



Study Plan for the Powell Creek (Auglaize River) Study Area 2013

Hydrologic Unit Code (HUC)
04100007 11

Defiance and Putnam Counties



Division of Surface Water
April 10, 2013

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Defiance and Putnam Counties, Ohio

In support of:
Powell Creek Nutrient Reduction Project
GLRI Grant GL-00E01131-0
State Grant EPAFPOWL12

Ohio Environmental Protection Agency
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Division of Surface Water
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April 10, 2013

CONTACTS

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- Defiance County – Matthew Smith 419-429-8381
- Putnam County – Jason Porinchok 419-429-8391

Sheriffs (emergencies dial 911)

- Defiance County – 419-784-1155
- Putnam County – 419-523-3208

Police Departments (emergencies dial 911)

- City of Defiance Police – 419-784-5050

Hospitals (emergencies dial 911 and maps attached)

- Mercy Hospital of Defiance – 419-782-8444
1404 E. 2nd St., Defiance, OH 43512
- Defiance Regional Medical Center – 419-783-6955
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INTRODUCTION

Dissolved reactive phosphorus (DRP) loadings into western Lake Erie from the Maumee River watershed are at record levels despite more than a decade of conservation programming (such as the Conservation Reserve Enhancement Program) focused on Lake Erie. Nutrient enrichment has caused the return of blue-green algae blooms in Lake Erie at levels not previously observed since the 1960s. While the sources of phosphorus are numerous, the largest land use (89%) in the Powell Creek watershed is cultivated cropland. The Powell Creek Nutrient Reduction project is designed to demonstrate the environmental benefits of targeting limited cost-share funding for agricultural nutrient reduction practices into small geographical land areas to produce measurable reductions in nitrogen, phosphorus and sediment loadings. Ohio EPA through the Division of Surface Water Nonpoint Source Program will partner with the Defiance County Soil & Water Conservation Districts, the Ohio Department of Natural Resources, Defiance County Health Department and local NRCS personnel to insure that this project is successfully implemented within the HUC 10 Powell Creek watershed. The bulk of requested funding will be sub-granted to the Defiance County SWCD to work directly with agricultural producers to accelerate improved nutrient management planning and facilitate implementation of recommended actions within the targeted project area.

During the 2013 field season (July through October) chemical, physical, and biological sampling will be conducted in the Powell Creek watershed to assess and characterize baseline water quality conditions prior to implementation of the Powell Creek Nutrient Reduction Project. The project will be implemented in the Powell Creek watershed (HUC 04100007 11) which is comprised of three (3) HUC12 sub-watersheds (North Powell Creek, Upper Powell Creek and Lower Powell Creek); the watershed lies within the Auglaize River basin, a tributary of the Maumee River. The Powell Creek watershed is located in northwest Ohio, overlapping parts of Defiance, Putnam, Henry and Paulding counties and is comprised of approximately 63,000 acres - of which about 84% is in agricultural production. The overwhelming majority of the watershed area is in Defiance and Putnam counties, which is where activities under this project will be concentrated. Other land uses within the Powell Creek watershed are forested cover (8.4%) and developed land, most of which is open space (7.1%) (Source: National Land Data Set, 2006).

The current aquatic life use designation of all primary streams in the Powell Creek watershed is unverified Warmwater Habitat (WWH). The entire watershed is located within the Huron-Erie Lake Plain ecoregion. Of eight sites that Ohio EPA sampled in the watershed in 2000, four met the designated or recommended aquatic life uses which included WWH, Modified Warmwater Habitat (MWH), and Limited Resource Water (LRW). However, these verified aquatic life use recommendations have not been codified in the Ohio Water Quality Standards. Based on the 2000 sampling and as currently specified in the 2012 Ohio Integrated Water Quality Monitoring and Assessment Report, principal causes of impairment are nutrients, siltation, organic enrichment/DO, flow alterations, and direct habitat alterations. Primary impairment sources identified are non-irrigated crop production and hydromodification-agriculture.

In addition to the above, specific objectives of the survey are:

- Establish the present biological conditions in the Powell Creek watershed by evaluating fish and macroinvertebrate communities;
- Identify the relative concentrations and loadings of nutrients and other selected parameters in surface water;
- Assess physical habitat influences on stream biotic integrity;
- Determine beneficial use attainment status and recommend changes if appropriate; and
- Confirm or revise causes and sources of beneficial use impairment as determined by earlier studies.

There is one permitted point source discharger within the watershed - the Continental WWTP discharges at RM 1.0 to an unnamed tributary to S. Fk. Powell Creek @ RM 13.36. Stream samples, including sample type, drainage area and location information are listed in Table 1 and represented graphically in Figure 1.

SAMPLING ACTIVITIES

Macroinvertebrate and Fish Assemblages

Macroinvertebrate assemblages using artificial substrates (quantitative sampling) and/or natural substrates (qualitative sampling) will be collected as listed in Table 1. Fish assemblages will be sampled using pulsed DC electrofishing protocols as listed in Table 1. Habitat will be scored using the Qualitative Habitat Evaluation Index (QHEI) at all fish sampling locations.

Chemical/Physical Water Sampling

Chemical sampling locations within the study area are listed in Table 1. Conventional chemical/physical water quality grab samples will be collected 3-5 times at each designated location during the survey. Samples will be collected between April and October. Datasondes© will be deployed at 3 locations for two 48-hour periods as detailed in Table 1. Chemical/physical parameters to be tested are listed in Table 2. An attempt will be made to sample surface waters across a variety of flow conditions, from lower flows to moderate and higher flows.

Chlorophyll Sampling

Benthic chlorophyll a samples are to be collected at designated wadeable and headwater sites noted in Table 1. Benthic chlorophyll samples are to be collected at least once, and should be timed to coincide with deployment of Datasonde© automated data loggers during stable, baseflow conditions (i.e., typically the second sonde deployment).

QUALITY ASSURANCE/SAMPLING METHODS

Ohio EPA Manuals

All biological, chemical, data processing, and data analysis methods and procedures adhere to those specified in the Surface Water Field Sampling Manual for water column chemistry, bacteria and flows (Ohio EPA 2013a), Biological Criteria for the Protection of Aquatic Life, Volumes II - III (Ohio EPA 1987, 1989a, 1989b, 2013b, 2013c), and The Qualitative Habitat Evaluation Index (QHEI); Rationale, Methods, and Application (Ohio EPA 1989c, 2006) for habitat assessment.

Use Attainment

Attainment/non-attainment of aquatic life uses will be determined by using biological criteria codified in Ohio Administrative Code (OAC) 3745-1-07, Table 7-17. Numerical biological criteria are based on multimetric biological indices including the Index of Biotic Integrity (IBI) and modified Index of Well-Being (MIwb), indices measuring the response of the fish community, and the Invertebrate Community Index (ICI), which indicates the response of the macroinvertebrate community.

Performance expectations for the tiered aquatic life uses (Warmwater Habitat [WWH], Exceptional Warmwater Habitat [EWH], and Modified Warmwater Habitat [MWH]) were developed using the regional reference site approach (Hughes et al. 1986; Omernik 1987). This fits the practical definition of biological integrity as the biological performance of the natural habitats within a region (Karr and Dudley 1981). Attainment of an aquatic life use is FULL if all three indices (or those available) meet the applicable criteria, PARTIAL if at least one of the indices did not attain and performance did not fall below the fair category, and NON if all indices either fail to attain or any index indicates poor or very poor performance. The Powell Creek watershed results will be compared to biocriteria for the Huron-Erie Lake Plain ecoregion.

Stream Habitat Evaluation

Physical habitat is evaluated using the Qualitative Habitat Evaluation Index (QHEI) developed by the Ohio EPA for streams and rivers in Ohio (Ohio EPA 1989c, Ohio EPA 2006). Various attributes of the available habitat are scored based on their overall importance to the establishment of viable, diverse aquatic faunas. Evaluations of type and quality of substrate, amount of instream cover, channel morphology, extent of riparian canopy, pool and riffle development and quality, and stream gradient are among the metrics used to evaluate the characteristics of a stream segment, not just the characteristics of a single sampling site. As such, individual sites may have much poorer physical habitat due to a localized disturbance yet still support aquatic communities closely resembling those sampled at adjacent sites with

better habitat, provided water quality conditions are similar. QHEI scores from hundreds of segments around the state have indicated that values higher than 60 were generally conducive to the establishment of warmwater faunas while those which scored in excess of 75-80 often typify habitat conditions which have the ability to support exceptional faunas.

Biological Community Assessment

Macroinvertebrates will be collected from artificial substrates and/or natural stream habitats. Artificial substrate collections will be collected at all sites with greater than 20 mi² drainage areas or at reference site locations. This sample provides quantitative data and consists of a composite sample of five modified Hester-Dendy multiple-plate artificial substrate samplers colonized for six weeks. Qualitative sampling will be conducted at all sampling locations. This sampling effort consists of an inventory of all observed macroinvertebrate taxa from the natural stream habitats at each site with no attempt to quantify populations other than notations on the predominance of specific taxa or taxa groups within major macrohabitat types (e.g., riffle, run, pool, margin). Detailed macroinvertebrate assemblage sampling protocols are documented in Biological Criteria for the Protection of Aquatic Life, Volume III (1989b, 2013c).

Fish will be sampled at each sampling location using pulsed DC headwater, wading, or boat electrofishing methods depending on watershed size at each sampling zone. Sites with drainage areas greater than 20 mi² or at reference site locations will be sampled twice during the sampling index period. Fish are processed in the field which includes identifying each individual to species, counting individuals at all sites, weighing individuals at wading and boat sites, and recording any external abnormalities. Detailed fish assemblage sampling protocols are documented in Biological Criteria for the Protection of Aquatic Life, Volume III (1989b, 2013c).

Surface Water

Surface water grab samples will be collected and preserved using appropriate methods, as outlined in Surface Water Field Sampling Manual for water column chemistry, bacteria and flows (Ohio EPA 2013a) and delivered to the Ohio EPA Division of Environmental Services lab for analyses. Datasonde® automated data loggers will be deployed at select locations to evaluate diel measurements of dissolved oxygen, pH, temperature, and conductivity.

Chlorophyll

Benthic chlorophyll a samples will be collected and preserved using appropriate methods, as outlined in Appendix II of Surface Water Field Sampling Manual for water column chemistry, bacteria and flows (Ohio EPA 2013a) and delivered to the Ohio EPA Division of Environmental Services lab for analyses. Alkalinity must be requested as a routine water quality parameter at all study sites along with the routine field parameters, especially temperature and pH.

Field Quality Control Samples

Ten percent of the water samples will be submitted to the lab as field duplicates. Field blanks will occur at a minimum of 5 percent of the water samples. Field instruments will be calibrated daily using manufacturer guidelines and requirements as noted in Surface Water Field Sampling Manual for water column chemistry, bacteria and flows (Ohio EPA 2013a).

Figure 1. Sampling locations (biological, physical habitat, and stream chemistry) and current land uses in the Powell Creek (Auglaize River) watershed study area, 2013.

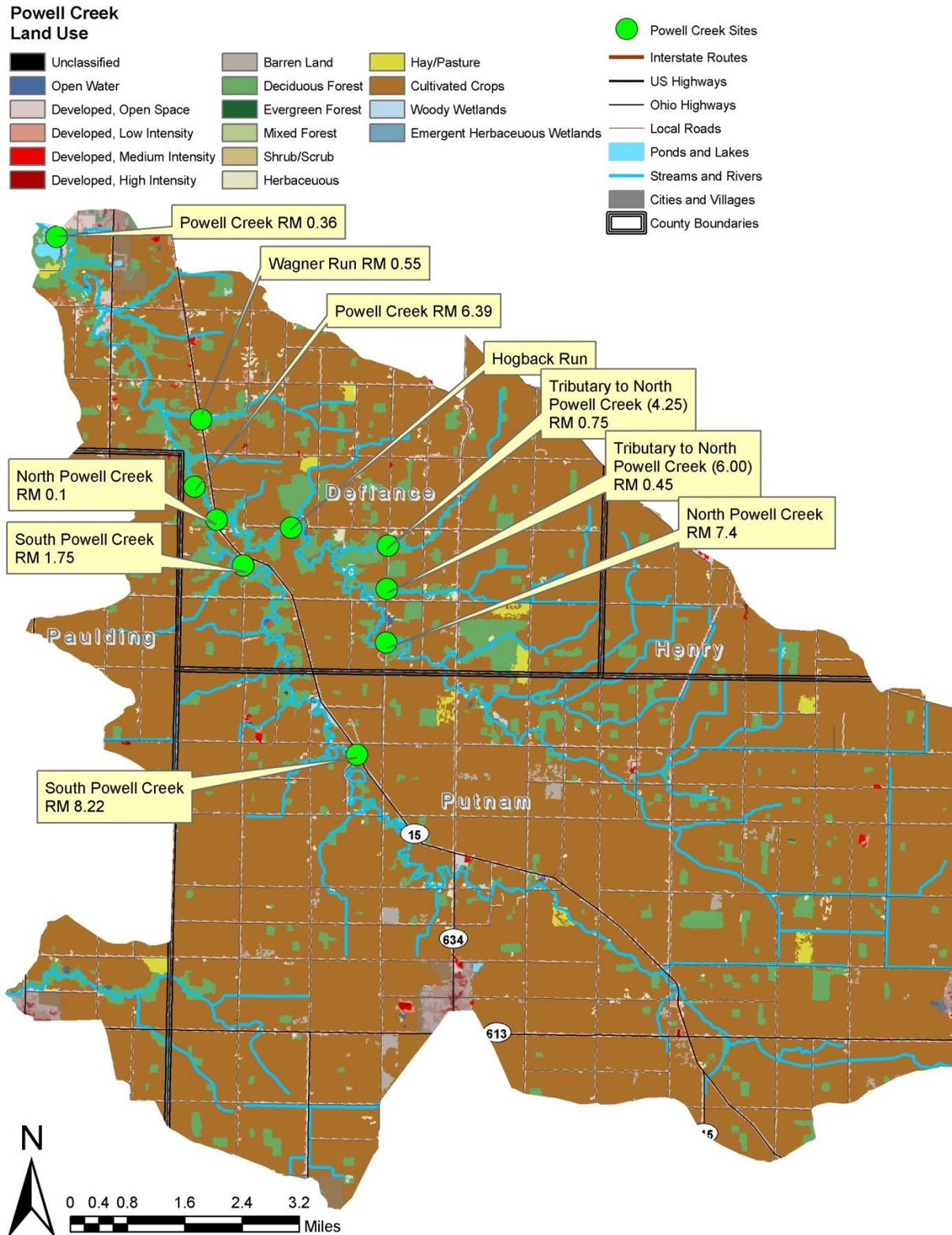


Table 1. Powell Creek (Auglaize River) watershed monitoring locations, 2013.

HUC12	Stream Code	Station	Latitude	Longitude	Sample Type	River Mile	Drainage Area	Location	County
04100007 11 01 North Powell Creek									
North Powell Creek	04-112-000	204280	41.1717	-84.2858	F2x, Mqt, C	7.40	30.7	Highland Center Rd. (Twp. Rd. 182)	Defiance
		P06G05	41.1958	-84.3319	F2x, Mqt, C, Cl, D	0.10	46.2	St. Rt. 15	Defiance
Trib. @ RM 6.00	04-112-003 (04-296)	302191	41.182530	-84.285898	F1x, Mql, C	0.45	4.0	Highland Center Rd. (Twp. Rd. 182)	Defiance
Trib. @ RM 4.25	04-112-001 (04-297)	302192	41.191261	-84.285837	F1x, Mql, C	0.75	4.3	Highland Center Rd. (Twp. Rd. 182)	Defiance
Hogback Run (@ RM 2.20)	04-113-000	302193	41.194586	-84.311403	F1x, Mql, C	0.10	2.1	Hoffman Rd. (Twp. Rd. 7)	Defiance
04100007 11 02 Upper Powell Creek (South Powell Creek)									
South Powell Creek	04-114-000	P06P06	41.1489	-84.2931	F2x, Mqt, C	8.22	25.7	Co. Rd. 22B	Putnam
		P06G04	41.1867	-84.3245	F2x, Mqt, C, Cl, D	1.75	35.2	Schubert Rd. (Co. Rd. 169)	Defiance
04100007 11 03 Lower Powell Creek (Powell Creek)									
Powell Creek	04-110-000	P06G08	41.2024	-84.3380	F2x, Mqt, C	6.39	85.0	Holly Rd. (Co. Rd. 9)	Defiance
		P06G07	41.2524	-84.3763	F2x, Mqt, C, Cl, D	0.36	97.0	Boy Scout Rd. ^a	Defiance
Wagner Run (@ RM 5.19)	04-111-000	P06G06	41.2161	-84.3366	F1x, Mql, C	0.55	3.4	St. Rt. 15	Defiance

F1x - Fish one-pass site; F2x – Fish two-pass site.
 Mqt - Macroinvertebrate quantitative site; Mql – Macroinvertebrate qualitative site.
 C - Chemical water quality site.
 Cl - Chlorophyll analysis site.
 D - Datasonde[®] automated data logger monitoring site.

a - Contact Pat Bohn (Camp Lakota ranger) at (419) 303-4510 for camp access.

Table 2. List of chemical/physical water quality parameters to be analyzed/ measured in surface water from the Powell Creek watershed. Water samples will be collected 3-5 times. Select sampling locations will be monitored for dissolved oxygen, pH, temperature, and conductivity using Datasonde© automated data loggers (Table 1).

Parameter	Units	Method	MDL
Temperature	°C	YSI 556 or Pro Plus Meter	
Dissolved Oxygen	mg/L	YSI 556 or Pro Plus Meter	
Dissolved Oxygen	%	YSI 556 or Pro Plus Meter	
pH	SU	YSI 556 or Pro Plus Meter	
Conductivity	µS/cm	YSI 556 or Pro Plus Meter	
Specific Conductivity	µS/cm	YSI 556 or Pro Plus Meter	
Dissolved Solids	mg/L	SM 2540 C	10
Suspended Solids	mg/L	SM 2540 D	5
Alkalinity	mg/L	USEPA 310.1	5
Ammonia	mg/L	USEPA 350.1	0.05
Chemical Oxygen Demand	mg/L	SM 5220 D	20
Chloride	mg/L	USEPA 325.1	5
Specific Conductivity (lab)	µS/cm	SM 2510 B	2
Nitrate-Nitrite	mg/L	USEPA 350.1	0.5
Nitrite	mg/L	USEPA 353.2	0.02
Sulfate	mg/L	USEPA 375.2	10
Kjeldahl Nitrogen	mg/L	USEPA 351.2	0.2
Orthophosphate	mg/L	USEPA 365.1	0.01
Phosphorus	mg/L	USEPA 365.4	0.01
Chlorophyll a	µg/L	USEPA 445.0	

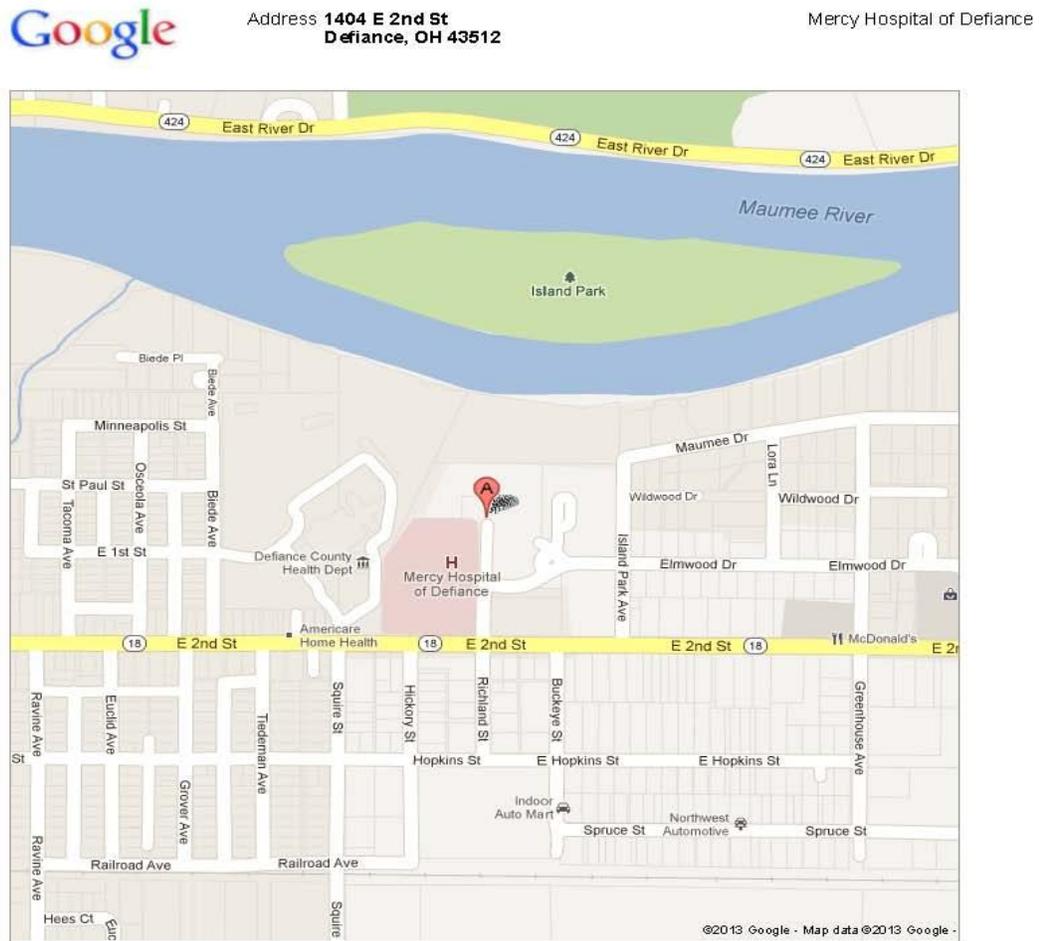
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Mercy Hospital of Defiance
419-782-8444

1404 East 2nd Street, Defiance, OH - Google Maps

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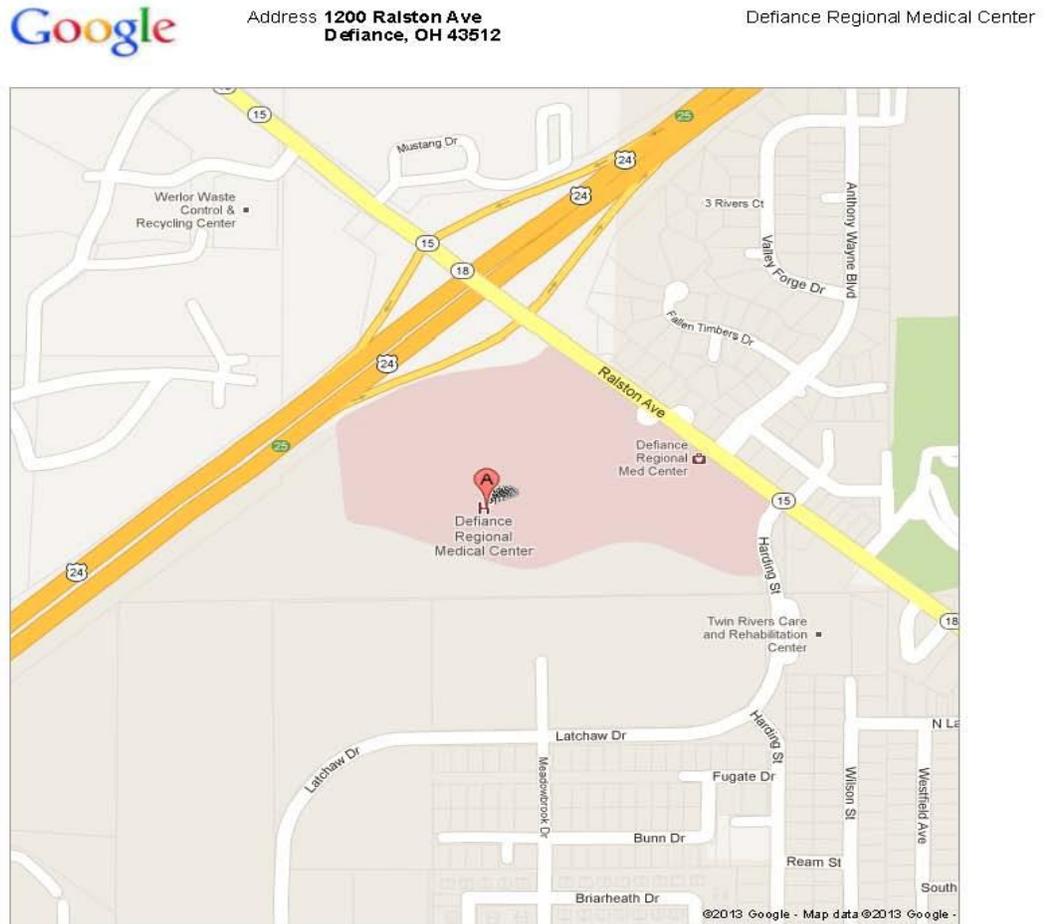


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419-783-6955

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