Appendix N: Final Preferred Solutions Conceptual Designs – Lovers Creek Watershed
EX. SANITARY MAINTENANCE

PROPERTY ACQUISITION:
NONE

EX. PROPERTY LINE

EXISTING SWMF OUTLET CONTROLS TO REMAIN

EX. WATERCOURSE

MATCH TO EXISTING @ 3:1 SLOPE

REPLACE/ABANDON EX. STORM SEWER

SWMF RETROFIT FOR WATER QUALITY TREATMENT:
LEVEL 1 "ENHANCED" TREATMENT (80% TSS REMOVAL)
PHOSPHORUS REDUCTION = 26.9 kg/year

SWMF WETLAND DETAILS:
BOTTOM ELEVATION = 292.60 m
PERMANENT POOL ELEVATION = 292.90 m
SURFACE AREA = 1,935 m²
PERMANENT POOL VOLUME = 925 m³

PERMANENT POOL VOLUME = 925 m³
SURFACE AREA = 1,935 m²
PERMANENT POOL ELEVATION = 292.90 m
BOTTOM ELEVATION = 292.60 m

LEGEND

PR. LID

EX. SANITARY MAINTENANCE
HOLE

EX. SANITARY SEWER

EX. STORM MAINTENANCE
HOLE

EX. STORM SEWER

EX. WATERCOURSE

EX. WATERMAIN

PROPERTY ACQUISITION

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DRAINAGE MASTER PLAN
PROJECT No. 96
SWMF RETROFIT No. 87 (LV17)
LOVERS CREEK WATERSHED

DATE: MARCH 2019
SCALE = 1:1,000

PROJECT No. 96
SWMF RETROFIT No. 87 (LV17)
LOVERS CREEK WATERSHED

DATE: MARCH 2019
SCALE = 1:1,000
EXISTING SWMF OUTLET CONTROLS:
1) 1 - 920 mm X 1000 mm RECTANGULAR ORIFICE
(INV. = 280.20 m)
2) 1 - 2000 mm X 2000 mm DICB (T/GRATE = 282.22 m)
WITH 1400 mm ø OUTLET PIPE (INV. = 278.38 m)
3) 1 - EMERGENCY OVERFLOW WEIR

EXISTING SWMF OUTLET CONTROLS TO REMAIN

SWMF RETROFIT FOR WATER QUALITY TREATMENT:
LEVEL 1 "ENHANCED" TREATMENT (80% TSS REMOVAL)
PHOSPHORUS REDUCTION = 90.1 kg/year
ADDITIONAL ACTIVE STORAGE = 2,910 m³

UNDERGROUND INFILTRATION SYSTEM:
DRAINAGE AREA = 96.9 ha
AREA = 1,765 m² (59 m X 30 m)
STORAGE VOLUME = 2,910 m³
PEAK DESIGN FLOW = N/A
TARGET CONTROL VOLUME = 3.0 mm
DEPTH OF COVER = 0.60 m (MIN)
BOTTOM ELEVATION = 277.00 m

SEDIMENT FOREBAY DETAILS:
PERMANENT POOL DEPTH = 1.0 m
PERMANENT POOL LEVEL = 280.20 m

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LEGEND
PR STORM MAINTENANCE HOLE
PR. STORM SEWER
EX. SANITARY SEWER
EX. SANITARY MAINTENANCE HOLE
PR. LID
EX. WATERMAIN
EX. STORM MAINTENANCE HOLE
EX. STORM SEWER
EX. WATERCOURSE
EX. PROPERTY LINE
PROPERTY ACQUISITION

DRAINAGE MASTER PLAN
FINAL PREFERRED ALTERNATIVE SOLUTION

DATE: MARCH 2019

PROJECT No. 97
SWMF RETROFIT No. 65 (LV07)
LOVERS CREEK WATERSHED

SCALE = 1:1,000
RAILWAY CROSSING:

EX. SANITARY MAINTENANCE
PR. STORM MAINTENANCE

DEPTH OF OVERTOPPING = 0.0 m (REGULATORY EVENT)

HAZEL STORM

DESIGN FLOOD FREQUENCY = REGIONAL (HURRICANE)

CONVEYANCE CAPACITY = 26.0 m³/s (FUTURE FLOWS)

PROPOSED: TWIN 2100 mm ø CONC. CULVERTS

DEPTH OF OVERTOPPING = 0.35 m (REGULATORY EVENT)

DESIGN FLOOD FREQUENCY = 1:25 YEAR

CONVEYANCE CAPACITY = 6.7 m³/s

EXISTING: 1200 mm ø CSP CULVERT

CONVEYANCE CAPACITY = 6.7 m³/s (EXISTING FLOWS)

DESIGN FLOOD FREQUENCY = REGIONAL (HURRICANE)

CONVEYANCE CAPACITY = 26.0 m³/s (FUTURE FLOWS)

EXISTING CULVERT

EXISTING CULVERT INVERTS

MATCH PROPOSED CULVERT INVERTS

REGRADE CHANNEL TO MATCH PROPOSED CULVERT INVERTS

HEADWALL/WINGWALLS

TO THE CITY’S DISCRETION.

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WARNING:

PROPERTY ACQUISITION:
(A) 140 LOCKHART RD. (PORTION OF)
MINIMUM RECOMMENDED PROPERTY ACQUISITION SHOWN

ACTUAL PROPERTY ACQUISITION TO BE CONFIRMED AT DETAILED DESIGN

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LEGEND

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

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.

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

EXISTING: TWIN 3800 mm x 650 mm CONC. BOX CULVERTS
CONVEYANCE CAPACITY = 4.0 m³/s (EXISTING FLOWS)
DESIGN FLOOD FREQUENCY = 1:25 YEAR
DEPTH OF OVERTOPPING = 0.64 m (REGULATORY EVENT)

PROPOSED: 10.67 m OPENBOTTOM SPAN STRUCTURE
CONVEYANCE CAPACITY = 13.5 m³/s (FUTURE FLOWS)
DESIGN FLOOD FREQUENCY = 1:100 YEAR
DEPTH OF OVERTOPPING = 0.29 m (REGULATORY EVENT)

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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. 99
CULVERT IMPROVEMENT No. 89 (LOCKHART RD.)
LOVERS CREEK WATERSHED
SCALE = 1:500
DATE: MARCH 2019
LOCKHART ROAD:
DESIGN FLOOD FREQUENCY CRITERIA = 1:100 YEAR

EXISTING: 6100 mm x 2400 mm CONC. BOX CULVERT
CONVEYANCE CAPACITY = 38.1 m$^3$/s (EXISTING FLOWS)
DESIGN FLOOD FREQUENCY = 1:10 YEAR
DEPTH OF OVERTOPPING = 1.55 m (REGULATORY EVENT)

PROPOSED: TWIN 10.67 m OPEN BOTTOM SPAN STRUCTURE
CONVEYANCE CAPACITY = 97.6 m$^3$/s (FUTURE FLOWS)
DESIGN FLOOD FREQUENCY = 1:100 YEAR
DEPTH OF OVERTOPPING = 1.03 m (REGULATORY EVENT)

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

THE SUBJECT ROAD HAS BEEN IDENTIFIED FOR FUTURE ROAD WIDENING
AS PART OF THE TRANSPORTATION MASTER PLAN. THE CULVERT IMPROVEMENT
SHOW 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**
- **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. 101**
CULVERT IMPROVEMENT No. 91
(LOCKHART RD)
LOVERS CREEK WATERSHED
SCALE = 1:500

DATE: MARCH 2019
EXISTING SWMF OUTLET CONTROLS:
1) EXISTING: 1 - 500 mm X 500 mm RECTANGULAR ORIFICE (INV. = 279.95 m)
2) EXISTING: 1 - 2000 mm X 1300 mm DICB (T/GRATE = 282.65 m)
3) EXISTING: 1 - EMERGENCY OVERFLOW WEIR (WEIR SILL INV. = 283.75 m)

EXISTING SWMF OUTLET CONTROLS TO REMAIN

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

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BCRY RAILWAY CROSSING:
DESIGN FLOOD FREQUENCY CRITERIA = 1:50 YEAR

EXISTING: 900 mm x 1050 mm CONC. ELLIPSE CULVERT
CONVEYANCE CAPACITY = 5.8 m³/s (EXISTING FLOWS)
DESIGN FLOOD FREQUENCY = 1:25 YEAR

PROPOSED: 1500 mm ø CONC. CULVERT
CONVEYANCE CAPACITY = 19.6 m³/s (FUTURE FLOWS)
DESIGN FLOOD FREQUENCY = REGIONAL (HURRICANE HAZEL) STORM
CULVERT SIZED TO PREVENT OVERTOPPING DURING REGIONAL STORM

PROPERTY ACQUISITION:
NONE

REGRADE/RESHAPE CHANNEL AT CULVERT INLET TO SUIT
REGRADE/RESHAPE CHANNEL AT CULVERT OUTLET TO SUIT
CONC. HEADWALL

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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.

**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

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ELLIS DRIVE:
ROAD CLASSIFICATION = URBAN LOCAL
DESIGN FLOOD FREQUENCY CRITERIA = 1:50 YEAR

EXISTING: TWIN 1350 mm ø CONC. CULVERT
CONVEYANCE CAPACITY = 5.3 m³/s (EXISTING FLOWS)
DESIGN FLOOD FREQUENCY = 1:10 YEAR
DEPTH OF OVERTOPPING = 0.90 m (REGULATORY EVENT)

PROPOSED: 3000 mm x 1200 mm CONC. BOX CULVERT
CONVEYANCE CAPACITY = 8.3 m³/s (FUTURE FLOWS)
DESIGN FLOOD FREQUENCY = 1:50 YEAR
DEPTH OF OVERTOPPING = 0.06 m (REGULATORY EVENT)

REGRADE/RESHAPE CHANNEL AT CULVERT INLET TO SUIT
REGRADE/RESHAPE CHANNEL AT CULVERT OUTLET TO SUIT

EX: TWIN 1350 mm ø CONC. CULVERT (TO BE REMOVED)
PR: 20m - 3000 mm x 1200 mm CONC. BOX CULVERT

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

PROPERTY ACQUISITION: NONE

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DRAINAGE MASTER PLAN
FINAL PREFERRED ALTERNATIVE SOLUTION
PROJECT No. 109
CULVERT IMPROVEMENT No. 99
(ELLIS DR.)
LOVERS CREEK WATERSHED
SCALE = 1:500

DATE: MARCH 2019
WELHAM ROAD:
ROAD CLASSIFICATION= MINOR COLLECTOR
DESIGN FLOOD FREQUENCY CRITERIA = 1:50 YEAR

EXISTING: TWIN 2000 mm ø CONC. CULVERTS
CONVEYANCE CAPACITY = 17.7 m³/s (EXISTING FLOWS)
DESIGN FLOOD FREQUENCY = 1:10 YEAR
DEPTH OF OVERTOPPING = 0.25 m (REGULATORY EVENT)

PROPOSED: TWIN 3000 mm x 1200 mm CONC. BOX CULVERTS
CONVEYANCE CAPACITY = 30.9 m³/s (FUTURE FLOWS)
DESIGN FLOOD FREQUENCY = 1:50 YEAR
DEPTH OF OVERTOPPING = 0.08 m (REGULATORY EVENT)

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DRAINAGE MASTER PLAN
FINAL PREFERRED ALTERNATIVE SOLUTION
PROJECT No. 110
CULVERT IMPROVEMENT No. 98
(WELHAM RD.)
LOVERS CREEK WATERSHED
SCALE = 1:500

DATE: MARCH 2019
EX. SANITARY MAINTENANCE

EX. STORM MAINTENANCE

WET POND DETAILS:
- BOTTOM ELEVATION = 253.50 m
- PERMANENT POOL ELEVATION = 255.50 m
- TOP ELEVATION = 257.50 m
- SURFACE AREA = 36,420 m²
- PERMANENT POOL VOLUME = 8,210 m³

LEVEL 3 "BASIC" TREATMENT (60% TSS REMOVAL)
- PHOSPHORUS REDUCTION = 142.5 kg/year
- ADDITIONAL ACTIVE STORAGE = 0 m³

EXISTING SWMF OUTLET CONTROLS:
- 1) 1 - 800 mm X 1020 mm RECTANGULAR ORIFICE (INV. = 255.50 m)
  WITH 1 - 1500 mm ø OUTLET PIPE (INV. = 255.04 m)
- 2) 2 - 3800 mm X 3050 mm DICB (T/GRATE = 261.18 m)
  WITH 2300 mm ø OUTLET PIPE (INV. 257.06 m)

PROPERTY ACQUISITION:
NONE

DRAINAGE MASTER PLAN
FINAL PREFERRED ALTERNATIVE SOLUTION

PROJECT No. 111
SWMF RETROFIT No. 30 (LV02)
LOVERS CREEK WATERSHED
SCALE = 1:1,500
DATE: MARCH 2019

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

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EXISTING SWMF OUTLET CONTROLS:
1) 1 - 600 mm x 500 mm RECTANGULAR ORIFICE (INV. = 265.55 m)
2) 3 - 800 mm x 420 mm RECTANGULAR ORIFICE (INV. = 267.79 m)

EXISTING SWMF OUTLET CONTROLS TO REMAIN

PROPOSED SWMF OUTLET CONTROLS:
3) 1 - 115 mm ø ORIFICE (INV. = 265.05 m)
4) EMERGENCY OVERFLOW WEIR (SILL = 265.90 m)

LEGEND

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

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PROPERTY ACQUISITION: NONE

HURONI A RD:
ROAD CLASSIFICATION= ARTERIAL
DESIGN FLOOD FREQUENCY CRITERIA = 1:100 YEAR

EXISTING: 1400 mm ø CSP CULVERT
CONVEYANCE CAPACITY = 3.7 m³/s (EXISTING FLOWS)
DESIGN FLOOD FREQUENCY = 1:2 YEAR
DEPTH OF OVERTOPPING = 0.68 m (REGULATORY EVENT)

PROPOSED: 3000 mm x 1200 mm CONC. BOX CULVERT
CONVEYANCE CAPACITY = 8.0 m³/s (FUTURE FLOWS)
DESIGN FLOOD FREQUENCY = 1:100 YEAR
DEPTH OF OVERTOPPING = 0.15 m (REGULATORY EVENT)

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REMOVE AND REPLACE EXISTING LOCAL STORM SEWER WITH TRUNK STORM SEWER

TIE EXISTING STORM SEWER INTO PROPOSED TRUNK STORM SEWER (TYPICAL)

AS PART OF DETAILED DESIGN, THE TRUNK STORM SEWER IS TO BE SIZED TO ELIMINATE OVERLAND FLOW DEFICIENCIES TO SUCH THAT THE CONSERVATION AUTHORITIES SAFE ACCESS/EGRESS CRITERIA IS SATISFIED.
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Legend
- Bank Erosion
- Bed Erosion/ Knickpoint
- Infrastructure at Risk
- PR. Storm Maintenance Hole
- PR. Storm Sewer
- EX. Storm Sewer
- EX. Sanitary Sewer
- EX. Watercourse
- EX. Watermain
- EX. Storm Maintenance Hole
- EX. Property Line
- Property Acquisition

DRAINAGE MASTER PLAN
FINAL PREFERRED ALTERNATIVE SOLUTION
PROJECT No. 120
WATERCOURSE IMPROVEMENT No. 22
LOVERS CREEK WATERSHED
SCALE = 1:1,500
DATE: MARCH 2019
REALIGN CHANNEL AND STABILIZE CHANNEL BANKS WITH BIO-ENGINEERING BANK TREATMENT TO STABILIZE EX. BANK AND BED EROSION AND CHANNEL MEANDER (SEE DETAILS)

CULVERT IMPROVEMENT No. 105 (SEE PROJECT No. 122)

LIMIT OF WATERCOURSE IMPROVEMENTS

EX. SANITARY MAINTENANCE BANK EROSION INFRASTRUCTURE AT RISK

LIMIT OF WATERCOURSE IMPROVEMENTS

LOVERS CREEK (REACH Lo-20)

LEGEND

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

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TATHAM ENGINEERING

Barrie

DRAINAGE MASTER PLAN
FINAL PREFERRED ALTERNATIVE SOLUTION

PROJECT No. 121
WATERCOURSE IMPROVEMENT No. 23
LOVERS CREEK WATERSHED

SCALE = 1:500

DATE: MARCH 2019
TOLLENDAL MILL ROAD:
ROAD CLASSIFICATION = MINOR COLLECTOR
DESIGN FLOOD FREQUENCY CRITERIA = 1:50 YEAR

EXISTING: 4150 mm ø CSP CULVERT
CONVEYANCE CAPACITY = 34.0 m³/s (EXISTING FLOWS)
DESIGN FLOOD FREQUENCY = 1:50 YEAR
DEPTH OF OVERTOPPING = 1.97 m (REGULATORY EVENT)

PROPOSED: 10356 mm x 3892 mm LOW PROFILE
BRIDGE PLATE CULVERT
CONVEYANCE CAPACITY = 119.3 m³/s (FUTURE FLOWS)
DESIGN FLOOD FREQUENCY = 1:100 YEAR
DEPTH OF OVERTOPPING = 2.39 m (REGULATORY EVENT)

EXISTING: 4150 mm ø CSP CULVERT
DESIGN FLOOD FREQUENCY CRITERIA = 1:50 YEAR

ROAD CLASSIFICATION = MINOR COLLECTOR
TOLLENDAL MILL ROAD:

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LEGEND

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

DATE: MARCH 2019

DRAINAGE MASTER PLAN
FINAL PREFERRED ALTERNATIVE SOLUTION
PROJECT No. 122
CULVERT IMPROVEMENT No. 105
(TOLLENDAL MILL RD.)
LOVERS CREEK WATERSHED
SCALE = 1:500