Associations between Fecal Indicator Bacteria Prevalence and Demographic Data in Private Water Supplies in Virginia

Tamara Latrice Smith

Thesis submitted to the faculty of the Virginia Polytechnic Institute and State University
in partial fulfillment of the requirements for the degree of

Master of Science
in
Biological Systems Engineering

Leigh-Anne Henry Krometis, Chair
Brian L. Benham
Charles Hagedorn
Susan West Marmagas

May 13, 2013
Blacksburg, VA

Keywords: private water system, coliform bacteria, *E. coli*, drinking water, well water quality, rural health, source tracking

Associations between Fecal Indicator Bacteria Prevalence and Demographic Data in Private Water Supplies in Virginia

Tamara Smith

ABSTRACT

Over 1.7 million Virginians rely on private water systems to supply household water. The heaviest reliance on these systems occurs in rural areas, which are often underserved in terms of financial resources and access to environmental health education. As the Safe Drinking Water Act (SDWA) does not regulate private water systems, it is the sole responsibility of the homeowner to maintain and monitor these systems.

Previous limited studies indicate that microbial contamination of drinking water from private wells and springs is far from uncommon, ranging from 10% to 68%, depending on type of organism and geological region. With the exception of one thirty-year old government study on rural water supplies, there have been no documented investigations of links between private system water contamination and household demographic characteristics, making the design of effective public health interventions, very difficult.

The goal of the present study is to identify potential associations between concentrations of fecal indicator bacteria (e.g. coliforms, *E. coli*) in 831 samples collected at the point-of-use in homes with private water supply systems and homeowner-provided demographic data (e.g. homeowner age, household income, education, water quality perception). Household income and the education of the perceived head of household were determined to have an association with bacteria concentrations. However, when a model was developed to evaluate strong associations between total coliform presence and potential predictors, no demographic parameters were deemed significant enough to be included in the final model. Of the 831 samples tested, 349 (42%) of samples tested positive for total coliform and 55 (6.6%) tested positive for *E. coli* contamination. Chemical and microbial source tracking efforts using fluorometry and qPCR suggested possible *E. coli* contamination from human septage in 21 cases. The findings of this research can ultimately aid in determining effective strategies for public health intervention and gain a better understanding of interactions between demographic data and private system water quality.

ACKNOWLEDGMENTS

It feels so good to be writing this. It is has been a long journey Virginia Tech, but my experience here will never be forgotten. I would like to thank my advisor Dr. Leigh-Anne Krometis for all of her patience, support, her gentle introduction into the real world, all the opportunities she afforded to me, and for taking the time out to be a good listener and a caring friend.

Professionally, I would like to thank all the members of my committee for spending time mentoring me and answering my questions. I want to thank all the undergraduate and graduate students of the Krometis group that helped me with my research and taught me valuable life lessons. I want to specifically thank Dr. Brian Benham and Erin Ling for the amazing work they do with VAHWQP and the countless families and individuals they have helped as a result. I want to thank Kelly Peeler and other members of the Water Quality lab for making me more efficient, more organized, and for being such a wealth of knowledge. I want to thank Annie Lawrence for all her help and patience. You have done more for me than you know, Annie.

I also want to thank several LISA collaborators for their patience and dedication to my research project. Thanks Yiming Peng, Peng Sun, Andy Hoegh, and Ho Cho for providing your expertise to graduate and undergraduate students alike and for improving the overall statistical quality of research originating from Virginia Tech.

On a personal level, I would like to thank fellow graduate students: Liz Collins, Caitlin Rippner, Stephanie Kulesza, Amanda Graumann, Betsy Claunch, Janell Henry, and Chris Wysong for moral support, many late-night craft sessions and all the love a girl can ask for. I would like to thank my parents for their endless devotion and support even when they didn’t understand my obsession with drinking water. I want to thank my beloved cousin, Marlene, for getting me out of bad moods, for being my restaurant buddy and always giving it to me straight, even when I refused to listen.

Lastly, I would like to thank my future husband, Joshua Bradley Hayes, for teaching me what love looks like, reminding that this too shall pass, being my rock and my #1 fan and for never giving up on me even when I gave up on myself. I treasure the time we have spent together and I look forward to the rest of our lives. I love you, honey. This is for you.

Table of Contents

LIST OF TABLES AND FIGURES

List of Tables

List of Figures

1 LITERATURE REVIEW

1.1 Provision of Drinking Water in the United States

The Environmental Protection Agency (EPA) regulates public drinking water systems via the Safe Drinking Water Act (SDWA) of 1974, which details health-based water quality standards and specific monitoring requirements. Since the implementation of the SDWA and related supplemental statutes, the proportion of the national population being served by water systems that meet all health-based standards has steadily increased (EPA, 1999). Although the majority of the United States' population (an estimated 310 million people) relies on public drinking water systems, between 23 and 45 million Americans currently rely on a private water supply system (i.e. wells, springs, and cisterns) for drinking water (Kenny et al., 2009). For many reasons – including issues of private property rights and the difficulty of locating and inspecting the considerable number of private water supply systems across the nation – the SDWA does not apply to private water supply systems. The EPA does provide guidance to homeowners with private water supply systems, which emphasize annual testing and routine maintenance (EPA, 2013). Nevertheless continuing reports documenting the high incidence of coliform bacteria contamination in wells suggests that these recommendations are not being communicated to homeowners, are being ignored, or are simply insufficient to protect public health (Allevi et al., in press; Bauder et al., 1993; Gosselin et al., 1997; Kross et al., 1993).

Other issues, such as chemical contamination, related to poor drinking water quality and private systems may reflect disparities between urban and rural populations. In

2008 the United States (US) reported to the World Health Organization (WHO, 2012) that while 99% of the total population used improved drinking water sources, only 94% of its rural population used improved drinking water sources (e.g. household connections/piped water, protected wells and springs, etc.). A recent study by the Rural Community Assistance Project reported that rural households are twice as likely to have limited access to drinking water or inadequate wastewater treatment (Gatseyer and Vaswani, 2004). The term "rural household" refers to households outside a Metropolitan Statistical Area (DHHS). Although many factors (education, economics, and development patterns) can influence the provision of water and sanitation in rural and urban areas, the relative effects and contributions of these factors are largely unknown or poorly characterized. It is worth noting that wastewater treatment is inextricably linked with drinking water quality in many rural areas. Those reliant on a private water supply, also frequently, rely on individual, on-site wastewater treatment systems. Many of the estimated 1.7 million people lacking proper wastewater disposal in the US are reliant on private water supplies such as wells, which can become contaminated if sewage and greywater is not adequately treated(Gasteyer and Vaswani, 2004; Macler and Merkle, 2000; Robertson and Edberg, 1997).

Proper maintenance of private drinking water supplies by homeowners is of particular concern in Virginia as close to 600,000 households in the Commonwealth rely on a private water supply system for household water. In 52 of Virginia's 95 counties, increases in the number of households being served by private water supplies are greater than increases in households connecting to public systems (Kenny et al., 2009; U.S.C.B., 1990). Although the type of private water supply system used varies according to local geology and access to water sources (e.g. well vs. spring vs. cistern vs. drilled or bored well), it is worth noting that in 38 of 95 counties in the Commonwealth groundwater is the dominant source of household water. Because the Census Bureau stop capturing information specific to private water supply system use in 1990, most statistics related to private water supply system use are outdated.

1.2 Groundwater Contamination Pathways

Available estimates indicate that 98% of private water supply systems across the United States are wells supplied by groundwater (Kenny et al., 2009). Over 100 viral and bacterial pathogens have been identified as potential groundwater contaminants, including *Escherichia coli (E. coli) Salmonella spp., Campylobacter jejuni, Shigella spp.* and adenovirus (Macler and Merkle, 2000). A recent USGS study of over 1,389 private household wells across the nation's major aquifers sampled at the point-of-entry (POE) (e.g. well head) reported that 23% of samples exceeded the SDWA's MCL (maximum contaminant level) for chemical contaminants (e.g. nitrate, fluoride, pesticides). In addition, 34% of samples were positive for total coliforms and 8% tested positive for *E. coli* (DeSimone et al., 2009).

Contaminants (e.g. water constituents that pose a health risk or produce an aesthetic concern) can enter groundwater naturally (e.g. metals from geologic formations) or through anthropogenic (human) activities (e.g. septic tanks, landfills, and large animal farms contributing nitrate and/or microorganisms) (Pye and Patrick, 1983). Potential sources of contamination include improperly placed septic tanks, proximity to wild animals and livestock, environmental factors such as heavy periods of rainfall, and well contamination through limestone and fissured rock (Brunkard et al., 2011). Private wells that are not properly constructed, not habitually tested, and/or are in proximity to potential sources of contamination are at risk of becoming compromised, which can lead to contaminant exposure (Swistock and Sharpe, 2005). It has also been shown that microbial contamination, on average, is higher for individual systems during summer months than the rest of the year (Craun et al., 2010).

Properly constructed private water supply systems provide multiple barriers that can prevent contamination of the water supply (e.g., well casing, grouting sanitary well caps). Water treatment, either Point-of-Entry (POE) or Point-of-Use (POU) can be used to reduce the level of contaminants present in the water supply. POE devices typically treat all of the water entering the house while POU devices typically treat the water at a single outlet or faucet. The decision to use POE, POU, or a combination of both in a given system is influenced by the water supply system type and the characteristics of the water. Cost effectiveness also plays a role in what methods are considered (EPA, 2008). Examples of POE devices are UV light systems, whole-house filters, "acid neutralizing" filters and ozonation; while POU devices may include activated carbon filters, reverse osmosis, and distillation units (EPA, 2008).

Several recent studies have emphasized the importance of preventative barriers in helping reduce bacterial contamination in private wells. In a 2001 survey of private water supply systems in Pennsylvania, 78 wells were tested for total coliform and *E. coli* presence/concentration. Contamination from *E. coli* was almost three times more likely to be found in wells with no sanitary well cap and no grouting, than in those wells that were grouted and had either a loose fitting "shoe box" cap or sanitary well cap (Zimmerman, 2001). However, a subsequent study in Pennsylvania that examined water quality in samples taken from within the house on a system with newer, properly constructed sanitary wells (e.g. well had both grout seal and a sanitary well cap) reported that a nontrivial number of these wells were still positive for coliform bacteria (29%) and *E. coli* (17%) (Swistock and Sharpe, 2005); suggesting that proper well construction and the associated contamination prevention barriers may not necessarily completely eliminate bacterial contamination. Ideally, private water supply systems should incorporate a multiple-barrier contamination prevention/treatment strategy to ensure a potable water supply.

Since 1992, the Commonwealth of Virginia has required homeowners to obtain a site permit for the construction and location of all new private wells (VDH, 1992). These regulations are intended to reduce the possibility of improperly constructed wells and contamination of ground water sources. These regulations do not apply to systems constructed before 1992, however, and no specific contamination barriers or treatment systems have been mandated.

1.3 Microbial Contamination in Private Systems

The contamination of drinking water by pathogenic microorganisms can have major public health implications. The US Centers for Disease Control (CDC) recently reported that while the incidence of waterborne disease outbreaks associated with municipal supplies has steadily decreased for the past three decades, the annual proportion of reported outbreaks associated with private water supplies has increased. Between 1991 and 2002, seventy-six percent of the 183 total reported outbreaks associated with drinking water were linked to the consumption of untreated groundwater or the failure of a groundwater treatment system in both private and public systems (Craun et al., 2010).

Although there are many potential chemical and physical drinking water contaminants associated with acute and/or chronic disease, microorganisms are consistently reported as the most frequent contaminant of human health concern in samples from private water supply systems. A recent compilation of research and extension studies conducted over the past 35 years indicated that total coliform contamination in samples taken from the POU of private water supplies throughout the United States was not uncommon, with overall incidence ranging from 15% to 85% (Allevi et al., in press). Several studies have linked *E. coli* contamination in rural private water supply systems with an elevated incidence of acute gastrointestinal illness (AGI) amongst homeowners reliant on these supplies for drinking water (Macler and Merkle, 2000; Raina et al., 1999; Strauss et al., 2001). A recent case-control study investigating possible risk factors for childhood sporadic gastrointestinal illness in the state of Washington reported that infection by *Salmonella* was associated with living in a home reliant on well water as a primary drinking source and a septic system as a system for wastewater treatment (Denno et al., 2009).

Total coliform, fecal coliforms, *E. coli*, and enterococci are generally used as indicator organisms to identify fecal contamination in water quality and health risk assessments. Direct pathogen detection is often too expensive or complicated to be reasonable for widespread monitoring regimens (Field and Samadpour, 2007; Meays et al., 2004; Scott et al., 2002). Although generally not pathogenic themselves, these fecal indicator organisms are used because they are commonly found in mammalian intestines and feces and their existence suggests that actual enteric pathogens are present.

Indicator organism occurrence suggests fecal contamination but simple detection does not generally provide information on the origin of this contamination, which can be useful when designing remediation efforts. Several source tracking techniques have evolved in recent decades to assist water quality researchers in identifying primary sources of contamination via microbial (e.g. specific species or gene) or chemical (e.g. anthropogenic compounds) markers specific to a given type of waste.

Many microbial source tracking techniques rely upon molecular analyses such as polymerase chain reaction (PCR), although historically indicator organisms have been detected via culture-based methods (e.g. membrane filtration). Culture-based detection can be time consuming and does not account for viable but nonculturable strains (Iijima et al., 2007; Khan et al., 2007; Ram et al., 2008). Molecular methods including PCR are faster, can detect all viable bacteria in a sample, and can also detect pathogens in very low concentrations (Abd-El-Haleem et al., 2003). However, one of the major disadvantages of PCR as it relates to environmental samples is that there is a window of opportunity where it can detect non-viable bacteria (i.e. lysed DNA) as well, which results in an overestimation of microbial concentrations and potential health risk as per presently established epidemiological relationships (Josephson et al., 1993). Therefore despite its future promise, qPCR (quantitative PCR) has yet to be incorporated into drinking water quality standards since a relationship with existing standards established using culture-based methods is unclear (Field and Samadpour, 2007). Recent studies have linked qPCR detection of enterococci with illness following recreational water exposure (Wade et al., 2008; Wade et al., 2006), but these associations cannot readily be adopted into drinking water regulations because of the innate differences in anticipated exposure/contamination between surface water and drinking water quality.

Chemical source tracking is often used in conjunction with microbial source tracking methods to provide further evidence of the primary origins of observed contamination. Common chemical targets include pharmaceutical and personal care products, fecal sterols/stanols, caffeine, and optical brighteners/fluorescent whitening agents (Hagedorn, 2011; Hagedorn and Weisberg, 2009; Peeler et al., 2006; Thomas and Foster, 2005). Optical brighteners are generally found in laundry detergents, paper products (bleached toilet paper) and some cosmetics. The presence of optical brighteners is considered suggestive of anthropogenic fecal contamination (e.g. sewage, septage).

The majority of source tracking studies examine ambient surface waters in combination with large-scale watershed remediation planning (Peeler et al., 2006); while the method of applying chemical and microbial source tracking to private systems has been limited to a handful of previous studies. Allevi et al. (in press) investigated 538 samples taken at POU from Virginia households dependent on private water supply systems for human wastewater contamination using fluorometry to detect optical brighteners and PCR to detect *Bacteroides.* Three of the 538 samples were identified as likely contaminated with human sewage. Another study used the presence of caffeine to identify probable human wastewater contamination within seventeen groundwater wells (Seiler et al., 2005). Caffeine concentrations as high as 0.23 μg/L were observed in some samples, though this level is considerably lower than concentrations typically found in wastewater (between 20 μg/L and 300 μg/L) and septic tank effluents (100-120 μg/L) (Charles and Stephen, 2009). Batt et al. (2006) examined the occurrence of antibiotics, in particular sulfonamides, and nitrate in six private wells in Idaho in an agricultural area. The collection point of these samples was not specified. Researchers detected two sulfonamide antimicrobials, sulfamethazine and sulfadimethoxine, with concentrations ranging from 0.046 μg/L to 0.22 μg/L, in samples from all six wells. Samples from three of the six wells, had nitrate levels that exceeded the 10 mg/L nitrate-N maximum contaminant level set by the US EPA, with a maximum observed concentration of 39.1 mg/L nitrate-N.

1.4 Factors Contributing to Private System Water Quality

Several previous surveys of water quality from private drinking water supplies have linked system construction/integrity or environmental factors to contaminant presence and/or magnitude. Bauder et. al (1993) examined nitrate concentrations in 3400 private well systems to identify associations between nitrate contamination, land use and geographic characteristics in Montana. Gosselin et. al (1997) observed nitrate as well as bacteria contamination in 1808 private well systems in rural Nebraska. Both studies came to similar conclusions: nitrate and bacterial contamination in groundwater depend on the groundwater region, geographic, climatic, and geological conditions and land-use practices. Despite similar findings, Ray and Shock (1996) warn that comparisons between many studies of private drinking water supply systems must be approached with caution, as sample selection and analytical practices are not standardized and often only cursorily described.

Possible connections between water quality and rural living and/or poverty are important, because although they are not necessarily interrelated, these parameters are often linked adequate water supply infrastructure and availability in the United States (Wescoat Jr et al., 2007). A survey of rural health care providers identified water quality as the primary environmental health issue of concern for rural communities (Robson and Schneider, 2001). Despite this, no peer-reviewed studies are available that explicitly investigate associations between private system drinking water quality and social-economic data; particularly as it relates to age, race, income, and education level.

The only accessible study discussing potential links between demographic data and water quality in private systems was instituted for the US EPA to gather information about rural water supplies in the US. This study was launched after Congress mandated the Safe Drinking Water Act of 1974 and was prepared by a host of collaborators (i.e. Department of Rural Sociology at Cornell University, EPA staff, consultants at Engineering Enterprises, and several social scientists from various universities) (Francis et al., 1981). The nearly 30-year old study took place from May 1978 to January 1979. Households within rural areas as defined by the US Census Bureau (2,654 in total) were surveyed and samples were obtained from 1,100 private systems linked to these households. Sampled supplies included individual, intermediate, and community systems. Households in this study were chosen using a complex stratified sampling system to achieve a representative sampling of all rural areas in the US. Of the 2,654 samples tested, 42% were positive for total coliform (average concentration = 10,475 organisms/100 mL) and 12.2% were positive for fecal coliform (no average concentration was provided). Samples from households specifically served by wells were positive for total coliform at a slightly higher rate (45%) with an average concentration of 10,607 organisms/100 mL. Demographic information was obtained via personal interviews with homeowners. The study found that households with incomes under $10,000 (N.B. national annual median income in 1978 = $13,512) and households with “less education” (i.e. no high school degree or equivalent) tended to have "coliform problems". Characteristics of households specifically being served by private wells were assessed to determine correlations to total coliform contamination. Income and education as well as Well depth and system maintenance showed little correlation. The strongest correlations, although still weak, were found between coliform concentration and well type and if the well was grouted (with correlation coefficients of 0.15 and 0.12, respectively). No strong correlation between household demographic data, water supply system, or system characteristics and total coliform contamination was discovered.

A comprehensive analysis of 2000 Census Bureau data by the Rural Community Assistance Project (RCAP) suggested links between poverty, race, and plumbing facilities adequacy. Households below the poverty line are almost two times as likely to have inadequate plumbing facilities as those above the poverty line. Racial groups that were heavily affected included American Indians and Alaskan natives, which had highest percentages of inadequate facilities overall, followed by Hispanics, Blacks, and Whites. Most notably, Virginia ranked fourth in the nation with the highest percentage of self-identified Black households lacking complete plumbing facilities at 1.53% (Gasteyer and Vaswani, 2004).

Other recent articles examined income or racial disparities and their relationship to water quality/water infrastructure. VanDerslice (2011) reported that only three available studies have compared the demographic characteristics of communities with drinking water quality, and that these yielded mixed results. For instance, one of the studies, Balazs et al. (2011), determined that in California's San Joaquin Valley, 327 smaller community systems serving a large percentage of Hispanics received drinking water with higher nitrate levels than communities with relatively small Hispanic populations. Average nitrate concentrations were determined via data obtained from the California Department of Public Health. The community systems were grouped into three categories based on nitrate level concentrations and then the groups with the highest Latino populations were analyzed for possible disparities. Another study in Arizona used arsenic concentrations to reflect disparities amongst economic and racial groups. The study concluded that there was no statistical significance in arsenic concentrations with regard to race or income. These studies did not specify if the community systems were public or private.

1.5 Conclusion

A substantial number of American households rely on private water supply systems (e.g. wells) as their main source of potable water. As the Safe Drinking Water Act does not apply to systems that serve fewer than 25 connections, the EPA only issues recommendations regarding testing and maintenance for these systems; compliance with specific water quality standards is not monitored or enforced. Potential contamination of these systems is a particular concern in the Commonwealth of Virginia where over 1.7 million out of 8.1 million residents rely on private water supply systems. Several recent studies have noted that contamination of private drinking water systems is common, which may be linked to an increasing number of reported outbreaks of infectious disease.

The goal of the present study is to identify potential associations between drinking water quality in private systems in rural Virginia and accompanying demographic information. Although several previous studies have examined the impacts of a group of environmental, system construction, and land use factors on water quality from private water supplies, the majority of studies investigating relationships between demographic characteristics and water have largely focused on access to water rather than water quality. A more thorough understanding of the interactions between socio-economic factors and water quality at the POU will be useful in identifying appropriate and effective strategies (e.g. educational efforts, subsidies) to improve homeowner maintenance of private water supply systems. This effort concentrates on microbial contamination (i.e. unacceptable levels of indicator bacteria) as there is a relatively clear associated health risk and a historically high incidence of contamination in these systems. In addition to indicator bacteria detection, this study will also employ source-tracking methods to identify possible routes of contamination and aid in the design of interventions to reduce human risk.

2 GOALS AND OBJECTIVES

The overall goal of this project is to identify possible associations between concentrations of fecal indicator bacteria in samples collected at the point of use (POU) by the homeowner using a private water supply system and homeowner-provided demographic data. Identified links will contribute to an understanding of potential water quality disparities in rural areas of Virginia and serve to aid in the design of future public health intervention strategies. Realization of this goal will be achieved through the following objectives:

1. Quantify contaminants of human health concern (e.g. total coliform-TC, *E. coli*-EC, nitrate) in water samples from private systems collected by the homeowner at the POU;
2. Identify possible associations between demographic data (e.g. household income, education level, age), nitrate and fecal indicator bacteria;
3. Apply chemical and microbial source tracking techniques to identify possible instances of human contamination.

3 EXPERIMENTAL METHODS

3.1 Sample Collection

Samples analyzed in this study were obtained through collaboration with the Virginia Household Water Quality Program (VAHWQP; www.wellwater.bse.vt.edu). Started in 1989, the VAHWQP organizes drinking water clinics that provide low-cost water quality testing (~$49) to homeowners along with relevant education on system maintenance, potential contamination vulnerabilities, and water treatment options should treatment be warranted. Since 1989, over 16,000 household samples provided by homeowners in 87 of the Commonwealth's 92 counties have been analyzed. Currently, each homeowner-collected sample is tested for 14 separate chemical and bacteriological constituents, including: total coliform bacteria, *E. coli*, pH, total dissolved solids, sodium, nitrate-N, sulfate, fluoride, manganese, iron, arsenic, copper, lead, and hardness.

Drinking water clinics are organized in collaboration with Virginia Cooperative Extension's county offices and agents. Each clinic has four phases 1) an informational meeting at which sample kits are distributed; 2) sample collection (typically the day following the kickoff meeting); 3) sample analysis; and 4) an interpretation meeting where sample results are summarized and participant questions addressed. Each sample kit contains: 1) instructions on how to properly collect samples from the tap inside the home; 2) a survey requesting information on homeowner perceived water quality issues, potential sources of local contamination, and demographic data (Appendix A); 3) and four sample bottles, each of which is used for a different analysis (Figure 3-1).

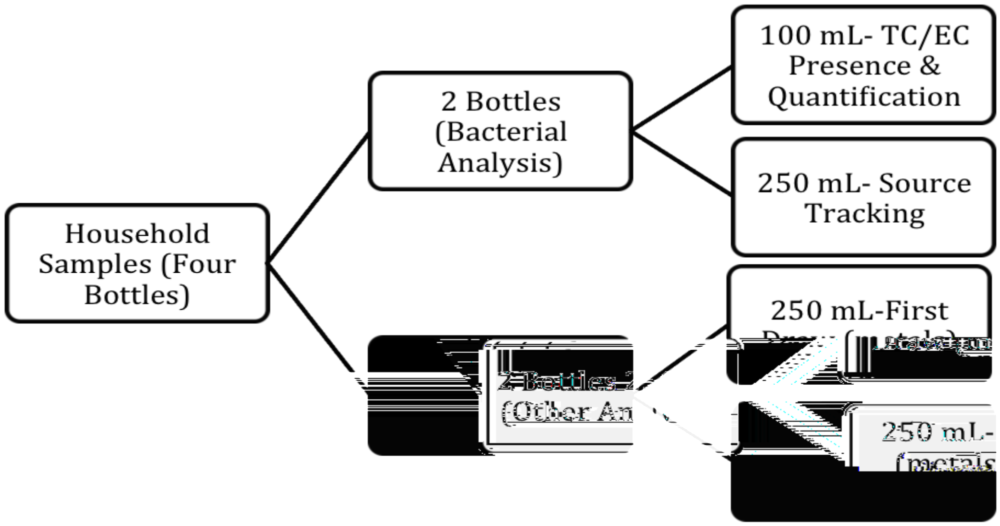

Figure 3-1: Sample Bottle Classification

Participants are instructed to collect their samples at POU and transport them on ice to a central location (often the local extension office) on a pre-arranged sample collection day. Following collection, the samples are transported on ice to the Virginia Tech campus for analysis. Holding times vary based on the location of the targeted county relative to Blacksburg; even in the most extreme case, no more than 12 hours pass from the time the samples are collected by the homeowner to when they are analyzed for bacteria. Following sample analysis, results are provided confidentially in a sealed envelope to each clinic participant at a final "Interpretation Meeting" led by a local extension agent or Virginia Tech faculty member.

Counties participating in VAHWQP during any given year are targeted based on local interest, county extension agent availability, and available funds. During 2012, VAHWQP Drinking Water Clinics were conducted in 33 counties across the state and yielded a total of 831 water samples. Participating counties in the 2012 Drinking Water

Clinics included: Albemarle, Brunswick, Charlotte, Clarke, Essex, Fairfax, Fauquier, Fluvanna, Frederick, Greene, Halifax, King George, Lancaster, Loudon, Louisa, Lunenburg, Madison, Mecklenburg, Montgomery, Nelson, Northumberland, Orange, Page, Prince William, Rappahannock, Richmond County, Russell, Shenandoah, Spotsylvania, Stafford, Tazewell, Warren and Westmoreland. These counties are highlighted in gray in Figure 3-2.

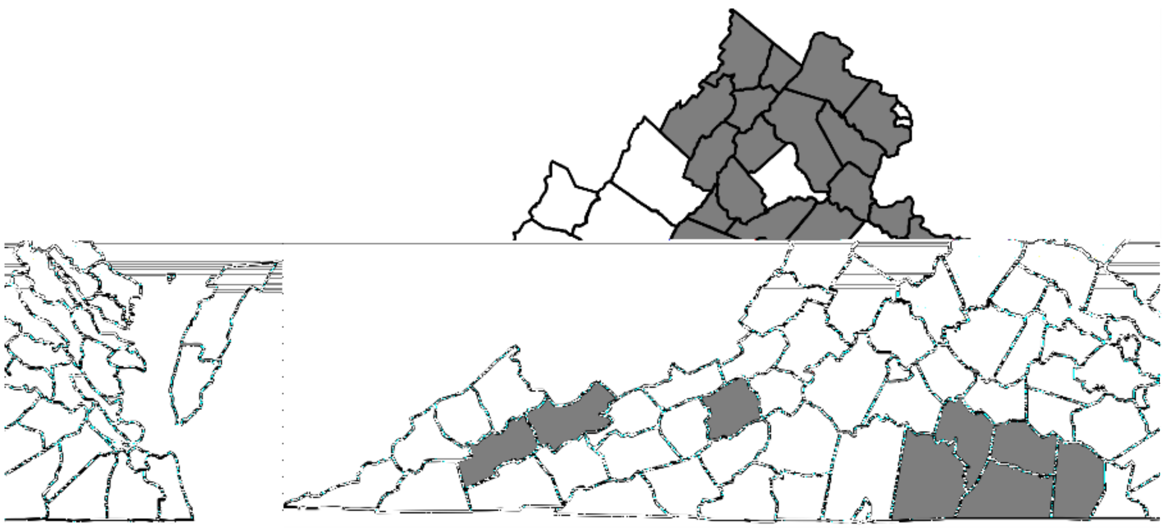

Figure 3-2: 2012 VAHWQP Drinking Water Clinics Counties

3.2 Indicator Bacteria Analyses

This project focused on quantifying fecal indicator bacteria as a measure of potential public health risk. Following arrival at the BSE Water Quality laboratory, each 100 mL sample reserved for microbial analysis (Figure 3-1) was analyzed via the Colilert® defined-substrate technique (www.idexx.com, Westbrook, ME, USA). As the Colilert® analysis only requires 100 mL, after inverting the bottle several times to ensure a homogenous mix, excess water (above the 100 mL fill line) was poured into a 15 mL sterile centrifuge tube and saved for subsequent fluorometry analysis. Quanti-tray®/2000s (capable of detecting counts of up to 2,419 MPN/100 mL) were used to quantify bacteria concentrations. Once filled, each quanti-tray was sealed and incubated at 35 ± 0.5° C for 24 ± 2 hours. A positive result for total coliform is indicated by a yellow color change and *E. coli*-positive wells fluoresce under Ultra-Violet light. The number of positive wells is converted to a Most Probable Number (MPN) concentration based on the Thomas equation (Hurley and Roscoe, 1983).

3.3 Additional Chemical and Physical Parameters

As illustrated in Figure 3-1, VAHWQP tests for a number of non-microbial water quality parameters as a part of their routine tests analysis. All analyses are performed using standard methods (Table 3-1) below. In addition to the constituents listed in Table 3-1), each sample is also analyzed for potassium, silicon, phosphorus, aluminum, vanadium, calcium, chromium, cobalt, magnesium, nickel, zinc, molybdenum, silver, cadmium, and tin. Results for these constituents are not reported to the VAHWQP drinking water participant. The reason for this is the desire to have the VAHWQP participants focus on a few critical constituents to build their awareness and encourage them to do routine testing in the future. For the analysis performed for this study, all of the data returned by the Virginia Tech labs was considered as a possible predictor of total coliform presence in the logistic regression analysis.

Table 3-1: Complete List of Chemical and Physical Parameters and Analysis on Drinking Water Samples

Parameter	Analysis	Parameter	Analysis
Total Coliform Bacteria	EPA Standard Methods 9223	Fluoride	EPA Standard Methods 300
E. coli	EPA Standard Methods 9223	Manganese	EPA Standard Methods 200.5

pH	EPA Standard Methods 4500-H^+	Iron	EPA Standard Methods 200.5
Conductivity	EPA Standard Methods 2510 B	Hardness	EPA Standard Methods 2340
Total Dissolved Solids (TDS)	EPA Standard Methods 2540D	Copper	EPA Standard Methods 200.5
Sodium	EPA Standard Methods 300.1	Lead	EPA Standard Methods 200.5
Nitrate-N	EPA Standard Methods 4500 NH_3	Arsenic	EPA Standard Methods 200.8
Sulfate	EPA Standard Methods 300		

*WEF 2009

3.4 Chemical Source Tracking: Fluorometry

Out of the 831 samples, 824 samples were analyzed using a 10AU™ Field and Laboratory fluorometer (www.turnerdesigns.com, Sunnyvale, CA, USA) in order to determine the presence of optical brighteners. Following the collection of samples as described previously, centrifuge tubes were stored in a dark 4° C refrigerator to prevent UV light exposure, which can degrade optical brighteners.

The samples were transferred to smaller glass tubes, inverted to re-suspend any particulate matter, and then individually read by the fluorometer. Fluorometry readings were recorded following reading stabilization (between 15-30 seconds). A sample was considered positive if the reading was higher than 30 fluorometric units (Cao et al., 2009; Hartel et al., 2007). In order to make sure that the reading reflected the presence of anthropogenic optical brighteners (e.g. laundry brighteners, toilet paper) rather than naturally fluorescing compounds found in the environment, each positive sample was exposed to UV light for approximately 4 hours following its initial reading. Because anthropogenic optical brighteners are expected to degrade while natural optical brighteners remain stable, the presence of anthropogenic brighteners was confirmed if the fluorometer reading after UV exposure had decreased by 30% or less when compared to the original reading. Pre and post UV exposure fluorometry readings for positive samples are provided in Appendix B.8.1.

3.5 Microbial Source Tracking: *Bacteroides spp.*

For all samples positive for *E. coli* via Colilert® (n=55), the corresponding 250 mL of sample water (Figure 3-1) was concentrated for storage and subsequent molecular analysis via filtration. Samples were filtered through sterile 0.04 μm Isopore™ membrane filters (www.millipore.com, Billerica, MA, USA) between 24-72 hours of arrival in a sterile biosafety cabinet and then the filters were stored in 2 mL cryogenic vials (www.sigmaaldrich.com, St. Louis, MO, USA) at -80°C until DNA extraction and qPCR analysis.

A total of 35 of the 55 *E. coli*-positive samples were analyzed using qPCR. This method was reserved for *E. coli* positive samples because they are more indicative of fecal contamination from animals (including people). Initially, only *E. coli* positive samples acquired from participating counties in the VAHQWP 2012 Drinking Water Clinics that are believed to be underserved (i.e. populations that are disadvantaged due to socio-economic disparities) were the only ones that were going to be analyzed, however the amount of samples that were received was not enough to ensure a large sample size and yield statistical significance if analyzed, so the decision was made to include all counties, although the *E. coli* positive samples from the previously completed counties were not filtered.

Two types of fecal indicators were used and detected by real-time PCR (qPCR): General *Bacteriodales* marker (GenBac or AllBac) and human-specific HF183 *Bacteroides*. These fecal indicators were specifically selected because GenBac is used to indicate that mammalian fecal contamination is present and HF183 can be used to detect human fecal contamination.

Both GenBac and HF183 primers and probes were purchased through Applied Biosystems™ (www.appliedbiosystems.com, Foster City, CA, USA) and custom-made. The forward primer employed for the detection of GenBac presence was GenBac3-F and the reverse primer was GenBac3-R. The forward primer used for HF183 was HF-183F and the reverse primer was HF183. The probes applied to specify amplification was GenBac3-P and HF183-P. The DNA sequences for the primers and probes are displayed in Table 3-2.

Table 3-2: Primer and Probe Identities, Target Genes and Sequences for Fecal Markers DNA Assays

Primer/Probe	Target Gene	Sequence (5'-3')
GenBac3-F	General *Bacteriodales*	GGGGTTCTGAGAGGAAGGT
GenBac3-R		CCGTCATCCTTCACGCTACT
GenBac3-P		6FAMCAATATTCCTCACTGCTGCCTCCCGTATAMRA
HF183-F	HF *Bacteriodales*	ATCATGAGTTCACATGTCCG
HF183-R		CGTAGGAGTTTGGACCGTGT
HF183-P		6FAMTATCGAAAATCTCACGGATTAACTCTTGTGTACGCTAMRA

DNA was extracted using a QIAamp® DNA Stool Mini Kit (www.qiagen.com, Valencia, CA, USA). Almost all the equipment that was necessary to complete this process was included in the kit with the exception of 1.5 mL and 2 mL microcentrifuge tubes. The kit included 50 QIAamp mini spin columns, 200 2 mL collection tubes, 50

InhibitEX Tablets, 140 mL of Buffer ASL, 33 mL Buffer AL, 19 mL Buffer AW1 (concentrated), 13 mL Buffer AW2 (concentrated), 12 mL Buffer AE, and 1.4 mL Proteinase K. The actual extractions were performed according to the instructions provided in the QIAamp® DNA Stool Handbook.

Using a pipette, 1.4 mL of Buffer ASL was added to the frozen filters already in 2 mL cryogenic tubes. The tubes were vortexed until the filters and buffer solution were completely homogenized. These mixtures were placed in a 95°C bath to increase total DNA yield and help lyse all bacteria in the sample. The sample was vortexed again for around 15 seconds and then centrifuged for 1 minute to separate the solid portion from the supernatant. An aliquot of 1.2 mL of the supernatant was pipetted into a 2 mL microcentrifuge tube and the solid was discarded. Next, 1 InhibitEX Tablet was added to each sample and vortexed immediately for 1 min or until the tablet was completely dispersed. The tubes were incubated for 1 minute at room temperature to allow all the inhibitors to adhere to the InhibitEX matrix. The samples were centrifuged again at full speed for 3 minutes to separate the solid from the supernatant. Next, all of the supernatant was pipetted into a new 1.5 mL microcentrifuge tube and centrifuged again for 3 minutes at full speed. An aliquot of 15 µL proteinase K was pipetted into a new 1.5 mL microcentrifuge tube and 200 µL of supernatant was pipetted into the 1.5 mL microcentrifuge tube containing the proteinase K. Next, 200 µL of Buffer AL was added to the tube and vortexed for 15 seconds. After that, the samples were incubated at 70°C for 10 minutes. Ethanol (200 µL) was added to the mix and vortexed. A new QIAamp spin column was labeled at the top of the lid and placed it in a 2 mL collection tube. The complete mix for each sample was carefully added to the QIAamp spin column without getting any of it on the rim. The spin column cap was closed and the tubes were centrifuged at full speed for 1 minute. The spin column was placed into a new 2 ml collection tube and the tube containing the remaining liquid was discarded. Next, 500 μL of Buffer AW1 was added into the spin column and centrifuged again for 1 minute at full speed. The spin column was placed into a new 2 mL collection tube and the tube containing the remaining liquid is discarded. After this, 500 μL of Buffer AW2 is added to the spin column and centrifuged at full speed for 3 minutes. The remaining liquid in the collection tube was discarded. The QIAamp spin column was placed in a new collection tube and the old collection tube was discarded. The tubes were centrifuged again at full speed for 1 minute and the old collection tube was again discarded. Then the spin column was placed into a new 1.5 mL microcentrifuge tube and 200 μL Buffer AE was pipetted directly onto the QIAamp membrane. Each sample was incubated again at room temperature for 1 minute and then centrifuged at full speed for 1 minute to elute DNA. The resulting samples were stored in a -80°C freezer until ready for analysis.

To conduct qPCR analysis an Eppendorf® Mastercycler® Pro (www.ependorf.com, Hamburg, Germany) the following steps were completed twice: once for General *Bacteriodales* and once for HF183 *Bacteroides*. The steps of the qPCR analysis are described below.

- Step 1: QPCR Reaction Set Up. All reactions components were properly thawed before they were mixed. The following constituents were added to each qPCR tube: 3 μL PCR-grade water, 10 μL KAPA PROBE FAST qPCR Master Mix, 1 μL forward primer, 1 μL reverse primer, 4 μL probe, 1 μL template DNA and ROX dye (0.4 μL).

- Step 2: Plate Set Up. The reaction mix was added to each well of the PCR plate and centrifuged to ensure thorough mixing.
- Step 3: Running the Reaction. The cycling protocol is described in Table 2.

Table 3-3: qPCR Cycling Protocol

Step	Temperature	Duration	Cycles
Enzyme Activation	95°C	3 min	Hold
Denature	95°C	3 sec	40
Anneal	60°C	20 sec	
Extension	72°C	8 sec	

3.6 Survey Data

Each VAHWQP sample kit included a survey designed to capture homeowner perceptions of existing household water quality, their private water supply system characteristics, perceived potential environmental threats, and household demographic data. A copy of this survey is included in Appendix A. Survey results were entered into an Access Database and later organized in Excel to be analyzed in SAS JMP Pro 10.0 (SAS Inc., Cary, NC, USA).

Several substitutions were necessary in order to process the received data using JMP Pro 10.0. Sample bacteria concentrations that were identified as being above the detection limit were given the number “2421” (e.g. >2419 MPN/100 mL) to distinguish them from the other concentrations and to allow the data to be processed for statistical analysis. In displaying “absence/presence” or “true/false” results in the raw data tables, zero, represents absence/false and "1" represents presence/true. System type was also abbreviated to help display the results in a more visually appealing manner. A list of the abbreviations included in the raw data tables in the Appendices is provided in Appendix B.8.2.

In order to perform the statistical analysis necessary to identify associations between education level and microbial contamination, contamination rates were compared only to the presumed "head of household" data. For the purposes of this study, the personal information requested on the survey (e.g. education, age) that was filled out first was assumed to correspond to the head of the household. If a child's information was listed first, then the last person's information was assumed to be the head of household.

3.7 Statistical Analysis

The overall goal of the statistical analysis was to determine whether the survey-supplied information and non-bacteria water quality constituents can be related to the presence/concentration of total coliform and *E. coli*. Since the bacteria data was not normally distributed, non-parametric tests used. All tests were performed in JMP® Pro 10.0 (SAS Inc., Cary, NC, USA). Table 3-4 summarizes the research question posed and the related statistical analysis.

Table 3-4: Summary of Statistical Methods

Research Question	**Statistical Method**
Is there an association between household income/education and bacteria presence?	Likelihood Ratio Test

Is there any difference in the dispersal of bacteria concentrations amongst education and household income categories?	Kruskal-Wallis Test
Do any chemical parameters and/or system characteristics (i.e. well depth, system age) bear statistical significance to bacteria concentrations?	Logistic Fit Test
What important parameters should be selected to be included in the model that predicts total coliform presence?	Forward Stepwise Selection
What is an effective way of evaluating the relationship between independent variables and a dependent response (i.e. total coliform presence)?	Nominal Logistic Regression Model
What is another way of describing the aforementioned relationships?	Odds ratios

3.7.1 Likelihood Ratio Test

The likelihood ratio test is considered to be one of the most powerful analyses for simple hypothesis testing. It is a chi-squared test that compares the fit of two models built on the same data (the null hypothesis vs. the alternative hypothesis). The objective of this test is to compute the probability of observing the data under the null hypothesis and the alternative hypothesis using the likelihood function. The likelihood ratio test is the nonparametric equivalent of Fisher's test.

The test statistic for the likelihood ratio test varies depending on what types of hypotheses one is testing. In testing the scenario for general hypotheses vs. alternative hypotheses the test statistic is as follows:

$$\lambda = \frac{sup_{\theta \in \Theta_0} L(\theta; x_1, x_2, \ldots, x_n)}{sup_{\theta \in \Theta} L(\theta; x_1, x_2, \ldots, x_n)} \qquad \text{Equation 3.1}$$

where θ is the parameter, the specified subset is Θ_0, the parameter space is Θ, and the likelihood *L*.

The likelihood ratio test was used to determine if there was any relationship between bacteria presence (total coliform or *E. coli*) and either education or income levels. The null hypothesis simply states that there is no association between bacteria presence and education or household income. The alternative hypothesis states that there is an association between bacteria presence and education or income levels.

This test is the default test in JMP when the option "analyze" is chosen from the start menu, "fit Y by X" is selected and the parameters being fitted are both categorical.

3.7.2 Kruskal-Wallis Test

The Kruskal-Wallis Non-Parametric One-Way Analysis of Variance (ANOVA) was employed to assess the relationships between demographic data and bacteria concentrations and was used in conjunction with the Chi-Squared Test. The Kruskal-Wallis Test is a nonparametric test and its goal is to determine whether samples originate from the same distribution or identical sample populations (Dodge, 2008). It is used to compare samples that are divided into more than one independent group. The test assumes that samples are random, however it does not assume that population distributions are normal. Unfortunately, the test cannot tell you how the groups differ from each other or to what extent they differ (i.e. does not specific direction/whether values for one group are greater or less than the other).

The null hypothesis for the Kruskal-Wallis Test states that there is no difference amongst sample populations. The alternative hypothesis states that at least one of the populations differs from the others. The test statistic, H, for Kruskal-Wallis is as follows:

$$H = \frac{12}{n(n+1)} \sum_{i=1}^{k} \frac{T_i^2}{n_i} - 3(n+1) \qquad \text{Equation 3.2}$$

where n is the number of groups, k is the number of all samples, and T is the rank sum for the *ith* sample. The null hypothesis states that if samples come from populations such that the probability that a random observation from one group is greater than a random observation from another group is 0.5 (alpha value).

This test was performed using total coliform and *E. coli* concentrations (MPN/ 100 mL). Education divisions were compared to the bacteria concentrations. Education was grouped into six categories: In school now, some high school, high school graduate, some college, college graduate, and post college graduate. The same test was used to compare household income categories and bacteria concentrations. Income was grouped into five divisions: less than or equal to $10,000, $11,000-$24,000, $25,000-$40,000, $41,000-$64,000, and equal to or over $65,000.

In order to run the test in JMP, the "Analyze" option was chosen, then "Fit Y by X" was selected and once that option was chosen, the Wilcoxon/Kruskal Wallis test was performed using the non-parametric test menu.

3.7.3 Stepwise Regression Analysis

A key technique in determining associations between parameters was to model bacteria presence/concentration using chemical constituent data, private water supply system characteristics, water quality perceptions, and household demographic data.

Initially, bacteria concentrations and *E. coli* absence/presence were considered to be the dependent response variable, but all were too "zero-heavy" to yield a model with acceptable accuracy. Consequently, the model discussed in this section only pertains to predicting total coliform presence/absence.

Since there were over 100 potential predictive variables that could be model inputs, variables were selected based on their individual significance to total coliform presence. A series of techniques were performed to weed out insignificant parameters and narrow down the choice of predictive variables. For instance, all chemical parameters were compared to total coliform presence by the Logistic Fit model. Any p-value was greater than 0.05 was not included in the stepwise analysis. There were also several variables that were categorical (e.g. 'yes/no', 'absence/presence' or several group levels), so each category level was identified as a potential variable. Even so, to accurately capture the whole effects of these parameters, groups were combined when entered in the model to yield one potential variable. Construction year and well depth were separately statistically significant to total coliform, yet they were not included in the list of potential predictors because of low survey response (less than half of households reported), which lowered the model's sample size and for that reason had to be removed.

Figure 3-3 captures the selection process for potential parameters used in the stepwise regression. System characteristics and physio-chemical variables were compared to total coliform concentrations to determine significance through the Logistic Fit test. Variables with high p-values (p-value> 0.05) were not included. The next step was to determine if the sample sizes/responses were large enough to be included in the model. For instance, if only 12 participants stated that they had blue staining, this variable was not included. Furthermore, many categorical variables, such as county and system type, had some groups with low response rates (n<20) that had to be combined to compensate for such sparse numbers.

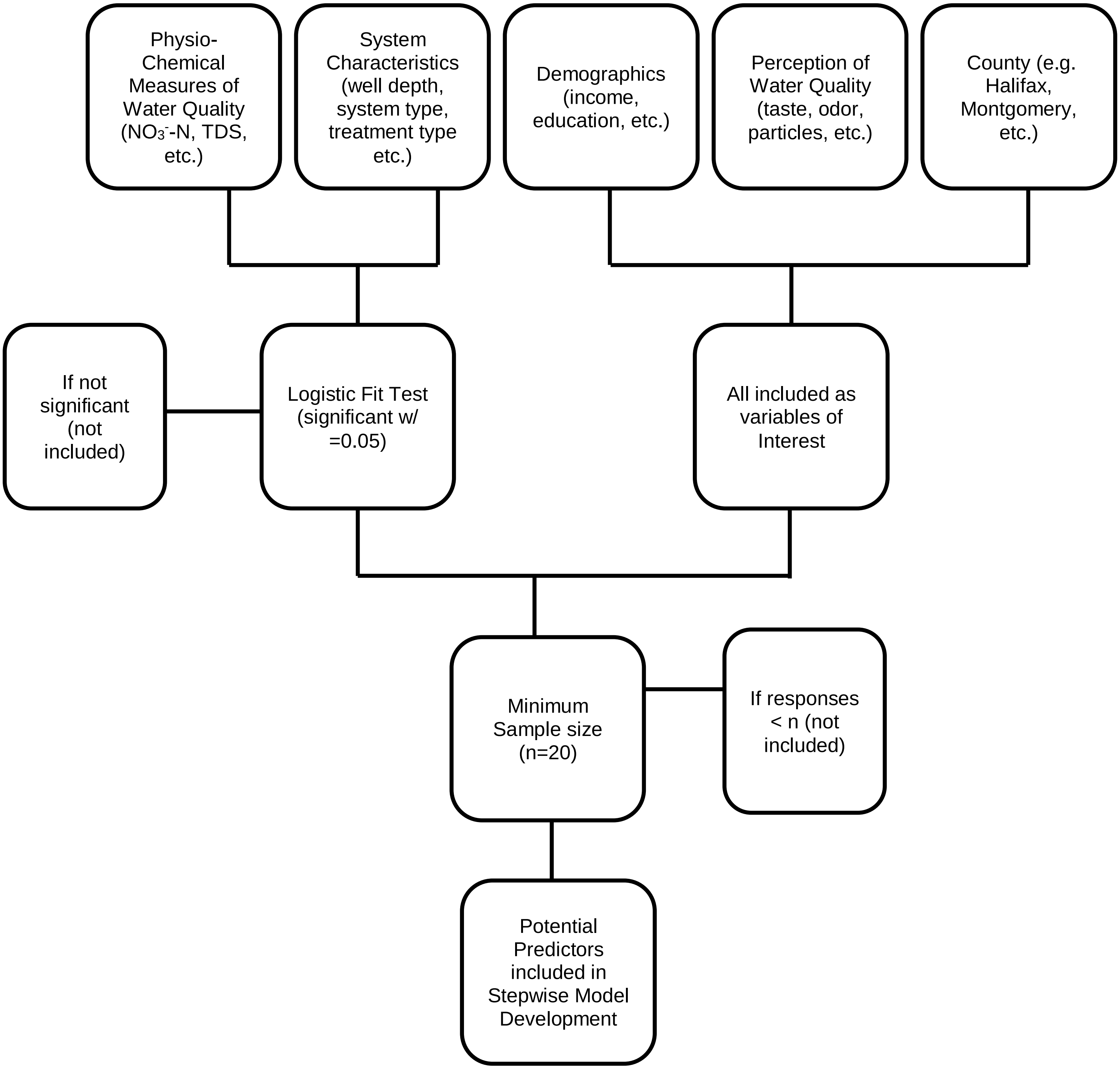

Figure 3-3: A Diagram of the Selection Process of Potential Predictors entered into Stepwise Analysis

Stepwise regression is a precursor procedure that determines which predictive variables will be in the model. There are three types of stepwise regression: forward selection, backward selection, and mixed selection. Forward selection begins with all variables being removed. Then, each variable is added based on the significance it has in predicting the dependent variable. Backward selection works in the opposite way. All variables are entered and then removed based on their significance. Mixed or bidirectional stepwise direction starts with entering all variables in the analysis, removes them one by one and then can renter variables if they become significant again. This can happen if one variable that is closely related to another variable is removed and the previous one is deemed significant and is inserted again.

In JMP, there are many components that comprise the Stepwise Regression Control interface. The user must specify the following: “stopping rule”, direction of regression, rules and restrictions, and if you want to make the model or simply run the model.

For the stopping rule a user can choose user-specified p-values, Corrected Akaike’s Information Criterion (AICc) or Bayesian Information Criterion (BIC) as the statistical rule for constructing the best model. AICc is a methodology for model selection that has is based on the calculation of the Kullback-Leibler distance (Kletting and Glatting, 2009). The general equation used to express the AICc is as follows:

$$AICc = -2\,ln(L) + 2K + \frac{2(K+1)(K+2)}{N-K-2} \qquad \text{Equation 3.3}$$

where K is the number of estimated parameters included in the model, N is the number of data points, and L refers to the maximum value of the likelihood function for the estimated model. The model with the minimum AICc value of all candidate models indicated the best model. The BIC also known as the Schwarz's information criterion is another criterion for model selection on a finite set of models. It is closely related to AIC, but it is considered to be more penalizing in regard to the number of parameters in the model than AICc (Posada and Buckley, 2004). The equation for this criterion is as follows:

$$BIC = -2lnL + Kln(N) \qquad \text{Equation 3.4}$$

where K, L, and N are the defined as the aforementioned terms. Due to its relative restrictiveness and parameter penalties, BIC was not chosen as the stopping rule for this study.

JMP also gives the option to choose the direction of stepwise regression; either forward, backward or mixed. There are several options for rules that you can impose on the procedure to fit your needs. You can combine effects, only look at whole effects, restrict terms that have precedents so that they cannot be entered until the precedents are entered and finally you have the option to not include any rules. An example of the stepwise control panel is included in Figure 3-4.

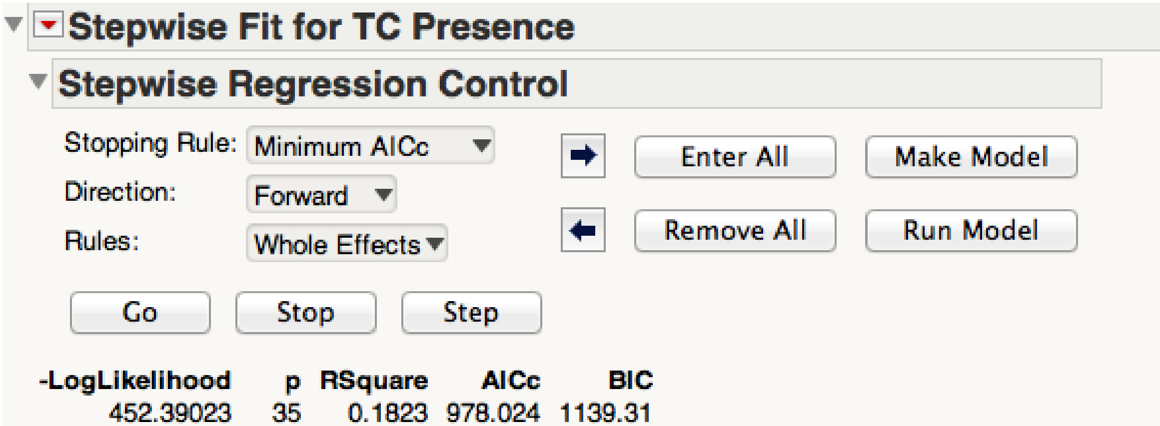

Figure 3-4: Screenshot of Stepwise Regression Control Panel

In order to perform these procedures in JMP, the "Analyze" option was chosen, followed by "fit Model". All the variables from the survey data were inputted with the dependent variable being "total coliform presence". The personality "stepwise" was then chosen and then in the "stopping rule"-minimum AICc was chosen because it puts fewer penalties on the amount of variables that can be inputted into a model than minimum BIC.

The data was examined using all types of stepwise regression and the model was chosen that had the least amount of parameters with the highest percent accuracy. Based on these criteria, forward selection was used to build the model. Since a great deal of the variables inputted into the model were categorical (e.g. multiple levels), the "whole effects" rule was selected to make sure the entire parameter was captured. The model was made and then run. The resulting parameters are included in Table 4-9.

3.7.4 Nominal Logistic Regression Model

Once the variables were selected via stepwise regression, they became the estimates in a Nominal Logistic Regression model in order to predict total coliform presence. Nominal logistic regression or the logit model is a type of logistic regression analysis that is used to predict the outcome of categorical (binary) dependent variables with a set of independent variables, which can either be quantitative or qualitative. This model is well suited for this data set because it does not assume normal distribution and can compare dependent variables to variables that are either continuous or discrete. It allows for adjustment to help reduce potential bias arising from the differences in the comparison of various groups (Hosmer and Lemeshow, 2000).

The logistic regression model is based on the logistic function that only yields response or dependent values between zero and one, but the independent values are not limited by these boundaries and can be infinite; which results in a curve like the one highlighted in Figure 3-5.

The logistic function is defined by the following formula:

$$f(x) = \frac{1}{1+e^{-x}} = \frac{e^{x}}{1+e^{x}} \qquad \text{Equation 3.5}$$

where f(x) is the response and x is the value of any given predictor variable. However, since we have a number of predictor variables that we want to use to estimate the response the equation can be rewritten to include the linear equation used to predict binary outcomes:

$$f(x) = \frac{e^{\beta_0+\beta_1 x_1 \dots + \varepsilon}}{1+e^{\beta_0+\beta_1 x_1 \dots + \varepsilon}} \qquad \text{Equation 3.6}$$

where β_0 is the intercept, β_1 is the coefficient estimate for predictor variable x_1, and ε is the error term. However, one of the main goals of the logistic model is to relate the response to the linear equation that predicts binary outcomes, so therefore we have to transform the above equation once again by substituting the response to the logit function as follows:

$$f'(x) = ln\left[\frac{f(x)}{1-f(x)}\right] = \beta_0 + \beta_{1x_1} + \varepsilon \qquad \text{Equation 3.7}$$

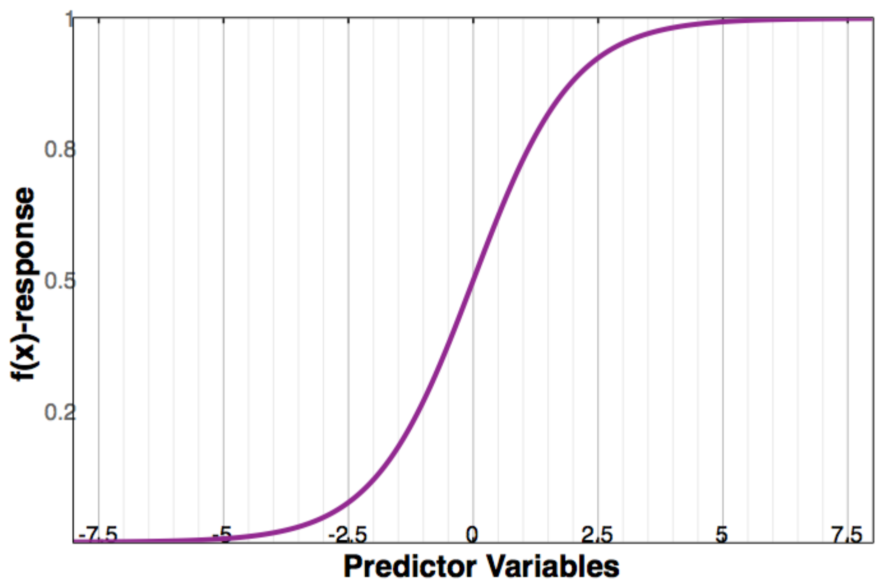

Figure 3-5: Example of Logistic Curve

In order to run this analysis in JMP, "Fit Model" was chosen under the "Analyze" option. The Nominal Logistic personality was chosen and all the selected parameters were chosen and then "run model" was selected. The output of the nominal logistic model includes several default tests like the whole model test, lack of fit, parameter estimates, and effect likelihood ratio tests. The model estimates and parameters that resulted from the Nominal Logistic Regression model are highlighted in Table 4-9.

To gain a better understanding of the associations taking place in the model, odds ratios were utilized. Odds ratios are a measure of the association between two variables and represent the likelihood that an outcome will happen in the presence of an exposure compared to the outcome if that exposure is absent (Szumilas, 2010). The odds ratios for the final model parameters are included in Table 4-.

Unlike other regression models, the coefficient of determination, R^2, is not used to verify how well a nominal logistic regression model performs because it does not represent the fraction of variability that is in the outcome of the model. Therefore there are other methods utilized to gauge the accuracy of these models. One of these ways is by observing the Receiver Operating Characteristic (ROC) curve. The ROC curve is a plot that evaluates the performance of a binary classifier system. It works by plotting the fraction of true positives (y-axis) versus the fraction of false positives (x-axis). The area under the curve (AUC) is a measure of the efficacy of prediction of the response using a test classifier, so it used to report the accuracy of the model. The AUC is simply an indicator of goodness of fit and commonly calculated using a non-parametric method based on approximating the area using trapezoids. A contingency table can also be constructed form the ROC curve and is given in Figure 4-10.

3.8 Nitrate Concentrations Statistical Analysis

For this study, nitrate concentration levels provided by VAHWQP were compared to the USEPA's MCL. A great deal of Nitrate that is introduced anthropogenically into the environment is through the use of fertilizers and nitrate that percolates into groundwater from septic tank drain fields. Elevated nitrate is considered to be a risk to human health concern because in young animals (< 6 months) nitrate is converted to nitrite. The nitrite binds to hemoglobin reducing oxygen saturation in the blood. As a result, there was an interest in determining whether there is an association between nitrate concentrations and fecal indicator bacteria concentrations. JMP was used to plot bacteria vs. nitrogen concentrations to investigate a potential relationship. Under the Analyze menu in JMP, the "Multivariate" option was selected and then "Nonparametric Correlations" was chosen. Spearman's rho was the test of choice to analyze correlations between Nitrate concentrations and bacteria concentrations (total coliform and *E. coli*). This test was ideal in analyzing the link between these two parameters because it is a nonparametric measure of statistical dependence and indicates the direction of association between two variables.

4 RESULTS

4.1 Participant Profile

A summary of demographic information collected from the 2012 VAHWQP drinking clinics is provided in Table 4-1. Questions about race were not included in surveys until halfway through the year, so this information is only available for 929 individuals out of a total 1936 people living in the 831 participating households. The dominant age group for participants was the "61+ " group. Although older age groups are not the highest age groups to volunteer nationally, they had the highest percent participation for volunteer activities concerning community service; civic, political and other activities (Bureau of Labor Satistics, 2012). Individuals with a Bachelor's degree or higher were more likely to participate in the program. The average household income of participating households was over $65,000 a year. Since the median Virginian income is $63,302, this result is in keeping with other reported statistics. Therefore, a typical participant in the 2012 drinking water clinics would be a white family who makes over $65,000 annually with a head of household that hold at least a Bachelor's degree. It is worth noting that almost half of the participating households had *never* previously tested their water. Also, majority of members drink the water from their private water supply systems, but only 8% indicated feeling sick to their stomach.

Table 4-1: Sample Demographics

Sample Demographics		
Total Number of Household Members		1936
Number of Households		831
Average Number of Participants per Household		2.3

Number of Households Members who drink system water		1591 (82%)
Number of Household Members who were sick to their stomach within the past month		156 (8%)
Racial Profile (n=929 Individuals)	White/Caucasian	795 (85.6%)
	African American	62 (6.7%)
	Asian American	9 (1%)
	Hispanic	37 (4.0%)
	Native American	16 (1.7%)
	Multi-Racial	10 (1.1%)
Age (n=1925 Individuals)	<1	8 (0.42%)
	1-10	148 (7.7%)
	10-20	201 (10.4%)
	21-40	223 (11.6%)
	41-60	618 (32.1%)
	61+	727 (37.8%)
Levels of Income (n=722 Households)	Less than $10,000	26 (3.6%)
	$11,000-$24,000	59 (8.17 %)
	$25,000-$40,000	124 (17.2%)
	$41,000-$64,000	134 (18.6%)
	$65,000 or above	379 (52.5%)
Level of Education (n=1871 Individuals)	In School Now	261 (13.9%)
	Some High School	67 (3.6%)
	High School Graduate	288 (15.4%)
	Some College	404 (21.6%)
	College Graduate	444 (23.7%)
	Post College (MS, PhD)	375 (20%)
Water Tested (n=818 Households)	Never Before	389 (47.6%)
	Once Before	319 (39%)
	When I think there is a problem	33 (4%)
	Every 5 years	33 (4%)
	Every other year	16 (1.9%)
	Every year	28 (3.4%)

Also included in the survey were two questions related to self-reported gastro-intestinal illness (i.e. “Has this person been sick to your stomach in the past month?”

and "Does this person drink the water from the well or spring?") The intent of these questions was to investigate a potential connection between *E. coli* presence and gastro-intestinal illness. Of the 55 samples that were positive for *E. coli,* 46 had at least one member who drinks the water from the system. Six hundred and forty-three *E. coli*-negative households out of 758 households had at least one household member that drinks the system water. Table 4-2 highlights the comparison of *E. coli*-positive households who had at least one sick member with *E. coli*-negative households with sick members. The percentages of sick members in households were around the same for *E. coli* positive and *E. coli* negative households, 14.5% and 14.2%, respectively. This may indicate that *E. coli* presence is an insufficient predictor of illness, although it is important to note that these are self-reported measures. Also, fluctuations in water quality might render existing measures of contamination a poor estimate of exposures that resulted in previous illness.

Table 4-2: *E. coli* and Illness in Households who Drink System Water

	***E. coli*-Positive**	***E. coli*-Negative**
Sick Households	8	80
Non-sick Households	38	563

4.2 System Profile

A summary of descriptors related to system type is provided in Table 4-3; notice that over half of the households reported no water treatment device of any kind. It is also important to note that households that did have a treatment device could possibly have more than one type of treatment device installed in their system.

Table 4-3: System Profiles

System Profiles		
System Type (n=830)	Springs	16 (1.9%)
	Cisterns	1 (0.012%)
	Drilled Wells	615 (7.4%)
	Dug/Bored Wells	113 (13.6%)
	Unknown Well	72 (8.7%)
	Other	13 (1.6%)
Type of Treatment Device	None	420 (50.5%)
	Ultraviolet light	21 (2.5%)
	Sediment Filter	239 (28.8%)
	Iron Removal	61 (7.3%)
	Chlorination System	14 (1.7%)
	Acid Neutralizer	55 (6.6%)
	Water Softener	144 (17.3%)
	Reverse Osmosis	18 (2.2%)
	Activated Carbon Filter	29 (3.4%)
	No Response	2 (0.24%)
Average Well Depth-ft. (n=473, reported)		252.4
Average Year Built (n=540, reported)		1989
Corrosion of Piping		11%
Type of Piping Material		11%
	Copper	399 (48%)
	Lead	7 (0.84%)
	Galvanized Steel	69 (8.3%)
	Plastic (PVC, PE, etc.)	590 (71%)
	Don't Know	39 (4.7%)
	Other	20 (2.4%)

4.3 Detection of Contaminants of Acute Human Health Risk

Forty-two percent (349) of samples tested positive for total coliforms, and approximately 7% (55) samples tested positive for *E. coli*. The contamination rates for total coliform bacteria were within the range of previously reported study results of private systems in Virginia (Allevi et al. *in press*). Rates of *E. coli* contamination were slightly lower than the Allevi et al. study, but remain in keeping with other previously reported contamination rates. Nitrate-N concentrations were generally low compared to previous studies (Bauder et al., 1993; Gosselin et al., 1997), with only three samples exceeding the EPA MCL of 10 mg/L. Table 4-4 provides an overall summary of bacteria and nitrate (major VAHWQP-targeted contaminants of human health concern) prevalence in the collected samples.

Table 4-4: Summary of Results for 2012 Drinking Water Clinics

2012 Drinking Water Clinics (n=831)	
Percent Positive for TC	42%
Average TC Concentration	155 MPN/ 100 mL
Maximum Observed TC Concentration	2421*
Percent Positive for EC	7%
Average EC Concentration	12 MPN/ 100 mL
Maximum Observed EC Concentration	2421*
NO_3^--N Concentrations	3 samples above MCL (.3%)
Average NO_3^--N Concentration	1.08 mg/L
Maximum Observed NO_3^--N Concentration	17.51

*values exceeded maximum detection limit.

Cumulative distribution plots illustrating the full range of observations of bacterial concentration are provided in Figures 4-1 and 4-2. In these plots, samples are arranged from lowest concentration to highest concentration on the y-axis and 0 to 1 percentile on the x-axis. These plots describe the probability that any given random sample has a total coliform or *E. coli* concentration below or equal to the corresponding value on the y-axis. In these figures, the black dotted line represents the Quanti-tray maximum detection level given standard dilutions (2420 MPN/100mL). As illustrated in the expanded view of Figure 4.1 (Figure 4-3), close to 60% of the non-zero total coliform concentrations are below 50 MPN/100mL. In Figure 4-4, close to 80% of the non-zero concentrations for *E. coli* are less than 50 MPN/100mL. It is also worth noting that although the average values given in Table 4-4 are low, 26 samples exceeded the maximum detection limits for total coliform and 1 sample exceeded the maximum detection limit for *E. coli*.

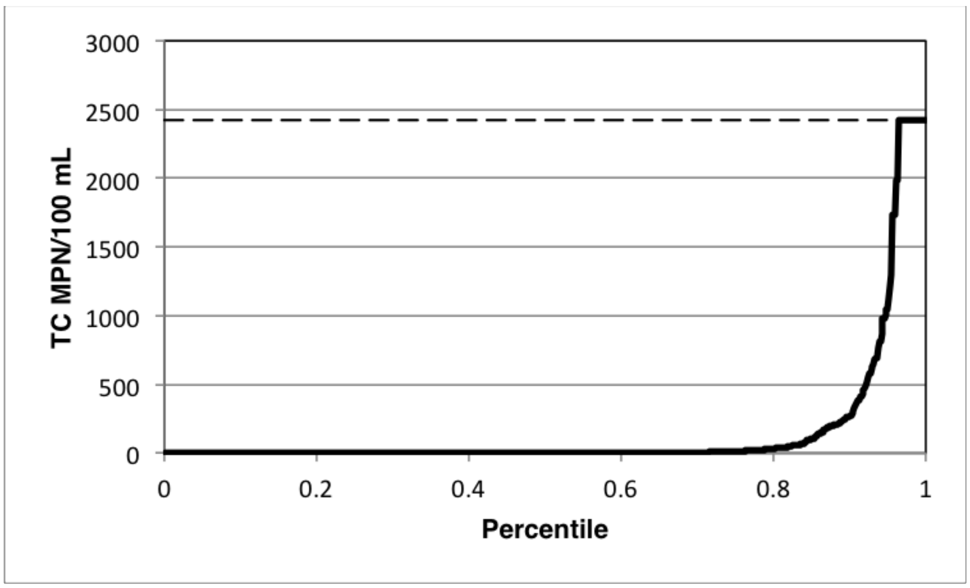

Figure 4-1: Cumulative Distributions for Total Coliform Concentrations

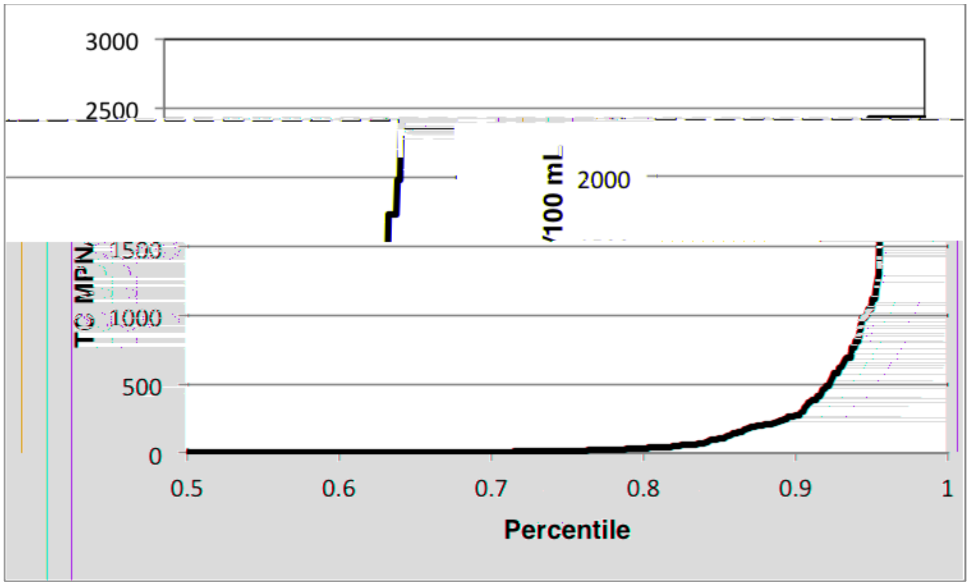

Figure 4-2: A Close-up of Cumulative Distributions for Total Coliform Concentrations

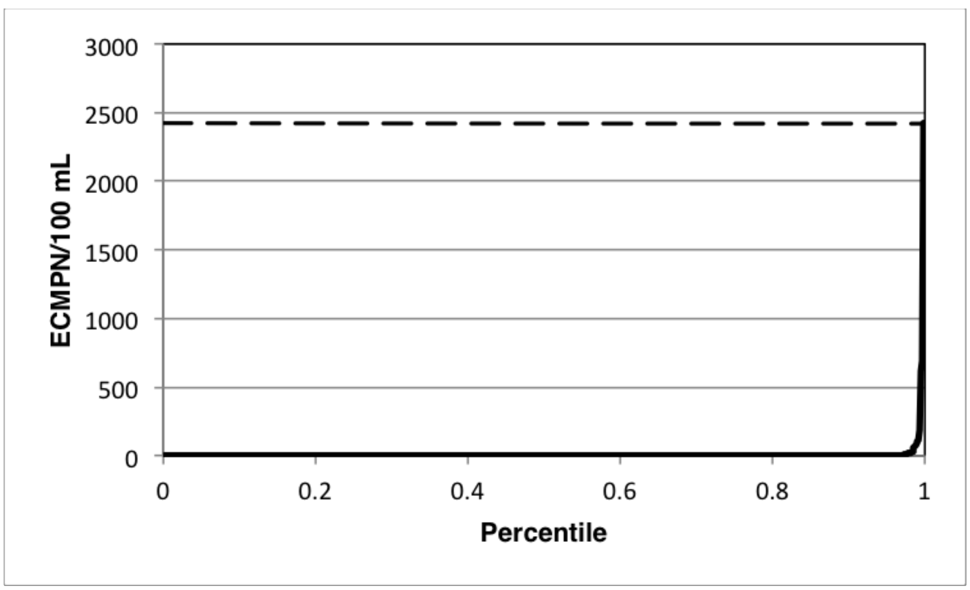

Figure 4-3: Cumulative Distribution for *E. coli* Concentrations

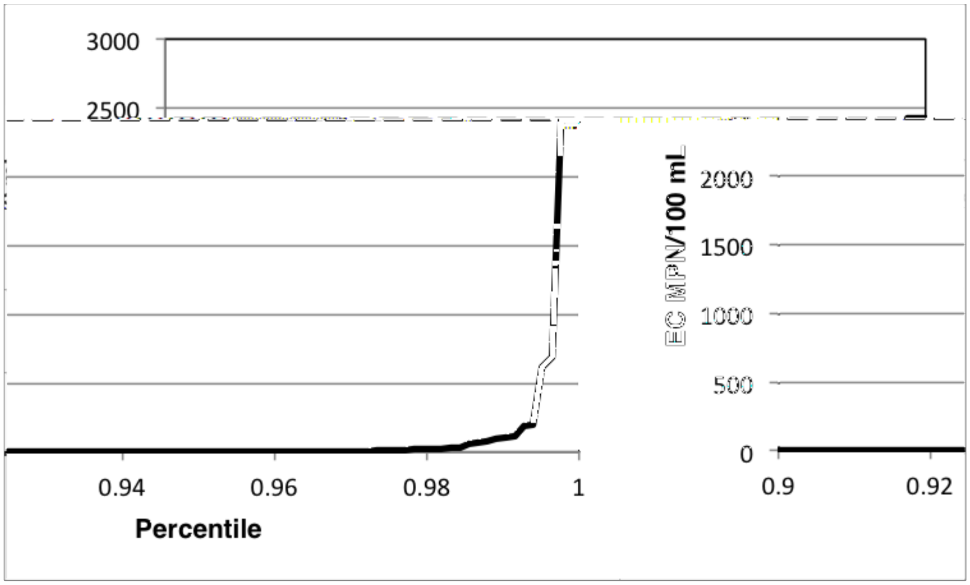

Figure 4-4: A Close-up of Cumulative Distributions for *E. coli* Concentrations

4.3.1 Relationship between Nitrate and Bacterial Contamination

Using Spearman's rho, significantly high associations were found between nitrate concentrations and total coliform or *E. coli* concentrations. An alpha value of 0.05 was used to determine significance. Shown below in Figure 4-5 is the scatterplot matrix of the correlations between nitrate and bacteria. Clusters that are encapsulated in red mark strong non-linear relationships between variables. The label for each row corresponds to the concentration represented in the y-axis and each column corresponds to the concentration represented in the x-axis for each relationship matrix. P-values for the spearman's rho test are provided in Table 4-5. Positive values for spearman's rho indicate that as nitrate concentrations increase, total coliform and *E. coli* concentrations tended to increase.

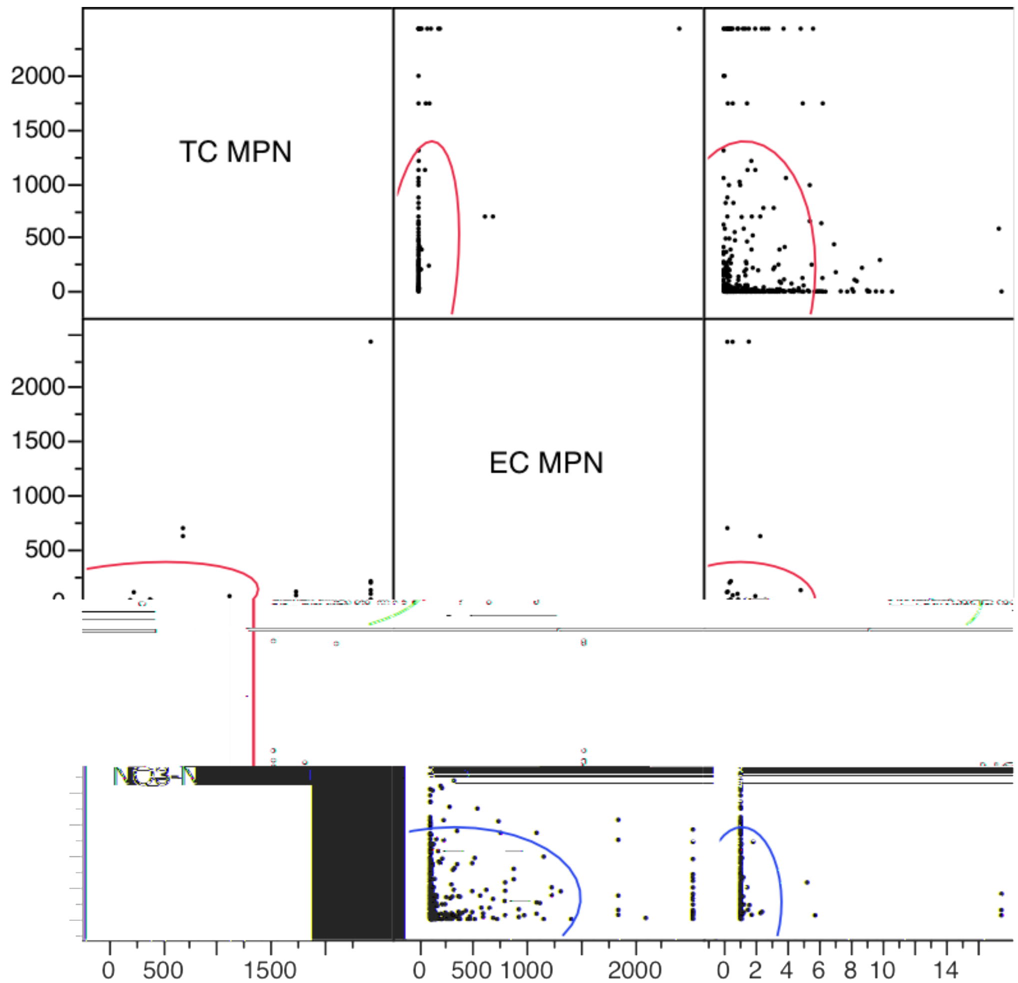

Figure 4-5: Scatterplot Matrix for Nitrate and Bacteria Concentrations

Table 4-5: Spearman's Rho Test

Variable	by Variable	Spearman ρ	Prob>|ρ|
Nitrate-N Concentration	Total Coliform Concentration	0.2586	<0.0001
Nitrate-N Concentration	*E. coli* Concentration	0.1182	0.0007

4.4 Differences in Bacterial Contamination by System Type

Previous work has suggested that system type or construction may be related to rates of contamination by fecal indicator bacteria (Bauder et al., 1993; Gosselin et al., 1997). Table 4-3 also provides a summary of characteristics of private water supply systems represented in the 2012 study year. More than half of participating households did not have water treatment of any kind. For those systems that do include a treatment device, sediment filters and water softeners are the most common. These devices aesthetic contaminants and are not used for reducing microbial contamination. Only 4.2% of the sampled households used treatment device designed to inactivate microorganisms (chlorination and UV systems).

Table 4-7 provides the prevalence of total coliform and *E. coli* positive samples by system type. While drilled wells make up the majority of the systems tested in the 2012 drinking water clinics (614 out of 831), only 36% tested positive for total coliform, 38% of the “unknown” wells, and 76% of the dug/bored wells were positive. The average total coliform concentration for the drilled wells was almost five times lower than that for dug/bored wells and more than six times lower than springs. All 16 springs (100%) were positive for total coliform and more than half were positive for *E. coli*. The average *E. coli* concentration in the springs was 20 times greater than the average concentration in the dug/bored wells and approximately 27 times greater than that in the drilled wells.

Table 4-6: Rates of contamination by System Type and Accompanying Average Concentrations within Positive Systems

System Type	Positive for Total Coliform	Positive for *E. coli*	Average TC MPN/100 mL	Average EC MPN/100 mL
Spring n=16	100% (n=16)	56% (n=9)	555	160
Dug/Bored Well n=112	76% (n=85)	5.4% (n=6)	465	8
Unknown Well n=73	38% (n=28)	5.5% (n=4)	113	2
Drilled Well n=614	36% (n=219)	4.6% (n=28)	89	6

4.5 Relationships between Indicator Bacteria and Demographics: Likelihood Ratio Test Results

The graphs below illustrate rates of indicator bacteria prevalence (total coliform and *E. coli*) by education and household income (Figure 4-6 thru -Figure 4-9). Note that there is no discernible pattern that emerges between education groups for either total coliform or *E. coli*; however, in regards to bacteria presence and household income, for both total coliform and *E. coli*, there appears to be higher rate of bacteria prevalence in lower income levels ($40k and lower). However, statistical tests suggest that annual household income has little effect on *E. coli* presence.

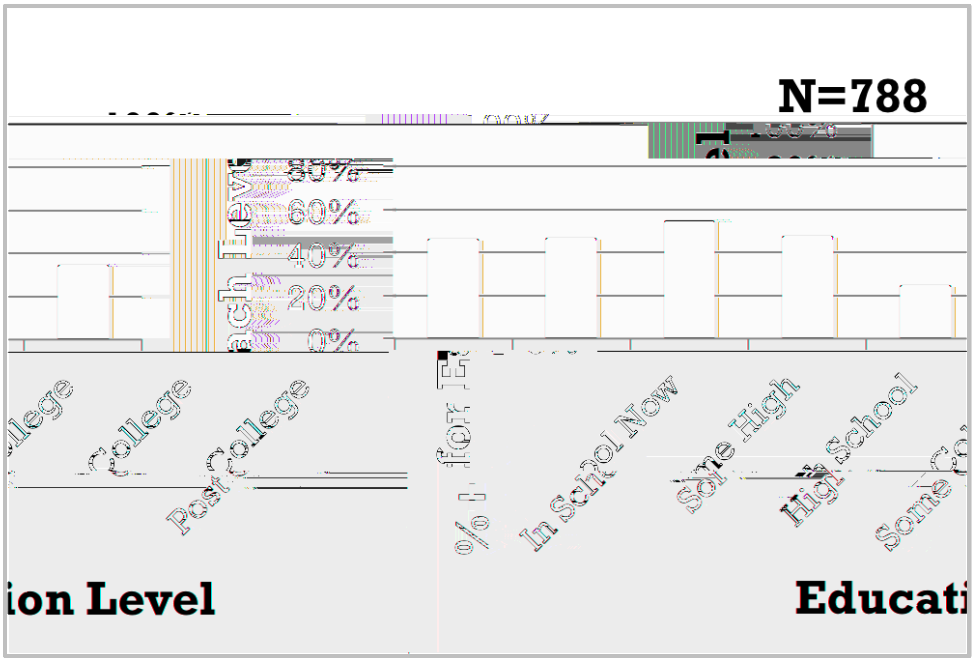

Figure 4-6: Total Coliform Presence by Education Groups

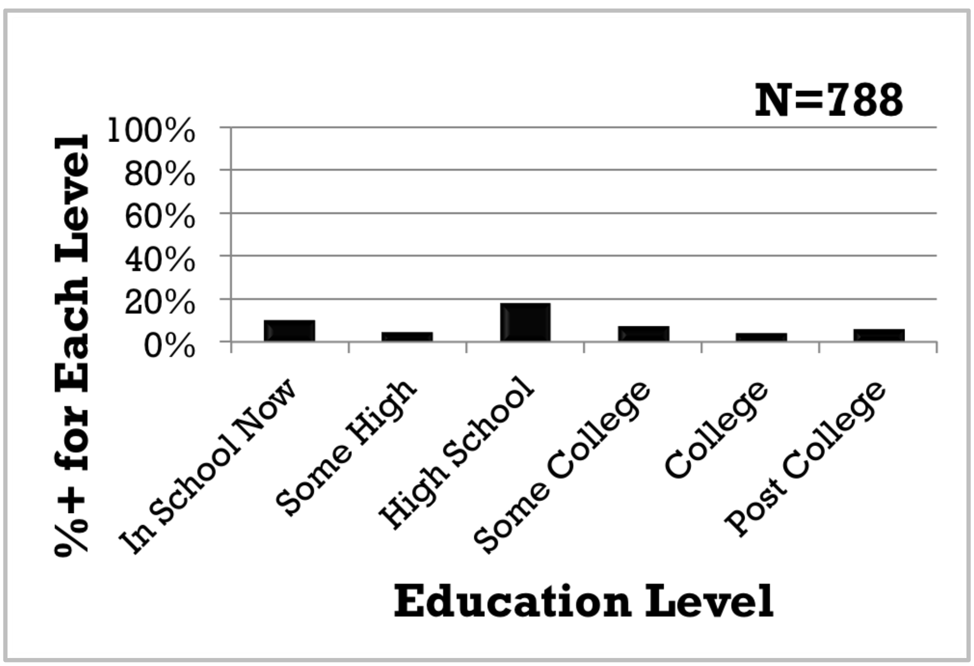

Figure 4-7: E. coli Presence by Education Groups

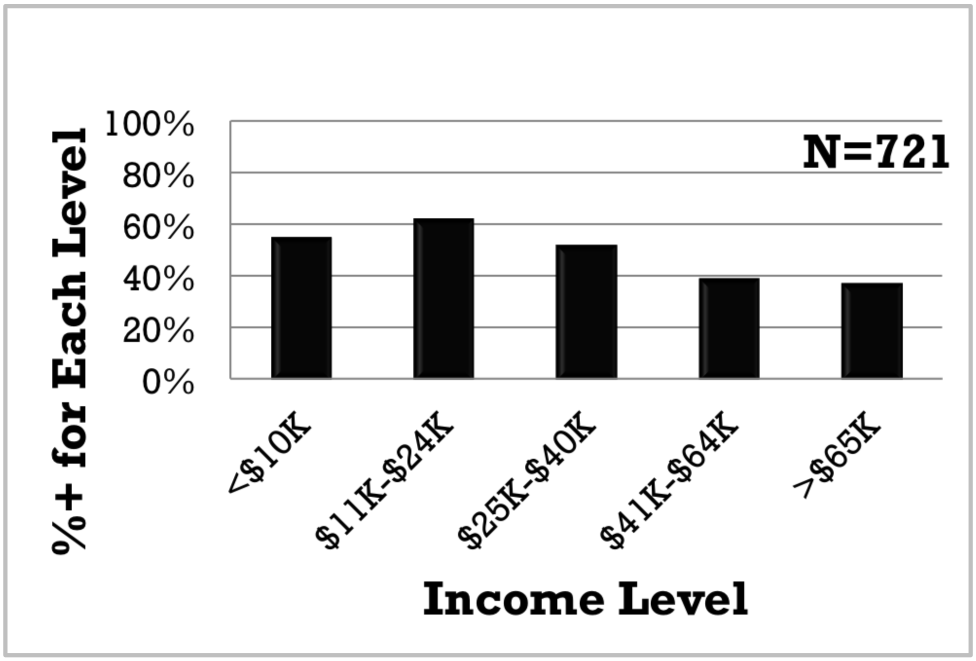

Figure 4-8: Total Coliform Presence by Income Groups

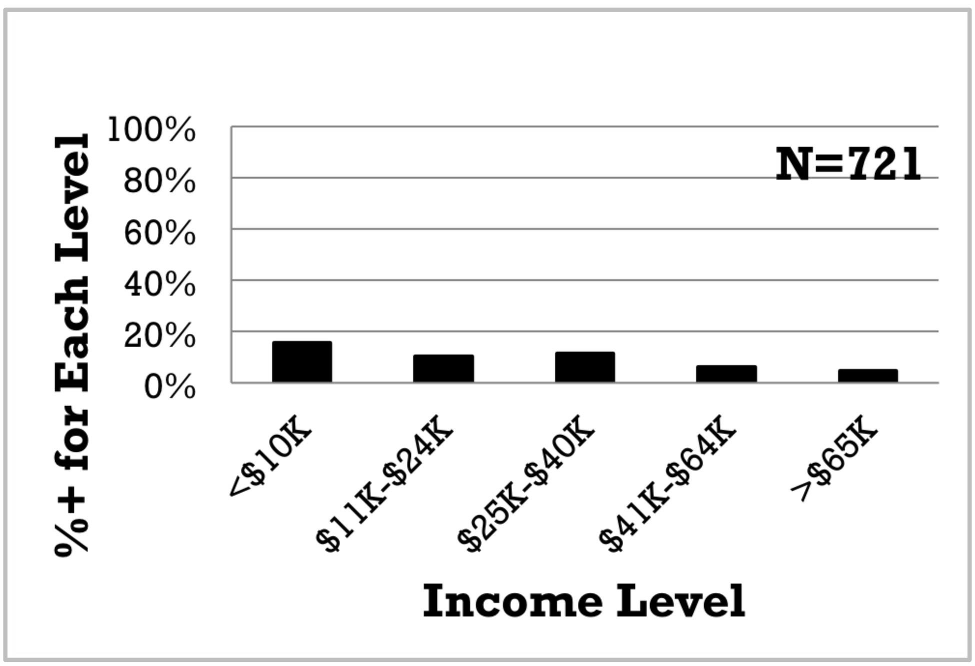

Figure 4-9: ***E. coli*** **Presence by Income Groups**

The likelihood ratio test was used to test whether education and household income had any influence on bacteria presence and bacteria prevalence trends were confirmed using this method. Table 4-8 displays the subsequent p-value from the likelihood ratio tests. An alpha value of 0.05 was chosen as the threshold of significance. P-values highlighted in bold indicate statistical significance. The only p-value deemed significant (below 0.05) pertains to determining if there is an association between total coliform presence and income level. The p-value associated with total coliform presence and education was close to being significant (p=0.0537).

Table 4-7: P-values for Likelihood Ratio Tests for Bacteria Presence

Likelihood Ratio Test	TC Presence p-values	EC Presence p-values
Income Level	**0.0145**	0.2838
Education Level	0.0537	0.1327

The Kruskal-Wallis Test was implemented to determine if there were differences in bacteria concentration distributions amongst the income and education categories (e.g. the null hypothesis states there is no difference in sample populations within groups). There is a significant difference between groups if the corresponding p-value is less than 0.05. In Table 4-9, the p-values for household income and education levels are significant for total coliform and *E. coli* concentrations, verifying that there are significant variations in concentration between income and education groups and this data may be useful in predicting bacteria concentration, but might not be helpful for predicting bacteria presence in a model.

Table 4-8: P-values for Kruskal-Wallis Tests for Bacteria Concentrations

Kruskal-Wallis Test	TC Concentrations p-values	EC Concentrations p-values
Income Level	**0.0002**	**0.0312**
Education Level	**0.0150**	**0.0271**

4.6 Predicting Bacteria Contamination

Forward Stepwise selection was used to determine those variables that were significant in the prediction of total coliform presence in a logistic regression model. This analysis was run using minimum AICc as the stopping rule and whole effects as the imposing rule for selecting predictor variables. The summary of the removed variables and the selection procedure is included in Appendix B.8.3.

County, pH, nitrate concentration, phosphorous concentration, aluminum concentration, whether a system had any treatment device, type of treatment (including ultra-violet light, water softener, and sediment filters), if a system was within a 100 feet of potential contamination (including a pond and a septic tank), if a system was within one-half mile of field crops/nursery and manufacturing operation were all variables deemed statistically significant enough to be included in the predictive model. Surprisingly, education and household income were not included as predictive variables in the stepwise analysis. Initially, system type and county categories were more statistically significant and greatly increased the model's predicting power for total coliform contamination, but these categories led to the model becoming unstable because some groups were very small ($n \geq 20$), therefore smaller categories had to be aggregated in order to stabilize the model thus lowering the potential accuracy of the model.

Reflecting on the results presented in Allevi et. al (2012), there was only one parameter that was included in both final model of this study and the one presented by Allevi et. al is the presence of any type of water treatment (Allevi, 2012). It is worth noting that year of construction and well depth were not included in the present model due to a poor response rate, while these factors were both included and significant in the Allevi et al. model. The results of the Nominal Logistic Regression Model are shown in Table 4-10. Notice that the words included in brackets next to parameter estimates indicate the specific category or subset of the parameter (i.e. “no” versus “yes” or “drilled well” versus “dug/bored well”). Also note that the model was used to predict the absence of total coliform using the aforementioned parameter estimates (i.e. what roles does a predictor play in estimating the absence of total coliform).

Table 4-9: Logistic Regression Model Predictor Estimates for Total Coliform Presence using Forward Stepwise Selection

Term	Estimate	Prob>ChiSq
Intercept	-4.1750	<0.0001
pH	0.4745	0.0003
Nitrate-N	-0.1896	0.0003
System Treatment [no]	-0.4270	0.0023
Ultra Violet Light [no]	-0.6004	0.0580
Water Softener [no]	0.1919	0.1902
Sediment Filter [no]	0.3024	0.0260
Steel Piping [no]	0.3926	0.0081
Septic System [no]	0.2257	0.0558
Pond or Freshwater Stream [no]	0.2519	0.1333
Field Crops/Nursery [no]	0.1543	0.0993
Manufacturing/processing operation [no]	0.5190	0.0757
Source [Drilled Well]	0.5158	0.0001
Source [Dug/Bored Well]	-0.6887	0.0005
Aluminum	-2.324	0.0581
Phosphorus	2.0332	0.0699
County [Albemarle]	1.2623	0.0002
County [Charlotte]	-0.9149	0.0169
County [Fluvanna]	0.5185	0.6477
County [Frederick]	0.6584	0.0844
County [Halifax]	-0.1890	0.4991
County [Lancaster]	-0.3969	0.3703
County [Loudoun]	0.8598	0.0211
County [Lunenburg]	-0.3478	0.4410
County [Mecklenburg]	-0.6300	0.0409
County [Northumberland]	-0.0767	0.8385
County [Other]	-0.2208	0.4809
County [Page]	0.2699	0.4782
County [Prince William]	-0.3023	0.3237
County [Richmond County]	0.3343	0.5263
County [Russell]	-0.1883	0.6476
County [Shenandoah]	0.0661	0.8898
County [Spotsylvania]	0.3563	0.2257
County [Stafford]	-0.5421	0.2876
County [Warren]	-0.3517	0.0699

Odds ratios were also calculated to break down the model into further detail. The results are summarized in Table 4-11. Note that the ratio odds are for *absence versus presence* of total coliform (e.g. the odds that total coliform is absent improves by a factor of 2.349 if treatment is present in a system and the odds that total coliform is absent decreases by a factor of 0.637 if a septic drain filed is within 100 ft. of a private water supply system.)

Table 4-10: Odds Ratio Table for Model Estimates

Model Parameters	Odds Ratio	95% Confidence Interval	p-value
pH	1.607*	1.250-2.080	--
NO_3-N	0.827*	0.742-0.9144	--
Al	0.098*	0.006-0.741	--
P	7.639*	0.974-78.38	--
Treatment	2.349	1.366-4.105	0.019
Ultra-Violet Light	3.322	1.044-13.14	0.042
Water Softener	0.6812	0.383-1.209	0.190
Sediment Filter	0.546	0.319-0.926	0.025
Steel Piping	0.456	0.253-0.812	0.008
Septic Drain Field	0.637	0.400-1.011	0.056
Pond/Freshwater Stream	0.604	0.312-1.171	0.1349
Field crops/nursery	0.734	0.508-1.060	0.0995
Manufacturing/Processing Operation	0.354	0.109-1.116	0.0759

*Unit odds ratio

County and System Type odds ratio was not included in Table 4-11 because most of the ratios were nonsensical since the subsets within these parameters had to be aggregated to combine smaller groups. However, one ratio that was important was having a drilled well instead of having a dug/bored well increases the chances of total coliform being absent by a factor of 3.335.

In order to determine the accuracy of the predicting ability of model, a Receiver Operating Characteristic (ROC) curve was produced and the area under the curve was analyzed to determine model accuracy. JMP Pro 10.0 constructs ROC Curve curves automatically and outputs the AUC (area under the curve). The ROC curve resulting from the previous model is shown in Figure 4-10. The resulting accuracy of the model given by the ROC curve was approximately 77%. The yellow diagonal line is 45° tangent to the curve and signifies the cutoff point where the false positives and false negatives are about the same.

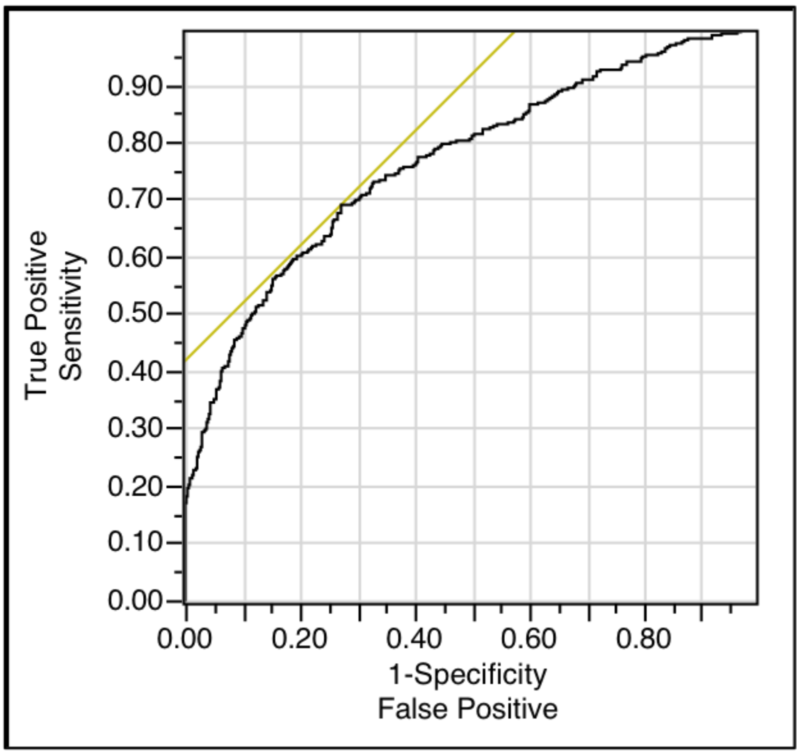

Figure 4-10: Resulting Receiver Operating Characteristic Curve from the Nominal Logistic Regression Model

To provide a more detail related to the accuracy of the developed model, a contingency table was created and provided in Figure 4-11. This was done by selecting "fit Y by X" in the analyze menu and comparing total coliform presence form the dataset with the predicted to total coliform presence from the model made automatically in JMP when you save the probability formula.

		Predicted: Positive	Predicted: Negative
Observed	Positive	398 48.12 72.63 83.26	80 9.69 28.78 16.74
	Negative	150 18.16 27.37 43.10	198 23.97 71.22 56.90

Count Total % Col% Row%

Figure 4-11: Contingency Elucidating the Accuracy of the Regression Model

In Figure 4-11, the upper left-hand quadrant represents the true positives; the lower left-hand quadrant represents the false positives; the bottom right-hand quadrant represents the true negatives; and the upper right-hand quadrant represents the false negatives. The legend to the right summarizes what the values in each quadrant are. The first value in each quadrant represents the total number of household samples that fell into that category. The second value represents the percentage of total samples that fell into that category. The third value is the percent of column's samples that fell into that category and the forth value is the percent of row's samples that fell into that category. Overall, the model performed well with a high percent of true positives and negatives (48% and 24%, respectively).

4.7 Source Tracking Results

4.7.1 Fluorometry Positive Samples

Of the 824 samples that were tested for the presence of optical brighteners, 30 tested positive (i.e. above 30 fluorometric units; raw data is provided in Appendix B.8.1). A summary of the response to the Participant Surveys for the fluorometry-positive samples is provided in Table 4-13 to get an idea of the features of these samples and approximate the source of fluorescing compounds found. It is surprising that less than a 1/5 of the samples were within 100 feet of a septic drain field, which is the presumed source of optical brighteners in samples. These samples had a higher average concentration for total coliform *and E. coli* than all the samples included in this study. Additionally, eighty-seven percent of these samples had no treatment of any kind comparative to the 50.5% of all samples.

Table 4-11: Summary of Fluorometry Positive Samples

Profile for Fluorometry Positive Samples		
Avg TC MPN/100 mL (n=30 samples, including negative samples)		352.1
Avg *E. coli* MPN/100 mL (n=30 samples, including negative samples)		110.7
System Type	Springs	10%
	Cisterns	0%
	Drilled Wells	57%
	Dug/Bored Wells	10%
	Unknown Well	13%
	No Response	7%
Treatment Device	Yes	13%
	No	87%
Average Well Depth (n=11, reported)		356.7
Average Year Built (n=12, reported)		1984
Corrosion of Piping		13%
Water Tested	Once	50%
	Never	50%
Objectionable odor		27%

Unnatural color		33%
Water Stains Application		37%
Visible Particles in Water		27%
Systems Located Within 100 feet of…		
	Septic System Drain Field	17%
	Pit, Privy, or Outhouse	3%
	Home Heating Oil Storage Tank	10%
	Pond or Freshwater Stream	10%
System is Located Within 1/2 Mile of …	Fruit Orchard	50%
	Farm Animal Operation	17%

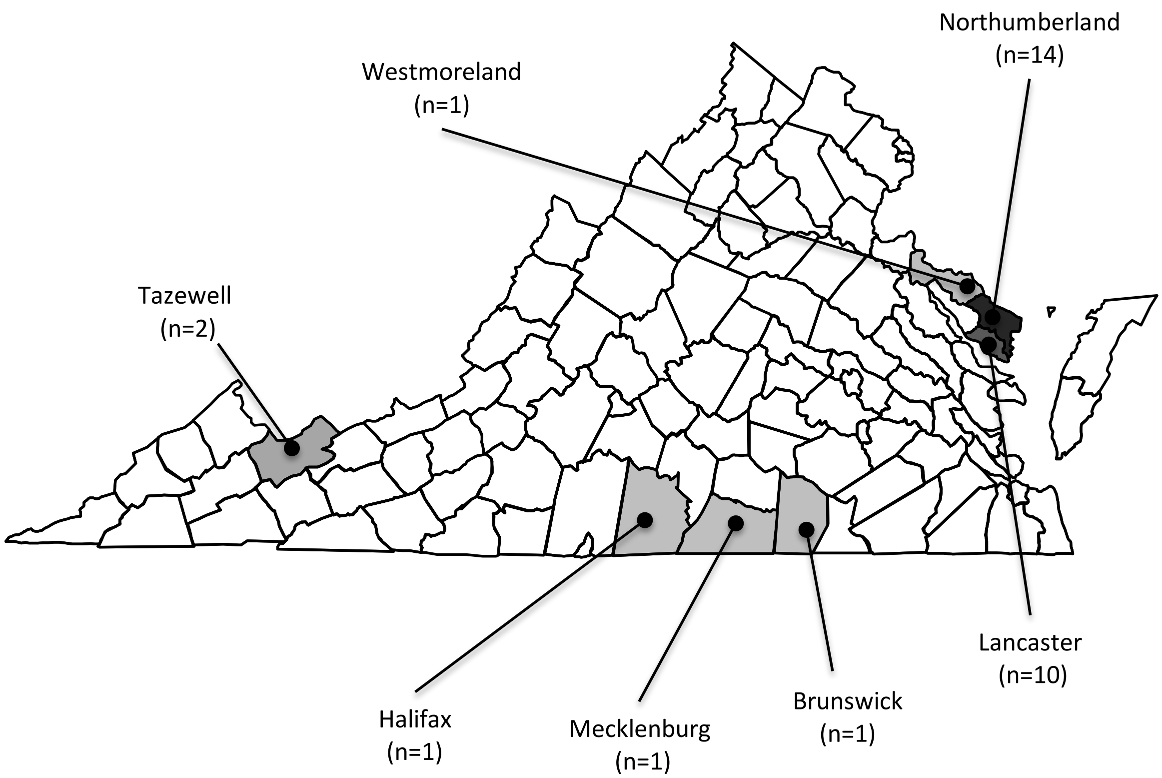

Figure 4-12: Counties of Fluorometry-Positive Samples

Figure 4-10 illustrates household locations for the thirty fluorometry-positive samples. Although detecting optical brighteners has been established as a source tracking method for septage, only 13% (4 out of 30) of the samples that tested positive for optical brighteners also tested positive for *E. coli*. This suggests that while chemical source tracking via optical brighteners is a proven method for surface waters, perhaps due to the differences in the respective quality of surface water and groundwater, relying on optical brighteners as a human septage contamination indicator in groundwater/drinking water might not be appropriate. There are several reasons that optical brighteners could be present without septic contamination. For instance, wastewater treatment plant effluent as well as septic tank effluent can be treated for *E. coli* and still include optical brighteners that have not been effectually degraded by adsorption, chlorination or UV. Diesel fuel and motor oil also fluoresce and water contaminated with these chemicals can travel through underground aquifers and then be taken up into private water systems. There is also a variety or naturally occurring organic compounds that can fluoresce (Hagedorn et al., 2011; Hartel et al., 2008).

Perhaps one of the most interesting patterns that emerged from the fluorometry positive samples is that 80% of the samples came from two counties in the Northern Neck of Virginia: Lancaster and Northumberland, but total number of samples from these counties combined (n = 85) made up only 10% of total sample population. Most of these samples came from drilled wells (58%) that were constructed after 1970 (12 reported). Only three samples were reported to be within 100 ft. of a septic drain field, which implies that the presence of optical brighteners in these systems might not have originated from the participants' septic tanks. What is more intriguing is that none of the fluorometry-positive samples from these counties were *E. coli* positive. Since these counties are located in the Coastal Plain physiographic province, which is known for, its high infiltration rates and sandy soils, differences in geologic characteristics and soil composition may impact the relative fate and transport of fluorescing chemicals versus microorganisms in this region. Further study is required to quantitatively assess this possibility and determine the suitability of optical brighteners as a sewage source-tracking target in groundwater in this region.

4.7.2 *Bacteroides* Positive Samples

All *E. coli* positive samples were tested to assess if bacteria contamination was human in origin. This was done using qPCR to identify specific DNA sequences of fecal indicators general *Bacteriodales* marker (GenBac or AllBac) and human-specific HF183 *Bacteroides.* Twenty-one out of 35 samples were found to be positive for both GenBac and HF183. Table 4-14 summarizes of the response to the Participant Surveys for the GenBac and HF183 positive samples. Notice that the average total coliform and *E. coli* concentrations for these samples are much higher than the average concentrations for all samples included in this study. Also, most of the *Bacteroides* positive samples were obtained from dug/bored wells.

Only one fluorometry-positive sample was also positive for *Bacteroides*. The system type identified for this sample was a spring and both bacteria concentrations were above the detection limit. It should be noted that this sample was the only sample collected in this study to exceed the maximum detection for *E. coli*. No treatment device was reported and participants indicated that the water had never been tested previously.

Bacteroides when present in water bodies exist in large quantities and can be an effective method for indicating human fecal contamination; however it is not present in 100% of the human population's intestinal tract so there is a small possibility that human fecal contamination is not being accurately captured. Therefore, there might be other human-specific markers that should be utilized in conjunction with HF183, so that a more accurate profile of human contamination can be presented.

Table 4-12: Summary Profile for *Bacteroides* Positive Sample

Profile for *Bacteroides* Positive Samples		
Avg TC MPN/100 mL (n=21 samples)		1715
Avg E. coli MPN/100 mL (n=21 samples)		170
System Type	Springs	5%
	Drilled Wells	33%
	Dug/Bored Wells	57%
	Unknown Well	5%
Treatment Device	Yes	19%
	No	81%
Systems Located Within 100 feet of…		
	Septic System Drain Field	22%
	Pit, Privy, or Outhouse	11%
	Home Heating Oil Storage Tank	11%
	Pond or Freshwater Stream	22%
System is Located Within 1/2 Mile of …	Septic Drain field	44%
	Outhouse	0%
Drink (n=44)	Yes	60%
	No	40%

5 SUMMARY & CONCLUSIONS

5.1 Prevalence of Bacterial Contamination

Millions of people nationwide rely on private water supply systems as their primary source of drinking water. Private water supply systems are especially important in Virginia, where over 1.7 million people rely on private water supply systems. Because the federal government does not regulate private water supply systems through the Safe Drinking Water Act, those that use private water supply systems are responsible for the care and maintenance of those systems and the quality of water that those systems produce. This study examined relationships between contaminants of human health concern (particularly total coliform, *E. coli*, and nitrate) and demographic data associated with 831 private water supply systems distributed among 33 of Virginia's 95 counties.

One of the studies objectives was to quantify two types of indicator bacteria: total coliform and *E. coli*. Forty-two percent (n=349) of samples were positive for total coliform with an average concentration of 155 MPN/100 mL and 7% (n=55) were positive for *E. coli* with an average concentration of 12 MPN/100 mL. This prevalence of indicator bacteria is similar to what other researchers have found in private water supply systems across the U.S. In this study, over 25 samples were over the maximum detection limit (2420 MPN/100 mL) for total coliform and 1 sample was over the maximum detection limit for *E. coli*. This reveals that a significant amount of private water supply systems are not being adequately protected. If a system is properly constructed and maintained then high levels of contaminants should not be present in the system. This is a testament to the validity and necessity of programs like VAHWQP, which help equip private water supply system owners with basic education and knowledge about maintaining their systems and aim to address the problem at the source.

5.2 Statistical Analysis

The second study objective was to explore relationships between chemical (as opposed to bacteriological) water quality characteristics of private water supply systems and survey data that included system characteristics, consumer perceptions about water quality, and demographic data (age, education, and income), looking specifically for relationships with the available data and specific contaminants that pose a specific risk to human health concern. Several statistical tests were employed to explore associations. Education and household income levels seemed to be better predictors of bacteria concentrations than bacteria presence, since household income only had an effect on the presence of total coliform and education had no effect on either total coliform or *E. coli* presence. This became more apparent because neither household income nor education was deemed significant enough to be included in the final model predicting total coliform presence. However, this fact does not imply that household income nor education are not related to bacteria contamination in private water supply systems because these analyses were conducted on self-reported data which can not be relied with complete assurance.

Water chemistry data was examined to determine if relationships between chemical water quality constituents and bacteria contamination could be determined. Nitrate concentrations were heavily associated with total coliform and *E. coli* concentrations and became one of the final predictive variables included in the Nominal

Logistic Regression model. Well depth and year of construction had to be removed as predictor variables because although they were statistically significant, many participants did not provide this data that, if provided, would have reduced the sample size and the validity of the model predictor.

A Forward Stepwise regression was used to determine potential predictors for total coliform contamination as a precursor to Nominal Logistic modeling. The selection process for parameters included in the stepwise analysis is highlighted in Figure 3-3. The Nominal Logistic model included several predictors including county of sample origin, nitrate-N concentration, pH, phosphorus concentration, aluminum concentration, if a system had any treatment device reported, treatment type (e.g. ultra violet light, water softener, and sediment filter), system type (e.g. drilled well, dug/bored well), if house plumbing was steel, if the system was located within 100 feet of a septic drain field or pond, and within one-half mile of a manufacturing/processing operation or field crops/nursery. This final model was able to predict total coliform absence/presence with an accuracy of 77%. Although, the model had very good predicting ability, it was based on self-reported data and therefore has very little "real world" applicability, so at best, it can serve as a guideline for more in-depth research and experimental design. For instance, it is common knowledge that the presence of Nitrate in a private water supply system is indicative of inadequate barrier protection, so its presence should accompany other types of contamination, including microorganisms. However according to the model, nitrate was related to the absence of total coliform bacteria, which makes no inherent sense. This fact also implies that just because the final model did not include any of the demographic data parameters provided by participating households, does not mean that these factors are not relevant to bacteria contamination in private water systems and a more quantitative study should be performed to examine these relationships.

The biggest hurdle in creating this model was that quite a few statistically significant categorical parameters that had too little information in particular categorical groups and therefore had to be reorganized, which greatly reduced the predicting power of the model. Other parameters had so few responses that they had to be excluded from the model altogether.

5.3 Source Tracking

The third objective was to determine the source of bacterial contamination and investigate whether the source was human in origin. Understanding the connection between indicator organisms and source tracking techniques in private water systems might help shed light on the heaviest pathogenic influences and help draw conclusions on what the next steps will be in reducing bacteria presence in these systems.

5.3.1 Fluorometry

Fluorometry was a method used to try to determine contamination via septic sewage, however results revealed that this method was more indicative of poor structural integrity of private water supply systems as opposed to fecal contamination. Thirty samples had positive fluorometer readings, however only 4 of those samples were positive for *E. coli* and with 80% of the fluorometry positive samples originating from two counties. Due to the geologic region and soil composition of these counties, there maybe other anthropogenic sources that are infiltrating the groundwater supplying private water supply systems that needs to be further investigated.

5.3.2 Bacteroides spp.

General *Bacteriodales* (GenBac or AllBac) and human-specific HF183 *Bacteroides* were indicator organisms were used to assess if bacteria contamination was human in origin. Specific DNA sequences of fecal indicators were identified using qPCR. Twenty-one samples tested positive for both GenBac and human specific HF183, which is disconcerting because this means that more than half of the *E. coli* present originated from human fecal matter. This demonstrates the need for action. Private supply systems are not being adequately protected and there should be more capital invested into repairing and maintaining these systems. Systematic testing of private water supply systems should be mandated by States to help reduce the risk of human fecal consumption and reduce risk of spreading disease. More state and local programs should be put in place, not only to provide education to private water supply system owners, but financial assistance to those in need of aid.

5.4 Suggested Future Research

Based on these conclusions, several suggestions can be made for future work. Below, a few suggestions are recommended that may enable potential projects to expand the scope of their work and draw more tangible conclusions. Because this study was based on data obtained by an extension program, a more qualitative research approach was taken. There were several limitations in the implementation and analysis for this study. There was very little control in the quality of data collected, so the results provided by this study should be treated as preliminary information. Ideally, a more controlled study, where trained researchers gathered information and performed sampling, would address some of the reoccurring limitations of this study. Self-reported data and its analyses are helpful in precursor experiments, but are not useful for drawing tangible conclusions. With that being said, research like this and programs like VAHWQP are helpful in building bonds between universities and respective communities and are often harbingers in the scientific community to lead researchers to ask the right questions.

Indicator bacteria presence in private water systems has already been established in several peer-reviewed studies. However, because their presence is so low it is sometimes hard to gain statistical significance between them and other relatable data. Therefore, the next study should strictly separate the positive and non-positive bacteria groups in the statistical analyses, particularly as it relates to modeling. If bacteria-positive concentrations are exclusively focused on instead of absence /presence, it might be able to paint a better picture of the driving forces behind bacteria contamination. If enough *E. coli* positive samples are collected (i.e. 100-150 samples), maybe a model can be developed to predict concentrations and pinpoint parameters related to *E. coli* contamination. A control group of non-positive samples could be employed to ensure that associations between the response and the variables are significant and can also allow for further investigation between possible interactions amongst potential predictor variables.

Also, one of the biggest limiting factors of this study was the difference in samples sizes amongst categorical data. It would be imperative to stratify samples based on county and separate them into equal groups. For instance, one could examine the incoming samples for one Drinking Water Clinic year and utilize a statistical program that can randomly pick out samples based on county, to guarantee random sampling. The same thing can be accomplished with type of system to get a better idea of the differences in bacteria contamination amongst private water systems. On homeowner surveys, participants should be asked the reason why they do not use a treatment device. Since this phenomenon is so prevalent, understanding the homeowner's motivation can be key in developing a strategy to help improve private system water quality. Also, a question can be formed that ask about the proximity of land-applied fertilizers to private systems. Nitrate contamination as well as Phosphorus contamination seemed to have significant associations to total coliform presence and since farming and agriculture are significant contributors to the Virginia economy, a question on pesticides should also be included. This could be used to compare results with other studies to determine if any leading contaminants in the state of Virginia emanate from agriculture.

Income levels should be re-categorized on VAHWQP surveys based on the median household income in Virginia ($63, 302). The aim would be to try to capture a profile of homes living below the national poverty line (around $22,000 for a household of four people), those living around the average income of Virginia and those who make higher incomes to deduce if household income plays a role in bacteria contamination. These divisions would also have the same sample size, so that it would be a true comparison. In regards to the survey, a simple question as the highest degree received in a household would be a better gauge of household education because other members of the households' education (i.e. three year old children) don't seem to intuitively relate to bacteria contamination.

Although, the main objective of this study was to compare demographic data to bacteria prevalence, a study that looked at the interactions between demographic data, system characteristics, county, and chemical parameters would be more helpful in explaining the role that demographic data plays in private water supply systems. Due to the inherent nature of environmental samples, there are many complex interrelationships between chemicals, organisms, etc.; therefore one should expect that parameter interaction would have a significant effect on the results of environmental data. Investigating these relationships can allow for better, more informed decisions to be made about the subsequent data.

The relationship between *E. coli* and the persistence of illness was not established in this study as previously anticipated. Again, this data was participant provided. In order to capture the information surrounding household member illness, the survey question was limited in the information collected in order to avoid leading inquiries. Another study should be conducted by capturing more meaningful health information coupled with *E. coli* presence to thoroughly examine the impact that *E. coli* prevalence has on human health.

The more interesting discoveries surrounding fluorometry positive samples is that not all samples that had really high initial fluorometric unit readings were positive for *E. coli* and leads to questioning the efficacy of using optical brighteners as a marker for human septage in drinking water. There is not enough known about the variables surrounding the co-occurrence of fluorescing compounds and *E. coli* contamination to be able to apply this technique to drinking water. This is made overwhelming clear by the fact that two counties produced 80% of the fluorometry-positive samples for this study. Further investigation is needed to find the reason for such high fluorometric disparities. Focusing on the influence geologic structure has on the fate and transport of anthropogenic fluorescing compounds can lend to determining what is different about these regions. Proximity to the coast and access to massive amounts of contaminated surface water (i.e. ocean) may play a major role in the presence of these compounds. If an equal amount of samples are coming from these counties as well as other counties, a more accurate profile of these regions can be developed. A simulation model can be constructed that examines the fate and transport these fluorescing compounds through the use of laboratory water columns and on-site monitoring wells.

In regard to microbial source tracking, GenBac and HF183 are both very good indicators of fecal contamination in samples, but if we are looking specifically at human contamination, HF183, alone will not be able to provide a holistic picture. Thus, in conjunction with HF183, an enteric virus such as pepper mild mottle virus (PMMoV) which as an established presence in human feces and has shown promise as good fecal indicator in coastal water environments, but can be further investigated and applied to private drinking water (Rosario et. al 2009).

6 WORK CITED

Abd-El-Haleem, D., Z. H. Kheiralla, S. Zaki, A. A. Rushdy, and W. Abd-El-Rahiem. 2003. Multiplex-PCR and PCR-RFLP assays to monitor water quality against pathogenic bacteria. *Journal of environmental monitoring : JEM* 5(6):865-870.

Allevi, R. P. 2012. *Quantifying potential sources of microbial contamination in household drinking water samples*. No. Book, Whole. University Libraries, Virginia Polytechnic Institute and State University, Blacksburg, Va U6 - ctx_ver=Z39.88-2004&ctx_enc=info%3Aofi%2Fenc%3AUTF-8&rfr_id=info:sid/summon.serialssolutions.com&rft_val_fmt=info:ofi/fmt:kev:mtx:book&rft.genre=book&rft.title=Quantifying+potential+sources+of+microbial+contamination+in+household+drinking+water+samples&rft.au=Allevi%2C+Richard+Paul&rft.date=2012-01-01&rft.pub=University+Libraries%2C+Virginia+Polytechnic+Institute+and+State+University&rft.externalDocID=b30429511 U7 - eBook U8 - FETCH-vt_catalog_b304295111.

Allevi, R. P., L. Krometis, C. Hagedorn, B. Benham, A. Lawerence, E. Ling, and P. Ziegler. in press. Quantitative Analysis of Microbial Contamination in Private Drinking Water Supply Systems. *Journal of Water and Health*.

Bauder, J. W., K. N. Sinclair, and R. E. Lund. 1993. Physiographic and Land-use Characteristics Associated with Nitrate-Nitrogen in Montana Groundwater. *Journal of environmental quality* 22(2):255-262.

Brunkard, J. M., E. Ailes, V. A. Roberts, V. Hill, E. D. Hilborn, G. F. Craun, A. Rajasingham, A. Kahler, L. Garrison, L. Hicks, J. Carpenter, T. J. Wade, M. J. Beach, and J. S. Yoder. 2011. Surveillance for Waterborne Disease Outbreaks Associated with Drinking Water-United States, 2007-2008. *Morbidity and Mortality Weekly Report* 60(SS12, Suppl. S):38-75.

Bureau of Labor Satistics, U. S. D. o. L. 2012. News Release: Volunteering in the United States.

Cao, Y., J. F. Griffith, and S. B. Weisberg. 2009. Evaluation of optical brightener photodecay characteristics for detection of human fecal contamination. *Water Research* 43(8):2273-2279.

Charles, H., and B. W. Stephen. 2009. Chemical-based fecal source tracking methods: current status and guidelines for evaluation. *Reviews in Environmental Science and Biotechnology* 8(3):275-287.

Craun, G. F., J. M. Brunkard, J. S. Yoder, V. A. Roberts, J. Carpenter, T. Wade, R. L. Calderon, J. M. Roberts, M. J. Beach, and S. L. Roy. 2010. Causes of Outbreaks Associated with Drinking Water in the United States from 1971 to 2006. *Clinical Microbiology Reviews* 23(3):507-+.

Denno, D. M., R. Jones, P. I. Tarr, W. E. Keene, C. M. Hutter, J. K. Koepsell, M. Patnode, D. Flodin-Hursh, L. K. Stewart, J. S. Duchin, and L. Rasmussen. 2009. Tri-county comprehensive assessment of risk factors for sporadic reportable bacterial enteric infection in children. *The Journal of Infectious Diseases* 199(4):467-476.
DeSimone, L. A., P. A. Hamilton, and R. J. Gilliom. 2009. Quality of water from domestic wells in principal aquifers of the United States, 1991–2004—Overview of major findings.
DHHS, U. How is Rural Defined? : Health Information Technology and Quality Improvement.
Dodge, Y. 2008. Kruskal-Wallis Table. 287-288. New York: Springer.
EPA, U. 1999. 25 Years of The Safe Water Drinking Act: History and Trends.
EPA, U. S. 2008. Point-of-Use or Point-of-Entry Treatment Options for Small Drinking Water Systems. O. o. G. W. a. D. Water, ed. Arlington, VA: The Cadmus Group, Inc.
EPA, U. S. 2013. Private Drinking Water Wells. Available at: http://water.epa.gov/drink/info/well/index.cfm.
Field, K. G., and M. Samadpour. 2007. Fecal source tracking, the indicator paradigm, and managing water quality. *Water Research* 41(16):3517-3538.
Francis, J. D., B. L. Brower, W. F. Graham, O. W. Larson III, J. L. McCaull, and H. M. Vigorita. 1981. National Statistical Assessment of Rural Water Conditions. Department of Rural Sociology Cornell University Report.
Gasteyer, S. A., and R. T. Vaswani. 2004. *Still Living Without the Basics in the 21st Century: Analyzing the Availability of Water and Sanitation Services in the United States*. Rural Community Assistance Partnership.
Gosselin, D. C., J. Hendrick, R. Tremblay, and X. H. Chen. 1997. Domestic well water quality in rural Nebraska: Focus on nitrate-nitrogen, pesticides, and coliform bacteria. *Ground water monitoring & remediation* 17(2):77-87.
Hagedorn, C. 2011. Chemical-Based Fecal Source Tracking Methods. 189-206. New York, NY: Springer New York.
Hagedorn, C., A. R. Blanch, V. J. Harwood, and SpringerLink. 2011. *Microbial source tracking: methods, applications, and case studies*. No. Book, Whole. Springer New York, New York.
Hagedorn, C., and S. B. Weisberg. 2009. Chemical-based fecal source tracking methods: current status and guidelines for evaluation. *Reviews in Environmental Science and Biotechnology* 8(3):275-287.
Hartel, P. G., K. J. Ritter, C. N. Belcher, C. Hagedorn, J. L. McDonald, J. A. Fisher, M. A. Saluta, J. W. Dickerson, L. C. Gentit, S. L. Smith, and N. S.

Mantripragada. 2007. Exposing water samples to ultraviolet light improves fluorometry for detecting human fecal contamination. *Water Research* 41(16):3629-3642.
Hartel, P. G., K. Rodgers, G. L. Moody, and S. N. J. Hemmings. 2008. Combining targeted sampling and fluorometry to identify human fecal contamination in a freshwater creek. *Journal of Water and Health* 6(1):105-116.
Hosmer, D. W., and S. Lemeshow. 2000. *Applied logistic regression*. No. Book, Whole. Wiley, New York.
Hurley, M. A., and M. E. Roscoe. 1983. Automated statistical analysis of microbial enumeration by dilution series. *Journal of Applied Microbiology* 55(1):159-164.
Iijima, Y., S. Tanaka, K. Miki, S. Kanamori, M. Toyokawa, and S. Asari. 2007. Evaluation of colony-based examinations of diarrheagenic Escherichia coli in stool specimens: low probability of detection because of low concentrations, particularly during the early stage of gastroenteritis. *Diagnostic Microbiology and Infectious Disease* 58(3):303-308.
Josephson, K. L., C. P. Gerba, and I. L. Pepper. 1993. Polymerase chain reaction detection of nonviable bacterial pathogens. *Applied and Environmental Microbiology* 59(10):3513-3515.
Kenny, J. F., N. L. Barber, S. S. Hutson, K. S. Linsey, J. K. Lovelace, and M. A. Maupin. 2009. Estimated Use of Water in the United States in 2005. U. S. G. Survey, ed. Reston, Virginia.
Khan, I. U. H., V. Gannon, R. Kent, W. Koning, D. R. Lapen, J. Miller, N. Neumann, R. Phillips, W. Robertson, E. Topp, E. van Bochove, and T. A. Edge. 2007. Development of a rapid quantitative PCR assay for direct detection and quantification of culturable and non-culturable Escherichia coli from agriculture watersheds. *Journal of Microbiological Methods* 69(3):480-488.
Kletting, P., and G. Glatting. 2009. Model selection for time-activity curves: The corrected Akaike information criterion and the F-test. *Zeitschrift für Medizinische Physik* 19(3):200-206.
Kross, B. C., G. R. Hallberg, D. R. Bruner, K. Cherryholmes, and J. K. Johnson. 1993. The nitrate contamination of private well water in Iowa. *American Journal of Public Health* 83(2):270-272.
Macler, B. A., and J. C. Merkle. 2000. Current knowledge on groundwater microbial pathogens and their control. *Hydrogeology Journal* 8(1):29-40.

Meays, C. L., K. Broersma, R. Nordin, and A. Mazumder. 2004. Source tracking fecal bacteria in water: a critical review of current methods. *Journal of environmental management* 73(1):71-79.
Peeler, K. A., S. P. Opsahl, and J. P. Chanton. 2006. Tracking anthropogenic inputs using caffeine, indicator bacteria, and nutrients in rural freshwater and urban marine systems. *Environmental Science & Technology* 40(24):7616-7622.
Posada, D., and T. R. Buckley. 2004. Model Selection and Model Averaging in Phylogenetics: Advantages of Akaike Information Criterion and Bayesian Approaches Over Likelihood Ratio Tests. *Systematic Biology* 53(5):793-808.
Pye, V. I., and R. Patrick. 1983. Ground Water Contamination in the United States. *Science* 221(4612):713-718.
Raina, P. S., F. L. Pollari, G. F. Teare, M. J. Goss, D. A. J. Barry, and J. B. Wilson. 1999. The relationship between E-coli indicator bacteria in well-water and gastrointestinal illnesses in rural families. *Canadian Journal of Public Health-Revue Canadienne De Sante Publique* 90(3):172-175.
Ram, S., P. Vajpayee, and R. Shanker. 2008. Rapid culture-independent quantitative detection of enterotoxigenic Escherichia coli in surface waters by real-time PCR with molecular beacon. *Environmental Science & Technology* 42(12):4577-4582.
Robertson, J. B., and S. C. Edberg. 1997. Natural protection of spring and well drinking water against surface microbial contamination .1. Hydrogeological parameters. *Critical reviews in microbiology* 23(2):143-178.
Robson, M., and D. Schneider. 2001. Environmental health issues in rural communities. *journal of environmental health* 63(10):16-19.
Scott, T. M., J. B. Rose, T. M. Jenkins, S. R. Farrah, and J. Lukasik. 2002. Microbial source tracking: Current methodology and future directions. *Applied and Environmental Microbiology* 68(12):5796-5803.
Seiler, R. L., S. D. Zaugg, J. M. Thomas, and D. L. Howcroft. 2005. Caffeine and pharmaceuticals as indicators of waste water contamination in wells. *Ground water* 37(3):405-410.
Strauss, B., W. King, A. Ley, and J. R. Hoey. 2001. A prospective study of rural drinking water quality and acute gastrointestinal illness. *BMC public health* 1(1):8-8.
Swistock, B. R., and W. E. Sharpe. 2005. The influence of well construction on bacterial contamination of private water wells in Pennsylvania. *journal of environmental health* 68(2).

Szumilas, M. 2010. Explaining odds ratios. *Journal of the Canadian Academy of Child and Adolescent Psychiatry = Journal de l'Académie canadienne de psychiatrie de l'enfant et de l'adolescent* 19(3):227-229.
Thomas, P. M., and G. D. Foster. 2005. Tracking acidic pharmaceuticals, caffeine, and triclosan through the wastewater treatment process. *Environmental toxicology and chemistry / SETAC* 24(1):25-30.
U.S.C.B. 1990. US Census of Population and Housing 1990: Detailed Housing Characteristics: Virginia.
VDH, V. D. o. H. 1992. Private Well Regulations. V. D. o. Health, ed. Richmond, Virginia: Commonwealth of Virginia State Board of Health.
Wade, T. J., R. L. Calderon, K. P. Brenner, E. Sams, M. Beach, R. Haugland, L. Wymer, and A. P. Dufour. 2008. High sensitivity of children to swimming-associated gastrointestinal illness: results using a rapid assay of recreational water quality. *Epidemiology (Cambridge, Mass.)* 19(3):375-383.
Wade, T. J., R. L. Calderon, E. Sams, M. Beach, K. P. Brenner, A. H. Williams, and A. P. Dufour. 2006. Rapidly Measured Indicators of Recreational Water Quality Are Predictive of Swimming-Associated Gastrointestinal Illness. *Environmental Health Perspectives* 114(1):24-28.
Wescoat Jr, J. L., L. Headington, and R. Theobald. 2007. Water and poverty in the United States. *Geoforum* 38(5):801-814.
WHO, W. H. O. 2012. Progress on Drinking Water and Sanitation. UNICEF. United States of America.
Zimmerman, T. M. 2001. *Relation between selected well-construction characteristics and occurrence of bacteria in private household-supply wells, south-central and southeastern Pennsylvania / by Tammy M. Zimmerman, Michele L. Zimmerman, and Bruce D. Lindsey ; in cooperation with the Pennsylvania Department of Environmental Protection, Bureau of Water Supply and Wastewater Management*. No. Book, Whole.

7 Appendix A. Drinking Water Clinics Participant Survey

SAMPLE IDENTIFICATION

Sample Number (LAB USE ONLY):

Please print clearly and complete both sides of form.

Date Collected: ____/____/_____ County: __________________ Email: __________________

Name: __________________________ Telephone: _(___)_______-______________________

Mailing Address: ____

Street address City Zip

Sample Location Address (if different from mailing address): ____

Street address City Zip

BEFORE COLLECTING YOUR SAMPLES:
Answer the questions below. This information helps us interpret your test results.
All information collected will be kept CONFIDENTIAL.
Read and follow the included sample collection instructions CAREFULLY.
Water samples must be collected ONLY on the morning of the assigned date. Make sure to bring this questionnaire with your bottles to the drop off location. Contact your extension office or the Water Quality Lab at 540-231-9058 with questions.

WATER SOURCE:

What household water supply source was drawn for sample? Check one:

❑ well ❑ spring ❑ cistern ❑ other → specify: ______________________

If well is checked above: (a) is it a: ❑ dug or bored well ❑ drilled well ❑ don't know;

(b) what is the well's depth, if known? _____ ft ❑ don't know

(c) what year was well constructed, if known? ______ ❑ don't know

What water treatment devices are currently installed? Check all that apply:

❑ none ❑ acid neutralizer
❑ ultraviolet (UV) light ❑ water softener (conditioner)

❑ sediment filter ❑ reverse osmosis
❑ iron removal ❑ activated carbon (charcoal) filter

❑ chlorination system ❑ other → specify: ________________

How often do you have your water tested? ❑ Never before ❑ Once before ❑ When I think there is a problem ❑ Every 5 years ❑ Every other year ❑ Every year

What pipe material(s) is/are used in your house for plumbing?
❑ copper ❑ lead ❑ galvanized steel ❑ plastic (PVC, PE, etc.) ❑ don't know
❑ other → specify: _____________

WATER CHARACTERISTICS: Please answer the following questions based on how you view your water is now.

Do you have problems with corrosion, pitting or pinhole leaks in pipes or plumbing fixtures?
❑yes ❑no

Does your water have an unpleasant taste? ❑ yes ❑ no
→ If YES, how would you describe the taste? Check all that apply:
❑bitter ❑sulfur ❑salty ❑metallic ❑oily ❑soapy ❑other → specify: _______________

Does your water have an unpleasant odor? ❑ yes ❑ no
→ If YES, how would you describe the odor? Check all that apply:
❑rotten egg/sulfur ❑kerosene or gas ❑musty ❑chemical ❑other → specify: __________

Does your water have an unnatural color or appearance? ❑ yes ❑ no
→ If YES, how would you describe the color or appearance? Check all that apply:
❑muddy ❑milky ❑black/gray tint ❑yellow tint ❑oily film ❑other →specify: _______

Does your water stain plumbing, cooking appliances, utensils, or laundry? ❑ yes ❑ no
→ If YES, how would you describe the stains? Check all that apply:
❑blue-green ❑rusty/orange/brown ❑black/gray ❑white/chalk ❑other → specify: _______

In a standing glass of water, do you notice floating or settled particles? ❑ yes ❑ no
→ If YES, how would you describe them? Check all that apply:
❑white flakes ❑black specks ❑red-orange slime ❑brown sediment ❑other → specify: ______

Is your water supply located within 100 feet of the following? Check all that apply:
❑ septic drain field ❑ home heating oil storage tank
❑ pit privy or outhouse ❑ pond or freshwater stream

❑ cemetery ❑ tidal shoreline or marsh

Is your water supply located within a ½ mile of any of the following? Check all that apply:

❑ landfill ❑ golf course ❑ abandoned quarry, industry, etc.
❑ illegal dump ❑ field crops/nursery ❑ farm animal operation
❑ active quarry ❑ manufacturing/processing operation → specify type:________
❑ commercial underground storage tank or supply lines (gas service station, heating oil supplier, etc.)

HEALTH and DEMOGRAPHIC QUESTIONS: Please answer the following questions about your family and other members of your household, based on how you use the water in your house.

What is the range of your annual household income?

❑ Less than $10,000
❑ $11,000 – 24,000
❑ $25,000 -40,000
❑ $ 41,000 – 64,000
❑ $65,000 or above

Please complete one line for each of the members of your household

Gender CIRCLE ONE	Age (years) CHECK ONE		Level of Education completed CHECK ONE	Has this person been sick to their stomach in the past month?	Does this person drink the water from the well or spring?
MALE FEMALE	❑ < 1 ❑ 1-5 ❑ 6-10 ❑ 11-15 ❑ 16-20	❑ 21-30 ❑ 31-40 ❑ 41-50 ❑ 51-60 ❑ 61 +	❑ In school now ❑ Some high school ❑ High school graduate ❑ Some college ❑ College graduate ❑ Post college (MS, PhD)	Yes No	Yes No
MALE FEMALE	❑ < 1 ❑ 1-5 ❑ 6-10 ❑ 11-15 ❑ 16-20	❑ 21-30 ❑ 31-40 ❑ 41-50 ❑ 51-60 ❑ 61 +	❑ In school now ❑ Some high school ❑ High school graduate ❑ Some college ❑ College graduate ❑ Post college (MS, PhD)	Yes No	Yes No
MALE	❑ < 1	❑ 21-30	❑ In school now	Yes	Yes

FEMALE	❑ 1-5 ❑ 6-10 ❑ 11-15 ❑ 16-20	❑ 31-40 ❑ 41-50 ❑ 51-60 ❑ 61 +	❑ Some high school ❑ High school graduate ❑ Some college ❑ College graduate ❑ Post college (MS, PhD)	No	No
MALE FEMALE	❑ < 1 ❑ 1-5 ❑ 6-10 ❑ 11-15 ❑ 16-20	❑ 21-30 ❑ 31-40 ❑ 41-50 ❑ 51-60 ❑ 61 +	❑ In school now ❑ Some high school ❑ High school graduate ❑ Some college ❑ College graduate ❑ Post college (MS, PhD)	Yes No	Yes No
MALE FEMALE	❑ < 1 ❑ 1-5 ❑ 6-10 ❑ 11-15 ❑ 16-20	❑ 21-30 ❑ 31-40 ❑ 41-50 ❑ 51-60 ❑ 61 +	❑ In school now ❑ Some high school ❑ High school graduate ❑ Some college ❑ College graduate ❑ Post college (MS, PhD)	Yes No	Yes No

8 Appendix B. Sample Information

8.1 Fluorometry Positive Samples

The samples below are the samples that were registered initially high fluorometric unit readings and then after four hours of ultraviolet (UV) exposure degraded more than 30%. Sample numbers are arbitrary lab numbers assigned to each sample and correspond to the samples listed in the later appendices.

Sample #	Before UV	After UV	% Change
193	75	20.1	73%
203	63.2	16.1	75%
209	68.9	17.6	74%
216	31.3	7.53	76%
217	38.1	9.91	74%
219	34.7	9.59	72%
221	41.6	10.8	74%
222	31.9	7.18	77%
229	39.8	23.6	41%
232	31.6	8.36	74%
238	57.8	14.9	74%
313	30.2	14.8	51%
316	90.3	60.8	33%
616	37.5	23	39%
649	49.8	30.9	38%
658	102	69.3	32%
733	30.3	9.85	67%
738	67.3	38.8	42%

Sample #	Before UV	After UV	% Change
735	33	7.97	76%
741	39.3	9.34	76%
714	109	34.9	68%
713	49.7	13	74%
711	81.5	30.5	63%
710	44.5	10.4	77%
715	33.7	7.86	77%
745	34.6	7.87	77%
749	331	168	49%
747	34.3	8.81	74%
746	36.9	8.51	77%
754	33	8.59	74%

8.2 Abbreviation Table

The abbreviations listed in this table apply to the abbreviations used in the subsequent appendices and correspond to the questions asked on the survey included with the kit.

Name	Abb.	Name	Abb.	Name	Abb.	Name	Abb.
Drilled Well	DW	Corrosion	COR	Milky Color	MIC	Privy/Outhouse	OUT
Dug/Bored Well	DBW	Unpleasant Taste	UT	Black Color	BC	Cemetery	CEM
Spring	SPG	Bitter Taste	BT	Yellow Color	YC	Home Heating Oil Storage	OIL
Cistern	CIS	Sulfur Taste	SUT	Oily Color	OC	Stream/Pond/Lake	PON
Other	OTH	Salty Taste	SAT	Staining	STN	Tidal/Shoreline/Marsh	TID
Treatment	TRT	Metallic Taste	MT	Blue Staining	BLUSTN	Compost/Trash	COM
Acid Neutralizer	ADN	Oily Taste	OT	Rusty Stain	RSTN	Landfill	LAN
UV light	UV	Soapy Taste	SOT	Black Stain	BLKSTN	Illegal Dump	DUM
Water Softener	WS	Objectionable Odor	OO	White Stain	WSTN	Active Quarry	ACQ
Sediment Filter	SF	Sulfur Odor	SO	Water Particles	WP	Commercial Underground Storage	COMSTR
Reverse Osmosis	RO	Kerosene Odor	KO	White Flakes	WF	Golf Course	GC
Iron Removal	IR	Musty Odor	MO	Black Specs	BLKSPC	Field crops/Nursery	ORC
Carbon Filter	CF	Chemical Odor	CO	Red Slime	RS	Manufacturing/Processing Operation	MANU
Chlorinator	CHLR	Unnatural Color	UC	Brown Sediment	BWNSED	Abandoned Quarry	ABQ
Water Tested	WT	Muddy Color	MUC	Septic System	SS	Farm/Animal Operation	FRM
Copper Piping	PC	Lead Piping	PL	Plastic Piping	PP	System Type	SYS
Year Constructed	YEAR	Steel Piping	PS	Unknown Piping	PU	Well Depth	DEPTH
Every Year	Evy Yr	When Problem	Whn Prob	Every 5 Years	Evy 5 Yrs	Every Other Year	Evy Oth Yr
Prefer Not to Answer	PNTA	College Grad	CG	Some College	SC	Some High school	SHS

Name	Abb.	Name	Abb.	Name	Abb.	Name	Abb.
High School Grad	HSG	Post College	PostC	In School Now	ISN	Household Members	#HM

8.3 Summary of Stepwise Selection Procedure

Below is the summary of the selection procedure for the forward stepwise that was used in determining the final nominal logistic model. Note that this includes the regrouped County and Source categories.

Parameter	Action	AICc
Source [all]	Entered	1048.96
Nitrate-N	Entered	1022.84
pH	-0.1896	1009.56
System Treatment	-0.4270	997.22
County [all]	-0.6004	994.08
Steel piping	0.1919	988.43
Aluminum	0.3024	986.02
Ultra Violet Light	0.3926	983.55
Septic System	0.2257	982.02
Field Crops/Nursery	0.2519	981.07
Sediment Filter	0.1543	980.16
Manufacturing/processing operation	0.5190	979.22
Phosphorus	0.5158	978.26
Pond or Freshwater Stream	-0.6887	978.04
Water Softener	-2.324	978.02
Illegal Dump	2.0332	978.04
Brown Sediment	1.2623	978.16
Red Slime	-0.9149	978.14
Privy/Outhouse	0.5185	978.26
Commercial Underground Storage	0.6584	978.72

Home Heating Oil Storage	-0.1890	979.36
Yellow Color	-0.3969	979.94
Tidal/Shoreline/Marsh	0.8598	980.35
Water Treatment	-0.3478	984.39
Golf Course	-0.6300	985.39
Best	-	978.02

8.4 Chemical and Bacterial Data

The gender, age, sick, drink, and education information comes from the first person listed within each household (with the exception of children listed first, then the last person's information was recorded) and this information was used in comparison of bacteria concentration (absence/presence) and demographic data. However, the numbers of households' members are included in the table below.

Sample	County	pH	EC	TDS	TC MPN/100 mL	EC MPN/100 mL	Household Income	Gender	Age	Sick	Drink	Education	#HM	NO_3-N
1	Albemarle	6.1	121	81.1	0	0	PNTA	F	>60	0	1	PostC	1	4.42
2	Albemarle	5.4	12	8.0	0	0	PNTA	M	>60	0	1	HSG	2	0.00
3	Greene	7.4	81	54.3	0	0	$41k- $64k	M	51-60	1	1	SC	3	0.21
4	Albemarle	6.2	141	94.5	0	0	>$65k	M	>60	0	1	PostC	2	0.99
5	Albemarle	7.5	330	221.1	0	0	>$65k	M	51-60	0	0	PostC	3	0.27
6	Albemarle	5.8	61	40.9	0	0	>$65k	F	>60	0	1	PostC	2	0.89
7	Fluvanna	7.4	210	140.7	0	0	>$65k	M	41-50	0	1	SC	2	0.00
8	Albemarle	8	220	147.4	0	0	>$65k	M	31-40	0	1	PostC	5	0.00
9	Fluvanna	6.3	65	43.6	0	0	>$65k	M	>60	1	1	CG	2	2.05
10	Albemarle	5.8	69	46.2	0	0	>$65k	M	>60	0	1	PostC	2	2.86
11	Madison	5.8	34	22.8	0	0	>$65k	M	>60	0	1	PostC	2	0.00
12	Albemarle	7.6	200	134.0	13.3	0	>$65k	M	51-60	0	1	PostC	2	0.51
13	Albemarle	7.3	137	91.8	0	0	$25K - $40K	F	31-40	0	1	CG	3	1.20
14	Albemarle	5.2	25	16.8	0	0	>$65k	M	41-50	0	0	CG	4	0.39
15	Albemarle	6.2	132	88.4	0	0	PNTA	M	>60	0	1	SC	4	1.64

Sample	County	pH	EC	TDS	TC MPN/100 mL	EC MPN/100 mL	Household Income	Gender	Age	Sick	Drink	Education	#HM	NO_3-N
16	Albemarle	7.3	200	134.0	0	0	>$65k	M	>60	0	1	CG	2	0.23
17	Greene	6.8	350	234.5	0	0	>$65k	M	>60	0	1	PostC	2	5.38
18	Greene	7.4	320	214.4	0	0	$41k- $64k	F	>60	0	1	PostC	2	0.00
19	Albemarle	7	210	140.7	0	0	>$65k	M	>60	0	1	-	2	0.00
20	Albemarle	6.8	220	147.4	0	0	>$65k	M	>60	0	1	CG	2	0.17
21	Albemarle	5.4	37	24.8	0	0	$41k- $64k	M	51-60	0	1	SC	3	1.91
22	Albemarle	6	63	42.2	0	0	>$65k	F	>60	0	1	PostC	1	0.16
23	Albemarle	7.2	188	126.0	0	0	>$65k	M	31-40	0	1	PostC	5	0.99
24	Albemarle	7.5	1840	1232.8	0	0	>$65k	M	41-50	0	1	CG	5	0.30
25	Albemarle	6.2	260	174.2	1.01	0	>$65k	M	>60	0	1	PostC	2	0.00
26	Albemarle	5.9	270	180.9	1.01	0	>$65k	M	51-60	0	1	CG	3	9.99
27	Greene	7.6	138	92.5	5.11	0	<$10k	F	21-30	0	1	SC	2	0.21
28	Albemarle	7.1	340	227.8	0	0	>$65k	M	>60	0	1	CG	2	0.13
29	Albemarle	6.2	100	67.0	0	0	PNTA	-	>60	0	0	HSG	2	0.70
30	Albemarle	7.7	235	157.5	0	0	>$65k	M	>60	0	1	PostC	2	0.00
31	Albemarle	6.1	55	36.9	0	0	>$65k	M	31-40	0	1	CG	2	0.14
32	Albemarle	5.7	43	28.8	19.98	1	>$65k	M	31-40	0	1	CG	2	0.60
33	Albemarle	6.2	93	62.3	42.59	0	$25K - $40K	M	21-30	0	1	HSG	5	0.00
34	Albemarle	7.8	270	180.9	0	0	$41k- $64k	F	>60	0	1	PostC	2	0.15
35	Fluvanna	7	176	117.9	41.99	0	$25K - $40K	F	>60	0	0	SC	1	0.00
36	Albemarle	6.8	280	187.6	0	0	>$65k	M	51-60	0	1	PostC	3	0.30
37	Albemarle	6.7	73	48.9	0	0	PNTA	-	-	-	-	-	-	0.00
38	Albemarle	6.6	405	271.4	0	0	>$65k	F	>60	0	1	PostC	3	3.67
39	Albemarle	7.1	220	147.4	0	0	$41k- $64k	-	41-50	0	1	PostC	2	0.00
40	Albemarle	6.3	121	81.1	2.04	0	>$65k	F	>60	0	1	SC	2	2.16
41	Albemarle	5.9	27	18.1	27.28	0	$25K - $40K	M	51-60	0	1	SC	2	0.00
42	Albemarle	6.6	156	104.5	0	0	$41k- $64k	F	51-60	0	1	PostC	1	0.00

Sample	County	pH	EC	TDS	TC MPN/100 mL	EC MPN/100 mL	Household Income	Gender	Age	Sick	Drink	Education	#HM	NO_3-N
43	Albemarle	5.8	61	40.9	0	0	>$65k	M	41-50	0	1	CG	6	0.24
44	Greene	6.7	270	180.9	0	0	>$65k	M	>60	0	1	PostC	2	0.00
45	Albemarle	5.9	70	46.9	0	0	>$65k	M	>60	1	1	CG	4	3.08
46	Albemarle	5.6	74	49.6	0	0	$25K - $40K	M	21-30	1	1	PostC	2	1.66
47	Albemarle	6.5	270	180.9	0	0	>$65k	M	41-50	0	1	CG	3	0.00
48	Albemarle	6	164	109.9	0	0	>$65k	F	>60	0	1	SC	1	0.31
49	Albemarle	7.8	156	104.5	1.01	0	>$65k	F	51-60	1	1	PostC	2	0.00
50	Albemarle	6.1	127	85.1	0	0	>$65k	F	51-60	0	1	CG	2	0.00
51	Greene	6.8	270	180.9	0	0	$25K - $40K	F	>60	0	1	CG	1	1.33
52	Orange	6.4	660	442.2	0	0	$11K - $24K	F	51-60	0	0	HSG	1	6.42
53	Albemarle	7	320	214.4	0	0	>$65k	M	>60	0	1	SC	2	0.20
54	Albemarle	7	400	268.0	0	0	>$65k	M	51-60	0	1	CG	2	0.23
55	Louisa	9.1	290	194.3	0	0	>$65k	M	>60	0	1	CG	2	0.30
56	Greene	7.5	179	119.9	0	0	>$65k	M	41-50	0	1	PostC	5	0.00
57	Greene	7.8	270	180.9	0	0	>$65k	M	51-60	0	1	CG	2	0.00
58	Albemarle	7	200	134.0	0	0	$25K - $40K	F	>60	0	1	SC	2	0.19
59	Albemarle	9	123	82.4	0	0	$41k- $64k	F	31-40	1	1	CG	3	0.17
60	Albemarle	6.2	134	89.8	0	0	>$65k	M	>60	0	1	CG	2	0.15
61	Albemarle	6	56	37.5	0	0	$41k- $64k	M	31-40	0	1	CG	3	0.28
62	Greene	5.9	68	45.6	16.04	0	>$65k	M	>60	0	1	PostC	2	0.46
63	Louisa	5.8	44	29.5	0	0	>$65k	M	51-60	0	1	PostC	2	0.00
64	Albemarle	7.6	230	154.1	0	0	>$65k	M	>60	0	1	CG	2	0.63
65	Greene	7.4	191	128.0	0	0	$41k- $64k	M	>60	0	0	CG	2	0.00
66	Albemarle	7.9	230	154.1	0	0	>$65k	F	41-50	0	1	PostC	2	0.00
67	Albemarle	5.8	320	214.4	207.58	0	>$65k	F	>60	0	1	PostC	1	3.21
68	Rappahannock	5.7	139	93.1	0	0	$25K - $40K	F	>60	0	1	PostC	2	3.36
69	Albemarle	6.8	168	112.6	0	0	>$65k	M	51-60	0	1	CG	2	0.00

Sample	County	pH	EC	TDS	TC MPN/100 mL	EC MPN/100 mL	Household Income	Gender	Age	Sick	Drink	Education	#HM	NO_3-N
70	Orange	5.8	29	19.4	0	0	>$65k	M	41-50	0	1	CG	4	1.18
71	Albemarle	5.7	40	26.8	0	0	>$65k	M	41-50	0	0	PostC	2	0.00
72	Albemarle	6.8	270	180.9	0	0	>$65k	F	>60	0	1	CG	2	2.92
73	Madison	7.8	185	124.0	0	0	>$65k	M	>60	0	1	PostC	2	0.00
74	Madison	6.8	66	44.2	0	0	>$65k	M	>60	0	1	PostC	2	0.25
75	Albemarle	6	76	50.9	0	0	$41k- $64k	F	>60	1	1	CG	5	0.38
76	Albemarle	6	64	42.9	0	0	<$10k	F	51-60	0	1	PostC	1	0.86
77	Louisa	6.8	143	95.8	0	0	$11K - $24K	F	21-30	0	1	CG	5	1.66
78	Albemarle	6.8	320	214.4	0	0	$41k- $64k	M	>60	0	1	CG	2	0.63
79	Albemarle	6.8	127	85.1	0	0	>$65k	-	-	-	-	-	-	0.00
80	Albemarle	6.2	79	52.9	0	0	PNTA	M	41-50	0	1	CG	5	0.37
81	Louisa	7.4	340	227.8	0	0	>$65k	F	>60	0	1	CG	2	0.45
82	Albemarle	6	94	63.0	121.75	0	>$65k	M	51-60	0	1	PostC	4	4.97
83	Orange	7.5	270	180.9	0	0	>$65k	M	51-60	0	1	PostC	3	0.21
84	Albemarle	5.1	240	160.8	2.04	0	$41k- $64k	M	41-50	0	1	CG	5	9.60
85	Albemarle	7.9	199	133.3	0	0	>$65k	M	>60	0	1	PostC	2	1.06
86	Albemarle	6.2	76	50.9	0	0	>$65k	F	51-60	0	1	PostC	3	0.00
87	Albemarle	8.2	350	234.5	2.04	0	>$65k	M	41-50	0	1	PostC	4	0.00
88	Spotsylvania	6.7	610	408.7	0	0	<$10k	F	51-60	0	1	SC	2	0.53
89	Fluvanna	6.1	60	40.2	0	0	$41k- $64k	M	51-60	0	1	CG	2	0.18
90	Albemarle	6	59	39.5	0	0	>$65k	F	51-60	0	1	CG	4	0.00
91	Albemarle	6.2	58	38.9	24.43	0	PNTA	-	-	-	-	-	-	1.90
92	Albemarle	5.8	60	40.2	1.01	0	PNTA	M	>60	0	1	SC	3	2.84
93	Nelson	6.5	96	64.3	6.36	0	>$65k	M	>60	0	0	CG	2	0.00
94	Orange	6.1	104	69.7	2.02	0	PNTA	M	31-40	0	1	PostC	1	0.43
95	Albemarle	6.4	73	48.9	0	0	>$65k	F	>60	0	1	SC	2	1.40
96	Albemarle	5.6	50	33.5	0	0	>$65k	M	>60	0	1	HSG	2	0.49
97	Loudoun	6.7	193	129.3	0	0	>$65k	M	>60	0	1	PostC	2	0.00
98	Loudoun	7.3	310	207.7	0	0	>$65k	M	>60	0	1	PostC	2	0.33

Sample	County	pH	EC	TDS	TC MPN/100 mL	EC MPN/100 mL	Household Income	Gender	Age	Sick	Drink	Education	#HM	NO_3-N
99	Loudoun	7.2	370	247.9	0	0	>$65k	M	>60	0	1	PostC	2	0.00
100	Loudoun	7.3	790	529.3	1.01	0	>$65k	M	1-5	0	1	PostC	2	0.58
101	Loudoun	6.9	220	147.4	1.01	0	>$65k	M	51-60	0	1	CG	2	0.96
102	Loudoun	6.6	280	187.6	0	0	>$65k	M	51-60	0	0	CG	2	0.00
103	Loudoun	6.8	510	341.7	0	0	>$65k	M	>60	0	0	SC	3	0.00
104	Loudoun	6.9	188	126.0	0	0	>$65k	M	41-50	0	1	CG	5	0.00
105	Loudoun	6.7	180	120.6	5.24	0	$41k- $64k	M	>60	0	1	CG	3	0.37
106	Loudoun	7.6	350	234.5	0	0	PNTA	M	51-60	0	0	-	2	0.00
107	Loudoun	7.5	200	134.0	0	0	>$65k	M	51-60	0	1	CG	3	0.30
108	Loudoun	6.9	290	194.3	0	0	>$65k	M	51-60	0	1	CG	2	0.00
109	Loudoun	6.7	195	130.7	0	0	>$65k	M	>60	0	1	SC	2	1.04
110	Loudoun	7.4	290	194.3	0	0	>$65k	M	51-60	0	0	SC	4	3.18
111	Loudoun	6.8	350	234.5	0	0	>$65k	M	>60	0	1	CG	2	3.88
112	Loudoun	7	950	636.5	0	0	PNTA	-	41-50	0	0	CG	1	1.20
113	Loudoun	6.9	230	154.1	0	0	>$65k	M	41-50	0	1	PostC	2	0.00
114	Loudoun	7.4	300	201.0	0	0	>$65k	M	31-40	0	1	PostC	5	4.76
115	Loudoun	7	270	180.9	0	0	>$65k	M	>60	0	1	SC	2	0.00
116	Loudoun	6.9	230	154.1	84.93	0	>$65k	M	41-50	0	1	CG	4	0.00
117	Loudoun	6.4	270	180.9	0	0	>$65k	M	41-50	0	1	CG	2	2.35
118	Loudoun	6.5	220	147.4	147.5	0	>$65k	F	>60	0	1	PostC	1	0.32
119	Loudoun	6.3	134	89.8	0	0	>$65k	F	>60	0	1	PostC	1	1.21
120	Loudoun	7.2	188	126.0	0	0	>$65k	M	>60	0	0	PostC	2	0.00
121	Loudoun	7.5	200	134.0	5.24	0	>$65k	M	41-50	0	1	CG	5	0.00
122	Loudoun	5.9	290	194.3	0	0	$41k- $64k	F	41-50	0	1	PostC	3	10.61
123	Loudoun	7	220	147.4	0	0	>$65k	M	51-60	0	1	CG	2	0.00
124	Loudoun	7.4	350	234.5	0	0	>$65k	M	41-50	0	1	PostC	4	0.00
125	Loudoun	6.9	580	388.6	45.46	0	$41k- $64k	F	>60	0	0	HSG	2	1.50
126	Loudoun	7.6	300	201.0	0	0	>$65k	M	41-50	0	1	PostC	5	0.00
127	Loudoun	6.4	1040	696.8	0	0	>$65k	M	51-60	0	1	CG	4	0.65

Sample	County	pH	EC	TDS	TC MPN/100 mL	EC MPN/100 mL	Household Income	Gender	Age	Sick	Drink	Education	#HM	NO_3-N
128	Loudoun	7.4	280	187.6	0	0	>$65k	M	51-60	0	1	CG	3	0.30
129	Loudoun	6.9	270	180.9	0	0	>$65k	M	41-50	0	1	PostC	3	1.11
130	Loudoun	7.5	220	147.4	0	0	>$65k	M	31-40	0	1	PostC	5	0.00
131	Loudoun	7.2	220	147.4	0	0	PNTA	M	51-60	0	1	SC	4	0.00
132	Loudoun	7.1	320	214.4	0	0	>$65k	M	>60	0	1	PostC	2	0.00
133	Loudoun	5.7	33	22.1	237.46	0	>$65k	F	>60	0	1	CG	1	0.00
134	Loudoun	6.6	480	321.6	0	0	>$65k	M	51-60	0	1	SC	5	0.00
135	Loudoun	7.5	330	221.1	0	0	>$65k	M	41-50	0	1	PostC	4	0.42
136	Loudoun	8	220	147.4	0	0	>$65k	F	>60	0	1	HSG	2	0.00
137	Loudoun	7.2	220	147.4	190.21	0	PNTA	-	-	-	-	-	-	0.00
138	Loudoun	7.4	310	207.7	0	0	>$65k	M	>60	0	1	PostC	2	0.00
139	Loudoun	7	186	124.6	0	0	>$65k	M	>60	0	1	PostC	3	0.00
140	Loudoun	5.8	310	207.7	1.01	1.01	$41k- $64k	M	>60	0	1	CG	2	5.39
141	Loudoun	6.5	750	502.5	0	0	$41k- $64k	F	>60	0	1	SC	1	0.53
142	Loudoun	7.6	260	174.2	0	0	$41k- $64k	F	>60	0	1	CG	2	0.00
143	Loudoun	7.8	195	130.7	0	0	>$65k	-	51-60	0	1	PostC	4	0.00
144	Loudoun	6.7	300	201.0	36.48	1.01	>$65k	M	1-5	0	1	ISN	5	1.27
145	Warren	6.3	110	73.7	0	0	>$65k	F	51-60	0	0	CG	2	0.00
146	Frederick	7	710	475.7	14.87	0	>$65k	M	>60	0	1	CG	4	3.34
147	Frederick	7.2	710	475.7	59.23	0	>$65k	-	51-60	0	1	CG	2	1.50
148	Frederick	7.4	580	388.6	0	0	PNTA	-	-	-	-	-	1	0.00
149	Clarke	7	660	442.2	14.87	0	PNTA	-	>60	0	1	CG	4	2.48
150	Frederick	6.8	1380	924.6	1.01	0	>$65k	M	41-50	0	1	CG	3	9.19
151	Frederick	7	800	536.0	0	0	>$65k	M	51-60	0	1	SC	2	0.73
152	Frederick	6.9	1070	716.9	0	0	$41k- $64k	M	>60	0	0	PostC	3	8.18
153	Clarke	7	182	121.9	0	0	$41k- $64k	M	41-50	0	1	PostC	2	0.00
154	Frederick	6.9	310	207.7	0	0	$25K - $40K	M	>60	0	0	SC	1	0.00
155	Frederick	7.1	110	737.0	0	0	$41k- $64k	F	>60	0	0	PostC	2	0.80

Sample	County	pH	EC	TDS	TC MPN/100 mL	EC MPN/100 mL	Household Income	Gender	Age	Sick	Drink	Education	#HM	NO_3-N
			0											
156	Frederick	7	440	294.8	0	0	PNTA	M	>60	0	1	CG	3	0.35
157	Frederick	5.9	45	30.2	0	0	>$65k	M	>60	0	1	CG	2	0.00
158	Frederick	7.1	590	395.3	0	0	$41k- $64k	M	>60	0	0	SC	1	0.00
159	Frederick	7.2	750	502.5	1.01	0	PNTA	F	51-60	0	1	SC	3	2.00
160	Frederick	7	790	529.3	0	0	$41k- $64k	F	41-50	0	1	CG	3	1.42
161	Frederick	7.5	340	227.8	0	0	>$65k	M	>60	1	1	SC	1	0.00
162	Frederick	7	740	495.8	0	0	>$65k	M	41-50	1	0	CG	4	2.73
163	Frederick	7	1340	897.8	7.36	1.01	$25K - $40K	M	>60	0	1	HSG	2	4.66
164	Frederick	6.9	280	187.6	0	0	>$65k	M	>60	0	1	CG	2	0.00
165	Clarke	7.2	850	569.5	0	0	>$65k	M	>60	0	1	PostC	2	0.63
166	Frederick	7.1	220	147.4	0	0	$41k- $64k	M	>60	0	1	SC	4	0.00
167	Frederick	6.9	960	643.2	0	0	>$65k	M	>60	0	1	CG	2	1.85
168	Frederick	6.1	1110	743.7	0	0	>$65k	M	41-50	0	0	CG	1	0.00
169	Frederick	6.9	870	582.9	0	0	>$65k	M	>60	0	1	CG	2	2.30
170	Frederick	7.4	540	361.8	0	0	PNTA	M	>60	0	1	HSG	2	0.00
171	Frederick	7.1	940	629.8	22.66	0	>$65k	M	>60	0	1	HSG	2	3.54
172	Frederick	7	490	328.3	0	0	>$65k	M	51-60	0	1	CG	2	0.00
173	Frederick	6.9	830	556.1	0	0	PNTA	M	>60	0	1	HSG	4	3.34
174	Frederick	7.1	720	482.4	0	0	>$65k	M	51-60	0	1	SC	2	5.66
175	Frederick	7.2	700	469.0	0	0	$41k- $64k	M	>60	1	1	SC	3	0.26
176	Frederick	7.1	850	569.5	0	0	PNTA	M	>60	0	1	PostC	2	2.31
177	Frederick	7.2	715	479.1	0	0	PNTA	M	51-60	0	1	SC	2	0.00
178	Frederick	7.2	560	375.2	183.1	0	$11K - $24K	F	>60	0	1	CG	2	2.18
179	Frederick	7.6	240	160.8	0	0	PNTA	M	>60	0	1	CG	1	0.25
180	Frederick	7	940	629.8	0	0	$41k- $64k	M	>60	0	1	PostC	2	2.09
181	Frederick	7.7	280	187.6	0	0	>$65k	M	>60	0	1	HSG	2	0.00
182	Frederick	7.4	260	174.2	0	0	$11K -	M	>60	0	1	SC	2	0.00

Sample	County	pH	EC	TDS	TC MPN/100 mL	EC MPN/100 mL	Household Income	Gender	Age	Sick	Drink	Education	#HM	NO_3-N
							$24K							
183	Frederick	7.3	370	247.9	0	0	$11K - $24K	-	-	0	0	-	2	0.63
184	Frederick	7.1	730	489.1	31.37	6.36	$41k- $64k	M	51-60	0	1	SC	2	4.73
185	Frederick	7.1	685	459.0	1.01	0	$25K - $40K	F	>60	0	1	SC	2	1.76
186	Frederick	7	700	469.0	2082	113.13	$25K - $40K	M	51-60	0	1	SC	1	4.86
187	Frederick	7.2	370	247.9	25.7	0	>$65k	M	51-60	0	0	PostC	1	0.00
188	Frederick	7.3	640	428.8	0	0	>$65k	M	41-50	0	1	CG	2	4.69
189	Frederick	7.1	740	495.8	0	0	PNTA	M	51-60	0	1	PostC	3	0.00
190	Frederick	7.2	240	160.8	0	0	$11K - $24K	M	>60	0	1	HSG	3	0.00
191	Montgomery	7.3	650	435.5	0	0	>$65k	F	21-30	0	0	PostC	2	5.95
192	Frederick	7.6	920	616.4	9.84	0	PNTA	F	-	0	0	-	1	0.00
193	Lancaster	8	620	415.4	0	0	<$10k	F	>60	0	1	SHS	1	0.13
194	Northumberland	8.4	690	462.3	0	0	PNTA	F	>60	0	1	HSG	2	0.06
195	Essex	4.9	127	85.1	7.43	0	$41k- $64k	F	41-50	1	1	PostC	2	3.76
196	Northumberland	8.6	960	643.2	0	0	$25K - $40K	F	>60	0	0	PostC	2	0.07
197	Lancaster	6.2	192	128.6	109.84	0	>$65k	M	>60	0	1	SC	2	3.81
198	Lancaster	5.6	87	58.3	92.6	0	$11K - $24K	M	51-60	0	1	SHS	3	3.53
199	Lancaster	8.3	920	616.4	0	0	$25K - $40K	F	41-50	0	1	PostC	2	0.00
200	Lancaster	8.4	970	649.9	0	0	$41k- $64k	M	>60	0	1	SC	2	0.00
201	Lancaster	4.8	41	27.5	1.01	0	$25K - $40K	M	51-60	0	1	SHS	5	0.46
202	Lancaster	8.4	800	536.0	0	0	>$65k	M	>60	0	1	PostC	2	0.00
203	Lancaster	7.8	380	254.6	0	0	$11K - $24K	F	51-60	0	1	HSG	1	0.37
204	Lancaster	7.8	1200	804.0	1.01	0	>$65k	F	51-60	0	0	HSG	2	0.13
205	Lancaster	8.3	400	268.0	499.04	0	>$65k	M	>60	0	1	PostC	2	0.08

Sample	County	pH	EC	TDS	TC MPN/100 mL	EC MPN/100 mL	Household Income	Gender	Age	Sick	Drink	Education	#HM	NO_3-N
206	Lancaster	8	400	268.0	0	0	>$65k	M	>60	0	1	PostC	2	0.20
207	Northumberland	8.6	770	515.9	0	0	>$65k	-	-	-	-	-	-	0.00
208	Lancaster	8.6	960	643.2	0	0	$11K - $24K	F	>60	0	1	PostC	2	0.00
209	Lancaster	8.3	970	649.9	0	0	>$65k	M	>60	0	1	PostC	1	0.26
210	Lancaster	6.2	157	105.2	1708.62	0	$41k- $64k	M	41-50	0	1	PostC	2	0.07
211	Lancaster	8.5	850	569.5	3.08	0	>$65k	M	51-60	0	1	SC	4	0.00
212	Lancaster	8.2	715	479.1	0	0	$25K - $40K	M	31-40	0	1	CG	4	0.09
213	Lancaster	8.4	790	529.3	0	0	$25K - $40K	M	21-30	0	1	HSG	2	0.00
214	Lancaster	8.4	810	542.7	0	0	>$65k	M	>60	0	1	HSG	2	0.17
215	Northumberland	8.6	810	542.7	0	0	$25K - $40K	F	>60	0	1	PostC	3	0.00
216	Lancaster	8	410	274.7	0	0	>$65k	M	41-50	0	1	HSG	2	0.28
217	Lancaster	8	370	247.9	0	0	>$65k	M	>60	0	1	CG	3	0.12
218	Lancaster	5.9	168	112.6	1.01	0	$25K - $40K	-	-	-	-	-	-	6.20
219	Northumberland	8.4	840	562.8	0	0	PNTA	M	51-60	0	1	HSG	2	0.14
220	Northumberland	8.5	800	536.0	0	0	>$65k	M	>60	0	1	-	4	0.06
221	Northumberland	8.3	510	341.7	0	0	$25K - $40K	M	>60	0	1	PostC	2	0.06
222	Northumberland	8	310	207.7	0	0	$41k- $64k	-	>60	0	1	CG	1	0.00
223	Northumberland	8.6	780	522.6	0	0	>$65k	F	>60	0	1	PostC	2	0.00
224	Northumberland	5.6	62	41.5	196.52	0	$11K - $24K	F	>60	0	1	PostC	2	0.33
225	Northumberland	5.6	131	87.8	8.58	0	$25K - $40K	F	>60	0	1	SC	2	4.13
226	Northumberland	6.2	88	59.0	246.99	0	$11K - $24K	F	>60	0	0	CG	1	1.44
227	Northumberland	8	300	201.0	0	0	>$65k	F	>60	0	1	SC	1	0.00

Sample	County	pH	EC	TDS	TC MPN/100 mL	EC MPN/100 mL	Household Income	Gender	Age	Sick	Drink	Education	#HM	NO_3-N
228	Northumberland	5.9	177	118.6	171.15	0	>$65k	M	51-60	0	1	CG	2	7.07
229	Northumberland	6.4	113	75.7	662.9	0	<$10k	M	>60	0	1	PostC	2	2.51
230	Northumberland	8.6	860	576.2	0	0	$25K - $40K	F	51-60	0	0	HSG	1	0.06
231	Lancaster	8.3	790	529.3	0	0	>$65k	M	>60	0	1	SC	2	0.00
232	Northumberland	8.2	335	224.5	0	0	$25K - $40K	F	>60	0	1	PostC	1	0.00
233	Lancaster	7.9	390	261.3	0	0	$41k- $64k	F	51-60	0	1	PostC	2	0.07
234	Northumberland	5.5	36	24.1	8.66	0	PNTA	M	>60	0	1	CG	2	0.42
235	Northumberland	8.3	350	234.5	0	0	$25K - $40K	M	51-60	0	1	HSG	1	0.00
236	Northumberland	8.7	780	522.6	3.08	0	$25K - $40K	F	>60	0	1	PostC	1	0.00
237	Northumberland	8	300	201.0	189.75	0	PNTA	F	>60	0	1	CG	1	0.00
238	Northumberland	8.4	650	435.5	0	0	PNTA	F	41-50	0	1	CG	4	0.10
239	Northumberland	7.9	320	214.4	0	0	>$65k	M	51-60	0	1	SC	2	0.00
240	Westmoreland	7.9	380	254.6	0	0	>$65k	M	>60	0	1	PostC	5	0.21
241	Westmoreland	8.1	300	201.0	0	0	$41k- $64k	M	31-40	0	1	SC	5	0.22
242	Northumberland	8.1	350	234.5	0	0	$41k- $64k	F	51-60	1	1	CG	4	0.00
243	Westmoreland	8	275	184.3	0	0	>$65k	M	41-50	0	1	SHS	5	0.00
244	Westmoreland	5.7	116	77.7	662.5	0	$11K - $24K	M	6-10	0	0	ISN	3	3.16
245	Northumberland	7.8	330	221.1	0	0	$41k- $64k	M	31-40	0	1	CG	4	0.25
246	Westmoreland	8.3	500	335.0	0	0	>$65k	M	6-10	0	1	ISN	3	0.00
247	Richmond County	8	330	221.1	0	0	$25K - $40K	M	>60	0	1	HSG	2	0.22
248	Richmond County	6	103	69.0	16.2	0	<$10k	F	>60	0	0	SHS	2	4.41

Sample	County	pH	EC	TDS	TC MPN/100 mL	EC MPN/100 mL	Household Income	Gender	Age	Sick	Drink	Education	#HM	NO_3-N
249	Richmond County	8.3	430	288.1	0	0	>$65k	M	>60	0	1	CG	2	0.00
250	Richmond County	5.4	36	24.1	0	0	$25K - $40K	M	>60	0	1	SC	2	0.19
251	Richmond County	8	320	214.4	0	0	>$65k	M	>60	0	1	PostC	2	0.00
252	Richmond County	6.8	290	194.3	843.28	0	>$65k	F	11-15	0	0	ISN	3	5.43
253	Richmond County	8.2	395	264.7	0	0	>$65k	F	11-15	0	1	ISN	3	0.23
254	Richmond County	5.7	45	30.2	136.15	0	>$65k	-	-	-	-	-	-	0.41
255	Richmond County	7.8	260	174.2	0	0	PNTA	M	41-50	0	1	HSG	4	0.00
256	Richmond County	7.6	250	167.5	2081.29	0	$11K - $24K	F	>60	0	1	SC	1	0.21
257	Richmond County	8	330	221.1	7.49	2.04	>$65k	M	51-60	0	1	SHS	3	0.00
258	Richmond County	8	280	187.6	2082	0	$41k- $64k	M	>60	0	1	HSG	1	0.00
259	Richmond County	6.1	220	147.4	56.41	0	$25K - $40K	M	21-30	0	1	HSG	2	5.04
260	Richmond County	8.4	440	294.8	0	0	$25K - $40K	M	51-60	0	1	HSG	2	0.00
261	Westmoreland	6.2	168	112.6	558.37	0	$11K - $24K	F	>60	0	1	SHS	1	5.43
262	Richmond County	8.3	380	254.6	0	0	$41k- $64k	M	>60	1	1	PostC	1	0.00
263	Richmond County	7.8	350	234.5	0	0	<$10k	M	41-50	0	1	SHS	3	0.44
264	Westmoreland	5.1	144	96.5	32.75	0	$25K - $40K	M	>60	0	1	HSG	3	2.01
265	Westmoreland	8.1	330	221.1	0	0	>$65k	M	>60	0	1	PostC	2	0.00
266	Westmoreland	7.5	450	301.5	0	0	PNTA	F	>60	0	1	CG	1	0.54
267	Westmoreland	7.5	560	375.2	0	0	$41k- $64k	F	>60	0	1	SC	2	0.00
268	Westmoreland	8.5	330	221.1	7.43	0	>$65k	M	51-60	1	1	CG	2	0.27

Sample	County	pH	EC	TDS	TC MPN/100 mL	EC MPN/100 mL	Household Income	Gender	Age	Sick	Drink	Education	#HM	NO_3-N
269	Westmoreland	8.2	350	234.5	0	0	<$10k	M	51-60	0	1	CG	2	0.00
270	Westmoreland	8.1	360	241.2	0	0	>$65k	M	31-40	0	1	CG	5	0.30
271	Westmoreland	5.9	94	63.0	2.04	0	$41k- $64k	F	>60	0	0	PostC	1	3.17
272	Westmoreland	8.3	490	328.3	0	0	<$10k	F	51-60	0	1	SC	1	0.25
273	Westmoreland	5.8	90	60.3	132.85	0	$25K - $40K	F	31-40	0	0	HSG	5	0.94
274	Westmoreland	8.4	510	341.7	0	0	$25K - $40K	F	31-40	0	1	HSG	5	0.00
275	Westmoreland	5.2	61	40.9	196.52	0	>$65k	M	31-40	0	1	HSG	5	3.14
276	Westmoreland	8.4	450	301.5	0	0	$41k- $64k	M	>60	0	1	PostC	2	0.00
277	Westmoreland	5.6	192	128.6	205.39	0	$41k- $64k	M	>60	0	1	PostC	2	8.72
278	Westmoreland	8.3	570	381.9	0	0	$41k- $64k	F	51-60	1	0	SC	3	0.00
279	Westmoreland	8.3	390	261.3	0	0	PNTA	M	51-60	0	1	CG	2	0.00
280	Westmoreland	7.8	470	314.9	0	0	$25K - $40K	F	>60	0	0	SC	2	0.00
281	Westmoreland	8.2	450	301.5	0	0	>$65k	M	>60	0	0	SC	2	0.28
282	Westmoreland	8.3	430	288.1	0	0	>$65k	M	>60	0	1	SC	2	0.00
283	Westmoreland	8.1	535	358.5	0	0	PNTA	M	>60	0	1	CG	1	0.00
284	Westmoreland	8.4	450	301.5	4.12	0	>$65k	F	>60	0	1	SC	1	0.00
285	Westmoreland	8.3	410	274.7	0	0	PNTA	M	>60	0	1	PostC	1	0.00
286	Westmoreland	5.4	118	79.1	843.28	0	>$65k	M	>60	0	1	HSG	4	6.16
287	Westmoreland	5.6	110	73.7	2082	0	$41k- $64k	M	>60	0	1	HSG	2	5.64
288	Westmoreland	5.5	159	106.5	197.6	0	$11K - $24K	F	41-50	0	1	SC	4	3.10

Sample	County	pH	EC	TDS	TC MPN/100 mL	EC MPN/100 mL	Household Income	Gender	Age	Sick	Drink	Education	#HM	NO_3-N
289	Russell	7	1000	670.0	2082	2082	$25K - $40K	M	51-60	0	1	PostC	5	1.59
290	Russell	7.1	490	328.3	41.99	1	$25K - $40K	M	51-60	0	1	PostC	5	0.16
291	Russell	7.4	520	348.4	0	0	>$65k	F	51-60	0	1	HSG	3	2.26
292	Russell	6.9	210	140.7	0	0	$11K - $24K	M	41-50	0	1	SHS	4	0.00
293	Russell	7.4	570	381.9	0	0	$25K - $40K	M	21-30	0	1	PostC	5	0.00
294	Russell	7.7	370	247.9	1.01	0	$25K - $40K	M	>60	0	1	HSG	2	1.30
295	Russell	7.5	350	234.5	33.6	0	PNTA	M	>60	0	1	SHS	2	0.68
296	Russell	7.5	390	261.3	0	0	>$65k	F	>60	0	1	PostC	2	0.18
297	Russell	7.1	620	415.4	338.45	29.62	$25K - $40K	M	>60	0	1	HSG	1	0.44
298	Russell	7.7	280	187.6	0	0	>$65k	F	51-60	1	1	PostC	1	1.51
299	Russell	7	680	455.6	0	0	$25K - $40K	M	51-60	0	1	CG	4	5.72
300	Russell	7.5	385	258.0	44.43	0	$25K - $40K	F	51-60	0	1	SC	2	0.00
301	Russell	7.3	380	254.6	23.16	0	$25K - $40K	M	>60	0	1	HSG	5	8.10
302	Tazewell	7.1	490	328.3	4.12	0	$25K - $40K	M	>60	1	1	SC	2	1.59
303	Russell	7	185	124.0	0	0	$25K - $40K	M	51-60	1	1	PostC	3	0.26
304	Russell	9	690	462.3	0	0	$41k- $64k	M	51-60	0	1	SC	2	0.00
305	Russell	7.1	640	428.8	3.08	0	$25K - $40K	F	51-60	0	1	SC	1	1.83
306	Russell	7.2	395	264.7	5.24	1.01	>$65k	M	31-40	0	1	PostC	2	0.35
307	Russell	7.5	460	308.2	0	0	>$65k	M	>60	0	1	HSG	2	1.70
308	Tazewell	8	198	132.7	1.01	0	PNTA	-	-	-	-	-	-	1.04
309	Tazewell	7.6	760	509.2	338.45	1.01	$25K - $40K	F	>60	0	1	SC	1	2.91
310	Tazewell	7.9	230	154.1	1.01	0	>$65k	M	6-10	0	1	ISN	3	0.94
311	Tazewell	7.5	280	187.6	222.32	94.74	>$65k	M	41-50	0	1	HSG	2	1.79

Sample	County	pH	EC	TDS	TC MPN/100 mL	EC MPN/100 mL	Household Income	Gender	Age	Sick	Drink	Education	#HM	NO_3-N
312	Tazewell	7.1	325	217.8	190.76	23.16	$41k- $64k	M	>60	0	1	SC	2	1.96
313	Tazewell	7.8	320	214.4	2082	2081.29	$41k- $64k	M	31-40	0	1	SC	4	0.38
314	Tazewell	7.2	360	241.2	2082	80.61	$41k- $64k	M	31-40	0	1	SC	4	0.58
315	Tazewell	6.4	131	87.8	4.12	0	$11K - $24K	M	>60	0	0	SC	2	0.79
316	Tazewell	7.4	240	160.8	657.99	657.99	$41k- $64k	M	31-40	0	1	SC	4	0.86
317	Tazewell	7.2	790	529.3	2082	0	>$65k	F	>60	0	1	SC	2	2.37
318	Russell	7.4	660	442.2	2.02	0	$25K - $40K	F	51-60	0	0	PostC	1	3.52
319	Russell	7	600	402.0	13.43	1.01	$25K - $40K	F	31-40	0	0	CG	1	9.09
320	Russell	6.2	26	17.4	1	0	$41k- $64k	M	51-60	0	1	SHS	2	0.21
321	Russell	7.5	380	254.6	0	0	>$65k	M	41-50	0	1	SC	4	1.42
322	Russell	7.6	220	147.4	0	0	PNTA	F	41-50	0	1	PostC	5	0.57
323	Russell	7.5	360	241.2	0	0	$41k- $64k	F	>60	0	1	PostC	2	0.88
324	Russell	7.4	440	294.8	0	0	$41k- $64k	M	>60	0	0	CG	2	0.40
325	Russell	7.6	195	130.7	0	0	$25K - $40K	M	51-60	0	1	SC	2	0.24
326	Russell	7.5	705	472.4	4.15	1.01	PNTA	M	51-60	0	1	-	3	0.29
327	Shenandoah	7.2	8	5.4	0	0	PNTA	M	>60	0	1	CG	2	2.94
328	Shenandoah	7.1	8	5.4	0	0	>$65k	M	>60	0	1	CG	2	2.24
329	Shenandoah	7.1	7	4.7	0	0	>$65k	M	41-50	1	1	PostC	4	3.79
330	Shenandoah	7.7	475	318.3	0	0	$25K - $40K	M	>60	0	1	CG	2	4.64
331	Shenandoah	7.6	615	412.1	0	0	$25K - $40K	M	>60	0	1	HSG	2	4.17
332	Shenandoah	7.5	469	314.2	21.66	0	PNTA	M	>60	0	0	SC	2	3.37
333	Shenandoah	7.7	271	181.6	25.99	0	PNTA	-	-	-	-	-	-	0.50
334	Shenandoah	8.1	526	352.4	0	0	>$65k	M	51-60	0	1	PostC	2	1.60
335	Shenandoah	7.2	777	520.6	0	0	>$65k	M	>60	0	1	CG	2	2.20
336	Shenandoah	8	290	194.3	1.01	0	>$65k	M	31-40	0	1	PostC	3	0.05
337	Shenandoah	8.2	395	264.7	0	0	>$65k	M	>60	0	1	CG	2	2.24
338	Shenandoah	7.2	579	387.9	73.47	2.04	$25K -	M	51-60	0	0	SC	1	4.28

Sample	County	pH	EC	TDS	TC MPN/100 mL	EC MPN/100 mL	Household Income	Gender	Age	Sick	Drink	Education	#HM	NO_3-N
							$40K							
339	Shenandoah	7.7	344	230.5	13.3	0	$41k- $64k	M	31-40	1	0	CG	2	0.00
340	Shenandoah	7.6	490	328.3	0	0	>$65k	M	41-50	0	1	CG	4	0.00
341	Shenandoah	7.1	977	654.6	0	0	>$65k	F	41-50	0	1	SC	3	0.00
342	Shenandoah	7.2	668	447.6	377.61	2.04	>$65k	M	>60	1	1	HSG	2	6.96
343	Shenandoah	7.1	586	392.6	2082	189.75	$11K - $24K	-	>60	0	1	HSG	1	0.46
344	Shenandoah	7.2	6	4.0	1.01	0	PNTA	M	-	0	0	-	2	2.50
345	Shenandoah	7.2	11	7.4	0	0	>$65k	F	51-60	0	1	SC	2	0.00
346	Shenandoah	7.2	755	505.9	0	0	PNTA	-	-	-	-	-	-	3.21
347	Page	6.9	130	87.1	0	0	$41k- $64k	M	51-60	0	1	PostC	2	1.55
348	Page	7.7	339	227.1	0	0	$41k- $64k	M	51-60	0	1	HSG	4	0.66
349	Page	7.5	374	250.6	0	0	$41k- $64k	M	51-60	0	1	SC	2	0.44
350	Page	7.9	389	260.6	0	0	$11K - $24K	F	>60	0	1	SC	2	0.00
351	Page	7.2	409	274.0	5.24	0	$25K - $40K	M	51-60	0	1	PostC	2	4.80
352	Page	5.6	51	34.2	0	0	$25K - $40K	F	41-50	0	1	CG	1	0.00
353	Page	7.4	572	383.2	1.01	0	$41k- $64k	M	>60	0	1	PostC	2	3.88
354	Page	7.2	687	460.3	304.21	0	$11K - $24K	F	51-60	0	0	CG	1	0.00
355	Page	7.7	492	329.6	0	0	$11K - $24K	F	>60	1	0	SHS	1	7.79
356	Warren	6.1	82	54.9	702.31	0	$25K - $40K	M	21-30	0	1	HSG	2	0.13
357	Warren	6.8	1104	739.7	20.2	0	<$10k	M	>60	0	1	HSG	1	0.37
358	Warren	7.1	218	146.1	1708.62	0	>$65k	M	51-60	0	1	HSG	2	0.00
359	Page	6.7	102	68.3	2.04	0	>$65k	M	51-60	0	1	PostC	4	2.26
360	Shenandoah	7.3	879	588.9	1.01	0	$41k- $64k	F	41-50	0	1	SC	3	17.51
361	Page	7.5	213	142.7	0	0	>$65k	M	41-50	0	1	CG	2	0.65
362	Page	7.5	520	348.4	0	0	$25K - $40K	M	>60	0	1	SC	2	1.34

Sample	County	pH	EC	TDS	TC MPN/100 mL	EC MPN/100 mL	Household Income	Gender	Age	Sick	Drink	Education	#HM	NO_3-N
363	Page	6.5	70	46.9	2082	8.42	$25K - $40K	M	>60	0	1	PostC	1	0.00
364	Warren	7.3	502	336.3	0	0	>$65k	M	51-60	0	0	HSG	2	0.00
365	Page	7.8	266	178.2	0	0	>$65k	M	51-60	0	1	CG	3	0.21
366	Warren	6.7	191	128.0	0	0	>$65k	M	51-60	0	1	HSG	2	0.00
367	Page	7.2	831	556.8	0	0	$25K - $40K	F	>60	0	1	SC	1	2.54
368	Page	6	98	65.7	9.75	0	$41k- $64k	M	51-60	0	1	CG	2	0.12
369	Page	7.5	606	406.0	3.08	0	PNTA	F	>60	0	1	HSG	1	0.00
370	Warren	7.4	494	331.0	43.85	1.01	>$65k	M	>60	0	1	HSG	2	0.47
371	Page	7.6	688	461.0	0	0	>$65k	M	>60	0	1	-	1	1.78
372	Page	7.7	421	282.1	0	0	>$65k	M	>60	0	1	CG	2	0.67
373	Page	7.9	287	192.3	1.01	0	$11K - $24K	M	41-50	0	1	CG	1	0.16
374	Page	7.5	343	229.8	1.01	0	>$65k	F	41-50	0	1	SC	5	0.18
375	Page	7.6	424	284.1	159.99	0	>$65k	M	>60	0	1	SC	2	0.00
376	Page	7.5	639	428.1	0	0	$41k- $64k	F	6-10	0	1	ISN	3	0.00
377	Page	7.1	1420	951.4	0	0	>$65k	M	>60	0	1	PostC	2	0.00
378	Page	7.8	182	121.9	0	0	$25K - $40K	F	51-60	0	1	CG	1	1.53
379	Page	7.4	235	157.5	3.08	0	>$65k	M	>60	0	0	CG	2	0.00
380	Page	7.4	626	419.4	0	0	$41k- $64k	M	>60	0	1	HSG	2	4.29
381	Page	7.3	845	566.2	1	0	$25K - $40K	M	>60	0	1	SC	2	7.38
382	Page	7.7	427	286.1	0	0	$41k- $64k	M	>60	0	1	SC	2	0.71
383	Page	6.8	511	342.4	0	0	>$65k	M	51-60	0	1	CG	4	0.00
384	Page	7.3	1017	681.4	0	0	<$10k	M	51-60	0	1	HSG	1	0.00
385	Page	7.6	579	387.9	0	0	$25K - $40K	F	51-60	0	1	SC	2	0.00
386	Page	8	224	150.1	0	0	>$65k	M	51-60	0	1	CG	2	0.00
387	Warren	6.3	180	120.6	0	0	$41k- $64k	M	41-50	0	1	HSG	2	1.40
388	Warren	7.5	629	421.4	0	0	PNTA	-	>60	0	1	-	2	0.00

Sample	County	pH	EC	TDS	TC MPN/100 mL	EC MPN/100 mL	Household Income	Gender	Age	Sick	Drink	Education	#HM	NO_3-N
389	Warren	7.1	940	629.8	0	0	PNTA	F	>60	0	1	PostC	1	0.26
390	Warren	6.9	290	194.3	3.06	0	$41k- $64k	F	>60	0	1	SC	1	0.00
391	Warren	6.6	128	85.8	0	0	PNTA	-	-	-	-	-	-	
392	Warren	7.4	504	337.7	0	0	$41k- $64k	M	>60	0	1	SC	2	5.73
393	Warren	7.2	869	582.2	7.29	0	>$65k	M	>60	0	1	CG	3	3.32
394	Warren	7	334	223.8	1.01	0	PNTA	M	>60	0	0	HSG	2	0.00
395	Warren	7.6	399	267.3	357.4	12.18	>$65k	M	>60	0	1	SC	2	3.85
396	Warren	7.8	378	253.3	0	0	>$65k	M	31-40	0	0	PostC	3	2.11
397	Warren	7.4	620	415.4	14.72	0	$41k- $64k	M	41-50	0	1	SHS	2	0.68
398	Warren	6.5	132	88.4	0	0	$25K - $40K	F	51-60	0	1	SC	3	1.21
399	Warren	6.4	108	72.4	5.24	0	>$65k	M	31-40	0	1	CG	4	0.66
400	Warren	7.7	445	298.2	0	0	$41k- $64k	M	>60	0	1	PostC	2	0.00
401	Warren	6.6	224	150.1	237.46	0	>$65k	F	21-30	0	1	CG	2	0.14
402	Warren	6.2	91	61.0	0	0	>$65k	M	>60	0	1	SC	1	0.00
403	Warren	7.9	326	218.4	11.06	0	>$65k	M	51-60	0	1	SC	2	2.16
404	Warren	6.6	206	138.0	4.15	0	>$65k	M	51-60	0	1	PostC	2	1.31
405	Warren	7.5	227	152.1	0	0	>$65k	M	>60	0	1	PostC	2	0.10
406	Warren	6.9	123	82.4	0	0	$25K - $40K	F	>60	0	0	-	1	1.85
407	Warren	7.3	371	248.6	0	0	>$65k	M	41-50	0	1	CG	3	0.00

Sample	County	pH	EC	TDS	TC MPN/100 mL	EC MPN/100 mL	Household Income	Gender	Age	Sick	Drink	Education	#HM	NO_3-N
408	Warren	7.4	423	283.4	41.05	0	$41k- $64k	M	>60	0	1	SC	2	2.53
409	Warren	6.8	144	96.5	248.91	0	>$65k	M	51-60	0	1	PostC	2	1.41
410	Warren	7.1	194	130.0	17.39	0	>$65k	M	51-60	0	1	SC	3	1.53
411	Warren	7.5	480	321.6	3.08	0	>$65k	M	51-60	0	1	PostC	3	7.38
412	Warren	7.5	483	323.6	18.78	0	$25K - $40K	-	-	-	-	-	-	
413	Warren	7.4	515	345.1	0	0	$41k- $64k	F	51-60	0	1	PostC	2	6.25
414	Warren	7.3	982	657.9	2.04	0	$41k- $64k	F	>60	0	0	SC	1	1.43
415	Warren	7.5	585	392.0	0	0	$41k- $64k	-	>60	0	1	CG	2	0.14
416	Warren	7.1	1405	941.4	0	0	>$65k	F	>60	0	1	CG	1	0.00
417	Warren	6.9	373	249.9	499.04	0	>$65k	M	51-60	0	0	CG	2	17.34
418	Warren	7.1	171	114.6	0	0	$25K - $40K	M	>60	0	0	CG	3	0.00
419	Warren	6.8	298	199.7	78.83	0	$41k- $64k	F	>60	0	1	PostC	1	3.62
420	Page	7.2	753	504.5	0	0	>$65k	M	51-60	0	1	CG	2	2.06
421	Warren	7	651	436.2	0	0	$25K - $40K	M	51-60	1	0	SC	2	0.00
422	Warren	6.4	156	104.5	0	0	$41k- $64k	M	>60	1	1	CG	2	0.00
423	Warren	7.3	298	199.7	0	0	$25K - $40K	F	>60	0	1	PostC	1	0.00
424	Warren	6.2	89	59.6	0	0	PNTA	F	>60	0	1	PostC	1	0.00
425	Shenandoah	6.9	298	199.7	0	0	$41k- $64k	M	51-60	0	1	SC	2	0.00
426	Warren	7.3	574	384.6	0	0	>$65k	M	41-50	1	1	PostC	4	5.30

Sample	County	pH	EC	TDS	TC MPN/100 mL	EC MPN/100 mL	Household Income	Gender	Age	Sick	Drink	Education	#HM	NO_3-N
427	Spotsylvania	7	318	213.1	0	0	PNTA	M	>60	0	1	-	2	0.22
428	Spotsylvania	6.8	81	54.3	0	0	PNTA	M	>60	0	1	CG	2	0.00
429	Spotsylvania	6.3	103	69.0	0	0	>$65k	M	>60	0	1	PostC	4	0.00
430	Spotsylvania	6.2	157	105.2	0	0	$41k- $64k	F	>60	1	0	SC	2	0.41
431	Spotsylvania	7.5	149	99.8	0	0	>$65k	M	51-60	0	1	PostC	2	0.00
432	Spotsylvania	5.1	86	57.6	4.15	0	>$65k	M	>60	1	0	PostC	2	0.29
433	Spotsylvania	6.6	87	58.3	0	0	PNTA	M	-	0	1	-	2	0.09
434	Spotsylvania	7.5	244	163.5	23.42	0	>$65k	M	>60	0	1	PostC	2	0.00
435	Stafford	7	108	72.4	59.23	0	>$65k	M	51-60	0	1	CG	2	1.37
436	Stafford	6.5	588	394.0	12.3	0	$25K - $40K	M	>60	0	1	CG	2	3.08
437	Spotsylvania	6.4	111	74.4	0	0	PNTA	M	>60	0	1	HSG	2	0.24
438	Spotsylvania	7.9	187	125.3	0	0	>$65k	F	>60	0	1	PostC	2	0.00
439	Stafford	7.5	268	179.6	0	0	>$65k	M	51-60	0	1	PostC	2	0.00
440	Stafford	6.8	192	128.6	17.21	0	>$65k	M	>60	0	1	HSG	2	1.69
441	Spotsylvania	7.4	418	280.1	0	0	>$65k	M	31-40	0	1	PostC	2	0.59
442	Spotsylvania	7.4	472	316.2	0	0	>$65k	M	51-60	0	0	SC	3	1.26
443	Spotsylvania	7	173	115.9	0	0	$25K - $40K	F	>60	0	1	HSG	1	0.00
444	Spotsylvania	8	200	134.0	0	0	>$65k	M	51-60	0	1	PostC	2	0.36
445	Spotsylvania	7.5	132	88.4	899.99	0	>$65k	F	16-20	0	1	SC	2	0.00
446	Spotsylvania	6.1	57	38.2	0	0	$41k- $64k	M	>60	0	1	CG	2	0.11
447	Louisa	6.8	192	128.6	0	0	>$65k	M	>60	0	1	PostC	2	0.10
448	Spotsylvania	7.8	170	113.9	0	0	>$65k	M	>60	0	1	HSG	2	0.00
449	Spotsylvania	7.2	303	203.0	0	0	PNTA	M	>60	0	1	PostC	2	0.00
450	Stafford	5.9	79	52.9	16.2	0	PNTA	M	>60	0	1	SC	2	0.22
451	Spotsylvania	7.4	227	152.1	4.15	0	>$65k	M	>60	0	1	PostC	2	4.23
452	Stafford	6.6	71	47.6	3.08	0	>$65k	M	>60	0	1	HSG	2	1.47
453	Stafford	7.9	374	250.6	0	0	>$65k	M	51-60	0	1	CG	2	0.00
454	Spotsylvania	6.5	138	92.5	0	0	$41k- $64k	F	21-30	0	1	CG	1	0.00

Sample	County	pH	EC	TDS	TC MPN/100 mL	EC MPN/100 mL	Household Income	Gender	Age	Sick	Drink	Education	#HM	NO_3-N
455	Spotsylvania	8.1	203	136.0	0	0	$11K - $24K	M	>60	0	0	SHS	2	0.00
456	Stafford	6.2	99	66.3	0	0	PNTA	M	>60	0	0	-	2	0.40
457	Stafford	6.8	169	113.2	0	0	$41k- $64k	M	>60	0	1	SC	2	0.00
458	Spotsylvania	6.4	74	49.6	0	0	>$65k	F	51-60	0	1	CG	2	0.64
459	Spotsylvania	7.2	414	277.4	0	0	PNTA	-	-	-	-	-	-	0.00
460	Stafford	6.7	190	127.3	0	0	>$65k	F	51-60	0	1	PostC	2	0.14
461	Spotsylvania	6	199	133.3	963.31	0	$11K - $24K	M	21-30	0	0	HSG	2	1.51
462	Stafford	7.2	297	199.0	13.18	0	>$65k	M	51-60	0	1	HSG	4	9.05
463	Spotsylvania	7.4	251	168.2	0	0	>$65k	M	51-60	0	1	CG	1	0.28
464	Spotsylvania	6.6	96	64.3	0	0	>$65k	M	41-50	0	1	HSG	2	2.83
465	Spotsylvania	7	83	55.6	0	0	PNTA	M	51-60	0	1	SC	5	0.11
466	Spotsylvania	7.1	131	87.8	0	0	>$65k	M	51-60	0	1	CG	3	0.00
467	Stafford	7.9	293	196.3	0	0	>$65k	-	41-50	0	1	CG	3	0.00
468	Spotsylvania	7.6	173	115.9	2082	0	>$65k	M	41-50	0	1	HSG	4	0.00
469	Spotsylvania	6.7	84	56.3	357.4	0	PNTA	M	>60	0	1	-	2	0.00
470	Spotsylvania	7.1	165	110.6	1.01	0	>$65k	M	51-60	0	0	CG	2	0.00
471	King George	8	260	174.2	9.84	0	$41k- $64k	F	>60	0	1	-	2	5.31
472	Stafford	6	55	36.9	2.04	0	$25K - $40K	M	51-60	0	0	CG	2	2.35
473	Stafford	6.5	146	97.8	8.58	0	$25K - $40K	-	>60	0	1	SC	2	3.68
474	Spotsylvania	6.4	90	60.3	2082	2.02	$25K - $40K	F	51-60	1	1	SC	1	0.37
475	Stafford	7.1	204	136.7	1490.64	0	>$65k	M	>60	0	1	CG	2	6.25
476	Spotsylvania	7.6	299	200.3	1.01	0	>$65k	M	>60	0	1	CG	2	0.00
477	Spotsylvania	6.4	53	35.5	0	0	>$65k	M	>60	0	1	PostC	4	1.79
478	Stafford	8.2	176	117.9	0	0	>$65k	M	>60	0	1	CG	2	0.12
479	Spotsylvania	6.2	40	26.8	0	0	$25K - $40K	M	41-50	0	0	HSG	4	0.00
480	Spotsylvania	7.7	239	160.1	0	0	>$65k	M	>60	0	1	PostC	2	0.00
481	Spotsylvania	7.6	267	178.9	0	0	$25K -	F	>60	0	0	PostC	1	1.63

Sample	County	pH	EC	TDS	TC MPN/100 mL	EC MPN/100 mL	Household Income	Gender	Age	Sick	Drink	Education	#HM	NO_3-N
							$40K							
482	Spotsylvania	6.2	72	48.2	66.07	0	>$65k	M	41-50	0	1	SC	4	0.83
483	Spotsylvania	7.8	214	143.4	248.91	0	>$65k	M	51-60	0	1	CG	2	0.00
484	Spotsylvania	7	159	106.5	2082	0	>$65k	M	>60	0	1	PostC	2	0.00
485	Spotsylvania	6.3	61	40.9	0	0	>$65k	M	>60	0	1	PostC	2	0.00
486	Stafford	6.4	74	49.6	183.1	0	>$65k	-	31-40	0	1	CG	2	0.37
487	Stafford	5.8	44	29.5	1117.98	1.01	>$65k	F	21-30	0	1	PostC	6	0.00
488	Spotsylvania	7.2	382	255.9	0	0	>$65k	M	>60	0	1	PostC	3	0.00
489	Spotsylvania	6.4	100	67.0	2.04	0	>$65k	F	>60	0	0	CG	1	0.92
490	Spotsylvania	6.8	349	233.8	297.66	3.08	>$65k	M	51-60	0	0	SC	3	0.40
491	Spotsylvania	6	114	76.4	945.09	0	$25K - $40K	M	>60	0	1	PostC	4	1.01
492	Spotsylvania	6.7	197	132.0	0	0	>$65k	M	>60	0	1	SC	3	1.42
493	Spotsylvania	6.2	81	54.3	0	0	>$65k	F	51-60	0	1	PostC	4	0.31
494	Spotsylvania	6.4	114	76.4	0	0	>$65k	M	51-60	0	1	CG	3	0.00
495	Spotsylvania	7.6	221	148.1	0	0	>$65k	M	31-40	0	1	CG	4	0.00
496	Stafford	6.8	117	78.4	8.58	0	>$65k	M	51-60	0	1	SC	2	0.98
497	Spotsylvania	6.6	104	69.7	177.08	0	$25K - $40K	M	>60	0	1	CG	3	1.31
498	Stafford	6.6	172	115.2	0	0	$41k- $64k	M	51-60	0	1	SC	2	0.00
499	Stafford	8.1	222	148.7	0	0	>$65k	M	41-50	0	1	CG	5	0.00
500	King George	7.7	850	569.5	1.01	0	$25K - $40K	F	31-40	0	0	PostC	1	0.00
501	Stafford	6.9	527	353.1	582.95	0	>$65k	M	>60	0	1	CG	2	0.00
502	Stafford	6.6	113	75.7	27.28	0	>$65k	M	51-60	0	1	CG	3	0.00
503	Stafford	7.6	159	106.5	1	0	PNTA	F	51-60	0	1	CG	3	0.45
504	Spotsylvania	6.4	95	63.7	1490.64	67.45	>$65k	M	>60	0	0	PostC	2	0.58
505	Stafford	7	276	184.9	0	0	>$65k	M	41-50	0	1	CG	2	0.20
506	Spotsylvania	7.3	176	117.9	0	0	>$65k	M	>60	0	1	SC	2	0.00
507	Spotsylvania	6.3	71	47.6	0	0	>$65k	M	>60	0	1	PostC	2	0.00
508	Spotsylvania	7.1	172	115.2	0	0	PNTA	F	>60	0	0	SC	1	0.32

Sample	County	pH	EC	TDS	TC MPN/100 mL	EC MPN/100 mL	Household Income	Gender	Age	Sick	Drink	Education	#HM	NO_3-N
509	Spotsylvania	6.4	206	138.0	15.88	0	$25K - $40K	M	>60	0	1	SC	2	0.65
510	Spotsylvania	8	1513	1013.7	0	0	>$65k	M	41-50	0	1	PostC	3	0.00
511	Stafford	8.2	239	160.1	320.73	0	>$65k	M	41-50	0	1	PostC	5	0.17
512	Spotsylvania	6.9	111	74.4	29.62	0	PNTA	M	41-50	0	0	CG	1	0.90
513	Spotsylvania	6.5	184	123.3	0	0	PNTA	M	>60	0	1	PostC	2	0.00
514	Spotsylvania	5.7	79	52.9	1.01	0	$41k- $64k	F	>60	0	0	SC	1	2.65
515	Stafford	6.9	176	117.9	122.48	0	>$65k	M	>60	0	1	CG	2	6.23
516	Spotsylvania	6.3	74	49.6	36	0	>$65k	M	51-60	0	1	CG	2	0.62
517	Spotsylvania	6.6	376	251.9	4.15	0	PNTA	M	>60	1	1	PostC	2	0.00
518	Spotsylvania	6.3	83	55.6	2082	1.01	$11K - $24K	M	>60	1	0	HSG	2	0.23
519	Spotsylvania	7.2	382	255.9	70.02	0	>$65k	M	>60	0	1	PostC	2	0.20
520	Spotsylvania	6.5	104	69.7	0	0	>$65k	M	>60	0	1	PostC	2	0.17
521	Spotsylvania	5.8	246	164.8	0	0	>$65k	M	>60	0	1	HSG	2	3.52
522	Mecklenburg	6.7	81	54.3	1.01	0	$41k- $64k	M	>60	0	1	PostC	2	0.11
523	Mecklenburg	6.7	140	93.8	11.06	0	$11K - $24K	F	31-40	0	1	HSG	4	0.19
524	Mecklenburg	8	184	123.3	0	0	$11K - $24K	M	16-20	1	0	SC	2	0.05
525	Charlotte	6.5	101	67.7	1	0	$41k- $64k	-	>60	0	1	HSG	2	0.37
526	Lunenburg	6.6	131	87.8	0	0	<$10k	F	31-40	0	1	-	6	0.38
527	Mecklenburg	6	240	160.8	105.89	0	$41k- $64k	-	51-60	0	0	SHS	2	0.93
528	Mecklenburg	6.7	88	59.0	0	0	$41k- $64k	M	>60	0	1	SC	2	0.08
529	Lunenburg	7.9	210	140.7	0	0	<$10k	M	>60	0	1	SHS	2	0.03
530	Lunenburg	6.6	95	63.7	169.07	0	$11K - $24K	M	>60	0	0	SHS	2	0.04
531	Charlotte	7.9	520	348.4	50.37	1.01	$11K - $24K	F	>60	0	1	PostC	2	0.00
532	Mecklenburg	6.1	54	36.2	0	0	$11K - $24K	-	>60	0	0	SC	1	0.36
533	Charlotte	6.8	61	40.9	1.01	0	>$65k	M	41-50	0	1	CG	4	0.11
534	Mecklenburg	6.5	179	119.9	2.04	0	$41k- $64k	-	>60	0	1	HSG	1	0.43

Sample	County	pH	EC	TDS	TC MPN/100 mL	EC MPN/100 mL	Household Income	Gender	Age	Sick	Drink	Education	#HM	NO_3-N
535	Charlotte	6.5	193	129.3	3.08	0	PNTA	M	>60	0	0	CG	2	0.19
536	Charlotte	7	206	138.0	54.62	0	$25K - $40K	F	41-50	0	1	CG	3	0.00
537	Charlotte	6.7	197	132.0	0	0	$41k- $64k	M	>60	0	1	HSG	2	0.05
538	Charlotte	6.3	165	110.6	2081.29	1.01	$11K - $24K	F	>60	1	1	CG	6	0.43
539	Charlotte	6.4	120	80.4	0	0	PNTA	M	>60	0	1	PostC	2	0.04
540	Charlotte	6.8	121	81.1	2.04	0	$41k- $64k	M	>60	1	1	CG	2	0.39
541	Mecklenburg	6.7	71	47.6	0	0	$25K - $40K	M	>60	0	1	HSG	2	0.09
542	Lunenburg	6.6	113	75.7	0	0	$41k- $64k	M	>60	0	1	CG	1	0.15
543	Charlotte	6.9	390	261.3	2.04	0	$25K - $40K	M	51-60	0	1	SC	1	0.92
544	Charlotte	7.2	230	154.1	2.04	0	$41k- $64k	M	51-60	0	1	SC	4	0.06
545	Lunenburg	6.3	77	51.6	0	0	$25K - $40K	M	>60	0	1	HSG	2	0.31
546	Charlotte	7.5	290	194.3	0	0	>$65k	M	>60	0	1	PostC	2	0.00
547	Mecklenburg	7.8	194	130.0	0	0	PNTA	M	51-60	0	1	SC	2	0.00
548	Lunenburg	7.2	116	77.7	0	0	$25K - $40K	M	>60	0	1	PostC	2	0.12
549	Lunenburg	7.2	148	99.2	1.01	0	PNTA	M	51-60	0	1	-	6	0.30
550	Charlotte	6.2	147	98.5	471.87	0	$11K - $24K	F	>60	0	0	HSG	1	0.72
551	Charlotte	6.4	143	95.8	0	0	PNTA	M	>60	0	0	HSG	1	0.70
552	Charlotte	6.1	156	104.5	4.15	0	$41k- $64k	M	51-60	0	1	SC	3	0.40
553	Lunenburg	6.6	110	73.7	4.12	0	$25K - $40K	M	>60	0	1	SC	2	0.02
554	Charlotte	6	40	26.8	1.01	0	$11K - $24K	F	>60	0	1	SC	3	0.12
555	Charlotte	7.2	85	57.0	0	0	$25K - $40K	M	>60	0	1	HSG	2	0.13
556	Charlotte	6.4	60	40.2	127.03	0	$25K - $40K	M	51-60	0	1	SC	3	0.24
557	Lunenburg	6.4	171	114.6	1490.64	100.33	$25K - $40K	M	51-60	0	0	SC	2	0.27
558	Lunenburg	6.7	81	54.3	0	0	PNTA	F	51-60	0	1	CG	1	0.10

Sample	County	pH	EC	TDS	TC MPN/100 mL	EC MPN/100 mL	Household Income	Gender	Age	Sick	Drink	Education	#HM	NO_3-N
559	Lunenburg	6.8	161	107.9	0	0	$41k- $64k	M	>60	0	1	HSG	2	0.00
560	Charlotte	7	106	71.0	25.41	0	$41k- $64k	M	41-50	0	1	CG	4	0.00
561	Lunenburg	6.6	75	50.3	0	0	$25K - $40K	M	>60	0	1	HSG	2	0.00
562	Lunenburg	6.1	118	79.1	0	0	$25K - $40K	M	>60	0	1	SC	1	0.03
563	Charlotte	7.1	140	93.8	0	0	$41k- $64k	M	>60	0	1	CG	2	0.09
564	Charlotte	6.5	76	50.9	0	0	PNTA	M	>60	0	1	CG	2	0.17
565	Charlotte	6.5	96	64.3	0	0	$41k- $64k	F	>60	0	1	HSG	2	0.45
566	Charlotte	7.2	144	96.5	0	0	<$10k	F	>60	0	1	SC	1	0.16
567	Charlotte	6.4	87	58.3	10.95	0	$11K - $24K	F	51-60	0	1	HSG	2	0.35
568	Charlotte	6.9	90	60.3	0	0	>$65k	M	>60	0	1	SC	2	0.05
569	Charlotte	6.7	106	71.0	36.03	0	>$65k	M	>60	0	1	SC	2	0.24
570	Lunenburg	5.8	78	52.3	1	0	>$65k	M	>60	0	1	PostC	2	0.63
571	Lunenburg	7.2	460	308.2	0	0	$11K - $24K	-	>60	0	1	HSG	3	0.10
572	Charlotte	8.1	220	147.4	3.08	0	PNTA	M	>60	0	1	HSG	2	0.00
573	Lunenburg	5.5	123	82.4	4.15	0	>$65k	M	51-60	0	1	CG	2	0.99
574	Lunenburg	6.8	240	160.8	68.68	0	$25K - $40K	F	>60	0	1	SC	1	0.12
575	Charlotte	7	125	83.8	2.04	0	$41k- $64k	M	>60	0	0	CG	2	0.46
576	Lunenburg	7.3	139	93.1	6.36	0	$25K - $40K	M	>60	0	1	SHS	2	0.04
577	Charlotte	6.5	64	42.9	0	0	$41k- $64k	M	>60	0	1	SC	2	0.00
578	Lunenburg	6.9	108	72.4	0	0	$25K - $40K	M	51-60	0	1	HSG	2	0.00
579	Charlotte	6.9	76	50.9	3.08	0	$25K - $40K	M	>60	0	0	SC	2	0.33
580	Lunenburg	7.6	270	180.9	2081.29	1.01	$25K - $40K	M	51-60	0	0	SC	2	0.00
581	Lunenburg	7.8	220	147.4	2.04	0	$25K - $40K	F	51-60	0	1	HSG	3	0.00
582	Charlotte	6.7	98	65.7	0	0	$41k- $64k	M	41-50	0	1	CG	2	0.04
583	Charlotte	6.2	86	57.6	2081.29	5.24	<$10k	M	>60	0	0	SC	1	0.05

Sample	County	pH	EC	TDS	TC MPN/100 mL	EC MPN/100 mL	Household Income	Gender	Age	Sick	Drink	Education	#HM	NO_3-N
584	Halifax	6.6	219	146.7	30.61	0	$11K - $24K	F	41-50	0	1	CG	2	1.19
585	Halifax	6.8	168	112.6	176.52	0	$25K - $40K	F	>60	0	0	SC	2	0.13
586	Halifax	6.1	90	60.3	-	0	<$10k	F	31-40	0	1	CG	4	1.22
587	Halifax	6.7	127	85.1	0	0	$41k- $64k	M	>60	0	0	SC	1	2.75
588	Halifax	6.4	185	124.0	657.99	0	$25K - $40K	M	>60	0	1	SC	3	1.78
589	Mecklenburg	6.4	77	51.6	0	0	$25K - $40K	M	>60	0	1	SC	2	0.67
590	Mecklenburg	6.6	208	139.4	0	0	$25K - $40K	M	>60	0	1	CG	2	0.00
591	Halifax	6.8	107	71.7	2.04	0	$25K - $40K	F	>60	0	1	HSG	2	0.87
592	Halifax	5.9	49	32.8	0	0	$11K - $24K	M	>60	0	1	SC	2	1.44
593	Halifax	6.6	99	66.3	0	0	$11K - $24K	F	31-40	0	1	CG	3	0.38
594	Halifax	6.4	185	124.0	27.6	0	>$65k	M	31-40	0	1	PostC	4	1.48
595	Halifax	7	209	140.0	54.57	0	$11K - $24K	M	>60	0	1	HSG	2	0.37
596	Halifax	6.4	97	65.0	0	0	$41k- $64k	F	31-40	0	1	PostC	4	2.52
597	Halifax	5.9	73	48.9	0	0	$11K - $24K	F	>60	0	1	PostC	1	2.50
598	Halifax	7.1	294	197.0	177.08	0	$25K - $40K	F	21-30	0	0	CG	2	0.00
599	Mecklenburg	6.5	106	71.0	2082	0	$41k- $64k	M	31-40	1	1	SC	3	2.82
600	Halifax	6.2	162	108.5	1.01	0	PNTA	F	>60	0	1	HSG	1	1.90

Sample	County	pH	EC	TDS	TC MPN/100 mL	EC MPN/100 mL	Household Income	Gender	Age	Sick	Drink	Education	#HM	NO_3-N
601	Halifax	7.2	220	147.4	0	0	$41k- $64k	-	-	-	-	-	-	0.00
602	Halifax	5.8	46	30.8	1.01	0	$11K - $24K	M	>60	0	1	SC	2	1.49
603	Halifax	6.6	263	176.2	5.2	0	$41k- $64k	M	51-60	0	1	SC	2	0.48
604	Halifax	6.1	63	42.2	2082	28.92	>$65k	M	51-60	0	1	HSG	3	0.92
605	Halifax	7.1	681	456.3	745.32	0	PNTA	M	51-60	0	0	-	2	0.24
606	Halifax	7.4	373	249.9	0	0	$25K - $40K	M	>60	0	0	SHS	2	0.20
607	Halifax	6.3	116	77.7	843.28	0	$11K - $24K	F	51-60	0	1	-	2	1.05
608	Halifax	6.6	115	77.1	27.6	0	<$10k	M	51-60	0	0	HSG	2	0.49
609	Halifax	7.3	627	420.1	0	0	$11K - $24K	F	>60	0	0	SHS	1	0.62
610	Mecklenburg	6.4	232	155.4	9.75	0	$11K - $24K	-	51-60	0	1	HSG	1	1.59
611	Halifax	6	73	48.9	0	0	>$65k	M	>60	0	1	PostC	1	0.39
612	Halifax	7	227	152.1	0	0	$41k- $64k	F	>60	1	1	PostC	1	0.00
613	Halifax	6.7	333	223.1	0	0	>$65k	M	>60	0	1	SC	2	0.46
614	Halifax	6.9	231	154.8	0	0	$25K - $40K	M	>60	0	1	HSG	2	0.00
615	Mecklenburg	5.9	216	144.7	3.08	0	>$65k	M	41-50	0	1	PostC	4	6.07
616	Halifax	6.8	571	382.6	0	0	>$65k	M	>60	0	1	SC	2	0.45
617	Halifax	6.2	113	75.7	399.13	0	$25K - $40K	F	51-60	0	0	HSG	1	1.48
618	Halifax	7	731	489.8	-	-	>$65k	M	51-60	0	1	PostC	3	0.20
619	Halifax	6.7	119	79.7	499.04	0	$25K - $40K	M	>60	0	1	SC	2	1.27

Sample	County	pH	EC	TDS	TC MPN/100 mL	EC MPN/100 mL	Household Income	Gender	Age	Sick	Drink	Education	#HM	NO_3-N
620	Halifax	6.1	96	64.3	0	0	<$10k	F	41-50	0	1	SC	3	2.23
621	Halifax	7.6	543	363.8	5.2	0	PNTA	M	51-60	0	0	-	6	0.00
622	Halifax	6.6	225	150.8	10.95	0	>$65k	M	51-60	0	1	PostC	2	0.50
623	Halifax	7.3	218	146.1	0	0	PNTA	F	>60	0	1	SC	1	0.51
624	Halifax	6.6	159	106.5	0	0	$41k- $64k	F	31-40	0	1	CG	4	0.64
625	Mecklenburg	6.5	73	48.9	1.01	0	$25K - $40K	F	51-60	0	1	SC	2	0.48
626	Mecklenburg	6.5	84	56.3	12.18	1.01	$25K - $40K	F	31-40	1	1	HSG	1	0.91
627	Mecklenburg	6.2	111	74.4	0	0	>$65k	M	>60	0	1	SC	2	2.24
628	Mecklenburg	5.4	25	16.8	3.08	0	$41k- $64k	-	51-60	0	0	CG	4	0.49
629	Mecklenburg	6.5	102	68.3	4.15	0	PNTA	M	>60	0	1	SHS	2	0.86
630	Mecklenburg	7.2	156	104.5	7.49	0	$25K - $40K	M	>60	0	1	SC	1	0.00
631	Mecklenburg	5.9	40	26.8	590.84	0	>$65k	M	>60	0	1	SC	2	1.14
632	Mecklenburg	7.3	194	130.0	0	0	>$65k	M	51-60	0	1	SC	4	0.79
633	Mecklenburg	7.3	195	130.7	1.01	0	$41k- $64k	F	>60	0	1	HSG	2	0.66
634	Mecklenburg	6.7	207	138.7	0	0	$11K - $24K	M	51-60	0	0	-	2	0.00
635	Mecklenburg	6.9	294	197.0	2.04	0	PNTA	M	31-40	0	1	CG	2	0.28

Sample	County	pH	EC	TDS	TC MPN/100 mL	EC MPN/100 mL	Household Income	Gender	Age	Sick	Drink	Education	#HM	NO_3-N
636	Mecklenburg	6.9	140	93.8	0	0	>$65k	F	51-60	0	1	SC	2	0.33
637	Brunswick	8.5	247	165.5	0	0	>$65k	F	1-5	0	1	ISN	2	0.23
638	Mecklenburg	6.9	170	113.9	17.57	3.08	>$65k	M	>60	0	1	SC	2	0.79
639	Mecklenburg	6.1	74	49.6	29.27	0	>$65k	M	41-50	0	1	CG	4	0.62
640	Mecklenburg	6.6	116	77.7	0	0	>$65k	F	21-30	0	1	CG	3	1.04
641	Halifax	8	456	305.5	0	0	$25K - $40K	M	>60	0	1	SHS	2	0.00
642	Halifax	6.8	162	108.5	0	0	$41k- $64k	M	51-60	0	1	HSG	3	1.01
643	Halifax	6.6	347	232.5	0	0	$25K - $40K	F	>60	0	1	SC	2	4.65
644	Mecklenburg	6.8	239	160.1	2082	177.57	PNTA	F	>60	0	1	HSG	2	0.38
645	Mecklenburg	5.8	51	34.2	0	0	>$65k	F	>60	0	1	PostC	2	0.94
646	Mecklenburg	5.9	98	65.7	231.53	1.01	$11K - $24K	F	41-50	0	1	SC	2	3.46
647	Halifax	6.5	112	75.0	843.28	0	PNTA	M	>60	0	1	SC	2	0.34
648	Halifax	6.9	130	87.1	1.01	0	PNTA	M	>60	0	1	SC	2	0.12
649	Mecklenburg	6.5	46	30.8	2082	2081.29	<$10k	M	51-60	0	1	SC	2	0.24
650	Halifax	6.4	74	49.6	2.04	0	$41k- $64k	F	51-60	0	1	SC	6	0.72
651	Halifax	6.5	202	135.3	2082	24.7	PNTA	F	>60	0	1	HSG	2	2.63
652	Brunswick	7.7	305	204.4	0	0	>$65k	F	21-30	1	1	PostC	2	0.00

Sample	County	pH	EC	TDS	TC MPN/100 mL	EC MPN/100 mL	Household Income	Gender	Age	Sick	Drink	Education	#HM	NO_3-N
653	Mecklenburg	5.7	55	36.9	497.93	0	$41k- $64k	M	>60	0	1	HSG	4	0.62
654	Mecklenburg	6.4	77	51.6	38.44	0	PNTA	M	>60	0	1	SC	2	0.40
655	Mecklenburg	6.5	148	99.2	0	0	>$65k	M	>60	0	1	SC	2	0.65
656	Mecklenburg	6.9	160	107.2	7.36	0	PNTA	M	>60	0	1	SC	2	0.54
657	Brunswick	5.8	118	79.1	36.96	0	PNTA	F	>60	0	0	HSG	1	0.90
658	Brunswick	6.4	114	76.4	657.99	582.95	$25K - $40K	M	>60	0	1	SC	1	2.31
659	Mecklenburg	9.1	202	135.3	0	0	PNTA	-	21-30	0	0	SC	2	0.20
660	Mecklenburg	6.2	127	85.1	205.39	0	$41k- $64k	M	>60	0	1	SC	2	1.84
661	Mecklenburg	7.6	264	176.9	237.46	0	PNTA	M	51-60	0	0	HSG	3	0.46
662	Mecklenburg	5.3	93	62.3	899.99	0	PNTA	M	>60	0	1	CG	2	3.93
663	Mecklenburg	6.4	149	99.8	4.12	0	PNTA	M	51-60	0	1	CG	3	0.11
664	Mecklenburg	6.9	544	364.5	0	0	$11K - $24K	F	>60	0	0	SC	1	1.86
665	Brunswick	8.8	202	135.3	0	0	PNTA	F	51-60	0	0	PostC	1	0.24
666	Mecklenburg	7.2	324	217.1	190.76	17.39	$11K - $24K	M	>60	0	1	HSG	2	0.29
667	Mecklenburg	7.3	352	235.8	0	0	$41k- $64k	M	51-60	0	1	HSG	3	0.10

Sample	County	pH	EC	TDS	TC MPN/100 mL	EC MPN/100 mL	Household Income	Gender	Age	Sick	Drink	Education	#HM	NO_3-N
668	Mecklenburg	6.7	148	99.2	0	0	>$65k	M	>60	0	1	CG	2	0.00
669	Mecklenburg	7.5	182	121.9	0	0	PNTA	M	51-60	0	0	CG	2	0.15
670	Mecklenburg	6.9	165	110.6	0	0	>$65k	M	>60	0	1	CG	2	0.10
671	Mecklenburg	6.5	69	46.2	421.97	0	>$65k	M	41-50	0	1	CG	4	0.36
672	Mecklenburg	6.5	154	103.2	5.24	0	$25K - $40K	F	41-50	0	1	SC	2	0.41
673	Mecklenburg	7.6	364	243.9	3.08	0	<$10k	M	41-50	0	1	HSG	3	0.00
674	Halifax	7.6	79	52.9	4.15	0	<$10k	F	51-60	0	0	CG	1	0.90
675	Halifax	7.5	282	188.9	0	0	$25K - $40K	F	>60	1	1	CG	1	0.13
676	Halifax	6.9	605	405.4	0	0	PNTA	M	>60	0	0	SC	2	0.00
677	Mecklenburg	7	1173	785.9	106.92	0	PNTA	-	-	-	-	-	-	0.00
678	Halifax	6.7	155	103.9	53.74	0	-	-	-	-	-	-	-	0.18
679	Halifax	7.1	277	185.6	1.01	0	PNTA	F	>60	0	1	HSG	1	2.26
680	Halifax	6.6	93	62.3	0	0	$25K - $40K	-	>60	1	1	SC	2	1.01
681	Halifax	6.3	83	55.6	2.02	0	$11K - $24K	M	>60	0	1	SC	2	0.32
682	Halifax	7.7	178	119.3	0	0	PNTA	M	>60	0	1	SC	2	0.10
683	Halifax	6.6	107	71.7	0	0	$41k- $64k	F	>60	0	0	CG	1	0.20
684	Halifax	6.6	88	59.0	56.41	0	$11K - $24K	F	>60	1	1	SC	2	0.11

Sample	County	pH	EC	TDS	TC MPN/100 mL	EC MPN/100 mL	Household Income	Gender	Age	Sick	Drink	Education	#HM	NO_3-N
685	Halifax	6.2	76	50.9	0	0	$41k- $64k	M	>60	0	1	SC	2	1.11
686	Halifax	7.2	290	194.3	0	0	PNTA	M	>60	0	1	HSG	2	0.14
687	Halifax	6.4	137	91.8	0	0	>$65k	M	41-50	0	1	CG	4	0.18
688	Halifax	6.5	129	86.4	0	0	$25K - $40K	M	41-50	1	1	SC	2	0.00
689	Halifax	7.3	280	187.6	1.01	0	PNTA	M	>60	0	1	CG	2	1.50
690	Halifax	6.7	82	54.9	0	0	$25K - $40K	M	>60	0	1	SC	1	1.28
691	Halifax	7.3	124	83.1	23.42	0	<$10k	M	51-60	0	1	SC	1	0.84
692	Halifax	7.6	156	104.5	0	0	$41k- $64k	M	>60	0	1	SC	5	0.22
693	Halifax	6.7	133	89.1	0	0	$25K - $40K	M	>60	1	0	SC	1	1.09
694	Halifax	7.4	518	347.1	0	0	$41k- $64k	M	>60	0	0	PostC	2	0.00
695	Halifax	6.7	216	144.7	0	0	$41k- $64k	F	>60	0	0	CG	2	0.33
696	Halifax	6.4	126	84.4	0	0	<$10k	F	>60	0	0	SHS	1	2.02
697	Halifax	7.8	237	158.8	0	0	PNTA	M	>60	0	1	SC	2	0.00
698	Halifax	6.9	433	290.1	2082	17.57	PNTA	F	31-40	0	1	PostC	2	1.37
699	Mecklenburg	6.3	273	182.9	14.58	0	>$65k	M	31-40	1	1	CG	4	1.12
700	Mecklenburg	5.6	114	76.4	2082	9.75	$41k- $64k	M	51-60	0	1	HSG	2	3.78
701	Mecklenburg	7.1	229	153.4	6.3	0	>$65k	F	51-60	0	1	CG	2	0.49
702	Mecklenburg	6	78	52.3	1490.64	0	$11K - $24K	M	51-60	0	1	SC	3	1.48
703	Brunswick	6.3	114	76.4	13.3	0	>$65k	M	>60	0	1	CG	2	0.50
704	Brunswick	8.3	220	147.4	14.72	0	>$65k	M	51-60	0	1	PostC	2	0.00

Sample	County	pH	EC	TDS	TC MPN/100 mL	EC MPN/100 mL	Household Income	Gender	Age	Sick	Drink	Education	#HM	NO_3-N
705	Mecklenburg	5.8	38	25.5	207.58	0	$25K - $40K	F	>60	1	1	CG	3	0.13
706	Richmond County	5.7	2313	1549.7	1490.64	0	PNTA	M	>60	0	1	SC	2	4.99
707	Lancaster	8.8	786	526.6	0	0	$25K - $40K	F	>60	0	1	SC	2	0.00
708	Lancaster	8.7	1331	891.8	0	0	>$65k	M	>60	0	1	PostC	2	0.10
709	Richmond County	8.6	503	337.0	0	0	PNTA	M	>60	0	1	SC	2	0.00
710	Lancaster	8.7	1333	893.1	1.01	0	$41k- $64k	M	>60	0	1	HSG	2	0.00
711	Lancaster	8.8	635	425.5	0	0	$11K - $24K	M	>60	0	0	HSG	1	0.00
712	Northumberland	6	68	45.6	446.18	0	$11K - $24K	M	>60	0	1	PostC	1	1.84
713	Lancaster	8.8	1673	1120.9	21.66	0	$25K - $40K	M	>60	0	1	CG	1	0.00
714	Lancaster	8.7	751	503.2	92.22	0	$11K - $24K	M	51-60	1	0	HSG	2	0.00
715	Northumberland	8.1	324	217.1	0	0	>$65k	M	>60	0	1	HSG	2	0.10
716	Northumberland	8.8	53	35.5	0	0	>$65k	M	>60	0	1	PostC	2	0.00
717	Northumberland	8.8	696	466.3	0	0	$41k- $64k	M	>60	0	0	PostC	2	0.00
718	Lancaster	8.6	790	529.3	0	0	>$65k	F	>60	0	0	PostC	2	0.00
719	Lancaster	8.8	876	586.9	14.43	0	>$65k	F	>60	0	1	PostC	1	0.00
720	Richmond County	8.6	378	253.3	0	0	PNTA	M	51-60	0	1	PostC	2	0.00
721	Lancaster	8.4	179	1205.	0	0	$25K -	M	>60	0	0	PostC	2	0.00

Sample	County	pH	EC	TDS	TC MPN/100 mL	EC MPN/100 mL	Household Income	Gender	Age	Sick	Drink	Education	#HM	NO_3-N
			9	3			$40K							
722	Northumberland	8.8	788	528.0	0	0	>$65k	M	>60	0	1	HSG	2	0.00
723	Northumberland	8.9	670	448.9	24.7	0	>$65k	M	>60	0	1	PostC	2	0.00
724	Lancaster	8.8	834	558.8	0	0	>$65k	M	>60	0	1	HSG	2	0.00
725	Northumberland	8.6	744	498.5	45.71	0	>$65k	M	>60	0	1	HSG	2	0.00
726	Northumberland	8.9	827	554.1	0	0	>$65k	M	11-15	0	0	ISN	3	0.00
727	Northumberland	9	853	571.5	103.34	0	$41k- $64k	F	>60	0	0	PostC	2	0.00
728	Northumberland	9.1	805	539.4	10.95	0	>$65k	M	>60	0	0	SC	2	0.00
729	Northumberland	6.5	2737	1833.8	2082	0	>$65k	M	>60	0	0	PostC	1	1.99
730	Northumberland	6.5	166	111.2	20.2	0	>$65k	M	>60	0	1	PostC	2	1.80
731	Northumberland	8.7	666	446.2	0	0	>$65k	F	>60	0	1	PostC	1	0.15
732	Northumberland	8.3	952	637.8	0	0	>$65k	-	>60	0	1	PostC	1	0.00
733	Northumberland	8.4	642	430.1	0	0	>$65k	M	>60	0	1	PostC	2	0.10
734	Northumberland	8.8	854	572.2	0	0	>$65k	M	>60	0	1	PostC	2	0.00
735	Northumberland	8.3	319	213.7	0	0	>$65k	M	>60	0	0	HSG	2	0.00
736	Richmond County	8	326	218.4	0	0	$41k- $64k	M	>60	0	1	CG	2	0.21

Sample	County	pH	EC	TDS	TC MPN/100 mL	EC MPN/100 mL	Household Income	Gender	Age	Sick	Drink	Education	#HM	NO_3-N
737	Richmond County	5.7	52	34.8	52.87	0	>$65k	M	>60	0	0	CG	2	0.30
738	Northumberland	9.8	108	72.4	0	0	$41k- $64k	M	>60	0	0	CG	2	0.24
739	Northumberland	5.4	132	88.4	21.42	0	<$10k	F	51-60	1	1	HSG	1	0.12
740	Northumberland	8.9	806	540.0	0	0	>$65k	M	51-60	0	0	CG	5	0.34
741	Northumberland	8.3	353	236.5	0	0	$11K - $24K	F	>60	0	1	SC	1	0.00
742	Richmond County	4.9	163	109.2	261.23	0	$41k- $64k	F	>60	0	1	HSG	1	9.85
743	Northumberland	8.7	841	563.5	0	0	$25K - $40K	F	>60	0	1	SC	2	0.00
744	Richmond County	8.4	228	152.8	216.86	0	PNTA	M	>60	0	1	SC	2	0.21
745	Northumberland	8.4	321	215.1	0	0	>$65k	M	>60	0	1	CG	2	0.00
746	Northumberland	8.5	402	269.3	0	0	$25K - $40K	F	>60	0	1	SC	1	0.00
747	Northumberland	8	349	233.8	2082	0	>$65k	M	21-30	0	1	PostC	4	0.43
748	Lancaster	8.9	942	631.1	0	0	PNTA	M	51-60	0	1	PostC	2	0.00
749	Lancaster	7.7	504	337.7	2082	0	>$65k	F	51-60	0	0	SC	1	0.00
750	Westmoreland	5.4	164	109.9	2.04	0	$11K - $24K	F	31-40	0	0	HSG	4	5.96
751	Westmoreland	8.4	396	265.3	0	0	$11K - $24K	M	31-40	0	0	HSG	4	0.00

Sample	County	pH	EC	TDS	TC MPN/100 mL	EC MPN/100 mL	Household Income	Gender	Age	Sick	Drink	Education	#HM	NO_3-N
752	Westmoreland	9	388	260.0	0	0	>$65k	M	>60	0	1	CG	2	0.00
753	Westmoreland	8.5	469	314.2	20.2	0	>$65k	F	>60	0	1	HSG	1	0.00
754	Westmoreland	8.6	634	424.8	162.62	0	>$65k	M	>60	0	1	PostC	2	0.22
755	Westmoreland	8.4	445	298.2	0	0	>$65k	M	>60	0	1	CG	2	0.21
756	Westmoreland	8.6	458	306.9	0	0	>$65k	M	>60	0	1	SC	2	0.00
757	Westmoreland	8.4	237	158.8	144.78	0	>$65k	M	>60	0	0	PostC	1	0.18
758	Westmoreland	8.4	410	274.7	0	0	>$65k	M	>60	0	1	-	2	0.21
759	Westmoreland	8.3	259	173.5	0	0	PNTA	M	41-50	0	1	SHS	5	0.17
760	Westmoreland	5.2	926	620.4	2082	1.01	<$10k	M	21-30	0	0	SC	3	0.00
761	Westmoreland	8.4	428	286.8	0	0	>$65k	M	>60	0	0	SC	2	0.19
762	Westmoreland	8.5	356	238.5	61.86	0	$11K - $24K	M	41-50	0	1	HSG	2	0.00
763	Westmoreland	6.2	319	213.7	2081.29	3.08	PNTA	F	16-20	0	0	SC	3	0.47
764	Lancaster	5.9	160	107.2	2082	7.43	>$65k	M	>60	0	1	PostC	2	2.41
765	Westmoreland	8.1	291	195.0	97.51	0	$11K - $24K	M	21-30	0	0	HSG	7	0.34
766	Westmoreland	8.6	624	418.1	18.98	0	-	-	-	-	-	-	-	0.25

Sample	County	pH	EC	TDS	TC MPN/100 mL	EC MPN/100 mL	Household Income	Gender	Age	Sick	Drink	Education	#HM	NO_3-N
767	Westmoreland	8.2	418	280.1	421.97	0	$25K - $40K	M	>60	0	1	HSG	2	0.13
768	Westmoreland	8.7	403	270.0	0	0	$41k- $64k	M	>60	1	1	PostC	2	0.00
769	Prince William	6.6	365	244.6	0	0	>$65k	M	51-60	0	1	CG	2	4.16
770	Prince William	9.4	397	266.0	0	0	$41k- $64k	M	31-40	0	1	CG	3	0.15
771	Prince William	7	761	509.9	2.04	0	>$65k	M	51-60	0	1	PostC	3	5.86
772	Prince William	7.9	979	655.9	0	0	>$65k	M	51-60	0	1	CG	2	0.00
773	Prince William	7.5	310	207.7	248.91	2.04	$41k- $64k	M	31-40	0	1	CG	3	0.30
774	Prince William	7.5	115	77.1	0	0	>$65k	M	>60	0	1	CG	2	0.17
775	Prince William	7.8	290	194.3	2.04	0	>$65k	M	>60	0	1	PostC	3	0.00
776	Fairfax	6.4	216	144.7	38.97	0	>$65k	F	>60	0	1	CG	2	0.40
777	Prince William	6.1	379	253.9	94.86	0	>$65k	F	51-60	1	0	PostC	2	8.39
778	Prince William	7.9	272	182.2	320.73	0	>$65k	M	>60	0	1	PostC	2	0.00
779	Prince William	7.1	433	290.1	15.88	0	>$65k	M	>60	0	1	PostC	2	1.31
780	Prince William	6.2	172	115.2	0	0	>$65k	M	51-60	0	1	HSG	5	4.97
781	Prince William	8.2	241	161.5	142.4	0	>$65k	M	>60	0	1	PostC	3	0.00

Sample	County	pH	EC	TDS	TC MPN/100 mL	EC MPN/100 mL	Household Income	Gender	Age	Sick	Drink	Education	#HM	NO_3-N
782	Rappahannock	6.7	98	65.7	3.08	0	>$65k	M	51-60	0	0	HSG	5	1.15
783	Prince William	7.4	347	232.5	0	0	>$65k	F	>60	0	1	PostC	2	0.41
784	Prince William	6.5	978	655.3	0	0	$41k- $64k	M	>60	0	0	SC	2	4.40
785	Prince William	6.5	108	72.4	0	0	>$65k	M	41-50	0	1	PostC	5	0.41
786	Prince William	9	457	306.2	338.45	2.02	>$65k	M	>60	0	1	CG	3	1.76
787	Prince William	7.8	430	288.1	1035.1	2.04	>$65k	M	>60	0	1	CG	3	1.75
788	Prince William	7.6	839	562.1	31.37	0	$41k- $64k	M	31-40	0	0	-	4	0.49
789	Prince William	7.6	483	323.6	299.65	0	>$65k	M	51-60	0	1	CG	2	0.53
790	Prince William	7.6	512	343.0	0	0	>$65k	M	>60	0	1	-	2	0.86
791	Prince William	7.6	323	216.4	0	0	>$65k	F	51-60	0	1	PostC	2	2.09
792	Warren	7.3	393	263.3	21.66	0	>$65k	M	51-60	0	1	SC	6	0.00
793	Prince William	7.9	632	423.4	4.12	0	$25K - $40K	M	>60	0	1	SC	2	1.82
794	Prince William	7.9	296	198.3	47.29	0	>$65k	M	51-60	0	1	PostC	6	1.39
795	Prince William	6.1	151	101.2	16.04	0	>$65k	M	51-60	0	1	HSG	4	0.47
796	Prince William	8	292	195.6	0	0	>$65k	M	51-60	0	1	PostC	2	1.58

Sample	County	pH	EC	TDS	TC MPN/100 mL	EC MPN/100 mL	Household Income	Gender	Age	Sick	Drink	Education	#HM	NO_3-N
797	Page	6.4	34	22.8	0	0	>$65k	F	51-60	0	0	CG	2	0.18
798	Prince William	7.4	327	219.1	1	0	$41k- $64k	F	6-10	0	1	ISN	6	0.49
799	Prince William	7.1	416	278.7	0	0	>$65k	M	41-50	0	1	SC	6	2.05
800	Prince William	6.9	474	317.6	144.51	0	$41k- $64k	M	>60	0	1	SC	1	1.38
801	Prince William	7.3	204	136.7	0	0	>$65k	M	51-60	0	1	SC	4	0.00
802	Prince William	6	163	109.2	0	0	>$65k	M	41-50	0	1	PostC	4	2.51
803	Prince William	7.2	562	376.5	9.84	0	>$65k	M	>60	0	1	PostC	2	2.78
804	Prince William	6.8	618	414.1	0	0	>$65k	M	>60	0	1	SC	5	0.12
805	Prince William	7.1	217	145.4	0	0	>$65k	M	>60	0	1	SC	2	0.50
806	Prince William	7	508	340.4	0	0	>$65k	M	51-60	0	1	PostC	2	1.23
807	Prince William	7	836	560.1	0	0	>$65k	M	21-30	0	1	PostC	2	1.61
808	Prince William	6.4	188	126.0	4.15	0	>$65k	M	51-60	0	1	PostC	4	3.31
809	Prince William	8.4	308	206.4	0	0	>$65k	M	>60	0	1	PostC	2	3.20
810	Prince William	6.9	1591	1066.0	0	0	>$65k	M	>60	0	1	PostC	2	5.04
811	Fairfax	8.6	224	150.1	0	0	>$65k	M	41-50	0	0	PostC	6	0.00
812	Prince William	5.9	114	76.4	0	0	>$65k	M	51-60	0	0	SC	3	1.05

Sample	County	pH	EC	TDS	TC MPN/100 mL	EC MPN/100 mL	Household Income	Gender	Age	Sick	Drink	Education	#HM	NO_3-N
813	Prince William	8	365	244.6	0	0	$41k- $64k	M	51-60	0	1	CG	3	4.16
814	Prince William	6.1	412	276.0	963.31	60.02	<$10k	F	>60	0	0	SC	1	2.00
815	Prince William	7	546	365.8	0	0	>$65k	F	1-5	0	0	ISN	3	0.00
816	Prince William	7.7	872	584.2	64.13	0	>$65k	F	>60	0	1	CG	2	0.22
817	Prince William	7.5	584	391.3	11.06	2.04	>$65k	M	51-60	0	1	PostC	6	0.00
818	Prince William	7.8	572	383.2	6.36	1.01	>$65k	M	51-60	0	1	PostC	6	0.00
819	Prince William	7.5	266	178.2	0	0	$41k- $64k	M	16-20	0	0	SHS	2	1.66
820	Prince William	7.4	604	404.7	0	0	>$65k	M	>60	0	1	PostC	2	0.29
821	Prince William	7.6	407	272.7	0	0	>$65k	M	51-60	0	1	CG	3	0.96
822	Prince William	7.8	441	295.5	226.79	0	>$65k	M	51-60	0	1	PostC	2	5.55
823	Prince William	7.4	217	145.4	0	0	>$65k	M	51-60	0	1	SHS	3	0.54
824	Prince William	8.3	168	112.6	0	0	>$65k	M	>60	0	1	CG	2	0.00
825	Prince William	6.7	362	242.5	0	0	$41k- $64k	-	>60	0	1	PostC	2	2.92
826	Prince William	7.6	362	242.5	55.47	0	>$65k	M	51-60	0	1	PostC	5	1.02
827	Prince William	6.5	236	158.1	0	0	>$65k	F	51-60	0	1	PostC	1	3.08

Sample	County	pH	EC	TDS	TC MPN/100 mL	EC MPN/100 mL	Household Income	Gender	Age	Sick	Drink	Education	#HM	NO_3-N
828	Fairfax	8.5	235	157.5	0	0	>$65k	M	41-50	0	0	PostC	6	0.10
829	Fauquier	7.4	411	275.4	36.96	0	>$65k	M	31-40	0	1	PostC	2	0.45
830	Prince William	6.9	828	554.8	106.63	0	>$65k	M	41-50	0	1	CG	2	8.25
831	Prince William	7.9	252	168.8	0	0	-	M	41-50	0	1	CG	6	1.30

8.5 System Construction and Treatment

Sample	SYS	DEPTH	YEAR	TRT	AND	UV	WS	SF	RO	IR	CF	CHLR	WT
1	DW	180	1995	0	0	0	0	0	0	0	0	0	Once
2	DBW	200	1963	1	0	0	0	0	0	1	0	0	Once
3	OTH	-	-	0	0	0	0	0	0	0	0	0	Never
4	DW	-	1970	0	0	0	0	0	0	0	0	0	Evy 5 Yrs
5	UNKW	-	-	1	1	0	0	1	0	0	0	0	Never
6	DW	100		0	0	0	0	0	0	0	0	0	Once
7	UNKW	-	-	1	0	0	0	0	0	0	0	0	Never
8	DW	410	2008	1	0	0	0	1	0	0	0	0	Never
9	DW	-	1980	1	0	0	0	1	0	0	0	0	Once
10	DW	105	1996	0	0	0	0	0	0	0	0	0	Never
11	DW	220	1990	1	0	0	0	1	0	0	0	0	Once
12	DW	-	-	1	0	0	1	0	0	0	0	0	Once
13	DW	300	2010	1	1	0	0	1	0	0	0	0	Never

Sample	SYS	DEPTH	YEAR	TRT	AND	UV	WS	SF	RO	IR	CF	CHLR	WT
14	DW	-	2004	1	0	0	0	1	0	0	0	0	Once
15	DBW	-	-	0	0	0	0	0	0	0	0	0	-
16	DW	-	-	1	0	0	0	1	0	1	0	0	Once
17	DW	-	2005	1	1	0	0	1	0	0	0	0	Once
18	DW	320	2010	1	0	0	1	0	0	0	0	0	Never
19	DBW	300	1979	0	0	0	0	0	0	0	0	0	Once
20	DW	-	2000	1	1	0	1	1	0	0	0	0	Never
21	UNKW	-	-	0	0	0	0	0	0	0	0	0	Never
22	DW	-	-	0	0	0	0	0	0	0	0	0	-
23	DW	165	2006	1	0	0	0	1	0	0	0	0	Never
24	DW	320	2006	0	0	0	0	0	0	0	0	0	Evy 5 Yrs
25	DW	180	1984	1	0	0	1	0	0	1	0	0	Once
26	DBW	50	1895	1	1	1	1	0	0	0	0	0	Once
27	UNKW	400	1980	1	0	0	0	1	0	0	0	0	Never
28	DW	240	2004	1	0	0	0	0	0	0	1	0	Once
29	DW	168		1	0	0	0	1	0	0	0	0	
30	DW	300	2010	0	0	0	0	0	0	0	0	0	Once
31	DW	175	2006	1	1	0	0	1	0	0	0	0	Once
32	SPG	-	-	0	0	0	0	0	0	0	0	0	Never
33	DW	-	-	0	0	0	0	0	0	0	0	0	Once
34	DW	-	1987	1	1	0	0	1	0	0	0	0	Whn Prob
35	DW	-	-	1	0	0	0	1	0	0	0	0	Once
36	DW	-	1998	1	0	0	1	0	0	0	0	0	Never
37	DW	250	2007	1	0	0	0	1	0	0	0	0	Once
38	DW	-	-	1	0	0	1	0	0	0	0	0	Never
39	DW	-	1997	0	0	0	0	0	0	0	0	0	Never
40	DW	-	-	1	0	0	0	1	0	0	0	0	Once

Sample	SYS	DEPTH	YEAR	TRT	AND	UV	WS	SF	RO	IR	CF	CHLR	WT
41	SPG	-	-	1	0	0	0	1	0	0	0	0	Never
42	DW	-	1980	1	0	0	0	0	0	0	1	0	-
43	DW	-	1990	1	0	0	0	1	0	0	0	0	Never
44	DW	250	1996	1	1	0	0	1	0	0	0	0	Never
45	DW	-	-	1	0	0	0	1	0	0	0	0	Never
46	UNKW	-	-	0	0	0	0	0	0	0	0	0	Never
47	DW	375		0	0	0	0	0	0	0	0	0	Once
48	DW	-	-	0	0	0	0	0	0	0	0	0	Once
49	DW	-	-	1	0	0	0	1	0	0	0	0	Once
50	DW	-	1991	1	0	0	0	1	0	0	0	0	Never
51	DW	240	1998	1	1	0	0	0	0	0	0	0	Never
52	DW	300	2011	0	0	0	0	0	0	0	0	0	Never
53	DW	305	2006	1	0	0	0	0	0	0	0	0	Evy 5 Yrs
54	DW	-	-	1	1	0	0	0	0	1	0	0	Once
55	DBW	50		1	1	0	0	1	0	0	0	0	Evy Oth Yr
56	DBW	-	2001	1	0	0	0	1	0	0	0	0	Never
57	DW	600	1989	1	0	0	0	0	0	0	1	0	Whn Prob
58	DW	130	1999	1	0	0	0	0	0	1	0	0	Evy Oth Yr
59	OTH	-	-	0	0	0	0	0	0	0	0	0	Never
60	DW	300	2001	0	0	0	0	0	0	0	0	0	Whn Prob
61	DW	-	-	1	0	0	0	1	0	0	0	0	Never
62	DW	350	1999	1	0	0	0	1	0	0	0	0	Evy 5 Yrs
63	DW	-	2007	0	0	0	0	0	0	0	0	0	Once
64	DW	-	1987	1	1	0	0	0	0	0	0	0	Evy 5 Yrs
65	DW	-	2004	1	0	0	0	1	0	0	0	0	Once

Sample	SYS	DEPTH	YEAR	TRT	AND	UV	WS	SF	RO	IR	CF	CHLR	WT
66	DW	-	-	0	0	0	0	0	0	0	0	0	Evy Oth Yr
67	DW	-	-	0	0	0	0	0	0	0	0	0	Evy Yr
68	DW	350	2003	1	0	0	0	1	0	0	0	0	Evy Oth Yr
69	DW	-	2005	1	0	0	0	1	0	0	0	0	Once
70	DW	80	1998	0	0	0	0	0	0	0	0	0	Once
71	DW	200	1999	0	0	0	0	0	0	0	0	0	Once
72	DW	-	-	1	1	0	0	0	0	0	0	0	-
73	DW	320	2005	1	0	0	1	0	0	0	0	0	Once
74	DW	305	2010	1	0	0	0	0	0	0	0	0	Once
75	DW	150	1989	1	0	0	0	1	0	0	0	0	Never
76	UNKW	200	1996	1	0	0	0	0	0	0	0	0	Evy Yr
77	DW	165	1993	0	0	0	0	0	0	0	0	0	Whn Prob
78	DW	150	1983	1	0	0	0	1	0	0	0	0	Once
79	DW	275	1986	1	0	0	0	1	0	0	0	0	Evy 5 Yrs
80	DW	125	1993	0	0	0	0	0	0	0	0	0	Evy 5 Yrs
81	DW	300		1	0	0	0	0	0	0	0	0	Once
82	DW	160	1985	0	0	0	0	0	0	0	0	0	Once
83	UNKW	-	-	0	0	0	0	0	0	0	0	0	Once
84	DBW	-	-	0	0	0	0	0	0	0	0	0	Never
85	DW	300	1998	0	0	0	0	0	0	0	0	0	Once
86	UNKW	-	-	0	0	0	0	0	0	0	0	0	Once
87	DW	350	2007	1	0	0	0	1	0	0	0	0	Once
88	DW	-	-	1	0	0	0	1	0	0	0	0	Once
89	DW	-	2002	0	0	0	0	0	0	0	0	0	Never
90	DW	-	1986	1	0	0	0	1	0	0	0	0	Evy Yr
91	DW	-	-	0	0	0	0	0	0	0	0	0	Once

Sample	SYS	DEPTH	YEAR	TRT	AND	UV	WS	SF	RO	IR	CF	CHLR	WT
92	DW	-	-	0	0	0	0	0	0	0	0	0	Once
93	DW	190	2008	0	0	0	0	0	0	0	0	0	Once
94	DW	300	2000	1	0	0	0	1	0	0	0	0	Never
95	DW	-	-	1	0	0	0	1	0	0	0	0	Once
96	UNKW	152	1983	0	0	0	0	0	0	0	0	0	Once
97	DW	280	2000	1	0	0	0	1	0	1	0	0	Evy Yr
98	DW	640	2005	1	0	0	0	0	0	0	1	0	Once
99	DW	800	2005	1	0	1	0	0	0	0	0	0	Evy Yr
100	DW	-	-	1	0	0	1	1	0	0	0	0	Once
101	DW	350	1987	1	0	0	1	1	0	1	1	0	Once
102	UNKW	400	1988	1	0	0	0	0	0	1	1	0	Once
103	DBW	100		1	0	0	1	1	0	1	0	0	Never
104	DW	-	-	1	0	0	0	1	0	1	0	0	-
105	DW	270	1981	1	0	0	0	1	0	0	0	0	Once
106	DW	500	2003	1	1	1	1	1	0	1	0	0	Evy 5 Yrs
107	DW	400	2003	1	0	0	1	1	0	0	0	0	Once
108	DW	-	2010	0	0	0	0	0	0	0	0	0	Never
109	DW	500	1905	1	0	0	0	1	0	0	0	0	Once
110	DW	700	2001	0	0	0	0	0	0	0	0	0	Never
111	DW	110	1983	1	1	0	1	0	0	0	0	1	Whn Prob
112	DW	200	1995	0	0	0	0	0	0	0	0	0	Never
113	DW	375	2006	1	0	0	0	1	0	1	0	0	Never
114	DW	440	2005	1	1	0	1	0	0	0	0	1	Once
115	DW	500	2005	1	0	0	1	0	0	0	0	0	Never
116	DW	300	1986	1	0	0	1	1	1	0	0	0	Never
117	DW	-	1965	1	0	0	1	0	0	0	0	0	Once
118	DW	-	1979	0	0	0	0	0	0	0	0	0	Never

Sample	SYS	DEPTH	YEAR	TRT	AND	UV	WS	SF	RO	IR	CF	CHLR	WT
119	DW	300	1968	0	0	0	0	0	0	0	0	0	Never
120	DW	-	-	1	1	0	0	0	0	1	0	0	Never
121	DW	325	1973	0	0	0	0	0	0	0	0	0	Never
122	DW	-	-	1	0	0	0	1	0	0	0	0	Once
123	DW	-	-	1	0	0	1	0	0	0	0	0	Never
124	DW	-	2006	1	0	0	0	1	0	0	0	0	Whn Prob
125	DW	100	1968	0	0	0	0	0	0	0	0	0	Once
126	DW	-	-	1	0	0	1	0	0	1	0	0	Once
127	DW	393	1963	1	0	0	0	1	0	0	0	0	Once
128	DW	-	-	1	0	0	1	1	0	0	0	0	Once
129	DW	225	2000	1	0	0	0	1	0	0	0	0	Once
130	DW	-	1992	1	0	0	0	1	0	0	0	0	Never
131	DW	500	1989	1	1	0	1	0	0	0	0	0	Whn Prob
132	DW	275		1	0	0	0	1	0	1	0	0	Once
133	SPG	-	-	1	0	1	0	0	0	0	0	0	Never
134	DW	450	2004	1	0	0	1	0	0	1	0	0	Once
135	DW	300	2006	1	0	0	0	1	0	1	0	0	Once
136	DW	505	1987	1	0	0	0	1	0	0	0	0	Once
137	UNKW	-	-	0	0	0	0	0	0	0	0	0	Never
138	DW	500	2006	1	0	0	0	1	0	0	0	0	Never
139	DW	-	-	1	0	0	0	1	0	1	0	0	Evy Oth Yr
140	DW	180		0	0	0	0	0	0	0	0	0	Evy 5 Yrs
141	DW	150		1	1	0	0	0	0	0	0	0	Evy Oth Yr
142	DW	-	-	0	0	0	0	0	0	0	0	0	Once
143	DW	150	1994	0	0	0	0	0	0	0	0	0	Never
144	DW	-	-	1	0	0	0	1	0	0	0	0	-

Sample	SYS	DEPTH	YEAR	TRT	AND	UV	WS	SF	RO	IR	CF	CHLR	WT
145	DW	220	2008	1	0	0	0	1	0	0	0	0	Never
146	DW	65	1978	1	0	0	1	0	0	0	0	0	Never
147	DW	140	1999	1	0	0	1	1	0	0	0	0	Evy 5 Yrs
148	DW	440	1982	1	0	1	1	0	0	1	0	0	Whn Prob
149	DW	-	-	1	0	0	1	0	0	0	0	0	Once
150	UNKW	-	-	1	0	0	1	1	0	0	0	0	Once
151	DW	340	1986	1	0	0	0	1	0	0	0	0	Once
152	DW	-	1978	1	0	0	1	0	0	0	0	0	Never
153	DW	340	2011	1	0	0	1	0	0	0	0	0	Once
154	DW	100	1975	0	0	0	0	0	0	0	0	0	Once
155	DW	-	1957	0	0	0	0	0	0	0	0	0	Whn Prob
156	DBW	100	1978	1	1	0	0	0	0	1	0	0	Never
157	DW	160	1972	1	0	0	1	0	1	0	0	0	Never
158	UNKW	64	1900	0	0	0	0	0	0	0	0	0	Never
159	DW	-	-	1	0	0	1	1	0	0	0	0	Never
160	DW	-	2001	1	0	0	1	0	0	0	0	0	Never
161	DW	-	-	0	0	0	0	0	0	0	0	0	Evy Oth Yr
162	DW	-	2002	0	0	0	0	0	0	0	0	0	Never
163	DW	175	1958	1	0	0	1	0	0	0	0	0	Whn Prob
164	DW	300	2000	1	0	0	1	1	0	0	0	0	Once
165	DW	-	-	1	0	0	1	0	0	0	0	0	Never
166	DW	425	2009	1	0	0	0	0	0	1	0	0	Never
167	DW	150	2000	1	0	0	1	0	0	0	0	0	Once
168	UNKW	-	-	1	0	1	1	0	0	0	0	0	Once
169	DW	-	-	1	0	0	1	1	0	1	0	0	Evy 5 Yrs

Sample	SYS	DEPTH	YEAR	TRT	AND	UV	WS	SF	RO	IR	CF	CHLR	WT
170	DW	98	1973	1	0	0	1	0	0	0	1	0	
171	DW	-	-	0	0	0	0	0	0	0	0	0	Never
172	DW	-	1997	1	0	0	1	0	0	0	0	0	Whn Prob
173	DW	200	1973	1	0	0	1	1	0	0	0	0	Never
174	DW	260	1995	1	0	0	1	0	0	0	0	0	Once
175	DW	750	1984	1	0	0	1	0	0	0	0	0	Never
176	DW	-	1990	1	0	0	1	0	0	0	0	0	Once
177	DW	-	1993	1	0	1	1	0	0	1	0	0	Once
178	DW	150	1976	0	0	0	0	0	0	0	0	0	Never
179	DW	200	1991	1	0	0	0	1	0	0	0	0	Evy Oth Yr
180	DW	75	1960	1	0	0	1	0	0	0	0	0	Once
181	DW	275	2007	1	0	0	0	0	0	0	1	0	Never
182	DW	-	1990	1	1	0	1	1	1	1	1	1	Once
183	OTH	-	-	0	0	0	0	0	0	0	0	0	Never
184	DW	125	1988	0	0	0	0	0	0	0	0	0	Never
185	DBW	-	1953	0	0	0	0	0	0	0	0	0	Never
186	UNKW	-	-	0	0	0	0	0	0	0	0	0	Never
187	DW	450	2001	1	0	0	1	1	0	1	0	0	Once
188	DW	-	2008	1	0	0	1	0	0	0	0	0	Once
189	UNKW	-	-	1	0	0	1	0	0	1	0	0	Once
190	DW	100	1978	0	0	0	0	0	0	0	0	0	Never
191	DW	300		1	0	0	1	0	0	0	0	0	Once
192	UNKW	-	-	0	0	0	0	0	0	0	0	0	-
193	-	-	-	0	0	0	0	0	0	0	0	0	Never
194	DW	720		0	0	0	0	0	0	0	0	0	Never
195	DBW	-	-	0	0	0	0	0	0	0	0	0	Never
196	DW	-	-	0	0	0	0	0	0	0	0	0	Never

Sample	SYS	DEPTH	YEAR	TRT	AND	UV	WS	SF	RO	IR	CF	CHLR	WT
197	DBW	35	1972	0	0	0	0	0	0	0	0	0	Whn Prob
198	DBW	60		0	0	0	0	0	0	0	0	0	Never
199	DW	-	1998	0	0	0	0	0	0	0	0	0	Once
200	DW	650	1996	0	0	0	0	0	0	0	0	0	Evy 5 Yrs
201	DBW	-	-	0	0	0	0	0	0	0	0	0	Never
202	DW	800	2011	0	0	0	0	0	0	0	0	0	Never
203	DW	-	-	0	0	0	0	0	0	0	0	0	Once
204	DW	325	2011	0	0	0	0	0	0	0	0	0	Never
205	OTH	-	-	0	0	0	0	0	0	0	0	0	Once
206	DW	320	2006	0	0	0	0	0	0	0	0	0	Once
207	DW	605	2007	1	0	0	0	0	1	0	1	0	Once
208	UNKW	-	-	0	0	0	0	0	0	0	0	0	Once
209	DW	350	2005	1	0	0	0	0	0	0	1	0	Once
210	DBW	66	1990	0	0	0	0	0	0	0	0	0	Once
211	DW	700	1985	0	0	0	0	0	0	0	0	0	Never
212	OTH	-	-	0	0	0	0	0	0	0	0	0	Never
213	DW	700	2000	0	0	0	0	0	0	0	0	0	Never
214	UNKW	-	-	0	0	0	0	0	0	0	0	0	Never
215	DW	-	-	0	0	0	0	0	0	0	0	0	Once
216	UNKW	-	-	0	0	0	0	0	0	0	0	0	Once
217	UNKW	-	1884	0	0	0	0	0	0	0	0	0	Never
218	DBW	25	1965	0	0	0	0	0	0	0	0	0	Once
219	DBW	-	2004	0	0	0	0	0	0	0	0	0	Once
220	DW	700	1992	0	0	0	0	0	0	0	0	0	Never
221	UNKW	-	1990	1	0	0	0	0	0	0	0	0	Once
222	DW	385	1970	0	0	0	0	0	0	0	0	0	Never
223	DW	600	2005	1	0	0	0	1	0	0	0	0	Once

Sample	SYS	DEPTH	YEAR	TRT	AND	UV	WS	SF	RO	IR	CF	CHLR	WT
224	UNKW	-	-	0	0	0	0	0	0	0	0	0	Never
225	UNKW	-	-	1	0	1	0	0	0	0	0	0	Never
226	DBW	-	1979	0	0	0	0	0	0	0	0	0	Never
227	DW	385	1984	0	0	0	0	0	0	0	0	0	Once
228	DBW	40	1987	0	0	0	0	0	0	0	0	0	Never
229	UNKW	-	-	0	0	0	0	0	0	0	0	0	Never
230	DW	700	1997	1	0	0	0	0	0	0	1	0	Evy 5 Yrs
231	DW	-	-	0	0	0	0	0	0	0	0	0	Once
232	DW	275	1975	0	0	0	0	0	0	0	0	0	Once
233	DW	330	1998	1	0	0	1	0	1	0	0	0	Once
234	DBW	-	-	1	0	0	0	0	0	0	0	0	Once
235	DW	200		0	0	0	0	0	0	0	0	0	Once
236	UNKW	-	1986	1	0	0	0	0	0	0	0	1	Whn Prob
237	DW	300	1984	0	0	0	0	0	0	0	0	0	Once
238	DW	-	-	0	0	0	0	0	0	0	0	0	Never
239	DW	-	1984	0	0	0	0	0	0	0	0	0	Never
240	DW	400	2005	0	0	0	0	0	0	0	0	0	Once
241	DW	400	1998	0	0	0	0	0	0	0	0	0	Evy 5 Yrs
242	DW	290	1995	0	0	0	0	0	0	0	0	0	Whn Prob
243	DBW	350		1	0	0	0	0	0	0	0	0	Never
244	DBW	-	-	0	0	0	0	0	0	0	0	0	Never
245	DW	-	-	0	0	0	0	0	0	0	0	0	Once
246	DW	-	-	0	0	0	0	0	0	0	0	0	Never
247	DW	-	2001	0	0	0	0	0	0	0	0	0	Once
248	DBW	38	1947	0	0	0	0	0	0	0	0	0	Once
249	DW	315	2004	0	0	0	0	0	0	0	0	0	Never

Sample	SYS	DEPTH	YEAR	TRT	AND	UV	WS	SF	RO	IR	CF	CHLR	WT
250	DBW	63		0	0	0	0	0	0	0	0	0	Once
251	DW	-	-	0	0	0	0	0	0	0	0	0	Evy 5 Yrs
252	DBW	25		0	0	0	0	0	0	0	0	0	Never
253	DW	350	1990	0	0	0	0	0	0	0	0	0	Never
254	DBW	50	1980	0	0	0	0	0	0	0	0	0	Never
255	DW	300	2010	0	0	0	0	0	0	0	0	0	Once
256	DW	-	1970	0	0	0	0	0	0	0	0	0	Never
257	DW	-	1955	0	0	0	0	0	0	0	0	0	Never
258	DW	-	-	0	0	0	0	0	0	0	0	0	Never
259	DBW	25		0	0	0	0	0	0	0	0	0	Never
260	DW	425	2000	0	0	0	0	0	0	0	0	0	Never
261	DBW	46		0	0	0	0	0	0	0	0	0	Never
262	DW	-	-	0	0	0	0	0	0	0	0	0	Never
263	DW	365	1998	0	0	0	0	0	0	0	0	0	Never
264	DBW	40	1948	0	0	0	0	0	0	0	0	0	Once
265	DW	-	-	1	0	0	0	0	0	0	0	1	Evy Yr
266	DW	-	-	0	0	0	0	0	0	0	0	0	Never
267	DW	-	-	1	0	0	0	0	0	1	0	0	Once
268	DW	-	-	1	0	0	0	0	0	0	0	0	Once
269	DW	-	-	0	0	0	0	0	0	0	0	0	Never
270	DW	-	1988	1	0	0	1	0	0	0	0	0	Never
271	DW	-	1974	0	0	0	0	0	0	0	0	0	Whn Prob
272	DW	240		1	0	0	0	1	0	0	0	0	Never
273	DBW	25		0	0	0	0	0	0	0	0	0	Never
274	DW	250		0	0	0	0	0	0	0	0	0	Never
275	DBW	70		1	0	0	0	1	0	0	0	0	Once
276	DW	235	1997	0	0	0	0	0	0	0	0	0	Once

Sample	SYS	DEPTH	YEAR	TRT	AND	UV	WS	SF	RO	IR	CF	CHLR	WT
277	DBW	23		0	0	0	0	0	0	0	0	0	Whn Prob
278	UNKW	-	-	0	0	0	0	0	0	0	0	0	Once
279	UNKW	-	-	0	0	0	0	0	0	0	0	0	Once
280	DW	225	2000	0	0	0	0	0	0	0	0	0	Once
281	DW	300	1991	0	0	0	0	0	0	0	0	0	Never
282	DW	-	2005	0	0	0	0	0	0	0	0	0	Once
283	DBW	25	1965	0	0	0	0	0	0	0	0	0	Once
284	DW	220	1990	0	0	0	0	0	0	0	0	0	Never
285	DW	275		0	0	0	0	0	0	0	0	0	Never
286	DBW	-	-	0	0	0	0	0	0	0	0	0	Once
287	DBW	65		0	0	0	0	0	0	0	0	0	Once
288	DBW	28	1947	0	0	0	0	0	0	0	0	0	Never
289	DW	140	2009	0	0	0	0	0	0	0	0	0	Never
290	SPG	-	-	1	0	0	0	1	0	0	0	0	Never
291	DW	365	2005	0	0	0	0	0	0	0	0	0	Never
292	DW	-	-	0	0	0	0	0	0	0	0	0	Once
293	UNKW	-	-	0	0	0	0	0	0	0	0	0	Never
294	DW	250	1970	0	0	0	0	0	0	0	0	0	Never
295	DW	400	1984	0	0	0	0	0	0	0	0	0	Never
296	DW	-	-	1	0	0	0	1	0	0	0	0	Never
297	DW	160	1958	0	0	0	0	0	0	0	0	0	Once
298	DW	260	1959	0	0	0	0	0	0	0	0	0	Never
299	DW	430	1983	1	0	1	1	0	0	0	0	0	Once
300	DW	-	1984	1	0	0	1	0	0	0	0	0	Evy 5 Yrs
301	DW	-	1990	0	0	0	0	0	0	0	0	0	Never
302	DW	65	1989	0	0	0	0	0	0	0	0	0	Never
303	DW	140	1963	1	0	0	0	0	0	0	0	1	Whn Prob

Sample	SYS	DEPTH	YEAR	TRT	AND	UV	WS	SF	RO	IR	CF	CHLR	WT
304	DW	480	1993	0	0	0	0	0	0	0	0	0	Once
305	DW	-	-	1	0	0	1	0	0	0	0	0	Never
306	DW	-	1980	0	0	0	0	0	0	0	0	0	Never
307	DW	-	-	0	0	0	0	0	0	0	0	0	Never
308	DW	-	-	1	0	0	0	1	0	0	0	0	Never
309	DW	-	-	0	0	0	0	0	0	0	0	0	Never
310	UNKW	-	-	0	0	0	0	0	0	0	0	0	Evy 5 Yrs
311	UNKW	-	-	1	0	0	0	0	0	0	0	0	Never
312	SPG	-	-	0	0	0	0	0	0	0	0	0	Once
313	SPG	-	-	0	0	0	0	0	0	0	0	0	Never
314	SPG	-	-	0	0	0	0	0	0	0	0	0	Never
315	DW	-	-	0	0	0	0	0	0	0	0	0	Once
316	SPG	-	-	0	0	0	0	0	0	0	0	0	Never
317	DW	125	1984	0	0	0	0	0	0	0	0	0	Once
318	DW	-	-	0	0	0	0	0	0	0	0	0	Once
319	DW	-	-	0	0	0	0	0	0	0	0	0	Never
320	SPG	-	-	0	0	0	0	0	0	0	0	0	Once
321	DW	-	-	0	0	0	0	0	0	0	0	0	Never
322	OTH	-	-	0	0	0	0	0	0	0	0	0	Never
323	OTH	-	-	1	0	0	1	0	0	0	0	1	Once
324	DW	500	2009	0	0	0	0	0	0	0	0	0	Never
325	DW	280	2006	1	0	0	0	1	0	0	0	0	Whn Prob
326	DW	-	-	0	0	0	0	0	0	0	0	0	Never
327	DW	420	1999	1	0	0	1	0	0	0	0	0	Once
328	DW	125	1979	1	0	0	0	1	0	0	0	0	Never
329	DW	400	2005	1	0	0	1	0	0	0	0	0	Never
330	DW	125	1989	1	0	0	1	0	0	0	0	0	Never

Sample	SYS	DEPTH	YEAR	TRT	AND	UV	WS	SF	RO	IR	CF	CHLR	WT
331	DW	300	1989	1	0	0	1	0	0	0	0	0	Never
332	SPG	-	-	1	0	0	0	1	0	0	0	0	-
333	DW	160	1982	1	0	1	0	1	0	0	0	1	Never
334	DW	300	2005	1	0	0	1	0	0	0	0	0	Never
335	DW	125	1979	0	0	0	0	0	0	0	0	0	Never
336	DW	597	2011	0	0	0	0	0	0	0	0	0	Never
337	DW	500	2007	1	0	0	1	0	0	0	0	0	Evy Yr
338	DW	100		0	0	0	0	0	0	0	0	0	Never
339	DW	-	-	0	0	0	0	0	0	0	0	0	Never
340	DW	150	1989	1	0	0	1	1	0	0	0	0	Once
341	DW	90	1973	1	0	0	1	1	1	0	1	0	Evy 5 Yrs
342	DW	-	1989	1	0	0	1	0	1	0	0	0	Once
343	DW	-	1946	0	0	0	0	0	0	0	0	0	Never
344	DW	100	1997	1	0	0	1	0	0	0	0	0	Once
345	DW	265	1995	1	0	0	1	1	0	0	0	0	Once
346	DW	-	1966	1	0	0	1	0	0	0	0	0	Never
347	DBW	25	1911	1	0	1	0	1	1	0	0	0	Evy 5 Yrs
348	DW	210	2005	1	0	0	0	1	0	0	0	0	Once
349	DW	-	1987	0	0	0	0	0	0	0	0	0	Never
350	DW	200		1	0	0	0	1	0	0	0	0	Never
351	DW	165	1980	0	0	0	0	0	0	0	0	0	Once
352	DW	230		0	0	0	0	0	0	0	0	0	Never
353	DW	600	1990	0	0	0	0	0	0	0	0	0	Evy 5 Yrs
354	DW	-	1965	1	0	0	1	0	0	1	0	0	Once
355	DW	98	1966	1	0	0	0	1	0	0	0	0	Never
356	DW	-	-	0	0	0	0	0	0	0	0	0	Once
357	DW	-	-	1	0	0	1	0	0	0	0	0	-

Sample	SYS	DEPTH	YEAR	TRT	AND	UV	WS	SF	RO	IR	CF	CHLR	WT
358	DW	235	1990	0	0	0	0	0	0	0	0	0	Never
359	DW	300	1976	1	0	0	0	1	0	0	0	0	Once
360	DBW	205	1940	1	0	0	0	1	0	0	0	0	Never
361	DW	150	1993	0	0	0	0	0	0	0	0	0	Never
362	DW	450	1988	0	0	0	0	0	0	0	0	0	Never
363	SPG	-	-	0	0	0	0	0	0	0	0	0	Once
364	DW	245	2012	0	0	0	0	0	0	0	0	0	Never
365	DW	204	1982	0	0	0	0	0	0	0	0	0	Once
366	DW	-	2006	0	0	0	0	0	0	0	0	0	Never
367	DW	150	1980	1	0	0	1	0	0	0	0	0	Once
368	SPG	-	-	0	0	0	0	0	0	0	0	0	Once
369	DW	-	1985	1	0	0	1	0	0	1	0	0	Once
370	DW	-	1985	0	0	0	0	0	0	0	0	0	Never
371	UNKW	-	-	0	0	0	0	0	0	0	0	0	Never
372	DW	480	1992	1	0	0	0	0	0	0	1	0	Once
373	DW	-	-	0	0	0	0	0	0	0	0	0	Never
374	DW	186	1983	1	0	0	0	0	0	0	1	0	Evy 5 Yrs
375	DW	365	1952	1	0	0	0	1	0	0	0	0	Once
376	UNKW	-	-	1	0	1	0	0	0	0	0	0	Once
377	DW	245		1	0	0	0	1	0	0	0	0	Once
378	DW	-	1978	0	0	0	0	0	0	0	0	0	Once
379	DW	198	1979	1	1	0	0	1	0	1	1	0	Whn Prob
380	DW	240	1979	0	0	0	0	0	0	0	0	0	Never
381	DW	200	1964	1	0	0	1	1	0	0	0	0	Evy 5 Yrs
382	DW	268	1977	1	0	0	1	0	0	0	0	0	Once
383	DW	120	1984	1	0	0	1	1	0	0	0	0	Once
384	DW	350	2001	1	0	0	0	1	0	0	0	0	Once

Sample	SYS	DEPTH	YEAR	TRT	AND	UV	WS	SF	RO	IR	CF	CHLR	WT
385	DW	125	1987	0	0	0	0	0	0	0	0	0	Once
386	DW	410	1990	1	0	0	0	1	0	0	0	0	Once
387	DW	-	-	1	0	0	0	1	0	0	0	0	Never
388	DW	-	1989	1	0	1	1	0	0	0	0	0	Never
389	DW	300	1990	1	0	0	1	0	0	0	0	0	Evy Oth Yr
390	DW	-	1992	1	0	0	1	0	0	0	0	0	Once
391	DBW	50		0	0	0	0	0	0	0	0	0	Never
392	DW	185	1994	1	1	0	1	0	0	0	0	0	Evy Yr
393	DW	-	1975	1	0	0	1	0	0	0	0	0	Evy 5 Yrs
394	DW	105		1	0	0	1	1	0	0	0	0	Once
395	DW	-	-	0	0	0	0	0	0	0	0	0	Never
396	DW	-	-	0	0	0	0	0	0	0	0	0	Once
397	DW	-	1955	1	0	0	1	1	0	0	0	0	Never
398	DW	600	1991	1	0	0	0	0	0	0	1	0	Once
399	DW	500	2006	1	0	0	0	1	0	0	0	0	Evy Yr
400	DW	120		1	0	0	1	0	0	0	0	0	Never
401	DW	-	2003	0	0	0	0	0	0	0	0	0	Evy Yr
402	DW	220	1991	1	0	0	0	1	0	0	0	0	Evy 5 Yrs
403	DW	165	1979	0	0	0	0	0	0	0	0	0	Once
404	DW	120	1979	0	0	0	0	0	0	0	0	0	Never
405	DW	500	2004	0	0	0	0	0	0	0	0	0	Never
406	UNKW	-	-	0	0	0	0	0	0	0	0	0	Never
407	DW	-	-	1	0	1	1	0	0	0	1	0	Never
408	DW	133	1976	1	0	0	0	1	0	0	0	0	Evy Oth Yr
409	DW	400	2003	1	0	0	0	1	0	0	0	0	Never
410	DW	130	1987	1	0	0	0	1	0	0	0	0	Never

Sample	SYS	DEPTH	YEAR	TRT	AND	UV	WS	SF	RO	IR	CF	CHLR	WT
411	DW	300	1997	1	0	0	1	0	0	0	0	0	Once
412	DW	200	2003	0	0	0	0	0	0	0	0	0	Never
413	UNKW	-	1975	0	0	0	0	0	0	0	0	0	Never
414	DW	-	1935	0	0	0	0	0	0	0	0	0	Never
415	DW	300	1997	0	0	0	0	0	0	0	0	0	Once
416	DW	120	1970	1	0	0	0	1	1	1	0	0	Whn Prob
417	DW	250	2005	0	0	0	0	0	0	0	0	0	Never
418	DW	400	1985	1	0	1	1	1	0	0	0	0	Evy Yr
419	DW	-	1998	0	0	0	0	0	0	0	0	0	Never
420	DW	150		1	0	0	1	1	0	0	0	0	Never
421	DW	90		1	0	0	0	1	0	0	0	0	Never
422	DW	-	2009	1	1	1	0	1	0	1	0	0	Once
423	UNKW	-	1990	1	0	0	1	1	0	0	0	0	Never
424	DW	100	1975	1	0	0	0	1	0	0	0	0	Once
425	DW	-	1987	0	0	0	0	0	0	0	0	0	Once
426	DW	120	1986	0	0	0	0	0	0	0	0	0	Whn Prob
427	DW	-	-	1	0	0	1	0	0	0	0	0	Once
428	UNKW	125	1999	1	0	0	1	1	0	0	0	0	Evy 5 Yrs
429	DW	125	2009	0	0	0	0	0	0	0	0	0	Once
430	DBW	-	1971	0	0	0	0	0	0	0	0	0	Whn Prob
431	DW	250	1998	1	1	0	1	1	0	1	0	0	Evy Yr
432	DBW	50	1973	1	0	0	0	0	0	0	0	0	Once
433	DW	600	2004	0	0	0	0	0	0	0	0	0	Once
434	DW	389	1987	1	1	0	1	0	1	0	0	0	Once
435	DBW	52	1982	1	0	0	0	0	0	0	0	0	
436	DW	200	1968	0	0	0	0	0	0	0	0	0	Never

Sample	SYS	DEPTH	YEAR	TRT	AND	UV	WS	SF	RO	IR	CF	CHLR	WT
437	DW	425	2007	1	0	0	0	1	0	0	0	0	Once
438	DW	-	1982	1	0	0	1	0	0	0	0	0	Never
439	DW	280	2001	1	0	0	1	0	0	0	0	0	Never
440	DBW	60	1965	1	1	0	0	0	0	0	1	0	Once
441	DW	-	2005	1	0	0	0	1	0	0	0	0	Never
442	DW	300	1999	0	0	0	0	0	0	0	0	0	Never
443	UNKW	-	-	1	0	0	0	1	0	0	0	0	Never
444	DBW	-	1980	1	1	0	0	0	0	0	0	0	Evy Oth Yr
445	DW	500		0	0	0	0	0	0	0	0	0	Once
446	DBW	41	1988	0	0	0	0	0	0	0	0	0	Once
447	DW	160	2005	1	0	0	0	1	0	1	0	0	Never
448	DW	220	2011	1	1	0	1	0	0	1	0	1	Once
449	DW	283	2008	0	0	0	0	0	0	0	0	0	Never
450	DBW	64	1974	0	0	0	0	0	0	0	0	0	Once
451	DBW	60	1983	1	1	0	0	1	0	0	0	0	Never
452	DBW	54	1969	1	0	0	0	0	0	0	1	0	Once
453	DW	266	1997	1	0	0	1	0	0	0	0	0	Evy 5 Yrs
454	DW	-	2010	1	0	0	0	1	0	0	0	0	Never
455	DW	240	1984	1	0	0	0	1	0	0	0	0	Never
456	DBW	-	-	0	0	0	0	0	0	0	0	0	Once
457	DBW	55	1980	1	0	1	0	1	0	0	0	0	Evy Yr
458	DW	65	2000	0	0	0	0	0	0	0	0	0	Never
459	DW	-	-	1	0	0	0	1	0	0	1	0	Evy Yr
460	DW	300		0	0	0	0	0	0	0	0	0	Once
461	DBW	-	-	0	0	0	0	0	0	0	0	0	Never
462	DW	80		0	0	0	0	0	0	0	0	0	Never
463	DW	-	1993	1	1	0	1	0	0	0	0	0	Once

Sample	SYS	DEPTH	YEAR	TRT	AND	UV	WS	SF	RO	IR	CF	CHLR	WT
464	DW	-	-	0	0	0	0	0	0	0	0	0	Evy Yr
465	DW	-	2006	1	0	0	0	1	0	0	0	0	Once
466	DW	300	2002	1	0	0	0	1	0	1	1	0	Once
467	DW	150	1978	1	0	0	1	0	0	0	0	0	Once
468	DW	310	1992	1	0	0	0	1	0	0	0	0	Never
469	DBW	-	-	0	0	0	0	0	0	0	0	0	Never
470	DW	-	1988	1	0	0	0	0	0	1	0	0	Once
471	DBW	55	1968	1	1	0	0	1	0	0	0	0	Evy Yr
472	DBW	60	1981	0	0	0	0	0	0	0	0	0	Whn Prob
473	DBW	60	1957	0	0	0	0	0	0	0	0	0	Once
474	DBW	-	1970	0	0	0	0	0	0	0	0	0	Once
475	DBW	45	1969	0	0	0	0	0	0	0	0	0	Once
476	UNKW	375	1999	1	0	0	1	1	0	0	0	0	Never
477	DW	750	1991	0	0	0	0	0	0	0	0	0	Never
478	DBW	-	1972	1	1	0	0	1	0	0	0	0	Once
479	DW	-	2008	0	0	0	0	0	0	0	0	0	Never
480	DW	140	2008	0	0	0	0	0	0	0	0	0	Once
481	DW	-	1997	0	0	0	0	0	0	0	0	0	Never
482	DBW	35	1955	0	0	0	0	0	0	0	0	0	Never
483	UNKW	-	-	1	1	0	1	0	0	1	0	0	Never
484	DW	250	1995	1	1	0	1	0	0	0	0	0	Never
485	DW	-	-	0	0	0	0	0	0	0	0	0	Never
486	DBW	40		1	0	0	1	1	0	0	0	0	Once
487	DBW	50	1979	0	0	0	0	0	0	0	0	0	Whn Prob
488	UNKW	-	1992	1	0	0	0	1	0	0	0	0	Once
489	DBW	65	1977	1	0	0	0	0	0	0	0	0	Once
490	DBW	47	1979	1	1	0	1	0	0	0	0	0	Once

Sample	SYS	DEPTH	YEAR	TRT	AND	UV	WS	SF	RO	IR	CF	CHLR	WT
491	DW	-	2011	0	0	0	0	0	0	0	0	0	Once
492	DW	340	1994	1	0	0	0	1	0	0	0	0	Never
493	UNKW	-	-	1	0	0	0	1	0	0	0	0	Once
494	DW	400	2002	1	0	0	0	0	0	1	0	0	Once
495	DW	-	2009	1	0	0	1	1	0	1	1	0	Evy Yr
496	DW	200		1	0	0	1	0	0	0	0	0	Never
497	DBW	36	1986	0	0	0	0	0	0	0	0	0	Never
498	DW	-	2000	0	0	0	0	0	0	0	0	0	Evy Oth Yr
499	DW	500	1988	1	0	0	1	0	0	0	0	1	Evy Oth Yr
500	DBW	-	-	1	0	0	1	0	0	0	0	0	Never
501	DBW	77	1982	0	0	0	0	0	0	0	0	0	Whn Prob
502	DW	600	2004	1	0	0	0	1	0	0	0	0	Once
503	DW	180	1995	0	0	0	0	0	0	0	0	0	Never
504	DBW	50	1974	1	0	0	0	1	0	0	0	0	Never
505	DW	-	1998	1	0	0	0	1	0	0	0	0	Never
506	DW	-	1990	1	0	0	1	0	0	1	0	1	Never
507	DW	305		0	0	0	0	0	0	0	0	0	Once
508	DW	275	1994	0	0	0	0	0	0	0	0	0	Whn Prob
509	DW	-	1993	0	0	0	0	0	0	0	0	0	Never
510	DW	400	2002	1	0	0	0	0	0	0	0	0	Whn Prob
511	DBW	40		1	1	0	0	1	0	0	0	0	Never
512	DBW	48		0	0	0	0	0	0	0	0	0	Once
513	DW	180	1995	1	1	0	0	1	0	0	0	0	Once
514	DBW	-	1984	1	0	0	0	0	0	0	1	0	Evy Oth Yr
515	DW	135	2002	1	0	0	0	1	0	0	0	0	Never

Sample	SYS	DEPTH	YEAR	TRT	AND	UV	WS	SF	RO	IR	CF	CHLR	WT
516	DW	-	2008	0	0	0	0	0	0	0	0	0	Never
517	DW	405	2003	1	0	0	0	0	0	1	0	0	Never
518	DBW	30	1990	0	0	0	0	0	0	0	0	0	Once
519	DW	300	2000	1	0	0	1	0	0	1	0	0	Once
520	DW	-	2005	1	1	0	1	1	0	0	0	0	Never
521	DW	605	1989	0	0	0	0	0	0	0	0	0	Once
522	DW	250	2007	1	0	0	0	1	0	0	0	0	Once
523	DBW	-	-	1	0	0	0	1	0	0	0	0	Once
524	OTH	-	-	0	0	0	0	0	0	0	0	0	Never
525	DW	100	1971	1	0	0	0	1	0	0	0	0	Once
526	DBW	-	1977	1	0	0	0	0	0	1	0	0	Never
527	DW	-	-	0	0	0	0	0	0	0	0	0	Never
528	DW	175	1993	1	0	0	0	1	0	0	0	0	Once
529	DW	-	-	1	0	0	0	1	0	0	0	0	Never
530	DW	-	-	0	0	0	0	0	0	0	0	0	Once
531	DW	180	1980	1	0	0	0	1	0	0	0	0	Once
532	UNKW	-	-	0	0	0	0	0	0	0	0	0	Never
533	DW	-	-	1	0	0	0	1	0	0	0	0	Never
534	DW	80		1	0	0	0	1	0	0	0	0	Never
535	DW	-	1964	0	0	0	0	0	0	0	0	0	Never
536	DW	-	1998	1	0	0	0	1	0	0	0	0	Never
537	DW	220	2009	0	0	0	0	0	0	0	0	0	Never
538	DW	250	1986	0	0	0	0	0	0	0	0	0	Once
539	DW	60	1975	0	0	0	0	0	0	0	0	0	Once
540	DW	240		1	0	0	0	1	0	0	0	0	Never
541	DW	300	1996	0	0	0	0	0	0	0	0	0	Never
542	DW	-	1940	0	0	0	0	0	0	0	0	0	Never
543	DW	-	-	1	0	0	0	1	0	0	0	0	Never

Sample	SYS	DEPTH	YEAR	TRT	AND	UV	WS	SF	RO	IR	CF	CHLR	WT
544	DW	200	1992	0	0	0	0	0	0	0	0	0	Once
545	DW	120	1995	0	0	0	0	0	0	0	0	0	Once
546	DW	235	2002	0	0	0	0	0	0	0	0	0	Never
547	DW	400	1997	1	0	0	1	0	0	0	0	0	Once
548	DW	201	2006	0	0	0	0	0	0	0	0	0	Once
549	DBW	51	2010	1	0	0	0	1	0	0	0	0	Once
550	DBW	-	1974	0	0	0	0	0	0	0	0	0	Never
551	DW	-	-	0	0	0	0	0	0	0	0	0	Once
552	DW	-	1987	0	0	0	0	0	0	0	0	0	Never
553	DBW	-	-	0	0	0	0	0	0	0	0	0	Never
554	DW	210	1997	0	0	0	0	0	0	0	0	0	Once
555	DW	89	1973	0	0	0	0	0	0	0	0	0	Never
556	DBW	-	1995	0	0	0	0	0	0	0	0	0	Once
557	DW	120		0	0	0	0	0	0	0	0	0	Once
558	DW	145	2005	0	0	0	0	0	0	0	0	0	Never
559	DW	300	1990	0	0	0	0	0	0	0	0	0	Once
560	DW	-	-	0	0	0	0	0	0	0	0	0	Once
561	DW	400	1979	1	0	0	0	1	0	0	0	0	Once
562	DW	175	1967	0	0	0	0	0	0	0	0	0	Once
563	DW	225	1930	1	0	0	0	1	0	0	0	0	Once
564	DW	-	1987	1	0	0	0	0	0	0	1	0	Never
565	DW	108	1970	1	0	0	0	1	0	0	0	0	Once
566	DW	225	2012	0	0	0	0	0	0	0	0	0	Never
567	DW	110	2001	1	0	0	0	1	0	0	0	0	Once
568	DW	187	1985	1	0	0	0	1	0	0	0	0	Once
569	UNKW	-	-	1	0	0	0	1	0	0	0	0	Never
570	DW	475		1	0	0	0	1	0	0	0	0	Never
571	DW	95	1955	0	0	0	0	0	0	0	0	0	Never

Sample	SYS	DEPTH	YEAR	TRT	AND	UV	WS	SF	RO	IR	CF	CHLR	WT
572	DW	300	1998	0	0	0	0	0	0	0	0	0	Never
573	DBW	42	2002	1	0	0	0	0	0	0	0	0	Never
574	DW	100	1988	0	0	0	0	0	0	0	0	0	Never
575	DW	130	1999	1	0	0	0	1	0	0	0	0	Never
576	DW	205	1987	0	0	0	0	0	0	0	0	0	Never
577	UNKW	-	1971	0	0	0	0	0	0	0	0	0	Never
578	UNKW	120		0	0	0	0	0	0	0	0	0	Never
579	DW	60	1986	0	0	0	0	0	0	0	0	0	Never
580	DW	80		0	0	0	0	0	0	0	0	0	Never
581	DW	-	2006	1	0	0	0	1	0	0	0	0	Never
582	DBW	-	-	0	0	0	0	0	0	0	0	0	Never
583	DBW	65	1971	0	0	0	0	0	0	0	0	0	Never
584	DW	-	1988	0	0	0	0	0	0	0	0	0	Never
585	DW	125	1970	1	0	0	0	1	0	0	0	0	Never
586	DW	-	-	0	0	0	0	0	0	0	0	0	Once
587	DW	200	1980	1	0	0	0	0	0	0	0	0	Once
588	DW	475	2002	1	0	0	0	1	0	0	0	0	Once
589	DW	142	1969	0	0	0	0	0	0	0	0	0	Never
590	DW	260	1983	1	0	0	1	0	0	0	0	0	Once
591	DW	-	1968	1	0	0	0	0	0	1	0	0	Never
592	DW	-	-	1	0	0	0	0	0	0	0	0	Once
593	DW	200		0	0	0	0	0	0	0	0	0	Evy Yr
594	DW	-	2002	1	0	0	0	1	0	0	0	0	Never
595	DW	110	1975	0	0	0	0	0	0	0	0	0	Never
596	DW	200		1	0	0	0	1	0	0	0	0	Once
597	DW	100	1989	0	0	0	0	0	0	0	0	0	Once
598	DW	150		1	0	0	0	1	0	0	0	0	Never
599	DW	250	2003	0	0	0	0	0	0	0	0	0	Never

Sample	SYS	DEPTH	YEAR	TRT	AND	UV	WS	SF	RO	IR	CF	CHLR	WT
600	UNKW	-	-	1	0	0	0	1	0	0	0	0	Once
601	DW	245	2006	1	0	0	0	1	0	0	0	0	Never
602	DW	-	-	0	0	0	0	0	0	0	0	0	Once
603	DW	200	1972	1	0	0	0	0	0	0	0	0	Never
604	SPG	-	-	1	0	0	0	1	0	0	0	1	Once
605	DW	300		1	0	0	1	1	0	0	1	0	Once
606	DW	325	1993	1	0	0	0	1	0	0	1	0	Once
607	DW	-	-	0	0	0	0	0	0	0	0	0	Never
608	DW	-	-	0	0	0	0	0	0	0	0	0	Never
609	DW	200	1988	0	0	0	0	0	0	0	0	0	Never
610	UNKW	-	-	0	0	0	0	0	0	0	0	0	Never
611	DW	300		1	0	0	0	1	0	0	0	0	Once
612	DW	-	1957	1	0	0	0	1	0	0	0	0	Never
613	DW	200	2006	1	0	0	0	1	0	0	0	0	Once
614	DBW	284	1993	1	0	0	0	1	0	0	0	0	Once
615	DW	160	1995	1	0	0	0	1	0	0	0	0	Never
616	DW	75		1	0	0	0	1	0	0	0	0	Once
617	DW	-	-	0	0	0	0	0	0	0	0	0	Once
618	DW	-	1979	0	0	0	0	0	0	0	0	0	Never
619	DW	-	-	0	0	0	0	0	0	0	0	0	Never
620	DW	-	-	0	0	0	0	0	0	0	0	0	Never
621	DW	280	2002	1	0	0	0	0	0	0	1	0	Once
622	SPG	-	-	1	0	0	0	1	0	0	0	0	Never
623	DW	400		0	0	0	0	0	0	0	0	0	Once
624	DW	300	2006	1	0	1	0	1	0	0	0	0	Whn Prob
625	DW	300	1999	0	0	0	0	0	0	0	0	0	Never
626	DW	-	2006	0	0	0	0	0	0	0	0	0	Evy Yr
627	DW	122	1963	0	0	0	0	0	0	0	0	0	Once

Sample	SYS	DEPTH	YEAR	TRT	AND	UV	WS	SF	RO	IR	CF	CHLR	WT
628	DBW	-	-	0	0	0	0	0	0	0	0	0	Never
629	DW	-	1999	1	0	0	0	1	0	0	0	0	Whn Prob
630	DW	-	1992	1	0	0	0	1	0	0	0	0	Never
631	UNKW	-	-	0	0	0	0	0	0	0	0	0	Never
632	DW	-	2003	0	0	0	0	0	0	0	0	0	Never
633	DW	-	1990	1	0	0	0	1	0	0	0	0	Never
634	DW	-	-	1	0	0	0	1	0	0	0	0	Once
635	DW	145	1988	0	0	0	0	0	0	0	0	0	Never
636	UNKW	-	1985	0	0	0	0	0	0	0	0	0	Never
637	DW	420	2012	0	0	0	0	0	0	0	0	0	Never
638	DW	145	1985	0	0	0	0	0	0	0	0	0	Never
639	DBW	60	1999	0	0	0	0	0	0	0	0	0	Never
640	DW	-	1992	1	0	0	1	0	0	0	0	0	Never
641	DW	450	2007	1	0	0	0	1	0	0	0	0	Once
642	DW	245	2003	1	0	0	0	1	0	0	0	0	Once
643	DW	300	2006	1	0	0	0	1	0	0	0	0	Once
644	DBW	-	1948	0	0	0	0	0	0	0	0	0	Never
645	UNKW	-	-	0	0	0	0	0	0	0	0	0	Never
646	DBW	65	1989	0	0	0	0	0	0	0	0	0	Once
647	SPG	-	-	1	0	0	0	1	0	0	0	0	Never
648	DW	180	2000	0	0	0	0	0	0	0	0	0	Never
649	SPG	-	-	0	0	0	0	0	0	0	0	0	Never
650	UNKW	-	-	1	0	0	0	1	0	0	0	0	Once
651	DBW	60	1890	0	0	0	0	0	0	0	0	0	Never
652	DW	-	2006	1	0	0	0	0	0	0	1	0	Never
653	DBW	-	-	0	0	0	0	0	0	0	0	0	Never
654	DW	220	1994	0	0	0	0	0	0	0	0	0	Once
655	DW	250	2000	1	0	0	0	1	0	0	0	0	Whn

Sample	SYS	DEPTH	YEAR	TRT	AND	UV	WS	SF	RO	IR	CF	CHLR	WT
													Prob
656	DW	450	2009	1	0	0	0	1	1	0	0	0	Once
657	DBW	-	-	0	0	0	0	0	0	0	0	0	Once
658	DBW	-	-	0	0	0	0	0	0	0	0	0	Never
659	OTH	-	-	0	0	0	0	0	0	0	0	0	Never
660	DW	165	1985	0	0	0	0	0	0	0	0	0	Once
661	DBW	-	2011	0	0	0	0	0	0	0	0	0	Never
662	DW	145	1976	0	0	0	0	0	0	0	0	0	Never
663	DW	-	2008	1	0	0	0	1	0	0	0	0	Once
664	DBW	-	1992	1	1	0	0	1	0	0	0	0	Never
665	OTH	-	-	0	0	0	0	0	0	0	0	0	Never
666	DW	450		0	0	0	0	0	0	0	0	0	Never
667	DW	260	2005	1	0	0	0	1	0	0	0	0	Never
668	DW	145	1976	1	0	0	1	1	0	0	0	0	Once
669	DBW	40	2010	0	0	0	0	0	0	0	0	0	Never
670	DW	140	2007	1	0	0	0	1	0	0	0	0	Never
671	DBW	65	1994	1	0	0	0	1	0	0	0	0	Never
672	DW	180	2006	0	0	0	0	0	0	0	0	0	Once
673	DW	168	1987	0	0	0	0	0	0	0	0	0	Once
674	UNKW	-	-	0	0	0	0	0	0	0	0	0	Never
675	DW	-	-	0	0	0	0	0	0	0	0	0	Once
676	DW	300	1977	1	0	0	0	0	0	0	0	0	Never
677	DBW	97	1936	0	0	0	0	0	0	0	0	0	Evy Yr
678	DW	175	2001	0	0	0	0	0	0	0	0	0	Whn Prob
679	DW	300	2002	1	0	0	0	1	0	0	0	0	Never
680	DW	98	1961	1	0	0	0	1	0	0	0	0	Never
681	DW	-	1982	1	0	0	0	1	0	0	0	0	Once
682	DBW	-	1940	1	0	0	0	0	0	0	0	0	Once

Sample	SYS	DEPTH	YEAR	TRT	AND	UV	WS	SF	RO	IR	CF	CHLR	WT
683	UNKW	-	-	0	0	0	0	0	0	0	0	0	Once
684	DW	-	-	0	0	0	0	0	0	0	0	0	Never
685	DW	85	2010	1	0	1	0	1	0	0	0	0	Once
686	DW	200		1	0	0	0	1	0	0	0	0	Once
687	DW	150	2003	1	0	0	0	1	0	0	0	0	Never
688	DW	-	-	1	0	0	0	1	0	0	0	0	Once
689	DW	300	2002	1	0	0	0	1	0	0	0	0	Never
690	DW	90		1	0	0	0	1	0	0	0	0	Never
691	DW	300		1	0	0	0	1	0	0	0	0	Never
692	DW	360	2007	1	0	0	0	1	0	0	0	0	Once
693	DW	-	2000	0	0	0	0	0	0	0	0	0	Never
694	DW	200	1988	0	0	0	0	0	0	0	0	0	Never
695	DW	200	1968	0	0	0	0	0	0	0	0	0	Never
696	DW	-	-	0	0	0	0	0	0	0	0	0	Never
697	DW	90	1976	1	0	0	0	1	0	0	0	0	Once
698	DBW	-	-	0	0	0	0	0	0	0	0	0	Never
699	DW	-	2004	1	0	0	0	1	0	0	0	0	Never
700	DBW	38	1974	0	0	0	0	0	0	0	0	0	Never
701	DW	180	1992	0	0	0	0	0	0	0	0	0	Never
702	DBW	-	2006	0	0	0	0	0	0	0	0	0	Once
703	DW	-	-	0	0	0	0	0	0	0	0	0	Once
704	DW	306	2008	0	0	0	0	0	0	0	0	0	Never
705	DBW	-	-	0	0	0	0	0	0	0	0	0	Once
706	DBW	35		0	0	0	0	0	0	0	0	0	Never
707	DW	630	2001	1	0	0	0	0	1	0	0	0	Once
708	DW	800		1	0	0	0	0	1	0	0	0	Never
709	DW	260		0	0	0	0	0	0	0	0	0	Never
710	DW	397		0	0	0	0	0	0	0	0	0	Once

Sample	SYS	DEPTH	YEAR	TRT	AND	UV	WS	SF	RO	IR	CF	CHLR	WT
711	DW	300	2011	0	0	0	0	0	0	0	0	0	Never
712	DBW	30		0	0	0	0	0	0	0	0	0	Once
713	DW	60		1	0	0	0	0	0	0	0	0	Once
714	DW	-	-	0	0	0	0	0	0	0	0	0	Once
715	DW	320	1992	0	0	0	0	0	0	0	0	0	Never
716	DW	-	-	1	0	0	0	0	1	0	0	0	Never
717	OTH	-	-	0	0	0	0	0	0	0	0	0	Never
718	DW	400	1997	0	0	0	0	0	0	0	0	0	Never
719	DW	-	1998	0	0	0	0	0	0	0	0	0	Never
720	DW	-	-	0	0	0	0	0	0	0	0	0	Never
721	DW	-	-	0	0	0	0	0	0	0	0	0	Once
722	DW	-	-	0	0	0	0	0	0	0	0	0	Never
723	DW	628	1990	0	0	0	0	0	0	0	0	0	Never
724	UNKW	-	1989	0	0	0	0	0	0	0	0	0	Never
725	DW	-	-	0	0	0	0	0	0	0	0	0	Never
726	DW	-	-	0	0	0	0	0	0	0	0	0	Once
727	UNKW	-	-	0	0	0	0	0	0	0	0	0	Once
728	DW	650	2008	0	0	0	0	0	0	0	0	0	Never
729	DBW	15	1955	0	0	0	0	0	0	0	0	0	Once
730	DBW	16	1964	1	0	0	0	1	1	0	0	0	Evy Oth Yr
731	DW	400	1990	0	0	0	0	0	0	0	0	0	Once
732	DW	480		0	0	0	0	0	0	0	0	0	Never
733	DW	-	-	0	0	0	0	0	0	0	0	0	Once
734	DW	800	2004	1	0	0	0	0	1	0	0	0	Once
735	DW	360	2002	0	0	0	0	0	0	0	0	0	Once
736	DW	500	2009	0	0	0	0	0	0	0	0	0	Never
737	DBW	-	-	0	0	0	0	0	0	0	0	0	Once
738	CIS	-	-	1	0	0	0	1	0	0	0	0	Never

Sample	SYS	DEPTH	YEAR	TRT	AND	UV	WS	SF	RO	IR	CF	CHLR	WT
739	DBW	40	1947	0	0	0	0	0	0	0	0	0	Never
740	DW	670	1993	1	0	0	0	1	0	0	0	0	Once
741	DW	412	1999	0	0	0	0	0	0	0	0	0	Never
742	DBW	50	1982	1	0	0	0	1	0	0	0	0	Never
743	DW	-	-	0	0	0	0	0	0	0	0	0	Never
744	DW	-	-	0	0	0	0	0	0	0	0	0	Never
745	DBW	-	-	0	0	0	0	0	0	0	0	0	Once
746	DW	600	1983	0	0	0	0	0	0	0	0	0	Once
747	DW	-	2006	1	0	0	1	0	0	0	0	0	Never
748	UNKW	-	-	0	0	0	0	0	0	0	0	0	Never
749	DBW	-	-	0	0	0	0	0	0	0	0	0	Never
750	UNKW	35		1	0	0	0	1	0	0	0	0	Never
751	UNKW	-	-	0	0	0	0	0	0	0	0	0	Never
752	DW	-	-	0	0	0	0	0	0	0	0	0	Never
753	DW	220	1990	0	0	0	0	0	0	0	0	0	Once
754	DW	750	1991	0	0	0	0	0	0	0	0	0	Once
755	DW	-	-	1	0	0	0	1	0	0	0	0	Never
756	DW	220	2002	1	0	0	0	1	0	0	0	0	Once
757	UNKW	-	1982	1	0	0	0	1	0	0	0	0	Never
758	UNKW	230	1995	1	0	0	0	1	0	0	0	0	Once
759	DW	300	2007	0	0	0	0	0	0	0	0	0	Never
760	UNKW	-	-	0	0	0	0	0	0	0	0	0	Never
761	DW	375	1998	0	0	0	0	0	0	0	0	0	Never
762	DW	-	-	0	0	0	0	0	0	0	0	0	Never
763	DBW	60	1989	0	0	0	0	0	0	0	0	0	Once
764	DBW	35	1985	0	0	0	0	0	0	0	0	0	Never
765	DW	-	-	0	0	0	0	0	0	0	0	0	Never
766	UNKW	-	-	0	0	0	0	0	0	0	0	0	-

Sample	SYS	DEPTH	YEAR	TRT	AND	UV	WS	SF	RO	IR	CF	CHLR	WT
767	DW	730	1999	1	0	0	0	1	0	0	0	0	Never
768	DBW	-	1992	1	0	0	0	0	0	0	0	0	Once
769	DW	-	1983	1	0	0	0	1	0	0	0	0	Never
770	DW	-	-	1	0	0	1	1	0	0	0	0	Never
771	DW	-	1984	1	1	0	1	0	0	0	0	0	Never
772	DW	-	-	1	0	0	1	0	0	0	0	0	Once
773	UNKW	-	-	0	0	0	0	0	0	0	0	0	Never
774	DW	-	1984	1	0	0	1	0	0	0	0	0	Once
775	UNKW	175	1996	1	1	0	1	0	0	0	0	0	Never
776	DW	420	1999	1	0	0	1	1	0	0	0	0	Never
777	DW	160	1985	1	0	0	0	1	0	0	0	0	Once
778	DW	220	1998	1	0	0	0	0	0	1	0	0	Never
779	DW	-	1980	1	1	0	1	1	0	1	0	0	Once
780	DW	280	1983	1	0	0	0	1	0	0	0	0	Evy 5 Yrs
781	DW	330	1981	0	0	0	0	0	0	0	0	0	Never
782	DW	240	1995	0	0	0	0	0	0	0	0	0	Never
783	DW	-	-	1	0	0	1	0	0	1	0	0	Never
784	DW	305	1985	1	0	0	0	0	0	1	0	0	Once
785	DW	200	2011	1	0	0	0	1	0	0	0	0	Once
786	DW	170		1	1	0	1	0	0	1	0	1	Once
787	DW	170		1	1	0	1	0	0	1	0	1	Once
788	UNKW	-	-	0	0	0	0	0	0	0	0	0	Whn Prob
789	DW	420	2004	1	0	0	1	0	0	0	0	0	Once
790	DW	-	-	0	0	0	0	0	0	0	0	0	Evy Oth Yr
791	DW	-	-	0	0	0	0	0	0	0	0	0	Evy Yr
792	DW	-	-	1	0	0	1	0	0	1	0	0	Once
793	DW	175	1979	0	0	0	0	0	0	0	0	0	Never

Sample	SYS	DEPTH	YEAR	TRT	AND	UV	WS	SF	RO	IR	CF	CHLR	WT
794	DW	-	-	0	0	0	0	0	0	0	0	0	Evy 5 Yrs
795	DW	130		0	0	0	0	0	0	0	0	0	Once
796	DW	-	2005	1	0	0	0	0	0	1	0	0	Once
797	DW	250		1	0	0	1	1	0	1	0	0	Evy 5 Yrs
798	DW	380	1979	1	0	0	0	1	0	0	0	0	Evy 5 Yrs
799	UNKW	-	2004	1	0	1	1	0	0	0	0	0	Evy Yr
800	DW	65		0	0	0	0	0	0	0	0	0	Once
801	DW	300	1995	1	0	0	0	1	0	1	0	0	Once
802	DBW	200	1984	1	1	0	1	0	1	0	0	0	Once
803	DW	145	1984	1	1	0	0	0	0	1	0	0	Once
804	DW	310	1983	1	1	0	0	1	1	1	0	0	Evy Yr
805	UNKW	125	1982	1	0	0	1	0	0	1	0	0	Never
806	DW	-	2009	1	1	0	1	0	0	0	0	0	Evy Yr
807	DW	450	2009	1	0	0	0	1	0	0	0	0	Once
808	DW	200	1982	1	1	0	0	1	0	0	0	0	Once
809	UNKW	149	1982	1	1	0	0	0	0	0	0	0	Once
810	DW	205	1986	1	1	0	1	0	0	0	0	0	Whn Prob
811	UNKW	-	2006	1	0	0	0	0	0	0	0	0	Never
812	DW	275	1983	1	1	0	1	0	0	0	0	0	Evy 5 Yrs
813	DW	205	1977	1	0	0	0	0	0	0	0	0	Never
814	DW	90		0	0	0	0	0	0	0	0	0	Once
815	DW	-	-	1	0	0	1	0	0	0	0	0	Never
816	DW	-	1981	1	0	0	1	0	0	0	0	0	Never
817	DW	1000	2007	0	0	0	0	0	0	0	0	0	Evy Yr
818	DW	1000	2007	1	0	0	0	1	0	1	0	0	Evy Yr
819	OTH	-	-	0	0	0	0	0	0	0	0	0	Never

Sample	SYS	DEPTH	YEAR	TRT	AND	UV	WS	SF	RO	IR	CF	CHLR	WT
820	DW	-	1985	1	1	0	1	0	0	0	0	0	Never
821	DW	275	1983	1	1	0	1	0	0	0	0	0	Evy 5 Yrs
822	DBW	-	1986	0	0	0	0	0	0	0	0	0	Never
823	OTH	-	-	0	0	0	0	0	0	0	0	0	Never
824	DW	400	1993	1	0	1	1	0	0	1	0	0	Once
825	DW	300	1979	1	0	0	0	1	0	0	0	0	Once
826	DW	310	2004	1	0	0	0	1	0	0	0	0	Evy Yr
827	DW	-	-	1	0	0	1	0	0	0	0	0	Once
828	UNKW	-	2006	1	0	0	0	0	0	0	0	0	Never
829	UNKW	450		1	0	0	0	1	0	0	0	0	Evy 5 Yrs
830	DW	-	-	1	0	0	1	1	0	1	0	0	Never
831	DW	-	2004	0	0	0	0	0	0	0	0	0	Evy Yr

8.6 Plumbing Material and Water Taste

Sample	PC	PL	PS	PP	PU	COR	UT	BT	SUT	SAT	MT	OT	SOT
1	1	0	0	1	0	0	0	0	0	0	0	0	0
2	1	0	0	1	0	0	0	0	0	0	0	0	0
3	1	1	0	1	0	0	1	0	0	0	0	0	0
4	1	0	1	1	0	0	0	0	0	0	0	0	0
5	1	0	0	1	0	0	0	0	0	0	0	0	0
6	0	0	0	1	0	0	0	0	0	0	0	0	0
7	0	0	0	0	1	0	0	0	0	0	0	0	0
8	0	0	0	1	0	0	0	0	0	0	0	0	0
9	1	0	0	1	0	0	0	0	0	0	0	0	0
10	0	0	0	1	0	0	0	0	0	0	0	0	0
11	1	0	0	1	0	0	0	0	0	0	0	0	0
12	1	0	0	1	0	0	0	0	0	0	0	0	0

Sample	PC	PL	PS	PP	PU	COR	UT	BT	SUT	SAT	MT	OT	SOT
13	0	0	0	1	0	0	0	0	0	0	0	0	0
14	0	0	0	0	1	0	0	0	0	0	0	0	0
15	1	0	0	0	0	0	0	0	0	0	0	0	0
16	0	0	0	1	0	0	0	0	0	0	0	0	0
17	0	0	0	1	0	0	0	0	0	0	0	0	0
18	0	0	0	1	0	0	0	0	0	0	0	0	0
19	1	0	0	1	0	0	0	0	0	0	0	0	0
20	0	0	0	1	0	0	0	0	0	0	0	0	0
21	0	0	0	0	1	0	0	0	0	0	0	0	0
22	0	0	0	1	0	0	0	0	0	0	0	0	0
23	0	0	0	1	0	0	0	0	0	0	0	0	0
24	0	0	0	1	0	0	1	0	0	0	0	0	0
25	1	0	0	1	0	0	0	0	0	0	0	0	0
26	0	0	0	1	0	1	0	0	0	0	0	0	0
27	0	0	0	1	0	0	0	0	0	0	0	0	0
28	0	0	0	1	0	0	0	0	0	0	0	0	0
29	0	0	0	0	0	0	0	0	0	0	0	0	0
30	1	1	0	0	0	0	0	0	0	0	0	0	0
31	0	0	0	0	0	0	0	0	0	0	0	0	0
32	0	0	0	0	0	0	0	0	0	0	0	0	0
33	1	0	0	0	0	0	0	0	0	0	0	0	0
34	1	0	0	1	0	0	0	0	0	0	0	0	0
35	0	0	0	1	0	0	0	0	0	0	0	0	0
36	0	0	0	1	0	1	0	0	0	0	0	0	0
37	0	0	0	0	0	0	0	0	0	0	0	0	0
38	0	0	0	1	0	0	0	0	0	0	0	0	0
39	1	0	0	1	0	0	0	0	0	0	0	0	0
40	0	0	0	1	0	0	0	0	0	0	0	0	0

Sample	PC	PL	PS	PP	PU	COR	UT	BT	SUT	SAT	MT	OT	SOT
41	0	0	0	0	1	0	0	0	0	0	0	0	0
42	0	0	0	1	0	0	0	0	0	0	0	0	0
43	0	0	0	1	0	1	0	0	0	0	0	0	0
44	0	0	0	1	0	0	0	0	0	0	0	0	0
45	0	0	0	1	0	0	0	0	0	0	0	0	0
46	1	0	0	1	0	0	1	1	0	0	0	0	0
47	1	0	0	1	0	1	0	0	0	0	0	0	0
48	1	0	0	1	0	0	0	0	0	0	0	0	0
49	1	0	0	1	0	0	0	0	0	0	0	0	0
50	1	0	0	1	0	0	0	0	0	0	0	0	0
51	0	0	0	1	0	0	0	0	0	0	0	0	0
52	0	0	0	1	0	0	0	0	0	0	0	0	0
53	1	0	0	1	0	0	0	0	0	0	0	0	0
54	0	0	0	1	0	0	0	0	0	0	0	0	0
55	1	0	0	1	0	0	0	0	0	0	0	0	0
56	0	0	0	1	0	0	0	0	0	0	0	0	0
57	0	0	0	1	0	0	0	0	0	0	0	0	0
58	1	0	0	1	0	0	0	0	0	0	0	0	0
59	0	0	0	0	1	0	1	1	0	0	0	0	0
60	1	0	0	1	0	0	0	0	0	0	0	0	0
61	1	0	0	1	0	1	0	0	0	0	0	0	0
62	0	0	0	1	0	0	0	0	0	0	0	0	0
63	0	0	0	1	0	0	0	0	0	0	0	0	0
64	1	0	0	0	0	1	0	0	0	0	0	0	0
65	0	0	0	1	0	0	1	1	0	0	0	0	0
66	0	0	0	1	0	0	0	0	0	0	0	0	0
67	1	0	0	1	0	0	1	0	0	0	1	0	0
68	0	0	0	1	0	0	0	0	0	0	0	0	0

Sample	PC	PL	PS	PP	PU	COR	UT	BT	SUT	SAT	MT	OT	SOT
69	0	0	0	1	0	0	0	0	0	0	0	0	0
70	0	0	0	1	0	0	1	0	0	0	1	0	0
71	0	0	0	0	0	0	0	0	0	0	0	0	0
72	1	0	0	0	0	0	0	0	0	0	0	0	0
73	0	0	0	1	0	0	0	0	0	0	0	0	0
74	1	0	0	1	0	0	0	0	0	0	0	0	0
75	1	0	0	1	0	0	0	0	0	0	0	0	0
76	0	0	0	1	0	0	0	0	0	0	0	0	0
77	1	0	0	0	0	0	0	0	0	0	0	0	0
78	0	0	0	1	0	0	0	0	0	0	0	0	0
79	1	0	0	1	0	0	0	0	0	0	0	0	0
80	0	0	0	1	0	0	0	0	0	0	0	0	0
81	0	0	0	1	0	0	0	0	0	0	0	0	0
82	0	0	0	1	0	0	0	0	0	0	0	0	0
83	1	0	0	0	0	0	0	0	0	0	0	0	0
84	0	0	1	1	0	1	0	0	0	0	0	0	0
85	0	0	0	1	0	0	0	0	0	0	0	0	0
86	0	0	0	0	0	0	0	0	0	0	0	0	0
87	1	0	0	1	0	0	1	0	0	0	0	0	0
88	0	0	0	1	0	0	0	0	0	0	0	0	0
89	0	0	0	1	0	0	0	0	0	0	0	0	0
90	1	0	0	1	0	0	1	0	0	0	1	0	0
91	0	0	1	0	0	1	0	0	0	0	0	0	0
92	0	0	0	1	0	0	0	0	0	0	0	0	0
93	0	0	0	1	0	0	0	0	0	0	0	0	0
94	0	0	0	1	0	0	0	0	0	0	0	0	0
95	0	0	0	1	0	0	0	0	0	0	0	0	0
96	0	0	0	1	0	0	1	0	0	0	1	0	0

Sample	PC	PL	PS	PP	PU	COR	UT	BT	SUT	SAT	MT	OT	SOT
97	0	0	0	1	0	0	0	0	0	0	0	0	0
98	0	0	0	1	0	0	0	0	0	0	0	0	0
99	0	0	0	1	0	0	0	0	0	0	0	0	0
100	0	0	0	1	0	0	0	0	0	0	0	0	0
101	1	0	0	0	0	0	0	0	0	0	0	0	0
102	1	0	0	1	0	0	1	0	0	0	0	0	0
103	1	0	0	1	0	1	0	0	0	0	0	0	0
104	1	0	0	1	0	0	0	0	0	0	0	0	0
105	1	0	0	1	0	0	0	0	0	0	0	0	0
106	1	0	0	0	0	0	0	0	0	0	0	0	0
107	0	0	0	1	0	0	0	0	0	0	0	0	0
108	1	0	1	1	0	0	1	0	1	0	0	0	0
109	1	0	0	1	0	0	0	0	0	0	0	0	0
110	1	0	0	0	0	0	0	0	0	0	0	0	0
111	1	0	0	0	0	0	0	0	0	0	0	0	0
112	0	0	0	1	0	0	0	0	0	0	0	0	0
113	0	0	0	1	0	0	0	0	0	0	0	0	0
114	0	0	0	1	0	0	0	0	0	0	0	0	0
115	1	0	0	0	0	0	0	0	0	0	0	0	0
116	1	0	0	1	0	0	0	0	0	0	0	0	0
117	0	0	0	1	0	0	1	0	0	0	1	0	0
118	1	0	0	0	1	0	0	0	0	0	0	0	0
119	1	0	1	0	0	0	0	0	0	0	0	0	0
120	1	0	0	0	0	0	0	0	0	0	0	0	0
121	1	0	0	0	0	0	0	0	0	0	0	0	0
122	0	0	0	1	0	0	1	0	0	0	1	0	0
123	1	0	1	1	0	0	0	0	0	0	0	0	0
124	0	0	0	1	0	1	0	0	0	0	0	0	0

Sample	PC	PL	PS	PP	PU	COR	UT	BT	SUT	SAT	MT	OT	SOT
125	1	0	0	0	0	0	1	0	0	0	0	0	0
126	0	0	0	1	0	0	1	0	1	1	0	0	0
127	1	0	1	1	0	1	0	0	0	0	0	0	0
128	0	0	0	1	0	0	0	0	0	0	0	0	0
129	0	0	0	1	0	0	0	0	0	0	0	0	0
130	1	0	0	1	0	0	0	0	0	0	0	0	0
131	1	0	0	0	0	0	1	0	1	0	0	0	0
132	1	0	0	1	0	0	0	0	0	0	0	0	0
133	0	0	0	0	1	0	0	0	0	0	0	0	0
134	1	0	0	0	0	0	0	0	0	0	0	0	0
135	0	0	0	1	0	0	0	0	0	0	0	0	0
136	1	0	0	0	0	0	0	0	0	0	0	0	0
137	0	0	1	1	0	0	0	0	0	0	0	0	0
138	0	0	0	1	0	0	0	0	0	0	0	0	0
139	1	0	0	1	0	0	0	0	0	0	0	0	0
140	1	0	0	0	0	1	0	0	0	0	0	0	0
141	1	0	1	1	0	0	0	0	0	0	0	0	0
142	1	0	0	0	0	0	0	0	0	0	0	0	0
143	1	0	0	0	0	1	0	0	0	0	0	0	0
144	1	0	0	0	0	0	0	0	0	0	0	0	0
145	0	0	0	1	0	0	0	0	0	0	0	0	0
146	1	0	0	0	0	0	0	0	0	0	0	0	0
147	1	0	0	0	0	0	0	0	0	0	0	0	0
148	1	0	0	1	0	0	0	0	0	0	0	0	0
149	1	0	0	1	0	0	0	0	0	0	0	0	0
150	1	0	0	0	0	0	0	0	0	0	0	0	0
151	0	0	0	1	0	0	0	0	0	0	0	0	0
152	1	0	0	0	0	0	1	0	0	1	0	0	0

Sample	PC	PL	PS	PP	PU	COR	UT	BT	SUT	SAT	MT	OT	SOT
153	1	0	0	1	0	0	0	0	0	0	0	0	0
154	1	0	0	1	0	0	0	0	0	0	0	0	0
155	0	0	0	0	1	1	0	0	0	0	0	0	0
156	1	0	0	1	0	1	0	0	0	0	0	0	0
157	1	0	0	1	1	0	1	0	1	0	0	0	0
158	1	0	0	0	0	1	1	1	0	0	0	0	0
159	1	0	0	1	0	0	0	0	0	0	0	0	0
160	0	0	0	1	0	0	0	0	0	0	0	0	0
161	1	0	0	1	0	0	0	0	0	0	0	0	0
162	0	0	0	1	0	0	1	0	0	0	0	1	0
163	0	0	0	1	0	0	1	1	0	0	0	0	0
164	1	0	0	1	0	0	0	0	0	0	0	0	0
165	1	0	0	0	0	0	0	0	0	0	0	0	0
166	0	0	0	1	0	0	0	0	0	0	0	0	0
167	1	0	0	1	0	0	0	0	0	0	0	0	0
168	1	0	0	0	0	0	1	0	0	0	1	0	0
169	1	0	0	0	0	0	0	0	0	0	0	0	0
170	1	0	0	1	0	0	0	0	0	0	0	0	0
171	1	0	1	1	0	0	0	0	0	0	0	0	0
172	1	0	0	0	0	0	0	0	0	0	0	0	0
173	1	0	0	0	0	0	0	0	0	0	0	0	0
174	1	0	0	1	0	0	0	0	0	0	0	0	0
175	1	0	0	0	0	0	0	0	0	0	0	0	0
176	1	0	0	1	0	0	0	0	0	0	0	0	0
177	1	0	0	0	0	0	0	0	0	0	0	0	0
178	1	0	0	1	0	0	0	0	0	0	0	0	0
179	1	0	0	1	0	0	0	0	0	0	0	0	0
180	1	0	0	1	0	0	0	0	0	0	0	0	0

Sample	PC	PL	PS	PP	PU	COR	UT	BT	SUT	SAT	MT	OT	SOT
181	0	0	0	1	0	0	0	0	0	0	0	0	0
182	1	0	0	0	0	0	0	0	0	0	0	0	0
183	0	0	0	0	1	0	1	0	0	0	1	0	0
184	1	0	0	1	0	0	0	0	0	0	0	0	0
185	1	0	1	1	0	0	0	0	0	0	0	0	0
186	0	0	1	1	0	0	0	0	0	0	0	0	0
187	1	0	0	0	0	0	0	0	0	0	0	0	0
188	0	0	0	1	0	0	0	0	0	0	0	0	0
189	1	0	0	1	0	0	1	0	0	0	0	0	0
190	0	0	0	0	0	0	1	0	0	0	1	0	0
191	0	0	0	0	1	0	0	0	0	0	0	0	0
192	0	0	0	0	1	0	0	0	0	0	0	0	0
193	0	0	0	0	1	0	0	0	0	0	0	0	0
194	0	0	0	1	0	0	0	0	0	0	0	0	0
195	0	0	0	1	0	1	0	0	0	0	0	0	0
196	1	0	0	1	0	0	0	0	0	0	0	0	0
197	1	0	0	0	0	0	0	0	0	0	0	0	0
198	1	0	0	1	0	1	0	0	0	0	0	0	0
199	1	0	0	1	0	0	1	0	0	1	0	0	0
200	1	0	0	1	0	0	0	0	0	0	0	0	0
201	0	0	0	1	0	0	0	0	0	0	0	0	0
202	0	0	0	1	0	0	1	0	1	0	0	0	0
203	0	0	0	1	0	0	0	0	0	0	0	0	0
204	1	0	1	1	0	0	0	0	0	0	0	0	0
205	0	0	0	1	0	0	0	0	0	0	0	0	0
206	0	0	0	1	0	0	0	0	0	0	0	0	0
207	0	0	0	1	0	0	0	0	0	0	0	0	0
208	1	0	0	1	0	0	0	0	0	0	0	0	0

Sample	PC	PL	PS	PP	PU	COR	UT	BT	SUT	SAT	MT	OT	SOT
209	1	0	0	0	0	0	0	0	0	0	0	0	0
210	0	0	0	1	0	1	0	0	0	0	0	0	0
211	0	0	1	1	0	0	0	0	0	0	0	0	0
212	1	0	0	0	0	0	1	0	1	0	0	0	0
213	1	0	0	0	0	0	0	0	0	0	0	0	0
214	1	0	1	1	0	0	0	0	0	0	0	0	0
215	0	0	0	1	0	0	0	0	0	0	0	0	0
216	0	0	0	1	0	0	0	0	0	0	0	0	0
217	0	0	0	0	1	0	0	0	0	0	0	0	0
218	1	0	0	1	0	0	1	0	0	0	0	0	0
219	0	0	0	1	0	0	0	0	0	0	0	0	0
220	0	0	0	1	0	0	0	0	0	0	0	0	0
221	1	0	1	1	0	0	0	0	0	0	0	0	0
222	1	0	0	1	0	0	0	0	0	0	0	0	0
223	0	0	0	1	0	0	0	0	0	0	0	0	0
224	0	0	0	1	0	0	0	0	0	0	0	0	0
225	1	0	0	1	0	0	0	0	0	0	0	0	0
226	0	0	0	0	1	0	1	0	0	0	1	0	0
227	1	0	0	0	0	0	0	0	0	0	0	0	0
228	0	0	0	1	0	0	0	0	0	0	0	0	0
229	0	0	0	1	0	1	0	0	0	0	0	0	0
230	1	0	0	0	0	0	1	0	0	1	0	0	0
231	1	0	0	1	0	0	0	0	0	0	0	0	0
232	1	0	0	0	0	0	1	0	0	0	1	1	0
233	1	0	0	1	0	0	0	0	0	0	0	0	0
234	1	0	0	1	0	1	0	0	0	0	0	0	0
235	1	0	0	1	0	0	0	0	0	0	0	0	0
236	1	0	0	1	0	0	1	1	0	0	0	0	0

Sample	PC	PL	PS	PP	PU	COR	UT	BT	SUT	SAT	MT	OT	SOT
237	0	0	0	1	0	0	0	0	0	0	0	0	0
238	0	0	0	1	0	0	0	0	0	0	0	0	0
239	0	0	0	1	0	1	0	0	0	0	0	0	0
240	0	0	0	1	0	0	0	0	0	0	0	0	0
241	0	0	0	1	0	0	0	0	0	0	0	0	0
242	1	0	0	1	0	0	0	0	0	0	0	0	0
243	0	0	0	1	1	0	1	0	0	0	0	1	0
244	1	0	0	1	0	0	0	0	0	0	0	0	0
245	0	0	0	1	0	0	0	0	0	0	0	0	0
246	0	0	0	1	0	0	0	0	0	0	0	0	0
247	0	0	0	1	0	0	0	0	0	0	0	0	0
248	0	0	0	1	0	0	0	0	0	0	0	0	0
249	0	0	0	1	0	0	0	0	0	0	0	0	0
250	0	0	0	1	0	0	0	0	0	0	0	0	0
251	0	0	0	1	0	0	1	0	1	0	0	0	0
252	0	0	0	0	0	0	0	0	0	0	0	0	0
253	0	0	0	1	0	0	0	0	0	0	0	0	0
254	0	0	0	0	0	0	0	0	0	0	0	0	0
255	0	0	0	1	0	0	0	0	0	0	0	0	0
256	1	0	0	1	0	1	0	0	0	0	0	0	0
257	1	0	1	0	0	0	0	0	0	0	0	0	0
258	1	0	0	1	0	0	0	0	0	0	0	0	0
259	0	0	0	1	0	1	0	0	0	0	0	0	0
260	1	0	0	0	0	0	0	0	0	0	0	0	0
261	1	0	0	0	0	1	0	0	0	0	0	0	0
262	0	0	0	0	1	0	0	0	0	0	0	0	0
263	0	0	0	1	0	0	0	0	0	0	0	0	0
264	1	0	0	1	0	1	0	0	0	0	0	0	0

Sample	PC	PL	PS	PP	PU	COR	UT	BT	SUT	SAT	MT	OT	SOT
265	1	0	1	0	0	0	0	0	0	0	0	0	0
266	0	0	0	1	0	0	0	0	0	0	0	0	0
267	1	0	1	1	0	0	0	0	0	0	0	0	0
268	0	0	0	1	0	0	0	0	0	0	0	0	0
269	1	0	0	0	0	0	0	0	0	0	0	0	0
270	0	0	0	1	0	0	0	0	0	0	0	0	0
271	1	0	0	0	0	0	0	0	0	0	0	0	0
272	0	0	0	1	0	0	0	0	0	0	0	0	0
273	0	0	0	0	1	0	0	0	0	0	0	0	0
274	1	0	0	1	0	0	0	0	0	0	0	0	0
275	0	0	0	1	0	0	0	0	0	0	0	0	0
276	1	0	0	0	0	0	0	0	0	0	0	0	0
277	0	0	0	1	0	0	0	0	0	0	0	0	0
278	0	0	1	1	0	0	0	0	0	0	0	0	0
279	1	0	0	0	0	0	1	0	1	0	0	0	0
280	0	0	0	1	0	0	0	0	0	0	0	0	0
281	0	0	0	1	0	0	1	0	0	1	0	0	0
282	0	0	0	1	0	0	0	0	0	0	0	0	0
283	0	0	0	1	0	0	0	0	0	0	0	0	0
284	0	0	0	1	0	0	1	0	1	0	0	0	0
285	0	0	0	1	0	0	0	0	0	0	0	0	0
286	0	0	0	1	0	0	0	0	0	0	0	0	0
287	0	0	0	1	0	0	0	0	0	0	0	0	0
288	1	0	1	1	0	0	0	0	0	0	0	0	0
289	0	0	0	1	0	0	0	0	0	0	0	0	0
290	0	0	0	1	0	0	0	0	0	0	0	0	0
291	0	0	0	1	0	0	0	0	0	0	0	0	0
292	0	0	0	1	0	0	0	0	0	0	0	0	0

Sample	PC	PL	PS	PP	PU	COR	UT	BT	SUT	SAT	MT	OT	SOT
293	0	0	0	1	0	0	1	0	1	0	0	0	0
294	0	0	0	1	0	0	0	0	0	0	0	0	0
295	0	0	1	1	0	1	0	0	0	0	0	0	0
296	0	0	0	1	0	0	0	0	0	0	0	0	0
297	0	0	0	1	0	0	0	0	0	0	0	0	0
298	0	0	1	1	0	0	0	0	0	0	0	0	0
299	0	0	0	1	0	0	0	0	0	0	0	0	0
300	0	0	0	1	0	0	0	0	0	0	0	0	0
301	0	0	0	1	0	0	0	0	0	0	0	0	0
302	0	0	1	0	0	0	0	0	0	0	0	0	0
303	1	0	0	0	0	1	1	0	0	0	0	0	0
304	0	0	0	1	0	0	0	0	0	0	0	0	0
305	1	0	1	1	0	1	0	0	0	0	0	0	0
306	1	0	1	1	0	1	0	0	0	0	0	0	0
307	1	0	0	1	0	1	0	0	0	0	0	0	0
308	0	0	0	1	0	0	0	0	0	0	0	0	0
309	1	0	1	0	0	0	0	0	0	0	0	0	0
310	1	0	1	1	0	0	0	0	0	0	0	0	0
311	0	0	0	0	1	0	0	0	0	0	0	0	0
312	1	0	1	1	0	0	0	0	0	0	0	0	0
313	0	0	0	0	0	0	0	0	0	0	0	0	0
314	0	0	0	0	0	0	0	0	0	0	0	0	0
315	0	0	1	1	0	0	0	0	0	0	0	0	0
316	0	0	0	0	0	0	0	0	0	0	0	0	0
317	0	0	1	1	0	0	0	0	0	0	0	0	0
318	1	0	0	0	0	0	1	0	0	0	1	0	0
319	0	0	0	0	1	0	0	0	0	0	0	0	0
320	0	0	1	1	0	0	0	0	0	0	0	0	0

Sample	PC	PL	PS	PP	PU	COR	UT	BT	SUT	SAT	MT	OT	SOT
321	0	0	1	1	0	0	0	0	0	0	0	0	0
322	0	0	0	0	1	1	0	0	0	0	0	0	0
323	0	0	0	0	1	0	0	0	0	0	0	0	0
324	0	0	0	1	0	0	0	0	0	0	0	0	0
325	1	0	0	0	0	0	0	0	0	0	0	0	0
326	0	0	0	1	0	0	0	0	0	0	0	0	0
327	1	0	0	0	0	0	0	0	0	0	0	0	0
328	1	0	1	1	0	0	0	0	0	0	0	0	0
329	0	0	0	1	0	0	0	0	0	0	0	0	0
330	0	0	0	1	0	0	0	0	0	0	0	0	0
331	1	0	0	0	0	0	0	0	0	0	0	0	0
332	1	0	0	0	0	0	0	0	0	0	0	0	0
333	1	0	0	0	0	0	0	0	0	0	0	0	0
334	1	0	0	0	0	0	0	0	0	0	0	0	0
335	0	0	0	0	0	0	0	0	0	0	0	0	0
336	1	0	0	1	0	0	0	0	0	0	0	0	0
337	0	0	0	1	0	0	0	0	0	0	0	0	0
338	1	0	1	1	0	1	0	0	0	0	0	0	0
339	1	1	0	0	0	0	0	0	0	0	0	0	0
340	1	0	0	0	0	0	1	0	1	1	0	0	0
341	0	0	0	1	0	0	0	0	0	0	0	0	0
342	1	0	0	0	0	1	1	0	0	0	0	0	1
343	0	1	0	0	0	0	0	0	0	0	0	0	0
344	1	0	0	1	0	0	0	0	0	0	0	0	0
345	1	0	0	1	0	0	1	0	1	0	0	0	0
346	1	0	0	1	0	0	0	0	0	0	0	0	0
347	1	0	1	0	0	0	0	0	0	0	0	0	0
348	0	0	0	1	0	1	0	0	0	0	0	0	0

Sample	PC	PL	PS	PP	PU	COR	UT	BT	SUT	SAT	MT	OT	SOT
349	1	0	0	0	0	0	0	0	0	0	0	0	0
350	1	0	0	0	0	0	0	0	0	0	0	0	0
351	1	0	0	0	0	0	0	0	0	0	0	0	0
352	1	0	0	0	0	1	1	0	0	0	0	0	0
353	1	0	1	0	0	0	0	0	0	0	0	0	0
354	1	0	0	0	0	0	1	0	1	1	0	0	0
355	0	0	1	1	0	0	0	0	0	0	0	0	0
356	0	0	0	1	0	1	0	0	0	0	0	0	0
357	0	0	0	1	0	0	0	0	0	0	0	0	0
358	1	0	0	0	0	0	0	0	0	0	0	0	0
359	1	0	0	0	0	0	0	0	0	0	0	0	0
360	0	0	0	1	0	0	0	0	0	0	0	0	0
361	0	0	0	1	0	0	0	0	0	0	0	0	0
362	1	0	1	1	0	0	0	0	0	0	0	0	0
363	1	0	1	1	0	0	0	0	0	0	0	0	0
364	0	0	0	1	0	0	0	0	0	0	0	0	0
365	1	0	1	0	0	0	0	0	0	0	0	0	0
366	0	0	0	1	0	0	0	0	0	0	0	0	0
367	1	0	0	0	0	0	0	0	0	0	0	0	0
368	0	0	0	0	1	0	0	0	0	0	0	0	0
369	0	0	0	0	1	0	0	0	0	0	0	0	0
370	1	0	0	0	0	0	0	0	0	0	0	0	0
371	0	0	0	1	0	0	0	0	0	0	0	0	0
372	0	0	0	1	0	0	0	0	0	0	0	0	0
373	1	0	0	1	0	0	0	0	0	0	0	0	0
374	1	0	0	0	0	0	0	0	0	0	0	0	0
375	1	0	1	1	0	0	0	0	0	0	0	0	0
376	1	0	0	0	0	0	0	0	0	0	0	0	0

Sample	PC	PL	PS	PP	PU	COR	UT	BT	SUT	SAT	MT	OT	SOT
377	0	0	0	1	0	0	0	0	0	0	0	0	0
378	1	0	0	0	0	0	0	0	0	0	0	0	0
379	1	0	0	1	0	0	0	0	0	0	0	0	0
380	1	0	0	0	0	0	0	0	0	0	0	0	0
381	1	0	0	1	0	0	0	0	0	0	0	0	0
382	1	0	0	0	0	0	0	0	0	0	0	0	0
383	1	0	0	0	0	0	1	0	1	0	1	0	0
384	0	0	0	1	0	0	1	0	0	0	1	0	0
385	0	0	0	1	0	0	0	0	0	0	0	0	0
386	1	0	0	0	0	0	0	0	0	0	0	0	0
387	1	0	0	0	0	0	0	0	0	0	0	0	0
388	0	0	0	1	0	0	0	0	0	0	0	0	0
389	0	0	0	1	0	0	1	0	0	0	0	0	0
390	1	0	0	0	0	0	1	0	1	0	0	0	0
391	1	0	0	0	0	1	0	0	0	0	0	0	0
392	1	0	0	0	0	0	0	0	0	0	0	0	0
393	0	0	0	1	0	0	0	0	0	0	0	0	0
394	1	0	0	0	0	0	1	0	0	0	1	0	0
395	0	0	0	0	1	0	0	0	0	0	0	0	0
396	1	0	0	1	0	0	0	0	0	0	0	0	0
397	1	0	0	0	0	0	1	1	0	1	0	0	0
398	1	0	0	1	0	0	0	0	0	0	0	0	0
399	1	0	0	0	0	0	0	0	0	0	0	0	0
400	0	0	0	1	0	0	0	0	0	0	0	0	0
401	1	0	0	0	0	0	0	0	0	0	0	0	0
402	0	0	0	1	0	0	0	0	0	0	0	0	0
403	1	0	0	1	0	0	0	0	0	0	0	0	0
404	0	0	0	1	0	1	0	0	0	0	0	0	0

Sample	PC	PL	PS	PP	PU	COR	UT	BT	SUT	SAT	MT	OT	SOT
405	1	0	0	0	0	0	0	0	0	0	0	0	0
406	0	0	0	1	0	0	0	0	0	0	0	0	0
407	1	0	0	0	0	0	1	0	1	0	0	0	0
408	1	0	0	0	0	0	0	0	0	0	0	0	0
409	0	0	0	1	0	0	0	0	0	0	0	0	0
410	1	0	0	0	0	0	0	0	0	0	0	0	0
411	0	0	0	1	0	0	0	0	0	0	0	0	0
412	0	0	1	0	0	1	0	0	0	0	0	0	0
413	0	0	0	1	0	0	0	0	0	0	0	0	0
414	0	1	1	1	0	1	0	0	0	0	0	0	0
415	0	0	0	1	0	0	0	0	0	0	0	0	0
416	1	0	0	0	0	1	1	0	0	0	1	0	0
417	1	0	0	0	0	0	1	0	0	0	1	0	0
418	1	0	0	0	0	0	1	0	0	1	0	0	0
419	0	0	0	0	1	0	0	0	0	0	0	0	0
420	1	0	0	1	0	1	0	0	0	0	0	0	0
421	1	0	0	0	0	0	1	0	0	0	1	0	0
422	0	0	0	1	0	0	0	0	0	0	0	0	0
423	0	0	0	1	0	0	1	0	1	0	0	0	0
424	1	0	0	1	0	0	0	0	0	0	0	0	0
425	1	0	0	0	0	0	0	0	0	0	0	0	0
426	1	0	0	0	0	1	0	0	0	0	0	0	0
427	0	0	0	1	0	0	0	0	0	0	0	0	0
428	1	0	0	0	0	0	0	0	0	0	0	0	0
429	0	0	0	1	0	0	0	0	0	0	0	0	0
430	0	0	0	1	0	1	1	0	0	0	0	0	0
431	1	0	0	0	0	1	0	0	0	0	0	0	0
432	0	0	0	1	0	0	0	0	0	0	0	0	0

Sample	PC	PL	PS	PP	PU	COR	UT	BT	SUT	SAT	MT	OT	SOT
433	0	0	0	1	0	0	0	0	0	0	0	0	0
434	1	0	0	0	0	0	0	0	0	0	0	0	0
435	1	0	0	0	0	0	1	0	0	0	0	0	0
436	1	0	0	1	0	1	1	1	0	0	0	0	0
437	0	0	0	1	0	0	0	0	0	0	0	0	0
438	0	0	0	0	1	0	0	0	0	0	0	0	0
439	1	0	0	0	0	0	0	0	0	0	0	0	0
440	1	0	0	1	0	0	0	0	0	0	0	0	0
441	0	0	0	1	0	0	0	0	0	0	0	0	0
442	1	0	0	1	0	1	1	0	0	0	1	0	0
443	0	0	0	1	0	0	0	0	0	0	0	0	0
444	1	0	0	0	0	0	0	0	0	0	0	0	0
445	0	0	0	1	0	0	1	0	1	0	0	0	0
446	1	0	0	1	0	0	0	0	0	0	0	0	0
447	1	0	0	1	0	0	0	0	0	0	0	0	0
448	0	0	0	1	0	0	0	0	0	0	0	0	0
449	1	0	0	1	0	0	0	0	0	0	0	0	0
450	0	0	0	1	0	0	0	0	0	0	0	0	0
451	1	0	0	0	0	0	0	0	0	0	0	0	0
452	0	0	0	1	0	1	0	0	0	0	0	0	0
453	1	0	0	1	0	0	1	0	0	0	1	0	0
454	0	0	0	1	0	0	1	0	0	0	0	0	0
455	1	0	0	0	0	0	0	0	0	0	0	0	0
456	0	0	0	0	0	0	0	0	0	0	0	0	0
457	1	0	0	1	0	1	0	0	0	0	0	0	0
458	0	0	0	1	0	0	1	0	0	0	1	0	0
459	1	0	0	0	0	0	1	0	1	0	0	0	0
460	1	0	0	1	0	0	1	0	0	0	1	0	0

Sample	PC	PL	PS	PP	PU	COR	UT	BT	SUT	SAT	MT	OT	SOT
461	0	0	0	1	0	0	0	0	0	0	0	0	0
462	1	0	0	0	0	1	0	0	0	0	0	0	0
463	1	0	0	0	0	0	0	0	0	0	0	0	0
464	0	0	0	0	0	0	0	0	0	0	0	0	0
465	0	0	0	1	0	0	0	0	0	0	0	0	0
466	0	0	0	1	0	0	0	0	0	0	0	0	0
467	1	0	0	0	0	0	0	0	0	0	0	0	0
468	0	0	0	1	0	0	0	0	0	0	0	0	0
469	0	0	0	1	0	0	0	0	0	0	0	0	0
470	1	0	0	0	0	0	0	0	0	0	0	0	0
471	1	0	0	1	0	0	0	0	0	0	0	0	0
472	1	0	0	1	0	1	0	0	0	0	0	0	0
473	0	0	0	1	0	0	1	0	0	0	1	0	0
474	1	0	0	0	0	1	0	0	0	0	0	0	0
475	0	0	0	1	0	1	1	0	0	0	1	0	0
476	0	0	0	1	0	0	0	0	0	0	0	0	0
477	0	0	0	1	0	0	0	0	0	0	0	0	0
478	1	0	0	1	0	0	0	0	0	0	0	0	0
479	0	0	0	1	0	0	0	0	0	0	0	0	0
480	0	0	0	1	0	0	0	0	0	0	0	0	0
481	0	0	0	1	0	0	0	0	0	0	0	0	0
482	1	0	0	0	0	0	1	0	1	0	0	0	0
483	1	0	0	0	0	0	0	0	0	0	0	0	0
484	0	0	0	1	0	0	0	0	0	0	0	0	0
485	0	0	0	1	0	0	0	0	0	0	0	0	0
486	1	0	0	0	0	1	0	0	0	0	0	0	0
487	1	0	0	1	0	1	0	0	0	0	0	0	0
488	0	0	0	1	0	0	0	0	0	0	0	0	0

Sample	PC	PL	PS	PP	PU	COR	UT	BT	SUT	SAT	MT	OT	SOT
489	1	0	0	0	0	0	0	0	0	0	0	0	0
490	1	0	0	1	0	0	1	0	0	0	0	0	0
491	1	0	0	1	0	0	1	0	1	0	1	0	0
492	0	0	0	1	0	0	0	0	0	0	0	0	0
493	0	0	0	1	0	1	0	0	0	0	0	0	0
494	1	0	0	1	0	0	0	0	0	0	0	0	0
495	0	0	0	1	0	0	0	0	0	0	0	0	0
496	0	0	0	1	0	0	0	0	0	0	0	0	0
497	1	0	0	0	0	0	0	0	0	0	0	0	0
498	1	0	0	1	0	0	0	0	0	0	0	0	0
499	0	0	0	1	0	0	0	0	0	0	0	0	0
500	0	0	0	1	0	0	1	0	1	0	1	0	0
501	1	0	0	1	0	0	0	0	0	0	0	0	0
502	0	0	0	1	0	0	0	0	0	0	0	0	0
503	1	0	0	0	0	0	0	0	0	0	0	0	0
504	1	0	0	0	0	0	0	0	0	0	0	0	0
505	1	0	0	1	0	0	0	0	0	0	0	0	0
506	1	0	0	1	0	0	0	0	0	0	0	0	0
507	0	0	0	1	0	0	0	0	0	0	0	0	0
508	0	0	1	0	0	0	0	0	0	0	0	0	0
509	1	0	0	1	0	1	0	0	0	0	0	0	0
510	0	0	0	1	0	1	1	0	1	1	0	0	0
511	1	0	0	1	0	0	0	0	0	0	0	0	0
512	1	0	0	0	1	0	0	0	0	0	0	0	0
513	1	0	0	1	0	0	0	0	0	0	0	0	0
514	0	0	0	1	0	0	0	0	0	0	0	0	0
515	0	0	0	1	0	1	0	0	0	0	0	0	0
516	0	0	0	1	0	0	0	0	0	0	0	0	0

Sample	PC	PL	PS	PP	PU	COR	UT	BT	SUT	SAT	MT	OT	SOT
517	0	0	0	1	0	0	1	1	0	0	0	0	0
518	1	0	0	0	0	0	1	1	0	0	0	0	0
519	0	0	0	1	0	0	0	0	0	0	0	0	0
520	0	0	0	1	0	0	0	0	0	0	0	0	0
521	1	0	0	0	0	0	1	1	0	0	1	0	0
522	0	0	0	1	0	0	0	0	0	0	0	0	0
523	0	0	0	1	0	0	0	0	0	0	0	0	0
524	1	0	1	1	0	1	1	1	0	0	0	0	0
525	0	0	0	1	0	0	0	0	0	0	0	0	0
526	1	0	0	1	0	0	0	0	0	0	0	0	0
527	0	0	0	1	0	0	0	0	0	0	0	0	0
528	0	0	0	1	0	0	0	0	0	0	0	0	0
529	0	0	0	1	0	0	0	0	0	0	0	0	0
530	0	0	0	1	0	0	1	0	0	0	1	0	0
531	1	0	1	1	0	0	0	0	0	0	0	0	0
532	0	0	0	0	1	0	0	0	0	0	0	0	0
533	0	0	0	1	0	0	0	0	0	0	0	0	0
534	1	0	0	1	0	0	0	0	0	0	0	0	0
535	0	0	0	1	0	1	1	0	0	0	1	0	0
536	0	0	0	1	0	0	0	0	0	0	0	0	0
537	0	0	0	1	0	0	0	0	0	0	0	0	0
538	1	0	1	1	0	0	0	0	0	0	0	0	0
539	1	0	0	0	0	0	1	0	0	0	1	0	0
540	0	0	0	1	0	0	0	0	0	0	0	0	0
541	0	0	0	1	0	0	0	0	0	0	0	0	0
542	0	0	0	1	0	0	0	0	0	0	0	0	0
543	0	0	0	1	0	0	0	0	0	0	0	0	0
544	0	0	0	1	0	0	0	0	0	0	0	0	0

Sample	PC	PL	PS	PP	PU	COR	UT	BT	SUT	SAT	MT	OT	SOT
545	0	0	0	1	0	0	0	0	0	0	0	0	0
546	0	0	0	1	0	0	0	0	0	0	0	0	0
547	1	0	0	0	0	0	0	0	0	0	0	0	0
548	0	0	0	1	0	0	0	0	0	0	0	0	0
549	0	0	0	1	0	0	0	0	0	0	0	0	0
550	0	0	0	1	0	0	0	0	0	0	0	0	0
551	0	0	0	1	0	1	0	0	0	0	0	0	0
552	1	0	0	0	0	0	0	0	0	0	0	0	0
553	0	0	0	1	0	0	0	0	0	0	0	0	0
554	0	0	0	1	0	0	0	0	0	0	0	0	0
555	1	0	0	1	0	0	0	0	0	0	0	0	0
556	0	0	0	1	0	0	0	0	0	0	0	0	0
557	1	0	0	1	0	0	0	0	0	0	0	0	0
558	1	0	0	1	0	0	0	0	0	0	0	0	0
559	1	0	0	0	0	0	0	0	0	0	0	0	0
560	0	0	1	0	0	1	1	1	1	0	0	0	0
561	1	0	0	0	0	0	0	0	0	0	0	0	0
562	1	0	0	1	0	0	0	0	0	0	0	0	0
563	1	0	0	1	0	0	0	0	0	0	0	0	0
564	0	0	0	1	0	0	0	0	0	0	0	0	0
565	1	0	0	1	0	0	0	0	0	0	0	0	0
566	1	0	0	1	0	0	0	0	0	0	0	0	0
567	0	0	0	1	0	0	0	0	0	0	0	0	0
568	0	0	0	1	0	0	0	0	0	0	0	0	0
569	1	0	0	1	0	0	0	0	0	0	0	0	0
570	1	0	0	1	0	1	0	0	0	0	0	0	0
571	1	0	0	1	0	0	0	0	0	0	0	0	0
572	0	0	0	1	0	0	0	0	0	0	0	0	0

Sample	PC	PL	PS	PP	PU	COR	UT	BT	SUT	SAT	MT	OT	SOT
573	0	0	0	1	0	0	0	0	0	0	0	0	0
574	1	0	0	0	0	0	0	0	0	0	0	0	0
575	0	0	0	1	0	0	0	0	0	0	0	0	0
576	0	0	0	1	0	0	0	0	0	0	0	0	0
577	1	0	0	1	0	0	0	0	0	0	0	0	0
578	0	0	0	1	0	0	0	0	0	0	0	0	0
579	0	0	0	1	0	0	0	0	0	0	0	0	0
580	0	0	0	1	0	0	0	0	0	0	0	0	0
581	0	0	0	1	0	0	0	0	0	0	0	0	0
582	0	0	0	1	0	0	0	0	0	0	0	0	0
583	0	0	0	1	0	0	0	0	0	0	0	0	0
584	0	0	0	1	0	0	0	0	0	0	0	0	0
585	1	0	0	1	0	0	0	0	0	0	0	0	0
586	0	0	1	1	0	0	0	0	0	0	0	0	0
587	0	0	0	1	0	0	0	0	0	0	0	0	0
588	0	0	0	1	0	0	0	0	0	0	0	0	0
589	1	0	0	1	0	0	0	0	0	0	0	0	0
590	0	0	1	1	0	1	1	0	0	0	0	0	0
591	1	0	0	0	0	0	1	0	0	0	1	0	0
592	1	0	0	1	0	0	0	0	0	0	0	0	0
593	1	0	0	1	0	0	0	0	0	0	0	0	0
594	1	0	0	1	0	0	0	0	0	0	0	0	0
595	0	0	1	1	0	0	0	0	0	0	0	0	0
596	0	0	0	1	0	0	0	0	0	0	0	0	0
597	0	0	0	1	0	0	0	0	0	0	0	0	0
598	1	0	0	1	0	0	0	0	0	0	0	0	0
599	0	0	0	1	0	0	0	0	0	0	0	0	0
600	1	0	0	1	0	0	0	0	0	0	0	0	0

Sample	PC	PL	PS	PP	PU	COR	UT	BT	SUT	SAT	MT	OT	SOT
601	0	0	0	1	0	0	0	0	0	0	0	0	0
602	1	0	0	1	0	0	0	0	0	0	0	0	0
603	1	0	0	1	0	0	0	0	0	0	0	0	0
604	0	0	0	1	0	0	0	0	0	0	0	0	0
605	1	0	0	1	0	0	0	0	0	0	0	0	0
606	0	0	0	1	0	0	0	0	0	0	0	0	0
607	1	0	0	1	0	0	0	0	0	0	0	0	0
608	0	0	0	1	0	0	0	0	0	0	0	0	0
609	1	0	0	0	0	1	0	0	0	0	0	0	0
610	1	0	1	0	0	0	0	0	0	0	0	0	0
611	0	0	0	1	0	0	0	0	0	0	0	0	0
612	1	0	0	1	0	1	1	0	1	0	0	0	0
613	0	0	0	1	0	0	0	0	0	0	0	0	0
614	0	0	0	1	0	0	0	0	0	0	0	0	0
615	0	0	0	1	0	1	0	0	0	0	0	0	0
616	0	0	0	1	0	1	0	0	0	0	0	0	0
617	1	0	0	1	0	0	0	0	0	0	0	0	0
618	1	0	0	1	0	0	0	0	0	0	0	0	0
619	0	0	0	1	0	0	0	0	0	0	0	0	0
620	0	0	0	1	0	0	0	0	0	0	0	0	0
621	1	0	0	1	0	1	0	0	0	0	0	0	0
622	0	0	0	1	0	0	0	0	0	0	0	0	0
623	0	0	0	1	0	0	0	0	0	0	0	0	0
624	1	0	0	1	0	0	0	0	0	0	0	0	0
625	0	0	0	1	0	0	0	0	0	0	0	0	0
626	0	0	0	1	0	0	0	0	0	0	0	0	0
627	1	0	1	1	0	0	0	0	0	0	0	0	0
628	0	0	0	1	0	0	0	0	0	0	0	0	0

Sample	PC	PL	PS	PP	PU	COR	UT	BT	SUT	SAT	MT	OT	SOT
629	1	0	0	1	0	1	0	0	0	0	0	0	0
630	0	0	0	1	0	0	1	0	1	0	1	0	0
631	0	0	0	1	0	0	0	0	0	0	0	0	0
632	0	0	0	1	0	0	0	0	0	0	0	0	0
633	0	0	0	1	0	0	0	0	0	0	0	0	0
634	0	0	0	1	0	0	1	0	1	0	0	0	0
635	0	0	0	1	0	0	0	0	0	0	0	0	0
636	1	0	0	1	0	0	0	0	0	0	0	0	0
637	0	0	0	1	0	0	0	0	0	0	0	0	0
638	0	0	0	1	0	0	1	0	0	0	0	0	0
639	0	0	0	1	0	1	0	0	0	0	0	0	0
640	0	0	0	1	0	0	0	0	0	0	0	0	0
641	0	0	0	1	0	0	0	0	0	0	0	0	0
642	0	0	0	1	0	0	0	0	0	0	0	0	0
643	0	0	0	1	0	0	0	0	0	0	0	0	0
644	0	0	0	1	0	0	0	0	0	0	0	0	0
645	0	0	0	1	1	0	0	0	0	0	0	0	0
646	0	0	0	1	0	1	0	0	0	0	0	0	0
647	1	0	1	1	0	0	0	0	0	0	0	0	0
648	1	0	1	1	0	0	0	0	0	0	0	0	0
649	0	0	0	1	0	0	1	0	1	0	0	0	0
650	0	0	0	1	0	0	0	0	0	0	0	0	0
651	1	0	1	1	0	1	0	0	0	0	0	0	0
652	0	0	0	1	0	1	0	0	0	0	0	0	0
653	1	0	1	1	0	0	0	0	0	0	0	0	0
654	0	0	0	1	0	0	0	0	0	0	0	0	0
655	1	0	0	1	0	1	0	0	0	0	0	0	0
656	0	0	0	1	0	0	0	0	0	0	0	0	0

Sample	PC	PL	PS	PP	PU	COR	UT	BT	SUT	SAT	MT	OT	SOT
657	1	0	0	1	0	0	1	0	0	0	0	0	0
658	0	0	0	1	0	0	0	0	0	0	0	0	0
659	0	0	0	1	0	0	0	0	0	0	0	0	0
660	1	0	0	0	0	0	0	0	0	0	0	0	0
661	0	0	0	1	0	0	0	0	0	0	0	0	0
662	1	0	0	1	0	0	0	0	0	0	0	0	0
663	0	0	0	1	0	0	0	0	0	0	0	0	0
664	0	0	0	1	0	1	0	0	0	0	0	0	0
665	0	0	0	0	1	0	0	0	0	0	0	0	0
666	0	0	0	1	0	0	0	0	0	0	0	0	0
667	0	0	0	1	0	0	0	0	0	0	0	0	0
668	1	0	0	0	0	0	0	0	0	0	0	0	0
669	0	0	1	1	0	0	0	0	0	0	0	0	0
670	0	0	0	1	0	0	0	0	0	0	0	0	0
671	0	0	0	1	0	0	0	0	0	0	0	0	0
672	0	0	0	1	0	0	0	0	0	0	0	0	0
673	0	0	0	1	0	0	0	0	0	0	0	0	0
674	0	0	1	1	0	0	0	0	0	0	0	0	0
675	0	0	0	1	0	0	0	0	0	0	0	0	0
676	1	0	0	1	0	1	1	0	0	0	0	0	0
677	0	0	0	1	0	0	0	0	0	0	0	0	0
678	0	0	0	1	0	0	0	0	0	0	0	0	0
679	0	0	0	1	0	0	0	0	0	0	0	0	0
680	0	0	0	1	0	0	0	0	0	0	0	0	0
681	0	0	0	0	1	0	0	0	0	0	0	0	0
682	1	0	0	1	0	0	0	0	0	0	0	0	0
683	0	0	0	1	0	0	0	0	0	0	0	0	0
684	0	0	0	1	0	0	1	0	1	0	0	0	0

Sample	PC	PL	PS	PP	PU	COR	UT	BT	SUT	SAT	MT	OT	SOT
685	0	0	0	1	0	0	0	0	0	0	0	0	0
686	1	0	0	0	0	0	0	0	0	0	0	0	0
687	0	0	0	1	0	0	0	0	0	0	0	0	0
688	0	0	0	1	0	0	0	0	0	0	0	0	0
689	0	0	0	1	0	0	0	0	0	0	0	0	0
690	0	0	0	1	0	0	0	0	0	0	0	0	0
691	1	0	0	1	0	1	0	0	0	0	0	0	0
692	0	0	0	1	0	0	0	0	0	0	0	0	0
693	0	0	0	1	0	0	0	0	0	0	0	0	0
694	1	0	0	1	0	1	0	0	0	0	0	0	0
695	1	0	0	1	0	1	0	0	0	0	0	0	0
696	1	0	0	1	0	0	0	0	0	0	0	0	0
697	1	0	0	0	0	0	0	0	0	0	0	0	0
698	1	0	0	1	0	0	0	0	0	0	0	0	0
699	1	0	0	1	0	0	0	0	0	0	0	0	0
700	1	0	0	1	0	0	0	0	0	0	0	0	0
701	0	0	0	1	0	0	0	0	0	0	0	0	0
702	0	0	0	1	0	0	0	0	0	0	0	0	0
703	0	0	0	1	0	0	0	0	0	0	0	0	0
704	0	0	0	1	0	0	0	0	0	0	0	0	0
705	0	0	0	1	0	0	0	0	0	0	0	0	0
706	1	0	0	0	0	0	0	0	0	0	0	0	0
707	1	0	0	0	0	0	0	0	0	0	0	0	0
708	1	0	0	0	0	0	0	0	0	0	0	0	0
709	1	0	1	0	0	0	0	0	0	0	0	0	0
710	1	0	0	1	0	0	0	0	0	0	0	0	0
711	0	0	0	1	0	0	1	0	0	0	0	0	0
712	1	0	0	1	0	0	0	0	0	0	0	0	0

Sample	PC	PL	PS	PP	PU	COR	UT	BT	SUT	SAT	MT	OT	SOT
713	0	0	0	0	1	1	1	0	1	1	0	1	0
714	0	0	0	0	1	1	1	0	1	0	0	0	0
715	1	0	1	1	0	0	0	0	0	0	0	0	0
716	0	0	0	1	0	0	0	0	0	0	0	0	0
717	1	0	0	1	0	0	1	0	1	0	0	1	1
718	1	0	0	1	0	0	0	0	0	0	0	0	0
719	1	0	0	0	0	0	0	0	0	0	0	0	0
720	1	0	0	0	0	0	0	0	0	0	0	0	0
721	0	0	0	1	0	0	0	0	0	0	0	0	0
722	0	0	0	1	0	0	1	0	1	0	0	0	0
723	1	0	0	1	0	0	0	0	0	0	0	0	0
724	1	0	0	0	0	0	0	0	0	0	0	0	0
725	1	0	0	0	0	0	0	0	0	0	0	0	0
726	1	0	0	0	0	0	0	0	0	0	0	0	0
727	1	0	0	1	0	0	1	0	0	1	0	0	0
728	0	0	0	1	0	0	0	0	0	0	0	0	0
729	1	0	1	1	0	0	0	0	0	0	0	0	0
730	1	0	1	1	0	0	0	0	0	0	0	0	0
731	1	0	0	1	0	0	0	0	0	0	0	0	0
732	1	0	1	0	0	0	1	0	1	0	0	1	0
733	0	0	0	1	0	0	0	0	0	0	0	0	0
734	1	0	0	0	0	0	0	0	0	0	0	0	0
735	1	0	0	0	0	0	1	1	0	0	0	0	0
736	1	0	0	1	0	0	0	0	0	0	0	0	0
737	0	0	0	1	0	1	1	0	0	0	1	0	0
738	1	0	0	1	0	0	0	0	0	0	0	0	0
739	0	0	0	1	0	1	1	0	0	0	0	0	0
740	0	0	0	1	0	0	0	0	0	0	0	0	0

Sample	PC	PL	PS	PP	PU	COR	UT	BT	SUT	SAT	MT	OT	SOT
741	1	1	0	0	0	0	0	0	0	0	0	0	0
742	0	0	0	1	0	1	1	0	0	0	1	0	0
743	1	0	0	0	0	0	0	0	0	0	0	0	0
744	1	0	1	1	0	0	0	0	0	0	0	0	0
745	0	0	0	0	1	0	0	0	0	0	0	0	0
746	1	0	0	1	0	0	0	0	0	0	0	0	0
747	0	0	0	0	1	0	0	0	0	0	0	0	0
748	1	0	0	0	0	0	0	0	0	0	0	0	0
749	0	0	0	1	0	0	0	0	0	0	0	0	0
750	1	0	0	1	0	0	0	0	0	0	0	0	0
751	0	0	0	1	0	0	0	0	0	0	0	0	0
752	1	0	0	0	0	0	0	0	0	0	0	0	0
753	0	0	0	1	0	0	0	0	0	0	0	0	0
754	0	0	0	1	0	0	0	0	0	0	0	0	0
755	1	0	0	0	0	0	0	0	0	0	0	0	0
756	0	0	0	1	0	1	1	0	1	0	0	0	0
757	0	0	0	0	1	0	0	0	0	0	0	0	0
758	1	0	0	0	0	0	0	0	0	0	0	0	0
759	0	0	0	1	0	0	0	0	0	0	0	0	0
760	0	0	0	1	0	0	1	0	0	0	0	0	0
761	1	0	0	1	0	0	0	0	0	0	0	0	0
762	1	1	1	0	0	0	0	0	0	0	0	0	0
763	0	0	0	1	0	0	1	1	0	0	1	0	0
764	0	0	0	1	0	0	0	0	0	0	0	0	0
765	0	0	0	1	0	1	0	0	0	0	0	0	0
766	0	0	0	0	0	0	0	0	0	0	0	0	0
767	1	0	0	1	0	0	0	0	0	0	0	0	0
768	1	0	1	1	0	0	0	0	0	0	0	0	0

Sample	PC	PL	PS	PP	PU	COR	UT	BT	SUT	SAT	MT	OT	SOT
769	1	0	0	0	0	0	0	0	0	0	0	0	0
770	0	0	0	1	0	0	0	0	0	0	0	0	0
771	1	0	0	0	0	0	0	0	0	0	0	0	0
772	1	0	0	0	0	0	0	0	0	0	0	0	0
773	1	0	0	1	0	0	0	0	0	0	0	0	0
774	1	0	0	0	0	0	0	0	0	0	0	0	0
775	1	0	0	1	0	0	0	0	0	0	0	0	0
776	0	0	0	1	0	0	0	0	0	0	0	0	0
777	1	0	0	0	0	1	1	0	0	0	0	0	0
778	0	0	0	1	0	0	1	0	1	0	0	0	0
779	1	0	0	1	0	0	0	0	0	0	0	0	0
780	0	0	0	1	0	0	0	0	0	0	0	0	0
781	1	0	0	1	0	0	0	0	0	0	0	0	0
782	0	0	0	1	0	0	0	0	0	0	0	0	0
783	1	0	0	1	0	0	0	0	0	0	0	0	0
784	1	0	0	0	0	0	0	0	0	0	0	0	0
785	0	0	0	1	0	0	0	0	0	0	0	0	0
786	1	0	0	1	0	0	0	0	0	0	0	0	0
787	1	0	0	1	0	0	0	0	0	0	0	0	0
788	0	0	0	1	0	0	0	0	0	0	0	0	0
789	0	0	0	1	0	0	0	0	0	0	0	0	0
790	0	0	0	1	0	0	0	0	0	0	0	0	0
791	0	0	0	1	0	0	0	0	0	0	0	0	0
792	1	0	0	0	0	0	1	0	0	0	1	1	0
793	1	0	0	1	0	0	0	0	0	0	0	0	0
794	0	0	0	1	0	0	0	0	0	0	0	0	0
795	1	0	0	1	0	1	0	0	0	0	0	0	0
796	0	0	0	1	0	0	0	0	0	0	0	0	0

Sample	PC	PL	PS	PP	PU	COR	UT	BT	SUT	SAT	MT	OT	SOT
797	0	0	0	1	0	0	1	0	0	0	1	0	0
798	1	0	1	0	0	0	0	0	0	0	0	0	0
799	0	0	0	1	0	0	0	0	0	0	0	0	0
800	1	0	0	0	0	0	0	0	0	0	0	0	0
801	0	0	0	0	0	0	1	0	1	0	0	0	0
802	1	0	0	0	0	0	0	0	0	0	0	0	0
803	1	0	0	1	0	0	0	0	0	0	0	0	0
804	1	0	0	0	0	0	0	0	0	0	0	0	0
805	1	0	0	1	0	0	0	0	0	0	0	0	0
806	0	0	0	1	0	0	0	0	0	0	0	0	0
807	1	0	0	0	0	0	1	0	0	0	1	0	0
808	1	0	0	1	0	0	0	0	0	0	0	0	0
809	1	0	0	1	0	1	0	0	0	0	0	0	0
810	1	0	0	0	0	0	0	0	0	0	0	0	0
811	0	0	0	0	1	0	0	0	0	0	0	0	0
812	1	0	0	0	0	1	0	0	0	0	0	0	0
813	1	0	0	0	0	0	1	1	0	0	0	0	0
814	1	0	0	1	0	1	0	0	0	0	0	0	0
815	1	0	0	1	0	1	1	1	1	0	0	0	0
816	1	0	0	0	0	0	0	0	0	0	0	0	0
817	0	0	0	1	0	1	1	0	1	0	0	0	0
818	0	0	0	1	0	1	1	0	1	0	0	0	0
819	1	0	0	0	0	0	1	0	0	1	0	0	0
820	1	0	0	0	0	0	0	0	0	0	0	0	0
821	1	0	0	0	0	1	0	0	0	0	0	0	0
822	1	0	0	0	0	0	0	0	0	0	0	0	0
823	1	0	0	0	0	0	1	0	0	0	0	0	0
824	1	0	0	0	0	0	0	0	0	0	0	0	0

Sample	PC	PL	PS	PP	PU	COR	UT	BT	SUT	SAT	MT	OT	SOT
825	1	0	0	0	0	1	0	0	0	0	0	0	0
826	1	0	0	1	0	0	0	0	0	0	0	0	0
827	1	0	0	0	0	0	0	0	0	0	0	0	0
828	0	0	0	0	1	0	0	0	0	0	0	0	0
829	1	0	0	0	0	0	0	0	0	0	0	0	0
830	1	0	0	0	0	0	0	0	0	0	0	0	0
831	0	0	0	1	0	0	0	0	0	0	0	0	0

8.7 Sample Odor and Color

Sample	OO	SO	KO	MO	CO	UC	MUC	MIC	BC	YC	OC
1	0	0	0	0	0	0	0	0	0	0	0
2	0	0	0	0	0	0	0	0	0	0	0
3	1	0	0	1	0	1	0	0	0	0	0
4	0	0	0	0	0	0	0	0	0	0	0
5	0	0	0	0	0	0	0	0	0	0	0
6	0	0	0	0	0	0	0	0	0	0	0
7	0	0	0	0	0	0	0	0	0	0	0
8	0	0	0	0	0	0	0	0	0	0	0
9	0	0	0	0	0	0	0	0	0	0	0
10	0	0	0	0	0	0	0	0	0	0	0
11	0	0	0	0	0	0	0	0	0	0	0
12	0	0	0	0	0	0	0	0	0	0	0
13	0	0	0	0	0	0	0	0	0	0	0
14	0	0	0	0	0	0	0	0	0	0	0
15	0	0	0	0	0	0	0	0	0	0	0
16	0	0	0	0	0	0	0	0	0	0	0
17	0	0	0	0	0	0	0	0	0	0	0

Sample	OO	SO	KO	MO	CO	UC	MUC	MIC	BC	YC	OC
18	1	1	0	0	0	0	0	0	0	0	0
19	0	0	0	0	0	0	0	0	0	0	0
20	0	0	0	0	0	0	0	0	0	0	0
21	0	0	0	0	0	0	0	0	0	0	0
22	0	0	0	0	0	0	0	0	0	0	0
23	0	0	0	0	0	0	0	0	0	0	0
24	1	1	0	0	0	0	0	0	0	0	0
25	0	0	0	0	0	0	0	0	0	0	0
26	0	0	0	0	0	0	0	0	0	0	0
27	0	0	0	0	0	0	0	0	0	0	0
28	0	0	0	0	0	0	0	0	0	0	0
29	0	0	0	0	0	0	0	0	0	0	0
30	0	0	0	0	0	0	0	0	0	0	0
31	0	0	0	0	0	0	0	0	0	0	0
32	0	0	0	0	0	0	0	0	0	0	0
33	0	0	0	0	0	0	0	0	0	0	0
34	0	0	0	0	0	0	0	0	0	0	0
35	0	0	0	0	0	0	0	0	0	0	0
36	0	0	0	0	0	0	0	0	0	0	0
37	0	0	0	0	0	0	0	0	0	0	0
38	0	0	0	0	0	0	0	0	0	0	0
39	0	0	0	0	0	0	0	0	0	0	0
40	0	0	0	0	0	0	0	0	0	0	0
41	0	0	0	0	0	0	0	0	0	0	0
42	1	1	0	0	0	0	0	0	0	0	0
43	0	0	0	0	0	0	0	0	0	0	0
44	0	0	0	0	0	0	0	0	0	0	0
45	0	0	0	0	0	0	0	0	0	0	0

Sample	OO	SO	KO	MO	CO	UC	MUC	MIC	BC	YC	OC
46	0	0	0	0	0	0	0	0	0	0	0
47	0	0	0	0	0	0	0	0	0	0	0
48	1	0	0	0	0	1	0	0	0	0	0
49	0	0	0	0	0	0	0	0	0	0	0
50	0	0	0	0	0	0	0	0	0	0	0
51	0	0	0	0	0	0	0	0	0	0	0
52	1	0	0	1	0	0	0	0	0	0	0
53	0	0	0	0	0	0	0	0	0	0	0
54	0	0	0	0	0	0	0	0	0	0	0
55	0	0	0	0	0	0	0	0	0	0	0
56	1	1	0	0	0	0	0	0	0	0	0
57	1	1	0	0	0	0	0	0	0	0	0
58	0	0	0	0	0	1	1	0	0	0	0
59	1	0	0	0	1	0	0	0	0	0	0
60	0	0	0	0	0	0	0	0	0	0	0
61	0	0	0	0	0	0	0	0	0	0	0
62	0	0	0	0	0	0	0	0	0	0	0
63	0	0	0	0	0	0	0	0	0	0	0
64	0	0	0	0	0	0	0	0	0	0	0
65	1	1	0	0	0	0	0	0	0	0	0
66	1	1	0	0	0	0	0	0	0	0	0
67	1	1	0	0	0	0	0	0	0	0	0
68	0	0	0	0	0	0	0	0	0	0	0
69	0	0	0	0	0	0	0	0	0	0	0
70	1	0	0	0	0	0	0	0	0	0	0
71	0	0	0	0	0	0	0	0	0	0	0
72	0	0	0	0	0	0	0	0	0	0	0
73	0	0	0	0	0	0	0	0	0	0	0

Sample	OO	SO	KO	MO	CO	UC	MUC	MIC	BC	YC	OC
74	0	0	0	0	0	0	0	0	0	0	0
75	0	0	0	0	0	0	0	0	0	0	0
76	0	0	0	0	0	0	0	0	0	0	0
77	0	0	0	0	0	0	0	0	0	0	0
78	0	0	0	0	0	0	0	0	0	0	0
79	0	0	0	0	0	1	0	0	0	0	0
80	0	0	0	0	0	0	0	0	0	0	0
81	1	1	0	0	0	0	0	0	0	0	0
82	0	0	0	0	0	0	0	0	0	0	0
83	0	0	0	0	0	0	0	0	0	0	0
84	0	0	0	0	0	0	0	0	0	0	0
85	0	0	0	0	0	0	0	0	0	0	0
86	0	0	0	0	0	0	0	0	0	0	0
87	0	0	0	0	0	0	0	0	0	0	0
88	0	0	0	0	0	0	0	0	0	0	0
89	0	0	0	0	0	0	0	0	0	0	0
90	0	0	0	0	0	0	0	0	0	0	0
91	0	0	0	0	0	0	0	0	0	0	0
92	0	0	0	0	0	0	0	0	0	0	0
93	0	0	0	0	0	0	0	0	0	0	0
94	0	0	0	0	0	0	0	0	0	0	0
95	0	0	0	0	0	0	0	0	0	0	0
96	0	0	0	0	0	0	0	0	0	0	0
97	1	1	0	0	0	0	0	0	0	0	0
98	0	0	0	0	0	0	0	0	0	0	0
99	0	0	0	0	0	0	0	0	0	0	0
100	0	0	0	0	0	0	0	0	0	0	0
101	0	0	0	0	0	0	0	0	0	0	0

Sample	OO	SO	KO	MO	CO	UC	MUC	MIC	BC	YC	OC
102	1	0	0	0	0	0	0	0	0	0	0
103	0	0	0	0	0	0	0	0	0	0	0
104	0	0	0	0	0	0	0	0	0	0	0
105	0	0	0	0	0	0	0	0	0	0	0
106	0	0	0	0	0	0	0	0	0	0	0
107	0	0	0	0	0	0	0	0	0	0	0
108	1	1	0	0	0	0	0	0	0	0	0
109	0	0	0	0	0	0	0	0	0	0	0
110	0	0	0	0	0	0	0	0	0	0	0
111	0	0	0	0	0	0	0	0	0	0	0
112	1	1	0	0	0	0	0	0	0	0	0
113	0	0	0	0	0	0	0	0	0	0	0
114	0	0	0	0	0	0	0	0	0	0	0
115	0	0	0	0	0	0	0	0	0	0	0
116	0	0	0	0	0	0	0	0	0	0	0
117	0	0	0	0	0	0	0	0	0	0	0
118	0	0	0	0	0	0	0	0	0	0	0
119	1	1	0	0	0	0	0	0	0	0	0
120	0	0	0	0	0	0	0	0	0	0	0
121	1	1	0	0	0	0	0	0	0	0	0
122	0	0	0	0	0	0	0	0	0	0	0
123	0	0	0	0	0	0	0	0	0	0	0
124	1	1	0	0	0	0	0	0	0	0	0
125	1	0	0	1	0	0	0	0	0	0	0
126	1	1	0	0	0	0	0	0	0	0	0
127	0	0	0	0	0	0	0	0	0	0	0
128	0	0	0	0	0	0	0	0	0	0	0
129	1	1	0	0	0	0	0	0	0	0	0

Sample	OO	SO	KO	MO	CO	UC	MUC	MIC	BC	YC	OC
130	1	1	0	0	0	0	0	0	0	0	0
131	1	1	0	0	0	1	0	0	0	1	0
132	0	0	0	0	0	0	0	0	0	0	0
133	0	0	0	0	0	0	0	0	0	0	0
134	0	0	0	0	0	0	0	0	0	0	0
135	0	0	0	0	0	0	0	0	0	0	0
136	0	0	0	0	0	0	0	0	0	0	0
137	1	1	0	0	0	0	0	0	0	0	0
138	0	0	0	0	0	0	0	0	0	0	0
139	0	0	0	0	0	0	0	0	0	0	0
140	0	0	0	0	0	0	0	0	0	0	0
141	0	0	0	0	0	0	0	0	0	0	0
142	0	0	0	0	0	0	0	0	0	0	0
143	0	0	0	0	0	0	0	0	0	0	0
144	0	0	0	0	0	0	0	0	0	0	0
145	0	0	0	0	0	0	0	0	0	0	0
146	0	0	0	0	0	0	0	0	0	0	0
147	0	0	0	0	0	0	0	0	0	0	0
148	0	0	0	0	0	0	0	0	0	0	0
149	0	0	0	0	0	0	0	0	0	0	0
150	0	0	0	0	0	0	0	0	0	0	0
151	1	1	0	0	0	0	0	0	0	0	0
152	1	1	0	0	0	0	0	0	0	0	0
153	0	0	0	0	0	0	0	0	0	0	0
154	0	0	0	0	0	0	0	0	0	0	0
155	0	0	0	0	0	0	0	0	0	0	0
156	0	0	0	0	0	0	0	0	0	0	0
157	1	1	0	0	0	1	0	0	1	0	0

Sample	OO	SO	KO	MO	CO	UC	MUC	MIC	BC	YC	OC
158	0	0	0	0	0	1	0	1	0	0	0
159	0	0	0	0	0	0	0	0	0	0	0
160	1	1	0	0	0	0	0	0	0	0	0
161	1	1	0	0	0	0	0	0	0	0	0
162	1	1	0	0	0	1	0	1	0	0	0
163	0	0	0	0	0	0	0	0	0	0	0
164	0	0	0	0	0	0	0	0	0	0	0
165	0	0	0	0	0	0	0	0	0	0	0
166	0	0	0	0	0	0	0	0	0	0	0
167	0	0	0	0	0	0	0	0	0	0	0
168	1	1	0	0	0	0	0	0	0	0	0
169	0	0	0	0	0	0	0	0	0	0	0
170	0	0	0	0	0	0	0	0	0	0	0
171	0	0	0	0	0	0	0	0	0	0	0
172	1	1	0	0	0	1	0	1	0	0	0
173	0	0	0	0	0	0	0	0	0	0	0
174	0	0	0	0	0	1	0	0	0	0	1
175	0	0	0	0	0	0	0	0	0	0	0
176	0	0	0	0	0	0	0	0	0	0	0
177	1	1	0	0	0	0	0	0	0	0	0
178	0	0	0	0	0	0	0	0	0	0	0
179	0	0	0	0	0	0	0	0	0	0	0
180	0	0	0	0	0	0	0	0	0	0	0
181	0	0	0	0	0	0	0	0	0	0	0
182	0	0	0	0	0	0	0	0	0	0	0
183	0	0	0	0	0	1	0	0	0	0	0
184	0	0	0	0	0	0	0	0	0	0	0
185	0	0	0	0	0	0	0	0	0	0	0

Sample	OO	SO	KO	MO	CO	UC	MUC	MIC	BC	YC	OC
186	0	0	0	0	0	0	0	0	0	0	0
187	0	0	0	0	0	1	0	0	0	0	0
188	1	1	0	0	0	0	0	0	0	0	0
189	1	1	0	0	0	0	0	0	0	0	0
190	0	0	0	0	0	0	0	0	0	0	0
191	0	0	0	0	0	0	0	0	0	0	0
192	0	0	0	0	0	0	0	0	0	0	0
193	0	0	0	0	0	0	0	0	0	0	0
194	0	0	0	0	0	0	0	0	0	0	0
195	1	1	0	0	0	0	0	0	0	0	0
196	0	0	0	0	0	0	0	0	0	0	0
197	0	0	0	0	0	0	0	0	0	0	0
198	0	0	0	0	0	0	0	0	0	0	0
199	1	1	0	0	0	0	0	0	0	0	0
200	0	0	0	0	0	0	0	0	0	0	0
201	0	0	0	0	0	0	0	0	0	0	0
202	1	1	0	0	0	0	0	0	0	0	0
203	1	1	0	0	0	0	0	0	0	0	0
204	0	0	0	0	0	1	0	0	1	0	0
205	0	0	0	0	0	0	0	0	0	0	0
206	0	0	0	0	0	0	0	0	0	0	0
207	1	1	0	0	0	0	0	0	0	0	0
208	0	0	0	0	0	0	0	0	0	0	0
209	0	0	0	0	0	0	0	0	0	0	0
210	0	0	0	0	0	0	0	0	0	0	0
211	0	0	0	0	0	0	0	0	0	0	0
212	0	0	0	0	0	0	0	0	0	0	0
213	1	0	0	0	0	0	0	0	0	0	0

Sample	OO	SO	KO	MO	CO	UC	MUC	MIC	BC	YC	OC
214	0	0	0	0	0	0	0	0	0	0	0
215	0	0	0	0	0	0	0	0	0	0	0
216	0	0	0	0	0	0	0	0	0	0	0
217	0	0	0	0	0	0	0	0	0	0	0
218	1	0	0	0	0	0	0	0	0	0	0
219	0	0	0	0	0	0	0	0	0	0	0
220	1	0	0	0	0	0	0	0	0	0	0
221	0	0	0	0	0	1	0	0	0	0	0
222	1	0	1	0	0	0	0	0	0	0	0
223	0	0	0	0	0	0	0	0	0	0	0
224	0	0	0	0	0	0	0	0	0	0	0
225	0	0	0	0	0	0	0	0	0	0	0
226	0	0	0	0	0	1	0	0	0	1	0
227	0	0	0	0	0	1	0	0	0	0	0
228	0	0	0	0	0	0	0	0	0	0	0
229	0	0	0	0	0	0	0	0	0	0	0
230	0	0	0	0	0	0	0	0	0	0	0
231	0	0	0	0	0	0	0	0	0	0	0
232	1	0	1	0	0	0	0	0	0	0	0
233	0	0	0	0	0	0	0	0	0	0	0
234	0	0	0	0	0	0	0	0	0	0	0
235	0	0	0	0	0	0	0	0	0	0	0
236	1	0	0	1	0	0	0	0	0	0	0
237	0	0	0	0	0	0	0	0	0	0	0
238	0	0	0	0	0	0	0	0	0	0	0
239	0	0	0	0	0	0	0	0	0	0	0
240	0	0	0	0	0	0	0	0	0	0	0
241	0	0	0	0	0	0	0	0	0	0	0

Sample	OO	SO	KO	MO	CO	UC	MUC	MIC	BC	YC	OC
242	0	0	0	0	0	0	0	0	0	0	0
243	0	0	0	0	0	0	0	0	0	0	0
244	0	0	0	0	0	0	0	0	0	0	0
245	0	0	0	0	0	0	0	0	0	0	0
246	1	1	0	0	0	0	0	0	0	0	0
247	0	0	0	0	0	0	0	0	0	0	0
248	0	0	0	0	0	0	0	0	0	0	0
249	0	0	0	0	0	0	0	0	0	0	0
250	0	0	0	0	0	0	0	0	0	0	0
251	1	1	0	0	0	0	0	0	0	0	0
252	0	0	0	0	0	0	0	0	0	0	0
253	0	0	0	0	0	0	0	0	0	0	0
254	0	0	0	0	0	0	0	0	0	0	0
255	0	0	0	0	0	0	0	0	0	0	0
256	0	0	0	0	0	0	0	0	0	0	0
257	0	0	0	0	0	1	0	0	0	0	1
258	0	0	0	0	0	0	0	0	0	0	0
259	0	0	0	0	0	0	0	0	0	0	0
260	0	0	0	0	0	0	0	0	0	0	0
261	0	0	0	0	0	0	0	0	0	0	0
262	0	0	0	0	0	0	0	0	0	0	0
263	0	0	0	0	0	0	0	0	0	0	0
264	0	0	0	0	0	0	0	0	0	0	0
265	0	0	0	0	0	0	0	0	0	0	0
266	0	0	0	0	0	0	0	0	0	0	0
267	0	0	0	0	0	0	0	0	0	0	0
268	0	0	0	0	0	0	0	0	0	0	0
269	1	1	0	0	0	0	0	0	0	0	0

Sample	OO	SO	KO	MO	CO	UC	MUC	MIC	BC	YC	OC
270	0	0	0	0	0	0	0	0	0	0	0
271	0	0	0	0	0	1	1	1	0	0	0
272	0	0	0	0	0	0	0	0	0	0	0
273	0	0	0	0	0	1	1	0	0	0	0
274	0	0	0	0	0	0	0	0	0	0	0
275	0	0	0	0	0	0	0	0	0	0	0
276	0	0	0	0	0	0	0	0	0	0	0
277	0	0	0	0	0	0	0	0	0	0	0
278	0	0	0	0	0	0	0	0	0	0	0
279	1	1	0	0	0	0	0	0	0	0	0
280	0	0	0	0	0	1	0	1	0	0	0
281	1	1	0	0	0	0	0	0	0	0	0
282	0	0	0	0	0	0	0	0	0	0	0
283	0	0	0	0	0	0	0	0	0	0	0
284	1	1	0	0	0	0	0	0	0	0	0
285	1	1	0	0	0	0	0	0	0	0	0
286	0	0	0	0	0	0	0	0	0	0	0
287	0	0	0	0	0	0	0	0	0	0	0
288	0	0	0	0	0	0	0	0	0	0	0
289	0	0	0	0	0	0	0	0	0	0	0
290	0	0	0	0	0	0	0	0	0	0	0
291	0	0	0	0	0	0	0	0	0	0	0
292	0	0	0	0	0	0	0	0	0	0	0
293	1	1	0	0	0	0	0	0	0	0	0
294	0	0	0	0	0	0	0	0	0	0	0
295	0	0	0	0	0	0	0	0	0	0	0
296	0	0	0	0	0	0	0	0	0	0	0
297	1	0	0	1	0	0	0	0	0	0	0

Sample	OO	SO	KO	MO	CO	UC	MUC	MIC	BC	YC	OC
298	0	0	0	0	0	0	0	0	0	0	0
299	0	0	0	0	0	0	0	0	0	0	0
300	0	0	0	0	0	0	0	0	0	0	0
301	0	0	0	0	0	0	0	0	0	0	0
302	0	0	0	0	0	0	0	0	0	0	0
303	1	0	0	1	0	1	1	0	0	0	0
304	1	1	0	0	0	0	0	0	0	0	0
305	0	0	0	0	0	0	0	0	0	0	0
306	0	0	0	0	0	0	0	0	0	0	0
307	0	0	0	0	0	0	0	0	0	0	0
308	0	0	0	0	0	0	0	0	0	0	0
309	0	0	0	0	0	0	0	0	0	0	0
310	0	0	0	0	0	0	0	0	0	0	0
311	0	0	0	0	0	0	0	0	0	0	0
312	0	0	0	0	0	0	0	0	0	0	0
313	0	0	0	0	0	1	1	0	0	0	0
314	0	0	0	0	0	1	1	0	0	0	0
315	0	0	0	0	0	0	0	0	0	0	0
316	0	0	0	0	0	1	1	0	0	0	0
317	0	0	0	0	0	0	0	0	0	0	0
318	0	0	0	0	0	0	0	0	0	0	0
319	0	0	0	0	0	0	0	0	0	0	0
320	0	0	0	0	0	0	0	0	0	0	0
321	0	0	0	0	0	0	0	0	0	0	0
322	0	0	0	0	0	1	1	0	0	0	0
323	0	0	0	0	0	0	0	0	0	0	0
324	0	0	0	0	0	0	0	0	0	0	0
325	0	0	0	0	0	0	0	0	0	0	0

Sample	OO	SO	KO	MO	CO	UC	MUC	MIC	BC	YC	OC
326	0	0	0	0	0	0	0	0	0	0	0
327	0	0	0	0	0	0	0	0	0	0	0
328	0	0	0	0	0	0	0	0	0	0	0
329	1	1	0	0	0	0	0	0	0	0	0
330	0	0	0	0	0	0	0	0	0	0	0
331	0	0	0	0	0	0	0	0	0	0	0
332	0	0	0	0	0	0	0	0	0	0	0
333	0	0	0	0	0	0	0	0	0	0	0
334	0	0	0	0	0	0	0	0	0	0	0
335	0	0	0	0	0	0	0	0	0	0	0
336	0	0	0	0	0	0	0	0	0	0	0
337	0	0	0	0	0	0	0	0	0	0	0
338	0	0	0	0	0	1	0	0	0	1	0
339	1	1	0	0	0	0	0	0	0	0	0
340	1	1	0	0	0	0	0	0	0	0	0
341	0	0	0	0	0	0	0	0	0	0	0
342	0	0	0	0	0	0	0	0	0	0	0
343	0	0	0	0	0	1	1	0	0	0	0
344	0	0	0	0	0	0	0	0	0	0	0
345	1	1	0	0	0	0	0	0	0	0	0
346	0	0	0	0	0	0	0	0	0	0	0
347	0	0	0	0	0	0	0	0	0	0	0
348	0	0	0	0	0	0	0	0	0	0	0
349	0	0	0	0	0	0	0	0	0	0	0
350	0	0	0	0	0	1	0	0	0	1	0
351	0	0	0	0	0	0	0	0	0	0	0
352	0	0	0	0	0	0	0	0	0	0	0
353	0	0	0	0	0	0	0	0	0	0	0

Sample	OO	SO	KO	MO	CO	UC	MUC	MIC	BC	YC	OC
354	1	1	0	0	0	0	0	0	0	0	0
355	0	0	0	0	0	1	1	1	0	0	0
356	0	0	0	0	0	0	0	0	0	0	0
357	0	0	0	0	0	0	0	0	0	0	0
358	0	0	0	0	0	0	0	0	0	0	0
359	0	0	0	0	0	0	0	0	0	0	0
360	0	0	0	0	0	0	0	0	0	0	0
361	0	0	0	0	0	0	0	0	0	0	0
362	0	0	0	0	0	0	0	0	0	0	0
363	0	0	0	0	0	0	0	0	0	0	0
364	0	0	0	0	0	0	0	0	0	0	0
365	0	0	0	0	0	0	0	0	0	0	0
366	0	0	0	0	0	0	0	0	0	0	0
367	0	0	0	0	0	0	0	0	0	0	0
368	0	0	0	0	0	0	0	0	0	0	0
369	1	0	0	0	0	0	0	0	0	0	0
370	0	0	0	0	0	0	0	0	0	0	0
371	0	0	0	0	0	0	0	0	0	0	0
372	0	0	0	0	0	0	0	0	0	0	0
373	1	1	0	0	0	0	0	0	0	0	0
374	0	0	0	0	0	0	0	0	0	0	0
375	0	0	0	0	0	0	0	0	0	0	0
376	1	1	0	0	0	0	0	0	0	0	0
377	0	0	0	0	0	0	0	0	0	0	0
378	0	0	0	0	0	1	1	0	0	0	0
379	0	0	0	0	0	0	0	0	0	0	0
380	0	0	0	0	0	0	0	0	0	0	0
381	0	0	0	0	0	0	0	0	0	0	0

Sample	OO	SO	KO	MO	CO	UC	MUC	MIC	BC	YC	OC
382	0	0	0	0	0	0	0	0	0	0	0
383	1	1	0	0	0	0	0	0	0	0	0
384	0	0	0	0	0	0	0	0	0	0	0
385	0	0	0	0	0	0	0	0	0	0	0
386	0	0	0	0	0	0	0	0	0	0	0
387	0	0	0	0	0	0	0	0	0	0	0
388	0	0	0	0	0	0	0	0	0	0	0
389	1	0	0	1	0	1	1	0	0	0	0
390	1	1	0	0	0	0	0	0	0	0	0
391	0	0	0	0	0	0	0	0	0	0	0
392	0	0	0	0	0	0	0	0	0	0	0
393	0	0	0	0	0	0	0	0	0	0	0
394	1	1	0	0	0	0	0	0	0	0	0
395	0	0	0	0	0	0	0	0	0	0	0
396	0	0	0	0	0	0	0	0	0	0	0
397	1	1	0	0	0	0	0	0	0	0	0
398	0	0	0	0	0	0	0	0	0	0	0
399	0	0	0	0	0	0	0	0	0	0	0
400	0	0	0	0	0	0	0	0	0	0	0
401	0	0	0	0	0	0	0	0	0	0	0
402	0	0	0	0	0	0	0	0	0	0	0
403	0	0	0	0	0	0	0	0	0	0	0
404	0	0	0	0	0	1	0	0	0	0	0
405	0	0	0	0	0	1	1	0	0	1	0
406	1	0	0	0	1	0	0	0	0	0	0
407	1	1	1	0	0	1	0	0	0	1	0
408	0	0	0	0	0	0	0	0	0	0	0
409	0	0	0	0	0	0	0	0	0	0	0

Sample	OO	SO	KO	MO	CO	UC	MUC	MIC	BC	YC	OC
410	0	0	0	0	0	0	0	0	0	0	0
411	0	0	0	0	0	0	0	0	0	0	0
412	0	0	0	0	0	0	0	0	0	0	0
413	0	0	0	0	0	0	0	0	0	0	0
414	0	0	0	0	0	0	0	0	0	0	0
415	0	0	0	0	0	0	0	0	0	0	0
416	1	1	0	0	0	0	0	0	0	0	0
417	0	0	0	0	0	0	0	0	0	0	0
418	0	0	0	0	0	0	0	0	0	0	0
419	0	0	0	0	0	0	0	0	0	0	0
420	0	0	0	0	0	0	0	0	0	0	0
421	1	0	0	0	0	1	0	0	0	0	0
422	1	1	0	0	0	1	0	0	0	1	0
423	1	1	0	0	0	1	0	0	0	1	0
424	0	0	0	0	0	0	0	0	0	0	0
425	0	0	0	0	0	0	0	0	0	0	0
426	0	0	0	0	0	0	0	0	0	0	0
427	0	0	0	0	0	0	0	0	0	0	0
428	0	0	0	0	0	0	0	0	0	0	0
429	0	0	0	0	0	0	0	0	0	0	0
430	1	0	0	1	0	1	1	0	1	1	0
431	1	1	0	0	0	0	0	0	0	0	0
432	0	0	0	0	0	0	0	0	0	0	0
433	0	0	0	0	0	0	0	0	0	0	0
434	0	0	0	0	0	0	0	0	0	0	0
435	0	0	0	0	0	0	0	0	0	0	0
436	0	0	0	0	0	0	0	0	0	0	0
437	0	0	0	0	0	0	0	0	0	0	0

Sample	OO	SO	KO	MO	CO	UC	MUC	MIC	BC	YC	OC
438	0	0	0	0	0	0	0	0	0	0	0
439	1	1	0	0	0	0	0	0	0	0	0
440	0	0	0	0	0	0	0	0	0	0	0
441	0	0	0	0	0	0	0	0	0	0	0
442	0	0	0	0	0	0	0	0	0	0	0
443	0	0	0	0	0	0	0	0	0	0	0
444	0	0	0	0	0	0	0	0	0	0	0
445	1	1	0	0	0	1	0	0	0	0	0
446	0	0	0	0	0	0	0	0	0	0	0
447	0	0	0	0	0	0	0	0	0	0	0
448	0	0	0	0	0	0	0	0	0	0	0
449	0	0	0	0	0	0	0	0	0	0	0
450	0	0	0	0	0	0	0	0	0	0	0
451	0	0	0	0	0	0	0	0	0	0	0
452	0	0	0	0	0	0	0	0	0	0	0
453	1	0	0	1	0	0	0	0	0	0	0
454	1	1	0	0	0	0	0	0	0	0	0
455	0	0	0	0	0	0	0	0	0	0	0
456	0	0	0	0	0	0	0	0	0	0	0
457	0	0	0	0	0	0	0	0	0	0	0
458	0	0	0	0	0	1	0	0	0	0	1
459	1	1	0	0	0	0	0	0	0	0	0
460	1	0	0	1	0	1	0	0	0	0	0
461	0	0	0	0	0	0	0	0	0	0	0
462	0	0	0	0	0	0	0	0	0	0	0
463	0	0	0	0	0	0	0	0	0	0	0
464	0	0	0	0	0	0	0	0	0	0	0
465	0	0	0	0	0	0	0	0	0	0	0

Sample	OO	SO	KO	MO	CO	UC	MUC	MIC	BC	YC	OC
466	0	0	0	0	0	0	0	0	0	0	0
467	1	1	0	0	0	0	0	0	0	0	0
468	1	1	0	0	0	0	0	0	0	0	0
469	0	0	0	0	0	0	0	0	0	0	0
470	1	0	0	0	0	0	0	0	0	0	0
471	0	0	0	0	0	0	0	0	0	0	0
472	0	0	0	0	0	0	0	0	0	0	0
473	0	0	0	0	0	0	0	0	0	0	0
474	0	0	0	0	0	0	0	0	0	0	0
475	1	0	0	1	0	1	0	0	0	0	1
476	1	1	0	0	0	0	0	0	0	0	0
477	0	0	0	0	0	0	0	0	0	0	0
478	0	0	0	0	0	0	0	0	0	0	0
479	0	0	0	0	0	0	0	0	0	0	0
480	0	0	0	0	0	0	0	0	0	0	0
481	0	0	0	0	0	0	0	0	0	0	0
482	1	1	0	0	0	1	0	0	0	0	0
483	1	1	0	0	0	0	0	0	0	0	0
484	0	0	0	0	0	0	0	0	0	0	0
485	0	0	0	0	0	0	0	0	0	0	0
486	0	0	0	0	0	0	0	0	0	0	0
487	0	0	0	0	0	0	0	0	0	0	0
488	0	0	0	0	0	0	0	0	0	0	0
489	0	0	0	0	0	0	0	0	0	0	0
490	0	0	0	0	0	1	1	0	0	0	0
491	1	1	0	1	0	0	0	0	0	0	0
492	0	0	0	0	0	0	0	0	0	0	0
493	0	0	0	0	0	0	0	0	0	0	0

Sample	OO	SO	KO	MO	CO	UC	MUC	MIC	BC	YC	OC
494	0	0	0	0	0	1	0	0	0	1	0
495	0	0	0	0	0	0	0	0	0	0	0
496	0	0	0	0	0	0	0	0	0	0	0
497	0	0	0	0	0	0	0	0	0	0	0
498	0	0	0	0	0	0	0	0	0	0	0
499	1	1	0	0	0	0	0	0	0	0	0
500	1	1	0	0	0	0	0	0	0	0	0
501	0	0	0	0	0	0	0	0	0	0	0
502	0	0	0	0	0	0	0	0	0	0	0
503	0	0	0	0	0	0	0	0	0	0	0
504	0	0	0	0	0	0	0	0	0	0	0
505	0	0	0	0	0	0	0	0	0	0	0
506	1	1	0	0	0	0	0	0	0	0	0
507	0	0	0	0	0	0	0	0	0	0	0
508	0	0	0	0	0	0	0	0	0	0	0
509	0	0	0	0	0	0	0	0	0	0	0
510	1	1	0	0	0	0	0	0	0	0	0
511	0	0	0	0	0	0	0	0	0	0	0
512	0	0	0	0	0	0	0	0	0	0	0
513	0	0	0	0	0	0	0	0	0	0	0
514	0	0	0	0	0	0	0	0	0	0	0
515	0	0	0	0	0	0	0	0	0	0	0
516	0	0	0	0	0	0	0	0	0	0	0
517	0	0	0	0	0	0	0	0	0	0	0
518	1	0	0	1	0	0	0	0	0	0	0
519	0	0	0	0	0	0	0	0	0	0	0
520	0	0	0	0	0	0	0	0	0	0	0
521	1	0	0	1	0	1	0	0	0	0	1

Sample	OO	SO	KO	MO	CO	UC	MUC	MIC	BC	YC	OC
522	0	0	0	0	0	0	0	0	0	0	0
523	0	0	0	0	0	0	0	0	0	0	0
524	1	1	0	1	0	0	0	0	0	0	0
525	0	0	0	0	0	0	0	0	0	0	0
526	0	0	0	0	0	1	0	0	0	1	0
527	0	0	0	0	0	0	0	0	0	0	0
528	0	0	0	0	0	0	0	0	0	0	0
529	0	0	0	0	0	0	0	0	0	0	0
530	1	0	0	0	0	1	0	0	0	1	0
531	0	0	0	0	0	0	0	0	0	0	0
532	0	0	0	0	0	1	0	1	0	0	0
533	0	0	0	0	0	0	0	0	0	0	0
534	0	0	0	0	0	1	1	0	0	0	0
535	1	1	0	0	0	1	0	0	0	1	0
536	1	1	0	0	0	0	0	0	0	0	0
537	0	0	0	0	0	0	0	0	0	0	0
538	0	0	0	0	0	0	0	0	0	0	0
539	0	0	0	0	0	0	0	0	0	0	0
540	0	0	0	0	0	0	0	0	0	0	0
541	0	0	0	0	0	0	0	0	0	0	0
542	0	0	0	0	0	0	0	0	0	0	0
543	0	0	0	0	0	0	0	0	0	0	0
544	0	0	0	0	0	0	0	0	0	0	0
545	0	0	0	0	0	0	0	0	0	0	0
546	1	1	0	0	0	0	0	0	0	0	0
547	0	0	0	0	0	0	0	0	1	0	0
548	0	0	0	0	0	0	0	0	0	0	0
549	0	0	0	0	0	0	0	0	0	0	0

Sample	OO	SO	KO	MO	CO	UC	MUC	MIC	BC	YC	OC
550	0	0	0	0	0	0	0	0	0	0	0
551	0	0	0	0	0	0	0	0	0	0	0
552	0	0	0	0	0	0	0	0	0	0	0
553	0	0	0	0	0	0	0	0	0	0	0
554	0	0	0	0	0	0	0	0	0	0	0
555	0	0	0	0	0	0	0	0	0	0	0
556	0	0	0	0	0	0	0	0	0	0	0
557	0	0	0	0	0	0	0	0	0	0	0
558	0	0	0	0	0	0	0	0	0	0	0
559	0	0	0	0	0	0	0	0	0	0	0
560	1	1	0	1	0	0	0	0	0	0	0
561	0	0	0	0	0	0	0	0	0	0	0
562	0	0	0	0	0	0	0	0	0	0	0
563	0	0	0	0	0	0	0	0	0	0	0
564	0	0	0	0	0	1	0	0	0	1	0
565	0	0	0	0	0	1	0	0	0	0	0
566	0	0	0	0	0	0	0	0	0	0	0
567	0	0	0	0	0	0	0	0	0	0	0
568	0	0	0	0	0	0	0	0	0	0	0
569	0	0	0	0	0	0	0	0	0	0	0
570	0	0	0	0	0	0	0	0	0	0	0
571	0	0	0	0	0	0	0	0	0	0	0
572	0	0	0	0	0	0	0	0	0	0	0
573	0	0	0	0	0	0	0	0	0	0	0
574	0	0	0	0	0	0	0	0	0	0	0
575	0	0	0	0	0	0	0	0	0	0	0
576	0	0	0	0	0	0	0	0	0	0	0
577	0	0	0	0	0	0	0	0	0	0	0

Sample	OO	SO	KO	MO	CO	UC	MUC	MIC	BC	YC	OC
578	0	0	0	0	0	0	0	0	0	0	0
579	0	0	0	0	0	1	0	0	0	0	0
580	0	0	0	0	0	1	0	0	0	0	1
581	0	0	0	0	0	0	0	0	0	0	0
582	0	0	0	0	0	1	0	1	0	0	0
583	0	0	0	0	0	1	1	0	0	0	0
584	0	0	0	0	0	0	0	0	0	0	0
585	0	0	0	0	0	0	0	0	0	0	0
586	1	0	0	0	0	0	0	0	0	0	0
587	0	0	0	0	0	1	0	0	0	0	0
588	0	0	0	0	0	0	0	0	0	0	0
589	0	0	0	0	0	0	0	0	0	0	0
590	1	0	0	0	0	1	0	0	0	0	0
591	0	0	0	0	0	0	0	0	0	0	0
592	0	0	0	0	0	0	0	0	0	0	0
593	0	0	0	0	0	0	0	0	0	0	0
594	0	0	0	0	0	0	0	0	0	0	0
595	0	0	0	0	0	0	0	0	0	0	0
596	0	0	0	0	0	0	0	0	0	0	0
597	0	0	0	0	0	0	0	0	0	0	0
598	1	1	0	0	0	1	0	0	0	1	0
599	0	0	0	0	0	0	0	0	0	0	0
600	0	0	0	0	0	0	0	0	0	0	0
601	1	1	0	0	0	0	0	0	0	0	0
602	0	0	0	0	0	0	0	0	0	0	0
603	0	0	0	0	0	1	1	0	0	0	0
604	0	0	0	0	0	0	0	0	0	0	0
605	0	0	0	0	0	0	0	0	0	0	0

Sample	OO	SO	KO	MO	CO	UC	MUC	MIC	BC	YC	OC
606	1	1	0	0	0	0	0	0	0	0	0
607	0	0	0	0	0	0	0	0	0	0	0
608	0	0	0	0	0	0	0	0	0	0	0
609	0	0	0	0	0	0	0	0	0	0	0
610	0	0	0	0	0	0	0	0	0	0	0
611	0	0	0	0	0	0	0	0	0	0	0
612	1	1	0	0	0	1	0	0	0	1	0
613	0	0	0	0	0	0	0	0	0	0	0
614	0	0	0	0	0	0	0	0	0	0	0
615	0	0	0	0	0	0	0	0	0	0	0
616	0	0	0	0	0	0	0	0	0	0	0
617	0	0	0	0	0	0	0	0	0	0	0
618	0	0	0	0	0	0	0	0	0	0	0
619	0	0	0	0	0	1	0	0	0	0	0
620	0	0	0	0	0	0	0	0	0	0	0
621	1	1	0	0	0	0	0	0	0	0	0
622	0	0	0	0	0	0	0	0	0	0	0
623	0	0	0	0	0	0	0	0	0	0	0
624	0	0	0	0	0	0	0	0	0	0	0
625	0	0	0	0	0	0	0	0	0	0	0
626	0	0	0	0	0	0	0	0	0	0	0
627	0	0	0	0	0	0	0	0	0	0	0
628	0	0	0	0	0	0	0	0	0	0	0
629	0	0	0	0	0	0	0	0	0	0	0
630	1	1	0	1	0	1	1	0	1	1	0
631	0	0	0	0	0	0	0	0	0	0	0
632	0	0	0	0	0	0	0	0	0	0	0
633	0	0	0	0	0	0	0	0	0	0	0

Sample	OO	SO	KO	MO	CO	UC	MUC	MIC	BC	YC	OC
634	1	1	0	0	0	1	0	0	0	1	1
635	0	0	0	0	0	0	0	0	0	0	0
636	0	0	0	0	0	0	0	0	0	0	0
637	0	0	0	0	0	0	0	0	0	0	0
638	1	1	0	0	0	1	0	0	0	0	0
639	0	0	0	0	0	0	0	0	0	0	0
640	0	0	0	0	0	1	1	0	0	0	0
641	0	0	0	0	0	0	0	0	0	0	0
642	0	0	0	0	0	0	0	0	0	0	0
643	0	0	0	0	0	0	0	0	0	0	0
644	0	0	0	0	0	1	1	0	0	0	0
645	0	0	0	0	0	0	0	0	0	0	0
646	0	0	0	0	0	0	0	0	0	0	0
647	0	0	0	0	0	0	0	0	0	0	0
648	0	0	0	0	0	0	0	0	0	0	0
649	1	1	0	0	0	1	0	0	0	1	0
650	0	0	0	0	0	0	0	0	0	0	0
651	1	1	0	0	0	1	0	0	0	0	0
652	1	1	0	0	0	0	0	0	0	0	0
653	1	1	0	1	0	0	0	0	0	0	0
654	0	0	0	0	0	0	0	0	0	0	0
655	0	0	0	0	0	0	0	0	0	0	0
656	1	0	0	1	0	0	0	0	0	0	0
657	1	0	0	0	0	1	1	0	0	0	0
658	0	0	0	0	0	1	1	0	0	0	0
659	0	0	0	0	0	0	0	0	0	0	0
660	0	0	0	0	0	0	0	0	0	0	0
661	1	0	0	0	0	0	0	0	0	0	0

Sample	OO	SO	KO	MO	CO	UC	MUC	MIC	BC	YC	OC
662	0	0	0	0	0	0	0	0	0	0	0
663	1	0	0	0	0	1	1	0	0	0	0
664	0	0	0	0	0	0	0	0	0	0	0
665	0	0	0	0	0	0	0	0	0	0	0
666	0	0	0	0	0	0	0	0	0	0	0
667	0	0	0	0	0	0	0	0	0	0	0
668	0	0	0	0	0	0	0	0	0	0	0
669	0	0	0	0	0	0	0	0	0	0	0
670	0	0	0	0	0	0	0	0	0	0	0
671	0	0	0	0	0	0	0	0	0	0	0
672	0	0	0	0	0	0	0	0	0	0	0
673	0	0	0	0	0	0	0	0	0	0	0
674	0	0	0	0	0	0	0	0	0	0	0
675	1	1	0	0	0	0	0	0	0	0	0
676	1	1	0	0	0	0	0	0	0	0	0
677	0	0	0	0	0	0	0	0	0	0	0
678	0	0	0	0	0	0	0	0	0	0	0
679	0	0	0	0	0	0	0	0	0	0	0
680	0	0	0	0	0	1	1	1	0	0	0
681	0	0	0	0	0	0	0	0	0	0	0
682	0	0	0	0	0	0	0	0	0	0	0
683	0	0	0	0	0	1	0	0	0	1	0
684	1	1	0	0	0	0	0	0	0	0	0
685	0	0	0	0	0	0	0	0	0	0	0
686	0	0	0	0	0	0	0	0	0	0	0
687	1	1	0	0	0	1	1	0	0	0	0
688	1	0	0	1	0	0	0	0	0	0	0
689	0	0	0	0	0	0	0	0	0	1	0

Sample	OO	SO	KO	MO	CO	UC	MUC	MIC	BC	YC	OC
690	0	0	0	0	0	0	0	0	0	0	0
691	0	0	0	0	0	0	0	0	0	0	0
692	0	0	0	0	0	0	0	0	0	0	0
693	0	0	0	0	0	0	0	0	0	0	0
694	0	0	0	0	0	0	0	0	0	0	0
695	0	0	0	0	0	0	0	0	0	0	0
696	0	0	0	0	0	1	0	1	0	0	0
697	0	0	0	0	0	0	0	0	0	0	0
698	0	0	0	0	0	0	0	0	0	0	0
699	0	0	0	0	0	0	0	0	0	0	0
700	0	0	0	0	0	0	0	0	0	0	0
701	0	0	0	0	0	0	0	0	0	0	0
702	0	0	0	0	0	0	0	0	0	0	0
703	0	0	0	0	0	0	0	0	0	0	0
704	0	0	0	0	0	0	0	0	0	0	0
705	0	0	0	0	0	0	0	0	0	0	0
706	0	0	0	0	0	0	0	0	0	0	0
707	0	0	0	0	0	0	0	0	0	0	0
708	0	0	0	0	0	0	0	0	0	0	0
709	1	1	0	0	0	0	0	0	0	0	0
710	0	0	0	0	0	0	0	0	0	0	0
711	0	0	0	0	0	1	1	0	0	1	0
712	0	0	0	0	0	0	0	0	0	0	0
713	1	1	0	0	0	0	0	0	0	0	0
714	1	1	0	0	0	1	1	0	0	1	1
715	0	0	0	0	0	0	0	0	0	0	0
716	1	1	0	0	0	0	0	0	0	0	0
717	1	0	0	0	1	0	0	0	0	0	0

Sample	OO	SO	KO	MO	CO	UC	MUC	MIC	BC	YC	OC
718	0	0	0	0	0	0	0	0	0	0	0
719	0	0	0	0	0	0	0	0	0	0	0
720	0	0	0	0	0	0	0	0	0	0	0
721	1	1	0	0	0	0	0	0	0	0	0
722	1	1	0	0	0	0	0	0	0	0	0
723	0	0	0	0	0	0	0	0	0	0	0
724	0	0	0	0	0	0	0	0	0	0	0
725	0	0	0	0	0	0	0	0	0	0	0
726	0	0	0	0	0	0	0	0	0	0	0
727	0	0	0	0	0	0	0	0	0	0	0
728	0	0	0	0	0	1	0	0	1	0	0
729	0	0	0	0	0	0	0	0	0	0	0
730	0	0	0	0	0	0	0	0	0	0	0
731	0	0	0	0	0	0	0	0	0	0	0
732	0	0	0	0	0	0	0	0	0	0	0
733	0	0	0	0	0	1	0	1	0	0	0
734	0	0	0	0	0	0	0	0	0	0	0
735	1	1	0	0	0	0	0	0	0	0	0
736	0	0	0	0	0	0	0	0	0	0	0
737	0	0	0	0	0	0	0	0	0	0	0
738	0	0	0	0	0	0	0	0	0	0	0
739	1	1	0	0	0	1	0	0	0	0	0
740	0	0	0	0	0	0	0	0	0	0	0
741	0	0	0	0	0	0	0	0	0	0	0
742	0	0	0	0	0	0	0	0	0	0	0
743	1	0	0	1	0	1	0	0	0	1	0
744	0	0	0	0	0	0	0	0	0	0	0
745	0	0	0	0	0	0	0	0	0	0	0

Sample	OO	SO	KO	MO	CO	UC	MUC	MIC	BC	YC	OC
746	1	1	0	0	0	1	0	0	0	0	0
747	0	0	0	0	0	0	0	0	0	0	0
748	0	0	0	0	0	0	0	0	0	0	0
749	0	0	0	0	0	1	0	0	0	0	0
750	0	0	0	0	0	0	0	0	0	0	0
751	0	0	0	0	0	0	0	0	0	0	0
752	1	1	0	0	0	1	0	1	0	0	0
753	1	1	0	0	0	0	0	0	0	0	0
754	0	0	0	0	0	0	0	0	0	0	0
755	0	0	0	0	0	0	0	0	0	0	0
756	1	1	0	0	0	0	0	0	0	0	0
757	0	0	0	0	0	0	0	0	0	0	0
758	0	0	0	0	0	0	0	0	0	0	0
759	0	0	0	0	0	0	0	0	0	0	0
760	1	0	0	0	0	1	0	0	0	0	0
761	0	0	0	0	0	0	0	0	0	0	0
762	0	0	0	0	0	0	0	0	0	0	0
763	1	1	0	1	0	0	0	0	0	0	0
764	0	0	0	0	0	0	0	0	0	0	0
765	0	0	0	0	0	0	0	0	0	0	0
766	0	0	0	0	0	0	0	0	0	0	0
767	0	0	0	0	0	0	0	0	0	0	0
768	1	1	0	0	0	0	0	0	0	0	0
769	0	0	0	0	0	0	0	0	0	0	0
770	0	0	0	0	0	0	0	0	0	0	0
771	0	0	0	0	0	0	0	0	0	0	0
772	0	0	0	0	0	0	0	0	0	0	0
773	0	0	0	0	0	1	1	0	0	0	0

Sample	OO	SO	KO	MO	CO	UC	MUC	MIC	BC	YC	OC
774	0	0	0	0	0	1	0	0	0	1	0
775	0	0	0	0	0	0	0	0	0	0	0
776	0	0	0	0	0	0	0	0	0	0	0
777	1	0	1	1	0	1	1	0	0	0	1
778	0	0	0	0	0	0	0	0	0	0	0
779	0	0	0	0	0	0	0	0	0	0	0
780	0	0	0	0	0	0	0	0	0	0	0
781	0	0	0	0	0	0	0	0	0	0	0
782	0	0	0	0	0	1	0	0	0	1	0
783	0	0	0	0	0	0	0	0	0	0	0
784	0	0	0	0	0	0	0	0	0	0	0
785	0	0	0	0	0	0	0	0	0	0	0
786	0	0	0	0	0	0	0	0	0	0	0
787	0	0	0	0	0	0	0	0	0	0	0
788	0	0	0	0	0	0	0	0	0	0	0
789	0	0	0	0	0	0	0	0	0	0	0
790	0	0	0	0	0	0	0	0	0	0	0
791	0	0	0	0	0	0	0	0	0	0	0
792	1	0	0	0	1	1	0	1	0	0	1
793	0	0	0	0	0	0	0	0	0	0	0
794	0	0	0	0	0	0	0	0	0	0	0
795	0	0	0	0	0	1	0	0	0	0	1
796	0	0	0	0	0	0	0	0	0	0	0
797	0	0	0	0	0	1	0	0	0	0	0
798	0	0	0	0	0	0	0	0	0	0	0
799	0	0	0	0	0	1	0	0	0	1	0
800	0	0	0	0	0	0	0	0	0	0	0
801	0	0	0	0	0	0	0	0	0	0	0

Sample	OO	SO	KO	MO	CO	UC	MUC	MIC	BC	YC	OC
802	0	0	0	0	0	0	0	0	0	0	0
803	0	0	0	0	0	0	0	0	0	0	0
804	0	0	0	0	0	0	0	0	0	0	0
805	0	0	0	0	0	1	0	0	0	0	0
806	0	0	0	0	0	0	0	0	0	0	0
807	0	0	0	0	0	0	0	0	0	0	0
808	0	0	0	0	0	0	0	0	0	0	0
809	0	0	0	0	0	1	0	0	0	0	0
810	0	0	0	0	0	0	0	0	0	0	0
811	1	1	0	0	0	1	0	0	0	1	0
812	0	0	0	0	0	0	0	0	0	0	0
813	0	0	0	0	0	0	0	0	0	0	0
814	0	0	0	0	0	1	0	0	0	0	1
815	1	1	0	0	0	1	0	0	0	1	0
816	0	0	0	0	0	0	0	0	0	0	0
817	1	1	0	0	0	0	0	0	0	0	0
818	1	1	0	0	0	0	0	0	0	0	0
819	0	0	0	0	0	0	0	0	0	0	0
820	0	0	0	0	0	0	0	0	0	0	0
821	0	0	0	0	0	0	0	0	0	0	0
822	0	0	0	0	0	0	0	0	0	0	0
823	1	0	0	1	0	0	0	0	0	0	0
824	0	0	0	0	0	0	0	0	0	0	0
825	0	0	0	0	0	0	0	0	0	0	0
826	0	0	0	0	0	0	0	0	0	0	0
827	0	0	0	0	0	0	0	0	0	0	0
828	1	1	0	0	0	1	0	0	0	1	0
829	0	0	0	0	0	0	0	0	0	0	0

Sample	OO	SO	KO	MO	CO	UC	MUC	MIC	BC	YC	OC
830	0	0	0	0	0	0	0	0	0	0	0
831	0	0	0	0	0	0	0	0	0	0	0

8.8 Water Staining and Particles

Sample	STN	BLUSTN	RSTN	BLKSTN	WSTN	WP	WF	BLKSPC	RS	BWNSED
1	1	1	0	0	0	0	0	0	0	0
2	0	0	0	0	0	0	0	0	0	0
3	0	0	0	0	0	1	0	0	0	1
4	0	0	0	0	0	0	0	0	0	0
5	1	0	0	0	1	0	0	0	0	0
6	0	0	0	0	0	0	0	0	0	0
7	1	0	0	0	1	1	0	0	0	0
8	1	0	0	0	1	1	1	0	0	0
9	1	1	0	0	0	0	0	0	0	0
10	0	0	0	0	0	1	1	0	0	0
11	0	0	0	0	0	0	0	0	0	0
12	0	0	0	0	0	0	0	0	0	0
13	1	0	0	0	0	0	0	0	0	0
14	1	1	0	0	0	0	0	0	0	0
15	1	1	0	0	0	0	0	0	0	0
16	1	0	1	0	0	0	0	0	0	0
17	0	0	0	0	0	1	1	0	0	0
18	1	0	1	0	0	0	0	0	0	0
19	0	0	0	0	0	0	0	0	0	0
20	0	0	0	0	0	0	0	0	0	0
21	1	1	0	0	0	0	0	0	0	0
22	1	1	0	0	0	1	0	0	0	0

Sample	STN	BLUSTN	RSTN	BLKSTN	WSTN	WP	WF	BLKSPC	RS	BWNSED
23	0	0	0	0	0	0	0	0	0	0
24	1	0	1	0	0	0	0	0	0	0
25	1	0	1	0	0	0	0	0	0	0
26	0	0	0	0	0	0	0	0	0	0
27	0	0	0	0	0	1	0	1	0	0
28	0	0	0	0	0	0	0	0	0	0
29	0	0	0	0	0	0	0	0	0	0
30	1	0	1	0	0	0	0	0	0	0
31	0	0	0	0	0	0	0	0	0	0
32	0	0	0	0	0	0	0	0	0	0
33	0	0	0	0	0	0	0	0	0	0
34	0	0	0	0	0	0	0	0	0	0
35	1	0	1	0	0	0	0	0	0	0
36	1	1	0	0	0	0	0	0	0	0
37	0	0	0	0	0	0	0	0	0	0
38	1	0	0	1	0	0	0	0	0	0
39	1	0	0	0	1	0	0	0	0	0
40	1	1	0	0	0	0	0	0	0	0
41	1	0	0	0	0	0	0	0	0	0
42	1	0	0	0	1	0	0	0	0	0
43	1	0	0	0	0	0	0	0	0	0
44	0	0	0	0	0	0	0	0	0	0
45	1	0	1	0	0	0	0	0	0	0
46	0	0	0	0	0	0	0	0	0	0
47	1	0	1	0	0	1	1	0	0	0
48	1	0	0	0	0	0	0	0	0	0
49	1	1	0	0	0	1	0	1	0	0
50	1	1	0	0	0	0	0	0	0	0

Sample	STN	BLUSTN	RSTN	BLKSTN	WSTN	WP	WF	BLKSPC	RS	BWNSED
51	1	0	1	0	0	0	0	0	0	0
52	0	0	0	0	0	0	0	0	0	0
53	0	0	0	0	0	0	0	0	0	0
54	1	0	0	0	1	0	0	0	0	0
55	0	0	0	0	0	0	0	0	0	0
56	0	0	0	0	0	0	0	0	0	0
57	1	0	0	0	1	0	0	0	0	0
58	1	0	1	0	0	0	0	0	0	0
59	1	0	0	0	0	0	0	0	0	0
60	0	0	0	0	0	0	0	0	0	0
61	1	0	1	0	0	0	0	0	0	0
62	0	0	0	0	0	0	0	0	0	0
63	1	0	1	0	0	0	0	0	0	0
64	0	0	0	0	0	0	0	0	0	0
65	1	0	1	0	0	0	0	0	0	0
66	0	0	0	0	0	0	0	0	0	0
67	1	1	0	0	0	0	0	0	0	0
68	0	0	0	0	0	0	0	0	0	0
69	0	0	0	0	0	0	0	0	0	0
70	1	0	1	0	0	0	0	0	0	0
71	0	0	0	0	0	0	0	0	0	0
72	0	0	0	0	0	0	0	0	0	0
73	1	0	0	0	0	0	0	0	0	0
74	0	0	0	0	0	0	0	0	0	0
75	1	1	0	0	0	0	0	0	0	0
76	1	1	0	0	0	0	0	0	0	0
77	0	0	0	0	0	0	0	0	0	0
78	1	0	0	0	1	1	0	1	0	0

Sample	STN	BLUSTN	RSTN	BLKSTN	WSTN	WP	WF	BLKSPC	RS	BWNSED
79	0	0	0	0	0	1	0	0	0	1
80	0	0	0	0	0	1	0	0	0	0
81	1	0	0	0	1	0	0	0	0	0
82	0	0	0	0	0	0	0	0	0	0
83	1	0	0	0	1	1	1	0	0	0
84	1	1	0	1	1	1	0	1	0	0
85	0	0	0	0	0	0	0	0	0	0
86	0	0	0	0	0	0	0	0	0	0
87	1	0	0	0	1	0	0	0	0	0
88	0	0	0	0	0	0	0	0	0	0
89	1	1	0	1	1	0	0	0	0	0
90	0	0	0	0	0	0	0	0	0	0
91	1	0	0	0	0	0	0	0	0	0
92	1	0	1	0	0	0	0	0	0	0
93	0	0	0	0	0	0	0	0	0	0
94	1	0	1	0	0	0	0	0	0	0
95	1	1	0	0	0	0	0	0	0	0
96	1	1	0	0	0	0	0	0	0	0
97	0	0	0	0	0	0	0	0	0	0
98	1	0	0	0	1	0	0	0	0	0
99	0	0	0	0	0	0	0	0	0	0
100	0	0	0	0	0	0	0	0	0	0
101	1	0	0	0	0	0	0	0	0	0
102	0	0	0	0	0	0	0	0	0	0
103	1	0	1	0	0	0	0	0	0	0
104	1	0	1	0	0	0	0	0	0	0
105	1	0	1	0	1	0	0	0	0	0
106	0	0	0	0	0	0	0	0	0	0

Sample	STN	BLUSTN	RSTN	BLKSTN	WSTN	WP	WF	BLKSPC	RS	BWNSED
107	0	0	0	0	0	0	0	0	0	0
108	0	0	0	0	0	0	0	0	0	0
109	1	0	0	0	1	0	0	0	0	0
110	1	0	1	1	0	0	0	0	0	0
111	0	0	0	0	0	0	0	0	0	0
112	0	0	0	0	0	0	0	0	0	0
113	1	0	0	0	1	0	0	0	0	0
114	0	0	0	0	0	0	0	0	0	0
115	1	0	1	0	0	0	0	0	0	0
116	1	0	1	0	0	0	0	0	0	0
117	1	0	1	0	0	0	0	0	0	0
118	1	1	0	0	0	0	0	0	0	0
119	1	0	0	0	1	1	1	0	0	0
120	1	0	1	0	1	0	0	0	0	0
121	0	0	0	0	0	0	0	0	0	0
122	1	1	0	0	0	0	0	0	0	0
123	0	0	0	0	0	0	0	0	0	0
124	1	1	1	1	0	1	1	0	0	0
125	0	0	0	0	0	0	0	0	0	0
126	0	0	0	0	0	0	0	0	0	0
127	1	0	0	0	1	0	0	0	0	0
128	1	0	0	0	1	0	0	0	0	0
129	1	0	1	0	0	1	1	0	0	0
130	1	1	1	0	1	0	0	0	0	0
131	1	0	1	0	1	0	0	0	0	0
132	1	0	1	1	1	0	0	0	0	0
133	0	0	0	0	0	0	0	0	0	0
134	0	0	0	0	0	0	0	0	0	0

Sample	STN	BLUSTN	RSTN	BLKSTN	WSTN	WP	WF	BLKSPC	RS	BWNSED
135	1	0	1	0	0	0	0	0	0	0
136	1	0	0	0	0	0	0	0	0	0
137	1	0	1	0	0	0	0	0	0	0
138	0	0	0	0	0	0	0	0	0	0
139	1	0	1	0	0	0	0	0	0	0
140	1	1	0	0	0	0	0	0	0	0
141	0	0	0	0	0	0	0	0	0	0
142	1	0	1	0	0	1	0	1	0	0
143	0	0	0	0	0	0	0	0	0	0
144	1	0	0	0	1	0	0	0	0	0
145	0	0	0	0	0	0	0	0	0	0
146	1	0	0	0	1	0	0	0	0	0
147	0	0	0	0	0	1	1	0	0	0
148	1	0	1	0	0	0	0	0	0	0
149	0	0	0	0	0	0	0	0	0	0
150	1	0	0	0	1	0	0	0	0	0
151	1	0	0	0	1	1	1	0	0	0
152	1	0	0	0	1	0	0	0	0	0
153	1	0	1	0	0	0	0	0	0	0
154	1	0	0	0	0	0	0	0	0	0
155	1	0	0	0	1	1	1	0	0	0
156	0	0	0	0	0	0	0	0	0	0
157	1	0	1	0	0	0	0	0	0	0
158	0	0	0	0	0	0	0	0	0	0
159	0	0	0	0	0	0	0	0	0	0
160	0	0	0	0	0	0	0	0	0	0
161	0	0	0	0	0	1	0	1	0	0
162	1	0	0	0	1	1	1	0	0	0

Sample	STN	BLUSTN	RSTN	BLKSTN	WSTN	WP	WF	BLKSPC	RS	BWNSED
163	1	0	1	0	0	0	0	0	0	0
164	0	0	0	0	0	0	0	0	0	0
165	0	0	0	0	0	0	0	0	0	0
166	0	0	0	0	0	0	0	0	0	0
167	0	0	0	0	0	0	0	0	0	0
168	1	0	1	0	0	0	0	0	0	0
169	0	0	0	0	0	0	0	0	0	0
170	0	0	0	0	0	0	0	0	0	0
171	1	0	0	0	1	0	0	0	0	0
172	1	0	1	0	0	0	0	0	0	0
173	0	0	0	0	0	0	0	0	0	0
174	0	0	0	0	0	0	0	0	0	0
175	1	0	1	0	0	0	0	0	0	0
176	0	0	0	0	0	0	0	0	0	0
177	0	0	0	0	0	0	0	0	0	0
178	1	0	0	0	1	0	0	0	0	0
179	0	0	0	0	0	0	0	0	0	0
180	0	0	0	0	0	0	0	0	0	0
181	1	0	0	0	0	1	0	0	0	0
182	0	0	0	0	0	0	0	0	0	0
183	1	0	1	0	0	1	0	0	0	0
184	0	0	0	0	0	0	0	0	0	0
185	0	0	0	0	0	0	0	0	0	0
186	0	0	0	0	0	0	0	0	0	0
187	1	0	1	0	0	1	0	0	1	1
188	0	0	0	0	0	0	0	0	0	0
189	1	0	1	0	1	0	0	0	0	0
190	1	0	1	0	0	0	0	0	0	0

Sample	STN	BLUSTN	RSTN	BLKSTN	WSTN	WP	WF	BLKSPC	RS	BWNSED
191	0	0	0	0	0	0	0	0	0	0
192	0	0	0	0	0	0	0	0	0	0
193	0	0	0	0	0	0	0	0	0	0
194	0	0	0	0	0	0	0	0	0	0
195	0	0	0	0	0	0	0	0	0	0
196	0	0	0	0	0	0	0	0	0	0
197	0	0	0	0	0	0	0	0	0	0
198	0	0	0	0	0	0	0	0	0	0
199	0	0	0	0	0	1	1	0	0	0
200	0	0	0	0	0	0	0	0	0	0
201	0	0	0	0	0	0	0	0	0	0
202	0	0	0	0	0	0	0	0	0	0
203	0	0	0	0	0	0	0	0	0	0
204	0	0	0	0	0	0	0	0	0	0
205	0	0	0	0	0	0	0	0	0	0
206	1	0	0	0	0	0	0	0	0	0
207	0	0	0	0	0	0	0	0	0	0
208	0	0	0	0	0	0	0	0	0	0
209	1	0	0	0	1	0	0	0	0	0
210	0	0	0	0	0	0	0	0	0	0
211	0	0	0	0	0	1	1	0	0	0
212	0	0	0	0	0	0	0	0	0	0
213	0	0	0	0	0	0	0	0	0	0
214	0	0	0	0	0	0	0	0	0	0
215	1	0	1	0	0	0	0	0	0	0
216	0	0	0	0	0	0	0	0	0	0
217	0	0	0	0	0	0	0	0	0	0
218	0	0	0	0	0	0	0	0	0	0

Sample	STN	BLUSTN	RSTN	BLKSTN	WSTN	WP	WF	BLKSPC	RS	BWNSED
219	0	0	0	0	0	0	0	0	0	0
220	1	0	1	0	0	0	0	0	0	0
221	1	0	1	0	0	0	0	0	0	0
222	0	0	0	0	0	0	0	0	0	0
223	0	0	0	0	0	0	0	0	0	0
224	0	0	0	0	0	0	0	0	0	0
225	1	1	0	0	0	0	0	0	0	0
226	0	0	0	0	0	0	0	0	0	0
227	0	0	0	0	0	0	0	0	0	0
228	0	0	0	0	0	0	0	0	0	0
229	1	0	1	0	0	1	1	0	0	0
230	0	0	0	0	0	0	0	0	0	0
231	0	0	0	0	0	0	0	0	0	0
232	0	0	0	0	0	1	0	1	1	0
233	1	0	0	1	0	0	0	0	0	0
234	1	1	0	0	0	0	0	0	0	0
235	0	0	0	0	0	0	0	0	0	0
236	0	0	0	0	0	0	0	0	0	0
237	0	0	0	0	0	0	0	0	0	0
238	0	0	0	0	0	0	0	0	0	0
239	1	0	1	0	0	0	0	0	0	0
240	0	0	0	0	0	0	0	0	0	0
241	0	0	0	0	0	0	0	0	0	0
242	1	0	0	0	1	0	0	0	0	0
243	0	0	0	0	0	0	0	0	0	0
244	0	0	0	0	0	0	0	0	0	0
245	1	0	1	0	0	0	0	0	0	0
246	0	0	0	0	0	0	0	0	0	0

Sample	STN	BLUSTN	RSTN	BLKSTN	WSTN	WP	WF	BLKSPC	RS	BWNSED
247	0	0	0	0	0	1	0	0	0	1
248	1	0	1	0	0	0	0	0	0	0
249	0	0	0	0	0	0	0	0	0	0
250	0	0	0	0	0	0	0	0	0	0
251	1	0	1	0	0	0	0	0	0	0
252	0	0	0	0	0	0	0	0	0	0
253	0	0	0	0	0	0	0	0	0	0
254	0	0	0	0	0	0	0	0	0	0
255	0	0	0	0	0	0	0	0	0	0
256	0	0	0	0	0	0	0	0	0	0
257	0	0	0	0	0	0	0	0	0	0
258	0	0	0	0	0	0	0	0	0	0
259	0	0	0	0	0	0	0	0	0	0
260	0	0	0	0	0	0	0	0	0	0
261	1	1	0	0	1	0	0	0	0	0
262	1	0	1	0	0	0	0	0	0	0
263	0	0	0	0	0	0	0	0	0	0
264	1	1	0	0	1	0	0	0	0	0
265	0	0	0	0	0	0	0	0	0	0
266	1	0	1	0	0	0	0	0	0	0
267	1	0	1	0	0	0	0	0	0	0
268	0	0	0	0	0	0	0	0	0	0
269	0	0	0	0	0	0	0	0	0	0
270	0	0	0	0	0	0	0	0	0	0
271	0	0	0	0	0	0	0	0	0	0
272	0	0	0	0	0	0	0	0	0	0
273	1	1	0	0	0	1	0	0	0	1
274	0	0	0	0	0	0	0	0	0	0

Sample	STN	BLUSTN	RSTN	BLKSTN	WSTN	WP	WF	BLKSPC	RS	BWNSED
275	0	0	0	0	0	0	0	0	0	0
276	0	0	0	0	0	0	0	0	0	0
277	0	0	0	0	0	0	0	0	0	0
278	1	0	1	0	1	0	0	0	0	0
279	0	0	0	0	0	0	0	0	0	0
280	1	0	1	0	0	1	0	1	0	0
281	0	0	0	0	0	0	0	0	0	0
282	0	0	0	0	0	0	0	0	0	0
283	1	0	1	0	0	0	0	0	0	0
284	0	0	0	0	0	1	0	1	0	0
285	0	0	0	0	0	0	0	0	0	0
286	1	1	0	0	0	0	0	0	0	0
287	0	0	0	0	0	0	0	0	0	0
288	1	1	0	0	0	0	0	0	0	0
289	1	0	1	0	1	0	0	0	0	0
290	1	0	0	0	1	0	0	0	0	0
291	1	0	0	0	1	0	0	0	0	0
292	0	0	0	0	0	0	0	0	0	0
293	0	0	0	0	0	1	1	0	0	0
294	0	0	0	0	0	0	0	0	0	0
295	1	0	0	0	1	0	0	0	0	0
296	1	0	0	0	1	1	0	0	0	1
297	1	0	1	0	0	0	0	0	0	0
298	0	0	0	0	0	0	0	0	0	0
299	1	0	0	0	1	0	0	0	0	0
300	0	0	0	0	0	0	0	0	0	0
301	0	0	0	0	0	0	0	0	0	0
302	1	0	0	0	1	1	1	0	0	0

Sample	STN	BLUSTN	RSTN	BLKSTN	WSTN	WP	WF	BLKSPC	RS	BWNSED
303	1	0	0	0	1	0	0	0	0	0
304	0	0	0	0	0	0	0	0	0	0
305	0	0	0	0	0	0	0	0	0	0
306	0	0	0	0	0	0	0	0	0	0
307	0	0	0	0	0	0	0	0	0	0
308	0	0	0	0	0	0	0	0	0	0
309	0	0	0	0	0	0	0	0	0	0
310	0	0	0	0	0	0	0	0	0	0
311	0	0	0	0	0	0	0	0	0	0
312	0	0	0	0	0	0	0	0	0	0
313	0	0	0	0	0	1	0	0	0	1
314	0	0	0	0	0	0	0	0	0	0
315	1	0	1	0	0	0	0	0	0	0
316	0	0	0	0	0	1	0	0	0	1
317	0	0	0	0	0	1	1	0	0	0
318	0	0	0	0	0	0	0	0	0	0
319	0	0	0	0	0	0	0	0	0	0
320	0	0	0	0	0	0	0	0	0	0
321	0	0	0	0	0	0	0	0	0	0
322	0	0	0	0	0	1	1	0	0	0
323	0	0	0	0	0	0	0	0	0	0
324	0	0	0	0	0	0	0	0	0	0
325	0	0	0	0	0	0	0	0	0	0
326	0	0	0	0	0	0	0	0	0	0
327	0	0	0	0	0	0	0	0	0	0
328	1	0	0	0	1	1	1	1	0	0
329	0	0	0	0	0	0	0	0	0	0
330	0	0	0	0	0	0	0	0	0	0

Sample	STN	BLUSTN	RSTN	BLKSTN	WSTN	WP	WF	BLKSPC	RS	BWNSED
331	1	0	0	0	1	1	0	0	1	0
332	0	0	0	0	0	0	0	0	0	0
333	0	0	0	0	0	0	0	0	0	0
334	0	0	0	0	0	0	0	0	0	0
335	1	0	0	0	1	1	1	1	0	0
336	0	0	0	0	0	0	0	0	0	0
337	0	0	0	0	0	0	0	0	0	0
338	1	0	1	0	0	0	0	0	0	0
339	0	0	0	0	0	0	0	0	0	0
340	1	0	1	0	0	0	0	0	0	0
341	0	0	0	0	0	0	0	0	0	0
342	1	0	0	0	1	0	0	0	0	0
343	1	0	1	0	0	0	0	0	0	0
344	0	0	0	0	0	0	0	0	0	0
345	1	0	0	0	1	1	1	0	0	0
346	0	0	0	0	0	0	0	0	0	0
347	1	1	0	0	0	0	0	0	0	0
348	1	0	1	0	0	0	0	0	0	0
349	0	0	0	0	0	0	0	0	0	0
350	0	0	0	0	0	0	0	0	0	0
351	1	1	0	0	0	0	0	0	0	0
352	1	1	0	0	0	0	0	0	0	0
353	1	0	0	0	1	1	1	0	0	0
354	1	0	1	0	0	0	0	0	0	0
355	0	0	0	0	0	1	0	0	0	1
356	0	0	0	0	0	0	0	0	0	0
357	1	0	1	0	0	0	0	0	0	0
358	1	0	1	0	0	1	0	1	0	0

Sample	STN	BLUSTN	RSTN	BLKSTN	WSTN	WP	WF	BLKSPC	RS	BWNSED
359	0	0	0	0	0	0	0	0	0	0
360	1	0	1	0	0	0	0	0	0	0
361	0	0	0	0	0	0	0	0	0	0
362	0	0	0	0	0	0	0	0	0	0
363	0	0	0	0	0	0	0	0	0	0
364	0	0	0	0	0	0	0	0	0	0
365	1	0	0	0	1	0	0	0	0	0
366	1	0	1	0	0	0	0	0	0	0
367	0	0	0	0	0	0	0	0	0	0
368	0	0	0	0	0	1	0	1	0	0
369	1	0	1	0	0	0	0	0	0	0
370	0	0	0	0	0	0	0	0	0	0
371	0	0	0	0	0	0	0	0	0	0
372	1	0	0	0	1	0	0	0	0	0
373	1	0	1	0	0	1	1	0	0	0
374	1	0	0	0	1	1	1	0	0	0
375	0	0	0	0	0	0	0	0	0	0
376	0	0	0	0	0	0	0	0	0	0
377	0	0	0	0	0	0	0	0	0	0
378	1	0	1	0	0	0	0	0	0	0
379	0	0	0	0	0	0	0	0	0	0
380	0	0	0	0	0	0	0	0	0	0
381	0	0	0	0	0	0	0	0	0	0
382	0	0	0	0	0	0	0	0	0	0
383	1	0	1	0	0	0	0	0	0	0
384	1	0	1	0	0	0	0	0	0	0
385	1	0	1	1	0	0	0	0	0	0
386	1	0	1	0	1	0	0	0	0	0

Sample	STN	BLUSTN	RSTN	BLKSTN	WSTN	WP	WF	BLKSPC	RS	BWNSED
387	0	0	0	0	0	0	0	0	0	0
388	0	0	0	0	0	0	0	0	0	0
389	0	0	0	0	0	1	1	0	0	0
390	0	0	0	0	0	0	0	0	0	0
391	1	0	1	0	0	0	0	0	0	0
392	1	1	0	0	0	0	0	0	0	0
393	1	1	0	0	0	0	0	0	0	0
394	1	0	1	0	0	1	0	0	1	0
395	0	0	0	0	0	0	0	0	0	0
396	0	0	0	0	0	0	0	0	0	0
397	1	0	0	0	1	1	1	0	0	0
398	0	0	0	0	0	0	0	0	0	0
399	1	1	0	0	0	0	0	0	0	0
400	1	0	1	0	0	0	0	0	0	0
401	0	0	0	0	0	0	0	0	0	0
402	0	0	0	0	0	0	0	0	0	0
403	0	0	0	0	0	0	0	0	0	0
404	1	1	1	0	0	0	0	0	0	0
405	1	0	1	0	0	0	0	0	0	0
406	0	0	0	0	0	0	0	0	0	0
407	1	0	1	1	0	1	0	0	1	0
408	0	0	0	0	0	1	1	0	0	0
409	1	0	1	1	0	0	0	0	0	0
410	0	0	0	0	0	0	0	0	0	0
411	0	0	0	0	0	0	0	0	0	0
412	0	0	0	0	0	1	1	0	0	0
413	0	0	0	0	0	1	1	0	0	0
414	1	1	0	0	1	1	1	0	0	0

Sample	STN	BLUSTN	RSTN	BLKSTN	WSTN	WP	WF	BLKSPC	RS	BWNSED
415	0	0	0	0	0	0	0	0	0	0
416	1	0	1	0	0	0	0	0	0	0
417	0	0	0	0	0	1	0	0	0	0
418	1	0	1	0	0	0	0	0	0	0
419	0	0	0	0	0	0	0	0	0	0
420	1	0	0	0	1	0	0	0	0	0
421	1	0	1	0	0	0	0	0	0	0
422	1	0	1	0	0	0	0	0	0	0
423	1	0	1	0	0	0	0	0	0	0
424	1	0	1	0	0	0	0	0	0	0
425	1	0	1	0	0	0	0	0	0	0
426	1	0	0	0	0	1	0	0	0	0
427	1	0	1	0	1	0	0	0	0	0
428	1	1	0	0	0	0	0	0	0	0
429	0	0	0	0	0	0	0	0	0	0
430	0	0	0	0	0	0	0	0	0	0
431	1	0	1	0	0	0	0	0	0	0
432	0	0	0	0	0	0	0	0	0	0
433	1	0	1	0	0	0	0	0	0	0
434	0	0	0	0	0	0	0	0	0	0
435	1	1	1	0	0	0	0	0	0	0
436	1	0	0	0	1	0	0	0	0	0
437	1	0	0	1	1	1	0	0	0	0
438	0	0	0	0	0	0	0	0	0	0
439	0	0	0	0	0	0	0	0	0	0
440	0	0	0	0	0	0	0	0	0	0
441	1	0	0	0	1	0	0	0	0	0
442	1	1	0	0	0	0	0	0	0	0

Sample	STN	BLUSTN	RSTN	BLKSTN	WSTN	WP	WF	BLKSPC	RS	BWNSED
443	0	0	0	0	0	0	0	0	0	0
444	1	0	0	0	1	0	0	0	0	0
445	1	0	1	0	0	0	0	0	0	0
446	0	0	0	0	0	0	0	0	0	0
447	1	0	1	0	1	0	0	0	0	0
448	0	0	0	0	0	0	0	0	0	0
449	0	0	0	0	0	0	0	0	0	0
450	0	0	0	0	0	0	0	0	0	0
451	0	0	0	0	0	0	0	0	0	0
452	1	1	0	0	0	0	0	0	0	0
453	0	0	0	0	0	0	0	0	0	0
454	1	0	1	0	0	1	0	0	0	0
455	0	0	0	0	0	1	0	1	0	0
456	1	1	0	1	0	0	0	0	0	0
457	1	1	0	0	0	0	0	0	0	0
458	0	0	0	0	0	0	0	0	0	0
459	1	0	1	0	0	0	0	0	0	0
460	1	0	1	0	0	1	0	0	0	1
461	0	0	0	0	0	0	0	0	0	0
462	1	1	1	0	0	1	0	1	0	0
463	0	0	0	0	0	0	0	0	0	0
464	0	0	0	0	0	0	0	0	0	0
465	1	0	0	0	1	0	0	0	0	0
466	1	0	1	0	1	1	0	0	1	1
467	0	0	0	0	0	0	0	0	0	0
468	0	0	0	0	0	0	0	0	0	0
469	1	0	0	0	0	0	0	0	0	0
470	1	0	1	0	0	0	0	0	0	0

Sample	STN	BLUSTN	RSTN	BLKSTN	WSTN	WP	WF	BLKSPC	RS	BWNSED
471	0	0	0	0	0	0	0	0	0	0
472	0	0	0	0	0	0	0	0	0	0
473	1	0	1	0	0	0	0	0	0	0
474	1	1	0	0	1	0	0	0	0	0
475	1	1	1	0	0	1	1	0	1	0
476	1	0	0	0	1	0	0	0	0	0
477	0	0	0	0	0	0	0	0	0	0
478	0	0	0	0	0	1	1	0	0	0
479	0	0	0	0	0	0	0	0	0	0
480	0	0	0	0	0	0	0	0	0	0
481	0	0	0	0	0	0	0	0	0	0
482	0	0	0	0	0	0	0	0	0	0
483	0	0	0	0	0	0	0	0	0	0
484	1	0	1	0	1	0	0	0	0	0
485	0	0	0	0	0	0	0	0	0	0
486	1	1	0	1	0	0	0	0	0	0
487	1	1	0	0	0	0	0	0	0	0
488	1	1	0	0	1	0	0	0	0	0
489	1	1	0	0	0	0	0	0	0	0
490	1	1	0	0	1	0	0	0	0	0
491	1	1	0	0	0	1	1	0	0	0
492	0	0	0	0	0	0	0	0	0	0
493	1	1	1	0	0	0	0	0	0	0
494	1	0	1	0	0	0	0	0	0	0
495	0	0	0	0	0	0	0	0	0	0
496	1	0	1	0	0	1	0	1	0	0
497	0	0	0	0	0	0	0	0	0	0
498	0	0	0	0	0	0	0	0	0	0

Sample	STN	BLUSTN	RSTN	BLKSTN	WSTN	WP	WF	BLKSPC	RS	BWNSED
499	1	0	1	0	0	1	1	0	0	0
500	1	0	1	0	0	0	0	0	0	0
501	0	0	0	0	0	0	0	0	0	0
502	0	0	0	0	0	0	0	0	0	0
503	1	0	1	0	0	0	0	0	0	0
504	0	0	0	0	0	1	0	0	0	1
505	0	0	0	0	0	0	0	0	0	0
506	1	0	1	0	0	0	0	0	0	0
507	0	0	0	0	0	0	0	0	0	0
508	0	0	0	0	0	0	0	0	0	0
509	1	1	1	0	0	0	0	0	0	0
510	1	1	0	0	1	0	0	0	0	0
511	1	1	0	0	0	0	0	0	0	0
512	1	0	1	0	0	0	0	0	0	0
513	1	1	0	0	0	0	0	0	0	0
514	0	0	0	0	0	0	0	0	0	0
515	1	0	1	0	0	0	0	0	0	0
516	1	0	0	0	1	0	0	0	0	0
517	1	0	1	0	0	0	0	0	0	0
518	0	0	0	0	0	0	0	0	0	0
519	1	0	1	0	0	0	0	0	0	0
520	0	0	0	0	0	0	0	0	0	0
521	1	1	0	0	0	0	0	0	0	0
522	1	0	0	1	0	0	0	0	0	0
523	0	0	0	0	0	0	0	0	0	0
524	1	0	0	0	1	1	0	0	0	1
525	0	0	0	0	0	0	0	0	0	0
526	1	0	1	1	0	0	0	0	0	0

Sample	STN	BLUSTN	RSTN	BLKSTN	WSTN	WP	WF	BLKSPC	RS	BWNSED
527	0	0	0	0	0	1	1	0	0	0
528	1	0	1	0	0	0	0	0	0	0
529	0	0	0	0	0	0	0	0	0	0
530	0	0	1	0	0	1	0	0	0	1
531	1	1	0	0	1	0	0	0	0	0
532	1	0	1	0	0	0	0	0	0	0
533	0	0	0	0	0	0	0	0	0	0
534	1	0	1	0	0	0	0	0	0	0
535	1	0	1	0	0	1	1	0	0	0
536	1	0	1	0	0	0	0	0	0	0
537	0	0	0	0	0	0	0	0	0	0
538	0	0	0	0	0	0	0	0	0	0
539	1	1	1	0	0	0	0	0	0	0
540	0	0	0	0	0	0	0	0	0	0
541	0	0	0	0	0	0	0	0	0	0
542	0	0	0	0	0	0	0	0	0	0
543	0	0	0	0	0	0	0	0	0	0
544	1	0	1	0	0	1	0	0	0	0
545	0	0	0	0	0	0	0	0	0	0
546	0	0	0	0	0	0	0	0	0	0
547	1	0	0	1	0	0	0	0	0	0
548	0	0	0	0	0	0	0	0	0	0
549	1	0	0	0	1	0	0	0	0	0
550	1	0	0	1	0	0	0	0	0	0
551	0	0	0	0	0	0	0	0	0	0
552	1	1	0	0	0	0	0	0	0	0
553	0	0	0	0	0	0	0	0	0	0
554	0	0	0	0	0	0	0	0	0	0

Sample	STN	BLUSTN	RSTN	BLKSTN	WSTN	WP	WF	BLKSPC	RS	BWNSED
555	0	0	0	0	0	0	0	0	0	0
556	1	0	0	1	0	0	0	0	0	0
557	0	0	0	0	0	0	0	0	0	0
558	0	0	0	0	0	0	0	0	0	0
559	0	0	0	0	0	0	0	0	0	0
560	1	0	1	0	0	0	0	0	0	0
561	1	1	0	0	0	0	0	0	0	0
562	1	0	0	0	1	0	0	0	0	0
563	1	0	0	0	1	0	0	0	0	0
564	1	0	1	0	0	0	0	0	0	0
565	1	1	0	0	0	0	0	0	0	0
566	0	0	0	0	0	0	0	0	0	0
567	0	0	0	0	0	0	0	0	0	0
568	1	0	0	0	1	0	0	0	0	0
569	1	1	0	0	0	0	0	0	0	0
570	1	1	0	0	0	0	0	0	0	0
571	0	0	0	0	0	0	0	0	0	0
572	0	0	0	0	0	1	1	0	0	0
573	0	0	0	0	0	0	0	0	0	0
574	0	0	0	0	0	0	0	0	0	0
575	0	0	0	0	0	0	0	0	0	0
576	0	0	0	0	0	0	0	0	0	0
577	0	0	0	0	0	0	0	0	0	0
578	1	0	1	0	0	1	0	0	1	0
579	1	0	1	0	0	0	0	0	0	0
580	0	0	0	0	0	0	0	0	0	0
581	1	0	0	0	0	0	0	0	0	0
582	0	0	0	0	0	1	0	0	1	0

Sample	STN	BLUSTN	RSTN	BLKSTN	WSTN	WP	WF	BLKSPC	RS	BWNSED
583	0	0	0	0	0	1	0	0	1	0
584	0	0	0	0	0	0	0	0	0	0
585	0	0	0	0	0	0	0	0	0	0
586	0	0	0	0	0	0	0	0	0	0
587	1	0	1	0	0	0	0	0	0	0
588	0	0	0	0	0	0	0	0	0	0
589	0	0	0	0	0	0	0	0	0	0
590	1	0	1	0	0	0	0	0	0	0
591	1	0	1	0	0	0	0	0	0	0
592	0	0	0	0	0	0	0	0	0	0
593	0	0	0	0	0	0	0	0	0	0
594	1	0	0	0	1	0	0	0	0	0
595	0	0	0	0	0	0	0	0	0	0
596	1	1	0	0	0	1	0	1	0	0
597	1	0	1	0	0	0	0	0	0	0
598	1	0	1	0	0	1	1	0	0	0
599	1	0	1	0	0	0	0	0	0	0
600	1	0	1	0	0	0	0	0	0	0
601	0	0	0	0	0	0	0	0	0	0
602	0	0	0	0	0	0	0	0	0	0
603	0	0	0	0	0	1	1	0	0	0
604	1	0	0	0	1	0	0	0	0	0
605	1	0	0	0	1	0	0	0	0	0
606	1	0	0	0	1	0	0	0	0	0
607	1	1	0	0	0	0	0	0	0	0
608	0	0	0	0	0	0	0	0	0	0
609	0	0	0	0	0	0	0	0	0	0
610	0	0	0	0	0	0	0	0	0	0

Sample	STN	BLUSTN	RSTN	BLKSTN	WSTN	WP	WF	BLKSPC	RS	BWNSED
611	0	0	0	0	0	0	0	0	0	0
612	1	0	1	0	0	0	0	0	0	0
613	0	0	0	0	0	0	0	0	0	0
614	0	0	0	0	0	0	0	0	0	0
615	0	0	0	0	0	0	0	0	0	0
616	1	0	1	0	1	1	0	1	0	0
617	1	1	0	0	0	0	0	0	0	0
618	1	0	1	0	1	0	0	0	0	0
619	1	0	0	0	0	0	0	0	0	0
620	0	0	0	0	0	0	0	0	0	0
621	1	0	1	0	1	0	0	0	0	0
622	0	0	0	0	0	0	0	0	0	0
623	0	0	0	0	0	0	0	0	0	0
624	0	0	0	0	0	0	0	0	0	0
625	0	0	0	0	0	0	0	0	0	0
626	0	0	0	0	0	0	0	0	0	0
627	0	0	0	0	0	0	0	0	0	0
628	1	0	1	0	0	0	0	0	0	0
629	1	0	0	0	0	0	0	0	0	0
630	1	0	1	1	0	1	0	0	0	1
631	0	0	0	0	0	0	0	0	0	0
632	0	0	0	0	0	0	0	0	0	0
633	1	0	1	0	0	0	0	0	0	0
634	1	0	1	1	0	0	0	0	0	0
635	0	0	0	0	0	0	0	0	0	0
636	0	0	0	0	0	0	0	0	0	0
637	0	0	0	0	0	0	0	0	0	0
638	1	0	1	0	0	0	0	0	0	0

Sample	STN	BLUSTN	RSTN	BLKSTN	WSTN	WP	WF	BLKSPC	RS	BWNSED
639	1	1	0	0	0	0	0	0	0	0
640	0	0	0	0	0	0	0	0	0	0
641	0	0	0	0	0	0	0	0	0	0
642	0	0	0	0	0	0	0	0	0	0
643	0	0	0	0	0	0	0	0	0	0
644	1	0	1	0	0	0	0	0	0	0
645	0	0	0	0	0	0	0	0	0	0
646	0	0	0	0	0	0	0	0	0	0
647	1	0	0	0	0	0	0	0	0	0
648	0	0	0	0	0	0	0	0	0	0
649	1	0	1	0	0	0	0	0	0	0
650	0	0	0	0	0	0	0	0	0	0
651	0	0	0	0	0	0	0	0	0	0
652	1	0	1	0	0	0	0	0	0	0
653	1	1	1	0	0	0	0	0	0	0
654	0	0	0	0	0	0	0	0	0	0
655	1	1	1	1	0	1	0	1	0	0
656	1	0	0	1	1	0	0	0	0	0
657	1	0	1	0	0	1	1	0	0	0
658	1	0	1	0	0	0	0	0	0	0
659	0	0	0	0	0	0	0	0	0	0
660	1	1	0	1	0	0	0	0	0	0
661	0	0	0	0	0	0	0	0	0	0
662	1	0	1	0	0	0	0	0	0	0
663	1	0	1	0	0	1	1	0	0	0
664	0	0	0	0	0	1	0	1	0	0
665	0	0	0	0	0	0	0	0	0	0
666	0	0	0	0	0	0	0	0	0	0

Sample	STN	BLUSTN	RSTN	BLKSTN	WSTN	WP	WF	BLKSPC	RS	BWNSED
667	0	0	0	0	0	0	0	0	0	0
668	0	0	0	0	0	0	0	0	0	0
669	0	0	0	0	0	0	0	0	0	0
670	0	0	0	0	0	0	0	0	0	0
671	0	0	0	0	0	1	0	0	0	1
672	0	0	0	0	0	0	0	0	0	0
673	1	0	0	0	1	0	0	0	0	0
674	0	0	0	0	0	1	1	0	0	0
675	0	0	0	0	0	0	0	0	0	0
676	1	0	0	0	1	0	0	0	0	0
677	0	0	0	0	0	0	0	0	0	0
678	0	0	0	0	0	0	0	0	0	0
679	1	0	1	0	0	0	0	0	0	0
680	1	0	1	0	0	0	0	0	0	0
681	0	0	0	0	0	0	0	0	0	0
682	0	0	0	0	0	0	0	0	0	0
683	1	0	1	0	0	0	0	0	0	0
684	1	0	1	0	0	0	0	0	0	0
685	0	0	0	0	0	0	0	0	0	0
686	1	0	0	1	0	0	0	0	0	0
687	1	0	1	0	0	1	0	0	1	0
688	1	0	0	1	0	1	0	1	0	0
689	1	0	1	0	0	0	0	0	0	0
690	0	0	0	0	0	0	0	0	0	0
691	0	0	0	0	0	0	0	0	0	0
692	0	0	0	0	0	1	0	1	0	0
693	0	0	0	0	0	0	0	0	0	0
694	1	0	0	0	1	1	0	1	0	0

Sample	STN	BLUSTN	RSTN	BLKSTN	WSTN	WP	WF	BLKSPC	RS	BWNSED
695	1	0	0	0	1	0	0	0	0	0
696	1	0	1	0	0	0	0	0	0	0
697	0	0	0	0	0	0	0	0	0	0
698	0	0	0	0	0	0	0	0	0	0
699	1	0	0	1	0	0	0	0	0	0
700	0	0	0	0	0	0	0	0	0	0
701	0	0	0	0	0	0	0	0	0	0
702	0	0	0	0	0	1	0	0	0	1
703	0	0	0	0	0	0	0	0	0	0
704	1	0	0	0	1	0	0	0	0	0
705	0	0	0	0	0	0	0	0	0	0
706	0	0	0	0	0	0	0	0	0	0
707	0	0	0	0	0	0	0	0	0	0
708	0	0	0	0	0	0	0	0	0	0
709	0	0	0	0	0	0	0	0	0	0
710	0	0	0	0	0	0	0	0	0	0
711	1	0	1	0	0	1	0	0	0	1
712	0	0	0	0	0	0	0	0	0	0
713	1	0	1	0	0	1	0	0	0	1
714	0	0	0	0	0	1	0	0	0	1
715	1	0	1	0	0	0	0	0	0	0
716	0	0	0	0	0	0	0	0	0	0
717	1	0	0	0	1	0	0	0	0	0
718	0	0	0	0	0	0	0	0	0	0
719	0	0	0	0	0	0	0	0	0	0
720	1	0	1	0	0	0	0	0	0	0
721	0	0	0	0	0	0	0	0	0	0
722	0	0	0	0	0	0	0	0	0	0

Sample	STN	BLUSTN	RSTN	BLKSTN	WSTN	WP	WF	BLKSPC	RS	BWNSED
723	0	0	0	0	0	0	0	0	0	0
724	0	0	0	0	0	0	0	0	0	0
725	0	0	0	0	0	0	0	0	0	0
726	1	0	1	0	0	0	0	0	0	0
727	0	0	0	0	0	0	0	0	0	0
728	1	0	0	1	0	0	0	0	0	0
729	0	0	0	0	0	1	0	0	0	1
730	1	1	0	0	0	0	0	0	0	0
731	0	0	0	0	0	0	0	0	0	0
732	1	0	1	0	0	0	0	0	0	0
733	1	0	1	0	0	0	0	0	0	0
734	0	0	0	0	0	0	0	0	0	0
735	0	0	0	0	0	0	0	0	0	0
736	1	1	0	0	0	0	0	0	0	0
737	1	0	1	0	0	0	0	0	0	0
738	0	0	0	0	0	0	0	0	0	0
739	1	0	1	0	0	1	0	0	0	1
740	0	0	0	0	0	0	0	0	0	0
741	1	1	1	0	0	0	0	0	0	0
742	0	0	0	0	0	0	0	0	0	0
743	1	0	1	0	0	0	0	0	0	0
744	1	0	0	0	0	0	0	0	0	0
745	0	0	0	0	0	0	0	0	0	0
746	0	0	0	0	0	0	0	0	0	0
747	0	0	0	0	0	0	0	0	0	0
748	1	0	0	1	0	0	0	0	0	0
749	0	0	0	0	0	0	0	0	0	0
750	0	0	0	0	0	0	0	0	0	0

Sample	STN	BLUSTN	RSTN	BLKSTN	WSTN	WP	WF	BLKSPC	RS	BWNSED
751	0	0	0	0	0	0	0	0	0	0
752	0	0	0	0	0	0	0	0	0	0
753	0	0	0	0	0	0	0	0	0	0
754	0	0	0	0	0	0	0	0	0	0
755	1	0	1	0	0	0	0	0	0	0
756	1	0	1	1	1	0	0	0	0	0
757	0	0	0	0	0	0	0	0	0	0
758	0	0	0	0	0	0	0	0	0	0
759	0	0	0	0	0	0	0	0	0	0
760	1	0	1	0	0	1	1	0	0	0
761	0	0	0	0	0	0	0	0	0	0
762	0	0	0	0	0	0	0	0	0	0
763	1	0	1	0	0	1	1	1	0	0
764	0	0	0	0	0	1	0	0	0	1
765	0	0	0	0	0	0	0	0	0	0
766	0	0	0	0	0	0	0	0	0	0
767	1	0	0	1	0	0	0	0	0	0
768	0	0	0	0	0	0	0	0	0	0
769	1	0	1	0	0	0	0	0	0	0
770	1	0	0	0	1	0	0	0	0	0
771	1	1	0	1	0	0	0	0	0	0
772	0	0	0	0	0	0	0	0	0	0
773	1	0	1	0	0	0	0	0	0	0
774	1	0	1	0	0	0	0	0	0	0
775	1	0	1	0	0	0	0	0	0	0
776	1	1	1	0	0	0	0	0	0	0
777	1	1	1	1	1	1	0	1	1	1
778	0	0	0	0	0	0	0	0	0	0

Sample	STN	BLUSTN	RSTN	BLKSTN	WSTN	WP	WF	BLKSPC	RS	BWNSED
779	1	0	1	0	0	0	0	0	0	0
780	0	0	0	0	0	0	0	0	0	0
781	0	0	0	0	0	1	0	1	0	0
782	0	0	0	0	0	0	0	0	0	0
783	0	0	0	0	0	0	0	0	0	0
784	1	0	1	0	0	0	0	0	0	0
785	0	0	0	0	0	0	0	0	0	0
786	0	0	0	0	0	0	0	0	0	0
787	0	0	0	0	0	0	0	0	0	0
788	1	0	0	0	1	0	0	0	0	0
789	1	0	0	0	1	0	0	0	0	0
790	0	0	0	0	0	0	0	0	0	0
791	0	0	0	0	0	1	0	0	0	0
792	1	0	1	1	0	1	0	0	0	0
793	1	0	0	0	1	0	0	0	0	0
794	0	0	0	0	0	1	1	0	0	0
795	1	1	0	0	0	0	0	0	0	0
796	1	0	1	0	0	0	0	0	0	0
797	1	0	1	0	0	0	0	0	0	0
798	0	0	0	0	0	0	0	0	0	0
799	0	0	0	0	0	0	0	0	0	0
800	1	0	0	0	1	0	0	0	0	0
801	1	0	1	0	0	0	0	0	0	0
802	1	1	1	0	0	1	1	0	0	0
803	0	0	0	0	0	0	0	0	0	0
804	0	0	0	0	0	0	0	0	0	0
805	0	0	0	0	0	0	0	0	0	0
806	0	0	0	0	0	0	0	0	0	0

Sample	STN	BLUSTN	RSTN	BLKSTN	WSTN	WP	WF	BLKSPC	RS	BWNSED
807	1	0	1	0	0	0	0	0	0	0
808	0	0	0	0	0	0	0	0	0	0
809	1	1	0	0	0	0	0	0	0	0
810	0	0	0	0	0	0	0	0	0	0
811	0	0	0	0	0	1	0	0	1	0
812	0	0	0	0	0	0	0	0	0	0
813	1	0	1	0	0	0	0	0	0	0
814	1	0	1	1	0	0	0	0	0	0
815	1	0	1	0	1	0	0	0	0	0
816	0	0	0	0	0	0	0	0	0	0
817	1	1	1	1	0	0	0	0	0	0
818	1	1	1	0	0	0	0	0	0	0
819	0	0	0	0	0	1	1	0	0	0
820	1	1	0	0	0	0	0	0	0	0
821	0	0	0	0	0	0	0	0	0	0
822	1	0	1	0	0	0	0	0	0	0
823	0	0	0	0	0	0	0	0	0	0
824	0	0	0	0	0	0	0	0	0	0
825	1	0	0	0	1	1	1	0	0	0
826	1	0	1	0	1	0	0	0	0	0
827	0	0	0	0	0	0	0	0	0	0
828	1	0	1	0	0	1	0	0	1	0
829	0	0	0	0	0	1	1	0	0	0
830	0	0	0	0	0	0	0	0	0	0
831	0	0	0	0	0	0	0	0	0	0