ALASKA Department of Environmental Conservation

KENAI RIVER
2008 PETROLEUM ASSESSMENT
FINAL REPORT

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ACRONYMS AND ABBREVIATIONS

°C .... Degrees Celsius
µg/L .... Micrograms per liter
ADEC .... Alaska Department of Environmental Conservation
ADF&G.......... Alaska Department of Fish and Game
ADNR............ Alaska Department of Natural Resources
AWQS .... Alaska Water Quality Standards (from 18 AAC 70)
BTEX............. Benzene, toluene, ethylbenzene, and xylenes
BWS .... Below water surface
cfs.................. Cubic feet per second
DI................... Deionized
DO................. Dissolved oxygen
EPA............... U.S. Environmental Protection Agency
GPS............... Global Positioning System
Horiba............ Horiba U-22 water quality meter
KWF .... Kenai Watershed Forum
LCS/LCSD..... Laboratory control sample/laboratory control sample duplicate
Mean…………Arithmetic average of the samples
Median……….Middle value of the sample distribution
µg/L .... Microgram per liter
mg/L .... Milligrams per liter
mS/cm .... Millisiemens per centimeter
MS/MSD........ Matrix spike/matrix spike duplicate
NTU............... Nephalometric turbidity units
OASIS .... OASIS Environmental, Inc.
ppb .... Parts per billion (ppb=µg/L)
ppm .... Parts per million (ppm=mg/L)
QA/QC........... Quality assurance and quality control
QAPP .... Quality Assurance Project Plan
RM................. River mile
RPD............... Relative percent difference
SGS............... SGS Environmental Services, Inc.
TAH............... Total aromatic hydrocarbons (TAH=BTEX)
USGS............ United States Geological Survey
YSI .... YSI 556 water quality meter

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EXECUTIVE SUMMARY

Water samples were collected from the Kenai River in July 2008 to determine concentrations of total aromatic hydrocarbons (TAH) in the river from motorboat activity. TAH is composed of Benzene, Toluene, Ethylbenzene, and Xylene (BTEX) which are components of gasoline, which is the source of the pollutant of concerns in this study. Because historical July TAH levels annually exceeded criteria in Alaska Water Quality Standards (AWQS), in 2006 Alaska listed the Kenai River as an impaired Category 5 water, under the Federal Clean Water Act Section 303(d), for not meeting Alaska's water quality criteria for petroleum hydrocarbons, oils and grease during the month of July. Subsequently, the State and others have taken steps to reduce the amount of petroleum entering the river. ADEC developed this project to collect information that will be used to help monitor reductions of petroleum levels as the Kenai River recovers and to determine when the river has recovered.

This project was similar to ADEC studies conducted in 2003 and 2007 of petroleum in the Kenai River. Similar to those 2007 studies, water samples were collected at Kenai River Mile (RM) 10.1 at 2-hour intervals around the third weekend in July when motorboat use on the river historically peaks. In addition to RM 10.1, samples were also collected at RMs 1.5 and 5. Sampling focused on TAH, but also included standard physical and chemical parameters (pH, dissolved oxygen, conductivity, salinity, turbidity, and temperature).

TAH concentrations were consistently low and near detection limits at all times. The results indicated that all samples collected from the Kenai River between July 19 and July 22, 2008 complied with the AWQS petroleum criteria for TAH. The TAH concentrations were generally low (<4 ug/L). TAH concentrations were generally somewhat higher for RM 10.1 than RM 1.5 and 5. This might be due to a higher concentration of boats within the immediate vicinity (~200 meters) of the sampling boat during of sampling events. The sustained and consistent decline in TAH concentrations from their 2003 levels are not due to differences in sampling methodology or dilution from flows, the difference can only be explained by petroleum loading rates. All three years of studies show the loadings vary with amounts of boat activity. Prior to this year's study, it was difficult to determine if the differences between the study years were due to differences in numbers of boats or due to use of non-2006 EPA compliant outboard motors on boats. Given that the boat numbers at RM 10.1 appear to be similar to the 2007 boat numbers during the July 19-24 sampling period and all motors used above RM 10.1 during the 2008 sampling period appeared to be the less polluting 2006 compliant types, the main reason for the observed decline in TAH concentrations appears to be due to elimination of the more polluting older 2-stroke motors

Future research efforts studying hydrocarbon contamination on the Kenai River should continue to focus on determining the levels of petroleum and the contributions from different numbers of boats. Any future monitoring should also continue to include standard physical and chemical parameters to help establish ambient conditions. These

parameters generally met criteria, with the exception of some measurements of pH obtained through a parallel effort by the Kenai Watershed Forum (KWF) at RM 1.5. KWF reported several values above the water quality standard for this parameter.

The results of this study indicate that a decline in TAH levels has occurred as a result of the ongoing recovery actions and that TAH levels are within AWQS criteria. If future monitoring shows this trend is permanent, then long-term, intensive TAH monitoring is not recommended, particularly after the Kenai River has been removed from impairment status.

1. BACKGROUND

In 2003, due to concerns about petroleum hydrocarbons in the Kenai River, ADEC contracted with OASIS Environmental, Inc. (OASIS) to conduct intensive sampling for petroleum and other water quality parameters in the Kenai River, focusing mainly on the lower river. The sources investigated for the 2003 project included stormwater outfalls, contaminated sites, motorboats operating on the river, and boat activity at the Kenai River Harbor near the river mouth. The assessment showed that stormwater and contaminated sites were not sources of measurable amounts of petroleum in the river, but that measurable amounts of TAH were contributed by motorboat activity and the TAH levels varied with the amount of boat activity. The sampling showed levels of TAH occasionally exceeded Alaska's water quality standards. The actual levels may have even been higher than those measured, for these reasons:

- The main sampling point at RM 10.1 (below mouth of Beaver Creek) used in 2003 was chosen because it was the lowest point in the river that typically has some downstream surface current during all tidal stages. However, large numbers of boats (over 100) may have fished below this point when the tide was not in. It was believed that results would have been higher if samples were obtained below all boat activity.
- July 2003 sampling included sample collection on Tuesdays and a 3-day intensive sampling effort on July 20–22 (Sunday–Tuesday). Numbers of boats on the river were higher on some days in July when sampling did not occur.
- River discharge flows during the July 2003 sampling effort were about 10% higher than average flows during the same period. TAH concentrations would have been higher if the river flowed at average discharge rates, as less water would have been available to dilute the petroleum.

From 2004-2006, additional TAH sampling was conducted by the Kenai Watershed Forum (KWF) and the Kenaitze Tribe with funding provided by ADEC and the U.S. Environmental Protection Agency (EPA). Results showed that, during the July sampling efforts in of each of those years, at least one TAH sample exceeded Alaska Water Quality Standards (AWQS) (Czarnezki, et al., 2008).

Because July TAH levels annually exceeded the AWQS for petroleum hydrocarbons for several years and because no controls existed to reduce these levels, in December 2006 ADEC included the lower Kenai River on its biannual list of impaired waters.

In 2007, ADEC developed a project to collect information on July TAH levels as part of its Kenai River recovery effort. ADEC contracted with OASIS to conduct sampling study at the same 2003 location (RM 10.1) where intensive sampling had occurred. The sampling period (July 21-24) was similar to that used in 2003. ADEC also contracted with KWF to conduct boat counts over the same period and to collect TAH samples lower in the river. As in 2003, the OASIS study showed TAH levels varied with numbers of motor boats operating on the river. A decline in TAH concentrations was observed, apparently due to a reduction in non-2006 compliant outboard motors. All TAH levels at RM 10.1 were compliant with AWQS criteria.

Although the 2007 sampling conducted by OASIS at RM 10.1 showed no exceedances of TAH standards, concurrent sampling conducted by KWF at RM 1.5 did show exceedances of AWQS TAH criteria. Subsequently, on March 1, 2008 the Alaska Department of Natural Resources enacted regulations that implemented changes for boats and motors on the Kenai River. The regulations were designed to address the problem of most of the hydrocarbons appearing to come from unburned gasoline released from older, two-stroke boat motors, which are heavily used during the month of July's peak sport fishery. The new regulations mandated that all motors used within the Kenai River Special Management Area during July must be either four-stroke or DFI two-stroke motors (ADNR, 2008). Also, in February 2008, the Alaska Board of Fisheries adopted restrictions (effective June 4, 2008) that prohibited use of older 2-stroke motors. This regulation prohibits the use of boats with older two-stroke motors (which lack direct fuel injection) in the personal use dip net fishery which occurs in the Lower Kenai River in July below the Warren Ames Bridge near RM 5 (ADFG, 2008).

To determine if the petroleum levels were decreasing and the river was recovering to non-impaired status, in July 2008, ADEC contracted with OASIS to conduct this study to measure the river's July TAH concentrations.

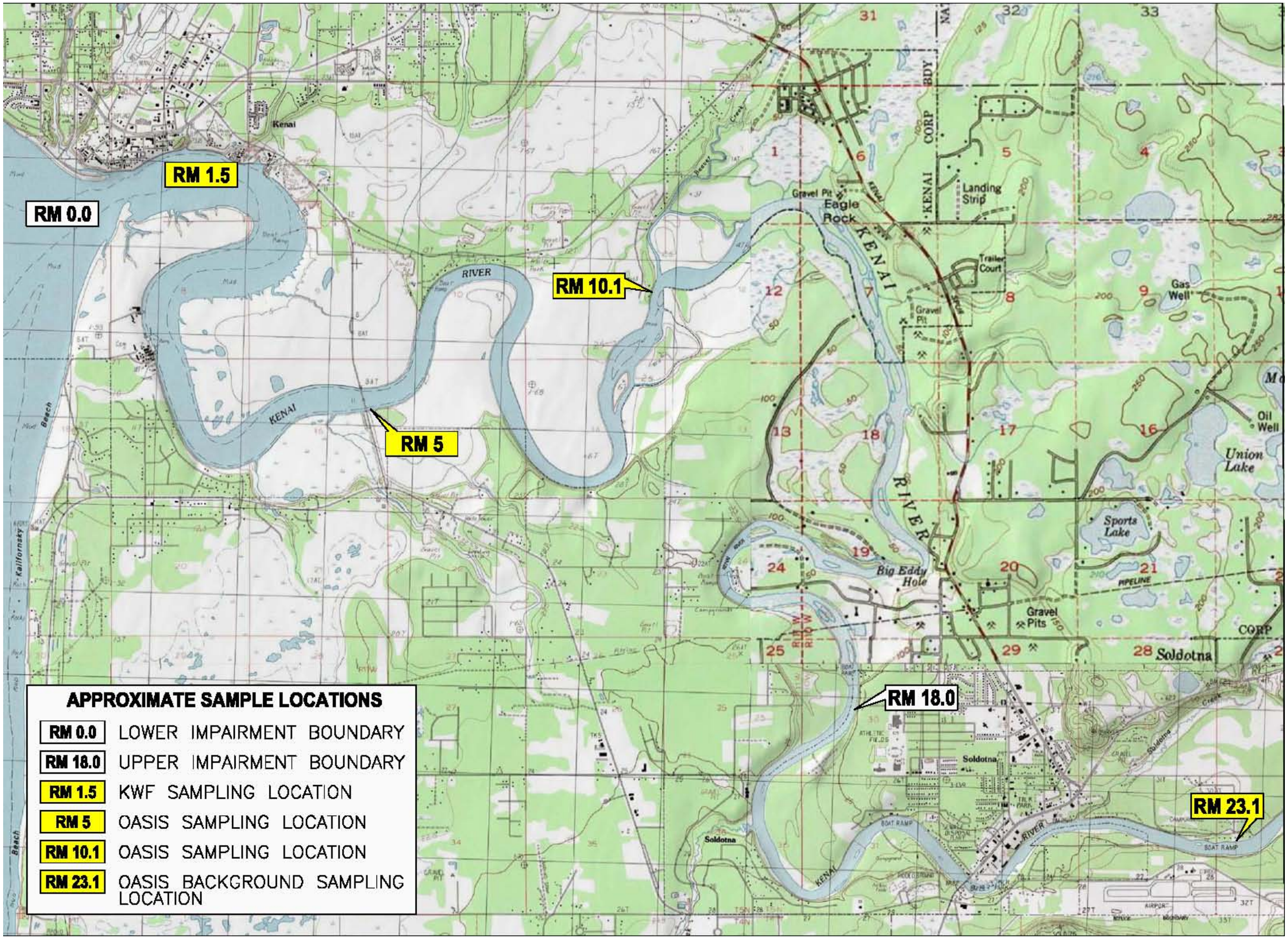

FIGURE 1: MAP OF KENAI RIVER 2008 SAMPLING LOCATIONS

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2. METHODS

ADEC's sampling strategy was to collect samples from two depths at three locations along transects at RMs 1.5, 5, and RM 10.1. Background samples were collected at RM 23. Figure 1 shows the sampling locations. Sampling at RMs 5, 10.1 and 23 was conducted by OASIS Environmental; sampling at RM 1.5 was conducted by the Kenai Watershed Forum (KWF). To the extent practical, OASIS and KWF used similar methods. Unless otherwise noted, the methods discussed below are those used by OASIS and followed the ADEC-approved July 2008 Sampling and Quality Assurance Project Plan (QAPP) (OASIS, 2008b).

The sample transect at RM 1.5 was in the Harbor area above the River mouth; a photo of the area is shown in Figure 2 (AGSDC, 2001). Intensive dipnetting for salmon occurs from shore and boats in this area during July sockeye salmon runs. Three factors influence the number of boats fishing in this area: hourly and daily changes in numbers of salmon entering the river, tidal stages (lower numbers of boats operate during slack tides), and regulations (dipnetting can only occur during openings and generally from 6 AM to 11 PM).

FIGURE 2: KENAI RIVER MOUTH and **RM 1.5**

The sampling transect at RM 5 was in the area immediately above the Warren Ames bridge, which marks the upper boundary of the river stretch where dipnetting is allowed. In contrast to RMs 1.5 and 10.1, very few boats fish or travel in this area. Even though it is 5 miles above the river mouth, the depth of the water is still significantly influenced by tides, varying by over 15 feet. Some shore fishing occurs immediately below the bridge on the south shore of the river; some boats will also beach there.

FIGURE 3: RM 5 ABOVE WARREN AMES BRIDGE

The sampling transect at RM 10.1 was in the area where ADEC contracted with OASIS to conduct extensive sampling in 2003 and 2007. This point, just below the Beaver Creek mouth, is in the lowest river stretch which flows during all tidal stages with boats operating upstream. Constant adjustments of speed and location of the sampling boat were required, as other boats often created wakes, surrounded the boat, and forced movement when fish were hooked.

FIGURE 4: RM 10.1 BELOW BEAVER CREEK

The sampling site at RM 23 is the area where reference samples were collected at approximately 5:30 AM on July 20 and 22. The sampling spot was at the upstream end of Swiftwater Campground, and is above the Soldotna Bridge and impaired area of the River. Although boat traffic is much lower here than in lower stretches, some traffic was observed during sampling. Samples were collected at this point by wading approximately 50 feet into the river to approximately 3 feet depth.

FIGURE 5: RM 23 BACKGROUND SITE

In order to maximize comparability of results at the transects, all samples were collected using the same methods and at the same points (see Figure 1) within each of the transects. In addition, the methods and one of the sampling transects (RM10.1) were also the same as those used in the 2003 and 2007 studies. Quality control samples were collected to verify sampling methods did not introduce bias. Specific procedures are discussed below.

Data collection at the transects at RMs 1, 5 and 10.1 began at 6 A.M. on Saturday, July 19, 2008 and continued every 2 hours through Saturday midnight. Sampling was conducted at the same times on the following Sunday (July 20) and Tuesday (July 22). Reference samples were collected at RM 23 at 5 A.M on July 19 and 22. Samples were collected by OASIS from 2 aluminum open-hulled river boats with 50 horsepower, four-stroke outboard motors. Due to the strong river current at most times, samples were taken off the side of the boat, with the boat motor running and the bow facing upstream. At the RM 5 transect during incoming and high tides, strong winds sometimes blew the boat upstream against the current. When this occurred, the boat's motor was turned off to assure samples were not collected downstream of the motor.

Water TAH samples were collected in Wildco VOC sampling devices provided by ADEC to both OASIS and KWF. The Wildco sampling device and its operation were designed by USGS (Shelton, 1997). The Wildco VOC sampler and its associated collection method were also used in the 2003 and 2007 sampling efforts.

As described in the OASIS QAPP (OASIS, 2008b), samples were collected every two hours at 12-inches below water surface (BWS) and near the river bottom in the main portion of the river current (thalweg). The two sample depths are labeled shallow and deep in the table of results discussed in the next section. Additional samples were collected at six-hour intervals at the same two depths at the right and left banks of the river. Prior to beginning sampling, at approximately 5 A.M. on July 19 and July 22, reference TAH samples were collected upstream of heavy boat traffic at RM 23. Reference samples were collected from the thalweg at 12-inches BWS. All samples at RMs 1, 5, and 10.1 were collected via boats. Due to logistical constraints, RM 23 samples were collected by wading. Field duplicates were collected at the rate of approximately ten percent of samples at the same section and depth immediately after collection of the original sample. Split samples were also collected at a rate of 5 percent of samples and were sent to the two different analytical laboratory used by OASIS and KWF in order to evaluate comparability of analytical results.

After being obtained, samples were preserved, packaged, and transported by OASIS to SGS Environmental Services (SGS) and by Kenai Watershed Forum (KWF) to Analytica Inc. Both laboratories previously conducted analyses of Kenai River TAH samples and have been approved by ADEC for TAH analysis. Laboratories also provided the sampling containers, coolers, gel ice, trip blanks and temperature blanks for each sampling event. The samples were analyzed for benzene, toluene, ethylbenzene, and xylenes (BTEX) or TAH. The laboratories reported results in hard-copy format and electronic form (Excel spreadsheet) within normal turnaround times.

FIGURE 6: ADDITION OF PRESERVATIVE

The samples were analyzed for benzene, toluene, ethylbenzene, and xylenes (BTEX) (components of TAH), using EPA Method 624. In addition to collecting TAH samples, a Horiba-U22 meter was used by OASIS and a Hach MS-5 Hydrolab was used by KWF to measure pH, temperature, conductivity, dissolved oxygen, and turbidity once during each 2-hour sampling interval. A peristaltic pump was used by OASIS to pump the water through a flow-through cell into a sampling vessel which contained the

Horiba meter probe. The end of the pump tubing was attached to the Wildco sampler to keep the tubing in place while the parameters stabilized, and also, to the extent possible, ensure physical and chemical measurements were obtained at the same depth and location as the TAH water samples.

The water quality meters were calibrated prior to sampling and calibration was checked during the two-day event. Prior to beginning sampling, the Wildco sampler was decontaminated using an Alconox® and deionized (DI) water wash and a DI water rinse.

Global Positioning System (GPS) coordinates were taken at each sample site to record locations and flow velocities. Field parameter measurements, GPS coordinates, sampling information, and comments were recorded on Sample Data Sheets and in field log books, provided in Appendix C (on attached CD). Photographs were used to document site conditions and are provided electronically in Appendix D (on attached CD).

The KWF also performed an aerial boat count over the same time period that samples were collected. Between the mouth and Skilak Lake, the river was flown five times on July 19 and 20 and four times on July 22, as shown below in Table 1:

TABLE 1: KWF AERIAL BOAT COUNT TIMES

July 19	July 20	July 22
07:15	07:15	07:15
08:00	08:00	08:00
08:45	08:45	08:45
14:00	14:00	14:00
20:00	20:00	

The river was divided into eight section and the KWF airplane observers counted motorized boats in each section. In addition, KWF observers in a boat counted the number of boats with two-stroke and four-stroke engines at RM 12.5 and below the Warren Ames Bridge (RM 5) during the same time periods as the aerial boat counts were conducted. The results of the KWF aerial boat count are included in Appendix B.

3. RESULTS AND DISCUSSION

The water quality parameter and laboratory analytical results are summarized in Appendix A. The Alaska Water Quality Standards (AWQS) from AAC 70 (ADEC, 2008)) are identified in the relevant section discussions.

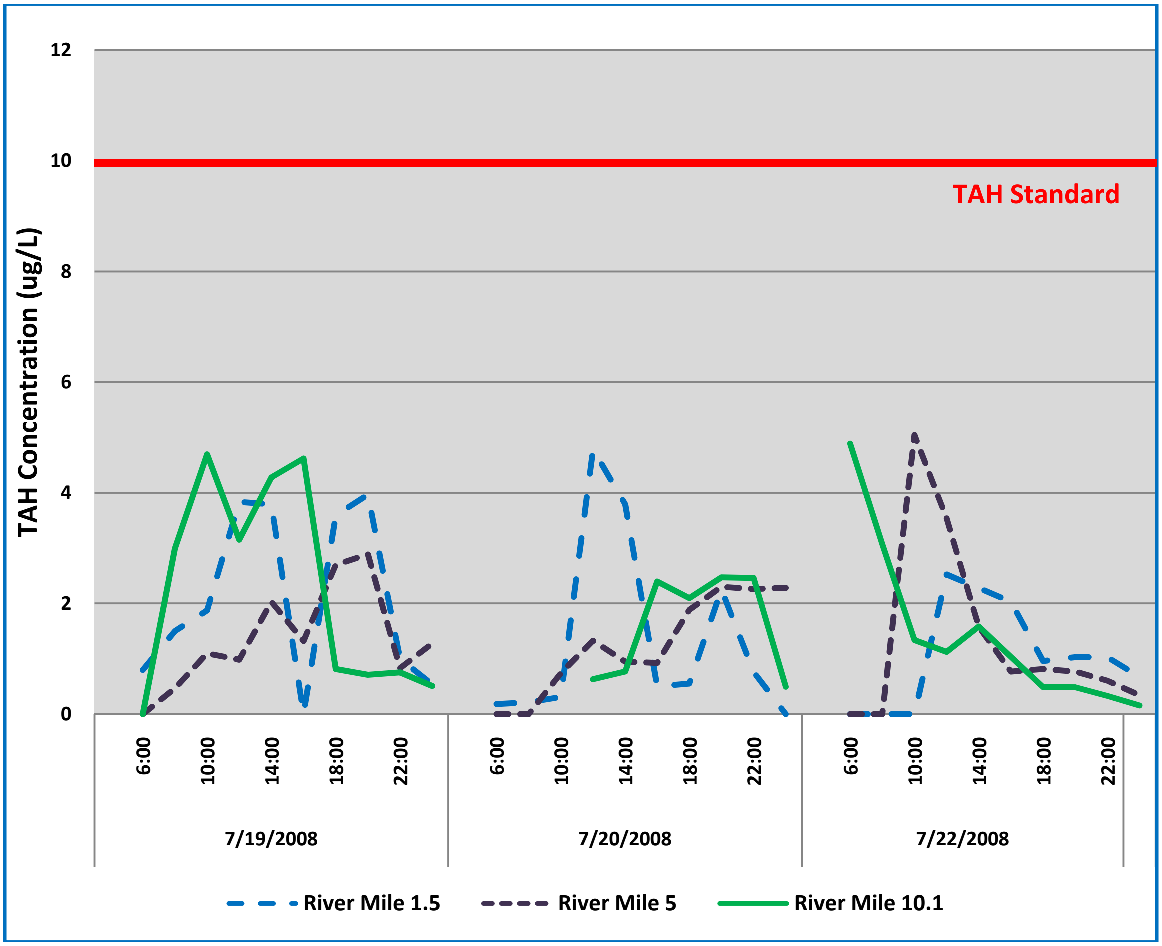
3.1. TAH results

Figure 7 shows the average TAH concentrations for samples collected in each transect of the river at 2-hour intervals from 6 am to midnight on July 19, 20, and 22. No TAH was detected in samples collected at the RM 23 reference site. TAH concentrations at the other sites were well below the AWQS of 10 µg/L. TAH was either not detected in those samples or was detected at very low levels. When detected, most results for individual compounds were J-flagged as estimates as the results were near the analytical method detection limits. The total TAH concentrations ranged from non-detect (ND) to 7.0 µg/L with a mean value of 1.6 µg/L. As seen in Appendix A, of 334 samples collected, only 2 were higher than 6 µg/L and only 6 (2% of total) were higher than 5 µg/L. The mean concentration of all samples was 1.6 µg/L with a standard deviation of 1.5 µg/L, indicating the mean was significantly below (>5 standard deviations) the 10 µg/L AWQS criterion. The highest concentration (7.0 µg/L) was a duplicate of another sample with a TAH concentration of 4.03 µg/L, and was approximately 2 standard deviations below 10 µg/L, which indicated it was outlier data. Note the non-detects are shown in Appendix A with their method detection limit (MDL); in performing data manipulation (summing, averaging, statistical tests) a value of "0" was used for non-detects.

Due to the high number of non-detects and estimates for most values of the TAH components, differences in TAH results between sites can best be evaluated qualitatively. The results do not indicate TAH concentrations varied based on sample collection depths or river cross-section. Qualitative differences do appear based on the time of sample collection. The average TAH concentrations for different sections of the river are plotted against time in Figure 7. The figure shows TAH concentrations vary within river reaches and for different days. In general, TAH concentrations at RM 1.5 were low early in the morning, increased through the afternoon, decreased in late afternoon and increased again before decreasing late at night. Trends of TAH concentrations at RM 5 and 10.1 were generally similar. On July 19, TAH concentrations at both transects were low early in the morning, rose at mid-day, dropped somewhat in the afternoon and then rose again before dropping late in the evening. On July 20, TAH concentrations were lower and peaked later in the day. On July 22 at all three transects, TAH concentrations peaked in mid-day and dropped in afternoon and evening. The drop in TAH levels corresponded to deteriorations in weather conditions through the day.

Several factors were considered in evaluating the data, including changes in collection points, changes in discharge flows, changes in numbers of boats and motor types, and variances in sample collection and analyses methods. These factors are discussed below.

FIGURE 7: AVERAGE TAH CONCENTRATIONS JULY 19-22



3.1.1. Comparison of TAH Concentrations at different depths and sections

An evaluation was conducted to determine if TAH concentrations in samples varied according to the depth, cross-section and river transect at which they were obtained. As mentioned above, because the TAH concentrations of almost all samples were either non-detects or j-flagged as estimates, statistical analysis of differences was limited to comparisons of means, medians, maximums, and standard deviations. Using the statistical program ProUCL 4.00.2, the data was determined to be non-normally distributed and therefore could not be analyzed using standard parametric statistics.

Figure 9 (below) provides a comparison of TAH results from several perspectives: by depth, cross-section and river transect. As each box in Figure 9 shows, TAH concentrations were very similar for samples collected at the same time and location but at different depths (near surface and streambed). Many of the results were virtually identical; and few varied by more than 1 ug/L. As the samples collected at different depths were collected 15-20 minutes apart, the small differences may have been due to differences of collection time and not due to depth.

FIGURE 8: RIVER MILE 10.1 - LEFT BANK, THALWEG, RIGHT

Table 2 shows samples collected near the streambed ranged from non-detect to 7.00 µg/L with a mean of 1.54 µg/L and a standard deviation of 1.46 µg/L. Samples collected near surface ranged from non-detect µg/L to 6.87 µg/L with a mean of 1.75 µg/L and a standard deviation of 1.6 µg/L. For samples collected at different sections, the minimums, maximums, means, and standard deviations were similar for the two depths.

By viewing results in each vertical set of boxes in Figure 9, a comparison also can be made of TAH concentrations taken at the same transect and time but at different cross-sections. This reveals similar TAH concentrations and trends for each transect and sampling time, regardless of whether samples were obtained in the thalweg or near a bank. TAH concentrations in thalweg and bank samples from all river locations ranged from non-detect to 7.00 µg/L with a mean of 1.63 µg/L, a median of 1.06 µg/L, and a standard deviation of 1.52 µg/L. Thalweg samples ranged from non-detect to 7.00 µg/L with a mean of 1.56 µg/L, a median of 0.93 µg/L, and a standard deviation of 1.58 µg/L. Left bank samples ranged from non-detect to 4.65 µg/L with a mean of 1.72 µg/L, a median of 1.16 µg/L, and a standard deviation of 1.44 µg/L. Right bank samples ranged from non-detect to 4.65 µg/L with a mean of 1.89 µg/L, a median of 1.63 µg/L, and a standard deviation of 1.47 µg/L.

The maximums for each of the river locations were 7.00 at RM 1.5, 5.07 at RM 5, and 4.98 µg/L at RM 10.1. Means were similar for each RM (1.63, 1.33, and 2.10 µg/L, respectively) and the 0.77 µg/L difference between the low and high means is below ranges of locations' standard deviations (1.26 to 1.71 µg/L). Medians were also similar (1.00, 0.94, and 1.32 µg/L).

In summary, the results indicate the river is well mixed with similar TAH concentrations at any one time in a stretch. This was consistent with findings in 2003 and 2007 studies.

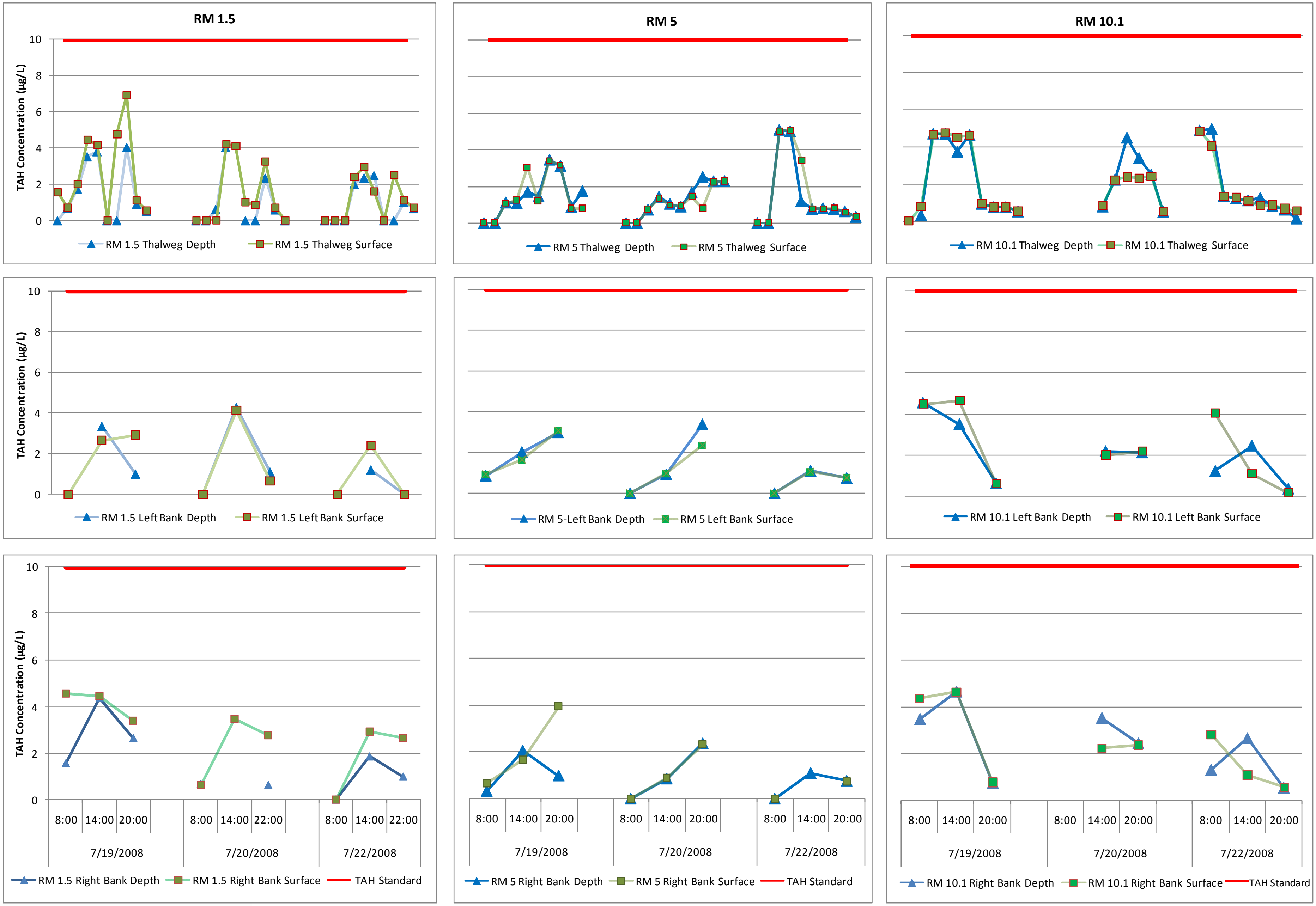
3.1.2. Comparison of TAH Concentrations at different transects

Figure 7 and Table 2 show the TAH concentrations at different sampling transects. The highest maximum concentration (7.0 µg/L) was observed in a duplicate sample collected at RM 1.5. The mean and median TAH concentrations for all three transects were within standard deviations calculated for each other. Although the differences don't appear significant, the mean and median TAH concentrations at RM10.1 were generally higher than those at RM 1.5, and those at RM 1.5 appeared generally higher than those at RM 5.

TABLE 2: TAH CONCENTRATION VARIABILITY

Sampling Location			TAH Statistics (µg/L) Mean	Median	Standard Deviation	Minimum	Maximum
RM 1.5	TW	D	1.08	0.60	1.38	0.00	7.00
		S	1.71	1.05	1.84	0.00	6.87
	LB	D	1.56	1.10	1.63	0.00	4.27
		S	1.41	0.65	1.60	0.00	4.10
	RB	D	1.60	1.28	1.39	0.00	4.38
		S	2.76	2.91	1.55	0.00	4.58
RM 5	TW	D	1.40	1.06	1.34	0.00	5.07
		S	1.41	0.89	1.42	0.00	5.07
	LB	D	1.35	0.93	1.22	0.00	3.41
		S	1.21	0.99	1.02	0.00	3.16
	RB	D	0.94	0.86	0.83	0.00	2.37
		S	1.29	0.82	1.34	0.00	3.97
RM 10.1	TW	D	2.07	1.22	1.77	0.00	4.98
		S	1.86	1.07	1.65	0.00	4.85
	LB	D	2.12	2.15	1.42	0.36	4.54
		S	2.41	2.11	1.78	0.18	4.65
	RB	D	2.42	2.55	1.46	0.56	4.65
		S	2.36	2.30	1.54	0.57	4.62

FIGURE 9: TAH LEVELS AT DIFFERENT DEPTHS AND SECTIONS



3.1.3. Comparison of TAH Concentrations to Boat Traffic

The KWF conducted aerial boat counts on the Kenai River at various times on July 19, 20 and 22, 2008. Figure 11 shows the number of boats counted below the Soldotna Bridge and above RMs 1.5, 5 and 10.1 at 6-hour intervals (8 A.M., 2 P.M., and 8 P.M.). Additional counts were conducted at 7:15 A.M. and 8:45 A.M. As they were similar to those recorded at 8 AM they are not displayed. A boat count for 8 P.M. on July 22 was not obtained as adverse weather prevented the flight needed to conduct the count. Field notes taken by sampling crews indicated that boat numbers appeared to drop on the evening of July 22; the winds and rain that prevented the aerial flight may also have contributed to the apparent drop in boats fishing on the river that evening.

No non-compliant 2-strokes were observed above RM 5 at any time. KWF estimated about 5% non-compliant 2-strokes were operating below RM 5 in the dip net fishery during the sampling periods. Therefore the differences in TAH levels at RMs 5 and 10.1 would not be influenced by numbers of different types of motors and differences in TAH levels at RM 1.5 may partially be due to types of motors used on some boats.

FIGURE 10: BOATS ABOVE RM 10.1

The top 3 boxes in Figure 11 below shows the average TAH concentrations at each location at the same 6 hour intervals that boat counts were conducted. These TAH concentrations are averages for all samples collected in each transect at those times. The bottom box of the figure shows the trend in combined average TAH concentration of all transects for all times from 6 am to midnight (i.e. not just times when boat counts were conducted).

The boat counts were compared to the TAH concentrations at the different sampling transects. Similar to trends observed in 2003 and 2007 and as shown in Figure 11, boat numbers were highest in the morning and then decreased in afternoons and evenings. As mentioned above, the TAH concentrations were consistently low (<4 ug/L) and near detection limits at all times and therefore statistical analyses cannot be conducted and only general observations can be made on the relationships between boat numbers and TAH concentrations:

- Numbers of boats were highest early in the day and then decreased. The trends in TAH concentrations varied between the different transects, but the average TAH concentration for all stations appeared to lag behind the number of boats above the sampling transect at earlier times. The overall average was low at 6 am, increased to

3-4 ug/L by mid-day, stayed near that level until about 8 pm, and then decreased to very low levels again.

- TAH concentrations at RMs 5 and 10.1 were lower on July 20, but not at RM 1.5; this corresponds to relatively fewer boats present at RMs 5 and 10.1 on July 20 but similar numbers of boats in the dip net fishery below RM 5 on all three dates.

TAH concentrations at RM 1.5 were at their lowest levels during 8 am boat counts. During the July 19-22 sampling period, high tides occurred near the 8 am boat counts, affecting TAH concentrations in two ways. First, the amount of water in RM 1.5 water column increased significantly, which resulted in diluting and therefore lowering the TAH concentrations. Second, the incoming high tide slowed and then stopped downstream river flows, and so the RM 1.5 water column contains no TAH contributions from upstream sources other than what may have been contributed prior to the high tide.

For sections of river not under tidal influence, the TAH travel time can generally be estimated for discharges from upstream boats to reach the sampling transects. As discussed in the 2007 Study report (OASIS, 2008), the river's velocity is affected by differences in discharge volumes, depths, stream slopes, meander characters, cross-sections (e.g., bank or thalweg) and tidal influences. As mentioned above, tidal influence can stop river flows. This was observed during incoming tides at both RMs 1 and RM 5. For non-tidal influenced flows, the average river velocity was slightly over 3 miles per hour. This velocity is based on comparing the July 19–22 discharge volumes of approximately 14,000 cubic feet per second (cfs) (USGS NWIS, 2008) with the velocity/discharge correlations in a USGS study of Kenai River dynamics ((Dorava, et al., 1997)). Assuming the river flows at this average velocity over a 5-mile stretch above the sampling transect, TAH contributions would be from boats at distances upstream of the transect near times shown in Table 3. Their relative contributions depend on discharges ongoing upstream at the distances and times shown below.

TABLE 3: FLOW DISTANCE AT DIFFERENT TIMES

Distance upstream (miles)	Time for TAH to reach sampling transect time (minutes) at 3.0 mph flow velocity
0.1	2
0.2	4
0.3	6
0.4	8
0.5	10
0.6	12
0.7	14
0.8	16
0.9	17
1	20
2	39
3	59
4	79
5	98

FIGURE 11: TAH CONCENTRATIONS AND BOAT NUMBERS ABOVE RM TRANSECTS

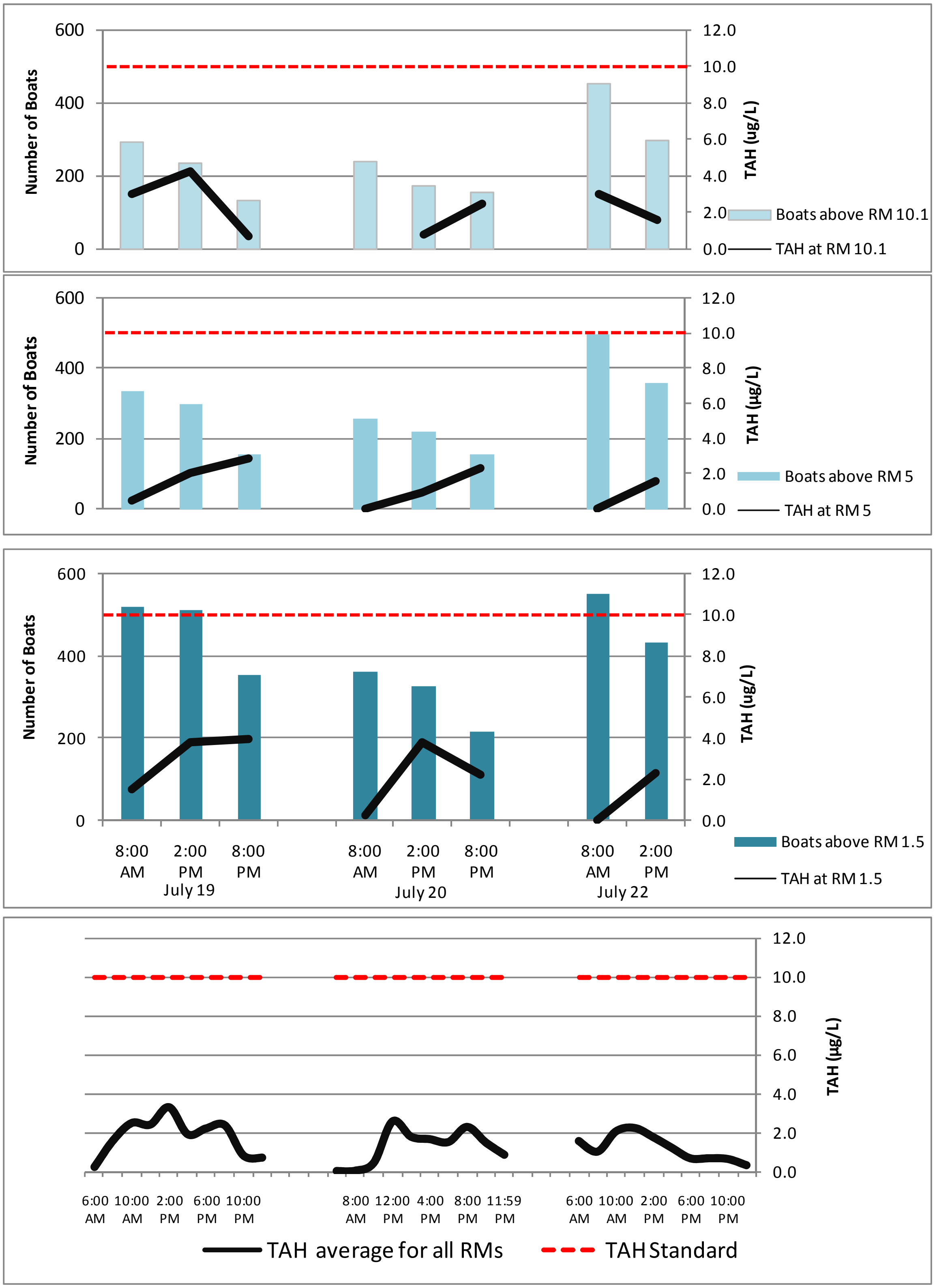
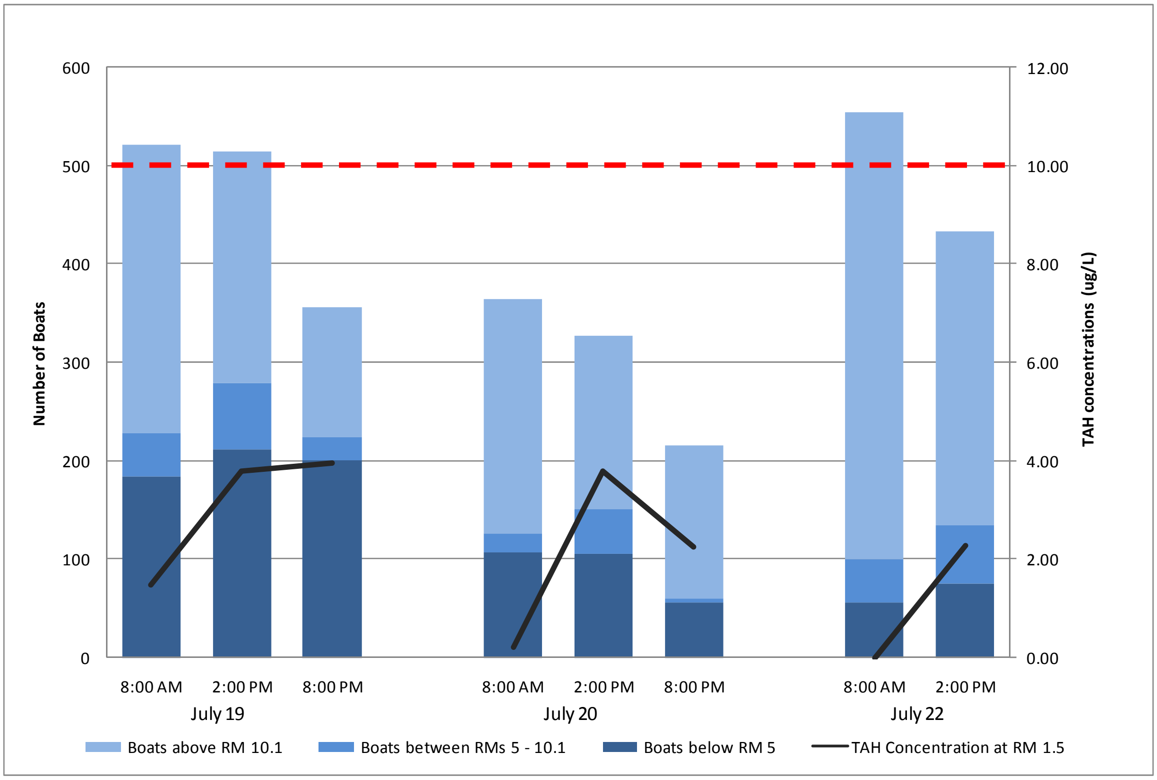


FIGURE 12: BOAT NUMBERS COMPARED WITH RM 1.5 TAH CONCENTRATIONS



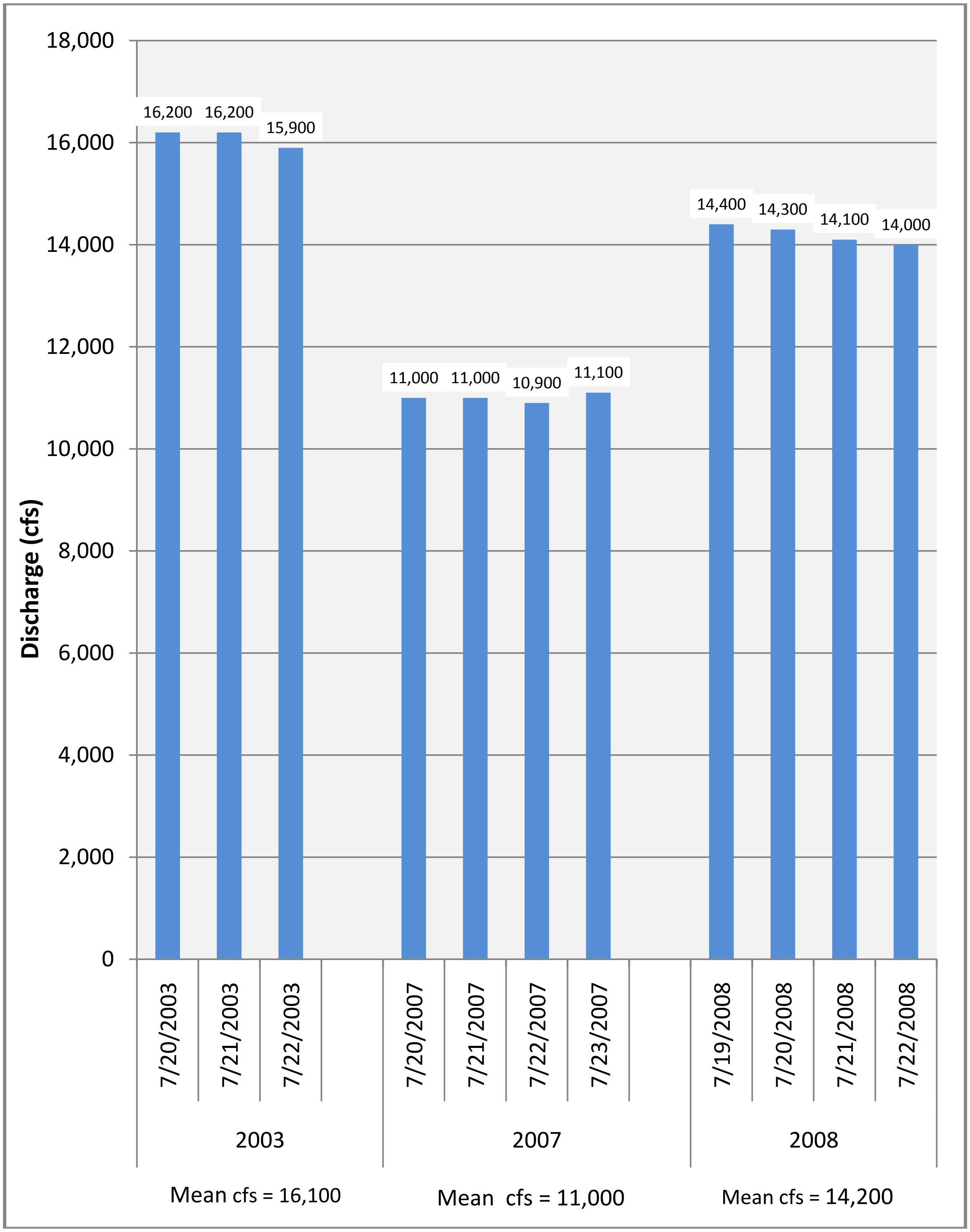
3.1.4. Comparison of TAH Concentrations with Time of Day

As seen in Figure 7, TAH concentrations start off low in both RM 1.5 and RM 5 and show a bimodal distribution with the greatest TAH concentrations being seen around 12:00 and 20:00 for the respective "peaks" and tapering off later in the night. RM 10.1 shows a different relationship between TAH concentration and time and has a more saw-tooth pattern and then decreases at night.

3.1.5. Comparison of TAH Concentrations with Flow

Figure 13 shows the discharge rates during the sampling period (USGS NWIS, 2008), compared with the discharge rates during the similar sampling periods in the 2003 and 2007 studies. River flow rates on July 19 and July 20 were very similar (with an average stage of 9.67 feet for July 19 and 9.65 on July 20); while July 22 was approximately 0.1 feet lower at 9.57 feet. Discharge ranged from a high of 14,400 cfs on July 19 and low of 14,000 on July 22. Figure 7 shows TAH concentrations over time with these changes in river stage. While there is a slight (< 3%) decrease in discharge over time during the study, no statistical discernable difference was found in TAH concentrations between the different days.

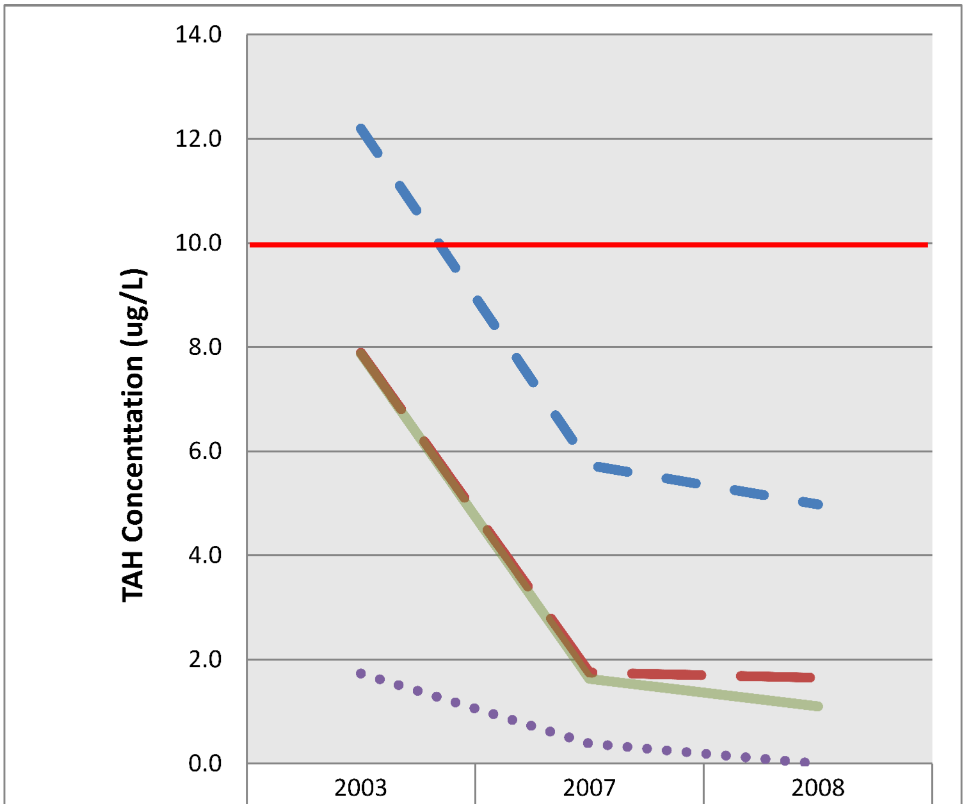
FIGURE 13: KENAI RIVER DISCHARGE RATES IN 2003, 2007, 2008



3.1.6. Comparison of 2008 with 2003 and 2007 TAH Concentrations

A comparison of the TAH concentrations measured in 2008 with those measured in 2003 and 2007 showed that the minimum, maximum, and median concentrations during the 2008 sampling event (0.0 µg/L, 7.0 µg/L, and 1.00 µg/L, respectively) are lower than those for the 2003 (1.53 µg/L, 10.76 µg/L, and 6.94 µg/L) and 2007 0.5 µg/L, 7.40 µg/L, and 2.41 µg/L, respectively) sampling events. Figure 14 illustrates the changes in the maximum, mean, median and minimum TAH concentrations at RM 10.1, which was the only transect sampled in all three years. These TAH concentration statistics have been flow-adjusted for the 2008 discharge rates, as explained below.

FIGURE 14: TRENDS IN KENAI RIVER TAH CONCENTRATIONS AT RM 10.1 IN 2003-2008



	2003	2007	2008
Max	12.2	5.7	5.0
Mean	7.9	1.8	1.7
Median	7.9	1.6	1.1
Minimum	1.7	0.4	0.0

Several potential causes for these differences were evaluated: differences in sampling and analytical methodology or sampling/analytical errors, differences in river discharge levels, and differences in motorboat numbers.

The sampling and analytical methodologies were similar in all three efforts at RM 10.1. The 2003 and 2007 sampling efforts did not include intensive sampling at RMs 1 or 5. OASIS collected the samples at same or similar locations, dates, and sampling intervals. The 2003 and 2007 efforts included sampling at 2 AM and 4 AM, which was not conducted in 2008 as all previous sampling indicated that TAH levels were either non-detect or very low (OASIS 2003, 2007) at those times. The same analytical laboratory (SGS) used the same analytical methods in all three years. All studies had few deviations from the sampling and analytical methods, and the deviations were similar. For these reasons, the lower levels of TAH concentrations in 2008 at RM 10.1, when compared with 2003 and 2007 appear to be actual differences in TAH levels and do not appear due to differences or errors in sampling or analytical methods.

Differences in TAH concentrations between 2008 and 2003 also do not appear to be due to differences in discharge volumes. As shown in Figure 13, the 2008 discharge rate of 14,200 cfs was 88% of the 16,100 cfs rate measured in 2003. The higher flows in 2003 should result in lower TAH concentrations for the same amount of TAH loading. However, the mean 2003 TAH concentration for the 6 AM to midnight timeframe at RM 10.1 on July 22 and 24 was 6.96 µg/L, which is almost seven times higher than the 2008 mean TAH concentration for similar periods. Figure 14 displays the changes in TAH concentrations, flow-adjusted to account for the differences in 2003 and 2007 discharge flows from those measured in 2008.

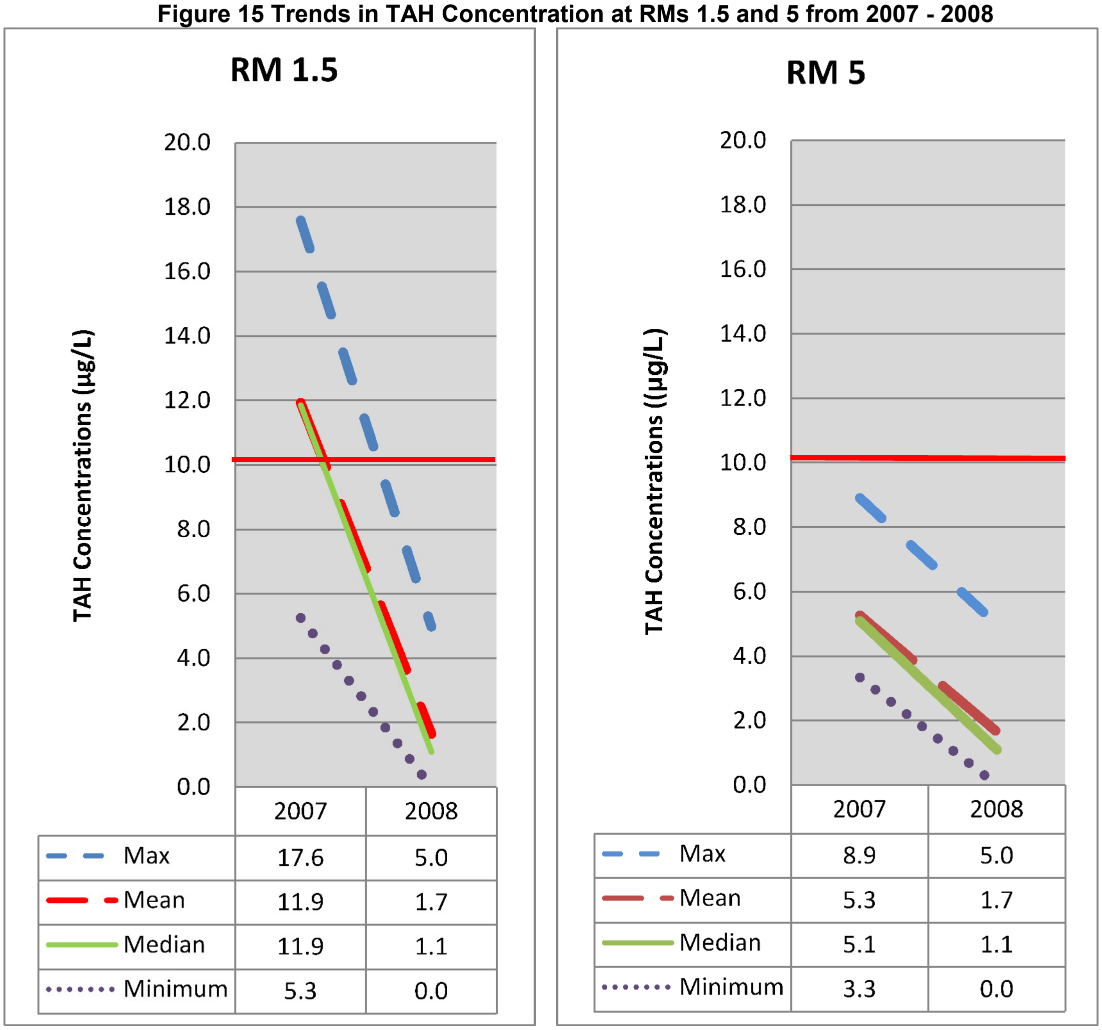
Differences in TAH concentrations measured in 2007 and 2008 could partly be due to higher dilution of TAH loadings by 2008 higher discharge volumes. The 2008 discharge rate was approximately 29% percent higher than those of 2007 and would result in a TAH concentration approximately 77% of the 2007 TAH concentrations for the same amount of TAH loading. The average 2008 TAH concentration was 71% of the 2007 loading. As shown in Figure 14, adjusting the 2007 TAH concentrations to 2008 flow rates suggests that loadings for each year were similar.

As the sustained dramatic and consistent decline in TAH concentrations from their 2003 levels are not due to differences in sampling methodology or dilution from flows, the difference can only be explained by petroleum loading rates. All three years of studies show the loadings varied with amounts of boat activity. Prior to this year's study, it was difficult to determine if the differences between the study years were due to differences in numbers of boats or due to use of non-2006 EPA compliant outboard motors on boats.

Given the boat numbers at RM 10.1 appear to be similar to boat numbers recorded during the 2007 July 19-24 sampling period and all motors used above RM 10.1 during the 2008 sampling period appeared to be the less polluting 2006 compliant types, the main reason for the observed decline in TAH concentrations appears to be due to elimination of the more polluting older 2-stroke motors.

As mentioned above, TAH sampling at RMs 1.5 and 5 in 2003 and 2007 during the July 19-24 period was not as intensive as sampling conducted during those years at RM 10.1. In 2003, OASIS collected one TAH sample at RM 1.5 after 10 pm on July 24, 2003 which measured 2.9 µg/L (OASIS, 2004); and KWF collected three TAH samples at RM 1.5 at different times on July 22, 2003 that ranged from non-detect to 10.49 µg/L (Ruffner, et al., 2003). In 2007, 17 samples were collected during the three-day period by KWF at both RMs 1.5 and 5. In 2008, 91 samples (and additional QC samples) were collected at RM 1.5 and 95 were collected at RM 5. The RM 1.5 and RM 5 samples collected in 2007 were collected from approximately 11 am to 10 pm, in contrast to the 6 am to midnight sampling conducted in 2008. Keeping in mind that the average TAH concentrations calculated for 2007 at RMs 1.5 and 5 do not include early morning and late evening TAH measurements, Figure 15 suggests that the maximum, median, mean, and minimum TAH concentrations declined from 2007 to 2008 at RMs 1.5 and 5.

Figure 15 Trends in TAH Concentration at RMs 1.5 and 5 from 2007 - 2008



RM 1.5	2007	2008
Max	17.6	5.0
Mean	11.9	1.7
Median	11.9	1.1
Minimum	5.3	0.0

RM 5	2007	2008
Max	8.9	5.0
Mean	5.3	1.7
Median	5.1	1.1
Minimum	3.3	0.0

3.2. Field Measurements

In addition to obtaining TAH samples, OASIS also conducted measurements of pH, conductivity, salinity, dissolved oxygen, and temperature. The water quality parameter and laboratory analytical results are summarized in the Appendix A and are graphed in figures accompanying the discussions below. The AWQS (ADEC, 2008) are included for compounds or parameters that are regulated.

FIGURE 16: LOGGING FIELD MEASURMENTS

3.2.1. pH

As shown in Figure 17, pH measurements varied between those collected at RM 1.5 and those collected at RMs 5 and 10.1. With one exception, pH readings at RM 5 and 10.1 ranged between from 7.14 and 7.93 pH units, which were similar to results in past studies and within the AWQS range of 6.5-8.5 pH units. Readings of pH at RM 1.5 ranged between 7.6 and 9.3 pH units, which were consistently higher than measurements taken in upstream reaches. The pH measurements at RM 1.5 also exhibit the same tidal oscillations as other field measurements, such as conductivity and salinity, with pH increasing with the incoming tide.

3.2.2. Temperature

Figure 18 shows that stream water temperature measurements ranged from 9.0°C to 12.6°C with a mean and median of 10.8°C, which were lower than temperatures observed in past studies and within the most stringent AWQS minimum standard of 13°C for spawning areas. Temperature exceedances were observed in both the 2003 and 2007 studies. Temperature also was affected by tidal oscillations at RM 1.5, with incoming warmer marine waters mixing with river water. Slight differences in temperatures at different depths at RM 1.5 suggest that the river water is over-riding the marine waters during the high-tidal periods.

3.2.3. Dissolved Oxygen

Figure 19 shows that dissolved oxygen (DO) ranged from 8.85 to 13.58 mg/L with a mean of 11.07 and median of 11.13 mg/L, well within the AWQS standard of 7 mg – 17 mg/l specified for fish and aquatic life. Measurements taken at RM 1.5 exhibited influences from tidal oscillations with DO decreasing during the incoming tide and the overall DO measurements being lower than those taken upstream.

FIGURE 17: KENAI RIVER PH LEVELS JULY 19-22 2008

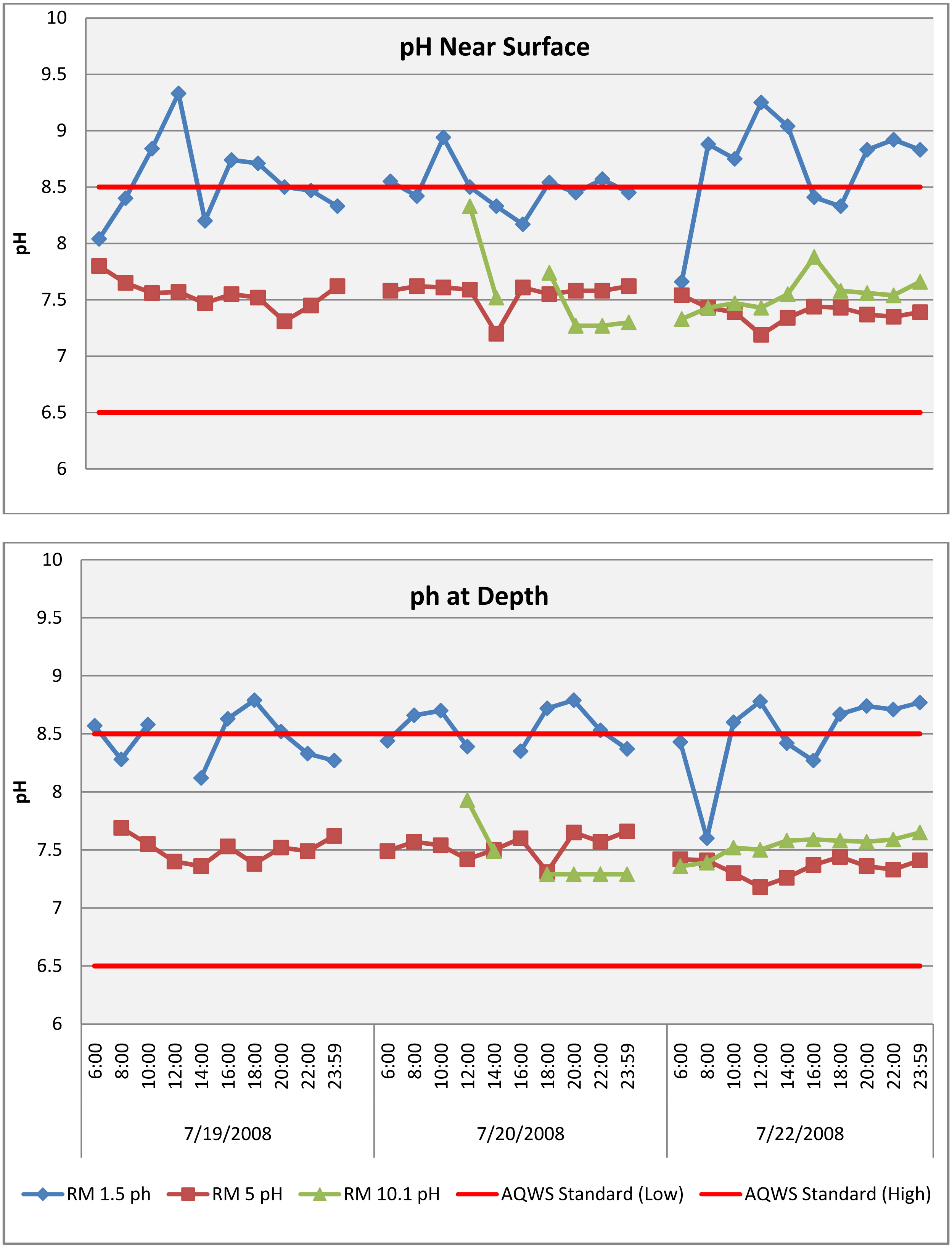


FIGURE 18: KENAI RIVER TEMPERATURE LEVELS JULY 19-22, 2008

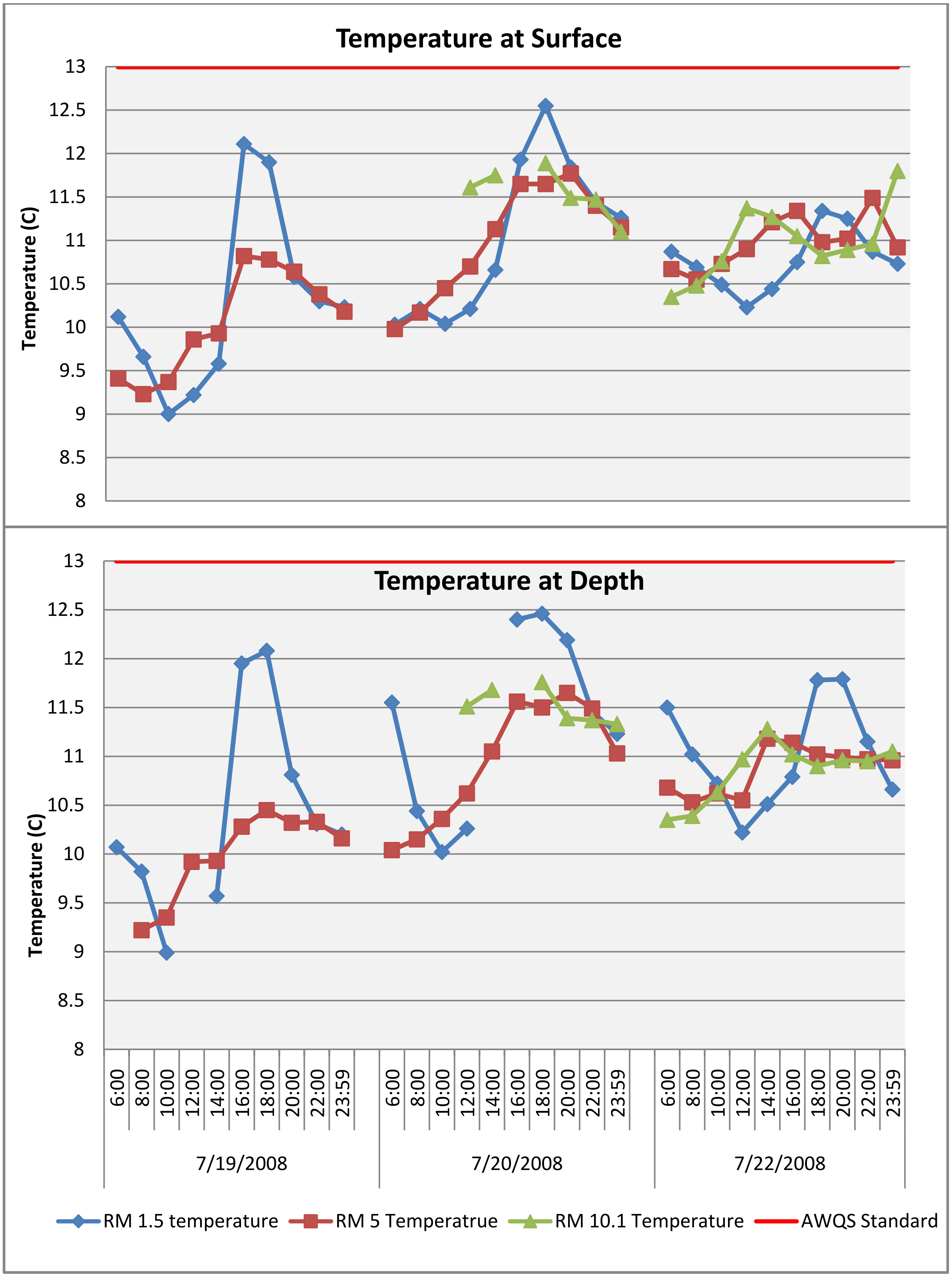
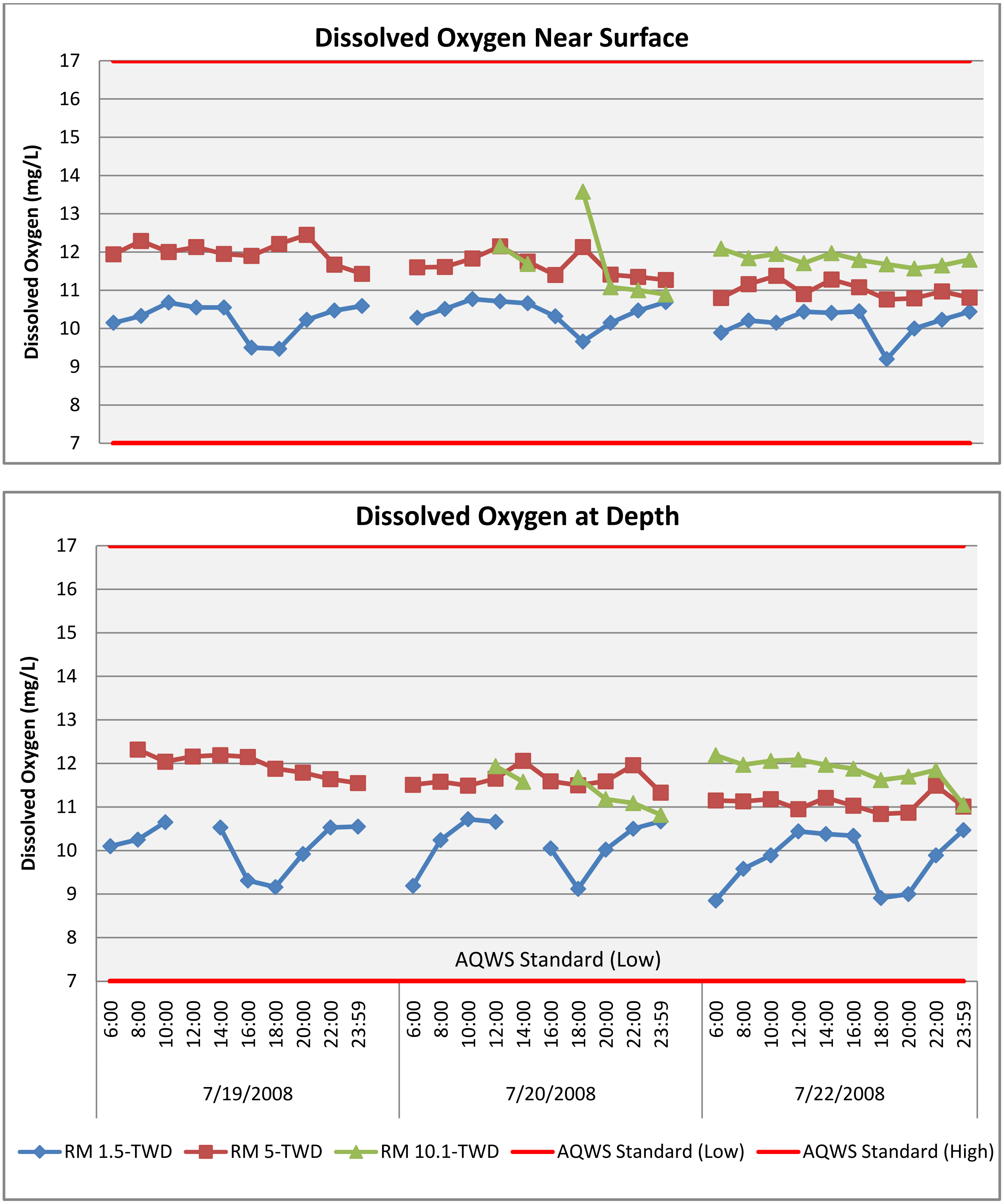


FIGURE 19: KENAI RIVER DISSOLVED OXYGEN LEVELS JULY 19-22, 2008

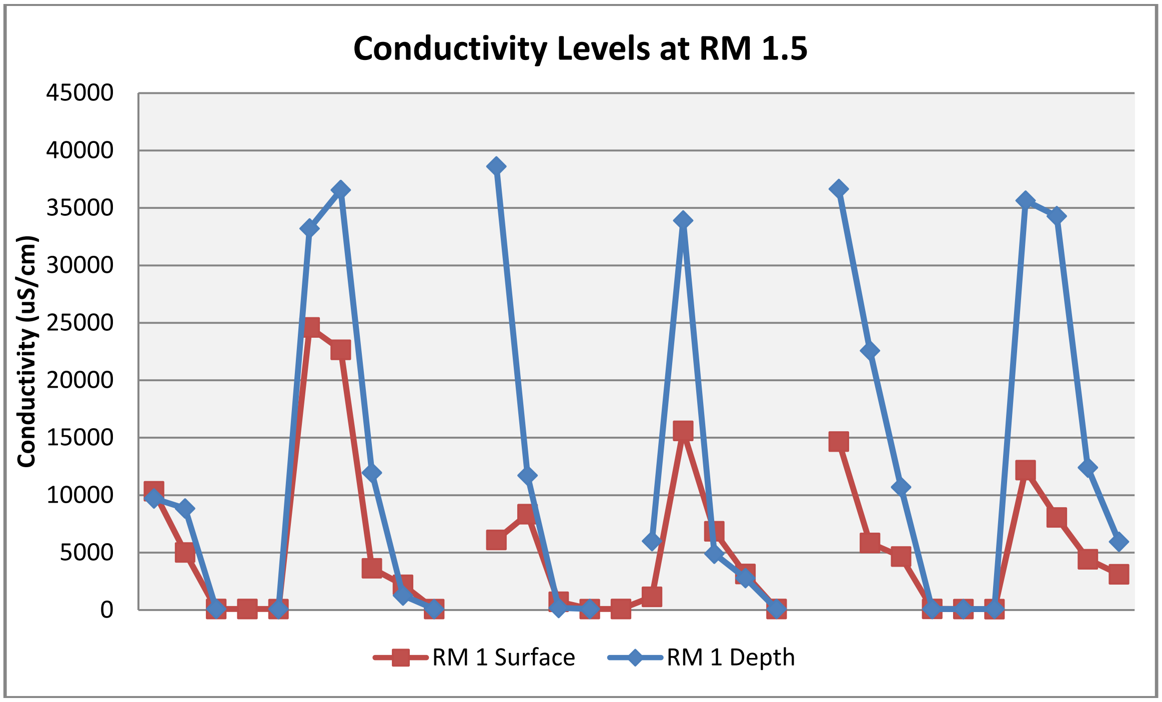


3.2.4. Conductivity and Salinity

As shown in Figure 20, conductivity values varied considerably, apparently due to salinity differences at the different transects from different degrees of tidal influence. Conductivity is not regulated in the AWQS. At RM 1.5 conductivity ranged from 78 to 38,611 microsiemens per centimeter (µS/cm) with a mean value of 8,066 and median value of 4,902 µS/cm. Conductivity values for RM 5 and RM 10.1 ranged from 151 to 478 µS/cm with a mean value of 227 and median value of 159 µS/cm. The conductivity values measured at RM10.1 are higher than those seen in the 2003 and 2007 studies (72-75 µS/cm). Evaluation of potential causes for the differences didn't identify changes in river conditions that could contribute to increased conductivity. A review of calibration and field logs indicated the Horiba U-22 meters were calibrated with the correct solutions and following the correct procedures, were operated properly, and data readouts were properly set. An evaluation was also conducted to determine if differences were due to the Horiba meters automatic adjustment of conductivity readings as the meters adjust conductivity by approximately 2% for each 1°C difference in water temperature from 25 °C. As stream temperatures of 9-12°C were approximately 13-15°C below 25°C, the normalization for a non-temperature compensated conductivity of 75 µS/cm would be approximately 100 µS/cm, which is not near the 2008 mean (227 µS/cm) and median (159 µS/cm) measurements. Another potential reason evaluated for the difference in results was use of different metering instruments. The 2007 study used YSI 556 meters while this study but the 2003 study also used Horiba U-22 instruments. In short, it was unknown why the conductivity readings differed from earlier years.

Salinity was measured but not detected at RMs 5 or 10.1, and was not directly measured at RM 1.5 by KWF. KWF measured conductibility at RM 1.5; and the conductivity results were then used to calculate salinity. Figure 21 shows salinity levels at RM1 that were determined by converting the conductivity measurements using the formula: 1 µS/cm = 0.640 parts per million (ppm). This conversion provides an estimate of salinity; more precise measurements require collection with proper instrumentation and evaluation of data on temperature, air pressure, and types of salts present in the water column. Estimated salinity levels at RM 1.5 approached levels measured at the Kenai River delta with measurements ranging from 0.0050% to 2.47%. Oscillations at RM 1.5 corresponded to tide cycles. Levels increased with depth in the water column during high tides, suggesting the Kenai River freshwater rode over incoming marine water. The salinity levels estimates at RMs 5 and 10.1 ranged from 0.0097% to 0.031% and are much lower than ocean levels (average approximately 3.5%) or in the Kenai River delta (up to 2.3%) (Bendock, 1996). An analysis of variance conducted to evaluate the difference in river sections and depths indicated no significant differences in river section or depth for RMs 5 and 10.1. AWQS has salinity criteria for marine waters but not directly for freshwaters; instead, there are AWQS for Sodium Absorption Ratio (SAR) for dissolved inorganic substances. The low salinity levels estimated from this sampling would not result in exceedances of those criteria.

FIGURE 20: KENAI RIVER SPECIFIC CONDUCTIVITY LEVELS JULY 19-22, 2008



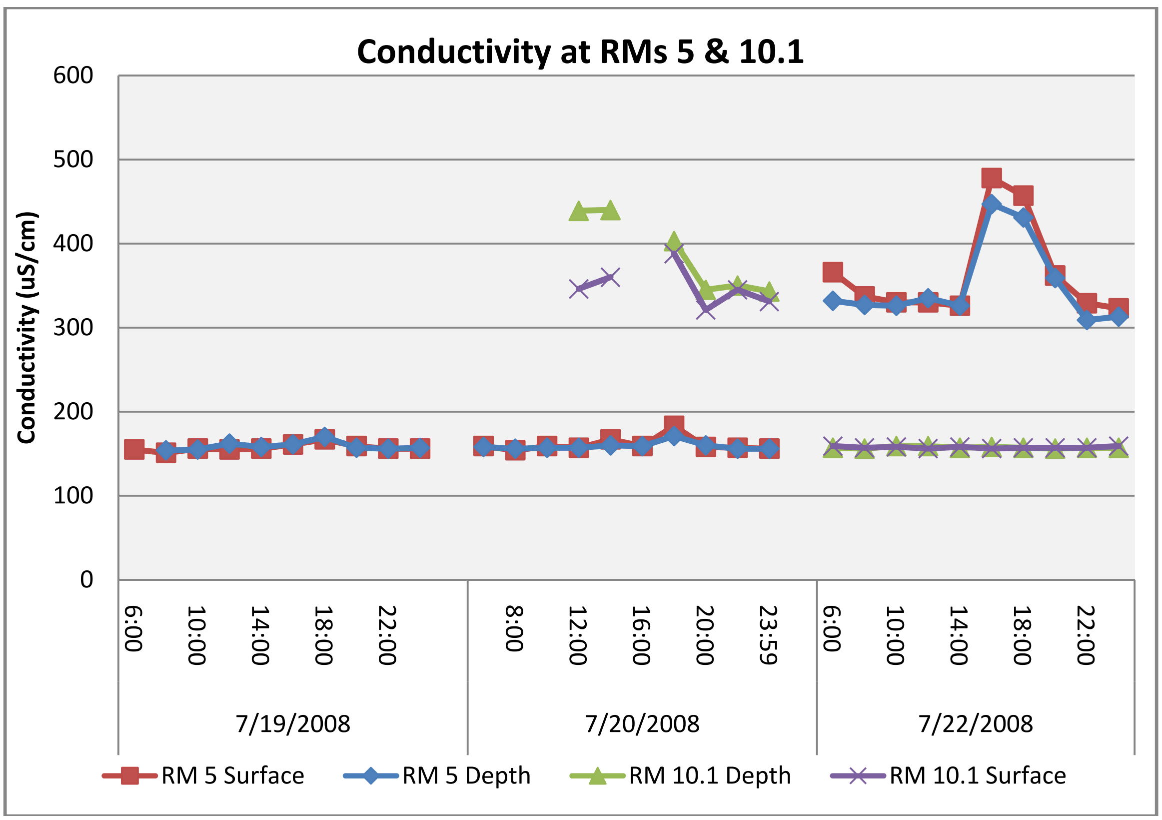
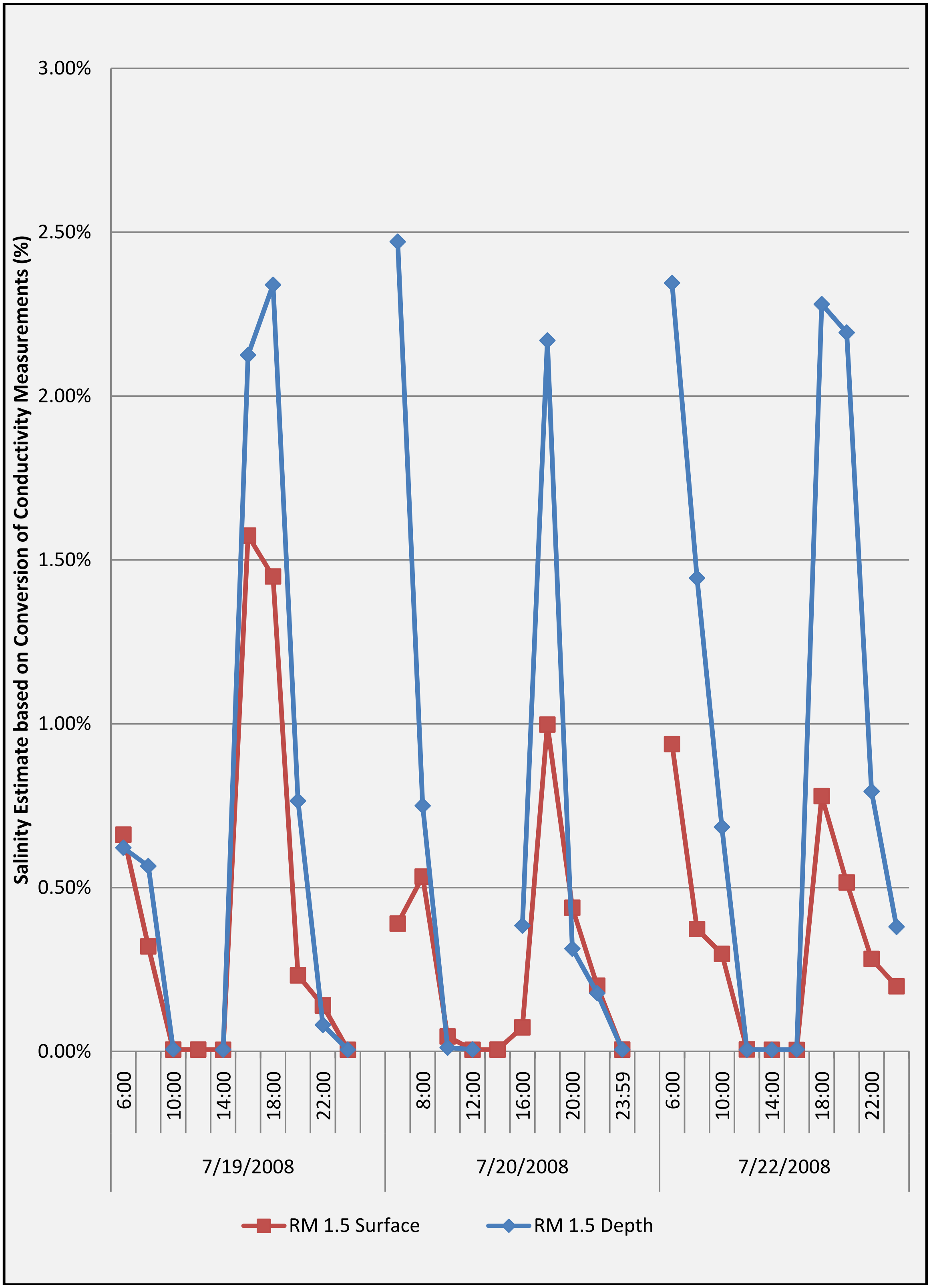


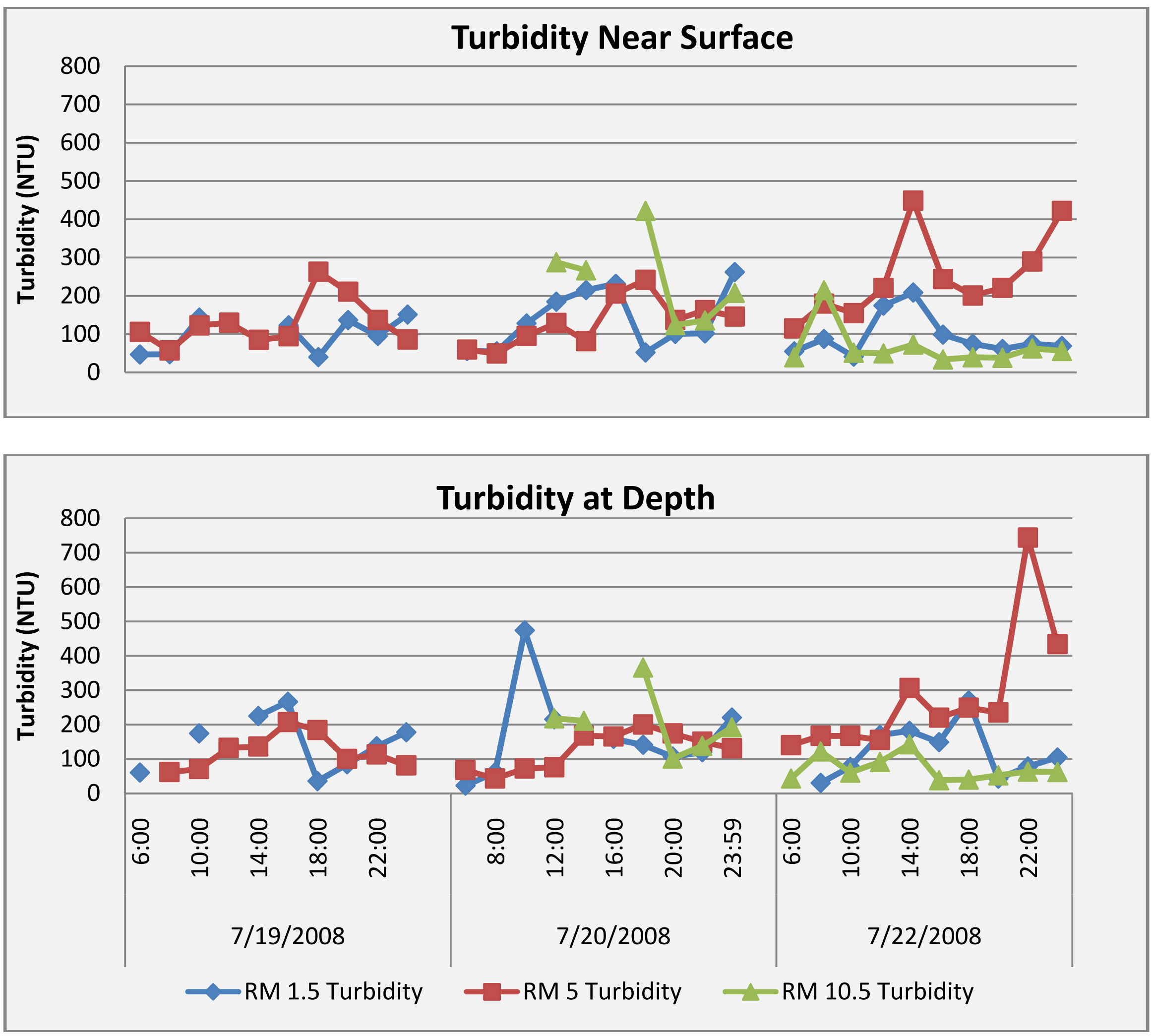
FIGURE 21: KENAI RIVER SALINITY AT RM 1.5 JULY 19-22, 2008



3.2.5. Turbidity

Turbidity levels are influenced by anthropogenic and natural factors (weather conditions, discharge levels, tidal stages, and contributions of glacial melt water). Figure 22 shows that turbidity ranged from 22 to 744 nephalometric turbidity units (NTUs); the distribution had a mean of 146 and a median of 130 NTUs with a standard deviation of 142 NTUs. These results are similar to the 2003 range of readings of 14 to 735 NTU (OASIS, 2004), but higher than the 7 to 19 NTU range observed in 2007 (OASIS, 2008). The causes for the difference in range of 2007 turbidity levels from 2003 and 2008 are unknown; however they may partially be due to the higher discharge volumes observed in 2003 and 2008. According to the AWQS, turbidity must be less than 5 NTU over background; however, background levels have not been established for the Kenai River so exceedances of this standard cannot be determined.

FIGURE 22: KENAI RIVER TURBIDITY LEVELS JULY 21-22, 2008



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4. CONCLUSIONS

The hydrocarbon and water quality sampling results indicate that all samples collected from the Kenai River between July 19 and July 22, 2008, complied with AWQS for TAH. The TAH concentrations were very low at 6 am, rose to 3-4 ug/L in the morning, and varied around this level until they dropped in the evening to very low levels again.

TAH concentrations at each of the RMs were similar. Those at RM 10.1 were generally slightly higher than those at RM 1.5 and 5; however the highest values were recorded at RM 1. As was observed in the 2003 and 2007 sampling efforts, no significant differences in TAH levels were observed at different depths or cross-sections of the river. The maximum, minimum, and median values for the 2008 TAH results at RM 10.1 were much lower than those observed in 2003 and similar to those observed in 2007.

Field measurements of temperature and dissolved oxygen did not indicate any exceedances. Measurements of pH at RMs 5 and 10.1 also didn't indicate exceedances; some pH measurements at RM 1.5 were higher than the WQS. Turbidity levels were similar to those measured in 2003 and higher than those measured during 2007, when lower discharge rates occurred. Conductivity and salinity were similar at all times at RMs 5 and 10.1; however, these parameters varied significantly with tidal stage at RM 1.5. Evaluation of salinity calculations at RM 1.5 and water temperature measurements suggests that the Kenai River freshwater over-rides incoming marine tides in this area.

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5. DATA VALIDATION

5.1. Adherence to Sampling Plan

Almost all sampling occurred as outlined in sampling and quality assurance plan developed by OASIS and approved by ADEC (OASIS, 2008b).Though field crews made every attempt to follow protocols in the sampling plan, there were some deviations:

- Samples were not collected at RM 10.1 during the morning of July 20, 2008 due to unexpected boat operation problems experienced by the scheduled sampling crew when returning the boat after midnight the previous evening. Due to potential safety concerns with lack of sleep, their RM 10.1 sampling effort began later than planned.
- Water quality measurements were collected at RM 10.1 on July 19, but are not regarded as accurate due to problems with operation of the meter probe in the flow-through cell. TAH samples were collected and were not affected by the meter probe problem. The operation problem was identified and corrected
- Some samples slightly exceeded holding temperatures upon delivery to the analytical laboratory. These samples were prioritized for analysis and an evaluation indicated results were similar to those for which temperatures were not exceeded.
- One sample was frozen in an analytical laboratory's refrigerator and was not successfully analyzed.

A few samples were not collected at RM 1.5 by KWF. It was beyond the scope of OASIS's project to perform detailed data validation on the KWF sampling effort. However, as discussed below, both OASIS and KWF operated under similar QAPPs approved by ADEC and a comparison of replicate samples analyzed by the OASIS and KWF subcontracted laboratories indicated good agreement in analytical results.

All other protocols were followed as specified in the QAPP, and the above deviations do not impact the study conclusions. Below is a more detailed discussion of the data validation process of analytical results and field quality measurements.

5.2. Analytical Results

The analytical results for the surface water and associated laboratory quality assurance and quality control (QA/QC) samples were reviewed to determine the integrity of the reported analytical results and determine if they met established data quality objectives.

Documentation associated with the surface water samples was reviewed to determine compliance with recommended holding times and sample preservation techniques. All Chain of Custody information was properly completed, signed and dated. All samples were analyzed by the laboratory identified in the ADEC-approved QAPP. All but one sample underwent the intended analysis. One sample (RM5-RBS-072208-1400) was not analyzed as to of its three sample vials were frozen in the analytical laboratory's refrigerator and the other vial was not analyzed due to an equipment malfunction.

All samples were analyzed within holding times. When samples were received at the analytical lab, some temperature blanks were warmer than 6°C, the top range of the specified holding temperature (4.0°C +/- 2.0°C). Temperatures of coolers were lower; the highest cooler temperature was 7.2°C for those coolers where temperature blanks exceeded 6°C. Discussions with field and laboratory personnel and review of field logs indicated samples were properly cooled prior to transport, but insufficient ice was placed in some coolers during the first transport to the laboratory. After identifying the problem, corrective action was taken to ensure the second shipment had enough ice. Subsequent samples were received at the lab within specified holding temperatures. A review of analytical results did not indicate that samples in containers with temperature blanks with exceedances had lower TAH concentrations. Similar minor exceedances were observed in 2003 and 2007 sampling efforts, and as concluded in those studies, they are not believed to have resulted in lower concentrations of TAHs in samples. The data was not qualified, as the potential for bias was minimal.

Most samples were preserved as outlined in the sampling plan. The project's sample collection method specified addition of hydrochloric acid preservative to sample vials after samples were collected, and collected water in the Wildco sampler was used to top off samples after preservative was added. Preservative was stored in small containers only opened during sample collection. Samples collected at RM 23 were intentionally not preserved with hydrochloric acid as sample vials were capped while submerged underwater to ensure no air bubbles were introduced; as the Wildco sampler was not used at RM 23, no representative water was available to top off samples.

During sample analyses, the analytical laboratory validated that all other sample were preserved with hydrochloric acid with two exceptions. A review of field logs and discussions with sampling personnel didn't indicate a cause for lack of preservative for two samples. These samples were analyzed within 7 days, which is the method's specified holding time for unpreserved samples. Therefore, the lack of preservative in these two samples did not impact the usability of their analytical results.

Field duplicates were collected to assess precision of the collection and analytical procedures. Twenty-eight duplicates and 18 split samples were collected at a rate of 10% of samples to represent different sampling locations, depths, and times. Field duplicates were submitted blind to the laboratory (i.e., they could not be identified by laboratory personnel as duplicates). Calculation of relative percent differences (RPDs) between primary and duplicate results requires that analyte concentrations must be greater than 10 times their reporting limit. Analytes were not detected at concentrations greater than 10 times the reporting limit, so no RPDs could be calculated.

Decontamination blanks were not collected or analyzed. During the 2003 study, decontamination blanks were collected and no TAH was detected. This was expected, as very low levels of TAH were in river water, and the sampling equipment was rinsed in Alconox and extensively flushed in river water prior to obtaining samples. As the same conditions existed and the same collection methods were used, no decontamination blanks were collected in the 2007 study or in this 2008 study.

Method blanks were analyzed to detect instrument and sample cross-contamination. All method blanks were below Practical Quantitation Limits.

Laboratory control samples and laboratory control sample duplicates (LCS/LCSD) were analyzed to confirm acceptable recovery of target analytes. No analytes in the LCS and LCSD samples were outside method control limits.

Matrix spikes and matrix spike duplicate (MS/MSD) samples were analyzed to evaluate possible matrix interference with analyte detection. No compounds used for matrix spikes or other laboratory contaminants were reported in associated project samples. Percent recoveries for multiple analytes in the MS and MSD, and RPDs for multiple analytes were outside method limits, which are common when analytes are present near method detection limits, and data usability was therefore not affected.

5.2.1. Comparison of Analytical Laboratory Results

To the extent possible, OASIS and KWF projects used the same sampling and analytical procedures and collected samples at the same times. As they contracted with different analytical laboratories, a quality control check was conducted to determine if any variations in sample results may have been due to differences in analyses and reporting by the two laboratories. To achieve this, six split samples (labeled triplicates) were collected by OASIS and KWF twice a day (noon and 6 pm) at each location at times when duplicates were also collected. For these events, four vials were filled in the Wildco sampler and processed in the field following normal procedures. Two vials (referred to as "triplicates") were subsequently transferred to the other organization and sent by them to their laboratory for analyses. The other two vials were (referred to as "originals") were kept by the sampling organization and processed as normal. Immediately after collection of the four vials, a "duplicate" sample was collected, processed and analyzed following normal procedures.

Table 3 shows that similar method detection limits were reported by the two laboratories. Totals for reporting / practical quantitation limits for TAH constituents are also similar.

TABLE 3 LABORATORY DETECTION AND REPORTING LIMITS

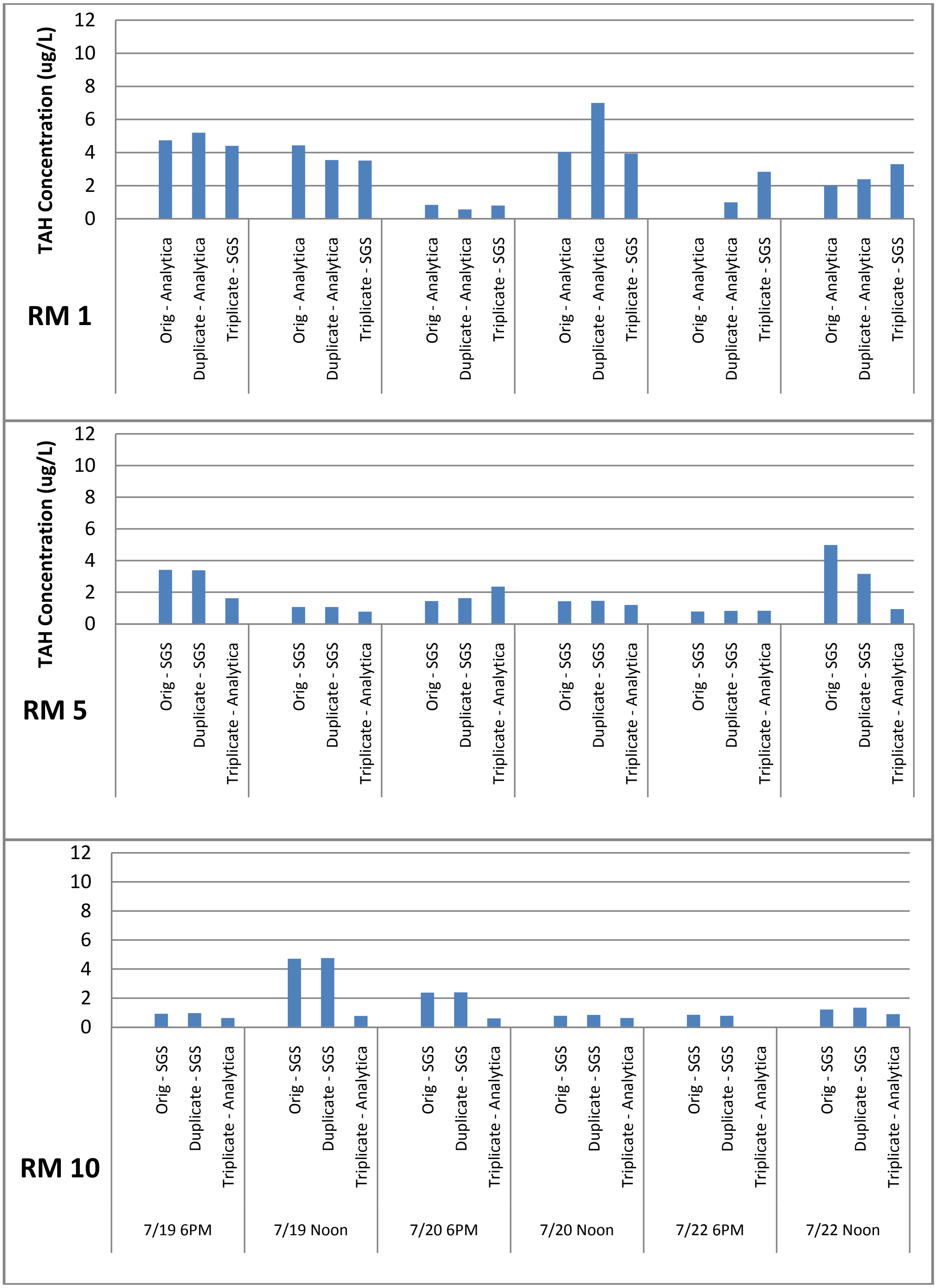
Limit type	Analytical Laboratory	Benzene	Toluene	Ethyl-benzene	Xylene - O	Xylene -M,P	Limits Sum
MDL	Analytica	0.3	0.3	0.3	0.2	0.5	1.6
	SGS	0.12	0.31	0.31	0.31	0.62	1.67
PQL / RPL	Analytica (PQL)	1	1	1	1	1	5
	SGS (RPL)	0.4	1	1	1	2	5.4
"MDL" = Method Detection Limit, "PQL" = Practical Quantitation Limit, "RPL" = Reporting Quantitation Limit							

Table 4 and Figure 23 (below) show that generally consistent results were found between the laboratories for replicates collected through this process.

TABLE 4: COMPARISON OF LABORATORY MEASUREMENTS OF TAH (UG/L) REPLICATES

Laboratory	Mean	Standard Deviation	Minimum recorded	Maximum Recorded
Analytica	1.96	1.88	0.00	7.00
SGS	2.18	1.42	0.78	4.98
Average	2.08	1.63	0.00	7.00

FIGURE 23: COMPARISON OF LABORATORY REPLICATE ANALYSES



5.3. Project Completeness for TAH Analyses

Project completeness measures the number of valid samples collected and analyzed divided by the number called for in the sampling design. Approximately ninety-six percent of samples were collected according to the sampling design. Ninety-nine percent of the collected samples submitted to the laboratory were analyzed and no data were rejected. The completeness for sampling and analysis for all TAH samples was 95%, meeting OASIS' goal of 95% for the project. The data quality objectives for the TAH measurements have been satisfied.

5.4. Field Measurements

The field measurements for this project included pH, temperature, dissolved oxygen, conductivity and turbidity. To the extent possible, these measurements were obtained as outlined in the sampling plan and QAPP (OASIS, 2008b). The field procedures and their data validation are discussed in the section on results.

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APPENDIX A

Kenai River 2008 Sampling Results Summary

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Appendix A - Kenai River 2008 Sampling Results Summary

Sample ID	RM	Sect	S/D	Date	TIme	Orig / Rep	Sam-pler	Lab doing analysis	Lab Comp Session	TAH (BTEX) (ug/L)	Benzene (ug/L)	Toluene (ug/L)	Ethyl-benzene (ug/L)	o-Xylene (ug/L)	m&p-Xylene (ug/L)	pH	DO (mg/L)	Tur-bidity (NTU)	Cond-uctivity (µS /cm)	Temp (°C)
TD 2	1.5	TW	D	7/19/2008	6:00	Orig	KWF	Analytica		ND	ND (0.3)	ND (0.3)	ND (0.3)	ND (0.2)	ND (0.5)	8.57	10.1	60	9715	10.07
TS 1	1.5	TW	S	7/19/2008	6:00	Orig	KWF	Analytica		1.53	ND (0.3)	0.93J	ND (0.3)	ND (0.2)	0.6J	8.04	10.15	46.9	10339	10.12
TS 1-DUP	1.5	TW	S	7/19/2008	6:00	Dup	KWF	Analytica		0.86	ND (0.3)	0.86J	ND (0.3)	ND (0.2)	ND (0.5)	8.36	10.21	69.7	8253	9.99
LBD 6	1.5	LB	D	7/19/2008	8:00	Orig	KWF	Analytica												
LBS 5	1.5	LB	S	7/19/2008	8:00	Orig	KWF	Analytica		ND	ND (0.3)	ND (0.3)	ND (0.3)	ND (0.2)	ND (0.5)	8.69	10.57	145.6	1608	9.36
RBD 8	1.5	RB	D	7/19/2008	8:00	Orig	KWF	Analytica		1.57	ND (0.3)	1.00	ND (0.3)	ND (0.2)	0.57J	8.63	10.05	76.4	11556	9.9
RBS 7	1.5	RB	S	7/19/2008	8:00	Orig	KWF	Analytica		4.56	0.86J	2.60	ND (0.3)	ND (0.2)	1.10	8.34	9.95	36.5	15656	10.25
TD 4	1.5	TW	D	7/19/2008	8:00	Orig	KWF	Analytica		0.69	ND (0.3)	0.69J	ND (0.3)	ND (0.2)	ND (0.5)	8.28	10.25		8840	9.82
TS 3	1.5	TW	S	7/19/2008	8:00	Orig	KWF	Analytica		0.68	ND (0.3)	0.68J	ND (0.3)	ND (0.2)	ND (0.5)	8.4	10.33	47.6	5012	9.66
TD 10	1.5	TW	D	7/19/2008	10:00	Orig	KWF	Analytica		1.75	ND (0.3)	1.20	ND (0.3)	ND (0.2)	0.55J	8.58	10.65	174.1	102.9	8.99
TS 9	1.5	TW	S	7/19/2008	10:00	Orig	KWF	Analytica		2.00	ND (0.3)	1.30	ND (0.3)	ND (0.2)	0.7J	8.84	10.68	143.3	93.1	9
TS 11 DUP	1.5	TW	S	7/19/2008	12:00	Dup	KWF	Analytica	7/19 Noon	3.55	0.8J	1.90	ND (0.3)	ND (0.2)	0.85J	8.15	10.51	256.6	88.7	9.27
TS 11	1.5	TW	S	7/19/2008	12:00	Orig	KWF	Analytica	7/19 Noon	4.44	0.94J	2.40	ND (0.3)	ND (0.2)	1.10	9.33	10.55		93.1	9.22
TD 12-DUP	1.5	TW	D	7/19/2008	12:00	Trip	KWF	SGS	7/19 Noon	3.52	0.65	1.89	ND (0.31)	0.63J	0.35					
LBD 16	1.5	LB	D	7/19/2008	14:00	Orig	KWF	Analytica		3.34	0.81J	1.70	ND (0.3)	ND (0.2)	0.83J	8.2	10.51	187.1	87.3	9.68
LBS 15	1.5	LB	S	7/19/2008	14:00	Orig	KWF	Analytica		2.65	0.56J	1.40	ND (0.3)	ND (0.2)	0.69J	8.16	10.47	411.6	101.3	9.73
RBD 18	1.5	RB	D	7/19/2008	14:00	Orig	KWF	Analytica		4.38	0.98J	2.20	ND (0.3)	ND (0.2)	1.20	8.17	10.39	281.6	123.3	9.82
RBS 17	1.5	RB	S	7/19/2008	14:00	Orig	KWF	Analytica		4.46	0.96J	2.30	ND (0.3)	ND (0.2)	1.20	8.19	10.46	232.6	102.5	9.77
TD 14	1.5	TW	D	7/19/2008	14:00	Orig	KWF	Analytica		3.80	0.83J	2.10	ND (0.3)	ND (0.2)	0.87J	8.12	10.53	224.5	85.4	9.57
TS 13	1.5	TW	S	7/19/2008	14:00	Orig	KWF	Analytica		4.11	0.91J	2.20	ND (0.3)	ND (0.2)	1.00	8.2	10.55		86.6	9.58
TD 20	1.5	TW	D	7/19/2008	16:00	Orig	KWF	Analytica		ND	ND (0.3)	ND (0.3)	ND (0.3)	ND (0.2)	ND (0.5)	8.63	9.31	266.1	33206	11.95
TS 19	1.5	TW	S	7/19/2008	16:00	Orig	KWF	Analytica		ND	ND (0.3)	ND (0.3)	ND (0.3)	ND (0.2)	ND (0.5)	8.74	9.5	123	24598	12.11
TS 21-DUP	1.5	TW	S	7/19/2008	18:00	Dup	KWF	Analytica	7/19 6PM	5.20	1.10	2.70	ND (0.3)	ND (0.2)	1.40	8.68	9.62	44.8	19252	11.85
TS 21	1.5	TW	S	7/19/2008	18:00	Orig	KWF	Analytica	7/19 6PM	4.74	0.94J	2.50	ND (0.3)	ND (0.2)	1.30	8.71	9.47	40	22652	11.9
TS 21-DUP2	1.5	TW	S	7/19/2008	18:00	Trip	KWF	SGS	7/19 6PM	4.41	0.75	2.44	ND (0.31)	0.82J	0.40					
TD 22	1.5	TW	D	7/19/2008	18:00	Orig	KWF	Analytica		ND	ND (0.3)	ND (0.3)	ND (0.3)	ND (0.2)	ND (0.5)	8.79	9.16	35.2	36557	12.08
LBS 25	1.5	LB	S	7/19/2008	20:00	Orig	KWF	Analytica		2.89	0.64J	1.50	ND (0.3)	ND (0.2)	0.75J	8.27	10.3	909	2378	10.38
RBD 28	1.5	RB	D	7/19/2008	20:00	Orig	KWF	Analytica		2.65	0.56J	1.40	ND (0.3)	ND (0.2)	0.69J	8.38	10.16	44.3	8586	10.54
RBS 27	1.5	RB	S	7/19/2008	20:00	Orig	KWF	Analytica		3.40	0.7J	1.90	ND (0.3)	ND (0.2)	0.8J	8.3	10.14	100.1	7980	10.63
TD 24	1.5	TW	D	7/19/2008	20:00	Orig	KWF	Analytica		4.03	0.83J	2.10	ND (0.3)	ND (0.2)	1.10	8.52	9.92	84.2	11950	10.81
TS 23	1.5	TW	S	7/19/2008	20:00	Orig	KWF	Analytica		6.87	1.30	3.20	ND (0.3)	0.67J	1.70	8.5	10.23	136.6	3633	10.58
LBD 26	1.5	LB	D	7/19/2008	22:00	Orig	KWF	Analytica		1.00	ND (0.3)	1.00	ND (0.3)	ND (0.2)	ND (0.5)	8.53	10.54	178.8	98.9	10.24
TD 30	1.5	TW	D	7/19/2008	22:00	Orig	KWF	Analytica		0.90	ND (0.3)	0.9J	ND (0.3)	ND (0.2)	ND (0.5)	8.33	10.53	136.6	1269	10.31
TS 29	1.5	TW	S	7/19/2008	22:00	Orig	KWF	Analytica		1.10	ND (0.3)	1.10	ND (0.3)	ND (0.2)	ND (0.5)	8.47	10.47	95	2199	10.3
TD 32	1.5	TW	D	7/19/2008	23:59	Orig	KWF	Analytica		0.51	ND (0.3)	0.51J	ND (0.3)	ND (0.2)	ND (0.5)	8.27	10.55	177.5	87.2	10.2
TS 31	1.5	TW	S	7/19/2008	23:59	Orig	KWF	Analytica		0.57	ND (0.3)	0.57J	ND (0.3)	ND (0.2)	ND (0.5)	8.33	10.59	151.2	88.5	10.23
TD 34	1.5	TW	D	7/20/2008	6:00	Orig	KWF	Analytica		ND	ND (0.3)	ND (0.3)	ND (0.3)	ND (0.2)	ND (0.5)	8.44	9.19	22	38611	11.55
TS 33	1.5	TW	S	7/20/2008	6:00	Orig	KWF	Analytica		ND	ND (0.3)	ND (0.3)	ND (0.3)	ND (0.2)	ND (0.5)	8.55	10.28	56	6100	10.03
TS 33-DUP	1.5	TW	S	7/20/2008	6:00	Dup	KWF	Analytica		0.55	ND (0.3)	0.55J	ND (0.3)	ND (0.2)	ND (0.5)	8.51	10.24	54	10302	10.24
LBS 37	1.5	LB	S	7/20/2008	8:00	Orig	KWF	Analytica		ND	ND (0.3)	ND (0.3)	ND (0.3)	ND (0.2)	ND (0.5)	8.52	10.29	612	10616	10.15
LBS 37 DUP	1.5	LB	D	7/20/2008	8:00	Dup	KWF	Analytica		ND	ND (0.3)	ND (0.3)	ND (0.3)	ND (0.2)	ND (0.5)	8.79	10.7	95		10.03
RBD 40	1.5	RB	D	7/20/2008	8:00	Orig	KWF	Analytica		0.68	ND (0.3)	0.68J	ND (0.3)	ND (0.2)	ND (0.5)	8.6	10.47	40	6637	10.26
RBS 39	1.5	RB	S	7/20/2008	8:00	Orig	KWF	Analytica		0.61	ND (0.3)	0.61J	ND (0.3)	ND (0.2)	ND (0.5)	8.34	10.15	95	12849	10.57
TD 36	1.5	TW	D	7/20/2008	8:00	Orig	KWF	Analytica		ND	ND (0.3)	ND (0.3)	ND (0.3)	ND (0.2)	ND (0.5)	8.66	10.24	60.7	11716	10.44
TS 35	1.5	TW	S	7/20/2008	8:00	Orig	KWF	Analytica		ND	ND (0.3)	ND (0.3)	ND (0.3)	ND (0.2)	ND (0.5)	8.42	10.51	55	8342	10.21
TD 42	1.5	TW	D	7/20/2008	10:00	Orig	KWF	Analytica		0.62	ND (0.3)	0.62J	ND (0.3)	ND (0.2)	ND (0.5)	8.7	10.72	474	184.4	10.02
TS 41	1.5	TW	S	7/20/2008	10:00	Orig	KWF	Analytica		ND	ND (0.3)	ND (0.3)	ND (0.3)	ND (0.2)	ND (0.5)	8.94	10.77	128	719	10.04
TD 44-DUP	1.5	TW	D	7/20/2008	12:00	Dup	KWF	Analytica	7/20 Noon	7.00	1.30	3.40	ND (0.3)	0.6J	1.70	8.3	10.69	222	90.5	10.32
TD 44	1.5	TW	D	7/20/2008	12:00	Orig	KWF	Analytica	7/20 Noon	4.03	0.83J	2.20	ND (0.3)	ND (0.2)	1.00	8.39	10.66	215	94.7	10.26
TD44-DUP2	1.5	TW	D	7/20/2008	12:00	Trip	KWF	SGS	7/20 Noon	3.94	0.65	2.14	ND (0.31)	0.75J	0.40					
TS 43	1.5	TW	S	7/20/2008	12:00	Orig	KWF	Analytica		4.16	0.86J	2.20	ND (0.3)	ND (0.2)	1.10	8.5	10.71	184.7	88	10.21
LBS 47	1.5	LB	S	7/20/2008	14:00	Orig	KWF	Analytica		4.10	0.9J	2.20	ND (0.3)	ND (0.2)	1.00	8.4	10.65	288	95	10.83
X 48	1.5	LB	S	7/20/2008	14:00	Orig	KWF	Analytica		3.05	0.67J	1.60	ND (0.3)	ND (0.2)	0.78J	8.28	10.65	235	96	10.79
X46	1.5	LB	D	7/20/2008	14:00	Orig	KWF	Analytica		4.27	0.87J	2.30	ND (0.3)	ND (0.2)	1.10	8.29	10.72	160	81	10.67

Appendix A - Kenai River 2008 Sampling Results Summary

Sample ID	RM	Sect	S/D	Date	TIme	Orig / Rep	Sam-pler	Lab doing analysis	Lab Comp Session	TAH (BTEX) (ug/L)	Benzene (ug/L)	Toluene (ug/L)	Ethyl-benzene (ug/L)	o-Xylene (ug/L)	m&p-Xylene (ug/L)	pH	DO (mg/L)	Tur-bidity (NTU)	Cond-uctivity (µS /cm)	Temp (°C)
TD 2	1.5	TW	D	7/19/2008	6:00	Orig	KWF	Analytica		ND	ND (0.3)	ND (0.3)	ND (0.3)	ND (0.2)	ND (0.5)	8.57	10.1	60	9715	10.07
TS 1	1.5	TW	S	7/19/2008	6:00	Orig	KWF	Analytica		1.53	ND (0.3)	0.93J	ND (0.3)	ND (0.2)	0.6J	8.04	10.15	46.9	10339	10.12
RBD 50	1.5	RB	D	7/20/2008	14:00	Orig	KWF	Analytica												
RBS 49	1.5	RB	S	7/20/2008	14:00	Orig	KWF	Analytica		3.48	0.73J	1.90	ND (0.3)	ND (0.2)	0.85J	8.31	10.54	392	126	11.03
TS 45	1.5	TW	S	7/20/2008	14:00	Orig	KWF	Analytica		4.07	0.87J	2.20	ND (0.3)	ND (0.2)	1.00	8.33	10.66	215	92	10.66
TD 52	1.5	TW	D	7/20/2008	16:00	Orig	KWF	Analytica		ND	ND (0.3)	ND (0.3)	ND (0.3)	ND (0.2)	ND (0.5)	8.35	10.05	158.1	6002	12.4
TS 51	1.5	TW	S	7/20/2008	16:00	Orig	KWF	Analytica		1.00	ND (0.3)	1.00	ND (0.3)	ND (0.2)	ND (0.5)	8.17	10.32	231.4	1155	11.93
TS 53-DUP	1.5	TW	S	7/20/2008	18:00	Dup	KWF	Analytica	7/20 6PM	0.57	ND (0.3)	0.57J	ND (0.3)	ND (0.2)	ND (0.5)	8.62	9.55	52.1	17052	12.62
TS 53	1.5	TW	S	7/20/2008	18:00	Orig	KWF	Analytica	7/20 6PM	0.84	ND (0.3)	0.84J	ND (0.3)	ND (0.2)	ND (0.5)	8.54	9.66	52.2	15590	12.55
TS 53-DUP2	1.5	TW	S	7/20/2008	18:00	Trip	KWF	SGS	7/20 6PM	0.80	0.2J	0.6J	ND (0.31)	ND (0.31)	ND (0.62)					
TD 54	1.5	TW	D	7/20/2008	18:00	Orig	KWF	Analytica		ND	ND (0.3)	ND (0.3)	ND (0.3)	ND (0.2)	ND (0.5)	8.72	9.12	140.7	33902	12.46
LBS 57	1.5	LB	S	7/20/2008	20:00	Orig	KWF	Analytica		0.65	ND (0.3)	0.65J	ND (0.3)	ND (0.2)	ND (0.5)	8.63	9.71	107.7	17630	11.93
RBS 59	1.5	RB	S	7/20/2008	20:00	Orig	KWF	Analytica		2.78	0.58J	1.50	ND (0.3)	ND (0.2)	0.7J	8.72	10.03	77.2	9046	11.81
TD 56	1.5	TW	D	7/20/2008	20:00	Orig	KWF	Analytica		2.34	0.52J	1.30	ND (0.3)	ND (0.2)	0.52J	8.79	10.02	106.7	4902	12.19
TS 55	1.5	TW	S	7/20/2008	20:00	Orig	KWF	Analytica		3.24	0.69J	1.80	ND (0.3)	ND (0.2)	0.75J	8.45	10.15	100.6	6859	11.84
LBD 58	1.5	LB	D	7/20/2008	22:00	Orig	KWF	Analytica		1.10	ND (0.3)	1.10	ND (0.3)	ND (0.2)	ND (0.5)	8.54	10.63	170.9	375	11.33
LBD 60	1.5	RB	D	7/20/2008	22:00	Orig	KWF	Analytica		0.63	ND (0.3)	0.63J	ND (0.3)	ND (0.2)	ND (0.5)	8.45	10.63	228	182.2	11.31
TD 62	1.5	TW	D	7/20/2008	22:00	Orig	KWF	Analytica		0.60	ND (0.3)	0.6J	ND (0.3)	ND (0.2)	ND (0.5)	8.53	10.5	119.3	2778	11.46
TS 61	1.5	TW	S	7/20/2008	22:00	Orig	KWF	Analytica		0.72	ND (0.3)	0.72J	ND (0.3)	ND (0.2)	ND (0.5)	8.57	10.47	102	3137	11.44
TD 64	1.5	TW	D	7/20/2008	23:59	Orig	KWF	Analytica		ND	ND (0.3)	ND (0.3)	ND (0.3)	ND (0.2)	ND (0.5)	8.37	10.67	220.1	92.7	11.23
TS 63	1.5	TW	S	7/20/2008	23:59	Orig	KWF	Analytica		ND	ND (0.3)	ND (0.3)	ND (0.3)	ND (0.2)	ND (0.5)	8.45	10.69	262.2	93.9	11.26
TD 66	1.5	TW	D	7/22/2008	6:00	Orig	KWF	Analytica		ND	ND (0.3)	ND(0.3)	ND (0.3)	ND (0.2)	ND (0.5)	8.43	8.85		36645	11.5
TS 65	1.5	TW	S	7/22/2008	6:00	Orig	KWF	Analytica		ND	ND (0.3)	ND(0.3)	ND (0.3)	ND (0.2)	ND (0.5)	7.66	9.89	55	14659	10.87
TS 65-DUP	1.5	TW	S	7/22/2008	6:00	Dup	KWF	Analytica		ND	ND (0.3)	ND(0.3)	ND (0.3)	ND (0.2)	ND (0.5)	8.26	9.41	53.9	14026	11
LBD 70	1.5	LB	D	7/22/2008	8:00	Orig	KWF	Analytica												
LBS 69	1.5	LB	S	7/22/2008	8:00	Orig	KWF	Analytica		ND	ND (0.3)	ND(0.3)	ND (0.3)	ND (0.2)	ND (0.5)	8.89	9.88	166.4	4900	10.75
RBS 71	1.5	RB	S	7/22/2008	8:00	Orig	KWF	Analytica		ND	ND (0.3)	ND(0.3)	ND (0.3)	ND (0.2)	ND (0.5)	8.84	10.09	72.7	6790	10.72
X72	1.5	RB	D	7/22/2008	8:00	Orig	KWF	Analytica		ND	ND (0.3)	ND(0.3)	ND (0.3)	ND (0.2)	ND (0.5)	8.8	10.04	67.7	6895	10.74
TD 68	1.5	TW	D	7/22/2008	8:00	Orig	KWF	Analytica		ND	ND (0.3)	ND(0.3)	ND (0.3)	ND (0.2)	ND (0.5)	7.6	9.58	29.8	22575	11.02
TS 67	1.5	TW	S	7/22/2008	8:00	Orig	KWF	Analytica		ND	ND (0.3)	ND(0.3)	ND (0.3)	ND (0.2)	ND (0.5)	8.88	10.21	87.4	5841	10.69
TD 74	1.5	TW	D	7/22/2008	10:00	Orig	KWF	Analytica		ND	ND (0.3)	ND(0.3)	ND (0.3)	ND (0.2)	ND (0.5)	8.6	9.89	76.8	10700	10.72
TS 73	1.5	TW	S	7/22/2008	10:00	Orig	KWF	Analytica		ND	ND (0.3)	ND(0.3)	ND (0.3)	ND (0.2)	ND (0.5)	8.75	10.15	41.2	4661	10.49
TD 76-DUP	1.5	TW	D	7/22/2008	12:00	Dup	KWF	Analytica	7/22 Noon	2.39	0.55J	1.30	ND (0.3)	ND (0.2)	0.54J	8.76	10.42	180.6	93.1	10.24
TD 76	1.5	TW	D	7/22/2008	12:00	Orig	KWF	Analytica	7/22 Noon	2.02	0.62J	1.40	ND (0.3)	ND (0.2)	ND (0.5)	8.78	10.44	169.3	88.5	10.22
TD 76-DUP2	1.5	TW	D	7/22/2008	12:00	Trip	KWF	SGS	7/22 Noon	3.30	0.60	1.04	ND (0.31)	1.66	ND (0.62)					
TS 75	1.5	TW	S	7/22/2008	12:00	Orig	KWF	Analytica		2.39	0.56J	1.30	ND (0.3)	ND (0.2)	0.53J	9.25	10.44	174.5	102.5	10.23
LBS 79	1.5	LB	S	7/22/2008	14:00	Orig	KWF	Analytica		2.39	0.59J	1.30	ND (0.3)	ND (0.2)	0.5J	8.59	10.36	284.2	94.7	10.52
X80	1.5	LB	D	7/22/2008	14:00	Orig	KWF	Analytica		1.20	ND (0.3)	1.20	ND (0.3)	ND (0.2)	ND (0.5)	8.37	10.3	384.7	118.1	10.57
RBS 81	1.5	RB	S	7/22/2008	14:00	Orig	KWF	Analytica		2.91	0.81J	1.50	ND (0.3)	ND (0.2)	0.6J	8.55	10.22	850	136.1	10.25
X82	1.5	RB	D	7/22/2008	14:00	Orig	KWF	Analytica		1.86	0.56J	1.30	ND (0.3)	ND (0.2)	ND (0.5)	8.39	10.23	1018	122.9	10.86
TS 77	1.5	TW	S	7/22/2008	14:00	Orig	KWF	Analytica		2.96	0.71J	1.60	ND (0.3)	ND (0.2)	0.65J	9.04	10.41	208.7	86	10.44
X78	1.5	TW	D	7/22/2008	14:00	Orig	KWF	Analytica		2.35	0.54J	1.30	ND (0.3)	ND (0.2)	0.51J	8.42	10.38	181.6	79.4	10.51
TD 84	1.5	TW	D	7/22/2008	16:00	Orig	KWF	Analytica		2.48	0.64J	1.30	ND (0.3)	ND (0.2)	0.54J	8.27	10.34	148.5	93.5	10.79
TS 83	1.5	TW	S	7/22/2008	16:00	Orig	KWF	Analytica		1.58	0.65J	0.93J	ND (0.3)	ND (0.2)	ND (0.5)	8.41	10.45	98.7	77.6	10.75
TS 85-DUP	1.5	TW	S	7/22/2008	18:00	Dup	KWF	Analytica	7/22 6PM	1.00	ND (0.3)	1.00	ND (0.3)	ND (0.2)	ND (0.5)	8.57	9.62	70.9	15116	11.44
TS 85	1.5	TW	S	7/22/2008	18:00	Orig	KWF	Analytica	7/22 6PM	ND	ND (0.3)	ND(0.3)	ND (0.3)	ND (0.2)	ND (0.5)	8.33	9.2	74.4	12178	11.34
TD 85-DUP2	1.5	TW	S	7/22/2008	18:00	Trip	KWF	SGS	7/22 6PM	2.84	0.37J	0.84J	ND (0.31)	1.63	ND (0.62)					
TD 86	1.5	TW	D	7/22/2008	18:00	Orig	KWF	Analytica		ND	ND (0.3)	ND(0.3)	ND (0.3)	ND (0.2)	ND (0.5)	8.67	8.91	269.9	35635	11.78
LBD 90	1.5	LB	D	7/22/2008	20:00	Orig	KWF	Analytica		ND	ND (0.3)	ND(0.3)	ND (0.3)	ND (0.2)	ND (0.5)	8.89	9.15	51.1	28086	11.64
LBS 89	1.5	LB	S	7/22/2008	20:00	Orig	KWF	Analytica		ND	ND (0.3)	ND(0.3)	ND (0.3)	ND (0.2)	ND (0.5)	9.04	9.19	50.7	25800	11.69
RBS 91	1.5	RB	S	7/22/2008	20:00	Orig	KWF	Analytica		2.65	0.56J	1.40	ND (0.3)	ND (0.2)	0.69J	9.04	9.86	58	9803	11.19
TD 88	1.5	TW	D	7/22/2008	20:00	Orig	KWF	Analytica		ND	ND (0.3)	ND(0.3)	ND (0.3)	ND (0.2)	ND (0.5)	8.74	9	42.3	34280	11.79
TS 87	1.5	TW	S	7/22/2008	20:00	Orig	KWF	Analytica		2.49	0.53J	1.30	ND (0.3)	ND (0.2)	0.66J	8.83	10	61.2	8060	11.25
RBD 92	1.5	RB	D	7/22/2008	22:00	Orig	KWF	Analytica		0.99	ND (0.3)	0.99J	ND (0.3)	ND (0.2)	ND (0.5)	8.73	10.01	60.1	7736	10.96

Appendix A - Kenai River 2008 Sampling Results Summary

Sample ID	RM	Sect	S/D	Date	TIme	Orig / Rep	Sam-pler	Lab doing analysis	Lab Comp Session	TAH (BTEX) (ug/L)	Benzene (ug/L)	Toluene (ug/L)	Ethyl-benzene (ug/L)	o-Xylene (ug/L)	m&p-Xylene (ug/L)	pH	DO (mg/L)	Tur-bidity (NTU)	Cond-uctivity (µS /cm)	Temp (°C)
TD 2	1.5	TW	D	7/19/2008	6:00	Orig	KWF	Analytica		ND	ND (0.3)	ND (0.3)	ND (0.3)	ND (0.2)	ND (0.5)	8.57	10.1	60	9715	10.07
TS 1	1.5	TW	S	7/19/2008	6:00	Orig	KWF	Analytica		1.53	ND (0.3)	0.93J	ND (0.3)	ND (0.2)	0.6J	8.04	10.15	46.9	10339	10.12
TD 94	1.5	TW	D	7/22/2008	22:00	Orig	KWF	Analytica		1.00	ND (0.3)	1.00	ND (0.3)	ND (0.2)	ND (0.5)	8.71	9.89	77.9	12401	11.15
TS 93	1.5	TW	S	7/22/2008	22:00	Orig	KWF	Analytica		1.10	ND (0.3)	1.10	ND (0.3)	ND (0.2)	ND (0.5)	8.92	10.23	75	4417	10.87
TD 96	1.5	TW	D	7/22/2008	23:59	Orig	KWF	Analytica		0.67	ND (0.3)	0.67J	ND (0.3)	ND (0.2)	ND (0.5)	8.77	10.47	104	5944	10.66
TS 95	1.5	TW	S	7/22/2008	23:59	Orig	KWF	Analytica		0.68	ND (0.3)	0.68J	ND (0.3)	ND (0.2)	ND (0.5)	8.83	10.44	69.1	3112	10.73
TS 95-DUP	1.5	TW	S	7/22/2008	23:59	Dup	KWF	Analytica												
RM5-TWD-071908-0600	5	TW	D	7/19/2008	6:00	Orig	OASIS	SGS		ND	ND (0.12)	ND (0.31)	ND (0.31)	ND (0.31)	ND (0.62)					
RM5-TWS-071908-0600	5	TW	S	7/19/2008	6:00	Orig	OASIS	SGS		ND	ND (0.12)	ND (0.31)	ND (0.31)	ND (0.31)	ND (0.62)	7.8	11.94	106	155	9.41
RM5-TWS-071908-0700	5	TW	S	7/19/2008	6:00	Dup	OASIS	SGS		ND	ND (0.12)	ND (0.31)	ND (0.31)	ND (0.31)	ND (0.62)	7.8	11.94	106	155	9.41
RM5-LBD-071908-0800	5	LB	D	7/19/2008	8:00	Orig	OASIS	SGS		0.87	0.23J	0.64J	ND (0.31)	ND (0.31)	ND (0.62)	7.6		118	154	9.27
RM5-LBS-071908-0800	5	LB	S	7/19/2008	8:00	Orig	OASIS	SGS		0.93	0.26J	0.67J	ND (0.31)	ND (0.31)	ND (0.62)	7.59	12.02	185	156	9.34
RM5-RBD-071908-0800	5	RB	D	7/19/2008	8:00	Orig	OASIS	SGS		0.33	ND (0.12)	0.33J	ND (0.31)	ND (0.31)	ND (0.62)	7.61	12.08	72.7	155	9.23
RM5-RBS-071908-0800	5	RB	S	7/19/2008	8:00	Orig	OASIS	SGS		0.66	0.19J	0.47J	ND (0.31)	ND (0.31)	ND (0.62)	7.62	12.17	104	153	9.77
RM5-TWD-071908-0800	5	TW	D	7/19/2008	8:00	Orig	OASIS	SGS		ND	ND (0.12)	ND (0.31)	ND (0.31)	ND (0.31)	ND (0.62)	7.69	12.32	61.7	154	9.22
RM5-TWS-071908-0800	5	TW	S	7/19/2008	8:00	Orig	OASIS	SGS		ND	ND (0.12)	ND (0.31)	ND (0.31)	ND (0.31)	ND (0.62)	7.65	12.29	57.4	151	9.23
RM5-TWD-071908-1000	5	TW	D	7/19/2008	10:00	Orig	OASIS	SGS		1.12	0.3J	0.82J	ND (0.31)	ND (0.31)	ND (0.62)	7.55	12.04	70.4	155	9.35
RM5-TWS-071908-1000	5	TW	S	7/19/2008	10:00	Orig	OASIS	SGS		1.08	0.33J	0.75J	ND (0.31)	ND (0.31)	ND (0.62)	7.56	12	123	156	9.37
RM5-TWD-071908-1300	5	TW	D	7/19/2008	12:00	Dup	OASIS	SGS	7/19 Noon	1.07	0.3J	0.77J	ND (0.31)	ND (0.31)	ND (0.62)	7.4	12.16	132	162	9.92
RM5-TWD-071908-1200	5	TW	D	7/19/2008	12:00	Orig	OASIS	SGS	7/19 Noon	1.07	0.32J	0.75J	ND (0.31)	ND (0.31)	ND (0.62)	7.4	12.16	132	162	9.92
RM5-TWD-071908-1230	5	TW	D	7/19/2008	12:00	Trip	OASIS	Analytica	7/19 Noon	0.77	ND (0.3)	0.77J	ND (0.3)	ND (0.2)	ND (0.5)	7.4	12.16	132	162	9.92
RM5-TWS-071908-1200	5	TW	S	7/19/2008	12:00	Orig	OASIS	SGS		1.24	0.35J	0.89J	ND (0.31)	ND (0.31)	ND (0.62)	7.57	12.13	130	155	9.86
RM5-LBD-071908-1400	5	LB	D	7/19/2008	14:00	Orig	OASIS	SGS		2.03	0.35J	ND (0.31)	ND (0.31)	ND (0.31)	1.68J	7.25	11.91	228	160	10.15
RM5-LBS-071908-1400	5	LB	S	7/19/2008	14:00	Orig	OASIS	SGS		1.66	ND (0.12)	ND (0.31)	ND (0.31)	ND (0.31)	1.66J	7.23	12.11	319	163	10.41
RM5-RBD-071908-1400	5	RB	D	7/19/2008	14:00	Orig	OASIS	SGS		2.06	0.37J	ND (0.31)	ND (0.31)	ND (0.31)	1.69J	7.4	11.73	106	156	10.27
RM5-RBS-071908-1400	5	RB	S	7/19/2008	14:00	Orig	OASIS	SGS		1.68	ND (0.12)	ND (0.31)	ND (0.31)	ND (0.31)	1.68J	7.46	11.77	178	160	10.27
RM5-TWD-071908-1400	5	TW	D	7/19/2008	14:00	Orig	OASIS	SGS		1.70	ND (0.12)	ND (0.31)	ND (0.31)	ND (0.31)	1.7J	7.36	12.19	136	158	9.93
RM5-TWS-071908-1400	5	TW	S	7/19/2008	14:00	Orig	OASIS	SGS		3.04	0.42	0.88J	ND (0.31)	ND (0.31)	1.74J	7.47	11.95	85.2	156	9.93
RM5-TWD-071908-1600	5	TW	D	7/19/2008	16:00	Orig	OASIS	SGS		1.45	0.39J	1.06	ND (0.31)	ND (0.31)	ND (0.62)	7.53	12.15	207	161	10.28
RM5-TWS-071908-1600	5	TW	S	7/19/2008	16:00	Orig	OASIS	SGS		1.19	0.31J	0.88J	ND (0.31)	ND (0.31)	ND (0.62)	7.55	11.9	94.7	161	10.82
RM5-TWS-071908-1830	5	TW	S	7/19/2008	18:00	Dup	OASIS	SGS	7/19 6PM	3.39	0.50	1.11	ND (0.31)	ND (0.31)	1.78J	7.52	12.21	263	167	10.78
RM5-TWS-071908-1800	5	TW	S	7/19/2008	18:00	Orig	OASIS	SGS	7/19 6PM	3.41	0.49	1.15	ND (0.31)	ND (0.31)	1.77J	7.52	12.21	263	167	10.78
RM5-TWS-071908-1900	5	TW	S	7/19/2008	18:00	Trip	OASIS	Analytica	7/19 6PM	1.62	ND (0.3)	1.10	ND (0.3)	ND (0.2)	0.52J					
RM5-TWD-071908-1800	5	TW	D	7/19/2008	18:00	Orig	OASIS	SGS		3.45	0.47	1.15	ND (0.31)	ND (0.31)	1.83J	7.38	11.88	184	170	10.45
RM5-LBD-071908-2000	5	LB	D	7/19/2008	20:00	Orig	OASIS	SGS		3.01	0.46	0.85J	ND (0.31)	ND (0.31)	1.7J	7.17	11.65	108	156	10.48
RM5-LBS-071908-2000	5	LB	S	7/19/2008	20:00	Orig	OASIS	SGS		3.10	0.43	0.93J	ND (0.31)	ND (0.31)	1.74J	7.14	11.65	117	157	10.42
RM5-RBD-071908-2000	5	RB	D	7/19/2008	20:00	Orig	OASIS	SGS		0.99	0.3J	0.69J	ND (0.31)	ND (0.31)	ND (0.62)	7.45	11.56	80	155	10.58
RM5-RBS-071908-2000	5	RB	S	7/19/2008	20:00	Orig	OASIS	SGS		3.97	0.36J	0.85J	ND (0.31)	1.04	1.72J	7.37	11.59	114	156	10.56
RM5-TWD-071908-2000	5	TW	D	7/19/2008	20:00	Orig	OASIS	SGS		3.11	0.43	0.95J	ND (0.31)	ND (0.31)	1.73J	7.52	11.79	100	157	10.32
RM5-TWS-071908-2000	5	TW	S	7/19/2008	20:00	Orig	OASIS	SGS		3.15	0.47	0.96J	ND (0.31)	ND (0.31)	1.72J	7.31	12.45	211	159	10.64
RM5-TWD-071908-2200	5	TW	D	7/19/2008	22:00	Orig	OASIS	SGS		0.87	0.25J	0.62J	ND (0.31)	ND (0.31)	ND (0.62)	7.49	11.64	113	156	10.33
RM5-TWS-071908-2200	5	TW	S	7/19/2008	22:00	Orig	OASIS	SGS		0.79	0.22J	0.57J	ND (0.31)	ND (0.31)	ND (0.62)	7.45	11.67	137	156	10.38
RM5-TWD-071908-0000	5	TW	D	7/19/2008	23:59	Orig	OASIS	SGS		1.74	0.63	1.11	ND (0.31)	ND (0.31)	ND (0.62)	7.62	11.55	81.2	157	10.16
RM5-TWS-071908-0000	5	TW	S	7/19/2008	23:59	Orig	OASIS	SGS		0.81	0.2J	0.61J	ND (0.31)	ND (0.31)	ND (0.62)	7.62	11.43	86.1	156	10.18
RM5-TWD-072008-0600	5	TW	D	7/20/2008	6:00	Orig	OASIS	SGS		ND	ND (0.12)	ND (0.31)	ND (0.31)	ND (0.31)	ND (0.62)	7.49	11.51	67.8	158	10.04
RM5-TWS-072008-0600	5	TW	S	7/20/2008	6:00	Orig	OASIS	SGS		ND	ND (0.12)	ND (0.31)	ND (0.31)	ND (0.31)	ND (0.62)	7.58	11.6	59.7	159	9.98
RM5-TWS-072008-0700	5	TW	S	7/20/2008	6:00	Dup	OASIS	SGS		ND	ND (0.12)	ND (0.31)	ND (0.31)	ND (0.31)	ND (0.62)	7.58	11.6	59.7	159	9.98
RM5-LBD-072008-0800	5	LB	D	7/20/2008	8:00	Orig	OASIS	SGS		ND	ND (0.12)	ND (0.31)	ND (0.31)	ND (0.31)	ND (0.62)	7.6	11.78	137	158	10.32
RM5-LBS-072008-0800	5	LB	S	7/20/2008	8:00	Orig	OASIS	SGS		ND	ND (0.12)	ND (0.31)	ND (0.31)	ND (0.31)	ND (0.62)	7.56	11.63	132	157	10.33
RM5-RBD-072008-0800	5	RB	D	7/20/2008	8:00	Orig	OASIS	SGS		ND	ND (0.12)	ND (0.31)	ND (0.31)	ND (0.31)	ND (0.62)	7.55	11.62	63.4	156	10.3
RM5-RBS-072008-0800	5	RB	S	7/20/2008	8:00	Orig	OASIS	SGS		ND	ND (0.12)	ND (0.31)	ND (0.31)	ND (0.31)	ND (0.62)	7.56	11.49	78.8	158	10.28
RM5-TWD-072008-0800	5	TW	D	7/20/2008	8:00	Orig	OASIS	SGS		ND	ND (0.12)	ND (0.31)	ND (0.31)	ND (0.31)	ND (0.62)	7.57	11.58	42.8	156	10.15
RM5-TWS-072008-0800	5	TW	S	7/20/2008	8:00	Orig	OASIS	SGS		ND	ND (0.12)	ND (0.31)	ND (0.31)	ND (0.31)	ND (0.62)	7.62	11.61	49.4	154	10.17
RM5-TWD-072008-1000	5	TW	D	7/20/2008	10:00	Orig	OASIS	SGS		0.73	0.2J	0.53J	ND (0.31)	ND (0.31)	ND (0.62)	7.54	11.49	71.9	157	10.36

Appendix A - Kenai River 2008 Sampling Results Summary

Sample ID	RM	Sect	S/D	Date	TIme	Orig / Rep	Sam-pler	Lab doing analysis	Lab Comp Session	TAH (BTEX) (ug/L)	Benzene (ug/L)	Toluene (ug/L)	Ethyl-benzene (ug/L)	o-Xylene (ug/L)	m&p-Xylene (ug/L)	pH	DO (mg/L)	Tur-bidity (NTU)	Cond-uctivity (µS /cm)	Temp (°C)
TD 2	1.5	TW	D	7/19/2008	6:00	Orig	KWF	Analytica		ND	ND (0.3)	ND (0.3)	ND (0.3)	ND (0.2)	ND (0.5)	8.57	10.1	60	9715	10.07
TS 1	1.5	TW	S	7/19/2008	6:00	Orig	KWF	Analytica		1.53	ND (0.3)	0.93J	ND (0.3)	ND (0.2)	0.6J	8.04	10.15	46.9	10339	10.12
RM5-TWS-072008-1000	5	TW	S	7/20/2008	10:00	Orig	OASIS	SGS		0.75	0.18J	0.57J	ND (0.31)	ND (0.31)	ND (0.62)	7.61	11.83	95.4	159	10.45
RM5-TWS-072008-1300	5	TW	S	7/20/2008	12:00	Dup	OASIS	SGS	7/20 Noon	1.46	0.37J	1.09	ND (0.31)	ND (0.31)	ND (0.62)	7.59	12.15	129	157	10.7
RM5-TWD-072008-1200	5	TW	D	7/20/2008	12:00	Orig	OASIS	SGS	7/20 Noon	1.43	0.35J	1.08	ND (0.31)	ND (0.31)	ND (0.62)	7.42	11.65	75.7	157	10.62
RM5-TWD-072008-1230	5	TW	D	7/20/2008	12:00	Trip	OASIS	Analytica	7/20 Noon	1.20	ND (0.3)	1.20	ND (0.3)	ND (0.2)	ND (0.5)	7.44	11.56	82.3	157	10.71
RM5-TWS-072008-1200	5	TW	S	7/20/2008	12:00	Orig	OASIS	SGS		1.34	0.34J	1.00	ND (0.31)	ND (0.31)	ND (0.62)	7.59	12.15	129	157	10.7
RM5-LBD-072008-1400	5	LB	D	7/20/2008	14:00	Orig	OASIS	SGS		0.93	0.25J	0.68J	ND (0.31)	ND (0.31)	ND (0.62)	7.53	11.58	187	159	11.34
RM5-LBS-072008-1400	5	LB	S	7/20/2008	14:00	Orig	OASIS	SGS		0.99	0.28J	0.71J	ND (0.31)	ND (0.31)	ND (0.62)	7.54	11.55	140	158	11.6
RM5-RBD-072008-1400	5	RB	D	7/20/2008	14:00	Orig	OASIS	SGS		0.86	0.22J	0.64J	ND (0.31)	ND (0.31)	ND (0.62)	7.39	11.58	171	158	11.38
RM5-RBS-072008-1400	5	RB	S	7/20/2008	14:00	Orig	OASIS	SGS		0.89	0.24J	0.65J	ND (0.31)	ND (0.31)	ND (0.62)	7.54	11.75	169	161	11.55
RM5-TWD-072008-1400	5	TW	D	7/20/2008	14:00	Orig	OASIS	SGS		1.05	0.3J	0.75J	ND (0.31)	ND (0.31)	ND (0.62)	7.5	12.06	168	160	11.05
RM5-TWS-072008-1400	5	TW	S	7/20/2008	14:00	Orig	OASIS	SGS		0.97	0.28J	0.69J	ND (0.31)	ND (0.31)	ND (0.62)	7.2	11.75	81.8	167	11.13
RM5-TWD-072008-1600	5	TW	D	7/20/2008	16:00	Orig	OASIS	SGS		0.90	0.24J	0.66J	ND (0.31)	ND (0.31)	ND (0.62)	7.6	11.59	165	159	11.56
RM5-TWS-072008-1600	5	TW	S	7/20/2008	16:00	Orig	OASIS	SGS		0.95	0.28J	0.67J	ND (0.31)	ND (0.31)	ND (0.62)	7.61	11.4	206	159	11.65
RM5-TWS-072008-1900	5	TW	S	7/20/2008	18:00	Dup	OASIS	SGS	7/20 6PM	1.63	0.39J	1.24	ND (0.31)	ND (0.31)	ND (0.62)	7.55	12.13	242	183	11.65
RM5-TWS-072008-1800	5	TW	S	7/20/2008	18:00	Orig	OASIS	SGS	7/20 6PM	1.44	0.34J	1.10	ND (0.31)	ND (0.31)	ND (0.62)	7.55	12.13	242	183	11.65
RM5-TWS-072008-1830	5	TW	S	7/20/2008	18:00	Trip	OASIS	Analytica	7/20 6PM	2.35	0.51J	1.30	ND (0.3)	ND (0.2)	0.54J	7.55	12.13	242	183	11.65
RM5-TWD-072008-1800	5	TW	D	7/20/2008	18:00	Orig	OASIS	SGS		1.66	0.41	1.25	ND (0.31)	ND (0.31)	ND (0.62)	7.31	11.5	200	171	11.5
RM5-LBD-072008-2000	5	LB	D	7/20/2008	20:00	Orig	OASIS	SGS		3.41	0.23J	0.52J	ND (0.31)	1.04	1.62J	7.62	11.51	174	159	11.63
RM5-LBS-072008-2000	5	LB	S	7/20/2008	20:00	Orig	OASIS	SGS		2.36	0.21J	0.51J	ND (0.31)	ND (0.31)	1.64J	7.61	11.37	184	156	11.58
RM5-RBD-072008-2000	5	RB	D	7/20/2008	20:00	Orig	OASIS	SGS		2.37	0.23J	0.52J	ND (0.31)	ND (0.31)	1.62J	7.57	11.46	275	158	11.67
RM5-RBS-072008-2000	5	RB	S	7/20/2008	20:00	Orig	OASIS	SGS		2.34	0.22J	0.5J	ND (0.31)	ND (0.31)	1.62J	7.61	11.46	205	157	11.76
RM5-TWD-072008-2000	5	TW	D	7/20/2008	20:00	Orig	OASIS	SGS		2.52	0.27J	0.61J	ND (0.31)	ND (0.31)	1.64J	7.65	11.59	174	160	11.65
RM5-TWS-072008-2000	5	TW	S	7/20/2008	20:00	Orig	OASIS	SGS		0.80	0.23J	0.57J	ND (0.31)	ND (0.31)	ND (0.62)	7.58	11.41	137	158	11.77
RM5-TWD-072008-2200	5	TW	D	7/20/2008	22:00	Orig	OASIS	SGS		2.27	0.19J	0.49J	ND (0.31)	ND (0.31)	1.59J	7.57	11.96	150	156	11.49
RM5-TWS-072008-2200	5	TW	S	7/20/2008	22:00	Orig	OASIS	SGS		2.25	0.17J	0.46J	ND (0.31)	ND (0.31)	1.62J	7.58	11.35	163	157	11.4
RM5-TWD-072008-0000	5	TW	D	7/20/2008	23:59	Orig	OASIS	SGS		2.28	0.18J	0.49J	ND (0.31)	ND (0.31)	1.61J	7.66	11.33	131	156	11.03
RM5-TWS-072008-0000	5	TW	S	7/20/2008	23:59	Orig	OASIS	SGS		2.28	0.18J	0.49J	ND (0.31)	ND (0.31)	1.61J	7.62	11.27	146	156	11.15
RM5-TWD-072208-0600	5	TW	D	7/22/2008	6:00	Orig	OASIS	SGS		ND	ND (0.12)	ND (0.31)	ND (0.31)	ND (0.31)	ND (0.62)	7.42	11.15	140	332	10.68
RM5-TWS-072208-0600	5	TW	S	7/22/2008	6:00	Orig	OASIS	SGS		ND	ND (0.12)	ND (0.31)	ND (0.31)	ND (0.31)	ND (0.62)	7.54	10.8	115	366	10.67
RM5-TWS-072208-0700	5	TW	S	7/22/2008	6:00	Dup	OASIS	SGS		ND	ND (0.12)	ND (0.31)	ND (0.31)	ND (0.31)	ND (0.62)	7.54	10.8	115	366	10.67
RM5-LBD-072208-0800	5	LB	D	7/22/2008	8:00	Orig	OASIS	SGS		ND	ND (0.12)	ND (0.31)	ND (0.31)	ND (0.31)	ND (0.62)	7.4	11.22	148	337	10.63
RM5-LBS-072208-0800	5	LB	S	7/22/2008	8:00	Orig	OASIS	SGS		ND	ND (0.12)	ND (0.31)	ND (0.31)	ND (0.31)	ND (0.62)	7.4	11.13	141	328	10.53
RM5-RBD-072208-0800	5	RB	D	7/22/2008	8:00	Orig	OASIS	SGS		ND	ND (0.12)	ND (0.31)	ND (0.31)	ND (0.31)	ND (0.62)	7.39	11.2	187	327	10.58
RM5-RBS-072208-0800	5	RB	S	7/22/2008	8:00	Orig	OASIS	SGS		ND	ND (0.12)	ND (0.31)	ND (0.31)	ND (0.31)	ND (0.62)	7.27	11.17	98.6	324	10.59
RM5-TWD-072208-0800	5	TW	D	7/22/2008	8:00	Orig	OASIS	SGS		ND	ND (0.12)	ND (0.31)	ND (0.31)	ND (0.31)	ND (0.62)	7.41	11.13	167	327	10.53
RM5-TWS-072208-0800	5	TW	S	7/22/2008	8:00	Orig	OASIS	SGS		ND	ND (0.12)	ND (0.31)	ND (0.31)	ND (0.31)	ND (0.62)	7.43	11.16	180	337	10.55
RM5-TWD-072208-1000	5	TW	D	7/22/2008	10:00	Orig	OASIS	SGS		5.07	0.41	1.03	0.84J	1.07	1.72J	7.3	11.18	167	326	10.62
RM5-TWS-072208-1000	5	TW	S	7/22/2008	10:00	Orig	OASIS	SGS		5.02	0.41	0.97J	0.86J	1.07	1.71J	7.39	11.38	155	330	10.73
RM5-TWD-072208-1300	5	TW	D	7/22/2008	12:00	Dup	OASIS	SGS	7/22 Noon	3.16	0.45	0.98J	ND (0.31)	ND (0.31)	1.73J	7.18	10.95	155	335	10.55
RM5-TWD-072208-1200	5	TW	D	7/22/2008	12:00	Orig	OASIS	SGS	7/22 Noon	4.98	0.42	0.93J	0.85J	1.06	1.72J	7.18	10.95	155	335	10.55
RM5-TWD-072208-1230	5	TW	D	7/22/2008	12:00	Trip	OASIS	Analytica	7/22 Noon	0.94	ND (0.3)	0.94J	ND (0.3)	ND (0.2)	ND (0.5)	7.18	10.95	155	335	10.55
RM5-TWS-072208-1200	5	TW	S	7/22/2008	12:00	Orig	OASIS	SGS		5.07	0.40	1.04	0.84J	1.05	1.74J	7.19	10.9	221	330	10.9
RM5-LBD-072208-1400	5	LB	D	7/22/2008	14:00	Orig	OASIS	SGS		1.11	0.38J	0.73J	ND (0.31)	ND (0.31)	ND (0.62)	7.26	11.12	212	345	11.04
RM5-LBS-072208-1400	5	LB	S	7/22/2008	14:00	Orig	OASIS	SGS		1.06	0.36J	0.7J	ND (0.31)	ND (0.31)	ND (0.62)	7.33	11.04	367	407	11.19
RM5-RBD-072208-1400	5	RB	D	7/22/2008	14:00	Orig	OASIS	SGS		1.10	0.42	0.68J	ND (0.31)	ND (0.31)	ND (0.62)	7.32	11.17	299	372	11.22
RM5-RBS-072208-1400	5	RB	S	7/22/2008	14:00	Orig	OASIS	SGS								7.23	11.06	381	369	11.27
RM5-TWD-072208-1400	5	TW	D	7/22/2008	14:00	Orig	OASIS	SGS		1.19	0.40	0.79J	ND (0.31)	ND (0.31)	ND (0.62)	7.26	11.21	306	326	11.18
RM5-TWS-072208-1400	5	TW	S	7/22/2008	14:00	Orig	OASIS	SGS		3.43	0.42	0.8J	ND (0.31)	ND (0.31)	2.21	7.34	11.28	449	326	11.21
RM5-TWD-072208-1600	5	TW	D	7/22/2008	16:00	Orig	OASIS	SGS		0.77	ND (0.12)	0.77J	ND (0.31)	ND (0.31)	ND (0.62)	7.37	11.03	220	447	11.14
RM5-TWS-072208-1600	5	TW	S	7/22/2008	16:00	Orig	OASIS	SGS		0.77	ND (0.12)	0.77J	ND (0.31)	ND (0.31)	ND (0.62)	7.44	11.08	244	478	11.34
RM5-TWS-072208-1900	5	TW	S	7/22/2008	18:00	Dup	OASIS	SGS	7/22 6PM	0.82	ND (0.12)	0.82J	ND (0.31)	ND (0.31)	ND (0.62)	7.43	10.76	201	457	10.98
RM5-TWS-072208-1800	5	TW	S	7/22/2008	18:00	Orig	OASIS	SGS	7/22 6PM	0.78	ND (0.12)	0.78J	ND (0.31)	ND (0.31)	ND (0.62)	7.43	10.76	201	457	10.98

Sample ID	RM	Sect	S/D	Date	TIme	Orig / Rep	Sam-pler	Lab doing analysis	Lab Comp Session	TAH (BTEX) (ug/L)	Benzene (ug/L)	Toluene (ug/L)	Ethyl-benzene (ug/L)	o-Xylene (ug/L)	m&p-Xylene (ug/L)	pH	DO (mg/L)	Tur-bidity (NTU)	Cond-uctivity (µS /cm)	Temp (^oC)
TD 2	1.5	TW	D	7/19/2008	6:00	Orig	KWF	Analytica		ND	ND (0.3)	ND (0.3)	ND (0.3)	ND (0.2)	ND (0.5)	8.57	10.1	60	9715	10.07
TS 1	1.5	TW	S	7/19/2008	6:00	Orig	KWF	Analytica		1.53	ND (0.3)	0.93J	ND (0.3)	ND (0.2)	0.6J	8.04	10.15	46.9	10339	10.12
RM5-TWS-072208-1830	5	TW	S	7/22/2008	18:00	Trip	OASIS	Analytica	7/22 6PM	0.83	ND (0.3)	0.83J	ND (0.3)	ND (0.2)	ND (0.5)	7.43	10.76	201	457	10.98
RM5-TWD-072208-1800	5	TW	D	7/22/2008	18:00	Orig	OASIS	SGS		0.81	ND (0.12)	0.81J	ND (0.31)	ND (0.31)	ND (0.62)	7.44	10.84	249	431	11.02
RM5-LBD-072208-2000	5	LB	D	7/22/2008	20:00	Orig	OASIS	SGS		0.75	ND (0.12)	0.75J	ND (0.31)	ND (0.31)	ND (0.62)	7.41	10.91	212	327	11.08
RM5-LBS-072208-2000	5	LB	S	7/22/2008	20:00	Orig	OASIS	SGS		0.78	ND (0.12)	0.78J	ND (0.31)	ND (0.31)	ND (0.62)	7.43	10.83	209	339	10.98
RM5-RBD-072208-2000	5	RB	D	7/22/2008	20:00	Orig	OASIS	SGS		0.76	ND (0.12)	0.76J	ND (0.31)	ND (0.31)	ND (0.62)	7.41	11.02	402	328	11.02
RM5-RBS-072208-2000	5	RB	S	7/22/2008	20:00	Orig	OASIS	SGS		0.74	ND (0.12)	0.74J	ND (0.31)	ND (0.31)	ND (0.62)	7.34	10.87	197	319	11.07
RM5-TWD-072208-2000	5	TW	D	7/22/2008	20:00	Orig	OASIS	SGS		0.76	ND (0.12)	0.76J	ND (0.31)	ND (0.31)	ND (0.62)	7.36	10.87	235	359	10.99
RM5-TWS-072208-2000	5	TW	S	7/22/2008	20:00	Orig	OASIS	SGS		0.83	ND (0.12)	0.83J	ND (0.31)	ND (0.31)	ND (0.62)	7.37	10.79	221	362	11.02
RM5-TWD-072208-2200	5	TW	D	7/22/2008	22:00	Orig	OASIS	SGS		0.64	ND (0.12)	0.64J	ND (0.31)	ND (0.31)	ND (0.62)	7.33	11.49	744	309	10.97
RM5-TWS-072208-2200	5	TW	S	7/22/2008	22:00	Orig	OASIS	SGS		0.57	ND (0.12)	0.57J	ND (0.31)	ND (0.31)	ND (0.62)	7.35	10.97	290	329	11.49
RM5-TWD-072208-0000	5	TW	D	7/22/2008	23:59	Orig	OASIS	SGS		0.34	ND (0.12)	0.34J	ND (0.31)	ND (0.31)	ND (0.62)	7.41	11.01	434	313	10.96
RM5-TWS-072208-0000	5	TW	S	7/22/2008	23:59	Orig	OASIS	SGS		0.34	ND (0.12)	0.34J	ND (0.31)	ND (0.31)	ND (0.62)	7.39	10.81	422	323	10.92
RM10-TWS-071908-0600	10.1	TW	S	7/19/2008	6:00	Orig	OASIS	SGS		ND	ND (0.12)	ND (0.31)	ND (0.31)	ND (0.31)	ND (0.62)					
RM10-TWS-071908-0700	10.1	TW	S	7/19/2008	6:00	Dup	OASIS	SGS		ND	ND (0.12)	ND (0.31)	ND (0.31)	ND (0.31)	ND (0.62)					
RM10-LBD-071908-0800	10.1	LB	D	7/19/2008	8:00	Orig	OASIS	SGS		4.54	0.32J	0.68J	0.83J	1.04	1.67J					
RM10-LBS-071908-0800	10.1	LB	S	7/19/2008	8:00	Orig	OASIS	SGS		4.49	0.27J	0.7J	0.83J	1.03	1.66J					
RM10-RBD-071908-0800	10.1	RB	D	7/19/2008	8:00	Orig	OASIS	SGS		3.48	0.27J	0.62J	ND (0.31)	1.03	1.56J					
RM10-RBS-071908-0800	10.1	RB	S	7/19/2008	8:00	Orig	OASIS	SGS		4.36	0.27J	0.59J	0.83J	1.03	1.64J					
RM10-TWD-071908-0800	10.1	TW	D	7/19/2008	8:00	Orig	OASIS	SGS		0.32	ND (0.12)	0.32J	ND (0.31)	ND (0.31)	ND (0.62)					
RM10-TWS-071908-0800	10.1	TW	S	7/19/2008	8:00	Orig	OASIS	SGS		0.79	0.24J	0.55J	ND (0.31)	ND (0.31)	ND (0.62)					
RM10-TWD-071908-1000	10.1	TW	D	7/19/2008	10:00	Orig	OASIS	SGS		4.72	0.33J	0.79J	0.85J	1.05	1.7J					
RM10-TWS-071908-1000	10.1	TW	S	7/19/2008	10:00	Orig	OASIS	SGS		4.67	0.33J	0.79J	0.84J	1.03	1.68J					
RM10-TWD-071908-1300	10.1	TW	D	7/19/2008	12:00	Dup	OASIS	SGS	7/19 Noon	4.76	0.36J	0.84J	0.83J	1.03	1.7J					
RM10-TWD-071908-1200	10.1	TW	D	7/19/2008	12:00	Orig	OASIS	SGS	7/19 Noon	4.71	0.34J	0.77J	0.85J	1.06	1.69J					
RM10-TWD-071908-1230	10.1	TW	D	7/19/2008	12:00	Trip	OASIS	Analytica	7/19 Noon	0.77	ND (0.3)	0.77J	ND (0.3)	ND (0.2)	ND (0.5)					
RM10-TWS-071908-1200	10.1	TW	S	7/19/2008	12:00	Orig	OASIS	SGS		4.75	0.34J	0.84J	0.84J	1.05	1.68J					
RM10-LBD-071908-1400	10.1	LB	D	7/19/2008	14:00	Orig	OASIS	SGS		3.50	0.29J	0.63J	ND (0.31)	1.02	1.56J					
RM10-LBS-071908-1400	10.1	LB	S	7/19/2008	14:00	Orig	OASIS	SGS		4.65	0.33J	0.76J	0.84J	1.06	1.66J					
RM10-RBD-071908-1400	10.1	RB	D	7/19/2008	14:00	Orig	OASIS	SGS		4.65	0.33J	0.73J	0.86J	1.05	1.68J					
RM10-RBS-071908-1400	10.1	RB	S	7/19/2008	14:00	Orig	OASIS	SGS		4.62	0.32J	0.71J	0.86J	1.05	1.68J					
RM10-TWD-071908-1400	10.1	TW	D	7/19/2008	14:00	Orig	OASIS	SGS		3.74	0.3J	0.73J	ND (0.31)	1.04	1.67J					
RM10-TWS-071908-1400	10.1	TW	S	7/19/2008	14:00	Orig	OASIS	SGS		4.52	0.3J	0.69J	0.83J	1.04	1.66J					
RM10-TWD-071908-1600	10.1	TW	D	7/19/2008	16:00	Orig	OASIS	SGS		4.64	0.31J	0.71J	0.85J	1.08	1.69J					
RM10-TWS-071908-1600	10.1	TW	S	7/19/2008	16:00	Orig	OASIS	SGS		4.60	0.33J	0.7J	0.85J	1.04	1.68J					
RM10-TWS-071908-1830	10.1	TW	S	7/19/2008	18:00	Dup	OASIS	SGS	7/19 6PM	0.97	0.27J	0.7J	ND (0.31)	ND (0.31)	ND (0.62)					
RM10-TWS-071908-1800	10.1	TW	S	7/19/2008	18:00	Orig	OASIS	SGS	7/19 6PM	0.92	0.25J	0.67J	ND (0.31)	ND (0.31)	ND (0.62)					
RM10-TWD-071908-1830	10.1	TW	S	7/19/2008	18:00	Trip	OASIS	Analytica	7/19 6PM	0.63	ND (0.3)	0.63J	ND (0.3)	ND (0.2)	ND (0.5)					
RM10-TWD-071908-1800	10.1	TW	D	7/19/2008	18:00	Orig	OASIS	SGS		0.93	0.23J	0.7J	ND (0.31)	ND (0.31)	ND (0.62)					
RM10-LBD-071908-2000	10.1	LB	D	7/19/2008	20:00	Orig	OASIS	SGS		0.62	0.18J	0.44J	ND (0.31)	ND (0.31)	ND (0.62)					
RM10-LBS-071908-2000	10.1	LB	S	7/19/2008	20:00	Orig	OASIS	SGS		0.60	0.15J	0.45J	ND (0.31)	ND (0.31)	ND (0.62)					
RM10-RBD-071908-2000	10.1	RB	D	7/19/2008	20:00	Orig	OASIS	SGS		0.75	0.2J	0.55J	ND (0.31)	ND (0.31)	ND (0.62)					
RM10-RBS-071908-2000	10.1	RB	S	7/19/2008	20:00	Orig	OASIS	SGS		0.78	0.22J	0.56J	ND (0.31)	ND (0.31)	ND (0.62)					
RM10-TWD-071908-2000	10.1	TW	D	7/19/2008	20:00	Orig	OASIS	SGS		0.75	0.2J	0.55J	ND (0.31)	ND (0.31)	ND (0.62)					
RM10-TWS-071908-2000	10.1	TW	S	7/19/2008	20:00	Orig	OASIS	SGS		0.76	0.21J	0.55J	ND (0.31)	ND (0.31)	ND (0.62)					
RM10-TWD-071908-2200	10.1	TW	D	7/19/2008	22:00	Orig	OASIS	SGS		0.75	0.21J	0.54J	ND (0.31)	ND (0.31)	ND (0.62)					
RM10-TWS-071908-2200	10.1	TW	S	7/19/2008	22:00	Orig	OASIS	SGS		0.76	0.2J	0.56J	ND (0.31)	ND (0.31)	ND (0.62)					
RM10-TWD-071908-2400	10.1	TW	D	7/19/2008	23:59	Orig	OASIS	SGS		0.51	0.14J	0.37J	ND (0.31)	ND (0.31)	ND (0.62)					
RM10-TWS-071908-2400	10.1	TW	S	7/19/2008	23:59	Orig	OASIS	SGS		0.51	0.16J	0.35J	ND (0.31)	ND (0.31)	ND (0.62)					
RM10-TWD-072008-1300	10.1	TW	D	7/20/2008	12:00	Dup	OASIS	SGS	7/20 Noon	0.84	0.22J	0.62J	ND (0.31)	ND (0.31)	ND (0.62)	7.93	11.94	218	439	11.51
RM10-TWD-072008-1200	10.1	TW	D	7/20/2008	12:00	Orig	OASIS	SGS	7/20 Noon	0.78	0.22J	0.56J	ND (0.31)	ND (0.31)	ND (0.62)	7.93	11.94	218	439	11.51
RM10-TWD-072008-1230	10.1	TW	D	7/20/2008	12:00	Trip	OASIS	Analytica	7/20 Noon	0.63	ND (0.3)	0.63J	ND (0.3)	ND (0.2)	ND (0.5)					
RM10-TWS-072008-1200	10.1	TW	S	7/20/2008	14:00	Orig	OASIS	SGS		0.83	0.22J	0.61J	ND (0.31)	ND (0.31)	ND (0.62)	8.33	12.16	288	346	11.61

Sample ID	RM	Sect	S/D	Date	TIme	Orig / Rep	Sam-pler	Lab doing analysis	Lab Comp Session	TAH (BTEX) (ug/L)	Benzene (ug/L)	Toluene (ug/L)	Ethyl-benzene (ug/L)	o-Xylene (ug/L)	m&p-Xylene (ug/L)	pH	DO (mg/L)	Tur-bidity (NTU)	Cond-uctivity (µS /cm)	Temp (°C)
TD 2	1.5	TW	D	7/19/2008	6:00	Orig	KWF	Analytica		ND	ND (0.3)	ND (0.3)	ND (0.3)	ND (0.2)	ND (0.5)	8.57	10.1	60	9715	10.07
TS 1	1.5	TW	S	7/19/2008	6:00	Orig	KWF	Analytica		1.53	ND (0.3)	0.93J	ND (0.3)	ND (0.2)	0.6J	8.04	10.15	46.9	10339	10.12
RM10-LBD-072008-1400	10.1	LB	D	7/20/2008	16:00	Dup	OASIS	SGS		2.18	0.18J	0.41J	ND (0.31)	ND (0.31)	1.59J	7.41	11.8	457	339	11.81
RM10-RBD-072008-1400	10.1	RB	D	7/20/2008	16:00	Orig	OASIS	SGS		3.53	0.21J	0.64J	ND (0.31)	1.04	1.64J	7.41	11.62	279	372	11.84
RM10-RBS-072008-1400	10.1	RB	S	7/20/2008	16:00	Orig	OASIS	SGS		2.24	0.19J	0.48J	ND (0.31)	ND (0.31)	1.57J	7.49	11.53	216	360	11.87
RM10-TWD-072008-1400	10.1	TW	D	7/20/2008	16:00	Orig	OASIS	SGS		2.23	ND (0.12)	0.58J	ND (0.31)	ND (0.31)	1.65J	7.49	11.58	211	440	11.68
RM10-TWS-072008-1400	10.1	TW	S	7/20/2008	16:00	Orig	OASIS	SGS		2.21	0.2J	0.42J	ND (0.31)	ND (0.31)	1.59J	7.52	11.69	267	360	11.75
RM10-LDS-072008-1400	10.1		S	7/20/2008	16:00	Orig	OASIS	SGS		2.00	0.14J	0.32J	ND (0.31)	ND (0.31)	1.54J	7.39	11.54	208	360	11.97
RM10-TWS-072008-1900	10.1	TW	S	7/20/2008	18:00	Dup	OASIS	SGS	7/20 6PM	2.40	0.21J	0.56J	ND (0.31)	ND (0.31)	1.63J	7.74	13.58	422	388	11.89
RM10-TWS-072008-1800	10.1	TW	S	7/20/2008	18:00	Orig	OASIS	SGS	7/20 6PM	2.38	0.24J	0.56J	ND (0.31)	ND (0.31)	1.58J	7.74	13.58	422	388	11.89
RM10-TWS-072008-1830	10.1	TW	S	7/20/2008	18:00	Trip	OASIS	Analytica	7/20 6PM	0.60	ND (0.3)	0.6J	ND (0.3)	ND (0.2)	ND (0.5)					
RM10-TWD-072008-1800	10.1	TW	D	7/20/2008	18:00	Orig	OASIS	SGS		4.50	0.23J	0.61J	0.84J	1.11	1.71J	7.29	11.68	366	403	11.76
RM10-LBD-072008-2000	10.1	LB	D	7/20/2008	20:00	Dup	OASIS	SGS		2.12	0.18J	0.38J	ND (0.31)	ND (0.31)	1.56J	7.24	11.08	149	317	11.89
RM10-LBS-072008-2000	10.1	LB	S	7/20/2008	20:00	Orig	OASIS	SGS		2.21	0.23J	0.44J	ND (0.31)	ND (0.31)	1.54J	7.38	11.27	230	380	11.89
RM10-RBD-072008-2000	10.1	RB	D	7/20/2008	20:00	Orig	OASIS	SGS		2.44	0.26J	0.58J	ND (0.31)	ND (0.31)	1.6J	7.26	11.16	113	329	11.56
RM10-RBS-072008-2000	10.1	RB	S	7/20/2008	20:00	Orig	OASIS	SGS		2.36	0.22J	0.53J	ND (0.31)	ND (0.31)	1.61J	7.26	11.1	119	318	11.56
RM10-TWD-072008-2000	10.1	TW	D	7/20/2008	20:00	Orig	OASIS	SGS		3.40	0.24J	0.55J	ND (0.31)	1.01	1.6J	7.29	11.18	101	345	11.39
RM10-TWS-072008-2000	10.1	TW	S	7/20/2008	20:00	Orig	OASIS	SGS		2.31	0.2J	0.51J	ND (0.31)	ND (0.31)	1.6J	7.27	11.08	124	321	11.49
RM10-TWD-072008-2200	10.1	TW	D	7/20/2008	22:00	Orig	OASIS	SGS		2.51	0.23J	0.65J	ND (0.31)	ND (0.31)	1.63J	7.29	11.09	138	350	11.37
RM10-TWS-072008-2200	10.1	TW	S	7/20/2008	22:00	Orig	OASIS	SGS		2.41	0.21J	0.55J	ND (0.31)	ND (0.31)	1.65J	7.27	11	136	345	11.47
RM10-TWD-072008-0000	10.1	TW	D	7/20/2008	23:59	Orig	OASIS	SGS		0.49	0.13J	0.36J	ND (0.31)	ND (0.31)	ND (0.62)	7.29	10.82	192	343	11.33
RM10-TWS-072108-0000	10.1	TW	S	7/20/2008	23:59	Orig	OASIS	SGS		0.50	0.13J	0.37J	ND (0.31)	ND (0.31)	ND (0.62)	7.3	10.89	208	331	11.1
RM10-TWD-072208-0600	10.1	TW	D	7/22/2008	6:00	Orig	OASIS	SGS		4.89	0.36J	0.89J	0.86J	1.06	1.72J	7.36	12.19	43	157	10.35
RM10-TWS-072208-0600	10.1	TW	S	7/22/2008	6:00	Orig	OASIS	SGS		4.85	0.38J	0.87J	0.83J	1.06	1.71J	7.33	12.09	40	159	10.35
RM10-TWS-072208-0700	10.1	TW	S	7/22/2008	6:00	Dup	OASIS	SGS		4.93	0.38J	0.91J	0.85J	1.06	1.73J	7.33	12.09	40	159	10.35
RM10-LBD-072208-0800	10.1	LB	D	7/22/2008	8:00	Dup	OASIS	SGS		1.22	0.35J	0.87J	ND (0.31)	ND (0.31)	ND (0.62)					
RM10-LBS-072208-0800	10.1	LB	S	7/22/2008	8:00	Orig	OASIS	SGS		4.05	0.36J	0.93J	ND (0.31)	1.05	1.71J	7.53	11.86	918	156	10.5
RM10-RBD-072208-0800	10.1	RB	D	7/22/2008	8:00	Orig	OASIS	SGS		1.31	0.36J	0.95J	ND (0.31)	ND (0.31)	ND (0.62)	7.47	12.05	50	157	10.43
RM10-RBS-072208-0800	10.1	RB	S	7/22/2008	8:00	Orig	OASIS	SGS		2.82	0.41	0.86J	ND (0.31)	ND (0.31)	1.55J	7.48	11.9	61	158	10.43
RM10-TWD-072208-0800	10.1	TW	D	7/22/2008	8:00	Orig	OASIS	SGS		4.98	0.42	0.93J	0.87J	1.06	1.7J	7.39	11.97	122	156	10.39
RM10-TWS-072208-0800	10.1	TW	S	7/22/2008	8:00	Orig	OASIS	SGS		4.05	0.38J	0.92J	ND (0.31)	1.05	1.7J	7.43	11.84	215	157	10.48
RM10-TWD-072208-1000	10.1	TW	D	7/22/2008	10:00	Orig	OASIS	SGS		1.36	0.37J	0.99J	ND (0.31)	ND (0.31)	ND (0.62)	7.52	12.06	60	159	10.63
RM10-TWS-072208-1000	10.1	TW	S	7/22/2008	10:00	Orig	OASIS	SGS		1.32	0.37J	0.95J	ND (0.31)	ND (0.31)	ND (0.62)	7.47	11.95	52	158	10.76
RM10-TWD-072208-1300	10.1	TW	D	7/22/2008	12:00	Dup	OASIS	SGS	7/22 Noon	1.34	0.34J	1.00	ND (0.31)	ND (0.31)	ND (0.62)	7.43	11.71	50	156	11.37
RM10-TWD-072208-1200	10.1	TW	D	7/22/2008	12:00	Orig	OASIS	SGS	7/22 Noon	1.22	0.33J	0.89J	ND (0.31)	ND (0.31)	ND (0.62)	7.5	12.09	91	159	10.97
RM10-TWD-072208-1230	10.1	TW	D	7/22/2008	12:00	Trip	OASIS	Analytica	7/22 Noon	0.90	ND (0.3)	0.9J	ND (0.3)	ND (0.2)	ND (0.5)					
RM10-TWS-072208-1200	10.1	TW	S	7/22/2008	12:00	Orig	OASIS	SGS		1.26	0.33J	0.93J	ND (0.31)	ND (0.31)	ND (0.62)	7.43	11.71	50	156	11.37
RM10-LBD-072208-1400	10.1	LB	D	7/22/2008	14:00	Dup	OASIS	SGS		2.45	0.31J	0.59J	ND (0.31)	ND (0.31)	1.55J	7.37	11.04	50	158	11.1
RM10-LBS-072208-1400	10.1	LB	S	7/22/2008	14:00	Orig	OASIS	SGS		1.11	0.28J	0.83J	ND (0.31)	ND (0.31)	ND (0.62)	7.57	11.84	48	157	11.19
RM10-RBD-072208-1400	10.1	RB	D	7/22/2008	14:00	Orig	OASIS	SGS		2.66	0.36J	0.72J	ND (0.31)	ND (0.31)	1.58J	7.55	12.04	61	158	11.21
RM10-RBS-072208-1400	10.1	RB	S	7/22/2008	14:00	Orig	OASIS	SGS		1.09	0.31J	0.78J	ND (0.31)	ND (0.31)	ND (0.62)	7.58	11.92	62	158	11.47
RM10-TWD-072208-1400	10.1	TW	D	7/22/2008	14:00	Orig	OASIS	SGS		1.11	0.32J	0.79J	ND (0.31)	ND (0.31)	ND (0.62)	7.58	11.97	143	157	11.28
RM10-TWS-072208-1400	10.1	TW	S	7/22/2008	14:00	Orig	OASIS	SGS		1.09	0.3J	0.79J	ND (0.31)	ND (0.31)	ND (0.62)	7.55	11.97	73	158	11.27
RM10-TWD-072208-1600	10.1	TW	D	7/22/2008	16:00	Orig	OASIS	SGS		1.25	0.38J	0.87J	ND (0.31)	ND (0.31)	ND (0.62)	7.59	11.88	38	158	11.02
RM10-TWS-072208-1600	10.1	TW	S	7/22/2008	16:00	Orig	OASIS	SGS		0.82	0.31J	0.51J	ND (0.31)	ND (0.31)	ND (0.62)	7.88	11.79	34	156	11.05
RM10-TWS-072208-1900	10.1	TW	S	7/22/2008	18:00	Dup	OASIS	SGS	7/22 6PM	0.78	0.27J	0.51J	ND (0.31)	ND (0.31)	ND (0.62)	7.57	11.71	37	158	10.87
RM10-TWS-072208-1800	10.1	TW	S	7/22/2008	18:00	Orig	OASIS	SGS	7/22 6PM	0.85	0.27J	0.58J	ND (0.31)	ND (0.31)	ND (0.62)	7.58	11.68	40	157	10.82
RM10-TWS-072208-1830	10.1	TW	S	7/22/2008	18:00	Trip	OASIS	Analytica	7/22 6PM	ND	ND (0.3)	ND(0.3)	ND (0.3)	ND (0.2)	ND (0.5)					
RM10-TWD-072208-1800	10.1	TW	D	7/22/2008	18:00	Orig	OASIS	SGS		0.82	0.29J	0.53J	ND (0.31)	ND (0.31)	ND (0.62)	7.58	11.62	40	157	10.9
RM10-LBD-072208-2000	10.1	LB	D	7/22/2008	20:00	Dup	OASIS	SGS		0.36	ND (0.12)	0.36J	ND (0.31)	ND (0.31)	ND (0.62)	7.57	11.66	53	155	10.95
RM10-LBS-072208-2000	10.1	LB	S	7/22/2008	20:00	Orig	OASIS	SGS		0.18	0.18J	ND (0.31)	ND (0.31)	ND (0.31)	ND (0.62)	7.56	11.7	48.9	155	10.97
RM10-RBD-072208-2000	10.1	RB	D	7/22/2008	20:00	Orig	OASIS	SGS		0.54	0.19J	0.35J	ND (0.31)	ND (0.31)	ND (0.62)	7.54	11.09	43	156	10.98
RM10-RBS-072208-2000	10.1	RB	S	7/22/2008	20:00	Orig	OASIS	SGS		0.57	0.19J	0.38J	ND (0.31)	ND (0.31)	ND (0.62)	7.57	11.78	50.3	157	10.97
RM10-TWD.072208-2000	10.1	TW	D	7/22/2008	20:00	Orig	OASIS	SGS		0.61	0.22J	0.39J	ND (0.31)	ND (0.31)	ND (0.62)	7.57	11.7	52.3	156	10.96

Appendix A - Kenai River 2008 Sampling Results Summary

Sample ID	RM	Sect	S/D	Date	TIme	Orig / Rep	Sam-pler	Lab doing analysis	Lab Comp Session	TAH (BTEX) (ug/L)	Benzene (ug/L)	Toluene (ug/L)	Ethyl-benzene (ug/L)	o-Xylene (ug/L)	m&p-Xylene (ug/L)	pH	DO (mg/L)	Tur-bidity (NTU)	Cond-uctivity (µS /cm)	Temp (°C)
TD 2	1.5	TW	D	7/19/2008	6:00	Orig	KWF	Analytica		ND	ND (0.3)	ND (0.3)	ND (0.3)	ND (0.2)	ND (0.5)	8.57	10.1	60	9715	10.07
TS 1	1.5	TW	S	7/19/2008	6:00	Orig	KWF	Analytica		1.53	ND (0.3)	0.93J	ND (0.3)	ND (0.2)	0.6J	8.04	10.15	46.9	10339	10.12
RM10-TWS-072208-2000	10.1	TW	S	7/22/2008	20:00	Orig	OASIS	SGS		0.66	0.2J	0.46J	ND (0.31)	ND (0.31)	ND (0.62)	7.56	11.57	38.6	157	10.89
RM10-TWD-072208-2200	10.1	TW	D	7/22/2008	22:00	Orig	OASIS	SGS		0.13	0.13J	ND (0.31)	ND (0.31)	ND (0.31)	ND (0.62)	7.59	11.85	63.1	157	10.95
RM10-TWS-072208-2200	10.1	TW	S	7/22/2008	22:00	Orig	OASIS	SGS		0.53	0.16J	0.37J	ND (0.31)	ND (0.31)	ND (0.62)	7.54	11.65	62.9	157	10.96
RM10-TWD-072208-0000	10.1	TW	D	7/22/2008	23:59	Orig	OASIS	SGS		0.31	ND (0.12)	0.31J	ND (0.31)	ND (0.31)	ND (0.62)	7.65	11.05	62	157	11.05
RM10-TWS-072208-0000	10.1	TW	S	7/22/2008	23:59	Orig	OASIS	SGS		ND	ND (0.12)	ND (0.31)	ND (0.31)	ND (0.31)	ND (0.62)	7.66	11.8	56.2	159	11.8
RM23-TWS-071908-0500	23	TW	S	7/19/2008	5:00	Dup	OASIS	SGS		ND	ND (0.12)	ND (0.31)	ND (0.31)	ND (0.31)	ND (0.62)					
RM23-TWS-071908-0600	23	TW	S	7/19/2008	5:00	Orig	OASIS	SGS		ND	ND (0.12)	ND (0.31)	ND (0.31)	ND (0.31)	ND (0.62)					
RM10-072208-0600	23	TW	S	7/22/2008	5:00	Orig	OASIS	SGS		ND	ND (0.12)	ND (0.31)	ND (0.31)	ND (0.31)	ND (0.62)					
RM23-TWS-072208-0500	23	TW	S	7/22/2008	5:00	Dup	OASIS	SGS		ND	ND (0.12)	ND (0.31)	ND (0.31)	ND (0.31)	ND (0.62)					

RM=River Mile, Sect = Section (TW = Thalweg, LB=Left Bank, RB=Right Bank), S/D = Surface/Depth, Orig/Rep = Original, Duplicate, or Triplicate
ND = Not detected; Method Detection Limit shown in parantheses; J = estimate; BTEX = Sum of actual detected concentrations for Benzene, Toluene, ethylbenzene, and xylene (includes J flagged estimates)

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APPENDIX B

Kenai River July 2008 Boat Counts

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Appendix B - Kenai River July 2008 Boat Count

Date	Time	RM 0 - 5	RM 5 - 8.5	RM 8.5 - 10	RM 10 - 12.5	RM 12.5 - 20	RM 20 - 36	RM 36 - 44	RM 44 - 50	Below Soldotna	TOTAL
7/19/2008	7:15	162	8	15	114	180	NC	NC	NC	479	
	8:00	185	13	30	105	188	17	9	29	521	576
	8:45	199	15	41	98	193	NC	NC	NC	546	
	14:00	212	34	34	61	173	39	17	33	514	603
	20:00	201	10	13	42	90	9	7	28	356	400
7/20/2008	7:15	99	2	3	89	133	NC	NC	NC	326	
	8:00	107	10	9	113	126	16	1	16	365	398
	8:45	120	8	20	127	136	NC	NC	NC	411	
	14:00	106	26	20	52	123	13	15	36	327	391
	20:00	57	1	2	56	100	11	4	15	216	246
7/22/2008	7:25	50	6	34	185	285	NC	NC	NC	560	
	7:50	56	5	39	186	268	20	4	18	554	596
	8:45	77	12	34	213	260	NC	NC	NC	596	
	14:00	76	10	49	79	220	21	7	28	434	490
	20:00	NC	NC	NC	NC	NC	NC	NC	NC	NC	

NC = Boat Count not conducted; RM = River Mile distance from Kenai River Mouth

No non-compliant 2-strokes were observed above the Warren Ames Bridge (RM 5) at anytime during the sampling period

5% non-compliant 2-strokes were operating below the Warren Ames Bridge during the sampling

Table information is based on independent boat count project conducted and reported (9-16-2008) by Robert Ruffner, Kenai Watershed Forum

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ATTACHMENTS ON CD

APPENDIX C – Field Notes

APPENDIX D – Photographs

APPENDIX E – Laboratory Results

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