Hall Run and Salt Run Project Identification

Clermont County, Ohio

TETRA TECH, INC.

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Table of Contents

List of Tables ii

List of Figures ii

1 Introduction..... 1-1

2 GIS Analysis..... 2-1

3 Field Review..... 3-1

4 Results 4-1

References R-1

Appendix A. Project Data Sheets..... A-1

List of Tables

Table 4-1. Recommended Project Sites 4-3

Table 4-2. BMP and Restoration Costs for Clermont County 4-4

List of Figures

Figure 2-1. Potential Projects 2-2

Figure 4-1. Proposed Project Sites 4-4

1 Introduction

Clermont County is evaluating the possibility of establishing a stormwater utility that would address both water quality and quantity issues related to stormwater runoff. Additionally, Clermont County is cooperating with Ohio Department of Transportation (ODOT) and surrounding local governments on the Eastern Corridor project, which involves improvements to State Route 32 from the Hamilton/Clermont border to the Stonelick-Olive Branch interchange. Watershed management projects in this area may be used as part of the County's required match for this project. The County is also exploring the possibility of creating a "mitigation bank," where entities such as ODOT could purchase mitigation credits from the County for projects already completed, or fund the implementation of projects as part of their mitigation requirements.

The purpose of this project was to identify stormwater projects within either the Hall Run or Salt Run watersheds that could be submitted to ODOT in August 2006. Potential projects include the construction of regional retention ponds or other Best Management Practices (BMPs), riparian zone protection/ restoration, and wetland or stream restoration projects.

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2 GIS Analysis

Current GIS shapefiles were obtained from Clermont County for use in a preliminary site search for potential projects. Aerial photography, environmental, topographic, parcel data, stormwater outfall inventory, and impervious area coverages were the primary data files used to screen potential project sites. The site search focused on highly impervious areas to maximize potential project benefits. Generally, these areas are located in the headwaters of both the Hall Run and Salt Run watersheds, near the I-275 and Highway 32 intersection, which is by far the most impervious area within the study area. Several existing ponds were identified that apparently collect the majority of the runoff from this area. The ponds were assumed to provide some stormwater treatment prior to discharging into nearby streams, so these sites were eliminated from consideration.

Twenty-one sites were identified through the analysis for field review as shown in Figure 2-1. Sites were selected based on the following factors:

1. maximum contributing drainage area,
2. highly impervious areas,
3. limited number of affected landowners,
4. flooding reports, and
5. topographic constraints.

Properties owned by the County and school system were given high priority, as well as parcels slated for new development based on a provided GIS coverage. GIS shapefiles and a report were provided by the County from a study performed by the University of Cincinnati on existing BMPs within the County. These sites were primarily dry detention basins and wet ponds.

As both watersheds are rural in nature with large residential areas, except for the large shopping area near the I-275 and Highway 32 intersection, locating projects that treated large impervious areas was difficult to achieve. Constructing stormwater projects on multiple parcels is generally avoided to prevent property acquisition and maintenance issues. The topography of the study area varies quite a bit, leading to a significant amount of varying drainage basins, and making it difficult to install large retention ponds that would treat large areas without impacting jurisdictional streams or other waterbodies.

For each of the 21 sites identified, drainage areas were delineated and percent imperviousness was determined using the provided GIS shapefiles. Based on these factors, stormwater management measures were selected and preliminarily sized to check for enough available space. Contour, parcel, and aerial photographs were used to site the BMPs, and maps were prepared for each feasible site to take into the field for further constraint analyses.

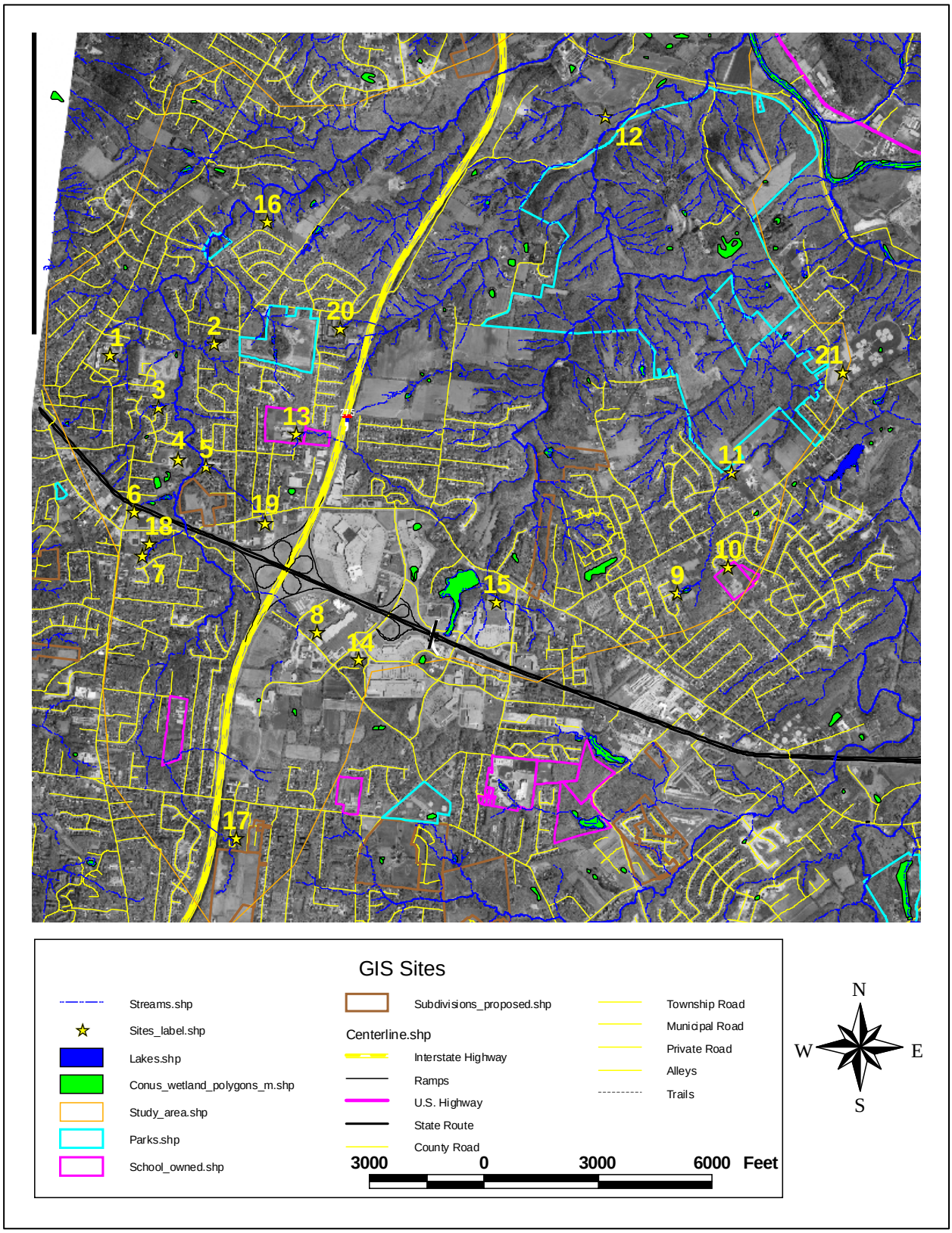

Figure 2-1. Potential Projects

3 Field Review

Site visits were conducted on April 24 and 25, 2006 to further evaluate the feasibility of the projects identified through the GIS analysis. The primary purposes of the visit was to make sure that the GIS coverages accurately depicted what actual site conditions were, and to identify potential construction constraints. Existing ponds and other BMPs identified during the GIS analysis were also visited to see if additional opportunities existed, such as treating areas that might bypass the existing management measures.

Using the prepared maps, each site was visited and field notes were taken. Several sites were immediately removed from consideration due to an existing device already installed, a change in land use from what the aerial photographs showed, or contributing area that was smaller than originally delineated. Additional sites not discovered during the GIS analysis were also identified, and drainage areas and preliminary sizing were performed for those sites as well. Section 4 provides the projects that were field-confirmed and recommended for submission to ODOT.

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4 Results and Recommendations

Based upon the GIS review and site visits, four potential projects were identified within the study area that presented good opportunities for stormwater management and water quality improvement. After further discussions with Clermont County stormwater staff, two additional sites were added due to impending development within the drainage area, and to locate a site that may serve as a more regional facility. These sites are presented in Table 4-1 and shown in Figure 4-1.

Drainage areas and percent imperviousness were determined from a GIS analysis of County-provided shapefiles. The impervious area coverage used was visually compared to aerial photos and briefly checked for accuracy for each of the projects identified. Drainage areas were delineated using the 1-meter contour data provided. Approximate surface areas identified for each project area are based on Ohio Department of Transportation methodology using the Water Quality Volume (WQv) method described in Volume 2 of the Drainage Design Manual (2006). Sizing was also confirmed using North Carolina Department of the Environment and Natural Resources methods which yielded similar results for computed surface areas with similar design assumptions.

The six projects presented in this document represent a preliminary screening of the study area, the Salt Run and Hall Run watersheds. Prior to additional design, surveys should be performed to confirm drainage areas, flow paths, structure inverts and surface elevations, as well as to accurately determine infrastructure constraints, such as water and sewer lines. Soil testing should be performed to verify soil properties, especially where infiltration practices are recommended. Hydric soils and areas proposed for wetlands should be evaluated by an environmental professional. Hydrologic and hydraulic models are also recommended for the entire study area to help the County identify capacity and conveyance problems.

Project data sheets and plan views for the four recommended projects are presented in Appendix A. Costs are presented for comparison purposes in Table 4-2 and in the project data sheets. Surface areas and costs provided reflect the area required for the water quality storm event (the 1-inch storm), and do not reflect additional storage volumes for larger storm events to provide peak flow control benefits.

In addition to the projects identified in this document, the County is encouraged to promote Low-Impact Development (LID) techniques to reduce stormwater runoff volumes from new development and to provide water quality benefits. Several residential communities were visited during the site evaluation. Each lot had an outlet from rooftop drains that discharged into the street, where it was then conveyed into the stormwater infrastructure, typically curbs, catch basins and piping. Allowing rooftop drains to outlet into natural, grassed areas would significantly reduce runoff associated with the increased imperviousness. Providing natural depressions between lots could also treat the runoff should soils prove to have high infiltration rates. Installing extended dry detention basins with controlled outlet structures at major outfalls would prevent downstream streambank erosion and scouring, as well as help meet open space requirements. Requiring buffers along streams and wet weather ditches and promoting sheet flow through the buffer would improve water quality by filtering pollutants and allowing for nutrient uptake by plants. Curb and gutter could be replaced with grassed swales to provide similar water quality benefits.

4.1 Retrofit Opportunities

Tetra Tech recommends that the County inventory the existing ponds and basins that currently exist within the study area. Several devices were observed in the Eastgate Mall area that appeared to collect runoff from the parking areas and perhaps the rooftop drainage as well. Surveying these sites to determine existing volumes and elevations would provide an indication as to how these devices are performing, as well as their potential for additional storage and water quality benefits. Additional

excavation, installing controlled outlet structures, and maintaining these devices would be a cost-effective solution to downstream flooding and streambank erosion issues.

Specific opportunities for retrofitting existing ponds include the 2-acre pond located to the west of Eastgate Mall adjacent to Old SR 74, and the 1-acre pond at the intersection of Clepper Lane and Eastgate South Drive. Both of these ponds already receive stormwater runoff from highly impervious drainage areas. Retrofitting these ponds would prove very cost-effective compared to constructing a new facility as the stormwater is already conveyed to these facilities, the ponds are excavated, and the property is currently dedicated for these facilities. Some work would need to be performed initially to drain the pond for surveying, as well as to accurately delineate the drainage area given the high number of stormwater basins and pipes. Opportunities exist in these areas to improve or convert the existing ponds to constructed wetlands for improved water quality where soil conditions and water sources allow, increase the existing storage capacities, and/or install controlled outlets and plants in the existing ponds to provide additional peak flow control and improve the treatment of stormwater by utilizing the nutrient uptake capacity of the plants.

Table 4-1. Recommended Project Sites

Site No.	Recommended Practice	Drainage Area (acres)	Impervious Area (acres)	Percent Impervious	Cq	WQv (ac-ft)	Address	Property Owner	Approximate Surface Area (sf)
A	Wetland	15.4	7.4	48.1	0.33	0.31	717 Barg Salt Run	Eastgate Baptist Church	13,820
	Bioretention	1.1	0.7	59.4	0.40	0.03			205
B	Wetland	7.2	6.7	93.7	0.79	0.35	650 Eastgate South Drive	KRG Eastgate Pavilion LLC	11,760
	Wetland	20.9	10.1	48.1	0.33	0.43	Corner of Aicholtz Road and Omni Drive	FFFS Part	18,730
C	Stream Restoration/ Wetland Creation	N/A	N/A	N/A	N/A	N/A	4619 Tealtown Road	Arthur Wiedenbein	900+/- L.F. 2 +/- acres
D	Wet Pond/ Bioretention	7.7	3.2	41.6	0.29	0.14	Summerside Elementary School - Vermona Drive	Mt Carmel School Board of Education	6,040
E	Wetland	130.1	N/A	30.0*	0.30	1.83	1000 Round Bottom Road (at River Valley Road)	Iona Borchers	75,940
				70.0*	0.49	4.02			163,320
F	Wet Pond	20.1	N/A	30.0*	0.23	0.28	904 Barg Salt Run Road	Anna Smith	11,730

*Assumed

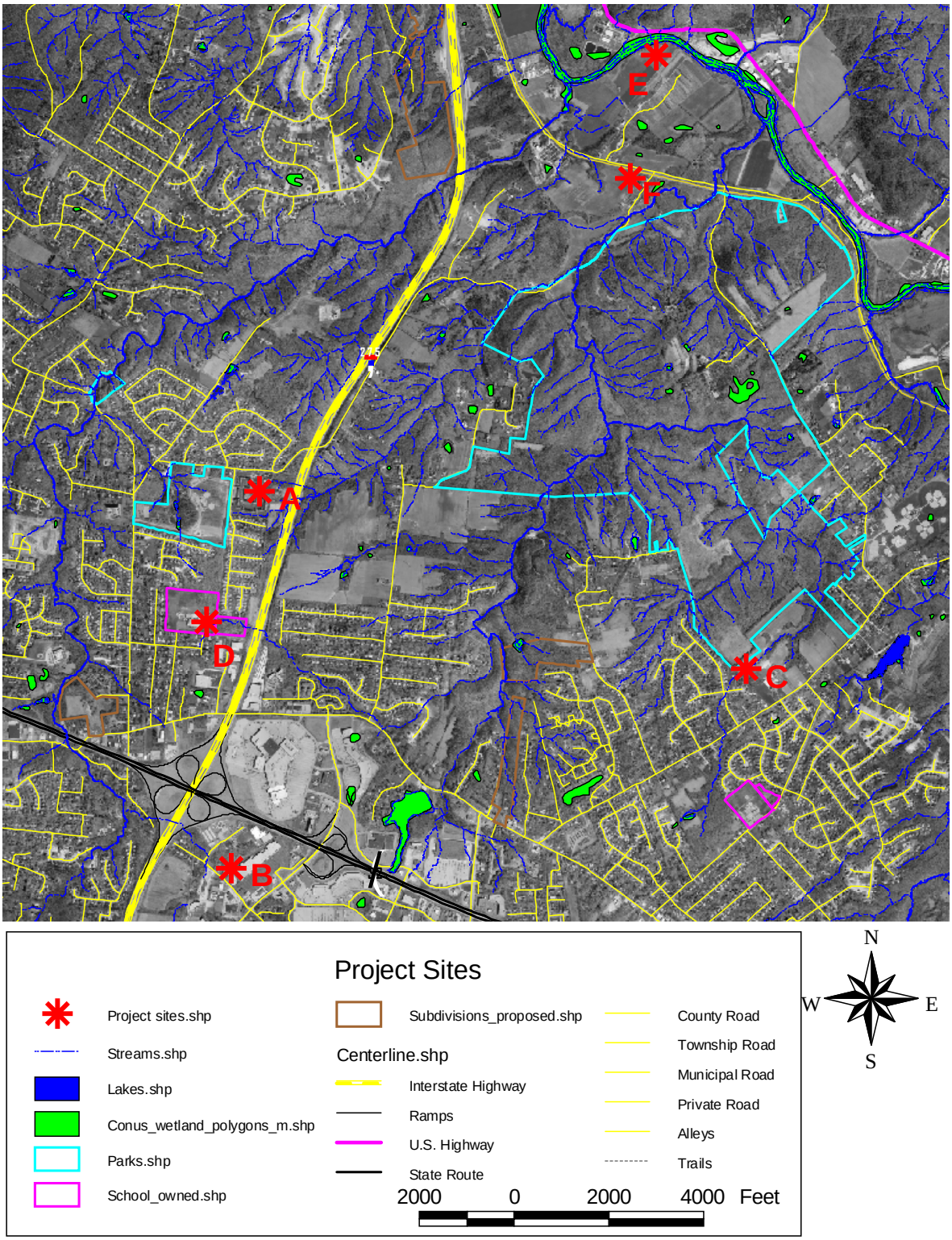

Figure 4-1. Proposed Project Sites

Table 4-2. BMP and Restoration Costs for Clermont County

Site ID	Construction[1,2]	Design and Engineering[3]	Easement Acquisition[4,5]	Total Initial Cost	Annual Inspection and Maintenance[7]
A-Wetland	$34,800	$8,700	$44,300	$87,800	$1,500
A-Bioretention	$2,300	$600	$700	$3,600	$1,100
B-Wetland (KRG)	$32,200	$8,100	$37,700	$78,000	$1,300
B-Wetland (FFFS)	$40,300	$10,100	$60,000	$110,400	$1,800
C-Stream Restoration	$212,900	$53,200	$100	$266,200	$400
C-Wetland Restoration	$47,700	$11,900	$14,000	$73,600	$400
D-Wet Pond	$16,000	$4,000	$19,400	$39,400	$1,900
E-Wetland[10]	$82,800 $113,900	$20,700 $28,500	$37,600 $523,000	$141,100 $665,400	$2,500 $2,000
F-Wet Pond	$78,900	$19,700	$243,300	$341,900	$2,000
Sum	$584,900	$146,300	$457,100	$1,188,300	$12,900
Min	$2,300	$600	$100	$3,600	$400
Median	$47,700	$11,900	$37,600	$87,800	$1,500
Average	$65,000	$16,300	$50,800	$132,000	$1,400
Max	$212,900	$53,200	$243,300	$341,900	$2,500

[1] BMP construction costs estimated from Center for Watershed Protection (2000), Wossink and Hunt (2003), and personal communication with W. Hunt at NC State University.

[2] Design and engineering costs were estimated by taking 25 percent of the construction costs (Wossink and Hunt, 2003).

[3] Easement acquisition was estimated as $100,000 per acre for BMPs and $5,000 per acre for stream and wetlands restoration.

[4] The project on the Mt. Carmel School Board of Education property may not have an easement acquisition cost.

[5] For bioretention, the annual inspection and maintenance cost was estimated by taking 6 percent of BMP construction costs (Weiss et al, 2005). For wet ponds and wetlands, drainage areas of the BMPs were matched with drainage area ranges from recent, unpublished NC State University maintenance cost research University (W. Hunt, NC State Department of Biological and Agricultural Engineering, personal communication, February 16, 2006).

[6] For restoration, inspection and maintenance cost assumes a 5-year monitoring period and long term management averaged over 20 years (NCEEP, 2003).

[7] Represents annual operation and maintenance cost, not discounted. Estimated by taking 5 percent of BMP construction costs.

[8] Restoration costs were assumed to be $233 per linear foot of stream restoration and $26,500 per acre of wetlands restoration (NCEEP, 2005).

[9] Out-of-state costs were converted to Ohio costs with R.S. Means Indices (R.S. Means, 2003).

[10] Assumed 30% and 70% impervious drainage area at final buildout.

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Appendix A. Project Data Sheets

Site A – Eastgate Baptist Church

Site A is located on the Eastgate Baptist Church property and would serve the majority of the church property and an apartment community to the west of the church. Several tributaries flow from west to east and cross under I-275 just to the east of the church property. A large, open area exists on the southern portion of the church property as shown in Figure A-1. Soils at the site are composed of Rossmoyne (RsC3) and Hickory (HkF2), which indicate that a stormwater wetland would work well at the site, particularly with the addition of tributary flow to serve as the main water source. Flow from the apartment complex enters a culvert at the southeast corner of the property, and then flows under the church parking lot and outlets into a channel that flows parallel to I-275, where it confluences with drainage from another sub-watershed. The runoff from the church property discharges just downstream of this confluence through a PVC pipe, which has significant erosion at the outlet. The channel along this reach is eroded with widening occurring.

Figure A-1 shows two possible locations for potential BMPs. The larger area to the south represents the approximate surface area required for a stormwater wetland to treat runoff from the entire contributing area. The smaller site is the surface area required for a bioretention facility to treat runoff from the church site only. Both projects could be constructed independently, or the wetland could be designed such that it would treat runoff from the entire drainage area by installing additional infrastructure to convey runoff to the wetland.

There appear to be minimal construction or access constraints for this site. Access would be from Barg Salt Run along the drive for the church, only one parcel would be affected, and water or sewer lines were not evident. Some clearing may need to be performed, although the vegetation in the area was sparse. Coordination with the church should be performed to discuss site restrictions and placement of the device. A stream determination needs to be made to see if a 401/404 permit is required for construction, as well as any other applicable permits from the County and State.

Drainage Area:	15.4 acres 1.1 acres
Percent Impervious:	48.1% 59.4%
Recommended Device:	Stormwater Wetland; Bioretention
Approximate BMP Surface Area:	13,820 ft^2 205 ft^2
Approximate Cost:	$87,000 $3,600

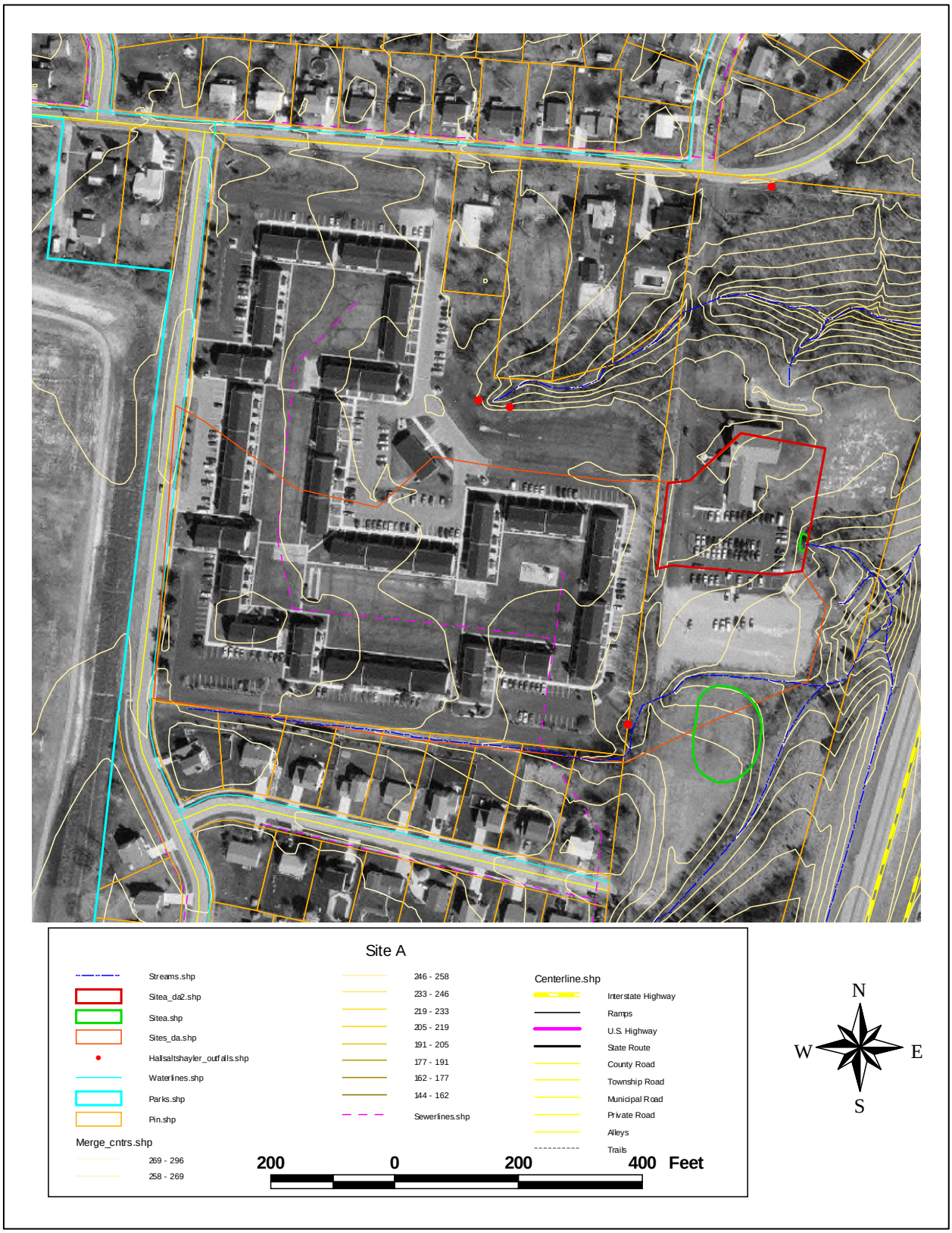

Figure A-1. Site A

Site B – KRG Eastgate Pavilion

The KRG Eastgate Pavilion area has two potential projects, both stormwater wetlands, as shown in Figure A-2. The drainage area for the smaller wetland, located to the rear of the shopping area, is highly impervious and could treat most of the runoff from the shopping center and associated parking area. A small depression with a concrete-lined channel exists at this site with two inlets from the shopping center, and one outlet that discharges into a wooded area behind the shopping center. Digital soil series show a soil with hydric properties at the recommended site (Clermont series). Retrofitting the existing depression with an extended dry detention basin or wet pond is also feasible, and would probably require less financial resources. As the area appears to already be devoted to stormwater management, this site is probably the simplest to implement.

The second wetland would treat a much larger area, and may provide some additional stormwater storage from a small tributary that flows from south to north at the western corner of the property. Existing wetland vegetation was observed at this site, and it was quite wet as well during the site visit. If this proposed wetland could be tied into the existing tributary, a much larger drainage area could be treated (~80 acres). Credit may be allowed for wetland creation, requiring coordination with the Army Corps of Engineers and other regulatory agencies to impact the adjacent stream. This wetland would also treat the runoff from the smaller drainage area.

Access to the smaller site would be from the Pavilion parking lot, and from either Aicholtz Road or Omni Drive for the larger wetland. Water and sewer lines parallel each street, but should not be affected during construction. Soils should be tested to determine infiltration and groundwater levels to confirm that enough water is available to sustain a constructed wetland. Clearing would need to occur on the larger wetland site.

Drainage Area:	7.2 acres 20.9 acres
Percent Impervious:	93.7% 48.1%
Recommended Device:	Stormwater Wetland
Approximate BMP Surface Area:	11,760 ft^2 18,730 ft^2
Approximate Cost:	$78,000 $110,400

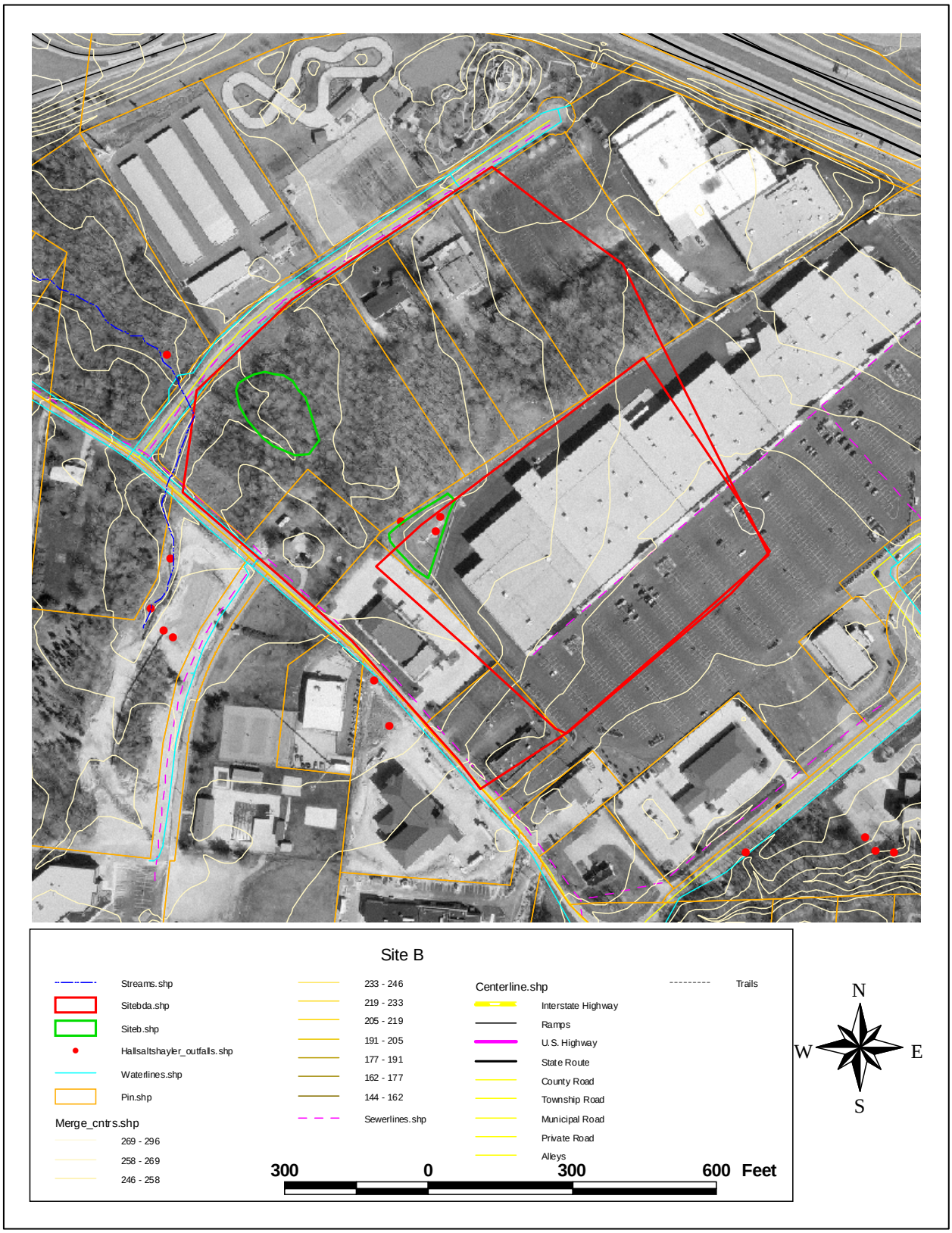

Figure A-2. Site B

Site C – Wiedenbein Property

Site C presents an opportunity for a stream restoration project with associated created wetlands. Located just downstream of two relatively large residential neighborhoods, this project provides an opportunity to directly obtain mitigation credits. In addition, the adjacent residential community has submitted complaints of flooding and standing water to the County. A property owner interviewed during the field review stated that the flooding was a direct result of the construction of the neighboring residential community, located upstream of the project site and on the east side of Tealtown Road. Restoring the stream reach and adding wetlands to the site may help alleviate some of the upstream flooding by adding additional conveyance and storage for storm event runoff. Detailed hydrologic and hydraulic modeling is recommended to confirm this assumption. Figure A-3 shows the stream reach and potential wetland creation area.

The site has existing wetland vegetation, so a wetland delineation should be performed to verify existing conditions. Should a wetland be determined to currently exist, enhancement to the wetland would still provide some mitigation credit in addition to stream credit for the restoration. Coordination with the Army Corps of Engineers and associated agencies would be required for this project.

Probably the most challenging aspect of this site is access. Access could be obtained from the Cincinnati Nature Center, or the property owner down their existing drive. The site is composed of two main parcels, both owned by the same family. The project is bordered by the Cincinnati Nature Center to the northwest, and by Clermont County Park Department property to the northeast, just downstream of the project reach. The entire reach was not walked, so additional opportunities for restoration, preservation, or buffer enhancement may exist on the County park property.

Recommended Practice:	Stream Restoration; Wetland Creation
Approximate Lengths and Areas:	900 +/- Linear Feet 2 +/- Acres
Approximate Cost:	$266,200 $73,600

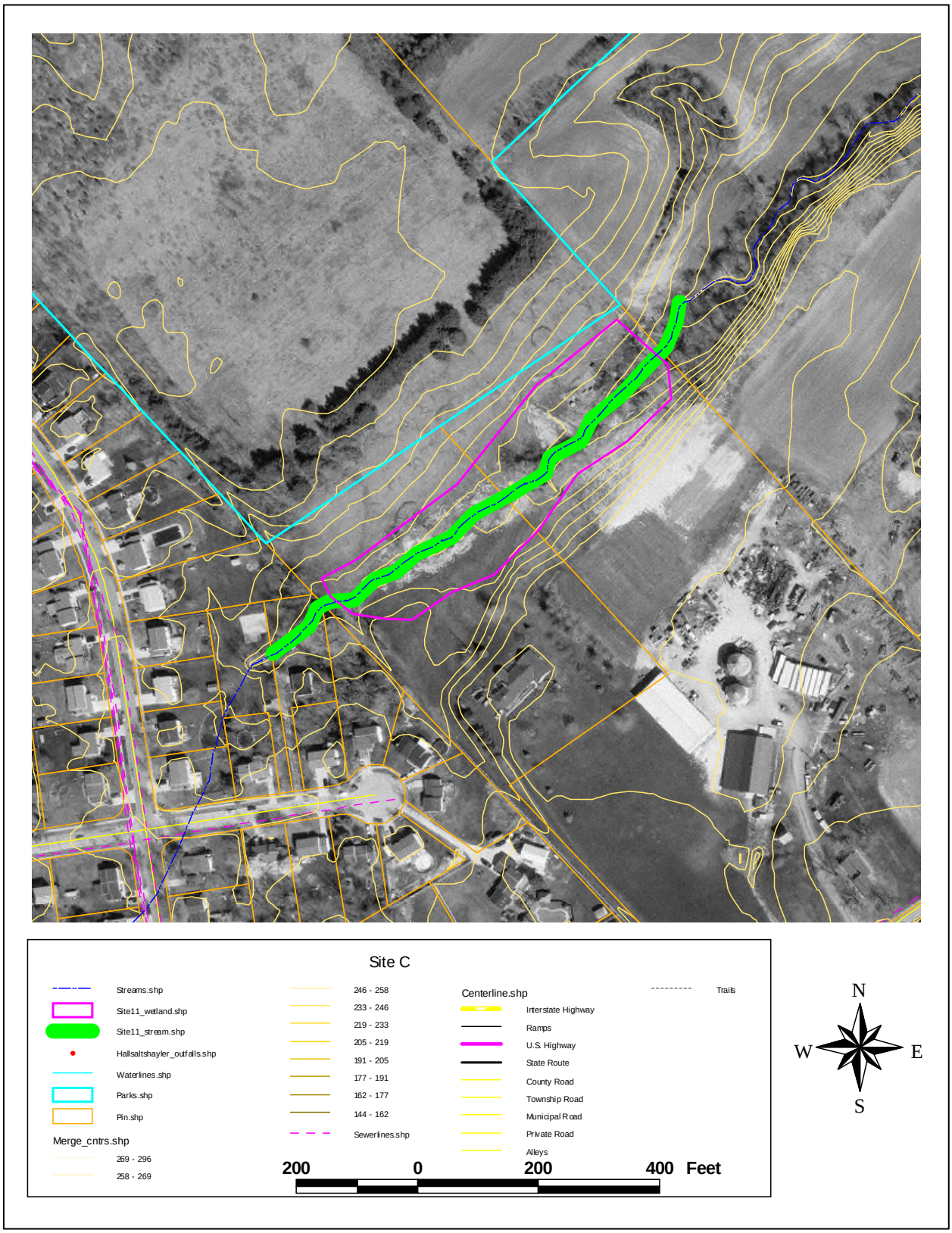

Figure A-3. Site C

Site D – Summerside Elementary School

A wet pond would serve this drainage area very well by providing peak flow control for downstream stream impacts as well as water quality improvement. A bioretention cell is probably better suited for the property, as this type of facility provides a very pleasing aesthetic value as well as an educational opportunity for children. Generally, wet ponds are avoided on school properties due to safety concerns with standing water. It is feasible that a wetland could be placed on the parcel, with the tributary flowing from south to north as the primary water source. Soils in the area do not appear to be hydric, and may preclude the installation of a constructed wetland. Jurisdictional stream issues would need to be resolved for a wetland as well.

Should a bioretention cell be selected, a comprehensive survey of the drainage infrastructure would need to be performed to verify the drainage area and outfall locations. A bioretention cell could be designed to accept flow from the impervious areas only, perhaps the rooftop or parking lot, by modifying the existing infrastructure to convey runoff into the new cell. Figure A-4 depicts the site showing the approximate size for a wet pond. The surface area for a constructed wetland would be similar, although a bit larger. The data provided below is for the wet pond only, as the contributing area for a bioretention cell is undetermined at this time, with a known upper drainage limit of one acre. A couple of cells could be installed independently depending on the drainage pattern.

The obvious constraint is the safety concern with installing devices that promote standing water so close to a school. A bioretention cell or stormwater wetland would provide a better educational opportunity than a wet pond, although wet ponds can be designed with appealing landscaping plans. Providing fencing would help alleviate some of the safety concerns. Some clearing is probably required for this project, and coordination with the school is recommended to confirm the actual site of the facility. Access would be from Edwilla Drive. No other significant construction constraints were observed.

Drainage Area:	7.7 acres
Percent Impervious:	41.6%
Recommended Device:	Wet Pond / Bioretention
Approximate BMP Surface Area:	6,040 ft^2
Approximate Cost:	$39,400

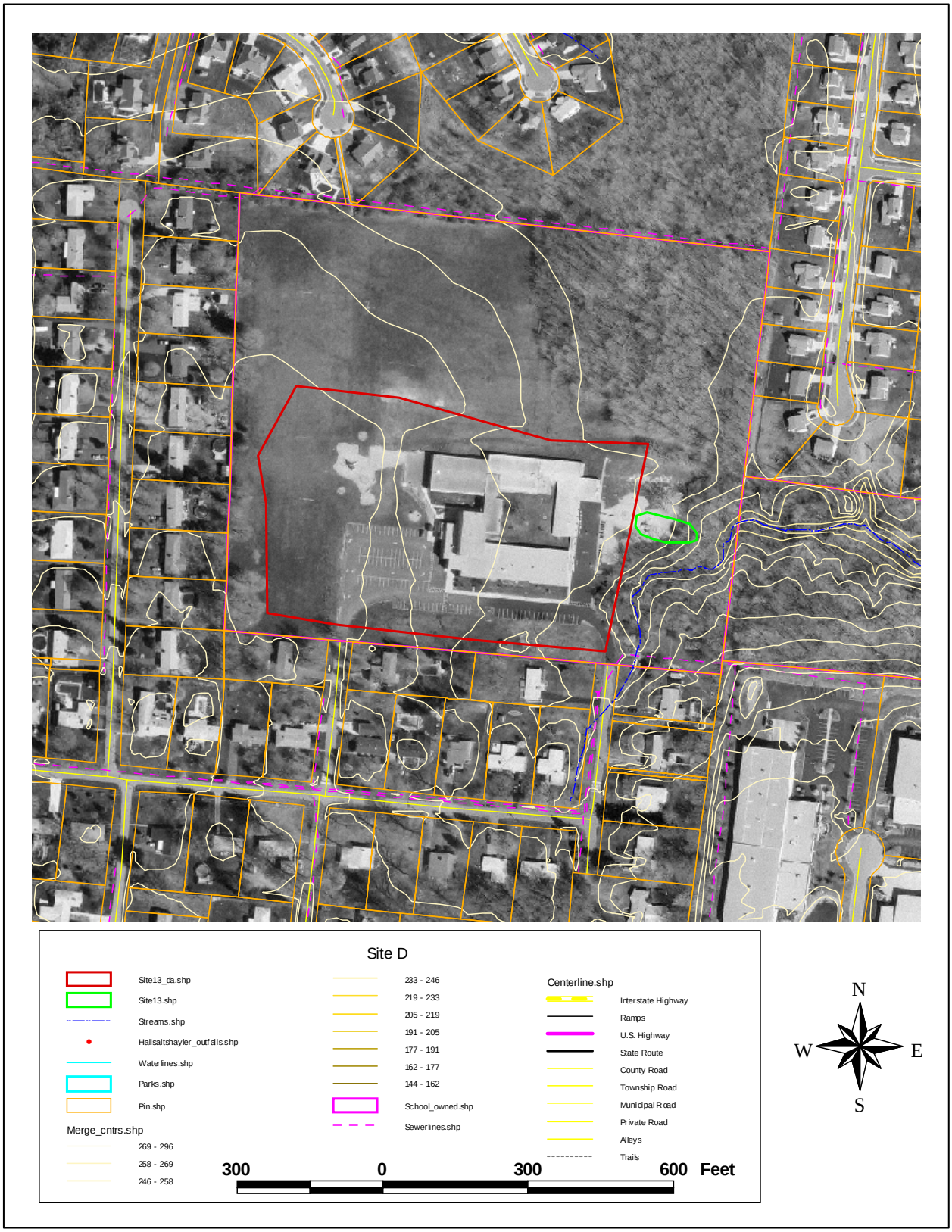

Figure A-4. Site D

Site E – River Valley Road Site

Site E is located adjacent to the East Fork Little Miami River on a large tract of land that is primed for development. This site would provide a regional facility that could serve a relatively large drainage area, 130 acres. The soil survey indicates hydric soils at this location, so a stormwater wetland is proposed for the site to provide water quality and hydrologic benefits from storm event runoff. As the site is still undeveloped, Site E provides an opportunity for peak flow control from the increased impervious areas associated with new development.

The only apparent constraint is the proximity of the 100-year floodplain for the East Fork Little Miami River. FEMA Q3 data indicates that portions of this site lie within the flood zone. Construction of a berm, or locating the proposed wetland outside the floodplain would preclude the site from being inundated by large storm events. Other constraints may become apparent as the site is developed. A geotechnical analysis should be performed to verify soil properties and groundwater depths to confirm the feasibility of a constructed wetland.

As the property is expected to be developed, the County has an opportunity to cost-share this facility with the developer. These opportunities could include the land for the facility being donated to the County, shared design and construction costs, or the developer could assume maintenance responsibilities. Access to the site would be from River Valley Road, and stormwater conveyances would need to be designed and installed to provide a means for the runoff to enter the device. Access and infrastructure requirements would need to be coordinated with the developer.

As the site is primarily open space at this time, two scenarios were analyzed. The first assumed that the final build-out for the drainage area would be 30 percent impervious, which is typical for a residential neighborhood, and the second that the percent impervious would be 70, representing a more commercial land use. Should the imperviousness vary, the information provided below for the facility would need to be adjusted, based on the expected final percent imperviousness. The proposed site is also very flat compared to the rest of the study area, so additional drainage could be accommodated by installing additional conveyances, such as swales and drainage pipes. The area depicted in Figure A-5 is to provide a general location for the wetland.

Drainage Area:	130.1 acres
Percent Impervious:	30% 70%
Recommended Device:	Wetland
Approximate BMP Surface Area:	75,940 ft^2 163,220 ft^2
Approximate Cost:	$141,100 $665,400

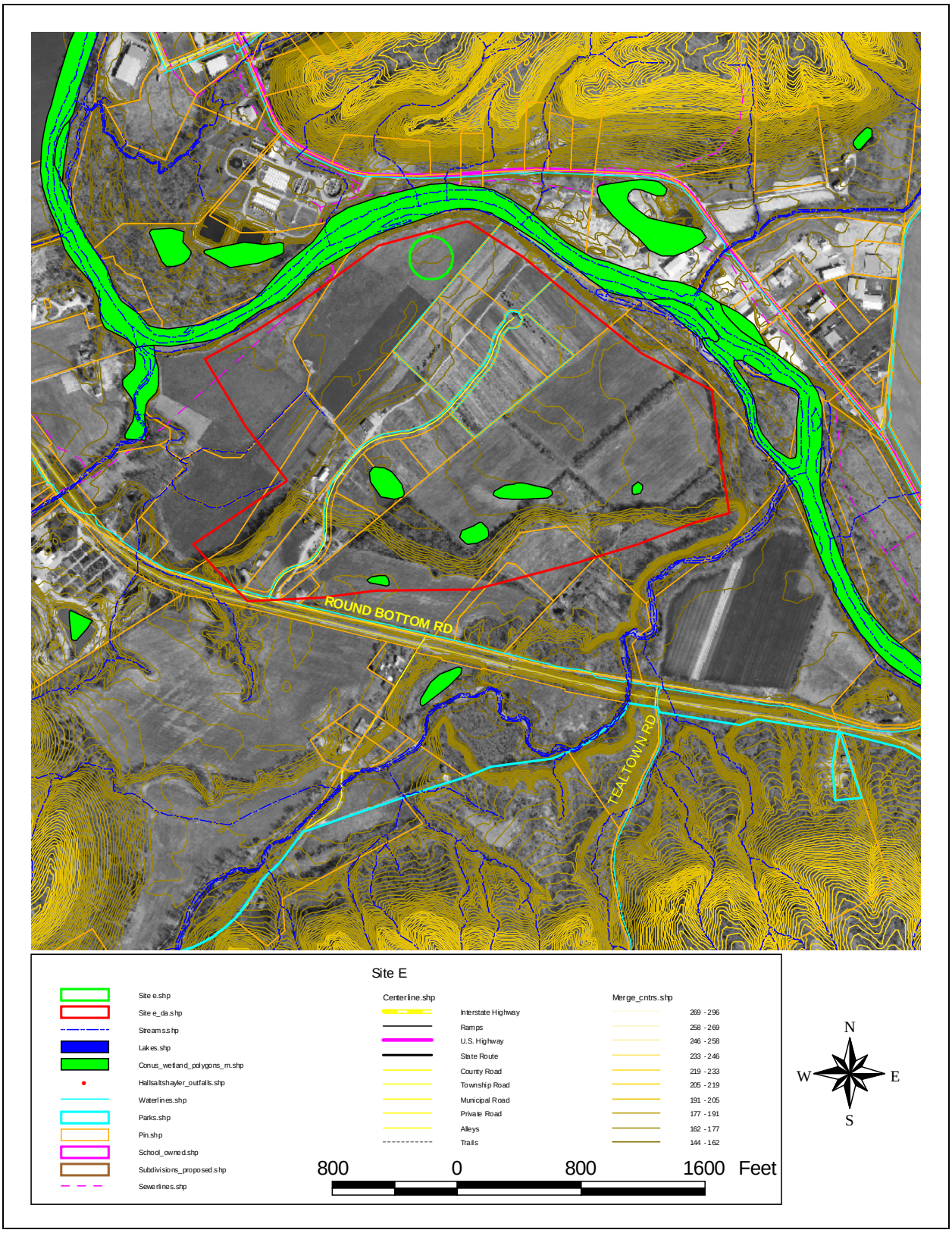

Figure A-5. Site E

Site F – Round Bottom Road Site

This site is located just south of Round Bottom Road at Tealtown Road on a large parcel that is primarily an open field. A wet pond is proposed for this site to serve potential development on the same parcel. The site is bordered by two small tributaries, one that flows into Salt Run, and the other to Hall Run just upstream of the confluence with the East Fork Little Miami River. Depending on whether the streams are classified as jurisdictional, additional drainages could be served by this facility by altering the existing hydrology, i.e., breaching the natural watershed. Topography suggests this is feasible due to the relative flat nature of the parcel.

Constraints are limited as the site is very rural in nature, and no obvious constraints to construction were observed. Once developed, constraints are expected to increase as utilities and other infrastructure is installed. Limited clearing, if any, is required, and access to the site could be from Round Bottom Road or Tealtown Road (see Figure A-6).

As with Site E, an imperviousness of 30 percent was assumed to reflect a residential neighborhood. The approximate surface area and costs would need to be adjusted based on a different drainage area and level of imperviousness.

Drainage Area:	20.1 acres
Percent Impervious:	N/A
Recommended Device:	Wet Pond
Approximate BMP Surface Area:	11,730 ft^2
Approximate Cost:	$341,900

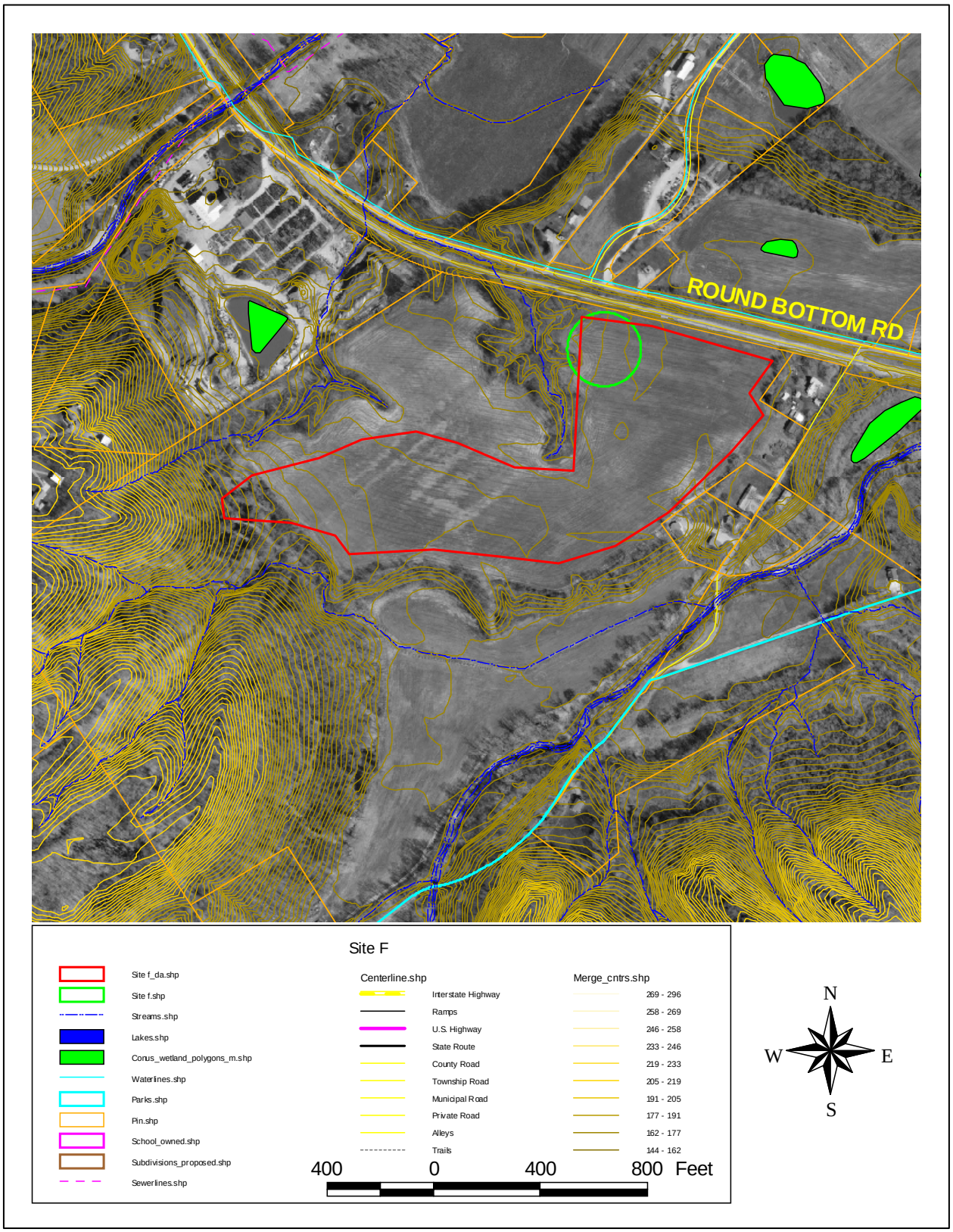

Figure A-6. Site F