3.2 HUMAN-SOURCED FECAL CONTAMINATION STUDY

The sampling and subsequent analysis of fecal coliforms (refer to Section 2.3.3.6) that was conducted last year (July 2000 – December 2000) confirmed that fecal coliforms from human sources are present in the watershed. While human input does not appear to be the dominant source of fecal coliform in the watershed, the levels of human-sourced fecal contamination measured during this study (refer to Appenxix J) are cause for concern. Human feces are considered particularly dangerous because of the human-specific viruses transmitted exclusively by human sources. This significant finding underscores the need for accurate information concerning the sources of fecal contamination within the watershed.

Further study is needed to better define the origins, magnitude, and spatial extent of fecal contamination from human sources in the Stevenson Creek Watershed. This study will provide information needed to plan and prioritize improvements directed at reducing fecal contamination within the watershed.

3.2.1 Purpose of Further Study

While circumstantial evidence implicates improperly functioning onsite wastewater treatment and disposal systems (OSTDS) in contamination of the Stevenson Creek Watershed, direct evidence is not available. The possible contribution of illicit sewage connections, sewage overflows, and the sub-drain system underlying the streets may also be contributing to the bacterial loading, and while there is a high likelihood that the source is OSTDS, information is not available concerning which OSTDS areas are contributing to the problem.

3.2.2 Plan of Study

Some of these issues can be addressed through further study, and a four-step approach is recommended. First, better information regarding the locations and other basic attributes of existing OSTDS and the sanitary sewer system is needed (Step 1). Secondly, additional sampling and field investigations are needed to direct attention to areas that are problematic with respect to fecal contamination (Step 2). Next, focused microbiological sampling can provide direct proof that OSTDS are contributing to water quality impairments (Step 3). Finally, the results of Steps 1 – 3 can be used to reach conclusions concerning the origins, magnitude, and extent of human-sourced fecal contamination within the Stevenson Creek Watershed as well as to provide information needed to plan improvements.

These four steps (Existing Data Compilation and Review, Data Collection and Conventional Sampling, Focused Microbiological Sampling, and Data Evaluation) are more specifically described below.

Existing Data Compilation and Review (Step 1)

Existing information concerning the OSTDS and sanitary sewer system should be compiled. In regards to OSTDS, this information should include locations, approximate age, general topography, soil type, and material type, as appropriate. In regards to the sanitary sewer system, this information should include interviews with city staff, results from smoke tests, video logs, rainfall, and flow monitoring as well as population and overall plant flow and capacity data. These sewer system data can be used to provide evaluations concerning the overall soundness of the sanitary sewer system as well as the feasibility of connecting OSTDS areas to the central sewer system.

One of the main purposes of the sanitary sewer evaluation is to assess the likelihood of sewage releases to the environment through overflows, cross-connections, or pipe structural problems. Loose pipe joints and cracks would not be expected to cause measurable exfiltration due to high groundwater; however, the possibility of capacity problems due to wet weather inflows should be investigated, as should the possibility of significant cracks or cross-connections with the storm sewer system.

The locations of septic tanks is generally not available (refer to Section 2.3.1.2) but can likely be inferred by cross-referencing sewer service bills and property tax data or other city and county databases. Approximate age can be estimated based on the age of the dwelling or structure, and recent repair permits. The septic tank points can be intersected with available soil data to assign soil type and seasonal high water elevation.

These OSTDS and sewer system characteristics will be used to plan the sampling program and to seek relationships between these characteristics and fecal contamination. The Healthy Beaches Tampa Bay study, an extensive, multi-agency study of Pinellas and Hillsborough County waters, can also be used to identify other areas of interest for the study if desired.

Data Collection and Conventional Sampling (Step 2).

The data from Step 1 can be used to develop a field investigation and sampling program designed to “zero-in” on problem areas. Field investigations can be used to collect evidence of illicit sewage connections to the storm sewer system and other problems (i.e. soggy drainfields, etc.). Water quality samples would be collected in channels and storm sewer pipes. The recommended sampling program would consist of a large number of samples from a minimum of two events. The large number of samples is for purposes of better and more refined delineation of problem areas. The sampling frequency will be selected based on costs with a minimum of one sample representative of dry conditions and one sample representative of wet conditions. Stormwater runoff samples are desirable, but introduce cost and logistic problems that should be carefully considered before they are included in this study. All samples will be analyzed for fecal coliforms; in addition, limited bacterial source tracking using antibiotic resistance analysis may be employed.

The sampling program will draw attention to problem areas, and together with the information collected in Step 1, will be used to design a microbiological sampling program that is focused on identifying areas where OSTDS usage is problematic.

Focused Microbiological Sampling (Step 3)

A detailed microbiological study should be undertaken that explores the prevalence of human pathogens (enteric viruses) and *E. coli* from human sources at various Stevenson Creek sites. Antibiotic resistance analysis for the source of fecal bacteria will indicate whether the contamination is dominated by human or animal sources. "Tracer" studies, in which a specific bacteriophage (bacterial virus) that cannot infect humans is flushed down the toilets of volunteer homes, can provide evidence of the rate of viral transport from OSTDS to surface water. Bacteriophage studies are superior to dye tracer studies because the bacteriophage particles are similar in size and soil adsorption properties to human viruses, therefore their transport rate is a better approximation for that of viral pathogens than dye particles, which often predict an overly rapid transport rate. Piezometer wells can be used to trace the direction and magnitude of a contamination plume.

If sufficient funds are available, a countywide study could be conducted in which the experiments mentioned above are conducted in OSTDS drainfields situated in various types of soil with different separation distances from the water table, and of various ages. Because they are time-consuming and require a great deal of expertise, such studies are rarely conducted and would contribute a great deal to our understanding of the processes governing transport of human pathogens from OSTDS drainfields.

Data Evaluation (Step 4)

The data collected in Steps 1 – 3 will be used to develop and prioritize improvement plans. In addition, correlations and other relationships will be sought so that the results of this study may provide useful information to other areas of Pinellas County that experience fecal contamination problems.

3.2.3 Dissemination of Results to End Users

A multi-county task force should be formed with representatives from entities such as city public works, the Pinellas County Department of Health, the University of South Florida, the Southwest Florida Water Management District, Tampa Bay Water, and the Florida Department of Environmental Protection. The purpose of the task force would be to foster communication and facilitate problem solving on water quality issues and studies. The synergistic potential of such a group could serve as a model for similar groups across the state and the nation.