2. Physical Environment

2.1 Topography and Watersheds

More than 10,000 years ago, the Cold Spring area evolved as a result of the Wisconsin Glaciation into a series of bluffs and upland hills that defined the adjacent lowlands as well as a network of drainageways, lakes and marshes. The southern boundary of Cold Spring is characterized by the hilly end-moraine feature caused by the St. Croix Moraine of both the Superior and Rainy Lobes.

The topography of eastern Stearns County (including Cold Spring) is irregular, with ground elevations varying approximately 350 feet, from the low point of approximately 950 feet above Mean Sea Level in the southeast corner of the County. The lowlands of Cold Spring are at about elevation 1,100 feet. Figure 2 illustrates topography and drainage boundaries in the City. The elevation change within the study area is approximately 200 feet.

The Sauk River bisects the City of Cold Spring from the southwest corner Chain of Lakes reservoir complex, to the northeast. All of the land within the study area drains to the Sauk River via storm sewer or surface drainage features, including Brewery Creek and other unnamed ephemeral and perennial streams.

2.2 Soils

The soils in the hills southeast of the Sauk River are comprised of the Koronis-Marcellon Association. This soil group is made up of nearly level to steep, well drained and somewhat poorly drained, medium coarse textured soils on uplands. The soils north and west of the hills are comprised of the Estherville-Hawick Association. This soil group is made up of nearly level to very steep soils, somewhat excessively drained and excessively drained, moderately coarse textured and coarse textured soils on outwash plains and stream terraces.

Granite Outcropping

Figure 2 Topography & Drainage Boundaries goes here

11 x 17 color

The numerous granite outcrops that exist in the southern and eastern portion of the study area are a unique geological feature of Cold Spring. This area is characterized by a mantle of glacial overburden up to 150 feet thick. The granite is quarried throughout the immediate area making it a strong economic commodity for the community. The outcrops and shallow bedrock depths constrain development in certain areas of the City.

A great deal of land grading is anticipated within Cold Spring in the future as development occurs. Special attention must be paid to erosion control measures in areas with steep slopes or adjacent water resources to protect the landscape from the degradation due to uncontrolled erosion.

Four soil hydrologic groups have been established by the Natural Resources Conservation Service (NRCS) for establishing runoff and infiltration potential. These are:

- Hydrologic Soil Group A – Low runoff potential – high infiltration rate
- Hydrologic Soil Group B – Moderate infiltration rate
- Hydrologic Soil Group C – Slow infiltration rate
- Hydrologic Soil Group D – High runoff potential – very slow infiltration rate

The hydrologic soil groups are combined with land use to estimate runoff that will occur over a given area for a particular rainfall amount. In Cold Spring, the majority of the soils are either Group A or B with the split being 30% and 61%, respectively. This means the soils in the Cold Spring study area are well suited to infiltrate runoff and replenish the underlying aquifers during unfrozen ground conditions. Group B soils were used as the basis for establishing runoff curve numbers to model the runoff potential from the landscape.

2.3 LAND USE

Cold Spring is only partially developed. In general, residential land use dominates the existing and future City limits, with commercial and industrial uses centered in the downtown business district and along Highway 23 as it traverses the City. There is also a scattering of institutional land use for the various school complexes within the City limits. The existing and future land use used by this study is shown on Figure 3.

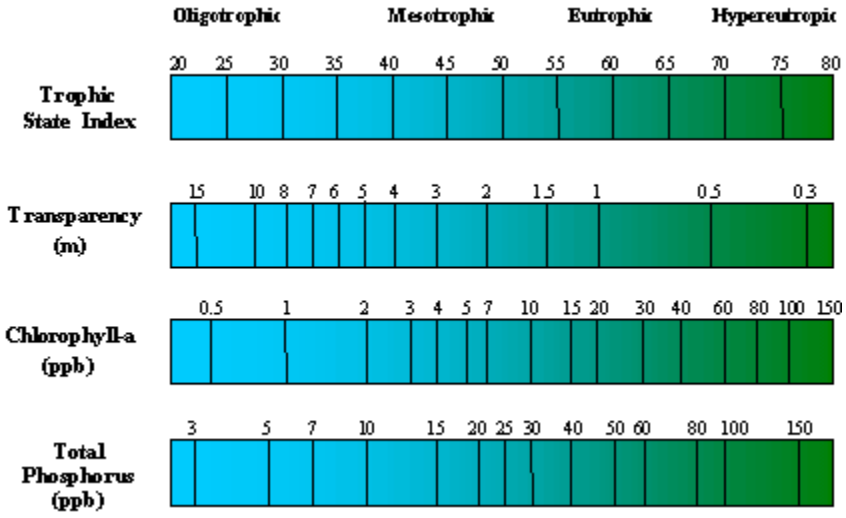
Most of the older parts of the City are almost 100% built and have high runoff rates. In the future, most activity will be related to redevelopment of older areas and development of raw land within the City limits or in future annexation areas.

Figure 3 – Future Land Use Map goes here

11 x 17 color

2.4 Key Water Resources

Cold Spring has within its study limit a large number of wetlands, the Sauk River, Brewery Creek, and several large lakes that are part of the Chain of Lakes reservoir complex. The lakes are monitored by the Minnesota Pollution Control Agency (MPCA) as part of the Citizens Lake Monitoring Program (CLMP). This program monitors lake water clarity, or transparency, using a Secchi Disk. This disk provides a quick method to evaluate the Total Phosphorus, Chlorophyll-a and Carlson's Trophic State Index (TSI) of the lake based on a direct relationship to water clarity. The following chart shows those relationships.



Key information on each of the priority lakes in the study area is summarized in Table 1. As is shown in the table, Knaus, Krays and Great Northern Lakes are all hypereutrophic and subject to frequent algal blooms. Byer Lake has no public access and therefore only limited public exposure.

Table 1. Lake Data Summary

Lake	DNR Identification Number	Surface Area (Acres)	Maximum Depth (Feet)	Carlson's TSI
Knaus	73-0086-00	205	20	86
Krays	73-0087-00	85	40	82
Great Northern	73-0083-00	213	19	84
Schneider	73-0082-00	53	52	49
Byer	73-0085-00	157	17	50-60*

* Estimated from satellite imagery

The Sauk River is listed as an impaired waterway

The dam that impounds the Chain of Lakes reservoir complex is located downtown. Downstream of the dam, the Sauk River runs free again until its confluence with the Mississippi River. This stretch of river and the majority of the Chain of Lakes reservoir complex are now listed as impaired waterbodies by the MPCA. This means that these waterbodies do not have sufficient water quality to support recreational use. The City's current expansion of the wastewater treatment facility, located just downstream of the dam, was required to meet very stringent discharge limits to minimize the impacts to the Sauk River. The 100-year floodplain for this river is shown in Figure 4.

Brewery Creek is a very special water resource that is situated within the City limits. This creek supports a robust trout fishery and is designated as a trout stream by the Minnesota Department of Natural Resources. This creek is one of the few trout fisheries in the area and is not well known for this distinction. The cold water necessary to support the trout fishery is supplied by a vast number of springs that are present along its banks. The creek, however, has been heavily impacted by changes in upstream land uses, which have resulted in increased volumes of runoff and their associated thermal impacts. As part of this study, floodplain modeling was undertaken to provide a more accurate floodplain map for the creek. The floodplain is presented in Figure 4.

Figure 4 also illustrates the National Wetland Inventory (NWI) for the City and surrounding study area. A large number of wetlands varying in size and type exist in the study area. Many of these wetlands have been impacted by changes in the adjacent land use. Wetlands are a vital part of the hydrologic cycle, filtering runoff and allowing the water to percolate back into the ground, replenishing the groundwater. Wetlands also provide habitat, food, and refuge for wildlife.

Figure 4 – NWI & Floodplain Map goes here

11 x 17 color