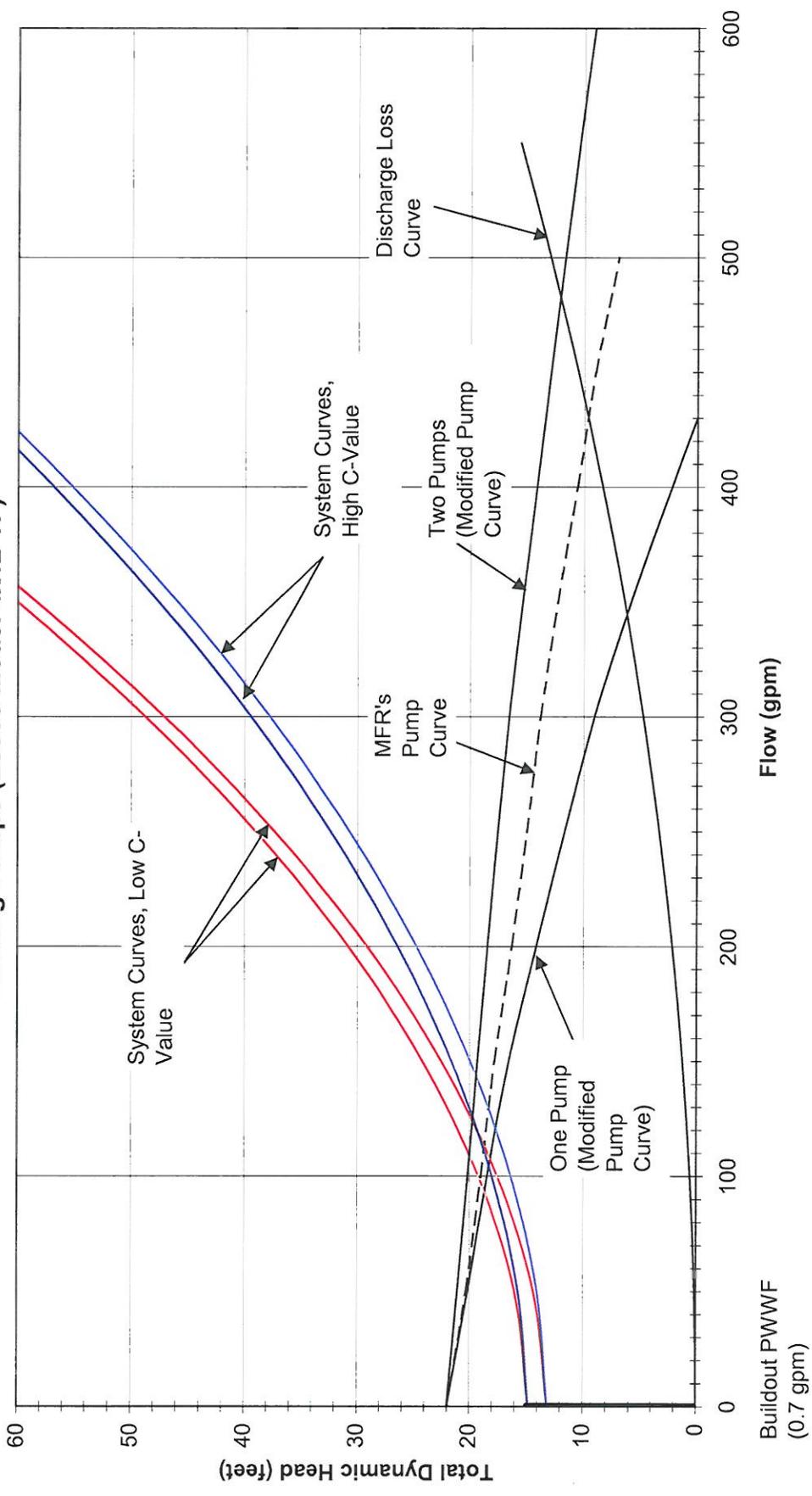


Figure 3-6
Pump Station #18
Pump and System Curves
Existing Pumps (Essco Model 4x12-TF)



APPENDIX 4L

Sewer Lateral Program Documents, Requirements, and Enforcement

Sewer Lateral Loan Program Guidelines

Sewer Lateral Repair/Replacement Loan Program Application

A Guideline to Sewer Laterals Inspection and Repair Requirements

Sewer Lateral Loan History: 2004 – 2011

CITY OF PACIFIC GROVE PRIVATE LATERAL SEWER REPLACEMENT PROGRAM SEWER LATERAL LOAN PROGRAM GUIDELINES

Thank you for your interest in the Sewer Lateral Loan Program. Loan funding is limited and is available on a first come first serve basis to qualified applicants. **Loans are NOT available to those required to replace sewer laterals as a result of mandatory inspections pursuant to the City's municipal code, Chapter 9.20.** Chapter 9.20 of the Pacific Grove Municipal Code is available for review at City Hall, the Pacific Grove Library, and on the internet at: www.ci.pg.ca.us

A. APPLICATION BY PROPERTY OWNER

1. Fill out the Sewer Lateral Repair/Replacement Loan Program application.
2. Return completed application along with required documentation to the Pacific Grove Community Development Department at City Hall, 300 Forest Avenue, Pacific Grove, California 93950. (Business hours are Monday through Thursday from 8:00 am to noon and 1:00 pm to 5:00 pm, Friday by appointment.)

B. CITY REVIEW PROCEDURE

The following procedure is to be followed when the City receives your application:

1. City will verify ownership of property.
2. City will determine eligibility for the Private Lateral Sewer Replacement Loan Program (PLSRLP) and notify the applicant of their eligibility status.
3. The City no longer requires a video of your sewer lateral to be submitted. However, you must provide a letter to the City signed by a California licensed plumbing contractor indicating the existing sewer lateral and connection to the City sewer system are not in a maintenance-free condition. The letter shall include if there is an existing 2-way cleanout, Sewer Relief Vent, and if a Backwater Valve is required as per City Code. If lateral is to be replaced a factory wye is required for connection. Permits are required and shall be obtained by the Contractor from the Building Department for all repairs and replacements. So be sure permit fees are included in your written estimates.
4. The applicant will then obtain at least two written estimates from California licensed plumbing contractors and submit them to the City for review. City cannot recommend any particular contractor. Bids for work shall be fixed bids, without allowance for extra costs.

C. LOAN PROCEDURE

1. The City shall determine the loan amount and terms based on consideration of:
 - The selected bid contractual amount
 - Availability of funding from City
 - Prioritization of projects based on financial need and condition of lateral
 - Other factors deemed appropriate by City staff to fully carry out the intent and purpose of the PSLRP.
2. The City shall provide the property owner with loan disclosure information.

3. Once the property owner has approved the disclosure, the City shall process the loan and prepare loan documents.
4. The property owner will sign the following:
 - Loan Program Agreement
 - Promissory Note
 - Deed of Trust
 - Disclosure Statement
 - Rescission Notice
5. If after the 3-day rescission period the property owner does not rescind the loan, the Deed of Trust shall be recorded at the Monterey County Recorder's Office. The act of recording provides constructive notice that the property has been encumbered. When the debt is fully paid the City will promptly reconvey the loan, thus releasing the security for the debt.
6. The property owner will be given notice to have their contractor proceed with the work. All necessary City permits must be obtained prior to commencement of the work. The work shall not be backfilled until inspected and approved by the City Building Department
7. Once the work is completed and the contractor has received final inspections by the Building Department, the contractor will be paid directly by the City. If there are any funds remaining a loan reduction will be processed.

D. LOAN TERMS

1. The maximum loan amount is \$10,000.
2. This loan program provides a deferred payment loan at 3% simple interest.
3. The loan including any interest is due and payable upon voluntary or involuntary transfer of title, contract to sell or transfer, or sale of the secured property, subordination of the City's loan, whichever is earlier.
4. There are no pre-payment penalties if you want to pay this loan off. No partial payments of monthly payments will be accepted.
5. Actual loan terms may vary from borrower to borrower depending on special circumstances.

Questions and applications to the loan program should be made to:
Housing Division staff at
City Hall
300 Forest Avenue, Pacific Grove, CA 93950

Phone: (831) 648-3199
Fax: (831) 648-3184
Email: Housing@ci.pg.ca.us



Sewer Lateral Repair/Replacement Loan Program Application

NOTICE

Loan funds are available to property owners that are seeking to repair/replace their private sewer lateral voluntarily. Loan funds are not available to property owners that are required to repair or replace their private sewer lateral in accordance with the Chapter 9.20 (see general description on reverse side) of the Pacific Grove Municipal Code. Additional information is available in the Inspections and Repairs of Sewer Laterals guide. Chapter 9.20 of the Pacific Grove Municipal Code is available for review at City Hall, the Pacific Grove Library, and on the internet at: www.ci.pg.ca.us.

*Submit this loan application to: Community Development Department, 2nd Floor
300 Forest Avenue, Pacific Grove, CA 93950 / Tel: (831) 648-3199, email: housing@ci.pg.ca.us*

SECTION I: General Information Please print clearly.

Current Property Owner(s):

Property Address:

Assessor's Parcel No.:

Is Property in a Trust? Yes No

Mailing Address (if different from above):

Social Security No.:

Date of Birth:

Phone Number:

Alternate Number:

Email Address:

Year Acquired
Property:

Original Cost:
\$

Amount of Existing Liens:
\$

Present Value of Property:
\$

Submit a copy of most recent payment statement(s) of primary and secondary liens (mortgages). N/A-No liens.

SECTION II: Site Information

1. State the nature of problem(s):

Tree Roots Collapsed Pipe Grease/Fat Build-up Other: _____

2. How many times have you had sewer backups in the last 12 months? _____

3. Has your private sewer lateral been inspected by a license plumber? No Yes

4. Is there an insurance claim for this work? No Yes *Please provide a copy of any claim information.*

5. Please indicate which describes the property? Owner occupied Tenant occupied Single-family dwelling
 Multi-family dwelling Other _____

SECTION III: Certification

I certify by signing this application that I am the legal owner of the property described herein. I am aware the submission of this document does not constitute that a loan has been approved by the City of Pacific Grove. I have read the information discussing the requirements of the Sewer Lateral Repair/Replacement Loan Program and am aware that a letter will be issued advising if funds have been approved. Work performed prior to receiving a loan authorization letter is performed at my own risk.

Signature of Applicant

Date:

Signature of Co-Applicant

Pacific Grove Municipal Code, Chapter 9.20 generally says:

To be eligible for the loan program, property owners must be replacing their lateral lines voluntarily. **Loan funds will not be available to property owners that have discovered damage through an inspection that is required by the City.** The City requires private sewer laterals to be inspected as follows:

- When building a new structure on property with existing lateral, or when otherwise proposing to connect a previously unconnected structure to an existing lateral.
- As a condition of approval of any major building remodel project. A major building remodel project is one that is estimated by the city to cost \$50,000 or more.
- Prior to the close of escrow when the property is transferred via sale or other transfer of ownership by deed, instrument or writing.
- Whenever the city finds that a sewage overflow emanating from a lateral has reached public property, including but not limited to a city street or the city storm drain system, or has flowed onto private property owned by another property owner.
- Whenever the city finds that a sewage overflow emanating from a lateral presents a threat to public health, even if it has not flowed across a property line



THIS IS NOT THE CERTIFICATION FORM

This information sheet provides additional information about the ordinance on the inspection, repair, or replacement of sewer laterals, adopted by the Pacific Grove City Council on December 15, 2004.

Section 9.20.040 Inspections and repairs of sewer laterals

(a) Property owners shall inspect, and provide to the City a report of the results of an inspection of, the laterals on their property prepared by a licensed plumber using closed circuit television (CCTV) inspection or other inspection or test method approved by the Director of Public Works, and if found defective, repair the lateral, as follows:

- (1) When building a new structure on property with an existing lateral, or when otherwise proposing to connect a previously unconnected structure to an existing lateral;
- (2) As a condition of approval of any major building remodel project. A major building remodel project is one that is estimated by the city to cost \$50,000 or more;
- (3) Prior to the close of escrow when the property is transferred via sale or other transfer of ownership by deed, instrument or writing;
- (4) Whenever the city finds that a sewage overflow emanating from a lateral has reached public property, including but not limited to a city street or the city storm drain system, or has flowed onto private property owned by another property owner.
- (5) Whenever the city finds that a sewage overflow emanating from a lateral presents a threat to public health, even if it has not flowed across a property line.

In the absence of a specific deadline, all inspection and testing work shall be completed within 60 days of notification by the city that such inspection is required. Existing laterals shall not be used if they are found to be defective by the inspection or if they fail city mandated tests or if they were constructed of materials deemed unacceptable by the Director of Public Works.

(b) As part of its periodic construction and maintenance of sewer mains, the city may discover defective laterals. The city may order the property owner to conduct an inspection, repair or replacement of any lateral that the city knows or reasonably suspects to be defective.

(c) The lateral shall be considered defective if it has any of the following conditions: displaced joints, root intrusion, substantial deterioration of the lines, damaged clean-out, defective clean-out, inflow, infiltration of extraneous water, or other conditions likely to substantially increase the chance for a lateral blockage, or if, within a period of one year, a lateral suffers two or more blockages resulting in overflows.

(d) Whenever defective laterals are found, the property owner, at the sole expense of the property owner, shall repair or replace the lateral. The Director of Public Works shall determine the extent of repair required, and more limited repair than complete replacement of the lateral may be permitted at the sole discretion of the Director of Public Works. The following requirements shall be met.

- (1) A replaced or repaired lateral shall not be covered or backfilled until it has been inspected by a representative of the City.
- (2) All new and repaired laterals must pass an air pressure test as specified by the Director of Public Works.
- (3) All repaired or replaced laterals shall be brought into compliance with the requirements of Section 9.20.030(d). Overflow devices must be installed on all repaired or replaced laterals, and backflow valves may be required to be installed on laterals meeting the criteria of Section 9.20.030(e).

(e) In the absence of a specific deadline established by the Director of Public Works, all repair or replacement work shall be completed within 60 days of notification by the City that such repair or replacement is required.

(f) When a lateral is completely replaced, the property owner is not required to inspect the lateral upon sale of the property for 10 years following the date of complete replacement of the lateral.

(g) Roots, grease, or other material which has accumulated in a lateral cleaned or maintained must shall be prevented from entering the sewer main during the any maintenance or repair of the lateral. In the event that material is permitted to enter the main causing or contributing to the cause of a sewage spill, the property owner and/or contractor performing such maintenance work, in addition to any criminal penalties imposed, shall be held civilly liable to the city for any fines or other expenses incurred by the city resulting from the spill.

(h) The city shall have the authority to recover from a property owner the city's expenses incurred in responding to sewer overflows on private property. In addition to any actual expenses incurred by the city resulting from an overflow, the city may impose civil administrative penalties against a property owner who fails to perform any act required in this section, which failure results in an

overflow reaching public or private property other than the property owner's property, according to the following schedule:

- (1) Up to \$500 for the first violation.
- (2) Up to \$1000 for a second violation occurring within three years after the first violation.
- (3) Up to \$2500 for each additional violation within a three year period exceeding two violations.

(j) The city manager shall have the authority to establish, waive, suspend or otherwise modify any civil administrative penalty imposed by this section that exceeds the direct costs of to the city upon a showing by the property owner of severe financial hardship, or upon a showing that the property owner has satisfactorily repaired the lateral to a degree sufficient to ensure avoidance of further violations.

Section 9.20.040 of the Municipal Code is available on the internet at: <http://www.ci.pacific-grove.ca.us>

STEPS TO FULFILL THIS REQUIREMENT:

1. Complete *Sewer Lateral Inspection and Repair Certification Form*
2. Thoroughly read Chapter 9.20 of Pacific Grove Municipal Code
3. Conduct recorded inspection (VHS or digital format), which must have a segment showing the property identification by videoing the building, address, significant building feature, or identifiable features of the surroundings prior to inserting the camera into the lateral and then continue filming to the lateral to connection with the sewer main. Recorded inspection is deemed complete when the camera is retrieved while still recording and shows the same address/features at the beginning of the recordation.
4. Submit completed and signed *Sewer Lateral Inspection and Repair Certification Form*, sign, and submit with recorded inspection to the Community Development Department

FREQUENTLY ASKED QUESTIONS:

Q: Who is an authorized representative?

A: Anyone authorized through written contract for buyer and seller may be an authorized representative

Q: When must the form and recording be submitted?

A: The certification form and recording must be submitted to the City prior to close of escrow.

Q: How long will it take for the City of Pacific Grove to make a determination on certification?

A: It may take up to ten (10) working days for the City to make a determination on the sewer lateral inspection and repair certification. Therefore, it is recommended the form and footage be submitted as soon as possible after the property has been listed for sale.

Q: How will the property owner be contacted about the City's determination?

A: The City will make a determination based on the video and form submitted. The owner and/or the authorized representative will be contacted via mail.

Q: What if the City determines that a sewer lateral replacement is necessary?

A: The property owner will have up to sixty (60) days to replace the sewer lateral from the date of notification by the City. Extraordinary circumstances requiring additional time to complete the work must be approved by the City.



CITY OF PACIFIC GROVE
www.ci.pacific-grove.ca.us

Certification Form for Sewer Lateral Inspection and Maintenance

NOTICE

In accordance with the Chapter 9.20 of the Pacific Grove Municipal Code, mandatory closed-circuit television or other approved inspections of sewer laterals are required when the sale of a property or major remodel is undertaken on a property. Additional information is available in the Inspections and Repairs of Sewer Laterals guide. Chapter 9.20 of the Pacific Grove Municipal Code is available for review at City Hall, the Pacific Grove Library, and on the internet at: www.ci.pg.ca.us.

**This form must be signed and submitted to:
Community Development Department, 300 Forest Avenue, Pacific Grove, CA 93950
Tel: (831)648-3190**

Current Property Owner(s):

Property Address:

Assessor's Parcel No.:

Mailing Address (if different from above):

City:

State:

ZIP Code:

Home Number:

Work Number:

Mobile Number:

Buyer(s):

Buyer(s)'s Current Address:

Mailing Address:

City:

State:

ZIP Code:

Home Number:

Work Number:

Mobile Number:

Full Name of Authorized Representative (Real Estate Agent):

Agency Name:

Mailing Address (if different from above):

City:

State:

ZIP Code:

Signature of Authorized Rep.:

Work Number:

Mobile Number:

Contracting Company Conducting Closed-Circuit Videorecording:

Individual Conducting Videorecording

Address:

Telephone:

City:

State:

Zip Code:

Contractor License Number:

Draw sketch of sewer laterals and connections (to be completed by contractor):

As contractor for the above-mentioned property, I certify that I have read the requirements for sewer lateral inspection and maintenance found in Chapter 9.20 of the Pacific Grove Municipal Code. I certify that the information and videorecording I have provided is true and correct. I acknowledge that I am certified and qualified to conduct the closed-circuit television videorecording.

Signature of Contractor:

Date:

As buyer of the above-mentioned property, I certify that I have read the requirements for sewer lateral inspection and maintenance found in Chapter 9.20 of the Pacific Grove Municipal Code. I certify that the information I have provided is true and correct. I acknowledge that I am aware that although this is not a condition of sale or transfer of the property, it is a requirement imposed by law.

Signature(s) of Buyer(s):

Date:

Full Name(s) (Please Print):

FOR CITY USE ONLY

Date Received: _____ Reviewed by: _____

A review of the tape revealed that a replacement or repairs to sewer lateral are not necessary.

A review of the tape revealed that a repair to sewer lateral at _____ is required to correct a _____. A building permit and/or encroachment permit may be required before beginning this repair. Please contact the Building Division at 648-3199 for more information.

A review of the tape revealed that the sewer lateral needs to be replaced. A building permit and encroachment permit are required. Please contact the Building Division at 648-3199 for more information.

Reviewed by: _____ Date of Review: _____

The City of Pacific Grove appreciates your efforts in complying with the City's regulations. Please continue to help keep our sewers clean by making sure that the sewer lines contain:

No Grease

No Paper Towels, Diapers, etc.

COPY

Stephen J. Leiker

From: Nat Rojanasathira
Sent: Tuesday, January 18, 2005 3:17 PM
To: Sheryl McKenzie; dean@shanklerealestate.com
Cc: Ross G. Hubbard; Jon Biggs; Stephen J. Leiker; Jean-Marie Findlen; Marilyn Schultz; Maryann L. Adams; Bridget E. Luce
Subject: Sewer Lateral Inspection and Maintenance Certification Form & Guide

Sheryl and Dean:

Thanks for getting back to us regarding changes to the certification form and guide. We have taken your suggestions into consideration and have made appropriate changes.

Attached are PDF files of revised versions of the Certification Form for Sewer Lateral Inspection and Maintenance and the Guide to Sewer Laterals Inspection and Repairs. The Form and Guide are also available to download on the web at: <http://www.ci.pg.ca.us/pubworks/sewer.htm>

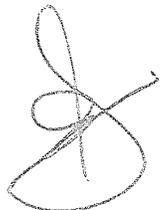
Please feel free to e-mail me if you have any questions.

Thanks,

Nat

Nat W. Rojanasathira
 Intern to the City Manager
 City of Pacific Grove

300 Forest Avenue / Pacific Grove, CA 93950
 Tel: (831)648-3106 / Fax: (831)657-9361
 E-Mail: nrojanasathira@ci.pg.ca.us
 Web: <http://www.ci.pg.ca.us>

Vince
 FYI & reading
 enjoyment.
 We need to show
 our staff so they
 know process.




CITY OF PACIFIC GROVE
www.ci.pacific-grove.ca.us

Certification Form for Sewer Lateral Inspection and Maintenance

NOTICE

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Current Property Owner(s):			
Property Address:			
Assessor's Parcel No.:			
Mailing Address (if different from above):			
City:		State:	ZIP Code:
Home Number:	Work Number:	Mobile Number:	
Buyer(s):			
Buyer(s)'s Current Address:			
Mailing Address:			
City:		State:	ZIP Code:
Home Number:	Work Number:	Mobile Number:	
Full Name of Authorized Representative (Real Estate Agent):			
Agency Name:			
Mailing Address (if different from above):			
City:		State:	ZIP Code:
Signature of Authorized Rep.:	Work Number:	Mobile Number:	
Contracting Company Conducting Closed-Circuit Videorecording:		Individual Conducting Videorecording	
Address:		Telephone:	
City:	State:	Zip Code:	Contractor License Number:

Draw sketch of sewer laterals and connections (to be completed by contractor):

As contractor for the above-mentioned property, I certify that I have read the requirements for sewer lateral inspection and maintenance found in Chapter 9.20 of the Pacific Grove Municipal Code. I certify that the information and videorecording I have provided is true and correct. I acknowledge that I am certified and qualified to conduct the closed-circuit television videorecording.

Signature of Contractor:

Date:

As buyer of the above-mentioned property, I certify that I have read the requirements for sewer lateral inspection and maintenance found in Chapter 9.20 of the Pacific Grove Municipal Code. I certify that the information I have provided is true and correct. I acknowledge that I am aware that although this is not a condition of sale or transfer of the property, it is a requirement imposed by law.

Signature(s) of Buyer(s):

Date:

Full Name(s) (Please Print):

FOR CITY USE ONLY

Date Received: _____ Reviewed by: _____

- A review of the tape revealed that a replacement or repairs to sewer lateral are not necessary.
- A review of the tape revealed that a repair to sewer lateral at _____ is required to correct a _____. A building permit and/or encroachment permit may be required before beginning this repair. Please contact the Building Division at 648-3199 for more information.
- A review of the tape revealed that the sewer lateral needs to be replaced. A building permit and encroachment permit are required. Please contact the Building Division at 648-3199 for more information.

Reviewed by: _____ Date of Review: _____

The City of Pacific Grove appreciates your efforts in complying with the City's regulations. Please continue to help keep our sewers clean by making sure that the sewer lines contain:

No Grease

No Paper Towels, Diapers, etc.

Sewer Lateral Replacement Loans:

As of: 1-Oct-11

LOAN NO.	NAME	RECORD DATE	INTEREST DATE	FY	INTEREST	ADDRESS	Loan Amt	Interest	Daily Interest	Days Outstanding	Interest Earned	Loan Payoff Date	Loan Payoff Amount	Interest Paid	total loan amount
S1	Souders, James	6/24/2004	6/1/2005	04/05	3%	860 Jewell Ave	\$ 7,750.09	\$ 232.50	\$ 0.64	0	\$ 1,459.99	6/13/2006	\$ 6,647.07	\$ 183.24	\$ 6,647.07
S2	Nelson, Barbara	6/24/2005	6/22/2005	04/05	3%	1207 Shafter	\$ 9,000.00	\$ 270.00	\$ 0.74	2,292	\$ 1,654.77				\$ 7,750.09
S3	Pesce, Thomas & Nancy	9/19/2005	8/16/2005	05/06	3%	821 Grove Acre Ave	\$ 6,923.38	\$ 207.70	\$ 0.57	2,234	\$ 1,271.25				\$ 9,000.00
S4	Ollinger, E/Baker, S.	10/14/2005	8/19/2005	05/06	3%	985 Benito Ct.	\$ -	\$ -	\$ -	0	\$ -				\$ 6,923.38
S5	Reighn, D/McVay, C.	9/20/2005	8/19/2005	05/06	3%	965 Sylda Dr.	\$ -	\$ -	\$ -	0	\$ -				\$ 6,963.74
S6	Golden, James & Jennifer	11/6/2005	9/20/2005	05/06	3%	987 Benito Ct.	\$ 5,400.23	\$ 162.01	\$ 0.44	2,193	\$ 973.37	5/12/2007	\$ 6,963.74	\$ 355.98	\$ 7,239.47
S7	Sterbick/Lessack	11/10/2005	9/29/2005	05/06	3%	983 Benito Ct.	\$ -	\$ -	\$ -	0	\$ -	10/31/2009	\$ 7,239.47	\$ 893.73	\$ 5,400.23
S8	Wright/Segura	6/30/2006	10/24/2005	05/06	3%	1309 Lincoln Ave	\$ 9,400.00	\$ 282.00	\$ 0.77	2,104	\$ 1,625.56	12/14/2006	\$ 8,000.00	\$ 309.17	\$ 9,400.00
S9	Hutt	1/13/2006	12/27/2005	05/06	3%	43 Esplanade	\$ 7,200.00	\$ 216.00	\$ 0.59	2,102	\$ 1,243.92				\$ 7,200.00
S10	Armstrong	1/13/2006	12/29/2005	05/06	3%	315 3rd Street	\$ -	\$ -	\$ -	0	\$ -	4/25/2008	\$ 4,728.61	\$ 394.46	\$ 4,728.61
S11	Miller, Allene	9/5/2006	8/25/2006	06/07	3%	1025 Forest Ave	\$ 5,500.00	\$ 165.00	\$ 0.45	1,838	\$ 830.88				\$ 5,500.00
S12	Tyndall, Lawrence & Cathleen	10/17/2006	9/19/2006	08/07	3%	1218 Miles Ave	\$ -	\$ -	\$ -	0	\$ -	8/11/2011	\$ 6,280.40	\$ 908.16	\$ 6,280.40
S13	Soper, Christopher & Hiroko	11/21/2006	10/30/2006	06/07	3%	984 Benito Ct	\$ 6,928.82	\$ 207.88	\$ 0.57	1,787	\$ 1,017.68				\$ 6,928.82
S14	McDowell, Stuart & Caren	12/18/2006	11/9/2006	06/07	3%	954 Sylda Dr	\$ 6,700.00	\$ 201.00	\$ 0.55	1,761	\$ 969.76				\$ 6,700.00
S15	McMillan, April	1/29/2007	12/5/2006	06/07	3%	186 Del Monte Blvd	\$ -	\$ -	\$ -	0	\$ -	9/5/2007	\$ 7,815.00	\$ 131.04	\$ 7,815.00
S16	Lake, Edwin & Sandra	5/15/2007	2/13/2007	06/07	3%	1315 Funston Ave	\$ 7,500.00	\$ 225.00	\$ 0.62	1,585	\$ 977.05				\$ 7,500.00
S17	Napier, Kirk & Laura	6/13/2007	5/30/2007	06/07	3%	604 Spruce Ave	\$ 6,889.35	\$ 200.68	\$ 0.55	1,570	\$ 863.20				\$ 6,889.35
S18	Schimpf, Michael & Lorraine	8/21/2007	6/14/2007	07/08	3%	312 9th Street	\$ 4,900.00	\$ 147.00	\$ 0.40	1,527	\$ 614.98				\$ 4,900.00
S19	Achman, Tracy S	8/21/2007	7/27/2007	07/08	3%	313 10th Street	\$ -	\$ -	\$ -	0	\$ -	5/30/2008	\$ 4,000.00	\$ 87.78	\$ 4,000.00
S20	Dawson, Carole J.S.	10/15/2007	9/6/2007	07/08	3%	220 Forest Park Court	\$ 6,750.00	\$ 202.50	\$ 0.55	1,360	\$ 754.52				\$ 6,750.00
S21	Danley, Christina	1/10/2008	1/10/2008	07/08	3%	914 Sylda Dr	\$ -	\$ -	\$ -	0	\$ -	4/14/2009	\$ 6,675.00	\$ -	\$ 6,675.00
S22	Hunt, Charles & Christine	4/24/2008	3/28/2008	07/08	3%	1123 Ripple Ave	\$ 7,000.00	\$ 210.00	\$ 0.58	1,262	\$ 726.08				\$ 7,000.00
S23	Anistratenko, Tanya	5/8/2008	4/17/2008	07/08	3%	1212 Shafter Ave	\$ -	\$ -	\$ -	0	\$ -	6/17/2009	\$ 9,400.00	\$ 275.89	\$ 9,400.00
S24	Bonner, Kathleen	9/19/2008	9/11/2008	08/09	3%	150 15th St	\$ 9,390.00	\$ 281.70	\$ 0.77	1,002	\$ 773.32				\$ 9,390.00
S25	Byrd, Oscar	1/9/2009	1/2/2009	08/09	3%	722 Hillcrest Ave	\$ 4,870.00	\$ 149.10	\$ 0.41	962	\$ 392.97				\$ 4,870.00
S26	Yant, Richard S. III	2/18/2009	2/11/2009	08/09	3%	314 7th St	\$ 5,950.00	\$ 178.50	\$ 0.49	981	\$ 580.54				\$ 5,950.00
S27	Russo Family Trust	1/30/2009	1/23/2009	08/09	3%	120 Asilomar	\$ 5,100.00	\$ 153.00	\$ 0.42	799	\$ 334.92				\$ 5,100.00
S28	Wilcox, Lybce I Trust	6/9/2009	6/2/2009	08/09	3%	216 17 Mile Dr	\$ 4,006.00	\$ 120.18	\$ 0.33	467	\$ 153.76				\$ 4,006.00
S29	The Ham Trust	8/16/2009	7/24/2009	09/10	3%	236 Cedar St.	\$ 4,600.00	\$ 138.00	\$ 0.38	437	\$ 165.22				\$ 4,600.00
S30	Collier, Sharon	6/28/2010	6/21/2010	09/10	3%	314 13th St.	\$ -	\$ -	\$ -	121	\$ 88.28				\$ -
S31	Miskomon, Christine	7/29/2010	7/21/2010	10/11	3%	822 Gibson Ave.	\$ 8,877.14	\$ 266.31	\$ 0.73		\$ -				\$ 8,877.14
S32	March, Lowell	6/10/2011	6/2/2011	10/11	3%		\$ -	\$ -	\$ -		\$ -				\$ -
							\$ 147,735.01	\$ 4,432.05				\$ 17,888.21	\$ 57,749.29	\$ 3,537.45	\$ 215,484.30

Waiting for info from Applicants
Cox, James & Cheryl
Stene, Elke
Erickson, Ellen

157 15th St.
1149 Presidio
1211 Presidio Blvd.

10,000 estimate
applicant backed out
1500 estimate

APPENDIX 4M

Safety Training Records

Tailgate Safety Meeting List: 2012

CWEA Certificates – Grade 1 Collection System Maintenance: Vince Gentry and Michael Aliotti

E1 - L

M - MIKE A.
V - VINCE G.
R - ROBIN K.
L - LAURE F.

City of Pacific Grove, Public Works Dept. 2012

Tailgate Safety Meeting List.

<u>JANUARY.</u>	Friday, 20 th Eye and Face Protection.	(PW Staff).	M, V, R.
<u>FEBRUARY.</u>	Friday, 10 th Chemical Safety and Glove Selection.	(PW Staff).	R.
<u>MARCH.</u>	Friday, 9 th Back Protection.	(PW Staff).	V, R.
<u>APRIL.</u>	Thurs, 19 th Hand Protection.	(PW Staff).	M, L, V.
ADDITIONAL	26 th		M, L, V, R.
<u>MAY.</u>	Thurs, 3 rd Front End Loaders.	(PW Staff).	M, L, V, R.
	Thurs, 10 th Company Nurse Program.	(PW Staff).	M, L, R.
	10 USA North		L, R.
	Thurs, 17 th GFC'S at work and home.	(PW Staff).	M, L, V, R.
	24 HEAD Protection		M, L, V, R.
	Thurs, 31 st Bloodborne pathogens.	(PW Staff).	M, L, V, R.
<u>JUNE.</u>	Thurs, 7 th Trenching and Excavation.	(PW Staff).	M, L.
	Thurs, 14 th Common Safety Mistakes.	(PW Staff).	M, L.
	Thurs, 21 st Work Site Fire Emergencies.	(PW Staff).	L, V.
	Thurs, 28 th Tree Trimming Safety.	(PW Staff).	M, V.
<u>JULY.</u>	Thurs, 5 th Take Care of your Back.	(PW Staff).	M, R.
	Thurs, 12 th Tow right Tow Safety & Vehicle DOT Safety Check & Inspect.	(PW & Golf).	M, L, R, V.
	Thurs, 19 th Fires, Fire Safety & Fire Extinguisher's.	(PW & Golf).	M, L, R, V.
	Thurs, 26 th 1).Construction Site Safety.	(PW & Golf).	M, R, V.
	2).Suspicious Envelopes.		
	3).Vehicle Accident Report Kits.		
	4).Vehicle Inspection Reports.		
	Tues, 31 st Flagger & Traffic Control.	(2 Year Certification, 14 PW Staff).	M, R.

AUGUST. Thurs, 2nd Safety in Earthquake Country. (PW & Golf). M, V, R.
 Thurs, 9th Gasoline: What you don't know can kill you. (PW & Golf). M, V, R.
 Thurs, 16th Stretch for Safety. (PW & Golf). M, L, R, V.
 Thurs, 23rd Understanding Material safety Data Sheets. (PW & Golf). M, L, R, V.
 Thurs, 30th Protect yourself from Chemical Hazards. (PW & Golf). M, R, V.

SEPTEMBER. Thurs, 6th Aerial Bucket Truck Training. (3 Year Certification, 13 PW Staff). V.
 Thurs, 13th Municipal Storm Water Pollution Prevention. (BMP'S) (PW Staff). M, V, R.
 Thurs, 20th C-O Could Spell Death. Carbon Monoxide. (PW & Golf). M, L, V, R.

OCTOBER. Thurs, 4th Listen up to Protect your Hearing. (PW & Golf). M, L, V, R.
 Thurs, 11th Skid Steer Safety. (PW Staff). M, L, V, R.
 Thurs, 18th Chainsaw Safety. (PW Corp Yard Staff) L, V, R.
 Thurs, 18th Municipal Storm Water Pollution Prevention. (BMP's) (Golf Staff)
 Thurs, 25th Responding to Emergencies & Protecting the Public. PW & Golf. M, V, R.
 Tues, 30th Haz-Mat First Responders Recertification. (Yearly Recertification, 5 PW Staff). M, V,

NOVEMBER. Thurs, 1st Lightning Strikes. PW & Golf. M, L, R, V.
 Thurs, 8th The ups and downs of Ladder Safety. PW Staff. M, L, R, V.
 Thurs, 15th Hand- Arm Vibration. PW Staff. M, L, R, V.
 Thurs, 15th BMP's, Best Management Practices. Golf Staff.
 Thurs, 29th Flu Prevention at Home & the Workplace. PW & Golf. M, L, R, V.

December. Thurs, 6th Harassment, Discrimination & Retaliation Prevention. PW & Golf. M, L, R, V.
 Thurs, 13th L.P.G. Liquid Propane Gas. PW & Golf. Mike, Lance, Robin, Vince
 Thurs, 20th U.S.A. Underground Service Alert. PW & Golf. Mike, Lance, Vince
 Thurs, 27th Evacuation Routes & Haz- Mat Spill Plan. PW & Golf. VINCE, ROBIN

CALIFORNIA WATER ENVIRONMENT ASSOCIATION

Certification of Competence

THIS IS TO CERTIFY THAT

Vincent Gentry

HAVING SUBMITTED ACCEPTABLE EVIDENCE OF QUALIFICATIONS
BY EDUCATION, TRAINING AND EXPERIENCE IS HEREBY
GRANTED THIS CERTIFICATION OF COMPETENCY AS A

GRADE I

COLLECTION SYSTEM MAINTENANCE

Expires On 7/31/2013



Carrie Mattingly, President
California Water Environment Association

Certificate No. 04072139



Lenny Rather, Chair
Technical Certification Program



**CALIFORNIA
WATER ENVIRONMENT
ASSOCIATION**
Certification of Competence

THIS IS TO CERTIFY THAT

Michael Aliotti

**HAVING SUBMITTED ACCEPTABLE EVIDENCE OF QUALIFICATIONS
BY EDUCATION, TRAINING AND EXPERIENCE IS HEREBY
GRANTED THIS CERTIFICATION OF COMPETENCY AS A**

**GRADE I
COLLECTION SYSTEM MAINTENANCE**

Expires On 7/31/2013



**Carrie Mattingly, President
California Water Environment Association**

Certificate No. 04072104



**Lenny Rather, Chair
Technical Certification Program**

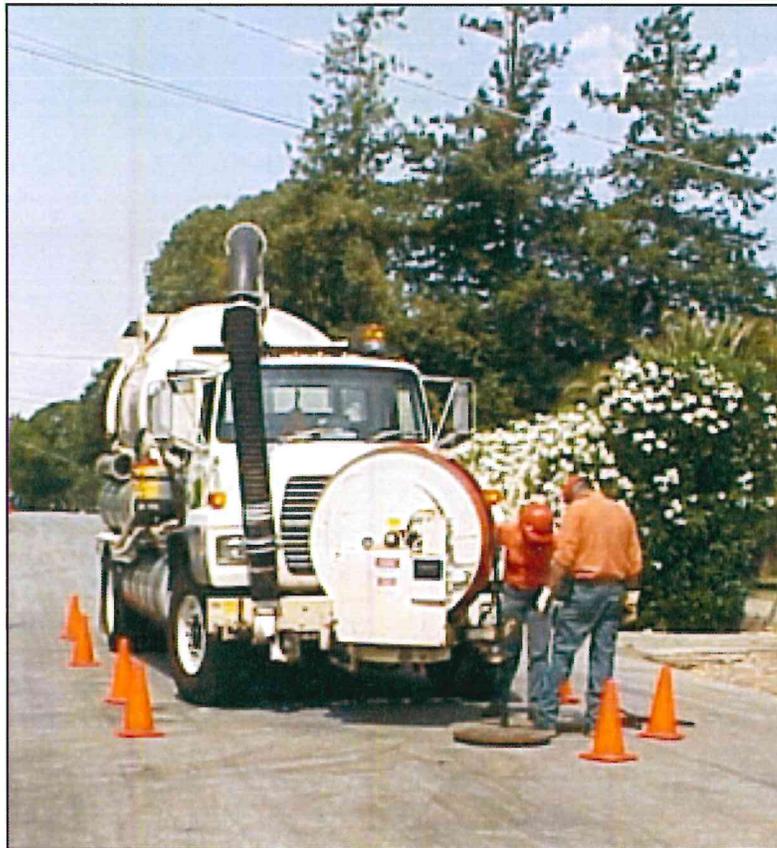


APPENDIX 4N

Sewer Line Cleaning and Manhole Inspection and Rehabilitation SOP

Best Practices Manual: Hydroflush Cleaning of Small-Diameter Sewers: February 2001
Manhole Rehabilitation and Replacement Technical Memorandum: May 10, 2004

California Collection System Collaborative Benchmarking Group



**Best Practices Manual:
Hydroflush Cleaning of Small-Diameter Sewers
February 2001**

Contents

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Section 1. Introduction

Seven public wastewater utilities with responsibilities for the operation and maintenance of wastewater collection systems agreed in 1998 to compare and improve their performance through the use of metric and process benchmarking. The seven participating agencies are:

- Central Contra Costa Sanitary District
- City of Los Angeles
- City of Sacramento
- City of San Diego
- Orange County Sanitation District
- Sacramento County Sanitation District No. 1
- Union Sanitary District

The initial metric benchmarking work was completed in September 1998. The group agreed to continue its efforts in the area of identifying best work practices using process benchmarking. This is the group's first effort at identifying "Best Practices." Hydroflush sewer cleaning of small-diameter sewers was selected because it was the most common of the daily work activities employed by the seven agencies. The work began on July 14, 1999. The goals for this effort were:

- Achieve consensus on Best Work Practices
- Produce a written generic procedure, including on-the-jobsite process steps, with performance expectations
- Produce common (and comparable) performance measures

Each of the seven participating utilities brought its best hydroflush crew to participate in a series of events to identify best work practices. The contents of this document are the results of observing their work and discussing the process, the details, and their "tricks of the trade." Subsequent meetings were held between November 1999, and January 2001.

Section 2. Safety

Safety is a key element of all work in wastewater collection system operation and maintenance. The minimum activities required to mitigate the hazards that will be encountered in hydroflush sewer cleaning are:

A. Use of Personal Protective Equipment

The hydroflush crew should be trained periodically in the use of personal protective equipment and they should use that equipment, as needed, to protect themselves from the hazards of the job. Proper use of this equipment should be periodically verified in the field.

The minimum items of personal protective equipment are:

- Hard hat
- Orange shirt/vest (reflective material for work in low-light conditions)
- Foot protection (safety shoes with steel toes or equivalent foot protection)
- Hearing protection
- Eye protection
- Face protection
- Hand protection
- Respiratory protection (from gases, volatile organics, and aerosols) [*Note: this can be accomplished with a respirator, a blower or a temporary manhole cover*]

The minimum items of crew safety equipment are:

- Two-way communication equipment (to coordinate work between different parts of the jobsite)

- Access to an atmosphere test meter (oxygen level, toxic gases, flammable/explosive level) *[Note: four of the seven utilities require their crews to test the atmosphere in a manhole before it is opened. They feel that it provides better protection as well as information regarding collection system performance.]*

B. Periodic Equipment Inspection

All equipment should be inspected at the start of the work day to ensure that it is in safe working order. There are requisite procedures for the inspection of heavy-duty trucks that should be followed.

In addition to other inspections, special attention should be given to the high-pressure hose. Areas where the outer surface of the hose has been cut or abraded should be replaced using couplings that are compatible with the specific hose in use. The hose should be pressure-tested to its full rated operating pressure following any repair. The test should be conducted in a way that does not place any of the operating personnel at risk of injury. The entire hose should be replaced periodically.

C. Down Hole Hose Protection

A device to protect the pressure hose from cuts and abrasions should be used at all times.

D. Leader Hose

A leader hose of a different color with a minimum length of 20 feet should be used to warn the crew that the nozzle is nearing the manhole (deeper manholes may necessitate the use of longer leader hoses).

E. Implementation of an Effective Traffic Control Setup

Traffic control requirements vary depending on the location and the risk to operating personnel and the public. CalTrans standards should be the minimum for congested and/or high-speed streets and highways. The minimum traffic controls for low-speed/low-traffic-density streets

should conform to local standards. In the case where there are no local standards, the minimum traffic control should be:

- Warning signs (signs with the symbol for “person working” are preferred)
- Directional arrow signs on front and rear of the hydroflush truck
- Traffic cones clearly delineating traffic lanes and directions

In addition, one or more flaggers should be used to control and direct traffic where visibility is limited or the possibility of collision exists.

F. Personal Hygiene

All operating personnel should receive periodic training in personal hygiene. Each truck should be equipped with cleaning materials for use after each job. Trucks should also be equipped with clean storage areas for clothing and food.

G. Backing

Ground guides (or spotters) should be used whenever the vehicle is backed. Hand signals should be standardized.

H. Manholes

All crews should be equipped with tools that support their daily work without the need for manhole entry.

I. Open Manholes

CalOSHA views open manholes as “open pits.” They must be guarded whenever they are open (e.g., an attendant must be present or a mechanical barrier must be in place).

J. Lock-out/Tag-out

Rotating power-take-off shafts and charged pressure systems can cause serious injury. All moving parts and sources of energy (e.g., power-take-off from transmission, hydraulic systems) should be “locked out” and “tagged out” prior to anyone working on the vehicle in order to prevent injury.

Section 3. Equipment Features

Best Practice Equipment Features

- Equipment layout to support quick setup and takedown
 - Ready storage for traffic warning signs and cones
- Front-mounted rotating and extending hose reel
- Truck well-lighted and well-marked for working at night or under other low-visibility conditions
 - Front and rear-facing directional arrows [*Note: eye-level strobe lights appear to provide additional visibility*]
- All controls (pump, reel, and vacuum) at operator work station and well-marked with permanent (engraved) markings
- Ready access to tools and accessories
 - Nozzle storage on/near hose reel
- Rotating tool purging and storage (for lubricating cleaning nozzles with bearings)
- Clean storage for clothing and food
- Two-way communication equipment
- Lights for working
 - Manhole light mounted on hose reel
 - Night light mounted on vacuum boom
 - Rear-facing lights to illuminate the work area
- Mirrors for improved passenger-side visibility
- Rear-view closed circuit television camera with monitor in cab
- Air conditioning for de-fogging windows in wet weather

[Note: Photographs of some of the Best Practice Equipment Features are shown in Attachment 2]

Management of Facilities

Hydroflush crews spend between 25% and 50% of their day traveling to and from jobsites, one quarter to one third of their day setting up and breaking down jobsites, and the remainder of their day cleaning sewers. Vehicles that minimize setup and takedown times will directly contribute to overall productivity.

Section 4. Nozzle Selection and Performance

Nozzle availability, selection, and condition are critical aspects of hydroflush operations. Crews should have a broad range of nozzles available on the truck to meet the anticipated range of routine and emergency situations. The nozzles should be specified to work with the size of the pump and the length of the hose normally in use.

The nozzle provides the pulling force for the hose, the cleaning action on the pipe wall, and the finishing action (returning the pipe to its full flow diameter). A 30-degree nozzle is the best balance between pulling force and cleaning action for use in small-diameter sewers. A 15-degree nozzle provides better pulling force and a 45-degree nozzle provides better cleaning action. Rotating nozzles are the most effective at cleaning grease off the wall of the pipe. Each of these nozzle types should be used as conditions dictate:

Cleaning Nozzles:

- Use **15-degree nozzle** for steep slopes and/or long runs
- Use **45-degree nozzle** when heavy deposits of grit are encountered
- Use a **rotating nozzle** when heavy deposits of grease are encountered

Finishing Nozzles:

- Use a **root saw** for roots
- Use a **chain flail** for roots or hard (calcified) grease
- Use a **proofing attachment** to verify that there are no obstructions to the flow area

A. Use of a Leader Hose

A leader hose of contrasting color should be used adjacent to the nozzle to warn the crew that the nozzle is approaching the manhole. The minimum length of leader hose should be 20 feet (deeper manholes may necessitate the use of longer leader hoses).

The use of a swivel connection to the main pressure hose is recommended on hoses greater than one inch in diameter.

B. Nozzle Condition

The condition of the nozzle is important. The jets wear with use. Nozzles with worn jets use significantly more water for equivalent pulling force, increasing the number of stops required to fill the water tank. Best Practice is to use a Go-Nogo gauge each week to determine the condition of the nozzle jets and to replace the jets or the nozzle when the wear exceeds standards.

Example:

30-degree nozzle
65 gallons per minute (gpm)
8 rear-facing jets

New Nozzle Jet Size:

#46 drill or 0.0810-inch diameter
Velocity @ 65 gpm = 506 feet per second

Worn Nozzle Jet Size:

#44 drill or 0.0860-inch diameter (the jets are worn when a #44 drill will fit in the jet).
Water velocity @ 65 gpm = 420 feet per second.
This represents a 30% reduction in cleaning and hose-pulling power.

Section 5. Work Planning

Crews cannot be efficient without prior proper planning. Best Practices include assigning work to crews for a period of a week or more so that on any given day the crew has additional work to fall back upon in the event that field conditions do not support completion of any assigned job (e.g., traffic too heavy, car parked over manhole). The work should be arranged in geographical order to minimize travel time between jobs. The crews should be responsible for planning each day's work and they should be held accountable for the quality of their planning. This planning can be accomplished at the end of the day while the equipment is being prepared for the following day's work or at the beginning of the day while the pre-trip inspection is being completed. The crews that took one minute at each jobsite to plan their efforts were more efficient than the crews that did not take that time. The work process flowchart is included as Attachment 1.

Production goals should be established at least each year. Daily production goals of 3,000 to 4,000 feet per eight-hour work day are considered typical.

Section 6. Order of Work at the Jobsite and Performance Expectation

On July 14, 1999, six crews were videotaped cleaning a 340-foot long, eight-inch sewer line located in a residential street. The sewer line was known to be clean and in good condition. The speed limit was 25 mph, the traffic was light, and the visibility was excellent. This is considered an "Easy Case" hydroflush cleaning situation. The videotapes were reviewed, the best practices were identified, and the tasks were timed.

What follows is a composite listing of the order of work that, in the judgment of the group at the meeting on January 26, 2000, meets the criteria of a safe worksite, is likely to produce quality work, and is completed in a competitive time. The crews that were the most efficient in their use of time employed the concept of "division of labor" to get the job done. These tasks and the associated time for performance are based on small-diameter sewer situated in a low-speed, low-traffic-density residential street. Additional job tasks and longer performance times would be expected under more demanding environmental conditions.

<u>Job Task</u>	<u>"Easy Case" Performance Expectation (minutes)</u>	<u>"Easy Case" Elapsed Time (minutes)</u>
Arrive at jobsite	0	0
Plan job	1.2	1.2
Walk to place traffic warning signs	2.6	3.8
Place traffic control cones and position truck	0.8	4.6
Test manhole for toxic/explosive gases	0.5	5.1
Open manhole (MH)	0.3	5.4

<u>Job Task (continued)</u>	<u>"Easy Case" Performance Expectation (minutes)</u>	<u>"Easy Case" Elapsed Time (minutes)</u>
Insert trap in outlet	0.3 (est.)	5.7
Insert hose	0.7	6.4
Run initial 50-100 feet and observe results	1.7 (est.)	8.1
Set up vacuum tube (if required)	0	8.1
Run remainder of line	4.0	12.1
Break down vacuum tube	0	12.1
Close MH cover, move truck, pick up cones	2.0	14.1
Retrieve warning signs	2.0	16.1
Depart jobsite	0	16.1

The work process flowchart is included as Attachment 1. The performance expectation for this job would increase from 16 to 19 minutes in the event that the quantity of grease and grit required the use of the vacuum equipment. Under this scenario the vacuum equipment would be deployed and an additional cleaning of the entire line would be required.

The need for a "Difficult Case" performance expectation was identified. The Difficult Case was defined as a line segment that has a heavy grease accumulation in a location with high-speed/heavy traffic. The Difficult Case observations were made of a crew cleaning a 400-foot long, eight-inch line segment in a four-lane street with a speed limit of 35 mph. The line segment requires frequent cleaning. The results are:

<u>Job Task</u>	<u>"Difficult Case" Performance Expectation (minutes)</u>	<u>"Difficult Case" Elapsed Time (minutes)</u>
Arrive at jobsite	0	0
Plan job	1.2	1.2
Walk to place traffic warning signs	2.6	3.8
Place traffic control cones and position truck	0.8	4.6
Test manhole for toxic/explosive gases	0.5	5.1
Open manhole (MH)	0.3	5.4

<u>Job Task (continued)</u>	“Difficult Case” Performance Expectation (minutes)	“Difficult Case” Elapsed Time (minutes)
Insert trap in outlet	0.3 (est.)	5.7
Insert hose	0.7	6.4
Run initial 50-100 feet and observe results	2.5 (est.)	8.9
Set up vacuum tube (if required)	1.5	10.4
Run remainder of line (step cleaning)	13.0	23.4
Break down vacuum tube	1.5	24.9
Close MH cover, move truck, pick up cones	2.0	26.9
Retrieve warning signs	3.0	29.9
Depart jobsite	0	29.9

The increase in time on the jobsite is due almost entirely to the additional time for cleaning using the step cleaning method and the additional time to deploy and stow the vacuum tube to remove the solids.

The following comparison shows the performance expectations for the two cases side-by-side for contrast:

<u>Job Task</u>	“Easy Case” Performance Expectation (minutes)	“Difficult Case” Performance Expectation (minutes)
Arrive at jobsite	0	0
Plan job	1.2	1.2
Walk to place traffic warning signs	2.6	3.6
Place traffic control cones and position truck	0.8	1.0
Test manhole for toxic/explosive gases	0.5	0.5
Open manhole (MH)	0.3	0.3
Insert trap in outlet	0.3 (est.)	0.3
Insert hose	0.7	0.7
Run initial 50-100 feet and observe results	1.7 (est.)	2.5
Set up vacuum tube (if required)	0	1.5

<u>Job Task (continued)</u>	"Easy Case" Performance Expectation (minutes)	"Difficult Case" Performance Expectation (minutes)
Run remainder of line	4.0	13.0
Break down vacuum tube	0	1.5
Close MH cover, move truck, pick up cones	2.0	2.0
Retrieve warning signs	2.0	3.0
Depart jobsite	0	0
Total Elapsed Time	16.0	31.0

Section 7. Standard Measures of Observed Results

Next to cleaning the sewer line, effective observation of results is the most important work product of the crew. This information is the basis for defining future maintenance activities. Consistency is important. The standards for "results" for six- and eight-inch diameter sewers are:

	Clear	Moderate	Heavy
Grit	No observable grit	Less than 5 gallons 15-20 minutes to clean 1-2 passes required Requires cleaning twice or less per year Only fine grit	More than 5 gallons More than 30 minutes to clean More than 4 passes required Requires cleaning four times per year
Grease	No observable grease	Small chunks/no "logs" 15-20 minutes to clean 1-2 passes required Requires cleaning twice or less per year	Big chunks/"logs" Operator concern for downstream plugging More than 30 minutes to clean More than 4 passes required
Liquefied grease		Vacuuming not required	Vacuuming not required
Roots	No observable roots	Thin/stringy roots present No large "clumps" 15-20 minutes to clean 1-2 passes required	Thick roots present Large "clumps" More than 30 minutes to clean More than 4 passes required
Other condition observations: Pipe material fragments Soil/dirt Rock (pipe bedding) Lost nozzle			

Section 8. Performance Measures

Two performance measures were developed for comparison of agency and crew performance. The two measures cover production and productivity. They are defined:

$$\text{Production} = \frac{\text{Total feet of sewer cleaned per month}}{\text{Average number of crews}} = \text{Feet per crew per month}$$

$$\text{Productivity} = \frac{\text{Production}}{\text{Working days} \times \text{hours per day} \times \# \text{ on crew}} = \text{Feet per gross labor hour}$$

Sample calculation:

Total feet cleaned in February	147,073
Average number of crews	3
Working days	19
Working hours per day	8
Number on crew	2

Production:

$$\begin{aligned} 147,073 \text{ feet} \div 3 \text{ crews} &= 49,024 \text{ feet per crew per month} \\ &= 2,580 \text{ feet per crew per day} \end{aligned}$$

Productivity:

$$49,024 \div 19 \text{ days} \times 8 \text{ hours/day} \times 2 = 161 \text{ feet per gross labor hour}$$

These performance measures should be implemented before the application of "Best Practices" and they should be tracked after the application to determine whether or not there has been an improvement in performance.

Section 9. Quality Assurance

The quality of the work is important in that poor quality work will likely result in an overflow. The recommended methods are **standard methods, operator training, operator accountability, and television inspection of the results.** The elements of the Quality Assurance methods are:

Standard Methods

The methods used in hydroflush cleaning should be standardized to the greatest extent possible. This would include the order of tasks and the tools recommended in this report. Operators should be expected to follow their agency's standard method or to have a reason for proceeding in another manner.

Operator Training

All hydroflush operators should be required to complete formal training before initial assignment and to participate in periodic refresher training. The training should cover the contents of this report. Their ability to follow the standard methods should be assessed at the conclusion of the training. Some qualitative assessment of the effectiveness of their cleaning methods would be in order. One example would be the removal of a measured amount of sand from a test facility.

Operator Accountability

Cleaning records should be kept so that the number of stoppages can be determined by the crew. Local performance goals should be established.

Television Inspection

Using television inspection to spot-check the quality of the work is the most direct method of measuring the quality of the work. Line segments

should be chosen randomly for each crew for each month worked. The line segment should be televised within one week of completion of the cleaning activity. Wherever possible, the results of that inspection should be communicated to the crew so that they can use it as a learning tool.

Proofing

Use of a proofing tool provides immediate feedback to the crew regarding the quality of their work. A proofing tool verifies that the sewer has been restored to its full cross-sectional area. Some examples of proofing tools are porcupine, root saw, rodding hook, or a flat disk attached to the hydro nozzle. The diameter of the proofing tool should be established by the local agency and the use and result of the proofing step should be reported by the crew.

Section 10. Field Application of “Best Practices”

The “Best Practices” for using a hydroflush to clean a small-diameter residential sewer have been described. They are proposed as a basis for training. The actual conditions that would be encountered during a normal workday will vary widely and productive/effective crews are expected to adopt these “Best Practices.” The three goals that must be satisfied, in priority order, are:

- **Work Safely**
- **Produce Quality Work**
- **Produce Competitive Quantities of Work**

The crews in the field are the only ones in a position to make the decisions that result in the satisfaction of the three criteria.

Attachments

Work Process Flowchart

Equipment Features



Vacuum tube storage

Clean storage compartment



Additional rear-view mirror

Lights on vacuum boom for night work



Hand nozzle and decant connections at front

Front-mounted hose reel



Vacuum tube storage

Clean storage compartment





Vacuum tube storage





Engraved control labels

Variations on traffic control signs and vacuum tube storage



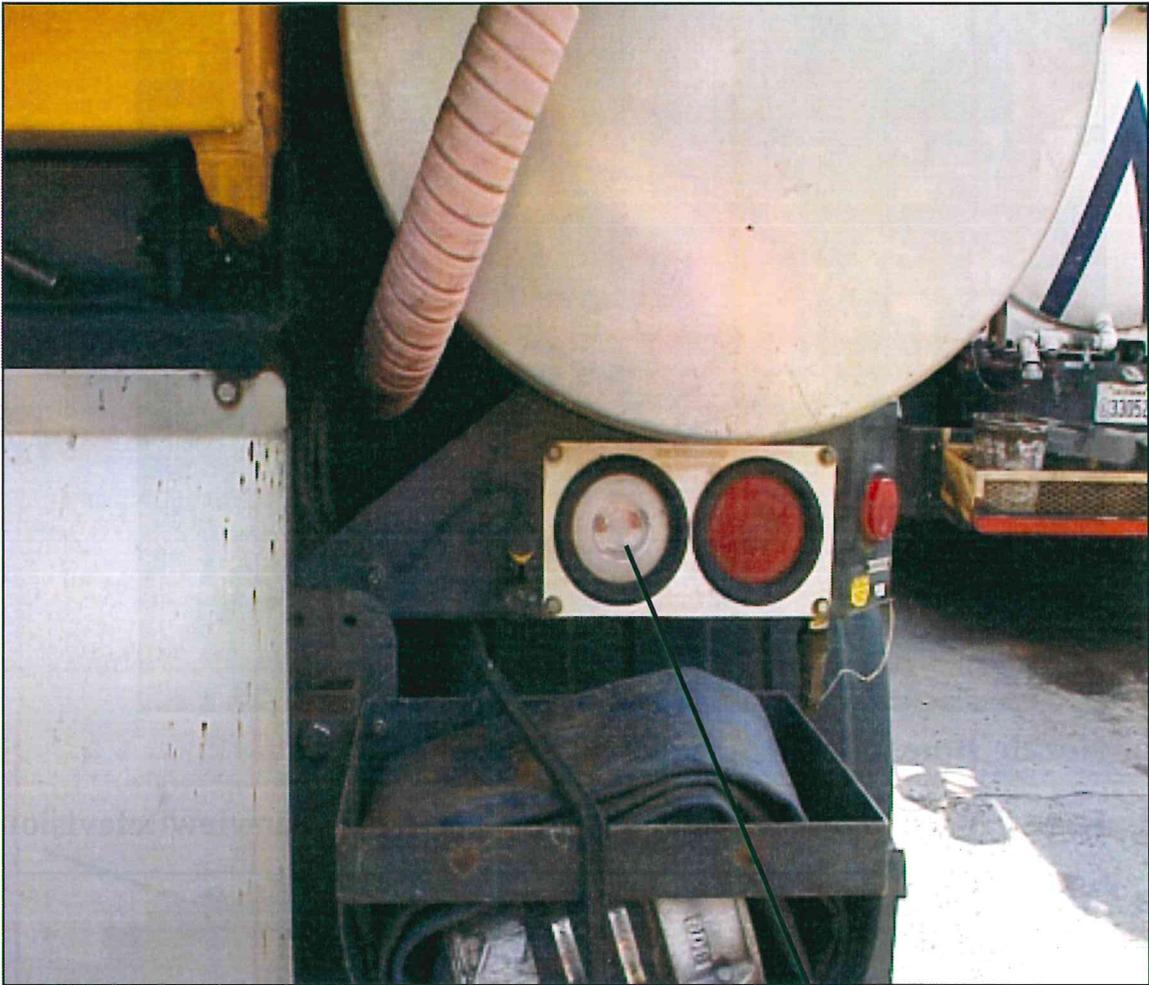


Nozzle storage

High-capacity cone storage

Rear-view television





High intensity strobe light

MANHOLE REHABILITATION AND REPLACEMENT

City of Pacific Grove Sewer System Asset Management Plan

May 10, 2004

Reviewed by: John Larson, P.E.

Prepared by: Dolly Yu, P.E., Christina Hartinger, P.E.

Introduction

The City's manholes are constructed of brick except for the pre-cast concrete manholes that replaced the brick manholes during sewer rehabilitation projects. Manholes are normally identified for replacement if the adjacent pipelines are also to be replaced. Some of the new manholes are T-Lock lined if they are located in turbulent areas such as the downstream end of a force main.

Manhole Inspections

Manhole inspections must be performed in order to determine the type of rehabilitation needed. There are several ways to conduct inspections of manholes: CCTV, top-side, and internal (manhole entry).

CCTV inspection is conducted by reviewing CCTV tapes. This is the least detailed of the three methods but can be used in the absence of any other type of inspection.

Top-side inspection consists of observations made from the surface. The manhole cover is removed and either a mirror utilizing sunlight or flashlight is used to observe the condition of the manhole. A camera mounted on an extendable metal pole can be lowered into the manhole to view the incoming and outgoing pipes and the internal condition of the manhole. There are two versions of this type of camera. The more expensive type is commercially available and can take digital pictures and movies. It has a special carrying case and is more rugged (Attachment A). A less expensive option is a "camera on a stick". A camera on a stick is simply an inexpensive film camera mounted on the end of a broomstick that can be outfitted with screw on extensions. A string is strung from the camera to the top of the manhole and a picture is taken by pulling on the string. This method does not allow viewing the pictures before they are developed. A metal pole or screwdriver can be used to probe the mortar to see if it has started to deteriorate (soft) but extent of deterioration cannot be determined.

Internal inspections are conducted with manhole entry. This allows for data to be collected on a more accurate level. The person can probe the mortar and determine the depth at which it has deteriorated.

During wet weather, it is further recommended that the City conducts field inspections to determine if there is any surcharging occurring during a storm event. This consists of opening manholes during a storm event in suspected high inflow & infiltration areas and observing the amount of surcharging (if any). If surcharging is observed, it would indicate either insufficient capacity in the system or a partial blockage of the pipeline.

Manhole Inspection Form

To facilitate the recording of observations and information collected during the manhole inspections, a recommended inspection form (Attachment B) is developed for use by the City. A similar form is used by the City of San Diego.

Using the inspection form, the following list of information will be collected and recorded:

- ◆ External data such as the manhole location, manhole ID, cover size, visibility and accessibility, type of access, and the type of vandalism deterrent installed.
- ◆ Internal data such as signs of vandalism, size and general condition of the manhole, type of odor control equipment installed, presence and severity of grease, sludge, roots, or infiltration, and the type of cleaning that is recommended.
- ◆ Dimensions consisting of the depth to the invert, height of rim above the ground surface, and the depth to the surcharge ring if a ring is visible.
- ◆ Manhole accessibility.
- ◆ Condition of locking or secured covers.
- ◆ Internal condition, including structural integrity.
- ◆ External condition, including erosion evidence and excessive plant growth.
- ◆ Depth of flow within the manhole.
- ◆ Manhole dimensions.
- ◆ Condition of key features (i.e. alfalfa bolt, rain trap, strap, bolts).

To prepare the data for analysis, the collected data should be compiled into the CMMS. As described below, this database can be used to classify the manholes, identify maintenance needs, and develop capital improvements, etc.

Typical Manhole Problems

The repair, rehabilitation, replacement, or maintenance of a manhole will be performed only if a problem requiring corrective action is detected. Typical problems encountered include the following:

- ◆ **Roots:** Roots can enter a manhole through deteriorated mortar between the bricks.
- ◆ **Inflow & Infiltration:** Infiltration can be detected at any location throughout the manhole but is most commonly observed at the intersection of the base and first riser joint and around the entry and exit pipelines.
- ◆ **Corrosion:** When sulfides are present in the wastewater stream due to the natural biodegradation of the sewage, structural deterioration is likely to occur to all concrete surfaces and mortar. In general, the bricks rarely corrode. Corrosion occurs in the brick manholes when sulfuric acids attack the cement bonding materials (mortar) and softens to a point when it can be washed away by I/I. Corrosion can also occur in the manhole frame, cover, and risers. The factors that control sulfide generation are wastewater velocity (turbulence), ambient water pH, air temperature within the sewer system, and oxygen availability. Hydrogen sulfide structural degradation of a manhole can be controlled through effective manhole rehabilitation, although wider measures may also be appropriate to control the generation of the sulfides.
- ◆ **Structural Deformation:** Structural degradation does not necessarily mean structural failure. For purposes of manhole inspections, structural degradation may be defined as damage to any of the structural components of a manhole. Structural degradation can occur due to movement and displacement. Structural degradation of manholes will occur with three dimensional displacement and movement. Three-dimensional movement can occur to the entire manhole structure due to settlement and movement of the ground around the manhole. This differential movement can be pronounced in certain clay, unstable soils, and in California, earthquakes. Such loading can impose unbalanced point loadings and increase tensile stress failures. Manholes made of brick are particularly susceptible to displacement and joint separation where unstable soils exist. Traffic induced loads can result in three-dimensional movement of the manhole cover, frame and chimney section.
- ◆ **Maintenance:** Field conditions that hinder normal maintenance and operations of a collection system should be considered in manhole rehabilitation. These conditions include deteriorated manhole steps, offset frames, buried manholes, manholes that are inaccessible due to location, other utilities passing through manholes, and non-structural problems that affect operations and maintenance access to the collection system.

Manhole Classification

The purpose of the classification is to provide an initial recommendation for each manhole based on the location and extent of damage to the manhole structure. Utilizing the manhole

inspection data, the damage (if any) at the invert, base, risers/walls, grade adjustment rings, and frame/cover is evaluated.

Based on the results of the classification process manholes are classified according to the following categories:

- ◆ **Not Inspected:** Inspection data indicates that inspection was not completed. This can be deduced from data contained in the manhole inspection database.
- ◆ **No Action:** Manhole has no known problems according to the inspection data provided.
- ◆ **Maintenance:** This classification is generally indicated for manholes needing non-structural repairs or removal of debris, roots, or grease. Maintenance was selected for the manholes that required replacement of the grade adjustment rings or replacement of the frame and cover.
- ◆ **Rehabilitation:** This includes any action that is needed to repair damaged manholes or to prevent further damage. Potential rehabilitation work can be anywhere from a complete, internal, structural re-build to chemical grout injection (to stop water infiltration) or root treatment with follow up surface treatments. Follow up surface treatments could potentially consist of full lining of the manhole from the base to the top. Rehabilitation is preferred over replacement based on the facts that it is lower cost, faster installation, less disruption to traffic, and it is safer (no open trenches).
- ◆ **Replacement:** This classification is selected for manholes with moderate or severe corrosion in the wall and/or base that are easily accessible, and whose depth is less than 20 feet. The manholes will be replaced with pre-cast manholes with some kind of corrosion protection (T-Lock lining or epoxy coating) depending on the location and the likelihood of corrosion. If the manholes are located in sewer lines that are designated for replacement projects and are not currently structurally deficient, they should be replaced during the sewer line replacement.

The decision to rehabilitate or replace the entire manhole is determined primarily from the manhole's condition, location, depth, environmental sensitivity, hydrology, accessibility, and cost of the proposed improvements. Replacement is typically more cost effective when the depth is in the range of 12 to 15 feet. Rehabilitation can occur on any manhole regardless of depth. However, in most cases, rehabilitation is the more cost effective option when the depth exceeds 15 feet.

Manhole Rehabilitation Methods

The rehabilitation of manholes can be divided into the following methods:

- ◆ Chemical grouting
- ◆ Coating systems

- ◆ Structural linings
- ◆ Corrosion protection
- ◆ Manhole frame, cover, and chimney

Chemical Grouting

Chemical grouting systems have achieved success in reducing extraneous flows in manhole structures. When applied properly, the process is a cost-effective option. Grouts do not add to the structural integrity of the manhole. The success of grouts in reducing manhole extraneous flows is largely dependent on soil conditions, groundwater conditions, injection patterns, gel time/grout mixture, containment of excessive grout migration, and selection of the proper type of grout.

There is a wide range of grouts on the market for pressure application. These include acrylamide, acrylate, urethane foam, and urethane gel. A cementitious product such as calcium aluminate concrete blends are not recommended because whatever deteriorated the existing structure will sooner or later deteriorate these materials unless an epoxy coating is applied. The common applications for pressure grouts are for brick manholes, active extraneous flows, structurally sound manholes, cohesive soils with optimal moisture content, and to improve and fill voids or stabilize the surrounding soil. Attachment C contains examples of grouting products.

Coating Systems

Coating systems have been used to restore manhole structures for many years. Coating systems range widely in their applications. In each application, a cementitious material containing portland cement, finely graded mineral fillers, and chemical additives, or epoxy is applied in one or more layers to the interior of a manhole that has been adequately cleaned and prepared. Most coating systems provide for both mechanical and chemical bonding. The system can be used to coat the entire manhole, including reconstruction of the bench and invert. Coatings are ideally suited for brick structures that show little or no evidence of movement or subsidence, since the coatings have little intrinsic structural qualities in shear and tension.

The most common and successful application is where the following conditions are prevalent:

- ◆ Brick structure.
- ◆ Observed extraneous flows.
- ◆ Missing or deteriorated mortar joints.
- ◆ Site conditions that prevent excavation or reconstruction.

Coating systems can be machine (spray) or hand applied (trowel, brush, or roller). Surfaces should be prepared by high-pressure water blasting to etch the structure and remove defective material. All active extraneous flows should be eliminated before coating the manhole. Where

necessary, voids should be hand packed with an appropriate patching compound. If the potential for hydrogen sulfide generation exists, the finish coat should be protected with an inorganic liquid polymer product to impregnate and protect the final surface. As an alternative, corrosion-resistant additives can be incorporated into the mix design or an epoxy coating can be used. The entire process (cleaning, prep, coating, and clean-up) should be carefully monitored if an independent contractor is performing the work. Post-rehabilitation dyed-water testing can be performed on a random sample of completed manholes to insure a successful project.

There are several coating systems available under various trade names. The following are descriptions of coating systems. Attachment D contains more information regarding coating products.

Polyurethane Coating

Polyurethane is a good product for gas deterioration, but can be questionable for infiltration problems. It must be applied properly and in multiple layers of thin coats because it shrinks as it cures and pulls itself off the surface. The structure should be dry for applying polyurethane. All infiltration leaks should be stopped using chemical grout injections and/or hydraulic cement prior to application of the product. The surface needs to be completely dry if even minimal adhesion is to be expected.

Actually, if you spray an entire new manhole with polyurethane, it will pull itself off the wall as it cures and will be slightly separated from the structure. The reason is that its power to shrink as it cures is greater than its ability to bond. The problem this causes with structures that have infiltration is obvious, but rather hidden from sight. The product separates itself from the surface as it cures and allows future infiltration to seep down behind the material and come out wherever the coating stops at the pipes or invert channel. Even after a good installation with the product completely cured, there is a need to drill and pump chemical foam grout behind the polyurethane coating in the lower walls, bench areas, and around pipes. The structure may look fine but not be functional during times when hydrostatic head and infiltration are present.

Because of this lack of bonding, the material must be applied thick enough to offset the possible future hydrostatic head of infiltration. Stage the product thickness to reduce the material cost of rehabilitating manholes. As the depth and potential hydrostatic head increases, so does the need for increased material thickness because the material will not adequately bond to the structure.

Epoxy Coating

Epoxy coating is rather brittle and may tend to crack except when applied with structural synthetic fibers. The strengths of epoxy are in its bonding ability and resistance to sewer gases and chemicals. Applied correctly and because of its bonding ability, epoxy coating can provide substantial help in preventing future infiltration. It takes several hours for epoxy coatings to solidify on the surface of the structure. The surface should be free of all infiltration prior to

applying an epoxy coating. Stop all infiltration with chemical grout or hydraulic cement prior to applying the product.

Polyurea Coating

Polyurea coating is resistant to sewer gases and chemicals, but adds practically no additional strength to the structure. It should not be used where there is potential for future infiltration problems, because the product remains more flexible than the other coatings and it does not bond well to the existing structure. The surface should be dry prior to applying the product. Stop all infiltration with chemical grout or hydraulic cement prior to applying the product.

Polyurethane Coating

Polyurethane coating is resistant to sewer gases and chemicals, but adds insignificant strength to the structure. It actually shrinks as it cures; therefore, it does not remain bonded well to the existing structure. The surface should be dry prior to applying the product. Because of its lack of bonding ability, it should not be used as a coating product where there is potential for future infiltration problems. Stop all infiltration with chemical grout or hydraulic cement prior to applying the product.

Calcium Aluminate Coating with Epoxy Finish

With the epoxy finish coat, calcium aluminate concrete can provide a viable product that adds structural and bonding qualities as well as good resistance to sewer gases and chemicals.

Epoxy/Fiberglass, Structural Coating

Epoxy/Fiberglass coating is very resistant to sewer gases and chemicals. It is cured-in-place under heat and pressure, and provides a structural coating that is bonded to the manhole. If applied to a relatively dry structure, it provides excellent protection against future infiltration problems. Stop all infiltration with chemical grout or hydraulic cement prior to installing the product.

Structural Linings

Structural rehabilitation of a manhole is any method that totally restores the structural integrity of a manhole through in-place, non-destructive methods. In-situ rehabilitation methods, such as poured-in-place concrete, have been used in a variety of applications. The application of reconstruction methods has been limited to the following conditions:

- ◆ Standard manhole dimensions (48 to 72-inch inside diameter)
- ◆ Substantial structural degradation
- ◆ Accessible location (Mobilization/Demobilization will require the manhole to be accessible by road. There must also be sufficient clear space for equipment.)
- ◆ Project size (Not cost effective if there are only a few manholes that need to be rehabilitated and are located singly in different areas. If several manholes need to be rehabilitated, unit costs can be reduced by rehabilitating them under one contract.)

◆ Life-cycle cost justification

The condition of most manhole structures does not justify structural reconstruction on the sole basis of reducing and controlling extraneous flows. Reconstruction methods are not cost competitive with coating and pressure grouting systems based on initial construction cost. Consideration should be given to a life-cycle cost analysis of reconstruction. Structural reconstruction methods that are currently available are poured-in-place concrete, prefabricated reinforced plastic mortar, prefabricated fiber-reinforced plastic, spiral-wound liner, and cured-in-place structural liners. A typical section through a rehabilitated manhole is shown in **Error! Reference source not found.**

Any linings should be designed to withstand the external pressures imposed by the ground water. Vertical traffic/ground loadings will be carried by the existing manhole structure, as it would be difficult to stand the lining on suitable foundations or provide sufficient thickness to carry the loads without restricting the access size. If vertical structural deterioration is the problem, total replacement may be the most economic solution. The following are descriptions of structural lining systems. Attachment E contains more information regarding structural lining products.

Pre-formed Fiberglass Inserts

Pre-formed fiberglass inserts are very effective in situations where manhole collapse is probable. The only weak point besides cost is that it is extremely hard to stop infiltration around pipes or where the insert stops at the bench area with a pre-formed, ridged insert. This type of rehabilitation requires the chimney and corbel areas of the manhole to be removed, and all infiltration in the bench area, around pipes, and the lower cylinder area of the manhole stopped; then the insert may be lowered into position, back poured with concrete, and completed at the surface area.

Poured-In-Place Concrete Rehabilitation

Poured-in-place concrete rehab is very effective where manhole collapse is probable. Like the pre-formed fiberglass insert, it is susceptible to infiltration around pipes, the lower cylinder, and bench areas. Therefore, infiltration around these areas should be stopped prior to installation of the formed and poured-in-place concrete application. The use of this process should be in conjunction with a synthetic liner material placed to the inside area of the manhole in the form, in order to provide interior surface that is resistant to sewer gases and chemicals.

Cured-In-Place Fiberglass Inserts

Cured-in-place fiberglass inserts are very effective at stopping all future infiltration and gas deterioration, as well as structural enhancement of the existing manhole. Prior to installing the insert, infiltration located within six inches of the edges of the liner should be controlled, such as around pipes or where the bench area meets the invert channel.

This system requires custom manufacturing a multiple layered liner and its inflation bladder that will provide a molded-in-place, laminated, epoxy/fiberglass insert that is bonded under steam injection and pressure to the existing surface. This patented, laminated liner contains a non-porous membrane bonded between the structural layers of fiberglass. This system provides excellent freeze/thaw qualities that help significantly in the northern areas of the US and in Canada. The cured-in-place fiberglass insert (Poly-Triplex Liner for example) carries a five-year, non-prorated warranty to stop infiltration and further deterioration of the manhole.

Cured-In-Place Fiberglass Liner

Cured-in-place fiberglass liners are very effective at stopping all future infiltration and sewer gas deterioration, as well as adding significant structural support to manholes. This is the same product as Cured-in-Place Fiberglass Inserts listed above except with slightly less structural fiberglass and resin. Both are pressurized with an inflation bladder.

Both are molded and bonded under steam injection to the existing structure to form a laminated, monolithic liner from the ring and cover to the invert channel. Both contain the same felt impregnated non-porous membrane bonded between the structural layers of fiberglass.

This product also carries a five-year, non-prorated warranty to stop infiltration and further deterioration. The liners are custom manufactured for each structure and when installed, form a monolithic structure from the ring and cover to the invert channel. This product provides excellent freeze/thaw qualities that help in the northern areas of the US and in Canada. With this process infiltration needs to be controlled that is within six inches of the edges of the liner around pipes or the invert channel prior to installing the liner.

Studded Plastic Liner

Studded plastic liner is mechanically attached to concrete. An example is T-Lock. This does not provide for complete structural support but can protect the manhole from corrosion.

Frame and Cover Rehabilitation

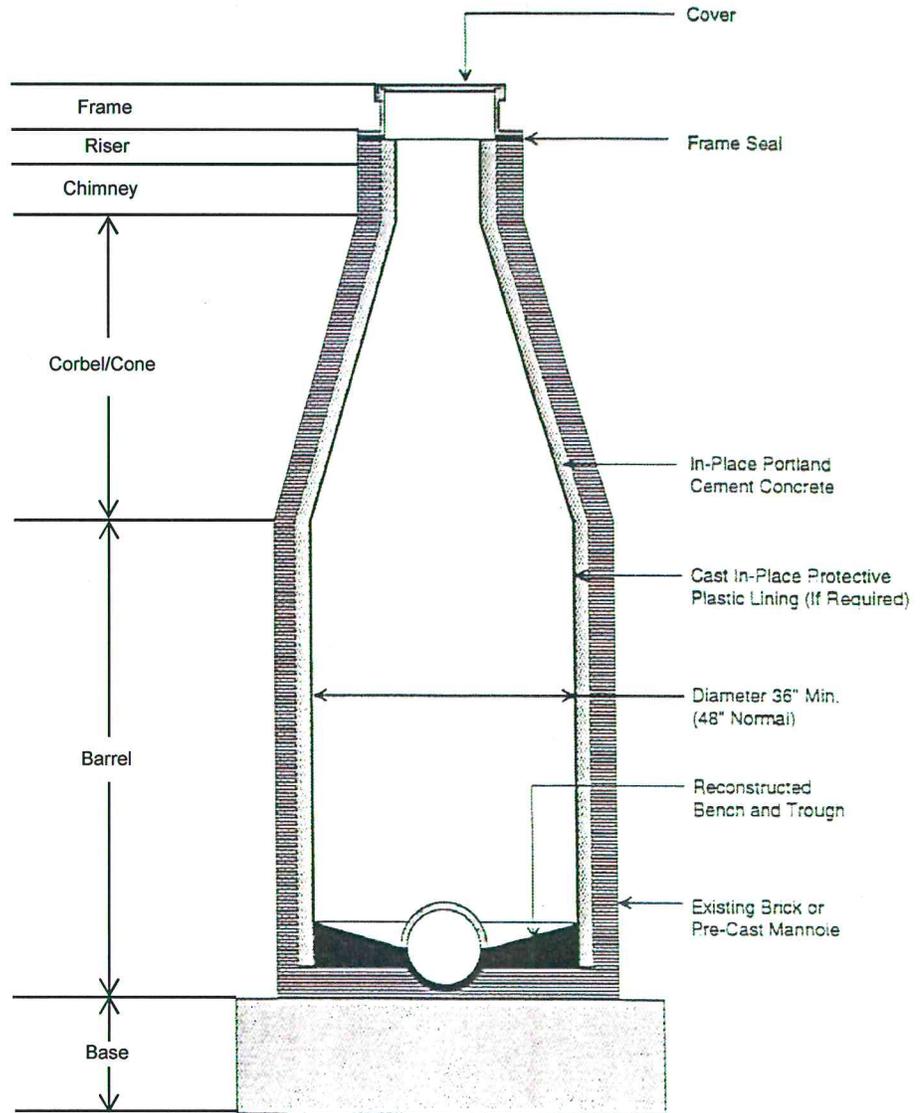
Leakage problems common with manhole frames and covers include surface water entering through the holes in the cover, through the space between the cover and the frame, and subsurface water entering under the manhole frame. Tests have consistently shown that these sources account for a significant portion of manhole leakage. Ground movement, thermal expansion and contraction of the surrounding pavement, frost, heave and traffic loadings cause the seal between the frame and cover to break and deteriorate, allowing subsurface water to enter the manhole. This water, entering the manhole after running along pavement subgrades, washes subgrade material in with it, resulting in the settlement of the pavement around the manhole.

Manhole covers can be sealed by either replacing them with new watertight covers; by sealing existing covers through the use of rubber cover gaskets and rubber vent and pick hole plugs; or

by installing watertight inserts under the existing manhole covers. The manhole frame-chimney joint area can be sealed internally without excavation when frame alignment and chimney condition permit or either internally or externally when realignment or replacement of the frame or reconstruction of the chimney and/or cone requires excavation. This sealing can be achieved by either installing a flexible manufactured seal, designed for this purpose, or by applying a flexible material to either the surface of the chimney and frame or between the adjusting rings and under the frame. Attachment E contains more information regarding frame and cover rehabilitation products.

Figure 1 shows the typical section of a rehabilitated manhole.

Figure 1: Typical Section of a Rehabilitated Manhole



Selection of Manhole Rehabilitation Methods

For the manholes with identified problems, recommendations for rehabilitation and replacement are developed as follows:

Condition		
Low to Moderate Deterioration	Newer Manhole	Do Nothing; reinspect in 2 years
Moderate Deterioration 1/2 to 1 1/8" of mortar or concrete corrosion	Any Manhole	Surface coat to prevent further damage; consider H ₂ S chemical treatment upstream of manhole
Serious Infiltration Constrant stream > 1.5 – 2.0 gpm	Any Manhole	Chemical grouting unless replacement is warranted due to structural condition
Serious Corrosion Reinforcing evident on precast barrels or 1 1/4" mortar eaten away	Any Manhole	Rehabilitate or replace. Rehabilitation preferred in heavy traffic areas. Replacement favored for manholes on lines due for replacement and shallow manholes
Frame and Cover Corrosion serious enough to threaten its ability to handle traffic loads	Any Manhole	Replace

- ◆ If the wall and/or base are severely corroded, then the manhole should be replaced or rehabilitated. A chemical seal may also be added to address inflow and infiltration.
- ◆ If the cone is severely corroded, then the cone and riser should be rehabilitated or replaced.
- ◆ If the frame and cover are severely corroded, then they should be replaced. The existing frame and cover can be reset if they are loose but still in good condition. If the frame and cover cannot be reset, then they should be replaced.

The economies of rehabilitation depend on such factors as severity of chemical attack or corrosion, location, depth of manhole and water table, number of manholes requiring rehabilitation or replacement, and wastewater flow control measures needed. In some situations, structural rehabilitation is not practical, and replacement is necessary. The details of manhole construction are widely known, and replacement should always include safety and operational considerations.

In addition, rehabilitation should include measures to ensure manhole safety and channel hydraulics. Access ladder rungs and step irons are important for safety and, if the manhole is seriously deteriorated, are frequently also suspect. Many communities and wastewater agencies do not install steps in new manholes. They prefer to use ladders, which then must be carried on the crew trucks, along with other safety apparatus needed for manhole entry. Eliminating the rungs reduces the risk to field personnel that a corroded rung could cause a fall or other injury. It also reduces the risk that unauthorized entry could lead to suffocation or other injury. Weak rungs should either be replaced with a new corrosion-resistant rung or removed completely.

The efficiency of the present channel should also be evaluated. If the flow is restricted or if disturbances are causing extraordinary head losses, repair work should improve the hydraulic characteristics. The existing base may have to be partly removed and reconstructed to provide better geometry and/or surface finish. Flows must be plugged temporarily and quick-setting products used, or flows must be temporarily rerouted while the structure is being repaired. Flexible sleeves can also be used to contain flows during repair.

Another important consideration is the entry requirement of maintenance equipment. Cleaning tools, closed-circuit television cameras, and in-line rehabilitation tools such as grouting packers require about 24 inches of straight pipe access. The channel should be built accordingly and self-cleaning benching provided.

Attachment F contains a relative rehabilitation cost comparison.

In summary, the City's manholes should be inspected either by CCTV, top-side, or internal (manhole entry). The classification procedure will then be used to generate a recommendation for each manhole that was inspected. The purpose of the analysis is to recommend the most feasible action that is needed to correct the observed damage.

Attachments

Attachment A - Camera for Manhole Inspection

Attachment B - Manhole Inspection Form

Attachment C - Chemical Grouting

Attachment D - Coating Products

Attachment E - Structural Lining Products

Attachment F - Manhole Rehabilitation Cost Comparison

APPENDIX 4O

Critical Equipment and Replacement Parts Inventory List

[Work Orders](#) | [Employee](#) | [Equipment](#) | [Material](#) | [Inventory](#) | [Fields/Codes](#) | [Schedule](#) | [Reports](#) | [Logout](#) | [Work Orders](#) | [Open Map](#) | [Contact Us](#) | [Home](#)

Tools		Select Category		All Categories	
Equipment Name	Description	Units	Unit Cost	Category	View Info
Speed Shoring GME Pump Machine	to work with shoring	Day	\$23.00	Machines	View Info
#12	Dump Truck	Day	\$264.00	Streets Dept.	View Info
#13	Back Hoe	Day	\$270.00	Streets Dept.	View Info
#13A	2011 License: 1292056	Day	\$85.00	Streets Dept.	View Info
#16	2011	Day	\$85.00	Streets Dept.	View Info
#17	Air Compressor	Day	\$130.00	Streets Dept.	View Info
#22	License: 488573	Day	\$0.00	Streets Dept.	View Info
#25	Boom Truck	Day	\$0.00	Streets Dept.	View Info
#26	1984 License: 456184	Day	\$0.00	Streets Dept.	View Info
#28	1957 Grader	Day	\$0.00	Streets Dept.	View Info
#30	License: 45506	Day	\$85.00	Streets Dept.	View Info
#31	Roller	Day	\$0.00	Streets Dept.	View Info
#32	Loader	Day	\$0.00	Streets Dept.	View Info
#33	Dump Truck License: 351518	Day	\$264.00	Streets Dept.	View Info
#34	Chipper License: 444884	Day	\$0.00	Streets Dept.	View Info
#41		Day	\$0.00	Streets Dept.	View Info
#49	Bobcat	Day	\$0.00	Streets Dept.	View Info
#67	1992	Day	\$0.00	Streets Dept.	View Info
#94	2012 Purchased 2/7/12	Day	\$30.00	General	View Info
1/2 Drill	2011 Purchased 7/7/11	Day	\$0.00	General	View Info
2/Lightstands	License: 325208	Hours	\$0.00	Streets Dept.	View Info
6x13 Equipment Trailer	2006 Purchased 1/30/06	Hours	\$50.00	Equipment	View Info
Air Compress	2008 Purchased 7/2/08	Day	\$130.00	General	View Info
Air Compressor	2009 Purchase 7/2/09	Day	\$90.00	Streets Dept.	View Info
Asphalt Compactor	2008 Purchase 4/6/08	Hours	\$25.00	Blowers	View Info
Back Pack Blower	2005	Hours	\$475.00	Equipment	View Info
Back Pack Spray	1994	Day	\$0.00	Equipment	View Info
Backhoe		Day	\$0.00	Saws	View Info
Band Saw		Day	\$0.00	General	View Info
Belt Sander		Day	\$20.00	Streets Dept.	View Info
Blower		Day	\$0.00	Streets Dept.	View Info

Bobcat							Streets Dept.	View Info
Bosch jig-saw							Saws	View Info
Bosch Rotary Hammer							Equipment	View Info
Bosch Skillsaw	w/ assorted bits	Day	\$20.00				Saws	View Info
Brad Nailer	1999 Purchased 4/7/99	Day	\$46.00				General	View Info
Burm Machine	1984 Purchased 12/7/84		\$0.00				Streets Dept.	View Info
Casket Carriage		Day	\$80.00				Equipment	View Info
Cement Mixer		Day	\$55.00				Streets Dept.	View Info
Chain Saw			\$0.00				Vehicles	View Info
Chevy Truck	1962 w/ 1955 roddler machine		\$0.00				Vehicles	View Info
Chevy Truck #50	1987 Purchased 2/3/87	Hours	\$200.00				Vehicles	View Info
Concrete Saw		Day	\$70.00				Streets Dept.	View Info
Cordless Drill1	2009 Purchased 1/1/09		\$0.00				General	View Info
Cordless Drill2	2010 Purchased 5/4/10		\$0.00				General	View Info
Cordless Sawosall	2011 Purchased 6/8/11		\$0.00				General	View Info
Core Drill	2012 Purchased 6/4/12		\$0.00				General	View Info
Coremaster	1994 Purchased 4/3/94		\$0.00				General	View Info
Dayton Generator		Day	\$245.00				Generators	View Info
Dewalt Hand Grinder	w/ Beveler	day	\$20.00				Saws	View Info
Echo		Day	\$33.00				Hedge Trimmer	View Info
Echo 1		Day	\$55.00				Chain Saws	View Info
Echo 2		Day	\$55.00				Equipment	View Info
Edger Trim		Day	\$0.00				General	View Info
Equipment 1	2010 Purchased 3/5/10	Hours	\$10.00				General	View Info
Equipment Trailer		Day	\$150.00				Streets Dept.	View Info
Fax/Phone	2008 Purchased 7/3/08		\$0.00				Equipment	View Info
Ford Truck #27		Hours	\$0.00				Vehicles	View Info
Ford Truck #51	Year: 2005 Purchased 1/1/05	Hours	\$0.00				Vehicles	View Info
Ford Truck #52	Year: 2008 Purchased 6/9/08	Hours	\$0.00				Vehicles	View Info
Ford Truck #59	Year: 2005 Purchased 5/1/05	Hours	\$0.00				Vehicles	View Info
Ford Truck #61	Year: 1996 Purchased 4/9/96	Hours	\$0.00				Vehicles	View Info
Ford Van #100	Year: 1993 Purchased 1/19/93	Hours	\$0.00				Vehicles	View Info
Framing	2003 Purchased 3/5/03		\$0.00				General	View Info
Gas Generator	Two in inventory	Day	\$50.00				Generators	View Info
Gehl	1998 Purchased 4/16/98	Hours	\$500.00				Equipment	View Info
Generator	1993 Purchased 4/9/93	Hours	\$200.00				Equipment	View Info
GMC Service Truck	1966		\$0.00				Vehicles	View Info

Used to pump shoring jacks with two 11/16 Year: 1988	Day	\$23.00	General	View Info
2010 Purchased 6/4/10	Day	\$95.00	Machines	View Info
2010 Purchased 9/6/10	Day	\$0.00	General	View Info
2010 Purchased 3/5/10	Hours	\$55.00	General	View Info
14"	Hours	\$50.00	Equipment	View Info
1500 Watt	Hours	\$0.00	General	View Info
3500 Watt	Hours	\$0.00	Streets Dept	View Info
Year: 2011 Purchased 6/20/11	Hours	\$0.00	Streets Dept	View Info
Year: 2009 Purchased 1/1/09	Hours	\$0.00	General	View Info
2008 Purchased 1/2/08	Day	\$62.00	Equipment	View Info
1965 Purchased 10/5/85	Hours	\$0.00	Equipment	View Info
90#	Day	\$50.00	General	View Info
60#	Day	\$80.00	General	View Info
1968 Purchased 4/6/68	Day	\$100.00	Saws	View Info
1965 Purchased 6/3/85	Day	\$55.00	Chain Saws	View Info
2002 Purchased 3/5/02	Day	\$0.00	Streets Dept	View Info
Year: 2008 Purchased 5/3/08	Day	\$0.00	General	View Info
1993 Purchased 9/2/93	Day	\$0.00	Equipment	View Info
1999	Day	\$35.00	Saws	View Info
1998	Day	\$20.00	Blowers	View Info
200	Day	\$0.00	General	View Info
2002 Purchased 3/5/02	Day	\$0.00	Equipment	View Info
Year: 2008 Purchased 5/3/08	Hours	\$0.00	Saws	View Info
Year: 2008 Purchased 5/3/08	Day	\$36.00	General	View Info
Year: 2008 Purchased 5/3/08	Day	\$36.00	General	View Info
Year: 2008 Purchased 5/3/08	Day	\$36.00	General	View Info
Year: 2008 Purchased 5/3/08	Hours	\$0.00	Equipment	View Info
Year: 2008 Purchased 5/3/08	Day	\$100.00	Saws	View Info
Year: 2008 Purchased 5/3/08	Day	\$0.00	Streets Dept	View Info
Year: 2008 Purchased 5/3/08	Day	\$0.00	Streets Dept	View Info

PalmSander	2009 Purchased 9/2/09	\$0.00	General	View Info
Pickup Truck		\$50.00	General	View Info
Planer	2012 Purchased 1/11/12	\$0.00	General	View Info
Pole Saw		\$55.00	Streets Dept	View Info
Portable Cutting Torches		\$0.00	Streets Dept	View Info
Power Planer	1997 Purchased 3/4/97	\$0.00	General	View Info
Power Pruner		\$55.00	Pole Saws	View Info
Pressure Washer		\$0.00	Streets Dept	View Info
Rake o Vac	2007 Purchased 11/5/07	\$200.00	Equipment	View Info
Ramsset		\$0.00	General	View Info
Reciprocator 1	Year: 2008	\$33.00	Equipment	View Info
Reciprocator 2	Year: 2009	\$33.00	Equipment	View Info
Router	Purchased 6/11/11	\$0.00	General	View Info
Router	2002 Purchased 2/30/02	\$0.00	General	View Info
Sawdust Vac	2008 Purchased 1/6/08	\$0.00	General	View Info
Sawosall		\$0.00	General	View Info
Sawer/Host Mending Machine	with dyes	\$0.00	Machines	View Info
Shindawa		\$33.00	Cultivator	View Info
Skillsaw	2010 Purchased 2/4/10	\$0.00	General	View Info
Skillsaw		\$18.00	General	View Info
Spectra Lazar		\$0.00	Equipment	View Info
Speed shore manhole box		\$120.00	General	View Info
Speed Shoring	trench shoring	\$12.00	General	View Info
speed shoring release tool		\$8.00	General	View Info
Spray Rig	Year: 1994 Purchased 8/1/94	\$0.00	Equipment	View Info
Stihl		\$55.00	Pole Saws	View Info
Stihl		\$20.00	Blowers	View Info
Stihl		\$55.00	Chain Saws	View Info
Stihl		\$55.00	Chain Saws	View Info
Stihl		\$33.00	Hedge Trimmer	View Info
Sump Pump	2002 Purchased 2/2/02	\$50.00	Equipment	View Info
Sweeper	Tymco	\$0.00	Streets Dept	View Info
Table Saw	1990 Purchased 5/12/90	\$0.00	General	View Info
Tanaka Leaf Blower		\$35.00	Blowers	View Info
Taylor Generator		\$270.00	Generators	View Info
Toro	2007 Purchased 3/25/07	\$200.00	Equipment	View Info
Toro Workman	2002 Purchased 2/31/02	\$0.00	Vehicles	View Info
Trailer	5x10	\$40.00	Streets Dept	View Info

Equipment Name	Year	Purchased	Hours	Cost	Department	Action
Tri King Mower	2003	Purchased 1/6/03	Day	\$0.00	Equipment	View Info
Frick 43	1997	2002 Vaccon hydrovacuum combo	Day	\$110.00	Vehicles	View Info
Frick 45			Day	\$85.00	Vehicles	View Info
Frick 47		2009 Hydro flush	Day	\$80.00	Vehicles	View Info
Water Trailer		Year: 2008 Purchased 6/30/08	Hours	\$0.00	Equipment	View Info
Weed Eater			Day	\$33.00	Streets Dept.	View Info
Weed Eater 1		Year: 2010	Day	\$33.00	Equipment	View Info
Weed Eater 2		Year: 2011	Day	\$33.00	Equipment	View Info
Weed Eater 3		Year: 2010	Day	\$33.00	Equipment	View Info
Weed Eaters		2008 Purchased 4/1/08	Hours	\$50.00	General	View Info
Westminster		2007 Purchased 6/2/07	Hours	\$0.00	Equipment	View Info
Williams Snake Machine		w/ 3 spools- 1-1/2	Day	\$80.00	Machines	View Info