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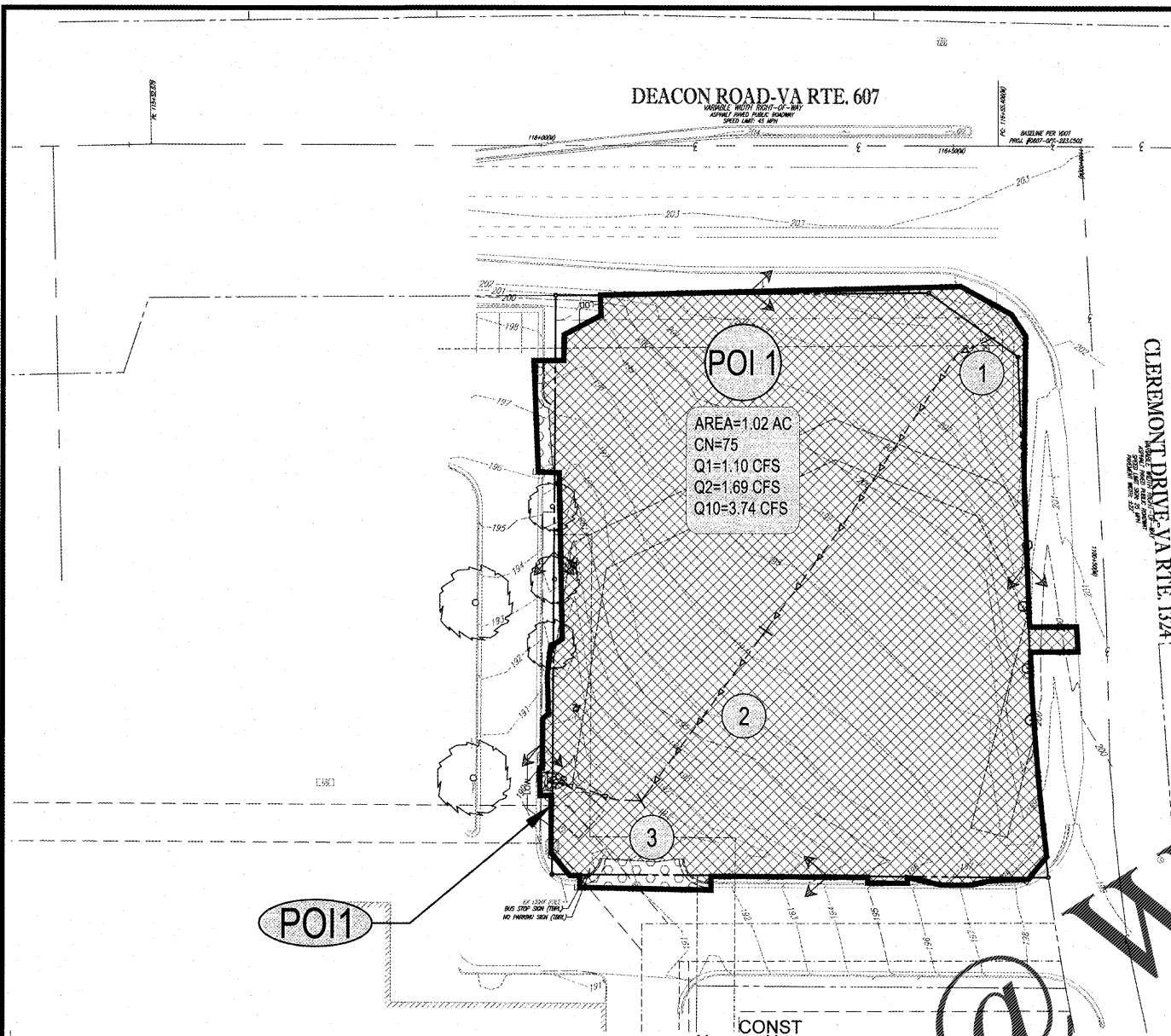
PROJECT:
NEW O'REILLY AUTO PARTS STORE
290 DEACON ROAD
FREDERICKSBURG, VA #4

SWM/BMP PLAN

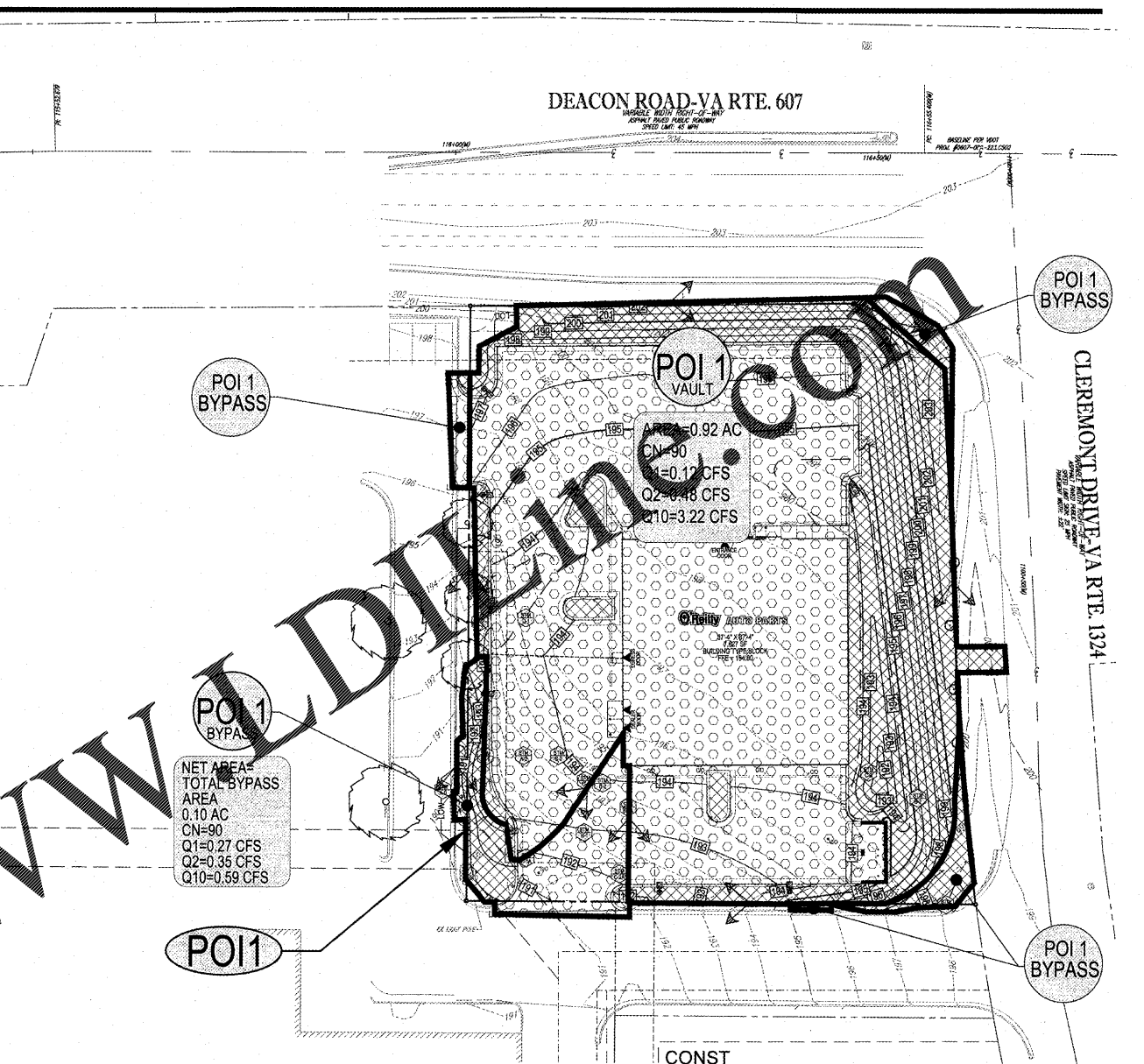
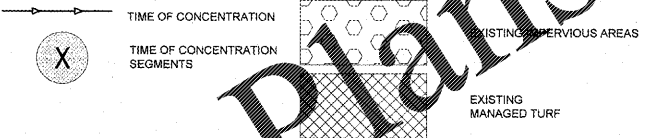
O'Reilly AUTO PARTS
CORPORATE OFFICES
550 SOUTH PATTERSON
SPRINGFIELD, MISSOURI 65802
(417) 862-2674 TELEPHONE

COMM #	4251
DATE:	11-2-18
REVISION	
DATE:	03-25-19
	06-24-19
	09-11-19

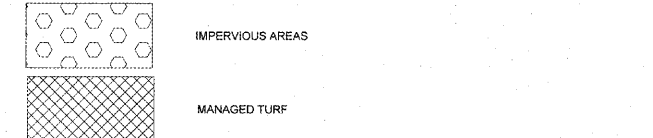
C3.4



1 PRE DEVELOPED DRAINAGE PLAN
C3.4 SCALE: 1" = 30'



2 POST DEVELOPED DRAINAGE PLAN
C3.4 SCALE: 1" = 30'



STORMWATER MANAGEMENT NARRATIVE

THE PROPOSED PROJECT IS FOR THE DEVELOPMENT OF AN EXISTING PROPERTY TO CONSTRUCT AN O'REILLY AUTO PARTS STORE AND ASSOCIATED SITE IMPROVEMENTS. THE EXISTING PROPERTY IS AN UNDEVELOPED PAD SITE. WITHIN THE DISTURBED AREA, THERE ARE 0.02 ACRES OF IMPERVIOUS AREA IN THE EXISTING CONDITION. THE TOTAL DISTURBED AREA IS 0.02 ACRES. THE POST DEVELOPMENT CONDITIONS WILL BE 87% IMPERVIOUS (0.66 ACRES) AND 33% PERVIOUS (0.34 ACRES). THE PRE AND POST DEVELOPMENT CONDITIONS WERE BOTH ANALYZED AT ONE POINT OF INTEREST (POI). THE ANALYZED POINT OF INTEREST IS LOCATED AT THE CORNER OF THE SITE IN THE SOUTHWEST CORNER AT STORM STRUCTURE EX-01 (PROPOSED STRUCTURE A-0). WATER QUALITY REQUIREMENTS FOR THIS SITE WILL BE MET BY PURCHASING 1.23 LBS OF NUTRIENT OFFSET CREDITS TO ENSURE THAT THERE IS NO DEGRADATION TO THE STORMWATER QUALITY CAUSED BY THE DEVELOPMENT OF THIS SITE. WATER QUANTITY REQUIREMENTS WILL BE MET THROUGH THE USE OF AN UNDERGROUND VAULT. THE VAULT IS AN ON-SITE DETENTION SYSTEM THAT UTILIZES A WEIR OUTFALL STRUCTURE. THIS MEASURE ATTENUATES THE POST DEVELOPMENT FLOWS TO MEET ENERGY BALANCE AND FLOOD PROTECTION REQUIREMENTS. THE PRE AND POST DEVELOPMENT FLOW RATES FOR THE 1-YEAR, 2-YEAR AND 10-YEAR STORM EVENTS FOR THIS SITE WERE CALCULATED USING THE SCS METHOD IN THE PROGRAM AUTOCAD HYDRAPLOW HYDROGRAPHS, AS SHOWN ON SHEETS C3.6 AND C3.7. TO CALCULATE THE OUTFALL REDUCTION REQUIRED TO MEET THE ENERGY BALANCE REQUIREMENTS, CURVE NUMBERS WERE CALCULATED USING VALUES FROM SCS TABLE 2.2A, RUNOFF CURVE NUMBERS FOR URBAN AREAS. RAINFALL DEPTHS USED TO CALCULATE FLOWS WERE TAKEN FROM NOAA ATLAS 14. THE PRE AND POST DEVELOPMENT FLOW RATES ARE SHOWN BELOW:

PRE-DEVELOPMENT FLOW RATES	POST-DEVELOPMENT FLOW RATES
POI 1	POI 1
1-YEAR CFS: 1.10	1-YEAR CFS: 0.36
2-YEAR CFS: 1.69	2-YEAR CFS: 0.54
10-YEAR CFS: 3.74	10-YEAR CFS: 3.59

AS SHOWN IN THE POST DEVELOPED DRAINAGE PLAN ABOVE, THE RUNOFF FROM THE 1-YEAR, 2-YEAR AND 10-YEAR STORM EVENTS HAS BEEN REDUCED IN THE POST-DEVELOPMENT CONDITION THEREFORE MEETING THE FLOOD PROTECTION REQUIREMENT. THE ENERGY BALANCE CALCULATIONS ON SHEET C3.7, THE REDUCTION IN THE POST DEVELOPMENT FLOWS ARE SUFFICIENT TO SATISFY THE ENERGY BALANCE EQUATION, THEREFORE MEETING THE CHANNEL PROTECTION REQUIREMENTS. 0.10 ACRES OF ONSITE RUNOFF ARE UNDETAINED AND ULTIMATELY DRAIN TO POI 1 AND IS SHOWN AS POI 1 BYPASS ON THIS SHEET. THE COMBINED RELEASE RATE OF THE DETENTION SYSTEM AND THE DISTURBED BYPASS AREA EQUALS 0.36 CFS. THE ALLOWABLE RELEASE RATE FOR ENERGY BALANCE WAS CALCULATED TO BE 0.36 CFS. THIS COMPUTATION TABLE CAN BE FOUND ON SHEET C3.7. THEREFORE, THE PROPOSED COMBINED RELEASE RATE MEETS ENERGY BALANCE REQUIREMENTS. SINCE BOTH FLOOD PROTECTION AND CHANNEL PROTECTION REQUIREMENTS HAVE BEEN SATISFIED, ALL STORMWATER QUANTITY REQUIREMENTS HAVE BEEN MET AND NO FURTHER ANALYSIS OR CALCULATIONS ARE REQUIRED.

BEST MANAGEMENT PRACTICES NARRATIVE
SINCE THE SUBJECT SITE IS AN EXISTING PAD SITE, WATER QUALITY REQUIREMENTS FOR THE DEVELOPMENT OF THIS SITE WERE CALCULATED USING THE VIRGINIA RUNOFF REDUCTION METHOD (VRRM) NEW DEVELOPMENT SPREADSHEET. USING THIS SPREADSHEET IT WAS DETERMINED THAT THE DEVELOPMENT OF THIS SITE WOULD REQUIRE THE TREATMENT OF AN ADDITIONAL 1.23 LBYR OF PHOSPHOROUS REMOVAL. TO MEET THIS REMOVAL REQUIREMENT, NUTRIENT OFFSET CREDITS WILL BE PURCHASED. SINCE THE PHOSPHOROUS REMOVAL ACHIEVED BY THESE CREDITS MEETS THE AMOUNT REQUIRED BY THE VRRM NEW DEVELOPMENT SPREADSHEET, ALL STORMWATER QUALITY REQUIREMENTS FOR THIS PROJECT HAVE BEEN MET AND NO FURTHER ANALYSIS IS REQUIRED.

CONCLUSION
SINCE THE 1-YEAR, 2-YEAR, AND 10-YEAR FLOW RATES IN THE POST-DEVELOPED CONDITION MEET ENERGY BALANCE AND FLOOD PROTECTION, IN ADDITION TO THE PHOSPHOROUS REMOVAL RATE MEETING THE VRRM NEW DEVELOPMENT PHOSPHOROUS REMOVAL REQUIREMENT, IT IS THE OPINION OF THE ENGINEER THAT THE STORMWATER QUANTITY AND QUALITY REQUIREMENTS ARE SATISFIED FOR THIS PROJECT.

ADEQUATE OUTFALL NARRATIVE
THE EXISTING SITE DRAINS TO THE SOUTH WEST CORNER OF THE PROPERTY TOWARDS POI 1 VIA SWALES ALONG THE SOUTH, EAST, AND WESTERN PROPERTY EDGES. THE PROPOSED DEVELOPMENT ADEQUATELY BYPASSES OFFSITE UNDISTURBED WATER FROM THE RIGHT OF WAY VIA STRUCTURE B-3 (SEE C3.7 FOR PIPE COMPUTATIONS), AND OVERRETAINS THE IMPROVEMENT AREA OF 1.02 ACRES WITH A CN OF 90 WITH THE PROPOSED VAULT. SINCE THE OVERALL FLOWS TO POI 1 FOR THE 1-YEAR, 2-YEAR AND 10-YEAR STORM EVENTS ARE REDUCED WITH THE DEVELOPMENT OF THIS SITE, THIS OUTFALL POINT IS CONSIDERED ADEQUATE. AS SUCH, IT IS THE OPINION OF THE ENGINEER THAT ADEQUATE OUTFALL REQUIREMENTS HAVE BEEN MET FOR THE SUBJECT SITE.



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PLAN REFERENCES

- REFER TO SWM/BMP DETAILS FOR ADDITIONAL SWM/BMP NOTES & DETAILS
- THIS PLAN TO BE UTILIZED FOR SWM/BMP PURPOSES ONLY

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PROJECT No.: V183201 SCALE: 1"=30'
DRAWN BY / CHECKED BY: DSH/JGR CAD I.D. SS0

H:\191001\DRAWING\PLAN DETAILS\PLAN DOCUMENTS\191001\SS0.DWG PRINTED BY: MGB/CHN 8/17/19 @ 11:55 AM LAST SAVED BY: MGB/CHN