Pilot Implementation of the Lake Tahoe Nearshore Monitoring Framework for Clarity Metrics

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Research Vessel (R/V) Mt. Rose monitoring clarity on Lake Tahoe

EXECUTIVE SUMMARY

This project was implemented to demonstrate a pilot monitoring program for evaluation of nearshore clarity metrics identified by the Lake Tahoe Nearshore Monitoring and Evaluation Framework. That framework recommended a minimum of four contiguous nearshore surveys each year to assess spatiotemporal patterns in turbidity, light transmissivity, and chlorophyll-a fluorescence. This project conducted five complete nearshore surveys from November 2014 through November 2015, using flow-through sensors on the R/V Mt. Rose that followed a consistent path-line around the entire nearshore at approximately the 7-meter depth contour. With approximately bimonthly circuits from April to November 2014, these monitoring surveys represented an annual cycle of typical lake changes that included spring snowmelt runoff, warming and increased lake stratification over summer, followed by cooling and water column mixing in the fall.

No single turbidity measurement exceeded the existing TRPA threshold standard of one nephelometric turbidity unit (NTU). The lowest single turbidity value measured was 0.081 NTU. These measurements were necessarily conducted during non-storm periods, however, so nearshore monitoring closer to outfall points during storm runoff events would likely yield values exceeding 1 NTU.

The range of turbidity values measured throughout the year spanned 0.081 to 0.999 NTU. Average of interquartile ranges, representing the bulk of collected data during each circuit, extended from 0.107 to 0.128 NTU. Highest turbidity was typically found near urban areas along the south shore, the northeast shore and northwest shore of Lake Tahoe. Nearshore areas along the northshore and just north of Emerald Bay yielded the best clarity conditions (lowest turbidity levels).

There was a general trend of increasing turbidity from 2001 through 2012, but the more recent nearshore circuits (2014–2015) showed that turbidity levels have returned to the range of values typical for the period from 2001 through 2008.

Transmissivity measurements were moderately correlated with turbidity ($r = -0.43$), and spatial patterns were similar, with the exception that the west shore of the lake showed more variability and lower clarity conditions than were assessed from turbidity measurements. The range of transmissivity values measured throughout the year spanned 76.33 to 98.90 percent light transmittance, with the average of interquartile ranges from each circuit extending from 96.55 to 97.28 percent. The best single value for light transmittance measured during the project was 98.90 percent just offshore from South Lake Tahoe in April 2015.

Chlorophyll-a values ranged from a minimum of 51.0 fluorescence units (in June 2015) to a maximum of 116.3 fluorescence units (in November 2015). Chlorophyll fluorescence was weakly correlated with transmissivity ($r = 0.02$), but there was no apparent direct correlation with turbidity. The interquartile range in relative chlorophyll-a was 59.98 to 65.56 relative fluorescence units.

A regression of watershed cumulative percent impervious cover density versus average turbidity over corresponding nearshore sections was relatively weak ($R^2 = 0.214$). Further examination of this relationship, including better delineation of landscape features and nearshore factors is recommended. This may benefit from development of models of the nearshore that incorporate important processes, such as hydrodynamic patterns, and localized features, such as stream inputs, stormwater outfalls and substrate composition.

Ultimately, however, these data must be integrated and analyzed with the monitoring data from other metrics associated with the Lake Tahoe Nearshore Evaluation and Monitoring Framework, specifically the trophic status metrics and aquatic community structure metrics. These metrics should be evaluated in aggregate, which would involve an integrated perspective on conditions and interactions between these nearshore metrics and associated processes. Longer-term, the spatiotemporal patterns in nearshore condition can only be evaluated effectively with a program of consistent, comparable and periodic monitoring surveys. Status of nearshore clarity metrics is fairly well established now, but it is recommended that the program of nearshore clarity monitoring be extended several years to provide a sufficient data set for trend analysis. This should include evaluation of additional factors potentially affecting the nearshore clarity metrics that include runoff, hydrodynamic conditions and linkages to onshore features.

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CA	California
CDOM	colored dissolved organic material
CV	coefficient of variation
DRI	Desert Research Institute
FWHM	full-width at half-maximum
GPS	global positioning system
km	kilometer
LTLP	Lake Tahoe License Plate Program
N	sample size (data points)
NTU	nephelometric turbidity unit
NV	Nevada
r	correlation coefficient
R^2	coefficient of determination
R/V	Research Vessel (e.g., R/V Mt. Rose)
sk_p	Pearson's skewness coefficient
TRPA	Tahoe Regional Planning Agency

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INTRODUCTION

Perceived changes in nearshore conditions at Lake Tahoe have been noted by both visitors and residents, with increasing stakeholder interest in managing the factors that may contribute to apparent deterioration of the nearshore environment. Contributing factors include urban runoff, aquatic invasive species, atmospheric deposition, stream inputs, recreational activities, and shorezone modification. Of particular concern to visitors, residents, and resource managers are the changes in nearshore clarity, increasing periphyton growth, and the spread of invasive species.

Contributing factors and observed nearshore response characteristics are interrelated and to some extent also directly connected to conditions in Lake Tahoe's deep-water region. The complexity of interactions in the nearshore, as well as the inherent spatial and temporal variability, makes monitoring and evaluation more difficult than for mid-lake condition. Therefore, a nearshore monitoring and evaluation framework was developed to address this complexity and to reduce it to a specific set of metrics or measureable characteristics that would be relevant to long-term assessment and evaluation of changes in nearshore condition (Heyvaert et al., 2013). Ultimately, tracking the status and trends associated with nearshore condition will require an established program of data collection. The results presented in this report focus on monitoring and evaluation of the nearshore clarity metrics. It is one part of the larger nearshore monitoring and evaluation framework previously developed through joint planning efforts of researchers and managers in the Lake Tahoe basin.

The intent of this project was to initiate a schedule of nearshore monitoring that would provide contemporary data useful for assessment of clarity conditions and for evaluation of the spatial and temporal variability associated with nearshore clarity metrics. As a pilot scale implementation it also provided the opportunity to resolve both anticipated and unanticipated issues before coordinating and implementing routine clarity monitoring as part of any longer-term nearshore monitoring program. Specific objectives were to:

- implement routine monitoring of clarity metrics as part of a standardized integrated approach to evaluate nearshore conditions;
- analyze and report on nearshore clarity data collected;
- evaluate protocols and sampling design to ensure cost effectiveness;
- document monitoring protocols utilized; and
- provide scientific assessment on the status and trends in nearshore clarity conditions, and effectively communicate these findings to public stakeholders.

BACKGROUND

Lake Tahoe is a unique environment that has been designated an "Outstanding National Water Resource" by the state of California and the US Environmental Protection Agency due to its ecological assets, its scenic characteristics, and the recreational opportunities that it provides. In Nevada it has been designated a "Water of Extraordinary Aesthetic or Ecologic Value". Of particular concern to resource managers is the fact that clarity in Lake Tahoe has decreased significantly during the last four decades. This is largely a consequence of fine sediment particle accumulation in the lake water from watershed runoff and from atmospheric deposition, and because there is more planktonic algae growth from increased nutrient inputs (e.g. Jassby et al., 1999; Swift et al., 2006; Sahoo et al., 2010).

Historically, research has been directed towards quantifying and understanding the sources of sediment and nutrient loading from watersheds, as well as the impacts that these pollutants have on mid-lake clarity. However, most visitor and resident experiences at Lake Tahoe occur within or close to the nearshore environment, however, where conditions translate directly into public perception of lake water quality. Significantly fewer resources have been devoted to understanding the nearshore processes, with no uniform and integrated approach adopted for monitoring long-term changes.

Environmental conditions in the nearshore have changed over time in response to natural and anthropogenic factors. These changes have included heavy growth of periphyton (attached algae) on rocks, piers, and other hard substrate in portions of the lake (e.g. Hackley et al., 2004; Hackley et al., 2011); the establishment of invasive fish species, such as the common carp, largemouth bass, and bluegill (Reuter and Miller, 2000); the spread of invasive aquatic plants, such as water milfoil and curly leaf pondweed; and most recently the appearance of benthic invertebrates, such as the Asian clam (Wittman 2008a; Wittman 2008b). Anthropogenic inputs of pollutants also are common to the nearshore, with elevated turbidity near some urbanized areas (Taylor et al., 2004; Susfalk et al., 2009), detectable concentrations of gasoline components near marinas (Allen et al., 1998; Miller et al., 2003, Rowe 2010), and accidental releases of raw sewage, such as the 2005 Kings Beach spill. Increased activity and changes in the nearshore zone are likely in the coming years, along with potential ecological and economic repercussions.

Recognizing the importance of the nearshore environment to Lake Tahoe's ecological health and regional economy, the science and management communities worked together recently to review and evaluate current nearshore standards and thresholds. This team developed a conceptual model of nearshore functions, evaluated a suite of measurable parameters and existing standards relevant to the nearshore, and then outlined a monitoring plan in the Lake Tahoe Nearshore Evaluation and Monitoring Framework (Heyvaert et al., 2013). This monitoring framework was structured to provide important nearshore data along with objective scientific evaluation that would contribute to assessment of longer-term status and trends associated with management strategies within the context of temporal and spatial variability inherent to the nearshore environment.

The monitoring framework is predicated on a set of directly measurable response metrics that inform the evaluation of integrative indicators. The selected indicators include nearshore clarity, trophic status, community structure, and conditions for human health. When linked to land use and pollutant loading assessments, the nearshore monitoring program can be used to inform targeted evaluation of causal linkages associated with measured changes in the nearshore, and it may help determine when and where nearshore ecological conditions change beyond desired limits.

Water clarity refers to the transparency or clearness of water, and is a commonly used indicator for the health of a water body. Federal, state, and regional agencies have adopted regulations to protect Lake Tahoe's renowned clarity, which includes both the pelagic (deep water) and the littoral (nearshore) zones. The nearshore represents an important socioeconomic value because this is where most visitors and residents experience the lake firsthand. Both California and Nevada recognize the unique ecological and aesthetic values of the nearshore environment, and both have adopted standards to protect the beneficial use and water quality of the nearshore, including water clarity. Secchi disk transparency is measured in the pelagic zone of Lake Tahoe, but this approach does not work in the littoral (nearshore) zone where water depth is insufficient for the method. Instead, instrument measurements of turbidity and light transmissivity are used as metrics of nearshore clarity.

The Tahoe Regional Planning Agency (TRPA) has adopted a standard for littoral Lake Tahoe water clarity consistent with California and Nevada that turbidity shall not exceed three nephelometric turbidity units in areas of stream influence, and that turbidity shall not exceed one nephelometric turbidity unit (NTU) in shallow waters of the Lake not directly influenced by stream discharges. Note that a nearshore turbidity of 1 NTU would be approximately equivalent to a Secchi disk clarity of only 3-6 m, however, which may not be appropriate for pristine areas like Bliss and Sand Harbor State Parks (Taylor *et al.*, 2004).

For purposes of monitoring and assessment the nearshore environment extends from existing shoreline to the average thermocline depth in mid-summer, or to a minimum lateral distance of 350 feet from the shoreline, whichever is greater (Heyvaert et al., 2013). Thermocline depth is defined as the point of maximum vertical temperature gradient, a structural hydrodynamic feature that effectively separates warmer mixed waters of the epilimnion from deeper cold waters of the hypolimnion. The 31-yr average thermocline depth in August at Lake Tahoe is 21 meters, or 69 feet (Coats et al., 2006). Although this thermocline depth may decrease slightly over time, given current climate trends, it reflects the typical historic conditions for Lake Tahoe and is considered appropriate for guiding a monitoring framework that must adapt to natural variability in lake water levels and changing thermodynamic structure.

A pilot scale implementation of nearshore monitoring was needed to demonstrate the feasibility of its application, to refine and document methods, and to evaluate the costs associated with recommended monitoring activities. This project was designed to address specifically the nearshore clarity metrics recommended in the Lake Tahoe Nearshore Evaluation and Monitoring Framework report. Those metrics include contiguous nearshore measurements of turbidity, transmissivity and chlorophyll.

As discussed in Taylor et al. (2004) the optical properties of water are broadly separated into two categories: apparent and inherent. Apparent optical properties are dependent on natural lighting and are also influenced by factors such as the angle of the sun above the horizon, cloud cover, and water surface conditions such as waves. The inherent optical properties of attenuation, absorption and scattering are not influenced by changes in the natural lighting or surface conditions.

Turbidity is an apparent optical measure of light scattering in water. It is commonly used in the Tahoe Basin for assessment of pollution from suspended fine sediment particles in urban stormwater and stream runoff, so it is a reasonable measure of nearshore conditions affected by stream inflow or urban runoff. Turbidity has disadvantages, however, when used in the clear water of Lake Tahoe. Its response profile to suspended particulates is more robust at high turbidity concentrations and less reliable at very low concentrations. Data are commonly presented in calibrated nephelometric turbidity units, which increase as the water becomes less clear. Turbidity is non-linearly related to Secchi clarity, however, and it does not respond to colored dissolved organic compounds (CDOM) like tannins that can reduce water clarity without increasing its turbidity.

Transmissivity is an inherent optical property that characterizes how much light is attenuated, or reduced, as it travels through water (Zaneveld and Pegan, 2003). Light attenuation is considered a preferred technique for clarity measurements in Lake Tahoe's nearshore water, as it is sensitive to both absorption and light scattering processes (Susfalk, et al, 2009). The response profile to suspended particulates is robust at very low concentration, which makes it capable of quantifying small changes in pristine, clear water conditions. Data are commonly presented as percentage transmittance, which decreases approximately linearly as the water becomes less clear. Unlike turbidity, transmissivity measurements are sensitive to light absorption by CDOM, which can be elevated in some stream and urban discharges.

Chlorophyll fluorescence is an inherent optical property of water that occurs when water is illuminated with light of one color and then emits, or fluoresces, light of a different color. It is commonly used as an indication of planktonic algae biomass. Data are commonly presented in relative fluorescence units, which increase as active chlorophyll concentrations increase.

Both turbidimeters and transmissometers have been used to measure water clarity in the nearshore of Lake Tahoe. The main advantage of the transmissometer is that it measures light attenuation directly and is more sensitive in low turbidity waters, where its response is linear over the range of typical impurity concentrations. Theoretically, this approach depends only upon inherent optical properties and would be preferred for clarity measurements where the water is very clean.

METHODS

Beginning in 1991 nearshore clarity was evaluated by periodically measuring offshore turbidity on the 25 meter depth contour at several locations (see Taylor, 2002), including 1) mouth of Upper Truckee River and Trout Creek; 2) El Dorado Beach; 3) mouth of Edgewood Creek; 4) Nevada Beach; 5) mouth of Incline Creek; 6) Burnt Cedar Beach; 7) mouth of Ward Creek; 8) Tahoe State Recreation Area; and 9) the mouth of Blackwood Creek. More recently, however, nearshore clarity has been measured in shallower waters considered more representative of littoral conditions where people interact with the lake and where effects from nearshore impacts are not excessively diluted by mixing with deeper offshore waters. Also, rather than simply measuring clarity at a few discrete locations, the more recent approach has been to conduct full perimeter lakeshore circuits over the course of two or three consecutive days, building spatial maps of nearshore clarity conditions around the lake. A brief overview of the monitoring approach is described below, with additional details on monitoring protocols used by this project provided in Appendix A.

MONITORING APPROACH

The methods used were similar to past studies (Taylor et al., 2004; Susfalk et al., 2009; Schladow et al., 2011), but modified to support the sampling approach described in the Lake Tahoe Nearshore Evaluation and Monitoring Framework (Heyvaert et al., 2013). We employed the Research Vessel (R/V) Mt. Rose to conduct monitoring surveys around the lake perimeter at approximately a seven-meter contour, which was chosen as a practical route that could be completed within a few days and would not be overly influenced by transient localized effects associated with boating or wind. Alexander and Wigart (2013) documented incidents of elevated turbidity in shallow waters (2 m depth) very close to the shoreline (≤280 m), attributed to high intensity boating, winds and currents. Reardon et al. (2016), however, calculated that sediment resuspension of particles ≤10 µm by wave-induced bottom shear stress would not extend beyond ~7 m with wave heights up to 0.5 m, which is the approximate wave-height limit for successful monitoring with the R/V Mt. Rose.

The R/V Mt. Rose is specially equipped to provide continuous measurements of water turbidity, light transmissivity, and relative chlorophyll. Lake water is sampled from a bow-mounted intake at a depth of approximately one-half meter below the water surface and pumped into the boat cabin, where it passes through an array of sensors that measure the clarity metrics on a continuous basis and records measurements approximately every two seconds. A datalogger aggregates information from the sensors and from a global positioning system (GPS) receiver to stream results onto a real-time display, which allows boat operators to follow predefined tracks and to respond immediately in the case of any anomalous readings that may require their attention.

Depending on boat speed, depth to bottom, and ambient lake conditions the surveys typically consisted of contiguous full-perimeter nearshore circuits run over the course of two or three consecutive days. Prior to each circuit two laboratory grade turbidimeters (Hach 2000 and Hach 2100) were calibrated with primary formazin standards (0.05 NTU, 0.5 NTU and 1 NTU), and then verified each day of the survey. Transmissivity was measured using a WET Labs C-Star light transmissometer, calibrated to no-light transmission and then full-light transmission each day with ultra-pure water. Chlorophyll-a fluorescence was measured with a factory calibrated WET Labs WETStar fluorometer that was checked for drift prior to monitoring. An established path was followed during each survey for consistency; however, water levels, weather conditions and recreational traffic on the lake occasionally required pilots to deviate from established path lines. Routine boat operating speeds were typically around 13 km/hour in the nearshore areas.

Weather conditions on the lake often determine when full circuits can begin. Ideally, the monitoring is conducted after several days of calm weather with no significant precipitation. Wind forecasts are particularly important because high waves can interfere with data collection and may create dangerous conditions. Therefore, every effort was made to identify extended periods of light to moderate breeze conditions prior to initiating the monitoring circuit. A summary of weather conditions encountered during each circuit and preceding the monitoring periods is provided in Appendix B.

DATA ANALYSIS

Continuous data acquired from each day of a nearshore survey were merged into a contiguous line around the lake as one complete circuit and then processed in ArcGIS to calculate distribution statistics and evaluate spatial autocorrelation. Individual field measurements of turbidity, transmissivity and chlorophyll are subject to varying degrees of transient noise due to measurement uncertainty and transient environmental effects. While sensor noise will typical occur at the level of individual measurements, transient environmental effects like the passage of a boat in front of the survey craft may affect a series of measurements within a geographical neighborhood. Localized deviations due to transient effects can be minimized with the use of a spatial filter. Here we used a low-pass sinc filter (damped sine wave) with a Blackman window where the filter width is defined by the distance over which there is a 50 percent drop in the response function, known as the full-width at half-maximum (FWHM). This type of filter has been identified as being optimal for smoothing and for enhancing the signal to noise ratio in continuously varying datasets (Smith, 2002).

To determine an appropriate FWHM dimension for the sinc filter it was necessary to know the characteristic scales of variability in the dataset. This allows one to balance the degree of smoothing versus the potential loss of information. GPS measurements from the nearshore survey were converted to along-shore distances and analyzed using the Incremental Spatial Autocorrelation function in ArcMap's Spatial Analyst toolset. Use of along-shore distance ensured that samples on opposite sides of a peninsula would not be treated as being proximate to each other. Output from the spatial autocorrelation function (Moran's I) indicated distances over which samples tend to be highly related to each other.

Based on a review of spatial autocorrelation for the measures associated with water clarity (turbidity, transmissivity, chlorophyll), it was determined that samples were highly related over distances ranging from about 500 to 1500 meters and that a characteristic scale of deviations from the regional mean was on the order of one kilometer. Smoothed versions of the nearshore measurements were made using a FWHM of 500 m to minimize the effect of transient effects while maintaining the dominant local features in the dataset, while circuit data for quintile distributions were smoothed with a FWHM of 1000 m to better emphasize regional patterns. Smaller filter widths would be appropriate for identification of effects from point sources, such as outfalls, if working closer to the shoreline.

Raw (non-smoothed) data were also averaged using Thiessen polygons to aggregate data within intervals along the shoreline, for comparison to previous data analyses (Heyvaert et al., 2013). In this case, the shoreline of Lake Tahoe was broken into 1-km intervals that served as midpoints for a set of Thiessen polygons used to aggregate data within each interval (Figure 1). The end result was that every nearshore sample point within the lake was assigned to its nearest Thiessen polygon midpoint along the shoreline. Then quartile values, the mean, standard deviation and the coefficient of variation were calculated from all sample data points within each section. There are 108 sections (polygons) numbered sequentially around the nearshore, beginning just north of Emerald Bay and proceeding clockwise back to that starting point.

Nearshore clarity status was assessed by evaluating the range of sample values for turbidity and transmissivity represented within each nearshore section over the monitoring period of this project (five circuits). Additionally, turbidity data from historic circuits were aggregated to represent the full range of nearshore conditions around the lake at specific times since 2001, albeit on an irregular basis, for comparison to the most recent series of circuits acquired by this project (2014–2015).

Data in the following results and discussion are presented first as a series of spatial charts with all five circuits represented on the same value scale, after application of the 500-meter smoothing function. This facilitates a consistent comparative view of monitoring results throughout the year in terms of overall conditions around the lake at a reasonably fine scale. Subsequently, the 1000-meter smoothed data are presented in quintile charts intended to emphasize areas with high and low values from each circuit, but each circuit is necessarily

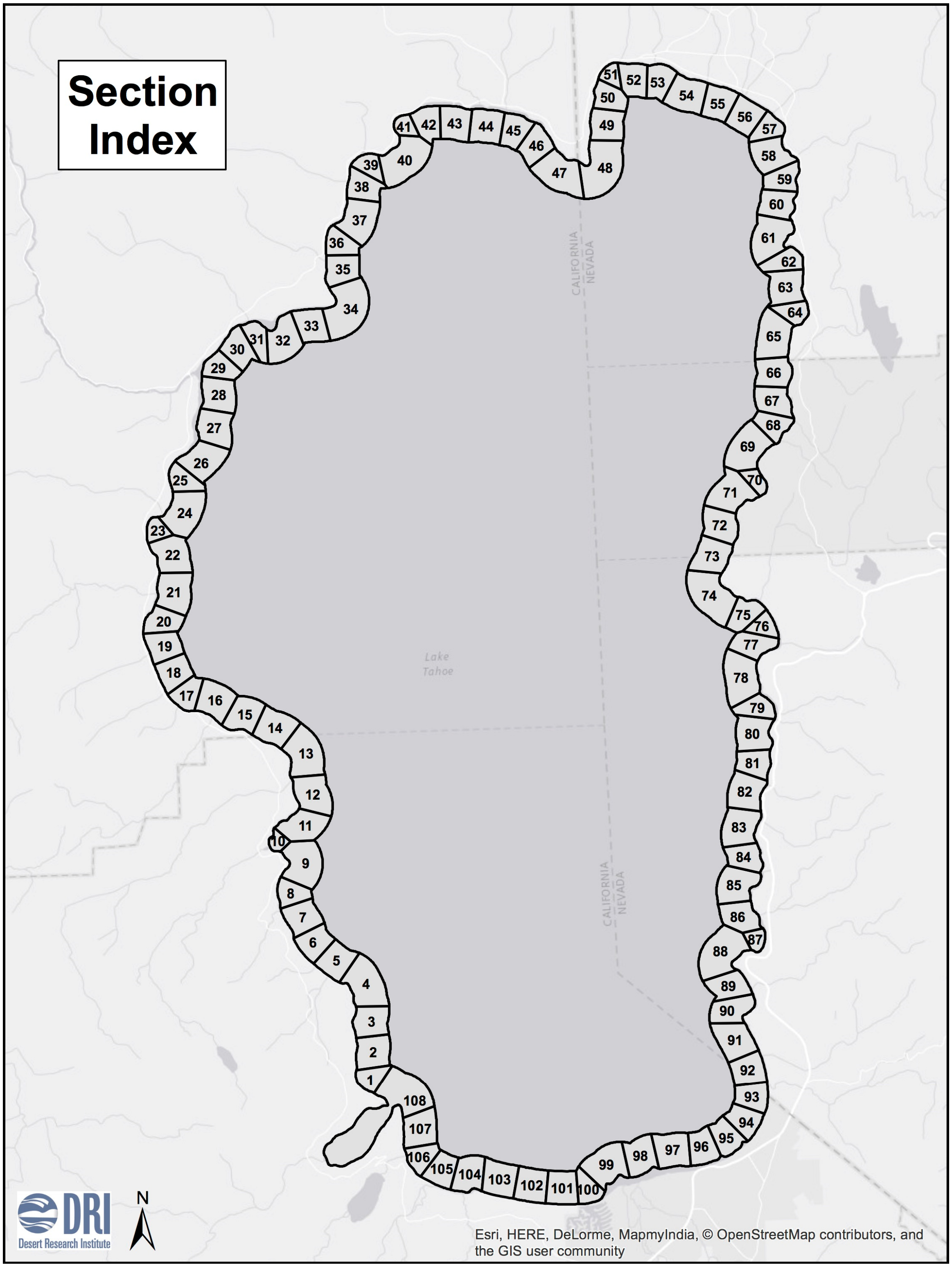

Figure 1. Lake Tahoe nearshore area divided into 1-km long Thiessen polygon sections for spatial analysis of clarity conditions. See Figure 10 for distribution of onshore impervious coverage.

represented on different value scales. Then aggregate raw data from all five circuits are presented as a series of box and whisker plots for each Thiessen polgon in sequence around the lake to demonstrate spatial patterns in the range of values measured during this project (see Figures 1 and 10 for polygon locations). Finally, turbidity and transmissivity results are presented at the whole lake scale as box and whisker plots of aggregate raw data from each circuit, which facilitates an evaluation of overall change in the nearshore condition over time.

RESULTS AND DISCUSSION

Five nearshore circuits were completed during the project period from November 2014 through November 2015. Each circuit is identified in the discussions below by the month and year that a circuit was initiated. The first circuit was completed in November 2014, and then starting in April 2015 successive circuits were conducted approximately every other month (June 2015, August 2015 and early November 2015). This series is expected to capture the main patterns of annual variation in nearshore clarity characteristics, beginning with spring runoff, followed by warming and stratification over summer, and then the cooling and deeper water column mixing of fall. Data from each nearshore circuit are organized by Thiessen polygon section and presented in Appendix C, with mid-section GPS coordinates of each Thiessen polygon provided in Appendix D.

TURBIDITY

Statistics for turbidity data collected during the project period are summarized in Table 1. Overall, turbidity values were very low, with circuit median values ranging from 0.103 to 0.131 NTU and no single value exceeding 1 NTU. For reference, U.S. EPA national secondary drinking water standards recommend that systems filtering surface water or ground water achieve turbidity <1.0 NTU. Lake Tahoe median turbidity from all five circuits was 0.118 NTU. Mean, median and maximum turbidity values in June 2015 and November 2015 were generally higher than during the other three circuits. Note that both November circuits are quite dissimilar, as reflected by the Pearson's skewness coefficient (sk_p). Each year autumn cooling and the onset of winter storms and winds break down thermal stratification. Thus, the timing and depth of lake mixing varies from year to year with differing effects on nearshore conditions likely during this period. Higher readings observed in the November 2015 circuit may reflect runoff effects from preceding rains (see Appendix B).

Nearshore areas with higher turbidity were found along the south to southwest shores of Lake Tahoe, as well as near the northwest and northeast portions of the lake (Figure 2). These areas tend to be offshore from urbanized zones with extended shallow shelves in the nearshore region. Emerald Bay also shows much higher turbidity compared to other parts of the lake. Data from all circuits are presented with the same value axis in Figure 2 for ease of comparison.

Table 1. Summary of nearshore turbidity measurements (NTU), 2014–2015 circuits.

Nearshore Circuit ID:	Nov-14	Apr-15	Jun-15	Aug-15	Nov-15
Maximum	0.187	0.640	0.937	0.685	0.999
75% Quantile	0.112	0.125	0.150	0.116	0.139
Median	0.106	0.117	0.131	0.103	0.131
25% Quantile	0.094	0.108	0.113	0.095	0.126
Minimum	0.081	0.092	0.086	0.083	0.115
Mean	0.106	0.122	0.139	0.114	0.141
Std Dev	0.013	0.031	0.044	0.039	0.035
CV (%)	12.7	25.3	31.7	34.5	24.8
N	15,951	15,450	15,383	15,229	13,313
sk_p	0.78	7.30	3.59	5.34	5.22

Spatial patterns in nearshore turbidity become more evident when presented by quantile plots (Figure 3), in which turbidity ranges vary with each circuit but are constrained to equivalent percentage distributions of the data. Looking at these plots, Emerald Bay is found to be consistently in the upper range of turbidity values around the lake. Generally, higher turbidity is also evident at South Lake Tahoe, as well as near Tahoe City and Incline Village, although less consistently than at Emerald Bay.

The turbidity values measured during this project period are summarized by nearshore Thiessen polygon sections in Figure 4, which confirms that turbidity values typically range higher in the Tahoe City area (sections 25 thru 32), near Incline Village (sections 54 thru 61) and for most of the South Lake Tahoe region (sections 86 through 104). Variability evident in the range of turbidity values is also greater at these locations.

A longer-term pattern in nearshore clarity is presented with data collected since 2001 using equivalent equipment and methods on board the R/V Mt Rose (Figure 5), although distance from shoreline and depth contours varied somewhat prior to 2012. These longer term data were extracted from previous nearshore circuits completed on an irregular basis as part of various research efforts funded by different projects. The clarity data from recent circuits in 2014–2015 show a fairly tight relationship in terms of their data distribution when compared to previous years. No data are available from contiguous nearshore circuits prior to 2001. The nearshore turbidity data from two circuits are well above average, August 2008 and October 2012, and it appeared that turbidity was increasing over time. However, the most recent circuits from 2014–2015 show that nearshore turbidity has returned to its typical range of values observed during the first few years of nearshore clarity measurements. This was a drought period in the Tahoe Basin. Interestingly, neither 2008 nor 2012 were unusual years for mid-lake clarity (UCD-TERC, 2015), although water year 2011 received about sixty percent more than the average for annual precipitation (1981–2015). This suggests that nearshore and midlake clarity conditions are not directly linked and so it is important to measure both.

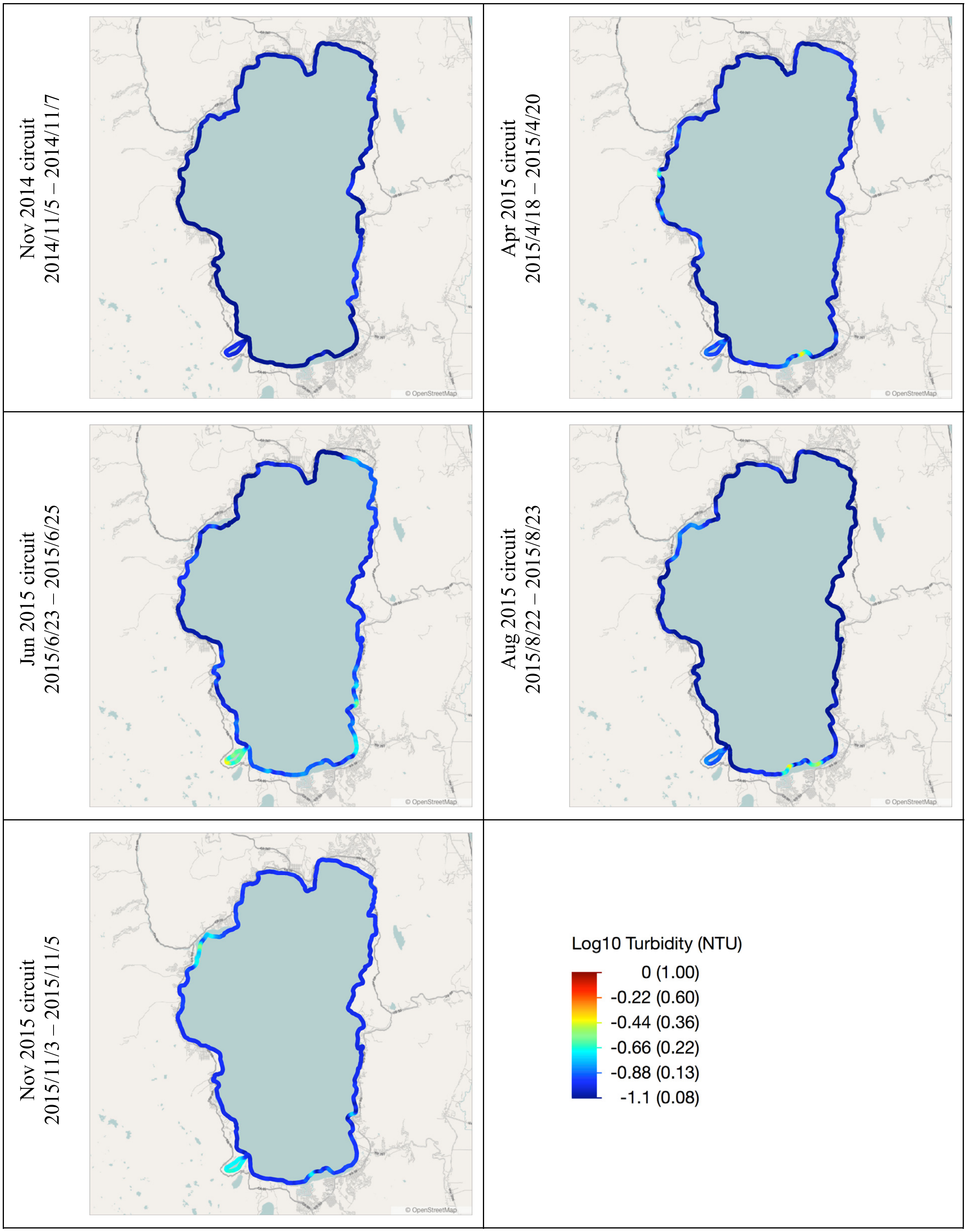

Figure 2. Nearshore turbidity measured during surveys conducted 2014–2015. All circuits are plotted on the same $\log_{10}$ turbidity scale (with corresponding NTUs). Data were smoothed with a 500 m low-pass filter to improve the signal to noise ratio and emphasize local features.

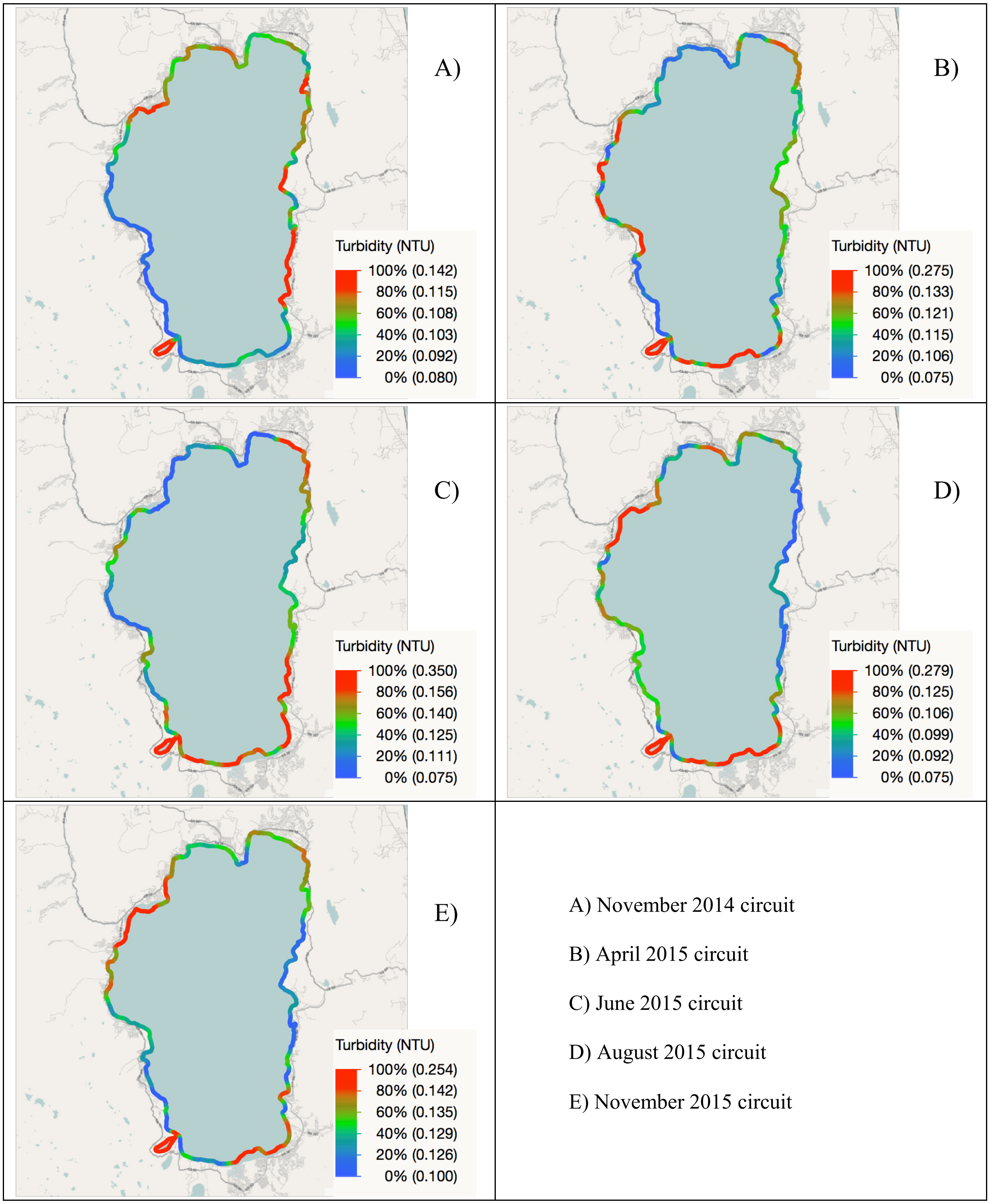

Figure 3. Nearshore turbidity data represented by quintiles for each 2014–2015 circuit. Data were smoothed with a 1000 m low-pass filter to emphasize regional patterns.

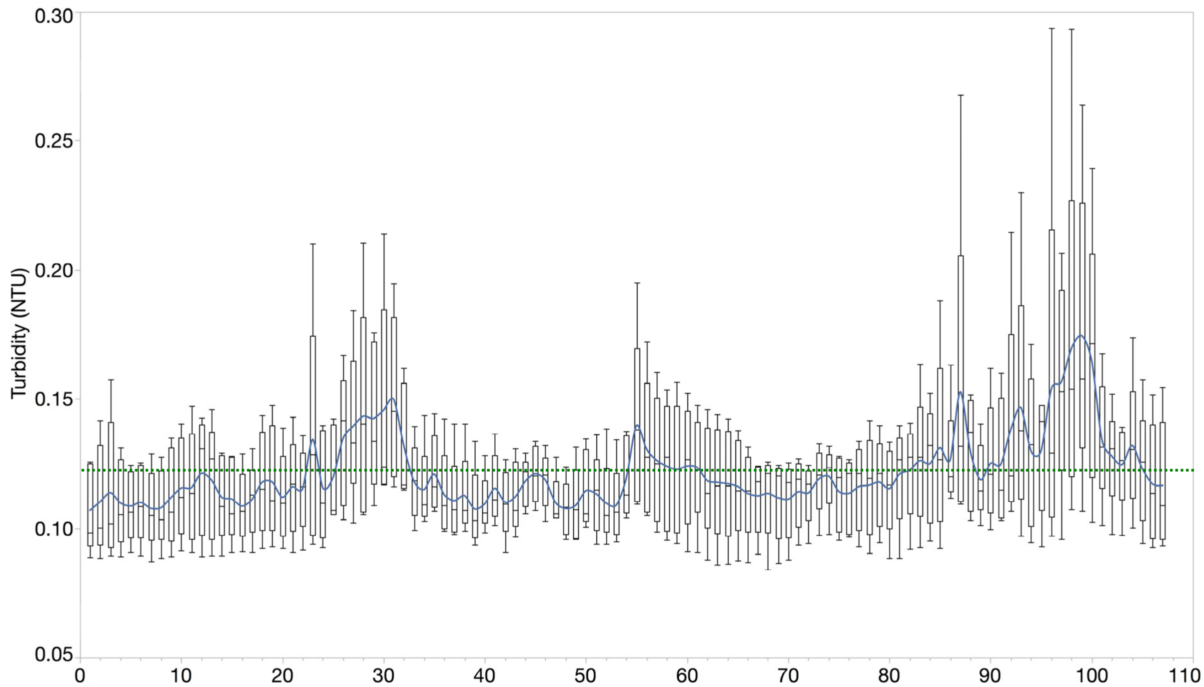

Figure 4. Spatial distribution of turbidity averaged over nearshore sections (identified by number in Figure 1) for each of the five full monitoring circuits completed in 2014–2015. Blue graph line indicates mean values for each section, relative to median, quartile, minimum and maximum section-averaged values shown as box and whisker plots. Dashed green line shows the mean of all polygon data (0.118 NTU). High values are located near Tahoe City (sections 26-32), Incline Village (sections 55-56) and South Lake Tahoe (sections 96-100). The Emerald Bay section (108) was also routinely high, but is not included in this chart.

These results correspond with findings from previous analysis of nearshore turbidity (Heyvaert et al., 2013), where it was reported that turbidity values <0.14 NTU represent the cleanest conditions in general for the nearshore of Lake Tahoe, while the most pristine conditions, found along 31 percent of the lakeshore perimeter, had a mean of 0.12 NTU. From these data a turbidity reference condition was suggested ranging between 0.12 to 0.14 NTU, and the new data from this project are consistent with this recommendation. Circuit 25 percent quartile values ranged from 0.094 to 0.126 NTU for the five nearshore surveys conducted in 2014–2015. Minimum reliable measurements with the calibrated Hach turbidimeters are about 0.01 NTU (precision), with 0.001 NTU resolution and accuracy of 2 percent of readings.

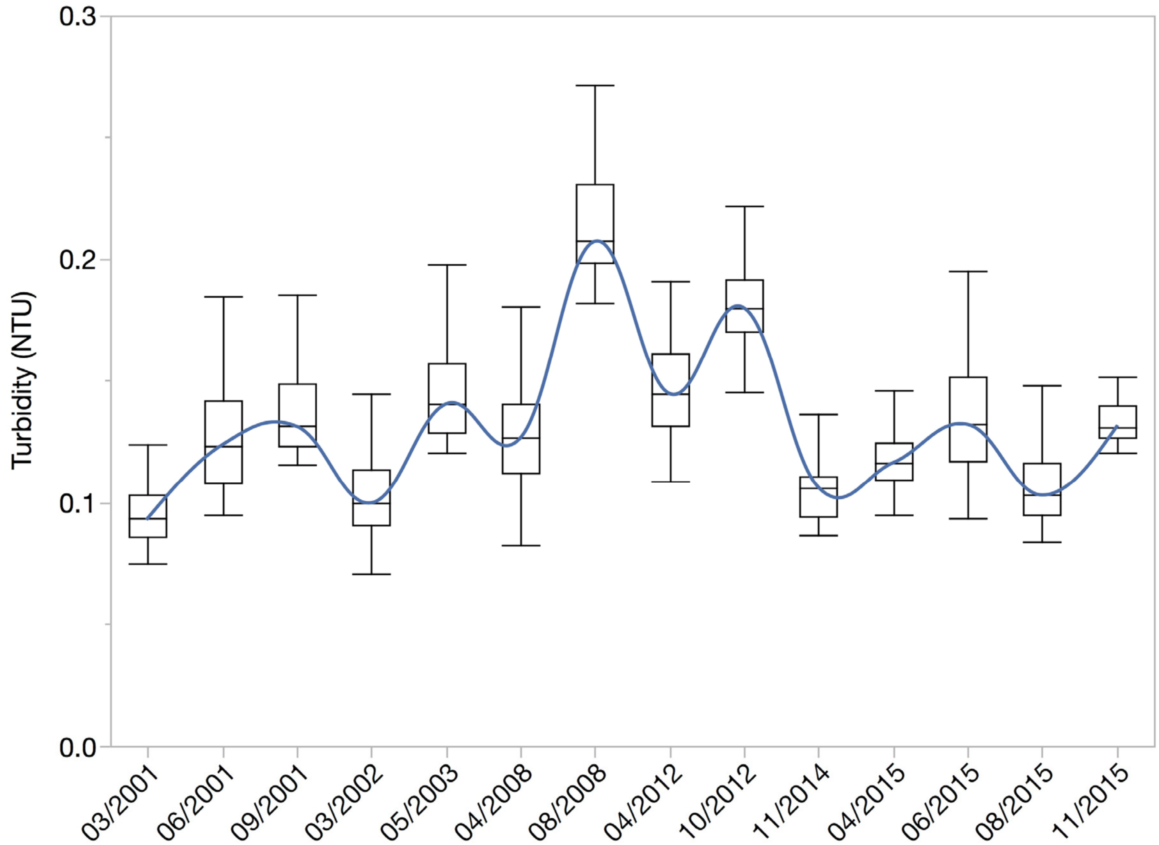

Figure 5. Distribution of section-average turbidity values obtained from individual complete nearshore clarity circuits (mm/yyyy) completed since 2001. The blue graph line follows median values from each circuit represented by quartile boxplots, with whiskers to outermost data points within 1.5 times the interquartile range.

TRANSMISSIVITY

Statistics for transmissivity data collected during this project period are summarized in Table 2. Transmissivity measurements are generally more responsive than turbidity measurements to slight differences of transparency in very clear water, such as in LakeTahoe. The circuit median values for transparency ranged from 96.00 to 97.58 percent, with higher numbers indicating better nearshore clarity. Lake Tahoe median transmissivity from all five circuits was 96.98 percent. The highest mean, median and maximum of transmissivity values occurred for the April 2015 and June 2015 circuits. Recall that June 2015 was also one of the two circuits with highest turbidity. Transmissivity and turbidity usually change in opposite directions; i.e., as transmissivity increases the turbidity decreases, although at the very low turbidity range near instrument detection levels resolution of small differences becomes difficult to detect. Transmissivity summary statistics from the two November circuits are more similar than was observed for turbidity, and the Pearson's

Table 2. Summary of nearshore transmissivity measurements (%), 2014–2015 circuits.

Nearshore Circuit ID:	Nov-14	Apr-15	Jun-15	Aug-15	Nov-15
Maximum	97.94	98.90	98.38	97.17	98.11
75% Quantile	97.18	97.95	97.49	96.76	97.00
Median	96.99	97.58	97.22	96.52	96.60
25% Quantile	96.46	97.20	96.94	96.03	96.13
Minimum	76.33	83.41	90.78	86.65	91.69
Mean	96.61	97.42	97.07	96.18	96.34
Std Dev	1.00	0.93	0.87	1.00	1.11
CV (%)	1.04	0.95	0.89	1.04	1.15
N	15,951	15,450	15,383	15,229	13,313
sk_p	-3.08	-4.83	-3.59	-2.72	-2.28

skewness coefficients (sk_p) are also quite similar from these circuits, as opposed to the case with turbidity. There are several factors that can affect transmissivity and turbidity measurements differently, however, and the Tahoe data show only a moderate relationship between these two different types of clarity measurements (r = -0.43).

Nearshore areas with lower transmissivity tend to be distributed with less regularity between circuits than observed with turbidity. The maps of transmissivity (Figure 6) show more detail than equivalent turbidity maps. This reflects the relative sensitivity of light transmissivity measurements to slight differences in very clear water, compared to turbidity measurements that are not as sensitive at resolving such slight differences. Areas of reduced transmissivity tend to cluster around the same areas as seen with turbidity: South Lake Tahoe, Incline Village, Tahoe City and Emerald Bay, but other areas also show some reduction in light transmissivity. In particular, along some parts of the east shore of Lake Tahoe transmissivity was proportionally lower than parts of the north or west shores (Figure 7). These regional spatial differences contributed to the relatively weak correlation between turbidity and transmissivity measurements.

The transmissivity values measured during this project are summarized by nearshore Thiessen polygon sections in Figure 8. The pattern here is somewhat similar to what was seen with turbidity. Transmissivity typically ranges lower near Tahoe City area (sections 25 thru 32) and for most of the South Lake Tahoe region (sections 86 through 104). The Incline Village area (sections 54 thru 61), however, does not seem to correspond with the diminished turbidity observed from that area. And interestingly, there is a general downward trend in transmissivity as one travels clock-wise around the lake starting north of Emerald Bay. The highest clarity nearshore water, in terms of transmissivity, appears to be located on the north shore and just above Emerald Bay. The processes contributing to these difference are not understood at this time.

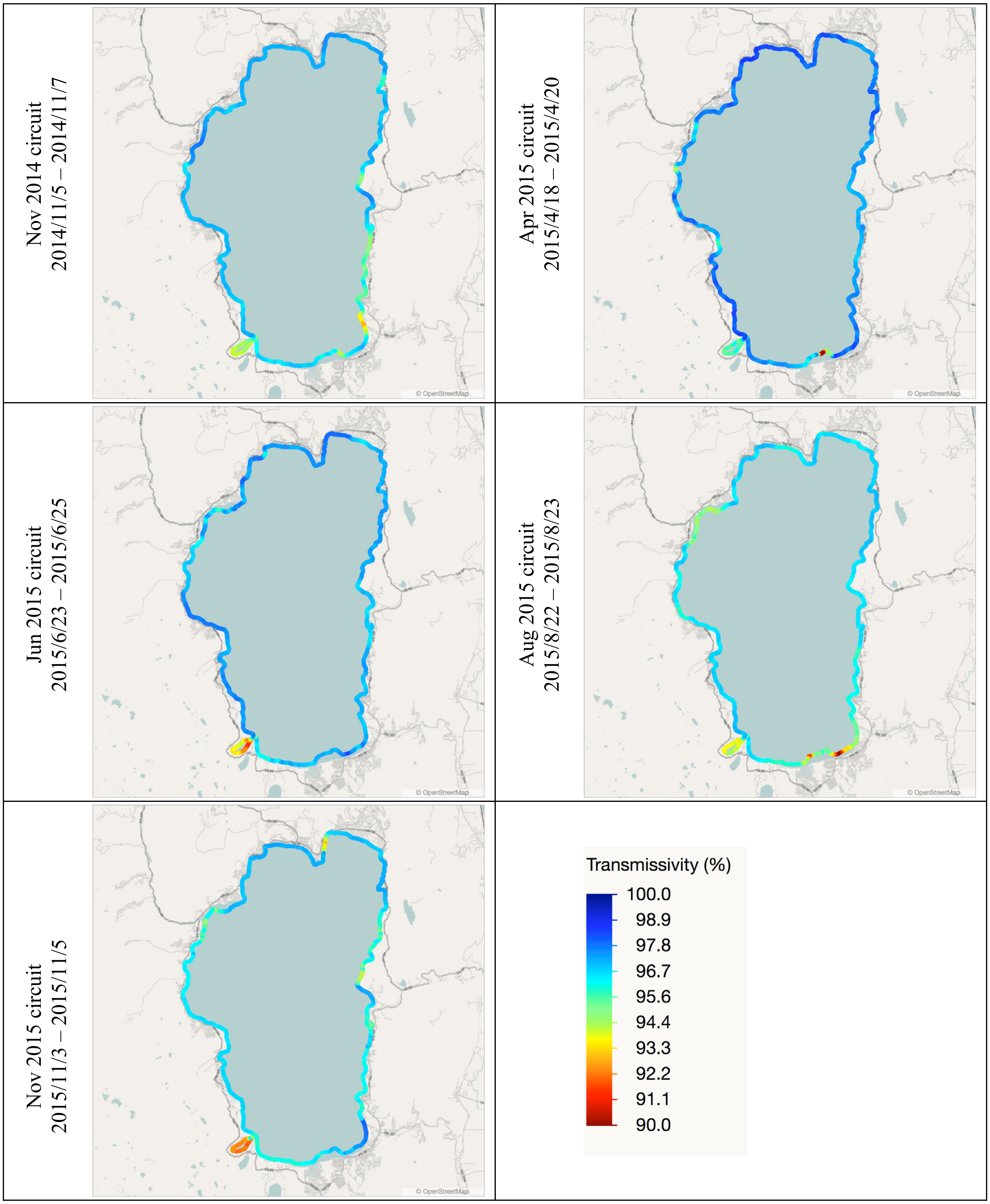

Figure 6. Nearshore transmissivity measured during surveys conducted 2014–2015. All circuits are plotted on the same linear transmissivity scale. Data were smoothed with a 500 m low-pass filter to improve the signal to noise ratio and emphasize local features.

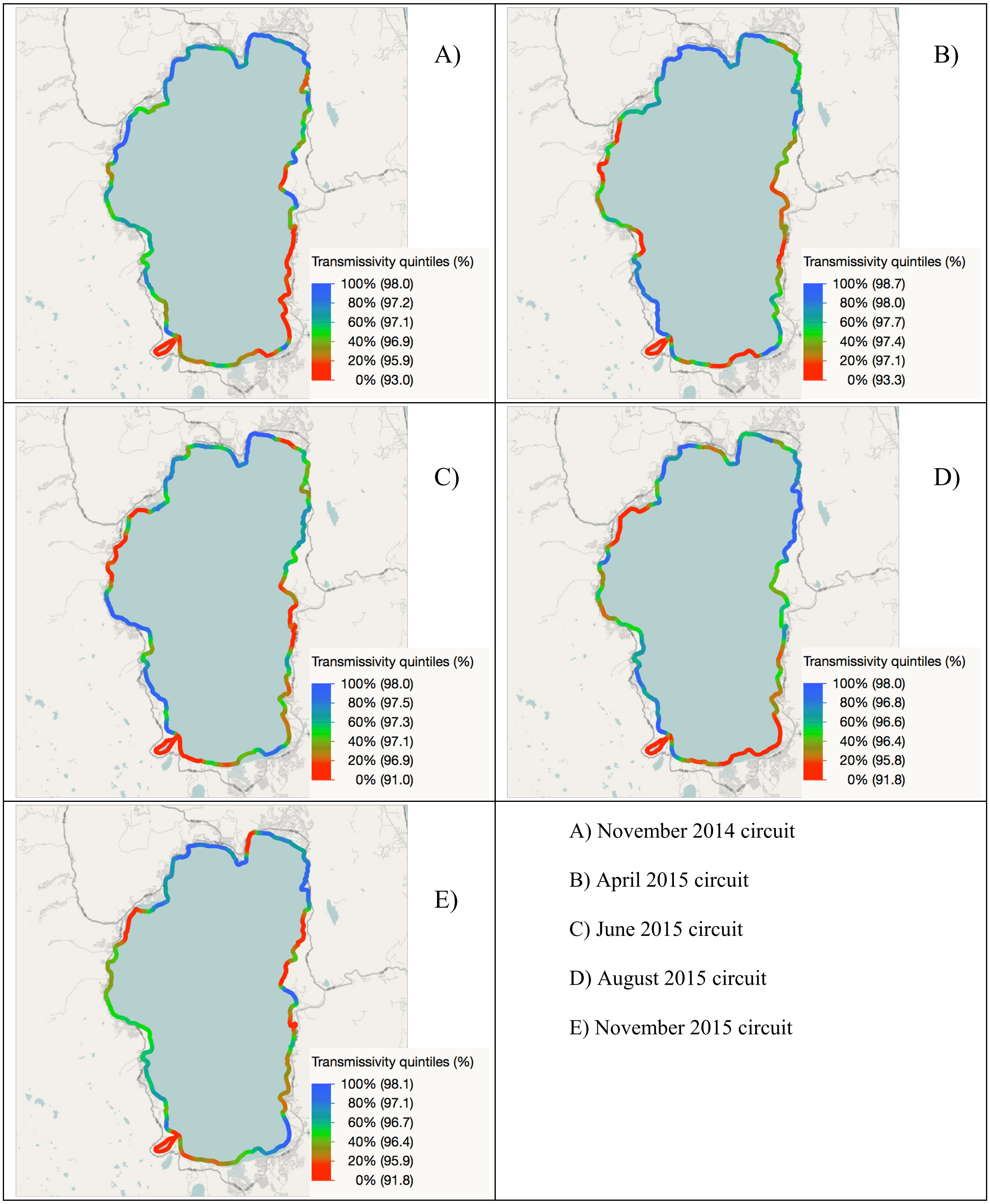

Figure 7. Nearshore transmissivity data represented by quintiles for each 2014–2015 circuit. Data were smoothed with a 1000 m low-pass filter to emphasize regional patterns.

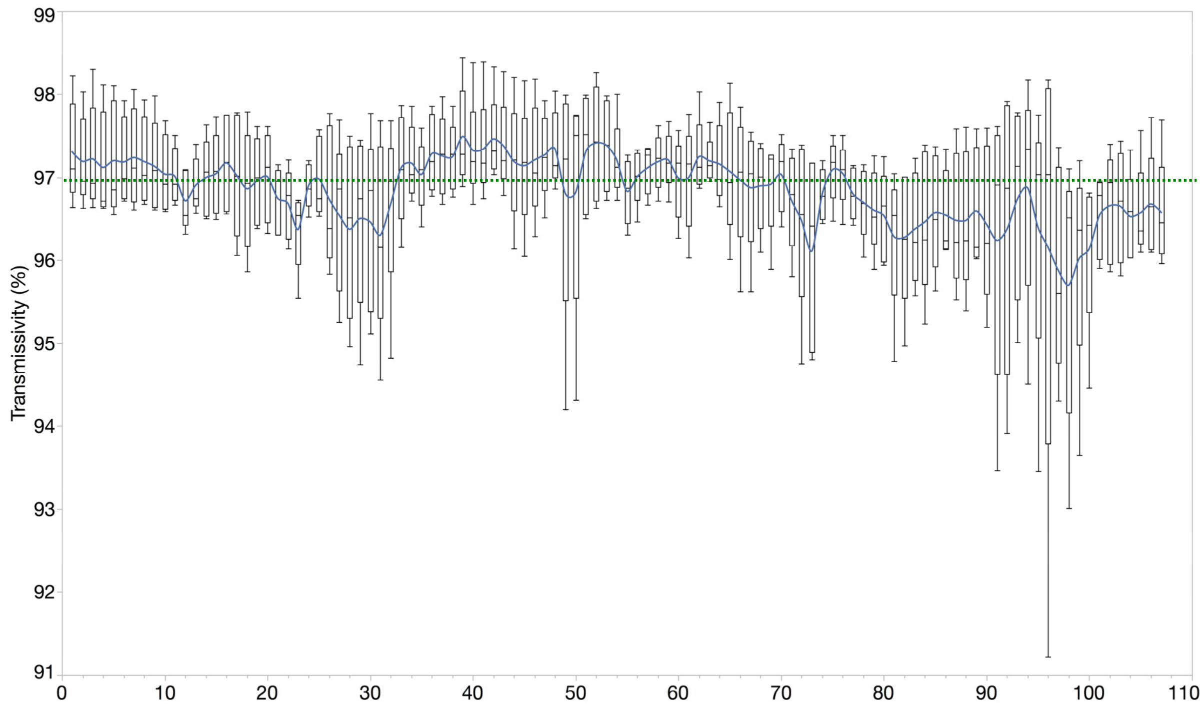

Figure 8. Spatial distribution of transmissivity averaged over nearshore sections (identified by number in Figure 1) for each of the five full monitoring circuits completed in 2014–2015. Blue graph line indicates mean values for each section, relative to median, quartile, minimum and maximum section-averaged values shown as box and whisker plots. Dashed green line shows mean of all polygon data (96.98%). Low transmissivity is generally observed near Tahoe City (sections 26-32), north of Glenbrook (sections 71-74) and most of the southwest shore especially near South Lake Tahoe (sections 96-100). The Emerald Bay section (108) is not included in this chart.

Only a few nearshore circuits measured transmissivity prior to 2014, and most of these consisted of incomplete circuits or contained erroneous data (e.g., transmissivity greater than 100%). Therefore, we only show results from transmissivity collected during the recent monitoring circuits in 2014–2015 (Figure 9). As with turbidity, the distribution of transmissivity data measured during circuits conducted by this project show a fairly tight relationship. The distribution pattern in circuit sequence is also similar with turbidity, although April and June 2015 circuits seem slightly different. Overall, the interquartile range (i.e. the bulk) of measured transmissivity values was highest during April and June 2015 circuits, and lowest during the August 2015 circuit.

These transmissivity results also correspond with previous findings, where it was reported that light transmittance in the most pristine conditions was >96.4 percent, found along 33 percent of the lakeshore perimeter (Heyvaert et al., 2013). A preliminary nearshore

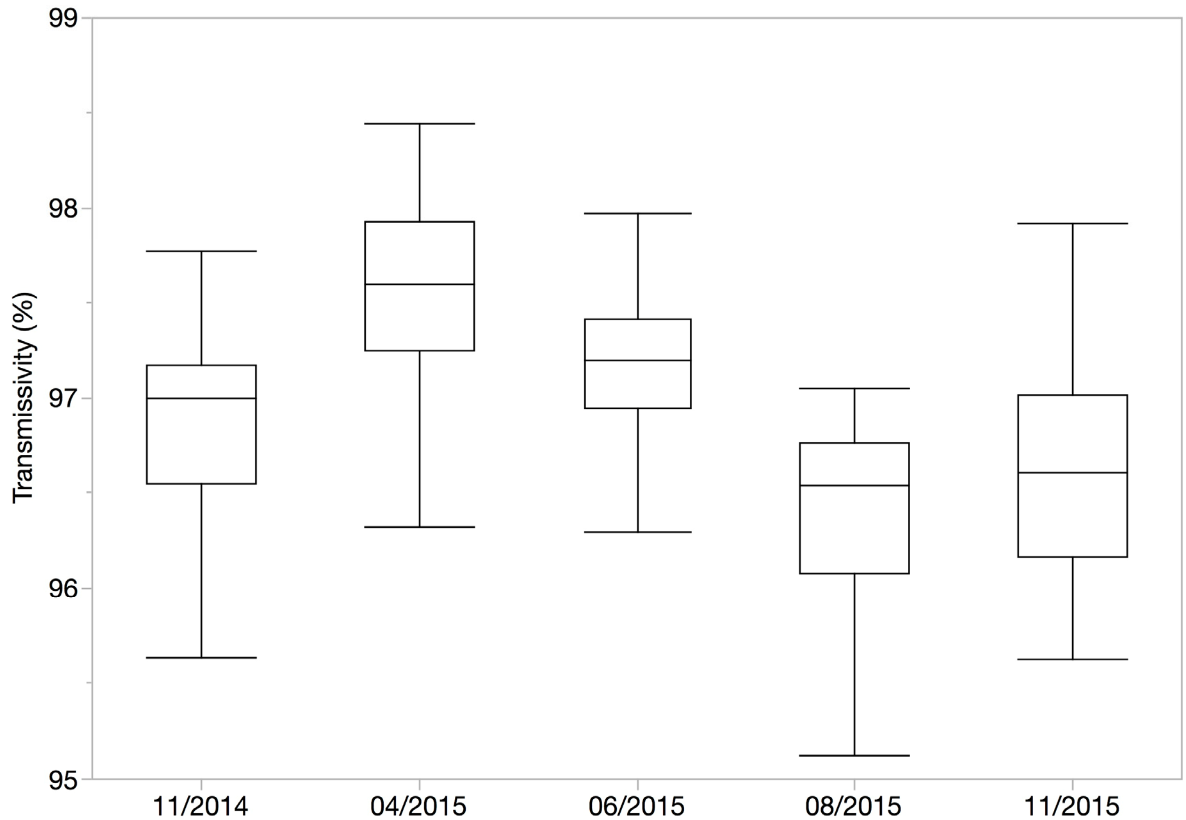

Figure 9. Distribution of section-average transmissivity values obtained from individual nearshore clarity circuits (mm/yyyy) completed during the project period, 2014–2015. Plots show median values for each circuit represented by quartile boxplots, with whiskers to outermost data points within 1.5 times the interquartile range.

transmissivity reference condition was proposed, ranging between 94.9 to 96.4 percent. New data from this project are consistent with this recommendation, although a somewhat higher percentage threshold may be appropriate. The circuit 75 percent quartile values ranged from 96.76 to 97.95 percent transmissivity for five nearshore surveys conducted in 2014–2015.

Chlorophyll

Chlorophyll-a fluorescence is an indicator of active phytoplankton biomass and chlorophyll concentrations. The sensor acquires measurements and then reports data in terms of relative fluorescence (voltage) units, not as a percentage. The statistics from 2014–2015 nearshore circuits are summarized in Table 3. Circuit median values for chlorophyll fluorescence units ranged from 54.4 to 70.7. The lake median value from all five circuits was 61.7 fluorescence units. The November 2015 survey acquired the highest readings of all five circuits, indicating that high turbidity readings from that month were likely associated with elevated concentrations of active algal biomass. This would result, for example, from progression of fall turn-over as the lake surface cools and begins to mix with nutrient

Table 3. Summary of nearshore chlorophyll-a (fluorescence units), 2014–2015 circuits.

Nearshore Circuit ID:	Nov-14	Apr-15	Jun-15	Aug-15	Nov-15
Maximum	96.6	89.8	74.8	78.9	116.3
75% Quantile	70.0	59.2	56.4	62.6	79.6
Median	66.0	57.1	54.4	60.5	70.7
25% Quantile	63.9	55.1	53.7	59.2	68.0
Minimum	55.8	51.7	51.0	53.7	57.8
Mean	67.8	57.5	55.4	61.0	74.1
Std Dev	6.0	3.3	3.1	2.7	9.3
CV (%)	8.9	5.7	5.5	4.4	12.5
N	15,946	15,450	15,383	15,229	13,313
sk_p	1.3	1.7	2.0	1.1	1.3

enriched deeper waters. The disparity observed between relatively low turbidity measured in November 2014 compared to turbidity in November 2015 would suggest that the November 2014 circuit occurred before the lake mixing had proceeded far enough to stimulate a phytoplankton bloom.

The lowest range of chlorophyll fluorescence was measured during the June 2015 circuit, which is somewhat surprising given spring snowmelt runoff. There may not have been a significant contribution of nutrients from the watershed that year, however, because winter precipitation was so low compared to normal. Also, a spring phytoplankton bloom earlier in the year may have exhausted nutrients in the thermocline after stratification was established.

These chlorophyll results are generally comparable to previous findings. Good water clarity conditions were associated with relative chlorophyll readings <59.5 fluorescence units. The data from 2014-2015 monitoring indicate a low range (from the 25% quartile) of 53.7 to 68.0 fluorescence units. The lowest value measured during this project was 51.0 units. The amount of reliable chlorophyll fluorescence data is limited, and additional monitoring will be need before further recommendations can be provided on suitable reference conditions. It should be noted that chlorophyll measurements by this method could be subject to a negative bias due to near-surface photobleaching of photosynthetic pigments from high light intensities (Maske and Latasa, 1997), unless the epilimnion is truly a fully mixed layer during monitoring.

As expected, given its name, Emerald Bay generally exhibited higher chlorophyll readings, as well as the consistently higher readings on a relative basis for turbidity and transmissivity. This is largely a consequence of its local geomorphological and natural ecological characteristics, however. It does not necessarily imply that Emerald Bay clarity has degraded.

After assembling all the data from 2014–2015 circuits a multivariate correlation analysis between chlorophyll and the other two clarity metrics showed only a weak relationship with transmissivity ($r = -0.32$) and no apparent relationship with turbidity ($r = 0.02$).

EVALUATING WATERSHED INFLUENCE

Given the apparent relationship between nearshore clarity metrics and urbanized areas around the lake, such as South Lake Tahoe, Tahoe City and Incline Village, we attempted to evaluate the linkage between development and nearshore turbidity. Impervious cover density was used as a surrogate for development and linked through extension of Thiessen polygons from the nearshore onto the surrounding landscape. Cumulative density of impervious cover (km^2) was calculated at progressive one kilometer distance contours away from the shoreline (Figure 10), and then impervious cover in each of these zones of increasing area was regressed against the associated Thiessen section mean turbidity. Each circuit of data was standardized to zero mean and unit variance for equivalency in the aggregate. Circuits were tested individually and then aggregated in various combinations, as follows: all five equally averaged (5A); the first four circuits equally averaged (4A); the last four circuits equally averaged (4B); and all five averaged, but with the first and the last circuits equally weighted as one (5B). The purpose for assessing these different combinations of circuits was to eliminate excess influence from repeated autumn runs (November 2014 and November 2015). Ultimately, the strongest effect was found within three kilometers of shoreline using the first four circuits (Figure 11). But the relationship was weak ($R^2 = 0.214$), explaining only about twenty percent of the variance in nearshore turbidity, and perhaps due mainly to the influence of a few high leverage points.

This was simply a preliminary attempt to link landscape characteristics with nearshore conditions, and there appear to be other important contributing factors. Wind patterns contributing to lake circulation and hydrodynamics are examples of additional factors. Although this cursory analysis did not directly support the hypothesis, urbanization may still be an important contributing factor. Evaluating how best to detect that in an expedient yet powerful manner is going to take more effort than was available with this project. Drainage flow-paths, outfalls, streams, the extent of nearshore shelves and substrate composition are all factors that likely contribute to what is ultimately observed as nearshore clarity, along with urbanization characteristics and lake hydrodynamics.

CONCLUSIONS

The project goal was to implement a pilot program of nearshore monitoring for clarity metrics identified by the Lake Tahoe Nearshore Monitoring and Evaluation Framework. That framework recommended a minimum of four contiguous nearshore surveys each year to assess spatiotemporal patterns in turbidity, light transmissivity, and chlorophyll-a fluorescence. This project conducted five complete nearshore surveys, with the first one done

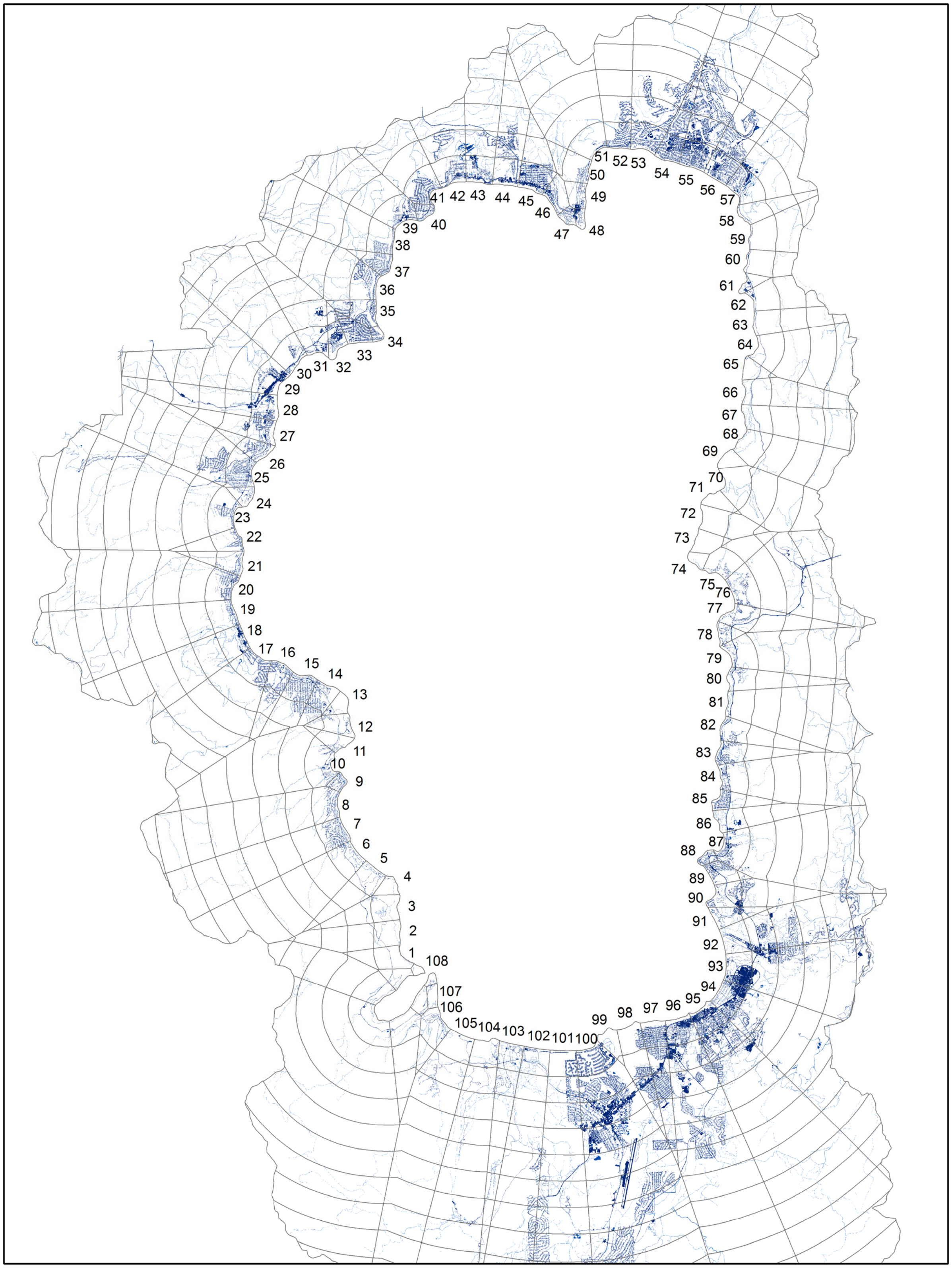

Figure 10. Onshore impervious coverage at successive one kilometer contours from the shoreline. Numbered sections correspond with the Thiessen polygons used to aggregate data from nearshore monitoring circuits (Figure 1).

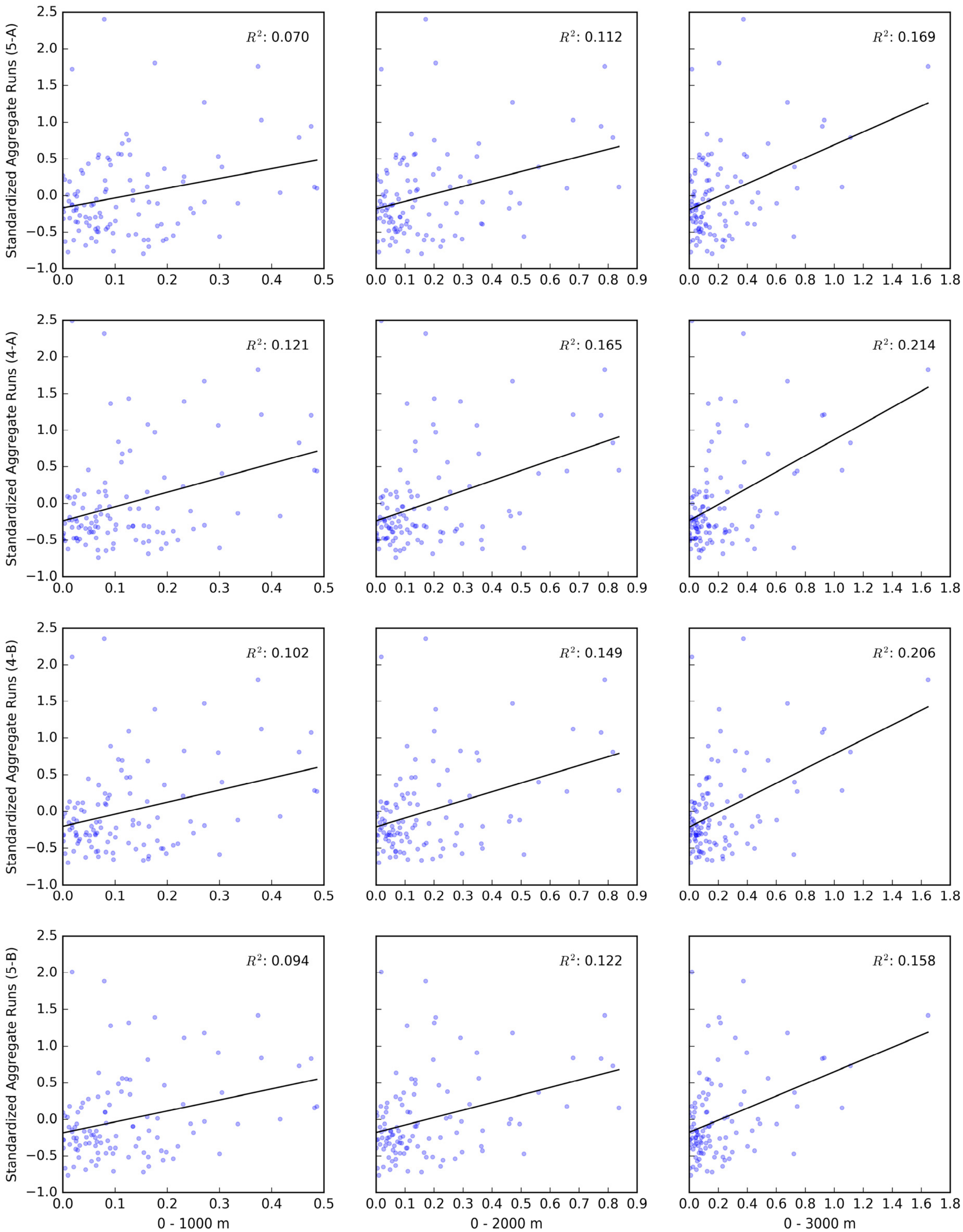

Figure 11. Regression of Thiessen polygon turbidity values standardized then aggregated across circuits and associated with neighboring landscape impervious coverage (see text for explanation). Cumulative density of impervious coverage (km^2) out to 3000 m from shoreline linked most strongly with the first four circuits standardized and averaged (R^2=0.214).

in November 2014 followed by approximately bimonthly circuits from April 2015 to November 2015. The series of nearshore monitoring surveys covered an annual cycle of lake changes that included the spring snowmelt runoff, warming and increased stratification over summer, then cooling and water column mixing in fall.

Nearshore turbidity is used as an existing TRPA threshold standard, which requires that measurements show less than 1 NTU (or less than 3 NTU in regions of stream influence). No single value of turbidity measured along the approximately seven-meter depth contour was greater than 0.999 NTU. The lowest single turbidity value measured was less than 0.081 NTU. These measurements were necessarily conducted during non-storm periods, however, so nearshore monitoring closer to outfall points during storm runoff events would likely yield values exceeding 1 NTU.

Following a consistent monitoring path-line at an appropriate depth contour (~7 m in this study) a moderate distance offshore achieves a balance between the objective of efficiently completing full contiguous nearshore surveys within a reasonable time against the higher variability and longer circuit times associated with monitoring at shallower depths. Further, each circuit is comparable and provides a comprehensive picture of the broader scale spatiotemporal patterns in nearshore conditions, while still retaining the regional signal of clarity condition. Characteristic scales of variability associated with each clarity metric were found to range from about 500 to 1500 meters, representing the spatial distance at which dominant patterns emerge in the monitoring circuits completed during this project period.

Spatial patterns in nearshore turbidity were evaluated by plotting interquartile ranges from the five monitoring circuits by distance sequentially around the nearshore. Regionally, though not consistently, nearshore turbidity was found to range highest near urban areas along the south shore, the northeast shore and the northwest shore of Lake Tahoe. Reduced clarity conditions, represented by the 75th percentile of turbidity data from each circuit, ranged from 0.112 NTU (in November 2014) to 0.150 (in June 2015). The best clarity conditions, represented by the 25th percentile from each circuit ranged from 0.094 NTU (November 2014) to 0.126 NTU (in November 2015). Areas along the northshore and just north of Emerald Bay yielded the best clarity conditions (lowest turbidity levels).

The temporal pattern in nearshore turbidity was examined through a sequence of boxplots representing aggregate data from each complete nearshore circuit conducted since 2001 ($n = 14$). There was a general trend of increasing turbidity through 2012, but more recent nearshore circuits (2014–2015) showed that turbidity levels have returned to the range of values typical for the period from 2001 through 2008.

Transmissivity measurements were moderately correlated with turbidity ($r = -0.43$), and spatial patterns were similar, with the exception that the west shore of the lake showed more variability and lower clarity conditions than observed from turbidity measurements. Reduced clarity conditions, represented by 25th percentile of transmissivity data from each circuit ranged from 96.03 percent (in August 2015) to 97.20 percent (in April 2015). The best clarity conditions, represented by the 75th percentile of transmissivity data from each circuit, ranged from 96.76 percent (in August 2015) to 97.95 percent (in April 2015). The best single value for light transmittance measured during the project was 98.90 percent in April 2015.

Chlorophyll-a values ranged from a minimum of 51.0 fluorescence units (in June 2015) to a maximum of 116.3 fluorescence units (in November 2015). The lower range of active algal biomass, represented by the 25th percentile of chlorophyll fluorescence data from each circuit, ranged from 55.1 (in April 2015) to 68.0 (in November 2015). The higher range of active algal biomass, represented by the 75th percentile of fluorescence data from each circuit, ranged from 56.4 (in June 2015) to 79.6 (in November 2015). Chlorophyll fluorescence was weakly correlated with transmissivity ($r = 0.02$), but there was no apparent direct correlation with turbidity.

A test of watershed linkage to nearshore conditions evaluated by regression of cumulative percent impervious cover density to nearshore average turbidity in corresponding nearshore sections did not reveal any strong relationship ($R^2 = 0.214$). However, low precipitation years, as during 2014–2015, would make finding a good relationship more difficult and the correlation could increase during higher runoff years. Further work along these lines with better delineation of landscape features and nearshore factors, such as location of stream outlets, drainage outfalls and substrate composition, would likely yield more meaningful results.

RECOMMENDATIONS

Longer-term spatiotemporal patterns in nearshore condition can only be evaluated effectively with a program of consistent, comparable and periodic monitoring surveys. It is recommended that ideally five nearshore circuits are conducted each year for several years in succession to span a reasonable range of annual precipitation regimes. These should be done on a bimonthly basis, beginning before the seasonal spring snowmelt and extending until significant lake mixing occurs. This would help elucidate the processes driving changes observed in patterns of nearshore clarity, assuming that relevant climate and hydrodynamic drivers are measured and evaluated simultaneously. Over time, as the seasonal patterns are determined, it should be feasible to reduce the number of annual circuits. Trends could be evaluated using a generalized additive model once the nearshore clarity monitoring is fully established and contiguous circuits are completed on a regular basis.

Ultimately, these data must be integrated and analyzed with monitoring for other metrics associated with the Lake Tahoe Nearshore Evaluation and Monitoring Framework, specifically the trophic status metrics and aquatic community structure metrics. The immediate objective would be to evaluate and report on interactions between nearshore metrics, but could also lead eventually to a model representing these data that takes into account potential forcing variables, such as hydrodynamic processes, sediment resuspension, stormwater outfalls and stream discharge.

Monitoring protocols for nearshore clarity circuits should follow the updated procedures summarized in Appendix A, followed by data analyses as shown in this report. It may be feasible to move the contiguous nearshore monitoring path-line into somewhat shallower water that will better detect local effects. Currently, the boat runs at about the 7-meter water-depth contour, relative to existing lake level, but a shallower 4 to 6 meter contour could be explored. The problem with this would be increased interference from piers, breakwaters, rocks and recreational areas, as well as longer circuit times. Currently, the entire circuit requires 2 to 3 days. Any adjustments towards a shallower contour should remain practicable within a total circuit time of 2–3 days, which is particularly important to consider during the shorter daylight times of spring and fall.

Studies of specific fine-scale features, such as individual outfalls, would benefit from focused monitoring over multiple tracks extending into shallower water within the area. Subsequent analysis of spatial autocorrelation in that specific vicinity would determine appropriate FWHM for low-pass spatial filtering to provide the most useful scale of measurement for capturing clarity features. Ideally, these focused studies would link to monitoring and sampling at designated outfalls in the area. This analysis could be coordinated with citizen science monitoring of outfalls, as is currently conducted by the Pipe Keepers Program organized by the League to Save Lake Tahoe.

What we are currently considering reference conditions and target values are based on irregularly repeated measurements taken between 2001 and 2015, measurements that were taken to address project-specific goals and that were not designed to address long-term monitoring objectives. These should be used only as interim values and must be reviewed periodically when more data are collected as part of an established nearshore monitoring program that evaluates the effects of hydrodynamic conditions, geomorphometry, substrate composition and other factors.

The standard operating procedure for low-level turbidity measurements uses a Hach 2000 turbidimeter in a flow-through system. Turbidity measurements taken utilizing other turbidimeter models, from the same or other manufacturers, and different collection systems would require calibration to this reference system for continuity of data. We should investigate suitable alternative models and newer technologies in case this turbidimeter fails, since it is no longer manufactured.

The mechanics of making good transmissivity measurements in Lake Tahoe continue to improve. Theoretically, transmissometers are superior to nephelometers (turbidimeters) in clear waters, because of the nearly linear relationship between transmissivity and clarity, which is not the case for turbidity and clarity. The data from this project, however, show that unknown factors are influencing these respective measurements and yielding disparate results in some areas. It is likely that the best approach for reporting on nearshore clarity will be a combination of both methods, but the factors influencing transmissivity measurements should be explored further and optical explanations of the divergent measurements between transmissivity and turbidity should be developed.

This type of monitoring program should continue to acquire the data needed to inform future reviews of threshold standards. The existing standard at 1 NTU can protect against worst case occurrences, if viewed as a “not to exceed” limit, but it may not be sufficiently protective of desired nearshore conditions in more pristine areas since it corresponds to a Secchi depth of only 3-6 m (Taylor, 2004). This work also shows that different values may be appropriate for different sections of the lake because a single numerical turbidity value for the entire nearshore could be unacceptably high or unachievably low depending on what part of the shoreline is being considered. Establishing such targets or limits would require sufficient evidence of appropriate and achievable levels for turbidity and transmissivity around the nearshore of Lake Tahoe. This project contributes to that body of evidence, but is insufficient without a consistent and periodic monitoring evaluation program in place.

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APPENDIX A. SUMMARY MONITORING PROTOCOLS FOR NEARSHORE CLARITY METRICS

- Verify all date/time settings and fix as necessary
- Be sure to record all calibration results with date and times of calibrations
- After launching R/V Mt. Rose, calibrate sensors (turbidity and transmissivity)
  - Open DRI's Rose Tracker program (Google Earth will also open)
  - Click on Calibration >> Calibrate Multiple Sensors
  - Calibrate Turbidity (both Hach 2000 and Hach 2100)
    - Unscrew sample cell for Hach turbidimeters. Do not touch glass cuvette with fingers, use Kimwipes. Use Windex and Kimwipes to clean outside and inside of cuvette.
    - Calibrate sensor with primary formazin standards (StablCal) before each circuit. Primary standards include <0.1 (nominal 0.05), 0.5 and 1 NTU.
    - Verify calibrations daily when conducting boat runs with the 0.05 and 1 NTU standards, and record values.
    - In the calibration window on the computer type in the calibration standard value in the box "STD". Ex: 0.05
    - Insert calibration standard vial into the Hach 2000 turbidimeter.
    - In the calibration window, watch the raw value on the computer screen for the sensor reading. The sensor value will change and should stabilize around the standard value you typed into the calibration window. If the STD is 0.05 the sensor reading should at least be within 10%. If the value is not within 10% then remove the standard vial from the turbidimeter and clean it again.
    - To set the calibration value click on the raw sensor value in the calibration window when the raw sensor value is near the STD.
    - Enter your next STD value, clean and insert the standard vial into the turbidimeter and set this next value.
  - The chlorophyll fluorescence sensor does not require daily calibration. It is tested at WET Labs with a liquid fluorescent standard and factory calibrated. Prior to each monitoring run instrument drift is evaluated per manufacturer specification.
  - Transmissivity
    - Wipe out (Kimwipes) and rinse (ultrapure DI) the tank that houses the transmissometer.
    - Wipe off the transmissometer lenses with Kimwipes

        - Calibrate transmissivity for zero value: In calibration window enter 0 for STD. Cover the transmissometer lens (side with the laser) with the dark plastic panel. When the raw sensor value in the calibration window settles around 55.0 click on it to set this value.
        - Calibrate transmissivity for 100% value: Place the transmissometer into the tank and fill it with ultrapure DI. In the calibration window on the computer, enter 100 for the STD then wait until the raw sensor value reaches a stable high number (e.g. 4800 to 5000). When you are satisfied with the sensor value, click on it to set the value.
    - When done calibrating, click accept.
    - On water deploy the bow-mounted boom and verify intake port depth is near 0.5 meters.
    - Turn on the pump, open valves and run lake water through the sensor system until bubbles are discharged and sensor readings stabilize.
    - Maintain steady pump speed through the system during data acquisition of monitoring runs.
    - Follow pathline on Rose Tracker display (~7 m contour), while attempting to maintain a constant boat speed of about 10 km/hour.
    - Rose Tracker program automatically notifies of divergent readings between the Tu_2000 and Tu_2100 sensors (>10%), indicating potential errors due to equipment malfunction, communications error, or inline bubbles. When this occurs, boat operator must flag the data, resolve issues and then retrace route from last good reading.
    - At the end of each day back up data on laptop. Export data: GPS error, time, sensor smoothing Tu_2000, Tu_2100, C_Star, Wet_star, Temp, Flow, Heading, Speed
    - To export data, select file >> export as csv format file.
- EXCEL (merged data file):
    - Open data in excel
    - Combine boat circuit data from multiple days into one excel file. Copy and paste data from each day into one file and then double check that you have selected all the data and the number of records add up correctly.
    - Fix any latitude/longitude errors. Ex: if longitude is a positive number it needs to be negative (-119).
    - For Tu_2000 sort and delete numbers that are negative or too low to be real (around 0.01).
    - Compare Tu_2000 and Tu_2100 data for divergent results or operator flagged data that should be removed (including C_Star and Wet Star data for those entries).

- For C_star sort and delete numbers that are negative. Raw C_star data are not displayed as a percent, so it is necessary to convert after cleaning up the data.
- Multiply raw C_star values by 100 to convert into percent transmission.
- Graph Turbidity, CStar, Chl-A individually to verify that data are smooth, without step changes or other transient spikes that need adjustment.
- Save as a .csv file for import to ArcGIS.

APPENDIX B. WEATHER CONDITIONS ASSOCIATED WITH EACH NEARSHORE MONITORING CIRCUIT CONDUCTED 2014–2015.

Date	Wind Speed	SLT (mph)	IV (mph)	Precipitation
11/2/14	gentle breeze	9.2	11.4	no precip
11/3/14	light breeze	6.9	6.9	no precip
11/4/14	gentle breeze	8.1	8.1	no precip
11/5/14	light breeze	5.8	6.9	no precip
11/6/14	moderate breeze	16.1	13.9	no precip
11/7/14	gentle breeze	9.2	6.9	no precip
4/15/15	fresh breeze	12.8	19.7	no precip
4/16/15	moderate breeze	9.2	17.2	no precip
4/17/15	gentle breeze	10.3	11.4	no precip
4/18/15	moderate breeze	9.2	15.0	no precip
4/19/15	moderate breeze	15.0	9.2	no precip
4/20/15	fresh breeze	13.9	18.3	no precip
6/20/15	moderate breeze	15.0	13.9	no precip
6/21/15	fresh breeze	16.1	24.2	no precip
6/22/15	moderate breeze	17.2	12.8	no precip
6/23/15	moderate breeze	12.8	13.9	no precip
6/24/15	moderate breeze	10.3	15.0	no precip
6/25/15	moderate breeze	10.3	15.0	no precip
8/19/15	moderate breeze	15.0	13.9	no precip
8/20/15	moderate breeze	13.9	12.8	no precip
8/21/15	moderate breeze	17.2	16.1	no precip
8/22/15	moderate breeze	12.8	15.0	no precip
8/23/15	moderate breeze	13.9	17.2	no precip
8/24/15	n/a	n/a	n/a	n/a
10/31/15	fresh breeze	12.8	21.9	trace
11/1/15	fresh breeze	20.8	17.2	rain (0.10 inch)
11/2/15	gentle breeze	9.2	8.1	rain (1.32 inch)
11/3/15	light breeze	4.7	5.8	rain (0.26 inch)
11/4/15	moderate breeze	12.8	6.9	trace
11/5/15	light breeze	5.8	4.7	no precip

Notes:

1) Nearshore circuit dates indicated by green highlighted cells.
2) Conditions are also shown for three days preceding nearshore circuits.
3) Weather conditions recorded in South Lake Tahoe (SLT) and Incline Village (IV).
4) August 2015 circuit was completed in two days.
5) Wind description based on Beaufort scale.
6) Wind speed values are for maximum sustained winds at each location during the day (not necessarily during monitoring time on the lake) .
7) Precipitation amounts derived from South Lake Tahoe Airport records (NOAA).

APPENDIX C1. MONITORING DATA FROM 2014–2015 NEARSHORE CIRCUITS FOR TRANSMISSIVITY (C-STAR SENSOR: %).

Circuit ID	Date	Section ID	MEAN_C-STAR	MIN_C-STAR	MAX_C-STAR	STDEV_C-STAR	MEDIAN_C-STAR
1	11/5/2014	1	97.109	93.047	97.238	0.363	97.154
1	11/5/2014	2	96.966	94.150	97.168	0.380	97.070
1	11/5/2014	3	96.859	96.567	97.028	0.095	96.874
1	11/5/2014	4	96.632	95.924	96.902	0.164	96.679
1	11/5/2014	5	96.858	95.980	97.014	0.119	96.874
1	11/5/2014	6	96.986	96.120	97.154	0.138	97.014
1	11/5/2014	7	97.118	95.645	97.321	0.165	97.126
1	11/5/2014	8	97.032	91.985	97.182	0.472	97.098
1	11/5/2014	9	97.085	96.455	97.182	0.074	97.098
1	11/5/2014	10	96.925	92.041	97.070	0.456	96.986
1	11/5/2014	11	96.921	96.469	97.126	0.087	96.930
1	11/5/2014	12	97.100	92.544	97.294	0.385	97.126
1	11/5/2014	13	97.049	96.735	97.182	0.078	97.070
1	11/5/2014	14	97.066	96.120	97.224	0.120	97.098
1	11/5/2014	15	97.080	92.013	97.238	0.439	97.119
1	11/5/2014	16	97.189	97.056	97.349	0.055	97.182
1	11/5/2014	17	97.023	93.843	97.224	0.305	97.070
1	11/5/2014	18	96.936	95.813	97.042	0.123	96.958
1	11/5/2014	19	96.999	95.617	97.154	0.171	97.042
1	11/5/2014	20	97.124	96.581	97.266	0.084	97.126
1	11/5/2014	21	97.008	96.679	97.154	0.074	97.014
1	11/5/2014	22	96.785	96.288	97.377	0.128	96.791
1	11/5/2014	23	96.546	94.583	97.852	0.282	96.567
1	11/5/2014	24	97.103	92.991	97.852	0.729	97.580
1	11/5/2014	25	97.571	97.405	97.685	0.055	97.573
1	11/5/2014	26	97.772	97.182	97.936	0.099	97.768
1	11/5/2014	27	97.696	97.377	97.852	0.096	97.699
1	11/5/2014	28	97.495	97.238	97.685	0.140	97.531
1	11/5/2014	29	97.309	97.070	97.461	0.068	97.321
1	11/5/2014	30	96.919	95.505	97.098	0.164	96.930
1	11/5/2014	31	97.056	96.916	97.238	0.071	97.042
1	11/5/2014	32	96.908	96.232	97.405	0.242	96.819
1	11/5/2014	33	96.849	95.952	97.154	0.186	96.874
1	11/5/2014	34	97.037	96.846	97.266	0.119	97.014
1	11/5/2014	35	97.151	96.721	97.293	0.071	97.154
1	11/5/2014	36	97.192	96.539	97.321	0.085	97.210
1	11/5/2014	37	97.284	97.042	97.405	0.077	97.308
1	11/5/2014	38	97.280	97.182	97.349	0.034	97.280
1	11/5/2014	39	97.283	96.986	97.391	0.055	97.287
1	11/5/2014	40	97.196	97.042	97.419	0.103	97.154
1	11/5/2014	41	97.133	96.623	97.238	0.063	97.126
1	11/5/2014	42	97.176	97.042	97.293	0.052	97.182
1	11/5/2014	43	97.188	96.749	97.293	0.068	97.210
1	11/5/2014	44	97.059	96.427	97.168	0.071	97.070
1	11/5/2014	45	97.037	96.819	97.154	0.060	97.042
1	11/5/2014	46	97.037	96.567	97.196	0.085	97.042
1	11/5/2014	47	97.240	96.874	97.363	0.065	97.238
1	11/5/2014	48	97.133	95.128	97.321	0.235	97.182
1	11/5/2014	49	97.225	96.455	97.587	0.311	97.433
1	11/5/2014	50	97.502	96.958	97.601	0.065	97.503

Circuit ID	Date	Section ID	MEAN_C-STAR	MIN_C-STAR	MAX_C-STAR	STDEV_C-STAR	MEDIAN_C-STAR
1	11/5/2014	51	97.521	97.210	97.629	0.049	97.517
1	11/5/2014	52	97.432	94.779	97.573	0.243	97.461
1	11/5/2014	53	97.386	97.042	97.517	0.062	97.391
1	11/5/2014	54	97.123	96.874	97.349	0.091	97.112
1	11/5/2014	55	97.129	96.735	97.238	0.079	97.126
1	11/5/2014	56	97.253	95.016	97.405	0.194	97.266
1	11/5/2014	57	97.343	96.707	97.447	0.078	97.349
1	11/5/2014	58	97.327	97.223	97.544	0.056	97.321
1	11/5/2014	59	97.325	97.000	97.514	0.052	97.321
1	11/5/2014	60	96.267	95.561	97.436	0.600	95.952
1	11/5/2014	61	96.032	76.870	97.066	1.421	95.952
1	11/5/2014	62	96.874	96.623	96.958	0.045	96.874
1	11/5/2014	63	97.145	96.930	97.348	0.112	97.125
1	11/5/2014	64	96.984	89.492	97.277	0.971	97.150
1	11/5/2014	65	96.854	88.549	97.098	0.708	96.916
1	11/5/2014	66	97.064	96.874	97.266	0.115	97.070
1	11/5/2014	67	97.051	96.819	97.293	0.141	97.000
1	11/5/2014	68	96.677	93.103	97.126	0.381	96.763
1	11/5/2014	69	97.220	97.098	97.349	0.055	97.238
1	11/5/2014	70	97.196	96.986	97.321	0.073	97.210
1	11/5/2014	71	96.791	95.240	97.098	0.253	96.860
1	11/5/2014	72	96.366	95.282	96.846	0.468	96.581
1	11/5/2014	73	94.987	94.569	95.449	0.157	95.003
1	11/5/2014	74	96.541	95.380	97.377	0.580	96.679
1	11/5/2014	75	97.504	97.293	97.629	0.091	97.517
1	11/5/2014	76	97.511	97.126	97.671	0.127	97.545
1	11/5/2014	77	97.082	96.732	97.489	0.108	97.083
1	11/5/2014	78	97.005	96.636	97.247	0.143	97.042
1	11/5/2014	79	96.523	96.176	96.915	0.191	96.455
1	11/5/2014	80	95.948	95.282	96.507	0.331	95.952
1	11/5/2014	81	94.789	94.416	95.380	0.234	94.688
1	11/5/2014	82	94.975	94.500	96.902	0.276	94.975
1	11/5/2014	83	95.578	95.044	95.841	0.205	95.659
1	11/5/2014	84	95.232	94.863	95.645	0.197	95.198
1	11/5/2014	85	95.631	95.086	96.358	0.201	95.582
1	11/5/2014	86	96.243	95.394	96.665	0.356	96.427
1	11/5/2014	87	95.529	94.500	95.813	0.142	95.561
1	11/5/2014	88	95.387	94.472	96.344	0.178	95.394
1	11/5/2014	89	96.020	94.290	96.735	0.360	96.008
1	11/5/2014	90	95.193	91.468	96.707	0.893	95.142
1	11/5/2014	91	93.468	86.844	95.897	1.014	93.466
1	11/5/2014	92	93.921	91.426	95.533	0.651	93.899
1	11/5/2014	93	96.052	93.927	96.707	0.618	96.211
1	11/5/2014	94	96.892	96.260	97.154	0.175	96.902
1	11/5/2014	95	96.666	95.645	96.986	0.178	96.651
1	11/5/2014	96	96.347	95.240	96.763	0.324	96.427
1	11/5/2014	97	95.222	93.270	96.944	1.028	94.905
1	11/5/2014	98	96.510	89.680	96.916	0.677	96.679
1	11/5/2014	99	96.368	92.684	96.874	0.563	96.427
1	11/5/2014	100	96.717	90.365	96.986	0.743	96.846
1	11/5/2014	101	96.789	90.588	97.028	0.593	96.888
1	11/5/2014	102	96.945	94.695	97.112	0.322	97.014
1	11/5/2014	103	96.720	92.432	97.070	0.604	96.846
1	11/5/2014	104	96.588	89.792	96.930	0.915	96.791
1	11/5/2014	105	96.546	84.888	96.958	1.299	96.860
1	11/5/2014	106	96.750	91.957	97.042	0.478	96.819

Circuit ID	Date	Section ID	MEAN_C-STAR	MIN_C-STAR	MAX_C-STAR	STDEV_C-STAR	MEDIAN_C-STAR
1	11/5/2014	107	96.203	89.107	96.735	1.010	96.455
1	11/5/2014	108	94.993	76.325	97.238	1.430	94.611
2	4/18/2015	1	98.226	97.998	98.372	0.088	98.206
2	4/18/2015	2	98.031	97.762	98.206	0.109	98.039
2	4/18/2015	3	98.308	97.735	98.427	0.110	98.344
2	4/18/2015	4	98.123	97.970	98.344	0.101	98.095
2	4/18/2015	5	98.114	97.873	98.206	0.088	98.150
2	4/18/2015	6	97.928	97.513	98.178	0.156	97.929
2	4/18/2015	7	98.067	97.845	98.261	0.134	98.123
2	4/18/2015	8	97.933	96.834	98.206	0.222	97.956
2	4/18/2015	9	97.981	97.513	98.178	0.185	98.067
2	4/18/2015	10	97.687	94.645	98.053	0.433	97.811
2	4/18/2015	11	97.504	96.848	97.956	0.371	97.596
2	4/18/2015	12	96.318	94.312	97.070	0.595	96.446
2	4/18/2015	13	96.738	95.462	97.458	0.582	96.945
2	4/18/2015	14	97.231	96.931	97.402	0.097	97.236
2	4/18/2015	15	97.283	97.070	97.458	0.085	97.264
2	4/18/2015	16	97.743	96.668	98.400	0.484	97.873
2	4/18/2015	17	97.785	97.374	98.095	0.255	97.866
2	4/18/2015	18	97.230	95.795	98.039	0.549	97.208
2	4/18/2015	19	97.329	95.241	98.136	0.821	97.679
2	4/18/2015	20	97.612	96.349	98.206	0.591	97.880
2	4/18/2015	21	97.159	96.599	97.458	0.258	97.236
2	4/18/2015	22	97.214	96.418	97.485	0.301	97.340
2	4/18/2015	23	95.547	92.525	97.153	1.302	96.141
2	4/18/2015	24	97.206	97.000	97.347	0.084	97.208
2	4/18/2015	25	97.416	97.139	97.652	0.126	97.444
2	4/18/2015	26	97.475	97.236	97.679	0.132	97.430
2	4/18/2015	27	96.871	96.183	97.568	0.396	96.903
2	4/18/2015	28	96.514	95.545	97.194	0.438	96.599
2	4/18/2015	29	97.446	96.446	97.827	0.469	97.685
2	4/18/2015	30	97.772	97.481	97.868	0.050	97.766
2	4/18/2015	31	97.686	97.175	97.929	0.124	97.644
2	4/18/2015	32	97.687	97.298	97.888	0.165	97.766
2	4/18/2015	33	97.870	97.481	98.214	0.140	97.827
2	4/18/2015	34	97.857	97.481	98.255	0.219	97.807
2	4/18/2015	35	97.591	97.033	97.868	0.190	97.644
2	4/18/2015	36	97.856	97.399	98.113	0.236	97.950
2	4/18/2015	37	97.979	97.685	98.214	0.138	97.960
2	4/18/2015	38	97.857	97.501	98.214	0.160	97.909
2	4/18/2015	39	98.445	98.214	98.561	0.079	98.479
2	4/18/2015	40	98.384	97.950	98.540	0.152	98.459
2	4/18/2015	41	98.398	98.235	98.561	0.096	98.388
2	4/18/2015	42	98.334	98.174	98.459	0.059	98.337
2	4/18/2015	43	98.282	97.725	98.398	0.083	98.296
2	4/18/2015	44	98.210	97.848	98.418	0.135	98.194
2	4/18/2015	45	98.169	97.827	98.398	0.125	98.174
2	4/18/2015	46	98.192	97.522	98.337	0.130	98.255
2	4/18/2015	47	97.927	97.440	98.214	0.186	97.990
2	4/18/2015	48	98.042	97.868	98.235	0.075	98.031
2	4/18/2015	49	98.000	97.705	98.174	0.083	98.001
2	4/18/2015	50	97.747	97.481	97.950	0.106	97.725
2	4/18/2015	51	97.999	97.379	98.418	0.175	97.950
2	4/18/2015	52	98.266	97.705	98.418	0.121	98.296
2	4/18/2015	53	97.985	96.483	98.235	0.181	97.990
2	4/18/2015	54	98.003	97.073	98.214	0.196	98.031

Circuit ID	Date	Section ID	MEAN_C-STAR	MIN_C-STAR	MAX_C-STAR	STDEV_C-STAR	MEDIAN_C-STAR
2	4/18/2015	55	97.269	96.707	97.603	0.196	97.318
2	4/18/2015	56	97.331	96.910	97.522	0.152	97.379
2	4/18/2015	57	97.349	97.155	97.522	0.069	97.338
2	4/18/2015	58	97.620	97.135	98.113	0.263	97.603
2	4/18/2015	59	97.674	97.155	98.031	0.257	97.787
2	4/18/2015	60	97.563	95.770	97.929	0.247	97.562
2	4/18/2015	61	97.762	97.481	97.950	0.120	97.787
2	4/18/2015	62	98.037	97.685	98.214	0.111	98.072
2	4/18/2015	63	97.659	97.440	97.868	0.111	97.644
2	4/18/2015	64	97.910	97.542	98.316	0.278	97.766
2	4/18/2015	65	98.140	97.542	98.296	0.169	98.214
2	4/18/2015	66	97.850	97.603	98.092	0.117	97.848
2	4/18/2015	67	97.550	97.073	97.990	0.330	97.532
2	4/18/2015	68	97.295	96.931	97.603	0.213	97.379
2	4/18/2015	69	97.269	97.094	97.420	0.080	97.277
2	4/18/2015	70	97.522	97.236	97.725	0.122	97.562
2	4/18/2015	71	97.341	97.073	97.542	0.068	97.338
2	4/18/2015	72	97.391	97.236	97.542	0.077	97.379
2	4/18/2015	73	97.171	96.768	97.318	0.087	97.175
2	4/18/2015	74	96.994	96.136	97.236	0.134	96.992
2	4/18/2015	75	97.182	97.073	97.298	0.046	97.175
2	4/18/2015	76	97.160	97.073	97.236	0.041	97.155
2	4/18/2015	77	97.147	96.992	97.277	0.054	97.155
2	4/18/2015	78	97.155	96.829	97.420	0.136	97.155
2	4/18/2015	79	97.262	96.829	97.603	0.163	97.257
2	4/18/2015	80	97.251	96.523	97.603	0.260	97.237
2	4/18/2015	81	97.046	96.870	97.216	0.094	97.033
2	4/18/2015	82	97.014	96.605	98.072	0.183	97.012
2	4/18/2015	83	96.895	96.605	97.236	0.174	96.870
2	4/18/2015	84	97.238	97.014	97.374	0.065	97.250
2	4/18/2015	85	97.371	97.153	97.555	0.088	97.347
2	4/18/2015	86	97.340	96.862	97.596	0.126	97.319
2	4/18/2015	87	97.586	97.374	97.707	0.094	97.596
2	4/18/2015	88	97.601	97.402	97.707	0.084	97.638
2	4/18/2015	89	97.583	97.208	97.638	0.041	97.596
2	4/18/2015	90	97.593	97.401	97.734	0.072	97.596
2	4/18/2015	91	97.616	97.402	97.818	0.074	97.624
2	4/18/2015	92	97.809	97.361	98.012	0.177	97.873
2	4/18/2015	93	97.776	97.319	98.136	0.234	97.846
2	4/18/2015	94	98.178	97.762	98.455	0.195	98.206
2	4/18/2015	95	97.750	97.208	98.233	0.231	97.749
2	4/18/2015	96	98.176	97.555	98.898	0.468	97.901
2	4/18/2015	97	95.600	91.749	98.774	1.718	95.386
2	4/18/2015	98	93.010	83.408	96.571	3.917	94.700
2	4/18/2015	99	96.549	96.155	96.848	0.208	96.605
2	4/18/2015	100	96.423	95.601	96.931	0.405	96.488
2	4/18/2015	101	96.961	96.543	97.180	0.147	96.987
2	4/18/2015	102	97.396	96.183	97.582	0.212	97.485
2	4/18/2015	103	97.443	97.208	97.610	0.101	97.471
2	4/18/2015	104	97.330	96.571	97.762	0.395	97.513
2	4/18/2015	105	97.563	97.430	97.762	0.079	97.568
2	4/18/2015	106	97.717	96.848	97.818	0.102	97.735
2	4/18/2015	107	97.689	97.402	97.818	0.096	97.707
2	4/18/2015	108	96.108	94.202	98.414	1.049	95.684
3	6/23/2015	1	97.541	95.651	97.773	0.200	97.548
3	6/23/2015	2	97.380	97.100	97.630	0.148	97.385

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3	6/23/2015	3	97.364	97.120	97.528	0.070	97.385
3	6/23/2015	4	97.460	97.140	97.691	0.112	97.446
3	6/23/2015	5	97.736	97.385	97.916	0.158	97.814
3	6/23/2015	6	97.526	96.569	97.650	0.114	97.548
3	6/23/2015	7	97.594	97.344	97.732	0.072	97.589
3	6/23/2015	8	97.531	96.998	97.691	0.179	97.610
3	6/23/2015	9	97.331	97.059	97.589	0.161	97.334
3	6/23/2015	10	97.352	97.059	97.508	0.088	97.365
3	6/23/2015	11	97.190	96.998	97.304	0.058	97.181
3	6/23/2015	12	97.081	96.773	97.304	0.110	97.079
3	6/23/2015	13	97.399	97.100	97.569	0.122	97.436
3	6/23/2015	14	97.634	97.263	97.895	0.173	97.671
3	6/23/2015	15	97.730	97.222	97.854	0.082	97.752
3	6/23/2015	16	97.755	97.487	97.875	0.084	97.773
3	6/23/2015	17	97.727	96.814	97.895	0.144	97.773
3	6/23/2015	18	97.794	97.630	97.895	0.059	97.814
3	6/23/2015	19	97.611	97.344	97.854	0.160	97.650
3	6/23/2015	20	97.408	96.365	97.671	0.233	97.446
3	6/23/2015	21	96.960	96.692	97.202	0.103	96.977
3	6/23/2015	22	96.912	95.998	97.100	0.159	96.957
3	6/23/2015	23	96.727	94.774	96.936	0.198	96.753
3	6/23/2015	24	96.864	96.488	97.079	0.167	96.936
3	6/23/2015	25	96.750	96.447	96.957	0.121	96.773
3	6/23/2015	26	96.386	96.018	96.651	0.169	96.437
3	6/23/2015	27	96.861	95.957	97.732	0.560	96.896
3	6/23/2015	28	97.242	96.508	97.691	0.232	97.253
3	6/23/2015	29	96.744	95.876	97.385	0.471	96.610
3	6/23/2015	30	96.842	96.345	97.385	0.297	96.763
3	6/23/2015	31	96.040	95.366	96.794	0.447	95.937
3	6/23/2015	32	96.949	95.590	97.630	0.455	96.977
3	6/23/2015	33	97.570	94.978	97.814	0.267	97.650
3	6/23/2015	34	97.346	96.508	97.712	0.362	97.508
3	6/23/2015	35	97.100	96.569	97.426	0.139	97.120
3	6/23/2015	36	97.665	96.896	98.079	0.336	97.732
3	6/23/2015	37	97.425	96.834	98.038	0.357	97.283
3	6/23/2015	38	97.360	96.855	97.732	0.185	97.344
3	6/23/2015	39	97.640	97.161	97.895	0.150	97.650
3	6/23/2015	40	97.195	95.590	97.895	0.778	97.691
3	6/23/2015	41	97.239	95.672	97.630	0.543	97.487
3	6/23/2015	42	97.431	96.834	97.610	0.105	97.426
3	6/23/2015	43	97.418	97.140	97.630	0.111	97.406
3	6/23/2015	44	97.333	97.018	97.610	0.143	97.344
3	6/23/2015	45	97.263	96.957	97.467	0.130	97.304
3	6/23/2015	46	97.477	97.344	97.569	0.063	97.508
3	6/23/2015	47	97.501	97.283	97.671	0.082	97.508
3	6/23/2015	48	97.510	96.467	97.650	0.106	97.508
3	6/23/2015	49	97.767	97.528	97.936	0.085	97.773
3	6/23/2015	50	97.739	96.794	97.997	0.197	97.793
3	6/23/2015	51	97.923	97.650	97.997	0.050	97.936
3	6/23/2015	52	97.929	97.752	98.018	0.057	97.956
3	6/23/2015	53	97.878	97.752	97.956	0.046	97.895
3	6/23/2015	54	97.171	96.345	97.895	0.523	97.140
3	6/23/2015	55	96.581	95.998	96.977	0.182	96.590
3	6/23/2015	56	96.981	96.528	97.222	0.122	96.977
3	6/23/2015	57	97.273	96.916	97.446	0.090	97.283
3	6/23/2015	58	97.232	96.998	97.446	0.111	97.242

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3	6/23/2015	59	97.174	95.814	97.446	0.156	97.202
3	6/23/2015	60	97.173	94.284	97.385	0.338	97.263
3	6/23/2015	61	97.169	96.569	97.426	0.143	97.202
3	6/23/2015	62	97.124	96.814	97.406	0.129	97.120
3	6/23/2015	63	97.193	96.896	97.569	0.205	97.202
3	6/23/2015	64	97.333	97.140	97.650	0.148	97.283
3	6/23/2015	65	97.420	97.120	97.671	0.119	97.426
3	6/23/2015	66	97.363	96.773	97.691	0.258	97.508
3	6/23/2015	67	97.326	96.977	97.569	0.119	97.344
3	6/23/2015	68	97.407	97.242	97.528	0.073	97.426
3	6/23/2015	69	97.271	96.896	97.508	0.153	97.324
3	6/23/2015	70	97.284	97.018	97.548	0.112	97.283
3	6/23/2015	71	97.136	96.998	97.324	0.073	97.120
3	6/23/2015	72	97.293	96.936	97.508	0.127	97.304
3	6/23/2015	73	97.177	93.672	97.528	0.466	97.283
3	6/23/2015	74	96.777	95.774	97.181	0.227	96.753
3	6/23/2015	75	97.043	96.896	97.161	0.064	97.049
3	6/23/2015	76	97.030	96.773	97.161	0.087	97.059
3	6/23/2015	77	96.773	96.447	96.998	0.143	96.794
3	6/23/2015	78	96.688	96.304	97.140	0.200	96.651
3	6/23/2015	79	96.848	96.610	96.998	0.083	96.855
3	6/23/2015	80	96.791	96.467	97.120	0.137	96.783
3	6/23/2015	81	96.545	95.896	97.263	0.241	96.508
3	6/23/2015	82	97.009	96.263	97.344	0.324	97.140
3	6/23/2015	83	97.232	97.038	97.426	0.076	97.242
3	6/23/2015	84	97.392	96.957	97.508	0.067	97.385
3	6/23/2015	85	97.154	96.120	97.508	0.166	97.130
3	6/23/2015	86	96.837	96.120	97.140	0.222	96.896
3	6/23/2015	87	97.005	95.488	97.365	0.263	97.059
3	6/23/2015	88	97.014	96.773	97.202	0.094	96.998
3	6/23/2015	89	97.141	97.018	97.263	0.049	97.120
3	6/23/2015	90	97.162	96.773	97.344	0.117	97.202
3	6/23/2015	91	96.908	96.651	97.038	0.064	96.916
3	6/23/2015	92	96.874	96.406	97.059	0.108	96.896
3	6/23/2015	93	97.138	96.814	97.548	0.162	97.120
3	6/23/2015	94	97.339	96.426	98.038	0.549	97.385
3	6/23/2015	95	97.085	96.732	97.446	0.198	97.069
3	6/23/2015	96	97.975	97.344	98.385	0.322	98.079
3	6/23/2015	97	97.365	96.610	97.956	0.312	97.334
3	6/23/2015	98	97.105	95.692	97.446	0.198	97.140
3	6/23/2015	99	97.200	96.712	97.324	0.092	97.222
3	6/23/2015	100	96.817	96.345	97.202	0.260	96.834
3	6/23/2015	101	96.915	96.161	97.140	0.135	96.936
3	6/23/2015	102	97.027	96.447	97.283	0.129	97.038
3	6/23/2015	103	97.149	95.774	97.406	0.241	97.263
3	6/23/2015	104	96.629	95.468	97.344	0.534	96.783
3	6/23/2015	105	96.297	95.794	97.283	0.385	96.161
3	6/23/2015	106	96.167	95.651	96.569	0.116	96.182
3	6/23/2015	107	96.453	95.366	96.753	0.185	96.467
3	6/23/2015	108	93.904	90.266	97.610	1.726	93.591
4	8/22/2015	1	97.023	96.843	97.168	0.078	97.046
4	8/22/2015	2	96.958	96.782	97.066	0.059	96.944
4	8/22/2015	3	96.936	96.640	97.107	0.071	96.924
4	8/22/2015	4	96.668	95.990	96.904	0.118	96.680
4	8/22/2015	5	96.554	96.173	96.701	0.122	96.599
4	8/22/2015	6	96.770	96.376	96.985	0.122	96.782

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4	8/22/2015	7	96.806	96.376	97.005	0.155	96.843
4	8/22/2015	8	96.782	95.909	96.904	0.121	96.823
4	8/22/2015	9	96.665	95.868	96.904	0.191	96.721
4	8/22/2015	10	96.595	95.584	96.782	0.156	96.640
4	8/22/2015	11	96.781	95.949	96.904	0.095	96.792
4	8/22/2015	12	96.539	95.848	96.721	0.117	96.559
4	8/22/2015	13	96.747	96.498	96.924	0.111	96.782
4	8/22/2015	14	96.502	96.376	96.680	0.077	96.477
4	8/22/2015	15	96.497	96.315	96.619	0.070	96.518
4	8/22/2015	16	96.557	95.523	96.680	0.115	96.559
4	8/22/2015	17	96.062	94.183	96.477	0.313	96.051
4	8/22/2015	18	95.870	95.543	96.173	0.195	95.868
4	8/22/2015	19	96.390	95.949	96.619	0.122	96.396
4	8/22/2015	20	96.575	96.335	97.127	0.121	96.599
4	8/22/2015	21	96.306	96.071	96.619	0.142	96.325
4	8/22/2015	22	96.140	94.914	96.680	0.153	96.132
4	8/22/2015	23	96.673	96.173	96.863	0.170	96.721
4	8/22/2015	24	96.785	96.619	96.883	0.051	96.782
4	8/22/2015	25	96.531	96.071	96.965	0.243	96.477
4	8/22/2015	26	95.839	94.751	96.802	0.685	95.909
4	8/22/2015	27	95.255	94.325	95.909	0.446	95.178
4	8/22/2015	28	94.959	94.325	95.361	0.274	95.036
4	8/22/2015	29	94.744	94.183	95.462	0.329	94.630
4	8/22/2015	30	95.120	94.406	95.523	0.299	95.239
4	8/22/2015	31	94.565	93.919	95.320	0.350	94.487
4	8/22/2015	32	94.827	93.939	95.624	0.410	94.751
4	8/22/2015	33	96.162	95.645	96.599	0.211	96.193
4	8/22/2015	34	96.714	96.193	97.127	0.316	96.762
4	8/22/2015	35	96.410	95.726	96.762	0.184	96.416
4	8/22/2015	36	96.773	96.112	97.005	0.220	96.843
4	8/22/2015	37	96.679	95.482	97.026	0.342	96.823
4	8/22/2015	38	96.768	96.315	96.944	0.166	96.823
4	8/22/2015	39	96.891	96.680	97.005	0.085	96.904
4	8/22/2015	40	96.678	96.092	97.066	0.254	96.660
4	8/22/2015	41	96.751	96.335	97.066	0.200	96.762
4	8/22/2015	42	97.040	96.944	97.107	0.040	97.036
4	8/22/2015	43	96.783	96.213	97.005	0.239	96.904
4	8/22/2015	44	96.143	95.868	96.335	0.112	96.173
4	8/22/2015	45	96.057	95.726	96.274	0.113	96.071
4	8/22/2015	46	96.288	95.442	96.538	0.284	96.416
4	8/22/2015	47	96.509	95.421	96.883	0.191	96.538
4	8/22/2015	48	96.868	96.477	97.107	0.138	96.904
4	8/22/2015	49	96.835	96.721	96.965	0.050	96.823
4	8/22/2015	50	96.777	96.579	96.904	0.071	96.792
4	8/22/2015	51	96.505	95.949	96.863	0.258	96.569
4	8/22/2015	52	96.629	96.335	96.721	0.047	96.640
4	8/22/2015	53	96.729	96.477	96.843	0.071	96.741
4	8/22/2015	54	96.724	96.416	96.904	0.095	96.741
4	8/22/2015	55	96.306	96.132	96.640	0.107	96.295
4	8/22/2015	56	96.466	96.132	96.619	0.079	96.477
4	8/22/2015	57	96.673	96.477	96.823	0.079	96.680
4	8/22/2015	58	96.721	96.416	96.863	0.075	96.721
4	8/22/2015	59	96.708	96.619	96.843	0.041	96.701
4	8/22/2015	60	96.774	96.680	96.863	0.039	96.782
4	8/22/2015	61	96.804	96.559	97.005	0.105	96.802
4	8/22/2015	62	96.979	96.559	97.107	0.062	96.985

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4	8/22/2015	63	97.049	96.823	97.147	0.065	97.066
4	8/22/2015	64	96.926	96.782	97.026	0.060	96.924
4	8/22/2015	65	96.942	96.721	97.066	0.095	96.985
4	8/22/2015	66	96.950	96.680	97.066	0.070	96.965
4	8/22/2015	67	96.832	96.680	97.005	0.077	96.823
4	8/22/2015	68	97.010	96.782	97.066	0.034	97.015
4	8/22/2015	69	96.927	96.619	97.005	0.056	96.924
4	8/22/2015	70	96.781	96.579	96.985	0.087	96.762
4	8/22/2015	71	96.555	96.376	96.741	0.101	96.518
4	8/22/2015	72	96.551	96.376	96.640	0.056	96.559
4	8/22/2015	73	96.412	95.787	96.579	0.089	96.416
4	8/22/2015	74	96.444	96.132	96.599	0.108	96.477
4	8/22/2015	75	96.472	96.234	96.619	0.094	96.477
4	8/22/2015	76	96.439	96.234	96.619	0.087	96.416
4	8/22/2015	77	96.574	96.315	96.640	0.056	96.599
4	8/22/2015	78	96.594	96.437	96.680	0.043	96.599
4	8/22/2015	79	96.493	96.234	96.701	0.104	96.538
4	8/22/2015	80	96.660	96.213	96.782	0.100	96.680
4	8/22/2015	81	96.659	96.173	96.762	0.078	96.680
4	8/22/2015	82	96.120	95.340	96.680	0.399	95.949
4	8/22/2015	83	95.939	94.528	96.559	0.284	96.010
4	8/22/2015	84	96.192	95.564	96.477	0.119	96.193
4	8/22/2015	85	96.490	95.868	96.680	0.127	96.477
4	8/22/2015	86	96.127	95.726	96.396	0.161	96.112
4	8/22/2015	87	96.218	96.031	96.396	0.074	96.234
4	8/22/2015	88	96.150	94.366	96.355	0.184	96.173
4	8/22/2015	89	96.161	95.584	96.335	0.109	96.173
4	8/22/2015	90	96.002	95.523	96.254	0.115	96.010
4	8/22/2015	91	95.799	94.345	96.173	0.310	95.909
4	8/22/2015	92	95.346	95.056	95.624	0.128	95.361
4	8/22/2015	93	95.006	94.061	95.604	0.343	95.056
4	8/22/2015	94	94.515	92.355	95.056	0.432	94.589
4	8/22/2015	95	93.463	91.888	94.426	0.542	93.452
4	8/22/2015	96	91.228	86.649	94.264	1.562	91.147
4	8/22/2015	97	94.304	90.731	95.828	1.367	94.873
4	8/22/2015	98	95.307	93.675	95.828	0.477	95.523
4	8/22/2015	99	93.653	88.477	95.137	1.724	94.426
4	8/22/2015	100	94.462	88.538	95.685	0.825	94.569
4	8/22/2015	101	95.910	95.482	96.132	0.128	95.949
4	8/22/2015	102	95.865	95.624	96.031	0.084	95.868
4	8/22/2015	103	95.820	95.462	96.152	0.130	95.807
4	8/22/2015	104	96.033	95.787	96.254	0.123	96.031
4	8/22/2015	105	96.354	95.523	96.559	0.153	96.396
4	8/22/2015	106	96.645	96.416	96.762	0.055	96.670
4	8/22/2015	107	96.574	95.726	96.782	0.132	96.599
4	8/22/2015	108	94.598	93.086	97.005	1.096	94.071
5	11/3/2015	1	96.636	96.515	96.696	0.037	96.640
5	11/3/2015	2	96.632	96.543	96.696	0.035	96.640
5	11/3/2015	3	96.642	96.265	96.779	0.088	96.668
5	11/3/2015	4	96.719	95.959	96.835	0.108	96.731
5	11/3/2015	5	96.743	96.654	96.807	0.038	96.752
5	11/3/2015	6	96.716	96.557	96.807	0.037	96.724
5	11/3/2015	7	96.613	96.501	96.724	0.050	96.613
5	11/3/2015	8	96.675	96.487	96.807	0.086	96.696
5	11/3/2015	9	96.610	96.487	96.779	0.053	96.613
5	11/3/2015	10	96.650	96.487	96.779	0.048	96.654

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5	11/3/2015	11	96.668	96.557	96.807	0.046	96.668
5	11/3/2015	12	96.545	96.307	96.779	0.106	96.557
5	11/3/2015	13	96.570	96.390	96.668	0.050	96.571
5	11/3/2015	14	96.552	96.362	96.640	0.058	96.557
5	11/3/2015	15	96.641	96.557	96.724	0.039	96.640
5	11/3/2015	16	96.631	96.501	96.807	0.057	96.640
5	11/3/2015	17	96.539	95.194	96.752	0.177	96.557
5	11/3/2015	18	96.482	96.293	96.627	0.059	96.487
5	11/3/2015	19	96.468	96.084	96.654	0.074	96.474
5	11/3/2015	20	96.329	95.945	96.460	0.066	96.334
5	11/3/2015	21	96.304	96.015	96.446	0.064	96.307
5	11/3/2015	22	96.377	96.237	96.585	0.063	96.376
5	11/3/2015	23	96.358	96.223	96.599	0.077	96.335
5	11/3/2015	24	96.524	96.056	97.155	0.371	96.362
5	11/3/2015	25	96.651	96.112	97.099	0.373	96.905
5	11/3/2015	26	96.225	94.791	97.141	0.486	96.251
5	11/3/2015	27	96.008	95.152	96.404	0.294	96.140
5	11/3/2015	28	95.647	94.373	96.446	0.618	95.709
5	11/3/2015	29	96.258	95.472	96.474	0.178	96.294
5	11/3/2015	30	95.647	94.485	96.376	0.567	95.876
5	11/3/2015	31	96.166	95.792	96.738	0.296	96.084
5	11/3/2015	32	97.016	96.376	97.169	0.124	97.044
5	11/3/2015	33	97.097	96.668	97.197	0.060	97.099
5	11/3/2015	34	96.910	96.654	97.072	0.077	96.905
5	11/3/2015	35	96.930	96.432	97.044	0.079	96.933
5	11/3/2015	36	96.937	96.807	97.072	0.054	96.933
5	11/3/2015	37	96.932	96.599	97.085	0.076	96.933
5	11/3/2015	38	96.967	96.640	97.225	0.118	96.960
5	11/3/2015	39	97.195	97.044	97.294	0.068	97.211
5	11/3/2015	40	97.178	97.016	97.294	0.061	97.183
5	11/3/2015	41	97.174	96.627	97.378	0.185	97.266
5	11/3/2015	42	97.319	96.988	97.378	0.047	97.322
5	11/3/2015	43	97.203	97.030	97.350	0.067	97.197
5	11/3/2015	44	97.212	96.571	97.322	0.073	97.211
5	11/3/2015	45	97.183	96.710	97.294	0.089	97.211
5	11/3/2015	46	97.055	96.877	97.238	0.078	97.044
5	11/3/2015	47	97.185	96.849	97.308	0.072	97.197
5	11/3/2015	48	97.150	96.905	97.280	0.063	97.155
5	11/3/2015	49	94.204	92.957	97.266	1.241	93.854
5	11/3/2015	50	94.315	92.123	95.935	0.958	94.272
5	11/3/2015	51	96.599	95.851	96.841	0.237	96.701
5	11/3/2015	52	96.812	96.563	96.938	0.060	96.814
5	11/3/2015	53	96.942	96.818	97.071	0.044	96.941
5	11/3/2015	54	97.045	96.877	97.242	0.089	97.047
5	11/3/2015	55	96.873	96.154	97.182	0.182	96.910
5	11/3/2015	56	97.018	96.729	97.225	0.128	97.002
5	11/3/2015	57	96.934	96.618	97.169	0.165	96.988
5	11/3/2015	58	97.038	96.590	97.308	0.182	97.086
5	11/3/2015	59	97.179	96.932	97.280	0.056	97.183
5	11/3/2015	60	97.191	96.696	97.336	0.073	97.197
5	11/3/2015	61	97.230	96.613	97.391	0.082	97.238
5	11/3/2015	62	97.225	96.696	97.391	0.116	97.252
5	11/3/2015	63	96.955	95.695	97.252	0.184	96.967
5	11/3/2015	64	96.649	96.251	96.891	0.120	96.668
5	11/3/2015	65	96.011	95.138	96.585	0.219	96.001
5	11/3/2015	66	95.627	94.763	96.168	0.329	95.709

Circuit ID	Date	Section ID	MEAN_C-STAR	MIN_C-STAR	MAX_C-STAR	STDEV_C-STAR	MEDIAN_C-STAR
5	11/3/2015	67	95.623	94.596	96.376	0.381	95.625
5	11/3/2015	68	96.101	95.333	96.571	0.289	96.154
5	11/3/2015	69	95.896	95.180	96.849	0.367	95.834
5	11/3/2015	70	96.406	95.695	96.807	0.249	96.432
5	11/3/2015	71	95.813	94.679	96.640	0.487	95.889
5	11/3/2015	72	94.761	91.828	96.084	0.785	94.777
5	11/3/2015	73	94.805	93.873	96.293	0.594	94.679
5	11/3/2015	74	97.208	95.528	97.433	0.401	97.322
5	11/3/2015	75	97.254	96.932	97.336	0.054	97.266
5	11/3/2015	76	97.098	96.807	97.294	0.123	97.120
5	11/3/2015	77	96.426	95.917	96.988	0.290	96.404
5	11/3/2015	78	96.049	95.472	96.946	0.243	96.070
5	11/3/2015	79	95.899	95.015	96.474	0.303	95.988
5	11/3/2015	80	96.028	94.862	96.964	0.364	96.070
5	11/3/2015	81	96.379	95.434	97.327	0.457	96.513
5	11/3/2015	82	96.256	92.217	97.364	0.565	96.251
5	11/3/2015	83	96.217	95.959	96.418	0.106	96.223
5	11/3/2015	84	96.247	95.959	96.487	0.136	96.272
5	11/3/2015	85	96.222	95.820	96.613	0.174	96.209
5	11/3/2015	86	96.164	95.764	96.404	0.148	96.181
5	11/3/2015	87	96.058	95.152	96.460	0.263	96.133
5	11/3/2015	88	96.235	95.556	96.766	0.229	96.195
5	11/3/2015	89	96.066	94.944	96.571	0.277	96.042
5	11/3/2015	90	96.205	94.971	96.668	0.320	96.293
5	11/3/2015	91	97.404	96.098	98.115	0.740	98.003
5	11/3/2015	92	97.920	97.670	98.031	0.054	97.920
5	11/3/2015	93	97.699	96.738	97.878	0.130	97.711
5	11/3/2015	94	97.442	97.044	97.572	0.088	97.447
5	11/3/2015	95	97.038	96.682	97.517	0.276	96.933
5	11/3/2015	96	97.040	96.446	97.489	0.222	97.002
5	11/3/2015	97	96.892	96.362	97.113	0.168	96.946
5	11/3/2015	98	96.562	96.223	96.946	0.186	96.487
5	11/3/2015	99	96.317	93.706	96.668	0.502	96.474
5	11/3/2015	100	96.281	95.542	96.529	0.172	96.258
5	11/3/2015	101	96.123	95.806	96.307	0.095	96.119
5	11/3/2015	102	96.050	95.834	96.195	0.077	96.070
5	11/3/2015	103	96.125	95.987	96.223	0.039	96.126
5	11/3/2015	104	96.038	95.806	96.195	0.088	96.056
5	11/3/2015	105	96.101	95.945	96.195	0.051	96.112
5	11/3/2015	106	96.105	95.917	96.223	0.056	96.112
5	11/3/2015	107	95.963	95.834	96.209	0.064	95.945
5	11/3/2015	108	93.388	91.689	96.696	1.707	92.468

APPENDIX C2. MONITORING DATA FROM 2014–2015 NEARSHORE CIRCUITS FOR TURBIDITY (HACH 2000 TURBIDIMETER: NTU).

Circuit ID	Date	Section ID	MEAN_TU-2000	MIN_TU-2000	MAX_TU-2000	STDEV_TU-2000	MEDIAN_TU-2000
1	11/5/2014	1	0.089	0.086	0.092	0.001	0.089
1	11/5/2014	2	0.088	0.086	0.091	0.001	0.088
1	11/5/2014	3	0.089	0.086	0.093	0.001	0.089
1	11/5/2014	4	0.089	0.086	0.096	0.002	0.089
1	11/5/2014	5	0.091	0.087	0.096	0.001	0.091
1	11/5/2014	6	0.089	0.086	0.093	0.002	0.090
1	11/5/2014	7	0.087	0.084	0.092	0.002	0.087
1	11/5/2014	8	0.088	0.085	0.091	0.001	0.088
1	11/5/2014	9	0.089	0.086	0.092	0.001	0.089
1	11/5/2014	10	0.091	0.088	0.093	0.001	0.092
1	11/5/2014	11	0.090	0.086	0.100	0.002	0.091
1	11/5/2014	12	0.089	0.086	0.097	0.002	0.088
1	11/5/2014	13	0.089	0.087	0.093	0.001	0.089
1	11/5/2014	14	0.089	0.086	0.092	0.001	0.089
1	11/5/2014	15	0.091	0.088	0.098	0.002	0.090
1	11/5/2014	16	0.091	0.088	0.094	0.001	0.091
1	11/5/2014	17	0.090	0.089	0.093	0.001	0.091
1	11/5/2014	18	0.092	0.089	0.100	0.002	0.092
1	11/5/2014	19	0.093	0.090	0.098	0.002	0.092
1	11/5/2014	20	0.092	0.089	0.098	0.002	0.092
1	11/5/2014	21	0.091	0.088	0.094	0.001	0.091
1	11/5/2014	22	0.092	0.089	0.107	0.002	0.092
1	11/5/2014	23	0.094	0.090	0.103	0.002	0.094
1	11/5/2014	24	0.100	0.093	0.104	0.003	0.101
1	11/5/2014	25	0.107	0.102	0.110	0.002	0.107
1	11/5/2014	26	0.103	0.099	0.111	0.002	0.104
1	11/5/2014	27	0.102	0.100	0.108	0.001	0.102
1	11/5/2014	28	0.105	0.101	0.113	0.003	0.104
1	11/5/2014	29	0.109	0.106	0.110	0.001	0.109
1	11/5/2014	30	0.117	0.109	0.123	0.002	0.117
1	11/5/2014	31	0.116	0.113	0.120	0.001	0.116
1	11/5/2014	32	0.117	0.110	0.121	0.003	0.118
1	11/5/2014	33	0.118	0.110	0.151	0.006	0.117
1	11/5/2014	34	0.112	0.108	0.122	0.003	0.112
1	11/5/2014	35	0.110	0.108	0.114	0.001	0.110
1	11/5/2014	36	0.109	0.105	0.116	0.002	0.109
1	11/5/2014	37	0.107	0.104	0.110	0.001	0.107
1	11/5/2014	38	0.107	0.104	0.110	0.001	0.107
1	11/5/2014	39	0.107	0.105	0.110	0.001	0.108
1	11/5/2014	40	0.109	0.104	0.119	0.003	0.109
1	11/5/2014	41	0.111	0.108	0.115	0.002	0.111
1	11/5/2014	42	0.109	0.106	0.115	0.002	0.110
1	11/5/2014	43	0.107	0.105	0.110	0.001	0.107
1	11/5/2014	44	0.111	0.110	0.117	0.001	0.111
1	11/5/2014	45	0.114	0.110	0.121	0.002	0.114
1	11/5/2014	46	0.115	0.110	0.122	0.003	0.115
1	11/5/2014	47	0.108	0.105	0.112	0.002	0.109
1	11/5/2014	48	0.108	0.106	0.114	0.001	0.108
1	11/5/2014	49	0.107	0.104	0.137	0.004	0.106
1	11/5/2014	50	0.105	0.103	0.120	0.002	0.104

Circuit ID	Date	Section ID	MEAN_TU-2000	MIN_TU-2000	MAX_TU-2000	STDEV_TU-2000	MEDIAN_TU-2000
1	11/5/2014	51	0.105	0.102	0.108	0.001	0.104
1	11/5/2014	52	0.105	0.102	0.110	0.002	0.105
1	11/5/2014	53	0.106	0.104	0.116	0.002	0.105
1	11/5/2014	54	0.108	0.105	0.111	0.001	0.108
1	11/5/2014	55	0.109	0.104	0.113	0.002	0.110
1	11/5/2014	56	0.108	0.106	0.111	0.001	0.108
1	11/5/2014	57	0.107	0.100	0.124	0.004	0.108
1	11/5/2014	58	0.103	0.098	0.134	0.004	0.102
1	11/5/2014	59	0.103	0.099	0.106	0.001	0.103
1	11/5/2014	60	0.113	0.101	0.129	0.011	0.105
1	11/5/2014	61	0.123	0.103	0.161	0.005	0.123
1	11/5/2014	62	0.114	0.110	0.120	0.002	0.113
1	11/5/2014	63	0.110	0.105	0.115	0.002	0.110
1	11/5/2014	64	0.108	0.105	0.117	0.002	0.108
1	11/5/2014	65	0.111	0.107	0.117	0.002	0.110
1	11/5/2014	66	0.110	0.106	0.116	0.002	0.110
1	11/5/2014	67	0.107	0.104	0.110	0.002	0.107
1	11/5/2014	68	0.113	0.105	0.122	0.005	0.113
1	11/5/2014	69	0.105	0.100	0.112	0.003	0.104
1	11/5/2014	70	0.105	0.102	0.109	0.001	0.104
1	11/5/2014	71	0.108	0.103	0.113	0.003	0.107
1	11/5/2014	72	0.112	0.106	0.122	0.004	0.111
1	11/5/2014	73	0.133	0.122	0.140	0.005	0.133
1	11/5/2014	74	0.122	0.108	0.139	0.008	0.121
1	11/5/2014	75	0.101	0.097	0.110	0.003	0.101
1	11/5/2014	76	0.099	0.096	0.110	0.003	0.098
1	11/5/2014	77	0.105	0.097	0.110	0.002	0.105
1	11/5/2014	78	0.105	0.103	0.110	0.001	0.105
1	11/5/2014	79	0.108	0.104	0.112	0.002	0.108
1	11/5/2014	80	0.112	0.106	0.119	0.003	0.111
1	11/5/2014	81	0.131	0.117	0.139	0.007	0.134
1	11/5/2014	82	0.141	0.089	0.155	0.009	0.142
1	11/5/2014	83	0.130	0.121	0.141	0.006	0.129
1	11/5/2014	84	0.136	0.123	0.150	0.008	0.138
1	11/5/2014	85	0.135	0.124	0.145	0.004	0.136
1	11/5/2014	86	0.120	0.108	0.187	0.014	0.114
1	11/5/2014	87	0.144	0.126	0.156	0.006	0.144
1	11/5/2014	88	0.137	0.094	0.152	0.007	0.138
1	11/5/2014	89	0.115	0.081	0.158	0.020	0.112
1	11/5/2014	90	0.100	0.091	0.122	0.007	0.100
1	11/5/2014	91	0.103	0.088	0.122	0.008	0.104
1	11/5/2014	92	0.107	0.099	0.128	0.005	0.105
1	11/5/2014	93	0.097	0.088	0.125	0.006	0.096
1	11/5/2014	94	0.095	0.087	0.125	0.009	0.092
1	11/5/2014	95	0.093	0.087	0.104	0.004	0.092
1	11/5/2014	96	0.097	0.086	0.105	0.003	0.097
1	11/5/2014	97	0.096	0.089	0.124	0.007	0.093
1	11/5/2014	98	0.107	0.093	0.148	0.014	0.099
1	11/5/2014	99	0.106	0.095	0.120	0.008	0.106
1	11/5/2014	100	0.103	0.099	0.106	0.002	0.103
1	11/5/2014	101	0.101	0.098	0.107	0.002	0.101
1	11/5/2014	102	0.098	0.092	0.105	0.003	0.098
1	11/5/2014	103	0.097	0.093	0.104	0.002	0.097
1	11/5/2014	104	0.100	0.093	0.139	0.006	0.099
1	11/5/2014	105	0.094	0.092	0.099	0.001	0.094
1	11/5/2014	106	0.093	0.090	0.098	0.002	0.092

Circuit ID	Date	Section ID	MEAN_TU-2000	MIN_TU-2000	MAX_TU-2000	STDEV_TU-2000	MEDIAN_TU-2000
1	11/5/2014	107	0.093	0.091	0.106	0.002	0.093
1	11/5/2014	108	0.113	0.087	0.137	0.016	0.121
2	4/18/2015	1	0.097	0.095	0.100	0.002	0.097
2	4/18/2015	2	0.100	0.097	0.110	0.003	0.099
2	4/18/2015	3	0.095	0.092	0.103	0.002	0.095
2	4/18/2015	4	0.101	0.092	0.116	0.004	0.102
2	4/18/2015	5	0.102	0.099	0.111	0.003	0.102
2	4/18/2015	6	0.108	0.098	0.136	0.008	0.108
2	4/18/2015	7	0.105	0.095	0.120	0.006	0.106
2	4/18/2015	8	0.103	0.097	0.143	0.007	0.102
2	4/18/2015	9	0.101	0.095	0.131	0.005	0.100
2	4/18/2015	10	0.112	0.102	0.167	0.012	0.108
2	4/18/2015	11	0.114	0.100	0.138	0.010	0.110
2	4/18/2015	12	0.143	0.121	0.176	0.013	0.141
2	4/18/2015	13	0.146	0.116	0.195	0.023	0.143
2	4/18/2015	14	0.127	0.117	0.166	0.008	0.126
2	4/18/2015	15	0.127	0.121	0.147	0.005	0.126
2	4/18/2015	16	0.113	0.095	0.131	0.012	0.116
2	4/18/2015	17	0.114	0.102	0.143	0.013	0.106
2	4/18/2015	18	0.144	0.105	0.205	0.026	0.138
2	4/18/2015	19	0.147	0.098	0.383	0.062	0.116
2	4/18/2015	20	0.117	0.097	0.177	0.022	0.109
2	4/18/2015	21	0.117	0.105	0.144	0.010	0.115
2	4/18/2015	22	0.116	0.106	0.177	0.014	0.113
2	4/18/2015	23	0.210	0.118	0.439	0.090	0.171
2	4/18/2015	24	0.110	0.106	0.118	0.002	0.110
2	4/18/2015	25	0.105	0.097	0.121	0.006	0.105
2	4/18/2015	26	0.114	0.110	0.121	0.003	0.115
2	4/18/2015	27	0.133	0.110	0.161	0.016	0.131
2	4/18/2015	28	0.141	0.118	0.187	0.018	0.136
2	4/18/2015	29	0.134	0.118	0.166	0.015	0.128
2	4/18/2015	30	0.118	0.115	0.124	0.002	0.117
2	4/18/2015	31	0.124	0.113	0.173	0.010	0.122
2	4/18/2015	32	0.116	0.110	0.141	0.007	0.113
2	4/18/2015	33	0.111	0.103	0.124	0.004	0.112
2	4/18/2015	34	0.109	0.101	0.117	0.004	0.110
2	4/18/2015	35	0.116	0.108	0.151	0.008	0.115
2	4/18/2015	36	0.114	0.105	0.129	0.007	0.113
2	4/18/2015	37	0.108	0.101	0.126	0.004	0.108
2	4/18/2015	38	0.112	0.105	0.133	0.005	0.112
2	4/18/2015	39	0.103	0.098	0.112	0.003	0.101
2	4/18/2015	40	0.106	0.100	0.142	0.008	0.103
2	4/18/2015	41	0.108	0.100	0.128	0.007	0.106
2	4/18/2015	42	0.107	0.103	0.117	0.003	0.106
2	4/18/2015	43	0.105	0.103	0.108	0.001	0.105
2	4/18/2015	44	0.105	0.098	0.115	0.005	0.105
2	4/18/2015	45	0.107	0.098	0.117	0.005	0.108
2	4/18/2015	46	0.103	0.098	0.115	0.004	0.101
2	4/18/2015	47	0.104	0.098	0.113	0.004	0.103
2	4/18/2015	48	0.110	0.105	0.120	0.003	0.110
2	4/18/2015	49	0.113	0.105	0.121	0.004	0.113
2	4/18/2015	50	0.127	0.117	0.145	0.007	0.126
2	4/18/2015	51	0.115	0.105	0.129	0.005	0.115
2	4/18/2015	52	0.104	0.100	0.110	0.002	0.103
2	4/18/2015	53	0.108	0.103	0.113	0.002	0.108
2	4/18/2015	54	0.113	0.103	0.169	0.011	0.108

Circuit ID	Date	Section ID	MEAN_TU-2000	MIN_TU-2000	MAX_TU-2000	STDEV_TU-2000	MEDIAN_TU-2000
2	4/18/2015	55	0.138	0.120	0.204	0.018	0.133
2	4/18/2015	56	0.128	0.115	0.155	0.009	0.126
2	4/18/2015	57	0.125	0.120	0.133	0.003	0.124
2	4/18/2015	58	0.128	0.112	0.171	0.011	0.124
2	4/18/2015	59	0.123	0.113	0.148	0.009	0.120
2	4/18/2015	60	0.127	0.117	0.136	0.005	0.126
2	4/18/2015	61	0.122	0.113	0.136	0.005	0.121
2	4/18/2015	62	0.113	0.109	0.122	0.003	0.112
2	4/18/2015	63	0.116	0.112	0.122	0.002	0.117
2	4/18/2015	64	0.117	0.110	0.124	0.003	0.118
2	4/18/2015	65	0.115	0.110	0.128	0.003	0.115
2	4/18/2015	66	0.115	0.112	0.118	0.002	0.115
2	4/18/2015	67	0.118	0.113	0.129	0.004	0.117
2	4/18/2015	68	0.121	0.115	0.131	0.004	0.121
2	4/18/2015	69	0.120	0.117	0.122	0.002	0.120
2	4/18/2015	70	0.118	0.113	0.122	0.002	0.118
2	4/18/2015	71	0.119	0.117	0.133	0.002	0.118
2	4/18/2015	72	0.117	0.115	0.122	0.001	0.118
2	4/18/2015	73	0.118	0.115	0.121	0.001	0.118
2	4/18/2015	74	0.124	0.118	0.161	0.005	0.122
2	4/18/2015	75	0.120	0.117	0.133	0.002	0.120
2	4/18/2015	76	0.121	0.118	0.148	0.004	0.121
2	4/18/2015	77	0.121	0.118	0.126	0.002	0.121
2	4/18/2015	78	0.119	0.115	0.138	0.003	0.120
2	4/18/2015	79	0.121	0.111	0.268	0.018	0.118
2	4/18/2015	80	0.117	0.110	0.141	0.004	0.117
2	4/18/2015	81	0.119	0.115	0.131	0.003	0.118
2	4/18/2015	82	0.119	0.101	0.124	0.003	0.120
2	4/18/2015	83	0.117	0.108	0.128	0.004	0.118
2	4/18/2015	84	0.109	0.106	0.132	0.003	0.108
2	4/18/2015	85	0.113	0.106	0.138	0.006	0.111
2	4/18/2015	86	0.117	0.111	0.146	0.006	0.116
2	4/18/2015	87	0.111	0.105	0.126	0.005	0.110
2	4/18/2015	88	0.110	0.106	0.120	0.003	0.110
2	4/18/2015	89	0.113	0.108	0.136	0.005	0.113
2	4/18/2015	90	0.121	0.110	0.146	0.008	0.120
2	4/18/2015	91	0.115	0.110	0.148	0.007	0.111
2	4/18/2015	92	0.114	0.106	0.172	0.012	0.110
2	4/18/2015	93	0.138	0.106	0.205	0.021	0.141
2	4/18/2015	94	0.107	0.098	0.133	0.007	0.105
2	4/18/2015	95	0.121	0.106	0.154	0.015	0.113
2	4/18/2015	96	0.112	0.092	0.139	0.010	0.113
2	4/18/2015	97	0.178	0.092	0.283	0.062	0.162
2	4/18/2015	98	0.293	0.156	0.645	0.146	0.273
2	4/18/2015	99	0.158	0.139	0.212	0.012	0.153
2	4/18/2015	100	0.171	0.141	0.230	0.023	0.168
2	4/18/2015	101	0.142	0.131	0.156	0.007	0.143
2	4/18/2015	102	0.128	0.120	0.146	0.007	0.125
2	4/18/2015	103	0.125	0.118	0.142	0.004	0.125
2	4/18/2015	104	0.132	0.116	0.158	0.013	0.128
2	4/18/2015	105	0.126	0.115	0.136	0.006	0.125
2	4/18/2015	106	0.114	0.109	0.125	0.004	0.111
2	4/18/2015	107	0.109	0.102	0.125	0.004	0.110
2	4/18/2015	108	0.144	0.095	0.319	0.027	0.148
3	6/23/2015	1	0.126	0.111	0.163	0.011	0.123
3	6/23/2015	2	0.142	0.118	0.179	0.017	0.139

Circuit ID	Date	Section ID	MEAN_TU-2000	MIN_TU-2000	MAX_TU-2000	STDEV_TU-2000	MEDIAN_TU-2000
3	6/23/2015	3	0.157	0.133	0.194	0.012	0.155
3	6/23/2015	4	0.131	0.109	0.189	0.016	0.126
3	6/23/2015	5	0.119	0.108	0.140	0.007	0.118
3	6/23/2015	6	0.123	0.108	0.252	0.018	0.118
3	6/23/2015	7	0.114	0.104	0.135	0.005	0.112
3	6/23/2015	8	0.117	0.104	0.177	0.014	0.112
3	6/23/2015	9	0.135	0.109	0.217	0.023	0.127
3	6/23/2015	10	0.141	0.117	0.221	0.018	0.136
3	6/23/2015	11	0.147	0.118	0.188	0.016	0.144
3	6/23/2015	12	0.138	0.117	0.168	0.011	0.139
3	6/23/2015	13	0.127	0.104	0.177	0.021	0.117
3	6/23/2015	14	0.108	0.100	0.140	0.006	0.107
3	6/23/2015	15	0.105	0.102	0.113	0.003	0.104
3	6/23/2015	16	0.107	0.098	0.129	0.005	0.106
3	6/23/2015	17	0.107	0.102	0.129	0.005	0.106
3	6/23/2015	18	0.106	0.100	0.120	0.004	0.106
3	6/23/2015	19	0.111	0.100	0.234	0.018	0.108
3	6/23/2015	20	0.110	0.102	0.123	0.004	0.109
3	6/23/2015	21	0.122	0.111	0.152	0.008	0.121
3	6/23/2015	22	0.122	0.111	0.144	0.006	0.123
3	6/23/2015	23	0.129	0.121	0.141	0.004	0.128
3	6/23/2015	24	0.136	0.123	0.161	0.007	0.136
3	6/23/2015	25	0.138	0.126	0.160	0.006	0.137
3	6/23/2015	26	0.147	0.133	0.179	0.008	0.146
3	6/23/2015	27	0.133	0.098	0.168	0.019	0.135
3	6/23/2015	28	0.107	0.097	0.129	0.007	0.108
3	6/23/2015	29	0.126	0.102	0.168	0.015	0.124
3	6/23/2015	30	0.124	0.106	0.149	0.011	0.128
3	6/23/2015	31	0.145	0.115	0.206	0.020	0.143
3	6/23/2015	32	0.115	0.098	0.170	0.018	0.108
3	6/23/2015	33	0.099	0.091	0.170	0.010	0.098
3	6/23/2015	34	0.103	0.092	0.121	0.008	0.100
3	6/23/2015	35	0.107	0.097	0.120	0.006	0.106
3	6/23/2015	36	0.099	0.086	0.185	0.013	0.096
3	6/23/2015	37	0.097	0.087	0.113	0.007	0.098
3	6/23/2015	38	0.105	0.095	0.124	0.006	0.104
3	6/23/2015	39	0.099	0.091	0.121	0.006	0.100
3	6/23/2015	40	0.106	0.091	0.150	0.016	0.098
3	6/23/2015	41	0.120	0.100	0.172	0.022	0.109
3	6/23/2015	42	0.117	0.098	0.146	0.010	0.117
3	6/23/2015	43	0.121	0.103	0.189	0.015	0.118
3	6/23/2015	44	0.122	0.102	0.148	0.010	0.123
3	6/23/2015	45	0.130	0.113	0.179	0.012	0.128
3	6/23/2015	46	0.121	0.102	0.157	0.011	0.118
3	6/23/2015	47	0.106	0.097	0.155	0.007	0.104
3	6/23/2015	48	0.100	0.095	0.112	0.004	0.100
3	6/23/2015	49	0.096	0.091	0.124	0.005	0.095
3	6/23/2015	50	0.106	0.091	0.391	0.037	0.097
3	6/23/2015	51	0.094	0.089	0.108	0.004	0.092
3	6/23/2015	52	0.094	0.089	0.108	0.003	0.093
3	6/23/2015	53	0.095	0.091	0.106	0.003	0.093
3	6/23/2015	54	0.134	0.092	0.210	0.038	0.124
3	6/23/2015	55	0.195	0.170	0.234	0.017	0.189
3	6/23/2015	56	0.172	0.154	0.205	0.013	0.170
3	6/23/2015	57	0.160	0.146	0.206	0.012	0.157
3	6/23/2015	58	0.154	0.143	0.174	0.007	0.154

Circuit ID	Date	Section ID	MEAN_TU-2000	MIN_TU-2000	MAX_TU-2000	STDEV_TU-2000	MEDIAN_TU-2000
3	6/23/2015	59	0.157	0.144	0.221	0.011	0.154
3	6/23/2015	60	0.152	0.141	0.177	0.006	0.151
3	6/23/2015	61	0.147	0.139	0.174	0.005	0.146
3	6/23/2015	62	0.146	0.139	0.166	0.005	0.144
3	6/23/2015	63	0.144	0.133	0.164	0.005	0.143
3	6/23/2015	64	0.142	0.135	0.160	0.005	0.141
3	6/23/2015	65	0.138	0.131	0.150	0.003	0.139
3	6/23/2015	66	0.131	0.115	0.152	0.011	0.134
3	6/23/2015	67	0.123	0.115	0.135	0.004	0.123
3	6/23/2015	68	0.123	0.117	0.164	0.008	0.121
3	6/23/2015	69	0.122	0.116	0.135	0.004	0.121
3	6/23/2015	70	0.120	0.113	0.131	0.003	0.120
3	6/23/2015	71	0.123	0.117	0.140	0.004	0.121
3	6/23/2015	72	0.120	0.115	0.140	0.004	0.120
3	6/23/2015	73	0.121	0.115	0.137	0.005	0.119
3	6/23/2015	74	0.132	0.119	0.179	0.009	0.131
3	6/23/2015	75	0.126	0.120	0.141	0.005	0.124
3	6/23/2015	76	0.124	0.118	0.179	0.008	0.121
3	6/23/2015	77	0.134	0.124	0.217	0.013	0.131
3	6/23/2015	78	0.142	0.126	0.161	0.007	0.141
3	6/23/2015	79	0.140	0.126	0.175	0.008	0.139
3	6/23/2015	80	0.133	0.120	0.150	0.005	0.132
3	6/23/2015	81	0.140	0.113	0.175	0.009	0.140
3	6/23/2015	82	0.133	0.112	0.188	0.014	0.129
3	6/23/2015	83	0.163	0.126	0.236	0.021	0.163
3	6/23/2015	84	0.152	0.120	0.203	0.018	0.150
3	6/23/2015	85	0.188	0.123	0.271	0.039	0.193
3	6/23/2015	86	0.163	0.121	0.251	0.032	0.159
3	6/23/2015	87	0.268	0.157	0.555	0.095	0.241
3	6/23/2015	88	0.147	0.120	0.263	0.023	0.141
3	6/23/2015	89	0.141	0.121	0.170	0.012	0.139
3	6/23/2015	90	0.162	0.129	0.210	0.018	0.160
3	6/23/2015	91	0.160	0.131	0.212	0.017	0.157
3	6/23/2015	92	0.215	0.159	0.328	0.032	0.210
3	6/23/2015	93	0.230	0.159	0.355	0.044	0.221
3	6/23/2015	94	0.171	0.112	0.542	0.082	0.137
3	6/23/2015	95	0.147	0.123	0.199	0.015	0.143
3	6/23/2015	96	0.129	0.102	0.197	0.019	0.128
3	6/23/2015	97	0.153	0.121	0.293	0.026	0.148
3	6/23/2015	98	0.161	0.132	0.218	0.019	0.155
3	6/23/2015	99	0.156	0.124	0.190	0.014	0.155
3	6/23/2015	100	0.173	0.143	0.243	0.020	0.170
3	6/23/2015	101	0.168	0.141	0.232	0.016	0.164
3	6/23/2015	102	0.152	0.129	0.200	0.014	0.150
3	6/23/2015	103	0.139	0.118	0.285	0.019	0.137
3	6/23/2015	104	0.174	0.121	0.231	0.031	0.176
3	6/23/2015	105	0.157	0.131	0.249	0.019	0.152
3	6/23/2015	106	0.152	0.126	0.205	0.015	0.149
3	6/23/2015	107	0.154	0.120	0.362	0.029	0.147
3	6/23/2015	108	0.262	0.111	1.000	0.090	0.267
4	8/22/2015	1	0.098	0.095	0.103	0.002	0.098
4	8/22/2015	2	0.099	0.096	0.102	0.001	0.099
4	8/22/2015	3	0.102	0.097	0.135	0.004	0.100
4	8/22/2015	4	0.105	0.100	0.118	0.003	0.105
4	8/22/2015	5	0.106	0.102	0.127	0.005	0.105
4	8/22/2015	6	0.103	0.099	0.112	0.002	0.103

Circuit ID	Date	Section ID	MEAN_TU-2000	MIN_TU-2000	MAX_TU-2000	STDEV_TU-2000	MEDIAN_TU-2000
4	8/22/2015	7	0.104	0.099	0.114	0.004	0.102
4	8/22/2015	8	0.103	0.100	0.108	0.002	0.103
4	8/22/2015	9	0.106	0.100	0.148	0.008	0.105
4	8/22/2015	10	0.104	0.102	0.108	0.002	0.103
4	8/22/2015	11	0.101	0.099	0.109	0.002	0.100
4	8/22/2015	12	0.106	0.100	0.169	0.008	0.103
4	8/22/2015	13	0.102	0.097	0.110	0.003	0.100
4	8/22/2015	14	0.106	0.100	0.112	0.002	0.106
4	8/22/2015	15	0.105	0.102	0.118	0.003	0.105
4	8/22/2015	16	0.103	0.100	0.121	0.003	0.103
4	8/22/2015	17	0.113	0.102	0.132	0.007	0.112
4	8/22/2015	18	0.115	0.105	0.164	0.009	0.112
4	8/22/2015	19	0.106	0.102	0.124	0.005	0.105
4	8/22/2015	20	0.102	0.097	0.143	0.005	0.102
4	8/22/2015	21	0.107	0.097	0.156	0.008	0.106
4	8/22/2015	22	0.110	0.093	0.162	0.006	0.110
4	8/22/2015	23	0.101	0.093	0.137	0.008	0.099
4	8/22/2015	24	0.093	0.090	0.099	0.001	0.093
4	8/22/2015	25	0.105	0.093	0.117	0.006	0.106
4	8/22/2015	26	0.142	0.109	0.312	0.046	0.121
4	8/22/2015	27	0.145	0.118	0.245	0.019	0.142
4	8/22/2015	28	0.153	0.143	0.170	0.006	0.154
4	8/22/2015	29	0.168	0.155	0.194	0.009	0.165
4	8/22/2015	30	0.156	0.143	0.181	0.010	0.150
4	8/22/2015	31	0.169	0.148	0.192	0.012	0.171
4	8/22/2015	32	0.162	0.135	0.201	0.014	0.165
4	8/22/2015	33	0.123	0.108	0.139	0.008	0.122
4	8/22/2015	34	0.107	0.090	0.139	0.009	0.108
4	8/22/2015	35	0.128	0.099	0.223	0.034	0.114
4	8/22/2015	36	0.101	0.090	0.146	0.013	0.095
4	8/22/2015	37	0.100	0.090	0.148	0.013	0.095
4	8/22/2015	38	0.099	0.093	0.122	0.007	0.096
4	8/22/2015	39	0.094	0.090	0.100	0.003	0.093
4	8/22/2015	40	0.098	0.090	0.129	0.007	0.096
4	8/22/2015	41	0.101	0.091	0.115	0.006	0.100
4	8/22/2015	42	0.090	0.089	0.092	0.001	0.090
4	8/22/2015	43	0.097	0.091	0.118	0.007	0.094
4	8/22/2015	44	0.122	0.108	0.140	0.007	0.120
4	8/22/2015	45	0.120	0.115	0.129	0.003	0.120
4	8/22/2015	46	0.123	0.105	0.240	0.028	0.112
4	8/22/2015	47	0.104	0.095	0.144	0.007	0.103
4	8/22/2015	48	0.096	0.089	0.103	0.004	0.095
4	8/22/2015	49	0.096	0.092	0.121	0.004	0.095
4	8/22/2015	50	0.101	0.095	0.116	0.005	0.100
4	8/22/2015	51	0.117	0.096	0.184	0.022	0.105
4	8/22/2015	52	0.108	0.101	0.121	0.004	0.106
4	8/22/2015	53	0.101	0.093	0.114	0.004	0.100
4	8/22/2015	54	0.104	0.097	0.121	0.005	0.102
4	8/22/2015	55	0.112	0.097	0.136	0.006	0.110
4	8/22/2015	56	0.105	0.100	0.115	0.003	0.104
4	8/22/2015	57	0.099	0.095	0.105	0.003	0.099
4	8/22/2015	58	0.095	0.093	0.109	0.003	0.095
4	8/22/2015	59	0.094	0.090	0.109	0.003	0.093
4	8/22/2015	60	0.091	0.089	0.095	0.001	0.090
4	8/22/2015	61	0.090	0.085	0.097	0.002	0.090
4	8/22/2015	62	0.088	0.084	0.093	0.002	0.087

Circuit ID	Date	Section ID	MEAN_TU-2000	MIN_TU-2000	MAX_TU-2000	STDEV_TU-2000	MEDIAN_TU-2000
4	8/22/2015	63	0.086	0.084	0.090	0.001	0.085
4	8/22/2015	64	0.086	0.084	0.090	0.001	0.085
4	8/22/2015	65	0.087	0.084	0.095	0.003	0.087
4	8/22/2015	66	0.087	0.084	0.095	0.002	0.085
4	8/22/2015	67	0.090	0.085	0.096	0.003	0.090
4	8/22/2015	68	0.084	0.083	0.090	0.001	0.084
4	8/22/2015	69	0.086	0.083	0.121	0.005	0.085
4	8/22/2015	70	0.088	0.084	0.095	0.002	0.089
4	8/22/2015	71	0.094	0.087	0.105	0.004	0.095
4	8/22/2015	72	0.094	0.090	0.099	0.002	0.095
4	8/22/2015	73	0.097	0.091	0.116	0.003	0.097
4	8/22/2015	74	0.098	0.091	0.108	0.003	0.097
4	8/22/2015	75	0.095	0.090	0.103	0.003	0.095
4	8/22/2015	76	0.097	0.091	0.102	0.003	0.096
4	8/22/2015	77	0.093	0.087	0.110	0.004	0.091
4	8/22/2015	78	0.090	0.089	0.096	0.001	0.090
4	8/22/2015	79	0.094	0.090	0.102	0.004	0.093
4	8/22/2015	80	0.088	0.085	0.103	0.003	0.088
4	8/22/2015	81	0.088	0.085	0.093	0.002	0.089
4	8/22/2015	82	0.092	0.087	0.106	0.003	0.091
4	8/22/2015	83	0.093	0.089	0.103	0.003	0.091
4	8/22/2015	84	0.095	0.091	0.105	0.003	0.095
4	8/22/2015	85	0.092	0.089	0.108	0.003	0.091
4	8/22/2015	86	0.112	0.093	0.133	0.010	0.115
4	8/22/2015	87	0.110	0.097	0.125	0.004	0.109
4	8/22/2015	88	0.103	0.096	0.125	0.007	0.100
4	8/22/2015	89	0.101	0.096	0.110	0.003	0.100
4	8/22/2015	90	0.112	0.100	0.247	0.017	0.109
4	8/22/2015	91	0.105	0.099	0.115	0.004	0.105
4	8/22/2015	92	0.120	0.110	0.136	0.007	0.118
4	8/22/2015	93	0.126	0.108	0.159	0.014	0.124
4	8/22/2015	94	0.132	0.121	0.149	0.007	0.131
4	8/22/2015	95	0.148	0.125	0.201	0.020	0.142
4	8/22/2015	96	0.294	0.136	0.484	0.104	0.302
4	8/22/2015	97	0.207	0.120	0.461	0.080	0.173
4	8/22/2015	98	0.154	0.121	0.262	0.031	0.144
4	8/22/2015	99	0.264	0.125	0.685	0.155	0.205
4	8/22/2015	100	0.239	0.144	0.484	0.079	0.214
4	8/22/2015	101	0.131	0.120	0.150	0.009	0.129
4	8/22/2015	102	0.131	0.124	0.140	0.003	0.131
4	8/22/2015	103	0.135	0.122	0.149	0.006	0.137
4	8/22/2015	104	0.124	0.106	0.146	0.009	0.122
4	8/22/2015	105	0.112	0.102	0.139	0.008	0.108
4	8/22/2015	106	0.099	0.097	0.121	0.003	0.099
4	8/22/2015	107	0.098	0.093	0.105	0.003	0.097
4	8/22/2015	108	0.148	0.089	0.339	0.029	0.156
5	11/3/2015	1	0.124	0.119	0.145	0.004	0.122
5	11/3/2015	2	0.123	0.119	0.140	0.004	0.122
5	11/3/2015	3	0.125	0.117	0.177	0.009	0.121
5	11/3/2015	4	0.123	0.117	0.147	0.005	0.121
5	11/3/2015	5	0.124	0.121	0.159	0.005	0.124
5	11/3/2015	6	0.125	0.121	0.137	0.003	0.126
5	11/3/2015	7	0.129	0.122	0.155	0.005	0.127
5	11/3/2015	8	0.128	0.121	0.137	0.004	0.127
5	11/3/2015	9	0.127	0.121	0.136	0.003	0.127
5	11/3/2015	10	0.129	0.124	0.142	0.003	0.129

Circuit ID	Date	Section ID	MEAN_TU-2000	MIN_TU-2000	MAX_TU-2000	STDEV_TU-2000	MEDIAN_TU-2000
5	11/3/2015	11	0.126	0.122	0.132	0.002	0.126
5	11/3/2015	12	0.131	0.124	0.140	0.004	0.131
5	11/3/2015	13	0.129	0.124	0.152	0.004	0.127
5	11/3/2015	14	0.129	0.124	0.162	0.005	0.128
5	11/3/2015	15	0.128	0.124	0.140	0.003	0.127
5	11/3/2015	16	0.129	0.124	0.137	0.002	0.129
5	11/3/2015	17	0.131	0.126	0.155	0.004	0.129
5	11/3/2015	18	0.131	0.124	0.145	0.005	0.131
5	11/3/2015	19	0.132	0.128	0.149	0.003	0.132
5	11/3/2015	20	0.139	0.129	0.154	0.004	0.139
5	11/3/2015	21	0.143	0.136	0.164	0.004	0.142
5	11/3/2015	22	0.136	0.127	0.152	0.005	0.136
5	11/3/2015	23	0.139	0.129	0.155	0.006	0.139
5	11/3/2015	24	0.140	0.132	0.154	0.005	0.139
5	11/3/2015	25	0.142	0.134	0.184	0.005	0.142
5	11/3/2015	26	0.167	0.137	0.329	0.042	0.147
5	11/3/2015	27	0.184	0.142	0.266	0.038	0.177
5	11/3/2015	28	0.210	0.140	0.326	0.067	0.213
5	11/3/2015	29	0.176	0.137	0.285	0.040	0.179
5	11/3/2015	30	0.214	0.179	0.276	0.025	0.210
5	11/3/2015	31	0.195	0.172	0.215	0.010	0.197
5	11/3/2015	32	0.150	0.137	0.175	0.008	0.149
5	11/3/2015	33	0.139	0.134	0.150	0.003	0.139
5	11/3/2015	34	0.144	0.137	0.155	0.003	0.144
5	11/3/2015	35	0.144	0.137	0.155	0.004	0.144
5	11/3/2015	36	0.143	0.139	0.155	0.003	0.142
5	11/3/2015	37	0.140	0.132	0.155	0.004	0.140
5	11/3/2015	38	0.140	0.132	0.157	0.007	0.139
5	11/3/2015	39	0.134	0.126	0.142	0.004	0.134
5	11/3/2015	40	0.128	0.124	0.139	0.002	0.128
5	11/3/2015	41	0.137	0.124	0.182	0.013	0.131
5	11/3/2015	42	0.127	0.122	0.142	0.003	0.126
5	11/3/2015	43	0.131	0.124	0.142	0.004	0.131
5	11/3/2015	44	0.129	0.122	0.150	0.003	0.129
5	11/3/2015	45	0.134	0.124	0.242	0.015	0.129
5	11/3/2015	46	0.132	0.122	0.144	0.005	0.132
5	11/3/2015	47	0.128	0.119	0.140	0.004	0.127
5	11/3/2015	48	0.124	0.117	0.137	0.003	0.124
5	11/3/2015	49	0.132	0.121	0.144	0.004	0.132
5	11/3/2015	50	0.135	0.129	0.147	0.003	0.134
5	11/3/2015	51	0.136	0.129	0.162	0.005	0.136
5	11/3/2015	52	0.139	0.131	0.174	0.008	0.136
5	11/3/2015	53	0.134	0.129	0.149	0.005	0.132
5	11/3/2015	54	0.138	0.126	0.167	0.009	0.139
5	11/3/2015	55	0.144	0.124	0.189	0.012	0.144
5	11/3/2015	56	0.140	0.131	0.160	0.005	0.140
5	11/3/2015	57	0.141	0.132	0.174	0.006	0.140
5	11/3/2015	58	0.141	0.132	0.167	0.006	0.139
5	11/3/2015	59	0.138	0.132	0.147	0.003	0.137
5	11/3/2015	60	0.138	0.132	0.162	0.004	0.137
5	11/3/2015	61	0.135	0.129	0.142	0.003	0.135
5	11/3/2015	62	0.132	0.129	0.140	0.002	0.131
5	11/3/2015	63	0.132	0.129	0.145	0.003	0.132
5	11/3/2015	64	0.133	0.127	0.150	0.004	0.132
5	11/3/2015	65	0.130	0.119	0.160	0.009	0.132
5	11/3/2015	66	0.124	0.121	0.129	0.002	0.124

Circuit ID	Date	Section ID	MEAN_TU-2000	MIN_TU-2000	MAX_TU-2000	STDEV_TU-2000	MEDIAN_TU-2000
5	11/3/2015	67	0.124	0.121	0.140	0.003	0.124
5	11/3/2015	68	0.126	0.121	0.134	0.003	0.126
5	11/3/2015	69	0.125	0.121	0.131	0.002	0.124
5	11/3/2015	70	0.125	0.122	0.154	0.004	0.124
5	11/3/2015	71	0.127	0.121	0.154	0.005	0.127
5	11/3/2015	72	0.124	0.121	0.144	0.004	0.124
5	11/3/2015	73	0.126	0.122	0.144	0.004	0.125
5	11/3/2015	74	0.126	0.121	0.131	0.002	0.126
5	11/3/2015	75	0.128	0.122	0.159	0.005	0.126
5	11/3/2015	76	0.127	0.122	0.134	0.002	0.126
5	11/3/2015	77	0.127	0.124	0.142	0.003	0.127
5	11/3/2015	78	0.127	0.121	0.164	0.004	0.126
5	11/3/2015	79	0.126	0.119	0.195	0.007	0.124
5	11/3/2015	80	0.126	0.119	0.147	0.005	0.126
5	11/3/2015	81	0.127	0.121	0.140	0.004	0.126
5	11/3/2015	82	0.128	0.122	0.142	0.004	0.127
5	11/3/2015	83	0.128	0.121	0.231	0.014	0.124
5	11/3/2015	84	0.132	0.117	0.210	0.019	0.124
5	11/3/2015	85	0.127	0.116	0.187	0.012	0.123
5	11/3/2015	86	0.120	0.116	0.132	0.004	0.119
5	11/3/2015	87	0.132	0.121	0.306	0.029	0.124
5	11/3/2015	88	0.152	0.119	0.999	0.126	0.124
5	11/3/2015	89	0.124	0.117	0.185	0.009	0.122
5	11/3/2015	90	0.131	0.115	0.296	0.031	0.124
5	11/3/2015	91	0.141	0.126	0.265	0.020	0.134
5	11/3/2015	92	0.136	0.127	0.164	0.006	0.136
5	11/3/2015	93	0.142	0.131	0.170	0.008	0.140
5	11/3/2015	94	0.144	0.136	0.157	0.004	0.144
5	11/3/2015	95	0.141	0.134	0.157	0.005	0.140
5	11/3/2015	96	0.137	0.126	0.167	0.006	0.137
5	11/3/2015	97	0.149	0.124	0.235	0.022	0.147
5	11/3/2015	98	0.133	0.126	0.155	0.005	0.131
5	11/3/2015	99	0.188	0.128	0.749	0.100	0.160
5	11/3/2015	100	0.137	0.126	0.177	0.010	0.134
5	11/3/2015	101	0.130	0.124	0.159	0.005	0.129
5	11/3/2015	102	0.131	0.124	0.144	0.005	0.129
5	11/3/2015	103	0.126	0.124	0.132	0.002	0.126
5	11/3/2015	104	0.131	0.122	0.145	0.006	0.129
5	11/3/2015	105	0.126	0.122	0.145	0.005	0.126
5	11/3/2015	106	0.129	0.122	0.159	0.006	0.127
5	11/3/2015	107	0.128	0.121	0.145	0.005	0.127
5	11/3/2015	108	0.208	0.119	0.263	0.049	0.233

APPENDIX C3. MONITORING DATA FROM 2014–2015 NEARSHORE CIRCUITS FOR CHLOROPHYLL (WET-STAR SENSOR: RELATIVE FLUORESCENCE UNITS).

Circuit ID	Date	Section ID	MEAN_WET-STAR	MIN_WET-STAR	MAX_WET-STAR	STDEV_WET-STAR	MEDIAN_WET-STAR
1	11/5/2014	1	80.743	76.845	86.365	1.624	80.245
1	11/5/2014	2	79.410	64.604	86.365	3.635	80.245
1	11/5/2014	3	82.226	78.885	91.125	2.413	81.605
1	11/5/2014	4	81.263	76.165	90.445	2.452	80.925
1	11/5/2014	5	78.740	73.444	84.325	2.357	78.205
1	11/5/2014	6	74.674	70.044	80.925	2.127	74.805
1	11/5/2014	7	71.563	68.004	75.485	1.895	72.084
1	11/5/2014	8	70.960	68.004	74.124	1.357	70.724
1	11/5/2014	9	70.789	68.004	74.804	1.175	70.724
1	11/5/2014	10	70.398	66.644	73.444	1.294	70.724
1	11/5/2014	11	69.599	66.644	72.764	1.485	69.364
1	11/5/2014	12	68.437	66.644	71.404	1.000	68.684
1	11/5/2014	13	69.240	66.644	72.084	1.163	69.364
1	11/5/2014	14	70.122	66.644	73.444	1.215	70.044
1	11/5/2014	15	73.390	69.364	78.885	1.550	73.444
1	11/5/2014	16	74.183	70.724	78.205	1.438	74.125
1	11/5/2014	17	72.920	70.044	76.165	1.224	72.764
1	11/5/2014	18	72.519	70.044	76.165	1.043	72.084
1	11/5/2014	19	73.082	70.044	77.525	1.491	72.764
1	11/5/2014	20	75.904	72.084	80.245	1.667	76.165
1	11/5/2014	21	76.169	72.084	82.285	1.738	76.165
1	11/5/2014	22	75.733	66.644	80.925	1.878	75.485
1	11/5/2014	23	76.466	66.644	80.245	2.008	76.165
1	11/5/2014	24	72.882	65.284	83.645	5.440	73.784
1	11/5/2014	25	68.741	65.284	72.764	1.747	68.684
1	11/5/2014	26	66.299	62.564	70.724	1.605	66.304
1	11/5/2014	27	64.442	62.564	67.324	1.024	63.924
1	11/5/2014	28	65.144	63.244	68.684	1.077	65.284
1	11/5/2014	29	64.691	62.564	67.324	0.996	64.604
1	11/5/2014	30	65.543	62.564	70.724	1.490	65.284
1	11/5/2014	31	65.037	62.564	68.684	1.068	65.284
1	11/5/2014	32	64.833	62.564	68.004	1.000	64.604
1	11/5/2014	33	65.895	63.924	70.724	1.447	65.284
1	11/5/2014	34	64.411	61.884	70.724	1.089	63.924
1	11/5/2014	35	63.421	61.884	66.644	0.925	63.244
1	11/5/2014	36	63.523	61.204	67.324	1.088	63.244
1	11/5/2014	37	64.743	62.564	70.044	1.235	64.604
1	11/5/2014	38	64.861	62.564	67.324	0.928	64.604
1	11/5/2014	39	65.012	62.564	68.004	1.048	65.284
1	11/5/2014	40	65.351	63.244	68.004	0.962	65.284
1	11/5/2014	41	65.219	62.564	68.004	1.066	65.284
1	11/5/2014	42	65.390	63.924	67.324	0.805	65.284
1	11/5/2014	43	64.647	62.564	66.644	0.917	64.604
1	11/5/2014	44	65.702	63.244	69.364	1.118	65.284
1	11/5/2014	45	67.926	64.604	74.804	1.819	68.004
1	11/5/2014	46	69.564	65.284	76.845	2.754	69.364
1	11/5/2014	47	65.114	62.564	69.364	1.293	64.604
1	11/5/2014	48	65.500	62.564	68.004	1.032	65.284

Circuit ID	Date	Section ID	MEAN_WET-STAR	MIN_WET-STAR	MAX_WET-STAR	STDEV_WET-STAR	MEDIAN_WET-STAR
1	11/5/2014	49	65.357	62.564	68.684	1.510	65.284
1	11/5/2014	50	63.815	62.564	65.964	0.826	63.924
1	11/5/2014	51	63.979	61.884	66.644	0.811	63.924
1	11/5/2014	52	63.887	61.884	68.004	1.095	63.924
1	11/5/2014	53	64.324	62.564	67.324	1.084	63.924
1	11/5/2014	54	65.475	63.244	68.004	1.015	65.284
1	11/5/2014	55	66.045	61.884	68.004	1.050	65.964
1	11/5/2014	56	65.114	62.564	68.004	0.879	65.284
1	11/5/2014	57	65.246	63.244	68.684	1.151	65.284
1	11/5/2014	58	68.404	62.564	74.804	2.663	68.684
1	11/5/2014	59	69.019	62.562	75.485	2.495	68.684
1	11/5/2014	60	67.395	63.244	73.444	2.518	66.984
1	11/5/2014	61	64.781	61.884	81.605	2.124	64.604
1	11/5/2014	62	64.341	61.204	68.684	1.317	63.924
1	11/5/2014	63	65.293	61.204	70.724	1.803	65.284
1	11/5/2014	64	63.774	61.200	67.324	1.285	63.920
1	11/5/2014	65	63.613	61.204	68.684	1.206	63.244
1	11/5/2014	66	63.334	61.204	68.004	1.041	63.244
1	11/5/2014	67	63.224	60.524	66.644	1.036	63.244
1	11/5/2014	68	63.488	61.204	66.644	1.293	63.244
1	11/5/2014	69	63.002	60.524	66.644	1.030	63.244
1	11/5/2014	70	63.857	61.204	68.684	1.565	63.244
1	11/5/2014	71	64.041	61.204	72.084	2.645	63.244
1	11/5/2014	72	63.178	60.524	68.004	1.532	62.564
1	11/5/2014	73	63.129	61.204	66.644	1.005	62.564
1	11/5/2014	74	63.894	61.884	68.684	1.472	63.924
1	11/5/2014	75	63.264	61.204	66.644	1.181	63.244
1	11/5/2014	76	62.218	60.523	63.924	0.793	61.884
1	11/5/2014	77	62.182	59.841	64.603	0.854	62.562
1	11/5/2014	78	61.643	59.843	63.924	0.663	61.204
1	11/5/2014	79	61.756	59.841	63.924	0.718	61.882
1	11/5/2014	80	61.312	59.840	65.284	0.965	61.204
1	11/5/2014	81	60.946	59.164	63.244	0.867	61.204
1	11/5/2014	82	64.773	60.524	78.205	1.603	65.284
1	11/5/2014	83	64.348	62.564	66.644	0.834	63.924
1	11/5/2014	84	63.106	59.844	66.644	1.239	63.244
1	11/5/2014	85	61.765	59.844	64.604	0.873	61.204
1	11/5/2014	86	62.681	59.844	65.284	1.010	62.564
1	11/5/2014	87	62.371	61.204	64.604	0.759	62.564
1	11/5/2014	88	63.389	61.204	73.444	1.352	63.924
1	11/5/2014	89	63.382	58.484	68.684	1.952	63.244
1	11/5/2014	90	62.449	55.763	72.084	4.857	61.204
1	11/5/2014	91	68.065	61.204	72.764	3.217	69.364
1	11/5/2014	92	62.740	59.844	66.644	1.065	62.564
1	11/5/2014	93	63.170	59.844	65.964	1.285	63.244
1	11/5/2014	94	65.856	63.244	68.004	1.069	65.964
1	11/5/2014	95	66.856	65.284	70.044	1.123	66.644
1	11/5/2014	96	63.189	58.484	67.324	1.747	63.244
1	11/5/2014	97	66.387	57.803	70.724	2.395	66.644
1	11/5/2014	98	65.964	63.924	69.364	1.014	65.964
1	11/5/2014	99	67.073	64.604	70.044	1.098	66.644
1	11/5/2014	100	67.888	65.964	69.364	0.912	68.004
1	11/5/2014	101	67.258	65.284	70.724	0.986	67.324
1	11/5/2014	102	67.921	65.284	71.404	1.254	68.004
1	11/5/2014	103	68.115	65.964	72.084	1.024	68.004
1	11/5/2014	104	68.257	65.964	70.724	1.065	68.004

Circuit ID	Date	Section ID	MEAN_WET-STAR	MIN_WET-STAR	MAX_WET-STAR	STDEV_WET-STAR	MEDIAN_WET-STAR
1	11/5/2014	105	67.876	65.284	70.724	1.069	68.004
1	11/5/2014	106	67.643	65.284	70.724	1.001	68.004
1	11/5/2014	107	67.932	65.284	73.444	0.991	68.004
1	11/5/2014	108	78.931	65.279	96.566	7.077	81.605
2	4/18/2015	1	53.751	52.363	55.083	0.430	53.723
2	4/18/2015	2	54.644	53.723	56.443	0.586	54.403
2	4/18/2015	3	53.900	52.363	55.763	0.557	53.723
2	4/18/2015	4	54.021	53.043	55.763	0.587	53.723
2	4/18/2015	5	54.014	52.363	55.083	0.570	53.723
2	4/18/2015	6	54.207	53.043	55.083	0.472	54.403
2	4/18/2015	7	54.200	53.043	55.083	0.422	54.403
2	4/18/2015	8	54.580	53.043	56.443	0.616	54.403
2	4/18/2015	9	54.715	53.043	56.443	0.723	54.403
2	4/18/2015	10	55.007	53.043	67.324	2.093	54.403
2	4/18/2015	11	55.245	53.043	58.484	0.925	55.083
2	4/18/2015	12	58.764	55.763	72.764	3.627	57.804
2	4/18/2015	13	57.624	54.403	63.924	1.987	57.123
2	4/18/2015	14	55.451	54.403	57.123	0.526	55.083
2	4/18/2015	15	55.083	53.723	56.443	0.511	55.083
2	4/18/2015	16	54.953	52.363	62.564	2.280	54.403
2	4/18/2015	17	54.030	52.363	55.763	0.561	54.403
2	4/18/2015	18	53.841	52.363	55.083	0.529	53.723
2	4/18/2015	19	54.324	52.363	57.123	0.836	54.403
2	4/18/2015	20	54.225	52.363	57.803	1.314	53.723
2	4/18/2015	21	57.158	55.083	59.164	0.825	57.123
2	4/18/2015	22	56.522	55.083	59.164	0.749	56.443
2	4/18/2015	23	58.218	55.763	65.284	2.078	57.804
2	4/18/2015	24	58.574	57.123	65.284	1.081	58.484
2	4/18/2015	25	57.545	56.443	59.164	0.543	57.804
2	4/18/2015	26	56.220	53.723	58.484	1.014	56.443
2	4/18/2015	27	55.969	54.403	57.803	0.797	55.763
2	4/18/2015	28	56.515	54.403	59.164	1.185	56.443
2	4/18/2015	29	56.083	54.403	57.800	0.651	55.763
2	4/18/2015	30	56.866	55.080	57.800	0.592	57.120
2	4/18/2015	31	56.535	55.080	57.800	0.677	56.440
2	4/18/2015	32	57.688	55.760	59.840	0.789	57.800
2	4/18/2015	33	57.985	55.760	59.160	0.577	57.800
2	4/18/2015	34	57.702	55.760	59.840	0.967	57.800
2	4/18/2015	35	58.378	56.440	63.920	0.864	58.480
2	4/18/2015	36	57.605	55.080	59.160	0.855	57.800
2	4/18/2015	37	57.038	55.080	59.160	0.751	57.120
2	4/18/2015	38	57.561	56.440	60.520	0.791	57.120
2	4/18/2015	39	55.793	54.400	57.120	0.640	55.760
2	4/18/2015	40	55.450	54.400	57.120	0.544	55.760
2	4/18/2015	41	55.391	53.720	56.440	0.500	55.080
2	4/18/2015	42	55.402	53.720	56.440	0.513	55.760
2	4/18/2015	43	55.867	55.080	57.120	0.441	55.760
2	4/18/2015	44	55.952	55.080	57.120	0.444	55.760
2	4/18/2015	45	56.310	55.080	57.800	0.591	56.440
2	4/18/2015	46	56.410	55.080	57.800	0.589	56.440
2	4/18/2015	47	57.360	55.760	59.840	0.950	57.120
2	4/18/2015	48	56.837	55.760	58.480	0.503	57.120
2	4/18/2015	49	56.500	55.760	57.800	0.440	56.440
2	4/18/2015	50	57.260	55.760	58.480	0.592	57.120
2	4/18/2015	51	57.419	56.440	59.160	0.551	57.120
2	4/18/2015	52	56.663	55.080	57.800	0.592	56.440

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2	4/18/2015	53	56.543	54.400	57.800	0.725	56.440
2	4/18/2015	54	55.594	53.720	57.800	1.028	55.080
2	4/18/2015	55	57.810	55.760	59.840	0.829	57.800
2	4/18/2015	56	59.498	57.120	61.200	0.628	59.840
2	4/18/2015	57	59.933	59.160	61.200	0.556	59.840
2	4/18/2015	58	59.123	57.120	60.520	0.684	59.160
2	4/18/2015	59	58.397	57.120	60.520	0.948	57.800
2	4/18/2015	60	59.440	57.800	61.200	0.792	59.840
2	4/18/2015	61	58.801	57.800	61.200	0.720	58.480
2	4/18/2015	62	58.292	57.120	61.200	0.812	57.800
2	4/18/2015	63	59.766	58.480	61.880	0.898	59.840
2	4/18/2015	64	59.489	57.120	61.200	1.096	59.840
2	4/18/2015	65	57.586	55.760	59.160	0.556	57.800
2	4/18/2015	66	59.053	57.120	61.880	0.931	59.160
2	4/18/2015	67	59.171	57.120	61.880	1.260	59.160
2	4/18/2015	68	61.398	59.160	64.600	1.521	61.200
2	4/18/2015	69	61.716	59.160	64.600	1.091	61.880
2	4/18/2015	70	59.835	57.800	61.880	1.027	59.840
2	4/18/2015	71	61.396	59.160	63.920	0.773	61.200
2	4/18/2015	72	59.964	58.480	61.200	0.757	59.840
2	4/18/2015	73	60.777	59.160	62.560	0.788	60.520
2	4/18/2015	74	62.909	61.200	65.280	0.894	62.560
2	4/18/2015	75	61.685	59.840	63.240	0.729	61.880
2	4/18/2015	76	62.736	60.520	65.280	0.728	62.560
2	4/18/2015	77	62.294	59.840	63.920	0.768	62.560
2	4/18/2015	78	62.840	59.840	65.960	1.259	62.560
2	4/18/2015	79	62.104	58.484	65.280	1.181	62.560
2	4/18/2015	80	61.156	57.803	64.600	1.646	60.520
2	4/18/2015	81	63.777	61.200	67.320	1.307	63.920
2	4/18/2015	82	65.793	59.160	87.000	4.808	64.600
2	4/18/2015	83	61.647	57.803	65.960	2.600	60.524
2	4/18/2015	84	58.363	57.123	59.844	0.581	58.484
2	4/18/2015	85	57.172	55.763	59.164	0.668	57.123
2	4/18/2015	86	56.794	55.763	58.484	0.514	56.443
2	4/18/2015	87	56.207	54.403	57.803	0.937	55.763
2	4/18/2015	88	55.230	54.403	57.123	0.586	55.083
2	4/18/2015	89	56.125	54.403	57.123	0.535	56.443
2	4/18/2015	90	56.735	54.403	59.163	0.993	57.123
2	4/18/2015	91	55.681	54.403	57.123	0.593	55.763
2	4/18/2015	92	54.727	53.723	55.763	0.447	54.403
2	4/18/2015	93	54.619	53.723	55.763	0.505	54.403
2	4/18/2015	94	54.220	53.043	55.083	0.462	54.403
2	4/18/2015	95	54.320	52.363	55.763	0.888	54.403
2	4/18/2015	96	53.647	51.683	55.083	0.638	53.723
2	4/18/2015	97	57.391	51.683	63.244	2.935	57.804
2	4/18/2015	98	64.162	54.403	90.445	10.633	61.884
2	4/18/2015	99	55.470	54.403	57.803	0.520	55.763
2	4/18/2015	100	55.184	53.723	57.123	0.663	55.083
2	4/18/2015	101	54.796	53.043	56.443	0.521	55.083
2	4/18/2015	102	54.350	52.363	57.123	0.730	54.403
2	4/18/2015	103	54.025	52.363	55.763	0.647	53.723
2	4/18/2015	104	54.503	53.043	57.123	0.901	54.403
2	4/18/2015	105	53.857	53.043	55.083	0.541	53.723
2	4/18/2015	106	54.595	53.043	55.763	0.451	54.403
2	4/18/2015	107	54.661	53.043	57.803	0.664	54.403
2	4/18/2015	108	61.154	53.043	71.404	3.788	62.564

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3	6/23/2015	1	55.114	53.040	61.200	1.588	55.080
3	6/23/2015	2	56.339	53.720	63.240	2.233	55.080
3	6/23/2015	3	57.592	55.080	61.880	1.237	57.800
3	6/23/2015	4	55.058	53.040	61.880	1.775	54.400
3	6/23/2015	5	54.062	52.360	57.120	0.774	53.720
3	6/23/2015	6	54.385	52.360	58.480	1.133	54.400
3	6/23/2015	7	53.234	52.360	54.400	0.528	53.040
3	6/23/2015	8	53.396	52.360	59.160	1.356	53.040
3	6/23/2015	9	55.011	53.040	61.880	1.663	55.080
3	6/23/2015	10	54.178	52.360	57.120	0.804	53.720
3	6/23/2015	11	54.439	53.040	57.800	0.812	54.400
3	6/23/2015	12	54.273	53.040	56.440	0.632	54.400
3	6/23/2015	13	52.977	51.000	55.080	0.999	53.040
3	6/23/2015	14	52.283	51.000	54.400	0.852	52.360
3	6/23/2015	15	52.098	51.000	53.720	0.503	52.360
3	6/23/2015	16	51.864	51.000	53.040	0.490	51.680
3	6/23/2015	17	52.481	51.000	53.720	0.612	52.360
3	6/23/2015	18	52.443	51.000	53.720	0.569	52.360
3	6/23/2015	19	52.207	51.000	54.400	0.502	52.360
3	6/23/2015	20	52.283	51.000	53.720	0.422	52.360
3	6/23/2015	21	53.632	52.360	56.440	0.674	53.720
3	6/23/2015	22	53.409	51.680	54.400	0.525	53.720
3	6/23/2015	23	53.938	52.360	55.080	0.498	53.720
3	6/23/2015	24	55.172	52.360	59.840	1.130	55.080
3	6/23/2015	25	55.150	53.040	57.120	0.920	55.080
3	6/23/2015	26	56.035	53.720	59.840	1.012	55.760
3	6/23/2015	27	55.188	53.040	57.800	1.126	55.080
3	6/23/2015	28	53.532	52.360	55.080	0.709	53.720
3	6/23/2015	29	54.632	52.360	56.440	0.997	54.400
3	6/23/2015	30	54.179	52.360	55.760	0.650	54.400
3	6/23/2015	31	54.753	53.040	56.440	0.877	54.400
3	6/23/2015	32	54.283	51.680	57.800	1.221	53.720
3	6/23/2015	33	52.600	51.000	56.440	1.013	52.360
3	6/23/2015	34	53.505	51.680	57.120	1.061	53.040
3	6/23/2015	35	53.637	52.360	60.520	0.902	53.720
3	6/23/2015	36	53.140	51.000	55.080	0.938	53.040
3	6/23/2015	37	53.223	51.680	56.440	1.023	53.040
3	6/23/2015	38	53.939	51.680	58.480	1.003	53.720
3	6/23/2015	39	53.182	52.360	54.400	0.533	53.040
3	6/23/2015	40	54.355	52.360	63.920	2.247	53.040
3	6/23/2015	41	55.246	52.360	60.520	1.803	55.080
3	6/23/2015	42	55.373	53.040	61.200	1.327	55.080
3	6/23/2015	43	56.393	53.720	63.240	2.078	55.760
3	6/23/2015	44	54.963	53.040	58.480	1.047	55.080
3	6/23/2015	45	54.690	53.040	57.120	0.730	54.400
3	6/23/2015	46	54.244	52.360	56.440	0.891	54.400
3	6/23/2015	47	53.443	52.360	55.080	0.568	53.720
3	6/23/2015	48	53.418	52.360	55.080	0.527	53.720
3	6/23/2015	49	52.857	51.680	54.400	0.506	53.040
3	6/23/2015	50	53.066	51.680	58.480	0.835	53.040
3	6/23/2015	51	53.003	51.680	55.080	0.759	53.040
3	6/23/2015	52	53.011	51.680	56.440	0.841	53.040
3	6/23/2015	53	52.422	51.000	55.080	0.906	52.360
3	6/23/2015	54	53.969	51.680	56.440	1.149	53.720
3	6/23/2015	55	54.875	53.040	57.800	0.873	55.080
3	6/23/2015	56	54.785	53.040	56.440	0.692	55.080

Circuit ID	Date	Section ID	MEAN_WET-STAR	MIN_WET-STAR	MAX_WET-STAR	STDEV_WET-STAR	MEDIAN_WET-STAR
3	6/23/2015	57	54.310	53.040	55.760	0.661	54.400
3	6/23/2015	58	54.028	52.360	55.760	0.695	53.720
3	6/23/2015	59	54.172	52.360	55.760	0.671	54.400
3	6/23/2015	60	54.129	52.360	55.760	0.650	53.720
3	6/23/2015	61	54.344	52.360	56.440	0.736	54.400
3	6/23/2015	62	54.159	52.360	55.760	0.728	54.400
3	6/23/2015	63	54.112	52.360	57.120	1.003	53.720
3	6/23/2015	64	53.979	52.360	55.080	0.687	53.720
3	6/23/2015	65	53.527	52.360	55.080	0.647	53.720
3	6/23/2015	66	54.153	52.360	57.120	0.994	53.720
3	6/23/2015	67	53.637	51.680	56.440	0.947	53.720
3	6/23/2015	68	53.520	52.360	55.080	0.619	53.720
3	6/23/2015	69	54.409	52.360	56.440	0.955	54.400
3	6/23/2015	70	54.276	52.360	56.440	0.793	54.400
3	6/23/2015	71	54.817	53.040	57.120	0.801	55.080
3	6/23/2015	72	54.227	52.360	56.440	0.975	54.400
3	6/23/2015	73	54.110	52.360	57.800	1.128	53.720
3	6/23/2015	74	56.504	53.720	58.480	1.263	56.440
3	6/23/2015	75	54.724	53.040	56.440	0.696	54.740
3	6/23/2015	76	54.629	53.040	56.440	0.653	54.400
3	6/23/2015	77	55.968	53.720	61.200	1.439	55.760
3	6/23/2015	78	57.032	53.040	59.840	1.446	57.120
3	6/23/2015	79	56.586	53.720	70.720	1.433	56.440
3	6/23/2015	80	57.456	55.080	59.840	1.078	57.800
3	6/23/2015	81	59.203	56.440	69.360	1.595	58.480
3	6/23/2015	82	58.545	56.440	64.600	1.595	57.800
3	6/23/2015	83	57.399	55.760	60.520	0.673	57.800
3	6/23/2015	84	56.611	55.080	60.520	0.680	56.440
3	6/23/2015	85	57.090	55.760	59.840	0.639	57.120
3	6/23/2015	86	57.276	55.760	59.840	0.696	57.120
3	6/23/2015	87	56.813	55.080	60.520	1.113	56.440
3	6/23/2015	88	56.603	55.080	58.480	0.721	56.440
3	6/23/2015	89	57.208	55.760	58.480	0.633	57.120
3	6/23/2015	90	57.146	55.080	72.760	1.469	57.120
3	6/23/2015	91	57.719	56.440	59.840	0.538	57.800
3	6/23/2015	92	57.763	55.760	59.160	0.667	57.800
3	6/23/2015	93	56.572	53.040	61.200	1.286	56.440
3	6/23/2015	94	55.798	53.040	59.160	1.473	55.080
3	6/23/2015	95	56.577	55.080	58.480	0.740	56.440
3	6/23/2015	96	54.837	53.040	64.600	1.385	54.400
3	6/23/2015	97	55.070	53.040	63.240	1.351	55.080
3	6/23/2015	98	56.117	54.400	57.800	0.662	56.440
3	6/23/2015	99	57.429	55.760	59.840	0.762	57.800
3	6/23/2015	100	58.088	56.440	61.200	0.981	57.800
3	6/23/2015	101	58.072	56.440	60.520	0.792	57.800
3	6/23/2015	102	57.177	55.760	59.840	0.816	57.120
3	6/23/2015	103	56.186	54.400	59.160	1.065	55.760
3	6/23/2015	104	59.281	54.400	70.040	3.098	59.500
3	6/23/2015	105	61.396	57.800	74.800	3.419	60.520
3	6/23/2015	106	60.761	57.800	67.320	1.538	60.520
3	6/23/2015	107	59.467	56.440	64.600	2.033	59.160
3	6/23/2015	108	64.578	52.360	72.080	4.403	65.960
4	8/22/2015	1	58.521	57.120	62.560	0.882	58.480
4	8/22/2015	2	59.823	57.800	62.560	0.958	59.840
4	8/22/2015	3	60.457	58.480	63.240	0.873	60.520
4	8/22/2015	4	60.647	58.480	67.320	0.990	60.520

Circuit ID	Date	Section ID	MEAN_WET-STAR	MIN_WET-STAR	MAX_WET-STAR	STDEV_WET-STAR	MEDIAN_WET-STAR
4	8/22/2015	5	60.037	58.480	61.880	0.634	59.840
4	8/22/2015	6	59.406	57.800	61.200	0.793	59.840
4	8/22/2015	7	58.969	57.120	61.880	0.758	59.160
4	8/22/2015	8	59.297	58.480	61.200	0.564	59.160
4	8/22/2015	9	60.062	58.480	67.320	0.957	59.840
4	8/22/2015	10	59.650	57.800	63.240	1.006	59.160
4	8/22/2015	11	60.771	58.480	63.240	0.710	60.520
4	8/22/2015	12	60.075	57.800	72.080	1.689	59.840
4	8/22/2015	13	59.507	57.800	61.880	0.825	59.160
4	8/22/2015	14	59.988	58.480	64.600	0.939	59.840
4	8/22/2015	15	60.073	58.480	63.920	0.682	59.840
4	8/22/2015	16	59.768	58.480	62.560	0.726	59.840
4	8/22/2015	17	60.246	58.480	63.920	1.182	59.840
4	8/22/2015	18	62.282	59.160	65.280	1.214	62.560
4	8/22/2015	19	61.084	59.160	63.920	1.155	60.520
4	8/22/2015	20	60.787	59.160	62.560	0.757	60.520
4	8/22/2015	21	62.101	59.840	70.720	1.217	61.880
4	8/22/2015	22	62.098	57.120	65.280	1.614	62.560
4	8/22/2015	23	58.406	56.440	63.240	1.512	57.800
4	8/22/2015	24	57.699	56.440	65.960	0.937	57.800
4	8/22/2015	25	58.768	56.440	65.960	1.132	59.160
4	8/22/2015	26	58.938	53.720	66.640	2.240	59.160
4	8/22/2015	27	60.830	57.800	67.320	2.410	59.840
4	8/22/2015	28	61.313	59.160	77.520	1.834	60.520
4	8/22/2015	29	62.933	59.160	70.040	1.982	62.560
4	8/22/2015	30	60.034	57.800	63.240	1.174	59.840
4	8/22/2015	31	62.263	58.480	66.640	1.949	62.560
4	8/22/2015	32	63.293	60.520	67.320	1.360	63.240
4	8/22/2015	33	59.910	57.800	63.240	1.282	59.840
4	8/22/2015	34	57.998	55.080	63.920	1.015	57.800
4	8/22/2015	35	58.331	56.440	64.600	1.079	57.800
4	8/22/2015	36	57.712	56.440	61.880	0.985	57.800
4	8/22/2015	37	57.631	56.440	62.560	0.927	57.800
4	8/22/2015	38	57.854	56.440	62.560	1.035	57.800
4	8/22/2015	39	57.781	56.440	61.200	0.786	57.800
4	8/22/2015	40	58.572	56.440	63.920	1.456	58.480
4	8/22/2015	41	58.367	56.440	62.560	1.357	57.800
4	8/22/2015	42	57.355	56.440	63.240	0.828	57.120
4	8/22/2015	43	57.795	56.440	59.160	0.552	57.800
4	8/22/2015	44	58.757	57.800	60.520	0.778	59.160
4	8/22/2015	45	60.345	58.480	65.960	1.353	60.520
4	8/22/2015	46	58.930	57.800	63.240	0.828	59.160
4	8/22/2015	47	58.558	57.120	60.520	0.694	58.480
4	8/22/2015	48	57.396	55.080	61.880	0.881	57.800
4	8/22/2015	49	57.708	56.440	61.880	0.757	57.800
4	8/22/2015	50	58.203	56.440	61.880	0.756	57.800
4	8/22/2015	51	59.300	57.800	65.960	1.370	59.160
4	8/22/2015	52	58.996	57.800	61.880	0.749	59.160
4	8/22/2015	53	58.549	56.440	61.880	0.923	58.480
4	8/22/2015	54	58.519	55.760	64.600	1.415	57.800
4	8/22/2015	55	61.569	59.160	68.000	1.140	61.880
4	8/22/2015	56	61.848	60.520	63.240	0.577	61.880
4	8/22/2015	57	61.698	59.840	68.000	0.963	61.880
4	8/22/2015	58	60.752	59.160	62.560	0.690	60.520
4	8/22/2015	59	61.273	59.160	63.240	0.644	61.200
4	8/22/2015	60	60.975	59.160	62.560	0.641	61.200

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4	8/22/2015	61	61.081	59.840	63.920	0.849	61.200
4	8/22/2015	62	60.813	59.160	65.960	0.899	60.520
4	8/22/2015	63	59.973	58.480	64.600	0.739	59.840
4	8/22/2015	64	60.721	59.160	66.640	0.932	60.520
4	8/22/2015	65	61.265	59.160	72.080	1.244	61.200
4	8/22/2015	66	60.742	59.160	63.920	0.734	60.520
4	8/22/2015	67	61.366	59.840	69.360	1.135	61.200
4	8/22/2015	68	60.361	59.160	62.560	0.732	60.520
4	8/22/2015	69	60.730	59.160	65.280	0.943	60.520
4	8/22/2015	70	60.794	59.160	64.600	0.813	60.520
4	8/22/2015	71	62.155	60.520	67.320	0.847	61.880
4	8/22/2015	72	62.034	60.520	66.640	0.914	61.880
4	8/22/2015	73	63.132	61.200	65.960	0.780	63.240
4	8/22/2015	74	63.248	61.200	68.000	1.342	63.240
4	8/22/2015	75	64.563	61.880	67.320	1.269	64.600
4	8/22/2015	76	63.836	61.880	65.960	0.782	63.920
4	8/22/2015	77	63.886	61.880	69.360	1.073	63.920
4	8/22/2015	78	64.136	61.880	70.040	1.134	63.920
4	8/22/2015	79	65.841	63.240	74.800	1.528	65.960
4	8/22/2015	80	64.247	61.880	72.080	1.463	64.600
4	8/22/2015	81	64.689	62.560	70.720	1.137	64.600
4	8/22/2015	82	64.139	60.520	72.760	1.842	63.920
4	8/22/2015	83	61.800	59.840	65.960	1.095	61.880
4	8/22/2015	84	62.418	59.840	68.680	1.161	61.880
4	8/22/2015	85	61.535	59.160	64.600	0.975	61.880
4	8/22/2015	86	63.999	61.880	72.760	1.491	64.600
4	8/22/2015	87	63.668	61.880	65.960	1.034	63.240
4	8/22/2015	88	64.105	61.880	67.320	1.313	64.260
4	8/22/2015	89	63.251	61.200	67.320	1.043	63.240
4	8/22/2015	90	61.844	60.520	70.720	1.255	61.880
4	8/22/2015	91	61.751	59.160	72.760	1.511	61.880
4	8/22/2015	92	62.629	60.520	68.000	1.176	62.560
4	8/22/2015	93	61.625	59.840	65.960	0.962	61.880
4	8/22/2015	94	60.700	59.160	63.240	0.890	60.520
4	8/22/2015	95	61.760	59.160	65.280	1.595	61.880
4	8/22/2015	96	60.695	57.120	69.360	1.848	60.520
4	8/22/2015	97	60.481	57.800	78.880	2.540	59.840
4	8/22/2015	98	58.975	57.120	70.040	1.278	59.160
4	8/22/2015	99	60.787	57.800	74.120	2.159	60.520
4	8/22/2015	100	63.090	59.160	72.080	2.396	62.560
4	8/22/2015	101	61.116	59.160	64.600	1.072	60.520
4	8/22/2015	102	61.112	59.160	64.600	0.865	60.860
4	8/22/2015	103	61.773	59.840	65.960	1.039	61.880
4	8/22/2015	104	61.715	59.840	64.600	0.815	61.880
4	8/22/2015	105	61.427	59.840	65.960	0.947	61.200
4	8/22/2015	106	60.037	58.480	63.240	0.862	59.840
4	8/22/2015	107	59.666	57.800	64.600	0.873	59.160
4	8/22/2015	108	66.031	57.800	79.560	3.755	67.320
5	11/3/2015	1	67.838	65.964	70.044	0.937	68.004
5	11/3/2015	2	69.318	67.324	73.444	1.138	69.364
5	11/3/2015	3	70.493	68.004	73.444	1.010	70.724
5	11/3/2015	4	72.460	68.684	75.485	1.379	72.764
5	11/3/2015	5	70.806	66.644	73.444	1.160	70.724
5	11/3/2015	6	69.942	65.964	74.124	1.722	70.044
5	11/3/2015	7	69.864	65.964	72.764	1.587	70.044
5	11/3/2015	8	69.246	67.324	72.764	1.528	68.684

Circuit ID	Date	Section ID	MEAN_WET-STAR	MIN_WET-STAR	MAX_WET-STAR	STDEV_WET-STAR	MEDIAN_WET-STAR
5	11/3/2015	9	71.477	68.684	76.165	1.312	71.404
5	11/3/2015	10	70.753	69.364	73.444	0.951	70.724
5	11/3/2015	11	69.968	67.324	72.764	1.182	70.044
5	11/3/2015	12	68.156	65.284	72.764	1.580	67.664
5	11/3/2015	13	67.701	65.964	71.404	1.140	67.324
5	11/3/2015	14	69.650	67.324	75.485	1.642	69.364
5	11/3/2015	15	67.516	64.604	70.724	1.406	67.324
5	11/3/2015	16	66.129	64.604	70.724	0.855	65.964
5	11/3/2015	17	66.923	64.604	70.044	1.466	66.644
5	11/3/2015	18	68.985	65.964	72.764	1.654	68.684
5	11/3/2015	19	71.178	68.684	74.805	1.272	71.404
5	11/3/2015	20	72.191	68.684	76.165	1.746	72.084
5	11/3/2015	21	71.625	68.684	76.165	1.465	71.404
5	11/3/2015	22	70.773	67.324	74.124	1.289	70.724
5	11/3/2015	23	70.599	68.684	73.444	0.973	70.724
5	11/3/2015	24	75.688	68.684	91.806	8.083	70.724
5	11/3/2015	25	78.815	66.644	91.806	8.467	79.565
5	11/3/2015	26	70.148	65.964	79.565	2.719	69.364
5	11/3/2015	27	69.426	67.324	74.124	1.414	68.684
5	11/3/2015	28	74.333	65.284	85.685	7.148	76.845
5	11/3/2015	29	70.039	64.604	81.605	5.352	68.004
5	11/3/2015	30	72.754	69.364	78.885	1.874	72.764
5	11/3/2015	31	75.462	74.124	80.245	1.151	75.485
5	11/3/2015	32	71.895	67.324	75.485	1.696	72.084
5	11/3/2015	33	68.886	65.964	71.404	0.973	68.684
5	11/3/2015	34	69.492	67.324	73.444	1.228	69.364
5	11/3/2015	35	68.070	64.604	72.764	1.514	68.004
5	11/3/2015	36	79.303	71.404	84.325	3.175	80.245
5	11/3/2015	37	79.143	75.485	85.005	2.449	78.885
5	11/3/2015	38	82.865	79.565	85.685	1.322	82.965
5	11/3/2015	39	82.407	78.205	86.365	1.858	82.285
5	11/3/2015	40	79.315	71.404	88.405	3.680	80.245
5	11/3/2015	41	73.209	68.684	78.205	2.396	74.125
5	11/3/2015	42	71.353	67.324	76.845	2.183	71.404
5	11/3/2015	43	68.897	67.324	72.764	1.218	68.684
5	11/3/2015	44	68.528	65.964	71.404	1.137	68.684
5	11/3/2015	45	70.914	65.964	74.124	1.285	71.404
5	11/3/2015	46	69.624	65.964	72.764	1.727	70.044
5	11/3/2015	47	67.099	63.244	70.044	1.277	67.324
5	11/3/2015	48	69.115	67.324	71.404	1.084	68.684
5	11/3/2015	49	70.618	68.004	72.766	1.244	70.726
5	11/3/2015	50	70.113	67.326	72.767	1.051	70.046
5	11/3/2015	51	70.415	68.007	72.769	1.102	70.047
5	11/3/2015	52	69.618	65.970	72.769	1.359	69.369
5	11/3/2015	53	69.129	67.330	71.412	0.830	68.694
5	11/3/2015	54	72.866	65.975	89.085	5.883	70.056
5	11/3/2015	55	71.346	65.982	79.565	3.390	72.084
5	11/3/2015	56	70.822	67.347	75.485	1.781	70.724
5	11/3/2015	57	70.596	65.986	80.245	3.029	71.404
5	11/3/2015	58	77.034	66.667	87.725	5.464	78.205
5	11/3/2015	59	78.125	71.404	90.445	4.565	76.845
5	11/3/2015	60	96.734	86.365	116.287	7.949	94.526
5	11/3/2015	61	100.182	85.005	112.207	5.959	101.326
5	11/3/2015	62	86.154	78.205	97.246	4.416	85.005
5	11/3/2015	63	88.953	74.124	104.046	8.073	90.105
5	11/3/2015	64	99.476	94.526	108.127	3.156	98.606

Circuit ID	Date	Section ID	MEAN_WET-STAR	MIN_WET-STAR	MAX_WET-STAR	STDEV_WET-STAR	MEDIAN_WET-STAR
5	11/3/2015	65	94.598	78.205	108.127	9.969	98.606
5	11/3/2015	66	87.029	78.205	93.166	3.401	87.725
5	11/3/2015	67	86.987	80.925	97.246	2.824	86.365
5	11/3/2015	68	87.536	82.285	99.966	3.314	86.705
5	11/3/2015	69	87.754	80.925	95.886	3.205	87.725
5	11/3/2015	70	87.677	83.645	93.166	2.078	87.725
5	11/3/2015	71	88.866	82.285	95.886	2.574	89.085
5	11/3/2015	72	82.346	76.845	89.085	1.953	82.285
5	11/3/2015	73	87.630	81.605	94.526	2.666	87.725
5	11/3/2015	74	93.826	89.085	102.686	2.877	93.166
5	11/3/2015	75	90.306	79.565	99.966	5.360	90.445
5	11/3/2015	76	76.951	74.124	81.605	1.947	76.845
5	11/3/2015	77	74.756	70.044	83.645	3.433	74.125
5	11/3/2015	78	81.957	74.125	89.085	2.885	82.285
5	11/3/2015	79	76.920	67.325	89.085	5.703	76.845
5	11/3/2015	80	75.334	65.965	89.085	6.498	75.485
5	11/3/2015	81	75.818	68.687	91.806	5.833	74.125
5	11/3/2015	82	75.460	67.343	87.045	5.121	74.125
5	11/3/2015	83	72.948	70.724	75.485	1.080	72.764
5	11/3/2015	84	70.598	67.324	74.124	1.769	70.044
5	11/3/2015	85	68.918	65.964	73.444	1.290	68.684
5	11/3/2015	86	67.614	65.964	71.404	1.099	67.324
5	11/3/2015	87	69.498	67.324	71.404	0.884	69.364
5	11/3/2015	88	70.442	65.964	72.764	1.463	70.724
5	11/3/2015	89	68.649	66.644	71.404	0.954	68.684
5	11/3/2015	90	71.468	68.004	75.485	1.913	71.404
5	11/3/2015	91	66.151	58.484	77.525	6.108	63.244
5	11/3/2015	92	61.034	57.803	68.684	1.730	60.524
5	11/3/2015	93	62.977	59.164	68.004	1.728	63.244
5	11/3/2015	94	66.632	61.884	71.404	1.894	65.964
5	11/3/2015	95	67.068	64.604	71.404	1.290	67.324
5	11/3/2015	96	64.972	61.884	67.324	0.981	64.604
5	11/3/2015	97	68.502	63.244	75.485	2.265	68.684
5	11/3/2015	98	65.922	63.244	72.764	1.725	65.964
5	11/3/2015	99	65.491	63.244	68.684	1.123	65.284
5	11/3/2015	100	64.119	61.884	68.004	1.433	63.924
5	11/3/2015	101	64.530	63.244	66.644	0.729	64.604
5	11/3/2015	102	65.793	63.244	68.684	1.178	65.964
5	11/3/2015	103	66.329	64.604	69.364	1.012	65.964
5	11/3/2015	104	66.624	64.604	69.364	0.996	66.644
5	11/3/2015	105	64.257	62.564	66.644	0.822	64.604
5	11/3/2015	106	63.459	61.884	64.604	0.791	63.244
5	11/3/2015	107	63.944	61.884	65.964	0.782	63.924
5	11/3/2015	108	79.389	63.924	90.445	8.037	82.285

APPENDIX D. MID-SECTION GPS LOCATIONS OF NEARSHORE THIESSEN POLYGONS USED ON 2014-2015 MONITORING CIRCUIT DATA.

Section ID	MID-LATITUDE	MID-LONGITUDE
1	38.9711631	-120.0925280
2	38.9797191	-120.0936858
3	38.9885179	-120.0946319
4	38.9969542	-120.0945300
5	39.0019625	-120.1032037
6	39.0081666	-120.1115903
7	39.0161481	-120.1163414
8	39.0246261	-120.1194706
9	39.0325430	-120.1148440
10	39.0385828	-120.1219518
11	39.0445006	-120.1150908
12	39.0516972	-120.1124844
13	39.0604608	-120.1131512
14	39.0658040	-120.1216645
15	39.0696378	-120.1317906
16	39.0739171	-120.1413046
17	39.0765438	-120.1519252
18	39.0838618	-120.1582677
19	39.0923684	-120.1620920
20	39.1010107	-120.1624978
21	39.1087998	-120.1583501
22	39.1176224	-120.1580522
23	39.1257919	-120.1612244
24	39.1309693	-120.1531108
25	39.1396509	-120.1529594
26	39.1459996	-120.1458275
27	39.1535931	-120.1424767
28	39.1622570	-120.1402923
29	39.1708978	-120.1385436
30	39.1773259	-120.1305898
31	39.1812104	-120.1209940
32	39.1812566	-120.1130793
33	39.1840283	-120.1026922
34	39.1858918	-120.0922076
35	39.1941587	-120.0952655
36	39.2031329	-120.0950265
37	39.2097234	-120.0883181
38	39.2185372	-120.0866110
39	39.2257534	-120.0812522
40	39.2272606	-120.0705593
41	39.2347939	-120.0696457
42	39.2383376	-120.0592968
43	39.2382294	-120.0477712
44	39.2369467	-120.0364522
45	39.2351675	-120.0251451
46	39.2299523	-120.0161790
47	39.2226758	-120.0095318
48	39.2233453	-120.0013923

Section ID	MID-LATITUDE	MID-LONGITUDE
49	39.2322526	-120.0008597
50	39.2409649	-119.9991822
51	39.2475292	-119.9949075
52	39.2483374	-119.9857601
53	39.2478369	-119.9743422
54	39.2434857	-119.9644237
55	39.2410533	-119.9532956
56	39.2366748	-119.9431941
57	39.2312593	-119.9340135
58	39.2232305	-119.9323509
59	39.2160715	-119.9286937
60	39.2076750	-119.9298364
61	39.2000606	-119.9320174
62	39.1949083	-119.9285257
63	39.1861387	-119.9281144
64	39.1775599	-119.9268228
65	39.1710785	-119.9332378
66	39.1624279	-119.9326925
67	39.1540253	-119.9335333
68	39.1463289	-119.9359700
69	39.1404498	-119.9440200
70	39.1325574	-119.9432268
71	39.1277161	-119.9505954
72	39.1199316	-119.9535939
73	39.1116082	-119.9574441
74	39.1039959	-119.9588348
75	39.1004518	-119.9490582
76	39.0938506	-119.9419426
77	39.0866036	-119.9441027
78	39.0794175	-119.9483534
79	39.0720479	-119.9437546
80	39.0637271	-119.9453218
81	39.0551559	-119.9449838
82	39.0469311	-119.9489226
83	39.0383381	-119.9507101
84	39.0297916	-119.9496354
85	39.0220786	-119.9521332
86	39.0145519	-119.9514174
87	39.0062570	-119.9494039
88	39.0029923	-119.9585003
89	38.9965379	-119.9561719
90	38.9883198	-119.9546219
91	38.9812759	-119.9548257
92	38.9728960	-119.9508620
93	38.9640134	-119.9498920
94	38.9557344	-119.9539045
95	38.9499692	-119.9617884
96	38.9467779	-119.9719310
97	38.9462553	-119.9833378
98	38.9446068	-119.9940454
99	38.9430707	-120.0044432
100	38.9373490	-120.0117375
101	38.9369504	-120.0232015
102	38.9379765	-120.0346791
103	38.9399466	-120.0459537
104	38.9409980	-120.0565670

Section ID	MID-LATITUDE	MID-LONGITUDE
105	38.9435517	-120.0675554
106	38.9491446	-120.0763091
107	38.9579489	-120.0778233
108	38.9504741	-120.1048847
1	38.9711631	-120.0925280
2	38.9797191	-120.0936858
3	38.9885179	-120.0946319
4	38.9969542	-120.0945300
5	39.0019625	-120.1032037
6	39.0081666	-120.1115903
7	39.0161481	-120.1163414
8	39.0246261	-120.1194706
9	39.0325430	-120.1148440
10	39.0385828	-120.1219518
11	39.0445006	-120.1150908
12	39.0516972	-120.1124844
13	39.0604608	-120.1131512
14	39.0658040	-120.1216645
15	39.0696378	-120.1317906
16	39.0739171	-120.1413046
17	39.0765438	-120.1519252
18	39.0838618	-120.1582677
19	39.0923684	-120.1620920
20	39.1010107	-120.1624978
21	39.1087998	-120.1583501
22	39.1176224	-120.1580522
23	39.1257919	-120.1612244
24	39.1309693	-120.1531108
25	39.1396509	-120.1529594
26	39.1459996	-120.1458275
27	39.1535931	-120.1424767
28	39.1622570	-120.1402923
29	39.1708978	-120.1385436
30	39.1773259	-120.1305898
31	39.1812104	-120.1209940
32	39.1812566	-120.1130793
33	39.1840283	-120.1026922
34	39.1858918	-120.0922076
35	39.1941587	-120.0952655
36	39.2031329	-120.0950265
37	39.2097234	-120.0883181
38	39.2185372	-120.0866110
39	39.2257534	-120.0812522
40	39.2272606	-120.0705593
41	39.2347939	-120.0696457
42	39.2383376	-120.0592968
43	39.2382294	-120.0477712
44	39.2369467	-120.0364522
45	39.2351675	-120.0251451
46	39.2299523	-120.0161790
47	39.2226758	-120.0095318
48	39.2233453	-120.0013923
49	39.2322526	-120.0008597
50	39.2409649	-119.9991822
51	39.2475292	-119.9949075
52	39.2483374	-119.9857601

Section ID	MID-LATITUDE	MID-LONGITUDE
53	39.2478369	-119.9743422
54	39.2434857	-119.9644237
55	39.2410533	-119.9532956
56	39.2366748	-119.9431941
57	39.2312593	-119.9340135
58	39.2232305	-119.9323509
59	39.2160715	-119.9286937
60	39.2076750	-119.9298364
61	39.2000606	-119.9320174
62	39.1949083	-119.9285257
63	39.1861387	-119.9281144
64	39.1775599	-119.9268228
65	39.1710785	-119.9332378
66	39.1624279	-119.9326925
67	39.1540253	-119.9335333
68	39.1463289	-119.9359700
69	39.1404498	-119.9440200
70	39.1325574	-119.9432268
71	39.1277161	-119.9505954
72	39.1199316	-119.9535939
73	39.1116082	-119.9574441
74	39.1039959	-119.9588348
75	39.1004518	-119.9490582
76	39.0938506	-119.9419426
77	39.0866036	-119.9441027
78	39.0794175	-119.9483534
79	39.0720479	-119.9437546
80	39.0637271	-119.9453218
81	39.0551559	-119.9449838
82	39.0469311	-119.9489226
83	39.0383381	-119.9507101
84	39.0297916	-119.9496354
85	39.0220786	-119.9521332
86	39.0145519	-119.9514174
87	39.0062570	-119.9494039
88	39.0029923	-119.9585003
89	38.9965379	-119.9561719
90	38.9883198	-119.9546219
91	38.9812759	-119.9548257
92	38.9728960	-119.9508620
93	38.9640134	-119.9498920
94	38.9557344	-119.9539045
95	38.9499692	-119.9617884
96	38.9467779	-119.9719310
97	38.9462553	-119.9833378
98	38.9446068	-119.9940454
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Section ID	MID-LATITUDE	MID-LONGITUDE
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3	38.9885179	-120.0946319
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5	39.0019625	-120.1032037
6	39.0081666	-120.1115903
7	39.0161481	-120.1163414
8	39.0246261	-120.1194706
9	39.0325430	-120.1148440
10	39.0385828	-120.1219518
11	39.0445006	-120.1150908
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13	39.0604608	-120.1131512
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15	39.0696378	-120.1317906
16	39.0739171	-120.1413046
17	39.0765438	-120.1519252
18	39.0838618	-120.1582677
19	39.0923684	-120.1620920
20	39.1010107	-120.1624978
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22	39.1176224	-120.1580522
23	39.1257919	-120.1612244
24	39.1309693	-120.1531108
25	39.1396509	-120.1529594
26	39.1459996	-120.1458275
27	39.1535931	-120.1424767
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29	39.1708978	-120.1385436
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31	39.1812104	-120.1209940
32	39.1812566	-120.1130793
33	39.1840283	-120.1026922
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36	39.2031329	-120.0950265
37	39.2097234	-120.0883181
38	39.2185372	-120.0866110
39	39.2257534	-120.0812522
40	39.2272606	-120.0705593
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42	39.2383376	-120.0592968
43	39.2382294	-120.0477712
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45	39.2351675	-120.0251451
46	39.2299523	-120.0161790
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53	39.2478369	-119.9743422
54	39.2434857	-119.9644237
55	39.2410533	-119.9532956
56	39.2366748	-119.9431941

Section ID	MID-LATITUDE	MID-LONGITUDE
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59	39.2160715	-119.9286937
60	39.2076750	-119.9298364
61	39.2000606	-119.9320174
62	39.1949083	-119.9285257
63	39.1861387	-119.9281144
64	39.1775599	-119.9268228
65	39.1710785	-119.9332378
66	39.1624279	-119.9326925
67	39.1540253	-119.9335333
68	39.1463289	-119.9359700
69	39.1404498	-119.9440200
70	39.1325574	-119.9432268
71	39.1277161	-119.9505954
72	39.1199316	-119.9535939
73	39.1116082	-119.9574441
74	39.1039959	-119.9588348
75	39.1004518	-119.9490582
76	39.0938506	-119.9419426
77	39.0866036	-119.9441027
78	39.0794175	-119.9483534
79	39.0720479	-119.9437546
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81	39.0551559	-119.9449838
82	39.0469311	-119.9489226
83	39.0383381	-119.9507101
84	39.0297916	-119.9496354
85	39.0220786	-119.9521332
86	39.0145519	-119.9514174
87	39.0062570	-119.9494039
88	39.0029923	-119.9585003
89	38.9965379	-119.9561719
90	38.9883198	-119.9546219
91	38.9812759	-119.9548257
92	38.9728960	-119.9508620
93	38.9640134	-119.9498920
94	38.9557344	-119.9539045
95	38.9499692	-119.9617884
96	38.9467779	-119.9719310
97	38.9462553	-119.9833378
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Section ID	MID-LATITUDE	MID-LONGITUDE
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23	39.1257919	-120.1612244
24	39.1309693	-120.1531108
25	39.1396509	-120.1529594
26	39.1459996	-120.1458275
27	39.1535931	-120.1424767
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31	39.1812104	-120.1209940
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55	39.2410533	-119.9532956
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Section ID	MID-LATITUDE	MID-LONGITUDE
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64	39.1775599	-119.9268228
65	39.1710785	-119.9332378
66	39.1624279	-119.9326925
67	39.1540253	-119.9335333
68	39.1463289	-119.9359700
69	39.1404498	-119.9440200
70	39.1325574	-119.9432268
71	39.1277161	-119.9505954
72	39.1199316	-119.9535939
73	39.1116082	-119.9574441
74	39.1039959	-119.9588348
75	39.1004518	-119.9490582
76	39.0938506	-119.9419426
77	39.0866036	-119.9441027
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80	39.0637271	-119.9453218
81	39.0551559	-119.9449838
82	39.0469311	-119.9489226
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85	39.0220786	-119.9521332
86	39.0145519	-119.9514174
87	39.0062570	-119.9494039
88	39.0029923	-119.9585003
89	38.9965379	-119.9561719
90	38.9883198	-119.9546219
91	38.9812759	-119.9548257
92	38.9728960	-119.9508620
93	38.9640134	-119.9498920
94	38.9557344	-119.9539045
95	38.9499692	-119.9617884
96	38.9467779	-119.9719310
97	38.9462553	-119.9833378
98	38.9446068	-119.9940454
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Section ID	MID-LATITUDE	MID-LONGITUDE
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26	39.1459996	-120.1458275
27	39.1535931	-120.1424767
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61	39.2000606	-119.9320174
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63	39.1861387	-119.9281144
64	39.1775599	-119.9268228

Section ID	MID-LATITUDE	MID-LONGITUDE
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