

CMOM SCIP Phase 1

TM 1 Cleaning and Inspection Drivers

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Revised By	Date	Reason
A. Lanier, A. Mandilag	4/18/2011	Initial Draft

Introduction

This TM was written under the CMOM SCIP MODELS PHASE 1 Project. The team has been asked by Gary Irwin to develop a tool that can be used to help manage the Maintenance Program's inspection and cleaning activities and the associated budgeting for those activities. The model results will help Gary understand how much should be spent and how it should be prioritized. The results will also help meet DEQ permit reporting requirements due at the end of the year. This is phase 1 of a multi-year project.

This TM describes the drivers that trigger either a cleaning or inspection activity. Each driver is described in terms of Hansen Work Order Activity Code, frequency, cost, and source of information. The first meeting was held on April 10, 2012, with Gail Luthy, Matt Marine (PDOTMO-Cleaning), and John McGregor (Pollution Prevention-FOG) to discuss the process currently used to determine when a pipe is inspected or cleaned, and what variables will cause a frequency to be modified. The Root Program was also discussed. A follow-on meeting was held on April 17, 2012 to review the final list of drivers and the process diagram. The results from these meetings are summarized in this document, and will be considered the basis for the Phase 1 model builds *[Note: at the end of Sprint One, Gary may request changes to these drivers. If so, amendments will be issued and the team will know as soon as possible]*.

Drivers

A pipe will have multiple drivers associated with inspection, cleaning, and root management. However, one driver is controlling, and that driver is the one with the highest frequency. See Table 1 for a list of the drivers by O&M Activity, the associated Hansen work order activity code, frequency of activity, cost, and source for information. Drivers that are grayed are considered unpredictable with the model, and

therefore will not be used in determining controlling drivers for assets. It is also assumed that any of the frequencies that are considered variable will be maintained constant throughout two entire PM cycles when the model is run.

Table 1 Drivers Associated with BES Operations and Maintenance

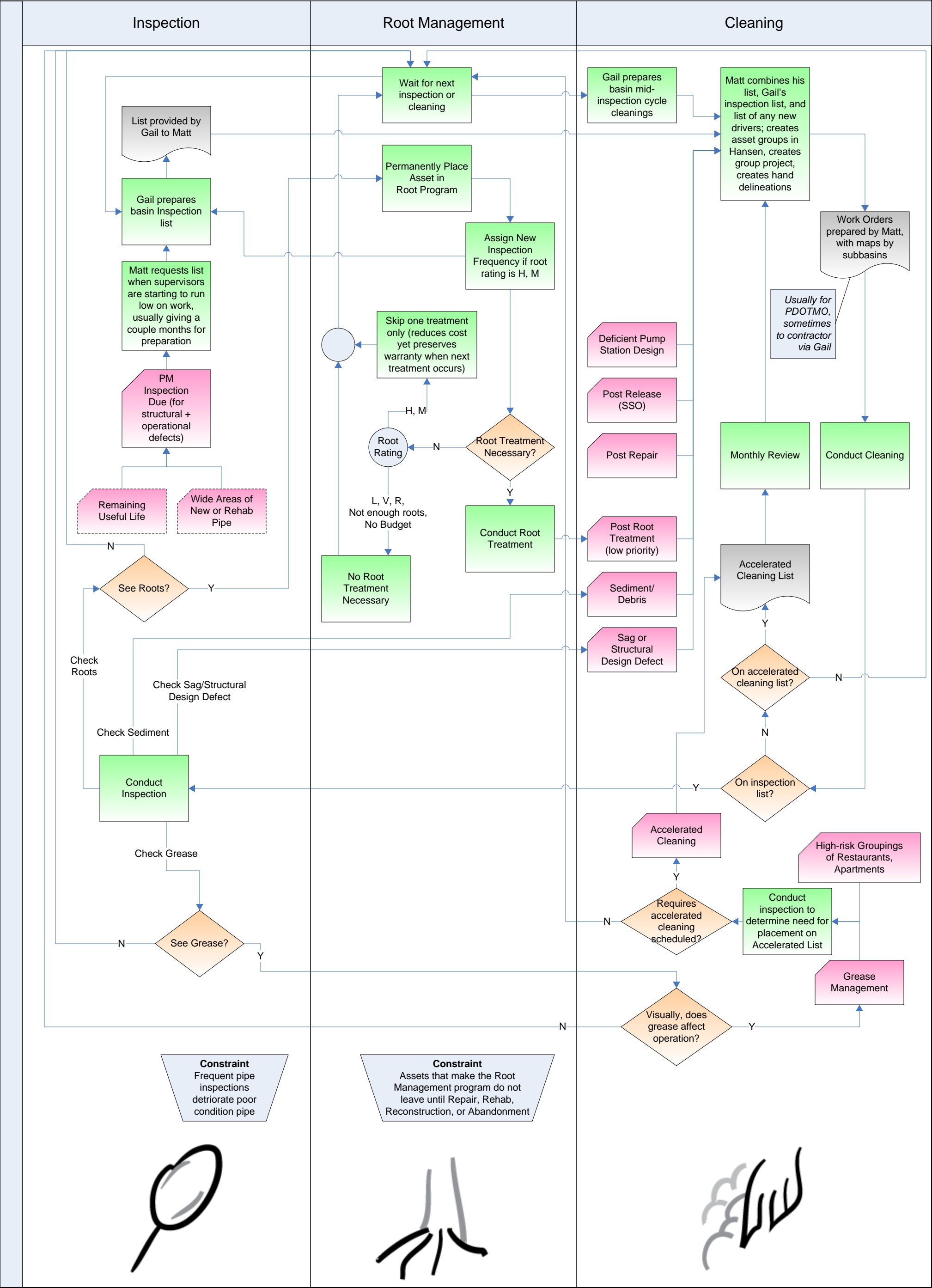
O&M ACTIVITY	Drivers (Hansen Work Order Activity Code)	Frequency	Cost (Unit Cost/LF)	Source of Info
Inspection	PM (TVSEWS)	12 years	\$0.80	Hansen
	Root Control (SPSWTV)	3 times treatment cycle (6 years or 9 years)	\$1.25	Hansen
	Grease (SPSWTV)	Experience-based; re-evaluate frequency after each inspection	\$1.25	Accelerated Areas List
	Post Repair (REPTV)	As needed	\$1.25	
	SSO (SPSWTV)	Event-driven	\$1.25	TRACKIT, TRACS
	Condition (SPSWTV)	Risk based – risk of not inspecting greater than cost of special sewer TV	\$1.25	Rehab model
	Accelerated Areas (SPSWTV)	Variable – Based on experience, anywhere from 3 mo to 5 yr	\$1.25	Accelerated Areas List
Cleaning	SSO (SPCLN)	As needed	\$1.73	TRACKIT, TRACS
	PM Inspection (SEWCLN)	if see grease, add to Matt's List to TV again in a year	\$0.85	Hansen
	Post Repair (REPCLN) (for CCTV)	As needed	\$1.73	Hansen
	Sags (SPCLN)	Variable	\$1.73	Accelerated Areas List
	Structural (SPCLN)	Variable	\$1.73	Accelerated Areas List
Root Management	Post Root Treatment (SPCLN)	As needed (typically do not re-TV)	\$1.73	Hansen
	Root Control/Grease (SEWSAW)	As needed (for both roots and grease; although Matt seldom uses this code for grease)	\$1.73	Hansen
	Root control (RTCHEM)	Root Priority H and pipe diam <16in = 2 years Root Priority M and pipe diam <16in = 3 years	\$1.20 for <16-in diameter \$2.93 for 16-in diameter and larger	Hansen

Process

The process diagram shows how the different drivers, activities, and lists prepared by Gail and Matt are related to each other. Depending on the driver and activities occurring, cascades of subsequent drivers and activities can be triggered; this leads to the conclusion that there are not two models to be developed (or even three when Gail indicated that Root Management needed to be separated from Cleaning), but only one with three different types of activities being spawned.

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CMOM SCIP Phase 1 – Current Process (DRAFT)- Sanitary and Combined Pipes



Legend

Drivers (start here)

Documents

Activity

Decisions

Constraints

Outstanding Issues

Post-repair Rehab Inspection Data – neither Matt nor Gail receive this “acceptance inspection” data, and therefore this information is not available to determine that a pipe with an inspection that resulted in a rehabilitation has any follow-up inspection records indicated the pipe now has a better structural and operational condition. This is an outstanding issue that has been going on for years and requires process improvements from Construction Engineering.

Grease Management Areas - Per John, the map layer for Grease Management Areas has not been updated for 8 years.

Summary of Meeting Notes

The following notes are from the April 10, 2012 and April 17, 2012 meetings and can be used for more information on the driver table and process diagram.

Scale of Reporting/ Work Orders

How do work orders get created and what do they look like?

- Gail sends tables organized by DRAINAGE BASINS to Matt (using ACCESS; not spatially driven), for **Inspection**. Gail gives Matt next basin in each district (NORT, SOUT, and WEST) that needs inspection. Gail may give Matt list of pipes (usually in Excel). Matt uses Hansen and ArcMap to create asset groups and then group projects
- Matt creates a map from that information, and breaks this down manually into SUBBASINS
 - Creates manageable work groups
 - Number of pipes limited to 150 to 200 maximum per SUBBASIN
 - Maps are given to crews
 - Currently, Matt hand delineates these subbasins. He will need access to the delineated catchments available through Systems Analysis. Catchment size may need to be expanded to account for the grouping Matt does (currently, catchment size is being controlled by placement of street inlets—he will need to roll this up to a coarser delineation)
- Matt also has a ‘Matt’s List’, specific to Accelerated Areas, not in Hansen.
 - Reviewed monthly
 - Work orders for cleaning generated from this
 - Refer to this for frequency

Why We Inspect (Inspection Drivers)

Why do we inspect?

- Current Preventive Maintenance

- Determine structural condition of sewers
 - Are mainline repairs needed?
 - Are lateral (wyehead) repairs needed?
 - Is mainline whole pipe rehab needed?
- Determine operational condition of sewers
 - Presence of roots?
 - Presence of grease?
 - Presence of debris?
 - I/I? (and amount)
 - Presence of sags (may trigger either operational –cleaning – or rehab response or no response)
- Schedule for TV inspection for structural issues – Goal is 12 years, reality is often different
- A scheduled inspection is a DRIVER for a CLEANING, since clean pipes are required for TV inspection

Inspection Drivers

What drives a TV inspection?

- Root Control Program Management
 - Re-inspection to determine effectiveness of treatment and monitor regrowth of roots
 - Initially performed without pre-cleaning
- Grease Management
- Re-inspection to determine if cleaning frequency is appropriate; [GML: Check with Matt Marine about pre-cleaning when doing re-inspections.
- Post Repair
 - Re-inspection to update condition grade after repair
 - Pre-cleaning performed prior to post repair re-inspection; [GML Confirm with Matt Marine
 - NOTE: Neither Matt nor Gail receive the post repair rehab inspection data from construction (the ‘acceptance inspection’).
- Post Release (SSO)
 - Affects pipes in vicinity, since the inspection is looking for more permanent type blockages as well as transitory. Usually the upstream and downstream pipes from the pipe generating the release are marked for inspection as well.
 - Enough pre-inspection cleaning performed to stop SSO. [GML: I’m not sure how much cleaning is generally performed but thought Matt indicated not a lot unless inspection indicates it is necessary.]

- Condition
 - Reinspection of pipes that have not been rehab'd in a timely manner
 - Resets Remaining Useful Life
- Accelerated Areas (Gary refers to these as 'hot spots'; preferred terminology by John McGregor is 'Accelerated Areas'). It does not refer to concentrations of any type of activity, but rather is anything on Matt's List.
 - Groupings of restaurants (e.g. Mall 205 area)
 - Vulnerable PS design (e.g., 99th & Broadway – no wetwell except for influent pipe)
 - Apartments
 - Pipe design
 - Why is it falling in?
 - Sag
 - Defects
 - Flat Slope
 - Low flow
 - CIP rehab and rebuild: these projects can trigger a pre-inspection, but that is paid for by the CIP. (this will not be part of the SCIP)

Why Do We Clean?

Primary mission – To Prevent SSO's

- Preventive (Planned) Maintenance – inspection depends on PM
 - Clean pipe so camera can get through for inspection
 - Remove rocks, etc that may impede camera progress
 - Remove excess sediment that may mask conditions in pipe
 - Remove paper, etc that may accumulate in sags or at offset joints.
 - Remove some roots and some grease if present so camera progress is not impeded
 - If grease and/or roots are present, at least trace amounts remain and are recorded. Generally sufficient to identify sewers for followup.
 - *[note: there are Grease Scores in Hansen, but these have not been vetted, per Gail. Do not use them at this time]*
 - If camera cannot progress through pipe due to accumulated materials (any of above) additional cleaning is performed so that inspection can be completed.
- Roots
- Grease – “accelerated areas”
- Sags

- Because of loss of flow capacity
- Because of grease settling
- Because of sediment buildup
- Structural
 - Slope
 - Offset joints that can cause debris/sediment to accumulate
- Matching inverts (e.g. small diameter to large)

Cleaning Drivers

- Original TV Inspection request (for Preventive Maintenance)
 - Crew might see grease, add to the list to TV again in a year ---- GETS ON MATT'S LIST
- Release Related (SSO's)
- Matt's List
 - Does not change that often
 - Reviewed monthly
 - Used to create work orders
 - Incorporates accelerated areas
 - Formulas to pre-determine what may get on list (e.g., certain proximities of restaurants) could be used in the future to assist in refining this acceleration list

Root Program

TV Inspection → Root Score → Root Priority in Hansen → Provide Root Treatment → Possible Root Clean

Once in this system, it never comes off until a repair, rehabilitation or replacement occurs on the pipe. The root priority never goes down, although it may go up.

e.g. A pipe gets a 2-yr treatment frequency; TV every 6 years to re-evaluate. If no roots found during inspection, skip one treatment cycle.

The cleaning referred to in this instance is generally NOT mechanical root removal. It is removal of dead roots using conventional cleaning (jet nozzle) methods. Root cleaning may also include the use of mechanical devices to remove roots from sewer, mostly performed by BOM with some contractors providing mechanical root removal. Mechanical root removal is used as infrequently as possible as mechanical root removal encourages root re-growth (pruning) and the devices used may damage the pipe.

Root Treatment Drivers – Chemical Application

- SSO (may trigger initial *mechanical root removal* to stop SSO followed by inclusion in *chemical root treatment program*)
- TV Inspection reveals heavy roots

- Root score is generated, then a Hansen Root Priority code assigned, based on evidence of taproots, capacity issues
 - >75 score is a Root Priority of H
 - 26 to 75 = M
 - 6 to 25 = L
 - 1 to 5 = V
- Historical List (coded in Hansen as a priority for treatment, see Root Priority on a custom tab)
 - H = frequency is 2-years (<16-inch diam)
 - M = frequency is 3-years (<16- inch diam)
 - L, V = have no routine treatment frequency. May be treated if field check indicates treatment warranted
 - R = reported roots, no evidence, no routine treatment frequency.. Inspection may be triggered to confirm presence or absence of roots.
- For >16-inches, frequency varies according to funding and latest TV inspection as likelihood of SSO is less than for smaller diameter pipes and costs are substantially higher for treatment
- Root priority may be raised based on re-inspection (example from V to H). Root priority is not reduced but treatment may be skipped occasionally if re-inspection indicates.
- Never comes off the list unless repaired or rehab

Root Cleaning Drivers – Mechanical Root Removal

- SSO (see above)
- Does not happen unless necessary for capacity or to remove roots that are causing more damage to the pipe than the mechanical root removal is likely to cause (such as tap roots that can actually break the pipe) [GML Mechanical root removal encourages regrowth (pruning) and may damage pipe.]
- Removal of tap roots [GML Tap roots are killed by treatment. However, tap roots do not deteriorate readily remaining in the sewer, reducing capacity and possibly accumulating debris.]
- Removal of dead roots after treatment when heavy concentrations of roots were present prior to treatment

Rehab Module

TV Inspections need to account for the eventuality that the risk of not doing inspection is greater than cost of doing inspection.

Documents/ Sources

- Gail's CMOM Report
 - Categories
 - Root treatment process categories

- Hansen
 - inspection records
 - Root priority
 - Cleaning records (special clean, root chemical records)
- Matt's LIST [rename this to 'Accelerated List']: assume locations stay on the list for 20 years
- SP_Grease_View (Hansen) Asset Group
 - Not comprehensive
- TRACKIT – call intake locations of SSO's. Shows where every release is, duplication of TRACS; updated nightly)
- TRACS (SSO)
- LINKO FOG (database of grease activities- inspection, records of grease trucks) - Ali Dirks; uses data in MAPWORKS

Additional Notes on Grease Management

- FOG focuses on grease accumulation in line that team can act on
- No mechanism is available for John to ask owners to minimize grease
- City has changes to code, but conflicts with plumbing code (John may require certain fixtures that are overridden by the plumbing code)
- FOG is doing more cost recovery now
- John mentioned Sags and Structural deficiencies so that cleaning in those areas could be done more frequently. [most of the time the cleaning of these is related to grease]
- Matt's List is variable, but SSO drives overall
- Jantzen Beach is an accelerated area
- LINKOFOG tracks inspections

Outstanding Questions for Gary (from April 17, 2012)

How does Gary want to deal with SSOs? Eventually we would like to add some accounting for SSOs, but maybe that will have to be done later, since currently the available information is not at the asset level. We could use TRACKIT/TRACS to count events but these are address-based. Also, would need to separate SSO main and SSO lateral.

In order to get predictive SSO data, we would need operational data like roots and root growth.

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