Report

Bethel Institutional Corridor Water System Feasibility Study Update

Prepared for

City of Bethel

July 2014

CH2MHILL®

949 East 36th Avenue
Suite 500
Anchorage, AK 99508

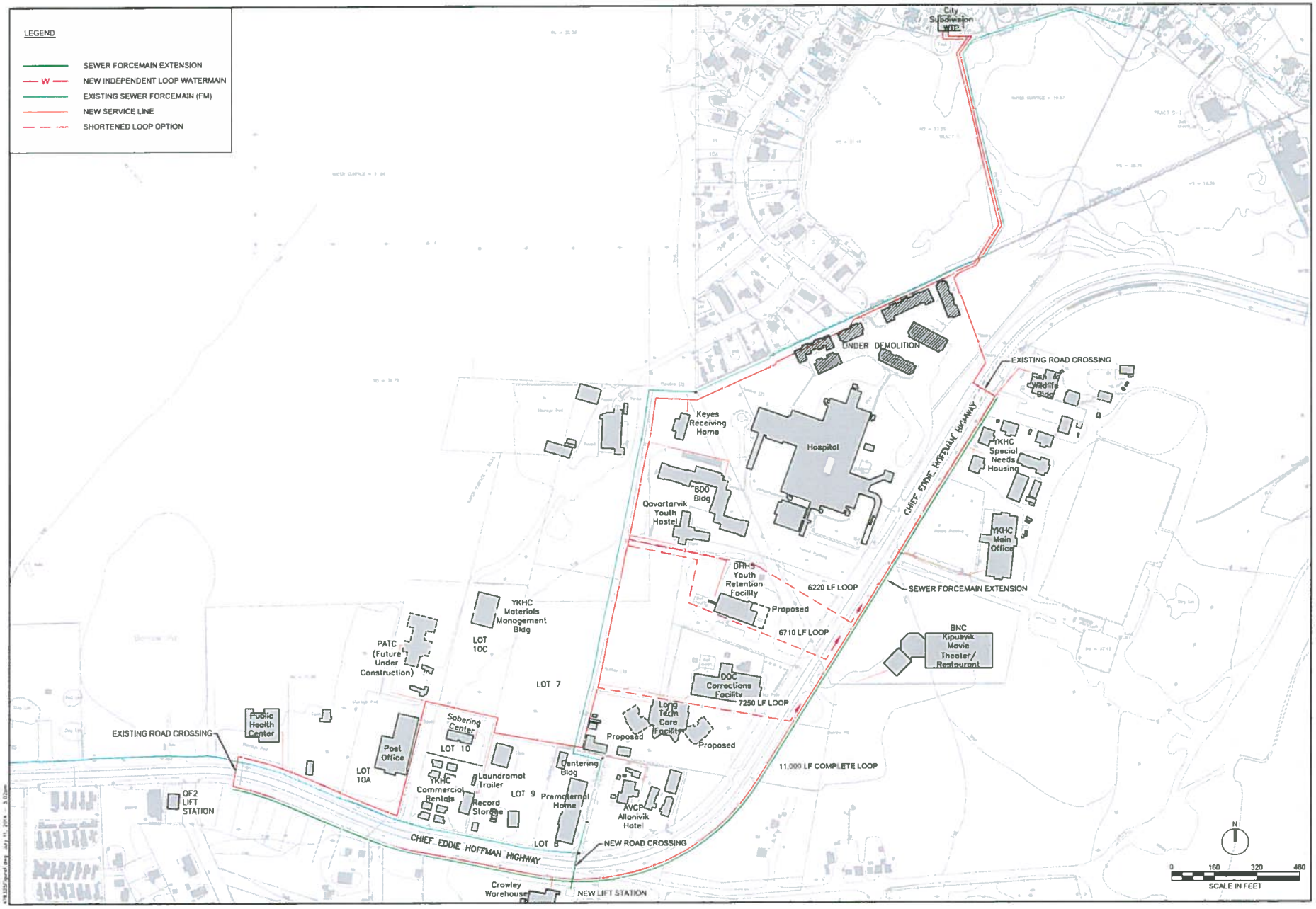
This report has been prepared under the supervision of a registered Professional Engineer.

Executive Summary

The Bethel Institutional Corridor Water System Feasibility Study Update was completed to investigate extending piped water service from the City Subdivision Water Treatment Plant (WTP) to institutional/commercial users located along the Chief Eddie Hoffman Highway.

A looped system is required for freeze protection. Layout options were discussed with the City of Bethel (City) and a new loop starting and ending at the City Subdivision WTP was chosen. At the City's request, the addition of a storage tank away from the WTP was avoided. Modeling was completed to ensure adequate pressure could also be provided for future expansion. Also included in the study at the City's request are the costs for an additional sewermain for all buildings to be served by piped water. The proposed layout is shown in Figure 1.

Twenty-two buildings will be served by the complete watermain. The estimated total installed cost is $10.5 million. In order to complete at least a portion of the loop with a current budget of $7 million, a phased approach will be necessary. A shortened loop that goes as far as the Qavartarvik Youth Hostel and the DHHS Youth Retention Facility can be completed in the first phase along with all of the necessary improvements at the WTP and all of the road borings for the complete project. Upon reception of further funding, the remainder of the loop could be installed later, as well as the new sewermain and lift station.



VILLAGE SAFE WATER

CH2MHILL

VERIFY SCALE
BAR IS ONE INCH ON ORIGINAL DRAWING. IF NOT ONE INCH ON THIS SHEET ADJUST SCALES ACCORDINGLY

City of Bethel
Bethel, Alaska
INSTITUTIONAL CORRIDOR WATER SYSTEM
CIVIL
PHASED LOOP CONSTRUCTION

REVISION	BY	DATE

Project No. 479325
Date JULY 2014
Designed K. Winter
Drawn R. Benfield
Approved T. Wolf

Sheet No. FIGURE 1
SHEET ___ OF ___

Contents

Section **Page**

Executive Summary ..... **iii**

Acronyms and Abbreviations ..... **v**

Background **1-1**
1.1 Authorization 1-1
1.2 Purpose and Need for Project 1-1
1.3 Planning Area 1-1
1.4 Scope of Study 1-2

Existing System **2-1**
2.1 City Subdivision WTP 2-1
2.2 Existing wells (private) 2-1
2.3 Potable Water Storage 2-2
2.4 Boiler Equipment 2-2

Design Criteria **3-1**
3.1 Site Visit 3-1
3.2 Corridor Description 3-1
3.3 Fire Marshal 3-3
3.4 Design Criteria 3-4
3.5 Easements 3-5

Conceptual Alternatives **4-1**
4.1 Larsen Alternative 4-1
4.2 Other Options Considered 4-1
4.3 New Loop from City Subdivision WTP 4-1
4.4 Modeling 4-1
4.5 Potable Water Storage Requirements 4-2
4.6 City Subdivision WTP Improvements 4-2
4.6.1 Pumps 4-2
4.6.2 Boiler System 4-5
4.6.3 Electrical Systems 4-5
4.7 Sewermain Extension 4-5
4.8 Phasing 4-5
4.9 Future 4-6

Project Elements to be Completed Prior to Design **5-1**
5.1 Flow Data 5-1
5.2 Geotechnical 5-1
5.3 Surveying 5-1
5.4 Permitting 5-1
5.5 Easements 5-1

Cost Estimate **6-1**

Conclusions and Recommendations **7-1**

References **8-1**

Section **Page**

Appendixes

A Schematic Drawings
B Cost Estimate

Acronyms and Abbreviations

°F	degrees Fahrenheit
AACEI	Association for the Advancement of Cost Engineering International
ADD	Average Daily Demand
ADEC	Alaska Department of Environmental Conservation
ADOT/PF	Alaska Department of Transportation and Public Facilities
APDES	Alaska Pollutant Discharge Elimination System
ASCE	American Society of Civil Engineers
City	City of Bethel
FPS	Feet per second
GCPD	Gallons per capita per day
gpm	gallons per minute
HDPE	high-density polyethylene
IBC	International Building Code
IC	Industrial Corridor
ISO	Insurance Services Office
MDD	Maximum Day Demand
mgd	million gallons per day
PHD	Peak Hour Demand
PSIG	Pounds per square inch gauge
WTP	water treatment plant
YKHC	Yukon-Kuskokwim Health Corporation

SECTION 1

Background

1.1 Authorization

The City of Bethel (City) retained CH2M HILL to develop this Feasibility Study Update. This effort was accomplished under contract, effective February 5, 2014.

1.2 Purpose and Need for Project

The City would like to extend piped water service from the City Subdivision WTP to institutional/commercial users located along the Chief Eddie Hoffman Highway. This area, known as the Institutional Corridor (IC), includes many commercial institutions and businesses for the City. The buildings in the IC currently either receive hauled water from the City or maintain private wells. Three of the largest users, the Yukon-Kuskokwim Health Corporation (YKHC) hospital, the Department of Corrections (DOC) Adult Correctional Facility, and the Department of Health and Human Services (DHHS) Youth Correctional Facility, requested that the City pursue piping water to the area.

Bethel continues to experience economic growth as a hub city for southwestern Alaska. Development is expected to continue as service industries provide additional jobs. According to the Alaska Department of Labor and Workforce Development, the estimated population increase in Bethel is approximately 1.25%, bringing the 2010 population of 6,080 to nearly 8,300 by 2035.

The City has a mixed system of piped and hauled water. A recent water and sewer cost allocation and rate study estimates that producing and delivering hauled water costs the City about twice as much as piped water while hauled sewage costs approximately six times as much as piped sewer (CH2M HILL, 2013). The City has been working toward replacing hauled water and sewer with a piped system since the first recommendation was published in the 1996 Bethel Water and Sewer Master Plan.

An Institutional Corridor Water System Feasibility Study was completed by Larsen Consulting Group, Inc. in 2010 (2010 Report). Since the first study was published, development has continued to occur in the IC area requiring a study revision. This revision will serve as an update to those items that have changed since 2010. Unless otherwise noted, all other source data is assumed to remain the same.

1.3 Planning Area

The IC is a 0.7 mile stretch of properties adjacent to the Highway and currently extends from the Yukon Delta National Wildlife Refuge Visitor Center & Bookstore to the Bethel Regional Public Health Center. The location is shown in Figure 2. Initially, the users of the IC watermain would be primarily institutional and commercial. Areas of interest for future expansion of this watermain include the Blueberry subdivision to the west and development of land to the south.

Figure 2: Planning Area

1.4 Scope of Study

Water must be provided with adequate volume and pressure to accommodate fire flows throughout the corridor in a manner that minimizes long-term operations and maintenance costs. The study examined the impact of the IC project on the City's existing water production and distribution system and investigated possible future expansion of the system to adjacent areas like Blueberry Subdivision.

The design criteria used in the 2010 Report have been updated and are further discussed in Section 3. Two potential routes were considered for the piped water extension. The final route selected maximizes the use of existing easements and provides a looped system that will minimize extra storage needs and line heating costs.

At the project kickoff meeting, the City requested that sewer service be considered for all property in the IC that will be served with water. Customers in piped water areas consume roughly two and a half times more water than those on hauled systems (ASCE, 1996). A cost estimate for a sewermain has been included in this study for the properties on the south side of the highway not currently connected to sewer.

SECTION 2

Existing System

The City of Bethel operates two water treatment plants which serve approximately 1,470 customers. 435 of those customers are on piped water systems while over 1,000 receive hauled water. However, the current piped demand is 60% of the total water produced (CH2M HILL, 2013). The City Subdivision WTP provides water for truck-haul operations, government offices and homes in the City Subdivision, the IC, and beyond. The Bethel Heights WTP supports the Bethel Heights subdivision, the high school, and can also provide water for the haul system if necessary.

2.1 City Subdivision WTP

The City Subdivision WTP was constructed in 2000. It was designed to produce 0.5 million gallons per day (mgd) and relies on one groundwater well capable of producing about 400 gallons per minute (gpm). The plant is currently operating at approximately 69 gpm average daily flow to serve the existing piped system and truck-haul operations, which is less than 20% capacity. The piped system serves 180 properties within City Subdivision. 3,500 to 4,000 gallon trucks are filled roughly twenty times per day.

Water storage at the City Subdivision WTP is in a 60 foot diameter by 24 feet high, 505,000 gallon welded steel tank. The 2010 Report states that the tank storage capacity is sufficient for the needs of the existing system only and can store several days' worth of the existing average daily flow of approximately 100,000 gallons per day, as well as meet peaking demands and fire flow requirements. Based on the recommendation of the 2010 Report, a second well will be installed in the summer of 2014. The WTP was designed to have a backup well but one was never installed.

The water distribution system in the City Subdivision consists of three heated watermain circulation loops; Loop A, Loop B and Loop C. The watermains are aboveground 6-inch diameter HDPE pipe, featuring insulated arctic pipe construction. According to the City Fire Chief, 990 gpm are available for fire flows from the loops. The current system operates one circulation pump per loop with a fourth operating as an in-line spare.

2.2 Existing wells (private)

The users in the IC that are not on hauled water service are currently maintaining their own water wells. Based on discussions with IC building owners, this is proving to be an expensive and time consuming task for maintenance staff who are stretched thin at these facilities. The majority of users are very interested in hooking onto piped water service and abandoning their individual wells. Issues sited include: expensive glycol systems for freeze protection, maintaining operator training for water systems for maintenance staff, subsidence at well location, and labor hours for water sampling and well maintenance.

Figure 3: Well head with glycol system

Figure 4: Subsidence at private well house

2.3 Potable Water Storage

The 2010 Report assumed an existing storage capacity of 505,000 gallons at the City Subdivision water treatment plant. The design drawings for the water treatment plant show a 24 foot tall, 60 foot diameter tank. It appears that the Larsen Study did not account for freeboard in the tank, and that the actual usable storage volume is less than stated in the study. The freeboard requirements must be calculated by a registered structural engineer, but it is estimated that true reservoir storage at the plant is roughly 485,000 gallons, not 505,000.

2.4 Boiler Equipment

Water in the existing tank is heated by circulating water through a heat exchanger located inside the City Subdivision WTP building. Once initially heated by the treatment process, the water inside an insulated storage tank requires relatively little additional energy to maintain a constant temperature due to its heat capacity. The current boilers are each capable of a 2,724,000 BTU output, according to the City Subdivision WTP design drawings. They are operated in a lead-lag condition and they are approximately 14 years old.

SECTION 3

Design Criteria

3.1 Site Visit

CH2M HILL staff conducted a site visit and project kick-off meeting with City staff on January 30, 2014. During their visit, they were able to meet with several of the users in the Industrial Corridor study area and discuss expansion plans for new and existing facilities. Several buildings have been built or relocated since the 2010 Report was completed. These facilities are listed in Table 1.

TABLE 1
New or relocated buildings in the Bethel Institutional Corridor 2010 to 2013

New/Relocated Building	Location	Status
BNC Kipusvik Movie theatre/restaurant	Adjacent to YKHC administrative offices; east side of highway	Currently under construction; Estimated completion – Summer 2014
12 YKHC Residential Houses	Adjacent to Post Office; north side of highway	Occupied, hauled water and sewer; Ready to plumb to water and sewer at any time
YKHC Medical Records Building	Adjacent to Post Office; north side of highway	Existing building, no water or sewer connection or plumbing currently, construction of fire suppression system anticipated
YKHC Phillips Ayagnirvik Treatment Center	Behind Post Office; north side of highway	Currently under construction; Estimated completion – May 2016
YKHC Centering Building	Adjacent to new Pre-Maternal bldg; north side of highway	Currently under construction; Estimated completion – Late 2014

3.2 Corridor Description

Currently, the majority of potential customers in the IC would be institutional users with some commercial users. There is land available for development on the south side of the Chief Eddie Hoffman Highway. The City is also interested in the possibility of expansion of piped water to nearby areas like the Blueberry Subdivision. Build out capacity is discussed in Section 3.5. The anticipated connections to the new watermain are listed in Table 2. Water use data for the new facilities has been estimated. Actual usage data of the existing buildings collected in 2010 has been used to complete modeling of the proposed system.

TABLE 2
Anticipated Water and Sewer Connections (listed from west to east along Chief Eddie Hoffman Highway)

Potential Client	Water Use (gal/day)	2010 Notes	2014 Notes	Expansions anticipated?	Connected to Sewer?
Bethel Regional Public Health Center	178	Hauled water			Yes
US Post Office	214	Hauled water			Yes
YKHC (New) PATC			Water tank, piped from pre-maternal home		Yes (proposed), lift station
12 YKHC Houses	260		Hauled water and sewer		No, ready to connect
YKHC Medical Records Building			To protect records, YKHC would like misters or other fire protection		No
YKHC - Sobering Center	142	Hauled water			No, 1,750 gal tank; provisions for future connection to city
YKHC Warehouse		Sprinkler system only in future		*Advised by YKHC to ignore now*	No
Mike Salzbrun's Warehouse	195	Sprinkler system and domestic water in future		Yes, of property (9 acres)	No
YKHC Housing - 32-Bed Pre-Maternal Facility	845	Based on 32 beds times 26.4 gal/bed/day	Well and 14,000 gal storage tank		Yes (proposed), lift station
YKHC Centering bldg (adjacent to Pre-Maternal)			Fed by Pre-Maternal home		Assumed yes
Allanivik Hotel	2,726	Well	28 beds, 16 baths, restaurant capacity of 80 people	Phased expansion Ultimately 15 room student housing, 4 public baths; 58 unit hotel, restaurant/conf center for 20-50; additional 30 room apt or hotel expansion	Yes
YKHC -18-Bed Long Term Care Facility	950	Based on 18 beds times 26.4 gal/bed/day		Yes, 18 more beds	Yes
Alaska DOC - Corrections Facility	6,871	Well with fire protection storage tank			Yes

TABLE 2
Anticipated Water and Sewer Connections (listed from west to east along Chief Eddie Hoffman Highway)

Potential Client	Water Use (gal/day)	2010 Notes	2014 Notes	Expansions anticipated?	Connected to Sewer?
Alaska DHHS - Youth Detention Facility		Served by DOC well	3,000 gal storage tank, will be 6,000 w/expansion, sprinklered	Yes, growing to 12 detention cells, 10 program (long-term) beds	Yes
Kipusvik New movie theatre/restaurant	800		5,000 gal water tank, hauled water		No, has 6,000 gal tank
Qavartarvik YKHC - Outpatient Hostel		Served by hospital well			Yes
YKHC-Annex "800 bldg"		Served by hospital well			Yes
YKHC - Keys Receiving Home		Served by hospital well	Moved behind 800 bldg		Assume yes
YKHC - Hospital	35,000	Well with fire protection storage tank		Yes, future expansion of intake facility	Yes
YKHC - Main Administrative Office		Served by hospital well			Yes
YKHC - Special Needs Housing	660	Hauled water	One additional building in 2014		Assume yes
Alaska State Fish and Wildlife	1,100	~~Hauled water~~	Well, no sprinklers		Yes

3.3 Fire Marshal

The State Fire Marshal and Plan Review Bureau cover areas of rural Alaska and has affirmed that the City must follow the 2009 Fire Code and the 2010 version of NFPA 13, 20, and 24. These state that a minimum fire flow of 1,500 gpm must be met at the farthest reach of the system.

The City Fire Chief has also requested that the design allow for adequate access to all sides of the buildings. Above ground waterlines must not impede hose layout and fire prevention. The City Fire Department also hopes to maintain or improve the City's Public Protection Classification, a point system from the Insurance Services Office (ISO) which rates the City's fire suppression capabilities.

As seen in Table 2, several of the larger buildings in the IC already have water storage tanks with fire suppression systems. The assumption of this study is that the City will be responsible for providing adequate fire flow at the main. The users would be responsible for fire suppression in their buildings.

3.4 Design Criteria

Tables 3 and 4 present the design criteria used for the IC watermain.

TABLE 3
Watermain Site Design Criteria[1]

Component	Criteria
Mean Annual Temperature	30 °F
Mean Minimum Temperature	0 °F
99% Dry Bulb Design Temperature	-46 °F
Mean Annual Precipitation	16 inches
Mean Annual Snowfall	45 inches
Design Thawing Index	3,200 °F - days
Design Freezing Index	4,400 °F - days
Design Wind Speed (3 sec gusts)	120 miles per hour
Seismic Load	Per current edition of IBC
Ground Snow Load	40 PSF
Active Layer Depth	2 - 7 feet
Presence of Permafrost	Generally continuous

[1]Bethel Water and Sewer Master Plan, CRW 2005

TABLE 4
Watermain Use Design Criteria

Component	Criteria
Design Period	20 Years (2035)
Average Daily Demand (ADD)	65 gallons/capita/day (GCPD)
Fire Flow	1500 GPM (minimum - 750 gpm both ways)
Residual Pressure	20 PSIG (minimum)
Hydrant Spacing	500 feet (minimum)
Minimum Circulation Velocity	2 FPS
Water Storage (3 components)	
Reserve Volume	3-day supply of ADD Based on most demanding building
Fire Supply	2-hour duration at 1500 GPM (minimum)
Equalization Volume	Max Daily Demand (MDD) less 8 hours of well pump output
Water Distribution (for local systems)	
Water Demand Peaking Factors	
Maximum Day Demand (MDD)	2.3 x ADD[2]

TABLE 4
Watermain Use Design Criteria

Component	Criteria
Peak Hour Demand (PHD)	4.5 x Annual ADD[2]
Minimum Pressure	20 PSIG
Maximum Pressure	100 PSIG
Minimum Pipe Diameter	6 inches
System capacity	Fire flow demand will govern. Design based on peak hourly demand (PHD).
Pressure Pumps	Design based on peak hourly demand (PHD).
Water Heating System	Maintain temperature of return water from distribution system @ 45 to 55 °F.
Water Storage Tank	Insulated, welded steel tank. Tank inlet and outlet shall be located to minimize short-circuiting.
Circulation Systems	Size system to meet peak hourly demands.
Emergency Standby Generator	Required as back up for power outages.
Circulation Loops	Provide between 1 - 2 ft/sec flow rate for water distribution loop circulation. [2]

[2] Cold Regions Utility Monograph, 3rd Ed., 1996.

3.5 Easements

Plats for the IC area were researched for the 2010 Report to determine the locations and dimensions of recorded utility easements and existing right of ways. CH2M HILL concurs with the 2010 Report that additional research, such as Title Searches and Reports should be commissioned prior to design implementation to verify whether or not easements are available along the full alignment. The alignment chosen for this study more closely follows the existing sewer forcemain where easements are already established. Easements will likely need to be obtained behind lots 8, 9, and 10 (from the Prematernal Home to the Sobering Center) and alongside Calista Drive, by the Post Office. A Utility Agreement will also need to be obtained from The Alaska Department of Transportation and Public Facilities (ADOT/PF) for the pipelines that parallel the Chief Eddie Hoffman Highway.

SECTION 4

Conceptual Alternatives

4.1 Larsen Alternative

The 2010 Institutional Corridor Water System Feasibility Study recommended a direct pipeline from the City Subdivision WTP to a 655,000 gallon storage tank and adjacent pump station located in the empty lot between the Bethel Regional Public Health Center and the Post Office. The pipeline would be heat traced for freeze protection. The storage tank would then feed a circulating loop along both sides of the Chief Eddie Hoffman Highway. The Larsen alternative maintains consistency with the Bethel Water and Sewer Master Plan but discussions with the City indicate that maintaining a water storage tank separate from the WTP is not a desirable option.

4.2 Other Options Considered

A connection to Loop A from the City Subdivision WTP was briefly considered to decrease the length of new pipe installed. However, as Loop A is only a 6-inch line, it does not have sufficient capacity for the required fire flows.

An alternative route along the north side of the Chief Eddie Hoffman Highway was presented to the City for consideration. This option could provide an access point for some of the properties from the front of their properties. The City preferred the back lot line access because easements have already been granted for the existing sewer forcemain.

The options considered and the Larsen Alternative are shown in Figure 5.

4.3 New Loop from City Subdivision WTP

The recommended alternative is an 11,000 foot, 8-inch insulated line that loops from the City Subdivision WTP, west along the back of existing properties, and south to the Chief Eddie Hoffman Highway. It would then go under the highway through a new road crossing to serve the south side before crossing again through an existing carrier pipe to return to the WTP. It is assumed that City ordinances will require one service per lot.

Pipe construction would be similar to the existing lines in Bethel. The lines should be installed with a heat trace channel but the system will be operated as a circulating heated water loop to prevent freezing.

The proposed layout is shown in the attached drawings in Appendix A.

4.4 Modeling

Modeling confirmed the base assumption that an 8-inch pipeline is needed for the loop. A 6-inch pipe provides insufficient capacity to deliver fire flow to the end of the loop without the line pressure dropping well below the 30 psig hydrant residual requirement or exceeding the maximum loop pressure of 100 psig.

The pipe direction of circulation was modeled in a counterclockwise direction. This direction minimizes system losses as the highest demands are closest to the discharge of the pump, which lowers the average loop velocity.

The loop has the capability to carry at least 130 gpm of extra demand flow, beyond the assumed flow demands, before supply pressure needs to be increased above 50 psig. This flow can be carried to any point in the loop. This extra demand flow can be increased depending on where the flow is withdrawn.

The consideration of additional future demand, or "build out", was also assessed. Build out, a term referencing additional capacity in the pipe loop, is highly dependent on where the additional flows are withdrawn from the system. If the build out flow is withdrawn near the halfway point of the loop to supply

future loops, pump stations, or reservoirs, the build out flow can be up to 185 gpm. If no reservoirs were installed for the hypothetical future loop, this flow could supply the equivalent of residential use for roughly 900 people. Adding reservoirs could substantially add to the population to be served with this flow as reservoirs could fill during non-peak usage. For build out withdrawn elsewhere off the proposed loop, the flow should be kept at a conservative 130 gpm.

Fire flows were modeled based on the City's desire to prepare now for future expansion to Blueberry Subdivision. The fire flow pump demand for the new loop alone would be 1,658 gpm @ 88 psig. If the City prefers to prepare now for the build out capacity of the loop, the high demand pump should be sized to provide 1843 gpm @ 100 psig.

4.5 Potable Water Storage Requirements

In analyzing the required storage capacity for the system, the option of providing additional work shifts for water production was considered as a means to reduce the storage requirement. The table below summarizes required storage, shift frequency, and flow conditions. It is possible to keep the existing reservoir as the sole storage for the system, provided the plant does not go offline for as long as it currently does.

TABLE 5
Required Storage for City Subdivision WTP with New Loop Under Differing Operating Conditions

Flow Condition	Max Time Between Water Production (days)	Required System Storage (total gallons)
Average Demand	2.66-current operations	545,000
	2.0	480,000
Semi Peak Demand	2.66-current operations	828,000
	1.66	636,000
	0.66	443,000
Peak Demand	1.66	693,000
	0.66	466,000

Under higher flows, the existing storage will be enough provided that work shifts occur every day. If no shifts are added, it is estimated that 828,000 gallons of water need to be stored in reservoirs for sufficient supply during high demand periods. This is equal to roughly 345,000 gallons of new storage.

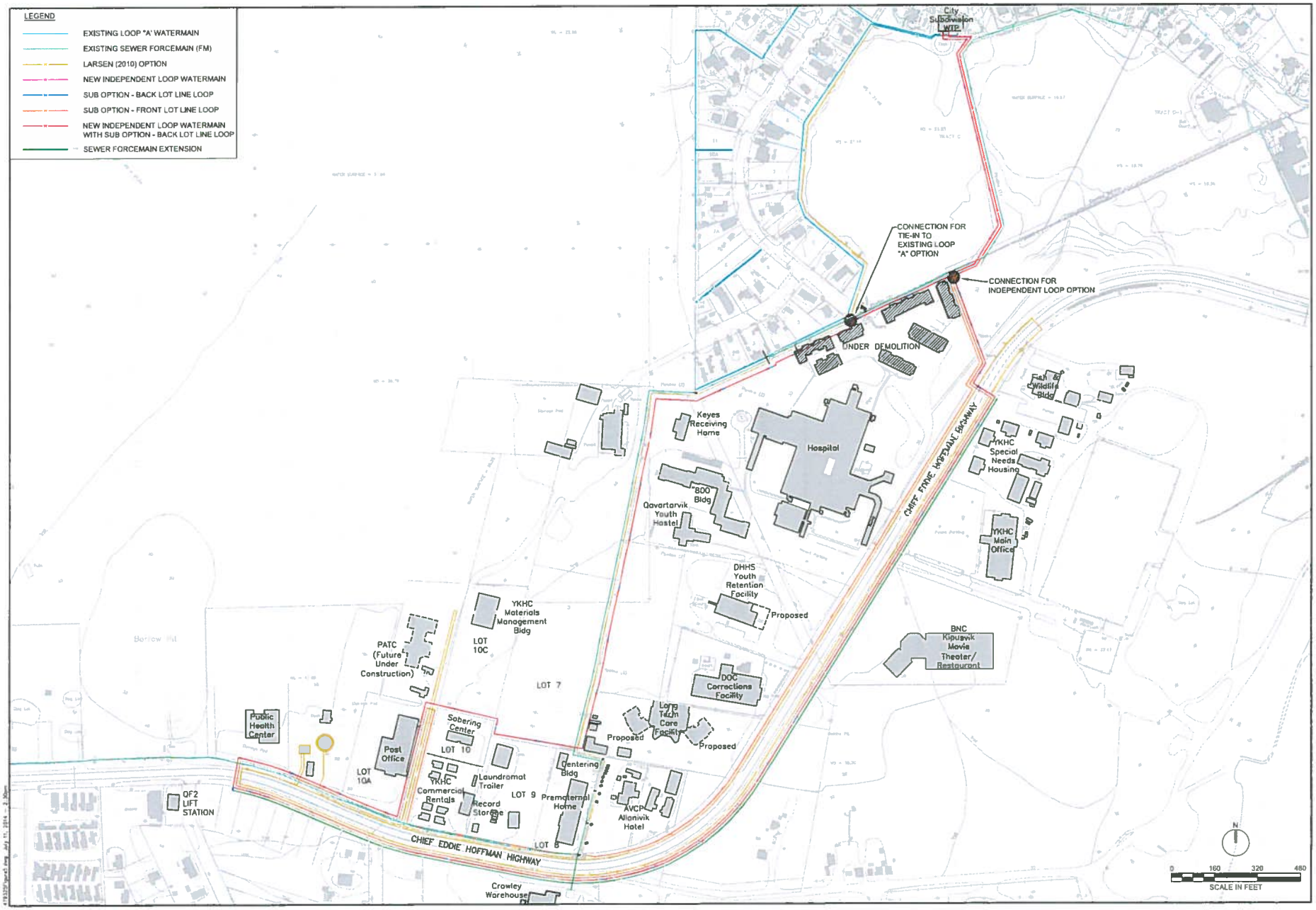
Note that estimated system storage requirements are highly dependent on peaking factors. Peaking factors have been conservatively assumed, however, prior to beginning any design, plant flow data should be collected and analyzed to determine the true peaking factors for the plant.

4.6 City Subdivision WTP Improvements

4.6.1 Pumps

With the addition of a new loop, the current high demand pump is inadequate, as it is shown to supply only 1200 gpm. A new 50 hp high-demand pump capable of 1,850 gpm and 100 psig will cover the demand at build out.

The current circulation pumps do not have the capacity that is needed for the new loop. A new circulation pump will be added to the system to circulate the new loop. It will be required to deliver 240 gpm at 30psig to maintain a 2 fps line velocity. A second, new circulation pump should also be purchased to install as a spare on the new loop.



VILLAGE SAFE WATER

CH2MHILL

VERIFY SCALE
BAR IS ONE INCH ON ORIGINAL DRAWING
0 1"
IF NOT ONE INCH ON THIS SHEET, ADJUST SCALES ACCORDINGLY

City of Bethel
Bethel, Alaska
INSTITUTIONAL CORRIDOR WATER SYSTEM
CIVIL
LOOP OPTIONS CONSIDERED

REVISION	BY	DATE

Project No. 479125
Date MAY 2014
Designed S. Winter
Drawn R. Bedford
Approved L. Wolf

Sheet No. FIGURE 5
SHEET ____ OF ____

4.6.2 Boiler System

After analyzing boiler loads for both average day and peak day, it was determined the boilers and all heat exchangers have adequate capacity for the modeling assumptions.

TABLE 6
Boiler loads

	Peak Day (Btu/hr)		Average Day (Btu/hr)	
Existing boiler capacity	2,724,000		2,724,000	
Raw water preheating for existing loops	(949,990)	@ 159 gpm	(413,040)	@ 69 gpm
Existing loop circulation heating	(565,000)		(565,000)	
Tank heating	(37,574)		(37,574)	
Sewer loop heating	(117,700)		(117,700)	
Building heating	(227,160)		(227,160)	
Raw water preheating for new loop load	(495,647)	@ 83 gpm	(215,499)	@ 36 gpm
New loop recirculation heating	(129,093)		(129,093)	
Excess boiler capacity (Btu/hr)	**201,834**		**1,018,934**	
Excess boiler capacity (%)	**7.4%**		**37.4%**	

It should be noted that the above results are conservative for a variety of reasons. Recirculation water temperature could be reduced to the minimum treatment process temperature, which would reduce raw water heating demands. Flow balancing using the storage tank could reduce the raw water flow required to be heated. Additionally, heating loads for the tank, sewer lines, and recirculation loops were assumed at heat exchanger stated loads, and as such, probably include excess capacity in the heat exchanger.

The raw water heat exchanger only has 4% excess capacity (when counting new loop's load) under peak day loading during a design winter event. The likelihood of both events coinciding is low, however, so this heat exchanger should be sufficient to serve loads. Additionally, flow balancing or reducing the raw water temperature to 41 degrees would reduce demand at this heat exchanger.

4.6.3 Electrical Systems

The 2010 Report stated that no upgrades were needed for the addition of two new pumps. A new investigation was not conducted for this update.

4.7 Sewermain Extension

Properties on the north side of the Chief Eddie Hoffman Highway have access to the existing sewer forcemain. When the watermain is extended to the south side of the highway, a sewer line should be placed in the same easement so that every building with unlimited access to water also has access to the public sewer. If the existing topography allows, a 6-inch, above ground, sewer line would run by gravity from the west end across from the Bethel Regional Public Health Center and from the east end near the Fish and Wildlife Center. A lift station at the low point would pump flow through a new road crossing to the existing forcemain on the north side.

4.8 Phasing

The City of Bethel is committed to providing piped water to its population. There are strong drivers for completing the IC water loop as described above. However, the City has limited funds for completing this

project. The City is holding $7 million in funds received from the State for this project specifically. The total installed cost for this project is currently estimated at nearly $10.6 million. In an effort to see at least some portion of this project completed, a possible phasing of projects is outlined here in order allow time to acquire additional funding.

The City has requested that any phased installation still allow the new watermain to be used immediately. Therefore, it will be necessary to shorten the loop to reduce costs. To avoid installation of a long length of temporary pipe used only to close the loop, as much of the final route should be installed as possible, with a temporary leg closing the loop at the end farthest from the WTP.

Several possibilities were considered for a shorter loop. The longest loop that stays under currently available funds must cut across between the Hospital and the Youth Correctional Facility before heading across the Chief Eddie Hoffman Highway and back up to the WTP. A slightly longer loop that would instead cut across closer to the Adult Correctional Facility has a total estimated installed cost of $7.05 million. As estimated, this exceeds the currently available funds.

Phase I of this installation would include all of the improvements needed at the WTP, a shortened water loop, the borings under the Chief Eddie Hoffman Highway, and service lines to the businesses that are within the shortened loop.

Phase II would include the remainder of the loop, service lines, and the new sewermain and lift station. The temporary leg closing the shorter loop would be removed once the full loop is installed.

If smaller cost increments are required, the sewermain could be completed in a separate year from the watermain, in a Phase III. It should be noted that mob/demob costs will be incurred for each phase.

4.9 Future

It will be possible to expand the IC watermain to either existing or future development. Depending on where the additional flows are withdrawn from the loop, the the build out flow can be between 130 and 185 gpm. A new reservoir or pump station would increase the capacity of an expanded system.

SECTION 5

Project Elements to be Completed Prior to Design

5.1 Flow Data

A thorough investigation of actual flows for existing buildings should be conducted prior to design. The Water and Sewer rate study also recommended implementation of tracking water production and demand at the WTP for data for future engineering (CH2M HILL, 2013).

5.2 Geotechnical

Previous information and published geologic data indicate fairly uniform subsurface conditions in the area. In undisturbed or undeveloped areas, soils in the upper 1 to 2 feet generally consist of a layer of organic materials (including vegetative matter, topsoil, and muskeg) underlain by loose fine sand, silty sand, and silt. These soils are typically marginally frozen (thermally-sensitive permafrost) below 2 ft. A desktop evaluation performed for the 2010 Report determined that shallow and warm permafrost conditions will require foundation designs that reduce the potential for utility damage as a result of permafrost thawing and settlement. Large structures, such as storage tanks, should also be insulated to maintain permafrost integrity. A detailed subsurface investigation should be conducted along the alignment to characterize the existing soils.

5.3 Surveying

CH2M HILL concurs with the 2010 Report that surveying must be performed to provide topographic information and horizontal location of the existing lines and right of way. Detailed information will be required at road crossings so that elevations can be established for design.

5.4 Permitting

As the state Office of Project Management and Permitting no longer coordinates the Coastal Project Questionnaire (CPQ), it will be the responsibility of the City or its consultant to coordinate with the pertinent regulatory agencies during the design phase. Interested parties which may require notification include the Alaska Department of Fish and Game and the Alaska Department of Natural Resources. For any fill placed in wetlands or other waters of the U.S., the City will contact the US Army Corps of Engineers for approval under the General Permit issued to the City for activities including creating foundation pads for structures and utilities.

As stated in the 2010 Report, an ADOT/PF Utility Agreement permit will likely be required for any road crossings on state property or for construction in the Highway right-of-way. An ADEC Approval to Construct and Operate will also be required.

5.5 Easements

As stated in Section 3.5, suitable easements and rights-of-way must be confirmed or established, as necessary, prior to design. Easements established for the sewer forcemain may need to be widened to accommodate two pipelines. Use of the State of Alaska's Right-of-way along the south side of the Chief Eddie Hoffman Highway should be coordinated with ADOT/PF by obtaining a Utility Agreement.

SECTION 6

Cost Estimate

The cost estimate was completed on a conceptual plan and is considered a Class 4 Estimate with an accuracy range of -30% to +50%. The project completion costs include construction, City administration, design, and construction support services. The cost range is shown in Table 7. This total project cost includes the complete loop, WTP improvements, and a new sewermain.

TABLE 7
Bethel IC Watermain Project Completion Cost Accuracy Range

	Accuracy Low Range -30%	Capital Total	Accuracy High Range +50%
Project Completion Cost	$7,383,000	$10,547,000	$15,820,000

As explained in Section 4.8, the total project costs exceed the available funds and the project will need to be completed in at least one additional phase.

A shortened loop that goes as far as the Qavartarvik Youth Hostel and the DHHS Youth Retention Facility can be completed in Phase I along with all of the necessary improvements at the WTP and all of the road borings for the complete project. Upon reception of further funding, the water loop could be installed later, as well as the additional sewermain. Phased costs could be as follows:

TABLE 8
Overall Costs
Bethel Watermain Loop – Phased Short Loop

	Accuracy Low Range -30%	Capital Total	Accuracy High Range +50%
Phase 1 Capital Cost	$4,748,000	**$6,783,000**	$10,175,000
Phase 2 Capital Cost	$3,632,000	**$5,188,000**	$7,782,000
Total Capital Cost Phases 1 & 2	***$8,380,000***	***$11,971,000***	***$17,957,000***

See Appendix B for cost estimate details. Appendix B1 contains the detailed estimate for the complete project without phasing. Appendix B2 contains cost details for a two-phase project.

SECTION 7

Conclusions and Recommendations

An 8-inch diameter, insulated loop is needed to serve the water needs of the IC in Bethel. The length of the total pipeline is 11,000 feet. In order to proceed with available funding, the project will have to be broken into phases. A shortened loop should be constructed to minimize the installation of wasted piping. The phased construction will include a loop that goes as far as the Qavartarvik Youth Hostel and the DHHS Youth Retention Facility, all of the necessary improvements at the WTP, and all of the road borings in Phase I. The loop could then be extended out to the Bethel Regional Public Health Center as shown in Figure 1 in a second phase. It is also recommended that an additional sewermain be constructed when the loop is completed, to avoid overloading hauled wastewater storage with an unlimited water source.

The necessary improvements at the WTP include a new high demand pump and two additional circulation pumps. The new high demand pump should be large enough to accommodate future build out at 1850 gpm and 100 psig output. A boiler or electrical system upgrade should not be required.

Operations at the WTP should be increased to work shifts six days per week to avoid construction of a new water storage tank. Service lines will be installed to the buildings requesting water service. It is recommended that the users connect piped water to their systems such that their existing water storage tanks remain in use.

SECTION 8

References

CH2M HILL. 2013. *City of Bethel Water andSewer Cost Allocation and Rate Study.*

CH2M HILL. 2005. *Geotechnical Report: QFC#2 Lift Station Replacement and Forcemain Consideration Bethel, Alaska.*

CRW Engineering Group, LLC. 2005. *Bethel Water and Sewer Facilities Master Plan Update.*

International Code Council, Inc. 2009. *International Fire Code*. Illinois: ICC.

Larsen Consulting Group, Inc. 2010. *Institutional Corridor Water System, Bethel, Alaska, Feasibility Study.*

Metcalf & Eddy, Inc. Revised by Tchobanoglous, George, Franklin L. Burton, and H. David Stensel. 2003. *Wastewater Engineering Treatment and Reuse*. 4th ed. New York: McGraw-Hill.

National Fire Protection Association. 2010. *NFPA 13: Standard for the Installation of Sprinkler Systems*. Quincy, MA: NFPA.

National Fire Protection Association. 2010. *NFPA 20: Standard for the Installation of Stationary Pumps for Fire Protection*. Quincy, MA: NFPA.

National Fire Protection Association. 2010. *NFPA 24: Standard for the Installation of Private Fire Service Mains and Their Appurtenances*. Quincy, MA: NFPA.

Roberts, Jill/State Fire Marshall's Office. 2014. Personal communication with Katie Winter/CH2M HILL. February 27.

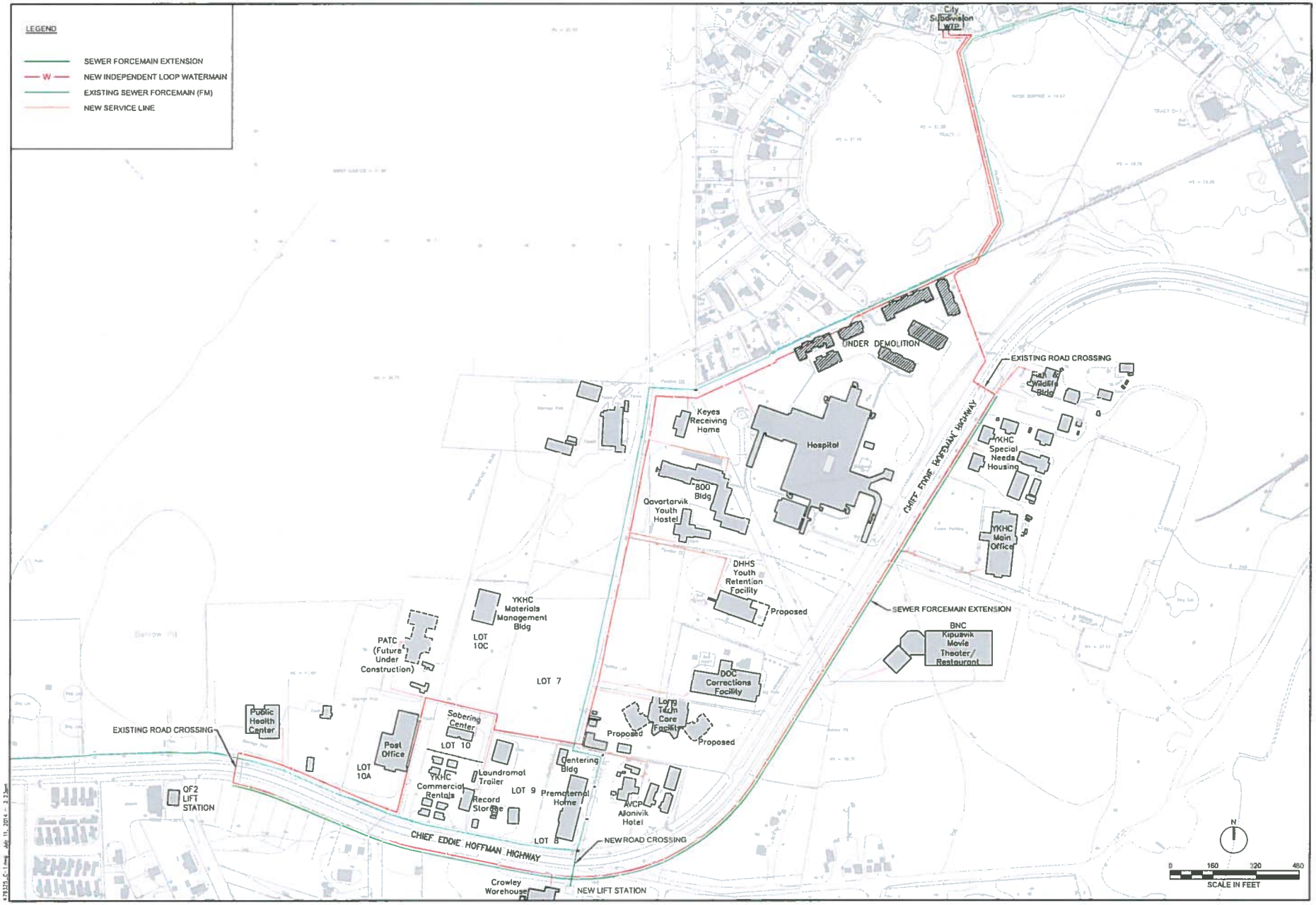
Smith, D.W., Ed. 1996. *Cold Regions Utilities Monograph*. 3rd ed. New York: ASCE.

State of Alaska Department of Commerce, Community, and Economic Development. 2012. *Community Information*. http://commerce.alaska.gov/cra/DCRAExternal/community . Accessed April 2014.

State of Alaska Department of Labor and Workforce Development, Research and Analysis Section. 2011. *Alaska Population Projections 2010 – 2035.*

Young, George/Bethel Fire Chief. 2014. Personal communication with Katie Winter/CH2M HILL. February 26.

Appendix A
Schematic Drawings



VILLAGE SAFE WATER

CH2MHILL

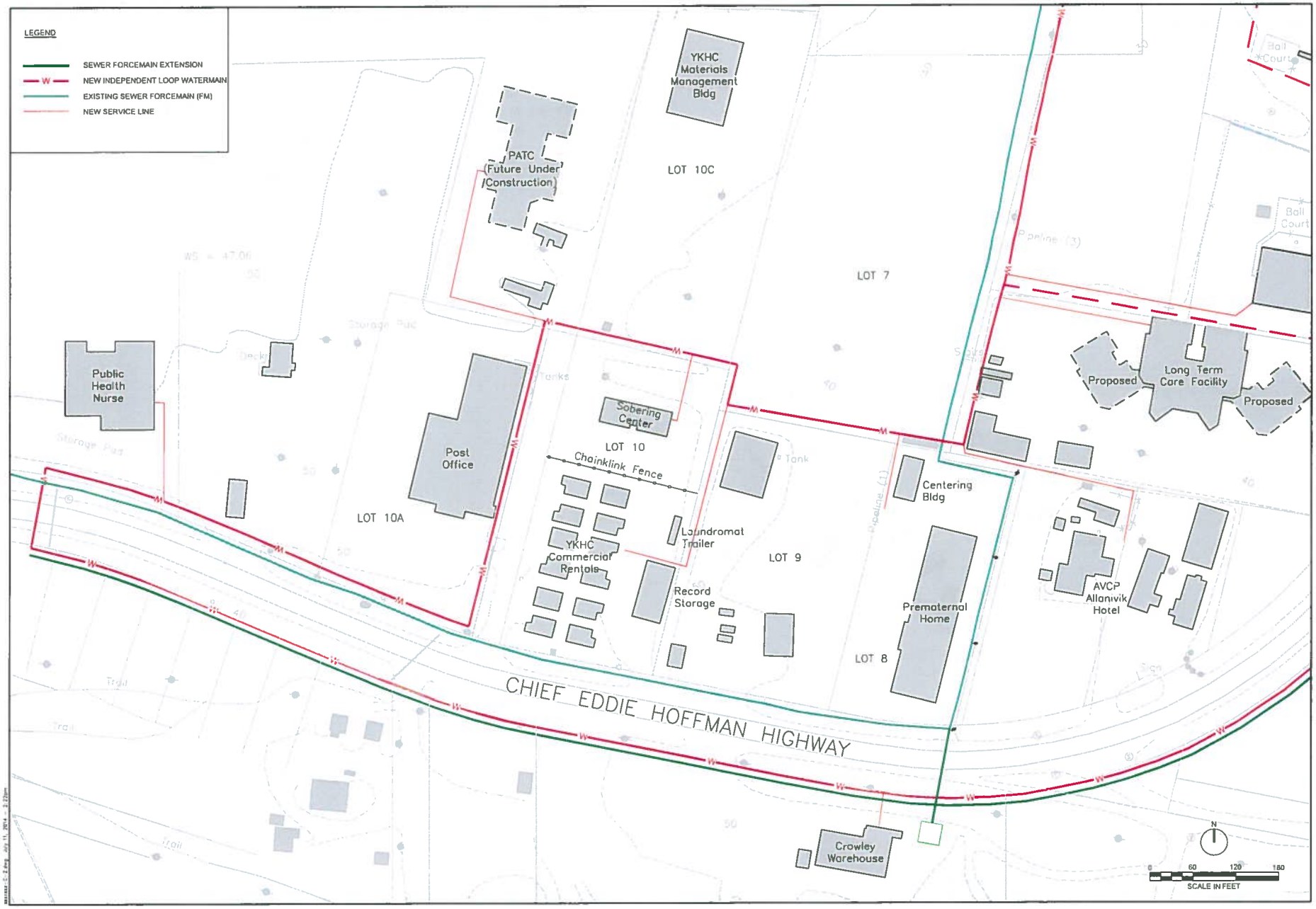
VERIFY SCALE
BASE ON ORIGINAL DRAWING
0 1"
IF NOT ONE INCH ON THIS SHEET, ADJUST SCALES ACCORDINGLY

City of Bethel
Bethel, Alaska
INSTITUTIONAL CORRIDOR
WATER SYSTEM
CIVIL
OVERALL LAYOUT

REVISION	BY	DATE

Project No. 479325
Date JULY 2014
Designed S. Winter
Drawn R. Benfield
Approved L. Wolf

Sheet No. C-1
SHEET 1 OF 5



VILLAGE SAFE WATER

CH2MHILL

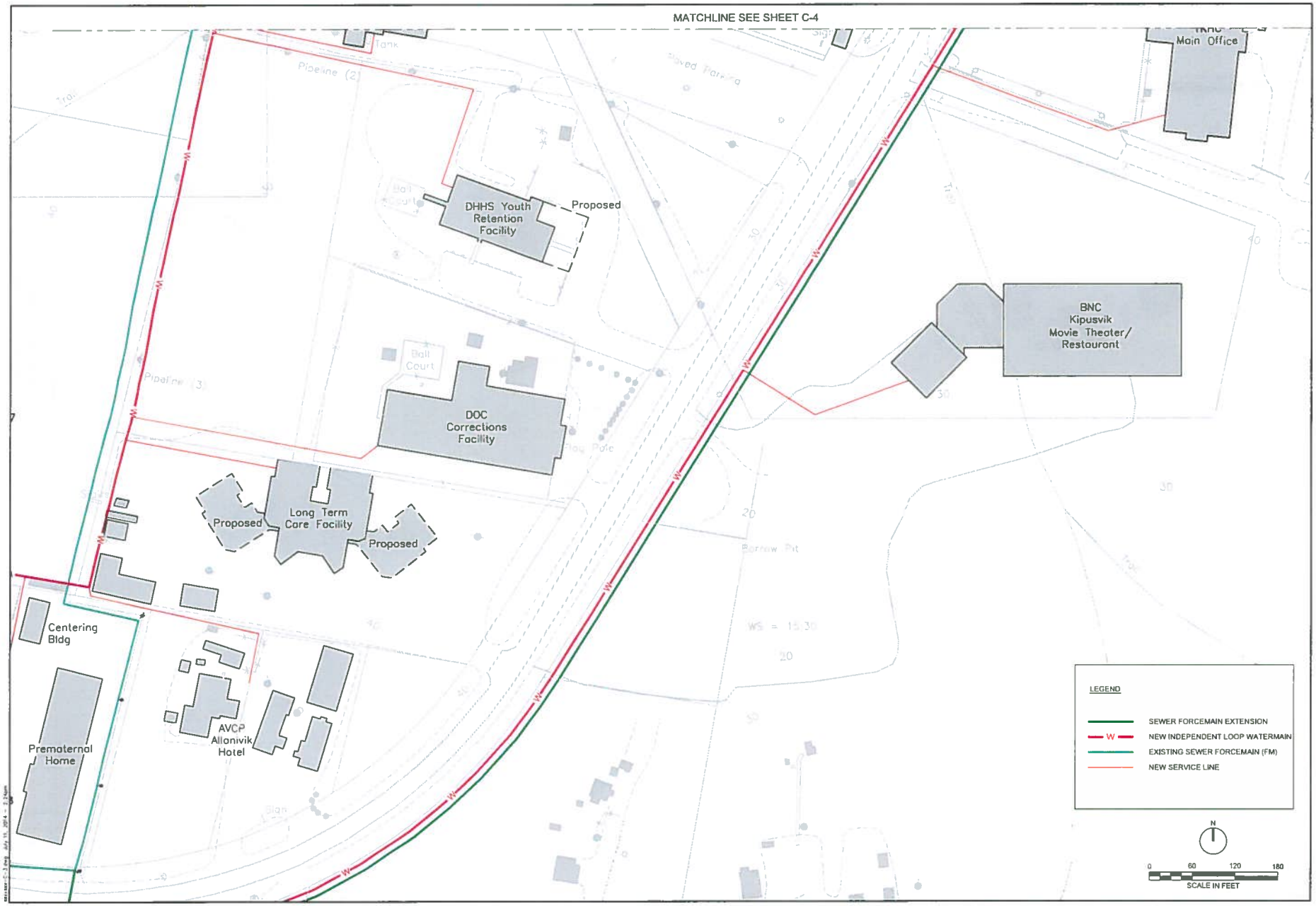
VERIFY SCALE
BAR IS ONE INCH ON ORIGINAL DRAWING.
IF NOT ONE INCH ON THIS SHEET, ADJUST SCALES ACCORDINGLY.

City of Bethel
Bethel, Alaska
INSTITUTIONAL CORRIDOR WATER SYSTEM
CIVIL LAYOUT

REVISION	BY	DATE

Project No. 479325
Date JULY 2014
Designed K. Winter
Drawn R. Benfield
Approved T. Wolf

Sheet No. C-2
SHEET 2 OF 5



VILLAGE SAFE WATER

CH2MHILL

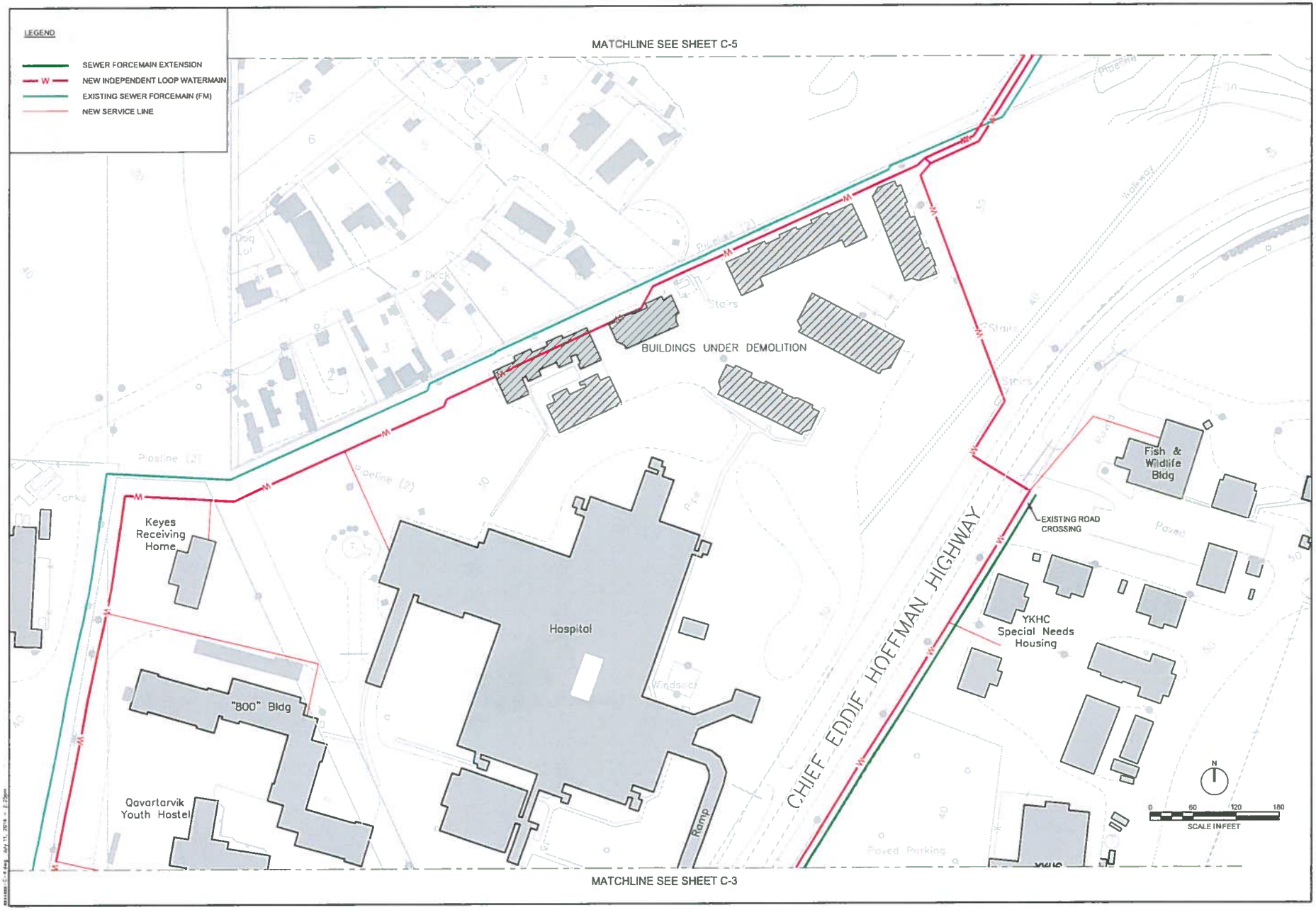
VERIFY SCALE
BAR IS ONE INCH ON ORIGINAL DRAWING.
0 1"
IF NOT ONE INCH ON THIS SHEET ADJUST SCALES ACCORDINGLY.

City of Bethel
Bethel, Alaska
INSTITUTIONAL CORRIDOR WATER SYSTEM
CIVIL LAYOUT

REVISION	BY	DATE

Project No. 479325
Date JULY 2014
Designed K. Winter
Drawn R. Benfield
Approved T. Wolf

Sheet No. C3
SHEET 3 OF 5



VILLAGE SAFE WATER

CH2MHILL

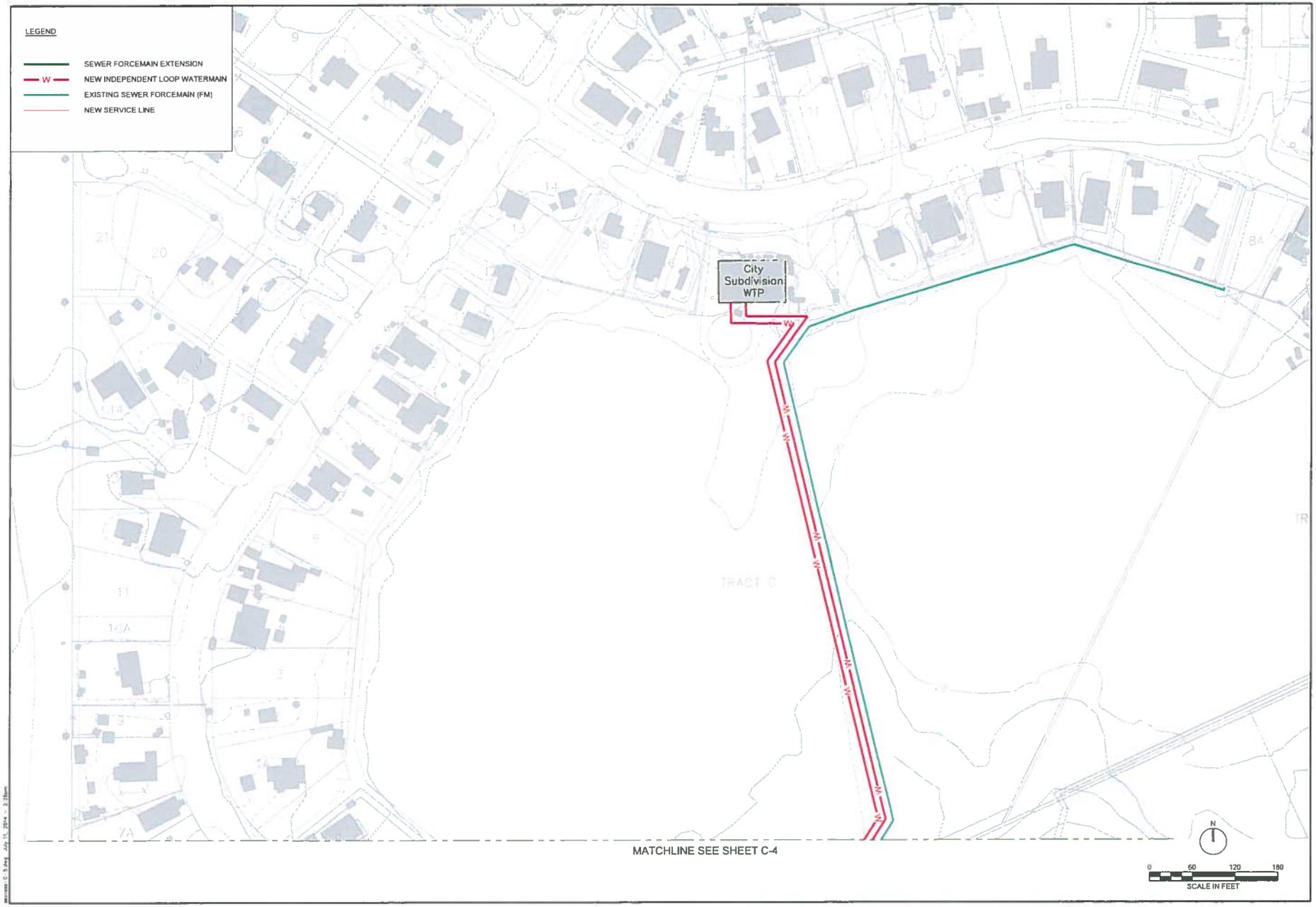
VERIFY SCALE
BAR IS ONE INCH ON ORIGINAL DRAWING.
IF NOT ONE INCH ON THIS SHEET ADJUST SCALES ACCORDINGLY

City of Bethel
Bethel, Alaska
INSTITUTIONAL CORRIDOR WATER SYSTEM
CIVIL LAYOUT

REVISION	BY	DATE

Project No. 479325
Date JULY 2014
Designed K. Winter
Drawn R. Benfield
Approved T. Wolf

Sheet No. C-4
SHEET 4 OF 5



VILLAGE SAFE WATER

CH2MHILL

VERIFY SCALE
BAR IS ONE INCH ON ORIGINAL DRAWING.
IF NOT ONE INCH ON THIS SHEET, ADJUST SCALES ACCORDINGLY.

City of Bethel
Bethel, Alaska
INSTITUTIONAL CORRIDOR
WATER SYSTEM
CIVIL
LAYOUT

REVISION	BY	DATE

Project No. 473325
Date JULY 2014
Designed K. Winter
Drawn R. Benfield
Approved L. Wolf

Sheet No. C-5
SHEET 5 OF 5

Appendix B
Cost Estimate

B1 – Complete Project Costs

CH2MHILL

Job Size:
Duration:

Detail Report

Project: Bethel Watermain Loop
Project No.: 479325
Design Stage: 10%

Estimator: N. Cavalleri
Revision / Date: 1/April 18, 2014
Estimate Class: 4

Bid Item	Description	Takeoff Quantity	Labor Amount	Material Amount	Sub Amount	Equip Amount	Other Amount	Direct Cost/Unit	Direct Amount	Grand Total W/ Markups	Grand Total Unit Price
01	Mobilization & Demobilization	1.00 LS					763,000	763,000.00 /LS	763,000	1,217,593	1,217,593.10 /LS
02	Traffic Control & Public Relations	4,000.00 LF					40,000	10.00 /LF	40,000	63,832	15.96 /LF
03	Construction Surveying	1.00 LS					35,000	35,000.00 /LS	35,000	55,853	55,852.88 /LS
04	Preparation of SWPPP	1.00 LS					15,000	15,000.00 /LS	15,000	23,937	23,936.95 /LS
05	Maintenance of Water Service	1.00 LS					150,000	150,000.00 /LS	150,000	239,370	239,369.56 /LS
06	8" Dia HDPE Arctic Insulated Watermain	11,000.00 LF	344,395	440,000	100,000	112,888		90.66 /LF	997,282	3,514,180	319.47 /LF
07	8" Dia HDPE Arctic Insulated Sewer Forcemain	4,000.00 LF	125,235	160,000	85,000	41,050		102.82 /LF	411,285	1,447,764	361.94 /LF
08	Air Release Valve in Main Line	10.00 EA	1,220	22,000	3,000			2,621.98 /EA	26,220	93,123	9,312.25 /EA
09	Isolation Valve in Main Line	10.00 EA	1,220	18,000	3,000			2,221.98 /EA	22,220	78,871	7,887.10 /EA
10	Road Crossing	9.00 EA	59,832	151,847	62,000	21,119		32,755.27 /EA	294,797	1,040,319	115,590.99 /EA
11	Fire Hydrant	22.00 EA	17,499	44,550		566		2,846.10 /EA	62,614	221,822	10,082.81 /EA
12	Pipe Supports	1,100.00 EA	237,128	165,000		75,776		434.46 /EA	477,904	1,680,809	1,528.01 /EA
13	Instrall Water Services with Mainline and Building Connections	20.00 EA	29,276	100,000		2,400		6,583.82 /EA	131,676	466,929	23,346.43 /EA
14	Circulation Pump	2.00 EA	6,979	20,000		3,425		15,201.65 /EA	30,403	107,595	53,797.42 /EA
15	High Demand Pump	1.00 EA	8,723	70,000		4,281		83,004.12 /EA	83,004	294,823	294,822.73 /EA

Property of CH2M Hill, Inc. All Rights Reserved - Copyright 2012

Estimate Totals

Construction Costs	Amount	Totals	Hours	Rate	% of Total
Labor	831,505		16,692.069 I		7.88%
Material	1,191,397				11.30%
Subcontract	253,000				2.40%
Equipment	261,504		6,142.682 I		2.48%
Subtotal Direct	**2,537,406**	**2,537,406**			24.06
Market Condition Adjustment	888,092			35.000 %	8.42%
Subtotal w/ Market Condition	**888,092**	**3,425,498**			8.42
General Conditions	513,825			15.000 %	4.87%
Subtotal w/ General Conditions	**513,825**	**3,939,323**			4.87
Material Sales Tax	83,398			7.000 %	0.79%
Subtotal w/ Sales Taxes	**83,398**	**4,022,721**			0.79
Contractor Overhead	603,408			15.000 %	5.72%
Contractor Profit	231,306			5.000 %	2.19%
Bider's Risk & Gen Liab Ins -%	48,574			1.000 %	0.46%
Payment & Performance Bonds	56,910			1.160 %	0.54%
Subtotal w/ Markups	**940,198**	**4,962,919**			8.91
Contingency	1,985,168			40.000 %	18.82%
Subtotal w/ Contingency	**1,985,168**	**6,948,087**			18.82
Escalation on Estimate Total	486,366			7.000 %	4.61%
Subtotal w/ Escalation	**486,366**	**7,434,453**			4.61
Non-Markup Items	1,003,000				9.51%
Subtotal Non-Markup Items	**1,003,000**	**8,437,453**			9.51
Construction Total		**8,437,453**			
City Administration	253,124			3.000 %	2.40%
Design Costs	843,745			10.000 %	8.00%
Construction Support Services	1,012,494			12.000 %	9.60%
Capital Total	**2,109,363**	**10,546,816**			20.00

Property of CH2M Hill, Inc. All Rights Reserved - Copyright 2012

CH2MHILL

Job Size:
Duration:

Detail Report

Project: Bethel Watermain Loop
Project No.: 479325
Design Stage: 10%

Estimator: N. Cavallen
Revision / Date: 1/April 18, 2014
Estimate Class: 4

Bid Item	Work Pkg	Trade Pkg	WorkActiv	Unit Price	Description	Takeoff Quantity	Labor Amount	Material Amount	Sub Amount	Equip Amount	Other Amount	Direct Cost/Unit	Direct Amount	Grand Total Unit Price	Grand Total W/ Markups
01					**Mobilization & Demobilization**										
	01.0				General Conditions										
		01-01			Construction Operations										
			NJC-012		**Mobilization & Demobilization**										
				01-01-05-00	General Conditions, Other										
					Mobilization & Demobilization	1.00 ls	-	-	-	-	763,000	763,000.00 /ls	763,000	1,217,593.10 /ls	1,217,593
					01-01-05-00 General Conditions, Other	1.00 LS					763,000	763,000.00 /LS	763,000	1,217,593.10 /LS	1,217,593
					NJC-012 Mobilization & Demobilization	1.00 LS					763,000	763,000.00 /LS	763,000	1,217,593.10 /LS	1,217,593
					01-01 Construction Operations	1.00 LS					763,000	763,000.00 /LS	763,000	1,217,593.10 /LS	1,217,593
					01.0 General Conditions	1.00 LS					763,000	763,000.00 /LS	763,000	1,217,593.10 /LS	1,217,593
					01 Mobilization & Demobilization	**1.00 LS**					**763,000**	**763,000.00 /LS**	**763,000**	**1,217,593.10 /LS**	**1,217,593**
02					**Traffic Control & Public Relations**										
	01.0				General Conditions										
		01-01			Construction Operations										
			NJC-006		**Traffic Control & Public Relations**										
				01-01-05-00	General Conditions, Other										
					Traffic Control & Public Relations	1.00 ls	-	-	-	-	40,000	40,000.00 /ls	40,000	63,831.90 /ls	63,832
					01-01-05-00 General Conditions, Other	1.00 LS					40,000	40,000.00 /LS	40,000	63,831.90 /LS	63,832
					NJC-006 Traffic Control & Public Relations	1.00 LS					40,000	40,000.00 /LS	40,000	63,831.90 /LS	63,832
					01-01 Construction Operations	1.00 LS					40,000	40,000.00 /LS	40,000	63,831.90 /LS	63,832
					01.0 General Conditions	1.00 LS					40,000	40,000.00 /LS	40,000	63,831.90 /LS	63,832
					02 Traffic Control & Public Relations	**4,000.00 LF**					**40,000**	**10.00 /LF**	**40,000**	**15.96 /LF**	**63,832**
03					**Construction Surveying**										
	01.0				General Conditions										
		01-01			Construction Operations										
			NJC-008		**Construction Surveying**										
				01-01-05-00	General Conditions, Other										
					Construction Surveying	1.00 ls	-	-	-	-	35,000	35,000.00 /ls	35,000	55,852.88 /ls	55,853
					01-01-05-00 General Conditions, Other	1.00 LS					35,000	35,000.00 /LS	35,000	55,852.88 /LS	55,853
					NJC-008 Construction Surveying	1.00 LS					35,000	35,000.00 /LS	35,000	55,852.88 /LS	55,853
					01-01 Construction Operations	1.00 LS					35,000	35,000.00 /LS	35,000	55,852.88 /LS	55,853
					01.0 General Conditions	1.00 LS					35,000	35,000.00 /LS	35,000	55,852.88 /LS	55,853
					03 Construction Surveying	**1.00 LS**					**35,000**	**35,000.00 /LS**	**35,000**	**55,852.88 /LS**	**55,853**
04					**Preparation of SWPPP**										
	01.0				General Conditions										
		01-01			Construction Operations										
			NJC-010		**Preparation of SWPPP**										
				01-01-05-00	General Conditions, Other										
					Preparation of SWPPP	1.00 ls	-	-	-	-	15,000	15,000.00 /ls	15,000	23,936.95 /ls	23,937
					01-01-05-00 General Conditions, Other	1.00 LS					15,000	15,000.00 /LS	15,000	23,936.95 /LS	23,937
					NJC-010 Preparation of SWPPP	1.00 LS					15,000	15,000.00 /LS	15,000	23,936.95 /LS	23,937
					01-01 Construction Operations	1.00 LS					15,000	15,000.00 /LS	15,000	23,936.95 /LS	23,937
					01.0 General Conditions	1.00 LS					15,000	15,000.00 /LS	15,000	23,936.95 /LS	23,937
					04 Preparation of SWPPP	**1.00 LS**					**15,000**	**15,000.00 /LS**	**15,000**	**23,936.95 /LS**	**23,937**
05					**Maintenance of Water Service**										
	01.0				General Conditions										
		01-01			Construction Operations										
			NJC-014		**Maintenance of Water Service**										
				01-01-05-00	General Conditions, Other										
					Maintenance of Water Service	1.00 ls	-	-	-	-	150,000	150,000.00 /ls	150,000	239,369.56 /ls	239,370
					01-01-05-00 General Conditions, Other	1.00 LS					150,000	150,000.00 /LS	150,000	239,369.56 /LS	239,370
					NJC-014 Maintenance of Water Service	1.00 LS					150,000	150,000.00 /LS	150,000	239,369.56 /LS	239,370
					01-01 Construction Operations	1.00 LS					150,000	150,000.00 /LS	150,000	239,369.56 /LS	239,370
					01.0 General Conditions	1.00 LS					150,000	150,000.00 /LS	150,000	239,369.56 /LS	239,370
					05 Maintenance of Water Service	**1.00 LS**					**150,000**	**150,000.00 /LS**	**150,000**	**239,369.56 /LS**	**239,370**
06					**8" Dia HDPE Arctic Insulated Watermain**										
	40.0				Process Piping										
		33-35			Pipelines										
			NJC-002		**Watermain Loop**										
				40-10-07-08	Pipe, HDPE, 8"										
					HDPE, butt fusion joints, 40' lengths, 8" diameter, SDR 11, Insulated	11,000.00 lf	344,395	440,000	-	112,888	-	81.57 /lf	897,282	287.72 /lf	3,164,892

Property of CH2M Hill, Inc. All Rights Reserved - Copyright 2012

CH2MHILL

Job Size:
Duration:

Detail Report

Project: Bethel Watermain Loop
Project No.: 479325
Design Stage: 10%

Estimator: N. Cavallari
Revision / Date: 1/April 18, 2014
Estimate Class: 4

Bid Item	Work Pkg	Trade Pkg	WorkActiv	Unit Price	Description	Takeoff Quantity	Labor Amount	Material Amount	Sub Amount	Equip Amount	Other Amount	Direct Cost/Unit	Direct Amount	Grand Total Unit Price	Grand Total W/ Markups
				40-10-07-08	Pipe, HDPE, 8"										
					Fittings Allowance	1.00 ls	-	-	100,000	-	-	100,000.00 /ls	100,000	349,287.18 /ls	349,287
					40-10-07-08 Pipe, HDPE, 8"	11,000.00 LF	344,395	440,000	100,000	112,888		90.66 /LF	997,282	319.47 /LF	3,514,180
					NJC-002 Watermain Loop	11,000.00 LF	344,395	440,000	100,000	112,888		90.66 /LF	997,282	319.47 /LF	3,514,180
					33-35 Pipelines	11,000.00 LF	344,395	440,000	100,000	112,888		90.66 /LF	997,282	319.47 /LF	3,514,180
					40.0 Process Piping	11,000.00 LF	344,395	440,000	100,000	112,888		90.66 /LF	997,282	319.47 /LF	3,514,180
					06 8" Dia HDPE Arctic Insulated Watermain	11,000.00 LF	344,395	440,000	100,000	112,888		90.66 /LF	997,282	319.47 /LF	3,514,180
07					8" Dia HDPE Arctic Insulated Sewer Forcemain										
	40.0				Process Piping										
		33-35			Pipelines										
			NJC-004		Sewer Forcemain										
				40-10-07-08	Pipe, HDPE, 8"										
					HDPE, butt fusion joints, 40' lengths, 8" diameter, SDR 11, Insulated	4,000.00 lf	125,235	160,000	-	41,050	-	81.57 /lf	326,285	287.72 /lf	1,150,870
					Fittings Allowance	1.00 ls	-	-	35,000	-	-	35,000.00 /ls	35,000	122,250.52 /ls	122,251
					40-10-07-08 Pipe, HDPE, 8"	4,000.00 LF	125,235	160,000	35,000	41,050		90.32 /LF	361,285	318.28 /LF	1,273,120
					NJC-004 Sewer Forcemain	4,000.00 LF	125,235	160,000	35,000	41,050		90.32 /LF	361,285	318.28 /LF	1,273,120
			NJC-005		Sewer Forcemain Lift Station										
				33-60-99-00	Pipeline Specials, Other										
					Sewer Lift Station Allowance	1.00 ls	-	-	50,000	-	-	50,000.00 /ls	50,000	174,643.62 /ls	174,644
					33-60-99-00 Pipeline Specials, Other	1.00 LS			50,000			50,000.00 /LS	50,000	174,643.62 /LS	174,644
					NJC-005 Sewer Forcemain Lift Station	1.00 EA			50,000			50,000.00 /EA	50,000	174,643.62 /EA	174,644
					33-35 Pipelines	4,000.00 LF	125,235	160,000	85,000	41,050		102.82 /LF	411,285	361.94 /LF	1,447,764
					40.0 Process Piping	4,000.00 LF	125,235	160,000	85,000	41,050		102.82 /LF	411,285	361.94 /LF	1,447,764
					07 8" Dia HDPE Arctic Insulated Sewer Forcemain	4,000.00 LF	125,235	160,000	85,000	41,050		102.82 /LF	411,285	361.94 /LF	1,447,764
08					Air Release Valve in Main Line										
	33.0				Piping										
		33-45			Pipeline Valves										
			NJC-018		Air Release Valve in Main Line										
				33-20-08-04	Valves, Air Valve Assembly										
					Air Valve Assembly	10.00 ea	1,220	22,000	-	-	-	2,321.98 /ea	23,220	8,264.39 /ea	82,644
					Miscellaneous Items Allowance	1.00 ls	-	-	3,000	-	-	3,000.00 /ls	3,000	10,478.63 /ls	10,479
					33-20-08-04 Valves, Air Valve Assembly	10.00 EA	1,220	22,000	3,000			2,621.98 /EA	26,220	9,312.25 /EA	93,123
					NJC-018 Air Release Valve in Main Line	10.00 EA	1,220	22,000	3,000			2,621.98 /EA	26,220	9,312.25 /EA	93,123
					33-45 Pipeline Valves	10.00 EA	1,220	22,000	3,000			2,621.98 /EA	26,220	9,312.25 /EA	93,123
					33.0 Piping		1,220	22,000	3,000			/LF	26,220	/LF	93,123
					08 Air Release Valve in Main Line	10.00 EA	1,220	22,000	3,000			2,621.98 /EA	26,220	9,312.25 /EA	93,123
09					Isolation Valve in Main Line										
	33.0				Piping										
		33-45			Pipeline Valves										
			NJC-020		Isolation Valve in Main Line										
				33-20-08-100	Valves, Isolation Valve										
					Isolation Valve Assembly	10.00 ea	1,220	18,000	-	-	-	1,921.98 /ea	19,220	6,839.24 /ea	68,392
					Miscellaneous Items Allowance	1.00 ls	-	-	3,000	-	-	3,000.00 /ls	3,000	10,478.63 /ls	10,479
					33-20-08-100 Valves, Isolation Valve	10.00 EA	1,220	18,000	3,000			2,221.98 /EA	22,220	7,887.10 /EA	78,871
					NJC-020 Isolation Valve in Main Line	10.00 EA	1,220	18,000	3,000			2,221.98 /EA	22,220	7,887.10 /EA	78,871
					33-45 Pipeline Valves	10.00 EA	1,220	18,000	3,000			2,221.98 /EA	22,220	7,887.10 /EA	78,871
					33.0 Piping		1,220	18,000	3,000			/LF	22,220	/LF	78,871
					09 Isolation Valve in Main Line	10.00 EA	1,220	18,000	3,000			2,221.98 /EA	22,220	7,887.10 /EA	78,871
10					Road Crossing										
	33.0				Piping										
		33-35			Pipelines										
			NJC-026		Road Crossing, Open Cut										
				40-10-07-08	Pipe, HDPE, 8"										
					Excavate Trench	340.00 cuyd	3,668	0	-	1,846	-	16.22 /cuyd	5,514	56.64 /cuyd	19,258
					Backfill Native	170.00 cuyd	468	0	-	67	-	3.15 /cuyd	536	11.00 /cuyd	1,871
					Pipe Bedding and Zone - Crushed Rock	190.00 cy	364	2,850	-	262	-	18.29 /cy	3,476	64.95 /cy	12,340
					Hauling, excavated or borrow material, loose cubic yards, 5 mile round trip, 1.1 loads/hour, 20 C.Y. dump trailer, highway haulers, excludes loading	170.00 lcy	427	-	-	672	-	6.47 /lcy	1,099	22.56 /lcy	3,839
					HDPE, butt fusion joints, 40' lengths, 8" diameter, SDR 11, Insulated	400.00 lf	12,523	16,000	-	4,105	-	81.57 /lf	32,628	287.72 /lf	115,087
					Pipe Casing	400.00 lf	2,299	30,000	-	735	-	82.59 /lf	33,034	293.71 /lf	117,484
					Surface Restoration	2,400.00 sf	-	-	12,000	-	-	5.00 /sf	12,000	17.46 /sf	41,914

Property of CH2M Hill, Inc. All Rights Reserved - Copyright 2012

Detail Report

Project: Bethel Watermain Loop
Project No.: 479325
Design Stage: 10%

Estimator: N. Cavalleri
Revision / Date: 1/April 18, 2014
Estimate Class: 4

Bid Item	Work Pkg	Trade Pkg	WorkActiv	Unit Price	Description	Takeoff Quantity	Labor Amount	Material Amount	Sub Amount	Equip Amount	Other Amount	Direct Cost/Unit	Direct Amount	Grand Total Unit Price	Grand Total W/ Markups
					40-10-07-08 Pipe, HDPE, 8"	400.00 LF	19,750	48,850	12,000	7,687		220.72 /LF	88,287	779.48 /LF	311,794
					NJC-026 Road Crossing, Open Cut	8.00 EA	19,750	48,850	12,000	7,687		11,035.84 /EA	88,287	38,974.22 /EA	311,794
					33-35 Pipelines	400.00 LF	19,750	48,850	12,000	7,687		220.72 /LF	88,287	779.48 /LF	311,794
		33-60			Trenchless Technology										
			NJC-024		Road Crossing, Bore and Jack										
				33-60-02-37	Pipeline Specials, Jack and Bore, 8" PVC in 24" Casing										
					Temp K Rail Rental, Delivery, Place, Remove and Return	16.00 ea		40,920	-	-	-	2,557.50 /ea	40,920	9,112.04 /ea	145,793
					Temporary Fencing, chain link, 6' high, 11 ga	160.00 lf	378	1,146	-	-	-	9.53 /lf	1,524	33.78 /lf	5,404
					Single Pipe, Pipe Skid	25.00 ea		6,394	-	-	-	255.75 /ea	6,394	911.20 /ea	22,780
					Closure Boot Seal	2.00 ea		2,455	-	-	-	1,227.60 /ea	2,455	4,373.79 /ea	8,748
					Shoring, cost per sfca trench wall, monthly rental	1,894.00 sf	-	11,333	-	-		6.69 /sf	11,333	23.84 /sf	40,378
					Concrete pressure grouting, cement and sand. 1:1 mix, maximum	420.00 cf	7,966	13,749	-	1,098	-	54.32 /cf	22,813	192.01 /cf	80,646
					Exc Jacking and Receiving Pits	230.00 cuyd	2,481		-	1,248	-	16.22 /cuyd	3,730	56.64 /cuyd	13,028
					Backfill Native	165.00 cuyd	455		-	65	-	3.15 /cuyd	520	11.00 /cuyd	1,816
					Pipe Zone - Crushed Rock	80.00 cy	153	1,200	-	110	-	18.29 /cy	1,464	64.95 /cy	5,196
					Hauling, excavated or borrow material, loose cubic yards, 5 mile round trip, 1.1 loads/hour, 20 C.Y. dump trailer, highway haulers, excludes loading	110.00 lcy	276	-	-	435	-	6.47 /lcy	711	22.58 /lcy	2,484
					Horizontal boring, roadwork, 1/2" thick wall, 24" diameter casing, includes casing only, 100' minimum, excludes jacking pits or dewatering	150.00 lf	23,676	19,800	-	8,936	-	349.41 /lf	52,411	1,229.68 /lf	184,452
					Horizontal boring, mobilization and demobilization, maximum	1.00 ea	-	-	50,000	-		50,000.00 /ea	50,000	174,643.62 /ea	174,644
					HDPE, butt fusion joints, 40' lengths, 8" diameter, SDR 11, insulated	150.00 lf	4,896	6,000	-	1,539	-	81.57 /lf	12,236	287.72 /lf	43,158
					33-60-02-37 Pipeline Specials, Jack and Bore, 8" PVC in 24" Casing	150.00 LF	40,082	102,997	50,000	13,432		1,376.74 /LF	206,511	4,856.83 /LF	728,525
					NJC-024 Road Crossing, Bore and Jack	150.00 LF	40,082	102,997	50,000	13,432		1,376.74 /LF	206,511	4,856.83 /LF	728,525
					33-60 Trenchless Technology	150.00 LF	40,082	102,997	50,000	13,432		1,376.74 /LF	206,511	4,856.83 /LF	728,525
					33.0 Piping	550.00 LF	59,832	151,847	62,000	21,119		536.00 /LF	294,797	1,891.49 /LF	1,040,319
					10 Road Crossing	9.00 EA	59,832	151,847	62,000	21,119		32,755.27 /EA	294,797	115,590.99 /EA	1,040,319
11					Fire Hydrant										
	33.0				Piping										
		33-45			Pipeline Valves										
			NJC-016		Fire Hydrant										
				33-20-04-01	Valves, Fire Hydrants										
					Water Utility Distribution Fire Hydrants	22.00 ea	11,666	33,550	-	377	-	2,072.40 /ea	45,593	7,345.38 /ea	161,598
					Miscellaneous Items for Fire Hydrant Installation	22.00 ea	5,833	11,000	-	189	-	773.70 /ea	17,021	2,737.44 /ea	60,224
					33-20-04-01 Valves, Fire Hydrants	22.00 EA	17,499	44,550		566		2,846.10 /EA	62,614	10,082.81 /EA	221,822
					NJC-016 Fire Hydrant	22.00 EA	17,499	44,550		566		2,846.10 /EA	62,614	10,082.81 /EA	221,822
					33-45 Pipeline Valves	22.00 EA	17,499	44,550		566		2,846.10 /EA	62,614	10,082.81 /EA	221,822
					33.0 Piping		17,499	44,550		566		/LF	62,614	/LF	221,822
					11 Fire Hydrant	22.00 EA	17,499	44,550		566		2,846.10 /EA	62,614	10,082.81 /EA	221,822
12					Pipe Supports										
	40.0				Process Piping										
		33-35			Pipelines										
			NJC-002		Watermain Loop										
				40-00-99-01	Pipe, Other										
					Pipe Supports	1,100.00 ea	237,128	165,000	-	75,776	-	434.46 /ea	477,904	1,528.01 /ea	1,680,809
					40-00-99-01 Pipe, Other	1,100.00 EA	237,128	165,000		75,776		434.46 /EA	477,904	1,528.01 /EA	1,680,809
					NJC-002 Watermain Loop	11,000.00 LF	237,128	165,000		75,776		43.45 /LF	477,904	152.80 /LF	1,680,809
					33-35 Pipelines	11,000.00 LF	237,128	165,000		75,776		43.45 /LF	477,904	152.80 /LF	1,680,809
					40.0 Process Piping	11,000.00 LF	237,128	165,000		75,776		43.45 /LF	477,904	152.80 /LF	1,680,809
					12 Pipe Supports	1,100.00 EA	237,128	165,000		75,776		434.46 /EA	477,904	1,528.01 /EA	1,680,809
13					Install Water Services with Mainline and Building Connections										
	33.0				Piping										
		33-50			Pipeline Specials										
			NJC-022		Install Water Services with Mainline and Building Connections										
				33-30-06-01	Pipe Specials, Tie-Ins										
					Pipe Tie-In's and Building Connection	20.00 ea	29,276	100,000	-	2,400	-	6,583.82 /ea	131,676	23,346.43 /ea	466,929
					33-30-06-01 Pipe Specials, Tie-Ins	20.00 EA	29,276	100,000		2,400		6,583.82 /EA	131,676	23,346.43 /EA	466,929
					NJC-022 Install Water Services with Mainline and Building Connections	20.00 EA	29,276	100,000		2,400		6,583.82 /EA	131,676	23,346.43 /EA	466,929
					33-50 Pipeline Specials	20.00 EA	29,276	100,000		2,400		6,583.82 /EA	131,676	23,346.43 /EA	466,929
					33.0 Piping		29,276	100,000		2,400		/LF	131,676	/LF	466,929

Property of CH2M Hill, Inc. All Rights Reserved - Copyright 2012

Bid Item	Work Pkg	Trade Pkg	WorkActiv	Unit Price	Description	Takeoff Quantity	Labor Amount	Material Amount	Sub Amount	Equip Amount	Other Amount	Direct Cost/Unit	Direct Amount	Grand Total Unit Price	Grand Total W/ Markups
					13 Instrall Water Services with Mainline and Building Connections	**20.00 EA**	**29,276**	**100,000**		**2,400**		**6,583.82 /EA**	**131,676**	**23,346.43 /EA**	**466,929**
14					**Circulation Pump**										
	43.0				Process Equipment										
		43-05			Furnish and Install Process Equipment										
			NJC-028		Circulation Pump										
				44-05-60-10	Circulation Pump										
					Furnish and Install Circulation Pump. Allowance	2.00 ea	6,979	20,000	-	3,425	-	15,201.65 /ea	30,403	53,797.43 /ea	107,595
					44-05-60-10 Circulation Pump	2.00 EA	6,979	20,000		3,425		15,201.65 /EA	30,403	53,797.42 /EA	107,595
					NJC-028 Circulation Pump	2.00 EA	6,979	20,000		3,425		15,201.65 /EA	30,403	53,797.42 /EA	107,595
					43-05 Furnish and Install Process Equipment	1.00 LS	6,979	20,000		3,425		30,403.30 /LS	30,403	107,594.85 /LS	107,595
					43.0 Process Equipment	1.00 LS	6,979	20,000		3,425		30,403.30 /LS	30,403	107,594.85 /LS	107,595
					14 Circulation Pump	**2.00 EA**	**6,979**	**20,000**		**3,425**		**15,201.65 /EA**	**30,403**	**53,797.42 /EA**	**107,595**
15					**High Demand Pump**										
	43.0				Process Equipment										
		43-05			Furnish and Install Process Equipment										
			NJC-030		High Demand Pump										
				44-05-60-15	High Demand Pump										
					Furnish and Install High Demand Pump. Allowance	1.00 ls	8,723	70,000	-	4,281	-	83,004.12 /ls	83,004	294,822.73 /ls	294,823
					44-05-60-15 High Demand Pump	1.00 EA	8,723	70,000		4,281		83,004.12 /EA	83,004	294,822.73 /EA	294,823
					NJC-030 High Demand Pump	1.00 EA	8,723	70,000		4,281		83,004.12 /EA	83,004	294,822.73 /EA	294,823
					43-05 Furnish and Install Process Equipment	1.00 LS	8,723	70,000		4,281		83,004.12 /LS	83,004	294,822.73 /LS	294,823
					43.0 Process Equipment	1.00 LS	8,723	70,000		4,281		83,004.12 /LS	83,004	294,822.73 /LS	294,823
					15 High Demand Pump	**1.00 EA**	**8,723**	**70,000**		**4,281**		**83,004.12 /EA**	**83,004**	**294,822.73 /EA**	**294,823**

Property of CH2M Hill, Inc. All Rights Reserved - Copyright 2012

Estimate Totals

Construction Costs	Amount	Totals	Hours	Rate	% of Total
Labor	831,505		16,692.069 I		7.88%
Material	1,191,397				11.30%
Subcontract	253,000				2.40%
Equipment	261,504		6,142.682 I		2.48%
Subtotal Direct	**2,537,406**	**2,537,406**			24.06
Market Condition Adjustment	888,092			35.000 %	8.42%
Subtotal w/ Market Condition	**888,092**	**3,425,498**			8.42
General Conditions	513,825			15.000 %	4.87%
Subtotal w/ General Conditions	**513,825**	**3,939,323**			4.87
Material Sales Tax	83,398			7.000 %	0.79%
Subtotal w/ Sales Taxes	**83,398**	**4,022,721**			0.79
Contractor Overhead	603,408			15.000 %	5.72%
Contractor Profit	231,306			5.000 %	2.19%
Bider's Risk & Gen Liab Ins -%	48,574			1.000 %	0.46%
Payment & Performance Bonds	56,910			1.160 %	0.54%
Subtotal w/ Markups	**940,198**	**4,962,919**			8.91
Contingency	1,985,168			40.000 %	18.82%
Subtotal w/ Contingency	**1,985,168**	**6,948,087**			18.82
Escalation on Estimate Total	486,366			7.000 %	4.61%
Subtotal w/ Escalation	**486,366**	**7,434,453**			4.61
Non-Markup Items	1,003,000				9.51%
Subtotal Non-Markup Items	**1,003,000**	**8,437,453**			9.51
Construction Total		**8,437,453**			
City Administration	253,124			3.000 %	2.40%
Design Costs	843,745			10.000 %	8.00%
Construction Support Services	1,012,494			12.000 %	9.60%
Capital Total	**2,109,363**	**10,546,816**			20.00

Property of CH2M Hill, Inc. All Rights Reserved - Copyright 2012

B2 – Phased Project Costs

CH2MHILL

Job Size:
Duration:

Phase 1 Summary Report

Project: Bethel Watermain Loop
Project No.: 479325
Design Stage: 10%

Estimator: N. Cavalleri
Revision / Date: 3/May 1, 2014
Estimate Class: 4

Area	Bid Item	Description	Takeoff Quantity	Labor Amount	Material Amount	Sub Amount	Equip Amount	Other Amount	Direct Cost/Unit	Direct Amount	Grand Total W/ Markups	Grand Total Unit Price
01		Phase 1										
	01	Mobilization & Demobilization	1.00 LS					510,000	510,000.00 /LS	510,000	510,000	510,000.00 /LS
	02	Traffic Control & Public Relations	1.00 LS					20,000	20,000.00 /LS	20,000	20,000	20,000.00 /LS
	03	Construction Surveying	1.00 LS					17,500	17,500.00 /LS	17,500	17,500	17,500.00 /LS
	04	Preparation of SWPPP	1.00 LS					7,500	7,500.00 /LS	7,500	7,500	7,500.00 /LS
	05	Maintenance of Water Service	1.00 LS					75,000	75,000.00 /LS	75,000	75,000	75,000.00 /LS
	06	8" Dia HDPE Arctic Insulated Watermain	6,220.00 LF	194,740	248,800	51,000	63,833		89.77 /LF	558,372	2,100,911	337.77 /LF
	08	Air Release Valve in Main Line	5.00 EA	610	11,000	1,500			2,621.98 /EA	13,110	49,688	9,937.59 /EA
	09	Isolation Valve in Main Line	5.00 EA	610	9,000	1,500			2,221.98 /EA	11,110	42,085	8,417.05 /EA
	10	Road Crossing	7.00 EA	130,120	333,415	56,000	44,140		80,525.06 /EA	563,675	2,126,622	303,803.09 /EA
	11	Fire Hydrant	13.00 EA	10,340	26,325		334		2,846.10 /EA	36,999	139,901	10,761.61 /EA
	12	Pipe Supports	622.00 EA	134,085	93,300		42,848		434.46 /EA	270,233	1,014,871	1,631.63 /EA
	13	Install Water Services with Mainline and Building Connections	10.00 EA	14,638	50,000		1,200		6,583.82 /EA	65,838	249,167	24,916.67 /EA
	14	Circulation Pump	2.00 EA	6,979	20,000		3,425		15,201.65 /EA	30,403	114,846	57,423.00 /EA
	15	High Demand Pump	1.00 EA	8,723	70,000		4,281		83,004.12 /EA	83,004	314,619	314,619.22 /EA
		01 Phase 1	1.00 LS	500,844	861,840	110,000	160,061	630,000	2,262,745.75 /LS	2,262,746	6,782,710	6,782,710.01 /LS

Property of CH2M Hill, Inc. All Rights Reserved - Copyright 2012

Phase 1Totals

Construction Costs	Amount	Totals	Hours	Rate	% of Total
Labor	500,844		10,087.944 I		7.38%
Material	861,840				12.71%
Subcontract	110,000				1.62%
Equipment	160,061		3,700.021 I		2.36%
Subtotal Direct	**1,632,745**	**1,632,745**			24.07
Market Condition Adjustment	571,461			35.000 %	8.43%
Subtotal w/ Market Condition	**571,461**	**2,204,206**			8.43
General Conditions	330,631			15.000 %	4.87%
Subtotal w/ General Conditions	**330,631**	**2,534,837**			4.87
Material Sales Tax	60,329			7.000 %	0.89%
Subtotal w/ Sales Taxes	**60,329**	**2,595,166**			0.89
Contractor Overhead	389,275			15.000 %	5.74%
Contractor Profit	149,222			5.000 %	2.20%
Bider's Risk & Gen Liab Ins -%	31,337			1.000 %	0.46%
Payment & Performance Bonds	36,714			1.160 %	0.54%
Subtotal w/ Markups	**606,548**	**3,201,714**			8.94
Contingency	1,280,686			40.000 %	18.88%
Subtotal w/ Contingency	**1,280,686**	**4,482,400**			18.88
Escalation on Estimate Total	313,768			7.000 %	4.63%
Subtotal w/ Escalation	**313,768**	**4,796,168**			4.63
Non-Markup Items	630,000				9.29%
Subtotal Non-Markup Items	**630,000**	**5,426,168**			9.29
Construction Total		**5,426,168**			
City Administration	162,785			3.000 %	2.40%
Design Costs	542,617			10.000 %	8.00%
Construction Support Services	651,140			12.000 %	9.60%
Capital Total	**1,356,542**	**6,782,710**			**20.00**

Property of CH2M Hill, Inc. All Rights Reserved - Copyright 2012

CH2MHILL

Job Size:
Duration:

Detail Report

Project: Bethel Watermain Loop
Project No.: 479325
Design Stage: 10%

Estimator: N. Cavalleri
Revision / Date: 3/May 1, 2014
Estimate Class: 4

Area	Bid Item	Work Pkg	Trade Pkg	WorkActiv	Unit Price	Description	Takeoff Quantity	Labor Amount	Material Amount	Sub Amount	Equip Amount	Other Amount	Direct Cost/Unit	Direct Amount	Grand Total Unit Price	Grand Total W/ Markups
01						Phase 1										
	01					Mobilization & Demobilization										
		01.0				General Conditions										
			01-01			Construction Operations										
				NJC-012		Mobilization & Demobilization										
					01-01-05-00	General Conditions, Other										
						Mobilization & Demobilization	1.00 ls	-	-	-	-	510,000	510,000.00 /ls	510,000	510,000.00 /ls	510,000
						01-01-05-00 General Conditions, Other	1.00 LS					510,000	510,000.00 /LS	510,000	510,000.00 /LS	510,000
						NJC-012 Mobilization & Demobilization	1.00 LS					510,000	510,000.00 /LS	510,000	510,000.00 /LS	510,000
						01-01 Construction Operations	1.00 LS					510,000	510,000.00 /LS	510,000	510,000.00 /LS	510,000
						01.0 General Conditions	1.00 LS					510,000	510,000.00 /LS	510,000	510,000.00 /LS	510,000
						01 Mobilization & Demobilization	1.00 LS					510,000	510,000.00 /LS	510,000	510,000.00 /LS	510,000
	02					Traffic Control & Public Relations										
		01.0				General Conditions										
			01-01			Construction Operations										
				NJC-006		Traffic Control & Public Relations										
					01-01-05-00	General Conditions, Other										
						Traffic Control & Public Relations	1.00 ls	-	-	-	-	20,000	20,000.00 /ls	20,000	20,000.00 /ls	20,000
						01-01-05-00 General Conditions, Other	1.00 LS					20,000	20,000.00 /LS	20,000	20,000.00 /LS	20,000
						NJC-006 Traffic Control & Public Relations	1.00 LS					20,000	20,000.00 /LS	20,000	20,000.00 /LS	20,000
						01-01 Construction Operations	1.00 LS					20,000	20,000.00 /LS	20,000	20,000.00 /LS	20,000
						01.0 General Conditions	1.00 LS					20,000	20,000.00 /LS	20,000	20,000.00 /LS	20,000
						02 Traffic Control & Public Relations	1.00 LS					20,000	20,000.00 /LS	20,000	20,000.00 /LS	20,000
	03					Construction Surveying										
		01.0				General Conditions										
			01-01			Construction Operations										
				NJC-008		Construction Surveying										
					01-01-05-00	General Conditions, Other										
						Construction Surveying	1.00 ls	-	-	-	-	17,500	17,500.00 /ls	17,500	17,500.00 /ls	17,500
						01-01-05-00 General Conditions, Other	1.00 LS					17,500	17,500.00 /LS	17,500	17,500.00 /LS	17,500
						NJC-008 Construction Surveying	1.00 LS					17,500	17,500.00 /LS	17,500	17,500.00 /LS	17,500
						01-01 Construction Operations	1.00 LS					17,500	17,500.00 /LS	17,500	17,500.00 /LS	17,500
						01.0 General Conditions	1.00 LS					17,500	17,500.00 /LS	17,500	17,500.00 /LS	17,500
						03 Construction Surveying	1.00 LS					17,500	17,500.00 /LS	17,500	17,500.00 /LS	17,500
	04					Preparation of SWPPP										
		01.0				General Conditions										
			01-01			Construction Operations										
				NJC-010		Preparation of SWPPP										
					01-01-05-00	General Conditions, Other										
						Preparation of SWPPP	1.00 ls	-	-	-	-	7,500	7,500.00 /ls	7,500	7,500.00 /ls	7,500
						01-01-05-00 General Conditions, Other	1.00 LS					7,500	7,500.00 /LS	7,500	7,500.00 /LS	7,500
						NJC-010 Preparation of SWPPP	1.00 LS					7,500	7,500.00 /LS	7,500	7,500.00 /LS	7,500
						01-01 Construction Operations	1.00 LS					7,500	7,500.00 /LS	7,500	7,500.00 /LS	7,500
						01.0 General Conditions	1.00 LS					7,500	7,500.00 /LS	7,500	7,500.00 /LS	7,500
						04 Preparation of SWPPP	1.00 LS					7,500	7,500.00 /LS	7,500	7,500.00 /LS	7,500
	05					Maintenance of Water Service										
		01.0				General Conditions										
			01-01			Construction Operations										
				NJC-014		Maintenance of Water Service										
					01-01-05-00	General Conditions, Other										
						Maintenance of Water Service	1.00 ls	-	-	-	-	75,000	75,000.00 /ls	75,000	75,000.00 /ls	75,000
						01-01-05-00 General Conditions, Other	1.00 LS					75,000	75,000.00 /LS	75,000	75,000.00 /LS	75,000
						NJC-014 Maintenance of Water Service	1.00 LS					75,000	75,000.00 /LS	75,000	75,000.00 /LS	75,000
						01-01 Construction Operations	1.00 LS					75,000	75,000.00 /LS	75,000	75,000.00 /LS	75,000
						01.0 General Conditions	1.00 LS					75,000	75,000.00 /LS	75,000	75,000.00 /LS	75,000
						05 Maintenance of Water Service	1.00 LS					75,000	75,000.00 /LS	75,000	75,000.00 /LS	75,000
	06					8" Dia HDPE Arctic Insulated Watermain										
		40.0				Process Piping										
			33-35			Pipelines										
				NJC-002		Watermain Loop										
					40-10-07-08	Pipe, HDPE, 8"										
						HDPE butt fusion joints, 40' lengths 8" diameter SDR 11 Insulated	6,220.00 lf	194,740	248,800	-	63,833	-	81.57 /lf	507,372	307.17 /lf	1,910,811
						Fittings Allowance	1.00 ls	-	-	51,000	-	-	51,000.00 /ls	51,000	190,299.96 /ls	190,300
						40-10-07-08 Pipe, HDPE, 8"	6,220.00 LF	194,740	248,800	51,000	63,833		89.77 /LF	558,372	337.77 /LF	2,100,911
						NJC-002 Watermain Loop	6,220.00 LF	194,740	248,800	51,000	63,833		89.77 /LF	558,372	337.77 /LF	2,100,911
						33-35 Pipelines	6,220.00 LF	194,740	248,800	51,000	63,833		89.77 /LF	558,372	337.77 /LF	2,100,911
						40.0 Process Piping	6,220.00 LF	194,740	248,800	51,000	63,833		89.77 /LF	558,372	337.77 /LF	2,100,911
						06 8" Dia HDPE Arctic Insulated Watermain	6,220.00 LF	194,740	248,800	51,000	63,833		89.77 /LF	558,372	337.77 /LF	2,100,911
	08					Air Release Valve in Main Line										
		33.0				Piping										
			33-45			Pipeline Valves										

Property of CH2M Hill, Inc. All Rights Reserved - Copyright 2012

CH2MHILL

Job Size:
Duration:

Detail Report

Project: Bethel Watermain Loop
Project No.: 479325
Design Stage: 10%

Estimator: N. Cavalleri
Revision / Date: 3/May 1, 2014
Estimate Class: 4

Area	Bid Item	Work Pkg	Trade Pkg	WorkActiv	Unit Price	Description	Takeoff Quantity	Labor Amount	Material Amount	Sub Amount	Equip Amount	Other Amount	Direct Cost/Unit	Direct Amount	Grand Total Unit Price	Grand Total W/ Markups
				NJC-018		Air Release Valve in Main Line										
					33-20-08-04	*Valves, Air Valve Assembly*										
						Air Valve Assembly	5.00 ea	610	11,000	-	-	-	2,321.98 /ea	11,610	8,818.18 /ea	44,091
						Miscellaneous Items Allowance	1.00 ls	-	-	1,500	-	-	1,500.00 /ls	1,500	5,597.06 /ls	5,597
						33-20-08-04 Valves, Air Valve Assembly	*5.00 EA*	*610*	*11,000*	*1,500*			*2,621.98 /EA*	*13,110*	*9,937.59 /EA*	*49,688*
						NJC-018 Air Release Valve in Main Line	5.00 EA	610	11,000	1,500			2,621.98 /EA	13,110	9,937.59 /EA	49,688
						33-45 Pipeline Valves	5.00 EA	610	11,000	1,500			2,621.98 /EA	13,110	9,937.59 /EA	49,688
						33.0 Piping	6,220.00 LF	610	11,000	1,500			2.11 /LF	13,110	7.99 /LF	49,688
						08 Air Release Valve in Main Line	5.00 EA	610	11,000	1,500			2,621.98 /EA	13,110	9,937.59 /EA	49,688
	09					Isolation Valve in Main Line										
		33.0				Piping										
			33-45			Pipeline Valves										
				NJC-020		Isolation Valve in Main Line										
					33-20-08-10 0	*Valves, Isolation Valve*										
						Isolation Valve Assembly	5.00 ea	610	9,000	-	-	-	1,921.98 /ea	9,610	7,297.64 /ea	36,488
						Miscellaneous Items Allowance	1.00 ls	-	-	1,500	-	-	1,500.00 /ls	1,500	5,597.05 /ls	5,597
						33-20-08-100 Valves, Isolation Valve	*5.00 EA*	*610*	*9,000*	*1,500*			*2,221.98 /EA*	*11,110*	*8,417.05 /EA*	*42,085*
						NJC-020 Isolation Valve in Main Line	5.00 EA	610	9,000	1,500			2,221.98 /EA	11,110	8,417.05 /EA	42,085
						33-45 Pipeline Valves	5.00 EA	610	9,000	1,500			2,221.98 /EA	11,110	8,417.05 /EA	42,085
						33.0 Piping	6,220.00 LF	610	9,000	1,500			1.79 /LF	11,110	6.77 /LF	42,085
						09 Isolation Valve in Main Line	5.00 EA	610	9,000	1,500			2,221.98 /EA	11,110	8,417.05 /EA	42,085
	10					Road Crossing										
		33.0				Piping										
			33-35			Pipelines										
				NJC-026		Road Crossing, Open Cut										
					40-10-07-08	*Pipe, HDPE, 8"*										
						Excavate Trench	170.00 cuyd	1,834	0	-	923	-	16.22 /cuyd	2,757	60.51 /cuyd	10,287
						Backfill Native	85.00 cuyd	234	0	-	34	-	3.15 /cuyd	268	11.76 /cuyd	999
						Pipe Bedding and Zone - Crushed Rock	95.00 cy	182	1,425	-	131	-	18.29 /cy	1,738	69.31 /cy	6,585
						Hauling, excavated or borrow material, loose cubic yards, 5 mile round trip, 1.1 loads/hour, 20 C.Y. dump trailer, highway haulers, excludes loading	85.00 lcy	213	-	-	336	-	6.47 /lcy	550	24.12 /lcy	2,051
						HDPE, butt fusion joints, 40' lengths, 8" diameter, SDR 11, Insulated	200.00 lf	6,262	8,000	-	2,053	-	81.57 /lf	16,314	307.17 /lf	61,434
						Pipe Casing	200.00 lf	1,150	15,000	-	367	-	82.59 /lf	16,517	313.41 /lf	62,681
						Surface Restoration	1,200.00 sf	-	-	6,000	-	-	5.00 /sf	6,000	18.66 /sf	22,388
						40-10-07-08 Pipe, HDPE, 8"	*200.00 LF*	*9,875*	*24,425*	*6,000*	*3,843*		*220.72 /LF*	*44,143*	*832.13 /LF*	*166,425*
						NJC-026 Road Crossing, Open Cut	4.00 EA	9,875	24,425	6,000	3,843		11,035.85 /EA	44,143	41,608.29 /EA	166,425
						33-35 Pipelines	650.00 LF	9,875	24,425	6,000	3,843		67.91 /LF	44,143	256.04 /LF	166,425
			33-60			Trenchless Technology										
				NJC-024		Road Crossing, Bore and Jack										
					33-60-02-37	*Pipeline Specials, Jack and Bore, 8" PVC in 24" Casing*										
						Temp K Rail Rental, Delivery, Place, Remove and Return	48.00 ea		122,760	-	-	-	2,557.50 /ea	122,760	9,722.01 /ea	466,656
						Temporary Fencing, chain link, 6' high, 11 ga	480.00 lf	1,135	3,437	-	-	-	9.53 /lf	4,573	36.05 /lf	17,303
						Single Pipe, Pipe Skid	75.00 ea		19,181	-	-	-	255.75 /ea	19,181	972.20 /ea	72,915
						Closure Boot Seal	6.00 ea		7,366	-	-	-	1,227.60 /ea	7,366	4,666.56 /ea	27,999
						Shoring, cost per sf/ca trench wall, monthly rental	5,082.00 sf	-	33,999	-	-		6.69 /sf	33,999	25.43 /sf	129,241
						Concrete pressure grouting, cement and sand, 1:1 mix, maximum	1,260.00 cf	23,898	41,247	-	3,294	-	54.32 /cf	68,440	204.97 /cf	258,281
						Exc Jacking and Receiving Pits	690.00 cuyd	7,444		-	3,745	-	16.22 /cuyd	11,189	60.51 /cuyd	41,751
						Backfill Native	495.00 cuyd	1,364		-	196	-	3.15 /cuyd	1,560	11.76 /cuyd	5,819
						Pipe Zone - Crushed Rock	240.00 cy	460	3,600	-	331	-	18.29 /cy	4,391	69.31 /cy	16,635
						Hauling, excavated or borrow material, loose cubic yards, 5 mile round trip, 1.1 loads/hour, 20 C.Y. dump trailer, highway haulers, excludes loading	330.00 lcy	829	-	-	1,305	-	6.47 /lcy	2,133	24.12 /lcy	7,961
						Horizontal boring, roadwork, 1/2" thick wall, 24" diameter casing, includes casing only, 100' minimum, excludes jacking pits or dewatering	450.00 lf	71,027	59,400	-	26,808	-	349.41 /lf	157,234	1,313.02 /lf	590,858
						Horizontal boring, mobilization and demobilization, maximum	1.00 ea	-	-	50,000	-	0	50,000.00 /ea	50,000	186,568.80 /ea	186,569
						HDPE, butt fusion joints, 40' lengths, 8" diameter, SDR 11, Insulated	450.00 lf	14,089	18,000	-	4,618	-	81.57 /lf	36,707	307.17 /lf	138,227
						33-60-02-37 Pipeline Specials, Jack and Bore, 8" PVC in 24" Casing	*450.00 LF*	*120,245*	*308,990*	*50,000*	*40,297*		*1,154.52 /LF*	*519,532*	*4,355.99 /LF*	*1,960,196*
						NJC-024 Road Crossing, Bore and Jack	450.00 LF	120,245	308,990	50,000	40,297		1,154.52 /LF	519,532	4,355.99 /LF	1,960,196
						33-60 Trenchless Technology	450.00 LF	120,245	308,990	50,000	40,297		1,154.52 /LF	519,532	4,355.99 /LF	1,960,196
						33.0 Piping	650.00 LF	130,120	333,415	56,000	44,140		867.19 /LF	563,675	3,271.73 /LF	2,126,622
						10 Road Crossing	7.00 EA	130,120	333,415	56,000	44,140		80,525.06 /EA	563,675	303,803.09 /EA	2,126,622
	11					Fire Hydrant										
		33.0				Piping										
			33-45			Pipeline Valves										
				NJC-016		Fire Hydrant										
					33-20-04-01	*Valves, Fire Hydrants*										
						Water Utility Distribution Fire Hydrants	13.00 ea	6,893	19,825	-	223	-	2,072.40 /ea	26,941	7,839.65 /ea	101,915
						Miscellaneous Items for Fire Hydrant Installation	13.00 ea	3,447	6,500	-	111	-	773.70 /ea	10,058	2,921.96 /ea	37,986
						33-20-04-01 Valves, Fire Hydrants	*13.00 EA*	*10,340*	*26,325*		*334*		*2,846.10 /EA*	*36,999*	*10,761.61 /EA*	*139,901*
						NJC-016 Fire Hydrant	13.00 EA	10,340	26,325		334		2,846.10 /EA	36,999	10,761.61 /EA	139,901
						33-45 Pipeline Valves	13.00 EA	10,340	26,325		334		2,846.10 /EA	36,999	10,761.61 /EA	139,901

Property of CH2M Hill, Inc. All Rights Reserved - Copyright 2012

CH2MHILL

Job Size:
Duration:

Detail Report

Project: Bethel Watermain Loop
Project No.: 479325
Design Stage: 10%

Estimator: N. Cavalleri
Revision / Date: 3/May 1, 2014
Estimate Class: 4

Area	Bid Item	Work Pkg	Trade Pkg	WorkActiv	Unit Price	Description	Takeoff Quantity	Labor Amount	Material Amount	Sub Amount	Equip Amount	Other Amount	Direct Cost/Unit	Direct Amount	Grand Total Unit Price	Grand Total W/ Markups
						33.0 Piping	6,220.00 LF	10,340	26,325		334		5.95 /LF	36,999	22.49 /LF	139,901
						11 Fire Hydrant	13.00 EA	10,340	26,325		334		2,846.10 /EA	36,999	10,761.61 /EA	139,901
	12					Pipe Supports										
		40.0				Process Piping										
			33-35			Pipelines										
				NJC-002		Watermain Loop										
					40-00-99-01	Pipe, Other										
						Pipe Supports	622.00 ea	134,085	93,300	-	42,848	-	434.46 /ea	270,233	1,631.63 /ea	1,014,871
						40-00-99-01 Pipe, Other	622.00 EA	134,085	93,300		42,848		434.46 /EA	270,233	1,631.63 /EA	1,014,871
						NJC-002 Watermain Loop	6,220.00 LF	134,085	93,300		42,848		43.45 /LF	270,233	163.16 /LF	1,014,871
						33-35 Pipelines	6,220.00 LF	134,085	93,300		42,848		43.45 /LF	270,233	163.16 /LF	1,014,871
						40.0 Process Piping	6,220.00 LF	134,085	93,300		42,848		43.45 /LF	270,233	163.16 /LF	1,014,871
						12 Pipe Supports	622.00 EA	134,085	93,300		42,848		434.46 /EA	270,233	1,631.63 /EA	1,014,871
	13					Install Water Services with Mainline and Building Connections										
		33.0				Piping										
			33-50			Pipeline Specials										
				NJC-022		Install Water Services with Mainline and Building Connections										
					33-30-06-01	Pipe Specials, Tie-Ins										
						Pipe Tie-In's and Building Connection	10.00 ea	14,638	50,000	-	1,200	-	6,583.82 /ea	65,838	24,916.67 /ea	249,167
						33-30-06-01 Pipe Specials, Tie-Ins	10.00 EA	14,638	50,000		1,200		6,583.82 /EA	65,838	24,916.67 /EA	249,167
						NJC-022 Install Water Services with Mainline and Building Connections	10.00 EA	14,638	50,000		1,200		6,583.82 /EA	65,838	24,916.67 /EA	249,167
						33-50 Pipeline Specials	10.00 EA	14,638	50,000		1,200		6,583.82 /EA	65,838	24,916.67 /EA	249,167
						33.0 Piping	6,220.00 LF	14,638	50,000		1,200		10.59 /LF	65,838	40.06 /LF	249,167
						13 Install Water Services with Mainline and Building Connections	10.00 EA	14,638	50,000		1,200		6,583.82 /EA	65,838	24,916.67 /EA	249,167
	14					Circulation Pump										
		43.0				Process Equipment										
			43-05			Furnish and Install Process Equipment										
				NJC-028		Circulation Pump										
					44-05-60-10	Circulation Pump										
						Furnish and Install Circulation Pump, Allowance	2.00 ea	6,979	20,000	-	3,425	-	15,201.65 /ea	30,403	57,423.00 /ea	114,846
						44-05-60-10 Circulation Pump	2.00 EA	6,979	20,000		3,425		15,201.65 /EA	30,403	57,423.00 /EA	114,846
						NJC-028 Circulation Pump	2.00 EA	6,979	20,000		3,425		15,201.65 /EA	30,403	57,423.00 /EA	114,846
						43-05 Furnish and Install Process Equipment	1.00 LS	6,979	20,000		3,425		30,403.30 /LS	30,403	114,846.00 /LS	114,846
						43.0 Process Equipment	1.00 LS	6,979	20,000		3,425		30,403.30 /LS	30,403	114,846.00 /LS	114,846
						14 Circulation Pump	2.00 EA	6,979	20,000		3,425		15,201.65 /EA	30,403	57,423.00 /EA	114,846
	15					High Demand Pump										
		43.0				Process Equipment										
			43-05			Furnish and Install Process Equipment										
				NJC-030		High Demand Pump										
					44-05-60-15	High Demand Pump										
						Furnish and Install High Demand Pump, Allowance	1.00 ls	8,723	70,000	-	4,281	-	83,004.12 /ls	83,004	314,619.22 /ls	314,619
						44-05-60-15 High Demand Pump	1.00 EA	8,723	70,000		4,281		83,004.12 /EA	83,004	314,619.22 /EA	314,619
						NJC-030 High Demand Pump	1.00 EA	8,723	70,000		4,281		83,004.12 /EA	83,004	314,619.22 /EA	314,619
						43-05 Furnish and Install Process Equipment	1.00 LS	8,723	70,000		4,281		83,004.12 /LS	83,004	314,619.22 /LS	314,619
						43.0 Process Equipment	1.00 LS	8,723	70,000		4,281		83,004.12 /LS	83,004	314,619.22 /LS	314,619
						15 High Demand Pump	1.00 EA	8,723	70,000		4,281		83,004.12 /EA	83,004	314,619.22 /EA	314,619
						01 Phase 1	1.00 LS	500,844	861,840	110,000	160,061	630,000	2,262,745.75 /LS	2,262,746	6,782,710.01 /LS	6,782,710

Property of CH2M Hill, Inc. All Rights Reserved - Copyright 2012

Phase 1 Totals

Construction Costs	Amount	Totals	Hours	Rate	% of Total
Labor	500,844		10,087.944 I		7.38%
Material	861,840				12.71%
Subcontract	110,000				1.62%
Equipment	160,061		3,700.021 I		2.36%
Subtotal Direct	**1,632,745**	**1,632,745**			24.07
Market Condition Adjustment	571,461			35.000 %	8.43%
Subtotal w/ Market Condition	**571,461**	**2,204,206**			8.43
General Conditions	330,631			15.000 %	4.87%
Subtotal w/ General Conditions	**330,631**	**2,534,837**			4.87
Material Sales Tax	60,329			7.000 %	0.89%
Subtotal w/ Sales Taxes	**60,329**	**2,595,166**			0.89
Contractor Overhead	389,275			15.000 %	5.74%
Contractor Profit	149,222			5.000 %	2.20%
Bider's Risk & Gen Liab Ins -%	31,337			1.000 %	0.46%
Payment & Performance Bonds	36,714			1.160 %	0.54%
Subtotal w/ Markups	**606,548**	**3,201,714**			8.94
Contingency	1,280,686			40.000 %	18.88%
Subtotal w/ Contingency	**1,280,686**	**4,482,400**			18.88
Escalation on Estimate Total	313,768			7.000 %	4.63%
Subtotal w/ Escalation	**313,768**	**4,796,168**			4.63
Non-Markup Items	630,000				9.29%
Subtotal Non-Markup Items	**630,000**	**5,426,168**			9.29
Construction Total		**5,426,168**			
City Administration	162,785			3.000 %	2.40%
Design Costs	542,617			10.000 %	8.00%
Construction Support Services	651,140			12.000 %	9.60%
Capital Total	**1,356,542**	**6,782,710**			**20.00**

Property of CH2M Hill, Inc. All Rights Reserved - Copyright 2012

CH2MHILL

Phase 2 Summary Report

Job Size:
Duration:

Project: Bethel Watermain Loop
Project No.: 479325
Design Stage: 10%

Estimator: N. Cavalleri
Revision / Date: 3/May 1, 2014
Estimate Class: 4

Area	Bid Item	Description	Takeoff Quantity	Labor Amount	Material Amount	Sub Amount	Equip Amount	Other Amount	Direct Cost/Unit	Direct Amount	Grand Total W/ Markups	Grand Total Unit Price
02		Phase 2										
	01	Mobilization & Demobilization	1.00 LS					348,000	348,000.00 /LS	348,000	348,000	348,000.00 /LS
	02	Traffic Control & Public Relations	1.00 LS					20,000	20,000.00 /LS	20,000	20,000	20,000.00 /LS
	03	Construction Surveying	1.00 LS					17,500	17,500.00 /LS	17,500	17,500	17,500.00 /LS
	04	Preparation of SWPPP	1.00 LS					7,500	7,500.00 /LS	7,500	7,500	7,500.00 /LS
	05	Maintenance of Water Service	1.00 LS					75,000	75,000.00 /LS	75,000	75,000	75,000.00 /LS
	06	8" Dia HDPE Arctic Insulated Watermain	5,030.00 LF	157,482	201,200	41,000	51,620		89.72 /LF	451,303	1,692,909	336.56 /LF
	07	8" Dia HDPE Arctic Insulated Sewer Forcemain	4,000.00 LF	133,857	166,000	85,000	43,806		107.17 /LF	428,663	1,606,226	401.56 /LF
	08	Air Release Valve in Main Line	5.00 EA	610	11,000	1,500			2,621.98 /EA	13,110	49,538	9,907.65 /EA
	09	Isolation Valve in Main Line	5.00 EA	610	9,000	1,500			2,221.98 /EA	11,110	41,958	8,391.68 /EA
	10	Road Crossing	4.00 EA	9,875	24,425	6,000	3,843		11,035.85 /EA	44,143	165,921	41,480.26 /EA
	11	Fire Hydrant	9.00 EA	7,159	18,225		231		2,846.10 /EA	25,615	96,562	10,729.11 /EA
	12	Pipe Supports	503.00 EA	108,432	75,450		34,650		434.46 /EA	218,533	818,213	1,626.67 /EA
	13	Instrall Water Services with Mainline and Building Connections	10.00 EA	14,638	50,000		1,200		6,583.82 /EA	65,838	248,415	24,841.49 /EA
		02 Phase 2	1.00 LS	432,664	555,300	135,000	135,351	468,000	1,726,314.51 /LS	1,726,315	5,187,742	5,187,741.94 /LS

Property of CH2M Hill, Inc. All Rights Reserved - Copyright 2012

Phase 2 Totals

Construction Costs	Amount	Totals	Hours	Rate	% of Total
Labor	432,664		8,686.802 I		8.34%
Material	555,300				10.70%
Subcontract	135,000				2.60%
Equipment	135,351		3,245.205 I		2.61%
Subtotal Direct	**1,258,315**	**1,258,315**			24.26
Market Condition Adjustment	440,410			35.000 %	8.49%
Subtotal w/ Market Condition	**440,410**	**1,698,725**			8.49
General Conditions	254,809			15.000 %	4.91%
Subtotal w/ General Conditions	**254,809**	**1,953,534**			4.91
Material Sales Tax	38,871			7.000 %	0.75%
Subtotal w/ Sales Taxes	**38,871**	**1,992,405**			0.75
Contractor Overhead	298,861			15.000 %	5.76%
Contractor Profit	114,563			5.000 %	2.21%
Bider's Risk & Gen Liab Ins -%	24,058			1.000 %	0.46%
Payment & Performance Bonds	28,187			1.160 %	0.54%
Subtotal w/ Markups	**465,669**	**2,458,074**			8.98
Contingency	983,229			40.000 %	18.95%
Subtotal w/ Contingency	**983,229**	**3,441,303**			18.95
Escalation on Estimate Total	240,891			7.000 %	4.64%
Subtotal w/ Escalation	**240,891**	**3,682,194**			4.64
Non-Markup Items	468,000				9.02%
Subtotal Non-Markup Items	**468,000**	**4,150,194**			9.02
Construction Total		**4,150,194**			
City Administration	124,506			3.000 %	2.40%
Design Costs	415,019			10.000 %	8.00%
Construction Support Services	498,023			12.000 %	9.60%
Capital Total	**1,037,548**	**5,187,742**			**20.00**

Property of CH2M Hill, Inc. All Rights Reserved - Copyright 2012

CH2MHILL

Job Size:
Duration:

Detail Report

Project: Bethel Watermain Loop
Project No.: 479325
Design Stage: 10%

Estimator: N. Cavallen
Revision / Date: 3/May 1, 2014
Estimate Class: 4

Area	Bid Item	Work Pkg	Trade Pkg	WorkActiv	Unit Price	Description	Takeoff Quantity	Labor Amount	Material Amount	Sub Amount	Equip Amount	Other Amount	Direct Cost/Unit	Direct Amount	Grand Total Unit Price	Grand Total W/ Markups
02						**Phase 2**										
	01					Mobilization & Demobilization										
		01.0				General Conditions										
			01-01			Construction Operations										
				NJC-012		Mobilization & Demobilization										
					01-01-05-00	*General Conditions, Other*										
						Mobilization & Demobilization	1.00 ls	-	-	-	-	348,000	348,000.00 /ls	348,000	348,000.00 /ls	348,000
						01-01-05-00 General Conditions, Other	*1.00 LS*					*348,000*	*348,000.00 /LS*	*348,000*	*348,000.00 /LS*	*348,000*
						NJC-012 Mobilization & Demobilization	1.00 LS					348,000	348,000.00 /LS	348,000	348,000.00 /LS	348,000
						01-01 Construction Operations	1.00 LS					348,000	348,000.00 /LS	348,000	348,000.00 /LS	348,000
						01.0 General Conditions	1.00 LS					348,000	348,000.00 /LS	348,000	348,000.00 /LS	348,000
						01 Mobilization & Demobilization	1.00 LS					348,000	348,000.00 /LS	348,000	348,000.00 /LS	348,000
	02					Traffic Control & Public Relations										
		01.0				General Conditions										
			01-01			Construction Operations										
				NJC-006		Traffic Control & Public Relations										
					01-01-05-00	*General Conditions, Other*										
						Traffic Control & Public Relations	1.00 ls	-	-	-	-	20,000	20,000.00 /ls	20,000	20,000.00 /ls	20,000
						01-01-05-00 General Conditions, Other	*1.00 LS*					*20,000*	*20,000.00 /LS*	*20,000*	*20,000.00 /LS*	*20,000*
						NJC-006 Traffic Control & Public Relations	1.00 LS					20,000	20,000.00 /LS	20,000	20,000.00 /LS	20,000
						01-01 Construction Operations	1.00 LS					20,000	20,000.00 /LS	20,000	20,000.00 /LS	20,000
						01.0 General Conditions	1.00 LS					20,000	20,000.00 /LS	20,000	20,000.00 /LS	20,000
						02 Traffic Control & Public Relations	1.00 LS					20,000	20,000.00 /LS	20,000	20,000.00 /LS	20,000
	03					Construction Surveying										
		01.0				General Conditions										
			01-01			Construction Operations										
				NJC-008		Construction Surveying										
					01-01-05-00	*General Conditions, Other*										
						Construction Surveying	1.00 ls	-	-	-	-	17,500	17,500.00 /ls	17,500	17,500.00 /ls	17,500
						01-01-05-00 General Conditions, Other	*1.00 LS*					*17,500*	*17,500.00 /LS*	*17,500*	*17,500.00 /LS*	*17,500*
						NJC-008 Construction Surveying	1.00 LS					17,500	17,500.00 /LS	17,500	17,500.00 /LS	17,500
						01-01 Construction Operations	1.00 LS					17,500	17,500.00 /LS	17,500	17,500.00 /LS	17,500
						01.0 General Conditions	1.00 LS					17,500	17,500.00 /LS	17,500	17,500.00 /LS	17,500
						03 Construction Surveying	1.00 LS					17,500	17,500.00 /LS	17,500	17,500.00 /LS	17,500
	04					Preparation of SWPPP										
		01.0				General Conditions										
			01-01			Construction Operations										
				NJC-010		Preparation of SWPPP										
					01-01-05-00	*General Conditions, Other*										
						Preparation of SWPPP	1.00 ls	-	-	-	-	7,500	7,500.00 /ls	7,500	7,500.00 /ls	7,500
						01-01-05-00 General Conditions, Other	*1.00 LS*					*7,500*	*7,500.00 /LS*	*7,500*	*7,500.00 /LS*	*7,500*
						NJC-010 Preparation of SWPPP	1.00 LS					7,500	7,500.00 /LS	7,500	7,500.00 /LS	7,500
						01-01 Construction Operations	1.00 LS					7,500	7,500.00 /LS	7,500	7,500.00 /LS	7,500
						01.0 General Conditions	1.00 LS					7,500	7,500.00 /LS	7,500	7,500.00 /LS	7,500
						04 Preparation of SWPPP	1.00 LS					7,500	7,500.00 /LS	7,500	7,500.00 /LS	7,500
	05					Maintenance of Water Service										
		01.0				General Conditions										
			01-01			Construction Operations										
				NJC-014		Maintenance of Water Service										
					01-01-05-00	*General Conditions, Other*										
						Maintenance of Water Service	1.00 ls	-	-	-	-	75,000	75,000.00 /ls	75,000	75,000.00 /ls	75,000
						01-01-05-00 General Conditions, Other	*1.00 LS*					*75,000*	*75,000.00 /LS*	*75,000*	*75,000.00 /LS*	*75,000*
						NJC-014 Maintenance of Water Service	1.00 LS					75,000	75,000.00 /LS	75,000	75,000.00 /LS	75,000
						01-01 Construction Operations	1.00 LS					75,000	75,000.00 /LS	75,000	75,000.00 /LS	75,000
						01.0 General Conditions	1.00 LS					75,000	75,000.00 /LS	75,000	75,000.00 /LS	75,000
						05 Maintenance of Water Service	1.00 LS					75,000	75,000.00 /LS	75,000	75,000.00 /LS	75,000
	06					8" Dia HDPE Arctic Insulated Watermain										
		40.0				Process Piping										
			33-35			Pipelines										
				NJC-002		Watermain Loop										
					40-10-07-08	*Pipe, HDPE, 8"*										
						HDPE butt fusion joints, 40' lengths, 8" diameter, SDR 11, Insulated	5,030.00 lf	157,482	201,200	-	51,620	-	81.57 /lf	410,303	306.24 /lf	1,540,391
						Fittings Allowance	1.00 ls	-	-	41,000	-	-	41,000.00 /ls	41,000	152,518.08 /ls	152,518
						40-10-07-08 Pipe, HDPE, 8"	*5,030.00 LF*	*157,482*	*201,200*	*41,000*	*51,620*		*89.72 /LF*	*451,303*	*336.56 /LF*	*1,692,909*
						NJC-002 Watermain Loop	5,030.00 LF	157,482	201,200	41,000	51,620		89.72 /LF	451,303	336.56 /LF	1,692,909
						33-35 Pipelines	5,030.00 LF	157,482	201,200	41,000	51,620		89.72 /LF	451,303	336.56 /LF	1,692,909
						40.0 Process Piping	5,030.00 LF	157,482	201,200	41,000	51,620		89.72 /LF	451,303	336.56 /LF	1,692,909
						06 8" Dia HDPE Arctic Insulated Watermain	5,030.00 LF	157,482	201,200	41,000	51,620		89.72 /LF	451,303	336.56 /LF	1,692,909
	07					8" Dia HDPE Arctic Insulated Sewer Forcemain										
		40.0				Process Piping										
			33-35			Pipelines										

Property of CH2M Hill, Inc. All Rights Reserved - Copyright 2012

CH2MHILL

Job Size:
Duration:

Detail Report

Project: Bethel Watermain Loop
Project No.: 479325
Design Stage: 10%

Estimator: N. Cavallen
Revision / Date: 3/May 1, 2014
Estimate Class: 4

Area	Bid Item	Work Pkg	Trade Pkg	WorkActiv	Unit Price	Description	Takeoff Quantity	Labor Amount	Material Amount	Sub Amount	Equip Amount	Other Amount	Direct Cost/Unit	Direct Amount	Grand Total Unit Price	Grand Total W/ Markups
				NJC-004		Sewer Forcemain										
					40-10-07-08	Pipe, HDPE, 8"										
						HDPE, butt fusion joints, 40' lengths, 8" diameter, SDR 11, Insulated	4,000.00 lf	125,235	160,000	-	41,050	-	81.57 /lf	326,285	306.24 /lf	1,224,963
						Fittings Allowance	1.00 ls	-	-	35,000	-	-	35,000.00 /ls	35,000	130,198.36 /ls	130,198
						Pipe Supports	40.00 ea	8,623	6,000	-	2,756	-	434.46 /ea	17,378	1,626.67 /ea	65,067
						40-10-07-08 Pipe, HDPE, 8"	4,000.00 LF	133,857	166,000	35,000	43,806		94.67 /LF	378,663	355.06 /LF	1,420,228
						NJC-004 Sewer Forcemain	4,000.00 LF	133,857	166,000	35,000	43,806		94.67 /LF	378,663	355.06 /LF	1,420,228
				NJC-005		Sewer Forcemain Lift Station										
					33-60-99-00	Pipeline Specials, Other										
						Sewer Lift Station Allowance	1.00 ls	-	-	50,000	-	-	50,000.00 /ls	50,000	185,997.64 /ls	185,998
						33-60-99-00 Pipeline Specials, Other	1.00 LS			50,000			50,000.00 /LS	50,000	185,997.64 /LS	185,998
						NJC-005 Sewer Forcemain Lift Station	1.00 EA			50,000			50,000.00 /EA	50,000	185,997.64 /EA	185,998
						33-35 Pipelines	4,000.00 LF	133,857	166,000	85,000	43,806		107.17 /LF	428,663	401.56 /LF	1,606,226
						40.0 Process Piping	4,000.00 LF	133,857	166,000	85,000	43,806		107.17 /LF	428,663	401.56 /LF	1,606,226
						07 8" Dia HDPE Arctic Insulated Sewer Forcemain	4,000.00 LF	133,857	166,000	85,000	43,806		107.17 /LF	428,663	401.56 /LF	1,606,226
	08					Air Release Valve in Main Line										
		33.0				Piping										
			33-45			Pipeline Valves										
				NJC-018		Air Release Valve in Main Line										
					33-20-08-04	Valves, Air Valve Assembly										
						Air Valve Assembly	5.00 ea	610	11,000	-	-	-	2,321.98 /ea	11,610	8,791.67 /ea	43,958
						Miscellaneous Items Allowance	1.00 ls	-	-	1,500	-	-	1,500.00 /ls	1,500	5,579.92 /ls	5,580
						33-20-08-04 Valves, Air Valve Assembly	5.00 EA	610	11,000	1,500			2,621.98 /EA	13,110	9,907.65 /EA	49,538
						NJC-018 Air Release Valve in Main Line	5.00 EA	610	11,000	1,500			2,621.98 /EA	13,110	9,907.65 /EA	49,538
						33-45 Pipeline Valves	5.00 EA	610	11,000	1,500			2,621.98 /EA	13,110	9,907.65 /EA	49,538
						33.0 Piping	4,780.00 LF	610	11,000	1,500			2.74 /LF	13,110	10.36 /LF	49,538
						08 Air Release Valve in Main Line	5.00 EA	610	11,000	1,500			2,621.98 /EA	13,110	9,907.65 /EA	49,538
	09					Isolation Valve in Main Line										
		33.0				Piping										
			33-45			Pipeline Valves										
				NJC-020		Isolation Valve in Main Line										
					33-20-08-100	Valves, Isolation Valve										
						Isolation Valve Assembly	5.00 ea	610	9,000	-	-	-	1,921.98 /ea	9,610	7,275.70 /ea	36,378
						Miscellaneous Items Allowance	1.00 ls	-	-	1,500	-	-	1,500.00 /ls	1,500	5,579.94 /ls	5,580
						33-20-08-100 Valves, Isolation Valve	5.00 EA	610	9,000	1,500			2,221.98 /EA	11,110	8,391.68 /EA	41,958
						NJC-020 Isolation Valve in Main Line	5.00 EA	610	9,000	1,500			2,221.98 /EA	11,110	8,391.68 /EA	41,958
						33-45 Pipeline Valves	5.00 EA	610	9,000	1,500			2,221.98 /EA	11,110	8,391.68 /EA	41,958
						33.0 Piping	4,780.00 LF	610	9,000	1,500			2.32 /LF	11,110	8.76 /LF	41,958
						09 Isolation Valve in Main Line	5.00 EA	610	9,000	1,500			2,221.98 /EA	11,110	8,391.68 /EA	41,958
	10					Road Crossing										
		33.0				Piping										
			33-35			Pipelines										
				NJC-026		Road Crossing, Open Cut										
					40-10-07-08	Pipe, HDPE, 8"										
						Excavate Trench	170.00 cuyd	1,834		-	923	-	16.22 /cuyd	2,757	60.32 /cuyd	10,255
						Backfill Native	85.00 cuyd	234		-	34	-	3.15 /cuyd	268	11.72 /cuyd	996
						Pipe Bedding and Zone - Crushed Rock	95.00 cy	182	1,425	-	131	-	18.29 /cy	1,738	69.10 /cy	6,565
						Hauling, excavated or borrow material, loose cubic yards, 5 mile round trip, 1.1 loads/hour, 20 C.Y. dump trailer, highway haulers, excludes loading	85.00 lcy	213	-	-	336	-	6.47 /lcy	550	24.05 /lcy	2,044
						HDPE, butt fusion joints, 40' lengths, 8" diameter, SDR 11, Insulated	200.00 lf	6,262	8,000	-	2,053	-	81.57 /lf	16,314	306.24 /lf	61,248
						Pipe Casing	200.00 lf	1,150	15,000	-	367	-	82.59 /lf	16,517	312.46 /lf	62,493
						Surface Restoration	1,200.00 sf	-	-	6,000	-	-	5.00 /sf	6,000	18.60 /sf	22,320
						40-10-07-08 Pipe, HDPE, 8"	200.00 LF	9,875	24,425	6,000	3,843		220.72 /LF	44,143	829.61 /LF	165,921
						NJC-026 Road Crossing, Open Cut	4.00 EA	9,875	24,425	6,000	3,843		11,035.85 /EA	44,143	41,480.26 /EA	165,921
						33-35 Pipelines	200.00 LF	9,875	24,425	6,000	3,843		220.72 /LF	44,143	829.61 /LF	165,921
						33.0 Piping	200.00 LF	9,875	24,425	6,000	3,843		220.72 /LF	44,143	829.61 /LF	165,921
						10 Road Crossing	4.00 EA	9,875	24,425	6,000	3,843		11,035.85 /EA	44,143	41,480.26 /EA	165,921
	11					Fire Hydrant										
		33.0				Piping										
			33-45			Pipeline Valves										
				NJC-016		Fire Hydrant										
					33-20-04-01	Valves, Fire Hydrants										
						Water Utility Distribution Fire Hydrants	9.00 ea	4,772	13,725	-	154	-	2,072.40 /ea	18,652	7,815.98 /ea	70,344
						Miscellaneous Items for Fire Hydrant Installation	9.00 ea	2,386	4,500	-	77	-	773.70 /ea	6,963	2,913.13 /ea	26,218
						33-20-04-01 Valves, Fire Hydrants	9.00 EA	7,159	18,225	231			2,846.10 /EA	25,615	10,729.11 /EA	96,562
						NJC-016 Fire Hydrant	9.00 EA	7,159	18,225	231			2,846.10 /EA	25,615	10,729.11 /EA	96,562
						33-45 Pipeline Valves	9.00 EA	7,159	18,225	231			2,846.10 /EA	25,615	10,729.11 /EA	96,562
						33.0 Piping	4,780.00 LF	7,159	18,225	231			5.36 /LF	25,615	20.20 /LF	96,562
						11 Fire Hydrant	9.00 EA	7,159	18,225	231			2,846.10 /EA	25,615	10,729.11 /EA	96,562
	12					Pipe Supports										
		40.0				Process Piping										

Property of CH2M Hill, Inc. All Rights Reserved - Copyright 2012

CH2MHILL

Job Size:
Duration:

Detail Report

Project: Bethel Watermain Loop
Project No.: 479325
Design Stage: 10%

Estimator: N. Cavalleri
Revision / Date: 3/May 1, 2014
Estimate Class: 4

Area	Bid Item	Work Pkg	Trade Pkg	WorkActiv	Unit Price	Description	Takeoff Quantity	Labor Amount	Material Amount	Sub Amount	Equip Amount	Other Amount	Direct Cost/Unit	Direct Amount	Grand Total Unit Price	Grand Total W/ Markups
			33-35			Pipelines										
				NJC-002		Watermain Loop										
					40-00-99-01	Pipe, Other										
						Pipe Supports	503.00 ea	108,432	75,450	-	34,650	-	434.46 /ea	218,533	1,626.67 /ea	818,213
						40-00-99-01 Pipe, Other	503.00 EA	108,432	75,450		34,650		434.46 /EA	218,533	1,626.67 /EA	818,213
						NJC-002 Watermain Loop	5,030.00 LF	108,432	75,450		34,650		43.45 /LF	218,533	162.67 /LF	818,213
						33-35 Pipelines	5,030.00 LF	108,432	75,450		34,650		43.45 /LF	218,533	162.67 /LF	818,213
						40.0 Process Piping	5,030.00 LF	108,432	75,450		34,650		43.45 /LF	218,533	162.67 /LF	818,213
						12 Pipe Supports	503.00 EA	108,432	75,450		34,650		434.46 /EA	218,533	1,626.67 /EA	818,213
	13					Install Water Services with Mainline and Building Connections										
		33.0				Piping										
			33-50			Pipeline Specials										
				NJC-022		Install Water Services with Mainline and Building Connections										
					33-30-06-01	Pipe Specials, Tie-Ins										
						Pipe Tie-In's and Building Connection	10.00 ea	14,638	50,000	-	1,200	-	6,583.82 /ea	65,838	24,841.49 /ea	248,415
						33-30-06-01 Pipe Specials, Tie-Ins	10.00 EA	14,638	50,000		1,200		6,583.82 /EA	65,838	24,841.49 /EA	248,415
						NJC-022 Install Water Services with Mainline and Building Connections	10.00 EA	14,638	50,000		1,200		6,583.82 /EA	65,838	24,841.49 /EA	248,415
						33-50 Pipeline Specials	10.00 EA	14,638	50,000		1,200		6,583.82 /EA	65,838	24,841.49 /EA	248,415
						33.0 Piping	4,780.00 LF	14,638	50,000		1,200		13.77 /LF	65,838	51.97 /LF	248,415
						13 Install Water Services with Mainline and Building Connections	10.00 EA	14,638	50,000		1,200		6,583.82 /EA	65,838	24,841.49 /EA	248,415
						02 Phase 2	1.00 LS	432,664	555,300	135,000	135,351	468,000	1,726,314.51 /LS	1,726,315	5,187,741.94 /LS	5,187,742

Property of CH2M Hill, Inc. All Rights Reserved - Copyright 2012

Phase 2 Totals

Construction Costs	Amount	Totals	Hours	Rate	% of Total
Labor	432,664		8,686.802 I		8.34%
Material	555,300				10.70%
Subcontract	135,000				2.60%
Equipment	135,351		3,245.205 I		2.61%
Subtotal Direct	**1,258,315**	**1,258,315**			24.26
Market Condition Adjustment	440,410			35.000 %	8.49%
Subtotal w/ Market Condition	**440,410**	**1,698,725**			8.49
General Conditions	254,809			15.000 %	4.91%
Subtotal w/ General Conditions	**254,809**	**1,953,534**			4.91
Material Sales Tax	38,871			7.000 %	0.75%
Subtotal w/ Sales Taxes	**38,871**	**1,992,405**			0.75
Contractor Overhead	298,861			15.000 %	5.76%
Contractor Profit	114,563			5.000 %	2.21%
Bider's Risk & Gen Liab Ins -%	24,058			1.000 %	0.46%
Payment & Performance Bonds	28,187			1.160 %	0.54%
Subtotal w/ Markups	**465,669**	**2,458,074**			8.98
Contingency	983,229			40.000 %	18.95%
Subtotal w/ Contingency	**983,229**	**3,441,303**			18.95
Escalation on Estimate Total	240,891			7.000 %	4.64%
Subtotal w/ Escalation	**240,891**	**3,682,194**			4.64
Non-Markup Items	468,000				9.02%
Subtotal Non-Markup Items	**468,000**	**4,150,194**			9.02
Construction Total		**4,150,194**			
City Administration	124,506			3.000 %	2.40%
Design Costs	415,019			10.000 %	8.00%
Construction Support Services	498,023			12.000 %	9.60%
Capital Total	**1,037,548**	**5,187,742**			**20.00**

Property of CH2M Hill, Inc. All Rights Reserved - Copyright 2012