

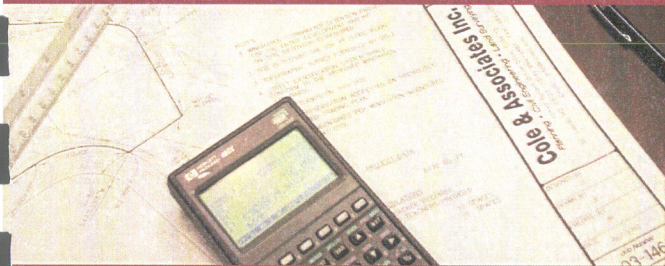
2009
Cole

ENGINEERS ARCHITECTS
PLANNERS SURVEYORS



Storm Water Management Facilities
Report

Village of St. Mary's
Phase 1



OK - JLS
8-18-09

Prepared For: McEagle Properties, LLC
1001 Boardwalk Place
O'Fallon, MO 63366

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10777 Sunset Office Drive
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Date: February 20, 2009
June 2, 2009

Job #: 07-0154

TABLE OF CONTENTS

1. EXECUTIVE SUMMARY
2. SITE WATER QUALITY CALCULATIONS – APPENDIX A
3. WET BASIN CALCULATIONS - APPENDIX B
4. GRASS CHANNEL CALCULATIONS - APPENDIX C
5. VORTSENTRY CALCULATIONS - APPENDIX D
6. INSPECTION MAINTENANCE REPORTS - APPENDIX E
7. DRAINAGE AREA MAP EXHIBIT - APPENDIX F

I. Executive Summary

The purpose of this report is to present the water quality analysis as required by the City of O' Fallon. The water quality calculations were performed using the requirement of the Georgia Stormwater Management Manual, Volume 2, August, 2001 and City of O' Fallon, Chapter 405, Section 405.247, Stormwater Quality – Best Management Practices, design criteria.

II. Water Quality Method of Analysis

The subject site is approximately 28.8 acres which is located just east of Highway M in the City of O' Fallon, Missouri. Phase One of the development includes redevelopment of the existing facility, construction of a new Independent Living building and Independent Living Villa's. Phase One constitutes approximately 18.4 acres. A large area of Phase One includes rehabilitation of existing building with no site improvements.

The required water quality volume was determined for three distinct drainage areas. The water quality volume is the storage needed to capture and treat 90% of the recorded daily rainfall which is equivalent to 1.14 inches of rainfall.

The water quality volume is to be treated using structural methods and Proprietary BMP's. A larger portion of the site flows to a lake and is treated using the lake, known as Drainage Area 1. A portion of the site drains, along the southern border of the site drains to a Grass Channel filter, known as drainage area 2. One additional small drainage area will be treated using a Contech VortSentry HS60 filter product. A water quality drainage area map can be found in Exhibit A. Water Quality Volume Calculations can be found in Exhibit B. Copies of operation and inspection maintenance reports are included in Exhibit C. A small area along the southern border, in and around some of the existing buildings is impractical to provide water quality treatment. Major areas of Drainage Area 1 include large areas of undisturbed ground that we will provide water quality treatment with the proposed lake. Further water quality treatment will be provided with the development of the remainder of the site.

III. Water Quality Summary

Area 1:

Required Water Quality Volume	= 29,621 cu. ft.
Provided Water Quality Volume	= 76,151 cu. ft.
Treatment Method	= Detention/Water Quality Pond

Area 2:

Required Water Quality Volume	= 2,178 cu. ft.
Provided Water Quality Volume	= 2,178 cu. ft.
Treatment Method	= Grass Channel

Area 3:

Required Water Quality Volume	= 8,130 cu. ft.
Max. Flow Rate	=2.17 cfs
Provided Flow Rate	=2.20 cfs
Treatment Method	= VortSentry HS60

Storm Water Quality Report

VILLAGE OF ST. MARY'S

APPENDIX A

Ca Job # 07-0154

Water Quality Calculations

Project Name: Village of St. Mary's
Project Number: 07-0154

Drainage Area 1 (Tributary to Basin B)

Water Quality Calculations

% Impervious = 59
P = 1.14 in.
A = 12.32 ac.

P = average rainfall event (inches)
A = drainage area (acres)
Rv = volumetric runoff coefficient

Rv = 0.581

WQv = 0.6800 ac.-ft.
Min WQv = 0.2053 ac.-ft.

**Use WQv = 0.6800 ac.-ft.
29621 cubic ft.**

Drainage Area 2 (Grass Channel_Drainage Area-"O")

Water Quality Calculations

% Impervious = 72
P = 1.14 in.
A = 0.7 ac.

P = average rainfall event (inches)
A = drainage area (acres)
Rv = volumetric runoff coefficient

Rv = 0.698

WQv = 0.0464 ac.-ft.
Min WQv = 0.0117 ac.-ft.

**Use WQv = 0.0464 ac.-ft.
2022 cubic ft.**

Drainage Area 3 (VortSentry)

Water Quality Calculations

% Impervious = 60
P = 1.14 in.
A = 3.33 ac.

P = average rainfall event (inches)
A = drainage area (acres)
Rv = volumetric runoff coefficient

Rv = 0.590

WQv = 0.1866 ac.-ft.
Min WQv = 0.0555 ac.-ft.

**Use WQv = 0.1866 ac.-ft.
8130 cubic ft.**

Storm Water Quality Report

VILLAGE OF ST. MARY'S

APPENDIX B

Ca Job # 07-0154

Water Quality Calculations

Basin B

$WQV=(P \times Rv \times A)/12$

$WQV= 0.680 \text{ Acre-Feet}$

$29620.80 \text{ Cubic Feet}$

Basin B

Treatment

Required Pool Volume = 1.0 WQV

WQV = 29,621 c.f.

Water Quality Volume Provided = Pool Volume - 76,151 c.f.

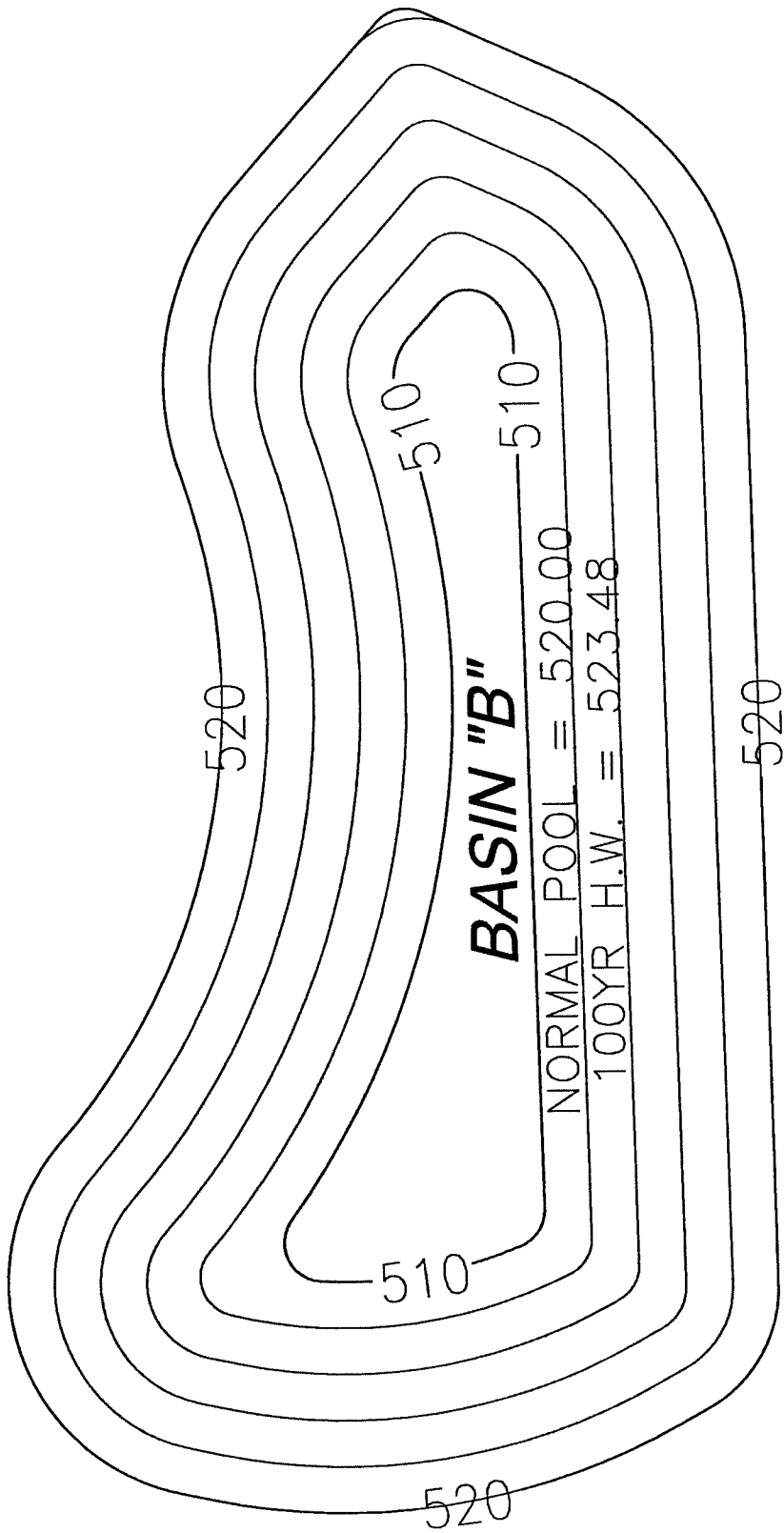
Shaded areas must be completed by designer

P= 1.14 inches I (Impervious in %)= 59.0 %

Rv=0.05 + .009(I) Area of site = 12.3 Acre

Rv= 0.6

JOB NO. 07-154
DATE: 2-20-09
CALC. BY: MEV



Elevation (ft)	Planimeter (sq.in)	Area (sq.ft)	A1+A2+sqr(A1*A2) (sq.ft)	Volume (cu.ft)	Volume Sum (cu.ft)
510.00	-----	2004	0	0	0
512.00	-----	3985	8815	5877	5877
514.00	-----	6199	15154	10103	15979
516.00	-----	8643	22162	14774	30754
518.00	-----	11320	29854	19903	50657
520.00	-----	14230	38242	25495	76151

POND VOLUME EQUATIONS

* Incremental volume computed by the Conic Method for Reservoir Volumes.

$$\text{Volume} = (1/3) * (\text{EL2}-\text{EL1}) * (\text{Area1} + \text{Area2} + \text{sq.rt.}(\text{Area1}*\text{Area2}))$$

where: EL1, EL2 = Lower and upper elevations of the increment
Area1, Area2 = Areas computed for EL1, EL2, respectively
Volume = Incremental volume between EL1 and EL2

Sediment Forebay Sizing Calculations-Basin B

Forebay-East

Project Name: Village of St. Mary's

Project Number: 07-0154

Detention:Lake

The sediment forebay is to be sized to capture 0.1 inches per impervious area of contributing drainage area. The forebay storage volume counts towards the total WQv requirements.

Impervious Area = 2.800 acres

Forebay Volume= Impervious Area*0.1in.

**Required Forebay Volume= 0.2800 ac-in.
1016.40 cubic feet**

Provided Forebay Volume = 3284.00 cubic feet

For sediment forebay volume, see the attached volume table.

Sediment Forebay Sizing Calculations-Basin B

Forebay West

Detention:Lake

The sediment forebay is to be sized to capture 0.1 inches per impervious area of contributing drainage area. The forebay storage volume counts towards the total WQv requirements.

Impervious Area = 2.000 acres

Forebay Volume= Impervious Area*0.1in.

**Required Forebay Volume= 0.2000 ac-in.
726.00 cubic feet**

Provided Forebay Volume = 6742.00 cubic feet

For sediment forebay volume, see the attached volume table.

Elevation (ft)	Planimeter (sq.in)	Area (sq.ft)	A1+A2+sqr(A1*A2) (sq.ft)	Volume (cu.ft)	Volume Sum (cu.ft)
520.00	-----	478	0	0	0
522.00	-----	1320	2592	1728	1728
523.00	-----	1804	4667	1556	3284

POND VOLUME EQUATIONS

* Incremental volume computed by the Conic Method for Reservoir Volumes.

Volume = (1/3) * (EL2-EL1) * (Area1 + Area2 + sq.rt.(Area1*Area2))

where: EL1, EL2 = Lower and upper elevations of the increment
Area1, Area2 = Areas computed for EL1, EL2, respectively
Volume = Incremental volume between EL1 and EL2

Elevation (ft)	Planimeter (sq.in)	Area (sq.ft)	A1+A2+sq ^{rt} (A1*A2) (sq.ft)	Volume (cu.ft)	Volume Sum (cu.ft)
520.00	-----	1229	0	0	0
522.00	-----	2610	5630	3753	3753
523.00	-----	3384	8966	2989	6742

POND VOLUME EQUATIONS

* Incremental volume computed by the Conic Method for Reservoir Volumes.

$$\text{Volume} = (1/3) * (\text{EL2}-\text{EL1}) * (\text{Area1} + \text{Area2} + \text{sq.rt.}(\text{Area1}*\text{Area2}))$$

where: EL1, EL2 = Lower and upper elevations of the increment
 Area1,Area2 = Areas computed for EL1, EL2, respectively
 Volume = Incremental volume between EL1 and EL2

Storm Water Quality Report

VILLAGE OF ST. MARY'S

APPENDIX C

Ca Job # 07-0154

Shaded areas must be completed by designer

Water Quality Calculations

Grass Channel

WQV=(P x Rv x A)/12
 WQV= 0.050 Acre-Feet
 2178.00 Cubic Feet

P= 1.14 inches
 Rv=0.05 + .009(I)
 Rv= 0.7
 I (Impervious in %)= 72.0 %
 Area of site = 0.7 Acre
 0.0011 SQMI

Peak Discharge

Qa=P*Rv
 Qa = 0.8
 CN=1000/(10+5P+10Qa-10SQRT(Qa^2+1.25QaP))
 CN= 96.5

la=(200/CN)-2
 la = 0.1
 la/P= 0.1
 qu from Exhibit = 950.0

Qp=qu*A*Qa
 Qp = 0.8

n = 0.15
 S = 0.015%
 D = 4" = 0.33'

Q = [1.49/n] D^{2/3} S^{1/2} D W
 W = (0.15) (0.8)/(1.49)(0.33)^{5/3} (0.015)^{1/2} = 4.17 ft < 6.0 ft.

V = Q A = (0.8 cfs)/(6 ft x 0.33 ft) = 0.40fps < 1.0fps

Lmin. = V x 5 fps x 60 sec. = 0.4 fps x 5fps x 60 sec. = 120 ft. < 200 ft. provided.

Storm Water Quality Report

VILLAGE OF ST. MARY'S

APPENDIX D

Ca Job # 07-0154

Operation and Inspection Maintenance Report for Detention Lake

Inspector Name : _____
 Inspection Date: _____
 Project Location: _____

Inspections to be completed per listed inspection frequencies and after any storm events exceeding 1 inch of rainfall.

Inspection Items	Checked ? Yes/No	Maintenance Needed? Yes/No	Inspection Frequency	Comments
1. Embankment				
Adequate vegetation and ground cover			Annually	
Embankment erosion			Annually	
Animal Burrows			Annually	
Cracking, bulging, or sliding of dam			Annually	
Leaks on downstream face			Annually	
Abutment protection or riprap failure			Annually	
Visual settlement or horizontal misalignment of top of dam			Annually	
Other (specify)			Annually	
2. Riser and principal spillway				
Low flow orifice obstructed			Annually	
Debris on low flow trash rack			Annually	
Corrosion of low flow trash rack			Annually	
Excessive sediment accumulated inside riser			Annually	
Crack or displacement of riser			Annually	
Minor Spalling of riser (<1")			Annually	
Major Spalling (rebar exposed)			Annually	
Joint failures			Annually	
Water tightness			Annually	
3. Permanent Pool				
Undesirable vegetative growth			Monthly	
Floating or floatable debris removal required			Monthly	
Visible pollution			Monthly	
High water marks			Monthly	
Shoreline problems			Monthly	
Other (specify)			Monthly	
4. Sediment forebays				
Sedimentation noted			Monthly	
Sedimentation removal when depth <50% design depth			Monthly	
5. Condition of Outfalls into pond				
Riprap Failures			Annually, S	
Slope erosion			Annually, S	
Storm drain pipes			Annually, S	
headwalls			Annually, S	
Other (specify)			Annually, S	

*S DENOTES AFTER MAJOR STORM

Necessary Action:

All debris, trash, sediment, and other waste material should be disposed of at a suitable disposal/ recycling sites and in compliance with all applicable local, state, and federal waste regulations.

If any of the items where answered Yes for "Maintenance Needed" , the item needs to be repaired or corrected within 2 weeks of the inspection date.

If no action is necessary, routine inspections should be continued.

Once any facility repairs are completed, the site should be reinspected to verify that necessary repairs have been made

Records of all inspections and maintenance are to be kept and provided to the City of O' Fallon on a yearly basis.

Inspector's Signature

**Operation and Inspection Maintenance Report for
VortSentry HS60 Filter**

Inspector Name : _____
 Inspection Date: _____
 Project Location: _____

Inspections to be completed per listed inspection frequencies and after any storm events exceeding 1 inch of rainfall.

Inspection Items	Checked ?Yes/No	Maintenance Needed? Yes/No	Inspection Frequency	Comments
1. Debris Removal				
Adjacent area clear of debris			Monthly	
Inlets and outlets clear of debris			Monthly	
Filtration facility clear of debris			Monthly	
2. Oil and grease				
Any evidence of filter clogging			Monthly	
3. Sediment deposition				
Filtration chamber clean of sediments			Annually	
Sediment Chamber not more than half full of sediment			Annually	
4. Structural components				
Any evidence of structural deterioration			Annually	
Grates in good condition			Annually	
Any evidence of spalling or cracking			Annually	
5. Outlet/overflow spillway				
Good condition no need for repair			Annually	
Any evidence of erosion			Annually	
6. Overall function of facility				
Any evidence of flow bypassing facility			Annually	
Any noticeable odors outside facility			Annually	

Necessary Action:

All debris, trash, sediment, and other waste material should be disposed of at a suitable disposal/ recycling sites and in compliance with all applicable local, state, and federal waste regulations.

If any of the items where answered Yes for "Maintenance Needed" , the item needs to be repaired or corrected within 2 weeks of the inspection date.

If no action is necessary, routine inspections should be continued.

Once any facility repairs are completed, the site should be reinspected to verify that necessary repairs have been made

Records of all inspections and maintenance are to be kept and provided to the City of O' Fallon on a yearly basis.

Inspector's Signature

Operation and Inspection Maintenance Report for Grass Channels

Inspector Name : _____
 Inspection Date: _____
 Project Location: _____

Inspections to be completed per listed inspection frequencies and after any storm events exceeding 1 inch of rainfall.

Inspection Items	Checked ?Yes/No	Maintenance Needed? Yes/No	Inspection Frequency	Comments
1. Debris Removal				
Facility and adjacent area clear of debris			Monthly	
Inlets and outlets clear of debris			Monthly	
2. Vegetation				
Adjacent Area stabilized			Monthly	
Grass Mowed to Maintain Height of 4-6 in. (during growing season)			Monthly	
Any evidence of erosion			Monthly	
Evidence of erosion around inlets and outlets			Monthly	
Evidence of erosion around check dams			Monthly	
Any dead or diseased plants (remove and replant from March 15 to May 31 or August 15 to September 30			Fall/Spring	
3. Dewatering				
facility dewater between storms			Monthly	
4. Sediment Deposition				
Swale clean of sediments			Annually	
Sediment should not be > than 25% of swale design capacity (approx. 8 in. of sediment)			Annually	

Necessary Action:

All debris, trash, sediment, and other waste material should be disposed of at a suitable disposal/ recycling sites and in compliance with all applicable local, state, and federal waste regulations.

If any of the items were answered Yes for "Maintenance Needed" , the item needs to be repaired or corrected within 2 weeks of the inspection date.

If no action is necessary, routine inspections should be continued.

Once any facility repairs are completed, the site should be reinspected to verify that necessary repairs have been made

Records of all inspections and maintenance are to be kept and provided to the City of O' Fallon on a yearly basis.

Inspector's Signature

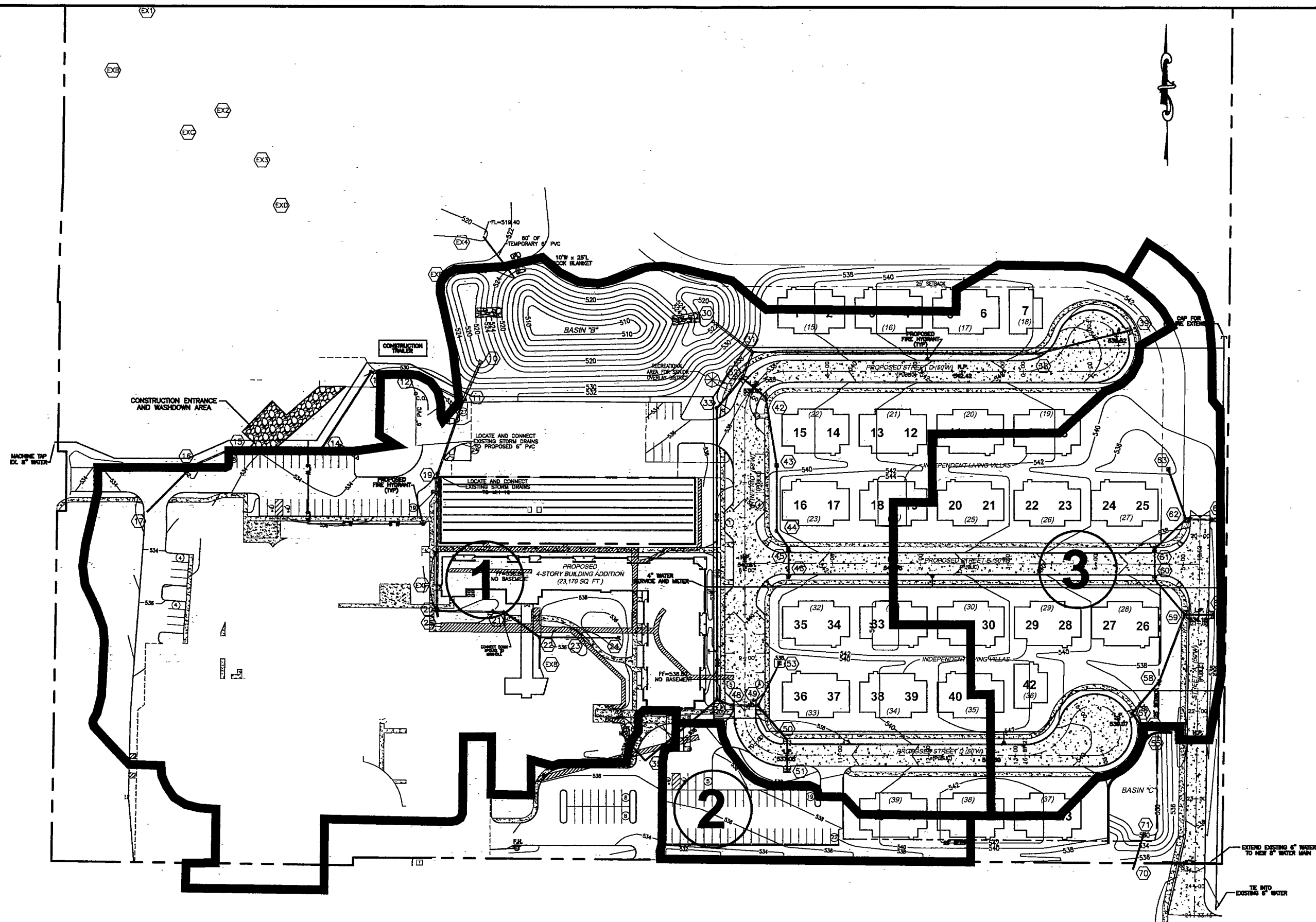
Storm Water Quality Report

VILLAGE OF ST. MARY'S

APPENDIX F

Ca Job # 07-0154

USER: Ken Koch, TAB, 1147 STORMWATER SOLUTIONS EXHIBIT
 DATE: February 20, 2009 - 11:16:10 AM
 DRAWING: ST. MARYS VILLAGE 07-0154-C12-DRAINAGE AREA



THIS SHEET FOR DRAINAGE CALCULATION PURPOSES ONLY AND NOT TO BE USED AS CONSTRUCTION PLANS

PLANNING AND DEVELOPMENT DEPARTMENT FILE # 0708.04

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DESIGN/CALC BY
 JKW/BJ
 DRAWN BY
 JKW/BJ
 CHECKED BY
 MEV
 DRAWING SCALE

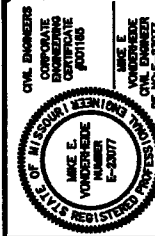
DATE
 2/11/09
 Job Number
 07-0154
 Sheet Number

C12.0

THE VILLAGE OF ST. MARYS
 IMPROVEMENT PLANS - PHASE 1

204 NORTH MAIN STREET
 OFFALON, MO. 63368

DRAINAGE AREA MAP



DEVELOPER/OWNER
MCEALE PROPERTIES, LLC
 201 BONDWALK SPRINGS PLACE OFFALON, MO. 63368
 CONTACT: ROB LOCKNER - PH: (636) 899-8830

CIVIL ENGINEER
 CORPORATE
 OFFICE
 201 BONDWALK SPRINGS PLACE
 OFFALON, MO. 63368
 CONTACT: ROB LOCKNER - PH: (636) 899-8830

NO. 10

DATE

REVISION DESCRIPTION