

MEMO

Date: August 3, 2023
 To: City of Dublin
 From: Matt Stechschulte, PE
 Subject: IGS Headquarters 6100 Emerald Parkway Stormwater Design
 Copies: Alex Rader



The proposed IGS Headquarters improvements will have detention and water quality provided by the existing regional wet basin constructed with the IGS Corporate Headquarters Stormwater Management Plan dated July 16, 2008. The location of the proposed improvements is within what was identified as the Phase 2 subarea. The existing wet basin was designed based on the assumption that the Phase 1 and Phase 2 subareas were each developed at 85% impervious cover. This study determined that once the proposed improvements are constructed the Phase 1 Subarea will be 70% impervious and Phase 2 Subarea will be 23% impervious which is far below the design threshold for the existing basin. The reduced impervious cover will serve to generate lower peak flow rates to the basin meaning the existing basin is more than adequately sized to manage the proposed improvements. In addition to meet the detention requirements the reduced impervious cover will also serve to reduce the water quality volume required to be treated by the existing wet basin. Table 1 below shows the subarea characteristics per the original design. Revised values have been included in red.

**Table 1
Subarea Characteristics**

Subarea Identifier	Tributary Area (acres)	Land Usage	Runoff Curve Number	% Impervious (%)	Time of Concentration (min)
Phase 1	7.79	Open Space, Impervious Cover	94 91	85% 70%	12.6
Phase 2	3.91	Open Space, Impervious Cover	94 79	85% 23%	12.6
Total	11.70	-	94 87	85% 54%	-

Attached to this memo is the previously approved stormwater management plan narrative and exhibits along with Exhibit 3 which shows the proposed improvements.



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IGS Corporate Headquarters

City Of Dublin

**June 2008
Revised July 2008**

Engineers

Surveyors

Planners

Scientists

Stormwater Management Plan

IGS Corporate Headquarters

City of Dublin, Ohio

Prepared By:

Evans, Mechwart, Hambleton & Tilton, Inc.
5500 New Albany Road
Columbus, Ohio 43054

I hereby certify that the calculations contained herein are accurate to the best of my knowledge and belief.



Douglas Turney
By: Douglas C. Turney, P.E.

7/16/08
Date



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Project Name: IGS Corporate Headquarters
Location: City of Dublin, Ohio
Type: Stormwater Management Plan
Reviewing Agency: City of Dublin

Rainfall Data Bulletin 71 Ohio Region 5

1-yr	2.17"
2-yr	2.70"
5-yr	3.35"
10-yr	3.86"
25-yr	4.64"
50-yr	5.33"
100-yr	6.06"

Rainfall Distribution: NRCS Type II 24 hour
Detention Policy: City of Dublin
Water Quality: Ohio EPA, City of Dublin
Hydrology Modeling Program: PondPack v10.0

Design:

Detention: Wet Basin
Water Quality: Wet Basin
Receiving Body: Cosgray Ditch



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1.0 INTRODUCTION

The following report provides a detailed analysis and design of the stormwater management plan for IGS Corporate Headquarters. The proposed site is located on the East side of Emerald Parkway and at the intersection with Innovation Drive. The 11.70 acre project area, which will be broken into two phases, involves the development of a vacant parcel into a commercial and business area. The stormwater management plan was designed to meet the City of Dublin stormwater management requirements as well as the water quality requirements of the Ohio EPA. The runoff from this site will be routed to a wet basin on the East side of the project area for water quality treatment and peak control before draining into Cosgray Ditch, which runs parallel with the Northern boundary of the site.

2.0 HYDROLOGIC ANALYSIS

Hydrologic parameters such as Runoff Curve Number (RCN) were determined using standard Natural Resources Conservation Service (NRCS) methodology. The 1-, 2-, 5-, 10-, 25-, 50-, and 100-year discharge amounts were calculated using the NRCS TR-55 method. This analysis reflects the NRCS Type II distribution, 24-hr storm duration. Rainfall depths were obtained from Bulletin 71, Rainfall Frequency Atlas of the Midwest. The peak flow rates were computed using the Pond Pack 10.0 Computer Program by Haestad Methods.

3.0 PRE-DEVELOPED ANALYSIS

The pre-developed condition of the 11.70 acre site is considered to be agricultural land use in Type "C" soils (Lewisburg Soils) corresponding to a Runoff Curve Number of 78. The time of concentration for the pre-developed site is 0.49 hours. The time of concentration calculations can be found in Appendix A. The development of the site will be completed in two phases, phase 1 and phase 2, and both phase 1 and 2 have the same pre-developed and post-developed conditions and all calculations will incorporate the areas of both phases as they will both be draining to the proposed basin. The project site has tributary areas to both Cosgray Ditch and Cramer ditch with the approximate divide running east to west through the middle of the site. The project site lies within several of the Dublin Sub-Basins which include Sub-Basins 740, 760, 910, and 920. Sub-Basins 740 and 760 are located in the Cosgray Watershed and Sub-Basins 910 and 920 are located in the Cramer Watershed. Since the site will only outlet to Cosgray Ditch, only Sub-Basins 740 and 760 will be considered for pre-developed peak flow rate calculations. Of the 11.70 acre project site, 0.79 acres lies within Dublin Sub-Basin 740 and 1.97 acres lies within Sub-Basin 760. The pre-developed peak flow rates can be found in the Table 1 which includes both the calculated pre-developed flow rates using TR-55 methods and those taken from the Dublin Master Plan.

**Table 1
Area Allocation Table**

Sub-basin Identifier #	On-Site Area (acres)	Off-Site Area (acres)	Total Area (acres)
740	0.79	0.00	0.79
760	1.97	0.00	1.97
Total (acres)	2.76	0.00	2.76



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**Table 1
Pre-developed Peak Flow Rates**

Storm Events (yr)	Calculated Pre-Developed Flow Rate (cfs)	Cosgray Subarea 740 Allowable Release Rates (cfs/acre)	Subarea 740 Allowable Release Rates (0.79 acres) (cfs)	Cosgray Subarea 760 Allowable Release Rates (cfs/acre)	Subarea 760 Allowable Release Rates (1.97 acres) (cfs)	Total Subarea Allowable Release Rates (cfs)
1	1.22	1.10	0.87	0.10	0.20	1.07
2	2.05	1.30	1.03	0.10	0.20	1.23
5	3.18	1.80	1.42	0.40	0.79	2.21
10	4.12	2.50	1.98	1.00	1.97	3.95
25	5.65	3.50	2.77	2.00	3.94	6.71
50	7.05	4.70	3.71	3.30	6.50	10.21
100	8.57	5.80	4.58	4.50	8.87	13.45

The 1-year pre-developed volume of runoff is 0.134 ac-ft.

4.0 POST-DEVELOPED ANALYSIS

Exhibit 1, provided within Appendix E, shows the post-developed workmap. Both Phase 1 and Phase 2 of the post-developed site will be considered to be a commercial and business area in Type “C” soils with a corresponding Runoff Curve Number of 94. The time of concentration for the post-developed site is 0.212 hours and the time of concentration calculation was obtained from the storm sewer calculations in Appendix A. The 1-year runoff volume for the post-developed site increases to 1.525 ac-ft, resulting in a 100-yr critical Storm. Table 2 shows the proposed release rates.

$$\% \text{ Increase} = [(1.525 - 0.134) / 0.134] \times 100 = 1038\%$$

100-Yr Critical Storm

**Table 2
Allowable Peak Release Rates**

Storm Events (yr)	Post-Developed Release Rates (cfs)	Allowable Release Rate (cfs)
1	1.07	1.07
2	1.23	1.07
5	2.21	1.07
10	3.95	1.07
25	6.71	1.07
50	10.21	1.07
100	13.45	1.07

5.0 OUTLET DESIGN

The proposed development will incorporate a single 4.5" orifice plate placed on a 12" outlet pipe to provide water quality and meet the allowable release rates for the proposed wet detention basin.

- Normal Pool – 890.00'
- 1st stage outlet – 4.5" orifice @ 890.00', located on North side of wet basin
- Tailwater control for 1st stage outlet – 12" outlet pipe @ 1.5%, invert of 890.00'
- Volume required (used) – 3.78 ac-ft
- Volume provided (available) – 5.38 ac-ft

To ensure that the proposed wet basin will be able to outlet into Cosgray Ditch during large storm events, the 10-year flood elevation was modeled as a constant tailwater elevation (892.75') for the proposed outlet structure. The 10-year flood elevation was chosen so as to incorporate the lag time for runoff entering Cosgray Ditch as those elevations are the result of the accumulation of runoff from the entire drainage area over time. The proposed outlet structure is capable of draining the basin given the constant tailwater elevation condition and will drain the basin in both small and large storm events.

6.0 WATER QUALITY

The Ohio EPA requires that 75% of the water quality volume be detained for a period of 24 hours while releasing less than half of that volume in less than 8 hours. The proposed wet basin will treat a water quality volume of 0.363 ac-ft for the 11.70 acres tributary to it which has a corresponding water quality elevation of 890.46'. Drawdown of the water quality volume will be accomplished by the 4.5" orifice.



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The City of Dublin also requires that the total volume of the stormwater management system be equal to $2.2V_b$ where V_b is the permanent pool volume. Using the Dublin Water Quality Equation, the calculated V_b is 0.363 ac-ft which equates to a total volume ($2.2V_b$) of 0.798 ac-ft. The proposed wet basin will provide 2.90 ac-ft of storage below the permanent pool and 5.38 ac-ft of storage above the permanent pool volume which will more than meet the requirement. Water quality calculations and a drawdown graph are included in Appendix B.

7.0 SEDIMENTATION

The Ohio EPA requires that during construction a site must provide a means by which to control the sediment laden runoff from the construction site. For each acre of drainage area that is tributary to the sediment basin, a drawdown volume of 67 yd³ is provided above the normal pool elevation. The basin will additionally provide more than the required 37 yd³ of settling volume below the normal pool elevation for each acre of disturbed area tributary to the basin.

The basin has a tributary drainage area of 11.70 acres which will yield a required drawdown volume of 0.49 ac-ft above the normal pool, corresponding to an elevation of 890.61' within the basin. The sediment basin will utilize a temporary riser pipe wrapped in filter fabric with four 2.0" orifices at 890.00' and two 3.0" orifices at 890.65' which will provide the proper 48-hour drawdown. The minimum 0.27 ac-ft of settling volume below the normal pool will be met by the sediment basin which has 2.29 ac-ft of storage below normal pool. Sedimentation Calculations and a drawdown graph are included within Appendix C of this report.

8.0 CONCLUSION

The proposed stormwater management plan for the IGS Corporate Headquarters meets all requirements for detention and water quality as set forth by the City of Dublin and the Ohio EPA. Tables 3, 4, and 5 show the pertinent hydrologic information for the IGS Corporate Headquarters site.

**Table 3
Proposed Peak Flow Rates**

Storm Event (Yr)	Allowable Release Rate (cfs)	Post-Developed Peak Release (cfs)
1	1.07	0.48
2	1.07	0.58
5	1.07	0.69
10	1.07	0.76
25	1.07	0.86
50	1.07	0.93
100	1.07	1.00



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**Table 4
Proposed Peak Water Surface Elevations**

Storm Event (yr)	Post-Developed Peak Water Surface Elevation (ft)
1	891.00
2	891.38
5	891.86
10	892.24
25	892.79
50	893.27
100	893.76

**Table 5
Stormwater Management Summary Table**

	1-yr	2-yr	5-yr	10-yr	25-yr	50-yr	100-yr
Pre Q (cfs)	1.07	1.23	2.21	3.95	6.71	10.21	13.45
Post Q (cfs)	22.61	29.57	38.07	44.70	54.78	63.64	72.98
Allowable Release (cfs)	1.07	1.07	1.07	1.07	1.07	1.07	1.07
Actual Release (cfs)	0.48	0.58	0.69	0.76	0.86	0.93	1.00
Peak WSE Post-Developed Site (ft)	891.00	891.38	891.86	892.24	892.79	893.27	893.76

**Table 6
Stage-Discharge Table**

Elevation (ft)	Post- developed Peak Outflow (cfs)
890.00	0.00
890.50	0.30
891.00	0.48
891.50	0.61
892.00	0.72
892.50	0.81
893.00	0.89
893.50	0.97
894.00	1.04
894.50	1.10
895.00	1.17



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Table 6
Stage-Area-Storage Table

Elevation	Wet Basin Area	Wet Basin Storage Volume
(ft)	(acres)	(ac-ft)
890.00	0.775	0.00
891.00	0.893	0.833
892.00	1.013	1.786
893.00	1.136	2.860
894.00	1.259	4.057
895.00	1.387	5.380

Water Quality Volume Calculation Spreadsheet

Project Name: IGS Corporate Headquarters

Prop Basin - Cosgray Ditch - North

Area = 11.7 acres

% imp = 0.85

C = 0.66

WQv = 0.484 ac-ft

-25% WQv for Wet Basins= 0.363 ac-ft

Water Quality Volume Elevation = 890.46 ft

Water quality volume calculated using the Ohio EPA formula CPA/12

The "C" coefficient was calculated using the ASCE method

$$C = 0.858i^3 - 0.778i^2 + 0.774i + 0.04$$

Ohio EPA formula

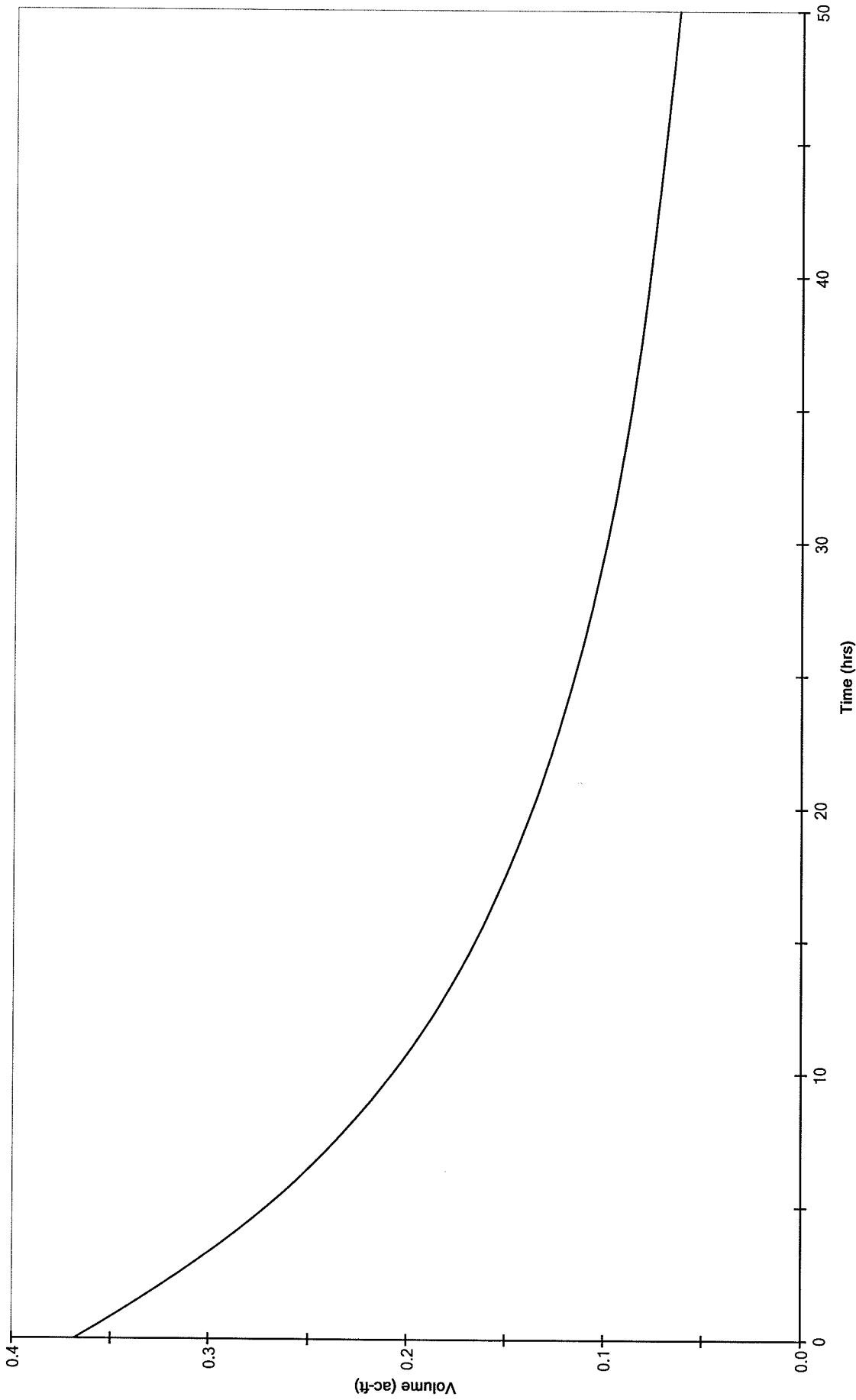
$$WQv = CPA/12$$

A = area (acres)

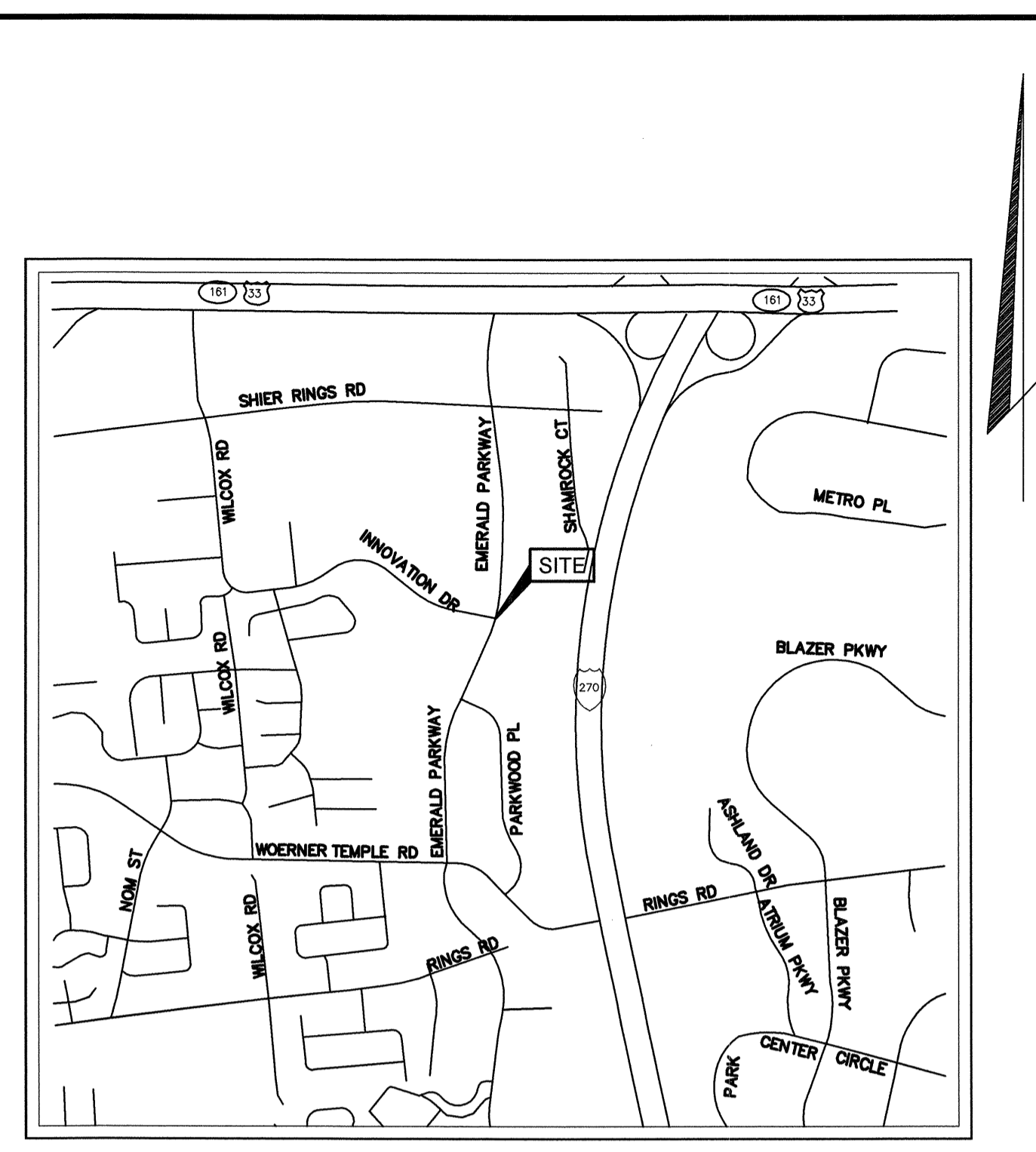
P = 0.75"

C = (see above)

Wet Basin
Water Quality Drawdown Graph



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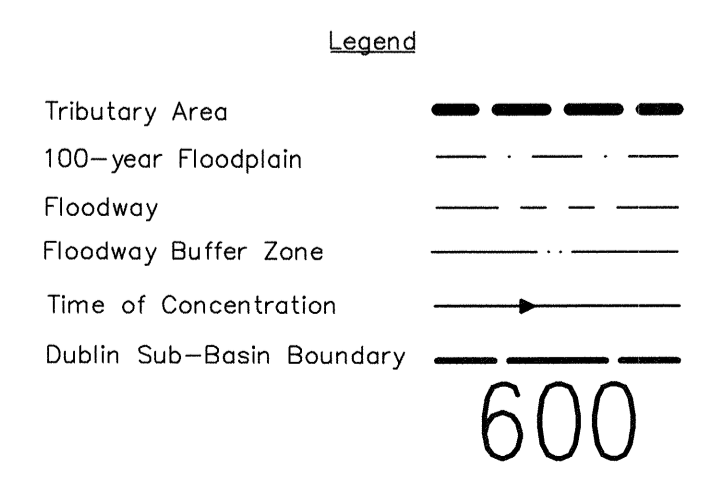


LOCATION MAP
Not To Scale

Subarea 001
Area= 11.70 Ac.
RCN= 78
TC=0.49 Hrs.

Pre-developed Land Use:
Agricultural land usage, no impervious areas

Soil Classification:
Lewisburg Soils
Type "C" Soils

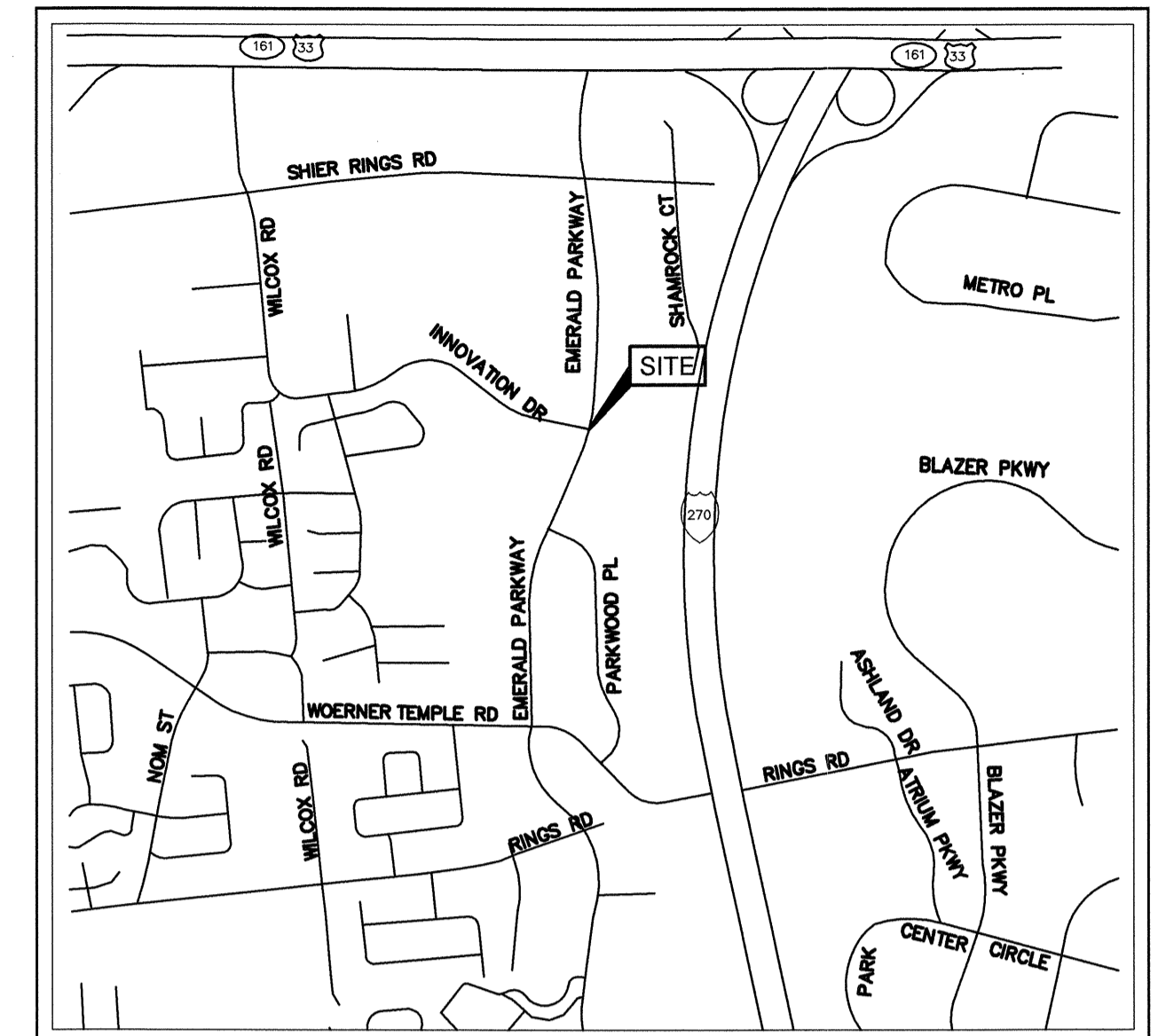
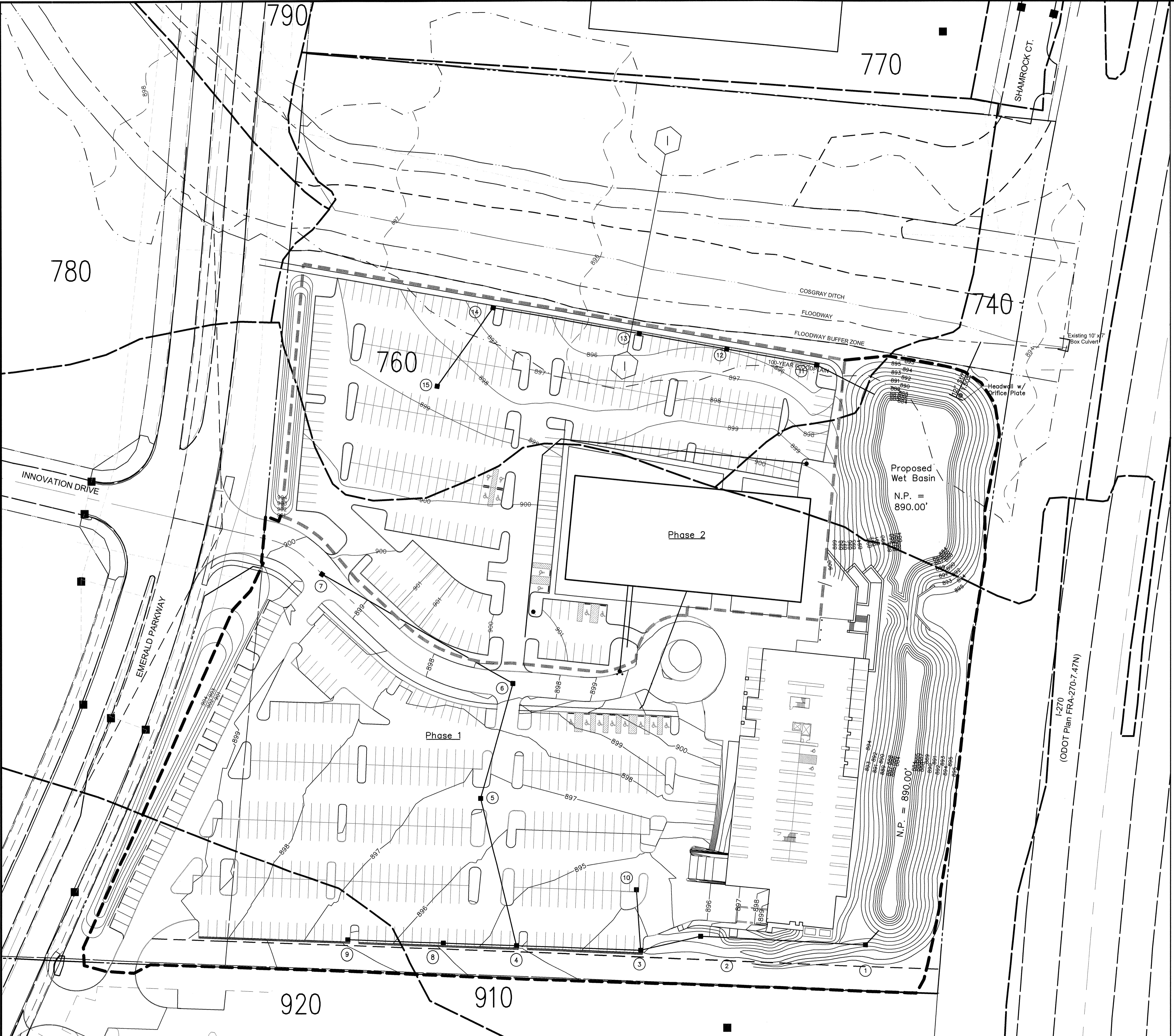


<p>Date</p> <p>JULY, 2008</p>	<p>Job No.</p> <p>2007-2390</p>	<p>Exhibit</p> <p>1/2</p>
<p>Scale</p> <p>1" = 80'</p>		

CITY OF DUBLIN, FRANKLIN COUNTY, OHIO
STORMWATER MANAGEMENT PLAN
FOR
IGS CORPORATE HEADQUARTERS
PRE-DEVELOPED WORKMAP

Evans, Mechwart, Hambleton & Tilton, Inc.
 Engineers • Surveyors • Planners • Scientists
 5200 New Albany Road, Columbus, OH 43220
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I:\COMPUTER\DEVELOPMENT\PROJECT\2007-2390\STORMWATER\DWG\2390\MM02.DWG-LAYOUT11 - 9 - AREFS: 78607825, 78657625, 79107625, 78607600, 78857600, 79107600, WFL1, WFL2, WFL3 - LAST SAVED BY: AMCBRODE [7/17/2008 1:12:47 PM] - PLOTTED BY: AMCBRODE [7/17/2008 1:13:53 PM]



LOCATION MAP
Not To Scale

Note: Phase 2 grading subject to change in Final Development Plan

Flood Elevations for Cosgray Ditch:

Flood Elevations for Cosgray Ditch were obtained from the Franklin County Flood Insurance Study, Volume 2 of 3, page 69P. The given flood elevations are in reference to Cross Section I which can be located on the Franklin County Flood Insurance Rate Map, Panel 109.

- 10-year flood elevation = 892.75'
- 50-year flood elevation = 894.50'
- 100-year flood elevation = 894.90'

Post-developed Land Use:
Commercial and Business land usage, approximately 85% impervious

Phase 1
Area= 7.79 Ac.
RCN=94
Post TC=0.21 Hrs.

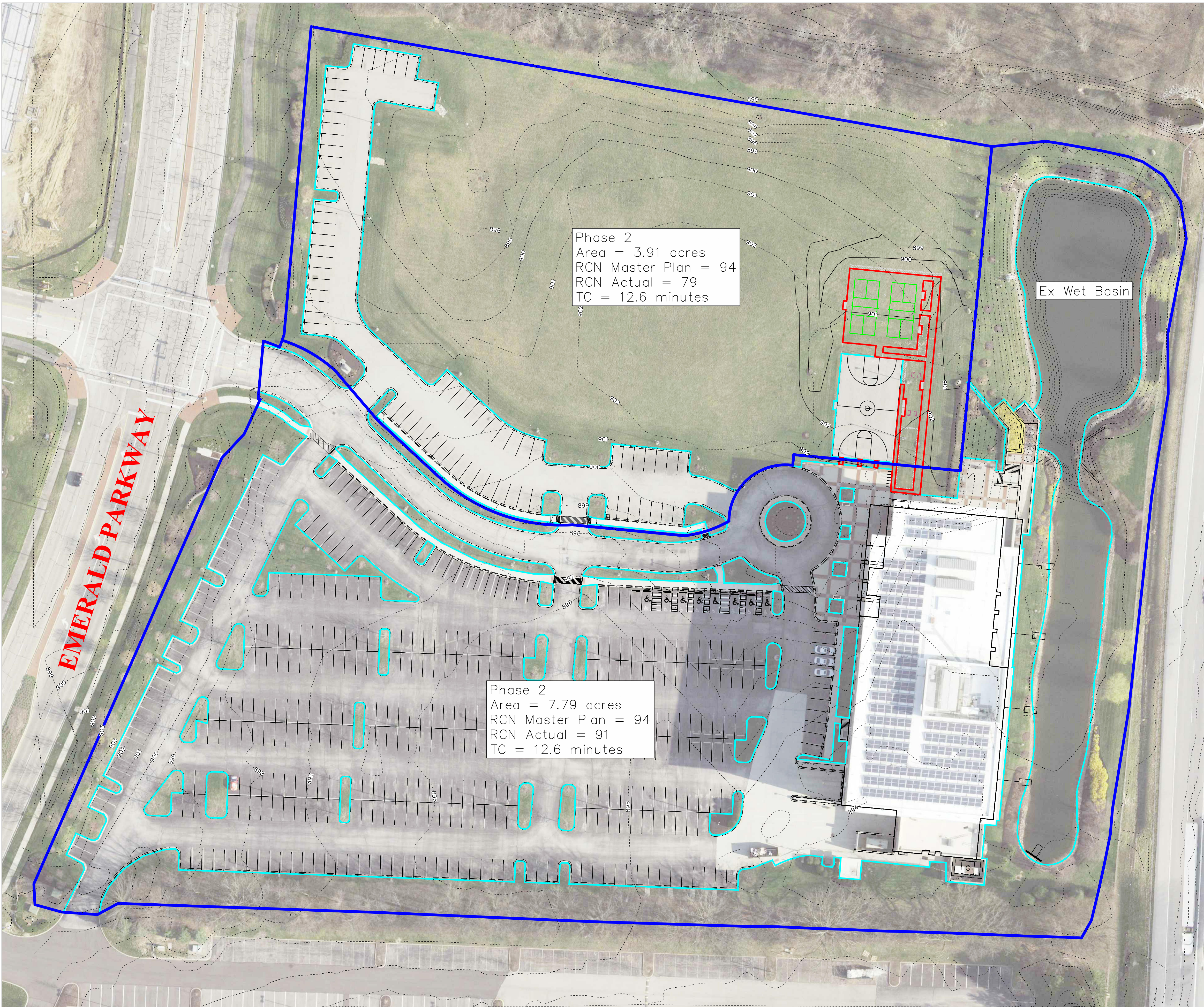
Phase 2
Area= 3.91 Ac.
RCN=94
Post TC=0.21 Hrs.

Total Tributary Area
Area= 11.70 Ac.

Legend

Tributary Area	---
100-year Floodplain	----
Floodway	-----
Floodway Buffer Zone	- - - - -
Phase Line	=====
Dublin Sub-Basin Boundary	=====

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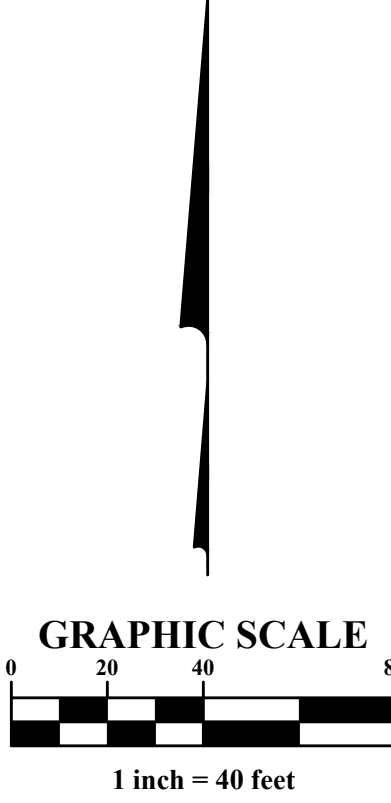


Phase 2
 Area = 3.91 acres
 RCN Master Plan = 94
 RCN Actual = 79
 TC = 12.6 minutes

Phase 2
 Area = 7.79 acres
 RCN Master Plan = 94
 RCN Actual = 91
 TC = 12.6 minutes

Ex Wet Basin

EMERALD PARKWAY



LEGEND

	TRIBUTARY BOUNDARY
	EXISTING IMPERVIOUS AREA
	PROPOSED IMPERVIOUS AREA

MARK	DATE	DESCRIPTION

CITY OF DUBLIN

CITY OF DUBLIN, FRANKLIN COUNTY, OHIO
 STORMWATER MANAGEMENT
 FOR
IGS HEADQUARTERS
6100 EMERALD PARKWAY
 POST-DEVELOPED STORMWATER TRIBUTARY MAP

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DATE
 August 2, 2023

SCALE
 1" = 40'

JOB NO.
 2023-0567

SHEET
Exhibit 3