A Report on the Status of Knowledge of the Number and Location of OSTDS in each County and Best Management Practices for Improving this Knowledge

Dear Members of the RRAC and DOH Staff:

This document contains the revised pages of the Final Draft Report for the Statewide Inventory of OSTDS. If you have already received a Final Draft Report, please replace the following portions of it:

1. Title Page : date changed to June 4, 2009
2. Table of Contents : changes in chapter titles and pagination
3. List of Tables, Figures and Appendix Contents : changed in table titles
4. Executive Summary : this is now a 3 page section, page numbers are repeated so that the following Chapter 1 begins on the same page as in the Draft submitted for the RRAC meeting on May 27, 2009.
5. Chapters 4.3 and 4.4, beginning on page 40 inclusive. This new version is one page longer than the previous and therefore page 52 is repeated.
6. Chapters 6 and 7 : changes in text
7. Chapter 8 : Appendix listing
8. All tables from the Appendix

In addition to the printed version of the Final Draft Report, a book of maps is provided and a DVD with additional information. The Survey and Responses are on the DVD as well as more detailed information on the modeling process.

Thank you very much for accepting these documents as part of our final draft report.

Sincerely,

Pamela Hall, EarthSTEPS
Stephen Clancy, GlobalMind

June 4th, 2009

The Florida Statewide Inventory of Onsite Sewage Treatment and Disposal Systems (OSTDS)

A Report on the Status of Knowledge of the Number and Location of OSTDS in each County and Best Management Practices for Improving this Knowledge

Final Draft Report

June 4, 2009

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Executive Summary

EarthSTEPS and GlobalMind of Tallahassee, Florida are pleased to provide the Florida Department of Health (FDOH), Division of Environmental Health (EHD), and the Bureau of Onsite Sewage Programs this Executive Report describing the Statewide Inventory of Onsite Sewage Treatment and Disposal Systems (OSTDS) in Florida. It serves as a brief overview of our project approach, methodology, resources, scope, and findings. Detailed information regarding each project task with accompanying tables and maps is found in the complete report.

To accomplish the inventory process, a database was constructed to facilitate the collection of existing onsite wastewater treatment systems (OTDS). This enabled the FDOH and County Environmental Health Directors a means to provide information on the number and location of OSTDS in every county in Florida.

Information collected through this effort serves as the baseline for all aspects of OSTDS management. It provides explicit OSTDS information and models for those charged with comprehensive planning and the growth management of urban infrastructure so that natural resources and human health can be protected and sustained.

Findings:

1. The project database utilized the Department of Revenue 2008 tax roll and Geographic Information Systems (GIS) information of nearly 9 million parcels. The development status of each parcel was determined using fields from the Florida Department of Revenue (DOR) data and resulted in 6,608,050 improved parcels.

2. Our team contacted all 2000 FDEP domestic wastewater treatment facilities (WWTF) and subsequently obtained data on the location of sewered parcels from approximately half of them. We accepted information any any electronic format that could be provided by the WWTF owners or managers. The results represent about 80% of the total permitted capacity of all WWTF. We identified 2,056,129 sewered parcels. Some vacant parcels were included in this accounting.

3. Using the permit data from the Environmental Health Database and from all other county permit databases that we located, we identified 564,026 parcels known to have an OSTDS. In addition from older and local county databases we identified 85,731 OSTDS parcels. This totals to 649,757 parcels known to have OSTDS. Some vacant parcels are included in this accounting.

4. We garnered other useful information on OSTDS using the linked permits from the EHDB and locally identified county databases. All of the information, including the source of identifiers was collected into a documented, relational database. The database includes field computed in subsequent analyses described below.

5. The result of this data collection was approximately 4 million improved parcels for which no wastewater treatment method was known. In order to assign a treatment to these parcels we developed a logistic regression model based on the over 2.5 million parcels with known wastewater treatment. The model descriptors were: characteristics of the parcels themselves (lot size, year built, etc.), characteristics of their nearest neighbor parcels (mean lot size, proportion with OSTDS) and the proportion of OSTDS for the category of land use, taxing authority and lot size category to which the parcel belonged.

6. We computed models for each county individually. We determined the most statistically reliable combinations of descriptors for the prediction of the location of known OSTDS using three main indicators: statistical significance (Z score) of each descriptor in combination with others, the proportion of parcels correctly classified to their known wastewater treatment method and the lowest number of incorrect classification of known OSTDS parcels as sewered.

7. The parameters of the individual county models were used to compute the probability of OSTDSs on all of the improved parcels for which independent information of wastewater method was not available. A parcel was classified as having an OSTDS if the probability from the model was $\geq$ 0.5 (50%). The total number of OSTDS for each county was computed as the sum of those classified by estimation and the known. Using different probability levels for parcel classification provided a range of predicted number of OSTDS. A higher estimate was computed using a probability of 0.25 and a lower estimate was computed using a probability of 0.75. The range of values, from high to low, was expressed as a percentage of the midpoint is order to more readily compare model reliability among the counties.

8. This Statewide Inventory estimates that there are 3,496,120 parcels with OSTDS in Florida (range: 3,317,152 to 3,652,276). The estimated range is 9.6% of the midpoint. This includes parcels that are currently (temporarily) vacant. The Inventory estimate is 3,446,132 improved parcels with OSTDS. There are estimated to be 3,129,708 sewered parcels. Using these estimates, 52% of the improved parcels are using OSTDS as a wastewater treatment method. The estimates for each county and the reliability of these estimates are discussed.

9. Two maps are provided for each county showing 1) the location of known sewer, known OSTDS and improved parcels that require an estimation of wastewater method and 2) known and estimated sewer, known and estimated OSTDS and any remaining improved undesignated parcels for which an estimate could not be done. The utility of these maps is immediately obvious.

10. A brief review of other locales within the United States and in Florida that have also estimated the number and location of OSTDS is provided. A survey of all 67 County Environmental Health Directors was done to ascertain their state of knowledge of the number and location of OSTDS in their county. As a result, a detailed methodology for proceeding with an inventory and recommendations about how to maintain an inventory is also provided. We provide

recommendations for further enchancement of the Statewide Inventory database and refinements to the modeling and estimation process.

11. In summary, the efforts of EarthSTEPS and GlobalMind provide a database that provides: 1) an inventory consisting of the number and location of existing OSTDS; 2) statistically based qualification of the OSTD inventory; 3) a foundation for the investigation of regional and local impacts of existing systems to identify where mitigation is needed; 4) a framework for the appropriate location of future development using OSTDS for the protection of public health; and recommendation for maintaining and updating resulting information resulting for currently contract tasks.

EHDB tax identification number was updated to normalize the number with dashes at predefined intervals that were consistent to published values on the Property Appraiser website. After completing this, more of the records were successfully joined. A secondary method of linking parcels is to utilize the physical address. The abbreviation for Terrace in the EHDB is "Ter." While the County DOR information uses "Terr." Although it is a minor detail, it prohibited nearly 1,200 records from joining properly.

Sumter County
First, it must be mentioned that in November, the GIS for Sumter County was incomplete as the Property Appraiser was still in the process of mapping. Therefore, we acquired the completed mapping in March to use in the inventory. The new parcel information contained 40,000 additional parcels. The EHDB does not contain an accurate tax identification number. Most of the records have the Section, Township and Range, which is not used by the property appraiser. Therefore, it is useless for the purposes of this project. Also, of the over 7,000 permits in the database, nearly 1,300 of them have an address denoted as "Legacy" and nearly 1,800 do not have house numbers {many of these are PO Boxes). It is not likely that all of the parcels with septic tanks represented in the EHDB will be linked to corresponding tax parcels.

Remaining Counties
A brief narrative for all counties will be provided in the final report. It is important to understand what conflicts occur in each county in order to better understand how to move forward in the future.

4.3 Identifying the Wastewater Treatment Method for Parcels

The quality of the estimation of the total number of OSTDS for this Statewide Inventory is dependent upon:

- How well parcels can be identified as developed.
- How many parcels can be assigned a wastewater treatment using independent information from which a model can be built.
- The degree of statistically identifiable differences between parcels that are sewered versus those using OSTDS to treat wastewater.

Determining Improvement Status of Parcels

The DOR tax roll provides a variety of fields that can be used to determine if a parcel is vacant or developed (improved). Vacant parcels do not need to be assigned a wastewater treatment method. For the purposes of this inventory, if we identified the wastewater treatment of a parcel, whether it was vacant or improved, we retained that information. But only the improved parcels required estimation of the form to wastewater treatment they had.

We were liberal in our definition of improved so that we would not miss a possible location of an OSTDS. An improved parcel was identified as one with:

- Vacant/Improvement DOR Code = Improved
- Number of buildings DOR field > 0
- Year improved was not missing, a value of 1900 or more

Identifying Wastewater Treatment for Parcels

The largest domestic WWTF treat 96% of the effluent of all domestic WWTF in Florida.[16] This is only 367 WWTF out of 2157 (17%). This means that capturing information from the largest is most important for obtaining a large number of parcels, but the remaining WWTF may represent highly scattered service areas in a "sea" of OSTDS parcels. Both of these classes of WWTF are crucial to a robust estimate of statewide number of OSTDS.

We were extremely successful in obtaining sewered parcel information. In all we obtained parcels from WWTF that represent 82% of the domestic sewage treatment in the State of Florida. In addition we successfully obtained parcel lists from 75% of the largest WWTF in Florida and 45% of the smaller facilities. In all, to date, we have over 2 million mapped sewer parcels.

Table 4-2**:** Summary of responses from FDEP permitted WWTF

Total WWTF				
Response	N WWTF	MGD	% N WWTF	%MGD
Data Received	1002	2097	46%	81%
No Response	1155	500		
Total	2157	2598		
Municipalities	N WWTF	MGD	% N WWTF	%MGD
Data Received	1889	1301	88%	50%
No Response	268	1296		
Total	2157	2598		
Capacity Class	N Large	%MGD	N Small	%MGD
	≥ 0.5 MGD		< 0.5 MGD	
Data Received	239	82%	763	43%
No Response	128	18%	1027	57%
Total	367	2509	1790	89%

The values in Table 4-2 differ slightly from those in Table 4-1. We often received a single data file that contained information from more than one WWTF. However, for the purposes of recording the receipt of files, each response was attributed to only one WWTF at the time of receipt and processing. Later it became evident that we were receiving data from more than one facility in many cases. Table 4-2 reflects this

[16] Florida Department of Environmental Protection, General Facts and Statistics about Wastewater in Florida. http://www.dep.state.fl.us/water/wastewater/facts.htm

summation of the data. We received sufficient information to identify 2,056,129 sewered parcels (Table 4-4).

As discussed above, identifying the parcel location that a given OSTDS permit refers to turned out to be the most daunting task. The EHDB has just over 900,000 permits of which 84% are active (Table 4-5). These parcels did not all link to addresses and some parcels had more than one permit link to them. In the end, there were 564,026 parcels for which there is at least one EHDB permit. This is 63% of the total EHDB permits.

In addition, from local CEHD databases that preceded the EHDB, we were able to identify 85,731 more parcels with permit evidence of an OSTDS. Unfortunately we were unable to obtain the large OSTDS permit databases for Columbia and Sarasota counties. According to the Columbia County EHD, their database has records back to 1973 and it is under active use. We were unable to obtained access to the database due to proprietary software access issues. We have not been able to assess how well the addresses of this database would link to the DOR GIS information.

We have identified a total of 649,757 parcels known to have OSTDS (Table 4-5).

In both cases of sewer or OSTDS parcel identification; some of these parcels are designated as vacant by our criteria of improved. There could be many reasons for this from simple inconsistent information in the DOR tax roll record for a given parcel, parcels on which a home burned down, was moved (mobile homes), etc. There were 114,985 vacant parcels with independently identified wastewater treatment methods. When needed, we distinguish between known sewered and OSTDS parcels that are improved versus our entire count of all parcels with a designated wastewater treatment.

Estimation of Wastewater Treatment for Parcels

Building a logistic regression model to estimate the probability for OSTDS

We used the over 2.6 million parcels with known wastewater treatment as the basis for modeling the characteristics of sewer vs. OSTDS parcels. The statistical analysis methodology utilized is a logistic regression. The treatment method consists of either sewer or OSTDS, hence is binary, and the logistic form of a regression is appropriate. The model is, essentially, a mathematical description of the "correlation" of parcel characteristics with their known form of wastewater treatment. The model produces a probability of a parcel having an OSTDS, ranging from 0 (no OSTDS) to 1 (OSTD present). The parameters of the model for parcels with known treatment and the characteristics of the parcels with unknown treatment are used to compute the probability that an unknown parcel has an OSTDS on it. The closer that probability is to 1, the more likely the parcel has an OSTDS, the more similar it is to parcels that do have OSTDSs.

The probability is a continuous value but it can be used to classify the parcel's wastewater treatment method. If the probability was ≥ 0.5, then the parcel was classified as having an OSTDS. For any value less than this, the parcel was classified as being sewered. These classification criteria can be varied to suit the conditions of the model and to provide a measure of reliability of the modeling out comes.

The following steps were taken to build the models:

1. Develop a set of variables describing parcel characteristics that would likely affect the wastewater treatment method present, such as the size of the parcel, its location in a city or unincorporated portion of a county.

2. Use these characteristics to fit parameters of a logistic regression to parcels for which the wastewater method has been determined independently of the modeling process.

3. Accept as useful a model that:
    - has as few interpretable descriptors as possible,
    - fulfills a recognized statistical significance criteria,
    - has a high value of correct classifications of parcels with known wastewater treatment methods, and
    - has a low value of OSTDS parcels incorrectly classified as sewered.

4. Apply the model to parcels with unknown wastewater treatment methods and assign a wastewater method to each using a low, median and high probability.

5. Compare the total number of estimated and known OSTDS parcels with other estimations such as the DOH annual cumulative estimate, estimates provided by the County Environmental Health Directors in the survey (part of this study) and a simple computation of the number of developed parcels – the number of parcels known to use sewer service for wastewater treatment.

Step 1:

Three types of characteristics were designated for each parcel,
- characteristics of the parcel itself,
- characteristics of its' nearest neighbors,
- parcels that belong to the same categories.

A characteristic of the parcel itself includes information available from the DOR tax rolls. The variables used were:
- parcel size (acres),
- number of buildings,
- size of buildings (total square feet) and
- year the structure was built.

The second set of variables was computed by identifying the five nearest neighboring parcels (using coordinates of the parcel centroids) and then computing their characteristics. The assumption these variables is that parcels located near each other will have similar wastewater treatment methods. We computed
- the percent of neighbors with identified OSTDS,
- percent of neighbors that were developed,
- the sum of the distance for all neighbors,

- the number of neighbors with the same taxing authority, land use and wastewater treatment method as the target parcel.

The third set of variables, also taken from the DOR tax rolls, describes political characteristics of parcels. We also divided parcels into size classes, using very fine categories for parcels under 1 acre and grosser categories up to greater than 5 acres. For these we computed the proportion of parcels with known OSTDS for each level of these categories. The categories used were

- tax authority,
- land use,
- neighborhood codes, and
- acreage size classes.

Step 2:

Logistic regression models were run using these variables only for parcels with wastewater treatment methods that had been determined independently, e.g. by FDEP WWTF permittees or county OSTDS databases.

The models were simplified by excluding variables that offered no additional statistical significance (measured by individual parameter Z scores and the change in the AIC criterion).

Models were also assessed as to how well they classified the wastewater treatment method on the parcel. Two measures of successful classification were 1) a high percentage of correct classifications, including both sewer and OSTDS, and 2) a low percentage of known OSTDS misclassified as being served by sewer. An example is provided below.

As an example, for Baker County, a model was used that incorporated the following descriptors: percentage of septic tanks in taxing authorities, percentage of septic tanks in land use classes, percentage of septic tanks in acreage size classes and the year the structure on the parcel was built. A total of 2,844 parcels with known wastewater treatment methods and values for all the descriptor variables were used to compute model parameters. These parameters were then used to compute the probability of an OSTDS for each parcel with the following results.

Table 4-3**:** A example of assessing the quality of prediction of a given model for the data used to compute the parameters of the model.

	Known		
Predicted	Sewer	OSTDS	Margin Total
Sewer	1498	8	1506
OSTDS	5	1333	1338
Margin Total	1503	1341	2844

Percent correctly classified = (1498 + 1333) / 2844 = 99.5%
Percent OSTDS incorrectly classified = 8 / 1341 = 0.6%

Step 3:

The model exhibiting the best balance of the fewest significant variables, the lowest AIC and the best percentage of correct classifications and the lowest error rate of classifying OSTDS ,was selected to estimate the parcels for which the wastewater method had not be determined independently.

Software was written using the open source R statistical programming platform. All code is available upon request. The detailed results of each model for each county are provided in the appendix. They are summarized in Table 4-7.

Step 4:

The selected model was used to compute the probability of an OSTDS for each parcel. The designation of a wastewater treatment method was both the classification by the probability and an assignment of an attributed used to make maps.

1. Undeveloped parcels = 0, no OSTDS
2. Developed parcels known to have sewer service = 0, "sewer"
3. Developed parcels know to have OSTDS = 1, "septic"
4. Developed parcels with probability < 0.5, = 0, "estimated sewer"
5. Developed parcels with probability ≥ 0.5 = 1, "estimated septic"
6. Developed parcels for which a probability could not be computed, probability = NULL, "not estimated".

The probability itself is the measure of reliability of the assignment of any given parcel to OSTDS or sewer. High values, near 1, mean that assigning the parcel to an OSTDS form of wastewater treatment is highly likely to be accurate. Parcels with low values, near 0, are assigned to the sewer category because there is a low probability that it has an OSTDS but since it is improved, the only alternative wastewater treatment is sewer.

We devised an overall measure of reliability for estimation for each county by changing the threshold of OSTDS vs. sewer designation. If the threshold is increased above the probability of 0.5 then it is less likely that a parcel will have an OSTDS and the total

number of estimated OSTDS will be lower. If the threshold is decreased to less than 0.5, then it is more likely that a parcel will be designated as OSTDS and the number of estimated OSTDS parcels will increase. We used the higher probability threshold of 0.75 for a more conservative estimate of the number of OSTD and the lower probability threshold of 0.25 for a more liberal estimate of the number of OSTDS in a county.

Step 5:

We compared the estimate of the total number of OSTDS from our models, including the range of estimates provide by a sliding probability threshold, to other available estimates.

The DOH annually reports the total number of OSTDS permits and has maintained a table of this data for decades. The cumulative number of OSTDS reflects a base value estimated from the 1970 Census and the total number of new construction permits issued each year. Abandonments are not subtracted from the permit counts as it is not always true that abandonment means no further use of OSTDS on the site. However, abandonment permits are not usually compared to other permits for a given OSTDS so it would be difficult to know from "where" to subtract them.

Most of the CEHDs provided estimates in response to a question in the survey they did for the Statewide Inventory. These estimates have a wide variety of histories. Some represent at least a year of work identifying parcels and inputting paper records. Others were done explicitly for this project's questionnaire and therefore, are a synopsis of the number of electronically stored permits. Still others were, freely admitted, educated guesses, based on in-house discussions and years of experience working in the county.

The third estimate provided is simply the subtraction of the number of known sewered parcels, as identified in this Inventory, from the total number of developed parcels in a given county. When all or nearly all of the WWTF have provided reliable data, this can offer a very sound initial estimate. Charlotte County has used this approach and is embarking on a 5-year plan to locate the OSTDS on all developed parcels that are not sewered according to the Charlotte County WWTF.

A summary table of improved parcels, known and estimated OSTDS and sewered parcels is provided in Table 4-6.

4.4 The Total Number of OSTDS in Florida

There are 6,608,050 improved parcels in Florida. This study produced an estimate of 3,446,132 improved parcels with OSTDS and 3,129,708 improved parcels provided wastewater treatment by FDEP WWTFs. Using these estimates, 52% of all improved parcels in Florida are use an OSTDS for wastewater treatment (Table 4-7).

In addition there are 50,850 undeveloped parcels that are indicated by independent means to have an OSTDS and 64,135 vacant sewered parcels. This brings the final total

OSTDS to 3,496,120. There were 32,210 parcels for which there was insufficient information to estimate wastewater treatment using the modeling technique described herein.

A range of the number of OSTDS was calculated for each county using a different threshold probability to classify parcel as having an OSTDS (Table 4-8). These values were calculated including the vacant parcels with independent designation of OSTDS. The values reported in the previous paragraph, were calculated using a probability of 0.5 as the threshold. Using 0.25, allowing more parcels to be designated as OSTDS, raises the estimate for OSTD to 3,652,276. Using 0.75, allowing fewer parcels to be designated as OSTDS, lowers the estimate to 3,317,152. Even though the reliability of the county level estimate varies a lot (discussed below), at the statewide level, the range is only 9.6% of the total number of OSTDS for the entire state.

Model Results: County Maps of Sewer and OSTDS parcels

Two maps are provided for each county. The first shows all improved parcels and those that have been identified through independent means as sewered (FDEP WWTF information) and containing an OSTDS (EHDB and other databases when applicable). Known sewered parcels are in bright red. Known OSTDS are in bright blue. These include some parcels that are undeveloped, but we show all the information we gleaned from the data collection portion of this project. The yellow parcels are improved but for no information on wastewater treatment was found. Vacant parcels are not shown.

The second map shows again, all of the known sewered and OSTDS parcels. These known parcels were used to develop models to predict where sewer and OSTDS would be for parcels without designated wastewater treatment. The estimation of the type of wastewater treatment for the remaining improved parcels is shown as light blue for estimated sewer parcels and pink for estimated OSTDS parcels. Parcels for which there was insufficient information to apply the current models are retained in yellow – improved but not yet estimated. The lack of information is most often due to missing or inconsistent field values in the DOR tax roll database.

The visualization of the results of the data collection and modeling make it immediately obvious how easily this information can be layered on any other geographic form of information, such as spring sheds, zones of potential storm surge, and comprehensive plan land use maps. The differentiation between known and estimated allows evaluation of the reliability of any count of OSTDS in a given area. The FDEP WWTF service areas are also apparent.

In addition, the identification of known and estimated parcels, along with the database and associated information will immediately provide the CEHDs with a capacity to prioritize any local need for better permitting or management information.

Model Results : Data Quality of County Estimates

The quality and quantity of sewer and OSTDS parcel information is the most critical to creating a robust model which can be used with confidence to estimate the number and location of all OSTDS in each county. If very little information is collected, there is no mathematics that will provide a robust model. The collection of FDEP WWTF parcel data was inconsistent among the counties. We did not have any authority to require either response to our request, a timely response or one that provided useful data. In addition, the large number of permits in the EHDB, resulted in a large variation in the successful linkage of permits to parcel addresses. The best solution to low levels of response is to target data collection and spend time developing sufficient personal contacts and assistance to the remaining large municipal and private WWTF so at to obtains information from them.

In addition, when either sewer or OSTDS parcel identification rates far exceeds the other, this will bias models resulting in the too frequent assignment of the most common wastewater method to estimated parcels. This problem can be addressed with more refined models using a Bayesian form of analysis that provides a methodology to weight the final probabilities based on an expectation that either sewer of OSTDS is a very dominant form of wastewater treatment in the county.

In the end, despite some low levels of response, we did obtain sufficient information to designate over 2.6 million parcels with known wastewater treatment method.

Model Results Reliability: Types of Counties

The counties have very different histories of growth and infrastructure development. This is evident in the number of parcels, their size distributions, the proportion that are improved, the number of WWTF and the size of the areas to which they provide service. The size, distribution and number (abundance) of WWTF will define the degree to which sewer and OSTDS is clustered, clearly separated or interspersed. Counties with similar numbers of large (>= 0.5 MGD permitted capacity) and small (<0.5 MGD permitted capacity) will share, for the most part, scales of dispersion and clustering.

We created six different groups of counties, reflecting the differences described above. The designations are not exact. These six groups represent general features of counties that dictate, to an extent, the type of variables that will be important in estimating the number of OSTDS parcels that are not identified. The current Statewide Inventory modeling method was to use a standard model form on all counties. Though different variables were selected for each county, the net results is the understanding that the types and numbers of WWTF largely dictate the type of decision tree and modeling that should be used to enhance the estimation of OSTDS in a county. As the quality of estimate can be improved for each county, so will the statewide become more reliable.

The six groups are simply labeled as Group A though F. The characteristics of these

groups and the quality of the models that were computed for each county is described in Table 4-8**.**

A. **Counties with very few WWTF and with a low number of parcels : Rural Counties**. OSTDS are most dominant form of wastewater treatment in these counties and that is unlikely to change in the near future. These are counties with 5 or less (some 0) large WWTF and similarly 0 to 10 small ones and with less than 20,000 improved parcels**.** The dominant sewer provider(s) are often municipalities, which provide sewer in a well-defined area and sometimes have tax authority for this area. The provision of sewer within the service area can be very "spotty" with scattered older OSTDS parcels within the boundaries. These counties have few other WWTF and those that exist serve only a single subdivision, school or mobile home park, etc. Manatee falls within the designations of 5 or less WWTF of each size class, but due to its large number of parcels, nearly an order of magnitude more than the other in the group, it was moved to Group B. Examples of Group A include Baker, Dixie, Jackson and Wakulla.

   Many rural counties had extremely few independently identified sewered parcels. This is largely due to a lack of response from small municipalities or their incapacity to provide an electronic form of their sewer customer database, if they have access to it at all. Baker, Bradford and Wakulla have both enough parcels and an even number of parcels for OSTDS and sewer from which a reliable model can be created. These models are the most reliable in this group.

   Of the 22 counties with 100 or less identified sewer parcels most of them are rural counties in Group A. The estimates for these counties are simply unreliable due to the low number of parcels that could be used for the model. However, rural counties can have much more reliable models with the successful data collection of the few municipal WWTF located in these counties. The other very small WWFT are often recreational vehicle parks, mobile home parks, schools, etc. These can be identified through other means such as using google-maps, SunBiz and various other forms of determining the ownership of the parcel and its' location. This is a time consuming process but would result in much better identification of OSTD for rural counties. Once these localized sewered areas are identified, it can be assumed that the rest of the county's parcels are all OSTDS.

B. **Small to medium sized counties with 5 or less large WWTF and with 10 to 50 small ones. Counties, generally, with small to intermediate improved parcel numbers.** These counties have relative few large WWTF, but quite a large number of small ones. Some of the large WWTF provide service to municipalities and substantial portions of the unincorporated area around their own jurisdictions. Older, "legacy" OSTDS are apt to be scattered within these established sewer areas because sewer lines were built to serve newer subdivision, leaving older ones on OSTDS. Because of the reach of the WWTFs into the unincorporated areas, sewer service information from the substantial providers is essential for a reliable estimation. The remaining few smaller

WWTF can create a sparse patchy distribution of sewer but there are only a few of them. This sort of situation may require separating out the effect of large WWTF by knowing their service areas directly and then modeling the remaining lots, looking for ways to identify the few small WWTF: large and intensely used parcels in a sea of OSTDS parcels.

The collection of sewered parcel information was very successful in Group B which has many reliable models. The range as a percentage of the midpoint, a form of confidence interval, is only 9.6% for the entire state but is exceeded by a number of county models in Group B. This is likely due to the large number of small WWTF are scattered within areas heavily dominated by OSTDS, yet these parcels appear to share many of the characteristics of the OSTDS. The large difference in the high and low estimates means that a large number of parcels have probabilities around 0.5. This means that parcel with different wastewater treatment methods are not effectively differentiated from each other using the current models. In order to improve these models, it is likely that separately modeling residential parcels from nonresidential parcels will distinguish the many smaller WWTF.

Alachua County has already completed extensive work on identifying sewered parcels and entering all of their paper permits into a database from which they can identify parcel location. For this inventory, we put their files of known sewer and known OSTDS together and joined them with the DOR GIS database. We modeled the approximately 7,000 remaining improved but undesignated parcels. The model incorrectly classified 11.8% of the known OSTDS parcels as sewered. Given the very reliable data that this county provided, this is an indication of how scattered older OSTDS systems are within existing well sewered areas. They are very difficult to identify as the parcels have most of the same characteristics as the surrounding sewered parcels. However, the range of estimates was very narrow, only 1% of the midpoint value. This means that the probabilities that were estimated for most of the undesignated parcels were all very close to 0 for sewered or 1 for OSTDS.

C. **Small to medium sized counties with about 5 to 20 large and 5 to 20 small WWTF. The number of WWTF is, more or less, evenly divided between large and small facilities**. Counties in Group C have many of the same characteristics as Group B, but the much larger number of small WWTFs than in the previous group substantially complicates estimation of OSTDS location outside of the major municipal providers. In addition, we had relatively little success obtaining sewer information even from the few large WWTF in a number of counties. Many of the other very low values of know sewered parcels, as seen in the Rural Counties (Group A) are found here. There are some exceptions, most notably Charlotte County where the CEHD provided us with information sufficient to identify all of the sewered parcels. Still, the model incorrectly classified 15.2% of the known OSTDS parcels. This indicates how interspersed the OSTDS parcels are within the sewered districts. They appear to have buildings, most likely residences, that have the same characteristics as sewered parcels.

D. **Large counties with 5 to 20 large WWTF, often including a few large service providers that serve through out the county and in addition, many smaller WWTF.** These are some of the largest counties with large government or authority sewer providers. The sewered parcels are usually more common in the named communities, but these service areas interspersed with older OSTDS areas. In some counties, the large WWTF may be wholesale treatment facilities. Their retail customers are small to medium sized cities that do not have their own WWTFs. Locating the service areas of these retail customers is essential for a reliable estimate. Examples include Brevard and Palm Beach which both have regionally shared WWTFs.

   Many of the models for counties in Group D were quite reliable. This is most likely due to the very large number of known sewer and OSTDS parcels, even if it is an incomplete accounting. However, bias is predominant in this group. The Bayesian method described above would improve these county estimates substantially.

   An interesting example of the complexity of having some, but not all of the sewer information and a large parcel number to estimate, occurs in Miami-Dade. For this county we were successful in obtaining the sewer records from the county WASD but had relatively few records of OSTDS compared to the total number of parcels in the county (Table 4-8, Group D). The ratio is about 10 to 1. However, we did not obtain a sewer parcel list from the City of Homestead. Homestead has many fewer sewer customers that the WASD, but it nonetheless represents a substantial amount of wastewater treatment capacity. The combination of having many more identified sewer parcels but not having the location of one large facility, led to an underestimation of the total number of OSTDS in Miami-Dade and to locating many of the estimated ones probably within the sewer service area of the City of Homestead (see maps for Miami-Dade in the appendix). This is clearly seen in the high proportion (65.1%) of known OSTDS that were incorrectly classified as sewered parcels by the current model. Obtaining the sewer information from Homestead and more careful modeling of residential parcels will greatly improve the reliability of the estimation for Miami-Dade.

E. **Many, many small WWTF and a wide range of large WWTF.** The number of small WWTF in these counties is 100 or more (92 in Volusia). Even though these may each serve a relatively small number of parcels, they collectively can represent quite a number of parcels. They may have distinctive features relative to OSTDS parcels, representing high-density land use that is very localized. However, we insufficient response to begin this form of modeling. Some targeted data collection would help remedy this situation.

   In addition, most of these counties have at least one, or many very large facilities. Obtaining sewer parcel information from all of the largest WWTF is essential in this group. Separately modeling the areas outside these largest WWTF service areas and modeling residential and nonresidential land uses separately would

greatly improve these estimates

F. **Counties with very few small WWTF (≤5) but quite a few large ones.** These counties are the inverse of all the others. Duval is included in this group and it has a single very large, county-wide sewer provider. An independent assessment of the number of OSTDS in Duval has been carried out by the water and sewer authority but we have not been able, yet, to obtain this information for comparison. Broward and Pinellas estimates would be greatly improved if the low number of known OSTDS could be accounted for with Bayesian modeling.

Comparison with other Estimates

The DOH provides an estimate of the total number of OSTDS based on 1970 census values and the cumulative number of permits since then for each county (Table 4-7). In addition, most of the CEHDs provided estimates. A third estimate is simply the total number of improved parcels minus the known sewer parcels. In theory, if all known sewer parcels were identified, then all remaining improved parcels should have an OSTDS.

The comparison of these three estimates and the Statewide Inventory, is based on the total number of improved parcels in the Inventory. So about 50,000 vacant parcels that have been independently identified as having an OSTDS are not included.

The Statewide Inventory estimated that there were 3,446,132 improved parcels with OSTDS. The DOH estimate is 2,661,072. The CEHD is 2,292,775 (10 counties did not provide any estimate). The large difference can be seen in the cumulative effect of much higher estimates in the Statewide Inventory that in the DOH estimate for large counties with many WWTF of which quite a number did not provide information such as, Brevard, Lake, Lee, Manatee, Orange, Pasco, Polk, St. Johns, and Volusia. There are a few cases in which the Statewide Inventory provides as substantially lower estimation: Miami-Dade, Duval, Hillsborough, and Sarasota. In another set of circumstances, the Statewide Inventory produces lower estimates than DOH, but these estimates were more similar to those provided by the CEHDs. Such cases include Sarasota, Clay and Broward. For many of the smaller counties, the DOH and Statewide Inventory estimates are quite similar. Flagler is a large exception and reflects the very little WWTF information we were able to obtain.

6.0 Best Management Practices and Recommendations

Improving and Maintaining a Reliable Inventory of the Number and Location of OSTDS in each County

There are a number of practices that facilitate the process of creating and maintaining an OSTDS inventory. First, reliable information is essential for the inventory to be useful to the CEHD and other agencies. One of the best ways to create a reliable inventory is to have an established set of standardized processes for creation and maintenance. It is important to ensure that public and private participants in the inventory development and maintenance understand their stake in the integrity of the inventory and thus implement the standardized processes. It is also important to be aware of OSTDS efforts both within Florida and nationally so as to learn from and communicate to others creating inventories.

Below are eight recommendations, which have been developed from this project's survey results and research findings for OSTDS inventory management, best practices, and problem resolution as identified from within Florida and nationally. Specifically, our recommendations address known problems that arise in creating and maintaining an OSTDS inventory. We suggest that instituting certain changes in regulations and communication might resolve a number of potential problems.

The recommendation are divided into three categories : Creation of an Inventory, Improving and Maintaining an Inventory, and Establishment of OSTDS Management System as it relates to this Statewide Inventory.

1. **Creation of an Inventory : The methods used to create and maintain an inventory are the same regardless of the goals for the inventory.**

   In most cases in Florida and throughout the U.S., the initial impetus for investigating the number and location of OSTDS is to assess the human health and environmental impacts on coastal areas, surface water, groundwater and other environmentally sensitive resources. But it actually the foundation for a number of important functions. An actively maintained and easily accessible inventory of OSTDS is essential for:

   - Improving the permitting of OSTDS
   - Determining the contribution of OSTDS to environmental impacts
   - Establishing maintenance and operating permits for OSTDS
   - Locating utility service areas where FDEP permitted sewer service is provided
   - Planning for land uses and infrastructure provision

The process of creating and maintaining an inventory is the same regardless of which of these recognized needs is paramount.

2. **Creation of an Inventory : An inventory of OSTDS includes a list of parcels, their location and the type of wastewater treatment in use. It is not a list of OSTDS permits. The critical feature of any OSTDS inventory is to align with Property Appraiser parcel ID and to link the permits to the parcels.**

   An inventory should include a designated form of wastewater treatment, including "no treatment necessary" such as for vacant, undeveloped parcels. It is as important to establish whether a parcel has an OSTDS as it is to be sure that it does not because it is served by a FDEP permitted sewer system. Each OSTDS requires a permit, but an OSTDS is located on a parcel. It is simpler to track the number and location of OSTDS and to update this information if the record is associated with the parcel as a unit of measurement, in addition to its association with a permit. Many other databases relevant to development are also based on parcels - the Property Appraiser's tax roll, provision of sewer service, building permits and development review. Also, environmental measurements are geographically based and can be easily displayed with parcel maps of OSTDS.

   Creating and maintaining the quality of an OSTDS inventory should coordinate with these other sources of parcel information. Again, if the fundamental unit of the inventory database is a parcel, this task is relatively simple to accomplish because the Property Appraiser must produce an annual tax roll that accounts for all changes in parcel information. Updating the inventory with the parcel list allows the CEHD to be assured that the appropriate wastewater treatment is being permitted.

   The inventory database should interact with the permit database. The permits should contain parcel IDs as provided in the DOR tax roll and addresses sufficient to link to the DOR GIS parcel maps. The inventory database can be linked to the permit database to provide information on the number and types of permits for a given parcel. This allows a count of the actual total number of OSTDS, not only the total number of parcels with OSTDS.

   Parcels without OSTDS should remain in the inventory (for the reasons given above) but need contain only information as to their source of wastewater treatment such as a DEP WWTF identification number. The FDEP maintains a list of their WWTF permits and contact information[17]. If the permit database is well maintained, the inventory database is also easily maintained.

   This recommendation does not ignore the fact that latitude and longitudinal coordinates offer a valid means of locating, mapping, and tracking OSTDS. We, in fact, believe that the exact position of the OSTDS on each parcel should be included as part of the permit and added whenever feasible (see suggestions below). In some cases it is the only feasible form of reporting location, such as on

[17] http://www.dep.state.fl.us/water/wastewater/facinfo.htm

very large parcels (military installations, parks and recreational parcels, etc.). In addition, if the components of OSTDS are well defined, then the location of their parts as well as the number of complete systems (by function) can be provided using GPS and as part of the permit. Then this permit information can be linked to the parcel inventory database.

However, we also believe that the use of a global position data form should not be used to the exclusion of parcel information. For the foreseeable future, only parcel data exist ubiquitously with legal standing in all counties throughout the state. As such, we contend that the use of parcel information remains the most viable solution for OSTDS locations in Florida for the inventory.

The next four recommendations are concerned with how to improve and maintain the Statewide Inventory. The Inventory is, even at this point, an extraordinary collection of data, database and GIS capacity. Yet its' integrity and utility can be greatly enhanced if it is well maintained.

Once parcels are connected to a centralized sewer, it is highly unlikely they will return to using OSTDS for wastewater treatment. Also, many, perhaps as much as three quarters of the FDEP WWTF are very unlikely to ever change their service areas unless it is to become subsumed into a much large facility, annual updates on their parcel service areas is unnecessary. This means that the initial data collection will suffice. The rest of the parcels in the inventory SHOULD be monitored through existing permitting and notification policies. Therefore, much of the maintenance of the Statewide Inventory is the timely, reliable and consistent of communication among the agencies and departments which regulate construction, growth management and environmental protection, about changes in the number and location of parcels and their wastewater treatment systems.

3. **Improving and Maintaining an Inventory : Elimination of parcels with "unknown" wastewater treatment methods**

   No inventory is ever completely accurate. The more important objective is to accurately assign a wastewater treatment method to each parcel in order to quantify the "known unknowns". Once these are identified, a process for determining the actual wastewater treatment type can be established and executed. However, this will be a long-term process for any county. Charlotte County expects the inventory verification process to take five years. Alachua County spent several months attempting to create an accurate inventory and wastewater treatment type still remains uncertain on a few thousand parcels. In jurisdictions outside Florida where OSTDS inspection and management plans are legal requirements, the inventory process has generally taken several years to reach a 95% level of accuracy.

   Elimination of "unknowns" requires some point of contact with the property owner and/or other government entities with jurisdiction over the parcel. Below are contact points and notification elements that have succeeded in reducing the

number of parcels with "unknown" wastewater treatments. These also are processes that will maintain the integrity of the inventory in general.

- Require annual communication with FDEP WWTF permittees regarding the parcels to which they provide centralized sewer service (recognizing that their cooperation is crucial to achieving any such goal).

- Communicate with development review boards and building permit entities to establish a process of notification when new parcels/new buildings are created.

- Update OSTDS inventory annually through Property Appraiser tax rolls.

- Provide the wastewater treatment type on the Property Appraiser public database access.

- Require identification of parcel wastewater treatment type at the point of sale.

- Require inspections of OSTDS on parcels at the point of sale.
  Provide mapping of the location of the OSTDSs on the property using GPS.
- Conduct an annual review of the OSTDS inventory by direct comparison to the previous year's inventory.

- Contact owners of parcels with "unknown" status directly.

- Identify where information regarding wastewater treatment type is missing by highlighting data gaps on the Property Appraiser's database and on maps provided to the public.

- Instituting rebate and/or incentive programs for OSTDS replacements for parcels to identify potentially unknown systems.

4. **Improving and Maintaining an Inventory: Require consistent, timely and well-documented communication between Environmental Health FDEP and the FDEP WWTF permittees regarding the provision of sewer service.**

   The FDEP and FDOH are the government entities that regulate wastewater treatment in FloridaIn order to manage their respective functions effectively, both departments must assure clear communication among the staff charged with implementing these regulations. It is critical that the staffing personnel be thoroughly informed about the activities of their counterparts. Unfortunately, according to the CEHDs, information on the location of FDEP permitted sewer service availability and service expansion is spotty. Changes are inconsistently communicated by FDEP WWTF permittees to the CEHDs. Only 40% report that they are regularly notified by FDEP permitted sewer service providers about the availability FDEP permitted sewer service, and only 19% actually have documentation of service locations on hand for their own reference. This means that in many counties, either the homeowner or contractor must provide

evidence of OSTDS, or staff must make individual phone calls and check with the local institutional memory.

It may also appear that knowledge of new sewer connections or the existence of OSTDS on a parcel would be communicated through plumbing permits or other construction permits. However, this does not appear to happen consistently or reliably so that the CEHD can use this as knowledge about the state of wastewater treatment on any given parcel. The circumstances under which this does happen quite effectively is when the Environmental Health Department is housed in conjunction with the building permit functions of the larger local governments.

Even though regulations for notification exist, such as through abandonment permits, the notification process is not executed consistently enough for most CEHDs to confidently report that they know which parcels are served by FDEP permitted sewer lines. Information on older OSTDS located either within sewer franchise areas or on the fringe of a rapidly developing area is often inadequately reported. Reconciliation of abandonment permits with the active permits for a parcel is often sporadic. CEHDs regularly have incomplete permit databases and/or poor permitting information, thus correlating the parcel location is difficult.

The communication between FDEP WWTF permittees and County CEHDs should, at a minimum incorporate the following requirements:

- Consistent, continuous notification when parcels are converted from OSTDS to FDEP permitted sewer service
- Capacity to reconcile abandonment permits with parcels having previously permitted OSTDS
- Notification of changes in FDEP permitted sewer service area and installation of new sewer lines
- Provision of regularly updated maps, in GIS format when possible, with **parcel identification** where FDEP permitted sewer service is provided;
- Provision of accurate maps, in GIS format where possible, delineating locations where future FDEP permitted sewer service is expected to become available within the time frame of the utility's current franchise or planning horizon

5. **Improving and Maintaining an Inventory: Coordination with other local government agencies that control development on a parcel.**

The number and development status of parcels changes each day. Various local government agencies are involved in the authorization and recording of the

subdivision and development of parcels. The county Property Appraiser is required by law to provide a certified tax roll of all parcels each year. This database provides a unique and stable identifier for each parcel and contains a large amount of information regarding development status. Parcels are "created" through the development review and the building permit process, altering the development status. Information about the wastewater treatment method on a parcel is an important component of assessing property values for taxation, development and sale.

As with effective communication with the FDEP as described above, there may appear to be sufficient regulation and policies in hand. However, the permitting processes such as rezoning or subdivision do not appear to effectively communicate information about wastewater treatment decisions to the CEHD.

In order to keep an OSTDS inventory up-to-date, communication among the Property Appraisers (PA), development review boards, building permit regulators and realtors is necessary or the inventory will quickly become inaccurate. The integrity of the most useful OSTDS inventory data is maintained through the following:

- Annual updates using the Property Appraisers tax roll
- Identification of wastewater treatment type in new subdivisions as part of the development review process
- Verification of wastewater treatment type that is installed as part of the building permit process
- Notification of the appropriate agency and the inventory at the point of sale of the wastewater treatment type that exists for the parcel and/or the structure being sold
- Sharing of information from the OSTDS inventory database with the Property Appraiser so that the wastewater treatment and any associated permits are available to the public on an ongoing basis

6. **Improving and Maintaining an Inventory: Paper records – when to add them to the inventory and / or to make them electronically available.**

The initial creation of an OSTDS inventory does not necessarily entail the entry of all existing paper permit data into an electronic format or the scanning of all permits. The Statewide Inventory provided by this project offers the initial version of the OSTDS inventory without, to date, any direct entry of data from paper records.

However, over twenty counties have records on legacy databases that have inconsistently linked with current parcel and GIS information, but could, potentially be enhanced by the addition of information from paper records.

Eight counties have scanned most records from which key information could be extracted for the purposes of the inventory. The information content and number of years of paper recording varies widely among counties. Records from legacy databases supplied to this project have been included in the Statewide Inventory and reconciled with existing records in the EHDB database.

Turning the information in paper permits into an electronically accessible form requires staff time, equipment, software and funding to accomplish. However, if much of staff time is currently spent supplying routine permit information to the public, making this information available in a public electronic database, especially if it is shared with the Property Appraiser, may free up staff time and expertise for other responsibilities.

Each county should assess the sufficiency of the Statewide Inventory compared to the amount of permit information that was included and what remains available in paper form. The following considerations are recommended for records that are NOT in any form that allows electronic access:

- Records within the last twenty years should be the high priority.
- Records older than twenty years may not contain useful information because many of these OSTDS may have been issued permits for repairs, modifications or replacements since the initial installation. Some may have been abandoned.
- Records that contain clear locational information should be a high priority;
- Records that contain large format paper are more expensive to scan, are not essential to the inventory, but are essential to OSTDS management.
- Scanning paper records reduces physical storage requirements;
- Scanning records and providing them in a database accessible to the public can reduce staff time spent on routine public requests for information.
- For all scanned records, access also should be provided through the Property Appraisers database.

These last two recommendations concern the value of an inventory in establishing a management system for OSTDS. Education of the public AND government personnel, at all levels, is the key to using OSTDS as a cost effective and environmentally sound wastewater treatment system.

7. **Establishing an OSTDS management system**

A management system that seeks to track and maintain the functional capacity of OSTDS to treat wastewater relies upon an inventory. The management system can be instituted without a completely accurate inventory, as long as processes to

eventually eliminate "unknown" parcels and to maintain the integrity of the inventory are established. In fact, a mandatory OSTDS management system, particularly one incorporating the requirement for an OSTDS operating permit, is an excellent way to quickly eliminate "unknown" parcels and to establish consistent communication among governmental and private entities involved in the sale and development of land.

The management system can target an environmentally sensitive area as a good reason for establishing , such systems, but the **process to create and maintain the inventory is the same everywhere**, regardless of environmental conditions on a given parcel or region.

- The Statewide Inventory provides the basis for creating a county inventory that is sufficient to establish an OSTDS management system.

- The Statewide Inventory should be improved using the recommendations provided herein.

- Residents must be informed of the value that having onsite wastewater treatment information as a component of development contributes to their own real estate holdings, their water resources and the local economy.

8. **Educate the public, local governmental agencies and FDEP WWTF permittees.**

The effectiveness of any OSTDS management system is fundamentally a product of the importance placed upon it by the public and other governmental entities involved in land development. Education on the positive environmental and fiscal impact that well sited and managed OSTDS can provide is essential to public understanding of the need for OSTDS inventory and management regimes.

Notifying property owners of parcels with unknown wastewater treatment methods is a straightforward means of obtaining up-to-date information. However, notifying thousands of property owners without a prior public discussion highlighting the value of maintaining an OSTDS inventory can potentially generate concern among the public. As Monroe County learned when over 16,000 property owners were notified as part of the Cesspool Elimination Program, requiring information without first educating people as to why this process is important can ignite a revolt. The Monroe County experience offers a valuable lesson that education must precede implementation of the inventory process.

Part of the education process is to clearly explain the goal of making the OSTDS inventory easily available in a context that provides value to the property owner. If the OSTDS inventory is effectively connected to the Property Appraiser database, it can provide information that buyers and sellers of property can use to assess the value of buildings and land. If the inventory is available in a GIS

format, the map layers of OSTDS locations can be overlaid onto all sorts of other information: springsheds, coastal pollution problems, infrastructure expansion plans, well locations, etc.

An intriguing idea encountered in the research for this project was the suggestion from a staff member of the Washington State Department of Health to generate a parcel map, color coding the parcels to indicate the degree of data and management for OSTDS. The parcels with an "unknown" status of wastewater treatment type, the status designation that the CEHDs wish to eliminate, should be indicated in RED, the most attention grabbing color. The suggested color coding for such a parcel map is as follows:

- Undeveloped - white
- Parcels served by a FDEP permitted sewer system - blue
- OSTDS and established maintenance programs - green
- OSTDS lacking a maintenance program - yellow
- "Unknown" wastewater treatment method - red.

Such mapping can contribute invaluable visual assistance at public meetings on environmental and planning issues. Individuals will identify the color of their own parcel. Many people will not wish to be red and will offer to provide information about OSTDS on their parcels. They may be sufficiently motivated to establish a formal maintenance plan so that they can be "turned green". This was a very successful method of increasing participation in OSTDS maintenance planning in Puget Sound.

Here are some suggestions culled from conversations with Florida CEHDs, environmental planners and other interested parties throughout the country:

- Require identification or inspection at point of sale, and provide the buyer with information on how the condition of the OSTDS affects property value.

- Provide easy access to parcel information about the wastewater treatment method through Property Appraiser's database and online permit access.

- Collaborate with planning agencies and environmental impact projects to provide parcel maps indicating wastewater treatment type and allow these maps to be freely used on Web sites for established entities.

- Collaborate with large FDEP sewer service providers to obtain the location of OSTDS in the context of sewer provision and infrastructure planning.

- Encourage property owners to provide information by providing color-coded maps for public meetings that show parcels in RED for which information is needed on wastewater treatment type.

9. **Most Important Overall Recommendations**

The following recommendations appear multiple times throughout the report due to their fundamental importance to the creation and maintenance of an OSTDS inventory at the county or state level. Lists can become sophisticated structures given the availability of database software. But the value of the list is a function of the quality, source, and integrity of the information input and maintenance routines. These recommendations include ways to slowly but surely eliminate parcels with "unknown" wastewater treatment methods and to communicate with the public in order to accomplish this quickly and effectively.

- Maintain the OSTDS inventory independently, key it to the Property Appraiser parcel ID and link it to the EHDB.

- Maintain the parcel component of the inventory in concert with the Property Appraiser tax roll and provide unambiguous parcel and OSTDS location information in the EHDB.

- Use the Statewide Inventory as a standardized starting point for individual county inventories. Provide the CEHDs with the capacity to utilize the Statewide Inventory for management purposes and to provide feedback as to its accuracy.

- Initiate a program to scan and produce electronic files from those paper permit records that are essential to creating an effective inventory.

- Create a consistent manner for reporting changes in wastewater treatment method on parcels due to activities of the FDEP WWTF permittees, building permit regulators and development review boards. This will provide the best way to maintain the inventory.

- Develop points of contact with parcel owners and local environmental programs where applicable during development review and at the point of sale in order to ascertain the wastewater treatment method for each parcel.

- Provide direct access to and maps of the inventory results to the Property Appraiser, planning departments, real estate agents and any forum for public education.

7.0 Refinement of the Inventory Database

There are two scales at which the Inventory Database can be refined so as to greatly extend its robustness and utility. The first is the DOH need for assessing human and health impacts and threats that extend beyond political boundaries and are determined by geological and ecological phenomena. The second is for use by the County Environmental Directors to perform their duties.

In reviewing the survey results submitted by all 67 counties, several key issues emerged that provided invaluable insight into County needs, priorities, and operational concerns. To address these first, we found that 22 counties performed some form of estimation or inventory in order to:

- improve the permitting or management process of OSTDS,
- provide the capacity to participate in growth management and comprehensive planning within their respective counties and regionally to optimize their potential to inform and educate the public on environmental health issues thus reducing risks to public health and the environment
- assess the environmental impacts to water and other natural resources,
- respond in a timely to government mandates and requests, usually for one or more of the three reasons listed above.

These estimations and inventories were accomplished in different ways by each of the 22 counties. This is in part due to differences of need and intent but also because few counties have the resources to collect data and/or the expertise to create a quality controlled database and to perform the necessary statistical analysis. Most estimates merely provide an account of the number of permits for OSTDS, but unlike the statewide inventory provided herein, they not are reconciled with the number of improved parcels in the county that might require onsite wastewater treatment. This form of estimation may suffice as a response to a request for the number of OSTDS, but it does not provide for any further use.

Alachua and Charlotte Counties are currently addressing their need for location and quantification of OSTDS. In Duval County, the Water and Sewer Authority has pursued a county level inventory. For these three counties, developing an adequate listing of sewered and septic parcels has taken a year or more.

Additional effort is indicated for these three counties to address various refinements consistent with their respective priorities. Access to the statewide inventory utilizes modeling, data reconciliation, and county level GIS mapping as described in detail throughout this report. It affords each county a means to move beyond counting of permits for inventory creation. It enables each county to address management needs for planning and prioritization to improve their existing inventories.

Table 7-1: Reasons listed by CEHD for performing an estimation or inventory.

County	Improvement of Permitting or Management Process	Growth Management	Environmental Impacts	Mandate from Local, State or Federal Govt.
Total	13	9	13	8
Alachua	Y	Y	Y	
Brevard	Y			Y
Calhoun	Y			
Charlotte	Y		Y	
Columbia	Y			
Miami Dade	Y			
Duval		Y	Y	
Flagler	Y	Y	Y	
Hardee			Y	Y
Hernando				Y
Hillsborough			Y	
Leon		Y	Y	
Martin			Y	Y
Monroe		Y	Y	Y
Okaloosa	Y	Y	Y	
Orange	Y	Y	Y	
Santa Rosa				Y
Sarasota				Y
St Lucie	Y	Y	Y	
Sumter	Y	Y		
Suwannee	Y			
Wakulla	Y		Y	Y

A number of counties clearly anticipate the need to expand their countywide management plans for OSTDS to include onsite inspection, either due to an impetus at the local level or in anticipation of regional or state directives or mandates. All of the EPA management programs rely on an actual inventory, not a count of permits. The distinction of an inventory developed solely through a count of existing permits and a comprehensive inventory is described in earlier chapters. Counties have self-identified the enormity of task and need to assess the extent to which their paper permit records need to be added to the existing EHDB. Methods for reconciling abandonment permits and efficiently identifying where and when a parcel changes from OSTDS to sewer are needed. Therefore, CEHDs are aware that they need an inventory and a clear priority list to pinpoint areas where OSTDS "probably" exist but for which there is no easily

accessible permit data. Their capacity and resources necessary to accomplish these tasks are limited; therefore few counties have made the attempt.

7.1 Refinement of the Inventory Database

Any information derived from a database is only as useful as the data itself. As discussed earlier, a robust and viable OSTDS inventory is both dynamic and flexible. Specifically, the statewide inventory is derived for multiple sources, each with elements driving our recommendations for refinement. We believe that information provided herein will illuminate the need to supply additional or expanded data in future endeavors. Counties and other stakeholders, upon review of information from this report, should be able to identify any missing, incorrect, or misleading information. To ensure that refinement efforts yield the desired outcomes, we submit the following recommendations that reflect our proposed data collection and model refinement procedures.

Data Collection

1. Provide the current synopsis of parcel wastewater treatments and maps to interested CEHDs for feedback on the assumptions and estimations made for this inventory, modeling and mapping. Provide maps in a format that can be enlarged on screen for detailed examination. A visit to each county and thorough discussion of the maps and database would greatly improve their content and utility to the CEHD.

2. Target those large WWTF that to date have failed to provide parcel data on their service areas. There are 130 municipal and/or large WWTF that have never responded to requests for parcel information. Approximately are ten additional retail customers of large regional WWTF. These entities were unknown through state sources and not compelled to participate. Although identified and contacted, they have not yet furnished information. Though our efforts to identify and develop a working relationship with these sources, we believe that their participation is probable and realistic. If data from these sources alone were obtained, the inventory would contain parcel information for 96% of the total effluent permitting capacity of FDEP WWTF, serving approximately 61% of the population of Florida.

   During the course of this project, researchers have found direct contact with previously nonresponsive WWTF through emails and phone calls to be effective in data gathering (this approach enabled the us to garner over 2 million parcels). Such targeted contacts with the remaining large and municipal WWTF could yield a 95% response rate and identify an additional half million sewered parcels.

3. Target small municipalities, especially in the rural counties of groups A and B. Some of these are smaller than the 0.5 MGD limit and may have difficultly providing data in an electronic format. Data entry or OCR conversion may be necessary. When these rural WWTF provide parcel lists, the identification of

OSTDS will be statistically reliable due to the process of elimination. This phenomenon is unique to rural areas with highly defined WWTF service areas.

4. Identify parcel of WWTF that serve a very limited number of parcels using other resources. There are many hundreds of very small WWTF that provide wastewater treatment to a recreational vehicle park, an apartment building, a restaurant or school. In addition, the address of the WWTF, provided by the FDEP permittee contact database, is often the same address as the served parcel. This can be identified and verified by "hand", using available web based information and phone calls. This is time consuming but will allow identification of small sewered areas in what is usually a large expanse of OSTDS.

5. As we worked to identify unmatched records in the EHDB, we found when linking the EHDB permitted systems to the DOR tax roll that not all records were successfully linked. We attempted to maximize the success rate by utilizing various string queries; however there were several counties with severely deficient data. To resolve this matter, it would be advantageous to perform more manual approaches in order to yield higher match rates for these counties. Where DOR data is deficient, it may be crucial to acquire alternative data sources to supplement the tax roll - E911 addresses or other high accuracy data.

Model Refinement

1. Some WWTF may never be forthcoming with provider data. In these cases the relationship between the permitted capacity of the WWTF and the number of parcels that the facility could potentially serve can be modeled through existing information in the database. Use this relationship and the physical location of the WWTF to estimate the parcels served by the facility. This will work well for those WWTF constructed to serve specific developments as such facilities are not apt to expand.

2. Customize models for each county by including local regulatory limits on the capacity for developments to use OSTDS for wastewater treatment. Florida has certain longstanding requirements that apply statewide. Local jurisdictions can also implement more stringent rules. Such regulations usually relate directly to land use density and intensity allowances for OSTDS. These rules can be captured in a model by a decision tree.

3. Separately model residential and nonresidential land uses. In many instances, nonresidential land uses have clearly distinct characteristics if they are sewered or using OSTDS. The distinctions among residential parcels are less obvious. Separating the two groups would provide better models that account for the unique differences among counties in their pattern of provision of wastewater treatment to residences.

4. Adjust for large difference in the known number of sewer and OSTDS parcels using a form of Bayesian analysis. Bayesian analysis is a method of providing a weighting to the final result when it is known that there are actually many more OSTDS or sewer parcels in a county or that the data collected is heavily biased towards one treatment form.

5. Even when WWTF provide parcel data, not all parcels can be linked to the GIS database. Therefore, modeling should be done even when all WWTF for a given county have supplied service area data. Municipal sewer service areas commonly have scattered OSTDS still in use. These parcels often fail to link up in OSTDS permit databases. Models tend to assume that any improved parcel within a sewered area is also sewered. These WWTF should be modeled individually by comparing the number of parcel records provided, the number linked to the GIS maps, the capacity of WWTF, the jurisdiction-specific regulations relating to the retention of OSTDS when sewer is available, and septic system use relative to land use regulations. Only a small number of WWTF in certain counties require such treatment.

This expanded data collection and model refinement will yield more reliable estimates of the number and location of OSTDS statewide. Such a product will provide each CEHD a specific listing of parcels for which OSTDS information has been estimated. They can then prioritize where to apply resources to locate OSTDS and ensure compliance with local and state regulations.

More data collection and modeling will yield significantly more reliable estimations. Reaching a higher level of data and model exploration should be possible to achieve in a twelve-month period using the above steps.

7.2 Areas of Future Study

The second scale is to provide cross-jurisdictional geographically explicit information about the number and distribution of OSTDS in relationship to other geographically displayed information. A statewide inventory based on county specific data collection methods and estimations that allow for direct comparison of reliability would enhance the assessment of impacts from OSTDS. As the measure of reliability of estimation is captured directly in the probability that any given parcel has an OSTDS, that reliability can be factored directly into any geographical accounting done with the Inventory Database. These probabilities can be mapped by color coding to identify areas of low or high quality information.

1. Environmental data on springsheds (as in Wakulla and Wekiva, the Ichetucknee), coastal seepage zones, areas threatened by storm surge can be overlaid onto the Inventory maps and the impact of OSTDS on these features quantified. The Wekiva Study Area and the Wakulla karst plain offer opportunities for the first comparisons because substantial work has been done in estimating the location and number of OSTDS. Through such calibration,

other defined sensitive areas can be assessed for the number of OSTDS located there. Assessments for flood plains (FEMA maps) and potential storm surge areas would allow DOH and local CEHD to take preventative action to mitigate harm to human health and to initiate OSTDS removal or replacement in these high risk areas.

2. Properly sited and maintained OSTDS provide sanitary wastewater treatment, but conventional systems and drain fields may not provide adequate denitrification, potentially contributing to nonpoint source nutrient pollution. With a thorough inventory, the relative contribution of OSTDS to nutrient pollution can be more accurately assessed in a geographical manner. It would also be possible to link details of permits to parcels and improve assessments of impact base on age, performance and local siting conditions. In addition, as nitrogen reducing systems are installed, their effectiveness in reducing the nitrogen load from OSTDS can be evaluated.

3. Water quality impacts from OSTDS can affect the resources of a neighboring county. A sound inventory and estimation can identify pollution sources and provide evidence that is unbiased by the capacity of the given jurisdiction to perform an analysis.

4. Costs and benefits of infrastructure expansions could be assessed more adequately with a reliable OSTDS inventory. Comprehensive planning for future land use designations can be facilitated if the locations of existing OSTDS are identifiable and identification of where it should be used can be done. With a statistically qualified inventory, allows the use of OSTDS as a permanent, planned component wastewater treatment. OSTDS can be effectively for development in areas where low density should be retained due to land use efficiencies or environmental sensitivity,

5. The capacity exists to identify the wastewater treatment method on improved parcels and also on platted and unplatted parcels currently undeveloped. With improvement in the base data (as described in Chapter 7.1) the Inventory Database can be employed to predict the location and estimate of the future number of OSTDS or sewered parcels for a given location. This would be helpful to comprehensive planning and growth management, as well as in assessing environmental impacts.

6. The inventory can be maintained in a variety of ways. The most important is the enhanced use of existing regulation for communication among the wastewater providers within a county. In addition, a third party could provide annual "checkups" of the Inventory when the new DOR tax roll is available. The existing Statewide Inventory includes an extensive contact database for greater ease of updating sewer parcel information from very large WWTFs.

7. This is the first statewide OSTDS inventory to be attempted in the US, though legislation is now emerging to accomplish this effort in other states. With the

proposed improvements in the baseline data, Florida will become a leader in exploring methods for creating a database that 1) provides consistent data to establish uniformity in OSTDS management, 2) improves assessment of environmental impacts from OSTDS nutrient loading, 3) helps in mitigating harmful effects from OSTDS on human health and welfare due to catastrophic weather, and 4) improves growth management through knowledge of the distribution of wastewater treatment methods.

7.3 Future Integration with Existing Databases

Through this project, the ability to obtain information on wastewater treatment methods from a range of sources has been established. Such information can now be incorporated into a database, its quality assessed and then linked to GIS parcel information. The information can be used to model the parcels for which a wastewater treatment method has previously not been identified. This project has successfully identified 6.6 million improved parcels, 2 million sewered parcels, and nearly 650,000 parcels with OSTDS. The project has successfully developed models to estimate the wastewater treatment method on the remaining improved parcels and via that model, provide a direct measure of the probability (re. reliability) of that estimate. The project has mapped all improved parcels, known sewer and OSTDS parcels and estimated many for each category of wastewater treatment. Much has been accomplished in six months.

This is the first statewide inventory of the number and location of OSTDS in the United States. The Florida DOH now possesses a very important tool with which to carry out its mission of protecting public health and environment.

8.0 Appendix – Tables and Figures not in text

8.1 Legends for Tables and Figures in the Appendix

Table 3-1 : Years of OSTDS Permit Data for Existing Electronic Databases as reported by CEHD

Description of the years of permit records in three categories of electronic databases: EHDB, CENTRAX, and legacy databases. A legacy database is any database that has permit records from past years which has not be integrated into the database currently in use, usually EHDB. The dates are truncated to the year reported by the CEHDs. The summary is the maximum range of all databases combined but does not yet reflect whether the legacy data is or is not useful or usable. The Access column refers to whether or not the database has been provided for integration into the Statewide Inventory. These legacy databases are being actively sought as they potentially contain valuable information. This table will be updated for the final version of this report.

Table 3-3 : FDEP Wastewater Treatment Facilities, Number and Capacity by County

This table contains information on the wastewater treatment facilities (WWTF) in each county. WWTF supply centralized sewer services to developed parcels and thus play an important role in determining which parcels have OSTDS. The larger facilities are often public or municipal facilities, but can also be operated by private authorities. They provide the majority of the effluent treatment and hence serve the largest number of parcels. The smaller facilities are more numerous, and do not often expand. Municipalities may also provide centralized sewer services which can be operated by a public or private entity. Municipalities are also included in the columns for Public and Private WWTF. This information is important for understanding the different challenges counties face in creating and maintaining an OSTDS inventory.

- # WWTF : Number of domestic wastewater treatment facilities
- Total MGD : WWTF permitted effluent capacity in millions of gallon per day
- Muncipal WWTF : Number of WWTF owned or operated for municipalities
- Public WWTF : Number of WWTF owned by a public entity
- Private WWTF : Number of WWTF owned by a private entity
- Public % of Total MGD : % of Total MGD that are permitted to Public WWTF
- Large WWTF : Number of WWTF with capacity of $\geq$ 0.5 MGD
- Large WWTF % of Total MGD : % of Total MGD permitted to Large WWTF
- Small WWTF : Number of WWTF with capacity of < 0.5 MGD

- Small WWTF % of Total MGD : % of Total MGD permitted to Small WWTF

Table 3-7 : Description of County Estimations of Number of OSTDS

Twenty-two counties that reported performing or planning to perform an inventory or estimate of OSTDS. The information presented is taken directly from the survey responses and edited only for formatting purposes. The Method and Reason columns are the items chosen as "very important" or "somewhat important". Onsite verification as a method of performing the inventory and the establishment of an RME as a reason for doing the inventory are highlighted.

Table 4-4: Response from FDEP Permitted Wastewater Treatment Facilities (WWTF) and the number of Sewered Parcels in Florida Counties

- # of Parcels
- # of Improved parcels
- Total number of WWTF
- Total permitting capacity in million gallons per day (MGD)
- Percent of WWTF that provided some form of data on sewer service
- Percent of total MGD the reporting WWTFs represent
- Number of sewer parcels collected by March
- Final number of known sewer parcels for the Statewide Inventory

Table 4-5: Number of OSTDS Permits in Databases and Number of Parcels with OSTDS in Florida Counties

- # of Parcels
- # of Improved parcels
- Active permits found on EHDB
- Closed permits found on EHDB
- EHD permits that were successfully linked to parcels by March. There can be more than one permit/parcel
- Final Number of unique septic parcels identified by at least one EHDB permit
- Number of permits from a CEHD database (not EHDB)
- Final Number of unique septic parcels identified by at least one CEHD database permit
- Final total number of known OSTDS parcels for the Statewide Inventory

Table 4-6 : Number of Known and Estimated Parcels with OSTDS or Sewer

- # of Parcels
- # of Improved parcels
- Total known sewer parcels for the Statewide Inventory
- Estimated number of sewer parcels using Inventory models
- Total number of sewer parcels, sum of known and estimated
- Total known OSTDS parcels for the Statewide Inventory

- Estimated number of OSTDS parcels using Inventory models
- Number of parcels for which wastewater treatment cannot be estimated
- Total number of OSTDS parcels, sum of known and estimated

Table 4-7: Comparison of The Statewide Inventory estimate of the number of OSTDS with other estimates for Florida Counties

- # of Improved parcels
- Total improved parcels with sewer , sum of known and estimated
- Total improved parcels with OSTDS, sum of known and estimated
- DOH estimate of OSTDS, July 1, 2008
- CEHD estimate of OSTDS as provided from the Inventory survey
- Total improved parcels – total improved parcels with sewer

  These three values include all identified OSTDS parcels, including currently vacant ones and all estimated OSTDS parcel
- Low value estimate of OSTDS, probability threshold =0.75
- Mid value estimate of OSTDS, probability threshold = 0.50
- High value estimate of OSTDS, probability threshold = 0.25

Table 4-8 : Grouping of Counties by Characteristics that affect Estimations and and Measures of Reliability

- Number of large (MGD $\geq$ 0.5)
- Number of small WWTF (MGD < 0.5)
- Number of improved parcels
- Number of known sewer parcels
- Number of known OSTDS parcels
- Number of variables in categories of self, neighbor and group that were retained in the final model

  Measures of model quality
- % of parcels with known wastewater treatments that the model correctly predicted
- % of parcels known to be OSTDS that the model predicted to be sewered
- Range from low to high estimate of OSTDS (From Table 4-7) as a percentage of the mid value estimate (standardized for comparison)
- Descriptive label of model quality

Table 4-9: Details of Modeling Results
Variables used for each county model indicated with "Y"
- Percent of parcels in each taxing authority category with OSTDS
- Percent of parcels in each land use category with OSTDS
- Percent of parcels in each neighborhood code with OSTDS (DOR field)
- Percent of parcels in lot size class categories with OSTDS
- Year structure built (DOR field)
- Number of buildings on parcel (DOR field)
- Total square feet of structures on parcel (DOR field)

- Parcel size in acres (DOR field)
- AIC – Akaike's information criterion, a measure of the reduction in model explanatory power when adding or deleting independent variables or interaction terms
- Number of parcels (with known wastewater treatment) used in the model
- Percent of total parcels that the model correctly classified
- Percent of total OSTDS parcels that the model incorrectly classified
- Number of vacant parcels
- Number of estimated OSTDS parcels
- Number of estimated sewer parcels
- Number of parcels for which an estimation cannot be calculated
- Number of known OSTDS parcels
- Number of known sewer parcels
- Number of known sewer parcels that are not improved (vacant)
- Number of known OSTDS parcels that are not improved (vacant)
- Number of known improved OSTDS parcels
- Number of known improved sewer parcels
- Total number of OSTDS when probability threshold = 0.25
- Total number of OSTDS when probablility threshold = 0.50
- Total number of OSTS when probability threshold = 0.75
- Range from high to low estimate of OSTDS as a percentage of the mid value estimate
- Total number of parcels for which a wastewater treatment was estimated
- Total number of parcels for which a wastewater treatment was known
- Total number of improved parcels with OSTDS
- Total number of improved parcels

8.2 List of Appendix Contents

Appendix: Database Information which contains diagrams of database design, database views and recommendations for refinement of the Statewide Inventory Database.

- Total number of OSTDS parcel by DOH : cumulative number of permits
- CEHD estimate as reported from the Inventory questionnaire
- Number of improved parcels minus number of known sewer parcels

Appendix : Information provided on the DVD

Folder : Survey of County EHDs

The survey provide to each County Environmental Health Director is provided only in an electronic format because of its size (300+ pages). The questions are in a separate file. The answers are provided in two formats. The first is as a spreadsheet which contains all responses to all questions. The second is a series of pdf, labeled according to the questions and responses that are in each one. They are divided into topical groups as described in the survey. For instance,

SurveyAnswers_4to12.pdf contains the questions and responses to questions 4 to 12 which all relate to the EHDB. There are a total of 12 files in this folder.

Folder : Model Results

This folder contains a file of the raw results as generated by software written for the Inventory analysis. Each county is done separately and are presented in county ID order (alphabetical).

Folder : DraftFinalReport_June042009

This report include Database Information from the Appendix.

Table 3 -1 : Years of OSTDS Permit Data for Existing Electronic Databases as reported by County Environmental Health Directors

County	*EHD(rehost)*	*CENTRAX*	*Legacy Data Bases*	*Summaryof Electronic Records*	*Access to Legacy Database*	*Paper Records*
Alachua	some 2007 - 2009	1997 - part of 2007	all records soon	1997 - 2009	CPHIUMS provided / useful	1985 - 2009
Baker	1998 - 2009	1998 - 2001	1985 - 1998	1985 - 2009	Database not yet useful	1997 - 2009
Bay	2005 - 2009	unknown		2005 - 2009		1995 - 2009
Bradford	no info provided	no info provided	no info provided	no info provided	CPHIUMS not yet useful	1973-1985 most,1986-2009 all
Brevard	2002-2009	2002 - 2007	1992 - 2006	1992 - 2009	Database provided / useful	will be electronic
Broward	all	from start to EHD migration		insufficient info provided		not used
Calhoun	1996 - 2009	1996 - 2007		1996 - 2009	Database provided / useful	1983-2009
Charlotte	1973 - 2009	1974 - 2009		1973 - 2009	Database provided / useful	some destroyed
Citrus	1998 - 2009	1998 - 2009		1998 - 2009		1994 - 2009
Clay	1996 - 2009	1996 - 2007	1973-1996	1973 - 2009	Database not yet useful	1973-2009
Collier	1998 - 2009	1998 - 2007		1998 - 2009		(1985) 2000 - 2009
Columbia	2000 - 2009		1973-1999	1973 - 2009	Request pending to Carmody	all electronic
Miami-Dade	1999 - 2009	1999 - 2007		1999 - 2009		no info
DeSoto	2000 - 2009	2000 - 2009		2000 - 2009		1998 - 2009
Dixie	1997 - 2009	1997 - 2009	1986 - 1997	1986 - 2009	CPHIUMS not yet useful	1968 - 2009
Duval	1993 - 2009	1993 - 2007	1993 - 2001	1993 - 2009	Request pending to WSAE	all electronic
Escambia	1998 - 2009	1998 - 2007		1998 - 2009	Database provided / useful	all
Flagler	1995 - 2009	1995 - 2009		1995 - 2009	Database provided / useful	1973 - 2009
Franklin	1999 - 2009			1999 - 2009		1980 - 2009
Gadsden	1995 - 2009	1995 - 2006		1995 - 2009		1987 - 1994
Gilchrist	1997 - 2009	1997 - 2009	1986 - 1997	1986 - 2009	CPHIUMS not yet useful	1974 - 2009
Glades	1995 - 2009	1995 - 2007		1995 - 2009		1995 - 2009
Gulf	1997 - 2009	1997 - 2007		1997 - 2009		1974 - 1997
Hamilton	2006 - 2009	1998 - 2007	1983 - 1997	1983 - 2009	CPHIUMS not yet useful	no info
Hardee	1998 - 2009	1998 - 2009		1998 - 2009		1984 - 1997
Hendry	1995 - 2009	1995 - 2007		1995 - 2009		1968 - 2009
Hernando	6/1998 - 2009	6/1998 - 2009		1998 - 2009		1972 - 1998
Highlands	1994 - 2009	1994 - 2008		1994 - 2009		all electronic
Hillsborough	spotty since 1995, 1999 pretty complete	spotty since inception to 1999		1995 - 2009		all electronic
Holmes	1996 - 2009	1996 - 2007		1996 - 2009	Database not yet useful	1973 - 2009
Indian River	3/30/1998 - 2009	3/30/1998 - 10/10/2008	1973 - 1997	1973 - 2009	Database not yet useful	1978 - 1985
Jackson	1994-present	1994 - 2006	1994-1996	1994 - 2009	Database not yet supplied	1996 - 2009
Jefferson	2006 forward	1991 forward to 2006		1991 - 2006		no info
Lafayette	around 2000 - 2009	1996 - 2000		1996 - 2009	CPHIUMS not yet useful	1978 - 2009

Table 3 -1 : Years of OSTDS Permit Data for Existing Electronic Databases as reported by County Environmental Health Directors

County	*EHD(rehost)*	*CENTRAX*	*Legacy Data Bases*	*Summaryof Electronic Records*	*Access to Legacy Database*	*Paper Records*
Lake	1999 - 2009	1999 - 2009		1999 - 2009		1995 - 1999
Lee	1998 - 2009	1998 - 2007		1998 - 2009	Database provided / useful	none exist
Leon	1998 - 2009	1998 - 2006	1988 - 1998	1998 - 2009	Database provided / useful	no info
Levy	2007 - 2009	1998 - 2007	1974 TO 1998	1974 - 2009	CPHIUMS not yet useful	1970 - 2009
Liberty	2008 - 2009	1997 - 2007	1989--1997	1989 - 2009	Database not yet useful	1975 - 2009
Madison	1991 - 2009	1991 - 2006		1991 - 2009		1967 - 2009
Manatee	2007 - 2009	no centrax		2007 - 2009		1960 - 1995 (approx)
Marion	1998 - 2009	1998 - 2007	1986-1998	1998 - 2009	Database provided / useful	1967 - 2009
Martin	1998 - 2009	1998 - 2007	1994 - 1998	1994 - 2009	Database not yet useful	archieved < 1983
Monroe	2005 - 2009	2004 - 2009	1985 - 2004	1985 - 2009	Database not yet useful	1985 - 2004
Nassau	All years	1997 - 2007	Beginning of permits to centrax	1997 - 2009	Request pending	all electronic
Okaloosa	1998 - 2009	1998 - 2007		1998 - 2009		soon all electronic
Okeechobee	2006 - 2009	1996 - 2005		1996 - 2009		2001- 2009
Orange	1999 - 2009	1999 - 2008	1993 - 1998	1993 - 2009	Database not yet useful	none exist
Osceola	1998 - 2009	1998 - 2007	1986 - 1998	1986 - 2009	Database not yet useful	1986 - 2007
Palm Beach	1999 - 2009	1999 - 2008	1993 - 1998	1993 - 2009	Database provided / useful	1980 - 1993
Pasco	1998 - 2009	1998 - 2007		1998 - 2009		1976 - 2009
Pinellas	all	unknown		insufficient info provided		1972 - 2009
Polk	migrated 1998, data entry to 2007	1998-2007		1998 - 2007(?)	Database lost	(1970) 1990 - 2009
Putnam	Centrax, no dates	1999 - start of rehost	1993 - 1999	1993 - 2009	CPHIUMS not yet useful	all electronic
St. Lucie	1999 - 2007 (?)	1999 - 2007	1987 - 1998	1987 - 2009	Database not yet useful	1984 -1986
St. Johns	2007 - 2009	1994 - 2007	1986 - 1994	1986 - 2009	Database provided / useful	no info
Santa Rosa	no info provided	no info provided	no info provided	no info provided		1970 - 2009
Sarasota	2006 -2/2/2009	2005 and some 2006	1972 - 2005/6	1972 - 2009	Database not yet useful	all electronic
Seminole	1999 - 2009	1999 - 2007	no accessible	1999 - 2009	Request pending	none exist
Sumter	2008 - 2009	1995 - 2008	finals from 1950's thru 1983	1950 - 2009	Request pending	1950 - 1983
Suwannee	Back to around 1998	2000 - 2007		1998 - 2009	CPHIUMS not yet useful	1990 - 2009
Taylor	1974 (incomplete upto 2002) - 2009	1974 - 2006		1974 - 2009		1974 - 2009
Union	1998 - 2009	1998 - 2007	1986-1998	1986 - 2009	CPHIUMS provided / useful	1973 - 2009
Volusia	1999 - 2009	1999 - 2007		1999 - 2007		1989 - 1999
Wakulla	2006 - 2009			2006 - 2009		1983 - 2009
Walton	4/1998 - 2009	1998 - 2007	hard copy list of all systems permitted from 1980 - 6/2003	1998 - 2009	Database provided / useful	1985 - 2009
Washington	2006 - 2009	1998 - 2006		1998 - 2009		no info

Table 3-3 : FDEP Wastewater Treatment Facilities, Number and Capacity by County

County	# WWTF	Total MGD	Municipal WWTF	Public WWTF	Private WWTF	Public % of Total MGD	Large WWTF	Large WWTF % of Total MGD	Small WWTF	Small WWTF % of Total MGD
Florida	2,157	2,598	268	615	1,542	83%	367	97%	1,752	3%
Alachua	20	22.6754	7	8	12	85%	4	95%	16	5%
Baker	4	1.593	1	3	1	98%	1	82%	3	18%
Bay	15	29.055	6	9	6	98%	7	98%	7	2%
Bradford	5	3.453	1	3	2	99%	2	99%	3	1%
Brevard	58	65.5486	11	23	35	98%	17	98%	39	2%
Broward	16	288.065	12	14	2	98%	15	100%	1	0%
Calhoun	1	1.5	1	1	0	100%	1	100%	0	0%
Charlotte	27	9.6798	1	6	21	64%	4	79%	23	21%
Citrus	66	6.6009	3	12	54	75%	6	77%	60	23%
Clay	24	17.5678	4	20	4	98%	7	88%	17	12%
Collier	23	49.7855	3	12	11	92%	6	99%	16	1%
Columbia	22	3.6578	6	10	12	96%	1	82%	19	18%
Miami-Dade	26	359.2855	3	8	18	60%	4	100%	21	0%
De Soto	20	3.924	1	5	15	86%	2	70%	18	30%
Dixie	4	0.523	2	2	2	95%	0	0%	3	100%
Duval	26	123.9815	5	18	8	100%	16	99%	9	1%
Escambia	11	33.556	1	9	2	100%	4	98%	6	2%
Flagler	19	8.6914	3	5	14	79%	4	81%	14	19%
Franklin	9	2.738	2	3	6	84%	2	80%	7	20%
Gadsden	10	4.267	4	4	6	49%	2	66%	8	34%
Gilchrist	5	0.3775	1	3	2	65%	0	0%	5	100%
Glades	21	0.5205	0	3	18	34%	0	0%	21	100%
Gulf	7	3.805	2	4	3	97%	1	81%	5	19%
Hamilton	10	1.6139	3	4	6	94%	1	74%	8	26%
Hardee	14	2.562	3	6	8	91%	1	47%	13	53%
Hendry	15	2.7644	2	5	10	78%	1	54%	14	46%
Hernando	31	8.8305	1	10	21	95%	7	92%	24	8%
Highlands	62	6.1544	4	5	57	54%	3	57%	59	43%
Hillsborough	122	151.0296	3	19	103	98%	10	97%	112	3%
Holmes	4	1.5185	3	3	1	95%	1	92%	3	8%
Indian River	12	13.8811	1	8	4	99%	5	96%	7	4%
Jackson	8	6.84	4	6	2	68%	3	91%	5	9%
Jefferson	4	1.2825	2	2	2	3%	1	78%	3	22%
Lafayette	2	0.363	1	1	1	41%	0	0%	2	100%
Lake	115	25.5349	16	24	91	69%	11	74%	103	26%

Table 3-3 : FDEP Wastewater Treatment Facilities, Number and Capacity by County

County	# WWTF	Total MGD	Municipal WWTF	Public WWTF	Private WWTF	Public % of Total MGD	Large WWTF	Large WWTF % of Total MGD	Small WWTF	Small WWTF % of Total MGD
Florida	2,157	2,598	268	615	1,542	83%	367	97%	1,752	3%
Lee	77	75.8023	7	16	61	82%	15	95%	57	5%
Leon	12	33.7197	2	4	8	95%	4	99%	8	1%
Levy	15	1.341	4	9	6	94%	0	0%	13	100%
Liberty	2	0.45	1	2	0	100%	0	0%	2	100%
Madison	6	1.2545	2	3	3	92%	1	79%	5	21%
Manatee	9	49.8225	2	6	3	100%	5	100%	4	0%
Marion	128	25.6435	5	26	102	64%	9	78%	117	22%
Martin	36	17.1781	3	6	30	58%	7	89%	29	11%
Monroe	237	17.5885	10	21	216	68%	2	60%	228	40%
Nassau	16	6.216	3	6	10	89%	3	80%	13	20%
Okaloosa	18	39.493	3	14	4	82%	12	99%	6	1%
Okeechobee	18	2.2815	0	6	12	86%	1	70%	17	30%
Orange	53	206.8123	6	15	38	50%	11	99%	39	1%
Osceola	39	32.659	3	11	28	90%	10	95%	29	5%
Palm Beach	54	162.1439	4	11	43	96%	10	99%	44	1%
Pasco	71	61.3513	4	13	58	50%	12	96%	59	4%
Pinellas	23	275.7815	14	17	6	99%	18	100%	5	0%
Polk	156	65.2846	21	39	117	91%	22	90%	133	10%
Putnam	28	3.8471	5	13	15	93%	1	78%	26	22%
St. Johns	27	17.2787	2	13	14	84%	10	95%	17	5%
St. Lucie	32	24.6025	1	6	26	49%	7	93%	25	7%
Santa Rosa	13	17.22	4	7	6	70%	6	95%	6	5%
Sarasota	47	37.9222	4	13	34	87%	13	98%	34	2%
Seminole	24	68.0386	8	11	13	90%	11	98%	13	2%
Sumter	33	8.0687	3	3	30	25%	4	82%	29	18%
Suwannee	9	1.6475	2	2	7	83%	1	76%	8	24%
Taylor	6	1.755	1	3	3	95%	1	71%	4	29%
Union	1	0.7	1	1	0	100%	1	100%	0	0%
Volusia	106	64.8656	14	26	80	95%	13	96%	92	4%
Wakulla	6	1.248	1	3	3	54%	1	48%	5	52%
Walton	11	10.83	3	7	4	22%	5	92%	6	8%
Washington	6	1.876	2	4	2	96%	1	64%	5	36%

Table 3-7 : Description of County Estimations of Number of OSTDS

County	Estimated OSTDS	Quality of Estimation	Date	How long did it take?
Alachua	30,410	96%	inventory to finish in about 3 months	14 months
Brevard	80,000	unknown	Annual estimates from 2005 - 2008	About 10 hours
Calhoun	4,680	90%	annually	no time
Charlotte	44,026	very good	estimation done, inventory in progress, 5 years to complete	1 Week
Columbia	20,000	80%	2008	4 MONTHS
Duval	approx 90,000	90% with GIS	EHD only tracks number of permits	
Flager	about 6,000	planned	started a few months ago	uncertain
Hardee	4,613	98%	annually	5 hours
Hernando	54,818	98%	done for this survey 2/5/09	one hour
Hillsborough	115,000 to 125,000	80-90%	2006-2007	1 week
Leon	38,000	95%	2009 until done	unknown
Martin	10,000 in 1994	Good	1994	SIX MONTHS
Monroe	27,024	90%	1996 Governors Executive Order	1 year
Miami-Dade	250,000	80%	Mar-09	24 hours
Okaloosa	30,000	expect 90%	start in 2010	1 year
Orange	113,000	80-85%	2006, started with Wekiva and expanded to rest of County	ongoing as area constantly growing
Santa Rosa	over 40,000	90%	July, 2000	1 month
Sarasota	43,223	90% identified	done in 2007	Not sure, I think I worked on it on and off for a month
St. Lucie	37,532	only adequate	done monthly but results are only adequate	1-2 weeks
Sumter	14,600	50% prior to 1984 98% after 1984	done every year	ongoing
Suwannee	about 6,000	planned	calculate annually, planning estimate in 2 years	2 hours per year
Wakulla	15,000	85%	quarterly (??)	1-2 days

Table 3-7 : Description of County Estimations of Number of OSTDS

County	Method	Reason
Alachua	Tax Roll, DEP WWTF parcels served, OSTDS DB	environmental impact, water protection, growth management
Brevard	Estimate in 1996/97 as baseline (unknown method), County DB for current annual estimates	update database
Calhoun	EHD(rehost), Centrax, County DB, paper records	improving permitting database, process
Charlotte	Tax Roll, DEP WWTF service areas, lines and laterals, reconciliation of abandonments with OSTDS permits, **onsite verification (inventory)**	improve permitting, environmental impact, water protection, **RME establishment**
Columbia	Paper records, tax rolls,	improving permitting database, process
Duval	Parcel based inventory being done by Water and Sewer Expansion Authority of City of Jacksonville. Tax Roll, DEP WWTF parcels served, known location OSTDS in sewered areas	environmental impact, water protection, growth management
Flager	Tax Roll, County DB, EHD(rehost), DB paper records, DEP WWTF parcels served, known location of OSTDS in sewered areas	improve permitting process, growth management, water protection
Hardee	Tax Roll, EHD(rehost), Centrax, DEP WWTF parcels served, service areas, location of known OSTDS in sewered areas, **onsite verification as part of permitting**	water protection, presumed DOH request
Hernando	US Census, EHD(rehost), Centrax, paper records,	presumed DOH request
Hillsborough	Tax Roll, Centrax, main and lateral sewer lines, known OSTDS in sewered areas, regulation exceptions, variances and grandfathering, census numbers	environmental impact, water protection
Leon	EHD(rehost), DEP WWTF service areas, mains and laterals, known OSTDS in sewered areas	environmental impact, growth management, water protection
Martin	EHD(rehost), Centrax, DB of paper records, DEP WWTF parcels served, main and lateral sewer lines, known location of OSTDS in sewered areas, regulation exceptions, variances and grandfathering	water protection, presumed DOH request
Monroe	Tax Roll, County DB, followed up since by repair permits and abandonments	comprehensive planning, water protection, cesspool elimination, required by legislature
Miami-Dade	EHD(rehost), jurisdiction boundaries, location of sewer mains and laterals, tax rolls and parcel development status, We determine from property appraisal that 500,000 lots exist in Dade County. Based upon water and sewer Department records about 1/2 of the lots are serviced by sewers. Therefore 250,000 lots are serviced by septic tanks.	improve permitting process
Okaloosa	EHD(rehost), Centrax, DB paper records, DEP WWTF parcels served, main and lateral sewer lines, contractor records, **onsite verification of OSTDS**	update database, environmental impact, growth management, water protection
Orange	Tax Roll, EHD(rehost), Centrax, DB of paper records, sewer mains and laterals, known location of OSTDS in sewered areas, **onsite verification**	improve permitting process, environmental impact, growth management, water protection
Santa Rosa	Tax rolls, Centrax, primary source was the total number of water connections less the total number of sewer connections yields the number of ostds.	I needed to have a number for a presentation to the board of county commisioners.
Sarasota	County DB, plus Centrax and rehost data minus abandonment permits	comprehensive planning
St. Lucie	EHD(rehost), Centrax, County DB, DEP WWTF parcels served and service area, lost track of sewer conversions in building boom	improve permitting process, environmental impact, growth management, water protection
Sumter	EHD(rehost), Centrax, County DB	improve permitting process, update database, growth management
Suwannee	Tax roll, EHD(rehost), Centrax, DB of paper records, known location OSTDS in sewered areas, reconciliation with abandonment permits,	improve permitting process
Wakulla	only EHD(rehost)	improve permitting process, budgeting

Table 4-4 : Response from FDEP permitted Waste Water Treatment Facilities (WWTF) and the number of Sewered Parcels in Florida Counties

County	# of Parcels	# of Improved	Total WWTF	Total MGD	Data Received % WWTF	Data Received % MGD	Sewer Parcels March 2009	Sewer Parcels Final
Florida	9,037,945	6,608,050	2,157	2597.9	52%	85%	360,322	2,056,129
Alachua	99,666	80,317	20	22.7	100%	100%	2,120	43,582
Baker	12,316	8,245	4	1.6	100%	100%	2	1,552
Bay	117,174	86,990	15	29.1	93%	76%	1	12,914
Bradford	14,521	10,004	5	3.5	100%	100%	14	1,425
Brevard	293,637	210,224	58	65.5	64%	99%	1,571	46,312
Broward	491,278	420,678	16	288.1	69%	72%	65,891	205,969
Calhoun	10,319	5,463	1	1.5	100%	100%	0	483
Charlotte	218,401	97,937	27	9.7	100%	100%	519	30,023
Citrus	127,838	65,700	66	6.6	38%	64%	131	134
Clay	83,504	66,656	24	17.6	83%	99%	1,521	28,128
Collier	175,775	97,498	23	49.8	52%	90%	1,070	5,407
Columbia	40,408	25,286	22	3.7	50%	96%	12	2,115
Miami-Dade	551,589	489,351	26	359.3	96%	98%	3	281,245
De Soto	19,116	11,114	20	3.9	35%	36%	6	6
Dixie	17,591	9,031	4	0.5	75%	24%	0	1
Duval	357,366	312,400	26	124.0	85%	100%	134,558	141,421
Escambia	149,188	123,033	11	33.6	91%	99%	0	55,060
Flagler	72,960	42,255	19	8.7	42%	74%	58	273
Franklin	16,040	6,784	9	2.7	78%	53%	163	164
Gadsden	26,750	17,421	10	4.3	80%	57%	580	571
Gilchrist	14,691	7,230	5	0.4	80%	91%	3	4
Glades	11,211	5,549	21	0.5	14%	5%	3	4
Gulf	16,700	8,978	7	3.8	86%	19%	2	730
Hamilton	14,491	5,613	10	1.6	70%	16%	343	344
Hardee	14,059	8,832	14	2.6	36%	19%	4	4
Hendry	35,534	13,006	15	2.8	53%	81%	12	12
Hernando	115,995	78,145	31	8.8	58%	78%	26,866	26,867
Highlands	97,890	39,863	62	6.2	35%	62%	4,847	4,897
Hillsborough	469,685	408,004	122	151.0	44%	98%	156	227,932
Holmes	15,324	8,344	4	1.5	50%	6%	1	88
Indian River	77,586	53,895	12	13.9	75%	91%	3	7,031
Jackson	39,917	18,894	8	6.8	63%	21%	5	402
Jefferson	12,685	6,392	4	1.3	75%	22%	7	7
Lafayette	6,874	2,829	2	0.4	50%	59%	3	3
Lake	223,070	151,439	115	25.5	41%	62%	649	27,948

Table 4-4 : Response from FDEP permitted Waste Water Treatment Facilities (WWTF) and the number of Sewered Parcels in Florida Counties

County	# of Parcels	# of Improved	Total WWTF	Total MGD	Data Received % WWTF	Data Received % MGD	Sewer Parcels March 2009	Sewer Parcels Final
Florida	9,037,945	6,608,050	2,157	2597.9	52%	85%	360,322	2,056,129
Lee	438,587	238,982	77	75.8	49%	74%	3,889	19,495
Leon	107,254	88,913	12	33.7	92%	98%	0	50,608
Levy	48,672	20,427	15	1.3	53%	26%	5	6
Liberty	6,130	2,663	2	0.5	50%	44%	1	1
Madison	15,868	7,643	6	1.3	50%	7%	2	7
Manatee	141,093	110,933	9	49.8	44%	0.05%	2	3
Marion	267,033	149,007	128	25.6	52%	89%	2,883	2,930
Martin	77,621	71,038	36	17.2	56%	89%	37	3,570
Monroe	90,174	48,106	237	17.6	41%	17%	121	1,107
Nassau	47,541	33,221	16	6.2	44%	87%	2,566	4,688
Okaloosa	100,727	84,025	18	39.5	56%	66%	995	995
Okeechobee	33,085	16,306	18	2.3	22%	14%	301	302
Orange	367,509	312,216	53	206.8	62%	97%	11	54,890
Osceola	149,286	112,276	39	32.7	33%	73%	36	12,067
Palm Beach	436,963	392,436	54	162.1	44%	95%	13	250,004
Pasco	252,568	245,141	71	61.4	37%	80%	17	1,921
Pinellas	434,384	406,913	23	275.8	78%	100%	1	240,932
Polk	308,683	222,889	156	65.3	38%	77%	15,109	19,519
Putnam	100,851	40,689	28	3.8	50%	14%	17	419
St. Johns	161,905	96,796	27	17.3	44%	48%	12,599	12,600
St. Lucie	153,137	108,869	32	24.6	72%	62%	37,163	42,172
Santa Rosa	90,806	58,861	13	17.2	85%	99%	1,180	9,642
Sarasota	216,810	154,387	47	37.9	55%	98%	230	75,243
Seminole	170,499	146,092	24	68.0	83%	100%	41,670	66,600
Sumter	71,736	51,432	33	8.1	52%	95%	4	28,059
Suwannee	28,795	14,113	9	1.6	89%	93%	2	29
Taylor	18,841	9,950	6	1.8	83%	29%	4	4
Union	6,718	3,673	1	0.7	100%	100%	0	0
Volusia	487,658	295,259	106	64.9	49%	22%	329	1,908
Wakulla	24,870	12,708	6	1.2	83%	60%	1	2,151
Walton	78,205	38,494	11	10.8	82%	99%	6	1,193
Washington	42,787	10,192	6	1.9	67%	29%	4	6

Table 4-5 : Number of OSTDS Permits in Databases and Number of Parcels with OSTDS in Florida Counties

County	# of Parcels	# of Improved	Active EHD Permits	Closed EHD Permits	Linked EHD Permits March 2009	Septic Parcels per EHDB	CHD Legacy Permits Obtained	CHD Legacy Permits Linked	Total OSTDS Known Parcels
Florida	9,037,945	6,608,050	755,674	144576	229,569	564,026	257,543	85,731	649,757
Alachua	99,666	80,317	22,128	82	6,220	9,445	33,916	20,191	29,636
Baker	12,316	8,245	1,533	1064	1	1,488	0	0	1,488
Bay	117,174	86,990	10,894	27	5,807	7,653	0	0	7,653
Bradford	14,521	10,004	3,070	4	155	1,869	0	27	1,896
Brevard	293,637	210,224	9,116	10455	2	14,195	28,485	11,240	25,435
Broward	491,278	420,678	13,132	233	5,769	8,468	0	0	8,468
Calhoun	10,319	5,463	1,637	0	16	139	486	0	139
Charlotte	218,401	97,937	4,435	14527	5,076	12,310	55,398	22,933	35,243
Citrus	127,838	65,700	24,839	762	621	17,436	0	0	17,436
Clay	83,504	66,656	15,083	46	5,146	10,519	0	0	10,519
Collier	175,775	97,498	14,827	107	5,676	6,404	0	0	6,404
Columbia	40,408	25,286	10,808	5	5,938	5,988	0	0	5,988
Miami-Dade	551,589	489,351	38,925	278	16,871	23,073	0	0	23,073
De Soto	19,116	11,114	3,693	27	2,185	2,620	0	0	2,620
Dixie	17,591	9,031	3,309	74	257	1,759	0	0	1,759
Duval	357,366	312,400	30,809	468	6,068	15,290	0	0	15,290
Escambia	149,188	123,033	25,922	1890	2,704	16,971	11,610	3,204	20,175
Flagler	72,960	42,255	2,716	54	4	1,737	5,609	705	2,442
Franklin	16,040	6,784	3,881	6	198	563	0	0	563
Gadsden	26,750	17,421	8,099	5	270	3,764	0	0	3,764
Gilchrist	14,691	7,230	1,895	1820	1,633	1,710	0	55	1,765
Glades	11,211	5,549	2,121	11	8	1,142	0	0	1,142
Gulf	16,700	8,978	3,421	46	1,156	1,797	0	0	1,797
Hamilton	14,491	5,613	1,757	14	117	776	0	0	776
Hardee	14,059	8,832	1,309	737	1,387	1,621	0	0	1,621
Hendry	35,534	13,006	4,132	85	72	2,404	0	0	2,404
Hernando	115,995	78,145	21,588	27	18	15,127	0	0	15,127
Highlands	97,890	39,863	12,129	149	960	7,923	0	0	7,923
Hillsborough	469,685	408,004	26,722	74	1,075	20,515	0	0	20,515
Holmes	15,324	8,344	3,233	61	44	316	0	0	316
Indian River	77,586	53,895	16,917	322	1	9,613	0	0	9,613
Jackson	39,917	18,894	9,437	35	90	4,206	0	0	4,206
Jefferson	12,685	6,392	3,499	0	2,000	2,165	0	0	2,165
Lafayette	6,874	2,829	1,089	13	2	587	0	0	587
Lake	223,070	151,439	23,776	1583	5	20,388	0	0	20,388

Table 4-5 : Number of OSTDS Permits in Databases and Number of Parcels with OSTDS in Florida Counties

County	# of Parcels	# of Improved	Active EHD Permits	Closed EHD Permits	Linked EHD Permits March 2009	Septic Parcels per EHDB	CHD Legacy Permits Obtained	CHD Legacy Permits Linked	Total OSTDS Known Parcels
Florida	9,037,945	6,608,050	755,674	144576	229,569	564,026	257,543	85,731	649,757
Lee	438,587	238,982	10,907	52238	48,651	55,863	39,742	12,216	68,079
Leon	107,254	88,913	13,427	28	8,787	9,762	26,777	8,625	18,387
Levy	48,672	20,427	9,234	27	963	4,555	0	1	4,556
Liberty	6,130	2,663	1,205	0	41	44	0	0	44
Madison	15,868	7,643	4,010	45	1,635	1,757	0	0	1,757
Manatee	141,093	110,933	5,524	1603	2,020	4,965	0	0	4,965
Marion	267,033	149,007	5,585	39291	37,055	37,238	21,232	585	37,823
Martin	77,621	71,038	10,165	167	1,138	3,568	0	27	3,595
Monroe	90,174	48,106	8,067	205	221	5,988	0	283	6,271
Nassau	47,541	33,221	10,396	33	6,649	6,974	0	0	6,974
Okaloosa	100,727	84,025	10,235	151	5,559	7,931	0	0	7,931
Okeechobee	33,085	16,306	4,623	8	2,310	2,500	0	0	2,500
Orange	367,509	312,216	33,555	383	2,053	20,989	0	0	20,989
Osceola	149,286	112,276	8,429	1006	3	7,286	0	0	7,286
Palm Beach	436,963	392,436	22,512	179	15,527	13,433	8,186	967	14,400
Pasco	252,568	245,141	23,491	1111	530	19,130	0	0	19,130
Pinellas	434,384	406,913	3,801	15	144	2,184	0	0	2,184
Polk	308,683	222,889	35,359	104	1,136	21,553	0	0	21,553
Putnam	100,851	40,689	8,764	125	266	7,269	0	0	7,269
St. Johns	161,905	96,796	20,866	91	3,057	13,906	10,959	0	13,906
St. Lucie	153,137	108,869	1,770	8359	796	4,458	0	3,868	8,326
Santa Rosa	90,806	58,861	24,905	59	859	13,240	0	0	13,240
Sarasota	216,810	154,387	7,997	31	2,349	4,783	0	0	4,783
Seminole	170,499	146,092	12,965	75	7,041	8,514	0	0	8,514
Sumter	71,736	51,432	7,125	144	506	1,859	0	0	1,859
Suwannee	28,795	14,113	6,620	30	1	1,192	0	0	1,192
Taylor	18,841	9,950	10,892	39	18	3,017	0	0	3,017
Union	6,718	3,673	1,861	17	926	937	1,360	773	1,710
Volusia	487,658	295,259	34,501	355	159	18,131	0	0	18,131
Wakulla	24,870	12,708	2,450	2836	1,605	3,154	0	0	3,154
Walton	78,205	38,494	8,706	612	8	4,109	13,783	31	4,140
Washington	42,787	10,192	3,846	118	4	1,756	0	0	1,756

Table 4-6 : Number of Known and Estimated Parcels and with OSTDS or Sewer

County	# Parcels	# Improved Parcels	# Known Sewer	# Estimated Sewer	Total Sewer	# Known Septic	# Estimated Septic	# Not Estimated	Total OSTDS (number)
Florida	9,037,945	6,608,050	2,056,129	1,137,714	3,193,843	649,757	2,846,363	50,904	3,496,120
Alachua	99666	80,317	43,582	1,470	45,052	29,636	1,204	5,943	30,840
Baker	12316	8,245	1,552	507	2,059	1,488	4,759	130	6,247
Bay	117174	86,990	12,914	21,458	34,372	7,653	46,521	0	54,174
Bradford	14521	10,004	1,425	883	2,308	1,896	6,053	0	7,949
Brevard	293637	210,224	46,312	20,097	66,409	25,435	120,826	85	146,261
Broward	491278	420,678	205,969	146,653	352,622	8,468	62,061	4,808	70,529
Calhoun	10319	5,463	483	1,786	2,269	139	3,096	80	3,235
Charlotte	218401	97,937	30,023	8,909	38,932	35,243	21,325	6,931	56,568
Citrus	127838	65,700	134	34	168	17,436	49,291	0	66,727
Clay	83504	66,656	28,128	16,659	44,787	10,519	12,251	0	22,770
Collier	175775	97,498	5,407	11,774	17,181	6,404	75,130	0	81,534
Columbia	40408	25,286	2,115	22,796	24,911	5,988	15,105	0	21,093
Miami-Dade	551589	489,351	281,245	98,677	379,922	23,073	97,817	0	120,890
De Soto	19116	11,114	6	3	9	2,620	7,867	881	10,487
Dixie	17591	9,031	1	0	1	1,759	7,585	0	9,344
Duval	357366	312,400	141,421	105,800	247,221	15,290	52,828	0	68,118
Escambia	149188	123,033	55,060	29,412	84,472	20,175	20,363	0	40,538
Flagler	72960	42,255	273	1,449	1,722	2,442	36,269	0	38,711
Franklin	16040	6,784	164	874	1,038	563	5,321	0	5,884
Gadsden	26750	17,421	571	446	1,017	3,764	10,920	2,194	14,684
Gilchrist	14691	7,230	4	2	6	1,765	5,748	0	7,513
Glades	11211	5,549	4	3	7	1,142	4,506	0	5,648
Gulf	16700	8,978	730	517	1,247	1,797	6,026	368	7,823
Hamilton	14491	5,613	344	1,681	2,025	776	3,007	0	3,783
Hardee	14059	8,832	4	0	4	1,621	7,461	0	9,082
Hendry	35534	13,006	12	23	35	2,404	10,924	0	13,328
Hernando	115995	78,145	26,867	3,153	30,020	15,127	33,330	1,273	48,457
Highlands	97890	39,863	4,897	436	5,333	7,923	29,453	0	37,376
Hillsborough	469685	408,004	227,932	119,112	347,044	20,515	47,637	0	68,152
Holmes	15324	8,344	88	216	304	316	7,809	0	8,125
Indian River	77586	53,895	7,031	3,250	10,281	9,613	34,816	0	44,429
Jackson	39917	18,894	402	340	742	4,206	15,315	0	19,521
Jefferson	12685	6,392	7	0	7	2,165	4,572	0	6,737
Lafayette	6874	2,829	3	10	13	587	2,352	0	2,939
Lake	223070	151,439	27,948	19,299	47,247	20,388	86,522	0	106,910

Table 4-6 : Number of Known and Estimated Parcels and with OSTDS or Sewer

County	# Parcels	# Improved Parcels	# Known Sewer	# Estimated Sewer	Total Sewer	# Known Septic	# Estimated Septic	# Not Estimated	Total OSTDS (number)
Florida	9,037,945	6,608,050	2,056,129	1,137,714	3,193,843	649,757	2,846,363	50,904	3,496,120
Lee	438587	238,982	19,495	5,658	25,153	68,079	155,759	0	223,838
Leon	107254	88,913	50,608	10,123	60,731	18,387	13,784	0	32,171
Levy	48672	20,427	6	12	18	4,556	16,319	0	20,875
Liberty	6130	2,663	1	0	1	44	2,621	0	2,665
Madison	15868	7,643	7	4	11	1,757	6,161	0	7,918
Manatee	141093	110,933	3	24	27	4,965	106,247	0	111,212
Marion	267033	149,007	2,930	2,990	5,920	37,823	108,783	0	146,606
Martin	77621	71,038	3,570	3,177	6,747	3,595	60,809	0	64,404
Monroe	90174	48,106	1,107	990	2,097	6,271	40,706	0	46,977
Nassau	47541	33,221	4,688	1,972	6,660	6,974	20,347	0	27,321
Okaloosa	100727	84,025	995	5,713	6,708	7,931	70,101	0	78,032
Okeechobee	33085	16,306	302	708	1,010	2,500	13,195	0	15,695
Orange	367509	312,216	54,890	42,392	97,282	20,989	196,505	0	217,494
Osceola	149286	112,276	12,067	70,274	82,341	7,286	23,419	0	30,705
Palm Beach	436963	392,436	250,004	82,000	332,004	14,400	49,149	0	63,549
Pasco	252568	245,141	1,921	2,320	4,241	19,130	221,780	0	240,910
Pinellas	434384	406,913	240,932	118,938	359,870	2,184	30,470	21,233	32,654
Polk	308683	222,889	19,519	15,023	34,542	21,553	168,585	0	190,138
Putnam	100851	40,689	419	868	1,287	7,269	32,796	0	40,065
St. Johns	161905	96,796	12,600	4,070	16,670	13,906	67,774	0	81,680
St. Lucie	153137	108,869	42,172	34,463	76,635	8,326	21,204	4,524	29,530
Santa Rosa	90806	58,861	9,642	8,302	17,944	13,240	31,184	0	44,424
Sarasota	216810	154,387	75,243	39,221	114,464	4,783	38,765	0	43,548
Seminole	170499	146,092	66,600	40,783	107,383	8,514	32,631	2,395	41,145
Sumter	71736	51,432	28,059	5,452	33,511	1,859	16,507	0	18,366
Suwannee	28795	14,113	29	4	33	1,192	13,068	0	14,260
Taylor	18841	9,950	4	0	4	3,017	7,439	0	10,456
Union	6718	3,673	0	0	0	1,710	2,202	0	3,912
Volusia	487658	295,259	1,908	1,579	3,487	18,131	274,325	59	292,456
Wakulla	24870	12,708	2,151	2,116	4,267	3,154	6,232	0	9,386
Walton	78205	38,494	1,193	805	1,998	4,140	32,937	0	37,077
Washington	42787	10,192	6	4	10	1,756	8,489	0	10,245

Table 4-7 : Comparison of This Study Estimate of OSTDS with other Estimates for Florida Counties

County	# Parcels (improved)	Total Sewer (improved)	Total OSTDS (improved)		DOH Estimate	CEHD Estimate	Improved-Known Sewer		Low OSTDS (prob 0.75)	Total OSTDS (incl. vacant)	High OSDTD (prob 0.25)	Estimate Range % Total
Florida	6,608,050	3,129,708	3,446,132		2,661,072	2,292,775	3,478,342		3,317,152	3,496,120	3,652,276	9.6%
Alachua	80,317	44,718	29,656		40,432	31,000	35,599		30,633	30,840	30,937	1.0%
Baker	8,245	2,010	6,105		7,508	7,000	6,235		6,240	6,247	6,257	0.3%
Bay	86,990	33,622	53,368		35,445	30,000	53,368		52,797	54,174	69,680	31.2%
Bradford	10,004	2,281	7,723		9,995	1,500	7,723		7,864	7,949	8,002	1.7%
Brevard	210,224	65,705	144,434		89,984	80,000	144,519		129,948	146,261	149,671	13.5%
Broward	420,678	345,589	70,281		106,886	65,000	75,089		68,756	70,529	72,697	5.6%
Calhoun	5,463	2,229	3,154		5,178	NA	3,234		1,107	3,235	4,298	98.6%
Charlotte	97,937	37,924	53,082		42,078	44,026	60,013		52,524	56,568	60,632	14.3%
Citrus	65,700	145	65,555		58,914	55,000	65,555		66,721	66,727	66,729	0.0%
Clay	66,656	44,651	22,005		31,167	20,000	22,005		21,671	22,770	24,120	10.8%
Collier	97,498	16,274	81,224		44,141	44,000	81,224		81,380	81,534	86,071	5.8%
Columbia	25,286	24,887	20,399		23,877	NA	399		20,881	21,093	21,262	1.8%
Miami-Dade	489,351	369,795	119,556		212,708	250,000	119,556		109,824	120,890	134,473	20.4%
De Soto	11,114	8	10,225		10,314	15,000	11,106		10,487	10,487	10,490	0.0%
Dixie	9,031	0	9,031		7,417	15,000	9,031		9,344	9,344	9,344	0.0%
Duval	312,400	245,063	67,337		90,868	90,000	67,337		65,481	68,118	71,170	8.4%
Escambia	123,033	83,520	39,513		68,901	NA	39,513		36,970	40,538	49,974	32.1%
Flagler	42,255	1,638	38,449		5,877	6,000	40,617		38,686	38,711	38,860	0.4%
Franklin	6,784	1,005	5,779		5,281	NA	5,779		5,111	5,884	6,530	24.1%
Gadsden	17,421	977	14,250		16,617	NA	16,444		14,605	14,684	14,869	1.8%
Gilchrist	7,230	4	7,226		7,487	15,000	7,226		7,513	7,513	7,513	0.0%
Glades	5,549	7	5,542		5,057	8,500	5,542		5,647	5,648	5,648	0.0%
Gulf	8,978	1,186	7,424		6,716	5,000	7,792		7,663	7,823	7,933	3.5%
Hamilton	5,613	1,995	4,480		3,926	4,000	3,618		3,001	3,783	4,645	43.5%
Hardee	8,832	2	8,830		8,632	NA	8,830		9,085	9,082	9,085	0.0%
Hendry	13,006	30	12,976		10,099	10,600	12,976		13,317	13,328	13,344	0.2%
Hernando	78,145	29,366	47,506		54,200	54,818	48,779		47,922	48,457	49,206	2.6%
Highlands	39,863	3,146	36,717		36,063	35,000	36,717		36,825	37,376	37,528	1.9%
Hillsborough	408,004	341,007	66,997		106,542	120,000	66,997		62,374	68,152	73,783	16.7%
Holmes	8,344	293	8,051		8,898	8,332	8,051		8,084	8,125	8,126	0.5%
Indian River	53,895	10,146	43,749		36,495	36,744	43,749		44,226	44,429	45,717	3.4%
Jackson	18,894	724	18,170		17,107	20,000	18,170		19,521	19,521	19,534	0.1%
Jefferson	6,392	2	6,390		5,236	NA	6,390		6,710	6,737	6,737	0.4%
Lafayette	2,829	12	2,817		3,170	3,000	2,817		2,939	2,939	2,939	0.0%
Lake	151,439	45,295	106,144		75,482	82,500	106,144		104,455	106,910	113,983	8.9%

Table 4-7 : Comparison of This Study Estimate of OSTDS with other Estimates for Florida Counties

County	# Parcels (improved)	Total Sewer (improved)	Total OSTDS (improved)		DOH Estimate	CEHD Estimate	Improved-Known Sewer		Low OSTDS (prob 0.75)	Total OSTDS (incl. vacant)	High OSDTD (prob 0.25)	Estimate Range % Total
Florida	6,608,050	3,129,708	3,446,132		2,661,072	2,292,775	3,478,342		3,317,152	3,496,120	3,652,276	9.6%
Lee	238,982	24,449	214,533		129,575	134,100	214,533		222,265	223,838	224,152	0.8%
Leon	88,913	58,145	30,768		38,768	NA	30,768		32,025	32,171	33,912	5.9%
Levy	20,427	13	20,414		21,845	18,000	20,414		20,852	20,875	20,878	0.1%
Liberty	2,663	0	2,663		3,045	5,000	2,663		2,665	2,665	2,665	0.0%
Madison	7,643	8	7,635		7,205	4,500	7,635		7,910	7,918	7,922	0.2%
Manatee	110,933	27	110,906		36,257	12,000	110,906		111,206	111,212	111,221	0.0%
Marion	149,007	4,980	144,027		118,944	120,000	144,027		140,827	146,606	147,541	4.6%
Martin	71,038	6,695	64,343		28,002	10,000	64,343		35,748	64,404	65,413	46.1%
Monroe	48,106	2,058	46,048		25,486	23,000	46,048		46,518	46,977	47,446	2.0%
Nassau	33,221	6,451	26,770		20,776	NA	26,770		26,581	27,321	27,330	2.7%
Okaloosa	84,025	6,614	77,411		31,643	30,000	77,411		77,677	78,032	78,513	1.1%
Okeechobee	16,306	838	15,468		12,350	12,500	15,468		15,189	15,695	16,403	7.7%
Orange	312,216	95,480	216,736		105,587	113,000	216,736		205,962	217,494	233,495	12.7%
Osceola	112,276	82,054	30,222		24,583	10,000	30,222		30,138	30,705	46,545	53.4%
Palm Beach	392,436	329,576	62,860		79,960	100,000	62,860		62,367	63,549	65,838	5.5%
Pasco	245,141	4,241	240,900		70,399	40,000	240,900		233,556	240,910	241,378	3.2%
Pinellas	406,913	353,030	32,650		23,835	5,000	53,883		24,887	32,654	35,989	34.0%
Polk	222,889	33,867	189,022		117,747	150,000	189,022		159,599	190,138	199,975	21.2%
Putnam	40,689	1,273	39,416		39,508	35,000	39,416		40,045	40,065	40,080	0.1%
St. Johns	96,796	16,162	80,634		28,760	NA	80,634		77,460	81,680	82,636	6.3%
St. Lucie	108,869	75,108	29,237		43,886	37,532	33,761		28,203	29,530	35,854	25.9%
Santa Rosa	58,861	16,453	42,408		43,538	NA	42,408		39,019	44,424	48,355	21.0%
Sarasota	154,387	111,780	42,607		80,014	43,223	42,607		41,581	43,548	54,167	28.9%
Seminole	146,092	102,861	40,836		39,773	49,000	43,231		37,321	41,145	44,925	18.5%
Sumter	51,432	33,193	18,239		19,406	14,600	18,239		18,342	18,366	18,409	0.4%
Suwannee	14,113	21	14,092		17,241	6,000	14,092		13,212	14,260	14,262	7.4%
Taylor	9,950	1	9,949		8,886	5,000	9,949		10,456	10,456	10,456	0.0%
Union	3,673	0	3,673		4,465	3,300	3,673		3,912	3,912	3,912	0.0%
Volusia	295,259	3,422	291,778		98,428	100,000	291,837		291,999	292,456	292,608	0.2%
Wakulla	12,708	3,655	9,053		10,698	15,000	9,053		8,364	9,386	10,877	26.8%
Walton	38,494	1,990	36,504		21,630	20,000	36,504		30,712	37,077	37,085	17.2%
Washington	10,192	7	10,185		10,134	20,000	10,185		10,242	10,245	10,247	0.0%

Table 4-8 : County Grouped by Characteristics that affect Estimations and Measures of Reliability

County	Large WWTF	Small WWTF	Known			Variables			Measures of Model Quality			
Group A	<= 3	<= 10	Improved Parcels	Sewer	OSTDS	self	neighbors	group	% Correct	% OSTDS Wrong	Range, % of Midpoint	Reliability
Baker	1	3	8,245	1,552	1,488	1	0	3	99.5%	0.6%	0.3%	good
Bradford	2	3	10,004	1,425	1,896	0	0	4	97.4%	1.7%	1.7%	good
Calhoun	1	0	5,463	483	139	0	0	3	90.0%	12.5%	98.6%	low number, poor
Dixie	0	3	9,031	1	1,759	1	0	0	99.9%	0.0%	0.0%	low number, biased
Franklin	2	7	6,784	164	563	1	0	1	98.3%	1.4%	24.1%	low number, good
Gadsden	2	8	17,421	571	3,764	0	0	4	99.3%	0.4%	1.8%	low number, biased
Gilchrist	0	5	7,230	4	1,765	0	0	1	99.8%	0.1%	0.0%	low number, biased
Gulf	1	5	8,978	730	1,797	1	0	4	95.9%	2.5%	3.5%	biased
Hamilton	1	8	5,613	344	776	1	0	1	93.1%	4.9%	43.5%	low number, good
Holmes	1	3	8,344	88	316	0	0	2	98.5%	0.6%	0.5%	low number
Jackson	3	5	18,894	402	4,206	0	0	3	99.2%	0.6%	0.1%	low number, biased
Jefferson	1	3	6,392	7	2,165	0	0	1	99.7%	0.0%	0.4%	low number, biased
Lafayette	0	2	2,829	3	587	0	0	1	99.8%	0.2%	0.0%	low number, biased
Liberty	0	2	2,663	1	44	0	0	1	97.8%	0.0%	0.0%	low number
Madison	1	5	7,643	7	1,757	0	0	2	99.5%	0.1%	0.2%	low number, biased
Suwannee	1	8	14,113	29	1,192	1	0	1	99.7%	0.1%	7.4%	low number, biased
Taylor	1	4	9,950	4	3,017	1	0	0	99.9%	0.0%	0.0%	low number, biased
Union	1	0	3,673	0	1,710	1	0	0	100.0%	0.0%	0.0%	low number, biased
Wakulla	1	5	12,708	2,151	3,154	1	0	2	80.1%	16.0%	26.8%	good
Washington	1	5	10,192	6	1,756	2	0	0	99.7%	0.0%	0.0%	low number, biased

Group B	<= 5	10 <= 50	Parcels	Sewer	OSTDS	self	neighbors	group	% Correct	% OSTDS Wrong	Range, % of Midpoint	Reliability
Alachua	4	16	80,317	43,582	29,636	2	0	4	93.0%	11.8%	1.0%	good
Bay	7	7	86,990	12,914	7,653	2	0	4	98.3%	3.2%	31.2%	good
Clay	7	17	66,656	28,128	10,519	2	0	1	92.7%	18.9%	10.8%	good
Collier	6	16	97,498	5,407	6,404	1	0	2	99.7%	0.4%	5.8%	good
Escambia	4	6	123,033	55,060	20,175	3	0	2	79.8%	65.8%	32.1%	poor
Indian River	5	7	53,895	7,031	9,613	0	0	1	94.1%	8.1%	3.4%	good
Leon	4	8	88,913	50,608	18,387	1	0	3	99.2%	1.9%	5.9%	biased, good
Manatee	5	4	110,933	3	4,965	2	0	0	99.9%	0.0%	0.0%	low number, biased
St. Johns	10	17	96,796	12,600	13,906	1	0	3	99.1%	1.4%	6.3%	good
Santa Rosa	6	6	58,861	9,642	13,240	0	0	4	82.0%	18.0%	21.0%	good
Seminole	11	13	146,092	66,600	8,514	3	0	1	93.3%	44.1%	18.5%	biased, poor
Walton	5	6	38,494	1,193	4,140	1	0	3	97.6%	0.1%	17.2%	biased

Table 4-8 : County Grouped by Characteristics that affect Estimations and Measures of Reliability

County	Large WWTF	Small WWTF	Known			Variables			Measures of Model Quality			
Group C	4 <= 20	5 <= 20	Parcels	Sewer	OSTDS	self	neighbors	group	% Correct	% OSTDS Wrong	Range, % of Midpoint	Reliability
Charlotte	4	23	97,937	30,023	35,243	2	0	4	79.2%	15.2%	14.3%	good
Columbia	1	19	25,286	2,115	5,988	2	0	4	97.7%	0.0%	1.8%	fair
De Soto	2	18	11,114	6	2,620	0	0	2	99.8%	0.1%	0.0%	low number, biased
Flagler	4	14	42,255	273	2,442	2	0	2	99.0%	0.9%	0.4%	low number, biased
Glades	0	21	5,549	4	1,142	2	0	0	99.6%	0.1%	0.0%	low number, biased
Hardee	1	13	8,832	4	1,621	1	0	0	99.8%	0.0%	0.0%	low number, biased
Hendry	1	14	13,006	12	2,404	2	0	2	99.8%	0.0%	0.2%	low number, biased
Highlands	3	59	39,863	4,897	7,923	0	0	2	99.6%	0.4%	1.9%	good
Levy	0	13	20,427	6	4,556	2	0	1	99.9%	0.0%	0.1%	low number, biased
Nassau	3	13	33,221	4,688	6,974	2	0	2	99.1%	0.6%	2.7%	fair
Okeechobee	1	17	16,306	302	2,500	1	0	1	89.2%	1.9%	7.7%	biased, good
Putnam	1	26	40,689	419	7,269	1	0	2	99.6%	0.2%	0.1%	biased, good
Sumter	4	29	51,432	28,059	1,859	1	0	2	99.4%	0.6%	0.4%	biased, good
Group D	5 <= 20	21 <= 60	Parcels	Sewer	OSTDS	self	neighbors	group	% Correct	% OSTDS Wrong	Range, % of Midpoint	Reliability
Brevard	17	39	210,224	46,312	25,435	1	0	4	91.1%	10.0%	13.5%	good
Citrus	6	60	65,700	134	17,436	1	0	1	99.2%	0.8%	0.0%	low number, biased
Miami-Dade	4	21	489,351	281,245	23,073	2	0	4	94.2%	65.1%	20.4%	fair
Hernando	7	24	78,145	26,867	15,127	1	0	4	98.6%	0.2%	2.6%	good
Lee	15	57	238,982	19,495	68,079	2	0	3	99.1%	0.6%	0.8%	biased, good
Martin	7	29	71,038	3,570	3,595	2	0	3	97.9%	3.0%	46.1%	good
Orange	11	39	312,216	54,890	20,989	0	0	3	97.4%	5.0%	12.7%	good
Osceola	10	29	112,276	12,067	7,286	0	0	4	99.1%	0.7%	53.4%	good
Palm Beach	10	44	392,436	250,004	14,400	0	0	4	99.0%	14.3%	5.5%	biased, fair
Pasco	12	59	245,141	1,921	19,130	0	0	4	98.1%	0.3%	3.2%	biased, fair
St. Lucie	7	25	108,869	42,172	8,326	3	0	2	90.6%	48.9%	25.9%	poor
Sarasota	13	34	154,387	75,243	4,783	1	0	4	97.2%	36.9%	28.9%	biased, poor

Table 4-8 : County Grouped by Characteristics that affect Estimations and Measures of Reliability

County	Large WWTF	Small WWTF	Known			Variables			Measures of Model Quality			
Group E	mixed	>=90	Parcels	Sewer	OSTDS	self	neighbors	group	% Correct	% OSTDS Wrong	Range, % of Midpoint	Reliability
Hillsborough	10	112	408,004	227,932	20,515	1	0	3	96.3%	32.6%	16.7%	biased, poor
Lake	11	103	151,439	27,948	20,388	1	0	3	97.9%	29.6%	8.9%	fair
Marion	9	117	149,007	2,930	37,823	1	0	4	99.2%	0.3%	4.6%	biased, fair
Monroe	2	228	48,106	1,107	6,271	1	0	2	99.0%	0.1%	2.0%	biased, fair
Polk	22	133	222,889	19,519	21,553	1	0	4	99.1%	0.5%	21.2%	good
Volusia	13	92	295,259	1,908	18,131	1	0	4	99.7%	0.1%	0.2%	biased, fair
Group F	5 <= 20	<= 5	Parcels	Sewer	OSTDS	self	neighbors	group	% Correct	% OSTDS Wrong	Range, % of Midpoint	Reliability
Broward	15	1	420,678	205,969	8,468	4	0	4	97.9%	47.7%	5.6%	biased, poor
Duval	16	9	312,400	141,421	15,290	1	0	4	97.4%	17.5%	8.4%	biased, fair
Okaloosa	12	6	84,025	995	7,931	0	0	4	99.9%	0.1%	1.1%	biased, fair
Pinellas	18	5	406,913	240,932	2,184	1	0	4	99.5%	40.5%	34.0%	biased, poor

Table 4-9 : Details of Modeling Results

COUNTY	perSptcTA	perSptcLUT	perSptcNBR	perSptcAcres	yrblt	Nbldg	totsqft	acres	AIC	N modeled	%Correct	%septicwrong
Florida												
Alachua	Y	Y	Y	Y	Y	Y			27,918.0	71,133	93.0%	11.8%
Baker	Y	Y		Y	Y				141.9	2,844	99.5%	0.6%
Bay	Y		Y	Y		Y	Y		1,854.6	20,528	98.3%	3.2%
Bradford	Y	Y	Y	Y					649.6	3,313	97.4%	1.7%
Brevard	Y	Y	Y	Y			Y		30,827.0	71,461	91.1%	10.0%
Broward	Y	Y		Y	Y	Y	Y	Y	34,923.0	204,073	97.9%	47.7%
Calhoun	Y	Y	Y						280.4	605	90.0%	12.5%
Charlotte	Y	Y	Y	Y		Y	Y		49,221.0	60,042	79.2%	15.2%
Citrus		Y					Y		1,372.5	17,570	99.2%	0.8%
Clay		Y		Y			Y		16,735.0	38,627	92.7%	18.9%
Collier	Y	Y					Y		404.0	11,810	99.7%	0.4%
Columbia	Y	Y	Y	Y		Y	Y		964.2	8,095	97.7%	0.02%
MiamiDade	Y	Y	Y	Y		Y	Y		101,837.0	300,874	94.2%	65.1%
DeSoto		Y	Y						26.3	2,623	99.8%	0.1%
Dixie								Y	20.0	1,760	99.9%	0.0%
Duval	Y	Y	Y	Y				Y	24,757.0	156,711	97.4%	17.5%
Escambia		Y		Y			Y	Y	71,155.0	75,716	79.8%	65.8%
Flagler			Y	Y	Y		Y		162.8	2,274	99.0%	0.9%
Franklin			Y					Y	179.5	727	98.3%	1.4%
Gadsden	Y	Y	Y	Y					224.5	4,332	99.3%	0.4%
Gilchrist		Y							37.6	1,763	99.8%	0.1%
Glades				Y		Y			45.8	1,146	99.6%	0.1%
Gulf	Y	Y	Y	Y	Y				584.8	1,999	95.9%	2.5%
Hamilton		Y						Y	691.6	1,117	93.1%	4.9%
Hardee								Y	57.8	1,625	99.8%	0.0%
Hendry	Y	Y				Y		Y	58.8	2,416	99.8%	0.04%
Hernando	Y	Y	Y	Y	Y				3,976.9	39,951	98.6%	0.2%
Highlands		Y	Y						386.6	12,778	99.6%	0.4%
Hillsborough	Y		Y	Y		Y			51,933.0	248,447	96.3%	32.6%
Holmes	Y	Y							68.0	404	98.5%	0.6%
IndianRiver	Y	Y	Y					Y	5,380.0	16,644	94.1%	8.1%
Jackson	Y	Y	Y						280.6	4,608	99.2%	0.6%
Jefferson		Y							35.7	2,158	99.7%	0.00%
Lafayette		Y							8.5	590	99.8%	0.2%
Lake	Y		Y	Y			Y		5,789.6	48,336	97.9%	29.6%

Table 4-9 : Details of Modeling Results

COUNTY	perSptcTA	perSptcLUT	perSptcNBR	perSptcAcres	yrblt	Nbldg	totsqft	acres	AIC	N modeled	%Correct	%septicwrong
Florida												
Lee	Y		Y	Y		Y		Y	4,831.6	87,574	99.1%	0.6%
Leon	Y	Y	Y				Y		4,773.8	68,410	99.2%	1.9%
Levy		Y					Y	Y	43.4	4,552	99.9%	0.00%
Liberty	Y								13.5	45	97.8%	0.00%
Madison		Y		Y					74.4	1,761	99.5%	0.1%
Manatee						Y		Y	44.5	4,968	99.9%	0.0%
Marion	Y	Y	Y	Y			Y		2,157.5	40,180	99.2%	0.3%
Martin	Y		Y	Y			Y	Y	891.5	7,165	97.9%	3.0%
Monroe	Y		Y				Y		568.7	7,378	99.0%	0.1%
Nassau	Y		Y				Y		821.6	11,662	99.1%	0.6%
Okaloosa	Y	Y	Y	Y					93.9	8,876	99.9%	0.1%
Okeechobee		Y						Y	1,504.1	2,802	89.2%	1.9%
Orange	Y		Y	Y					12,329.0	75,879	97.4%	5.0%
Osceola	Y	Y	Y	Y					1,243.0	19,287	99.1%	0.7%
PalmBeach	Y	Y	Y	Y					19,285.0	263,974	99.0%	14.3%
Pasco	Y	Y		Y					2,563.0	21,041	98.1%	0.3%
Pinellas	Y	Y	Y	Y		Y			7,527.4	241,127	99.5%	40.5%
Polk	Y	Y	Y	Y		Y			2,735.5	40,959.0	99.1%	0.5%
Putnam	Y	Y				Y			367.6	7,675	99.6%	0.2%
StJohns		Y	Y	Y		Y			1,367.1	26,355	99.1%	1.4%
StLucie			Y	Y	Y	Y	Y		22,511.0	48,187	90.6%	48.9%
SantaRosa	Y	Y	Y	Y					16,514.0	22,823	82.0%	18.0%
Sarasota	Y	Y	Y	Y			Y		12,253.0	79,947	97.2%	36.9%
Seminole	Y			Y	Y		Y		27,131.0	69,427	93.3%	44.1%
Sumter	Y		Y				Y		982.6	29,908	99.4%	0.6%
Suwannee				Y				Y	172.2	1,221	99.7%	0.1%
Taylor								Y	59.5	3,021	99.9%	0.00%
Union								Y	4.0	1,710	100.0%	0.0%
Volusia	Y	Y	Y	Y		Y			395.9	20,033	99.7%	0.1%
Wakulla		Y		Y			Y		4,569.0	5,302	80.1%	16.0%
Walton	Y		Y	Y			Y		744.5	5,333	97.6%	0.1%
Washington						Y		Y	77.9	1,762	99.7%	0.00%

Table 4-9 : Details of Modeling Results

COUNTY	NULL (vacant no WW)	EstSeptic	EstSewer	NotEstimated	Known Septic	Known Sewer	Known Vac Septic	Known Vac Sewer	Known Imp Septic	Known Imp Sewer
Florida	2,850,379	2,846,363	1,137,714	50,904	649,757	2,056,129	50,850	64,135	598,907	1,991,994
Alachua	17,831	1,204	1,470	5,943	29,636	43,582	1,184	334	28,452	43,248
Baker	3,880	4,759	507	130	1,488	1,552	142	49	1,346	1,503
Bay	28,628	46,521	21,458	0	7,653	12,914	806	750	6,847	12,164
Bradford	4,264	6,053	883	0	1,896	1,425	226	27	1,670	1,398
Brevard	80,882	120,826	20,097	85	25,435	46,312	1,827	704	23,608	45,608
Broward	63,319	62,061	146,653	4,808	8,468	205,969	248	7,033	8,220	198,936
Calhoun	4,735	3,096	1,786	80	139	483	81	40	58	443
Charlotte	115,970	21,325	8,909	6,931	35,243	30,023	3,486	1,008	31,757	29,015
Citrus	60,943	49,291	34	0	17,436	134	1,172	23	16,264	111
Clay	15,947	12,251	16,659	0	10,519	28,128	765	136	9,754	27,992
Collier	77,060	75,130	11,774	0	6,404	5,407	310	907	6,094	4,500
Columbia	14,404	15,105	22,796	0	5,988	2,115	694	24	5,294	2,091
MiamiDade	50,777	97,817	98,677	0	23,073	281,245	1,334	10,127	21,739	271,118
DeSoto	7,739	7,867	3	881	2,620	6	262	1	2,358	5
Dixie	8,246	7,585	0	0	1,759	1	313	1	1,446	0
Duval	42,027	52,828	105,800	0	15,290	141,421	781	2,158	14,509	139,263
Escambia	24,178	20,363	29,412	0	20,175	55,060	1,025	952	19,150	54,108
Flagler	30,359	36,269	1,449	0	2,442	273	262	84	2,180	189
Franklin	9,086	5,321	874	0	563	164	105	33	458	131
Gadsden	8,855	10,920	446	2,194	3,764	571	434	40	3,330	531
Gilchrist	7,172	5,748	2	0	1,765	4	287	2	1,478	2
Glades	5,556	4,506	3	0	1,142	4	106	0	1,036	4
Gulf	7,262	6,026	517	368	1,797	730	399	61	1,398	669
Hamilton	8,683	3,007	1,681	0	776	344	165	30	611	314
Hardee	4,973	7,461	0	0	1,621	4	252	2	1,369	2
Hendry	22,171	10,924	23	0	2,404	12	352	5	2,052	7
Hernando	36,245	33,330	3,153	1,273	15,127	26,867	951	654	14,176	26,213
Highlands	55,181	29,453	436	0	7,923	4,897	659	2,187	7,264	2,710
Hillsborough	54,489	47,637	119,112	0	20,515	227,932	1,155	6,037	19,360	221,895
Holmes	6,895	7,809	216	0	316	88	74	11	242	77
IndianRiver	22,876	34,816	3,250	0	9,613	7,031	680	135	8,933	6,896
Jackson	19,654	15,315	340	0	4,206	402	1,351	18	2,855	384
Jefferson	5,941	4,572	0	0	2,165	7	347	5	1,818	2
Lafayette	3,922	2,352	10	0	587	3	122	1	465	2
Lake	68,913	86,522	19,299	0	20,388	27,948	766	1,952	19,622	25,996

Table 4-9 : Details of Modeling Results

COUNTY	NULL (vacant no WW)	EstSeptic	EstSewer	NotEstimated	Known Septic	Known Sewer	Known Vac Septic	Known Vac Sewer	Known Imp Septic	Known Imp Sewer
Florida	2,850,379	2,846,363	1,137,714	50,904	649,757	2,056,129	50,850	64,135	598,907	1,991,994
Lee	189,596	155,759	5,658	0	68,079	19,495	9,305	704	58,774	18,791
Leon	14,352	13,784	10,123	0	18,387	50,608	1,403	2,586	16,984	48,022
Levy	27,779	16,319	12	0	4,556	6	461	5	4,095	1
Liberty	3,464	2,621	0	0	44	1	2	1	42	0
Madison	7,939	6,161	4	0	1,757	7	283	3	1,474	4
Manatee	29,854	106,247	24	0	4,965	3	306	0	4,659	3
Marion	114,507	108,783	2,990	0	37,823	2,930	2,579	940	35,244	1,990
Martin	6,470	60,809	3,177	0	3,595	3,570	61	52	3,534	3,518
Monroe	41,100	40,706	990	0	6,271	1,107	929	39	5,342	1,068
Nassau	13,560	20,347	1,972	0	6,974	4,688	551	209	6,423	4,479
Okaloosa	15,987	70,101	5,713	0	7,931	995	621	94	7,310	901
Okeechobee	16,380	13,195	708	0	2,500	302	227	172	2,273	130
Orange	52,733	196,505	42,392	0	20,989	54,890	758	1,802	20,231	53,088
Osceola	36,240	23,419	70,274	0	7,286	12,067	483	287	6,803	11,780
PalmBeach	41,410	49,149	82,000	0	14,400	250,004	689	2,428	13,711	247,576
Pasco	7,417	221,780	2,320	0	19,130	1,921	10	0	19,120	1,921
Pinellas	20,627	30,470	118,938	21,233	2,184	240,932	4	6,840	2,180	234,092
Polk	84,003	168,585	15,023	0	21,553	19,519	1,116	675	20,437	18,844
Putnam	594,999	32,796	868	0	7,269	419	649	14	6,620	405
StJohns	63,555	67,774	4,070	0	13,906	12,600	1,046	508	12,860	12,092
StLucie	42,448	21,204	34,463	4,524	8,326	42,172	293	1,527	8,033	40,645
SantaRosa	28,438	31,184	8,302	0	13,240	9,642	2,016	1,491	11,224	8,151
Sarasota	58,798	38,765	39,221	0	4,783	75,243	941	2,684	3,842	72,559
Seminole	19,576	32,631	40,783	2,395	8,514	66,600	309	4,522	8,205	62,078
Sumter	19,859	16,507	5,452	0	1,859	28,059	127	318	1,732	27,741
Suwannee	14,503	13,068	4	0	1,192	29	168	12	1,024	17
Taylor	8,381	7,439	0	0	3,017	4	507	3	2,510	1
Union	2,806	2,202	0	0	1,710	0	239	0	1,471	0
Volusia	191,656	274,325	1,579	59	18,131	1,908	678	65	17,453	1,843
Wakulla	11,217	6,232	2,116	0	3,154	2,151	333	612	2,821	1,539
Walton	39,130	32,937	805	0	4,140	1,193	573	8	3,567	1,185
Washington	32,532	8,489	4	0	1,756	6	60	3	1,696	3

Table 4-9 : Details of Modeling Results

COUNTY	Total OSTDS prob >=0.25	Total OSTDS prob >= 0.5	Total OSTDS prob >= 0.75	Differnce 75%-25% of Median	sum OSTDS prob >=0.5	Total Parcels Estimated WWT	Total Parcels Known WWT	Total OSTDS Improved Only	Total Improved
Florida	3,652,276	3,496,120	3,317,152	9.6%	3,357,576	3,984,077	2,705,886	3,445,270	6,608,050
Alachua	30,937	30,840	30,633	1.0%	30,726	2,674	73,218	29,656	80,317
Baker	6,257	6,247	6,240	0.3%	6,211	5,266	3,040	6,105	8,245
Bay	69,680	54,174	52,797	31.2%	52,061	67,979	20,567	53,368	86,990
Bradford	8,002	7,949	7,864	1.7%	7,746	6,936	3,321	7,723	10,004
Brevard	149,671	146,261	129,948	13.5%	135,812	140,923	71,747	144,434	210,224
Broward	72,697	70,529	68,756	5.6%	66,778	208,714	214,437	70,281	420,678
Calhoun	4,298	3,235	1,107	98.6%	2,234	4,882	622	3,154	5,463
Charlotte	60,632	56,568	52,524	14.3%	54,338	30,234	65,266	53,082	97,937
Citrus	66,729	66,727	66,721	0.0%	66,303	49,325	17,570	65,555	65,700
Clay	24,120	22,770	21,671	10.8%	21,747	28,910	38,647	22,005	66,656
Collier	86,071	81,534	81,380	5.8%	78,596	86,904	11,811	81,224	97,498
Columbia	21,262	21,093	20,881	1.8%	20,830	37,901	8,103	20,399	25,286
MiamiDade	134,473	120,890	109,824	20.4%	111,949	196,494	304,318	119,556	489,351
DeSoto	10,490	10,487	10,487	0.0%	10,485	7,870	2,626	10,225	11,114
Dixie	9,344	9,344	9,344	0.0%	9,338	7,585	1,760	9,031	9,031
Duval	71,170	68,118	65,481	8.4%	64,959	158,628	156,711	67,337	312,400
Escambia	49,974	40,538	36,970	32.1%	37,516	49,775	75,235	39,513	123,033
Flagler	38,860	38,711	38,686	0.4%	38,478	37,718	2,715	38,449	42,255
Franklin	6,530	5,884	5,111	24.1%	5,444	6,195	727	5,779	6,784
Gadsden	14,869	14,684	14,605	1.8%	14,573	11,366	4,335	14,250	17,421
Gilchrist	7,513	7,513	7,513	0.0%	7,505	5,750	1,769	7,226	7,230
Glades	5,648	5,648	5,647	0.0%	5,637	4,509	1,146	5,542	5,549
Gulf	7,933	7,823	7,663	3.5%	7,439	6,543	2,527	7,424	8,978
Hamilton	4,645	3,783	3,001	43.5%	3,371	4,688	1,120	3,618	5,613
Hardee	9,085	9,082	9,085	0.0%	9,065	7,461	1,625	8,830	8,832
Hendry	13,344	13,328	13,317	0.2%	13,296	10,947	2,416	12,976	13,006
Hernando	49,206	48,457	47,922	2.6%	47,801	36,483	41,994	47,506	78,145
Highlands	37,528	37,376	36,825	1.9%	36,758	29,889	12,820	36,717	39,863
Hillsborough	73,783	68,152	62,374	16.7%	64,524	166,749	248,447	66,997	408,004
Holmes	8,126	8,125	8,084	0.5%	7,974	8,025	404	8,051	8,344
IndianRiver	45,717	44,429	44,226	3.4%	43,407	38,066	16,644	43,749	53,895
Jackson	19,534	19,521	19,521	0.1%	19,482	15,655	4,608	18,170	18,894
Jefferson	6,737	6,737	6,710	0.4%	6,724	4,572	2,172	6,390	6,392
Lafayette	2,939	2,939	2,939	0.0%	2,939	2,362	590	2,817	2,829
Lake	113,983	106,910	104,455	8.9%	104,858	105,821	48,336	106,144	151,439

Table 4-9 : Details of Modeling Results

COUNTY	Total OSTDS prob >=0.25	Total OSTDS prob >= 0.5	Total OSTDS prob >= 0.75	Differnce 75%-25% of Median	sum OSTDS prob >=0.5	Total Parcels Estimated WWT	Total Parcels Known WWT	Total OSTDS Improved Only	Total Improved
Florida	3,652,276	3,496,120	3,317,152	9.6%	3,357,576	3,984,077	2,705,886	3,445,270	6,608,050
Lee	224,152	223,838	222,265	0.8%	221,997	161,417	87,574	214,533	238,982
Leon	33,912	32,171	32,025	5.9%	32,001	23,907	68,995	30,768	88,913
Levy	20,878	20,875	20,852	0.1%	20,858	16,331	4,562	20,414	20,427
Liberty	2,665	2,665	2,665	0.0%	2,614	2,621	45	2,663	2,663
Madison	7,922	7,918	7,910	0.2%	7,897	6,165	1,764	7,635	7,643
Manatee	111,221	111,212	111,206	0.0%	111,155	106,271	4,968	110,906	110,933
Marion	147,541	146,606	140,827	4.6%	143,368	111,773	40,753	144,027	149,007
Martin	65,413	64,404	35,748	46.1%	53,359	63,986	7,165	64,343	71,038
Monroe	47,446	46,977	46,518	2.0%	45,452	41,696	7,378	46,048	48,106
Nassau	27,330	27,321	26,581	2.7%	26,346	22,319	11,662	26,770	33,221
Okaloosa	78,513	78,032	77,677	1.1%	77,445	75,814	8,926	77,411	84,025
Okeechobee	16,403	15,695	15,189	7.7%	14,870	13,903	2,802	15,468	16,306
Orange	233,495	217,494	205,962	12.7%	201,703	238,897	75,879	216,736	312,216
Osceola	46,545	30,705	30,138	53.4%	30,136	93,693	19,353	30,222	112,276
PalmBeach	65,838	63,549	62,367	5.5%	62,556	131,149	264,404	62,860	392,436
Pasco	241,378	240,910	233,556	3.2%	230,369	224,100	21,051	240,900	245,141
Pinellas	35,989	32,654	24,887	34.0%	28,466	149,408	243,116	32,650	406,913
Polk	199,975	190,138	159,599	21.2%	172,550	183,608	41,072	189,022	222,889
Putnam	40,080	40,065	40,045	0.1%	39,957	33,664	7,688	39,416	40,689
StJohns	82,636	81,680	77,460	6.3%	77,682	71,844	26,506	80,634	96,796
StLucie	35,854	29,530	28,203	25.9%	28,811	55,667	50,498	29,237	108,869
SantaRosa	48,355	44,424	39,019	21.0%	41,783	39,486	22,882	42,408	58,861
Sarasota	54,167	43,548	41,581	28.9%	41,809	77,986	80,026	42,607	154,387
Seminole	44,925	41,145	37,321	18.5%	38,941	73,414	75,114	40,836	146,092
Sumter	18,409	18,366	18,342	0.4%	17,886	21,959	29,918	18,239	51,432
Suwannee	14,262	14,260	13,212	7.4%	13,773	13,072	1,221	14,092	14,113
Taylor	10,456	10,456	10,456	0.0%	10,447	7,439	3,021	9,949	9,950
Union	3,912	3,912	3,912	0.0%	3,912	2,202	1,710	3,673	3,673
Volusia	292,608	292,456	291,999	0.2%	291,438	275,904	20,039	291,778	295,259
Wakulla	10,877	9,386	8,364	26.8%	8,606	8,348	5,305	9,053	12,708
Walton	37,085	37,077	30,712	17.2%	32,268	33,742	5,333	36,504	38,494
Washington	10,247	10,245	10,242	0.0%	10,218	8,493	1,762	10,185	10,192