MEMORANDUM

To: Mayor McConnell and Members of the Assembly
Jim Dinley, Municipal Administrator

From: Michael Harmon, P.E., Public Works Director
Lance Henrie, P.E., Senior Engineer

Reviewed: Stephen Weatherman, P.E., Municipal Engineer
Jay Sweeney, Finance Director

Cc: Mark Buggins, Environmental Superintendent

Date: October 15, 2012

Subject: Ordinance 2012-37 - Increase in Rates/Fees for Sewer Service

Background:

On July 12, 2011 the Assembly approved award of a professional services contract to DOWL HKM to complete the Sewer System Master Plan. The purpose of this study is to serve as a guideline to help prioritize and budget for upgrading and/or reconstructing the existing sewer system infrastructure and installing new infrastructure. The Master Plan will also be used as a factual basis for securing local, state, and federal funding for the required improvements.

Analysis

A thorough and comprehensive analysis of the condition of the Municipal Sewer System has been completed with this Master Plan. The results of the analysis have identified essential repairs and replacements of wastewater infrastructure, time frames in which the repairs need to be accomplished and projected costs for the repairs.

The proposed sewer rate/fee increases are necessary to ensure that there is sufficient cash flow to fund operations and debt service associated with the Sewer System Capital Improvement Plan (CIP) in accordance with the Sewer Master Plan. Rate increases for Fiscal Year 2011 and 2012 were increased by 13.33% with projected increases of 13.33% through Fiscal Year 2015 to coincide with CBS water rate increases. The financial analysis associated with this Master Plan (10-year rate schedule) recommends a yearly rate/fee increase of 9.5% through Fiscal Year 2018 and then lowering the increase to 6.5% through Fiscal Year 2022.

Fiscal Note

A key element of the Municipal Wastewater Treatment Master Plan is an in-depth pro forma financial analysis and rate forecast, performed by the FCS Group in conjunction with DOWL HKM.

In the course of preparing the financial analysis and rate forecast, the FCS Group engaged in extensive financial modeling in order to prepare prospective financial statements showing the effects of different financial variables such as borrowing rates, expense inflation rates, and different capital structures. The modeling was thorough, detailed and well executed, constituting some of the best independent work the CBS staff has seen.

Our Finance Department independently prepared its own high level financial analysis in order to vet the analyses of the FCS Group. The Finance Department verified that the rate increases indicated by the FCS Group analyses are indeed appropriate and necessary to fund the wastewater capital improvement plan, while at the same time not setting user fees higher than required.

Recommendation:

Approve Ordinance 2012-37 amending Sitka General Code at Chapter 15.04 entitled "Sewer System" at Subsection 15.04.320 entitled "Rates and Fees" and at Chapter 15.05 entitled "Water System" at Subsection 15.05.625B, entitled "Wastewater Service – Sawmill Cove Industrial Park" to adjust the rates for sewer service in accordance with the Sewer System Master Plan to fund the Capital Improvement Projects Plan.

Sponsor: Administrator

CITY AND BOROUGH OF SITKA

ORDINANCE NO. 2012-37

AN ORDINANCE OF THE CITY AND BOROUGH OF SITKA AMENDING SITKA GENERAL CODE TO ADJUST THE RATES FOR SEWER SERVICE AND MAKE CLERICAL EDITS AT SECTION 15.04.320 ENTITLED "RATES AND FEES", AND ADJUST THE WASTEWATER RATES AND MAKE CLERICAL EDITS AT SECTION 15.05.625 ENTITLED "WASTEWATER SERVICE – SAWMILL COVE INDUSTRIAL PARK"

1. **CLASSIFICATION.** This ordinance is of a permanent nature and is intended to become a part of the Sitka General Code.

2. **SERVERABILITY.** If any provision of this ordinance or any application to any person or circumstance is held invalid, the remainder of this ordinance and application to any person or circumstance shall not be affected.

3. **PURPOSE.** This ordinance will increase rates for sewer service as well as make clerical edits by amending SGC 15.04.320 entitled "Rates and Fees, as follows,:

- Subsection A entitled "Base Rate," from $38.53 to $42.19 per unit per month
- Subsection B entitled "Sewer Service in Conjunction with Metered Water," from one times the unmetered sewer base rate plus $2.11 rather than plus $1.93 per one thousand metered gallons

In addition, this ordinance increases wastewater rates and makes clerical edits at Sawmill Cove Industrial Park by amending SGC 15.05.625B entitled "Wastewater Service – Sawmill Cove Industrial Park" as follows:

- Subsection 1 entitled "Unmetered wastewater, domestic" from $38.43 to 42.19 per month
- Subsection 2 entitled "Treated wastewater, metered" from $2.27 to $2.49 per one thousand gallons water use

The additional funds are needed to cover the operating costs and infrastructure replacements in the Wastewater Fund and fund the Capital Improvement Projects Plan in accordance with the Sewer System Master Plan. These additional charges follow the schedule in the Sewer System Master Plan and the presentation by FCS Group – Solutions Oriented Consulting, which is for a 9.5 % rate increases per year through Fiscal Year 2018.

4. ENACTMENT, NOW, THEREFORE, BE IT ENACTED by the Assembly of the City and Borough of Sitka that SGC 15.04.320 and SGC 15.05.625B are amended to read as follows (new language underlined; deleted language stricken):

15.04.320 Rates and Fees

A. Base rate: forty two dollars and nineteen cents ($42.19) ~~thirty-eight dollars and fifty-three cents~~ per unit per month.

* * *

B. Sewer Service in Conjunction with Metered Water. Minimum charge: One times the unmetered sewer base rate plus two dollars and eleven cents ($2.11) ~~one dollar and ninety three cents~~ per one thousand metered gallons.

* * *

C. Connection fee: six hundred dollars ($600.00) per connection.

15.05.625 Water and wastewater rates—Sawmill Cove Industrial Park.

* * *

B. Wastewater Service—Sawmill Cove Industrial Park.

1. Unmetered wastewater, domestic: forty two dollars and nineteen cents ($42.19) ~~thirty-eight dollars and fifty-three cents~~ per month.

2. Treated wastewater, metered: one hundred dollars ($100.00) per month minimum.

   a. Treated wastewater, metered: two dollars and forty nine cents ($2.49) ~~two dollars and twenty-seven cents~~ per one thousand gallons water use.

* * *

5. EFFECTIVE DATE. This ordinance shall become effective within 30 days after passage by the Assembly of the City and Borough of Sitka.

PASSED, APPROVED, AND ADOPTED by the Assembly of the City and Borough of Sitka, Alaska this 23 day of October, 2012.

____
Mim McConnell, Mayor

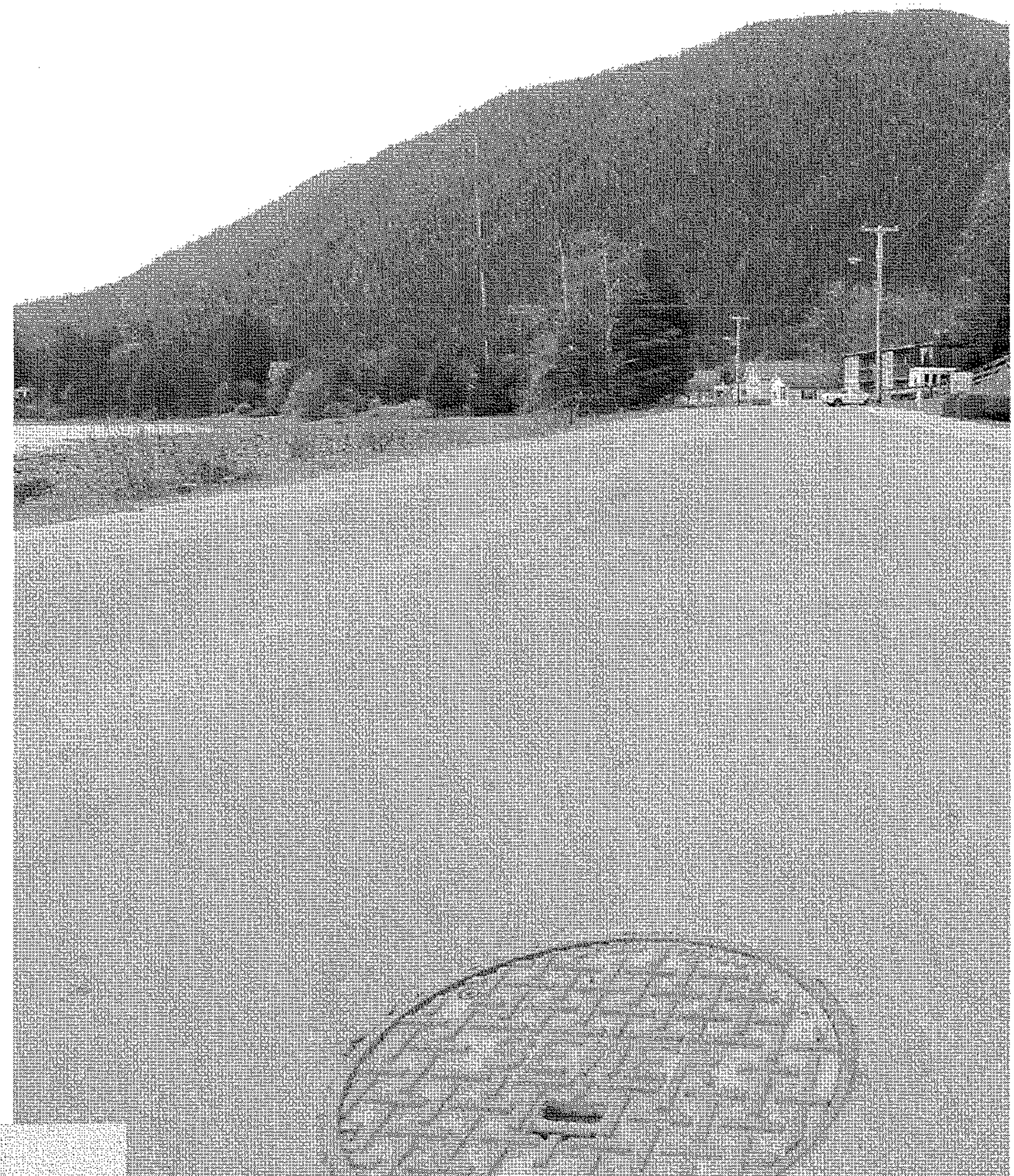
ATTEST:

____
Colleen Ingman, MMC
Municipal Clerk

The City and Borough of Sitka

Municipal Sanitary Sewer Master Plan

October 2012



Prepared by:

DOWL HKM

G.V. Jones & Associates • O'Neill Surveying & Engineering • FCS Group • Carson Dorn

CITY AND BOROUGH OF SITKA
MUNICIPAL SANITARY SEWER
MASTER PLAN

Prepared for:

City and Borough of Sitka
Department of Public Works
100 Lincoln Street
Sitka, Alaska 99835

Prepared by:

DOWL HKM
4041 B Street
Anchorage, Alaska 99503
(907) 562-2000

W.O. 60854

October 2012

TABLE OF CONTENTS

Page

TABLE OF CONTENTS (cont)

Page

TABLE OF CONTENTS (cont)

FIGURES **Page**

TABLES

APPENDICES

LIST OF ACRONYMS

AAC .... Alaska Administrative Code
APDES .... Alaska Pollutant Discharge Elimination System
BOD .... biochemical oxygen demand
CBS .... City and Borough of Sitka
CCTV .... closed circuit television
CFR .... Code of Federal Regulations
CWA .... Clean Water Act
DBP .... disinfection by-product
DEC .... State of Alaska Department of Environmental Conservation
DO .... dissolved oxygen
DOT&PF .... State of Alaska Department of Transportation and Public Facilities
FC .... fecal coliform
FO .... forward osmosis
GIS .... Geographic Information System
I/I .... inflow and infiltration
lbs/day .... pounds per pay
LTCIP .... Long-Term Capital Improvement Project
μg/L .... micrograms per liter
mg/L .... milligrams per liter
mgd .... million gallons per day
MH .... manhole
mL .... milliliter
NPDES .... National Pollutant Discharge Elimination System
O&M .... operation and maintenance
POTW .... publicly owned treatment works
PVC .... polyvinyl chloride
SCADA .... Supervisory Control and Data Acquisition
SCIP .... Sawmill Cove Industrial Park
STCIP .... Short-Term Capital Improvement Project
TSS .... total suspended solid
USEPA .... United States Environmental Protection Agency
UV .... ultraviolet
VFD .... variable frequency drive
WWTP .... wastewater treatment plant

EXECUTIVE SUMMARY

Key Aspects of the Plan:

- A comprehensive wastewater treatment infrastructure Capital Improvement Plan has been developed through 2030. The plan identifies required infrastructure needs, target years, and anticipated funding sources.
- A comprehensive financial analysis and forecast was completed in conjunction with the wastewater Capital Improvement Plan. This forecast modeled the financial impacts of the Capital Improvement Plan and was used as the basis for determining user rate increases.

Assembly Decision Point:

We are recommending that wastewater user fees increase by 9.5% per year from FY 2013 through FY 2018, then by 6.5% per year from FY 2019 through FY 2022.

Other Important Points:

The City and Borough of Sitka engaged DOWL HKM and the FCS Group in early 2012 to prepare a comprehensive wastewater treatment system master plan. These consultants prepared the attached plan, with help and input from City and Borough of Sitka staff.

The Finance department vetted the financial analysis and forecast prepared by the consultants and agrees with the recommended rate increases.

Public Works' staff is in agreement with the engineering scope of the plan and has had substantial input on both its requirements and on the timing of improvements.

Maximum planning for use of federal and state loans and grants was done when developing recommended rate increases. Loans and grants were always considered as the first and primary source of project funding.

Due diligence was accomplished by both the consultants and City and Borough of Sitka staff to ensure that all known environmental regulations will be complied with when developing the Capital Improvement Plan.

1.0 INTRODUCTION

The City and Borough of Sitka (CBS) and DOWL HKM entered into contract in July 2011 to complete the CBS Municipal Sanitary Sewer Master Plan. The objectives of the master plan are as follows:

- Provide an inventory of the existing sanitary sewer system using closed circuit television (CCTV) records analysis, smoke testing record analysis, and infiltration and inflow analysis.
- Recommendations for upgrades to the CBS Geographic Information System (GIS) database.
- Present and future regulatory compliance analysis.
- Condition assessment of the gravity mains, force mains, and lift stations.
- Capital improvement project identification and cost estimation for the collection system and wastewater treatment plant (WWTP).
- Sewer rate study including an operating forecast, capital financing analysis, and rate forecast.

1.1 Existing Conditions

The CBS sanitary sewer system collects and treats the sanitary wastewater from nearly 98% of the population consisting of approximately 3,000 residential and commercial customers. The maximum federally permitted average flow for the CBS WWTP is 1.8 million gallons per day (mgd) on a monthly basis. The average flow to the wastewater treatment facility is 1.2 to 1.4 mgd, a decrease from 1.8 mgd in the 1980s. The reduction is due to removal of extraneous flows resulting from inflow and infiltration (I/I) entering the system through leaks and improper connections.

Current flows do not include Sawmill Cove Industrial Park (SCIP), which currently has a separate collection and treatment system. SCIP will soon be on-line with the CBS system with the completion of the new Sawmill Cove Lift Station. Currently, these flows are not significant when added to the existing flows to the WWTP.

Due to the geology and topography, the wastewater collection system is particularly complex for the community's size. The collection system includes a combination of gravity and force mains, 41 major lift stations with 19 connected to Supervisory Control and Data Acquisition (SCADA) remote monitoring and control system. The collection system extends nearly 6 miles from the central business district to the north to just past the Alaska Marine Lines Barge Facility, 5.5 miles southeast to SCIP, and 2 miles west to the United States Coast Guard Air Station. In total, there is approximately 40 miles of collection system mains of various sizes and materials.

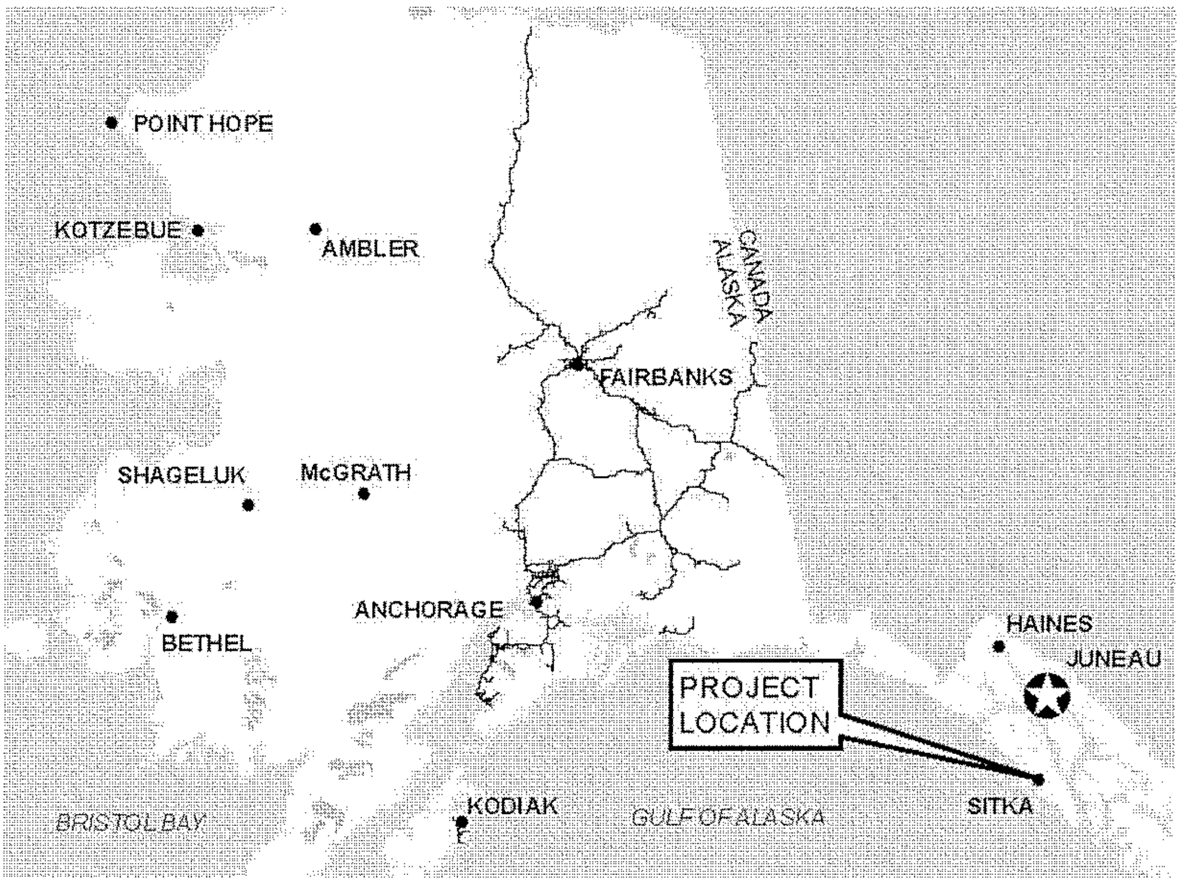


Figure 1: Location and Vicinity Map

The CBS sewage collection system conveys domestic wastewater across the Sitka Channel to the municipal wastewater treatment facility located on Japonski Island owned and operated by the CBS. The WWTP consists of a conventional primary treatment process that provides raw sewage comminution, grit removal, and primary clarification prior to discharge to a marine outfall. Gravity thickened primary sludge is mechanically dewatered on a belt filter press. Lime is added after the sludge is pressed. Dewatered cake along with scum and grit are transported to a permitted facility for land disposal.

The treatment system and discharge are monitored under a permit administered by the United States Environmental Protection Agency (USEPA). The current permit allows the plant to discharge primary effluent under Section 301(h) of the Clean Water Act (CWA) that waives secondary treatment requirements for the system pending continued compliance with the requirements of the waiver.

2.0 REGULATORY COMPLIANCE ANALYSIS

2.1 Background

In 1972, Congress passed the Federal Water Pollution Control Act Amendments termed the CWA. Key provisions of the CWA include requirements that all publicly owned treatment works (POTW) discharging to the waters of the United States meet secondary treatment standards. These standards, defined by regulation (Code of Federal Regulations 40 CFR 132.102), include achieving performance goals for reduction of influent wastewater solids and organic concentrations and effluent wastewater quality criteria.

To administer these regulatory requirements, the CWA promulgated the National Pollutant Discharge Elimination System (NPDES) permit program. Under this program, POTWs are issued individual permits for the discharge of treated wastewater to a receiving environment. These permits stipulate each plant's specific performance requirements for both the reduction of influent loadings and effluent wastewater quality.

In addition under Section 401, the CWA directs each state to develop and update its own set of water quality standard regulations. Water quality standard regulations define designated uses of waters receiving treated wastewater discharges, establish water quality criteria to be maintained in those receiving waters, and prohibit lowering receiving water quality to conditions that would prevent the designated use of the water body assigned by the state. The CWA charges states with the responsibility of reviewing proposed POTW discharge permits and to certify whether draft permits issued will degrade the use of the receiving water.

Congress amended the CWA in 1977 by adding Section 301(h) that authorized the USEPA to issue modified permits allowing discharge of effluent of less than secondary quality when discharging to marine waters. Eligibility for operation under a 301(h) waiver included submittal of an application by September 1979 (subsequently extended to December 1982) and demonstration that the proposed discharge complies with criteria intended to protect the marine environment, including attaining water quality standards. The USEPA initially received over 200 applications, they approved 54, and have since not reissued over 20 permits. Alaska currently has nine waivers (Anchorage, Haines, Ketchikan, Pelican, Petersburg, Sitka, Skagway, Whittier, and Wrangell)[1]. The waivers were issued based on nine criteria that the applicant was required to meet in order to obtain the waiver. The CWA specified that the permits may not be issued for longer than five-year terms, with applicants applications for renewal filed at least 180 days prior to the expiration date. If the reviewing authority (USEPA) did not reissue the permit prior to the expiration date, the existing permit was considered "administratively continued," and the permit application process is considered "backlogged."

Permits under Section 301(h) have been issued case by case based on a demonstration that state water quality standards could be met, that no adverse impact to receiving water uses would occur, and that no industrial discharges would be included. They also required state certification that state receiving water quality standards could be attained (section 401 Reasonable Assurance Certifications). A discharge and receiving water-monitoring program established by the specific permit would be periodically reviewed at 5-year intervals and based on new information provided on plant performance and receiving water quality sampling. These data would be used to revise and re-issue the permit, or require additional treatment.

On August 27, 2005, the governor of Alaska signed Senate Bill 10 that directed the State of Alaska Department of Environmental Conservation (DEC) to seek primacy for the NPDES wastewater permit program administered by the USEPA. The bill directed DEC to submit a primacy application to the USEPA by July 1, 2006.

The USEPA granted the State of Alaska primacy to administer the NPDES program under the State's Alaska Pollutant Discharge Elimination System (APDES) in October 2008. Authority to administer the program is being transferred from the USEPA to the DEC in phases that began in

[1] Not including 77 Native Alaskan Villages included in 40 CFR 125.

2008 and is due to be completed late in 2012. An APDES permit is to be obtained for any effluent discharge for facilities that DEC has received authority. Facilities for which the USEPA retained authority include: federal facilities in Denali National Park and Preserve, Indian Country facilities, facilities operating outside state waters (three miles from shore), and facilities issued CWA Section 301(h) waivers from secondary treatment standards, which would include Sitka. As such, Sitka's permit is issued by the USEPA, but monitoring and performance reports are required to be submitted to both the USEPA and DEC.

2.2 Wastewater Treatment Facilities

States are required to comply with federal water pollution control regulations. The State of Alaska administers its own wastewater and water quality standard regulations (Alaska Administrative Codes 18 AAC 72 and 18 AAC 70, respectively). These regulations address the quality of treated effluent discharged and minimum water quality standards to be maintained for receiving waters. The State of Alaska has adopted additional design and performance requirements that are carried out through a plan review and approval process.

The following provides a brief summary of the state wastewater regulations that may be applicable for wastewater treatment and disposal for Sitka should the existing 301(h) waiver be discontinued.

2.2.1 Secondary Treatment Facilities

For point-source discharges to the land or water surface, both the State and USEPA require the equivalent of secondary wastewater treatment unless waived under Section 301(h). Secondary treatment is defined in federal statute (40 CFR 133) in terms of treated effluent quality using the 5-day biochemical oxygen demand (BOD_5), a measure of organic concentration, total suspended solids (TSS), pH, and other wastewater quality parameters the permitting agency believe applicable for compliance with current regulatory criteria. At a minimum, the quality of treated effluent is regulated in terms of concentrations of organics and solids and in terms of percent removals achieved for these parameters by the treatment process. Table 1 summarizes the minimum treatment requirements for conventional treatment plants. In this context, conventional treatment systems are those systems using biological and/or mechanical processes to achieve secondary treatment standards.

Table 1: Secondary Treatment Criteria

Parameter	Criteria for Conventional Treatment Systems
Concentration of Effluent BOD	30-day average shall not exceed 30 mg/L. 7-day average shall not exceed 45 mg/L. 30-day percent removal shall not be less than 85% unless influent waste strength is dilute.
Concentration of Effluent Carbonaceous BOD [Carbonaceous BOD may be substituted]	30-day average shall not exceed 25 mg/L. 7-day average shall not exceed 40 mg/L. 30-day percent removal shall not be less than 85% unless influent waste strength is dilute.
Concentration of Effluent TSSs	30-day average shall not exceed 30 mg/L. 7-day average shall not exceed 45 mg/L. 30-day percent removal shall not be less than 85% unless influent waste strength is dilute.
Effluent pH	$\geq$ 6.0 and $\leq$ 9.0

In addition to construction plan reviews for wastewater systems, DEC wastewater permitting requires periodic effluent sampling and reporting.

2.2.2 Water Quality Standard Regulations for Discharge to Water

In addition to meeting secondary treatment, wastewater regulations also require point-source dischargers to meet state and federal receiving water quality standards as outlined in Alaska Statute (18 AAC 70). In these regulations, release of treated wastewater into surface or groundwater must not raise the concentration of contaminants in the receiving water at the edge of a designated mixing zone above the water quality criteria limitations stipulated in the regulations.

In order to evaluate the impact on the receiving environment, a determination of water quality use designation is first required, as discussed below.

2.2.3 Marine Water Designation

Alaska statue establishes four classifications of water quality that apply to marine waters (18 AAC 70). These classifications are based on intended water use as noted in the table below. The water quality criteria include fecal coliform (FC) bacteria, dissolved gases, pH, turbidity, temperature, dissolved organic substances, sediment, toxins and other deleterious organic and inorganic substances, petroleum hydrocarbons, total residual chlorine, radioactivity, and residues.

For wastewater discharged from small community facilities, the most difficult water quality parameter to meet is normally the FC requirement. The maximum allowable discharge parameter for FC is based on a classification of water body use, as defined in Table 2.

Table 2: State of Alaska Water Quality Standards for Fecal Coliform

Water Body Use	Fecal Coliform FC/100mL
(A) Water supply	
(i) aquaculture	20
(ii) seafood processing	20
(iii) industrial	200
(B) Water recreation	
(i) contact recreation	100
(ii) secondary recreation	200
(C) Growth and propagation of fish, shellfish, other aquatic life and wildlife	Not applicable
(D) Harvesting for consumption of raw mollusks or other raw aquatic life	14

The marine waters around Sitka are unclassified; the most stringent water quality criteria apply unless the community applies for a water body reclassification. The most stringent water quality standards require that the FC concentration not exceed 14 colonies per 100 milliliters (mL) of sample on a monthly average for samples outside of the designated mixing zone (described below).

2.3 Mixing Zone Criteria

The USEPA regulations give states the flexibility to "waive" applicable water quality standards under certain circumstances. Section 70.032 of AAC Chapter 70 (Water Quality Standards) includes provisions for defining a mixing zone as a region in which water quality criteria may be exceeded about the point of wastewater discharge. The concept of a mixing zone was developed as a method of administering the regulations in a practical methodology considering the treatment technology, economics, and environmental impacts. A mixing zone is designated by the applicant and then reviewed and approved by the DEC or USEPA. The regulations stipulate that the DEC will consider: (1) physical, biological, and chemical characteristics of the receiving water, including volume and rate; (2) effects the discharge may have on the uses of the receiving water; (3) flushing and mixing characteristics of the receiving water; (4) effluent treatment technology requirements under federal or state law; (5) characteristics of the effluent, including volume, flow rate, and quality after treatment; (6) methods to analyze and model near-field and far-field mixing; and (7) cumulative effects of multiple mixing zones and diffuse, non-point-source inputs located within or affecting the receiving water.

Water quality regulations require that the mixing zone must be as small as practicable and can be authorized only after the applicant has submitted evidence that demonstrates that the water quality standards will be met and that effluent treatment is adequate for the parameters of concern. The mixing zone must also comply with the maximum size limitations. "For estuarine and marine waters, the cumulative linear length of the mixing zones intersected on any given cross section of an estuary, inlet cove, channel, or other marine water, measured at mean lower low water, may not exceed 10% of the total length of that cross section, nor may the total horizontal area allocated to mixing zones in these waters exceed 10% of the surface as measured at mean lower low water." (18 AAC 70.255(e)(1)(A)).

2.4 Current Regulatory Permit Compliance

The existing NPDES permit (AK-002147-4) for the City and Borough of Sitka was issued December 31, 2001 and expired on January 2, 2007. In accordance with the regulations, the CBS re-submitted their application for permit renewal on June 7, 2006. In December 2006, the USEPA responded that the application was complete and timely and that the USEPA would administratively extend the current permit until such time as the USEPA could issue a new permit. As of August 2012, the USEPA has not issued the CBS a new permit; the USEPA has placed the application review as a Tier 2 priority system. As previously noted, the USEPA retains permit authority over the nine 301(h) waivered systems; as such, DEC will continue to be required to provide a review and Certificate of Reasonable Assurance under provisions of Section 401. Any applicant for a Federal permit which may result in any discharge into the navigable waters is required to provide a certification from the State that such discharge will comply with the applicable provisions of the CWA.

The current permit effluent limits for Sitka are shown in the table below.

Table 3: Effluent Limitations

Effluent Parameter	Unit of Measurement	Monthly Average	Maximum Daily
BOD_5[1]	mg/L	140	200
	lbs/day	2,100	3,000
TSSs[1]	mg/L	140	200
	lbs/day	2,100	3,000
Total Flow	mgd	1.8	5.3
Fecal Coliform	# FC/100 mL	1,000,000	1,500,000
Copper	µg/L	243	354
Dissolved Oxygen	mg/L	--	2.0[2]

[1] The monthly average effluent loading shall not exceed 70% of the monthly average influent loading for 5-day BOD_5 and TSSs.
[2] Minimum daily limitation.

The table below summarizes the required monitoring requirements.

Table 4: Influent/Effluent Monitoring Requirements

Effluent Parameter	Sample Location	Sample Frequency	Sample Type
Average Monthly Flow, mgd	Influent or Effluent	Continuous	Recording
BOD_5, mg/L	Influent and Effluent	Weekly	24-hour composite
TSS, mg/L	Influent and Effluent	Weekly	24-hour composite
Temperature, °C	Effluent	Weekly	Grab
pH, S.U.	Effluent	Weekly	Grab
Dissolved Oxygen, mg/L	Effluent	Weekly	Grab
Fecal Coliform Bacteria, Colonies/100 mL	Effluent	Monthly	Grab
Total Ammonia as N, mg/L	Effluent	Monthly	24-hour composite
Copper, µg/L[1]	Effluent	Monthly	24-hour composite
Toxic Pollutants and Pesticides$_2$	Effluent	2/permit term[3]	Grab
Whole Effluent Toxicity[4], TU_c	Effluent	2/permit term[5]	24-hour composite

[1] Copper results will be reported as total recoverable copper.
[2] "Toxic pollutants" are defined as the 126 priority pollutants listed in 40 CFR 401.15.
[3] The permittee shall conduct analyses of the effluent for toxic pollutants and pesticides during the dry season (July through September) in the first and fourth years of the permit term. Samples shall be grab samples. Sampling and analysis shall be conducted according to methods approved in 40 CFR Part 136.
[4] See Part I.C.
[5] Whole Effluent Toxicity monitoring shall be conducted once per year in the first and fourth years of the permit term.

In order to evaluate treatment plant performance and permit compliance, the last three years of daily operator data (Discharge Monitoring Reports) were analyzed and are discussed below.

2.5 Wastewater Flows

The Discharge Monitoring Reports for the past two years of operation were analyzed for compliance with the wastewater permit requirements. Figure 2 shows the monthly average of the daily flows and the maximum daily flows for each month for the years 2009 through 2011. The results indicate that the plant has been in compliance with the permit requirements of 1.8 mgd for average daily flows, and 5.3 mgd for maximum day flows.

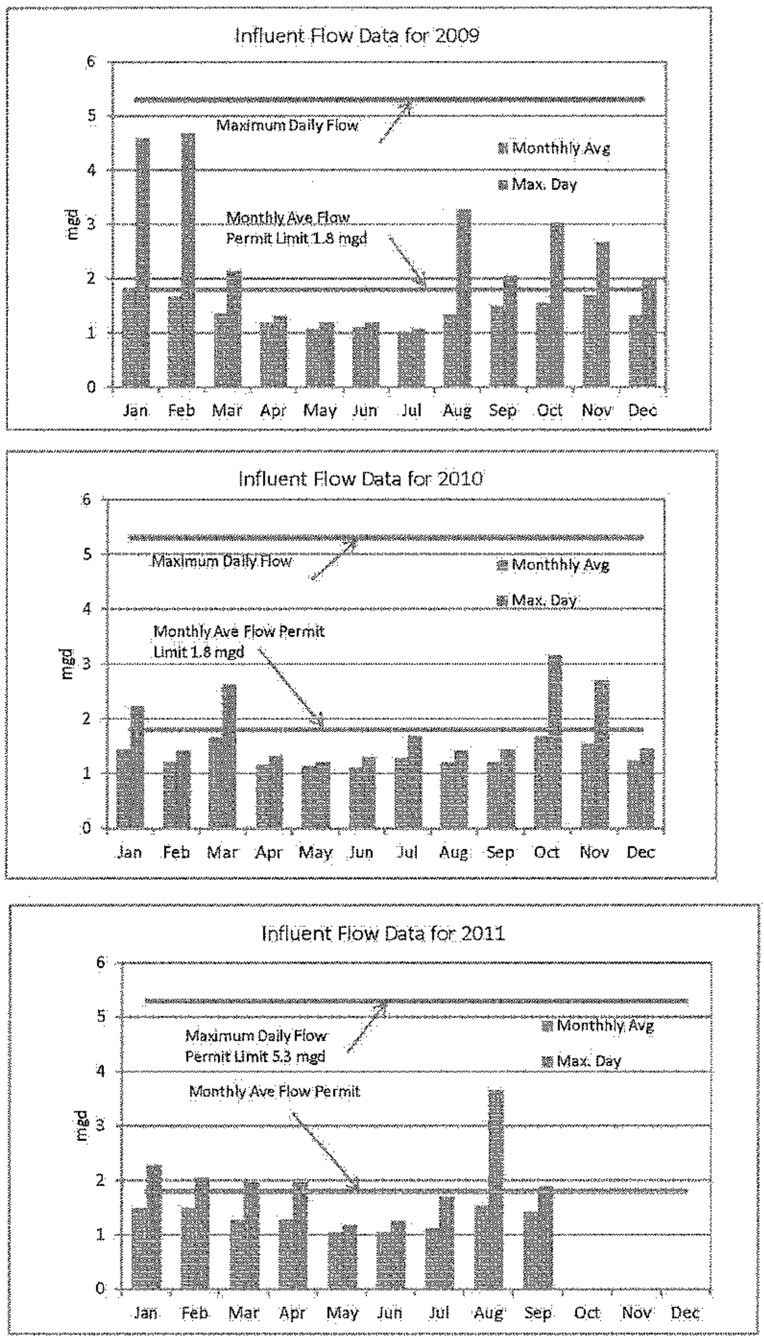


Figure 2: Wastewater Flows for 2009 through 2011

2.6 Wastewater Treatment Plant Performance

The discharge permit establishes monthly average and maximum daily limits based on concentration (mg/L) and mass (lbs/day) limits for BOD_5 and TSS as well as a minimum percentage removal (30%) for each. In addition maximum discharge concentrations of FC and copper, and a minimum daily dissolved oxygen (DO) concentration are stipulated. Figures 3 through 6 show the BOD and TSS concentration and mass discharge based on monthly averages (n=4) for 2009 through 2011. As shown, the facility has been in compliance.

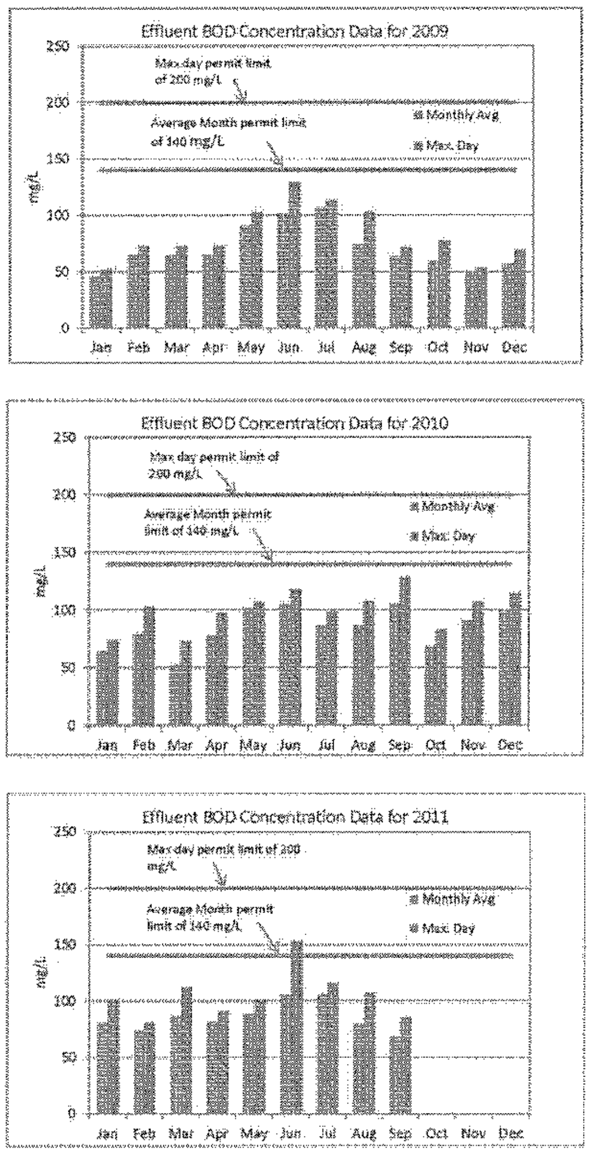
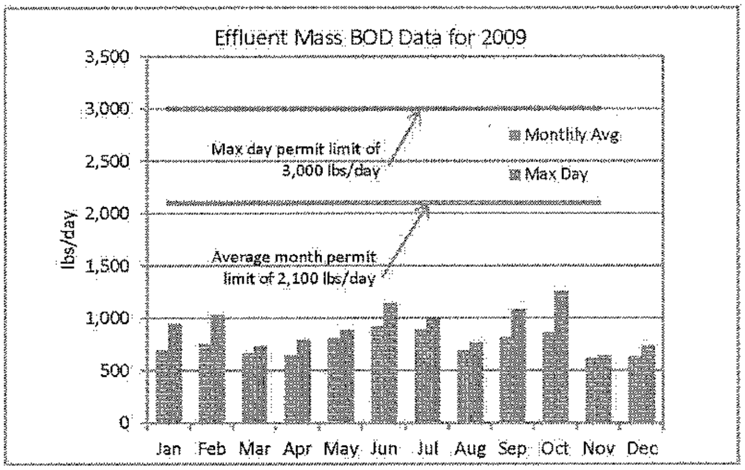
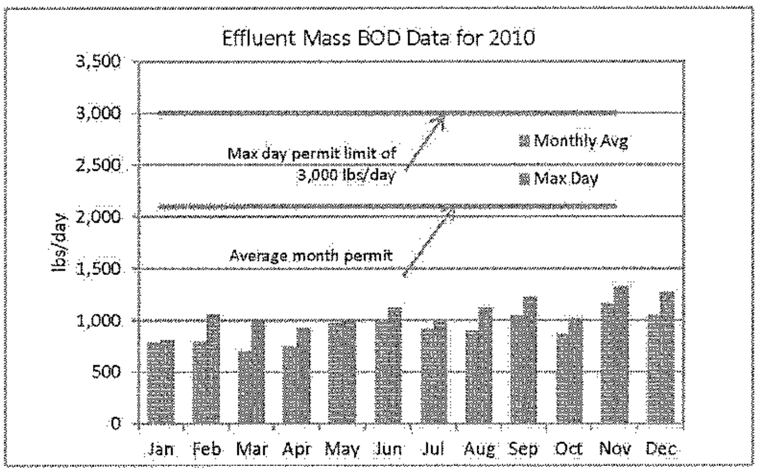


Figure 3: Biochemical Oxygen Demand Effluent Discharge Concentration for 2009 through 2011





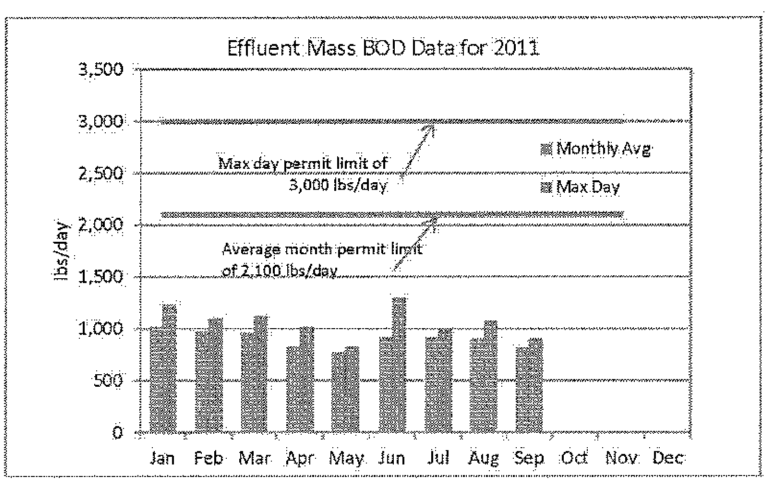


Figure 4: Biochemical Oxygen Demand Effluent Mass Discharge for 2009 through 2011

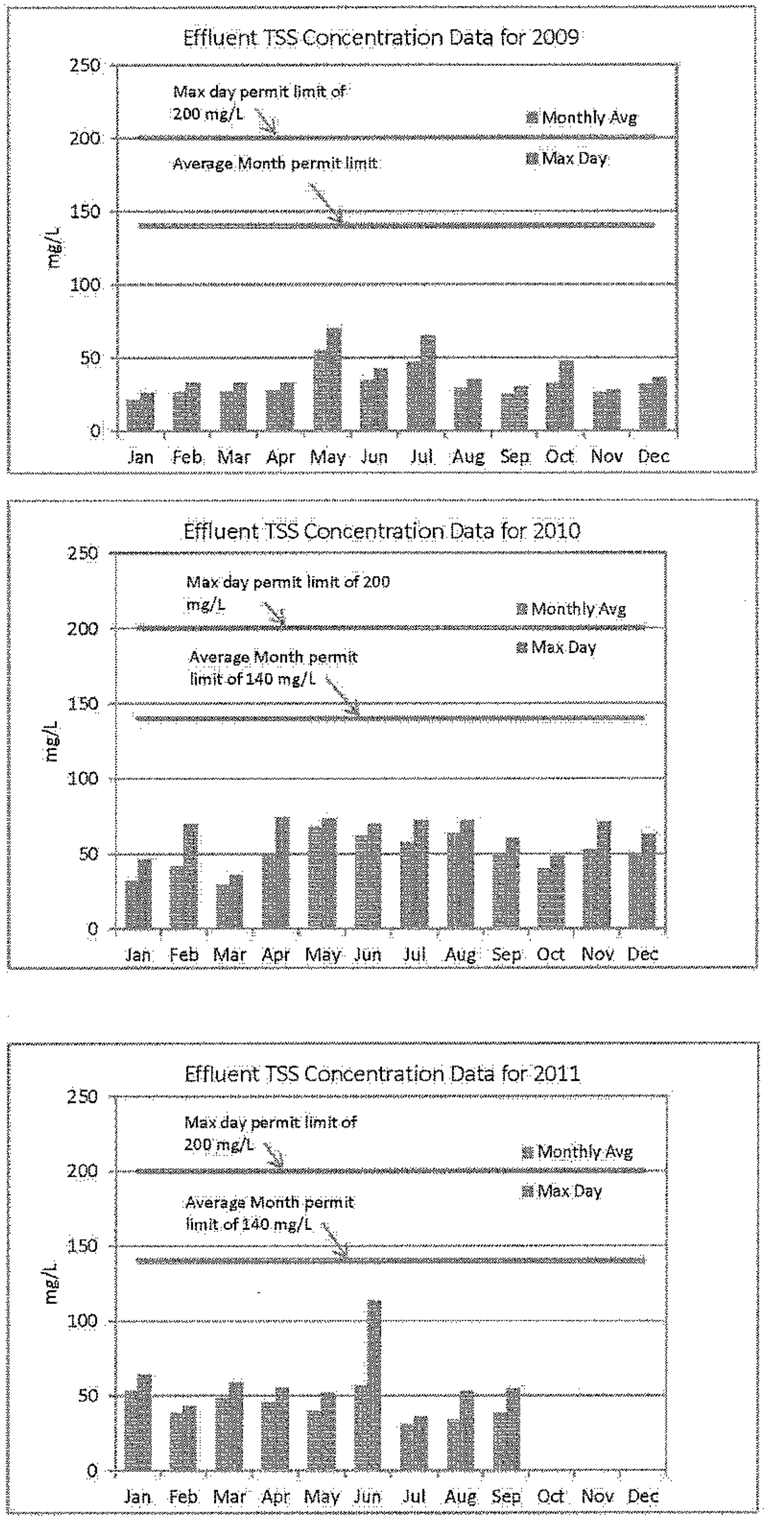


Figure 5: Total Suspended Solid Effluent Discharge Concentration for 2009 through 2011

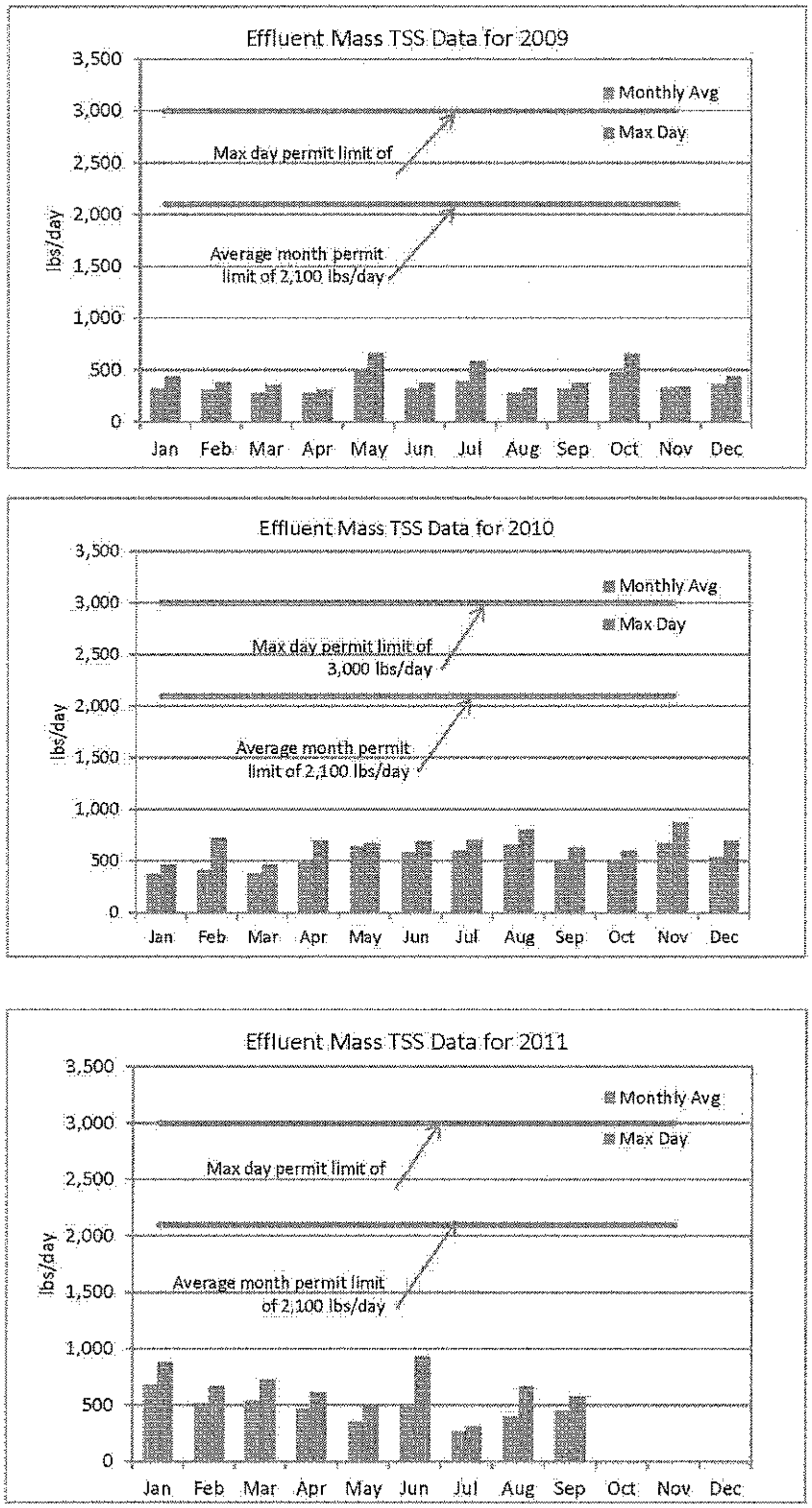


Figure 6: Total Suspended Solid Effluent Mass Discharge for 2009 through 2011

Figure 7 shows the monthly average treatment removal efficiency for 2009 through 2011. As can be seen the plant has been in compliance with the permit requirements for BOD and TSS, and based on record review, also been in compliance with other permit parameters for DO, pH, and FC.

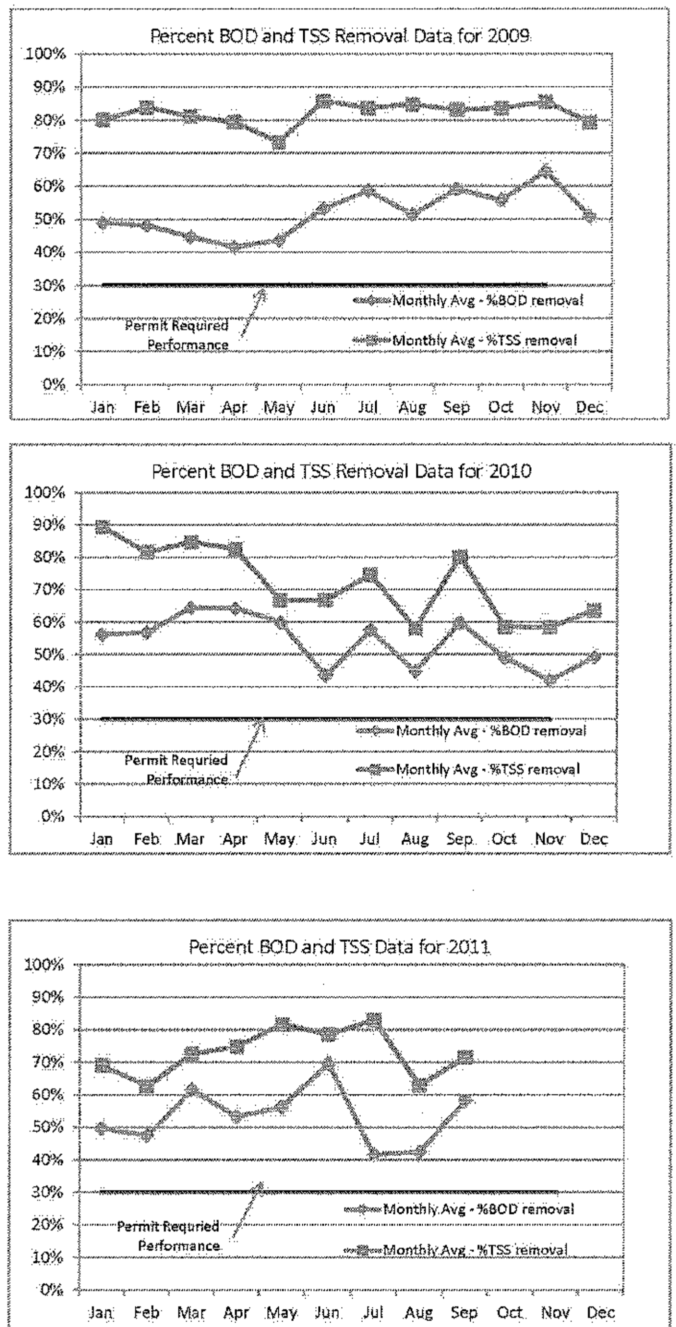


Figure 7: Biochemical Oxygen Demand and Total Suspended Solid Monthly Average Removal Efficiency for 2009 through 2011

2.7 Receiving Water Quality Compliance

In addition to the effluent monitoring program as discussed in the previous section, the discharge permit requires periodic sampling of the receiving waters to determine compliance with water quality standard regulations. The permit required semi-annual sampling in the second and fourth years of the permit for temperature, salinity, DO, pH, and Secchi disk depth at the surface, mid-depth, and the bottom at four locations, including the eastern and western boundary of the zone of initial dilution as two reference stations (at least 750 meters west and east of the discharge and at the same depth). The zone of initial dilution is defined in the permit as a rectangle of 386.5 feet perpendicular to shore and 190.9 feet wide and was designated with an initial dilution of 122:1.

The permit required FC monitoring in July of each year, and in the fourth year of the permit, required monitoring five times a year (April, June, July, August, and November) at the water surface at seven (7) locations listed below:

Table 5: Fecal Coliform Surface Water Sampling Locations and Fecal Coliform Permit Limits

Location	Description	Water Quality Permit Limitations
1	Shoreline area of human use, close to the discharge point	200 FC/100mL
2	Shoreline area just outside of the point where the outer edge of the mixing zone touches the shoreline	14 FC/100mL
3	Outside the edge of the mixing zone between Passage and Smith Islands	14 FC/100mL
4	Shore area of human use inside the mixing zone in Sitka Harbor near the boat ramp	200 FC/100mL
5	Outside edge of the mixing zone between Morne Island and the Sitka National Park	14 FC/100mL
6	Outside the edge of the mixing zone between Whale and Kayak Islands	14 FC/100mL
7	500 m southeast of the discharge (between Rockwell and Beardslee Islands)	200 FC/100mL

The water quality standards for FC were set at 14 FC/100 mL on a monthly average, and 43 FC/100 mL as a maximum at the edge of a mixing zone defined as a circle of radius 1,600 meters centered over the outfall diffuser. In addition the FC value is not to exceed 200 FC/100mL at the shoreline within the designated mixing zone.

Results from the 2010 Monitoring summary indicate that the facility has been in compliance with the permit requirements with the exception of one sample in August 2010 for Location 2 which exceeded the standard with a reported value of 35 FC/100mL. The results of three re-samples had a mean value of 3 FC/100mL. Results of the 2011 monitoring (July 2011) indicate compliance with the standards at all sampling locations.

2.8 Monitoring Programs

In addition to fixed water quality standards for some parameters, the permit also requires establishment and maintenance of several different monitoring programs.

2.9 Future Regulatory Implications

As previously noted, the WWTP for Sitka is permitted to treat wastewater to less than secondary standards under provisions of USEPA's 301(h) waiver program. The permit is issued at 5-year intervals based on information collected by the utility to show that no adverse impacts of solids accumulation, water quality standard violations, or negative biological impacts in the vicinity of the discharge has occurred. The permit also requires state concurrence.

There are currently no proposed federal regulations that would change these regulations, although the nature of the water quality standards are such that they are subject to revision as new data become available or techniques are improved. There are few cities and communities that still continue to receive discharge permits under the 301(h) program; many larger communities have not been re-issued permits after litigation or changes in local or regional viewpoints. The Municipality of Anchorage has taken a pro-active approach to their permit renewal since it has expired in 2004. Since the listing of the Beluga Whale as an endangered species in Cook Inlet in 2008, the utility has conducted extensive sampling and monitoring, biological assessment, detailed hydrodynamic evaluations, as well as resource agency coordination and public presentations of their findings. The USEPA is still reviewing their submittal information.

At the present time, there are several areas of wastewater treatment and disposal concern that the USEPA is pursuing, including:

- Wet-weather flows

- Nutrients
- Disinfection by-products (DBP)
- Pharmaceuticals and endocrine disruptors

A brief discussion of each is provided below.

2.9.1 Wet-Weather Flows

Wet weather discharges are point source discharges resulting from precipitation events, such as rainfall and snowmelt. They include stormwater runoff, combined sewer overflows, and wet weather sanitary sewer overflows.

Release of stormwater runoff can pose receiving water quality concerns. Stormwater accumulates pollutants such as oil and grease, chemicals, nutrients, metals, and bacteria as it travels across land. Combined sewer overflows and wet weather sanitary sewer overflows contain a mixture of raw sewage, industrial wastewater, and stormwater.

For POTWs, events of rainfall and/or snowmelt can pose excessive hydraulic loadings to the treatment plant. This in turn can result in plant flooding, loss of biomass for biological treatment systems, and release of poorly treated effluent. For coastal dischargers, wet weather events can result in beach closings, disruption to shellfish harvesting, and complaints of floating debris flushed from the treatment plant.

Several POTWs that are adversely impacted by wet weather flows have installed wet weather flow side stream treatment infrastructure. For these systems, during wet weather events, influent wastewater flows are split. Part of the influent is directed to the main treatment plant where it receives the same treatment provided for dry weather flow conditions. The remainder of the influent flow is directed to a side stream wet weather flow treatment system comprised of screening, sedimentation, or other physical processes that primarily address solids reduction. Effluent from the wet weather side stream treatment train is then blended with treated effluent from POTW's main treatment train prior to final discharge. The approach to wet weather treatment achieves compliance with the effluent quality requirements in the combined final discharge flow stream.

From a regulatory perspective, the practice of blending treated wet-weather flows has been in a long-term state of flux. In 1979, the USEPA promulgated the bypass regulation which prohibits intentional bypassing of wastewater treatment facilities [40 CFR 122.41(m)]. In November of 2003, the USEPA proposed a policy in support of wet weather treated flow blending which maintained effluent quality compliance with discharge permits. However lawsuits and Congressional action caused the agency to retract this policy in 2005. In 2009, the USEPA proposed draft guidance suggesting all wet weather flows must receive biological treatment prior to discharge, and directing utilities that wish to blend to first complete and secure agency concurrence for the practice using a "Utility Analysis." The analysis requires a utility to demonstrate why blending is necessary, and, if supported by the primacy agency, would provide the utility assurance that bypass enforcement action would not be taken.

To date, USEPA's draft guidance policy for blending is supported by the State of Alaska in its APDES permitting program. For Sitka, if future wet weather flows are expected to pose excessive hydraulic loading to the treatment facility, side stream wet weather treatment will need to demonstrate compliance with the USEPA and DEC policies for blending.

2.9.2 Nutrients

The control of the discharge of nutrients (nitrogen and phosphorus) from municipal WWTPs is part of the water quality goals of the CWA. Permits establish effluent limitations on the concentrations of nutrients based on designated water body use, state water quality standards, or other issues related to water uses. In its various forms, excessive nutrient concentrations can deplete DO in receiving waters, stimulate aquatic plant growth, exhibit toxicity toward aquatic life, present a public health hazard, and affect the suitability of wastewater for reuse purposes.

Ammonia in wastewater effluents is generally toxic to many marine organisms, especially salmonoid species, and therefore is currently addressed with permit limits for several Alaskan POTWs. Recent studies have reported that ammonium discharged to coastal waters can inhibit the uptake of nitrate by phytoplankton. Biological nitrification achieved with conventional secondary activated sludge treatment is used as means to reduce the impact of wastewater ammonia on receiving waters.

Wastewater effluents contribute to receiving water nitrogen and phosphorus concentrations that can cause eutrophication, the excessive growth of plant and/or algae blooms in lakes, streams, and rivers. In northern marine waters, eutrophication occurs naturally due to seasonal introduction of organics and nutrients into the water column that results in algal biomass production often manifest by green colored water. Whales migrating to Alaska have taken advantage of this phenomenon for millennia. But in some coastal areas, especially those with higher human population density and/or industrial activity, the nutrient loading from natural seasonal runoff is augmented with additional nutrient loadings that can degrade the receiving water.

USEPA's efforts to develop national nitrogen and phosphorous nutrient criteria were initiated in 1998 with its publication entitled "National Strategy for the Development of Regional Nutrient Criteria." In this document, the USEPA suggested as a starting point that receiving water nitrogen and phosphorous concentration data extracted from multiple databases available at the time could be used to set water quality criteria to protect against over-enrichment of receiving waters. However, as pointed out by several researchers, ambient receiving water nutrient concentrations alone were not effective as indicators for the water body's susceptibility to eutrophication. Factors other than concentrations of nitrogen and phosphorous in various forms can contribute to algal productivity including sunlight exposure, concentrations of dissolved organics, microbial predation, and water column hydrodynamic turbulence.

Given the foregoing, dynamic modeling of water bodies was developed as a tool to quantitatively predict susceptibility to eutrophication. While these models have shown promise, they require extensive effort and expense to collect input data that reflect the character and condition of the receiving water's environment.

What the USEPA is currently using as guidance for establishing nutrient water quality criteria for marine and estuary waters is referred to as ecoregional nutrient criteria. These criteria attempt to classify a marine or estuary receiving water according to multiple factors which when compiled result in recommended nutrient water quality criteria to be maintained in the receiving water.

For Alaska and other Region 10 states, most community POTWs discharging to marine waters are currently required to collect nutrient concentration data in the receiving water to be used in compiling a regional database. Data collected will be used to update the region's nutrient water quality criteria limits. As this data collection process takes time, there is no anticipated nutrient effluent concentration limit anticipated in the near term for Sitka.

2.9.3 Disinfection By-Products

DBPs are often halogenated organic compounds. Many have been determined to be carcinogenic in relatively low concentrations. They can be formed in both water and wastewater disinfection processes. To date, the USEPA has set maximum contaminant limits for nine halogenated organic compounds. However, epidemiological research has identified other DBPs that are yet to be regulated that occur in both treated water and wastewater.

DBP occurrence in treated wastewater was noted as a concern for some public water systems producing potable water from source waters receiving treated wastewater from upstream POTWs. DBPs in those public water systems were traced to the source waters and eventually to the upstream wastewater treatment facilities.

Like DBP formation in water treatment, wastewater treatment DBPs form when wastewater organics are exposed to oxidants such as halogens used for disinfection. By-products of disinfection can include residuals such as chloramines, inorganics such as chlorite, chlorate, bromate, and ammonia, oxidized organics such as aldehydes, carboxylic acids, and nitrosoamines, and halogenated organics such as TTHMs, HAA5s, haloacetonitriles, halokeyones, chloropheonols.

For most community utility systems, treated wastewater is not directly recycled, reused, or otherwise consumed for human use without first being diluted and/or degraded by natural processes in the receiving environment. And therefore setting regulatory limits for treated wastewater DBPs has not been a priority for the USEPA or States. However, it has come to light that some wastewater DBPs are carcinogenic or otherwise harmful at extremely low concentrations. One nitrosoamine, N-Nitrosodimethylamine or NDMA, has been shown to produce cancer in every species of laboratory animal tested. And its formation in wastewater treatment systems appears to be enhanced by the presence of excess un-oxidized nitrogen compounds such as normally found in conventional primary effluents.

While we found no research published to date on adverse impacts of treated wastewater DBPs on marine environments, preliminary indications are that nitrosoamine formation is likely occurring in chlorinated primary effluents, that it has wide-ranging adverse impacts on many animal species including humans, and could be the focus of regulatory action in the future as more data become available.

2.9.4 Pharmaceuticals and Endocrine Disruptors

The term "endocrine disrupters" generally means the synthetic chemicals and natural plant compounds that may affect the endocrine system—the communication system of glands, hormones, and cellular receptors that control the body's internal functions. Many of these disrupters have been associated with developmental, reproductive, and other health problems in wildlife and laboratory animals.

The use and disposal of pharmaceuticals entering sewer systems can lead to endocrine disrupters. This may be related to the growing number of antibiotics, painkillers, and antidepressants in the population; prescription drug sales increased by an annual rate of 11% between 2000 and 2005. The two largest sources of pharmaceuticals entering our wastewater treatment systems are from hospitals and homeowners. They enter the sanitary sewer primarily through excretion of partially metabolized pharmaceuticals by the human body, and the disposal of unused or expired medications down the drain or toilet. WWTPs are designed to remove conventional pollutants, such as suspended solids and biodegradable organic compounds, but they are not designed to remove low concentrations of synthetic pollutants, such as pharmaceuticals.

2.10 Implications for City and Borough of Sitka Wastewater Treatment

Based on the available information the existing WWTP may be expected continue to perform at the same levels as in the past with the understanding that the permit requirements and continued waiver provisions are at the discretion of the permitting agency. Other locations have had their 301(h) waivers discontinued when they have not performed to the permit requirements, have exceeded regulated parameters, or have had new permit water quality parameters added which required plant upgrades to achieve compliance. For purposes of this study, future implications of more stringent marine water quality standards (such as ammonia, DBPs, or toxics) are speculative given the performance record of the facility and the limited receiving water quality sampling results performed to date. It is possible that additional water quality monitoring may be required in the future with the results influencing the need for future capital expenditures. Of note is that secondary treatment is defined by regulation to mean removal of conventional pollutants (BOD and TSS) to 85% removal level as compared to 30% for primary. Additional treatment process would be required in addition to conventional secondary treatment to achieve treatment objectives other than the conventional pollutant removals.

3.0 CONDITION ASSESSMENT METHODOLOGY

In association with DOWL HKM, O'Neill Surveying and Engineering assisted with the condition assessment of the existing sewer main collection system. Drainage basins were evaluated and structural deficiencies and/or operation and maintenance (O&M) recommendations were identified using the following sources of information:

- Historical knowledge of the CBS wastewater collection system,
- CCTV field reports on file at the treatment plant, and
- Previously completed smoke test data provided by the CBS.

Drainage basins were initially divided into the following categories:

- **1 - Excellent:** Drainage basins that were constructed within the past 15 years and passed the CCTV inspection required for acceptance by CBS.
- **5 - Imminent of Collapse:** Areas initially received this grade that contained the oldest mains, known maintenance problems, areas that cannot be videoed due to fittings (45 or 22-1/2 deg.) in the mains, substandard main size, squashed pipe, misaligned joints, etc.
- **2 - Good, 3 - Fair, or 4 - Poor rating**: The remaining drainage basins were set aside for further evaluation.

The basins receiving an initial overall condition rating of Poor [4] and Imminent Collapse [5] ratings were assessed with special emphasis on:

1. Identify high-risk mains that could cause extensive service disruption to Sitkans or harm the environment.
2. Investigating sources of Infiltration and Inflow (I/I)

3.1 Review of Closed-Circuit Television Reports

Using the 10- to 20-year-old CCTV reports, individual reaches of pipe with the [4] and [5] basins were categorized by **structural** defects (cracked, fractured, deformed, collapsed, break, hole, etc.), or **operational** defects (roots, debris, infiltration, and service condition) requiring maintenance. The defects were typically not quantified or qualified. A sanitary sewer CCTV worksheet was created and used to document the structural and maintenance ratings of each main.

The following scoring criteria were used when evaluating the overall **structural** condition of each reach.

1 - Excellent: Main in "like new condition," No action predicted in the foreseeable future. Thirty plus years of service life, very little risk to Sitkans or the environment.

2 - Good: Main is in good condition but has some minor structural defects. No indication of an increased rate of deterioration. No action expected for 20 plus years.

3 - Fair: Main has moderate defects. Cracks in the main and at the joints, some infiltration, bellies present, depth up to double the average depth of liquid in the main, may have minor deformation. Rate of deterioration expected to be slightly advanced due to defects. Ten to twenty years of service life. Expect some action required in the next 15 years.

4 - Poor: Main is developing severe defects. Offset joints and breaks in the main, separation of joints, belly causing camera to go underwater, infiltration. Anticipate rate of deterioration to be accelerated. Five to ten years of service life. Expect some action in 7 years.

5 - Imminent of Collapse - Main is likely to collapse within the next 5 years. Main could cause collateral damage or harm to the environment. Reach requires immediate action.

The following scoring criteria were used when evaluating the overall O&M condition of each reach.

1 - None Required: Main in "like new condition." No maintenance required in the foreseeable future.

2 - Infrequent Maintenance: Main is in good condition but has some minor grease visible, or debris in the main. No indication that the defects are increasing or are affecting the flow characteristics of the main. Main required infrequent maintenance. No action predicted for 20 plus years.

3 - Occasional Maintenance: Main that has moderate O&M issues but the main is adequate. Bellies in the main, grease, and debris in the main. Main will function adequately, but requires occasional maintenance. Action predicted in the next 10 to 20 years. More maintenance will extend the service life.

4 - Annual or Bi-annual Maintenance: Main is developing severe defects. Offset joints, breaks in the main, and separation of joints cause rocks/sediment to enter the main. Bellies cause solids to settle out. Expect some action required in 5 to 10 years.

5 - Many times per Year: Main is in very poor condition. Maintenance required many times per year. Main may require weekly monitoring. Reach requires immediate attention. Action required in less than 5 years.

Based on the results of the CCTV report review, the following drainage basins and streets were further evaluated.

Table 6: Drainage Basins Requiring Further Evaluation

Drainage Basin	Street/Location	Condition Ratings	
		Structural	O&M
2	Anna Drive	3	4
3	Jamestown Drive	4	3
4	Wolff Drive	4	3
5	Lance Drive	4	4
6&6A	Sawmill Creek Road (SMCR) at Jarvis Street	3	4
6B	Price Street	3	4
9	SMCR, DeGroff Street at Park Street	5	4
11	Baranof Street	3	4
12	DeGroff Street, Hollywood Way, Highland, Baranof, and Merrill	5	4
18	Princess Way, Seward Street, and Barracks Street	4	3
19	Tlingit Way, Marine, and Seward Streets	4	3
20	Observatory, Seward, and American Streets	4	3
22	New Archangel Sewer Upgrade	NA	NA
23	Lake Street, Hirst, Kincaid, and Monastery Streets	4	5
31	Kimsham, Tilson, and Petersen Streets	5	5
42	Old Harbor Mountain Road	4	2
47	Viking Way and Valhalla Drive	4	2
13	Monastery Street (SMCR to Degroff Street)	3	2
24	Verstovia Street	2	2
25	Verstovia Street	2	2
30	Jeff Davis Street and Lincoln Street	2	2

Figure 8: Drainage Basins

3.2 Smoke Testing and Inflow and Infiltration Assessment

The CBS performed smoke testing of the wastewater collection system beginning in May of 1992 for a three-month period and again for two months starting in July of 2001, mostly in the core area of town. Other tests, confined to suspect areas of town, have been done in the intervening years. The drainage basins covered in the testing program included around 95% of the city sanitary sewer system. The drainage basins not smoke tested are:

- Blatchley Middle School (Basin 29).
- Peterson Street, Kimsham Street (Basin 31).
- Benchlands (Basin 38).
- Japonski Airport, Coast Guard Housing area, and Japonski Island Lift Station 6 (Basin 82).
- Alice Island, Charcoal Island, and Japonski Island Lift Station 7 (Basin 83).

In all of the drainage basins tested, 130 defects identified by the presence of smoke were deemed worthy of follow up. This included inspections of crawl spaces, basements, and in-house plumbing requiring property owner involvement. About 20% of the defects were found to not be contributing to the I/I problem. These included separated pipes above ground, uncapped plumbing, and lack of or dry P-traps in building floor drains. About 60% of the defects were confirmed to contribute to infiltration and inflow into the CBS wastewater system. These included separated or offset joints, sewer service lines, uncapped cleanouts, yard drains, and roof leader connections. Although these were not exclusively in the older part of town, well over 60% were, and matched closely with the sanitary sewers installed in the 1950s and 1960s, or earlier.

The remaining 20% of the problems were considered to be direct connections to the sanitary system or combined flows. No storm drain system exists in many of these drainage basins.

A sanitary sewer manhole rehabilitation program commenced in 1992 focused on reducing inflow into the wastewater system. Watertight manhole frames and lids are replacing the older pick-hole type. Watertight plugs are being installed at the top of the mainline cleanouts. The CBS standard drawings have been modified to reflect these changes. A pressure grouting system was used to abate all visible manhole leaks. Manhole inverts, lifting eye holes, manhole sections, and adjusting rings were re-grouted. Private and public roof drain connections were addressed and most have been removed from the wastewater collection system.

Recently in drainage basin [7], the Crescent Harbor lift station pump run times increased dramatically. Smoke testing of the drainage basin revealed a fairly large flow attributed to the Sitka Sound Science Center and promptly removed. During this inspection, 2 additional service lines were found to be leaking. The housing in this area of town was constructed in the 1940s and it was common then to use combined sewer outfalls directly into Sitka Sound. To date, only a few of these properties are served with an available storm drain system.

With the recent rehabilitation of Oja and Monastery Streets sewers, and the Brady Street sewer, it is probable that a great deal of infiltration was eliminated. Originally these segments of the collection system consisted of three-foot lengths of concrete bell and spigot pipe.

It is speculated that between 50% and 75% of the CBS collection system I/I is from sewer services to individual properties. As the CBS replaces older sections of main throughout the system, the sewer services are typically replaced to the right-of-way where they are connected to the existing service. However, the majority of the leaks/defects found by smoke testing are on private property and continue to contribute to I/I. Further discussion on remaining I/I issues and recommendations are presented in Section 4.2.

4.0 CONDITION ASSESSMENT RECOMMENDATIONS

The following section provides a summary of each deficient portion of the collection system, and recommendations for improvements.

4.1 Gravity and Sewer Force Main Recommendations

4.1.1 <u>Anna Drive Basin Sewer Main (Basin 2)</u>

This subdivision was constructed in the mid-1980s and lies at the base of a steep slope. A drainage basin ran through the subdivision but was relocated next to the roadway through the placement of fill. The 8-inch polyvinyl chloride (PVC) sewer main, which was constructed down the middle of the subdivision at a minimum slope, has settled creating bellies in the following sections of main:

- From the first manhole (MH) upstream of the intersection of Sawmill Creek Road (SMCR) and Anna Drive (MH 2-1) up to the manhole at the intersection with Anna Court (MH 2-2).
- From the manhole at the Anna Drive and Anna Court intersection (MH 2-2) to the eastern Anna Court manhole (MH 2-3).
- From the Eastern Anna Court manhole (MH 2-3) to the clean out at Anna Court turnaround.

Recommendations

1. Clean and videotape the entire basin within next 1 to 5 years. Include from MH 2-2 to the clean out and continuing further up the hill toward Riggs Road and Miller Drive. This segment of the collection system was never videoed.
2. Reassess the drainage basin.

4.1.2 Jamestown Drive Basin Sewer Main (Basin 3)

The Jamestown Drive Subdivision (Rosie Ashby Subdivision) was constructed in 1977. The wastewater originally collected into an 8-inch PVC main, passed through a septic tank along the SMCR side of 101 Jamestown Drive, crossed SMCR and discharged into Jamestown Bay. The Jamestown Bay Interceptor sewer project intercepted this outfall at the manhole at the intersection of Jamestown and SMCR (MH 1-15). The steep hillside the subdivision was constructed on in addition to the tremendous amount of stormwater flowing down the mountainside, made the subdivision prone to stormwater issues. The CBS revised the storm drainage system due to sloughing of the uphill slope (Jamestown Drive). It is believed that the sewer mains between the manholes in front of 107 Jamestown Drive (MH 3-2A) and 109 Jamestown Drive (MH 3-3), and MH 3-3 to the manhole in front of 115 Jamestown Drive (MH 3-4) were replaced with DIP as part of the storm/slope stabilization project. The reach between MH 3-4 and the cleanout at the end of Jamestown Drive still remains as the 1977 original sewer main and has developed bellies, point loads, and moderate leakage.

Recommendations

1. This reach should be replaced prior to the next paving project on Jamestown Drive.

4.1.3 Wolff Drive Sewer Main (Basin 4)

The Wolff Drive subdivision was built in phases starting in 1975 and was constructed using the overburden as fill in the roadway prism and for lot preparation. Subsequently several of the homes have developed foundation problems along with the sewer mains. The problematic mains are between the following manholes:

- From the manhole just upstream of the intersection of Wolf Drive and SMCR (MH 4-1) to the manhole where Wolf Drive tees (MH 4-4).
- From the manhole between 107 and 108 Wolf Drive (MH 4-3) to clean out at 116 Wolf Drive.
- From the manhole between 132 and 133 Wolf Drive (MH 4-6) to clean out at 124 Wolf Drive.

The above reaches have developed offset joints, deflection at joints, point loads causing dimples/pinnacles in the flow line, deformations/squashed mains, and infiltration at the service connections and pipe joints.

As the subdivision continues to age, the organic matter in the roadway prism will continue to decay exacerbating the problem. Cleaning of the line is not foreseen as a maintenance concern due to the steepness of the subdivision.

Recommendations

1. Clean and CCTV the entire subdivision.
2. Reassess the entire subdivision.
3. Reconstruct the sanitary sewer prior to the next asphalt-paving project or as indicated in the reassessment.

4.1.4 Lance Drive Sewer Main (Basin 5)

Lance Drive was constructed in three phases in 1978, 1981, and the final project to the top of the subdivision including the reach from the 216 Lance Drive manhole (MH 5-6) to the cleanout at the end of Lance Drive in the mid-1990s. The 612 feet of main between the 208 Lance Drive manhole (MH 5-5) and MH 5-6 is problematic due to the length of the main, age of 30 years, a 1-foot-long piece missing in the top of the main 179 feet downstream from MH 5-6, off-set joints and bellies up to 90% of the main depth causing stagnant water, and grease and sludge buildup in the main.

Recommendation

1. Clean and CCTV the drainage basin
2. Reassess the basin
3. Replace length of main determined from reassessment.
4. Add a new manhole between MH 5-5 and MH 5-6 and replace the lids on the existing two manholes (MH 5-5 and MH 5-6) with watertight lids.

4.1.5 Sawmill Creek Road at Jarvis Street Sewer Main (Basins 6 and 6A)

The following three 8-inch PVC mains were constructed in 1987 and have settled resulting in bellies:

- The main from the 1207 SMCR manhole (MH 6-1) to the manhole at the Jarvis/SMCR intersection (MH 6A-1).
- The main from MH 6A-1 to the first manhole up Jarvis Street (MH 6A-2).
- The main from MH 6-1 to the next manhole up SMCR (MH 6-2).

The following mains have maintenance ratings of poor [4].

- From the manhole at the Smith Street/SMCR intersection (MH 6-5) to the next manhole upstream on SMCR (MH 6-6),
- From MH 6-6 to the 1315 SMCR manhole (MH 6-7),

- From the manhole at the Eagle Way/SMCR intersection (MH 6-11) to the manhole at the Price Street/SMCR (MH 6-12)

These two basins have high groundwater due to the Park Service discharge of a storm drain onto their property along the southerly side of SMCR. The existing soils are questionable in regards to their support capabilities but must have been acceptable when the main was first installed out of the roadway prism. In the early 1990s, the State of Alaska Department of Transportation and Public Facilities (DOT&PF) widened Jarvis Street and provided a turn lane, curb and gutter and repaving for access to the post office. Through this project the sanitary sewer main fell within the road prism. The settling of the sewer main may have resulted from compaction during road construction.

Recommendations

1. Biannual cleaning with reassessment after the first cleaning.
2. CCTV video the reach from the upstream Eagle Way manhole (MH 6-8) through the Eagle Way/SMCR intersection manhole (MH 6-11) and assess this stretch of main.
3. Do nothing until the next repaving project if additional defects are not developing.
4. Replace the main between MH 6-1 to MH 6A-2 and MH 6-5 to MH 6-12.

4.1.6 Price Street Sewer Main (Basin 6B)

Price Street was developed in several phases. The main in the initial phase was built in 1986, and now has a belly between the manhole upstream of the Price Street/SMCR intersection (MH 6B-0) and the manhole at the intersection of Burkhart and Price (MH 6B-1). The 8-inch PVC main has separated 7 feet downstream of MH 6B-1 toward MH 6B-0, and deflects to the right resulting in the main filling with groundwater. Sludge buildup is noted in the pool of water, the main then turns slightly to the left before it rises and enters MH 6B-0. This area is not in muskeg and should have a sound trench base. Do not expect any further settlement of the main. The separation is troublesome.

Recommendations

1. Bi-annual cleaning and reassessment after the initial cleaning.

2. Replace the main from MH 6B-0 to MH 6B-1, prior to repaving depending on the reassessment.

4.1.7 Sawmill Creek Road, Degroff Street at Park Street Sewer Mains (Basin 9)

The easterly half of the DeGroff Street sewer main (east of Baranof) from the cleanout to the 621 Degroff Street manhole (MH 9-9) has broken joints and leaks. There are holes, bellies, grease and slime growth, and three areas have been patched in the 8-inch transite main. This area has a high groundwater table and the ground consists of muskeg or soft soils. The sanitary sewer main from the Park Street extension manhole (MH 9-10) enters the reach between MH 9-9 and the manhole at the Park Street/Degroff Street intersection (MH 9-11) approximately 18 feet upstream from MH 9-11 and there is no manhole at the junction. The Park Street extension was reconstructed in conjunction with the Biorka and Park Street improvements in 2006.

The existing 8-inch cast iron sewer main constructed in 1966 beneath SMCR between the following manholes is in Fair [3] condition:

- From the manhole at 606 SMCR (MH 9-7) to the manhole at 620 SMCR (MH 9-8).
- From the manhole at the Park Street/Degroff Street intersection (MH 9-11) to the manhole at 711 SMCR (MH 9-12) and up the manhole at the intersection of Jeff Davis and SMCR.

Recommendations

1. Replace the entire 46 year old main (MH 9-9 to CO) and add one additional manhole to meet the CBS design criteria of 150 feet maximum length of main leading to an end of line clean out. This area is in the older part of town and would recommend replacement of the sewer services to within 5 feet of the structures. The homeowners would be required to connect the new service to the building waste line. Consider replacement of the sewer main from MH 9-9 to MH 9-11 as part of this project.

2. The sanitary sewer beneath SMCR (Fair [3] condition) should be reassessed prior to the next scheduled paving project for SMCR.

3. The collection system on the easterly end of Etolin Street, from the manhole just east of the intersection of Etolin and Park Street to the cleanout at 201 Jeff Davis Street (MHs 9-2, 9-3, 9-3A and cleanout) has never been CCTV inspected. It is recommended that this section of main is cleaned, video inspected and assessed.

4.1.8 Baranoff Street Sewer Main (Basin 11)

The main between the manhole at the intersection of SMCR and Baranof (MH 11-3) to the manhole at the intersection of Baranof and Bjorka (MH 11-4) and between MH 11-4 and the cleanout at 406 Baranof Street has developed bellies and the pipe is over half full of wastewater and sludge in places.

Recommendations

1. Replace the sewer main prior to the next paving schedule.

4.1.9 Degroff Street, Hollywood Way, Highland, Baranof, and Merrill Sewer Mains (Basin 12)

The entire Drainage Basin 12 received a rating of Poor [4] in both the Structural and Maintenance aspects with the exception of the first and last reaches. The first reach from the manhole at the Degroff/Lake Street intersection (MH 13-4) to the manhole at the intersection of Degroff/Hollywood Way (MH 12-1) has received a rating of Imminent of Collapse [5] in the structural category due to the following commentary:

Starting at MH 12-1 and working towards MH 13-4 (which contains standing water):

- 2' out of the manhole, "out of water";
- 6' from manhole, "slope drops, joint leaky";
- 18' - "getting deeper";
- 22' - "pipe changes direction, drops left, waterfall";
- 34' - "changes to PVC joints leaky";
- 35' - "pipe flattens";
- 38' - "camera under water";
- 47' - "camera out of water and back to transite? or DIP?"; and
- 53' - "pipe drops considerable."

The last manhole on Merrill Street (MH 12-5) to the end-of-line cleanout on Merrill Street received a Fair [3] rating in both categories.

The ground in this area is a muskeg/soft soil and there is a high groundwater table due to the proximity to Swan Lake and Wrinkleneck Creek.

The sewer mains in this basin were constructed in 1967 with 8-inch transite main. The main has bellies, deflected and separated joints, sludge/sediment accumulation, leaky services, etc., similar to the reach described above. The main on Highland Street is in similar condition. The Hollywood Way sewer was constructed with 8-inch PVC as part of the Sitka Low Cost Housing Community Housing Project. The condition of the Hollywood Way main is similar to the remainder of the drainage basin.

Recommendations

1. Replace Drainage Basin 12.

2. Lower the main on Lake Street between the manhole in front of 400 Lake Street (MH 13-2) to the manhole in front of 408 Lake Street (MH 13-3), and MH 13-3 to the manhole at the intersection of Degroff/Lake Street (MH 13-4). This will accommodate lowering the main through Drainage Basin 12. Lowering the main through Drainage Basin 12 will increase the slope in the mains, increase the fall through the manholes, help to match the crown of the DeGroff Street collector and the Lake Street trunk line, etc.

3. Replace the sewer services to within 5 feet of the structures. This area is an older part of town, with homes built in the 1950s. Smoke test data indicates a high percentage of these services leak. The homeowner could be responsible for connecting the structure's existing service to the newly installed services.

4.1.10 Princess Way, Seward Street and Barracks Street Sewer Main (Basin 18)

Princess Way is a platted, paved, and maintained as a CBS alley/one-lane street. Princess Way has around 400 feet of existing 4-inch sanitary sewer main that serves three houses with no cleanout at the end. The date the sewer line was constructed is unknown, but it is thought to date to the late 1930s despite minimal problems.

The Princess Way sewer main connects to the Seward Street main at the manhole at the intersection of Seward Street and Princess Way (MH 18-3), which then flows to the manhole at the intersection of Seward and Barracks (MH 18-2). It is recommended that the feasibility be studied of redirecting the Seward Street flow (currently goes from Barracks to Lincoln Street) from MH 18-2 to the manhole at the intersection of Marine and Seward (MH 19-3). Barracks received a Poor [4] Structural rating due to the 8-inch diameter, 3-foot lengths of concrete pipe. Only the top 50 feet of Barracks Street has been videoed. A portion of the Pioneer Home roof leaders are reported to enter a manhole inside the southeast corner of the building which then enters the sanitary sewer system. A second manhole located outside near the southeast corner of the building by Barracks Street is also thought to contain stormwater that enters the sanitary sewer. This drainage basin, along with the lower portion of Drainage Basin 19 requires additional study prior to reconstruction. The concrete visible on the surface of Barracks Street is actually the cover for the Pioneers Home underground heating oil tanks. The portion of the main videoed was in Poor [4] condition, mainly due to the age and material of the pipe. Maintenance appears not to be a problem.

Recommendations

1. Replace all of Princess Way, Seward, and Barracks Streets sanitary sewer.

2. Remove the roof leader ties to the sanitary sewer and reconnect to a new storm extended up Barracks from Lincoln Street.

4.1.11 Tlingit Way, Marine, and Seward Streets Sewer Main (Basin 19)

The existing Tlingit Way sewer main is a 6-inch concrete and orangeburg main. The Seward Street main from the manhole at the intersection of Marine and Seward (MH 19-3) to the manhole at 204 Kaagwaantaan Street (MH 19-1) is a 6-inch concrete main with numerous holes. Both sewer mains are undersized and were in rated as Poor [4] or Imminent of Collapse [5] in the CCTV reports.

Recommendations

1. Replace the Tlingit and Seward Street sewer mains.

4.1.12 Observatory, Seward, and American Street Sewer Main (Basin 20)

The existing 6-inch PVC main on American Street has two 45 degree bends just downstream of the manhole at the intersection of American/Seward Street (MH 20-1) making it impassable for the CBS cleaning equipment and for the CCTV camera. The 6-inch main is undersized per CBS and DEC standards. The main is intact and has required little maintenance due to the steep slope of the road. It is assumed the slope of the pipe flattens toward Lincoln Street following the road grade. There are no intermediate manholes in the over 300-foot reach.

All of the joints leak in the reach of 3-foot concrete bell and spigot main from MH 20-1 to manhole at the intersection of Observatory/Seward Street (MH 20-2). Maintenance on the Seward Street main is not an issue. The over 450-foot length of 6-inch concrete bell and spigot sewer main on Observatory Street, constructed around the 1940s, is rated as Poor [4], but does not have a high occurrence of complaints. A cleanout was installed in the main prior to the main reducing to 4-inch for approximately the last 100 feet. This area of town sits on a hillside with an existing storm drain system. The groundwater table is low. The soils are buildable quality, with no muskeg. There are very few bellies and minimal debris as indicated by the CCTV field reports.

Recommendations

1. Reconstruct the entire length of Observatory Street including Rigling Way and Seward Street from Observatory to American.

2. Add manholes on the Observatory Street main to meet CBS standards. I/I appears to be less of an issue in this area so replacement of the sewer services to within 5 feet of the house may not be warranted.

3. The American reach of sewer main is functioning well and has as a projected service life of over 20 years, but does not meet CBS standards. If maintenance on American becomes an issue add manholes to meet CBS standards.

4.1.13 Lake Street, Hirst, Kincaid and Monastery Streets Sewer Mains (Basin 23)

Sewer Mains in the entire low-lying area of Blocks 1 through 6 of the Sirstad Addition exhibit the same characteristics. All of the 12- and 14-inch ductile iron main in Lake Street, between the manhole at the intersection of Hirst/Lake Street (MH 23-1) and the manhole at the intersection of First/Lake Street (MH 23-8), lays half full of sewage (bellies) collecting sediment. The manholes appear to be staying in their original positions or are at least higher than the mains between them. In addition to the scum, rocks have been noted in most of the sewer main reaches. The 8-inch transite main on Hirst Street between MH 23-1 and the manhole at the intersection of Hirst/Monastery Street (MH 23-2) had maintenance issues in the past (sewer backed up into the basement at 502 Hirst Street twice) and has numerous bellies similar to those in Lake Street and the joints appeared to be offset or separated and leaking. The reach to the east of MH 23-2 on Hirst Street is in similar condition. The main north from MH 23-2 has no CCTV record. The Kincaid Street sewer main from MH 23-5 to MH 23-4 is newer PVC main, constructed in 1971, but also has numerous bellies with grease and sludge build-up. The Monastery Street sewage system upstream of the manhole at the intersection of Kinkead/Monastery Street (MH 23-4) has numerous leaky service taps and several bellies.

Recommendations

1. It is recommended that the entire lower portion of Drainage Basin 23 on Lake Street be replaced in phases.

2. Lower the main on Lake Street in Drainage Basin 13 to increase the slope of the Lake Street main line and to increase the slope of the existing services. The section of main between the manhole at the roundabout (MH 13-1) and the first manhole down Lake Street (MH 13-2) has already been lowered as part of the round-about project. The Hirst Street sewer main can also be lowered to further guard against the backup of sewage into the basement apartment at 502 Hirst Street, the lowest client in that drainage basin. The relative floor elevation of the basement should be obtained to establish the relief between there and the invert of the service at the main. The crowns of the smaller collectors to the larger trunk lines should match. Wrinkleneck Creek and the Swan Lake drainage were listed as a Tier I State of Alaska Impaired Water Body. As part of the CBS attempts to remove Swan Lake from the list a requirement is included to confirm sanitary sewer connections.

3. Replace services to within 5 feet of the structures. It is further recommended that the homeowner extend the new main under the residence and connect directly into the building waste line. All of this work should be inspected. There are very few basements in this area of Sitka (or in Sitka in general) mainly due to the amount of rain per year (90 inches), high groundwater table (in this case the influence of Swan Lake and Wrinkleneck Creek, and soil conditions - muskeg in this area. It is strongly suggested that this drainage rehabilitation take precedence over other lower ranking mains.

4.1.14 Kimsham, Tilson, and Petersen Street Sewer Main (Basin 31)

The following stretches of pipe have bellies, rock infiltration, offset joints, deflections, and sludge build up:

- The entire stretch of main on Kimsham Street.
- The main from the manhole at the intersection of Edgecumbe Drive and Peterson Street (MH 31-3) to the manhole at the intersection of Peterson/Kimsham Street (MH 31-5).
- The main from the manhole at the intersection of Tilson/Kimsham Street (MH 31-9) to the manhole at 306 Tilson Street (MH 31-10).

The structural rating on these sections of pipe was Poor [4] or Imminent Failure [5] and the maintenance rating was Imminent Failure [5]. It is recommended that the entire drainage basin is cleaned and a CCTV inspection is performed to determine the condition of the entire basin.

Recommendations

1. CCTV and reassess all of Drainage Basin 31.
2. Replace the entire Kimsham Street main, the Peterson Street main from MH 31-3 to MH 31-5, and the Tilson Street main from MH 31-9 to MH 31-10.

4.1.15 Old Harbor Mountain Road Sewer Main (Basin 42)

The primary access to Harbor Mountain used to be through the Sea and Ski Trailer court on Gary's Street. At that time the roadway was maintained by the State of Alaska. During their ownership an 8-inch PVC sewer main was extended from the manhole just to the west of the Shuler Drive and Halibut Point Road intersection up through the Sea and Ski trailer court (sometime after 1984). Since then, the ownership of the roadway corridor was transferred to the City and Borough of Sitka. Property owners along this portion of roadway requested connection to the 8-inch PVC main and their requests were approved. The CBS filmed the main by cutting the top out of the pipe as no cleanouts existed. Point loads (indicated by dimples at the flow-line), deflection at joints, "zig-zagging" and two 45-degree elbows were found in the reach. Despite these deficiencies, maintenance has not been a problem due to the steepness of the road.

Recommendations

1. Replace the sewer main prior to roadway improvements.

4.1.16 Viking Way and Valhalla Drive Sewer Main (Basin 47)

This subdivision was constructed prior to the Cove Interceptor Sewer project along Halibut Point Road. The 8-inch PVC sewer main and manholes were originally constructed and maintained as a private system with an ocean outfall. This drainage was intercepted by the Cove Interceptor project in the mid-1980s. In the late 1990s the subdivision property requested ownership and maintenance of the sewer be taken over by CBS. At that time the manholes were upgraded by the addition of channels, I/I into the manholes was eliminated, and watertight frames and lids were installed. The main from the manhole at the intersection of Valhalla Drive and Viking Way (MH 47-2) to the manhole at 101 Viking Way (MH 47-1) contains offset and deformed joints, deflections at joints - "drop offs" and point loads - "bad bumps." Maintenance has not been an issue due to the steep roadway slopes (17% plus).

Recommendations

1. Replace the main between MH 47-1 and MH 47-2 prior to upgrades to the road.

2. CCTV and reassess the reach from the manhole at the intersection of Viking Way and Halibut Point Road (MH 47-0) to MH 47-1. This reach of main is not at a constant slope and is assumed to follow the roadway vertical curve.

4.1.17 Monastery Street Sewer Main (Sawmill Creek Road to DeGroff Street) (Basin 13)

The 400+ foot stretch of 45 year old 8-inch diameter transite main is rated in Fair [3] condition with little maintenance needs. There is one protruding leaking service, three other leaking services at the main, and one "small belly or flat line" noted. None of the joints were mentioned to be problematic. Two of the services were reported to be "running." There are two cleanouts, one in the middle of the 400-foot run and the other at the end of the line.

Recommendations

1. Replace the sanitary sewer main when a new water main is constructed or this stretch or road is repaved.

2. Addition of a storm sewer is also recommended. There is no storm sewer in this leg of Monastery.

4.1.18 Verstovia Street (Basin 24)

The 8-inch PVC sewer main at the easterly end of Verstovia Street from A Street to Charles received a Good [2] rating. The main from the manhole at the intersection of A Street and Verstovia Street (MH 24-6) to the cleanout west is approximately 95 feet, contained wyes and noted only one defect as "bumpy" at 77 feet. The main approximately 315 feet to the east of MH 24-6 indicated one joint deformed. No I/I issues were noted. No maintenance issues were noted for this section of Verstovia main.

Recommendations

1. The cleanouts are PVC and should be replaced with DIP to meet the City Standards.

2. A second manhole should be installed 150 feet from the east cleanout to meet City Standards.

3. Watertight manhole frame and lids should be added.

4.1.19 Verstovia Street (Basin 25)

The main from the manhole at the intersection of Verstovia Street and Sirstad Street (MH 25-4) to the cleanout upstream to the east at 427 Verstovia Street is 334 feet, and from MH 25-4 to the cleanout at 400 Verstovia Street is 286 feet. Both sections of main are in Good [2] condition.

Recommendations

1. Recommend replacement of cleanouts with DIP cleanouts.
2. Place an additional manhole to the west and east of MH 25-4.

3. Add watertight frames and lids to meet CBS standards.

4.1.20 Jeff Davis Street and Lincoln Street (Jeff Davis To Lake Street (Basin 10)

Both Jeff Davis and Lincoln Streets were assessed in Good [2] condition. Both Finn Alley and Barlo have DIP stubs across Lincoln to the back of the sidewalk for future upgrades.

Recommendations

1. No additional upgrades are necessary at this time.

4.1.21 Halibut Point Road Sewer Main

Following the review of the record drawings for the 1985 Halibut Point Road Interceptor (City Limits to Granite Creek), it was determined that numerous services and stub-outs were undersized for the number of residences they were serving. Numerous properties along Halibut Point Road did not receive a service during the 1985 project. It is recommended that the undersized services be upgraded and all lots provided a sewer service prior to the next paving schedule. Halibut Point Road's ductile iron main constructed primarily in 1986 and 1999 is in good condition and there are no documented locations needing replacement or repair.

Recommendations

1. Assess the Halibut Point Road sewer main, manholes, and services prior to the DOT&PF paving project.

2. The reconstruction and addition of services based on the assessment of Halibut Point Road is recommended in coordination with the repaving project.

4.2 Inflow and Infiltration Improvements

Recommendations for reducing infiltration on private property include:

- For new construction where rehabilitating older drainage basins, the following options should be considered by CBS:

  1. Replace the sewer service all the way to the house waste line under the house.

2. Replace the sewer services to within 5' of the building structure and require the property owner to connect with new pipe to the house waste line under the house.

3. Replace the sewer service to the property line and require the property owner to replace the remainder of the service to the building waste line under the house.

- For areas not scheduled for main rehabilitation, the following options should be considered by CBS:
  1. Establish penalty for noncompliance and reasonable time frame to comply.
  2. Inspect property for:
     - Existing sump pumps connected to sanitary sewer
     - Footing drains
     - Roof drains
     - Area drains
     - Defects identified by smoke testing
     - Defects identified by video inspection
  3. Require building permit and final inspection

4.3 Lift Stations

In association with DOWL HKM, Carson Dorn, Inc., assisted with the condition assessment of the CBS lift stations. Boreal Controls, Inc., assisted specifically with the assessment of the lift station electrical and control systems. A site visit to each of the lift stations was completed with Dan Cox, from the CBS Public Works Department. Proposed electrical and SCADA improvement were based on information obtained from Rob Dahlquist of CBS. Inventory forms were created for information available such as year constructed, wet well dimensions, motor horsepower, and pump performance (see Appendix A). The site visits and follow-up conversations with CBS personnel resulted in the following recommended capital improvements.

4.3.1 <u>Channel Lift Station</u>

This is an old lift station that uses pneumatic injectors and compressors for pumping wastewater. It is inefficient and is requiring significantly more maintenance in order to remain operational. There is also no vehicular access to the lift station to allow for maintenance. It is recommended that the lift station be replaced with a new lower maintenance submersible pump lift station and that access be improved.

4.3.2 Brady Lift Station

The plug valve has failed in the dry pit and there is no way to isolate the pump for maintenance. The plug valve needs to be replaced. Additionally, the pumps can only operate at two speeds meaning there is no variable frequency drive (VFD) to allow for a smooth increase in pump flows as wastewater flows increase. As a result, the pump jumps from high flow to low flow. Recommend a new plug valve and three VFDs, one for each motor, and new pumps. At a minimum, new impellers will be required to prevent clogging that has occurred at other lift stations where similar improvements were made.

4.3.3 Old Thomsen Harbor Lift Station

The lift station currently uses a calcium hypochlorite tablet feeder that is sufficient, but slightly more costly. In the future, a brine electrolysis hypochlorite generator could be added at this station to allow hypochlorite to be added to the wastewater flow as it is pumped across Sitka Channel to control odors at the WWTP.

4.3.4 Lake Street Lift Station

The lift station and wet well are in a location that is difficult to access and the pumps, piping, and control panel are in very poor shape. The lift station needs to be replaced. Recommend replacement of the lift station.

4.3.5 Jamestown Lift Station

Both pumps are pumping significantly less than the original design flow rate and have been in operation for nearly 30 years and they are beginning to wear out. The pumps should be replaced with similar pumps with consideration being given to increasing the pumping capacity to handle increased wastewater flows originating from the Sawmill Cove area.

4.3.6 East Jamestown Lift Station

This lift station is currently serving only a single house and is an old outdated pneumatic injector type pump. The pump station should be replaced with a small residential grinder type pump such as a Barnes or EOne.

4.3.7 Crescent Lift Station

This lift station is reaching the end of its useful life and CBS staff have made modifications to keep it functioning as long as possible. Recommend full replacement of the lift station and controls.

4.3.8 Lift Station Electrical and Supervisory Control and Data Acquisition Assessment Improvements

- Channel Lift Station - Electrical and controls are 28 years old and need to be replaced. Level controller is a bubbler system and needs to be replaced. Station is not part of SCADA system. Recommend replacing electrical and control systems. Install new pressure transducer for level controls. Add station to SCADA system.
- Lake Street Lift Station - Electrical and controls are in very poor condition and need to be replaced. Service is 208V Wild Leg Delta. Level control is by float switch and needs to be replaced. Station is not part of SCADA system. Recommend replacing electrical and control systems. Upgrade electrical service to 480V. Install new pressure transducer for level controls and add station to SCADA system.
- East Jamestown Lift Station - Electrical and controls are 29 years old and need to be replaced. Station is not part of SCADA system. Recommend installing new packaged lift station and add radio alarm to SCADA system.
- Old Sitka Rocks Lift Station - Electrical and controls are 27 years old and need to be replaced. Level controller is a bubbler system and needs to be replaced. Station is not part of SCADA system. Recommend replacing electrical and control systems. Install new pressure transducer for level controls and add station to SCADA system.
- Granite Creek Lift Station - Electrical and controls are 27 years old and need to be replaced. Level controller is a bubbler system and needs to be replaced. Station is not

part of SCADA system. Recommend replacing electrical and control systems, installing new pressure transducer for level controls, and adding station to SCADA system.

- Centennial Lift Station - Electrical and controls are approximately 30 years old and need to be replaced. Level control is by floats and needs to be replaced. Station is not part of SCADA system. Recommend replacing electrical and control systems, installing new pressure transducer for level controls, and adding station to SCADA system.
- Castle Hill Lift Station - Electrical and controls are approximately 30 years old and need to be replaced. Level control is by floats and needs to be replaced. Station in not part of SCADA system. Recommend replacing electrical and control systems, install new pressure transducer for level controls, and add station to SCADA system.
- Monastery Street Lift Station - Electrical and controls are 26 years old, in very poor condition, and need to be replaced. Level control is by float switches and needs to be replaced. Station is not part of SCADA system. Recommend replacing electrical and control systems, upgrade electrical service to 480V, install new pressure transducer for level controls, and add station to SCADA system.
- BIHA Lift Station - Electrical and controls are approximately 20 years old and need to be replaced. Level control is by floats and needs to be replaced. Station is not part of SCADA system. Recommend replacing electrical and control systems, installing new pressure transducer for level controls, and adding station to SCADA system.
- Japonski Island Lift Station 5 - Electrical and controls are in very poor condition, and need to be replaced. Level control is by float switches and needs to be replaced. Station is not part of SCADA system. Recommend replacing electrical and control systems, upgrade electrical service, install new pressure transducer for level controls, and add station to SCADA system.

No capital improvements were recommended for the following lift stations:

- Cove Lift Station
- Halibut Point Lift Station
- Sandy Beach Lift Station
- New Thomsen Harbor Lift Station
- Blatchley Lift Station
- Wachusetts Lift Station
- Landfill Lift Station
- Eagle Way Lift Station
- Blueberry Lane Lift Station
- Whale Park Lift Station
- Sawmill Cove Lift Station
- Rands Drive Lift Station
- New BIHA Indian River Lift Station
- BIHA EOne Indian River Lift Station
- Lincoln Street Lift Station
- Lightering Lift Station
- Sealing Cove Lift Station
- Japonski Island 1, 2, 3, 4, 6, 7, and 8 Lift Stations

4.4 Lift Station Capacity

The community of Sitka experienced a significant storm event on August 19-21, 2011, during which time Sitka received a total of 5.19 inches of rain over the 3-day period. The daily rainfall total was 1.41 inches, 2.89 inches, and 0.89 inches on August, 19, 20, and 21, respectively. These rainfall totals were compared against historic precipitation records to determine the approximate exceedance probability (recurrence interval) associated with the storm to provide a level of perspective on the magnitude of the storm event. Since its publication in 1963, the United States Department of Commerce Weather Bureau's *Technical Paper No. 47: Probable Maximum Precipitation and Rainfall-Frequency Data for Alaska for Areas to 400 Square Miles, Durations to 24 Hours, and Return Periods from 1 to 100 Years* (TP-47) has been the source for short-term precipitation data used for defining design storm precipitation levels for hydrologic analyses. TP-47 includes a series of isopluvial maps (rainfall contours) used to show regional precipitation patterns and allow for extrapolating precipitation data from weather stations to other areas within the project area. From TP-47, the 24-hour rainfall values for Sitka are approximately 5 inches for a 1-year storm, 8 inches for a 25-year storm, 9 inches for a 50-year storm, and 10 inches for a 100-year storm. By this standard, the recorded 2011 rain event would be considered on par with a 1-year storm event.

Reviewing extensive rainfall data for Sitka suggests the August 2011 storm was a more substantial and less common rain event. The Western Regional Climate Center (WRCC) and analyzed and published rainfall data collected at the Sitka Rocky Gutierrez Airport is available for a 57-year period ranging from 1949 to 2006. Over this time period, the largest 24-hour rain event recorded is 8.50 inches, measured on September 1, 1967. The largest 24-hour rain event recorded during the month of August is 4.36 inches, measured August 11, 1961. Over the 57 years on record, there have only been three recorded events that exceeded 5 inches of rainfall within a 24-hour period. This suggests that a 5-inch storm event has a recurrence interval of approximately 20 years, rather than 1 year as indicated by TP-47. The discrepancy between TP-47 and the WRCC data is likely due to the fact that the isopluvial maps in TP-47 cannot account for extremely localized orthographic effects and rain shadow conditions. Additionally, at the time TP-47 was published, substantially less recorded rainfall data was available for analysis in Alaska. Given these conditions, the WRCC data is considered more applicable for estimating the relative magnitude of the 2011 storm even in Sitka.

Comparing the 24-hour rainfall of 2.89 inches (August 21, 2011) against WRCC data indicates the exceedance probability is approximately 2 to 4%, correlating to a 25- to 50-year storm event. The 48-hour rainfall of 4.30 inches (August 19-20, 2011) has an exceedance probability of approximately 5%, correlating to a 20-year storm event. The 72-hour rainfall of 5.19 inches (August 19-21, 2011) has an exceedance probability of approximately 4 to 5%, correlating to a 20- to 25-year storm event. Therefore, it is reasonable to conclude that the August 19-21, 2011 storm event was equivalent to a 20- to 25-year storm event, having a 4 to 5% probability of occurring in any given year.

Considering infiltration and inflow should be highest during large storm events, run times for the lift stations during this time should be representative of the high end. The following table shows the lift stations that exceeded 7 hours of pumping per day during this period.

Table 7: Lift Station Run Times During August 19-21 Rain Storm Event

Lift Station Name	Pump Run Times (hours/day)
Channel	Pump 1 - 7.5 Pump 2 - 7.1
Brady	Pump 1 - 7.9 Pump 2 - 6.6 Pump 3 - 7.6
Thomsen	Pump 1 - 24 Pump 2 - 7.3 Pump 3 - 7.6
Lincoln Street	Pump 1 - 2.5* Pump 2 - 6.7 Pump 3 - 9.4
BIHA	Pump 1 - 11.2 Pump 2 - 7.9
Landfill	Pump 1 - 13.1 Pump 2 - 4.2

*Pump was pulled during August 19-21 rain storm event

4.5 Future Developments

Three future developments were evaluated as part of the condition. Both developments will have an effect on the future loading of the wastewater system.

The loading calculations for future developments were based on an average of 2.1 people per residency and an average of 150 gallons of wastewater produced per day per capita. Therefore for projection purposes, 315 gallons of wastewater production per day per residential lot was used to predict the increased loading on the wastewater collection system. Five hundred gallons of wastewater production per day per commercial lot was used to predict the increased loading on the wastewater collection system due to commercial development. An average of 15 gallons of wastewater produced per day per capita was estimated for schools and training facilities.

Whitcomb Heights Subdivision

Initial roadway development and the platting of the Whitcomb Heights subdivision have occurred in preparation for the future development. One hundred fifty-two residential housing parcels have been platted as part of the Whitcomb Heights Subdivision development in Drainage Basin 38. The Whitcomb Heights development is approximately 1 mile long with Kramer Avenue to the South and Harbor Mountain Bypass Road to the North as the primary access points. The Whitcomb Heights developments are projected to increase the loading on the CBS wastewater collection system by approximately 50,000 gallons per day once developed.

Baranof Island Housing Authority (BIHA)

Fourteen (14) lots have been platted on the southern edge of Indian River Road in Drainage Basin 10A. A facility for the State Troopers Training Academy is also in planning stage along Indian River Road. The Indian River Road developments are projected to increase the loading on the Sitka wastewater collection system by approximately 5,000 gallons per day once developed.

Bus Driver Training Facility (Sitka Tribe of Alaska)

The location of the bus driver training facility is on Charcoal Drive between Charcoal Island and Alice Island. A maximum occupancy of 20 people was estimated to determine the peak flow from the training facility. From the Minimum Standards for Public Water Systems, 15 gallons per capita per day was used to determine the peak flows resulting from students at the bus training facility. During peak flows the bus driver training facility is projected to increase the loading on the CBS wastewater collection system by 300 gallons per day once developed.

Future developments within City and Borough limits will have impacts to the existing lift stations summarized in Table 8.

Swimming Pool

State funding for construction of a new swimming pool at Mount Edgecumbe High School is pending. To accommodate draining the pool, new pumps would likely need to be evaluated and potentially replaced at Japonski Island Lift Station 5, or complete replacement of Japonski Lift Station 5 depending on pool location. Design of the pool will likely require distributing drainage of the 670,000-gallon pool over several days due to limitations of the collection system, lift station(s), and possibly even the WWTP.

Table 8: Future Developments Impacts to Lift Stations

Future Development	Impacted Lift Stations	Estimated Additional Flow (gpd)
Whitcomb Heights Subdivision	Sandy Beach, Brady, Thomsen	50,000
BIHA Developments	BIHA, Lincoln Street, Thomsen	5,000
Bus Driver Training Facility	Japonski 7	300
Swimming Pool	Japonski 5	10,000-20,000

The overall future development impacts to the existing lift station downstream of the developments will be minimal on a percentage basis, increasing flows ranging from 1 to 5%. Table 9 estimates the flow for each of the lift stations during the rain event listed in Section 4.4 and the percent increase resulting from future development.

Table 9: Modeled Wastewater Flow to Pre-Stressed Lift Stations

Lift Station Name	Modeled Existing Wastewater Flow	Percentage Increase From Future Developments
Channel	Not impacted by future developments	N/A
Brady	1.0 mgd	4.7%
Thomsen	2.1 mgd	2.5%
Lincoln Street	1.0 mgd	0.5%
BIHA	0.17 GPD	2.9%
Landfill	Not impacted by future developments	N/A

4.6 Wastewater Treatment Recommendations

In association with DOWL HKM, G.V. Jones & Associates assisted with the condition assessment of the CBS WWTP.

4.6.1 Treated Wastewater Effluent Disinfection

As required under its existing operating discharge permit, FC concentrations measured outside the limits of the mixing zone must meet state water quality standards for the use of that water. For Sitka, these water quality standards have been met based on maintaining effluent limits of 1.0 million FC per 100 mL as a monthly average, and 1.5 million FC per 100 mL as a daily maximum. These effluent FC concentration limits have been attainable without the use of any effluent disinfection.

However, during warmer months and with reduced plant influent flows resulting from successful corrective action to reduce collection system inflow/infiltration (I/I) flows, concentrations of FC in the plant effluent have increased. A summary of FC monitoring results for the plant is presented in Table 10.

Table 10: Mixing Zone Fecal Coliform Monitoring Results (CFU/100 mL) 2002-2011

Date	Receiving Water Quality Monitoring Station Numbers						
	1 (Inside)*	2 (Outside)*	3 (Outside)*	4 (Inside)*	5 (Outside)*	6 (Outside)*	7 (Inside)*
7/25/2002	5	3	0	6	1	0	1
7/1/2003	2	10	0	1	0	1	2
7/30/2004	9	4	4	17	8	0	1
4/14/2005	0	0	0	0	0	0	0
6/16/2005	0	0	0	0	0	0	0
7/14/2005	0	1	0	5	0	0	1
8/25/2005	16	67**	3	11	3	1	0
8/26/2005		0					
11/25/2005	14	10	4	8	12	8	12
7/18/2006	2	0	2	19	0	1	0
7/26/2007	8	8	0	31	1	0	1
7/3/2008	53	7	0	13	0	1	3
7/27/2009	1	4	0	2	1	0	0
4/28/2010	4	0	3	0	0	2	4
6/9/2010	1	0	0	1	0	0	0
7/7/2010	0	0	0	2	2	0	0
8/18/2010	2	35	0	95	1	0	2
8/26/2010		3					
11/18/2010	3	1	2	2	1	1	7
7/6/2011	3	2	0	2	1	0	6

* Permit Limits: Monitoring stations inside the mixing zone shall not exceed 200 CFU/100 mL. Monitoring points outside the mixing zone shall not exceed a monthly average of 14 CFU/100 mL and a daily maximum of 43 CFU/100 mL.
** On 8/25/2005 Station 2 had a 67 CFU/100 mL count. Subsequent re-sampling the following day yielded a result of 0 CFU/100 mL.

To provide additional control of effluent FC concentrations, in 2011, the CBS set up equipment to hypochlorinate sewage flows entering the Thomsen Harbor Lift Station located upstream of the sewage treatment plant. Hypochlorination was achieved using calcium hypochlorite tablets which dissolve as flow passes over them.

To continue to maintain permitted effluent FC counts in the receiving water at the designated sampling stations, a disinfection process is recommended for operation on the existing primary effluent. With disinfection in place, the FC concentrations in the effluent will be reduced thereby controlling their concentrations in the receiving water.

Options for disinfecting primary effluent include:

1. Chemical oxidation processes
   A. Chlorine gas
   B. Hypochlorite
   C. Chlorine dioxide
   D. Ozone
2. Photo-oxidation or ultraviolet (UV) disinfection

For the disinfection processes deploying oxidation, regulatory requirements include extinguishing any free oxidant residual remaining after dosing the effluent with chlorine or ozone prior to release to the receiving water. For chlorine, dechlorination with a sulfur product such as bisulfite or sulfur dioxide is commonly used for this purpose. For ozone, the half-life of ozone is so short, the free residual disappears very rapidly following dosing.

Of the oxidation processes, only chlorine has been used extensively for disinfection of primary effluents. By comparison, ozone is considerably more expensive. Comparing the chlorine disinfection alternatives, gas chlorination is by far less expensive than any other chlorine disinfection process. However concerns over the liability associated with an accidental release of chlorine gas, and the generation of DBPs formed when chlorine is exposed to incompletely nitrified effluents has caused many utilities to choose UV disinfection as their preferred method of effluent disinfection.

UV disinfection has not typically been deployed for disinfection of primary effluent. For CBS, the primary effluent typically includes 50 mg/L of suspended solids. These solids can block the transmission of light through the water before reaching the target organisms. And dissolved organics in primary effluent can absorb UV light, thereby increasing the energy and costs required for photolytic disinfection.

However newer configurations of UV disinfection equipment have been developed for disinfection of primary effluent. Caveats for its use on primary effluent include data collection to confirm the quality of primary effluent is compatible with the performance limits of the equipment, and collimated beam testing to identify the dose of UV light needed to achieve the target coliform inactivation performance objectives.

For purposes of this plan, UV effluent disinfection is recommended as the basis for the wastewater effluent disinfection capital improvement project over the use of chlorination/de-chlorination. Tablet chlorination similar to the program used in 2011 and 2012 at the Thomsen Harbor Lift Station can continue to be effective for control of FC counts and regulatory compliance, and should be continued as a practice for the near term. However chlorination of primary effluents creates elevated concentrations of nitrogenous DBPs, which are likely to be regulated in the future. As a consequence, deployment of UV disinfection at the plant is recommended over forms of chlorine disinfection. The timing for implementation of the UV upgrade would largely depend upon the future promulgation of regulations addressing effluent nitrogenous DBPs.

Elements of the UV effluent disinfection upgrade project are outlined below.

1. Effluent Bypass Pumping during Construction
2. Earthwork
   A. Clearing and Grading
   B. Excavation for Channel Construction
   C. Site Grading and Drainage
3. Disinfection Process Infrastructure
   A. Electrical Power Supply
   B. Reinforced Concrete Effluent Channels
      i. Primary channel
      ii. Bypass channel sized for future UV banks
   C. Channel Grating
   D. Flow control gates and gate actuators
4. UV Equipment
   A. Banks of UV Lamps immersed in Channel
      i. Duty and redundant banks
   B. UV Lamp Cleaning System
      i. Hydraulic Drive Wiper System
      ii. Chemical Dosing System
   C. UV Power Supply and Disinfection Process Control Panel
5. Building Enclosure for UV Equipment
   A. Insulated, ventilated, heated, lighted structure
   B. Sized for enclosure of primary and bypass channels, and UV process control equipment
6. Connections to Existing Primary Effluent Box and 24-inch Outfall Sewer

In support of this recommendation, the CBS is encouraged to implement a program of supplemental primary effluent quality data collection that would include UV transmittance in unfiltered samples, and soluble (Fe^{+2}) concentrations for samples filtered through 1.2 μm glass fiber filters.

4.6.2 Biosolids Disposal Facility Upgrades

Residuals generated at the treatment plant are dewatered and transported to an existing disposal facility, termed the "Biosolids Landfill." This existing landfill is planned for expansion.

Objectives of this expansion project are to develop a new disposal cell adjacent to the existing active Biosolids Landfill for placement of wastewater treatment residuals. Dredged fill material produced from the Swan Lake Restoration Project will be transported to the Biosolids Landfill for beneficial use as cover material over dewatered residuals placed in the facility.

At the current rate of residuals generation, the existing Biosolids Landfill has a projected remaining life of approximately 6 years, and therefore additional capacity for local disposal of these solids is needed.

Elements of work required to achieve this expansion are outlined below.

- Clear and grub the expansion area of the existing Biosolids Landfill
- Stockpile excavated material on the down-gradient edge of the new disposal cell as an earthen wall or dike for containment of deposited dewatered wastewater residual solids.
- Upgrade the access road to the Biosolids Landfill to enable access to the new disposal cell.
- Provide drainage collection for runoff leaving the new disposal cell. Direct this flow to forested wetland for natural treatment prior to reaching Granite Creek.
- Route surface runoff from abutting areas around the disposal cell.

4.6.3 Primary Effluent Heat Recovery

Treated primary effluent from the WWTP is currently discharged to a submerged diffuser system at the end of the marine outfall structure. Temperatures of the effluent vary between 7 and 14 degrees Celsius. Heat retained in the effluent following treatment is currently dissipated in the ocean at the outfall diffusers.

This capital improvement project will deploy heat recovery equipment that would capture a portion of this heat for beneficial use. A pre-design evaluation of this upgrade is currently underway to confirm feasibility and identify equipment configurations.

In general, the upgrade would deploy a heat pump process. In this process, a portion of the primary effluent would be treated for solids removal and disinfectant addition. The pre-treated primary effluent would then be directed through the evaporator portion of a heat pump loop wherein a pumped heat transfer medium such as ammonia or Freon is used to adsorb heat from the effluent, and then release that heat to a heating load within the treatment facility using a condenser.

To make the process efficient, the primary effluent must be treated to reduce its potential to deposit scale or biofilms on wetted heat transfer surfaces. In addition, the physical distance between condenser and evaporator should be kept to a minimum. And finally, the upper temperature of the circulated heat transfer medium is may be limited making the process limited to application where only low temperature heat is needed.

4.6.4 Leachate Treatment and Disposal

The closed Kimsham municipal solid waste disposal landfill is configured to collect leachate and convey it to the WWTP. Generation rates for collected leachate average 134,000 gallons per day. Compared to current average day flows of 1.3 mgd, the leachate poses a small percentage (10% +/-) of the hydraulic loading to the municipal wastewater treatment facility.

A common textbook hydraulic loading rate for primary clarifiers achieving conventional performance of 60% solids removal is 750 gallons per day per square foot of surface area. This value can range between 400 and 1,000. The three primary basins at the treatment plant each have a surface area of 600 square feet. These data would suggest the plant with all three basins on line has a nominal sedimentation basin capacity of approximately 1.35 mgd, which is roughly equal to the current average day influent flow to the facility.

Given the foregoing, the objective of the leachate treatment capital improvement project is to separate collected leachate from the municipal sewer system, and to provide dedicated leachate treatment and disposal separate from the domestic WWTP.

Leachate treatment requirements would depend on effluent quality stipulated by a discharge permit. For Sitka, the quality of leachate generated by the landfill is reported to include relatively dilute concentrations of metals (with the exception of iron which averages 38 mg/L) an average pH of 6.7, and moderate alkalinity and salinity. Based on available leachate quality reported for Sitka and elsewhere, and current regulatory criteria, the objectives of leachate treatment would be to provide flow equalization, reduce the concentration of iron and associated color from oxidized iron, and provide control of effluent pH and DO.

Collected leachate would be directed to a flow equalization basin where pretreatment for iron removal would occur. From the equalization basin, leachate would be concentrated to between 10 and 20% of its original volume using membrane filtration operating on a forward osmosis (FO) process. The draw solution for the FO process would be seawater pumped from tidewater to the leachate treatment facility. Common leachate contaminants including metals and organics are rejected by the FO process. Treated leachate quality would be suitable for release back to tidewater with the draw solution. Concentrate produced by the FO process would be directed to the sewage collection system for conveyance to the existing wastewater treatment facility.

For planning purposes, the assumptions made for this capital improvement project included a treatment facility located at or adjacent to the existing landfill. As available space for staging new infrastructure at the existing landfill is limited, the plan would deploy process equipment and supporting infrastructure with minimal footprint.

Several residential sewer service customers are currently connected to the leachate collection sewer system. As this project would divert leachate to a separate treatment facility, a small domestic wastewater sewage lift station would be installed as part of this project to continue sewer service to these customers.

Elements of this upgrade project used for pre-design planning level project cost estimating are summarized below.

1. Site Preparation
   - A. Clearing and Grubbing
   - B. Rock excavation
   - C. D1 Gravel Pad Placement
   - D. Access Road Extension

   E. Parking and Snow Stockpiling Areas
   F. Outdoor Area lighting
2. Yard Piping
   A. Leachate piping
      i. New diversion manhole with overflow to existing leachate drain to the municipal WWTP
      ii. New 8-inch gravity sewer to buried concrete flow EQ basin
   B. Domestic water piping
      i. Potable water service extension
         (a) Size: 8-inch service
   C. Domestic sewer for personnel restroom in new treatment building
      i. 6-inch sewer to existing leachate drain to WWTP
3. New Leachate Treatment Facility
   A. Flow EQ Basins
   B. Raw Leachate Pump station
   C. Leachate Treatment Equipment
      i. Prescreening
      ii. Iron Removal
      iii. pH reduction with acid addition
      iv. Forward Osmosis Membrane Skid for Concentrating Leachate
      v. Seawater UF Membrane Skid for Brine Draw Solution
      vi. Clean-in-Place membrane chemical cleaning skid
      vii. Concentrated Leachate Batch Tanks
         (a) pH neutralization
         (b) DO addition
   D. Seawater intake and pumping station for FO draw solution supply
4. Other Treatment Building Components
   A. Process Instrumentation and Control Station
   B. Motor Control Center
   C. Heating and Ventilation Systems
   D. Building Fire Protection System

The decision to fund and implement this capital improvement would be based on whether or not reduction of leachate contributions to the existing domestic wastewater treatment facility are needed to maintain the performance, effluent quality, and regulatory compliance of the existing plant. Due to cost/benefit analysis, it is recommended that this capital improvement upgrade be deferred until such time as the existing treatment plant is unable to maintain regulatory compliance with discharge permit effluent limits and water quality criteria. This project was not included in the financial analysis.

5.0 CAPITAL IMPROVEMENT PROJECTS

The recommendations from the condition assessment were used to develop CIPs. Short-term projects are those that are higher priority and should be completed within a 6-year time frame. Long-term projects are those that are lesser priority, and should be completed sometime within the next 20 years. The time frames given in the condition assessment were used to aid in prioritization of the CIPs, but the project's final prioritization was also based on annual budgets and discussions with CBS.

5.1 Short-Term (10-Year) Capital Improvement Programs

The Short-Term (10-year) Capital Improvement Projects (STCIP) presented in Table 11 were developed to address the recommendations from the condition assessment and comments made by the CBS. The projects presented in Table 11 should be implemented in the next 10 years. Figure 9 provides an overview of the STCIP locations. Appendix B includes individual figures for each sewer main replacement project included in the STCIP list.

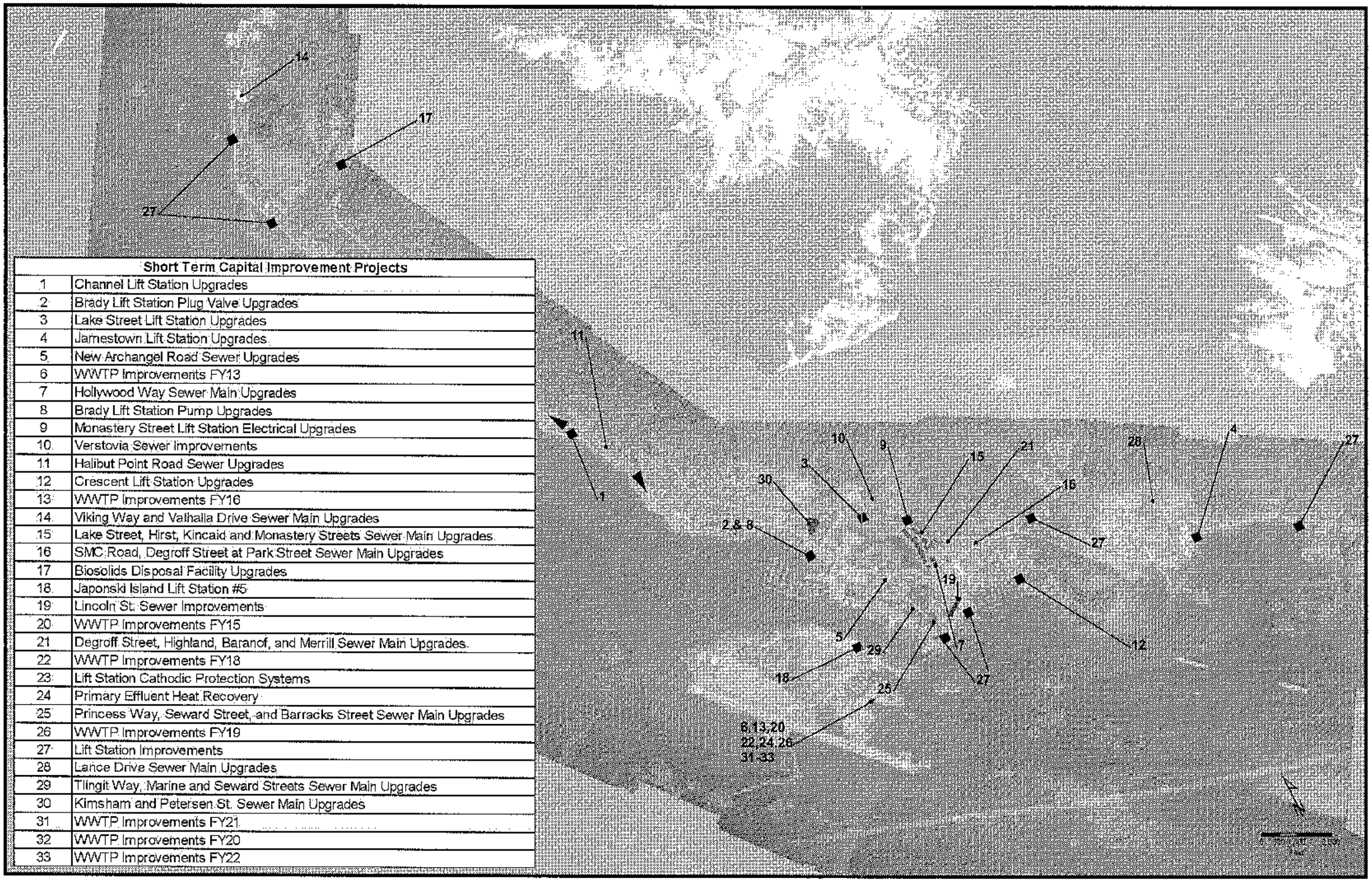
Table 11: Short-Term (10-Year) Capital Improvement Projects

Project Name	Description	Suggested Time Frame	Projected FY	Sanitary Sewer Improvements Cost Estimate (FY12 VALUE)	State Grant	State Loan	CBS WW Enterprise Fund
Baranof Sewer Replacement	1,000 feet of Main, 6 MH, 15 services	1-3 years	2013	$740,000	$518,000	$222,000	-
STCIP#2- Brady Lift Station Plug Valve Upgrades	Plug Valve Replacement	1-3 years	2013	$90,000	-	-	$90,000
STCIP#4- Jamestown Lift Station Upgrades	Replace Pumps With Similar Pumps or Anti-Clog Pumps. New check valves.	1-3 years	2013	$50,000	-	-	$50,000
STCIP#6-WWTP Improvements FY13	Garage Door, Man Door Rplacement, and Boiler Replacement	1-3 years	2013	$45,000	-	-	$45,000
STCIP#5- New Archangel Sewer Upgrades	200 feet of Main, 2 services	1-3 years	2014	$275,000	-	$250,000	$25,000
STCIP#7- Hollywood Way Sewer Main Upgrades	500 feet of Main, 2 MHs, 8 services ($25K funded in 2013 for design, $250K for construction in FY14)	1-6 years	2014	$275,000	-	$250,000	$25,000
STCIP#8- Brady Lift Station Pump Upgrades	Replace existing pump with new pump equipped with variable frequency drive.	1-3 years	2014	$75,000	-	-	$75,000
STCIP#11- Halibut Point Road Sewer Upgrades	Estimated 10 sewer services and stubouts to be added or replaced on the Halibut Point Road main During DOT roadway reconstruction. MH and mainline stub at Harbor Mountain Road	1-2 years (coordinated with ADOT re-paving)	2014	$75,000	-	-	$75,000

Project Name	Description	Suggested Time Frame	Projected FY	Sanitary Sewer Improvements Cost Estimate (FY12 VALUE)	State Grant	State Loan	CBS WW Enterprise Fund
STCIP#3- Lake Street Lift Station Upgrades	Lift Station Replacement	1-3 years	2014	$450,000	-	$200,000	$250,000
STCIP#1- Channel Lift Station Upgrades	Lift Station Replacement	1-3 years	2015	$450,000	$294,000	$126,000	$30,000
STCIP#9- Monastery Street Lift Station Electrical Upgrades	Replace Electrical and Control Systems. Upgrade Electrical service.	1-3 years	2015	$400,000	$259,000	$111,000	$30,000
STCIP#12- Crescent Lift Station Upgrades	Lift Station Replacement	1-6 years	2015	$450,000	$283,500	$121,500	$45,000
STCIP#20- WWTP Improvements FY15	Garage Door Replacement, New/Rebuild Blowers and Piping, High Pressure pump.	1-6 years	2015	$90,000	-	-	$90,000
STCIP#17- Biosolids Disposal Facility Upgrades	Expand Biosolids Disposal Area And Access Improvements.	1-6 years	2016	$800,000	$504,000	$216,000	$80,000
STCIP#10- Verstovia Sewer Improvements	Minor Improvements to Sewer Manholes and Services, as Required. Project is in Conjunction with a Verstovia Way Repaving Project.	3-6 years	2016	$50,000	-	-	$50,000
STCIP#13- WWTP Improvements FY16	Exterior Paint, HVAC System, Plant Sump Pumps, Hypochlorite Generator, Clarifier Louvers	3-6 years	2016	$709,000	-	$638,000	$71,000
STCIP#16- SMC Road, Degroff Street at Park Street Sewer Main Upgrades	800 feet of Main, 5 MHs, 28 services	3-6 years	2016	$1,020,000	$672,700	$288,300	$59,000

Project Name	Description	Suggested Time Frame	Projected FY	Sanitary Sewer Improvements Cost Estimate (FY12 VALUE)	State Grant	State Loan	CBS WW Enterprise Fund
STCIP#19- Lincoln Street Sewer Improvements	Minor Improvements to Sewer Manholes and Services, as Required. Project is in Conjunction with a Lincoln Street Repaving Project.	3-6 years	2017	$50,000	-	-	$50,000
STCIP#21- Degroff Street, Highland, Baranof, and Merrill Sewer Main Upgrades	1,600 feet of Main, 7 MHs, 64 services	3-6 years	2017	$1,877,500	$1,314,250	$563,250	-
STCIP#23- Lift Station Cathodic Protection Systems	Thomsen, Brady, Lincoln, Sandy Beach, Halibut Point, and Eagle Way Lift Stations	3-6 years	2017	$180,000	$128,000	-	$52,000
STCIP#24- Primary Effluent Heat Recovery	Deploy Heat Pump Process	3-6 years	2017	$1,200,000	$840,000	$360,000	-
STCIP#22- WWTP Improvements FY18	Generator Replacement, Clafier Drives	3-6 years	2018	$120,000	-	-	$120,000
STCIP#15- Lake, Hirst, Kincaid and Monastery Streets Sewer Main Upgrades	3,550 feet of Main, 14 MHs, 74 services	3-6 years	2018	$2,460,000	$1,502,900	$644,100	$313,000
STCIP#26- WWTP Improvements FY19	Vinyl Floor Replacement, Scum Collector	6-10 Years	2019	$70,000	-	-	$70,000
STCIP#27- Lift Station Improvements	Replace Electrical and Control Systems and Install New Transducer for The Old Sitka rocks, Granite Creek, Centennial, Castle Hill and BIHA Lift Stations	6-10 Years	2019	$500,000	-	$450,000	$50,000

Project Name	Description	Suggested Time Frame	Projected FY	Sanitary Sewer Improvements Cost Estimate (FY12 VALUE)	State Grant	State Loan	CBS WW Enterprise Fund
STCIP#18- Japonski Island Lift Station #5	Lift Station Replacement	6-10 Years	2020	$300,000	$189,000	$81,000	$30,000
STCIP#14- Viking Way and Valhalla Drive Sewer Main Upgrades	400 feet of Main, 3 MHs, 8 ervices. Project to be completed in conjuction with paving project.	6-10 years	2020	$310,000	-	$279,000	$31,000
STCIP#32- WWTP Improvements FY20	Channel Monster	6-10 years	2020	$55,000			$55,000
STCIP#28- Lance Drive Sewer Main Upgrades	650 feet of main, 3 MHs, 14 services. Project to be completed in conjuction with paving project.	6-15 years	2021	$470,000	-	$423,000	$47,000
STCIP#29- Tlingit Way, Marine and Seward Streets Sewer Main Upgrades	400 feet of Main, 4 MHs, 11 services. Project to be completed in conjuction with paving project.	6-10 years	2021	$380,000	-	$340,000	$40,000
STCIP#31- WWTP Improvements FY21	Interior Lighting, DorrClone Classifer	6-10 Years	2021	$75,000	-	-	$75,000
STCIP#33- WWTP Improvements FY22	Dorr-Oliver Grit Collector, Wemco pumps	6-10 Years	2022	$85,000			$85,000
STCIP#25- Princess Way, Seward Street, and Barracks Street Sewer Main Upgrades	550 feet of Main, 4 MHs, 11 services. Project to be completed in conjuction with paving project.	6-15 years	2022	$420,000	-	$375,000	$45,000
STCIP#30- Kimsham and Petersen Street Sewer Main Upgrades	1,600 feet of main, 8 MHs, 24 services. Project to be completed in conjuction with paving project.	6-10 years	2022	$990,000	$630,000	$270,000	$90,000



	Short Term Capital Improvement Projects
1	Channel Lift Station Upgrades
2	Brady Lift Station Plug Valve Upgrades
3	Lake Street Lift Station Upgrades
4	Jamestown Lift Station Upgrades
5	New Archangel Road Sewer Upgrades
6	WWTP Improvements FY13
7	Hollywood Way Sewer Main Upgrades
8	Brady Lift Station Pump Upgrades
9	Monastery Street Lift Station Electrical Upgrades
10	Verstovia Sewer Improvements
11	Halibut Point Road Sewer Upgrades
12	Crescent Lift Station Upgrades
13	WWTP Improvements FY16
14	Viking Way and Valhalla Drive Sewer Main Upgrades
15	Lake Street, Hirst, Kincaid and Monastery Streets Sewer Main Upgrades
16	SMC Road, Degroff Street at Park Street Sewer Main Upgrades
17	Biosolids Disposal Facility Upgrades
18	Japonski Island Lift Station #5
19	Lincoln St. Sewer Improvements
20	WWTP Improvements FY15
21	Degroff Street, Highland, Baranof, and Merrill Sewer Main Upgrades
22	WWTP Improvements FY18
23	Lift Station Cathodic Protection Systems
24	Primary Effluent Heat Recovery
25	Princess Way, Seward Street, and Barracks Street Sewer Main Upgrades
26	WWTP Improvements FY19
27	Lift Station Improvements
28	Lance Drive Sewer Main Upgrades
29	Tlingit Way, Marine and Seward Streets Sewer Main Upgrades
30	Kimsham and Petersen St. Sewer Main Upgrades
31	WWTP Improvements FY21
32	WWTP Improvements FY20
33	WWTP Improvements FY22

Figure 9: Short-Term Capital Improvement Projects

Table 12 presents O&M costs for the proposed STCIP WWTP related project.

Table 12: Near-Term Projects Annual O&M Cost Estimates

	Treated Wastewater Effluent Disinfection	Biosolids Disposal Facility Upgrades	Primary Effluent Heat Recovery	Leachate Treatment and Disposal
Labor	$6,365	$38,708		$45,027
Energy	$31,670	$65,534		$21,468
Consumables	$76,488	$2,389		$125,277
Contingency	$22,905	$21,326		$38,354
Total, Rounded Up	$140,000	$130,000	($5,000)	$240,000

5.2 Long-Term Capital Improvement Projects

The projects presented in Table 13 were developed to address the recommendations from the condition assessment and comments made by the CBS. These projects are numbered to correspond with Figure 10. The projects presented in Table 13 should be implemented in the future 10 to 20 years. Figure 10 provides an overview of Long-Term Capital Improvement Project (LTCIP) location.

Table 13: Long-Term Capital Improvement Projects

Project Name	Description	Suggested Time Frame	Projected FY	Sanitary Sewer Improvements Cost Estimate (FY12 VALUE)	State Grant	State Loan	CBS WW Enterprise Fund
LTCIP#1- Anna Drive Basin Sewer Main Upgrade	500 feet of main, 3 MHs, 14 services	10-20 years	2024	$430,000	$270,900	$116,100	$43,000
LTCIP#2- Wolff Drive Sewer Main Upgrade	1,450 feet of main, 4 MHs, 38 services	10-20 years	2025	$1,070,000	$674,100	$288,900	$107,000
LTCIP#3- Price Street Sewer Main Upgrade	300 feet of main, 2 MH, 3 services	10-15 years	2026	$190,000	$119,700	$51,300	$19,000
LTCIP#6- Observatory and Seward Sewer Main Upgrade	1,050 feet of main, 7 MHs, 29 services	10-20 years	2026	$900,000	$567,000	$243,000	$90,000
LTCIP#18- Thomsen Harbor Lift Station Upgrades	Hypochlorite Generator Addition	10-20 years	2025-30 (2028)	$225,000	$158,000	-	$67,000
LTCIP#9- WWTP Roof Replacement	Roof Replacement	10-20 years	2027	$500,000	-	-	$500,000
LTCIP#4- Old Harbor Mountain Road Sewer Main Upgrade	500 feet of main, 3 MHs, 12 services	10-20 years	2030	$400,000	$252,000	$108,000	$40,000
LTCIP#7- Sawmill Creek Road at Jarvis Street Sewer Main Upgrade	600 feet of main, 1 MH, 3 services	10-20 years	2030	$250,000	$157,500	$67,500	$25,000
LTCIP#8- Jamestown Drive Sewer Main Upgrade	275 feet of main, 1 MH, 6 services	10-20 years	2030	$200,000	$126,000	$54,000	$20,000
LTCIP#11- Long-Term WWTP Improvements	Moyno Pumps (FY26), Sludge Press (FY30), and Lime Equipment (FY31)	6-20 years	2026-2030+	$655,000	-	-	$655,000

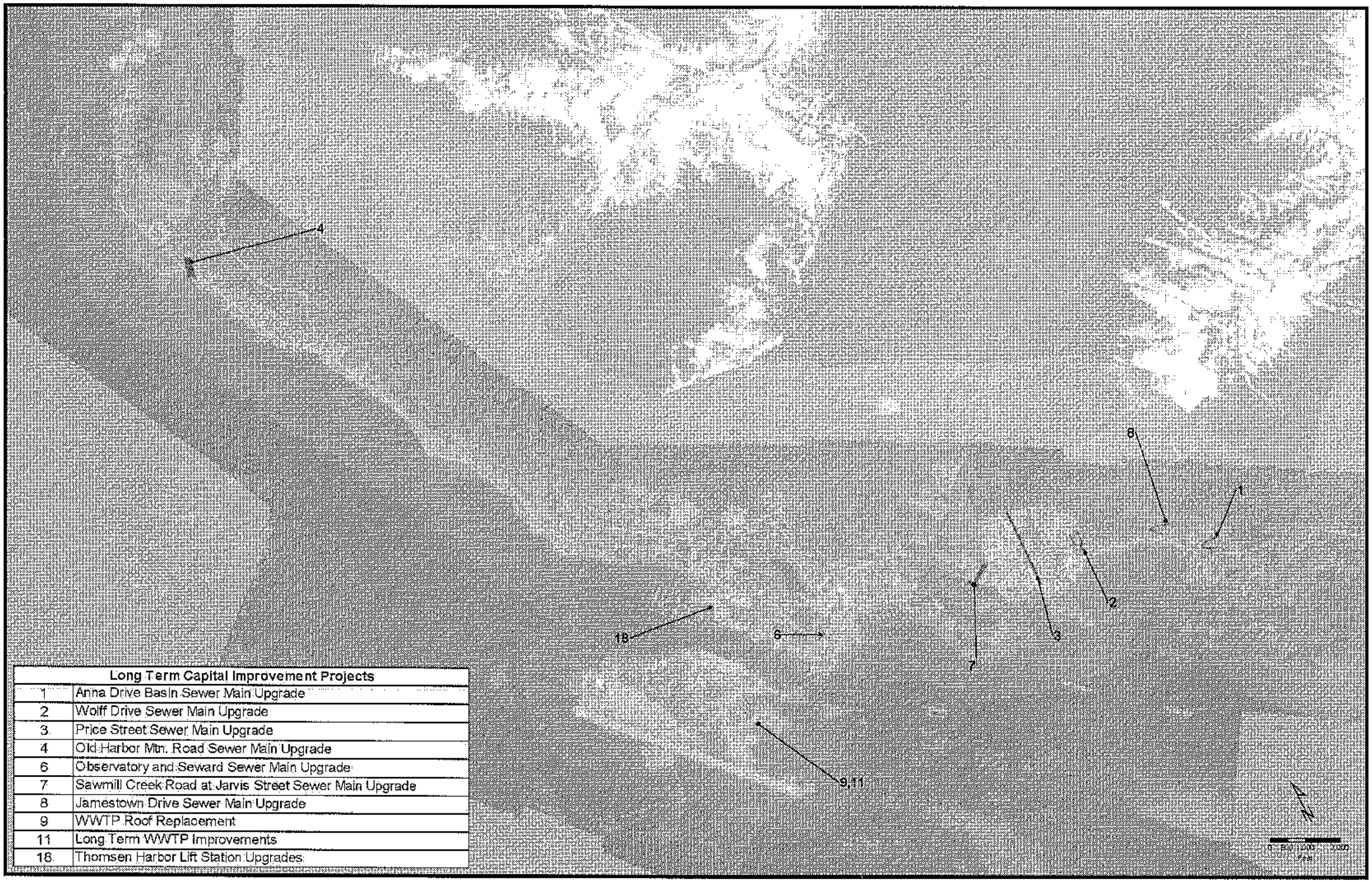


Figure 10: Long-Term Capital Improvement Projects

5.2.1 Wastewater Secondary Treatment

The CBS requested information on what might be required as upgrades to the treatment system should the 301(h) waiver be withdrawn, and the plant be reconfigured to produce secondary quality effluent. While this upgrade is not anticipated to occur in the near term, it is used to develop a basis for a LTCIP for the CBS sewer utility.

The future projected WWTP loadings used for this planning analysis are summarized below:

Average day influent wastewater flow	2 mgd
Maximum day influent flow	5 mgd
Average Influent BOD_5 concentration	187 mg/L
COD/BOD_5 ratio	2
Average TSSs concentration	210 mg/L
Average influent temperature	8 degrees Celsius
Average influent TKN	40 mg/L

For purposes of this plan, the treatment objectives of a secondary treatment plant would be as follows:

1. Produce the following minimum effluent quality
2. Average 30 day effluent BOD_5 of 30 mg/L or less
3. Average 30 day effluent TSS of 30 mg/L or less
4. Average 30 day NH3-N concentrations of 10 mg/L or less
5. Median 30 day FC counts of 200/100 mL

There are a number of alternative secondary treatment process configurations that are able to operate on municipal wastewater to achieve the aforementioned treatment objectives. Some of the more commonly deployed processes include the following:

1. Conventional Activated Sludge Treatment
2. Sequencing Batch Reactor Treatment
3. Integrated Fixed Film Activated Sludge Treatment
4. Membrane Bioreactor Treatment

The foregoing are all aerobic processes that deploy aeration systems to furnish DO to heterotrophic microorganisms in support of their metabolic processes in which they oxidize organics in the influent wastewater. More recently there has been increasing interest in deployment of anaerobic biological processes as the primary mode of wastewater stabilization. These emerging alternative treatment technologies are of interest because of their inherent savings in aeration energy and, for larger treatment plants, their compatibility in supporting on-site combined heat and power generation facilities.

For purposes of this review, a conventional activated sludge configuration is assumed.

The main elements required for operation of the existing plant as a secondary treatment process include biological reactor basins, secondary clarifiers, effluent disinfection, and associated pumps, conveyance structures, and process automation control systems. While larger secondary treatment plants include primary clarification as pretreatment to the secondary process basins, it is not uncommon for smaller treatment facilities such as Sitka's to operate with only screening and grit removal as pretreatment to the secondary processes. Existing solids processing gravity thickening and belt filter press dewatering would remain in service.

Existing Plant Hydraulic Profile

The existing plant's hydraulic profile as shown in the plant's record drawings includes a water surface elevation in the grit basins of 30.28 and 31.25 MSL for flows of 0.5 and 5.3 mgd, respectively. Water surface elevations in the existing primary basins are reported as 27.30 and 27.41 MSL for flows of 0.5 and 5.3 mgd, respectively. These data would suggest that the existing plant hydraulic profile allows insertion of secondary process basins between the grit basins and primary effluent trough outlet weir with an available gravity head of between 2.98 and 3.84 feet for flows of 0.5 to 5.3 mgd, respectively. This available differential head is sufficient to avoid interim pumping to lift degritted wastewater to the secondary process basins.

Replacement of Existing Primary Basins

The existing primary treatment process includes three sedimentation basins, each with approximate plan dimensions of 18 feet wide by 68 feet long and a side water depth (SWD) of approximately 9.8 feet.

The SWD of the three existing basins is less than what would normally be installed for new secondary clarifiers. Issues related to operating shallow clarifier basins include limited volume for settled sludge storage, lower settled sludge solids concentration, and greater potential for solids washout during events of events of high influent flow to the plant.

For planning purposes, the existing primary clarifiers would be replaced in their current location with similar rectangular basins with SWDs of between 14 and 16 feet deep.

The new secondary clarifier basins would be configured with the following elements:

1. Three each rectangular common wall reinforced concrete basins
2. Secondary Effluent Weirs and Troughs
3. Sludge Collection Mechanism
4. Scum Collection Mechanism
   A. Return Activated Sludge (RAS) Pumps
   B. Waste Activated Sludge (WAS) Pumps
   C. Waste Scum Pumps
   D. Basin Drain Pumps

New Secondary Biological Process Building

New reactor basins would be installed to support the biomass used for stabilization of influent organics. For this review, these new aerated reactors would be configured as two parallel basins, with a total installed volume of approximately 1 million gallons. A common influent flow split box would be configured to direct flow to either or both of these basins as needed. Assuming a SWD of 15 feet, these basins would occupy a footprint of approximately 56 feet wide by 94 feet long. A process building would be constructed as a weather enclosure for these basins and the blowers and associated process equipment.

A fine bubble diffused aeration system would be used to supply air and DO to the suspended growth biomass within the basins. Blowers sized to maintain mixed liquor DO concentrations of between 2 and 4 mg/L would deliver 2,200 to 2,800 cfm requiring between 100 and 125 Hp operating power. Other significant operating costs include process building heat, ventilation, and operational labor.

Other components of the secondary basin building would include:

i. Administrative Offices for Superintendent
ii. SCADA Control Room and Plant Operations Center
iii. Conference Room and Operator Training Center
iv. Document Archives Area
v. Restrooms and Showers for Operations Personnel
vi. Break Room

Effluent Disinfection

To achieve the target effluent microbial quality performance objective, disinfection of secondary effluent would be required. For purposes of this review, it is assumed a new UV effluent disinfection system would be required. Major elements of this process upgrade would include:

1. Secondary Effluent Channels and Channel Flow Control Gates for UV Equipment
2. UV Lamp Equipment
3. Building Enclosure over the UV Process Equipment
4. Connections to existing 24-inch marine outfall

Residuals Processing and Disposal

The upgrade to secondary treatment will result in the production of a larger volume of residual biosolids than currently produced by the existing primary treatment facility.

For example, for an existing average day flow of 2 mgd, an influent TSS of 210 mg/L, a 60% reduction in solids across the primary basins, and 28% cake solids from the belt filter press operating on gravity thickened sludge conditioned with lime at 100 gm lime/kg dry sludge solids, the average sludge production rate is approximately 4.9 cy/day.

By contrast, for an average day flow of 2 mgd, with no primary clarifiers, a conventional activated sludge plant producing effluent BOD and TSS concentrations in the mid-teens, and using the existing belt filter press to produce a 13% cake solids concentration operating on gravity thickened polymer conditioned waste activated sludge, the average sludge production rate is approximately 5.7 cy/day.

Based on the foregoing data, the volume of waste residuals produced for the secondary treatment process is expected to be greater than the volume of residuals produced by the existing primary treatment process. The implication is that the Biosolids Landfill will fill more quickly, and require an alternative residuals management scheme sooner than current operations with the primary treatment process.

Reuse of Existing Process Equipment and Facilities

The following process equipment would continue to be reused with the existing plant upgraded to operate as a secondary process.

1. Influent Raw Sewage Comminuter
2. Grit Removal Process Equipment
3. Gravity Thickener Operating on WAS and Secondary Scum
4. Belt Filter Press
5. Truck Haul Wastewater Residuals Conveyance
6. Biosolids Landfill Disposal Area
7. Marine Outfall and Submerged Diffuser

Capital and Operating Costs

Estimates of capital and operating costs were prepared for the upgrade to secondary treatment and are presented in the paragraphs below.

Procedures used to estimate the cost of upgrading the existing primary treatment plant to secondary treatment are identical to those described for the STCIPs.

Table 14 summarizes the Capital Cost estimated for developing a conventional activated sludge process at the site of the existing treatment facility. Table 15 presents estimates of O&M costs for the facility.

Comparing operating costs between primary and secondary treatment, the cost to operate a secondary treatment plant may be two to four times the cost to operate a primary treatment plant, depending on local conditions, unit pricing for power, labor, and consumables, and what if any consideration is given to capital replacement costs.

Table 14: Upgrade to Secondary Treatment Capital Cost Estimates

Conversion to Secondary Treatment	
Construction Cost Subtotal	$34,836,512
Construction Contractor's General Requirements	$3,483,651
Project Contingency	$11,496,049
Construction Contractor O&P	$12,454,053
Project Bonding and Insurance	$498,162
Pilot Testing	$0
Engineering Design and Construction Management	$12,454,053
Owner Project Administration	$996,324
Project Permitting and Legal Support	$498,162
Surveying and Geotechnical Investigation	$1,494,486
Total, Rounded Up	$78,200,000

Table 15: Secondary Treatment Annual Operation and Maintenance Cost Estimates

Conversion to Secondary Treatment Disinfection	
Labor	$82,086
Energy	$296,436
Consumables	$385,992
Contingency	$152,935
Total, Rounded Up	$920,000

5.3 Cost Estimation Methodology

5.3.1 Collection System

The CBS bid tabs were provided for recent CBS utility projects. The Seward Street Repaving Project (2009), Oja Way Sewer and Water Replacement Project (2010), and Monastery Street Water and Sewer Project (2011) bid tabs were used as a basis for recent unit costs for sanitary sewer projects. The costs for per linear foot of new sewer main, new sewer services, and new sewer manholes were determined by averaging the unit prices from the three CBS bid tabs provided.

Additional construction costs related to the projects such as mobilization, paving, filling existing mains w/slurry, traffic maintenance, etc., were calculated using the Oja Way and Monastery Street utility projects, which were believed to be most representative of the proposed CIP projects. Additional construction costs were estimated at approximately 200% of the cost directly associated with the sewer improvements (sewer main, services, manholes).

In addition,

- A 25% contingency cost was included in the total project cost to account for variances in the project scope, construction costs, and cost estimating methodology.
- A 20% design, inspection, and construction administration cost was included in the total project cost.

Estimated lift station construction costs were estimated based on comparisons with similar projects in Southeast Alaska and total projects include the estimated construction cost plus 50% to account for design, inspection, and CBS administration and contingency.

5.4 Wastewater Treatment Plant

The following assumptions were used in the preparation of project capital costs.

1. Cost values are presented as year 2011 United States dollars. No escalation is assumed for future changes to construction costs.
2. Components of cost used to prepare estimates of project capital costs include:
   A. Construction Cost Subtotal, assumed to be the costs of constructing the project scope of work, exclusive of Contractor General Requirements, Contingency for Unidentified Work Scope, and Contractor Overhead and Profit.
   B. Construction Contractor's General Requirements
      i. Defined as the Construction Contractor's costs for project management, project facilities, utilities, permits and engineering, tools and supplies, miscellaneous equipment, travel, insurance, taxes, and maintenance,
      ii. Assumed to be 10% of the Construction Cost Subtotal.
   C. Project Contingency for Unidentified Work Scope identified during design is assumed to be 30% of the sum of the Construction Cost Subtotal and the Construction Contractor's General Requirements
   D. Construction Cost without Overhead and Profit (O&P) is the sum of the Construction Cost Subtotal, the Contractor's General Requirements, and the Project Contingency for Unidentified Work Scope.
   E. Contractor O&P, defined as 25% of the Construction Cost without O&P

F. Total Constructed Cost, defined as the sum of the Construction Cost without O&P and the Contactor O&P

G. Project Bonding and Insurance, assumed to be 1% of the Construction Cost without O&P

H. Project Pilot Testing, including efforts to confirm proposed treatment process performance and identify design criteria

I. Engineering Design and Construction Contract Administration Management, assumed to be 25% of the Construction Cost without O&P

J. Owner Administration of the Project, assumed to be 2% of the Construction Cost without O&P

K. Project Permitting and Legal Support Services, assumed to be 1% of the Construction Cost without O&P

L. Surveying and Geotechnical Investigations, assumed to be 3% of the Construction Cost without O&P

Components of cost used to prepare estimates of O&M costs include:

1. Labor costs assuming:
   A. O&M employee base pay of $50,000 per year with a benefits package equal to 25% of the annual base pay.
2. Energy Costs including electrical power and heat
   A. Electrical energy cost of $0.07/kWh
3. Consumables' Costs including
   A. Procurement and shipping costs for replacement parts to maintain equipment
   B. Payments to a capital recovery fund to amortize major equipment
   C. Fuels and lubricants to operate rolling equipment
   D. Services required for operations such as phone, internet, and laboratory services

6.0 WASTEWATER SYSTEM FINANCIAL PROGRAM

Working with DOWL HKM, FCS Group provided the Financial Program in support of the CBS Wastewater System Master Plan. This section documents the objectives, assumptions, findings, and recommendations for the Financial Program. An electronic copy of the wastewater rate model will be submitted separately on CD-ROM. Major study elements include:

- Evaluation of Financial Policies
- Development of Capital Financing Strategies
- Assessment of Revenue Needs (FY 2012/13 to 2021/22)
- Forecast of Rate Adjustments (FY 2012/13 to 2021/22)

Capital Financing strategies were developed for a 6-year, 10-year, and 20-year period to coincide with the master planning effort. The revenue needs assessment and resulting rate forecast focused on the 10-year period (FY 2012/13 to 2021/22).

6.1 Financial Policies

In order to establish adequate rates, a utility must define its benchmark(s) for financial performance. Typically, several different standards are necessary to satisfy all financial objectives. Like any business, a municipal utility requires certain minimum levels of cash reserves to operate; these reserves address variability and timing of expenditures and receipts, as well as occasional disruptions in activities, costs, or revenues. In addition, as a public service provider, a municipal utility has a commitment to provide an essential service at a certain standard. Therefore, protection against financial disruption is very important.

This section outlines best practice financial policies that the CBS might consider in the context of this mission. It also addresses policy direction from CBS staff for incorporation of selected policies into this rate study, appropriate to the unique needs and circumstances of the CBS. These policies form the foundation of utility management and, with routine application, can act as overarching guidelines for consistent decision making.

The following policies are evaluated:

- Self-Supporting Enterprise Fund
- Cash Reserves
- System Reinvestment Funding
- Debt Management

6.1.1 Self-Supporting Enterprise Fund

A fund is an accountability unit used to maintain control over resources segregated for specific activities or objectives. Proprietary, or enterprise, funds report services for which a utility charges customers a fee. These funds are generally self-supporting, receiving revenues for payment of services on a user fee basis as opposed to property taxes or other general fund revenue sources.

Conceptually, and by accounting convention, a utility is divided into two primary activity centers; operating and capital. For financial forecasting purposes, operating costs tend to be ongoing and predictable, while capital costs are highly variable in comparison. In addition, each of these has specific funding sources and mechanisms available to them.

When determining the amount of rate revenue required, we necessarily separate these cost centers to reflect these differences. Note, however, that there is some interaction between the two centers - for example, capital projects may be funded through a policy of system reinvestment funding from rates, direct rate funding, or through debt issuance. In each case, rates are paying for capital projects. These demands on operational resources (primarily rates) thus become expenditures from that perspective.

This ideal separation is illustrated in the exhibit below.

Capital Account	Operating Account
Sources of Funding	**Sources of Funding**
Connection Charges	User Rates
Debt Proceeds	Interest Earnings
Transfers from Operations	Miscellaneous Service Fees
Interest Earnings	
Grants	**Uses**
	Operating & Maintenance Expenses
Uses	Rate-Funded Capital
Capital Project Funding	System Reinvestment (R&R) Funding
	Debt Service
	Addition to Operating Reserves

Though virtually all utilities maintain reserves in some form, the segregation of those reserves can vary greatly between utilities. While a complete delineation of the functions of reserves is not always documented, the underlying purposes remain valid components of reserve management. Further, as reserve objectives are identified, the mechanisms for managing, using, and replenishing those reserves become important elements of financial management.

When evaluating reserve levels and objectives, it is vital to recognize that the value of reserves lies in their use. It goes without saying that a strategy that deliberately avoids the use of reserves negates their purpose. Fluctuations of reserve levels merely indicate that the system is working, while lack of variation strongly suggests that the reserves are, in fact, unnecessary.

The CBS maintains a single Wastewater Fund in which operating and capital-related cash deposits and withdrawals are made. No specific policy is in place to establish the desired level of cash balances. For purposes of this financial analysis, we have separated the Wastewater Fund into an Operating Account and a Capital Account to identify appropriate sources and uses for each account.

The rate strategy developed for this study presumes that the Wastewater Fund will operate as a self-supporting enterprise fund, with minimum cash balances established as further discussed below.

6.1.2 Operating (Working Capital) Reserves

An operating reserve is essentially a minimum unrestricted fund balance used to accommodate the short-term cycles of revenues and expenses. For rate modeling, it would be a minimum balance that is maintained through rate increases as necessary; for budgeting, it would be a minimum ending balance for the utility operating fund; and for accounting, the balance would simply appear as part of unrestricted cash and investments.

Operating or working capital reserves provide a "cushion" that can be used to cover cash balance fluctuations. These reserves are intended to address both anticipated and unanticipated changes in revenues and expenses. Examples of the former include billing and receipt cycles, payroll cycles, and other payables; examples of the latter include droughts, economic cycles, and other periods of low demand.

Target funding levels are often characterized in terms of a recommended number of days of cash O&M expenses, with the minimum number of days varying with the expected risk of unanticipated needs - these are likely to vary among utilities based on the relative volatility of revenues and expenses.

Industry practice ranges from 30 days to 120 days of O&M, with the lower end more appropriate for utilities with very stable revenue streams and the higher end more appropriate for utilities with significant seasonal variations. This study incorporates an operating account cash balance target of between 30 and 45 days of O&M expense. This target level is consistent with industry practice for utilities with primarily flat rate systems with relatively stable revenues year around.

The target balance should be evaluated as of June 30 of each fiscal year, with the balance expected to vary during the course of a year. In any year where the cash balance exceeds the target, we recommend transferring the excess to the capital account to help pay for capital projects.

The rate management strategy presented in this study demonstrates that this target is met in each year of the study period.

6.1.3 Capital Contingency

In addition to protecting against variations in operating costs and revenues, it is prudent to establish and maintain a capital contingency reserve to meet unexpected emergency capital outlays. While it would be impractical to reserve against major system-wide failures such as earthquake or other catastrophic events, it is reasonable and prudent to identify and quantify possible failures of individual system components. There are several methods used in the industry to set the level of these types of reserves, including:

- Most Costly Piece of Equipment: A utility may predict the cost of replacing the most expensive piece of equipment or facility that each utility relies on, such as its largest or most powerful pump, and reserve an amount equal to the cost of a major repair of that facility.
- Average Annual Cost of Capital Program: Alternatively, a utility may use a percentage of its 5- or 10-year capital program, or set the reserve equal to the average annual costs of it capital program.
- Percentage of Utility Plant: As a rule of thumb, a utility may elect to hold a contingency reserve equal to a percentage of its fixed assets, usually 1% to 2% of the original cost of total assets. Essentially, the contingency reserve becomes a minimum balance in the

utility capital account. If a system reinvestment funding policy has been established, those cash resources can also be relied on for this purpose (nesting system reinvestment funding monies within the contingency reserve). This would avoid the need for multiple reserve policies when they can serve overlapping purposes.

- Reliance on Other Reserve Resources: Many cities maintain "rainy day" funds as hedges against emergencies or unusual circumstances. In such cases, extending the applicability of these funds to utility emergency repairs could preclude the need for a separate utility contingency.

The rate strategy developed for this study incorporates a minimum capital contingency of 1% of utility assets, nested with the policy to fund system reinvestment through rates, further discussed below. Additional resources used toward this balance include interest earnings and transfers of excess operating reserves.

6.1.4 System Reinvestment Funding

System reinvestment funding from rates provides for: (1) ongoing system integrity through reinvestment in the system - replacing physical assets with cash assets; (2) rate stability through regular accumulation of cash toward funding future replacement costs; and (3) charging customers commensurate with their consumption of system facilities.

Each year, wastewater system assets lose value, and as they lose value they are moving toward eventual replacement. That accumulating loss in value and future liability is measured for financial purposes as annual depreciation expense, which is based on the original cost of the asset over its anticipated useful life. While this expense reflects the consumption of the existing asset at its original investment, the replacement of that asset will likely cost much more, factoring in inflation and construction conditions. Therefore, the added annual replacement liability is even greater than the recorded annual depreciation. Given the integrated nature of system assets, it is likely that multiple assets will have to be replaced concurrently. This further exacerbates the issue of capital investment "spikes." It is prudent to develop a long-term replacement funding strategy to mitigate the impacts to ratepayers during these periods of substantial system investment.

System reinvestment funding specifically addresses the concept of funding repair and replacements through a regular and predictable rate provision. By establishing a steady funding mechanism, a system reinvestment funding program can then be structured, which takes into account the defined funding source, accumulation of funds when funding exceeds near-term needs, and augmentation of funds (for example through debt) when repair and replacement needs exceed available cash resources. A common approach of municipal utilities is to establish a policy of system reinvestment funding through rates using depreciation expense as the benchmark for the appropriate level of funding. Depreciation is a commonly used accounting measure of the decline in asset value attributable to the wear and tear associated with routine use. Depreciation expense is recorded as a system expense for purposes of financial reporting. However, because depreciation expense is a non-cash expense, it generally does not appear in cash-based budgets, thus potentially disguising a very real and accumulating cost of the system.

Collecting the amount of annual depreciation expense through rates provides a stable funding source for capital expenditures, especially those related to repair and replacement of existing system plant. It is important to note that depreciation is not equal to the future replacement cost of the utility systems, but serves simply as a starting point for addressing long-term replacement needs. As noted previously, actual system replacement costs will be significantly higher than the cost originally incurred to build the systems.

The CBS's historical practice has been to fund capital needs through a combination of grants, loans, and "pay-as-you-go" funding from rates. While this approach meets annual capital funding needs, it would likely result in significant "spikes" in rates to fund inevitable peaks in infrastructure needs as wastewater system assets age. A system reinvestment funding policy to annually fund from rates an amount equal to annual depreciation expense is included beginning in FY 2013/14. To mitigate near-term rate impacts, this policy was phased in over the 10-year study period. Once system reinvestment funding is fully phased in, funds will accumulate in years where system reinvestment funding deposits exceed capital replacement needs and will be drawn down as needed to appropriately balance the use of cash and debt financing of capital projects.

It is worth noting that as state grant and low-cost loans are becoming more and more competitive, eligibility criterion are expanding to include review of best management practices such as system reinvestment funding policies.

6.1.5 Debt Management

Debt management policies are intended to: (1) provide an appropriate balance of debt and equity financing of capital needs; (2) maintain credit worthiness for future debt issuance; and (3) promote equity between existing and future ratepayers. As noted above, a combination of sources (grants, loans, and cash) are assumed to fund capital needs. The priority of funding will of course continue to secure as much grant funding as possible, followed by the combination of low cost loans and cash financing. Historically, the CBS has had limited cash to fund the capital program and thus has relied on the issuance of loans. With the implementation of a system reinvestment funding policy, the CBS will have more flexibility in its decision to use cash or debt in the future. Standard loan/bond underwriter preference for municipalities is to maintain a debt-to-equity ratio of no greater than 50% debt/50% equity (cash). The wastewater utility is currently at a 19% debt to 81% equity ratio, which is well within these guidelines. To assist the CBS in maintaining this ratio, we recommend debt-financing no more than 75% of the capital program over a 6-year rolling period.

6.1.6 Cumulative Impact of Fiscal Policies

Satisfying all of these policy objectives might seem daunting at first, but the outcome is that multiple benchmarks overlap, resulting in the simultaneous achievement of multiple objectives within the same level of rates. For example, the policy for system reinvestment funding through rates serves several beneficial purposes: it provides a cash resource to the capital account that helps build capital contingency reserves; it contributes to the cash funding of capital, helping to maintain healthy debt-to-equity ratios; and it helps to avoid rate spikes during periods of significant replacement needs.

Each criterion provides a different perspective on how much revenue is appropriate, and satisfying them all generally results in higher rates than if only a single standard is considered. However, this approach reduces financial risk and increases financial stability - any near-term increases that result will help to promote more stable, and lower, long-term rates.

In summary, utility reserves are intended to absorb fluctuation in revenues or expenditures without abrupt rate impacts. As reserve levels vary, a policy structure can define the mechanisms for regulating those levels and returning them to intended targets. The general objectives of these and other policy elements are stable and predictable rates and funding sources, along with equitable recovery of costs from customers as they are being incurred.

6.2 Study Assumptions

In addition to the financial policies summarized above, the following major assumptions were used in preparing this analysis:

- The study period includes FY 2012/13 - FY 2031/32 for capital financing strategies and FY 2012/13 - FY 2021/22 for focused revenue needs and rate adjustment strategies.
- The FY 2011/12 beginning cash balance of $3.6 million was first allocated to the operating account to meet the maximum target of 45 days of O&M in 2018 ($500,000), with the remainder allocated to the capital reserves ($3.1 million).
- Interest earnings are generated in the operating and capital accounts based on the assumed interest rate applied to annual beginning cash balances. Interested earnings are estimated at 3.0% in the current year, reducing to 1.0% over the study period, consistent with economic forecasts.
- Revenue under existing rates is assumed to remain fairly flat over the study period, currently at about $2.0 million. For rate setting purposes, conservative customer growth is assumed at about 10 new lots per year (0.25% per year).
- Miscellaneous revenues (jobbing labor, bad debt and other miscellaneous revenues) are budgeted at $161,200 and average about $185,000 over the study period.
- O&M expenditures are based on the FY 2011/12 operating budget, escalated by 2.5% annual inflation, with the exception of employee benefits, which are escalated at 3.5%. O&M expenses range from $2.1 million to $2.7 million by the end of the study period.
- Connection charge revenue, estimated at $6,000 per year (calculated at $600 per new lot), is assumed to be used to help fund capital projects.

- Debt service on existing state loans averages about $213,000 a year over the 10-year study period.
- The annual capital program was provided in 2012 costs, then escalated by 3.0% per year to the year of anticipated construction for each project.
- Future years' debt service payments incorporate impacts of the proposed capital financing plan. State loans assume an interest rate of 1.5% and a 20-year repayment term, and are assumed to fund capital needs in excess of grant and cash funding. Incremental debt service of about $119,000 begins in FY 2012/13, increasing to about $207,000 by the end of the 10-year study period.
- System reinvestment funding (equal to annual depreciation expense) is phased in over the 10-year study period beginning in FY 2013/14 at about $162,000, increasing to about $1.7 million by the end of study period.

6.3 Revenue Requirement Analysis

The revenue requirement analysis determines the total amount of revenue needed each year of the study period to pay O&M costs, capital-related costs, and impacts of financial policies. A capital funding analysis, revenue needs assessment, rate forecast and reserves analysis was prepared for the wastewater utility. Forecasted total financial requirements were compared against forecasted total rate revenue under existing rates to determine annual and cumulative rate adjustments needed to ensure financial sustainability over time. Results are summarized below.

6.3.1 Capital Financing Strategy

The CBS has identified approximately $26 million (escalated) in wastewater capital projects planned for construction through FY 2031/32. Capital spending levels vary from year to year, with an average annual spending of roughly $1.3 million. The capital funding plan assumes a mix of funding from cash balances (including system reinvestment funding from rates) and state grants and loans.

Exhibit 1 summarizes funding sources for the 6-year, 10-year, and 20-year capital programs. As noted previously, the rate strategy and forecast focuses on the 6-and 10-year capital plan, as shown in Exhibit 2.

Exhibit 1: Total Capital Financing Plan

Capital Funding	6-Yr Total	10-Yr Total	20-Yr Total
Total Capital Projects	**$ 13,508,544**	**$ 18,268,045**	**$ 25,882,211**
Grants	7,212,287	8,298,374	11,878,443
State Loans	1,506,282	1,506,282	1,506,282
Capital Fund Balance	4,789,976	8,463,389	12,497,486
Total Funding Sources	**$ 13,508,544**	**$ 18,268,045**	**$ 25,882,211**

6.3.1.1 Six-Year Capital Financing Plan

Of the $26 million in planned capital costs, about $13.5 million, or 52%, is scheduled to occur during the 6-year study period. About $7.2 million (53%) is expected to be funded with grants, another $1.5 million (11%) funded from loans, with the remaining $4.8 million (35%) funded from cash, generated through existing cash balances and system reinvestment funding.

6.3.1.2 Ten-Year Capital Financing Plan

Exhibit 2 summarizes the 10-year capital financing plan (FY 2012/13 - 2021/22).

Exhibit 2: Ten-Year Capital Financing Plan

	FY Ending											
Capital Funding	2013	2014	2015	2016	2017	2018	Subtotal	2019	2020	2021	2022	Total
Total Capital Projects	$ 978,500	$ 1,193,513	$ 1,518,891	$ 2,902,687	$ 3,834,299	$ 3,080,655	$13,508,544	$ 701,028	$ 842,402	$ 1,206,915	$ 2,009,155	$18,268,045
Grants	533,540	-	914,066	1,324,386	2,645,753	1,794,541	7,212,287	-	239,420	-	846,667	8,298,374
State Loans	-	-	-	259,032	662,554	584,695	1,506,282	-	-	-	-	1,506,282
Capital Fund Balance	444,960	1,193,513	604,824	1,319,269	525,992	701,418	4,789,976	701,028	602,983	1,206,915	1,162,488	8,463,389
Total Funding Sources	$ 978,500	$ 1,193,513	$ 1,518,891	$ 2,902,687	$ 3,834,299	$ 3,080,655	$13,508,544	$ 701,028	$ 842,402	$ 1,206,915	$ 2,009,155	$18,268,045

About $18.3 million (71%) of the planned capital needs occur within the 10-year study period. About $8.3 million (45%) is expected to be funded with grants, $1.5 million (8%) funded from loans, with the remaining $8.5 million (46%) funded from cash balances.

Based on this financing plan, the capital program will remain within the suggested debt management policy of funding no more than 75% of the program with debt.

6.3.1.3 Total Capital Financing Plan

The total capital financing plan was summarized in Exhibit 1. Over the 20-year study period, about $11.9 million (46%) is expected to be funded with grants, $1.5 million (6%) funded from loans, with the remaining $12.5 million (48%) funded from cash balances.

6.3.2 Revenue Needs Assessment

Wastewater revenue requirements (summarized in Exhibit 3) reflect the assumptions described herein. Existing rate revenues are based on FY 2011/12 rates, plus growth, prior to any proposed rate increases. Interest earnings are based on the fiscal year's beginning operating account balance. As shown, forecasted revenues under existing rates are not sufficient to meet the needs of the utility over the study period.

Exhibit 3: Revenue Needs Assessment

	FY Ending									
Revenue Requirements	**2013**	**2014**	**2015**	**2016**	**2017**	**2018**	**2019**	**2020**	**2021**	**2022**
Revenues										
Existing Rate Revenues	$ 2,040,062	$ 2,045,162	$ 2,050,275	$ 2,055,401	$ 2,060,539	$ 2,065,691	$ 2,070,855	$ 2,076,032	$ 2,081,222	$ 2,086,425
Other Operating Revenues	166,800	170,970	175,244	179,625	184,116	188,719	193,437	198,273	203,230	208,310
Operating Acct Interest Earnings	15,084	8,660	5,711	3,630	2,317	2,747	2,981	2,814	2,642	2,573
Total Revenues	**$ 2,221,946**	**$ 2,224,792**	**$ 2,231,230**	**$ 2,238,656**	**$ 2,246,973**	**$ 2,257,156**	**$ 2,267,273**	**$ 2,277,118**	**$ 2,287,094**	**$ 2,297,309**
Expenses										
Annual O&M Expenditures	$ 2,117,901	$ 2,174,735	$ 2,233,125	$ 2,293,117	$ 2,354,754	$ 2,418,082	$ 2,483,150	$ 2,550,006	$ 2,618,701	$ 2,689,286
Existing Debt Service	238,500	237,760	237,019	236,280	208,430	207,689	206,950	206,209	205,469	204,729
New Debt Service	118,862	118,862	118,862	118,862	133,950	172,541	206,597	206,597	206,597	206,597
System Reinvestment	-	161,309	327,393	500,203	690,158	901,041	1,118,217	1,314,401	1,515,651	1,726,832
Total Expenses	**$ 2,475,263**	**$ 2,692,667**	**$ 2,916,400**	**$ 3,148,462**	**$ 3,387,292**	**$ 3,699,353**	**$ 4,014,914**	**$ 4,277,213**	**$ 4,546,418**	**$ 4,827,444**
Annual Surplus / (Deficiency)	**$ (253,317)**	**$ (467,875)**	**$ (685,170)**	**$ (909,806)**	**$(1,140,320)**	**$(1,442,197)**	**$(1,747,642)**	**$(2,000,095)**	**$(2,259,324)**	**$(2,530,136)**

A summary of ending fund balances is shown in Exhibit 4.

Exhibit 4: Ending Fund Balances

	FY Ending									
Ending Fund Balances	**2013**	**2014**	**2015**	**2016**	**2017**	**2018**	**2019**	**2020**	**2021**	**2022**
Operating Fund	346,384	285,547	241,975	231,737	274,659	298,120	281,377	264,240	257,325	267,619
Capital Fund	2,522,647	1,559,510	1,319,269	525,992	701,418	943,526	1,376,150	2,107,330	2,443,139	3,037,915
Total	**2,869,031**	**1,845,057**	**1,561,244**	**757,729**	**976,077**	**1,241,646**	**1,657,527**	**2,371,570**	**2,700,464**	**3,305,534**

6.3.3 Rate Schedule

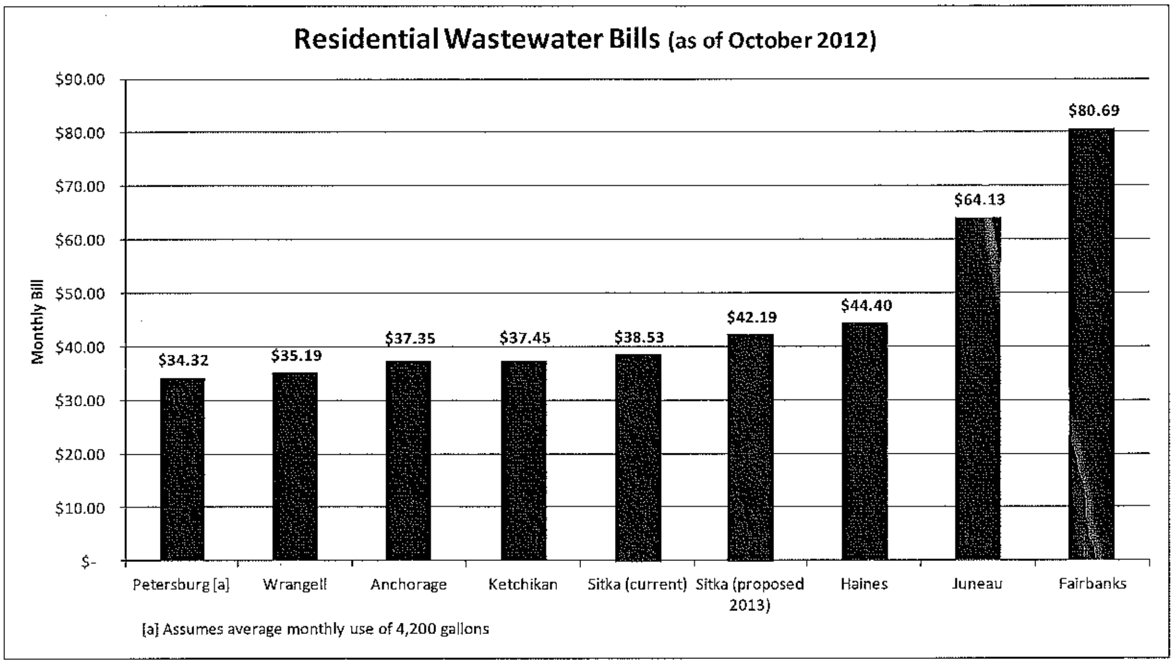
Exhibit 5 presents the proposed rate schedule for the study period. This rate strategy was designed to smooth the necessary rate increases over time, while integrating financial policies, funding the capital program, and meeting the annual operational needs of the wastewater utility.

Exhibit 5: Rate Schedule

		FY Ending									
Rate Forecast	**Existing**	**2013**	**2014**	**2015**	**2016**	**2017**	**2018**	**2019**	**2020**	**2021**	**2022**
Annual Rate Adjustment		9.50%	9.50%	9.50%	9.50%	9.50%	9.50%	6.50%	6.50%	6.50%	6.50%
Cumulative Rate Increase		9.50%	19.90%	31.29%	43.77%	57.42%	72.38%	83.58%	95.52%	108.23%	121.76%
Monthly Residential Rate	$38.53	$42.19	$46.20	$50.59	$55.39	$60.66	$66.42	$70.73	$75.33	$80.23	$85.44
Monthly Dollar Impact		$3.66	$4.01	$4.39	$4.81	$5.26	$5.76	$4.32	$4.60	$4.90	$5.21
Commercial (General, Misc)	$38.53	$42.19	$46.20	$50.59	$55.39	$60.66	$66.42	$70.73	$75.33	$80.23	$85.44
Commercial Specifics (additional)											
Bar, lounge, restaurant (per seat)	$1.93	$2.11	$2.31	$2.53	$2.77	$3.03	$3.32	$3.54	$3.77	$4.01	$4.27
Barber, beauty shop (per station)	$23.12	$25.31	$27.72	$30.35	$33.24	$36.39	$39.85	$42.44	$45.20	$48.14	$51.27
Bowling alley (per lane)	$38.53	$42.19	$46.20	$50.59	$55.39	$60.66	$66.42	$70.73	$75.33	$80.23	$85.44
Church (per 10 seats)	$3.85	$4.22	$4.62	$5.06	$5.54	$6.07	$6.64	$7.07	$7.53	$8.02	$8.54
Office/office space (over 10 emp.)	$7.71	$8.44	$9.24	$10.12	$11.08	$12.13	$13.28	$14.15	$15.07	$16.05	$17.09
Hospital (per bed)	$30.82	$33.75	$36.96	$40.47	$44.31	$48.52	$53.13	$56.59	$60.27	$64.18	$68.36
Meat Market	$115.59	$126.57	$138.60	$151.76	$166.18	$181.97	$199.25	$212.20	$226.00	$240.69	$256.33
Grocery store	$308.24	$337.52	$369.59	$404.70	$443.14	$485.24	$531.34	$565.88	$602.66	$641.83	$683.55
Rest Home (per bed)	$7.71	$8.44	$9.24	$10.12	$11.08	$12.13	$13.28	$14.15	$15.07	$16.05	$17.09
Hotel/motel (per room)	$11.56	$12.66	$13.86	$15.18	$16.62	$18.20	$19.93	$21.22	$22.60	$24.07	$25.63
Dormitory/boarding house (per bed)	$11.56	$12.66	$13.86	$15.18	$16.62	$18.20	$19.93	$21.22	$22.60	$24.07	$25.63
Bed & breakfast (per room)	$5.78	$6.33	$6.93	$7.59	$8.31	$9.10	$9.96	$10.61	$11.30	$12.03	$12.82
Commercial Laundry (per wet machine)	$308.24	$337.52	$369.59	$404.70	$443.14	$485.24	$531.34	$565.88	$602.66	$641.83	$683.55
Launderette (per wet machine)	$38.53	$42.19	$46.20	$50.59	$55.39	$60.66	$66.42	$70.73	$75.33	$80.23	$85.44
Schools, college, day care (per 10 students)	$15.41	$16.88	$18.48	$20.23	$22.16	$24.26	$26.57	$28.29	$30.13	$32.09	$34.18
Theater (per 10 seats)	$7.71	$8.44	$9.24	$10.12	$11.08	$12.13	$13.28	$14.15	$15.07	$16.05	$17.09
Car wash (per stall); no minimum	$77.06	$84.38	$92.40	$101.17	$110.79	$121.31	$132.84	$141.47	$150.67	$160.46	$170.89
Sewer Service with Metered Water											
Base Rate	$38.53	$42.19	$46.20	$50.59	$55.39	$60.66	$66.42	$70.73	$75.33	$80.23	$85.44
Volume Rate (per kgal)	$1.93	$2.11	$2.31	$2.53	$2.77	$3.04	$3.33	$3.54	$3.77	$4.02	$4.28

For informational purposes only, Exhibit 6 presents a comparison of residential wastewater bills and proposed rates with a sampling of neighboring jurisdictions.

Exhibit 6: Comparison of Residential Wastewater Bills



APPENDIX A

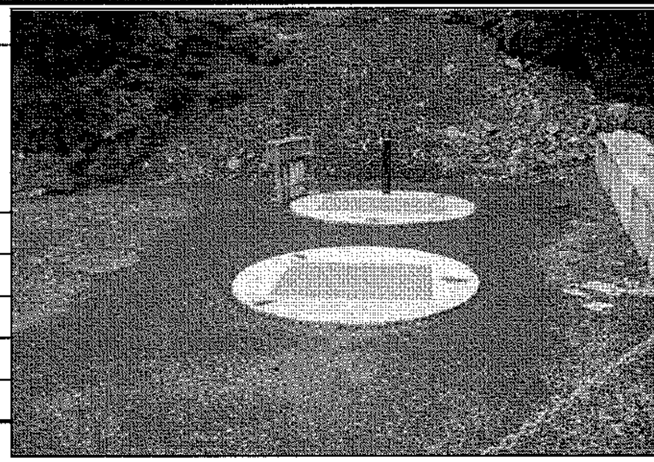
Lift Station Inventory Forms

Lift Station Name

Cove Lift Station

Location	

Lift Station Data



Year Constructed	2010
Type	
Submersible	X
Suction Lift	
Dry Pit	
Wet Well Diameter	
Wet Well Lid Elev	
Wet Well Invert Elev	
Wet Well Depth	
Force Main Diameter	

Electrical Data

Motor Horsepower	6.5
Voltage	480
Phase	3

Pump Data

Date Pumps Installed	2010
Manufacturer	FLYGT
Pump Model	NP3102.095SH
Design Flow Rate	
Design Discharge Head	49'
Pump 1 Measured Flow Rate	
Date Measured	
Pump 2 Measured Flow Rate	
Date Measured	

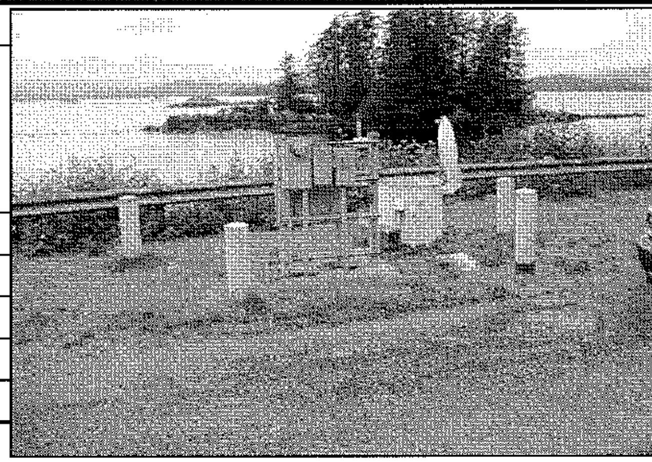
Comments

1) 2 pump station

Capital Improvements

Lift Station Name	
Old Sitka Rocks Lift Station	
Location	

Lift Station Data



Year Constructed	1985
Type	
Submersible	
Suction Lift	
Dry Pit	X
Wet Well Diameter	
Wet Well Lid Elev	
Wet Well Invert Elev	
Wet Well Depth	
Force Main Diameter	

Electrical Data

Motor Horsepower	7.5
Voltage	480
Phase	3

Pump Data

Date Pumps Installed	
Manufacturer	Cornell
Pump Model	4NNT-YM
Design Flow Rate	185 gpm
Design Discharge Head	42'
Pump 1 Measured Flow Rate	128
Date Measured	1/13/2003
Pump 2 Measured Flow Rate	122
Date Measured	1/13/2003

Comments

1) 2 Pump Station

Capital Improvements

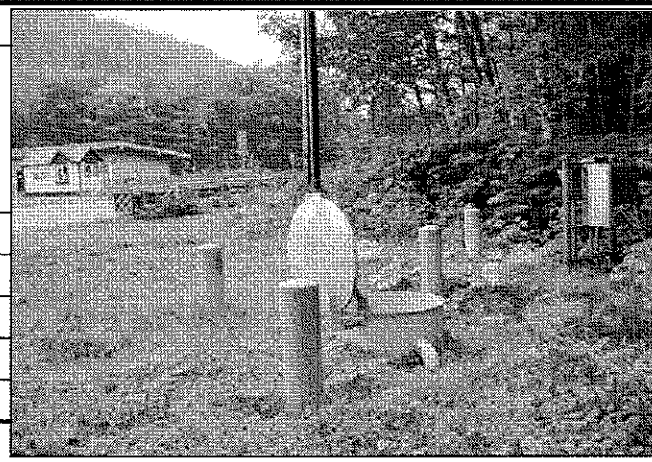
None.

Lift Station Name

Granite Creek Lift Station

Location	

Lift Station Data



Year Constructed	1985	
Type		
	Submersible	
	Suction Lift	
	Dry Pit	X
Wet Well Diameter		
Wet Well Lid Elev		
Wet Well Invert Elev	15.40'	
Wet Well Depth		
Force Main Diameter	5" HDPE	

Electrical Data

Motor Horsepower	2
Voltage	480
Phase	3

Pump Data

Date Pumps Installed	
Manufacturer	Cornell
Pump Model	4 NNT-VM
Design Flow Rate	235 gpm
Design Discharge Head	17'
Pump 1 Measured Flow Rate	163
Date Measured	1/13/2003
Pump 2 Measured Flow Rate	165
Date Measured	1/13/2003

Comments

1) Record Drawing From Cove Interceptor (Granite Creek Interceptor to Cove) Sheets 3,10,12
2) 2 Pump Station

Capital Improvements

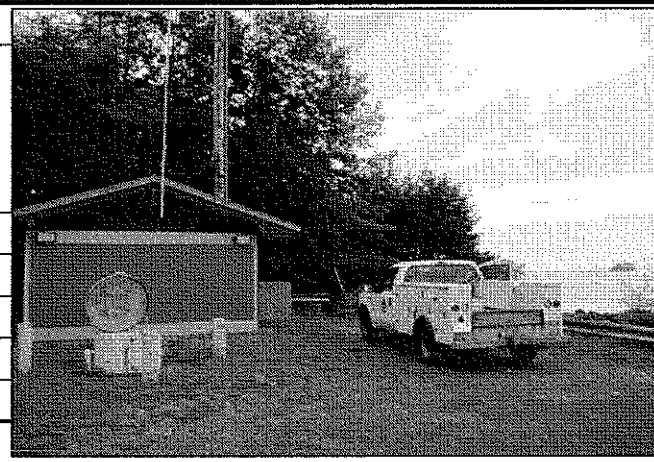
None.

Lift Station Name

Halibut Point Lift Station

Location	

Lift Station Data



Year Constructed	1984
Type	
Submersible	
Suction Lift	
Dry Pit	X
Wet Well Diameter	8.0' X 9.0'
Wet Well Lid Elev	18.00'
Wet Well Invert Elev	3.17'
Wet Well Depth	14.83'
Force Main Diameter	10"

Electrical Data

Motor Horsepower	7.5
Voltage	200
Phase	3

Pump Data

Date Pumps Installed	1984
Manufacturer	Cornell
Pump Model	6NHT-VM
Design Flow Rate	650 gpm
Design Discharge Head	20'
Pump 1 Measured Flow Rate	702
Date Measured	2/22/1993
Pump 2 Measured Flow Rate	687
Date Measured	2/22/1993

Comments

1) 3 Pump Station
2) Record Drawings From Granite Creek Interceptor (Granite Creek to City Limits) Sheet 16

Capital Improvements

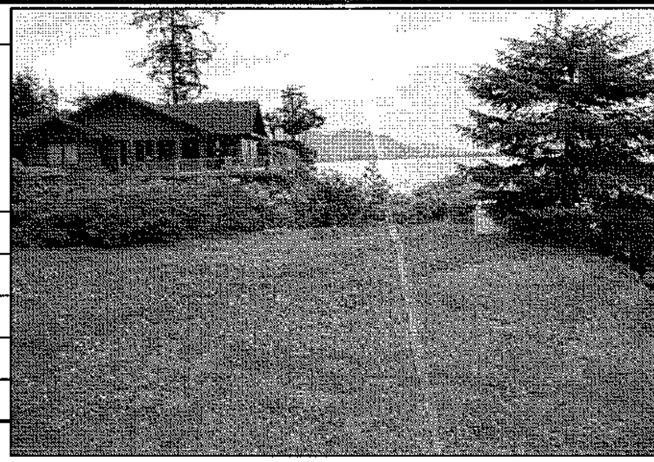
None.

Lift Station Name

Channel Lift Station

Location	

Lift Station Data



Year Constructed	1984
Type	
Submersible	
Suction Lift	
Dry Pit	X
Wet Well Diameter	
Wet Well Lid Elev	
Wet Well Invert Elev	
Wet Well Depth	
Force Main Diameter	

Electrical Data

Motor Horsepower	3
Voltage	230
Phase	1

Pump Data

Date Pumps Installed	1984 1 Compressor Replaced 1985
Manufacturer	Speedaire Compressor
Pump Model	Pneumatic Ejector 32172
Design Flow Rate	
Design Discharge Head	
Pump 1 Measured Flow Rate	
Date Measured	
Pump 2 Measured Flow Rate	
Date Measured	

Comments

1) 2 Airpots 2 Compressors

Capital Improvements

1) No vehicle access to lift station. Need to provide vehicle access to lift station.

2) Lift Station in poor shape and needs to be replaced with new lower maintenance submersible pump lift station.

Lift Station Name

Sandy Beach Lift Station

Location	

Lift Station Data

Year Constructed	1984
Type	
Submersible	
Suction Lift	
Dry Pit	X
Wet Well Diameter	14.0' X 9.0'
Wet Well Lid Elev	24.00'
Wet Well Invert Elev	2.00'
Wet Well Depth	22.00'
Force Main Diameter	12"

Electrical Data

Motor Horsepower	7.5
Voltage	200
Phase	3

Pump Data

Date Pumps Installed	1984
Manufacturer	Cornell
Pump Model	6 NHT-VM
Design Flow Rate	645 GPM
Design Discharge Head	20'
Pump 1 Measured Flow Rate	445
Date Measured	1/14/2003
Pump 2 Measured Flow Rate	485
Date Measured	1/14/2003
Pump 3 Measured Flow Rate	433
Date Measured	1/14/2003

Comments

1) Record Drawings From Granite Creek Interceptor (Granite Creek to City Limits) Sheet 16
2) 3 Pump Station

Capital Improvements

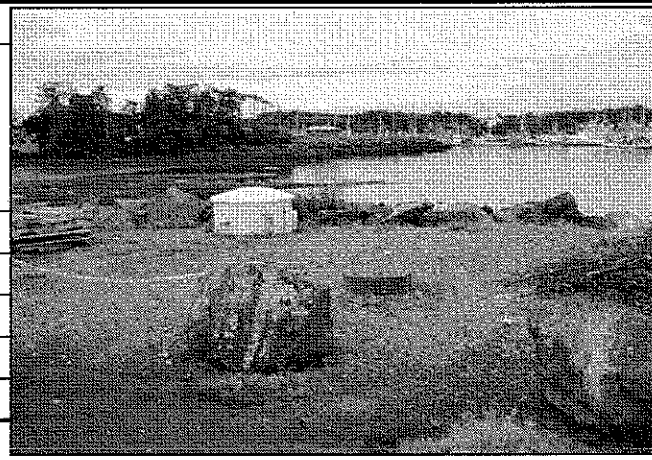
None.

Lift Station Name

Brady Lift Station

Location	

Lift Station Data



Year Constructed	1983
Type	
Submersible	
Suction Lift	
Dry Pit	X
Wet Well Diameter	9'X14' Rectangle
Wet Well Lid Elev	16.0'
Wet Well Invert Elev	
Wet Well Depth	
Force Main Diameter	14"

Electrical Data

Motor Horsepower	25/14
Voltage	460
Phase	3

Pump Data

Date Pumps Installed	1983
Manufacturer	Allis Chalmers
Pump Model	400
Design Flow Rate	2490 High 1620 Low
Design Discharge Head	21'
Pump 1 Measured Flow Rate	
Date Measured	
Pump 2 Measured Flow Rate	
Date Measured	

Comments

1) Brady Lift Station has three pumps. Halibut Point Road Interceptor 9 of 11.

2) Record Drawings From Lift Station Brady Street Sheets 9,10

3) No VFD Pump runs low and kicks into high with larger flows.

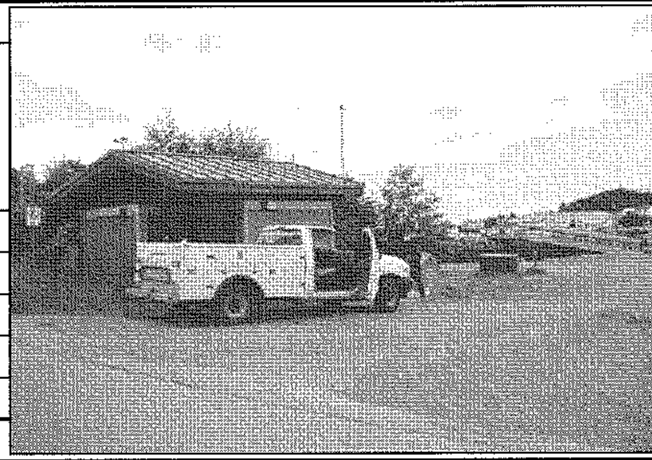
1) Plug valve has failed in the dry pit and there is no way to isolate pumps for maintenance. Plug valve needs to be replaced.

Lift Station Name

Old Thomsen Harbor Lift Station

Location	

Lift Station Data



Year Constructed	1982
Type	
Submersible	
Suction Lift	
Dry Pit	X
Wet Well Diameter	9.0' X 15.0'
Wet Well Lid Elev	6.51'
Wet Well Invert Elev	-6.7'
Wet Well Depth	13.21'
Force Main Diameter	16" and 12"

Electrical Data

Motor Horsepower	#1 60 on VFD	#2- #3 100
Voltage	460	460
Phase	3	3

Pump Data

Date Pumps Installed		1982
Manufacturer	Allis Chalmers	Allis Chalmers
Pump Model	NSWV	NSWV
Design Flow Rate		3340 High 1470 Low
Design Discharge Head		#2-80' #3-56'
Pump 1 Measured Flow Rate		
Date Measured		
Pump 2 Measured Flow Rate		
Date Measured		

Comments

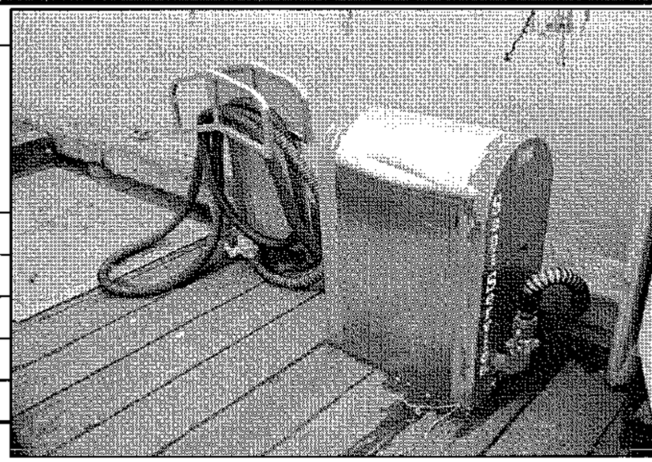
1) Old Thomsen Harbor Lift Station has three pumps.
2) Main lift station to pump wastewater from downtown to the wastewater treatment plant.
3) Record Drawings From Lift Stations Thomsen Harbor Sheets 13,14,15,16,27,30,31
4) 3 Pump Station

Capital Improvements

1) Need to add a brine electrolosis disinfection system to add hypochlorite for odor control at the wastewater treatment plant.

Lift Station Name			
New Thomsen Harbor Lift Station			
Location			

Lift Station Data



Year Constructed	
Type	
Submersible	
Suction Lift	X
Dry Pit	
Wet Well Diameter	
Wet Well Lid Elev	
Wet Well Invert Elev	
Wet Well Depth	
Force Main Diameter	

Electrical Data

Motor Horsepower	1.5	1.5	1.5
Voltage	230	230	230
Phase	1	1	1

Pump Data

Date Pumps Installed		At Old Thompsen	At Crescent Harbor
Manufacturer	ABS	ABS	ABS
Pump Model	Piranha	Piranha	S20
Design Flow Rate	30	30	35
Design Discharge Head			
Pump 1 Measured Flow Rate			
Date Measured			
Pump 2 Measured Flow Rate			
Date Measured			

Comments

1) Small suction lift system to pump waste water from vessel on-board holding tanks.
2) Lift station only has a single pump.

Capital Improvements

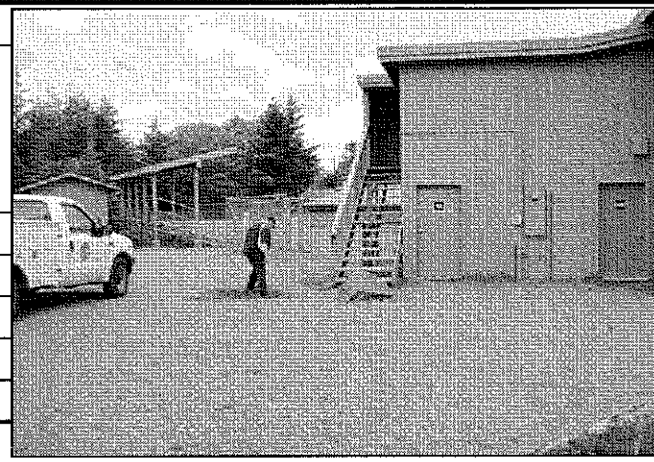
None.

Lift Station Name

Blatchley Lift Station

Location	

Lift Station Data



Year Constructed	mid 1990's
Type	
Submersible	X
Suction Lift	
Dry Pit	
Wet Well Diameter	5.0'
Wet Well Lid Elev	38.0'
Wet Well Invert Elev	31.49'
Wet Well Depth	6.51'
Force Main Diameter	

Electrical Data

Motor Horsepower	1.4
Voltage	230
Phase	1

Pump Data

Date Pumps Installed	mid 1990s
Manufacturer	ABS
Pump Model	Piranha Grinder
Design Flow Rate	30 gpm
Design Discharge Head	8'
Pump 1 Measured Flow Rate	
Date Measured	
Pump 2 Measured Flow Rate	
Date Measured	

Comments

1) Small submerisble pump serving the ball field.
2) Lift station only has a single pump.
3) Record Drawings From Blatchley Jr. High School Sewer Improvement Details Sheet 3.02

Capital Improvements

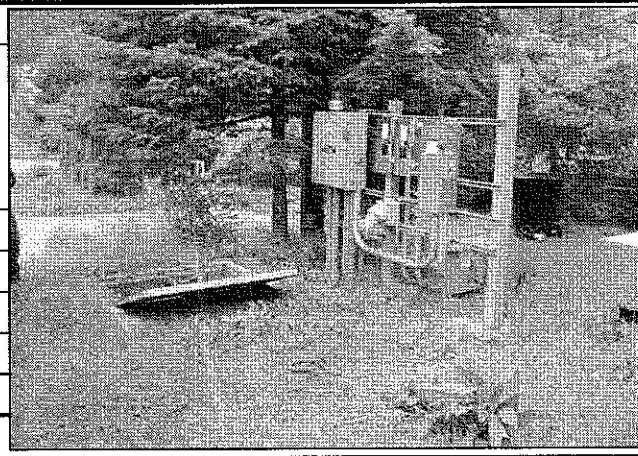
None.

Lift Station Name

Monastery Street Lift Station

Location	

Lift Station Data



Year Constructed		
Type		
	Submersible	X
	Suction Lift	
	Dry Pit	
Wet Well Diameter		
Wet Well Lid Elev		
Wet Well Invert Elev	17.6	
Wet Well Depth		
Force Main Diameter	4" P.V.C.	

Electrical Data

Motor Horsepower	
Voltage	
Phase	

Pump Data

Date Pumps Installed	
Manufacturer	
Pump Model	
Design Flow Rate	
Design Discharge Head	
Pump 1 Measured Flow Rate	
Date Measured	
Pump 2 Measured Flow Rate	
Date Measured	

Comments

1) Record Drawings From Sirstad St. Lift Station Sheet 31.

Capital Improvements

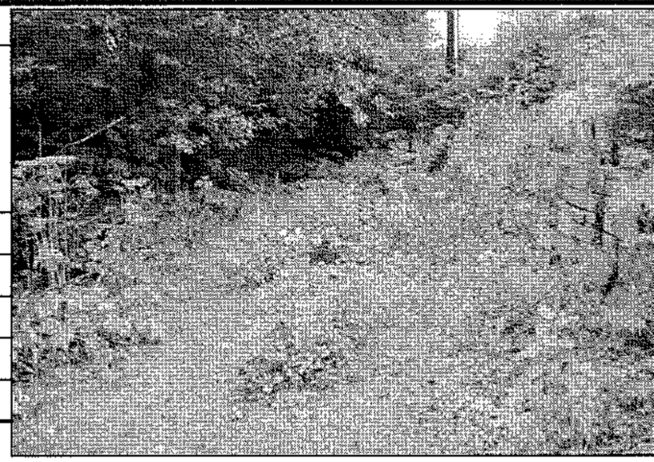
None.

Lift Station Name

Lake Street Lift Station

Location	

Lift Station Data



Year Constructed	
Type	
Submersible	X
Suction Lift	
Dry Pit	
Wet Well Diameter	
Wet Well Lid Elev	
Wet Well Invert Elev	22.0'
Wet Well Depth	
Force Main Diameter	4"

Electrical Data

Motor Horsepower	5
Voltage	208
Phase	Wild Leg Delta

Pump Data

Date Pumps Installed	
Manufacturer	Paco
Pump Model	QDN-495
Design Flow Rate	
Design Discharge Head	
Pump 1 Measured Flow Rate	182
Date Measured	1/14/2003
Pump 2 Measured Flow Rate	200
Date Measured	1/14/2003

Comments

1) Lift station may not be located in public right-of-way. Property survey needs to be conducted to locate property lines and right-of-way.
2) Record Drawings From Lake Street Sewer and Sewer Lift Station Sheets 1,2
3) 2 Pump Station

Capital Improvements

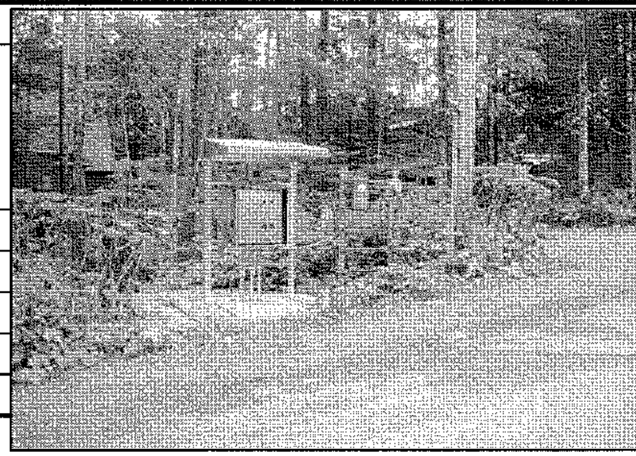
1) Lift station and control panel needs to be completely replaced.

Lift Station Name

Wachusetts Lift Station

Location	

Lift Station Data



Year Constructed	2009	
Type		
	Submersible	X
	Suction Lift	
	Dry Pit	
Wet Well Diameter		
Wet Well Lid Elev		
Wet Well Invert Elev		
Wet Well Depth		
Force Main Diameter	4" A.C.	

Electrical Data

Motor Horsepower	2
Voltage	230
Phase	1

Pump Data

Date Pumps Installed	2009
Manufacturer	ABS
Pump Model	S20
Design Flow Rate	35 gpm
Design Discharge Head	
Pump 1 Measured Flow Rate	
Date Measured	
Pump 2 Measured Flow Rate	
Date Measured	

Comments

1) Record Drawings From Wachusetts Street Sewer Sheet 1
2) Pump Station

Capital Improvements

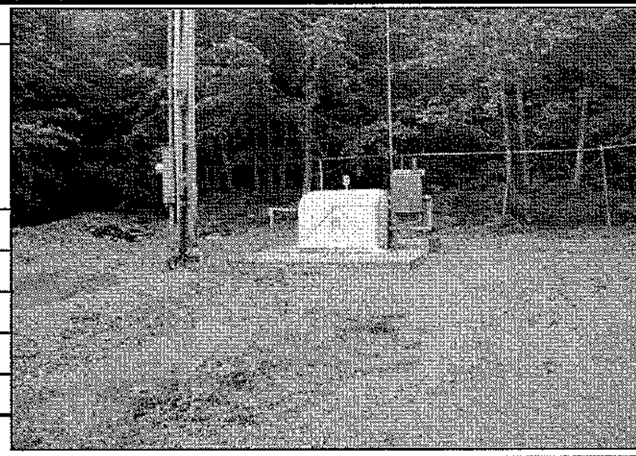
None.

Lift Station Name

Landfill Lift Station

Location	

Lift Station Data



Year Constructed	2001	
Type		
	Submersible	
	Suction Lift	X
	Dry Pit	
Wet Well Diameter		
Wet Well Lid Elev		
Wet Well Invert Elev		
Wet Well Depth		
Force Main Diameter		

Electrical Data

Motor Horsepower	10
Voltage	460
Phase	3

Pump Data

Date Pumps Installed	2001
Manufacturer	Hydronix
Pump Model	40 MP
Design Flow Rate	
Design Discharge Head	
Pump 1 Measured Flow Rate	222
Date Measured	4/21/2005
Pump 2 Measured Flow Rate	235
Date Measured	4/21/2005

Comments

1) 2 pump station.

Capital Improvements

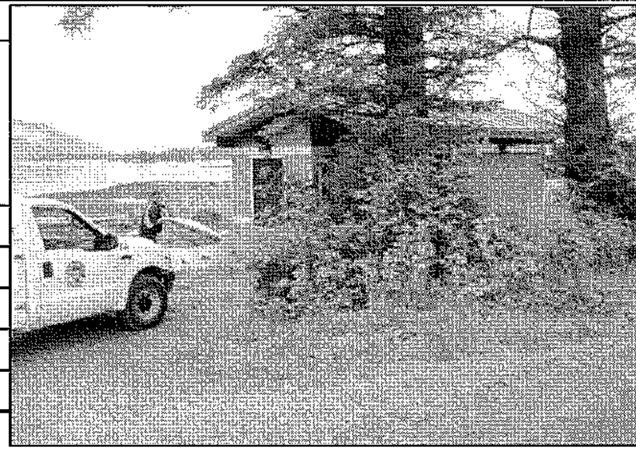
None.

Lift Station Name

Eagle Way Lift Station

Location	

Lift Station Data



Year Constructed	1984	
Type		
	Submersible	
	Suction Lift	
	Dry Pit	X
Wet Well Diameter		
Wet Well Lid Elev		
Wet Well Invert Elev		
Wet Well Depth		
Force Main Diameter		

Electrical Data

Motor Horsepower	25
Voltage	208
Phase	3

Pump Data

Date Pumps Installed	1984 #1 Replaced in 2002
Manufacturer	Fairbanks Morse
Pump Model	B5433C
Design Flow Rate	870 gpm
Design Discharge Head	69.5
Pump 1 Measured Flow Rate	750
Date Measured	1/14/2003
Pump 2 Measured Flow Rate	567
Date Measured	1/14/2003

Comments

1) 2 Pump Station
2) Inlet and Discharge Pipe are 10". Pump size is 4". Pump needs to be properly sized.

Capital Improvements

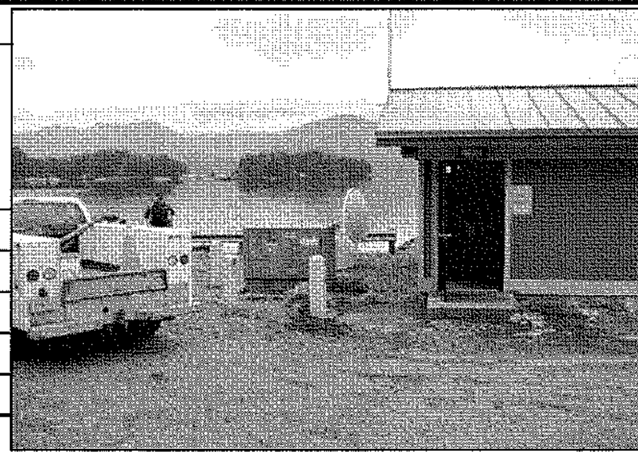
None.

Lift Station Name

Jamestown Lift Station

Location	

Lift Station Data



Year Constructed	1984
Type	
Submersible	
Suction Lift	
Dry Pit	X
Wet Well Diameter	8.0'
Wet Well Lid Elev	19.4'
Wet Well Invert Elev	-0.3'
Wet Well Depth	19.7'
Force Main Diameter	8"

Electrical Data

Motor Horsepower	
Voltage	
Phase	

Pump Data

Date Pumps Installed	March 1984
Manufacturer	Fairbanks Morse
Pump Model	5432 c
Design Flow Rate	580 gpm
Design Discharge Head	21'
Pump 1 Measured Flow Rate	490
Date Measured	1/14/2003 (New Impeller Installed 2009)
Pump 2 Measured Flow Rate	440
Date Measured	1/14/2003 (New Impeller Installed 2009)

Comments

1) Record Drawings From Jamestown Bay Interceptor Jamestown Bay to City Limits Sheet 12,14,23.
2) Both pumps need to be replaced. Pumps need to be properly sized.

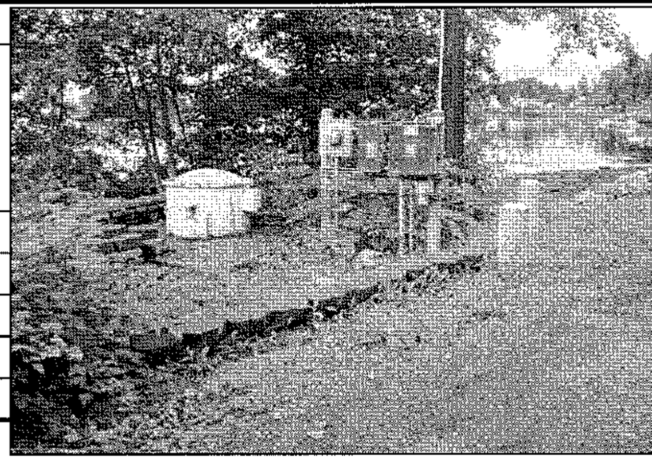
Capital Improvements

1) 2 Pump Station

Lift Station Name

East Jamestown Lift Station	
Location	

Lift Station Data



Year Constructed	1985
Type	
Submersible	
Suction Lift	
Dry Pit	X
Wet Well Diameter	4.0'
Wet Well Lid Elev	15.8
Wet Well Invert Elev	8.0'
Wet Well Depth	7.8'
Force Main Diameter	4"

Electrical Data

Motor Horsepower	3 - 1750 RPM
Voltage	230
Phase	1

Pump Data

Date Pumps Installed	March 6 1985
Manufacturer	UseMCD L.S. Quincy Compressor
Pump Model	Pneumatic Ejector
Design Flow Rate	50
Design Discharge Head	25
Pump 1 Measured Flow Rate	
Date Measured	
Pump 2 Measured Flow Rate	
Date Measured	

Comments

1) Lift station is only serving one house.
2) Record Drawings From Jamestown Bay Interceptor Jamestown Bay to City Limits Sheet 8.2
3) 1 Pot, 2 Compressors

Capital Improvements

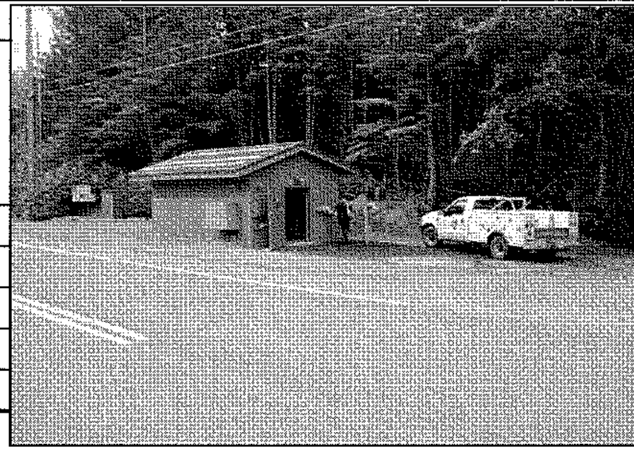
1) Plan to replace lift station pumps with a residential grinder pump such as a Barnes Pump.
2) Add water header to lift station location to serve beach houses on Jamestown Bay that do not have access to CBS water system.

Lift Station Name

Blueberry Lane Lift Station

Location	

Lift Station Data



Year Constructed		
Type		
	Submersible	X
	Suction Lift	
	Dry Pit	
Wet Well Diameter	8' Diameter	
Wet Well Lid Elev	70.0'	
Wet Well Invert Elev	59.8'	
Wet Well Depth	10.2'	
Force Main Diameter	6" Dia HDPE	

Electrical Data

Motor Horsepower	18 hp
Voltage	480 v
Phase	3 Phase

Pump Data

Date Pumps Installed	
Manufacturer	Flygt
Pump Model	Model NP3153 454 Impeller
Design Flow Rate	210 gpm
Design Discharge Head	105'
Pump 1 Measured Flow Rate	262 gpm
Date Measured	8/28/2007
Pump 2 Measured Flow Rate	259 gpm
Date Measured	8'28'2007

Comments

No comments.

Capital Improvements

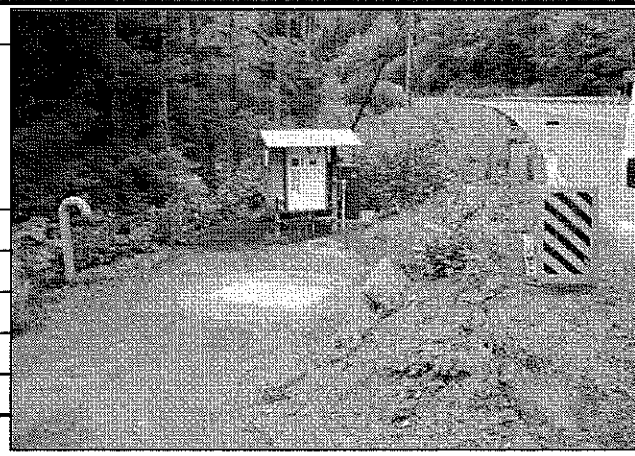
None.

Lift Station Name

Peace Lane

Location	

Lift Station Data



Year Constructed	2007
Type	
Submersible	X
Suction Lift	
Dry Pit	
Wet Well Diameter	8' Diameter
Wet Well Lid Elev	51.0'
Wet Well Invert Elev	40.6'
Wet Well Depth	10.4'
Force Main Diameter	6-inch

Electrical Data

Motor Horsepower	7.5 HP
Voltage	480 v
Phase	3 Phase

Pump Data

Date Pumps Installed	August, 2007
Manufacturer	Flygt
Pump Model	NP3127 489 Impeller
Design Flow Rate	210 gpm
Design Discharge Head	48'
Pump 1 Measured Flow Rate	242 gpm
Date Measured	8/29/2007
Pump 2 Measured Flow Rate	248 gpm
Date Measured	8/29/2007

Comments

No comments.

Capital Improvements

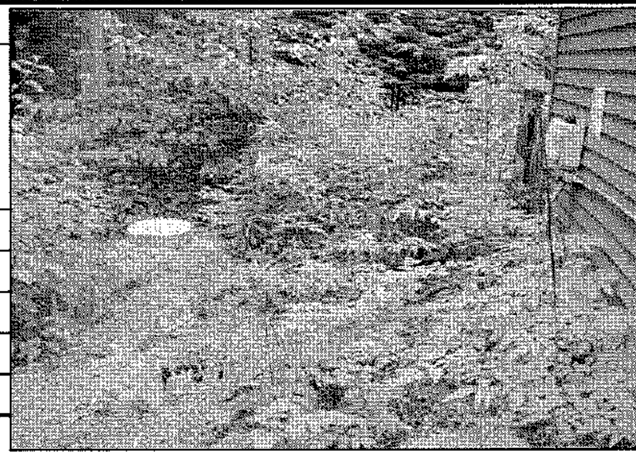
None.

Lift Station Name

Whale Park Lift Station

Location	

Lift Station Data



Year Constructed		
Type		
	Submersible	X
	Suction Lift	
	Dry Pit	
Wet Well Diameter	29.5"	
Wet Well Lid Elev	82.00'	
Wet Well Invert Elev	74.35'	
Wet Well Depth	7.65'	
Force Main Diameter	1 1/4"	

Electrical Data

Motor Horsepower	1 HP
Voltage	240v
Phase	1 Phase

Pump Data

Date Pumps Installed	August, 2007
Manufacturer	EOne Corporation
Pump Model	Model 1020 Residential Grinder Pump
Design Flow Rate	15 gpm @ 0' TDH, 9 gpm @ 138' TDH
Design Discharge Head	25'
Pump 1 Measured Flow Rate	
Date Measured	
Pump 2 Measured Flow Rate	
Date Measured	

Comments

1) Lift station only has one pump and handles flows from the Whale Park bathrooms.

Capital Improvements

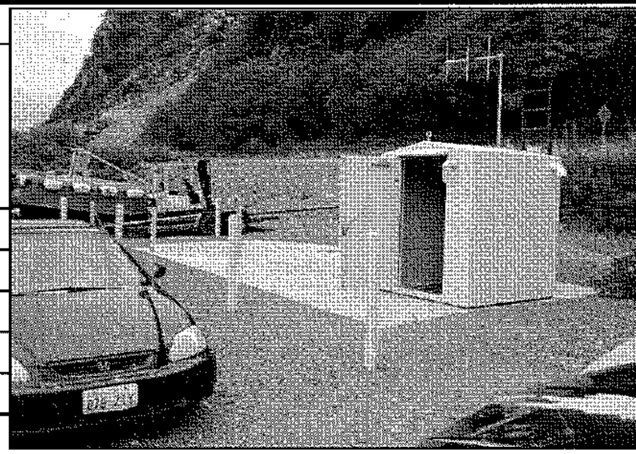
None.

Lift Station Name

Sawmill Cove Lift Station

Location	

Lift Station Data



Year Constructed	2011
Type	
Submersible	X
Suction Lift	
Dry Pit	
Wet Well Diameter	8' diameter
Wet Well Lid Elev	20.0'
Wet Well Invert Elev	8.5'
Wet Well Depth	11.5'
Force Main Diameter	6" HDPE

Electrical Data

Motor Horsepower	11 HP
Voltage	480v
Phase	3 Phase

Pump Data

Date Pumps Installed	1/25/2011
Manufacturer	Flygt
Pump Model	NP3127 w/ 248 Impeller
Design Flow Rate	175 gpm
Design Discharge Head	105'
Pump 1 Measured Flow Rate	165 gpm
Date Measured	1/25/2011
Pump 2 Measured Flow Rate	167 gpm
Date Measured	1/25/2011

Comments

No comments.

Capital Improvements

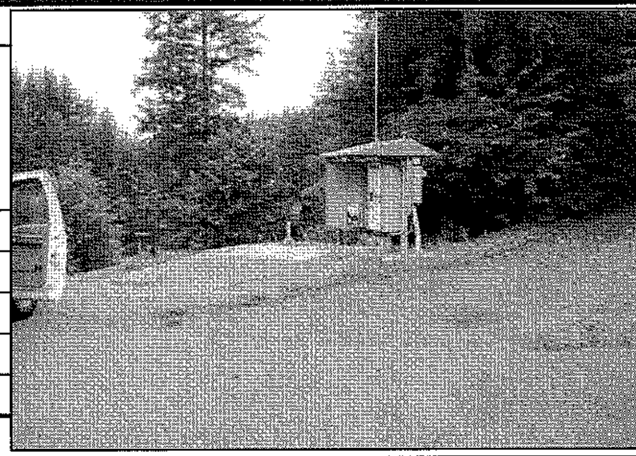
None.

Lift Station Name

Rands Drive Lift Station

Location	

Lift Station Data



Year Constructed		
Type		
	Submersible	X
	Suction Lift	
	Dry Pit	
Wet Well Diameter	8' diameter	
Wet Well Lid Elev	54.85'	
Wet Well Invert Elev	39.26'	
Wet Well Depth	15.59'	
Force Main Diameter	4" HDPE	

Electrical Data

Motor Horsepower	15 hp
Voltage	480v
Phase	3 Phase

Pump Data

Date Pumps Installed	21-Aug-02
Manufacturer	Ebara
Pump Model	
Design Flow Rate	
Design Discharge Head	
Pump 1 Measured Flow Rate	150 gpm
Date Measured	8/21/2002
Pump 2 Measured Flow Rate	141 gpm
Date Measured	8/21/2002

Comments

No comments.

Capital Improvements

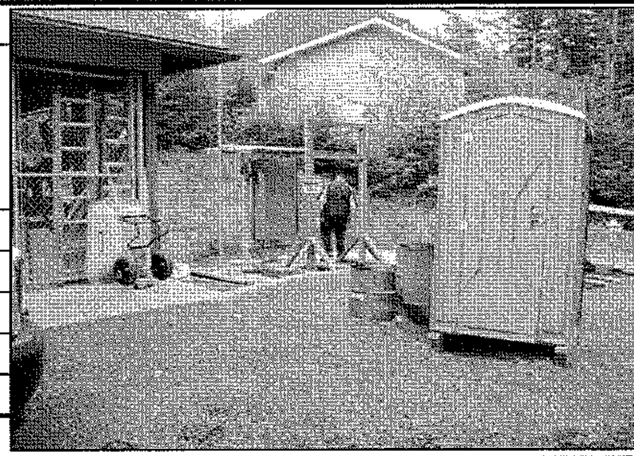
None.

Lift Station Name

New BIHA Indian River Lift Station

Location	

Lift Station Data



Year Constructed	2008	
Type		
	Submersible	X
	Suction Lift	
	Dry Pit	
Wet Well Diameter	6'	
Wet Well Lid Elev		
Wet Well Invert Elev		
Wet Well Depth	9' 6"	
Force Main Diameter		

Electrical Data

Motor Horsepower	3
Voltage	480
Phase	3

Pump Data

Date Pumps Installed	2008 (Start Up Day 11/14/08)
Manufacturer	FLYGT
Pump Model	NP3085.092
Design Flow Rate	119 GPM
Design Discharge Head	21'
Pump 1 Measured Flow Rate	
Date Measured	
Pump 2 Measured Flow Rate	
Date Measured	

Comments

1) 2 pump station

Capital Improvements

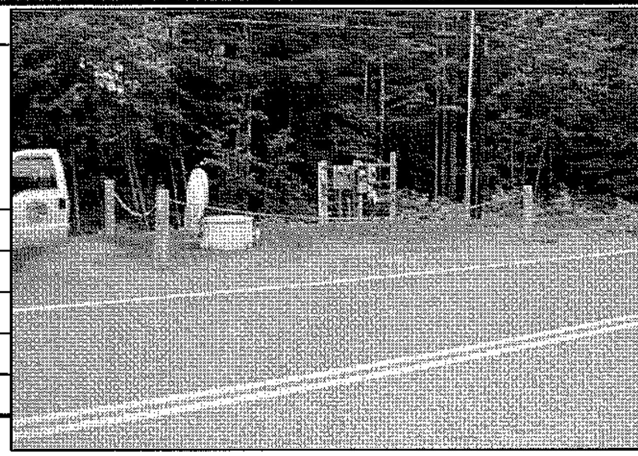
None.

Lift Station Name

BIHA Indian River Lift Station

Location	

Lift Station Data



Year Constructed		
Type		
	Submersible	
	Suction Lift	
	Dry Pit	X
Wet Well Diameter		
Wet Well Lid Elev		
Wet Well Invert Elev		
Wet Well Depth		
Force Main Diameter		

Electrical Data

Motor Horsepower	
Voltage	
Phase	

Pump Data

Date Pumps Installed	
Manufacturer	Hydronix
Pump Model	40 MP
Design Flow Rate	
Design Discharge Head	
Pump 1 Measured Flow Rate	103
Date Measured	1/15/2003
Pump 2 Measured Flow Rate	101
Date Measured	1/15/2003

Comments

1) 2 Pump Station

Capital Improvements

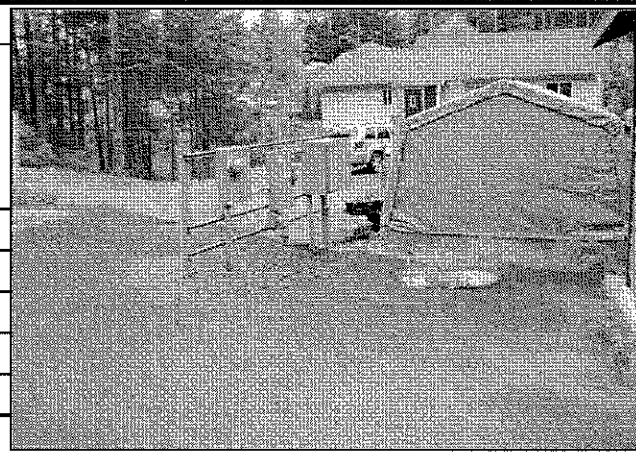
None.

Lift Station Name

BIHA EOne Indian River Lift Station

Location	

Lift Station Data



Year Constructed	1998
Type	
Submersible	X
Suction Lift	
Dry Pit	
Wet Well Diameter	
Wet Well Lid Elev	
Wet Well Invert Elev	
Wet Well Depth	
Force Main Diameter	

Electrical Data

Motor Horsepower	2
Voltage	230
Phase	1

Pump Data

Date Pumps Installed	
Manufacturer	E-One
Pump Model	
Design Flow Rate	14 gpm
Design Discharge Head	
Pump 1 Measured Flow Rate	
Date Measured	
Pump 2 Measured Flow Rate	
Date Measured	

Comments

No comments.

Capital Improvements

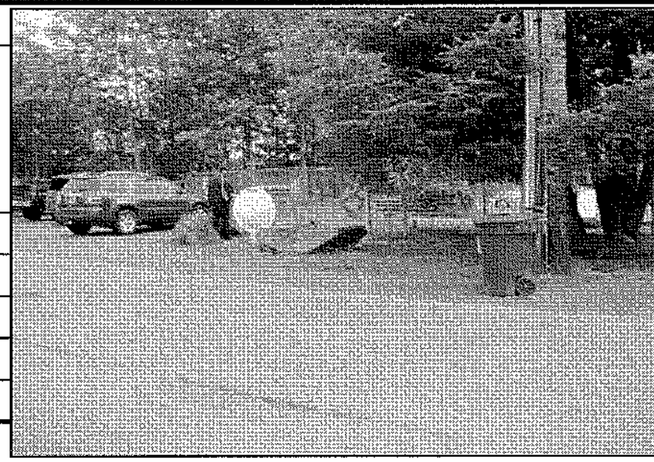
None.

Lift Station Name

Crescent Lift Station

Location	

Lift Station Data



Year Constructed	1983
Type	
Submersible	
Suction Lift	
Dry Pit	X
Wet Well Diameter	4.0'
Wet Well Lid Elev	19.8'
Wet Well Invert Elev	12.54'
Wet Well Depth	7.26
Force Main Diameter	4"

Electrical Data

Motor Horsepower	2
Voltage	230
Phase	1

Pump Data

Date Pumps Installed	Late 90's
Manufacturer	ABS
Pump Model	S20
Design Flow Rate	40 GPM
Design Discharge Head	34'
Pump 1 Measured Flow Rate	
Date Measured	
Pump 2 Measured Flow Rate	
Date Measured	

Comments

1) **Record Drawings From Jamestown Bay Interceptor Jamestown Bay to City Limits Sheet 13,26**
2) **2 Pump Station**

Capital Improvements

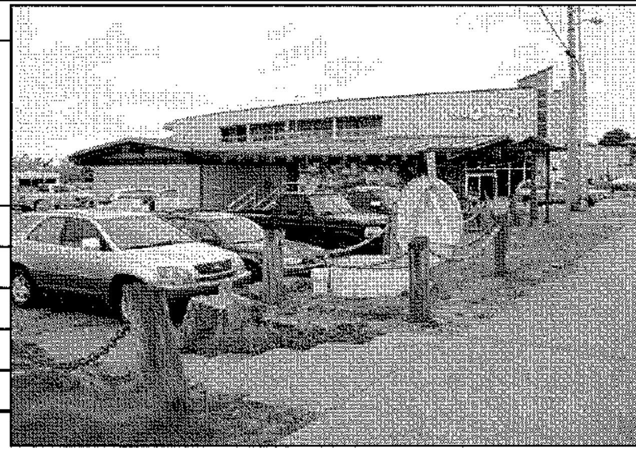
1) **Pump station needs to be replaced with new lift station with submersible pumps.**

Lift Station Name

Lincoln Street Lift Station

Location	

Lift Station Data



Year Constructed	1982
Type	
Submersible	
Suction Lift	
Dry Pit	X
Wet Well Diameter	14.0'X9.0'
Wet Well Lid Elev	
Wet Well Invert Elev	-2.4'
Wet Well Depth	10' 8-1/2"
Force Main Diameter	14"

Electrical Data

Motor Horsepower	#1 20 on VFD	#2 and #3
Voltage	460	460
Phase	3	3

Pump Data

Date Pumps Installed	2011	1982
Manufacturer	Allis Chalmers	Allis Chalmers
Pump Model	NSWV	NSWV
Design Flow Rate		Low 1250 gpm High 2150 gpm
Design Discharge Head		Low 23' High 40'
Pump 1 Measured Flow Rate		
Date Measured		
Pump 2 Measured Flow Rate		
Date Measured		

Comments

1) Record Drawings From Central Interceptor Sheet 17,34
2) 3 Pump Station

Capital Improvements

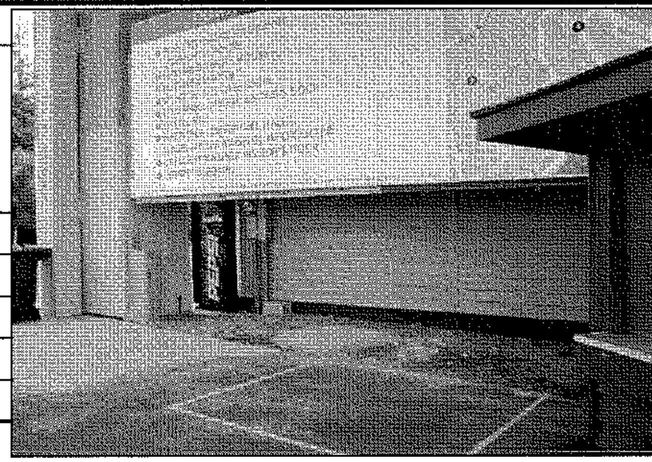
None.

Lift Station Name

Lightering Lift Station

Location	

Lift Station Data



Year Constructed	1998
Type	
Submersible	X
Suction Lift	
Dry Pit	
Wet Well Diameter	
Wet Well Lid Elev	
Wet Well Invert Elev	
Wet Well Depth	
Force Main Diameter	

Electrical Data

Motor Horsepower	1.5
Voltage	230
Phase	1

Pump Data

Date Pumps Installed	1998
Manufacturer	ABS
Pump Model	Piranha Grinder
Design Flow Rate	30 gpm
Design Discharge Head	6'
Pump 1 Measured Flow Rate	
Date Measured	
Pump 2 Measured Flow Rate	
Date Measured	

Comments

1) **Small seasonal lift station serving a public restroom.**
2) **2 Pump Station**

Capital Improvements

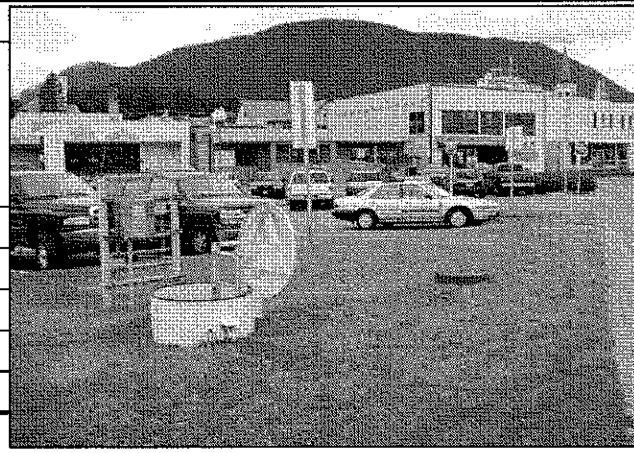
None.

Lift Station Name

Castle Hill Lift Station

Location	

Lift Station Data



Year Constructed	1982
Type	
Submersible	
Suction Lift	
Dry Pit	X
Wet Well Diameter	
Wet Well Lid Elev	
Wet Well Invert Elev	
Wet Well Depth	
Force Main Diameter	4" D.I.P.

Electrical Data

Motor Horsepower	5
Voltage	230
Phase	1

Pump Data

Date Pumps Installed	January 2003
Manufacturer	HYDROMATIC
Pump Model	40 MP
Design Flow Rate	150 GPM
Design Discharge Head	31'
Pump 1 Measured Flow Rate	156
Date Measured	1/15/2003
Pump 2 Measured Flow Rate	156
Date Measured	1/15/2003

Comments

1) Record Drawings From Central Interceptor Sawmill Creeek to Thomsen Harbor Sheet 12,36
2) 2 Pump Station

Capital Improvements

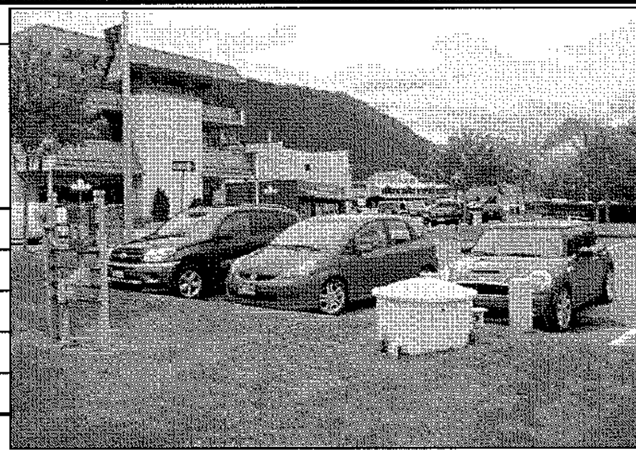
None.

Lift Station Name

Centennial Lift Station

Location	

Lift Station Data



Year Constructed	
Type	
Submersible	
Suction Lift	
Dry Pit	X
Wet Well Diameter	4'
Wet Well Lid Elev	18.5'
Wet Well Invert Elev	1.2'
Wet Well Depth	17.3'
Force Main Diameter	4"

Electrical Data

Motor Horsepower	3 1750 rpm
Voltage	230
Phase	1

Pump Data

Date Pumps Installed	Late 1991
Manufacturer	HYDR-O-MATIC
Pump Model	40 MP
Design Flow Rate	80 gpm
Design Discharge Head	25'
Pump 1 Measured Flow Rate	60
Date Measured	1/15/2003
Pump 2 Measured Flow Rate	65
Date Measured	1/15/2003

Comments

1) 2 Pump Station
2) Record Drawings From Central Interceptor 20,35

Capital Improvements

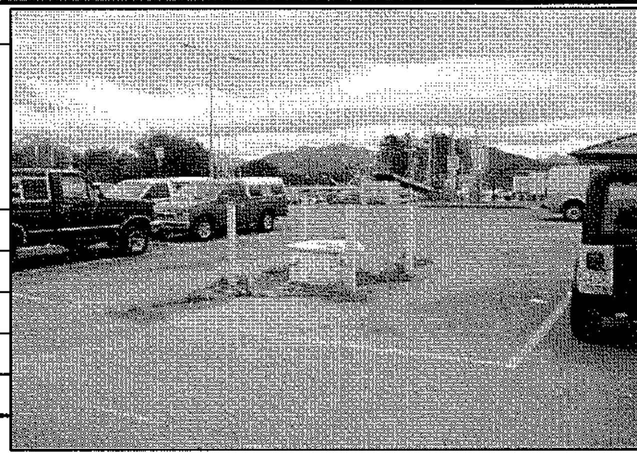
None.

Lift Station Name

Sealing Cove Lift Station

Location	

Lift Station Data



Year Constructed	mid 1990's	
Type		
	Submersible	X
	Suction Lift	
	Dry Pit	
Wet Well Diameter	3'	
Wet Well Lid Elev		
Wet Well Invert Elev		
Wet Well Depth		
Force Main Diameter		

Electrical Data

Motor Horsepower	2
Voltage	230
Phase	1

Pump Data

Date Pumps Installed	mid 1990's
Manufacturer	ABS
Pump Model	Piranha
Design Flow Rate	25 gpm
Design Discharge Head	20'
Pump 1 Measured Flow Rate	
Date Measured	
Pump 2 Measured Flow Rate	
Date Measured	

Comments

1) 1 Pump Station

Capital Improvements

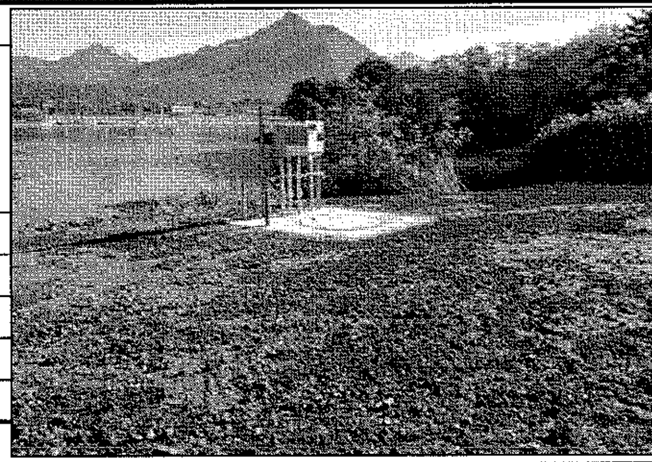
None.

Lift Station Name

Japonski LS-1 Lift Station

Location	

Lift Station Data



Year Constructed	2012
Type	
Submersible	X
Suction Lift	
Dry Pit	
Wet Well Diameter	4'
Wet Well Lid Elev	22.0'
Wet Well Invert Elev	9.40'
Wet Well Depth	12.6'
Force Main Diameter	2" HDPE

Electrical Data

Motor Horsepower	2 hp
Voltage	200 v
Phase	3 phase

Pump Data

Date Pumps Installed	2012
Manufacturer	Barnes
Pump Model	SGVF
Design Flow Rate	25 gpm
Design Discharge Head	20'
Pump 1 Measured Flow Rate	
Date Measured	
Pump 2 Measured Flow Rate	
Date Measured	

Comments

Barnes SGVF Recessed Vortex Submersible Grinder Pump

Capital Improvements

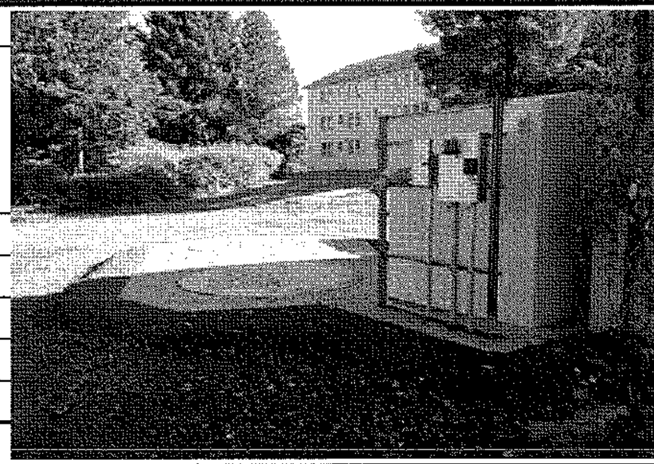
Replaced in 2012

Lift Station Name

Japonski LS-2 Lift Station

Location	

Lift Station Data



Year Constructed	2012	
Type		
	Submersible	X
	Suction Lift	
	Dry Pit	
Wet Well Diameter	5'	
Wet Well Lid Elev	25.74'	
Wet Well Invert Elev	15.04'	
Wet Well Depth	10.70'	
Force Main Diameter	4"	

Electrical Data

Motor Horsepower	2.7 hp
Voltage	200 v
Phase	3 phase

Pump Data

Date Pumps Installed	2012
Manufacturer	Flygt
Pump Model	FP3068.090LT
Design Flow Rate	120 gpm
Design Discharge Head	16.5'
Pump 1 Measured Flow Rate	
Date Measured	
Pump 2 Measured Flow Rate	
Date Measured	

Comments

No comments.

Capital Improvements

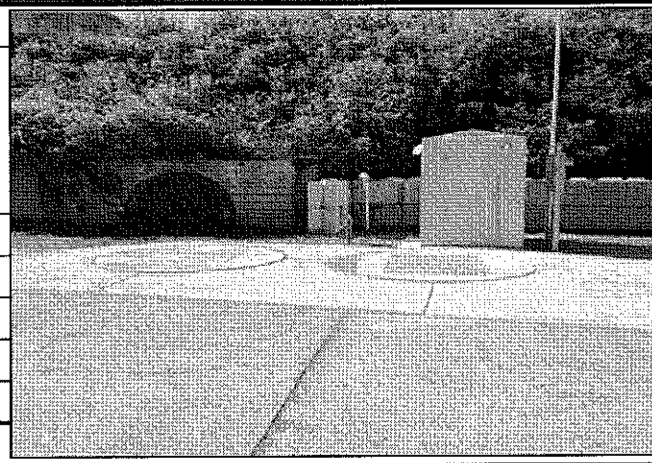
Replaced in 2012

Lift Station Name

Japonski LS-3 Lift Station

Location	

Lift Station Data



Year Constructed	2012
Type	
Submersible	X
Suction Lift	
Dry Pit	
Wet Well Diameter	8'
Wet Well Lid Elev	18.20'
Wet Well Invert Elev	6.33'
Wet Well Depth	11.87'
Force Main Diameter	4"

Electrical Data

Motor Horsepower	11 hp
Voltage	200 v
Phase	3 phase

Pump Data

Date Pumps Installed	2012
Manufacturer	Flygt
Pump Model	NP3127.090SH
Design Flow Rate	200 gpm
Design Discharge Head	60.0'
Pump 1 Measured Flow Rate	209 gpm
Date Measured	
Pump 2 Measured Flow Rate	191 gpm
Date Measured	

Comments

Measured pump flows will vary depending on whether the force main is connected to the 10", 16" or both force mains from Thomson Harbor. Pump flow rates will also vary depending on flow rate in the force mains from Thomson Harbor as a result of high heads that will occur during higher flow periods.

Capital Improvements

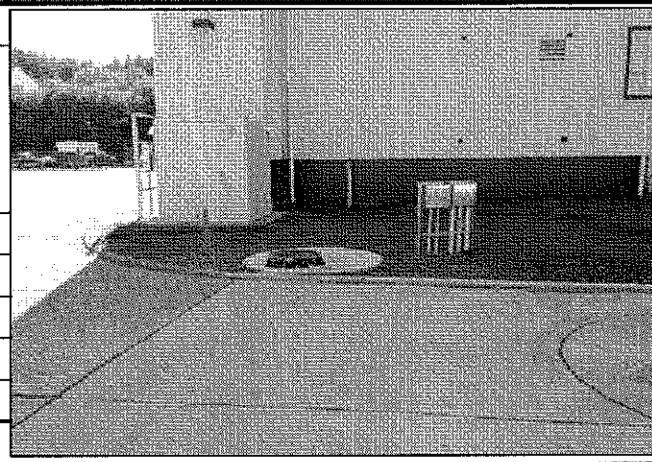
Replaced in 2012

Lift Station Name

Japonski LS-4 Lift Station

Location	

Lift Station Data



Year Constructed	2012
Type	
Submersible	X
Suction Lift	
Dry Pit	
Wet Well Diameter	8'
Wet Well Lid Elev	18.00'
Wet Well Invert Elev	4.45'
Wet Well Depth	13.55'
Force Main Diameter	6"

Electrical Data

Motor Horsepower	17 hp
Voltage	200 v
Phase	3 phase

Pump Data

Date Pumps Installed	2012
Manufacturer	Flygt
Pump Model	NP3153.091SH
Design Flow Rate	450 gpm
Design Discharge Head	67.4'
Pump 1 Measured Flow Rate	512 gpm
Date Measured	7/25/2012
Pump 2 Measured Flow Rate	505 gpm
Date Measured	7/25/2012

Comments

Measured pump flows will vary depending on whether the force main is connected to the 10", 16" or both force mains from Thomson Harbor. Pump flow rates will also vary depending on flow rate in the force mains from Thomson Harbor as a result of high heads that will occur during higher flow periods.

Capital Improvements

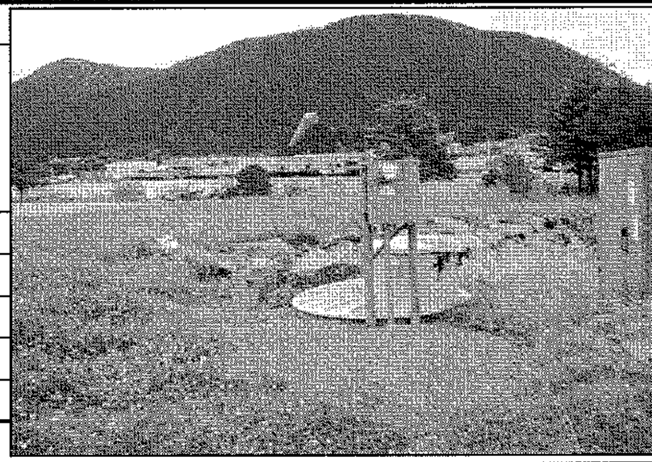
Replaced in 2012.

Lift Station Name

Japonski LS-5 Lift Station

Location	

Lift Station Data



Year Constructed	
Type	
Submersible	
Suction Lift	X
Dry Pit	
Wet Well Diameter	
Wet Well Lid Elev	
Wet Well Invert Elev	
Wet Well Depth	
Force Main Diameter	

Electrical Data

Motor Horsepower	
Voltage	
Phase	

Pump Data

Date Pumps Installed	
Manufacturer	
Pump Model	
Design Flow Rate	
Design Discharge Head	
Pump 1 Measured Flow Rate	
Date Measured	
Pump 2 Measured Flow Rate	
Date Measured	

Comments

No comments.

Capital Improvements

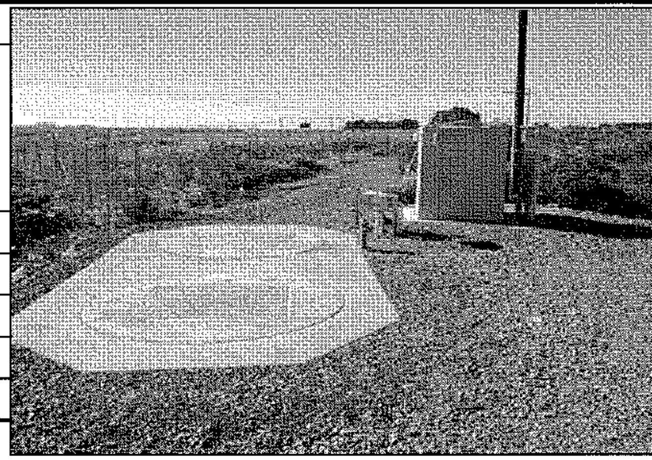
Long Term Plan FY 20 Replacement.

Lift Station Name

Japonski LS-6 Lift Station

Location	

Lift Station Data



Year Constructed	2012
Type	
Submersible	X
Suction Lift	
Dry Pit	
Wet Well Diameter	8'
Wet Well Lid Elev	15.00'
Wet Well Invert Elev	2.83'
Wet Well Depth	12.17'
Force Main Diameter	6"

Electrical Data

Motor Horsepower	6.5 hp
Voltage	200 v
Phase	3 phase

Pump Data

Date Pumps Installed	2012
Manufacturer	Flygt
Pump Model	NP3102.090.SH
Design Flow Rate	250 gpm
Design Discharge Head	56'
Pump 1 Measured Flow Rate	214 gpm
Date Measured	
Pump 2 Measured Flow Rate	205 gpm
Date Measured	

Comments

Measured pump flows will vary depending on whether the force main is connected to the 10", 16" or both force mains from Thomson Harbor. Pump flow rates will also vary depending on flow rate in the force mains from Thomson Harbor as a result of high heads that will occur during higher flow periods.

Capital Improvements

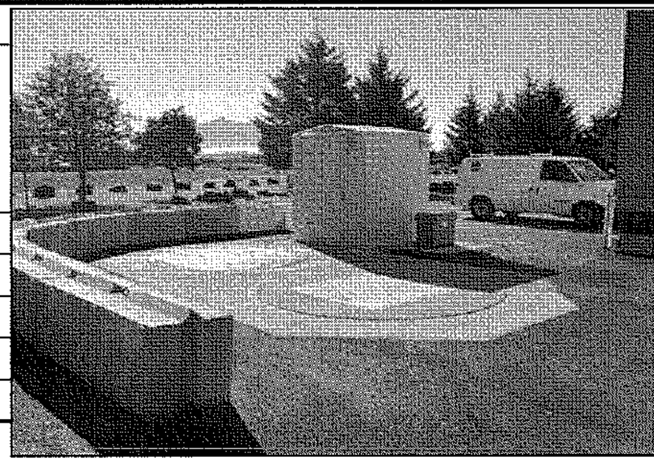
Replaced in 2012.

Lift Station Name

Japonski LS-7 Lift Station

Location	

Lift Station Data



Year Constructed	2012	
Type		
	Submersible	X
	Suction Lift	
	Dry Pit	
Wet Well Diameter	5'	
Wet Well Lid Elev	19.35'	
Wet Well Invert Elev	1.54'	
Wet Well Depth	17.81'	
Force Main Diameter	6"	

Electrical Data

Motor Horsepower	4 hp
Voltage	200 v
Phase	3 phase

Pump Data

Date Pumps Installed	2012
Manufacturer	Flygt
Pump Model	NP3085.092SH
Design Flow Rate	150 gpm
Design Discharge Head	54'
Pump 1 Measured Flow Rate	180 gpm
Date Measured	7/24/2012
Pump 2 Measured Flow Rate	180 gpm
Date Measured	7/24/2012

Comments

Measured pump flows will vary depending on whether the force main is connected to the 10", 16" or both force mains from Thomson Harbor. Pump flow rates will also vary depending on flow rate in the force mains from Thomson Harbor as a result of high heads that will occur during higher flow periods.

Capital Improvements

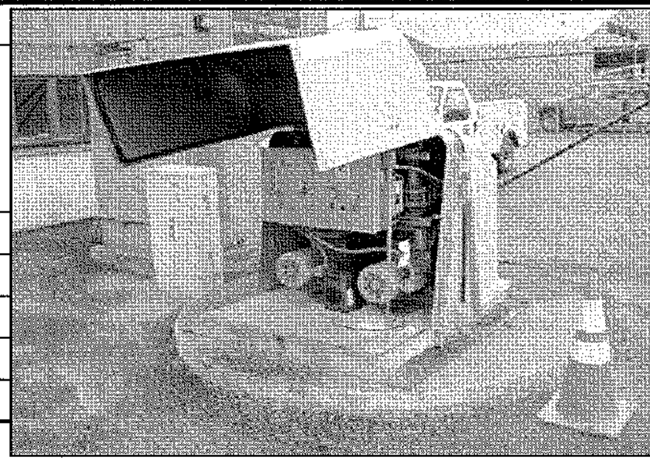
Replaced in 2012

Lift Station Name

Japonski LS-8 Lift Station

Location	

Lift Station Data



Year Constructed	1984
Type	
Submersible	
Suction Lift	X
Dry Pit	
Wet Well Diameter	60"
Wet Well Lid Elev	
Wet Well Invert Elev	
Wet Well Depth	90"
Force Main Diameter	

Electrical Data

Motor Horsepower	1.5
Voltage	208
Phase	3

Pump Data

Date Pumps Installed	1984
Manufacturer	Hydronix
Pump Model	40MP
Design Flow Rate	50 gpm
Design Discharge Head	15'
Pump 1 Measured Flow Rate	
Date Measured	
Pump 2 Measured Flow Rate	
Date Measured	

Comments

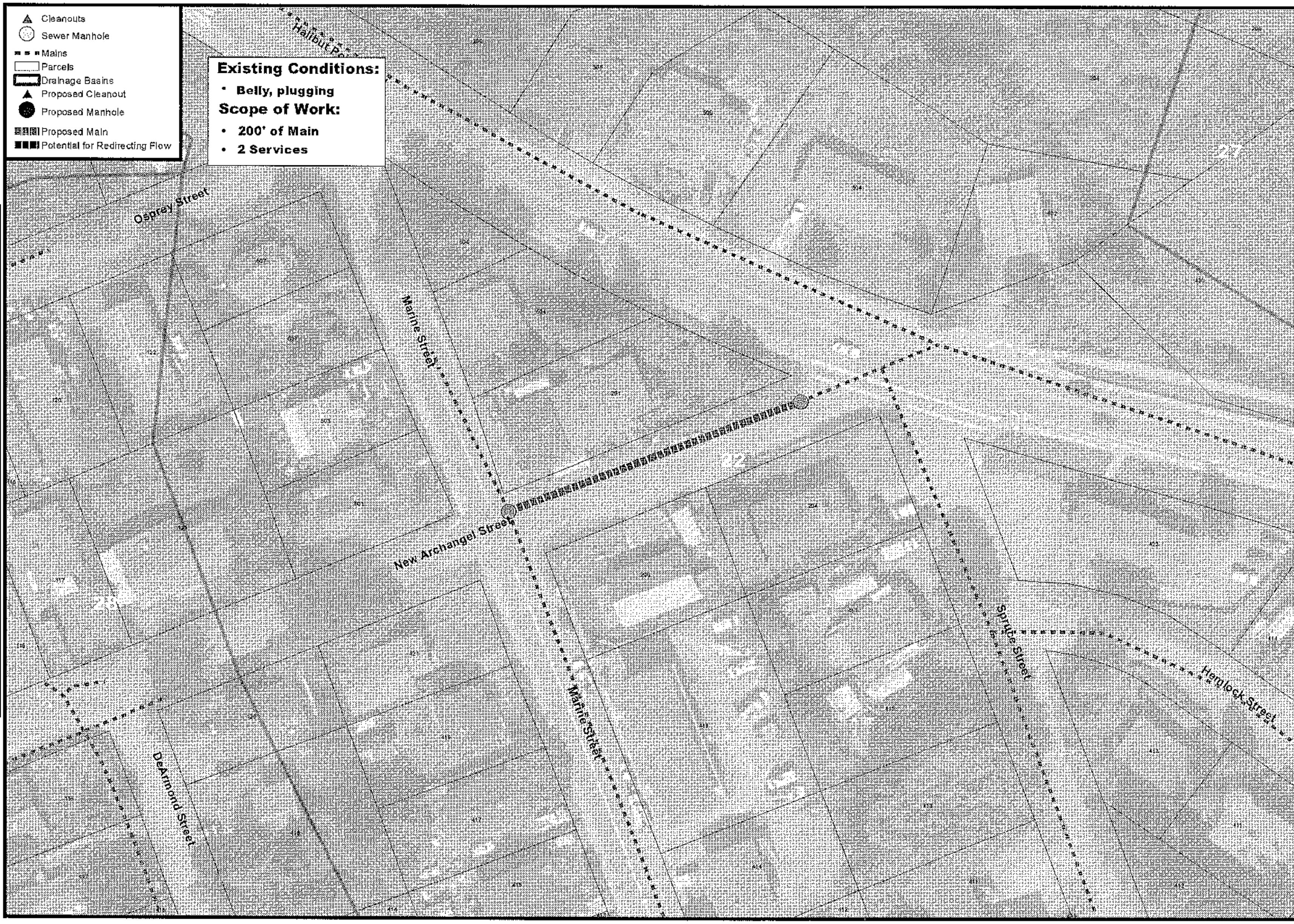
1) 2 Pump Station

Capital Improvements

None.

APPENDIX B

Short-Term Capital Improvement Project Figures



SANITARY SEWER

CITY AND BOROUGH OF SITKA

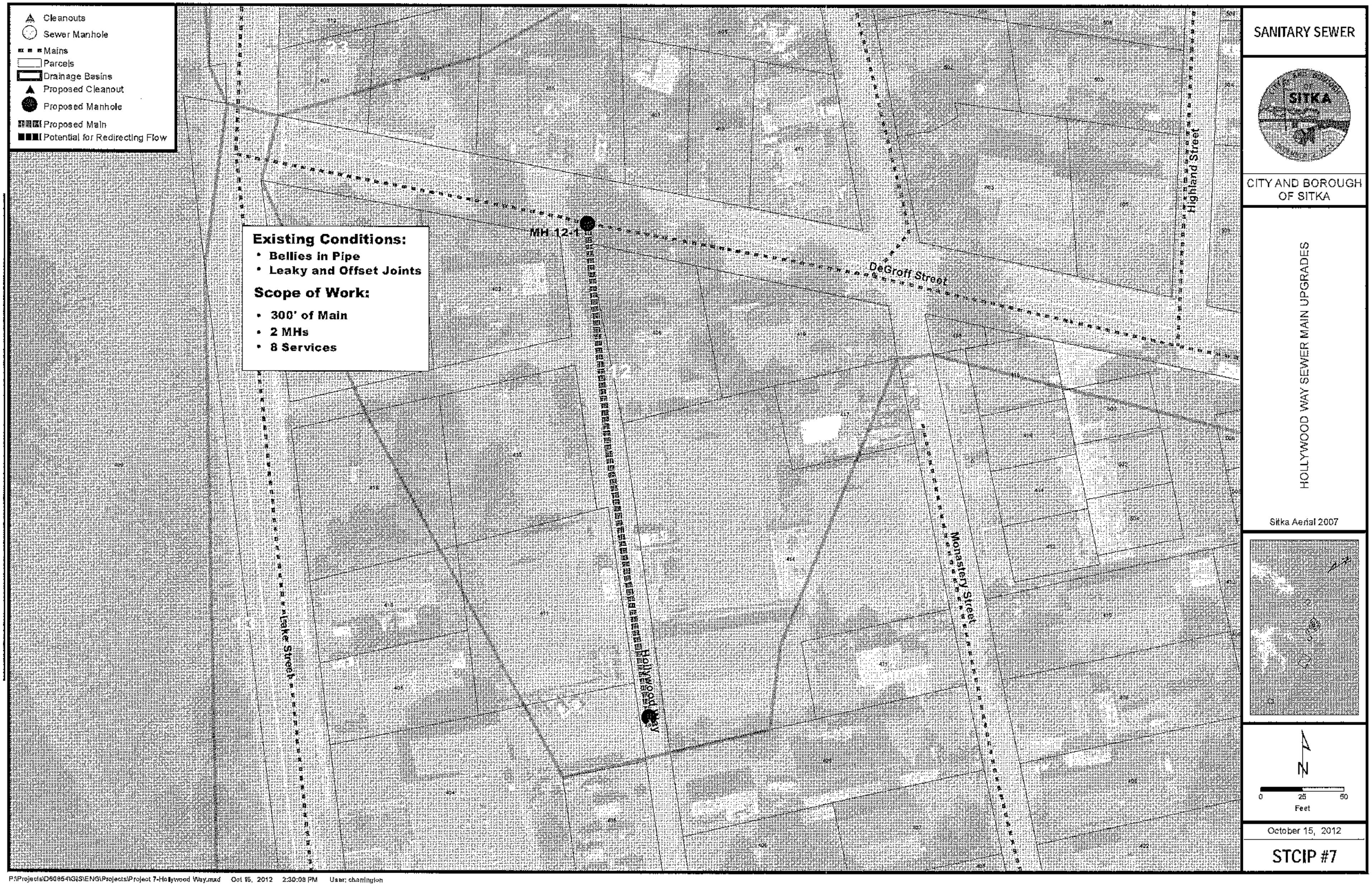
NEW ARCHANGEL STREET SEWER MAIN UPGRADES

Sitka Aerial 2007

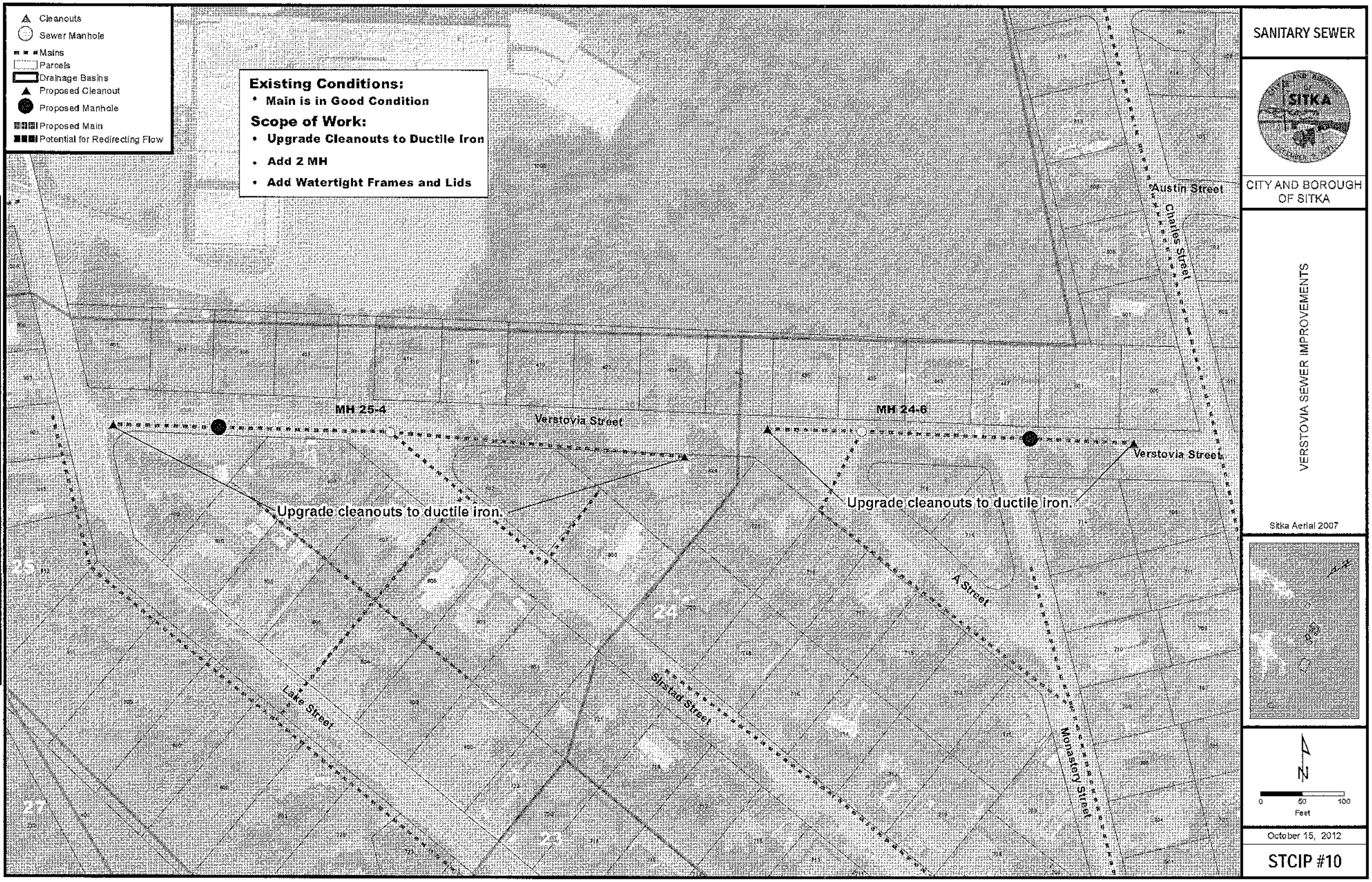
0 25 50 Feet

October 15, 2012

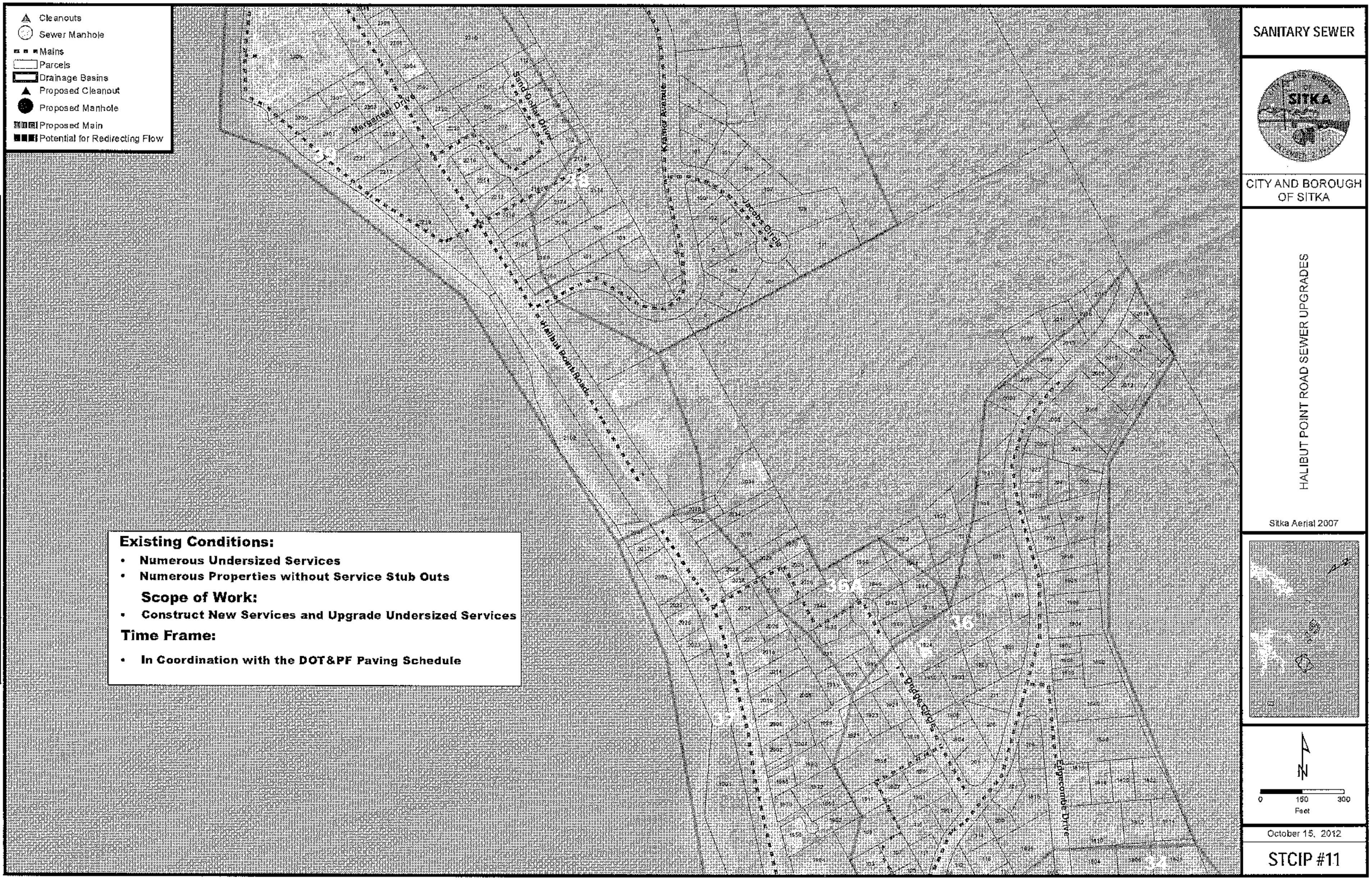
STCIP #5



SANITARY SEWER
CITY AND BOROUGH OF SITKA
HOLLYWOOD WAY SEWER MAIN UPGRADES
Sitka Aerial 2007
Feet
October 15, 2012
STCIP #7
Cleanouts
Sewer Manhole
Mains
Parcels
Drainage Basins
Proposed Cleanout
Proposed Manhole
Proposed Main
Potential for Redirecting Flow
Existing Conditions:
• Bellies in Pipe
• Leaky and Offset Joints
Scope of Work:
• 300' of Main
• 2 MHs
• 8 Services
MH 12-1
DeGroff Street
Highland Street
Monastery Street
Hollywood Way
Lake Street
P:\Projects\D60654\GIS\ENG\Projects\Project 7-Hollywood Way.mxd Oct 15, 2012 2:30:08 PM User: charrington



Cleanouts
Sewer Manhole
Mains
Parcels
Drainage Basins
Proposed Cleanout
Proposed Manhole
Proposed Main
Potential for Redirecting Flow
Existing Conditions:
• Main is in Good Condition
Scope of Work:
• Upgrade Cleanouts to Ductile Iron
• Add 2 MH
• Add Watertight Frames and Lids
MH 25-4
MH 24-6
Verstovia Street
Verstovia Street
Upgrade cleanouts to ductile iron.
Upgrade cleanouts to ductile iron.
Austin Street
Charles Street
A Street
Sirstad Street
Lake Street
Monastery Street
25
24
27
23
SANITARY SEWER
SITKA
CITY AND BOROUGH OF SITKA
VERSTOVIA SEWER IMPROVEMENTS
Sitka Aerial 2007
N
0
50
100
Feet
October 15, 2012
STCIP #10



Existing Conditions:

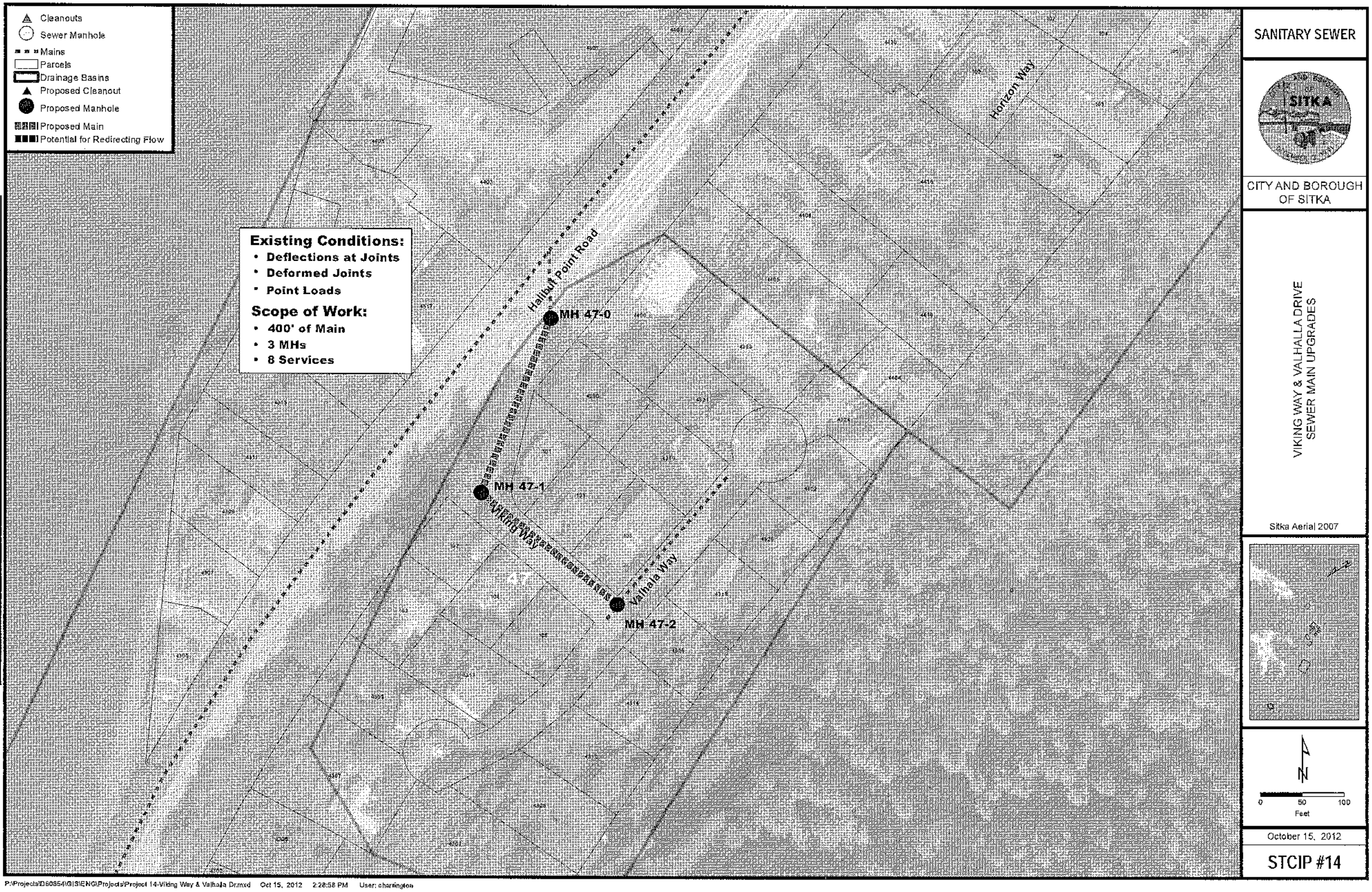
- Numerous Undersized Services
- Numerous Properties without Service Stub Outs

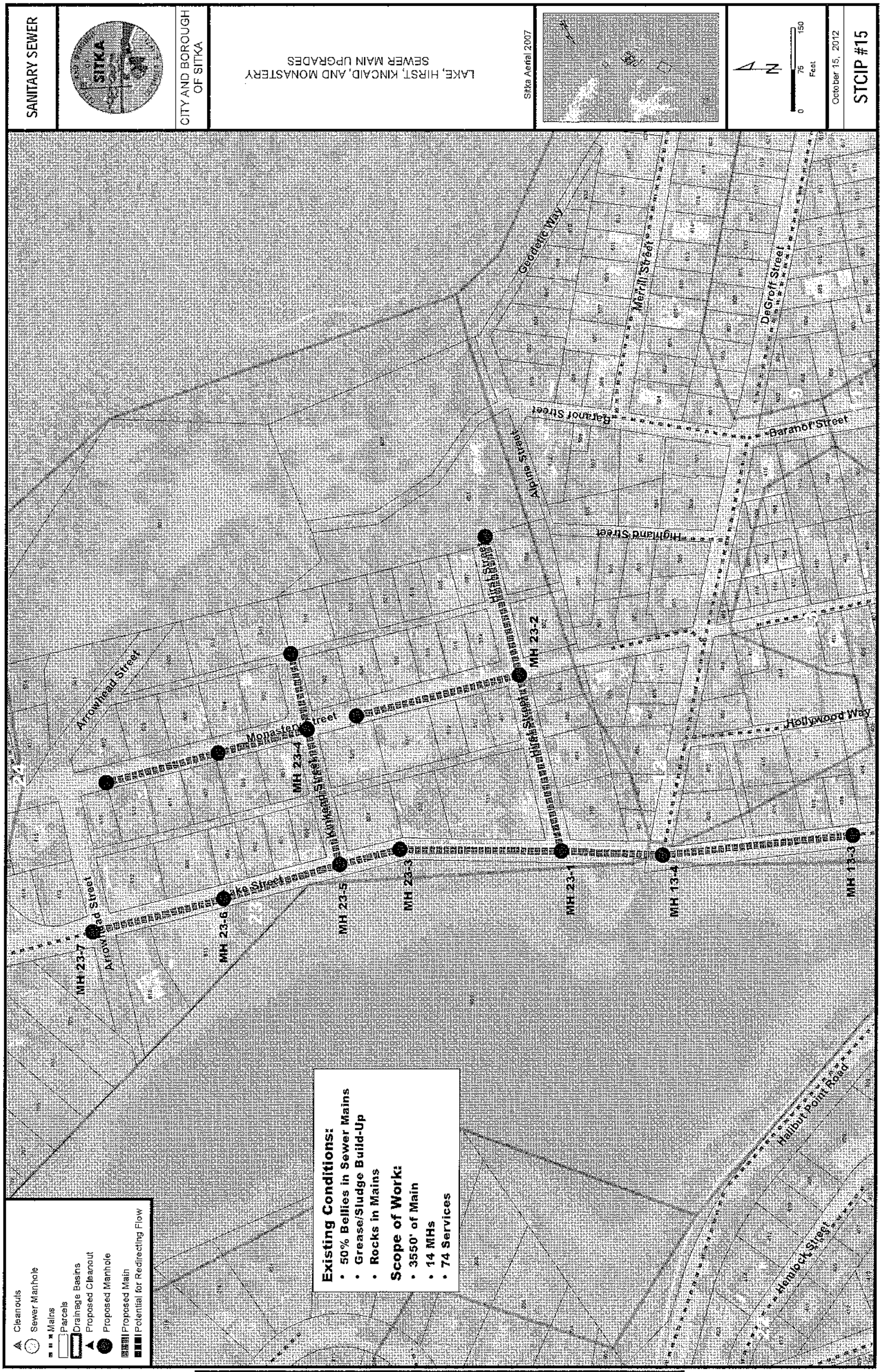
Scope of Work:

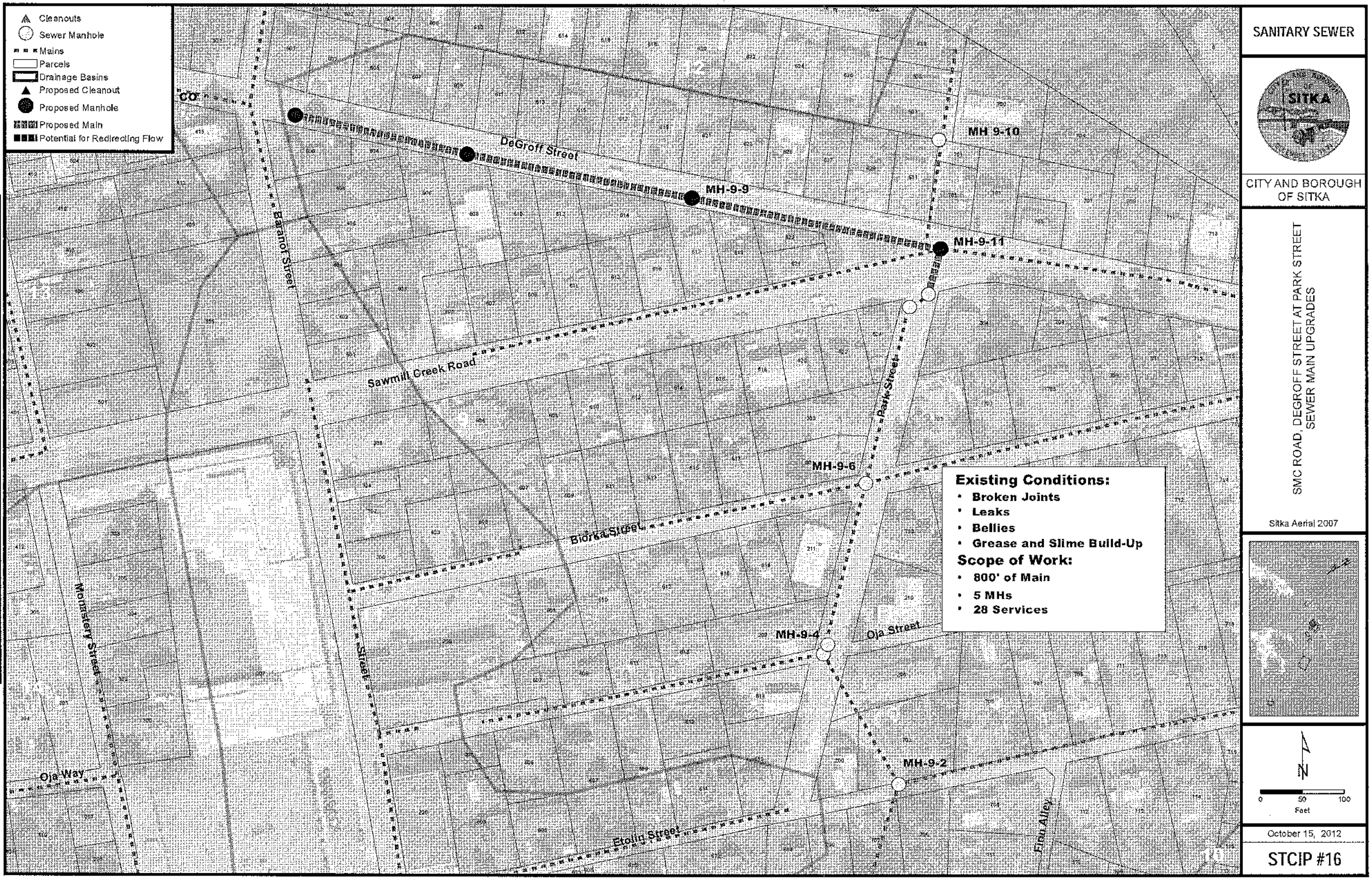
- Construct New Services and Upgrade Undersized Services

Time Frame:

- In Coordination with the DOT&PF Paving Schedule


Cleanouts
Sewer Manhole
Mains
Parcels
Drainage Basins
Proposed Cleanout
Proposed Manhole
Proposed Main
Potential for Redirecting Flow
Existing Conditions:
• Deflections at Joints
• Deformed Joints
• Point Loads
Scope of Work:
• 400' of Main
• 3 MHs
• 8 Services
Halibut Point Road
Horizon Way
Viking Way
Valhalla Way
MH 47-0
MH 47-1
MH 47-2
47
SANITARY SEWER
CITY AND BOROUGH OF SITKA
VIKING WAY & VALHALLA DRIVE
SEWER MAIN UPGRADES
Sitka Aerial 2007
0
50
100
Feet
October 15, 2012
STCIP #14
P:\Projects\D60854\GIS\ENG\Projects\Project 14-Viking Way & Valhalla Dr.mxd Oct 15, 2012 2:28:58 PM User: charrington


SANITARY SEWER
CITY AND BOROUGH OF SITKA
LAKE, HIRST, KINCAID, AND MONASTERY
SEWER MAIN UPGRADES
Sitka Aerial 2007
N
0 75 150
Feet
October 15, 2012
STCIP #15
Cleanouts
Sewer Manhole
Mains
Parcels
Drainage Basins
Proposed Cleanout
Proposed Manhole
Proposed Main
Potential for Redirecting Flow
Existing Conditions:
• 50% Bellies in Sewer Mains
• Grease/Sludge Build-Up
• Rocks in Mains
Scope of Work:
• 3550' of Main
• 14 MHs
• 74 Services
Geodetic Way
Merrill Street
DeGroff Street
Baranof Street
Alpine Street
Highland Street
Hirst Street
Hollywood Way
Arrowhead Street
Monastery Street
Kinkaid Street
Lake Street
Halibut Point Road
Hemlock Street
MH 23-7
MH 23-6
MH 23-5
MH 23-4
MH 23-3
MH 23-2
MH 23-1
MH 13-4
MH 13-3



SANITARY SEWER

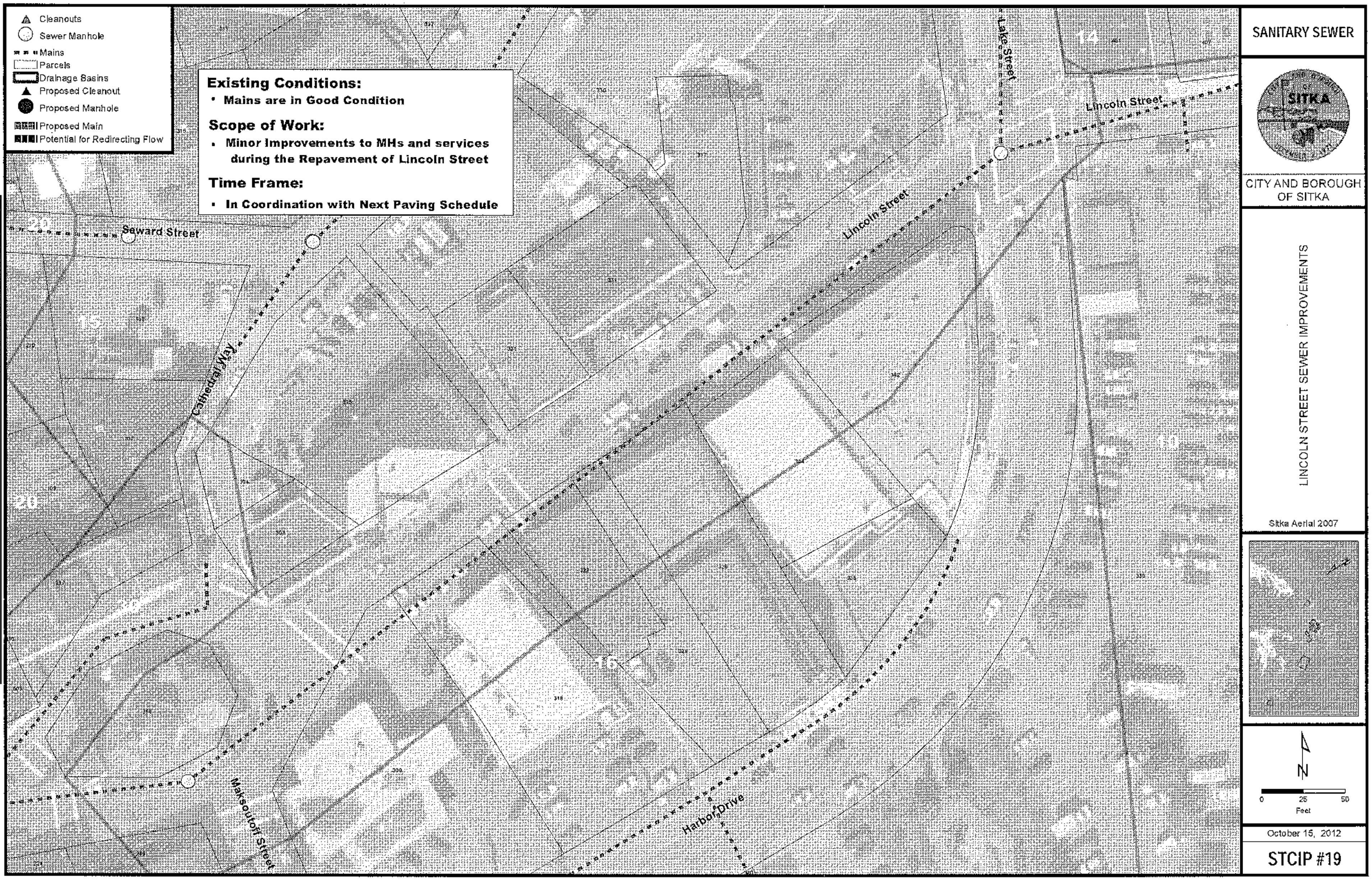
CITY AND BOROUGH OF SITKA

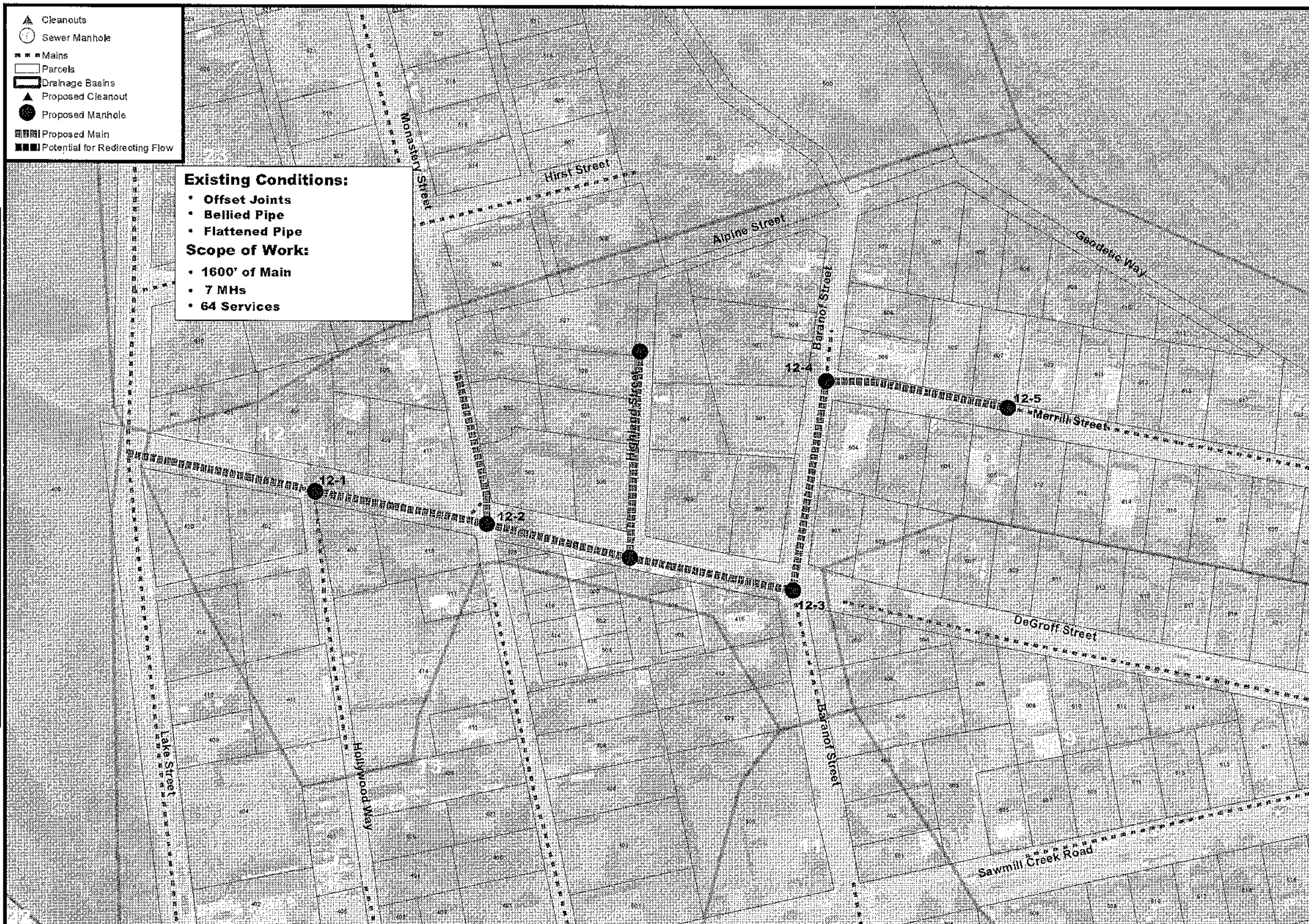
SMC ROAD, DEGROFF STREET AT PARK STREET
SEWER MAIN UPGRADES

Sitka Aerial 2007

October 15, 2012

STCIP #16


Cleanouts
Sewer Manhole
Mains
Parcels
Drainage Basins
Proposed Cleanout
Proposed Manhole
Proposed Main
Potential for Redirecting Flow
Existing Conditions:
• Mains are in Good Condition
Scope of Work:
• Minor Improvements to MHs and services during the Repavement of Lincoln Street
Time Frame:
• In Coordination with Next Paving Schedule
Seward Street
Cathedral Way
Lincoln Street
Lake Street
Maksoutoff Street
Harbor Drive
SANITARY SEWER
SITKA
CITY AND BOROUGH OF SITKA
LINCOLN STREET SEWER IMPROVEMENTS
Sitka Aerial 2007
N
0
25
50
Feet
October 15, 2012
STCIP #19



SANITARY SEWER

CITY AND BOROUGH OF SITKA

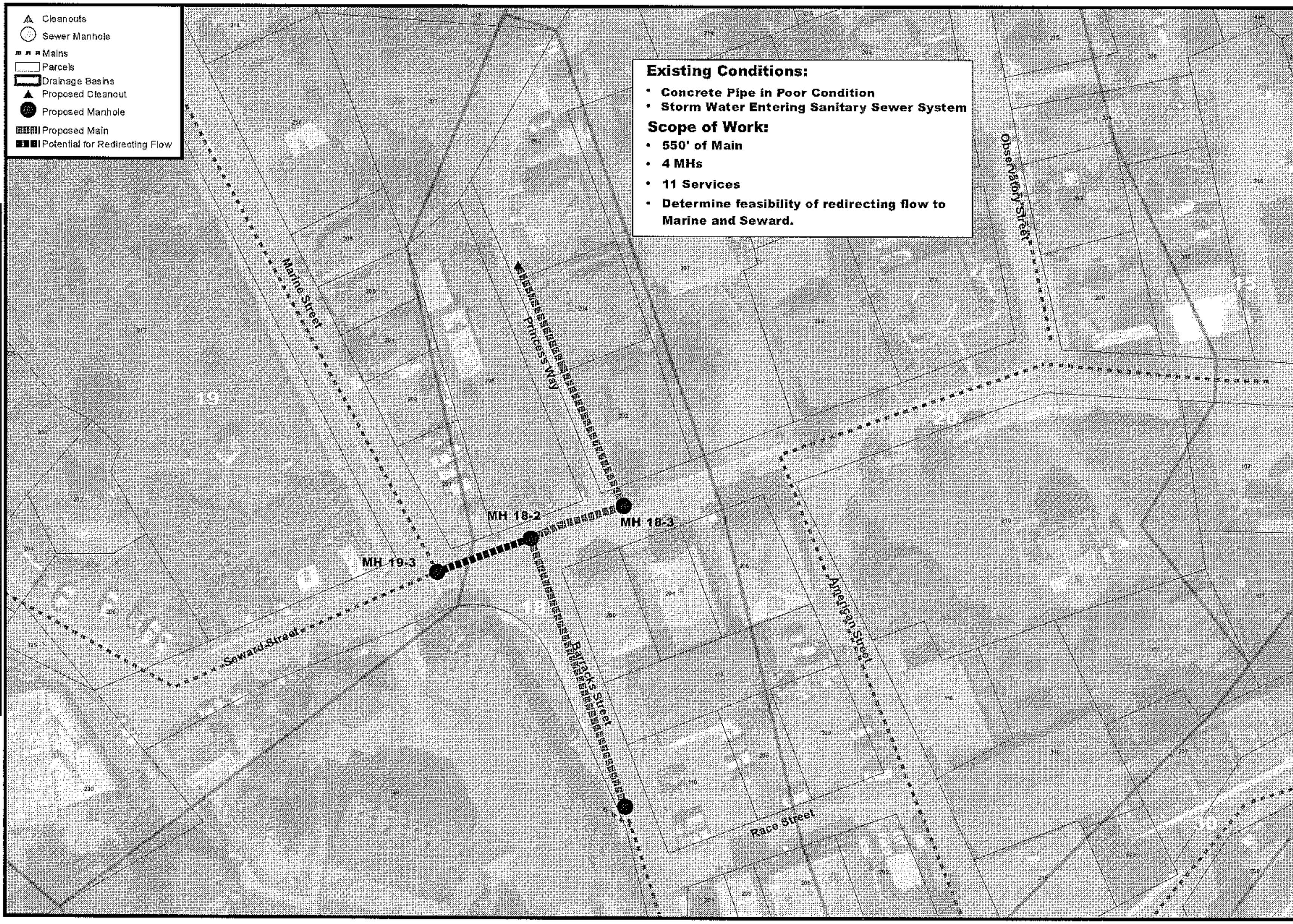
DEGROFF ST, HIGHLAND, BARANOF, AND MERRILL SEWER MAIN UPGRADES

Sitka Aerial 2007

0 50 100 Feet

October 15, 2012

STCIP #21



SANITARY SEWER

CITY AND BOROUGH OF SITKA

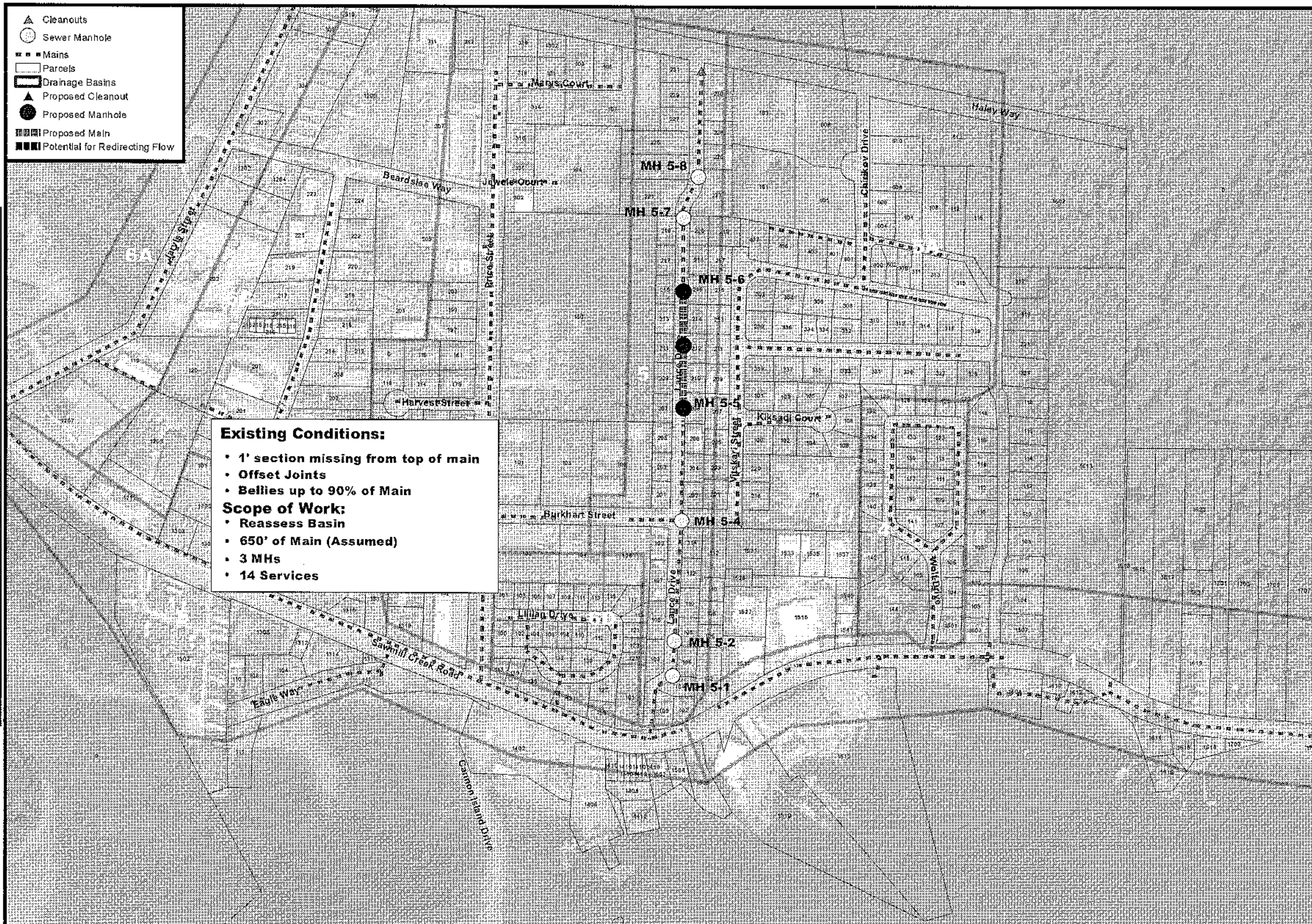
PRINCESS WAY, SEWARD ST, BARRACKS ST
SEWER MAIN UPGRADES

Sitka Aerial 2007

0 25 50
Feet

October 15, 2012

STCIP #25



SANITARY SEWER

CITY AND BOROUGH OF SITKA

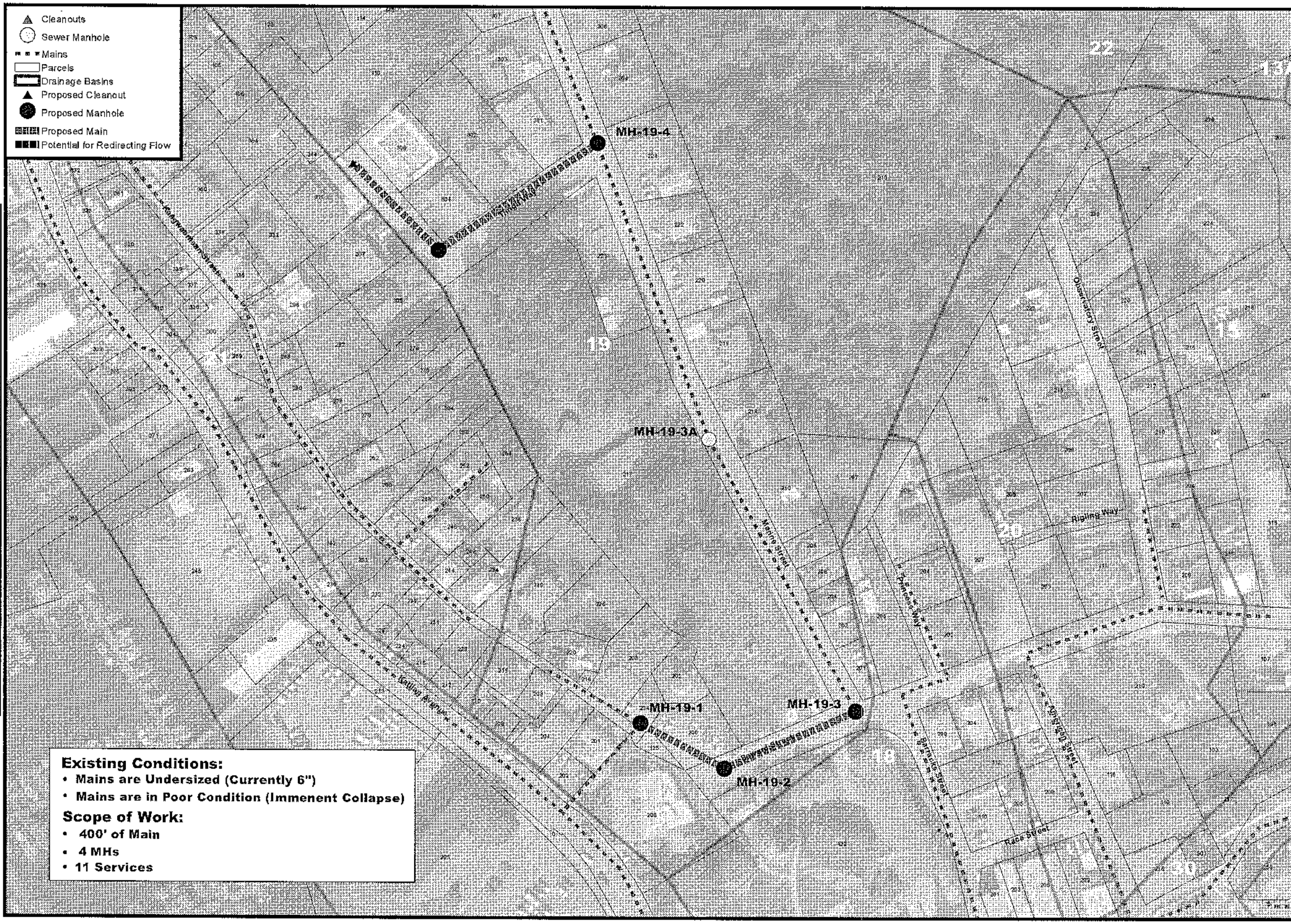
LANCE DRIVE SEWER MAIN UPGRADES

Sitka Aerial 2007

0 150 300 Feet

October 15, 2012

STCIP #28



SANITARY SEWER

CITY AND BOROUGH OF SITKA

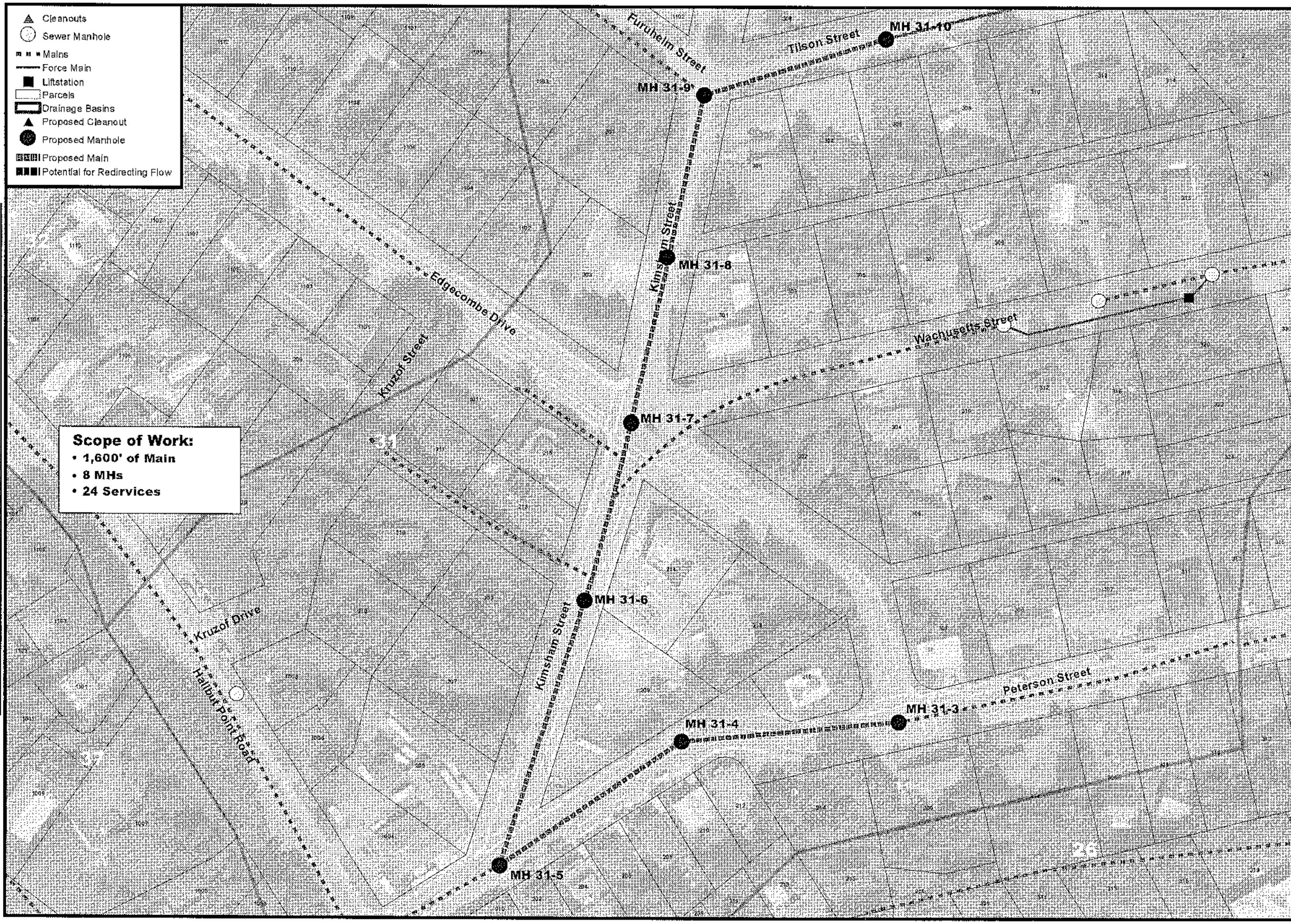
TLINGIT WAY, MARINE, AND SEWARD STREETS
SEWER MAIN UPGRADES

Sitka Aerial 2007

0 50 100
Feet

October 15, 2012

STCIP #29

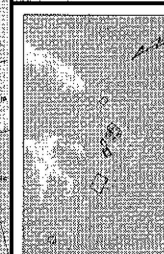


SANITARY SEWER

CITY AND BOROUGH OF SITKA

KIMSHAM AND PETERSEN STREET
SEWER MAIN UPGRADES

Sitka Aerial 2007



October 15, 2012

STCIP #30

DOWL HKM

G.V. Jones & Associates

O'Niell Surveying & Engineering

FCS Group

Carson Dorn