

Section 4.0

Infrastructure

4.0 INFRASTRUCTURE

This section describes the Project's interaction with existing domestic water, sanitary sewer, stormwater management, and energy and telecommunications systems. The Project's final design will adhere to applicable protocols and design standards so that the Project is properly supported by and properly uses the existing utility infrastructure. Detailed design of the Project's utility systems will proceed in conjunction with the design of the building and interior mechanical systems.

4.1 Regulatory Framework

This section, in addition to a description of existing and future infrastructure topics, discusses the regulatory framework of utility connection reviews and standards.

- ◆ In the City of Boston, the Boston Water and Sewer Commission (BWSC) is responsible for water, sewer, and stormwater systems. BWSC administers their reviews by a Site Plan Approval process. The Proponent will submit plans in accordance with BWSC's Site Plan review process prior to any construction. Additionally, the Proponent will be coordinating the cutting and capping of any utilities with BWSC in order to obtain a Termination Verification Approval.
- ◆ The Proponent will consult with BWSC, at the time of the BWSC Site Plan review process, concerning the Department of Environmental Protection/Massachusetts Water Resources Authority Infiltration/Inflow removal policy.
- ◆ The Boston Fire Department reviews projects with respect to fire protection measures such as fire department connections, standpipes and hydrants.
- ◆ Energy and telecommunication system connections are coordinated with the respective utility providers.
- ◆ New utility connections are authorized by the City of Boston Public Works Department through the street opening permit process.

4.2 Utilities

4.2.1 *Wastewater System*

Sewage generated by the proposed Main Building Expansion Project will discharge to an existing 12-inch BWSC sewer in Binney Street. Sanitary sewage discharged to this system is conveyed by BWSC and Massachusetts Water Resources Authority (MWRA) sewers to the MWRA Deer Island Wastewater Treatment Plant for treatment and disposal.

The proposed Project includes the creation of up to 36 net new patient beds and 35,695 net-new sf of clinical space. Based upon a sewage generation rate of 200 gallons per day (gpd) per hospital bed and 200 gpd per 1,000 sf of clinical space, the Project will generate a net new average daily sewer flow of approximately 14,350 gpd.

BWSC's comment letter dated May 29, 2009 ("the BWSC comment letter") noted the discovery of sources of stormwater discharging to the sanitary sewer system. The Proponent and its consultants are coordinating the identification of these sources as well as determining corrective actions.

4.2.2 Domestic and Fire Protection Water

Domestic water will be provided through the existing Main Building infrastructure. According to BWSC record information, the Main Building is provided BWSC water via a looped system of 12-inch water mains in Longwood Avenue, Binney Street and internal campus water mains. The average daily water use is estimated to be approximately 15,775 gpd. Water demand is based upon estimated sewage generation with an added factor of 10 percent for consumption, system losses, and other usage. Fire protection water is expected to be provided through a new connection to the existing 8-inch water main in Binney Street.

The State Building Code requires the use of water-conserving fixtures. Water conservation measures such as low-flow toilets and restricted flow faucets will help reduce the domestic water demand on the existing water distribution system. The Project, through the LEED process, is currently targeting a 20% reduction in domestic water consumption.

4.2.3 Stormwater Management

The Project site is currently impervious under both existing and future conditions. Accordingly the Project will affect neither the pattern of, nor quantity of, stormwater discharging from the existing Main Building to the BWSC system and any receiving bodies of water. The new building is expected to connect roof drainage to the existing 12-inch storm drain in Binney Street.

As part of the BWSC Site Plan review process, the Proponent will be submitting a stormwater management plan showing the proposed drainage infrastructure related to this Project.

4.2.4 Energy and Telecommunications Systems

This section provides a summary of the energy systems that are expected to support the proposed Main Building Expansion Project. The following utility systems are discussed in this section:

- ◆ Natural gas

- ◆ Electricity
- ◆ Steam
- ◆ Telecommunications

In addition, consideration was given to the sustainable elements of the energy supply provision for the Project. The final design process for the Project will adhere to applicable protocols and design standards so that the proposed Project is properly supported by, and in turn, properly uses the existing utility infrastructure. Detailed design of the Project's utility systems will proceed in conjunction with the design of the building and interior mechanical systems.

The systems discussed herein include those owned or managed by both Children's and private utility companies. There will be close coordination among these entities and with the Project engineers and architects during subsequent reviews and design efforts. The Project will connect to existing city and utility company systems in Binney Street. Based on initial investigations and consultations with the appropriate agencies and utility companies, existing infrastructure systems are available at the Project site and appear adequately sized to accept the incremental increase in demand associated with the development and operation of the Project.

Natural Gas Service

Any natural gas needs for the Project will be met via internal connections to the existing Main Building.

Steam

The Project will require 7,000 pounds per hour of steam for interior heating purposes. It is expected that the steam requirement will be provided from the Medical Area Total Energy Plant (MATEP) through existing steam infrastructure in Binney Street.

Electrical Service

The Project will require approximately 2.2 MW of electricity. Discussions continue with both NSTAR and MATEP concerning power supply and location of the service to Children's. The currently proposed location is in a vault below one of the two ambulance drives. That vault will be a fire-rated design that complies with Utility, Building Code, and Fire Code requirements.

Telecommunications

It is currently expected that the Project's telecommunications needs will be met through internal connections to the existing Main Building.

4.2.5 *Protection of Utilities*

Existing public and private infrastructure located within the public right-of-way will be protected, where required, during construction. The installation of proposed utilities within the public way will be in accordance with the BWSC, Boston Public Works Department, the Dig-Safe Program, and governing utility company requirements. All necessary permits will be obtained before the commencement of work. Specific methods for constructing proposed utilities where they are near to, or connect with, existing water, sewer, or drain facilities will be reviewed by the BWSC as part of its Site Plan Review Process.

4.3 **Sustainability**

4.3.1 *Leadership in Energy and Environmental Design*

The Main Building Expansion has been registered with the USGBC for LEED-NC v2.2 and the Project team anticipates achieving a LEED Silver rating. The Project will be the first LEED certified building for Children's Hospital, and as so is a test case for the Hospital in what actions they can take to make their new projects more sustainable while integrating those projects into their existing campus.

There are two issues related to hospitals that have a significant effect on how they can integrate sustainable practices into their campus. First, the nature of caring for people in hospitals requires that the structures be designed using only the most dependable of systems. A loss or malfunction of any mechanical, electrical or plumbing system, even for a few seconds, can have critical consequences to a patient. Second, the control of the spread of infection in a hospital is an enormous effort, and a great deal of time and energy is expended in reducing the potential that one patient's illness spreads to others. The distribution and filtration of air, the disposal of waste, the selection of finishes and the ability to keep them clean, even the types of plumbing fixtures and controls selected, all make a difference in controlling the spread of infections. As a result of these two issues, hospitals will generally opt for more conventional systems that have known maintenance issues, established dependability, and have been in use for many years without any adverse effects on building occupants.

Since hospitals consume more energy per square foot than any other building type, there has already been great incentive for them to find ways to save energy. Children's already has in place programs that seek to reduce its energy demands, as well monitor how efficiently energy is used. Please see Section 2.3 of the IMP Amendment for a description of Campus wide sustainability initiatives. The team is investigating how these current programs will fit into the LEED certification system.

In the Sustainable Sites category the Project hopes to achieve at least 7 of the 14 possible points available. Many of these are achievable due to the location and nature of the Project site; it is a previously developed site in a dense, urban, mixed-use neighborhood. There is

easy access to public transportation as well as pedestrian access to local services. Children's encourages staff to use public and alternative methods of transport and those efforts will be furthered with this Project. No additional parking is proposed. The Project will, at a minimum, use a high-albedo roof; however the Project team is investigating the potential use of a green roof system to assist in reducing the quantity of the stormwater runoff, alleviating the problems of an urban heat island effect, and restoring habitat and maximizing open space on this previously developed site which has little to no building setback.

Water Efficiency points and an overall reduction in potable water use should be achieved by using low-flow fixtures, where applicable, and governed by the Federal Energy Policy Act of 1992. There are currently no plans to utilize irrigation in the landscaping. The LEED credit for Innovative Wastewater Technologies does not appear to be achievable for this Project because such technologies pose unknown risks in a hospital setting.

Children's Hospital Boston will aggressively pursue points in the Energy and Atmosphere portion of LEED, but hospitals are highly regulated by the building code and licensure requirements to provide a safe, healing environment that minimizes the spread of disease and infection. As such, the hospital has little control to alter the number of air-changes, lighting levels, and temperature in a way to see truly substantial reductions. Children's anticipate achieving at least a 17.5% reduction in energy use through the use of high-efficiency equipment, carefully planned lighting, and new technologies that use energy more efficiently. Children's does not anticipate any on-site renewable energy as part of the Project. The Main Building Expansion will be a clinical use (emergency, radiology, surgery and patient care), and such systems are difficult to tie into the complex electrical system in those areas (they are better used in non-clinical areas). Children's does anticipate achieving some or all of the enhanced commissioning, refrigerant management, and measurement and verification credits.

In terms of the Building Materials used, Children's goal is to source regional materials and materials with recycled content whenever feasible and not conflicting with the nature and requirements of a healthcare facility project. The diversion of construction waste from landfills or incineration will be investigated. Recycling these materials is still being studied.

Indoor Environmental Quality will receive special attention on this Project due to the nature of the healthcare building type. The use of low-emitting materials and the control of indoor pollutants are of paramount importance for the health and well-being of all occupants. When feasible, access to daylight will be provided and the ability to control lighting systems will be implemented.

Additionally, the Project team plans on implementing portions of the Green Guide for Healthcare to achieve LEED Innovation & Design credits. The Project is currently planned to achieve 50 of 97 credits under the Green Guidelines for Healthcare. The final number of credits will be determined as the design process continues.