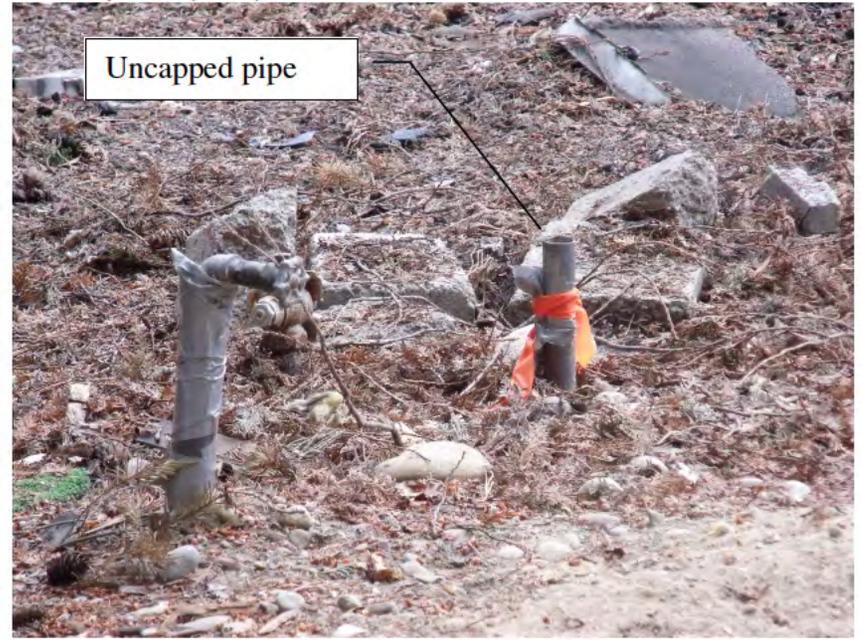


6208 202nd St. SW, Lynnwood, WA (S-82)



Area surrounding uncapped pipe.



Smoke emanating from uncapped pipe.

6208 202nd St. SW, Lynnwood, WA (S-83)



View from 202th St. SW in Lynnwood



Smoke emanating from unknown source behind trailer.

Near manhole #2-80 on 200th St. SW, Lynnwood, WA (S-84)



Smoke emanating from crack in sidewalk and base of street sign.



Crack in sidewalk and base of street sign.

5703 202nd St. SW, Lynnwood, WA (S-85)



North side of building.



Smoke emanating from unknown source on roof top.

5523 204th St. SW, Lynnwood, WA (S-86)



View of south side and southeast corner of house.



Smoke emanating from downspout.

5910 207th Pl. SW, Lynnwood, WA (S-87)



Front of house and driveway.



Smoke emanating from drain at base of driveway.

20923 59th Pl. W, Lynnwood, WA (S-88)



Area surrounding water meter box.



Smoke emanating from water meter box cover.

6207 211th St. SW, Lynnwood, WA (S-89)



View of east and north sides of house.



Smoke emanating from rain gutter.

21101 Hwy 99, Lynnwood, WA (S-90)



Car wash under carport at Enterprise Rent-a-Car



Smoke emanating from grate under carport.

6125 202nd St. SW, Lynnwood, WA (S-91)

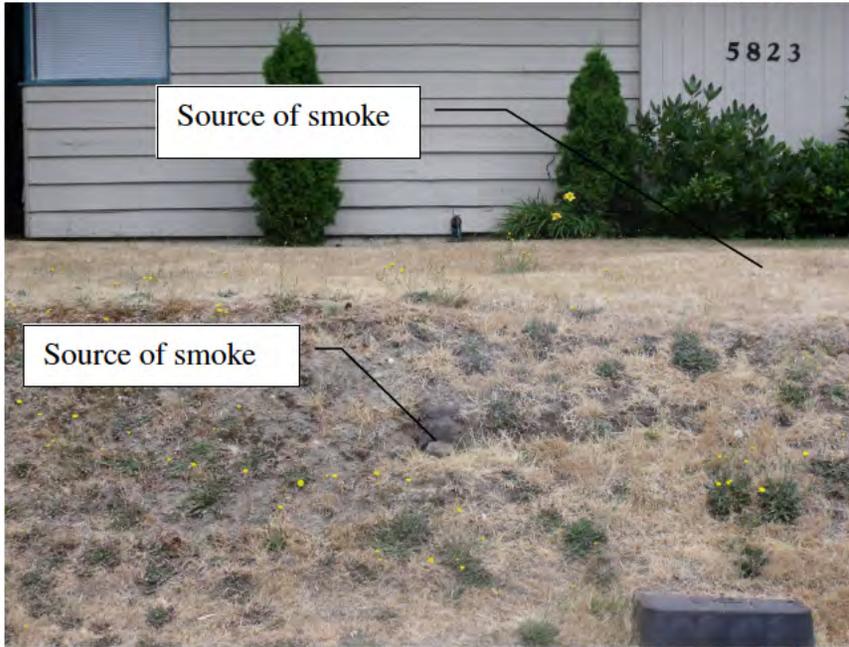


View of south side of building and area surrounding hole in ground.



Smoke emanating from hole in ground.

5823 202nd St. SW, Lynnwood, WA (S-92)



View of south side of building and area surrounding two holes.



Smoke emanating from hole in ground on sideslope.



View of front of building and smoke emanating from hole in ground.



View from above of smoke emanating from hole in ground.

5827 207th Pl. SW, Lynnwood, WA (S-93)



Smoke seen from storm drain in driveway.



Smoke emanating from drain in driveway.

20920 (Near 55th Ave W and 210th St. SW), Lynnwood, WA (S-94)



Private driveway.

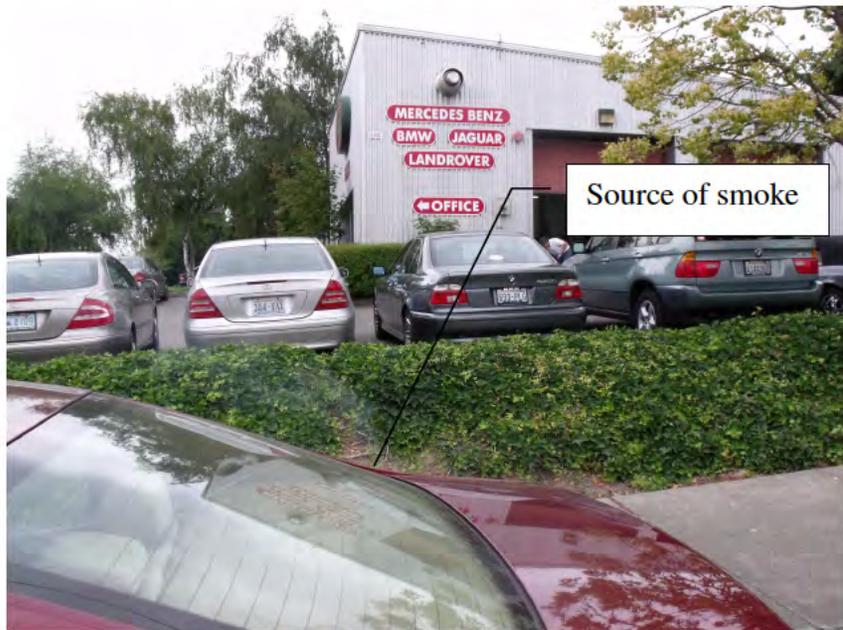


East side of building



Smoke emanating from depression in the ground.

21116 67th Ave W, Lynnwood, WA (S-95)



East side of building and parking lot.



Smoke emanating from hole in water meter box cover.

20903 54th Ave W, Lynnwood, WA (S-96)



Front of house and driveway



Smoke emanating from under the deck.

6210 200th St. SW, Lynnwood, WA (S-97)



Lynnwood Bowl and Skate's parking lot.



Smoke emanating from cleanout cap.



Smoke emanating from cleanout cap.

67th Ave W and 214th St SW in Lynnwood (S-98)



Area surrounding manhole.



Smoke emanating from manhole cover.

APPENDIX C
MANHOLE INSPECTION

BACKGROUND

Gray & Osborne, Inc. conducted manhole inspections in the City of Lynnwood on March 9th and 11th of 2010 by a crew of two people. No precipitation occurred on March 9th, however, there was steady rainfall during inspection on March 11th. In addition, the manhole inspection followed a significant period of wet weather, so the groundwater level was higher. Manhole inspections included a visual inspection of the area surrounding the manhole lid and removing the lid and conducting a visual inspection of the inside of the manhole.

The area surrounding the manhole was inspected to determine if the manhole was located in a low area where surface water could inflow through the lid. The condition of the manhole channel was inspected for impediments to flow through the manhole, a potential source of surcharges. The interior of the manhole was inspected for signs of groundwater infiltration. Signs of infiltration could be seen as stains and mineral deposits or as visible water entering the manhole through cracks or penetrations. The manhole interior was also inspected for structural defects including cracks, shifting riser sections or offset manhole frame and grates. The presence of these could also indicate locations for groundwater infiltration and root penetration.

MANHOLE INSPECTION LOCATION

A total of 34 manholes were inspected in six Flow Meter Basins. The manholes were chosen from manholes identified during TV inspection and discussions with City crews. The manholes inspected can be seen in Figure C-1. The number of manholes inspected in each Flow Meter Basin is shown in Table C-1.

TABLE C-1

Manholes Inspected

| Flow Meter Basin | Manholes Inspected |
|-------------------------|---------------------------|
| Flow Meter Basin #1 | 2 |
| Flow Meter Basin #3 | 6 |
| Flow Meter Basin #4 | 22 |
| Flow Meter Basin #5 | 1 |
| Flow Meter Basin #6 | 2 |
| Flow Meter Basin #7 | 1 |
| Total | 34 |

RESULTS

Each manhole inspection was documented with an inspection report indicating the manhole number, date of inspection, conditions encountered during the inspection, and who performed the inspection. The manhole inspection reports can be found at the end of Appendix C. In addition, photos were taken of all the manholes inspected. The photos were organized to create a summary sheet for each manhole and can also be found at the end of Appendix C.

Each of the manhole problems identified were ranked by the severity of the problem using the same designations as the other inspection results. The severity of each problem was broken down into the following categories; Severe, Heavy, Medium, Light, and None problems. The Severe category included the most severe problems and the Light category included least severe problems. The None category included manhole inspections where no problems were located. Most of the manholes inspected were in relatively good condition with 31 manholes having either light or no problems. However, three manholes were identified with medium problems showing mineral deposits and visible infiltration into the manhole. Results are seen in Table C-2.

TABLE C-2

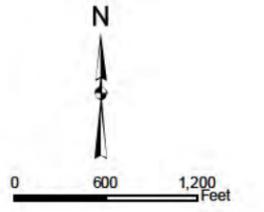
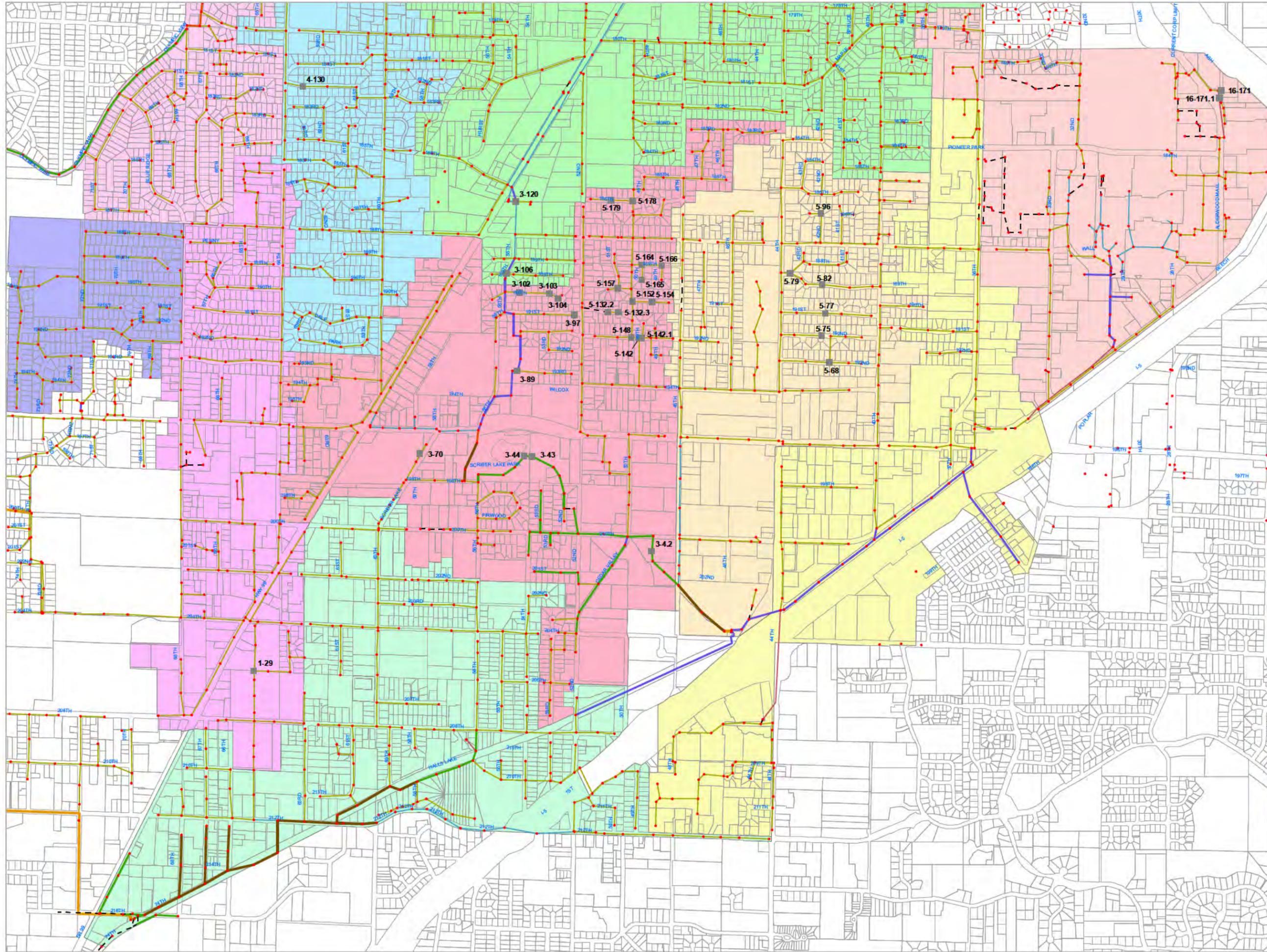
Manhole Problems Severity

| Severity | Number of Problems |
|-----------------|---------------------------|
| Medium | 3 |
| Light | 27 |
| None | 4 |
| Total | 34 |

SUMMARY

A summary of results of each of the manholes can be seen in Table C-3. This table contains all the information about the manhole inspection including the manhole number, location, a description of the problem, and the source of the flow entering the manhole. The table includes a manhole reference number for the manhole inspection problems so that can be used to reference the manhole inspection summary sheets and photos at the end of Appendix C.

All the manhole inspection problems were assigned a problem number related to the proximity to the manhole number that is consistent with the numbering for the results of the other sources of inspection. The problem number is the upstream manhole number and the length downstream the mainline from the manhole. All the manhole inspection problem numbers end in the designation N/A because the problems were all located in the manhole.



LEGEND:

- INSPECTED MANHOLE
- SEWER MANHOLE
- SEWERLINES:**
- - unknown
- 6 in
- 8 in
- 10 in
- 12 in
- 15 in
- 18 in
- 21 in
- 24 in
- ▭ PARCELS
- FLOW METER BASINS:**
- ▭ BASIN #1
- ▭ BASIN #2
- ▭ BASIN #3
- ▭ BASIN #4
- ▭ BASIN #5
- ▭ BASIN #6
- ▭ BASIN #7
- ▭ BASIN #8
- ▭ BASIN #9
- ▭ BASIN #10
- ▭ BASIN #11

CITY OF LYNNWOOD

FIGURE C-1
MANHOLE INSPECTION

Gray & Osborne, Inc.
CONSULTING ENGINEERS

Table C-3

Manhole Inspection Results Summary

| Reference Number | Manhole | Problem Number | Location | Basin | Description | Potential Source of Flow | Severity | Year Tested |
|------------------|---------|----------------|-------------------------------|-------|--|--|----------|-------------|
| M-1 | 1-29 | 1-29-N/A | Near Hwy 99 and 186th PI SW | 7 | Heavy mineral deposits on riser section; visible infiltration; heavy mineral deposits on wet benches; heavy flows through manhole | Visible infiltration through manhole walls | Light | 2010 |
| M-2 | 3-4.2 | 3-4.2-N/A | Near 48th Ave W & 200th St SW | 4 | Visible infiltration down south side wall- wall is broken up | Visible infiltration through spalled area on manhole wall | Light | 2010 |
| M-3 | 3-43 | 3-43-N/A | Scriber Lake Park | 4 | Substantial flow through manhole; mineral deposits on riser sections; interior walls are wet; flow on benches | No visible infiltration source | Light | 2010 |
| M-4 | 3-44 | 3-44-N/A2 | Scriber Lake Park | 4 | Substantial flow through manhole; mineral deposits on riser sections; interior walls are wet; flow on benches | No visible infiltration source | Light | 2010 |
| M-5 | 3-70 | 3-70-N/A | Scriber Lake Rd & 196th St SW | 4 | Roots in manhole riser section | No visible infiltration source | Light | 2010 |
| M-6 | 3-89 | 3-89-N/A | Near 56th Ave W & 193rd PI SW | 4 | Benches are wet; heavy flows through manhole; streaks down interior riser section walls; light mineral deposits on interior manhole walls | No visible infiltration source | Light | 2010 |
| M-7 | 3-97 | 3-97-N/A | Near 52nd Ave W & 191st St SW | 4 | East interior manhole wall is wet; numerous streaks on interior manhole wall; uneven grade around manhole cover; north side bench visibly wet; some riser bricks have moved, grout fallen out in places; no visible flow through manhole | Water streaks on interior manhole walls, no visible infiltration | Light | 2010 |
| M-8 | 3-102 | 3-102-N/A | 190th St SW & 55th Ave W | 4 | Visible infiltration through interior manhole walls; north manhole bench is very wet; visible water dripping on south interior manhole wall | Visible infiltration through interior riser section walls, water dripping on south interior manhole wall | Light | 2010 |
| M-9 | 3-103 | 3-103-N/A | 190th St SW (near 55th Ave W) | 4 | Visible infiltration on interior manhole walls; numerous mineral deposits on manhole bench; infiltration through riser sections; both manhole benches are wet | Visible infiltration through interior riser section walls | Medium | 2010 |
| M-10 | 3-104 | 3-104-N/A | 190th St SW (near 55th Ave W) | 4 | Numerous cracks in pavement surrounding manhole; top manhole riser is wet | No visible infiltration source | Light | 2010 |
| M-11 | 3-106 | 3-106-N/A | 55th Ave W & 189th PI SW | 6 | Manhole is surcharging; roots pushing through between riser sections; mineral deposits formed outside north and east inlets; interior walls are wet | No visible infiltration source | Light | 2010 |
| M-12 | 3-120 | 3-120-N/A | Hwy 99 (near 186th PI SW) | 6 | Heavy flows through manhole | No visible infiltration source | Light | 2010 |
| M-13 | 4-130 | 4-130-N/A | 182nd St SW & 64th Ave W | 5 | Manhole rim below adjacent grade; stains down manhole interior wall; wet on base of north side wall- perhaps circular crack; pavement cracked in multiple spots around manhole cover | Infiltration stains on manhole interior wall | Light | 2010 |
| M-14 | 5-68 | 5-68-N/A | 192nd PI SW & 44th Ave W | 3 | Mineral deposits around north and west pipes; infiltration stains on north interior wall; benches are wet and covered with deposits | Infiltration stains on north interior wall | Light | 2010 |
| M-15 | 5-75 | 5-75-N/A | 192nd St SW & 44th Ave W | 3 | Labeled "Drain" on cover- however identified as sewer manhole on basemap; appears to be catch basin- could be surcharged | No visible infiltration source | Light | 2010 |
| M-16 | 5-77 | 5-77-N/A | 191st St SW & 44th Ave W | 3 | Deposits causing damming inside manhole; manhole channel may be in low spot; benches are full of deposits | No visible infiltration source | Light | 2010 |
| M-17 | 5-79 | 5-79-N/A | 189th PI SW & 44th Ave W | 3 | Steady, clear flow through manhole; deposits on bench- may be from surcharge event | No visible infiltration source | Light | 2010 |
| M-18 | 5-96 | 5-96-N/A | 42nd PI W & 188th St SW | 3 | Dripping water from leak in manhole riser section; interior walls are wet; mineral deposits on one riser section around entire section circumference- may be leak all around | Visible dripping water in manhole riser section | Light | 2010 |
| M-19 | 5-142.1 | 5-142.1-N/A | 192nd St SW (near 49th PI W) | 4 | Manhole riser sections are wet; mineral deposits on risers | No visible infiltration source | Light | 2010 |
| M-20 | 5-142 | 5-142-N/A | 192nd St SW (near 49th PI W) | 4 | Lateral crack in pavement across entire roadway width jutting out laterally from manhole; inflow from crack in manhole cover; significant flow from west; manhole risers are wet; | Inflow from crack in manhole cover | Light | 2010 |
| M-21 | 5-148 | 5-148-N/A | 192nd St SW (near 49th PI W) | 4 | Bench is wet; significant flow from north; lateral crack in road from manhole to both edges of pavement; pavement around manhole rim has been elevated; mineral deposits around outside of north pipe invert | No visible infiltration source | Light | 2010 |
| M-22 | 5-152 | 5-152-N/A | 190th St SW (near 51st PI W) | 4 | Steady flow through manhole; quite a bit of debris on bench; manhole rim and cover have shifted 1.5 to 2 inches; manhole risers are wet | Manhole rim and cover has shifted and risers are wet | Light | 2010 |
| M-23 | 5-154 | 5-154-N/A | 190th St SW (near 51st PI W) | 4 | Mineral deposits on outside of east invert and south side bench; cracks in pavement around manhole rim; streaks on interior manhole walls; grasses and weeds overgrown on manhole cover | Infiltration stains on manhole interior wall | Light | 2010 |
| M-24 | 5-164 | 5-164-N/A | 189th St SW & 50th PI W | 4 | Wet bench; seepage around edge from top of bench up to first riser section; visible infiltration around manhole rim; pavement is cracked around manhole rim; rim slightly above grade of pavement | Visible infiltration around manhole rim | Light | 2010 |

Table C-3

Manhole Inspection Results Summary

| Reference Number | Manhole | Problem Number | Location | Basin | Description | Potential Source of Flow | Severity | Year Tested |
|------------------|----------|----------------|---|-------|---|--|----------|-------------|
| M-25 | 5-165 | 5-165-N/A | 50th PI W (near 189th St SW) | 4 | Sticks, debris and firecrackers inside; wet benches; stains on north side interior wall; minor pavement cracking around manhole rim | Visible infiltration stains on north side interior wall | Light | 2010 |
| M-26 | 5-166 | 5-166-N/A | 189th St SW & 49th PI W | 4 | Wet benches; seepage around edge at top of bench up to first rung of manhole | No visible infiltration source | Light | 2010 |
| M-27 | 5-178 | 5-178-N/A | 49th PI W & 186th PI SW | 4 | Pavement cracked around manhole rim; lateral pavement cracking across entire roadway width jutting out from manhole; benches are wet; mineral deposits on south riser section | No visible infiltration source | Light | 2010 |
| M-28 | 5-179 | 5-179-N/A | 186th PI SW (near 49th PI W) | 4 | South bench is wet and has deposited solids; visible infiltration on southeast interior wall behind ladder rung | Visible infiltration on southeast interior wall behind ladder rung | Light | 2010 |
| M-29 | 16-171.1 | 16-171.1-N/A | Alderwood Mall Pkwy (near Beech Rd) | 1 | Heavy mineral deposits on south interior wall; benches are wet; visible infiltration through north interior wall | Visible infiltration through north interior wall | Medium | 2010 |
| M-30 | 16-171 | 16-171-N/A | Alderwood Mall Pkwy (near Beech Rd) | 1 | Benches are wet; visible infiltration through manhole wall right above bench; manhole wall has mineral deposits | Visible infiltration through manhole wall above bench | Medium | 2010 |
| M-31 | 5-132.2 | 5-132.2-N/A | 191st St SW (East of 52nd Ave W) | 4 | Minimal flows through manhole; streaks on interior walls; manhole cover is flush with pavement | Manhole in good condition | None | 2010 |
| M-32 | 5-132.1A | 5-132.1A-N/A | 191st St SW (East of 52nd Ave W) | 4 | Minimal flows through manhole; no visible infiltration; appears to be newer manhole | Manhole in good condition | None | 2010 |
| M-33 | 5-157 | 5-157-N/A | 51st PI W (North of 190th St SW) | 4 | Benches appear dry; no visible infiltration; steady flows from west; manhole rim above adjacent grade | Manhole in good condition | None | 2010 |
| M-34 | 5-82 | 5-82-N/A | 189th PI SW (Between 40th Ave W & 44th Ave W) | 3 | Minor ponding on manhole cover; could not get cover off of manhole | Unknown | None | 2010 |

MANHOLE INSPECTION REPORTS

MANHOLE INSPECTION PHOTOS

M-1

Basin: Flow Meter #7

MH#: 1-29

Description of Problem:

- Heavy mineral deposits on riser sections
- Visible infiltration- walls are dripping
- Heavy flows through manhole
- Benches are very moist
- Heavy mineral deposits on benches
- Manhole rim above adjacent grade



Visible infiltration and mineral deposits on interior manhole walls.



Benches are wet and inundated with mineral deposits.



Heavy flows through manhole.

M-2

Basin: Flow Meter #4

MH #: 3-4.2

Description of Problem:

- Manhole rim at or above grade
- Visible infiltration down south side wall- wall is broken up



Infiltration streaks and stains on interior walls.



Interior wall is spalling and visible infiltration through spalled area.



Manhole rim is at or above grade.

M-3, M-4

Basin: Flow Meter #4

MH # 3-43 & 44

Description of Problem:

- Substantial flow through manhole
- Mineral deposits on riser sections
- Interior walls are wet
- Flow on benches (possible surcharge)
- Manhole rim at or above adjacent grade



Flow on manhole benches



Substantial flows through manhole including flow on benches.



Manhole rim at or above adjacent grade.

M-5

Basin: Flow Meter #4

MH #: 3-70

Description of Problem:

- No current flow
- No visible infiltration
- Roots in manhole riser section
- No ladder



No ladder in manhole. Manhole rim flush with adjacent grade.



No current flows through manhole.



Debris on manhole bench.

M-6

Basin: Flow Meter #4

MH #: 3-89

Description of Problem:

- Benches are wet
- Heavy flows through manhole
- Toilet paper on 2nd highest rung of manhole ladder
- Streaks down interior riser section walls
- Light mineral deposits on interior manhole walls



Streaks on interior riser section walls.



Heavy flows through manhole.



Benches are wet and have mineral deposits.

M-7

Basin: Flow Meter #4

MH #: 3-97

Description of Problem:

- East interior manhole wall is wet
- Numerous streaks on interior manhole wall
- Uneven grade around manhole cover
- North side bench visibly wet
- Some riser bricks have moved- grout fallen out in places

-No flow through manhole



No existing flow through manhole but north side bench is visibly wet.



East interior manhole wall is wet.



Infiltration streaks or stains on interior manhole wall.

M-8

Basin: Flow Meter #4

MH #: 3-102

Description of Problem:

- Visible infiltration through interior manhole walls
- North manhole bench is very wet
- South manhole bench is wet too-not as much as north side though
- Visible water dripping on south interior manhole wall

- Minimal flow through manhole
- Manhole cover above adjacent grade



Visible water dripping on south interior manhole wall.



Minimal flow through manhole. North side bench is wet.



Visible infiltration through interior manhole walls.

M-9

Basin: Flow Meter #4

MH #: 3-103

Description of Problem:

- Visible infiltration on interior manhole walls
- Numerous mineral deposits on manhole bench
- Infiltration through riser sections
- Both manhole benches are wet

- Minimal flow through manhole
- Good seal with manhole cover



Mineral deposits on manhole bench. Minimal flow through manhole.



Visible infiltration on interior manhole walls.



Infiltration through riser sections.

M-10

Basin: Flow Meter #4 MH #: 3-104

Description of Problem:

- Numerous cracks in pavement surrounding manhole
- Top manhole riser is wet
- Brick manhole

- Minimal flow from southeast
- No visible infiltration



Minimal flow from southeast.



Brick manhole.



No visible infiltration.

M-11

Basin: Flow Meter #6

MH #: 3-106

Description of Problem:

- Manhole is surcharging
- Roots pushing through between riser sections (minor)
- Mineral deposits formed outside north and east inlets
- Interior walls are wet



Heavy flows through manhole.



Roots pushing through between riser sections (minor).



Manhole is surcharging.

M-12

Basin: Flow Meter #6

MH #: 3-120

Description of Problem:

-Heavy flows through manhole



Heavy flows through manhole.



Mineral deposits on manhole benches.



Flows on manhole benches.

M-13

Basin: Flow Meter #5

MH #: 4-130

Description of Problem:

- Manhole rim below adjacent grade
- Stains down manhole interior wall
- Wet on base of north side wall- perhaps a circular crack
- Pavement cracked in multiple spots around manhole cover



Minimal flow through manhole.



Wet on base of north side wall-appears to be a circular crack.



Infiltration stains on manhole interior wall.

M-14

Basin: Flow Meter #3

MH #: 5-68

Description of Problem:

- Steady flow from north invert
- Mineral deposits around north and west pipes
- Infiltration stains on north interior wall
- Benches are wet
- Benches also covered with deposits (possibly from surcharge events)

-Rim flush with adjacent grade



Steady flows through manhole.



Infiltration stains on north interior wall.



Mineral deposits around north and west pipes. Bench is covered with deposits.

M-15

Basin: Flow Meter #3

MH #: 5-75

Description of Problem:

- Labeled "Drain" on cover- however identified as sewer manhole on basemap
- 12 inch concrete outlet to west
- Appears to be catch basin-could be surcharged
- No channels



Appears to be a catch basin.



Concrete outlet to west.



Manhole cover is labeled drain. Identified as manhole on basemap.