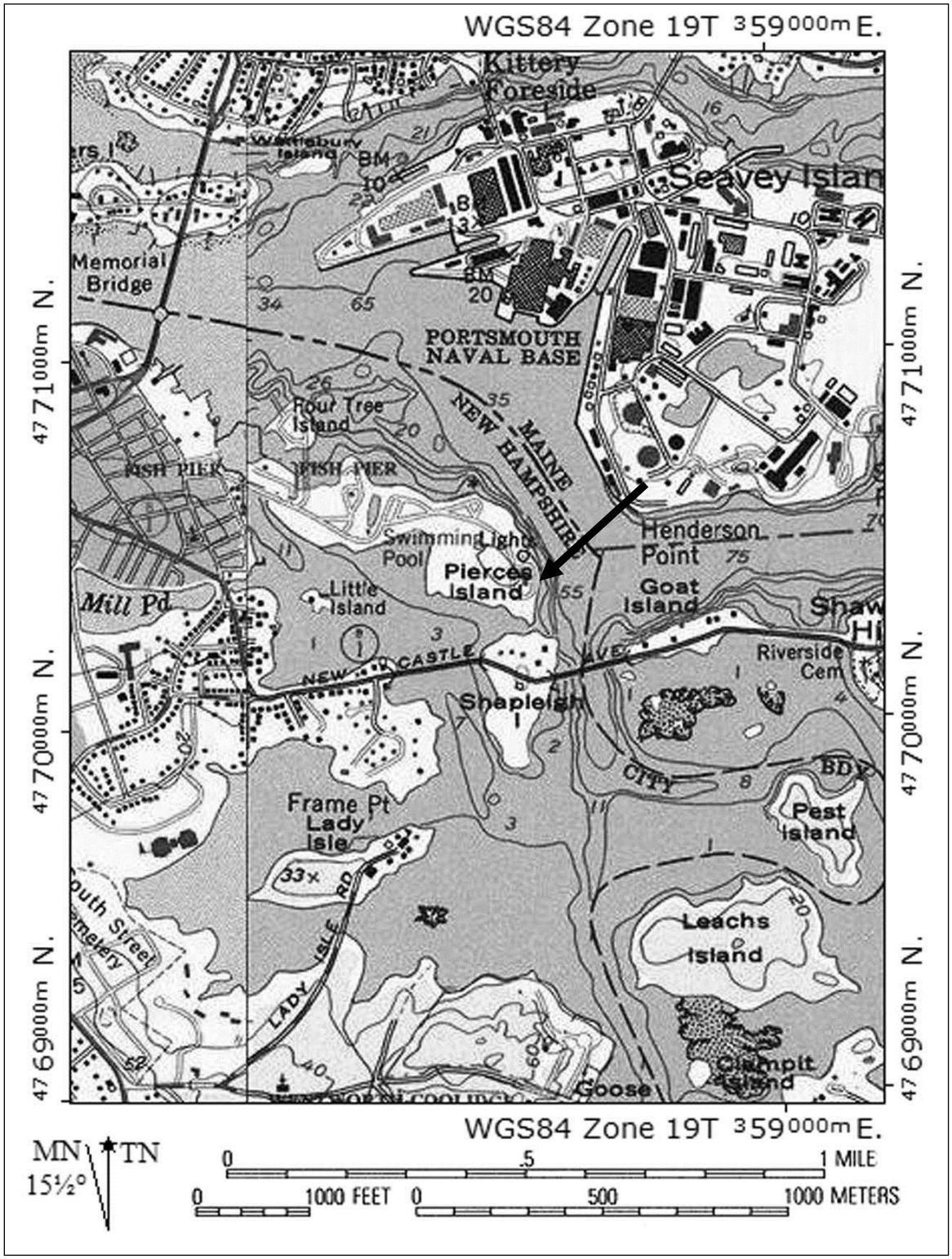


FIGURE 1: Location Map. Arrow locates Sludge Processing Building (USGS Kittery ME Quadrangle, 1995).

FIGURE 2: Location Map Detail. Arrow locates Sludge Processing Building within Portsmouth Wastewater Treatment Facility complex at south end of Peirce Island (Portsmouth NH GIS Tax map).

FIGURE 3: Aerial photograph of Portsmouth Wastewater Treatment Facility complex. Arrow locates Sludge Processing Building. See Figure 4 for facilities identification (Bing Map, Microsoft Corporation 2017).

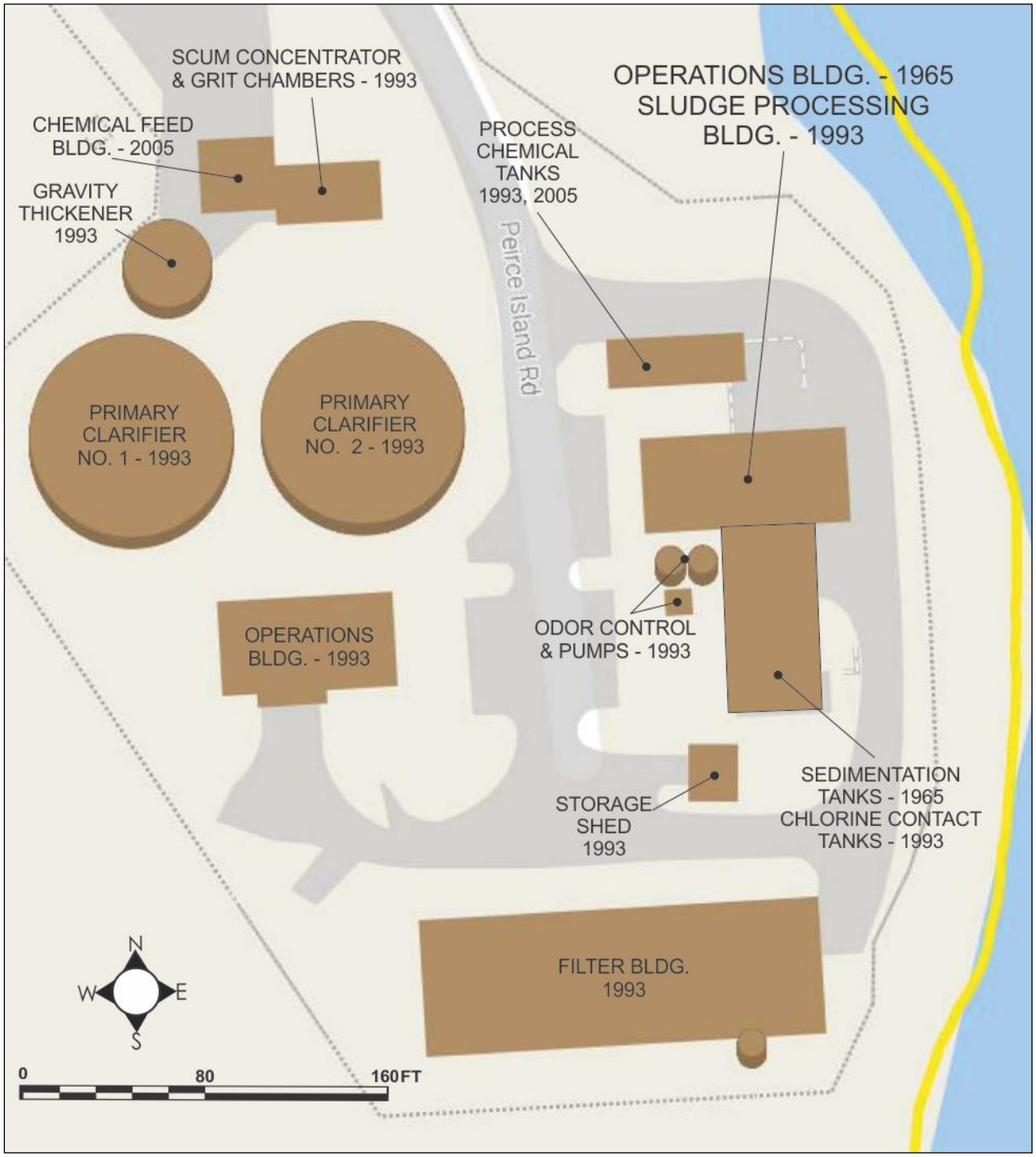


FIGURE 4: Portsmouth Wastewater Treatment Facility in 2016, identifying buildings and structures with dates of construction and reconstruction where applicable (Portsmouth NH GIS Tax map).

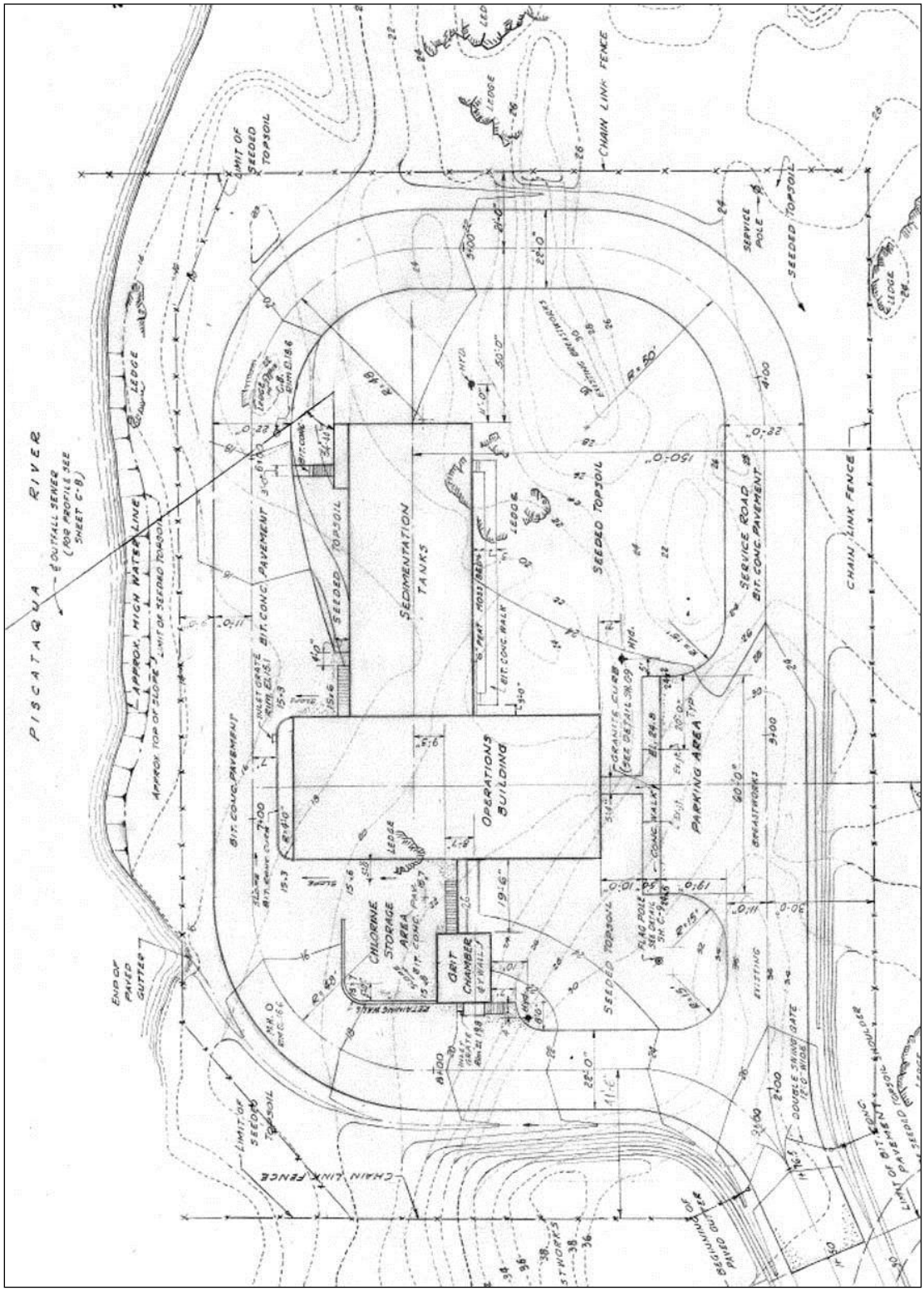


FIGURE 5: Record drawing of Portsmouth Sewage Treatment Plant built 1965, showing Operations Building, (present Sludge Processing Building), Grit Chamber and Sedimentation Tanks, comprising entire 1965 facility. Clip from sheet C-2, Grading & Planting Plan (Metcalf & Eddy, 1963).

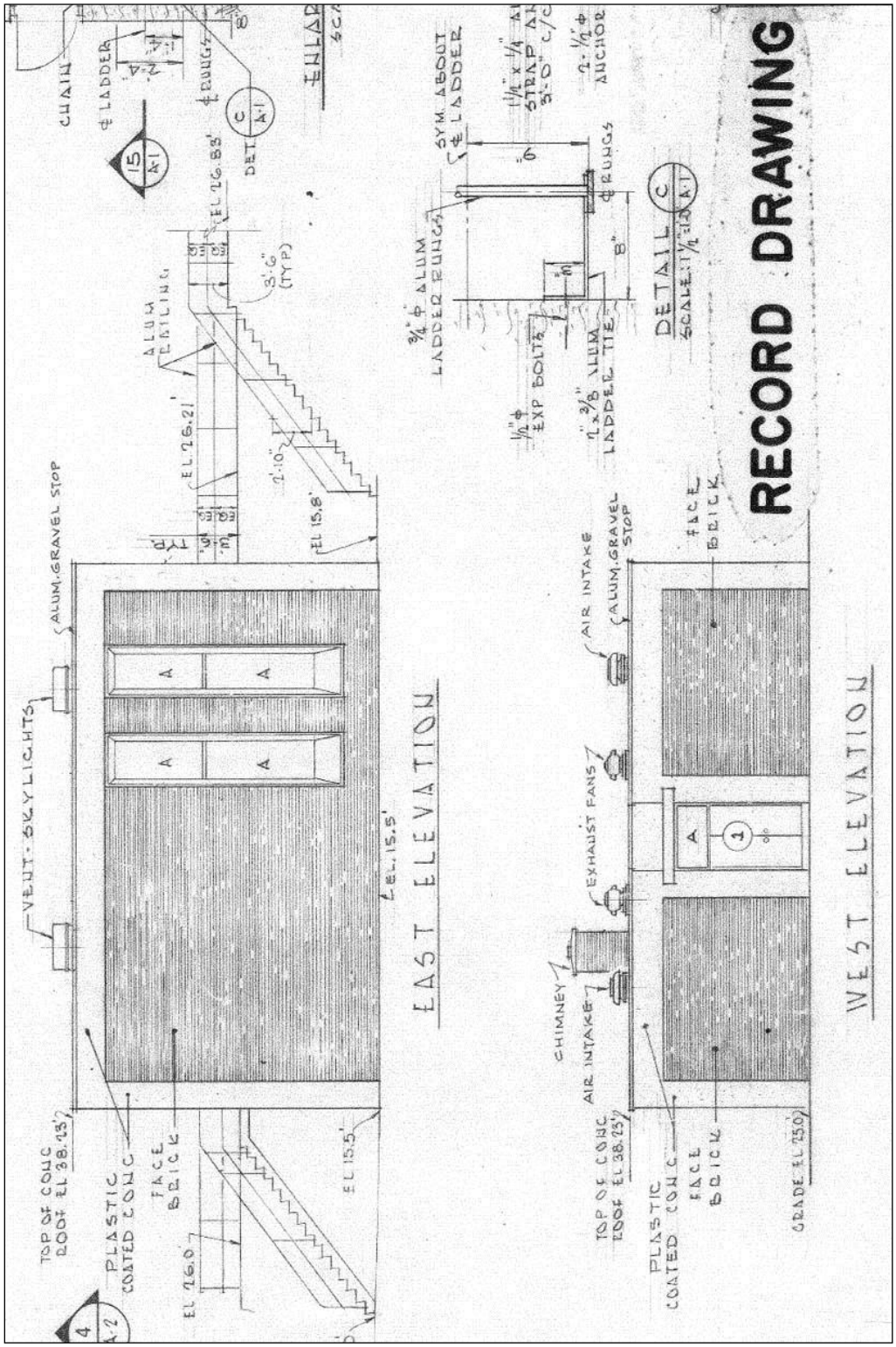


FIGURE 6: Record drawing of West (front) and East (rear) elevations of Portsmouth Sewage Treatment Plant Operations Building built 1965, converted to present Sludge Processing Building in 1993. Clip from sheet A-1, Operations Building, Plans and Elevations (Metcalf & Eddy, 1963).

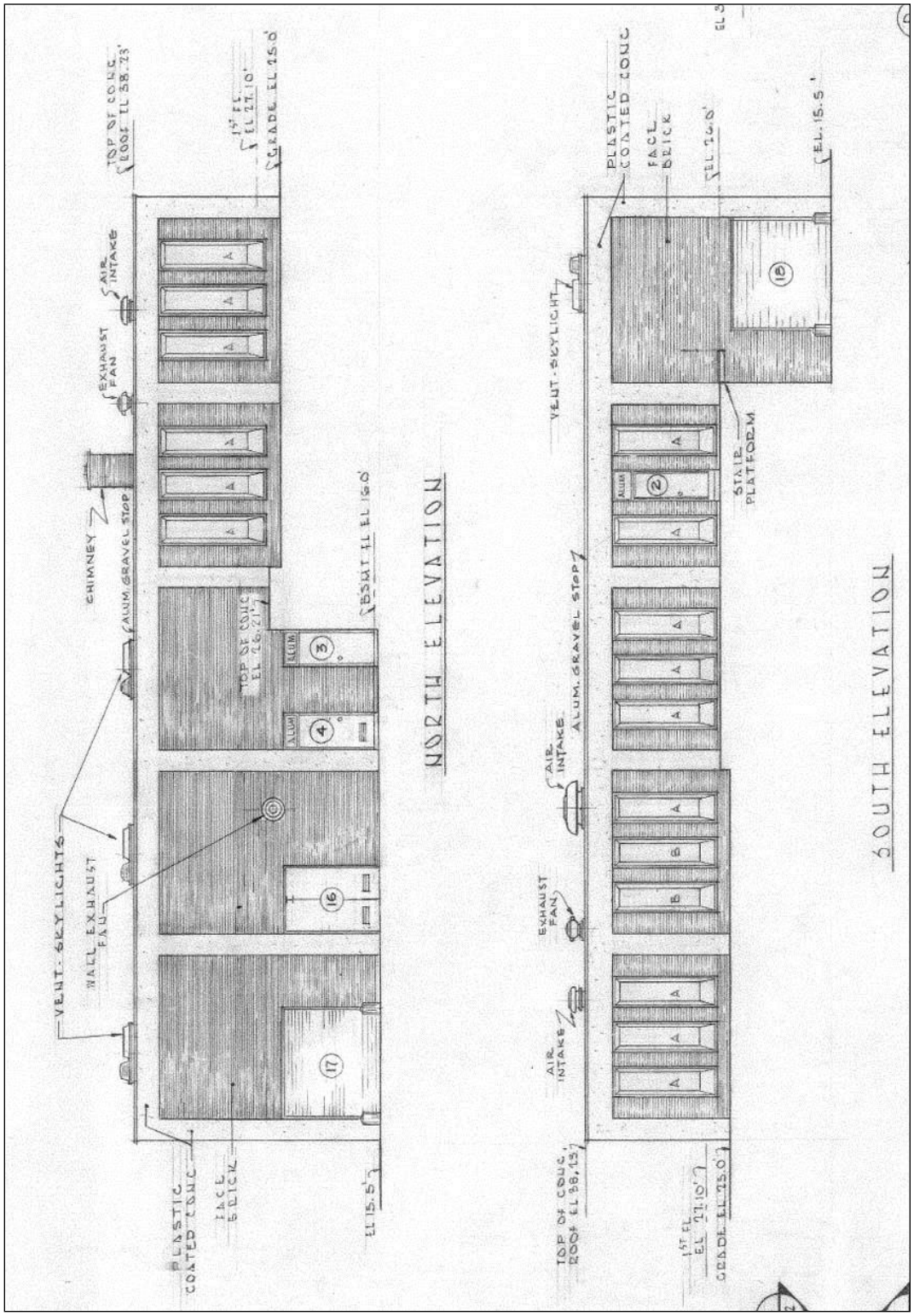


FIGURE 7: Record drawing of North and South side elevations of Operations Building built 1965, converted to present Sludge Processing Building in 1993. Clip from sheet A-1, Operations Building, Plans and Elevations (Metcalf & Eddy, 1963).

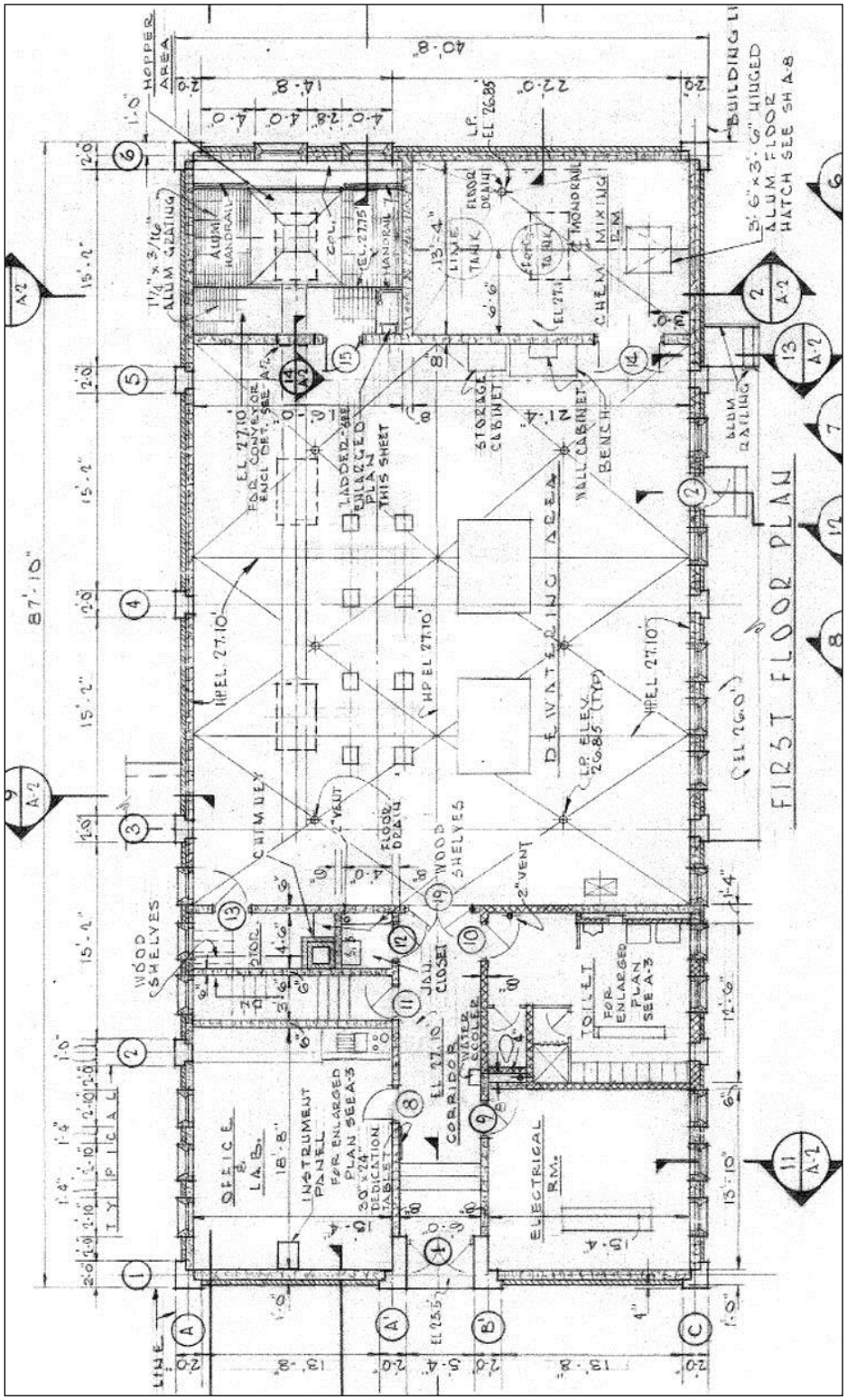


FIGURE 8: Record drawing of First Floor Plan of Operations Building built 1965, converted to present Sludge Processing Building in 1993. Clip from sheet A-2, Operations Building, Plans and Elevations (Metcalf & Eddy, 1963).

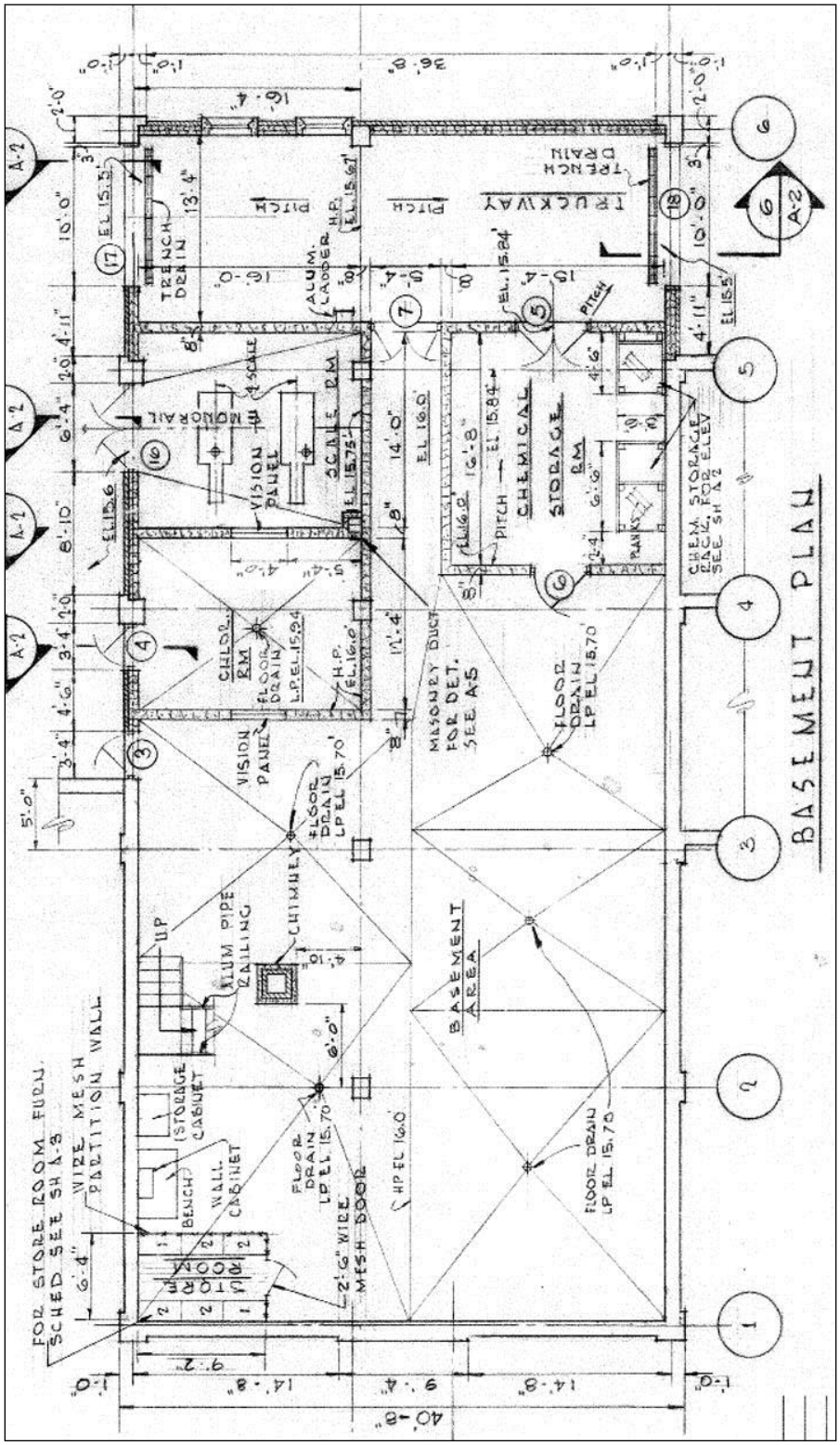


FIGURE 9: Record drawing of Basement Plan of Operations Building built 1965, converted to present Sludge Processing Building in 1993. Clip from sheet A-2, Operations Building, Plans and Elevations (Metcalf & Eddy, 1963).

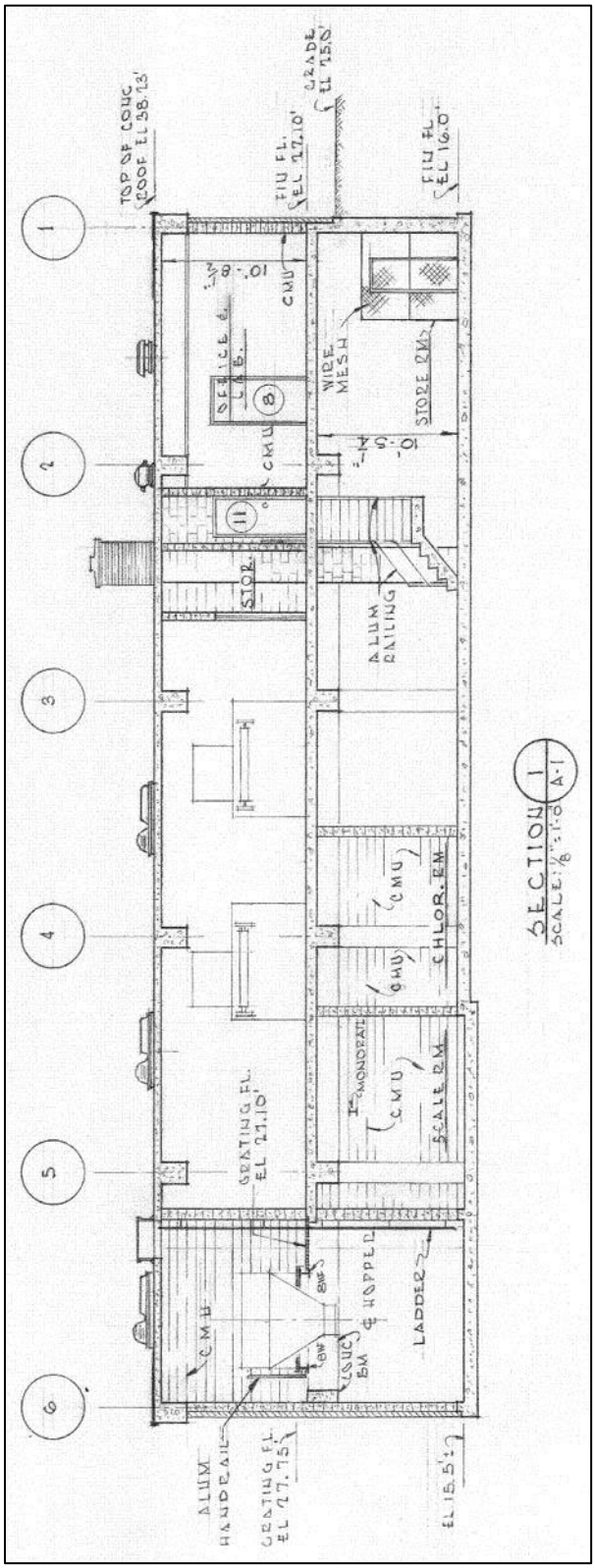


FIGURE 10: Record drawing showing longitudinal Section of Operations Building built 1965, converted to present Sludge Processing Building in 1993. Clip from sheet A-3, Operations Building, Wall & Building Sections (Metcalf & Eddy, 1963).

FIGURE 11: Building dedication plaque mounted in hallway inside Sludge Processing Building (Photo by Historic Documentation Co., January 2017).

INDEX TO PHOTOGRAPHS

SLUDGE PROCESSING BUILDING
Peirce Island Wastewater Treatment Plant
Portsmouth, Rockingham County, New Hampshire.
New Hampshire State No. 743
Photographer: Rob Tucher
January 2017

NH-743-1 Context view, looking past Grit Chambers (left) and Clarifier No. 2 (right), showing front of Sludge Processing Building in distance (center). Looking southeast.

NH-743-2 Oblique view of front and north side of Sludge Processing Building. Looking southeast.

NH-743-3 Front elevation of Sludge Processing Building. Looking east.

NH-743-4 South side of Sludge Processing Building, rear section, showing Chlorine Contact Tanks in foreground. Looking north.

NH-743-5 Rear elevation of Sludge Processing Building. Looking west.

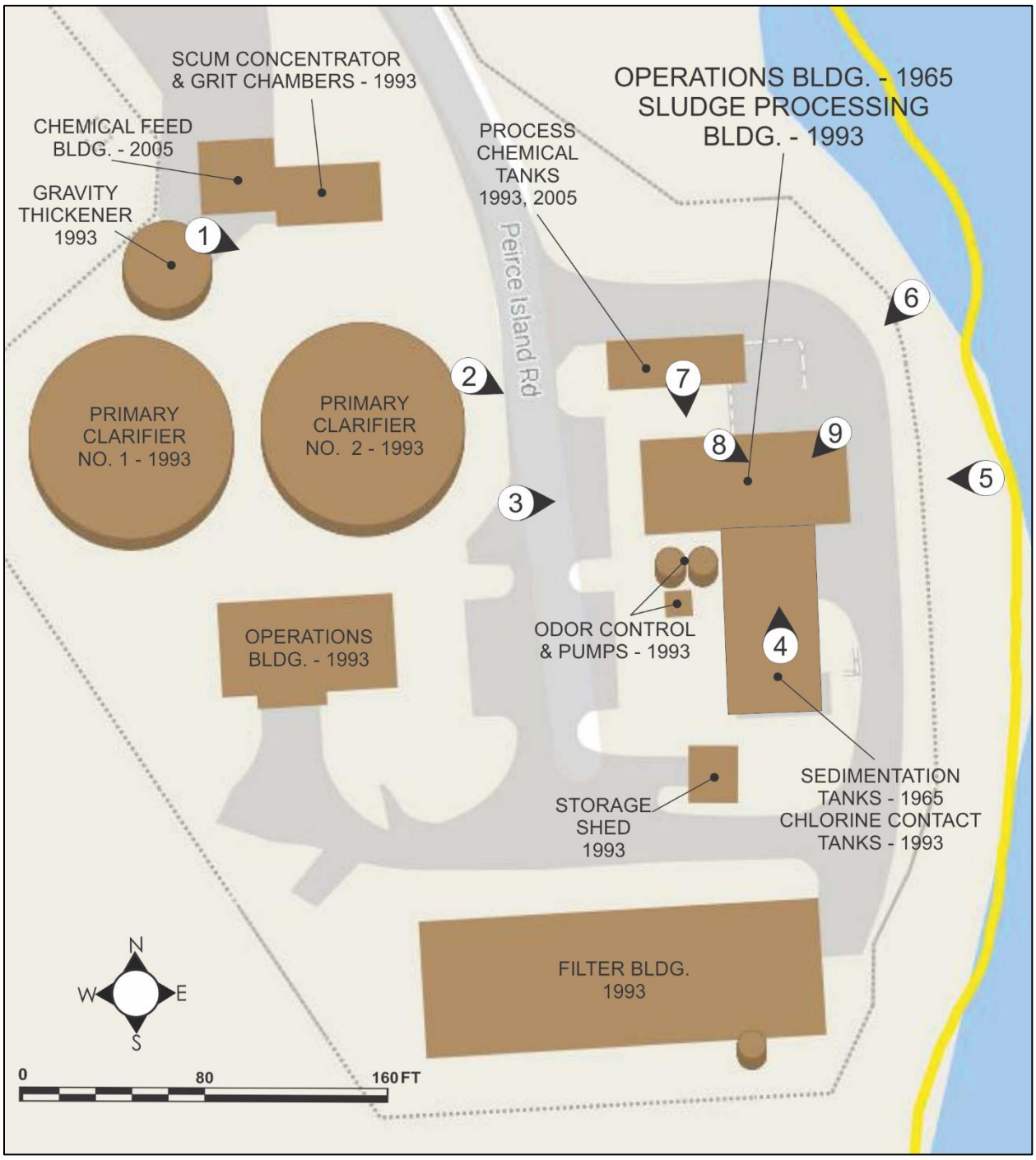
NH-743-6 Oblique view of rear and north side of Sludge Processing Building, rear section, showing vehicle and pedestrian doors. Looking southwest.

NH-743-7 North side of Sludge Processing Building, front section, showing detail of windows, concrete building column and brick facing. Looking south.

NH-743-8 Interior, first floor, dewatering room, showing belt filter press sludge processor (center) and belt conveyor (foreground) that transport dewatered sludge to hopper at rear of building. Looking southeast.

NH-743-9 Interior, first floor, dewatering room, showing belt conveyor (center), sludge hopper, (lower left) and two belt filter press sludge processors (right). Looking southwest.

CHURCH STREET PUMP HOUSE
NH STATE No. 743
KEY TO PHOTOGRAPHS



NH-743-1: Context view, looking past Grit Chambers (left) and Clarifier No. 2 (right), showing front of Sludge Processing Building in distance (center). Looking southeast.

NH-743-2: Oblique view of front and north side of Sludge Processing Building. Looking southeast.

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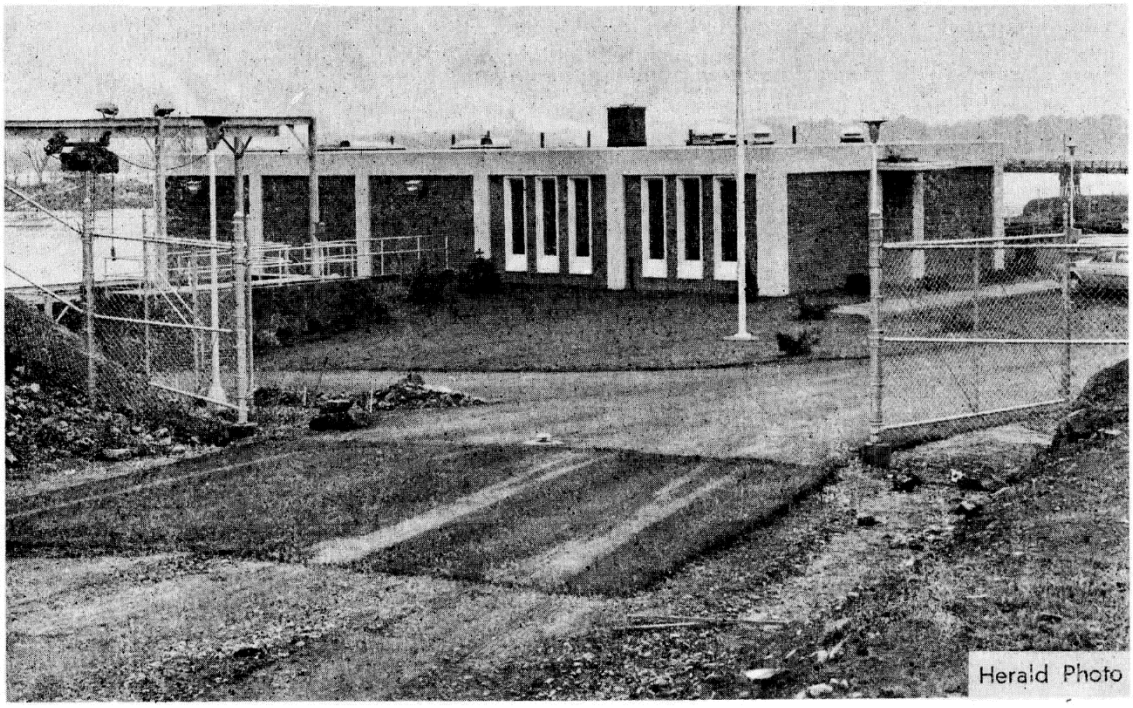
NH-743-8: Interior, first floor, dewatering room, showing belt filter press sludge processor (center) and belt conveyor (foreground) that transport dewatered sludge to hopper at rear of building. Looking southeast.

NH-743-9: Interior, first floor, dewatering room, showing belt conveyor (center), sludge hopper, (lower left) and two belt filter press sludge processors (right). Looking southwest.

CITY OF PORTSMOUTH, N.H.

PEIRCE ISLAND SEWAGE TREATMENT PLANT



Timothy J. Conners - Mayor
C. Richard Williams - Assistant Mayor
Robert C. Violette - City Manager

City Councilmen

Samuel McMaster — Raymond C. Dunphy
Robert E. Whalen — Clayton E. Osborn
Lucien O. Geoffrion — Frank Butterworth, Jr.
Edmund T. Scarponi

Harvey Construction Co., Inc.
Contractors

Metcalf & Eddy
Engineers

1965

SEWAGE TREATMENT

WHY

Sewage is water that carries bacteria, grease, scum and other polluting substances that originate in the toilets and sinks of a city, and also industrial wastes. If untreated sewage is discharged into a stream or other body of water, all life - human, animal and aquatic - is endangered. Therefore, to maintain health standards, sewage must be transported by means of pipelines and pumping stations to a central point for treatment before it can be safely discharged to a water body.

HOW

A sewage treatment plant removes pollution of three major types:

1. Settleable solids such as paper, food wastes, etc.
2. Floating materials like grease and scum.
3. Harmful bacteria.

IN PORTSMOUTH

The old Sewage Treatment Plant at Wentworth Acres was constructed in 1942, and has served this small section of the City well for many years. It has a capacity of about

600,000 gallons per day. This plant will require improvements in the near future.

The new Peirce Island Sewage Treatment Plant can provide adequate treatment by modern methods for the entire City. Presently, there are approximately 5,500 people discharging sewage to the new treatment plant. At present, the plant will treat sewage from 12,000 people or an average flow of 1,500,000 gallons per day, and a maximum flow of 3,600,000 gallons per day.

HOW DOES OUR NEW PLANT WORK

The attached diagram will assist in understanding the operation.

The sewage from the various sections of the City is carried by the sewers to a central pumping station at Gates and Mechanic Streets. Here the large solids, rags and other debris, are caught in a screen and mechanically removed. The debris is deposited in trash cans and hauled away, while the sewage is pumped to the Peirce Island Treatment Plant.

At the Peirce Island Plant the sewage first enters a grit chamber where sand and other heavier material that can damage mechanical equipment, is removed by settling. The next step is chlorination. In this process chlorine is added to the sewage to disinfect it by destroying harmful bacteria.

After chlorination the sewage moves very slowly through two settling tanks. It takes approximately two and one-half hours for the sewage to flow from the head to the tail end of the settling tanks. During this time the settleable solids in the sewage fall to the bottom to form sludge. The scum, grease, and oil in the sewage float on the surface. Mechanical equipment pushes the sludge to hoppers at one end of the tank, and the scum to the other end.

The sludge is periodically pumped from the tanks to the vacuum filters, which remove water from the sludge with the aid of chemicals. The resulting solid material is a moist, harmless, and odorless mass of sludge which is trucked from the treatment plant to the dump. Approximately five truck loads will be taken to the dump each week. The treated sewage is then safely discharged to the river

Another feature is the plant's ability to expand to meet future needs. The time will come when the present capacity will be exceeded due to the installation of new sewers throughout the City, and increased usage of the existing system. To meet this condition, the design of the new plant provides for the future addition of one grit chamber and two primary settling tanks. These changes

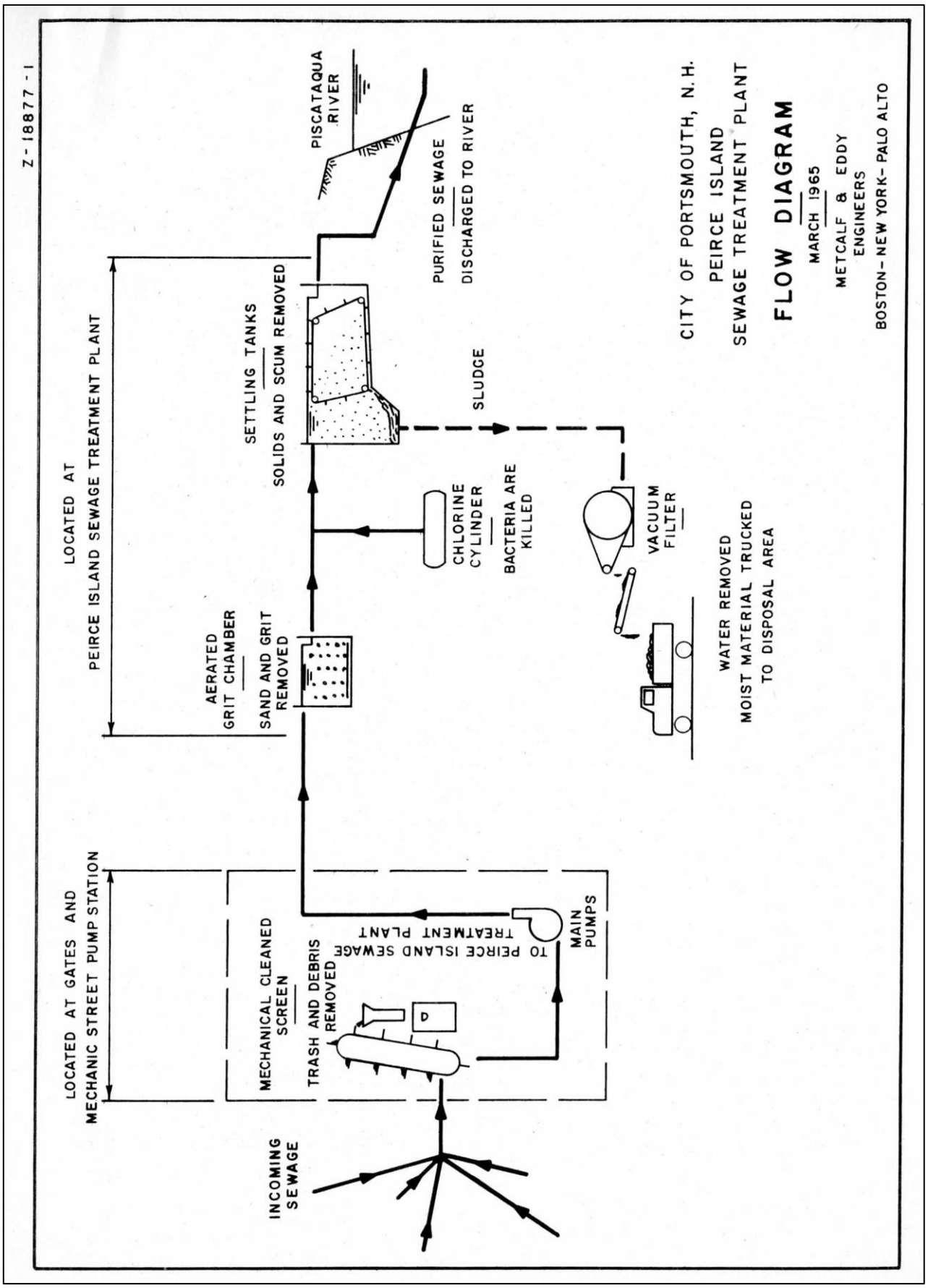
will increase the capacity of the plant so that it can serve 24,000 people. The average flow handled could be 3,000,000 gallons per day, and the maximum 7,200,000 gallons per day. The step method of construction was adopted to limit construction costs to actual needs and thus save money for the City.

WHAT DID IT COST

The contract for constructing the new treatment plant was awarded on the basis of competitive bids. It included the new treatment plant and also the construction of sewage pumping stations at Deer and Market Streets, and at Gates and Mechanic Streets.

The total cost of the sewage treatment plant and the two pumping stations is approximately $1,148,600. The cost of the sewage treatment plant only is approximately $548,000. Extended efforts by the City officials produced grants of $250,000 from the Federal Government, and $332,000 from the State of New Hampshire, which helped to pay for the work. Thus the actual cost of the entire project to the City of Portsmouth is approximately $566,600.

This project represents another progressive step in the capital improvements program of the City of Portsmouth. The citizens of the City should be proud of their new Peirce Island Sewage Treatment Plant.


Z-18877-1
PISCATAQUA RIVER
PURIFIED SEWAGE DISCHARGED TO RIVER
SETTLING TANKS
SOLIDS AND SCUM REMOVED
SLUDGE
CHLORINE CYLINDER
BACTERIA ARE KILLED
VACUUM FILTER
WATER REMOVED
MOIST MATERIAL TRUCKED TO DISPOSAL AREA
AERATED GRIT CHAMBER
SAND AND GRIT REMOVED
LOCATED AT PEIRCE ISLAND SEWAGE TREATMENT PLANT
TO PEIRCE ISLAND SEWAGE TREATMENT PLANT
MAIN PUMPS
MECHANICAL CLEANED SCREEN
TRASH AND DEBRIS REMOVED
INCOMING SEWAGE
LOCATED AT GATES AND MECHANIC STREET PUMP STATION
CITY OF PORTSMOUTH, N.H.
PEIRCE ISLAND
SEWAGE TREATMENT PLANT
FLOW DIAGRAM
MARCH 1965
METCALF & EDDY ENGINEERS
BOSTON-NEW YORK-PALO ALTO

This attractive facility is a constant reminder that Portsmouth recognizes its obligation to protect the health of its residents, and also that it is doing its part to control the pollution of the Piscataqua River.