APPENDICES

Appendix 1. Historic and projected population in northwest Indiana.

Upper county figures: Division of Water estimates, in-basin portion only.
Lower county figures: U.S. Census Bureau, total county (1910-1990); Indiana State Board of Health (1988), total county (2000-2010).
City figures: U.S. Census Bureau (1960-1990); Division of Water projections (2000-2010) (tabulation includes only cities and towns having at least 2,500 residents in 1980).

Location	1910	1920	1930	1940	1950	1960	1970	1980	1990	2000	2010
Lake County	75873	152242	252822	282762	353509	491339	518511	486695	435283	422394	410710
	82864	159957	261310	293195	368152	513269	546253	522965	475594	*459124	*446424
Crown Point						8443	10931	16455	17728	17114	16641
Dyer						3993	4906	9555	10923	10545	10253
East Chicago						57669	46982	39786	33892	32718	31813
Gary						178320	175415	151953	116646	112606	109492
Griffith						9483	18168	17026	17916	17296	16817
Hammond						111698	107983	93714	84236	81319	79070
Highland						16284	24947	25935	23696	22875	22243
Hobart						18680	21485	22987	21822	21066	20484
Lake Station[1]						9309	9858	14294	13899	13418	13046
Merrillville[2]						-	-	27677	27257	26313	25585
Munster						10313	16514	20671	19949	19258	18726
New Chicago						2312	2231	3284	2066	1994	1939
St. John[3]						1128	1757	3974	4921	4751	4619
Schererville						2875	3663	13209	19926	19236	18704
Whiting						8137	7054	5630	5155	4976	4839
LaPorte County	29448	32249	41731	43628	51340	63359	71363	70257	67861	62616	61097
	45797	50443	60490	63660	76808	95111	105342	108632	107066	99390	96980
Michigan City						36653	39369	36850	33822	31397	30636
Trail Creek						1552	2697	2581	2463	2286	2231
Porter County	14873	14441	17332	21545	32985	51273	75879	99267	104148	108305	111359
	20540	20256	22821	27836	40076	60279	87114	119816	128932	133710	137480
Chesterton						4335	6177	8531	9124	9462	9729
Portage						11822	19127	27409	29060	30137	30987
Porter						2189	3058	2988	3118	3234	3325
Valparaiso						15227	20020	22247	24414	25319	26033
St Joseph County	78	79	91	107	121	130	125	133	132	121	123
	84312	103304	160033	161823	205058	238614	244827	241617	247052	242530	246450
Total (In-Basin)	120272	199011	311976	348042	437955	606101	665878	656352	607424	593436	583289

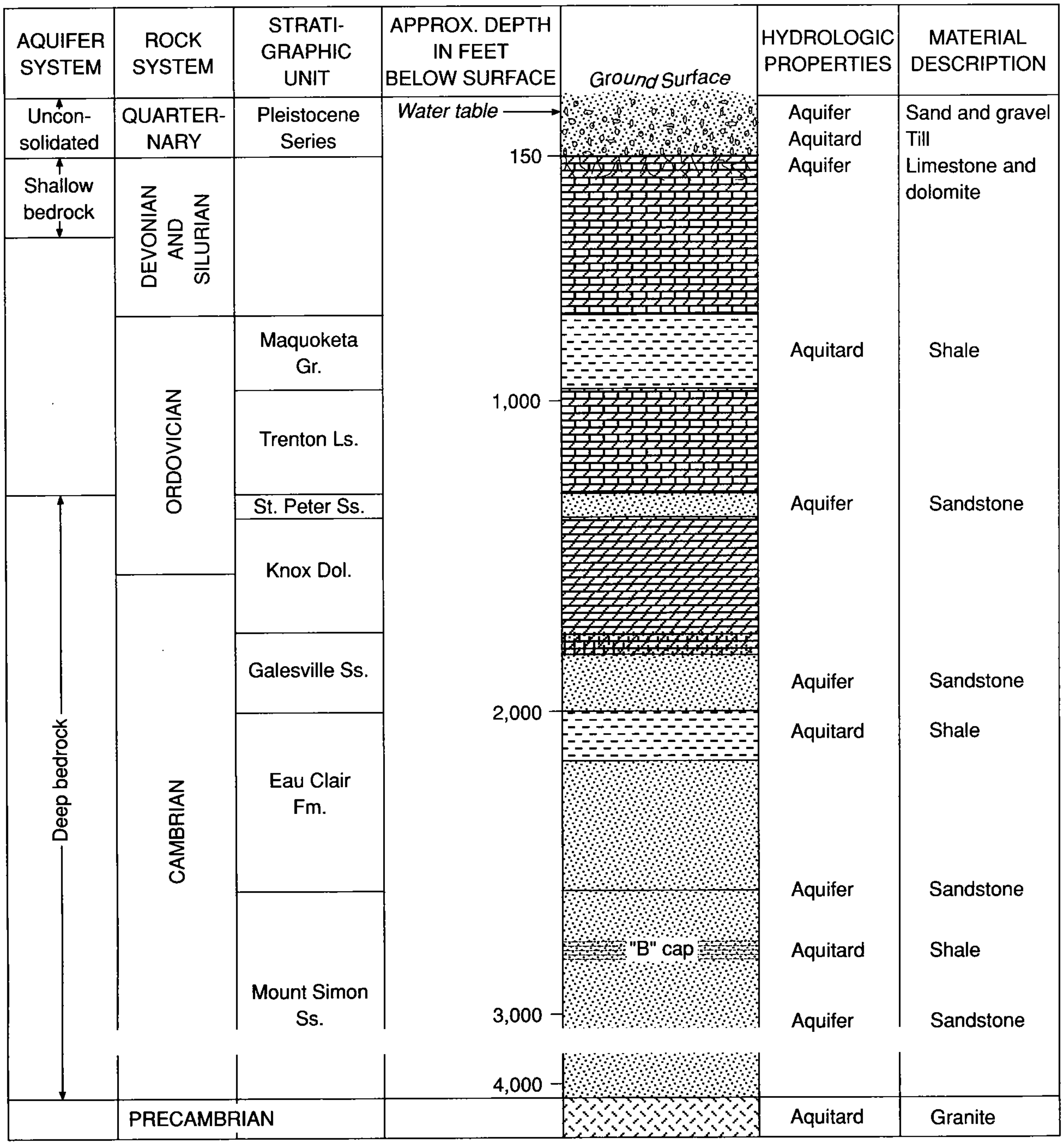
* Lake County projections have been adjusted to reflect 1990 Census
1 Lake Station - East Gary town was renamed Lake Station city
2 Merrillville - town was incorporated (1970 population 24,075)
3 St. John - Corporate limit lies partially outside basin boundary.

Appendix 2. Land Use for the Lake Michigan Region

{U.S. Geological Survey digital files Land-use and land-cover. Values are approximate}

Land Use	Acreage	Sq. miles	Percent
URBAN OR BUILT-UP LAND	113627	177.53	29.39
Residential	56860	88.84	14.71
Commercial	18466	28.85	4.78
Industrial	22284	34.82	5.76
Trans., Comm. & Util.	9705	15.16	2.51
Mixed Urban/Built-up	184	0.29	0.05
Other Urban/Built-up	6128	9.57	1.58
AGRICULTURAL LAND	189107	295.48	48.91
Cropland and Pasture	188203	294.07	48.69
Orchards, etc.	768	1.20	0.19
Confined feeding	96	0.15	0.02
Other Agricultural land	40	0.06	0.01
FOREST LAND	66016	103.15	17.08
Deciduous Forest	65456	102.27	16.93
Evergreen Forest	409	0.64	0.11
Mixed Forest	151	0.24	0.04
LAKES AND WETLANDS	11768	18.38	3.05
Lakes	1135	1.77	0.29
Reservoir	3198	5.00	0.83
Bays	955	1.49	0.25
Forested Wetland	3815	5.96	0.99
Nonforested Wetland	2665	4.16	0.69
BARREN LAND	6042	9.44	1.57
Sandy areas other than beaches	933	1.46	0.24
Str. Mines, Quarries, Gr. pits	1656	2.59	0.43
Transitional areas	3151	4.92	0.82
Mixed Barren land	302	0.47	0.08
TOTAL	386560	603.98	100.00

Appendix 3. Geologic column from surface of Valparaiso Moraine to Precambrian basement



* Aquifers having 10,000 parts per million (ppm) are generally not considered a source for drinking water.

** The Mount Simon sandstone below the "B" cap shale is considered the most suitable of the aquifers for waste injection.

*** Chloride values may approach or exceed 10,000 ppm, especially in the eastern portion of the Region.

The following paragraphs give a brief description of the erosion and accretion conditions that exist in the 5 littoral cells along Indiana's 45 mile coastline starting at the Michigan state line to the east, and ending with the Illinois state line to the west. The figure below identifies the locations of the 5 littoral cells.

Michigan City to Michigan state line (CZM Reach)

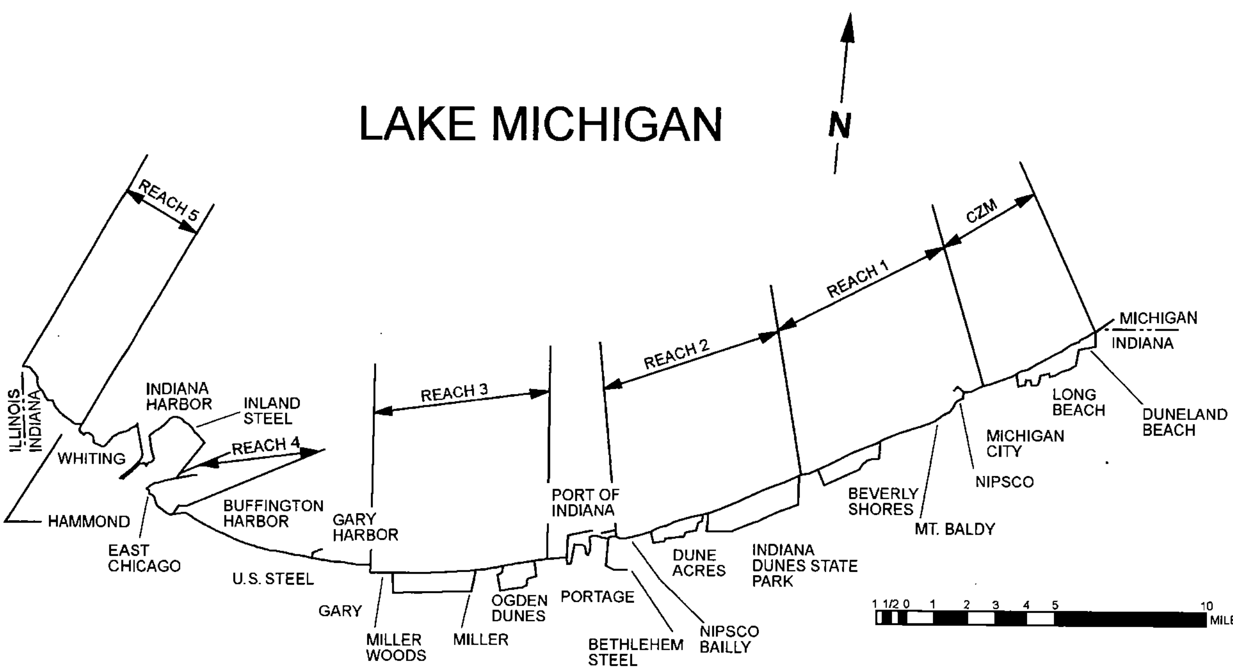
The shoreline east of Michigan City has a northeast by southwest orientation, causing "net" longshore sand movement to be from the east toward the west.

The lighthouse pier at Trail Creek in Michigan City extends 1000 feet out into Lake Michigan from the present day shoreline (see aerial photo on next page). This shoreline immediately east of Michigan City is approximately 0.3 miles (1500 feet) lakeward of the 'natural' 1834 shoreline. Construction in 1836 of the first east and west piers at Trail Creek created a "total littoral barrier", completely blocking the westward movement of sand. The beach toward the east grew lakeward at a rate of 10 feet per year, requiring new pier extensions be built to maintain an open navigation channel. At the same time, the "sand-starved" shoreline west of Trail Creek began to erode.

By 1910 the pier complex was in the configuration seen today, with an east and west pier at Trail Creek, a detached breakwater west of the lighthouse, and NIPSCO's sheet-steel and rock wall extending one mile west of Trail Creek. Continuous accumulation of sand against the east pier wall built the east shoreline lakeward, until sand eventually began to leak westward around the end of the lighthouse pier during storms of sufficient intensity.

This movement of sand around the east pier resulted in a "balance" between the volume of sand coming in from the east and the volume of sand moving west into the Trail Creek channel. The position of the shoreline immediately east of the pier stabilized in 1934, requiring beach nourishment materials be brought in to artificially create a beach on the north side of the Michigan City marina.

Sand leaking around the lighthouse means the pier is now a "partial littoral barrier". However, the detached breakwater west of the lighthouse continues to capture the sand by detaining it in the low energy "shadow zone" between the detached wall and the shoreline.



Therefore, the Michigan City breakwater complex remains a "total littoral barrier".

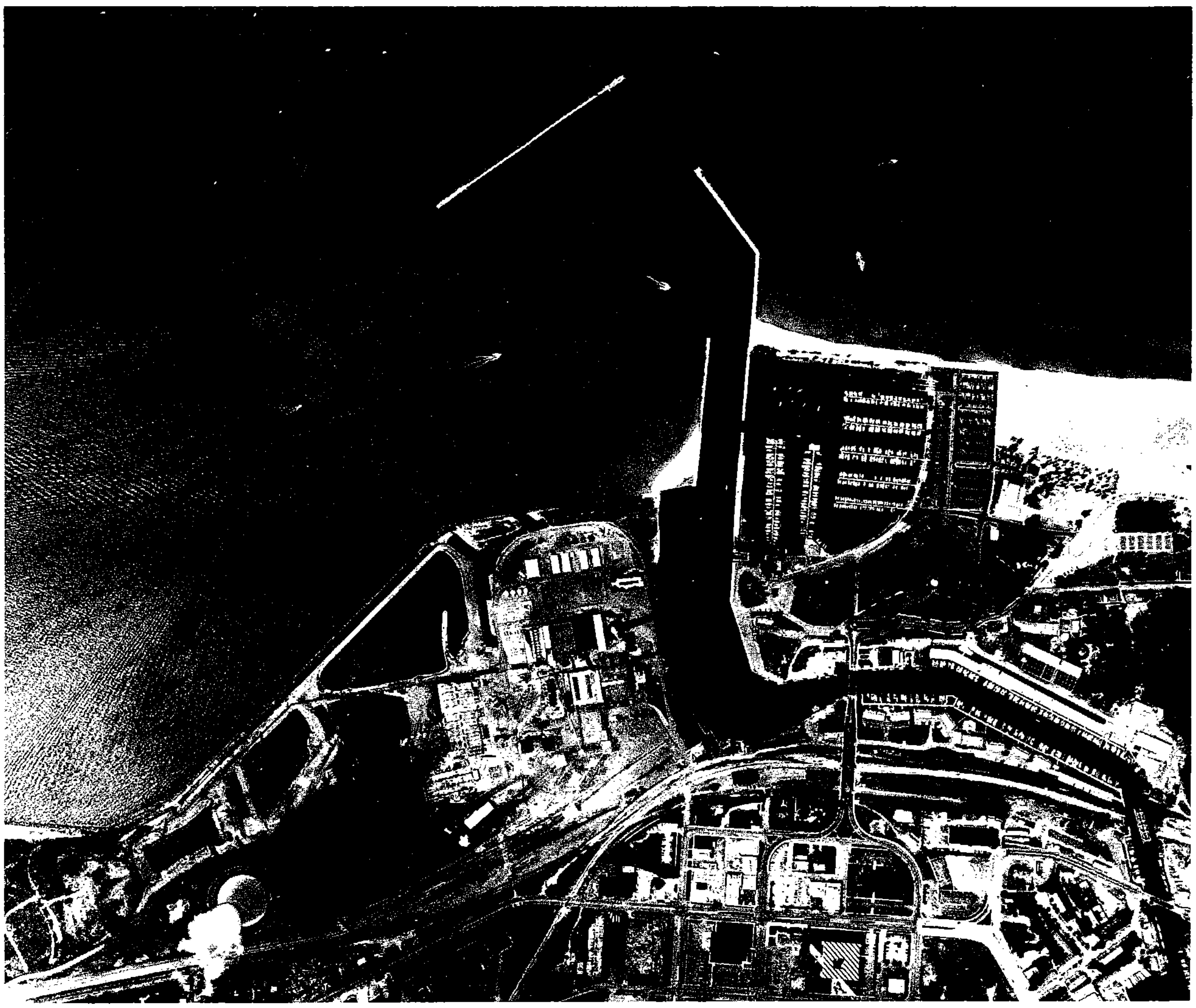
Frequent dredging is necessary to keep the Trail Creek channel open for deeper draft vessels. Dredging records from 1920 to 1978 show a total of 1.6 million cubic yards of sand have been removed from the area west of the lighthouse. Most of this sand was barged offshore and dumped in deep water.

During high lake levels and years with high energy storms, the "fillet" beach east of the lighthouse pier can disappear, resulting in approximately 2 to 5 feet of water depth along the north breakwall of the Michigan City marina. The beach returns again during lower lake levels and years with lower energy storms.

The effect of the "accretional fillet" of trapped sand extends approximately one mile toward the east from Trail Creek, creating an area of wide beaches and expanding "back beach" sand dunes. However, the periodic loss of the beach at the marina indicates there can still be episodes of erosion within the sand accretion area.

East of the one mile extent of the "accretional fillet" effect, the coast is fairly well armored by breakwalls along approximately two miles (10,400 feet) of the central portion of this CZM Reach. This corresponds to the community of Long Beach.

The Indiana-Michigan state line lies 0.7 miles (3,600 feet) east of the armored Long Beach section. The



shoreline is more natural and is recessional (suffers erosion). During the 1980s high lake level period, one section of this shoreline had to be protected by an emergency sheet-steel wall to prevent a road from being undercut. Later, a low profile rock revetment was placed along the toe of the dune-bluff from the wall to the Michigan state line to protect the rest of the road. Post-1986 low lake levels have allowed sand to bury most of this rock revetment. But, it is there as insurance to protect the natural dune-bluff and roadway from any more loss if lake levels rise to 1986 conditions again.

The erosion experienced along the eastern-most portion of Indiana's CZM Reach is influenced by the construction of a harbor entrance at New Buffalo, Michigan. The harbor is located 4.8 miles northeast of the Indiana-Michigan state line. Shortly after its construction, erosion rates toward the southwest increased, indicating sand was being trapped on the north side of the harbor. The trapped sand would normally have supplied sand to maintain Indiana's beaches.

Port of Indiana (Burns International Harbor complex) to Michigan City (Reach 1 and Reach 2)

The Corps of Engineers has divided the single "littoral cell" between the Port of Indiana and Michigan City into two reaches. The western Reach 2 extends from the Port of Indiana to Beverly Shores. The eastern Reach 1 includes Beverly Shores and extends to the Michigan City harbor. The shoreline has a northeast by southwest orientation, resulting in a "net" direction of sediment movement from the east toward the west. Both Reach 1 and 2 are generally recessional (suffer erosion).

In western Reach 2, the eastern most wall of the Port of Indiana "breakwater complex" extends north approximately 0.4 miles (2000 feet) into the waters of Lake Michigan, creating a "total littoral barrier" to sand movement toward the west. The "accretional fillet" forming east of the breakwater is creating wide beaches and expanding low sand dunes in the "back beach" area.

The Northern Indiana Public Service Company (NIPSCO) Bailly power plant's water intake is located only 2000 feet east of the Port complex in Lake Michigan. It is continuously threatened of being buried by the continual accumulation of sand. NIPSCO has established a dredging program to keep the water intake from being clogged with sand. NIPSCO by-passes 75% of the dredged Lake Michigan sand downdrift to Ogden Dunes, west of the Port. This "nourishment sand" helps mitigate shoreline erosion. NIPSCO back-passes 25% of the sand toward the east to Beverly Shores. The State of Indiana encourages the use of clean and suitable dredge material as beach nourishment.

The sand-trapping effect of the Port of Indiana extends approximately 1 mile toward the east. The expanding wide beaches and sand dune growth is similar to the "accretional fillet" processes observed immediately east of the Michigan City breakwater and the U.S. Steel breakwater in Gary. Just like the shoreline east of Michigan City, periods of high lake level and severe storms can still threaten coastal structures with erosion in the eastern portion of this accretion zone.

East of this accretion zone, and west of Beverly Shores, the "long term" dune-bluff erosion rates in Reach 2 are variable, with some areas of the coast having high recession rates and some low. The Indiana Dunes State Park lies along 3.3 miles of the shoreline immediately west of Beverly Shores within this variable erosion rate zone. The park is operated by the Indiana Department of Natural Resources. In contrast, dune-bluff erosion rates in eastern Reach 1 (Beverly Shores to Michigan City) have been consistently high historically.

Construction of the 1836 Michigan City breakwater at Trail Creek was the beginning of severe "sand starved" conditions in Reach 1. The 'highest' erosion rates originally occurred immediately west of Trail Creek until these rates were 'transferred' 1 mile to the west to the Crescent Dune and Mt. Baldy shoreline by the construction of NIPSCO's sheet-steel shore protection.

The Crescent Dune area continues to experience 'long term' background erosion rates of approximately 10 feet per year, which are among the highest erosion rates in Indiana. The very existence of Indiana's largest migrating sand dune, Mt. Baldy, located within the boundaries of the Indiana Dunes National Lakeshore was and is still threatened by erosion. Fortunately, as expected, erosion rates progressively decrease toward the west, over the 2 mile length of shoreline from Crescent Dune to the east end of Beverly Shores.

However, a nearly continuous six (6) foot rise in Lake Michigan's lake level, between 1964 and 1974, combined with severe storms to exacerbate long term erosion conditions to a point where "rock revetment" had to be constructed along the eastern 2.5 miles (13,000 foot) of Beverly Shores coast in 1974. Multiple houses were lost to erosion and the roadway along the shoreline was threatened.

"Beach nourishment" projects were conducted in 1974 and again in 1981 to mitigate some of the man-induced erosion on the shoreline at Mt. Baldy. The beach nourishment projects halted the erosion of the "natural" dune-bluff while the nourishment material lasted. Some of this beach nourishment material is probably responsible for a portion of the wide beaches that formed in the central portion of Beverly Shores following the lake level decline after 1986.

Gary works (U.S. Steel lakefill) to Port of Indiana (Burns Int'l Harbor) (Reach 3)

Indiana's shoreline from the U.S. Steel lakefill breakwater in Gary, to the Portage/Burns Waterway in Portage, is identified as Reach 3. The shoreline at Gary is located at the southern-most tip of Lake Michigan, with the shoreline east of Gary having a northeast by southwest orientation. This causes the "net" movement of sand to be from the east toward the west. In general, Reach 3 is accretional in the western third and recessional in the eastern third.

The U.S. Steel lakefill breakwater, constructed in 1967, creates a "littoral barrier" to the westward movement of sand. For approximately 2 miles east, the beach has continued to widen lakeward and new 'back beach' sand dunes have expanded lakeward along with the widening beach. Native dune grasses capture wind blown sand, increasing the height of these new dunes.

One mile east of the lakefill wall, a hundred foot wide beach now lies between the boat launch ramps at Lake Street and the waters of Lake Michigan. Bulldozers try to maintain a small non-structural open water channel across the beach as access to Lake Michigan during the boating season. The central portion of this "littoral cell" (Reach 3) consists of the Indiana Dunes National Lakeshore "West Beach Unit". It has been relatively stable, even during the high lake level period between 1978 to 1987. But, erosion still reaches the "natural" dune-bluffs when storms are intense.

Man-induced erosion on the downdrift (west) side of the Port of Indiana began after construction started in 1967. The eastern 1.2 miles of Reach 3 includes the Portage/Burns Waterway and the community of Ogden Dunes. The shoreline immediately west of the waterway suffers extreme high erosion rates similar to the Crescent Dune area west of Michigan City.

Rising and sustained high lake levels from 1964 to 1986 exacerbated erosion conditions. The average rates of bluff-top recession range from -17.7 feet per year east of Ogden Dunes at the Portage/Burns Waterway (between 1969 and 1978), to -4.7 feet per year at the west end of Ogden Dunes, 1.2 miles toward the west (between 1969 and 1978). This shows erosion rates decrease toward the west with increasing distance from the last shore protection structure, as expected. But, private seawall construction and other methods of erosion control are necessary to protect the lakefront homes in Ogden Dunes.

Sand nourishment from the NIPSCO Bailly power plant dredge program contributes sand to the offshore sand bars in approximately 12 feet of water. Dredging of the Portage/Burns Waterway provided "beach nourishment" sand to help mitigate the "sand starved" conditions in 1985. This nourishment sand and lower lake levels since the "1986 high" have allowed beaches to return to the shoreline of Ogden Dunes. A return to high 1986 lake levels could mean a return of the erosion conditions that forced the construction of the seawalls.

Between Reach 3 and Reach 4

The portion of Gary's shoreline from the eastern wall of the U.S. Steel lakefill breakwater in the east, to the western breakwater at Buffington Harbor in the west is approximately 6.8 miles of non-eroding industrial property. Structures protect and stabilize this man-made land. This shoreline has a northwest by southeast orientation which would normally move sand from the west toward the east. But, because there is no shoreline to erode, there is essentially no sediment to move in the "net" longshore water currents created by storm waves.

Buffington Harbor to Indiana Harbor complex (Reach 4)

Reach 4 covers 1.3 miles of shoreline between Buffington Harbor in Gary to the east, and the Indiana Harbor complex in East Chicago to the west. The shoreline has a northwest by southeast orientation which would normally cause the "net" sediment transport to be from the west toward the east.

However, the Indiana Harbor complex is the largest man-made lakefill structure on the Indiana coast, located at the mouth of the Grand Calumet river. The harbor extends 2.6 miles (14,000 feet) out into Lake Michigan, perpendicular to the shoreline, in a northeast by southwest orientation. Its size and orientation creates a low energy "shadow zone" which shelters the western portion of Reach 4 from direct wave attack by north storm waves. This causes some sand to move westward into this low energy zone, which is opposite to the expected direction if the Indiana Harbor was not there. The eastern portion of Reach 4 is not sheltered and sediment moves from west toward the east as expected.

There does not appear to be large quantities of sand trapped by this "total littoral barrier" primarily because the only sand source is one mile of open coast, part of which has erosion protection. With the Indiana Harbor to the west and Buffington Harbor extending 0.6 miles out into Lake Michigan on the east, Reach 4 is a "closed littoral cell". The main way sand is lost from this "littoral transport system" is to move it far offshore into deep water during severe storm events.

Indiana Harbor complex to Illinois state line (Reach 5)

Reach 5 covers 3.9 miles of Indiana's shoreline from the west edge of the Indiana Harbor complex to the Indiana-Illinois state line. The shoreline has a northwest by southeast orientation which would normally cause the "net" sediment transport to be from the west toward the east. However, 2.3 miles north of the Indiana-Illinois state line, the Calumet Harbor breakwater extends 0.8 miles (4,262 feet) due east from the Illinois shoreline out into Lake Michigan, and then another 1.5 miles (8,075 feet) southeast. This breakwater lies partly in Illinois but mostly in Indiana's waters.

The large size and orientation of the Calumet Harbor creates a large low energy "shadow zone" which shelters the western portion of Reach 5 from direct wave attack by north storm waves. This causes sand to move both eastward and westward within this low energy zone, dependent on the amount of sheltering created by smaller man-made lakefills along Indiana's shore. The highly armored nature of Reach 5 makes contemporary erosion rates and direction of sediment movement difficult to determine because they have been severely modified by shore protection and the massive lakefill structures built out into the waters of Lake Michigan.

The eastern-most portion of Reach 5 is not sheltered by the Calumet Harbor breakwater and sediment moves from west toward the east as expected. No large "accumulation fillets" are found because of the small amount of erodible shoreline that exists between the structures. Erosion is still a concern at the Whihala Beach bathhouse and boat launch facilities.

On the positive side, the Calumet Harbor provides a protected entrance to the Calumet River in Illinois. It also provides some protection to Indiana's Hammond and Whiting shorelines from direct attack by north storm waves. On the negative side, the size of the Calumet Harbor creates a "total littoral barrier" to sand movement, preventing any Illinois sand from reaching Indiana's coast.

Historic erosion data from as far back as 1938 shows isolated areas experienced substantial shoreline erosion. But, recent industrial shoreline protection has made this area relatively stable on the whole.

Appendix 5. Description of wetland protection programs [1]

Administrative agency: IDNR, Indiana Department of Natural Resources - Divisions of Water (DOW), Nature Preserves (DNP), Fish and Wildlife (DFW) and Soil Conservation (DSC); IDEM, Indiana Department of Environmental Management; USACE, U.S. Army Corps of Engineers; USEPA, U.S. Environmental Protection Agency; USDA, U.S. Department of Agriculture, TNC, The Nature Conservancy. Slash denotes cooperative program.

		Program	Administrative Agency	Relevance or Benefit to Wetlands
REGULATORY	STATE	Flood Control Act (IC 13-2-22)	IDNR-DOW	Requires permit from Natural Resources Commission for construction, excavation or filling within a stream's floodway and its encompassed wetlands
REGULATORY	STATE	Lake Preservation Act (IC 13-2-11.1)	IDNR-DOW	Requires permit from Natural Resources Commission to alter the bed or shoreline of a public freshwater lake of natural origin
REGULATORY	STATE	Nature Preserves Act (IC 14-4-5)	IDNR-DNP	Protects wetlands contained within a dedicated Nature Preserve[2]
REGULATORY	STATE	Water quality regulations	IDEM	Authority to protect most wetland types is inherent in the Indiana Stream Pollution Control Law (IC 1971, 13-1-13) and portions of 330 IAC 1-1, which establishes water quality standards for designated water use categories. Anti-degradation provisions typically are applied to wetlands
REGULATORY	FEDERAL	Section 404/401 permit program	USACE/IDEM/USEPA	Regulates discharge of dredge or fill into wetlands and waterways; Section 401 of Federal Clean Water Act requires a water quality certification or waiver by IDEM prior to issuance of a Section 404 dredge-and-fill permit from USACE; USEPA may evaluate suitability of sites for fill placement
REGULATORY	FEDERAL	1986 Emergency Wetlands Resources Act		Requires that statewide outdoor recreation plans include wetland priority conservation plan

Appendix 5. Description of wetland protection programs – Continued

		Program	Administrative Agency	Relevance or Benefit to Wetlands
NON REGULATORY	STATE	Wetland conservation program	IDNR-DFW	Funds land acquisition for wetland protection and waterfowl management
		Natural areas registry	IDNR-DNP/TNC	Encourages voluntary conservation efforts on private land containing significant natural communities or rare plant or animal species
		Natural heritage protection campaign (IC 14-4-5.1)	IDNR-DNP/TNC	Identifies and ranks significant natural areas according to the need for protection; funds acquisition and protection of these areas
		Non-game and endangered wildlife program	IDNR-DFW	Protects wetland habitat if it supports endangered, threatened or special concern wildlife species; program includes monitoring surveys of wetland wildlife
		Wildlife habitat cost-share project	IDNR-DFW	Reimburses landowners for developing or improving wildlife habitat, including wetlands
		Classified wildlife habitat and riparian lands program	IDNR-DFW	Provides technical assistance and reduced property tax assessment for land and wetlands placed in the program
	FEDERAL	Food Security Act (1985 Farm Bill)	USDA	"Swampbuster" provision revokes certain federal farm program benefits if wetlands are converted into farmland Conservation Reserve Program promotes financial incentives for removing wetlands from production for at least 10 years Conservation Easements Program grants easements on wetlands to aid in farm debt reduction

1 Portions of this table were summarized from the appendix to "Indiana Outdoor Recreation 1989: An Assessment and Policy Plan" (Indiana Department of Natural Resources, 1988c).

2 Nature Preserves, which may be publicly or privately owned, possess significant natural communities, geologic features, or rare plant and animal species.

Appendix 6. Standards and suggested limits for selected inorganic constituents

(All values except pH and are in milligrams per liter. If multiple uses have been designated, the most protective standard applies. Dash indicates no available criterion).

Aquatic life: Values for all constituents except iron, pH, selenium, and silver are 4-day average concentrations; selenium value is the 24-hour average; silver criterion is not to be exceeded at any time. All values are chronic aquatic criteria which apply outside the mixing zone, except for silver which is the acute aquatic criterion. Where applicable, trace metal standards were calculated using a hardness value of 325 milligrams per liter.

Public supply: Unless otherwise noted, values represent maximum permissible level of contaminant in water at the tap. National secondary regulations (denoted sec) are not enforceable; both national primary regulations and state regulations are enforceable (references b, c, f and m).

Irrigation and livestock: All values from the National Academy of Sciences, 1974.

Constituent	Aquatic life		Public supply		Irrigation	Livestock
	Value	Reference	Value	Reference		
Arsenic (trivalent)	0.190	a	0.05	b,c	0.10	0.2
Barium	-	-	2.0	l	-	-
Cadmium	0.003	a	0.005	l	0.01	0.05
Chloride	230	i	250 sec	d,e	-	-
Chlorine	0.011	a	-	-	-	-
Chromium (total)	0.011	a	0.1	l	0.1	1.0
Copper	0.032	a	1.0 sec	l	0.20	0.5
Cyanide	0.005	a	0.2	l	-	-
Fluoride	-	-	4.0	f	1.0	2.0
	-	-	2.0 sec	f		
Iron	1.00	j	0.3 sec	e	5.0	-
Lead	0.014	a	-	l	5.0	0.1
Manganese	-	-	0.05 sec	e	0.20	-
Mercury (inorganic)	0.012	a	0.002	b,c	-	0.01
Nickel	0.427	k	0.1	l	0.20	-
Nitrate (as nitrogen)	-	-	10.0	b,c	-	-
pH (standard unit)	6.0-9.0	d	6.5-8.5 sec	l	4.5-9.0	-
Selenium	0.035	g	0.05	l	0.02	0.05
Silver	0.015	g	0.1 sec	l	-	-
Sulfate	-	-	250 sec	d,e	-	-
Total dissolved solids	-	-	500 sec	l	500-1000	3000
Zinc	0.288	h	5.0 sec	e	2.0	25.0

a U.S. Environmental Protection Agency, 1985a.
b Indiana Environmental Management Board, 1979.
c U.S. Environmental Protection Agency, 1986c.
d Indiana Stream Pollution Control Board, 1985.
e U.S. Environmental Protection Agency, 1979.
f ______1986a.
g ______1980.
h ______1987a.
i ______1988a.
j ______1976b.
k ______1986b.
l ______1993a.

Appendix 7. Statistics of selected constituents for surface waters in the Lake Michigan Region

Statistics of constituents sampled at selected IDEM stream monitoring stations. (Locations of individual monitoring stations displayed in figure 41 and table 17)

Monitoring Station	No. of samples	Median	Mean	Percentiles 10th	90th	Maximum value	Minimum value
			Dissolved oxygen (mg/L)				
GCR 34	102	4.4	4.3	0.6	7.3	11.5	0.0
GCR 37	102	7.3	7.2	4.8	10.2	11.6	3.2
LCR 13	93	6.4	6.5	2.3	10.7	12.8	0.0
LCR 39	103	8.9	9.1	6.6	12.4	16.2	4.8
IHC 3S	105	6.6	6.6	3.8	9.5	11.7	2.0
IHC 3W	98	5.9	6.0	3.5	8.8	10.1	1.9
IHC 0	96	7.8	7.9	6.0	10.1	12.7	3.9
BD 1	106	8.1	8.5	6.2	11.3	14.4	5.1
TC 0.5	96	8.5	8.3	4.2	12.2	14.0	1.3
			Specific conductance (µmhos/cm)				
GCR 34	105	1091	1120	756	1508	1960	241
GCR 37	105	440	519	332	764	5000	243
LCR 13	99	942	973	521	1460	1820	155
LCR 39	102	602	570	403	700	998	290
IHC 3S	107	467	493	354	680	1049	155
IHC 3W	103	490	504	350	672	988	273
IHC 0	97	380	391	276	510	777	203
BD 1	104	520	555	401	665	3300	7
TC 0.5	95	454	460	278	617	772	184
			Chloride (mg/L)				
GCR 34	73	165	166	110	235	300	19
GCR 37	72	41	41	32	50	67	26
LCR 13	NA	NA	NA	NA	NA	NA	NA
LCR 39	NA	NA	NA	NA	NA	NA	NA
IHC 3S	75	45	47	34	62	80	21
IHC 3W	73	47	50	37	64	98	29
IHC 0	103	33	35	23	49	62	14
BD 1	114	43	44	34	54	99	6
TC 0.5	102	32	32	16	46	60	9
			Hardness (mg/L as $CaCO_3$)				
GCR 34	106	300	337	233	442	2260	112
GCR 37	108	176	177	160	196	242	126
LCR 13	104	380	372	249	486	592	88
LCR 39	77	322	308	242	354	384	89
IHC 3S	110	181	184	164	208	246	152
IHC 3W	106	186	188	165	210	266	146
IHC 0	103	162	165	146	184	358	16
BD 1	114	252	251	217	286	322	113
TC 0.5	102	220	219	167	266	280	97
			Total iron (mg/L)				
GCR 34	111	0.9	1.3	0.5	2.3	16.0	0.3
GCR 37	108	1.2	1.5	0.6	2.4	6.3	0.3
LCR 13	NA	NA	NA	NA	NA	NA	NA
LCR 39	NA	NA	NA	NA	NA	NA	NA
IHC 3S	110	1.2	1.3	0.7	2.2	4.4	0.3
IHC 3W	106	0.7	0.8	0.4	1.0	3.6	0.1
IHC 0	98	0.5	0.6	0.2	1.2	3.5	<0.02
BD 1	115	1.0	1.6	0.6	2.6	17.0	0.4
TC 0.5	102	0.8	1.2	0.3	1.9	11.0	0.1

NA = Insufficient data available over the period of study.

Appendix 7. Statistics of selected constituents for surface waters in the Lake Michigan Region – Continued

Statistics of constituents from IDEM monitoring stations along Lake Michigan and Wolf Lake (Locations of individual monitoring stations displayed in figure 41 and table 17)

Monitoring Station	No. of samples	Median	Mean	Percentiles 10th	Percentiles 90th	Maximum value	Minimum value
			Specific conductance (μmhos/cm)				
LM EC	96	280	271	200	323	383	23
LM G	96	270	258	183	311	359	135
LM H	96	279	265	179	320	670	23
LM M	92	271	259	180	310	450	132
LM W	96	270	266	193	324	400	116
WL SL	104	364	377	235	501	1340	163
			Chloride (mg/L)				
LM EC	112	11	12	10	13	119	9
LM G	121	10	11	9	13	23	9
LM H	124	11	11	10	13	19	9
LM M	115	10	11	9	13	44	8
LM W	123	11	12	10	15	95	<5
WL SL	NA	NA	NA	NA	NA	NA	NA
			Sulfate (mg/L)				
LM EC	120	25	25	22	27	39	19
LM G	119	23	24	21	26	49	<5
LM H	121	25	25	22	27	38	19
LM M	114	24	25	22	28	80	18
LM W	120	25	25	22	28	32	19
WL SL	NA	NA	NA	NA	NA	NA	NA
			Hardness (mg/L as $CaCO_3$)				
LM EC	123	142	146	134	160	318	110
LM G	121	141	145	134	156	250	122
LM H	124	144	145	132	162	240	124
LM M	115	142	147	136	158	303	122
LM W	123	142	144	134	156	176	124
WL SL	76	143	141	102	179	246	96
			Total Phosphorous (mg/L as P)				
LM EC	123	<0.03	0.05	<0.03	0.06	1.37	<0.03
LM G	122	<0.03	0.08	<0.03	0.05	3.70	<0.03
LM H	122	<0.03	0.07	<0.03	0.08	1.34	<0.03
LM M	116	<0.03	0.07	<0.03	0.05	1.40	<0.03
LM W	122	<0.03	0.05	<0.03	0.04	2.25	<0.03
WL SL	109	0.04	0.12	<0.03	0.10	2.75	<0.03
			Nitrate+nitrite (mg/L as N)				
LM EC	123	0.3	0.4	0.2	0.4	8.9	<0.1
LM G	121	0.3	0.4	0.2	0.4	4.6	0.2
LM H	123	0.3	0.4	0.2	0.4	4.3	<0.1
LM M	116	0.3	0.4	0.2	0.4	4.9	<0.1
LM W	122	0.3	0.4	0.2	0.5	4.0	<0.1
WL SL	108	<0.1	0.2	<0.1	0.4	0.5	<0.1

NA = Insufficient data available over the period of study.

Appendix 8. Summary of fishery surveys on selected streams and lakes {Indiana Department of Natural Resources, Fish and Wildlife Division}

Fisheries sampling studies done by the Indiana Department of Natural Resources, Division of Fish and Wildlife may provide additional information about fish populations and water quality of streams. The multiple-year surveys, conducted for fisheries management purposes, can provide insights concerning changes in fish populations and water quality in streams through time. Fish are collected at numerous stations and classified by species, size and weight and water-quality samples are taken. In the Lake Michigan Region, IDNR fish sampling studies have been done on the **Little Calumet River** and on **Deep River**.

Within recent years, the East Branch (1974 and 1977) and the West Branch (1980) of the Little Calumet River have each been sampled by the IDNR.

Stocked annually with juvenile salmon and steelhead trout, the **East Branch of the Little Calumet River** plays an important role in Indiana as one of two watersheds managed for salmonids. Fifty-one stations were sampled throughout the watershed in 1977, and the dominant species were found to be nearly identical to those found in the 1974 survey. Generally, the water quality was found to be capable of supporting a coldwater fishery, especially at the upper stations. Some of the tributaries, however, exhibited poor fish habitat and marginal water quality. **Salt Creek** was found to have the poorest water quality in the watershed.

The **West Branch of the Little Calumet River**, sampled in 1980 at five fish collection stations by IDNR, was found to support a very limited and undesirable fish population.

An initial fishery survey of **Deep River** and **Burns Ditch** was conducted by the IDNR in 1978 to identify fish species, document fish habitat and water quality, and evaluate potential of the stream as a salmonid stocking site. As a result of the study, it was concluded that water quality was only marginal for salmonids and even warm-water fish.

An additional fishery investigation was conducted in 1991-92 of **Deep River** and **Burns Ditch** to see if any substantial changes had occurred since 1978. Sampling was conducted at 6 stations in July and August of 1991 to identify the resident population, and in February of 1992 at 2 stations to determine if salmonids were utilizing the stream.

Steelhead trout were found in significant numbers in Deep River below Lake George, even in the summer. A surprising number of bluegill and bass were also found in Deep River between the dams at Lake Station and Lake George at Hobart. However, carp continued to be the dominate species in the 1991-92 collection as it had in the 1978 survey. Water quality in both **Burns Ditch** and **Deep River** was found to still be only marginal for healthy, warm-water fish production.

Wolf Lake–1987–Previous Indiana fisheries surveys were conducted in 1969, 1974, and 1977. The 1987 Wolf Lake fish population was dominated by nongame fish. Alewife, gizzard shad, carp, and golden shiner made up 66 percent and 58 percent of the fish collected by number and weight, respectively. Desirable game species were present but are not abundant because of severe competition with alewife, shad, carp and golden shiners.

In 1977, the same four species accounted for 71 percent of the survey catch by number and 74 percent by weight. Surveys conducted in 1969 and 1974 also revealed the presence of large numbers of nongame fish, although bluegill were the most abundant fish by number in both surveys.

Despite the abundance of nongame fish, Wolf Lake continues to support a fair fishery for bluegill, channel catfish, and largemouth bass. Harvestable-size black crappie, white bass, and northern pike have reportedly been caught. Tiger muskellunge and walleye stocked by Illinois are also occasionally caught in Indiana.

Lake George at Hammond–A small fish survey was conducted of the north basin in 1976, and a brief survey of the south basin was made in 1977. Because the lake is very shallow, there have been massive winterkills in both the north and south basins. The potential for winterkill makes the prospect of sport fishing in the lake doubtful in the near future. In addition, because the lake has a history of use as a fill site for industrial waste, the 1977 survey recommended that a careful evaluation of the entire ecosystem be made before an investment of time or money be made to re-establish sport fishing in the lake. If sport fishing is to be a part of any future recreational use of Lake George, the survey identified renovation and restocking as essential.

Hog Lake was surveyed by the IDNR in 1965, 1969, 1980, and 1985. Although aquatic weed problems have been identified in the lake through the years, the 1985 report described Hog Lake as one of the prettiest places to fish in northwestern Indiana. Described as having an out-of-balance fish population in 1965, Hog Lake was described in 1985 as having good sport fishing. Average alkalinity has increased in the lake through time which may cause an improvement of the carrying-capacity of the lake, but may also cause an increase of aquatic weed problems.

Marquette Park Lagoon–fish surveys were conducted in 1972, 73, and 78. Undesirable species (golden shiner, carp, lake chubsucker and goldfish) made up approximately 21 percent of the population by number in 1978. However, in 1973, undesirable species comprised approximately 59 percent of the fish population. So, although nearly half of lake's biomass consists of undesirable fish, their number has dropped considerably in the 5-year interval. Fish population in 1978 appeared to be capable of furnishing good recreational fishing opportunities. It is believed that the lagoon receives heavy fishing pressure. Consequently, despite good growth rates, few large game fish were found in 1973 or 1978.

Kennedy Park Oxbow–(1982) Fish management is very difficult on this oxbow lake because there is occasional flooding of the lake from the Little Calumet River, and the lake is connected to the river even at normal levels. However, the lake is providing recreational fishing opportunities in spite of an abundance of gizzard shad and carp. Many people fish the lake, probably because it is located near an apartment complex.

Hobart Township Lake (Rosser Park)–1981 The lake does not have an outlet structure and appears to drain westward toward a small marsh near the Little Calumet River. Game fish accounted for 59.9% of the sample; however, game fish comprised only 15.8% of the sample by weight. Despite the overall poor quality of the fishery, no renovation was recommended for the lake at the time of the survey because there was no suitable outlet structure to prevent ingress of fish from below the lake.

Grand Boulevard Park Lake–1982 The lake's water quality appeared adequate for warmwater fish only. At the time of the survey, aquatic weeds were abundant throughout most of this relatively shallow lake. Because the lake is so shallow, it may occasionally have winterkill. The lake was supporting a moderate amount of fishing despite the presence of a large carp population. It is possible that, barring another severe winter, fishing in this lake could improve. There are sufficient numbers and sizes of bluegill and largemouth bass to provide satisfactory fishing. To improve the quality of sport fishing, the survey recommended that the lake be deepened to reduce the chances of winterkill and reduce the areas in which submersed aquatic weeds will grow.

Appendix 9. Results of chemical analysis from selected water wells

{All values in milligrams per liter except as indicated.}

Location: Locations are shown on Plate 3

Well owner: USGS, United States Geological Survey

Township: N, North

Range: E, East; W, West

Aquifer systems: CAL, Calumet; LAC, Lacustrine Plain; LPC, Lacustrine Plain underlying the Calumet; VM, Valparaiso Moraine; KK, Kankakee; SD, Silurian and Devonian bedrock

Date sampled: month and year

Location Number	Well Owner	Township	Range	Section	Well Depth (feet)	Aquifer System	Date Sampled	pH[1]	Hardness as $CaCO_3$	Calcium	Magnesium	Sodium	Potassium	Iron	Manganese	Alkalinity as $CaCO_3$[2]	Chloride	Sulfate	Fluoride	Nitrate as Nitrogen	Total Dissolved Solids[3]
									LAKE COUNTY												
1.	CRN PT NEW	34N	8W	9	100	VM	4/84	7.4	782	196.0	71.0	13.0	3.4	4.80	0.23	434.0	13.0	350.0	< 0.1	< 0.10	912
2.	CRN PT NEW	34N	8W	9	96	VM	4/84	7.9	756	198.0	63.0	16.0	3.4	5.50	0.25	438.0	21.0	330.0	< 0.1	< 0.10	900
3.	BUFFENBARGR	34N	9W	12	52	VM	10/87	7.6	672	132.0	83.5	53.8	2.6	1.90	0.10	509.3	< 0.1	378.0	0.4	< 0.02	958
4.	CRN PT NEW	34N	8W	9	97	VM	4/84	7.2	758	191.0	68.0	16.0	3.4	6.20	0.25	436.0	20.0	330.0	0.1	< 0.10	897
5.	CRN PT NEW	34N	8W	9	98	VM	4/84	7.6	566	142.0	52.0	14.0	2.5	3.80	0.14	432.0	14.0	140.0	0.1	< 0.10	628
6.	G MISHIVICH	34N	8W	12	73	VM	10/87	7.7	377	93.5	34.9	8.4	0.5	2.10	0.10	304.4	5.8	107.0	0.3	< 0.02	435
7.	CRN PT NEW	34N	8W	9	105	VM	4/84	7.3	604	150.0	55.0	14.0	2.6	3.10	0.12	470.0	13.0	170.0	0.2	< 0.10	690
8.	CRN PT NEW	34N	8W	9	92	VM	4/84	7.5	606	161.0	50.0	11.0	2.2	5.10	0.17	388.0	14.0	230.0	0.1	< 0.10	707
9.	CRN PT NEW	34N	8W	9	90	VM	4/84	7.4	474	127.0	38.0	10.0	1.8	2.70	0.11	314.0	14.0	140.0	0.2	< 0.10	522
10.	CRN PT NEW	34N	8W	9	97	VM	4/84	7.6	740	182.0	69.0	17.0	2.6	3.50	0.14	436.0	22.0	310.0	0.1	< 0.10	868
11.	CRN PT NEW	34N	8W	9	96	VM	4/84	7.7	476	126.0	39.0	11.0	1.9	2.40	0.12	314.0	15.0	160.0	0.2	< 0.10	544
12.	CRN PT	34N	8W	9	275	SD	7/73	7.8	40	10.0	4.0	410.0	7.0	4.60	0.08	740.0	110.0	26.0	6.0	< 0.10	1022
13.	M FEDER	34N	8W	4	100	VM	5/55	7.2	404	99.0	38.0	7.1	1.7	2.30	0.07	311.0	7.0	87.0	0.2	0.07	429
14.	A PICARD	35N	7W	33	61	VM	10/87	7.4	375	92.6	35.0	5.7	0.4	3.00	0.10	314.6	5.7	107.0	0.2	< 0.02	438
15.	W KOONCE	35N	9W	26	94	VM	10/87	7.9	370	81.7	40.4	22.1	1.0	1.80	< 0.10	409.3	< 0.1	49.1	0.4	< 0.02	442
16.	INDEP HILL	35N	8W	20	95	VM	4/79	7.4	294	63.0	33.0	16.0	2.0	2.40	0.02	328.0	< 1.0	< 5.0	0.4	< 0.10	314
17.	F RUBERY	35N	8W	20	192	SD	8/60	7.4	310	64.0	37.0	15.0	2.0	1.20	0.00	342.0	3.0	3.0	0.9	.	331
18.	LINCOLN GAR	35N	8W	19	85	VM	12/77	7.1	672	126.0	86.0	31.0	5.0	3.00	0.04	432.0	19.0	240.0	0.5	0.40	770
19.	G MRAK	35N	7W	21	98	VM	10/87	6.9	522	120.0	54.5	13.2	1.0	2.30	0.10	479.0	1.5	165.0	0.2	< 0.02	645
20.	R WADE	35N	8W	24	58	VM	10/87	7.9	341	62.7	45.0	24.4	1.2	1.50	< 0.10	451.6	< 0.1	< 0.1	0.5	< 0.02	406
21.	SCHERERVILL	35N	9W	17	400	SD	3/87	8.1	216	56.0	18.0	110.0	7.1	0.11	0.00	356.0	5.0	140.0	1.0	0.40	551

Appendix 9. Results of chemical analysis from selected water wells – Continued

Location Number	Well Owner	Township	Range	Section	Well Depth (feet)	Aquifer System	Date Sampled	pH[1]	Hardness as $CaCO_3$	Calcium	Magnesium	Sodium	Potassium	Iron	Manganese	Alkalinity as $CaCO_3$[2]	Chloride	Sulfate	Fluoride	Nitrate as Nitrogen	Total Dissolved Solids[3]
LAKE COUNTY - continued																					
22.	HOWARD LONG	35N	9W	14	50	VM	10/81	7.3	628	122.0	79.0	26.0	3.1	3.20	0.03	464.0	< 5.0	210.0	.	.	722
23.	DYER	35N	10W	13	250	SD	5/86	7.6	644	193.0	39.0	39.0	5.3	9.50	0.19	406.0	18.0	343.0	0.5	0.00	891
24.	SCHERERVILL	35N	9W	16	324	SD	6/60	7.6	588	107.0	78.0	53.0	7.0	0.80	0.01	422.0	2.0	275.0	0.4	0.05	776
25.	SCHERERVILL	35N	9W	15	326	SD	3/87	7.5	460	93.0	55.0	29.0	4.1	0.35	0.06	322.0	10.0	190.0	0.5	0.30	575
26.	DYER	35N	10W	13	274	SD	11/75	7.4	608	120.0	75.0	45.0	6.0	2.10	0.04	404.0	17.0	290.0	0.5	0.10	798
27.	DYER	35N	10W	13	215	SD	1/76	7.3	608	120.0	75.0	43.0	6.0	2.00	0.03	402.0	14.0	280.0	0.5	< 0.10	782
28.	SEVEN UP	35N	8W	10	72	LAC	6/54	7.6	299	68.0	31.0	12.0	1.5	0.82	0.11	271.0	3.8	40.0	0.1	.	320
29.	KITT EVANS	35N	9W	11	51	LAC	10/81	7.3	474	96.0	57.0	22.0	2.9	2.60	0.02	388.0	< 5.0	130.0	.	.	543
30.	FRANK ROZIC	35N	9W	11	60	LAC	10/81	7.6	240	53.0	26.0	7.0	1.4	1.10	0.02	168.0	7.0	77.0	.	.	273
31.	PLANT FOODS	35N	9W	9	252	SD	5/55	7.4	196	38.0	25.0	148.0	6.7	0.74	0.00	443.0	13.0	71.0	0.2	0.02	570
32.	ANTON GOSE	35N	9W	11	62	LAC	10/81	7.3	668	123.0	87.0	37.0	3.9	4.80	0.03	460.0	< 5.0	280.0	.	.	812
33.	R COLWELL	35N	10W	12	60	LAC	10/87	7.2	490	131.0	39.7	17.6	1.2	5.60	0.20	293.6	12.5	272.0	0.4	< 0.02	656
34.	JOHN PRICE	35N	9W	11	57	LAC	10/81	7.7	236	54.0	24.0	12.0	0.9	0.84	0.08	120.0	17.0	120.0	.	.	301
35.	ART HEGEDUS	35N	9W	11	53	LAC	10/81	7.4	500	96.0	63.0	26.0	3.5	3.50	0.03	392.0	< 5.0	200.0	.	.	627
36.	SYLV REDER	35N	9W	1	56	LAC	10/81	7.3	398	94.0	40.0	16.0	1.8	3.70	0.09	312.0	21.0	100.0	.	.	464
37.	USGS	35N	9W	2	82	LAC	5/54	7.8	360	73.0	43.0	23.0	2.0	2.40	0.00	368.0	6.0	18.0	0.2	.	388
38.	AMER CHEMCL	35N	9W	2	74	LAC	10/81	7.6	312	59.0	40.0	63.0	5.7	0.14	< 0.02	396.0	5.0	60.0	.	.	470
39.	SALESBURY E	35N	9W	1	82	LAC	10/81	7.6	322	74.0	34.0	19.0	2.3	1.40	0.02	334.0	< 5.0	34.0	.	.	365
40.	MAPES MFG	36N	9W	35	60	LAC	5/55	7.4	319	80.0	29.0	19.0	1.9	1.60	0.00	231.0	12.0	101.0	0.4	0.25	384
41.	5031 CLEVEL	36N	8W	32	26	LAC	2/81	7.1	132	33.0	12.0	5.6	1.4	< 0.05	< 0.02	96.0	12.0	27.0	.	0.20	149
42.	E VAN BYSSU	36N	9W	36	50	LAC	10/81	7.6	228	62.0	18.0	11.0	1.0	2.90	0.04	244.0	< 5.0	< 5.0	.	.	242
43.	RDG JEWELL	36N	9W	35	50	LAC	10/81	7.8	200	50.0	18.0	7.0	0.7	0.77	0.03	200.0	< 5.0	18.0	.	.	215
44.	HAYWORTH	36N	8W	31	59	LAC	10/81	7.4	300	75.0	27.0	13.0	1.4	2.10	0.02	328.0	< 5.0	12.0	.	.	328
45.	MONARCH OIL	36N	7W	33	31	LAC	11/81	7.6	244	59.0	23.0	6.5	0.5	0.10	0.08	162.0	9.0	77.0	.	.	272
46.	D WALDRON	36N	9W	34	36	LAC	10/81	7.7	204	51.0	18.0	12.0	1.2	1.10	< 0.02	224.0	< 5.0	< 5.0	.	.	218
47.	LOVIN	36N	9W	35	38	LAC	8/81	7.8	156	38.0	15.0	6.0	0.9	0.64	0.02	168.0	< 5.0	5.0	.	.	166
48.	CITIZENS TV	36N	9W	34	87	LAC	10/81	7.8	228	49.0	26.0	37.0	2.5	1.00	< 0.02	316.0	< 5.0	< 5.0	.	.	305
49.	4380 HAYES	36N	8W	29	36	LAC	2/81	8.3	268	66.0	25.0	38.0	2.7	1.90	< 0.02	363.0	< 5.0	< 5.0	.	< 0.10	351
50.	P SANTELIK	36N	8W	29	60	LAC	2/81	8.3	300	70.0	30.0	47.0	2.0	0.32	0.12	216.0	50.0	110.0	.	< 0.10	439
51.	J DICKERSON	36N	8W	29	60	LAC	2/81	8.1	304	74.0	29.0	36.0	1.7	0.42	0.14	220.0	38.0	110.0	.	< 0.10	421
52.	G HARTHOORN	36N	8W	30	40	LAC	2/81	7.8	246	69.0	18.0	71.0	7.0	< 0.05	0.06	176.0	81.0	90.0	.	5.90	448
53.	F JARAS	36N	9W	29	185	SD	10/87	7.4	216	46.7	24.2	71.1	2.1	< 0.01	< 0.10	361.9	6.8	44.0	0.8	0.00	413
54.	D B AUTO	36N	9W	11	30	CAL	2/81	7.8	396	112.0	28.0	19.0	1.5	3.70	0.38	148.0	66.0	200.0	0.1	.	519
55.	J R WAGNER	36N	8W	30	80	LAC	2/81	7.6	70	20.0	5.0	4.2	0.6	0.08	0.03	73.0	< 5.0	8.0	.	< 0.10	82

Appendix 9. Results of chemical analysis from selected water wells – Continued

Location Number	Well Owner	Township	Range	Section	Well Depth (feet)	Aquifer System	Date Sampled	pH[1]	Hardness as $CaCO_3$	Calcium	Magnesium	Sodium	Potassium	Iron	Manganese	Alkalinity as $CaCO_3$[2]	Chloride	Sulfate	Fluoride	Nitrate as Nitrogen	Total Dissolved Solids[3]
LAKE COUNTY - continued																					
56.	B LEEP	36N	9W	21	100	LAC	10/87	8.1	62	16.8	4.9	62.8	0.8	0.15	< 0.10	197.5	3.5	< 0.1	0.9	< 0.02	208
57.	NEW CHICAGO	36N	7W	21	64	LAC	7/60	8.0	200	48.0	20.0	3.0	< 1.0	0.08	0.00	146.0	7.0	48.0	0.0	0.29	214
58.	NEW CHICAGO	36N	7W	21	59	LAC	7/60	8.2	229	55.0	22.0	5.0	1.0	0.20	0.00	175.0	7.0	56.0	0.0	0.31	251
59.	NEW CHICAGO	36N	7W	21	61	LAC	7/60	7.9	212	52.0	20.0	4.0	< 1.0	0.10	0.01	154.0	8.0	50.0	0.0	0.36	227
60.	NEW CHICAGO	36N	7W	21	64	LAC	7/60	8.0	217	51.0	22.0	4.0	1.0	0.01	0.00	166.0	5.0	45.0	0.0	0.41	228
61.	LAKESTATION	36N	7W	16	85	LAC	2/83	7.5	354	88.0	33.0	11.0	1.6	0.16	0.06	250.0	22.0	79.0	0.0	2.30	387
62.	LAKESTATION	36N	7W	16	64	LAC	2/83	7.5	360	91.0	32.0	15.0	2.2	0.15	0.08	248.0	28.0	93.0	0.2	1.80	412
63.	LAKESTATION	36N	7W	16	52	LAC	11/80	7.7	310	77.0	28.0	27.0	2.6	1.70	0.19	240.0	45.0	56.0	0.2	< 0.10	382
64.	LAKESTATION	36N	7W	16	86	LAC	2/83	7.6	382	98.0	33.0	19.0	2.4	0.31	0.10	256.0	35.0	110.0	0.2	2.30	454
65.	LAKE STATIO	36N	7W	16	65	LAC	2/83	7.8	322	82.0	28.0	19.0	3.1	0.21	0.08	214.0	34.0	92.0	0.2	2.20	389
66.	2600 CO LI	36N	7W	16	46	LAC	2/81	8.2	344	87.0	31.0	28.0	3.4	2.70	0.21	260.0	43.0	85.0	.	< 0.10	436
67.	USGS A20	36N	8W	10	24	CAL	7/87	7.2	380	110.0	26.0	150.0	4.2	0.01	0.03	246.0	250.0	76.0	1.3	.	765
68.	HOMER CLARK	36N	9W	11	282	SD	5/62	7.5	52	12.0	5.4	98.0	2.6	0.10	0.07	198.0	44.0	5.2	1.0	0.18	287
69.	USGS B10	36N	8W	6	21	CAL	7/87	7.7	220	57.0	19.0	9.3	1.5	< 3.00	< 1.00	150.0	40.0	31.0	0.7	.	248
70.	USGS 237 B	36N	7W	6	45	CAL	4/81	7.0	930	240.0	80.0	390.0	6.7	5.00	0.94	261.0	990.0	140.0	0.1	.	2009
71.	USGS 233 B	36N	7W	4	47	CAL	10/80	8.0	180	41.0	18.0	72.0	3.8	0.02	0.04	117.0	130.0	71.0	0.0	1.70	410
72.	USGS C20	36N	9W	5	6	CAL	7/87	6.9	180	59.0	8.0	21.0	1.6	0.01	0.43	148.0	11.0	71.0	0.4	.	261
73.	USGS LAKE	36N	9W	3	23	CAL	7/86	7.3	372	110.0	21.0	4.3	1.1	8.20	.	229.0	11.0	150.0	.	.	443
74.	SHELL OIL	36N	9W	3	310	SD	6/54	7.6	54	13.0	5.2	136.0	2.9	0.65	0.00	257.0	55.0	4.5	3.2	0.80	375
75.	USGS C18	36N	9W	2	25	CAL	7/87	7.1	390	120.0	22.0	190.0	5.9	.	0.43	490.0	240.0	93.0	0.3	.	966
76.	USGS B7	36N	8W	6	10	CAL	7/87	7.4	210	63.0	13.0	6.8	1.8	< 3.00	< 1.00	180.0	11.0	34.0	1.1	.	239
77.	USGS B8	36N	8W	6	40	CAL	7/87	7.0	.	150.0	29.0	230.0	4.2	16.00	0.41	344.0	420.0	95.0	0.1	.	1151
78.	USGS 236 B	36N	7W	6	45	CAL	10/80	7.3	450	120.0	36.0	240.0	11.0	6.20	0.27	227.0	540.0	80.0	0.1	0.01	1154
79.	USGS E20	36N	10W	1	8	CAL	7/87	7.1	450	150.0	18.0	26.0	4.2	5.70	2.10	430.0	56.0	13.0	1.3	.	534
80.	USGS A4	37N	8W	35	25	CAL	7/87	7.2	240	66.0	18.0	3.1	1.7	1.60	0.38	168.0	4.6	52.0	0.7	.	249
81.	USGS 239 B	37N	8W	36	65	CAL	4/81	7.0	290	85.0	19.0	7.7	1.6	0.25	0.02	279.0	13.0	8.3	0.1	.	302
82.	USGS 235 B	37N	7W	33	45	CAL	4/81	7.2	230	73.0	12.0	5.2	0.8	4.10	0.18	157.0	9.9	76.0	0.2	.	276
83.	GARY AIRPOR	37N	9W	35	41	CAL	2/81	7.8	520	162.0	28.0	3.0	1.8	10.00	0.61	352.0	13.0	160.0	0.3	.	590
84.	USGS D68	37N	9W	32	26	CAL	7/87	7.6	280	94.0	11.0	16.0	3.5	2.70	0.16	182.0	27.0	93.0	0.8	.	357
85.	USGS C12	37N	9W	34	20	CAL	7/87	6.8	710	240.0	27.0	91.0	5.3	.	.	251.0	130.0	490.0	3.2	.	1137
86.	USGS 275	37N	7W	31	24	CAL	4/81	7.7	410	120.0	27.0	220.0	4.0	0.91	0.59	310.0	380.0	64.0	0.3	.	1003
87.	MID CON COK	37N	9W	36	50	CAL	2/81	7.3	1020	288.0	73.0	28.0	9.9	36.00	0.29	396.0	27.0	640.0	0.2	.	1340
88.	USGS 238 B	37N	8W	36	65	CAL	4/81	7.3	1600	430.0	120.0	620.0	7.8	13.00	0.24	472.0	820.0	1200.0	< 0.1	.	3494
89.	USGS A6	37N	8W	36	7	CAL	7/87	7.3	430	92.0	48.0	58.0	48.0	0.08	0.11	321.0	52.0	190.0	1.8	.	683

Appendix 9. Results of chemical analysis from selected water wells – Continued

Location Number	Well Owner	Township	Range	Section	Well Depth (feet)	Aquifer System	Date Sampled	pH[1]	Hardness as $CaCO_3$	Calcium	Magnesium	Sodium	Potassium	Iron	Manganese	Alkalinity as $CaCO_3$[2]	Chloride	Sulfate	Fluoride	Nitrate as Nitrogen	Total Dissolved Solids[3]
LAKE COUNTY - continued																					
90.	USGS 251	37N	7W	33	27	CAL	4/81	7.3	350	98.0	26.0	85.0	2.9	0.13	0.25	238.0	200.0	53.0	< 0.1	0.17	608
91.	USGS E10	37N	10W	36	9	CAL	7/87	7.0	460	150.0	21.0	62.0	6.5	9.10	0.91	335.0	190.0	24.0	0.8	.	665
92.	NIPSCO	37N	9W	25	42	CAL	2/81	8.0	324	109.0	13.0	65.0	8.8	< 0.05	0.39	152.0	95.0	190.0	1.1	.	573
93.	USGS D60	37N	9W	33	8	CAL	7/87	7.0	390	120.0	23.0	8.4	4.3	.	.	348.0	15.0	35.0	2.3	.	417
94.	USGS C3	37N	9W	23	30	CAL	7/87	7.3	440	130.0	27.0	54.0	5.7	6.70	0.11	291.0	110.0	120.0	0.7	.	629
95.	USGS C4	37N	9W	23	15	CAL	7/87	7.2	450	150.0	18.0	99.0	7.6	0.09	0.06	288.0	150.0	170.0	0.9	.	768
96.	USGS C1	37N	9W	22	7	CAL	7/87	7.3	620	220.0	16.0	130.0	34.0	0.01	0.10	232.0	140.0	540.0	0.5	.	1220
97.	USGS D21	37N	9W	18	20	CAL	7/87	7.4	580	160.0	43.0	54.0	15.0	1.60	0.25	390.0	78.0	210.0	1.6	.	797
98.	WHIHALA BCH	37N	9W	8	34	CAL	2/84	6.4	642	170.0	53.0	20.0	7.3	4.50	0.28	282.0	60.0	330.0	0.3	< 0.10	815
99.	USGS E2	37N	9W	6	6	CAL	7/87	7.6	190	52.0	15.0	6.3	2.3	0.01	< 0.01	142.0	9.8	35.0	0.5	.	206
PORTER COUNTY																					
100.	ROZHON	35N	6W	36	85	VM	10/87	7.2	538	145.0	42.6	3.5	0.4	4.10	0.20	380.5	23.7	175.0	0.3	< 0.02	623
101.	VALPARAISO	35N	5W	29	126	VM	9/87	7.4	314	90.0	22.0	2.8	1.6	3.60	0.22	200.0	< 5.0	100.0	< 0.1	< 0.10	340
102.	VALPARAISO	35N	5W	29	138	VM	9/87	7.4	332	90.0	26.0	3.4	1.7	1.70	0.14	246.0	5.0	79.0	0.0	< 0.10	355
103.	VALPARAISO	35N	5W	29	129	VM	9/87	7.4	319	85.0	26.0	3.0	1.5	1.40	0.14	224.0	6.0	82.0	0.1	< 0.10	340
104.	SHOREWOOD	35N	6W	19	119	VM	8/77	7.1	517	119.0	53.0	12.0	2.0	1.70	0.06	426.0	10.0	87.0	0.3	< 0.10	541
105.	SCHUBERT E	35N	6W	23	65	VM	9/87	7.5	280	76.1	21.9	36.4	0.8	1.80	0.10	257.0	26.0	79.6	0.1	< 0.02	397
106.	WHEELER H S	35N	7W	13	55	VM	10/87	7.8	234	66.3	16.6	4.5	0.3	0.50	< 0.10	151.6	19.2	33.3	< 0.1	< 0.02	232
107.	KRAISINGER	35N	6W	11	125	VM	9/87	7.6	418	111.0	34.6	4.3	0.4	3.00	0.10	308.4	0.9	143.0	0.1	< 0.02	482
108.	G HOWARD	35N	7W	12	72	LAC	11/81	7.7	208	48.0	21.0	11.0	1.2	0.77	0.02	228.0	< 5.0	8.0	.	.	227
109.	BURL HUCKAB	35N	7W	1	72	LAC	11/81	7.7	268	46.0	37.0	41.0	2.8	1.40	< 0.02	358.0	< 5.0	< 5.0	.	.	343
110.	WARN MCAFEE	35N	7W	2	145	LAC	11/81	7.6	184	40.0	20.0	56.0	5.2	1.50	0.03	294.0	5.0	< 5.0	.	.	304
111.	WORTHINGTON	35N	7W	3	137	LAC	11/81	7.7	292	62.0	34.0	79.0	5.1	1.30	0.02	322.0	110.0	< 5.0	.	.	485
112.	ED CARNEY	35N	7W	2	161	LAC	11/81	7.6	208	43.0	24.0	96.0	5.9	0.91	0.00	312.0	85.0	< 5.0	.	.	442
113.	PAUL HOHRUN	35N	7W	3	141	LAC	11/81	7.8	172	37.0	19.0	73.0	4.0	0.79	< 0.02	292.0	32.0	5.0	.	.	346
114.	JASN GALLER	35N	7W	3	80	LAC	11/81	7.2	524	130.0	49.0	32.0	11.0	< 5.00	< 0.02	378.0	23.0	190.0	.	.	662
115.	WILLM KASLO	35N	7W	3	100	LAC	11/81	7.7	222	47.0	25.0	68.0	5.7	0.57	< 0.02	304.0	52.0	< 5.0	.	.	381
116.	E WARD	36N	7W	35	90	LAC	11/81	7.8	178	38.0	20.0	59.0	2.5	0.77	< 0.02	308.0	< 5.0	< 5.0	.	.	305
117.	ELLINGHAUSE	36N	7W	34	102	LAC	11/81	7.8	220	46.0	25.0	91.0	4.4	0.86	< 0.02	302.0	86.0	< 5.0	.	.	434
118.	ELMER KUHRT	36N	7W	36	96	LAC	11/81	7.7	260	42.0	37.0	44.0	3.8	0.22	< 0.02	352.0	< 5.0	< 5.0	.	.	338
119.	GRG SHAFFER	36N	7W	34	105	LAC	11/81	7.4	180	40.0	19.0	76.0	5.4	1.30	0.00	296.0	35.0	< 5.0	.	.	354
120.	SOUTH HAVEN	36N	6W	34	93	VM	5/79	7.4	418	102.0	40.0	6.0	1.5	1.90	0.09	332.0	5.0	100.0	0.2	< 0.10	456

Appendix 9. Results of chemical analysis from selected water wells – Continued

Location Number	Well Owner	Township	Range	Section	Well Depth (feet)	Aquifer System	Date Sampled	pH[1]	Hardness as $CaCO_3$	Calcium	Magnesium	Sodium	Potassium	Iron	Manganese	Alkalinity as $CaCO_3^2$	Chloride	Sulfate	Fluoride	Nitrate as Nitrogen	Total Dissolved Solids[3]
PORTER COUNTY - Countinued																					
121.	S HAVEN SUB	36N	6W	34	101	VM	10/75	8.0	400	95.0	39.0	6.0	2.0	1.70	0.08	318.0	4.0	74.0	0.2	0.10	413
122.	RICH RAFFIN	36N	5W	32	165	VM	9/81	6.7	668	158.0	66.0	6.0	1.5	13.00	0.22	380.0	68.0	200.0	.	.	741
123.	JOANIE FOLL	36N	6W	36	68	VM	9/81	7.0	414	102.0	38.0	5.0	2.0	1.90	0.15	310.0	11.0	91.0	0.1	< 0.10	437
124.	CP LOWRENCE	36N	6W	36	181	VM	9/81	7.5	542	137.0	49.0	5.0	1.8	< 0.05	< 0.02	404.0	< 5.0	130.0	0.2	0.60	566
125.	R D MARKINS	36N	5W	30	142	VM	9/81	7.5	474	122.0	41.0	3.0	1.0	0.26	0.13	376.0	< 5.0	97.0	.	.	490
126.	S HAVEN SUB	36N	6W	29	131	LAC	10/75	7.4	460	78.0	65.0	80.0	5.0	1.30	0.02	448.0	120.0	4.0	0.4	0.60	623
127.	LUTH CHURCH	36N	5W	30	140	VM	9/81	7.6	472	120.0	42.0	3.0	1.3	1.70	0.08	326.0	< 5.0	140.0	.	.	504
128.	S HAVEN SUB	36N	6W	29	170	LAC	3/69	8.1	196	38.0	24.0	135.0	6.0	1.00	0.00	338.0	100.0	< 1.0	0.6	< 0.10	507
129.	ED PILLMAN	36N	6W	26	69	VM	9/81	6.9	614	145.0	61.0	19.0	1.9	5.80	0.20	440.0	56.0	130.0	0.2	< 0.10	683
130.	PAT MULLEN	36N	5W	30	150	VM	9/81	6.8	724	171.0	72.0	5.0	1.3	4.20	0.16	420.0	10.0	290.0	.	.	806
131.	SUNST HL FM	36N	6W	25	46	VM	9/81	7.6	304	78.0	27.0	9.0	1.9	1.40	0.04	198.0	17.0	110.0	0.1	< 0.10	363
132.	RBT BROWNER	36N	6W	27	75	LAC	9/81	7.2	348	83.0	34.0	7.0	1.2	1.90	0.04	298.0	< 5.0	56.0	0.2	< 0.10	362
133.	W MCCLELLAN	36N	5W	30	168	VM	9/81	7.0	506	125.0	47.0	3.0	1.0	3.60	0.10	388.0	< 5.0	130.0	.	.	543
134.	LIBERTY FRM	36N	6W	25	149	VM	9/81	7.0	444	111.0	40.0	7.0	1.4	6.40	0.11	380.0	< 5.0	90.0	.	.	487
135.	STAN OIL CO	36N	5W	30	87	VM	9/81	6.9	608	154.0	54.0	26.0	2.2	2.80	0.08	284.0	200.0	88.0	.	.	697
136.	G MATAVICH	36N	5W	19	80	VM	9/81	7.4	630	155.0	59.0	53.0	3.5	2.30	0.11	312.0	230.0	100.0	.	.	790
137.	STAN OIL CO	36N	5W	19	105	VM	9/81	7.5	464	115.0	43.0	38.0	2.7	2.70	0.09	320.0	107.0	66.0	.	.	567
138.	ELMWOOD PRK	36N	6W	23	62	VM	9/81	6.9	430	101.0	43.0	5.0	1.4	2.40	0.10	330.0	9.0	99.0	0.2	< 0.10	459
139.	LIBERTY M S	36N	6W	23	70	LAC	3/73	7.5	434	107.0	40.0	10.0	2.0	2.20	0.07	384.0	4.0	66.0	0.2	< 0.10	462
140.	2924 GLENRO	36N	7W	14	35	LAC	2/81	8.1	164	34.0	19.0	6.5	0.7	< 0.05	0.06	132.0	< 5.0	40.0	.	1.60	181
141.	TOLL ROAD	36N	5W	18	90	LAC	5/56	7.6	388	96.0	36.0	7.7	1.8	3.20	0.02	352.0	2.0	40.0	0.1	0.05	398
142.	LEIMBACHER	36N	5W	10	108	VM	10/87	7.5	316	84.0	25.7	3.5	0.3	3.10	0.10	290.3	1.5	51.8	0.2	< 0.02	344
143.	PORTAGE N U	36N	6W	8	75	LAC	10/75	8.1	266	69.0	23.0	8.0	1.0	0.30	0.06	190.0	18.0	56.0	0.2	1.80	291
144.	PORTAGE N U	36N	6W	8	74	LAC	10/83	7.6	312	82.0	26.0	11.0	1.2	0.22	0.07	220.0	26.0	55.0	0.1	3.00	337
145.	SEAS HEATIN	36N	7W	11	34	CAL	2/81	8.0	194	48.0	18.0	8.0	1.9	0.85	0.06	120.0	13.0	81.0	.	< 0.10	243
146.	USGS 229 B	36N	7W	2	62	CAL	4/80	7.7	140	38.0	12.0	11.0	0.7	0.51	0.04	130.0	11.0	15.0	0.2	0.05	166
147.	USGS 240 B	36N	6W	6	55	LAC	4/81	7.4	350	90.0	30.0	62.0	2.9	< 0.01	0.00	183.0	150.0	99.0	< 0.1	.	544
148.	USGS 227 B	37N	6W	34	52	LAC	4/80	7.1	220	60.0	18.0	6.0	1.7	2.60	0.19	170.0	19.0	43.0	0.1	0.00	253
149.	USGS 227 C	37N	6W	34	24	LAC	4/81	6.1	300	75.0	28.0	190.0	7.0	0.01	0.09	112.0	430.0	88.0	0.0	0.28	886
150.	CHESTERTON	37N	6W	36	81	LAC	12/82	7.5	372	90.0	35.0	11.0	2.4	1.20	0.09	282.0	20.0	79.0	0.2	< 0.10	408
151.	USGS 225 B	37N	6W	34	55	LAC	4/80	8.3	210	50.0	20.0	5.5	1.0	0.50	0.13	150.0	6.6	58.0	0.2	0.02	232
152.	USGS 228 B	37N	6W	32	52	LAC	5/80	6.7	320	89.0	24.0	13.0	2.1	0.05	0.04	250.0	24.0	55.0	0.2	0.09	357
153.	OGDEN DUNES	37N	7W	35	28	CAL	4/57	7.4	213	54.0	19.0	3.8	0.8	0.13	0.15	167.0	3.0	38.0	0.1	0.93	228
154.	USGS 231 B	37N	7W	34	45	CAL	10/80	7.0	240	59.0	22.0	1.9	0.7	7.60	0.37	219.0	4.9	48.0	0.1	0.07	276

Appendix 9. Results of chemical analysis from selected water wells – Continued

Location Number	Well Owner	Township	Range	Section	Well Depth (feet)	Aquifer System	Date Sampled	pH[1]	Hardness as $CaCO_3$	Calcium	Magnesium	Sodium	Potassium	Iron	Manganese	Alkalinity as $CaCO_3$[2]	Chloride	Sulfate	Fluoride	Nitrate as Nitrogen	Total Dissolved Solids[3]
PORTER COUNTY - Countinued																					
155.	MOORE-USGS	37N	7W	35	22	CAL	4/74	6.9	280	70.0	25.0	8.6	2.0	.	.	258.0	7.6	29.0	.	.	297
156.	TITTLE-USGS	37N	7W	35	30	CAL	10/73	8.0	260	66.0	24.0	50.0	1.2	.	.	176.0	78.0	82.0	.	.	407
157.	CHESTERTON	37N	6W	36	73	LAC	12/82	7.4	370	90.0	35.0	12.0	2.1	0.62	0.07	260.0	32.0	77.0	0.2	< 0.10	405
158.	USGS 206 A	37N	5W	35	182	LAC	10/80	7.6	230	57.0	22.0	8.1	2.6	0.67	0.14	254.0	3.1	0.0	0.2	0.01	246
159.	USGS 206 B	37N	5W	35	72	LAC	10/80	7.4	250	61.0	24.0	4.4	0.9	1.20	0.11	260.0	2.7	28.0	0.2	0.01	278
160.	USGS 206 C	37N	5W	35	24	LAC	4/81	8.1	300	72.0	28.0	8.1	0.9	0.29	0.10	132.0	15.0	140.0	< 0.1	.	344
161.	USGS 230 S	37N	7W	35	55	CAL	5/80	6.7	440	120.0	33.0	70.0	2.0	0.05	0.27	290.0	120.0	120.0	0.1	0.00	639
162.	USGS 230 D	37N	7W	35	126	LPC	5/80	7.2	290	72.0	26.0	280.0	2.9	0.06	0.28	130.0	500.0	17.0	0.8	0.01	977
163.	USGS 230 D	37N	7W	35	24	CAL	4/81	5.9	42	13.0	2.3	3.8	0.7	0.49	0.03	12.0	5.4	27.0	< 0.1	2.00	62
164.	USGS 242 B	37N	6W	31	83	CAL	4/81	7.7	160	41.0	14.0	22.0	0.9	0.67	0.04	171.0	33.0	1.4	0.3	.	216
165.	USGS 226 R	37N	6W	35	64	LAC	4/81	7.3	530	140.0	44.0	73.0	4.1	3.80	0.29	311.0	210.0	94.0	0.2	.	756
166.	USGS 226G	37N	6W	35	30	LAC	4/81	7.4	380	85.0	40.0	16.0	1.0	< 0.01	0.00	274.0	44.0	66.0	0.2	2.30	419
167.	USGS 207 A	37N	5W	27	170	LAC	10/80	7.6	240	56.0	24.0	23.0	2.6	1.50	0.04	272.0	32.0	0.0	0.2	0.01	301
168.	USGS 207 B	37N	5W	27	85	LAC	10/80	7.6	240	58.0	22.0	9.1	2.1	1.40	0.03	267.0	7.2	0.0	0.2	0.01	260
169.	USGS 244 A	37N	7W	25	125	LPC	10/80	7.8	73	19.0	6.2	78.0	1.3	0.03	0.05	249.0	19.0	2.0	1.2	0.07	276
170.	USGS 244 B	37N	7W	25	65	CAL	10/80	7.3	310	86.0	24.0	8.1	1.3	3.10	0.18	294.0	24.0	43.0	0.0	0.03	366
171.	USGS 232 B	37N	7W	27	45	CAL	4/81	7.3	320	92.0	22.0	6.2	1.9	7.00	0.12	315.0	15.0	14.0	0.0	.	347
172.	USGS 224 B	37N	6W	27	52	LAC	10/80	7.1	340	81.0	33.0	4.2	1.4	0.01	< 0.01	308.0	8.5	45.0	0.1	1.50	359
173.	USGS 223 B	37N	6W	26	113	LAC	10/80	7.5	250	56.0	27.0	45.0	2.4	0.01	0.06	354.0	62.0	0.0	0.4	0.03	405
174.	USGS 105 DP	37N	6W	28	77	LPC	5/78	7.7	250	57.0	25.0	75.0	2.0	0.05	0.36	200.0	160.0	8.3	0.5	.	448
175.	USGS 106 SH	37N	6W	28	25	CAL	5/78	7.0	300	75.0	28.0	30.0	1.7	< 0.01	< 0.01	210.0	58.0	77.0	< 0.1	.	396
176.	USGS 219 B	37N	5W	30	69	LAC	10/80	7.2	430	81.0	55.0	12.0	2.3	1.20	0.09	409.0	4.9	84.0	0.2	0.02	486
177.	KRATZ-USGS	37N	7W	26	27	CAL	4/74	7.0	310	90.0	21.0	86.0	10.0	.	.	263.0	120.0	53.0	.	.	538
178.	US ARMY	37N	6W	27	125	LAC	9/64	7.9	428	81.0	55.0	9.9	1.5	0.29	0.16	331.0	12.0	103.0	0.1	0.20	462
179.	USGS 103	37N	6W	27	77	LPC	5/78	8.2	110	29.0	10.0	37.0	1.9	0.16	0.04	170.0	19.0	1.5	0.6	.	201
180.	USGS 104	37N	6W	27	24	CAL	5/78	7.7	370	84.0	39.0	17.0	2.3	2.60	0.09	280.0	14.0	100.0	< 0.1	.	427
181.	USGS 205 B	37N	5W	26	65	LAC	10/80	7.5	220	55.0	20.0	5.9	1.3	0.65	0.05	216.0	3.8	17.0	0.2	0.01	233
182.	USGS 208 B	37N	5W	28	71	LAC	10/80	7.3	370	67.0	50.0	30.0	3.2	0.23	0.03	471.0	9.3	30.0	0.4	0.24	473
183.	NIPSCO USGS	37N	6W	27	24	CAL	9/76	7.1	300	63.0	35.0	15.0	3.4	2.90	0.13	291.0	16.0	28.0	0.1	.	338
184.	USGS 243 B	37N	5W	19	85	LAC	4/80	7.3	310	64.0	37.0	21.0	2.3	0.02	0.01	320.0	7.1	15.0	0.4	0.19	339
185.	USGS 243 C	37N	5W	19	165	LAC	5/80	7.5	290	60.0	35.0	19.0	2.4	0.02	0.02	310.0	7.3	8.4	0.7	0.14	318
186.	NIPSCO USGS	37N	6W	22	23	CAL	10/77	7.2	340	72.0	39.0	14.0	2.1	0.08	0.08	290.0	15.0	56.0	0.1	.	372
187.	USGS GRT MS	37N	6W	22	8	CAL	4/81	7.6	360	81.0	38.0	11.0	1.3	1.60	0.08	304.0	18.0	71.0	0.2	.	405
188.	USGS 102	37N	6W	21	86	LPC	1/78	8.3	190	20.0	33.0	21.0	2.5	0.07	0.06	210.0	7.9	1.9	0.1	.	213

Appendix 9. Results of chemical analysis from selected water wells – Continued

Location Number	Well Owner	Township	Range	Section	Well Depth (feet)	Aquifer System	Date Sampled	pH[1]	Hardness as $CaCO_3$	Calcium	Magnesium	Sodium	Potassium	Iron	Manganese	Alkalinity as $CaCO_3$[2]	Chloride	Sulfate	Fluoride	Nitrate as Nitrogen	Total Dissolved Solids[3]
PORTER COUNTY - Countinued																					
189.	NIPSCO USGS	37N	6W	22	23	CAL	10/77	6.7	160	46.0	12.0	7.0	3.2	17.00	0.34	217.0	11.0	14.0	0.1	.	241
190.	USGS GRT MS	37N	6W	22	8	CAL	5/81	6.9	420	86.0	50.0	13.0	2.1	1.50	0.05	391.0	9.8	55.0	0.2	.	452
191.	NIPSCO USGS	37N	6W	22	22	CAL	9/76	7.1	230	58.0	20.0	5.4	1.7	3.60	0.11	196.0	5.8	25.0	0.2	.	237
192.	NIPSCO USGS	37N	6W	21	29	CAL	3/77	6.4	660	240.0	15.0	21.0	34.0	0.22	0.61	0.0	12.0	730.0	0.1	.	1053
193.	NIPSCO USGS	37N	6W	21	49	CAL	5/78	7.8	280	110.0	1.9	16.0	17.0	0.20	0.06	38.0	11.0	270.0	1.7	.	451
194.	NIPSCO USGS	37N	6W	21	29	CAL	5/78	6.5	630	250.0	0.7	12.0	25.0	0.36	0.04	55.0	34.0	590.0	0.0	.	945
195.	NIPSCO D	37N	6W	22	13	CAL	10/77	.	47	14.0	2.9	2.6	1.1	0.09	0.00	8.0	3.6	47.0	0.0	.	76
196.	USGS 222 A	37N	6W	24	180	LAC	4/81	7.8	200	47.0	20.0	190.0	3.9	0.42	0.05	224.0	290.0	0.6	0.9	0.01	687
197.	USGS 222 B	37N	6W	24	62	LAC	4/81	7.7	320	62.0	41.0	34.0	2.9	0.85	0.03	349.0	13.0	40.0	0.5	.	404
198.	USGS 222 C	37N	6W	24	28	LAC	4/81	6.1	130	32.0	12.0	21.0	4.1	1.20	0.02	31.0	59.0	71.0	< 0.1	0.10	219
199.	USGS GRT MS	37N	6W	22	16	CAL	4/81	7.1	340	68.0	42.0	20.0	1.1	1.30	0.05	401.0	12.0	0.2	0.4	.	386
200.	USGS GRT MS	37N	6W	22	13	CAL	4/81	6.7	430	98.0	44.0	9.2	2.1	5.00	0.14	491.0	4.5	1.2	0.2	.	459
201.	USGS GRT MS	37N	6W	23	7	CAL	4/81	6.3	170	37.0	18.0	58.0	3.8	0.89	0.17	68.0	110.0	67.0	< 0.1	.	336
202.	USGS 101 DP	37N	6W	21	75	CAL	10/77	7.5	230	46.0	27.0	35.0	3.6	1.30	0.08	230.0	26.0	38.0	0.4	.	315
203.	USGS GRT MS	37N	6W	22	9	CAL	4/81	6.6	270	60.0	29.0	15.0	0.8	9.00	0.21	327.0	14.0	7.4	0.2	.	332
204.	NIPSCO D	37N	6W	21	17	CAL	4/78	.	290	87.0	18.0	14.0	15.0	0.12	0.21	69.0	10.0	250.0	< 0.1	.	436
205.	USGS GRT MS	37N	6W	22	8	CAL	4/81	6.9	400	74.0	52.0	17.0	2.0	0.01	0.05	393.0	10.0	59.0	0.3	.	450
206.	USGS GRT MS	37N	6W	22	20	CAL	4/81	7.1	470	96.0	55.0	14.0	2.3	1.90	0.10	396.0	8.4	94.0	0.2	.	509
207.	USGS GRT MS	37N	6W	22	18	CAL	4/81	7.0	440	93.0	51.0	12.0	2.1	1.90	0.09	400.0	9.1	98.0	0.2	.	507
208.	USGS GRT MS	37N	6W	22	18	CAL	4/81	7.0	400	78.0	51.0	13.0	1.9	2.00	0.05	371.0	13.0	85.0	0.3	.	467
209.	USGS GRT MS	37N	6W	22	12	CAL	4/81	7.0	400	77.0	51.0	16.0	2.1	1.40	0.04	363.0	12.0	81.0	0.3	.	459
210.	NIPSCO D	37N	6W	21	21	CAL	4/78	.	380	110.0	26.0	14.0	9.8	< 0.10	3.90	45.0	12.0	400.0	0.1	.	603
211.	LUTZ-USGS	37N	6W	24	60	LAC	4/74	6.8	160	38.0	16.0	25.0	3.0	.	.	52.0	80.0	54.0	.	.	247
212.	NIPSCO D	37N	6W	21	17	CAL	4/78	.	320	88.0	25.0	13.0	7.6	0.43	1.50	64.0	10.0	290.0	< 0.1	.	474
213.	USGS GRT MS	37N	6W	23	8	CAL	4/81	7.3	140	36.0	12.0	4.2	0.5	0.81	0.04	149.0	3.8	14.0	0.1	.	161
214.	DUNE ACRES	37N	6W	23	16	CAL	5/88	7.3	218	55.0	19.0	10.0	1.1	6.80	0.13	188.0	16.0	21.0	0.1	< 0.10	242
215.	NIPSCO D	37N	6W	21	12	CAL	4/78	.	60	15.0	5.4	3.2	0.5	1.80	0.07	33.0	4.9	41.0	.	.	92
216.	USGS 107 DP	37N	6W	23	64	CAL	10/77	8.4	180	46.0	16.0	14.0	1.6	0.31	0.18	160.0	20.0	21.0	0.2	.	215
217.	USGS 108 SH	37N	6W	23	16	CAL	10/77	7.3	140	34.0	13.0	13.0	1.1	5.50	0.35	200.0	4.9	2.1	0.2	.	194
218.	KAISER-USGS	37N	6W	24	13	CAL	4/74	7.6	290	57.0	36.0	26.0	4.0	.	.	328.0	11.0	4.6	.	.	335
219.	USGS GRT MS	37N	6W	22	8	CAL	10/80	5.4	96	30.0	5.2	1.5	0.5	11.00	0.12	72.0	8.0	30.0	0.1	0.00	131
220.	NIPSCO D	37N	6W	22	12	CAL	10/77	.	39	8.0	4.7	3.2	1.7	6.30	0.12	5.0	6.0	54.0	0.1	.	87
221.	USGS GRT MS	37N	6W	22	8	CAL	4/81	6.1	150	40.0	12.0	2.5	0.2	18.00	0.09	114.0	7.7	70.0	< 0.1	.	219
222.	USGS GRT MS	37N	6W	23	5	CAL	4/81	6.6	220	53.0	22.0	7.1	0.2	5.70	0.17	248.0	6.5	5.0	0.1	.	249

Appendix 9. Results of chemical analysis from selected water wells – Continued

Location Number	Well Owner	Township	Range	Section	Well Depth (feet)	Aquifer System	Date Sampled	pH[1]	Hardness as $CaCO_3$	Calcium	Magnesium	Sodium	Potassium	Iron	Manganese	Alkalinity as $CaCO_3$[2]	Chloride	Sulfate	Fluoride	Nitrate as Nitrogen	Total Dissolved Solids[3]
PORTER COUNTY - Countinued																					
223.	USGS 220 R	37N	6W	24	63	LAC	10/80	7.6	290	48.0	41.0	30.0	2.9	1.30	0.03	427.0	17.0	1.0	0.5	0.01	398
224.	USGS 220 C	37N	6W	24	16	CAL	4/81	8.0	230	56.0	22.0	10.0	4.6	0.25	0.03	138.0	32.0	72.0	< 0.1	0.00	280
225.	USGS 218 A	37N	5W	19	141	LAC	4/80	6.9	460	79.0	64.0	25.0	2.8	1.90	0.04	468.0	7.3	28.0	0.4	0.00	489
226.	USGS 218 B	37N	5W	19	25	LAC	4/80	5.8	140	34.0	13.0	3.9	0.3	0.71	0.04	80.0	9.4	50.0	0.1	0.00	159
227.	USGS 209	37N	5W	16	75	LAC	10/80	7.2	430	80.0	55.0	18.0	3.0	0.99	0.07	497.0	6.3	13.0	0.3	0.01	475
228.	USGS 210 A	37N	5W	15	106	LAC	5/80	7.3	470	73.0	69.0	70.0	4.7	0.59	0.16	430.0	7.5	190.0	0.8	0.05	674
229.	USGS 210 B	37N	5W	15	28	LAC	4/80	6.7	350	64.0	46.0	70.0	55.0	9.90	1.10	520.0	77.0	42.0	0.1	0.01	676
230.	DUNESP-USGS	37N	6W	13	120	CAL	4/74	7.8	310	56.0	41.0	130.0	11.0	.	.	325.0	210.0	1.2	.	.	644
231.	DUNESP-USGS	37N	6W	13	92	CAL	10/73	7.6	390	69.0	53.0	59.0	8.2	.	.	481.0	29.0	2.5	.	.	509
232.	USGS 221A	37N	6W	13	24	CAL	4/81	7.5	240	69.0	16.0	1.4	1.0	0.02	0.02	235.0	1.4	23.0	< 0.1	0.82	254
233.	USGS GRT MS	37N	5W	17	6	CAL	10/80	6.5	130	32.0	13.0	15.0	0.6	2.80	0.15	61.0	29.0	48.0	0.0	0.00	177
234.	USGS GRT MS	37N	5W	18	5	CAL	4/81	6.7	170	41.0	17.0	11.0	0.8	4.30	0.18	108.0	36.0	51.0	0.1	.	226
235.	USGS 211 A	37N	5W	16	176	LAC	4/81	7.5	290	46.0	43.0	89.0	9.3	1.20	0.01	486.0	13.0	1.8	0.5	.	495
236.	USGS 211 B	37N	5W	16	22	LAC	4/81	6.0	310	55.0	42.0	15.0	2.1	0.74	0.07	298.0	12.0	26.0	0.4	.	332
237.	USGS 204 B	37N	5W	13	125	LAC	4/81	7.4	270	60.0	28.0	12.0	1.8	0.24	0.03	277.0	4.9	15.0	0.3	.	288
238.	USGS 204 C	37N	5W	13	57	LAC	4/81	6.9	1600	200.0	270.0	82.0	7.4	4.20	0.04	664.0	11.0	1200.0	0.5	.	1093
239.	USGS 211 9	37N	5W	16	6	LAC	5/86	6.0	.	13.0	3.3	37.0	1.2	.	.	58.0	51.0	16.0	.	.	156
240.	USGS 241 A	37N	5W	10	137	LAC	5/80	7.1	280	58.0	33.0	46.0	4.0	0.75	0.08	310.0	51.0	1.0	0.4	0.12	380
241.	USGS 241 B	37N	5W	10	85	LAC	5/80	7.4	300	55.0	39.0	47.0	2.8	1.10	0.09	370.0	14.0	0.3	0.5	0.02	382
242.	USGS 241 C	37N	5W	10	24	LAC	4/81	7.5	320	53.0	45.0	24.0	3.3	2.10	0.04	350.0	18.0	8.1	0.2	.	364
243.	D VENANDER	37N	5W	12	76	LAC	12/81	7.5	120	19.0	17.0	120.0	2.7	0.09	< 0.02	268.0	99.0	< 5.0	.	.	419
244.	USGS GRT MS	37N	5W	9	5	CAL	4/81	6.7	180	41.0	20.0	23.0	3.4	1.50	0.05	167.0	29.0	35.0	< 0.1	.	253
245.	GEORGE HERO	37N	5W	12	33	LAC	12/81	7.2	178	45.0	16.0	4.2	1.2	4.10	0.19	124.0	11.0	55.0	.	.	211
246.	USGS 321 9	37N	5W	9	6	CAL	5/86	7.0	.	54.0	33.0	53.0	0.7	.	.	334.0	19.0	41.0	.	.	401
247.	CHESTER LEW	37N	5W	12	48	LAC	12/81	7.3	64	18.0	5.0	90.0	1.6	0.46	< 0.02	210.0	29.0	< 5.0	.	.	270
248.	ROY JOHNSON	37N	5W	12	75	LAC	12/81	7.6	138	29.0	16.0	97.0	4.4	0.54	< 0.02	272.0	68.0	< 5.0	.	.	378
249.	USGS 305 7	37N	5W	9	6	CAL	5/86	6.3	.	50.0	14.0	13.0	2.9	.	.	158.0	7.5	61.0	.	.	243
250.	USGS 305-156	37N	5W	9	156	LPC	11/84	7.7	0	26.0	15.0	160.0	4.3	.	.	359.0	110.0	0.2	.	.	531
251.	USGS 305-11B	37N	5W	9	11	CAL	5/86	6.4	.	55.0	9.6	3.5	1.8	.	.	130.0	2.5	55.0	.	.	205
252.	USGS 305B 7	37N	5W	9	7	CAL	5/86	6.2	.	24.0	4.9	7.2	1.4	.	.	67.0	2.7	26.0	.	.	106
253.	USGS GRT MS	37N	5W	9	5	CAL	4/81	7.1	510	160.0	27.0	32.0	0.9	8.00	0.68	406.0	32.0	180.0	0.2	.	684
254.	USGS305 11A	37N	5W	9	9	CAL	5/86	6.1	.	14.0	4.7	7.9	1.4	.	.	32.0	7.4	31.0	.	.	86
255.	USGS 305D 8	37N	5W	9	8	CAL	5/86	6.5	.	65.0	7.9	41.0	2.5	.	.	164.0	57.0	37.0	.	.	309
256.	USGS GRT MS	37N	5W	10	6	CAL	4/81	6.6	81	20.0	7.6	19.0	1.1	2.10	0.09	47.0	39.0	39.0	0.1	.	156

Appendix 9. Results of chemical analysis from selected water wells – Continued

Location Number	Well Owner	Township	Range	Section	Well Depth (feet)	Aquifer System	Date Sampled	pH[1]	Hardness as $CaCO_3$	Calcium	Magnesium	Sodium	Potassium	Iron	Manganese	Alkalinity as $CaCO_3$[2]	Chloride	Sulfate	Fluoride	Nitrate as Nitrogen	Total Dissolved Solids[3]
PORTER COUNTY - Countinued																					
257.	USGS 322	37N	5W	9	12	CAL	5/86	8.2	.	19.0	7.7	0.7	0.3	.	.	60.4	1.8	19.0	.	.	85
258.	USGS306 212	37N	5W	9	212	LPC	3/85	7.6	.	41.0	32.0	150.0	6.9	.	.	382.0	120.0	< 2.0	.	.	579
259.	NOAH HAMILT	37N	5W	12	22	LAC	12/81	6.9	208	57.0	16.0	23.0	8.8	3.90	0.32	180.0	31.0	54.0	.	.	302
260.	USGS BL1	37N	5W	11	17	CAL	8/88	6.6	.	320.0	150.0	40.0	0.0	1.90	0.10	438.0	81.0	980.0	0.1	.	1846
261.	USGS 215 B	37N	5W	11	33	CAL	4/81	8.0	120	35.0	8.9	27.0	1.0	< 0.10	< 0.01	101.0	44.0	37.0	< 0.1	0.70	214
262.	USGS BL2	37N	5W	11	12	CAL	8/88	6.8	.	130.0	28.0	440.0	2.2	0.02	< 0.01	302.0	590.0	190.0	0.1	.	1561
263.	AUDREY FRAS	37N	5W	12	13	LAC	12/81	7.0	204	50.0	19.0	25.0	6.8	3.30	0.14	160.0	39.0	55.0	.	.	294
264.	LAUDERDALE	37N	5W	12	16	LAC	12/81	6.8	144	35.0	14.0	6.2	11.0	0.05	0.02	106.0	8.0	61.0	.	.	199
265.	DAN ADNEY	37N	5W	12	20	LAC	12/81	6.8	180	42.0	18.0	57.0	12.0	0.21	0.03	152.0	54.0	76.0	.	.	350
266.	USGS GRT MS	37N	5W	3	8	CAL	4/81	7.1	370	96.0	31.0	45.0	1.6	4.30	0.18	440.0	45.0	7.1	0.3	.	495
267.	USGS 212 A	37N	5W	4	212	LPC	5/80	8.2	280	54.0	36.0	330.0	7.9	0.84	0.06	240.0	540.0	2.0	0.7	0.03	1116
268.	USGS 216	37N	5W	1	49	LAC	10/80	7.6	170	30.0	24.0	85.0	3.3	0.69	0.01	293.0	66.0	0.0	0.4	0.01	386
269.	USGS 216G	37N	5W	1	11	LAC	4/81	7.6	190	44.0	20.0	4.8	1.9	0.52	0.29	213.0	5.2	1.9	0.2	.	207
270.	USGS GRT MS	37N	5W	2	6	CAL	4/81	6.0	110	32.0	8.3	72.0	7.5	0.01	0.35	39.0	100.0	79.0	< 0.1	5.70	328
271.	USGS BL4	37N	5W	2	6	CAL	8/88	5.9	71	18.0	6.3	46.0	1.5	0.03	0.03	25.0	52.0	54.0	0.1	.	193
272.	USGS GRT MS	37N	5W	2	14	CAL	4/81	6.4	180	50.0	14.0	4.3	1.1	16.00	0.43	166.0	12.0	40.0	< 0.1	.	238
273.	NORBERG-USG	37N	5W	1	30	CAL	4/74	7.0	110	27.0	10.0	16.0	8.0	.	.	58.0	12.0	65.0	.	.	173
274.	CASTEL-USGS	38N	5W	36	105	LPC	4/74	8.0	180	33.0	23.0	47.0	4.2	.	.	249.0	13.0	0.5	.	.	270
275.	USGS 214 B	38N	5W	35	26	CAL	4/81	7.1	180	45.0	16.0	24.0	2.4	0.72	0.04	133.0	41.0	57.0	< 0.1	.	266
276.	USGS 217 SH	38N	5W	36	13	CAL	4/81	6.8	41	12.0	2.7	1.9	0.5	0.65	0.03	44.0	1.2	8.2	< 0.1	.	54
277.	MCKINN-USGS	38N	5W	36	28	CAL	10/73	8.0	120	34.0	9.4	33.0	5.3	.	.	159.0	20.0	10.0	.	.	207
278.	WARDEN-USGS	38N	5W	36	96	LPC	10/73	8.2	71	19.0	5.8	76.0	3.2	.	.	202.0	22.0	1.6	.	.	249

LAPORTE COUNTY

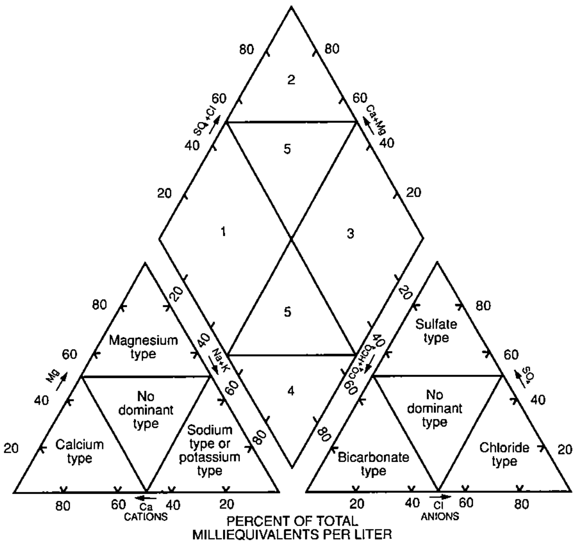
Location Number	Well Owner	Township	Range	Section	Well Depth (feet)	Aquifer System	Date Sampled	pH[1]	Hardness as $CaCO_3$	Calcium	Magnesium	Sodium	Potassium	Iron	Manganese	Alkalinity as $CaCO_3$[2]	Chloride	Sulfate	Fluoride	Nitrate as Nitrogen	Total Dissolved Solids[3]
279.	PURDUE-WVLL	36N	4W	9	155	VM	3/73	7.7	342	85.0	32.0	3.0	1.0	2.10	0.08	296.0	2.0	43.0	0.2	< 0.10	346
280.	E HAYMAN	37N	4W	21	85	LAC	10/87	7.5	278	77.1	20.7	2.3	0.4	1.00	0.10	279.1	7.9	21.2	0.1	< 0.02	298
281.	JONGKIND	37N	3W	19	272	VM	11/74	7.8	326	82.0	30.0	5.0	2.0	1.00	0.10	288.0	4.0	36.0	0.2	0.10	333
282.	USGS 201 A	37N	4W	9	205	LAC	4/80	7.8	260	39.0	40.0	54.0	5.8	0.20	0.03	350.0	23.0	6.9	0.7	0.03	392
283.	USGS 201 B	37N	4W	9	30	LAC	4/80	7.0	710	86.0	120.0	33.0	2.6	1.90	0.03	530.0	97.0	94.0	0.3	0.01	753
284.	CITGO STATI	37N	3W	2	185	VM	9/87	6.7	278	75.0	22.0	4.0	0.4	1.20	0.10	242.4	16.8	36.8	< 0.1	< 0.02	302
285.	USGS 202 A	37N	4W	5	150	LAC	4/80	7.3	190	35.0	26.0	59.0	4.5	0.89	0.00	300.0	20.0	0.5	0.6	0.02	327
286.	USGS 202 B	37N	4W	5	23	CAL	4/80	6.8	220	60.0	18.0	9.1	0.5	2.00	0.21	150.0	7.3	71.0	0.2	0.02	258
287.	C NOWAK	38N	3W	32	90	LAC	9/87	7.1	232	63.7	17.7	6.4	0.4	1.70	0.10	246.4	6.8	9.0	< 0.1	< 0.02	254

Appendix 9. Results of chemical analysis from selected water wells – Continued

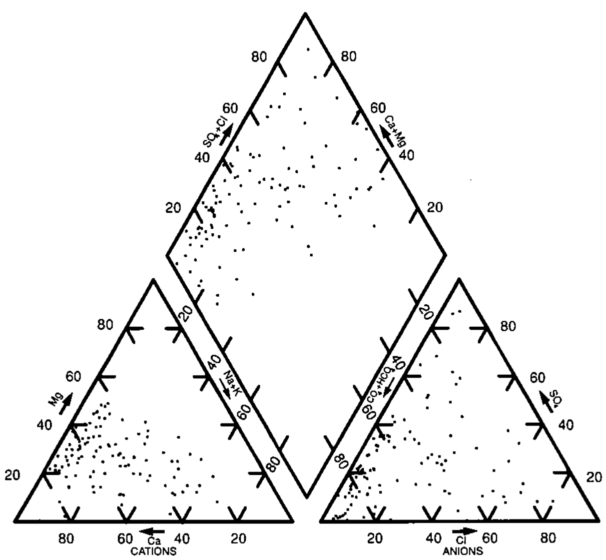
Location Number	Well Owner	Township	Range	Section	Well Depth (feet)	Aquifer System	Date Sampled	pH[1]	Hardness as $CaCO_3$	Calcium	Magnesium	Sodium	Potassium	Iron	Manganese	Alkalinity as $CaCO_3$[2]	Chloride	Sulfate	Fluoride	Nitrate as Nitrogen	Total Dissolved Solids[3]
LAPORTE COUNTY - Contiinued																					
288.	G BLADECKI	38N	2W	36	116	KK	9/87	7.5	390	108.0	29.6	3.4	0.6	0.10	0.30	376.6	22.1	41.3	0.1	1.20	433
289.	USGS 203 A	38N	4W	31	193	LPC	4/80	7.3	170	31.0	23.0	72.0	8.3	0.52	0.01	306.0	24.0	0.9	0.6	0.02	344
290.	USGS 203 B	38N	4W	31	33	CAL	4/80	7.8	150	42.0	12.0	27.0	1.0	0.97	0.22	190.0	7.3	3.3	0.3	0.02	207
291.	TRAIL CREEK	38N	4W	34	40	CAL	9/87	8.3	279	74.9	22.4	51.5	1.8	0.10	0.10	201.0	78.9	97.0	< 0.1	< 0.02	447
292.	PALMER DAIR	38N	4W	25	188	LAC	7/54	7.7	207	42.0	25.0	79.0	2.5	0.83	0.00	307.0	49.0	1.4	0.5	0.14	385
293.	F EVANS	38N	2W	26	153	KK	9/87	6.4	283	74.0	23.8	2.1	0.3	1.10	0.10	269.5	8.6	35.1	0.1	< 0.02	307
294.	A LISIECKE	38N	3W	22	91	LAC	9/87	8.3	246	57.1	25.1	14.3	0.8	1.30	< 0.10	301.6	1.8	1.8	0.4	< 0.02	284
295.	R KENNEDY	38N	2W	18	44	LAC	9/87	9.5	295	71.8	28.2	9.6	0.7	1.40	< 0.10	308.4	8.2	20.1	0.2	< 0.02	325
296.	L POVLOCK	38N	2W	15	110	VM	9/87	8.5	251	64.6	21.9	2.0	0.3	0.10	< 0.10	225.5	0.6	42.4	0.1	< 0.02	267
297.	E KOVAS	38N	1W	17	57	VM	9/87	6.8	317	82.6	26.8	3.1	0.5	2.60	0.10	304.4	3.2	41.4	0.2	< 0.02	343

1 Results in standard p.H. units.
2 Laboratory analysis.
3 TDS values are the sum of major constituents expected in an anhydrous residue of a ground-water sample with bicarbonate converted to carbonate in the solid phase.

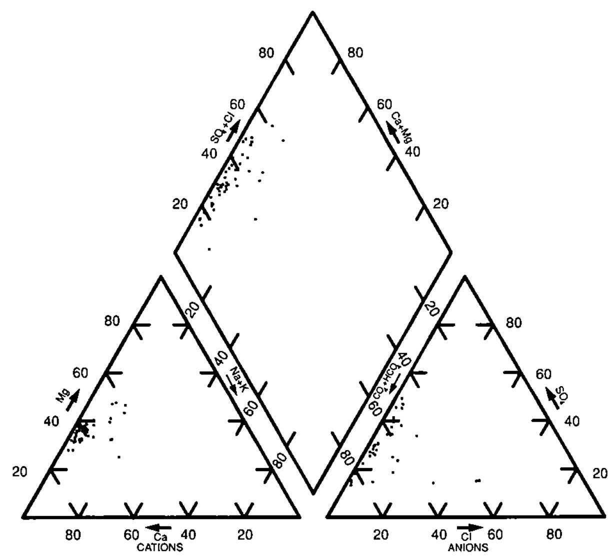
Appendix 10. Piper trilinear diagrams of ground-water quality data for major aquifer systems



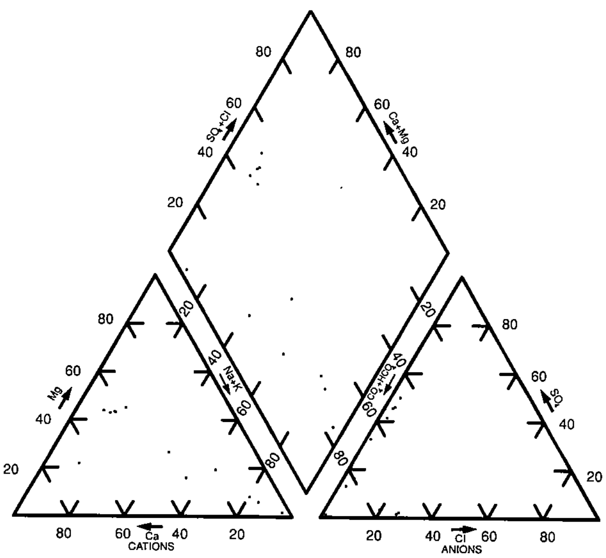
CALUMET AQUIFER



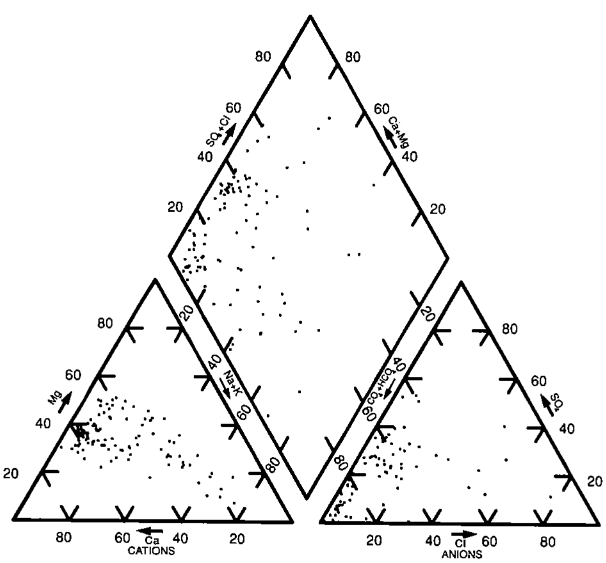
VALPARAISO AQUIFER



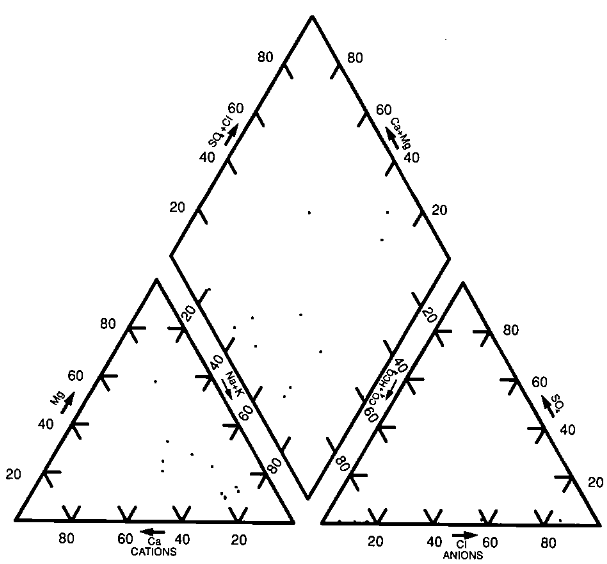
SILURIAN-DEVONIAN AQUIFER



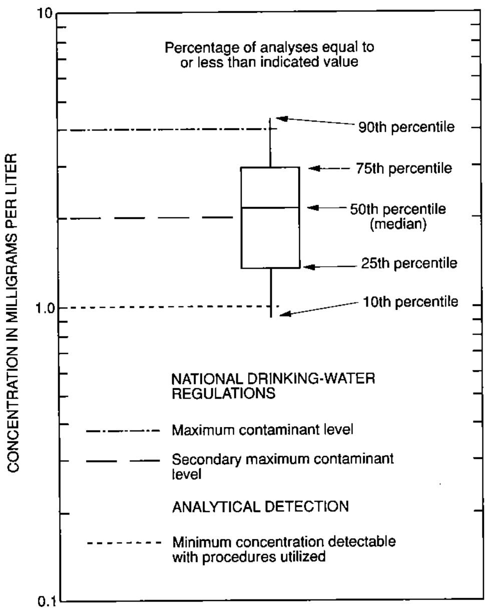
LACUSTRINE PLAIN AQUIFER



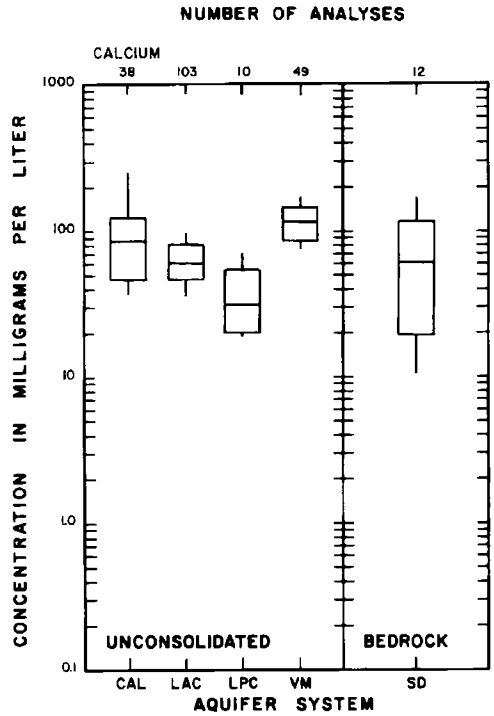
LACUSTRINE PLAIN UNDER THE CALUMET

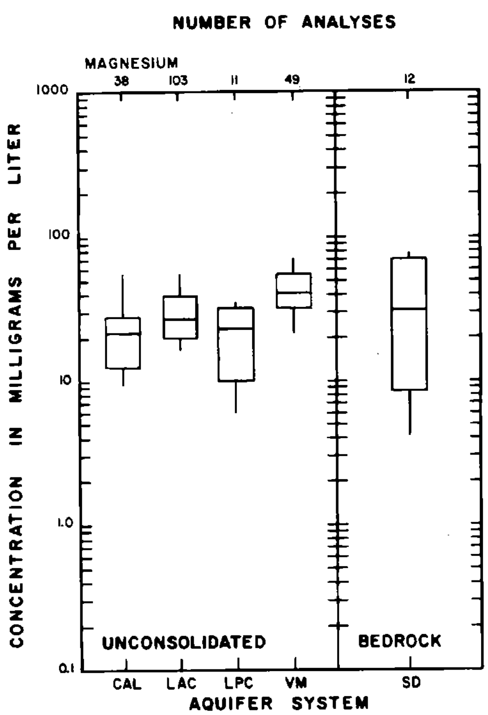


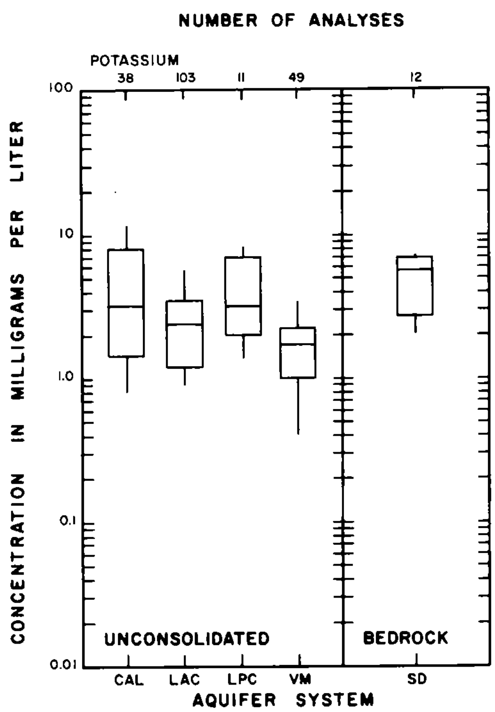
Appendix 11. Statistical analysis of calcium, magnesium, and potassium in ground water of the major aquifer systems



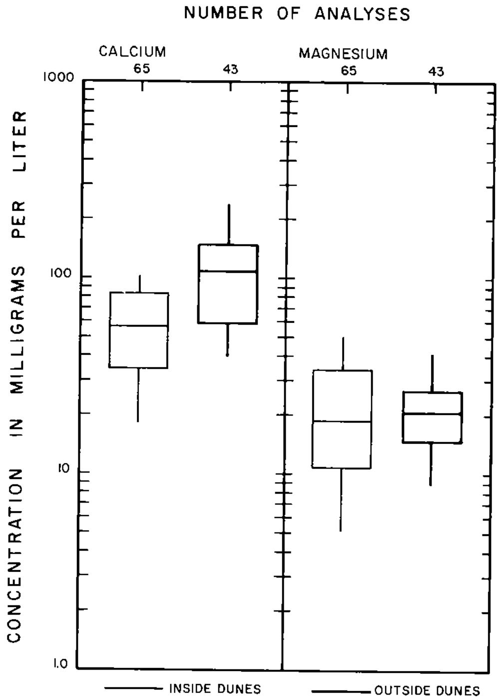
CAL Calumet Aquifer system
LAC Lacustrine Plain Aquifer system
LPC Lacustrine Plain Aquifer system underlying the Calumet
VM Valparasio Moraine Aquifer system
SD Silurian and Devonian Bedrock Aquifer system

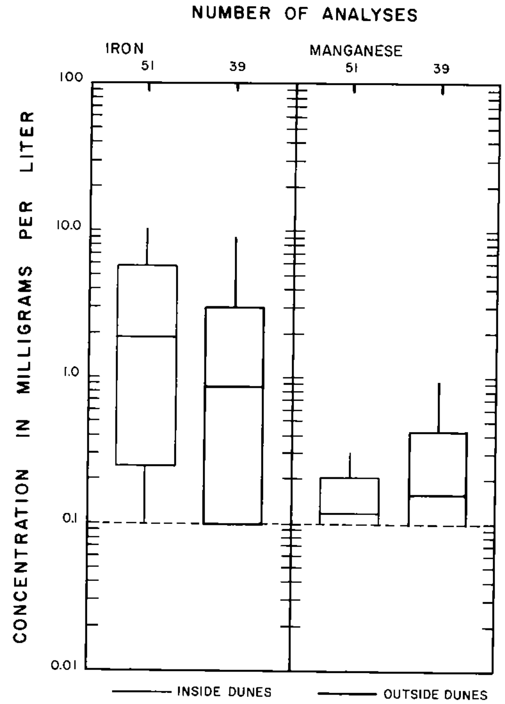


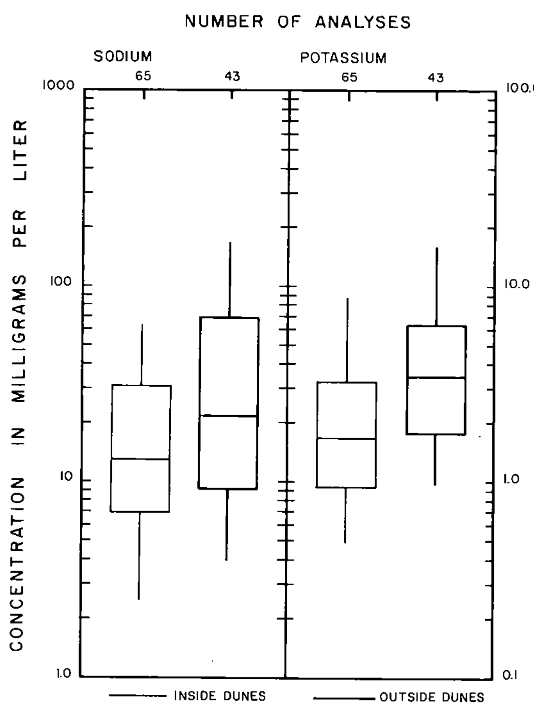


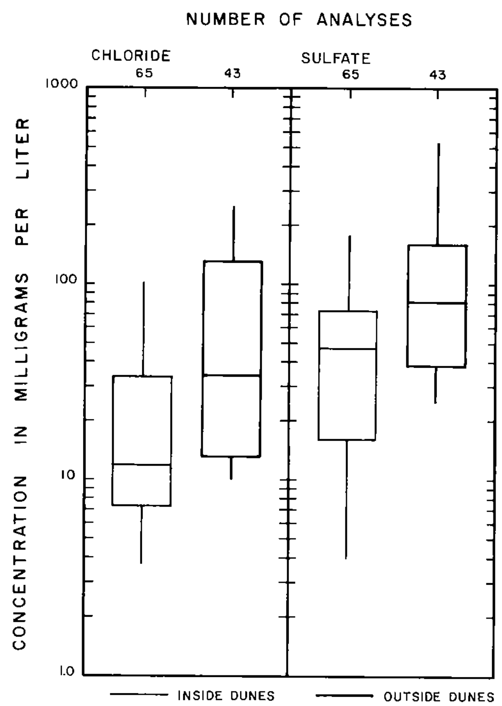


Appendix 12. Statistical analyses of selected constituents inside and outside the boundaries of the Indiana Dunes National Lakeshore

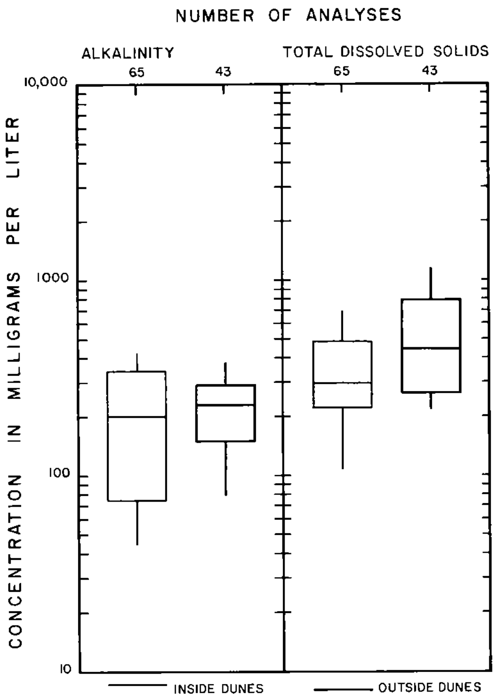


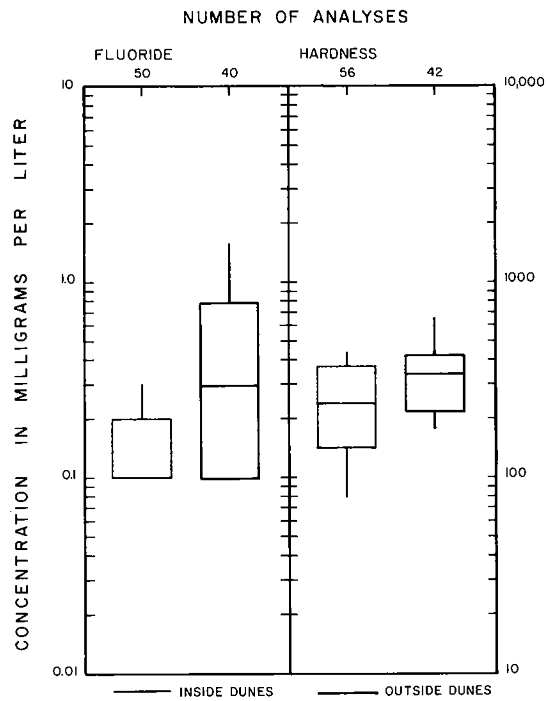






Appendix 12. Statistical analyses of selected constituents inside and outside the boundaries of the Indiana Dunes National Lakeshore – Continued





Appendix 13. Registered water-use data by type, county, and source (1990)

{Numbers denote water use in million of gallons. County data refer to areas within the Region only.}

County	Source	Industrial	Energy Production	Public Supply	Miscellaneous	Agricultural	Total Water use
LAKE	surface	515443.2*	289372.0	26491.8	7.3	259.3	831573.6*
	ground	1282.8	-	1432.2	1226.0	42.9	3983.9
	combined	516726.0*	289372.0	27924.0	1233.3	302.2	835557.5*
LAPORTE	surface	-	29909.0	2735.2	0.6	14.9	32659.7
	ground	15.5	-	15.6	6.9	-	38.0
	combined	15.5	29909.0	2750.8	7.5	14.9	32697.7
PORTER	surface	163395.9	92669.0	999.9[1]	1.4	37.2	257103.4
	ground	1451.5	-	799.4[1]	22.1	13.7	2286.7
	combined	164847.4	92669.0	1799.3[1]	23.5	50.9	259390.1
TOTAL[2]	surface	678839.1*	411950	30226.9	9.3	311.3	1121336.6*
	ground	2749.7	-	2247.2	1255.0	56.8	6308.7
	combined	681588.9*	411950	32474.1	1264.3	368.2	1127645.6*

[1] Excludes withdrawals for the city of Valparaiso because the facilities are outside the Region.
[2] Totals may not equal sum of county values because of differences in rounding.
* Totals reflect 1991 estimates for a surface-water intake of # 45-00839-IN.