INTERPRETATION OF DOMESTIC WATER WELL PRODUCTION DATA AS A TOOL FOR DETECTION OF TRANSMISSIVE BEDROCK FRACTURED ZONES UNDER COVER OF THE GLACIAL FORMATIONS IN GEAUGA COUNTY, OHIO

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Madan Maharjan

CHAPTER ONE

INTRODUCTION

Hydraulic conductivity in fractured rock formations is closely related to fracture characteristics like fracture aperture and frequency, fracture length, fracture orientation and angle, fracture interconnectivity, filling materials, and fracture plane features (Hamn et al., 2007). Fractures of all sizes have a dominant effect on the transport properties in tight sedimentary rock formations. Fluid flow in fractured rocks is a subject of importance in many projects including investigations of groundwater resources in bedrock aquifers, hazardous waste disposal, nuclear waste repository and oil and gas production. Fractured rock aquifers underlie approximately 100% of Geauga County. Despite their importance for water supply for city and domestic use, irrigation, livestock supplies etc., it is extremely difficult to quantify the bulk properties controlling fluid transport through fractured rock (Brown, 1989).

Conventional methods for the determination of bulk fracture and rock hydraulic properties include hydraulic testing (Gernand & Heidtman, 1997), borehole logging (Low, Kelly, & Vomvoris, 1994), laboratory hydraulic tests (ASTM D7100-06) and investigations of drill cores (Moeton & Lovd, 1998). However such techniques require implementation of elaborate and costly drilling programs, and significantly long periods of time to conduct pumping, packer or tracer tests.

Alternatively, water well log and pumping test data from private residence water wells could prove an alternative means to determine regional fracture pattern, which is cost and time effective.

Objectives of the Study

The objectives of the study are to map the hydraulic conductivity of the Sharon Sandstone within the study area, to test the feasibility of locating transmissive bedrock fractured zones under the blanket of glacial till and define their spatial trends (if any) using available hydraulic (pumping test) data from Well Logs and Drilling Reports of private residential water wells, and further analyze the origin of the fractures in relation to geological history of the area. For this purpose, Geauga County is chosen as the study area (Figure 1) which is located in Northeastern Ohio about 32km (20 miles) east of Cleveland. It is bounded on the north by Lake County, on the east by Ashtabula and Trumbull Counties, on the south by Portage County and on the west by highly urbanized Cuyahoga County. Geauga County lies between 81^{o}00'12"and 81^{o}23'30" west longitude and 41^{o}20'52" and 41^{o}42'53" north latitude. The entire county lies within the Connecticut Western Reserve and has an area of about 1067 square km (412 square miles).

Pumping test data, Well Logs and Drilling Reports, for the proposed study area are available on the website of Water Division of the Ohio Department of Natural Resources. (http://www.dnr.state.oh.us/water/maptechs/wellogs/app/).

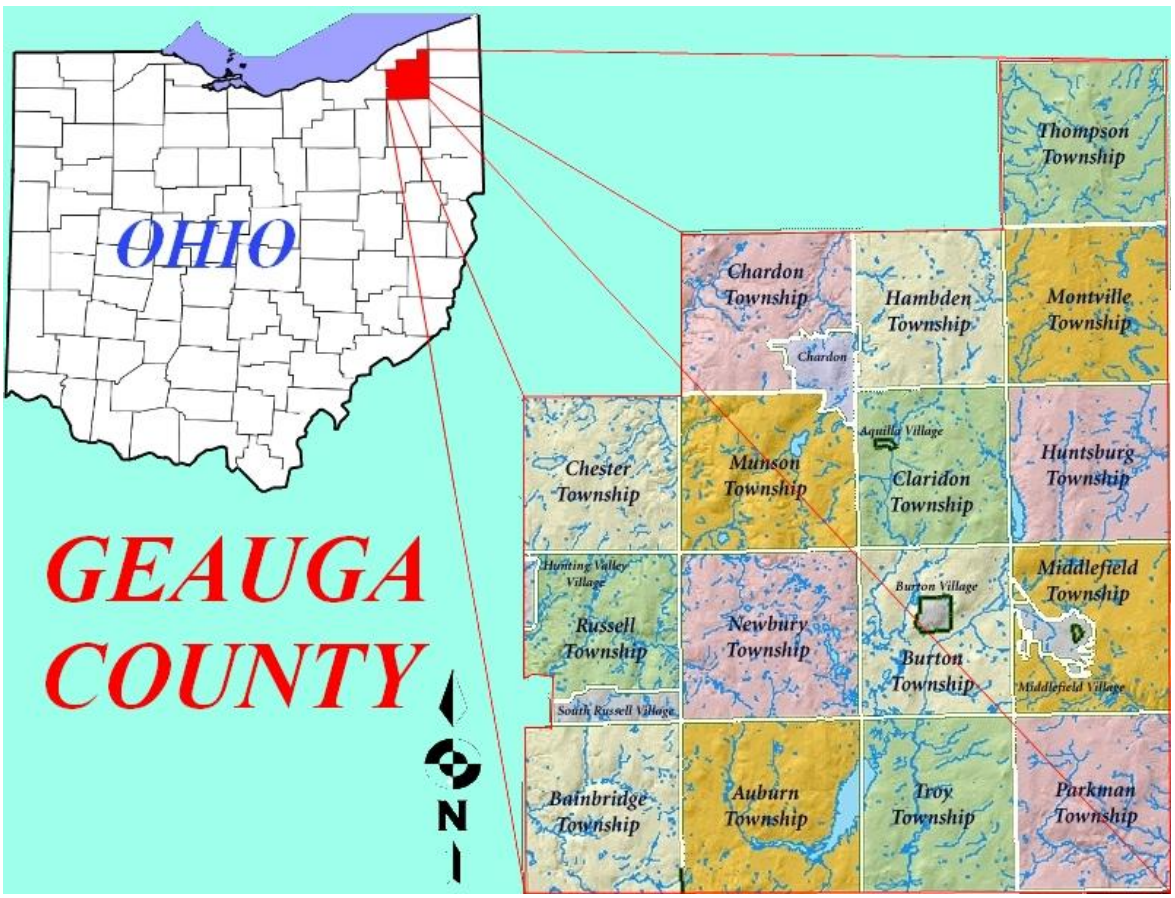

Figure 1: Location map of the study area. (http://www.auditor.co.geauga.oh.us)

Hypotheses

1. The values of hydraulic conductivity computed from private residential water wells are mappable.

2. The values of hydraulic conductivity computed for the Sharon Sandstone member of Pennsylvanian Pottsville Formation in Geauga County, Ohio, have bimodal distribution.

3. The low-value population represents hydraulic properties of the primary porosity, while the high-value population represents the transmissive fractured zones (secondary porosity) within the Sharon aquifer located underneath the blanket of glacial tills.

4. The high-values demonstrate distinct trends providing clues as to the distribution and the origin of the fractured zones.

Previous work

A procedure for delineation of transmissive bedrock fracture zones under glacial drift formations using the data from residential Water Well Logs and Drilling Reports was conducted as a pilot project by Asim et al. (2004). Besides this, virtually no detailed investigations concerning the delineation of fractures using hydrogeologic properties under the glacial drift have been found. However, the literature related to the field of fractures determination in bedrock aquifers is vast. The references contribution is not intended as an exhaustive review of the subject, and for the sake of brevity, the number of references cited herein is limited. A review of the literature reveals that there are numerous studies applying various geophysical methods to identify fracture zones in bedrock formations. For example, electrical conductivity, 2D-resistivity anomalies or

GPR reflections were found useful in detection of fluid-filled fractures by Degnan, Clark and Harte (2004). P-wave and cross-polarized S-wave vibrators were used to investigate the potential utility of shear-wave anisotropy measurements in characterizing a fractured rock mass by Majer (1988) and Liu (1991). A pilot shallow electrical resistivity survey and numerical modeling experiment was undertaken to explore the efficacy of direct current (DC), dipole-dipole resistivity and very low frequency (VLF) electromagnetic methods in detecting the fractured zone beneath a relatively thick overburden within the crystalline basement rocks of Ile-Ile, southwestern Nigeria by Adepelumi in 2006. Wright et al. (1998) introduced a new fracture diagnostic technology, a downhole tiltmeter for fracture mapping. Gettings and Bultman (2005) used gravity and aeromagnetic anomaly data to develop a method to map the location of possible deep penetrating fractures over a 120,000 km^2 area. Ugwu and Nwosu (2009) used electromagnetic profiling technique to detect fractures for groundwater development in Oha Ukwu Local Government Area. Morin et al. (1997) used the combination of geophysical tools, caliper, temperature, fluid conductivity, formation electrical resistivity, natural gamma activity, acoustic borehole televiewer and heat-pulse flowmeter under ambient and pumping conditions to characterize the fractures type, orientation spatial distribution, frequency and transmissivity of an aquifer. Runkel, et al. (2006) applied a combination of hydrostratigraphic approach and geophysical logs to recognize regionally extensive bedding-plane fracture clusters, exceptionally high hydraulic conductivity features in siliciclastic-dominated strata which are largely friable sandstone with high intergranular conductivity.

Because all the raw data used in this thesis, i.e. Water Well Logs and Driller Reports from the Ohio Department of Natural Resources, Division of Water are originally in the English system of units, results of all the calculations are presented here in both, English and metric units.

CHAPTER TWO

GEOLOGY AND HYDROGEOLOGY OF THE STUDY AREA

Glacial Geology of the Study Area

After the deposition of the youngest bedrock units (Pennsylvanian), the study area was lifted during the Appalachian Orogeny in late Palaeozoic time above sea level. This was followed by a long period of erosion during which rolling hills and valleys were carved into the bedrock surface. During the Pleistocene Epoch (ice age), glaciers scoured the hilltops and deepened some valleys, producing rock debris (drift) that was carried along with the ice and deposited by melt water (outwash) in the bedrock valleys, or directly by the ice (till) when the glaciers melted (Baker, 1964).

During the Pleistocene Epoch (2 million to 10,000 years ago), at least four major episodes of glaciations occurred in North America. In Ohio, evidence exists for three of these periods: the Wisconsinan, which occurred between 70,000 and 10,000 years ago; the Illinoian, which occurred at least 120,000 years ago, and the pre-Illinoian. Approximately two thirds of the state is covered by the mantle of glacial material deposited during these periods (Fig. 2).

The majority of the glacial materials in Ohio were deposited by the Wisconsinan glaciers. Less extensive Illinoian-age deposits are found in the southwestern counties of the state along most of the glacial boundary. Pre-Illinoian deposits are evident at the surface only in Hamilton County. Glacial deposits in Ohio average 10 to 12 meter (35 to 40 feet) in thickness. However, thicknesses range in places from less than a foot (on bedrock uplands) to more than 152 meter (500 feet) in buried valleys (Stout, Ver Steeg, & Lamb, 1943). Glacial till (Wisconsinan age) covers most of Geauga County. Till, by definition, is deposited directly by glacial ice and is typically a poorly sorted mixture of clay, silt, sand, and gravel. The total thickness of all till layers in Geauga County ranges from less than a meter (2 feet) on the crest of some knobs and ridges to several hundred meter in the deeper buried valleys (Totten, 1988).

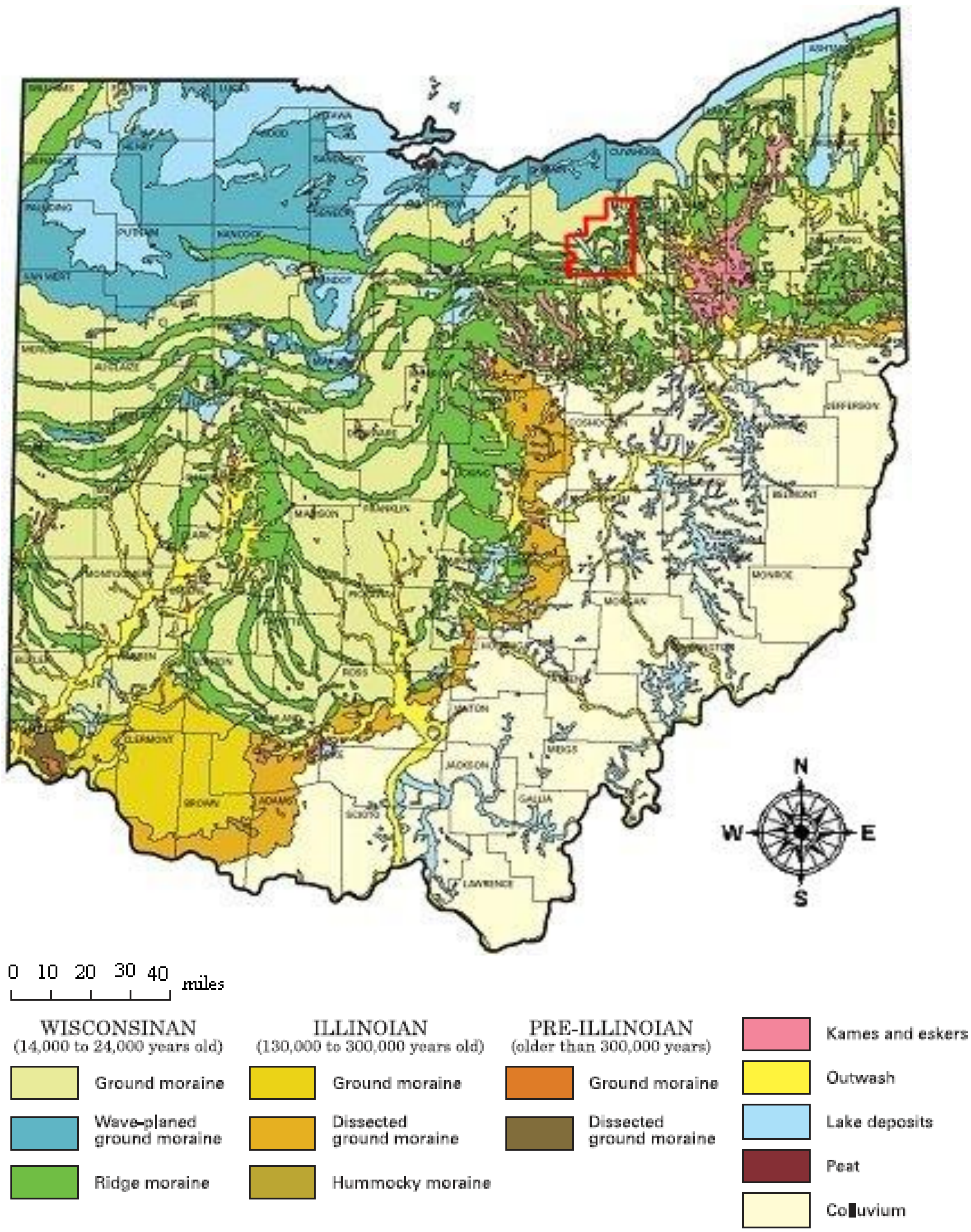

Figure 2: Glacial geological map of Ohio (study area delineated in red).

(http://www.dnr.state.oh.us/portals/10/pdf/glacial.pdf)

The Defiance Moraine (a glacial end moraine) virtually surrounds the County on three sides: east, west, and north. This feature is composed primarily of glacial till with some gravel. Totten (1988) described the Defiance Moraine in Geauga County as "...a more or less continuous belt of hummocky topography typically 1.6 to 3.2 km (1 to 2 miles) wide with 3 to 9 meter (10 to 30 feet) of relief..." Other smaller end moraines or segments of end moraines can be found in Russell, Chester, Clairdon, Middlefield, and Parkman Townships (Totten, 1988). The end moraines in Geauga County have been interpreted as indicating the furthest extent of the advance of a glacier during Wisconsin glaciations (Totten, 1988). However, there are glacial formations south of this line, all the way to quite a few miles south of Kent.

As glacial ice melts, a tremendous volume of water is released. This melt water carries sand, gravel, silt, and clay previously trapped within the glacial ice. The moving water sorts these materials by size, depositing the coarse sand and gravel close to the source of the melt water and carrying away the silt and clay downstream. If the sand and gravel is deposited directly on the land surface in front of glacial ice the resulting formation is referred to as an "outwash deposit". If the sand and gravel was deposited in holes or depressions on the ice, and then laid down on the land surface as the ice melted, the resulting deposit is referred to as a "kame". In areas where ice remained in the valleys while the uplands were ice-free, meltwater often deposited sand and gravel that would sometimes accumulate in bands along the margins between the ice and the uplands. Deposits of this type are called "kame terraces".

Outwash deposits, kames and kame terraces are common in Geauga County. Outwash deposits found near the surface in the County are primarily confined to the valleys currently occupied by the larger streams which flow through the County (Totten, 1988).

Kames and kame terraces are also found within the valleys of the major streams. However, a large area approximately 16 km long and 8 km wide of kames and kame terraces covered by a layer of glacial till occurs in Auburn, Newbury, Munson, Burton, and Troy Townships (Totten, 1988).

Lacustrine deposits are the surficial deposits within most of the Cuyahoga River valley and large parts of many of the other large river valleys. Layers of silt and fine sand are the primary components of these deposits. Surface runoff washed these sediments into lakes which occupied the valleys when glacial ice blocked the flow in the rivers. Over a period of time the silt and sand settled to the bottom of the lakes and accumulated into thick deposits. Lacustrine deposits also occur where kettle lakes have been filled in with sediments.

Streams which flowed either prior to or between periods of glaciation cut deep valleys into the bedrock underlying Geauga County. The largest and deepest of these valleys form a network which trends northeast to southwest and northwest to southeast through the center of the county.

As glacial ice advanced through the County, the bedrock valleys were partially or in some areas totally filled with glacial drift. This material consists of primarily till but does contain some significant layers of outwash sand and gravel in many areas.

Bedrock Geology of the Study Area

Bedrock underlying Geauga County belongs to the Devonian, Mississippian and Pennsylvanian Systems (Table 1). These formations are composed predominantly of sandstones, conglomerates, and shale. There are four hydrogeologic units namely: Pottsville Formation, the Cuyahoga Group, the Berea Sandstone, and the Pre-Berea rocks (i.e, the Bedford Shale). Bedrock sub-cropping within the buried stream channels is predominantly shale belonging to the Mississippian and Devonian Systems. The lowermost units in the shallower valleys are typically of the Mississippian age Meadville Shale and Orangeville Shale while the lowermost units in the deeper valleys are the Cleveland Shale and the Chagrin Shale (Devonian System).

The Sharon Sandstone is the basal unit of the Pottsville Formation, and rests disconformably on the underlying Mississippian Cuyahoga Group. The Sharon Sandstone (Pennsylvanian System) is the youngest bedrock formation predominantly capping the numerous bedrock ridges and knobs in the northern third of the county. Most ridges and knobs in the southern two thirds are capped by either the Massillon Sandstone (Pennsylvanian System) or the Sharon Sandstone. Some ridges in the southwest corner of the county are capped by the Mercer Shale. Sugarloaf Mountain, the highest point in Geauga County, is capped by the Homewood Sandstone (Pennsylvanian System). Because of a gentle southward dip, the Pottsville Formation has a limited areal extent in the northern part of the County, where it commonly caps topographic high areas. The shale unit of the Sharon Sandstone member is usually thin or absent within the study area, having been removed by erosion. The shale is gray to black sandy shale which contains fossilized plant fragments and thin beds of coal (Baker, 1964). The Sharon Sandstone is predominantly a quartzose or pebbly sandstone with the conglomerate phase occurring in local channels or layers (Fuller, 1974).

The Cuyahoga Group (Mississippian) is comprised of interbedded sandstones, siltstones, and shale. The Group consists of three formations: the Meadville Shale, the Sharpsville Sandstone, and the Orangeville Shale (Baker, 1964). The youngest formation of the Cuyahoga Group, the Meadville Shale, is composed of homogeneous, dark, blue-gray, fissile shale interbedded with abundant layers of siltstone and sandstone. The Sharpsville Sandstone is a flaggy, thin bedded, fine-grained, bluish sandstone or siltstone interbedded with blue-gray shale, which grades into the overlying Meadville. Beneath the Sharpsville is the Orangeville Shale. It, like the Meadville, consists of relatively few layers of interbedded sandstone and siltstone (Baker, 1964).

The Berea Sandstone (Mississippian) underlies the Cuyahoga Group which comprises fine to medium-grained, well sorted quartz sandstone. It is relatively uniform in thickness, varying from about 10 to 15 meter. However, at places, because of the disconformable surface with the underlying Bedford Shale, thicknesses are known to reach up to 45 meter in what are believed to be channel fillings (Baker, 1964).

The rocks below Berea Sandstone belong to Bedford Shale which crop out only at the bottom of a few stream channels in the study area. It is bluish-gray to buff-colored clay shale or silty shale interbedded with numerous thin beds or blue-gray siltstone and fine grained calcareous sandstone. It is about 15 to 21 meter thick in Geauga County

(Baker, 1964). Deeper, Bedford Shale is followed by the Devonian Ohio Shale sub-cropping only in the deepest buried valleys of Geauga County.

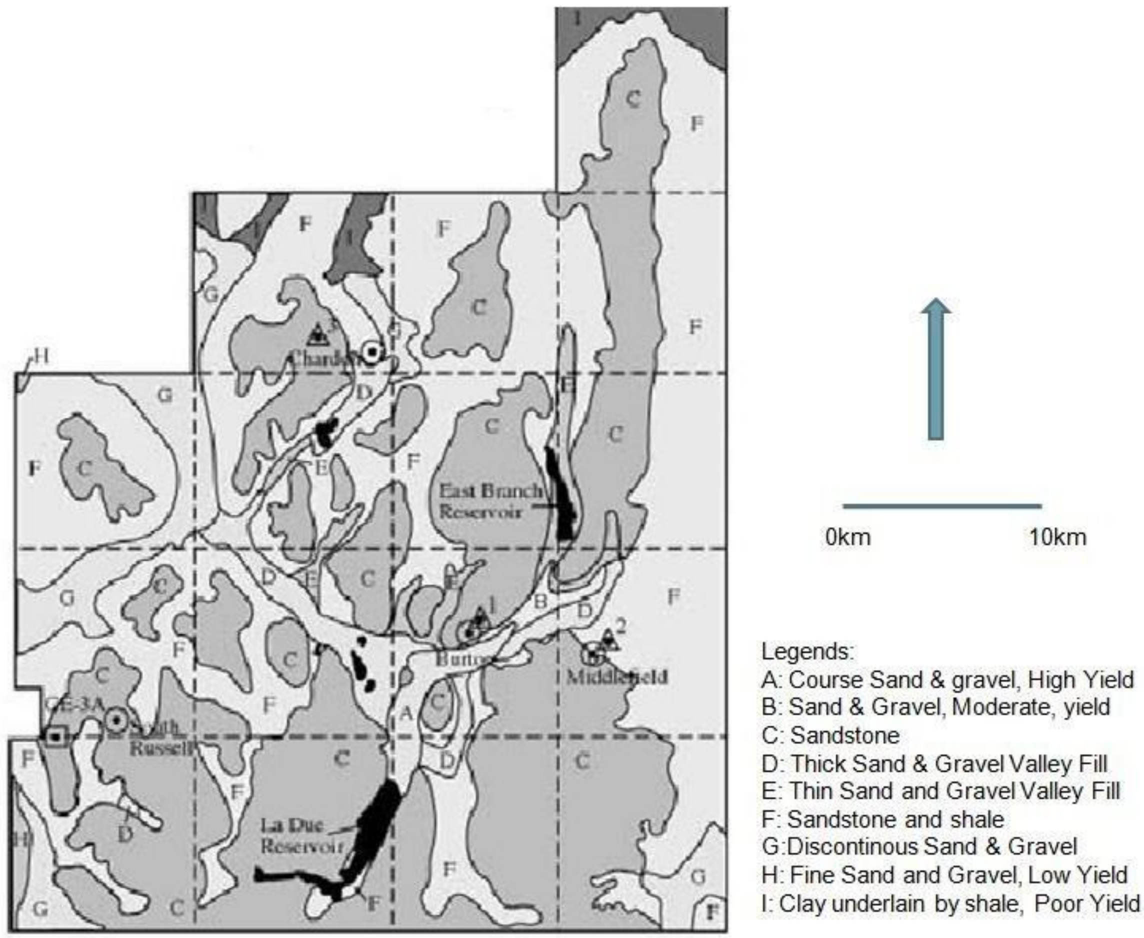

Figure 3: Hydrogeological Map of Geauga County. (Ground-Water Resources of Geauga County map, A. C. Walker, 1978, ODNR Division of Water)

Table 1: Generalized Bedrock Stratigraphy of Geauga County (modified after Aller & Ballou, 1994).

System	Formation	Members	Rock Type
Pennsylvanian	Pottsville	Homewood Sandstone	White to tan, medium-to coarse grained sandstone
		Mercer Shale	Blue-gray to black, silty to sandy, micaceous shale, locally interbedded with sandstone or siltstone layers
		Massillon Sandstone	White to buff, fine-to medium-grained sandstone, locally contains thin layers of shale
		Quakerstown	Coal, found locally
		Sharon Shale	Blue-gray, sandy micaceous shale, may contain thin layers of siltstone and/ or sandstone
		Sharon Coal	Coal, found locally
		Sharon Conglomerate	White, medium-to coarse-grained sandstone; contains lenses of pebbles
Mississippian	Cuyahoga	Meadville Shale	Interbedded blue-gray shale and siltstone
		Sharpsville Sandstone	Blue-gray sandstone and siltstones interbedded with shale
		Orangeville Shale	Blue-gray, silty shale with some siltstone layers
		Berea Sandstone	Gray to blue-gray, fine-to medium-grained sandstone
		Bedford Shale	Blue-gray, silty shale with thin interbedded siltstones
Devonian	Ohio Shale	Cleveland Shale	Dark-gray to black shale
		Chagrin Shale	Blue-gray silty shale with some thin siltstones layers

Hydrogeology

Geauga County lies within the glaciated central hydrogeologic region of the DRASTIC system. The DRASTIC model is a standardized system for evaluating ground water pollution potential. The acronym DRASTIC stands for ***D***epth to water, net ***R***echarge, ***A***quifer media, ***S***oil media, ***T***opography, ***I***mpact of the vadose zone, and hydraulic ***C***onductivity. (Aller et al.,1987) The entire county is covered by variable thicknesses of glacial till and outwash sand and gravel. The thickest deposits are found in the areas underlain by buried valleys. The coarser-grained deposits constitute the major ground-water resource. Yields from the till are variable but generally low. The glacial deposits also serve as the source of recharge to the underlying bedrock aquifers.

Aquifers within Geauga County are divided into two general groups: consolidated sandstone and shale formations within the bedrock, and unconsolidated glacial deposits. Of these two, the most wide-spread aquifers are the various bedrock formations. Bedrock aquifers on the ridges and hills are primarily the Sharon Conglomerate and the Massilon Sandstone. Yields from these formations may be as high as 545 cubic meters per day (100 gallons per minute) in some locations (Walker, 1987). In the valleys and lowlands, the principal bedrock aquifers are the interbedded sandstone and shale of the Mississippian System (Table 1). Devonian-age shale is the lowermost water bearing formation sub-cropping in a small band along the northern edge of the county (Figure 3). Yields from this formation are typically small, usually barely enough for domestic needs.

Unconsolidated aquifers are found primarily within the buried valley areas. Outwash sand and gravel deposits in these valleys may yield more than 2725 cubic meters per day (500 gallons per minute) from large diameter wells (Walker, 1987). Other sand and gravel aquifers within the county include widely scattered kame deposits and alluvial deposits underlying the floodplains of some of the larger streams.

In particular, the Pottsville Formation is the most reliable source of groundwater within the study area. Yields are variable, depending upon the texture of the rock unit, degree of cementation, amount of fracturing, aquifer thickness, character of the overlying material, presence or absence of aquifer boundaries, and well construction characteristics. The unfractured sandstone phase has only moderate (less than about 100 cubic meters per day) yield. However, yields from individual wells can be very high (over 550 cubic meter per day) if one or more fractures or joints are intersected by a well. Stanley (1973) was able to establish good correlation between jointing in the Pottsville Formation and high well yields. High yields can also be obtained if the true conglomerate phase is tapped. However, the pebbly sandstone phase (usually referred to as conglomerate on drillers' logs) is more abundant than the true conglomerate (Fuller, 1974). The porosity of this pebbly sandstone phase is actually less than that of the sandstone phase (Wells' personal communication), and therefore, mentioning of the presence of conglomerate on a drillers' log does not correlate with greater than moderate yields (50 to 100 cubic meters per day).

All formations of the Cuyahoga Group are poorly permeable so that most groundwater circulation occurs in interconnected fractures and joints. The Group generally yields limited amounts of water to wells (less than 5-25 cubic meters per day), although some drillers report higher yields where wells tap local sandstone horizon or where the shale directly underlie sand and gravel deposits which can feed water into the joints of the underlying shale. The Cuyahoga varies in thickness form 20 to 66 meter. The wells open to both the Sharon Sandstone and the Cuyahoga Group are likely to yield more water because major contribution is associated with Sharon Sandstone.

The Berea Sandstone is used as a source of groundwater in the study area only in areas where it is relatively shallow or where an adequate groundwater supply cannot be found at shallower depths. Yields from Berea sandstone are variable (27 to 108 cubic meters per day) and depend upon the presence of recharge or barrier boundaries, degree of partial penetration, number and degree of interconnecting fractures, nature of the overlying deposits, and the type of well construction.

The Bedford Shale is not known to be a dependable source of groundwater. It has a low yield and poor quality water. Because of these reasons very few wells are drilled into this formation.

Hydraulic Conductivity and its Relation with Fractured Zones

Hydraulic properties of an aquifer depend not only upon syn-genetic characteristics of an aquifer like grain size, porosity, cementation and compaction but also post-genetic characteristics like joints and fractures that developed under different mechanisms. The increment of hydraulic conductivity in an aquifer clearly reflects the presence of fracture.

The hydraulic conductivity of fractured rocks is strongly related to the geometric properties and the weathering degree along the groundwater flow paths (Karagüzel & Kiliç, 2000; Foyo, Sánchez, & Tomillo, 2005). Field tests are considered to be more useful than the laboratory tests because the former represents an *in situ* situation with a scale larger than the representative elementary volume. Nevertheless, field tests to determine hydraulic conductivity are often difficult, particularly in areas with complex field conditions.

Hydraulic conductivity is significantly affected by fracture networks in rocks which are characterized by fracture properties such as aperture, frequency, length, specific orientation, the interconnectivity of the network, filling materials, and features of the fracture surface (Sahimi, 1995). The fracture properties are dependent on the tectonic history of the rocks. To quantify flow in fractured rocks, it is important to understand the relationship between hydraulic conductivity and the fracture properties.

Fractured rock formations are hydrogeologically complex. Geologic structure and in situ stress fields control the occurrence of fractures, which are the predominant mechanism for fluid movement. No formation is uniformly fractured, and thus, assumption of formation homogeneity and even isotropy that are commonly applied in consolidated porous media may not be appropriate for the description of fluid movement in fractured rock. In addition hydraulic conductivity of fractures can vary over many orders of magnitude in contrast to the range associated with unconsolidated geologic media. Also because of complex geologic structures and fracture connectivity, hydraulic properties of fractured rock do not vary smoothly in space. It is not uncommon to observe abrupt spatial changes in the hydraulic properties in fractured rock with both depth and areal extent. (Shapiro, 2002).

CHAPTER THREE

METHODOLOGY

The main source of data for this thesis was Ohio Department of Natural Resources (ODNR) Division of Water which is a repository of all the Water Well Logs and Drilling Reports. Also an example of Water Well Log and Drilling Report is shown in Table 2. Among thousands of residential water wells which tapped groundwater from Sharon Sandstone, a relatively shallow aquifer found in Geauga County, only 617 randomly selected well points were choosen for the study purpose. The 617 well points are depicted in figure 4. Also the summarized form of well log data and drilling report and the implication of those to calculation of hydraulic conductivity is shown in Appendix III.

Each Water Well Log and Drilling Report contains the following information (which is not always the case):

1. wells location
2. well construction details
3. well production test data
4. lithologic description

Table 2: An example of Water Well Log and Drilling Report from ODNR.

Water Well Log and Drilling Report
Ohio Department of Natural Resources
Division of Water
Phone: 614-265-6740 Fax: 614-265-6767

Well Log Number: 66447

ORIGINAL OWNER AND LOCATION

Original Owner Name: *VILLAGE OF CHAGRIN F*

County: *GEAUGA*	**Township:** *RUSSELL*	**Section Number:**
Address: *WASHINGTON ST E*		**Lot Number:**
City:	**State:** *OH*	**Zip Code:**
Location Number:	**Location Map Year:**	**Location Area:**
Latitude:	**Longitude:**	

CONSTRUCTION DETAILS

Borehole Diameter: 1:	**Borehole Depth: 1:** *107 ft.*	**Depth to Bedrock:**
2:	**2:**	
Casing Diameter: 1: *12 in.*	**Casing Length: 1:** *12 ft.*	**Casing Thickness: 1:**
2:	**2:**	**2:**
Casing Height Above Ground:	**Aquifer Type:** *Sandstone*	
Date of Completion: *6/30/1954*	**Total Depth:** *107 ft.*	**Well Use:**
Driller's Name: *OHIO DRILLING COMPANY*		

Screen Diameter:	**Slot Size:**	**Screen Length:**
Type:	**Material:**	
Set Between:		

Gravel Pack Material/Size:	**Vol/Wt Used:**
Method of Installation:	**Placed:**

Grout Material/Size:	**Vol/Wt Used:**
Method of Installation:	**Placed**

WELL TEST DETAILS

Static Water Level: *60 ft.*	**Test Rate:** *50 gpm*	**Associated Reports**
Drawdown: *34 ft.*	**Test Duration:** *8 hrs.*	*NONE*

COMMENTS: *NONE*

WELL LOG

Formations	From	To
CLAY & GRAVEL	0	12
YELLOW SANDSTONE	12	60
GRAY SANDSTONE	60	80
WHITE SANDSTONE	80	104
SHALE	104	107

Each well location was identified and plotted on Google Earth satellite mosaic then ground elevation (from MSL) and location (geographic coordinates) for each water-well were identified from Google Earth map and were tabulated for further data processing and mapping in ARCGIS 9.3.1 and Surfer 8.0 using the x-y-z coordinate system. The mapped well points were shown in figure 4.

Well construction details consist of borehole diameter, total depth of well, casing length, casing diameter, thickness of casing, well usage, aquifer type and date of construction. Some of these data are essential for calculation of hydraulic conductivity of the aquifer.

Transmissivity is often estimated from specific capacity data because of the expense of conducting standard aquifer tests to obtain transmissivity and the relative ease of availability of specific capacity data. Most often, analytic expressions relating specific capacity to transmissivity derived by Thomasson et al. (1960), Theis (1963), or Brown (1963) are used for this analysis (Razack & Huntley, 1991). In this thesis, all data sets from the 617 water wells penetrating Pottsville Formation within Geauga County were analyzed for transmissivity using specific capacity data provided by Theis (1963) method.

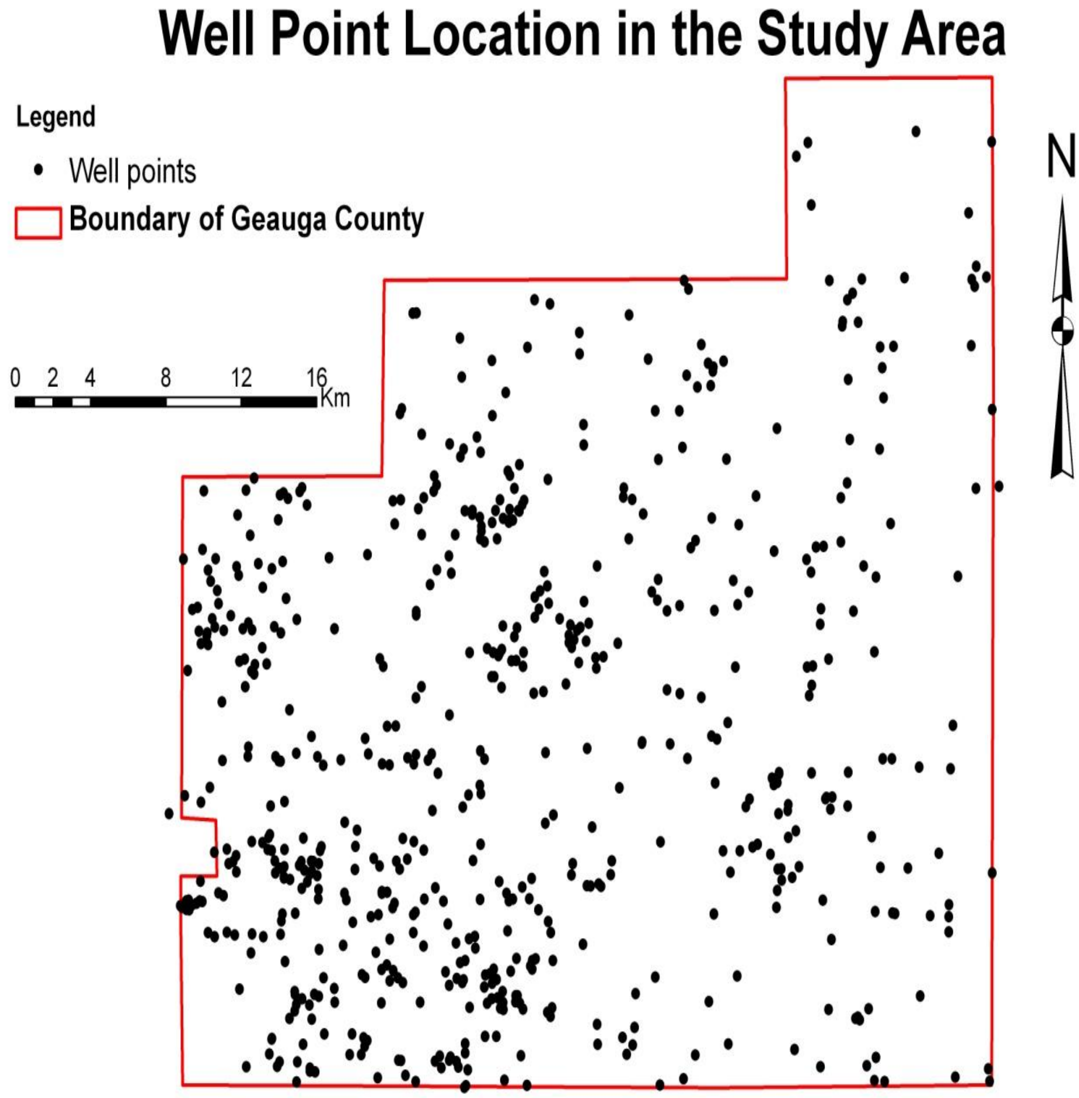

Figure 4: Location map of the 617 residential water wells generated in GIS 9.3.1.

Pumping tests are usually conducted only in public supply water wells, and there were very few of those in Geauga County, when compared with the number of single-home (residential) water wells. Each residential well was (supposed to be) tested for the production rate upon completion of drilling which consists of the following information:

1. static water level (or depth from the well-head to the water level in the well)
2. rate of pumping (or bailing)
3. time duration of pumping (or bailing)
4. water level or drawdown at the end of pumping

Although the lithologic descriptions are far from precise, they are adequate to distinguish between hydrostratigraphic units with varying permeability. Each lithologic profile is defined macroscopically by a driller, i.e. not by a trained geologist. Nevertheless, drillers are well trained to distinguish macroscopically general types of sedimentary rock formations (Eckstein's personal communication). All this data formed a basis for construction of the subsurface geology to reveal the aquifer thickness and subsequently isopach map of the region.

Aquifer properties are usually estimated by interpretation of constant-rate pumping test, during which the amount of drawdown is recorded at a given distance from the pumping well. Theis (1935) has shown the following relationship between the temporal and spatial distribution of drawdown around a pumping well as a function of the pumping rate and the hydraulic properties of an aquifer:

$$h_o - h_{(r,t)} = \frac{Q}{4\pi T}\int_u^\infty \frac{e^{-y}dy}{y} = \frac{Q}{4\pi T}w(u) \qquad (1)$$

Where;

$h_o - h_{(r,t)}$ is the drawdown (L)

t is the time since the pumping began in days (t)

r is the radial distance from the center of the pumped well to the observation well (L)

Q is the rate of pumping (L^3/t)

T is the coefficient of transmissibility $(T = K \cdot b)$ (L^2/t)

K is the hydraulic conductivity (L/t)

b is the aquifer thickness (L)

$$u = \frac{r^2 S}{4Tt} \quad (2)$$

Where, S is storage coefficient of an aquifer (dimensionless)

$$S = \frac{4Tt}{r^2} u \quad (3)$$

$$w(u) = -0.5772 - \ln(u) + u - \frac{u^2}{2.2!} + \frac{u^3}{3.3!} - \frac{u^4}{4.4!} + \cdots \quad (4)$$

The drawdown observation is made within the pumped (or bailed) well $r = r_w$ (where r_w is the well radius). The r_w in residential water wells is very small (usually 3” = 0.0762 m) r^2 is even smaller, rendering the value of u (in eq. 2) small. Hence, only the first two terms on the right side of the eq. (4) remain significant. Following Cooper and Jacob (1946) and Jacob’s (1950) approximation, the eq. (1) can be simplified to:

$$h_o - h_{(r_w,t)} = \frac{Q}{4\pi T}\{-0.5772 - \ln(u)\} \qquad (5)$$

Kruseman and de Ridder (2000) have computed the following ranges of error resulting from this approximation:

For u (dimensionless) smaller than	0.03	0.05	0.1	0.15
The error is less than	1%	2%	5%	10%

Conversion of the natural logarithm to the logarithm with base 10 and substituting the value of "u" from equation (2) to eq. (5) leads to further simplification:

$$h_o - h_{(r_w,t)} = \frac{2.303\,Q}{4\pi T}\log\left(\frac{2.25Tt}{r_w^2 S}\right) \qquad (6)$$

or

$$\frac{Q}{h_o - h_{(r_w,t)}} = \frac{4\pi T}{2.303\ log\left(\frac{2.25\ Tt}{r_w^2 S}\right)} \qquad (7)$$

where, the left side of the eq. (7) is called specific capacity which is dependant solely on two unknown constants T and S.

The assumptions made in this equation are:

1. the well penetrates and is uncased through the entire thickness of the aquifer
2. well loss is negligible
3. the effective radius of the well is not affected by the drilling and development operation and is equal to the nominal radius of drilling

(Walton, 1970)

The Sharon aquifer consists of hard and competent sandstone; all the water wells were cased only to the top of the formation, leaving the entire thickness of Sharon aquifer uncased. Furthermore, residential water wells are usually tested at a relatively low rate, almost always at Q<100 cubic meters per day. Therefore, it was assumed that the exposed section of the aquifer in each well represents an entire thickness of the aquifer (i.e. that the upflow through the well bottom, if any, is negligible) and that well loss can be considered negligible. Also the nominal radius of wells in the study area can be considered to be the effective radius. Well construction practices such as gravel packing and enlarging the hole beneath the casing, could increase the effective radius. However, well records indicate that these construction practices are not used in the area.

There are two unknown aquifer parameters in the equation, namely transmissivity (T) and storage coefficient (S). Transmissivity is defined as the volume of water flowing through a unit cross-sectional area of an aquifer i.e. 1sq meter. times the aquifer thickness (b), under a hydraulic gradient of 1 m/m in a given amount of time (usually a day). The storage coefficient is defined as the volume of water that an aquifer releases or takes into storage per unit surface area of aquifer per unit change in the head normal to the surface. It is therefore a dimensionless value. The storage coefficient of the well depends upon the aquifer nature. It ranges from 0.01 to 0.3 for unconfined aquifer and 0.0001 to 0.001 for the leaky aquifer. (Mace et al., 1999)

Asim, et al. (2004) used the value of $S \approx 0.001$ for calculation in all the water wells that penetrated the sandstone aquifer, assuming semi-confined conditions, with the glacial till as the “leaky-confining” layer. In this study, values of $S\approx 0.001$ were assumed for a leaky aquifer and S≈ 0.1for unconfined aquifer conditions. The semi-confined (or leaky) and unconfined conditions were determined upon examination of the static water level in each water well in relation to the top of the aquifer. The wells which have static water level within the aquifer itself before pumping are considered as unconfined and rest are considered as leaky aquifer. The value of S is strongly dependant on the degree of confinement which means, the value of T can be computed assuming the value of S based on the groundwater level in the well as well as the lithological description, i.e. whether the aquifer is confined, leaky or entirely unconfined. As the specific capacity, pumping rate (yield) divided by the drawdown, of the aquifer in the equation 7 is the function of the logarithm of (1/S) even large errors in estimating (or assuming) the value of S does not cause significant error in the resulting value of transmissivity. An error of two orders of magnitude in the value of S yields roughly 10% to 20% error in the resulting value of transmissivity (Walton, 1970) which are shown in figures 5 and 6 for leaky and unconfined aquifer respectively.

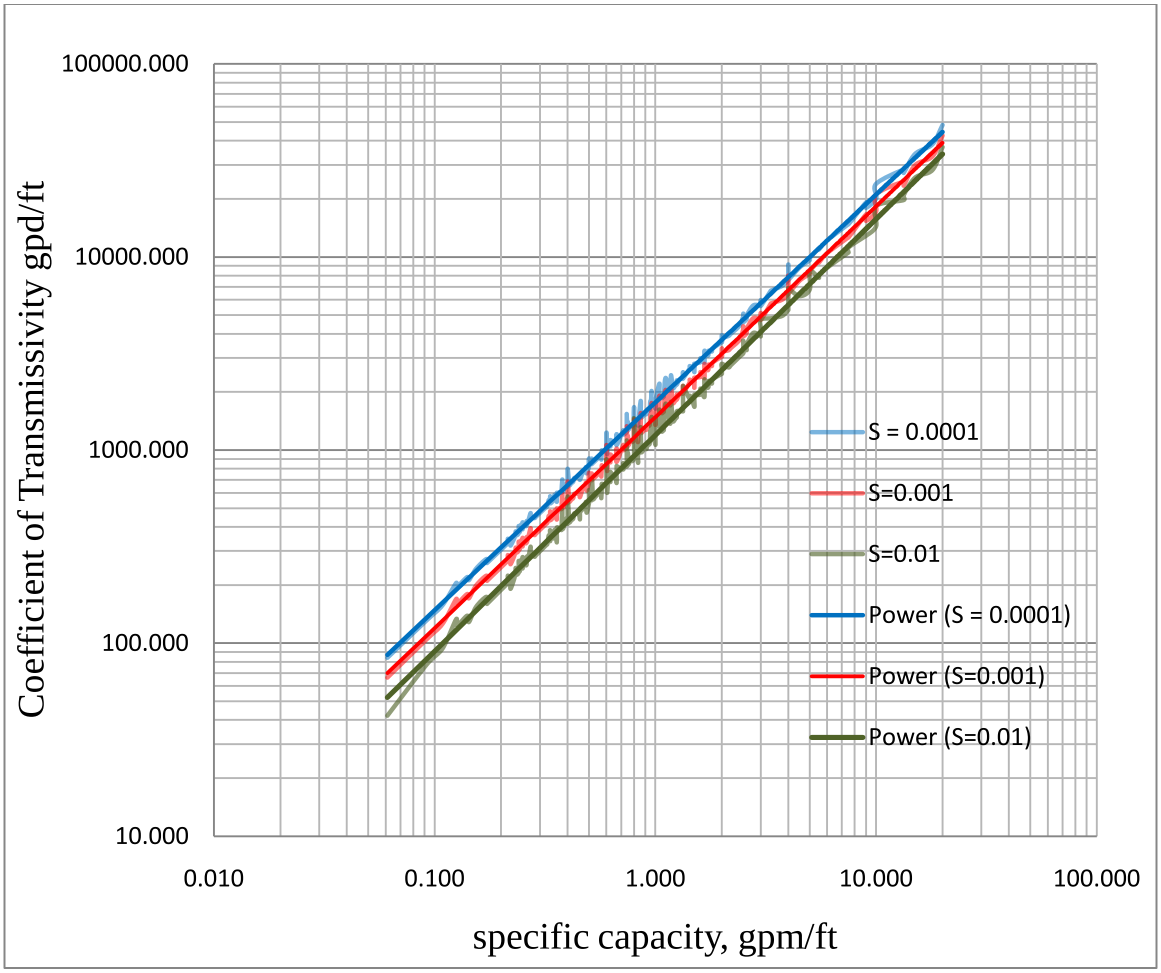

Figure 5: Graphs of specific capacity versus coefficient of transmissibility for pumping period of one hour in leaky aquifer for different values of storage coefficient (S). (Appendix II)

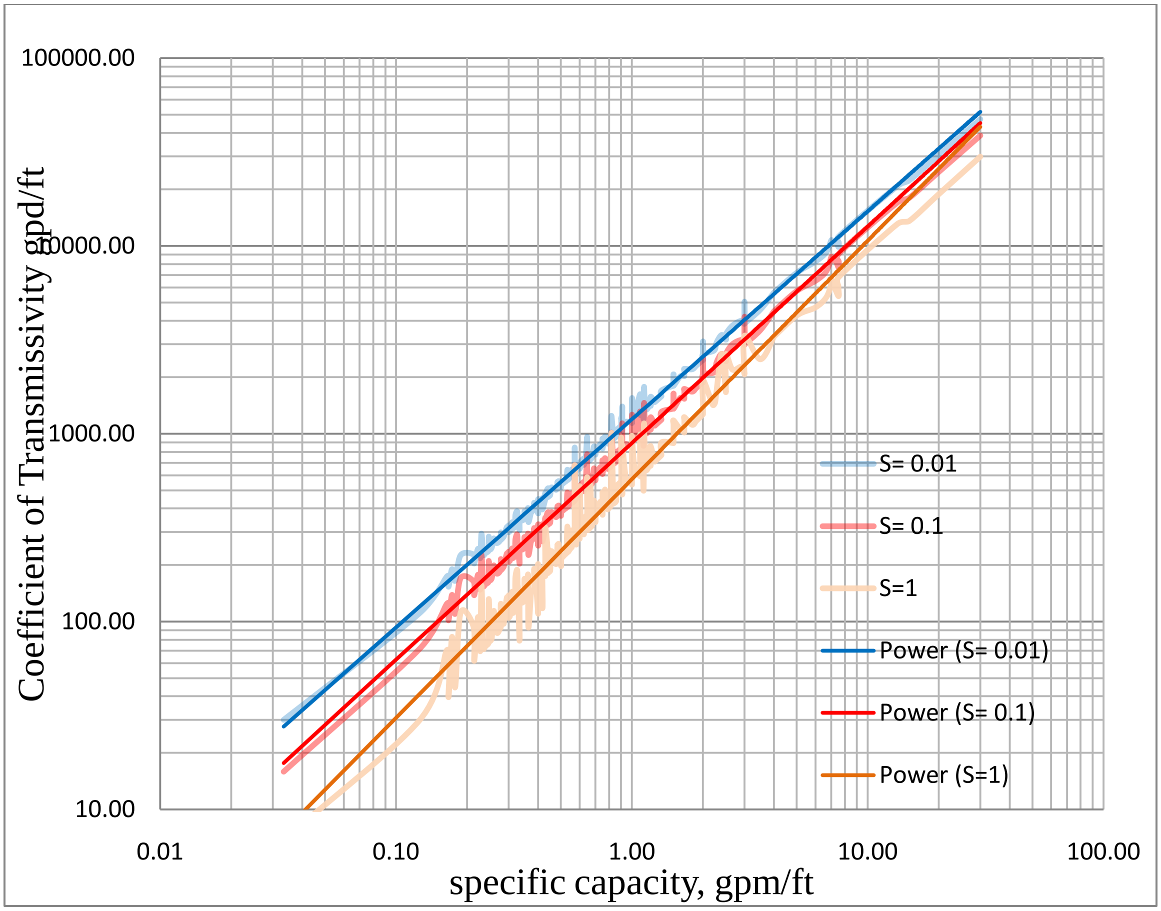

Figure 6: Graphs of specific capacity versus coefficient of transmissibility for pumping period of one hour in unconfined aquifer for different values of storage coefficient (S). (Appendix II)

The value of T was computed iteratively in Excel 2007 using Solver to a convergence factor of ±1%, and then the value of T was divided by the thickness of the aquifer (taken from the lithological description on the well log report) which yields the hydraulic conductivity value for the aquifer in the immediate vicinity of the well. (Appendix II).

Further, the values of the hydraulic conductivity computed from each well for the aquifer were used to generate frequency histogram (using Excel 2007) to see the distribution of hydraulic conductivity. Later, a contour map of hydraulic conductivity is plotted to delineate higher conductivity values so as to demark the fracture (using GIS 9.3.1). Similarly, potentiometric map, isopach map and contour map of transmissivity were also constructed using the well log data in GIS 9.3.1.

The data were further used to depict a Shaded Relief Map of hydraulic conductivity to analyze the regional trend of the fracture pattern in Surfer 8.0 because contour map of hydraulic conductivity itself could not produce the trend of higher conductivity. Shaded relief maps were created at 45° horizontal, 20° vertical and 135° horizontal, 26° vertical using the shaded relief map in Surfer version 8.0 (Figures 17 & 18). The 45° and 135° horizontals were chosen for shaded relief map because these generate distinct linear pattern of hydraulic conductivity in the map after examining in all directions. The Central difference gradient method and Lambertain Reflection shaded method were used as relief parameters. Other parameters were set at the default values provided by the software.

CHAPTER FOUR

RESULTS

The values of hydraulic conductivity calculated from the specific capacity data for the 617 water wells, penetrating Sharon Sandstone, Pottsville Formation within Geauga County (Figure. 4), were plotted in the form of a histogram (Figure. 7) and summarized in a frequency distribution table (Table 3).

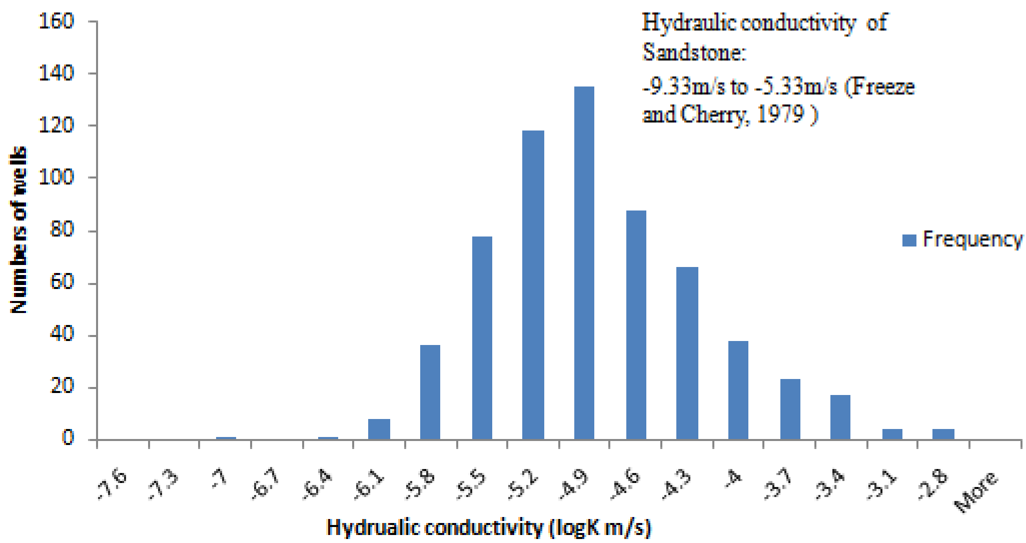

Figure 7: Histogram showing hydraulic conductivity distribution calculated from the specific capacity tests for all the wells employed in the study (N=617) within the Sharon Sandstone aquifer, Geauga County.

Table 3: Frequency distribution of hydraulic conductivity of Sharon Sandstone.

Negative log hydraulic conductivity m/s	Frequency
6.55 – 6.25	1
6.25 – 5.95	8
5.95 – 5.65	36
5.65 – 5.35	78
5.5 – 5.05	118
5.05 – 4.75	135
4.75 – 4.45	88
4.45 – 4.15	66
4.15 – 3.85	38
3.85 – 3.55	23
3.55 – 3.25	17
3.25 – 2.95	4
2.95 – 2.65	4

The calculated hydraulic conductivity values follow normal Gaussian normal curve (Figure 8). A cumulative probability curve is also drawn in same figure along with a maximum published value of hydraulic conductivity for sandstone to separate high and low conductive groups. Almost 70% of the calculated values of hydraulic conductivity (Figure 8) exhibit higher values than the maximum value published for sandstones. For example, Fetter (1980) presents the range from $3.77x10^{-9}$ m/s ($1.07x10^{-3}$ ft/day) to 1.04 x 10^{-4} m/s (29.48 ft/day); Freeze and Cherry (1979) reported $4.72x10^{-10}$ m/s ($1.34x10^{-4}$ ft/day) to $4.72x10^{-6}$ m/s (1.34 ft/day); and Domenico and Schwartz (1970) give the range of $3x10^{-10}$ m/s ($8.50x10^{-5}$ ft/day) to $6x10^{-6}$ m/s (0.85 ft/day). The calculated hydraulic conductivity values are shown in Appendix – IV.

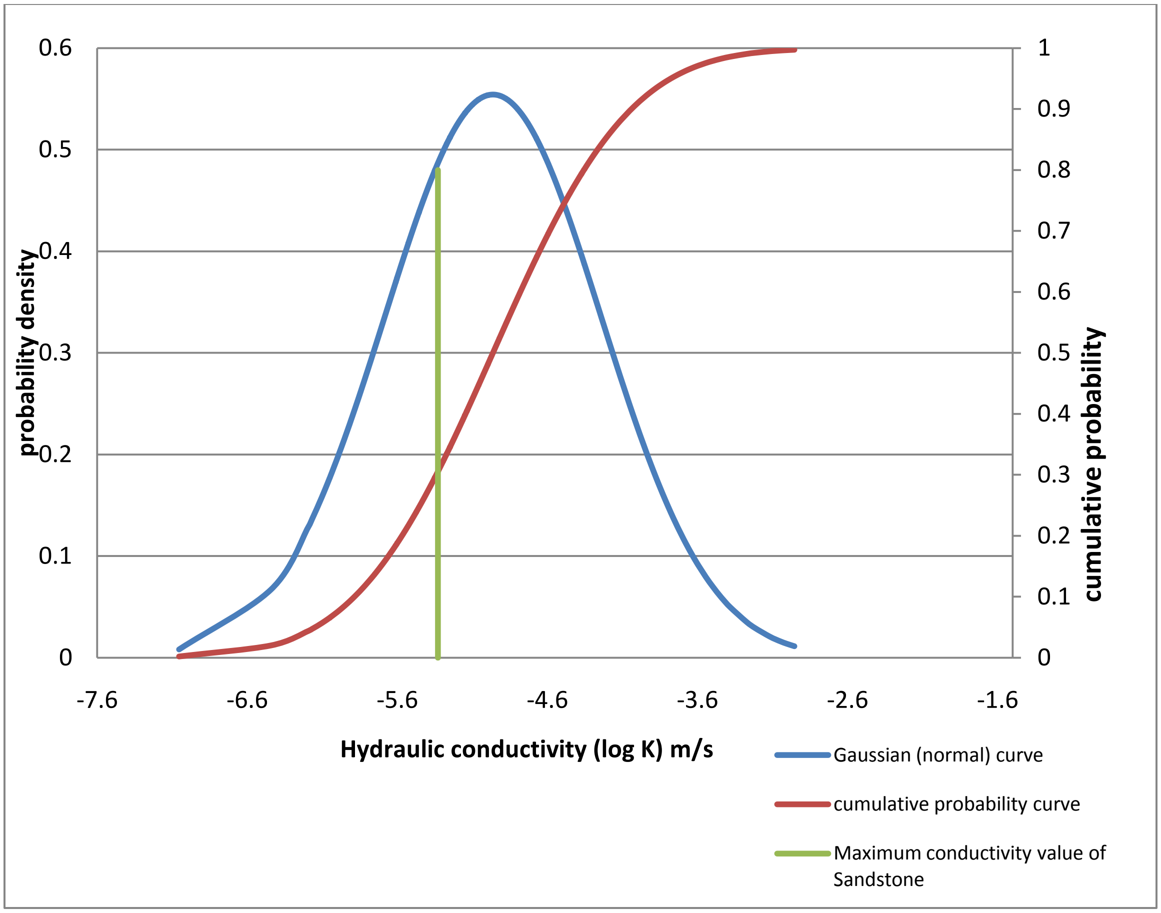

Figure 8: Normal distribution curve and cumulative probability distribution plotted for the calculated log values of hydraulic conductivity. (Based on Appendix IV)

Box and Whisker plot is a way of graphically depicting groups of numerical data through the smallest observation, first quartile (Q1), median (Q2), third quartile (Q3), and largest observation. Box and Whisker plot, 1 through 16, represents hydraulic conductivity of each township from the Geauga County and last, the 17th plot represents the overall conductivity value for the Geauga County (Figure 9). The inconsistent Box and Whisker plot illustrates the spatial variation of hydraulic conductivity in the County (Table 4).

Figure 9 depicts the first quartile values of hydraulic conductivity for half of townships have higher hydraulic conductivity than the maximum value of hydraulic conductivity of sandstone reported in various publications. (Fetter, 1980; Freeze and Cherry, 1979; Domenico and Schwartz, 1990, etc.).

The aquifer in the southern townships of the County has generally higher hydraulic conductivity values than the northern townships. The longer whiskers in the upper part of figure 9 specify that there are distinctly higher hydraulic conductivities within the formation though it might be a signature of an anomalous outlier.

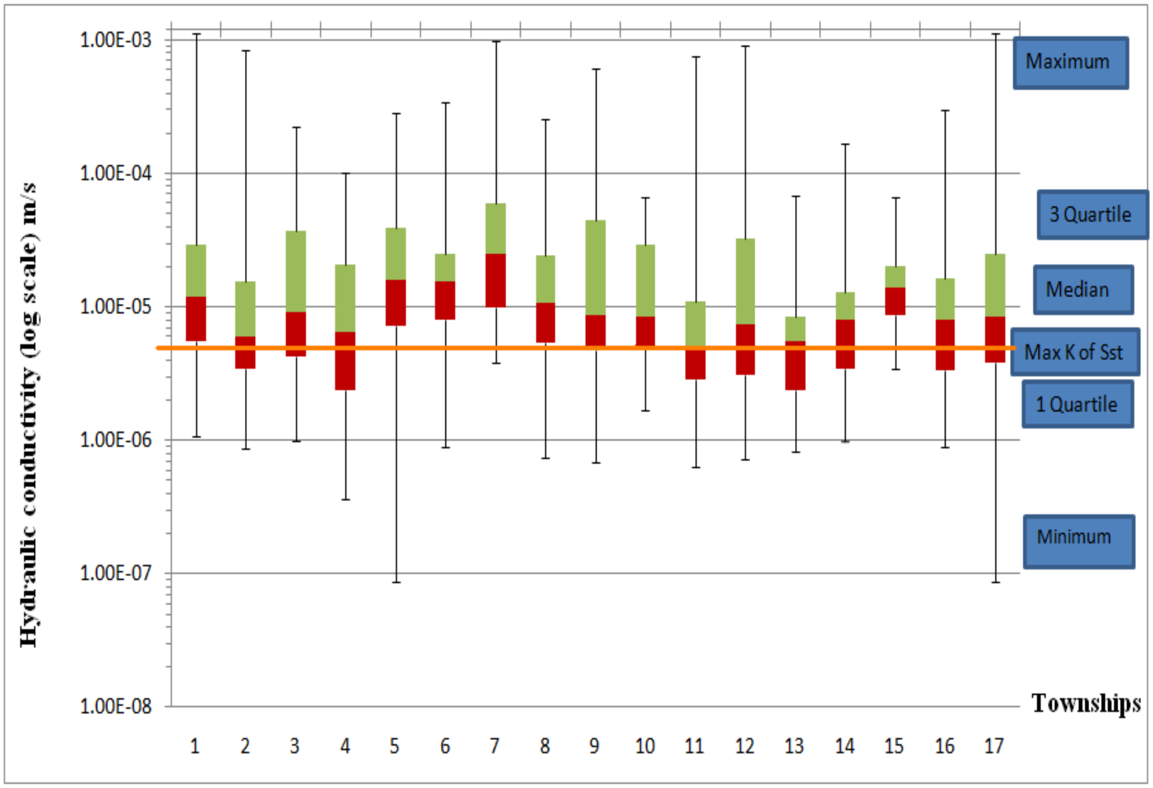

Figure 9: Box and Whisker plot of hydraulic conductivity of Sharon Sandstone for each Township in Geauga County.

Table 4: Distribution of hydraulic conductivities (10^{-6} m/s) of Sharon Sandstone for each township within Geauga County. (Based on the Appendix – I)

Township	S.N.	Minimum	1 Quarter	Median	3 Quartile	Max
Auburn	1	1.07	5.55	11.8	28.9	1110
Bainbridge	2	0.871	3.41	5.95	15.6	830
Burton	3	1.00	4.27	9.18	36.7	221
Chardon	4	0.360	2.35	6.53	20.7	100
Chester	5	0.088	7.22	15.9	39.1	285
Claridon	6	0.892	7.92	15.4	25.1	341
Hambden	7	3.87	9.90	25.1	60.0	980
Huntsburg	8	0.745	5.42	10.7	24.3	254
Middlefield	9	0.677	4.78	8.74	44.3	609
Montville	10	1.67	4.92	8.52	29.6	65.6
Munson	11	0.640	2.82	4.82	11.0	755
Newbury	12	0.726	3.09	7.33	32.3	906
Parkman	13	0.823	2.34	5.59	8.46	67.9
Russell	14	0.988	3.42	8.01	12.9	167
Thompson	15	3.43	8.74	14.0	20.4	65.9
Troy	16	0.902	3.36	8.07	16.5	299
Geauga County	17	0.088	3.81	8.41	25.0	1110

A Semivariogram is one of the significant functions to indicate spatial correlation in observations measured at sample locations. It is commonly represented as a graph that shows the variance in measure with distance between all pairs of sampled locations. The nugget effect can be attributed to measurement errors or spatial sources of variation at distances smaller than the sampling interval or both. Measurement error occurs because of the error inherent in measuring devices. However, natural phenomena can vary spatially over a range of scales. Variation at microscales smaller than the sampling distances will appear as part of the nugget effect which is equal to y-intercept of the semivariogram.

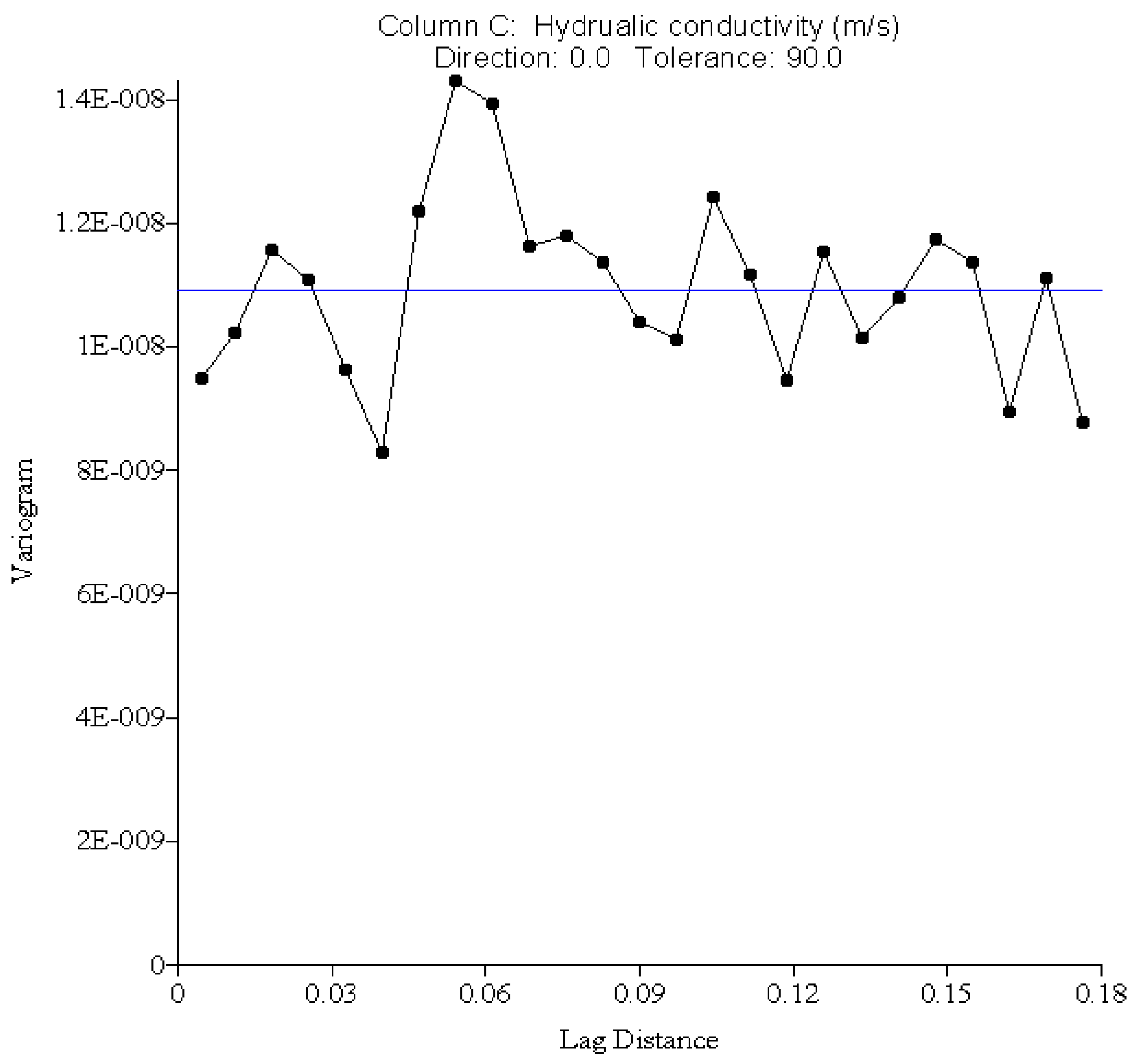

Figure 10: Semivariogram of hydraulic conductivity displaying nuggets effect.

The observed micro nugget effect in the semivariogram for hydraulic conductivity (Plotted in Surfer 8.0) suggests there is a local-scale heterogeneity or measurement error.

However, distinct linear trends of hydraulic conductivity shown in regional scale (Figure 17 & 18) imply that the local heterogeneity or error has very less effect to the regional signal. The resulting trends of fractures do not differ much from the earlier reported trend of fractures in Ohio by Ver Steeg (1944); Evans (1994); and Asim et. al. (2004).

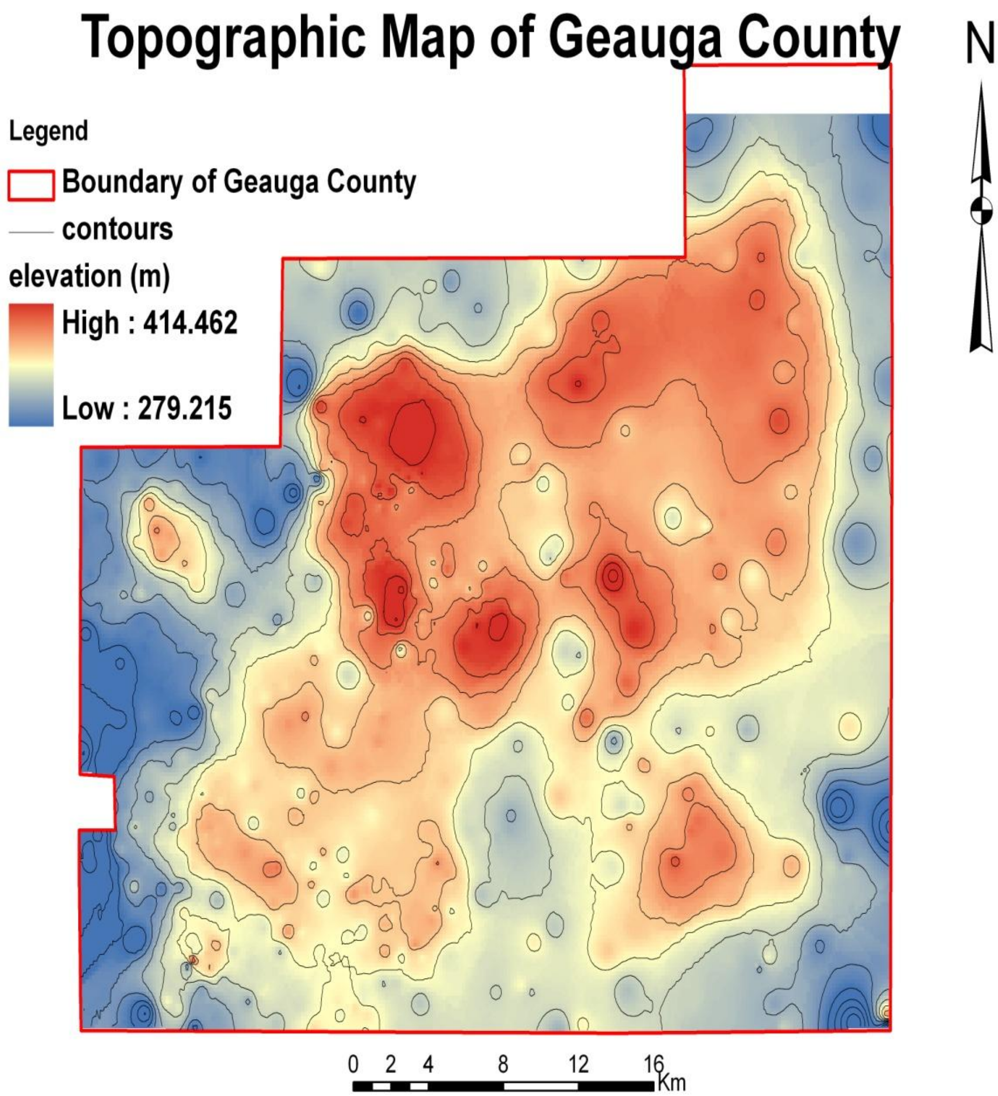

Figure 11: Topographic map of Geauga County. (Based on a compilation of the Water Well Logs employed in this study)

Topographic map of the County demonstrates high elevation at the northern and central parts of the County and low lands at lower eastern and western boundaries (Figure 11). The topographic relief of the region is observed to be 140 meters. (Appendix – V)

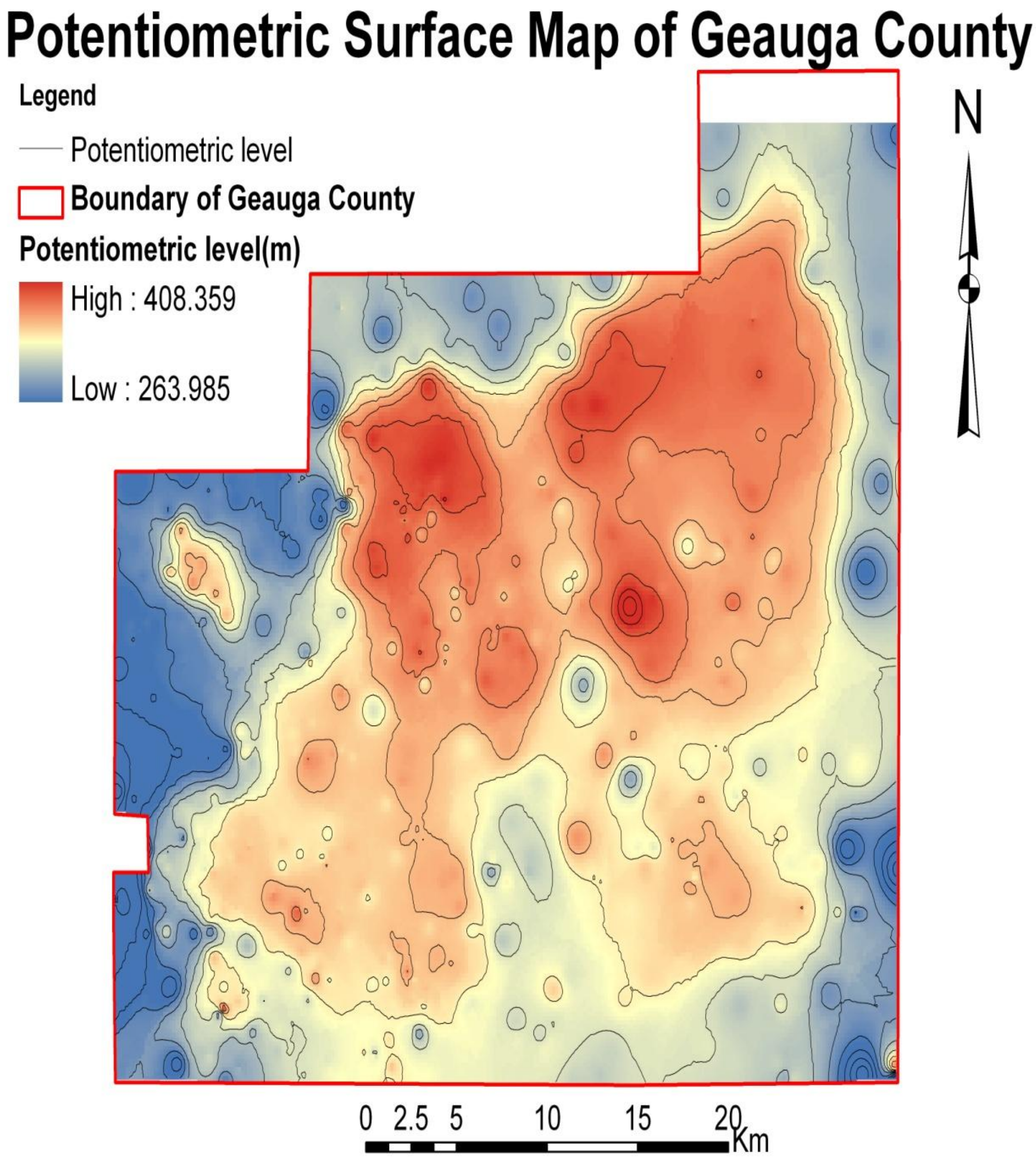

Figure 12: Potentiometric surface in the Sharon Sandstone Aquifer, Pottsville Group. (Based on a compilation of the Water Well Logs employed in this study)

Figure 12 shows the potentiometric surface for Sharon Sandstone constructed using the ground water levels reported in the well logs (Appendix–VI). Although the map is based on the ground water levels that were not measured simultaneously, the potentiometric surface and the general ground water flow direction in the County closely corresponds with the ground water potentiometric map produced by the U.S. Geological Survey within their Water-Resources Investigations (Jagucki & Darner, 2001).

Water levels in the aquifer range from 260 m to 405 m (above the sea levels). Precipitation followed by infiltration through glacial till is the main source of recharge into aquifer. Pettyjohn and Henning (1979) used base-flow separation of stream hydrographs to estimate that 5.08 to 20.32 cm (2 to 8 in.) of precipitation per year reached the water table in Geauga County. Ground water in the surficial glacial deposits and Pottsville Formation generally flows from the uplands toward adjacent streams and buried valleys (Figure 13). Primary areas of groundwater discharge include the Cuyahoga River, Chagrin River, and Grand River and their tributary streams (Jagucki & Lesney, 1995).

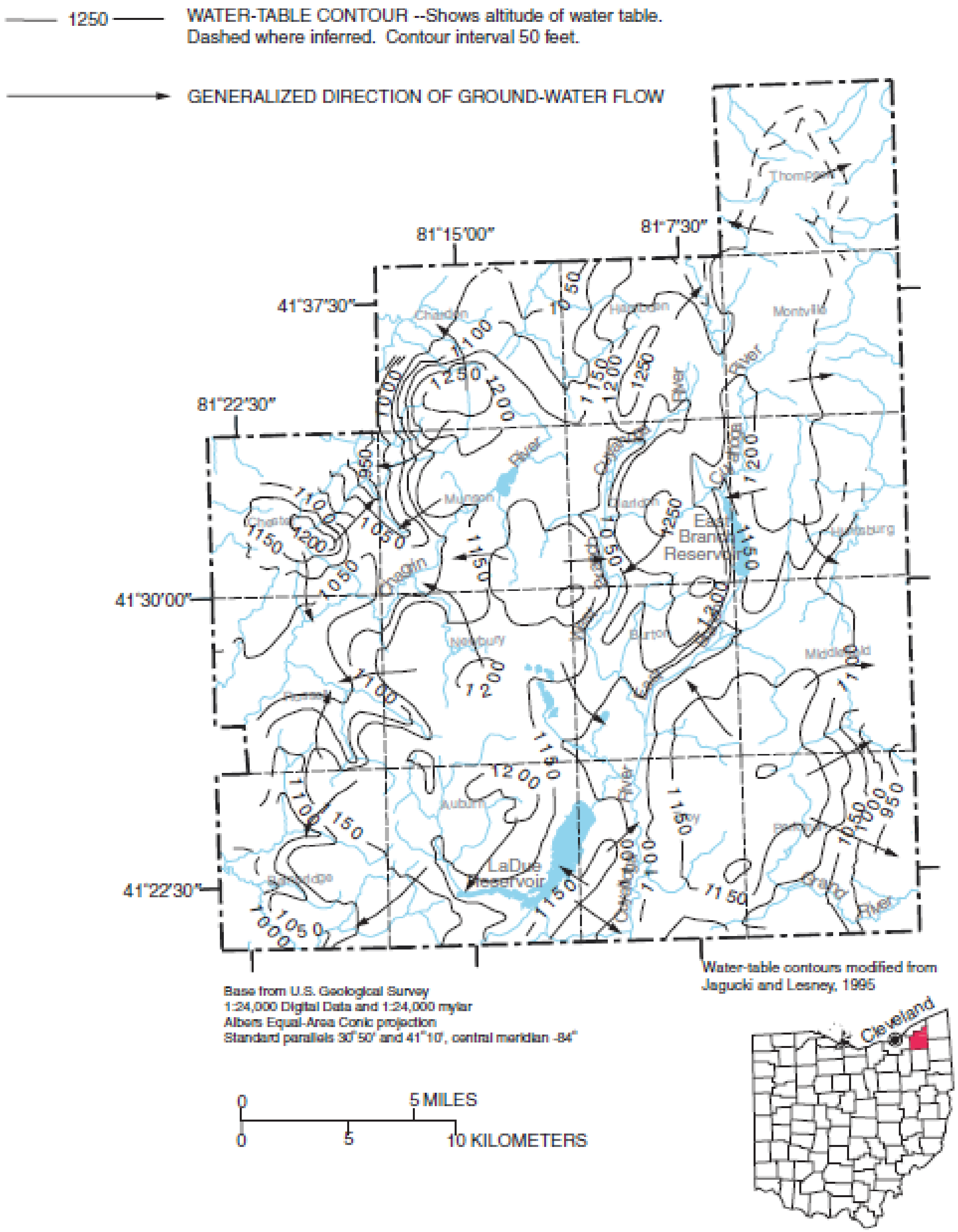

Figure 13: Ground-water levels and direction of flow in the Pottsville Formation and glacial deposits, Geauga County, Ohio, September 6-9, 1994. (Jagucki & Darner, 2001).

The isopach map of Sharon Sandstone demonstrates that the aquifer is thick in the middle portion of the County and thinner in the boundaries including a few regions in the center due to the erosion during glaciations. The remnant thickness of the aquifer ranges from very few centimeters to 38 meters (Appendix–VII).

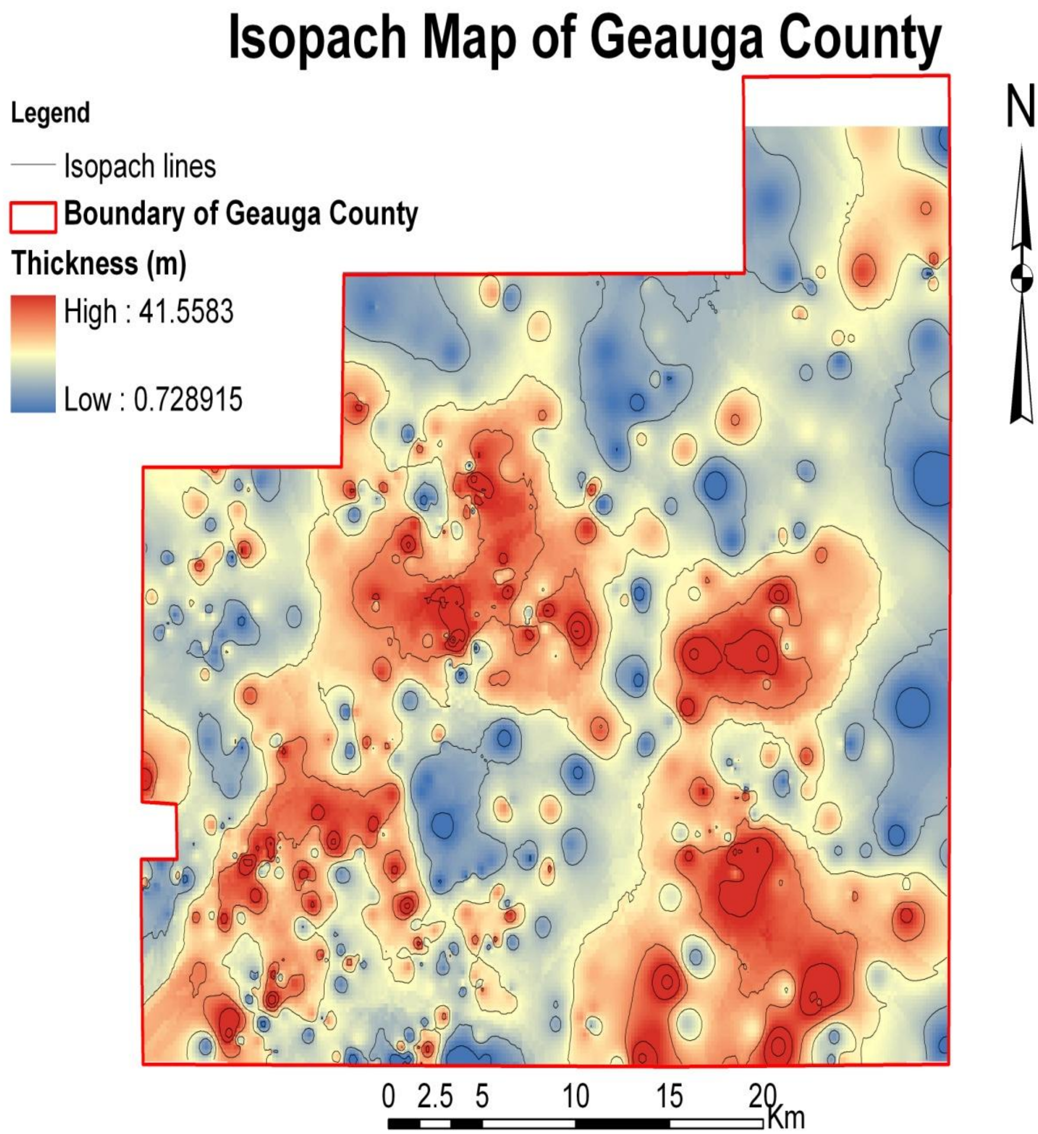

Figure 14: Isopach map of Sharon Sandstone, Geauga County. (Based on a compilation of the Water Well Logs employed in this study)

Transmissivity of Sharon Sandstone was calculated in the range from $2.28x10^{-6}$ m^2/s to $6.129x10^{-3}$ m^2/s (2 ft^2/day to 5697 ft^2/day) and average is $3.09x10^{-4}$ m^2/s (287 ft^2/day) (Appendix – IX). The calculated average value of transmissivity is slightly lower than the value observed by Sedam (1973) from Pottsville Formation. He found the average value of transmissivity for Sharon member of Pottsville Formation, Geauga County to be 4.84×10^{-4} m^2/s (450 ft^2/day).

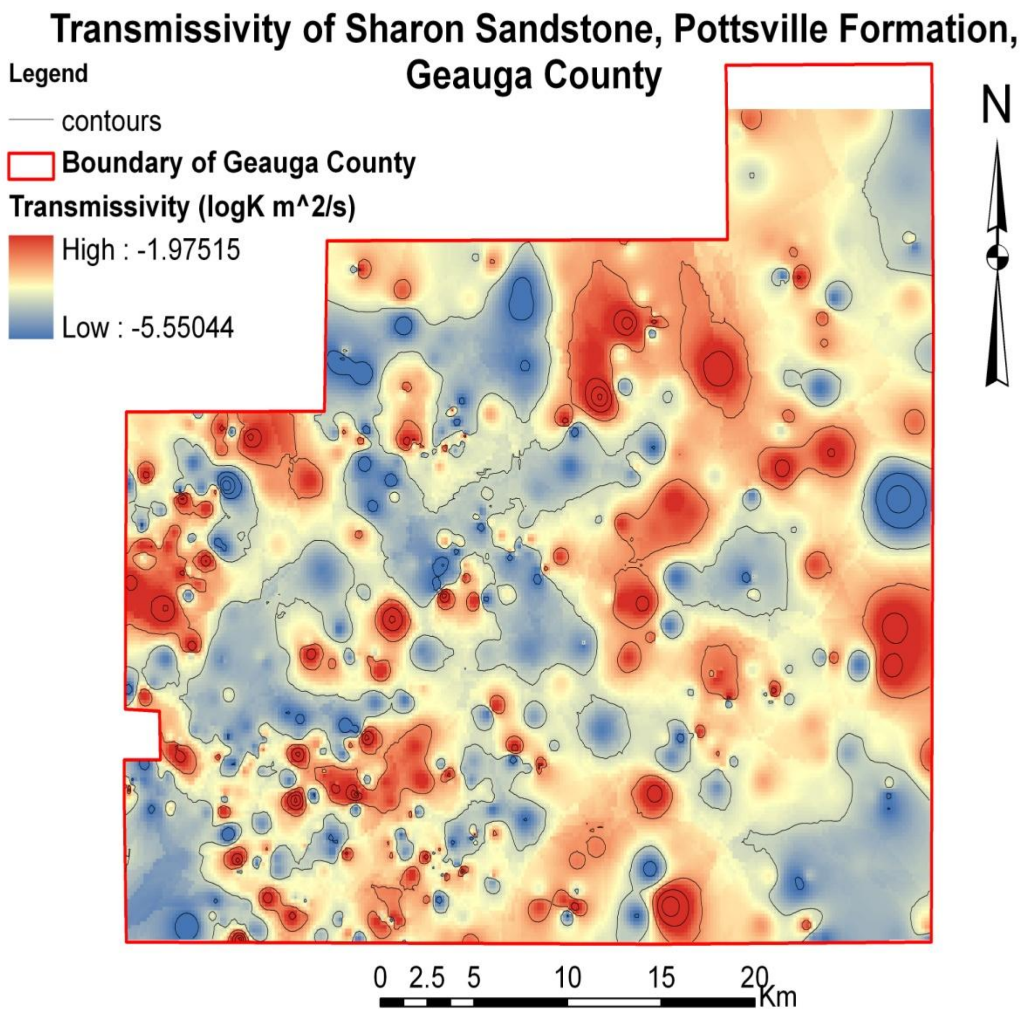

Figure 15: Contouring of transmissivity within Geauga County. (Based on calculation using equation 7).

The contour map of hydraulic conductivity of Sharon Sandstone shows quasi-linear alignment of the higher values only in one direction, NE-SW. The range of hydraulic conductivity is 1.11 x 10^{-3} to 8.80 x 10^{-8} m/s (314.64 to 2.49x10^{-2} ft/day), and the average (geometric mean) hydraulic conductivity is 9.88 x 10^{-6} m/s (2.80 ft/day). (Appendix – VIII).

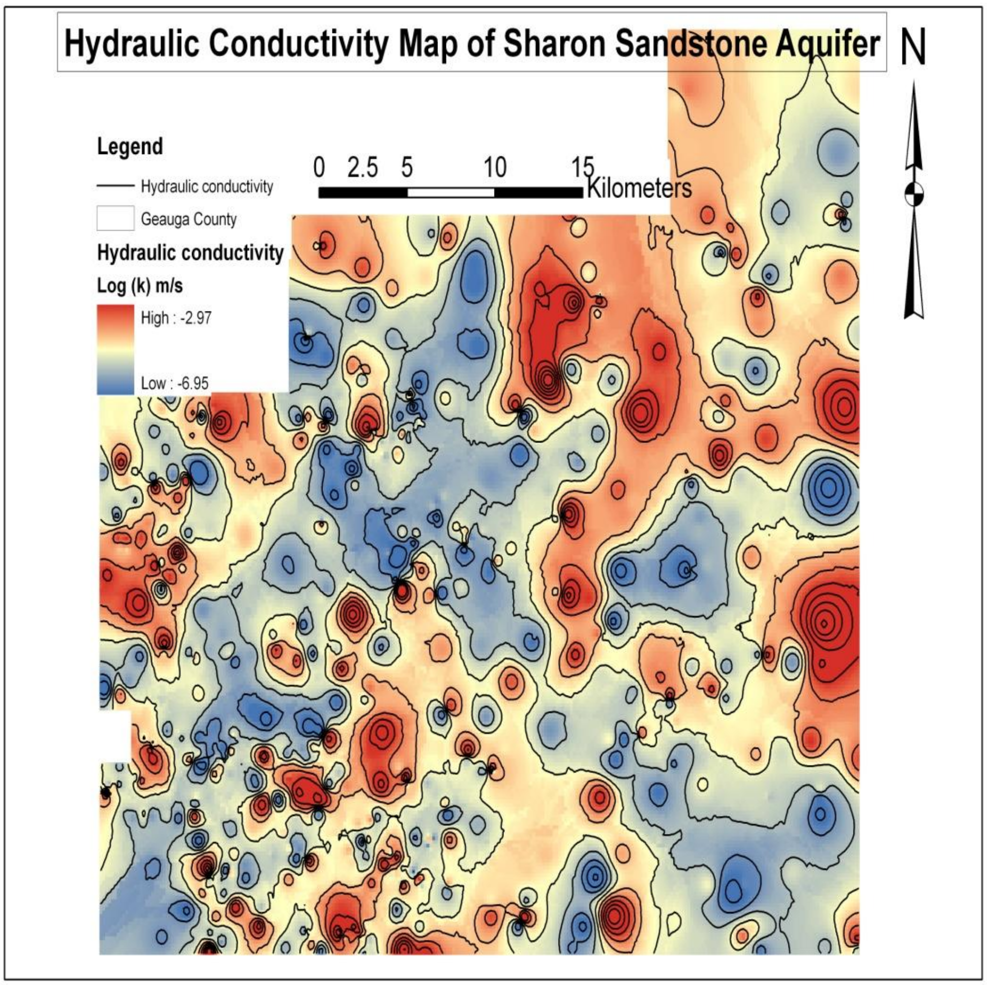

Figure 16: Contouring of hydraulic conductivity within Geauga County. (Based on calculation using equation 7)

Neither transmissivity nor hydraulic conductivity map could depict clear alignment of higher values of conductivity. However, the more distinct linear trends of hydraulic conductivity are depicted, using the shaded relief map of hydraulic conductivity in Surfer 8.0 software (Figures 17 & 18). The regional trends of the higher conductivity values are N34^{0}E and N44^{0}W. The observed fracture pattern is nearly orthogonal to each other.

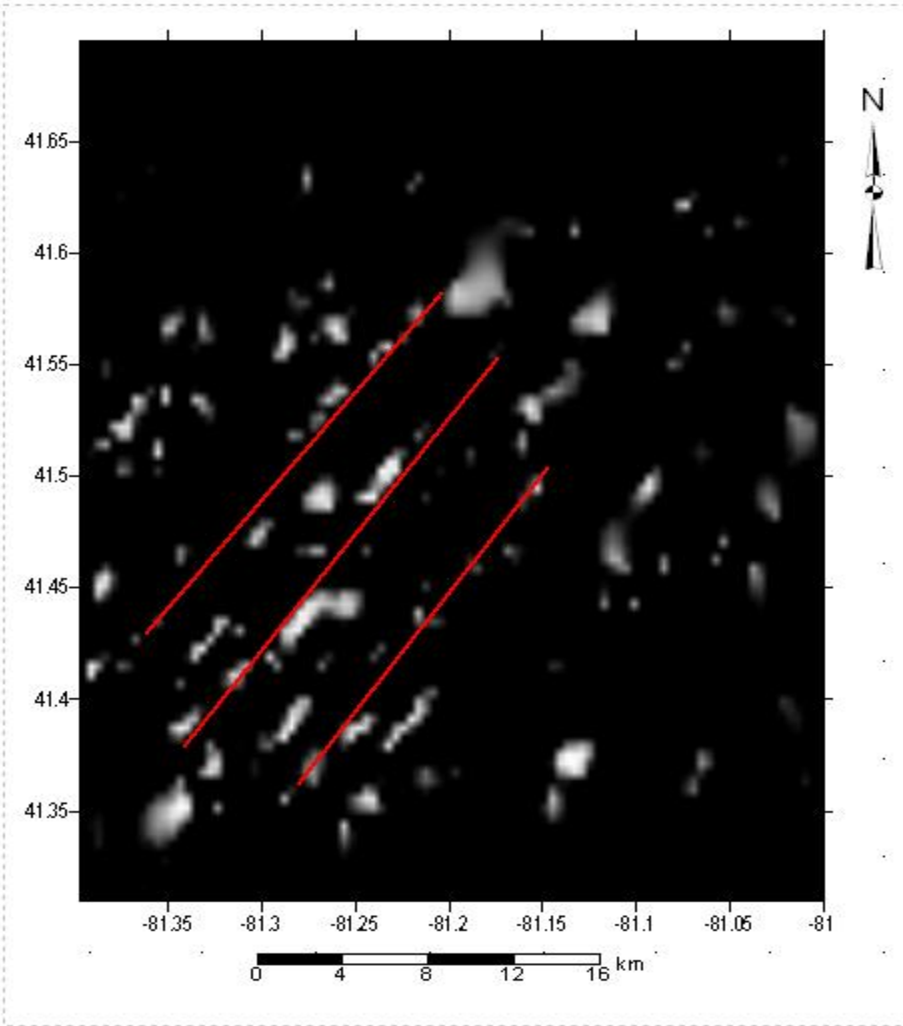

Figure 17: General NE-SW trend of higher hydraulic conductivities for Sharon Sandstone aquifer, Pottsville Formation, Geauga County. (Produced in Surfer 8.0)

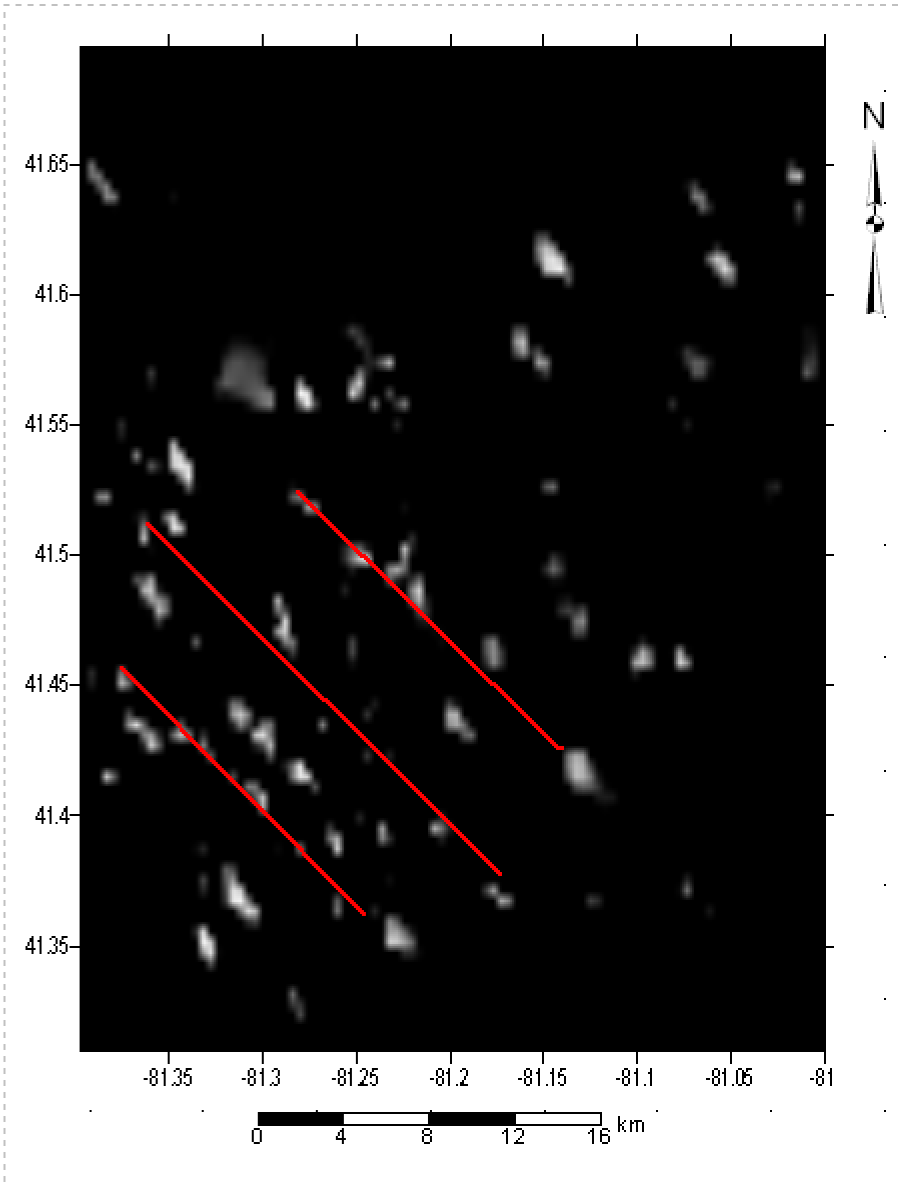

Figure 18: General NW-SE trend of higher hydraulic conductivity values for Sharon Sandstone aquifer, Pottsville Formation, Geauga County. (Produced using Surfer 8.0)

CHAPTER FIVE

DISCUSSION

The porosity of earth materials is the percentage of voids in the rock or soil (Fetter, 2001). While dealing with hydrogeology, since water flows through interconnected pores within an earth material, one should not only define porosity but also characterize its types. There are different types of porosity depending upon size and origin of pore spaces but these can be generalized into two types; one being primary and other being secondary porosity. Primary porosity is the porosity inherent to a rock. It is “locked into” the rock at the time of lithification. Secondary porosity is developed in the rock at any time after deposition and lithification. (Fetter, 2001)

Joints

Almost all the clastic sedimentary rocks are fractured. It is just a matter of scale. Based on the timing of joint propagation during the history of burial, lithification, deformation and denudation of clastic rocks within sedimentary basins, three types of joints may be distinguished: tectonic, hydraulic, and release. Tectonic joints are formed due to force exerted on the rock faster than the rock is able to bend to accommodate the strain; hydraulic joints form at depth prior to uplift in response to abnormal fluid pressures, whereas release joints form near the surface in response to thermal-elastic contraction accompanying uplift and erosion. Tectonic joints are distinguished from hydraulic joints, compressive or tensile stress is a mechanism for propagation of a joint, whereas compaction by overburden loading leads to propagate in the latter case. The orientation of release joint is controlled by either a residual or contemporary tectonic stress. (Engelder, 1985)

Five sets of joints in the bedrock of the Appalachian plateau province formed at different stages of the Alleghanian orogeny is shown in figure 19 (Evans, 1994). Cross fold joint, joint intersecting fold axis, set oriented 340^0-360^0 was the first set; and cross fold joint set oriented 300^0-325^0 was the second set to form in the plateau province in the early Alleghanian tectonic jointing and detachment. The second set is interpreted to be a pre to syn-folding joint set. Cross fold joint oriented 270^0-295^0 is the third set to have formed in the plateau province and it is interpreted to be a late syn-to post-folding (Belt, Wise, & Lyons, 1991). Wise et al. (1991) showed that early folding in the Appalachian plateau province was coeval with the formation of Pennsylvanian Upper Freeport coal swamps. Therefore, if third set of joints and the dominant coal joints are coeval, they formed during and after folding. The fourth set of joints oriented 010^0-050^0 are attributed to release joints where the orientation is fabric controlled. Stage four is interpreted to be a discrete deformation event separated by some time interval from the end of Stage 3 deformation and the Alleghanian orogeny. Finally, the fifth set of joints oriented 050^0-085^0 are parallel to the present-day stress field and interpreted as neotectonic in origin because the North American plate has moved in a WSW direction since the Late Cretaceous-Early Tertiary.(Torsvik, Mosar, & Eide, 2001)

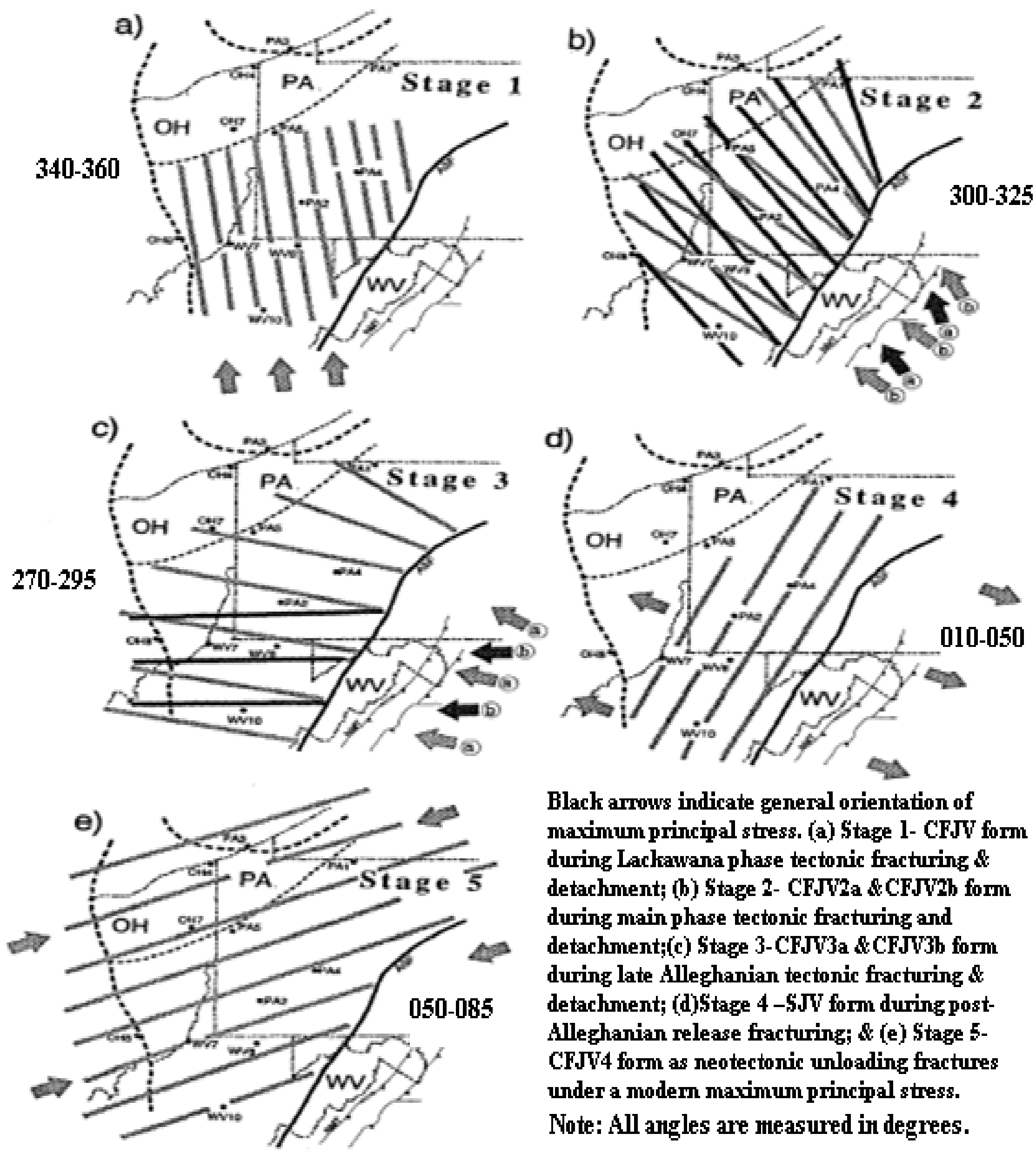

Figure 19: Schematic map illustrating orientation of fractures sets formed during five stage of deformation in the central Appalachian Plateau (Modified after Evans, 1994).

Not only tectonic stresses but also glacial loading can impart stresses in the underlying lithosphere in two ways. It can depress the lithosphere underneath causing compression, and it can cause a fore bulge out in front of the glacier causing tension. Induced fractures from tension in the fore bulge should align roughly parallel to the former ice edge (Hasegawa, Adams, & Yamazaki, 1985). Several authors have focused on the effect of glacial loading and unloading in relation to post-glaciation deformation at the ice edge. Using the model from Walcott (1970) and Adams (1989), one can determine that a 2 km thick ice sheet induces longitudinal stresses on the order of about 20MPa compression under the edge of the ice sheet and a tension of about 20 MPa at the fore bulge of the ice sheet. All stresses are aligned radially or tangentially to the ice margin. In some portions of the shield, the compressional and tensional stresses should be parallel to the contemporary stress field, and in others they should be perpendicular to it (Figure 20). In Ohio, their models predict a structural strike of the fore bulge to be oriented northwest. This indicates that the maximum horizontal compression developed during glacial loading is oriented NE below the glacial load, with NE-directed tension in the fore bulge region which produces joints striking NE. The southwest to northeast trend fracture corresponds to the direction of glacial advance and retreat as a result of the stress generated due to loading and subsequent unloading during glacial age (Asim et al., 2004).

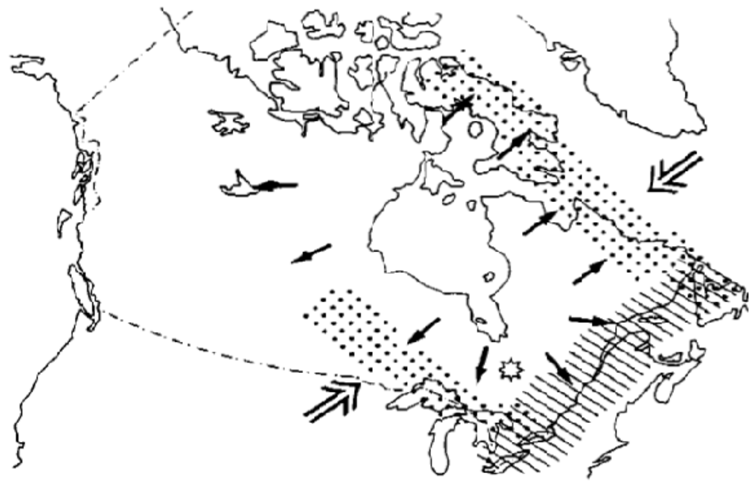

Figure 20: Regions, where glacially induced stresses (small arrows), are superposed on regional tectonic stresses (large arrows). Striped region is where the two stresses are orthogonal, and dotted pattern is where the two are parallel (Adams, 1989).

Throughout most of the coal area in eastern Ohio, the joints in the coal beds show remarkable uniformity in trend and usually occur in two sets, known as the face and the butt joints, which stand at right angles to each other (Figure 21), one set extends northeast-southwest and the other northwest-southeast. These joints were presumably formed by the deformation at the time the Appalachians were folded.(Ver Steeg, 1944)

In figure 21, the heavy broken lines indicate the major structures. The minor folds are indicated by broken lines representing the crests of the anticlines and solid lines representing the crests of the synclines. The joints in the rock formations are indicated by solid straight lines tipped by barbs. The joints in the coal beds are straight, light dotted lines.

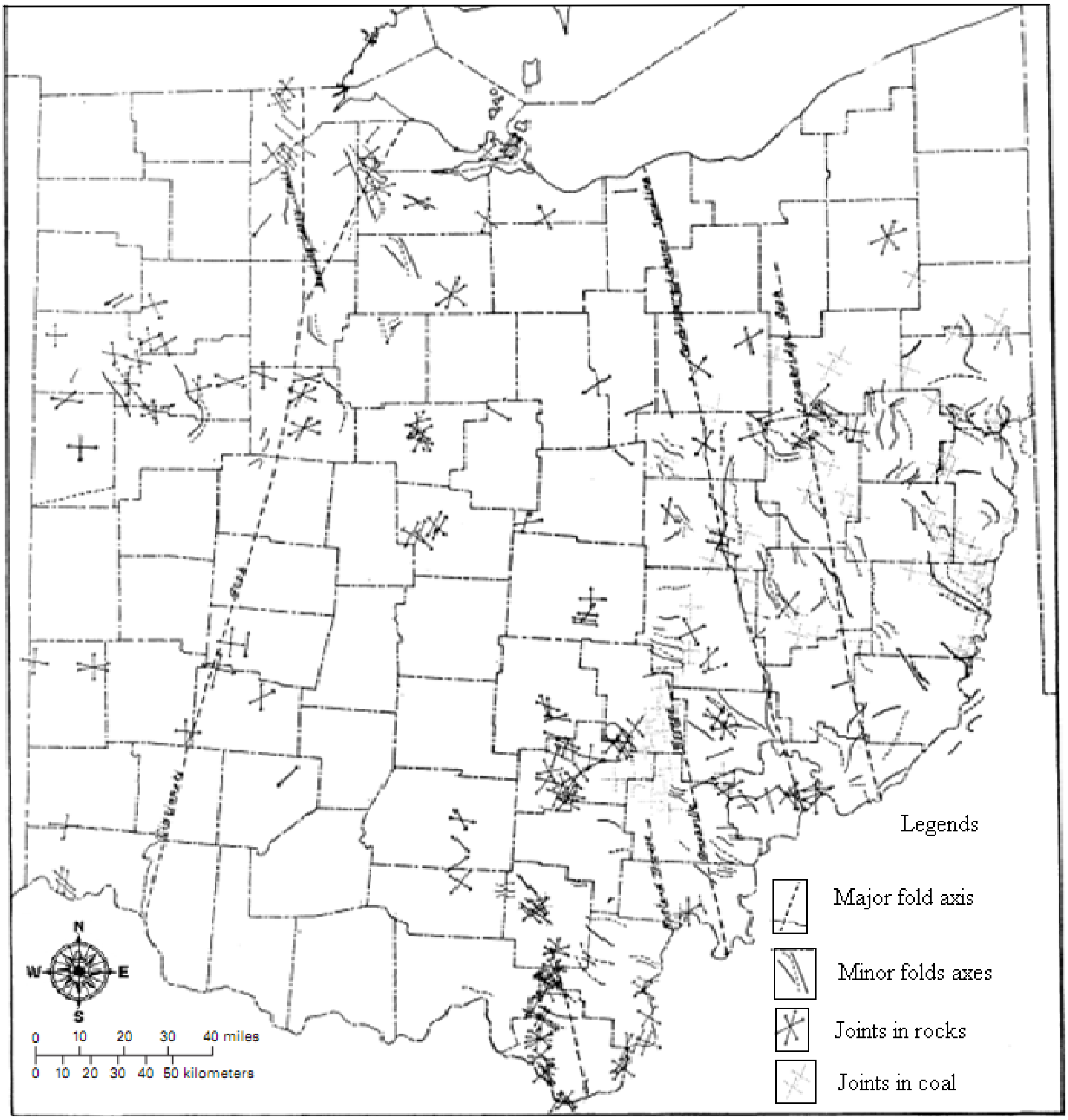

Figure 21: Map of Ohio showing structural features (Ver Steeg, 1944).

Hydrogeology

Studies of well tests often report a large number of fractures intersecting a well, but only one or two actually transmitting fluid. Thus, the question of fracture connectivity is of prime importance. Even domains that appear to be heavily fractured may not, in fact, be well-connected. A series of numerical studies of flow in fracture lattices and networks has demonstrated the conditions under which flow channeling arises (Berkowitz, 2002). That shows even a (geometrically) well-connected network can exhibit sparse preferential flow paths, and appears to be near the percolation threshold (the density of fractures above which the connectivity of fractures is sufficient to permit flow through at least a portion of the network, from one side of a domain to the other) if the distribution of fracture conductivities is sufficiently broad. It is thus clear that the distribution of fracture conductivities, as well as the degree of geometrical connectivity among fractures, is the controlling factors for the fluid flow in fracture. (Berkowitz, 2002)

Most of the times, the fracture itself plays a vital role in increasing the hydraulic conductivity of a formation. Yet, in some cases, even the presence of an immense number of fractures close to each other does not increase the aquifer conductivity because of lack of interconnectivity. So the presence of a few but interconnected and wide-aperture fractures can significantly increase the conductivity of an aquifer. This is common in fractured aquifer in contrast to granular unfractured aquifers. As a result, fractured rock aquifers exhibit a stronger heterogeneity due to the large contrast in hydraulic properties between the high permeability fractures and the surrounding rock matrix of lower permeability. (Lemieux, Therrien, & Kirkwood, 2006)

In such heterogeneous zone, well yield may differ from one place to another by many orders of magnitude. These differences are caused by a combination of both independent and interrelated factors that may influence the hydrological and geological characteristics of the well sites. Some of these factors are important at the local scale, others at the sub-regional scale, and still others at the regional scale. Regional-scale factors include net precipitation, runoff, and regional stresses, which can produce gradual changes in rock permeability (Rohr-Torp, 1994). More local factors include topography, rock type, overburden, structural position, joint and fracture characteristics, and recharge from surface water bodies (Brook, 1988).

The Sharon Sandstone aquifer is not deeper than 100m in most cases. So the hydraulic conductivity obtained from the pumping test truly reflects the effect of the fractures within the aquifer because transmissivity of the fractured aquifer decreases as aquifer depth increases and it is believed that most of the regional groundwater flow occurs in the uppermost 100m. The mere fact of continuity and consistency of the two trend lines shown on figures 17&18 give very strong indication of the interconnectivity of the fractures within the Sharon Sandstone aquifer. At greater depths, the interconnected fractures become sparser and groundwater flow is limited (Nastev et al., 2004).

Data Analysis

The greater the numbers of samples, the better it would follow the normal distribution regardless of the nature of distribution. A consequence of Central Limit Theorem is that if we average measurements of a particular quantity, the distribution of our average tends toward a normal distribution. Hence, bimodal distribution can’t be expected. However, the maximum published value of hydraulic conductivity for sandstone separates two distinct groups of population from the normal distribution curve itself (Figure 8). Only 30%, or less wells in the study area have lesser conductivity values than maximum published value for sandstone. Hydraulic conductivity for most sandstone is observed to range from 3.77×10^{-9} m/s (1.07×10^{-3} ft/day) to 1.04×10^{-4} m/s (29.48×10^{-4} ft/day) (Fetter, 2001); 4.72×10^{-10} m/s (1.34×10^{-4} ft/day) to 4.72×10^{-6} m/s (1.34 ft/day) (Freeze & Cherry, 1979), and 3×10^{-10} m/s (8.50×10^{-5} ft/day) to 6×10^{-6} m/s (1.70 ft/day) (Domenico & Schwartz, 1970). The group of wells within lower hydraulic conductivity zone represents primary porosity and rest of the population belongs to the high conductive zone representing fracture porosity (Figure 8). Here, the maximum value of hydraulic conductivity of sandstone was chosen to separate the high and low conductive groups from normal Gaussian curve because hydraulic conductivity higher than the selected value represents the fractures in the aquifer.

The positively skewed histogram of the hydraulic conductivities suggested that there were few but significant number of wells with relatively very high hydraulic conductivity in the formation. This can be inferred as some wells have well connected joints and fractures with significant amount of fluid transmitted into these wells.

The analytical solutions predicting transmissivity from specific capacity do not agree well with the measured transmissivity, apparently due to turbulent well loss within the production wells, which is not taken into account by any of the analytic solutions (Thomasson, Olmstead, & LeRoux, 1960); (Theis, Brown, & Myers, 1963); (Brown, 1963). However, the wells developed in Geauga County in the Pottsville Formation are neither cased nor screened and are also used only for domestic purpose so turbulent well loss can be neglected. Because of this reason, the estimated result of the transmissivity from specific capacity is definitely not too far from the measured transmissivity in the field by any of the standard testing methods.

The expected range of hydraulic conductivity of sandstones is from 4.72 $X10^{-10}$ m/s ($1.34x10^{-4}$ ft/day) to 4.72 $X10^{-6}$ m/s (1.34 ft/day), while for karst limestone it is between 4.72 $X10^{-6}$ m/s (1.34 ft/day) to 0.47 m/s ($1.34x10^{5}$ ft/day) (Freeze & Cherry, 1979). It is found that average (geometric mean) hydraulic conductivity of the Sharon Sandstone is $9.88x10^{-6}$ m/s (2.80 ft/day) and median value of hydraulic conductivity is 8.75x 10^{-6} m/s (2.48 ft/day) while the value ranges from $8.8x10^{-8}$ m/s to $1.11x10^{-3}$ m/s ($2.49x10^{-2}$ to 314.64 ft/day). The range observed for the Sharon aquifer is more similar to karst limestones than sandstones further suggesting that flow through the Sharon aquifer is characterized by conduit flow. This fact is supported by the study in which, a combination of the outcrop and subsurface data indicated channelized flow within the Sharon Sandstone, and characterized by a network of channels with multiple high permeability pathways along bedding planes, fractures and joint networks (Foos, 2003). The fact is realized since the high spatial variability in chemical composition of ground water indicates that the springs are hydrologically isolated from each other and flow is occurring through well-defined channels or conduits (Foos, 2003).

Though there are some spatial variations in hydraulic conductivity values on a local scale, regional alignments of higher hydraulic conductivity values provide a trend which represents fracture patterns in Sharon Sandstone orienting into two distinct directions of N34^{0}E and N44^{0}W (Figures 17 & 18). These trends of fracture orientation are fairly close with the trends of N45^{0}E and N45^{0}W identified in Portage County by Stanley (1973); N21^{0}E and N57^{0}W obtained for Southwestern Pennsylvania and Northwestern West Virginia, with equal amount of separation between the joint systems, by Bench, Diamond and McCulloch (1977), second and fourth cross fold joint set from Appalachian plateau province as found in Evans (1994), NE and NW joints identified in coal bed and NE-SW and NW- SE in clastic bedrock from Ohio by Ver Steeg (1944). Demissie (personal communication) also reported in his on-going research that the relatively higher hydraulic conductivity values of Cuyahoga Shale from Geauga County, Bainbridge Township, Ohio align at an orientation of N52^{0}E and N48^{0}W. Bair et al. (2010) recorded joint orientations of N55^{0}E and N55^{0}W from Sharon Sandstone in one of the best sandstone quarries and Route 422 outcrop from Bainbridge Township Though Evans (1994) and Ver Steeg (1944) identified five and three different joints sets in clastic sedimentary bed rock in Ohio, respectively, only two prominent transmissive joint sets were recognized from Geauga County. With these references, it can be inferred that the NW joint set is associated with the Alleghanian orogeny whereas NE joint set still needs more documentation because, glacial induced fracture, due to loading and unloading in Ohio is apparently also aligning in NE direction (Walcott, 1970; Adams, 1989: Asim et al., 2004).

CHAPTER SIX

CONCLUSION

The hydraulic conductivity, estimated from water well log and drilling reports of the residential water well within the Sharon Sandstone aquifer of Geauga County, Ohio, applying Cooper and Jacob (1946) and Jacob's (1950) approximation to Theis' (1935) non-equilibrium radial flow equation, is mappable on a regional scale since large number of residential water wells are available. Though there is some local spatial variability in hydraulic conductivity data, higher values of conductivity aligned into two distinct orientations representing the linear pattern of fractures with $N34^0E$ and $N44^0W$, following the regional fracture pattern of the Allegheny Plateau Province. The $N34^0E$ trend also follows the alignment resulting from the glacial loading and unloading.

It can also be concluded that transmissive fractured rock aquifer exhibits strong heterogeneity because of the large contrast in hydraulic properties between the high permeability fractures and low permeability of the surrounding rock matrix. The resulting hydraulic conductivity has an average value of 9.88×10^{-6} m/s (2.80 ft/day) (geometric mean) with a range of 8.80×10^{-8} m/s to 1.11×10^{-3} m/s (2.49×10^{-2} to 314 ft/day).

The calculated hydraulic conductivity is valid since all the wells in the study area are unscreened and uncased within the aquifer. The production test rates themselves were also low (25-100 m^3/day). Hence, the well loss is negligible and the drawdown computed as the difference between the initial and the final water level remains unaffected.

The aquifer in the southern townships has higher conductivity values than in the northern townships because of a gentle southward dipping beds and limited areal extent of Sharon Sandstone in topographic high areas in the north.

The calculated frequency distribution of hydraulic conductivity of Sharon Sandstone could not portray bimodal distribution because the data falls into quasi-log normal slightly right skewed distribution. However, the maximum value of hydraulic conductivity of typical sandstones published in the literature separates the normal bell shaped curve into two parts. One consisting more than 70% of wells with high conductivity subsequently representing secondary porosity (fractures, joints or faults) and other 30% or less representing primary porosity with low conductivity.

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Appendix – I

Univariate Statistics of Individual Townships of Geauga County

(Generated by Surfer 8.0 based on compiled water well log data)

Univariate Statistics for Auburn Township			
Parameters	LONGITUDE	LATITUDE	Hydraulic conductivity(m/s)
Minimum:	-81.391941	41.309931	1.1E-06
25%-tile:	-81.269979	41.3733	5.5E-06
Median:	-81.250739	41.387287	1.2E-05
75%-tile:	-81.230522	41.40689	3.0E-05
Maximum:	-81.180293	41.44935	1.1E-03
Midrange:	-81.286117	41.3796405	5.6E-04
Range:	0.211648	0.139419	1.1E-03
Interquartile Range:	0.039457	0.03359	2.4E-05
Median Abs. Deviation:	0.019718	0.016887	8.1E-06
Mean:	-81.25080636	41.38731404	5.1E-05
Standard Deviation:	0.031380946	0.023658966	1.3E-04
Variance:	0.000984764	0.000559747	1.7E-08
Coef. of Variation:			2.6E+00
Coef. of Skewness:			5.7E+00
Univariate Statistics for Bainbridge Township			
Minimum:	-81.391192	41.349476	8.7E-07
25%-tile:	-81.358097	41.366944	3.4E-06
Median:	-81.336902	41.396543	6.2E-06
75%-tile:	-81.325467	41.413827	1.6E-05
Maximum:	-81.298337	41.424483	8.3E-04
Midrange:	-81.3447645	41.3869795	4.2E-04
Range:	0.092855	0.075007	8.3E-04
Interquartile Range:	0.03263	0.046883	1.3E-05
Median Abs. Deviation:	0.015308	0.019047	3.7E-06
Mean:	-81.34091716	41.39136807	3.7E-05
Standard Deviation:	0.025810742	0.023343829	1.1E-04
Variance:	0.000666194	0.000544934	1.3E-08
Coef. of Variation:			3.0E+00
Coef. of Skewness:			5.3E+00

Univariate Statistics for Burton Township			
Parameters	LONGITUDE	LATITUDE	Hydraulic conductivity
Minimum:	-81.181748	41.426873	1.0E-06
25%-tile:	-81.149191	41.446936	4.4E-06
Median:	-81.124116	41.459935	9.4E-06
75%-tile:	-81.106124	41.47411	3.7E-05
Maximum:	-81.100858	41.500285	2.2E-04
Midrange:	-81.141303	41.463579	1.1E-04
Range:	0.08089	0.073412	2.2E-04
Interquartile Range:	0.043067	0.027174	3.3E-05
Median Abs. Deviation:	0.018368	0.014175	7.9E-06
Mean:	-81.13061454	41.45991186	2.5E-05
Trim Mean (10%):	-81.12979235	41.45962977	1.9E-05
Standard Deviation:	0.023847331	0.019921615	4.2E-05
Variance:	0.000568695	0.000396871	1.8E-09
Coef. of Variation:			1.7E+00
Coef. of Skewness:			3.6E+00

Univariate Statistics for Chardon Township			
Parameters	LONGITUDE	LATITUDE	Hydraulic conductivity
Minimum:	-81.286812	41.532078	3.6E-07
25%-tile:	-81.262999	41.579449	2.3E-06
Median:	-81.248218	41.592352	6.5E-06
75%-tile:	-81.225738	41.616458	2.1E-05
Maximum:	-81.163172	41.633826	1.0E-04
Midrange:	-81.224992	41.582952	5.0E-05
Range:	0.12364	0.101748	1.0E-04
Interquartile Range:	0.037261	0.037009	1.8E-05
Median Abs. Deviation:	0.022185	0.018466	4.8E-06
Mean:	-81.24327612	41.59642704	1.6E-05
Trim Mean (10%):	-81.24486604	41.59759878	1.3E-05
Standard Deviation:	0.030535574	0.024268164	2.1E-05
Variance:	0.000932421	0.000588944	4.5E-10
Coef. of Variation:			1.3E+00
Coef. of Skewness:			2.6E+00

Univariate Statistics for Chester Township			
Parameters	LONGITUDE	LATITUDE	Hydraulic conductivity
Minimum:	-81.3905	41.498976	8.8E-08
25%-tile:	-81.377401	41.51351	7.1E-06
Median:	-81.361124	41.528072	1.6E-05
75%-tile:	-81.344211	41.543009	4.4E-05
Maximum:	-81.302382	41.568912	2.8E-04
Midrange:	-81.346441	41.533944	1.4E-04
Range:	0.088118	0.069936	2.8E-04
Interquartile Range:	0.03319	0.029499	3.7E-05
Median Abs. Deviation:	0.016277	0.014562	1.1E-05
Mean:	-81.35953514	41.53050594	3.5E-05
Trim Mean (10%):	-81.36035736	41.53024104	2.7E-05
Standard Deviation:	0.019786432	0.020574784	5.4E-05
Variance:	0.000391503	0.000423322	2.9E-09
Coef. of Variation:			1.5E+00
Coef. of Skewness:			3.2E+00

Univariate Statistics for Claridon Township			
Parameters	LONGITUDE	LATITUDE	Hydraulic conductivity
Minimum:	-81.193147	41.503605	8.9E-07
25%-tile:	-81.175562	41.523008	7.8E-06
Median:	-81.147492	41.543643	1.9E-05
75%-tile:	-81.125074	41.555906	2.6E-05
Maximum:	-81.0000001	41.565984	3.4E-04
Midrange:	-81.09657355	41.5347945	1.7E-04
Range:	0.193146902	0.062379	3.4E-04
Interquartile Range:	0.050488	0.032898	1.8E-05
Median Abs. Deviation:	0.022889	0.018382	1.1E-05
Mean:	-81.14486314	41.53954764	4.8E-05
Trim Mean (10%):	-81.1496921	41.54002295	3.5E-05
Standard Deviation:	0.039857879	0.01871036	9.1E-05
Variance:	0.001588651	0.000350078	8.2E-09
Coef. of Variation:			1.9E+00
Coef. of Skewness:			2.5E+00

Univariate Statistics for Hambden Township			
Parameters	LONGITUDE	LATITUDE	Hydraulic conductivity
Minimum:	-81.198726	41.575767	3.9E-06
25%-tile:	-81.163047	41.587023	9.7E-06
Median:	-81.148639	41.606376	2.5E-05
75%-tile:	-81.136956	41.612226	6.1E-05
Maximum:	-81.106281	41.64074	9.8E-04
Midrange:	-81.1525035	41.6082535	4.9E-04
Range:	0.092445	0.064973	9.8E-04
Interquartile Range:	0.026091	0.025203	5.2E-05
Median Abs. Deviation:	0.011683	0.012907	2.0E-05
Mean:	-81.14901795	41.60386468	1.1E-04
Trim Mean (10%):	-81.14860788	41.60334835	6.2E-05
Standard Deviation:	0.019362813	0.018760286	2.3E-04
Variance:	0.000374919	0.000351948	5.1E-08
Coef. of Variation:			2.1E+00
Coef. of Skewness:			3.1E+00

Univariate Statistics for Huntsburg Township			
Parameters	LONGITUDE	LATITUDE	Hydraulic conductivity
Minimum:	-81.092111	41.503099	7.5E-07
25%-tile:	-81.085229	41.521506	5.3E-06
Median:	-81.072672	41.539396	1.3E-05
75%-tile:	-81.059598	41.552414	2.5E-05
Maximum:	-81.01106	41.604772	2.5E-04
Midrange:	-81.0515855	41.5539355	1.3E-04
Range:	0.081051	0.101673	2.5E-04
Interquartile Range:	0.025631	0.030908	2.0E-05
Median Abs. Deviation:	0.012947	0.01789	8.6E-06
Mean:	-81.06876283	41.54052444	3.6E-05
Trim Mean (10%):	-81.07091	41.53884806	2.5E-05
Standard Deviation:	0.021909011	0.023832435	6.4E-05
Variance:	0.000480005	0.000567985	4.1E-09
Coef. of Variation:			1.8E+00
Coef. of Skewness:			2.6E+00

Univariate Statistics for Middlefield Township			
Parameters	LONGITUDE	LATITUDE	Hydraulic conductivity
Minimum:	-81.107795	41.410951	6.8E-07
25%-tile:	-81.089723	41.438598	4.8E-06
Median:	-81.079861	41.452873	8.7E-06
75%-tile:	-81.050951	41.463968	4.4E-05
Maximum:	-81.003186	41.500621	6.1E-04
Midrange:	-81.0554905	41.455786	3.0E-04
Range:	0.104609	0.08967	6.1E-04
Interquartile Range:	0.038772	0.02537	4.0E-05
Median Abs. Deviation:	0.017417	0.014059	5.4E-06
Mean:	-81.06811608	41.45505912	5.4E-05
Trim Mean (10%):	-81.06921396	41.45499591	3.2E-05
Standard Deviation:	0.028020784	0.023656066	1.2E-04
Variance:	0.000785164	0.000559609	1.4E-08
Coef. of Variation:			2.2E+00
Coef. of Skewness:			3.9E+00

Univariate Statistics for Montsville Township			
Parameters	LONGITUDE	LATITUDE	Hydraulic conductivity
Minimum:	-81.081205	41.579467	1.7E-06
25%-tile:	-81.071464	41.609039	4.5E-06
Median:	-81.056866	41.625616	9.6E-06
75%-tile:	-81.04526	41.638717	3.1E-05
Maximum:	-81.003203	41.642029	6.6E-05
Midrange:	-81.042204	41.610748	3.4E-05
Range:	0.078002	0.062562	6.4E-05
Interquartile Range:	0.026204	0.029678	2.6E-05
Median Abs. Deviation:	0.014598	0.015133	7.4E-06
Mean:	-81.05183661	41.62024889	1.9E-05
Trim Mean (10%):	-81.05304069	41.6214365	1.7E-05
Standard Deviation:	0.024960362	0.01977923	2.0E-05
Variance:	0.00062302	0.000391218	3.8E-10
Coef. of Variation:			1.0E+00
Coef. of Skewness:			1.1E+00

Univariate Statistics for Munson Township			
Parameters	LONGITUDE	LATITUDE	Hydraulic conductivity
Minimum:	-81.296478	41.468455	6.4E-07
25%-tile:	-81.255638	41.511842	2.8E-06
Median:	-81.235202	41.534993	4.9E-06
75%-tile:	-81.219733	41.555793	1.1E-05
Maximum:	-81.189395	41.57144	7.6E-04
Midrange:	-81.2429365	41.5199475	3.8E-04
Range:	0.107083	0.102985	7.5E-04
Interquartile Range:	0.035905	0.043951	8.3E-06
Median Abs. Deviation:	0.018263	0.021967	3.2E-06
Mean:	-81.23891168	41.53346331	2.2E-05
Trim Mean (10%):	-81.23852726	41.53382938	8.5E-06
Standard Deviation:	0.027179906	0.023378068	9.1E-05
Variance:	0.000738747	0.000546534	8.3E-09
Coef. of Variation:			4.1E+00
Coef. of Skewness:			7.3E+00

Univariate Statistics for Newberry Township			
Parameters	LONGITUDE	LATITUDE	Hydraulic conductivity
Minimum:	-81.357691	41.420351	7.3E-07
25%-tile:	-81.280138	41.43685	3.1E-06
Median:	-81.25176	41.465054	7.3E-06
75%-tile:	-81.228204	41.482814	3.2E-05
Maximum:	-81.192793	41.504395	9.1E-04
Midrange:	-81.275242	41.462373	4.5E-04
Range:	0.164898	0.084044	9.1E-04
Interquartile Range:	0.051934	0.045964	2.9E-05
Median Abs. Deviation:	0.028378	0.025668	6.4E-06
Mean:	-81.25417478	41.46153276	4.8E-05
Trim Mean (10%):	-81.25356354	41.46148178	2.5E-05
Standard Deviation:	0.034880217	0.025228158	1.4E-04
Variance:	0.00121663	0.00063646	1.9E-08
Coef. of Variation:			2.9E+00
Coef. of Skewness:			5.3E+00

Univariate Statistics for Parkman Township			
Parameters	LONGITUDE	LATITUDE	Hydraulic conductivity
Minimum:	-81.106508	41.349618	8.2E-07
25%-tile:	-81.08016	41.355309	2.3E-06
Median:	-81.059219	41.376101	5.6E-06
75%-tile:	-81.032975	41.410685	8.7E-06
Maximum:	-81.004499	41.466976	6.8E-05
Midrange:	-81.0555035	41.408297	3.4E-05
Range:	0.102009	0.117358	6.7E-05
Interquartile Range:	0.047185	0.055376	6.4E-06
Median Abs. Deviation:	0.022322	0.026164	3.3E-06
Mean:	-81.05671465	41.38518146	9.1E-06
Trim Mean (10%):	-81.05681558	41.38325517	7.0E-06
Standard Deviation:	0.027757423	0.030064167	1.4E-05
Variance:	0.000770475	0.000903854	1.8E-10
Coef. of Variation:			1.5E+00
Coef. of Skewness:			3.4E+00

Univariate Statistics for Russell Township			
Parameters	LONGITUDE	LATITUDE	Hydraulic conductivity
Minimum:	-81.397295	41.397574	9.9E-07
25%-tile:	-81.359413	41.429618	3.4E-06
Median:	-81.343962	41.43834	8.3E-06
75%-tile:	-81.328226	41.466554	1.3E-05
Maximum:	-81.299289	41.516322	1.7E-04
Midrange:	-81.348292	41.456948	8.4E-05
Range:	0.098006	0.118748	1.7E-04
Interquartile Range:	0.031187	0.036936	9.7E-06
Median Abs. Deviation:	0.015639	0.011951	4.9E-06
Mean:	-81.34338853	41.44814195	2.3E-05
Trim Mean (10%):	-81.34311574	41.44730594	1.8E-05
Standard Deviation:	0.022445519	0.023546697	3.9E-05
Variance:	0.000503801	0.000554447	1.5E-09
Coef. of Variation:			1.7E+00
Coef. of Skewness:			2.7E+00

Univariate Statistics for Thompton Township			
Parameters	LONGITUDE	LATITUDE	Hydraulic conductivity
Minimum:	-81.096958	41.641154	3.4E-06
25%-tile:	-81.08986	41.665364	1.0E-05
Median:	-81.014529	41.685932	1.4E-05
75%-tile:	-81.010849	41.691207	3.0E-05
Maximum:	-81.003452	41.695001	6.6E-05
Midrange:	-81.050205	41.6680775	3.5E-05
Range:	0.093506	0.053847	6.3E-05
Interquartile Range:	0.079011	0.025843	2.0E-05
Median Abs. Deviation:	0.02522	0.017695	1.1E-05
Mean:	-81.0449875	41.67296725	2.0E-05
Trim Mean (10%):	-81.04324833	41.67459717	1.5E-05
Standard Deviation:	0.038321184	0.019783642	1.9E-05
Variance:	0.001468513	0.000391392	3.7E-10
Coef. of Variation:			9.6E-01
Coef. of Skewness:			1.6E+00

Univariate Statistics for Troy Township			
Parameters	LONGITUDE	LATITUDE	Hydraulic conductivity
Minimum:	-81.185935	41.348331	9.0E-07
25%-tile:	-81.174425	41.362937	2.9E-06
Median:	-81.145342	41.387517	8.1E-06
75%-tile:	-81.128572	41.424852	1.7E-05
Maximum:	-81.104058	41.433463	3.0E-04
Midrange:	-81.1449965	41.390897	1.5E-04
Range:	0.081877	0.085132	3.0E-04
Interquartile Range:	0.045853	0.061915	1.4E-05
Median Abs. Deviation:	0.020023	0.028324	6.3E-06
Mean:	-81.14746221	41.39167789	3.4E-05
Trim Mean (10%):	-81.14775229	41.39176976	2.0E-05
Standard Deviation:	0.02681154	0.029779982	7.1E-05
Variance:	0.000718859	0.000886847	5.0E-09
Coef. of Variation:			2.1E+00
Coef. of Skewness:			2.9E+00

Appendix- II

T-S Curve Data for Unconfined Aquifer within Geauga County

(Calculated transmissivity using equation 7 for different storativity values)

S = 0.01		*S= 0.1*		*S=1*	
specific capacity (gpm/ft)	Transmissivity (gpd/ft)	specific capacity (gpm/ft)	Transmissivity (gpd/ft)	specific capacity (gpm/ft)	Transmissivity (gpd/ft)
0.03	30.02	0.03	15.87	0.03	6.89
0.13	110.37	0.13	71.06	0.13	29.64
0.16	174.68	0.16	124.92	0.16	70.76
0.17	153.46	0.17	101.58	0.17	39.57
0.17	190.42	0.17	138.63	0.17	82.97
0.18	165.19	0.18	109.97	0.18	44.69
0.19	225.62	0.19	170.05	0.19	111.48
0.21	227.90	0.21	163.66	0.21	93.96
0.21	204.34	0.21	138.16	0.21	61.85
0.22	244.46	0.22	177.67	0.22	105.80
0.23	218.46	0.23	148.39	0.23	69.87
0.23	294.32	0.23	226.76	0.23	156.26
0.23	226.23	0.23	154.03	0.23	71.57
0.24	230.31	0.24	157.00	0.24	73.39
0.24	232.40	0.24	158.52	0.24	74.32
0.25	240.00	0.25	164.06	0.25	77.74
0.25	284.01	0.25	210.33	0.25	131.96
0.25	243.41	0.25	166.54	0.25	79.27
0.25	248.09	0.25	169.95	0.25	81.38
0.26	276.09	0.26	197.95	0.26	113.09
0.26	267.81	0.26	188.84	0.26	101.91

0.26	277.43	0.26	198.96	0.26	113.75
0.27	261.87	0.27	180.02	0.27	87.61
0.28	273.30	0.28	188.39	0.28	92.81
0.28	299.09	0.28	215.29	0.28	93.25
0.28	274.25	0.28	189.08	0.28	124.53
0.29	283.13	0.29	195.60	0.29	97.31
0.29	283.13	0.29	195.60	0.29	97.31
0.30	320.00	0.30	231.10	0.30	135.03
0.30	299.18	0.30	207.39	0.30	104.69
0.30	325.97	0.30	235.62	0.30	138.04
0.30	302.60	0.30	209.90	0.30	106.26
0.31	338.56	0.31	245.15	0.31	144.40
0.31	313.30	0.31	217.78	0.31	111.22
0.31	315.32	0.31	219.27	0.31	112.15
0.32	321.80	0.32	224.05	0.32	115.17
0.32	366.92	0.32	271.38	0.32	169.69
0.33	386.61	0.33	289.75	0.33	187.38
0.33	330.75	0.33	230.65	0.33	119.33
0.33	359.99	0.33	261.41	0.33	155.29
0.33	306.91	0.33	203.16	0.33	79.14
0.33	336.97	0.33	235.25	0.33	122.24
0.33	354.39	0.33	253.62	0.33	144.00
0.34	345.62	0.34	241.64	0.34	126.30
0.35	354.70	0.35	248.36	0.35	130.56
0.35	387.21	0.35	282.11	0.35	169.21
0.36	364.23	0.36	255.42	0.36	135.06
0.36	402.44	0.36	293.72	0.36	177.05
0.36	338.96	0.36	226.08	0.36	93.11
0.37	382.65	0.37	269.09	0.37	143.78
0.38	384.80	0.38	270.69	0.38	144.80
0.38	384.80	0.38	270.69	0.38	144.80
0.38	390.58	0.38	274.98	0.38	147.56
0.38	430.14	0.38	314.86	0.38	150.10
0.38	395.92	0.38	278.96	0.38	191.38
0.39	402.45	0.39	283.81	0.39	153.22
0.39	404.67	0.39	285.46	0.39	154.28
0.40	413.78	0.40	292.25	0.40	110.11
0.40	413.78	0.40	292.25	0.40	110.11
0.40	377.83	0.40	254.04	0.40	158.64

0.40	413.78	0.40	292.25	0.40	158.64
0.40	377.83	0.40	254.04	0.40	158.64
0.40	413.78	0.40	292.25	0.40	158.64
0.40	449.35	0.40	329.54	0.40	201.36
0.42	433.22	0.42	306.74	0.42	118.01
0.42	454.92	0.42	329.53	0.42	167.99
0.42	395.79	0.42	267.00	0.42	194.31
0.43	447.15	0.43	317.14	0.43	174.72
0.43	447.15	0.43	317.14	0.43	201.69
0.43	485.22	0.43	357.01	0.43	220.12
0.43	469.46	0.43	340.56	0.43	317.14
0.44	510.33	0.44	379.68	0.44	241.06
0.44	460.56	0.44	327.17	0.44	181.22
0.44	513.66	0.44	382.26	0.44	242.85
0.44	465.79	0.44	331.08	0.44	183.76
0.44	465.79	0.44	331.08	0.44	183.76
0.45	472.33	0.45	335.97	0.45	186.94
0.45	518.04	0.45	382.20	0.45	237.40
0.48	503.29	0.48	359.17	0.48	202.07
0.48	503.29	0.48	359.17	0.48	202.07
0.48	505.74	0.48	361.01	0.48	203.28
0.48	507.81	0.48	362.56	0.48	204.29
0.48	507.81	0.48	362.56	0.48	204.29
0.48	553.90	0.48	409.78	0.48	256.40
0.48	512.40	0.48	366.01	0.48	206.54
0.48	555.31	0.48	410.87	0.48	257.15
0.49	514.59	0.49	367.65	0.49	207.62
0.49	560.33	0.49	414.74	0.49	259.82
0.50	531.59	0.50	380.43	0.50	198.31
0.50	531.59	0.50	380.43	0.50	215.99
0.50	531.59	0.50	380.43	0.50	215.99
0.50	531.59	0.50	380.43	0.50	215.99
0.50	531.59	0.50	380.43	0.50	215.99
0.50	531.59	0.50	380.43	0.50	215.99
0.50	517.23	0.50	365.31	0.50	215.99
0.50	531.59	0.50	380.43	0.50	215.99
0.52	555.47	0.52	398.39	0.52	227.81
0.53	563.04	0.53	404.09	0.53	231.56
0.53	644.23	0.53	486.73	0.53	320.92

0.53	571.45	0.53	410.43	0.53	235.74
0.55	586.01	0.55	421.41	0.55	243.00
0.55	591.48	0.55	425.53	0.55	245.72
0.56	598.17	0.56	430.58	0.56	249.07
0.56	647.35	0.56	481.90	0.56	249.07
0.56	598.17	0.56	430.58	0.56	306.41
0.57	617.33	0.57	445.05	0.57	258.66
0.57	846.18	0.57	681.12	0.57	258.66
0.57	617.33	0.57	445.05	0.57	681.12
0.58	626.42	0.58	451.92	0.58	263.22
0.58	683.33	0.58	509.75	0.58	325.84
0.59	689.70	0.59	514.69	0.59	329.29
0.60	651.95	0.60	471.24	0.60	276.07
0.60	705.01	0.60	526.55	0.60	276.07
0.60	705.01	0.60	526.55	0.60	276.07
0.60	651.95	0.60	471.24	0.60	276.07
0.60	651.95	0.60	471.24	0.60	337.59
0.60	651.95	0.60	471.24	0.60	526.55
0.61	712.90	0.61	532.67	0.61	341.87
0.61	716.34	0.61	535.33	0.61	343.74
0.63	737.62	0.63	551.85	0.63	291.46
0.63	682.38	0.63	494.29	0.63	355.32
0.64	752.49	0.64	563.39	0.64	363.43
0.65	965.09	0.65	778.93	0.65	369.72
0.65	764.02	0.65	572.35	0.65	587.80
0.65	766.50	0.65	574.28	0.65	371.08
0.65	712.94	0.65	517.48	0.65	306.99
0.65	715.60	0.65	519.50	0.65	308.35
0.67	733.38	0.67	533.01	0.67	317.41
0.67	792.26	0.67	594.30	0.67	317.41
0.67	767.88	0.67	568.99	0.67	317.41
0.67	792.26	0.67	594.30	0.67	317.41
0.67	733.38	0.67	533.01	0.67	317.41
0.67	792.26	0.67	594.30	0.67	357.49
0.67	792.26	0.67	594.30	0.67	385.18
0.67	733.38	0.67	533.01	0.67	385.18
0.67	733.38	0.67	533.01	0.67	385.18
0.67	733.38	0.67	533.01	0.67	385.18
0.67	733.38	0.67	533.01	0.67	533.01

0.68	744.45	0.68	541.43	0.68	323.07
0.69	857.93	0.69	654.48	0.69	441.26
0.70	774.42	0.70	564.23	0.70	338.43
0.70	836.20	0.70	628.51	0.70	409.31
0.71	818.19	0.71	607.80	0.71	384.39
0.74	882.95	0.74	664.95	0.74	435.10
0.75	836.35	0.75	611.44	0.75	370.35
0.75	940.94	0.75	719.94	0.75	370.35
0.75	902.49	0.75	680.20	0.75	370.35
0.75	836.35	0.75	611.44	0.75	370.35
0.75	836.35	0.75	611.44	0.75	445.91
0.75	836.35	0.75	611.44	0.75	488.64
0.76	918.34	0.76	692.57	0.76	454.70
0.77	967.52	0.77	740.94	0.77	503.88
0.79	885.54	0.79	649.02	0.79	395.88
0.79	885.54	0.79	649.02	0.79	395.88
0.79	885.54	0.79	649.02	0.79	395.88
0.80	969.20	0.80	732.32	0.80	402.73
0.80	969.20	0.80	732.32	0.80	402.73
0.80	898.70	0.80	659.08	0.80	482.96
0.80	898.70	0.80	659.08	0.80	482.96
0.81	912.23	0.81	669.44	0.81	409.79
0.81	1010.85	0.81	770.68	0.81	518.91
0.82	1248.02	0.82	1012.42	0.82	1012.42
0.83	940.49	0.83	691.07	0.83	424.55
0.83	940.49	0.83	691.07	0.83	424.55
0.86	970.44	0.86	714.03	0.86	440.25
0.86	1045.91	0.86	792.37	0.86	525.81
0.87	1062.65	0.87	805.49	0.87	535.20
0.87	1062.65	0.87	805.49	0.87	535.20
0.89	1088.74	0.89	825.95	0.89	549.84
0.90	1103.76	0.90	837.73	0.90	558.28
0.90	1218.32	0.90	955.70	0.90	955.70
0.91	1036.08	0.91	764.41	0.91	474.80
0.91	1398.56	0.91	1137.00	0.91	565.21
0.91	1116.07	0.91	847.39	0.91	869.02
0.94	1159.58	0.94	881.56	0.94	589.74
1.00	1151.82	1.00	853.49	1.00	536.23
1.00	1151.82	1.00	853.49	1.00	536.23

1.00	1151.82	1.00	853.49	1.00	536.23
1.00	1151.82	1.00	853.49	1.00	536.23
1.00	1151.82	1.00	853.49	1.00	536.23
1.00	1151.82	1.00	853.49	1.00	536.23
1.00	1239.72	1.00	944.57	1.00	536.23
1.00	1239.72	1.00	944.57	1.00	536.23
1.00	1151.82	1.00	853.49	1.00	536.23
1.00	1151.82	1.00	853.49	1.00	536.23
1.00	1151.82	1.00	853.49	1.00	536.23
1.00	1239.72	1.00	944.57	1.00	536.23
1.00	1203.32	1.00	906.93	1.00	594.55
1.00	1151.82	1.00	853.49	1.00	635.09
1.00	1326.98	1.00	1034.46	1.00	635.09
1.00	1151.82	1.00	853.49	1.00	635.09
1.00	1151.82	1.00	853.49	1.00	635.09
1.00	1239.72	1.00	944.57	1.00	730.62
1.00	1151.82	1.00	853.49	1.00	853.49
1.00	1550.21	1.00	1262.73	1.00	968.32
1.03	1274.79	1.03	972.18	1.03	655.01
1.08	1627.03	1.08	1314.58	1.08	593.53
1.08	1258.84	1.08	936.08	1.08	593.53
1.08	1258.84	1.08	936.08	1.08	993.88
1.11	1294.70	1.11	963.80	1.11	612.82
1.11	1351.85	1.11	1023.05	1.11	677.19
1.12	1207.06	1.12	869.26	1.12	503.49
1.13	1760.39	1.13	1437.27	1.13	1106.58
1.13	1574.80	1.13	1246.05	1.13	906.41
1.15	1350.03	1.15	1006.62	1.15	642.68
1.15	1451.29	1.15	1111.41	1.15	755.82
1.17	1366.67	1.17	1019.51	1.17	651.69
1.18	1482.62	1.18	1136.17	1.18	773.82
1.20	1410.01	1.20	1053.09	1.20	675.18
1.20	1515.27	1.20	1161.99	1.20	675.18
1.20	1410.01	1.20	1053.09	1.20	792.59
1.20	1576.50	1.20	1225.04	1.20	859.52
1.25	1475.24	1.25	1103.70	1.25	710.65
1.25	1475.24	1.25	1103.70	1.25	710.65
1.25	1475.24	1.25	1103.70	1.25	710.65
1.33	1584.52	1.33	1188.61	1.33	770.35

1.33	1584.52	1.33	1188.61	1.33	770.35
1.33	1701.34	1.33	1309.35	1.33	900.10
1.50	1804.98	1.50	1360.40	1.50	891.83
1.50	1804.98	1.50	1360.40	1.50	891.83
1.50	1804.98	1.50	1360.40	1.50	891.83
1.50	1804.98	1.50	1360.40	1.50	891.83
1.50	2012.63	1.50	1574.45	1.50	891.83
1.50	2066.65	1.50	1629.87	1.50	891.83
1.50	1804.98	1.50	1360.40	1.50	1036.95
1.50	1936.25	1.50	1495.92	1.50	1119.91
1.50	1804.98	1.50	1360.40	1.50	1178.09
1.60	2020.36	1.60	1549.32	1.60	1056.79
1.67	2027.77	1.67	1534.57	1.67	1015.79
1.67	2027.77	1.67	1534.57	1.67	1015.79
1.67	2173.47	1.67	1684.86	1.67	1176.25
1.67	2220.17	1.67	1732.87	1.67	1226.95
1.80	2207.52	1.80	1675.46	1.80	1116.57
1.88	2309.18	1.88	1755.28	1.88	1173.85
2.00	2479.44	2.00	1889.15	2.00	1270.19
2.00	2479.44	2.00	1889.15	2.00	1270.19
2.00	2653.96	2.00	2068.92	2.00	1270.19
2.00	3100.43	2.00	2525.46	2.00	1461.24
2.00	2479.44	2.00	1889.15	2.00	1461.24
2.00	2653.96	2.00	2068.92	2.00	1936.65
2.20	2753.85	2.20	2105.40	2.20	1426.47
2.25	2822.82	2.25	2159.83	2.25	1465.93
2.29	3071.37	2.29	2403.79	2.29	1711.40
2.40	3361.32	2.40	2663.80	2.40	2663.80
2.50	3169.68	2.50	2434.07	2.50	1665.37
2.50	3387.38	2.50	2657.95	2.50	1665.37
2.50	3387.38	2.50	2657.95	2.50	1902.13
2.50	3169.68	2.50	2434.07	2.50	1902.13
2.50	3387.38	2.50	2657.95	2.50	2657.95
2.67	3769.87	2.67	2995.67	2.67	2196.94
2.92	4008.22	2.92	3158.65	2.92	2279.69
3.00	3872.50	3.00	2991.85	3.00	2073.90
3.00	5057.32	3.00	4201.65	3.00	2073.90
3.00	3872.50	3.00	2991.85	3.00	2073.90
3.00	3872.50	3.00	2991.85	3.00	3329.74

3.50	4585.75	3.50	3560.29	3.50	2493.47
4.00	5654.80	4.00	4493.50	4.00	3295.41
4.00	5654.80	4.00	4493.50	4.00	3295.41
5.00	7207.58	5.00	5759.12	5.00	4267.43
6.00	8266.61	6.00	6519.46	6.00	4712.35
6.67	9272.92	6.67	7333.80	6.67	5330.09
7.00	10735.74	7.00	8721.16	7.00	6285.10
7.00	10383.59	7.00	8362.03	7.00	6656.56
7.50	10542.35	7.50	8363.49	7.50	5413.77
7.50	9891.59	7.50	7696.00	7.50	6123.64
7.50	11189.55	7.50	9024.91	7.50	6801.99
13.33	20843.38	13.33	17013.41	13.33	13093.47
15.00	22379.11	15.00	18049.82	15.00	13603.98
20.00	30552.62	20.00	24794.36	20.00	18891.49
30.00	47334.60	30.00	38724.99	30.00	29918.48

T-S Curve Data for Confined Aquifer within Geauga County

S = 0.0001		*S = 0.001*		*S = 0.01*	
specific capacity (gpm/ft)	Transmissivity (gpd/ft)	specific capacity (gpm/ft)	Transmissivity (gpd/ft)	specific capacity (gpm/ft)	Transmissivity (gpd/ft)
0.061	84.133	0.061	66.381	0.061	42.084
0.092	131.145	0.092	104.568	0.092	77.179
0.108	157.244	0.108	125.884	0.108	93.608
0.125	205.109	0.125	169.369	0.125	132.897
0.126	196.619	0.126	160.319	0.126	123.157
0.140	220.017	0.140	179.764	0.140	138.577
0.143	212.269	0.143	171.020	0.143	128.647
0.154	243.223	0.154	199.080	0.154	153.933
0.171	272.666	0.171	223.625	0.171	173.495
0.172	260.211	0.172	210.509	0.172	159.514
0.173	260.907	0.173	211.083	0.173	159.964
0.175	265.155	0.175	214.589	0.175	162.712
0.187	283.971	0.187	230.125	0.187	174.905
0.192	292.840	0.192	237.454	0.192	180.664
0.194	294.884	0.194	239.144	0.194	181.993
0.211	324.174	0.211	263.375	0.211	201.068
0.212	324.623	0.212	263.746	0.212	201.361
0.214	329.181	0.214	267.521	0.214	204.337
0.214	347.543	0.214	286.207	0.214	223.575
0.217	334.340	0.217	271.793	0.217	207.705
0.220	339.241	0.220	275.853	0.220	210.908
0.221	320.672	0.221	256.829	0.221	191.128
0.231	356.621	0.231	290.257	0.231	222.282
0.233	379.525	0.233	312.998	0.233	245.089
0.234	362.643	0.234	295.251	0.234	226.228
0.240	372.052	0.240	303.055	0.240	232.397
0.240	404.585	0.240	336.132	0.240	266.380
0.243	376.604	0.243	306.832	0.243	235.385
0.244	399.471	0.244	329.722	0.244	258.538
0.247	411.563	0.247	341.067	0.247	269.189
0.250	388.817	0.250	316.968	0.250	243.407
0.250	388.817	0.250	316.968	0.250	243.407
0.250	422.698	0.250	351.412	0.250	278.783

0.259	403.309	0.259	329.003	0.259	252.940
0.261	429.422	0.261	354.856	0.261	255.432
0.261	407.096	0.261	332.149	0.261	278.777
0.267	439.687	0.267	363.475	0.267	285.725
0.272	471.843	0.272	394.537	0.272	315.879
0.273	450.435	0.273	372.503	0.273	293.005
0.283	444.514	0.283	363.255	0.283	280.113
0.286	449.082	0.286	367.055	0.286	283.131
0.286	449.082	0.286	367.055	0.286	283.131
0.286	449.082	0.286	367.055	0.286	283.131
0.291	458.495	0.291	374.887	0.291	289.355
0.300	473.346	0.300	387.250	0.300	299.185
0.300	473.346	0.300	387.250	0.300	299.185
0.300	473.346	0.300	387.250	0.300	299.185
0.301	475.396	0.301	388.957	0.301	300.543
0.308	486.446	0.308	398.159	0.308	307.865
0.313	494.646	0.313	404.990	0.313	313.303
0.320	507.455	0.320	415.664	0.320	321.804
0.324	513.490	0.324	420.695	0.324	325.813
0.328	548.941	0.328	455.368	0.328	359.985
0.329	550.879	0.329	457.001	0.329	361.308
0.333	530.280	0.333	434.694	0.333	336.973
0.333	530.280	0.333	434.694	0.333	336.973
0.333	530.280	0.333	434.694	0.333	336.973
0.333	530.280	0.333	434.694	0.333	336.973
0.333	530.280	0.333	434.694	0.333	336.973
0.333	530.280	0.333	434.694	0.333	336.973
0.333	558.768	0.333	463.646	0.333	336.973
0.333	575.382	0.333	480.505	0.333	336.973
0.333	530.280	0.333	434.694	0.333	336.973
0.333	558.768	0.333	463.646	0.333	366.690
0.333	530.280	0.333	434.694	0.333	366.690
0.333	558.768	0.333	463.646	0.333	366.690
0.333	530.280	0.333	434.694	0.333	383.941
0.343	546.624	0.343	448.328	0.343	347.849
0.349	586.708	0.349	487.192	0.349	385.775
0.350	558.904	0.350	458.575	0.350	356.029
0.353	563.965	0.353	462.799	0.353	359.402
0.357	540.564	0.357	437.640	0.357	332.061

0.357	601.711	0.357	499.841	0.357	364.227
0.357	571.201	0.357	468.840	0.357	396.034
0.366	604.516	0.366	499.978	0.366	393.342
0.375	602.020	0.375	494.591	0.375	384.800
0.375	602.020	0.375	494.579	0.375	384.800
0.375	602.020	0.375	494.579	0.375	384.800
0.378	704.462	0.378	597.432	0.378	488.850
0.380	610.230	0.380	501.440	0.380	390.287
0.396	672.279	0.396	559.390	0.396	444.398
0.400	645.341	0.400	530.792	0.400	413.783
0.400	645.341	0.400	530.792	0.400	413.783
0.400	679.491	0.400	565.480	0.400	449.350
0.400	800.984	0.400	688.453	0.400	574.572
0.407	658.215	0.407	541.559	0.407	422.410
0.414	669.326	0.414	550.855	0.414	429.860
0.417	674.329	0.417	555.042	0.417	433.217
0.424	687.533	0.424	566.093	0.424	442.078
0.429	716.497	0.429	594.169	0.429	469.464
0.444	722.823	0.444	595.642	0.444	465.792
0.450	732.548	0.450	603.788	0.450	472.334
0.455	740.511	0.455	610.460	0.455	436.924
0.455	740.511	0.455	610.460	0.455	477.693
0.455	740.511	0.455	610.460	0.455	477.693
0.455	740.511	0.455	610.460	0.455	477.693
0.455	701.576	0.455	570.843	0.455	477.693
0.469	765.430	0.469	631.344	0.469	494.476
0.481	786.557	0.481	649.058	0.481	508.720
0.484	816.174	0.484	678.171	0.484	537.552
0.488	757.176	0.488	616.957	0.488	473.376
0.500	820.437	0.500	677.476	0.500	531.590
0.500	820.437	0.500	677.476	0.500	531.590
0.500	863.073	0.500	720.758	0.500	557.566
0.500	845.396	0.500	702.823	0.500	575.912
0.500	863.073	0.500	720.758	0.500	575.912
0.500	905.559	0.500	763.815	0.500	575.912
0.500	863.073	0.500	720.758	0.500	619.859
0.514	903.593	0.514	757.433	0.514	548.639
0.514	845.664	0.514	698.647	0.514	608.797
0.516	848.922	0.516	701.382	0.516	701.382

0.522	858.845	0.522	709.712	0.522	557.555
0.533	879.374	0.533	726.951	0.533	571.450
0.548	905.291	0.548	748.721	0.548	589.007
0.549	907.964	0.549	750.967	0.549	590.792
0.550	908.940	0.550	751.786	0.550	591.480
0.563	931.155	0.563	770.454	0.563	606.545
0.565	935.989	0.565	774.517	0.565	609.824
0.567	938.567	0.567	776.684	0.567	611.574
0.568	892.661	0.568	729.532	0.568	562.626
0.571	995.735	0.571	833.222	0.571	646.960
0.571	975.548	0.571	812.746	0.571	667.892
0.600	998.000	0.600	826.661	0.600	651.946
0.600	998.000	0.600	826.661	0.600	651.946
0.600	1049.114	0.600	878.525	0.600	651.946
0.600	998.000	0.600	826.661	0.600	651.946
0.600	1049.114	0.600	878.525	0.600	651.946
0.600	998.000	0.600	826.661	0.600	651.946
0.600	998.000	0.600	826.661	0.600	651.946
0.600	998.000	0.600	826.661	0.600	651.946
0.600	1049.114	0.600	878.525	0.600	705.006
0.600	1231.038	0.600	1062.529	0.600	705.006
0.600	998.000	0.600	826.661	0.600	757.637
0.600	998.000	0.600	826.661	0.600	878.525
0.600	1100.054	0.600	930.129	0.600	892.122
0.603	952.560	0.603	779.386	0.603	602.256
0.611	1069.918	0.611	896.188	0.611	719.486
0.615	1077.926	0.615	902.989	0.615	725.062
0.625	1042.725	0.625	864.295	0.625	682.380
0.625	1095.957	0.625	918.303	0.625	737.622
0.625	1127.011	0.625	949.769	0.625	769.727
0.652	1091.477	0.652	905.342	0.652	715.603
0.654	1094.482	0.654	907.873	0.654	717.652
0.658	1101.759	0.658	914.002	0.658	722.615
0.667	1117.535	0.667	927.292	0.667	673.945
0.667	1117.535	0.667	927.292	0.667	733.380
0.667	1117.535	0.667	927.292	0.667	733.380
0.667	1117.535	0.667	927.292	0.667	733.380
0.667	1117.535	0.667	927.292	0.667	733.380
0.667	1207.412	0.667	1018.421	0.667	733.380

0.667	1207.412	0.667	1018.421	0.667	733.380
0.667	1207.412	0.667	1018.421	0.667	826.479
0.667	1117.535	0.667	927.292	0.667	826.479
0.667	1207.412	0.667	1018.421	0.667	826.479
0.667	1060.561	0.667	869.388	0.667	826.479
0.714	1264.218	0.714	1061.343	0.714	792.069
0.714	1203.423	0.714	999.682	0.714	855.098
0.741	1251.307	0.741	1040.071	0.741	824.848
0.741	1538.746	0.741	1330.888	0.741	1120.761
0.745	1258.449	0.745	1046.096	0.745	829.740
0.750	1268.095	0.750	1054.235	0.750	836.349
0.750	1268.095	0.750	1054.235	0.750	836.349
0.750	1331.914	0.750	1118.955	0.750	836.349
0.750	1395.523	0.750	1183.365	0.750	836.349
0.750	1268.095	0.750	1054.235	0.750	902.491
0.750	1268.095	0.750	1054.235	0.750	902.491
0.750	1331.914	0.750	1118.955	0.750	902.491
0.750	1331.914	0.750	1118.955	0.750	968.125
0.758	1281.840	0.758	1065.834	0.758	845.770
0.759	1348.286	0.759	1132.893	0.759	913.963
0.781	1324.853	0.781	1102.142	0.781	875.271
0.800	1358.983	0.800	1130.960	0.800	898.700
0.800	1358.983	0.800	1130.960	0.800	898.700
0.800	1358.983	0.800	1130.960	0.800	898.700
0.800	1427.035	0.800	1199.963	0.800	898.700
0.800	1358.983	0.800	1130.960	0.800	940.008
0.800	1669.316	0.800	1444.897	0.800	969.197
0.800	1669.316	0.800	1444.897	0.800	1218.056
0.800	1398.819	0.800	1171.366	0.800	1444.897
0.833	1419.789	0.833	1182.327	0.833	866.434
0.833	1348.659	0.833	1110.084	0.833	940.488
0.857	1795.725	0.857	1555.342	0.857	1014.661
0.857	1505.989	0.857	1262.389	0.857	1312.390
0.862	1472.339	0.862	1226.741	0.862	976.647
0.882	1509.504	0.882	1258.164	0.882	1002.244
0.900	1541.884	0.900	1285.549	0.900	1024.561
0.909	1533.644	0.909	1274.368	0.909	1010.181
0.917	1572.503	0.917	1311.452	0.917	1045.679
0.930	1597.454	0.930	1332.564	0.930	1062.895

0.941	1617.600	0.941	1349.612	0.941	1076.803
0.947	1789.790	0.947	1522.118	0.947	1250.709
0.952	1719.186	0.952	1449.126	0.952	1174.812
0.960	2024.404	0.960	1755.293	0.960	1483.354
0.962	1818.303	0.962	1546.647	0.962	1271.209
1.000	1726.145	1.000	1441.516	1.000	1063.180
1.000	1726.145	1.000	1441.516	1.000	1063.180
1.000	1726.145	1.000	1441.516	1.000	1151.824
1.000	1640.874	1.000	1354.952	1.000	1151.824
1.000	1726.145	1.000	1441.516	1.000	1151.824
1.000	1811.118	1.000	1527.631	1.000	1151.824
1.000	1726.145	1.000	1441.516	1.000	1151.824
1.000	1726.145	1.000	1441.516	1.000	1151.824
1.000	1640.874	1.000	1354.952	1.000	1151.824
1.000	1726.145	1.000	1441.516	1.000	1239.718
1.000	1811.118	1.000	1527.631	1.000	1239.718
1.000	1726.145	1.000	1441.516	1.000	1239.718
1.000	1811.118	1.000	1527.631	1.000	1441.516
1.042	2206.928	1.042	1915.015	1.042	1326.060
1.042	1920.213	1.042	1625.333	1.042	1620.071
1.071	1858.517	1.071	1553.685	1.071	1243.504
1.071	1858.517	1.071	1553.685	1.071	1243.504
1.071	1858.517	1.071	1553.685	1.071	1243.504
1.071	1858.517	1.071	1553.685	1.071	1243.504
1.083	1880.637	1.083	1572.438	1.083	1258.844
1.091	1894.721	1.091	1584.381	1.091	1268.614
1.111	2362.747	1.111	2051.449	1.111	1736.949
1.167	2035.912	1.167	1704.154	1.167	1366.670
1.176	2442.838	1.176	2112.700	1.176	1778.955
1.200	2098.228	1.200	1757.049	1.200	1410.013
1.231	2155.852	1.231	1805.977	1.231	1450.125
1.250	2191.914	1.250	1836.606	1.250	1475.244
1.250	2298.018	1.250	1944.085	1.250	1475.244
1.250	2191.914	1.250	1836.606	1.250	1584.842
1.286	2322.857	1.286	1958.301	1.286	1588.015
1.333	2348.595	1.333	1969.743	1.333	1584.516
1.333	2461.739	1.333	2084.338	1.333	1584.516
1.333	2527.762	1.333	2151.138	1.333	1652.957
1.333	2527.762	1.333	2151.138	1.333	1652.957

1.333	2414.824	1.333	2036.841	1.333	1701.341
1.333	2414.824	1.333	2036.841	1.333	2151.138
1.333	2348.595	1.333	1969.743	1.333	2151.138
1.429	2649.622	1.429	2245.411	1.429	1835.276
1.429	2720.341	1.429	2316.952	1.429	1908.049
1.455	2701.000	1.455	2289.477	1.455	1871.943
1.500	2663.828	1.500	2237.911	1.500	1672.699
1.500	2663.828	1.500	2237.911	1.500	1804.982
1.500	2663.828	1.500	2237.911	1.500	1804.982
1.500	2663.828	1.500	2237.911	1.500	1804.982
1.500	2663.828	1.500	2237.911	1.500	1804.982
1.500	2536.189	1.500	2108.470	1.500	1804.982
1.500	2791.045	1.500	2366.730	1.500	1804.982
1.500	2663.828	1.500	2237.911	1.500	1804.982
1.500	2791.045	1.500	2366.730	1.500	1936.249
1.500	2663.828	1.500	2237.911	1.500	1936.249
1.500	2791.045	1.500	2366.730	1.500	1936.249
1.600	2854.069	1.600	2399.925	1.600	1938.394
1.600	2989.729	1.600	2537.275	1.600	2078.321
1.667	2839.577	1.667	2364.654	1.667	1880.976
1.667	3263.480	1.667	2793.839	1.667	2318.230
1.722	3087.618	1.722	2598.985	1.722	2102.513
1.739	3120.012	1.739	2626.609	1.739	2125.304
1.739	3267.413	1.739	2775.823	1.739	2277.271
1.800	3236.795	1.800	2726.222	1.800	2207.522
1.818	3361.910	1.818	2847.334	1.818	2325.156
2.000	3622.235	2.000	3055.262	2.000	2479.436
2.000	3622.235	2.000	3055.262	2.000	2479.436
2.000	3622.235	2.000	3055.262	2.000	2479.436
2.000	3791.642	2.000	3226.707	2.000	2479.436
2.000	3791.642	2.000	3226.707	2.000	2479.436
2.000	3791.642	2.000	3226.707	2.000	2479.436
2.000	3928.057	2.000	3364.613	2.000	2479.436
2.000	3622.235	2.000	3055.262	2.000	2653.959
2.000	3622.235	2.000	3055.262	2.000	2653.959
2.000	3622.235	2.000	3055.262	2.000	2653.959
2.000	3622.235	2.000	3055.262	2.000	2653.959
2.000	3791.642	2.000	3226.707	2.000	2794.065
2.143	3899.058	2.143	3291.814	2.143	2675.208

2.200	4010.116	2.200	3386.768	2.200	2753.854
2.400	4400.214	2.400	3720.516	2.400	3030.547
2.500	4931.068	2.500	4226.982	2.500	3169.685
2.500	5086.359	2.500	4383.829	2.500	3297.197
2.500	4719.863	2.500	4013.468	2.500	3514.116
2.500	4596.035	2.500	3888.170	2.500	3673.211
2.586	4765.238	2.586	4033.095	2.586	3290.033
2.600	5012.326	2.600	4278.839	2.600	3535.645
2.778	5611.754	2.778	4830.777	2.778	4040.646
3.000	5582.091	3.000	4733.460	3.000	3872.499
3.000	5582.091	3.000	4733.460	3.000	3872.499
3.000	5582.091	3.000	4733.460	3.000	3872.499
3.000	5582.091	3.000	4733.460	3.000	3872.499
3.000	5582.091	3.000	4733.460	3.000	3872.499
3.000	5582.091	3.000	4733.460	3.000	3872.499
3.000	5983.833	3.000	5139.612	3.000	4285.164
3.000	5582.091	3.000	4733.460	3.000	4733.460
3.333	6691.412	3.333	5753.818	3.333	4805.052
3.333	6691.412	3.333	5753.818	3.333	4805.052
3.750	7079.794	3.750	6020.202	3.750	4945.795
4.000	7583.285	4.000	6453.413	4.000	5307.918
4.000	7583.285	4.000	6453.413	4.000	5307.918
4.000	7583.285	4.000	6453.413	4.000	5307.918
4.000	7921.126	4.000	6794.913	4.000	5307.918
4.000	7583.285	4.000	6453.413	4.000	5307.918
4.000	7583.285	4.000	6453.413	4.000	5307.918
4.000	9125.527	4.000	8009.840	4.000	5307.918
4.000	9125.527	4.000	8009.840	4.000	5654.801
4.000	7583.285	4.000	6453.413	4.000	6884.528
4.000	7583.285	4.000	6453.413	4.000	6884.528
4.500	8818.202	4.500	7550.243	4.500	6266.204
5.000	9615.184	5.000	8204.370	5.000	6774.762
5.000	9862.136	5.000	8453.964	5.000	8453.964
5.500	11104.555	5.500	9558.155	5.500	7796.464
5.500	10912.142	5.500	9363.811	5.500	7993.600
6.000	12177.503	6.000	10491.142	6.000	8785.247
7.500	14793.203	7.500	12680.985	7.500	10542.349
7.500	14793.203	7.500	12680.945	7.500	10542.349
7.500	14793.203	7.500	12680.945	7.500	10542.349

7.500	15425.146	7.500	13319.139	7.500	10542.349
7.500	14793.203	7.500	12680.945	7.500	11189.553
9.000	19151.797	9.000	16630.401	9.000	12855.493
9.000	17951.498	9.000	15418.835	9.000	12855.493
10.000	20074.237	10.000	17261.454	10.000	14415.155
10.000	23918.474	10.000	21137.030	10.000	18334.226
13.333	28352.963	13.333	24617.386	13.333	19697.434
13.333	27231.777	13.333	23485.954	13.333	20843.384
15.000	34103.860	15.000	29919.164	15.000	25698.059
18.000	38303.594	18.000	33260.801	18.000	28166.231
20.000	48208.111	20.000	42647.677	20.000	37045.339

Appendix III

Calculation of hydraulic conductivity using Water Well Logs and Drilling Report data from within Auburn Township

Latitude	Longitude	Elevation (m)	Potentiometric surface	total depth of well (m)	Aquifer thickness (m)	Aquifer type	Discharge (m^3/sec)	Time (sec)	Drawdown (m)	Assumed Storativity	Calculated Transmissivity (m^2/s)	Hydraulic conductivity (m/s)
41.3501	-81.2368	352	347.43	15.24	0.61	Leaky	6.31E-04	3600	3.05	0.001	2.07E-04	3.40E-04
41.3854	-81.2426	368	352.76	35.97	1.52	Leaky	9.46E-04	3600	12.19	0.001	7.11E-05	4.66E-05
41.3574	-81.2633	362	346.76	32.31	1.52	Leaky	6.31E-04	3600	12.19	0.001	4.56E-05	2.99E-05
41.3589	-81.2678	364	351.81	22.56	1.83	Leaky	6.31E-04	3600	6.10	0.001	9.74E-05	5.32E-05
41.3570	-81.2700	361	345.76	26.52	1.83	Leaky	9.46E-04	3600	1.52	0.001	6.80E-04	3.72E-04
41.3898	-81.2338	373	360.81	30.48	4.27	Leaky	5.68E-04	7200	15.24	0.001	3.40E-05	7.96E-06
41.4128	-81.2903	365	360.43	21.95	2.74	Leaky	1.58E-03	86400	1.52	0.001	1.46E-03	5.32E-04

41.4112	-81.2794	359	354.43	17.07	3.05	Leaky	1.01E-03	3600	5.18	0.001	1.94E-04	6.36E-05
41.3867	-81.2406	370	357.81	26.82	3.35	Leaky	9.46E-04	3600	3.05	0.001	3.22E-04	9.59E-05
41.3482	-81.226	351	343.68	13.72	4.27	Leaky	9.46E-04	3600	3.05	0.001	3.22E-04	7.54E-05
41.4145	-81.2895	364	357.90	17.37	3.66	Leaky	9.46E-04	3600	3.05	0.001	3.22E-04	8.79E-05
41.4180	-81.2358	369	361.38	20.73	4.57	Leaky	1.26E-03	3600	1.52	0.001	9.27E-04	2.03E-04
41.4222	-81.2393	367	362.43	24.69	3.96	Leaky	9.46E-04	3600	13.72	0.001	6.25E-05	1.58E-05
41.4157	-81.2484	368	358.86	19.51	4.57	Leaky	9.46E-04	3600	1.77	0.001	5.80E-04	1.27E-04
41.3758	-81.2373	357	349.38	20.73	5.49	Leaky	9.46E-04	3600	1.52	0.001	6.80E-04	1.24E-04
41.3905	-81.2419	365	355.86	28.35	5.79	Leaky	1.26E-03	3600	7.62	0.001	1.63E-04	2.81E-05
41.4235	-81.2238	372	365.60	20.73	6.40	Leaky	7.57E-04	3600	10.67	0.001	6.44E-05	1.01E-05
41.3099	-81.2278	370	367.56	17.37	6.40	Leaky	9.46E-04	3600	4.27	0.001	2.23E-04	3.49E-05
41.3782	-81.2957	349	339.25	36.88	6.71	Leaky	1.58E-03	3600	9.14	0.001	1.70E-04	2.53E-05
41.3839	-81.2465	368	360.68	16.46	6.71	Leaky	1.58E-03	7200	1.52	0.001	1.24E-03	1.85E-04
41.3936	-81.2136	359	352.90	20.73	6.71	Leaky	1.26E-03	3600	4.57	0.001	2.83E-04	4.22E-05
41.3634	-81.2555	356	352.95	25.30	7.01	Leaky	9.46E-04	3600	5.18	0.001	1.81E-04	2.58E-05
41.3884	-81.2459	373	371.78	17.37	7.32	Leaky	7.57E-04	3600	6.10	0.001	1.19E-04	1.62E-05

41.3855	-81.2854	361	348.81	25.30	7.62	Leaky	1.26E-03	3600	1.52	0.001	9.27E-04	1.22E-04
41.4181	-81.2954	369	361.38	16.76	8.23	Leaky	9.46E-04	86400	1.52	0.001	8.48E-04	1.03E-04
41.3995	-81.1991	345	332.81	24.38	8.23	Leaky	9.46E-04	3600	21.34	0.001	3.84E-05	4.67E-06
41.3631	-81.1921	349	343.51	23.47	8.84	Leaky	1.39E-03	5400	3.66	0.001	4.13E-04	4.67E-05
41.4184	-81.2929	364	359.43	17.68	9.45	Leaky	9.46E-04	86400	3.05	0.001	4.06E-04	4.30E-05
41.3936	-81.2234	370	359.33	24.38	9.45	Leaky	1.26E-03	3600	3.05	0.001	4.39E-04	4.65E-05
41.3704	-81.1924	351	337.28	30.78	9.75	Leaky	9.46E-04	3600	7.62	0.001	1.19E-04	1.22E-05
41.3823	-81.2376	368	359.47	22.86	9.75	Leaky	8.83E-04	3600	10.06	0.001	8.14E-05	8.34E-06
41.4160	-81.2248	368	361.90	24.69	10.67	Leaky	7.57E-04	3600	12.19	0.001	5.56E-05	5.22E-06
41.3763	-81.2388	359	348.33	27.43	10.67	Leaky	9.46E-04	3600	12.19	0.001	7.11E-05	6.66E-06
41.4214	-81.1916	343	341.48	19.51	10.67	Leaky	1.89E-03	3600	1.22	0.001	1.82E-03	1.71E-04
41.3800	-81.24	368	356.42	30.78	11.28	Leaky	9.46E-04	7200	5.49	0.001	1.80E-04	1.60E-05
41.3796	-81.2429	370	354.76	35.36	11.58	Leaky	1.89E-03	3600	20.12	0.001	8.77E-05	7.57E-06
41.4103	-81.2804	359	358.54	30.78	11.89	Leaky	9.46E-03	1800	0.91	0.001	1.32E-02	1.11E-03
41.4000	-81.26	380	357.75	39.01	12.50	Leaky	9.46E-04	3600	4.27	0.001	2.23E-04	1.79E-05
41.4206	-81.1906	345	342.26	18.29	12.80	Leaky	1.58E-03	7200	11.58	0.001	1.40E-04	1.09E-05

41.3781	-81.245	375	356.71	36.88	13.11	Leaky	1.58E-03	3600	12.19	0.001	1.24E-04	9.48E-06
41.3590	-81.2289	346	343.87	24.38	13.41	Leaky	2.52E-03	3600	22.25	0.001	1.08E-04	8.02E-06
41.4023	-81.2509	368	357.94	26.82	13.72	Leaky	9.46E-04	3600	17.68	0.001	4.73E-05	3.45E-06
41.3784	-81.2771	359	351.38	25.91	13.72	Leaky	1.26E-03	3600	7.62	0.001	1.63E-04	1.18E-05
41.3894	-81.2649	363	353.55	25.91	13.72	Leaky	1.26E-03	5400	4.88	0.001	2.73E-04	1.99E-05
41.4014	-81.2916	375	362.81	28.04	14.02	Leaky	6.31E-04	3600	6.10	0.001	9.74E-05	6.94E-06
41.4159	-81.2327	369	361.08	23.47	14.33	Leaky	1.14E-03	7200	5.18	0.001	2.34E-04	1.63E-05
41.4153	-81.2347	369	361.38	24.08	14.63	Leaky	1.26E-03	3600	7.62	0.001	1.63E-04	1.11E-05
41.3480	-81.2552	357	347.86	31.70	14.63	Leaky	1.26E-03	1800	6.10	0.001	1.95E-04	1.33E-05
41.3785	-81.2315	367	356.33	30.48	15.85	Leaky	9.46E-04	3600	6.10	0.001	1.51E-04	9.56E-06
41.3783	-81.2374	360	356.95	25.60	15.85	Leaky	9.46E-04	3600	7.01	0.001	1.30E-04	8.21E-06
41.4152	-81.266	356	348.99	23.47	15.85	Leaky	1.26E-03	3600	3.05	0.001	4.39E-04	2.77E-05
41.3988	-81.2754	356	351.43	24.69	15.85	Leaky	2.52E-03	7200	14.02	0.001	1.89E-04	1.19E-05
41.3888	-81.2437	374	358.76	36.58	17.07	Leaky	1.26E-03	7200	9.14	0.001	1.42E-04	8.29E-06
41.3600	-81.2556	356	349.60	29.87	18.29	Leaky	1.58E-03	3600	10.06	0.001	1.53E-04	8.38E-06
41.3980	-81.2507	371	363.38	27.43	18.90	Leaky	1.26E-03	28800	10.67	0.001	1.34E-04	7.08E-06

41.4120	-81.2205	381	365.76	38.10	19.81	Leaky	1.26E-03	3600	9.14	0.001	1.33E-04	6.73E-06
41.3546	-81.2669	357	347.86	36.88	21.03	Leaky	1.26E-03	3600	3.05	0.001	4.39E-04	2.09E-05
41.3661	-81.246	349	344.43	30.48	21.34	Leaky	1.89E-03	3600	6.10	0.001	3.22E-04	1.51E-05
41.3943	-81.231	373	362.33	37.19	21.95	Leaky	1.26E-03	3600	19.81	0.001	5.72E-05	2.61E-06
41.4207	-81.1955	351	347.34	31.09	23.47	Leaky	6.31E-04	7200	6.10	0.001	1.04E-04	4.41E-06
41.4135	-81.3919	369	365.95	30.48	24.38	Leaky	1.26E-03	3600	9.14	0.001	1.33E-04	5.46E-06
41.3942	-81.2219	369	357.72	42.67	24.69	Leaky	1.89E-03	3600	31.39	0.001	5.39E-05	2.18E-06
41.4201	-81.2699	366	358.99	37.19	26.52	Leaky	1.26E-03	3600	8.23	0.001	1.49E-04	5.64E-06
41.3539	-81.2543	365	358.90	36.58	28.04	Leaky	9.46E-04	3600	6.10	0.001	1.51E-04	5.40E-06
41.3929	-81.258	367	356.64	42.67	29.26	Leaky	1.26E-03	3600	32.61	0.001	3.31E-05	1.13E-06
41.4069	-81.2638	359	356.56	76.20	32.00	Leaky	9.46E-03	7200	24.99	0.001	4.21E-04	1.32E-05
41.3585	-81.2626	359	334.01	29.57	4.57	Uncon	8.83E-04	18000	0.61	0.1	1.32E-03	2.88E-04
41.3904	-81.2955	362	351.64	16.46	6.10	Uncon	8.20E-04	3600	6.10	0.1	7.44E-05	1.22E-05
41.4186	-81.2955	369	358.33	17.07	6.40	Uncon	9.46E-04	3600	4.57	0.1	1.23E-04	1.92E-05
41.3856	-81.2569	356	346.86	17.37	8.23	Uncon	6.31E-04	3600	6.10	0.1	5.47E-05	6.64E-06
41.3569	-81.2597	367	346.58	30.48	10.06	Uncon	1.26E-03	4320	1.22	0.1	7.81E-04	7.76E-05

41.3915	-81.2243	375	360.67	36.58	6.40	Uncon	9.46E-04	1800	22.25	0.1	1.60E-05	2.49E-06
41.4078	-81.2158	376	354.66	30.48	7.92	Uncon	6.31E-04	3600	3.05	0.1	1.23E-04	1.55E-05
41.3519	-81.2841	358	345.81	22.86	10.67	Uncon	1.26E-03	3600	3.05	0.1	2.71E-04	2.54E-05
41.3656	-81.1803	360	337.75	45.42	19.20	Uncon	7.57E-04	3600	1.22	0.1	4.30E-04	2.24E-05
41.4494	-81.2567	375	352.44	33.53	5.18	Uncon	7.57E-04	3600	9.14	0.1	4.20E-05	8.11E-06
41.3871	-81.2595	361	351.86	21.34	12.19	Uncon	8.83E-04	3600	6.10	0.1	8.11E-05	6.65E-06
41.3935	-81.2556	366	353.81	24.38	12.19	Uncon	9.46E-04	3600	3.05	0.1	1.95E-04	1.60E-05
41.4015	-81.2537	376	360.76	31.09	13.72	Uncon	1.58E-03	3600	3.05	0.1	3.50E-04	2.55E-05
41.3764	-81.214	354	342.42	21.95	10.36	Uncon	1.14E-03	3600	3.05	0.1	2.41E-04	2.32E-05
41.3866	-81.2563	358	351.90	21.34	15.24	Uncon	8.20E-04	3600	7.62	0.1	5.73E-05	3.76E-06
41.3780	-81.2293	366	351.98	24.99	10.97	Uncon	9.46E-04	3600	0.30	0.1	2.59E-03	2.36E-04
41.3572	-81.2863	352	341.33	24.38	13.72	Uncon	1.26E-03	7200	4.57	0.1	1.88E-04	1.37E-05
41.3900	-81.29	368	355.81	24.38	12.19	Uncon	6.31E-04	1800	6.10	0.1	3.35E-05	2.75E-06
41.3765	-81.2534	365	350.98	28.96	14.94	Uncon	9.46E-04	86400	1.52	0.1	6.04E-04	4.04E-05
41.3919	-81.293	367	351.76	25.91	10.67	Uncon	6.94E-04	3600	10.67	0.1	3.15E-05	2.95E-06
41.3733	-81.2147	355	346.47	25.60	17.07	Uncon	9.46E-04	3600	9.45	0.1	5.26E-05	3.08E-06

41.3748	-81.2162	355	344.03	27.43	16.46	Uncon	9.46E-04	3600	5.79	0.1	9.33E-05	5.67E-06
41.3510	-81.2974	346	339.90	23.16	17.07	Uncon	6.31E-04	3600	4.57	0.1	7.66E-05	4.49E-06
41.3496	-81.2793	366	347.71	36.58	18.29	Uncon	1.58E-03	3600	18.29	0.1	4.41E-05	2.41E-06
41.3873	-81.2877	369	353.15	33.22	17.37	Uncon	9.46E-04	1800	6.10	0.1	7.78E-05	4.48E-06
41.3845	-81.2632	358	347.33	30.48	19.81	Uncon	6.31E-04	7200	1.52	0.1	2.97E-04	1.50E-05
41.3905	-81.2235	378	359.71	33.22	14.94	Uncon	7.57E-04	3600	3.05	0.1	1.51E-04	1.01E-05
41.3574	-81.2876	351	341.86	24.38	15.24	Uncon	9.46E-04	3600	10.67	0.1	4.56E-05	2.99E-06
41.4038	-81.2805	372	359.81	31.09	18.90	Uncon	6.31E-04	3600	7.62	0.1	4.20E-05	2.22E-06
41.3759	-81.2278	361	351.25	31.09	21.34	Uncon	1.26E-03	3600	6.71	0.1	1.10E-04	5.15E-06
41.4043	-81.2353	368	354.59	33.22	19.81	Uncon	9.46E-04	3600	3.66	0.1	1.59E-04	8.01E-06
41.4103	-81.2971	386	358.57	46.63	13.72	Uncon	1.26E-03	7200	6.10	0.1	1.36E-04	9.90E-06
41.3808	-81.2313	379	357.05	48.77	19.81	Uncon	1.26E-03	3600	26.82	0.1	2.13E-05	1.08E-06
41.3862	-81.2917	380	367.81	35.36	23.16	Uncon	1.20E-03	3600	15.24	0.1	3.95E-05	1.71E-06
41.3808	-81.2305	380	354.09	42.67	16.76	Uncon	9.46E-04	3600	4.57	0.1	1.23E-04	7.32E-06
41.3474	-81.256	365	352.20	39.62	26.82	Uncon	1.89E-03	3600	26.82	0.1	3.47E-05	1.29E-06
41.3549	-81.2588	364	347.24	38.10	21.34	Uncon	1.14E-03	2160	3.05	0.1	2.23E-04	1.05E-05

41.4247	-81.2047	350	323.79	30.48	4.27	Uncon	7.57E-04	3600	15.24	0.1	2.28E-05	5.34E-06
41.3660	-81.2407	350	323.79	36.27	10.06	Uncon	1.89E-03	1800	28.65	0.1	2.77E-05	2.75E-06
41.4160	-81.2752	372	356.76	33.53	18.29	Uncon	6.31E-04	7200	6.10	0.1	6.13E-05	3.35E-06
41.4037	-81.2146	367	345.36	47.24	25.60	Uncon	1.26E-03	7200	17.98	0.1	3.91E-05	1.53E-06

Calculation of hydraulic conductivity using Water Well Logs and Drilling Report data from Bainbridge Township

Latitude	Longitude	Elevation (m)	Potentiometric surface	total depth of well (m)	Aquifer thickness (m)	Aquifer type	Discharge (m^3/sec)	Time (sec)	Drawdown (m)	Assumed Storativity	Calculated Transmissivity (m^2/s)	Hydraulic conductivity (m/s)
41.4107	-81.3369	366	355.64	28.96	32.00	Uncon	3.28E-03	21600	14.02	0.1	1.79E-04	6.18E-06
41.4038	-81.3786	303	292.94	6.40	38.40	Leaky	8.20E-04	7200	23.16	0.001	3.21E-05	5.02E-06
41.4129	-81.3912	292	269.75	3.05	31.70	Leaky	7.57E-04	3600	10.36	0.001	6.65E-05	2.18E-05
41.3775	-81.3364	354	349.43	11.89	17.37	Leaky	9.46E-04	3600	13.72	0.001	6.25E-05	5.26E-06
41.3655	-81.3043	354	341.81	8.23	30.48	Leaky	1.58E-03	3600	18.29	0.001	7.98E-05	9.69E-06
41.3775	-81.3302	370	356.89	23.16	24.99	Uncon	9.46E-04	3600	4.57	0.1	1.23E-04	5.29E-06
41.3873	-81.3234	359	344.98	20.12	28.65	Uncon	1.01E-03	3600	2.44	0.1	2.71E-04	1.35E-05

41.3884	-81.3049	355	336.71	24.99	36.58	Uncon	1.89E-03	3600	6.10	0.1	1.95E-04	7.82E-06
41.4033	-81.3576	333	317.15	13.72	17.68	Uncon	6.31E-04	3600	3.66	0.1	9.93E-05	7.24E-06
41.3753	-81.3372	394	384.86	18.59	20.12	Uncon	1.26E-03	3600	4.57	0.1	1.71E-04	9.19E-06
41.3875	-81.3035	353	343.86	13.41	28.96	Leaky	9.46E-04	3600	12.19	0.001	7.11E-05	5.30E-06
41.4195	-81.3257	371	355.76	12.19	33.53	Leaky	8.83E-04	3600	12.19	0.001	6.59E-05	5.41E-06
41.3992	-81.3140	365	352.81	9.75	28.96	Leaky	1.26E-03	7200	7.62	0.001	1.72E-04	1.77E-05
41.3550	-81.3603	299	293.51	6.40	51.21	Leaky	8.20E-04	3600	36.58	0.001	1.81E-05	2.83E-06
41.4122	-81.3891	289	268.27	5.18	42.06	Leaky	1.89E-03	21600	0.61	0.001	4.30E-03	8.30E-04
41.4153	-81.3891	289	268.27	28.96	52.12	Leaky	6.31E-04	3600	3.05	0.001	2.07E-04	7.15E-06
41.3723	-81.3291	371	349.05	36.88	39.01	Uncon	9.46E-04	3600	3.66	0.1	1.59E-04	4.30E-06
41.4039	-81.3697	332	325.60	14.33	14.63	Uncon	7.57E-04	7200	3.05	0.1	1.67E-04	1.17E-05
41.3594	-81.3108	338	333.73	6.10	15.24	Leaky	1.26E-03	3600	1.52	0.001	9.27E-04	1.52E-04
41.3631	-81.3331	335	327.38	3.05	22.86	Leaky	1.26E-03	3600	15.24	0.001	7.63E-05	2.50E-05
41.4236	-81.3423	367	356.64	34.44	36.58	Uncon	1.89E-03	3600	26.21	0.1	3.57E-05	1.04E-06
41.3726	-81.3397	333	323.86	5.49	34.14	Leaky	6.31E-04	3600	4.57	0.001	1.33E-04	2.43E-05
41.4028	-81.3659	348	338.86	22.86	23.16	Uncon	8.83E-04	7200	7.01	0.1	7.69E-05	3.37E-06

41.3495	-81.3363	317	310.90	17.07	27.43	Leaky	2.52E-03	50400	0.61	0.001	6.13E-03	3.59E-04
41.4155	-81.3879	291	272.10	3.96	28.96	Leaky	6.94E-04	3600	36.58	0.001	1.50E-05	3.79E-06
41.3652	-81.3481	350	336.28	25.60	35.66	Uncon	1.26E-03	3600	22.86	0.1	2.59E-05	1.01E-06
41.3651	-81.3483	351	337.59	32.92	37.19	Uncon	1.89E-03	3600	14.02	0.1	7.47E-05	2.27E-06
41.4198	-81.3338	370	358.42	9.45	21.64	Leaky	1.01E-03	3600	3.96	0.001	2.60E-04	2.75E-05
41.4105	-81.3431	354	352.48	22.56	24.38	Leaky	1.51E-03	3600	6.10	0.001	2.52E-04	1.12E-05
41.3797	-81.3336	358	351.90	17.07	24.38	Leaky	1.26E-03	3600	9.14	0.001	1.33E-04	7.81E-06
41.4138	-81.3863	297	274.14	7.01	32.00	Leaky	1.07E-03	3600	9.14	0.001	1.12E-04	1.59E-05
41.3823	-81.3372	358	347.03	10.67	16.15	Uncon	1.26E-03	3600	0.30	0.1	3.56E-03	3.34E-04
41.3832	-81.3637	311	292.71	20.73	35.66	Uncon	1.01E-03	3600	9.14	0.1	5.90E-05	2.85E-06
41.3784	-81.3180	353	339.28	23.16	27.43	Uncon	6.31E-04	3600	6.10	0.1	5.47E-05	2.36E-06
41.3668	-81.3230	347	328.10	11.89	32.92	Leaky	1.58E-03	3600	1.52	0.001	1.18E-03	9.92E-05
41.3964	-81.3581	326	316.86	15.24	30.48	Leaky	1.26E-03	3600	15.24	0.001	7.63E-05	5.01E-06
41.4171	-81.3713	339	325.59	1.22	23.16	Leaky	6.31E-04	3600	9.75	0.001	5.82E-05	4.77E-05
41.4022	-81.3522	324	303.27	28.04	35.05	Uncon	7.57E-04	3600	6.71	0.1	6.06E-05	2.16E-06
41.3597	-81.3493	359	332.18	34.14	35.05	Uncon	1.14E-03	7200	6.10	0.1	1.20E-04	3.53E-06

41.3534	-81.3299	336	326.86	18.29	36.58	Leaky	1.26E-03	3600	21.34	0.001	5.27E-05	2.88E-06
41.4144	-81.3842	300	278.36	4.27	34.44	Leaky	6.94E-04	3600	8.23	0.001	7.78E-05	1.82E-05
41.3669	-81.3097	353	342.64	19.20	28.96	Uncon	9.46E-04	3600	5.49	0.1	9.93E-05	5.17E-06
41.4222	-81.3311	370	357.81	10.36	24.69	Leaky	6.31E-04	3600	3.05	0.001	2.07E-04	2.00E-05
41.4121	-81.3877	295	275.49	7.32	34.44	Leaky	6.31E-04	3600	14.02	0.001	3.91E-05	5.34E-06
41.3976	-81.3255	343	336.90	13.11	18.59	Uncon	5.05E-04	3600	4.88	0.1	5.47E-05	4.17E-06
41.4153	-81.3826	303	287.15	9.75	33.53	Leaky	6.31E-04	3600	17.68	0.001	3.03E-05	3.10E-06
41.3813	-81.3370	357	350.60	3.96	18.59	Leaky	9.46E-04	3600	1.52	0.001	6.80E-04	1.72E-04
41.4031	-81.3439	335	313.05	12.19	39.62	Leaky	9.46E-04	3600	1.52	0.001	6.80E-04	5.58E-05
41.4151	-81.3815	305	283.97	9.14	37.80	Leaky	9.46E-04	3600	16.15	0.001	5.22E-05	5.71E-06
41.3805	-81.3256	373	350.14	9.14	42.67	Leaky	9.46E-04	1800	4.57	0.001	1.95E-04	2.13E-05
41.4245	-81.3264	372	356.76	11.58	31.09	Leaky	6.31E-04	3600	4.57	0.001	1.33E-04	1.15E-05
41.4156	-81.3125	379	369.86	16.76	39.62	Leaky	9.46E-04	7200	21.34	0.001	4.11E-05	2.45E-06
41.4161	-81.3258	375	355.19	15.54	34.14	Uncon	6.31E-04	3600	3.05	0.1	1.23E-04	7.89E-06
41.4181	-81.3737	336	332.34	18.90	22.86	Leaky	6.94E-04	7200	5.49	0.001	1.29E-04	6.82E-06
41.3645	-81.3024	358	336.66	21.64	38.10	Uncon	1.58E-03	3600	4.57	0.1	2.21E-04	1.02E-05

41.3624	-81.3037	357	340.85	14.33	37.19	Leaky	2.21E-03	3600	14.33	0.001	1.50E-04	1.05E-05
41.4224	-81.3823	297	287.86	5.49	36.58	Leaky	6.31E-04	3600	21.34	0.001	2.46E-05	4.48E-06
41.3835	-81.3183	359	346.81	17.68	27.13	Uncon	6.31E-04	3600	6.10	0.1	5.47E-05	3.09E-06
41.4022	-81.3755	310	285.01	13.41	54.25	Leaky	1.26E-03	9000	24.69	0.001	4.90E-05	3.65E-06
41.3813	-81.3278	371	349.66	32.00	36.58	Uncon	6.31E-04	1800	7.62	0.1	3.65E-05	1.14E-06
41.3593	-81.3054	351	340.33	14.33	27.74	Leaky	9.46E-04	3600	3.05	0.001	3.22E-04	2.24E-05
41.4075	-81.3094	376	357.71	25.91	42.67	Uncon	1.89E-03	3600	0.30	0.1	5.56E-03	2.15E-04
41.3568	-81.3359	336	326.25	18.90	27.74	Uncon	9.46E-04	3600	6.10	0.1	8.79E-05	4.65E-06
41.3544	-81.3300	337	321.15	11.58	27.43	Uncon	7.57E-04	3600	6.40	0.1	6.40E-05	5.52E-06
41.4095	-81.3007	384	378.82	19.81	39.32	Leaky	8.83E-04	3600	24.69	0.001	3.03E-05	1.53E-06
41.3551	-81.3456	351	334.24	24.08	29.26	Uncon	6.31E-04	3600	3.05	0.1	1.23E-04	5.09E-06
41.3933	-81.3418	363	358.43	13.41	17.37	Uncon	5.05E-04	3600	13.72	0.1	1.58E-05	1.18E-06
41.4080	-81.3435	355	351.04	20.12	23.47	Uncon	9.46E-04	3600	8.23	0.1	6.19E-05	3.08E-06
41.3531	-81.3274	334	323.33	8.53	24.38	Leaky	9.46E-04	3600	15.24	0.001	5.56E-05	6.52E-06
41.4240	-81.3424	365	360.43	28.96	36.58	Leaky	1.26E-03	3600	18.29	0.001	6.25E-05	2.16E-06
41.4180	-81.3134	377	361.15	30.48	35.05	Uncon	1.26E-03	7200	10.06	0.1	7.65E-05	2.51E-06

41.3965	-81.2983	375	360.06	9.45	17.68	Uncon	6.31E-04	3600	2.74	0.1	1.39E-04	1.47E-05
41.4230	-81.3395	366	356.86	33.53	36.58	Uncon	1.26E-03	1800	18.29	0.1	2.92E-05	8.71E-07
41.3568	-81.3444	356	337.71	9.14	36.58	Leaky	9.46E-04	3600	13.72	0.001	6.25E-05	6.83E-06

Calculation of hydraulic conductivity using Water Well Logs and Drilling Report data from Burton Township

Latitude	Longitude	Elevation (m)	Potentiometric surface	total depth of well (m)	Aquifer thickness (m)	Aquifer type	Discharge (m^3/sec)	Time (sec)	Drawdown (m)	Assumed Storativity	Calculated Transmissivity (m^2/s)	Hydraulic conductivity (m/s)
41.4335	-81.1241	354	341.81	25.91	14.33	Uncon	6.31E-04	3600	10.67	0.1	2.81E-05	1.96E-06
41.4619	-81.1053	348	346.48	24.99	10.06	Leaky	3.15E-03	2880	16.76	0.001	1.83E-04	1.82E-05
41.4614	-81.1053	349	342.60	28.04	18.29	Leaky	1.14E-03	3600	1.83	0.001	6.80E-04	3.72E-05
41.4726	-81.171	365	351.89	30.48	24.38	Uncon	9.46E-04	3600	17.98	0.1	2.44E-05	1.00E-06
41.4564	-81.1817	349	341.38	19.81	3.96	Leaky	1.26E-03	3600	7.62	0.001	1.63E-04	4.10E-05
41.4801	-81.1299	389	358.52	42.67	29.87	Uncon	7.57E-04	3600	9.14	0.1	4.20E-05	1.41E-06
41.4670	-81.1492	387	367.49	25.30	6.10	Uncon	5.05E-04	10800	0.91	0.1	4.30E-04	7.06E-05
41.4893	-81.1425	375	359.76	25.30	17.07	Uncon	7.57E-04	3600	0.61	0.1	9.37E-04	5.49E-05

41.4383	-81.1009	383	359.53	28.96	20.73	Uncon	7.57E-04	3600	2.44	0.1	1.95E-04	9.43E-06
41.4481	-81.1011	368	355.81	36.58	25.60	Uncon	1.89E-03	3600	24.38	0.1	3.89E-05	1.52E-06
41.4581	-81.1358	338	323.37	38.10	19.20	Leaky	6.31E-04	10800	4.57	0.001	1.46E-04	7.62E-06
41.4724	-81.1575	357	350.60	17.07	15.24	Uncon	8.20E-04	54000	3.66	0.1	1.89E-04	1.24E-05
41.4583	-81.1061	357	350.90	33.53	9.14	Leaky	1.26E-03	7200	3.05	0.001	4.64E-04	5.07E-05
41.4906	-81.1528	349	341.68	14.33	2.74	Leaky	1.58E-03	10800	3.05	0.001	6.07E-04	2.21E-04
41.4495	-81.1213	376	356.19	36.27	25.91	Uncon	9.46E-04	7200	4.57	0.1	1.36E-04	5.24E-06
41.4920	-81.1589	350	325.62	38.71	8.23	Leaky	9.46E-04	7200	7.62	0.001	1.26E-04	1.53E-05
41.5003	-81.1262	400	377.75	45.72	31.09	Uncon	2.21E-03	7200	30.48	0.1	4.05E-05	1.30E-06
41.4523	-81.1194	365	355.86	20.73	19.51	Uncon	6.31E-04	7200	4.57	0.1	8.54E-05	4.38E-06
41.4752	-81.1377	374	355.10	26.52	9.45	Uncon	1.01E-03	7200	2.13	0.1	3.45E-04	3.66E-05
41.4348	-81.1179	364	353.03	24.08	20.73	Uncon	8.83E-04	5400	6.40	0.1	8.18E-05	3.95E-06
41.4730	-81.1708	365	351.59	24.38	18.90	Uncon	1.26E-03	7200	7.01	0.1	1.16E-04	6.13E-06
41.4358	-81.1156	367	361.21	19.51	14.33	Uncon	1.01E-03	7200	1.22	0.1	6.46E-04	4.51E-05
41.4469	-81.1055	366	357.16	25.91	20.42	Uncon	9.46E-04	3600	3.96	0.1	1.45E-04	7.08E-06
41.4741	-81.135	380	361.71	35.36	14.02	Leaky	7.57E-04	3600	6.10	0.001	1.19E-04	8.47E-06

41.4368	-81.162	369	367.48	47.24	13.72	Leaky	9.46E-04	3600	18.29	0.001	4.56E-05	3.32E-06
41.4269	-81.1059	374	357.24	43.28	34.75	Uncon	2.84E-03	3600	6.10	0.1	3.10E-04	8.93E-06
41.4322	-81.1095	371	362.47	22.86	12.19	Leaky	1.26E-03	7200	9.75	0.001	1.32E-04	1.08E-05
41.4599	-81.1086	357	351.82	24.38	7.01	Leaky	2.52E-03	3600	13.11	0.001	1.91E-04	2.73E-05

Calculation of hydraulic conductivity using Water Well Logs and Drilling Report data from Chadon Township

Latitude	Longitude	Elevation (m)	Potentiometric surface	total depth of well (m)	Aquifer thickness (m)	Aquifer type	Discharge (m^3/sec)	Time (sec)	Drawdown (m)	Assumed Storativity	Calculated Transmissivity (m^2/s)	Hydraulic conductivity (m/s)
41.6117	-81.2428	353	334.10	49.38	6.10	Leaky	9.46E-04	7200	7.62	0.001	1.26E-04	2.07E-05
41.5917	-81.2426	397	377.49	36.58	15.24	Leaky	1.26E-03	1800	17.07	0.001	6.29E-05	4.13E-06
41.5814	-81.263	395	387.38	24.38	5.18	Leaky	9.46E-04	7200	6.10	0.001	1.61E-04	3.10E-05
41.5848	-81.2764	396	377.10	35.05	11.28	Leaky	7.57E-04	7200	28.96	0.001	2.30E-05	2.04E-06
41.5942	-81.2859	310	305.12	30.48	15.54	Leaky	2.52E-03	7200	17.07	0.001	1.53E-04	9.81E-06
41.5739	-81.2297	404	388.76	31.09	25.60	Uncon	1.26E-03	1800	16.76	0.1	3.25E-05	1.27E-06
41.5794	-81.2564	402	382.19	28.35	14.02	Uncon	1.26E-03	7200	2.44	0.1	3.82E-04	2.72E-05

41.6219	-81.2009	339	314.92	35.97	16.76	Uncon	1.26E-03	43200	26.52	0.1	3.26E-05	1.94E-06
41.6290	-81.2788	344	338.51	38.71	8.23	Leaky	2.52E-03	10800	3.66	0.001	8.27E-04	1.00E-04
41.5784	-81.2482	394	380.59	24.69	14.63	Uncon	9.46E-04	3600	3.05	0.1	1.95E-04	1.34E-05
41.6198	-81.2581	320	311.47	21.34	7.92	Leaky	2.52E-03	3600	7.62	0.001	3.45E-04	4.35E-05
41.6338	-81.2224	346	323.75	36.58	18.90	Uncon	1.89E-03	3600	11.28	0.1	9.62E-05	5.09E-06
41.5924	-81.2868	309	294.37	36.58	28.35	Uncon	5.68E-04	3600	21.95	0.1	1.02E-05	3.60E-07
41.5884	-81.1989	376	357.71	25.91	20.73	Uncon	6.31E-04	1800	7.62	0.1	3.65E-05	1.76E-06
41.6322	-81.215	334	315.71	29.87	6.71	Leaky	6.31E-04	3600	2.44	0.001	2.64E-04	3.94E-05
41.6289	-81.2807	343	329.59	30.48	4.88	Leaky	8.83E-04	10800	17.07	0.001	5.05E-05	1.04E-05
41.6056	-81.2572	356	331.92	54.25	10.36	Leaky	6.31E-04	14400	24.38	0.001	2.43E-05	2.35E-06
41.5697	-81.2704	383	365.32	27.43	12.19	Uncon	6.31E-04	7200	5.18	0.1	7.40E-05	6.07E-06
41.6165	-81.2257	348	329.10	45.11	10.36	Leaky	1.26E-03	10800	9.14	0.001	1.46E-04	1.41E-05
41.6141	-81.2008	346	319.79	36.58	14.94	Uncon	1.26E-03	10800	27.43	0.1	2.55E-05	1.71E-06
41.5321	-81.1632	355	348.90	24.08	16.76	Leaky	1.26E-03	7200	12.19	0.001	1.04E-04	6.18E-06
41.5700	-81.2341	406	387.41	35.36	8.23	Leaky	1.26E-03	7200	4.88	0.001	2.79E-04	3.39E-05
41.5839	-81.2499	400	381.71	32.00	19.20	Uncon	1.14E-03	86400	4.88	0.1	2.07E-04	1.08E-05

41.6000	-81.2362	396	386.86	18.90	10.36	Uncon	7.57E-04	3600	6.10	0.1	6.77E-05	6.53E-06
41.5767	-81.2578	394	378.76	36.27	22.86	Uncon	1.26E-03	7200	7.01	0.1	1.16E-04	5.06E-06

Calculation of hydraulic conductivity using Water Well Logs and Drilling Report data from Chester Township

Latitude	Longitude	Elevation (m)	Water table elevation	total depth of well (m)	Aquifer thickness (m)	Aquifer type	Discharge (m^3/sec)	Time (sec)	Drawdown (m)	Assumed Storativity	Calculated Transmissivity (m^2/s)	Hydrualic conductivity (m/s)
41.5628	-81.3442	330	308.97	27.13	6.71	Uncon	9.46E-04	3600	0.61	0.1	1.20E-03	4.43E-05
41.5032	-81.3611	325	310.06	42.67	14.63	Leaky	3.15E-03	3600	27.74	0.001	1.08E-04	7.38E-06
41.5178	-81.3767	331	306.62	36.58	9.75	Leaky	6.31E-04	10800	4.57	0.001	1.46E-04	1.5E-05
41.5281	-81.3742	331	315.76	28.96	12.19	Leaky	5.05E-04	3600	7.62	0.001	5.97E-05	4.9E-06
41.5115	-81.3793	334	308.70	41.15	9.14	Leaky	9.46E-04	1800	3.05	0.001	3.03E-04	3.31E-05
41.5142	-81.3620	351	312.90	53.34	15.24	Uncon	6.31E-04	7200	3.05	0.1	1.36E-04	8.91E-06
41.5084	-81.3787	335	301.17	49.68	14.94	Leaky	5.05E-04	3600	2.44	0.001	2.07E-04	1.39E-05
41.5127	-81.3790	335	305.74	42.06	12.19	Leaky	1.26E-03	10800	1.83	0.001	8.27E-04	6.78E-05
41.5139	-81.3577	341	315.09	55.47	14.63	Leaky	6.31E-04	7200	3.05	0.001	2.20E-04	1.5E-05

41.5176	-81.3362	365	359.21	17.98	14.63	Uncon	9.46E-04	10800	6.10	0.1	1.03E-04	7.07E-06
41.4990	-81.3885	305	295.86	19.81	12.80	Uncon	1.26E-03	7200	1.22	0.1	8.28E-04	6.46E-05
41.5635	-81.3426	328	312.76	33.83	12.19	Leaky	9.46E-04	3600	4.27	0.001	2.23E-04	1.83E-05
41.5135	-81.3712	342	305.42	48.77	10.06	Leaky	7.57E-04	3600	1.52	0.001	5.35E-04	5.32E-05
41.5367	-81.3650	358	330.57	44.81	10.97	Leaky	6.31E-04	3600	17.37	0.001	3.08E-05	2.81E-06
41.5133	-81.3831	334	309.92	39.62	12.19	Leaky	9.46E-04	18000	1.83	0.001	6.30E-04	5.17E-05
41.5024	-81.3636	325	309.15	40.84	7.32	Leaky	1.26E-03	7200	1.52	0.001	9.76E-04	0.000133
41.5012	-81.3563	328	313.37	36.58	5.49	Leaky	1.58E-03	3600	9.75	0.001	1.58E-04	2.89E-05
41.5148	-81.3755	336	309.79	35.05	5.49	Leaky	6.31E-04	3600	4.27	0.001	1.44E-04	2.62E-05
41.5292	-81.3524	377	367.86	18.90	12.80	Uncon	1.89E-03	86400	3.05	0.1	6.04E-04	4.72E-05
41.5073	-81.3527	333	311.97	41.76	6.40	Leaky	9.46E-04	3600	0.61	0.001	1.82E-03	0.000285
41.5190	-81.3678	337	309.57	43.28	15.85	Uncon	9.46E-04	3600	1.52	0.1	4.30E-04	2.71E-05
41.5654	-81.3337	319	304.98	21.34	6.40	Leaky	2.52E-03	3600	7.01	0.001	3.77E-04	5.9E-05
41.5615	-81.3404	332	315.85	38.10	16.15	Leaky	6.31E-04	3600	15.85	0.001	3.41E-05	2.11E-06
41.5689	-81.3566	325	300.62	43.28	21.64	Uncon	9.46E-04	7200	7.62	0.1	7.57E-05	3.5E-06
41.5538	-81.3451	348	312.95	56.39	18.29	Leaky	1.58E-03	1800	4.57	0.001	3.40E-04	1.86E-05

41.5150	-81.3470	348	317.52	54.86	7.92	Leaky	6.31E-04	7200	19.81	0.001	2.86E-05	3.61E-06
41.5127	-81.3438	345	326.71	48.77	3.35	Leaky	7.57E-04	3600	18.90	0.001	3.44E-05	1.03E-05
41.5355	-81.3787	328	315.50	28.96	5.79	Leaky	8.20E-04	3600	7.01	0.001	1.11E-04	1.92E-05
41.5234	-81.3736	330	312.93	36.27	13.11	Leaky	9.46E-04	14400	6.10	0.001	1.70E-04	1.3E-05
41.5556	-81.3645	334	309.31	42.67	18.29	Uncon	8.83E-04	7200	6.40	0.1	8.54E-05	4.67E-06
41.5395	-81.3905	325	309.15	24.38	9.75	Uncon	6.31E-04	3600	8.53	0.1	3.67E-05	3.76E-06
41.5360	-81.3481	377	364.81	21.34	4.27	Leaky	1.26E-03	7200	4.57	0.001	3.00E-04	7.02E-05
41.5212	-81.3862	325	301.23	34.44	17.68	Uncon	8.20E-04	3600	3.66	0.1	1.35E-04	7.61E-06
41.5400	-81.3208	338	312.40	48.77	13.11	Leaky	8.83E-04	3600	3.66	0.001	2.45E-04	1.87E-05
41.5482	-81.3585	375	361.89	33.53	7.92	Leaky	7.57E-04	3600	15.85	0.001	4.17E-05	5.26E-06
41.5645	-81.3605	327	310.54	28.96	12.19	Leaky	1.14E-03	14400	5.79	0.001	2.19E-04	1.79E-05
41.5142	-81.3181	337	316.27	47.55	9.14	Leaky	1.39E-03	7200	8.84	0.001	1.63E-04	1.78E-05
41.5386	-81.3430	364	350.28	38.10	25.91	Uncon	1.26E-04	7200	18.29	0.1	2.28E-06	8.8E-08
41.5592	-81.3313	327	305.66	33.53	9.75	Leaky	1.14E-03	10800	0.61	0.001	2.39E-03	0.000245
41.5014	-81.3506	332	312.80	52.43	15.85	Leaky	6.31E-04	3600	3.05	0.001	2.07E-04	1.31E-05
41.5336	-81.3640	365	359.51	27.43	24.99	Uncon	2.52E-03	7200	0.91	0.1	2.44E-03	9.78E-05

41.5641	-81.3348	323	310.20	24.38	6.10	Leaky	1.26E-03	3600	6.10	0.001	2.07E-04	3.4E-05
41.5315	-81.3774	328	310.32	32.00	14.63	Uncon	7.57E-04	7200	4.88	0.1	9.77E-05	6.68E-06
41.5430	-81.3814	325	310.98	32.31	11.28	Leaky	9.46E-04	3600	1.22	0.001	8.65E-04	7.67E-05
41.5397	-81.3751	333	316.24	37.19	13.11	Leaky	7.57E-04	3600	6.10	0.001	1.19E-04	9.06E-06
41.5643	-81.3807	323	301.66	34.75	14.94	Uncon	1.26E-03	3600	4.57	0.1	1.71E-04	1.14E-05
41.5252	-81.3413	371	361.86	24.99	12.80	Leaky	1.26E-03	5400	12.19	0.001	1.01E-04	7.89E-06
41.5379	-81.3547	382	363.10	33.22	17.68	Uncon	9.46E-04	5400	10.97	0.1	4.74E-05	2.68E-06
41.5088	-81.3821	326	311.06	32.61	6.40	Leaky	7.57E-04	3600	7.01	0.001	1.02E-04	1.59E-05
41.5220	-81.3837	330	304.09	38.10	14.63	Uncon	6.31E-04	7200	10.97	0.1	3.09E-05	2.11E-06
41.5411	-81.3024	314	307.90	30.48	18.29	Leaky	1.26E-03	7200	3.05	0.001	4.64E-04	2.54E-05

Calculation of hydraulic conductivity using Water Well Logs and Drilling Report data from Claridon Township

Latitude	Longitude	Elevation (m)	Potentiometric surface	total depth of well (m)	Aquifer thickness (m)	Aquifer type	Discharge (m^3/sec)	Time (sec)	Drawdown (m)	Assumed Storativity	Calculated Transmissivity (m^2/s)	Hydraulic conductivity (m/s)
41.5246	-81.1636	368	361.60	18.29	11.28	Leaky	9.46E-04	3600	10.06	0.001	8.77E-05	7.78E-06

41.5620	-81.1798	372	367.73	18.29	9.45	Leaky	5.05E-04	3600	4.57	0.001	1.04E-04	1.11E-05
41.5275	-81.1198	377	371.21	30.48	20.42	Leaky	2.52E-03	7200	7.01	0.001	3.99E-04	1.95E-05
41.5276	-81.1662	349	344.12	24.69	15.54	Leaky	2.52E-03	7200	19.81	0.001	1.30E-04	8.35E-06
41.5654	-81.1796	364	356.99	14.63	8.53	Uncon	1.26E-03	3600	0.91	0.1	1.05E-03	1.23E-04
41.5625	-81.1163	375	368.29	23.16	0.61	Leaky	1.26E-03	86400	7.62	0.001	2.08E-04	3.41E-04
41.5545	-81.1374	374	367.60	21.34	8.84	Leaky	6.94E-04	3600	15.85	0.001	3.79E-05	4.29E-06
41.5436	-81.1475	380	373.60	20.42	17.68	Uncon	6.31E-04	7200	6.71	0.1	5.49E-05	3.11E-06
41.5463	-81.1452	381	378.56	20.12	17.98	Uncon	2.52E-03	7200	10.36	0.1	1.63E-04	9.08E-06
41.5208	-81.1363	415	408.90	23.77	15.24	Leaky	9.46E-04	7200	3.05	0.001	3.40E-04	2.23E-05
41.5230	-81.1251	390	387.26	33.22	14.33	Leaky	1.96E-03	3600	5.49	0.001	3.73E-04	2.61E-05
41.5469	-81.1773	369	360.16	30.78	24.69	Uncon	1.01E-03	3600	12.50	0.1	4.08E-05	1.65E-06
41.5660	-81.0000	361	354.29	24.38	4.57	Leaky	3.15E-03	3600	17.68	0.001	1.76E-04	3.86E-05
41.5318	-81.1272	378	376.78	22.86	14.94	Leaky	1.64E-03	7200	3.05	0.001	6.15E-04	4.12E-05
41.5559	-81.1703	355	353.02	22.86	4.57	Leaky	7.57E-04	5400	8.53	0.001	8.54E-05	1.87E-05
41.5036	-81.1931	402	374.57	41.45	16.15	Uncon	9.46E-04	3600	12.19	0.1	3.89E-05	2.41E-06
41.5521	-81.1246	373	368.73	20.73	11.58	Leaky	1.51E-03	86400	7.62	0.001	2.52E-04	2.18E-05

41.5090	-81.1825	382	359.75	37.49	35.66	Uncon	9.46E-04	3600	1.52	0.1	4.30E-04	1.21E-05
41.5424	-81.1077	354	346.38	16.15	5.18	Leaky	1.14E-03	9000	10.67	0.001	1.09E-04	2.10E-05
41.5226	-81.1529	383	373.86	25.30	1.52	Leaky	1.14E-03	7200	2.74	0.001	4.64E-04	3.04E-04
41.5207	-81.1590	387	369.63	33.22	16.76	Uncon	1.26E-03	5400	5.49	0.1	1.47E-04	8.77E-06
41.5612	-81.1756	378	369.77	27.43	25.30	Uncon	9.46E-04	3600	19.20	0.1	2.26E-05	8.92E-07

Calculation of hydraulic conductivity using Water Well Logs and Drilling Report data from Hambden Township

Latitude	Longitude	Elevation (m)	Water table elevation	total depth of well (m)	Aquifer thickness (m)	Aquifer type	Discharge (m^3/sec)	Time (sec)	Drawdown (m)	Assumed Storativity	Calculated Transmissivity (m^2/s)	Hydraulic conductivity (m/s)
41.6175	-81.1425	393	382.33	22.86	12.19	Uncon	6.31E-04	3600	3.05	0.1	1.23E-04	1.01E-05
41.5758	-81.163	385	382.56	14.33	4.88	Leaky	1.14E-03	5400	0.30	0.001	4.78E-03	9.80E-04
41.5870	-81.1063	377	374.26	22.86	20.42	Uncon	2.21E-03	10800	1.52	0.1	1.25E-03	6.14E-05
41.6079	-81.137	393	380.81	25.60	9.75	Leaky	9.46E-04	3600	0.61	0.001	1.82E-03	1.87E-04
41.6094	-81.1367	391	382.47	24.38	11.58	Leaky	1.58E-03	3600	15.85	0.001	9.33E-05	8.05E-06
41.5810	-81.1987	377	358.71	24.38	12.19	Uncon	6.31E-04	3600	6.10	0.1	5.47E-05	4.48E-06

41.6025	-81.138	386	381.43	19.51	4.27	Leaky	7.57E-04	3600	12.19	0.001	5.56E-05	1.30E-05
41.5935	-81.1531	401	388.81	25.60	3.05	Leaky	7.57E-04	3600	6.10	0.001	1.19E-04	3.90E-05
41.5801	-81.1515	384	377.90	25.91	16.15	Leaky	6.31E-04	3600	9.14	0.001	6.25E-05	3.87E-06
41.6021	-81.1444	394	383.33	24.38	11.58	Leaky	9.46E-04	3600	2.13	0.001	4.73E-04	4.08E-05
41.6282	-81.177	351	327.84	46.94	10.36	Leaky	9.46E-04	3600	4.27	0.001	2.23E-04	2.15E-05
41.5934	-81.1646	391	384.90	23.16	5.49	Leaky	1.89E-03	12600	4.57	0.001	4.84E-04	8.81E-05
41.6407	-81.1507	349	323.70	39.62	5.79	Leaky	1.26E-03	54000	5.18	0.001	3.04E-04	5.24E-05
41.6107	-81.1393	389	383.82	19.51	10.97	Leaky	1.58E-03	86400	7.32	0.001	2.75E-04	2.51E-05
41.6122	-81.168	362	336.09	53.04	5.49	Leaky	9.46E-04	3600	3.05	0.001	3.22E-04	5.86E-05
41.5758	-81.1305	369	364.43	22.86	18.29	Uncon	1.26E-03	10800	8.84	0.1	9.41E-05	5.14E-06
41.6115	-81.1319	387	377.55	20.12	10.06	Leaky	1.26E-03	1800	6.10	0.001	1.95E-04	1.94E-05
41.6377	-81.1486	355	325.43	47.24	12.19	Leaky	1.14E-03	3600	9.14	0.001	1.19E-04	9.74E-06
41.6064	-81.1496	389	381.08	22.86	8.53	Leaky	2.52E-03	7200	0.91	0.001	3.54E-03	4.15E-04

Calculation of hydraulic conductivity using Water Well Logs and Drilling Report data from Huntsburg Township

Latitude	Longitude	Elevation (m)	Potentiometric surface	total depth of well (m)	Aquifer thickness (m)	Aquifer type	Discharge (m^3/sec)	Time (sec)	Drawdown (m)	Assumed Storativity	Calculated Transmissivity (m^2/s)	Hydraulic conductivity (m/s)
41.5058	-81.0596	368	355.20	24.38	15.24	Uncon	1.51E-03	10800	3.05	0.1	3.83E-04	2.51E-05
41.5618	-81.0757	382	376.51	25.60	14.02	Leaky	1.01E-03	3600	9.45	0.001	1.01E-04	7.19E-06
41.5651	-81.0111	335	315.19	41.45	1.22	Leaky	1.26E-03	10800	4.57	0.001	3.09E-04	2.54E-04
41.5672	-81.0727	383	370.81	21.34	7.32	Leaky	1.26E-03	10800	4.57	0.001	3.09E-04	4.23E-05
41.6048	-81.0722	388	380.38	29.87	9.45	Leaky	7.57E-04	7200	6.10	0.001	1.26E-04	1.34E-05
41.5031	-81.0815	364	356.68	18.90	14.33	Uncon	1.26E-03	3600	9.14	0.1	7.66E-05	5.35E-06
41.5332	-81.0197	332	305.18	56.39	12.80	Leaky	3.15E-04	3600	24.99	0.001	9.54E-06	7.45E-07
41.5458	-81.0756	378	370.38	19.81	7.62	Leaky	1.58E-03	5400	1.52	0.001	1.21E-03	1.59E-04
41.5524	-81.0518	369	361.38	24.38	13.72	Leaky	9.46E-04	3600	1.52	0.001	6.80E-04	4.96E-05
41.5330	-81.0589	384	368.46	32.00	18.29	Uncon	1.14E-03	86400	6.71	0.1	1.45E-04	7.96E-06
41.5215	-81.0852	385	375.86	37.19	33.53	Uncon	1.26E-03	3600	6.10	0.1	1.23E-04	3.66E-06
41.5205	-81.0697	361	358.87	19.20	17.37	Uncon	1.26E-03	86400	10.67	0.1	9.79E-05	5.63E-06

41.5347	-81.09	378	364.59	30.78	18.29	Uncon	7.57E-04	3600	8.53	0.1	4.56E-05	2.49E-06
41.5394	-81.0921	360	353.60	20.73	10.97	Leaky	1.51E-03	86400	9.14	0.001	2.08E-04	1.89E-05
41.5159	-81.0856	370	360.86	20.12	14.94	Uncon	7.57E-04	7200	6.10	0.1	7.57E-05	5.07E-06
41.5439	-81.0877	375	367.38	18.59	10.67	Leaky	9.46E-04	3600	4.57	0.001	2.07E-04	1.94E-05
41.5442	-81.0839	379	363.76	29.87	17.37	Uncon	1.26E-03	7200	2.44	0.1	3.82E-04	2.20E-05
41.5371	-81.0648	379	354.31	38.10	21.34	Uncon	1.14E-03	19800	6.10	0.1	1.37E-04	6.44E-06

Calculation of hydraulic conductivity using Water Well Logs and Drilling Report data from Middlefield Township

Latitude	Longitude	Elevation (m)	Potentiometric surface	total depth of well (m)	Aquifer thickness (m)	Aquifer type	Discharge (m^3/sec)	Time (sec)	Drawdown (m)	Assumed Storativity	Calculated Transmissivity (m^2/s)	Hydraulic conductivity (m/s)
41.4255	-81.0032	297	275.66	31.39	8.84	Leaky	1.14E-03	3600	3.05	0.001	3.92E-04	4.43E-05
41.4899	-81.0909	367	360.90	21.03	18.29	Uncon	7.57E-04	5400	5.18	0.1	8.73E-05	4.78E-06
41.4407	-81.0973	380	361.41	32.92	10.36	Leaky	7.57E-04	5400	4.57	0.001	1.68E-04	1.62E-05
41.4523	-81.0831	356	339.24	25.91	7.62	Leaky	6.31E-04	3600	9.14	0.001	6.25E-05	8.20E-06
41.4617	-81.0897	361	353.08	23.16	18.90	Uncon	1.26E-03	86400	9.45	0.1	1.12E-04	5.92E-06

41.5006	-81.0891	383	361.66	41.15	26.82	Uncon	7.57E-04	3600	4.27	0.1	1.03E-04	3.83E-06
41.4529	-81.0825	356	348.38	18.29	3.66	Leaky	1.14E-03	86400	9.14	0.001	1.53E-04	4.17E-05
41.4503	-81.1009	368	362.82	20.73	6.71	Leaky	1.14E-03	5400	1.22	0.001	1.09E-03	1.62E-04
41.4498	-81.0724	360	348.42	21.34	17.07	Uncon	9.46E-04	7200	7.32	0.1	7.93E-05	4.65E-06
41.5003	-81.0919	375	358.85	43.59	35.36	Uncon	1.26E-03	3600	24.38	0.1	2.39E-05	6.77E-07
41.4791	-81.0221	354	341.81	19.20	1.52	Leaky	1.26E-03	3600	1.52	0.001	9.27E-04	6.09E-04
41.4633	-81.0232	365	347.93	40.84	8.84	Leaky	1.26E-03	3600	1.52	0.001	9.27E-04	1.05E-04
41.4110	-81.0510	375	363.11	47.55	15.24	Leaky	1.01E-03	3600	7.32	0.001	1.33E-04	8.74E-06
41.4620	-81.0722	343	336.29	24.38	23.16	Uncon	1.89E-03	3600	11.58	0.1	9.33E-05	4.03E-06
41.4640	-81.0382	355	338.54	39.93	13.11	Leaky	3.79E-04	3600	7.62	0.001	4.36E-05	3.32E-06
41.4531	-81.0799	352	351.39	24.69	12.80	Leaky	1.14E-03	7200	0.91	0.001	1.51E-03	1.18E-04
41.4669	-81.0513	357	352.43	20.42	5.18	Leaky	1.51E-03	7200	4.57	0.001	3.65E-04	7.04E-05
41.4274	-81.0568	355	345.25	23.77	9.45	Leaky	1.26E-03	86400	8.23	0.001	1.91E-04	2.02E-05
41.4486	-81.0808	354	353.39	21.34	10.06	Leaky	1.26E-03	3600	13.41	0.001	8.77E-05	8.72E-06
41.4936	-81.0896	379	366.81	33.53	26.52	Uncon	8.20E-04	3600	3.66	0.1	1.35E-04	5.07E-06
41.4386	-81.0610	355	350.43	24.38	17.98	Leaky	1.26E-03	7200	6.40	0.001	2.08E-04	1.16E-05

41.4277	-81.0957	387	365.36	40.84	30.48	Uncon	1.01E-03	7200	5.18	0.1	1.27E-04	4.16E-06
41.4271	-81.0436	353	349.95	13.72	9.14	Leaky	6.31E-04	7200	9.14	0.001	6.66E-05	7.29E-06
41.4326	-81.0288	300	292.08	24.38	2.44	Leaky	1.26E-03	10800	9.75	0.001	1.36E-04	5.60E-05
41.4575	-81.1078	357	350.90	24.38	15.24	Leaky	1.26E-03	3600	3.05	0.001	4.39E-04	2.88E-05

Calculation of hydraulic conductivity using Water Well Logs and Drilling Report data from Montville Township

Latitude	Longitude	Elevation (m)	Potentiometric surface	total depth of well (m)	Aquifer thickness (m)	Aquifer type	Discharge (m^3/sec)	Time (sec)	Drawdown (m)	Assumed Storativity	Calculated Transmissivity (m^2/s)	Hydraulic conductivity (m/s)
41.6418	-81.0453	354	331.75	29.57	23.16	Uncon	7.57E-04	7200	4.57	0.1	1.05E-04	4.54E-06
41.6420	-81.0060	334	325.16	20.73	12.19	Uncon	1.26E-03	7200	9.14	0.1	8.54E-05	7.00E-06
41.6407	-81.0812	373	372.39	18.29	5.18	Leaky	1.89E-03	7200	9.14	0.001	2.20E-04	4.24E-05
41.5830	-81.0715	381	369.72	30.48	14.63	Leaky	1.26E-03	1800	12.50	0.001	8.87E-05	6.06E-06
41.6259	-81.0748	389	371.02	36.58	19.81	Uncon	1.26E-03	3600	18.59	0.1	3.31E-05	1.67E-06
41.5981	-81.0552	377	373.34	24.69	10.36	Leaky	9.46E-04	3600	3.66	0.001	2.64E-04	2.55E-05
41.6413	-81.0657	391	375.15	28.65	16.15	Uncon	2.21E-03	3600	8.53	0.1	1.59E-04	9.82E-06

41.6242	-81.0750	390	380.55	28.65	12.50	Leaky	1.26E-03	7200	10.67	0.001	1.20E-04	9.58E-06
41.6256	-81.0674	393	375.32	33.53	13.41	Leaky	1.89E-03	10800	3.05	0.001	7.39E-04	5.51E-05
41.5795	-81.0571	394	369.62	38.40	14.02	Uncon	9.46E-04	14400	14.02	0.1	4.16E-05	2.97E-06
41.6166	-81.0569	388	373.37	24.38	16.46	Uncon	9.46E-04	3600	4.57	0.1	1.23E-04	7.45E-06
41.6169	-81.0505	375	365.86	24.38	15.24	Uncon	1.26E-03	3600	15.24	0.1	4.20E-05	2.76E-06
41.6338	-81.0725	389	373.76	25.91	10.97	Uncon	9.46E-04	10800	3.05	0.1	2.26E-04	2.06E-05
41.6387	-81.0116	344	324.19	35.36	19.20	Uncon	1.26E-03	3600	15.54	0.1	4.10E-05	2.14E-06
41.6171	-81.0132	344	322.36	38.10	6.10	Leaky	1.39E-03	3600	7.32	0.001	1.88E-04	3.09E-05
41.6361	-81.0701	386	372.89	22.86	6.71	Leaky	1.26E-03	5400	4.57	0.001	2.93E-04	4.37E-05
41.6090	-81.0559	383	372.33	23.47	5.18	Leaky	1.89E-03	7200	6.10	0.001	3.40E-04	6.56E-05
41.5940	-81.0032	332	326.82	35.97	11.28	Leaky	2.52E-03	7200	30.78	0.001	8.04E-05	7.13E-06

Calculation of hydraulic conductivity using Water Well Logs and Drilling Report data from Munson Township

Latitude	Longitude	Elevation (m)	Potentiometric surface	total depth of well (m)	Aquifer thickness (m)	Aquifer type	Discharge (m^3/sec)	Time (sec)	Drawdown (m)	Assumed Storativity	Calculated Transmissivity (m^2/s)	Hydraulic conductivity (m/s)
41.5406	-81.2633	395	383.11	36.58	31.70	Uncon	1.26E-03	3600	24.69	0.1	2.36E-05	7.44E-07
41.5528	-81.2426	401	377.84	42.67	16.76	Leaky	1.89E-03	3600	19.51	0.001	9.07E-05	5.41E-06
41.5055	-81.2422	410	378.61	54.25	42.98	Uncon	1.58E-03	3600	22.86	0.1	3.38E-05	7.87E-07
41.5234	-81.2156	389	373.76	36.58	31.09	Uncon	1.89E-03	3600	7.62	0.1	1.51E-04	4.87E-06
41.5350	-81.2177	380	372.68	30.48	27.13	Uncon	2.21E-03	9000	13.11	0.1	1.11E-04	4.08E-06
41.5536	-81.2327	375	368.60	19.20	7.62	Leaky	6.94E-04	3600	10.36	0.001	6.05E-05	7.93E-06
41.5152	-81.2376	414	378.95	45.11	25.30	Uncon	9.46E-04	14400	3.05	0.1	2.34E-04	9.26E-06
41.5162	-81.1965	387	366.27	41.45	31.39	Uncon	9.46E-04	3600	2.44	0.1	2.52E-04	8.03E-06
41.5593	-81.2283	401	395.51	25.91	18.29	Leaky	1.26E-03	3600	3.05	0.001	4.39E-04	2.40E-05
41.5118	-81.2059	376	371.12	24.69	11.58	Leaky	1.58E-03	9000	7.32	0.001	2.34E-04	2.02E-05
41.5070	-81.2451	400	374.09	39.62	17.07	Uncon	9.46E-04	3600	7.62	0.1	6.77E-05	3.97E-06
41.5529	-81.2346	377	363.89	28.96	23.77	Uncon	6.31E-04	10800	3.96	0.1	1.06E-04	4.48E-06

41.5458	-81.2462	390	383.90	30.18	21.64	Leaky	1.14E-03	3600	10.67	0.001	1.00E-04	4.64E-06
41.5055	-81.2535	365	355.86	25.91	18.90	Uncon	9.46E-04	3600	6.10	0.1	8.79E-05	4.65E-06
41.5469	-81.2483	382	375.90	23.77	10.06	Leaky	2.21E-03	1800	17.68	0.001	1.12E-04	1.11E-05
41.5344	-81.2622	390	384.51	18.29	17.68	Uncon	9.46E-04	7200	4.57	0.1	1.36E-04	7.68E-06
41.5006	-81.2948	358	353.73	17.68	17.07	Uncon	7.57E-04	3600	7.62	0.1	5.21E-05	3.05E-06
41.4685	-81.2792	374	354.19	29.57	18.59	Uncon	9.46E-04	3600	3.05	0.1	1.95E-04	1.05E-05
41.5113	-81.2320	393	372.88	37.19	24.99	Uncon	9.46E-04	7200	17.68	0.1	2.84E-05	1.14E-06
41.5019	-81.2011	401	370.52	42.67	18.59	Uncon	9.46E-04	3600	7.62	0.1	6.77E-05	3.64E-06
41.5075	-81.2046	393	368.01	35.66	28.96	Uncon	1.07E-03	3600	10.67	0.1	5.28E-05	1.82E-06
41.5005	-81.2279	376	358.63	38.71	10.97	Leaky	1.39E-03	3600	3.05	0.001	4.87E-04	4.44E-05
41.5054	-81.2390	409	372.42	48.77	29.26	Uncon	5.68E-04	3600	6.10	0.1	4.83E-05	1.65E-06
41.5468	-81.2403	378	364.28	32.00	11.89	Leaky	9.46E-04	3600	4.57	0.001	2.07E-04	1.74E-05
41.5547	-81.2486	400	382.32	32.92	10.36	Leaky	1.26E-03	86400	5.49	0.001	2.95E-04	2.84E-05
41.5570	-81.2556	380	379.39	16.76	1.52	Leaky	7.57E-04	86400	0.91	0.001	1.15E-03	7.55E-04
41.5147	-81.2004	377	368.77	30.48	24.69	Uncon	1.77E-03	1800	7.62	0.1	1.25E-04	5.06E-06
41.5608	-81.2273	399	385.28	36.58	32.92	Uncon	1.89E-03	7200	22.86	0.1	4.74E-05	1.44E-06

41.5178	-81.2103	373	365.99	24.38	16.76	Leaky	1.51E-03	86400	8.53	0.001	2.24E-04	1.33E-05
41.5257	-81.2222	367	351.76	27.43	23.47	Uncon	6.31E-04	5400	3.05	0.1	1.30E-04	5.55E-06
41.5033	-81.2965	334	318.76	40.23	16.46	Leaky	1.26E-03	7200	24.99	0.001	4.74E-05	2.88E-06
41.5642	-81.2706	369	359.55	32.00	15.85	Leaky	6.94E-04	3600	6.10	0.001	1.08E-04	6.82E-06
41.5607	-81.2902	325	305.80	42.67	26.82	Uncon	1.89E-03	9000	20.73	0.1	5.49E-05	2.05E-06
41.5572	-81.2411	386	384.78	24.38	16.15	Leaky	1.58E-03	7200	23.16	0.001	6.57E-05	4.07E-06
41.5297	-81.2163	383	376.29	24.38	16.46	Leaky	6.31E-04	7200	6.10	0.001	1.04E-04	6.29E-06
41.5664	-81.2692	389	370.71	25.91	18.90	Uncon	9.46E-04	7200	3.96	0.1	1.60E-04	8.45E-06
41.5040	-81.1894	405	377.57	41.45	16.46	Uncon	1.58E-03	3600	3.05	0.1	3.50E-04	2.13E-05
41.5146	-81.2308	381	363.32	32.31	19.20	Uncon	1.26E-03	86400	6.71	0.1	1.63E-04	8.51E-06
41.5618	-81.2754	378	365.20	30.48	23.77	Uncon	6.31E-04	14400	17.68	0.1	1.99E-05	8.38E-07
41.5102	-81.2034	387	367.19	34.14	20.12	Uncon	1.01E-03	7200	6.40	0.1	9.95E-05	4.95E-06
41.5067	-81.2380	401	374.18	48.77	36.88	Uncon	1.26E-03	3600	21.95	0.1	2.72E-05	7.37E-07
41.5572	-81.2521	388	381.29	29.26	4.57	Leaky	1.26E-03	86400	1.52	0.001	1.15E-03	2.52E-04
41.5096	-81.1976	393	378.37	32.00	14.33	Leaky	7.57E-04	7200	13.41	0.001	5.35E-05	3.74E-06
41.5572	-81.2302	393	376.85	34.14	31.70	Uncon	1.58E-03	7200	3.05	0.1	3.82E-04	1.20E-05

41.5543	-81.2374	387	379.08	21.64	18.29	Uncon	1.01E-03	7200	1.22	0.1	6.46E-04	3.53E-05
41.5570	-81.2297	389	379.86	25.91	25.91	Uncon	5.05E-04	3600	7.62	0.1	3.22E-05	1.24E-06
41.5685	-81.2160	395	381.28	25.91	17.37	Uncon	1.58E-03	3600	4.57	0.1	2.21E-04	1.27E-05
41.5523	-81.2892	304	297.90	27.43	6.40	Leaky	1.58E-03	14400	7.92	0.001	2.22E-04	3.47E-05
41.5370	-81.1924	372	370.48	21.34	19.51	Leaky	1.26E-03	7200	18.59	0.001	6.54E-05	3.35E-06
41.5213	-81.2203	378	363.98	33.53	24.99	Uncon	9.46E-04	3600	19.51	0.1	2.21E-05	8.86E-07
41.5192	-81.2791	341	334.29	15.24	14.63	Uncon	2.21E-03	7200	3.66	0.1	4.54E-04	3.10E-05
41.5356	-81.2691	387	374.81	30.48	19.51	Uncon	1.89E-03	3600	18.29	0.1	5.47E-05	2.80E-06
41.5156	-81.2052	367	365.48	34.44	8.53	Leaky	9.46E-04	3600	6.10	0.001	1.51E-04	1.78E-05
41.5558	-81.2522	389	376.50	36.58	12.80	Leaky	1.89E-03	3600	24.08	0.001	7.21E-05	5.63E-06
41.5578	-81.2780	322	299.14	41.15	9.45	Leaky	6.31E-04	14400	1.83	0.001	4.01E-04	4.25E-05
41.5204	-81.2790	353	345.38	31.09	30.18	Uncon	1.26E-03	7200	7.62	0.1	1.05E-04	3.49E-06
41.5497	-81.2478	391	380.33	22.86	15.54	Uncon	1.26E-03	3600	6.10	0.1	1.23E-04	7.89E-06
41.5536	-81.2350	384	362.05	42.67	24.08	Uncon	9.46E-04	7200	8.23	0.1	6.93E-05	2.88E-06
41.5183	-81.2222	364	355.16	31.09	19.51	Leaky	9.46E-04	7200	13.11	0.001	7.00E-05	3.59E-06
41.5714	-81.2352	407	388.41	27.43	17.07	Uncon	8.83E-04	7200	8.84	0.1	5.89E-05	3.45E-06

41.5137	-81.2019	375	370.73	24.99	18.29	Leaky	9.46E-04	1800	20.73	0.001	3.69E-05	2.02E-06
41.5611	-81.2389	397	385.42	28.96	24.08	Uncon	1.58E-03	9000	17.37	0.1	5.46E-05	2.27E-06
41.5056	-81.2276	374	357.24	41.76	15.24	Leaky	1.26E-03	7200	6.10	0.001	2.20E-04	1.44E-05
41.5240	-81.1987	367	358.16	18.29	14.63	Uncon	1.26E-03	7200	9.45	0.1	8.22E-05	5.62E-06
41.5484	-81.2604	394	376.63	42.67	24.99	Leaky	1.58E-03	3600	25.30	0.001	5.59E-05	2.24E-06
41.5025	-81.2334	384	373.94	23.16	17.68	Uncon	7.57E-04	3600	7.62	0.1	5.21E-05	2.95E-06
41.5575	-81.2342	400	379.88	39.01	16.76	Leaky	6.31E-04	14400	6.10	0.001	1.10E-04	6.55E-06
41.5302	-81.2723	376	369.29	25.60	21.34	Uncon	1.26E-03	14400	24.69	0.1	3.02E-05	1.42E-06
41.5484	-81.2764	371	367.95	35.66	18.29	Leaky	9.46E-04	7200	32.61	0.001	2.58E-05	1.41E-06
41.5279	-81.2197	379	371.68	16.76	15.24	Uncon	6.31E-04	7200	7.92	0.1	4.52E-05	2.97E-06
41.5611	-81.2865	334	308.09	36.58	10.67	Uncon	1.26E-03	7200	3.05	0.1	2.97E-04	2.79E-05
41.5514	-81.2477	389	367.66	49.38	11.89	Leaky	1.58E-03	14400	28.04	0.001	5.67E-05	4.77E-06
41.5653	-81.2320	408	380.57	42.06	34.14	Uncon	5.68E-04	28800	14.63	0.1	2.44E-05	7.16E-07
41.5091	-81.2060	389	372.54	34.44	28.04	Uncon	8.20E-04	10800	24.08	0.1	1.80E-05	6.40E-07

Calculation of hydraulic conductivity using Water Well Logs and Drilling Report data from Newbury Township

Latitude	Longitude	Elevation (m)	Potentiometric surface	total depth of well (m)	Aquifer thickness (m)	Aquifer type	Discharge (m^3/sec)	Time (sec)	Drawdown (m)	Assumed Storativity	Calculated Transmissivity (m^2/s)	Hydraulic conductivity (m/s)
41.428	-81.297	368	354.89	35.36	24.08	Uncon	1.58E-03	3600	11.28	0.1	7.78E-05	3.23E-06
41.497	-81.243	387	368.71	33.53	7.92	Leaky	7.57E-04	10800	15.24	0.001	4.83E-05	6.10E-06
41.491	-81.218	383	360.44	42.67	21.03	Uncon	1.26E-03	3600	20.12	0.1	3.02E-05	1.43E-06
41.430	-81.252	361	353.38	18.90	8.23	Leaky	1.89E-03	3600	4.57	0.001	4.39E-04	5.34E-05
41.437	-81.358	337	317.19	30.48	19.81	Uncon	6.94E-04	3600	6.10	0.1	6.12E-05	3.09E-06
41.494	-81.207	400	378.66	40.23	18.59	Leaky	9.46E-04	3600	6.10	0.001	1.51E-04	8.15E-06
41.454	-81.254	372	359.50	24.38	4.88	Leaky	9.46E-04	7200	6.10	0.001	1.61E-04	3.30E-05
41.465	-81.280	372	359.20	29.26	14.63	Leaky	9.46E-04	7200	9.14	0.001	1.04E-04	7.08E-06
41.467	-81.283	384	365.10	38.40	23.77	Uncon	9.46E-04	7200	10.67	0.1	5.13E-05	2.16E-06
41.483	-81.263	351	340.33	21.34	7.62	Leaky	4.73E-03	7200	3.05	0.001	1.91E-03	2.51E-04
41.462	-81.269	362	358.04	22.86	9.75	Leaky	3.15E-03	14400	5.49	0.001	6.94E-04	7.12E-05
41.470	-81.248	371	363.68	28.35	19.81	Leaky	1.14E-03	7200	21.03	0.001	5.10E-05	2.57E-06

41.504	-81.240	413	384.35	42.98	29.57	Uncon	6.31E-04	9000	14.33	0.1	2.35E-05	7.95E-07
41.489	-81.279	372	367.43	18.29	16.15	Uncon	1.26E-03	14400	6.10	0.1	1.49E-04	9.20E-06
41.438	-81.285	356	346.86	30.48	22.25	Uncon	9.46E-04	3600	21.34	0.1	1.99E-05	8.92E-07
41.436	-81.248	366	360.82	32.00	1.83	Leaky	1.26E-03	5400	4.57	0.001	2.93E-04	1.60E-04
41.471	-81.197	378	364.28	29.26	12.80	Leaky	6.31E-04	3600	10.67	0.001	5.27E-05	4.12E-06
41.469	-81.217	364	350.28	24.38	3.35	Leaky	6.31E-04	7200	7.62	0.001	8.13E-05	2.42E-05
41.430	-81.289	374	347.79	32.00	20.12	Uncon	6.94E-04	3600	5.79	0.1	6.49E-05	3.23E-06
41.420	-81.228	370	364.82	22.86	5.18	Leaky	1.26E-03	10800	18.29	0.001	6.91E-05	1.33E-05
41.447	-81.213	367	350.24	30.18	10.36	Leaky	9.46E-04	5400	1.83	0.001	5.77E-04	5.57E-05
41.434	-81.275	369	359.25	26.21	14.33	Leaky	1.26E-03	3600	0.61	0.001	2.48E-03	1.73E-04
41.469	-81.272	368	357.33	24.38	14.63	Uncon	1.26E-03	3600	7.62	0.1	9.47E-05	6.47E-06
41.466	-81.273	366	353.81	28.96	21.64	Uncon	1.26E-03	43200	3.05	0.1	3.63E-04	1.68E-05
41.448	-81.271	377	357.19	44.20	24.08	Uncon	1.39E-03	3600	15.24	0.1	4.70E-05	1.95E-06
41.467	-81.246	378	364.89	30.48	7.92	Uncon	1.89E-03	3600	17.37	0.1	5.81E-05	7.33E-06
41.491	-81.223	379	365.59	39.93	21.03	Leaky	9.46E-04	3600	1.52	0.001	6.80E-04	3.23E-05
41.454	-81.248	373	362.03	28.04	8.23	Leaky	1.14E-03	3600	6.10	0.001	1.85E-04	2.24E-05

41.443	-81.217	369	351.63	36.88	19.81	Leaky	9.46E-04	3600	19.51	0.001	4.24E-05	2.14E-06
41.442	-81.195	352	336.15	21.95	18.59	Uncon	6.31E-04	3600	5.49	0.1	6.19E-05	3.33E-06
41.479	-81.293	366	354.42	25.30	4.88	Uncon	9.46E-04	3600	5.79	0.1	9.33E-05	1.91E-05
41.500	-81.193	403	371.61	54.86	14.63	Uncon	1.26E-03	5400	23.47	0.1	2.71E-05	1.85E-06
41.493	-81.277	360	354.21	16.15	23.77	Uncon	8.83E-04	7200	6.71	0.1	8.10E-05	3.41E-06
41.457	-81.249	379	366.81	28.04	7.62	Leaky	9.46E-04	3600	7.62	0.001	1.19E-04	1.56E-05
41.429	-81.204	353	346.90	15.24	9.75	Uncon	1.89E-03	1800	1.22	0.1	1.11E-03	1.13E-04
41.479	-81.289	369	356.81	30.78	19.81	Leaky	9.46E-04	3600	21.64	0.001	3.78E-05	1.91E-06
41.437	-81.280	372	355.24	36.58	29.57	Uncon	1.14E-03	3600	19.81	0.1	2.71E-05	9.16E-07
41.421	-81.197	354	349.73	29.87	16.15	Leaky	1.89E-03	7200	25.60	0.001	7.18E-05	4.45E-06
41.430	-81.283	370	357.81	24.99	22.25	Leaky	9.46E-04	3600	3.05	0.001	3.22E-04	1.45E-05
41.503	-81.231	379	369.86	28.65	1.83	Uncon	7.57E-04	3600	6.10	0.1	6.77E-05	3.70E-05
41.465	-81.295	376	370.51	27.74	12.80	Leaky	8.20E-04	3600	3.66	0.001	2.26E-04	1.77E-05
41.493	-81.238	356	349.90	28.04	3.35	Leaky	6.31E-04	86400	0.30	0.001	3.04E-03	9.06E-04
41.497	-81.242	388	374.28	39.32	20.12	Uncon	6.31E-04	3600	18.29	0.1	1.46E-05	7.26E-07
41.465	-81.292	380	367.81	26.21	5.18	Uncon	6.94E-04	3600	1.52	0.1	3.03E-04	5.84E-05
41.427	-81.287	370	360.86	30.18	10.36	Uncon	1.58E-03	7200	21.03	0.1	4.22E-05	4.07E-06

Calculation of hydraulic conductivity using Water Well Logs and Drilling Report data from Parkman Township

Latitude	Longitude	Elevation (m)	Potentiometric surface	total depth of well (m)	Aquifer thickness (m)	Aquifer type	Discharge (m^3/sec)	Time (sec)	Drawdown (m)	Assumed Storativity	Calculated Transmissivity (m^2/s)	Hydraulic conductivity (m/s)
41.3612	-81.0979	349	341.38	33.53	15.24	Leaky	1.58E-03	1800	9.14	0.001	1.60E-04	1.05E-05
41.3543	-81.0051	378	369.16	14.94	3.35	Leaky	7.57E-04	3600	3.35	0.001	2.28E-04	6.79E-05
41.4095	-81.0241	347	308.29	53.64	19.51	Uncon	5.68E-04	7200	8.84	0.1	3.52E-05	1.81E-06
41.3725	-81.0687	342	334.38	42.67	32.00	Leaky	1.89E-03	3600	35.05	0.001	4.77E-05	1.49E-06
41.3720	-81.0667	336	334.48	20.42	19.51	Uncon	6.94E-04	5400	10.06	0.1	3.64E-05	1.87E-06
41.3584	-81.0589	336	331.12	24.99	7.32	Leaky	1.58E-03	1800	13.41	0.001	1.05E-04	1.43E-05
41.3730	-81.0676	345	335.25	35.36	34.14	Uncon	1.26E-03	3600	21.34	0.1	2.81E-05	8.23E-07
41.4113	-81.0592	366	356.86	31.09	16.15	Leaky	7.57E-04	3600	6.10	0.001	1.19E-04	7.35E-06
41.3550	-81.0855	345	337.99	35.66	32.92	Uncon	1.26E-03	7200	3.66	0.1	2.42E-04	7.36E-06
41.3513	-81.0209	283	274.47	28.96	13.11	Leaky	9.46E-04	3600	12.80	0.001	6.74E-05	5.14E-06
41.4107	-81.0497	372	351.27	41.15	22.86	Uncon	1.01E-03	7200	5.49	0.1	1.19E-04	5.19E-06
41.4670	-81.0556	355	342.81	29.26	14.33	Leaky	6.31E-04	3600	9.14	0.001	6.25E-05	4.36E-06

41.3761	-81.0623	357	344.20	31.70	30.18	Uncon	1.26E-03	7200	9.14	0.1	8.54E-05	2.83E-06
41.4129	-81.1065	393	354.90	57.91	29.57	Uncon	1.26E-03	2880	12.19	0.1	5.25E-05	1.78E-06
41.3496	-81.0548	348	337.33	24.38	17.37	Uncon	6.31E-04	3600	7.92	0.1	4.01E-05	2.31E-06
41.4013	-81.0802	374	356.32	31.09	21.64	Uncon	1.26E-03	7200	6.71	0.1	1.22E-04	5.63E-06
41.4099	-81.0330	350	342.08	23.77	15.85	Uncon	9.46E-04	3600	6.10	0.1	8.79E-05	5.54E-06
41.3806	-81.0377	329	316.50	25.91	11.28	Leaky	7.57E-04	3600	8.23	0.001	8.56E-05	7.59E-06
41.4040	-81.0240	344	326.02	30.18	28.35	Uncon	5.05E-04	10800	7.62	0.1	3.90E-05	1.38E-06
41.4156	-81.0843	386	364.05	40.23	19.81	Uncon	1.01E-03	5400	3.05	0.1	2.23E-04	1.12E-05
41.4140	-81.0240	331	328.56	15.24	14.02	Uncon	1.26E-03	3600	6.10	0.1	1.23E-04	8.75E-06
41.3497	-81.0045	284	268.76	22.56	7.62	Uncon	6.31E-04	3600	6.40	0.1	5.16E-05	6.77E-06
41.3499	-81.0597	340	325.06	21.95	8.23	Uncon	6.94E-04	3600	7.01	0.1	5.19E-05	6.30E-06
41.4238	-81.0990	388	364.84	44.20	29.87	Uncon	8.83E-04	7200	7.32	0.1	7.33E-05	2.45E-06
41.3553	-81.0633	340	335.43	34.75	11.58	Leaky	1.26E-03	5400	3.35	0.001	4.09E-04	3.53E-05
41.3757	-81.0815	348	331.24	32.92	14.63	Leaky	1.26E-03	10800	9.14	0.001	1.46E-04	1.00E-05

Calculation of hydraulic conductivity using Water Well Logs and Drilling Report data from Russell Township

Latitude	Longitude	Elevation (m)	Potentiometric surface	total depth of well (m)	Aquifer thickness (m)	Aquifer type	Discharge (m^3/sec)	Time (sec)	Drawdown (m)	Assumed Storativity	Calculated Transmissivity (m^2/s)	Hydraulic conductivity (m/s)
41.4296	-81.3340	368	352.76	32.00	22.56	Uncon	6.31E-04	3600	4.57	0.1	7.66E-05	3.40E-06
41.4306	-81.2993	368	348.19	39.62	32.00	Uncon	1.26E-03	3600	3.05	0.1	2.71E-04	8.48E-06
41.4317	-81.3653	342	329.81	19.81	12.19	Uncon	7.57E-04	3600	4.57	0.1	9.47E-05	7.77E-06
41.4381	-81.3331	359	354.43	22.86	18.59	Uncon	1.26E-03	3600	13.72	0.1	4.76E-05	2.56E-06
41.4978	-81.3566	327	311.76	39.62	6.71	Leaky	1.26E-03	3600	3.05	0.001	4.39E-04	6.55E-05
41.4511	-81.3821	315	301.28	35.05	16.76	Leaky	1.58E-03	3600	3.05	0.001	5.59E-04	3.33E-05
41.4932	-81.3609	322	310.72	42.67	17.98	Leaky	1.58E-03	3600	31.39	0.001	4.41E-05	2.45E-06
41.4470	-81.3973	274	265.16	28.96	20.12	Uncon	1.32E-03	3600	5.49	0.1	1.47E-04	7.28E-06
41.4514	-81.3421	347	341.82	18.29	10.06	Leaky	1.26E-03	1800	9.14	0.001	1.25E-04	1.24E-05
41.5163	-81.3594	340	311.04	39.62	7.32	Leaky	6.31E-04	3600	10.67	0.001	5.27E-05	7.21E-06
41.4848	-81.3397	328	318.86	25.60	22.25	Uncon	9.46E-04	3600	7.32	0.1	7.10E-05	3.19E-06
41.4498	-81.3487	339	334.73	15.85	7.92	Leaky	6.31E-04	7200	9.14	0.001	6.66E-05	8.41E-06

41.4677	-81.3263	356	349.90	22.86	10.97	Leaky	9.46E-04	5400	9.45	0.001	9.75E-05	8.88E-06
41.4662	-81.3448	318	296.97	46.33	7.32	Leaky	8.20E-04	3600	17.98	0.001	3.96E-05	5.42E-06
41.4751	-81.3292	354	347.90	23.16	18.90	Uncon	1.26E-03	3600	9.14	0.1	7.66E-05	4.05E-06
41.4258	-81.3651	352	338.28	19.81	14.33	Uncon	9.46E-04	7200	0.61	0.1	1.30E-03	9.05E-05
41.4712	-81.3594	325	300.62	49.68	8.23	Leaky	1.39E-03	7200	1.22	0.001	1.37E-03	1.67E-04
41.4297	-81.3293	375	359.76	38.10	32.61	Uncon	1.26E-03	3600	13.72	0.1	4.76E-05	1.46E-06
41.4264	-81.3325	375	355.19	31.39	21.03	Uncon	9.46E-04	3600	4.57	0.1	1.23E-04	5.83E-06
41.4364	-81.3526	344	339.43	17.07	7.62	Leaky	9.46E-04	5400	12.50	0.001	7.18E-05	9.43E-06
41.4288	-81.3688	338	335.87	12.19	10.36	Uncon	2.21E-03	3600	3.05	0.1	5.12E-04	4.94E-05
41.4339	-81.3420	359	353.82	23.77	19.51	Uncon	1.14E-03	7200	18.59	0.1	3.32E-05	1.70E-06
41.4536	-81.3898	279	263.76	39.01	30.18	Uncon	1.14E-03	3600	18.29	0.1	2.98E-05	9.88E-07
41.4877	-81.3720	308	299.47	26.21	10.97	Leaky	9.46E-04	3600	0.61	0.001	1.82E-03	1.66E-04
41.4296	-81.3282	374	358.76	33.53	26.21	Uncon	1.26E-03	3600	12.19	0.1	5.47E-05	2.09E-06
41.4409	-81.3073	369	351.93	36.58	28.04	Uncon	1.26E-03	3600	19.51	0.1	3.13E-05	1.12E-06
41.4438	-81.3132	361	353.08	26.21	21.64	Uncon	1.58E-03	1800	18.29	0.1	3.84E-05	1.77E-06
41.4660	-81.3440	320	305.37	38.10	3.35	Leaky	7.57E-04	3600	8.84	0.001	7.92E-05	2.36E-05

41.4336	-81.3483	354	346.99	17.68	16.46	Uncon	1.89E-03	7200	10.67	0.1	1.14E-04	6.92E-06
41.4565	-81.3778	314	295.71	39.62	17.68	Leaky	6.31E-04	3600	9.14	0.001	6.25E-05	3.53E-06
41.4336	-81.3251	368	360.38	24.99	18.59	Uncon	9.46E-04	5400	10.67	0.1	4.89E-05	2.63E-06
41.4349	-81.3243	365	354.64	22.86	20.73	Uncon	6.31E-04	9000	1.83	0.1	2.49E-04	1.20E-05
41.3976	-81.3255	342	329.81	31.09	19.20	Uncon	9.46E-04	7200	3.05	0.1	2.15E-04	1.12E-05
41.4383	-81.3497	350	346.65	13.72	11.58	Uncon	1.58E-03	7200	10.36	0.1	9.56E-05	8.25E-06
41.4351	-81.3081	365	355.86	22.86	18.29	Uncon	1.26E-03	3600	10.67	0.1	6.40E-05	3.50E-06
41.4277	-81.3421	356	350.82	19.20	14.63	Uncon	1.01E-03	7200	4.88	0.1	1.36E-04	9.28E-06
41.4340	-81.3697	333	326.90	15.24	13.72	Uncon	1.26E-03	3600	6.10	0.1	1.23E-04	8.94E-06
41.4645	-81.3235	355	330.92	33.53	26.52	Uncon	1.26E-03	7200	12.50	0.1	5.96E-05	2.25E-06
41.4272	-81.3445	351	343.99	19.51	16.15	Uncon	7.57E-04	7200	2.74	0.1	1.88E-04	1.16E-05
41.4250	-81.3299	377	355.66	39.62	27.74	Uncon	1.26E-03	7200	3.05	0.1	2.97E-04	1.07E-05
41.4393	-81.3490	353	347.51	18.29	9.14	Leaky	1.26E-03	7200	18.29	0.001	6.66E-05	7.29E-06
41.4743	-81.3034	362	351.64	24.38	15.85	Uncon	2.52E-03	7200	11.89	0.1	1.40E-04	8.81E-06
41.4677	-81.3464	319	303.76	48.16	16.76	Leaky	1.26E-03	3600	18.29	0.001	6.25E-05	3.73E-06
41.4255	-81.3465	345	342.26	15.54	11.89	Leaky	1.01E-03	7200	2.44	0.001	4.64E-04	3.90E-05

41.4690	-81.3364	313	297.15	31.39	17.68	Uncon	6.31E-04	3600	4.57	0.1	7.66E-05	4.33E-06
41.4687	-81.3019	371	353.32	27.43	20.12	Uncon	1.77E-03	7200	1.22	0.1	1.20E-03	5.97E-05
41.4267	-81.3084	355	347.99	24.99	13.41	Leaky	1.14E-03	3600	0.61	0.001	2.22E-03	1.65E-04
41.4679	-81.3596	328	299.35	48.77	6.71	Leaky	1.89E-03	3600	20.12	0.001	8.77E-05	1.31E-05
41.4298	-81.3467	349	344.43	20.73	15.54	Leaky	9.46E-04	14400	7.62	0.001	1.34E-04	8.60E-06
41.4288	-81.3256	375	357.93	37.19	12.19	Leaky	1.01E-03	7200	3.35	0.001	3.29E-04	2.70E-05
41.4988	-81.3578	323	309.28	36.58	7.62	Leaky	3.15E-03	7200	10.67	0.001	3.23E-04	4.23E-05
41.4663	-81.3718	307	291.15	42.06	17.37	Leaky	1.26E-03	7200	26.21	0.001	4.50E-05	2.59E-06
41.4330	-81.3756	325	282.33	56.39	10.67	Leaky	9.46E-04	7200	3.05	0.001	3.40E-04	3.19E-05
41.4260	-81.3291	377	357.19	40.23	32.00	Uncon	1.58E-03	3600	20.42	0.1	3.87E-05	1.21E-06
41.4666	-81.3151	359	347.72	32.00	21.03	Uncon	1.39E-03	7200	10.36	0.1	8.25E-05	3.92E-06
41.4340	-81.3501	344	337.90	25.91	19.51	Leaky	1.14E-03	3600	12.19	0.001	8.68E-05	4.45E-06
41.4282	-81.3351	370	355.37	30.78	25.91	Uncon	9.46E-04	7200	9.45	0.1	5.90E-05	2.28E-06
41.4296	-81.3666	340	335.43	15.24	9.45	Leaky	1.26E-03	3600	1.52	0.001	9.27E-04	9.81E-05

Calculation of hydraulic conductivity using Water Well Logs and Drilling Report data from Thompson Township

Latitude	Longitude	Elevation (m)	Potentiometric surface	total depth of well (m)	Aquifer thickness (m)	Aquifer type	Discharge (m^3/sec)	Time (sec)	Drawdown (m)	Assumed Storativity	Calculated Transmissivity (m^2/s)	Hydraulic conductivity (m/s)
41.6412	-81.0130	338	324.89	21.64	2.44	Leaky	9.46E-04	7200	6.10	0.001	1.61E-04	6.59E-05
41.6859	-81.0970	326	325.70	16.15	8.53	Leaky	1.26E-03	5400	10.67	0.001	1.17E-04	1.37E-05
41.6950	-81.0397	342	337.12	18.29	17.37	Uncno	1.58E-03	86400	7.62	0.1	1.81E-04	1.04E-05
41.6654	-81.0145	334	326.38	23.77	20.42	Uncno	1.58E-03	10800	14.33	0.1	6.99E-05	3.43E-06
41.6459	-81.0108	342	325.24	42.37	23.77	Leaky	1.77E-03	28800	22.56	0.001	8.59E-05	3.61E-06
41.6912	-81.0035	311	308.56	16.46	3.66	Leaky	5.05E-04	7200	9.14	0.001	5.22E-05	1.43E-05
41.6909	-81.0915	329	323.51	19.20	10.97	Leaky	1.89E-03	10800	6.40	0.001	3.33E-04	3.03E-05
41.6682	-81.0899	344	328.15	29.57	5.79	Leaky	1.14E-03	86400	13.72	0.001	9.89E-05	1.71E-05

Calculation of hydraulic conductivity using Water Well Logs and Drilling Report data from Troy Township

Latitude	Longitude	Elevation (m)	Potentiometric surface	total depth of well (m)	Aquifer thickness (m)	Aquifer type	Discharge (m^3/sec)	Time (sec)	Drawdown (m)	Assumed Storativity	Calculated Transmissivity (m^2/s)	Hydraulic conductivity (m/s)
41.4298	-81.1853	338	333.43	12.80	6.71	Leaky	6.31E-04	1800	6.71	0.001	8.20E-05	1.22E-05
41.3592	-81.1453	354	335.71	36.88	24.38	Uncon	1.26E-03	7200	18.59	0.1	3.76E-05	1.54E-06
41.3787	-81.1388	369	351.02	41.45	31.70	Uncon	1.26E-03	7200	23.47	0.1	2.86E-05	9.02E-07
41.3693	-81.1744	355	339.76	29.87	19.20	Uncon	9.46E-04	3600	6.10	0.1	8.79E-05	4.58E-06
41.3595	-81.1783	351	344.60	23.77	19.20	Uncon	7.57E-04	7200	12.19	0.1	3.39E-05	1.76E-06
41.3633	-81.1295	344	340.95	18.29	11.28	Leaky	2.52E-03	3600	0.91	0.001	3.38E-03	2.99E-04
41.4335	-81.1321	352	345.29	24.38	11.89	Leaky	1.58E-03	3600	11.58	0.001	1.31E-04	1.10E-05
41.4257	-81.1286	371	357.89	31.09	26.52	Uncon	1.26E-03	3600	12.80	0.1	5.16E-05	1.95E-06
41.3875	-81.1645	347	340.60	23.47	16.46	Leaky	1.14E-03	5400	4.27	0.001	2.81E-04	1.71E-05
41.4190	-81.1061	377	364.20	30.48	20.12	Uncon	1.26E-03	3600	9.14	0.1	7.66E-05	3.81E-06
41.3879	-81.1253	370	354.76	32.00	8.53	Leaky	1.14E-03	5400	6.40	0.001	1.81E-04	2.13E-05
41.4105	-81.1365	355	350.43	20.73	13.11	Leaky	1.26E-03	3600	1.52	0.001	9.27E-04	7.08E-05

41.3816	-81.1739	363	356.29	25.91	18.29	Leaky	1.26E-03	3600	4.57	0.001	2.83E-04	1.55E-05
41.4269	-81.1043	377	361.15	27.43	22.86	Uncon	1.89E-03	10800	7.62	0.1	1.76E-04	7.70E-06
41.4249	-81.1859	340	330.86	22.86	8.23	Leaky	1.07E-03	3600	7.92	0.001	1.30E-04	1.59E-05
41.4228	-81.1041	377	349.57	35.05	26.82	Uncon	9.46E-04	3600	3.05	0.1	1.95E-04	7.29E-06
41.3483	-81.1624	340	334.82	23.16	13.72	Leaky	1.14E-03	3600	9.75	0.001	1.11E-04	8.07E-06
41.3506	-81.1510	362	333.35	49.99	31.09	Uncon	8.83E-04	7200	6.10	0.1	9.03E-05	2.91E-06
41.3629	-81.1754	349	344.12	16.15	9.45	Leaky	1.39E-03	5400	1.22	0.001	1.35E-03	1.42E-04

Uncon = Unconfined Aquifer

Appendix – IV

Data for Probability and Gaussian Distribution Curves obtained for 617 wells.

item	Longitude	Latitude	Hydrualic conductivity (m/s)	log K (Xi)	Gaussian Distribution f(x)*	Probability graph F(x)*	Portion below Xi (percentile)
1	-81.2804	41.4103	1.11E-03	-2.9542	0.0034	0.9994	0.0008
2	-81.1630	41.5758	9.80E-04	-3.0087	0.0045	0.9992	0.0024
3	-81.2381	41.4929	9.06E-04	-3.0429	0.0053	0.9990	0.0041
4	-81.3891	41.4122	8.30E-04	-3.081	0.0064	0.9988	0.0057
5	-81.2556	41.5570	7.55E-04	-3.1219	0.0078	0.9985	0.0073
6	-81.0221	41.4791	6.09E-04	-3.2157	0.0120	0.9976	0.0089
7	-81.2903	41.4128	5.32E-04	-3.2744	0.0156	0.9968	0.0105
8	-81.1496	41.6064	4.15E-04	-3.3825	0.0246	0.9946	0.0122
9	-81.2700	41.3570	3.72E-04	-3.4295	0.0297	0.9934	0.0138
10	-81.3363	41.3495	3.59E-04	-3.4448	0.0315	0.9929	0.0154
11	-81.1163	41.5625	3.41E-04	-3.4677	0.0344	0.9921	0.0170
12	-81.2368	41.3501	3.40E-04	-3.4688	0.0345	0.9921	0.0186
13	-81.3372	41.3823	3.34E-04	-3.4763	0.0356	0.9918	0.0203
14	-81.1529	41.5226	3.04E-04	-3.5168	0.0414	0.9903	0.0219
15	-81.1295	41.3633	2.99E-04	-3.5239	0.0425	0.9900	0.0235
16	-81.2626	41.3585	2.88E-04	-3.5402	0.0452	0.9893	0.0251
17	-81.3527	41.5073	2.85E-04	-3.5456	0.0461	0.9890	0.0267
18	-81.0111	41.5651	2.54E-04	-3.5959	0.0552	0.9865	0.0284
19	-81.2521	41.5572	2.52E-04	-3.599	0.0558	0.9863	0.0300
20	-81.2631	41.4828	2.51E-04	-3.600	0.0560	0.9862	0.0316
21	-81.3313	41.5592	2.45E-04	-3.6108	0.0581	0.9856	0.0332
22	-81.2293	41.3780	2.36E-04	-3.6264	0.0614	0.9847	0.0348
23	-81.1528	41.4906	2.21E-04	-3.6548	0.0676	0.9829	0.0365
24	-81.3094	41.4075	2.15E-04	-3.668	0.0707	0.9820	0.0381
25	-81.2358	41.4180	2.03E-04	-3.6928	0.0767	0.9801	0.0397

26	-81.1370	41.6079	1.87E-04	-3.7285	0.0861	0.9772	0.0413
27	-81.2465	41.3839	1.85E-04	-3.7329	0.0873	0.9768	0.0429
28	-81.2754	41.4337	1.73E-04	-3.7616	0.0955	0.9742	0.0446
29	-81.3370	41.3813	1.72E-04	-3.7653	0.0966	0.9739	0.0462
30	-81.1916	41.4214	1.71E-04	-3.7675	0.0973	0.9737	0.0478
31	-81.3594	41.4712	1.67E-04	-3.7775	0.1003	0.9727	0.0494
32	-81.3720	41.4877	1.66E-04	-3.7797	0.1010	0.9724	0.0511
33	-81.3084	41.4267	1.65E-04	-3.7819	0.1017	0.9722	0.0527
34	-81.1009	41.4503	1.62E-04	-3.791	0.1045	0.9713	0.0543
35	-81.2482	41.4359	1.60E-04	-3.7957	0.1061	0.9708	0.0559
36	-81.0756	41.5458	1.59E-04	-3.7974	0.1066	0.9706	0.0575
37	-81.3108	41.3594	1.52E-04	-3.8178	0.1133	0.9684	0.0592
38	-81.1754	41.3629	1.42E-04	-3.8465	0.1232	0.9650	0.0608
39	-81.3636	41.5024	1.33E-04	-3.8746	0.1334	0.9614	0.0624
40	-81.2484	41.4157	1.27E-04	-3.897	0.1421	0.9583	0.0640
41	-81.2373	41.3758	1.24E-04	-3.9066	0.1459	0.9569	0.0656
42	-81.1796	41.5654	1.23E-04	-3.9084	0.1466	0.9566	0.0673
43	-81.2854	41.3855	1.22E-04	-3.9147	0.1491	0.9557	0.0689
44	-81.0799	41.4531	1.18E-04	-3.929	0.1549	0.9535	0.0705
45	-81.2041	41.4288	1.13E-04	-3.9454	0.1619	0.9509	0.0721
46	-81.0232	41.4633	1.05E-04	-3.9792	0.1767	0.9452	0.0737
47	-81.2954	41.4181	1.03E-04	-3.9869	0.1802	0.9438	0.0754
48	-81.2788	41.6290	1.00E-04	-3.9979	0.1853	0.9418	0.0770
49	-81.3230	41.3668	9.92E-05	-4.0036	0.1879	0.9408	0.0786
50	-81.3666	41.4296	9.81E-05	-4.0081	0.1900	0.9399	0.0802
51	-81.3640	41.5336	9.78E-05	-4.0096	0.1907	0.9396	0.0818
52	-81.2406	41.3867	9.59E-05	-4.0181	0.1947	0.9380	0.0835
53	-81.3651	41.4258	9.05E-05	-4.0432	0.2069	0.9330	0.0851
54	-81.1646	41.5934	8.81E-05	-4.0549	0.2127	0.9305	0.0867
55	-81.2895	41.4145	8.79E-05	-4.0559	0.2132	0.9303	0.0883
56	-81.2597	41.3569	7.76E-05	-4.11	0.2413	0.9180	0.0900
57	-81.3814	41.5430	7.67E-05	-4.1151	0.2441	0.9168	0.0916
58	-81.2260	41.3482	7.54E-05	-4.1228	0.2482	0.9149	0.0932
59	-81.2687	41.4616	7.12E-05	-4.1477	0.2619	0.9085	0.0948
60	-81.1365	41.4105	7.08E-05	-4.1502	0.2633	0.9079	0.0964
61	-81.1492	41.4670	7.06E-05	-4.1511	0.2638	0.9076	0.0981
62	-81.0513	41.4669	7.04E-05	-4.1526	0.2646	0.9072	0.0997

63	-81.3481	41.5360	7.02E-05	-4.1537	0.2652	0.9069	0.1013
64	-81.0051	41.3543	6.79E-05	-4.1681	0.2733	0.9031	0.1029
65	-81.3790	41.5127	6.78E-05	-4.1686	0.2736	0.9029	0.1045
66	-81.0130	41.6412	6.59E-05	-4.1808	0.2806	0.8995	0.1062
67	-81.0559	41.6090	6.56E-05	-4.1828	0.2817	0.8990	0.1078
68	-81.3566	41.4978	6.55E-05	-4.1839	0.2823	0.8987	0.1094
69	-81.3885	41.4990	6.46E-05	-4.1894	0.2855	0.8971	0.1110
70	-81.2794	41.4112	6.36E-05	-4.1963	0.2895	0.8951	0.1126
71	-81.1063	41.5870	6.14E-05	-4.212	0.2986	0.8905	0.1143
72	-81.3019	41.4687	5.97E-05	-4.2238	0.3055	0.8870	0.1159
73	-81.3337	41.5654	5.90E-05	-4.2294	0.3088	0.8852	0.1175
74	-81.1680	41.6122	5.86E-05	-4.232	0.3103	0.8844	0.1191
75	-81.2918	41.4647	5.84E-05	-4.2337	0.3113	0.8839	0.1207
76	-81.0288	41.4326	5.60E-05	-4.252	0.3223	0.8781	0.1224
77	-81.3439	41.4031	5.58E-05	-4.2534	0.3231	0.8776	0.1240
78	-81.2133	41.4465	5.57E-05	-4.2545	0.3238	0.8773	0.1256
79	-81.0674	41.6256	5.51E-05	-4.2591	0.3265	0.8758	0.1272
80	-81.1425	41.4893	5.49E-05	-4.2605	0.3274	0.8753	0.1288
81	-81.2518	41.4300	5.34E-05	-4.2729	0.3348	0.8712	0.1305
82	-81.2678	41.3589	5.32E-05	-4.2738	0.3354	0.8709	0.1321
83	-81.3712	41.5135	5.32E-05	-4.2745	0.3358	0.8707	0.1337
84	-81.1507	41.6407	5.24E-05	-4.2805	0.3394	0.8687	0.1353
85	-81.3831	41.5133	5.17E-05	-4.2867	0.3432	0.8665	0.1370
86	-81.1061	41.4583	5.07E-05	-4.2949	0.3482	0.8637	0.1386
87	-81.0518	41.5524	4.96E-05	-4.3046	0.3541	0.8603	0.1402
88	-81.3688	41.4288	4.94E-05	-4.3065	0.3553	0.8596	0.1418
89	-81.3713	41.4171	4.77E-05	-4.3212	0.3642	0.8544	0.1434
90	-81.3524	41.5292	4.72E-05	-4.3264	0.3674	0.8525	0.1451
91	-81.1921	41.3631	4.67E-05	-4.3306	0.3700	0.8509	0.1467
92	-81.2426	41.3854	4.66E-05	-4.3313	0.3704	0.8506	0.1483
93	-81.2234	41.3936	4.65E-05	-4.3329	0.3714	0.8501	0.1499
94	-81.1156	41.4358	4.51E-05	-4.3461	0.3795	0.8451	0.1515
95	-81.2279	41.5005	4.44E-05	-4.3531	0.3838	0.8424	0.1532
96	-81.0032	41.4255	4.43E-05	-4.3534	0.3840	0.8423	0.1548
97	-81.3442	41.5628	4.43E-05	-4.3535	0.3841	0.8422	0.1564
98	-81.0701	41.6361	4.37E-05	-4.36	0.3881	0.8397	0.1580
99	-81.2581	41.6198	4.35E-05	-4.3613	0.3889	0.8392	0.1596

100	-81.2929	41.4184	4.30E-05	-4.367	0.3923	0.8370	0.1613
101	-81.2780	41.5578	4.25E-05	-4.3717	0.3952	0.8352	0.1629
102	-81.0812	41.6407	4.24E-05	-4.373	0.3960	0.8347	0.1645
103	-81.3578	41.4988	4.23E-05	-4.3732	0.3961	0.8346	0.1661
104	-81.0727	41.5672	4.23E-05	-4.3741	0.3967	0.8342	0.1677
105	-81.2136	41.3936	4.22E-05	-4.3746	0.3970	0.8340	0.1694
106	-81.0825	41.4529	4.17E-05	-4.3794	0.3999	0.8321	0.1710
107	-81.1272	41.5318	4.12E-05	-4.3854	0.4036	0.8297	0.1726
108	-81.1817	41.4564	4.10E-05	-4.387	0.4046	0.8290	0.1742
109	-81.1444	41.6021	4.08E-05	-4.3889	0.4058	0.8283	0.1759
110	-81.2534	41.3765	4.04E-05	-4.3933	0.4085	0.8265	0.1775
111	-81.2150	41.6322	3.94E-05	-4.4049	0.4156	0.8217	0.1791
112	-81.3465	41.4255	3.90E-05	-4.4088	0.4180	0.8201	0.1807
113	-81.1531	41.5935	3.90E-05	-4.4092	0.4182	0.8199	0.1823
114	-81.0000	41.5660	3.86E-05	-4.4139	0.4210	0.8180	0.1840
115	-81.1053	41.4614	3.72E-05	-4.4295	0.4305	0.8113	0.1856
116	-81.2312	41.5026	3.70E-05	-4.4315	0.4317	0.8105	0.1872
117	-81.1377	41.4752	3.66E-05	-4.437	0.4351	0.8081	0.1888
118	-81.0633	41.3553	3.53E-05	-4.4519	0.4440	0.8015	0.1904
119	-81.2374	41.5543	3.53E-05	-4.4521	0.4441	0.8014	0.1921
120	-81.2278	41.3099	3.49E-05	-4.4574	0.4473	0.7991	0.1937
121	-81.2892	41.5523	3.47E-05	-4.4594	0.4485	0.7982	0.1953
122	-81.3348	41.5641	3.40E-05	-4.4688	0.4541	0.7939	0.1969
123	-81.2341	41.5700	3.39E-05	-4.4692	0.4543	0.7937	0.1985
124	-81.3821	41.4511	3.33E-05	-4.4772	0.4590	0.7901	0.2002
125	-81.3793	41.5115	3.31E-05	-4.4797	0.4605	0.7889	0.2018
126	-81.2539	41.4538	3.30E-05	-4.4818	0.4618	0.7879	0.2034
127	-81.2228	41.4907	3.23E-05	-4.4902	0.4667	0.7841	0.2050
128	-81.3756	41.4330	3.19E-05	-4.4965	0.4704	0.7811	0.2066
129	-81.2630	41.5814	3.10E-05	-4.5082	0.4771	0.7756	0.2083
130	-81.2791	41.5192	3.10E-05	-4.5083	0.4772	0.7755	0.2099
131	-81.0132	41.6171	3.09E-05	-4.5098	0.4781	0.7748	0.2115
132	-81.0915	41.6909	3.03E-05	-4.5179	0.4827	0.7709	0.2131
133	-81.2633	41.3574	2.99E-05	-4.5245	0.4865	0.7677	0.2147
134	-81.3563	41.5012	2.89E-05	-4.5396	0.4949	0.7603	0.2164
135	-81.1078	41.4575	2.88E-05	-4.5405	0.4954	0.7599	0.2180
136	-81.2486	41.5547	2.84E-05	-4.546	0.4985	0.7571	0.2196

137	-81.2419	41.3905	2.81E-05	-4.5518	0.5017	0.7542	0.2212
138	-81.2865	41.5611	2.79E-05	-4.5549	0.5034	0.7527	0.2229
139	-81.2660	41.4152	2.77E-05	-4.5575	0.5048	0.7514	0.2245
140	-81.3338	41.4198	2.75E-05	-4.5612	0.5068	0.7495	0.2261
141	-81.1086	41.4599	2.73E-05	-4.5636	0.5081	0.7483	0.2277
142	-81.2564	41.5794	2.72E-05	-4.5648	0.5088	0.7477	0.2293
143	-81.3678	41.5190	2.71E-05	-4.5666	0.5098	0.7467	0.2310
144	-81.3256	41.4288	2.70E-05	-4.5689	0.5110	0.7456	0.2326
145	-81.3755	41.5148	2.62E-05	-4.582	0.5180	0.7389	0.2342
146	-81.1251	41.5230	2.61E-05	-4.5838	0.5190	0.7379	0.2358
147	-81.2555	41.3634	2.58E-05	-4.5885	0.5214	0.7354	0.2374
148	-81.2537	41.4015	2.55E-05	-4.5934	0.5240	0.7329	0.2391
149	-81.0552	41.5981	2.55E-05	-4.594	0.5243	0.7326	0.2407
150	-81.2841	41.3519	2.54E-05	-4.5943	0.5244	0.7324	0.2423
151	-81.3024	41.5411	2.54E-05	-4.5959	0.5253	0.7316	0.2439
152	-81.2957	41.3782	2.53E-05	-4.5962	0.5254	0.7314	0.2455
153	-81.0596	41.5058	2.51E-05	-4.6	0.5274	0.7294	0.2472
154	-81.1393	41.6107	2.51E-05	-4.6007	0.5277	0.7291	0.2488
155	-81.3331	41.3631	2.50E-05	-4.6016	0.5282	0.7286	0.2504
156	-81.3397	41.3726	2.43E-05	-4.6146	0.5348	0.7217	0.2520
157	-81.2171	41.4691	2.42E-05	-4.6155	0.5352	0.7212	0.2536
158	-81.2283	41.5593	2.40E-05	-4.6196	0.5373	0.7190	0.2553
159	-81.3440	41.4660	2.36E-05	-4.6269	0.5409	0.7151	0.2569
160	-81.2140	41.3764	2.32E-05	-4.6339	0.5443	0.7113	0.2585
161	-81.3054	41.3593	2.24E-05	-4.6488	0.5514	0.7031	0.2601
162	-81.2480	41.4543	2.24E-05	-4.6488	0.5514	0.7031	0.2618
163	-81.1803	41.3656	2.24E-05	-4.6499	0.5519	0.7025	0.2634
164	-81.1363	41.5208	2.23E-05	-4.6514	0.5526	0.7017	0.2650
165	-81.0839	41.5442	2.20E-05	-4.6579	0.5556	0.6981	0.2666
166	-81.3912	41.4129	2.18E-05	-4.6611	0.5571	0.6962	0.2682
167	-81.1246	41.5521	2.18E-05	-4.662	0.5574	0.6958	0.2699
168	-81.1770	41.6282	2.15E-05	-4.6667	0.5596	0.6932	0.2715
169	-81.3256	41.3805	2.13E-05	-4.6717	0.5618	0.6903	0.2731
170	-81.1253	41.3879	2.13E-05	-4.6725	0.5622	0.6899	0.2747
171	-81.1894	41.5040	2.13E-05	-4.6726	0.5622	0.6898	0.2763
172	-81.1077	41.5424	2.10E-05	-4.6776	0.5644	0.6870	0.2780
173	-81.2669	41.3546	2.09E-05	-4.6803	0.5656	0.6855	0.2796

174	-81.2428	41.6117	2.07E-05	-4.6838	0.5671	0.6835	0.2812
175	-81.0725	41.6338	2.06E-05	-4.6857	0.5679	0.6824	0.2828
176	-81.0568	41.4274	2.02E-05	-4.6938	0.5714	0.6778	0.2844
177	-81.2059	41.5118	2.02E-05	-4.6954	0.5720	0.6769	0.2861
178	-81.3311	41.4222	2.00E-05	-4.6992	0.5736	0.6747	0.2877
179	-81.2649	41.3894	1.99E-05	-4.7011	0.5744	0.6736	0.2893
180	-81.1198	41.5275	1.95E-05	-4.7092	0.5777	0.6690	0.2909
181	-81.0877	41.5439	1.94E-05	-4.7118	0.5787	0.6675	0.2925
182	-81.1319	41.6115	1.94E-05	-4.7131	0.5793	0.6667	0.2942
183	-81.3787	41.5355	1.92E-05	-4.7163	0.5805	0.6649	0.2958
184	-81.2955	41.4186	1.92E-05	-4.7176	0.5810	0.6641	0.2974
185	-81.2929	41.4787	1.91E-05	-4.7184	0.5814	0.6636	0.2990
186	-81.0921	41.5394	1.89E-05	-4.723	0.5831	0.6610	0.3006
187	-81.3208	41.5400	1.87E-05	-4.7285	0.5852	0.6577	0.3023
188	-81.1703	41.5559	1.87E-05	-4.7287	0.5853	0.6576	0.3039
189	-81.3451	41.5538	1.86E-05	-4.7309	0.5862	0.6563	0.3055
190	-81.3426	41.5635	1.83E-05	-4.7372	0.5885	0.6526	0.3071
191	-81.3842	41.4144	1.82E-05	-4.739	0.5892	0.6516	0.3088
192	-81.1053	41.4619	1.82E-05	-4.7398	0.5894	0.6511	0.3104
193	-81.3605	41.5645	1.79E-05	-4.7462	0.5917	0.6474	0.3120
194	-81.2600	41.4000	1.79E-05	-4.748	0.5924	0.6463	0.3136
195	-81.3181	41.5142	1.78E-05	-4.7495	0.5929	0.6454	0.3152
196	-81.2052	41.5156	1.78E-05	-4.7508	0.5934	0.6446	0.3169
197	-81.3140	41.3992	1.77E-05	-4.7525	0.5940	0.6436	0.3185
198	-81.2952	41.4651	1.77E-05	-4.7532	0.5942	0.6432	0.3201
199	-81.2403	41.5468	1.74E-05	-4.7588	0.5961	0.6399	0.3217
200	-81.1645	41.3875	1.71E-05	-4.7671	0.5989	0.6349	0.3233
201	-81.0899	41.6682	1.71E-05	-4.7674	0.5990	0.6347	0.3250
202	-81.2734	41.4664	1.68E-05	-4.7755	0.6016	0.6299	0.3266
203	-81.2327	41.4159	1.63E-05	-4.7878	0.6054	0.6224	0.3282
204	-81.0973	41.4407	1.62E-05	-4.7893	0.6059	0.6215	0.3298
205	-81.2459	41.3884	1.62E-05	-4.7894	0.6059	0.6214	0.3314
206	-81.2556	41.3935	1.60E-05	-4.7949	0.6076	0.6181	0.3331
207	-81.2400	41.3800	1.60E-05	-4.7964	0.6080	0.6172	0.3347
208	-81.3821	41.5088	1.59E-05	-4.7977	0.6083	0.6164	0.3363
209	-81.3863	41.4138	1.59E-05	-4.798	0.6084	0.6162	0.3379
210	-81.1859	41.4249	1.59E-05	-4.7999	0.6090	0.6151	0.3395

211	-81.2393	41.4222	1.58E-05	-4.8023	0.6097	0.6136	0.3412
212	-81.2486	41.4573	1.56E-05	-4.8072	0.6110	0.6106	0.3428
213	-81.1739	41.3816	1.55E-05	-4.8103	0.6119	0.6087	0.3444
214	-81.2158	41.4078	1.55E-05	-4.8103	0.6119	0.6087	0.3460
215	-81.1589	41.4920	1.53E-05	-4.8142	0.6129	0.6064	0.3476
216	-81.2460	41.3661	1.51E-05	-4.8218	0.6149	0.6017	0.3493
217	-81.2632	41.3845	1.50E-05	-4.8237	0.6153	0.6005	0.3509
218	-81.3577	41.5139	1.50E-05	-4.8238	0.6153	0.6005	0.3525
219	-81.3767	41.5178	1.50E-05	-4.8238	0.6153	0.6005	0.3541
220	-81.2983	41.3965	1.47E-05	-4.8339	0.6178	0.5942	0.3558
221	-81.2832	41.4304	1.45E-05	-4.84	0.6192	0.5904	0.3574
222	-81.2276	41.5056	1.44E-05	-4.8415	0.6195	0.5895	0.3590
223	-81.0589	41.3584	1.43E-05	-4.8437	0.6200	0.5881	0.3606
224	-81.0035	41.6912	1.43E-05	-4.8452	0.6204	0.5872	0.3622
225	-81.2257	41.6165	1.41E-05	-4.8501	0.6214	0.5842	0.3639
226	-81.3787	41.5084	1.39E-05	-4.8579	0.6230	0.5793	0.3655
227	-81.2863	41.3572	1.37E-05	-4.8627	0.6239	0.5763	0.3671
228	-81.0970	41.6859	1.37E-05	-4.8637	0.6241	0.5757	0.3687
229	-81.3234	41.3873	1.35E-05	-4.8698	0.6253	0.5719	0.3703
230	-81.2482	41.5784	1.34E-05	-4.8741	0.6260	0.5692	0.3720
231	-81.0722	41.6048	1.34E-05	-4.8741	0.6260	0.5692	0.3736
232	-81.2103	41.5178	1.33E-05	-4.8751	0.6262	0.5686	0.3752
233	-81.2282	41.4204	1.33E-05	-4.8753	0.6262	0.5685	0.3768
234	-81.2552	41.3480	1.33E-05	-4.8759	0.6263	0.5681	0.3784
235	-81.2638	41.4069	1.32E-05	-4.8807	0.6271	0.5651	0.3801
236	-81.3596	41.4679	1.31E-05	-4.8833	0.6276	0.5634	0.3817
237	-81.3506	41.5014	1.31E-05	-4.8837	0.6276	0.5632	0.3833
238	-81.1380	41.6025	1.30E-05	-4.8847	0.6278	0.5626	0.3849
239	-81.3736	41.5234	1.30E-05	-4.8869	0.6281	0.5612	0.3865
240	-81.2160	41.5685	1.27E-05	-4.8964	0.6295	0.5552	0.3882
241	-81.3421	41.4514	1.24E-05	-4.9058	0.6308	0.5493	0.3898
242	-81.1575	41.4724	1.24E-05	-4.9067	0.6309	0.5487	0.3914
243	-81.1853	41.4298	1.22E-05	-4.9124	0.6315	0.5451	0.3930
244	-81.2955	41.3904	1.22E-05	-4.9137	0.6317	0.5443	0.3947
245	-81.1924	41.3704	1.22E-05	-4.9144	0.6318	0.5439	0.3963
246	-81.1825	41.5090	1.21E-05	-4.9188	0.6322	0.5411	0.3979
247	-81.2302	41.5572	1.20E-05	-4.919	0.6323	0.5409	0.3995

248	-81.3243	41.4349	1.20E-05	-4.9203	0.6324	0.5401	0.4011
249	-81.2754	41.3988	1.19E-05	-4.9242	0.6328	0.5377	0.4028
250	-81.2771	41.3784	1.18E-05	-4.9263	0.6330	0.5363	0.4044
251	-81.3697	41.4039	1.17E-05	-4.9334	0.6336	0.5318	0.4060
252	-81.3445	41.4272	1.16E-05	-4.9338	0.6336	0.5316	0.4076
253	-81.0610	41.4386	1.16E-05	-4.9363	0.6338	0.5300	0.4092
254	-81.3264	41.4245	1.15E-05	-4.9391	0.6340	0.5282	0.4109
255	-81.3807	41.5643	1.14E-05	-4.9417	0.6342	0.5266	0.4125
256	-81.0843	41.4156	1.12E-05	-4.9493	0.6347	0.5217	0.4141
257	-81.3255	41.3976	1.12E-05	-4.951	0.6348	0.5207	0.4157
258	-81.3431	41.4105	1.12E-05	-4.951	0.6348	0.5207	0.4173
259	-81.2483	41.5469	1.11E-05	-4.9533	0.6349	0.5192	0.4190
260	-81.2347	41.4153	1.11E-05	-4.9543	0.6349	0.5186	0.4206
261	-81.1798	41.5620	1.11E-05	-4.9564	0.6350	0.5172	0.4222
262	-81.1321	41.4335	1.10E-05	-4.9567	0.6350	0.5171	0.4238
263	-81.1906	41.4206	1.09E-05	-4.9626	0.6353	0.5133	0.4254
264	-81.1095	41.4322	1.08E-05	-4.9656	0.6354	0.5114	0.4271
265	-81.2499	41.5839	1.08E-05	-4.9683	0.6354	0.5097	0.4287
266	-81.3299	41.4250	1.07E-05	-4.9698	0.6355	0.5087	0.4303
267	-81.2792	41.4685	1.05E-05	-4.9782	0.6356	0.5034	0.4319
268	-81.3037	41.3624	1.05E-05	-4.9791	0.6356	0.5028	0.4335
269	-81.2588	41.3549	1.05E-05	-4.98	0.6356	0.5022	0.4352
270	-81.0979	41.3612	1.05E-05	-4.9802	0.6356	0.5021	0.4368
271	-81.0397	41.6950	1.04E-05	-4.9811	0.6356	0.5015	0.4384
272	-81.2807	41.6289	1.04E-05	-4.9848	0.6356	0.4992	0.4400
273	-81.3438	41.5127	1.03E-05	-4.9893	0.6356	0.4963	0.4417
274	-81.3024	41.3645	1.02E-05	-4.9918	0.6356	0.4947	0.4433
275	-81.2235	41.3905	1.01E-05	-4.9943	0.6355	0.4932	0.4449
276	-81.2238	41.4235	1.01E-05	-4.9972	0.6355	0.4913	0.4465
277	-81.1425	41.6175	1.01E-05	-4.9974	0.6355	0.4912	0.4481
278	-81.0815	41.3757	1.00E-05	-4.9999	0.6354	0.4896	0.4498
279	-81.2971	41.4103	9.90E-06	-5.0045	0.6353	0.4867	0.4514
280	-81.0657	41.6413	9.82E-06	-5.008	0.6351	0.4845	0.4530
281	-81.2859	41.5942	9.81E-06	-5.0083	0.6351	0.4843	0.4546
282	-81.1486	41.6377	9.74E-06	-5.0113	0.6350	0.4824	0.4562
283	-81.3043	41.3655	9.69E-06	-5.0136	0.6349	0.4809	0.4579
284	-81.0750	41.6242	9.58E-06	-5.0186	0.6346	0.4777	0.4595

285	-81.2315	41.3785	9.56E-06	-5.0196	0.6346	0.4771	0.4611
286	-81.2450	41.3781	9.48E-06	-5.0233	0.6343	0.4747	0.4627
287	-81.1009	41.4383	9.43E-06	-5.0254	0.6342	0.4734	0.4643
288	-81.3526	41.4364	9.43E-06	-5.0255	0.6342	0.4733	0.4660
289	-81.3421	41.4277	9.28E-06	-5.0325	0.6337	0.4689	0.4676
290	-81.2376	41.5152	9.26E-06	-5.0335	0.6336	0.4683	0.4692
291	-81.2791	41.4892	9.20E-06	-5.0361	0.6334	0.4666	0.4708
292	-81.3372	41.3753	9.19E-06	-5.0368	0.6333	0.4662	0.4724
293	-81.1452	41.5463	9.08E-06	-5.0419	0.6329	0.4629	0.4741
294	-81.3751	41.5397	9.06E-06	-5.0427	0.6328	0.4625	0.4757
295	-81.3697	41.4340	8.94E-06	-5.0486	0.6322	0.4587	0.4773
296	-81.1059	41.4269	8.93E-06	-5.049	0.6322	0.4584	0.4789
297	-81.3620	41.5142	8.91E-06	-5.0503	0.6320	0.4577	0.4806
298	-81.3263	41.4677	8.88E-06	-5.0515	0.6319	0.4569	0.4822
299	-81.3034	41.4743	8.81E-06	-5.0548	0.6315	0.4548	0.4838
300	-81.1590	41.5207	8.77E-06	-5.057	0.6313	0.4534	0.4854
301	-81.0240	41.4140	8.75E-06	-5.0581	0.6311	0.4527	0.4870
302	-81.0510	41.4110	8.74E-06	-5.0583	0.6311	0.4526	0.4887
303	-81.0808	41.4486	8.72E-06	-5.0594	0.6310	0.4519	0.4903
304	-81.3467	41.4298	8.60E-06	-5.0656	0.6302	0.4480	0.4919
305	-81.2308	41.5146	8.51E-06	-5.0701	0.6296	0.4451	0.4935
306	-81.2993	41.4306	8.48E-06	-5.0715	0.6294	0.4443	0.4951
307	-81.1350	41.4741	8.47E-06	-5.072	0.6293	0.4440	0.4968
308	-81.2692	41.5664	8.45E-06	-5.0731	0.6292	0.4433	0.4984
309	-81.3487	41.4498	8.41E-06	-5.0753	0.6288	0.4419	0.5000
310	-81.2556	41.3600	8.38E-06	-5.077	0.6286	0.4408	0.5016
311	-81.1662	41.5276	8.35E-06	-5.0784	0.6284	0.4399	0.5032
312	-81.2376	41.3823	8.34E-06	-5.0788	0.6283	0.4397	0.5049
313	-81.2437	41.3888	8.29E-06	-5.0814	0.6279	0.4381	0.5065
314	-81.3497	41.4383	8.25E-06	-5.0835	0.6276	0.4367	0.5081
315	-81.2374	41.3783	8.21E-06	-5.0857	0.6272	0.4353	0.5097
316	-81.0831	41.4523	8.20E-06	-5.0863	0.6271	0.4350	0.5113
317	-81.2073	41.4941	8.15E-06	-5.0889	0.6267	0.4333	0.5130
318	-81.2567	41.4494	8.11E-06	-5.0912	0.6263	0.4319	0.5146
319	-81.1624	41.3483	8.07E-06	-5.093	0.6260	0.4308	0.5162
320	-81.1367	41.6094	8.05E-06	-5.094	0.6258	0.4301	0.5178
321	-81.1965	41.5162	8.03E-06	-5.095	0.6257	0.4295	0.5194

322	-81.2289	41.3590	8.02E-06	-5.0957	0.6255	0.4291	0.5211
323	-81.2353	41.4043	8.01E-06	-5.0966	0.6254	0.4285	0.5227
324	-81.2338	41.3898	7.96E-06	-5.0989	0.6250	0.4271	0.5243
325	-81.0589	41.5330	7.96E-06	-5.0993	0.6249	0.4268	0.5259
326	-81.2327	41.5536	7.93E-06	-5.1005	0.6247	0.4261	0.5276
327	-81.3258	41.4161	7.89E-06	-5.1029	0.6242	0.4246	0.5292
328	-81.2478	41.5497	7.89E-06	-5.1029	0.6242	0.4246	0.5308
329	-81.3413	41.5252	7.89E-06	-5.1029	0.6242	0.4246	0.5324
330	-81.3049	41.3884	7.82E-06	-5.1067	0.6235	0.4222	0.5340
331	-81.3336	41.3797	7.81E-06	-5.1075	0.6233	0.4217	0.5357
332	-81.1636	41.5246	7.78E-06	-5.1091	0.6230	0.4207	0.5373
333	-81.3653	41.4317	7.77E-06	-5.1097	0.6229	0.4204	0.5389
334	-81.1043	41.4269	7.70E-06	-5.1135	0.6221	0.4180	0.5405
335	-81.2622	41.5344	7.68E-06	-5.1147	0.6219	0.4172	0.5421
336	-81.1358	41.4581	7.62E-06	-5.118	0.6212	0.4152	0.5438
337	-81.3862	41.5212	7.61E-06	-5.1187	0.6211	0.4148	0.5454
338	-81.0377	41.3806	7.59E-06	-5.1198	0.6208	0.4141	0.5470
339	-81.2429	41.3796	7.57E-06	-5.1207	0.6206	0.4135	0.5486
340	-81.0569	41.6166	7.45E-06	-5.1277	0.6191	0.4091	0.5502
341	-81.3611	41.5032	7.38E-06	-5.1322	0.6180	0.4064	0.5519
342	-81.0855	41.3550	7.36E-06	-5.1334	0.6177	0.4056	0.5535
343	-81.0592	41.4113	7.35E-06	-5.1335	0.6177	0.4056	0.5551
344	-81.2463	41.4668	7.33E-06	-5.135	0.6174	0.4046	0.5567
345	-81.2305	41.3808	7.32E-06	-5.1357	0.6172	0.4042	0.5583
346	-81.1041	41.4228	7.29E-06	-5.1374	0.6168	0.4032	0.5600
347	-81.0436	41.4271	7.29E-06	-5.1375	0.6168	0.4031	0.5616
348	-81.3490	41.4393	7.29E-06	-5.1375	0.6168	0.4031	0.5632
349	-81.3973	41.4470	7.28E-06	-5.1377	0.6167	0.4030	0.5648
350	-81.3576	41.4033	7.24E-06	-5.1402	0.6161	0.4014	0.5665
351	-81.3594	41.5163	7.21E-06	-5.142	0.6157	0.4003	0.5681
352	-81.0757	41.5618	7.19E-06	-5.1433	0.6153	0.3995	0.5697
353	-81.3891	41.4153	7.15E-06	-5.1454	0.6148	0.3982	0.5713
354	-81.0032	41.5940	7.13E-06	-5.147	0.6144	0.3972	0.5729
355	-81.1055	41.4469	7.08E-06	-5.1498	0.6137	0.3956	0.5746
356	-81.2507	41.3980	7.08E-06	-5.1498	0.6137	0.3955	0.5762
357	-81.2801	41.4651	7.08E-06	-5.15	0.6136	0.3954	0.5778
358	-81.3362	41.5176	7.07E-06	-5.1505	0.6135	0.3951	0.5794

359	-81.0060	41.6420	7.00E-06	-5.1546	0.6124	0.3926	0.5810
360	-81.2916	41.4014	6.94E-06	-5.1584	0.6114	0.3903	0.5827
361	-81.3483	41.4336	6.92E-06	-5.16	0.6110	0.3893	0.5843
362	-81.3444	41.3568	6.83E-06	-5.1655	0.6095	0.3860	0.5859
363	-81.2706	41.5642	6.82E-06	-5.1665	0.6092	0.3854	0.5875
364	-81.3737	41.4181	6.82E-06	-5.1665	0.6092	0.3853	0.5891
365	-81.0045	41.3497	6.77E-06	-5.1692	0.6084	0.3837	0.5908
366	-81.2205	41.4120	6.73E-06	-5.1722	0.6075	0.3818	0.5924
367	-81.3774	41.5315	6.68E-06	-5.1751	0.6067	0.3801	0.5940
368	-81.2388	41.3763	6.66E-06	-5.1764	0.6063	0.3793	0.5956
369	-81.2595	41.3871	6.65E-06	-5.1771	0.6061	0.3789	0.5972
370	-81.2569	41.3856	6.64E-06	-5.1776	0.6059	0.3786	0.5989
371	-81.2342	41.5575	6.55E-06	-5.1839	0.6040	0.3748	0.6005
372	-81.2362	41.6000	6.53E-06	-5.1848	0.6038	0.3742	0.6021
373	-81.3274	41.3531	6.52E-06	-5.1857	0.6035	0.3737	0.6037
374	-81.2717	41.4687	6.47E-06	-5.1888	0.6025	0.3718	0.6053
375	-81.0648	41.5371	6.44E-06	-5.1913	0.6017	0.3703	0.6070
376	-81.0597	41.3499	6.30E-06	-5.2004	0.5988	0.3649	0.6086
377	-81.2163	41.5297	6.29E-06	-5.2011	0.5985	0.3644	0.6102
378	-81.3369	41.4107	6.18E-06	-5.2087	0.5960	0.3599	0.6118
379	-81.1632	41.5321	6.18E-06	-5.2091	0.5959	0.3596	0.6135
380	-81.1708	41.4730	6.13E-06	-5.2129	0.5946	0.3574	0.6151
381	-81.2429	41.4967	6.10E-06	-5.215	0.5938	0.3561	0.6167
382	-81.2704	41.5697	6.07E-06	-5.2171	0.5931	0.3549	0.6183
383	-81.0715	41.5830	6.06E-06	-5.2175	0.5929	0.3546	0.6199
384	-81.0897	41.4617	5.92E-06	-5.2274	0.5894	0.3488	0.6216
385	-81.3325	41.4264	5.83E-06	-5.2342	0.5869	0.3448	0.6232
386	-81.3815	41.4151	5.71E-06	-5.2435	0.5834	0.3394	0.6248
387	-81.2162	41.3748	5.67E-06	-5.2467	0.5821	0.3375	0.6264
388	-81.2699	41.4201	5.64E-06	-5.249	0.5812	0.3362	0.6280
389	-81.0697	41.5205	5.63E-06	-5.2492	0.5812	0.3361	0.6297
390	-81.2522	41.5558	5.63E-06	-5.2496	0.5810	0.3358	0.6313
391	-81.0802	41.4013	5.63E-06	-5.2497	0.5809	0.3357	0.6329
392	-81.1987	41.5240	5.62E-06	-5.2501	0.5808	0.3355	0.6345
393	-81.2222	41.5257	5.55E-06	-5.2555	0.5787	0.3324	0.6361
394	-81.0330	41.4099	5.54E-06	-5.2562	0.5784	0.3320	0.6378
395	-81.3300	41.3544	5.52E-06	-5.2579	0.5777	0.3310	0.6394

396	-81.3919	41.4135	5.46E-06	-5.2624	0.5759	0.3284	0.6410
397	-81.3448	41.4662	5.42E-06	-5.2661	0.5744	0.3263	0.6426
398	-81.2426	41.5528	5.41E-06	-5.2666	0.5741	0.3260	0.6442
399	-81.3257	41.4195	5.41E-06	-5.2672	0.5739	0.3257	0.6459
400	-81.2543	41.3539	5.40E-06	-5.2674	0.5738	0.3255	0.6475
401	-81.0815	41.5031	5.35E-06	-5.2719	0.5719	0.3230	0.6491
402	-81.3877	41.4121	5.34E-06	-5.2725	0.5717	0.3226	0.6507
403	-81.2047	41.4247	5.34E-06	-5.2726	0.5717	0.3226	0.6524
404	-81.3035	41.3875	5.30E-06	-5.2758	0.5703	0.3208	0.6540
405	-81.3302	41.3775	5.29E-06	-5.2762	0.5702	0.3205	0.6556
406	-81.3585	41.5482	5.26E-06	-5.2787	0.5691	0.3191	0.6572
407	-81.3364	41.3775	5.26E-06	-5.2794	0.5688	0.3187	0.6588
408	-81.1213	41.4495	5.24E-06	-5.2807	0.5682	0.3179	0.6605
409	-81.2248	41.4160	5.22E-06	-5.2826	0.5674	0.3169	0.6621
410	-81.0497	41.4107	5.19E-06	-5.2847	0.5665	0.3157	0.6637
411	-81.3097	41.3669	5.17E-06	-5.2864	0.5658	0.3147	0.6653
412	-81.2278	41.3759	5.15E-06	-5.2883	0.5649	0.3136	0.6669
413	-81.1305	41.5758	5.14E-06	-5.2888	0.5647	0.3134	0.6686
414	-81.0209	41.3513	5.14E-06	-5.289	0.5646	0.3132	0.6702
415	-81.3456	41.3551	5.09E-06	-5.293	0.5629	0.3110	0.6718
416	-81.2224	41.6338	5.09E-06	-5.2932	0.5628	0.3109	0.6734
417	-81.0896	41.4936	5.07E-06	-5.2947	0.5621	0.3100	0.6750
418	-81.0856	41.5159	5.07E-06	-5.2953	0.5618	0.3097	0.6767
419	-81.2578	41.5767	5.06E-06	-5.2955	0.5617	0.3096	0.6783
420	-81.2004	41.5147	5.06E-06	-5.2959	0.5616	0.3094	0.6799
421	-81.3786	41.4038	5.02E-06	-5.2992	0.5601	0.3075	0.6815
422	-81.3581	41.3964	5.01E-06	-5.3006	0.5595	0.3067	0.6831
423	-81.2034	41.5102	4.95E-06	-5.3056	0.5572	0.3039	0.6848
424	-81.3742	41.5281	4.90E-06	-5.3099	0.5553	0.3016	0.6864
425	-81.2156	41.5234	4.87E-06	-5.3127	0.5540	0.3000	0.6880
426	-81.0909	41.4899	4.78E-06	-5.3209	0.5501	0.2954	0.6896
427	-81.2477	41.5514	4.77E-06	-5.3215	0.5498	0.2951	0.6912
428	-81.1991	41.3995	4.67E-06	-5.3305	0.5455	0.2902	0.6929
429	-81.3645	41.5556	4.67E-06	-5.3307	0.5455	0.2901	0.6945
430	-81.3359	41.3568	4.65E-06	-5.3326	0.5445	0.2891	0.6961
431	-81.2535	41.5055	4.65E-06	-5.3326	0.5445	0.2891	0.6977
432	-81.0724	41.4498	4.65E-06	-5.3329	0.5444	0.2889	0.6994

433	-81.2462	41.5458	4.64E-06	-5.3335	0.5441	0.2885	0.7010
434	-81.1744	41.3693	4.58E-06	-5.3395	0.5412	0.2853	0.7026
435	-81.0453	41.6418	4.54E-06	-5.3427	0.5396	0.2836	0.7042
436	-81.2974	41.3510	4.49E-06	-5.348	0.5370	0.2807	0.7058
437	-81.1987	41.5810	4.48E-06	-5.3483	0.5368	0.2805	0.7075
438	-81.3823	41.4224	4.48E-06	-5.3488	0.5366	0.2803	0.7091
439	-81.2346	41.5529	4.48E-06	-5.3489	0.5366	0.2803	0.7107
440	-81.2877	41.3873	4.48E-06	-5.3489	0.5365	0.2802	0.7123
441	-81.3501	41.4340	4.45E-06	-5.3518	0.5351	0.2787	0.7139
442	-81.1973	41.4208	4.45E-06	-5.352	0.5350	0.2786	0.7156
443	-81.1955	41.4207	4.41E-06	-5.3552	0.5334	0.2768	0.7172
444	-81.1194	41.4523	4.38E-06	-5.3587	0.5316	0.2750	0.7188
445	-81.0556	41.4670	4.36E-06	-5.3605	0.5307	0.2741	0.7204
446	-81.3364	41.4690	4.33E-06	-5.3632	0.5293	0.2726	0.7220
447	-81.3291	41.3723	4.30E-06	-5.3665	0.5277	0.2709	0.7237
448	-81.1374	41.5545	4.29E-06	-5.3678	0.5270	0.2702	0.7253
449	-81.3255	41.3976	4.17E-06	-5.3797	0.5208	0.2639	0.7269
450	-81.0957	41.4277	4.16E-06	-5.3813	0.5200	0.2631	0.7285
451	-81.2426	41.5917	4.13E-06	-5.3844	0.5183	0.2615	0.7301
452	-81.1972	41.4707	4.12E-06	-5.3851	0.5180	0.2612	0.7318
453	-81.2177	41.5350	4.08E-06	-5.3891	0.5159	0.2591	0.7334
454	-81.2869	41.4268	4.07E-06	-5.3901	0.5153	0.2586	0.7350
455	-81.2411	41.5572	4.07E-06	-5.3909	0.5149	0.2582	0.7366
456	-81.3292	41.4751	4.05E-06	-5.3922	0.5142	0.2575	0.7382
457	-81.0722	41.4620	4.03E-06	-5.3951	0.5127	0.2560	0.7399
458	-81.2451	41.5070	3.97E-06	-5.4015	0.5092	0.2527	0.7415
459	-81.1179	41.4348	3.95E-06	-5.4039	0.5079	0.2515	0.7431
460	-81.3151	41.4666	3.92E-06	-5.4063	0.5066	0.2503	0.7447
461	-81.1515	41.5801	3.87E-06	-5.4126	0.5032	0.2471	0.7464
462	-81.0891	41.5006	3.83E-06	-5.4173	0.5006	0.2447	0.7480
463	-81.1061	41.4190	3.81E-06	-5.4194	0.4995	0.2437	0.7496
464	-81.3879	41.4155	3.79E-06	-5.4211	0.4985	0.2429	0.7512
465	-81.3905	41.5395	3.76E-06	-5.4244	0.4966	0.2412	0.7528
466	-81.2563	41.3866	3.76E-06	-5.4252	0.4962	0.2408	0.7545
467	-81.1976	41.5096	3.74E-06	-5.4275	0.4949	0.2397	0.7561
468	-81.3464	41.4677	3.73E-06	-5.4287	0.4942	0.2391	0.7577
469	-81.0852	41.5215	3.66E-06	-5.4367	0.4898	0.2351	0.7593

470	-81.3755	41.4022	3.65E-06	-5.4372	0.4895	0.2349	0.7609
471	-81.2011	41.5019	3.64E-06	-5.4386	0.4887	0.2342	0.7626
472	-81.0108	41.6459	3.61E-06	-5.4423	0.4866	0.2324	0.7642
473	-81.3470	41.5150	3.61E-06	-5.4425	0.4865	0.2323	0.7658
474	-81.2222	41.5183	3.59E-06	-5.445	0.4851	0.2311	0.7674
475	-81.3778	41.4565	3.53E-06	-5.4518	0.4812	0.2278	0.7690
476	-81.3493	41.3597	3.53E-06	-5.4527	0.4807	0.2274	0.7707
477	-81.3081	41.4351	3.50E-06	-5.4563	0.4786	0.2257	0.7723
478	-81.3566	41.5689	3.50E-06	-5.4564	0.4786	0.2256	0.7739
479	-81.2790	41.5204	3.49E-06	-5.4575	0.4779	0.2251	0.7755
480	-81.2352	41.5714	3.45E-06	-5.4622	0.4752	0.2229	0.7771
481	-81.2509	41.4023	3.45E-06	-5.4626	0.4750	0.2227	0.7788
482	-81.0145	41.6654	3.43E-06	-5.4653	0.4734	0.2214	0.7804
483	-81.2766	41.4931	3.41E-06	-5.4678	0.4720	0.2202	0.7820
484	-81.3340	41.4296	3.40E-06	-5.469	0.4713	0.2196	0.7836
485	-81.3659	41.4028	3.37E-06	-5.473	0.4690	0.2178	0.7853
486	-81.1924	41.5370	3.35E-06	-5.4744	0.4682	0.2171	0.7869
487	-81.2752	41.4160	3.35E-06	-5.4745	0.4681	0.2170	0.7885
488	-81.1948	41.4421	3.33E-06	-5.4778	0.4661	0.2155	0.7901
489	-81.0382	41.4640	3.32E-06	-5.4785	0.4658	0.2152	0.7917
490	-81.1620	41.4368	3.32E-06	-5.4787	0.4656	0.2151	0.7934
491	-81.2965	41.4279	3.23E-06	-5.4906	0.4586	0.2096	0.7950
492	-81.2885	41.4297	3.23E-06	-5.491	0.4584	0.2094	0.7966
493	-81.3397	41.4848	3.19E-06	-5.4959	0.4555	0.2072	0.7982
494	-81.1475	41.5436	3.11E-06	-5.5077	0.4485	0.2018	0.7998
495	-81.3826	41.4153	3.10E-06	-5.5084	0.4481	0.2015	0.8015
496	-81.3183	41.3835	3.09E-06	-5.5097	0.4473	0.2009	0.8031
497	-81.3577	41.4369	3.09E-06	-5.5105	0.4468	0.2006	0.8047
498	-81.2147	41.3733	3.08E-06	-5.5112	0.4464	0.2002	0.8063
499	-81.3435	41.4080	3.08E-06	-5.512	0.4459	0.1999	0.8079
500	-81.2948	41.5006	3.05E-06	-5.5153	0.4439	0.1984	0.8096
501	-81.2876	41.3574	2.99E-06	-5.5243	0.4386	0.1945	0.8112
502	-81.0571	41.5795	2.97E-06	-5.5273	0.4367	0.1932	0.8128
503	-81.2197	41.5279	2.97E-06	-5.5274	0.4367	0.1931	0.8144
504	-81.2930	41.3919	2.95E-06	-5.5296	0.4353	0.1921	0.8160
505	-81.2334	41.5025	2.95E-06	-5.5306	0.4347	0.1917	0.8177
506	-81.1510	41.3506	2.91E-06	-5.5368	0.4310	0.1890	0.8193

507	-81.3299	41.3534	2.88E-06	-5.54	0.4291	0.1877	0.8209
508	-81.2965	41.5033	2.88E-06	-5.5408	0.4286	0.1873	0.8225
509	-81.2350	41.5536	2.88E-06	-5.5412	0.4283	0.1871	0.8241
510	-81.3637	41.3832	2.85E-06	-5.5458	0.4255	0.1852	0.8258
511	-81.0623	41.3761	2.83E-06	-5.5482	0.4241	0.1842	0.8274
512	-81.3603	41.3550	2.83E-06	-5.5488	0.4237	0.1839	0.8290
513	-81.3650	41.5367	2.81E-06	-5.5512	0.4222	0.1829	0.8306
514	-81.2691	41.5356	2.80E-06	-5.5525	0.4215	0.1824	0.8323
515	-81.0505	41.6169	2.76E-06	-5.5598	0.4170	0.1793	0.8339
516	-81.2407	41.3660	2.75E-06	-5.5605	0.4166	0.1790	0.8355
517	-81.2900	41.3900	2.75E-06	-5.5609	0.4163	0.1788	0.8371
518	-81.3547	41.5379	2.68E-06	-5.5721	0.4095	0.1742	0.8387
519	-81.3251	41.4336	2.63E-06	-5.5797	0.4049	0.1711	0.8404
520	-81.2310	41.3943	2.61E-06	-5.5838	0.4023	0.1694	0.8420
521	-81.3718	41.4663	2.59E-06	-5.5869	0.4004	0.1682	0.8436
522	-81.2483	41.4698	2.57E-06	-5.5894	0.3989	0.1672	0.8452
523	-81.3331	41.4381	2.56E-06	-5.5919	0.3973	0.1662	0.8468
524	-81.3134	41.4180	2.51E-06	-5.6001	0.3923	0.1630	0.8485
525	-81.0900	41.5347	2.49E-06	-5.6034	0.3903	0.1617	0.8501
526	-81.2243	41.3915	2.49E-06	-5.6035	0.3903	0.1616	0.8517
527	-81.3125	41.4156	2.45E-06	-5.6102	0.3861	0.1590	0.8533
528	-81.0990	41.4238	2.45E-06	-5.6104	0.3860	0.1590	0.8549
529	-81.3609	41.4932	2.45E-06	-5.6105	0.3859	0.1589	0.8566
530	-81.2793	41.3496	2.41E-06	-5.6179	0.3814	0.1561	0.8582
531	-81.1931	41.5036	2.41E-06	-5.6183	0.3811	0.1559	0.8598
532	-81.3180	41.3784	2.36E-06	-5.6271	0.3758	0.1526	0.8614
533	-81.2572	41.6056	2.35E-06	-5.6292	0.3745	0.1518	0.8630
534	-81.0548	41.3496	2.31E-06	-5.6369	0.3697	0.1490	0.8647
535	-81.3351	41.4282	2.28E-06	-5.6423	0.3665	0.1470	0.8663
536	-81.3483	41.3651	2.27E-06	-5.6444	0.3651	0.1462	0.8679
537	-81.2389	41.5611	2.27E-06	-5.6448	0.3649	0.1461	0.8695
538	-81.3235	41.4645	2.25E-06	-5.6483	0.3628	0.1448	0.8712
539	-81.2604	41.5484	2.24E-06	-5.6505	0.3614	0.1440	0.8728
540	-81.2805	41.4038	2.22E-06	-5.6532	0.3598	0.1430	0.8744
541	-81.2219	41.3942	2.18E-06	-5.6611	0.3549	0.1402	0.8760
542	-81.3522	41.4022	2.16E-06	-5.6656	0.3522	0.1386	0.8776
543	-81.2832	41.4673	2.16E-06	-5.666	0.3520	0.1385	0.8793

544	-81.3424	41.4240	2.16E-06	-5.6661	0.3519	0.1384	0.8809
545	-81.2172	41.4434	2.14E-06	-5.6693	0.3499	0.1373	0.8825
546	-81.0116	41.6387	2.14E-06	-5.6703	0.3493	0.1369	0.8841
547	-81.3837	41.5220	2.11E-06	-5.6748	0.3466	0.1354	0.8857
548	-81.3404	41.5615	2.11E-06	-5.6752	0.3463	0.1352	0.8874
549	-81.3282	41.4296	2.09E-06	-5.6808	0.3429	0.1333	0.8890
550	-81.2902	41.5607	2.05E-06	-5.6887	0.3382	0.1306	0.8906
551	-81.2764	41.5848	2.04E-06	-5.6898	0.3375	0.1303	0.8922
552	-81.2019	41.5137	2.02E-06	-5.695	0.3343	0.1285	0.8938
553	-81.1241	41.4335	1.96E-06	-5.7073	0.3269	0.1244	0.8955
554	-81.2712	41.4482	1.95E-06	-5.7094	0.3257	0.1237	0.8971
555	-81.1286	41.4257	1.95E-06	-5.7108	0.3248	0.1233	0.8987
556	-81.2009	41.6219	1.94E-06	-5.7113	0.3245	0.1231	0.9003
557	-81.2888	41.4788	1.91E-06	-5.7189	0.3200	0.1207	0.9019
558	-81.0667	41.3720	1.87E-06	-5.7285	0.3142	0.1176	0.9036
559	-81.1928	41.4999	1.85E-06	-5.7317	0.3124	0.1166	0.9052
560	-81.2046	41.5075	1.82E-06	-5.7388	0.3081	0.1144	0.9068
561	-81.0241	41.4095	1.81E-06	-5.7433	0.3055	0.1130	0.9084
562	-81.1065	41.4129	1.78E-06	-5.7507	0.3012	0.1108	0.9100
563	-81.3132	41.4438	1.77E-06	-5.7513	0.3008	0.1106	0.9117
564	-81.1783	41.3595	1.76E-06	-5.7537	0.2994	0.1099	0.9133
565	-81.1989	41.5884	1.76E-06	-5.7542	0.2991	0.1098	0.9149
566	-81.2008	41.6141	1.71E-06	-5.7671	0.2916	0.1059	0.9165
567	-81.2917	41.3862	1.71E-06	-5.768	0.2910	0.1057	0.9182
568	-81.3420	41.4339	1.70E-06	-5.7689	0.2905	0.1054	0.9198
569	-81.0748	41.6259	1.67E-06	-5.7765	0.2861	0.1032	0.9214
570	-81.1773	41.5469	1.65E-06	-5.782	0.2830	0.1017	0.9230
571	-81.2390	41.5054	1.65E-06	-5.7825	0.2827	0.1015	0.9246
572	-81.1453	41.3592	1.54E-06	-5.8123	0.2658	0.0933	0.9263
573	-81.3007	41.4095	1.53E-06	-5.815	0.2643	0.0926	0.9279
574	-81.2146	41.4037	1.53E-06	-5.8166	0.2634	0.0922	0.9295
575	-81.1011	41.4481	1.52E-06	-5.8184	0.2624	0.0917	0.9311
576	-81.0687	41.3725	1.49E-06	-5.8264	0.2580	0.0897	0.9327
577	-81.3293	41.4297	1.46E-06	-5.836	0.2527	0.0872	0.9344
578	-81.2273	41.5608	1.44E-06	-5.8421	0.2494	0.0857	0.9360
579	-81.2180	41.4914	1.43E-06	-5.8434	0.2487	0.0854	0.9376
580	-81.2723	41.5302	1.42E-06	-5.8487	0.2458	0.0840	0.9392

581	-81.2764	41.5484	1.41E-06	-5.85	0.2451	0.0837	0.9408
582	-81.1299	41.4801	1.41E-06	-5.852	0.2440	0.0832	0.9425
583	-81.0240	41.4040	1.38E-06	-5.8614	0.2390	0.0809	0.9441
584	-81.1262	41.5003	1.30E-06	-5.8847	0.2267	0.0755	0.9457
585	-81.2560	41.3474	1.29E-06	-5.8878	0.2251	0.0748	0.9473
586	-81.2297	41.5739	1.27E-06	-5.8966	0.2206	0.0729	0.9489
587	-81.2297	41.5570	1.24E-06	-5.9056	0.2160	0.0709	0.9506
588	-81.3291	41.4260	1.21E-06	-5.9178	0.2099	0.0683	0.9522
589	-81.3418	41.3933	1.18E-06	-5.9287	0.2045	0.0660	0.9538
590	-81.3278	41.3813	1.14E-06	-5.9428	0.1977	0.0632	0.9554
591	-81.2320	41.5113	1.14E-06	-5.9438	0.1972	0.0630	0.9571
592	-81.2580	41.3929	1.13E-06	-5.9468	0.1957	0.0624	0.9587
593	-81.3073	41.4409	1.12E-06	-5.9523	0.1931	0.0614	0.9603
594	-81.2313	41.3808	1.08E-06	-5.968	0.1857	0.0584	0.9619
595	-81.3423	41.4236	1.04E-06	-5.9845	0.1782	0.0554	0.9635
596	-81.3481	41.3652	1.01E-06	-5.9955	0.1733	0.0534	0.9652
597	-81.1710	41.4726	1.00E-06	-5.9993	0.1716	0.0528	0.9668
598	-81.3898	41.4536	9.88E-07	-6.0054	0.1689	0.0518	0.9684
599	-81.2801	41.4368	9.16E-07	-6.0383	0.1549	0.0464	0.9700
600	-81.1388	41.3787	9.02E-07	-6.0448	0.1522	0.0454	0.9716
601	-81.2855	41.4380	8.92E-07	-6.0495	0.1503	0.0447	0.9733
602	-81.1756	41.5612	8.92E-07	-6.0497	0.1502	0.0447	0.9749
603	-81.2203	41.5213	8.86E-07	-6.0527	0.1489	0.0442	0.9765
604	-81.3395	41.4230	8.71E-07	-6.0601	0.1460	0.0432	0.9781
605	-81.2754	41.5618	8.38E-07	-6.0768	0.1394	0.0408	0.9797
606	-81.0676	41.3730	8.23E-07	-6.0844	0.1365	0.0397	0.9814
607	-81.2397	41.5044	7.95E-07	-6.0994	0.1309	0.0377	0.9830
608	-81.2422	41.5055	7.87E-07	-6.1042	0.1291	0.0371	0.9846
609	-81.0197	41.5332	7.45E-07	-6.1277	0.1207	0.0342	0.9862
610	-81.2633	41.5406	7.44E-07	-6.1286	0.1204	0.0341	0.9878
611	-81.2380	41.5067	7.37E-07	-6.1327	0.1189	0.0336	0.9895
612	-81.2416	41.4968	7.26E-07	-6.1393	0.1167	0.0328	0.9911
613	-81.2320	41.5653	7.16E-07	-6.1452	0.1146	0.0321	0.9927
614	-81.0919	41.5003	6.77E-07	-6.1695	0.1066	0.0294	0.9943
615	-81.2060	41.5091	6.40E-07	-6.1937	0.0991	0.0269	0.9959
616	-81.2868	41.5924	3.60E-07	-6.4434	0.0425	0.0100	0.9976
617	-81.3430	41.5386	8.80E-08	-7.0554	0.0027	0.0005	0.9992

*Mean and Standard Deviation are calculated for the Gaussian distribution and probability distribution curves which are equal to -4.9835 and 0.62765 respectively.

Appendix - V

Elevation of Individual Well Points from Google Earth Map

Longitude	Latitude	elevation (m)
-81.2368	41.3501	352
-81.2426	41.3854	368
-81.2633	41.3574	362
-81.2678	41.3589	364
-81.2700	41.3570	361
-81.2903	41.4128	365
-81.2794	41.4112	359
-81.2406	41.3867	370
-81.2895	41.4145	364
-81.2393	41.4222	367
-81.2338	41.3898	373
-81.2260	41.3482	351
-81.2358	41.4180	369
-81.2484	41.4157	368
-81.2373	41.3758	357
-81.2419	41.3905	365
-81.2238	41.4235	372
-81.2278	41.3099	370
-81.2957	41.3782	349
-81.2465	41.3839	368
-81.2136	41.3936	359
-81.2555	41.3634	356
-81.2459	41.3884	373
-81.2854	41.3855	361
-81.2954	41.4181	369
-81.1991	41.3995	345
-81.1921	41.3631	349
-81.2929	41.4184	364
-81.2234	41.3936	370
-81.1924	41.3704	351
-81.2376	41.3823	368
-81.2248	41.4160	368
-81.2388	41.3763	359
-81.1916	41.4214	343
-81.2400	41.3800	368
-81.2429	41.3796	370
-81.2804	41.4103	359
-81.2600	41.4000	380
-81.1906	41.4206	345
-81.2450	41.3781	375
-81.2289	41.3590	346
-81.2509	41.4023	368
-81.2771	41.3784	359
-81.2649	41.3894	363
-81.2916	41.4014	375
-81.2327	41.4159	369
-81.2347	41.4153	369
-81.2552	41.3480	357
-81.2315	41.3785	367
-81.2374	41.3783	360
-81.2660	41.4152	356
-81.2754	41.3988	356
-81.2437	41.3888	374

-81.2556	41.3600	356
-81.2507	41.3980	371
-81.2205	41.4120	381
-81.2669	41.3546	357
-81.2460	41.3661	349
-81.2310	41.3943	373
-81.1955	41.4207	351
-81.3919	41.4135	369
-81.2219	41.3942	369
-81.2699	41.4201	366
-81.2543	41.3539	365
-81.2580	41.3929	367
-81.2638	41.4069	359
-81.2626	41.3585	359
-81.2955	41.3904	362
-81.2955	41.4186	369
-81.2569	41.3856	356
-81.2597	41.3569	367
-81.2243	41.3915	375
-81.2158	41.4078	376
-81.2841	41.3519	358
-81.1803	41.3656	360
-81.2567	41.4494	375
-81.2595	41.3871	361
-81.2556	41.3935	366
-81.2537	41.4015	376
-81.2140	41.3764	354
-81.2563	41.3866	358
-81.2293	41.3780	366
-81.2863	41.3572	352
-81.2900	41.3900	368
-81.2534	41.3765	365
-81.2930	41.3919	367
-81.2147	41.3733	355
-81.2162	41.3748	355
-81.2974	41.3510	346
-81.2793	41.3496	366
-81.2877	41.3873	369
-81.2632	41.3845	358

-81.2235	41.3905	378
-81.2876	41.3574	351
-81.2805	41.4038	372
-81.2278	41.3759	361
-81.2353	41.4043	368
-81.2971	41.4103	386
-81.2313	41.3808	379
-81.2917	41.3862	380
-81.2305	41.3808	380
-81.2560	41.3474	365
-81.2588	41.3549	364
-81.2047	41.4247	350
-81.2407	41.3660	350
-81.2752	41.4160	372
-81.2146	41.4037	367
-81.3369	41.4107	366
-81.3786	41.4038	303
-81.3912	41.4129	292
-81.3364	41.3775	354
-81.3043	41.3655	354
-81.3302	41.3775	370
-81.3234	41.3873	359
-81.3049	41.3884	355
-81.3576	41.4033	333
-81.3372	41.3753	394
-81.3035	41.3875	353
-81.3257	41.4195	371
-81.3140	41.3992	365
-81.3603	41.3550	299
-81.3891	41.4122	289
-81.3891	41.4153	289
-81.3291	41.3723	371
-81.3697	41.4039	332
-81.3108	41.3594	338
-81.3331	41.3631	335
-81.3423	41.4236	367
-81.3397	41.3726	333
-81.3659	41.4028	348
-81.3363	41.3495	317

-81.3879	41.4155	291
-81.3481	41.3652	350
-81.3483	41.3651	351
-81.3338	41.4198	370
-81.3431	41.4105	354
-81.3336	41.3797	358
-81.3863	41.4138	297
-81.3372	41.3823	358
-81.3637	41.3832	311
-81.3180	41.3784	353
-81.3230	41.3668	347
-81.3581	41.3964	326
-81.3713	41.4171	339
-81.3522	41.4022	324
-81.3493	41.3597	359
-81.3299	41.3534	336
-81.3842	41.4144	300
-81.3097	41.3669	353
-81.3311	41.4222	370
-81.3877	41.4121	295
-81.3255	41.3976	343
-81.3826	41.4153	303
-81.3370	41.3813	357
-81.3439	41.4031	335
-81.3815	41.4151	305
-81.3256	41.3805	373
-81.3264	41.4245	372
-81.3125	41.4156	379
-81.3258	41.4161	375
-81.3737	41.4181	336
-81.3024	41.3645	358
-81.3037	41.3624	357
-81.3823	41.4224	297
-81.3183	41.3835	359
-81.3755	41.4022	310
-81.3278	41.3813	371
-81.3054	41.3593	351
-81.3094	41.4075	376
-81.3359	41.3568	336

-81.3300	41.3544	337
-81.3007	41.4095	384
-81.3456	41.3551	351
-81.3418	41.3933	363
-81.3435	41.4080	355
-81.3274	41.3531	334
-81.3424	41.4240	365
-81.3134	41.4180	377
-81.2983	41.3965	375
-81.3395	41.4230	366
-81.3444	41.3568	356
-81.1241	41.4335	354
-81.1053	41.4619	348
-81.1053	41.4614	349
-81.1710	41.4726	365
-81.1817	41.4564	349
-81.1299	41.4801	389
-81.1492	41.4670	387
-81.1425	41.4893	375
-81.1009	41.4383	383
-81.1011	41.4481	368
-81.1358	41.4581	338
-81.1575	41.4724	357
-81.1061	41.4583	357
-81.1528	41.4906	349
-81.1213	41.4495	376
-81.1589	41.4920	350
-81.1262	41.5003	400
-81.1194	41.4523	365
-81.1377	41.4752	374
-81.1179	41.4348	364
-81.1708	41.4730	365
-81.1156	41.4358	367
-81.1055	41.4469	366
-81.1350	41.4741	380
-81.1620	41.4368	369
-81.1059	41.4269	374
-81.1095	41.4322	371
-81.1086	41.4599	357

-81.2428	41.6117	353
-81.2426	41.5917	397
-81.2630	41.5814	395
-81.2764	41.5848	396
-81.2859	41.5942	310
-81.2297	41.5739	404
-81.2564	41.5794	402
-81.2009	41.6219	339
-81.2788	41.6290	344
-81.2482	41.5784	394
-81.2581	41.6198	320
-81.2224	41.6338	346
-81.2868	41.5924	309
-81.1989	41.5884	376
-81.2150	41.6322	334
-81.2807	41.6289	343
-81.2572	41.6056	356
-81.2704	41.5697	383
-81.2257	41.6165	348
-81.2008	41.6141	346
-81.1632	41.5321	355
-81.2341	41.5700	406
-81.2499	41.5839	400
-81.2362	41.6000	396
-81.2578	41.5767	394
-81.3442	41.5628	330
-81.3611	41.5032	325
-81.3767	41.5178	331
-81.3742	41.5281	331
-81.3793	41.5115	334
-81.3620	41.5142	351
-81.3787	41.5084	335
-81.3790	41.5127	335
-81.3577	41.5139	341
-81.3362	41.5176	365
-81.3885	41.4990	305
-81.3426	41.5635	328
-81.3712	41.5135	342
-81.3650	41.5367	358

-81.3831	41.5133	334
-81.3636	41.5024	325
-81.3563	41.5012	328
-81.3755	41.5148	336
-81.3524	41.5292	377
-81.3527	41.5073	333
-81.3678	41.5190	337
-81.3337	41.5654	319
-81.3404	41.5615	332
-81.3566	41.5689	325
-81.3451	41.5538	348
-81.3470	41.5150	348
-81.3438	41.5127	345
-81.3787	41.5355	328
-81.3736	41.5234	330
-81.3645	41.5556	334
-81.3905	41.5395	325
-81.3481	41.5360	377
-81.3862	41.5212	325
-81.3208	41.5400	338
-81.3585	41.5482	375
-81.3605	41.5645	327
-81.3181	41.5142	337
-81.3430	41.5386	364
-81.3313	41.5592	327
-81.3506	41.5014	332
-81.3640	41.5336	365
-81.3348	41.5641	323
-81.3774	41.5315	328
-81.3814	41.5430	325
-81.3751	41.5397	333
-81.3807	41.5643	323
-81.3413	41.5252	371
-81.3547	41.5379	382
-81.3821	41.5088	326
-81.3837	41.5220	330
-81.3024	41.5411	314
-81.1636	41.5246	368
-81.1798	41.5620	372

-81.1198	41.5275	377
-81.1662	41.5276	349
-81.1796	41.5654	364
-81.1163	41.5625	375
-81.1374	41.5545	374
-81.1475	41.5436	380
-81.1452	41.5463	381
-81.1363	41.5208	415
-81.1251	41.5230	390
-81.1773	41.5469	369
-81.0000	41.5660	361
-81.1272	41.5318	378
-81.1703	41.5559	355
-81.1931	41.5036	402
-81.1246	41.5521	373
-81.1825	41.5090	382
-81.1077	41.5424	354
-81.1529	41.5226	383
-81.1590	41.5207	387
-81.1756	41.5612	378
-81.1425	41.6175	393
-81.1630	41.5758	385
-81.1063	41.5870	377
-81.1370	41.6079	393
-81.1367	41.6094	391
-81.1987	41.5810	377
-81.1380	41.6025	386
-81.1531	41.5935	401
-81.1515	41.5801	384
-81.1444	41.6021	394
-81.1770	41.6282	351
-81.1646	41.5934	391
-81.1507	41.6407	349
-81.1393	41.6107	389
-81.1680	41.6122	362
-81.1305	41.5758	369
-81.1319	41.6115	387
-81.1486	41.6377	355
-81.1496	41.6064	389

-81.0596	41.5058	368
-81.0757	41.5618	382
-81.0111	41.5651	335
-81.0727	41.5672	383
-81.0722	41.6048	388
-81.0815	41.5031	364
-81.0197	41.5332	332
-81.0756	41.5458	378
-81.0518	41.5524	369
-81.0589	41.5330	384
-81.0852	41.5215	385
-81.0697	41.5205	361
-81.0900	41.5347	378
-81.0921	41.5394	360
-81.0856	41.5159	370
-81.0877	41.5439	375
-81.0839	41.5442	379
-81.0648	41.5371	379
-81.0032	41.4255	297
-81.0909	41.4899	367
-81.0973	41.4407	380
-81.0831	41.4523	356
-81.0897	41.4617	361
-81.0891	41.5006	383
-81.0825	41.4529	356
-81.1009	41.4503	368
-81.0724	41.4498	360
-81.0919	41.5003	375
-81.0221	41.4791	354
-81.0232	41.4633	365
-81.0510	41.4110	375
-81.0722	41.4620	343
-81.0382	41.4640	355
-81.0799	41.4531	352
-81.0513	41.4669	357
-81.0568	41.4274	355
-81.0808	41.4486	354
-81.0896	41.4936	379
-81.0610	41.4386	355

-81.0957	41.4277	387
-81.0436	41.4271	353
-81.0288	41.4326	300
-81.1078	41.4575	357
-81.0453	41.6418	354
-81.0060	41.6420	334
-81.0812	41.6407	373
-81.0715	41.5830	381
-81.0748	41.6259	389
-81.0552	41.5981	377
-81.0657	41.6413	391
-81.0750	41.6242	390
-81.0674	41.6256	393
-81.0571	41.5795	394
-81.0569	41.6166	388
-81.0505	41.6169	375
-81.0725	41.6338	389
-81.0116	41.6387	344
-81.0132	41.6171	344
-81.0701	41.6361	386
-81.0559	41.6090	383
-81.0032	41.5940	332
-81.2633	41.5406	395
-81.2426	41.5528	401
-81.2422	41.5055	410
-81.2156	41.5234	389
-81.2177	41.5350	380
-81.2327	41.5536	375
-81.2376	41.5152	414
-81.1965	41.5162	387
-81.2283	41.5593	401
-81.2059	41.5118	376
-81.2451	41.5070	400
-81.2346	41.5529	377
-81.2462	41.5458	390
-81.2535	41.5055	365
-81.2483	41.5469	382
-81.2622	41.5344	390
-81.2948	41.5006	358

-81.2792	41.4685	374
-81.2320	41.5113	393
-81.2011	41.5019	401
-81.2046	41.5075	393
-81.2279	41.5005	376
-81.2390	41.5054	409
-81.2403	41.5468	378
-81.2486	41.5547	400
-81.2556	41.5570	380
-81.2004	41.5147	377
-81.2273	41.5608	399
-81.2103	41.5178	373
-81.2222	41.5257	367
-81.2965	41.5033	334
-81.2706	41.5642	369
-81.2902	41.5607	325
-81.2411	41.5572	386
-81.2163	41.5297	383
-81.2692	41.5664	389
-81.1894	41.5040	405
-81.2308	41.5146	381
-81.2754	41.5618	378
-81.2034	41.5102	387
-81.2380	41.5067	401
-81.2521	41.5572	388
-81.1976	41.5096	393
-81.2302	41.5572	393
-81.2374	41.5543	387
-81.2297	41.5570	389
-81.2160	41.5685	395
-81.2892	41.5523	304
-81.1924	41.5370	372
-81.2203	41.5213	378
-81.2791	41.5192	341
-81.2691	41.5356	387
-81.2052	41.5156	367
-81.2522	41.5558	389
-81.2780	41.5578	322
-81.2790	41.5204	353

-81.2478	41.5497	391
-81.2350	41.5536	384
-81.2222	41.5183	364
-81.2352	41.5714	407
-81.2019	41.5137	375
-81.2389	41.5611	397
-81.2276	41.5056	374
-81.1987	41.5240	367
-81.2604	41.5484	394
-81.2334	41.5025	384
-81.2342	41.5575	400
-81.2723	41.5302	376
-81.2764	41.5484	371
-81.2197	41.5279	379
-81.2865	41.5611	334
-81.2477	41.5514	389
-81.2320	41.5653	408
-81.2060	41.5091	389
-81.2965	41.4279	368
-81.2429	41.4967	387
-81.2180	41.4914	383
-81.2518	41.4300	361
-81.3577	41.4369	337
-81.2073	41.4941	400
-81.2539	41.4538	372
-81.2801	41.4651	372
-81.2832	41.4673	384
-81.2631	41.4828	351
-81.2687	41.4616	362
-81.2483	41.4698	371
-81.2397	41.5044	413
-81.2791	41.4892	372
-81.2855	41.4380	356
-81.2482	41.4359	366
-81.1972	41.4707	378
-81.2171	41.4691	364
-81.2885	41.4297	374
-81.2282	41.4204	370
-81.2133	41.4465	367
-81.2754	41.4337	369
-81.2717	41.4687	368
-81.2734	41.4664	366
-81.2712	41.4482	377
-81.2463	41.4668	378
-81.2228	41.4907	379
-81.2480	41.4543	373
-81.2172	41.4434	369
-81.1948	41.4421	352
-81.2929	41.4787	366
-81.1928	41.4999	403
-81.2766	41.4931	360
-81.2486	41.4573	379
-81.2041	41.4288	353
-81.2888	41.4788	369
-81.2801	41.4368	372
-81.1973	41.4208	354
-81.2832	41.4304	370
-81.2312	41.5026	379
-81.2952	41.4651	376
-81.2381	41.4929	356
-81.2416	41.4968	388
-81.2918	41.4647	380
-81.2869	41.4268	370
-81.0979	41.3612	349
-81.0051	41.3543	378
-81.0241	41.4095	347
-81.0687	41.3725	342
-81.0667	41.3720	336
-81.0589	41.3584	336
-81.0676	41.3730	345
-81.0592	41.4113	366
-81.0855	41.3550	345
-81.0209	41.3513	283
-81.0497	41.4107	372
-81.0556	41.4670	355
-81.0623	41.3761	357
-81.1065	41.4129	393
-81.0548	41.3496	348

-81.0802	41.4013	374
-81.0330	41.4099	350
-81.0377	41.3806	329
-81.0240	41.4040	344
-81.0843	41.4156	386
-81.0240	41.4140	331
-81.0045	41.3497	284
-81.0597	41.3499	340
-81.0990	41.4238	388
-81.0633	41.3553	340
-81.0815	41.3757	348
-81.3340	41.4296	368
-81.2993	41.4306	368
-81.3653	41.4317	342
-81.3331	41.4381	359
-81.3566	41.4978	327
-81.3821	41.4511	315
-81.3609	41.4932	322
-81.3973	41.4470	274
-81.3421	41.4514	347
-81.3594	41.5163	340
-81.3397	41.4848	328
-81.3487	41.4498	339
-81.3263	41.4677	356
-81.3448	41.4662	318
-81.3292	41.4751	354
-81.3651	41.4258	352
-81.3594	41.4712	325
-81.3293	41.4297	375
-81.3325	41.4264	375
-81.3526	41.4364	344
-81.3688	41.4288	338
-81.3420	41.4339	359
-81.3898	41.4536	279
-81.3720	41.4877	308
-81.3282	41.4296	374
-81.3073	41.4409	369
-81.3132	41.4438	361
-81.3440	41.4660	320

-81.3483	41.4336	354
-81.3778	41.4565	314
-81.3251	41.4336	368
-81.3243	41.4349	365
-81.3255	41.3976	342
-81.3497	41.4383	350
-81.3081	41.4351	365
-81.3421	41.4277	356
-81.3697	41.4340	333
-81.3235	41.4645	355
-81.3445	41.4272	351
-81.3299	41.4250	377
-81.3490	41.4393	353
-81.3034	41.4743	362
-81.3464	41.4677	319
-81.3465	41.4255	345
-81.3364	41.4690	313
-81.3019	41.4687	371
-81.3084	41.4267	355
-81.3596	41.4679	328
-81.3467	41.4298	349
-81.3256	41.4288	375
-81.3578	41.4988	323
-81.3718	41.4663	307
-81.3756	41.4330	325
-81.3291	41.4260	377
-81.3151	41.4666	359
-81.3501	41.4340	344
-81.3351	41.4282	370
-81.3666	41.4296	340
-81.0130	41.6412	338
-81.0970	41.6859	326
-81.0397	41.6950	342
-81.0145	41.6654	334
-81.0108	41.6459	342
-81.0035	41.6912	311
-81.0915	41.6909	329
-81.0899	41.6682	344
-81.1853	41.4298	338

-81.1453	41.3592	354
-81.1388	41.3787	369
-81.1744	41.3693	355
-81.1783	41.3595	351
-81.1295	41.3633	344
-81.1321	41.4335	352
-81.1286	41.4257	371
-81.1645	41.3875	347
-81.1061	41.4190	377

-81.1253	41.3879	370
-81.1365	41.4105	355
-81.1739	41.3816	363
-81.1043	41.4269	377
-81.1859	41.4249	340
-81.1041	41.4228	377
-81.1624	41.3483	340
-81.1510	41.3506	362
-81.1754	41.3629	349

Appendix - VI

Potentiometric Surface Map of Sharon Aquifer, Geauga County (Based on 617 Water Well Logs)

Longitude	Latitude	potentiometric map (m)
-81.2368	41.3501	347.43
-81.2426	41.3854	352.76
-81.2633	41.3574	346.76
-81.2678	41.3589	351.81
-81.2700	41.3570	345.76
-81.2903	41.4128	360.43
-81.2794	41.4112	354.43
-81.2406	41.3867	357.81
-81.2895	41.4145	357.90
-81.2393	41.4222	362.43
-81.2338	41.3898	360.81
-81.2260	41.3482	343.68
-81.2358	41.4180	361.38
-81.2484	41.4157	358.86
-81.2373	41.3758	349.38
-81.2419	41.3905	355.86
-81.2238	41.4235	365.60
-81.2278	41.3099	367.56
-81.2957	41.3782	339.25
-81.2465	41.3839	360.68
-81.2136	41.3936	352.90
-81.2555	41.3634	352.95
-81.2459	41.3884	371.78
-81.2854	41.3855	348.81
-81.2954	41.4181	361.38
-81.1991	41.3995	332.81
-81.1921	41.3631	343.51
-81.2929	41.4184	359.43
-81.2234	41.3936	359.33
-81.1924	41.3704	337.28
-81.2376	41.3823	359.47
-81.2248	41.4160	361.90
-81.2388	41.3763	348.33
-81.1916	41.4214	341.48
-81.2400	41.3800	356.42
-81.2429	41.3796	354.76
-81.2804	41.4103	358.54
-81.2600	41.4000	357.75
-81.1906	41.4206	342.26
-81.2450	41.3781	356.71
-81.2289	41.3590	343.87
-81.2509	41.4023	357.94
-81.2771	41.3784	351.38
-81.2649	41.3894	353.55
-81.2916	41.4014	362.81
-81.2327	41.4159	361.08
-81.2347	41.4153	361.38
-81.2552	41.3480	347.86
-81.2315	41.3785	356.33
-81.2374	41.3783	356.95
-81.2660	41.4152	348.99

-81.2556	41.3600	349.60
-81.2754	41.3988	351.43
-81.2437	41.3888	358.76
-81.2507	41.3980	363.38
-81.2205	41.4120	365.76
-81.2669	41.3546	347.86
-81.2460	41.3661	344.43
-81.2310	41.3943	362.33
-81.1955	41.4207	347.34
-81.3919	41.4135	365.95
-81.2219	41.3942	357.72
-81.2699	41.4201	358.99
-81.2543	41.3539	358.90
-81.2580	41.3929	356.64
-81.2638	41.4069	356.56
-81.2626	41.3585	334.01
-81.2955	41.3904	351.64
-81.2955	41.4186	358.33
-81.2569	41.3856	346.86
-81.2597	41.3569	346.58
-81.2243	41.3915	360.67
-81.2158	41.4078	354.66
-81.2841	41.3519	345.81
-81.1803	41.3656	337.75
-81.2567	41.4494	352.44
-81.2595	41.3871	351.86
-81.2556	41.3935	353.81
-81.2537	41.4015	360.76
-81.2140	41.3764	342.42
-81.2563	41.3866	351.90
-81.2293	41.3780	351.98
-81.2863	41.3572	341.33
-81.2900	41.3900	355.81
-81.2534	41.3765	350.98
-81.2930	41.3919	351.76
-81.2147	41.3733	346.47
-81.2162	41.3748	344.03
-81.2974	41.3510	339.90
-81.2793	41.3496	347.71
-81.2877	41.3873	353.15
-81.2632	41.3845	347.33
-81.2235	41.3905	359.71
-81.2876	41.3574	341.86
-81.2805	41.4038	359.81
-81.2278	41.3759	351.25
-81.2353	41.4043	354.59
-81.2971	41.4103	358.57
-81.2313	41.3808	357.05
-81.2917	41.3862	367.81
-81.2305	41.3808	354.09
-81.2560	41.3474	352.20
-81.2588	41.3549	347.24
-81.2047	41.4247	323.79
-81.2407	41.3660	323.79
-81.2752	41.4160	356.76
-81.2146	41.4037	345.36
-81.3369	41.4107	355.64
-81.3786	41.4038	292.94
-81.3912	41.4129	269.75
-81.3364	41.3775	349.43
-81.3043	41.3655	341.81
-81.3302	41.3775	356.89
-81.3234	41.3873	344.98
-81.3049	41.3884	336.71
-81.3576	41.4033	317.15
-81.3372	41.3753	384.86
-81.3035	41.3875	343.86
-81.3257	41.4195	355.76
-81.3140	41.3992	352.81
-81.3603	41.3550	293.51
-81.3891	41.4122	268.27
-81.3891	41.4153	268.27
-81.3291	41.3723	349.05
-81.3697	41.4039	325.60
-81.3108	41.3594	333.73
-81.3331	41.3631	327.38
-81.3423	41.4236	356.64
-81.3397	41.3726	323.86

-81.3659	41.4028	338.86
-81.3363	41.3495	310.90
-81.3879	41.4155	272.10
-81.3481	41.3652	336.28
-81.3483	41.3651	337.59
-81.3338	41.4198	358.42
-81.3431	41.4105	352.48
-81.3336	41.3797	351.90
-81.3863	41.4138	274.14
-81.3372	41.3823	347.03
-81.3637	41.3832	292.71
-81.3180	41.3784	339.28
-81.3230	41.3668	328.10
-81.3581	41.3964	316.86
-81.3713	41.4171	325.59
-81.3522	41.4022	303.27
-81.3493	41.3597	332.18
-81.3299	41.3534	326.86
-81.3842	41.4144	278.36
-81.3097	41.3669	342.64
-81.3311	41.4222	357.81
-81.3877	41.4121	275.49
-81.3255	41.3976	336.90
-81.3826	41.4153	287.15
-81.3370	41.3813	350.60
-81.3439	41.4031	313.05
-81.3815	41.4151	283.97
-81.3256	41.3805	350.14
-81.3264	41.4245	356.76
-81.3125	41.4156	369.86
-81.3258	41.4161	355.19
-81.3737	41.4181	332.34
-81.3024	41.3645	336.66
-81.3037	41.3624	340.85
-81.3823	41.4224	287.86
-81.3183	41.3835	346.81
-81.3755	41.4022	285.01
-81.3278	41.3813	349.66
-81.3054	41.3593	340.33

-81.3094	41.4075	357.71
-81.3359	41.3568	326.25
-81.3300	41.3544	321.15
-81.3007	41.4095	378.82
-81.3456	41.3551	334.24
-81.3418	41.3933	358.43
-81.3435	41.4080	351.04
-81.3274	41.3531	323.33
-81.3424	41.4240	360.43
-81.3134	41.4180	361.15
-81.2983	41.3965	360.06
-81.3395	41.4230	356.86
-81.3444	41.3568	337.71
-81.1241	41.4335	341.81
-81.1053	41.4619	346.48
-81.1053	41.4614	342.60
-81.1710	41.4726	351.89
-81.1817	41.4564	341.38
-81.1299	41.4801	358.52
-81.1492	41.4670	367.49
-81.1425	41.4893	359.76
-81.1009	41.4383	359.53
-81.1011	41.4481	355.00
-81.1358	41.4581	323.37
-81.1575	41.4724	350.60
-81.1061	41.4583	350.90
-81.1528	41.4906	341.68
-81.1213	41.4495	356.19
-81.1589	41.4920	325.62
-81.1262	41.5003	377.75
-81.1194	41.4523	355.86
-81.1377	41.4752	355.10
-81.1179	41.4348	353.03
-81.1708	41.4730	351.59
-81.1156	41.4358	361.21
-81.1055	41.4469	357.16
-81.1350	41.4741	361.71
-81.1620	41.4368	367.48
-81.1059	41.4269	357.24

-81.1095	41.4322	362.47
-81.1086	41.4599	351.82
-81.2428	41.6117	334.10
-81.2426	41.5917	377.49
-81.2630	41.5814	387.38
-81.2764	41.5848	377.10
-81.2859	41.5942	305.12
-81.2297	41.5739	388.76
-81.2564	41.5794	382.19
-81.2009	41.6219	314.92
-81.2788	41.6290	338.51
-81.2482	41.5784	380.59
-81.2581	41.6198	311.47
-81.2224	41.6338	323.75
-81.2868	41.5924	294.37
-81.1989	41.5884	357.71
-81.2150	41.6322	315.71
-81.2807	41.6289	329.59
-81.2572	41.6056	331.92
-81.2704	41.5697	365.32
-81.2257	41.6165	329.10
-81.2008	41.6141	319.79
-81.1632	41.5321	348.90
-81.2341	41.5700	387.41
-81.2499	41.5839	381.71
-81.2362	41.6000	386.86
-81.2578	41.5767	378.76
-81.3442	41.5628	308.97
-81.3611	41.5032	310.06
-81.3767	41.5178	306.62
-81.3742	41.5281	315.76
-81.3793	41.5115	308.70
-81.3620	41.5142	312.90
-81.3787	41.5084	301.17
-81.3790	41.5127	305.74
-81.3577	41.5139	315.09
-81.3362	41.5176	359.21
-81.3885	41.4990	295.86
-81.3426	41.5635	312.76

-81.3712	41.5135	305.42
-81.3650	41.5367	330.57
-81.3831	41.5133	309.92
-81.3636	41.5024	309.15
-81.3563	41.5012	313.37
-81.3755	41.5148	309.79
-81.3524	41.5292	367.86
-81.3527	41.5073	311.97
-81.3678	41.5190	309.57
-81.3337	41.5654	304.98
-81.3404	41.5615	315.85
-81.3566	41.5689	300.62
-81.3451	41.5538	312.95
-81.3470	41.5150	317.52
-81.3438	41.5127	326.71
-81.3787	41.5355	315.50
-81.3736	41.5234	312.93
-81.3645	41.5556	309.31
-81.3905	41.5395	309.15
-81.3481	41.5360	364.81
-81.3862	41.5212	301.23
-81.3208	41.5400	312.40
-81.3585	41.5482	361.89
-81.3605	41.5645	310.54
-81.3181	41.5142	316.27
-81.3430	41.5386	350.28
-81.3313	41.5592	305.66
-81.3506	41.5014	312.80
-81.3640	41.5336	359.51
-81.3348	41.5641	310.20
-81.3774	41.5315	310.32
-81.3814	41.5430	310.98
-81.3751	41.5397	316.24
-81.3807	41.5643	301.66
-81.3413	41.5252	361.86
-81.3547	41.5379	363.10
-81.3821	41.5088	311.06
-81.3837	41.5220	304.09
-81.3024	41.5411	307.90

-81.1636	41.5246	361.60
-81.1798	41.5620	367.73
-81.1198	41.5275	371.21
-81.1662	41.5276	344.12
-81.1796	41.5654	356.99
-81.1163	41.5625	368.29
-81.1374	41.5545	367.60
-81.1475	41.5436	373.60
-81.1452	41.5463	378.56
-81.1363	41.5208	408.90
-81.1251	41.5230	387.26
-81.1773	41.5469	360.16
-81.0000	41.5660	354.29
-81.1272	41.5318	376.78
-81.1703	41.5559	353.02
-81.1931	41.5036	374.57
-81.1246	41.5521	368.73
-81.1825	41.5090	359.75
-81.1077	41.5424	346.38
-81.1529	41.5226	373.86
-81.1590	41.5207	369.63
-81.1756	41.5612	369.77
-81.1425	41.6175	382.33
-81.1630	41.5758	382.56
-81.1063	41.5870	374.26
-81.1370	41.6079	380.81
-81.1367	41.6094	382.47
-81.1987	41.5810	358.71
-81.1380	41.6025	381.43
-81.1531	41.5935	388.81
-81.1515	41.5801	377.90
-81.1444	41.6021	383.33
-81.1770	41.6282	327.84
-81.1646	41.5934	384.90
-81.1507	41.6407	323.70
-81.1393	41.6107	383.82
-81.1680	41.6122	336.09
-81.1305	41.5758	364.43
-81.1319	41.6115	377.55

-81.1486	41.6377	325.43
-81.1496	41.6064	381.08
-81.0596	41.5058	355.20
-81.0757	41.5618	376.51
-81.0111	41.5651	315.19
-81.0727	41.5672	370.81
-81.0722	41.6048	380.38
-81.0815	41.5031	356.68
-81.0197	41.5332	305.18
-81.0756	41.5458	370.38
-81.0518	41.5524	361.38
-81.0589	41.5330	368.46
-81.0852	41.5215	375.86
-81.0697	41.5205	358.87
-81.0900	41.5347	364.59
-81.0921	41.5394	353.60
-81.0856	41.5159	360.86
-81.0877	41.5439	367.38
-81.0839	41.5442	363.76
-81.0648	41.5371	354.31
-81.0032	41.4255	275.66
-81.0909	41.4899	360.90
-81.0973	41.4407	361.41
-81.0831	41.4523	339.24
-81.0897	41.4617	353.08
-81.0891	41.5006	361.66
-81.0825	41.4529	348.38
-81.1009	41.4503	362.82
-81.0724	41.4498	348.42
-81.0919	41.5003	358.85
-81.0221	41.4791	341.81
-81.0232	41.4633	347.93
-81.0510	41.4110	363.11
-81.0722	41.4620	336.29
-81.0382	41.4640	338.54
-81.0799	41.4531	351.39
-81.0513	41.4669	352.43
-81.0568	41.4274	345.25
-81.0808	41.4486	353.39

-81.0896	41.4936	366.81
-81.0610	41.4386	350.43
-81.0957	41.4277	365.36
-81.0436	41.4271	349.95
-81.0288	41.4326	292.08
-81.1078	41.4575	350.90
-81.0453	41.6418	331.75
-81.0060	41.6420	325.16
-81.0812	41.6407	372.39
-81.0715	41.5830	369.72
-81.0748	41.6259	371.02
-81.0552	41.5981	373.34
-81.0657	41.6413	375.15
-81.0750	41.6242	380.55
-81.0674	41.6256	375.32
-81.0571	41.5795	369.62
-81.0569	41.6166	373.37
-81.0505	41.6169	365.86
-81.0725	41.6338	373.76
-81.0116	41.6387	324.19
-81.0132	41.6171	322.36
-81.0701	41.6361	372.89
-81.0559	41.6090	372.33
-81.0032	41.5940	326.82
-81.2633	41.5406	383.11
-81.2426	41.5528	377.84
-81.2422	41.5055	378.61
-81.2156	41.5234	373.76
-81.2177	41.5350	372.68
-81.2327	41.5536	368.60
-81.2376	41.5152	378.95
-81.1965	41.5162	366.27
-81.2283	41.5593	395.51
-81.2059	41.5118	371.12
-81.2451	41.5070	374.09
-81.2346	41.5529	363.89
-81.2462	41.5458	383.90
-81.2535	41.5055	355.86
-81.2483	41.5469	375.90

-81.2622	41.5344	384.51
-81.2948	41.5006	353.73
-81.2792	41.4685	354.19
-81.2320	41.5113	372.88
-81.2011	41.5019	370.52
-81.2046	41.5075	368.01
-81.2279	41.5005	358.63
-81.2390	41.5054	372.42
-81.2403	41.5468	364.28
-81.2486	41.5547	382.32
-81.2556	41.5570	379.39
-81.2004	41.5147	368.77
-81.2273	41.5608	385.28
-81.2103	41.5178	365.99
-81.2222	41.5257	351.76
-81.2965	41.5033	318.76
-81.2706	41.5642	359.55
-81.2902	41.5607	305.80
-81.2411	41.5572	384.78
-81.2163	41.5297	376.29
-81.2692	41.5664	370.71
-81.1894	41.5040	377.57
-81.2308	41.5146	363.32
-81.2754	41.5618	365.20
-81.2034	41.5102	367.19
-81.2380	41.5067	374.18
-81.2521	41.5572	381.29
-81.1976	41.5096	378.37
-81.2302	41.5572	376.85
-81.2374	41.5543	379.08
-81.2297	41.5570	379.86
-81.2160	41.5685	381.28
-81.2892	41.5523	297.90
-81.1924	41.5370	370.48
-81.2203	41.5213	363.98
-81.2791	41.5192	334.29
-81.2691	41.5356	374.81
-81.2052	41.5156	365.48
-81.2522	41.5558	376.50

-81.2780	41.5578	299.14
-81.2790	41.5204	345.38
-81.2478	41.5497	380.33
-81.2350	41.5536	362.05
-81.2222	41.5183	355.16
-81.2352	41.5714	388.41
-81.2019	41.5137	370.73
-81.2389	41.5611	385.42
-81.2276	41.5056	357.24
-81.1987	41.5240	358.16
-81.2604	41.5484	376.63
-81.2334	41.5025	373.94
-81.2342	41.5575	379.88
-81.2723	41.5302	369.29
-81.2764	41.5484	367.95
-81.2197	41.5279	371.68
-81.2865	41.5611	308.09
-81.2477	41.5514	367.66
-81.2320	41.5653	380.57
-81.2060	41.5091	372.54
-81.2965	41.4279	354.89
-81.2429	41.4967	368.71
-81.2180	41.4914	360.44
-81.2518	41.4300	353.38
-81.3577	41.4369	317.19
-81.2073	41.4941	378.66
-81.2539	41.4538	359.50
-81.2801	41.4651	359.20
-81.2832	41.4673	365.10
-81.2631	41.4828	340.33
-81.2687	41.4616	358.04
-81.2483	41.4698	363.68
-81.2397	41.5044	384.35
-81.2791	41.4892	367.43
-81.2855	41.4380	346.86
-81.2482	41.4359	360.82
-81.1972	41.4707	364.28
-81.2171	41.4691	350.28
-81.2885	41.4297	347.79

-81.2282	41.4204	364.82
-81.2133	41.4465	350.24
-81.2754	41.4337	359.25
-81.2717	41.4687	357.33
-81.2734	41.4664	353.81
-81.2712	41.4482	357.19
-81.2463	41.4668	364.89
-81.2228	41.4907	365.59
-81.2480	41.4543	362.03
-81.2172	41.4434	351.63
-81.1948	41.4421	336.15
-81.2929	41.4787	354.42
-81.1928	41.4999	371.61
-81.2766	41.4931	354.21
-81.2486	41.4573	366.81
-81.2041	41.4288	346.90
-81.2888	41.4788	356.81
-81.2801	41.4368	355.24
-81.1973	41.4208	349.73
-81.2832	41.4304	357.81
-81.2312	41.5026	369.86
-81.2952	41.4651	370.51
-81.2381	41.4929	349.90
-81.2416	41.4968	374.28
-81.2918	41.4647	367.81
-81.2869	41.4268	360.86
-81.0979	41.3612	341.38
-81.0051	41.3543	369.16
-81.0241	41.4095	308.29
-81.0687	41.3725	334.38
-81.0667	41.3720	334.48
-81.0589	41.3584	331.12
-81.0676	41.3730	335.25
-81.0592	41.4113	356.86
-81.0855	41.3550	337.99
-81.0209	41.3513	274.47
-81.0497	41.4107	351.27
-81.0556	41.4670	342.81
-81.0623	41.3761	344.20

-81.1065	41.4129	354.90
-81.0548	41.3496	337.33
-81.0802	41.4013	356.32
-81.0330	41.4099	342.08
-81.0377	41.3806	316.50
-81.0240	41.4040	326.02
-81.0843	41.4156	364.05
-81.0240	41.4140	328.56
-81.0045	41.3497	268.76
-81.0597	41.3499	325.06
-81.0990	41.4238	364.84
-81.0633	41.3553	335.43
-81.0815	41.3757	331.24
-81.3340	41.4296	352.76
-81.2993	41.4306	348.19
-81.3653	41.4317	329.81
-81.3331	41.4381	354.43
-81.3566	41.4978	311.76
-81.3821	41.4511	301.28
-81.3609	41.4932	310.72
-81.3973	41.4470	265.16
-81.3421	41.4514	341.82
-81.3594	41.5163	311.04
-81.3397	41.4848	318.86
-81.3487	41.4498	334.73
-81.3263	41.4677	349.90
-81.3448	41.4662	296.97
-81.3292	41.4751	347.90
-81.3651	41.4258	338.28
-81.3594	41.4712	300.62
-81.3293	41.4297	359.76
-81.3325	41.4264	355.19
-81.3526	41.4364	339.43
-81.3688	41.4288	335.87
-81.3420	41.4339	353.82
-81.3898	41.4536	263.76
-81.3720	41.4877	299.47
-81.3282	41.4296	358.76
-81.3073	41.4409	351.93

-81.3132	41.4438	353.08
-81.3440	41.4660	305.37
-81.3483	41.4336	346.99
-81.3778	41.4565	295.71
-81.3251	41.4336	360.38
-81.3243	41.4349	354.64
-81.3255	41.3976	329.81
-81.3497	41.4383	346.65
-81.3081	41.4351	355.86
-81.3421	41.4277	350.82
-81.3697	41.4340	326.90
-81.3235	41.4645	330.92
-81.3445	41.4272	343.99
-81.3299	41.4250	355.66
-81.3490	41.4393	347.51
-81.3034	41.4743	351.64
-81.3464	41.4677	303.76
-81.3465	41.4255	342.26
-81.3364	41.4690	297.15
-81.3019	41.4687	353.32
-81.3084	41.4267	347.99
-81.3596	41.4679	299.35
-81.3467	41.4298	344.43
-81.3256	41.4288	357.93
-81.3578	41.4988	309.28
-81.3718	41.4663	291.15
-81.3756	41.4330	282.33
-81.3291	41.4260	357.19
-81.3151	41.4666	347.72
-81.3501	41.4340	337.90
-81.3351	41.4282	355.37
-81.3666	41.4296	335.43
-81.0130	41.6412	324.89
-81.0970	41.6859	325.70
-81.0397	41.6950	337.12
-81.0145	41.6654	326.38
-81.0108	41.6459	325.24
-81.0035	41.6912	308.56
-81.0915	41.6909	323.51

-81.0899	41.6682	328.15
-81.1853	41.4298	333.43
-81.1453	41.3592	335.71
-81.1388	41.3787	351.02
-81.1744	41.3693	339.76
-81.1783	41.3595	344.60
-81.1295	41.3633	340.95
-81.1321	41.4335	345.29
-81.1286	41.4257	357.89
-81.1645	41.3875	340.60

-81.1061	41.4190	364.20
-81.1253	41.3879	354.76
-81.1365	41.4105	350.43
-81.1739	41.3816	356.29
-81.1043	41.4269	361.15
-81.1859	41.4249	330.86
-81.1041	41.4228	349.57
-81.1624	41.3483	334.82
-81.1510	41.3506	333.35
-81.1754	41.3629	344.12

Appendix - VII

Thickness of Sharon Sandstone Aquifer, Geauga County (Based on 617 Water Well Logs)

Longitude	Latitude	Aquifer thickness (m)
-81.2368	41.3501	0.61
-81.2426	41.3501	1.52
-81.2633	41.3501	1.52
-81.2678	41.3501	1.83
-81.2700	41.3501	1.83
-81.2903	41.3501	2.74
-81.2794	41.3501	3.05
-81.2406	41.3501	3.35
-81.2895	41.3501	3.66
-81.2393	41.3501	3.96
-81.2338	41.3501	4.27
-81.2260	41.3501	4.27
-81.2358	41.4180	4.57
-81.2484	41.4157	4.57
-81.2373	41.3758	5.49
-81.2419	41.3905	5.79
-81.2238	41.4235	6.40
-81.2278	41.3099	6.40
-81.2957	41.3782	6.71
-81.2465	41.3839	6.71
-81.2136	41.3936	6.71
-81.2555	41.3634	7.01
-81.2459	41.3884	7.32
-81.2854	41.3855	7.62
-81.2954	41.4181	8.23
-81.1991	41.3995	8.23
-81.1921	41.3631	8.84
-81.2929	41.4184	9.45
-81.2234	41.3936	9.45
-81.1924	41.3704	9.75
-81.2376	41.3823	9.75
-81.2248	41.4160	10.67
-81.2388	41.3763	10.67
-81.1916	41.4214	10.67
-81.2400	41.3800	11.28
-81.2429	41.3796	11.58
-81.2804	41.4103	11.89
-81.2600	41.4000	12.50
-81.1906	41.4206	12.80
-81.2450	41.3781	13.11
-81.2289	41.3590	13.41
-81.2509	41.4023	13.72
-81.2771	41.3784	13.72
-81.2649	41.3894	13.72
-81.2916	41.4014	14.02
-81.2327	41.4159	14.33
-81.2347	41.4153	14.63
-81.2552	41.3480	14.63
-81.2315	41.3785	15.85
-81.2374	41.3783	15.85
-81.2660	41.4152	15.85
-81.2754	41.3988	15.85
-81.2437	41.3888	17.07
-81.2556	41.3600	18.29
-81.2507	41.3980	18.90

-81.2205	41.4120	19.81
-81.2669	41.3546	21.03
-81.2460	41.3661	21.34
-81.2310	41.3943	21.95
-81.1955	41.4207	23.47
-81.3919	41.4135	24.38
-81.2219	41.3942	24.69
-81.2699	41.4201	26.52
-81.2543	41.3539	28.04
-81.2580	41.3929	29.26
-81.2638	41.4069	32.00
-81.2626	41.3585	4.57
-81.2955	41.3904	6.10
-81.2955	41.4186	6.40
-81.2569	41.3856	8.23
-81.2597	41.3569	10.06
-81.2243	41.3915	6.40
-81.2158	41.4078	7.92
-81.2841	41.3519	10.67
-81.1803	41.3656	19.20
-81.2567	41.4494	5.18
-81.2595	41.3871	12.19
-81.2556	41.3935	12.19
-81.2537	41.4015	13.72
-81.2140	41.3764	10.36
-81.2563	41.3866	15.24
-81.2293	41.3780	10.97
-81.2863	41.3572	13.72
-81.2900	41.3900	12.19
-81.2534	41.3765	14.94
-81.2930	41.3919	10.67
-81.2147	41.3733	17.07
-81.2162	41.3748	16.46
-81.2974	41.3510	17.07
-81.2793	41.3496	18.29
-81.2877	41.3873	17.37
-81.2632	41.3845	19.81
-81.2235	41.3905	14.94
-81.2876	41.3574	15.24

-81.2805	41.4038	18.90
-81.2278	41.3759	21.34
-81.2353	41.4043	19.81
-81.2971	41.4103	13.72
-81.2313	41.3808	19.81
-81.2917	41.3862	23.16
-81.2305	41.3808	16.76
-81.2560	41.3474	26.82
-81.2588	41.3549	21.34
-81.2047	41.4247	4.27
-81.2407	41.3660	10.06
-81.2752	41.4160	18.29
-81.2146	41.4037	25.60
-81.3369	41.4107	28.96
-81.3786	41.4038	6.40
-81.3912	41.4129	3.05
-81.3364	41.3775	11.89
-81.3043	41.3655	8.23
-81.3302	41.3775	23.16
-81.3234	41.3873	20.12
-81.3049	41.3884	24.99
-81.3576	41.4033	13.72
-81.3372	41.3753	18.59
-81.3035	41.3875	13.41
-81.3257	41.4195	12.19
-81.3140	41.3992	9.75
-81.3603	41.3550	6.40
-81.3891	41.4122	5.18
-81.3891	41.4153	28.96
-81.3291	41.3723	36.88
-81.3697	41.4039	14.33
-81.3108	41.3594	6.10
-81.3331	41.3631	3.05
-81.3423	41.4236	34.44
-81.3397	41.3726	5.49
-81.3659	41.4028	22.86
-81.3363	41.3495	17.07
-81.3879	41.4155	3.96
-81.3481	41.3652	25.60

-81.3483	41.3651	32.92
-81.3338	41.4198	9.45
-81.3431	41.4105	22.56
-81.3336	41.3797	17.07
-81.3863	41.4138	7.01
-81.3372	41.3823	10.67
-81.3637	41.3832	20.73
-81.3180	41.3784	23.16
-81.3230	41.3668	11.89
-81.3581	41.3964	15.24
-81.3713	41.4171	1.22
-81.3522	41.4022	28.04
-81.3493	41.3597	34.14
-81.3299	41.3534	18.29
-81.3842	41.4144	4.27
-81.3097	41.3669	19.20
-81.3311	41.4222	10.36
-81.3877	41.4121	7.32
-81.3255	41.3976	13.11
-81.3826	41.4153	9.75
-81.3370	41.3813	3.96
-81.3439	41.4031	12.19
-81.3815	41.4151	9.14
-81.3256	41.3805	9.14
-81.3264	41.4245	11.58
-81.3125	41.4156	16.76
-81.3258	41.4161	15.54
-81.3737	41.4181	18.90
-81.3024	41.3645	21.64
-81.3037	41.3624	14.33
-81.3823	41.4224	5.49
-81.3183	41.3835	17.68
-81.3755	41.4022	13.41
-81.3278	41.3813	32.00
-81.3054	41.3593	14.33
-81.3094	41.4075	25.91
-81.3359	41.3568	18.90
-81.3300	41.3544	11.58
-81.3007	41.4095	19.81

-81.3456	41.3551	24.08
-81.3418	41.3933	13.41
-81.3435	41.4080	20.12
-81.3274	41.3531	8.53
-81.3424	41.4240	28.96
-81.3134	41.4180	30.48
-81.2983	41.3965	9.45
-81.3395	41.4230	33.53
-81.3444	41.3568	9.14
-81.1241	41.4335	14.33
-81.1053	41.4619	10.06
-81.1053	41.4614	18.29
-81.1710	41.4726	24.38
-81.1817	41.4564	3.96
-81.1299	41.4801	29.87
-81.1492	41.4670	6.10
-81.1425	41.4893	17.07
-81.1009	41.4383	20.73
-81.1011	41.4481	25.60
-81.1358	41.4581	19.20
-81.1575	41.4724	15.24
-81.1061	41.4583	9.14
-81.1528	41.4906	2.74
-81.1213	41.4495	25.91
-81.1589	41.4920	8.23
-81.1262	41.5003	31.09
-81.1194	41.4523	19.51
-81.1377	41.4752	9.45
-81.1179	41.4348	20.73
-81.1708	41.4730	18.90
-81.1156	41.4358	14.33
-81.1055	41.4469	20.42
-81.1350	41.4741	14.02
-81.1620	41.4368	13.72
-81.1059	41.4269	34.75
-81.1095	41.4322	12.19
-81.1086	41.4599	7.01
-81.2428	41.6117	6.10
-81.2426	41.5917	15.24

-81.2630	41.5814	5.18
-81.2764	41.5848	11.28
-81.2859	41.5942	15.54
-81.2297	41.5739	25.60
-81.2564	41.5794	14.02
-81.2009	41.6219	16.76
-81.2788	41.6290	8.23
-81.2482	41.5784	14.63
-81.2581	41.6198	7.92
-81.2224	41.6338	18.90
-81.2868	41.5924	28.35
-81.1989	41.5884	20.73
-81.2150	41.6322	6.71
-81.2807	41.6289	4.88
-81.2572	41.6056	10.36
-81.2704	41.5697	12.19
-81.2257	41.6165	10.36
-81.2008	41.6141	14.94
-81.1632	41.5321	16.76
-81.2341	41.5700	8.23
-81.2499	41.5839	19.20
-81.2362	41.6000	10.36
-81.2578	41.5767	22.86
-81.3442	41.5628	6.71
-81.3611	41.5032	14.63
-81.3767	41.5178	9.75
-81.3742	41.5281	12.19
-81.3793	41.5115	9.14
-81.3620	41.5142	15.24
-81.3787	41.5084	14.94
-81.3790	41.5127	12.19
-81.3577	41.5139	14.63
-81.3362	41.5176	14.63
-81.3885	41.4990	12.80
-81.3426	41.5635	12.19
-81.3712	41.5135	10.06
-81.3650	41.5367	10.97
-81.3831	41.5133	12.19
-81.3636	41.5024	7.32

-81.3563	41.5012	5.49
-81.3755	41.5148	5.49
-81.3524	41.5292	12.80
-81.3527	41.5073	6.40
-81.3678	41.5190	15.85
-81.3337	41.5654	6.40
-81.3404	41.5615	16.15
-81.3566	41.5689	21.64
-81.3451	41.5538	18.29
-81.3470	41.5150	7.92
-81.3438	41.5127	3.35
-81.3787	41.5355	5.79
-81.3736	41.5234	13.11
-81.3645	41.5556	18.29
-81.3905	41.5395	9.75
-81.3481	41.5360	4.27
-81.3862	41.5212	17.68
-81.3208	41.5400	13.11
-81.3585	41.5482	7.92
-81.3605	41.5645	12.19
-81.3181	41.5142	9.14
-81.3430	41.5386	25.91
-81.3313	41.5592	9.75
-81.3506	41.5014	15.85
-81.3640	41.5336	24.99
-81.3348	41.5641	6.10
-81.3774	41.5315	14.63
-81.3814	41.5430	11.28
-81.3751	41.5397	13.11
-81.3807	41.5643	14.94
-81.3413	41.5252	12.80
-81.3547	41.5379	17.68
-81.3821	41.5088	6.40
-81.3837	41.5220	14.63
-81.3024	41.5411	18.29
-81.1636	41.5246	11.28
-81.1798	41.5620	9.45
-81.1198	41.5275	20.42
-81.1662	41.5276	15.54

-81.1796	41.5654	8.53
-81.1163	41.5625	0.61
-81.1374	41.5545	8.84
-81.1475	41.5436	17.68
-81.1452	41.5463	17.98
-81.1363	41.5208	15.24
-81.1251	41.5230	14.33
-81.1773	41.5469	24.69
-81.0000	41.5660	4.57
-81.1272	41.5318	14.94
-81.1703	41.5559	4.57
-81.1931	41.5036	16.15
-81.1246	41.5521	11.58
-81.1825	41.5090	35.66
-81.1077	41.5424	5.18
-81.1529	41.5226	1.52
-81.1590	41.5207	16.76
-81.1756	41.5612	25.30
-81.1425	41.6175	12.19
-81.1630	41.5758	4.88
-81.1063	41.5870	20.42
-81.1370	41.6079	9.75
-81.1367	41.6094	11.58
-81.1987	41.5810	12.19
-81.1380	41.6025	4.27
-81.1531	41.5935	3.05
-81.1515	41.5801	16.15
-81.1444	41.6021	11.58
-81.1770	41.6282	10.36
-81.1646	41.5934	5.49
-81.1507	41.6407	5.79
-81.1393	41.6107	10.97
-81.1680	41.6122	5.49
-81.1305	41.5758	18.29
-81.1319	41.6115	10.06
-81.1486	41.6377	12.19
-81.1496	41.6064	8.53
-81.0596	41.5058	15.24
-81.0757	41.5618	14.02

-81.0111	41.5651	1.22
-81.0727	41.5672	7.32
-81.0722	41.6048	9.45
-81.0815	41.5031	14.33
-81.0197	41.5332	12.80
-81.0756	41.5458	7.62
-81.0518	41.5524	13.72
-81.0589	41.5330	18.29
-81.0852	41.5215	33.53
-81.0697	41.5205	17.37
-81.0900	41.5347	18.29
-81.0921	41.5394	10.97
-81.0856	41.5159	14.94
-81.0877	41.5439	10.67
-81.0839	41.5442	17.37
-81.0648	41.5371	21.34
-81.0032	41.4255	8.84
-81.0909	41.4899	18.29
-81.0973	41.4407	10.36
-81.0831	41.4523	7.62
-81.0897	41.4617	18.90
-81.0891	41.5006	26.82
-81.0825	41.4529	3.66
-81.1009	41.4503	6.71
-81.0724	41.4498	17.07
-81.0919	41.5003	35.36
-81.0221	41.4791	1.52
-81.0232	41.4633	8.84
-81.0510	41.4110	15.24
-81.0722	41.4620	23.16
-81.0382	41.4640	13.11
-81.0799	41.4531	12.80
-81.0513	41.4669	5.18
-81.0568	41.4274	9.45
-81.0808	41.4486	10.06
-81.0896	41.4936	26.52
-81.0610	41.4386	17.98
-81.0957	41.4277	30.48
-81.0436	41.4271	9.14

-81.0288	41.4326	2.44
-81.1078	41.4575	15.24
-81.0453	41.6418	23.16
-81.0060	41.6420	12.19
-81.0812	41.6407	5.18
-81.0715	41.5830	14.63
-81.0748	41.6259	19.81
-81.0552	41.5981	10.36
-81.0657	41.6413	16.15
-81.0750	41.6242	12.50
-81.0674	41.6256	13.41
-81.0571	41.5795	14.02
-81.0569	41.6166	16.46
-81.0505	41.6169	15.24
-81.0725	41.6338	10.97
-81.0116	41.6387	19.20
-81.0132	41.6171	6.10
-81.0701	41.6361	6.71
-81.0559	41.6090	5.18
-81.0032	41.5940	11.28
-81.2633	41.5406	31.70
-81.2426	41.5528	16.76
-81.2422	41.5055	42.98
-81.2156	41.5234	31.09
-81.2177	41.5350	27.13
-81.2327	41.5536	7.62
-81.2376	41.5152	25.30
-81.1965	41.5162	31.39
-81.2283	41.5593	18.29
-81.2059	41.5118	11.58
-81.2451	41.5070	17.07
-81.2346	41.5529	23.77
-81.2462	41.5458	21.64
-81.2535	41.5055	18.90
-81.2483	41.5469	10.06
-81.2622	41.5344	17.68
-81.2948	41.5006	17.07
-81.2792	41.4685	18.59
-81.2320	41.5113	24.99

-81.2011	41.5019	18.59
-81.2046	41.5075	28.96
-81.2279	41.5005	10.97
-81.2390	41.5054	29.26
-81.2403	41.5468	11.89
-81.2486	41.5547	10.36
-81.2556	41.5570	1.52
-81.2004	41.5147	24.69
-81.2273	41.5608	32.92
-81.2103	41.5178	16.76
-81.2222	41.5257	23.47
-81.2965	41.5033	16.46
-81.2706	41.5642	15.85
-81.2902	41.5607	26.82
-81.2411	41.5572	16.15
-81.2163	41.5297	16.46
-81.2692	41.5664	18.90
-81.1894	41.5040	16.46
-81.2308	41.5146	19.20
-81.2754	41.5618	23.77
-81.2034	41.5102	20.12
-81.2380	41.5067	36.88
-81.2521	41.5572	4.57
-81.1976	41.5096	14.33
-81.2302	41.5572	31.70
-81.2374	41.5543	18.29
-81.2297	41.5570	25.91
-81.2160	41.5685	17.37
-81.2892	41.5523	6.40
-81.1924	41.5370	19.51
-81.2203	41.5213	24.99
-81.2791	41.5192	14.63
-81.2691	41.5356	19.51
-81.2052	41.5156	8.53
-81.2522	41.5558	12.80
-81.2780	41.5578	9.45
-81.2790	41.5204	30.18
-81.2478	41.5497	15.54
-81.2350	41.5536	24.08

-81.2222	41.5183	19.51
-81.2352	41.5714	17.07
-81.2019	41.5137	18.29
-81.2389	41.5611	24.08
-81.2276	41.5056	15.24
-81.1987	41.5240	14.63
-81.2604	41.5484	24.99
-81.2334	41.5025	17.68
-81.2342	41.5575	16.76
-81.2723	41.5302	21.34
-81.2764	41.5484	18.29
-81.2197	41.5279	15.24
-81.2865	41.5611	10.67
-81.2477	41.5514	11.89
-81.2320	41.5653	34.14
-81.2060	41.5091	28.04
-81.2965	41.4279	24.08
-81.2429	41.4967	7.92
-81.2180	41.4914	21.03
-81.2518	41.4300	8.23
-81.3577	41.4369	19.81
-81.2073	41.4941	18.59
-81.2539	41.4538	4.88
-81.2801	41.4651	14.63
-81.2832	41.4673	23.77
-81.2631	41.4828	7.62
-81.2687	41.4616	9.75
-81.2483	41.4698	19.81
-81.2397	41.5044	29.57
-81.2791	41.4892	16.15
-81.2855	41.4380	22.25
-81.2482	41.4359	1.83
-81.1972	41.4707	12.80
-81.2171	41.4691	3.35
-81.2885	41.4297	20.12
-81.2282	41.4204	5.18
-81.2133	41.4465	10.36
-81.2754	41.4337	14.33
-81.2717	41.4687	14.63

-81.2734	41.4664	21.64
-81.2712	41.4482	24.08
-81.2463	41.4668	7.92
-81.2228	41.4907	21.03
-81.2480	41.4543	8.23
-81.2172	41.4434	19.81
-81.1948	41.4421	18.59
-81.2929	41.4787	4.88
-81.1928	41.4999	14.63
-81.2766	41.4931	23.77
-81.2486	41.4573	7.62
-81.2041	41.4288	9.75
-81.2888	41.4788	19.81
-81.2801	41.4368	29.57
-81.1973	41.4208	16.15
-81.2832	41.4304	22.25
-81.2312	41.5026	1.83
-81.2952	41.4651	12.80
-81.2381	41.4929	3.35
-81.2416	41.4968	20.12
-81.2918	41.4647	5.18
-81.2869	41.4268	10.36
-81.0979	41.3612	15.24
-81.0051	41.3543	3.35
-81.0241	41.4095	19.51
-81.0687	41.3725	32.00
-81.0667	41.3720	19.51
-81.0589	41.3584	7.32
-81.0676	41.3730	34.14
-81.0592	41.4113	16.15
-81.0855	41.3550	32.92
-81.0209	41.3513	13.11
-81.0497	41.4107	22.86
-81.0556	41.4670	14.33
-81.0623	41.3761	30.18
-81.1065	41.4129	29.57
-81.0548	41.3496	17.37
-81.0802	41.4013	21.64
-81.0330	41.4099	15.85

-81.0377	41.3806	11.28
-81.0240	41.4040	28.35
-81.0843	41.4156	19.81
-81.0240	41.4140	14.02
-81.0045	41.3497	7.62
-81.0597	41.3499	8.23
-81.0990	41.4238	29.87
-81.0633	41.3553	11.58
-81.0815	41.3757	14.63
-81.3340	41.4296	22.56
-81.2993	41.4306	32.00
-81.3653	41.4317	12.19
-81.3331	41.4381	18.59
-81.3566	41.4978	6.71
-81.3821	41.4511	16.76
-81.3609	41.4932	17.98
-81.3973	41.4470	20.12
-81.3421	41.4514	10.06
-81.3594	41.5163	7.32
-81.3397	41.4848	22.25
-81.3487	41.4498	7.92
-81.3263	41.4677	10.97
-81.3448	41.4662	7.32
-81.3292	41.4751	18.90
-81.3651	41.4258	14.33
-81.3594	41.4712	8.23
-81.3293	41.4297	32.61
-81.3325	41.4264	21.03
-81.3526	41.4364	7.62
-81.3688	41.4288	10.36
-81.3420	41.4339	19.51
-81.3898	41.4536	30.18
-81.3720	41.4877	10.97
-81.3282	41.4296	26.21
-81.3073	41.4409	28.04
-81.3132	41.4438	21.64
-81.3440	41.4660	3.35
-81.3483	41.4336	16.46
-81.3778	41.4565	17.68

-81.3251	41.4336	18.59
-81.3243	41.4349	20.73
-81.3255	41.3976	19.20
-81.3497	41.4383	11.58
-81.3081	41.4351	18.29
-81.3421	41.4277	14.63
-81.3697	41.4340	13.72
-81.3235	41.4645	26.52
-81.3445	41.4272	16.15
-81.3299	41.4250	27.74
-81.3490	41.4393	9.14
-81.3034	41.4743	15.85
-81.3464	41.4677	16.76
-81.3465	41.4255	11.89
-81.3364	41.4690	17.68
-81.3019	41.4687	20.12
-81.3084	41.4267	13.41
-81.3596	41.4679	6.71
-81.3467	41.4298	15.54
-81.3256	41.4288	12.19
-81.3578	41.4988	7.62
-81.3718	41.4663	17.37
-81.3756	41.4330	10.67
-81.3291	41.4260	32.00
-81.3151	41.4666	21.03
-81.3501	41.4340	19.51
-81.3351	41.4282	25.91
-81.3666	41.4296	9.45
-81.0130	41.6412	2.44
-81.0970	41.6859	8.53
-81.0397	41.6950	17.37
-81.0145	41.6654	20.42
-81.0108	41.6459	23.77
-81.0035	41.6912	3.66
-81.0915	41.6909	10.97
-81.0899	41.6682	5.79
-81.1853	41.4298	6.71
-81.1453	41.3592	24.38
-81.1388	41.3787	31.70

-81.1744	41.3693	19.20
-81.1783	41.3595	19.20
-81.1295	41.3633	11.28
-81.1321	41.4335	11.89
-81.1286	41.4257	26.52
-81.1645	41.3875	16.46
-81.1061	41.4190	20.12
-81.1253	41.3879	8.53

-81.1365	41.4105	13.11
-81.1739	41.3816	18.29
-81.1043	41.4269	22.86
-81.1859	41.4249	8.23
-81.1041	41.4228	26.82
-81.1624	41.3483	13.72
-81.1510	41.3506	31.09
-81.1754	41.3629	9.45

Appendix - VIII

Hydraulic Conductivity of Sharon Sandstone, Geauga County (Based on a calculation using equation 7)

Longitude	Latitude	Hydraulic conductivity (m/s)	log k (m/s)
-81.2804	41.4103	1.11E-03	-2.954
-81.1630	41.5758	9.80E-04	-3.009
-81.2381	41.4929	9.06E-04	-3.043
-81.3891	41.4122	8.30E-04	-3.081
-81.2556	41.5570	7.55E-04	-3.122
-81.0221	41.4791	6.09E-04	-3.216
-81.2903	41.4128	5.32E-04	-3.274
-81.1496	41.6064	4.15E-04	-3.382
-81.2700	41.3570	3.72E-04	-3.430
-81.3363	41.3495	3.59E-04	-3.445
-81.1163	41.5625	3.41E-04	-3.468
-81.2368	41.3501	3.40E-04	-3.469
-81.3372	41.3823	3.34E-04	-3.476
-81.1529	41.5226	3.04E-04	-3.517
-81.1295	41.3633	2.99E-04	-3.524
-81.2626	41.3585	2.88E-04	-3.540
-81.3527	41.5073	2.85E-04	-3.546
-81.0111	41.5651	2.54E-04	-3.596
-81.2521	41.5572	2.52E-04	-3.599
-81.2631	41.4828	2.51E-04	-3.600
-81.3313	41.5592	2.45E-04	-3.611
-81.2293	41.3780	2.36E-04	-3.626
-81.1528	41.4906	2.21E-04	-3.655
-81.3094	41.4075	2.15E-04	-3.668
-81.2358	41.4180	2.03E-04	-3.693
-81.1370	41.6079	1.87E-04	-3.729
-81.2465	41.3839	1.85E-04	-3.733
-81.2754	41.4337	1.73E-04	-3.762
-81.3370	41.3813	1.72E-04	-3.765
-81.1916	41.4214	1.71E-04	-3.767
-81.3594	41.4712	1.67E-04	-3.778
-81.3720	41.4877	1.66E-04	-3.780
-81.3084	41.4267	1.65E-04	-3.782
-81.1009	41.4503	1.62E-04	-3.791
-81.2482	41.4359	1.60E-04	-3.796
-81.0756	41.5458	1.59E-04	-3.797
-81.3108	41.3594	1.52E-04	-3.818
-81.1754	41.3629	1.42E-04	-3.846
-81.3636	41.5024	1.33E-04	-3.875
-81.2484	41.4157	1.27E-04	-3.897
-81.2373	41.3758	1.24E-04	-3.907
-81.1796	41.5654	1.23E-04	-3.908
-81.2041	41.4288	1.13E-04	-3.945
-81.0232	41.4633	1.05E-04	-3.979

-81.2854	41.3855	1.22E-04	-3.915
-81.0799	41.4531	1.18E-04	-3.929
-81.2954	41.4181	1.03E-04	-3.987
-81.2788	41.6290	1.00E-04	-3.998
-81.3230	41.3668	9.92E-05	-4.004
-81.1646	41.5934	8.81E-05	-4.055
-81.2895	41.4145	8.79E-05	-4.056
-81.2597	41.3569	7.76E-05	-4.110
-81.3814	41.5430	7.67E-05	-4.115
-81.2260	41.3482	7.54E-05	-4.123
-81.2687	41.4616	7.12E-05	-4.148
-81.1365	41.4105	7.08E-05	-4.150
-81.1492	41.4670	7.06E-05	-4.151
-81.0513	41.4669	7.04E-05	-4.153
-81.3481	41.5360	7.02E-05	-4.154
-81.0051	41.3543	6.79E-05	-4.168
-81.3790	41.5127	6.78E-05	-4.169
-81.0130	41.6412	6.59E-05	-4.181
-81.0559	41.6090	6.56E-05	-4.183
-81.3566	41.4978	6.55E-05	-4.184
-81.3885	41.4990	6.46E-05	-4.189
-81.2794	41.4112	6.36E-05	-4.196
-81.1063	41.5870	6.14E-05	-4.212
-81.3019	41.4687	5.97E-05	-4.224
-81.3337	41.5654	5.90E-05	-4.229
-81.1680	41.6122	5.86E-05	-4.232
-81.2918	41.4647	5.84E-05	-4.234
-81.0288	41.4326	5.60E-05	-4.252
-81.3439	41.4031	5.58E-05	-4.253
-81.2133	41.4465	5.57E-05	-4.255
-81.0674	41.6256	5.51E-05	-4.259
-81.1425	41.4893	5.49E-05	-4.261
-81.2518	41.4300	5.34E-05	-4.273
-81.2678	41.3589	5.32E-05	-4.274
-81.3712	41.5135	5.32E-05	-4.274
-81.1507	41.6407	5.24E-05	-4.280
-81.3831	41.5133	5.17E-05	-4.287

-81.1061	41.4583	5.07E-05	-4.295
-81.0518	41.5524	4.96E-05	-4.305
-81.3688	41.4288	4.94E-05	-4.307
-81.3713	41.4171	4.77E-05	-4.321
-81.3524	41.5292	4.72E-05	-4.326
-81.1921	41.3631	4.67E-05	-4.331
-81.2426	41.3854	4.66E-05	-4.331
-81.2234	41.3936	4.65E-05	-4.333
-81.1156	41.4358	4.51E-05	-4.346
-81.2279	41.5005	4.44E-05	-4.353
-81.0032	41.4255	4.43E-05	-4.353
-81.3442	41.5628	4.43E-05	-4.354
-81.0701	41.6361	4.37E-05	-4.360
-81.2581	41.6198	4.35E-05	-4.361
-81.2929	41.4184	4.30E-05	-4.367
-81.2780	41.5578	4.25E-05	-4.372
-81.0812	41.6407	4.24E-05	-4.373
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-81.2136	41.3936	4.22E-05	-4.375
-81.0825	41.4529	4.17E-05	-4.379
-81.1272	41.5318	4.12E-05	-4.385
-81.1817	41.4564	4.10E-05	-4.387
-81.1444	41.6021	4.08E-05	-4.389
-81.2534	41.3765	4.04E-05	-4.393
-81.2150	41.6322	3.94E-05	-4.405
-81.3465	41.4255	3.90E-05	-4.409
-81.1531	41.5935	3.90E-05	-4.409
-81.0000	41.5660	3.86E-05	-4.414
-81.1053	41.4614	3.72E-05	-4.430
-81.2312	41.5026	3.70E-05	-4.431
-81.1377	41.4752	3.66E-05	-4.437
-81.0633	41.3553	3.53E-05	-4.452
-81.2374	41.5543	3.53E-05	-4.452
-81.2278	41.3099	3.49E-05	-4.457
-81.2892	41.5523	3.47E-05	-4.459
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-81.2341	41.5700	3.39E-05	-4.469
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-81.3793	41.5115	3.31E-05	-4.480
-81.2539	41.4538	3.30E-05	-4.482
-81.2228	41.4907	3.23E-05	-4.490
-81.3756	41.4330	3.19E-05	-4.496
-81.2630	41.5814	3.10E-05	-4.508
-81.2791	41.5192	3.10E-05	-4.508
-81.0132	41.6171	3.09E-05	-4.510
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-81.2633	41.3574	2.99E-05	-4.524
-81.3563	41.5012	2.89E-05	-4.540
-81.1078	41.4575	2.88E-05	-4.540
-81.2486	41.5547	2.84E-05	-4.546
-81.2419	41.3905	2.81E-05	-4.552
-81.2865	41.5611	2.79E-05	-4.555
-81.2660	41.4152	2.77E-05	-4.557
-81.3338	41.4198	2.75E-05	-4.561
-81.1086	41.4599	2.73E-05	-4.564
-81.2564	41.5794	2.72E-05	-4.565
-81.3678	41.5190	2.71E-05	-4.567
-81.3256	41.4288	2.70E-05	-4.569
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-81.1251	41.5230	2.61E-05	-4.584
-81.2555	41.3634	2.58E-05	-4.589
-81.2537	41.4015	2.55E-05	-4.593
-81.0552	41.5981	2.55E-05	-4.594
-81.2841	41.3519	2.54E-05	-4.594
-81.3024	41.5411	2.54E-05	-4.596
-81.2957	41.3782	2.53E-05	-4.596
-81.0596	41.5058	2.51E-05	-4.600
-81.1393	41.6107	2.51E-05	-4.601
-81.3331	41.3631	2.50E-05	-4.602
-81.3397	41.3726	2.43E-05	-4.615
-81.2171	41.4691	2.42E-05	-4.616
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-81.3440	41.4660	2.36E-05	-4.627

-81.2140	41.3764	2.32E-05	-4.634
-81.3054	41.3593	2.24E-05	-4.649
-81.2480	41.4543	2.24E-05	-4.649
-81.1803	41.3656	2.24E-05	-4.650
-81.1363	41.5208	2.23E-05	-4.651
-81.0839	41.5442	2.20E-05	-4.658
-81.3912	41.4129	2.18E-05	-4.661
-81.1246	41.5521	2.18E-05	-4.662
-81.1770	41.6282	2.15E-05	-4.667
-81.3256	41.3805	2.13E-05	-4.672
-81.1253	41.3879	2.13E-05	-4.673
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-81.1077	41.5424	2.10E-05	-4.678
-81.2669	41.3546	2.09E-05	-4.680
-81.2428	41.6117	2.07E-05	-4.684
-81.0725	41.6338	2.06E-05	-4.686
-81.0568	41.4274	2.02E-05	-4.694
-81.2059	41.5118	2.02E-05	-4.695
-81.3311	41.4222	2.00E-05	-4.699
-81.2649	41.3894	1.99E-05	-4.701
-81.1198	41.5275	1.95E-05	-4.709
-81.0877	41.5439	1.94E-05	-4.712
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-81.3787	41.5355	1.92E-05	-4.716
-81.2955	41.4186	1.92E-05	-4.718
-81.2929	41.4787	1.91E-05	-4.718
-81.0921	41.5394	1.89E-05	-4.723
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-81.1703	41.5559	1.87E-05	-4.729
-81.3451	41.5538	1.86E-05	-4.731
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-81.3842	41.4144	1.82E-05	-4.739
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-81.3181	41.5142	1.78E-05	-4.749
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-81.3140	41.3992	1.77E-05	-4.753
-81.2952	41.4651	1.77E-05	-4.753
-81.2403	41.5468	1.74E-05	-4.759
-81.1645	41.3875	1.71E-05	-4.767
-81.0899	41.6682	1.71E-05	-4.767
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-81.2327	41.4159	1.63E-05	-4.788
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-81.3821	41.5088	1.59E-05	-4.798
-81.3863	41.4138	1.59E-05	-4.798
-81.1859	41.4249	1.59E-05	-4.800
-81.2393	41.4222	1.58E-05	-4.802
-81.2486	41.4573	1.56E-05	-4.807
-81.1739	41.3816	1.55E-05	-4.810
-81.2158	41.4078	1.55E-05	-4.810
-81.1589	41.4920	1.53E-05	-4.814
-81.2460	41.3661	1.51E-05	-4.822
-81.2632	41.3845	1.50E-05	-4.824
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-81.2983	41.3965	1.47E-05	-4.834
-81.2832	41.4304	1.45E-05	-4.840
-81.2276	41.5056	1.44E-05	-4.841
-81.0589	41.3584	1.43E-05	-4.844
-81.0035	41.6912	1.43E-05	-4.845
-81.2257	41.6165	1.41E-05	-4.850
-81.3787	41.5084	1.39E-05	-4.858
-81.2863	41.3572	1.37E-05	-4.863
-81.0970	41.6859	1.37E-05	-4.864
-81.3234	41.3873	1.35E-05	-4.870
-81.2482	41.5784	1.34E-05	-4.874
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-81.2103	41.5178	1.33E-05	-4.875
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-81.2552	41.3480	1.33E-05	-4.876
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-81.3596	41.4679	1.31E-05	-4.883
-81.3506	41.5014	1.31E-05	-4.884
-81.1380	41.6025	1.30E-05	-4.885
-81.3736	41.5234	1.30E-05	-4.887
-81.2160	41.5685	1.27E-05	-4.896
-81.3421	41.4514	1.24E-05	-4.906
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-81.2955	41.3904	1.22E-05	-4.914
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-81.2754	41.3988	1.19E-05	-4.924
-81.2771	41.3784	1.18E-05	-4.926
-81.3697	41.4039	1.17E-05	-4.933
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-81.3024	41.3645	1.02E-05	-4.992
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-81.0750	41.6242	9.58E-06	-5.019
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-81.1009	41.4383	9.43E-06	-5.025
-81.3526	41.4364	9.43E-06	-5.026
-81.3421	41.4277	9.28E-06	-5.033
-81.2376	41.5152	9.26E-06	-5.033
-81.2791	41.4892	9.20E-06	-5.036
-81.3372	41.3753	9.19E-06	-5.037
-81.1452	41.5463	9.08E-06	-5.042
-81.3751	41.5397	9.06E-06	-5.043
-81.3697	41.4340	8.94E-06	-5.049
-81.1059	41.4269	8.93E-06	-5.049
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-81.0808	41.4486	8.72E-06	-5.059
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-81.1367	41.6094	8.05E-06	-5.094
-81.1965	41.5162	8.03E-06	-5.095
-81.2289	41.3590	8.02E-06	-5.096
-81.2353	41.4043	8.01E-06	-5.097
-81.2338	41.3898	7.96E-06	-5.099
-81.0589	41.5330	7.96E-06	-5.099
-81.2327	41.5536	7.93E-06	-5.101
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-81.1043	41.4269	7.70E-06	-5.113
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-81.3862	41.5212	7.61E-06	-5.119
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-81.0855	41.3550	7.36E-06	-5.133
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-81.0032	41.5940	7.13E-06	-5.147
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-81.2507	41.3980	7.08E-06	-5.150
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-81.0060	41.6420	7.00E-06	-5.155
-81.2916	41.4014	6.94E-06	-5.158
-81.3483	41.4336	6.92E-06	-5.160
-81.3444	41.3568	6.83E-06	-5.165
-81.2706	41.5642	6.82E-06	-5.166
-81.3737	41.4181	6.82E-06	-5.167
-81.0045	41.3497	6.77E-06	-5.169
-81.2205	41.4120	6.73E-06	-5.172
-81.3774	41.5315	6.68E-06	-5.175
-81.2388	41.3763	6.66E-06	-5.176
-81.2595	41.3871	6.65E-06	-5.177
-81.2569	41.3856	6.64E-06	-5.178
-81.2342	41.5575	6.55E-06	-5.184
-81.2362	41.6000	6.53E-06	-5.185
-81.3274	41.3531	6.52E-06	-5.186
-81.2717	41.4687	6.47E-06	-5.189
-81.0648	41.5371	6.44E-06	-5.191
-81.0597	41.3499	6.30E-06	-5.200
-81.2163	41.5297	6.29E-06	-5.201
-81.3369	41.4107	6.18E-06	-5.209
-81.1632	41.5321	6.18E-06	-5.209
-81.1708	41.4730	6.13E-06	-5.213
-81.2429	41.4967	6.10E-06	-5.215

-81.2704	41.5697	6.07E-06	-5.217
-81.0715	41.5830	6.06E-06	-5.218
-81.0897	41.4617	5.92E-06	-5.227
-81.3325	41.4264	5.83E-06	-5.234
-81.3815	41.4151	5.71E-06	-5.243
-81.2162	41.3748	5.67E-06	-5.247
-81.2699	41.4201	5.64E-06	-5.249
-81.0697	41.5205	5.63E-06	-5.249
-81.2522	41.5558	5.63E-06	-5.250
-81.0802	41.4013	5.63E-06	-5.250
-81.1987	41.5240	5.62E-06	-5.250
-81.2222	41.5257	5.55E-06	-5.255
-81.0330	41.4099	5.54E-06	-5.256
-81.3300	41.3544	5.52E-06	-5.258
-81.3919	41.4135	5.46E-06	-5.262
-81.3448	41.4662	5.42E-06	-5.266
-81.2426	41.5528	5.41E-06	-5.267
-81.3257	41.4195	5.41E-06	-5.267
-81.2543	41.3539	5.40E-06	-5.267
-81.0815	41.5031	5.35E-06	-5.272
-81.3877	41.4121	5.34E-06	-5.273
-81.2047	41.4247	5.34E-06	-5.273
-81.3035	41.3875	5.30E-06	-5.276
-81.3302	41.3775	5.29E-06	-5.276
-81.3585	41.5482	5.26E-06	-5.279
-81.3364	41.3775	5.26E-06	-5.279
-81.1213	41.4495	5.24E-06	-5.281
-81.2248	41.4160	5.22E-06	-5.283
-81.0497	41.4107	5.19E-06	-5.285
-81.3097	41.3669	5.17E-06	-5.286
-81.2278	41.3759	5.15E-06	-5.288
-81.1305	41.5758	5.14E-06	-5.289
-81.0209	41.3513	5.14E-06	-5.289
-81.3456	41.3551	5.09E-06	-5.293
-81.2224	41.6338	5.09E-06	-5.293
-81.0896	41.4936	5.07E-06	-5.295
-81.0856	41.5159	5.07E-06	-5.295

-81.2578	41.5767	5.06E-06	-5.296
-81.2004	41.5147	5.06E-06	-5.296
-81.3786	41.4038	5.02E-06	-5.299
-81.3581	41.3964	5.01E-06	-5.301
-81.2034	41.5102	4.95E-06	-5.306
-81.3742	41.5281	4.90E-06	-5.310
-81.2156	41.5234	4.87E-06	-5.313
-81.0909	41.4899	4.78E-06	-5.321
-81.2477	41.5514	4.77E-06	-5.322
-81.1991	41.3995	4.67E-06	-5.331
-81.3645	41.5556	4.67E-06	-5.331
-81.3359	41.3568	4.65E-06	-5.333
-81.2535	41.5055	4.65E-06	-5.333
-81.0724	41.4498	4.65E-06	-5.333
-81.2462	41.5458	4.64E-06	-5.334
-81.1744	41.3693	4.58E-06	-5.340
-81.0453	41.6418	4.54E-06	-5.343
-81.2974	41.3510	4.49E-06	-5.348
-81.1987	41.5810	4.48E-06	-5.348
-81.3823	41.4224	4.48E-06	-5.349
-81.2346	41.5529	4.48E-06	-5.349
-81.2877	41.3873	4.48E-06	-5.349
-81.3501	41.4340	4.45E-06	-5.352
-81.1973	41.4208	4.45E-06	-5.352
-81.1955	41.4207	4.41E-06	-5.355
-81.1194	41.4523	4.38E-06	-5.359
-81.0556	41.4670	4.36E-06	-5.360
-81.3364	41.4690	4.33E-06	-5.363
-81.3291	41.3723	4.30E-06	-5.366
-81.1374	41.5545	4.29E-06	-5.368
-81.3255	41.3976	4.17E-06	-5.380
-81.0957	41.4277	4.16E-06	-5.381
-81.2426	41.5917	4.13E-06	-5.384
-81.1972	41.4707	4.12E-06	-5.385
-81.2177	41.5350	4.08E-06	-5.389
-81.2869	41.4268	4.07E-06	-5.390
-81.2411	41.5572	4.07E-06	-5.391

-81.3292	41.4751	4.05E-06	-5.392
-81.0722	41.4620	4.03E-06	-5.395
-81.2451	41.5070	3.97E-06	-5.401
-81.1179	41.4348	3.95E-06	-5.404
-81.3151	41.4666	3.92E-06	-5.406
-81.1515	41.5801	3.87E-06	-5.413
-81.0891	41.5006	3.83E-06	-5.417
-81.1061	41.4190	3.81E-06	-5.419
-81.3879	41.4155	3.79E-06	-5.421
-81.3905	41.5395	3.76E-06	-5.424
-81.2563	41.3866	3.76E-06	-5.425
-81.1976	41.5096	3.74E-06	-5.428
-81.3464	41.4677	3.73E-06	-5.429
-81.0852	41.5215	3.66E-06	-5.437
-81.3755	41.4022	3.65E-06	-5.437
-81.2011	41.5019	3.64E-06	-5.439
-81.0108	41.6459	3.61E-06	-5.442
-81.3470	41.5150	3.61E-06	-5.442
-81.2222	41.5183	3.59E-06	-5.445
-81.3778	41.4565	3.53E-06	-5.452
-81.3493	41.3597	3.53E-06	-5.453
-81.3081	41.4351	3.50E-06	-5.456
-81.3566	41.5689	3.50E-06	-5.456
-81.2790	41.5204	3.49E-06	-5.457
-81.2352	41.5714	3.45E-06	-5.462
-81.2509	41.4023	3.45E-06	-5.463
-81.0145	41.6654	3.43E-06	-5.465
-81.2766	41.4931	3.41E-06	-5.468
-81.3340	41.4296	3.40E-06	-5.469
-81.3659	41.4028	3.37E-06	-5.473
-81.1924	41.5370	3.35E-06	-5.474
-81.2752	41.4160	3.35E-06	-5.475
-81.1948	41.4421	3.33E-06	-5.478
-81.0382	41.4640	3.32E-06	-5.478
-81.1620	41.4368	3.32E-06	-5.479
-81.2965	41.4279	3.23E-06	-5.491
-81.2885	41.4297	3.23E-06	-5.491

-81.3397	41.4848	3.19E-06	-5.496
-81.1475	41.5436	3.11E-06	-5.508
-81.3826	41.4153	3.10E-06	-5.508
-81.3183	41.3835	3.09E-06	-5.510
-81.3577	41.4369	3.09E-06	-5.511
-81.2147	41.3733	3.08E-06	-5.511
-81.3435	41.4080	3.08E-06	-5.512
-81.2948	41.5006	3.05E-06	-5.515
-81.2876	41.3574	2.99E-06	-5.524
-81.0571	41.5795	2.97E-06	-5.527
-81.2197	41.5279	2.97E-06	-5.527
-81.2930	41.3919	2.95E-06	-5.530
-81.2334	41.5025	2.95E-06	-5.531
-81.1510	41.3506	2.91E-06	-5.537
-81.3299	41.3534	2.88E-06	-5.540
-81.2965	41.5033	2.88E-06	-5.541
-81.2350	41.5536	2.88E-06	-5.541
-81.3637	41.3832	2.85E-06	-5.546
-81.0623	41.3761	2.83E-06	-5.548
-81.3603	41.3550	2.83E-06	-5.549
-81.3650	41.5367	2.81E-06	-5.551
-81.2691	41.5356	2.80E-06	-5.552
-81.0505	41.6169	2.76E-06	-5.560
-81.2407	41.3660	2.75E-06	-5.561
-81.2900	41.3900	2.75E-06	-5.561
-81.3547	41.5379	2.68E-06	-5.572
-81.3251	41.4336	2.63E-06	-5.580
-81.2310	41.3943	2.61E-06	-5.584
-81.3718	41.4663	2.59E-06	-5.587
-81.2483	41.4698	2.57E-06	-5.589
-81.3331	41.4381	2.56E-06	-5.592
-81.3134	41.4180	2.51E-06	-5.600
-81.0900	41.5347	2.49E-06	-5.603
-81.2243	41.3915	2.49E-06	-5.603
-81.3125	41.4156	2.45E-06	-5.610
-81.0990	41.4238	2.45E-06	-5.610
-81.3609	41.4932	2.45E-06	-5.610

-81.2793	41.3496	2.41E-06	-5.618
-81.1931	41.5036	2.41E-06	-5.618
-81.3180	41.3784	2.36E-06	-5.627
-81.2572	41.6056	2.35E-06	-5.629
-81.0548	41.3496	2.31E-06	-5.637
-81.3351	41.4282	2.28E-06	-5.642
-81.3483	41.3651	2.27E-06	-5.644
-81.2389	41.5611	2.27E-06	-5.645
-81.3235	41.4645	2.25E-06	-5.648
-81.2604	41.5484	2.24E-06	-5.650
-81.2805	41.4038	2.22E-06	-5.653
-81.2219	41.3942	2.18E-06	-5.661
-81.3522	41.4022	2.16E-06	-5.666
-81.2832	41.4673	2.16E-06	-5.666
-81.3424	41.4240	2.16E-06	-5.666
-81.2172	41.4434	2.14E-06	-5.669
-81.0116	41.6387	2.14E-06	-5.670
-81.3837	41.5220	2.11E-06	-5.675
-81.3404	41.5615	2.11E-06	-5.675
-81.3282	41.4296	2.09E-06	-5.681
-81.2902	41.5607	2.05E-06	-5.689
-81.2764	41.5848	2.04E-06	-5.690
-81.2019	41.5137	2.02E-06	-5.695
-81.1241	41.4335	1.96E-06	-5.707
-81.2712	41.4482	1.95E-06	-5.709
-81.1286	41.4257	1.95E-06	-5.711
-81.2009	41.6219	1.94E-06	-5.711
-81.2888	41.4788	1.91E-06	-5.719
-81.0667	41.3720	1.87E-06	-5.729
-81.1928	41.4999	1.85E-06	-5.732
-81.2046	41.5075	1.82E-06	-5.739
-81.0241	41.4095	1.81E-06	-5.743
-81.1065	41.4129	1.78E-06	-5.751
-81.3132	41.4438	1.77E-06	-5.751
-81.1783	41.3595	1.76E-06	-5.754
-81.1989	41.5884	1.76E-06	-5.754
-81.2008	41.6141	1.71E-06	-5.767

-81.2917	41.3862	1.71E-06	-5.768
-81.3420	41.4339	1.70E-06	-5.769
-81.0748	41.6259	1.67E-06	-5.776
-81.1773	41.5469	1.65E-06	-5.782
-81.2390	41.5054	1.65E-06	-5.783
-81.1453	41.3592	1.54E-06	-5.812
-81.3007	41.4095	1.53E-06	-5.815
-81.2146	41.4037	1.53E-06	-5.817
-81.1011	41.4481	1.52E-06	-5.818
-81.0687	41.3725	1.49E-06	-5.826
-81.3293	41.4297	1.46E-06	-5.836
-81.2273	41.5608	1.44E-06	-5.842
-81.2180	41.4914	1.43E-06	-5.843
-81.2723	41.5302	1.42E-06	-5.849
-81.2764	41.5484	1.41E-06	-5.850
-81.1299	41.4801	1.41E-06	-5.852
-81.0240	41.4040	1.38E-06	-5.861
-81.1262	41.5003	1.30E-06	-5.885
-81.2560	41.3474	1.29E-06	-5.888
-81.2297	41.5739	1.27E-06	-5.897
-81.2297	41.5570	1.24E-06	-5.906
-81.3291	41.4260	1.21E-06	-5.918
-81.3418	41.3933	1.18E-06	-5.929
-81.3278	41.3813	1.14E-06	-5.943
-81.2320	41.5113	1.14E-06	-5.944
-81.2580	41.3929	1.13E-06	-5.947

-81.3073	41.4409	1.12E-06	-5.952
-81.2313	41.3808	1.08E-06	-5.968
-81.3423	41.4236	1.04E-06	-5.985
-81.3481	41.3652	1.01E-06	-5.996
-81.1710	41.4726	1.00E-06	-5.999
-81.3898	41.4536	9.88E-07	-6.005
-81.2801	41.4368	9.16E-07	-6.038
-81.1388	41.3787	9.02E-07	-6.045
-81.2855	41.4380	8.92E-07	-6.049
-81.1756	41.5612	8.92E-07	-6.050
-81.2203	41.5213	8.86E-07	-6.053
-81.3395	41.4230	8.71E-07	-6.060
-81.2754	41.5618	8.38E-07	-6.077
-81.0676	41.3730	8.23E-07	-6.084
-81.2397	41.5044	7.95E-07	-6.099
-81.2422	41.5055	7.87E-07	-6.104
-81.0197	41.5332	7.45E-07	-6.128
-81.2633	41.5406	7.44E-07	-6.129
-81.2380	41.5067	7.37E-07	-6.133
-81.2416	41.4968	7.26E-07	-6.139
-81.2320	41.5653	7.16E-07	-6.145
-81.0919	41.5003	6.77E-07	-6.169
-81.2060	41.5091	6.40E-07	-6.194
-81.2868	41.5924	3.60E-07	-6.443
-81.3430	41.5386	8.80E-08	-7.055

Appendix - IX

Transmissivity of Sharon Sandstone, Geauga County (Based on a calculation using equation 7 for 617 Water Well Logs)

Longitude	Latitude	Transmissivity, T (m^2/s)	log T (m^2/s)
-81.2804	41.4103	1.32E-02	-1.88
-81.3363	41.3495	6.13E-03	-2.21
-81.3094	41.4075	5.56E-03	-2.25
-81.1630	41.5758	4.78E-03	-2.32
-81.3891	41.4122	4.30E-03	-2.37
-81.3372	41.3823	3.56E-03	-2.45
-81.1496	41.6064	3.54E-03	-2.45
-81.1295	41.3633	3.38E-03	-2.47
-81.2381	41.4929	3.04E-03	-2.52
-81.2293	41.3780	2.59E-03	-2.59
-81.2754	41.4337	2.48E-03	-2.61
-81.3640	41.5336	2.44E-03	-2.61
-81.3313	41.5592	2.39E-03	-2.62
-81.3084	41.4267	2.22E-03	-2.65
-81.2631	41.4828	1.91E-03	-2.72
-81.1916	41.4214	1.82E-03	-2.74
-81.3527	41.5073	1.82E-03	-2.74
-81.1370	41.6079	1.82E-03	-2.74
-81.3720	41.4877	1.82E-03	-2.74
-81.0799	41.4531	1.51E-03	-2.82
-81.2903	41.4128	1.46E-03	-2.84
-81.3594	41.4712	1.37E-03	-2.86
-81.1754	41.3629	1.35E-03	-2.87
-81.2626	41.3585	1.32E-03	-2.88
-81.3651	41.4258	1.30E-03	-2.89
-81.1063	41.5870	1.25E-03	-2.90
-81.2465	41.3839	1.24E-03	-2.91
-81.0756	41.5458	1.21E-03	-2.92
-81.3442	41.5628	1.20E-03	-2.92
-81.3019	41.4687	1.20E-03	-2.92
-81.3230	41.3668	1.18E-03	-2.93
-81.2556	41.5570	1.15E-03	-2.94
-81.2521	41.5572	1.15E-03	-2.94
-81.2041	41.4288	1.11E-03	-2.96
-81.1009	41.4503	1.09E-03	-2.96
-81.1796	41.5654	1.05E-03	-2.98
-81.3636	41.5024	9.76E-04	-3.01
-81.1425	41.4893	9.37E-04	-3.03
-81.2358	41.4180	9.27E-04	-3.03
-81.2854	41.3855	9.27E-04	-3.03
-81.3108	41.3594	9.27E-04	-3.03
-81.0221	41.4791	9.27E-04	-3.03
-81.0232	41.4633	9.27E-04	-3.03
-81.3666	41.4296	9.27E-04	-3.03
-81.1365	41.4105	9.27E-04	-3.03
-81.3814	41.5430	8.65E-04	-3.06
-81.2954	41.4181	8.48E-04	-3.07
-81.3885	41.4990	8.28E-04	-3.08
-81.2788	41.6290	8.27E-04	-3.08
-81.3790	41.5127	8.27E-04	-3.08
-81.2597	41.3569	7.81E-04	-3.11
-81.0674	41.6256	7.39E-04	-3.13
-81.2687	41.4616	6.94E-04	-3.16

-81.2700	41.3570	6.80E-04	-3.17
-81.2373	41.3758	6.80E-04	-3.17
-81.3370	41.3813	6.80E-04	-3.17
-81.3439	41.4031	6.80E-04	-3.17
-81.1053	41.4614	6.80E-04	-3.17
-81.0518	41.5524	6.80E-04	-3.17
-81.2228	41.4907	6.80E-04	-3.17
-81.1156	41.4358	6.46E-04	-3.19
-81.2374	41.5543	6.46E-04	-3.19
-81.3831	41.5133	6.30E-04	-3.20
-81.1272	41.5318	6.15E-04	-3.21
-81.1528	41.4906	6.07E-04	-3.22
-81.3524	41.5292	6.04E-04	-3.22
-81.2534	41.3765	6.04E-04	-3.22
-81.2484	41.4157	5.80E-04	-3.24
-81.2133	41.4465	5.77E-04	-3.24
-81.3821	41.4511	5.59E-04	-3.25
-81.3712	41.5135	5.35E-04	-3.27
-81.3688	41.4288	5.12E-04	-3.29
-81.2279	41.5005	4.87E-04	-3.31
-81.1646	41.5934	4.84E-04	-3.32
-81.1444	41.6021	4.73E-04	-3.33
-81.1061	41.4583	4.64E-04	-3.33
-81.3024	41.5411	4.64E-04	-3.33
-81.1529	41.5226	4.64E-04	-3.33
-81.3465	41.4255	4.64E-04	-3.33
-81.2791	41.5192	4.54E-04	-3.34
-81.2234	41.3936	4.39E-04	-3.36
-81.2660	41.4152	4.39E-04	-3.36
-81.2669	41.3546	4.39E-04	-3.36
-81.1078	41.4575	4.39E-04	-3.36
-81.2283	41.5593	4.39E-04	-3.36
-81.2518	41.4300	4.39E-04	-3.36
-81.3566	41.4978	4.39E-04	-3.36
-81.1492	41.4670	4.30E-04	-3.37
-81.1803	41.3656	4.30E-04	-3.37
-81.3678	41.5190	4.30E-04	-3.37
-81.1825	41.5090	4.30E-04	-3.37
-81.2638	41.4069	4.21E-04	-3.38

-81.1921	41.3631	4.13E-04	-3.38
-81.0633	41.3553	4.09E-04	-3.39
-81.2929	41.4184	4.06E-04	-3.39
-81.2780	41.5578	4.01E-04	-3.40
-81.1198	41.5275	3.99E-04	-3.40
-81.0032	41.4255	3.92E-04	-3.41
-81.0596	41.5058	3.83E-04	-3.42
-81.2564	41.5794	3.82E-04	-3.42
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-81.2302	41.5572	3.82E-04	-3.42
-81.3337	41.5654	3.77E-04	-3.42
-81.1251	41.5230	3.73E-04	-3.43
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-81.2734	41.4664	3.63E-04	-3.44
-81.2537	41.4015	3.50E-04	-3.46
-81.1894	41.5040	3.50E-04	-3.46
-81.1377	41.4752	3.45E-04	-3.46
-81.2581	41.6198	3.45E-04	-3.46
-81.1363	41.5208	3.40E-04	-3.47
-81.0559	41.6090	3.40E-04	-3.47
-81.3756	41.4330	3.40E-04	-3.47
-81.3451	41.5538	3.40E-04	-3.47
-81.0915	41.6909	3.33E-04	-3.48
-81.3256	41.4288	3.29E-04	-3.48
-81.3578	41.4988	3.23E-04	-3.49
-81.2406	41.3867	3.22E-04	-3.49
-81.2895	41.4145	3.22E-04	-3.49
-81.2260	41.3482	3.22E-04	-3.49
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-81.1059	41.4269	3.10E-04	-3.51
-81.0111	41.5651	3.09E-04	-3.51
-81.0727	41.5672	3.09E-04	-3.51
-81.1507	41.6407	3.04E-04	-3.52
-81.3793	41.5115	3.03E-04	-3.52
-81.2918	41.4647	3.03E-04	-3.52
-81.3481	41.5360	3.00E-04	-3.52

-81.2632	41.3845	2.97E-04	-3.53
-81.2865	41.5611	2.97E-04	-3.53
-81.3299	41.4250	2.97E-04	-3.53
-81.2486	41.5547	2.95E-04	-3.53
-81.0701	41.6361	2.93E-04	-3.53
-81.2482	41.4359	2.93E-04	-3.53
-81.2136	41.3936	2.83E-04	-3.55
-81.1739	41.3816	2.83E-04	-3.55
-81.1645	41.3875	2.81E-04	-3.55
-81.2341	41.5700	2.79E-04	-3.55
-81.1393	41.6107	2.75E-04	-3.56
-81.2649	41.3894	2.73E-04	-3.56
-81.2841	41.3519	2.71E-04	-3.57
-81.3234	41.3873	2.71E-04	-3.57
-81.2993	41.4306	2.71E-04	-3.57
-81.2150	41.6322	2.64E-04	-3.58
-81.0552	41.5981	2.64E-04	-3.58
-81.3338	41.4198	2.60E-04	-3.59
-81.3431	41.4105	2.52E-04	-3.60
-81.1246	41.5521	2.52E-04	-3.60
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-81.3243	41.4349	2.49E-04	-3.60
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-81.2140	41.3764	2.41E-04	-3.62
-81.2376	41.5152	2.34E-04	-3.63
-81.2059	41.5118	2.34E-04	-3.63
-81.2327	41.4159	2.34E-04	-3.63
-81.0051	41.3543	2.28E-04	-3.64
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-81.2103	41.5178	2.24E-04	-3.65
-81.2588	41.3549	2.23E-04	-3.65
-81.2278	41.3099	2.23E-04	-3.65
-81.2600	41.4000	2.23E-04	-3.65
-81.3426	41.5635	2.23E-04	-3.65
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-81.2892	41.5523	2.22E-04	-3.65

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-81.3577	41.5139	2.20E-04	-3.66
-81.0812	41.6407	2.20E-04	-3.66
-81.2276	41.5056	2.20E-04	-3.66
-81.3605	41.5645	2.19E-04	-3.66
-81.3255	41.3976	2.15E-04	-3.67
-81.0610	41.4386	2.08E-04	-3.68
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-81.0568	41.4274	1.91E-04	-3.72
-81.1575	41.4724	1.89E-04	-3.72
-81.2754	41.3988	1.89E-04	-3.72
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-81.2863	41.3572	1.88E-04	-3.73
-81.3445	41.4272	1.88E-04	-3.73
-81.2480	41.4543	1.85E-04	-3.73
-81.1053	41.4619	1.83E-04	-3.74
-81.0397	41.6950	1.81E-04	-3.74

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-81.3140	41.3992	1.72E-04	-3.76
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-81.3181	41.5142	1.63E-04	-3.79
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-81.2539	41.4538	1.61E-04	-3.79
-81.0130	41.6412	1.61E-04	-3.79
-81.2692	41.5664	1.60E-04	-3.80
-81.0979	41.3612	1.60E-04	-3.80
-81.2353	41.4043	1.59E-04	-3.80
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-81.3620	41.5142	1.36E-04	-3.87
-81.2622	41.5344	1.36E-04	-3.87
-81.3421	41.4277	1.36E-04	-3.87
-81.3862	41.5212	1.35E-04	-3.87
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-81.3397	41.3726	1.33E-04	-3.88
-81.3336	41.3797	1.33E-04	-3.88
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-81.2004	41.5147	1.25E-04	-3.90
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-81.2305	41.3808	1.23E-04	-3.91
-81.3302	41.3775	1.23E-04	-3.91
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-81.3456	41.3551	1.23E-04	-3.91
-81.1425	41.6175	1.23E-04	-3.91
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-81.0569	41.6166	1.23E-04	-3.91
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-81.1531	41.5935	1.19E-04	-3.93
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-81.0497	41.4107	1.19E-04	-3.93
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-81.1708	41.4730	1.16E-04	-3.94
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-81.2289	41.3590	1.08E-04	-3.97
-81.2346	41.5529	1.06E-04	-3.97
-81.0453	41.6418	1.05E-04	-3.98
-81.2790	41.5204	1.05E-04	-3.98
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-81.2801	41.4651	1.04E-04	-3.98
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-81.3263	41.4677	9.75E-05	-4.01
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-81.0330	41.4099	8.79E-05	-4.06
-81.1744	41.3693	8.79E-05	-4.06
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-81.2595	41.3871	8.11E-05	-4.09
-81.2766	41.4931	8.10E-05	-4.09
-81.0032	41.5940	8.04E-05	-4.09
-81.3043	41.3655	7.98E-05	-4.10
-81.0724	41.4498	7.93E-05	-4.10
-81.3440	41.4660	7.92E-05	-4.10
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-81.3364	41.4690	7.66E-05	-4.12
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-81.2955	41.3904	7.44E-05	-4.13
-81.2704	41.5697	7.40E-05	-4.13
-81.0990	41.4238	7.33E-05	-4.14
-81.2522	41.5558	7.21E-05	-4.14
-81.3526	41.4364	7.18E-05	-4.14
-81.1973	41.4208	7.18E-05	-4.14
-81.2426	41.3854	7.11E-05	-4.15
-81.2388	41.3763	7.11E-05	-4.15
-81.3035	41.3875	7.11E-05	-4.15
-81.3397	41.4848	7.10E-05	-4.15
-81.2222	41.5183	7.00E-05	-4.15
-81.0145	41.6654	6.99E-05	-4.16
-81.2350	41.5536	6.93E-05	-4.16
-81.2282	41.4204	6.91E-05	-4.16
-81.2362	41.6000	6.77E-05	-4.17
-81.2451	41.5070	6.77E-05	-4.17
-81.2011	41.5019	6.77E-05	-4.17
-81.2312	41.5026	6.77E-05	-4.17
-81.0209	41.3513	6.74E-05	-4.17
-81.0436	41.4271	6.66E-05	-4.18
-81.3487	41.4498	6.66E-05	-4.18
-81.3490	41.4393	6.66E-05	-4.18
-81.3912	41.4129	6.65E-05	-4.18
-81.3257	41.4195	6.59E-05	-4.18
-81.2411	41.5572	6.57E-05	-4.18
-81.1924	41.5370	6.54E-05	-4.18
-81.2885	41.4297	6.49E-05	-4.19

-81.2238	41.4235	6.44E-05	-4.19
-81.3300	41.3544	6.40E-05	-4.19
-81.3081	41.4351	6.40E-05	-4.19
-81.2426	41.5917	6.29E-05	-4.20
-81.2393	41.4222	6.25E-05	-4.20
-81.3364	41.3775	6.25E-05	-4.20
-81.3424	41.4240	6.25E-05	-4.20
-81.3444	41.3568	6.25E-05	-4.20
-81.1515	41.5801	6.25E-05	-4.20
-81.0831	41.4523	6.25E-05	-4.20
-81.0556	41.4670	6.25E-05	-4.20
-81.3778	41.4565	6.25E-05	-4.20
-81.3464	41.4677	6.25E-05	-4.20
-81.3435	41.4080	6.19E-05	-4.21
-81.1948	41.4421	6.19E-05	-4.21
-81.2752	41.4160	6.13E-05	-4.21
-81.3577	41.4369	6.12E-05	-4.21
-81.3522	41.4022	6.06E-05	-4.22
-81.2327	41.5536	6.05E-05	-4.22
-81.3742	41.5281	5.97E-05	-4.22
-81.3235	41.4645	5.96E-05	-4.22
-81.3351	41.4282	5.90E-05	-4.23
-81.3637	41.3832	5.90E-05	-4.23
-81.2352	41.5714	5.89E-05	-4.23
-81.3713	41.4171	5.82E-05	-4.24
-81.2463	41.4668	5.81E-05	-4.24
-81.2563	41.3866	5.73E-05	-4.24
-81.2310	41.3943	5.72E-05	-4.24
-81.2477	41.5514	5.67E-05	-4.25
-81.2604	41.5484	5.59E-05	-4.25
-81.1380	41.6025	5.56E-05	-4.25
-81.2248	41.4160	5.56E-05	-4.25
-81.3274	41.3531	5.56E-05	-4.25
-81.2902	41.5607	5.49E-05	-4.26
-81.1475	41.5436	5.49E-05	-4.26
-81.2569	41.3856	5.47E-05	-4.26
-81.3180	41.3784	5.47E-05	-4.26
-81.3255	41.3976	5.47E-05	-4.26
-81.3183	41.3835	5.47E-05	-4.26

-81.1987	41.5810	5.47E-05	-4.26
-81.2691	41.5356	5.47E-05	-4.26
-81.3282	41.4296	5.47E-05	-4.26
-81.2389	41.5611	5.46E-05	-4.26
-81.2219	41.3942	5.39E-05	-4.27
-81.1976	41.5096	5.35E-05	-4.27
-81.2046	41.5075	5.28E-05	-4.28
-81.3299	41.3534	5.27E-05	-4.28
-81.1972	41.4707	5.27E-05	-4.28
-81.3594	41.5163	5.27E-05	-4.28
-81.2147	41.3733	5.26E-05	-4.28
-81.1065	41.4129	5.25E-05	-4.28
-81.0035	41.6912	5.22E-05	-4.28
-81.3815	41.4151	5.22E-05	-4.28
-81.2948	41.5006	5.21E-05	-4.28
-81.2334	41.5025	5.21E-05	-4.28
-81.0597	41.3499	5.19E-05	-4.29
-81.0045	41.3497	5.16E-05	-4.29
-81.1286	41.4257	5.16E-05	-4.29
-81.2832	41.4673	5.13E-05	-4.29
-81.2483	41.4698	5.10E-05	-4.29
-81.2807	41.6289	5.05E-05	-4.30
-81.3755	41.4022	4.90E-05	-4.31
-81.3251	41.4336	4.89E-05	-4.31
-81.2429	41.4967	4.83E-05	-4.32
-81.2390	41.5054	4.83E-05	-4.32
-81.0687	41.3725	4.77E-05	-4.32
-81.3331	41.4381	4.76E-05	-4.32
-81.3293	41.4297	4.76E-05	-4.32
-81.2965	41.5033	4.74E-05	-4.32
-81.2273	41.5608	4.74E-05	-4.32
-81.3547	41.5379	4.74E-05	-4.32
-81.2509	41.4023	4.73E-05	-4.33
-81.2712	41.4482	4.70E-05	-4.33
-81.2876	41.3574	4.56E-05	-4.34
-81.0900	41.5347	4.56E-05	-4.34
-81.1620	41.4368	4.56E-05	-4.34
-81.2633	41.3574	4.56E-05	-4.34
-81.2197	41.5279	4.52E-05	-4.34

-81.3718	41.4663	4.50E-05	-4.35
-81.3609	41.4932	4.41E-05	-4.36
-81.2793	41.3496	4.41E-05	-4.36
-81.0382	41.4640	4.36E-05	-4.36
-81.2172	41.4434	4.24E-05	-4.37
-81.2869	41.4268	4.22E-05	-4.37
-81.2567	41.4494	4.20E-05	-4.38
-81.2805	41.4038	4.20E-05	-4.38
-81.1299	41.4801	4.20E-05	-4.38
-81.0505	41.6169	4.20E-05	-4.38
-81.3585	41.5482	4.17E-05	-4.38
-81.0571	41.5795	4.16E-05	-4.38
-81.3125	41.4156	4.11E-05	-4.39
-81.0116	41.6387	4.10E-05	-4.39
-81.1773	41.5469	4.08E-05	-4.39
-81.1262	41.5003	4.05E-05	-4.39
-81.0548	41.3496	4.01E-05	-4.40
-81.3448	41.4662	3.96E-05	-4.40
-81.2917	41.3862	3.95E-05	-4.40
-81.3877	41.4121	3.91E-05	-4.41
-81.2146	41.4037	3.91E-05	-4.41
-81.0240	41.4040	3.90E-05	-4.41
-81.1011	41.4481	3.89E-05	-4.41
-81.1931	41.5036	3.89E-05	-4.41
-81.3291	41.4260	3.87E-05	-4.41
-81.1991	41.3995	3.84E-05	-4.42
-81.3132	41.4438	3.84E-05	-4.42
-81.1374	41.5545	3.79E-05	-4.42
-81.2888	41.4788	3.78E-05	-4.42
-81.1453	41.3592	3.76E-05	-4.43
-81.2019	41.5137	3.69E-05	-4.43
-81.3905	41.5395	3.67E-05	-4.44
-81.3278	41.3813	3.65E-05	-4.44
-81.1989	41.5884	3.65E-05	-4.44
-81.0667	41.3720	3.64E-05	-4.44
-81.3423	41.4236	3.57E-05	-4.45
-81.0241	41.4095	3.52E-05	-4.45
-81.2560	41.3474	3.47E-05	-4.46
-81.3438	41.5127	3.44E-05	-4.46

-81.3404	41.5615	3.41E-05	-4.47
-81.2338	41.3898	3.40E-05	-4.47
-81.1783	41.3595	3.39E-05	-4.47
-81.2422	41.5055	3.38E-05	-4.47
-81.2900	41.3900	3.35E-05	-4.47
-81.3420	41.4339	3.32E-05	-4.48
-81.0748	41.6259	3.31E-05	-4.48
-81.2580	41.3929	3.31E-05	-4.48
-81.2009	41.6219	3.26E-05	-4.49
-81.2297	41.5739	3.25E-05	-4.49
-81.2297	41.5570	3.22E-05	-4.49
-81.3786	41.4038	3.21E-05	-4.49
-81.2930	41.3919	3.15E-05	-4.50
-81.3073	41.4409	3.13E-05	-4.50
-81.3837	41.5220	3.09E-05	-4.51
-81.3650	41.5367	3.08E-05	-4.51
-81.3007	41.4095	3.03E-05	-4.52
-81.3826	41.4153	3.03E-05	-4.52
-81.2723	41.5302	3.02E-05	-4.52
-81.2180	41.4914	3.02E-05	-4.52
-81.3898	41.4536	2.98E-05	-4.53
-81.3395	41.4230	2.92E-05	-4.53
-81.3470	41.5150	2.86E-05	-4.54
-81.1388	41.3787	2.86E-05	-4.54
-81.2320	41.5113	2.84E-05	-4.55
-81.1241	41.4335	2.81E-05	-4.55
-81.0676	41.3730	2.81E-05	-4.55
-81.2407	41.3660	2.77E-05	-4.56
-81.2380	41.5067	2.72E-05	-4.57
-81.1928	41.4999	2.71E-05	-4.57
-81.2801	41.4368	2.71E-05	-4.57
-81.3481	41.3652	2.59E-05	-4.59
-81.2764	41.5484	2.58E-05	-4.59
-81.2008	41.6141	2.55E-05	-4.59
-81.3823	41.4224	2.46E-05	-4.61
-81.2320	41.5653	2.44E-05	-4.61
-81.1710	41.4726	2.44E-05	-4.61
-81.2572	41.6056	2.43E-05	-4.61
-81.0919	41.5003	2.39E-05	-4.62

-81.2633	41.5406	2.36E-05	-4.63
-81.2397	41.5044	2.35E-05	-4.63
-81.2764	41.5848	2.30E-05	-4.64
-81.2047	41.4247	2.28E-05	-4.64
-81.1756	41.5612	2.26E-05	-4.65
-81.2203	41.5213	2.21E-05	-4.65
-81.2313	41.3808	2.13E-05	-4.67
-81.2754	41.5618	1.99E-05	-4.70
-81.2855	41.4380	1.99E-05	-4.70

-81.3603	41.3550	1.81E-05	-4.74
-81.2060	41.5091	1.80E-05	-4.75
-81.2243	41.3915	1.60E-05	-4.80
-81.3418	41.3933	1.58E-05	-4.80
-81.3879	41.4155	1.50E-05	-4.82
-81.2416	41.4968	1.46E-05	-4.84
-81.2868	41.5924	1.02E-05	-4.99
-81.0197	41.5332	9.54E-06	-5.02
-81.3430	41.5386	2.28E-06	-5.64