

***City of Molalla
Clackamas County, Oregon***

I/I FLOW MAPPING

MARCH 2018



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Project No. 100.26

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Clackamas County, Oregon

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DRAFT

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Table of Contents

SECTION 1: EXECUTIVE SUMMARY

1.1 Executive Summary	1-1
-----------------------------	-----

SECTION 2: INTRODUCTION

2.1 General	2-1
-------------------	-----

2.2 Scope of Study	2-1
--------------------------	-----

SECTION 3: EXISTING CONDITIONS

3.1 Field Investigation	3-1
-------------------------------	-----

3.2 Flow Mapping	3-2
------------------------	-----

SECTION 4: CONCLUSIONS AND RECOMMENDATIONS

4.1 Summary	4-1
-------------------	-----

APPENDICES

Appendix A Key Map

Appendix B I/I Flow Mapping (Figures A, B, C, and D)

SECTION 1:

EXECUTIVE SUMMARY

SECTION 1: EXECUTIVE SUMMARY

1.1 Executive Summary

The following report summarizes a wastewater collection system study performed for the City of Molalla (City). Continuous strain upon the City's wastewater treatment system has prompted this study to alleviate specific problems within the collection system. Findings identified can assist the City in locating and isolating deficiencies that when repaired will result in a reduction of infiltration and inflow (I/I) problems occurring within the collection system.

The following report is the culmination of a detailed investigation of I/I in the City of Molalla's wastewater collection system. The project included the following investigative efforts that are summarized within this report:

- Preliminary investigation,
- Flow field survey (flow measurements in manholes),
- Flow mapping,
- Analysis and report.

There was a wide range of deficiencies found in the City of Molalla. These problems burden the City's wastewater treatment plant by increasing hydraulic loading. If gone unchecked, the wastewater collection system will continue to degrade, I/I will increase and thereby occupying valuable WWTP capacity, increasing treatment cost and cause increasing wear on wastewater process equipment.

SECTION 2:

INTRODUCTION

SECTION 2: INTRODUCTION

2.1 General

Infiltration and inflow (I/I) is an ongoing problem affecting many Oregon communities, including the City of Molalla. Infiltration and inflow, which is defined as groundwater and rainwater that enters a sanitary sewer collection system, creates many wastewater related problems. Rain induced sewer flows can hydraulically overload a wastewater treatment plant or pump station, increase the cost of operations, potentially cause a discharge of inadequately treated effluent, and lead to regulatory compliance issues. Wastewater collection systems continue to degrade over time, if gone unchecked I/I will increase. In addition, I/I can cause flows to exceed the capacity of the pipes, compromising the collection system and overloading a wastewater treatment plant.

2.2 Scope of Study

This report is intended to assist the City of Molalla's ongoing maintenance of the collection system for the reduction of I/I.

Field Survey

Field surveys were performed to identify I/I by taking instantaneous flow measurements at selected manholes within the collection system. Each manhole at the flow measuring locations was inspected for defects leading to ground water infiltration and surface inflow.

Flow Mapping

The results from the flow mapping were utilized to determine potential areas with significant sources of I/I.

Conclusions and Recommendations

Conclusions and recommendations were developed that identify portions of the City of Molalla's sewer collection system that need improvement work or further investigation. Television inspection of these areas is anticipated to provide confirmation and exact locations of these additional sources of I/I.

SECTION 3:
EXISTING CONDITIONS

SECTION 3: EXISTING CONDITIONS

3.1 Field Investigation

Field investigations were performed on January 29, 2018 to determine the quantity and sources of extraneous water that enters Molalla's sewer collection system. Potential sources of infiltration include: manhole joint failure, manhole channel defects, cracks in pipes, pipe joint failures, leaking pipe penetrations, and root intrusions. Potential sources of inflow include storm drains, roof drains, and contributions from manhole lids or open clean-outs.

Flow measurements consisted of instantaneous water depth recording using "Flow Poke" equipment at incoming pipe segments within manholes as well as general observations. Flow measurements were conducted by two crews of two persons each, including one person from City staff. Crews moved from manhole to manhole in as short a time as possible between 10:30 P.M. and 5:00 A.M., when domestic and commercial sewage contributions were minimal.

Flow measurements were taken at selected manholes by using portable Flow Poke equipment. These meters allowed the flow mapping team to take instantaneous measurements without physically entering the manhole. The flow meter measures water depth across a V-notch weir and can be used for pipes up to 12-inches in diameter. Accuracy is plus or minus five percent for flows up to 640 gallons per minute (gpm). This accuracy is considerably higher than having to physically measure the water depth, as was done prior to the invention of the portable flow 'flow poke equipment.' When flows were encountered that were less than 5 gpm, no further investigation was performed in the upstream collection system.

By determining the relative increases in measured flow between manhole sections, problem areas can be identified and prioritized. The flow poking indicated a number of deficiencies that need to be addressed. The findings are summarized as follows:

Flow Poking Findings

- Excess flow of 24 gpm along Fenton Avenue from TL_B_19 to TL_B_22, and including TL_B_21 to TL_B_24 along Kimberly Court.
- Excess flow of 32 gpm along Patrol St. from TL_B_2 to TL_B_27.
- Manhole TL_B_2 has leakage.
- Excess flow of 80 gpm from TL_5 to TLA_48 along Grange Avenue, from TL_A_48 to TL_A_30 along E Main Street, and along Lola Avenue from TL_A_33 to TL_A_22.
- Manhole TL_A_30 has leakage.
- Excess flow of 14 gpm from TL_A_22 on East 2nd to TL_A_18 on Eckerd Avenue.
- Excess flow of 18 gpm from TL_A_18 to TL_A_16 along Eckerd Avenue.
- Excess flow of 14 gpm along S. Swiegle from BC_A3_17 to BC_A3_7.
- Excess flow of 10 gpm along Berkley Avenue from BC_A3_12 to clean-out located south of BC_A3_14 near East 5th St.
- Excess flow of 18 gpm from BC_A3_18 on East Main Street, to BC_A3_12 on Berkley Avenue.
- Excess flow of 38 gpm from TL_A_28 to TL_A_26 along East Main Street.
- Excess flow of 23 gpm beginning at the S. Molalla Pump Station, continuing to manhole BC_A1_2, and terminating at the clean-out located east of manhole BC_A1_3. Additional smoke testing and TVing is recommended. A portion of this sewer line extends into an abandoned subdivision that presents a higher risk of infiltration and inflow.

- Excess flow of 16 gpm beginning at manhole BC_A3_21 and continuing south on Metzler to BC_A3_2, terminating at clean-out at the intersection of Metzler and West 4th Street.
- Excess flow of 14 gpm beginning at BC_A3_20 along S. Molalla Avenue, and continuing to BC_A3_3, and terminating at a clean-out located in the City Park. Includes service laterals extending east on 2nd Street.
- Excess flow of 12 gpm beginning at TL_A2_6, continuing south on S. Cole Avenue until TL_A2_4, and then continuing east on East 7th Street until TL_A2_3.
- Excess flow of 11 gpm starting at TL_A2_3 and terminating at the clean-out east of manhole TL_A2_5.
- Manhole TL_A2_6 has leakage.
- Excess flow of 10 gpm beginning at TL_B_2 along North Cole Avenue, and terminating at the clean-out south of TL_B_31, including TL_B_29 along Garden Court until TL_B_4.
- Excess flow of 15 gpm beginning at TL_B_8 along Oak Street, and continuing to clean-out east of TL_B_12.
- Excess flow of 10 gpm beginning at TL_B_8 on East Heintz Street to TL_B_9, continuing to TL_B_10 on East Park Avenue.
- Manhole TL_C_6 has leakage.
- Manhole TL_C_4 has leakage.
- Excess flow of 10 gpm beginning at BC_B_1 along South Molalla Forest Road to BC_B_18. Includes 8" sewer line extending west to BC_B_10.
- Excess flow of 10 gpm beginning at BC_C_71 along Meadowlawn Place to BC_C_59.
- Manhole TL_50 has leakage.
- Manhole TL_28 has leakage.
- Manhole TL_F_22 has leakage.
- Manhole BC_A_47 has leakage.
- Manhole BC_A_39 has leakage.
- Excess flow of 10 gpm beginning at TL_A1_5, continuing to TL_A1_1 on East 8th Street, continuing east on East 8th Street until TL_A1_6, and then terminating at the clean-out at the end of Mathias Court. Additional inspections and TVing is required in subbasin TL_A1 to determine deficiencies.
- Manhole BC_A_45 has leakage.
- Excess flow of 10 gpm beginning at TL_C2_11 along Explorer Avenue, continuing to TL_C2_6 along Escort Street, continuing to TL_C2_5 along Bronco Avenue, and continuing along Glory Ln to TL_C2_1. Includes TL_C2_15 along Probe Street terminating at TL_C2_16. Additional inspections and TVing is required in subbasin TL_C2 to identify and isolate deficiencies.

Based on visual inspections of numerous manholes, excess flow was present on the Bear Creek main, from manhole TL_40 to BC_A_45. Excess flow was also identified on the Toliver main, from manhole TL_46 continuing to TL_39 to TL_20 along Toliver Road, from TL_20 to TL_19 along Kennel Avenue, and from TL_19 to TL_2 along East Heintz Street. These lines require TV viewing to identify deficiencies.

3.2 Flow Mapping

Flow mapping results, using the City's existing collection system map, are provided in the Appendices. Appendix A is a Key Map indexing the locations of the flow maps provided in Appendix B. Appendix B includes Figures A, B, C, and D. Line segments have been color coded to illustrate the approximate I/I flow that was measured and recorded.

SECTION 4:

CONCLUSIONS AND RECOMMENDATIONS

SECTION 4: CONCLUSIONS AND RECOMMENDATIONS

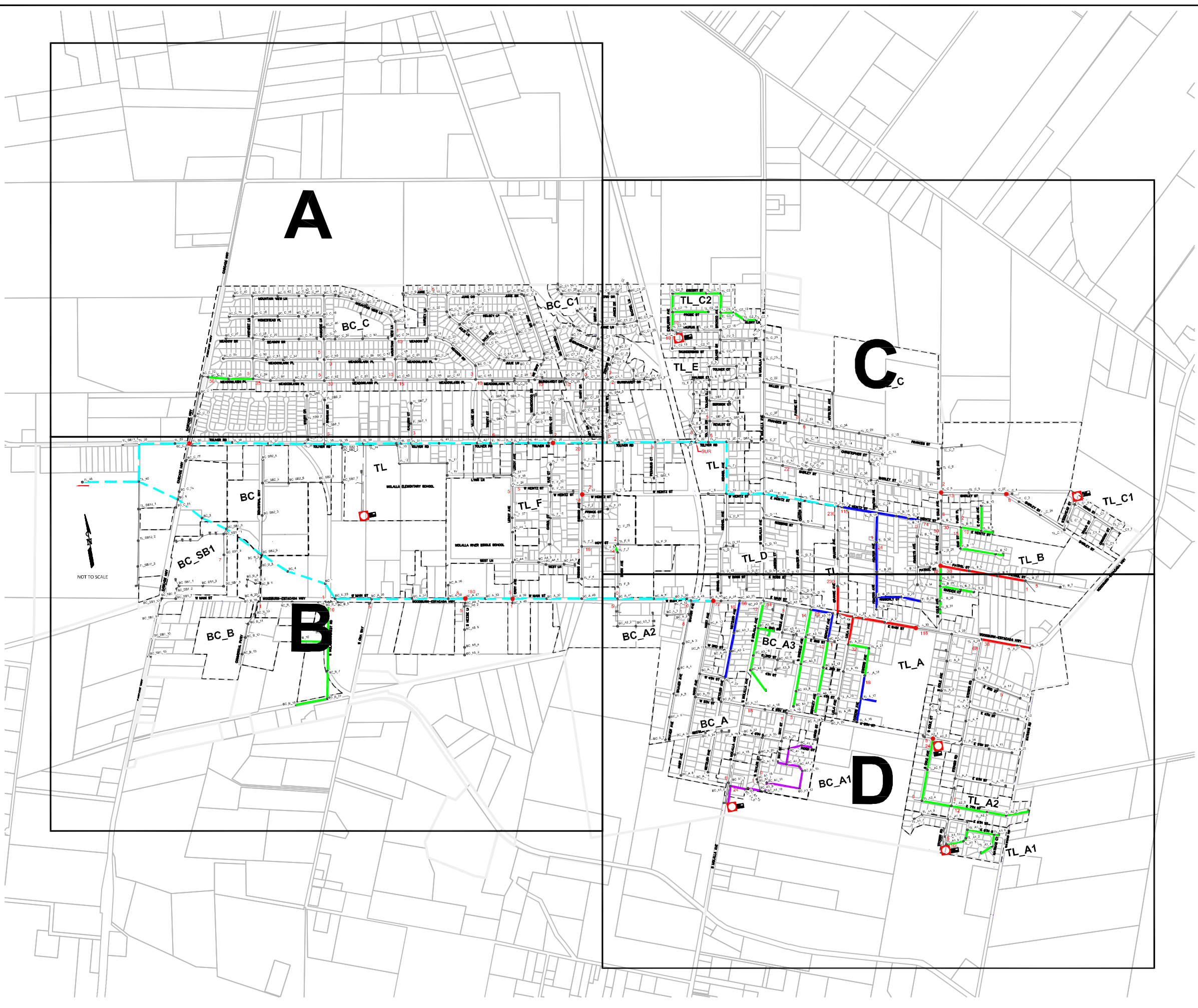
4.1 Summary

Infiltration and inflow is a major problem with the City's collection system. Several areas with high infiltration and inflow were identified during field investigations. High infiltration rates will likely require subsequent investigations performed by the City (i.e. television inspection), and smoke testing of select areas to refine the scope of work related to each I/I repair project. Field investigations also revealed several manholes that were leaking. Manhole repairs can be performed without further investigation.

Cost estimates will be provided in the City's Wastewater Facility and Collection System Master Plan for high priority areas. Conservatively, cost estimates will be based on full main line and manhole replacement. However, prior to design, each area should be further investigated to determine the best approach to addressing each collection system deficiency and mitigating infiltration and inflow.

APPENDICES

APPENDIX A: KEY MAP



APPENDIX B: I/I Flow Mapping (Figures A, B, C, and D)

LEGEND

COLOR CODE

FLOW INCREASE

MORE THAN 25 GPM

21 GPM TO 25 GPM

16 GPM TO 20 GPM

10 GPM TO 15 GPM

9 GPM OR LESS

REQUIRES TV VIEWING

PUMP STATION

CLEAN OUT

MANHOLE

FLOW IN GPM

SURCHARGED MANHOLE

MANHOLE LEAKING

MATCHLINE - SEE SHEET B FOR CONT

MATCHLINE - SEE SHEET C FOR CONT

THE DYER PARTNERSHIP
ENGINEERS & PLANNERS

DATE: JAN., 2018

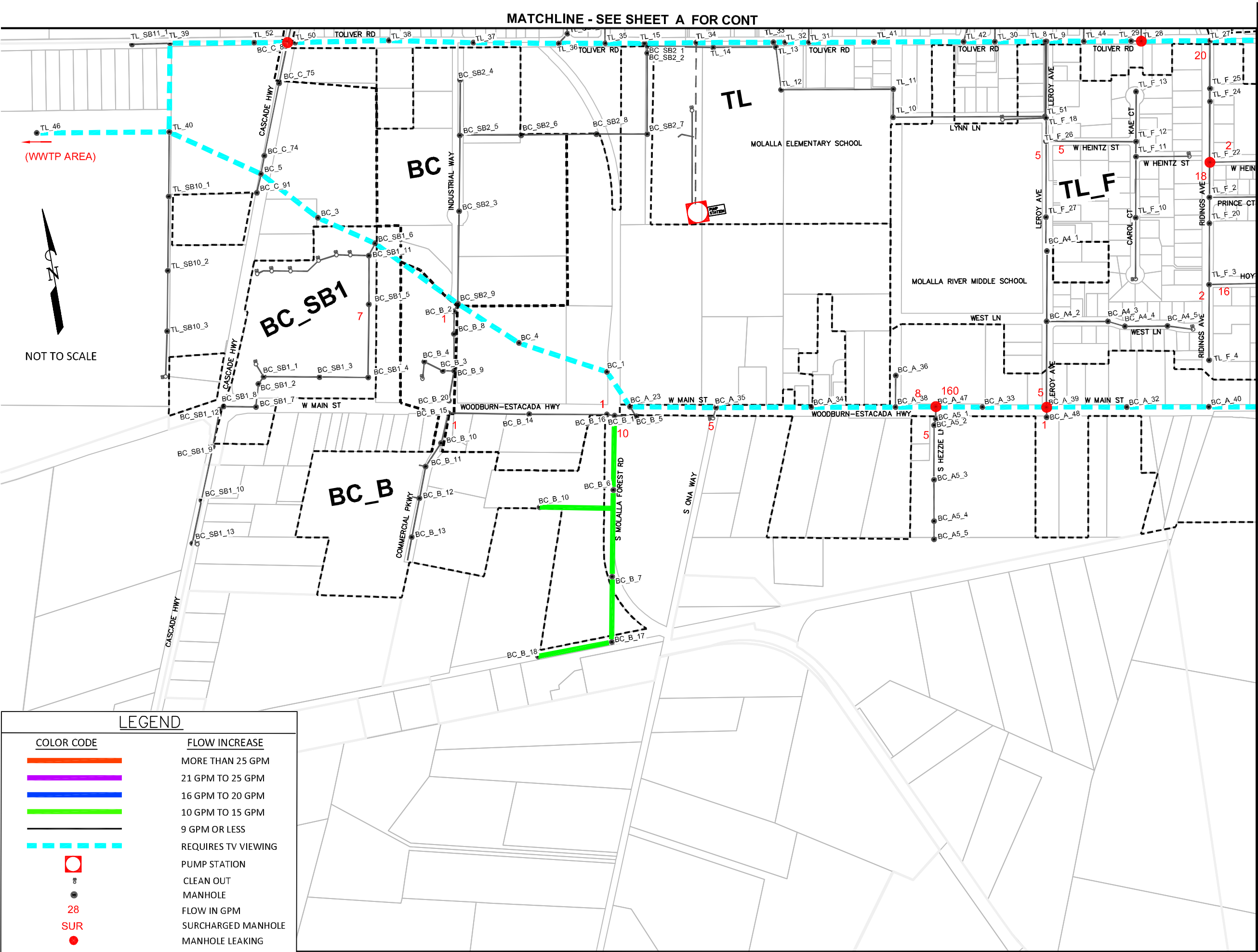
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CITY OF MOLALLA
CLACKAMAS COUNTY, OREGON

I&I FLOW MAPPING

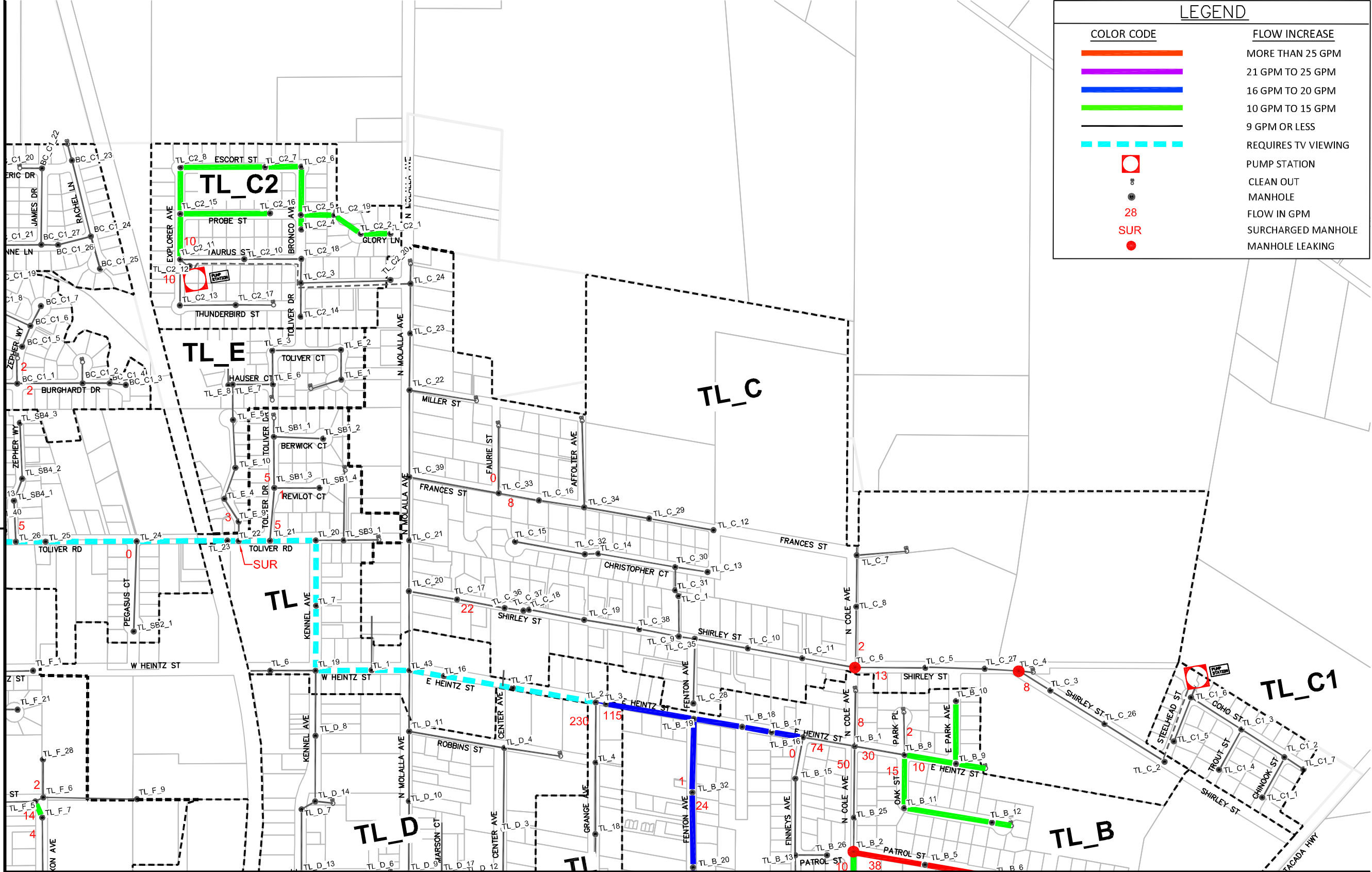
FIGURE NO.

A



MATCHLINE - SEE SHEET A FOR CONT

MATCHLINE - SEE SHEET B FOR CONT



MATCHLINE - SEE SHEET D FOR CONT

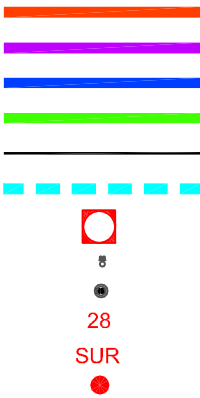
MATCHLINE - SEE SHEET B FOR CONT

MATCHLINE - SEE SHEET C FOR CONT



LEGEND

COLOR CODE



FLOW INCREASE

- MORE THAN 25 GPM
- 21 GPM TO 25 GPM
- 16 GPM TO 20 GPM
- 10 GPM TO 15 GPM
- 9 GPM OR LESS
- REQUIRES TV VIEWING
- PUMP STATION
- CLEAN OUT
- MANHOLE
- FLOW IN GPM
- SURCHARGED MANHOLE
- MANHOLE LEAKING