Draft Environmental Assessment

University of Texas Medical Branch at Galveston, Texas

Proposed District Heating and Cooling Project

FEMA-1791-DR-TX / Project Worksheet 15503, Project Worksheet 15521 / FEMA-1791-TX-366

Galveston County, Texas

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LIST OF ACRONYMS AND ABBREVIATIONS

AEI	Affiliated Engineers, Inc.
BFE	Base Flood Elevation
BMP	Best Management Practices
CBRS	Coastal Barrier Resource System
CBRA	Coastal Barriers Resources Act
CCC	Coastal Coordination Council
CEQ	Council on Environmental Quality
CFR	Code of Federal Regulations
CO_2	carbon dioxide
CO_2e	carbon dioxide equivalent
CSW/JSRH	Clinical Service Wing/ Jennie Sealy Replacement Hospital
CZMA	Coastal Zone Management Act
DEA	Draft Environmental Assessment
DHCP	District Heating and Cooling Project
DSHS	Texas Department of State Health Service
EIS	Environmental Impact Statement
EPA	U.S. Environmental Protection Agency
GHG	Greenhouse Gas

FEMA	Federal Emergency Management Agency
FONSI	Finding of No Significant Impact
GLO	Texas General Land Office
HABS	Historical American Building Survey
HHW	heating hot water
HMGP	Hazard Mitigation Grant Program
Hp	Horse power
HRSG	Heat Recovery Steam Generator
IPCC	Intergovernmental Panel on Climate Change
MOA	Memorandum of Agreement
Mph	miles per hour
MSL	mean sea level
NEPA	National Environmental Policy Act
NESHAP	National Emission Standards for Hazardous Air Pollutants
NHPA	National Historic Preservation Act
NO_x	oxides of nitrogen
NPDES	National Pollutant Discharge Elimination System
NSR	new source review
OSHA	Occupational Safety and Health Administration
PAG	Public Assistance Grant Program
Plan	Construction Safety and Health Plan
$PM_{2.5}$	particle pollution 2.5 microns or less in diameter
PM_{10}	particle pollution 10 microns or less in diameter
PNP	Private Nonprofit
PSD	Prevention of significant Deterioration
SGC	University of Texas System Supplementary General Conditions
SFHA	Special Flood Hazard Area
SHPO	State Historic Preservation Officer
SOI	Secretary of the Interior
SPPP	Stormwater Pollution Prevention Plan
TAC	Antiquities Code of Texas
TAHPR	Texas Asbestos Health Protection Rules
TCEQ	Texas Commission on environmental Quality
THPO	Tribal Historic Preservation Officer
TPDES	Texas Pollutant Discharge Elimination System
TPWD	State of Texas Parks and Wildlife Department
UGC	State of Texas Uniform General Conditions
UTMB	University of Texas Medical Branch at Galveston, Texas
VOC	volatile organic compounds

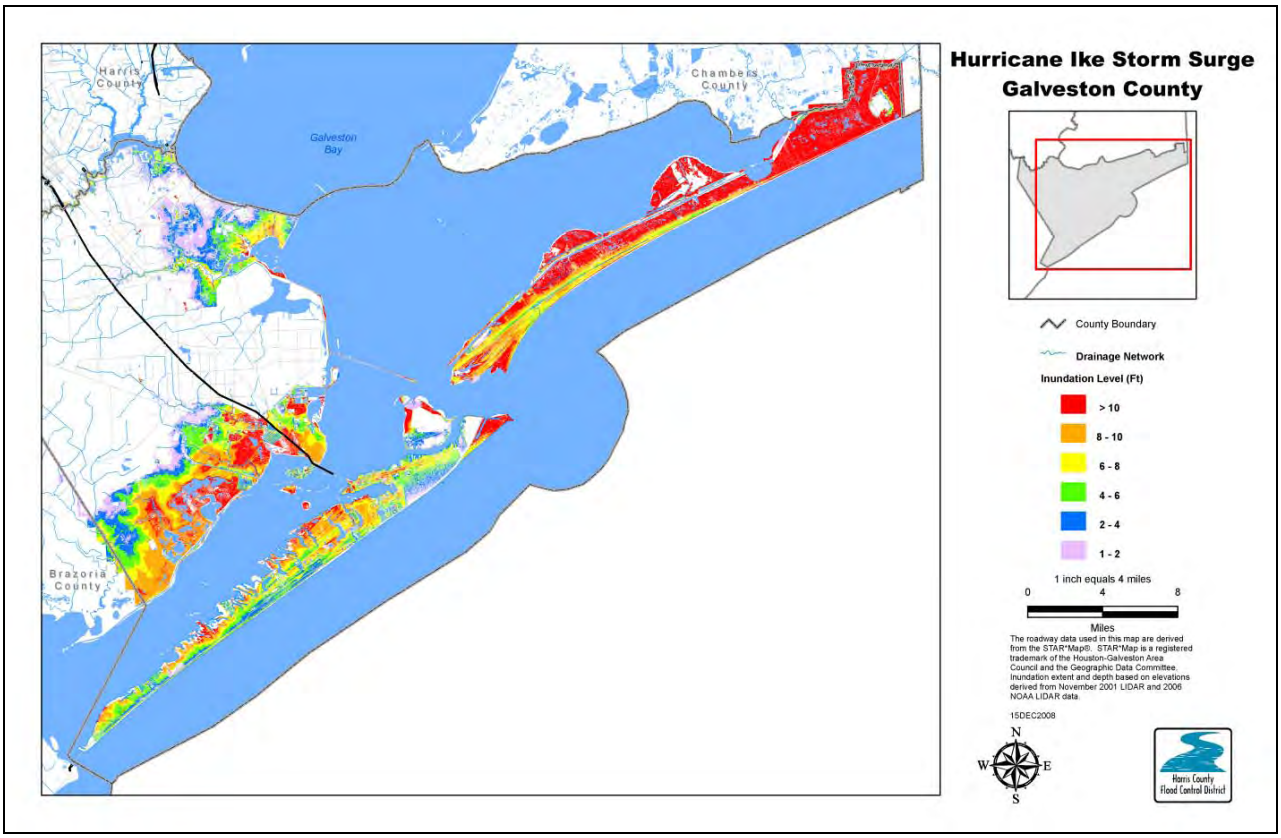
1.0 INTRODUCTION

This draft environmental assessment (DEA) analyzes the potential environmental impacts that could result from the construction and operation of a flood protected District Heating and Cooling Project (DHCP) and associated site activities at the University of Texas Medical Branch at Galveston, Texas (UTMB). The existing district heating cooling system generates chilled water, hot water and/or steam at the Central and West Utility Plants that are piped underground or overhead to individual buildings for space heating, domestic water heating, air conditioning and process uses. As a result, the individual buildings served by the current system do not need their own boilers, furnaces, chillers, or air conditioners.

The United States Department of Homeland Security's Federal Emergency Management Agency (FEMA) is proposing to partially fund the DHCP construction. On September 12, 2008, Hurricane Ike reached Galveston Island with 110 mph winds and wide-scale flooding, causing the immediate failure of all facility systems at UTMB. Over the course of the following weeks, UTMB's current district heating and cooling system, essential to all UTMB operations, remained submerged in salt water, sustaining extensive permanent damage before mechanical pumping efforts could begin. The proposed replacement DHCP would support the essential and simultaneous needs for hot water and chilled water to forty-nine buildings on the UTMB campus and would be designed and constructed to prevent or reduce damage from natural events similar to Hurricane Ike.

1.1 Project Authority

Hurricane Ike, a Category 2 hurricane with a storm surge above normal high tide levels, moved across the Louisiana and Texas gulf coasts on September 13, 2008. Maximum sustained winds at landfall were estimated at 85 miles per hour (mph) and on Galveston Island, winds reached 110 mph with gusts of 125 mph. The largest storm surge was estimated at 17 feet and possibly 20 feet in some Galveston Island areas (Figure 1-1). Hurricane Ike was the third most expensive disaster in FEMA history, behind Katrina and Andrew, and resulted in the largest evacuation of Texans in the state's history (FEMA 2008a).



(Source NOAA 2010)

Figure 1-1: Maximum storm surge inundation levels (water depth) for Galveston County, Texas, including Galveston Island and the Bolivar Peninsula, during Hurricane Ike. Areas shaded in red indicate where the water depths exceeded 10 feet. Image courtesy of the Harris County Flood Control District.

President Bush declared a major disaster for the State of Texas due to damages from Hurricane Ike and signed a disaster declaration (FEMA 2008) on September 13, 2008, authorizing FEMA to provide federal assistance in designated areas of Texas. FEMA is administering this disaster assistance pursuant to the *Robert T. Stafford Disaster Relief and Emergency Assistance Act* (Stafford Act), PL 93-288, as amended. Sections 404 and 406 of the Stafford Act authorizes FEMA's to repair, restore and replace state and local government and certain Private Nonprofit facilities damaged as a result of the declared event.

The *National Environmental Policy Act of 1969* (NEPA) requires that federal agencies consider the environmental consequences of proposed actions before decisions are made. In complying with NEPA, FEMA follows the Council on Environmental Quality (CEQ) regulations (40 Code of Federal Regulations [CFR] Parts 1500-1508) and FEMA's implementing regulations at 44 CFR 10.1 – 10.14. FEMA examined their proposal to fund the DHCP against the list of categorical exclusions[a] found in 44 CFR 10.8 and concluded that the Proposed Action could not be categorically excluded and that an environmental assessment was the appropriate level of analysis. This DEA assesses the potential environmental consequences resulting from construction and operation of the proposed DHCP and associated activities. The objectives of this DEA are to:

- Describe the underlying purpose and need for FEMA action (Chapter 2);
- Describe the Proposed Action and identify any reasonable alternatives that satisfy the purpose and need for FEMA action (Chapter 3);
- Describe the relevant baseline environmental conditions at UTMB (Chapter 4);
- Analyze the potential effects to the existing environment from implementation of the Proposed Action (Chapter 4); and
- Compare the impacts of the Proposed Action with the No Action Alternative (Chapter 4).

The DEA process also provides FEMA and UTMB with environmental information that can be used in developing mitigative actions, if necessary, to avoid or minimize adverse effects to the quality of the human and natural environment from the implementation of the Proposed Action.

The analysis of potential effects in this DEA is based on a sliding scale approach. The key element of this approach entails focusing on environmental issues in proportion to their potential effects (40 CFR Part 1502.2[b]). That is, certain aspects of the proposal may have a greater potential for environmental effects than others; and therefore are discussed in greater detail in this DEA. Chapters 1.0, 2.0, 3.0 and 4.0 are intended to provide sufficient detail so that the reader may understand the direct as well as the indirect and cumulative environmental consequences of the Proposed Action and the No Action Alternative. FEMA will use the findings in this DEA to determine whether to prepare an Environmental Impact Statement (EIS) or a Finding of No Significant Impact (FONSI).

1.2 Project Location

UTMB, the third oldest medical school west of the Mississippi River, is a component of the University of Texas System located in Galveston, Texas, on the east end of Galveston Island 48 miles south of Houston, Texas (Figure 1-2). Within Galveston, UTMB is located at 301 University Boulevard and is generally bounded by Harborside Drive on the north, 2nd Street to

[a]"Categorical Exclusion" means a category of actions which do not individually or cumulatively have a significant effect on the human environment and which have been found to have no such effect in procedures adopted by a Federal agency in implementation of these regulations and for which, therefore, neither an environmental assessment nor an environmental impact statement is required (40 CFR Sec. 1508.4).

the east, 14th Street to the west, and Market Street to the south. UTMB is bounded by residential and commercial properties on all sides (NIAID 2005).

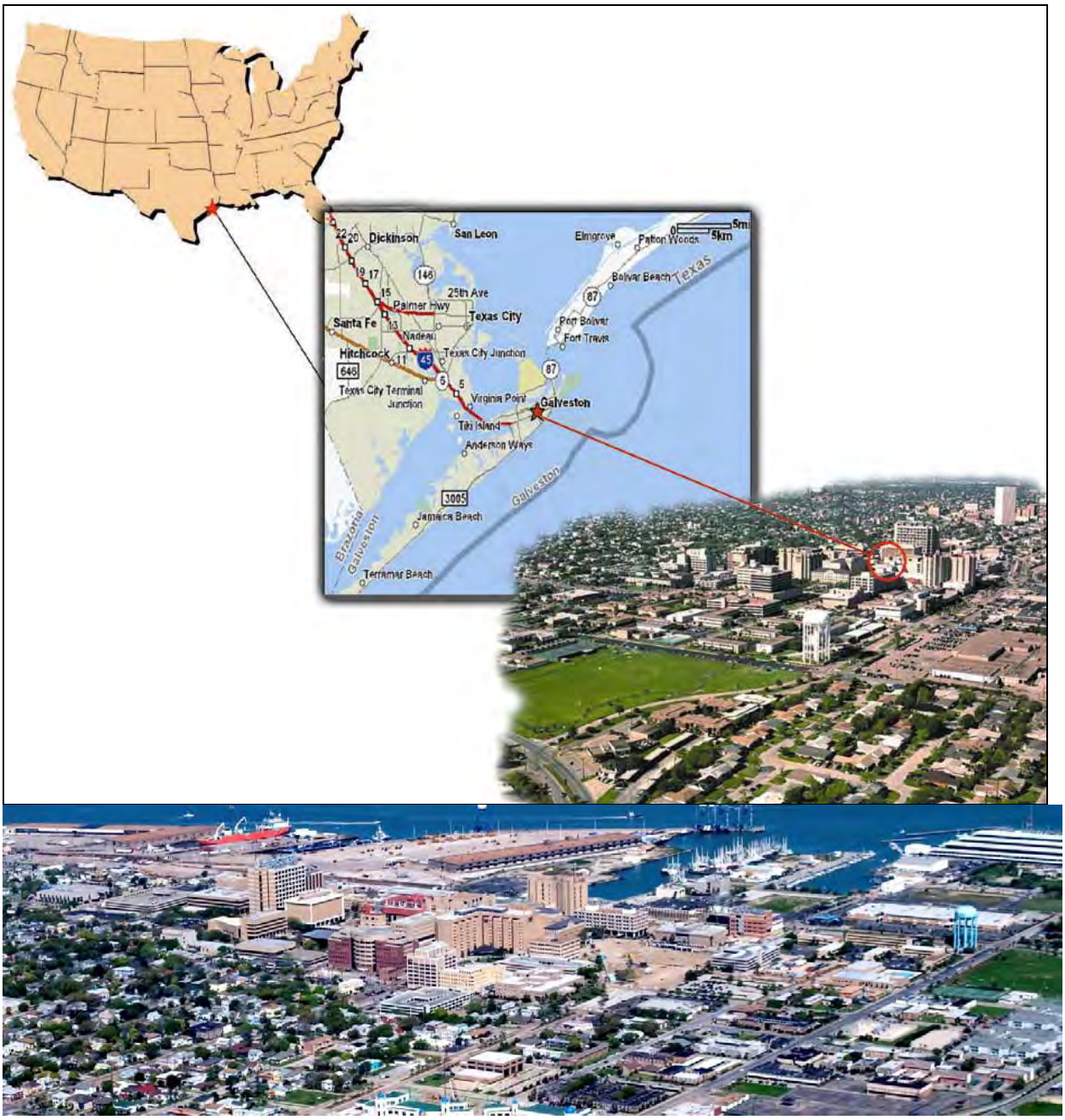


Figure 1-2: Location of UTMB.

Established in 1891 as the University of Texas Medical Department, UTMB has over 6,000 staff, 1,000 faculty, and 2,500 students on an 84-acre campus containing more than 70 major buildings. The campus includes four schools, three institutes for advanced study, a major medical library, a network of hospitals and clinics that provide a full range of primary and specialized medical care and numerous research facilities. UTMB is one of three Level 1 Trauma Centers serving a Houston metropolitan area of over 5.5 million people. In its several

hospital facilities, UTMB also provides critical tertiary and quaternary care to the state, and the Texas Department of Criminal Justice Hospital (AEI 2012).

The proposed project located within the UTMB property is generally bounded to the north by Harborside Drive, 12th Street to the west, Market Street to the south, and 4th Street to the east. Figure 1-3 shows most of the locations within the UTMB campus affected by the project. In addition, Rebecca Sealy Hospital (M121) south of Market St would be connected to the thermal distribution loops and Maurice Ewing Hall (M71) would have its own small boiler mounted on a platform or on the roof. Valve pit I north of Harborside Drive would also be removed. All construction would take place within existing right-of-ways or on UTMB property. The only proposed construction outside the UTMB campus would be the borings that occur on Market and 4th Streets within the city right-of-way. These areas have been coordinated with the City of Galveston with traffic plans developed and license to use permits granted for these locations.

Currently, UTMB's natural gas is provided by a gas main that provides service to the entire Galveston community. A component of the project is the construction of a dedicated natural gas line from the 59th & Port Industrial city gate to connection points within UTMB to avoid potential UTMB service interruptions as a result of severe weather event affecting the entire Galveston community.

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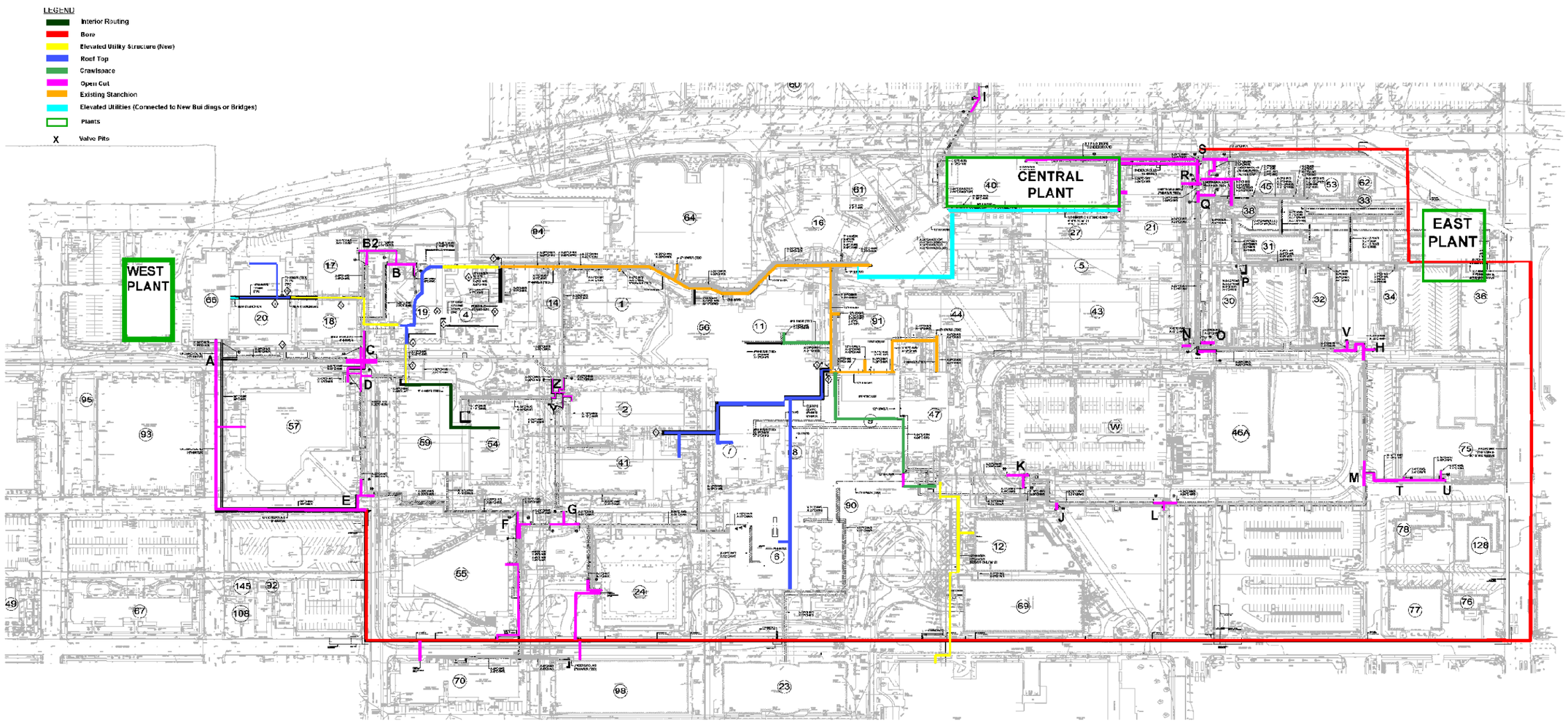

Figure 1-3: DHCP Plants and Distribution Lines Locations

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2.0 PURPOSE AND NEED

The FEMA Public Assistance Grant (PAG) Program and the Hazard Mitigation Grant Program are based on statutes, regulations and policies. The statute, the *Robert T. Stafford Disaster Relief and Emergency Assistance Act* (Stafford Act), is the underlying document that authorizes the program. Regulations published in Title 44 of the *Code of Federal Regulations* (44 CFR) Part 206 implement and interpret the statute. Policies are written to apply the statute and regulations to specific situations. These documents govern the eligibility criteria through which FEMA provides funds. (FEMA 2012).

The objective of these FEMA programs is to provide assistance to state, Tribal and local governments, and certain types of Private Nonprofit (PNP) organizations so that communities can quickly respond to and recover from major disasters or emergencies declared by the President. Through these programs, FEMA provides supplemental Federal disaster grant assistance for debris removal, emergency protective measures, and the repair, replacement, or restoration of disaster-damaged, publicly owned facilities and the facilities of certain PNP organizations. These programs also encourage protection of these damaged facilities from future events by providing assistance for hazard mitigation measures during the recovery process. As a means of meeting these objectives, mitigation funding is available through the Hazard Mitigation Grant Program (Section 404 of the Stafford Act) and funding for the restoration of damaged facilities is available through the Public Assistance Program (Section 406 of the Stafford Act). The Stafford Act was passed on November 23, 1988, amending Public Law 93-288, the Disaster Relief Act of 1974 and provides FEMA the authority to fund the restoration of eligible facilities that have sustained damage due to a presidentially declared disaster.

Section 406 of the Stafford Act authorizes FEMA through its Public Assistance Program to provide funding for the repair, restoration, or replacement of damaged facilities. Title 44 CFR §206.203 Federal Grant Assistance contains a provision for the consideration of improved projects, projects that incorporate additional improvements but still restore the function of a damaged facility.

Section 404 of the Stafford Act established the Hazard Mitigation Grant Program (HMGP). Hazard mitigation is any sustained action taken to reduce or eliminate long-term risk to people and property from natural hazards and their effects. A key purpose of the HMGP is to ensure that the opportunity to take critical mitigation measures to protect life and property from future disasters is not lost during the recovery and reconstruction process following a disaster. The 404 program does not necessarily apply to damaged facilities resulting from the current declared disaster. It focuses on repetitive damages from past disasters and funds new or improved facilities.

A combination of Section 404 (mitigation) and 406 (improved project) funding is proposed. The use of these funds would implement measures that reduce future loss to life and property, protect the federal investment in public infrastructure and ultimately, help build disaster resistant communities (FEMA 2007 and 2010).

UTMB requires and would use FEMA financial disaster support to assure uninterrupted reliability of UTMB's essential health treatment, care, and research operations as a result of future storm events and avoid or reduce the need for future FEMA public assistance funding. A component institution of the University of Texas System, UTMB is one of three Level 1 Trauma Centers serving a Houston metropolitan area of over 5.5 million people. In its several hospital facilities, UTMB also provides critical tertiary and quaternary care to the state, and the Texas Department of Criminal Justice Hospital. The damage caused by Hurricane Ike immediately suspended all UTMB campus operations.

Producing and distributing thermal utilities to forty-nine UTMB buildings, the district heating and cooling system is comprised of interdependent individual components. The failure of any individual component will hinder the overall capacity of the entire system. The proposed DHCP is designed to minimize the risks of loss of operation and capacity and insure that critical facilities remain functional during disaster events.

To sufficiently assure future reliability of critical UTMB operations and protection of remaining assets in a location subject to recurrent hurricanes and floods, the DHCP addresses component damage and also presents an approach to mitigation that would insure the return of UTMB's hospital and patient care operations in a timely manner. The need for assured reliability of uninterrupted treatment, care and research operations in a hurricane and flood-prone location is critical. Implementing the proposed mitigation measures to the district heating and cooling system would allow UTMB to maintain continuity of operations and fulfill its mission serving the city of Galveston and the nine-county trauma center region.

3.0 ALTERNATIVES

3.1 Proposed Action

UTMB operates and maintains a district heating and cooling system that produces steam and chilled water at two plants. The steam or water is piped via underground or overhead distribution to individual buildings for space heating, domestic hot water, process uses, and air conditioning. As a result, the fifty-two individual buildings, served by the district heating and cooling system at the time of Hurricane Ike, did not need their own boilers, furnaces, chillers, or air conditioners.

The purpose of the Proposed Action is to modify the current district heating and cooling system to prevent and further reduce the threat of future damages should a storm similar in size to Hurricane Ike occur. The DHCP facilitates the application of energy savings technologies such as combined heat and power and thermal energy storage that are highly encouraged by the State of Texas and the US Department of Energy.

3.1.1 General Description

The existing district heating and cooling system could not be operated during hurricane Ike because electrical and gas service were shut off by the utility suppliers. The East and West Power Plants would have cogeneration electrical equipment and a dedicated gas line to ensure the continued operation or rapid start-up of hot water, steam and chilled production and distribution equipment during or immediately after a severe weather event. Additionally, much of the current steam production requirements would be replaced by a hot water system. All buildings on campus would be converted from primary steam heating to the use of heating hot water. In a number of facilities, the use of steam heating coils in air-handling units and other air moving devices would need to be converted to heating hot water. The domestic water heaters utilizing steam would also need to be converted to heating hot water. Where feasible the existing utility penetrations points into the buildings would be utilized.

Co-generation, also known as combined heat and power, is the production of electricity and heat from a single fuel source. Considered highly efficient, co-generation captures heat lost during the production of electricity and converts it into useful thermal energy, usually in the form of steam or hot water. Co-generation systems are typically 60-80 percent efficient which is significantly more efficient than the traditional power plant efficiency of approximately 30 percent.

These efficiency gains also result in cost savings, reduced air pollution and greenhouse gas emissions, increased power reliability and quality, reduced grid congestion and avoided distribution losses. (http://sustainability.yale.edu/co-generation)

The DHCP electrical generation and steam production and hot water, and chilled water equipment would be housed in new or modified protected plants (addressed in Section 3.1.1.1 below) that would not to be subject to inundation during a flood event. The 32 damaged utility vaults would be abandon in-place. All heating and cooling shut-off valves in the damaged utility vaults would be replaced with above ground valves. There are potentially two elevated platforms which would be approximately 20 feet by 20 feet and elevated to provide for flood protection. The preference would be to put the equipment on the roofs, but the platforms, if required, would be on concrete columns supported by spread footings or piles. The design has not progressed to the point of making a final determination. These locations would be Animal Research Center (M20) and Maurice Ewing Hall (M71).

A two-million gallon thermal water storage tank is proposed at both the new East Plant and the West Plant (Figure 3-1) addition. The dimensions are 150 feet in length, 55 feet in width, and 33 feet in height and would be recessed no more than 10 feet into the existing grade; these tanks would provide a 3-day backup source of evaporation make-up water for the thermal utility generation equipment. The utility distribution system would consist of new sub grade and elevated hot water/steam/chilled water supply lines installed adjacent to the current supply lines which would be abandoned in place. Climate controlled walkways and elevated pipe stanchions would be used to re-route new piping to serve the existing campus buildings.

The building and equipment designs consider operations in a Base Flood[b] and/or Special Flood Hazard Area[c] (SFHA). Steam distribution below the SFHA would not occur as the limited steam distribution would be constructed above the SFHA. Rather, heat energy would be moved via hot water in a distribution system that is compatible with the inundation of salt water. Similar to the hot water system, chilled water distribution that is below the Base Flood Elevation would occur in a manner that is compatible with the inundation of salt water. Electrical generation equipment would be installed in elevated or protected structures above the SFHA.

[b] The flood having a one percent chance of being equaled or exceeded in any given year. This is the regulatory standard also referred to as the "100-year flood." The base flood is the national standard used by the National Flood Insurance Program and all Federal agencies for the purposes of requiring the purchase of flood insurance and regulating new development. Base Flood Elevations are typically shown on Flood Insurance Rate Maps.

[c] The land area covered by the floodwaters of the base flood [see footnote b] is the Special Flood Hazard Area (SFHA) on National Flood Insurance Program maps. The SFHA is the area where the NFIP's floodplain management regulations must be enforced and the area where the mandatory purchase of flood insurance applies.

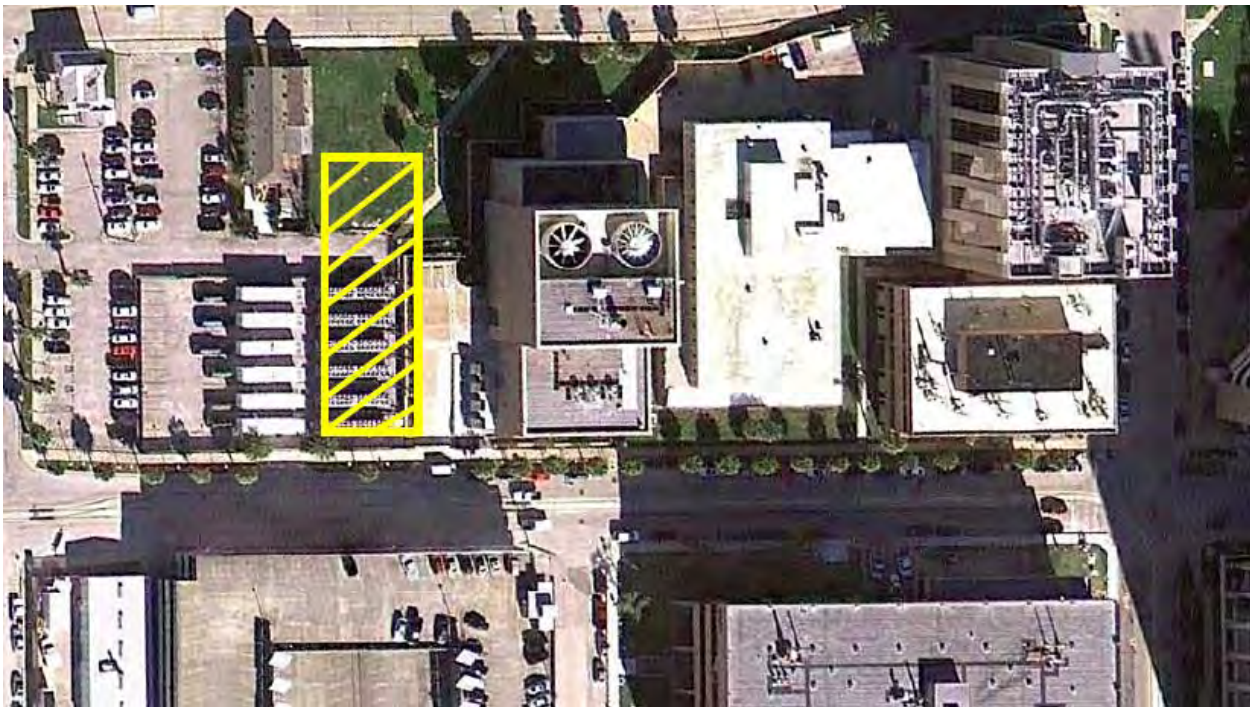

Figure 3-1: West Plant Thermal Water Tank Proposed Location.

The pre and post Ike chiller and boiler capacities are summarized in Tables 3.1 and 3.2. The boiler and heat recovery steam generator (HRSG) capacities are presented in MMBtuh (million Btuh). Converting the boiler output from steam to hot water does not change the capacity rating of the boilers in MMBtuh. However, the new hot water system would be significantly more efficient than the previous steam system; therefore, less boiler capacity is needed. UTMB's Rebecca Sealy Hospital Building (M121) utilized a series of 4 air-cooled and water-cooled domestic and HVAC boilers and chillers for associated building services. The utility plant units were located on the street level floor, and were solely for use of the Rebecca Sealy Hospital Building (M121), and not connected to a distributed "loop" utility system. These utilities were damaged beyond repair during Hurricane Ike and replaced by temporary equipment. The DHCP project would tie the Rebecca Sealy Hospital Building (M121) into the distributed loop utility system. Maurice Ewing Hall (M71) would have its own boiler since it is not cost effective to connect it to the thermal loop. This boiler would be placed on a small platform (20 feet X 20 feet and 25 feet above mean sea level) just northeast of the building or on the roof.

Table 3-1: UTMB District Energy Heating and Cooling Capacity

2008 Pre-Ike		Completed 2010 Capital Project	Proposed FEMA 406 Project	Proposed FEMA 404 Project
Chiller Capacity	**Tons**			
Central Plant				
Chiller 3	2,000	0	0	0
Chiller 4	2,200	0	0	0
Chiller 5	2,200	0	0	0
Chiller 6	3,000	3,000	0	0
Chiller 7	3,000	3,000	0	0
Chiller 8	3,700	3,700	0	0
Chiller 9	3,700	3,700	0	0
West Plant				
Chiller 10		2,800	2,800	2,800
Chiller 11		3,400	3,400	3,400
Chiller 2	4,500	4,500	4,500	4,500
Chiller 12				2,800
Rebecca Sealy Hospital				
Chiller 1	200	200	0	0
Chiller 2	500	500	0	0
Chiller 3	200	200	0	0
Chiller 4	200	200	0	0
East Plant				
Chiller 13			3,400	3,400
Chiller 14			3,400	3,400
Chiller 8			3,700	3,700
Chiller 9			3,700	3,700
Total Capacity	**25,400**	25,200	24,900	27,700
Firm Capacity	20,900	20,700	20,400	23,200
Capacity Changes from Pre-Ike		**(200)**	**(500)**	2300
Steam and Hot Water Capacity	**MMBtuh**			
West Plant				
Boiler 9	100	100	100	100
New HRSG				75
Central Plant				
Boiler 1	100	100	0	0
Boiler 2	100	100	0	0
Rebecca Sealy Hospital				
Boiler 1	10	10	0	0
Boiler 2	10	10	0	0
Boiler 3	2	2	0	0
Boiler 4	1	1	0	0
East Plant				
New HRSG			75	75
Services Building				
3 New Boilers			30	30
Maurice Ewing Hall				
1 New Boiler			3	30
Total Capacity	323	323	208	280
Firm Capacity	223	223	108	180
Capacity Changes from Pre-Ike		0	(115)	(43)

Table 3-2: UTMB District Energy Heating and Cooling Loads

	Loads	Tons
2008 Peak Load		18,688
Demolition		
18	1108 Strand	(487)
5	Surgical Research Building	(201)
25	Carpenter Shop	(25)
27	Surgical Research Annex	(147)
33	Nolan Hall	(100)
35	Morgan hall	(100)
43	610 Texas Ave Bldg.	(450)
44	Jennie Sealy Replacement Hospital	(387)
	Total Demolition	**(1,897)**
New Loads		
17E	Research Building	413
B2	Jennie Sealy Replace Hospital (Phase 1)	1,917
B1	Clinical Services Wing	1,301
CC	Conditioned Corridors	200
T1-T3	Student Housing (400 units)	0
121	Rebecca Sealy	1,233
	Total New Loads	**5,064**
Renovations		
	First Floor Space Adjustments	(177)
6	Children's Hospital	400
24	Moody Library	0
54	Basic Sciences Building	0
	Total Renovations	**223**
2015 Total Net Load		**22,078**

The proposed construction administration and equipment and supplies staging area is Lot W located at 600 Harborside Drive between Harborside Drive and Barracuda Ave immediately west of 6th Street (Figure 3-2). Lot W is approximately 5.6 acres with 4.5 acres paved. The paved area is not anticipated to be disturbed. Unpaved areas consist of scrub vegetation on sandy soil that is typical of the native soil on the island. The unpaved areas are to be covered with a nonwoven geotextile fabric and eight inches of compacted crushed concrete to prevent erosion from vehicular traffic in this area (AEI 2010).

Figure 3-2: Proposed Construction Administration and Staging Area – Lot W (Google Earth).

3.1.1.1 Electricity and Utility Production

The Central (M40) and West Plants (M66), constructed in 1964 and Building 66 constructed in 1994, respectively, are currently the sources of steam and chilled water for the heating, process, and cooling needs of UTMB.

The Central Plant (M40) cooling towers were damaged by wind and the boilers were damaged due to the inundation of the steam supply and condensate return system by salt water as a result from Hurricane Ike as documented in the FEMA Project Work Sheet PA-06-TX-1791-PW-12102 (FEMA 2009). The existing hurricane damaged Central Plant (Figure 3-3) would require substantial and major modifications, to protect critical equipment and services from natural events similar to Hurricane Ike. The Central Plant engineering assessment concluded that the equipment within the Central plant is too tall and the structure too low to raise the equipment above the base flood elevation. Additionally, space is not available to construct a floodwall.

Therefore, the Central Plant will be demolished due to the damage it sustained and the limitations to protect the facility from flooding.

Figure 3-3: Central Plant

The West Plant (M66) (Figure 3-4 and Figure 3-5) would be repaired with critical equipment elevated and a floodwall constructed. In order to reduce the non-permanent (temporary) construction cost and to provide reliable utilities, a new permanent elevated East Plant would be constructed.

Figure 3-4: West Plant

Figure 3-5: West Plant

An elevated East Plant is required to ensure that future DHCP operations are not at risk. The new East Plant would also provide the campus thermal requirements during the distribution system reconstruction.

In addition, temporary utility support equipment is proposed during construction to eliminate the need to shutting down building services. This will involve using ten, 3,100 Hp diesel fueled, Temporary Boiler Plants during the construction period. It will also involve using ten, 1,000 ton, Temporary Chilled Water Plants during the construction period as well.

Both the West and East Plant protected structures would be constructed primarily with auger cast pile foundations with cast in place reinforced concrete pile caps; cast in place reinforced concrete columns, beams, joists and elevated slabs; and a combination of masonry, precast concrete and metal panel exterior skin. To engage the East and West Plants most cost effectively into the DHCP with the least amount of temporary equipment, the following sequence would occur:

1. Demolish Morgan Hall [M35] and Construct the East Plant
2. Repair the West Plant (M66)
3. Demolish the Existing Central Plant (M40)

East Plant (Figure 3-6)***:*** Based on the conceptual design the East Plant would be a new elevated single-story 25,000 sq. ft. thermal utility plant located on the northeastern corner of the UTMB campus. The finished first floor elevation would be a minimum of 25 feet above mean sea level which would allow for truck traffic below the first floor. The total height of the plant would be less than 100 feet above grade with all critical equipment located above SFHA. The plant would contain elevated hot water convertors, electrically driven chillers, cooling towers, basins, and associated mechanical and electrical accessories. This plant would also provide the temporary measures required to support the repairs to the thermal distribution loop. A two million gallon chilled water thermal storage capacity would be provided. This tank would provide a 3-day backup source of evaporation make-up water for the thermal utility generation equipment and shift electrical demand to off peak hours thereby reducing the strain on the electric grid. The proposed site is currently occupied by Morgan Hall (M35), a parking lot, walkways, and green space. It is bordered on the north by City of Galveston-owned land.

Figure 3-6: Proposed Elevated East Plant Location

West Plant (M66) (Figure 3-7 and Figure 3-8)*:* As documented in the FEMA Project Work Sheet PA-06-TX-1791-PW-12102 (FEMA 2009a), the West Plant's lower crawlspace and lower cooling tower sump were inundated with salt water during Hurricane Ike. The electrical power components located in these areas were not designed to be submerged and are not of sufficient construction to tolerate contact with salt water. Salt water caused pre-mature corrosion of steel cabinets, busses and conductors, degraded cable insulation, and caused rigid steel conduits and bushings to corrode at an accelerated rate. Failures of equipment due to excessive corrosion in the electrical system have been documented. All of the chilled water, steam, condensate and plumbing components including the pipe, insulation, pumps, hangers, valves, and gauges in the lower crawlspace were also damaged as a result of exposure to salt water. Additionally, the chiller located on the first level, although not submerged, was inundated by salt water and debris. Repairs and elevation of critical equipment are proposed for the West Plant. A new additional structure is proposed for the West Plant due to lack of space in the existing plant and to provide the proper level of protection for emergency generation equipment. A two million gallon chilled water thermal storage capacity would also be provided. This tank would provide a 3-day backup source of evaporation make-up water for the thermal utility generation equipment and shift electrical demand to off peak hours thereby reducing the strain on the electric grid.

To provide further protection a new cast-in-place concrete freestanding cantilever floodwall is proposed to surround the existing building. The proposed 25-foot wall would be designed to withstand 20 feet of static water pressure. A slurry wall would be installed below grade in conjunction with the new floodwall to slow the water seeping through the soils and prevent or lessen the water pressure acting on the crawlspace slab and the cooling tower pit slab and/or prevent the water from reaching the ground floor level structure. The slurry wall would be constructed by means of jet grouting that would eliminate the need for dewatering. Since

dewatering would not be required, the only adjacent building, Animal Research Center (M20), would not be structurally impacted. At this time, the depth of ground disturbance cannot be provided, as the slurry wall has not been designed to a point at which the depth can be determined.

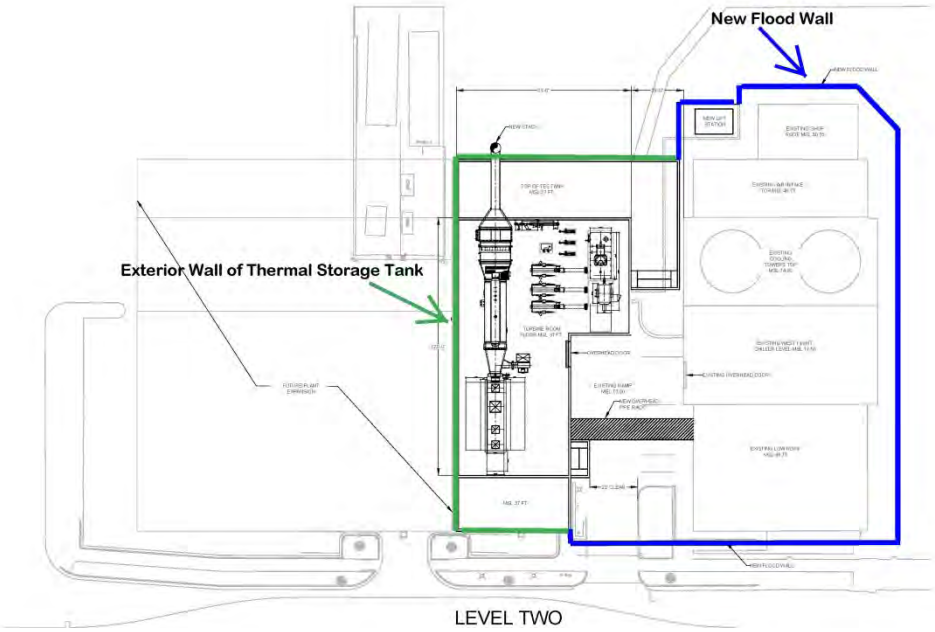

Figure 3-7: Elevated West Plant Schematic

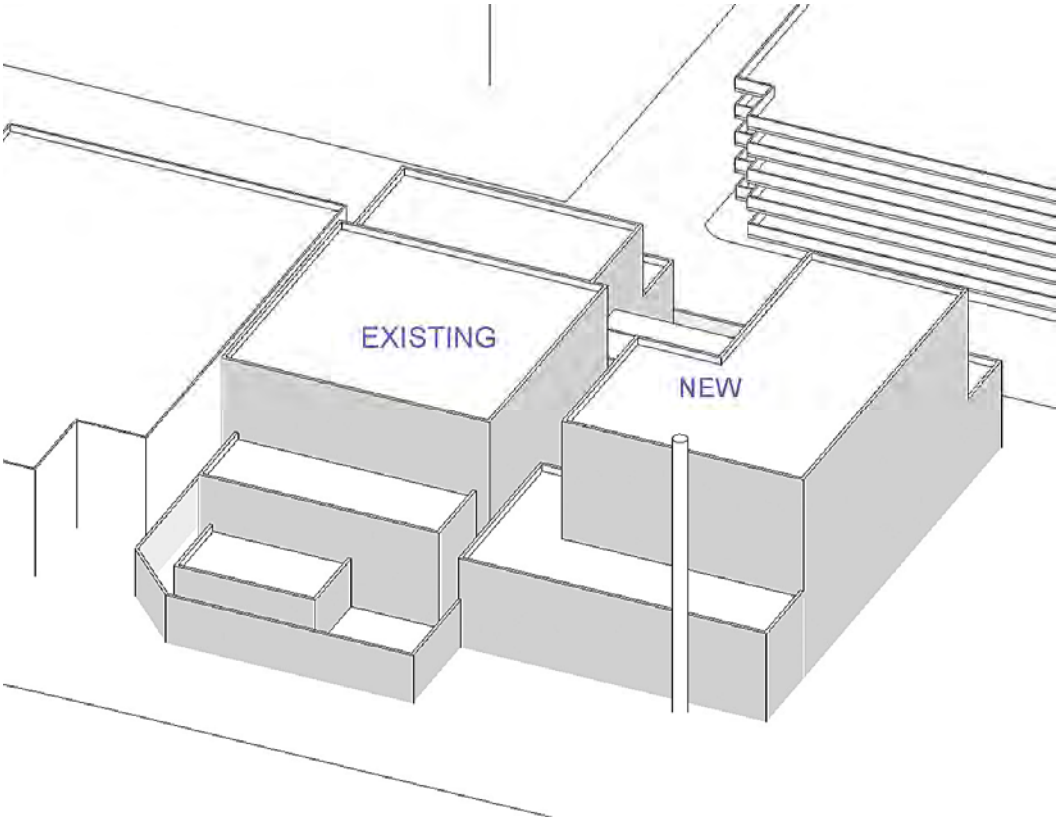

Figure 3-8: Elevated West Plant Diagram

3.1.1.2 Distribution System

Table 3-3 provides a list of existing buildings and the connection points for the DHCP upgrades.

Table 3-3: Buildings and Connection Points for the DHCP

Building Number	Building Name	Connection
M1	Ashbel Smith Building "Old Red"	Stanchion Distribution
M2	William Keiller Building	Rooftop Distribution
M4	Marvin Graves Building	Stanchion Distribution
M5	Surgical Research Building	Demolished for CSW/JSRH
M6	Children's Hospital	Rooftop Distribution
M7	Clinical Sciences	Rooftop Distribution
M8	John Sealy Annex	Rooftop Distribution
M9	John Sealy Annex	Rooftop Distribution
M11	McCullough Building	Rooftop Distribution
M12	Administration Building	Elevated Supports
M14	Jamail Student Center	Stanchion Distribution
M16	TDCJ Hospital	Stanchion Distribution
M17	Research Building	Elevated Supports
M18	1108 Strand Building	Elevated Supports

Building Number	Building Name	Connection
M19	Mary Moody Northern Pavilion	Elevated Supports
M20	Animal Research Center	Elevated Supports
M21	Research Support Building	Elevated Supports
M23	Shriners Hospital	Rooftop Distribution
M24	Moody Medical Library	Crawlspace
M25	Carpenter Shop	Demolished for CSW/JSRH
M27	Surgical Research Annex	Demolished for CSW/JSRH
M30	Brackenridge Hall	Existing Connection
M31	Clay Hall	Existing Connection
M32	Bethel Hall	Existing Connection
M33	Nolan Hall	To be Demolished
M34	Vinsant Hall	Existing Connection
M38	Dorm Machine Room	Underground Distribution
M35	Morgan Hall	To be Demolished
M40	Central Plant	To be Demolished
M41	Galveston National Lab	Rooftop Distribution
Shope Laboratory	BSL-4 (next to Keiller)	Rooftop Distribution
M43	610 Texas Ave Building	Demolished for CSW/JSRH
M44	Jennie Sealy Replacement Hospital	Demolished for CSW/JSRH
M47	Waverly Smith Pavilion	Rooftop Distribution
M54	Basic Science Building	Elevated Supports
M55	Levin Hall	Crawlspace
M56	University Hospital Clinic	Stanchion Distribution
M57	School of Nursing	Crawlspace
M59	TG Blocker Medical Research Building	Elevated Supports
M61	Services Building	Elevated Supports
M64	Emergency Room Building	Stanchion Distribution
M66	West Plant	Plant
M69	Parking Garage #1	Underground Distribution
M70	Pharmacology Building	Crawlspace
M71	Maurice Ewing Hall	New Boiler Plant
M75	Alumni Field House	Underground Distribution
M90	John Sealy Hospital	Rooftop Distribution
M91	John Sealy Annex	Rooftop Distribution
M94	Parking Garage #2	Underground Distribution
M98	Parking Garage #3	Underground Distribution
M121	Rebecca Sealy Hospital	Elevated Supports

Building Number	Building Name	Connection
B1	Clinical Services Wing	Elevated Supports
TBD	East Plant	Plant

Note: Of the 52 buildings served by the district heating and cooling system Pre-Ike, 5 have been demolished for the CSW/JSRH project and three are scheduled for demolition. Three new buildings would be added (CSW, JSRH, and East Plant) to bring the total to 49

The conversion from steam heating to hot water heating would require the installation of replacement lines and energy converters in 35 building on campus as identified in Table 3-4.

Table 3-4: List of Building that would require the Installation of Replacement Lines and Energy Converters

Building Number	Building Name	Address
M1*	Ashbel Smith Building "Old Red"	914 Strand
M2**	William Keiller Building	915 Strand
M4**	Marvin Graves Building	1012 Strand
M6	Children's Hospital	820 Market Street
M7	Clinical Sciences	208 9th Street
M8	John Sealy Annex	226 9th Street
M9	John Sealy Annex	221 University
M11	McCullough Building	819 Harborside
M12	Administration Building	301 University Blvd
M14	Jamail Student Center	920 The Strand
M16	TDCJ Hospital	809 Harborside
M17	Research Building	105 11th Street
M19	Mary Moody Northern Pavilion	120 11th Street
M20	Animal Research Center	1121 Harborside
M21	Research Support Building	609 Harborside
M24	Moody Medical Library	914 Market
M38**	Dorm Machine Room	108 6th Street
M40	Central Plant	715 Harborside
M41	Galveston National Lab	221 9th Street
M47	Waverly Smith Pavilion	211 University
M54	Basic Science Building	1005 Strand
M55	Levin Hall	1006 Market
M56	University Hospital Clinic	902 Texas Avenue
M57	School of Nursing	1114 Mechanic
M59	TG Blocker Medical Research Building	224 11th Street
M61	Services Building	801 Harborside
M64	Emergency Room Building	901 Harborside
M66	West Plant	1202 Strand
M70	Pharmacology Building	1003 Market
M71	Maurice Ewing Hall	716 Harborside

Building Number	Building Name	Address
M75	Alumni Field House	227 4TH Street
M90	John Sealy Hospital	301 8th Street
M91	John Sealy Annex	729 Harborside
M98	Parking Garage #3	1015 Market
M121	Rebecca Sealy Hospital	404 8TH Street

Buildings M30**, M31**, M32**, M33**, M34**, M35** are serviced by equipment located in M38**
*Building listed on the National Register of Historic Places
**Buildings Eligible for Listing on the National Register of Historic Places

***Steam*:** The DHCP distribution would retain the undamaged UTMB steam and condensate system currently in place above the special flood hazard area. The UTMB underground steam and condensate system would be abandoned in place and the valve pits demolished and filled.

***Heating Hot Water*:** The UTMB underground steam and condensate system would be abandoned and replaced with a direct buried 210°F supply heating hot water system. The heating hot water system would be designed to be in direct contact with saltwater or brackish groundwater. The heating hot water system installed below 16.0 feet mean sea level (MSL) would be constructed of a watertight pre-insulated piping material with polyethylene jacketing. The necessary valves would be ductile iron with appropriate coatings to make them saltwater resistant and intended to be direct buried.

The preliminary design includes piping ranging in size from 2 to 16-inch diameter pre-insulated supply and return pipes distributing heating hot water (HHW). A combination of open cut trenching and microtunneling would be used to install the main runs of the distribution piping, which would be buried between 4 and 22 feet below existing grade. Trenching would occur primarily along 12th Street from Strand to Mechanic Street, on Mechanic Street from 12th to 11th Street. Microtunneling (boring) would occur along 11th from Mechanic to Market Street, along Market from 11th to 4th Street, 4th Street – Market Street to Harborside Drive, and Harborside Drive – 4th Street to the new Jeanie Sealy Replacement Hospital. Near Market and 6th Street, the buried nonfunctional, but historic, Galveston seawall is present in the area that would be affected by installation of the distribution pipe. The seawall was listed in the National Register of Historic Places in 1977 and designated a National Civil Engineering Landmark by the American Society of Civil Engineers in 2001 (Figure 3-9 and Figure 3-10) . The proposed thermal distribution path runs along Market Street and will cross the seawall at the intersection of Market and Sixth Streets (See Figure 1-3). All of the piping along Market Street will be in a steel casing that is bored at a depth of 15-20 feet except at the seawall. It is not possible to bore through or under the seawall so the piping will rise up to 4 feet below the surface as it approaches the intersection and be at that depth until it is clear of the seawall and riprap. Excavation will take place to find the exact location of the seawall prior to digging the bore pit that will be just to the west of the seawall. Figure 3-9 and 3-10 shows a picture of the seawall during construction and an engineering drawing cross section. Once clear of the riprap the piping will once again drop down to the bore depth of 15-20 feet and continue on to 4th St. The dimensions of the open cut through the seawall will be approximately 10 feet wide and 9 feet deep which would allow about 3 feet of clearance around the pipes. The amount of riprap that must be removed will depend on the depth of the riprap in this area and the length. The drawings indicate that the riprap is

approximately 8 below the top of the seawall and 40 feet in length. Potentially, 1-2 feet of riprap over the course of 40 feet will need to be removed. Every effort will be made to minimize the demolition of this structure. The dimensions indicated here are the worst cases and the design team is evaluating reductions in cover over the utilities and required clearance under the piping to reduce the impact to the seawall. UTMB would comply with Memorandum of Agreement (MOA) titled "*The Demolition of Morgan Hall, Nolan Hall, and A Portion Of The Original Galveston Seawall Located At 502 And 414 Texas Avenue and The Corner of 6th And Market Street, Galveston, TX*" The Draft MOA was circulated for signature on February 1, 2013. The signed FONSI and the Final EA will be pending approval of the MOA by the signatory agencies.

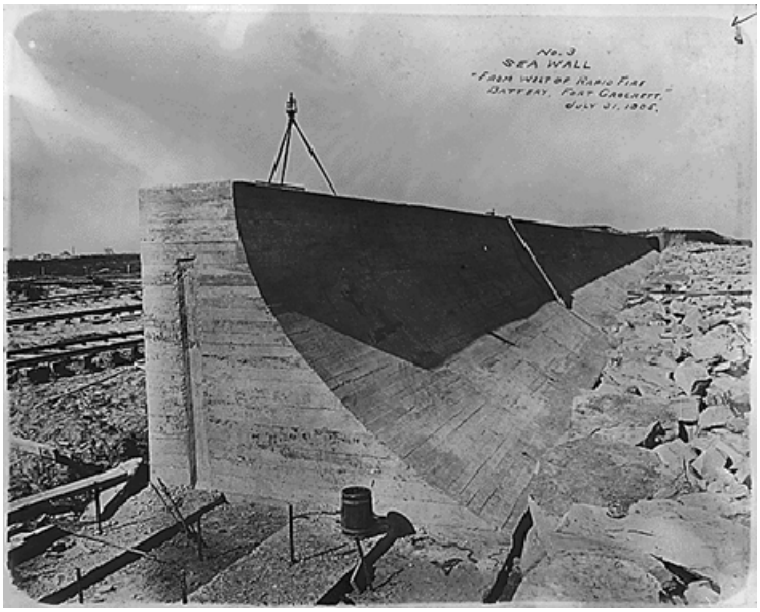

Figure 3-9: Galveston Seawall Under Construction July 31, 1905

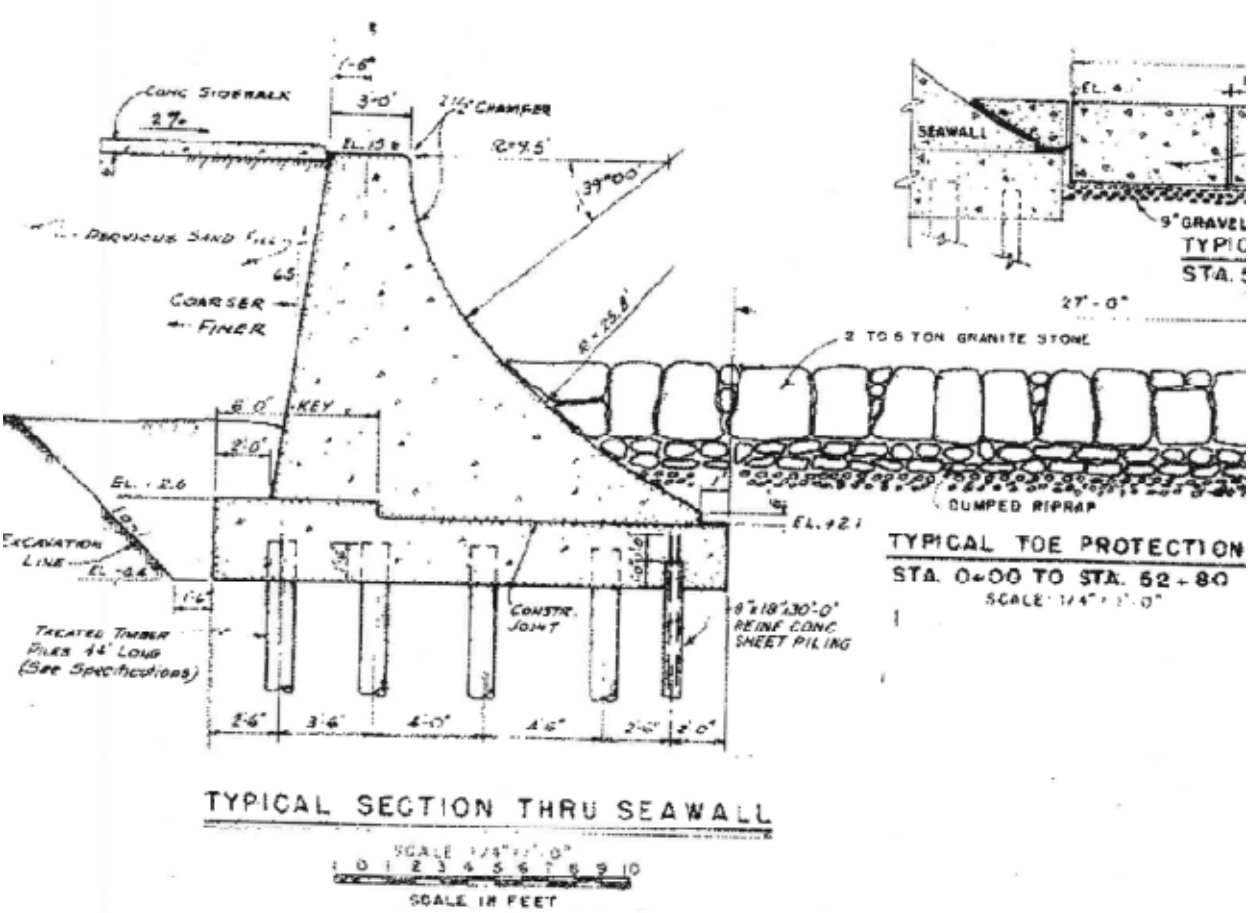

Figure 3-10: Galveston Seawall Engineering Drawing Cross Section

Traffic control measures would be in place during construction which would consist of street closures and vehicle rerouting, conversion of two-way streets to one way, traffic control personnel and use of appropriate warning and directional signage. Open trenching would occur primarily within existing roadways using standard construction excavation equipment such as backhoes and front loaders. Trenches would be 4 to 8 feet deep and 4 to 6 feet wide and require dewatering. Shoring, bracing, or trench boxes would be used to safely maintain the integrity of the trench. No shoring or bracing would be in contact with any building on the UTMB campus during construction. Excavated soils would be stockpiled adjacent to the trench. Microtunneling uses a horizontal boring machine, remotely controlled from the surface, and would be used to install a steel bore sleeve (casing) that could range in size from 48 to 60-inches in diameter at a depth of approximately 22 feet between pits to contain the two HHW pipes. Dewatering would be required at the pits with minimal dewatering utilized for microtunneling.

Bore and receiving pits would be required for multiple functions such as the installation of the primary piping and installing and removing the microtunneling machine. Branch pits would be used to install branch piping and valves required to connect to the buildings on the campus and expansion pits would house the expansion loops required within the utility distribution system. The individual pits may be used for more than one of these functions. Selected pits would also

be used as installation points to lower the sections of HHW pipe. The pits would be excavated approximately 22 feet deep, and may be round or rectangular, varying from 10 feet wide up to 40 feet long, depending on the functions of the pit. There are sixteen pits in the preliminary design. To create the pits, the existing street paving would be removed. The location of each pit is shown in the following Table 3-5 and in Appendix A drawings which show the pit locations, traffic patterns and laydown/equipment spaces to support the boring operation: A vertical drilling machine would then inject concrete into the soil in a manner that would form the floor and walls of the pits. The existing soils would then be excavated and dewatering would occur as necessary. Once the first bore and receiving pits are complete, the microtunneling machine would be installed in the bore pit and would horizontally bore and install the bore sleeve to the receiving pit. The soil excavated by the microtunneling machine would be slurried and pumped to the surface for separation and disposal. Handling of all soil and water from the excavation of the pits and the bore would be treated to acceptable standards before disposal, following standard stormwater pollution prevention plan Clean Water Act guidelines. Once the bore sleeve is installed in each section and the microtunneling machine is removed at the receiving pit, the utility piping would-be lowered and installed, welding the sections together and pushing or winching the pipe horizontally through the bore sleeve on supports. The space around the HHW pipe within the bore sleeve would then be grouted after completion of the pipe installation and the required pipe testing in each section. The pits would be backfilled, the surface conditions restored, and the construction areas re-opened to vehicular and pedestrian traffic.

Table 3-5: Bore Pit Locations

Pit #	Latitude	Longitude	Depth	Length	Width	Function(s)
Pit #1	29^0 18' 35.18" N	94^0 46' 49.91" W	22 feet	31 feet	14 feet	Bore/Expansion Loop
Pit #2	29^0 18' 32.47" N	94^0 46' 49.13" W	22 feet	16 feet	10 feet	Receiving
Pit #3	29^0 18' 32.82" N	94^0 46' 47.31" W	22 feet	28 feet	10 feet	Branch/Expansion Loop
Pit #4	29^0 18' 33.39" N	94^0 46' 45.46" W	22 feet	28 feet	10 feet	Branch/Expansion Loop
Pit #5	29^0 18' 33.91" N	94^0 46' 43.33" W	22 feet	28 feet	10 feet	Branch/Expansion Loop
Pit #6	29^0 18' 34.51" N	94^0 46' 40.96" W	22 feet	31 feet	14 feet	Bore/Receiving/Expansion Loop
Pit #7	29^0 18' 35.36" N	94^0 46' 38.03" W	22 feet	28 feet	10 feet	Expansion Loop
Pit #8	29^0 18' 35.98" N	94^0 46' 35.39" W	22 feet	28 feet	10 feet	Bore/Receiving/Branch/ Expansion Loop
Pit #9	29^0 18' 36.97" N	94^0 46' 31.48" W	22 feet	28 feet	10 feet	Expansion Loop
Pit #10	29^0 18' 37.83" N	94^0 46' 28.35" W	22 feet	31 feet	14 feet	Bore/Branch/Expansion Loop
Pit #10A	29^0 18' 38.43" N	94^0 46' 25.89" W				Deleted in VE
Pit #11	29^0 18' 36.78" N	94^0 46' 24.54" W	22 feet	28 feet	10 feet	Branch/Expansion Loop
Pit #12	29^0 18' 39.43" N	94^0 46' 22.24" W	22 feet	28 feet	10 feet	Branch/Expansion Loop
Pit #13	29^0 18' 40.32" N	94^0 46' 18.86" W	22 feet	16 feet	10 feet	Receiving
Pit #14	29^0 18' 42.67" N	94^0 46' 20.08" W	22 feet	28 feet	10 feet	Branch/Expansion Loop
Pit #15	29^0 18' 44.35" N	94^0 46' 20.64" W	22 feet	28 feet	10 feet	Branch/Expansion Loop
Pit #16	29^0 18' 47.25" N	94^0 46' 21.70" W	22 feet	31 feet	14 feet	Bore/Branch/Expansion Loop

The current plan is to use a jet-grouted enclosure around the pits – see Figure 3-11, eliminating the need to dewater the surrounding areas in order to excavate the pits. Since the risk of damage

to the surrounding improvements (buildings, paving, utilities, etc.) is chiefly due to the dewatering systems, this means and methods of the installation of the work significantly reduces the risk to the project.

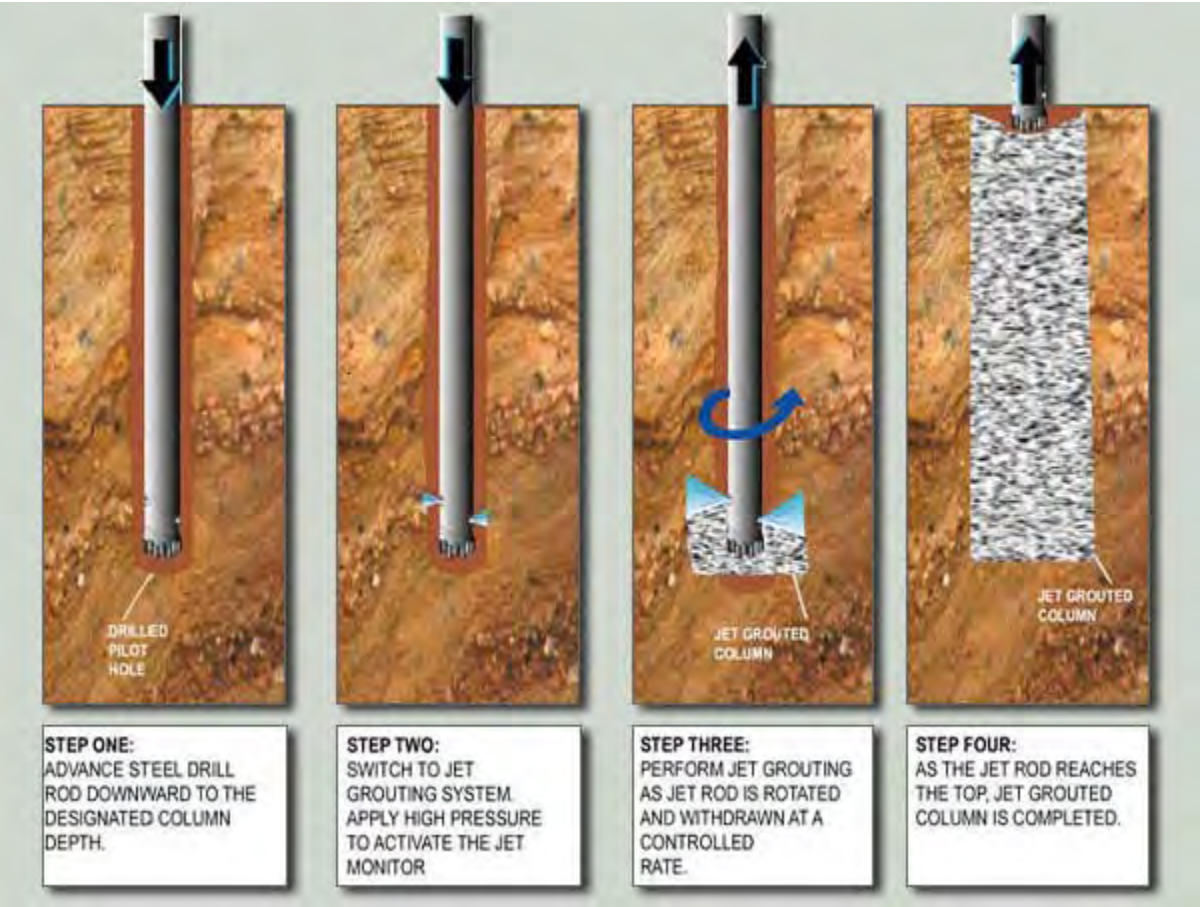

Figure 3-11: Jet-Grouting Illustration

If, during the tunneling and installation of the bore casing, the microtunneling machine hits an unforeseen obstruction it is unable to bore through, the machine would not be able to reverse out of the bore, or to turn to go around the obstruction. In this event, the machine would have to be "rescued". The rescue is accomplished by creating what amounts to be a receiver pit at the location of the obstruction. A pit is excavated to either remove the obstruction, or to remove the microtunneling machine, depending upon the nature of the obstruction. Should buried utilities or a previously unknown contaminated site be encountered work would stop until the hazard is identified, evaluated, and a plan implemented to ensure the safe restart of operations.

Elevated Utility Supports (Figures 3-12, 3-13, and 3-14): In the vicinity of 11th and Strand, the "west" elevated utility supports are required to cross both of these streets and connect heating hot water and steam from the West Plant (M66) to the existing distribution loop and to research buildings in this area (Figure 13). The elevated path runs from the West Plant over building Animal Research Center (M20), between buildings Research Building (M17) and 1108 Strand Building (M18), and then crosses 11th Street and Strand to service buildings Mary Moody Northern Pavilion (M19) and TG Blocker Medical Research Building (M59) as well as

completing the loop connection to the existing stanchion system. The "east" elevated utility supports is located in the plaza area near buildings Waverly Smith Pavilion (M47), John Sealy Hospital (M90), Administration Building (M12) and Rebecca Sealy Hospital (M121) and provide for interconnection of the chilled water loop and service to the Rebecca Sealy Hospital building (M121), which is currently being serviced by a temporary plant. See figures 3-12 and 3-13 below which depict the routes for the east and west elevated supports.

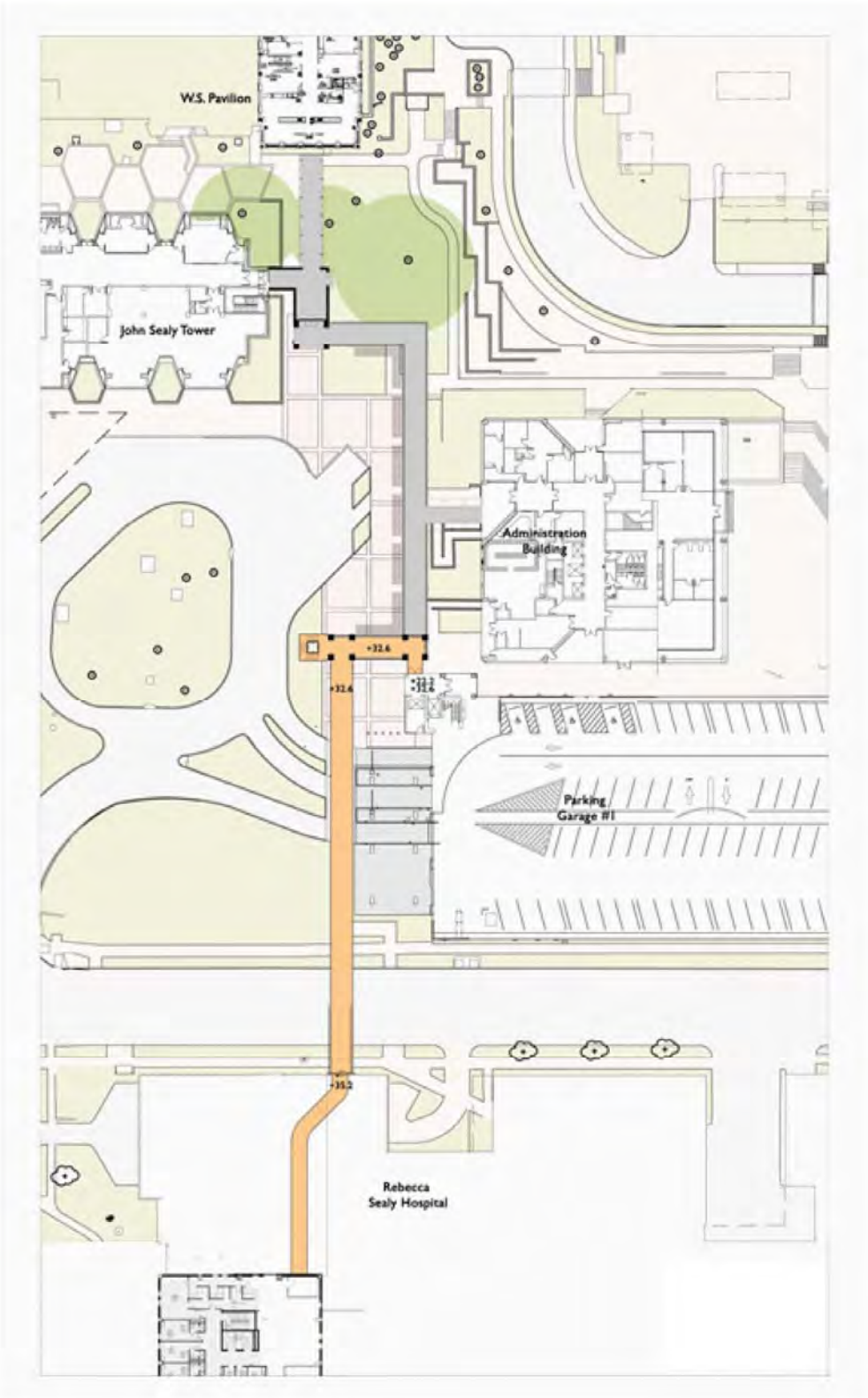

Figure 3-12: East Elevated Utility Route

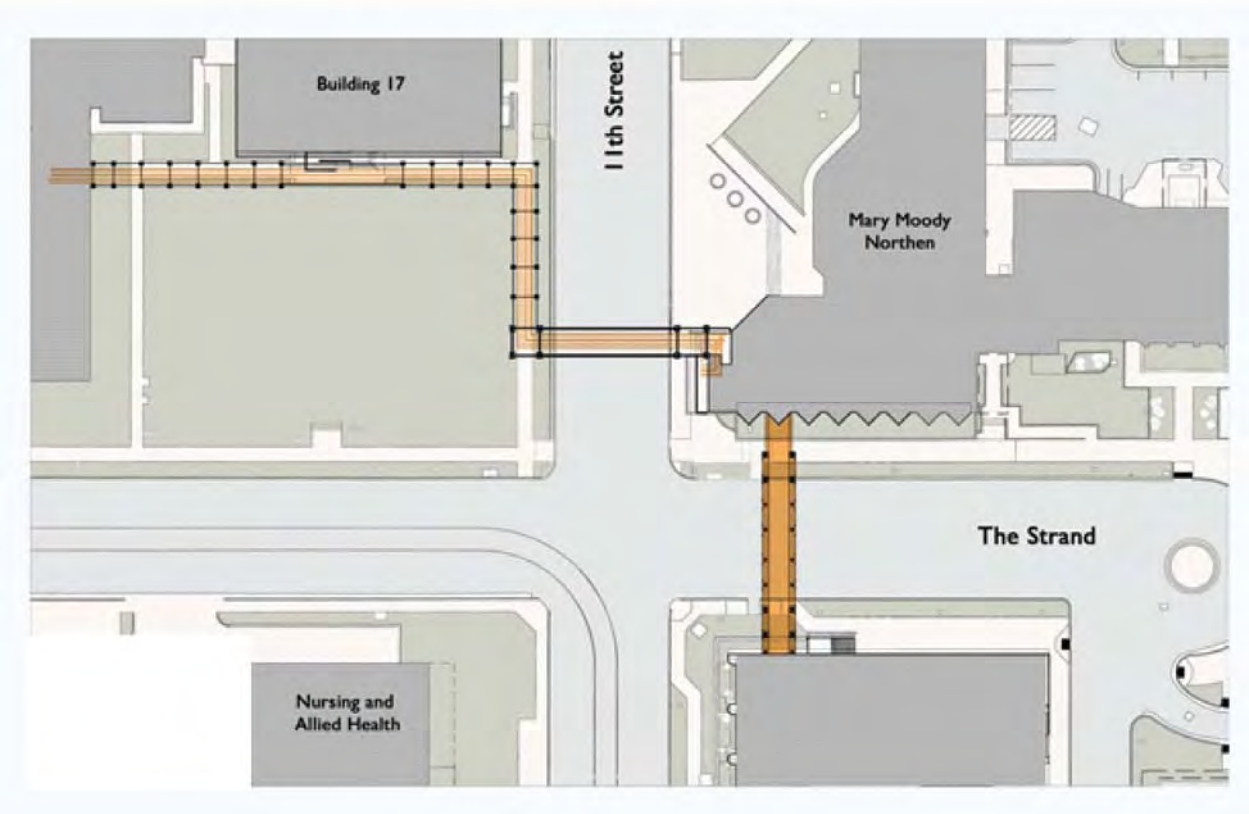

Figure 3-13: West Elevated Utility Route

Figure 3-14: Conceptual Design Drawing of the Proposed Pipe Crossing Near the Intersection of 11th Street and Strand.

Chilled Water System: The campus underground chilled water system would be partially replaced within the valve pits with new chilled water piping and valves. Pipe ranging in size from 4 to 36-inches for the chilled water supply/return line is proposed for installation throughout the campus. The chilled water system materials installed below the base flood elevation (BFE) would be constructed of a watertight pre-insulated piping material with polyethylene jacketing, appropriate for direct contact with salt water or brackish groundwater. The valves would be ductile iron with appropriate coatings to make them saltwater resistant and intended to be direct buried.

Building/Structure Modifications and Demolition Activities: *Terracon Consultants, Inc.* has conducted project specific asbestos surveys during the months of June, July and August 2012 in the potentially effected building basements and mechanical rooms, 25 valve pits, and the exterior utility pipe rack. Additionally, a lead based paint survey was performed on the exterior utility pipe rack. Asbestos was found present in 9 buildings (Children's Hospital (M6), Clinical Sciences (M7), John Sealy Annex (M9), McCullough Building (M11), Administration Building (M12), Moody Medical Library (M24), Basic Science Building (M54), Levin Hall (M55), and Pharmacology Building (M70)) of the 21 buildings sampled to date, 2 of the 25 value pits, and the exterior utility pipe rack. Lead paint was present on the exterior utility pipe rack (Terracon 2012 and 2012a through 2012j). The identified asbestos containing materials would be removed prior to construction modification activities that may disturb it. Similarly, prior to work on lead paint containing structures an airborne monitoring program and engineering controls would be in place and workers would be trained and implement specific work practices to avoid or minimize exposure to airborne lead.

An experienced and licensed demolition subcontractor would conduct the demolition of Morgan Hall (M35), Central Plant (M40), and Nolan Hall (M33). All buildings proposed for demolition would completely removed from the site. A Pre-demolition Conference(s) would be conducted at the demolition site. The building would be vacated and its use discontinued before start of work and all utilities verified as having been disconnected and capped. A survey of existing conditions of the building would be made to determine whether removing any element might result in a structural deficiency or unplanned collapse of any portion of the structure or adjacent structures during demolition. A licensed and qualified civil or structural engineer would be retained to provide analysis, including calculations, necessary to ensure the safe execution of the demolition work. Surveys would be performed as the Work progresses to detect hazards resulting from demolition activities. As part of the project scope, the Demolition Subcontractor would prepare all drawings, documents, and applications and obtain all government agency approvals and permits required for demolition activities. They would conduct demolition operations and remove materials to ensure minimum interference with roads, streets, walks, and other adjacent occupied and utilized facilities. Streets, walks, or other adjacent occupied or utilized facilities would not be obstructed without permission from UTMB. Alternate routes around closed or obstructed traffic ways would be provided if required. The Demolition Subcontractor would conduct demolition operations to prevent injury to people and damage to adjacent buildings and facilities to remain. They would ensure safe passage of people around demolition area by the erection of temporary protection, such as walks, fences, railings, canopies, and covered passageways, where required. Protection of existing site improvements, appurtenances, and landscaping that are designated to remain in place would be provided.

Interior and exterior shoring, bracing, or structural support would be provided and maintained to preserve stability and prevent movement, settlement, or collapse of Morgan Hall and adjacent buildings to remain. When required, supports would be strengthened or added during progress of demolition. The use of explosives would not be permitted. The demolition contractor would comply with federal, state and local regulations pertaining to water, air, solid waste, chemical waste, sanitary waste, sediment and noise pollution. The natural resources within the project boundaries would be protected or restored to an equivalent condition.

Demolition activities would be confined to areas defined by public roads, easements, and work area limits indicated on the project drawings. Compliance with applicable regulations concerning the direct or indirect discharge of pollutants to underground and natural surface waters would be maintained. Hazardous substances would be prevented from entering the ground, drainage areas, or local bodies of water in such quantities as to affect normal use, aesthetics, or produce a measurable ecological impact on the area. Construction equipment would be stored and serviced at staging areas designated as such. The staging areas that would be in use for the duration of the project, approximately 4 and half years, are Lot W (as illustrated in Figure 3-1) and the areas indicated per the map legend as "Fenced Work Area and Lay Down Area" in yellow on the six Appendix A drawings.

Appropriate methods to limit dust and dirt rising and scattering in the air would be used to minimize at the lowest practical level. Volatile liquids, including fuels and solvents, would be stored in closed containers with provisions for secondary containment. Equipment would be properly maintained to reduce gaseous pollutant emissions.

At the end of the project, indications of temporary construction facilities, such as work areas, structures, stockpiles or waste areas would be removed.

All rubbish and waste materials would be transported to a disposal facility that can legally accept the materials for that purpose. Permitted waste hauler or Contractor's trucking services and personnel would be used.

Demolition equipment would be located throughout the building and debris and materials removed so as not to impose excessive loads on supporting walls, floors, or framing. Concrete and masonry would be demolished in sizes that would be suitable for acceptance at disposal facilities. Structural framing members would be removed and lowered to ground by method suitable to avoid free fall and to prevent ground impact or dust generation.

Below-grade construction, including foundation walls and footings would be removed. Below-grade areas and voids resulting from building demolition operations would be filled to street level with satisfactory soil materials.

3.1.1.3 Dedicated Natural Gas Pipeline

A component of the project is the construction and operation of a dedicated natural gas pipeline to UTMB will be constructed, maintained, and operated by the Texas Gas Service Company. All necessary permits and approvals have been obtained (ONEOK, Inc. 2012). This dedicated

pipeline will segregate UTMB loads from the rest of Galveston Island. The construction and operation of a dedicated natural gas line would avoid potential UTMB service interruptions as a result of severe weather event affecting the entire Galveston community.

The plan is evolving but calls for the installation of a dedicated main line from the 59th & Port Industrial city gate to entry points within UTMB. The main line would supply sufficient volume to meet UTMB's current gas usage requirements as well as be scalable to accommodate future combined heat and power systems. The steel pipeline would be installed using the horizontal directional drilling technique. The new feed pipeline would connect the transmission line to the delivery location, and would be installed alongside a roadway in a developed area of industrial and commercial enterprises within the city of Galveston. The new pipeline would be approximately 4.2 miles in length. A horizontal directional drilling technique would be used to install the feed pipeline to the delivery location. The entire route would be drilled utilizing this technique in order to minimize the impact to the surrounding property and the environment. The ground surface would only be disturbed at the starting and ending locations of the pipeline installation and every 600 feet along the route in order to follow installation protocols and ensure the integrity of the pipeline. Any portion of the pipeline near a sensitive environmental location would not have surface disturbance in the area and would be avoided if practical. As part of the project, the pipeline installation contractor may conduct hydrostatic testing, with one possible option resulting in the collection and proper disposal of test waters. If water is used on the project, the test waters would consist of treated public drinking water (Apex 2011).

The construction site is located entirely within the city limits of Galveston (Apex 2011). It is anticipated that the route would be constructed in utility right-of-ways. (Figure 3-15). There would be no interruptions to natural gas supply during required pipeline maintenance, as UTMB would retain their connection with the current natural gas pipeline. The dedicated line would be hydrostatically tested every 7 – 14 years depending upon pipeline design and inspection techniques.

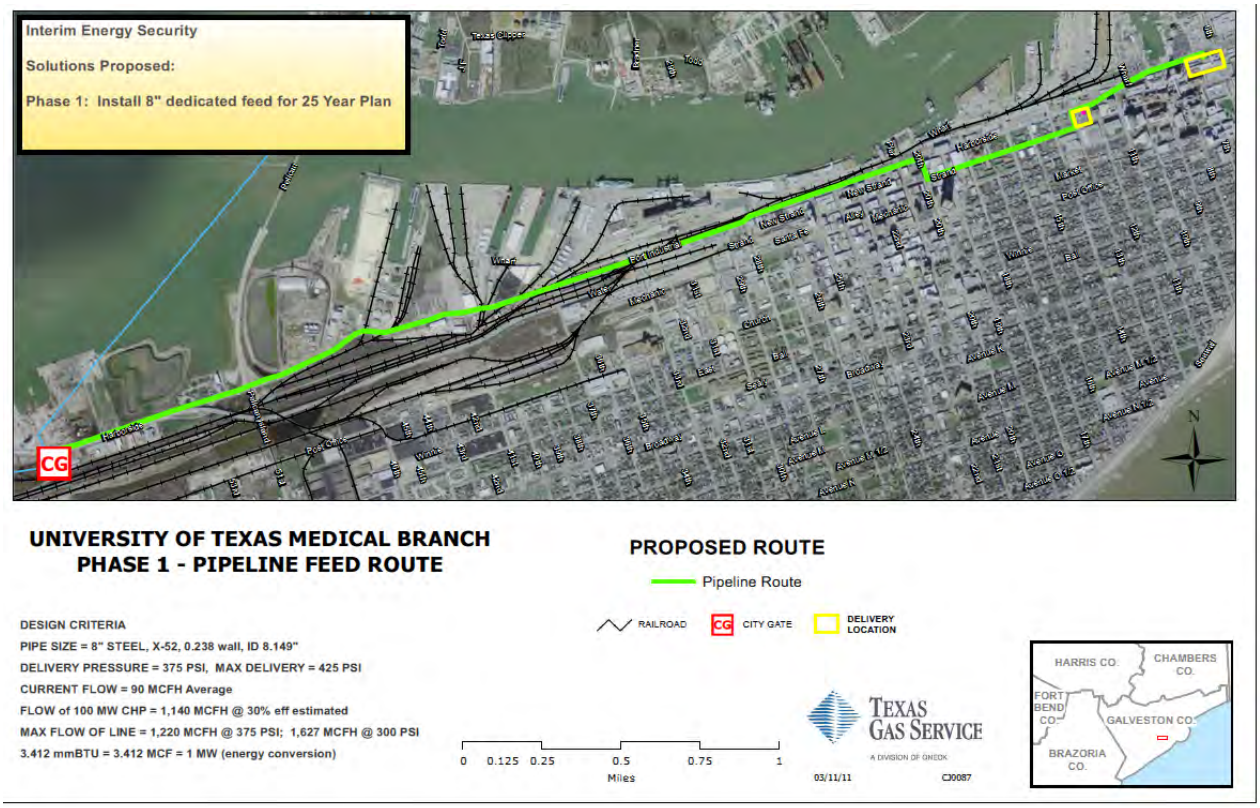

Figure 3-15: Natural Gas Pipeline Concepual Route.

In general, the main line would be excavated sufficiently to provide a minimum cover of thirty-six inches from the top of the pipe. If the line traverses shifting sand or sand dunes, the ditch would be cut sufficiently to provide a minimum cover of sixty inches from the top of the pipe. Each service line would be installed with a minimum cover of twenty-four inches from the main to the property line, twenty-four inches from the property line to the structure and thirty inches in alleys, easements, streets and roads.

3.2 No Action

The No Action Alternative has been analyzed to comply with the CEQ's NEPA implementing regulations (40 CFR Part 1502.14(d)), to provide a baseline against which the impacts of the Proposed Action can be compared. This analysis provides a benchmark, enabling decision makers to compare the potential environmental effects of the Proposed Action.

Under the No Action Alternative FEMA would not fund the DHCP construction at the UTMB campus in Galveston, Texas. Consequently, the proposed replacement DHCP would not be constructed or operated. The consequences of the No Action Alternative are that UTMB would not have assured reliability of uninterrupted treatment, care, and research operations in a hurricane and flood-prone location. UTMB is one of three Level 1 Trauma Centers serving a Houston metropolitan area of over 5.5 million people. In its several hospital facilities, UTMB also provides critical tertiary and quaternary care to the state, and the Texas Department of Criminal Justice Hospital. Should a storm similar in size, to that of Hurricane Ike, occur UTMB

may again be forced to shut down and not be able to provide urgent treatment care to the surrounding communities for a substantial period of time.

3.3 Alternatives Considered and Dismissed

CEQ regulations require federal agencies to analyze all reasonable alternatives. Reasonable alternatives are those that could be carried out based on technical, economic, environmental, and other factors that meet the Purpose and Need for the proposed action. For this DEA, the following alternatives were considered but eliminated from detailed study.

***Alternative a* –Central Plant Mitigation**. The existing hurricane damaged Central Plant would require substantial and major modifications to protect critical equipment and services from natural events similar to Hurricane Ike. Various methods of raising the equipment within the plant were considered. The engineering assessment determined that the equipment within the production plant is too tall and the structure too low to raise the equipment above the base flood elevation. In effect, the Central Plant would need to be rebuilt as a taller building which would have a substantial higher cost compared to the Proposed Action. The use of a floodwall around the Central Plant was considered. However, there is not enough space around the Central Plant to construct an effective floodwall. The high water table in Galveston would require a very deep foundation to prevent undermining of the floodwall itself. The anticipated depth of this floodwall would be approximately 50 feet below local grade with the slurry construction at an elevation of 35 feet to 40 feet below MSL. The depth of this wall would require it to be approximately 5 feet thick. Density of the in-ground utilities and the proximity of surrounding buildings around the Central Plant make the installation of floodwalls not feasible. Therefore, this Alternative was not considered technically or economically reasonable.

***Alternative b* - Elevating Steam Distribution Systems**. Elevating the entire steam distribution systems was considered as a mitigation option. Steam could be routed across the campus utilizing elevated stanchions or pipe arbors to carry the piping above SFHA. This would eliminate the conversion process to heating hot water. This alternative is more expensive than burying the heating hot water piping and implementing the building conversions and was not considered reasonable. There will still be process steam requirements on the campus in 6 research buildings (Keiller Building (M2), Research Building (M17), Animal Research Center (M20), Research Support Building (M21), Galveston National Lab (M41), and TG Blocker Medical Research Building (M59)). The existing steam distribution system would be removed from all other buildings and even these 6 buildings would have their heating requirements covered by the new heating hot water system.

***Alternative c* - Electric Steam Generators**. Eliminating the central steam system was considered. The process needs of each building with large steam loads would be supplied by electric steam generators. The electrical modifications necessary to allow for numerous steam generators across the campus would be expensive and less energy efficient. Specifically, CenterPoint Energy would be required to bring another 10-12 Megawatts of electrical power to the UTMB campus and there is no route through existing easements. Unlike natural gas which is brought to the buildings through existing easements and can easily be routed to the plants, electricity must be fed through existing duct banks which do not have adequate capacity. Additionally, the space needed to accommodate the new electrical transformers, switchgear and

other equipment is not available at most of the locations where an electric steam generator would be necessary. In those buildings that would no longer be connected to the central steam system, there would be a few pieces of equipment such as sterilizers and small autoclaves which would be powered by electricity. For these reasons, this alternative was not considered reasonable.

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4.0 AFFECTED ENVIRONMENT AND IMPACTS

4.1 Physical Resources

4.1.1 Geology, Soils, and Seismicity

The UTMB campus is located on Galveston Island, a low barrier island situated at the southern end of Galveston Bay. Galveston Island is located within the Coastal Plain Physiographic Province, which is topographically characterized as lowlands, coastlines, and barrier islands, indented with small inlets, bays, and marshes. The UTMB campus is located at elevations of 5 to 10 feet above mean sea level (NIAID 2005). Subsurface conditions at the proposed site were evaluated by drilling 12 test borings to depths of approximately 50 feet below the existing grade along the alignment of the proposed thermal distribution system (Terracon 2011).

Geology: The geology underlying the Coastal Plain Physiographic Province consists of unconsolidated soils deposited between the Oligocene Epoch (33.7 to 23.8 million years ago) and the Holocene Epoch (10,000 years ago to today). These deposits extend from the land surface to depths of more than 4,000 feet below the surface. Three depositional environments are reflected in the lithology of unconsolidated sediments: alluvial plain (continental); delta, lagoon, and beach (transitional); and continental shelf (marine). The gradual rise of the land surface and dip of the depositional basin results in a wedge-shaped configuration of these depositional environments, which thickens toward the Gulf of Mexico. The heterogeneity of these deposits (an overlapping mixture of sands, silt, and clay) resulted from the oscillations of ancient shorelines (NIAID 2005).

Soils: Soils underlying UTMB and much of the City of Galveston are located in an area containing fill and spoil, formerly classified as the Galveston-Urban Land Complex. Fill is composed of material dredged for raising land surface above Holocene alluvium and barrier island deposits, creating elevated land surfaces. Spoil is dredged material from coastal waterways. These soils are comprised of fine sand to a depth of 5 feet (some of which is dredged material) and are characterized as nonsaline, moderately alkaline, and somewhat excessively drained (NIAID 2005).

During subsurface testing groundwater was initially observed at depths that ranged from about 8 to 11 feet below existing grade (top of paving). The borings were drilled through the existing asphalt/concrete pavement. Approximately 3 to 4 inches of asphaltic concrete surface course and about 6 inches of crushed stone were observed overlying the subgrade soils for asphaltic concrete pavement at some sections and approximately 5 to 9½ inches of concrete was observed overlying the subgrade soils for the concrete pavement sections. In addition, some of the concrete pavement sections were covered with one to 2 inches of asphaltic concrete. Fill soils were observed that extended to depths that ranged from about 8 to 22 feet. The native subsurface soil generally consisted of sands and lean clays, with occasional layers of fat clays and silts to termination depths of these borings which was approximately 50 feet below existing grade (Terracon 2011).

Seismicity: The U.S. Geological Survey has identified southeastern Texas in the “lowest hazard” category for seismic risk (DHHS 2005 and USGS 2011). Galveston is located within the

Gulf Coast Normal Faults Region. This region extends from the Dallas/Fort Worth area, on mainland Texas, into the Gulf of Mexico beyond Galveston Island. The Gulf Coast Normal Faults Region is comprised of a belt of small, individual faults with historically low seismicity and is in seismic zone 0 - the lowest hazard classification. However, in 1956, a 3.8 magnitude earthquake on the Richter Scale occurred within 2 to 3 miles southwest of the UTMB campus. An earthquake of that magnitude would be felt noticeably by persons indoors and create vibrations similar to the passing of a heavy truck (NIAID 2005).

4.1.1.1 Proposed Action

The demolition and construction activities of the proposed project are expected to disturb less than 15 acres of land within the UTMB campus. The construction sites are within a built environment and much of the area is overlain with roadway or building payments. The subsurface is generally engineered fill and compacted soils which have been disturbed in excess of 20 feet in depth, through previous construction activities. The East and West Plants and pipeline materials have been designed for the applicable seismic building standard. There would be no effect to the geology from construction and operation of the proposed DHCP.

The Geotechnical Engineering Report prepared for the proposed project states that “Based on the information obtained from our subsurface exploration, the thermal distribution system can be installed along the proposed project alignment” (Terracon 2011). However, there are certain considerations during construction. Control of groundwater would be accomplished in a manner that would preserve the strength of the soils, would not cause instability of the excavation, and would not result in damage to existing structures. Where necessary, the water groundwater would be lowered in advance of excavation by well points, deep wells, pumps, or similar methods. The contractor would determine the effective method(s) of groundwater management prior to starting excavation operations. In regards to worker safety, Occupational Safety and Health Administration (OSHA) Safety and Health Standards require the protection of workers from excavation instability in trench situations. For any excavation construction activities, all OSHA guidelines and directives would be followed by the contractor during construction to insure a safe working environment.

The Texas Pollutant Discharge Elimination System (TPDES) Stormwater Program regulates stormwater discharges from three potential sources: municipal separate storm sewer systems, construction activities, and industrial activities. Operators of construction sites that are one acre or larger may be required to obtain authorization to discharge stormwater under a TPDES construction stormwater permit. This permitting mechanism is designed to prevent stormwater runoff from washing harmful pollutants into local surface waters such as streams, rivers, lakes, or coastal waters. Texas is authorized to implement the National Pollutant Discharge Elimination System (NPDES) Stormwater Program and administer their own stormwater permitting programs. In compliance with the NPDES, a Stormwater Pollution Prevention Plan employing best management practices would be developed and utilized to minimize soil erosion during construction. TPDES General Permit, No. TXR150000, Texas Commission on environmental Quality (TCEQ) General Permit to Discharge Wastes under provisions of Section 402 of the Clean Water Act and Chapter 26 of the Texas Water Code, dated March 5, 2003 is applicable for this project.

Construction of the dedicated natural gas pipeline would minimize surface disturbance through the use of horizontal directional drilling. Therefore, construction and operation of the dedicated natural gas pipeline effects would be expected to be similar to the installation and operation of the DHCP pipelines.

4.1.1.2 No Action Alternative

Under the No Action Alternative, the DHCP would not be funded or constructed. Therefore, there would be no effect to geology or soils.

4.1.2 Air Quality

National Ambient Air Quality Standards have been established by the U.S. Environmental Protection Agency (EPA) to designate the legal limitations on six pollutant concentration levels allowed to occur in the ambient air. The six air pollutants are: carbon monoxide, lead, nitrogen dioxide, ozone, particle pollution 10 microns or less in diameter (PM_{10}) and 2.5 microns or less in diameter ($PM_{2.5}$), and sulfur dioxide. Since health-based criteria have been used to establish the standards, these six pollutants are referred to as “criteria air pollutants.” Areas within a state or the state itself are designated with respect to each of these six pollutants as: attainment (i.e., in compliance with the standards); non-attainment (i.e., not in compliance with the standards); or unclassifiable (i.e., insufficient data to classify). The purpose of the non-attainment designation is to identify air quality problem areas for which solutions must be sought. The Houston-Galveston-Brazoria area holds nonattainment status for ground-level ozone under the 1997 8-hour standard which became effective June 15, 2005. For ozone, the Federal *Clean Air Act* establishes nonattainment area classifications ranked according to the severity of the area’s air pollution problem. These classifications—marginal, moderate, serious, severe, and extreme—translate to varying requirements with which Texas and nonattainment areas must comply. Counties affected under this status are Brazoria, Chambers, Fort Bend, Galveston, Harris, Liberty, Montgomery, and Waller. The region was classified as being in “moderate" nonattainment of the 8-hour standard and was given a maximum attainment date of June 15, 2010. However, due to a 2007 request by Texas Governor Rick Perry, the region has been reclassified as a "severe" nonattainment region with a maximum attainment date of June 15, 2019 (HGAC2012).

Ground-level ozone is not emitted directly into the air, as it is created by chemical reactions between oxides of nitrogen (NO_x) and volatile organic compounds (VOC) in the presence of sunlight. Emissions from industrial facilities and electric utilities, motor vehicle exhaust, gasoline vapors, and chemical solvents are some of the major sources of NO_x and VOC.

4.1.2.1 Proposed Action

The new emissions units include one natural gas fired, 5.7 MW turbines and three natural gas fired boilers at the East Plant and a second 5.7 MW natural gas fired turbine at the West Plant. Air emission authorization for the new emission units could include the following:

- Texas Commission on Environmental Quality (TCEQ) Electric Generating Unit Standard Permit and Boiler Standard Permit

- TCEQ minor new source review air permit amendment
- Prevention of Significant Deterioration (PSD) Permit for Criteria Pollutants
- PSD Permit for Greenhouse Gas (GHG) Pollutants
- Nonattainment New Source Review Permits.
  (AEI 2012a)

The net impact of the proposed turbines and boilers is a decrease in emissions in the region. The following area emission reductions have been estimated using EPA's CHP Emissions Calculator from the website http://www.epa.gov/chp/basic/calculator.html.

CHP Results

The results generated by the CHP Emissions Calculator are intended for eductional and outreach purposes only; it is not designed for use in developing emission inventories or preparing air permit applications.

The results of this analysis have not been reviewed or endorsed by the EPA CHP Partnership.

Annual Emissions Analysis					
	CHP System	Displaced Electricity Production	Displaced Thermal Production	Emissions/Fuel Reduction	Percent Reduction
NOx (tons/year)	21.52	39.58	16.36	34.41	62%
SO2 (tons/year)	0.36	37.13	0.10	36.87	99%
CO2 (tons/year)	70,330	67,713	19,092	16,476	19%
Carbon (metric tons/year)	17,390	16,743	4,721	4,074	19%
Fuel Consumption (MMBtu/year)	1,205,306	825,561	327,198	(52,547)	-5%
Number of Cars Removed				2,721	

This CHP project will reduce emissions of Carbon Dioxide (CO2) by 16,476 tons per year

This is equal to 4,074 metric tons of carbon equivalent (MTCE) per year

This reduction is equal to removing the carbon emissions of 2,721 cars

The limiting factor for the permitting options is the GHG PSD major modification threshold level of 75,000 tons of carbon dioxide equivalent (CO2e). The estimated emissions of CO2e from the turbines with maximum duct burner firing and the boilers operating at 8,760 hours per year is 145,768 tons per year.

The following table 4-1 shows the local calculated impact of project emission increases

Table 4-1: Local Calculated Impact of Project Emission Increases

	VOC	NOX	CO	SO2	PM/PM10/ PM2.5	H2SO4	CO2e
	ton/yr	ton/yr	ton/yr	ton/yr	ton/yr	ton/yr	ton/yr
2 Gas Turbines w/Duct Burners*	3.9	7.8	71.8	1.6	23.7	0.5	130,394
3 10,000 lb Boilers**	0.7	1.3	4.9	0.2	1.0		15,374
Project Increase	4.7	9.2	76.7	1.7	24.6	0.5	145,768
Nonattainment Netting Trigger	5.0	5.0					
Nonattainment Modification Threshold	25.0	25.0					
PSD Major Modification Threshold	N/A	40.0	100.0	40.0	25/15/10	7.0	75,000
Contemporaneous Increases	2.5	12.8					60,422
Net Increase:	7.2	21.9					206,190
Trigger Nonattainment	No	No					N/A
Trigger PSD	N/A	No					Yes

*New East Plant – One gas Turbine with Burner
*West Plant Addition – One Gas Turbine with Duct Burner.
**Services Building – Three Boilers

Greenhouse Gas Permit
As shown on the table, project emissions of CO2e would require a greenhouse gas permit from EPA Region 6.

State/PSD Permit
It is anticipated based on the calculated project emissions that PSD would be triggered for PM10 and PM2.5 and possibly CO. SO2 and H2SO4 emissions would be required to be authorized under a State New Source Review (NSR) permit. Under the current construction schedule, the DHCP would be completed and emissions verified during the summer of 2015. The TCEQ is the permitting authority for the state and PSD review.

Nonattainment Permit
The projected emission increases would not trigger nonattainment NSR.

During site preparation and construction, the use of heavy equipment, delivery trucks, and worker vehicles would temporarily increase particulate, NO_x, and VOC emissions and would generate fugitive dust in the proposed project area from combustion of gasoline and diesel fuel and disturbance of soils. However, due to the implementation of good engineering and Best Management Practices (BMP) and few large construction vehicles, air emissions would be minor. Site watering practices would limit dust emissions. Additionally, all construction vehicles and equipment would be maintained in good working order to minimize pollution and fugitive dust. Air emissions would be brief and similar to those experienced during any ordinary construction effort. The potential effect on ambient air quality from demolition and construction activities would be temporary and localized, and would not adversely affect the overall air quality of the region. There are no sensitive populations that live in close proximity to the construction area. Hospital staff and patients would not be affected due to the implementation of

BMPs, low air emissions, restrictions from entering the construction zone, and lack of exposure as they would reside indoors.

An asbestos survey found asbestos-containing materials and lead paint to be present in the materials and structures scheduled for demolition and disposal. The survey was to determine if asbestos or lead paint was present and was not quantitative. Thus, the specific amount of asbestos and lead paint has not been ascertained at this time. Prior to and during building demolition, appropriate abatement measures would be determined and implemented by an appropriately licensed contractor to prevent the airborne generation of asbestos and lead paint - containing materials. Additional details regarding the management of asbestos and lead paint emissions are presented in Section 4.6.7 for Health and Safety.

Construction of the dedicated natural gas pipeline would have effects similar to the DHCP pipeline installation. The operation of the natural gas pipeline would provide natural gas to the UTMB campus and those effects are addressed in the DHCP air quality impacts section above.

4.1.2.2 No Action Alternative

The No Action alternative would have no change to air quality.

4.1.3 Climate Change

The release of anthropogenic (human activity) caused greenhouse gases and their potential contribution to global warming are inherently cumulative phenomena. While the scientific understanding of climate change is evolving, the Intergovernmental Panel on Climate Change (IPCC) Fourth Assessment Report stated that the warming of the Earth's climate is unequivocal, and that warming is very likely attributable to increases in atmospheric greenhouse gases caused by human activities (IPCC 2007). The IPCC's Fourth Assessment Report indicates that changes in many physical and biological systems, such as increases in global temperatures, more frequent heat waves, rising sea levels, coastal flooding, loss of wildlife habitat, spread of infectious disease, and other potential environmental impacts are linked to changes in the climate system, and that some changes may be irreversible (IPCC 2007).

4.1.3.1 Proposed Action

Greenhouse gas emissions from operation of the proposed DHCP would be minor. Additionally, since the DHCP is designed to be more efficient than the existing district heating and cooling system the current air emissions would not substantially change, and may be reduced given higher plant and equipment energy efficiencies. Thus, compared to the 8,026 million tons (7,282 million metric tons) of CO_2 equivalent greenhouse gases emitted in the U.S. In 2007 (DOE 2008) and the 54 billion tons (49 billion metric tons) of CO_2-equivalent anthropogenic greenhouse gases emitted globally in 2004 (IPCC 2007), DHCP emissions would be extremely small. At present, there is no methodology which would allow FEMA to estimate the specific impacts (if any) this increment of climate change would produce in the vicinity of Galveston, Texas, or elsewhere.

Once constructed there would be no direct emissions from the operation of the dedicated natural gas pipeline.

4.1.3.2 No Action Alternative

There would be no change to existing conditions.

4.2 Water Resources

4.2.1 Water Quality

Water quality is a measure of the suitability of water for a particular use based on selected physical, chemical, and biological characteristics such as temperature, dissolved mineral content, and number of bacteria. Selected characteristics are then compared to numeric standards and/or guidelines to determine the water's suitability for a particular use.

4.2.1.1 Proposed Action

The demolition and construction activities of the proposed project are expected to disturb less than 15 acres of land within the UTMB campus. A Stormwater Pollution Prevention Plan employing best management practices would be developed and utilized to minimize soil erosion and avoid impacts to surface water quality during construction.

There would be no increase in the impermeable surface area or direct wastewater discharges from the DHCP operations. Thus, the proposed action would have no effect to water quality.

The dedicated natural gas pipeline construction would employ best management practices to minimize soil erosion and avoid impacts to surface water quality during construction.

4.2.1.2 No Action Alternative

There would be no change to water quality under the No Action Alternative.

4.2.2 Wetlands

The proposed UTMB construction sites do not support any surface water, e.g., streams, ponds, or wetlands. Therefore, the proposed action is not subject to Section 404 of the Clean Water Act or Section 10 of the Rivers and Harbors Act.

The proposed dedicated natural gas pipeline route is to be constructed in an area zoned for industrial and commercial use. The proposed pipeline path would cross an estuarine channel that flows from Galveston Bay. However, no excavation or other pipeline installation activities are expected to impact the channel due to the horizontal directional drilling technique. At one location, the proposed pipeline path is located adjacent to and north of an estuarine emergent wetland. Pipeline installation would occur along the opposite side of the road adjacent to the wetland using directional boring to avoid impacts to the wetland (Apex 2011).

4.2.2.1 Proposed Action

During construction of the DHCP, a Stormwater Pollution Prevention Plan employing best management practices would be implemented and utilized to minimize soil erosion and avoid impacts from any storm water discharges that have the potential to reach any wetlands.

There would be no direct wastewater discharges from DHCP operations. Thus, the proposed action would have no effect on wetlands.

There would be no direct wastewater discharge from the dedicated natural gas pipeline therefore the construction and operation of the dedicated natural gas pipeline would have no effect on wetlands. However, the dedicated natural gas pipeline would require a Nationwide Permit 12 (for Utility Line Activities) from the U.S. Army Corps of Engineers. The permit would be submitted after the project has been completed. The U.S. Army Corps of Engineers would only need to be contacted prior to construction if a Pre-Construction Notification is required. It will be the responsibility of UTMB to determine if a Pre-Construction Notification is required. UTMB would also be responsible for following the Nationwide Permit 12 General and Regional Conditions and submitting the permit after the completion of construction.

4.2.2.2 No Action Alternative

There would be no effect to wetlands under the No Action Alternative.

4.2.3 Floodplains

Floodplains are lowland and relatively flat areas adjoining inland and coastal waters, including flood-prone areas of offshore islands. At a minimum, these areas are subject to a 1 percent or greater chance of flooding in any given year, commonly referred to as a 100-year floodplain and a 0.2 percent chance of a 500-year flood event occurring in any given year. *Executive Order 11988, Floodplain Management* directs each federal agency to avoid the long- and short-term adverse impacts associated with the occupancy and modification of floodplains, including the direct and indirect support of floodplain development, whenever there is a practicable alternative. Based on the most recent FEMA Flood Insurance Rate Maps which are pending adoption (Community Panel Numbers 48167C0434G, 48167C0437G, 48167C0441G, and 48167C0442) the project is within Zone AE, base flood elevation determined, that ranges from 12 to 13 feet in elevation (Appendix B) the construction of this project would take place within the 100-year floodplain. The FEMA 100-year water surface elevation at UTMB is 11.1 feet and the floodplain elevation for a 500-year storm is 14 feet with a potential wave crest of 20 feet. Federal guidelines promulgated in 44 CFR 9.4 define the new construction or substantial improvement of facilities as a critical action. Critical action involves activities and facilities that even a slight chance of flooding poses too great a threat. As a result, these actions are given special consideration when formulating regulatory alternatives and floodplain management plans. These facilities are to be elevated to or above the 500-year flood level or the utility and sanitary facilities that are below the 500-year flood level have walls that are substantially impermeable to the passage of water and with structural components having the capacity of resisting hydrostatic and hydrodynamic loads and effects of buoyancy. To comply with *Executive Order 11988, Floodplain Management*, FEMA is required to follow the procedure

outlined in 44 CFR Part 9 to assure that alternatives to the proposed action have been considered. This procedure, also known as the Executive Order 11988 - Floodplain Management Eight-Step Decision Making Process, has been completed for the proposed action and is included in Appendix C. In a letter dated September 13, 2012 (Appendix D) the City of Galveston Floodplain Manager states "In my capacity as the City of Galveston's Floodplain Manager, I have reviewed the Draft Environmental Assessment (EA) for UTMB's proposed District Heating and Cooling System. The City of Galveston commends UTMB for its mitigation efforts, and supports the proposed mitigation activities and projects described in the Draft EA." I find no objection to the activities proposed in the Draft EA, nor any conflict between the proposed activities and the City's existing ordinances."

4.2.3.1 Proposed Action

To assure safety and operational reliability from future flood events, the proposed project design complies with the key elevation criteria established by multiple sources. The numbers listed below are elevations above Mean Sea Level.

Base Flood Elevation Calculation

- FEMA 100 Year (1%) Water Surface Elevation 11.1 Feet
- FEMA 500 Year (0.2%)Water Surface Elevation 14.0 Feet

City of Galveston Floor Elevation Requirement

- Current floor elevation requirement (100 year) 12.1 Feet
- Proposed floor elevation for critical buildings (500 year) 15.0 Feet

Code of Federal Regulations 15.0 Feet

(CFR-44 States that all critical facilities shall be protected to the minimum elevation of 1 foot above the FEMA 500 year flood)

The East and West Plant critical functions and components would be elevated above the 500-year flood stage as defined in the FEMA Flood Insurance Rate elevation maps. The West Plant a new cast-in-place concrete freestanding cantilever floodwall is proposed to surround the existing building. The proposed 25-foot wall would be designed to withstand 20 feet of static water pressure. The East Plant finished first floor elevation would be a minimum of 25 feet above mean sea level which would allow for truck traffic below the first floor. The total height of the plant would be less than 100 feet above grade with all critical equipment located above SFHA. The plant would contain elevated hot water convertors, electrically driven chillers, cooling towers, basins, and associated mechanical and electrical accessories. The other components of the projects are either raised above the 500-year floodplain or are designed to operate in the case of seawater inundation. Based on the Floodplain Management process for this project, there is no practicable engineering alternative to avoid DHCP construction and operation in the 500-year floodplain.

The dedicated natural gas pipeline is within the 100 and 500-year floodplain and would be designed to operate in the case of seawater inundation. There is no practicable engineering alternative to avoid natural gas pipeline construction and operation in the 500-year floodplain.

4.2.3.2 No Action Alternative

There would be no effect to existing conditions.

4.3 Coastal Resources

The Texas General Land Office (GLO) and the Coastal Coordination Council (CCC) regulates development in the designated coastal zone under the requirements of the *Coastal Zone Management Act* (CZMA). A central requirement of the CZMA is for each state to develop a management program for its coastal zone. To meet this requirement, Texas established a coastal zone boundary and a system of permits to regulate uses and activities in the coastal zone. These permits are required for those projects which have a direct impact on coastal waters.

The USFWS regulates federal funding in Coastal Barrier Resource System (CBRS) Units under the *Coastal Barriers Resources Act* (CBRA). The Act protects undeveloped coastal barriers and related areas by prohibiting direct or indirect federal funding of projects in these areas that might support development. The purpose is to promote more appropriate use and conservation of coastal barriers along the Gulf of Mexico.

4.3.1 Proposed Action

The UTMB campus is located in the designated Texas Coastal Management Zone. Based on a review of the CCC, General Concurrence #5, FEMA has determined that this project is consistent with the goals and policies of the Texas Coastal Management Program and consistency review procedures as implemented by the GLO.

The UTMB campus is not part of a CBRS. Therefore, CBRA does not apply.

The dedicated natural gas pipeline is consistent with the goals and policies of the Texas Coastal Management Program and consistency review procedures as implemented by the GLO and compliant with the CBRS.

4.3.2 No Action Alternative

The No Action alternative would have no effect on the coastal zone or the Coastal Barrier Resource System.

4.4 Biological Resources

On March 19, 2012, as part of this DEA analysis, a biologist toured the proposed UTMB DHCP project area and a desk top study (Appendix D) was conducted by a professional biologist for the proposed dedicated natural gas pipeline.

4.4.1 Threatened and Endangered Species and Critical Habitat

The Unites States Fish and Wildlife Service (USFWS) and State of Texas Parks and Wildlife Department (TPWD) have administrative and legal authority to study, list, and take actions to protect plant and animal species in the Texas coastal region under the *Endangered Species Act* of 1973 and the TPWD Code. State endangered and threatened plant species are governed under 31 TAC 69.1 through 69.9.

4.4.1.1 Proposed Action

The UTMB campus site survey confirmed that construction work would occur within a mainly paved and built environment within the UTMB campus property. This location does not support any natural habitat. Wildlife present are common species (e.g., pigeons, rats, and feral animals) that have adapted to a landscaped and built environment bustling with human activity. Habitat for federal or state protected plant or animal species is not present.

For proposed work on the UTMB campus FEMA has determined No Effect to Federally listed Threatened and Endangered species based on the proposed scope of work, land use, and the existing habitat identified by UTMB and their consultants.

For the dedicated natural gas pipeline, the habitat present within the right-of-way adjacent to the roadway was reflective of a disturbed environment and consisted primary of weedy species adapted to disturbed conditions. The conclusions of the desktop assessment were that:

- The construction site is not located in, or adjacent to designated critical habitat for any listed species;
- Eight Federally listed species are identified for Galveston County, Texas in the USFWS Endangered Species List at http://www.fws.gov/endangered. These species are: 1) Attwater's greater prairie-chicken, 2) Eskimo curlew, 3) green sea turtle, 4) hawksbill sea turtle, 5) Kemp's Ridley sea turtle, 6) leatherback sea turtle, 7) loggerhead sea turtle, and 8) piping plover; and
- An additional twelve species found on the Texas Wildlife and Parks Department (TPWD) threatened and endangered species list for Galveston County, which can be found at http://www.tpwd.state.tx.us. These species are: 1) American peregrine falcon, 2) bald eagle, 3) brown pelican, 4) reddish egret, 5) whitefaced ibis, 6) white-tailed hawk, 7) whooping crane, 8) wood stork, 9) smalltooth sawfish, and 10) Louisiana black bear. (Apex 2011)

The area surrounding an estuarine channel to be crossed and the adjacent estuarine emergent wetland is potential habitat for three state listed threatened and endangered species (wood stork, white-faced ibis, and reddish egret). However, there are no expected impacts to these species or the surrounding habitat due to the lack of surface disturbance in this area. Field personnel and construction crews would be informed of all the listed species and the need for avoidance of construction impacts in the event that they are encountered. It is the opinion of the professional biologist that no listed species or critical habitat would be affected by the pipeline construction activities (Apex 2011).

4.4.1.2 No Action Alternative

The No Action alternative would have no effect on threatened or endangered species or their habitat.

4.4.2 Wildlife and Fish

Wildlife present are common species (e.g., pigeons, rats, and feral animals) that have adapted to a landscaped and built environment bustling with human activity. There is no aquatic habitat present.

4.4.2.1 Proposed Action

Demolition, construction, and DHCP operations would have no long-term effect on any plant or animal species within the region.

The construction and operation of the dedicated natural gas pipeline would have no long-term effect on any plant or animal species within the region.

4.4.3.2 No Action alternative

The No Action alternative would have no effect on wildlife or fish.

4.5 Cultural Resources

Cultural resources are those aspects of the physical environment that relate to human culture, society, and cultural institutions that hold communities together and link them to their surroundings. Cultural resources include prehistoric and historic archaeological sites, architectural properties, and ethnographic resources[d]. Archaeological sites are the tangible remains of past activities that show use or modification by people. Architectural properties such as buildings and structures can be part of larger archaeological sites or can be considered alone.

A number of federal statutes address the identification of cultural resources and federal responsibilities with regard to cultural resources. Foremost among these is the *National Historic Preservation Act* (NHPA) and its implementing regulations. Section 106 of the NHPA describes the process for identification and evaluation of cultural resources, assessment of effects of Federal Undertakings on historic resources, and consultation to avoid, reduce, or mitigate adverse effects. Resources that are at least 50 years old, retain seven aspects of integrity, and are determined to meet one or more of four criteria of significance are considered to be eligible for listing on the National Register of Historic Places (NRHP) and are termed historic properties. The NHPA does not require preservation of historic properties, but does ensure that federal agency decisions concerning the treatment of these properties result from meaningful

[d]Ethnographic resources is the branch of anthropology that deals with the scientific description of specific human cultures.

consideration of cultural and historic values and identification of options available to protect the properties. Under the provisions of NHPA Sections 106 and 110b, federal agencies must take into account the effects that their projects have on historic properties. If a project is determined to have an adverse effect to a historic property that is eligible for or listed on the NRHP, steps must be taken in order to mitigate the adverse effect. It is FEMA's responsibility to assess the possible adverse effects of an undertaking to historic properties. An adverse effect is an effect of an Undertaking that may alter a historic property's characteristics in a way that could jeopardize its inclusion in the National Register. Typical examples of adverse effect often involve the physical destruction of all or part of a property, change in the property's use, transfer, introduction of elements that diminish integrity, alteration of a property, etc.

If impacts to historic properties cannot be avoided, FEMA makes the determination of adverse effects, and informs the (State Historic Preservation Officer (SHPO) and/or Tribal Historic Preservation Officer (THPO) and other consulting parties of the decision. Typically as a result, a Memorandum of Agreement (MOA) per 36 CFR, § 800.6 (Resolution of adverse effects) would be prepared. The MOA is a legally binding agreement document, which outlines the treatment measures to minimize or mitigate the adverse effects. This document defines the terms and conditions agreed upon to resolve the adverse effects of an undertaking upon historic properties.

4.5.1 Proposed Action

The proposed demolition, line installation, East Plant construction site, and West Plant expansion areas are all located in the heart of the UTMB campus surrounded by other campus buildings. The area has been heavily disturbed, generally in excess of 20 feet in depth, through previous construction activities. In the event that archeological deposits, including any Native American pottery, stone tools, bones, or human remains, are uncovered, the project would be halted and UTMB would stop all work immediately in the vicinity of the discovery and take reasonable measures to avoid or minimize harm to the finds. All archeological findings would be secured and access to the sensitive area restricted. UTMB would inform FEMA immediately and FEMA would consult with the SHPO or THPO and Tribes and work in sensitive areas cannot resume until consultation is completed and appropriate measures have been taken to ensure that the project is in compliance with the National Historic Preservation Act.

The originally proposed distribution of utilities from the East Plant was rerouted to avoid conflicts with existing utilities, existing buildings (including those eligible for listing on the National Register of Historic Places), planned buildings, and an adjacent service station. The current proposed route (Figure 4-1) avoids these conflicts. Morgan Hall (M35) would be demolished under the proposed action.

Bore and receiving pits would be required for multiple functions such as the installation of the primary piping and installing and removing the microtunneling machine. Branch pits would be used to install branch piping and valves required to connect to the buildings on the campus and expansion pits would house the expansion loops required within the utility distribution system. The individual pits may be used for more than one of these functions. Selected pits would also be used as installation points to lower the sections of HHW pipe. The pits would be excavated approximately 22 feet deep, and may be round or rectangular, varying from 10 feet wide up to 40 feet long, depending on the functions of the pit. There are sixteen pits in the preliminary design.

To create the pits, the existing street paving would be removed. The location of each pit is shown in the following Table 3-5 and in Appendix A drawings which show the pit locations, traffic patterns and laydown/equipment spaces to support the boring operation: A vertical drilling machine would then inject concrete into the soil in a manner that would form the floor and walls of the pits. The existing soils would then be excavated and dewatering would occur as necessary. Once the first bore and receiving pits are complete, the microtunneling machine would be installed in the bore pit and would horizontally bore and install the bore sleeve to the receiving pit. The soil excavated by the microtunneling machine would be slurried and pumped to the surface for separation and disposal. Handling of all soil and water from the excavation of the pits and the bore would be treated to acceptable standards before disposal, following standard stormwater pollution prevention plan Clean Water Act guidelines. Once the bore sleeve is installed in each section and the microtunneling machine is removed at the receiving pit, the utility piping would-be lowered and installed, welding the sections together and pushing or winching the pipe horizontally through the bore sleeve on supports. The space around the HHW pipe within the bore sleeve would then be grouted after completion of the pipe installation and the required pipe testing in each section. The pits would be backfilled, the surface conditions restored, and the construction areas re-opened to vehicular and pedestrian traffic.

The current plan is to use a jet-grouted enclosure around the pits, eliminating the need to dewater the surrounding areas in order to excavate the pits. Since the risk of damage to the surrounding improvements (buildings, paving, utilities, etc.) is chiefly due to the dewatering systems, this means and methods of the installation of the work significantly reduces the risk to the project. If, during the tunneling and installation of the bore casing, the microtunneling machine hits an unforeseen obstruction it is unable to bore through, the machine would not be able to reverse out of the bore, or to turn to go around the obstruction. In this event, the machine would have to be “rescued”. The rescue is accomplished by creating what amounts to be a receiver pit at the location of the obstruction. A pit is excavated to either remove the obstruction, or to remove the microtunneling machine, depending upon the nature of the obstruction. Should buried utilities or a previously unknown contaminated site be encountered work would stop until the hazard is identified, evaluated, and a plan implemented to ensure the safe restart of operations. No shoring or bracing would be in contact with any building on the UTMB campus during construction.

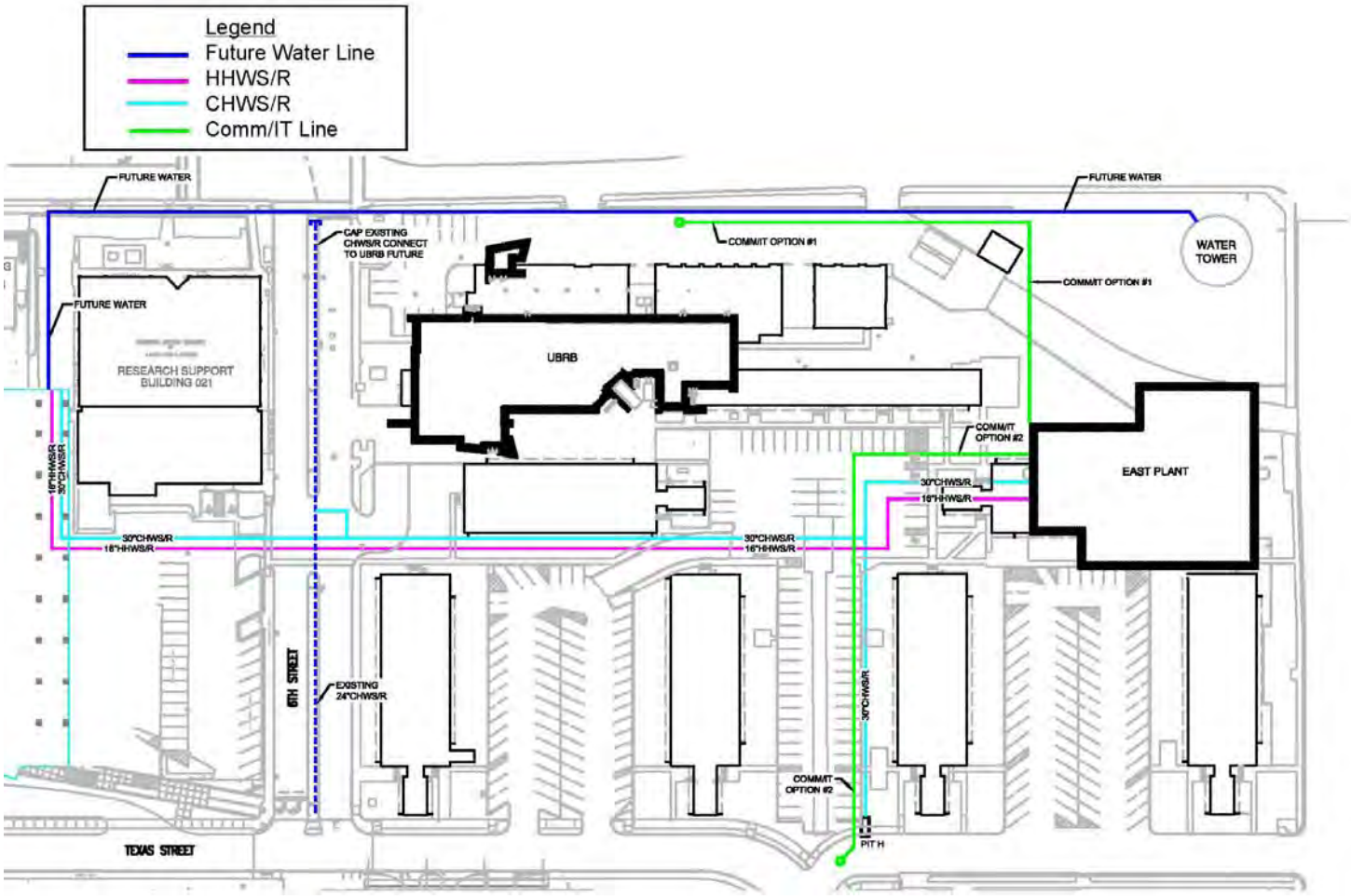

Figure 4-1: Proposed East Plant Utility Distribution Route

Morgan Hall (Figure 4-2) a two-story, 10,000 square foot dormitory building for UTMB students was constructed in 1955. The building is proposed for demolition to provide space for the construction of East Plant. Morgan Hall has been determined eligible for listing in the NRHP.

Figure 4-2: South Side of Morgan Hall

Nolan Hall (Figure 4-3) is the only three story building in the complex. The building has a flat roof and brick veneer with a mixture of metal framed fixed windows and metal 2/2 single hung windows. Nolan Hall has been determined eligible for listing in the NRHP. This building will be demolished at a later date.

Figure 4-3: South Side of Nolan Hall

Excavation and installation of DHCP piping in the vicinity of Market and 6th Street would entail distribution pipe installation which could affect the Galveston Seawall that was constructed in 1904. The Seawall, which is not visible in this location, has been abandoned and buried and the seaward side filled and developed. Thus, it is not serving in its original function. The Seawall crosses the UTMB campus, and is expected to be encountered during the installation of the hot water supply and return piping in Market Street at or near the intersection with 6th Street (University Blvd). However, its exact location, depth, and condition are not known. Field verification would be necessary to obtain this information. Once this information is available, the current design may or may not have to be modified due to the existing conditions. The section of the Seawall in the vicinity of the UTMB campus was part of the original Seawall construction completed in 1904. Design drawings of the original Seawall are not available as the County lost their maps during Hurricane Ike. The County was able to provide a drawing of the "newer" Seawall. This new Seawall design is similar to the older sections of the seawall such as exists on the UTMB campus. According to the Galveston County Engineer's office, "the Seawall near UTMB has a 5 foot top width and has a wooden sheet pile cut off wall under it. From the information on the older Seawall available online from the Galveston and Texas History Center, Rosenberg Library (http://www.gthcenter.org/exhibits/seawall/index.html), the Seawall was: "made of concrete, was 3.3 miles long, 16 feet at its base, and 5 feet wide on top, and 17 feet high. The outer face of the Seawall was curved to carry waves upwards. Riprap was placed along the base facing the Gulf of Mexico to break up wave action." This description appears to coincide with the information received from the County Engineer. The approximate routing of the old Seawall in the vicinity of the UTMB campus is shown on Figure 4-4 (not to scale). From near the Texas Department of Criminal Justice Hospital on the north side, it runs diagonally southeast towards the intersection of 6th St and Market Street, and then south along

Market Street toward Seawall Boulevard. This is just an approximation, and the actual crossing location for the seawall at the hot water piping route would have to be field verified (Tellepsen 2012). Correspondence from the Texas Historical Commission states that this portion of the Galveston Seawall is eligible for listing in the National Register of Historic Places. The seawall would only be disturbed to a depth and width required to accommodate the hot water piping. The piping would require a minimum cover of 4 feet and would require a clearance of 3 feet on all sides of the pipes. The approximate dimensions of the trench near the proximity of the seawall would be 9 feet below grade and 10 feet wide.

FEMA has determined that Morgan Hall and Nolan Hall meet National Register Criteria C as an example of mid-century modern style residences for the UTMB campus. In addition, FEMA has determined the dormitories are significant at the local level. They were part of the UTMB campus expansion during the mid-20th century. While many of the buildings constructed during this period on the campus no longer remain, Morgan Hall and Nolan Hall are almost entirely intact. In addition, FEMA, in consultation with SHPO, determined that the original Galveston Seawall is individually eligible for listing in the National Register of Historic Places and that both Undertakings would have an adverse effect on the historic properties.

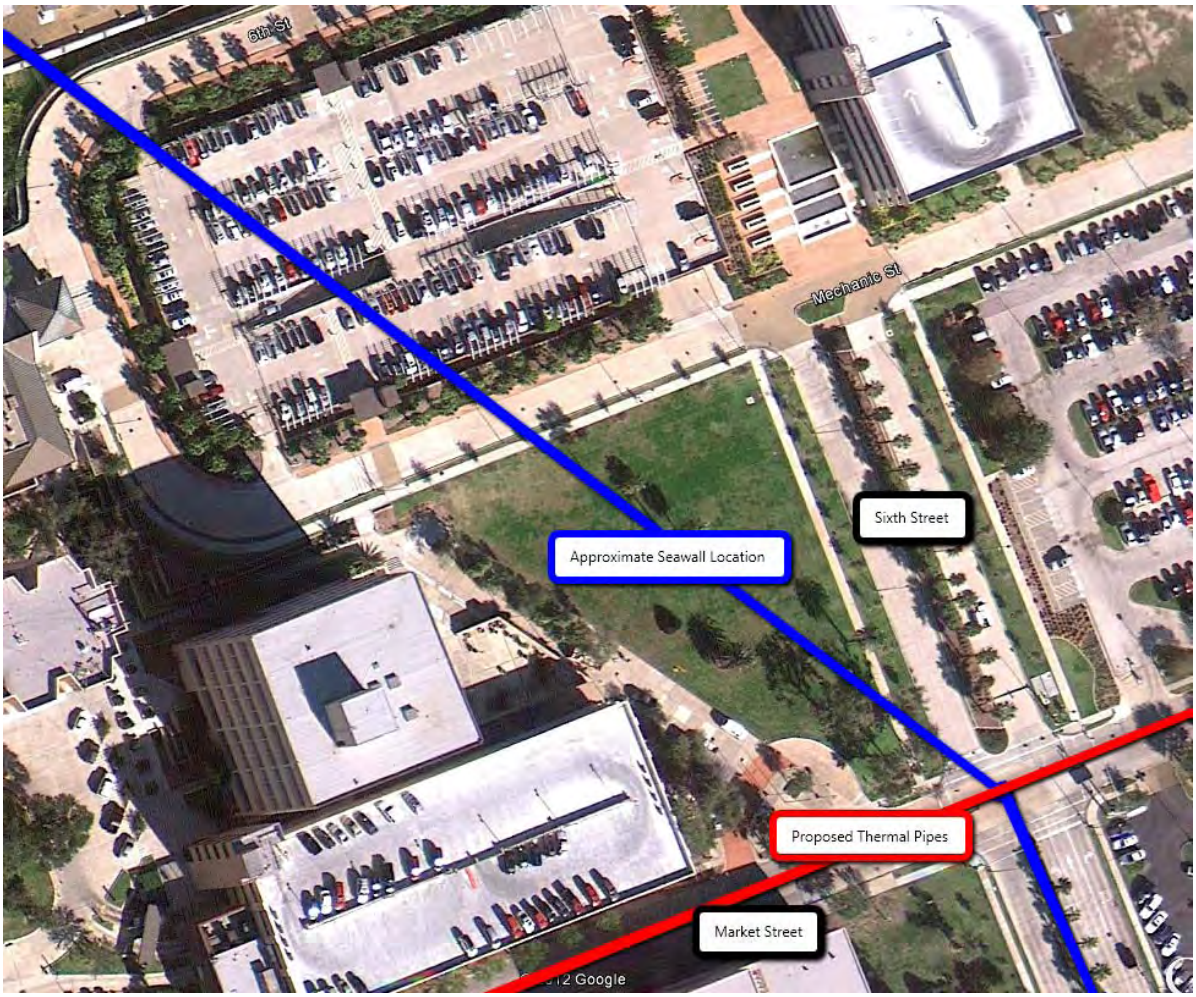

Figure 4-4: Location of the Proposed DHCP Pipe Installation in Relationship to the Galveston Seawall.

An MOA has been prepared between FEMA, the Texas State Historic Preservation Office (SHPO), the Texas Department of Public Safety/ Texas Department of Emergency Management (TXDPS/TDEM), and UTMB (Appendix D). The MOA has established treatment measures to mitigate the adverse effect to historic properties. These treatment measures include a recordation of the mid-century dormitory complex and original buried Galveston Seawall, historic resource survey, archaeological report, Texas Historical Marker for the buried original Galveston Seawall and National Historic Landmark nomination for the Galveston Seawall.

UTMB shall be responsible for completing the following measures to treat the adverse effects resulting from the Undertakings.

- **Building Recordation:** Within 60 days of execution of this Agreement, UTMB shall digitally photograph the entire collection of dormitories including Morgan Hall (bldg. 35), Nolan Hall (bldg. 33), Bethel Hall (bldg. 32), Brackenridge Hall (bldg. 30), Clay Hall (bldg. 31), Vinsant Hall (bldg. 34) and the Dorm Machine Room (bldg. 38).

  Historic Resource Survey: Within 180 days of execution of this Agreement, UTMB shall complete a THC historic resource survey form for each of the following dormitories:

  - 1. University of Texas Medical Branch at Galveston, Morgan Hall (1955)
  - 2. University of Texas Medical Branch at Galveston, Nolan Hall (1955)
  - 3. University of Texas Medical Branch at Galveston, Vinsant Hall (1955)
  - 4. University of Texas Medical Branch at Galveston, Bethel Hall (1953)
  - 5. University of Texas Medical Branch at Galveston, Clay Hall (1955)
  - 6. University of Texas Medical Branch at Galveston, Brackenridge Hall (1955)
  - 7. University of Texas Medical Branch at Galveston, Dorm Machine Room (1955)
  - 8. University of Texas at Arlington, Lipscomb Hall (1957)
  - 9. University of Texas at Austin, Creekside Residence Hall (1955)
  - 10. University of Texas at Austin, Blanton Dormitory (1955)
  - 11. University of Texas at Austin, Moore-Hall Dormitory (1956)
  - 12. University of Texas at Austin, Kinsolving Dormitory (1958)
  - 13. University of Texas at Austin, Beauford H. Jester Center (1969)
  - 14. University of Texas at Austin, Jester Dormitory (1969)

- **Seawall Recordation:** UTMB intends to remove only the necessary portions of the original Galveston Seawall and will make every effort to minimize the disturbance to the original Galveston Seawall. However, if UTMB determines that it is necessary to remove a section larger than 9 feet by 10 feet, UTMB shall immediately notify TXDPS/TDEM, who will then notify FEMA before any removal begins. The Seawall

will be digitally photographed upon its exposure at the intersection of 6th Street and Market Street.

- **Texas Historical Marker Nomination:** UTMB will apply for a subject marker through THC's History Programs Division within 180 days of the execution date of this MOA. The subject marker will commemorate the location of the buried original Galveston Seawall at the site of the Undertaking near 6th Street and Market Street. The marker nomination will supplement the existing original Galveston Seawall historical marker and note that a portion of the original Galveston Seawall was buried at this location during Galveston's Island's grade raising and expansion.
- **National Register and National Historic Landmark Nomination:** UTMB will update the current National Register nomination form for the Galveston Seawall. In addition, UTMB will draft a National Historic Landmark nomination for the Galveston Seawall.

  National Historic Landmark Nomination: UTMB will prepare a National Historic Landmark nomination for the Galveston Seawall in order to expand on the existing understanding of this nationally-significant resource.
- UTMB shall be responsible for providing a Secretary of the Interior (SOI) qualified archaeologist to monitor the following UTMB ground disturbing activities connected to the District Heating and Cooling Project:
  - 1. Open Cut Utility Trenches
  - 2. Boring Pits (not to include actual horizontal drilling)
  - 3. Original Galveston Seawall Exposure
  - 4. West Plant Floodwall
  - 5. Thermal Water Storage Tanks
  - 6. Any additional ground disturbance that may result from repairs and mitigation to the chilled water valve pits and pipes

  An archaeological report will be submitted to FEMA within 60 days of completion of all monitoring activities. This report will describe the original Galveston Seawall Undertaking as well as any findings or activities encountered during ground disturbing activities. If possible, this report will also include an archaeological profile (cross-section) of the original Galveston Seawall.

The conversion from steam heating to hot water heating would require the installation of replacement lines and energy converters in 35 building on campus. Four of the 35 buildings are listed or considered eligible for listing on the NRHP. Work on these buildings would use the same or similar materials so that the resulting modifications would match all physical and visual aspects including form, color and workmanship of the buildings. The result would match all physical and visual aspects, so as not to affect their NRHP status. Prior to any building modifications, consultation between FEMA with the SHPO would have been conducted and NHPA requirements met.

The UTMB buildings eligible for listing or currently listed on the National Register of Historic Places along with proposed modifications are:

Ashbel Smith Building (M1): Completed in 1891, the Ashbel Smith Building ("Old Red") housed the entire medical school when it first opened. It is named for a prominent Texas physician and statesman who played a major role in the establishment of both the University of Texas in Austin and the Medical Department in Galveston. Recognized for its ornate, Romanesque style, the building is known informally today as "Old Red" because of its ruddy exterior of red pressed brick from south Harris County's Cedar Bayou area, red Texas granite columns, and sandstone capitals and ornamentation. Designed by renowned architect Nicholas Clayton, the impressive structure is listed on the National Register of Historic Places and is a registered Texas historic landmark. The building was extensively damaged by Hurricane Ike but has been restored.

Figure 4-5: Photograph of the existing penetration points

Currently, Old Red is being served by a 4-inch, 150-psig steam line that enters the building through the north wall of the 1st level mechanical room from the stanchion located north of the building at a height 20 feet above grade (Figure 4-5). The steam line is then routed up to the 2nd level mechanical room. The high-pressure steam is reduced to a low-pressure steam system by pressure reducing values located at the 1st and 2nd levels to serve a hot water converter for heating and domestic hot water generation. The scope of work proposes removing the existing steam line and replacing it with a new 3-inch campus hot water supply and return. The new line would follow the same route as the removed steam piping.

William Keiller Building (M2): Constructed in 1925, this structure served as the Laboratory Building and was renamed for Dr. William Keiller, who served on the faculty from 1891 to 1931. The sandstone building was enlarged in 1932 with a mirror-image addition to the original structure. It is now occupied by the Department of Pathology (UTMB Public Affairs 2012).

Figure 4-6: William Keiller Building Showing Current Line Penetrations.

Currently the William Keiller Building is being served by a 6-inch, 100 psig steam line that enters the building from a utility vault located on the Northwest corner of the building ground floor (Figure 4-6). It is then routed through an interstitial wall cavity to the first central mechanical room where it is reduced to a lower pressure. The scope of work proposes new penetrations into this building from the south side. The existing steam distribution would be raised and routed from an underground distribution to an overhead distribution requiring a new penetration (Figure 4-7). The existing steam and condensate piping serving the building would be replaced with a new 6-inch campus hot water supply and return that would be routed parallel to the new high-pressure overhead steam distribution to the new mechanical spaces to serve the conversion equipment.

Figure 4-7: William Keiller Building Showing Proposed Line Penetration site (red X)

Marvin L. Graves Building (M4): Constructed in 1931 as the State Psychopathic Hospital and was enlarged in 1936. Although located on the UTMB campus, it was administered independently of the school. Because of heavy damage from a 1943 hurricane, the state vacated the building. It sat unoccupied and unrepaired until 1945, when the state legislature gave it to UTMB. Reopened as a university psychiatric facility, the structure was extensively remodeled in 1959 and updated again in 1979. The building was renamed in memory of Dr. Marvin L. Graves, who served as UTMB professor of medicine from 1905 to 1926 and who introduced psychiatry into the university's curriculum. It currently houses classrooms and administrative offices (UTMB 2009).

Figure 4-8: The existing lines for Marvin L. Graves east are approximately 16.5 feet above grade and penetrate the building from the west.

Figure 4-9: The existing lines for Marvin L. Graves west are approximately 20 feet above grade and penetrate the building from the north.

Currently the Marvin Graves Building is being served by a 3-inch, 100 psig steam line that enters the building through the west wall of the 2nd level mechanical room piping chase from the utility stanchion located west of the building and is routed up through stacking mechanical rooms to the 5th level penthouse where it is reduced to low pressure (Figures 4-8 and 4-9). The new scope of work proposed removing the existing steam pipe and providing a new 2.5-inch campus hot water supply and return that follows the same route as the removed steam piping.

Dorm Machine Room (M38): Constructed in 1955 as a 150 square foot physical plant building that services the dormitory buildings at the northeast side of campus (UTMB 2009).

Figure 4-10: Dorm Machine Room - the elevation shown is approximately 2 feet above grade penetrating the building from the north.

Currently the Dorm Machine Room is being served by a steam line that enters the building through the north wall 1st level mechanical room from underground piping routed from north of the building (Figure 4-10). The high-pressure steam is reduced to low pressure steam by a pressure reducing valve located in the mechanical room. The new scope of work proposes removing the existing steam piping and providing a new campus hot water supply and return that would follow the same routing as the removed steam piping. As with most other buildings that are fed from the underground piping, trenches will be open cut to get the feed lines to the individual buildings. Generally trenching would be to a depth of approximately 4 feet.

The dedicated natural gas pipeline route was reviewed for preliminary archeological issues and the proposed route designed to avoid existing features. On April 14, 2011, the Texas Historical Commission agreed, after an Antiquities Code of Texas Review, that no survey was required and that the project may proceed (ONEOK, Inc. 2011) (Appendix E).

4.5.2 No Action Alternative

There would be no effect to cultural resources.

4.6 Socioeconomic Resources

4.6.1 Socioeconomics

The socioeconomic environment evaluated for this DEA encompasses Galveston County and the City of Galveston. This geographic location forms the basic economic region of influence and defines the area in which the predominant social and economic impacts are likely to take place.

4.6.1.1 Proposed Action

The direct benefit to the UTMB mission realized by FEMA's investment in the mitigated DHCP is the assured reliability of uninterrupted treatment, care, and research operations in a location subject to recurrent hurricane and flood. Additionally, an improved DHCP would avoid or decrease the requirement for future FEMA funding subsequent to a natural disaster.

The economic benefits of demolition and construction impacts would be temporary and diminish as the project reaches completion at the start of the fifth year. In addition to the direct project work force additional employment in other sectors would occur. Total annual employment (direct, indirect, and induced) created during the construction phase would benefit the retail trade and professional services, with living accommodations and food services sectors generating most of the indirect jobs. The increase in employment would be modest relative to the size of the county's economy and workforce. The regional labor force would likely be able to fill all construction employment requirements generated by the project.

Operation of the proposed DHCP would commence with some components on-line in 2014 and full operations in 2017. The design life is for at least 30 years. The proposed workforce positions already exist. Therefore, there would be little change to the existing socioeconomic conditions. However, should future storm events similar to Hurricane Ike occur, the DHCP would not suffer damage that could result in the long-term shut down or compromise of support functions, thereby avoiding major and adverse economic consequences.

There would be a short-term benefit economic from pipeline construction and a long-term benefit to UTMB as the DHCP would have a dedicated natural gas supply that may prevent the shutdown of UTMB operations as a result of a future storm events.

4.6.1.2 No Action Alternative

Health care at UTMB could be substantially compromised should a similar flooding event to Hurricane Ike occur.

4.6.2 Environmental Justice

Under Executive Order 12898 *Federal Actions to Address Environmental Justice in Minority and Low-Income Populations*, the federal agency, in this case FEMA is responsible for identifying and addressing potential disproportionately high and adverse human health and environmental impacts on minority and low income populations and to identify alternatives that could mitigate these impacts. Minority persons are those who identify themselves as Hispanic or Latino, Asian,

Black or African American, American Indian or Alaska Native, Native Hawaiian or Other Pacific Islander, or multi-racial (with at least one race designated as a minority race under CEQ Guidelines). Persons whose income is below the federal poverty threshold are designated as low income.

4.6.2.1 Proposed Action

There are no adverse impacts identified from DHCP construction and operation. Therefore, there would be no disproportionately high and adverse human health effects on minority and low income populations.

There are no adverse impacts identified from the dedicated natural gas pipeline construction and operation. Therefore, there would be no disproportionately high and adverse human health effects on minority and low income populations.

4.6.2.2 No Action Alternative

There would be no disproportionate high and adverse human health effects on minority and low income populations under current conditions. However, should the current support service areas again undergo severe flooding; these populations may be disproportionately and adversely affected. Disproportionate and adverse effects could result from lack of access to health care facilities and services because of the difficulty in arranging for or general lack of transportation, associated travel costs, and availability and potential cost of medical services outside the Galveston region.

4.6.3 Land Tenure and Use

The construction and operation of the proposed DHCP were compared against the existing land use categories in the area that surrounds the proposed site. Effects were identified based on determinations of compatibility among land use reasonably anticipated to occur as a result of the Proposed Action and existing adjacent land uses.

4.6.3.1 Proposed Action

The proposed DHCP would be located on the UTMB campus, a major health science center in the southwestern United States with more than 70 major buildings, over 2,500 students, medical interns, residents, and fellows, and 1,000 full-time faculty members. The UTMB campus and the area immediately surrounding the campus have a mix of urbanized residential, commercial, and industrial land uses (e.g., Port of Galveston). The proposed location of the East Plant is compatible with UTMB's Master Plan.
During construction, there would be no change in land use designation as effects would be temporary. There would be no alteration of current land use patterns or planning resulting from the proposed DHCP because it would replace existing infrastructure. Therefore, there would be no change in land use designation.

There would be no long-term effects from the construction and operation of the proposed DHCP because there would be no change in the land use under the UTMB Master Plan.

The proposed dedicated natural gas pipeline will be constructed in utility right-of-ways. Therefore, there would be no change to existing land use.

4.6.3.2 No Action Alternative

Under the No Action Alternative, the DHCP would not be funded or constructed. Therefore, there would be no effect to land use.

4.6.4 Waste Management

Current activities at the UTMB campus generate construction debris, sanitary solid, medical, hazardous, and radiological wastes. Construction debris includes asphalt, concrete, scrap metal, and paper. Sanitary solid waste consists of general trash collected from offices, restrooms, patient waiting rooms, classrooms, and cafeterias. The handling and storage of hazardous materials is addressed in the UTMB Safety Manual. The manual notes that almost all laboratory chemicals are considered hazardous waste when discarded and provides instructions for hazardous waste management. The hazardous wastes generated by UTMB facilities are regulated in Texas by a combination of federal laws and state laws.

4.6.4.1 Proposed Action

Construction activity would generate construction, solid, and/or hazardous waste. Waste material would be salvaged when economically feasible to decrease the amount of material to be disposed. Asbestos and lead paint containing materials were found to be present in the materials and structures proposed for demolition. Prior to demolition, any necessary abatement measures would be implemented and the asbestos and lead containing materials would be disposed of in a legally compliant manner per the Texas Commission on Environmental Quality and Texas Department of State Health Services rules and guidelines. Additional details regarding asbestos and lead paint and how they would be managed can be found in Section 4.6.7 for Health and Safety. Similarly, if any contaminated waste is identified during demolition, it would be disposed of according to UTMB's Environmental and Health and Safety Services guidelines. Hazardous waste generated during construction would be the Construction Manager at Risk (general contractor's) responsibility to dispose of in accordance with all applicable regulations.

Waste streams generated by DHCP operations would be well understood and managed and disposed of in the same manner as such waste at other UTMB clinical facilities. Additionally, since DHCP operations would only change the waste generation location (East Plant) and not increase operational waste, there would be little, if any, effect to the future UTMB waste stream from DHCP operations.
Construction of the dedicated natural gas pipeline would generate similar waste products as UTMB construction. Pipeline operation would generate minor amount of maintenance waste.

4.6.4.2 No Action Alternative

Under the No Action Alternative, the types and amounts of waste currently generated on the UTMB campus would not change. Similarly, the management of those wastes would not change.

4.6.5 Noise

The city's current noise ordinance, created in 1960, states that "The creation of any unreasonably loud, disturbing or unnecessary noise or noise of such kind, intensity or duration as to be detrimental to the life or health of any natural person is prohibited. As used in this section the word "natural person" shall be construed to apply to natural persons of normal nervous sensibilities." (Galveston City 2012) and allows police officers and judges to determine what is "unreasonable." (The Daily News 2012).

Current ambient noise conditions are primarily the result of roadway commuter and worker traffic and building functions (e.g., heating, ventilation, and air conditioning systems). There are no residences, schools, or noise-sensitive land uses within close proximity to the proposed construction area.

4.6.5.1 Proposed Action

During construction, expected noise levels would be typical of an active building site and occur primarily during daylight hours. Demolition and construction noise may be evident for persons in transit to other UTMB buildings in the immediate area. However, once inside a building the demolition and construction noise would not be intrusive.

DHCP plant operations would generate noise but contribute negligibly to ambient noise levels and would have little to no effect on the public. The noise generated by the new turbines and boiler would be contained by local enclosures and the application of sound reduction materials to stay within all applicable regulations. The DHCP design criteria for noise levels at the UTMB property line is 60 dB (A). On average, a conversation at three feet is approximately 60 dB (A).

Noise generation from construction of the dedicated natural gas pipeline would be minor. Once operational there would be negligible pipeline noise.

4.6.5.2 No Action Alternative

The No Action alternative would not change the ambient noise level in the area.

4.6.6 Traffic

Site vehicle traffic in the vicinity of the proposed construction sites primarily utilizes Harborside Drive – a State Highway; Mechanic, Market, and Strand Streets; and 4th, 6th, 11th, 12th Streets.
4.6.6.1 Proposed Action

During site construction, Harborside Drive would remain open and Hospital access would be maintained during the construction period. Traffic control measures would be in place during construction which would consist of street closures and vehicle rerouting, conversion of two-way streets to one way, presences of traffic control personnel and use of appropriate warning and directional signage. Excavations would be covered with anchored steel plates during non-working hours and open lanes for normal traffic flow. The construction contractor would prepare traffic control plans and submit them for UTMB approval ten working days prior to implementation. There may be slight traffic delays during construction. Traffic conditions would return to normal once the open trenching or boring effort is completed.

Traffic control measures, if necessary, for instillation of the dedicated natural gas pipeline would be expected to be similar to construction traffic control at UTMB.

4.6.6.2 No Action Alternative

There would be no permanent changes to traffic flow patterns.

4.6.7 Health and Safety

The State of Texas Uniform General Conditions (UGC) and University of Texas System Supplementary General Conditions (SGC) make safety during construction the responsibility of the contractor. Also, the prevailing state and federal law for health and safety, such as Occupational Safety and Health Administration regulations, apply to the contractor.

4.6.7.1 Proposed Action

The Project Architect would, in addition to the UGC and SGC, include requirements of the UTMB Environmental Health and Safety Department in the construction contract. The University of Texas System, Office of Facilities Planning and Construction would assign a Resident Construction Manager whose job function would include overseeing the safe conduct of construction operations.

Potential human health effects during site demolition activities, line installation, and construction and modification of the East and West Plants, respectively would be similar to that of any major construction project. However, asbestos and lead paint is present in the materials and structures scheduled for disposal and/or demolition.

Asbestos is a group of naturally occurring silicate minerals. Mined and milled from native rock, asbestos is fibrous, thin, and strong. Characteristics, like heat resistance, chemical inertness, and insulating capacity, coupled with the flexibility to be woven, make asbestos suitable for use in many industrial applications. Breathing asbestos-containing air into the lungs is the exposure route of greatest concern. Exposure to asbestos may result in the slow build-up of scar-like tissue in the lungs called asbestosis. This scarred tissue state impairs the ability of the lungs and heart to adequately provide oxygen to the body. This is a serious disease, and can eventually lead to disability or death in people exposed to high amounts of asbestos. Lung cancer starts within the respiratory tissues, and mesothelial cancer grows from the thin membranes that surround the lung or the abdominal cavities. Both lung cancer and mesothelioma are usually

fatal. These asbestos-related diseases do not appear immediately, but may develop 20 to 50 years after exposure (DSHS 2012).

The EPA National Emission Standards for Hazardous Air Pollutants (NESHAP) require that prior to renovation or demolition a survey be conducted to determine the presence of asbestos. The Asbestos Program of the Texas Department of State Health Service (DSHS) regulates the removal of asbestos from public buildings within the state. The two main sets of rules and regulations enforced by DSHS are the Texas Asbestos Health Protection Rules (TAHPR) and the Federal NESHAP. TAHPR applies to all buildings that are subject to public occupancy, or to which the general public has access, and to all persons disturbing, removing, encapsulating, or enclosing asbestos within public buildings for any purpose. NESHAP applies to the abatement of any friable [readily crumbled; brittle] asbestos-containing building material or to the demolition of a facility (DSHS 2012). Both of these regulations require that written notification be submitted before beginning renovation or demolition projects. The DSHS Demolition/Renovation form combines the requirements of the NESHAP and the TAHPR. The DSHS has been (asbestos survey has been completed) and would be notified (asbestos abatement) of this work. Asbestos abatement would be performed by a licensed asbestos abatement contractor who would determine the appropriate removal and containment process. Asbestos abatement measures would prevent exposure of the worker and the public to asbestos.

Lead is a heavy, low melting, bluish-gray metal that occurs naturally in the Earth's crust. However, it is rarely found naturally as a metal. It is usually found combined with two or more other elements to form lead compounds. Lead compounds are used as a pigment in paints, dyes, and ceramic glazes and in caulk. The amount of lead used in these products has been reduced in recent years to minimize lead’s harmful effect on people and animals (DHHS 2007). Lead is a highly toxic metal that may cause a range of health problems, especially in young children. When lead is absorbed into the body, it can cause damage to the brain and other vital organs, like the kidneys, nerves and blood. Lead may also cause behavioral problems, learning disabilities, seizures and in extreme cases, death. Some symptoms of lead poisoning may include headaches, stomachaches, nausea, tiredness and irritability (HUD 2012).

OSHA regulations govern exposure of workers to lead regardless of the concentrations of lead identified in paint. The OSHA regulations, which have been established for general and construction industries, cover any type of workplace activity that could expose an employee to potential lead contamination (OSHA Standards 29 CFR 1926.62 and 1910.1925). The OSHA standards for lead require that employee exposure to airborne lead be maintained below 50 micrograms of lead per cubic meter of air calculated as an eight-hour time-weighted average. The OSHA construction standard classifies construction activities that could result in exposure to airborne lead and specifies training requirements, engineering controls and work practices that must be followed when engaging in those activities. Lead abatement measures would prevent exposure of the worker and the public to airborne lead.

Routine construction activities have the potential to expose workers or site visitors to common hazards such as slips-trips-falls, electrical shock, heat stress, or fire and explosion hazards. Workers could be potentially exposed to high noise levels from heavy equipment operation and activities such as cutting metal or grinding operations. Many construction accidents can and are

avoided with proper training and adequate safety equipment. To ensure a safe working environment during construction, construction contractors would be required to comply with the federal and state health and safety regulations and UTMB construction safety contract standards. All site contractors would be required to submit and adhere to a Construction Safety and Health Plan (Plan). This Plan would be reviewed and approved by the Resident Construction Manager prior to the start of construction activities. During construction, the UTMB Resident Construction Manager would routinely verify that construction contractors are adhering to the Plan and federal and state health and safety standards. Compliance with the Plan and health and safety standards would minimize the potential adverse effects to worker health and safety during construction.

The proposed DHCP East and West Plant operations would be tasks already performed by the trained personnel who either work at the Central Plant or the West Plant. DHCP start-up activities and permanent duties would benefit from existing and validated standard operation procedures and personnel already familiar with and having the operational experience with work that would be conducted within the Plants. Thus, the operational requirements and hazards are well understood.

The general public would be one of the beneficiaries as the DHCP would be protected and elevated from future flooding events which would help prevent a medical care disruption to the public should a similar flooding event compared to Hurricane Ike occur.

There would be no adverse effects expected from DHCP operations.

Construction of the dedicated natural gas pipeline would have similar risks and controls to the installation of the DHCP pipelines. There are no adverse effects expected from construction. The operation of the dedicated natural gas pipeline would substantially reduce the risk of UTMB medical care disruption to the public from an event similar to Hurricane Ike.

4.6.7.2 No Action Alternative

Health care at UTMB could be substantially compromised should a similar flooding event to Hurricane Ike occur.

4.7 Summary Table

The following table 4-2 summarizes the potential impacts of the Proposed Action Alternatives and mitigation measures or best management practices (BMPs) to reduce or avoid those impacts.

Table 4-2: Summary Table of Potential Impacts, Coordination/Permit, and Mitigation/BMP

Affected Environment/ Resource Area	Potential Impacts	Agency Coordination/Permits	Mitigation/BMPs
Geology, soils, and Seismicity	Potential for soil erosion and runoff during construction.	UTMB would obtain from the Texas Commission on Environmental Quality a General Permit to Discharge Wastes under the provisions of Section 402 of the *Clean Water Act* and Chapter 26 of the Texas Water Code. This would require the preparation of a Storm Water Pollution Prevention Plan to address discharges that would reach Waters of the United States to identify and address potential sources of pollution that are reasonably expected to affect the quality of discharges from the construction site, including off-site material storage areas, overburden and stockpiles of dirt, borrow areas, equipment staging areas, vehicle repair areas, fueling areas, etc., used solely by the permitted project.	A Stormwater Pollution Prevention Plan would be implemented to minimize soil erosion during construction.
Air Quality	Air emission authorizations are required.	Air emission authorization for the new emission units would or could include the following: Texas Commission on Environmental Quality (TCEQ) Electric Generating Unit Standard Permit and Boiler Standard Permit; TCEQ minor new source review air permit amendment; Prevention of Significant Deterioration (PSD) Permit for Criteria Pollutants from TCEQ as it is anticipated based on the calculated project emissions that PSD would be triggered for PM10 and PM2.5 and possible CO. SO2, and H2SO4 would be required to be authorized under a State New Source Review (NSR) permit; EPA Region 6 PSD Permit for Greenhouse Gas Pollutants permitted for the emission units maximum firing rate of 8,760 hours per year.	The appropriate air emission permits would be obtained prior to operation.
	Asbestos and lead paint containing materials or structures	Notification to the Texas Department of State Health Services.	Prior to and during demolition activities, abatement measures would be implemented by a

Affected Environment/ Resource Area	Potential Impacts	Agency Coordination/Permits	Mitigation/BMPs
	are present. During site preparation and construction, the use of heavy equipment, delivery trucks, and worker vehicles would temporarily increase particulate, NOx and VOC emissions and would generate fugitive dust in the proposed project area from combustion of gasoline and diesel fuel and disturbance of soils.		licensed asbestos and lead abatement contractor to avoid the generation of airborne asbestos or lead particles. Best Management Practices and site watering practices would limit dust emissions.
Climate Change	Insignificant potential impacts to climate change.	None	None
Water Quality	Negligible impacts to water during construction.	UTMB would obtain from the Texas Commission on Environmental Quality a General Permit to Discharge Wastes under the provisions of Section 402 of the Clean Water Act and Chapter 26 of the Texas Water Code. This would require the preparation of a Storm Water Pollution Prevention Plan to address discharges that would reach Waters of the United States to identify and address potential sources of pollution that are reasonably expected to affect the quality of discharges from the construction site, including off-site material storage areas, overburden and stockpiles of dirt, borrow areas, equipment staging areas, vehicle repair areas, fueling areas, etc., used solely by the permitted project.	A Stormwater Pollution Prevention Plan would be implemented to minimize soil erosion during construction.
Wetlands	Negligible potential impacts to wetlands offsite.	UTMB would obtain from the Texas Commission on Environmental Quality a General	A Stormwater Pollution Prevention Plan would be implemented to minimize soil

Affected Environment/ Resource Area	Potential Impacts	Agency Coordination/Permits	Mitigation/BMPs
		Permit to Discharge Wastes under the provisions of Section 402 of the Clean Water Act and Chapter 26 of the Texas Water Code. This would require the preparation of a Storm Water Pollution Prevention Plan to address discharges that would reach Waters of the United States to identify and address potential sources of pollution that are reasonably expected to affect the quality of discharges from the construction site, including off-site material storage areas, overburden and stockpiles of dirt, borrow areas, equipment staging areas, vehicle repair areas, fueling areas, etc., used solely by the permitted project.	erosion during construction.
	Natural gas Pipeline – Negligible potential impacts to water quality during construction.	U.S. Army Corps of Engineers Nationwide Permit that provides for the protection of the aquatic environment by ensuring that the Nation Wide Permits authorize only those activities with minimal adverse effects on the aquatic environment.	Self-certified under COE Nation Wide Permit 12.
Floodplains	The DHCP is located in the 500-year flood plain.	Compliance with the City of Galveston Flood Damage Prevention Ordinance	The proposed design specifies housing critical building systems, equipment, and functions, above 15 feet msl, which would exceed the 500-year flood level by 1 foot and is in compliance with the City of Galveston Flood Damage Prevention Ordinance and Executive Order 11988.
		To comply with Executive Order 11988, Floodplain Management, FEMA is required to follow the procedure outlined in 44 CFR Part 9 to assure that alternatives to the proposed action have been considered.	Executive Order 11988 - Floodplain Management Eight-Step Decision Making Process, has been completed for the proposed action.
Coastal Resources	The UTMB campus is located in the designated Texas Coastal Management Zone.	Based on a review of the CCC, General Concurrence #5, FEMA has determined that this project is consistent with the goals and policies of the Texas Coastal	None

Affected Environment/ Resource Area	Potential Impacts	Agency Coordination/Permits	Mitigation/BMPs
		Management Program and consistency review procedures as implemented by the GLO.	
Threatened and Endangered Species and Critical Habitat	None	FEMA has determined No Effect to Federally listed Threatened and Endangered species based on the proposed scope of work, land use, and the existing habitat identified by UTMB and their consultants.	None
Wildlife and Fish	Negligible potential impacts wildlife and fish.	None	None
Cultural Resources	The Proposed Action is located in the heart of the UTMB campus surrounded by other campus buildings. The area has been heavily and completely disturbed through previous construction activities.	None	In the event that archeological deposits are uncovered, UTMB would stop all work immediately in the vicinity of the discovery and take reasonable measures to avoid or minimize harm to the finds. All archeological findings would be secured and access to the sensitive area restricted. UTMB would inform FEMA immediately and FEMA would consult with the SHPO or THPO and Tribes. Work in sensitive areas would not resume until consultation is completed and appropriate measures have been taken to ensure that the project is in compliance with the National Historic Preservation Act.
	Morgan Hall (M35) and Nolan Hall (M33) are proposed for demolition and has been determined eligible for listing on the National Register of Historic Places.	The State Historic Preservation Officer (SHPO) and Texas Historic Commission approval is required prior to building demolition.	A Memorandum of Agreement (MOA) has been prepared between FEMA, the SHPO, the Texas Department of Emergency Management, and UTMB. The MOA has established the treatment measures to mitigate the adverse effect to historic properties. These treatment measures include a recordation of buildings and a historical narrative. Prior to building demolition consultation, by FEMA with the SHPO, would have been conducted and NHPA requirements met

Affected Environment/ Resource Area	Potential Impacts	Agency Coordination/Permits	Mitigation/BMPs
	The Galveston Seawall which is eligible for listing on the National Register of Historic Places is present at Market and 6th Street. Installation of the DHCP pipeline would occur in this area.	SHPO and Texas Historic Commission approval is required prior to pipe installation in this area.	Prior to pipe installation consultation, by FEMA with the SHPO would have been conducted and NHPA requirements met.
	The conversation from steam heating to hot water heating would require the installation of replacement lines and energy converters in 35 building on campus. Four of the 35 building are listed or considered eligible for listing on the NRHP.	The SHPO and Texas Historic Commission approval is required prior to building modifications.	Prior to building modifications consultation, by FEMA with the SHPO, would have been conducted and NHPA requirements met Work on these buildings would use the same or similar materials so that the resulting modifications would match all physical and visual aspects including form, color and workmanship of the buildings. The result would match all physical and visual aspects, so as not to affect their NRHP status.
	The dedicated natural gas pipeline route was reviewed for preliminary archeological issues and the proposed route designed to avoid existing features.	On April 14, 2011, the Texas Historical Commission agreed, after an Antiquities Code of Texas Review, that no survey was required and that the project may proceed.	None
Socioeconomics	Temporary beneficial impacts to regional workforce during construction. Long-term beneficial impacts to regional healthcare.	None	None
Environmental Justice	All populations would benefit from the Proposed Action.	None	None
Land Tenure and Use	None. Proposed Action is consistent with current land use patterns and municipal zoning ordinances.	None	None

Affected Environment/ Resource Area	Potential Impacts	Agency Coordination/Permits	Mitigation/BMPs
Waste Management	Asbestos and lead - containing materials are present.	Notification to the Texas Department of State Health Services regarding asbestos abatement prior to demolition activities.	Asbestos and lead abatement measures would be implemented prior to demolition. After recovery of the asbestos and lead-containing material, the waste would be disposed in a legally compliant manner.
Noise	Temporary increase of noise during construction	None	None
Traffic	Temporary traffic re-routing and control during construction	None	Traffic management via rerouting, implementation of one-way traffic flow, flagman, and controlled vehicle access.
Health and Safety	Routine construction activities have the potential to expose workers or site visitors to common hazards such as slips-trips-falls, electrical shock, heat stress, or fire and explosion hazards. Potential airborne asbestos and lead exposure.	Notification to the Texas Department of State Health Services.	Construction contractors would be required to comply with the federal and state health and safety regulations and UTMB construction safety contract standards. All site contractors would be required to submit and adhere to a Construction Safety and Health Plan. Construction contractors would be required to follow both the TAHPR and the Federal NESHAP rules for handling asbestos and OSHA regulations for controlling airborne lead emissions.

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5.0 CUMULATIVE IMPACTS

Section 1508.7 of the CEQ regulations implementing the procedural provisions of NEPA defines cumulative effects as "the impact on the environment which results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency (federal or non-federal) or person undertakes such actions." The regulations further explain that "cumulative effects can result from individually minor, but collectively significant actions taking place over a period of time."

The impact of Hurricane Ike was campus-wide and all of the buildings on the campus received either wind or flood damage. There are numerous other projects to replace buildings or repair facilities to pre-disaster condition with upgrades to codes and standards.

5.1 Proposed Action

The cumulative impact to the natural resources on the campus from construction and operation of the DHCP is negligible as new construction and renovation would occur within an already built environment. In general, new construction replaces old and/or damaged facilities, upgrades infrastructure to code, and improves facility and equipment efficiencies. Thus, this is a benefit to the human environment. In the future, new buildings and infrastructure, such as those associated with the DHCP, would be able to withstand an event similar to Hurricane Ike without substantial damage, thereby avoiding prolonged impacts to health care services.

There are no cumulative impacts identified for the dedicated natural gas pipeline.

5.2 No Action Alternative

In the future, storm events would jeopardize UTMB health care services as the existing DHCP would be susceptible to major flooding and prolonged shutdown from storm events

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6.0 AGENCY COORDINATION AND PERMITS

As part of the development of early interagency coordination related to the Hurricane Ike response and recovery efforts at UTMB, state and federal resource protection agencies were contacted. These agencies included the U.S. Army Corps of Engineers, Texas Commission on Environmental Quality, TPWD, and Texas Historical Commission.

Under Executive Order 12372 Intergovernmental Review of Federal Programs, federal agencies are required to provide opportunities for consultation by state and local governments that would provide non-federal funds for, or that would be directly affected by, proposed federal financial assistance or direct federal development. At the state level, this task is accomplished by identifying those state agencies that should be involved in the planning and development of activities in compliance with Executive Order 12372, and providing those agencies with the opportunity to evaluate proposals in a timely, effective fashion. Texas has chosen to participate in the intergovernmental review process and a copy of this DEA has been provided to the Director, State Grants Team, Governor's Office of Budget and Planning located in Austin, Texas (OMB 2012).

In addition to the coordination and permits specified below it is anticipated that only utility permits or similar permits or approvals would be needed from any other regulatory agencies.

FEMA has provided copies of this DEA to federal, state, and local elected and appointed government officials and agencies. The proposed project would be reviewed by other governmental agencies during certain permit and approval review processes.

Based upon the studies and consultations identified in this DEA, several conditions and mitigation measures must be taken by the UTMB prior to and during project implementation. Table 6-1 provides a summary of conditions and permit requirements. The table is followed by a discussion of each requirement

Table 6-1: Conditions and Permit Requirements

AGENCY or REGULATION	REQUIREMENT
State Grants Team, Governor's Office of Budget and Planning	Provide a copy of the DEA for the intergovernmental review process.
Federal, state, and local elected and appointed government officials and agencies	Provide a copy of the DEA for the review and comment.
Texas Commission on Environmental Quality	Obtain a General Permit to Discharge Wastes under the provisions of Section 402 of the Clean Water Act and Chapter 26 of the Texas Water Code
Texas Commission on Environmental Quality	Obtain an Electric Generating Unit Standard Permit and Boiler Standard Permit; minor new source review air permit amendment; and Prevention of Significant Deterioration Permit for Criteria Pollutants;
Environmental Protection Agency Region 6	Prevention of Significant Deterioration Permit for Greenhouse Gas Pollutants
FEMA - *Executive Order 11988, Floodplain Management*	Complete the *Executive Order 11988 - Floodplain Management Eight-Step Decision Making Process*
Texas General Land Office.	Determine consistency with the goals and policies of the Texas Coastal Management Program and consistency

AGENCY or REGULATION	REQUIREMENT
	review procedures.
City of Galveston, Department of Planning and Community Development	FEMA coordination to ensure the Proposed Action would be in compliance with the City of Galveston Flood Damage Prevention Ordinance.
State Historic Preservation Office	Consultation required prior to demolition or modification of any structures or building listed on or eligible for listing on the NRHP.
Texas Department of State Health Service	Written notification prior to renovation or demolition of structures or building containing asbestos.
Natural Gas Pipeline - U.S. Army Corps of Engineers	UTMB would be responsible for following the NWP-12 General and Regional Conditions and submitting the permit after the completion of construction.

- UTMB would obtain from the Texas Commission on Environmental Quality a General Permit to Discharge Wastes under the provisions of Section 402 of the Clean Water Act and Chapter 26 of the Texas Water Code. A Storm Water Pollution Prevention Plan that addresses discharges that could reach Waters of the United States for this project has been prepared. The Storm Water Pollution Prevention Plan identifies and addresses potential sources of pollution that are reasonably expected to affect the quality of discharges from the construction site, including off-site material storage areas, overburden and stockpiles of dirt, borrow areas, equipment staging areas, vehicle repair areas, fueling areas, etc., used solely by the permitted project. The Storm Water Pollution Prevention Plan describes the implementation of practices that would be used to minimize to the extent practicable the discharge of pollutants in storm water associated with construction activity and non-storm water discharges.

- Air emission authorization for the new emission units would or could include the following: Texas Commission on Environmental Quality (TCEQ) Electric Generating Unit Standard Permit and Boiler Standard Permit; TCEQ minor new source review air permit amendment; Prevention of Significant Deterioration (PSD) Permit for Criteria Pollutants from TCEQ as it is anticipated based on the calculated project emissions that PSD would be triggered for PM_{10} and $PM_{2.5}$ and possible CO. SO_2, and H_2SO_4 would be required to be authorized under a State New Source Review (NSR) permit; and EPA Region 6 PSD Permit for Greenhouse Gas Pollutants permitted for the emission units maximum firing rate of 8,760 hours per year.

- To comply with *Executive Order 11988*, *Floodplain Management*, FEMA is required to follow the procedure outlined in 44 CFR Part 9 to assure that alternatives to the proposed action have been considered. This procedure, also known as the Executive Order 11988 - Floodplain Management Eight-Step Decision Making Process, has been completed for the proposed action and is included in Appendix A.

- The UTMB campus is located in the designated Texas Coastal Management Zone. Based on a review of the Coastal Coordination Council, General Concurrence #5, FEMA has determined that this project is consistent with the goals and policies of the Texas Coastal Management Program and consistency review procedures as implemented by the Texas General Land Office.

- FEMA personnel would coordinate with the floodplain administrator for the City of Galveston, Department of Planning and Community Development to ensure the Proposed Action would be in compliance with the City of Galveston Flood Damage Prevention Ordinance.

- FEMA has determined that Morgan Hall and Nolan Hall meet National Register Criteria C as an example of mid-century modern style residences for the UTMB campus. In addition, FEMA believes the dormitories are significant at the local level. They were part of the UTMB campus expansion during the mid-20th century. While many of the buildings constructed during this period on the campus no longer remain, Morgan Hall and Nolan Hall are almost entirely intact. In addition, FEMA, in consultation with SHPO, determined that the original Galveston Seawall is individually eligible for listing in the National Register of Historic Places and that both Undertakings would have an adverse effect on the historic properties. An MOA has been prepared between FEMA, the Texas State Historic Preservation Office (SHPO), the Texas Department of Emergency Management (TDEM), and UTMB (Appendix D). The MOA has established the treatment measures to mitigate the adverse effect to historic properties. These treatment measures include a recordation of buildings and a historical narrative.

- The EPA National Emission Standards for Hazardous Air Pollutants (NESHAP) require that prior to renovation or demolition a survey be conducted to determine the presence of asbestos. This survey has been conducted for this project. The Asbestos Program of the Texas Department of State Health Service (DSHS) regulates the removal of asbestos from public buildings within the state. The two main sets of rules and regulations enforced by DSHS are the Texas Asbestos Health Protection Rules (TAHPR) and the Federal NESHAP. Both of these regulations require that written notification be submitted before beginning renovation or demolition projects. The DSHS Demolition/Renovation form combines the requirements of the NESHAP and the TAHPR. The DSHS has been (asbestos survey has been completed) and would be notified (asbestos abatement) of this work. Asbestos abatement would be performed by a licensed asbestos abatement contractor who would determine the appropriate removal and containment process.

- In the February 21, 2012, Federal Register (77 FR 10184-10290), the U.S. Army Corps of Engineers announced the reissuance of 48 existing Nationwide Permits (NWPs) and the issuance of two new NWPs. The regional conditions for Texas have been finalized and are intended to provide additional protection of the aquatic environment by ensuring that the NWPs authorize only those activities with minimal adverse effects on the aquatic environment. Regional conditions help ensure protection of high value waters within the districts. The natural gas pipeline would need to meet the General and Regional Conditions for a NWP-12. The permit would be submitted to the U.S. Army Corps of Engineers after the project has been completed. The U.S. Army Corps of Engineers would only need to be contacted prior to construction if a Pre-Construction Notification is required. It is the responsibility of the Applicant to determine if a Pre-Construction Notification is required. UTMB would be responsible for following the NWP-12 General and Regional Conditions and submitting the permit after the completion of construction.

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7.0 PUBLIC INVOLVEMENT

The Initial Public Notice concerning FEMA actions located in or that may affect wetland areas or the 100-year floodplain, and critical actions within the 500-year floodplain was published in Galveston County on October 19, 2008.

UTMB will provide additional notification to the public of the availability of the draft EA through publication of a Final Floodplain Notice and Notice of Availability for the Draft Environmental Assessment for the proposed project in the Galveston County Daily News informing the public of FEMA's decision to proceed with the project. In the notice, the public was invited to comment on the proposed action for a period of 10 days that commenced on February 4, 2013. The Draft EA and the Public Notice was also made available on the FEMA and UTMB websites at https://www.fema.gov/environmental-documents-and-public-notices-in-region-vi and http://www.utmb.edu/, respectively. In addition, the Draft EA will be available at the following Galveston County Public Libraries:

Dickinson Public Library
1837 Hwy 517 E
Dickinson, TX 77539

Rosenberg Library
2310 Sealy Ave
Galveston, TX 77550

Genevieve Miller Hitchcock Public Library
8005 Barry Ave
Hitchcock, TX 77563

La Marque Public Library
1011 Bayou Rd
La Marque, TX 77568

Helen Hall Library
100 W Walker St
League City, TX 77573

Mae S. Bruce Library
13302 6th St
Santa Fe, TX 77510

Moore Memorial Public Library
1701 9th Ave N
Texas City, TX 77590

Friendswood Public Library
416 S Friendswood Dr.
Friendswood, TX 7754

A copy of the Public Notice is attached in Appendix E. The Final EA will include a summation of comments received on the DEA.

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8.0 CONCLUSION

The findings of this Draft Environmental Assessment provide the analysis necessary to demonstrate that there are no significant environmental impacts to the human or natural environment from the proposed District Heating and Cooling Project. Therefore, it is anticipated that the proposed action will meet the requirements for a FONSI under NEPA and the preparation of an EIS will not be required.

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10.0 LIST OF PREPARERS

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CHARLES PERGLER
Affiliation: Tetra Tech, Inc., Senior Program Manager / NEPA Project Manager
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Alan Hermely, FEMA Region 6, Environmental Specialist

Leah Anderson, FEMA Region 6, Deputy Environmental Officer

Ashley Bechtold, FEMA Region 6, Historic Preservation Specialist

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APPENDIX A: PIT LOCATIONS

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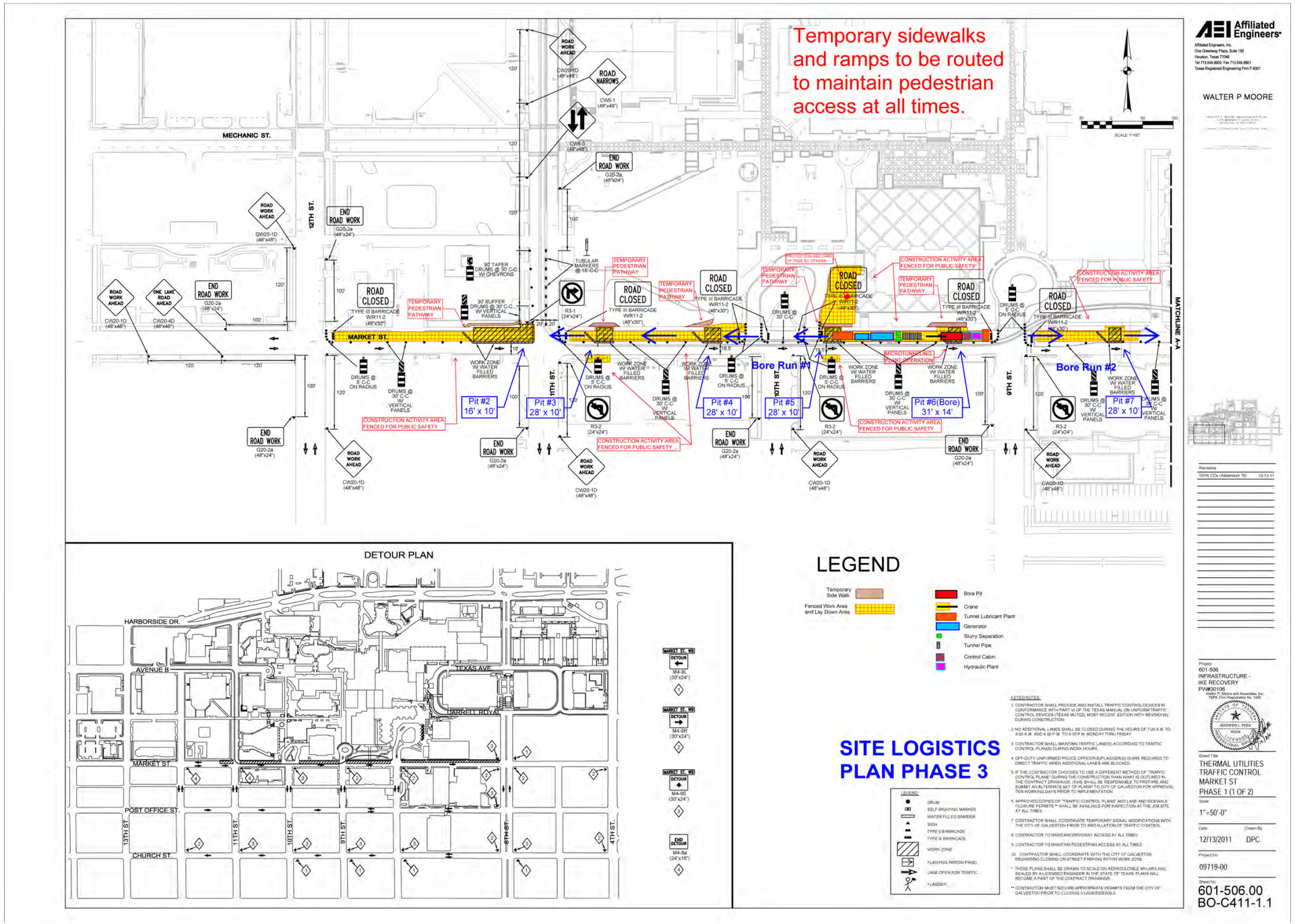
Temporary sidewalks and ramps to be routed to maintain pedestrian access at all times.
MECHANIC ST.
MARKET ST.
12TH ST.
11TH ST.
10TH ST.
9TH ST.
MATCHLINE A-A
Bore Run #1
Bore Run #2
Pit #2 16' x 10'
Pit #3 28' x 10'
Pit #4 28' x 10'
Pit #5 28' x 10'
Pit #6(Bore) 31' x 14'
Pit #7 28' x 10'
ROAD CLOSED
END ROAD WORK
ROAD WORK AHEAD
ROAD NARROWS
ONE LANE ROAD AHEAD
TEMPORARY PEDESTRIAN PATHWAY
CONSTRUCTION ACTIVITY AREA FENCED FOR PUBLIC SAFETY
WORK ZONE W/ WATER FILLED BARRIERS
DETOUR PLAN
HARBORSIDE DR.
AVENUE B
TEXAS AVE.
JARRELL ROYAL
POST OFFICE ST.
CHURCH ST.
13TH ST.
4TH ST.
LEGEND
Temporary Side Walk
Fenced Work Areas and Lay Down Area
Bore Pit
Crane
Tunnel Lubricant Plant
Generator
Slurry Separation
Tunnel Pipe
Control Cabin
Hydraulic Plant
SITE LOGISTICS PLAN PHASE 3
KEYED NOTES:
LEGEND:
DRUM
SELF RIGHTING MARKER
WATER FILLED BARRIER
SIGN
TYPE II BARRICADE
TYPE III BARRICADE
WORK ZONE
FLASHING ARROW PANEL
LANE OPEN FOR TRAFFIC
FLAGGER
Affiliated Engineers
WALTER P MOORE
Revisions
100% CDs (Addendum 10) 12-13-11
Project
601-506
INFRASTRUCTURE - IKE RECOVERY
PW#30106
Sheet Title
THERMAL UTILITIES TRAFFIC CONTROL MARKET ST PHASE 1 (1 OF 2)
Scale
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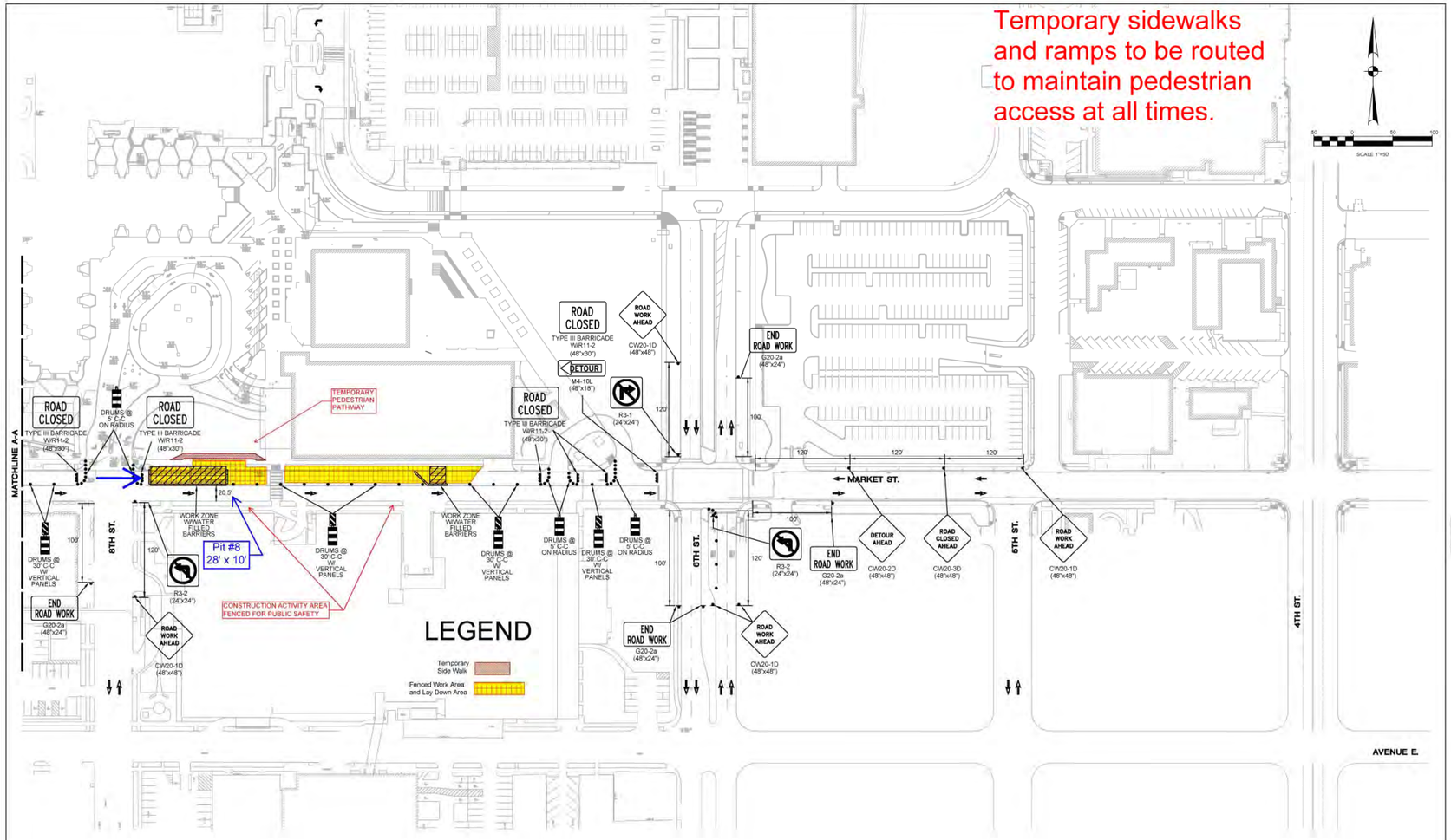
Date 12/13/2011
Drawn By DPC
Project No
09719-00
Sheet No
601-506.00
BO-C411-1.1



SEE DETOUR PLAN
ON SHEET BO-C411-1.1

SITE LOGISTICS PLAN PHASE 3

LEGEND:

- DRUM
- SELF RIGHTING MARKER
- WATER FILLED BARRIER
- SIGN
- TYPE II BARRICADE
- TYPE III BARRICADE
- WORK ZONE
- FLASHING ARROW PANEL
- LANE OPEN FOR TRAFFIC
- FLAGGER

KEYED NOTES:

1. CONTRACTOR SHALL PROVIDE AND INSTALL TRAFFIC CONTROL DEVICES IN CONFORMANICE WITH PART VI OF THE TEXAS MANUAL ON UNIFORM TRAFFIC CONTROL DEVICES (TEXAS MUTCD), MOST RECENT EDITION (WITH REVISIONS) DURING CONSTRUCTION
2. NO ADDITIONAL LANES SHALL BE CLOSED DURING THE HOURS OF 7:00 A.M. TO 9:00 A.M. AND 4:00 P.M. TO 6:00 P.M. MONDAY THRU FRIDAY
3. CONTRACTOR SHALL MAINTAIN TRAFFIC LANE(S) ACCORDING TO TRAFFIC CONTROL PLAN(S) DURING WORK HOURS:
4. OFF-DUTY UNIFORMED POLICE OFFICER(S)/FLAGGER(S) IS/ARE REQUIRED TO DIRECT TRAFFIC WHEN ADDITIONAL LANES ARE BLOCKED.
5. IF THE CONTRACTOR CHOOSES TO USE A DIFFERENT METHOD OF "TRAFFIC CONTROL PLANS" DURING THE CONSTRUCTION THAN WHAT IS OUTLINED IN THE CONTRACT DRAWINGS, (S)HE SHALL BE RESPONSIBLE TO PREPARE AND SUBMIT AN ALTERNATE SET OF PLANS* TO CITY OF GALVESTON FOR APPROVAL TEN WORKING DAYS PRIOR TO IMPLEMENTATION.
6. APPROVED COPIES OF "TRAFFIC CONTROL PLANS" AND LANE AND SIDEWALK CLOSURE PERMITS ** SHALL BE AVAILABLE FOR INSPECTION AT THE JOB SITE AT ALL TIMES.
7. CONTRACTOR SHALL COORDINATE TEMPORARY SIGNAL MODIFICATIONS WITH THE CITY OF GALVESTON PRIOR TO INSTALLATION OF TRAFFIC CONTROL.
8. CONTRACTOR TO MAINTAIN DRIVEWAY ACCESS AT ALL TIMES.
9. CONTRACTOR TO MAINTAIN PEDESTRIAN ACCESS AT ALL TIMES.
10. CONTRACTOR SHALL COORDINATE WITH THE CITY OF GALVESTON REGARDING CLOSING ON-STREET PARKING WITHIN WORK ZONE.

* THESE PLANS SHALL BE DRAWN TO SCALE ON REPRODUCIBLE MYLARS AND SEALED BY A LICENSED ENGINEER IN THE STATE OF TEXAS. PLANS WILL BECOME A PART OF THE CONTRACT DRAWINGS.

** CONTRACTOR MUST SECURE APPROPRIATE PERMITS FROM THE CITY OF GALVESTON PRIOR TO CLOSING A LANE/SIDEWALK.

AEI Affiliated Engineers
Affiliated Engineers, Inc.
One Greenway Plaza, Suite 150
Houston, Texas 77046
Tel 713.548.8900 Fax 713.548.8901
Texas Registered Engineering Firm F-8301

WALTER P MOORE

Revisions
100% CDs (Addendum 16) 12-13-11

Project
601-506
INFRASTRUCTURE - IKE RECOVERY
PW#30106
Walter P. Moore and Associates, Inc.
TBPE Firm Registration No. 1858

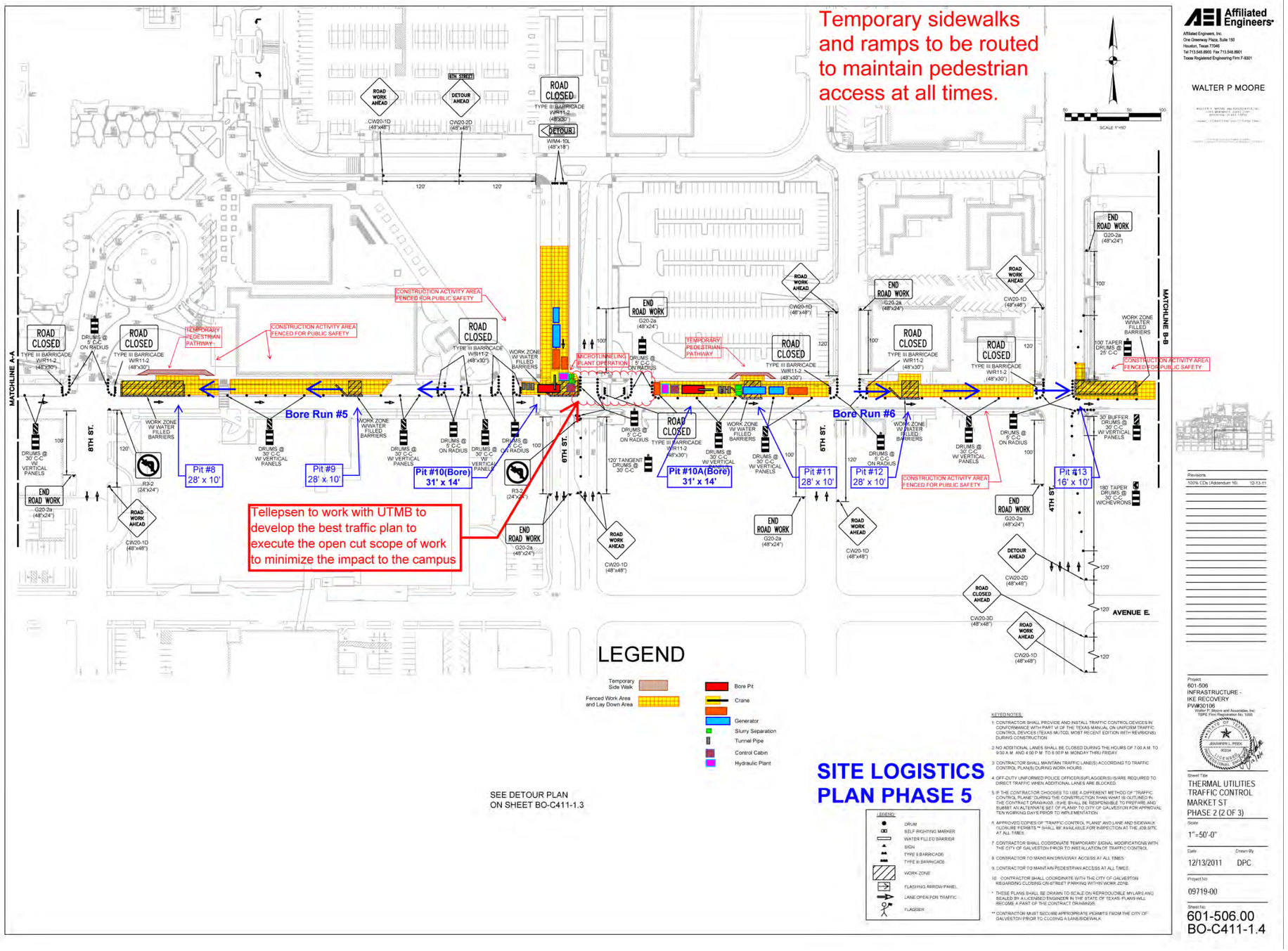
Sheet Title
THERMAL UTILITIES
TRAFFIC CONTROL
MARKET ST
PHASE 1 (2 OF 2)

Scale
1"=50'-0"

Date 12/13/2011 Drawn By DPC

Project No.
09719-00

Sheet No.
601-506.00
BO-C411-1.2


Temporary sidewalks and ramps to be routed to maintain pedestrian access at all times.
Tellepsen to work with UTMB to develop the best traffic plan to execute the open cut scope of work to minimize the impact to the campus
Bore Run #5
Bore Run #6
Pit #8 28' x 10'
Pit #9 28' x 10'
Pit #10(Bore) 31' x 14'
Pit #10A(Bore) 31' x 14'
Pit #11 28' x 10'
Pit #12 28' x 10'
Pit #13 16' x 10'
8TH ST.
6TH ST.
4TH ST.
AVENUE E.
MATCHLINE A-A
MATCHLINE B-B
CONSTRUCTION ACTIVITY AREA FENCED FOR PUBLIC SAFETY
TEMPORARY PEDESTRIAN PATHWAY
ROAD CLOSED
END ROAD WORK
ROAD WORK AHEAD
DETOUR AHEAD
ROAD CLOSED AHEAD
LEGEND
Temporary Side Walk
Fenced Work Area and Lay Down Area
Bore Pit
Crane
Generator
Slurry Separation
Tunnel Pipe
Control Cabin
Hydraulic Plant
SEE DETOUR PLAN ON SHEET BO-C411-1.3
SITE LOGISTICS PLAN PHASE 5
Affiliated Engineers
WALTER P MOORE
Revisions
100% CDs (Addendum 16) 12-13-11
Project
601-506
INFRASTRUCTURE - IKE RECOVERY
PW#30106
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Sheet No
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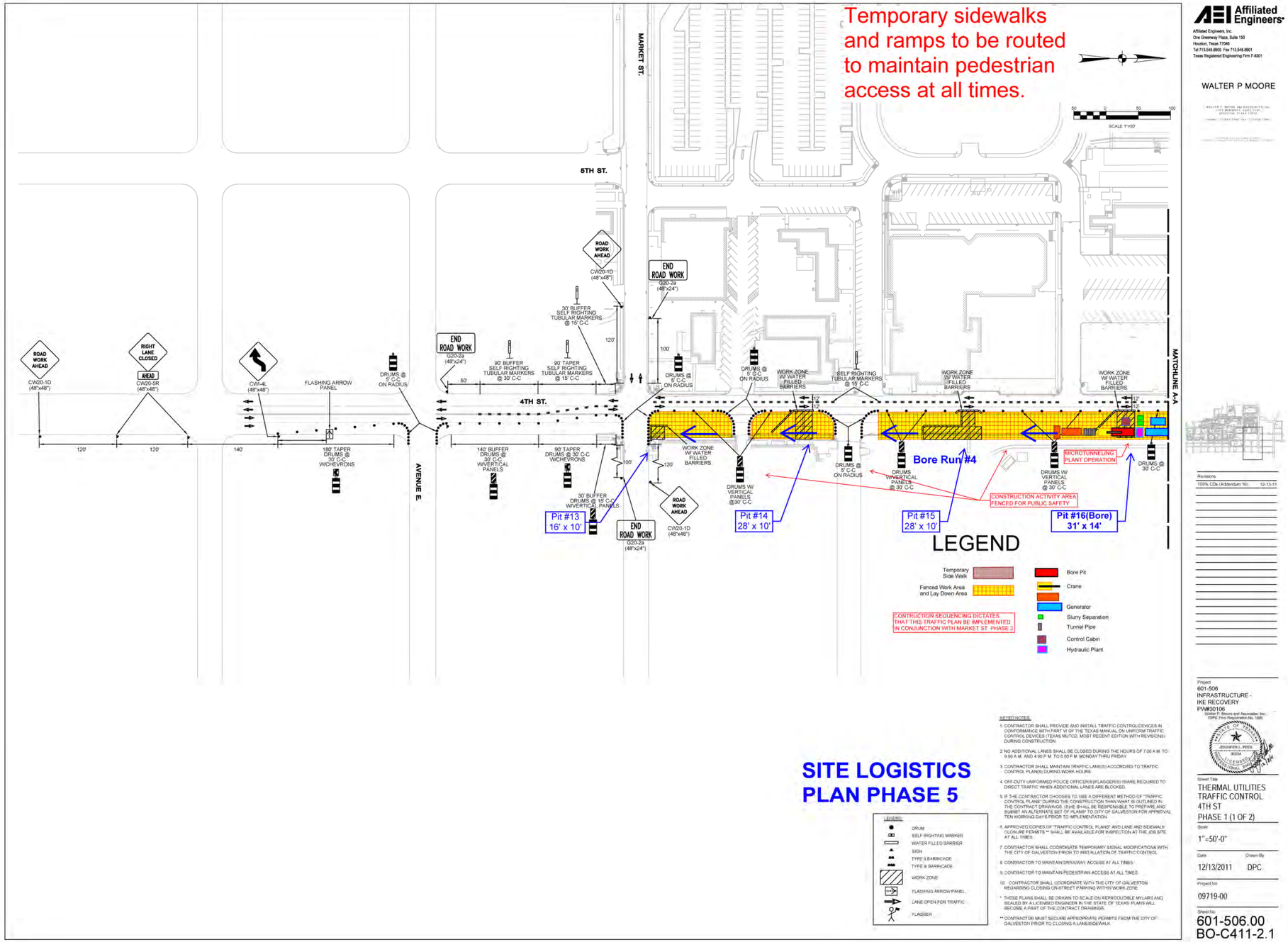
Temporary sidewalks and ramps to be routed to maintain pedestrian access at all times.
MARKET ST.
5TH ST.
4TH ST.
AVENUE E.
MATCHLINE A-A
ROAD WORK AHEAD
CW20-1D (48"x48")
RIGHT LANE CLOSED
AHEAD
CW20-5H (48"x48")
CW1-4L (48"x48")
FLASHING ARROW PANEL
DRUMS @ 5' C-C ON RADIUS
END ROAD WORK
G20-2a (48"x24")
90' BUFFER SELF RIGHTING TUBULAR MARKERS @ 30' C-C
90' TAPER SELF RIGHTING TUBULAR MARKERS @ 15' C-C
30' BUFFER SELF RIGHTING TUBULAR MARKERS @ 15' C-C
180' TAPER DRUMS @ 30' C-C W/CHEVRONS
140' BUFFER DRUMS @ 30' C-C W/VERTICAL PANELS
90' TAPER DRUMS @ 30' C-C W/CHEVRONS
30' BUFFER DRUMS @ 15' C-C W/VERTICAL PANELS
WORK ZONE W/ WATER FILLED BARRIERS
DRUMS W/ VERTICAL PANELS @30' C-C
Bore Run #4
MICROTUNNELING PLANT OPERATION
CONSTRUCTION ACTIVITY AREA FENCED FOR PUBLIC SAFETY
Pit #13 16' x 10'
Pit #14 28' x 10'
Pit #15 28' x 10'
Pit #16(Bore) 31' x 14'
LEGEND
Temporary Side Walk
Fenced Work Area and Lay Down Area
Bore Pit
Crane
Generator
Slurry Separation
Tunnel Pipe
Control Cabin
Hydraulic Plant
CONTRUCTION SEQUENCING DICTATES THAT THIS TRAFFIC PLAN BE IMPLEMENTED IN CONJUNCTION WITH MARKET ST. PHASE 2
SITE LOGISTICS PLAN PHASE 5
KEYED NOTES:
1. CONTRACTOR SHALL PROVIDE AND INSTALL TRAFFIC CONTROL DEVICES IN CONFORMANCE WITH PART VI OF THE TEXAS MANUAL ON UNIFORM TRAFFIC CONTROL DEVICES (TEXAS MUTCD, MOST RECENT EDITION WITH REVISIONS) DURING CONSTRUCTION.
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6. APPROVED COPIES OF "TRAFFIC CONTROL PLANS" AND LANE AND SIDEWALK CLOSURE PERMITS ** SHALL BE AVAILABLE FOR INSPECTION AT THE JOB SITE AT ALL TIMES.
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8. CONTRACTOR TO MAINTAIN DRIVEWAY ACCESS AT ALL TIMES.
9. CONTRACTOR TO MAINTAIN PEDESTRIAN ACCESS AT ALL TIMES.
10. CONTRACTOR SHALL COORDINATE WITH THE CITY OF GALVESTON REGARDING CLOSING ON-STREET PARKING WITHIN WORK ZONE.
* THESE PLANS SHALL BE DRAWN TO SCALE ON REPRODUCIBLE MYLARS AND SEALED BY A LICENSED ENGINEER IN THE STATE OF TEXAS. PLANS WILL BECOME A PART OF THE CONTRACT DRAWINGS.
** CONTRACTOR MUST SECURE APPROPRIATE PERMITS FROM THE CITY OF GALVESTON PRIOR TO CLOSING A LANE/SIDEWALK.
LEGEND:
DRUM
SELF RIGHTING MARKER
WATER FILLED BARRIER
SIGN
TYPE II BARRICADE
TYPE III BARRICADE
WORK ZONE
FLASHING ARROW PANEL
LANE OPEN FOR TRAFFIC
FLAGGER
Affiliated Engineers
Affiliated Engineers, Inc.
One Greenway Plaza, Suite 150
Houston, Texas 77046
Tel 713.548.8900 Fax 713.548.8901
Texas Registered Engineering Firm F-8301
WALTER P MOORE
Revisions:
100% CDs (Addendum 10): 12-13-11
Project:
601-506
INFRASTRUCTURE - IKE RECOVERY
PW#30106
Walter P. Moore and Associates Inc.
TBPE Firm Registration No. 1005
JENNIFER L. PEEK
Sheet Title
THERMAL UTILITIES TRAFFIC CONTROL 4TH ST PHASE 1 (1 OF 2)
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12/13/2011
Drawn By
DPC
Project No
09719-00
Sheet No
601-506.00
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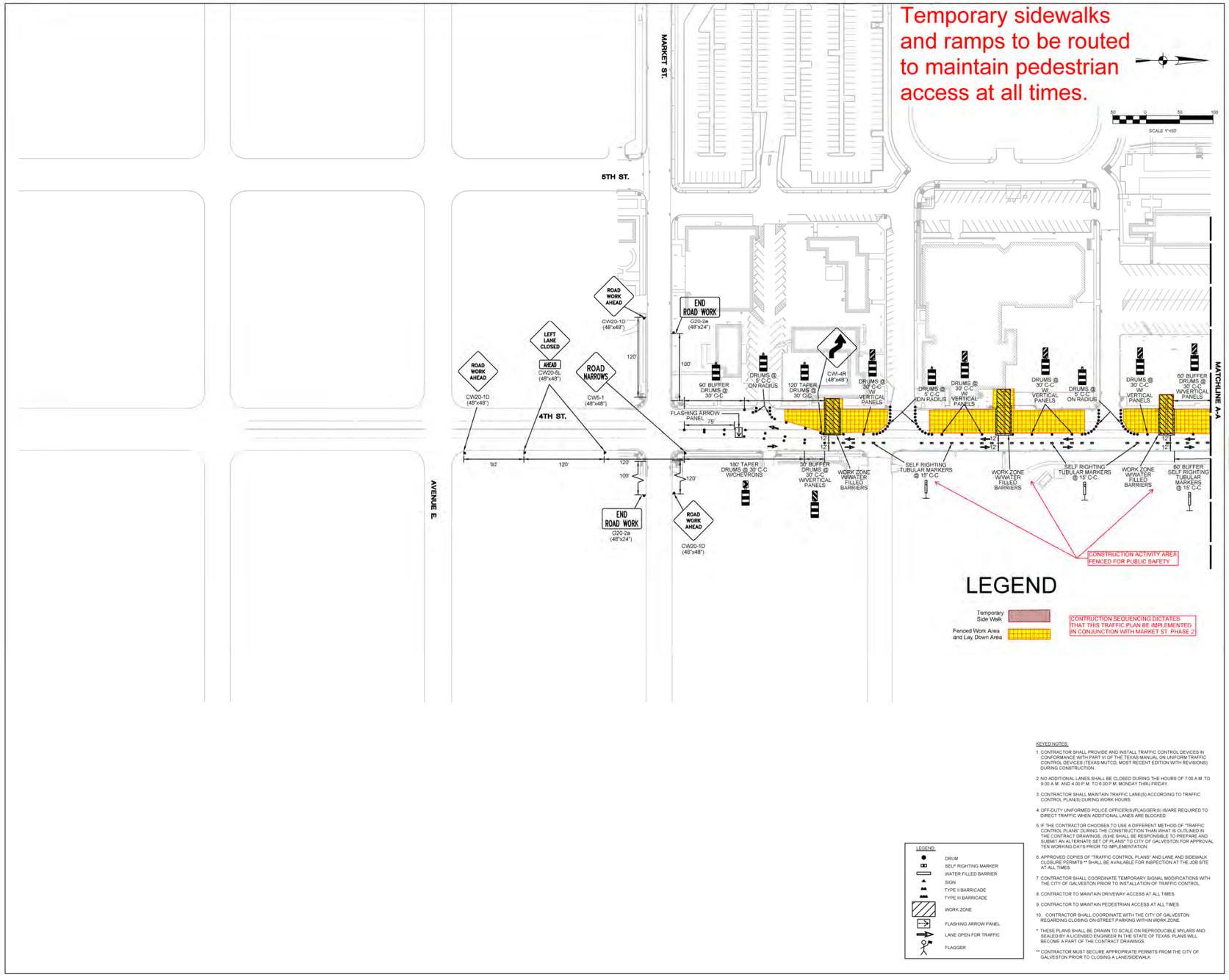
Temporary sidewalks and ramps to be routed to maintain pedestrian access at all times.
MARKET ST.
5TH ST.
4TH ST.
AVENUE E.
MATCHLINE A-A
ROAD WORK AHEAD
CW20-1D (48"x48")
LEFT LANE CLOSED
AHEAD
CW20-5L (48"x48")
ROAD NARROWS
CW5-1 (48"x48")
END ROAD WORK
G20-2a (48"x24")
90' BUFFER DRUMS @ 30' C/C
DRUMS @ 5' C.C. ON RADIUS
120' TAPER DRUMS @ 30' C/C
CW-4R (48"x48")
DRUMS @ 30' C/C W/ VERTICAL PANELS
FLASHING ARROW PANEL
180' TAPER DRUMS @ 30' C/C W/CHEVRONS
30' BUFFER DRUMS @ 30' C/C W/VERTICAL PANELS
WORK ZONE W/WATER FILLED BARRIERS
SELF RIGHTING TUBULAR MARKERS @ 15' C/C
60' BUFFER DRUMS @ 30' C/C W/VERTICAL PANELS
CONSTRUCTION ACTIVITY AREA FENCED FOR PUBLIC SAFETY
LEGEND
Temporary Side Walk
Fenced Work Area and Lay Down Area
CONTRUCTION SEQUENCING DICTATES THAT THIS TRAFFIC PLAN BE IMPLEMENTED IN CONJUNCTION WITH MARKET ST PHASE 2
SCALE 1"=50'
LEGEND
DRUM
SELF RIGHTING MARKER
WATER FILLED BARRIER
SIGN
TYPE II BARRICADE
TYPE III BARRICADE
WORK ZONE
FLASHING ARROW PANEL
LANE OPEN FOR TRAFFIC
FLAGGER
KEYED NOTES:
1. CONTRACTOR SHALL PROVIDE AND INSTALL TRAFFIC CONTROL DEVICES IN CONFORMANCE WITH PART VI OF THE TEXAS MANUAL ON UNIFORM TRAFFIC CONTROL DEVICES (TEXAS MUTCD; MOST RECENT EDITION WITH REVISIONS) DURING CONSTRUCTION.
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Affiliated Engineers
Affiliated Engineers, Inc.
One Greenway Plaza, Suite 150
Houston, Texas 77046
Tel 713.548.8900 Fax 713.548.8901
Texas Registered Engineering Firm F-8301
WALTER P MOORE
Revisions
100% CDs (Addendum 10): 12-13-11
Project
601-506
INFRASTRUCTURE - IKE RECOVERY
PW#30106
Walter P. Moore and Associates, Inc.
TBPE Firm Registration No. 1850
JENNIFER L. PEEK
90354
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Sheet No.
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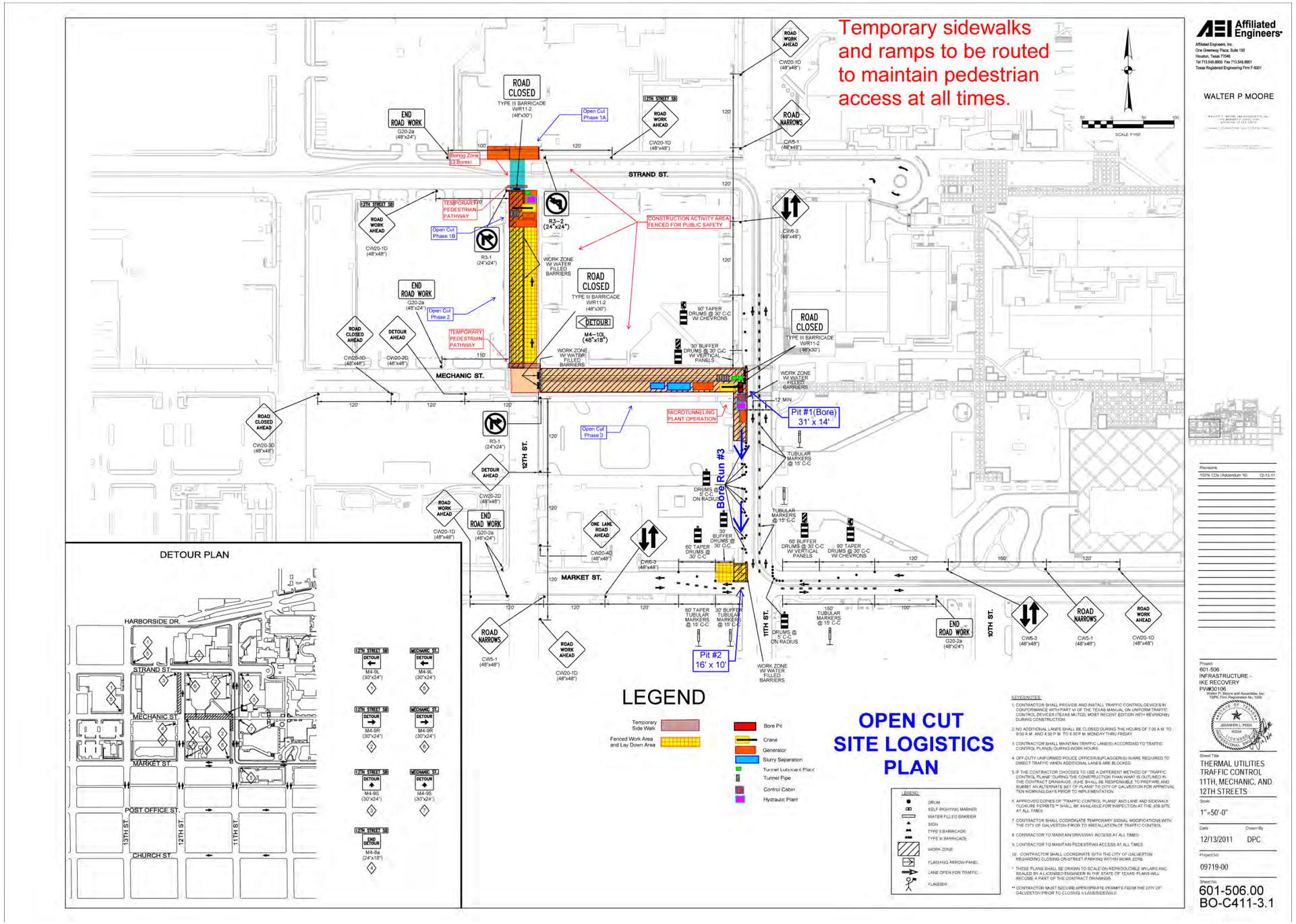
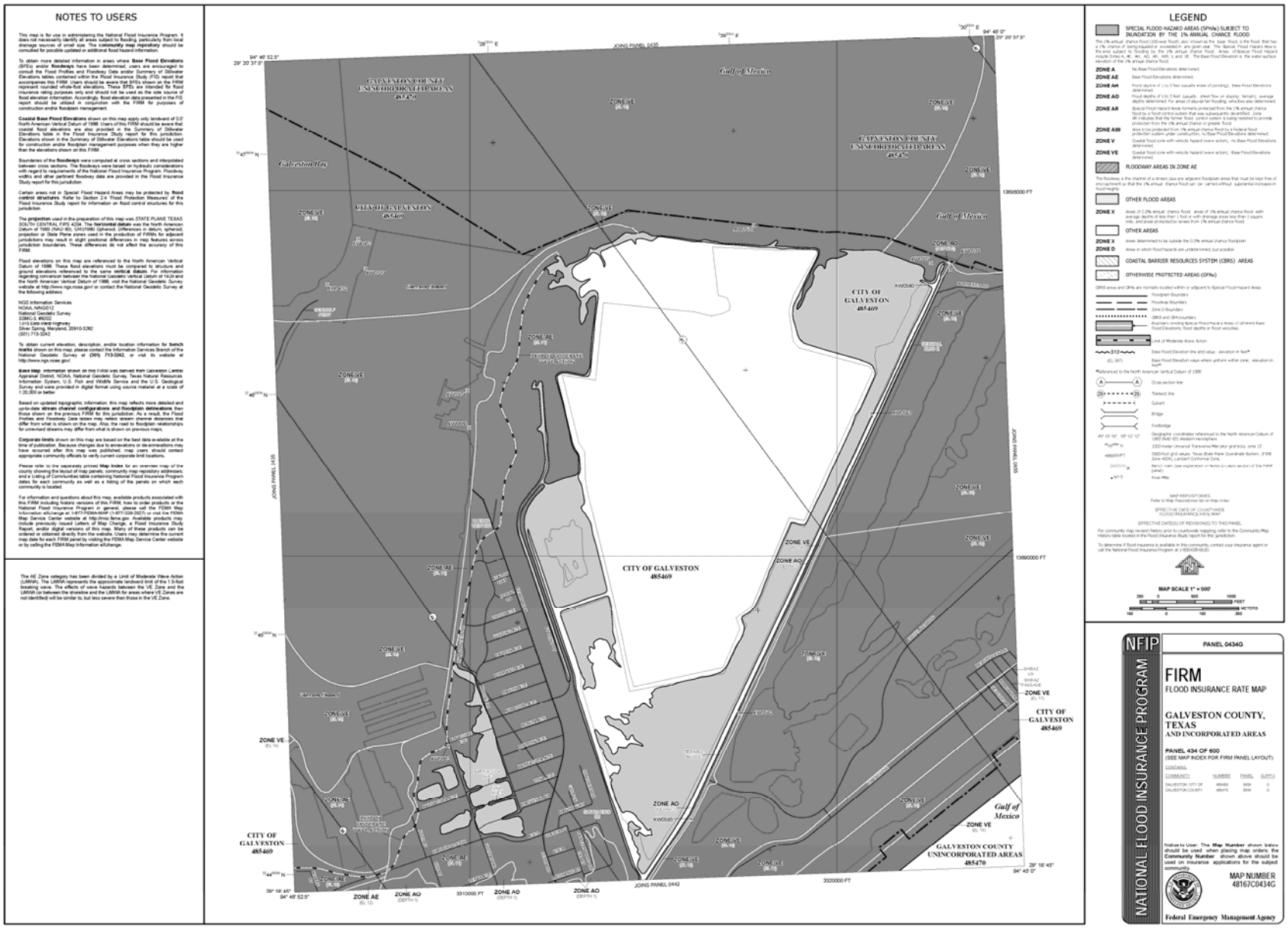

Temporary sidewalks and ramps to be routed to maintain pedestrian access at all times.
Affiliated Engineers
WALTER P MOORE
STRAND ST.
MECHANIC ST.
MARKET ST.
12TH ST.
11TH ST.
10TH ST.
ROAD CLOSED
END ROAD WORK
DETOUR AHEAD
ROAD WORK AHEAD
ROAD NARROWS
ONE LANE ROAD AHEAD
ROAD CLOSED AHEAD
Open Cut Phase 1A
Open Cut Phase 1B
Open Cut Phase 2
Open Cut Phase 3
Borrg Zone (3 Bores)
TEMPORARY PEDESTRIAN PATHWAY
CONSTRUCTION ACTIVITY AREA FENCED FOR PUBLIC SAFETY
WORK ZONE W/ WATER FILLED BARRIERS
MICROTUNNELING PLANT OPERATION
Pit #1(Bore) 31' x 14'
Pit #2 16' x 10'
Bore Run #3
DETOUR PLAN
HARBORSIDE DR.
POST OFFICE ST.
CHURCH ST.
LEGEND
Temporary Side Walk
Fenced Work Area and Lay Down Area
Bore Pit
Crane
Generator
Slurry Separation
Tunnel Lubricant Plant
Tunnel Pipe
Control Cabin
Hydraulic Plant
OPEN CUT SITE LOGISTICS PLAN
Project
601-506
INFRASTRUCTURE - IKE RECOVERY
PW#30106
THERMAL UTILITIES TRAFFIC CONTROL 11TH, MECHANIC, AND 12TH STREETS
Scale
1"=50'-0"
Date
12/13/2011
Drawn By
DPC
Project No
09719-00
Sheet No
601-506.00
BO-C411-3.1

APPENDIX B: FEMA FLOOD INSURANCE RATE MAPS WHICH ARE PENDING ADOPTION - COMMUNITY PANEL NUMBERS 48167C0434G, 48167C0437G, 48167C0441G, AND 48167C0442


NOTES TO USERS
LEGEND
GALVESTON COUNTY UNINCORPORATED AREAS 485470
CITY OF GALVESTON 485469
Gulf of Mexico
Galveston Bay
ZONE VE
ZONE AE
ZONE AO
JOINS PANEL 0435
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JOINS PANEL 0445
JOINS PANEL 0435
13690000 FT
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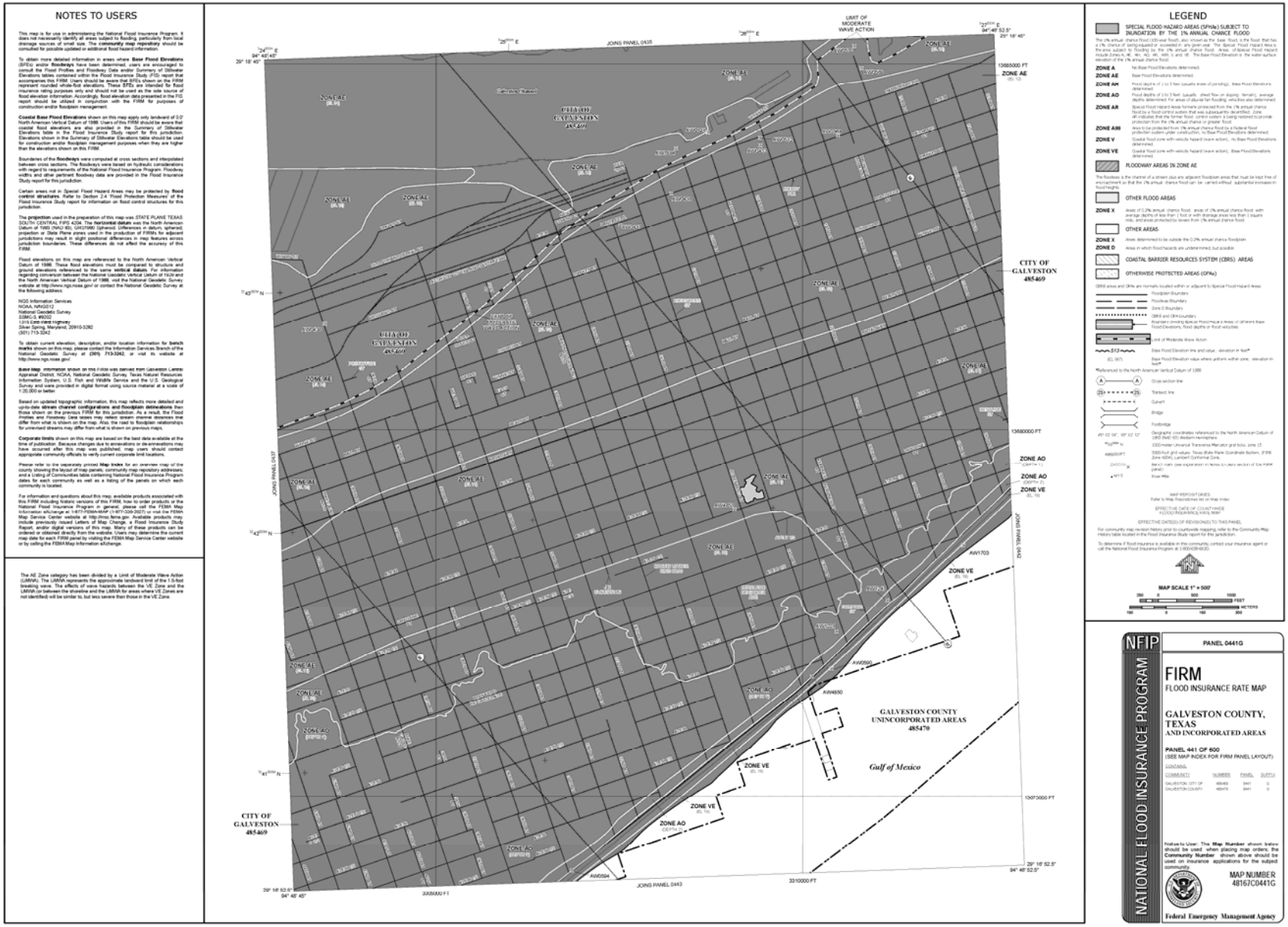
NFIP
NATIONAL FLOOD INSURANCE PROGRAM
PANEL 0434G
FIRM
FLOOD INSURANCE RATE MAP
GALVESTON COUNTY, TEXAS
AND INCORPORATED AREAS
PANEL 434 OF 600
(SEE MAP INDEX FOR FIRM PANEL LAYOUT)
MAP NUMBER
48167C0434G
Federal Emergency Management Agency


NOTES TO USERS
LEGEND
LIMIT OF MODERATE WAVE ACTION
JOINS PANEL 0435
JOINS PANEL 0443
JOINS PANEL 0437
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CITY OF GALVESTON 485469
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NATIONAL FLOOD INSURANCE PROGRAM
PANEL 0441G
FIRM
FLOOD INSURANCE RATE MAP
GALVESTON COUNTY, TEXAS
AND INCORPORATED AREAS
PANEL 441 OF 600
(SEE MAP INDEX FOR FIRM PANEL LAYOUT)
MAP NUMBER
48167C0441G
Federal Emergency Management Agency

NOTES TO USERS
LEGEND
Gulf of Mexico
GALVESTON COUNTY
UNINCORPORATED AREAS
485470
CITY OF GALVESTON
485469
ZONE AE
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JOINS PANEL 0434
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MAP SCALE 1" = 500'
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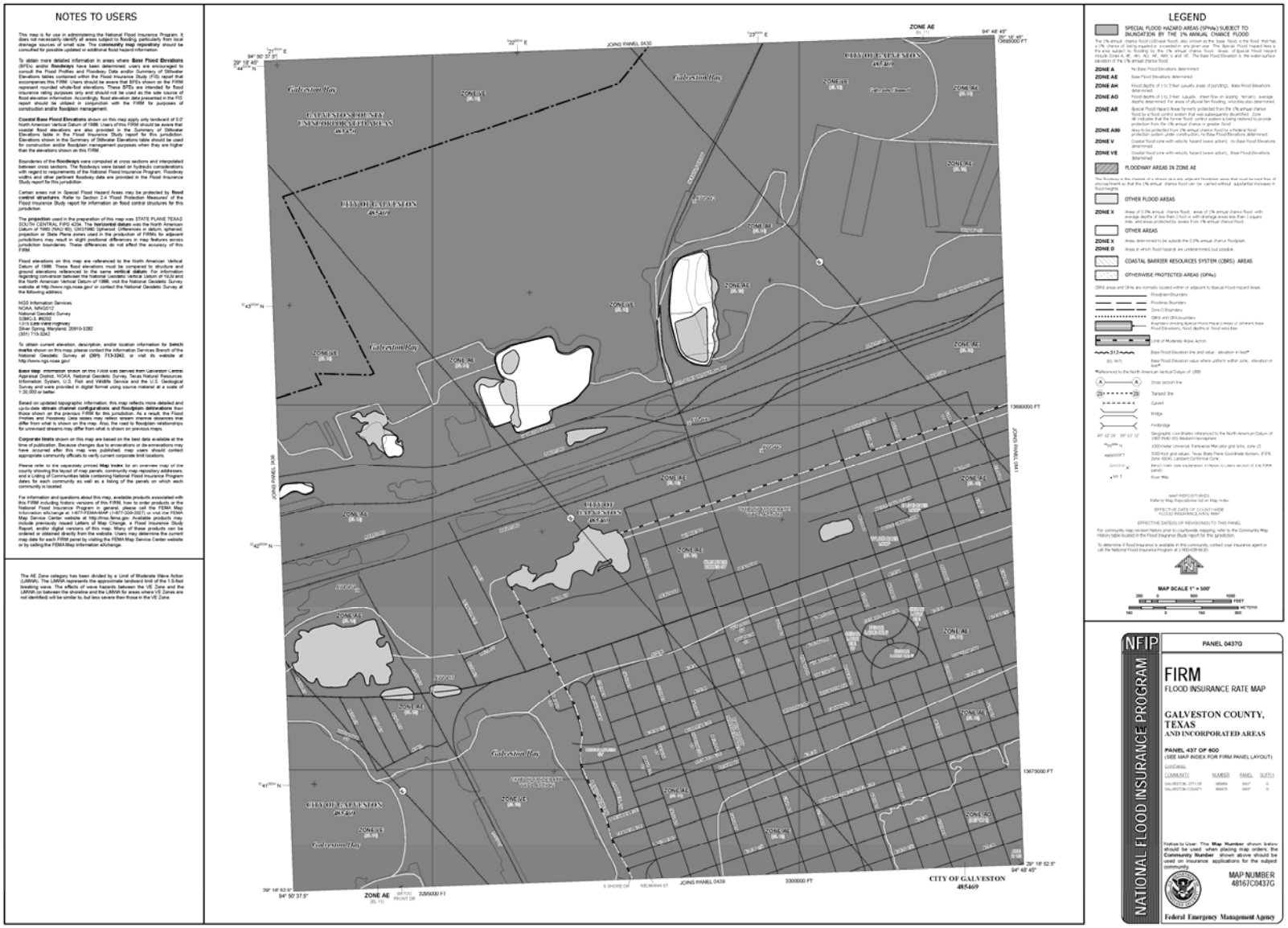
NATIONAL FLOOD INSURANCE PROGRAM
PANEL 0442G
FIRM
FLOOD INSURANCE RATE MAP
GALVESTON COUNTY, TEXAS
AND INCORPORATED AREAS
PANEL 442 OF 600
MAP NUMBER
48167C0442G
Federal Emergency Management Agency


NOTES TO USERS
LEGEND
NFIP
NATIONAL FLOOD INSURANCE PROGRAM
PANEL 0437G
FIRM
FLOOD INSURANCE RATE MAP
GALVESTON COUNTY, TEXAS
AND INCORPORATED AREAS
PANEL 437 OF 600
(SEE MAP INDEX FOR FIRM PANEL LAYOUT)
MAP NUMBER
48167C0437G
Federal Emergency Management Agency
ZONE AE
CITY OF GALVESTON
485469
JOINS PANEL 0430
JOINS PANEL 0439
JOINS PANEL 0436
JOINS PANEL 0438
Galveston Bay
GALVESTON COUNTY
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48167C
CITY OF GALVESTON
485469
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APPENDIX C: EXECUTIVE ORDER 11988 – FLOODPLAIN MANAGEMENT EIGHT-STEP DECISION MAKING PROCESS

UNIVERSITY OF TEXAS MEDICAL BRANCH AT GALVESTON, TEXAS PROPOSED DISTRICT HEATING AND COOLING PROJECT
Executive Order 11988 – Floodplain Management
Eight-Step Decision Making Process

Executive Order 11988 (Floodplain Management) requires federal agencies "to avoid to the extent possible the long and short term adverse impacts associated with the occupancy and modification of the floodplain and to avoid direct or indirect support of floodplain development wherever there is a practicable alternative." FEMA's implementing regulations are at 24 CFR Part 9, which includes an eight-step decision-making process for compliance with this part. This eight-step process is applied to the University of Texas Medical Branch at Galveston, Texas (UTMB) proposed modifications to the UTMB campus district heating and cooling system. This project would take place within the 100-year and 500-year floodplains. The steps in the decision making process are as follows:

***Step 1* Determine if the proposed action is located in the Base Floodplain.**

The proposed District Heating and Cooling Project (DHCP) involves the construction of a new thermal utility plant (East Plant), repair of the thermal utility West Plant, installation of heating hot water lines, and installation of cooling chilled water lines within the UTMB campus. The DHCP distribution would retain the undamaged UTMB steam and condensate system currently in place above the special flood hazard area. A component of the project is the construction and operation of a 4.2 mile dedicated natural gas pipeline to UTMB. The plan is evolving but calls for the installation of a dedicated main line from the 59th & Port Industrial city gate to entry points within UTMB. The pipeline would be constructed, maintained, and operated by the Texas Gas Service Company. This dedicated pipeline will segregate UTMB loads from the rest of Galveston Island.

Based on the most recent FEMA Flood Insurance Rate Maps which are pending adoption (Community Panel Numbers 48167C0434G, 48167C0437G, 48167C0441G, and 48167C0442), the construction of this project would take place within the 500-year floodplain. The FEMA 100-year water surface elevation at UTMB is 11.1 feet and the floodplain elevation for a 500-year storm is 14 feet. Federal guidelines promulgated in 44 CFR 9.4 define the new construction or substantial improvement of these facilities as a critical action. Critical action involves activities and facilities that even a slight chance of flooding poses too great a threat. As a result, these actions are given special consideration when formulating regulatory alternatives and floodplain management plans. The East and West Plants and associated distribution lines are classified as "critical actions" as they would serve critical emergency facilities (i.e. hospitals).

***Step 2* Early public notice (Preliminary Notice)**

The Initial Public Notice concerning FEMA actions located in or that may affect wetland areas or the 100-year floodplain, and critical actions within the 500-year floodplain was published in Galveston County on October 19, 2008.

***Step 3* Identify and evaluate alternatives to locating in the base floodplain.**

There are no practical or cost-effective alternatives to accomplish the repair and modifications to the DHCP, including the construction and operation of the dedicated natural gas pipeline, outside of the base floodplain. The repairs and modifications are to an existing system and are designed to prevent or minimize the threat of future damages should a storm similar in size to Hurricane Ike occur.

***Step 4* Identify impacts of proposed action associated with occupancy or modification of the floodplain.**

Impact on natural function of the floodplain

The DHCP Project would not adversely affect the functions and values of the 100-year or 500-year floodplains. The East Plant would be constructed within an area already occupied by numerous large buildings while the West Plant already exists. The heating hot water system, chilled water systems and dedicated natural gas pipeline would be constructed underground resulting in no fill added to the floodplains. Therefore, the project would have no measurable effect on floodplain functions and values as it will not impede or redirect flood flows. The DHCP would not facilitate an increase in population or housing within the UTMB campus nor facilitate development in the 100-year or 500-year floodplains as the project would modify an existing system.

Impact of the floodwater on the proposed facilities

The East Plant would be built with the first level above the Special Flood Hazard Area. Repairs and elevation of critical equipment are proposed for the West Plant. Both plants would have critical functions and components elevated above the 500-year flood stage as defined in the FEMA Flood Insurance Rate elevation maps. Further, the West Plant would have a floodwall constructed to provide additional protection.

The DHCP distribution would retain the undamaged UTMB steam and condensate system currently in place above the special flood hazard area. The heating hot water system would be designed to be in direct contact with saltwater or brackish groundwater. The heating hot water system installed below ground would be constructed of a watertight pre-insulated piping material with polyethylene jacketing. The necessary valves would be ductile iron with appropriate coatings to make them saltwater resistant and intended to be direct buried. The campus underground chilled water system would be partially replaced within the valve pits with new chilled water piping and valves. The chilled water system materials installed below the Base Flood Elevation would be constructed of a watertight pre-insulated piping material with polyethylene jacketing, appropriate for direct contact with salt water or brackish groundwater. The valves would be ductile iron with appropriate coatings to make them saltwater resistant and intended to be direct buried. Similar to the heating and chilled water distribution system the dedicated natural gas pipeline would be saltwater resistant and designed to be direct buried.

***Step 5* Design or modify the proposed action to minimize threats to life and property and preserve its natural and beneficial floodplain values.**

The DHCP is designed to avoid or minimize floodplain impacts. Because the thermal utility plants are located within already highly developed areas and the utility distribution systems,

including the dedicated natural gas pipeline, are located underground the project will have no effect on the natural and beneficial values of the 100-year or 500-year floodplains.

***Step 6* Re-evaluate the proposed action.**

The project will not facilitate development in the floodplains nor aggravate the current flood hazard because the facilities would not impede or redirect flood flows. Floodplain values would not be disrupted as the project will not change water levels in the floodplain or reduce floodplain habitat. Therefore, it is practicable to construct the proposed project within the floodplain.

Alternatives consisting of locating the project outside the floodplain or taking "no action" are not practicable.

***Step 7* Findings and Public Explanation (Final Notification)**

A Final Floodplain Notice and Notice of Availability for the Draft Environmental Assessment for the project will be published in the Galveston County Daily News informing the public of FEMA's decision to proceed with the project.

After evaluating alternatives, including impacts and mitigation opportunities FEMA determined that the proposed project is the most practical alternative.

It is FEMA's determination that there is no practicable alternative to the district heating and cooling system repair and modification or the construction and operation of the dedicated natural gas pipeline in the 100- and 500-year floodplains because:

1. The repair and modification is to the existing district heating and cooling system is already within the flood plain of the UTMB campus and existing utility routes.

2. The construction of the East Plant, repair and modifications to the West Plant, and installation and modification of the distribution system will not adversely affect the functions and values of the 100-year or 500-year floodplains.

3. The DHCP has been designed to function or come back on-line quickly during or after a 100-year or 500-year flood event. Both plants would have critical functions and components elevated above the 500-year flood stage and the distribution lines have been designed to withstand saltwater or brackish water inundation.

4. The Proposed Action is the most cost-effective way to repair and modify the current district heating and cooling system to prevent and further reduce the threat of future damages should a storm similar in size to Hurricane Ike occur.

5. Implementation of the Proposed Action is the most effective way to assure uninterrupted reliability or limit interruption of UTMB's essential health treatment, care, and research operations as a result of future storm events.

A “no action” plan would leave critical UTMB operations vulnerable to future storm events thereby compromising the health care system.

Step 8 **Implement the action**

The proposed DHCP will be constructed in accordance with applicable floodplain development requirements.

APPENDIX D: CITY OF GALVESTON LETTER

City of Galveston

Department of Planning and Community Development

P. O. Box 779 / Galveston, Texas 77553-0779 / Ph (409) 797-3660 / Fax (409) 797-3661

September 13, 2012

Steve LeBlanc
Assistant Vice-President, Facilities Risk Management
The University of Texas Medical Branch

Dear Mr. LeBlanc:

In my capacity as the City of Galveston's Floodplain Manager, I have reviewed the Draft Environmental Assessment (EA) for UTMB's proposed District Heating and Cooling System. The City of Galveston commends UTMB for its mitigation efforts, and supports the proposed mitigation activities and projects described in the Draft EA.

I find no objection to the activities proposed in the Draft EA, nor any conflict between the proposed activities and the City's existing ordinances. I would note, however, that the City does not currently have a freeboard requirement in our Flood Damage Prevention Ordinance, as described in the Draft EA.

If there are any questions, or if you need any additional information, please do not hesitate to contact me.

Regards,

David Ewald
Floodplain Manager, CBO
City of Galveston

APPENDIX E: CULTURAL RESOURCES CORRESPONDENCE

ONEOK

RECEIVED
MAR 28 2011
TEXAS HISTORICAL COMMISSION

FedEx 8696 6713 0474

March 25, 2011

Mr. Bill Martin
Texas Historical Commission
P. O. Box 12276
Austin, TX 78711-2276

REVIEW OF HISTORICAL IMPACT
Linear Natural Gas Pipeline – Galveston Island, Texas
Medical Feed Pipeline Main

Dear Mr. Martin:

Texas Gas Service Company (TGS, a subsidiary of ONEOK, Inc.), has a priority project on Galveston Island. We have been requested to install a new 6 inch natural gas feed to the University of Texas Medical Branch. To expedite this work, TGS will be horizontal directional drilling (HDD) the entire approximate four (4) mile route (Figure1). The only surface disturbances will be to tie in the two connecting pipes between bores.

We have had BCS review the route for preliminary archeological issues (Figure 2). It appears we will be able to skirt any existing features.

Because of the subsurface nature of the construction, current industrial nature of the area and past disturbances, TGS would request your concurrence with initiation of this project.

We certainly appreciate your assistance and look forward to receiving clearance for the project. If you have any questions concerning the enclosed material, please contact me at 918-732-1315.

Sincerely,

Ron G Carver

R. G. Carver, P.E.
ONEOK, Inc.
Senior Environmental Engineer

ANTIQUITIES CODE OF TEXAS REVIEW
NO SURVEY REQUIRED
PROJECT MAY PROCEED
by Mark H Wolfe
for Mark Wolfe
Executive Director, THC
Date 4-14-11
Track# 201110721

Enclosures

xc: Galveston Medical Feed PL

100 West Fifth Street • Tulsa, OK 74103-4298
P.O. Box 871 • Tulsa, OK 74102-0871
(918) 732-1300 • Fax (918) 732-1399
www.oneok.com

U. S. Department of Homeland Security
FEMA Region 6
800 North Loop 288
Denton, TX 76209-3698

FEMA

November 21, 2012

Reid Nelson, Director
Office of Federal Agency Programs
Advisory Council on Historic Preservation
1100 Pennsylvania Avenue NW, Suite 803
Old Post Office Building
Washington, DC 20004

RE: Notification of Adverse Effect to Historic Properties
Federal Emergency Management Agency (FEMA),
University of Texas Medical Branch, District Heating and Cooling Project
Galveston County, Galveston, TX

Dear Mr. Nelson:

The Federal Emergency Management Agency (FEMA), Region VI proposes to provide Public Assistance (PA) grant funds as authorized under the Robert T. Stafford Disaster Relief and Emergency Assistance Act, P.L. 93-288, as amended, to the University of Texas Medical Branch, Texas (UTMB Galveston campus) through the Texas Division of Emergency Management (TDEM) for the proposed District Heating and Cooling project, which includes the demolition of Nolan Hall and the removal of a portion of the original Galveston Seawall (Undertaking).

FEMA Region VI is notifying the Advisory Council on Historic Preservation (ACHP) of an adverse effect to historic properties due to the proposed Undertaking in accordance with 36 CFR 800.6(a)(1). We believe that this project meets the criteria for ACHP participation as outlined in 36 CFR 800.6(a)(1)(i).

UTMB is proposing a campus wide district heating and cooling system that will provide chilled water, hot water and/or steam that is piped underground or overhead from the central and west utility plants to 49 individual buildings on the campus. This project will require the demolition of a mid-century dormitory and the removal of a portion of the original Galveston Seawall. In accordance with the Programmatic Agreement between FEMA Region VI, TDEM, and Texas State Historic Preservation Office (SHPO), FEMA initiated Section 106 review on the Undertaking. After review of documentation provided by Witt Associates and the University of Texas Medical Branch, it was determined that the demolition of Nolan Hall and the removal of a portion of the Galveston Seawall is necessary in order for UTMB to install a new heating and cooling system throughout the UTMB campus.

Reid Nelson
November 21, 2012
Page 2

Prior consultation between the SHPO and FEMA dated September 17, 2009 and July 23, 2012 indicated that Nolan Hall is **Eligible** for listing in the National Register of Historic Places. FEMA determines this dormitory complex meets National Register Criteria C as a collection of mid-century modern style residences for the UTMB campus. In addition, FEMA feels this dormitory complex is significant at the local level. These dormitories were part of the UTMB campus expansion during the mid-20th century. While many of the buildings constructed during this period on the campus no longer remain, the dormitory complex is almost entirely intact with seven of the eight buildings remaining with minimum exterior alterations consisting of replacement of exterior doors and the addition of ADA compliant ramps. All original windows are still intact. FEMA determined that the demolition of Nolan Hall would be an **Adverse Effect** to historic properties. SHPO concurred with this determination on August 10, 2012.

The Galveston Seawall is currently listed on the National Register. However, the current nomination form does not clarify whether the buried portion of the original Galveston Seawall is included in the listing. In a letter dated July 13, 2012 from the Texas State Historic Preservation Office (SHPO) it was determined that the buried portion of the Seawall is also **Eligible** for listing in the National Register. UTMB is proposing to remove an approximate 10' wide x 9' deep portion of the wall in order to compensate for the installation of heating and cooling piping. The prior removal of 265 linear feet (Clinical Service Wing Project) of this structure destroyed a significant amount of this historic resource and the integrity of the original Galveston Seawall continues to be compromised by the additional removal of a 10' x 9' section. FEMA determines that the removal of this section will be an **Adverse Effect** to historic properties. SHPO concurred with this determination on November 13, 2012.

It is important to note that FEMA, and its applicants, including the Texas Division of Emergency Management and UTMB will be addressing the prior removal of the 265 linear feet of the original Galveston Seawall in a separate explanatory memorandum. This will be addressed to your attention in the near future.

We have enclosed copies of all correspondence conducted to date and photographs of the buildings. Please see the District and Heating and Cooling system consultation letter for a complete scope of work on the project.

We look forward to receiving the ACHP's response within 15 days of receipt of this letter. Should you need additional information please feel free to contact me or Ms. Ashley Bechtold, Historic Preservation Specialist, at 940-268-9518 or via email at ashley.bechtold@fema.dhs.gov.

Sincerely,

Kevin Jaynes
Regional Environmental Officer
FEMA Region VI

Reid Nelson
November 21, 2012
Page 3

cc: John Ketchum, FEMA Federal Preservation Officer
Mark Wolfe, Texas State Historic Preservation Officer

Enclosures
Previous consultations and correspondence with Texas SHPO

APPENDIX F: MEMORANDUM OF AGREEMENT

MEMORANDUM OF AGREEMENT
AMONG
THE U.S. DEPARTMENT OF HOMELAND SECURITY,
FEDERAL EMERGENCY MANAGEMENT AGENCY;
THE TEXAS STATE HISTORIC PRESERVATION OFFICER;
THE TEXAS DEPARTMENT OF PUBLIC SAFETY/TEXAS DIVISION OF EMERGENCY MANAGEMENT; AND
THE UNIVERSITY OF TEXAS MEDICAL BRANCH; REGARDING
THE DEMOLITION OF MORGAN HALL, NOLAN HALL AND A PORTION OF THE ORIGINAL GALVESTON SEAWALL
LOCATED AT 414 & 502 TEXAS AVENUE &
THE INTERSECTION OF SIXTH AND MARKET STREETS, GALVESTON, TX

WHEREAS, the Federal Emergency Management Agency (FEMA) of the Department of Homeland Security, pursuant to Sections 404 and 406 of the Robert T. Stafford Disaster Relief and Emergency Assistance Act (42 U.S.C. §5121-5206) and implementing regulations in Title 44 of the Code of Federal Regulations (44 CFR Part 206), proposes to provide Public Assistance and Hazard Mitigation Assistance to the University of Texas Medical Branch (UTMB) through the Texas Department of Public Safety/Texas Division of Emergency Management (TXDPS/TDEM) in response to damages caused by Hurricane Ike (DR-1791-TX) and in response to UTMB's proposal for a District Heating and Cooling project (Undertakings). The Public Assistance portion of the project will include the demolition of Morgan Hall and a portion of the buried original Galveston Seawall. The Hazard Mitigation Grant Program (HMGP) portion of the project will include implementing hazard mitigation measures at UTMB's West Plant such as the construction of a floodwall and the installation of chilled water thermal storage; and

WHEREAS, the Undertakings as defined in 36 CFR 800.16 (y) and inclusive of both Public Assistance and Hazard Mitigation Assistance, are UTMB's proposal for a campus wide District Heating and Cooling project that will provide the UTMB Galveston campus with protection of the raw materials, production, and distribution of chilled water, hot water and/or steam that is piped underground or overhead from the Central and West utility plants to the majority of buildings on the campus. A new East Plant will be constructed in the building footprint of Morgan Hall. This East plant will relocate the Central Plant functions. In addition, the proposed thermal distribution path shown in Exhibit A attached to this Memorandum of Agreement (MOA) will run along Market Street and will cross a portion of the buried original Galveston Seawall at the intersection of Market and Sixth Streets. All piping will be in a steel casing that is bored at a depth of fifteen to twenty feet except when the Seawall is encountered. It will be necessary to open cut through the Seawall in order to allow proper clearance around the pipes. This project is directly connected to the demolition of Morgan Hall and the removal of a portion of the buried original Galveston Seawall; and

WHEREAS, UTMB has requested to utilize FEMA funding that was previously approved for the repair of Nolan Hall in an alternate project. This alternate project request includes the demolition of Nolan Hall, Morgan Hall and multiple non-historic buildings on campus; and

WHEREAS, the demolition of Nolan Hall is anticipated, and will occur in support of future UTMB plans and is not part of these FEMA Undertakings. However, all signatories have agreed upon including the Nolan Hall demolition adverse effect and resolution of adverse effect in this MOA; and

WHEREAS, related to the District Heating and Cooling project is a dedicated Natural Gas Pipeline that will be constructed to minimize interruptions to the UTMB service operations. The Natural Gas Pipeline will connect the UTMB campus with a Texas Gas Service terminal located 4.2 miles west, at the 59th and Port Industrial city gate. This pipeline is not a FEMA funded Undertaking, and thus FEMA has no responsibilities in accordance with Section 106 of the National Historic Preservation Act (16 U.S.C. § 470f) (NHPA), and its implementing regulations, 36 CFR Part 800; and

WHEREAS, UTMB consulted with the Texas State Historic Preservation Officer (SHPO) on the Natural Gas Pipeline under the Antiquities Code of Texas and on April 14, 2011, SHPO concurred that no archeological survey was required and the project may proceed; and

WHEREAS, FEMA initiated consultation with the SHPO, in accordance with Section 106 of the NHPA and the Texas Statewide Programmatic Agreement among FEMA, the Texas Historical Commission (THC), and the Governor's Division of Emergency Management (now TXDPS/TDEM) that was executed on August 30, 2005; and

WHEREAS, FEMA, in consultation with the SHPO, determined that the Area of Potential Effects (APE), is shown in Exhibit A attached to this MOA, and includes the entire UTMB campus bounded to the north by Harborside Drive, Twelfth Street to the west, Market Street to the south and Fourth Street to the east. This includes the Standing Structures APE consisting of the entire dormitory complex bounded by Harborside Drive on the north, Fourth Street on the east, Strand Street on the south, and Sixth Street on the west; and FEMA, in consultation with SHPO, has defined the provisional Archaeological APE to include the entire UTMB campus; and

WHEREAS, on July 23, 2012, FEMA, in consultation with SHPO, determined that Morgan Hall and Nolan Hall are eligible for listing in the National Register of Historic Places (NRHP) under Criterion C as part of a collection of mid-twentieth century style dormitories. SHPO concurred with FEMA's determination on August 10, 2012. In addition, the exposed Galveston Seawall is currently listed in the NRHP. However, the National Register nomination did not clarify whether or not the buried portion of the original Galveston Seawall was included in this listing. Therefore, FEMA in consultation with SHPO, determined that the buried portion of the original Galveston Seawall is individually eligible for listing in the NRHP under Criterion A for Community Planning and Development and Criterion C for Engineering. The SHPO response was received on July 13, 2012; and

WHEREAS, FEMA in consultation with SHPO, determined that the adverse effects as defined in 36 CFR 800.5 (a)(1) are the demolition of Nolan Hall, Morgan Hall and the removal of a portion of the original Galveston Seawall; and

WHEREAS, FEMA, in consultation with SHPO, determined that the Standing Structures Area of Potential Effect (APE) is not located within a previously listed or eligible NRHP Historic District. However, the Dormitory complex, which includes Nolan Hall, Morgan Hall, Vinsant Hall, Bethel Hall, Brackenridge Hall, Clay Hall and the Dorm Machine Room, is eligible under Criterion C as a collection of mid-twentieth century style dormitories; and

WHEREAS, FEMA, in consultation with SHPO, determined that the prehistoric archaeological potential of the campus appears low due to prior dispersed fill material, but historic deposits that postdate the construction of the Seawall may be present and there is no guarantee that the fill material is uniformly distributed throughout the project area; and

WHEREAS, an archaeologist meeting the Secretary of the Interior's (SOI) Professional Qualification Standards, as determined by FEMA, will monitor ground disturbing activities as addressed in Stipulation I.G. Seawall Recordation and any archaeological discoveries will be addressed under Stipulation IV., Discoveries and Unanticipated Effects, of this MOA; and

WHEREAS, in accordance with 36 CFR 800.6(a)(1), FEMA notified the Advisory Council on Historic Preservation (ACHP) of its adverse effect determination, and on December 20, 2012, the ACHP notified FEMA that it had chosen not to participate in consultation for these Undertakings at this time; and

WHEREAS, FEMA has invited the SHPO, TXDPS/TDEM, the grantee, and UTMB, the sub-grantee, to participate in this consultation and execute this MOA as Invited Signatories; and

WHEREAS, FEMA notified the Alabama Coushatta Tribe of Texas, and provided information regarding identified historic properties in the APE, information regarding the history and topography of the APE, and afforded the Tribe an opportunity to participate in the consultation; and

WHEREAS, the Alabama Coushatta Tribe of Texas did not express an interest in the Undertakings and therefore FEMA has fulfilled its NHPA Section 106 responsibilities to consult with Indian Tribes. In the future, FEMA will not consult with or provide reports, materials, etc. to Tribes regarding these Undertakings unless properties that may have traditional religious and cultural importance to Tribes are identified through the discoveries and unanticipated effects provisions set out in Stipulation IV of this MOA; and

WHEREAS, FEMA provided information to the American Society of Civil Engineers, the Galveston Historic Foundation, the UTMB Alumni Association, the City of Galveston, and the Galveston Historical Museum about the Undertaking and the opportunity to participate in this consultation; and

WHEREAS, the American Society of Civil Engineers, the Galveston Historic Foundation, the UTMB Alumni Association, the City of Galveston, and the Galveston Historical Museum have not requested Consulting Party status; and

WHEREAS, FEMA provided information to the public regarding the Undertakings on the UTMB website, and the Galveston Daily Newspaper for a 15-day comment period between January 14, 2013 and January 28, 2013 and invited the public to fax comments or contact FEMA by telephone, and FEMA received no public comments regarding the Undertakings; and

NOW, THEREFORE, FEMA, SHPO, TXDPS/TDEM, and UTMB, hereafter referred to as "Signatories," agree that the Undertakings will be implemented in accordance with the following Stipulations in order to take into account the adverse effects of the Undertakings on historic properties and to satisfy FEMA's Section 106 responsibilities for the Undertakings.

STIPULATIONS

To the extent of its legal authority and in coordination with SHPO, TXDPS/TDEM, UTMB and FEMA shall ensure that the following measures are implemented:

I. TREATMENT MEASURES

UTMB shall be responsible for completing the following mitigation measures to resolve the adverse effects resulting from the Undertakings:

A. ***Building Recordation***: Within 180 days of the execution date of this MOA, UTMB shall digitally photograph the entire collection of Dormitories including Morgan Hall (bldg. 35), Nolan Hall (bldg. 33), Bethel Hall (bldg. 32), Brackenridge Hall (bldg. 30), Clay Hall (bldg. 31), Vinsant Hall (bldg. 34) and the Dorm Machine Room (bldg. 38). The digital photography and color photographs must comply with the "Best" category of requirements from the National Register Photo Policy Fact Sheet: http://www.nps.gov/history/nr/publications/guidance/Photo_Policy_final.doc, with the following additional requirements:

1. Image files shall be saved as uncompressed Tagged Image File Format (TIFF) files on appropriate CD-R media.

2. Color images must be produced in RGB (Red Green Blue) color mode as 24-bit or 48-bit color files.

3. Images of the Dormitory Complex shall be saved with a separate photo log created that contains the following information for each image:

a) Name and address of building;

b) Date of photograph;

c) Name of photographer; and

d) Description of the view, including the camera direction

4. Photographic prints of each image shall be provided. Prints shall be 4”x6” or larger, and must be printed on manufacturer recommend archival quality paper using manufacturer recommend ink for photographic printing.

B. Images taken of the Dormitory Complex shall include:

1. One (1) view of each façade;

2. Two (2) oblique views, taken from opposing corners to show all facades;

3. One (1) contextual view showing the entire collection of dormitories; and

4. Additional images of exterior character-defining features, outbuildings, or other exterior elements, as appropriate.

C. Select available existing architectural or general construction drawings as designated and approved by FEMA and the SHPO shall be photographed. A site plan of the dormitory complex shall be included to provide an orientation for the photographs.

D. ***Historic Resource Survey***: Within 180 days of the execution date of this MOA, UTMB shall complete a THC historic resource survey form for each of the following mid-twentieth century dormitories in the University of Texas System:

1. University of Texas Medical Branch at Galveston, Morgan Hall (1955)
2. University of Texas Medical Branch at Galveston, Nolan Hall (1955)
3. University of Texas Medical Branch at Galveston, Vinsant Hall (1955)
4. University of Texas Medical Branch at Galveston, Bethel Hall (1953)
5. University of Texas Medical Branch at Galveston, Clay Hall (1955)
6. University of Texas Medical Branch at Galveston, Brackenridge Hall (1955)
7. University of Texas Medical Branch at Galveston, Dorm Machine Room (1955)
8. University of Texas at Arlington, Lipscomb Hall (1957)
9. University of Texas at Austin, Creekside Residence Hall (1955)
10. University of Texas at Austin, Blanton Dormitory (1955)
11. University of Texas at Austin, Moore-Hall Dormitory (1956)
12. University of Texas at Austin, Kinsolving Dormitory (1958)

13. University of Texas at Austin, Beauford H. Jester Center (1969)
14. University of Texas at Austin, Jester Dormitory (1969)

Photographs of buildings 1-7 will be covered in Stipulation I. A. *Building Recordation*. Photographs of buildings 8-14 are not required to follow the photography requirements listed in Stipulation I. A. and they must meet the THC standards for the historic resource survey form.

E. Within 180 days of execution of this MOA , UTMB shall submit one or more CD-R's containing the completed historic resource survey forms with all Dormitory digital images, photo log and site plan to FEMA for review and approval. Within 30 days of receipt, FEMA will advise UTMB if the submitted documentation is satisfactory or request specific revisions. FEMA will then send to SHPO for review and approval. SHPO shall advise FEMA within 30 days of receipt if the submitted documentation is satisfactory or request specific revisions. SHPO shall also advise FEMA if any revised documentation is to be submitted to SHPO for a second 30-day review. Upon acceptance by SHPO, FEMA shall notify TXDPS/TDEM of this acceptance and that the demolition of Morgan Hall & Nolan Hall may proceed.

F. ***Galveston Seawall Recordation***: UTMB intends to remove only the necessary portions of the original Galveston Seawall and will make every effort to minimize the disturbance to the original Galveston Seawall. However, if UTMB determines that it is necessary to remove a section larger than 9 feet by 10 feet, UTMB shall immediately notify TXDPS/TDEM, who will then notify FEMA before any removal begins. The Seawall will be digitally photographed upon its exposure at the intersection of 6th Street and Market Street. The photographic requirements for the Seawall will be the same as listed in I.A. Where possible, images taken of the Seawall shall include:

1. The initial exposure of the Seawall;
2. The Seawall and construction materials intact and uncovered before any removal;
3. The actual removal of any portion of the Seawall; and
4. Additional images of any removed Seawall section, any exposed rip-rap and/or rebar, and any other elements, as appropriate.

G. Per consultation dated October 8, 2012, UTMB shall be responsible for providing a qualified archaeologist to monitor the following UTMB ground disturbing activities connected to the District Heating and Cooling project:

1. Open Cut Utility Trenches
2. Boring Pits (not to include actual horizontal drilling)

3. Original Galveston Seawall Exposure
4. West Plant Floodwall
5. Thermal Water Storage Tanks
6. Any additional ground disturbance that may result from repairs and mitigation to the chilled water valve pits and pipes

The archaeologist will meet SOI Professional Qualifications Standards as stipulated in 48 FR 44738-9, September 29, 1983. The archaeologist will only be required to monitor when new ground disturbance occurs at the construction site. It will be up to the discretion of UTMB and the archaeologist to determine in the field what construction activities would necessitate the presence of the archaeologist.

H. An archaeological report will be submitted to FEMA within 60 days of completion of all monitoring activities. This report will describe the original Galveston Seawall Undertaking as well as any findings or activities encountered during ground disturbing activities. If possible, this report will also include an archaeological profile (cross-section) of the original Galveston Seawall. This report will be submitted along with the entire original Galveston Seawall photography documentation listed in Stipulation 1.F., Seawall Recordation. Within 30 days of receipt, FEMA will advise UTMB if the submitted documentation is satisfactory or request specific revisions. FEMA will then send to SHPO for review and approval. SHPO shall advise FEMA within 30 days of receipt if the submitted documentation is satisfactory or request specific revisions.

I. ***Texas Historical Marker Nomination***: UTMB will apply for a subject marker through THC's History Programs Division within 180 days of the execution date of this MOA. The subject marker will commemorate the location of the buried original Galveston Seawall at the site of the Undertaking near 6th Street and Market Street. The marker nomination will supplement the existing original Galveston Seawall historical marker and note that a portion of the original Galveston Seawall was buried at this location during Galveston's Island's grade raising and expansion.

1. UTMB will purchase and display the subject marker in a manner visible from the public right-of-way within three months of the SHPO's approval of the subject marker application.

J. ***National Historic Landmark Nomination***: UTMB will prepare a National Historic Landmark nomination for the Galveston Seawall in order to expand on the existing understanding of this nationally-significant resource.

1. Within 180 days of the execution date of this agreement, UTMB will prepare a briefing statement to the THC. The briefing statement will be prepared by a person or persons with a record of independently preparing successful National Register and/or National Historic Landmark nominations, preferably with expertise in the history of major urban infrastructure projects in the United States. The briefing statement will follow the recommendations made by National

Historic Landmark staff at the National Park Service (NPS) in the comments forwarded to the THC in 2010 (attached as Exhibit B of this MOA).

2. THC will forward the briefing statement to NPS, and if approved, UTMB will follow NPS recommendations in the preparation of the National Historic Landmark nomination. The National Historic Landmark nomination will follow the NPS guidelines at http://www.nps.gov/nhl/tutorial/Workshop6/writing1.htm and in the NPS Bulletin "How to Prepare National Historic Landmark Nominations" (http://www.cr.nps.gov/nr/publications/bulletins/pdfs/NHLS.pdf).
3. UTMB will provide a draft nomination to the THC for review and carbon copy FEMA. THC may consult with National Historic Landmark staff at NPS, and within 60 days of receipt will provide a technical opinion concerning whether or not the property is adequately documented. If the nomination form is determined by the THC to be inadequately documented, the THC will provide UTMB with an explanation of that determination.

4. If necessary, UTMB will revise the nomination to address any and all THC comments and submit revised drafts to the THC for review.

5. Upon acceptance of the final draft nomination, THC will acknowledge UTMB in writing that the terms of this section have been fulfilled.

K. Any staff or contractor hired to complete the treatment measures will be a SOI Qualified individual, as defined in 36 CFR Part 61, Appendix A, for Section 106 review of the Undertakings. FEMA will be allowed to have direct communication with the archaeologist and architectural historian hired to complete these treatment measures. This communication could involve email exchange and/or direct phone calls. In addition, FEMA and SHPO will be notified in advance of any scheduled important milestones throughout this process, which can include but is not limited to, the unearthing of the original Galveston Seawall at Sixth Street and Market Street.

II. DELIVERABLES

A. All treatment measures listed in Stipulation I. can be submitted upon each individual completion date. It is not necessary to submit all completed items at one time.

B. UTMB shall provide one (1) hard copy of the completed historic resource survey forms, the complete Dormitory and Seawall recordation (excluding the archeological report) including a set of photographic prints and one or more CD-R's containing the Dormitory and original Galveston Seawall digital images and photo log to the SHPO. UTMB will provide all Seawall recordation (excluding the archeological report) to the American Society of Civil Engineers and to the archives department at the Galveston Rosenberg Library and to the Moody Medical Library. In addition, UTMB will provide all Dormitory recordation to the archives department at the Galveston Rosenberg Library and to the Moody Medical Library.

C. After final receipt of each treatment measure, FEMA will notify UTMB in writing that the Stipulation has been completed.

III. CHANGES TO APPROVED SCOPE OF WORK

A. UTMB shall immediately notify TXDPS/TDEM if there are proposed changes to the Undertakings. When notified by UTMB, TXDPS/TDEM shall notify FEMA as soon as possible of any proposed change to the approved scope of work for an undertaking related to a historic property. FEMA shall then consult with SHPO to determine if the change will have an effect on the Undertaking.

IV. DISCOVERIES AND UNANTICIPATED EFFECTS

A. UTMB shall notify TXDPS/TDEM immediately if it appears that the Undertaking has affected a previously unidentified property, including archaeological deposits, during the implementation of this Agreement. TXDPS/TDEM shall require UTMB to immediately stop all activities in the vicinity of the discovery and shall require UTMB to take all reasonable measures to avoid or minimize harm to the property until TXDPS/TDEM notifies UTMB in writing that the project can proceed.

B. TXDPS/TDEM shall notify FEMA immediately regarding the previously unidentified property or unexpected effects.

C. FEMA shall notify SHPO and other parties that may have an interest in the previously unidentified property or unexpected effects at the earliest possible time, but no later than 72 hours after FEMA is notified by TXDPS/TDEM, and FEMA will initiate consultation to develop actions that will take into account the effects of the Undertaking.

V. ANTICIPATORY ACTIONS

A. FEMA will not grant assistance to UTMB should it, with the intent to avoid the requirements of this MOA or Section 106 of the NHPA, adversely affect a historic property to which the assistance would relate, or having the legal power to prevent it, allow such an action to occur. After consultation with the ACHP, FEMA may determine that the circumstances justify granting such assistance despite an adverse effect created or permitted by UTMB, and FEMA shall complete consultation for the Undertaking pursuant to 36 CFR § 800.9(c).

VI. DISPUTE RESOLUTION

A. Should any Signatory raise an objection in writing to FEMA, to the manner in which the terms of this MOA are being implemented, or to any documentation prepared in accordance with and subject to the terms of this MOA, FEMA shall notify the Signatories of the objection in writing, requesting their comments within 14 days of receipt of notification. FEMA shall consult with the objecting party, and if that party so requests,

any other Signatory, for no more than 30 days. FEMA shall seek resolution by the most expeditious and appropriate method and may transmit its written notice and accept comments via e-mail.

B. If the objection is resolved within 30 days, the Signatories shall proceed in accordance with the resolution.

C. If FEMA determines within 30 days that the objection cannot be resolved as described above FEMA shall forward all documentation relevant to the dispute to the ACHP, including FEMA's proposed resolution of the dispute. FEMA shall request comments from the ACHP and will take the ACHP's response into account when reaching a final decision regarding the dispute. If the ACHP does not provide FEMA with recommendations of comments within 30 calendar days of receipt of documents, FEMA may assume that the ACHP does not object to its recommended approach. Within 14 additional days, FEMA shall render a final written decision to the other Signatories.

D. Any recommendation or comment provided by a Signatory or the ACHP shall be understood to pertain only to the subject of the dispute. The Parties will not be required to cease work on activities unrelated to the objection while the objection is being reviewed and resolved.

E. FEMA may authorize TXDPS/TDEM to notify UTMB that they may implement any portion of the Undertaking subject to dispute after completing the requirements of this Stipulation.

VII. AMENDMENTS, TERMINATION, AND DURATION

A. If FEMA determines that it is not feasible to complete the Undertaking or fulfill the requirements of this MOA,FEMA shall immediately notify SHPO and TXDPS/TDEM in writing. Within 30 days of this notice, FEMA shall meet with the other Signatories, in person or by telephone, to determine if the MOA must be amended or terminated and proceed accordingly.

B. If any Signatory determines that the MOA should be amended, the Signatory shall submit a written request to FEMA. Within 30 days of this request, FEMA shall meet with the other Signatories, in person or by telephone, to consider this request.

A. The Signatories shall make a good faith effort to amend the MOA prior to taking steps to terminate it, as outlined in Stipulation C below.

B. The MOA may only be amended upon the written agreement of all Signatories and the process shall comply with 36 CFR § 800.6(c)(7).

C. Termination: Any Signatory may terminate this MOA by providing a 30-day written notice to the other Signatories. During this 30 day time frame, the Signatories shall meet in person or by telephone to seek amendments or other actions that would

prevent termination. Should consultation fail, FEMA shall promptly notify the other parties in writing of the termination of this MOA.

1. Termination of this MOA prior to fulfillment of its requirements will require compliance with 36 CFR Part 800.

2. This MOA may be terminated without further consultation by the execution of a subsequent agreement that explicitly terminates or supersedes its terms.

D. Duration: Unless amended or terminated in accordance with Stipulations A and B above, this MOA will remain in effect for the duration of the District Heating and Cooling project construction or until FEMA determines it has been satisfactorily fulfilled. FEMA will notify the other Signatories in writing if FEMA determines that this Agreement has been fulfilled and is terminated.

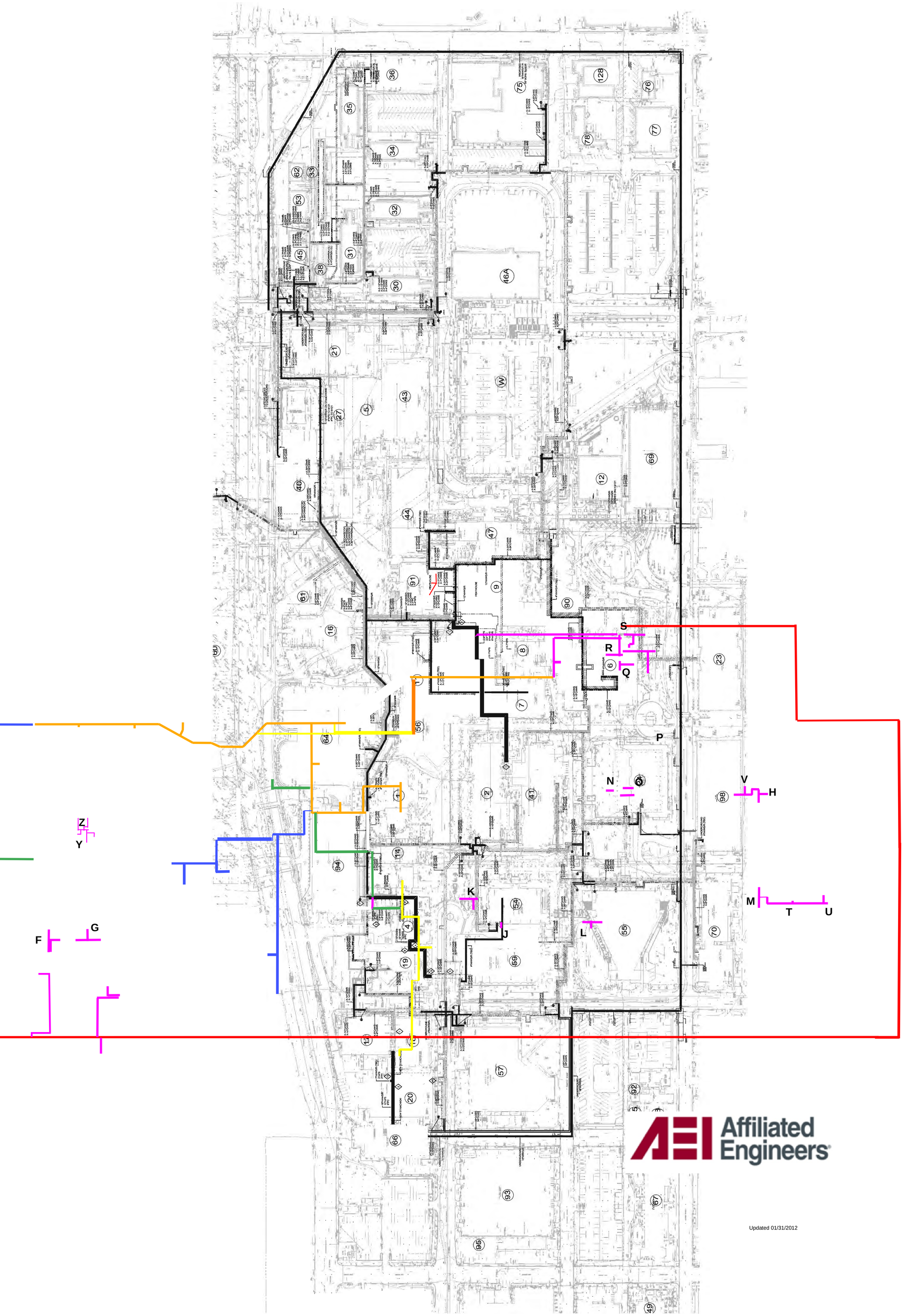
VIII. EXECUTION

A. This MOA will become effective on the date of final signature.

B. This MOA shall be executed in counterparts, with a separate page for each signatory and FEMA shall ensure that each party is provided with a fully executed copy, including original signature pages.

EXECUTION AND IMPLEMENTATION of this Agreement by all Signatories evidences that FEMA has afforded the ACHP a reasonable opportunity to comment on the Undertakings and its effects on historic properties, that FEMA has taken into account the effects of the Undertakings on historic properties, and that FEMA has satisfied its responsibilities under Section 106 of the National Historic Preservation Act and its implementing regulations.

Exhibit A



Affiliated Engineers

Updated 01/31/2012

Exhibit B

Briefing Statement

Potential NHL: Galveston Seawall, Galveston, Texas
Date: August 10, 2009

SIGNIFICANCE:

The Galveston Seawall is significant in several national historic contexts. Its original construction in 1902-1904 represents an early example of the use of reinforced concrete on a massive scale and its application to the engineering of coastal barriers. Reinforced concrete construction in the United States was largely experimental through the end of the 19th century, with several notable examples of its use but no large-scale implementation of the technology. Nineteenth-century coastal structures similar to the Seawall – such as the port seawalls of Boston, New York and San Francisco, or the offshore breakwaters of the American northeast – were constructed of stone rubble or blocks, with concrete sometimes used to augment the stone but not as the primary material. By the second decade of the 20th century reinforced concrete would emerge as the material of choice for many such structures, but construction of the Galveston Seawall represents an early example of the material's implementation on a large scale and was at the forefront of civil engineering technology for its time and application. A board of nationally recognized experts - including Henry Martyn Robert, a former Chief Engineer of the Army Corps of Engineers, Alfred Noble, a member of the Commission to determine the route of the Panama Canal and soon to be President of the American Society of Civil Engineers, and Henry Clay Ripley, an engineer with the Galveston branch of the Army Corps of Engineers – conceived the design. Engineering publications of the day described the project's novel concrete mixing and handling machines. Subsequent extensions of the Seawall through 1963 largely followed the original design, with a few minor modifications, which is in many ways a testament to the advanced engineering of the original effort.

Built in response to the devastating hurricane of 1900, the Seawall and associated raising of the city's grade also contribute to the history of public works in the United States, providing an early 20th-century example of government response to a major natural disaster. America's citizens and newspapers immediately recognized the 1900 Galveston Hurricane as a significant national catastrophe, and it is still considered the deadliest natural disaster in U.S. history. Local leaders had discussed the construction of a protective breakwater or seawall in Galveston since the late 1870s, but the state had refused to fund it. Although the federal government had just completed substantial harbor improvements at Galveston in 1896 – an effort considered necessary for navigation and thereby national and international commerce – there was still considerable debate in Congress over whether or not the federal government was responsible for, or even justified in, funding the protection of private land from flooding or similar damage from waterways. Although members of the U.S. and Texas statehouses and statewide and national media outlets expressed support for Galveston's Seawall project, aid was initially slow to come and disagreement continued over who was responsible for its funding. Unwilling to wait, the local government took the unusual step of independently planning and funding the Seawall's initial construction, with the City engaging its own expert engineering team and the County proposing a $1.5 million bond, which passed almost unanimously. State and federal support would come soon after, but their initial involvement was tentative. The state provided indirect funding for the grade-raising project, by dedicating state taxes collected in the area for investment in the project, and early federal involvement was limited to an extension of the Seawall intended to protect Ft. Crockett Military Reservation. Over the first half of the 20th century, however, the federal government assumed an increasingly significant role in flood control and similar projects throughout the nation. This is reflected in the funding for subsequent Seawall extensions and improvements, with the federal government providing 70% of the funding for extensions in 1918 and nearly all funding for the 1920s and 1950s extensions, as well as substantial improvements in the 1930s. Similarly, the Army Corps of Engineers has assumed responsibility for nearly all design and construction oversight for work on the Seawall since the original local effort. The Galveston Seawall and grade-raising project provides important insight into public and political ideas around the turn of the 20th century about the role of government in protecting people and property from floods and similar disasters, as well as a concrete example of how those ideas evolved over subsequent decades.

The Seawall should be considered within the context of the nation's cultural and economic history as well, in which it represents a community's unique competitive effort to remain viable and retain control of a major national port. When the 1900 hurricane hit, Galveston was already in the midst of significant competition with the city of Houston over control of Texas' substantial port traffic. Galveston Bay creates a natural harbor and had been designated a port of entry since 1825, when it was still under Mexican rule. The strength of its port traffic made Galveston the largest city in Texas in 1870 and 1880, but Houston merchants were simultaneously pursuing efforts to improve the Houston Ship Channel and make it navigable by oceangoing ships, thereby bypassing Galveston and establishing direct international trade. With the city having already slipped to the state's fourth largest, the 1900 storm was a severe blow to Galveston's diminishing prominence and raised the very real question of whether the city could survive at all. Texas' second-largest port at Indianola had simply been abandoned following a severe hurricane in 1884. Galveston's leaders and citizens knew that the city's survival was at stake and understood the immense economic implications of their response. The chosen response centered on two bold actions – the creation of a new form of commission-based local government intended to ensure an efficient and professional support structure for businesses and residents, and construction of the Seawall, with the grade raised behind it, to protect their physical property from future storms. The scale of the initial Seawall and grade-raising project – construction of a solid wall 3.5 miles long, and the of raising streets, utilities and over 2000 buildings by several feet – was immense for a community of its size to undertake and underscores the urgency they felt about its need. Although the Seawall did not prevent Houston from emerging as the primary Texas port, it did allow the community to remain viable and develop other sectors of its economy while also preventing hundreds of millions of dollars in future property damages. The story of the Galveston Seawall provides a significant historical example of community response and public investment in the context of national economic competition and development.

The Galveston Seawall was individually listed on the National Register in 1977, and designated a National Historic Civil Engineering Landmark in 2001.

INTEGRITY:
The Galveston Seawall retains a remarkably high degree of historic integrity and has not been significantly altered since its completion in 1963. Extensions were added to the Seawall in 1904-1905, 1918-1921, 1923-1926, 1926-1927, 1953, and 1958-1963, all of which are very similar in design and construction to the original section. A portion of the original section, which ran north-south along Sixth Street, was abandoned after the 1920s extensions made it obsolete and covered over as development extended eastward. A series of groins were also added in 1936-1939 to protect the shore from erosion, and the groins were rehabilitated in 1970. Besides these historic extensions and minor alterations, the Seawall remains as originally constructed, though it has settled in areas over time. Its characteristic curved concrete face remains visible along its length.

COMPARISON TO SIMILAR PROPERTIES:
A search of the National Register database indicates no other seawalls are individually listed. The Port of San Francisco Embarcadero Historic District (NR 2006) includes a seawall as a contributing structure, and other historic districts may include similar structures. The Embarcadero seawall was originally rubble stone construction, although a revised design built after 1909 is very similar to that used at Galveston. Four breakwaters, a similar type of engineered coastal barrier, are individually listed on the National Register, but none are constructed of concrete and none date to the same period as the Galveston Seawall. The Galveston Seawall is also the only structure of its type designated by the American Society of Civil Engineers as a National Historic Civil Engineering Landmark.

OWNERSHIP AND SUPPORT:
The Galveston Seawall is owned by the County of Galveston and the U.S. Army Corps of Engineers, both of whom support its designation as a National Historic Landmark.

United States Department of the Interior

NATIONAL PARK SERVICE
INTERMOUNTAIN REGION
12795 West Alameda Parkway
PO Box 25287
Denver, Colorado 80225-0287

H34 (IMDE-HPP)

FEB 5 2010

Mr. Brian M. Davis
Director of Preservation Services
Galveston Historical Foundation
502 20th Street
Galveston, TX 77550

Subject: Draft review of the Galveston Seawall National Historic Landmark (NHL) Briefing Statement

Dear Mr. Davis:

Enclosed are our comments on the Seawall NHL briefing statement. In terms of developing a national context and assessing relative significance of the Galveston Seawall, it may be helpful for you to consult with a historian who is knowledgeable about major urban construction projects, such as Martin Melosi of the University of Houston.

Let me know if you have any questions and when we might review the next draft.

Sincerely,

Thomas G. Keohan

Thomas G. Keohan
Texas NHL Coordinator

enclosure

cc:
Mark Wolf, State Historic Preservation Officer, Texas Historical Commission, P.O. Box 12276, Austin, TX 78711-2276

DRAFT

COMMENTS ON BRIEFING STATEMENT FOR GALVESTON SEAWALL
NATIONAL PARK SERVICE, INTERMOUNTAIN REGIONAL OFFICE
JANUARY 19, 2010

When we advise interested parties on how to prepare a briefing statement, we provide key points that should be included:

1) Why is the site significant? Explain within the context of a bigger national picture. For example, if it is important within a history context (pattern of national history):
    a) describe that national pattern of history (likewise if the site is of architectural significance, archeological significance, etc., explain the national aspect of architecture or archeology). Then
    b) explain how this site has an important association with that national pattern of history.
2) Compare the site to similar properties, i.e. properties that are also important within the same historic context. Why should this resource be considered one of the best in the country?

The briefing statement suggests that the Galveston Seawall is nationally significant under four (or more) different national contexts:

A) "Represents an early example of the use of reinforced concrete on a massive scale and its application to the engineering of coastal barriers." The discussion merges two different contexts here – use of reinforced concrete on a massive scale, and the use of reinforced concrete in coastal barriers. The statement includes a brief history of the building material (its use was largely experimental through the end of the 19th century, with several notable examples of its use but no large-scale implementation of the technology, and it became the material of choice for many structures). However, we are left to wonder about several key aspects.

- Why is reinforced concrete nationally significant (item 1a above). Furthermore, why would the size or type of project be an important aspect of that significance? That is, why would use of reinforced concrete in a massive structure be a nationally significant trend, or why would the use of the material in a coastal barrier be nationally significant?
- More specifically, why would the Galveston seawall have an important association with the emergence of reinforced concrete; that is, why would it be exceptionally valuable for the study of the use of reinforced concrete (item 1b)?
- And finally, what other massive structures and/or coastal barriers used reinforced concrete in that era (item 2), and how would an objective party evaluate their significance in comparison to the Galveston structure?

B) "An early 20th-century example of government response to a major natural disaster." Two main aspects are discussed: federal and local response. The discussion notes that at the time there was still considerable debate in Congress over whether the federal government was responsible for, or even justified in, funding the protection of private land from flooding. However, as it turned out, the federal government did not fund the Galveston seawall, and instead funded only an extension (built a year after the seawall was constructed) that protected the federal Ft. Crockett Military Reservation. So it appears that no changes were made in federal policy. This aspect of this context would not be considered to be nationally significant. The discussion notes, however, that over time the federal government assumed an increasingly significant role in flood control, which was indicated in the federal government funding 70% of the 1918 Galveston extension, and even more for subsequent extensions. If that shift in federal policy is proven to be nationally significant, one would pose the question: "Where are the best places in the country that demonstrate that shift?" If a book has been written on the topic, what projects does it point out as being pivotal in the shift? Was the seawall the project that precipitated that shift? Was there another place that caused the shift that would better tell that story?

The statement notes that the local government planned and funded the initial construction, engaging its own expert engineering team. This local effort continued a method of operation that had been in effect since the early years of the nation. It would be extremely difficult to justify national significance based on local funding and management – unless this local response is nationally significant because of its exceptional size and scale (as compared to other local responses nationally), and/or that it can be demonstrated that this was the last large local response to a major disaster before major intervention by the federal government.

C) "Represents a community's unique competitive effort to remain [economically] viable and retain control of a major national port." As observed in the discussion of local government above, it would be extremely difficult to provide evidence for national significance in this context. First, why would there be national significance in local communities striving to remain economically viable (item 1a above)? Why would Galveston have an important association with that pattern of history (1b above)? And what other communities could also claim that they were nationally significant within this context (item 2)? This thesis seems almost impossible to argue.

D) "The scale of the initial Seawall and grade-raising project – construction of a solid wall 3.5 miles long, and the raising of streets, utilities and over 2000 buildings by several feet – was immense." As you have noted, other similar structures had been constructed prior to Galveston's (such as port seawalls of Boston, New York and San Francisco, and the offshore breakwaters of the American northeast); presumably these structures were a similar scale. Other than its use of reinforced concrete, are there any other aspects of the engineering that would make the Galveston seawall a type specimen? Including the grade raising in your statement about immensity is appropriate: after lifting structures and utilities (such as

streetcar tracks, fireplugs, and water pipes) and about 2,000 buildings, fill soil up to 11 feet was deposited beneath them. The extensive grade raising provided support for the seawall but also facilitated drainage and sewage systems. As you noted, the American Society of Civil Engineering designated the Galveston Seawall a National Historic Civil Engineering Landmark in 2001; however, the designation was titled Galveston Seawall and Grade Raising Project. It would seem that the combination seawall and grade raising would be a way to evaluate the significance of the resources. Have you considered this option? If you do consider this option, please note that it would involve including the raised area within the NHL district boundary. Also, this option would necessitate a comparison with other areas within the United States that have undergone grade raising.

In conclusion, it appears that the most promising approach (based on the information in the briefing statement) would be context A. However, we would require additional information, as noted in our comments above, to make that evaluation. In addition, the scale of the grade raising project is notable as well, and may be worth exploring. We would be happy to discuss your options on the telephone. If you are interested, let us know when you would be available.

MEMORANDUM OF AGREEMENT
AMONG
THE U.S. DEPARTMENT OF HOMELAND SECURITY,
FEDERAL EMERGENCY MANAGEMENT AGENCY;
THE TEXAS STATE HISTORIC PRESERVATION OFFICER; THE TEXAS DEPARTMENT OF PUBLIC SAFETY/TEXAS DIVISION OF EMERGENCY MANAGEMENT; AND
THE UNIVERSITY OF TEXAS MEDICAL BRANCH; REGARDING
THE DEMOLITION OF MORGAN HALL, NOLAN HALL AND A PORTION OF THE ORIGINAL GALVESTON SEAWALL
LOCATED AT 414 & 502 TEXAS AVENUE & CORNER OF SIXTH AND MARKET STREETS, GALVESTON, TX

SIGNATORY:

FEDERAL EMERGENCY MANAGEMENT AGENCY

By: _____ Date: _____
Kevin Jaynes
Regional Environmental Officer
Region VI

By: _____ Date: _____
George A. Robinson
Regional Administrator
Region VI

MEMORANDUM OF AGREEMENT
AMONG
THE U.S. DEPARTMENT OF HOMELAND SECURITY,
FEDERAL EMERGENCY MANAGEMENT AGENCY;
THE TEXAS STATE HISTORIC PRESERVATION OFFICER; THE TEXAS DEPARTMENT OF PUBLIC SAFETY/TEXAS DIVISION OF EMERGENCY MANAGEMENT; AND
THE UNIVERSITY OF TEXAS MEDICAL BRANCH; REGARDING
THE DEMOLITION OF MORGAN HALL, NOLAN HALL AND A PORTION OF THE ORIGINAL GALVESTON SEAWALL
LOCATED AT 414 & 502 TEXAS AVENUE & CORNER OF SIXTH AND MARKET STREET, GALVESTON, TX

SIGNATORY:

THE TEXAS STATE HISTORIC PRESERVATION OFFICER

By: _____ Date: _____
Mark Wolfe
Executive Director
Texas Historical Commission

MEMORANDUM OF AGREEMENT
AMONG
THE U.S. DEPARTMENT OF HOMELAND SECURITY,
FEDERAL EMERGENCY MANAGEMENT AGENCY;
THE TEXAS STATE HISTORIC PRESERVATION OFFICER;
THE TEXAS DEPARTMENT OF PUBLIC SAFETY/TEXAS DIVISION OF EMERGENCY MANAGEMENT; AND
THE UNIVERSITY OF TEXAS MEDICAL BRANCH; REGARDING
THE DEMOLITION OF MORGAN HALL, NOLAN HALL AND A PORTION OF THE ORIGINAL GALVESTON SEAWALL
LOCATED AT 414 & 502 TEXAS AVENUE & CORNER OF SIXTH AND MARKET STREET, GALVESTON, TX

SIGNATORY:

TEXAS DIVISION OF EMERGENCY MANAGEMENT/ TEXAS DEPARTMENT OF PUBLIC SAFETY

By: _____ Date: _____
W. Nim Kidd, CEM
Assistant Director, Texas Department of Public Safety
Chief, Texas Division of Emergency Management

MEMORANDUM OF AGREEMENT
AMONG
THE U.S. DEPARTMENT OF HOMELAND SECURITY,
FEDERAL EMERGENCY MANAGEMENT AGENCY;
THE TEXAS STATE HISTORIC PRESERVATION OFFICER; THE TEXAS DEPARTMENT OF PUBLIC SAFETY/TEXAS DIVISION OF EMERGENCY MANAGEMENT; AND
THE UNIVERSITY OF TEXAS MEDICAL BRANCH; REGARDING
THE DEMOLITION OF MORGAN HALL, NOLAN HALL AND A PORTION OF THE ORIGINAL GALVESTON SEAWALL
LOCATED AT 414 & 502 TEXAS AVENUE & CORNER OF SIXTH AND MARKET STREET, GALVESTON, TX

SIGNATORY:

UNIVERSITY OF TEXAS MEDICAL BRANCH

By: _____ Date: _____
William R. Elger, *CPA*
Executive Vice President,
Chief Business and Finance Officer

APPENDIX G: PUBLIC NOTICE

Federal Emergency Management Agency
PUBLIC NOTICE
Notice of Availability of the Draft Environmental Assessment (Draft EA) and Final Notice of a Proposed Activity in a 100-Year Floodplain for the Proposed District Heating and Cooling Project University of Texas Medical Branch at Galveston, Texas

The Federal Emergency Management Agency (FEMA) hereby gives notice to the public of its intent to reimburse the University of Texas Medical Branch (UTMB) at Galveston, Texas for eligible costs to repair and/or replace campus facilities damaged by Hurricane Ike beginning on September 13, 2008 and to provide assistance for hazard mitigation measures during the recovery process to protect these damaged facilities from future events. This notice applies to the Public Assistance program implemented under the authority of the *Robert T. Stafford Disaster Relief and Emergency Assistance Act*, 42 U.S.C. §§ 5121-5206.

Interested persons are hereby notified that UTMB, located at 301 University Boulevard, Galveston, Texas, has applied to FEMA for assistance to modify the UTMB district heating and cooling system and associated activities (District Heating and Cooling Project) after sustaining an estimated $1 billion in damages, including lost revenue due to the closure of UTMB's hospital's facilities.

The Central and West Plants are currently the sources of steam and chilled water for the heating, process, and cooling needs of UTMB. The Central Plant would require substantial and major modifications to protect critical equipment and services from natural events similar to Hurricane Ike. In order to reduce the non-permanent (temporary) construction cost and to provide reliable utilities, the Central Plant functions would be relocated to a proposed elevated East Plant. Without the elevated East Plant, the district heating and cooling system future operations would remain at risk. The new East Plant would also provide the campus thermal requirements during the distribution system reconstruction. The West Plant would be repaired with critical equipment elevated and protected with floodwall. The district heating and cooling system, the electrical generation equipment, and steam and chilled water production equipment, that had to be shut down during Hurricane Ike, would be modified to assure continued service or rapid startup during or after severe weather events. Additionally, much of the current steam production requirements would be replaced by a hot water system. All buildings on campus would be converted from primary steam heating to the use of heating hot water. In a number of facilities, the use of steam heating coils in air-handling units and other air moving devices would need to be converted to heating hot water. The domestic water heaters utilizing steam would also need to be converted to heating hot water.

An additional component of the project is the construction and operation of a dedicated natural gas pipeline to UTMB. The pipeline would be constructed, maintained, and operated by the Texas Gas Service Company. It would connect the UTMB campus to a Texas Gas Service terminal located 4.2 miles west, at the 59th and Port Industrial city gate. This dedicated pipeline will segregate UTMB loads from the rest of Galveston Island. The construction and operation of a dedicated natural gas line would avoid potential UTMB service interruptions as a result of severe weather event affecting the entire Galveston community.

The purpose and need for the project is to cost effectively repair and modify UTMB's current district heating and cooling system to prevent or reduce the threat of future damages should a storm similar in size to Hurricane Ike occur, thereby, avoiding the loss of essential health care services.

This notice also serves as the Notice for Final Public Review of a Proposed Activity in the 100-Year Floodplain. This notice is provided pursuant to 44 CFR Part 9.12, (Floodplain Management and Protection of Wetlands), and FEMA's implementing regulation for Executive Order 11988, Floodplain Management, concerning FEMA's funding assistance for activities within and/or affect a floodplain. UTMB has reevaluated the alternatives to building in the floodplain and has determined that it has no practicable alternative. The proposed District Heating and Cooling Project shall comply with state and local floodplain protection procedures. The Initial Public Notice concerning FEMA actions located in or that may affect wetland areas or the 100-year floodplain, and critical actions within the 500-year floodplain was published in Galveston County on October 19, 2008.

In accordance with the *National Environmental Policy Act of 1969*(NEPA) and FEMA NEPA implementing regulations, a Draft Environmental Assessment (EA) was prepared to assess the potential impacts of the proposed action on the human and natural environment. The Draft EA summarizes the purpose and need, alternatives, affected environment, and potential environmental consequences for the proposed action. The Draft EA is available for comment and can be viewed and downloaded from FEMA's website at : https://www.fema.gov/environmental-documents-and-public-notices-in-region-vi or at the UTMB website at http://www.utmb.edu/. The Draft EA can also be viewed at the Galveston City Hall, Dickinson Public Library, La Marque Public Library, Friendswood Public Library, Helen Hall Library, Rosenberg Library, Mae S. Bruce Library, Genevieve Miller Hitchcock Public Library, and the Moore Memorial Public Library.

In conjunction with the published public notice, a public meeting will be conducted at Levin Hall located on the UTMB Campus, South Auditorium, Room 2.222 located at 1006 Market Street, Galveston, Texas, 77550 on February 6, 2013, between 4:00 p.m. and 8:00 p.m. Free parking will be available at Parking Garage 4, located at 10th and Market Street, Galveston, Texas. The purpose of the public meeting is to discuss the proposed UTMB District Heating and Cooling Project and to address any questions the public may have regarding the project or the Draft EA. Substantive comments collected during the meeting will be addressed as appropriate in the final EA.

The comment period will end 10 days from the initial notice publication date of February 4, 2013. Written comments on the Draft EA can be mailed or faxed to the contact below.

If no substantive comments are received, the Draft EA will become final and a Finding of No Significant Impact (FONSI) will be issued for the project. Substantive comments will be addressed as appropriate in the final documents.

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FEMA