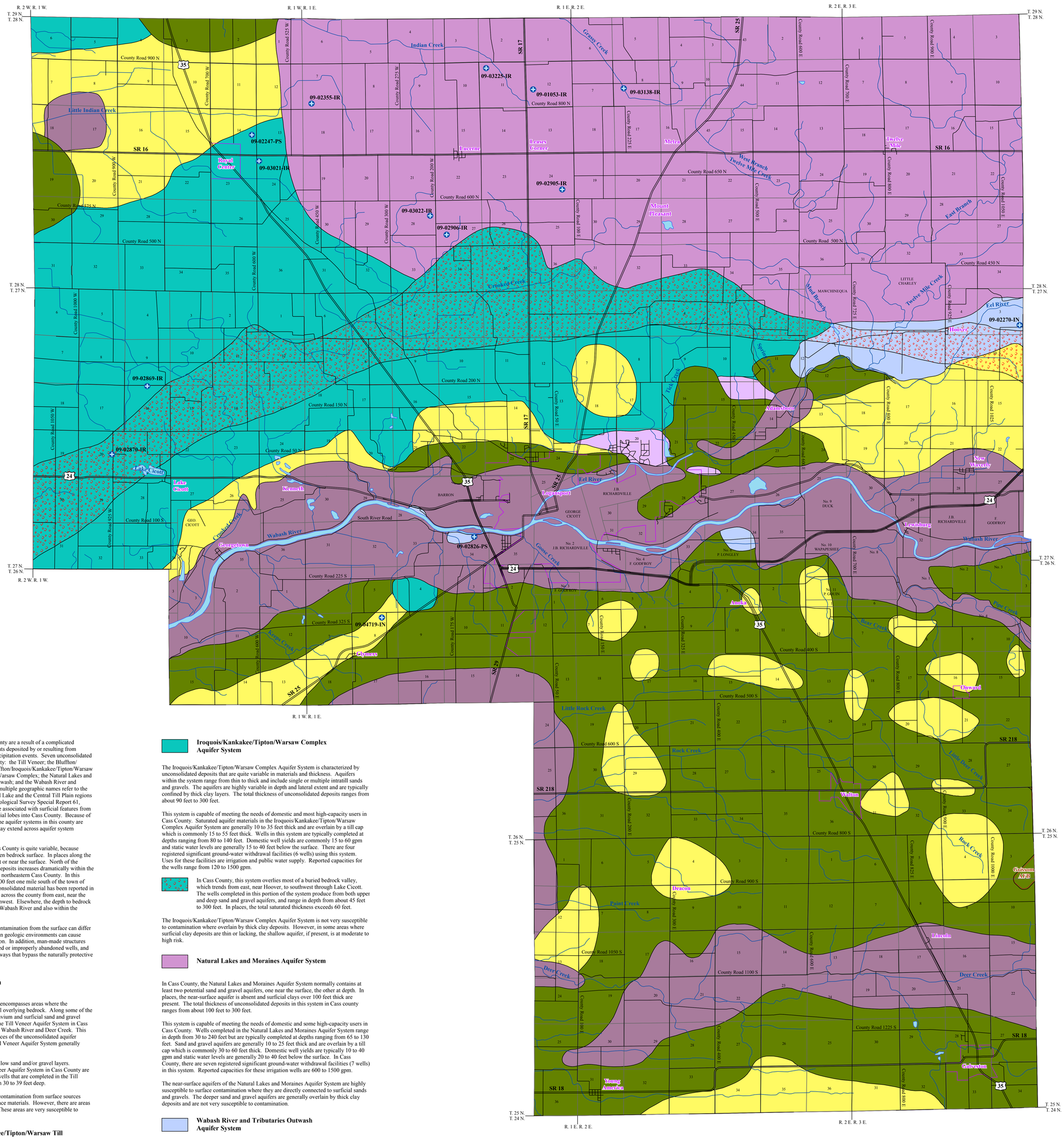
UNCONSOLIDATED AQUIFER SYSTEMS OF CASS COUNTY, INDIANA



The unconsolidated aquifer systems of Cass County are a result of a complicated sequence of glacial events and comprise sediments deposited by or resulting from glaciers, glacial meltwaters, and post-glacial precipitation events. Seven unconsolidated aquifer systems have been mapped in Cass County: the Till Veneer; the Bluffton/Iroquois/Kankakee/Tipton/Warsaw Till; the Bluffton/Iroquois/Kankakee/Tipton/Warsaw Till Subsystem; the Iroquois/Kankakee/Tipton/Warsaw Complex; the Natural Lakes and Moraines; the Wabash River and Tributaries Outwash; and the Wabash River and Tributaries Outwash Subsystem. Systems with multiple geographic names refer to the physiographic units of the Northern Moraine and Lake and the Central Till Plain regions (Physiographic Divisions of Indiana, Indiana Geological Survey Special Report 61, Henry H. Gray, 2000). The individual names are associated with surficial features from the advancement of at least three Wisconsin glacial lobes into Cass County. Because of the complicated glacial geology, boundaries of the aquifer systems in this county are commonly gradational and individual aquifers may extend across aquifer system boundaries.

The thickness of unconsolidated deposits in Cass County is quite variable, because glacial material has been deposited over an uneven bedrock surface. In places along the Wabash River and some tributaries, bedrock is at or near the surface. North of the Wabash River, the thickness of unconsolidated deposits increases dramatically within the rolling morainic topography of north-central and northeastern Cass County. In this region, the greatest reported thickness is about 300 feet one mile south of the town of Twelve Mile. In addition, about 300 feet of unconsolidated material has been reported in the deepest parts of a bedrock valley, which cuts across the county from east, near the town of Hoover, through Lake Cicott to the southwest. Elsewhere, the depth to bedrock is less than 100 feet in many places south of the Wabash River and also within the northwestern corner of Cass County.

Regional estimates of aquifer susceptibility to contamination from the surface can differ considerably from local reality. Variations within geologic environments can cause variation in susceptibility to surface contamination. In addition, man-made structures such as poorly constructed water wells, unplugged or improperly abandoned wells, and open excavations, can provide contaminant pathways that bypass the naturally protective clays.

Till Veneer Aquifer System

In Cass County, the Till Veneer Aquifer System encompasses areas where the unconsolidated material is predominantly thin till overlying bedrock. Along some of the major streams, this system also includes thin alluvium and surficial sand and gravel outwash deposits overlying shallow bedrock. The Till Veneer Aquifer System in Cass County is primarily mapped, in places, along the Wabash River and Deer Creek. This system has the most limited ground-water resources of the unconsolidated aquifer systems in the county. Total thickness of the Till Veneer Aquifer System generally ranges from about 25 to 50 feet.

Potential aquifers within this system include shallow sand and/or gravel layers. However, nearly all wells started in the Till Veneer Aquifer System in Cass County are completed in the underlying bedrock. The few wells that are completed in the Till Veneer Aquifer System in this county range from 30 to 39 feet deep.

This system is generally not very susceptible to contamination from surface sources because of the low permeability of the near-surface materials. However, there are areas where protective clay layers are thin or absent. These areas are very susceptible to contamination.

Bluffton/Iroquois/Kankakee/Tipton/Warsaw Till Aquifer System

The Bluffton/Iroquois/Kankakee/Tipton/Warsaw Till Aquifer System primarily consists of glacial till with intratill sand and gravel layers. In Cass County, this aquifer system ranges in thickness from about 50 feet to 230 feet.

Wells completed in this system are capable of meeting the needs of most domestic and some high-capacity users in Cass County. However, approximately 60 percent of wells started in this system utilize the underlying bedrock aquifer. Saturated aquifer materials include sand and/or gravel deposits that are commonly 10 to 20 feet thick and are generally overlain by 10 to 40 feet of till. Wells producing from this aquifer system are typically 60 to 90 feet deep. Domestic well capacities are commonly 15 to 50 gallons per minute (gpm). Static water levels generally range from 10 to 35 feet below the surface. There is one registered significant ground-water withdrawal facility (1 well) using the Bluffton/Iroquois/Kankakee/Tipton/Warsaw Till Aquifer System. The facility's use is for industry and the single well has a reported pumping rate of 250 gpm.

This system overlies part of a buried bedrock valley southeast of Hoover. The lone well completed in this portion of the system shows that this area has the potential for high-capacity yields. The well produces from a deep aquifer at a depth of 227 feet. The saturated gravel layer is 11 feet thick and the static water level is 116 feet.

The Bluffton/Iroquois/Kankakee/Tipton/Warsaw Till Aquifer System typically has a low susceptibility to surface contamination because intratill sand and gravel units are commonly overlain by thick glacial till. Shallow wells completed in this system are moderately susceptible to contamination.

Bluffton/Iroquois/Kankakee/Tipton/Warsaw Till Aquifer Subsystem

Areas where unconsolidated materials are generally greater than 50 feet in thickness, yet have limited aquifer potential, are mapped as the Bluffton/Iroquois/Kankakee/Tipton/Warsaw Till Aquifer Subsystem in Cass County. The subsystem in this county ranges from about 40 to 140 feet thick. However, the depth to bedrock is generally less than 100 feet. Potential aquifer materials include intratill sand and gravel deposits. Where present, aquifer materials are typically capped by till that is commonly 5 to 35 feet thick.

About 90 percent of wells started in this subsystem in Cass County are completed in the underlying bedrock aquifer system. However, the Bluffton/Iroquois/Kankakee/Tipton/Warsaw Till Aquifer Subsystem is capable of meeting the needs of some domestic users in the county. The few wells producing from this subsystem are completed at depths of 35 to 140 feet. Intratill sand and gravel aquifer materials are typically about 10 feet thick. Domestic well yields are commonly 10 to 15 gpm and static water levels are generally 15 to 50 feet below the surface.

This subsystem is generally not very susceptible to surface contamination because intratill sand and gravel units are overlain by thick till deposits. Wells producing from shallow aquifers are moderately to highly susceptible to contamination.

Iroquois/Kankakee/Tipton/Warsaw Complex Aquifer System

The Iroquois/Kankakee/Tipton/Warsaw Complex Aquifer System is characterized by unconsolidated deposits that are quite variable in materials and thickness. Aquifers within the system range from thin to thick and include single or multiple intratill sands and gravels. The aquifers are highly variable in depth and lateral extent and are typically confined by thick clay layers. The total thickness of unconsolidated deposits ranges from about 90 feet to 300 feet.

This system is capable of meeting the needs of domestic and most high-capacity users in Cass County. Saturated aquifer materials in the Iroquois/Kankakee/Tipton/Warsaw Complex Aquifer System are generally 10 to 35 feet thick and are overlain by a till cap which is commonly 15 to 55 feet thick. Wells in this system are typically completed at depths ranging from 80 to 140 feet. Domestic well yields are commonly 15 to 60 gpm and static water levels are generally 15 to 40 feet below the surface. There are four registered significant ground-water withdrawal facilities (6 wells) using this system. Uses for these facilities are irrigation and public water supply. Reported capacities for the wells range from 120 to 1500 gpm.

In Cass County, this system overlies most of a buried bedrock valley, which trends from east, near Hoover, to southwest through Lake Cicott. The wells completed in this portion of the system produce from both upper and deep sand and gravel aquifers, and range in depth from about 45 feet to 300 feet. In places, the total saturated thickness exceeds 60 feet.

The Iroquois/Kankakee/Tipton/Warsaw Complex Aquifer System is not very susceptible to contamination where overlain by thick clay deposits. However, in some areas where surficial clay deposits are thin or lacking, the shallow aquifer, if present, is at moderate to high risk.

Natural Lakes and Moraines Aquifer System

In Cass County, the Natural Lakes and Moraines Aquifer System normally contains at least two potential sand and gravel aquifers, one near the surface, the other at depth. In places, the near-surface aquifer is absent and surficial clays over 100 feet thick are present. The total thickness of unconsolidated deposits in this system in Cass county ranges from about 100 feet to 300 feet.

This system is capable of meeting the needs of domestic and some high-capacity users in Cass County. Wells completed in the Natural Lakes and Moraines Aquifer System range in depth from 30 to 240 feet but are typically completed at depths ranging from 65 to 130 feet. Sand and gravel aquifers are generally 10 to 25 feet thick and are overlain by a till cap which is commonly 30 to 60 feet thick. Domestic well yields are typically 10 to 40 gpm and static water levels are generally 20 to 40 feet below the surface. In Cass County, there are seven registered significant ground-water withdrawal facilities (7 wells) in this system. Reported capacities for these irrigation wells are 600 to 1500 gpm.

The near-surface aquifers of the Natural Lakes and Moraines Aquifer System are highly susceptible to surface contamination where they are directly connected to surficial sands and gravels. The deeper sand and gravel aquifers are generally overlain by thick clay deposits and are not very susceptible to contamination.

Wabash River and Tributaries Outwash Aquifer System

The Wabash River and Tributaries Outwash Aquifer System is mapped along sections of the Wabash River and Eel River in Cass County. In places, sand and gravel from the melting glaciers (outwash) were deposited in the stream valleys. The total thickness of unconsolidated deposits in this system ranges from about 70 feet to over 230 feet.

This aquifer system is capable of meeting the needs of domestic and high-capacity users in Cass County. Wells in the Wabash River and Tributaries Outwash Aquifer System are typically completed at depths ranging from 60 to 100 feet. Sand and gravel aquifers are commonly 20 to 50 feet thick and are generally capped by silt, sandy clay, or clay ranging from 5 to 20 feet thick. However, in many places, the protective cap layer is missing and unsaturated sand and gravel deposits lie above the productive aquifer. Domestic well yields in the Wabash River and Tributaries Outwash Aquifer System are commonly 30 to 60 gpm and static water levels are generally 10 to 25 feet below the surface. In Cass County, there are two registered significant ground-water withdrawal facilities (6 wells) in this system. Uses for these facilities are public water supply and industry. Reported capacities for these wells range from 150 to 1400 gpm.

In places, this system overlies segments of a deep buried bedrock valley. The wells completed in this portion of the system produce from both upper and deep sand and gravel aquifers, and range in depth from 60 to 130 feet. In places, the total saturated thickness exceeds 55 feet.

This system is moderately susceptible to surface contamination where overlying clay or silt deposits are present. However, areas that lack overlying clay or silt deposits are highly susceptible to contamination.

Wabash River and Tributaries Outwash Aquifer Subsystem

In Cass County, the Wabash River and Tributaries Outwash Aquifer Subsystem is mapped along portions of the Eel River. Total thickness of unconsolidated deposits overlying bedrock ranges from about 40 to over 100 feet.

The Wabash River and Tributaries Outwash Aquifer Subsystem has the potential to meet the needs of domestic and some high-capacity users. The wells in this system are typically completed at depths ranging from 60 to 80 feet. Saturated aquifer materials include sand and gravel deposits that are commonly 10 to 25 feet thick. Domestic well yields typically range from 15 to 60 gpm with static water levels of 15 to 40 feet below the surface.

The aquifer materials in the Wabash River and Tributaries Outwash Aquifer Subsystem are generally overlain by 5 to 25 feet of silt or clay. However, in many places, this layer is missing and unsaturated sand and gravel deposits lie above the productive aquifer. Areas within this aquifer system that have overlying clay or silt deposits are moderately susceptible to surface contamination; whereas, areas that lack overlying clay or silt deposits are highly susceptible to contamination.

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1 0.5 0 1 Mile

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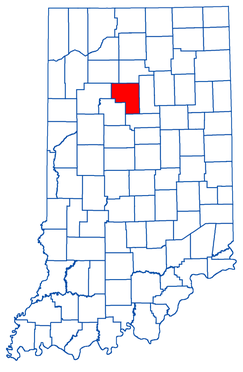
Location Map



EXPLANATION

- Registered Significant Ground-Water Withdrawal Facility
- Stream
- County Road
- State Road & US Highway
- Municipal Boundary
- U.S. Military Base
- Lake & River

Map generated by Scott H. Dean
IDNR, Division of Water, Resource Assessment Section

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This map was created from several existing shapefiles. Township and Range Lines of Indiana (line shapefile, 20020621), Land Survey Lines of Indiana (polygon shapefile, 20020621), and County Boundaries of Indiana (polygon shapefile, 20020621), were all from the Indiana Geological Survey and based on a 1:24,000 scale. Draft road shapefiles, System1 and System2 (line shapefiles, 2003), were from the Indiana Department of Transportation and based on a 1:24,000 scale. Populated Areas in Indiana 2000 (polygon shapefile, 20021000) was from the U.S. Census Bureau and based on a 1:100,000 scale. Streams27 (line shapefile, 20000420) was from the Center for Advanced Applications in GIS at Purdue University. Unconsolidated aquifer systems coverage (Unterreiner, 2008) was based on a 1:24,000 scale.

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by
Gerald A. Unterreiner
Division of Water, Resource Assessment Section

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