Section 4

Regional Conveyance System Age

Components of the County's regional conveyance system vary in age from over 100 years old to newly constructed facilities. Simply stated, older conveyance facilities are likely to be more deteriorated than newer ones. However, age alone cannot and should not determine the need for capital improvements to the conveyance system. Information on the age of conveyance system components is discussed here only to identify portions of the system that may need to be replaced over time if they deteriorate to a point where maintenance and repair are no longer feasible or cost-effective.

4.1 Pipe Age

A general age breakdown of regional conveyance pipes is shown in Figure 4-1. The chart is divided into categories coinciding with major capital expansion programs of the former Municipality of Metropolitan Seattle (Metro) and now King County Wastewater Treatment Division (WTD). These include pre 1961 pipe assumed from the local service providers, Phase 1 Metro construction (1961 to 1969), phase 2 (1970 to 1983), Phase 3 (1984 to 1986), and projects constructed since then. The pre 1961 pipe is further divided to show the ages of older conveyance pipes.

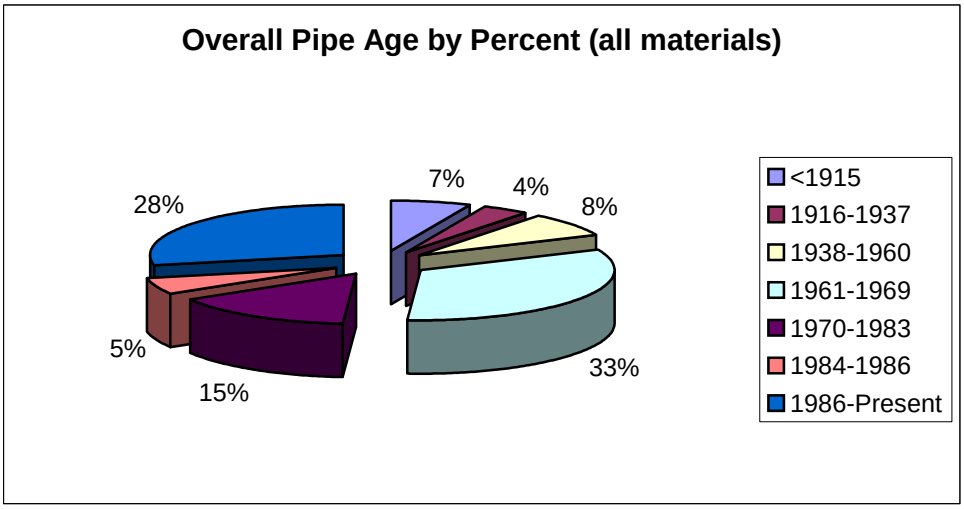

Figure 4-1. Overall Age of the Conveyance System

Consistent inspection is required to identify and assess condition. Older facilities that have shown signs of deterioration are inspected more frequently. Consistent inspection allows for timely maintenance activity that can and does extend the life of facilities well beyond their listed design life. A discussion of the WTD condition assessment programs is covered in Section 3 of this technical memorandum.

4.2 Expected Life of Sewer Pipe

The expected life of sewer pipe is primarily dependent on its construction material and the environmental and operational elements each pipe is subject to during its operation. Different wastewater agencies and groups have developed service life expectancies for individual sewage facilities, often related to cost and depreciation accounting practices. The United States Environmental Protection Agency and the State of California use 50 years for any type of wastewater pipe. British industry standards range from 80 to 125 years depending upon pipe diameter. This variation in projected life expectancy demonstrates that there is no universally accepted standard for life expectancy of any conveyance system component or material type.

Newer plastic pipe materials are believed to have longer service lives and lower life cycle costs, but most installations have not been in service long enough to determine the expected life.

Figure 4-2 below shows the percent breakdown of the conveyance system by material. WTD has 33 distinct types of pipe in its inventory. For this memorandum, the 33 pipe types have been categorized by their primary structural material into one of five categories: brick, concrete, ferrous materials (iron or steel), plastic, and miscellaneous (wood, clay, or asbestos). The miscellaneous category makes up less than one percent of the system.

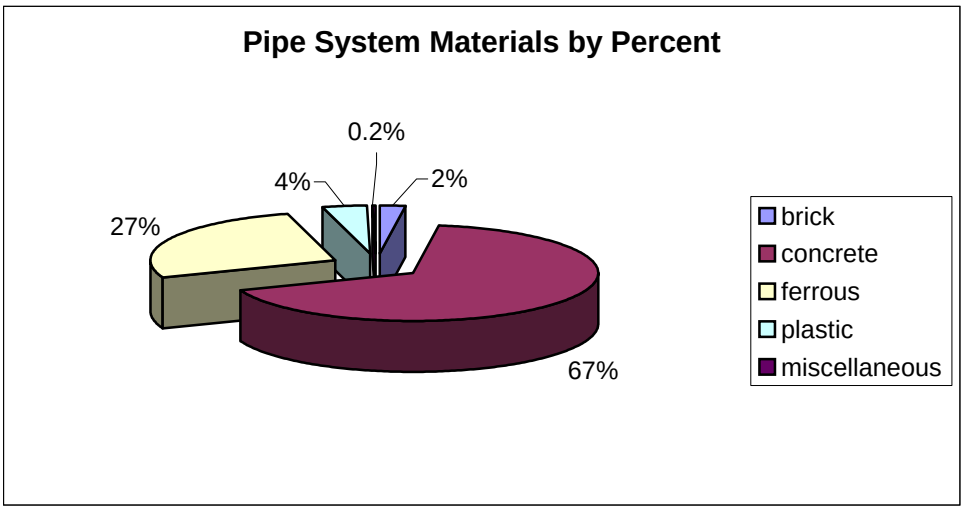

Figure 4-2. Breakdown of Conveyance System Components by Material Type

The following sections show the age of the wastewater conveyance system based on the categories of construction material.

4.2.1 Brick Sewers

The brick sewers are primarily in the combined service area, and 85% of these pipes were constructed prior to 1915.

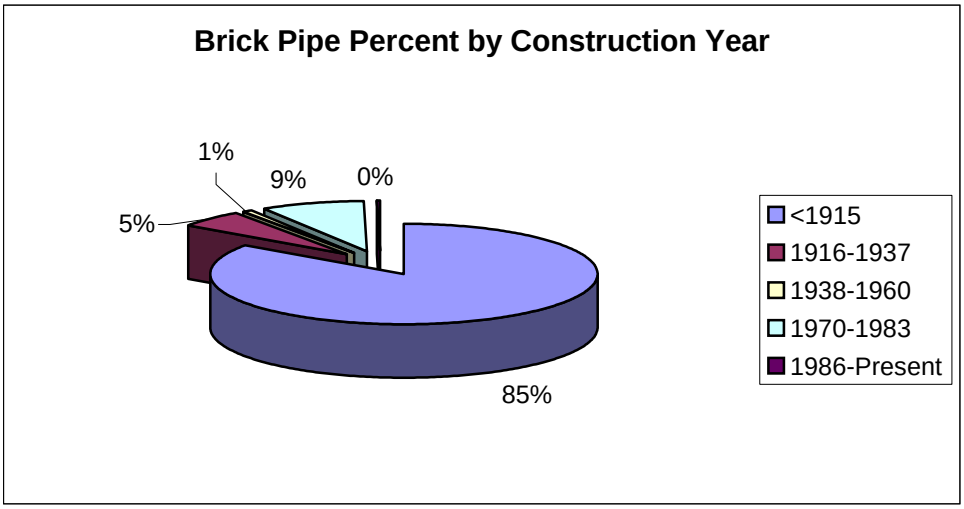

Figure 4-3. Age Breakdown of Brick Sewers

4.2.2 Concrete Pipe

Concrete pipe includes some older brick pipe that has been rehabilitated with concrete. The major factor contributing to the deterioration of concrete pipe is corrosion due to hydrogen sulfide gas that naturally occurs in wastewater. As shown in the figure below, 80% of concrete pipe in the system was constructed after 1961.

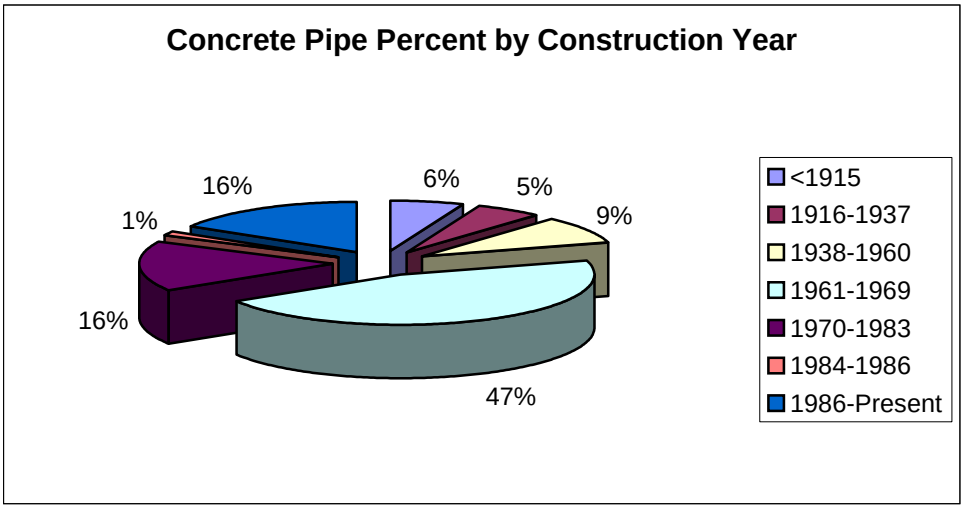

Figure 4-4. Age Breakdown of Concrete Pipe

4.2.3 Ferrous Pipe

Pipes made of ferrous materials include ductile iron, cast iron, and other steel/concrete and plastic lined steel hybrid pipes. The hybrid pipes are included in the ferrous pipes because the primary structure of the pipe is provided by the ferrous material. The most significant factors contributing to the deterioration of ferrous pipe are exterior galvanic corrosion and interior H_2S corrosion.

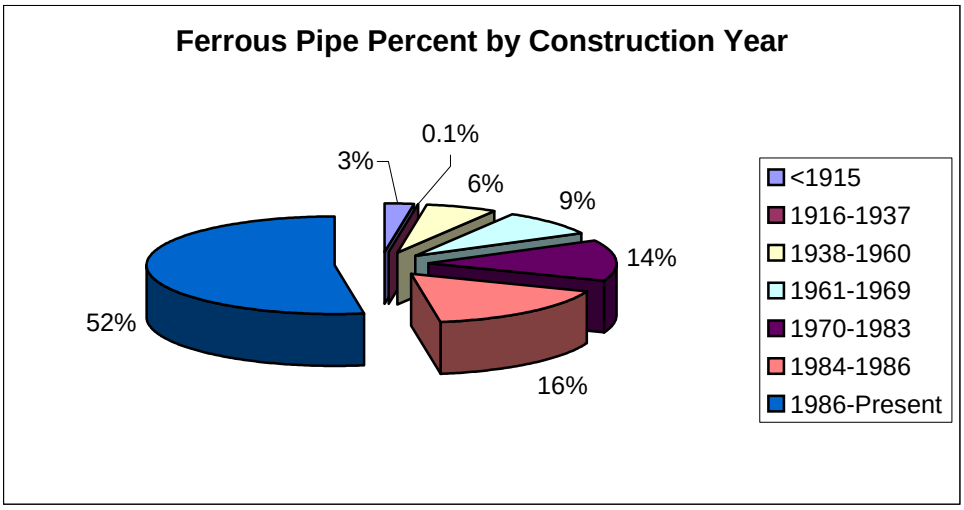

Figure 4-5. Age Breakdown of Ferrous Pipe

4.2.4 Plastic Pipe

As seen in Figure 4.6 all of the plastic pipe in the system has been constructed since 1961.

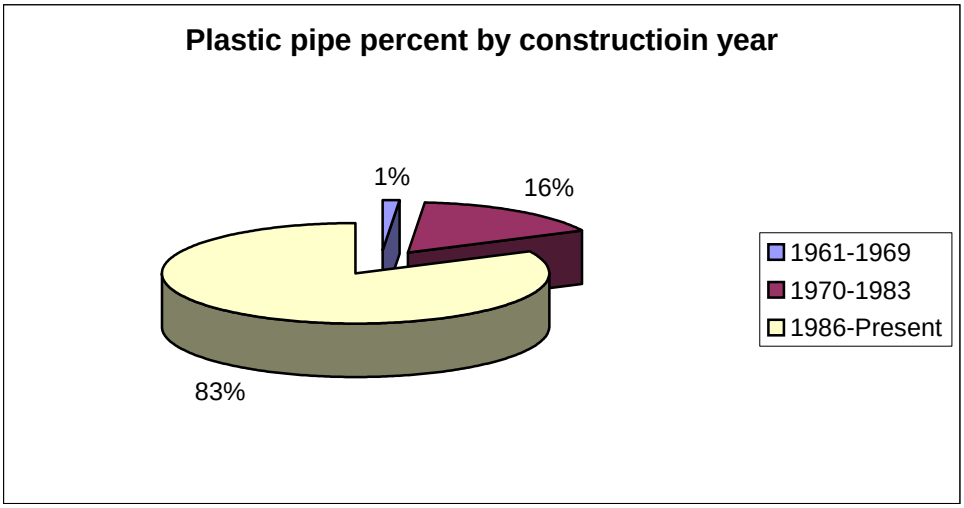

Figure 4-6. Age Breakdown of Plastic Pipe

4.3 Age of Mechanical Equipment (pumps and pump station equipment)

Mechanical or rotating equipment associated with the pumped conveyance of wastewater has shorter life expectancy and higher levels of inspection, maintenance, and replacement during their use. Typical life spans for wastewater mechanical equipment are 15 to 25 years. The mechanical equipment at a given pump station typically varies to serve the unique functions of each individual pump station.

The monitoring, maintenance, and replacement programs for mechanical equipment in place at the county are discussed in Sections 1 and 3 of this technical memorandum.

4.4 Maps of Age and Condition by Planning Basin

The following maps show the location of conveyance system components according to their age and material types by planning basin.

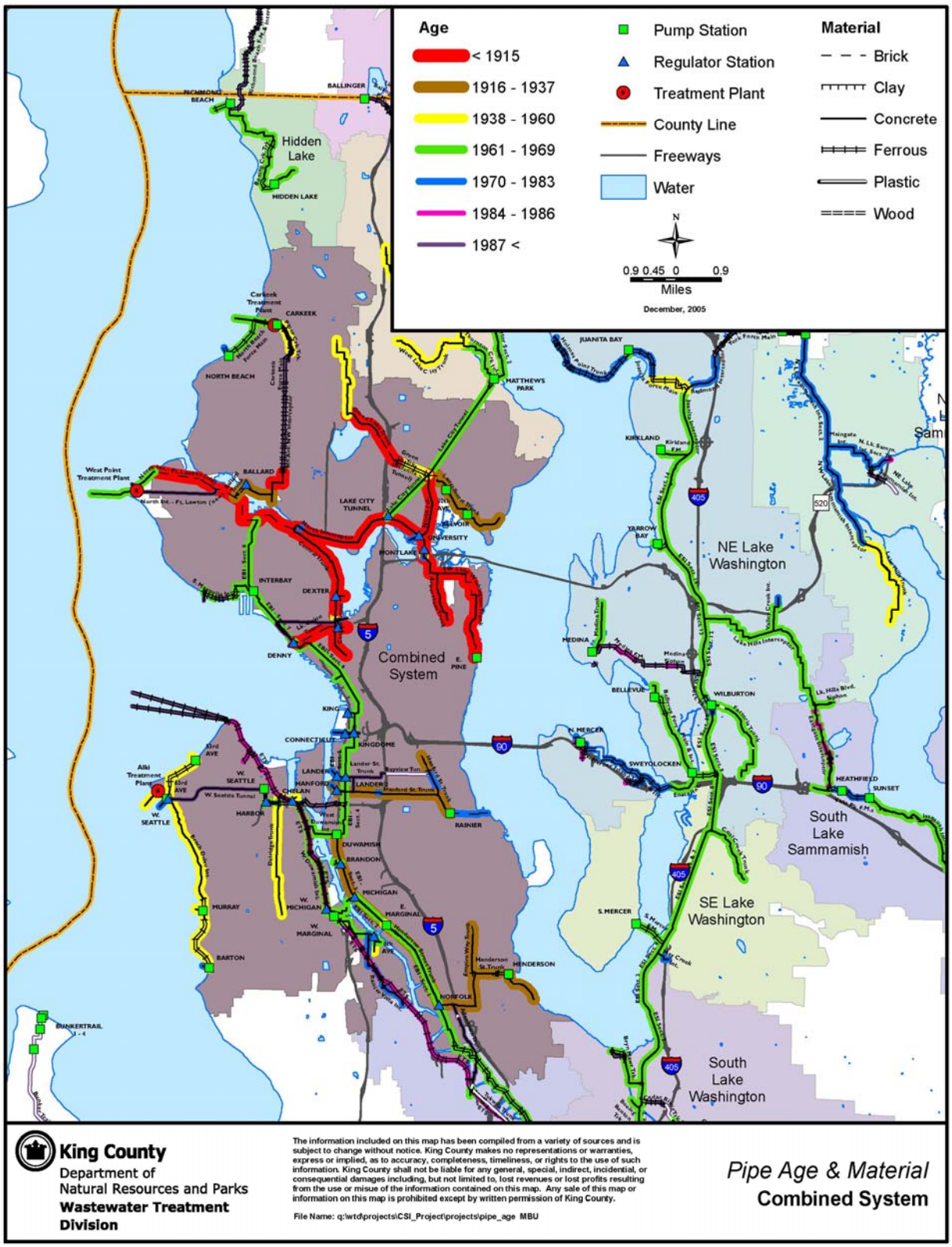

Figure 4-7. Pipe Age and Material – Combined System

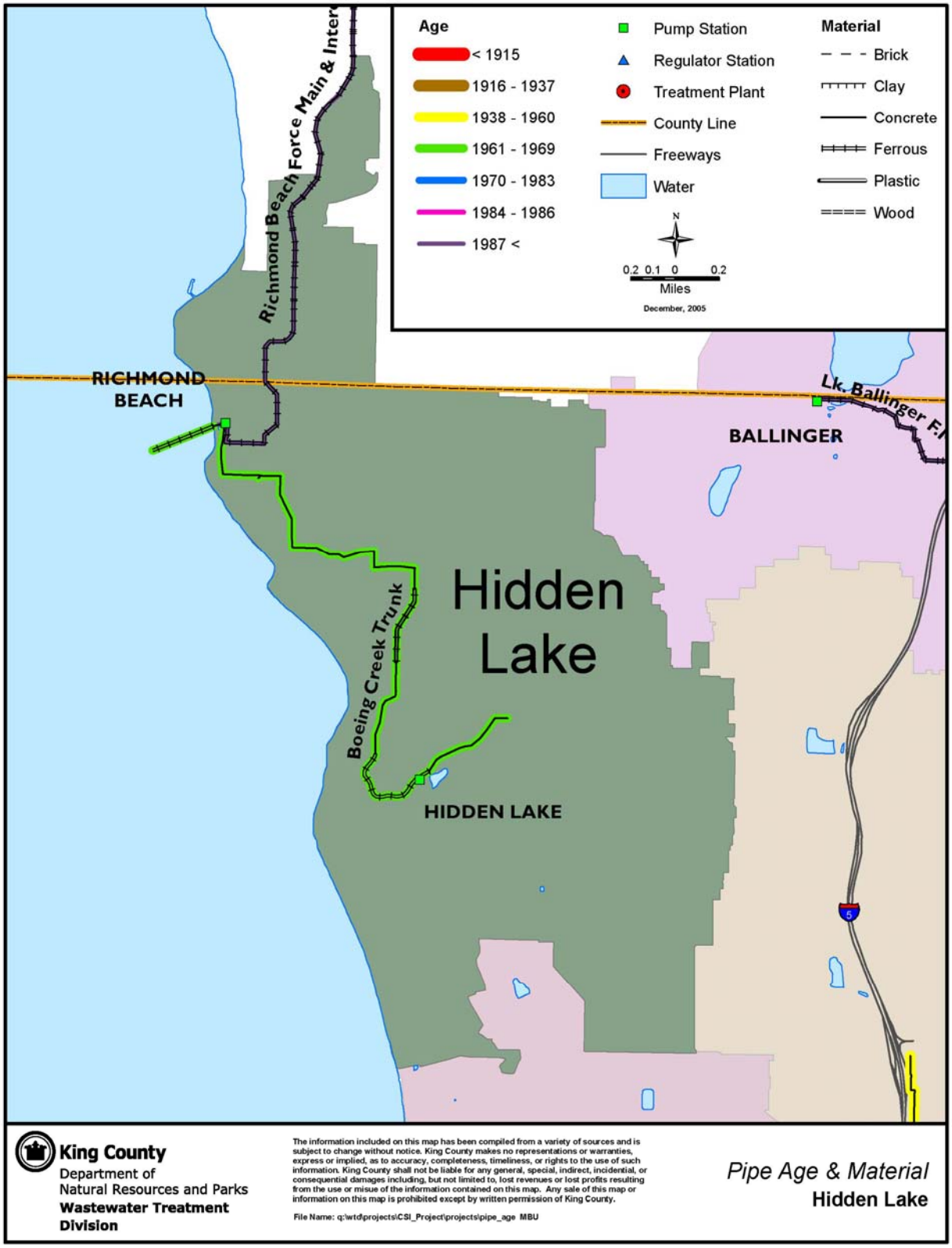

Figure 4-8. Pipe Age and Material – Hidden Lake

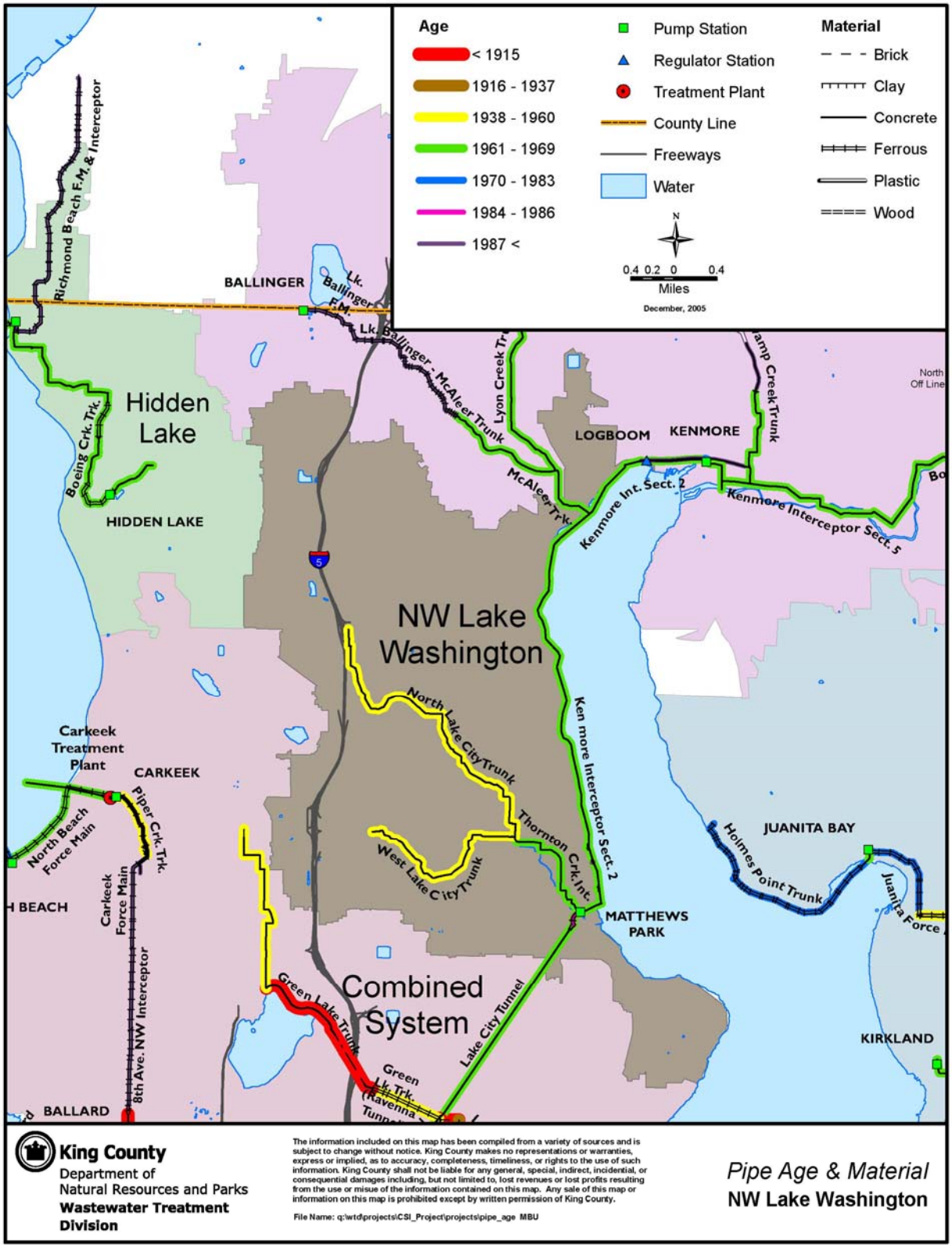

Figure 4-9. Pipe Age and Material – Northwest Lake Washington

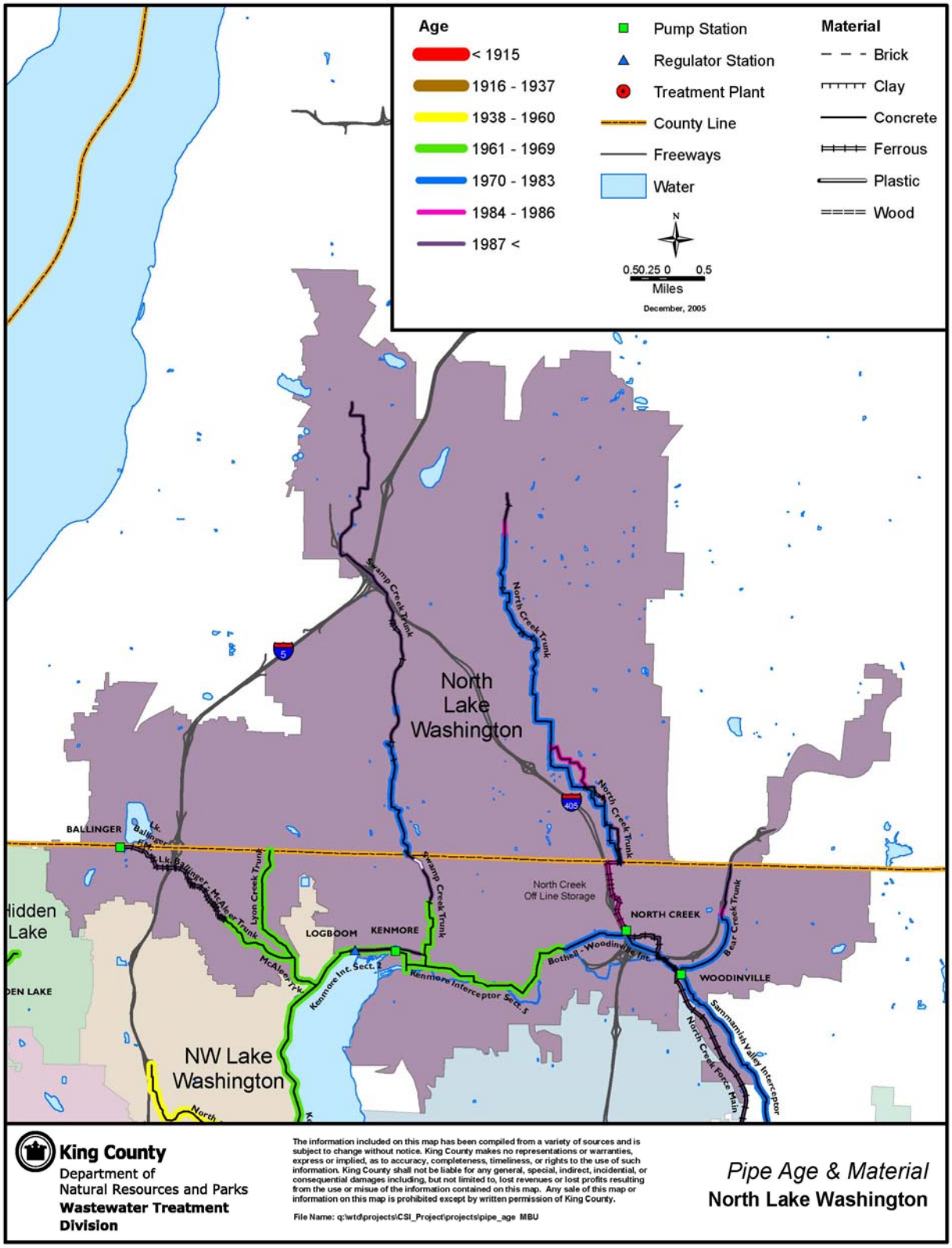

Figure 4-10. Pipe Age and Material – North Lake Washington

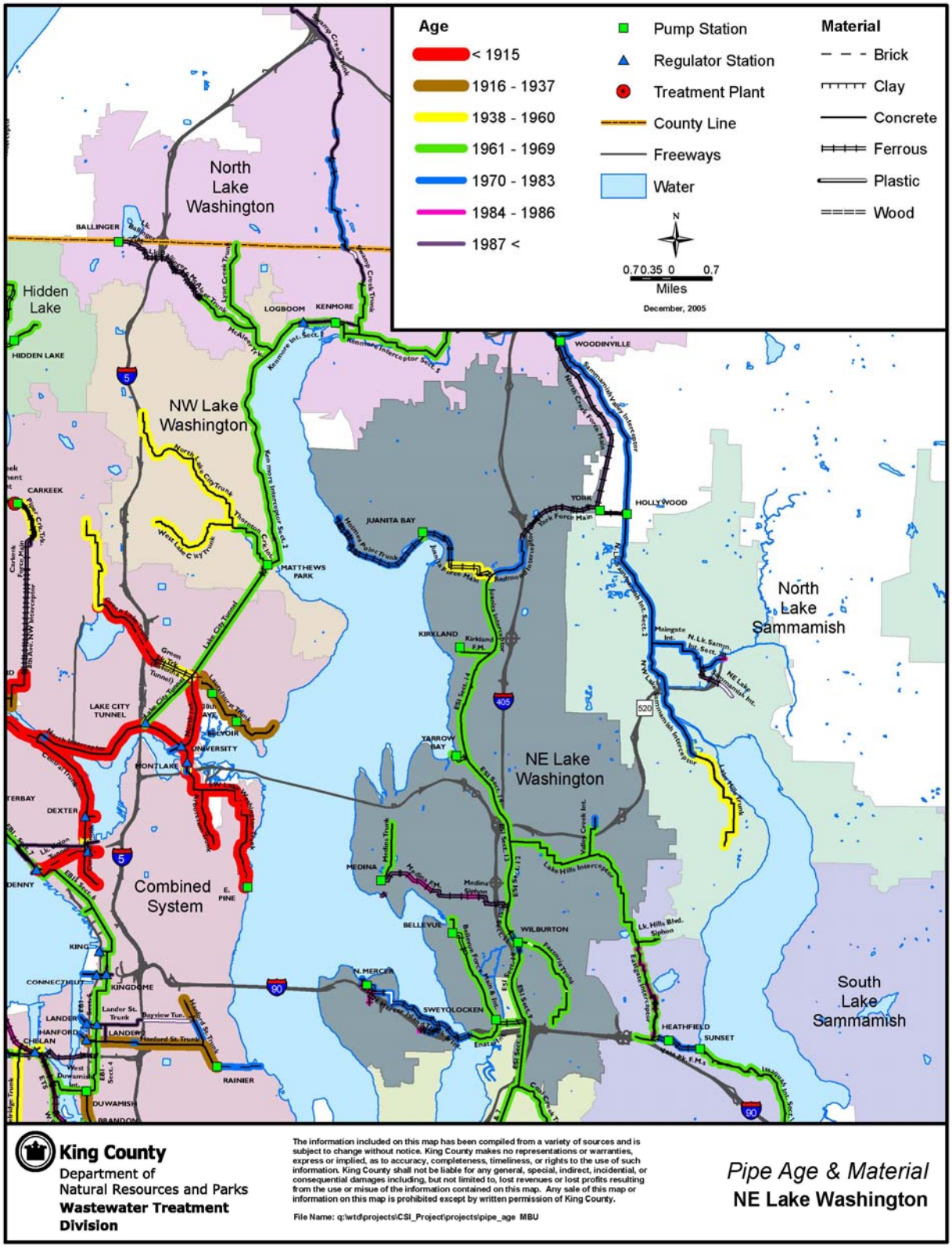

Figure 4-11. Pipe Age and Material – Northeast Lake Washington

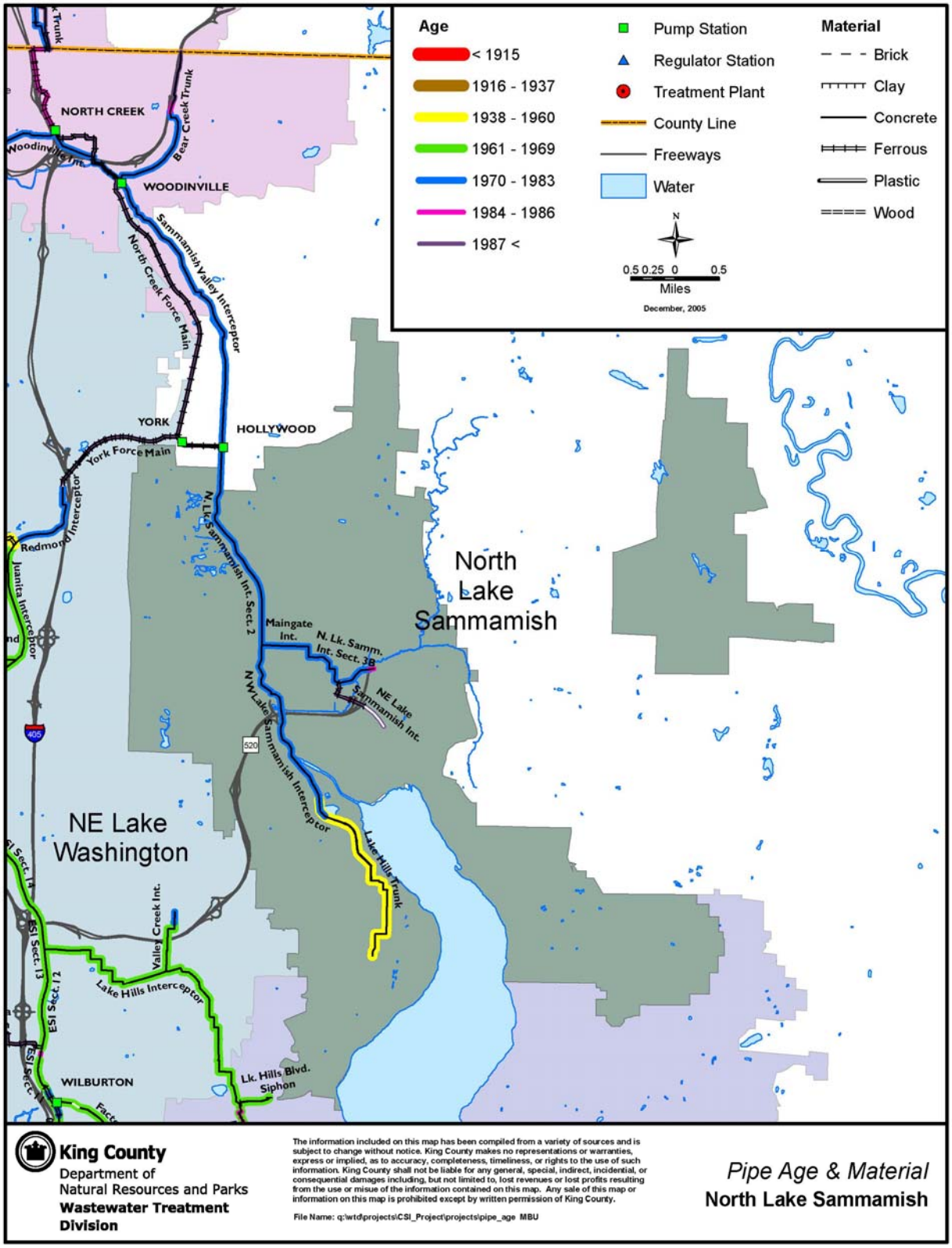

Figure 4-12. Pipe Age and Material – North Lake Sammamish

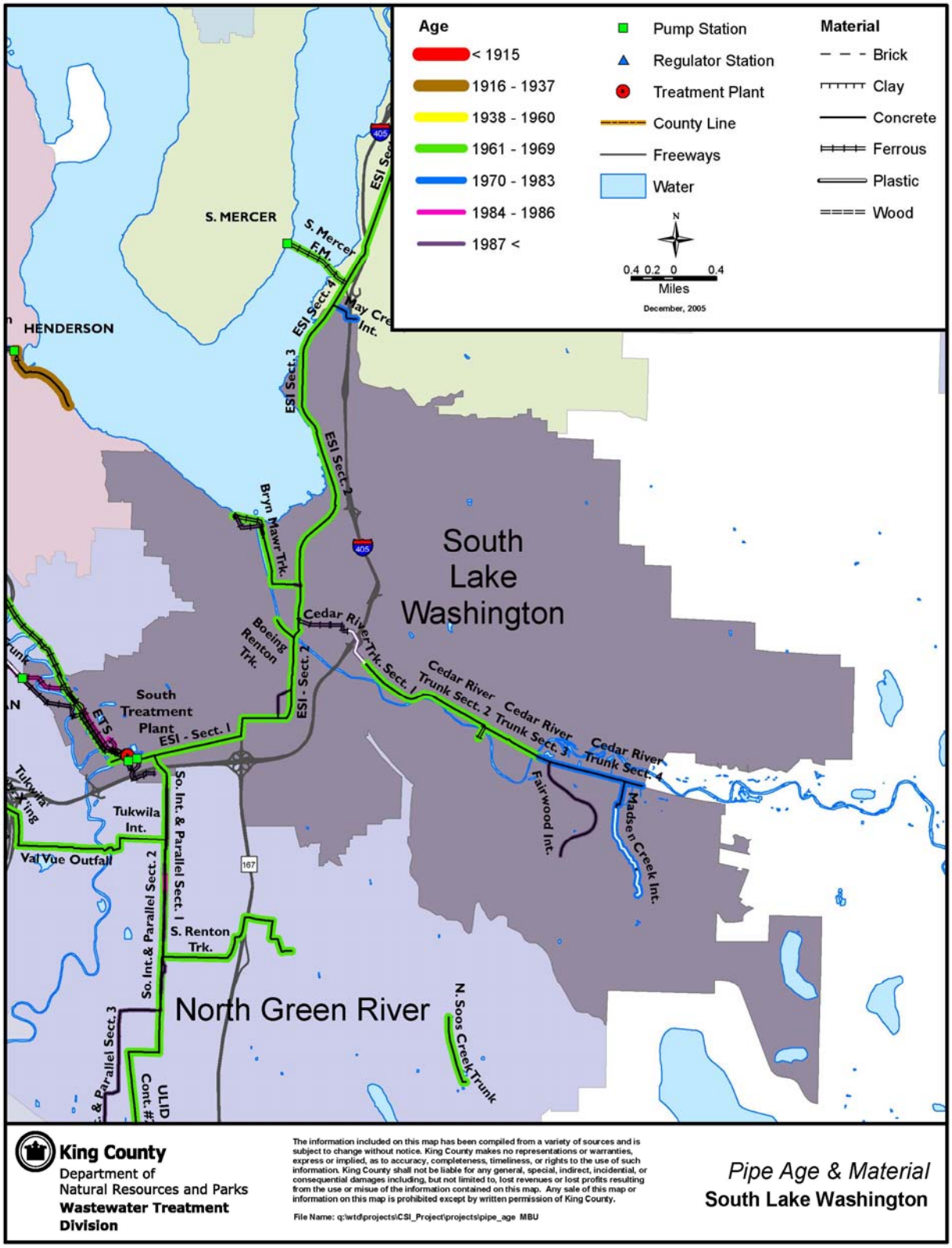

Figure 4-13. Pipe Age and Material – South Lake Washington

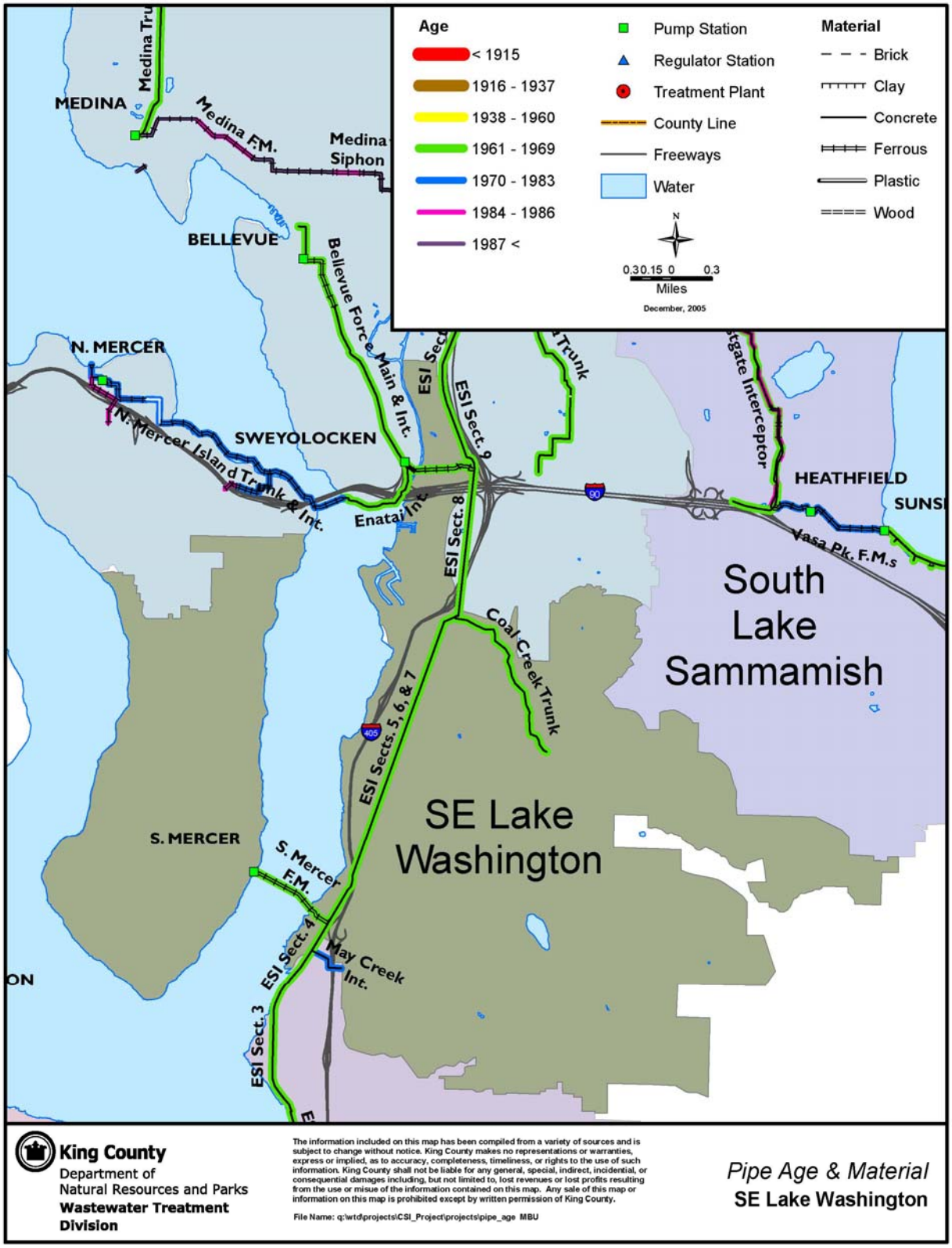

Figure 4-14. Pipe Age and Material – Southeast Lake Washington

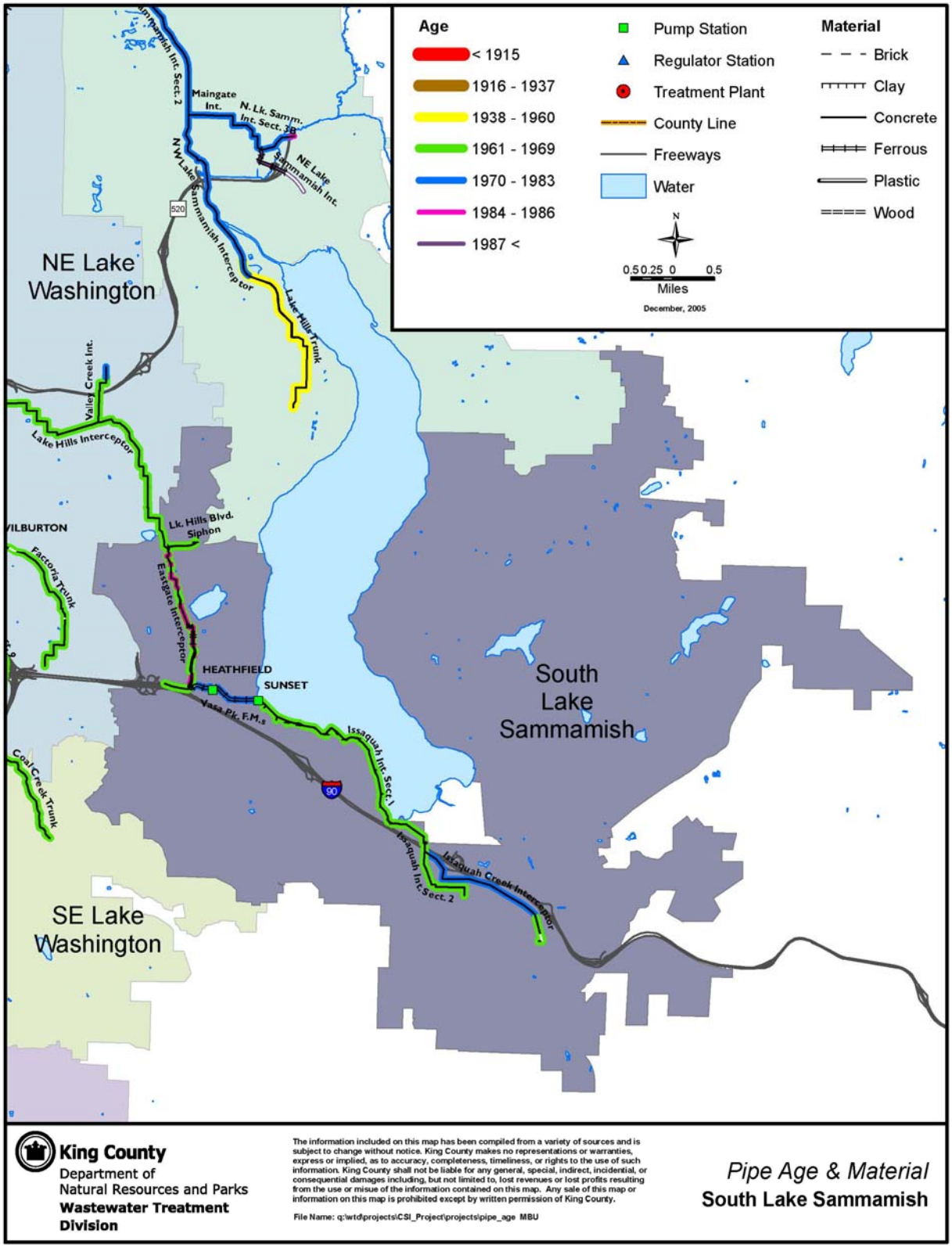

Figure 4-15. Pipe Age and Material – South Lake Sammamish

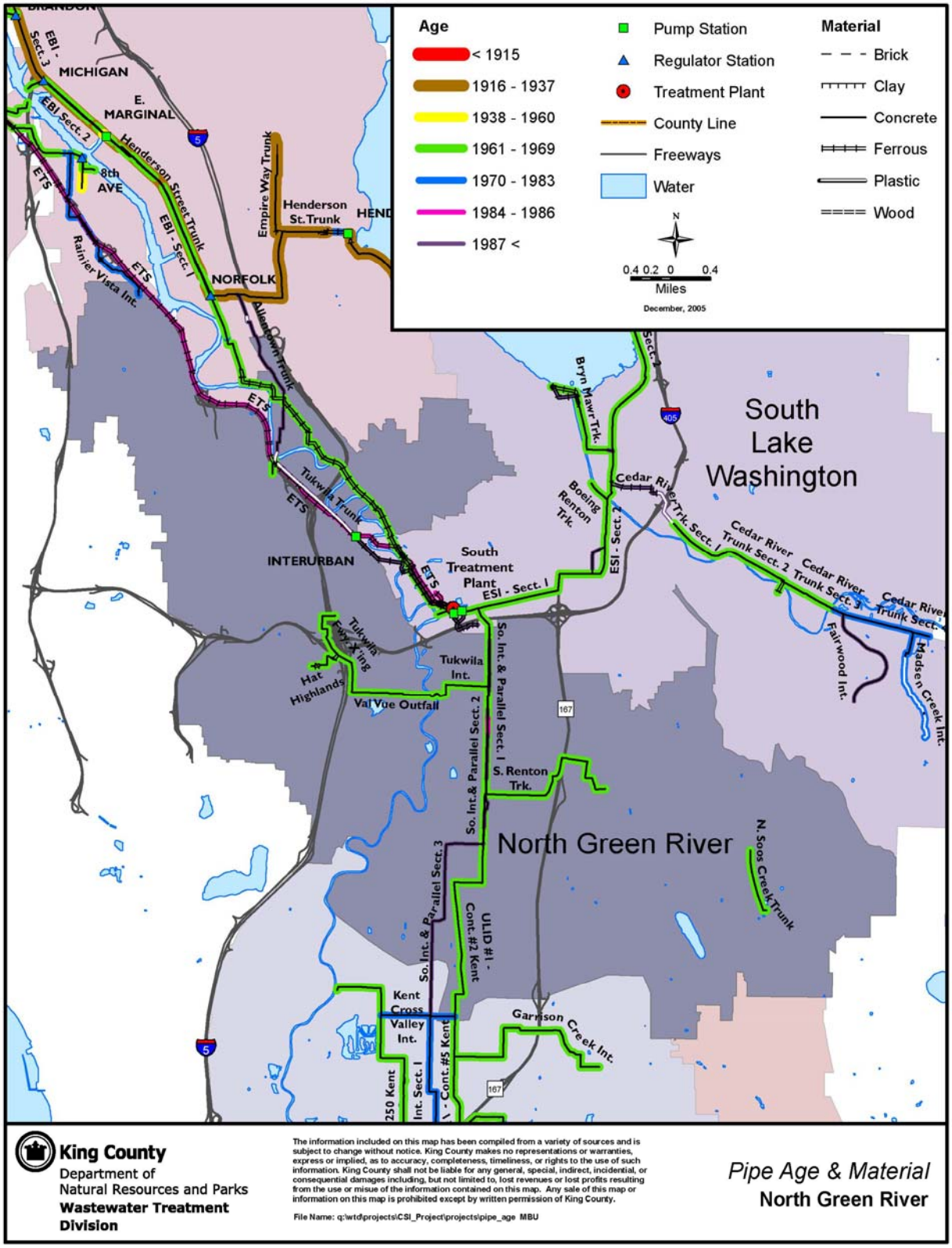

Figure 4-16. Pipe Age and Material – North Green River

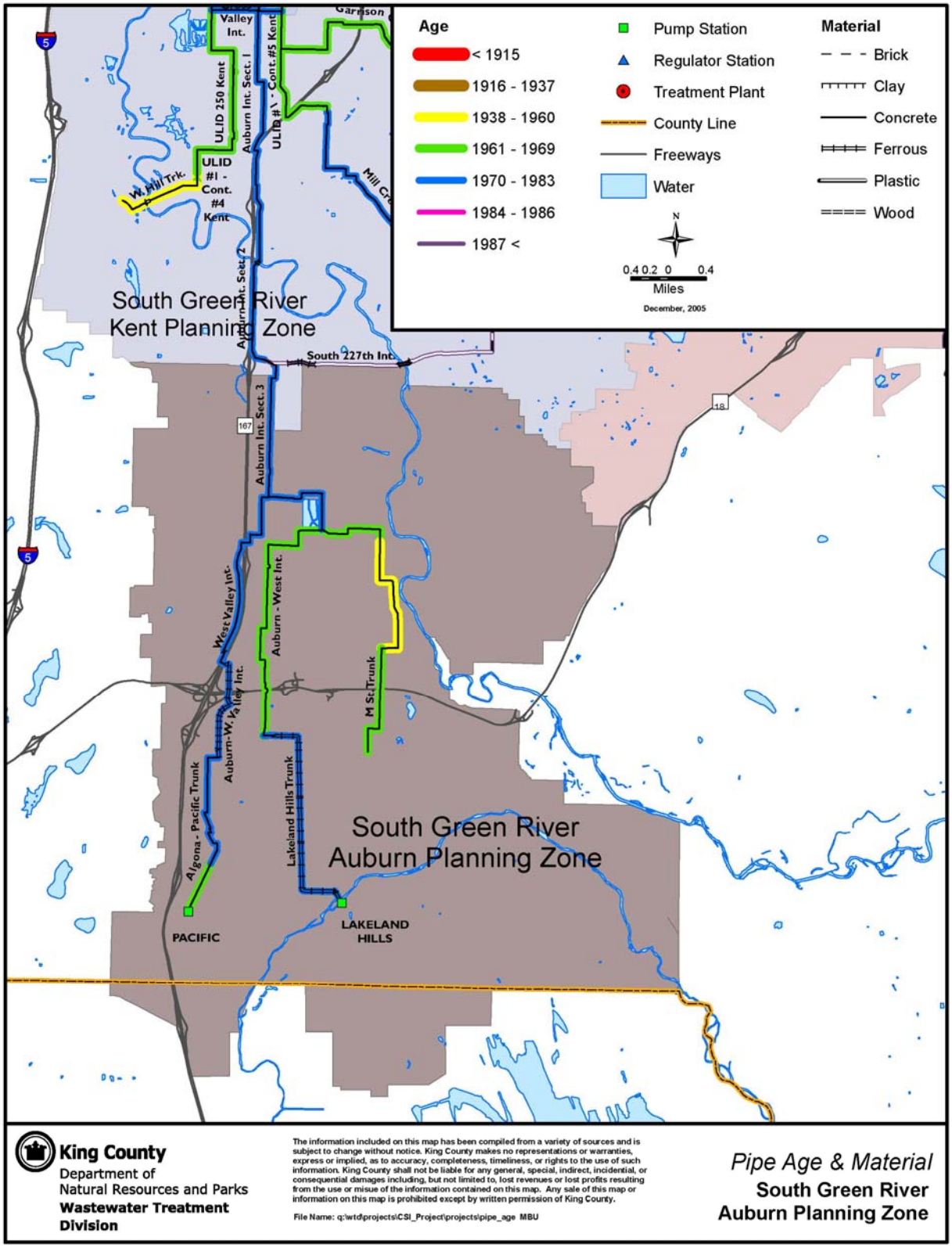

Figure 4-17. Pipe Age and Material – South Green River, Auburn Planning Zone

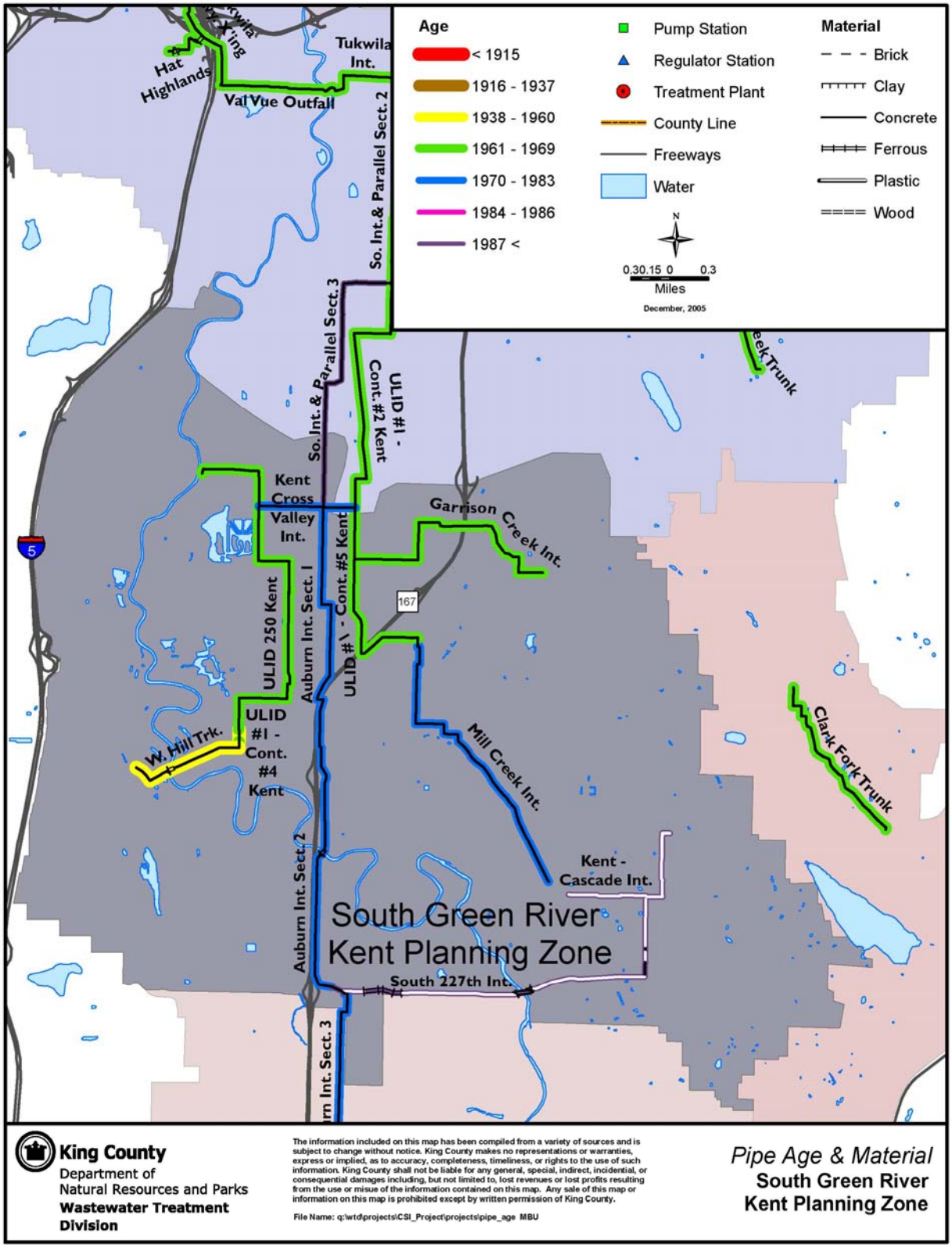

Figure 4-18. Pipe Age and Material – South Green River, Kent Planning Zone

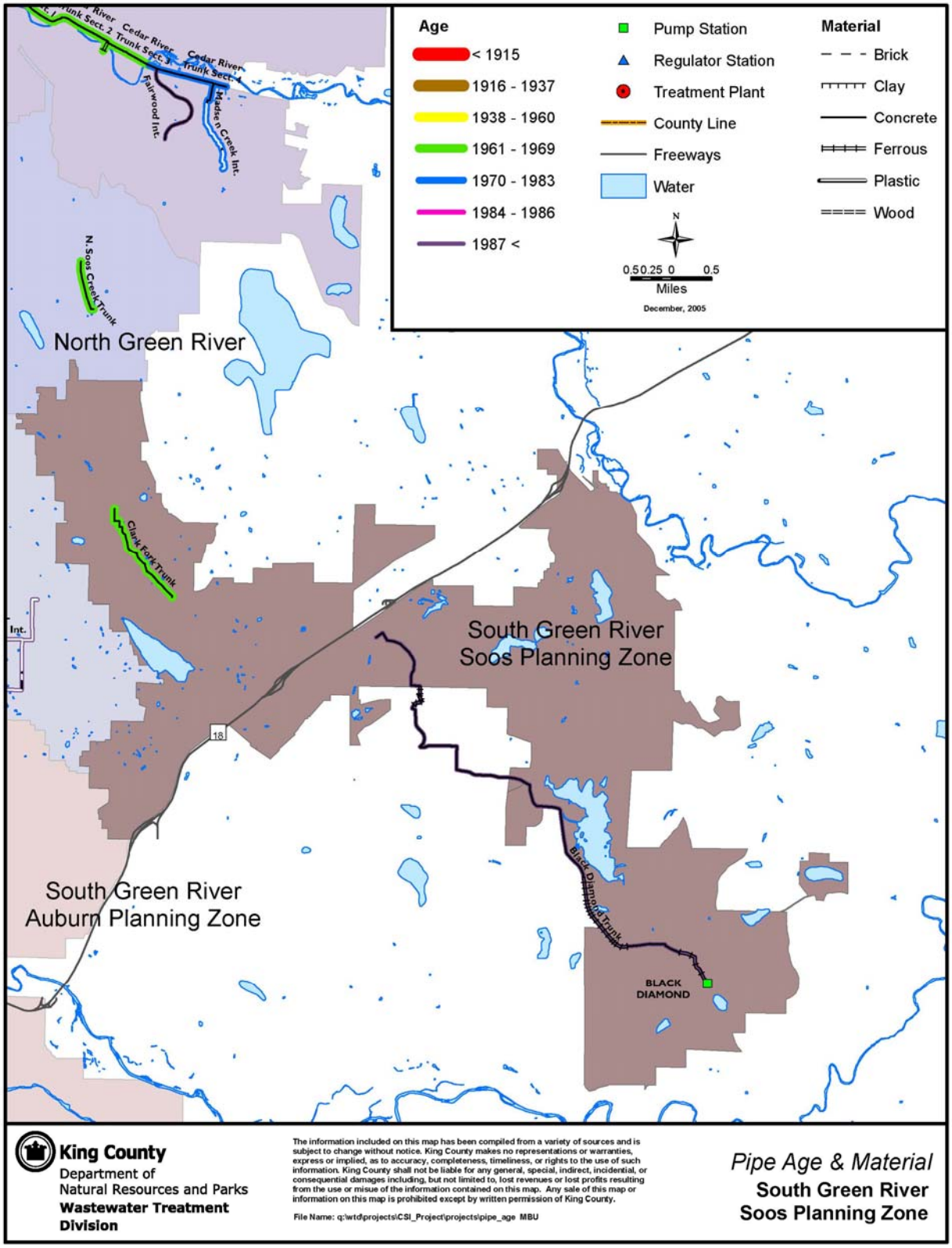

Figure 4-19. Pipe Age and Material – South Green River, Soos Planning Zone