

Road Operations - Drainage Asset Management Program



Drainage Example:

Bryan Chappell – Engineering Tech 3



Vactor Crews

Detailed Look at Drainage Maintenance do to NPDES

- The NPDES Phase I Municipal Stormwater Permit Requirements Operations and Maintenance Section
 - **S5.C.9.b.iii.(1) Annually inspect all permitted stormwater treatment and flow control facilities (12 months)**
 - **S5.C.9.b.iv.(1) Annually inspect catch basins and inlets owned and operated by the permittee (6 months)**
 - Inspections maybe conducted on a “circuit basis” immediately upstream of any outfall
 - Outfall = “Waters of the State”



How do we get started?

- What we had to do to get started;
 - Know what our assets are
 - Know where our assets are
 - Know what criteria to use to rate assets
 - Know how to rate our assets consistently



Drainage Inventory (What and Where)

- Road Operations, Surface Water Management and GIS have been collecting drainage data since about 1999
- **19,500** number of CB/MH
- **50,000** segments of pipe for **550** miles
- **39,000** segments of channel for **1,150** miles



Stormwater Treatment and Flow Control Facilities

- Vaults
- Tanks
- StormFilters
- Media Filter Drains
- Bioswales
- Hydrodynamic Separators
- Channel Weirs
- CB's with
 - **Frop's**
 - **Weirs**



Condition Assessment (Criteria)

No Work Necessary	0	- No Defect	Good Condition
	1	- Minor Defect; Isolated	
	2	- Minor Defect; Several	Fair Condition
3	- Minor Defect; Predominant		
Work Should Be Scheduled Within 6 Months	4	- Significant Defect; Isolated	Poor Condition
	5	- Significant Defect; Several	
	6	- Significant Defect; Predominant	
Work Should Be Scheduled Within 2 Months	7	- Same as 4 with secondary damage	Very Poor Condition
	8	- Same as 5 with secondary damage	
	9	- Same as 6 with secondary damage	



Pierce County Drainage Assessment Manual

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Presented By

Pierce County Public Works and Utilities
Road Operations



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Drainage Manual (Consistency)



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Pierce County Asset Management Program

Drainage Collection Procedures and Asset Assessment Manual

Equipment

Data Collection Procedures and Guidelines

This is for collection of drainage features as defined by this manual within the ROW and Public Works Facilities Maintained by Road Operations.

Items needed for data collection:

- Laptop
- ArcPad 8.0
 - County Base Map Layer
 - Road Layer
 - Drainage Layer
 - Our Feature Shapefiles and Geodatabase
- USB GPS Navigation Receiver

Supplemental items needed for data collection:

- Map of area to collect data
- Safety equipment (PPE)
- Flash Light (Million candle)
- Lid Puller
- Shovel
- Machete
- Rods (20')
- Tape Measure
- Persuader (pulling tight lids)
- T-handle locking lid key (3-4' tall)
- Mirrors
- Flat head screw driver Lg
- Dixon Yellow Chalk
- Rags
- Hand sanitizer
- Leather gloves
- Compass
- Wasp and Hornet spray
- Paper
- Pen
- Pencil
- Calculator
- Clip board
- Highlighter
- Cones



Procedures and Guidelines

Inspection Procedures and Guidelines

Non-Structural Inspection of Assets

The following inspection procedures offer a method of determining feature attribute and condition information by observing and recording the presence of severities of defects or distresses in the feature. The elements of **Bioswale / Channel / Rain Garden, Filter Strip, Media Filter Drain, and Pond** feature information and condition rating can be assessed as follows:

- Visually identify the feature
- Identify the feature on the laptop in GIS by selecting the feature
- Verify the **Asset Info Tab** has the correct information in it (walk the length of the feature) and make changes to items that are incorrect or missing
- Select the **Condition Tab** and fill out the items for the feature.
- Select the **Comments Tab** and verify that Assessment Date is correct and that the initials of the collector are in the Assessed By.

Structural Inspection of Assets

The following inspection procedures offer a method of determining feature attribute and condition information by observing and recording the presence of specific severities of defects or distresses in the feature. The elements of **Pipe / Live Stream Culvert, Tank, Catch Basin type 1 and Type 2 / Manhole, Channel Barrier, Access Lid, Vault, and Sand Filter** feature information and condition rating can be assessed as follows:

- Visually identify the feature
- Identify the feature on the laptop in GIS by selecting the feature
- Verify the **Asset Info Tab** has the correct information in it (walk the length of the feature, pull lids as needed) and make changes to items that are incorrect or missing
- Select the **Condition Tab** and fill out the items for the feature.
- If feature has a Mechanical Filter in it select the **MF Tab** and fill in the information (Optional)
- If feature has a Control Structure in it select the **CS Tab** and fill in the information (Optional)
- Select the **Comments Tab** and verify that Assessment Date is correct and that the initials of the collector are in the Assessed By.

Notes:

Maintenance requirements are located in the Pierce County Stormwater Manual and enforced by the Department of Ecology through the Phase I Municipal Stormwater Permit. The Phase I permit is the National Pollutant Discharge Elimination System (NPDES) and State Waste Discharge General Permit for discharges from Large and Medium Municipal Separate Storm Sewer Systems (MS4). The NPDES Permit complies with the provisions of the State of Washington Water Pollution Control Law and The Federal Water Pollution Control Act.

Confined space is required anytime a body part breaks the plain of the access to a structure.

Not all Structural features will have a Mechanical Filter or a Control Structure associated with it.

There are numerous types of defects and several possible severities and extents for each defect. In the following pages of this manual the defects are described and illustrated for Bioswale / Channel / Rain Garden, Pipe / Live Stream Culvert, Tank, Catch Basin type 1 and Type 2 / Manhole, Channel Barrier, Access Lid, Vault, Sand Filter, Filter Strip, Media Filter Drain, and Pond.

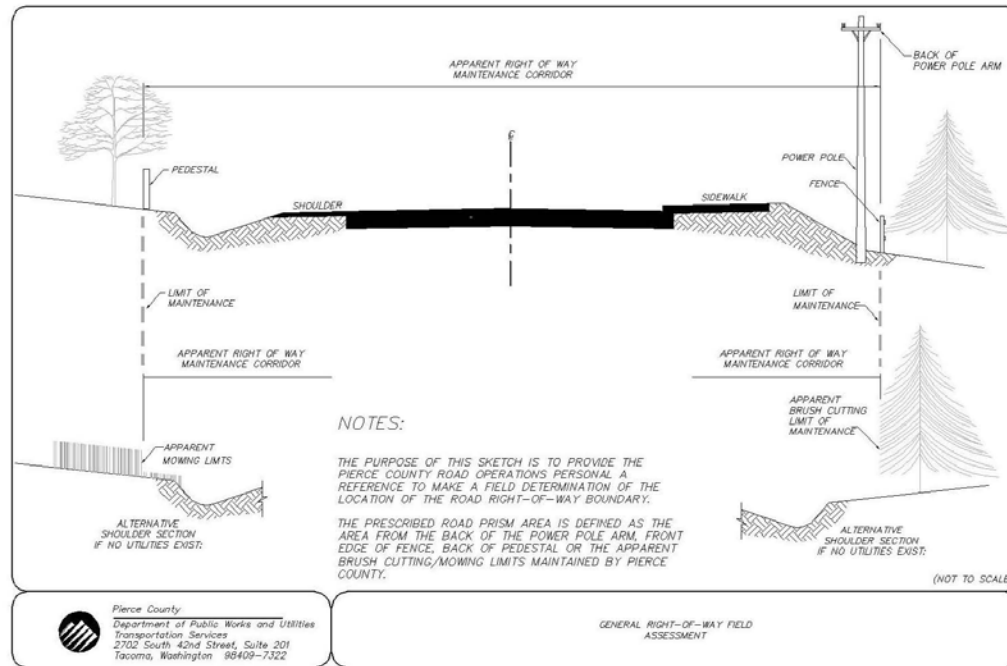
***Anytime you select "Other" you need to record supporting comments to help describe the attribute information in the comments box.**

***If a feature does not exist, DO NOT DELETE IT. In the comment field say, "DOES NOT EXIST".**



General Guidelines for ROW Limits

ROW Limits



When cleaning a feature that goes off ROW, clean only to the apparent ROW / maintenance limits.



Catch Basin and Manhole

Catch Basin Type 1 and Type 2 / Manhole

A chamber or well, usually built at the curb line of a street, for the admission of surface water to a storm sewer or subdrain, having at its base a sediment sump designed to retain sediment and debris below the point of overflow. The difference between a Catch Basin Type 2 and a Manhole is that a Manhole does not have a sump.

Rating of Catch Basin / Manhole

<u>No Defect</u>	
MINOR (Do Nothing)	Very minor defects (Minor trash, sediment greater than 1 ft from IE)
MODERATE (Do before next Assessment)	Needs some work within 6 months (Sediment less than 1 ft from IE, crack but no sediment coming in)
SEVERE (Do within 2 months)	Need work now (Cracks allowing soil into structure, water missing structure, sediment in the pipe, major trash)



Catch Basin Type 1



Catch Basin Type 2 / Manhole



Data Assessment for CB/MH

Data Assessment: Point Feature

The image shows three screenshots of the MH_CB data entry form. The first screenshot shows the 'Asset Info' tab with fields for MH/CB ID, Structure Type, Structure Material, Sump Depth, Locking Lid, Lid Type, Lid Material, Lid Length, Lid Width, Lid Shape, Flow Direction, and Discharge Destination. The second screenshot shows the 'Condition' tab with fields for Structure Damage, Lid Damage, Lid Position, and Sediment Level. The third screenshot shows the 'MF' tab with fields for Assessment Date, Assessed By, and Description.

Attributes in form to be filled out:

Tab 1 – Asset Info

- **Structure Type** – Type of asset (BRICK/MORTER, CB1, CB2, CURB INLET, CBMF, MH, MHMF, OTHER, PIPE)
- **Structure Material** – Material the pipe is made out of (CONCRETE, OTHER, METAL)
- **Sump Depth** – How deep is the sump, from the bottom of the pipe to the sump
- **Depth Inches** – How deep is the structure from the rim to the sump
- **Locking Lid** – Does the structure have a locking lid (YES, NO)
- **Lid Type** – Type of the lid (BEEHIVE, BI_GRATE, CMBGRATE, GRATED_OTHER, HB, OTHER, ROLLED, SLT_GRATE, SOLID, UTILITY, VANED)
- **Lid Material** – Material the lid is made of (CONCRETE, OTHER, METAL, WOOD)
- **Lid Length** – Length of the lid, in inches
- **Lid Width** – Width of the lid, in inches
- **Lid Shape** – Shape of the lid (RECTANGLE, ROUND, SQUARE, OTHER)
- **Flow Direction** – Direction of flow (E, N, NE, NW, S, SE, SW, W)
- **Discharge Destination** – What is the next feature in this system (DRAINAGE_STRUCTURE, CHANNEL, PIPE, CHANNEL_BARRIER, VAULT, FILTER_STRIP, ECOLOGY_EMBANKMENT, STORMWATER_POND, FRESH_WATER, SALT_WATER, UNKNOWN, OTHER, NONE)

Tab 2 – Condition REPAIR

- **Structure Damage** – What damage does the structure have (N/A, NONE, MINOR, MODERATE, SEVERE)
- **Lid Damage** – What kind of damage does the lid have (NONE, MINOR, SEVERE)
- **Lid Position** – Where is the lid related to the surface around it (LEVEL, LOW, HIGH)

MAINTENANCE

- **Sediment Level** – Deepest recorded sediment level in the access openings (0=No visible sediment, 3=Greater than 1ft below I.E., 6=Less than 1ft below I.E., 9=Above the I.E.)

Tab 3 – MF Info

- See page # _ for Mechanical Filters

The image shows a screenshot of the MH_CB data entry form with the 'CS' (Comments) tab selected. It includes fields for Cap Color, # of Cartridges, Filter Height, Sump Line, and Top of Curbside, along with a large text area for comments.



Data Assessment for CB/MH

Tab 4 – CS Info

- See page #_ for Control Structures

Tab 5 – Comments

- **Assessment Date** – Date data was collected
- **Assessed By** – Who collected the information
- **Description** – Additional descriptions that came from GIS data coverage
- **Comments** – Additional comments needed

Required fields *italicized*

The screenshot shows a software window titled "MH_CB" with a menu bar containing "Form", "Page", "Control", and "Layout". Below the menu bar are five tabs: "Asset Info", "Condition", "MF", "CS", and "Comments". The "CS" tab is selected and active. The form content is organized into sections: "INFORMATION" with a dropdown for "Control/WQ Structure Type" and a dropdown for "Cleanout Gate"; "REPAIR" with a dropdown for "Control/WQ Functioning" and a dropdown for "Control/WQ Damage"; and "MAINTENANCE" with a dropdown for "Oil Presence". At the bottom of the window are "OK" and "Cancel" buttons.



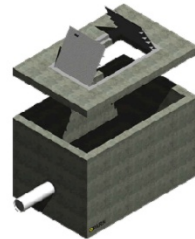
Data Assessment for CB/MH

Locking Lid:



LOCK

Lid Shape:



RECTANGLE



ROUND



SQUARE



Data Assessment for CB/MH

Lid Type:



BEEHIVE



BISECTED GRATE



COMBINATION GRATE



GRATED OTHER



HERRING BONE



OTHER



ROLLED



SLOTTED GRATE



SOLID



UTILITY



VANED





Tab 2 – Condition

Catch Basin / manholes that are not maintained will not be able to filter the sediment and pollutants out of the storm water runoff as designed.

SEVERITY:	Minor	Bent rungs that are still attached and functional, minor cracks in structure with no sediment entering the structure, sediment or trash greater than 1ft from IE.
	Moderate	Trash immediately upstream of grate, sediment entering the structure through holes or cracks in structure, grate is low, rungs not safe, grate stuck, broken or missing, sediment is less than 1 ft from IE.
	Severe	Vegetation, trash, or sediment blocking water from entering the structure, cracks that are allowing sediment into the structure, lid is not attached to the structure, broken or could not be opened, grate is raised and water is bypassing the structure sediment to the IE.
EXTENT:		The extent of the catch basin / manhole defect is related to the entire defined feature. Catch basin / manholes will be measured by an extent range of (1,4,7) Minor, (2,5,8) Moderate, or (3,6,9) Severe. For example, a value of 3 equals minor severity, high extent.
ACTION:		Based on the action required to repair/maintain a catch basin / manhole, a function code(s) of (40L, 40H) and work units will be assigned to represent the associated activity.

The feature being assessed will be rated based on severity of Minor (1-3), Moderate (4-6), and Severe (7-9) scales. The rating of 1, 4, and 7 are isolated distresses within a feature. The rating of 2, 5 and 8 are moderate distress areas within the feature. The rating of 3, 6 and 9 are distresses that exist throughout the majority of the feature. Condition values of 7, 8 and 9 are 4, 5 and 6 but with a secondary impact to another asset. The rating of Minor means that there are signs of a potential maintenance need in the future but still within the Pierce County Stormwater Manual (PCSWM) requirements. The rating of Moderate means that there are currently signs of a maintenance need per the PCSWM, but which are not affecting another asset at this time. The rating of Severe means that there are currently signs of a maintenance need per the PCSWM, and the condition is affecting another asset or has greatly affected the function of the feature. **See PCSWM for specific detailed requirements.**

Condition Rating

Condition Types

Condition Type: REPAIR



Structural Damage

Cracks in underground structures can allow sediment to enter the structure, or be a sign of collapse.



Lid Damage

Damage to lids could allow trash into the structure.



Lid Position

If the lid of a structure is low, it could cause pavement failure sooner, or cause damage to vehicles.
If the lid is high, it could allow water to bypass the structure and remain on the roadway.

MAINTENANCE



Sediment Level

Sediment level is measured from the sump to the top of the sediment.





Mechanical Filter

A canister-type filter with zeolite/perlite/granular activated carbon or some other combination of media that are found in vaults, catch basins, or manholes manufactured by a proprietary system. The target pollutants for removal are total suspended solids (TSS), total and soluble phosphorous, total nitrogen, soluble metals, oil & grease and other organics.

Rating of Mechanical Filters

	No Defect
MINOR (Do Nothing)	Very minor defects (Spotty sediment on cartridge, scum line below)
MODERATE (Do before next Assessment)	Needs some work within 6 months
SEVERE (Do within 2 months)	Need work now (Top of cartridge covered with sediment, scum line above)

Mechanical Filter



Mechanical Filters

**Data Assessment:
Polygon, Point Feature**

Mechanical Filter Info

MI_CB
Form Page Control Layout
Asset Info Condition MF CS Comments
INFORMATION
Cap Color [dropdown]
of Cartridges [text]
Filter Height [dropdown]
MAINTENANCE
Scum Line [dropdown]
Top of Carister [dropdown]
OK Cancel

Vaults
Form Page Control Layout
Asset Info Condition MF CS Comments
INFORMATION
Cap Color [dropdown]
of Cartridges [text]
Filter Height [dropdown]
MAINTENANCE
Scum Line [dropdown]
Top of Carister [dropdown]
OK Cancel

Attributes in form to be filled out:

Tab 3 – Mechanical Filter

Information

- **Cap Color** – Color of the cap (BLUE, GRAY, GREEN, ORANGE, WHITE)
- **# of Cartridges** – How many cartridges are in the structure
- **Filter Height** – What is the height of the cartridges (12", 18", 27")

Condition

- **Scum Line** – Where is the scum line located (ABOVE CARTRIDGE, BELOW CARTRIDGE, NONE)
- **Top of Cartridge** – Sediment level on top of the cartridge (COVERED SEDIMENT NONE, SPOTTY SEDIMENT ,)

Required fields *italicized*



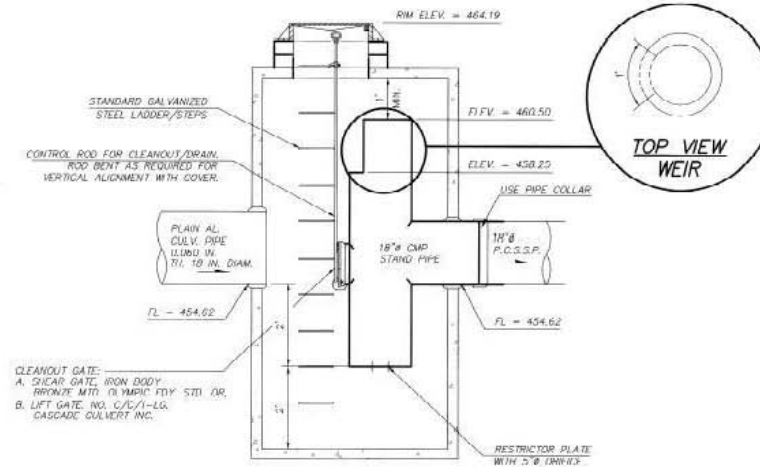
Control Structure

Control Structure

Control structures are located in catch basins or manholes and are restrictor devices for controlling outflow from a facility to meet the desired performance. Riser type restrictor devices ("tees" or "FROP-Ts") also provide some incidental oil/water separation to temporarily detain oil or other floatable pollutants in runoff due to accidental spill or illegal dumping. Weirs and baffles are located within catch basins, manholes, tanks or vaults. Weirs are designed to restrict flow and baffles are designed to slow down flow. The Hydrodynamic System (HDS) removes finer sediment, particles, free oil, and debris from urban runoff. This system uses an effective combination of swirl-concentration and flow-control technologies to maximize treatment. It is not allowed as a standalone system but only as a treatment train. An HDS can be located in a catch basin type 2 / manhole or a vault. **Weirs can also be located in ditches but are called ditch weirs under channel barriers.**

Rating of Control Structures

No Defect	
MINOR (Do Nothing)	Very minor defects) (Trace of oil)
MODERATE (Do before next Assessment)	Needs some work within 6 months (Flow restrictor damaged)
SEVERE (Do within 2 months)	Need work now (Flow restrictor not functioning, oil thick at surface)



Frop-T



Data Assessment: Point Feature

Attributes in form to be filled out:

Tab 3/4 – Control Structure

Information

- ***Control/WQ Structure Type*** – Type of control structure located within the feature (BAFFLE, BAFLE/FROP-T, FROP-T, HDS, NONE, OTHER, WEIR, SAND_FILTER, COALESCING_PLATES, DOWN TURNED ELBOW, FROP-B, DROP STRUCTURE, GATE VALVE)
- ***Cleanout Gate*** – Is there a cleanout gate (YES, NO)

Condition

- ***Control/WQ Functioning*** – Is there flow restrictor functioning (N/A, YES, NO)
- ***Control/WQ Damage*** – Is there damage to the flow restrictor (YES, NO)
- ***Oil Presence*** – Is there an oil presence that completely covers the top of the water (N/A, YES, NO)

Required fields *italicized*

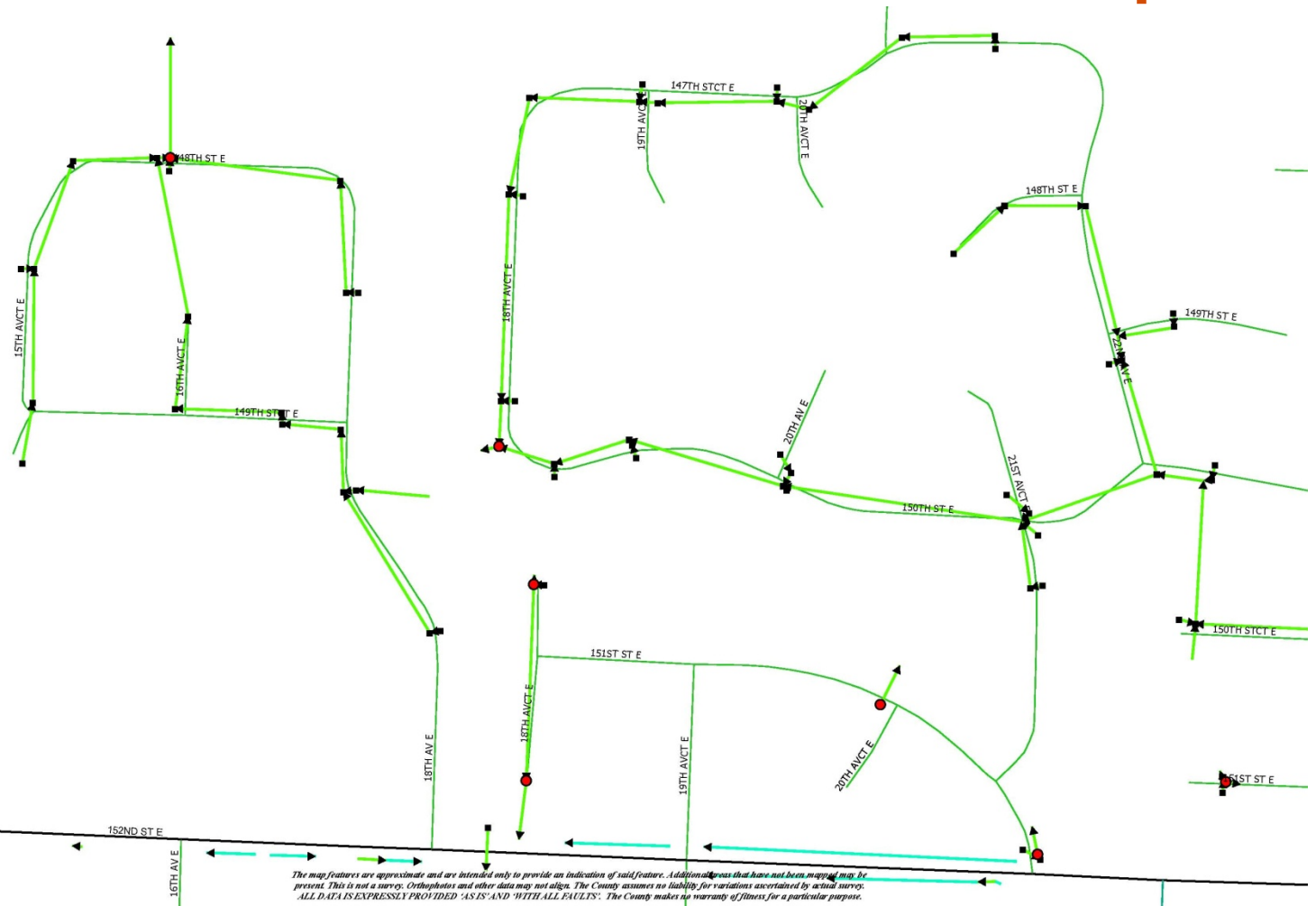
Control Structure Info



Inspection Process



Initial Inspection Example

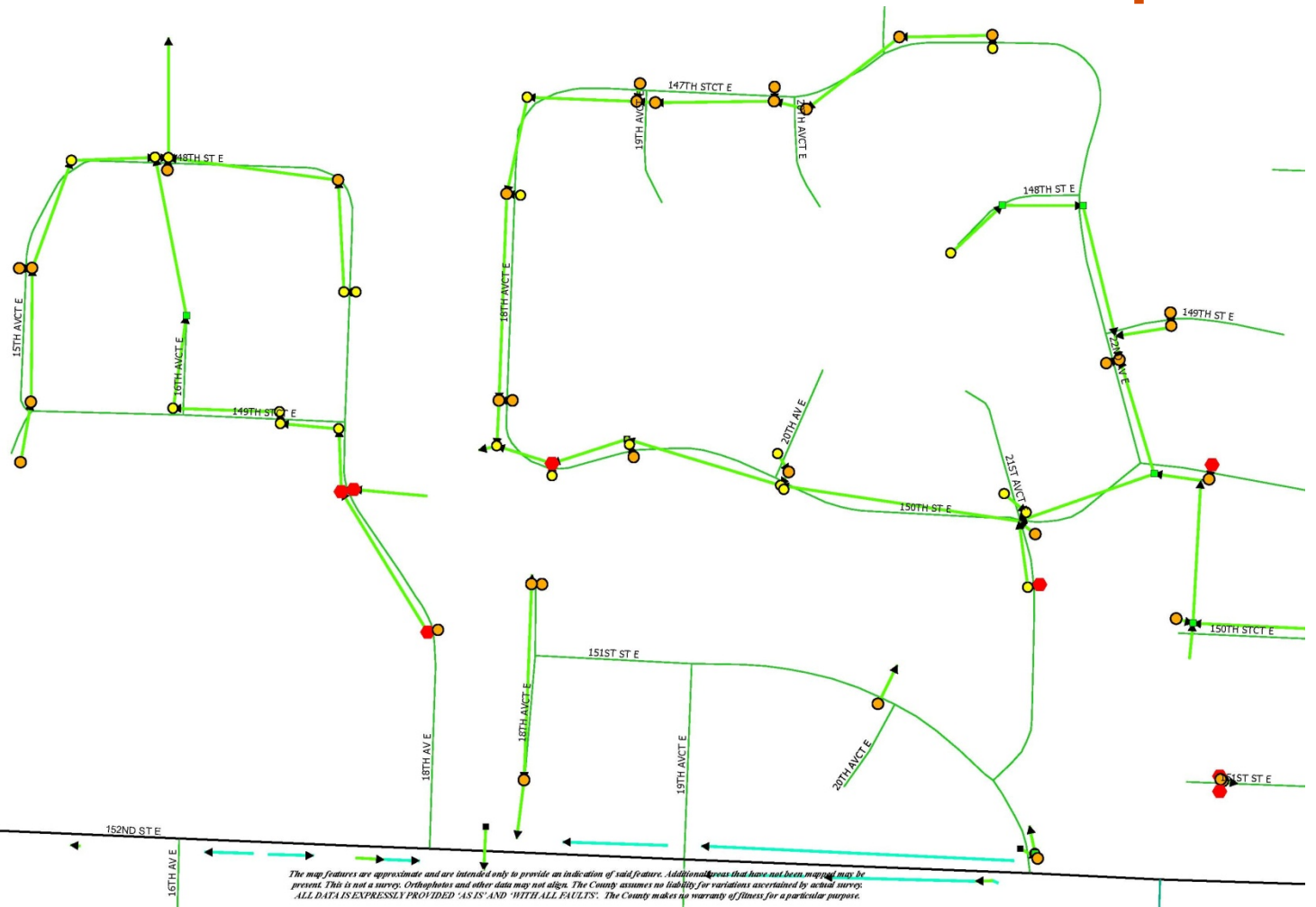


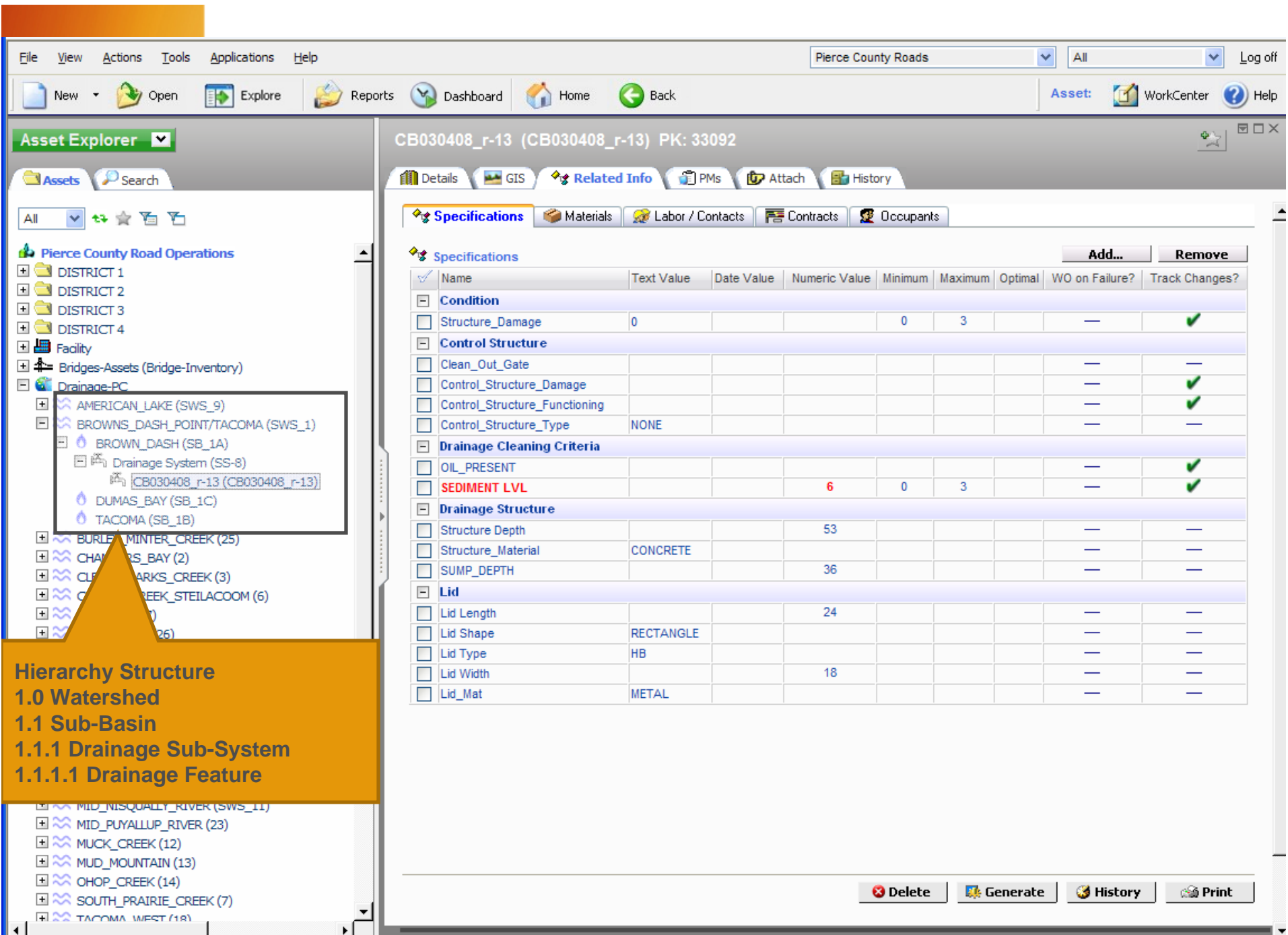
Upstream

- Every time an inspection of a CB/MH occurs you **shall** go to the next 3 structures upstream from that CB/MH until you come across either 3 CB/MH's in a row that do not require cleaning (a score of 3 or less) or there are no more CB/MH's in that system.



Completed Inspection Example





Pierce County Asset Management Program

Drainage Maintenance Data Collection Procedures

This is for collection of maintenance information on drainage features within the ROW only

Additional Items needs for maintenance data collection not associated with a vactor truck:

- Laptop
- ArcPad 8.0
 - County Base Map Layer
 - Road Layer
 - Drainage Layer
 - Our Feature Shapefiles and Geodatabase
- USB GPS Navigation Receiver

Inspection Procedures and Guidelines

Guideline for Collection of Maintenance Information of Drainage Assets

The following inspection procedures offer a method of determining condition at time of maintenance by observing and recording the severities of defects or distresses in the feature.

- Visually identify the feature
- Identify the feature on the laptop in GIS by selecting the feature
- Note the items needed to fill out the form before cleaning the feature
- Fill out the form as much as you can, then clean the feature if needed
- If sediment level was scored a 5 or greater, move to the next feature upstream until you have either finished the system or have inspected 3 in a row that scored less than 5 which does not require cleaning. If the original feature had a sediment score less than 5 move on to the next assigned feature to be cleaned.

Notes:

The GIS form that is to be filled out is used for a condition assessment before maintenance is performed, but some information that is needed to be filled out might not be able to be collected before cleaning of the feature ex. Structure Condition, but should still reflect a before maintenance condition.

Rating of Catch Basin / Manhole

NONE (Do Nothing)	0 – No Defect
MINOR (Do Nothing)	3 – Very minor defects (Sediment greater than 1 foot from IE)
MODERATE (Do before next Assessment)	5,6 – Needs some work within 6 months (Sediment less than 1 foot from IE, grate low, cracks no sediment)
SEVERE (Do within 2 months)	7,9 – Need work now, affecting another asset (Grate high, cracks with sediment, grate or area around broken)

Procedures and Guidelines



Vactor Forms

Data Assessment: Point Feature

Catch Basin's and Manhole's
Form Page Control Layout

Lid_Damage (40F) [dropdown]
Lid_Position (40PR) [dropdown]
Sediment_Level [dropdown]
Structure_Damage (40L) [dropdown]
Work Performed 40I 40H 40F
Needs: Dewatering Traffic Control
Date_Inspected [dropdown] 10/14/2011
Date_Cleared [dropdown] 10/14/2011
Visited_By [text]
Comments [text]
OK Cancel

Line Feature

Pipes
Form Page Control Layout

Pipe Material [dropdown]
Pipe Diameter [text] Flow Direction [dropdown]
Sediment_Level [dropdown]
Pipe_Cleaned 40J 40D
Date_Visited [dropdown] 10/14/2011
Visited_By [text]
Comments [text]
OK Cancel

Catch Basin's and Manhole's

- **Lid_Damage** – What kind of damage does the lid and surrounding area have (0=NONE, 5=MINOR, 9=SEVERE)
- **Lid_Position** – Where is the lid related to the surface around it (0=LEVEL, 5=LOW, 7=HIGH)
- **Sediment_Level** – Sediment level below from the Invert Elevation (IE) (0=No visible sediment, 3=Greater than 1ft below I.E., 6=Less than 1ft below the IE, 9=Above the I.E.)
- **Structural_Damage** – What damage does the structure have (0=NONE, 3=MINOR, 6=MODERATE, 9=SEVERE)
- **Work Performed** – What maintenance function was performed (40I, 40H, 40F)
- **Needs** – What is needed to maintain structure (Dewatering, Traffic Control)
- **Date_Inspected** – Date feature was Inspected
- **Visited_By** – Who collected the information
- **Comments** – Additional comments needed

Pipes

- **Pipe Material** – What material is the pipe made of (ADS, CMP, CONCRETE, HDPE (CORRUGATED), HDPE (SOLID WALL), OTHER, PERF ADS, PERF CMP, PERF CONC, PERF PVC, STEEL, WOOD)
- **Pipe Diameter** – What is the diameter of the pipe in inches
- **Sediment_Level** – What is the sediment level in the pipe (0=No Visible Sediment, 3=Less than 10%, 6=Greater than 10%, 9=Pipe Plugged)
- **Pipe_Cleaned** – What maintenance function was used to clean the pipe (40J, 40D)
- **Date_Visited** – Date data was collected
- **Visited_By** – Who collected the information
- **Comments** – Additional comments needed



Totals



Inspection & Cleaning Stats CB/MH's

- CB/MH inspected this year = 16,500
(1.1.11 Through 8.18.11 with over 15,000 from 3.7.11 to 5.24.11)
- CB/MH cleaned this year = 7,200
(1.1.11 Through 8.30.11 with over 6,100 from 3.21.11 to 8.30.11)
- Current percent of public CB/MH within the Right-of-Way inspected ~ 85%
- Estimated amount of sediment/pollutants removed this year from CB/MH Cleaned = 1,250 cu yds



Dollars Spent in 2011

- **40 Series** (Actual Labor, Equipment, and Material)
 - **H (Mechanical Cleaning)** **\$599,583 EA**
 - **J (Jet Rodding of Pipe)** **\$140,854 LH**
 - **I (Inspection)** **\$272,736 LH**
 - **W (Decanting)** **\$16,423 TON**
- **Engineering** (Estimated)
 - **Inspections/Program** **\$50,000**

**Estimated Total Spent
to date in 2011** **\$1,079,596**





Pierce County
Public Works and Utilities
Transportation Services
Road Operations Division

Maintenance Standard

Page 1 of 2

Effective Date
1/01/03

Revision Date
N/A

40H

Function:	Mechanically Clean Drainage Structure	Function Code:	40H
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Function Description

Purpose:

To prevent flooding, erosion and damage to road infrastructure and wildlife habitat. Drainage structure cleaning includes the inspection of the pipe body and/or adjacent ditch(s) to determine if further maintenance activities are required.

Procedure:

Establish traffic control as necessary. If work is being conducted in or near a wet area, an approved Work Order and/or HPA must be on site. Install BMPs as needed or dictated by permit or work order. Remove debris from the drainage structure with a camel/vactor truck. Any generated waste materials shall be hauled to the assigned decant station. Inspect adjacent drainage features, and note any additional maintenance needs.

Quality:

The drainage structure shall be clear of all materials to the bottom of the structure. All work shall be recorded on the appropriate Regional Road Maintenance Guideline checklist.

Inspection:

As soon as is practicable upon completion of work, the site shall be reviewed by a Lead Worker or Supervisor. The inspection shall ensure that the scope of work completed meets service level expectations and environmental requirements.

Resource Requirements

Work Unit: Each

Labor			Equipment			Materials		
Job Class Code	Job Class Description	Hours / work Unit	Equip Code	Equip Description	Hours per Work Unit	Material Code	Material Description	Quantity per Work Unit
9018	FS	.0370	005H	Crew Cab, Pick up	.0290	PY05	Vactor Solids	3.8860
9154	MT	1.1490	008K	Camel	.5640	PY06	Vactor Liquids	77.0690
9151	MW	.0540				7000	Water	14.4730

Note - Traffic Control For This Function Charged To: **40T**

Hand Tools	Power Tools	Consumable	Safety
Round Point Shovel Grate Hook Lid Wrench Flash Light Pike Pole Pole Tongs Potato Hook Pry Bar Sledge Hammer			PPE Gas Monitor Rubber Boots Rain Gear Safety Glasses Hearing Protection

Planning and Control Data

Unit Cost (Operational)	Average Daily Production	Average Annual Production		Average Production per Lane Mile	% of Total Annual Budget
		Work Units	Dollars		
\$67.58 per Each	40 Each (8 hour day)	2,079 Each	\$140,498.82	.6685 Each per Mile	.0084%





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