National Assessment of Onsite Wastewater Treatment Systems (2015-2018): Trends and Resources

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Abstract

The National Environmental Services Center (NESC) has conducted a national assessment of onsite wastewater treatment system (OWTS) permits in 1993, 1998, and 2015 - 2018. The OWTS data collected in this effort includes new, residential system permits; residential system repairs; new, commercial system (multi-family, commercial, institutional, etc.) permits; and commercial system repairs. This information is illustrated to show a consistency

This led to the development of Onsite System Utilization Rate (OSUR) on new housing, a ratio of onsite system permits over the new single-family housing permits within the same county and time frame. The national OSUR in 2015 represents the most reliable OSUR value with an 82% local agency response rate and 63% of total new single-family housing permits included in OSUR calculation. The national OSUR in 2015 is calculated to be 30%, which suggests approximately 1/3 of new housings use an onsite system.

The knowledge of the current trends and the status of existing OWTS provides local, state, and federal government agencies with necessary information to appropriately allocate resources to ensure OWTS are providing necessary environmental and human health protections. The effort of this project exemplifies: a) widespread reliance on decentralized wastewater treatment to properly treat wastewater across the United States, b) the need to leverage appropriate resources to ensure continued environmental and public health protection, and c) the need for a national database of onsite wastewater system permits.

1. Introduction

Onsite wastewater treatment systems (OWTS) have been and will continue to be a viable option for the treatment of wastewater in areas not served by centralized wastewater treatment systems. Every state in the nation has a population served by decentralized (onsite) wastewater systems. The measurement of OWTS utilization on a national scale has not been conducted since the 1990 Census. Currently, groups are working to have decentralized wastewater questions included in the American Community survey through the U.S. Census Bureau. However, this task will take several years to complete and at this time, there is no commitment to ensure the topic will be addressed in future surveys.

In response, the National Environmental Services Center (NESC) conducted a national assessment of onsite wastewater systems in 1993 and 1998. NESC published the results of both surveys in a report titled, "*National Onsite Wastewater Treatment: A National Small Flows Clearinghouse Summary of Onsite Systems in the United States, 1998*." **Table 1** is a summary of the total of the permits reported.

Table 1. Historical onsite wastewater system permit data reported in 1993 and 1998 broken down by new, repair/replace, and failing.

Historical onsite system permits by type						
	New residential onsite system permits		Repair / Replace onsite system permits		Reported failing onsite system	
	1993	1998	1993	1998	1993	1998
Total	270,431	333,838	68,515	81,925	56,263	88,889

1.1 Project Objective

The objective of this project is to conduct a national assessment of onsite wastewater system installations over the period of 2015-2018.

1.2 Project Activities Summary

NESC has gathered onsite wastewater system utilization data over the four-year span 2015-2018. This effort is composed of two phases: Phase 1) pilot survey for collection of 2015 data; and Phase 2) expansion of dataset to include 2016-2018. Phase 1 is the initial attempt to contact agencies for onsite system permit data pertaining to 2015. The data complied allows permit data to be analyzed by a) size: single-family and large (terminology changed to "residential" and "commercial" in Phase 2); and b) type: new and repair/replace. Depending on the quality of the data received, repair/replace was further broken down by type of repair. The Phase 1 analysis led to the concept development of **Onsite System Utilization Rate (OSUR)**, a measure to calculate the percentage of new residential housing built with an onsite wastewater system permit. Phase 2 concluded this study by expanding the Phase 1 database to include 2015-2018, and utilizing the data to determine trends in onsite wastewater system installation with relation to new housing construction as well as onsite system maintenance across the United States.

1.3 What This Report Contains

This report is to convey the information obtained from state and local regulators/permitting authorities regarding onsite wastewater installations during 2015-2018. Specifically, the report first describes the methods used for information collection, data sources, and reliability. A national overview is provided to summarize permitting agency responses, and type of data collected. The data includes new, residential system permits; residential system repairs; new, commercial system (multi-family, commercial, institutional, etc.) permits; and commercial system repairs. This report also includes the calculated OSUR and their trends as well as decentralized infrastructure sustainability indicated by system replacement rates.

1.4 Potential Benefits

Knowledge of the current trends and the status of existing OWTS will provide local, state, and federal government agencies with necessary information to appropriately allocate resources to ensure OWTS are providing necessary environmental and human health protections. This effort acknowledges centralized wastewater treatment is not a viable option, economically or environmentally, for everyone. Onsite systems, when properly sited and installed, provide as good if not better wastewater treatment and environmental protection as large-scale centralized systems. This effort exemplifies a) widespread reliance on decentralized wastewater treatment to properly treat wastewater across the United States, and b) the need to leverage appropriate resources to

ensure continued environmental and public health protection. Manufacturers and contractors may utilize the report findings to identify market trends, opportunities, and potential coverage gaps.

2. Information Collection Methods

2.1 Onsite Wastewater Treatment System Information

NESC worked with the project sponsor to develop a state regulatory assessment survey via an online tool. NESC sent a request to state onsite regulatory agencies in all 50 states and solicited assistance from the State Onsite Regulators Association (SORA) to encourage its members to respond to the request. Data collected from the state regulatory agencies provided NESC with each state's respective permitting structure and preliminary data regarding the number of new, residential, and commercial onsite system permits and onsite system repair permits. If the state agency maintains permit data, NESC requested the state share the local permitting level data. For state agencies not maintaining permit data, NESC compiled a contact list of local permitting authorities and requested they complete the online assessment about their local-level data.

*2.2 H*ousing Information

NESC collected monthly housing data, constructed and manufactured, at the county level through the Census Bureau. Constructed housing permits are installation permits for housing units constructed onsite; whereas, manufactured housing installation permits are equivalent to housing units constructed offsite and delivered in modules. Both housing permits were counted with a 6-month lag; *i.e.,* permits in 2015 consist of permits from July 2014 to June 2015. The 6-month lag count is done in order to account for a 6-month construction period and number of finished constructions with an onsite wastewater treatment permit in the report year. The information made available through the Census Bureau was limited at a county level and thus subsidized by estimates provided through an algorithm utilizing decennial historical housing percentages. These estimates were highly accurate in comparison to the data provided through the Census Bureau.

2.3 Sources of Data

The Census Bureau provides two sets of data in the "Residential building permits survey documentation county ASCII files" 1) estimates with imputation and 2) reported only. The estimates with imputation dataset include reported data for monthly respondents and imputed data for non-respondents, and was utilized for this project. Reported data is composed of construction authorized by building permits submitted by local permit officials, and obtained through Form C-404, "Report of Building or Zoning Permits Issued and Local Public Construction." Mitigation of missing data is done by either 1) Survey of Use of Permits (SUP) or 2) imputation. The SUP is used to collect information on housing available only for about 850 areas for which Census Bureau interviewers list and sample the permits that authorized construction of new residential structures. For places not in the SUP, imputations are based on the assumption the ratio of current month authorizations to those of a year ago should be the same for both respondents and non-respondents.

2.4 Reliability of the Data

Explicit measures of the effects of errors are not available. However, the Census Bureau has expressed the importance of detecting and correcting the operational errors of the data to a degree of "reasonableness and consistency." These operational errors are attributed to many sources: inability to obtain information about all cases, differences in interpretation of questions, inability

or unwillingness by respondents to provide correct information, and errors made in processing the data.

The reported statistics are also influenced by the following limiting factors:

1. The portion of building permit records is inherently limited since such records do not reflect construction activity outside of areas subject to local permit requirements. This portion is likely to be minimal.
2. Building permit jurisdictions may close their books a few days before the end of the month/year; therefore, totals may not strictly align with the calendar month/year.
3. Roughly three percent of residential houses built in permit-issuing places are built without a permit according to a previous Census Bureau study spanning four years.

To the extent most of these limiting factors apply rather consistently over an extended period, they may not seriously impair the usefulness of building permit statistics as prompt indicators of trends in residential construction activity.

3. Results: National Summary

The *Onsite Wastewater System Installation Assessment* in 2015 (Phase 1) received an overall 82% response rate from state regulatory/permitting agencies. The follow-up survey for 2016-2018 (Phase 2) received an overall 45% response rate. Phase 1 was successful in reaching permit authorities in 47 states. Phase 2 was only able to make contact with 30 states; however, states with missing county level data were updated. Arizona was added to the list of successful surveys in Phase 2 from no data collected in Phase 1. Texas was moved from state total to county level data. Kentucky provided to the state total in Phase 2. Continued expansion of this database to make a thorough account of trends in the nation will be done with updates as data is collected.

3.1 Permitting Authority Responses

Permitting authorities vary from state to state and vary within a state depending on system size, type, and/or location. The majority of respondents reported from a county or multi-county authority. Near a third of states maintained a centralized database for permits. Half of the respondents reporting from local permitting authorities such as health departments, city/village/townships. In consideration of state versus local permit collection/handling, Alabama and Kansas have decentralized to local agencies due to cuts in funding. California and Kentucky are working toward a state centralized permit collection system. Given the range of jurisdictions (*i.e.*, level of government), regulation of OWTS is a difficult task for state agencies to collect permit data.

The assessment was broken down by the size of regulated OWTS in addition to function/use of the onsite system permit. Participants were given the following options to select if they regulate by size: 1) residential, residential onsite wastewater systems only; 2) commercial (multi-family, commercial, institutional) onsite wastewater systems only; or 3) both residential and commercial, onsite wastewater systems, but separately; and 4) combined residential and commercial, onsite wastewater systems, without separation.

As an adjustment from Phase 1, an additional breakdown of the collected information was used. Participants were given the additional option to select if they regulate by function: 1) Flowrate; 2) Discharge (surface vs subsurface); 3) Use (commercial, domestic, etc.), 4) No factor of separation; and 5) Other. Option 1 gave respondents the option to specify with most elaborating difference in definition of what is considered a residential permit by gallon per day (GPD). This assessment assumes residential is < 2,500 GPD. This factor is not universal and varies by state/local agency. Other specifications are done by waste strength, water quality, pretreatment options, etc. with relation to commercial output. **Appendix A** summarizes the national assessment of permitting authority including information on agency authority and factors of separation for OWTS permit categorization (e.g., size, use, discharge).

3.2 Size and Types of OWTS Permits

Phase 1 and Phase 2 report a total of 282,147; 196,349; 203,786; and 191,378 onsite wastewater treatment systems were permits and/or installed for 2015, 2016, 2017, and 2018, respectively. There is no national standard for size classification; and unfortunately, not all states distinguish between residential and commercial onsite systems. States that do separate by size have different

measurements for categorization; size and function (flowrate, discharge, use, end treatment). The majority of states define residential and commercial in relation to the size of the system. The residential classification, on a national scale, is refers to a system size of < 2,500 GPD. This term does not define the limit of the study; rather, clarifies the referenced system size by a majority of the states. State maximum flow rate definitions for a residential sized OWTS vary from 1,500 GPD and 5,000 GPD. The state-by-state size definitions are discussed in the state review section of the report, but vary mainly due to climate and site soil type. Classification of OWTS by size, residential and commercial, is clarified by the end use of the system, refer to **Appendix A**. **Table 2** provides total permits by size (Residential, Commercial, or Combined) with the percentage of permit size to total permits. The "Combined" permits refers to states that do not separate permits into category of size or function. The percentages have remained constant through Phase 1 and 2.

Table 2. Documented national total onsite system permit breakdown by size in 2015 – 2018. Percentage of permit size to total permits.

Documented national total OWTS permits by size 2015 - 2018								
Permit size	2015		2016		2017		2018	
Residential	195,602	70%	149,929	70%	159,496	73%	148,112	70%
Commercial	3,668	1%	3,443	2%	3,479	2%	3,513	2%
Combined	81,093	29%	59,656	28%	56,935	26%	58,932	28%
Total Permits	**280,363**		**213,028**		**219,910**		**210,557**	

New onsite system permits accounted for ~70% of the total permits issued in 2015-2018; with repair/replacement permits accounting for ~30% of total permits. The increase of reported new permits of 8%, from 2015 (67%) to the following three years (~75%), can be explained by comparing the national survey response rate of Phase 1 (82%) to Phase 2 (~45%). The total number of new and repair / replace permits reported dropped significantly from 2015 to 2016. The significant decrease in reported total OWTS permits from 2015 to the following three years can be explained by comparing the national survey response rate of Phase 1 (82%) to Phase 2 (~45%). There is a peak in total OWTS permits for 2017 at 219,910 total permits followed by the lowest number of permits at ~210,557 for 2018. **Table 3** provides total values and percentages of new and repair/replace OWTS permits reported nationally.

Table 3. Documented national total onsite wastewater treatment system permit breakdown by type (new and repair/replace) in 2015 – 2018. Percentage of permit type to total permits.

Documented national total OWTS permits by type 2015 - 2018								
Permit Type	2015		2016		2017		2018	
New	189,233	67%	160,129	75%	166,192	76%	157,691	75%
Repair / Replace	91,130	33%	52,899	25%	53,718	24%	52,866	25%
Total Permits	**280,363**		**213,028**		**219,910**		**210,557**	

Table 4 provides total values and percentages of new OWTS permits reported nationally in 2015 - 2018. New permits broken down further by size (residential, commercial, and combined). Size is denoted by residential, commercial, and combined. The "combined" category represents states that do not separate by size. There is no change with the comparison of commercial and combined permits even with the change in response rate between 2015 - 2018. There is a decrease of reported residential new permit from 2015 to 2016. The significant changes in residential new permit totals and percentages from 2015 to the following three years can be explained by comparing the national survey response rate of Phase 1 (82%) to Phase 2 (45%). However, an area of interest is the ~10,000 residential new permit increase for 2017. There was an expected drop in residential permits with some states unable to report 2017 data (i.e. Oregon – no data available, Alabama – 33% response rate for 2017 and 2018).

Table 4. Documented national new onsite system permit breakdown by size and type in 2015 – 2018. Percentage of permit type to total permits.

Documented national new OWTS permits 2015 - 2018								
Size	2015		2016		2017		2018	
Residential	131,410	69%	100,229	63%	109,780	66%	98,310	62%
Commercial	2,776	1%	2,361	1%	2,379	1%	2,328	1%
Combined	55,047	29%	57,539	36%	54,033	33%	57,053	36%
Total New	**189,233**		**160,129**		**166,192**		**157,691**	
Notes:	Size is denoted by residential, commercial, and combined.							
	"Combined" denotes state that do not separate by size.							

Table 5 provides total values and percentages of repair/replace OWTS permits issued nationally in 2015 - 2018. Repair/replace permits broken down further by size (residential, commercial, and combined). Size is denoted by residential, commercial, and combined. The combined category represents states that do not separate by size. The significant changes in residential and combined repair / replace permit totals and percentages from 2015 to the following three years can be explained by comparing the national response rate of Phase 1 (82%) to Phase 2 (45%). There is a decrease of ~15,000 residential repair / replace as well as a decrease of ~24,000 combined repair / replace permits from 2015 to 2016. Notice the 40% increase of ~800 combined repair /replace permit for 2017 followed by the 34% decrease of ~1,000 combined repair / replace permits. There is a 20% increase of commercial repair / replace permits between 2015 and 2016 even with the decrease in response rate.

Table 5. Documented national repair/replace onsite wastewater treatment system permit breakdown by size in 2015 – 2018. Percentage of permit type to total permits.

Documented national repair / replace OWTS permits 2015 - 2018								
Size	2015		2016		2017		2018	
Residential	64,192	70%	49,700	94%	49,716	93%	49,802	94%
Commercial	892	1%	1,082	2%	1,100	2%	1,185	2%
Combined	26,046	29%	2,117	4%	2,902	5%	1,879	4%
Total Repair/Replace	**91,130**		**52,899**		**53,718**		**52,866**	
Notes:	Size is denoted by residential, commercial, and combined.							
	"Combined" denotes state that do not separate by size.							

States that categorize the repair / replace permits include Alaska, Connecticut, Florida, Iowa, Idaho, Kansas, Kentucky, Massachusetts, Maryland, Missouri, and West Virginia. These permits are designated as tank, drainfield, tank & drainfield, or other. A majority of repairs (~70%) were classified as drainfield.

3.3 Onsite System Utilization Rate

The collected data was used to calculate onsite system utilization rate (OSUR) for new housings, which is defined as the ratio of number of reported new, residential housing with onsite system permits to total new housing permits plus manufactured housing shipments with a 6-month lag for installation (*Equation 1*):

$$OSUR = \frac{OWTS\ Permits}{(TNH)} \qquad \textit{Equation 1}$$

where OWTS permits are residential or combined (residential and commercial) depending on data availability; and total new housing (TNH) is the sum of manufactured and constructed housing with a 6-month lag.

Data for housing permits and shipments was obtained from the U.S. Census Bureau and imputed with historical decennial data to fill in missing data. Residential housing permits used to calculate the OSUR are "lagged" by six months to account for the estimated time from the housing permit being issued to the onsite system installation. Where partial data from a state was collected (*i.e.*, data from some but not all counties), the Adjusted OSUR was calculated based on the housing permits from the responding counties with reported onsite system installations (*Equation 2*):

$$Adjusted\ OSUR = \frac{OWTS\ Permits}{(TNH)\ X\ (NH\%)} \qquad \textit{Equation 2}$$

where OWTS permits are residential or combined (residential and commercial) depending on data availability; total new housing (TNH) is the sum of manufactured and constructed housing with a 6-month lag; and (NH%) is new housing percentage that is located within responding counties.

Residential OWTS permit data was collected from 48 states in 2015 (New Hampshire and Nevada did not report). Of the 48 states responding, 42 reported new and replacement systems separately, and the remaining six reported a combined total. Of the 42 responding states, 33 states separate residential and commercial onsite system permits. Definitions of residential and commercial systems vary from state to state. Each state's agency authority and categorization of permit by size and function are shown in **Appendix A**. State definition and parameters of onsite wastewater treatment systems are provided within the individual state sections that follow the National Summary. **Appendix C** provides two tables of new OWTS permits for each state by type: residential and commercial in 2015-2018. **Appendix D** provides two tables of repair/replace OWTS permits for each state by type: residential and commercial in 2015-2018.

The numbers utilized in the OSUR calculation are dependent on the data availability for each state. The possible datasets used in the calculations are residential new installation or total new installation (combined, both residential and commercial) moving from left to right in **Appendix C**. When the OSUR calculation is dependent on data from total new installation (combined residential and commercial systems) or total permits (new installation and repair/replace), the OSUR value is expected to have a deviation from the actual OSUR value for the state. The OSUR calculated with total new installation (combined residential and commercial systems) is a minor source of deviation as the data from the states that reported residential and commercial systems separately. **Table 4** suggests commercial onsite wastewater treatment system permits make up approximately two percent (1%) of all new installations when counted separated. Therefore, these states (Alabama, Hawaii, Louisiana, Maine, Nebraska) were included in the adjusted national OSUR calculation with the understanding small deviation will be expected. The OSUR calculated with total permits (new installations and repair/replace installations) is a major source of deviation as the 2015 data set suggest repair/replace installations are approximately 33% of all installations (**Table 2**). Therefore, these states (Arkansas, Delaware, Mississippi, New Mexico, Texas) were excluded from the adjusted national OSUR calculation. In addition, Vermont reported a significant portion of the new OWTS permits include a combination of: boundary line adjustments, permit revisions, minor amendments, change of use, water supply permits, etc. Therefore, Vermont was removed from the adjusted national OSUR calculation.

The accuracy of the state's OSUR value is dependent upon the available data as discussed previously, the county response rate, and total new housing within responding counties. For example, Oregon had a moderate county response rate of 67% with 87% of the total new housing within those responding counties. This gives a high probability that the OSUR is accurate for Oregon. An OSUR for responding counties was calculated based on new, residential housing and onsite system permits located within the counties, providing an accurate value for the county. As county response of new, residential housing within responding counties approaches 100%, the accuracy of the OSUR value increases. Refer to **Appendix B** for two tables on state data set reliability: i) inclusion/exclusion in adjusted national OSUR assessment, ii) notes on reliability of state data set, iii) survey response rate by county, and iv) percentage of total new housing included for the adjusted OSUR.

3.4 Historical comparison of OSUR

There are significant decreases in reported new housing permits and new housings with an onsite system permits when comparing the data from the 1998 report with the data collected in 2015-2018. It must be taken into account that the 1993 and 1998 national survey received a similar response rate to the 2016-2018 Phase 2 of 45%. The data provided from the 1998 report indicates new housing permit demand was much higher in 1993 and 1998 than the new housing permits in 2015, a difference of greater than 100% (~750,000 permits, **Table 7**). Similarly, the data provided from the 1998 report indicates the demand for new housings with an onsite system had decreased from 1998 to 2015 by near 100% (~145,000 permits). A main reason for this discrepancy is that data reliability. Specifically, the reliability of the data in terms of county response rate by state is not provided in the 1998 report. The only indicator of response rate is 48% of local agencies for the nation as a whole, and the number of local agencies that responded in 1993 (1,566); 1998 (1,546); and both 1993 and 1998 (917). The 1998 report indicates state totals; therefore all new housing permits within the state are included with the calculated OSUR values. Any reference to OSUR for the years of 1993 (21%) and 1998 (23%) are unadjusted. It is assumed that new housing with onsite system permit totals represent the state as a whole, without an adjustment with the county response rate. This causes the state and national OSURs for 1993 and 1998 to be lower than actual OSURs. The national manufactured housing values for 1993 and 1998 were annual totals with no 6-month lag. This causes a small deviation from the actual OSUR value in accordance to how 2015-2018 OSURs were calculated (see sections 2.2 and 3.3).

When comparing unadjusted national OSURs**,** the rates are similar for 1993 and 1998 to the 2015-2018 rates (**Table 7**). The 2015 unadjusted OSUR may be higher due to higher county response rate (82%) versus the ~45% response rate for all other years. The unadjusted OSUR is not an accurate calculation of the nation and is considered the minimum OSUR value. The adjusted OSURs calculated for the period of 2015-2018 are a more accurate representation of real onsite system utilization rates for new housing, which show **approximately 1/3 of new housings use an onsite system**.

Table 7. National overview of new housing permits, onsite wastewater treatment system permits, and resulting Onsite System Utilization Rate (OSUR).

National new housing permits						
Permit Type	1993*	1998*	2015	2016	2017	2018
Total new OWTS	270,431	333,383	189,233	160,129	166,192	157,691
(%) included in OSUR	NA	NA	73%	77%	76%	73%
Adjusted new OWTS	NA	NA	138,681	123,746	126,591	115,203
Total new housing	1,285,714	1,472,479	731,686	808,755	875,484	938,365
(%) included in OSUR	90%	93%	63%	49%	46%	42%
Adjusted total new housing	1,163,219	1,373,855	460,447	399,207	399,339	396,196
Adjusted OSUR	23%	24%	30%	31%	32%	30%

The (*) indicates housing numbers are annual total with no 6-month lag. This will have a small deviation in actual OSUR value.

Adjusted total removes data sets with no response or incompatible data, refer to **Appendix B**.

Unable to parse incompatible data in the historical dataset (1993, 1998) due to data set limitations.

3.5 Conclusion of National Assessment

The National Environmental Services Center (NESC) has conducted a national assessment of onsite wastewater treatment system (OWTS) permits in 1993, 1998, and 2015 - 2018. The OWTS data collected in this effort includes new, residential system permits; residential system repairs; new, commercial system (multi-family, commercial, institutional, etc.) permits; and commercial system repairs.

The combination of OWTS and new residential housing permits led to the concept development of Onsite System Utilization Rate (OSUR), a measure to calculate the percentage of new residential housing built with onsite wastewater system permits. The national adjusted OSUR value increases to ~ 30 – 32% for 2015 – 2018, excluding non-respondent counties and inconsistent data format, refer back to **Table 7** for comparison of unadjusted and adjusted OSUR values. The most reliable dataset suggests approximately a third of annual new single-family housing use onsite wastewater treatment systems.

4 Discussion: Untapped Potential in a National Onsite System Database

The exciting part of this research is not what it has uncovered but the untapped potential in a national onsite system database. The knowledge of the current trends and the status of existing OWTS provides government agencies with necessary information to appropriately allocate resources to ensure OWTS are providing necessary environmental and human health protections. The findings of the full national assessment report can be used to identify market trends, opportunities, and potential coverage gaps. The knowledge potential increases exponentially in possibility by combining the OWTS permit database with other variables such as geographic location, socio-economics, and water-soil quality indexes. These types of analysis can identify high need/low funded areas, inefficiencies in the current funding opportunities at a national and state level, needs for product redesign in areas with high repair/replace rates, and impacts of onsite systems on the surrounding environment. The effort of this project exemplifies: a) widespread reliance on decentralized wastewater treatment to properly treat wastewater across the United States, b) the need to leverage appropriate resources to ensure continued environmental and public health protection, and c) the need for a national database of onsite wastewater system permits.

Details on data collection process and analysis can be found in the national assessment. Further breakdown of permits by size and type, state by state definitions, and OSUR statistics are found in the "Onsite Wastewater Installation Assessment: Phase 2 (2015 – 2018) Report" at www.nesc.wvu.edu upon request.

5 Appendix

Appendix A

National assessment of permit agency authority and permit categorization.

State	Agency Control	OWTS Permit Catagorization (Size; Function)
AK	State, City, Town/Village/Borough	Residential Only; Use
AL	County	Residential & Commercial; Flowrate, Discharge
AR	State	Combined; Flowrate <5,000 GPD, Discharge < 3,000 GPD
AZ	State, County	Residential & Commercial
CA	County, City	Residential & Commercial or Combined; Flowrate, Discarge
CO	County, Multi-County HD, City-Council HD	Residential Only; Flowrate < 2,000 GPD
CT	State, City-Council HD	Residential and Commercial; Flowrate < 2,000 GPD
DE	State	Residential and Commercial; Flowrate < 2,500 GPD
FL	State, County	Residential & Commercial
GA	State, County	Residential & Commercial; Flowrate, Use
HI	State	Residential & Commercial; Flowrate
IA	State, County, Multi-County HD, City	Residential & Commercial; Use, Flowrate < 1,500 GPD
ID	State, Multi-County Health District	Residential & Commercial; Flowrate, Discharge
IL	State, County	Residential & Commercial; Discharge <1,500 GPD
IN	State	Residential & Commercial; Use
KS	County	Residential & Commercial; Use
KY	State, County, Board of Health	Combined
LA	State	Combined
MA	County, City-Council HD	Combined; Use
MD	County, City-Council HD	Residential & Commercial; Flowrate < 5,000 GPD, Use
ME	State, City-Council HD	Combined
MI	State, Multi-County HD, City-County HD	Residential & Commercial; Flowrate, Discharge, Use
MN	County, City, Township, Water District	Residential & Commercial; Flowrate, Discharge
MO	State, County	Residential & Commercial
MS	State	Residential & Commercial; Flowrate < 3,000 GPD, Use
MT	Multi-County HD	Residential & Commercial; Flowrate, Use
NC	County, Multi-County HD	Residential & Commercial; Flowrate < 3,000, Use
ND	County, Multi-County HD, City-Council HD	Residential & Commercial; Flowrate, Use
NE	State, County	Residential & Commercial; Use
NH	State	Residential & Commercial; Use (commercial, domestic)
NJ	County, City-Council HD	Residential & Commercial; Use
NM	State	Combined; Use, Flowrate < 5,000 GPD
NV	State, City-Council HD	Residential & Commercial; Use
NY	County, City-Council HD	Residential & Commercial
OH	Board of Health	Residential Only; Flowrate, Discharge, Use
OK	State	Residential & Commercial; Flowrate < 5,000 GPD
OR	State, County, City, Multi-County	Residential & Commercial; Flowrate < 2,500 GDP
PA	Township	Residential & Commercial
RI	County, City	Residential Only
SC	State	Residential & Commercial
SD	County	Residential & Commercial
TN	State	Residential Only
TX	State	Combined; Use
UT	County, Multi-County HD	Residential & Commercial; Flowrate < 5,000 GPD , Discharge
VA	County, City, Local HD	Residential & Commercial; Flowrate
VT	State, Town/Village/Borough	Combined; Flowrate < 6,500 GDP
WA	County, Multi-County HD, City-County HD	Residential & Commercial; Flowrate
WI	State	Combined
WV	County	Residential & Commercial; Flowrate
WY	County	Residential & Commercial; Discharge < 2,000 GPD

Appendix B

The two tables below show state data set: i) inclusion/exclusion in adjusted national OSUR assessment, ii) notes on reliability of state data set, iii) survey response rate by county, and iv) percentage of total new housing included for the adjusted OSUR.

Data set reliability notes and statistics			Survey response rate (Responding / Total Counties)				New housing included in adjusted OSUR (Percentage of total new housing included)			
State		Notes on reliability	2015	2016	2017	2018	2015	2016	2017	2018
AK	Include	Unadjusted OSUR due to inconsistent boundaries of permit agency	48%	0%	0%	0%	52%	0%	0%	0%
AL	Include	No separation of system but few commercial onsite systems permitted.	100%	100%	33%	33%	100%	100%	30%	32%
AR	Exclude	No separation of new installations and repair/replace permits.	100%	0%	0%	0%	100%	0%	0%	0%
AZ	Include	No issues with data.	13%	13%	13%	13%	59%	67%	65%	61%
CA	Include	Low response rate. No issues with data.	24%	22%	22%	22%	24%	15%	15%	18%
CO	Include	No issues with data.	100%	100%	100%	100%	100%	100%	100%	100%
CT	Include	Unadjusted OSUR. All permits issued at town level.	NA	0%	0%	0%	NA	0%	0%	0%
DE	Exclude	No separation of new installations and repair/replace permits.	100%	0%	0%	0%	100%	0%	0%	0%
FL	Include	No issues with data.	100%	100%	100%	100%	100%	100%	100%	100%
GA	Include	No issues with data.	99%	100%	100%	100%	100%	100%	100%	100%
HI	Include	No separation of system, but few commercial onsite systems permitted.	100%	100%	100%	100%	100%	100%	100%	100%
IA	Include	Low response rate. No issues with data.	21%	3%	3%	3%	19%	1%	0%	1%
ID	Include	No issues with data.	100%	100%	100%	100%	100%	100%	100%	100%
IL	Include	No issues with data.	100%	100%	0%	0%	100%	100%	0%	0%
IN	Include	No issues with data.	92%	100%	100%	100%	99%	100%	100%	100%
KS	Include	No issues with data.	42%	4%	4%	4%	63%	2%	2%	2%
KY	Include	Low response rate. No issues with data.	100%	100%	100%	100%	100%	100%	100%	100%
LA	Include	No separation of system but few commercial onsite systems permitted.	97%	100%	100%	100%	100%	100%	100%	100%
MA	Include	Unadjusted OSUR. All permits issued at city level.	12%	0%	0%	0%	NA	0%	0%	0%
MD	Include	Low response rate. No issues with data.	21%	0%	0%	0%	26%	0%	0%	0%
ME	Include	No separation of system but few commercial onsite systems permitted.	94%	0%	0%	0%	98%	0%	0%	0%
MI	Include	Low response rate. No issues with data.	20%	100%	100%	100%	17%	100%	100%	100%
MN	Include	No issues with data.	100%	100%	100%	100%	100%	100%	100%	100%
MO	Include	Low response rate. No issues with data.	63%	10%	10%	10%	38%	9%	11%	11%
MS	Exclude	No separation of new installations and repair/replace permits.	100%	0%	0%	0%	100%	0%	0%	0%

Data set reliability notes and statistics			Survey response rate (Responding / Total Counties)				New housing included in adjusted OSUR (Percentage of total new housing included)			
State		Notes on reliability	2015	2016	2017	2018	2015	2016	2017	2018
MT	Include	Unadjusted OSUR due to inconsistent boundaries of permit agency.	25%	2%	2%	2%	13%	1%	1%	1%
NC	Include	No issues with data.	90%	85%	85%	NA	98%	98%	98%	NA
ND	Include	No issues with data.	81%	52%	52%	52%	66%	57%	59%	63%
NE	Include	No separation of system but few commercial onsite systems permitted.	100%	100%	100%	100%	100%	100%	100%	100%
NH	Exclude	No data available.	No Data Collected				No Data Collected			
NJ	Include	Unadjusted OSUR. All permits issued at town level.	8%	0%	0%	0%	NA	0%	0%	0%
NM	Exclude	No separation of new installations and repair/replace permits.	100%	0%	0%	0%	100%	0%	0%	0%
NV	Exclude	No data available.	No Data Collected				No Data Collected			
NY	Include	No issues with data.	15%	0%	0%	0%	14%	0%	0%	0%
OH	Include	No issues with data.	100%	100%	100%	100%	100%	100%	100%	100%
OK	Include	No issues with data.	100%	100%	100%	100%	100%	100%	100%	100%
OR	Include	No issues with data.	67%	3%	NA	100%	89%	NA	NA	100%
PA	Include	No issues with data.	91%	0%	0%	0%	90%	0%	0%	0%
RI	Include	Unadjusted OSUR. All permits issued at city level.	NA	0%	0%	0%	NA	0%	0%	0%
SC	Include	State total with no county level data. Repairs not tracked.	100%	0%	0%	0%	100%	0%	0%	0%
SD	Include	State total with no county level data. Agency estimate. No issues with data.	100%	3%	3%	3%	100%	NA	NA	NA
TN	Include	No issues with data.	100%	100%	100%	100%	100%	100%	100%	100%
TX	Exclude	No separation of new installations and repair/replace permits.	100%	100%	100%	100%	100%	100%	100%	100%
UT	Include	No issues with data.	87%	7%	7%	7%	62%	9%	9%	9%
VA	Include	No issues with data.	81%	0%	0%	0%	89%	0%	0%	0%
VT	Exclude	OSUR above 100%. Significant portion of permits include revisions.	100%	100%	100%	100%	100%	100%	100%	100%
WA	Include	No issues with data.	31%	18%	18%	18%	19%	13%	14%	14%
WI	Include	State total with no county level data. No issues with data.	100%	0%	0%	0%	100%	0%	0%	0%
WV	Include	No issues with data.	44%	9%	9%	9%	53%	7%	7%	8%
WY	Include	Low response rate. No issues with data.	39%	0%	0%	0%	37%	0%	0%	0%
Total	--	--	**85%**	**52%**	**40%**	**45%**	**63%**	**49%**	**46%**	**42%**

Appendix D

Tables below provide state by state numbers of new onsite wastewater system treatment permits by size (residential, commercial, total) in 2015-2018. Total represents residential and commercial as well as combined permits of states that do not separate by size.

New Onsite Wastewater Treatment System Permits												
	Residential				Commercial				Total			
State	2015	2016	2017	2018	2015	2016	2017	2018	2015	2016	2017	2018
AK	1,127	--	--	--	45	--	--	--	1,172	--	--	--
AL	--	--	--	--	--	--	--	--	7,733	8,271	3,132	3,549
AR	4,203	--	--	--	--	--	--	--	4,203	--	--	--
AZ	1,467	1,766	2,373	3,048	4	2	7	7	1,471	1,768	2,380	3,055
CA	1,308	1,479	1,472	1,502	49	243	183	236	1,357	1,722	1,655	1,738
CO	6,311	8,386	9,727	10,420	2	2	4	3	6,313	8,388	9,731	10,423
CT	--	--	--	--	--	--	--	--	255	--	--	--
DE	--	--	--	--	--	--	--	--	1,807	--	--	--
FL	7,008	12,253	15,027	17,306	363	503	509	512	7,371	12,756	15,536	17,818
GA	9,489	10,276	11,706	12,578	--	494	532	520	9,489	10,770	12,238	13,098
HI	1,108	932	1,105	1,202	--	--	--	--	1,108	932	1,105	1,202
IA	1,004	75	106	92	15	--	--	--	1,019	75	106	92
ID	1,934	3,364	3,365	3,947	139	84	138	132	2,073	3,448	3,503	4,079
IL	2,603	--	--	--	--	--	--	--	2,603	1,532		
IN	3,865	--	--	--	--	--	--	--	3,865	3,074	3,376	3,947
KS	648	170	163	153	8	--	--	--	656	170	163	153
KY	6,692	7,062	7,547	7,351	5	--	--	--	6,697	7,062	7,547	7,351
LA	--	--	--	--	--	--	--	--	7,318	10,352	10,368	9,380
MA	841	--	--	--	22	--	--	--	863	--	--	--
MD	443	--	--	--	6	--	--	--	449	--	--	--
ME	2,635	--	--	--	--	--	--	--	2,635	--	--	--
MI	2,308	8,522	9,911	9,554	22	403	474	477	2,330	8,925	10,385	10,031
MN	4,041	4,398	4,449	4,258	247	357	402	319	4,288	4,755	4,851	4,577
MO	785	696	689	656	20	--	--	--	805	696	689	656
MS	7,460	--	--	--	300	--	--	--	7,460	--	--	--

New Onsite Wastewater Treatment System Permits												
	Residential				Commercial				Total			
State	2015	2016	2017	2018	2015	2016	2017	2018	2015	2016	2017	2018
MT	787	28	14	12	20	--	--	--	807	28	14	12
NC	11,514	16,173	17,794	NA	14	5	4	10	11,514	16,173	17,794	10
ND	802	697	628	573	14	65	63	60	825	723	648	592
NE	1,316	1,617	1,664	1,459	62	--	--	--	1,378	1,617	1,664	1,459
NH	No Data Collected				No Data Collected				No Data Collected			
NJ	273	--	--	--	14	--	--	--	287	--	--	--
NM	--	--	--	--	--	--	--	--	4,420	326	16	--
NV	No Data Collected				No Data Collected				No Data Collected			
NY	688	--	--	--	38	--	--	--	726	--	--	--
OH	3,539	3,930	4,290	4,068	115	--	--	--	3,654	4,218	4,225	4,067
OK	7,658	5,997	5,835	5,823	17	30	10	8	7,675	6,027	5,845	5,831
OR	1,439	1,392	--	1,873	184	143	--	--	1,623	1535	--	1,873
PA	4,771	--	--	--	364	--	--	--	5,135	--	--	--
RI	--	--	--	--	--	--	--	--	431	--	--	--
SC	8,491	--	--	--	2	--	--	--	8,493	--	--	--
SD	1,900	690	687	723	100	--	--	--	2,000	690	687	723
TN	7,720	8,536	9,229	9,627	--	--	--	--	7,720	8,536	9,229	9,627
TX	--	--	--	--	--	--	--	--	28,791	31,167	34,692	37,614
UT	1,029	252	297	268	15	--	--	--	1,044	252	297	268
VA	7,251	--	--	--	72	--	--	--	7,323	--	--	--
VT	1,400	--	--	--	450	--	--	--	1,850	2,483	2,470	2,527
WA	1,725	1,419	1,596	1,725	26	30	53	44	1,751	1,449	1,649	1,769
WI	--	--	--	--	--	--	--	--	4,852	--	--	--
WV	1,143	119	106	92	11	--	--	--	1,154	209	197	170
WY	429	--	--	--	11	--	--	--	440	--	--	--
TOTAL	**131,155**	**100,229**	**109,780**	**98,310**	**2,776**	**2,361**	**2,379**	**2,328**	**189,233**	**160,129**	**166,192**	**157,691**

Appendix E

Tables below provide state by state numbers of repair/replace onsite wastewater treatment system permits by size: residential, commercial, and total in 2015-2018. Total represents residential and commercial as well as permits of states that do not separate by size.

Repair / Replace Onsite Wastewater Treatment System Permits												
	Residential				Commercial				Total			
State	2015	2016	2017	2018	2015	2016	2017	2018	2015	2016	2017	2018
AK	475	--	--	--	24	--	--	--	499	--	--	--
AL	--	--	--	--	--	--	--	--	4,102	1,184	1,157	1,039
AR	--	--	--	--	--	--	--	--	--	--	--	--
AZ	59	51	49	33	7	8	11	5	66	59	60	38
CA	1,244	107	114	156	14	39	43	51	1,258	146	157	207
CO	1,453	1,574	1,754	1,982	2	--	--	--	1,455	1,574	1,754	1,982
CT	--	--	--	--	--	--	--	--	877	--	--	--
DE	--	--	--	--	--	--	--	--	--	--	--	--
FL	18,867	17,052	16,720	18,050	526	497	479	532	19,393	17,549	17,199	18,582
GA	8,923	6,401	6,893	8,521	--	228	259	320	8,923	6,629	7,152	8,841
HI	--	60	47	15	--	--	--	--	3	--	--	--
IA	584	--	--	--	4	--	--	--	587	--	--	--
ID	--	--	--	--	--	--	--	--	696	--	545	676
IL	2,272	--	--	--	--	--	--	--	2,272	--	--	--
IN	3,012	--	--	--	--	--	--	--	3,012	--	--	--
KS	--	--	--	--	2	--	--	--	632	--	--	--
KY	--	--	--	--	3	--	--	--	191	418	342	255
LA	--	--	--	--	--	--	--	--	1,831	418	342	255
MA	--	--	--	--	--	--	--	--	1261	--	--	--
MD	--	--	--	--	--	--	--	--	946	--	--	--
ME	2,687	--	--	--	--	--	--	--	2,687	--	--	--
MI	630	4,963	5,191	5,483	9	127	131	166	639	5,090	5,322	5,649
MN	6,414	6,178	6,795	5,723	152	150	172	105	6,566	6,328	6,967	5,828
MO	418	--	--	--	8	--	--	--	426	--	--	--
MS	--	--	--	--	--	--	--	--	--	--	--	--

Repair / Replace Onsite Wastewater Treatment System Permits												
	Residential				Commercial				Total			
State	2015	2016	2017	2018	2015	2016	2017	2018	2015	2016	2017	2018
MT	166	--	--	--	2	--	--	--	168	--	--	--
NC	6,265	4,984	5,156	NA	4	7	5	6	6,265	4,991	5,161	6
ND	60	45	37	15	4	--	--	--	64	--	--	--
NE	--	--	--	--	--	--	--	--	236	--	--	--
NH	No Data Collected				No Data Collected				No Data Collected			
NJ	894	--	--	--	12	--	--	--	906	--	--	--
NM	--	--	--	--	--	--	--	--	--	--	--	--
NV	No Data Collected				No Data Collected				No Data Collected			
NY	747	--	--	--	13	--	--	--	760	--	--	--
OH	2,863	3,601	3,926	4,387	42	--	--	--	2,905	3,552	4,318	3,847
OK	--	--	--	--	--	--	--	--	164	--	--	--
OR	2,165	1,830	--	2,219	--	26	--	--	2,165	1856	--	2,219
PA	--	--	--	--	--	--	--	--	2,796	--	--	--
RI	--	--	--	--	--	--	--	--	1,101	--	--	--
SC	--	--	--	--	--	--	--	--	--	--	--	--
SD	52	33	38	28	10	--	--	--	10	--	--	--
TN	2,904	2,567	2,736	2,940	--	--	--	--	2,904	2,567	2,736	2,940
TX	--	--	--	--	--	--	--	--	--	--	--	--
UT	131	7	7	5	15	--	--	--	146	7	7	5
VA	--	--	--	--	--	--	--	--	3,865	--	--	--
VT	450	--	--	--	30	--	--	--	480	531	499	497
WA	457	247	253	245	9	--	--	--	466	--	--	--
WI	--	--	--	--	--	--	--	--	6,979	--	--	--
WV	--	--	--	--	--	--	--	--	348	--	--	--
WY	--	--	--	--	--	--	--	--	80	--	--	--
TOTAL	**64,192**	**49,700**	**49,716**	**49,802**	**892**	**1,082**	**1,100**	**1,185**	**91,130**	**52,899**	**53,718**	**52,866**

Appendix F

Calculation of OSUR values with numbers provided in the two tables. Adjusted OSUR, as shown by Equation 2 is OWTS Permits divided by total new housing within responding counties. OSUR values over 100% are noted by (*) and unadjusted OSUR values are noted by (**). Total new housing with onsite system permits removes new commercial OWTS from total new OWTS permits.

Onsite System Utilization Rate Calculation																
	New Housing (Total & Percentage within Responding Counties)								Total New Housing with onsite system permits				Onsite System Utilization Rate (OSUR)			
State	2015		2016		2017		2018		2015	2016	2017	2018	2015	2016	2017	2018
AK	1,579	100%	1,900	0%	712	0%	1,276	0%	1,127	--	--	--	** 71%	--	--	--
AL	13,041	100%	15,303	100%	17,343	30%	17,338	32%	7,733	8,271	3,132	3,549	59%	54%	60%	64%
AR	7,126	100%	8,440	0%	9,146	0%	9,158	0%	4,203	--	--	--	59%	--	--	--
AZ	21,128	59%	24,275	67%	25,511	65%	29,778	61%	1,467	1,766	2,373	3,048	12%	11%	14%	17%
CA	39,541	24%	49,669	15%	57,387	15%	66,780	18%	1,308	1,479	1,472	1,520	14%	20%	17%	13%
CO	17,770	100%	21,808	100%	23,921	100%	28,574	100%	6,311	8,386	9,727	10,420	36%	38%	41%	36%
CT	2,515	NA	2,583	0%	2,593	0%	2,658	0%	255	--	--	--	** 10%	--	--	--
DE	4,516	100%	4,527	0%	4,925	0%	5,458	0%	1,807	--	--	--	40%	--	--	--
FL	72,596	100%	76,189	100%	82,368	100%	95,444	100%	7,008	12,253	15,027	17,306	10%	16%	18%	18%
GA	28,499	100%	36,671	100%	41,407	100%	44,604	100%	9,489	10,276	11,706	12,578	33%	28%	28%	28%
HI	2,422	100%	2,085	100%	2,481	100%	2,461	100%	1,108	932	1,105	1,202	46%	45%	45%	49%
IA	7,722	19%	7,607	1%	8,866	0%	9,028	1%	1,004	75	106	92	68%	** 1%	** 1%	** 1%
ID	7,104	100%	8,673	100%	9,731	100%	11,708	100%	1,934	3,364	3,365	3,947	27%	39%	35%	34%
IL	10,753	100%	12,114	100%	11,893	0%	11,749	0%	2,603	1,532	--	--	24%	13%	--	--
IN	13,056	99%	14,752	100%	16,531	100%	17,723	100%	3,865	3,074	3,376	3,947	30%	21%	20%	22%
KS	4,980	63%	5,630	2%	5,998	2%	6,018	2%	648	170	163	153	21%	** 3%	** 3%	** 3%
KY	8,286	100%	10,262	100%	10,761	100%	11,154	100%	6,692	7,062	7,547	7,351	81%	69%	70%	66%
LA	14,200	100%	20,571	100%	19,443	100%	18,820	100%	7,318	10,352	10,368	9,380	52%	50%	53%	50%
MA	7,107	NA	7,859	0%	7,491	0%	7,369	0%	841	--	--	--	12%	--	--	--
MD	11,149	26%	11,963	0%	12,597	0%	12,672	0%	443	--	--	--	15%	--	--	--
ME	3,019	98%	3,966	0%	4,193	0%	4,361	0%	2,635	--	--	--	89%	--	--	--
MI	16,141	17%	18,587	100%	21,124	100%	21,263	100%	2,308	8,522	9,911	9,554	84%	46%	47%	45%
MN	11,778	100%	12,682	100%	14,948	100%	15,091	100%	4,041	4,398	4,449	4,258	34%	35%	30%	28%
MO	8,898	38%	11,371	9%	12,150	11%	12,781	11%	785	696	689	656	23%	68%	52%	47%
MS	8,150	100%	9,325	0%	10,196	0%	9,690	0%	7,460	--	--	--	92%	--	--	--

Onsite System Utilization Rate Calculation																
	New Housing (Total & Percentage within Responding Counties)								Total New Housing with onsite system permits				Onsite System Utilization Rate (OSUR)			
State	2015		2016		2017		2018		2015	2016	2017	2018	2015	2016	2017	2018
MT	2,453	13%	2,644	1%	2,810	1%	2,959	1%	787	28	14	12	** 32%	** 1%	** 1%	** 1%
NC	41,830	98%	42,402	98%	47,968	98%	55,687	NA	11,514	16,173	17,794	NA	28%	39%	38%	
ND	5,675	66%	3,253	57%	2,531	59%	2,184	63%	802	697	628	573	21%	38%	42%	42%
NE	5,425	100%	5,200	100%	5,625	100%	5,060	100%	1,316	1,617	1,664	1,459	24%	31%	30%	29%
NH	2,393	0%	3,061	0%	3,102	0%	3,124	0%	No Data Collected				No Data Collected			
NJ	10,848	NA	10,543	0%	9,905	0%	10,989	0%	273	--	--	--	3%	--	--	--
NM	4,988	100%	5,161	0%	5,266	0%	5,880	0%	4,420	326	16	--	89%	--	--	--
NV	10,676	0%	11,670	0%	13,192	0%	13,583	0%	No Data Collected				No Data Collected			
NY	9,173	14%	12,833	0%	12,524	0%	11,637	0%	688	--	--	--	54%	--	--	--
OH	14,711	100%	16,503	100%	17,797	100%	18,261	100%	3,539	4,218	4,225	4,067	24%	26%	24%	22%
OK	11,781	100%	11,516	100%	11,576	100%	11,377	100%	7,658	5,997	5,835	5,823	65%	52%	50%	51%
OR	11,102	89%	11,562	NA	11,872	0%	12,893	100%	1,439	1392	--	1,873	15%	** 12%	NA	15%
PA	16,782	90%	15,917	0%	16,913	0%	17,030	0%	4,771	--	--	--	32%	--	--	--
RI	834	NA	912	0%	1001	0%	1,056	0%	431	--	--	--	52%	--	--	--
SC	26,793	100%	29,372	0%	32,648	0%	34,614	0%	8,491	--	--	--	32%	--	--	--
SD	3,152	100%	3,009	NA	3,467	NA	3,350	NA	1,900	690	687	723	60%	** 23%	** 20%	** 22%
TN	23,706	100%	26,176	100%	30,056	100%	31,155	100%	7,720	8,536	9,229	9,627	33%	33%	31%	31%
TX	116,048	100%	120,114	100%	131,629	100%	138,467	100%	28,791	31,167	34,692	37,614	25%	26%	26%	27%
UT	12,697	62%	15,180	9%	16,631	9%	19,232	9%	1,029	252	297	268	13%	18%	20%	15%
VA	20,813	89%	22,687	0%	23,764	0%	22,603	0%	7,251	--	--	--	39%	--	--	--
VT	1,083	100%	1,247	100%	1,349	100%	1,246	100%	1,400	2,483	2,470	2,527	* 129%	* 199%	* 183%	* 202%
WA	20,606	19%	22,963	13%	23,012	14%	25,550	14%	1,725	1,419	1,596	1,725	44%	48%	50%	48%
WI	10,165	100%	11,140	0%	12,245	0%	12,483	0%	4,852	--	--	--	48%	--	--	--
WV	3,016	53%	3,110	7%	3,260	7%	3,377	8%	1,143	119	106	92	72%	55%	46%	34%
WY	1,860	37%	1,768	0%	1,625	0%	1,612	0%	429	--	--	--	62%	--	--	--
TOTAL	731,686	63%	808,755	49%	875,484	46%	938,365	42%	186,762	157,722	163,769	155,344	26%	20%	19%	17%
ADJ Total	**460,447**		**399,207**		**399,339**		**396,196**		**138,681**	**123,746**	**126,591**	**115,203**	**30%**	**31%**	**32%**	**29%**