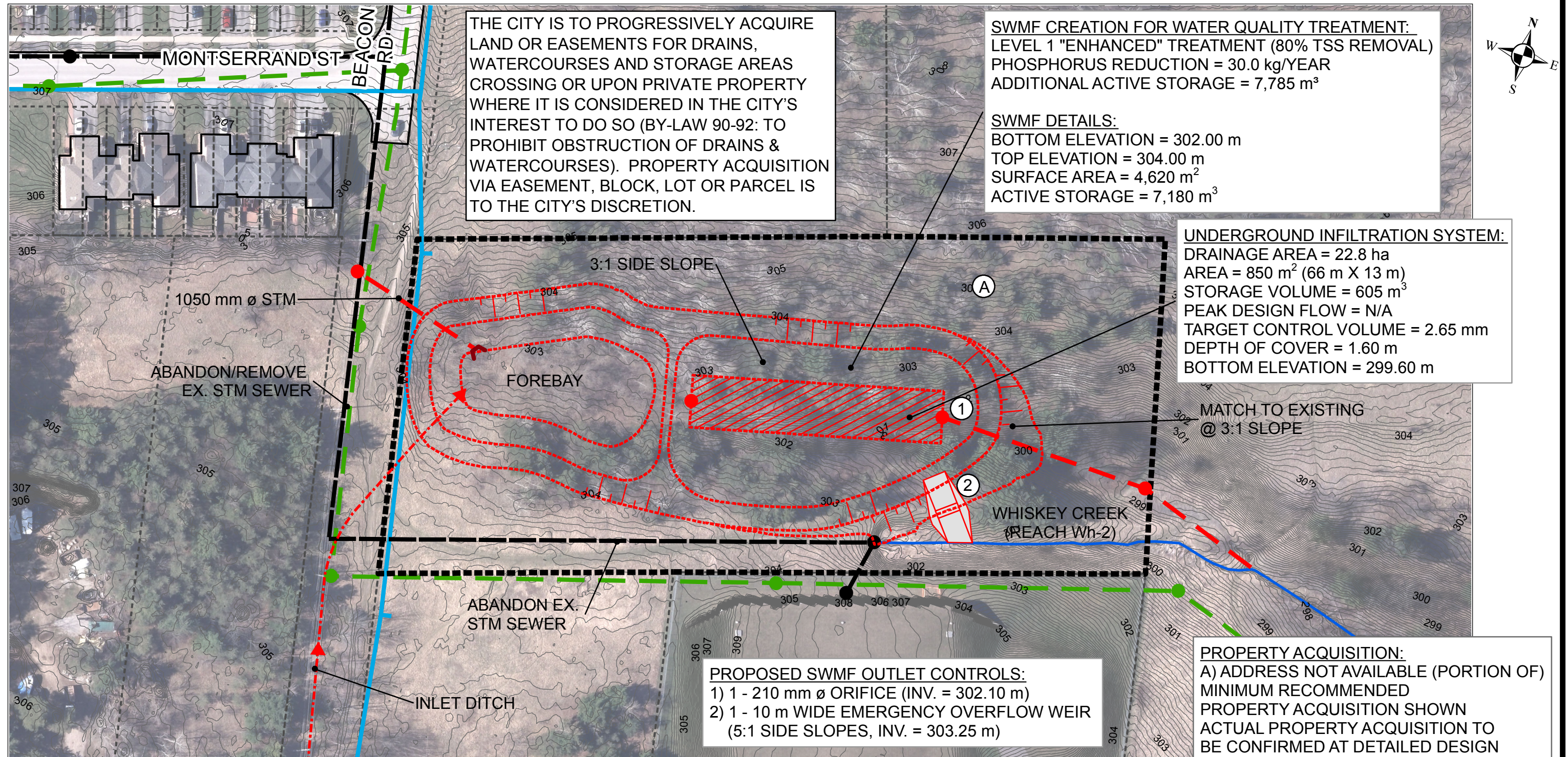


**Appendix N:
Final Preferred Solutions
Conceptual Designs – Whiskey
Creek Watershed**



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LEGEND

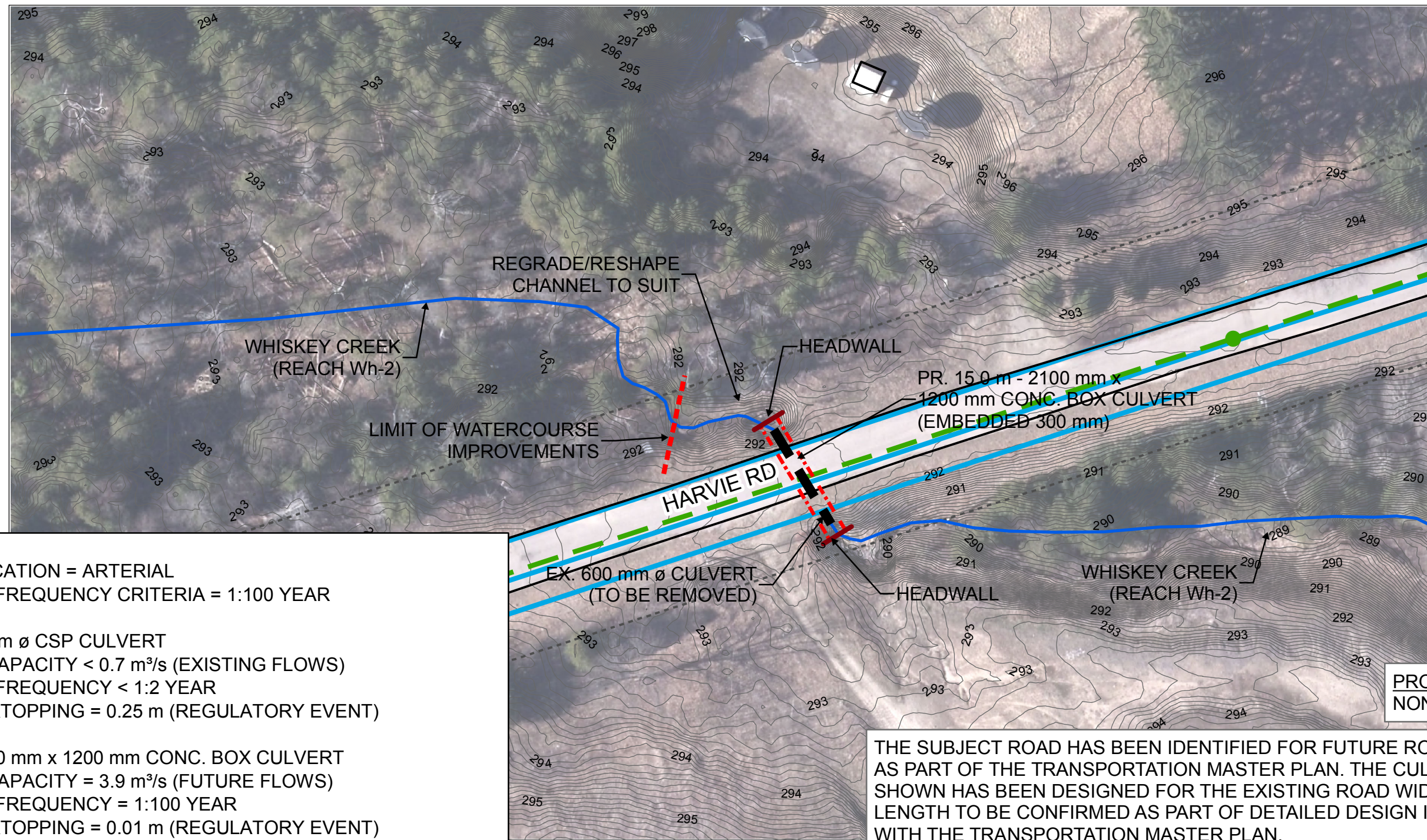
- | | | | |
|---|-------------------------------|-------|----------------------------|
| ● | PR STORM MAINTENANCE HOLE | — | EX. WATERMAIN |
| — | PR. STORM SEWER | ● | EX. STORM MAINTENANCE HOLE |
| — | EX. SANITARY SEWER | — | EX. STORM SEWER |
| ● | EX. SANITARY MAINTENANCE HOLE | — | EX. WATERCOURSE |
| ▨ | PR. LID | - - - | EX. PROPERTY LINE |
| | | ▨ | PROPERTY ACQUISITION |

DRAINAGE MASTER PLAN
FINAL PREFERRED ALTERNATIVE SOLUTION

PROJECT No. 67
SWMF RETROFIT No. 42
WHISKEY CREEK WATERSHED

SCALE = 1:1,000

DATE: MARCH 2019



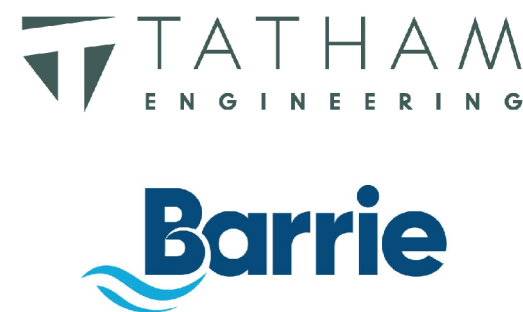
HARVIE ROAD:
 ROAD CLASSIFICATION = ARTERIAL
 DESIGN FLOOD FREQUENCY CRITERIA = 1:100 YEAR

EXISTING: 600 mm Ø CSP CULVERT
 CONVEYANCE CAPACITY < 0.7 m³/s (EXISTING FLOWS)
 DESIGN FLOOD FREQUENCY < 1:2 YEAR
 DEPTH OF OVERTOPPING = 0.25 m (REGULATORY EVENT)

PROPOSED: 2100 mm x 1200 mm CONC. BOX CULVERT
 CONVEYANCE CAPACITY = 3.9 m³/s (FUTURE FLOWS)
 DESIGN FLOOD FREQUENCY = 1:100 YEAR
 DEPTH OF OVERTOPPING = 0.01 m (REGULATORY EVENT)

PROPERTY ACQUISITION:
 NONE

THE SUBJECT ROAD HAS BEEN IDENTIFIED FOR FUTURE ROAD WIDENING AS PART OF THE TRANSPORTATION MASTER PLAN. THE CULVERT IMPROVEMENT SHOWN HAS BEEN DESIGNED FOR THE EXISTING ROAD WIDTH. THE CULVERT LENGTH TO BE CONFIRMED AS PART OF DETAILED DESIGN IN COORDINATION WITH THE TRANSPORTATION MASTER PLAN.



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LEGEND

- | | |
|------------------------------|---------------------------------|
| --- PR. CULVERT | --- EX. SANITARY SEWER |
| --- PR. STORM SEWER | ● EX. SANITARY MAINTENANCE HOLE |
| ● PR STORM MAINTENANCE HOLE | --- EX. WATERMAIN |
| --- EX. STORM SEWER | ■ EX. CULVERT |
| ● EX. STORM MAINTENANCE HOLE | --- EX. PROPERTY LINE |
| --- WATERCOURSE | ■ PROPERTY ACQUISITION |

DRAINAGE MASTER PLAN **FINAL PREFERRED ALTERNATIVE SOLUTION**

PROJECT No. 68
 CULVERT IMPROVEMENT No. 53
 (HARVIE ROAD)
 WHISKEY CREEK WATERSHED

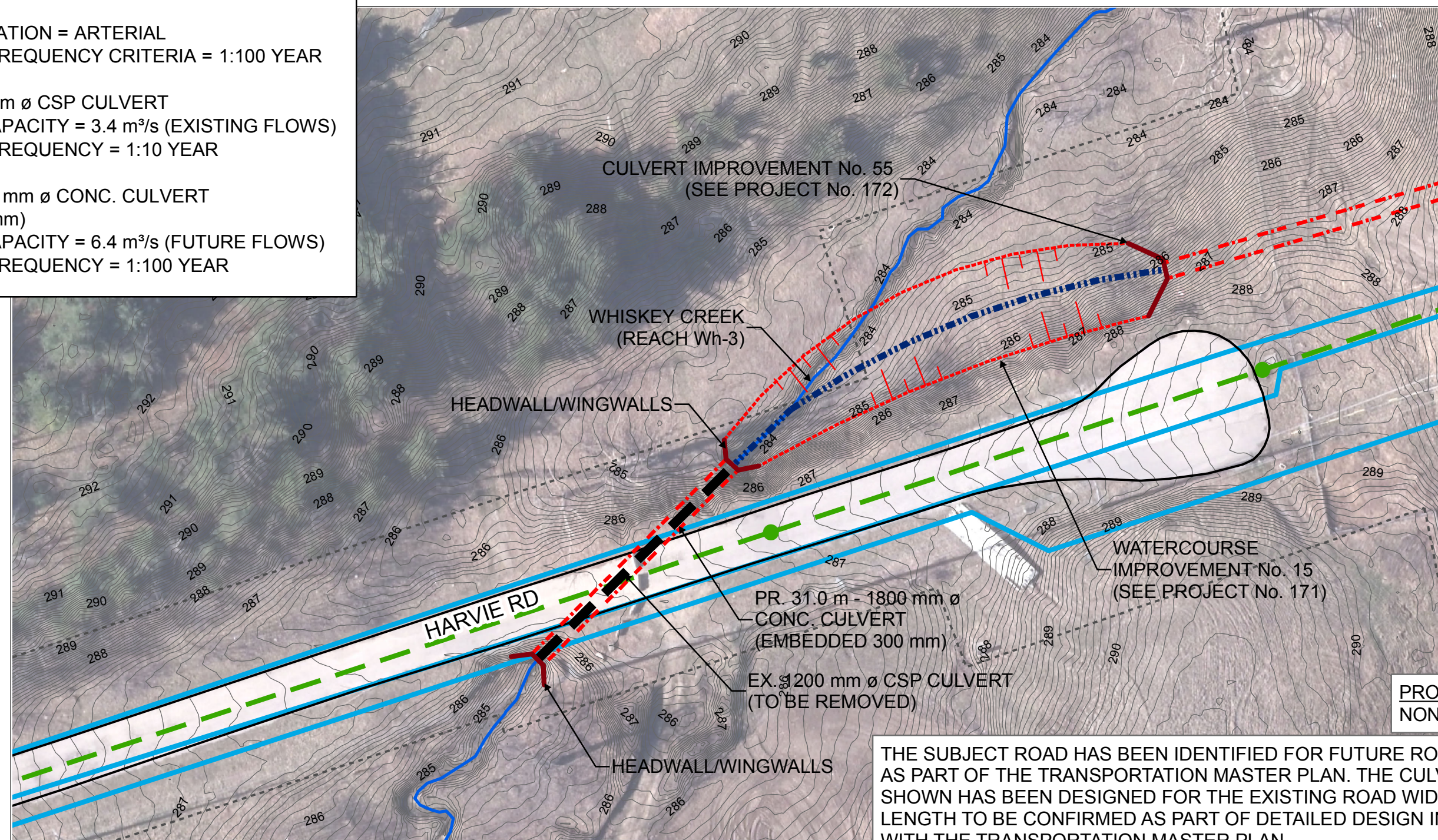
SCALE = 1:500

DATE: MARCH 2019

HARVIE ROAD:
ROAD CLASSIFICATION = ARTERIAL
DESIGN FLOOD FREQUENCY CRITERIA = 1:100 YEAR

EXISTING: 1200 mm ø CSP CULVERT
CONVEYANCE CAPACITY = 3.4 m³/s (EXISTING FLOWS)
DESIGN FLOOD FREQUENCY = 1:10 YEAR

PROPOSED: 1800 mm ø CONC. CULVERT
(EMBEDDED 300mm)
CONVEYANCE CAPACITY = 6.4 m³/s (FUTURE FLOWS)
DESIGN FLOOD FREQUENCY = 1:100 YEAR



PROPERTY ACQUISITION:
NONE

THE SUBJECT ROAD HAS BEEN IDENTIFIED FOR FUTURE ROAD WIDENING AS PART OF THE TRANSPORTATION MASTER PLAN. THE CULVERT IMPROVEMENT SHOWN HAS BEEN DESIGNED FOR THE EXISTING ROAD WIDTH. THE CULVERT LENGTH TO BE CONFIRMED AS PART OF DETAILED DESIGN IN COORDINATION WITH THE TRANSPORTATION MASTER PLAN.



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LEGEND

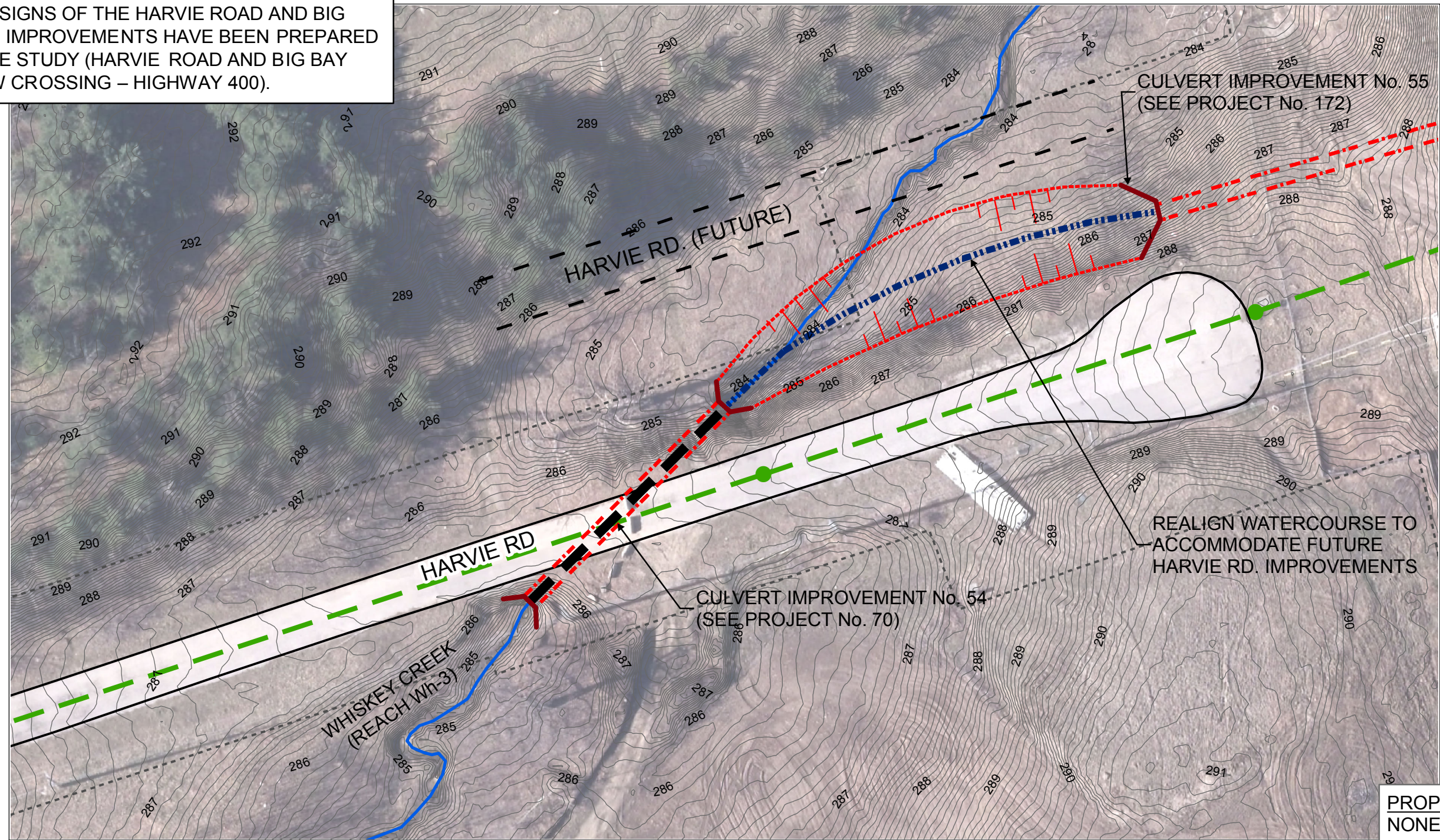
- | | |
|------------------------------|---------------------------------|
| --- PR. CULVERT | --- EX. SANITARY SEWER |
| --- PR. STORM SEWER | ● EX. SANITARY MAINTENANCE HOLE |
| ● PR STORM MAINTENANCE HOLE | --- EX. WATERMAIN |
| --- EX. STORM SEWER | ■ EX. CULVERT |
| ● EX. STORM MAINTENANCE HOLE | --- EX. PROPERTY LINE |
| --- WATERCOURSE | ■ PROPERTY ACQUISITION |

DRAINAGE MASTER PLAN FINAL PREFERRED ALTERNATIVE SOLUTION

PROJECT No. 70
CULVERT IMPROVEMENT No. 54
(HARVIE ROAD)
WHISKEY CREEK WATERSHED
SCALE = 1:500

DATE: MARCH 2019

CONCEPTUAL DESIGNS OF THE HARVIE ROAD AND BIG BAY POINT ROAD IMPROVEMENTS HAVE BEEN PREPARED UNDER SEPARATE STUDY (HARVIE ROAD AND BIG BAY POINT ROAD NEW CROSSING – HIGHWAY 400).



PROPERTY ACQUISITION:
NONE



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LEGEND

- | | | | |
|--|-------------------------------|--|----------------------------|
| | BANK EROSION | | EX. SANITARY SEWER |
| | BED EROSION/ KNICKPOINT | | EX. WATERCOURSE |
| | INFRASTRUCTURE AT RISK | | EX. WATERMAIN |
| | PR. STORM MAINTENANCE HOLE | | EX. STORM MAINTENANCE HOLE |
| | PR. STORM SEWER | | EX. STORM SEWER |
| | EX. SANITARY MAINTENANCE HOLE | | EX. PROPERTY LINE |
| | | | PROPERTY ACQUISITION |

DRAINAGE MASTER PLAN
FINAL PREFERRED ALTERNATIVE SOLUTION

PROJECT No. 171
WATERCOURSE IMPROVEMENT No. 15
WHISKEY CREEK WATERSHED

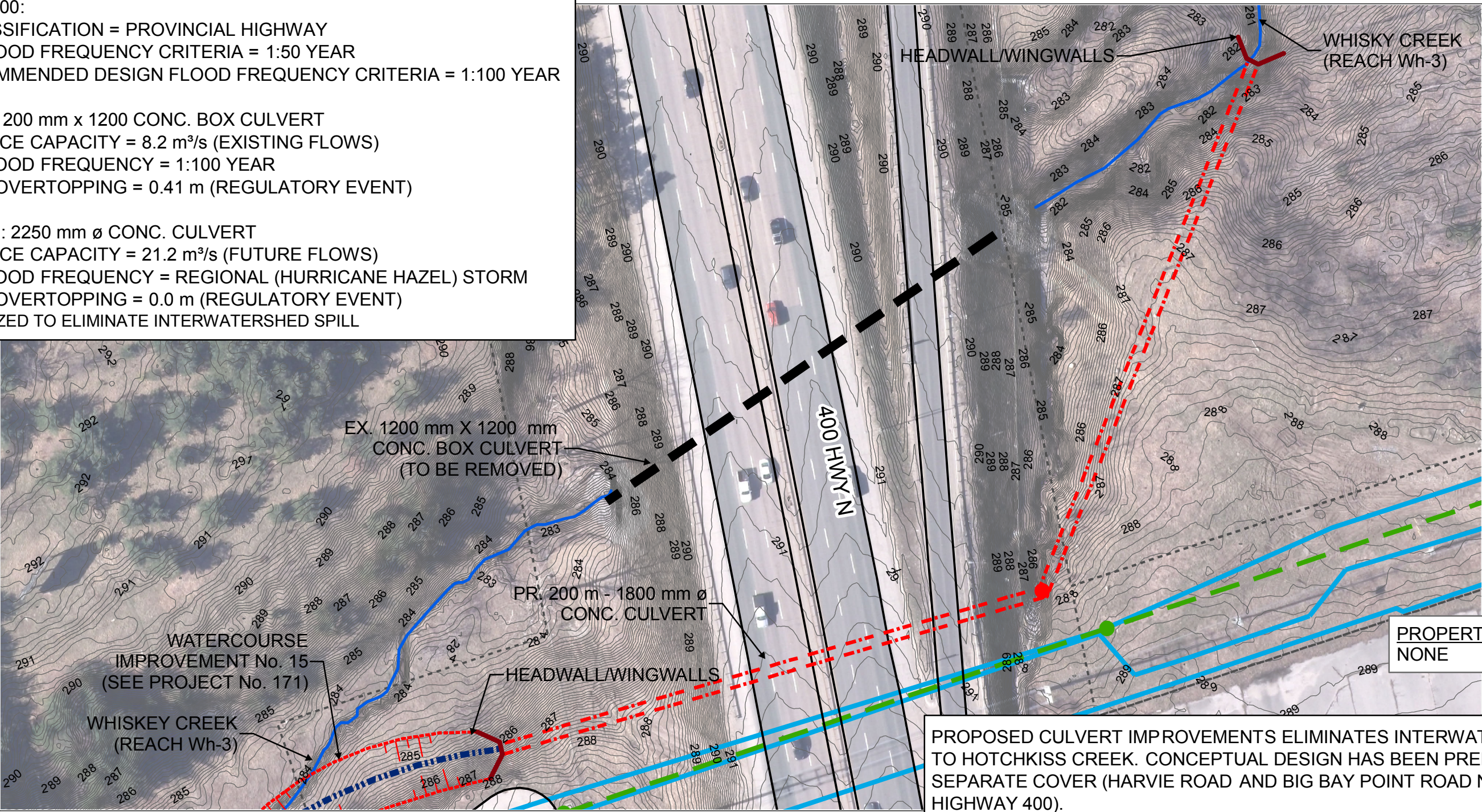
SCALE = 1:500

DATE: JANUARY 2019

HIGHWAY 400:
ROAD CLASSIFICATION = PROVINCIAL HIGHWAY
DESIGN FLOOD FREQUENCY CRITERIA = 1:50 YEAR
MDP RECOMMENDED DESIGN FLOOD FREQUENCY CRITERIA = 1:100 YEAR

EXISTING: 1200 mm x 1200 CONC. BOX CULVERT
CONVEYANCE CAPACITY = 8.2 m³/s (EXISTING FLOWS)
DESIGN FLOOD FREQUENCY = 1:100 YEAR
DEPTH OF OVERTOPPING = 0.41 m (REGULATORY EVENT)

PROPOSED: 2250 mm ø CONC. CULVERT
CONVEYANCE CAPACITY = 21.2 m³/s (FUTURE FLOWS)
DESIGN FLOOD FREQUENCY = REGIONAL (HURRICANE HAZEL) STORM
DEPTH OF OVERTOPPING = 0.0 m (REGULATORY EVENT)
CULVERT SIZED TO ELIMINATE INTERWATERSHED SPILL



PROPERTY ACQUISITION:
NONE

PROPOSED CULVERT IMPROVEMENTS ELIMINATES INTERWATERSHED SPILL TO HOTCHKISS CREEK. CONCEPTUAL DESIGN HAS BEEN PREPARED UNDER SEPARATE COVER (HARVIE ROAD AND BIG BAY POINT ROAD NEW CROSSING – HIGHWAY 400).



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LEGEND

- | | |
|------------------------------|---------------------------------|
| --- PR. CULVERT | --- EX. SANITARY SEWER |
| --- PR. STORM SEWER | ● EX. SANITARY MAINTENANCE HOLE |
| ● PR STORM MAINTENANCE HOLE | --- EX. WATERMAIN |
| --- EX. STORM SEWER | --- EX. CULVERT |
| ● EX. STORM MAINTENANCE HOLE | --- EX. PROPERTY LINE |
| --- WATERCOURSE | --- PROPERTY ACQUISITION |

DRAINAGE MASTER PLAN
FINAL PREFERRED ALTERNATIVE SOLUTION

PROJECT No. 172
CULVERT IMPROVEMENT No. 55
(HIGHWAY 400)
WHISKEY CREEK WATERSHED
SCALE = 1:750

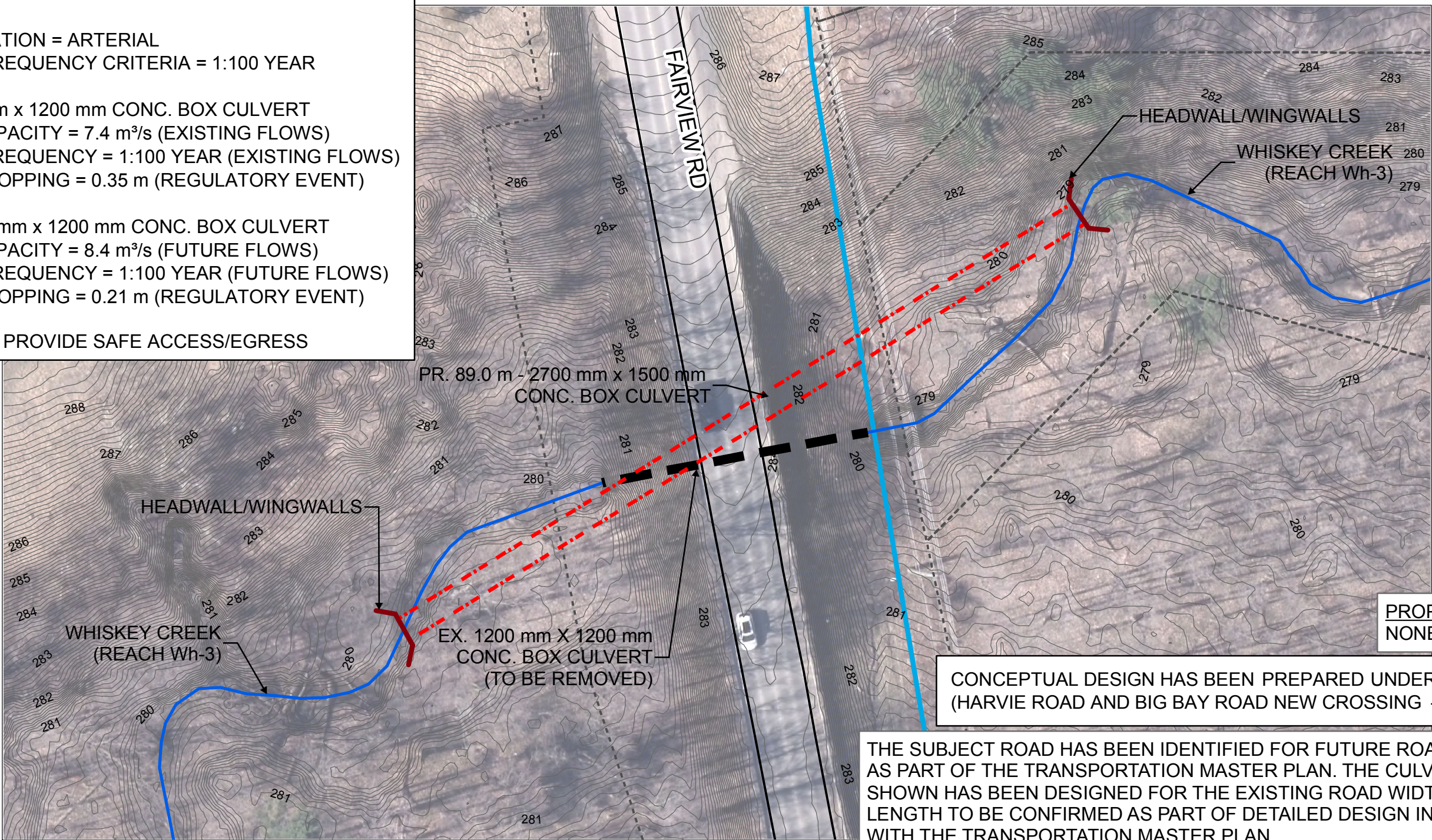
DATE: JANUARY 2019

FAIRVIEW ROAD:
ROAD CLASSIFICATION = ARTERIAL
DESIGN FLOOD FREQUENCY CRITERIA = 1:100 YEAR

EXISTING: 1200 mm x 1200 mm CONC. BOX CULVERT
CONVEYANCE CAPACITY = 7.4 m³/s (EXISTING FLOWS)
DESIGN FLOOD FREQUENCY = 1:100 YEAR (EXISTING FLOWS)
DEPTH OF OVERTOPPING = 0.35 m (REGULATORY EVENT)

PROPOSED: 1800 mm x 1200 mm CONC. BOX CULVERT
CONVEYANCE CAPACITY = 8.4 m³/s (FUTURE FLOWS)
DESIGN FLOOD FREQUENCY = 1:100 YEAR (FUTURE FLOWS)
DEPTH OF OVERTOPPING = 0.21 m (REGULATORY EVENT)

CULVET SIZED TO PROVIDE SAFE ACCESS/EGRESS



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LEGEND

- | | |
|------------------------------|---------------------------------|
| --- PR. CULVERT | --- EX. SANITARY SEWER |
| --- PR. STORM SEWER | ● EX. SANITARY MAINTENANCE HOLE |
| ● PR STORM MAINTENANCE HOLE | --- EX. WATERMAIN |
| --- EX. STORM SEWER | ■ EX. CULVERT |
| ● EX. STORM MAINTENANCE HOLE | --- EX. PROPERTY LINE |
| --- WATERCOURSE | ■ PROPERTY ACQUISITION |

DRAINAGE MASTER PLAN
FINAL PREFERRED ALTERNATIVE SOLUTION

PROJECT No. 71
CULVERT IMPROVEMENT No. 56
(FAIRVIEW ROAD)
WHISKEY CREEK WATERSHED

SCALE = 1:500

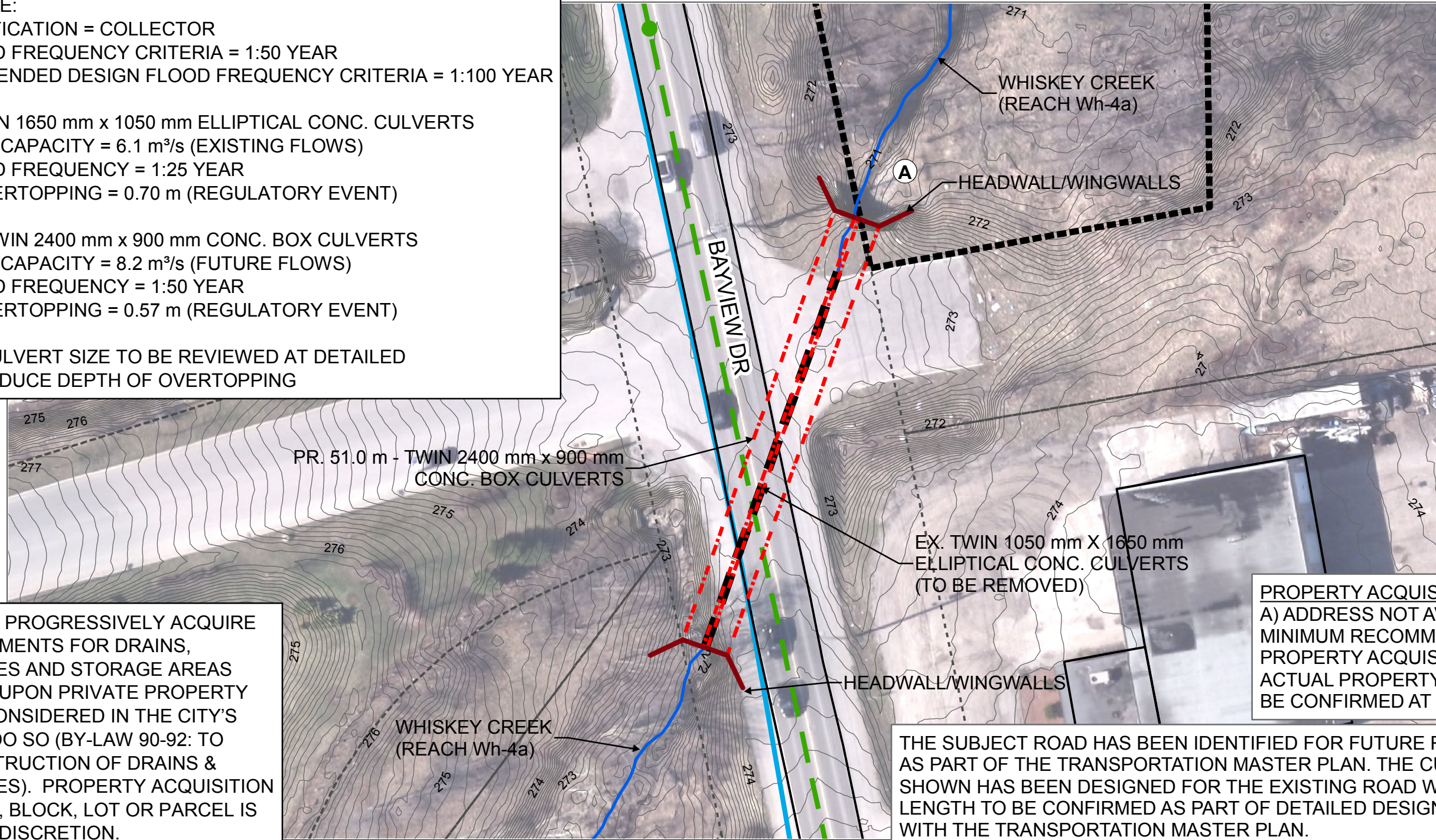
DATE: MARCH 2019

BAYVIEW DRIVE:
ROAD CLASSIFICATION = COLLECTOR
DESIGN FLOOD FREQUENCY CRITERIA = 1:50 YEAR
MDP RECOMMENDED DESIGN FLOOD FREQUENCY CRITERIA = 1:100 YEAR

EXISTING: TWIN 1650 mm x 1050 mm ELLIPTICAL CONC. CULVERTS
CONVEYANCE CAPACITY = 6.1 m³/s (EXISTING FLOWS)
DESIGN FLOOD FREQUENCY = 1:25 YEAR
DEPTH OF OVERTOPPING = 0.70 m (REGULATORY EVENT)

PROPOSED: TWIN 2400 mm x 900 mm CONC. BOX CULVERTS
CONVEYANCE CAPACITY = 8.2 m³/s (FUTURE FLOWS)
DESIGN FLOOD FREQUENCY = 1:50 YEAR
DEPTH OF OVERTOPPING = 0.57 m (REGULATORY EVENT)

PROPOSED CULVERT SIZE TO BE REVIEWED AT DETAILED
DESIGN TO REDUCE DEPTH OF OVERTOPPING



THE CITY IS TO PROGRESSIVELY ACQUIRE LAND OR EASEMENTS FOR DRAINS, WATERCOURSES AND STORAGE AREAS CROSSING OR UPON PRIVATE PROPERTY WHERE IT IS CONSIDERED IN THE CITY'S INTEREST TO DO SO (BY-LAW 90-92: TO PROHIBIT OBSTRUCTION OF DRAINS & WATERCOURSES). PROPERTY ACQUISITION VIA EASEMENT, BLOCK, LOT OR PARCEL IS TO THE CITY'S DISCRETION.

PROPERTY ACQUISITION:
A) ADDRESS NOT AVAILABLE (PORTION OF) MINIMUM RECOMMENDED PROPERTY ACQUISITION SHOWN
ACTUAL PROPERTY ACQUISITION TO BE CONFIRMED AT DETAILED DESIGN

THE SUBJECT ROAD HAS BEEN IDENTIFIED FOR FUTURE ROAD WIDENING AS PART OF THE TRANSPORTATION MASTER PLAN. THE CULVERT IMPROVEMENT SHOWN HAS BEEN DESIGNED FOR THE EXISTING ROAD WIDTH. THE CULVERT LENGTH TO BE CONFIRMED AS PART OF DETAILED DESIGN IN COORDINATION WITH THE TRANSPORTATION MASTER PLAN.



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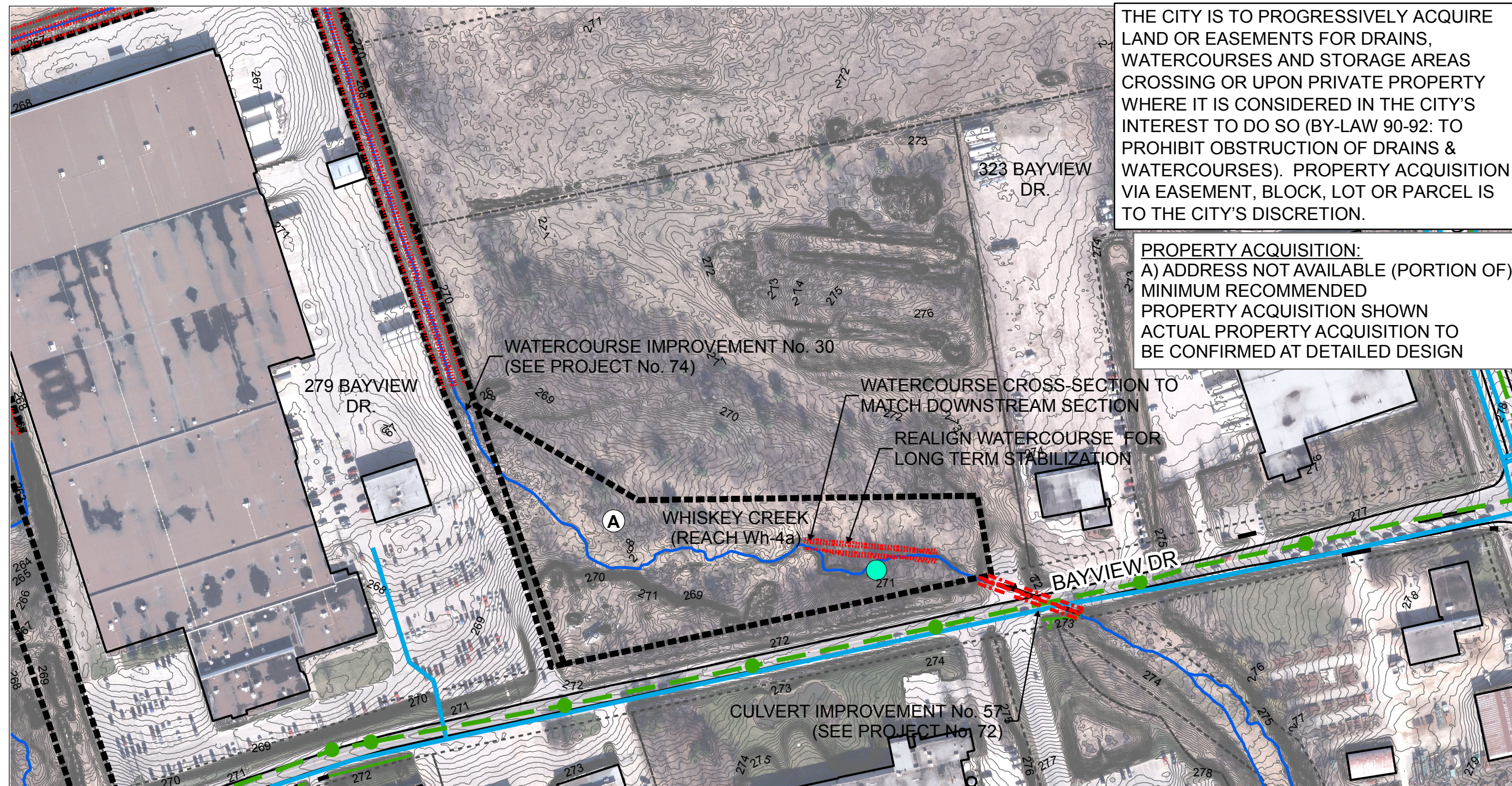
LEGEND

- | | |
|------------------------------|---------------------------------|
| --- PR. CULVERT | --- EX. SANITARY SEWER |
| --- PR. STORM SEWER | ● EX. SANITARY MAINTENANCE HOLE |
| ● PR STORM MAINTENANCE HOLE | --- EX. WATERMAIN |
| --- EX. STORM SEWER | --- EX. CULVERT |
| ● EX. STORM MAINTENANCE HOLE | --- EX. PROPERTY LINE |
| --- WATERCOURSE | --- PROPERTY ACQUISITION |

DRAINAGE MASTER PLAN FINAL PREFERRED ALTERNATIVE SOLUTION

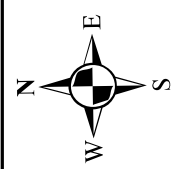
PROJECT No. 72
CULVERT IMPROVEMENT No. 57
(BAYVIEW DRIVE)
WHISKEY CREEK WATERSHED
SCALE = 1:500

DATE: MARCH 2019



THE CITY IS TO PROGRESSIVELY ACQUIRE LAND OR EASEMENTS FOR DRAINS, WATERCOURSES AND STORAGE AREAS CROSSING OR UPON PRIVATE PROPERTY WHERE IT IS CONSIDERED IN THE CITY'S INTEREST TO DO SO (BY-LAW 90-92: TO PROHIBIT OBSTRUCTION OF DRAINS & WATERCOURSES). PROPERTY ACQUISITION VIA EASEMENT, BLOCK, LOT OR PARCEL IS TO THE CITY'S DISCRETION.

PROPERTY ACQUISITION:
A) ADDRESS NOT AVAILABLE (PORTION OF) MINIMUM RECOMMENDED PROPERTY ACQUISITION SHOWN
ACTUAL PROPERTY ACQUISITION TO BE CONFIRMED AT DETAILED DESIGN



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LEGEND

- | | | | |
|--|-------------------------------|--|----------------------------|
| | BANK EROSION | | EX. SANITARY SEWER |
| | BED EROSION/ KNICKPOINT | | EX. WATERCOURSE |
| | INFRASTRUCTURE AT RISK | | EX. WATERMAIN |
| | PR. STORM MAINTENANCE HOLE | | EX. STORM MAINTENANCE HOLE |
| | PR. STORM SEWER | | EX. STORM SEWER |
| | EX. SANITARY MAINTENANCE HOLE | | EX. PROPERTY LINE |
| | PROPERTY ACQUISITION | | |

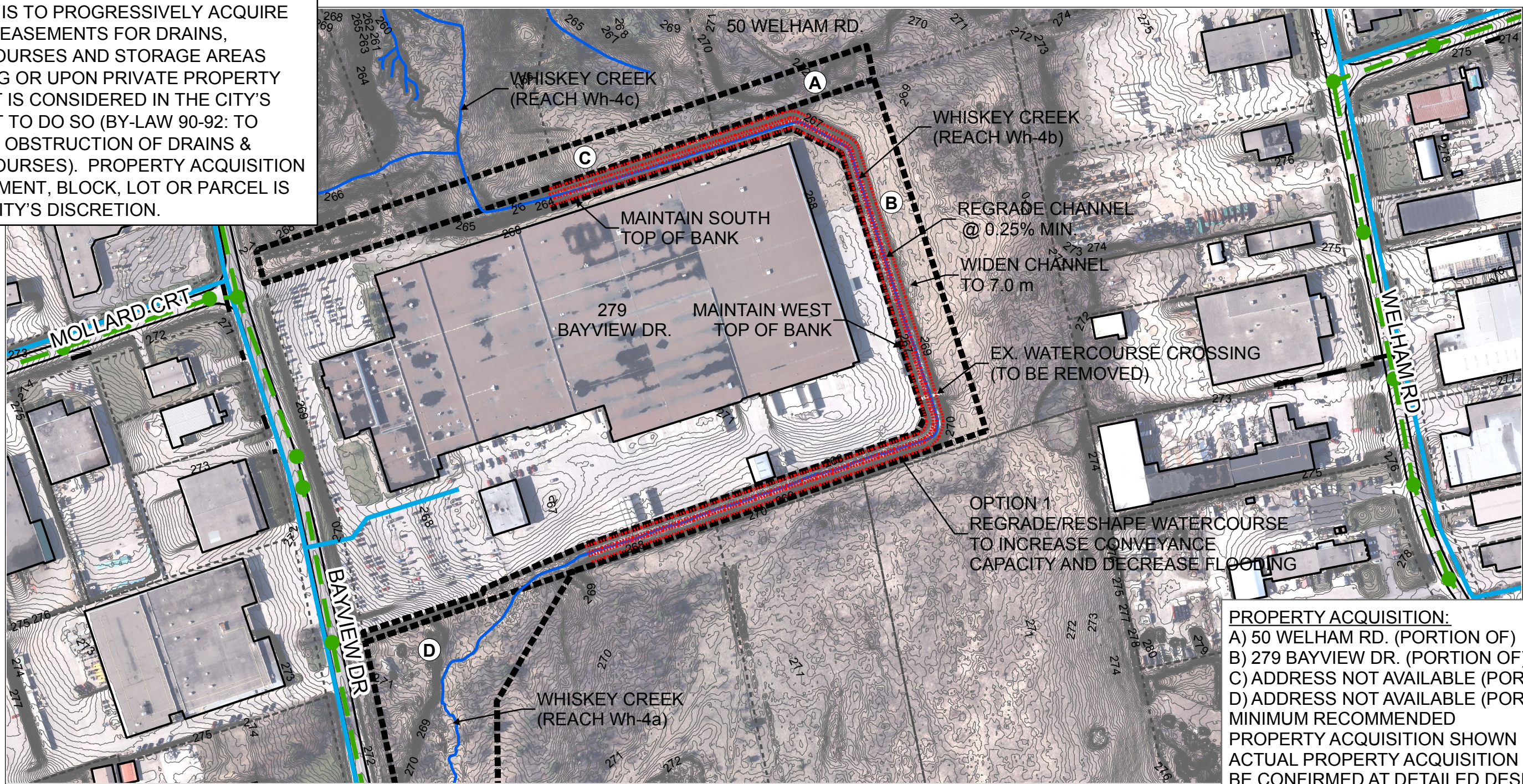
DRAINAGE MASTER PLAN FINAL PREFERRED ALTERNATIVE SOLUTION

PROJECT No. 73
WATERCOURSE IMPROVEMENT No. 16
WHISKEY CREEK WATERSHED

SCALE = 1:2,000

DATE: MARCH 2019

THE CITY IS TO PROGRESSIVELY ACQUIRE LAND OR EASEMENTS FOR DRAINS, WATERCOURSES AND STORAGE AREAS CROSSING OR UPON PRIVATE PROPERTY WHERE IT IS CONSIDERED IN THE CITY'S INTEREST TO DO SO (BY-LAW 90-92: TO PROHIBIT OBSTRUCTION OF DRAINS & WATERCOURSES). PROPERTY ACQUISITION VIA EASEMENT, BLOCK, LOT OR PARCEL IS TO THE CITY'S DISCRETION.



PROPERTY ACQUISITION:
A) 50 WELHAM RD. (PORTION OF)
B) 279 BAYVIEW DR. (PORTION OF)
C) ADDRESS NOT AVAILABLE (PORTION OF)
D) ADDRESS NOT AVAILABLE (PORTION OF)
MINIMUM RECOMMENDED
PROPERTY ACQUISITION SHOWN
ACTUAL PROPERTY ACQUISITION TO
BE CONFIRMED AT DETAILED DESIGN



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LEGEND

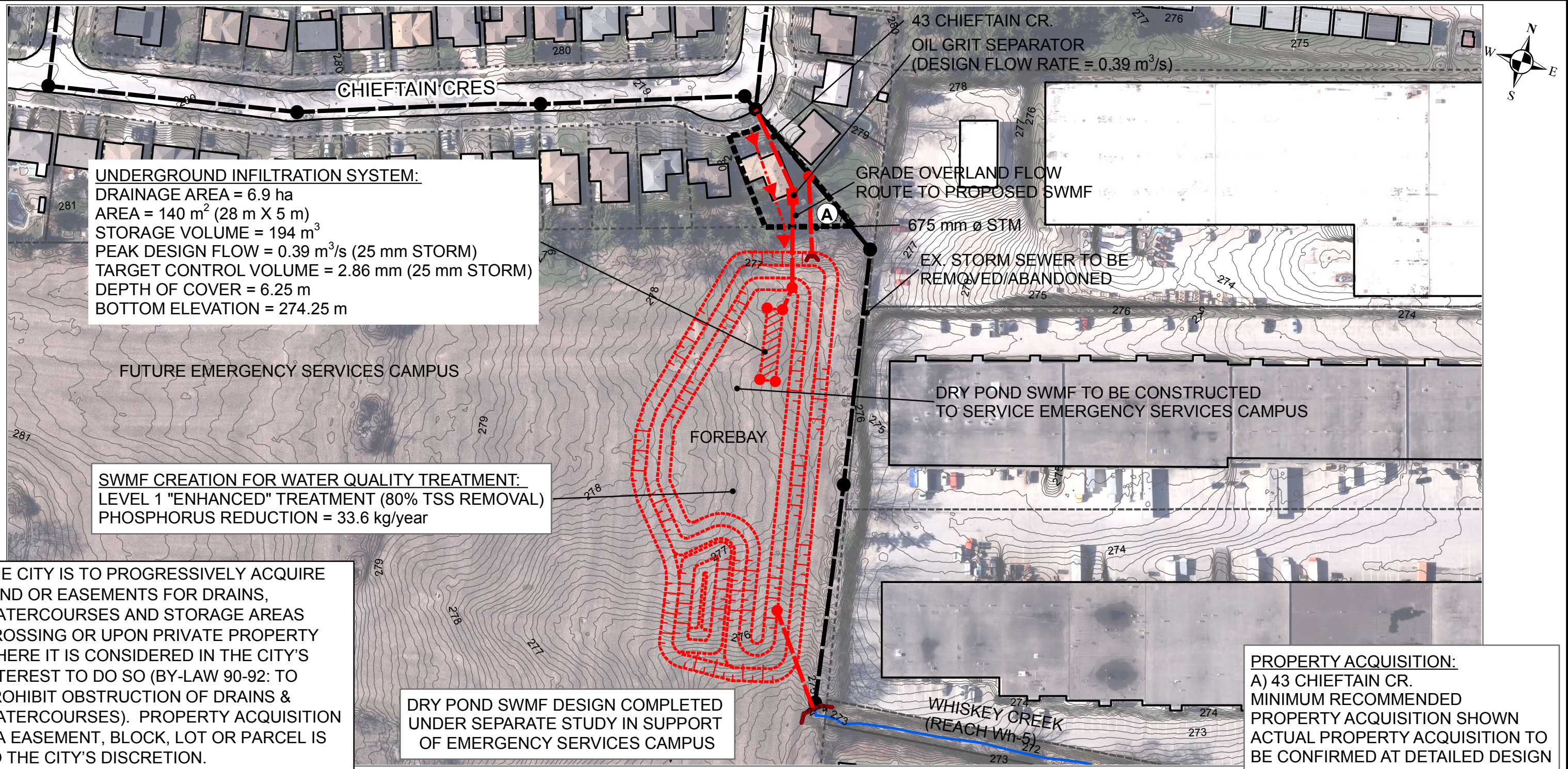
- | | | | |
|--|-------------------------------|--|----------------------------|
| | BANK EROSION | | EX. SANITARY SEWER |
| | BED EROSION/ KNICKPOINT | | EX. WATERCOURSE |
| | INFRASTRUCTURE AT RISK | | EX. WATERMAIN |
| | PR. STORM MAINTENANCE HOLE | | EX. STORM MAINTENANCE HOLE |
| | PR. STORM SEWER | | EX. STORM SEWER |
| | EX. SANITARY MAINTENANCE HOLE | | EX. PROPERTY LINE |
| | | | PROPERTY ACQUISITION |

DRAINAGE MASTER PLAN
FINAL PREFERRED ALTERNATIVE SOLUTION

PROJECT No. 74
WATERCOURSE IMPROVEMENT No. 30
WHISKEY CREEK WATERSHED

SCALE = 1:2,500

DATE: MARCH 2019



THE CITY IS TO PROGRESSIVELY ACQUIRE LAND OR EASEMENTS FOR DRAINS, WATERCOURSES AND STORAGE AREAS CROSSING OR UPON PRIVATE PROPERTY WHERE IT IS CONSIDERED IN THE CITY'S INTEREST TO DO SO (BY-LAW 90-92: TO PROHIBIT OBSTRUCTION OF DRAINS & WATERCOURSES). PROPERTY ACQUISITION VIA EASEMENT, BLOCK, LOT OR PARCEL IS TO THE CITY'S DISCRETION.



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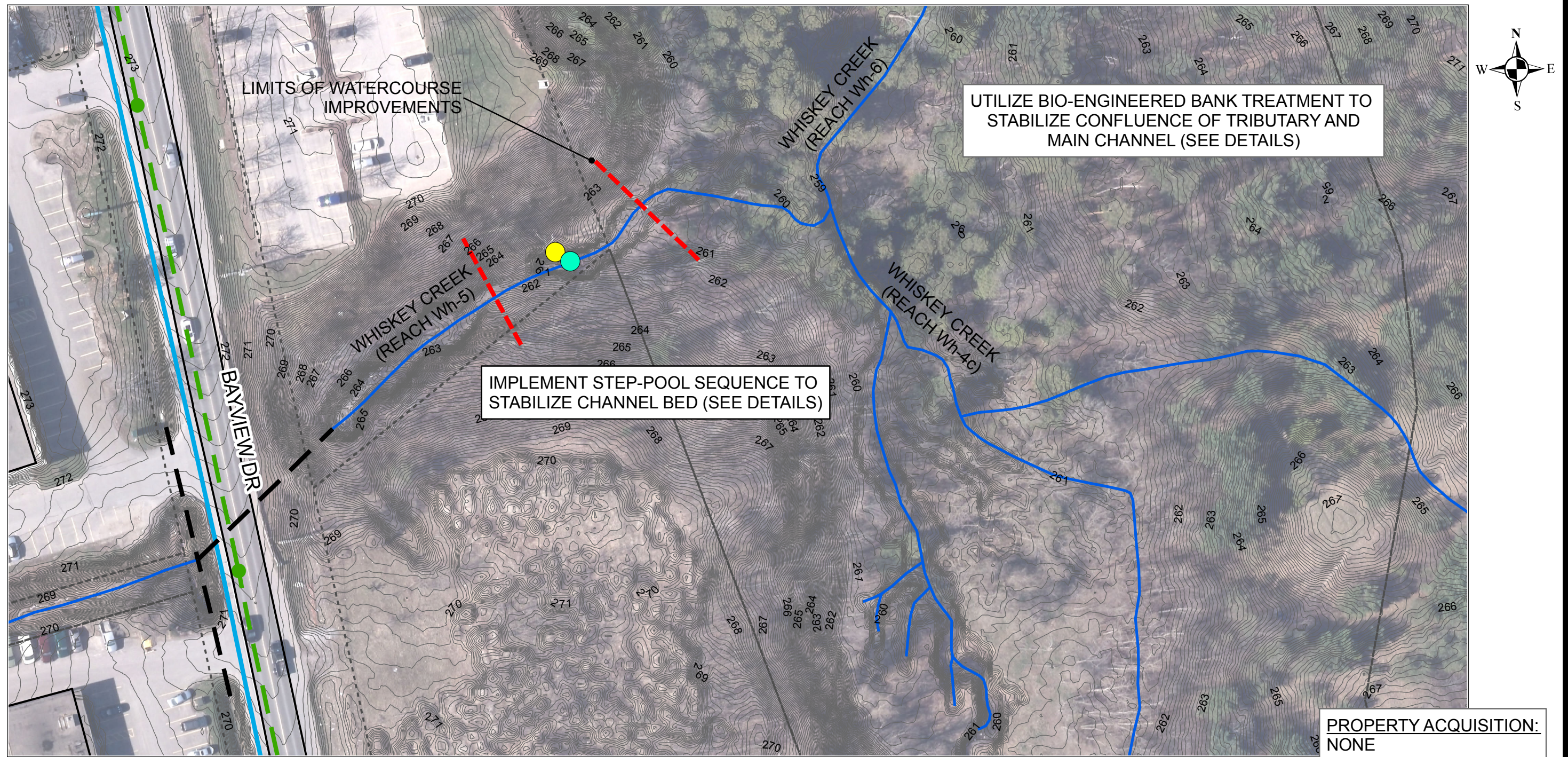
LEGEND			
●	PR STORM MAINTENANCE HOLE	—	EX. WATERMAIN
—	PR. STORM SEWER	●	EX. STORM MAINTENANCE HOLE
—	EX. SANITARY SEWER	—	EX. STORM SEWER
●	EX. SANITARY MAINTENANCE HOLE	—	EX. WATERCOURSE
▨	PR. LID	- - -	EX. PROPERTY LINE
		▭	PROPERTY ACQUISITION

DRAINAGE MASTER PLAN
FINAL PREFERRED ALTERNATIVE SOLUTION

PROJECT No. 75
SWMF RETROFIT No. 40
WHISKEY CREEK WATERSHED

SCALE = 1:1,250

DATE: MARCH 2019



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LEGEND

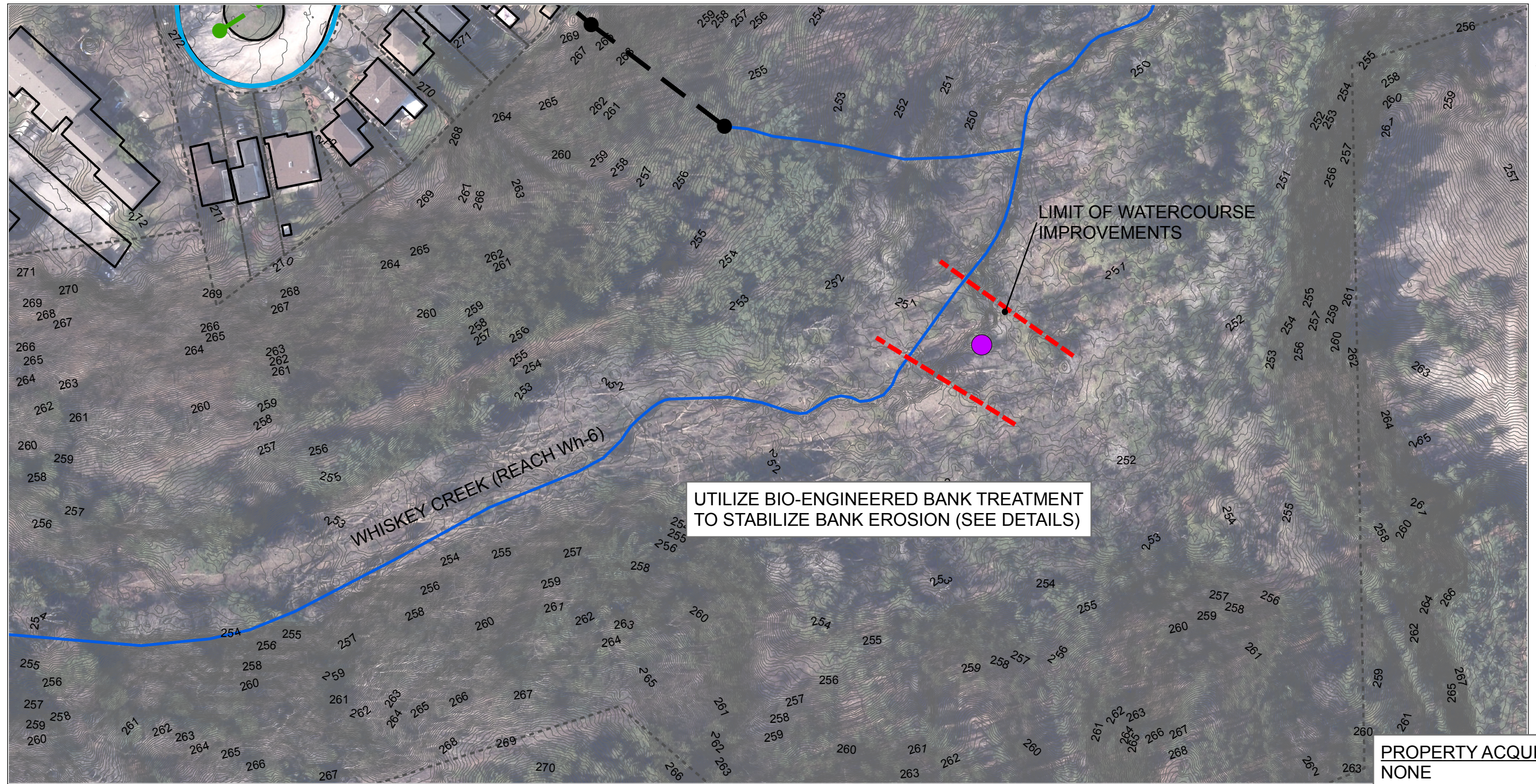
- | | |
|--|---|
| ● BANK EROSION | --- EX. SANITARY SEWER |
| ● BED EROSION/ KNICKPOINT | --- EX. WATERCOURSE |
| ● INFRASTRUCTURE AT RISK | --- EX. WATERMAIN |
| ● PR. STORM MAINTENANCE HOLE | ● EX. STORM MAINTENANCE HOLE |
| --- PR. STORM SEWER | --- EX. STORM SEWER |
| ● EX. SANITARY MAINTENANCE HOLE | EX. PROPERTY LINE |
| | PROPERTY ACQUISITION |

DRAINAGE MASTER PLAN **FINAL PREFERRED ALTERNATIVE SOLUTION**

PROJECT No. 76
WATERCOURSE IMPROVEMENT No. 17
WHISKEY CREEK WATERSHED

SCALE = 1:750

DATE: MARCH 2019



PROPERTY ACQUISITION:
NONE



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LEGEND

- | | | | |
|--|-------------------------------|--|----------------------------|
| | BANK EROSION | | EX. SANITARY SEWER |
| | BED EROSION/ KNICKPOINT | | EX. WATERCOURSE |
| | INFRASTRUCTURE AT RISK | | EX. WATERMAIN |
| | PR. STORM MAINTENANCE HOLE | | EX. STORM MAINTENANCE HOLE |
| | PR. STORM SEWER | | EX. STORM SEWER |
| | EX. SANITARY MAINTENANCE HOLE | | EX. PROPERTY LINE |
| | | | PROPERTY ACQUISITION |

DRAINAGE MASTER PLAN FINAL PREFERRED ALTERNATIVE SOLUTION

PROJECT No. 77
WATERCOURSE IMPROVEMENT No. 18
WHISKEY CREEK WATERSHED

SCALE = 1:1,000

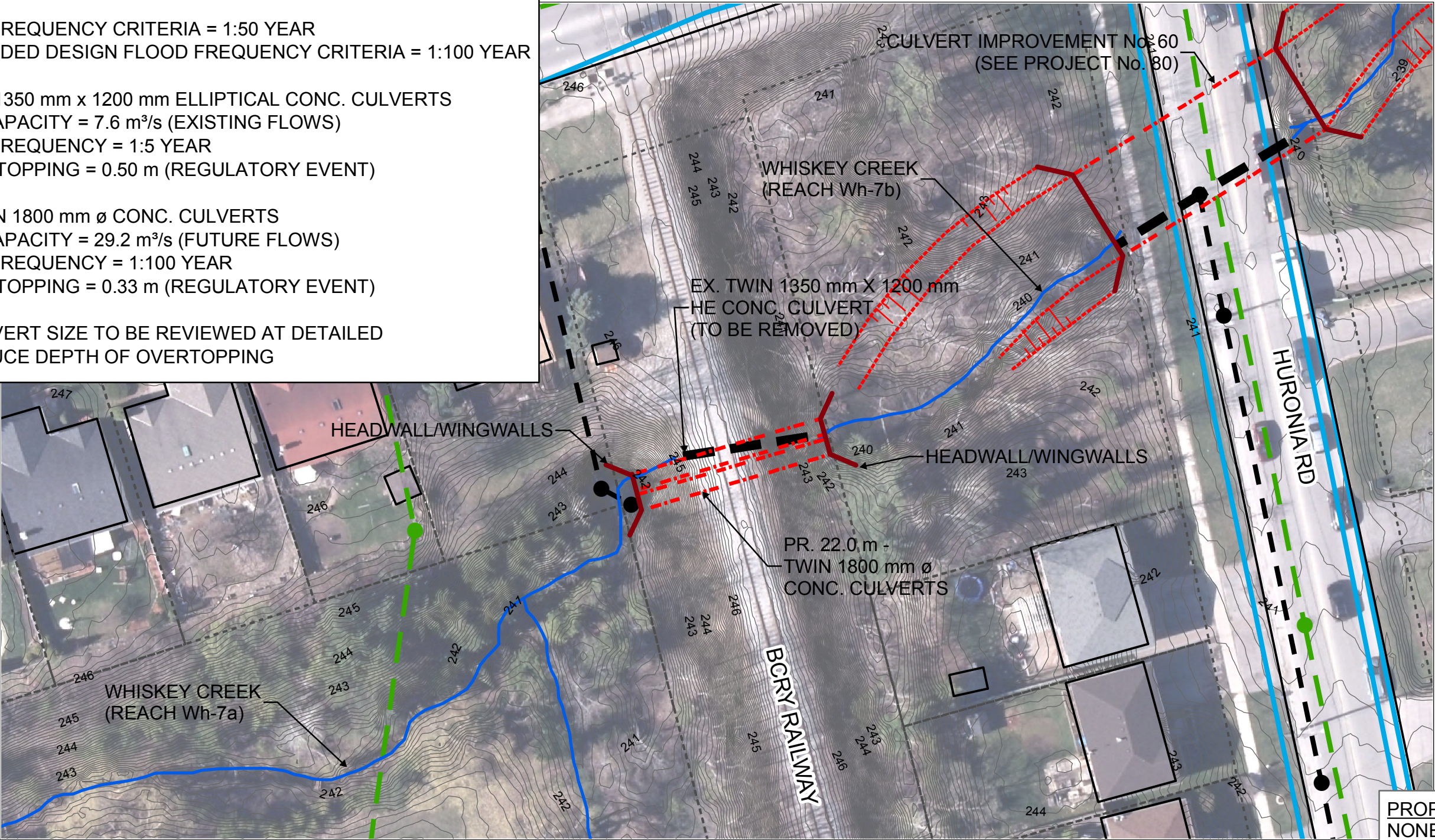
DATE: MARCH 2019

BCRY RAILWAY:
DESIGN FLOOD FREQUENCY CRITERIA = 1:50 YEAR
MDP RECOMMENDED DESIGN FLOOD FREQUENCY CRITERIA = 1:100 YEAR

EXISTING: TWIN 1350 mm x 1200 mm ELLIPTICAL CONC. CULVERTS
CONVEYANCE CAPACITY = 7.6 m³/s (EXISTING FLOWS)
DESIGN FLOOD FREQUENCY = 1:5 YEAR
DEPTH OF OVERTOPPING = 0.50 m (REGULATORY EVENT)

PROPOSED: TWIN 1800 mm ø CONC. CULVERTS
CONVEYANCE CAPACITY = 29.2 m³/s (FUTURE FLOWS)
DESIGN FLOOD FREQUENCY = 1:100 YEAR
DEPTH OF OVERTOPPING = 0.33 m (REGULATORY EVENT)

PROPOSED CULVERT SIZE TO BE REVIEWED AT DETAILED
DESIGN TO REDUCE DEPTH OF OVERTOPPING



PROPERTY ACQUISITION:
NONE



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LEGEND

- | | |
|------------------------------|---------------------------------|
| --- PR. CULVERT | --- EX. SANITARY SEWER |
| --- PR. STORM SEWER | ● EX. SANITARY MAINTENANCE HOLE |
| ● PR STORM MAINTENANCE HOLE | --- EX. WATERMAIN |
| --- EX. STORM SEWER | --- EX. CULVERT |
| ● EX. STORM MAINTENANCE HOLE | --- EX. PROPERTY LINE |
| --- WATERCOURSE | --- PROPERTY ACQUISITION |

DRAINAGE MASTER PLAN FINAL PREFERRED ALTERNATIVE SOLUTION

PROJECT No. 78
CULVERT IMPROVEMENT No. 147
(BCRY RAILWAY)
WHISKEY CREEK WATERSHED
SCALE = 1:500

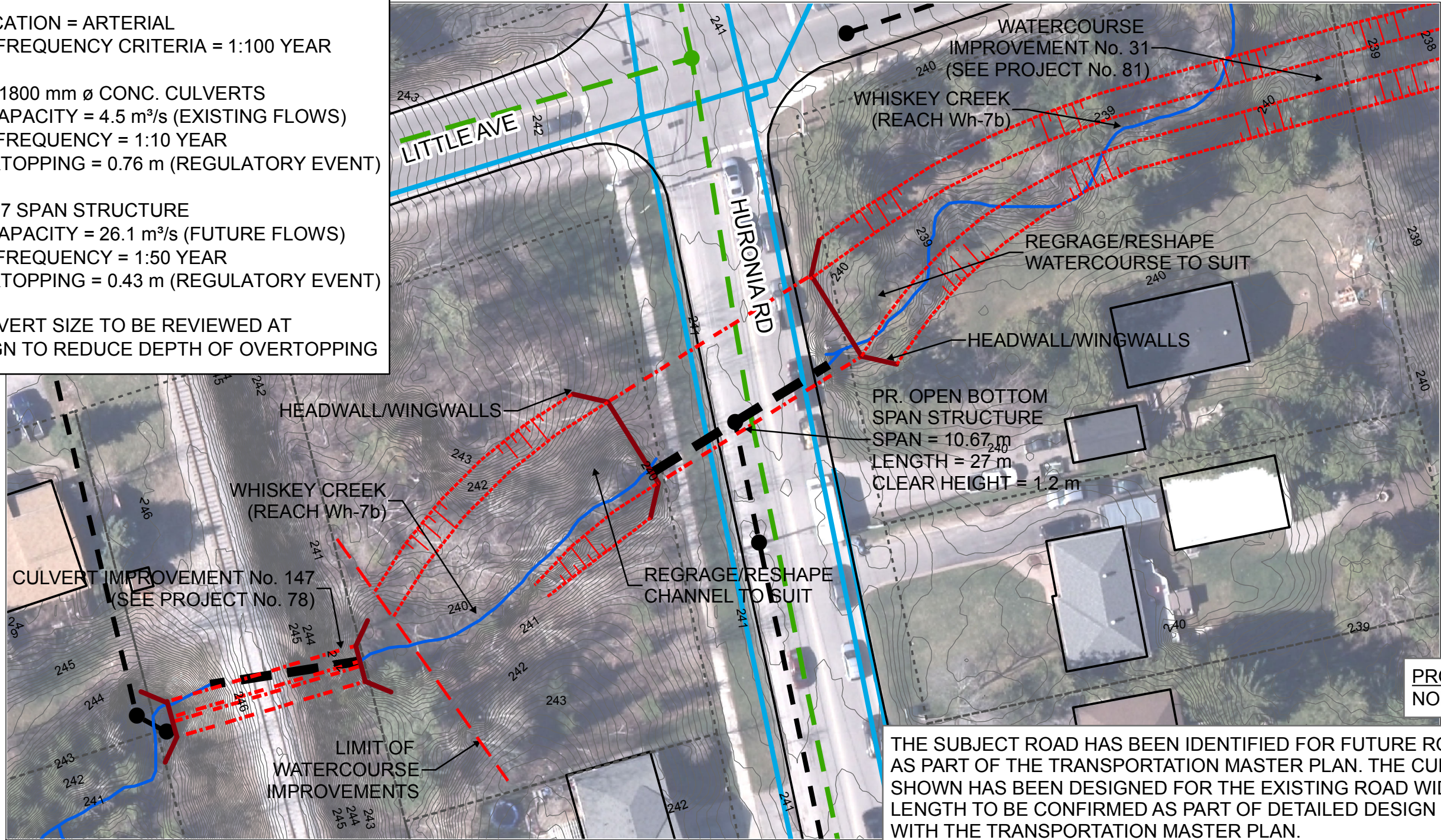
DATE: MARCH 2019

HURONIA ROAD:
ROAD CLASSIFICATION = ARTERIAL
DESIGN FLOOD FREQUENCY CRITERIA = 1:100 YEAR

EXISTING: TWIN 1800 mm Ø CONC. CULVERTS
CONVEYANCE CAPACITY = 4.5 m³/s (EXISTING FLOWS)
DESIGN FLOOD FREQUENCY = 1:10 YEAR
DEPTH OF OVERTOPPING = 0.76 m (REGULATORY EVENT)

PROPOSED: 10.67 SPAN STRUCTURE
CONVEYANCE CAPACITY = 26.1 m³/s (FUTURE FLOWS)
DESIGN FLOOD FREQUENCY = 1:50 YEAR
DEPTH OF OVERTOPPING = 0.43 m (REGULATORY EVENT)

PROPOSED CULVERT SIZE TO BE REVIEWED AT
DETAILED DESIGN TO REDUCE DEPTH OF OVERTOPPING



PROPERTY ACQUISITION:
NONE

THE SUBJECT ROAD HAS BEEN IDENTIFIED FOR FUTURE ROAD WIDENING AS PART OF THE TRANSPORTATION MASTER PLAN. THE CULVERT IMPROVEMENT SHOWN HAS BEEN DESIGNED FOR THE EXISTING ROAD WIDTH. THE CULVERT LENGTH TO BE CONFIRMED AS PART OF DETAILED DESIGN IN COORDINATION WITH THE TRANSPORTATION MASTER PLAN.



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LEGEND

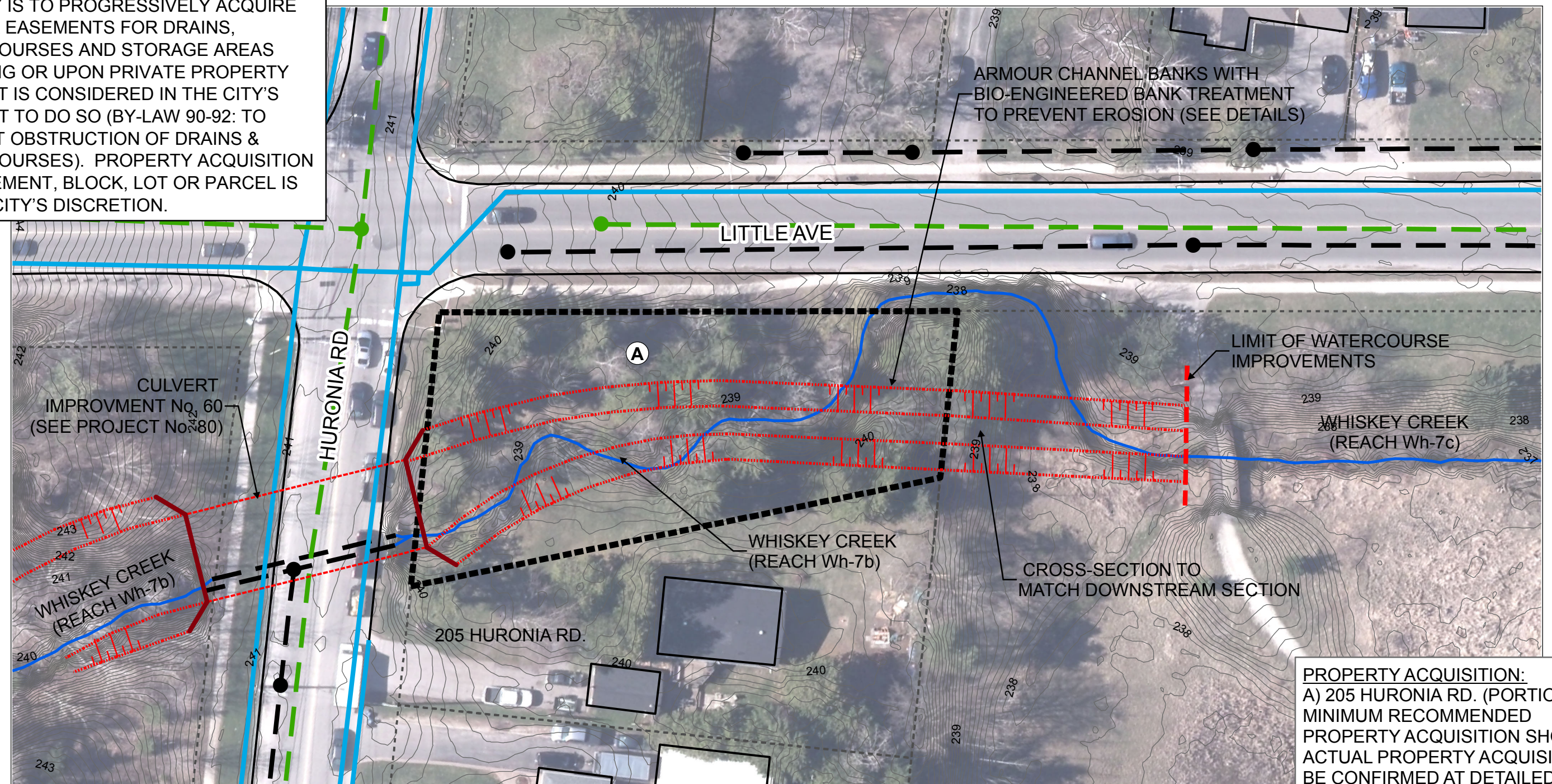
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|-----|----------------------------|-----|-------------------------------|
| --- | PR. CULVERT | --- | EX. SANITARY SEWER |
| --- | PR. STORM SEWER | ● | EX. SANITARY MAINTENANCE HOLE |
| ● | PR STORM MAINTENANCE HOLE | --- | EX. WATERMAIN |
| --- | EX. STORM SEWER | --- | EX. CULVERT |
| ● | EX. STORM MAINTENANCE HOLE | --- | EX. PROPERTY LINE |
| --- | WATERCOURSE | --- | PROPERTY ACQUISITION |

DRAINAGE MASTER PLAN
FINAL PREFERRED ALTERNATIVE SOLUTION

PROJECT No. 80
CULVERT IMPROVEMENT No. 60
(HURONIA ROAD)
WHISKEY CREEK WATERSHED
SCALE = 1:500

DATE: MARCH 2019

THE CITY IS TO PROGRESSIVELY ACQUIRE LAND OR EASEMENTS FOR DRAINS, WATERCOURSES AND STORAGE AREAS CROSSING OR UPON PRIVATE PROPERTY WHERE IT IS CONSIDERED IN THE CITY'S INTEREST TO DO SO (BY-LAW 90-92: TO PROHIBIT OBSTRUCTION OF DRAINS & WATERCOURSES). PROPERTY ACQUISITION VIA EASEMENT, BLOCK, LOT OR PARCEL IS TO THE CITY'S DISCRETION.



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LEGEND

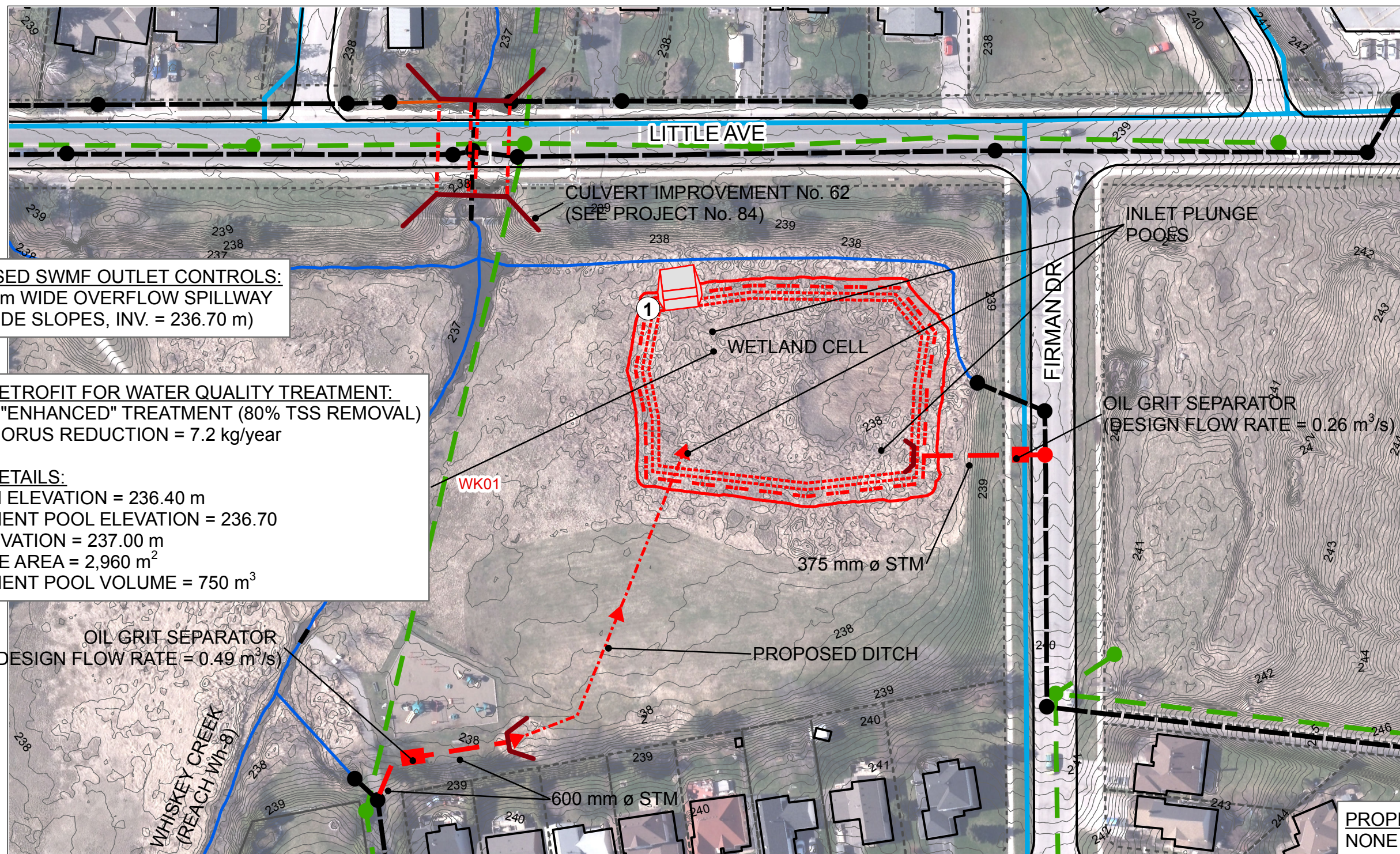
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|--|-------------------------------|--|----------------------------|
| | BANK EROSION | | EX. SANITARY SEWER |
| | BED EROSION/ KNICKPOINT | | EX. WATERCOURSE |
| | INFRASTRUCTURE AT RISK | | EX. WATERMAIN |
| | PR. STORM MAINTENANCE HOLE | | EX. STORM MAINTENANCE HOLE |
| | PR. STORM SEWER | | EX. STORM SEWER |
| | EX. SANITARY MAINTENANCE HOLE | | EX. PROPERTY LINE |
| | | | PROPERTY ACQUISITION |

DRAINAGE MASTER PLAN FINAL PREFERRED ALTERNATIVE SOLUTION

PROJECT No. 81
WATERCOURSE IMPROVEMENT No. 31
WHISKEY CREEK WATERSHED

SCALE = 1:500

DATE: MARCH 2019



PROPOSED SWMF OUTLET CONTROLS:
1) 1 - 10 m WIDE OVERFLOW SPILLWAY
(5:1 SIDE SLOPES, INV. = 236.70 m)

SWMF RETROFIT FOR WATER QUALITY TREATMENT:
LEVEL 1 "ENHANCED" TREATMENT (80% TSS REMOVAL)
PHOSPHORUS REDUCTION = 7.2 kg/year

SWMF DETAILS:
BOTTOM ELEVATION = 236.40 m
PERMANENT POOL ELEVATION = 236.70
TOP ELEVATION = 237.00 m
SURFACE AREA = 2,960 m²
PERMANENT POOL VOLUME = 750 m³

PROPERTY ACQUISITION:
NONE

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LEGEND

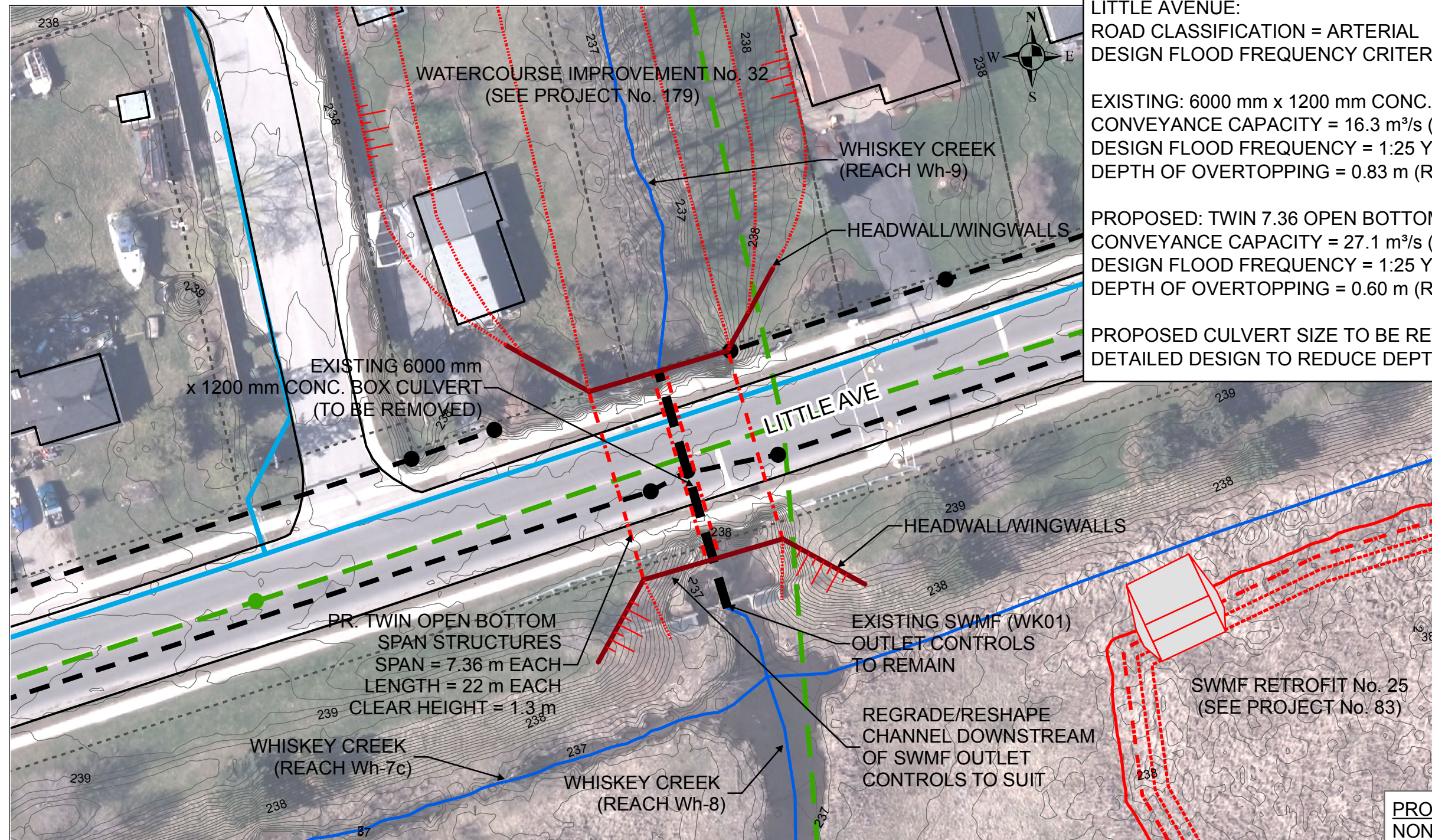
- | | |
|---------------------------------|------------------------------|
| ● PR STORM MAINTENANCE HOLE | — EX. WATERMAIN |
| — PR. STORM SEWER | ● EX. STORM MAINTENANCE HOLE |
| — EX. SANITARY SEWER | — EX. STORM SEWER |
| ● EX. SANITARY MAINTENANCE HOLE | — EX. WATERCOURSE |
| ▨ PR. LID | ▨ EX. PROPERTY LINE |
| | ▨ PROPERTY ACQUISITION |

DRAINAGE MASTER PLAN
FINAL PREFERRED ALTERNATIVE SOLUTION

PROJECT No. 83
SWMF RETROFIT No. 25 (WK01)
WHISKEY CREEK WATERSHED

SCALE = 1:1,000

DATE: MARCH 2019



LEGEND

---	PR. CULVERT	---	EX. SANITARY SEWER
---	PR. STORM SEWER	●	EX. SANITARY MAINTENANCE HOLE
●	PR STORM MAINTENANCE HOLE	---	EX. WATERMAIN
---	EX. STORM SEWER	---	EX. CULVERT
●	EX. STORM MAINTENANCE HOLE	---	EX. PROPERTY LINE
---	WATERCOURSE	---	PROPERTY ACQUISITION

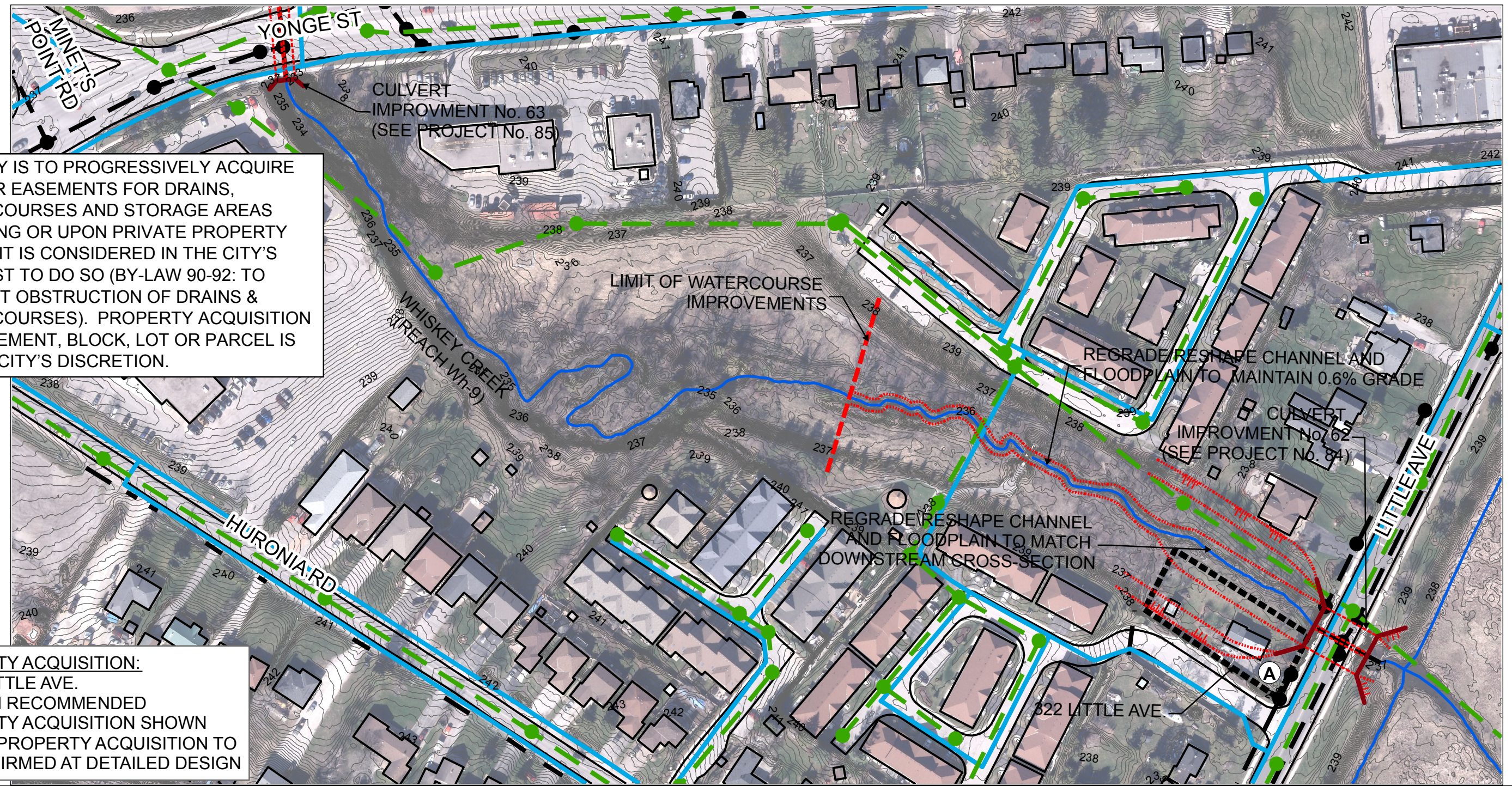
DRAINAGE MASTER PLAN **FINAL PREFERRED ALTERNATIVE SOLUTION**

PROJECT No. 84
 CULVERT IMPROVEMENT No. 62
 (LITTLE AVENUE)
 WHISKEY CREEK WATERSHED
 SCALE = 1:500

DATE: MARCH 2019

THE CITY IS TO PROGRESSIVELY ACQUIRE LAND OR EASEMENTS FOR DRAINS, WATERCOURSES AND STORAGE AREAS CROSSING OR UPON PRIVATE PROPERTY WHERE IT IS CONSIDERED IN THE CITY'S INTEREST TO DO SO (BY-LAW 90-92: TO PROHIBIT OBSTRUCTION OF DRAINS & WATERCOURSES). PROPERTY ACQUISITION VIA EASEMENT, BLOCK, LOT OR PARCEL IS TO THE CITY'S DISCRETION.

PROPERTY ACQUISITION:
A) 322 LITTLE AVE.
MINIMUM RECOMMENDED
PROPERTY ACQUISITION SHOWN
ACTUAL PROPERTY ACQUISITION TO
BE CONFIRMED AT DETAILED DESIGN



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LEGEND

- | | | | |
|--|-------------------------------|--|----------------------------|
| | BANK EROSION | | EX. SANITARY SEWER |
| | BED EROSION/ KNICKPOINT | | EX. WATERCOURSE |
| | INFRASTRUCTURE AT RISK | | EX. WATERMAIN |
| | PR. STORM MAINTENANCE HOLE | | EX. STORM MAINTENANCE HOLE |
| | PR. STORM SEWER | | EX. STORM SEWER |
| | EX. SANITARY MAINTENANCE HOLE | | EX. PROPERTY LINE |
| | | | PROPERTY ACQUISITION |

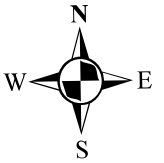
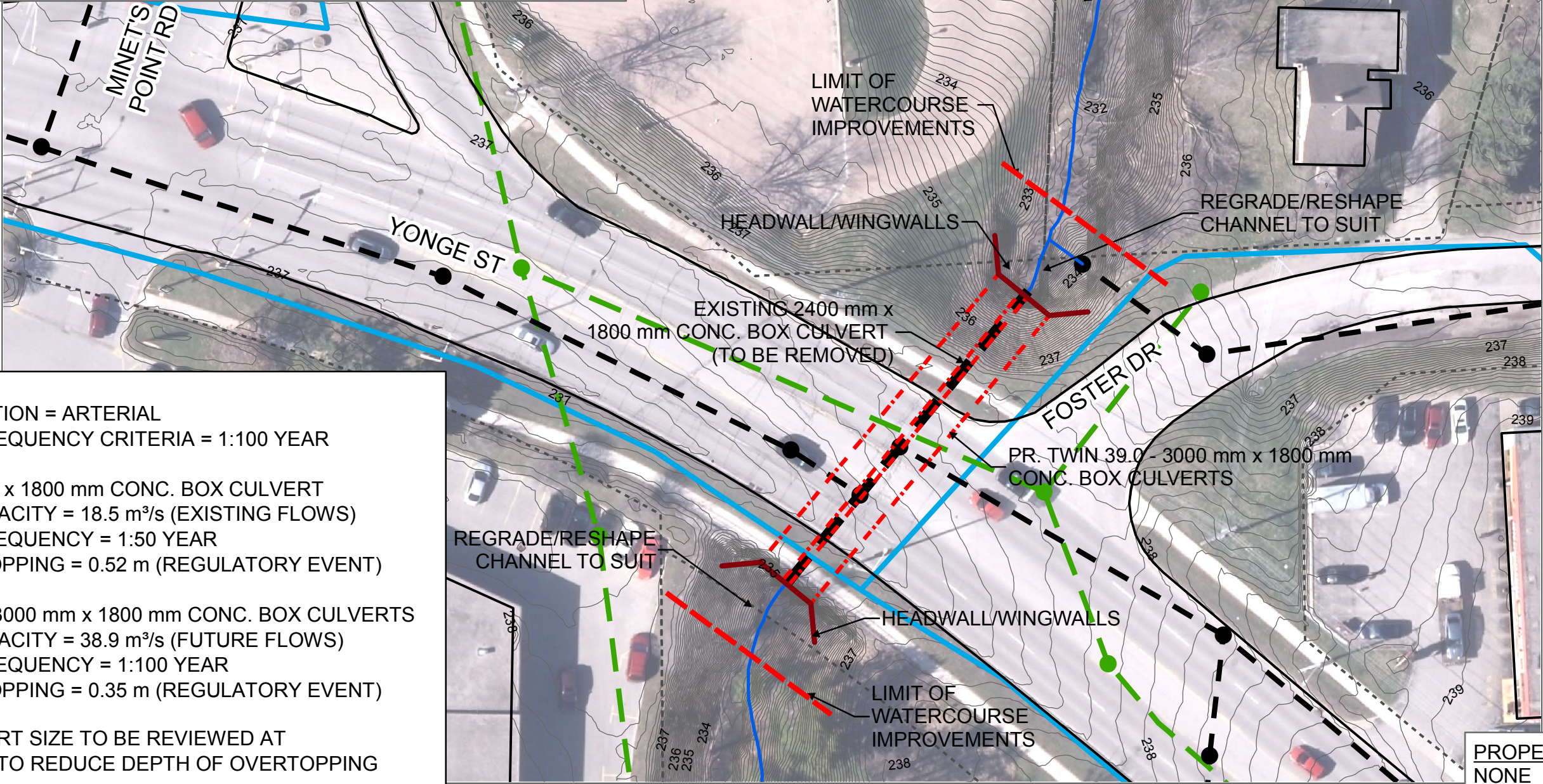
DRAINAGE MASTER PLAN **FINAL PREFERRED ALTERNATIVE SOLUTION**

PROJECT No. 179
WATERCOURSE IMPROVEMENT No. 32
WHISKEY CREEK WATERSHED

SCALE = 1:1,500

DATE: MARCH 2019

THE SUBJECT ROAD HAS BEEN IDENTIFIED FOR FUTURE ROAD WIDENING AS PART OF THE TRANSPORTATION MASTER PLAN. THE CULVERT IMPROVEMENT SHOWN HAS BEEN DESIGNED FOR THE EXISTING ROAD WIDTH. THE CULVERT LENGTH TO BE CONFIRMED AS PART OF DETAILED DESIGN IN COORDINATION WITH THE TRANSPORTATION MASTER PLAN.



YONGE STREET:
ROAD CLASSIFICATION = ARTERIAL
DESIGN FLOOD FREQUENCY CRITERIA = 1:100 YEAR

EXISTING: 2400 mm x 1800 mm CONC. BOX CULVERT
CONVEYANCE CAPACITY = 18.5 m³/s (EXISTING FLOWS)
DESIGN FLOOD FREQUENCY = 1:50 YEAR
DEPTH OF OVERTOPPING = 0.52 m (REGULATORY EVENT)

PROPOSED: TWIN 3000 mm x 1800 mm CONC. BOX CULVERTS
CONVEYANCE CAPACITY = 38.9 m³/s (FUTURE FLOWS)
DESIGN FLOOD FREQUENCY = 1:100 YEAR
DEPTH OF OVERTOPPING = 0.35 m (REGULATORY EVENT)

PROPOSED CULVERT SIZE TO BE REVIEWED AT
DETAILED DESIGN TO REDUCE DEPTH OF OVERTOPPING



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LEGEND

- | | |
|------------------------------|----------------------------------|
| --- PR. CULVERT | --- EX. SANITARY SEWER |
| --- PR. STORM SEWER | ● EX. SANITARY MAINTENANCE HOLES |
| ● PR STORM MAINTENANCE HOLE | --- EX. WATERMAIN |
| --- EX. STORM SEWER | --- EX. CULVERT |
| ● EX. STORM MAINTENANCE HOLE | --- EX. PROPERTY LINE |
| --- WATERCOURSE | --- PROPERTY ACQUISITION |

DRAINAGE MASTER PLAN FINAL PREFERRED ALTERNATIVE SOLUTION

PROJECT No. 85
CULVERT IMPROVEMENT No. 63
(YONGE STREET)
WHISKEY CREEK WATERSHED

SCALE = 1:500

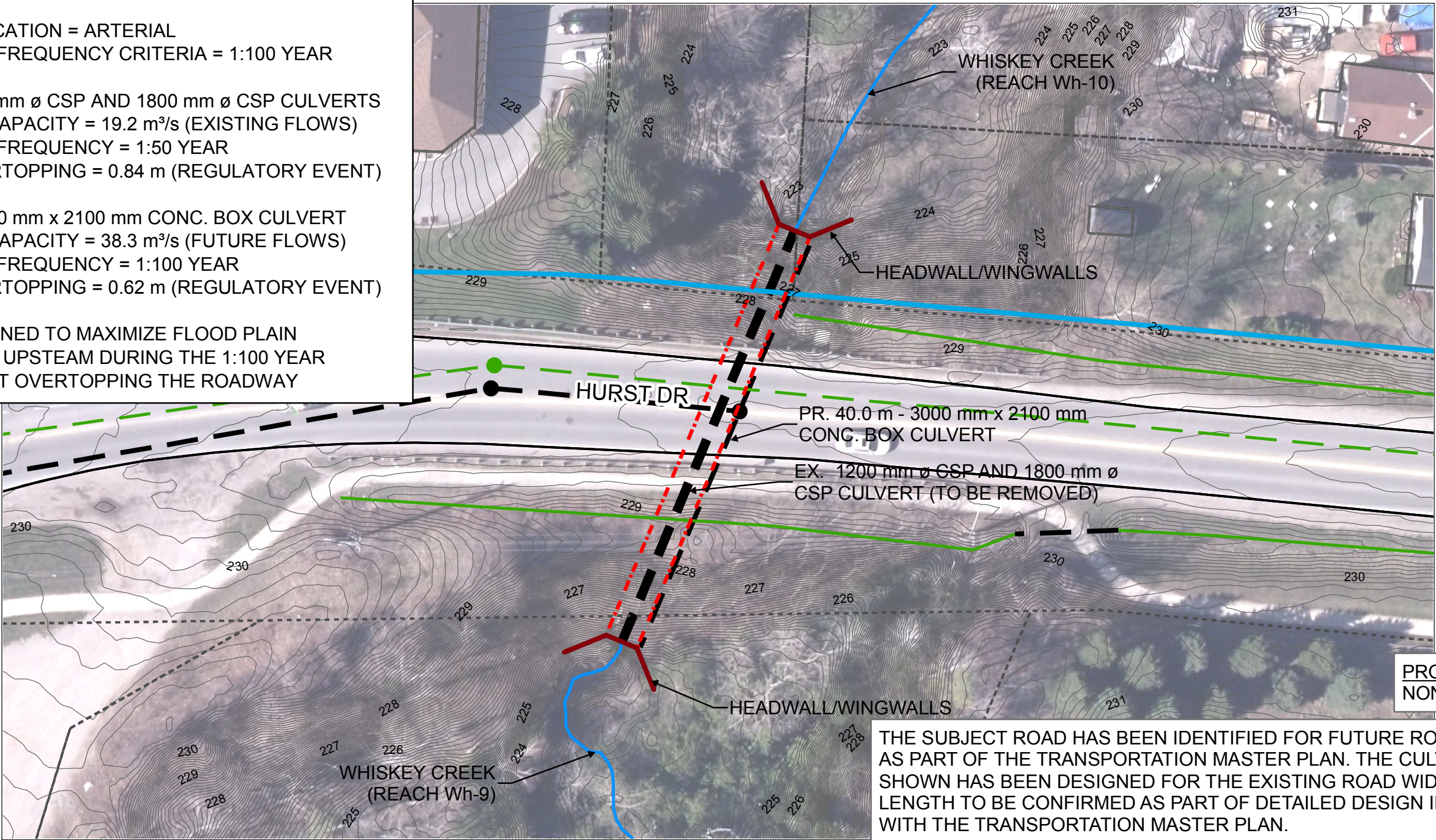
DATE: MARCH 2018

HURST DRIVE:
ROAD CLASSIFICATION = ARTERIAL
DESIGN FLOOD FREQUENCY CRITERIA = 1:100 YEAR

EXISTING: 1200 mm Ø CSP AND 1800 mm Ø CSP CULVERTS
CONVEYANCE CAPACITY = 19.2 m³/s (EXISTING FLOWS)
DESIGN FLOOD FREQUENCY = 1:50 YEAR
DEPTH OF OVERTOPPING = 0.84 m (REGULATORY EVENT)

PROPOSED: 3600 mm x 2100 mm CONC. BOX CULVERT
CONVEYANCE CAPACITY = 38.3 m³/s (FUTURE FLOWS)
DESIGN FLOOD FREQUENCY = 1:100 YEAR
DEPTH OF OVERTOPPING = 0.62 m (REGULATORY EVENT)

CULVERT DESIGNED TO MAXIMIZE FLOOD PLAIN
STORAGE USED UPSTREAM DURING THE 1:100 YEAR
STORM WITHOUT OVERTOPPING THE ROADWAY



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LEGEND

- PR. CULVERT
- PR. STORM SEWER
- PR STORM MAINTENANCE HOLE
- EX. STORM SEWER
- EX. STORM MAINTENANCE HOLE
- WATERCOURSE
- EX. SANITARY SEWER
- EX. SANITARY MAINTENANCE HOLE
- EX. WATERMAIN
- EX. CULVERT
- EX. PROPERTY LINE
- PROPERTY ACQUISITION

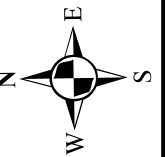
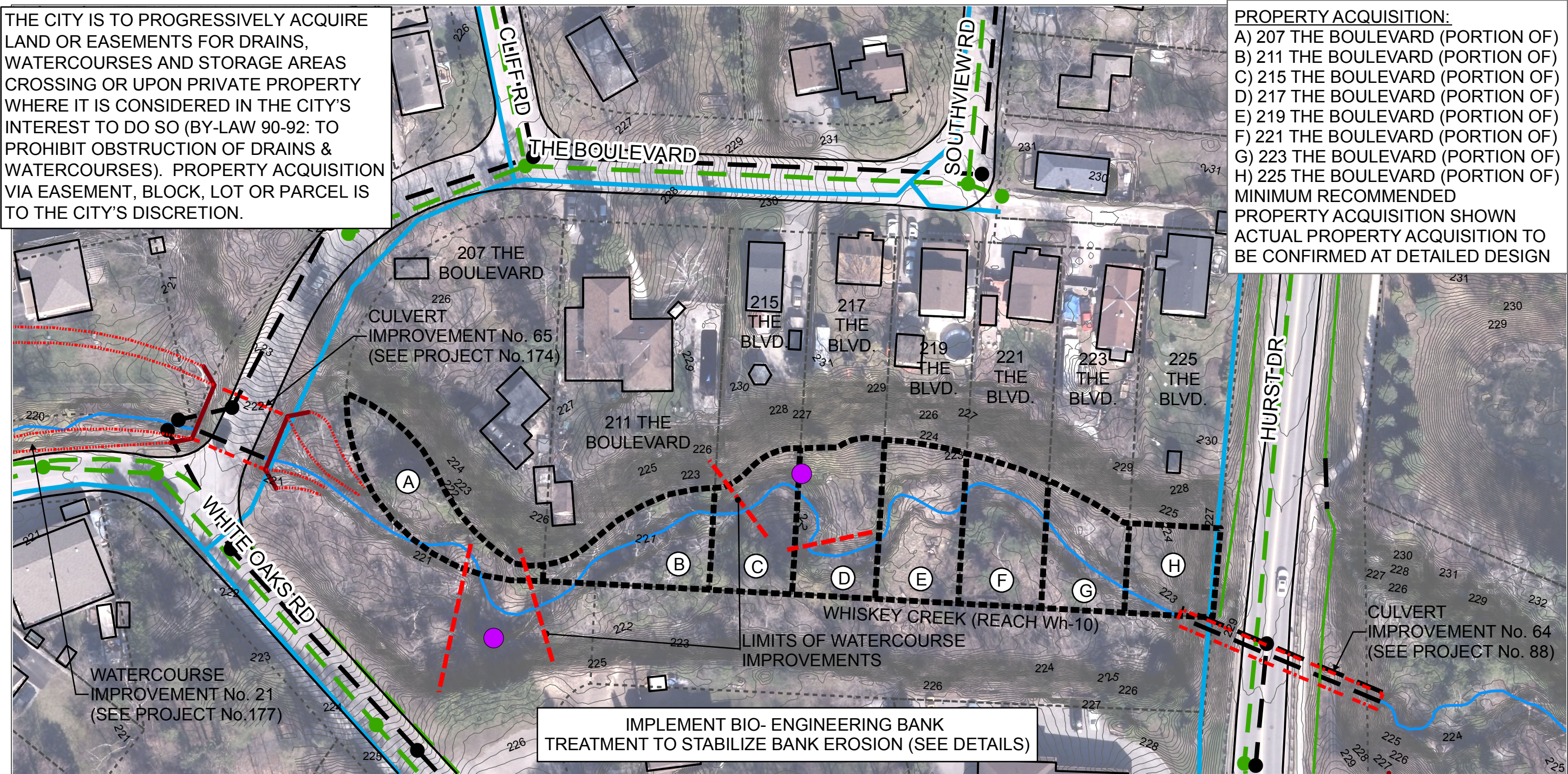
DRAINAGE MASTER PLAN FINAL PREFERRED ALTERNATIVE SOLUTION

PROJECT No. 88
CULVERT IMPROVEMENT No. 64
(HURST DRIVE)
WHISKEY CREEK WATERSHED
SCALE = 1:400

DATE: MARCH 2019

THE CITY IS TO PROGRESSIVELY ACQUIRE LAND OR EASEMENTS FOR DRAINS, WATERCOURSES AND STORAGE AREAS CROSSING OR UPON PRIVATE PROPERTY WHERE IT IS CONSIDERED IN THE CITY'S INTEREST TO DO SO (BY-LAW 90-92: TO PROHIBIT OBSTRUCTION OF DRAINS & WATERCOURSES). PROPERTY ACQUISITION VIA EASEMENT, BLOCK, LOT OR PARCEL IS TO THE CITY'S DISCRETION.

PROPERTY ACQUISITION:
 A) 207 THE BOULEVARD (PORTION OF)
 B) 211 THE BOULEVARD (PORTION OF)
 C) 215 THE BOULEVARD (PORTION OF)
 D) 217 THE BOULEVARD (PORTION OF)
 E) 219 THE BOULEVARD (PORTION OF)
 F) 221 THE BOULEVARD (PORTION OF)
 G) 223 THE BOULEVARD (PORTION OF)
 H) 225 THE BOULEVARD (PORTION OF)
 MINIMUM RECOMMENDED
 PROPERTY ACQUISITION SHOWN
 ACTUAL PROPERTY ACQUISITION TO
 BE CONFIRMED AT DETAILED DESIGN



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LEGEND

- | | | | |
|--|-------------------------------|--|----------------------------|
| | BANK EROSION | | EX. SANITARY SEWER |
| | BED EROSION/ KNICKPOINT | | EX. WATERCOURSE |
| | INFRASTRUCTURE AT RISK | | EX. WATERMAIN |
| | PR. STORM MAINTENANCE HOLE | | EX. STORM MAINTENANCE HOLE |
| | PR. STORM SEWER | | EX. STORM SEWER |
| | EX. SANITARY MAINTENANCE HOLE | | EX. PROPERTY LINE |
| | PROPERTY ACQUISITION | | |

DRAINAGE MASTER PLAN FINAL PREFERRED ALTERNATIVE SOLUTION

PROJECT No. 89
 WATERCOURSE IMPROVEMENT No. 19
 WHISKEY CREEK WATERSHED

SCALE = 1:750

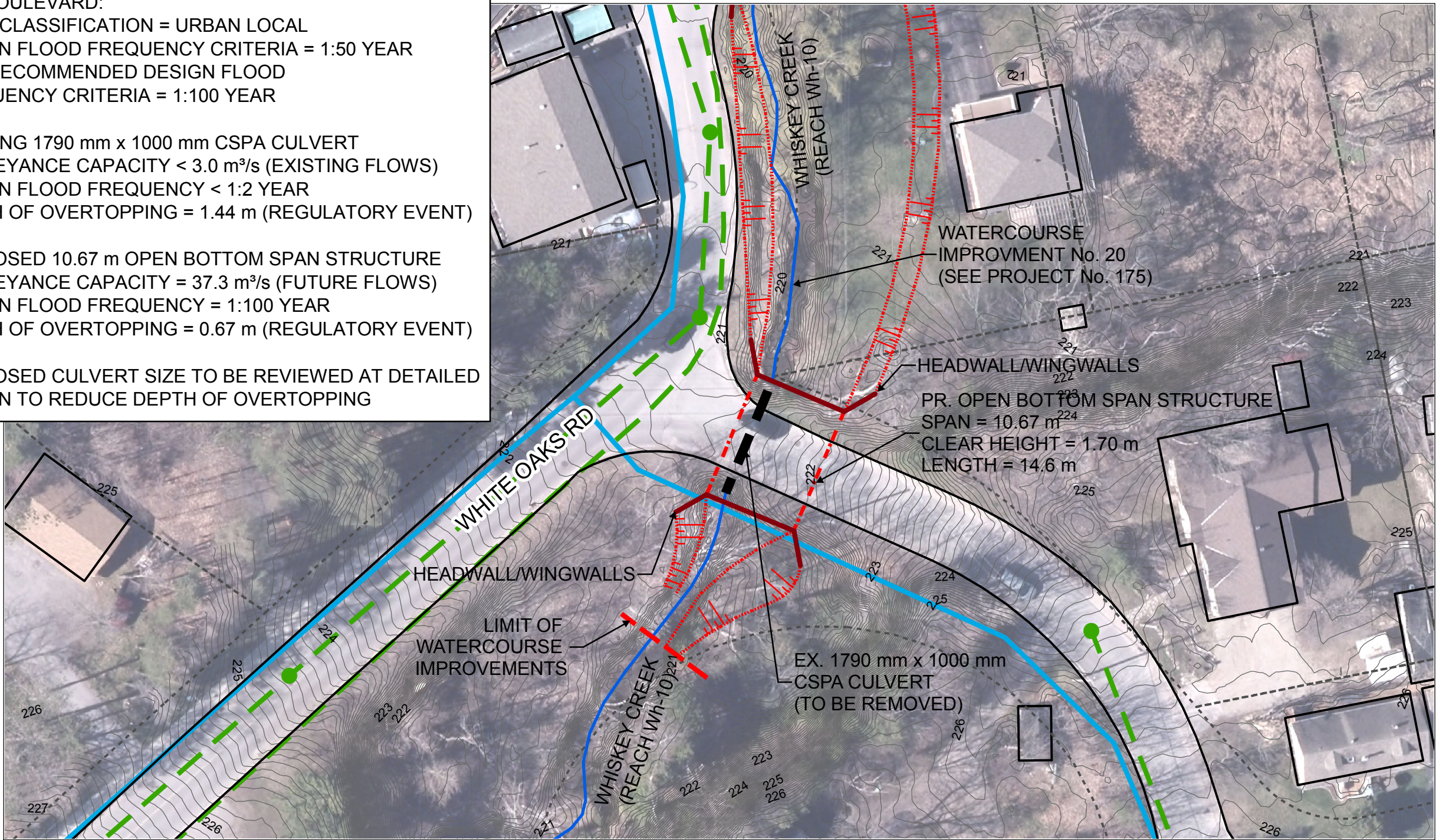
DATE: MARCH 2019

THE BOULEVARD:
ROAD CLASSIFICATION = URBAN LOCAL
DESIGN FLOOD FREQUENCY CRITERIA = 1:50 YEAR
MDP RECOMMENDED DESIGN FLOOD
FREQUENCY CRITERIA = 1:100 YEAR

EXISTING 1790 mm x 1000 mm CSPA CULVERT
CONVEYANCE CAPACITY < 3.0 m³/s (EXISTING FLOWS)
DESIGN FLOOD FREQUENCY < 1:2 YEAR
DEPTH OF OVERTOPPING = 1.44 m (REGULATORY EVENT)

PROPOSED 10.67 m OPEN BOTTOM SPAN STRUCTURE
CONVEYANCE CAPACITY = 37.3 m³/s (FUTURE FLOWS)
DESIGN FLOOD FREQUENCY = 1:100 YEAR
DEPTH OF OVERTOPPING = 0.67 m (REGULATORY EVENT)

PROPOSED CULVERT SIZE TO BE REVIEWED AT DETAILED
DESIGN TO REDUCE DEPTH OF OVERTOPPING



PROPERTY ACQUISITION:
NONE



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LEGEND

- | | |
|------------------------------|---------------------------------|
| --- PR. CULVERT | --- EX. SANITARY SEWER |
| --- PR. STORM SEWER | ● EX. SANITARY MAINTENANCE HOLE |
| ● PR STORM MAINTENANCE HOLE | --- EX. WATERMAIN |
| --- EX. STORM SEWER | --- EX. CULVERT |
| ● EX. STORM MAINTENANCE HOLE | --- EX. PROPERTY LINE |
| --- WATERCOURSE | --- PROPERTY ACQUISITION |

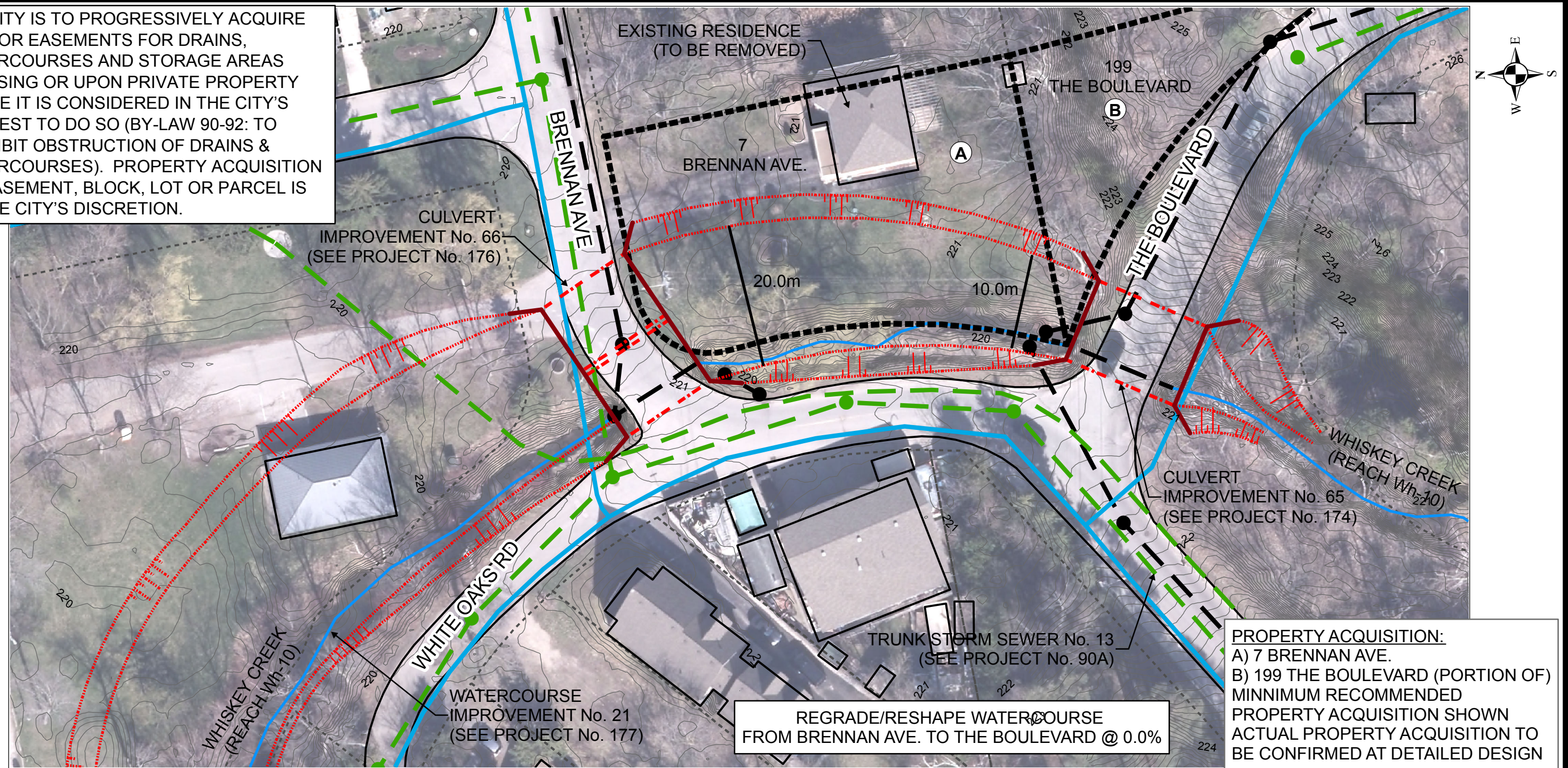
DRAINAGE MASTER PLAN **FINAL PREFERRED ALTERNATIVE SOLUTION**

PROJECT No. 174
CULVERT IMPROVEMENT No. 65
(THE BOULEVARD)
WHISKEY CREEK WATERSHED

SCALE = 1:500

DATE: MARCH 2019

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LEGEND

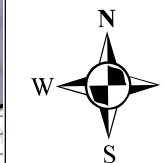
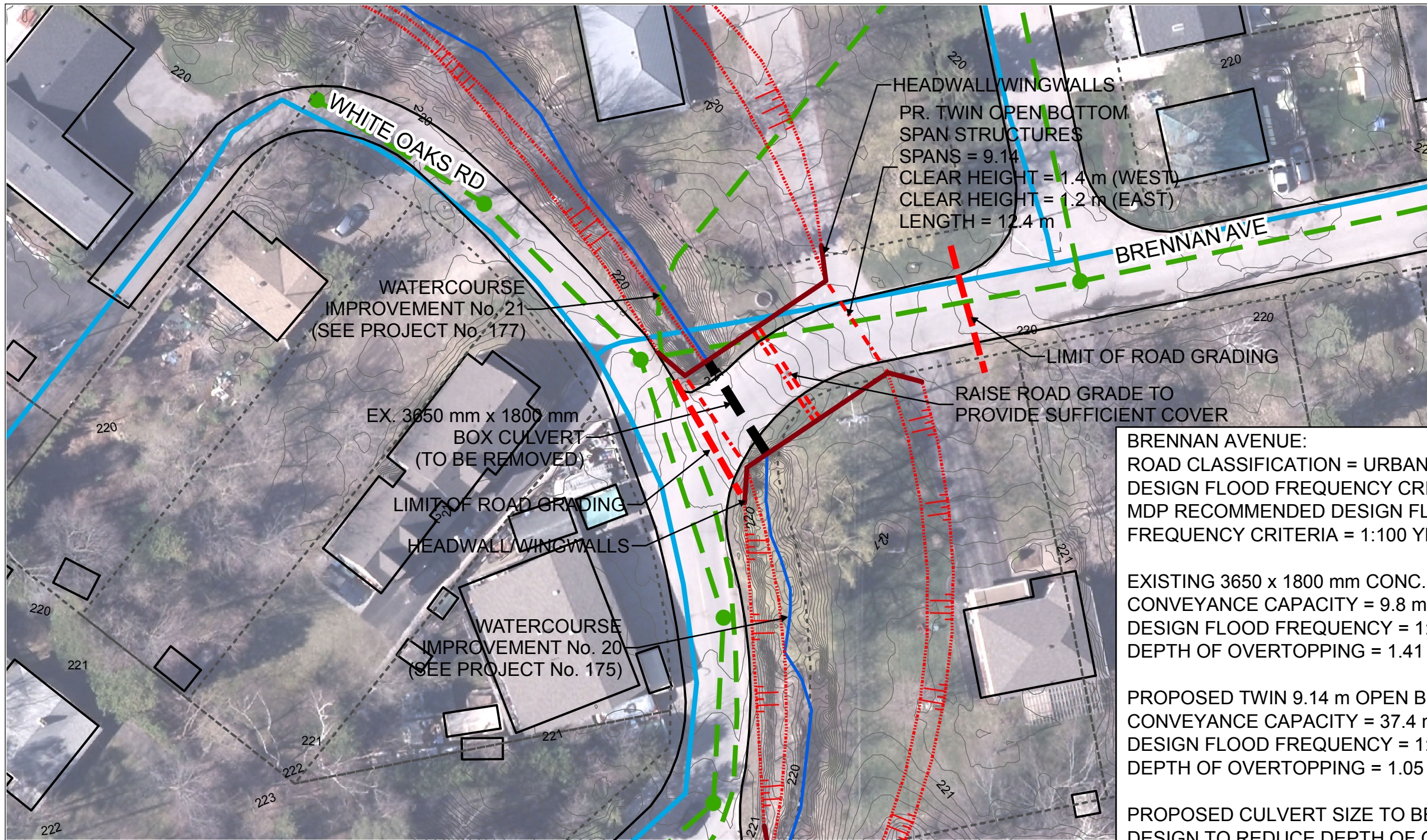
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|--|-------------------------------|--|----------------------------|
| | BANK EROSION | | EX. SANITARY SEWER |
| | BED EROSION/ KNICKPOINT | | EX. WATERCOURSE |
| | INFRASTRUCTURE AT RISK | | EX. WATERMAIN |
| | PR. STORM MAINTENANCE HOLE | | EX. STORM MAINTENANCE HOLE |
| | PR. STORM SEWER | | EX. STORM SEWER |
| | EX. SANITARY MAINTENANCE HOLE | | EX. PROPERTY LINE |
| | | | PROPERTY ACQUISITION |

DRAINAGE MASTER PLAN FINAL PREFERRED ALTERNATIVE SOLUTION

PROJECT No. 175
WATERCOURSE IMPROVEMENT No. 20
WHISKEY CREEK WATERSHED

SCALE = 1:500

DATE: MARCH 2019



PROPERTY ACQUISITION:
NONE

BRENNAN AVENUE:
 ROAD CLASSIFICATION = URBAN LOCAL
 DESIGN FLOOD FREQUENCY CRITERIA = 1:50 YEAR
 MDP RECOMMENDED DESIGN FLOOD FREQUENCY CRITERIA = 1:100 YEAR

EXISTING 3650 x 1800 mm CONC. BOX CULVERT
 CONVEYANCE CAPACITY = 9.8 m³/s (EXISTING FLOWS)
 DESIGN FLOOD FREQUENCY = 1:5 YEAR
 DEPTH OF OVERTOPPING = 1.41 m (REGULATORY EVENT)

PROPOSED TWIN 9.14 m OPEN BOTTOM SPAN STRUCTURES
 CONVEYANCE CAPACITY = 37.4 m³/s (FUTURE FLOWS)
 DESIGN FLOOD FREQUENCY = 1:100 YEAR
 DEPTH OF OVERTOPPING = 1.05 m (REGULATORY EVENT)

PROPOSED CULVERT SIZE TO BE REVIEWED AT DETAILED DESIGN TO REDUCE DEPTH OF OVERTOPPING



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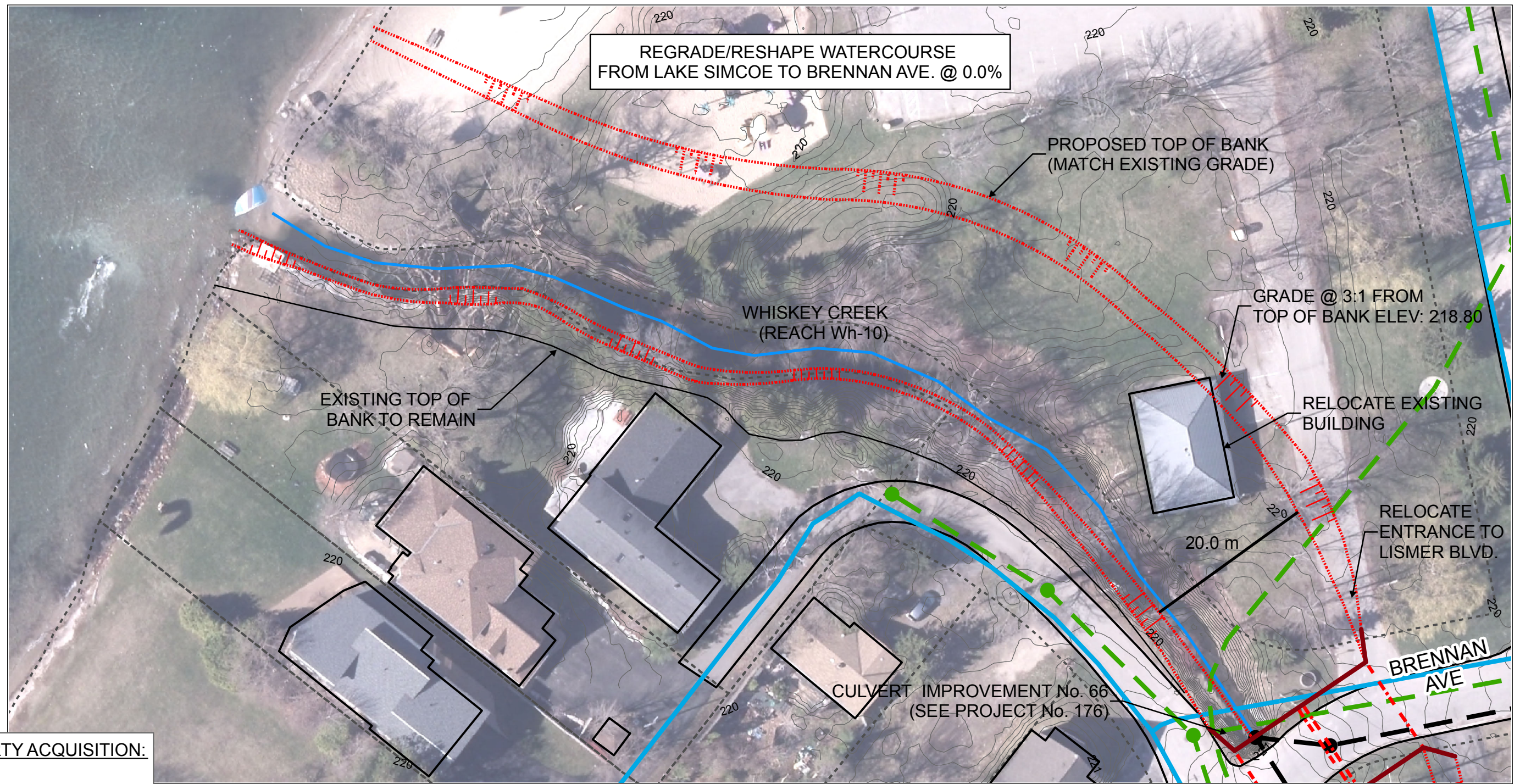
LEGEND

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|------------------------------|---------------------------------|
| --- PR. CULVERT | --- EX. SANITARY SEWER |
| --- PR. STORM SEWER | ● EX. SANITARY MAINTENANCE HOLE |
| ● PR STORM MAINTENANCE HOLE | --- EX. WATERMAIN |
| --- EX. STORM SEWER | --- EX. CULVERT |
| ● EX. STORM MAINTENANCE HOLE | --- EX. PROPERTY LINE |
| --- WATERCOURSE | --- PROPERTY ACQUISITION |

DRAINAGE MASTER PLAN **FINAL PREFERRED ALTERNATIVE SOLUTION**

PROJECT No. 176
 CULVERT IMPROVEMENT No. 66
 (BRENNAN AVE.)
 WHISKEY CREEK WATERSHED
 SCALE = 1:500

DATE: MARCH 2019



PROPERTY ACQUISITION:
NONE



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LEGEND

- | | | | |
|--|-------------------------------|--|----------------------------|
| | BANK EROSION | | EX. SANITARY SEWER |
| | BED EROSION/ KNICKPOINT | | EX. WATERCOURSE |
| | INFRASTRUCTURE AT RISK | | EX. WATERMAIN |
| | PR. STORM MAINTENANCE HOLE | | EX. STORM MAINTENANCE HOLE |
| | PR. STORM SEWER | | EX. STORM SEWER |
| | EX. SANITARY MAINTENANCE HOLE | | EX. PROPERTY LINE |
| | | | PROPERTY ACQUISITION |

DRAINAGE MASTER PLAN **FINAL PREFERRED ALTERNATIVE SOLUTION**

PROJECT No. 177
WATERCOURSE IMPROVEMENT No. 21
WHISKEY CREEK WATERSHED

SCALE = 1:500

DATE: MARCH 2019