

## ABSTRACT

BURDETTE, JENNIFER ANN. Wetland Assessment Using the Hydric Soil Technical Standard. (Under the direction of Drs. Stephen W. Broome and Michael J. Vepraskas.)

The National Technical Committee for Hydric Soils developed the Hydric Soil Technical Standard (HSTS) to identify a functioning wetland (hydric) soil using quantitative measurements of saturation and anaerobic conditions. We used the HSTS to assess wetland restoration success and to compare surface treatments designed to replicate microtopographic relief found in forested wetlands. Experiments were conducted on a wetland restored from agricultural fields in eastern NC where monitoring stations were installed across three surface treatments in the restored wetland: 1) a microtopography (MT) treatment created by roughing the soil surface to mimic the uneven surface of forested wetlands, 2) a crown removal treatment imposed by grading the field flat, and 3) a control treatment that had no surface alteration. Monitoring stations were also installed in a nearby nonriverine swamp forest as a reference wetland. Weekly measurements of water table depth and redox potential were collected for 15 months. Soil at all monitoring stations met the HSTS, indicating that functioning hydric soils were restored. Although a significant difference between surface treatments was not detected, the MT treatment resulted in anaerobic conditions most similar to the reference wetland, signifying that this type of surface treatment should be considered for wetland restoration of areas with smooth surfaces. The HSTS proved to be a useful tool in evaluating wetland restoration success and microtopographic effects. Microtopographic relief did not create nonhydric areas as measured by HSTS; however, microtopographic relief is likely to influence plant establishment.

Wetland Assessment Using the Hydric Soil  
Technical Standard

by  
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## **BIOGRAPHY**

Jennifer Burdette was born in Charleston, Kanawha County, West Virginia in 1968. In 1986, she graduated from DuPont High School in Belle, West Virginia. After her freshman year at West Virginia Technical Institute, Jennifer moved to Myrtle Beach, South Carolina. Jennifer's interest in wetlands began during a good number of field trips around the low country including Carolina bays while attending Coastal Carolina University. After receiving a B. S. in Biology and Marine Science in 1991, Jennifer moved back to the Teays Valley area of West Virginia where she met and married her husband Matt and worked as an environmental consultant.

In order to work more with wetlands and eventually pursue an advanced degree, Jennifer and Matt moved to Raleigh, North Carolina in 1999. Jennifer worked as an environmental consultant primarily with Soil & Environmental Consultants, PA until 2003 when she entered the graduate program in the Soil Science Department at North Carolina State University. She worked as a co-op for the Raleigh Regulatory Office of the U. S. Army Corps of Engineers for a little over year and a start-up wetland restoration firm before 2005 when she started her own environmental consulting business, Burdette Land Consulting, Inc. with her husband Matt. Jennifer had her son, Sam, in 2007 and continues practicing wetland science with her consulting business.

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## 1.0 INTRODUCTION

Wetlands, protected under Section 404 of the Clean Water Act of 1977, are defined as “those areas that are inundated or saturated by surface or ground water at a frequency and duration sufficient to support, and under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions. Wetlands generally include swamps, marshes, bogs, and other similar areas” (33 CFR 328.3(b); 1984).

Recognition that wetlands are ecologically important habitats that play a vital role in maintaining the quality of our nation’s waters led to their legal protection on both private and public lands (Lewis, 1995). Historically, wetlands were considered unproductive wastelands, which along with government programs such as the Swamp Lands Act, contributed to a rapid rate of loss prior to the mid 1970s (Mitsch & Gosselink, 1993). An accurate assessment of actual wetland loss isn’t possible due to lack of information regarding the pre-settlement extent of wetlands. However, Mitsch and Gosselink reviewed a patchwork of available surveys conducted in the contiguous United States using various definitions of wetlands to provide a general estimate that 53% of original wetland area has been lost (1993).

As it is not possible to completely avoid additional impacts to wetlands due to the inevitable intersection of these habitats with roads and other development deemed

beneficial to society, regulation of wetlands in the United States has evolved to a goal of no overall net loss of wetland function (USACE, 1990). The US Army Corps of Engineers (USACE) is responsible for regulating the discharge of fill material into wetlands and other waters of the US under Section 404 of the Clean Water Act as a natural extension to their responsibility for maintaining the nation's navigable waters under the Rivers and Harbors Act of 1899 (Lewis, 1995). In order to achieve the no net loss policy, permits for the discharge of fill material require the applicant to avoid impacts where possible, minimize unavoidable impacts, and submit a plan to mitigate the remaining impacts to wetlands and waters of the US (USACE, 1990). Types of mitigation, often referred to as compensatory mitigation, include restoration, enhancement, creation, and preservation of existing wetlands in limited circumstances. Of these, restoration and creation are the only types of mitigation that result in a gain of wetland acreage, which directly supports the goal of no overall net loss of wetlands. Wetland restoration generally refers to re-establishment of hydrophytic vegetation and wetland hydrology within a former wetland where hydric soils are already present (USACE, 2002). Wetland creation generally refers to altering the physical and biological components of an upland area to develop a jurisdictional wetland where all three parameters of a wetland are absent including hydric soils (USACE, 2002). Much of the available regulatory guidance regarding compensatory mitigation identifies wetland restoration as the type of mitigation with the greatest potential for success (NRC, 2001; USACE, 2002).

## **1.1 Hydric Soils Background**

Hydric soils are one of three parameters whose presence is required for an area to be classified as a jurisdictional wetland according to the *Corps of Engineers Wetland Delineation Manual* (Environmental Laboratory, 1987). Hydric soils are currently defined as “a soil that formed under conditions of saturation, flooding, or ponding long enough during the growing season to develop anaerobic conditions in the upper part” (Federal Register, July 13, 1994). The Natural Resources Conservation Service (NRCS) through its National Technical Committee for Hydric Soils (NTCHS) is responsible for technical aspects of hydric soils including development and application of the definition, criteria, field indicators, and standards of data collection to more accurately characterize hydric soils.

The criteria for hydric soils were developed based on soil properties used in Soil Taxonomy to extract a list of hydric soils from the National Soil Information System database. This list is published as *Hydric Soils of the United States* and updated by the NTCHS as necessary. To help identify and delineate hydric soils in the field, experienced soil scientists with the NRCS and later the NTCHS developed field indicators that are based on morphological soil properties found in soils formed under wet conditions (Mausbach and Parker, 2001). *Field Indicators of Hydric Soils* describes field indicators specific to the US

Department of Agriculture Land Resource Regions and their proper application to soil profile descriptions (USDA, NRCS, 2003).

## **1.2 Hydric Soils in Wetland Restoration/Creation**

Field indicators work very well for identifying and delineating hydric soils in the field, where a single site visit is used to make a determination. However, morphological features of hydric soils may indicate that saturation and anaerobic conditions have existed previously (USDA, NRCS, 2008). The presence of field indicators may not always represent the current hydrologic regime if changes have occurred in the site's groundwater hydrology due to artificial drainage systems or down-cutting of streams (Mausbach and Parker, 2001). Soils that exhibit hydric soil field indicators, but lack wetland hydrology are still hydric soils. Wetland hydrology is a water table within 30 cm of the surface for a continuous period of at least 5% of the growing season. Field indicators of wetland hydrology include, but are not limited to, direct observation of saturation or inundation, watermarks on woody vegetation, drift lines, sediment deposits, drainage patterns within wetlands, and the presence of oxidized root channels in the soil (Environmental Laboratory, 1987). Although these areas have hydric soils they do not meet the criteria for jurisdictional wetlands because they lack wetland hydrology. Further, these soils also would not be currently functioning hydric soils. Morphological features that do not represent current hydrologic conditions of saturation and anaerobiosis are relict. Relict

features can be distinguished from active features by their sharper and less diffuse boundary (USDA, NRCS, 2003). This qualitative measure is difficult to discern by all but experienced soil scientists.

Some morphological changes that occur to soils formed under conditions of saturation and anaerobiosis are irreversible such as the translocation and/or depletion of iron. In upland soils, iron is dispersed throughout the soil matrix in coatings around individual soil particles. Soil exposure to saturated and anaerobic conditions causes the chemical reduction of and, over prolonged periods, the removal of the iron coatings from individual soil particles producing a depleted or gray matrix. This iron usually precipitates into iron concentrations when the soil becomes unsaturated. It can sometimes be leached from the system if reducing conditions persist for extended periods along with water movement out of the system. Once saturated and anaerobic conditions persist within a soil long enough for the removal iron from the matrix, the iron cannot be redistributed throughout the matrix even after the hydrology that created it is no longer present (Vepraskas, 1999).

It is this characteristic of hydric soils that makes their presence in an area that does not meet jurisdictional wetland hydrology criteria the best and most often used indicator for a potentially viable wetland restoration site. Once a wetland is restored, field indicators of hydric soils are also not as helpful to evaluate success especially in the early stages. Field

indicators based on relict morphological features present within the soil at a wetland restoration site do not indicate whether saturated and anaerobic conditions have been successfully restored. Additionally, contemporaneous morphological features of hydric soils can only be distinguished from relict ones by their sharp boundaries making this determination somewhat difficult (USDA, NRCS, 2003). In wetland creation projects where wetland hydrology is introduced to formerly upland soils, hydric soil morphologies may require a much longer time frame to develop than the 5-year monitoring period commonly used by the USACE to determine restoration success (Bishel Machung et al., 1996). Although Baldwin (2008) found a significant increase in redoximorphic features 8 years after restoration, very few restoration projects have baseline data to identify this type of trend as a means for evaluating restoration success.

These complications posed by hydric soils in wetland restoration and creation explain in part why the hydric soil parameter remains absent from most performance standards to evaluate restoration success for compensatory mitigation purposes (Matthews and Endress, 2008). It can also be attributed to the lack of a method for measuring the current functional status of hydric soils prior to 2000. In his review of the performance standards contained in over 300 permits issued by the USACE, Streever (1999) found “no universally used performance standards for compensatory mitigation.” Most examples of performance standards focus on the assessment of the hydrophytic vegetation and wetland hydrology

criteria of restored or created wetlands (Streever, 1999; Cole and Shafer, 2002). The USACE's guidance on wetland restoration and creation also provides little information on evaluation of the hydric soil parameter (Hayes et al., 2000; USACE, 2002). Even more recent reviews of performance standards still find that nearly all are structural measures of vegetation characteristics with few functional criteria (Matthews and Endress, 2008). The majority of wetland creation/restoration projects either assume successful restoration of hydric soils based on re-establishment of wetland hydrology or require changes in soil properties within a time frame too short for these changes to be detected (NRC, 1995).

There are many studies that have compared soil properties of created/restored wetlands to their natural counterparts to evaluate their equivalency and develop trajectories to predict when these created/restored systems might reach functional equivalency (Nevel et al., 2004). Much of the attention to soil properties has focused on soil organic matter (SOM) content of mostly emergent wetlands showing accumulation, wetland soil development, and an increased availability of nutrients (Nevel et al., 2004). Studies on creation/restoration sites that were less than 20 years old found significantly less SOM than in reference wetlands and no correlation between time and SOM (Bischel Machung et al., 1996; Shaffer and Ernst, 1999; and Cole and Brooks, 2001). Longer term studies (15 to 75 years of recovery/development) on marshes and forested wetlands suggest a lag time for SOM accumulation, very slow accumulation (< 50% of reference after 55 years), and non linear

trajectories for some soil properties and wetland attributes (Wigginton et al., 2000; Craft et al., 2002; Bruland and Richardson, 2006; Ballentine and Schneider, 2009). Craft (2002) estimated 30 years for stream side soils in a created brackish marsh to reach the equivalency of natural marshes and more than 200 years for the upland fringe. Wigginton et al. (2000) found carbon levels increased with successional stage of forested floodplain wetlands and would take over 50 years to develop 75 percent of the carbon level of a reference site and possibly longer. These studies of SOM content show the inherent nature of soil formation/morphology which reflects conditions that have developed over decades to centuries. Despite the value of these studies toward long term monitoring and development of trajectories for wetland attributes, new performance standards have not emerged that address soil function in these created and restored systems within the 3 to 5 year timeframe that regulators must judge restoration success (Nevel et al., 2004; Matthews and Endress, 2008).

Current recommendations to improve creation/restoration success recognize that only time will unequivocally replace vegetation and soil structural components of undisturbed natural wetlands and suggest development of simple methods to measure function to determine success (Zedler, 1996; Ehrenfield, 2000; and Hobbs and Harris, 2001). Comprehensive literature reviews of wetland creation/restoration research have also described a need for more practical functional assessment to facilitate adaptive management and improved

success, establishment of more long term studies to further understanding of dynamic ecosystem development, and advancement of standardized data collection to allow more effective cross project comparisons (NRC, 2001; Nevel et al., 2004).

### **1.3 Hydric Soil Technical Standard**

To establish technical methodology and standards for assessing the current functional status of hydric soils, the NTCHS (2009) introduced the Hydric Soil Technical Standard (HSTS).

The HSTS is a method to determine the hydric status of a soil based on quantitative measurements of saturation and anaerobic conditions. It establishes the minimum criteria for the period of measurement and duration and frequency with which saturation and anaerobic conditions must occur for a soil to be functioning as a hydric soil. The NTCHS (2009) recommends application of the HSTS for the following objectives:

- a) “evaluate the function of wetland restoration, mitigation, creation, and construction;
- b) evaluate onsite the current functional hydric status of a soil; and
- c) with appropriate regional data modify, validate, eliminate, or adopt hydric soil field indicators for the region.”

Because anaerobic conditions occur only when soil microbes are active, the HSTS does not limit the time of year in which saturation and anaerobic conditions occur such as during the growing season. Confirming the presence of anaerobic conditions using the HSTS requires

either soil redox potential data or reduced iron data (NTCHS, 2009). To collect soil redox potential (Eh) data, five platinum electrodes are installed at the appropriate depth for the type of soil material. Anaerobic conditions can also be confirmed using IRIS tubes and alpha-alpha-Dipyridyl dye testing. To determine if the soil is saturated, the HSTS calls for piezometer data and recommends this data to be verified with open well data.

Piezometer, soil redox potential data or iron, and pH data should be collected weekly. At least one year of these measurements is recommended by the HSTS. The measurement period should, at a minimum, capture the entire cycle from drier conditions, throughout a given period of wet conditions, and back to drier conditions. The HSTS requires confirmation of both anaerobic conditions and saturated conditions for at least 14 consecutive days for a soil to be considered to be currently functioning as a hydric soil.

Saturated and anaerobic conditions must be prevalent during normal climatic conditions and cannot be based on a wetter than normal period of precipitation according to the jurisdictional criteria of the *1987 Corps of Engineers Wetlands Delineation Manual* (Environmental Laboratory, 1987). The absence of saturated and anaerobic conditions during a period of drier than normal precipitation conditions cannot be used as evidence that an area does not meet the jurisdictional criteria for a wetland. The HSTS must be met more than 50 percent of the time, in other words, more than 1 out of 2 years. The HSTS

assumes the frequency requirement is met if data are collected during a 30<sup>th</sup> to 70<sup>th</sup> percentile precipitation probability, which has often been used to represent normal precipitation conditions.

#### **1.4 Surface Treatments for Wetland Restoration of Agricultural Fields**

Agricultural fields represent the majority of disturbed habitats targeted for wetland restoration. Lilly (1981) describes the significant changes that occur to the surface as wetlands with organic soils, often referred to as blackland soils, are converted to agricultural fields. In order to provide adequate drainage for agricultural crops, the wetlands have to be ditched, graded, and drained. Parallel ditches are usually dug at regular intervals at a spacing that is determined by the permeability of the soil to be drained. To encourage positive drainage, spoil from the ditches is sometimes used to build up the area in between the edge of the ditches to form a slight crown in the center usually a foot or less higher in elevation than the ditches. Repeated plowing in addition to the initial ditching and grading produce a smooth surface that is very different in vertical structure from the original, rough and uneven surface of forested wetlands. The organic matter content of these former wetland soils also continually declines over time as the rate of decomposition increases due to increased aerobic soil conditions.

Agricultural fields developed on hydric soils of the Coastal Plain are good sites for wetland restoration projects. Usually these restoration efforts involve planting woody species and restoring wetland hydrology by plugging the ditches to stop artificial drainage. Several studies have shown the influence of microtopographic heterogeneity in forest communities. Using detrended correspondence analysis, Beatty (1984) found that mounds and pits in a maple-beech forest in eastern New York had characteristic assemblages of species. Jones et al. (1996) showed that microtopography can influence fine-root dynamics in forested wetlands of low order stream floodplains. Roots were least abundant in hollows. However, their results of higher net primary productivity in hollows over hummocks were contrary to their predictions and inconclusive. In experimental wetland communities, Vivian-Smith (1997) found microtopographic heterogeneity significantly altered plant community composition. The heterogeneity treatment contained the most species and more of the rarer species.

Scherrer (2000) examined the question of causation in her study on the presence of mature trees on mounds within a nonriverine wet hardwood forest located on the Lower Coastal Plain of North Carolina. The study found more stems of all diameters occurred on mounds suggesting that trees do not cause mounds, but mounds do provide better substrate for establishment for many of the tree species in these forests (Scherrer, 2000).

Tweedy (2001) researched the effects of surface roughing (creation of microtopography) and two levels of water table control on runoff from wetland restorations on prior-converted cropland at two sites on the North Carolina Coastal Plain. He found that rough microtopography treatments showed decreased total outflow volume, decreased outflow intensity, and commonly increased duration of outflow (i.e. released water more slowly) over smooth topography treatments.

After their review of the wetland regulatory program under Section 404 of the Clean Water, the National Research Council (2001) developed Operational Guidelines for Creating or Restoring Self-Sustaining Wetlands. One of these ten guidelines was a recommendation to use appropriately heterogeneous topography, such as that associated with a target wetland type, as a model for restoration projects (NRC, 2001). However, we encountered field personnel with the US Army Corps of Engineers that remain skeptical of incorporating microtopographic variability into restoration and creation plans. One concern of regulatory personnel is that application of this technique may result in wetland restorations and creations with less jurisdictional acreage because wetland hydrology criteria may not be met on the hummocks especially in restorations or creations in which the wetland hydrology may only be present for 5 to 12.5 percent of the growing season. Although they recognize some of the potential benefits such as a more diverse plant community and increased infiltration associated with microtopographic replication, these regulatory

personnel still believe construction of microtopography is impractical for the following reasons:

- a) microtopographic variability will develop on its own within a few years of restoration,
- b) expense of construction,
- c) technical difficulty associated with achieving the correct structural pattern on different soil types especially sandy soils, and
- d) increased complexity of evaluation.

### **1.5 Restoration Project Background**

In 2000, the North Carolina Coastal Federation (NCCF) commenced one of the largest coastal restoration and preservation projects in the history of North Carolina. The NCCF is a non-profit organization whose mission is to protect and restore coastal North Carolina. With grants from the Clean Water Management Trust Fund, a total of 1,684 ha of cropland, forested freshwater wetlands, and salt marsh comprising North River Farms was acquired for coastal habitat restoration and preservation (NCCF, Undated). This land, situated on the east side of North River, is also adjacent to Open Grounds Farm. Row crops including corn, soybeans, wheat, and cotton are grown on this farm that is approximately 18,000 ha in size. The NCCF is working with the NC Ecosystem Enhancement Program (formerly the Wetland Restoration Program), National Oceanic & Atmospheric Administration, US Fish and Wildlife Service, US Environmental Protection Agency and other partners to ensure

not only successful restoration, but to also provide valuable opportunities for large-scale and long-term research most suitable for understanding restoration of complete ecosystems. The objective of the NCCF was to re-establish natural plant communities most appropriate to hydrogeomorphological settings present, provide habitat for a variety of wildlife, and improve the quality of water discharging into the North River through restoration of wetlands and establishment of riparian buffer areas along the river's tributaries.

North River is open to Back Sound of the Cape Lookout seashore. The North Carolina Division of Water Quality (NCDWQ) places North River in its own subbasin within the White Oak River Basin. It contains 9.7 km of brackish and estuarine creeks and nearly 20,000 ha of estuarine areas used for shellfishing. These waters are classified as Class SA waters indicating that they are tidal saltwaters suitable for commercial shellfishing and all other tidal water uses. The area of North River adjacent to the project does not support shellfishing harvesting due to fecal coliform bacteria contamination (NCDWQ, 2001). NCCF retained the Department of Biological and Agricultural Engineering (BAE) of NC State University working in conjunction with the Departments of Forestry and Soil Science to restore, monitor, and conduct research on approximately 100 ha of agricultural fields designated as Phase I of the North River project.

The large scale wetland restoration undertaken in Phase I of the North River Farms project provided an opportunity to use the HSTS to determine whether a functioning hydric soil had been successfully restored. BAE also conducted research on the hydrological effects of three surface treatments that were designed to reverse some of the effects that conversion to agriculture had on these former wetlands. For one of the surface treatments, BAE graded the field flat to remove the crowns between ditches prior to proceeding with the restoration effort. The second surface treatment was a microtopography treatment, which was accomplished by using farm implements to create artificial microtopography prior to planting and restoration of wetland hydrology. The third treatment served as the control, to which no surface treatment was applied, but ditches were plugged.

This study had two objectives. First, to utilize the HSTS as a performance standard to measure the current functional status of hydric soils present within Phase I of the North River Wetland Restoration project. Use of the HSTS provided real-time measurement of saturation and anaerobic conditions to provide baseline data and to accommodate adaptive management if restoration data shows that saturation and anaerobic conditions are too far outside the range of those conditions observed in an appropriately chosen reference wetland. The second objective was to use the HSTS to detect differences in hydric soil function between two different surface treatments and the absence of a surface treatment used to restore wetlands on prior-converted cropland.

## 2.0 MATERIALS & METHODS

### 2.1 Site Description

The research was conducted on former agricultural fields located on the Lower Coastal Plain of North Carolina in Carteret County (Figure 2.1). Cleared and graded of forest vegetation in the 1970s, these agricultural fields are relatively young. Ditches spaced approximately 100 m apart and approximately 120 cm deep provided drainage to manage a rotation of corn, soybeans, and winter wheat. Farmers had crowned areas between ditches approximately 30 cm in height to promote positive drainage. Figure 2.2 shows the condition of the project area immediately prior to restoration.

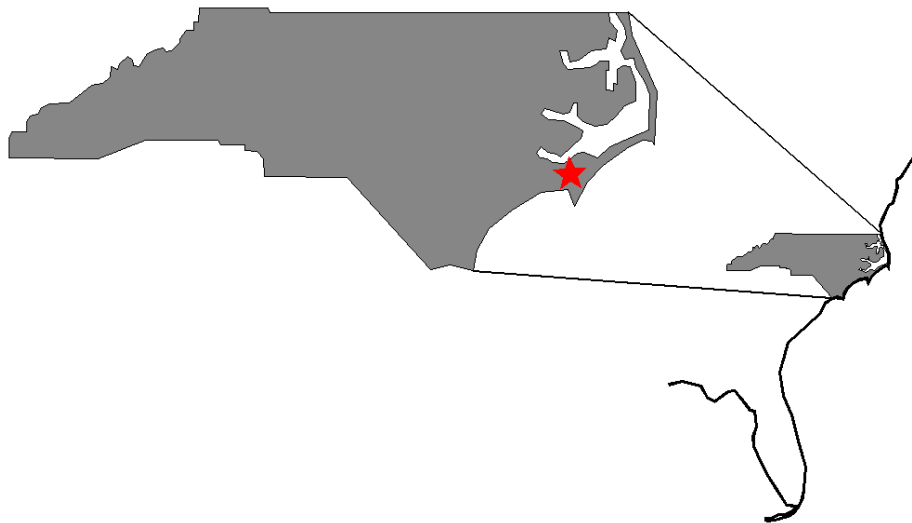


Figure 2.1. The project is located on the Lower Coastal Plain of North Carolina.



Figure 2.2. Photograph from air showing agricultural fields prior to restoration in March 2003 (*photo courtesy of NCCF*).

Planning any successful restoration requires evaluating the prospective restoration area to similar reference sites with respect to landscape position, vegetation, soil series, and local habitat value. Two separate fields make up the restoration areas of Phase I. Both fields are relatively flat with an elevation range of no more than 2 m without any natural drainage features or creeks (Figure 2.3). These fields are precipitation flats positioned at the edge of a large interstream divide, which is nearly completely occupied by Open Grounds Farm. Although organic soils occupy the majority of the interstream divide, mineral soils with a high organic content have developed along the edges of the divide including the restoration area. Soils within the restoration areas consist primarily of very poorly drained Deloss fine sandy loam classified as fine-loamy, mixed, thermic Typic Umbraquults (Figure 2.4). A

few small inclusions of Arapahoe fine sandy loam (Typic Humaquepts), Wasda muck (Histic Humaquepts), and Leon sand (Aeric Haplaquods) are also present (USDA, SCS, 1978). The percent carbon measurements from the A-horizon in the restoration area averaged  $9.92 \pm 3.90$  and ranged from 4.51 to 20.70 (Baldwin, unpublished data, 2004).



Figure 2.3. Site location shown on Morehead City, NC USGS topographic map. The map is a 30x60 minute series topographic quadrangle (1:100,000) dated 1990.

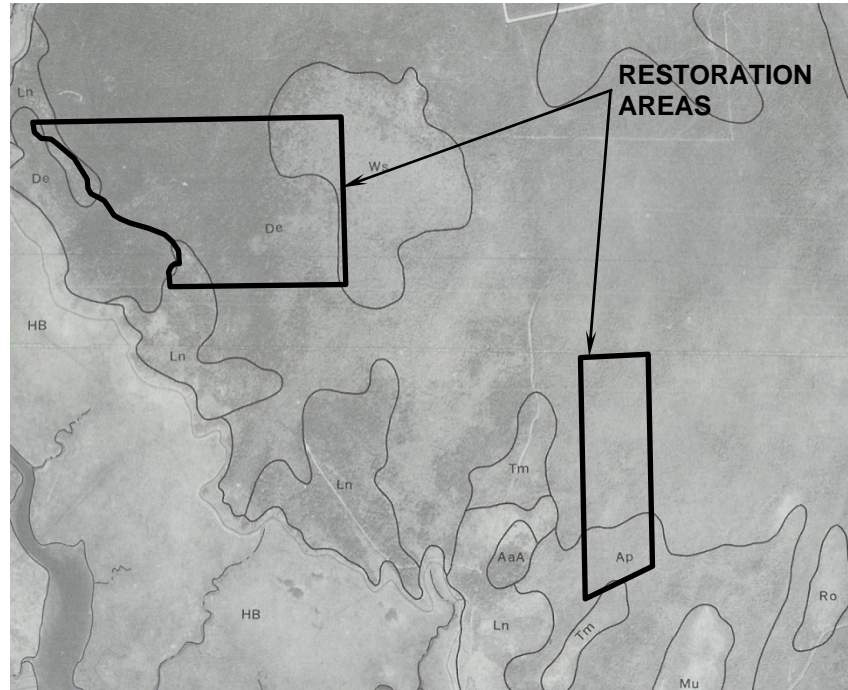


Figure 2.4. Restoration site superimposed on Soil Survey of Carteret County, North Carolina. Deloss fine sandy loam (De), Wasda muck (Ws), Arapahoe fine sandy loam (Ap), and Leon sand (Ln) are the major soils mapped on the restoration sites (USDA, SCS, 1978).

Nonriverine wet hardwood forest (NWHF) was selected as the primary target plant community from the Classification of the Natural Communities of North Carolina – Third Approximation (Schafale and Weakley, 1990). This was based on the landscape position and soils of the restoration site. Other suitable target communities were planned for small inclusions of minor soil series significantly different from Deloss fine sandy loam that were

found across most of the site. These included estuarine fringe forest, nonriverine swamp forest, and tidal marsh. Table 2.1 summarizes the planting plan for the site restoration.

Table 2.1. Planting plan for North River Restoration Site.

| Planting Area<br>Soil Type   | Tree Species         |                                     | Wetland<br>Plant<br>Indicator<br>Status <sup>1</sup> | Acres of<br>Restoration<br>Area | Total<br>Number |
|--|----------------------|-------------------------------------|--|---------------------------------|-----------------|
|  | Common Name          | Scientific Name                     |  |                                 |                 |
| WASDA/<br>DELOSS – WET<br>Wasda muck/<br>Deloss fine sandy<br>loam | Atlantic White Cedar | <i>Chamecyparis thyoides</i>        | OBL  | 93                              | 14,670          |
|  | water tupelo         | <i>Nyssa aquatica</i>               | FAC  |                                 | 365             |
|  | baldecypress         | <i>Taxodium distichum</i>           | OBL  |                                 | 12,200          |
|  | overcup oak          | <i>Quercus lyrata</i>               | OBL  |                                 | 6,600           |
| DELOSS – DRY<br>Deloss fine sandy<br>loam                          | swamp tupelo         | <i>Nyssa sylvatica var. biflora</i> | FAC  | 135                             | 869             |
|  | water oak            | <i>Quercus nigra</i>                | FAC  |                                 | 18,500          |
|  | laurel oak           | <i>Quercus laurifolia</i>           | FACW   |                                 | 10,000          |
|  | green ash            | <i>Fraxinus pennsylvanica</i>       | FACW   |                                 | 11,500          |
| LEON<br>Leon sand  | longleaf pine        | <i>Pinus palustris</i>              | FACU+  | 30                              | 9,156           |

<sup>1</sup> OBL = Obligate Wetland, FACW = Facultative Wetland Plant, FAC = Facultative, FACU+ = Species more frequently found in uplands than Facultative Upland Plant.

## 2.2 Reference Wetland Description

A nonriverine swamp forest/small stream swamp forest approximately 20 ha in size and located approximately 2 km east of the restoration area served as the reference wetland for the project (Figure 2.5). This wetland occupies a depressional area elongated along the north-south axis. There is approximately 30 cm of elevation difference between the center

of the depression and the edge. Agricultural fields bound the wetland to the north while early successional forest of sweet gum (*Liquidambar styraciflua*), Loblolly pine (*Pinus taeda*), and red maple (*Acer rubrum*) generally bounds it on the east and west sides. This forested wetland grades into tidal marsh dominated by black needle rush (*Juncus roemerianus*) to south where it connects to Wards Creek, a tributary of the North River.

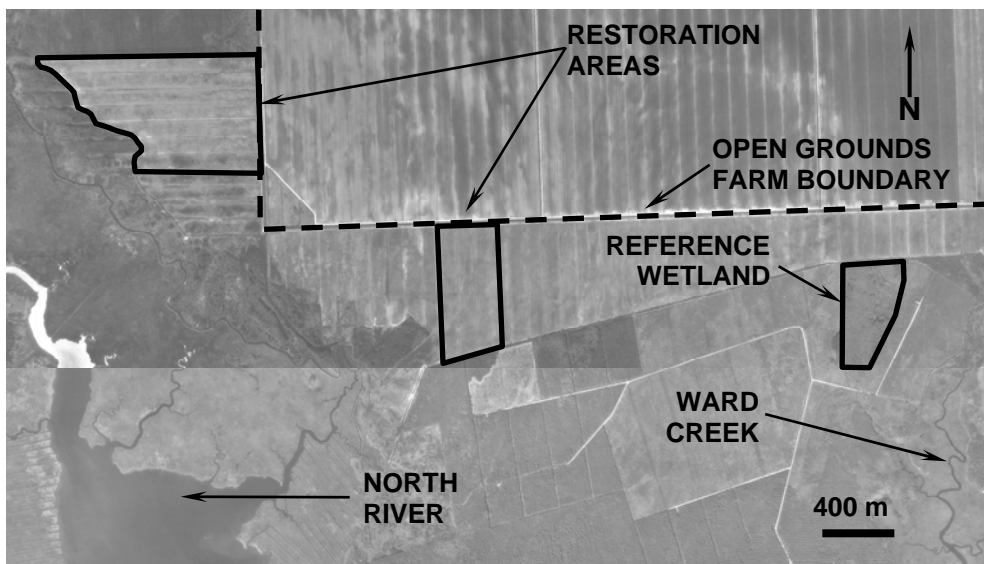


Figure 2.5. Aerial photograph showing restoration areas and reference wetland. The 1998 photograph (Harkers Island Quadrangle, 1 m resolution) was obtained from NC Center for Geographic Information and Analysis.

Wasda muck is the primary soil series present in the reference wetland based on soil profile descriptions from auger borings, which is listed as an inclusion within the Deloss fine sandy loam mapped on the site by the Carteret County Soil Survey. The percent carbon measurements of the O and A-horizons in the reference wetland averaged  $15.49 \pm 7.48$  and ranged from 6.22 to 27.68 (Baldwin, unpublished data, 2004).

Swamp black gum (*Nyssa sylvatica*) and red maple (*Acer rubrum*) dominate the overstory of the reference wetland while horse sugar (*Symplocos tinctoria*), red bay (*Persea borbonia*), and wax myrtle (*Morella cerifera*) make up the understory. *Leucothoe* (*Leucothoe axillaris*), fetter-bush (*Lyonia lucida*), and Virginia chain fern (*Woodwardia areolata*) cover most of the forest floor along with many various-sized roots.

The reference wetland is classified as a nonriverine swamp forest community, not the nonriverine hardwood forest community selected as the target community for the restoration area. Schafale (2008) explains that nonriverine swamp forests are the natural community type most similar to nonriverine wet hardwood forests. In addition to being wetter, nonriverine swamp forests share many plant species with nonriverine wet hardwood forests, but are dominated by Swamp black gum (*Nyssa sylvatica*) and red maple (*Acer rubrum*) instead of oaks (Schafale, 2008). Nonriverine hardwood forest are a rare wetland type because they are relatively drier than other Coastal Plain wetland types and were more

likely to be converted to agriculture since less effort was required to improve drainage (Schafale, 2008). The reference wetland's proximity and similarity of hydrologic regime warrants use of this natural wetland as the best available comparison to the restoration area since nonriverine hardwood forest communities were not available nearby.

### **2.3 Site Restoration**

In January 2003, BAE began oversight of restoration activities on the site. Weirs were set at 0.15 m below ground surface to plug the downstream end of ditches in order to stop drainage and monitor the flow leaving treatments imposed in the restored area. Earthen plugs were also placed in the ditches to provide land connections and ensure complete blockage of drainage without the expense of filling the ditches entirely. Contractors constructed artificial tree-throws across the entire restoration area at rate of approximately 5 per acre by excavating the upper 15 cm to 30 cm of the A-horizon with a bulldozer blade and piling it next to the excavated area.

After construction was completed in March 2003, woody plant species were planted in each of the soil groups present within the restoration area (Table 2.1). The overall density of woody species planted equaled approximately 300 trees/ha. Longleaf pine seedlings were planted on a few 1-ha sized areas of Leon sand within the restoration area to facilitate development of estuarine fringe forest usually found on these soils. Areas of Wasda muck

and depressional areas within Deloss fine sandy loam received primarily bald cypress and Atlantic white cedar due to their greater tolerance for wetness.

## 2.4 Study Design

A randomized complete block design with three replications was established by BAE within the restoration site to evaluate the performance of three surface treatments. The treatments were (1) control, (2) crown removal, and (3) microtopography. The northern field contained two blocks, and the eastern field contained the third (Figures 2.6 and 2.7).

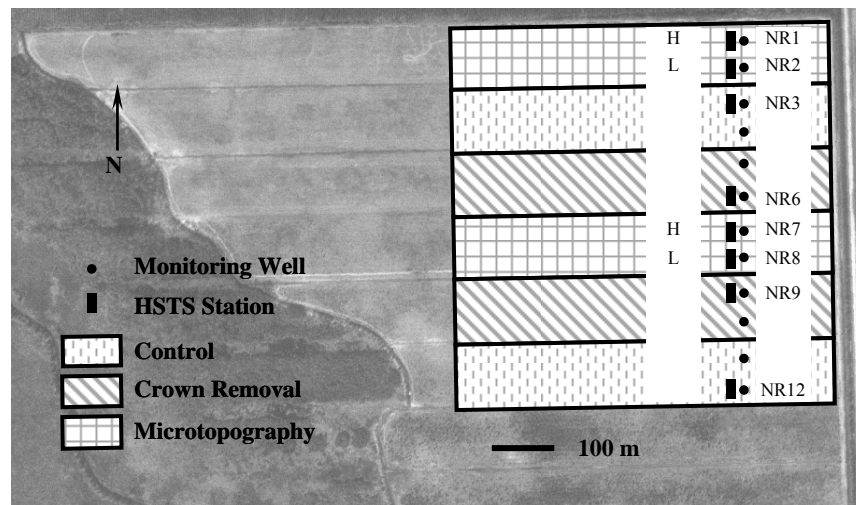


Figure 2.6. Treatment layout of northern restoration field. Block 1 (NR1 – NR6) and Block 2 (NR7 – NR12) were located in the northern field. One station was installed in each treatment except for microtopography that received two in order to characterize topographic high positions separately from low ones.

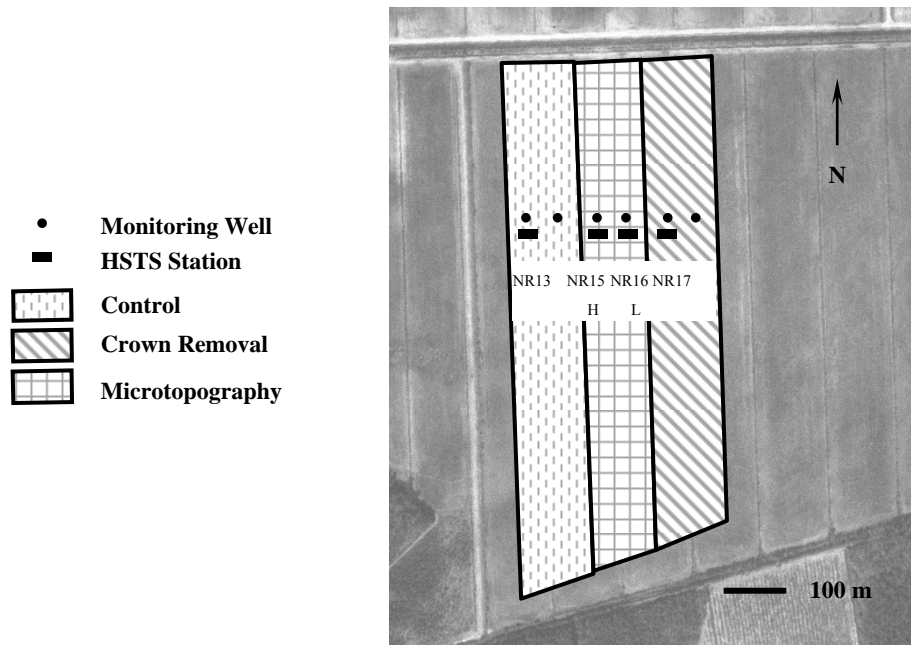


Figure 2.7. Treatment layout of eastern restoration field. Block 3 (NR13 – NR17) was located in the eastern field. One station was installed in each treatment except for microtopography that received two in order to characterize topographic high positions separately from low ones.

The control was left as it was when farming was stopped. The slight crowns in the center of the fields, which were created to facilitate drainage for crop production, were left intact. The second treatment removed the crowns, which were created in the center of fields as part of their conversion to agriculture. The act of re-grading left the soil surface of the entire area slightly roughed although there was no specific attempt to do so.

The microtopography treatment was created by roughing the soil surface upon restoration to mimic the micro-highs and lows often found in forested wetlands. Contractors used a

farm plow adjusted to excavate approximately 15 cm and pile it adjacent to the excavation to create surface micro-highs and lows (Figure 2.8).



Figure 2.8. Foreground shows the microtopography treatment after construction in late spring of 2003 (*photo courtesy of Restoration Systems*).

Earthen berms were constructed around each plot to separate them hydrologically and allow for water quality and quantity sampling. A conceptual cross-section of the treatments illustrates the different surfaces created (Figure 2.7). Two continuous recording monitoring wells were installed within each plot along a transect placed across the study area in each field. Wells were installed to a depth of 2 m below ground surface and situated midway between the ditch and berm in each plot. BAE maintained and collected the data from

these wells (Wright, 2005). HSTS monitoring stations were located along this same transect of wells for this study.

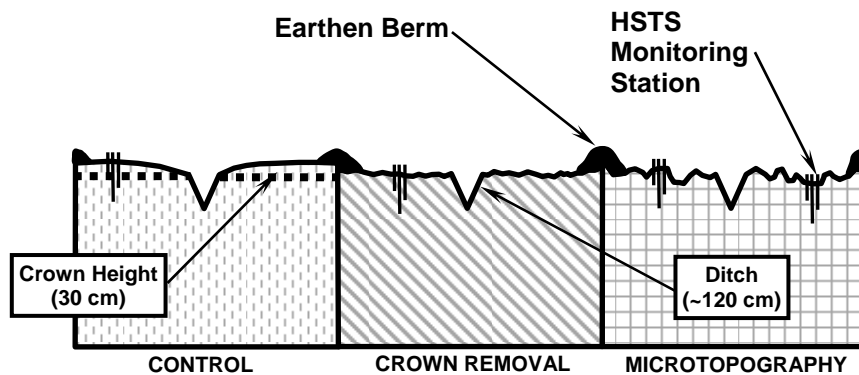


Figure 2.9. Conceptual cross-section of treatments. The control treatment did not involve a surface treatment and remained smooth as it was left after farming ceased. The microtopography treatment had the roughest surface and, the crown removal treatment resulted in a flatter, slightly roughed surface.

One HSTS station was installed adjacent to one of the wells in each plot except for the microtopography treatment. The microtopography treatment received two stations per plot, one in a low and another in a high microtopographic position (Figure 2.7). The high and low microtopographic stations were not located adjacent to one another, but in separate well locations.

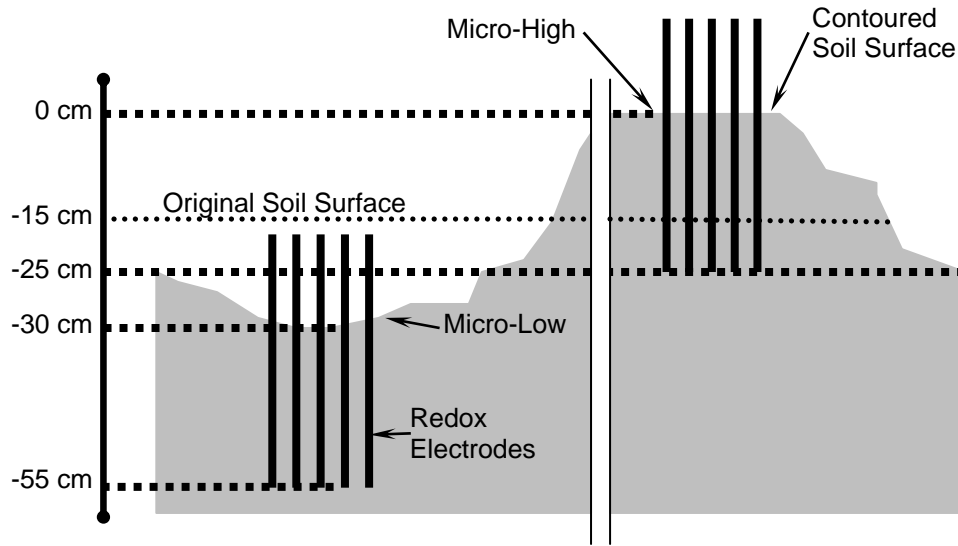


Figure 2.10. Conceptual cross-section of microtopography showing redox probe installation. The amplitude of the microtopography was limited to approximately 30 cm.

BAE installed three transects of wells within the reference wetland. Transects run east-west across the short axis of the elongated depression. We placed four monitoring stations adjacent to wells in the northern and middle transects where the reference is appropriately classified as nonriverine swamp forest. Between the middle and southern transects, this community grades to a coastal plain small stream swamp (blackwater subtype). Two monitoring stations were located on the eastern and western edges, which were the driest areas of the wetland, and two were located in the center and wettest area in the wetland. Additionally, those stations located at the edge of the wetland were situated on

microtopographic high positions, while the two center stations were situated within microtopographic low positions (Figure 2.11).

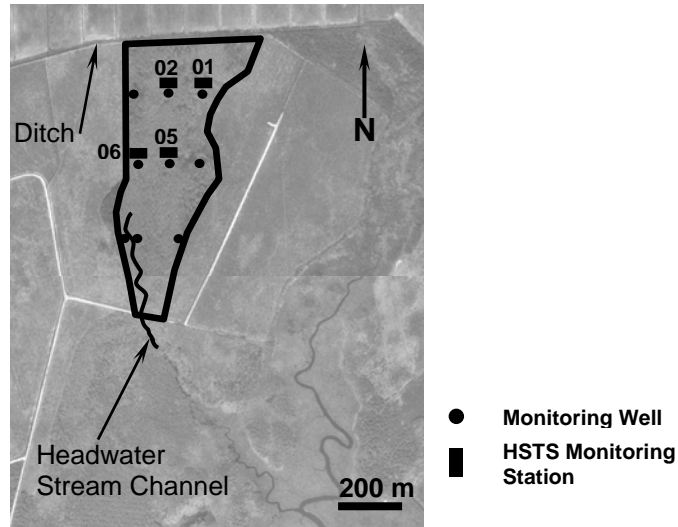


Figure 2.11. Reference wetland HSTS station and monitoring well layout.

## 2.6 Monitoring Stations

Platinum electrodes were installed to provide soil redox potential (Eh) data for determining the presence of anaerobic conditions required to meet the HSTS. The electrodes were constructed according to the method described by Smith (1998). As specified in the HSTS for loamy and clayey soil materials, each station contained a bank of five platinum electrodes installed at the 25-cm depth as measured from soil surface. Another bank of five

platinum electrodes was installed at a depth of 61 cm to measure redox potential. However, this deeper bank of electrodes is not required by the HSTS.

A set of four piezometers and one open well were used to determine the presence of saturated conditions. Two piezometers were installed at 25 cm and two more at 100 cm. Piezometers were constructed and installed in general accordance with the Wetlands Regulatory Assistance Program’s publication entitled “Installing Monitoring Wells/Piezometers in Wetlands” (Sprecher, 2000). Each station was installed adjacent to one of the previously described open wells in order to verify the piezometer data with auto-recorded, well data. A schematic of the monitoring station setup is shown in Figure 2.12.

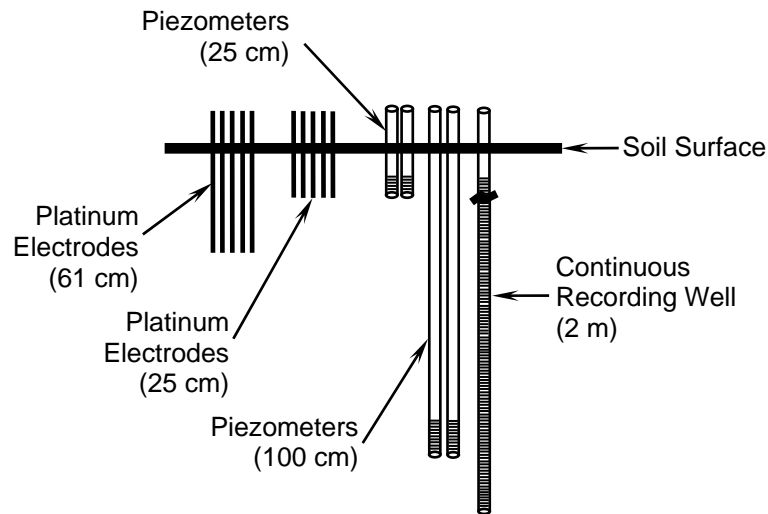


Figure 2.12. Schematic of HSTS equipment and supplemental electrode bank. The bank of platinum electrodes installed at a depth of 61 cm is not required by the HSTS.

## 2.7 Data Collection

Depth to free water within each piezometer and soil redox potential were measured on as close to a weekly basis as possible for approximately 15 months beginning in September 2003. Soil redox data were collected using an Accumet Model AP-62 (mV/pH/°C) Portable Meter (Fisher Scientific Co. – Pittsburg, PA) equipped with an Ag/AgCl, KCL saturated reference electrode (Jenson Instruments – Tacoma, WA) for approximately the first 12 months of the study until it was damaged. A Calomel reference electrode was used for the remainder of the study. Data collected using the Ag/AgCl electrode was corrected by a factor of +200 mV, and the Calomel reference electrode data was corrected by a factor of +250 mV.

To obtain soil redox potential measurements at each monitoring station, the reference electrode, which was connected to the positive terminal of the Accumet meter, was inserted into the ground surface to a depth of 10 cm. The area around the reference electrode was wetted to ensure good electrical contact with the soil. Each platinum electrode was connected to the negative terminal of the meter until the potential reading stabilized. This usually required only 5 to 10 seconds except when it was raining when it could take twice as long or more for the reading to stabilize.

The depth to free water in each piezometer was measured using a Solinst Mini 101 model electronic water level indicator. The measurement was taken from the top of the piezometer. At the beginning of the study, the height of the piezometer above the ground surface was measured and subtracted from the water level measurements obtained in the field.

The pH was measured at a depth of 25 cm and 61 cm from the ground surface at each monitoring station twice during the study. One of these measurements occurred on March 12, 2004 after an extended period of saturation that began in December 2003 and another on June 16, 2004 during a dry or unsaturated period beginning around mid March. A stainless steel, punch-type soil probe was used to obtain a small sample of soil from each depth. A 1:1 ratio of soil and water was mixed into a slurry and pH of the slurry was measured using the Accumet meter equipped with a pH/ATC electrode.

Precipitation was measured within each restored field on the site using three Davis Rain Collector tipping bucket recorders equipped with HOBO<sup>®</sup> data loggers (Wright, 2005). Data from one of these recorders located in the eastern field was used because it had the least amount of missing data. Data from one of the recorders located in the northern field was used to fill in the missing data. During periods where on-site data were not available,

data from the Beaufort Smith Field, NC (KMRH) weather station operated by the State Climate Office of North Carolina were used to substitute for the missing data.

Historic precipitation values were obtained from the weather station near Morehead City, NC. Data from this station were used by the Natural Resources Conservation Service to generate WETS Tables that summarize climatic data for wetland determinations. These tables define the normal range of monthly precipitation and growing season based on 30 years of climatic data observed by the National Weather Service Cooperative Network. The 30-year period used for the Morehead City, NC station WETS Table was from 1971 to 2000.

## **2.8 Data Analysis**

After applying the appropriate correction factor to the field soil redox potential measurements, each of the five measurements for a particular depth and station were compared to a threshold redox potential value. Measurements falling below this threshold indicate the presence of anaerobic conditions. The average pH collected from each depth and station was used to calculate the threshold redox potential using the following Eh/pH equation shown in Figure 2.14 (NTCHS, 2009).

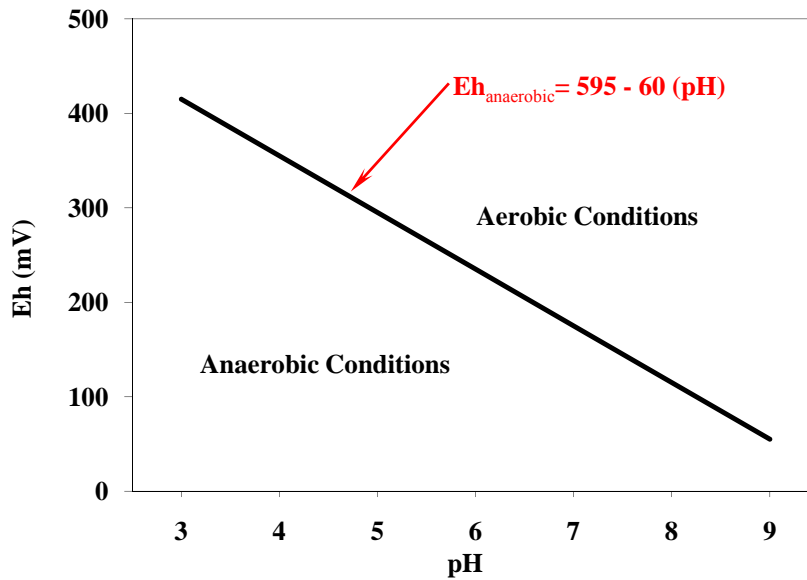


Figure 2.14. Eh/pH diagram. This graph was developed by the NTCHS (2009) to generally separate aerobic conditions from anaerobic conditions specifically for the HSTS and does not represent the threshold for any particular elements such as carbon, nitrogen, iron, etc.

If redox potential values for at least three out of the five electrodes were lower than this threshold redox potential value, then anaerobic conditions were presumed present for that particular depth, station, and point in time. The HSTS requires both anaerobic conditions and saturation in order to confirm that a soil is functioning as a hydric soil.

Free water in at least one of the shallowest piezometers (25 cm) confirmed the presence of saturated conditions. Data from all four piezometers installed at each station were plotted with the station's continuous well data to verify the accuracy of the piezometer data. The HSTS requires that saturation and anaerobic conditions occur during a period of normal antecedent rainfall conditions.

The Direct Antecedent Rainfall Evaluation Method (DAREM) is recommended by the HSTS and was used to determine the antecedent precipitation for each month of the study (NTCHS, 2009; Sumner et al., 2009). It utilizes the 30<sup>th</sup> to 70<sup>th</sup> percentile precipitation probability for three months preceding the month of measurement to classify the antecedent conditions of the measurement month. Using this method, conditional values are assigned to each of the three precipitation classes. Drier than normal precipitation conditions receive a value of 1, normal conditions receive a value of 2, and wetter than normal precipitation conditions receive a value of 3. Each month is classified based on the total amount of precipitation. Drier than normal precipitation conditions occur when the total monthly precipitation is less than the 30<sup>th</sup> percentile precipitation probability. Total monthly precipitation is classified as normal when it falls between the 30<sup>th</sup> and 70<sup>th</sup> percentile precipitation probabilities. Wetter than normal conditions occur when the total monthly precipitation is greater than the 70<sup>th</sup> percentile precipitation probability. Months were then weighted according to their proximity to the month of measurement. The first

month prior to the month of measurement received a month weight value of 3. The second month received a value of 2, and the third month a value of 1. Each month's conditional value was multiplied by the month's weight value. The sum of the results for all three months indicates the antecedent rainfall conditions for the month of measurement. A sum from 6 to 9 indicates drier than normal antecedent conditions, a sum of 10 to 14 indicates normal antecedent conditions, and a sum of 15 to 18 indicates wetter than normal antecedent conditions. Table 2.2 shows an example of this process to evaluate antecedent precipitation conditions.

Table 2.2. Example of antecedent precipitation evaluation for a May 2004 measurement

|   | Month | 30 <sup>th</sup> percentile (mm) | 70 <sup>th</sup> percentile (mm) | Rain -fall 2004 | Condition (dry, wet, or normal) | Conditional Value | Month Weight Value | Product of previous two columns |
|---|-------|----------------------------------|----------------------------------|-----------------|---------------------------------|-------------------|--------------------|---------------------------------|
| 1 <sup>st</sup> prior month   | Apr   | 42                               | 97                               | 61              | normal                          | 2                 | 3                  | 6                               |
| 2 <sup>nd</sup> prior month   | Mar   | 80                               | 124                              | 67              | dry                             | 1                 | 2                  | 2                               |
| 3 <sup>rd</sup> prior month   | Feb   | 61                               | 113                              | 105             | normal                          | 2                 | 1                  | 2                               |
|   |       |                                  |                                  |                 |                                 |                   | <b>Sum</b>         | 10                              |
| <b>Antecedent Rainfall Condition: (drier than normal =6-9, normal=10-14, or wetter than normal=15-18)</b> |       |                                  |                                  |                 |                                 |                   |                    | <b>normal</b>                   |

The antecedent conditions for the month of May 2004 were classified as normal using the DAREM method to evaluate normal rainfall for short-term assessments.

Although not explicitly allowed by the HSTS, months in which the precipitation conditions were drier than normal as well as normal were used to determine if the HSTS was met. It

was reasoned that if a soil were wet enough to meet the HSTS during drier than normal precipitation conditions then it would also meet the HSTS during normal precipitation conditions.

For each measurement, the antecedent rainfall condition, depth to water, and redox potentials are recorded and evaluated to determine if the saturation and anaerobic conditions are met (Table 2.3). Technical Standard Data Sheets were completed for each station during the study period (Appendix A). Although saturation and anaerobic conditions indicate that a soil is functioning as a hydric soil at that point in time, there are additional criteria established to ensure that the duration and occurrence frequency are sufficient for a hydric soil to develop. Saturated and anaerobic conditions must persist for at least 14 consecutive days to meet the duration criteria during a period of normal (or drier than normal for this study) antecedent precipitation conditions (NTCHS, 2009).

Table 2.3. Example of Technical Standard Data Sheet for an HSTS station.

| Date     | Antecedent Condition | Depth to water in piezometer (cm) | Redox Potentials by Electrode |             |            |            |             | Is soil anaerobic? | Saturated and anaerobic? |
|----------|----------------------|-----------------------------------|-------------------------------|-------------|------------|------------|-------------|--------------------|--------------------------|
|          |                      |                                   | 1                             | 2           | 3          | 4          | 5           |                    |                          |
|          |                      |                                   | -----mv-----                  |             |            |            |             |                    |                          |
| 03/12/04 | normal               | 4.8                               | <b>-49</b>                    | <b>-176</b> | <b>-92</b> | <b>-26</b> | <b>-11</b>  | yes                | yes                      |
| 03/20/04 | normal               | 1.8                               | <b>-53</b>                    | <b>-181</b> | <b>-97</b> | <b>-26</b> | <b>59</b>   | yes                | yes                      |
| 03/28/04 | normal               | 16.7                              | <b>-49</b>                    | <b>-180</b> | <b>-91</b> | <b>-28</b> | <b>18</b>   | yes                | yes                      |
| 04/04/04 | drier                | 17.7                              | <b>15</b>                     | <b>-194</b> | <b>-95</b> | <b>-37</b> | <b>-61</b>  | yes                | yes                      |
| 04/10/04 | drier                | 36.8                              | <b>-51</b>                    | <b>-187</b> | <b>-84</b> | <b>-30</b> | <b>-82</b>  | yes                | no                       |
| 04/25/04 | drier                | 36.8                              | <b>-50</b>                    | <b>-187</b> | <b>-74</b> | <b>-39</b> | <b>-121</b> | yes                | no                       |
| 05/09/04 | normal               | 41.3                              | <b>-215</b>                   | <b>-195</b> | <b>-85</b> | <b>-44</b> | <b>-64</b>  | yes                | no                       |
| 05/16/04 | normal               | 70.8                              | <b>-69</b>                    | <b>-171</b> | <b>-55</b> | <b>111</b> | <b>40</b>   | yes                | no                       |
| 05/23/04 | normal               | 85.8                              | <b>-77</b>                    | <b>-196</b> | <b>419</b> | <b>217</b> | <b>190</b>  | yes                | no                       |

Saturation is present when the depth to water in the piezometer equals 25 cm or less. The following equation was used to determine the critical redox potential value that indicates when the soil should be anaerobic:

$E_{h_{anaerobic}} = 595 - 60(\text{pH})$ . Redox potentials in bold are less than the critical redox potential value calculated as shown:  $E_{h_{anaerobic}} = 595 - 60(4.55) = 595 - \underline{273} = \underline{322}$ .

The mean number of days that the treatments and the reference wetland met the saturation and anaerobic conditions criteria of the HSTS and the mean number of days with anaerobic conditions were analyzed statistically using SAS statistical software (SAS Institute, Inc., 1985). The Tukey method was applied to an ANOVA means test to control the type-I experiment-wise rate to adjust for multiple pair-wise comparisons.

### 3.0 RESULTS AND DISCUSSION

#### 3.1 Precipitation

Wetter than normal precipitation conditions prevailed throughout the study period of 2003 except for the month of September (Figure 3.1). Beginning in February 2004, normal or drier than normal precipitation conditions occurred except for the months of September and October. A Category 1 hurricane and tropical storm that passed near the restoration area during August resulted in the wetter than normal antecedent precipitation condition for September and October 2004.

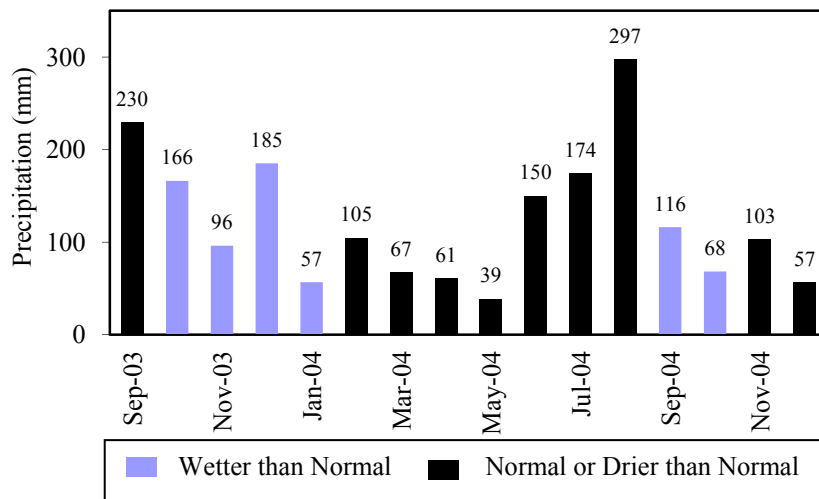


Figure 3.1. Study period monthly precipitation and antecedent rainfall condition. Each month's total precipitation is shown and classified using the DAREM method for determining antecedent precipitation conditions.

### 3.2 pH

Table 3.1 provides a statistical summary of the soil pH measurements collected from the installation depths of both electrode banks at each station within the reference wetland and treatment areas. The soil pH in the treatment areas stayed consistent at the 25 to the 61-cm depth. Soil pH increased slightly from the 25 to the 61-cm depth within the reference wetland. The range in pH values was larger in the reference wetland than in restoration site.

Table 3.1. Summary of pH data.

| Study Area              | Minimum | Maximum | Mean            |
|-------------------------|---------|---------|-----------------|
| ----- 25-cm Depth ----- |         |         |                 |
| Reference               | 3.99    | 6.18    | $4.94 \pm 0.77$ |
| Restoration/Treatments  | 4.30    | 5.58    | $4.79 \pm 0.35$ |
| Overall                 |         |         | $4.83 \pm 0.48$ |
| ----- 61-cm Depth ----- |         |         |                 |
| Reference               | 4.44    | 6.47    | $5.53 \pm 0.76$ |
| Restoration/Treatments  | 4.29    | 5.27    | $4.75 \pm 0.25$ |
| Overall                 |         |         | $4.95 \pm 0.55$ |

Soil pH values from reference and restoration were averaged to provide a common aerobic/anaerobic threshold for graphical comparison.

### **3.3 Reference Wetland Characterization**

Figure 3.2 shows the depth of saturation using measurements from the shallowest piezometers at each station within the reference wetland. REF 05 was the wettest monitoring station, whereas REF 01 was the driest. Although the stations were not positioned in a straight line across the hydrologic gradient, they showed the full range of hydrologic conditions within the reference wetland. REF 05 was the only station that was inundated during the wetter than normal precipitation conditions of 2003, due to its location within a micro-depression in the center of the reference wetland. The average depth of water within this micro-depression was 10 cm. Ponding at REF 05 reached its highest at 16 cm above the ground surface during August 2004 after a Category 1 hurricane and a tropical storm passed near the site. All of the remaining stations were saturated without standing water. These saturated conditions persisted for more than 14 days, exceeding the minimum conditions required by the HSTS during 2003. REF 02, REF 05, and REF 06 exhibited saturated conditions throughout the study period of 2003, while REF 01 had only two separate occurrences of saturated conditions. The first occurrence was only one weekly measurement, but the second occurrence persisted for 25 days. Although data collected during 2003 cannot be used to determine if the HSTS was met, they do provide valuable information about the extreme wet conditions that help to shape and maintain this particular natural community.

Normal or drier than normal precipitation conditions occurred throughout 2004 except for the months of January, September and October. Only data collected during periods of normal or drier than normal precipitation conditions can be used to determine if the HSTS was met. In the locations of REF 02, REF 05, and REF06, saturated conditions continued into 2004 until the beginning of April. Although saturated conditions were observed in the location of REF 01 three times during the same period, they did not persist for more than one weekly measurement.

In mid April 2004, the water table in the reference wetland dropped precipitously and remained 100 cm or more below the ground surface until August. Saturated or wetter conditions briefly returned to all the reference stations during the month of August when tropical weather affected the site. All of the reference wetland stations were unsaturated near the soil surface throughout September and October. At the end of November, saturated conditions returned to the center stations, but not the edge stations.

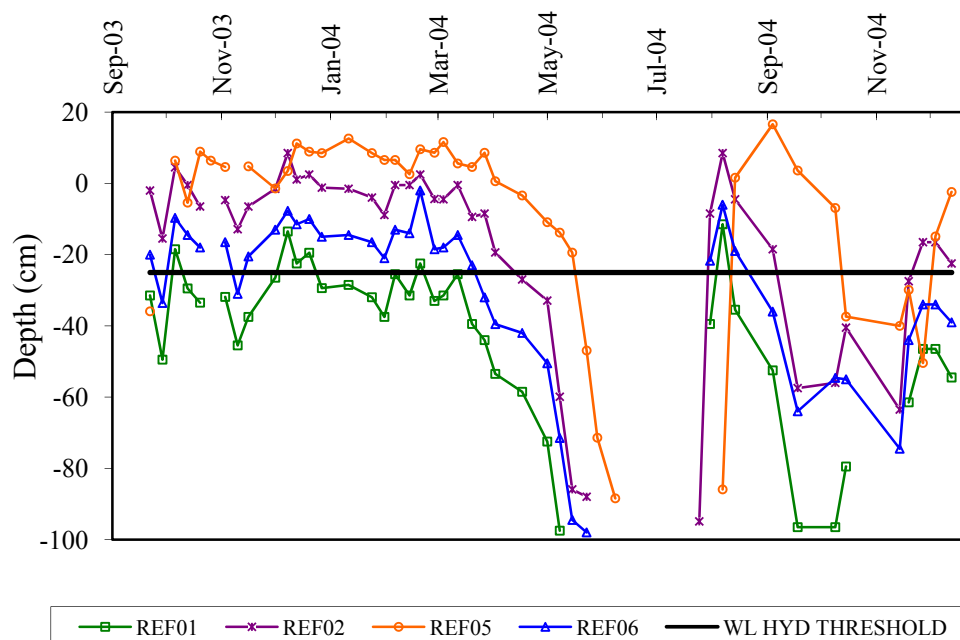


Figure 3.2. Reference station water table from shallowest piezometer measurements. REF01 was the driest and REF05 was the wettest in the reference wetland.

Figure 3.3 depicts the average redox potentials at the 25-cm depth that were measured at each of the reference stations throughout the study. The pH (4.94) results from the 25-cm depth at each of the reference stations were averaged to calculate a threshold redox potential (298 mV), below which indicated the presence of anaerobic conditions.

Anaerobic conditions were present in all of the reference stations except REF 01 during the wet period, from the beginning of the study through May 2004. However, only the period of anaerobic conditions from February to May 2004 are useful for applying the HSTS when normal or drier than normal precipitation conditions also occurred. As expected from the

water table data, all of the reference stations were generally aerobic throughout the summer and fall of 2004 with a few exceptions. REF 02 and REF 06 exhibited anaerobic conditions from mid July through the end of August in response to tropical weather systems that affected the site. Anaerobic conditions also returned to REF 05 during this time period, and generally remained through the end of the study period. REF 02, the second station located in the center of the reference wetland, began to exhibit anaerobic conditions again in early December.

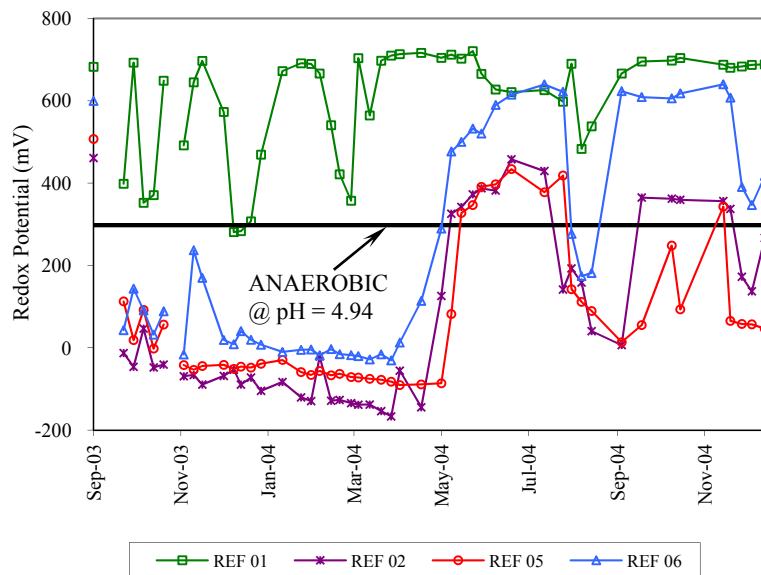


Figure 3.3. Reference station soil redox at 25-cm depth. Threshold for anaerobic conditions was calculated to be 298 mV.

Figure 3.4 depicts redox potentials at the 61-cm depth that were also measured at each of the reference stations throughout the study. The average pH (5.53) from the 61-cm depth was used to calculate a threshold redox potential (263 mV), below which indicated the presence of anaerobic conditions. Soil redox potential measurements from the 61-cm depth followed the same trend as those from the 25-cm depth at REF 02, REF 05, and REF 06. In contrast to the results from the 25-cm depth, the redox potential at the 61-cm depth at REF 01 was much like the soil redox potential signatures of the remaining stations reflecting greater frequency and duration of saturation at this depth.

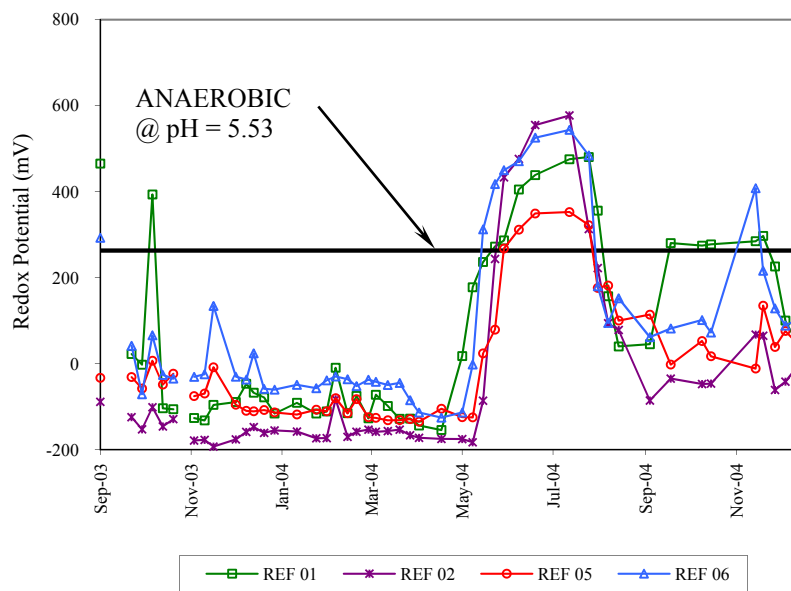


Figure 3.4. Reference station soil redox at 61-cm depth. Threshold for anaerobic conditions was calculated to be 263 mV.

The field indicators of hydric soils observed were compared to the events that each station met the HSTS during normal or drier than normal precipitation conditions (Table 3.2). Stations located in the center of the reference wetland met the requirements more than the stations located near the edge of the wetland. Saturation near the soil surface slows the diffusion of oxygen. Oxygen in soil water is depleted by microbes feeding on oxidizable carbon in the soil producing anaerobic conditions. Soil saturation also reduces the daily maximum soil temperature. Anaerobic conditions and lower soil temperatures both contribute to slower decomposition of organic matter on top of and in the soil. Over time, more frequent and longer durations of saturated and anaerobic conditions result in a greater accumulation of organic matter. Hydric soil field indicators generally represent a particular frequency and duration of saturated and anaerobic conditions when they are present in undrained soils (Vepraskas and Caldwell, 2008). Of the field indicators observed in the reference wetland, an Umbric Surface (F13) indicates the least degree of soil wetness and a Histic Epipedon (A2) indicates the greatest degree of soil wetness. The 1 cm Muck (A9) hydric soil field indicator represents intermediate saturated and anaerobic conditions between the Umbric Surface and Histic Epipedon. These results are in agreement with those of Vepraskas and Caldwell (2008).

Table 3.2. Comparison of HSTS results to field indicators of hydric soils at reference stations.

| <b>Station ID</b> | <b>Position</b> | <b>Field Indicator Name</b>  | <b>Field Indicator Symbol</b> | <b>HSTS Event</b>             | <b>Duration (days)</b> |
|-------------------|-----------------|------------------------------|-------------------------------|-------------------------------|------------------------|
| REF 01            | Edge            | 1 cm muck<br>Umbric surface  | A9<br>F13                     | --                            | 0                      |
| REF 02            | Center          | 1 cm muck<br>Umbric surface  | A9<br>F13                     | Feb – Apr<br>Aug<br>Dec       | 70<br>15<br>17         |
| REF 05            | Center          | Histic Epipedon<br>1 cm muck | A2<br>A9                      | Feb – May<br>Aug<br>Nov – Dec | 99<br>15<br>25         |
| REF 06            | Edge            | Umbric surface               | F13                           | Feb - Mar<br>Aug              | 57<br>15               |

REF 01 was the only station within the reference wetland that did not meet the HSTS during the study period. However, the field indicators of hydric soils observed in the location of REF 01 suggest this soil formed under much wetter conditions than are present today. The inconsistency of these results prompted further investigation to ensure that the indicators identified in this location were not an anomaly such as might occur within a stump hole. Additional auger borings completed around the location of REF 01 confirmed that the original soil profile description is representative of the general location and not an isolated occurrence of these field indicators in the landscape.

REF01 did not exhibit a water table within 30 cm of the surface during the growing season under normal antecedent precipitation conditions for more than one weekly measurement.

Therefore, REF01 did not meet jurisdictional wetland hydrologic criteria during the study period. There are several factors that may contribute to the different wetland hydrology and HSTS results observed between REF01 located on the edge of the reference wetland and REF02 located in the center, and the inconsistencies of the field indicators present REF01. REF01 is approximately 30 cm higher in elevation than REF02. There are three ditches that are located to the north and east of REF01 that more than likely have lowered the groundwater table slightly in this area. Wright (2005) found that monitoring wells located along the reference wetland edge had an average water table depth within 30 cm of the surface for 5.7 % of the growing season of 2003, but did not during 2004. The jurisdictional wetland hydrologic criteria requires the water table be within 30 cm of the soil surface continuously for at least 5 % of the growing season in most years, which is the 50% probability of recurrence (Environmental Laboratory, 1987). Although reference edge monitoring wells exceeded the jurisdictional criteria threshold of 5 % in 1 out of 2 years, it did only during wetter than normal antecedent precipitation conditions. Only jurisdictional wetland hydrology criteria occurring during normal antecedent precipitation conditions are believed to represent conditions with a 50% probability of recurrence (Sprecher and Warne, 2000). Therefore, REF01 did not meet jurisdictional wetland hydrologic criteria for 2003 or 2004. Jarzemsky (2009) also found that the average of reference edge monitoring wells did not meet jurisdictional wetland hydrologic criteria at least 5% of the growing season in 2006 through 2008. This suggests that the network of drainage ditches in the area may

have lowered the local water table enough to remove wetland hydrology from the edges of this depressional wetland. Although REF01 no longer exhibits wetland hydrology, saturated and anaerobic conditions were observed for a maximum duration of 25 days during wetter than normal antecedent precipitation conditions. REF01 may no longer have wetland hydrology, but still experiences sufficient periods of saturated and anaerobic conditions to slow the process of subsidence usually observed when organic soils are drained. Therefore, the hydric soil field indicators present at REF01 may be relict representing the conditions in which the soil formed, but not the current status of the soil. Since the location of REF 01 was determined to be representative of the general location and did not exhibit wetland hydrology or current hydric soil function, data from REF 01 was not used to characterize the reference wetland for comparison with the restoration areas.

#### **3.4 Evaluation Tool for Restoration Success**

Water table and soil redox potential data from all twelve stations located in the restoration were averaged together to provide an overall picture of the restoration's performance. Figure 3.5 shows the relationship between saturation, in this case resulting from a high water table, and soil redox potential within the restoration area. An average depth to the water table of 25 cm or shallower confirms the presence of saturated conditions. Based on the mean treatment pH (4.79), anaerobic conditions are present when the average soil redox

potential drops below the threshold soil redox potential of 305 mV. As observed in the reference wetland, saturated and anaerobic conditions prevailed from the beginning of the study through May 2004. These conditions were generally absent during the summer and fall except for the wet month of August. At the end of the study, the data showed the return of saturated and anaerobic conditions, but not to the extent observed the previous winter after a prolonged period of wetter than normal precipitation conditions.

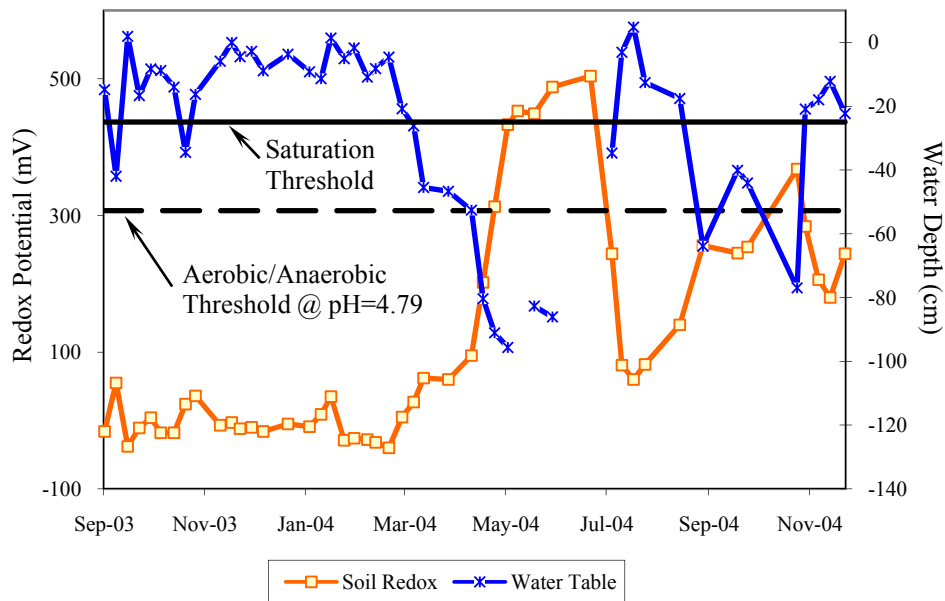
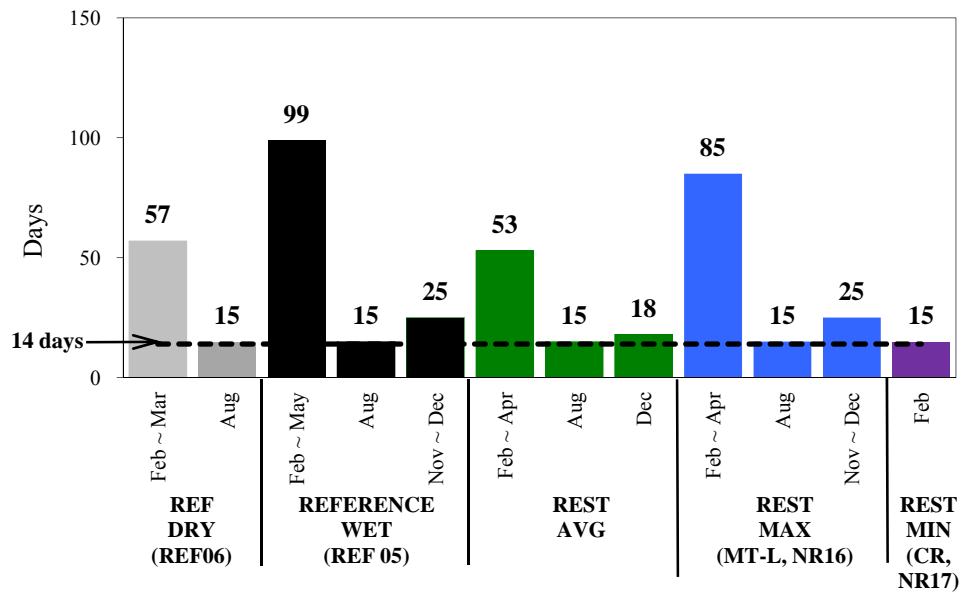


Figure 3.5. Average soil redox and water table depth for restoration area. The saturation threshold at 25 cm is required by the HSTS. Threshold for anaerobic conditions was calculated to be 305 mV.

Using water table and soil redox potential data collected during normal or drier than normal precipitation conditions, we determined whether the HSTS was met for each station. The HSTS requires saturated and anaerobic conditions to persist for at least 14 consecutive days during normal or drier than normal precipitation conditions in order for the standard to be met. Figure 3.6 illustrates the consecutive periods during 2004, in which the HSTS was met in both the reference wetland and restoration areas. This was the only time during the study when normal or drier than normal precipitation conditions occurred. A consecutive period means the HSTS was met continuously without periods of aerobic conditions. All monitoring stations within the restoration areas met the HSTS. Even the driest station met the standard once during the study period. The monitoring station within the restoration areas exhibiting the longest extent of saturated and anaerobic conditions was strikingly similar to the wettest of the reference wetland stations. On average, the restoration areas met the HSTS for the same number of periods as the wettest reference wetland station (REF 05), but usually for shorter durations.



Consecutive Periods of 2004

Figure 3.6. Comparison of restoration to reference consecutive periods HSTS met during 2004. The HSTS requires at least 14 consecutive days of saturated and anaerobic conditions.

### 3.5 HSTS Assessment of Surface Treatment Effects

Water table data from each treatment was averaged to reflect saturated conditions associated with each surface treatment of the study (Figure 3.7). Results from the two monitoring stations located within microtopography treatments were averaged together to provide this overall treatment comparison. Gaps in the data indicate that the water table dropped below the 100-cm depth of the deepest piezometers. Saturated conditions exhibited by the individual treatments generally follow the same trend as shown in the

reference wetland. The water table of the microtopography treatment fluctuated less drastically, consistently had the highest water table, and exhibited the longest duration of saturated conditions during the first half of the study than the other two treatments.

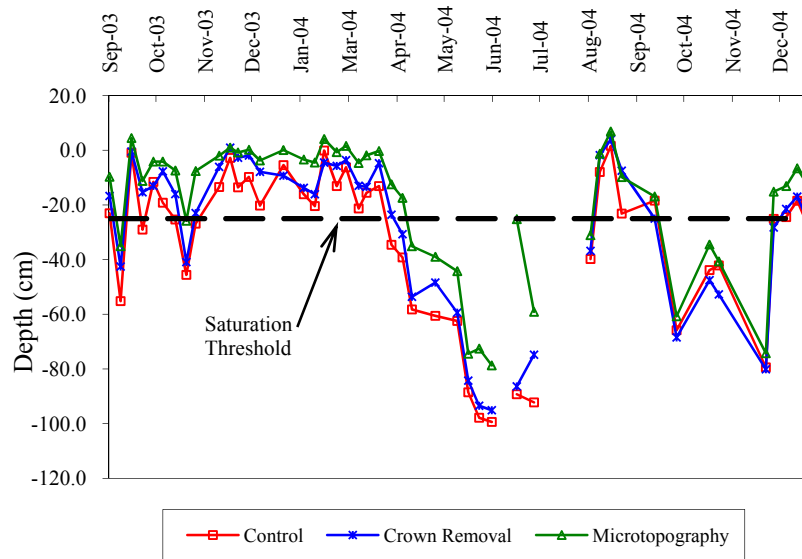


Figure 3.7. Restoration water table from shallowest piezometer measurements. The saturation threshold at 25 cm is required by the HSTS.

The average soil redox potential at the 25-cm depth of each treatment was compared to the wettest (REF 05) and driest stations (REF 06) of the reference wetland (Figure 3.8). The pH results (4.83) from the 25-cm depth of each of the treatment and reference stations were averaged to calculate a threshold redox potential (305 mV) to separate aerobic from anaerobic conditions. All treatments exhibited anaerobic conditions continuously from the

beginning of the study to around May 2004. However, microtopography treatment stations remained anaerobic for 15 days longer than control stations, and 8 days longer than crown removal stations. As with the stations in the reference wetland, the soil redox potential of the treatment stations reflected the aerobic conditions of the drier summer season.

Anaerobic conditions returned to the microtopography stations throughout most of the fall and winter, while control and crown removal stations had predominantly aerobic conditions during this same period. Generally, all of the treatments fell within the soil redox potential range found in the reference wetland.

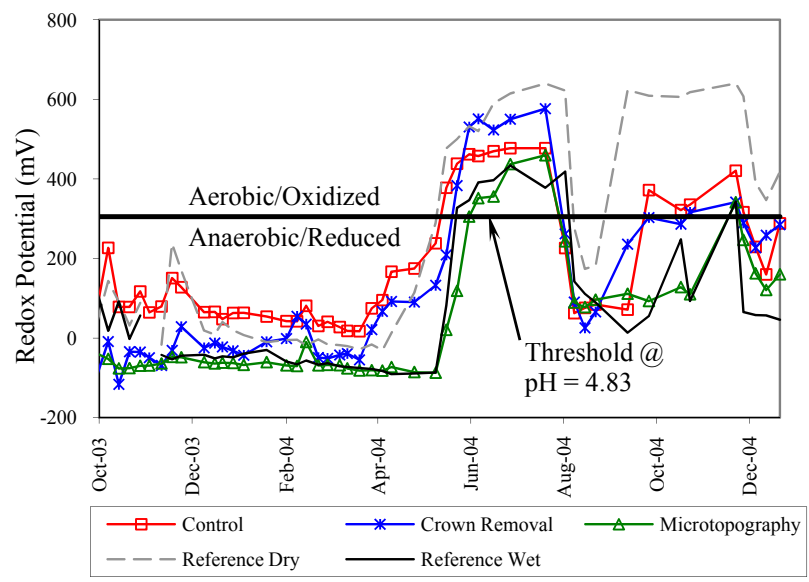


Figure 3.8. Treatment soil redox averages from the reference wettest and driest stations at 25-cm depth. Threshold for anaerobic conditions was calculated to be 305 mV.

Soil redox potentials at the 61-cm depth for each treatment were also compared (Figure 3.9). The average pH (4.95) from the 61-cm depth was used to calculate a threshold redox potential (298 mV), below which indicates the presence of anaerobic conditions. Soil redox potential measurements from the 61-cm depth followed the same trend as those from the 25-cm depth except during the fall of 2004. Aerobic conditions did not extend down to the 61-cm depth during this same period.

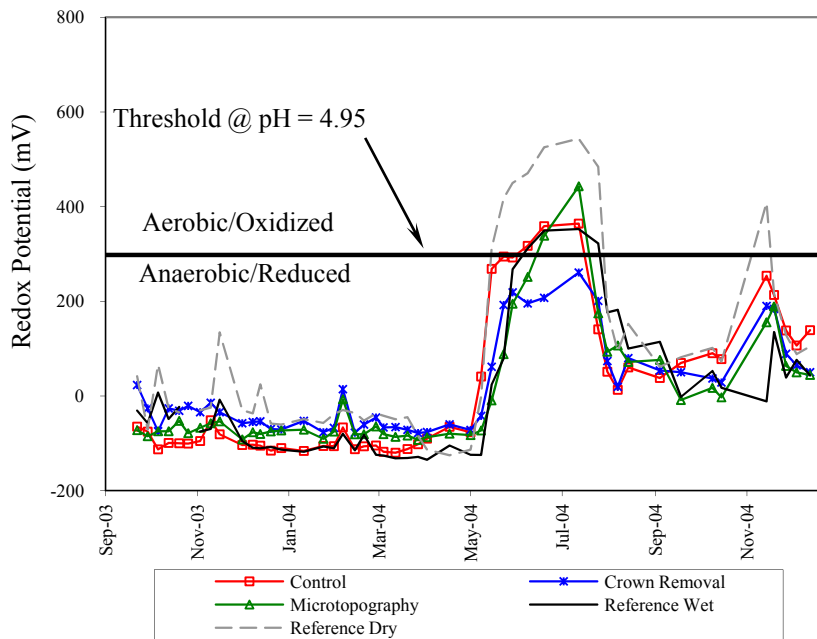


Figure 3.9. Treatment averages compared to reference wettest and driest soil redox at 61-cm depth. Threshold for anaerobic conditions was calculated to be 298 mV.

Using water table and soil redox potential data collected during normal or drier than normal precipitation conditions once again, we determined whether the HSTS was met for each station in the restoration area by treatment (Figure 3.10).

As previously shown for the entire restoration area, all of the treatments met the HSTS. The microtopography treatment (both highs and lows) had the longest consecutive period of saturated and anaerobic conditions, while the control treatment had the shortest. However, this difference is not large at approximately 23 days. The treatments did not meet the HSTS for as long a duration as the reference station that was saturated for the longest period, which was located in a micro-low in the center of the wetland. However, they did have the same number of HSTS events as this reference station, which is one additional consecutive period more than the driest station. Therefore, the HSTS events in the wetlands restored by all three treatments fall within the range of those found in a nearby natural wetland. Monitoring stations located on high positions within the microtopography treatment met the HSTS only slightly less than their lower elevation counterparts. Therefore, replication of microtopographic relief does not appear to create nonfunctioning areas within the restoration area when it is accomplished in a similar manner and physical setting.

All three treatments met jurisdictional wetland hydrology criteria two times during the study period when antecedent precipitation conditions were normal or drier than normal (Wright, 2005). The first event occurred from March to April and averaged 15 days. The second event occurred in August and averaged 24 days (Wright, 2005).

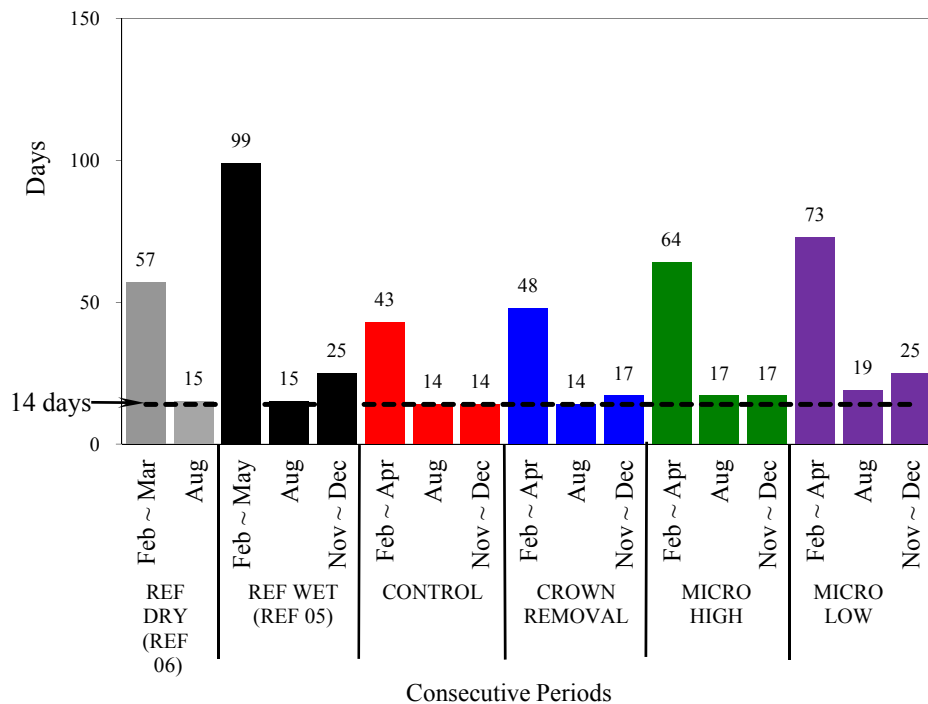


Figure 3.10. Average treatment consecutive periods HSTS met during 2004. The HSTS requires saturated and anaerobic conditions for at least 14 days for the standard to be met.

The total number of days that the saturated and anaerobic conditions criteria of the HSTS were met in each surface treatment were compared to the reference wetland stations

regardless of the duration of these conditions (Figure 3.11). Once again all three treatments fall within the range of saturated and anaerobic conditions observed in the reference wetland. Statistical analysis of the number of days that treatment means met the HSTS did not show a significant difference among the three treatments (p-value = 0.3304). However, the highs and lows in the microtopography treatment exhibited the greatest total number of days with approximately 31 more days than the other two treatments. Although the control and crown removal treatments exceeded the minimum number of days in which the reference wetland met the HSTS requirements, the microtopography treatment more closely matched the midrange of the reference wetland conditions.

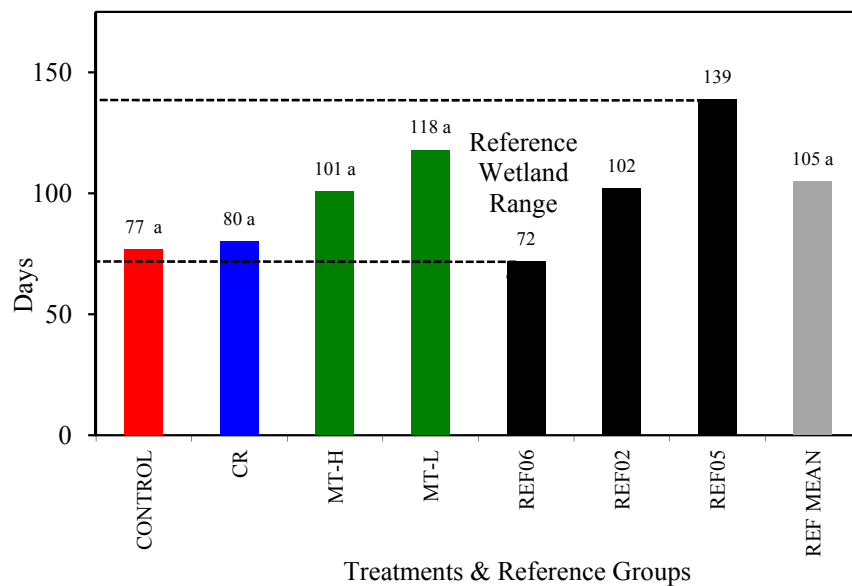


Figure 3.11. Number of days HSTS criteria met during normal or drier precipitation conditions. Values followed by the same letter are not significantly different ( $\alpha = 0.05$ ).

To better understand the effects of the blocks on the difference between surface treatments, Figure 3.12 compares the total number days that HSTS requirements were met on a per block basis with the range of that observed in the reference wetland. Recall that block 1 and 2 are located in the northern field, and block 3 is located in the eastern field of the restoration areas. There was little difference between the surface treatments observed in block 1. In block 2, the control treatment met HSTS requirements slightly less than the other two treatments, but within the range observed in the reference wetland. A distinct difference in the total number of days each treatment met HSTS requirements was observed in block 3. Block 3 is approximately 1 m higher in elevation than blocks 1 and 2. In block 3, the control and crown removal treatments met the HSTS requirements near the minimum level observed in the reference wetland. The microtopography treatment performed the same as it did in the lower elevation blocks falling in the midrange of the reference wetland conditions.

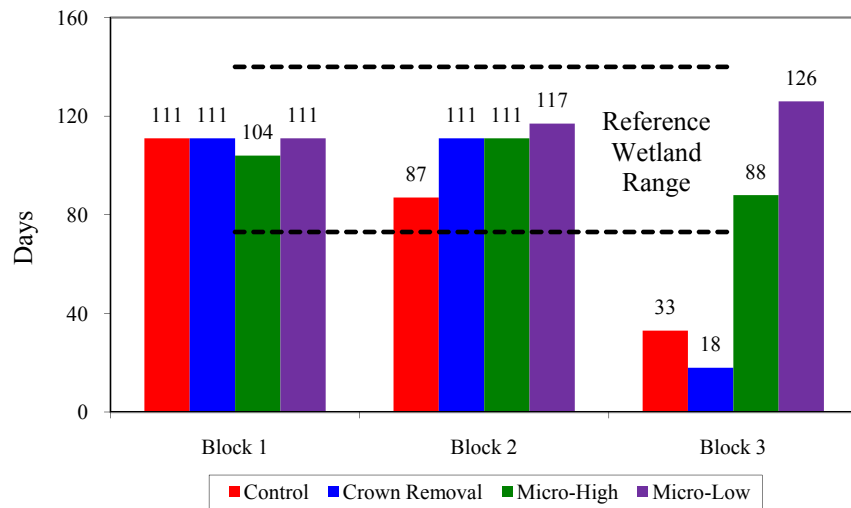


Figure 3.12. Block comparison of number of days HSTS criteria met during normal or drier precipitation conditions. The range in which the reference wetland met the HSTS was from 73 to 140.

However, Figure 3.13 shows that although the differences observed in block 3 may have been amplified by differences in station elevations, some treatment effects were observed. The microtopography treatment stations met the criteria for the HSTS an equal or greater number of days even when it was the highest elevation within the block such as in blocks 1 and 2. Microtopography treatment stations met the criteria for the HSTS a greater number of days than the other treatments in block 3; however, this effect was amplified by slightly higher elevation in the area of the station transect within the crown removal treatment.

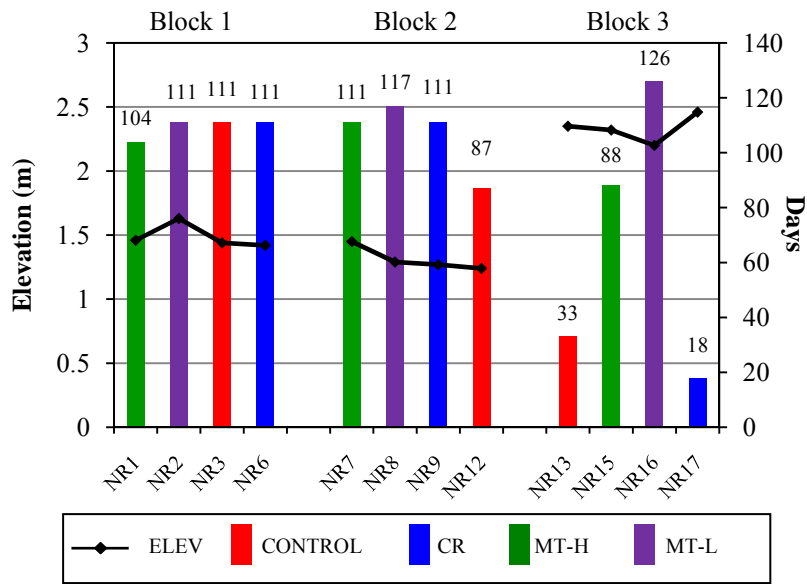


Figure 3.13. Elevations (m) and HSTS results of each station within the restoration during normal or drier precipitation conditions. Elevation data was provided by Wright (2005).

From these data, microtopographic relief appears to be most important in a drier situation where the water table is farther from the ground surface. This suggests that, in a similar landscape position on fine sandy loam soils, replicating microtopographic relief at the onset of restoration projects improves its chances of reproducing biogeochemical conditions found in natural wetlands.

### **3.6 Anaerobic Conditions Assessment of Surface Treatments**

The HSTS requires both saturated and anaerobic conditions to be present for the standard to be met. Study treatments did not show a significant difference in the total number of days that both criteria for the standard were met. Although saturation causes anaerobic conditions, it is anaerobic conditions that influence which plant species are able to successfully compete in a particular setting. Several factors affect the time required for soils to become anaerobic and determine how long anaerobic conditions persist after soils become unsaturated. The most important factor is soil organic matter, but microbial communities and unsaturated groundwater flow patterns also influence anaerobic conditions (Vepraskas et al., 2006; Vepraskas and Faulkner, 2001). Understanding the specific frequency and duration of anaerobic conditions may be more important to recreating the frequency and duration of saturation necessary to develop and maintain specific target wetland plant communities. Anaerobic conditions were measured at both reference and restoration stations for approximately two months in the summer when soils were not saturated or influenced by any potential capillary fringe. Therefore, the average total number of days that anaerobic conditions were present in each treatment regardless of saturation was also compared to the reference wetland (Figure 3.14). These data on anaerobic conditions without a saturation requirement revealed a more narrow range in the reference wetland. The control and high position of the microtopography treatment fell within the range of the reference wetland. However, crown removal was 3 days shorter and

the low position of the microtopography treatment was 30 days longer than the range observed in the reference wetland. The high position of the microtopography treatment also had anaerobic conditions for approximately 23 days longer than the other treatments. Statistical analysis showed that the mean number of days that anaerobic conditions were present was significantly different between the three treatments (p-value = 0.0164). Although the low position of the microtopography treatment exhibited anaerobic conditions a greater number of days than the control and crown removal treatments, it was not significantly different from the high position of the microtopography treatment or the average of the reference wetland ( $\alpha = 0.05$ ).

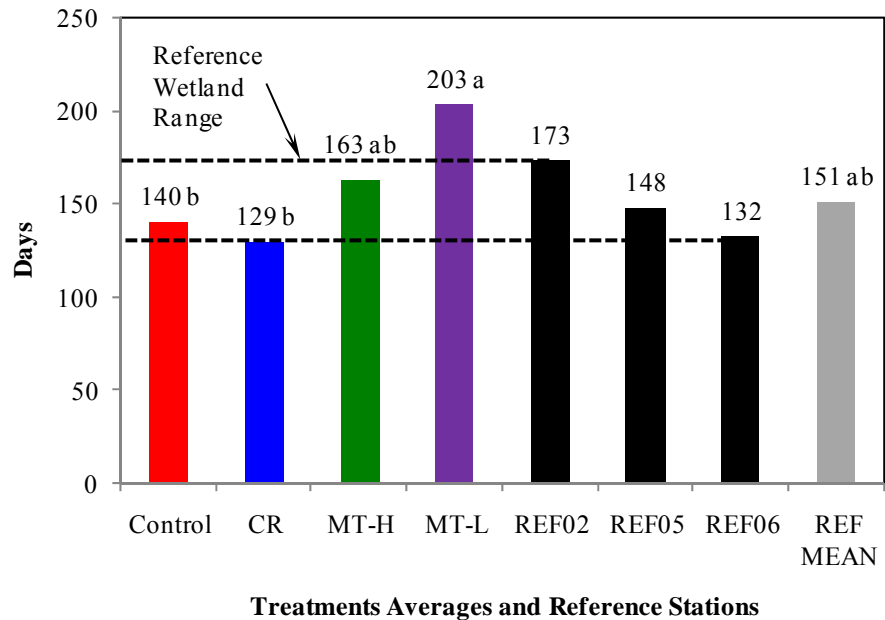


Figure 3.14. Number of days anaerobic conditions present during normal or drier precipitation conditions. Values followed by the same letter are not significantly different ( $\alpha=0.05$ ).

To better understand the effects of the blocks on the difference between surface treatments, Figure 3.15 compares the total number days that anaerobic conditions were present on a per block basis with the range of that observed in the reference wetland. There was more variability in the anaerobic conditions of the surface treatments and fewer individual stations were within the range observed in the reference wetland than detected using HSTS data. Both positions of the microtopography treatment equaled or exceeded the number of days of anaerobic conditions in all three blocks.

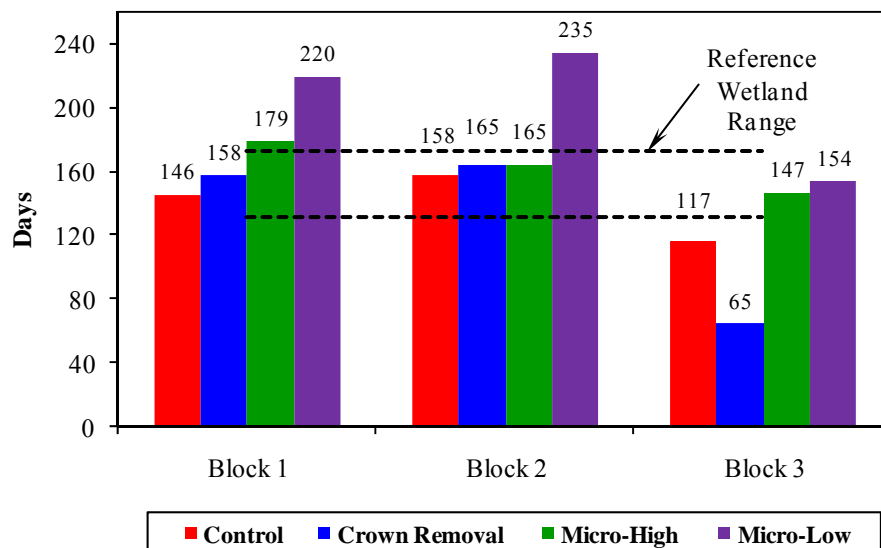


Figure 3.15. Block comparison of the number of days anaerobic conditions were present during normal or drier precipitation conditions. The range in which anaerobic conditions were present within the reference wetland was 132 to 173.

Anaerobic conditions appear to be less sensitive to elevation than HSTS results (Figure 3.16). In blocks 1 and 2, both positions of the microtopography treatment had equal or longer number of days of anaerobic conditions than control and crown removal despite being located at slightly higher elevations. This was even more pronounced in block 3 where microtopographic stations were located at lower elevations than their control and crown removal counterparts. Also in block 3, the high position of the microtopography treatment had anaerobic conditions for 30 days longer than control with only 3 cm

difference in elevation suggesting that the presence of micro-lows increased the anaerobic conditions of micro-highs in this study. In all three blocks, the microtopography treatment equaled or exceeded the number of days observed in the control and crown removal regardless of its relative elevation within each block.

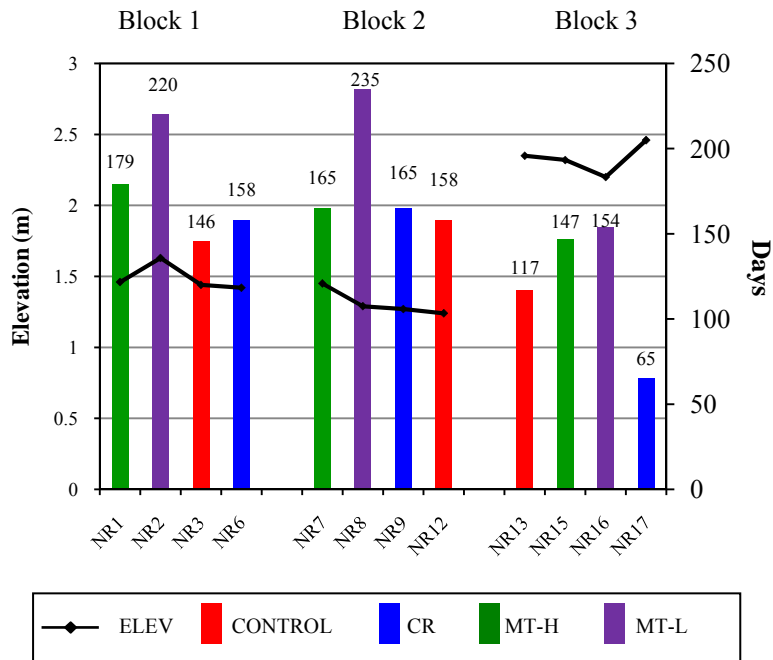


Figure 3.16. Elevations (m) and anaerobic conditions present at each station within the restoration during normal or drier precipitation conditions. Elevation data was provided by Wright (2005).

## 4.0 CONCLUSIONS

### 4.1 Reference Wetland Characterization

A successful wetland restoration begins with selecting the most appropriate target plant community based on the soil types and hydrogeomorphic setting of the restoration site. The best available reference wetland nearby the restoration site allows a comparison that is calibrated to temporally dynamic antecedent precipitation conditions. Improving characterization of soil function and properties in addition to wetland hydrology that shapes and maintains natural wetland plant communities should improve wetland restoration success. In this study, the HSTS illustrated the differences in the frequency and duration of saturated and anaerobic conditions between monitoring stations representative of the hydrological gradient within the natural wetland selected as a reference wetland establishing a range calibrated to antecedent conditions to evaluate the success of the restoration. The results also corresponded well with field indicators of currently functioning hydric soils. One monitoring station within the reference wetland was an exception where the hydric soil indicators present did not correspond well with the hydric soil field indicators present. This station within the reference wetland did not meet the HSTS during the study period. It also did not satisfy the criteria for wetland hydrology during periods of normal antecedent precipitation conditions (Wright, 2005). Based on the HSTS results of this study, the soil formed under much wetter conditions than currently

present and/or perhaps that fluctuations of antecedent precipitation and soil saturation and anaerobic conditions required to maintain this mature wetland plant community are greater than what is currently estimated by these methods. The HSTS's ability to distinguish changes in the frequency and duration of saturated and anaerobic conditions not yet reflected by field indicators of hydric soils could provide an additional tool for adaptive management of restoration and creation projects to increase their likelihood for success. This study also shows that the HSTS is an important tool to understanding the dynamics of soil saturation and anaerobic conditions that occur in natural wetlands. As a real-time, direct measurement of hydric soil function, this method provides the level of wetland characterization necessary to recreate the soil saturation and anaerobic conditions of a target wetland type and/or plant community for wetland restoration and creation.

#### **4.2 Evaluation Tool for Restoration Success**

Soils at each monitoring station within restored wetland areas met the HSTS showing that the hydric soil parameter and biogeochemical function had been successfully restored to the areas around the stations within less than two years from the initial site work. This shows the potential benefit of the HSTS as a much needed short-term performance measure for the commonly under evaluated hydric soils parameter in wetland restoration. When utilizing the HSTS as a performance standard to evaluate the success of restored or created wetlands, HSTS stations should be distributed throughout the wetland in a manner to fully

characterize the entire hydrologic gradient. A single transect such as was necessary to evaluate surface treatment effects in this study may be adequate on wetland types with a larger hydrologic gradient than present in NRW wetland systems. Beyond jurisdictional wetland success, a comparison of the HSTS results from the restored to the reference wetland indicated that saturated soil and anaerobic conditions similar to the reference wetland had been achieved increasing the probability that the restored wetland will eventually develop into a similar forested wetland community.

This study establishes baseline data of saturated and anaerobic conditions required for the formation of hydric soils in the context of a large-scale hydrogeomorphically appropriate wetland restoration recommended by extensive literature reviews of restoration research (NRC, 2001; Nevel et al., 2004). The implementation of a complete randomized block designed to test two surface treatments and absence of one will supply opportunities for long-term research to relate differences in saturated and anaerobic conditions that occur throughout each successional stage to the mature plant community that develops. However, future studies should incorporate additional station replicates within each treatment in each block to increase the sample size and power of statistical analysis. The HSTS also provides a standardized method to enable cross project comparisons using regulatory monitoring results. Although the cost of the materials to construct the HSTS is comparable to monitoring wells, a cost-effective method to collect data on the daily basis is not yet

available. Continuous data recording of soil redox potential requires instrumentation that currently costs approximately \$3,000 to \$5,000 per HSTS station. Future studies could concentrate on development of a cost of effective method to record daily soil redox potential measurements to greatly improve the utility of the standard.

### **4.3 HSTS Assessment of Surface Treatment Effects**

Agricultural fields on hydric soils located on the Lower Coastal Plain of North Carolina are one of the most viable types of available wetland restoration sites. Refining construction techniques for this form of restoration serves to improve the potential for functional replacement of natural wetlands lost to agricultural conversion. The most cost-effective method for restoring these agricultural fields is to plug the ditches to remove artificial drainage and plant woody species. However, this method may not successfully restore wetland hydrology to crowned areas in between ditches, depending on the height of the crown. Extensive fine-grading and expensive heavy equipment is required to remove the crown to re-create a flat field. It is difficult to complete this grading without increasing soil compaction and causing additional losses of topsoil and organic matter from the soil. Replicating microtopographic relief as part of restoration efforts is a common recommendation for wetland restoration plans. In this study, microtopographic relief was incorporated using a farm plough to rough the surface of the agricultural field prior to restoring wetland hydrology. It was hypothesized that incorporating microtopographic

relief would increase the saturated and anaerobic conditions more than crown removal thereby reducing costs and avoiding additional damage to the soil structure.

Restoration areas where microtopographic relief had been constructed as part of the original site work met the HSTS a greater number of days than the crown removal treatment which was similar to the control treatment where no ground disturbance occurred. Although a significant difference in treatments was not detected, the microtopography treatment appeared to be more important in creating saturated soil and anaerobic conditions in drier areas of the restored wetland. However, this effect was amplified by a slightly higher elevation in the area of the station transect within the crown removal treatment in block 3. This elevation variability within the treatments was greater than the variability observed between treatments. The relatively small difference (30 cm) between the height of the crown and the lowest elevation within the treatment also contributed to the small variability between treatments. Methods to determine if short-term monitoring data is representative of normal antecedent precipitation conditions also limits the number of observations that are available for statistically analysis. More replicates would be required to obtain statistically significant results with monitoring time frames shorter than two years.

Using the HSTS to compare the microtopographic lows to the microtopographic highs within the microtopography treatment, showed that the low areas met the HSTS

requirements a greater number of days than the high areas. However, the microtopographic high areas also met the HSTS confirming a functioning hydric soil in these areas as well as the low areas. Therefore, construction of microtopographic relief does not create micro highs that are nonhydric when utilized on soils similar to soils within this study. However, this same lack of significant difference between microtopographic highs and lows and treatments also suggests the HSTS has limited potential to determine the effectiveness of constructing microtopographic relief and removing the crown in restoring agricultural fields to natural wetland communities. The lack of significant difference between the soil redox potential of microtopographic highs and lows can also be explained by the similar saturation conditions between these topographic positions at the depth below ground surface (25 cm) at which soil redox potential is measured for the HSTS. The greatest difference between microtopographic highs and lows more than likely occurs at depths shallower than 25 cm. Microtopography of this magnitude may only create aerobic conditions at the soil surface.

#### **4.4 Anaerobic Condition Assessment of Surface Treatment Effects**

Because anaerobic conditions were observed often in unsaturated soils, the surface treatment effects on anaerobic conditions were examined. Soil saturation has often been used as a cost-effective surrogate measure for the presence of anaerobic conditions. In this study, there was greater variability in the anaerobic conditions of the surface treatments and

fewer individual stations were within the range observed in the reference wetland than detected using HSTS data. Both positions of the microtopography treatment equaled or exceeded the number of days of anaerobic conditions in all three blocks. In all three blocks, the microtopography treatment equaled or exceeded the number of days observed in the control and crown removal regardless of its relative elevation within each block. Therefore, anaerobic conditions may be important beyond whether the soil is saturated at the time. Greater focus on anaerobic condition signatures of natural wetlands, may improve the predictability of replicating these wetland plant communities.

## 5.0 REFERENCES

- Baldwin, A.E. 2008. Changes to soil properties in a forested wetland following 8 years of restoration. M.S. Thesis. North Carolina State University. Raleigh, NC.
- Ballantine, K. and R. Schneider. 2009. Fifty-five years of soil development in restored freshwater depressional wetlands. *Ecological Applications*. 19:1467-148.
- Beatty, S.W. 1984. Influence of microtopography and canopy species on spatial patterns of forest understory plants. *Ecology*. 65:1406-1419.
- Bishel Machung, L., R.P. Brooks, S.S. Yates, and K.L. Hoover. 1996. Soil properties of reference wetlands and wetland creation projects in Pennsylvania. *Wetlands*. 16:532-541.
- Bruland, G.L. and C.L. Richardson. 2006. Comparison of soil organic matter in created, restored and paired natural wetlands in North Carolina. *Wetlands Ecology and Management*. 14:245-251.
- Cole, C.A., R.P. Brooks, and D.H. Wardrop. 2001. Assessing the relationship between biomass and soil organic matter in created wetlands of central Pennsylvania, USA. *Ecological Engineering*. 17:423-428.
- Cole, C.A., and D. Shafer. 2002. Section 404 wetland mitigation and permit success criteria in Pennsylvania, USA, 1986-1999. *Environmental Management*. 30:508-515.
- Craft, C., S. Broome, and C. Campbell. 2002. Fifteen years of vegetation and soil development after brackish-water marsh creation. *Restoration Ecology*. 10:248-258.
- Ehrenfeld, J.G. 2000. Defining the limits of restoration: the need for realistic goals. *Restoration Ecology*. 8:2-9.
- Environmental Laboratory. 1987. U. S. Army Corps of Engineers Wetlands Delineation Manual. U. S. Army Corps of Engineers Waterways Experiment Station. Technical Report Y-87-1.
- Federal Register. 1994. Changes in hydric soils of the United States. Washington, DC, July 13 (current Hydric Soil definition).

Hayes, D.F., T.J. Olin, J. Fischenich, and M.R. Palermo. 2000. Wetlands engineering handbook. U. S. Army Corps of Engineers, ERDC/EL TR-WRP-RE-21.

Hobbs, R.J. and J.A. Harris. 2001. Restoration ecology: repairing the earth's ecosystems in the new millennium. *Restoration Ecology*. 9:239-246.

Jones, R.H., B.G. Lockaby, and G.L. Somers. 1996. Effects of microtopography and disturbance on fine-root dynamics in wetland forests of low-order stream floodplains. *American Midland Naturalist*. 136:57-71.

Lewis, W.M., and National Research Council. Committee on Characterization of Wetlands. 1995. *Wetlands : Characteristics and boundaries*. Washington, DC: National Academy Press.

Lilly, J.P. 1981. The blackland soils of North Carolina: Their characteristics and management for agriculture. North Carolina Agricultural Research Service Technical Bulletin No. 270.

Matthews, J.W. and A.G. Endress. 2008. Performance criteria, compliance success, and vegetation development in compensatory mitigation wetlands. *Environmental Management*. 41:130-141.

Mausbach, M.J. and W.B. Parker. 2001. Background and history of the concept of hydric soils. p. 19-33. In J.L. Richardson and M.J. Vepraskas (ed.) *Wetland soils: genesis, hydrology, landscapes, and classification*. Lewis Publishers, Boca Raton, FL.

Mitsch, W.J. and J.G. Gosselink. 1993. *Wetlands, Second Edition*. New York: Van Nostrand Reinhold.

National Research Council. Committee on Mitigating Wetland Losses. 2001. *Compensating For Wetland Losses Under The Clean Water Act*. Washington, D.C.: National Academy Press.

National Technical Committee for Hydric Soils (NTCHS), Natural Resource Conservation Service, United States Department of Agriculture. Technical Note 11 Available online at [ftp://ftp-fc.sc.egov.usda.gov/NSSC/Hydric\\_Soils/note11.pdf](ftp://ftp-fc.sc.egov.usda.gov/NSSC/Hydric_Soils/note11.pdf). [Accessed 14 July 2009]. USDA-NRCS, Lincoln, NE.

Nevel, B., J. Milam, G. Arnold, and R. Harris. 2004. Measuring mitigation: A review of the science for compensatory mitigation performance standards. Environmental Law Institute, Washington, D.C. Available at [http://www.elistore.org/reports\\_detail.asp?ID=10991](http://www.elistore.org/reports_detail.asp?ID=10991) (verified 20 Nov 2009).

North Carolina Coastal Federation. Undated. Restoring North Carolina's Coast. North Carolina Coastal Federation Restoration & Protection Projects: NC Clean Water Management Trust Fund. Newport, NC.

North Carolina Department of Environment and Natural Resources Division of Water Quality Water Quality Section Environmental Services Branch. 2000. Basinwide Assessment Report - White Oak River Basin. Raleigh, NC.

Schafale, M.P. 2008. Nonriverine wet hardwood forests in North Carolina status and trends. [Online] Available at <http://www.ncnhp.org/Images/Other%20Publications/nrwhf2008rpt.pdf> (verified 17 Nov 2009).

Schafale, M.P., A.S. Weakley, and North Carolina Natural Heritage Program. 1990. Classification of the natural communities of North Carolina: Third Approximation. Raleigh, NC: N.C. Natural Heritage Program, Division of Parks and Recreation, Dept. of Environment, Health, and Natural Resources.

Scherrer, E. 2000. Using microtopography to restore wetland plant communities in eastern North Carolina. MS Thesis. North Carolina State University. Raleigh, NC.

Shaffer, P.W. and T.L. Ernst. 1999. Distribution of soil organic matter in freshwater emergent/open water wetlands in the Portland, Oregon metropolitan area. *Wetlands*. 19:505-516.

Smith, B.M. 1998. The effects of microtopographic relief and soil temperature on the restoration of prior converted wetlands. MS Thesis. North Carolina State University. Raleigh, NC.

Sprecher, S.W. 2000. Installing monitoring wells/piezometers in wetlands. Vicksburg, MS: US Army Engineering and Research Development Center, Wetlands Regulatory Assistance Program, ERDC TN--WRAP-00-02.

Sprecher, S.W. and A.G. Warne. 2000. Accessing and using meteorological data to evaluate wetland hydrology. WRAP Technical Notes Collection, ERDC/EL TR-WRAP-00-1. U.S. Army Engineer Research and Development Center, Vicksburg, MS.

Streever, B. 1999. Examples of performance standards for wetland creation and restoration in section 404 permits and an approach to developing performance standards. Vicksburg, MS: U. S. Army Engineer Research and Development Center, TN WRP WG-RS-3.3.

Sumner, J.P., M.J. Vepraskas, and R.K. Kolka. 2009. Methods to evaluate normal rainfall for short-term wetland hydrology assessment. *Wetlands*. 29:1049-1062.

Tweedy, K.L., and R.O. Evans. 2001. Hydrologic characterization of two prior converted wetland restoration sites in eastern North Carolina. *Transactions of the ASAE* 44, (5) (Sept/Oct): 1135-1142.

USDA, NRCS. 2003. Field indicators of hydric soils in the United States, Version 5.01. G.W. Hurt, P.M. Whited, and R.F. Pringle (eds.). USDA, NRCS in cooperation with the National Technical Committee for Hydric Soils, Fort Worth, TX.

USDA, SCS. 1978. Soil survey of Carteret County, North Carolina. R. A. Goodwin, Jr.

U. S. Army Corps of Engineers. 2002. Regulatory guidance letter no. 02-2.

U. S. Army Corps of Engineers and Environmental Protection Agency. 1990. Memorandum of agreement between the Environmental Protection Agency and Department of the Army concerning the determination of mitigation under the Clean Water Act Section 404 (b)(1) guidelines. February 7, 1990.

Vepraskas, M.J. 1999. Redoximorphic features for identifying aquic conditions. Technical Bulletin 301. NC Agricultural Research Service, NCSU, Raleigh, NC.

Vepraskas, M.J. and P.V. Caldwell. 2008. Interpreting morphological features in wetland soils with a hydrologic model. *Catena*. 73:153-165.

Vepraskas, M.J. and S.P. Faulkner. 2001. Redox chemistry of hydric soils. p. 85-105. *In* J.L. Richardson and M.J. Vepraskas (ed.) *Wetland soils: genesis, hydrology, landscapes, and classification*. Lewis Publishers, Boca Raton, FL.

Vepraskas, M.J., J.L. Richardson, and J.P. Tandarich. 2006. Dynamics of redoximorphic feature formations under controlled ponding in created riverine wetlands. *Wetlands*. 26:486-496.

Vivian-Smith, G. 1997. Microtopographic heterogeneity and floristic diversity in experimental wetland communities. *Journal of Ecology*. 85:71-82.

Wigginton, J.D., B.G. Lockaby, and C.C. Trettin. 2000. Soil organic matter formation and sequestration across a forested floodplain chronosequence. *Ecological Engineering*. 15:S141-S155.

Wright, J.D. 2005. The evaluation and modeling of the effects of surface treatments on hydrology of a restored wetland in the Coastal Plain of North Carolina. MS Thesis. North Carolina State University. Raleigh, NC.

Zedler, J.B. 1996. Ecological issues in wetland mitigation: An introduction to the forum. *Ecological Applications*. 6:33-37.

## **APPENDICES**

## **APPENDIX A**

### Hydric Soil Technical Standard Data

**Table A.1. Redox potential (mV) measurements from 25-cm depth.**

| <b>Date</b>     | <b>REF01<br/>25-30</b> | <b>REF01<br/>25-36</b> | <b>REF01<br/>25-35</b> | <b>REF01<br/>25-33</b> | <b>REF01<br/>25-39</b> | <b>REF01<br/>AVG</b> | <b>REF01<br/>Corrected<br/>Avg</b> |
|-----------------|------------------------|------------------------|------------------------|------------------------|------------------------|----------------------|------------------------------------|
| <b>09/09/03</b> | 575                    | 597                    | 79                     | 565                    | 597                    | 483                  | 683                                |
| <b>09/16/03</b> |                        |                        |                        |                        |                        |                      |                                    |
| <b>09/30/03</b> | 401                    | 631                    | -45                    | -95                    | 99                     | 198                  | 398                                |
| <b>10/07/03</b> | 600                    | 616                    | 51                     | 580                    | 616                    | 493                  | 693                                |
| <b>10/14/03</b> | 127                    | 340                    | 69                     | 90                     | 135                    | 152                  | 352                                |
| <b>10/21/03</b> | 226                    | 649                    | -34                    | -17                    | 30                     | 171                  | 371                                |
| <b>10/28/03</b> | 558                    | 598                    | 8                      | 507                    | 572                    | 449                  | 649                                |
| <b>11/03/03</b> |                        |                        |                        |                        |                        |                      |                                    |
| <b>11/11/03</b> | 591                    | 655                    | 56                     | 90                     | 66                     | 292                  | 492                                |
| <b>11/18/03</b> | 600                    | 394                    | 32                     | 601                    | 597                    | 445                  | 645                                |
| <b>11/24/03</b> | 633                    | 608                    | 44                     | 586                    | 613                    | 497                  | 697                                |
| <b>12/09/03</b> | 549                    | 606                    | -1                     | 172                    | 538                    | 373                  | 573                                |
| <b>12/16/03</b> | 97                     | 93                     | -14                    | 66                     | 163                    | 81                   | 281                                |
| <b>12/21/03</b> | 63                     | 221                    | -18                    | 14                     | 137                    | 83                   | 283                                |
| <b>12/28/03</b> | 43                     | 369                    | -12                    | 23                     | 112                    | 107                  | 307                                |
| <b>01/04/04</b> | 547                    | 656                    | 60                     | -18                    | 101                    | 269                  | 469                                |
| <b>01/19/04</b> | 641                    | 657                    | 53                     | 399                    | 611                    | 472                  | 672                                |
| <b>02/01/04</b> | 617                    | 659                    | 41                     | 508                    | 631                    | 491                  | 691                                |
| <b>02/08/04</b> | 633                    | 654                    | 31                     | 499                    | 630                    | 489                  | 689                                |
| <b>02/14/04</b> | 547                    | 643                    | 36                     | 503                    | 601                    | 466                  | 666                                |
| <b>02/22/04</b> | 418                    | 643                    | -28                    | 88                     | 582                    | 341                  | 541                                |

**Table A.1. Continued.**

| <b>Date</b>     | <b>REF01<br/>25-30</b> | <b>REF01<br/>25-36</b> | <b>REF01<br/>25-35</b> | <b>REF01<br/>25-33</b> | <b>REF01<br/>25-39</b> | <b>REF01<br/>AVG</b> | <b>REF01<br/>Corrected<br/>Avg</b> |
|-----------------|------------------------|------------------------|------------------------|------------------------|------------------------|----------------------|------------------------------------|
| <b>02/28/04</b> | 389                    | 388                    | -11                    | 24                     | 317                    | 221                  | 421                                |
| <b>03/07/04</b> | 616                    | 661                    | 56                     | -3                     | -545                   | 157                  | 357                                |
| <b>03/12/04</b> | 624                    | 677                    | 68                     | 496                    | 653                    | 504                  | 704                                |
| <b>03/20/04</b> | 579                    | 597                    | -5                     | 58                     | 593                    | 364                  | 564                                |
| <b>03/28/04</b> | 645                    | 668                    | 47                     | 501                    | 625                    | 497                  | 697                                |
| <b>04/04/04</b> | 647                    | 667                    | 30                     | 543                    | 661                    | 510                  | 710                                |
| <b>04/10/04</b> | 639                    | 669                    | 35                     | 557                    | 666                    | 513                  | 713                                |
| <b>04/25/04</b> | 644                    | 662                    | 50                     | 567                    | 658                    | 516                  | 716                                |
| <b>05/09/04</b> | 618                    | 655                    | 38                     | 575                    | 635                    | 504                  | 704                                |
| <b>05/16/04</b> | 649                    | 604                    | 47                     | 596                    | 665                    | 512                  | 712                                |
| <b>05/23/04</b> | 592                    | 607                    | 51                     | 600                    | 662                    | 502                  | 702                                |
| <b>05/31/04</b> | 642                    | 629                    | 58                     | 610                    | 664                    | 521                  | 721                                |
| <b>06/06/04</b> | 354                    | 625                    | 70                     | 616                    | 662                    | 465                  | 665                                |
| <b>06/16/04</b> | 153                    | 629                    | 73                     | 617                    | 665                    | 427                  | 627                                |
| <b>06/27/04</b> | 65                     | 632                    | 132                    | 613                    | 663                    | 421                  | 621                                |
| <b>07/20/04</b> | 45                     | 615                    | 201                    | 612                    | 656                    | 426                  | 626                                |
| <b>08/02/04</b> | 46                     | 632                    | 170                    | 614                    | 527                    | 398                  | 598                                |
| <b>08/08/04</b> | 612                    | 669                    | 143                    | 383                    | 642                    | 490                  | 690                                |
| <b>08/15/04</b> | 401                    | 73                     | 8                      | 571                    | 363                    | 283                  | 483                                |
| <b>08/22/04</b> | 623                    | 666                    | -48                    | 140                    | 308                    | 338                  | 538                                |
| <b>09/12/04</b> | 378                    | 566                    | 104                    | 616                    | 578                    | 448                  | 648                                |

**Table A.1. Continued.**

| <b>Date</b>     | <b>REF01<br/>25-30</b> | <b>REF01<br/>25-36</b> | <b>REF01<br/>25-35</b> | <b>REF01<br/>25-33</b> | <b>REF01<br/>25-39</b> | <b>REF01<br/>AVG</b> | <b>REF01<br/>Corrected<br/>Avg</b> |
|-----------------|------------------------|------------------------|------------------------|------------------------|------------------------|----------------------|------------------------------------|
| <b>09/26/04</b> | 439                    | 606                    | 102                    | 596                    | 678                    | 484                  | 684                                |
| <b>10/17/04</b> | 434                    | 556                    | 55                     | 542                    | 637                    | 445                  | 695                                |
| <b>10/23/04</b> | 453                    | 558                    | 80                     | 544                    | 634                    | 454                  | 704                                |
| <b>11/22/04</b> | 396                    | 494                    | 83                     | 539                    | 635                    | 429                  | 679                                |
| <b>11/27/04</b> | 379                    | 477                    | 75                     | 539                    | 630                    | 420                  | 670                                |
| <b>12/05/04</b> | 372                    | 506                    | 95                     | 500                    | 632                    | 421                  | 671                                |
| <b>12/12/04</b> | 377                    | 503                    | 79                     | 537                    | 630                    | 425                  | 675                                |
| <b>12/21/04</b> | 420                    | 503                    | 90                     | 532                    | 628                    | 435                  | 685                                |

**Table A.1. Continued.**

| <b>Date</b>     | <b>REF02</b> | <b>REF02</b> | <b>REF02</b> | <b>REF02</b> | <b>REF02</b> | <b>REF02</b> | <b>REF02</b>         |
|-----------------|--------------|--------------|--------------|--------------|--------------|--------------|----------------------|
|                 | <b>25-04</b> | <b>25-03</b> | <b>25-09</b> | <b>25-06</b> | <b>25-08</b> | <b>AVG</b>   | <b>Corrected Avg</b> |
| <b>09/09/03</b> | 212          | 361          | 100          | 306          | 325          | 261          | 461                  |
| <b>09/16/03</b> |              |              |              |              |              |              |                      |
| <b>09/30/03</b> | -294         | -98          | -192         | -118         | -362         | -213         | -13                  |
| <b>10/07/03</b> | -331         | -152         | -205         | -194         | -349         | -246         | -46                  |
| <b>10/14/03</b> | -250         | -127         | -183         | -86          | -120         | -153         | 47                   |
| <b>10/21/03</b> | -155         | -250         | -200         | -280         | -354         | -248         | -48                  |
| <b>10/28/03</b> | -104         | -203         | -204         | -350         | -342         | -241         | -41                  |
| <b>11/03/03</b> |              |              |              |              |              |              |                      |
| <b>11/11/03</b> | -115         | -173         | -294         | -391         | -372         | -269         | -69                  |
| <b>11/18/03</b> | -108         | -174         | -229         | -424         | -395         | -266         | -66                  |
| <b>11/24/03</b> | -265         | -102         | -248         | -459         | -373         | -289         | -89                  |
| <b>12/09/03</b> | -131         | -149         | -286         | -473         | -303         | -268         | -68                  |
| <b>12/16/03</b> | -161         | -104         | -240         | -481         | -280         | -253         | -53                  |
| <b>12/21/03</b> | -164         | -179         | -293         | -458         | -353         | -289         | -89                  |
| <b>12/28/03</b> | -167         | -151         | -310         | -490         | -244         | -272         | -72                  |
| <b>01/04/04</b> | -175         | -199         | -312         | -472         | -364         | -304         | -104                 |
| <b>01/19/04</b> | -176         | -87          | -310         | -478         | -364         | -283         | -83                  |
| <b>02/01/04</b> | -213         | -209         | -314         | -492         | -373         | -320         | -120                 |
| <b>02/08/04</b> | -217         | -218         | -318         | -485         | -409         | -329         | -129                 |
| <b>02/14/04</b> | -135         | -120         | -284         | -318         | -248         | -221         | -21                  |
| <b>02/22/04</b> | -227         | -227         | -317         | -501         | -370         | -328         | -128                 |

**Table A.1. Continued.**

| <b>Date</b>     | <b>REF02</b> | <b>REF02</b> | <b>REF02</b> | <b>REF02</b> | <b>REF02</b> | <b>REF02</b> | <b>REF02</b>         |
|-----------------|--------------|--------------|--------------|--------------|--------------|--------------|----------------------|
|                 | <b>25-04</b> | <b>25-03</b> | <b>25-09</b> | <b>25-06</b> | <b>25-08</b> | <b>AVG</b>   | <b>Corrected Avg</b> |
| <b>02/28/04</b> | -229         | -223         | -310         | -496         | -374         | -326         | -126                 |
| <b>03/07/04</b> | -241         | -239         | -308         | -492         | -391         | -334         | -134                 |
| <b>03/12/04</b> | -249         | -237         | -311         | -491         | -404         | -338         | -138                 |
| <b>03/20/04</b> | -251         | -235         | -316         | -495         | -393         | -338         | -138                 |
| <b>03/28/04</b> | -260         | -234         | -372         | -497         | -405         | -354         | -154                 |
| <b>04/04/04</b> | -278         | -252         | -407         | -496         | -400         | -367         | -167                 |
| <b>04/10/04</b> | -279         | -266         | -396         | -488         | 152          | -255         | -55                  |
| <b>04/25/04</b> | -276         | -291         | -425         | -482         | -249         | -345         | -145                 |
| <b>05/09/04</b> | -128         | 34           | -418         | -233         | 374          | -74          | 126                  |
| <b>05/16/04</b> | 10           | 55           | -45          | 205          | 404          | 126          | 326                  |
| <b>05/23/04</b> | 25           | 54           | -57          | 273          | 415          | 142          | 342                  |
| <b>05/31/04</b> | 12           | 70           | 82           | 280          | 420          | 173          | 373                  |
| <b>06/06/04</b> | 14           | 64           | 124          | 308          | 426          | 187          | 387                  |
| <b>06/16/04</b> | -32          | 82           | 151          | 306          | 403          | 182          | 382                  |
| <b>06/27/04</b> | 119          | 231          | 185          | 338          | 416          | 258          | 458                  |
| <b>07/20/04</b> | 28           | 263          | 170          | 316          | 370          | 229          | 429                  |
| <b>08/02/04</b> | -109         | 70           | -156         | -317         | 220          | -58          | 142                  |
| <b>08/08/04</b> | -225         | 68           | 16           | 33           | 72           | -7           | 193                  |
| <b>08/15/04</b> | -97          | -1           | -124         | -227         | 242          | -41          | 159                  |
| <b>08/22/04</b> | -198         | -180         | -118         | -224         | -77          | -159         | 41                   |
| <b>09/12/04</b> | -314         | -265         | -316         | -173         | 101          | -193         | 7                    |

**Table A.1. Continued.**

| <b>Date</b>     | <b>REF02<br/>25-04</b> | <b>REF02<br/>25-03</b> | <b>REF02<br/>25-09</b> | <b>REF02<br/>25-06</b> | <b>REF02<br/>25-08</b> | <b>REF02<br/>AVG</b> | <b>REF02<br/>Corrected<br/>Avg</b> |
|-----------------|------------------------|------------------------|------------------------|------------------------|------------------------|----------------------|------------------------------------|
| <b>09/26/04</b> | -2                     | 266                    | -28                    | 181                    | 408                    | 165                  | 365                                |
| <b>10/17/04</b> | -60                    | 253                    | -58                    | 43                     | 382                    | 112                  | 362                                |
| <b>10/23/04</b> | -68                    | 251                    | -62                    | 37                     | 389                    | 109                  | 359                                |
| <b>11/22/04</b> | -71                    | 277                    | -46                    | 61                     | 310                    | 106                  | 356                                |
| <b>11/27/04</b> | -78                    | 236                    | -57                    | -1                     | 336                    | 87                   | 337                                |
| <b>12/05/04</b> | -168                   | 228                    | -153                   | -173                   | -121                   | -77                  | 173                                |
| <b>12/12/04</b> | -161                   | -31                    | -138                   | -194                   | -40                    | -113                 | 137                                |
| <b>12/21/04</b> | -165                   | 162                    | -120                   | -204                   | 412                    | 17                   | 267                                |

**Table A.1. Continued.**

| <b>Date</b>     | <b>REF05<br/>25-73</b> | <b>REF05<br/>25-48</b> | <b>REF05<br/>25-58</b> | <b>REF05<br/>25-56</b> | <b>REF05<br/>25-47</b> | <b>REF05<br/>AVG</b> | <b>REF05<br/>Corrected<br/>Avg</b> |
|-----------------|------------------------|------------------------|------------------------|------------------------|------------------------|----------------------|------------------------------------|
| <b>09/09/03</b> | 77                     | 529                    | 433                    | 36                     | 460                    | 307                  | 507                                |
| <b>09/16/03</b> |                        |                        |                        |                        |                        |                      |                                    |
| <b>09/30/03</b> | -94                    | -87                    | -95                    | -99                    | -62                    | -87                  | 113                                |
| <b>10/07/03</b> | -148                   | -291                   | -217                   | -155                   | -96                    | -181                 | 19                                 |
| <b>10/14/03</b> | -113                   | -46                    | -173                   | -116                   | -91                    | -108                 | 92                                 |
| <b>10/21/03</b> | -158                   | -293                   | -312                   | -116                   | -131                   | -202                 | -2                                 |
| <b>10/28/03</b> | -1                     | -314                   | -114                   | -145                   | -143                   | -143                 | 57                                 |
| <b>11/03/03</b> |                        |                        |                        |                        |                        |                      |                                    |
| <b>11/11/03</b> | -188                   | -324                   | -321                   | -171                   | -206                   | -242                 | -42                                |
| <b>11/18/03</b> | -186                   | -315                   | -319                   | -275                   | -173                   | -254                 | -54                                |
| <b>11/24/03</b> | -131                   | -321                   | -284                   | -306                   | -178                   | -244                 | -44                                |
| <b>12/09/03</b> | -189                   | -306                   | -281                   | -254                   | -178                   | -242                 | -42                                |
| <b>12/16/03</b> | -196                   | -315                   | -289                   | -271                   | -185                   | -251                 | -51                                |
| <b>12/21/03</b> | -187                   | -313                   | -282                   | -267                   | -180                   | -246                 | -46                                |
| <b>12/28/03</b> | -199                   | -273                   | -289                   | -291                   | -188                   | -248                 | -48                                |
| <b>01/04/04</b> | -202                   | -268                   | -270                   | -282                   | -172                   | -239                 | -39                                |
| <b>01/19/04</b> | -98                    | -250                   | -297                   | -307                   | -196                   | -230                 | -30                                |
| <b>02/01/04</b> | -204                   | -266                   | -302                   | -322                   | -200                   | -259                 | -59                                |
| <b>02/08/04</b> | -214                   | -274                   | -307                   | -331                   | -203                   | -266                 | -66                                |
| <b>02/14/04</b> | -205                   | -267                   | -291                   | -328                   | -190                   | -256                 | -56                                |
| <b>02/22/04</b> | -213                   | -275                   | -307                   | -337                   | -202                   | -267                 | -67                                |

**Table A.1. Continued.**

| <b>Date</b>     | <b>REF05</b> | <b>REF05</b> | <b>REF05</b> | <b>REF05</b> | <b>REF05</b> | <b>REF05</b> | <b>REF05</b>         |
|-----------------|--------------|--------------|--------------|--------------|--------------|--------------|----------------------|
|                 | <b>25-73</b> | <b>25-48</b> | <b>25-58</b> | <b>25-56</b> | <b>25-47</b> | <b>AVG</b>   | <b>Corrected Avg</b> |
| <b>02/28/04</b> | -210         | -271         | -301         | -200         | -334         | -263         | -63                  |
| <b>03/07/04</b> | -218         | -281         | -304         | -209         | -342         | -271         | -71                  |
| <b>03/12/04</b> | -214         | -282         | -313         | -207         | -345         | -272         | -72                  |
| <b>03/20/04</b> | -205         | -287         | -316         | -356         | -212         | -275         | -75                  |
| <b>03/28/04</b> | -205         | -300         | -316         | -213         | -353         | -277         | -77                  |
| <b>04/04/04</b> | -216         | -304         | -321         | -212         | -359         | -282         | -82                  |
| <b>04/10/04</b> | -222         | -324         | -324         | -364         | -218         | -290         | -90                  |
| <b>04/25/04</b> | -224         | -312         | -328         | -367         | -213         | -289         | -89                  |
| <b>05/09/04</b> | -228         | -298         | -313         | -378         | -214         | -286         | -86                  |
| <b>05/16/04</b> | -220         | 124          | 20           | -374         | -139         | -118         | 82                   |
| <b>05/23/04</b> | 118          | 307          | 15           | 57           | 140          | 127          | 327                  |
| <b>05/31/04</b> | 70           | 350          | 35           | 37           | 241          | 147          | 347                  |
| <b>06/06/04</b> | 35           | 405          | 196          | 47           | 272          | 191          | 391                  |
| <b>06/16/04</b> | 9            | 364          | 306          | 34           | 272          | 197          | 397                  |
| <b>06/27/04</b> | 251          | 294          | 318          | 17           | 289          | 234          | 434                  |
| <b>07/20/04</b> | 40           | 167          | 385          | -2           | 299          | 178          | 378                  |
| <b>08/02/04</b> | 41           | 232          | 455          | 39           | 325          | 218          | 418                  |
| <b>08/08/04</b> | -108         | -124         | 59           | -46          | -69          | -58          | 142                  |
| <b>08/15/04</b> | -60          | -84          | -75          | -97          | -127         | -89          | 111                  |
| <b>08/22/04</b> | -128         | -84          | -118         | -108         | -114         | -110         | 90                   |
| <b>09/12/04</b> | -116         | -193         | -240         | -168         | -214         | -186         | 14                   |

**Table A.1. Continued.**

| <b>Date</b>     | <b>REF05<br/>25-73</b> | <b>REF05<br/>25-48</b> | <b>REF05<br/>25-58</b> | <b>REF05<br/>25-56</b> | <b>REF05<br/>25-47</b> | <b>REF05<br/>AVG</b> | <b>REF05<br/>Corrected<br/>Avg</b> |
|-----------------|------------------------|------------------------|------------------------|------------------------|------------------------|----------------------|------------------------------------|
| <b>09/26/04</b> | -202                   | -210                   | -12                    | -123                   | -176                   | -145                 | 55                                 |
| <b>10/17/04</b> | -46                    | 27                     | -11                    | -28                    | 49                     | -2                   | 248                                |
| <b>10/23/04</b> | -207                   | -136                   | -144                   | -104                   | -193                   | -157                 | 93                                 |
| <b>11/22/04</b> | 140                    | 80                     | 117                    | -9                     | 136                    | 93                   | 343                                |
| <b>11/27/04</b> | -228                   | -191                   | -173                   | -91                    | -240                   | -185                 | 65                                 |
| <b>12/05/04</b> | -312                   | -116                   | -178                   | -103                   | -252                   | -192                 | 58                                 |
| <b>12/12/04</b> | -314                   | -151                   | -153                   | -88                    | -259                   | -193                 | 57                                 |
| <b>12/21/04</b> | -361                   | -190                   | -164                   | -97                    | -207                   | -204                 | 46                                 |

**Table A.1. Continued.**

| <b>Date</b>     | <b>REF06<br/>25-43</b> | <b>REF06<br/>25-50</b> | <b>REF06<br/>25-42</b> | <b>REF06<br/>25-40</b> | <b>REF06<br/>25-45</b> | <b>REF06<br/>AVG</b> | <b>REF06<br/>Corrected<br/>Avg</b> |
|-----------------|------------------------|------------------------|------------------------|------------------------|------------------------|----------------------|------------------------------------|
| <b>09/09/03</b> | 139                    | 524                    | 429                    | 411                    | 495                    | 400                  | 600                                |
| <b>09/16/03</b> |                        |                        |                        |                        |                        |                      |                                    |
| <b>09/30/03</b> | -126                   | -171                   | -184                   | -108                   | -196                   | -157                 | 43                                 |
| <b>10/07/03</b> | -112                   | -283                   | 89                     | -62                    | 86                     | -56                  | 144                                |
| <b>10/14/03</b> | -138                   | -156                   | -168                   | -124                   | 42                     | -109                 | 91                                 |
| <b>10/21/03</b> | -145                   | -182                   | -200                   | -148                   | -166                   | -168                 | 32                                 |
| <b>10/28/03</b> | -162                   | -81                    | -227                   | -158                   | 71                     | -111                 | 89                                 |
| <b>11/03/03</b> |                        |                        |                        |                        |                        |                      |                                    |
| <b>11/11/03</b> | -157                   | -210                   | -320                   | -173                   | -222                   | -216                 | -16                                |
| <b>11/18/03</b> | -73                    | 337                    | -202                   | 224                    | -101                   | 37                   | 237                                |
| <b>11/24/03</b> | -110                   | -79                    | -271                   | 120                    | 189                    | -30                  | 170                                |
| <b>12/09/03</b> | -101                   | -102                   | -363                   | -164                   | -175                   | -181                 | 19                                 |
| <b>12/16/03</b> | -116                   | -122                   | -412                   | -185                   | -121                   | -191                 | 9                                  |
| <b>12/21/03</b> | -85                    | -96                    | -366                   | -157                   | -93                    | -159                 | 41                                 |
| <b>12/28/03</b> | -111                   | -116                   | -365                   | -178                   | -132                   | -180                 | 20                                 |
| <b>01/04/04</b> | -126                   | -125                   | -398                   | -178                   | -136                   | -193                 | 7                                  |
| <b>01/19/04</b> | -158                   | -185                   | -388                   | -179                   | -140                   | -210                 | -10                                |
| <b>02/01/04</b> | -140                   | -141                   | -400                   | -193                   | -150                   | -205                 | -5                                 |
| <b>02/08/04</b> | -170                   | -132                   | -389                   | -189                   | -141                   | -204                 | -4                                 |
| <b>02/14/04</b> | -187                   | -155                   | -375                   | -213                   | -160                   | -218                 | -18                                |
| <b>02/22/04</b> | -177                   | -135                   | -370                   | -196                   | -138                   | -203                 | -3                                 |

**Table A.1. Continued.**

| <b>Date</b>     | <b>REF06</b> | <b>REF06</b> | <b>REF06</b> | <b>REF06</b> | <b>REF06</b> | <b>REF06</b> | <b>REF06</b>         |
|-----------------|--------------|--------------|--------------|--------------|--------------|--------------|----------------------|
|                 | <b>25-43</b> | <b>25-50</b> | <b>25-42</b> | <b>25-40</b> | <b>25-45</b> | <b>AVG</b>   | <b>Corrected Avg</b> |
| <b>02/28/04</b> | -177         | -146         | -387         | -215         | -153         | -216         | -16                  |
| <b>03/07/04</b> | -207         | -150         | -374         | -207         | -151         | -218         | -18                  |
| <b>03/12/04</b> | -210         | -152         | -374         | -210         | -154         | -220         | -20                  |
| <b>03/20/04</b> | -222         | -161         | -380         | -215         | -163         | -228         | -28                  |
| <b>03/28/04</b> | -219         | -178         | -324         | -196         | -163         | -216         | -16                  |
| <b>04/04/04</b> | -232         | -186         | -328         | -202         | -205         | -231         | -31                  |
| <b>04/10/04</b> | -8           | -184         | -326         | -189         | -229         | -187         | 13                   |
| <b>04/25/04</b> | 13           | -186         | 189          | -174         | -272         | -86          | 114                  |
| <b>05/09/04</b> | 47           | -67          | 84           | -159         | 542          | 89           | 289                  |
| <b>05/16/04</b> | 47           | 496          | 77           | 155          | 609          | 277          | 477                  |
| <b>05/23/04</b> | 70           | 557          | 61           | 187          | 625          | 300          | 500                  |
| <b>05/31/04</b> | 102          | 561          | 56           | 297          | 646          | 332          | 532                  |
| <b>06/06/04</b> | 90           | 520          | 11           | 345          | 635          | 320          | 520                  |
| <b>06/16/04</b> | 84           | 540          | 168          | 524          | 633          | 390          | 590                  |
| <b>06/27/04</b> | 102          | 537          | 240          | 552          | 642          | 415          | 615                  |
| <b>07/20/04</b> | 198          | 510          | 316          | 541          | 633          | 440          | 640                  |
| <b>08/02/04</b> | 115          | 550          | 254          | 560          | 630          | 422          | 622                  |
| <b>08/08/04</b> | -15          | 613          | 63           | -121         | -156         | 77           | 277                  |
| <b>08/15/04</b> | -48          | 186          | 80           | -187         | -161         | -26          | 174                  |
| <b>08/22/04</b> | -109         | 524          | -54          | -214         | -239         | -18          | 182                  |
| <b>09/12/04</b> | 324          | 565          | 349          | 283          | 595          | 423          | 623                  |

**Table A.1. Continued.**

| <b>Date</b>     | <b>REF06<br/>25-43</b> | <b>REF06<br/>25-50</b> | <b>REF06<br/>25-42</b> | <b>REF06<br/>25-40</b> | <b>REF06<br/>25-45</b> | <b>REF06<br/>AVG</b> | <b>REF06<br/>Corrected<br/>Avg</b> |
|-----------------|------------------------|------------------------|------------------------|------------------------|------------------------|----------------------|------------------------------------|
| <b>09/26/04</b> | 275                    | 556                    | 272                    | 309                    | 633                    | 409                  | 609                                |
| <b>10/17/04</b> | 214                    | 554                    | 231                    | 183                    | 597                    | 356                  | 606                                |
| <b>10/23/04</b> | 269                    | 529                    | 212                    | 223                    | 606                    | 368                  | 618                                |
| <b>11/22/04</b> | 397                    | 439                    | 377                    | 151                    | 586                    | 390                  | 640                                |
| <b>11/27/04</b> | 445                    | 426                    | 320                    | 184                    | 412                    | 357                  | 607                                |
| <b>12/05/04</b> | 16                     | 17                     | -34                    | 186                    | 518                    | 141                  | 391                                |
| <b>12/12/04</b> | -21                    | -71                    | -98                    | 165                    | 509                    | 97                   | 347                                |
| <b>12/21/04</b> | -21                    | 147                    | 66                     | 211                    | 435                    | 168                  | 418                                |

**Table A.1. Continued.**

| <b>Date</b>     | <b>NR01<br/>25-63</b> | <b>NR01<br/>25-87</b> | <b>NR01<br/>25-64</b> | <b>NR01<br/>25-61</b> | <b>NR01<br/>25-67</b> | <b>NR01<br/>AVG</b> | <b>NR01<br/>Corrected<br/>Avg</b> |
|-----------------|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|---------------------|-----------------------------------|
| <b>09/16/03</b> | -148                  | -262                  | -240                  | -263                  | 96                    | -163                | 37                                |
| <b>09/30/03</b> | -188                  | -328                  | -252                  | -209                  | -59                   | -207                | -7                                |
| <b>10/07/03</b> | -231                  | -283                  | -240                  | -195                  | -222                  | -234                | -34                               |
| <b>10/14/03</b> | -203                  | -319                  | -292                  | -273                  | -102                  | -238                | -38                               |
| <b>10/21/03</b> | -181                  | -321                  | -263                  | -252                  | -170                  | -237                | -37                               |
| <b>10/28/03</b> | -166                  | -350                  | -254                  | -271                  | -55                   | -219                | -19                               |
| <b>11/03/03</b> | -193                  | -320                  | -236                  | -276                  | -81                   | -221                | -21                               |
| <b>11/11/03</b> | -184                  | -300                  | -255                  | -280                  | -88                   | -221                | -21                               |
| <b>11/18/03</b> | -191                  | -330                  | -235                  | -262                  | -85                   | -221                | -21                               |
| <b>11/24/03</b> | -199                  | -339                  | -231                  | -268                  | -85                   | -224                | -24                               |
| <b>12/09/03</b> | -212                  | -350                  | -241                  | -213                  | -128                  | -229                | -29                               |
| <b>12/16/03</b> | -168                  | -357                  | -386                  | -206                  | -112                  | -246                | -46                               |
| <b>12/21/03</b> | -217                  | -352                  | -369                  | -201                  | -129                  | -254                | -54                               |
| <b>12/28/03</b> | -204                  | -350                  | -338                  | -205                  | -89                   | -237                | -37                               |
| <b>01/04/04</b> | -232                  | -345                  | -334                  | -220                  | -61                   | -238                | -38                               |
| <b>01/19/04</b> | -238                  | -351                  | -307                  | -212                  | -96                   | -241                | -41                               |
| <b>02/01/04</b> | -368                  | -403                  | -380                  | -171                  | -410                  | -346                | -146                              |
| <b>02/08/04</b> | -241                  | -357                  | -296                  | -216                  | -159                  | -254                | -54                               |
| <b>02/14/04</b> | -201                  | -336                  | -280                  | -219                  | -44                   | -216                | -16                               |
| <b>02/22/04</b> | -244                  | -360                  | -291                  | -222                  | -212                  | -266                | -66                               |
| <b>02/28/04</b> | -248                  | -369                  | -287                  | -227                  | -183                  | -263                | -63                               |

**Table A.1. Continued.**

| <b>Date</b>     | <b>NR01<br/>25-63</b> | <b>NR01<br/>25-87</b> | <b>NR01<br/>25-64</b> | <b>NR01<br/>25-61</b> | <b>NR01<br/>25-67</b> | <b>NR01<br/>AVG</b> | <b>NR01<br/>Corrected<br/>Avg</b> |
|-----------------|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|---------------------|-----------------------------------|
| <b>03/07/04</b> | -237                  | -368                  | -293                  | -224                  | -263                  | -277                | -77                               |
| <b>03/12/04</b> | -249                  | -376                  | -292                  | -226                  | -211                  | -271                | -71                               |
| <b>03/20/04</b> | -253                  | -381                  | -297                  | -226                  | -141                  | -260                | -60                               |
| <b>03/28/04</b> | -249                  | -380                  | -291                  | -228                  | -182                  | -266                | -66                               |
| <b>04/04/04</b> | -185                  | -394                  | -295                  | -237                  | -261                  | -274                | -74                               |
| <b>04/10/04</b> | -251                  | -387                  | -284                  | -230                  | -282                  | -287                | -87                               |
| <b>04/25/04</b> | -250                  | -387                  | -274                  | -239                  | -321                  | -294                | -94                               |
| <b>05/09/04</b> | -415                  | -395                  | -285                  | -244                  | -264                  | -321                | -121                              |
| <b>05/16/04</b> | -269                  | -371                  | -255                  | -89                   | -160                  | -229                | -29                               |
| <b>05/23/04</b> | -277                  | -396                  | 219                   | 17                    | -10                   | -89                 | 111                               |
| <b>05/31/04</b> | -270                  | -384                  | 267                   | 99                    | 106                   | -36                 | 164                               |
| <b>06/06/04</b> | -264                  | -381                  | 248                   | 143                   | 103                   | -30                 | 170                               |
| <b>06/16/04</b> | -245                  | -366                  | 293                   | 220                   | 164                   | 13                  | 213                               |
| <b>06/27/04</b> | -199                  | 101                   | 370                   | 320                   | 261                   | 171                 | 371                               |
| <b>07/20/04</b> | 237                   | 69                    | 491                   | 352                   | 480                   | 326                 | 526                               |
| <b>08/02/04</b> | -61                   | -83                   | -54                   | 177                   | -203                  | -45                 | 155                               |
| <b>08/08/04</b> | -59                   | -44                   | -219                  | 62                    | -147                  | -81                 | 119                               |
| <b>08/15/04</b> | -119                  | -100                  | -245                  | -173                  | -33                   | -134                | 66                                |
| <b>08/22/04</b> | -99                   | -88                   | -205                  | -37                   | -53                   | -96                 | 104                               |
| <b>09/12/04</b> | -143                  | -118                  | -214                  | -168                  | -58                   | -140                | 60                                |
| <b>09/26/04</b> | -174                  | -145                  | -231                  | -208                  | -151                  | -182                | 18                                |

**Table A.1. Continued.**

| <b>Date</b>     | <b>NR01<br/>25-63</b> | <b>NR01<br/>25-87</b> | <b>NR01<br/>25-64</b> | <b>NR01<br/>25-61</b> | <b>NR01<br/>25-67</b> | <b>NR01<br/>AVG</b> | <b>NR01<br/>Corrected<br/>Avg</b> |
|-----------------|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|---------------------|-----------------------------------|
| <b>10/17/04</b> | -220                  | -183                  | -261                  | -209                  | -160                  | -207                | 43                                |
| <b>10/23/04</b> | -249                  | -219                  | -305                  | -269                  | -7                    | -210                | 40                                |
| <b>11/22/04</b> | -215                  | -41                   | 485                   | 279                   | 25                    | 107                 | 357                               |
| <b>11/27/04</b> | 36                    | -54                   | -125                  | -148                  | -5                    | -59                 | 191                               |
| <b>12/05/04</b> | -203                  | -167                  | -244                  | -94                   | -116                  | -165                | 85                                |
| <b>12/12/04</b> | -203                  | -172                  | -232                  | -83                   | -104                  | -159                | 91                                |
| <b>12/21/04</b> | -197                  | -160                  | -188                  | -77                   | -143                  | -153                | 97                                |

**Table A.1. Continued.**

| <b>Date</b>     | <b>NR02<br/>25-75</b> | <b>NR02<br/>25-71</b> | <b>NR02<br/>25-74</b> | <b>NR02<br/>25-70</b> | <b>NR02<br/>25-92</b> | <b>NR02<br/>AVG</b> | <b>NR02<br/>Corrected<br/>Avg</b> |
|-----------------|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|---------------------|-----------------------------------|
| <b>09/16/03</b> | -279                  | -183                  | -274                  | -106                  | -169                  | -202                | -2                                |
| <b>09/30/03</b> | -299                  | -273                  | -287                  | -143                  | -423                  | -285                | -85                               |
| <b>10/07/03</b> | -251                  | -311                  | -418                  | -173                  | -281                  | -287                | -87                               |
| <b>10/14/03</b> | -294                  | -353                  | -379                  | -189                  | -54                   | -254                | -54                               |
| <b>10/21/03</b> | -291                  | -353                  | -388                  | -151                  | -434                  | -323                | -123                              |
| <b>10/28/03</b> | -278                  | -323                  | -337                  | -146                  | -122                  | -241                | -41                               |
| <b>11/03/03</b> | -296                  | -358                  | -375                  | -143                  | -419                  | -318                | -118                              |
| <b>11/11/03</b> | -294                  | -348                  | -372                  | -154                  | -420                  | -318                | -118                              |
| <b>11/18/03</b> | -297                  | -365                  | -334                  | -156                  | -417                  | -314                | -114                              |
| <b>11/24/03</b> | -293                  | -342                  | -361                  | -152                  | -364                  | -302                | -102                              |
| <b>12/09/03</b> | -256                  | -379                  | -368                  | -155                  | -393                  | -310                | -110                              |
| <b>12/16/03</b> | -280                  | -405                  | -368                  | -160                  | -385                  | -320                | -120                              |
| <b>12/21/03</b> | -313                  | -414                  | -364                  | -153                  | -383                  | -325                | -125                              |
| <b>12/28/03</b> | -299                  | -431                  | -377                  | -164                  | -411                  | -336                | -136                              |
| <b>01/04/04</b> | -307                  | -425                  | -379                  | -173                  | -418                  | -340                | -140                              |
| <b>01/19/04</b> | -298                  | -414                  | -376                  | -170                  | -385                  | -329                | -129                              |
| <b>02/01/04</b> | -247                  | -355                  | -291                  | -212                  | -157                  | -252                | -52                               |
| <b>02/08/04</b> | -321                  | -387                  | -382                  | -173                  | -402                  | -333                | -133                              |
| <b>02/14/04</b> | -157                  | -210                  | -276                  | -178                  | -248                  | -214                | -14                               |
| <b>02/22/04</b> | -316                  | -365                  | -391                  | -185                  | -411                  | -334                | -134                              |
| <b>02/28/04</b> | -322                  | -350                  | -390                  | -195                  | -366                  | -325                | -125                              |

**Table A.1. Continued.**

| <b>Date</b>     | <b>NR02<br/>25-75</b> | <b>NR02<br/>25-71</b> | <b>NR02<br/>25-74</b> | <b>NR02<br/>25-70</b> | <b>NR02<br/>25-92</b> | <b>NR02<br/>AVG</b> | <b>NR02<br/>Corrected<br/>Avg</b> |
|-----------------|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|---------------------|-----------------------------------|
| <b>03/07/04</b> | -303                  | -342                  | -389                  | -191                  | -420                  | -329                | -129                              |
| <b>03/12/04</b> | -314                  | -328                  | -386                  | -194                  | -421                  | -329                | -129                              |
| <b>03/20/04</b> | -314                  | -317                  | -399                  | -198                  | -425                  | -331                | -131                              |
| <b>03/28/04</b> | -297                  | -299                  | -395                  | -198                  | -405                  | -319                | -119                              |
| <b>04/04/04</b> | -301                  | -294                  | -398                  | -201                  | -427                  | -324                | -124                              |
| <b>04/10/04</b> | -288                  | -285                  | -394                  | -198                  | -421                  | -317                | -117                              |
| <b>04/25/04</b> | -289                  | -326                  | -379                  | -212                  | -407                  | -323                | -123                              |
| <b>05/09/04</b> | -290                  | -370                  | -389                  | -232                  | -421                  | -340                | -140                              |
| <b>05/16/04</b> | -292                  | -346                  | -383                  | -231                  | -415                  | -333                | -133                              |
| <b>05/23/04</b> | -287                  | -321                  | -376                  | -234                  | -407                  | -325                | -125                              |
| <b>05/31/04</b> | 73                    | 17                    | -371                  | -230                  | 73                    | -88                 | 112                               |
| <b>06/06/04</b> | 187                   | 160                   | -360                  | -189                  | 125                   | -15                 | 185                               |
| <b>06/16/04</b> | 240                   | 167                   | -165                  | -221                  | 116                   | 27                  | 227                               |
| <b>06/27/04</b> | 322                   | 311                   | 93                    | 48                    | 123                   | 179                 | 379                               |
| <b>07/20/04</b> | 488                   | 533                   | 88                    | -15                   | 69                    | 233                 | 433                               |
| <b>08/02/04</b> | -37                   | -65                   | -82                   | 25                    | -205                  | -73                 | 127                               |
| <b>08/08/04</b> | -82                   | -83                   | -107                  | 22                    | -248                  | -100                | 100                               |
| <b>08/15/04</b> | -100                  | -94                   | -115                  | 18                    | -220                  | -102                | 98                                |
| <b>08/22/04</b> | -95                   | -94                   | -108                  | 29                    | -241                  | -102                | 98                                |
| <b>09/12/04</b> | -129                  | -107                  | -139                  | 44                    | -127                  | -92                 | 108                               |
| <b>09/26/04</b> | -164                  | -132                  | -171                  | 38                    | -236                  | -133                | 67                                |

**Table A.1. Continued.**

| <b>Date</b>     | <b>NR02<br/>25-75</b> | <b>NR02<br/>25-71</b> | <b>NR02<br/>25-74</b> | <b>NR02<br/>25-70</b> | <b>NR02<br/>25-92</b> | <b>NR02<br/>AVG</b> | <b>NR02<br/>Corrected<br/>Avg</b> |
|-----------------|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|---------------------|-----------------------------------|
| <b>10/17/04</b> | -190                  | -173                  | -217                  | 1                     | -420                  | -200                | 50                                |
| <b>10/23/04</b> | -252                  | -193                  | -271                  | -50                   | -425                  | -238                | 12                                |
| <b>11/22/04</b> | 182                   | 169                   | 35                    | -8                    | -30                   | 70                  | 320                               |
| <b>11/27/04</b> | 2                     | -71                   | -86                   | -19                   | -194                  | -74                 | 176                               |
| <b>12/05/04</b> | -40                   | -76                   | -91                   | -1                    | -150                  | -72                 | 178                               |
| <b>12/12/04</b> | -48                   | -88                   | -94                   | 4                     | -231                  | -91                 | 159                               |
| <b>12/21/04</b> | -71                   | -108                  | -114                  | -11                   | -318                  | -124                | 126                               |

**Table A.1. Continued.**

| <b>Date</b>     | <b>NR03</b>  |              |              |              |              |            | <b>NR03</b>          |
|-----------------|--------------|--------------|--------------|--------------|--------------|------------|----------------------|
|                 | <b>25-60</b> | <b>25-62</b> | <b>25-68</b> | <b>25-66</b> | <b>25-65</b> | <b>AVG</b> | <b>Corrected Avg</b> |
| <b>09/16/03</b> | 408          | 52           | 410          | 3            | 72           | 189        | 389                  |
| <b>09/30/03</b> | -67          | -69          | -124         | -401         | -99          | -152       | 48                   |
| <b>10/07/03</b> | -28          | -60          | -297         | -297         | -191         | -175       | 25                   |
| <b>10/14/03</b> | -43          | -95          | -179         | -233         | -134         | -137       | 63                   |
| <b>10/21/03</b> | -97          | -62          | -55          | -238         | -149         | -120       | 80                   |
| <b>10/28/03</b> | -28          | -51          | -256         | -239         | -83          | -131       | 69                   |
| <b>11/03/03</b> | -136         | -47          | -108         | -334         | -109         | -147       | 53                   |
| <b>11/11/03</b> | -135         | -51          | -69          | -385         | -83          | -145       | 55                   |
| <b>11/18/03</b> | -113         | -48          | -101         | -263         | -140         | -133       | 67                   |
| <b>11/24/03</b> | -123         | -45          | -112         | -185         | -110         | -115       | 85                   |
| <b>12/09/03</b> | -167         | -127         | -117         | -257         | -138         | -161       | 39                   |
| <b>12/16/03</b> | -126         | -130         | -93          | -207         | -117         | -135       | 65                   |
| <b>12/21/03</b> | -168         | -119         | -121         | -243         | -150         | -160       | 40                   |
| <b>12/28/03</b> | -152         | -122         | -110         | -221         | -124         | -146       | 54                   |
| <b>01/04/04</b> | -176         | -138         | -124         | -157         | -117         | -142       | 58                   |
| <b>01/19/04</b> | -174         | -163         | -128         | -186         | -121         | -154       | 46                   |
| <b>02/01/04</b> | -173         | -177         | -127         | -321         | -107         | -181       | 19                   |
| <b>02/08/04</b> | -174         | -188         | -112         | -326         | -97          | -179       | 21                   |
| <b>02/14/04</b> | -91          | -198         | -114         | -303         | -50          | -151       | 49                   |
| <b>02/22/04</b> | -174         | -216         | -123         | -353         | -99          | -193       | 7                    |
| <b>02/28/04</b> | -183         | -217         | -133         | -369         | -85          | -197       | 3                    |

**Table A.1. Continued.**

| <b>Date</b>     | <b>NR03</b>  |              |              |              |              |            | <b>NR03</b>          |
|-----------------|--------------|--------------|--------------|--------------|--------------|------------|----------------------|
|                 | <b>25-60</b> | <b>25-62</b> | <b>25-68</b> | <b>25-66</b> | <b>25-65</b> | <b>AVG</b> | <b>Corrected Avg</b> |
| <b>03/07/04</b> | -169         | -216         | -138         | -360         | -130         | -203       | -3                   |
| <b>03/12/04</b> | -174         | -216         | -132         | -379         | -152         | -211       | -11                  |
| <b>03/20/04</b> | -165         | -226         | -138         | -391         | -106         | -205       | -5                   |
| <b>03/28/04</b> | -166         | -228         | -145         | -384         | -72          | -199       | 1                    |
| <b>04/04/04</b> | -140         | -231         | -138         | -390         | -100         | -200       | 0                    |
| <b>04/10/04</b> | -169         | -237         | -156         | -389         | -101         | -210       | -10                  |
| <b>04/25/04</b> | -162         | -230         | -192         | -375         | -128         | -217       | -17                  |
| <b>05/09/04</b> | -162         | -145         | -167         | -267         | -106         | -169       | 31                   |
| <b>05/16/04</b> | 281          | 163          | 276          | -45          | 223          | 180        | 380                  |
| <b>05/23/04</b> | 424          | 121          | 487          | 58           | 390          | 296        | 496                  |
| <b>05/31/04</b> | 446          | 72           | 575          | 37           | 418          | 310        | 510                  |
| <b>06/06/04</b> | 461          | 67           | 570          | 39           | 461          | 320        | 520                  |
| <b>06/16/04</b> | 474          | 61           | 597          | 24           | 504          | 332        | 532                  |
| <b>06/27/04</b> | 518          | 74           | 620          | 234          | 513          | 392        | 592                  |
| <b>07/20/04</b> | 490          | 70           | 602          | 66           | 573          | 360        | 560                  |
| <b>08/02/04</b> | 135          | -220         | 225          | -131         | 82           | 18         | 218                  |
| <b>08/08/04</b> | 85           | -174         | 47           | -119         | 65           | -19        | 181                  |
| <b>08/15/04</b> | -35          | -97          | 48           | -59          | 49           | -19        | 181                  |
| <b>08/22/04</b> | 72           | -143         | 88           | -32          | 4            | -2         | 198                  |
| <b>09/12/04</b> | 144          | -219         | -32          | -74          | -14          | -39        | 161                  |
| <b>09/26/04</b> | 511          | 255          | 419          | -67          | 311          | 286        | 486                  |

**Table A.1. Continued.**

| <b>Date</b>     | <b>NR03<br/>25-60</b> | <b>NR03<br/>25-62</b> | <b>NR03<br/>25-68</b> | <b>NR03<br/>25-66</b> | <b>NR03<br/>25-65</b> | <b>NR03<br/>AVG</b> | <b>NR03<br/>Corrected<br/>Avg</b> |
|-----------------|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|---------------------|-----------------------------------|
| <b>10/17/04</b> | 482                   | -219                  | 356                   | -149                  | 51                    | 104                 | 354                               |
| <b>10/23/04</b> | 454                   | -100                  | 392                   | -159                  | 345                   | 186                 | 436                               |
| <b>11/22/04</b> | 482                   | -29                   | 550                   | -35                   | 461                   | 286                 | 536                               |
| <b>11/27/04</b> | 235                   | -125                  | 353                   | -18                   | 84                    | 106                 | 356                               |
| <b>12/05/04</b> | 438                   | -175                  | 66                    | -144                  | 20                    | 41                  | 291                               |
| <b>12/12/04</b> | 440                   | -173                  | 31                    | -129                  | -80                   | 18                  | 268                               |
| <b>12/21/04</b> | 469                   | -183                  | -7                    | -140                  | -107                  | 6                   | 256                               |

**Table A.1. Continued.**

| <b>Date</b>     | <b>NR06<br/>25-29</b> | <b>NR06<br/>25-28</b> | <b>NR06<br/>25-27</b> | <b>NR06<br/>25-21</b> | <b>NR06<br/>25-91</b> | <b>NR06<br/>AVG</b> | <b>NR06<br/>Corrected<br/>Avg</b> |
|-----------------|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|---------------------|-----------------------------------|
| <b>09/16/03</b> | 65                    | 320                   | -310                  | -310                  | 38                    | -39                 | 161                               |
| <b>09/30/03</b> | -262                  | -174                  | -303                  | -411                  | -175                  | -265                | -65                               |
| <b>10/07/03</b> | -338                  | -209                  | -228                  | -397                  | -47                   | -244                | -44                               |
| <b>10/14/03</b> | -248                  | -445                  | -338                  | -453                  | -240                  | -345                | -145                              |
| <b>10/21/03</b> | -188                  | -279                  | -308                  | -396                  | -108                  | -256                | -56                               |
| <b>10/28/03</b> | -125                  | -150                  | -297                  | -392                  | -120                  | -217                | -17                               |
| <b>11/03/03</b> | -143                  | -198                  | -288                  | -371                  | -143                  | -229                | -29                               |
| <b>11/11/03</b> | -146                  | -231                  | -281                  | -414                  | -215                  | -257                | -57                               |
| <b>11/18/03</b> | 6                     | -166                  | -255                  | -374                  | -187                  | -195                | 5                                 |
| <b>11/24/03</b> | -105                  | -199                  | -270                  | -232                  | -191                  | -199                | 1                                 |
| <b>12/09/03</b> | -135                  | -403                  | -268                  | -270                  | -191                  | -253                | -53                               |
| <b>12/16/03</b> | -83                   | -351                  | -266                  | -253                  | -190                  | -229                | -29                               |
| <b>12/21/03</b> | -117                  | -281                  | -261                  | -336                  | -187                  | -236                | -36                               |
| <b>12/28/03</b> | -103                  | -204                  | -256                  | -341                  | -187                  | -218                | -18                               |
| <b>01/04/04</b> | -93                   | -194                  | -287                  | -364                  | -191                  | -226                | -26                               |
| <b>01/19/04</b> | -64                   | -174                  | -267                  | -176                  | -189                  | -174                | 26                                |
| <b>02/01/04</b> | -165                  | -170                  | -265                  | -323                  | -188                  | -222                | -22                               |
| <b>02/08/04</b> | -175                  | -166                  | -264                  | -281                  | -189                  | -215                | -15                               |
| <b>02/14/04</b> | -42                   | -310                  | -202                  | -59                   | -174                  | -157                | 43                                |
| <b>02/22/04</b> | -187                  | -422                  | -260                  | -341                  | -181                  | -278                | -78                               |
| <b>02/28/04</b> | -139                  | -415                  | -266                  | -316                  | -188                  | -265                | -65                               |

**Table A.1. Continued.**

| <b>Date</b>     | <b>NR06<br/>25-29</b> | <b>NR06<br/>25-28</b> | <b>NR06<br/>25-27</b> | <b>NR06<br/>25-21</b> | <b>NR06<br/>25-91</b> | <b>NR06<br/>AVG</b> | <b>NR06<br/>Corrected<br/>Avg</b> |
|-----------------|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|---------------------|-----------------------------------|
| <b>03/07/04</b> | -188                  | -361                  | -273                  | -344                  | -161                  | -265                | -65                               |
| <b>03/12/04</b> | -187                  | -337                  | -272                  | -372                  | -181                  | -270                | -70                               |
| <b>03/20/04</b> | -185                  | -470                  | -276                  | -383                  | -180                  | -299                | -99                               |
| <b>03/28/04</b> | -184                  | -477                  | -297                  | -394                  | -187                  | -308                | -108                              |
| <b>04/04/04</b> | -192                  | -478                  | -292                  | -398                  | -181                  | -308                | -108                              |
| <b>04/10/04</b> | 26                    | -444                  | -278                  | -353                  | -174                  | -245                | -45                               |
| <b>04/25/04</b> | -8                    | -476                  | -291                  | -410                  | -170                  | -271                | -71                               |
| <b>05/09/04</b> | 263                   | -182                  | -304                  | -395                  | 68                    | -110                | 90                                |
| <b>05/16/04</b> | 401                   | 71                    | -315                  | -140                  | 409                   | 85                  | 285                               |
| <b>05/23/04</b> | 431                   | 62                    | 98                    | 55                    | 403                   | 210                 | 410                               |
| <b>05/31/04</b> | 396                   | 135                   | 263                   | 224                   | 427                   | 289                 | 489                               |
| <b>06/06/04</b> | 403                   | 143                   | 328                   | 256                   | 397                   | 305                 | 505                               |
| <b>06/16/04</b> | 422                   | 227                   | 313                   | 271                   | 446                   | 336                 | 536                               |
| <b>06/27/04</b> | 177                   | 249                   | 288                   | 290                   | 435                   | 288                 | 488                               |
| <b>07/20/04</b> | 198                   | 244                   | 31                    | 232                   | 478                   | 237                 | 437                               |
| <b>08/02/04</b> | -204                  | -30                   | -137                  | -66                   | -221                  | -132                | 68                                |
| <b>08/08/04</b> | -271                  | -142                  | -114                  | -135                  | -215                  | -175                | 25                                |
| <b>08/15/04</b> | -178                  | -171                  | -112                  | -138                  | -31                   | -126                | 74                                |
| <b>08/22/04</b> | -230                  | -106                  | -104                  | -115                  | -186                  | -148                | 52                                |
| <b>09/12/04</b> | -281                  | -90                   | -126                  | -156                  | -188                  | -168                | 32                                |
| <b>09/26/04</b> | 63                    | 155                   | -152                  | -167                  | 471                   | 74                  | 274                               |

**Table A.1. Continued.**

| <b>Date</b>     | <b>NR06<br/>25-29</b> | <b>NR06<br/>25-28</b> | <b>NR06<br/>25-27</b> | <b>NR06<br/>25-21</b> | <b>NR06<br/>25-91</b> | <b>NR06<br/>AVG</b> | <b>NR06<br/>Corrected<br/>Avg</b> |
|-----------------|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|---------------------|-----------------------------------|
| <b>10/17/04</b> | -46                   | 129                   | -210                  | -172                  | -172                  | -94                 | 156                               |
| <b>10/23/04</b> | -71                   | 181                   | -218                  | -203                  | 407                   | 19                  | 269                               |
| <b>11/22/04</b> | -18                   | 136                   | -31                   | -17                   | 3                     | 15                  | 265                               |
| <b>11/27/04</b> | -59                   | 2                     | -60                   | -111                  | -163                  | -78                 | 172                               |
| <b>12/05/04</b> | -205                  | -125                  | -186                  | -164                  | -225                  | -181                | 69                                |
| <b>12/12/04</b> | -292                  | -118                  | -191                  | -169                  | -269                  | -208                | 42                                |
| <b>12/21/04</b> | -20                   | 53                    | -173                  | -122                  | -158                  | -84                 | 166                               |

**Table A.1. Continued.**

| <b>Date</b>     | <b>NR07<br/>25-20</b> | <b>NR07<br/>25-22</b> | <b>NR07<br/>25-25</b> | <b>NR07<br/>25-26</b> | <b>NR07<br/>25-24</b> | <b>NR07<br/>AVG</b> | <b>NR07<br/>Corrected<br/>Avg</b> |
|-----------------|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|---------------------|-----------------------------------|
| <b>09/16/03</b> | -373                  | -339                  | -329                  | -332                  | -314                  | -337                | -137                              |
| <b>09/30/03</b> | -339                  | -324                  | -346                  | -326                  | -332                  | -333                | -133                              |
| <b>10/07/03</b> | -476                  | -321                  | -247                  | -318                  | -332                  | -339                | -139                              |
| <b>10/14/03</b> | -495                  | -395                  | -377                  | -251                  | -503                  | -404                | -204                              |
| <b>10/21/03</b> | -428                  | -294                  | -313                  | -325                  | -324                  | -337                | -137                              |
| <b>10/28/03</b> | -433                  | -308                  | -326                  | -310                  | -261                  | -328                | -128                              |
| <b>11/03/03</b> | -400                  | -304                  | -336                  | -323                  | -322                  | -337                | -137                              |
| <b>11/11/03</b> | -228                  | -313                  | -315                  | -333                  | -332                  | -304                | -104                              |
| <b>11/18/03</b> | -13                   | -258                  | -291                  | -260                  | -308                  | -226                | -26                               |
| <b>11/24/03</b> | 32                    | -300                  | -313                  | -317                  | -322                  | -244                | -44                               |
| <b>12/09/03</b> | 50                    | -312                  | -326                  | -405                  | -329                  | -264                | -64                               |
| <b>12/16/03</b> | 43                    | -316                  | -322                  | -392                  | -322                  | -262                | -62                               |
| <b>12/21/03</b> | 50                    | -198                  | -314                  | -383                  | -318                  | -233                | -33                               |
| <b>12/28/03</b> | 45                    | -164                  | -316                  | -382                  | -319                  | -227                | -27                               |
| <b>01/04/04</b> | -22                   | -298                  | -320                  | -375                  | -323                  | -268                | -68                               |
| <b>01/19/04</b> | 39                    | -309                  | -315                  | -381                  | -320                  | -257                | -57                               |
| <b>02/01/04</b> | 42                    | -230                  | -308                  | -365                  | -314                  | -235                | -35                               |
| <b>02/08/04</b> | 37                    | -308                  | -311                  | -370                  | -327                  | -256                | -56                               |
| <b>02/14/04</b> | -38                   | -288                  | -279                  | -318                  | -261                  | -237                | -37                               |
| <b>02/22/04</b> | 41                    | -307                  | -301                  | -364                  | -318                  | -250                | -50                               |
| <b>02/28/04</b> | 38                    | -213                  | -315                  | -358                  | -323                  | -234                | -34                               |

**Table A.1. Continued.**

| <b>Date</b>     | <b>NR07<br/>25-20</b> | <b>NR07<br/>25-22</b> | <b>NR07<br/>25-25</b> | <b>NR07<br/>25-26</b> | <b>NR07<br/>25-24</b> | <b>NR07<br/>AVG</b> | <b>NR07<br/>Corrected<br/>Avg</b> |
|-----------------|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|---------------------|-----------------------------------|
| <b>03/07/04</b> | 12                    | -301                  | -298                  | -355                  | -311                  | -251                | -51                               |
| <b>03/12/04</b> | -4                    | -315                  | -309                  | -348                  | -323                  | -260                | -60                               |
| <b>03/20/04</b> | -22                   | -444                  | -311                  | -361                  | -324                  | -292                | -92                               |
| <b>03/28/04</b> | -94                   | -374                  | -312                  | -354                  | -322                  | -291                | -91                               |
| <b>04/04/04</b> | -75                   | -393                  | -314                  | -353                  | -181                  | -263                | -63                               |
| <b>04/10/04</b> | -86                   | -384                  | -290                  | -363                  | -318                  | -288                | -88                               |
| <b>04/25/04</b> | -211                  | -329                  | -306                  | -349                  | -297                  | -298                | -98                               |
| <b>05/09/04</b> | -246                  | -322                  | -316                  | -320                  | -371                  | -315                | -115                              |
| <b>05/16/04</b> | -261                  | -375                  | -13                   | -369                  | -300                  | -264                | -64                               |
| <b>05/23/04</b> | -181                  | -278                  | -52                   | -341                  | -270                  | -224                | -24                               |
| <b>05/31/04</b> | 113                   | 398                   | 235                   | 132                   | 224                   | 220                 | 420                               |
| <b>06/06/04</b> | 183                   | 460                   | 307                   | 136                   | 346                   | 286                 | 486                               |
| <b>06/16/04</b> | 54                    | 462                   | 198                   | 115                   | 365                   | 239                 | 439                               |
| <b>06/27/04</b> | 15                    | 440                   | 389                   | 235                   | 359                   | 288                 | 488                               |
| <b>07/20/04</b> | -123                  | 382                   | 354                   | 90                    | 343                   | 209                 | 409                               |
| <b>08/02/04</b> | -79                   | 4                     | -22                   | -67                   | -20                   | -37                 | 163                               |
| <b>08/08/04</b> | -102                  | -18                   | -22                   | -139                  | -14                   | -59                 | 141                               |
| <b>08/15/04</b> | -148                  | -79                   | -146                  | -143                  | -133                  | -130                | 70                                |
| <b>08/22/04</b> | -164                  | -90                   | -112                  | -180                  | -151                  | -139                | 61                                |
| <b>09/12/04</b> | -133                  | -92                   | -106                  | -174                  | -106                  | -122                | 78                                |
| <b>09/26/04</b> | -28                   | -226                  | -30                   | -215                  | 222                   | -55                 | 145                               |

**Table A.1. Continued.**

| <b>Date</b>     | <b>NR07<br/>25-20</b> | <b>NR07<br/>25-22</b> | <b>NR07<br/>25-25</b> | <b>NR07<br/>25-26</b> | <b>NR07<br/>25-24</b> | <b>NR07<br/>AVG</b> | <b>NR07<br/>Corrected<br/>Avg</b> |
|-----------------|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|---------------------|-----------------------------------|
| <b>10/17/04</b> | -112                  | -360                  | -124                  | -263                  | -137                  | -199                | 51                                |
| <b>10/23/04</b> | -174                  | -370                  | -148                  | -264                  | -159                  | -223                | 27                                |
| <b>11/22/04</b> | -14                   | -168                  | -5                    | 44                    | 282                   | 28                  | 278                               |
| <b>11/27/04</b> | 9                     | -189                  | -3                    | 46                    | 152                   | 3                   | 253                               |
| <b>12/05/04</b> | -18                   | -269                  | -192                  | 26                    | 184                   | -54                 | 196                               |
| <b>12/12/04</b> | -82                   | -368                  | -113                  | -48                   | -75                   | -137                | 113                               |
| <b>12/21/04</b> | -98                   | -369                  | -94                   | -69                   | -130                  | -152                | 98                                |

**Table A.1. Continued.**

| <b>Date</b>     | <b>NR08</b>  |              |              |              |              |            | <b>NR08</b>          |
|-----------------|--------------|--------------|--------------|--------------|--------------|------------|----------------------|
|                 | <b>25-14</b> | <b>25-11</b> | <b>25-15</b> | <b>25-86</b> | <b>25-18</b> | <b>AVG</b> | <b>Corrected Avg</b> |
| <b>09/16/03</b> | -57          | -173         | -247         | -403         | -200         | -216       |                      |
| <b>09/30/03</b> | -96          | -213         | -321         | -409         | -171         | -242       | -42                  |
| <b>10/07/03</b> | -103         | -233         | -356         | -406         | -175         | -255       | -55                  |
| <b>10/14/03</b> | -117         | -260         | -360         | -407         | -188         | -266       | -66                  |
| <b>10/21/03</b> | -109         | -286         | -410         | -408         | -154         | -273       | -73                  |
| <b>10/28/03</b> | -185         | -349         | -357         | -419         | -165         | -295       | -95                  |
| <b>11/03/03</b> | -158         | -353         | -385         | -419         | -163         | -296       | -96                  |
| <b>11/11/03</b> | -166         | -382         | -403         | -419         | -155         | -305       | -105                 |
| <b>11/18/03</b> | -162         | -395         | -416         | -396         | -101         | -294       | -94                  |
| <b>11/24/03</b> | -153         | -408         | -411         | -415         | -133         | -304       | -104                 |
| <b>12/09/03</b> | -159         | -411         | -413         | -403         | -135         | -304       | -104                 |
| <b>12/16/03</b> | -159         | -420         | -423         | -410         | -139         | -310       | -110                 |
| <b>12/21/03</b> | -162         | -414         | -415         | -414         | -137         | -308       | -108                 |
| <b>12/28/03</b> | -162         | -416         | -416         | -421         | -149         | -313       | -113                 |
| <b>01/04/04</b> | -166         | -416         | -409         | -404         | -159         | -311       | -111                 |
| <b>01/19/04</b> | -165         | -404         | -382         | -430         | -163         | -309       | -109                 |
| <b>02/01/04</b> | -168         | -405         | -376         | -432         | -190         | -314       | -114                 |
| <b>02/08/04</b> | -172         | -407         | -375         | -428         | -190         | -314       | -114                 |
| <b>02/14/04</b> | -140         | -381         | -325         | -384         | -171         | -280       | -80                  |
| <b>02/22/04</b> | -180         | -406         | -339         | -428         | -193         | -309       | -109                 |
| <b>02/28/04</b> | -182         | -414         | -383         | -426         | -197         | -320       | -120                 |

**Table A.1. Continued.**

| <b>Date</b>     | <b>NR08<br/>25-14</b> | <b>NR08<br/>25-11</b> | <b>NR08<br/>25-15</b> | <b>NR08<br/>25-86</b> | <b>NR08<br/>25-18</b> | <b>NR08<br/>AVG</b> | <b>NR08<br/>Corrected<br/>Avg</b> |
|-----------------|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|---------------------|-----------------------------------|
| <b>03/07/04</b> | -211                  | -420                  | -410                  | -415                  | -180                  | -327                | -127                              |
| <b>03/12/04</b> | -262                  | -419                  | -391                  | -436                  | -197                  | -341                | -141                              |
| <b>03/20/04</b> | -339                  | -428                  | -407                  | -437                  | -196                  | -361                | -161                              |
| <b>03/28/04</b> | -347                  | -422                  | -397                  | -437                  | -194                  | -359                | -159                              |
| <b>04/04/04</b> | -372                  | -418                  | -391                  | -437                  | -195                  | -363                | -163                              |
| <b>04/10/04</b> | 24                    | -422                  | -400                  | -437                  | -255                  | -298                | -98                               |
| <b>04/25/04</b> | -322                  | -425                  | -409                  | -423                  | -183                  | -352                | -152                              |
| <b>05/09/04</b> | -363                  | -418                  | -394                  | -425                  | -148                  | -350                | -150                              |
| <b>05/16/04</b> | 44                    | -19                   | -410                  | -405                  | -21                   | -162                | 38                                |
| <b>05/23/04</b> | 20                    | 26                    | 37                    | -413                  | 44                    | -57                 | 143                               |
| <b>05/31/04</b> | -2                    | 29                    | 32                    | 30                    | 49                    | 28                  | 228                               |
| <b>06/06/04</b> | -20                   | 1                     | 24                    | 17                    | 96                    | 24                  | 224                               |
| <b>06/16/04</b> | -19                   | 8                     | 29                    | 25                    | 280                   | 65                  | 265                               |
| <b>06/27/04</b> | 274                   | -5                    | 18                    | 17                    | 412                   | 143                 | 343                               |
| <b>07/20/04</b> | 427                   | -44                   | 4                     | -5                    | 380                   | 152                 | 352                               |
| <b>08/02/04</b> | -315                  | -47                   | -43                   | -32                   | -314                  | -150                | 50                                |
| <b>08/08/04</b> | -336                  | -41                   | -56                   | -75                   | -342                  | -170                | 30                                |
| <b>08/15/04</b> | -346                  | -34                   | -62                   | -81                   | -384                  | -181                | 19                                |
| <b>08/22/04</b> | -291                  | 10                    | -36                   | -52                   | -369                  | -148                | 52                                |
| <b>09/12/04</b> | -255                  | -6                    | 3                     | -62                   | -153                  | -95                 | 105                               |
| <b>09/26/04</b> | -279                  | -70                   | -101                  | -108                  | -253                  | -162                | 38                                |

**Table A.1. Continued.**

| <b>Date</b>     | <b>NR08<br/>25-14</b> | <b>NR08<br/>25-11</b> | <b>NR08<br/>25-15</b> | <b>NR08<br/>25-86</b> | <b>NR08<br/>25-18</b> | <b>NR08<br/>AVG</b> | <b>NR08<br/>Corrected<br/>Avg</b> |
|-----------------|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|---------------------|-----------------------------------|
| <b>10/17/04</b> | -316                  | -64                   | -80                   | -103                  | -299                  | -172                | 78                                |
| <b>10/23/04</b> | -325                  | -74                   | -102                  | -109                  | -434                  | -209                | 41                                |
| <b>11/22/04</b> | -139                  | -41                   | -27                   | -34                   | -30                   | -54                 | 196                               |
| <b>11/27/04</b> | -117                  | -29                   | -43                   | -75                   | -85                   | -70                 | 180                               |
| <b>12/05/04</b> | -235                  | -62                   | -80                   | -92                   | -167                  | -127                | 123                               |
| <b>12/12/04</b> | -207                  | -52                   | -73                   | -73                   | -171                  | -115                | 135                               |
| <b>12/21/04</b> | -190                  | -45                   | -71                   | -69                   | -141                  | -103                | 147                               |

**Table A.1. Continued.**

| <b>Date</b>     | <b>NR09<br/>25-16</b> | <b>NR09<br/>25-13</b> | <b>NR09<br/>25-19</b> | <b>NR09<br/>25-10</b> | <b>NR09<br/>25-12</b> | <b>NR09<br/>AVG</b> | <b>NR09<br/>Corrected<br/>Avg</b> |
|-----------------|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|---------------------|-----------------------------------|
| <b>09/16/03</b> | -351                  | -351                  | -336                  | -334                  | -323                  | -339                | -139                              |
| <b>09/30/03</b> | -343                  | -358                  | -353                  | -342                  | -338                  | -347                | -147                              |
| <b>10/07/03</b> | -342                  | -358                  | -335                  | -338                  | -318                  | -338                | -138                              |
| <b>10/14/03</b> | -347                  | -352                  | -350                  | -301                  | -440                  | -358                | -158                              |
| <b>10/21/03</b> | -302                  | -323                  | -350                  | -287                  | -394                  | -331                | -131                              |
| <b>10/28/03</b> | -332                  | -324                  | -385                  | -328                  | -395                  | -353                | -153                              |
| <b>11/03/03</b> | -315                  | -347                  | -344                  | -327                  | -431                  | -353                | -153                              |
| <b>11/11/03</b> | -333                  | -345                  | -326                  | -286                  | -420                  | -342                | -142                              |
| <b>11/18/03</b> | -412                  | -456                  | -443                  | -315                  | -408                  | -407                | -207                              |
| <b>11/24/03</b> | -324                  | -329                  | -304                  | -311                  | -321                  | -318                | -118                              |
| <b>12/09/03</b> | -335                  | -334                  | -313                  | -323                  | -329                  | -327                | -127                              |
| <b>12/16/03</b> | -310                  | -323                  | -305                  | -319                  | -262                  | -304                | -104                              |
| <b>12/21/03</b> | -309                  | -329                  | -322                  | -324                  | -316                  | -320                | -120                              |
| <b>12/28/03</b> | -329                  | -330                  | -341                  | -463                  | -320                  | -357                | -157                              |
| <b>01/04/04</b> | -331                  | -341                  | -363                  | -464                  | -323                  | -364                | -164                              |
| <b>01/19/04</b> | -315                  | -332                  | -388                  | -465                  | -316                  | -363                | -163                              |
| <b>02/01/04</b> | -322                  | -331                  | -399                  | -467                  | -325                  | -369                | -169                              |
| <b>02/08/04</b> | -322                  | -399                  | -399                  | -458                  | -322                  | -380                | -180                              |
| <b>02/14/04</b> | -273                  | -291                  | -338                  | -371                  | -265                  | -308                | -108                              |
| <b>02/22/04</b> | -331                  | -338                  | -459                  | -467                  | -324                  | -384                | -184                              |
| <b>02/28/04</b> | -326                  | -443                  | -433                  | -474                  | -322                  | -400                | -200                              |

**Table A.1. Continued.**

| <b>Date</b>     | <b>NR09<br/>25-16</b> | <b>NR09<br/>25-13</b> | <b>NR09<br/>25-19</b> | <b>NR09<br/>25-10</b> | <b>NR09<br/>25-12</b> | <b>NR09<br/>AVG</b> | <b>NR09<br/>Corrected<br/>Avg</b> |
|-----------------|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|---------------------|-----------------------------------|
| <b>03/07/04</b> | -334                  | -348                  | -385                  | -460                  | -315                  | -368                | -168                              |
| <b>03/12/04</b> | -324                  | -386                  | -429                  | -469                  | -319                  | -385                | -185                              |
| <b>03/20/04</b> | -335                  | -408                  | -439                  | -471                  | -324                  | -395                | -195                              |
| <b>03/28/04</b> | -316                  | -351                  | -439                  | -468                  | -322                  | -379                | -179                              |
| <b>04/04/04</b> | -330                  | -352                  | -441                  | -469                  | -321                  | -383                | -183                              |
| <b>04/10/04</b> | -332                  | -378                  | -437                  | -465                  | -289                  | -380                | -180                              |
| <b>04/25/04</b> | -350                  | -343                  | -407                  | -459                  | -321                  | -376                | -176                              |
| <b>05/09/04</b> | -334                  | -330                  | -403                  | -418                  | -329                  | -363                | -163                              |
| <b>05/16/04</b> | -351                  | -341                  | -412                  | -446                  | -326                  | -375                | -175                              |
| <b>05/23/04</b> | 74                    | 208                   | 230                   | -336                  | -291                  | -23                 | 177                               |
| <b>05/31/04</b> | 246                   | 446                   | 368                   | 258                   | 252                   | 314                 | 514                               |
| <b>06/06/04</b> | 255                   | 491                   | 500                   | 258                   | 299                   | 361                 | 561                               |
| <b>06/16/04</b> | 286                   | 453                   | 390                   | 187                   | -180                  | 227                 | 427                               |
| <b>06/27/04</b> | 358                   | 499                   | 510                   | 163                   | 251                   | 356                 | 556                               |
| <b>07/20/04</b> | 315                   | 536                   | 532                   | 506                   | 474                   | 473                 | 673                               |
| <b>08/02/04</b> | -99                   | -170                  | -58                   | -150                  | -188                  | -133                | 67                                |
| <b>08/08/04</b> | -109                  | -124                  | -15                   | -162                  | -129                  | -108                | 92                                |
| <b>08/15/04</b> | -168                  | -187                  | -186                  | -212                  | -218                  | -194                | 6                                 |
| <b>08/22/04</b> | -87                   | -191                  | -165                  | -167                  | -202                  | -162                | 38                                |
| <b>09/12/04</b> | -166                  | -214                  | -250                  | -198                  | -264                  | -218                | -18                               |
| <b>09/26/04</b> | -190                  | -216                  | -277                  | -222                  | -274                  | -236                | -36                               |

**Table A.1. Continued.**

| <b>Date</b>     | <b>NR09<br/>25-16</b> | <b>NR09<br/>25-13</b> | <b>NR09<br/>25-19</b> | <b>NR09<br/>25-10</b> | <b>NR09<br/>25-12</b> | <b>NR09<br/>AVG</b> | <b>NR09<br/>Corrected<br/>Avg</b> |
|-----------------|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|---------------------|-----------------------------------|
| <b>10/17/04</b> | -219                  | -212                  | -278                  | -297                  | -210                  | -243                | -43                               |
| <b>10/23/04</b> | -229                  | -220                  | -281                  | -290                  | -293                  | -263                | -63                               |
| <b>11/22/04</b> | -213                  | -24                   | -205                  | -286                  | -124                  | -170                | 30                                |
| <b>11/27/04</b> | -102                  | -50                   | -61                   | -100                  | -4                    | -63                 | 137                               |
| <b>12/05/04</b> | -270                  | -299                  | -295                  | -325                  | -367                  | -311                | -111                              |
| <b>12/12/04</b> | -226                  | -230                  | -196                  | -253                  | -205                  | -222                | -22                               |
| <b>12/21/04</b> | -217                  | -224                  | -197                  | -270                  | -253                  | -232                | -32                               |

**Table A.1. Continued.**

| <b>Date</b>     | <b>NR12<br/>25-90</b> | <b>NR12<br/>25-87</b> | <b>NR12<br/>25-95</b> | <b>NR12<br/>25-82</b> | <b>NR12<br/>25-85</b> | <b>NR12<br/>AVG</b> | <b>NR12<br/>Corrected<br/>Avg</b> |
|-----------------|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|---------------------|-----------------------------------|
| <b>09/16/03</b> | 174                   | 226                   | 118                   | 273                   | 312                   | 221                 | 421                               |
| <b>09/30/03</b> | -57                   | -207                  | -197                  | -113                  | 182                   | -78                 | 122                               |
| <b>10/07/03</b> | 58                    | 33                    | 270                   | 32                    | 312                   | 141                 | 341                               |
| <b>10/14/03</b> | -41                   | -244                  | -182                  | -105                  | 14                    | -112                | 88                                |
| <b>10/21/03</b> | 4                     | -222                  | -176                  | -97                   | -44                   | -107                | 93                                |
| <b>10/28/03</b> | -69                   | -255                  | -100                  | -67                   | 364                   | -25                 | 175                               |
| <b>11/03/03</b> | -105                  | -207                  | -149                  | -91                   | -24                   | -115                | 85                                |
| <b>11/11/03</b> | -154                  | -179                  | -126                  | -97                   | 132                   | -85                 | 115                               |
| <b>11/18/03</b> | -98                   | -32                   | 60                    | 25                    | 302                   | 51                  | 251                               |
| <b>11/24/03</b> | -145                  | -129                  | -148                  | -69                   | 505                   | 3                   | 203                               |
| <b>12/09/03</b> | -158                  | -108                  | -80                   | -94                   | -80                   | -104                | 96                                |
| <b>12/16/03</b> | -162                  | -123                  | -88                   | -98                   | -14                   | -97                 | 103                               |
| <b>12/21/03</b> | -158                  | -128                  | -82                   | -94                   | -170                  | -126                | 74                                |
| <b>12/28/03</b> | -156                  | -136                  | -84                   | -95                   | -36                   | -101                | 99                                |
| <b>01/04/04</b> | -161                  | -136                  | -89                   | -94                   | -27                   | -101                | 99                                |
| <b>01/19/04</b> | -135                  | -125                  | -151                  | -103                  | -51                   | -113                | 87                                |
| <b>02/01/04</b> | -143                  | -139                  | -88                   | -94                   | -61                   | -105                | 95                                |
| <b>02/08/04</b> | -149                  | -140                  | -98                   | -101                  | -84                   | -114                | 86                                |
| <b>02/14/04</b> | -152                  | -132                  | -95                   | -89                   | -16                   | -97                 | 103                               |
| <b>02/22/04</b> | -149                  | -140                  | -96                   | -75                   | -62                   | -104                | 96                                |
| <b>02/28/04</b> | -155                  | -143                  | -94                   | -85                   | 24                    | -91                 | 109                               |

**Table A.1. Continued.**

| <b>Date</b>     | <b>NR12<br/>25-90</b> | <b>NR12<br/>25-87</b> | <b>NR12<br/>25-95</b> | <b>NR12<br/>25-82</b> | <b>NR12<br/>25-85</b> | <b>NR12<br/>AVG</b> | <b>NR12<br/>Corrected<br/>Avg</b> |
|-----------------|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|---------------------|-----------------------------------|
| <b>03/07/04</b> | -151                  | -146                  | -109                  | -92                   | -56                   | -111                | 89                                |
| <b>03/12/04</b> | -148                  | -145                  | -81                   | -56                   | -94                   | -105                | 95                                |
| <b>03/20/04</b> | -78                   | -143                  | -102                  | -84                   | -59                   | -93                 | 107                               |
| <b>03/28/04</b> | -71                   | -106                  | -182                  | -88                   | -1                    | -90                 | 110                               |
| <b>04/04/04</b> | -82                   | -76                   | -151                  | -80                   | -54                   | -89                 | 111                               |
| <b>04/10/04</b> | -20                   | -35                   | -58                   | 8                     | 118                   | 3                   | 203                               |
| <b>04/25/04</b> | -28                   | -75                   | -64                   | -21                   | 128                   | -12                 | 188                               |
| <b>05/09/04</b> | 53                    | -84                   | -75                   | 2                     | 136                   | 6                   | 206                               |
| <b>05/16/04</b> | 98                    | -15                   | 102                   | 8                     | 194                   | 77                  | 277                               |
| <b>05/23/04</b> | 80                    | 189                   | 241                   | 32                    | 225                   | 153                 | 353                               |
| <b>05/31/04</b> | 160                   | 278                   | 242                   | 82                    | 214                   | 195                 | 395                               |
| <b>06/06/04</b> | 210                   | 301                   | 176                   | 90                    | 177                   | 191                 | 391                               |
| <b>06/16/04</b> | 266                   | 279                   | 154                   | 129                   | 161                   | 198                 | 398                               |
| <b>06/27/04</b> | 281                   | 272                   | 167                   | -17                   | 201                   | 181                 | 381                               |
| <b>07/20/04</b> | 249                   | 192                   | 289                   | -4                    | 213                   | 188                 | 388                               |
| <b>08/02/04</b> | -219                  | -310                  | -298                  | -225                  | -274                  | -265                | -65                               |
| <b>08/08/04</b> | -324                  | -296                  | -294                  | -194                  | -248                  | -271                | -71                               |
| <b>08/15/04</b> | -189                  | -327                  | -301                  | -201                  | -137                  | -231                | -31                               |
| <b>08/22/04</b> | -323                  | -309                  | -290                  | -170                  | -258                  | -270                | -70                               |
| <b>09/12/04</b> | 30                    | -325                  | -283                  | -306                  | -271                  | -231                | -31                               |
| <b>09/26/04</b> | 213                   | 130                   | -28                   | 106                   | 66                    | 97                  | 297                               |

**Table A.1. Continued.**

| <b>Date</b>     | <b>NR12<br/>25-90</b> | <b>NR12<br/>25-87</b> | <b>NR12<br/>25-95</b> | <b>NR12<br/>25-82</b> | <b>NR12<br/>25-85</b> | <b>NR12<br/>AVG</b> | <b>NR12<br/>Corrected<br/>Avg</b> |
|-----------------|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|---------------------|-----------------------------------|
| <b>10/17/04</b> | 144                   | -240                  | -287                  | -171                  | 11                    | -109                | 141                               |
| <b>10/23/04</b> | 34                    | -301                  | -270                  | -155                  | -67                   | -152                | 98                                |
| <b>11/22/04</b> | 180                   | -79                   | 33                    | -50                   | -80                   | 1                   | 251                               |
| <b>11/27/04</b> | 63                    | -119                  | -55                   | -111                  | -58                   | -56                 | 194                               |
| <b>12/05/04</b> | 83                    | -353                  | -51                   | -150                  | -119                  | -118                | 132                               |
| <b>12/12/04</b> | 0                     | -412                  | -258                  | -281                  | -147                  | -220                | 30                                |
| <b>12/21/04</b> | 54                    | -302                  | -69                   | -63                   | -92                   | -94                 | 156                               |

**Table A.1. Continued.**

| <b>Date</b>     | <b>NR13<br/>25-UT1</b> | <b>NR13<br/>25-UT2</b> | <b>NR13<br/>25-UT3</b> | <b>NR13<br/>25-UT4</b> | <b>NR13<br/>25-UT5</b> | <b>NR13<br/>AVG</b> | <b>NR13<br/>Corrected<br/>Avg</b> |
|-----------------|------------------------|------------------------|------------------------|------------------------|------------------------|---------------------|-----------------------------------|
| <b>09/16/03</b> |                        |                        |                        |                        |                        |                     |                                   |
| <b>09/30/03</b> | -174                   | -155                   | -176                   | -116                   | -11                    | -126                | 74                                |
| <b>10/07/03</b> | 425                    | 211                    | -36                    | -18                    | -13                    | 114                 | 314                               |
| <b>10/14/03</b> | -215                   | -119                   | -148                   | -38                    | -63                    | -117                | 83                                |
| <b>10/21/03</b> | -176                   | -127                   | -165                   | -130                   | -93                    | -138                | 62                                |
| <b>10/28/03</b> | -12                    | -98                    | -118                   | -92                    | -138                   | -92                 | 108                               |
| <b>11/03/03</b> | -135                   | -158                   | -162                   | -138                   | -128                   | -144                | 56                                |
| <b>11/11/03</b> | -110                   | -124                   | -157                   | -144                   | -126                   | -132                | 68                                |
| <b>11/18/03</b> | 34                     | -78                    | -12                    | -147                   | -129                   | -66                 | 134                               |
| <b>11/24/03</b> | -14                    | -75                    | -145                   | -146                   | -143                   | -105                | 95                                |
| <b>12/09/03</b> | -86                    | -150                   | -168                   | -142                   | -151                   | -139                | 61                                |
| <b>12/16/03</b> | -92                    | -165                   | -172                   | -143                   | -281                   | -171                | 29                                |
| <b>12/21/03</b> | -129                   | -125                   | -172                   | -139                   | -287                   | -170                | 30                                |
| <b>12/28/03</b> | -86                    | -143                   | -174                   | -144                   | -271                   | -164                | 36                                |
| <b>01/04/04</b> | -97                    | -172                   | -172                   | -142                   | -244                   | -165                | 35                                |
| <b>01/19/04</b> | -119                   | -224                   | -180                   | -140                   | -189                   | -170                | 30                                |
| <b>02/01/04</b> | -158                   | -235                   | -202                   | -146                   | -189                   | -186                | 14                                |
| <b>02/08/04</b> | -141                   | -228                   | -200                   | -147                   | -180                   | -179                | 21                                |
| <b>02/14/04</b> | 88                     | -130                   | -190                   | -149                   | -160                   | -108                | 92                                |
| <b>02/22/04</b> | -156                   | -288                   | -245                   | -153                   | -211                   | -211                | -11                               |
| <b>02/28/04</b> | -141                   | -196                   | -246                   | -151                   | -212                   | -189                | 11                                |

**Table A.1. Continued.**

| <b>Date</b>     | <b>NR13</b>   |               |               |               |               |            | <b>NR13</b>          |
|-----------------|---------------|---------------|---------------|---------------|---------------|------------|----------------------|
|                 | <b>25-UT1</b> | <b>25-UT2</b> | <b>25-UT3</b> | <b>25-UT4</b> | <b>25-UT5</b> | <b>AVG</b> | <b>Corrected Avg</b> |
| <b>03/07/04</b> | -176          | -197          | -294          | -138          | -211          | -203       | -3                   |
| <b>03/12/04</b> | -133          | -271          | -367          | -165          | -213          | -230       | -30                  |
| <b>03/20/04</b> | -154          | -257          | -393          | -165          | -280          | -250       | -50                  |
| <b>03/28/04</b> | 295           | -238          | -142          | -157          | -192          | -87        | 113                  |
| <b>04/04/04</b> | 378           | -204          | 15            | -137          | -178          | -25        | 175                  |
| <b>04/10/04</b> | 423           | 81            | -26           | 1             | 64            | 109        | 309                  |
| <b>04/25/04</b> | 459           | 76            | -17           | -15           | 267           | 154        | 354                  |
| <b>05/09/04</b> | 494           | 425           | 14            | -5            | 459           | 277        | 477                  |
| <b>05/16/04</b> | 516           | 428           | 19            | -28           | 444           | 276        | 476                  |
| <b>05/23/04</b> | 371           | 446           | 18            | 6             | 483           | 265        | 465                  |
| <b>05/31/04</b> | 396           | 433           | 89            | 25            | 460           | 281        | 481                  |
| <b>06/06/04</b> | 351           | 402           | 43            | 12            | 499           | 261        | 461                  |
| <b>06/16/04</b> | 197           | 436           | 121           | 67            | 572           | 279        | 479                  |
| <b>06/27/04</b> | 185           | 380           | 121           | 41            | 567           | 259        | 459                  |
| <b>07/20/04</b> | 296           | 399           | 104           | 79            | 536           | 283        | 483                  |
| <b>08/02/04</b> | 209           | 524           | 147           | 146           | 603           | 326        | 526                  |
| <b>08/08/04</b> | -226          | -132          | -192          | -195          | 137           | -122       | 78                   |
| <b>08/15/04</b> | -103          | -119          | -212          | -213          | 37            | -122       | 78                   |
| <b>08/22/04</b> | 130           | -210          | -269          | -130          | 103           | -75        | 125                  |
| <b>09/12/04</b> | -187          | -103          | -143          | -79           | -66           | -116       | 84                   |
| <b>09/26/04</b> | -167          | 379           | -1            | 33            | 418           | 132        | 332                  |

**Table A.1. Continued.**

| <b>Date</b>     | <b>NR13<br/>25-UT1</b> | <b>NR13<br/>25-UT2</b> | <b>NR13<br/>25-UT3</b> | <b>NR13<br/>25-UT4</b> | <b>NR13<br/>25-UT5</b> | <b>NR13<br/>AVG</b> | <b>NR13<br/>Corrected<br/>Avg</b> |
|-----------------|------------------------|------------------------|------------------------|------------------------|------------------------|---------------------|-----------------------------------|
| <b>10/17/04</b> | -72                    | 484                    | 54                     | 115                    | 513                    | 219                 | 469                               |
| <b>10/23/04</b> | -86                    | 480                    | 95                     | 110                    | 507                    | 221                 | 471                               |
| <b>11/22/04</b> | -45                    | 453                    | 114                    | 124                    | 479                    | 225                 | 475                               |
| <b>11/27/04</b> | 9                      | 316                    | 55                     | -4                     | 369                    | 149                 | 399                               |
| <b>12/05/04</b> | -8                     | -226                   | -12                    | -121                   | 440                    | 15                  | 265                               |
| <b>12/12/04</b> | -287                   | -259                   | -55                    | -214                   | 472                    | -69                 | 181                               |
| <b>12/21/04</b> | -46                    | 418                    | 36                     | 134                    | 469                    | 202                 | 452                               |

**Table A.1. Continued.**

| <b>Date</b>     | <b>NR15<br/>25-41</b> | <b>NR15<br/>25-46</b> | <b>NR15<br/>25-49</b> | <b>NR15<br/>25-38</b> | <b>NR15<br/>25-34</b> | <b>NR15<br/>AVG</b> | <b>NR15<br/>Corrected<br/>Avg</b> |
|-----------------|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|---------------------|-----------------------------------|
| <b>09/16/03</b> |                       |                       |                       |                       |                       |                     |                                   |
| <b>09/30/03</b> | -390                  | -124                  | -291                  | -217                  | -437                  | -292                | -92                               |
| <b>10/07/03</b> | -150                  | -147                  | -180                  | -218                  | -180                  | -175                | 25                                |
| <b>10/14/03</b> | -178                  | -168                  | -340                  | -373                  | -386                  | -289                | -89                               |
| <b>10/21/03</b> | -145                  | -288                  | -177                  | -219                  | -382                  | -242                | -42                               |
| <b>10/28/03</b> | -182                  | -246                  | -356                  | -404                  | -412                  | -320                | -120                              |
| <b>11/03/03</b> | -140                  | -96                   | -183                  | -238                  | -329                  | -197                | 3                                 |
| <b>11/11/03</b> | -159                  | -138                  | -176                  | -163                  | -386                  | -204                | -4                                |
| <b>11/18/03</b> | -156                  | -137                  | -173                  | -129                  | -387                  | -196                | 4                                 |
| <b>11/24/03</b> | -155                  | -132                  | -170                  | -122                  | -377                  | -191                | 9                                 |
| <b>12/09/03</b> | -161                  | -132                  | -156                  | -257                  | -402                  | -222                | -22                               |
| <b>12/16/03</b> | -166                  | -132                  | -171                  | -175                  | -400                  | -209                | -9                                |
| <b>12/21/03</b> | -162                  | -128                  | -169                  | -258                  | -401                  | -224                | -24                               |
| <b>12/28/03</b> | -161                  | -179                  | -170                  | -206                  | -449                  | -233                | -33                               |
| <b>01/04/04</b> | -158                  | -188                  | -174                  | -238                  | -365                  | -225                | -25                               |
| <b>01/19/04</b> | -162                  | -57                   | -168                  | -208                  | -342                  | -187                | 13                                |
| <b>02/01/04</b> | -172                  | -211                  | -177                  | -243                  | -395                  | -240                | -40                               |
| <b>02/08/04</b> | -162                  | -199                  | -171                  | -230                  | -384                  | -229                | -29                               |
| <b>02/14/04</b> | -134                  | -186                  | -198                  | -191                  | -178                  | -177                | 23                                |
| <b>02/22/04</b> | -166                  | -208                  | -174                  | -231                  | -378                  | -231                | -31                               |
| <b>02/28/04</b> | -169                  | -217                  | -172                  | -239                  | -373                  | -234                | -34                               |

**Table A.1. Continued.**

| <b>Date</b>     | <b>NR15<br/>25-41</b> | <b>NR15<br/>25-46</b> | <b>NR15<br/>25-49</b> | <b>NR15<br/>25-38</b> | <b>NR15<br/>25-34</b> | <b>NR15<br/>AVG</b> | <b>NR15<br/>Corrected<br/>Avg</b> |
|-----------------|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|---------------------|-----------------------------------|
| <b>03/07/04</b> | -165                  | -214                  | -149                  | -225                  | -322                  | -215                | -15                               |
| <b>03/12/04</b> | -166                  | -234                  | -172                  | -243                  | -345                  | -232                | -32                               |
| <b>03/20/04</b> | -165                  | -230                  | -172                  | -234                  | -354                  | -231                | -31                               |
| <b>03/28/04</b> | -162                  | -230                  | -170                  | -238                  | -371                  | -234                | -34                               |
| <b>04/04/04</b> | -169                  | -307                  | -173                  | -239                  | -365                  | -251                | -51                               |
| <b>04/10/04</b> | -165                  | -240                  | -152                  | -231                  | -352                  | -228                | -28                               |
| <b>04/25/04</b> | -165                  | -289                  | -173                  | -223                  | -373                  | -245                | -45                               |
| <b>05/09/04</b> | -71                   | -233                  | -169                  | -131                  | -232                  | -167                | 33                                |
| <b>05/16/04</b> | 35                    | 24                    | 44                    | 365                   | 50                    | 104                 | 304                               |
| <b>05/23/04</b> | 71                    | 88                    | 174                   | 329                   | 68                    | 146                 | 346                               |
| <b>05/31/04</b> | 190                   | 107                   | 218                   | 552                   | 84                    | 230                 | 430                               |
| <b>06/06/04</b> | 257                   | 114                   | 215                   | 565                   | 303                   | 291                 | 491                               |
| <b>06/16/04</b> | 436                   | 135                   | 262                   | 541                   | 58                    | 286                 | 486                               |
| <b>06/27/04</b> | 390                   | 139                   | 319                   | 601                   | 88                    | 307                 | 507                               |
| <b>07/20/04</b> | 387                   | 203                   | 358                   | 577                   | 58                    | 317                 | 517                               |
| <b>08/02/04</b> | 433                   | 167                   | 354                   | 610                   | 95                    | 332                 | 532                               |
| <b>08/08/04</b> | -104                  | -238                  | -103                  | -41                   | -143                  | -126                | 74                                |
| <b>08/15/04</b> | -23                   | -129                  | -96                   | 1                     | -136                  | -77                 | 123                               |
| <b>08/22/04</b> | -229                  | -126                  | -31                   | 44                    | -51                   | -79                 | 121                               |
| <b>09/12/04</b> | 107                   | -175                  | -65                   | -178                  | 440                   | 26                  | 226                               |
| <b>09/26/04</b> | 274                   | -9                    | 70                    | 394                   | -72                   | 131                 | 331                               |

**Table A.1. Continued.**

| <b>Date</b>     | <b>NR15<br/>25-41</b> | <b>NR15<br/>25-46</b> | <b>NR15<br/>25-49</b> | <b>NR15<br/>25-38</b> | <b>NR15<br/>25-34</b> | <b>NR15<br/>AVG</b> | <b>NR15<br/>Corrected<br/>Avg</b> |
|-----------------|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|---------------------|-----------------------------------|
| <b>10/17/04</b> | 309                   | 63                    | 121                   | 503                   | 10                    | 201                 | 451                               |
| <b>10/23/04</b> | 268                   | 65                    | 137                   | 514                   | 32                    | 203                 | 453                               |
| <b>11/22/04</b> | 217                   | 101                   | 122                   | 519                   | 25                    | 197                 | 447                               |
| <b>11/27/04</b> | 338                   | 73                    | 146                   | 306                   | 19                    | 176                 | 426                               |
| <b>12/05/04</b> | -106                  | -32                   | -63                   | 436                   | -80                   | 31                  | 281                               |
| <b>12/12/04</b> | -242                  | -271                  | -96                   | 117                   | -142                  | -127                | 123                               |
| <b>12/21/04</b> | 382                   | -245                  | 94                    | 414                   | -103                  | 108                 | 358                               |

**Table A.1. Continued.**

| <b>Date</b>     | <b>NR16<br/>25-93</b> | <b>NR16<br/>25-88</b> | <b>NR16<br/>25-94</b> | <b>NR16<br/>25-81</b> | <b>NR16<br/>25-83</b> | <b>NR16<br/>AVG</b> | <b>NR16<br/>Corrected<br/>Avg</b> |
|-----------------|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|---------------------|-----------------------------------|
| <b>09/16/03</b> |                       |                       |                       |                       |                       |                     |                                   |
| <b>09/30/03</b> | -115                  | -94                   | -53                   | -77                   | -38                   | -75                 | 125                               |
| <b>10/07/03</b> | -183                  | -324                  | -207                  | -176                  | -234                  | -225                | -25                               |
| <b>10/14/03</b> | -179                  | -263                  | -187                  | -144                  | -260                  | -207                | -7                                |
| <b>10/21/03</b> | -199                  | -294                  | -188                  | -161                  | -362                  | -241                | -41                               |
| <b>10/28/03</b> | -141                  | -257                  | -202                  | -199                  | -272                  | -214                | -14                               |
| <b>11/03/03</b> | -185                  | -326                  | -185                  | -202                  | -331                  | -246                | -46                               |
| <b>11/11/03</b> | -175                  | -250                  | -188                  | -206                  | -336                  | -231                | -31                               |
| <b>11/18/03</b> | -175                  | -295                  | -175                  | -204                  | -314                  | -233                | -33                               |
| <b>11/24/03</b> | -173                  | -302                  | -176                  | -135                  | -334                  | -224                | -24                               |
| <b>12/09/03</b> | -195                  | -251                  | -172                  | -198                  | -352                  | -234                | -34                               |
| <b>12/16/03</b> | -203                  | -261                  | -171                  | -199                  | -353                  | -237                | -37                               |
| <b>12/21/03</b> | -166                  | -263                  | -162                  | -187                  | -361                  | -228                | -28                               |
| <b>12/28/03</b> | -173                  | -255                  | -163                  | -191                  | -365                  | -229                | -29                               |
| <b>01/04/04</b> | -157                  | -257                  | -163                  | -188                  | -349                  | -223                | -23                               |
| <b>01/19/04</b> | -171                  | -310                  | -150                  | -191                  | -377                  | -240                | -40                               |
| <b>02/01/04</b> | -159                  | -261                  | -145                  | -186                  | -373                  | -225                | -25                               |
| <b>02/08/04</b> | -229                  | -243                  | -148                  | -193                  | -365                  | -236                | -36                               |
| <b>02/14/04</b> | -71                   | -185                  | -92                   | -95                   | -232                  | -135                | 65                                |
| <b>02/22/04</b> | -167                  | -243                  | -142                  | -197                  | -366                  | -223                | -23                               |
| <b>02/28/04</b> | -176                  | -240                  | -144                  | -203                  | -385                  | -230                | -30                               |

**Table A.1. Continued.**

| <b>Date</b>     | <b>NR16<br/>25-93</b> | <b>NR16<br/>25-88</b> | <b>NR16<br/>25-94</b> | <b>NR16<br/>25-81</b> | <b>NR16<br/>25-83</b> | <b>NR16<br/>AVG</b> | <b>NR16<br/>Corrected<br/>Avg</b> |
|-----------------|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|---------------------|-----------------------------------|
| <b>03/07/04</b> | -151                  | -222                  | -129                  | -193                  | -356                  | -210                | -10                               |
| <b>03/12/04</b> | -171                  | -228                  | -150                  | -201                  | -373                  | -225                | -25                               |
| <b>03/20/04</b> | -163                  | -205                  | -140                  | -194                  | -370                  | -214                | -14                               |
| <b>03/28/04</b> | -169                  | -203                  | -146                  | -202                  | -357                  | -215                | -15                               |
| <b>04/04/04</b> | -170                  | -204                  | -148                  | -192                  | -367                  | -216                | -16                               |
| <b>04/10/04</b> | -172                  | -200                  | -141                  | -228                  | -354                  | -219                | -19                               |
| <b>04/25/04</b> | -172                  | -160                  | -150                  | -185                  | -336                  | -201                | -1                                |
| <b>05/09/04</b> | -161                  | -137                  | -163                  | -358                  | -332                  | -230                | -30                               |
| <b>05/16/04</b> | -150                  | -159                  | -133                  | -199                  | -315                  | -191                | 9                                 |
| <b>05/23/04</b> | 292                   | 259                   | -128                  | 17                    | -130                  | 62                  | 262                               |
| <b>05/31/04</b> | 412                   | 285                   | 103                   | 312                   |                       | 278                 | 478                               |
| <b>06/06/04</b> | 486                   | 315                   | 215                   | 509                   | 253                   | 356                 | 556                               |
| <b>06/16/04</b> | 475                   | 289                   | 86                    | 441                   | 233                   | 305                 | 505                               |
| <b>06/27/04</b> | 508                   | 301                   | 106                   | 515                   | 251                   | 336                 | 536                               |
| <b>07/20/04</b> | 539                   | 254                   | 42                    | 501                   | 273                   | 322                 | 522                               |
| <b>08/02/04</b> | 535                   | 101                   | -75                   | 414                   | 181                   | 231                 | 431                               |
| <b>08/08/04</b> | -223                  | -139                  | -119                  | -41                   | -115                  | -127                | 73                                |
| <b>08/15/04</b> | -118                  | -195                  | -100                  | -36                   | -95                   | -109                | 91                                |
| <b>08/22/04</b> | -66                   | -116                  | -54                   | 28                    | -79                   | -57                 | 143                               |
| <b>09/12/04</b> | -110                  | -153                  | -129                  | -12                   | -140                  | -109                | 91                                |
| <b>09/26/04</b> | -199                  | -259                  | -246                  | -213                  | -287                  | -241                | -41                               |

**Table A.1. Continued.**

| <b>Date</b>     | <b>NR16<br/>25-93</b> | <b>NR16<br/>25-88</b> | <b>NR16<br/>25-94</b> | <b>NR16<br/>25-81</b> | <b>NR16<br/>25-83</b> | <b>NR16<br/>AVG</b> | <b>NR16<br/>Corrected<br/>Avg</b> |
|-----------------|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|---------------------|-----------------------------------|
| <b>10/17/04</b> | -42                   | -184                  | -160                  | -167                  | -222                  | -155                | 95                                |
| <b>10/23/04</b> | -20                   | -198                  | -179                  | -183                  | -236                  | -163                | 87                                |
| <b>11/22/04</b> | 507                   | 221                   | 58                    | 183                   | 37                    | 201                 | 451                               |
| <b>11/27/04</b> | 60                    | 22                    | -22                   | 11                    | -47                   | 5                   | 255                               |
| <b>12/05/04</b> | -177                  | -124                  | -89                   | -184                  | -115                  | -138                | 112                               |
| <b>12/12/04</b> | -200                  | -113                  | -117                  | -129                  | -169                  | -146                | 104                               |
| <b>12/21/04</b> | -95                   | -102                  | -115                  | -98                   | -159                  | -114                | 136                               |

**Table A.1. Continued.**

| <b>Date</b>     | <b>NR17<br/>25-59</b> | <b>NR17<br/>25-52</b> | <b>NR17<br/>25-51</b> | <b>NR17<br/>25-54</b> | <b>NR17<br/>25-57</b> | <b>NR17<br/>AVG</b> | <b>NR17<br/>Corrected<br/>Avg</b> |
|-----------------|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|---------------------|-----------------------------------|
| <b>09/16/03</b> |                       |                       |                       |                       |                       |                     |                                   |
| <b>09/30/03</b> | -440                  | -224                  | -231                  | -229                  | -164                  | -258                | -58                               |
| <b>10/07/03</b> | -91                   | -202                  |                       | 7                     | 109                   | -44                 | 156                               |
| <b>10/14/03</b> | -274                  | -365                  | -273                  | -228                  | -91                   | -246                | -46                               |
| <b>10/21/03</b> | -124                  | -192                  | -81                   | -92                   | -90                   | -116                | 84                                |
| <b>10/28/03</b> | -187                  | -203                  | -135                  | -126                  | -29                   | -136                | 64                                |
| <b>11/03/03</b> | -347                  | -191                  | -97                   | -84                   | -114                  | -167                | 33                                |
| <b>11/11/03</b> | -418                  | -202                  | -170                  | -137                  | -108                  | -207                | -7                                |
| <b>11/18/03</b> | 95                    | -170                  | -457                  | 1                     | 74                    | -91                 | 109                               |
| <b>11/24/03</b> | -63                   | -202                  | 423                   | -39                   | -104                  | 3                   | 203                               |
| <b>12/09/03</b> | -5                    | -224                  | -73                   | -93                   | -72                   | -93                 | 107                               |
| <b>12/16/03</b> | -36                   | -232                  | -87                   | -100                  | -70                   | -105                | 95                                |
| <b>12/21/03</b> | -29                   | -244                  | -99                   | -105                  | -73                   | -110                | 90                                |
| <b>12/28/03</b> | -56                   | -258                  | -102                  | -107                  | -81                   | -121                | 79                                |
| <b>01/04/04</b> | -156                  | -252                  | -96                   | -112                  | -83                   | -140                | 60                                |
| <b>01/19/04</b> | -96                   | -209                  | -111                  | -69                   | 32                    | -91                 | 109                               |
| <b>02/01/04</b> | -37                   | -152                  | -1                    | 142                   | -18                   | -13                 | 187                               |
| <b>02/08/04</b> | 8                     | -91                   | 462                   | 373                   | 42                    | 159                 | 359                               |
| <b>02/14/04</b> | 7                     | -28                   | -27                   | -100                  | -1                    | -30                 | 170                               |
| <b>02/22/04</b> | -115                  | -137                  | 6                     | -96                   | -82                   | -85                 | 115                               |
| <b>02/28/04</b> | -114                  | -129                  | -26                   | -99                   | -77                   | -89                 | 111                               |

**Table A.1. Continued.**

| <b>Date</b>     | <b>NR17<br/>25-59</b> | <b>NR17<br/>25-52</b> | <b>NR17<br/>25-51</b> | <b>NR17<br/>25-54</b> | <b>NR17<br/>25-57</b> | <b>NR17<br/>AVG</b> | <b>NR17<br/>Corrected<br/>Avg</b> |
|-----------------|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|---------------------|-----------------------------------|
| <b>03/07/04</b> | -142                  | -144                  | -34                   | -96                   | -53                   | -94                 | 106                               |
| <b>03/12/04</b> | -57                   | -133                  | -61                   | -67                   | 11                    | -61                 | 139                               |
| <b>03/20/04</b> | -75                   | -104                  | -51                   | -82                   | -38                   | -70                 | 130                               |
| <b>03/28/04</b> | 68                    | 47                    | 461                   | 130                   | 48                    | 151                 | 351                               |
| <b>04/04/04</b> | 65                    | 461                   | 546                   | 353                   | 36                    | 292                 | 492                               |
| <b>04/10/04</b> | 67                    | 495                   | 598                   | 300                   | 45                    | 301                 | 501                               |
| <b>04/25/04</b> | 79                    | 510                   | 614                   | 312                   | 76                    | 318                 | 518                               |
| <b>05/09/04</b> | 108                   | 406                   | 532                   | 218                   | 90                    | 271                 | 471                               |
| <b>05/16/04</b> | 100                   | 531                   | 612                   | 253                   | 88                    | 317                 | 517                               |
| <b>05/23/04</b> | 163                   | 562                   | 612                   | 368                   | 105                   | 362                 | 562                               |
| <b>05/31/04</b> | 241                   | 579                   | 640                   | 377                   | 103                   | 388                 | 588                               |
| <b>06/06/04</b> | 294                   | 582                   | 654                   | 304                   | 96                    | 386                 | 586                               |
| <b>06/16/04</b> | 313                   | 587                   | 652                   | 355                   | 120                   | 405                 | 605                               |
| <b>06/27/04</b> | 333                   | 597                   | 656                   | 330                   | 113                   | 406                 | 606                               |
| <b>07/20/04</b> | 382                   | 593                   | 540                   | 428                   | 158                   | 420                 | 620                               |
| <b>08/02/04</b> | 494                   | 590                   | 621                   | 410                   | 135                   | 450                 | 650                               |
| <b>08/08/04</b> | -62                   | 147                   | 39                    | -206                  | -143                  | -45                 | 155                               |
| <b>08/15/04</b> | -196                  | -145                  | -182                  | -279                  | -214                  | -203                | -3                                |
| <b>08/22/04</b> | -70                   | 58                    | -43                   | -260                  | -148                  | -93                 | 107                               |
| <b>09/12/04</b> | 541                   | 566                   | 575                   | 505                   | 283                   | 494                 | 694                               |
| <b>09/26/04</b> | 543                   | 593                   | 616                   | 521                   | 78                    | 470                 | 670                               |

**Table A.1. Continued.**

| <b>Date</b>     | <b>NR17<br/>25-59</b> | <b>NR17<br/>25-52</b> | <b>NR17<br/>25-51</b> | <b>NR17<br/>25-54</b> | <b>NR17<br/>25-57</b> | <b>NR17<br/>AVG</b> | <b>NR17<br/>Corrected<br/>Avg</b> |
|-----------------|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|---------------------|-----------------------------------|
| <b>10/17/04</b> | 516                   | 552                   | 582                   | 498                   | 81                    | 446                 | 696                               |
| <b>10/23/04</b> | 491                   | 543                   | 595                   | 493                   | 85                    | 441                 | 691                               |
| <b>11/22/04</b> | 499                   | 537                   | 556                   | 485                   | 77                    | 431                 | 681                               |
| <b>11/27/04</b> | 274                   | 329                   | 362                   | 274                   | 61                    | 260                 | 510                               |
| <b>12/05/04</b> | 458                   | 516                   | 577                   | 468                   | 98                    | 423                 | 673                               |
| <b>12/12/04</b> | 487                   | 520                   | 587                   | 494                   | 186                   | 455                 | 705                               |
| <b>12/21/04</b> | 414                   | 511                   | 580                   | 469                   | 128                   | 420                 | 670                               |

**Table A.2. Redox potential (mV) measurements from 61-cm depth.**

| <b>Date</b>     | <b>REF01<br/>61-34</b> | <b>REF01<br/>61-20</b> | <b>REF01<br/>61-22</b> | <b>REF01<br/>61-82</b> | <b>REF01<br/>61-28</b> | <b>REF01<br/>AVG</b> | <b>REF01<br/>Corrected<br/>Avg</b> |
|-----------------|------------------------|------------------------|------------------------|------------------------|------------------------|----------------------|------------------------------------|
| <b>09/09/03</b> | 319                    | 327                    | 3                      | 283                    | 395                    | 265                  | 465                                |
| <b>09/16/03</b> |                        |                        |                        |                        |                        |                      |                                    |
| <b>09/30/03</b> | -128                   | -161                   | -134                   | -251                   | -214                   | -178                 | 22                                 |
| <b>10/07/03</b> | -180                   | -155                   | -154                   | -290                   | -232                   | -202                 | -2                                 |
| <b>10/14/03</b> | 306                    | 251                    | 158                    | -113                   | 365                    | 193                  | 393                                |
| <b>10/21/03</b> | -235                   | -104                   | -474                   | -300                   | -405                   | -304                 | -104                               |
| <b>10/28/03</b> | -240                   | -95                    | -506                   | -268                   | -421                   | -306                 | -106                               |
| <b>11/03/03</b> |                        |                        |                        |                        |                        |                      |                                    |
| <b>11/11/03</b> | -208                   | -206                   | -505                   | -295                   | -417                   | -326                 | -126                               |
| <b>11/18/03</b> | -210                   | -231                   | -494                   | -298                   | -427                   | -332                 | -132                               |
| <b>11/24/03</b> | -215                   | -128                   | -494                   | -323                   | -319                   | -296                 | -96                                |
| <b>12/09/03</b> | -219                   | -118                   | -482                   | -327                   | -300                   | -289                 | -89                                |
| <b>12/16/03</b> | -227                   | -78                    | -482                   | -332                   | -115                   | -247                 | -47                                |
| <b>12/21/03</b> | -236                   | -68                    | -481                   | -358                   | -195                   | -268                 | -68                                |
| <b>12/28/03</b> | -241                   | -112                   | -474                   | -347                   | -218                   | -278                 | -78                                |
| <b>01/04/04</b> | -242                   | -182                   | -465                   | -340                   | -351                   | -316                 | -116                               |
| <b>01/19/04</b> | -244                   | 18                     | -468                   | -350                   | -410                   | -291                 | -91                                |
| <b>02/01/04</b> | -252                   | -95                    | -462                   | -347                   | -423                   | -316                 | -116                               |
| <b>02/08/04</b> | -256                   | -47                    | -465                   | -355                   | -433                   | -311                 | -111                               |
| <b>02/14/04</b> | -214                   | 46                     | -336                   | -212                   | -331                   | -209                 | -9                                 |
| <b>02/22/04</b> | -261                   | -147                   | -468                   | -358                   | -342                   | -315                 | -115                               |

**Table A.2. Continued.**

| <b>Date</b>     | <b>REF01<br/>61-34</b> | <b>REF01<br/>61-20</b> | <b>REF01<br/>61-22</b> | <b>REF01<br/>61-82</b> | <b>REF01<br/>61-28</b> | <b>REF01<br/>AVG</b> | <b>REF01<br/>Corrected<br/>Avg</b> |
|-----------------|------------------------|------------------------|------------------------|------------------------|------------------------|----------------------|------------------------------------|
| <b>02/28/04</b> | -256                   | -48                    | -460                   | -348                   | -263                   | -275                 | -75                                |
| <b>03/07/04</b> | -258                   | -173                   | -470                   | -356                   | -378                   | -327                 | -127                               |
| <b>03/12/04</b> | -249                   | -100                   | -461                   | -349                   | -202                   | -272                 | -72                                |
| <b>03/20/04</b> | -253                   | -214                   | -465                   | -332                   | -227                   | -298                 | -98                                |
| <b>03/28/04</b> | -252                   | -249                   | -462                   | -349                   | -328                   | -328                 | -128                               |
| <b>04/04/04</b> | -242                   | -232                   | -459                   | -344                   | -361                   | -328                 | -128                               |
| <b>04/10/04</b> | -247                   | -264                   | -460                   | -348                   | -399                   | -344                 | -144                               |
| <b>04/25/04</b> | -253                   | -281                   | -474                   | -343                   | -420                   | -354                 | -154                               |
| <b>05/09/04</b> | -252                   | 18                     | -479                   | -337                   | 139                    | -182                 | 18                                 |
| <b>05/16/04</b> | 35                     | 77                     | -194                   | -69                    | 40                     | -22                  | 178                                |
| <b>05/23/04</b> | 15                     | 57                     | 122                    | -55                    | 43                     | 36                   | 236                                |
| <b>05/31/04</b> | 37                     | 69                     | 126                    | 65                     | 65                     | 72                   | 272                                |
| <b>06/06/04</b> | 91                     | 22                     | 149                    | 124                    | 47                     | 87                   | 287                                |
| <b>06/16/04</b> | 183                    | 401                    | 181                    | 184                    | 77                     | 205                  | 405                                |
| <b>06/27/04</b> | 259                    | 380                    | 135                    | 196                    | 223                    | 239                  | 439                                |
| <b>07/20/04</b> | 283                    | 457                    | 197                    | 175                    | 265                    | 275                  | 475                                |
| <b>08/02/04</b> | 258                    | 477                    | 151                    | 220                    | 297                    | 281                  | 481                                |
| <b>08/08/04</b> | 273                    | 168                    | 229                    | 104                    | 5                      | 156                  | 356                                |
| <b>08/15/04</b> | -14                    | -108                   | 99                     | -57                    | -135                   | -43                  | 157                                |
| <b>08/22/04</b> | -131                   | -146                   | -190                   | -190                   | -142                   | -160                 | 40                                 |
| <b>09/12/04</b> | 43                     | -184                   | -180                   | -266                   | -186                   | -155                 | 45                                 |

**Table A.2. Continued.**

| <b>Date</b>     | <b>REF01<br/>61-34</b> | <b>REF01<br/>61-20</b> | <b>REF01<br/>61-22</b> | <b>REF01<br/>61-82</b> | <b>REF01<br/>61-28</b> | <b>REF01<br/>AVG</b> | <b>REF01<br/>Corrected<br/>Avg</b> |
|-----------------|------------------------|------------------------|------------------------|------------------------|------------------------|----------------------|------------------------------------|
| <b>09/26/04</b> | 51                     | 275                    | 63                     | -53                    | 66                     | 80                   | 280                                |
| <b>10/17/04</b> | 101                    | 26                     | 52                     | -18                    | -38                    | 25                   | 275                                |
| <b>10/23/04</b> | 103                    | 27                     | 56                     | -16                    | -33                    | 27                   | 277                                |
| <b>11/22/04</b> | 129                    | 16                     | 79                     | 15                     | -65                    | 35                   | 285                                |
| <b>11/27/04</b> | 152                    | 41                     | 65                     | -2                     | -21                    | 47                   | 297                                |
| <b>12/05/04</b> | 93                     | 61                     | 39                     | -67                    | -246                   | -24                  | 226                                |
| <b>12/12/04</b> | -52                    | -245                   | -1                     | -204                   | -246                   | -150                 | 100                                |
| <b>12/21/04</b> | -207                   | -252                   | -118                   | -230                   | -244                   | -210                 | 40                                 |

**Table A.2. Continued.**

| <b>Date</b>     | <b>REF02<br/>61-90</b> | <b>REF02<br/>61-85</b> | <b>REF02<br/>61-91</b> | <b>REF02<br/>61-88</b> | <b>REF02<br/>61-26</b> | <b>REF02<br/>AVG</b> | <b>REF02<br/>Corrected<br/>Avg</b> |
|-----------------|------------------------|------------------------|------------------------|------------------------|------------------------|----------------------|------------------------------------|
| <b>09/09/03</b> | -346                   | -325                   | -319                   | -299                   | -153                   | -288                 | -88                                |
| <b>09/16/03</b> |                        |                        |                        |                        |                        |                      |                                    |
| <b>09/30/03</b> | -257                   | -299                   | -335                   | -389                   | -341                   | -324                 | -124                               |
| <b>10/07/03</b> | -320                   | -263                   | -344                   | -479                   | -357                   | -353                 | -153                               |
| <b>10/14/03</b> | -241                   | -221                   | -261                   | -470                   | -313                   | -301                 | -101                               |
| <b>10/21/03</b> | -319                   | -295                   | -321                   | -447                   | -346                   | -346                 | -146                               |
| <b>10/28/03</b> | -340                   | -285                   | -276                   | -408                   | -335                   | -329                 | -129                               |
| <b>11/03/03</b> |                        |                        |                        |                        |                        |                      |                                    |
| <b>11/11/03</b> | -372                   | -313                   | -300                   | -535                   | -373                   | -379                 | -179                               |
| <b>11/18/03</b> | -371                   | -310                   | -297                   | -522                   | -385                   | -377                 | -177                               |
| <b>11/24/03</b> | -381                   | -320                   | -333                   | -537                   | -392                   | -393                 | -193                               |
| <b>12/09/03</b> | -370                   | -315                   | -319                   | -524                   | -352                   | -376                 | -176                               |
| <b>12/16/03</b> | -360                   | -297                   | -311                   | -480                   | -344                   | -358                 | -158                               |
| <b>12/21/03</b> | -315                   | -309                   | -320                   | -456                   | -336                   | -347                 | -147                               |
| <b>12/28/03</b> | -370                   | -319                   | -326                   | -452                   | -336                   | -361                 | -161                               |
| <b>01/04/04</b> | -368                   | -316                   | -308                   | -452                   | -331                   | -355                 | -155                               |
| <b>01/19/04</b> | -368                   | -302                   | -315                   | -480                   | -324                   | -358                 | -158                               |
| <b>02/01/04</b> | -365                   | -314                   | -322                   | -523                   | -343                   | -373                 | -173                               |
| <b>02/08/04</b> | -374                   | -319                   | -325                   | -524                   | -322                   | -373                 | -173                               |
| <b>02/14/04</b> | -331                   | -276                   | -226                   | -300                   | -280                   | -283                 | -83                                |
| <b>02/22/04</b> | -366                   | -312                   | -321                   | -532                   | -319                   | -370                 | -170                               |

**Table A.2. Continued.**

| <b>Date</b>     | <b>REF02<br/>61-90</b> | <b>REF02<br/>61-85</b> | <b>REF02<br/>61-91</b> | <b>REF02<br/>61-88</b> | <b>REF02<br/>61-26</b> | <b>REF02<br/>AVG</b> | <b>REF02<br/>Corrected<br/>Avg</b> |
|-----------------|------------------------|------------------------|------------------------|------------------------|------------------------|----------------------|------------------------------------|
| <b>02/28/04</b> | -345                   | -305                   | -316                   | -514                   | -310                   | -358                 | -158                               |
| <b>03/07/04</b> | -323                   | -302                   | -303                   | -524                   | -314                   | -353                 | -153                               |
| <b>03/12/04</b> | -318                   | -304                   | -317                   | -524                   | -328                   | -358                 | -158                               |
| <b>03/20/04</b> | -313                   | -304                   | -314                   | -512                   | -340                   | -357                 | -157                               |
| <b>03/28/04</b> | -309                   | -305                   | -311                   | -493                   | -347                   | -353                 | -153                               |
| <b>04/04/04</b> | -278                   | -287                   | -318                   | -516                   | -432                   | -366                 | -166                               |
| <b>04/10/04</b> | -273                   | -300                   | -306                   | -513                   | -468                   | -372                 | -172                               |
| <b>04/25/04</b> | -282                   | -303                   | -297                   | -509                   | -483                   | -375                 | -175                               |
| <b>05/09/04</b> | -278                   | -301                   | -289                   | -516                   | -491                   | -375                 | -175                               |
| <b>05/16/04</b> | -293                   | -297                   | -309                   | -510                   | -504                   | -383                 | -183                               |
| <b>05/23/04</b> | -307                   | -289                   | -296                   | -506                   | -31                    | -286                 | -86                                |
| <b>05/31/04</b> | -57                    | 399                    | -50                    | -64                    | -10                    | 44                   | 244                                |
| <b>06/06/04</b> | 62                     | 482                    | 350                    | 152                    | 120                    | 233                  | 433                                |
| <b>06/16/04</b> | 74                     | 479                    | 496                    | 165                    | 167                    | 276                  | 476                                |
| <b>06/27/04</b> | 276                    | 531                    | 538                    | 210                    | 220                    | 355                  | 555                                |
| <b>07/20/04</b> | 384                    | 475                    | 515                    | 243                    | 269                    | 377                  | 577                                |
| <b>08/02/04</b> | 20                     | 260                    | 287                    | 77                     | -79                    | 113                  | 313                                |
| <b>08/08/04</b> | -18                    | -12                    | 225                    | -57                    | -26                    | 22                   | 222                                |
| <b>08/15/04</b> | -108                   | -88                    | -44                    | -208                   | -82                    | -106                 | 94                                 |
| <b>08/22/04</b> | -114                   | -98                    | -91                    | -238                   | -67                    | -122                 | 78                                 |
| <b>09/12/04</b> | -284                   | -351                   | -348                   | -348                   | -97                    | -286                 | -86                                |

**Table A.2. Continued.**

| <b>Date</b>     | <b>REF02<br/>61-90</b> | <b>REF02<br/>61-85</b> | <b>REF02<br/>61-91</b> | <b>REF02<br/>61-88</b> | <b>REF02<br/>61-26</b> | <b>REF02<br/>AVG</b> | <b>REF02<br/>Corrected<br/>Avg</b> |
|-----------------|------------------------|------------------------|------------------------|------------------------|------------------------|----------------------|------------------------------------|
| <b>09/26/04</b> | -228                   | -276                   | -269                   | -283                   | -116                   | -234                 | -34                                |
| <b>10/17/04</b> | -300                   | -345                   | -333                   | -344                   | -164                   | -297                 | -47                                |
| <b>10/23/04</b> | -304                   | -345                   | -332                   | -346                   | -154                   | -296                 | -46                                |
| <b>11/22/04</b> | -323                   | 192                    | -303                   | -356                   | -122                   | -182                 | 68                                 |
| <b>11/27/04</b> | -309                   | -164                   | -157                   | -309                   | 15                     | -185                 | 65                                 |
| <b>12/05/04</b> | -325                   | -336                   | -350                   | -366                   | -177                   | -311                 | -61                                |
| <b>12/12/04</b> | -311                   | -290                   | -335                   | -382                   | -141                   | -292                 | -42                                |
| <b>12/21/04</b> | -306                   | -292                   | -335                   | -215                   | -114                   | -252                 | -2                                 |

**Table A.2. Continued.**

| <b>Date</b>     | <b>REF05<br/>61-86</b> | <b>REF05<br/>61-72</b> | <b>REF05<br/>61-89</b> | <b>REF05<br/>61-92</b> | <b>REF05<br/>61-67</b> | <b>REF05<br/>AVG</b> | <b>REF05<br/>Corrected<br/>Avg</b> |
|-----------------|------------------------|------------------------|------------------------|------------------------|------------------------|----------------------|------------------------------------|
| <b>09/09/03</b> | -46                    | -89                    | -183                   | -453                   | -394                   | -233                 | -33                                |
| <b>09/16/03</b> |                        |                        |                        |                        |                        |                      |                                    |
| <b>09/30/03</b> | -229                   | -229                   | -203                   | -167                   | -327                   | -231                 | -31                                |
| <b>10/07/03</b> | -226                   | -226                   | -234                   | -264                   | -338                   | -258                 | -58                                |
| <b>10/14/03</b> | -207                   | -256                   | -188                   | -143                   | -171                   | -193                 | 7                                  |
| <b>10/21/03</b> | -244                   | -276                   | -235                   | -185                   | -303                   | -249                 | -49                                |
| <b>10/28/03</b> | -254                   | -283                   | -217                   | -282                   | -80                    | -223                 | -23                                |
| <b>11/03/03</b> |                        |                        |                        |                        |                        |                      |                                    |
| <b>11/11/03</b> | -345                   | -264                   | -251                   | -135                   | -382                   | -275                 | -75                                |
| <b>11/18/03</b> | -361                   | -259                   | -249                   | -106                   | -372                   | -269                 | -69                                |
| <b>11/24/03</b> | -379                   | -270                   | -217                   | 23                     | -198                   | -208                 | -8                                 |
| <b>12/09/03</b> | -394                   | -256                   | -295                   | -137                   | -395                   | -295                 | -95                                |
| <b>12/16/03</b> | -407                   | -261                   | -303                   | -170                   | -407                   | -310                 | -110                               |
| <b>12/21/03</b> | -410                   | -258                   | -297                   | -209                   | -379                   | -311                 | -111                               |
| <b>12/28/03</b> | -418                   | -263                   | -255                   | -217                   | -386                   | -308                 | -108                               |
| <b>01/04/04</b> | -420                   | -261                   | -294                   | -216                   | -376                   | -313                 | -113                               |
| <b>01/19/04</b> | -433                   | -268                   | -277                   | -220                   | -392                   | -318                 | -118                               |
| <b>02/01/04</b> | -439                   | -269                   | -208                   | -241                   | -377                   | -307                 | -107                               |
| <b>02/08/04</b> | -439                   | -272                   | -266                   | -247                   | -329                   | -311                 | -111                               |
| <b>02/14/04</b> | -426                   | -253                   | -268                   | -214                   | -239                   | -280                 | -80                                |
| <b>02/22/04</b> | -444                   | -255                   | -286                   | -238                   | -352                   | -315                 | -115                               |

**Table A.2. Continued.**

| <b>Date</b>     | <b>REF05<br/>61-86</b> | <b>REF05<br/>61-72</b> | <b>REF05<br/>61-89</b> | <b>REF05<br/>61-92</b> | <b>REF05<br/>61-67</b> | <b>REF05<br/>AVG</b> | <b>REF05<br/>Corrected<br/>Avg</b> |
|-----------------|------------------------|------------------------|------------------------|------------------------|------------------------|----------------------|------------------------------------|
| <b>02/28/04</b> | -435                   | -263                   | -290                   | -155                   | -269                   | -282                 | -82                                |
| <b>03/07/04</b> | -439                   | -268                   | -307                   | -245                   | -363                   | -324                 | -124                               |
| <b>03/12/04</b> | -441                   | -269                   | -311                   | -242                   | -367                   | -326                 | -126                               |
| <b>03/20/04</b> | -443                   | -274                   | -321                   | -248                   | -372                   | -332                 | -132                               |
| <b>03/28/04</b> | -430                   | -283                   | -320                   | -258                   | -365                   | -331                 | -131                               |
| <b>04/04/04</b> | -433                   | -271                   | -322                   | -250                   | -368                   | -329                 | -129                               |
| <b>04/10/04</b> | -431                   | -283                   | -328                   | -260                   | -372                   | -335                 | -135                               |
| <b>04/25/04</b> | -404                   | -292                   | -323                   | -350                   | -155                   | -305                 | -105                               |
| <b>05/09/04</b> | -424                   | -290                   | -317                   | -249                   | -341                   | -324                 | -124                               |
| <b>05/16/04</b> | -424                   | -266                   | -307                   | -296                   | -331                   | -325                 | -125                               |
| <b>05/23/04</b> | -13                    | -253                   | -301                   | 26                     | -338                   | -176                 | 24                                 |
| <b>05/31/04</b> | 144                    | -173                   | -301                   | 32                     | -306                   | -121                 | 79                                 |
| <b>06/06/04</b> | 239                    | -70                    | 0                      | 119                    | 50                     | 68                   | 268                                |
| <b>06/16/04</b> | 142                    | 11                     | 29                     | 169                    | 208                    | 112                  | 312                                |
| <b>06/27/04</b> | 134                    | 184                    | 30                     | 154                    | 244                    | 149                  | 349                                |
| <b>07/20/04</b> | 77                     | 267                    | 21                     | 188                    | 210                    | 153                  | 353                                |
| <b>08/02/04</b> | 62                     | 227                    | -8                     | 152                    | 178                    | 122                  | 322                                |
| <b>08/08/04</b> | -118                   | 124                    | -40                    | 11                     | -95                    | -24                  | 176                                |
| <b>08/15/04</b> | 4                      | 33                     | -113                   | 4                      | -19                    | -18                  | 182                                |
| <b>08/22/04</b> | -132                   | -88                    | -110                   | -4                     | -165                   | -100                 | 100                                |
| <b>09/12/04</b> | 4                      | 15                     | -152                   | -170                   | -126                   | -86                  | 114                                |

**Table A.2. Continued.**

| <b>Date</b>     | <b>REF05<br/>61-86</b> | <b>REF05<br/>61-72</b> | <b>REF05<br/>61-89</b> | <b>REF05<br/>61-92</b> | <b>REF05<br/>61-67</b> | <b>REF05<br/>AVG</b> | <b>REF05<br/>Corrected<br/>Avg</b> |
|-----------------|------------------------|------------------------|------------------------|------------------------|------------------------|----------------------|------------------------------------|
| <b>09/26/04</b> | -162                   | -192                   | -150                   | -184                   | -322                   | -202                 | -2                                 |
| <b>10/17/04</b> | 15                     | -229                   | -203                   | -227                   | -342                   | -197                 | 53                                 |
| <b>10/23/04</b> | -135                   | -234                   | -203                   | -223                   | -368                   | -233                 | 17                                 |
| <b>11/22/04</b> | -143                   | -312                   | -218                   | -237                   | -397                   | -261                 | -11                                |
| <b>11/27/04</b> | -115                   | -85                    | -152                   | -121                   | -102                   | -115                 | 135                                |
| <b>12/05/04</b> | -161                   | -231                   | -209                   | -117                   | -337                   | -211                 | 39                                 |
| <b>12/12/04</b> | -138                   | -171                   | -187                   | -116                   | -258                   | -174                 | 76                                 |
| <b>12/21/04</b> | -160                   | -202                   | -203                   | -133                   | -335                   | -207                 | 43                                 |

**Table A.2. Continued.**

| <b>Date</b>     | <b>REF06<br/>61-73</b> | <b>REF06<br/>61-60</b> | <b>REF06<br/>61-84</b> | <b>REF06<br/>61-68</b> | <b>REF06<br/>61-69</b> | <b>REF06<br/>AVG</b> | <b>REF06<br/>Corrected<br/>Avg</b> |
|-----------------|------------------------|------------------------|------------------------|------------------------|------------------------|----------------------|------------------------------------|
| <b>09/09/03</b> | 87                     | 351                    | 252                    | -101                   | -126                   | 93                   | 293                                |
| <b>09/16/03</b> |                        |                        |                        |                        |                        |                      |                                    |
| <b>09/30/03</b> | -135                   | -74                    | -149                   | -147                   | -287                   | -158                 | 42                                 |
| <b>10/07/03</b> | -229                   | -157                   | -389                   | -196                   | -384                   | -271                 | -71                                |
| <b>10/14/03</b> | 46                     | -250                   | -108                   | -170                   | -188                   | -134                 | 66                                 |
| <b>10/21/03</b> | -207                   | -189                   | -250                   | -180                   | -305                   | -226                 | -26                                |
| <b>10/28/03</b> | -470                   | -146                   | -258                   | -1                     | -299                   | -235                 | -35                                |
| <b>11/03/03</b> |                        |                        |                        |                        |                        |                      |                                    |
| <b>11/11/03</b> | -223                   | -207                   | -246                   | -176                   | -300                   | -230                 | -30                                |
| <b>11/18/03</b> | -274                   | -224                   | -236                   | -132                   | -257                   | -225                 | -25                                |
| <b>11/24/03</b> | -151                   | 59                     | 132                    | -108                   | -261                   | -66                  | 134                                |
| <b>12/09/03</b> | -115                   | -128                   | -376                   | -234                   | -298                   | -230                 | -30                                |
| <b>12/16/03</b> | -156                   | -94                    | -384                   | -265                   | -286                   | -237                 | -37                                |
| <b>12/21/03</b> | 61                     | -62                    | -323                   | -271                   | -284                   | -176                 | 24                                 |
| <b>12/28/03</b> | -166                   | -159                   | -369                   | -296                   | -303                   | -259                 | -59                                |
| <b>01/04/04</b> | -180                   | -186                   | -358                   | -281                   | -297                   | -260                 | -60                                |
| <b>01/19/04</b> | -174                   | -198                   | -346                   | -227                   | -300                   | -249                 | -49                                |
| <b>02/01/04</b> | -186                   | -220                   | -352                   | -235                   | -292                   | -257                 | -57                                |
| <b>02/08/04</b> | -173                   | -194                   | -330                   | -217                   | -279                   | -239                 | -39                                |
| <b>02/14/04</b> | -193                   | -191                   | -332                   | -152                   | -281                   | -230                 | -30                                |
| <b>02/22/04</b> | -182                   | -199                   | -314                   | -218                   | -268                   | -236                 | -36                                |

**Table A.2. Continued.**

| <b>Date</b>     | <b>REF06<br/>61-73</b> | <b>REF06<br/>61-60</b> | <b>REF06<br/>61-84</b> | <b>REF06<br/>61-68</b> | <b>REF06<br/>61-69</b> | <b>REF06<br/>AVG</b> | <b>REF06<br/>Corrected<br/>Avg</b> |
|-----------------|------------------------|------------------------|------------------------|------------------------|------------------------|----------------------|------------------------------------|
| <b>02/28/04</b> | -206                   | -217                   | -325                   | -230                   | -282                   | -252                 | -52                                |
| <b>03/07/04</b> | -178                   | -204                   | -297                   | -233                   | -274                   | -237                 | -37                                |
| <b>03/12/04</b> | -184                   | -216                   | -307                   | -221                   | -282                   | -242                 | -42                                |
| <b>03/20/04</b> | -197                   | -221                   | -304                   | -240                   | -285                   | -249                 | -49                                |
| <b>03/28/04</b> | -208                   | -201                   | -291                   | -242                   | -282                   | -245                 | -45                                |
| <b>04/04/04</b> | -226                   | -253                   | -287                   | -257                   | -401                   | -285                 | -85                                |
| <b>04/10/04</b> | -367                   | -252                   | -278                   | -263                   | -407                   | -313                 | -113                               |
| <b>04/25/04</b> | -443                   | -241                   | -267                   | -284                   | -392                   | -325                 | -125                               |
| <b>05/09/04</b> | -432                   | -240                   | -257                   | -247                   | -391                   | -313                 | -113                               |
| <b>05/16/04</b> | 69                     | -253                   | -261                   | -176                   | -388                   | -202                 | -2                                 |
| <b>05/23/04</b> | 36                     | 72                     | 119                    | 20                     | 314                    | 112                  | 312                                |
| <b>05/31/04</b> | 87                     | 91                     | 124                    | 395                    | 391                    | 218                  | 418                                |
| <b>06/06/04</b> | 163                    | 86                     | 89                     | 453                    | 458                    | 250                  | 450                                |
| <b>06/16/04</b> | 180                    | 108                    | 34                     | 515                    | 516                    | 271                  | 471                                |
| <b>06/27/04</b> | 206                    | 206                    | 86                     | 570                    | 559                    | 325                  | 525                                |
| <b>07/20/04</b> | 197                    | 201                    | 127                    | 606                    | 587                    | 344                  | 544                                |
| <b>08/02/04</b> | 128                    | 202                    | 90                     | 530                    | 470                    | 284                  | 484                                |
| <b>08/08/04</b> | -82                    | 129                    | -59                    | -42                    | -46                    | -20                  | 180                                |
| <b>08/15/04</b> | -161                   | -24                    | -150                   | -96                    | -96                    | -105                 | 95                                 |
| <b>08/22/04</b> | 187                    | -145                   | -128                   | -121                   | -33                    | -48                  | 152                                |
| <b>09/12/04</b> | -209                   | -135                   | -135                   | -148                   | -65                    | -138                 | 62                                 |

**Table A.2. Continued.**

| <b>Date</b>     | <b>REF06<br/>61-73</b> | <b>REF06<br/>61-60</b> | <b>REF06<br/>61-84</b> | <b>REF06<br/>61-68</b> | <b>REF06<br/>61-69</b> | <b>REF06<br/>AVG</b> | <b>REF06<br/>Corrected<br/>Avg</b> |
|-----------------|------------------------|------------------------|------------------------|------------------------|------------------------|----------------------|------------------------------------|
| <b>09/26/04</b> | 49                     | -210                   | -130                   | -184                   | -116                   | -118                 | 82                                 |
| <b>10/17/04</b> | 62                     | -243                   | -185                   | -173                   | -204                   | -149                 | 101                                |
| <b>10/23/04</b> | -151                   | -231                   | -167                   | -141                   | -197                   | -177                 | 73                                 |
| <b>11/22/04</b> | 145                    | 145                    | 43                     | 474                    | -17                    | 158                  | 408                                |
| <b>11/27/04</b> | -96                    | 3                      | 5                      | 73                     | -155                   | -34                  | 216                                |
| <b>12/05/04</b> | -155                   | -199                   | -135                   | 84                     | -202                   | -121                 | 129                                |
| <b>12/12/04</b> | -168                   | -205                   | -126                   | -127                   | -182                   | -162                 | 88                                 |
| <b>12/21/04</b> | -88                    | -150                   | -125                   | -174                   | -191                   | -146                 | 104                                |

**Table A.2. Continued.**

| <b>Date</b>     | <b>NR01<br/>61-46</b> | <b>NR01<br/>61-38</b> | <b>NR01<br/>61-44</b> | <b>NR01<br/>61-31</b> | <b>NR01<br/>61-47</b> | <b>NR01<br/>AVG</b> | <b>NR01<br/>Corrected<br/>Avg</b> |
|-----------------|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|---------------------|-----------------------------------|
| <b>09/09/03</b> |                       |                       |                       |                       |                       |                     |                                   |
| <b>09/16/03</b> | -331                  | -358                  | -193                  | -288                  | -244                  | -283                | -83                               |
| <b>09/30/03</b> | -353                  | -304                  | -218                  | -300                  | -323                  | -300                | -100                              |
| <b>10/07/03</b> | -266                  | -398                  | -391                  | -263                  | -340                  | -332                | -132                              |
| <b>10/14/03</b> | -228                  | -376                  | -133                  | -395                  | -355                  | -297                | -97                               |
| <b>10/21/03</b> | -303                  | -391                  | -273                  | -273                  | -350                  | -318                | -118                              |
| <b>10/28/03</b> | -256                  | -384                  | -54                   | -220                  | -338                  | -250                | -50                               |
| <b>11/03/03</b> | -297                  | -399                  | -246                  | -252                  | -342                  | -307                | -107                              |
| <b>11/11/03</b> | -300                  | -403                  | -195                  | -255                  | -339                  | -298                | -98                               |
| <b>11/18/03</b> | -277                  | -386                  | -190                  | -240                  | -340                  | -287                | -87                               |
| <b>11/24/03</b> | -278                  | -377                  | -163                  | -261                  | -365                  | -289                | -89                               |
| <b>12/09/03</b> | -296                  | -381                  | -216                  | -281                  | -412                  | -317                | -117                              |
| <b>12/16/03</b> | -138                  | -385                  | -155                  | -277                  | -415                  | -274                | -74                               |
| <b>12/21/03</b> | -160                  | -352                  | -171                  | -273                  | -404                  | -272                | -72                               |
| <b>12/28/03</b> | -178                  | -379                  | -143                  | -274                  | -396                  | -274                | -74                               |
| <b>01/04/04</b> | -234                  | -390                  | -124                  | -285                  | -398                  | -286                | -86                               |
| <b>01/19/04</b> | -264                  | -133                  | -111                  | -450                  | -413                  | -274                | -74                               |
| <b>02/01/04</b> | -321                  | -122                  | -221                  | -225                  | -365                  | -251                | -51                               |
| <b>02/08/04</b> | -259                  | -319                  | -236                  | -429                  | -415                  | -332                | -132                              |
| <b>02/14/04</b> | -248                  | -314                  | -44                   | -417                  | -397                  | -284                | -84                               |
| <b>02/22/04</b> | -255                  | -333                  | -256                  | -418                  | -386                  | -330                | -130                              |

**Table A.2. Continued.**

| <b>Date</b>     | <b>NR01<br/>61-46</b> | <b>NR01<br/>61-38</b> | <b>NR01<br/>61-44</b> | <b>NR01<br/>61-31</b> | <b>NR01<br/>61-47</b> | <b>NR01<br/>AVG</b> | <b>NR01<br/>Corrected<br/>Avg</b> |
|-----------------|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|---------------------|-----------------------------------|
| <b>02/28/04</b> | -278                  | -344                  | -247                  | -446                  | -409                  | -345                | -145                              |
| <b>03/07/04</b> | -267                  | -340                  | -210                  | -434                  | -406                  | -331                | -131                              |
| <b>03/12/04</b> | -271                  | -350                  | -221                  | -439                  | -411                  | -338                | -138                              |
| <b>03/20/04</b> | -150                  | -353                  | -210                  | -447                  | -417                  | -315                | -115                              |
| <b>03/28/04</b> | -166                  | -349                  | -169                  | -418                  | -414                  | -303                | -103                              |
| <b>04/04/04</b> | -199                  | -364                  | -217                  | -449                  | -423                  | -330                | -130                              |
| <b>04/10/04</b> | -142                  | -404                  | -255                  | -388                  | -415                  | -321                | -121                              |
| <b>04/25/04</b> | -147                  | -363                  | -262                  | -405                  | -405                  | -316                | -116                              |
| <b>05/09/04</b> | -136                  | -376                  | -285                  | -393                  | -413                  | -321                | -121                              |
| <b>05/16/04</b> | -102                  | -361                  | 12                    | -302                  | -413                  | -233                | -33                               |
| <b>05/23/04</b> | -117                  | -378                  | 41                    | -351                  | -414                  | -244                | -44                               |
| <b>05/31/04</b> | -87                   | -355                  | 37                    | -330                  | -394                  | -226                | -26                               |
| <b>06/06/04</b> | -90                   | -278                  | 66                    | -227                  | -271                  | -160                | 40                                |
| <b>06/16/04</b> | -110                  | 40                    | 370                   | 203                   | 15                    | 104                 | 304                               |
| <b>06/27/04</b> | 25                    | 51                    | 497                   | 260                   | 103                   | 187                 | 387                               |
| <b>07/20/04</b> | -3                    | 26                    | 438                   | 344                   | 81                    | 177                 | 377                               |
| <b>08/02/04</b> | -83                   | -53                   | -81                   | -43                   | -63                   | -65                 | 135                               |
| <b>08/08/04</b> | -69                   | -33                   | -134                  | -11                   | -66                   | -63                 | 137                               |
| <b>08/15/04</b> | -98                   | -57                   | 55                    | 49                    | 19                    | -6                  | 194                               |
| <b>08/22/04</b> | -77                   | -19                   | -133                  | -80                   | -65                   | -75                 | 125                               |
| <b>09/12/04</b> | -107                  | -26                   | -138                  | -143                  | -115                  | -106                | 94                                |

**Table A.2. Continued.**

| <b>Date</b>     | <b>NR01<br/>61-46</b> | <b>NR01<br/>61-38</b> | <b>NR01<br/>61-44</b> | <b>NR01<br/>61-31</b> | <b>NR01<br/>61-47</b> | <b>NR01<br/>AVG</b> | <b>NR01<br/>Corrected<br/>Avg</b> |
|-----------------|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|---------------------|-----------------------------------|
| <b>09/26/04</b> | -128                  | -74                   | -252                  | -212                  | -154                  | -164                | 36                                |
| <b>10/17/04</b> | -177                  | -124                  | -240                  | -260                  | -192                  | -199                | 51                                |
| <b>10/23/04</b> | -218                  | -163                  | -260                  | -260                  | -235                  | -227                | 23                                |
| <b>11/22/04</b> | -117                  | -119                  | 112                   | -176                  | -188                  | -98                 | 152                               |
| <b>11/27/04</b> | 32                    | -42                   | -82                   | 77                    | -56                   | -14                 | 236                               |
| <b>12/05/04</b> | -168                  | -114                  | -216                  | -110                  | -174                  | -156                | 94                                |
| <b>12/12/04</b> | -168                  | -112                  | -142                  | -392                  | -184                  | -200                | 50                                |
| <b>12/21/04</b> | -160                  | -88                   | -187                  | -379                  | -170                  | -197                | 53                                |

**Table A.2. Continued.**

| <b>Date</b>     | <b>NR02<br/>61-07</b> | <b>NR02<br/>61-05</b> | <b>NR02<br/>61-06</b> | <b>NR02<br/>61-08</b> | <b>NR02<br/>61-48</b> | <b>NR02<br/>AVG</b> | <b>NR02<br/>Corrected<br/>Avg</b> |
|-----------------|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|---------------------|-----------------------------------|
| <b>09/09/03</b> |                       |                       |                       |                       |                       |                     |                                   |
| <b>09/16/03</b> | -16                   | -209                  | -67                   | -302                  | -322                  | -183                | 17                                |
| <b>09/30/03</b> | -395                  | -209                  | -329                  | -358                  | -283                  | -315                | -115                              |
| <b>10/07/03</b> | -400                  | -172                  | -330                  | -358                  | -282                  | -308                | -108                              |
| <b>10/14/03</b> | -332                  | -208                  | -310                  | -312                  | -276                  | -288                | -88                               |
| <b>10/21/03</b> | -381                  | -168                  | -248                  | -344                  | -262                  | -281                | -81                               |
| <b>10/28/03</b> | -315                  | -140                  | -215                  | -314                  | -268                  | -250                | -50                               |
| <b>11/03/03</b> | -376                  | -139                  | -216                  | -314                  | -246                  | -258                | -58                               |
| <b>11/11/03</b> | -341                  | -130                  | -202                  | -251                  | -256                  | -236                | -36                               |
| <b>11/18/03</b> | -300                  | -131                  | -192                  | -232                  | -253                  | -222                | -22                               |
| <b>11/24/03</b> | -330                  | -128                  | -190                  | -218                  | -231                  | -219                | -19                               |
| <b>12/09/03</b> | -326                  | -126                  | -202                  | -217                  | -367                  | -248                | -48                               |
| <b>12/16/03</b> | -338                  | -130                  | -212                  | -219                  | -383                  | -256                | -56                               |
| <b>12/21/03</b> | -321                  | -119                  | -204                  | -215                  | -378                  | -247                | -47                               |
| <b>12/28/03</b> | -317                  | -129                  | -225                  | -225                  | -379                  | -255                | -55                               |
| <b>01/04/04</b> | -325                  | -130                  | -229                  | -230                  | -363                  | -255                | -55                               |
| <b>01/19/04</b> | -314                  | -124                  | -225                  | -220                  | -359                  | -248                | -48                               |
| <b>02/01/04</b> | -267                  | -327                  | -274                  | -455                  | -421                  | -349                | -149                              |
| <b>02/08/04</b> | -312                  | -122                  | -219                  | -220                  | -366                  | -248                | -48                               |
| <b>02/14/04</b> | -270                  | -116                  | -222                  | -218                  | -230                  | -211                | -11                               |
| <b>02/22/04</b> | -300                  | -123                  | -222                  | -216                  | -367                  | -246                | -46                               |

**Table A.2. Continued.**

| <b>Date</b>     | <b>NR02<br/>61-07</b> | <b>NR02<br/>61-05</b> | <b>NR02<br/>61-06</b> | <b>NR02<br/>61-08</b> | <b>NR02<br/>61-48</b> | <b>NR02<br/>AVG</b> | <b>NR02<br/>Corrected<br/>Avg</b> |
|-----------------|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|---------------------|-----------------------------------|
| <b>02/28/04</b> | -304                  | -122                  | -219                  | -212                  | -364                  | -244                | -44                               |
| <b>03/07/04</b> | -287                  | -177                  | -212                  | -212                  | -354                  | -248                | -48                               |
| <b>03/12/04</b> | -285                  | -117                  | -218                  | -206                  | -357                  | -237                | -37                               |
| <b>03/20/04</b> | -268                  | -131                  | -219                  | -204                  | -354                  | -235                | -35                               |
| <b>03/28/04</b> | -272                  | -118                  | -216                  | -201                  | -343                  | -230                | -30                               |
| <b>04/04/04</b> | -272                  | -120                  | -220                  | -201                  | -346                  | -232                | -32                               |
| <b>04/10/04</b> | -261                  | -104                  | -194                  | -196                  | -338                  | -219                | -19                               |
| <b>04/25/04</b> | -233                  | -111                  | -197                  | -191                  | -305                  | -207                | -7                                |
| <b>05/09/04</b> | -243                  | -127                  | -219                  | -192                  | -300                  | -216                | -16                               |
| <b>05/16/04</b> | -251                  | -130                  | -218                  | -186                  | -315                  | -220                | -20                               |
| <b>05/23/04</b> | -236                  | -150                  | -216                  | -187                  | -307                  | -219                | -19                               |
| <b>05/31/04</b> | -229                  | -163                  | -223                  | -190                  | -331                  | -227                | -27                               |
| <b>06/06/04</b> | -223                  | -151                  | -45                   | -97                   | -328                  | -169                | 31                                |
| <b>06/16/04</b> | 87                    | 12                    | 175                   | 160                   | 112                   | 109                 | 309                               |
| <b>06/27/04</b> | 248                   | 79                    | 283                   | 160                   | 175                   | 189                 | 389                               |
| <b>07/20/04</b> | 256                   | 53                    | 472                   | 127                   | 381                   | 258                 | 458                               |
| <b>08/02/04</b> | -87                   | -60                   | -141                  | -209                  | -29                   | -105                | 95                                |
| <b>08/08/04</b> | -107                  | -76                   | -31                   | -126                  | -43                   | -77                 | 123                               |
| <b>08/15/04</b> | -115                  | -98                   | -34                   | -40                   | -35                   | -64                 | 136                               |
| <b>08/22/04</b> | -122                  | -91                   | -33                   | -74                   | -106                  | -85                 | 115                               |
| <b>09/12/04</b> | -103                  | -81                   | -81                   | -91                   | -125                  | -96                 | 104                               |

**Table A.2. Continued.**

| <b>Date</b>     | <b>NR02<br/>61-07</b> | <b>NR02<br/>61-05</b> | <b>NR02<br/>61-06</b> | <b>NR02<br/>61-08</b> | <b>NR02<br/>61-48</b> | <b>NR02<br/>AVG</b> | <b>NR02<br/>Corrected<br/>Avg</b> |
|-----------------|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|---------------------|-----------------------------------|
| <b>09/26/04</b> | -167                  | -120                  | -121                  | -116                  | -152                  | -135                | 65                                |
| <b>10/17/04</b> | -246                  | -154                  | -178                  | -157                  | -197                  | -186                | 64                                |
| <b>10/23/04</b> | -314                  | -209                  | -236                  | -215                  | -248                  | -244                | 6                                 |
| <b>11/22/04</b> | 56                    | 14                    | 120                   | -133                  | -34                   | 5                   | 255                               |
| <b>11/27/04</b> | -110                  | -87                   | -94                   | -94                   | -93                   | -96                 | 154                               |
| <b>12/05/04</b> | -126                  | -101                  | -120                  | -101                  | -155                  | -121                | 129                               |
| <b>12/12/04</b> | -165                  | -143                  | -117                  | -103                  | -161                  | -138                | 112                               |
| <b>12/21/04</b> | -182                  | -158                  | -135                  | -133                  | -185                  | -159                | 91                                |

**Table A.2. Continued.**

| <b>Date</b>     | <b>NR03<br/>61-01</b> | <b>NR03<br/>61-41</b> | <b>NR03<br/>61-45</b> | <b>NR03<br/>61-40</b> | <b>NR03<br/>61-42</b> | <b>NR03<br/>AVG</b> | <b>NR03<br/>Corrected<br/>Avg</b> |
|-----------------|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|---------------------|-----------------------------------|
| <b>09/09/03</b> |                       |                       |                       |                       |                       |                     |                                   |
| <b>09/16/03</b> | -209                  | -298                  | -317                  | -105                  | -259                  | -238                | -38                               |
| <b>09/30/03</b> | -233                  | -330                  | -433                  | -85                   | -287                  | -274                | -74                               |
| <b>10/07/03</b> | -226                  | -338                  | -423                  | -69                   | -286                  | -268                | -68                               |
| <b>10/14/03</b> | -243                  | -408                  | -458                  | -118                  | -221                  | -290                | -90                               |
| <b>10/21/03</b> | -183                  | -391                  | -434                  | -67                   | -412                  | -297                | -97                               |
| <b>10/28/03</b> | -192                  | -410                  | -429                  | -87                   | -284                  | -280                | -80                               |
| <b>11/03/03</b> | -235                  | -422                  | -437                  | -230                  | -289                  | -323                | -123                              |
| <b>11/11/03</b> | -232                  | -417                  | -430                  | -356                  | -318                  | -351                | -151                              |
| <b>11/18/03</b> | -256                  | -416                  | -422                  | -396                  | -297                  | -357                | -157                              |
| <b>11/24/03</b> | -223                  | -416                  | -415                  | -409                  | -346                  | -362                | -162                              |
| <b>12/09/03</b> | -232                  | -536                  | -406                  | -419                  | -357                  | -390                | -190                              |
| <b>12/16/03</b> | -233                  | -533                  | -394                  | -425                  | -354                  | -388                | -188                              |
| <b>12/21/03</b> | -237                  | -450                  | -411                  | -426                  | -381                  | -381                | -181                              |
| <b>12/28/03</b> | -248                  | -536                  | -408                  | -426                  | -377                  | -399                | -199                              |
| <b>01/04/04</b> | -247                  | -517                  | -411                  | -440                  | -391                  | -401                | -201                              |
| <b>01/19/04</b> | -216                  | -542                  | -412                  | -435                  | -393                  | -400                | -200                              |
| <b>02/01/04</b> | -238                  | -532                  | -409                  | -433                  | -397                  | -402                | -202                              |
| <b>02/08/04</b> | -238                  | -510                  | -407                  | -436                  | -393                  | -397                | -197                              |
| <b>02/14/04</b> | -195                  | -505                  | -178                  | -407                  | -380                  | -333                | -133                              |
| <b>02/22/04</b> | -238                  | -484                  | -406                  | -436                  | -409                  | -395                | -195                              |

**Table A.2. Continued.**

| <b>Date</b>     | <b>NR03<br/>61-01</b> | <b>NR03<br/>61-41</b> | <b>NR03<br/>61-45</b> | <b>NR03<br/>61-40</b> | <b>NR03<br/>61-42</b> | <b>NR03<br/>AVG</b> | <b>NR03<br/>Corrected<br/>Avg</b> |
|-----------------|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|---------------------|-----------------------------------|
| <b>02/28/04</b> | -243                  | -493                  | -408                  | -436                  | -412                  | -398                | -198                              |
| <b>03/07/04</b> | -227                  | -499                  | -406                  | -433                  | -397                  | -392                | -192                              |
| <b>03/12/04</b> | -243                  | -548                  | -401                  | -440                  | -403                  | -407                | -207                              |
| <b>03/20/04</b> | -257                  | -507                  | -400                  | -440                  | -417                  | -404                | -204                              |
| <b>03/28/04</b> | -260                  | -478                  | -394                  | -438                  | -389                  | -392                | -192                              |
| <b>04/04/04</b> | -300                  | -545                  | -338                  | -441                  | -413                  | -407                | -207                              |
| <b>04/10/04</b> | -303                  | -439                  | -353                  | -435                  | -411                  | -388                | -188                              |
| <b>04/25/04</b> | -268                  | -429                  | -358                  | -428                  | -407                  | -378                | -178                              |
| <b>05/09/04</b> | -310                  | -426                  | -387                  | -432                  | -402                  | -391                | -191                              |
| <b>05/16/04</b> | -311                  | -427                  | -377                  | -434                  | -420                  | -394                | -194                              |
| <b>05/23/04</b> | 286                   | 86                    | 237                   | 84                    | -380                  | 63                  | 263                               |
| <b>05/31/04</b> | 464                   | 31                    | -12                   | 37                    | 61                    | 116                 | 316                               |
| <b>06/06/04</b> | 473                   | 15                    | -6                    | 23                    | 38                    | 109                 | 309                               |
| <b>06/16/04</b> | 438                   | 10                    | 78                    | 14                    | 41                    | 116                 | 316                               |
| <b>06/27/04</b> | 519                   | 19                    | 291                   | 28                    | 67                    | 185                 | 385                               |
| <b>07/20/04</b> | 506                   | 1                     | 236                   | 5                     | 35                    | 157                 | 357                               |
| <b>08/02/04</b> | -20                   | -39                   | -211                  | -30                   | -50                   | -70                 | 130                               |
| <b>08/08/04</b> | -228                  | -40                   | -216                  | -32                   | -82                   | -120                | 80                                |
| <b>08/15/04</b> | -351                  | -42                   | -231                  | -39                   | -110                  | -155                | 45                                |
| <b>08/22/04</b> | -294                  | 24                    | -158                  | -14                   | -84                   | -105                | 95                                |
| <b>09/12/04</b> | -180                  | -16                   | -174                  | -6                    | -103                  | -96                 | 104                               |

**Table A.2. Continued.**

| <b>Date</b>     | <b>NR03<br/>61-01</b> | <b>NR03<br/>61-41</b> | <b>NR03<br/>61-45</b> | <b>NR03<br/>61-40</b> | <b>NR03<br/>61-42</b> | <b>NR03<br/>AVG</b> | <b>NR03<br/>Corrected<br/>Avg</b> |
|-----------------|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|---------------------|-----------------------------------|
| <b>09/26/04</b> | -196                  | -42                   | -188                  | -32                   | -121                  | -116                | 84                                |
| <b>10/17/04</b> | -207                  | -58                   | -245                  | -64                   | -159                  | -147                | 103                               |
| <b>10/23/04</b> | -229                  | -65                   | -258                  | -72                   | -171                  | -159                | 91                                |
| <b>11/22/04</b> | -1                    | -36                   | 32                    | -26                   | -170                  | -40                 | 210                               |
| <b>11/27/04</b> | -26                   | -65                   | -44                   | -47                   | -131                  | -63                 | 187                               |
| <b>12/05/04</b> | -153                  | -62                   | -168                  | -66                   | -187                  | -127                | 123                               |
| <b>12/12/04</b> | -165                  | -63                   | -171                  | -90                   | -192                  | -136                | 114                               |
| <b>12/21/04</b> | -155                  | -59                   | -184                  | -68                   | -177                  | -129                | 121                               |

**Table A.2. Continued.**

| <b>Date</b>     | <b>NR06<br/>61-17</b> | <b>NR06<br/>61-04</b> | <b>NR06<br/>61-13</b> | <b>NR06<br/>61-19</b> | <b>NR06<br/>61-10</b> | <b>NR06<br/>AVG</b> | <b>NR06<br/>Corrected<br/>Avg</b> |
|-----------------|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|---------------------|-----------------------------------|
| <b>09/09/03</b> |                       |                       |                       |                       |                       |                     |                                   |
| <b>09/16/03</b> | -175                  | -334                  | -41                   | -176                  | -218                  | -189                | 11                                |
| <b>09/30/03</b> | -164                  | -196                  | -188                  | -167                  | -182                  | -179                | 21                                |
| <b>10/07/03</b> | -120                  | -220                  | -198                  | -121                  | -186                  | -169                | 31                                |
| <b>10/14/03</b> | -181                  | -246                  | -156                  | -137                  | -228                  | -190                | 10                                |
| <b>10/21/03</b> | -168                  | -234                  | -197                  | -150                  | -202                  | -190                | 10                                |
| <b>10/28/03</b> | -79                   | -237                  | -207                  | -144                  | -220                  | -177                | 23                                |
| <b>11/03/03</b> | -188                  | -239                  | -148                  | -131                  | -201                  | -181                | 19                                |
| <b>11/11/03</b> | -180                  | -242                  | -223                  | -134                  | -180                  | -192                | 8                                 |
| <b>11/18/03</b> | -137                  | -210                  | -200                  | -132                  | -165                  | -169                | 31                                |
| <b>11/24/03</b> | -194                  | -223                  | -231                  | -125                  | -199                  | -194                | 6                                 |
| <b>12/09/03</b> | -147                  | -221                  | -440                  | -126                  | -208                  | -228                | -28                               |
| <b>12/16/03</b> | -188                  | -208                  | -437                  | -124                  | -213                  | -234                | -34                               |
| <b>12/21/03</b> | -246                  | -213                  | -419                  | -121                  | -202                  | -240                | -40                               |
| <b>12/28/03</b> | -417                  | -212                  | -424                  | -116                  | -210                  | -276                | -76                               |
| <b>01/04/04</b> | -415                  | -80                   | -431                  | -122                  | -211                  | -252                | -52                               |
| <b>01/19/04</b> | -425                  | -161                  | -424                  | -120                  | -222                  | -270                | -70                               |
| <b>02/01/04</b> | -418                  | -218                  | -420                  | -116                  | -225                  | -279                | -79                               |
| <b>02/08/04</b> | -414                  | -203                  | -418                  | -116                  | -226                  | -275                | -75                               |
| <b>02/14/04</b> | -313                  | -30                   | -343                  | -103                  | -144                  | -187                | 13                                |
| <b>02/22/04</b> | -406                  | -214                  | -400                  | -113                  | -223                  | -271                | -71                               |

**Table A.2. Continued.**

| <b>Date</b>     | <b>NR06<br/>61-17</b> | <b>NR06<br/>61-04</b> | <b>NR06<br/>61-13</b> | <b>NR06<br/>61-19</b> | <b>NR06<br/>61-10</b> | <b>NR06<br/>AVG</b> | <b>NR06<br/>Corrected<br/>Avg</b> |
|-----------------|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|---------------------|-----------------------------------|
| <b>02/28/04</b> | -408                  | -216                  | -421                  | -121                  | -210                  | -275                | -75                               |
| <b>03/07/04</b> | -394                  | -193                  | -334                  | -118                  | -184                  | -245                | -45                               |
| <b>03/12/04</b> | -335                  | -204                  | -395                  | -120                  | -219                  | -255                | -55                               |
| <b>03/20/04</b> | -374                  | -213                  | -412                  | -126                  | -212                  | -267                | -67                               |
| <b>03/28/04</b> | -375                  | -141                  | -417                  | -138                  | -240                  | -262                | -62                               |
| <b>04/04/04</b> | -366                  | -217                  | -424                  | -135                  | -230                  | -274                | -74                               |
| <b>04/10/04</b> | -354                  | -195                  | -411                  | -116                  | -218                  | -259                | -59                               |
| <b>04/25/04</b> | -337                  | -218                  | -401                  | -130                  | -167                  | -251                | -51                               |
| <b>05/09/04</b> | -355                  | -216                  | -405                  | -138                  | -181                  | -259                | -59                               |
| <b>05/16/04</b> | -336                  | -125                  | -408                  | -152                  | -184                  | -241                | -41                               |
| <b>05/23/04</b> | -236                  | -100                  | -121                  | -224                  | -170                  | -170                | 30                                |
| <b>05/31/04</b> | -27                   | -10                   | -43                   | -137                  | 302                   | 17                  | 217                               |
| <b>06/06/04</b> | -1                    | -12                   | -4                    | -3                    | 390                   | 74                  | 274                               |
| <b>06/16/04</b> | -38                   | -9                    | 65                    | 14                    | 512                   | 109                 | 309                               |
| <b>06/27/04</b> | -18                   | -7                    | 254                   | -1                    | 453                   | 136                 | 336                               |
| <b>07/20/04</b> | -13                   | -90                   | 287                   | -18                   | 544                   | 142                 | 342                               |
| <b>08/02/04</b> | 10                    | -42                   | -48                   | 111                   | 269                   | 60                  | 260                               |
| <b>08/08/04</b> | -94                   | -80                   | -199                  | -66                   | -4                    | -89                 | 111                               |
| <b>08/15/04</b> | -92                   | -18                   | -219                  | -95                   | -56                   | -96                 | 104                               |
| <b>08/22/04</b> | -90                   | -79                   | -177                  | -76                   | -94                   | -103                | 97                                |
| <b>09/12/04</b> | -99                   | -98                   | -191                  | -116                  | -119                  | -125                | 75                                |

**Table A.2. Continued.**

| <b>Date</b>     | <b>NR06<br/>61-17</b> | <b>NR06<br/>61-04</b> | <b>NR06<br/>61-13</b> | <b>NR06<br/>61-19</b> | <b>NR06<br/>61-10</b> | <b>NR06<br/>AVG</b> | <b>NR06<br/>Corrected<br/>Avg</b> |
|-----------------|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|---------------------|-----------------------------------|
| <b>09/26/04</b> | -127                  | -126                  | -110                  | -156                  | -108                  | -125                | 75                                |
| <b>10/17/04</b> | -190                  | -165                  | -249                  | -192                  | -222                  | -204                | 46                                |
| <b>10/23/04</b> | -193                  | -179                  | -291                  | -215                  | -280                  | -232                | 18                                |
| <b>11/22/04</b> | -69                   | -32                   | -21                   | 19                    | 500                   | 79                  | 329                               |
| <b>11/27/04</b> | -1                    | -58                   | -11                   | -41                   | 70                    | -8                  | 242                               |
| <b>12/05/04</b> | -180                  | -114                  | -161                  | -251                  | -226                  | -186                | 64                                |
| <b>12/12/04</b> | -187                  | -116                  | -177                  | -212                  | -221                  | -183                | 67                                |
| <b>12/21/04</b> | -170                  | -104                  | -165                  | -193                  | -311                  | -189                | 61                                |

**Table A.2. Continued.**

| <b>Date</b>     | <b>NR07<br/>61-09</b> | <b>NR07<br/>61-02</b> | <b>NR07<br/>61-03</b> | <b>NR07<br/>61-16</b> | <b>NR07<br/>61-15</b> | <b>NR07<br/>AVG</b> | <b>NR07<br/>Corrected<br/>Avg</b> |
|-----------------|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|---------------------|-----------------------------------|
| <b>09/09/03</b> |                       |                       |                       |                       |                       |                     |                                   |
| <b>09/16/03</b> | -175                  | -182                  | -225                  | -406                  | -174                  | -232                | -32                               |
| <b>09/30/03</b> | -206                  | -201                  | -255                  | -359                  | -194                  | -243                | -43                               |
| <b>10/07/03</b> | -187                  | -169                  | -241                  | -350                  | -185                  | -226                | -26                               |
| <b>10/14/03</b> | -240                  | -240                  | -232                  | -235                  | -238                  | -237                | -37                               |
| <b>10/21/03</b> | -224                  | -177                  | -245                  | -245                  | -168                  | -212                | -12                               |
| <b>10/28/03</b> | -236                  | -70                   | -173                  | -126                  | -189                  | -159                | 41                                |
| <b>11/03/03</b> | -235                  | -146                  | -254                  | -282                  | -192                  | -222                | -22                               |
| <b>11/11/03</b> | -244                  | -158                  | -252                  | -213                  | -180                  | -209                | -9                                |
| <b>11/18/03</b> | -218                  | -177                  | -225                  | -283                  | -169                  | -214                | -14                               |
| <b>11/24/03</b> | -232                  | -153                  | -253                  | -132                  | -185                  | -191                | 9                                 |
| <b>12/09/03</b> | -244                  | -131                  | -260                  | -274                  | -200                  | -222                | -22                               |
| <b>12/16/03</b> | -245                  | -91                   | -216                  | -42                   | -198                  | -158                | 42                                |
| <b>12/21/03</b> | -242                  | -104                  | -255                  | -195                  | -189                  | -197                | 3                                 |
| <b>12/28/03</b> | -234                  | -66                   | -256                  | -55                   | -199                  | -162                | 38                                |
| <b>01/04/04</b> | -236                  | -55                   | -253                  | -86                   | -192                  | -164                | 36                                |
| <b>01/19/04</b> | -237                  | -66                   | -252                  | -11                   | -208                  | -155                | 45                                |
| <b>02/01/04</b> | -227                  | -137                  | -247                  | -123                  | -202                  | -187                | 13                                |
| <b>02/08/04</b> | -231                  | -128                  | -156                  | -11                   | -204                  | -146                | 54                                |
| <b>02/14/04</b> | -222                  | -28                   | -34                   | 9                     | -105                  | -76                 | 124                               |
| <b>02/22/04</b> | -236                  | -139                  | -214                  | -67                   | -205                  | -172                | 28                                |

**Table A.2. Continued.**

| <b>Date</b>     | <b>NR07<br/>61-09</b> | <b>NR07<br/>61-02</b> | <b>NR07<br/>61-03</b> | <b>NR07<br/>61-16</b> | <b>NR07<br/>61-15</b> | <b>NR07<br/>AVG</b> | <b>NR07<br/>Corrected<br/>Avg</b> |
|-----------------|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|---------------------|-----------------------------------|
| <b>02/28/04</b> | -243                  | -125                  | -148                  | -11                   | -210                  | -147                | 53                                |
| <b>03/07/04</b> | -228                  | -133                  | -188                  | -124                  | -185                  | -172                | 28                                |
| <b>03/12/04</b> | -241                  | -147                  | -233                  | -66                   | -206                  | -179                | 21                                |
| <b>03/20/04</b> | -240                  | -151                  | -244                  | -136                  | -399                  | -234                | -34                               |
| <b>03/28/04</b> | -244                  | -155                  | -250                  | -13                   | -417                  | -216                | -16                               |
| <b>04/04/04</b> | -244                  | -162                  | -258                  | -107                  | -423                  | -239                | -39                               |
| <b>04/10/04</b> | -240                  | -165                  | -258                  | -194                  | -426                  | -257                | -57                               |
| <b>04/25/04</b> | -225                  | -161                  | -250                  | -200                  | -435                  | -254                | -54                               |
| <b>05/09/04</b> | -230                  | -138                  | -145                  | -208                  | -425                  | -229                | -29                               |
| <b>05/16/04</b> | -264                  | -199                  | -158                  | -229                  | -423                  | -255                | -55                               |
| <b>05/23/04</b> | -242                  | -221                  | -159                  | -207                  | -395                  | -245                | -45                               |
| <b>05/31/04</b> | -243                  | -230                  | -205                  | -193                  | -396                  | -253                | -53                               |
| <b>06/06/04</b> | 162                   | 92                    | -156                  | 114                   | -379                  | -33                 | 167                               |
| <b>06/16/04</b> | 152                   | 55                    | -63                   | 0                     | -394                  | -50                 | 150                               |
| <b>06/27/04</b> | 291                   | 102                   | 247                   | 21                    | -59                   | 120                 | 320                               |
| <b>07/20/04</b> | 330                   | 67                    | 322                   | 39                    | 227                   | 197                 | 397                               |
| <b>08/02/04</b> | -59                   | -42                   | 303                   | -36                   | -48                   | 24                  | 224                               |
| <b>08/08/04</b> | -128                  | 6                     | 44                    | -46                   | -50                   | -35                 | 165                               |
| <b>08/15/04</b> | -182                  | -1                    | 10                    | 21                    | -87                   | -48                 | 152                               |
| <b>08/22/04</b> | -214                  | -91                   | -92                   | -106                  | -96                   | -120                | 80                                |
| <b>09/12/04</b> | -96                   | -69                   | -78                   | -83                   | -94                   | -84                 | 116                               |

**Table A.2. Continued.**

| <b>Date</b>     | <b>NR07<br/>61-09</b> | <b>NR07<br/>61-02</b> | <b>NR07<br/>61-03</b> | <b>NR07<br/>61-16</b> | <b>NR07<br/>61-15</b> | <b>NR07<br/>AVG</b> | <b>NR07<br/>Corrected<br/>Avg</b> |
|-----------------|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|---------------------|-----------------------------------|
| <b>09/26/04</b> | -66                   | -142                  | -234                  | -125                  | -124                  | -138                | 62                                |
| <b>10/17/04</b> | -262                  | -199                  | -285                  | -182                  | -196                  | 54                  | 304                               |
| <b>10/23/04</b> | -139                  | -201                  | -295                  | -180                  | -193                  | 57                  | 307                               |
| <b>11/22/04</b> | 51                    | -70                   | -288                  | -95                   | -202                  | 48                  | 298                               |
| <b>11/27/04</b> | -50                   | 56                    | 67                    | -15                   | 30                    | 280                 | 530                               |
| <b>12/05/04</b> | -130                  | -152                  | -206                  | -149                  | -180                  | 70                  | 320                               |
| <b>12/12/04</b> | -159                  | -167                  | -281                  | -126                  | -174                  | 76                  | 326                               |
| <b>12/21/04</b> | -173                  | -164                  | -274                  | -142                  | -198                  | 52                  | 302                               |

**Table A.2. Continued.**

| <b>Date</b>     | <b>NR-08<br/>61-18</b> | <b>NR08<br/>61-62</b> | <b>NR08<br/>61-11</b> | <b>NR08<br/>61-12</b> | <b>NR08<br/>61-14</b> | <b>NR08<br/>AVG</b> | <b>NR08<br/>Corrected<br/>Avg</b> |
|-----------------|------------------------|-----------------------|-----------------------|-----------------------|-----------------------|---------------------|-----------------------------------|
| <b>09/09/03</b> |                        |                       |                       |                       |                       |                     |                                   |
| <b>09/16/03</b> | -177                   | -223                  | -443                  | -318                  | -64                   | -245                | -45                               |
| <b>09/30/03</b> | -156                   | -358                  | -459                  | -253                  | -100                  | -265                | -65                               |
| <b>10/07/03</b> | -172                   | -263                  | -450                  | -225                  | -130                  | -248                | -48                               |
| <b>10/14/03</b> | -157                   | -244                  | -432                  | -235                  | -200                  | -254                | -54                               |
| <b>10/21/03</b> | -178                   | -234                  | -420                  | -272                  | -116                  | -244                | -44                               |
| <b>10/28/03</b> | -157                   | -228                  | -407                  | -214                  | -31                   | -207                | -7                                |
| <b>11/03/03</b> | -141                   | -200                  | -416                  | -201                  | -148                  | -221                | -21                               |
| <b>11/11/03</b> | -157                   | -206                  | -402                  | -203                  | -120                  | -218                | -18                               |
| <b>11/18/03</b> | -157                   | -198                  | -379                  | -164                  | -83                   | -196                | 4                                 |
| <b>11/24/03</b> | -139                   | -190                  | -404                  | -209                  | -99                   | -208                | -8                                |
| <b>12/09/03</b> | -161                   | -195                  | -395                  | -233                  | -138                  | -224                | -24                               |
| <b>12/16/03</b> | -153                   | -194                  | -387                  | -245                  | -142                  | -224                | -24                               |
| <b>12/21/03</b> | -161                   | -188                  | -379                  | -236                  | -135                  | -220                | -20                               |
| <b>12/28/03</b> | -161                   | -187                  | -366                  | -239                  | -141                  | -219                | -19                               |
| <b>01/04/04</b> | -171                   | -192                  | -364                  | -248                  | -155                  | -226                | -26                               |
| <b>01/19/04</b> | -168                   | -195                  | -348                  | -254                  | -141                  | -221                | -21                               |
| <b>02/01/04</b> | -175                   | -200                  | -346                  | -269                  | -147                  | -227                | -27                               |
| <b>02/08/04</b> | -150                   | -194                  | -332                  | -277                  | -139                  | -218                | -18                               |
| <b>02/14/04</b> | -187                   | -177                  | -282                  | -233                  | -154                  | -207                | -7                                |
| <b>02/22/04</b> | -173                   | -198                  | -319                  | -301                  | -141                  | -226                | -26                               |

**Table A.2. Continued.**

| <b>Date</b>     | <b>NR-08<br/>61-18</b> | <b>NR08<br/>61-62</b> | <b>NR08<br/>61-11</b> | <b>NR08<br/>61-12</b> | <b>NR08<br/>61-14</b> | <b>NR08<br/>AVG</b> | <b>NR08<br/>Corrected<br/>Avg</b> |
|-----------------|------------------------|-----------------------|-----------------------|-----------------------|-----------------------|---------------------|-----------------------------------|
| <b>02/28/04</b> | -186                   | -214                  | -317                  | -332                  | -146                  | -239                | -39                               |
| <b>03/07/04</b> | -186                   | -245                  | -300                  | -273                  | -139                  | -229                | -29                               |
| <b>03/12/04</b> | -178                   | -250                  | -306                  | -335                  | -146                  | -243                | -43                               |
| <b>03/20/04</b> | -178                   | -245                  | -297                  | -348                  | -149                  | -243                | -43                               |
| <b>03/28/04</b> | -248                   | -233                  | -257                  | -351                  | -189                  | -256                | -56                               |
| <b>04/04/04</b> | -189                   | -246                  | -282                  | -354                  | -199                  | -254                | -54                               |
| <b>04/10/04</b> | -181                   | -251                  | -281                  | -360                  | -165                  | -248                | -48                               |
| <b>04/25/04</b> | -248                   | -262                  | -264                  | -282                  | -160                  | -243                | -43                               |
| <b>05/09/04</b> | -272                   | -349                  | -258                  | -365                  | -152                  | -279                | -79                               |
| <b>05/16/04</b> | -250                   | -373                  | -261                  | -344                  | -115                  | -269                | -69                               |
| <b>05/23/04</b> | -145                   | -20                   | -282                  | 23                    | 79                    | -69                 | 131                               |
| <b>05/31/04</b> | 35                     | 61                    | -41                   | 34                    | 385                   | 95                  | 295                               |
| <b>06/06/04</b> | 320                    | 67                    | -6                    | 30                    | 498                   | 182                 | 382                               |
| <b>06/16/04</b> | 289                    | 72                    | 9                     | 59                    | 542                   | 194                 | 394                               |
| <b>06/27/04</b> | 442                    | 66                    | -2                    | 51                    | 579                   | 227                 | 427                               |
| <b>07/20/04</b> | 570                    | 51                    | -25                   | 275                   | 598                   | 294                 | 494                               |
| <b>08/02/04</b> | 80                     | -148                  | -129                  | -169                  | -67                   | -87                 | 113                               |
| <b>08/08/04</b> | 6                      | -178                  | -160                  | -232                  | -118                  | -136                | 64                                |
| <b>08/15/04</b> | -1                     | -190                  | -152                  | -193                  | -8                    | -109                | 91                                |
| <b>08/22/04</b> | -67                    | -183                  | -141                  | -171                  | -125                  | -137                | 63                                |
| <b>09/12/04</b> | -81                    | -127                  | -136                  | -136                  | -116                  | -119                | 81                                |

**Table A.2. Continued.**

| <b>Date</b>     | <b>NR-08<br/>61-18</b> | <b>NR08<br/>61-62</b> | <b>NR08<br/>61-11</b> | <b>NR08<br/>61-12</b> | <b>NR08<br/>61-14</b> | <b>NR08<br/>AVG</b> | <b>NR08<br/>Corrected<br/>Avg</b> |
|-----------------|------------------------|-----------------------|-----------------------|-----------------------|-----------------------|---------------------|-----------------------------------|
| <b>09/26/04</b> | -144                   | -148                  | -167                  | -156                  | -75                   | -138                | 62                                |
| <b>10/17/04</b> | -267                   | -186                  | -207                  | -183                  | -169                  | -202                | 48                                |
| <b>10/23/04</b> | -261                   | -201                  | -224                  | -193                  | -204                  | -217                | 33                                |
| <b>11/22/04</b> | -232                   | -194                  | -283                  | -34                   | 352                   | -78                 | 172                               |
| <b>11/27/04</b> | 20                     | -135                  | -129                  | -74                   | 122                   | -39                 | 211                               |
| <b>12/05/04</b> | -165                   | -201                  | -316                  | -141                  | -105                  | -186                | 64                                |
| <b>12/12/04</b> | -54                    | -183                  | -296                  | -71                   | -131                  | -147                | 103                               |
| <b>12/21/04</b> | -150                   | -183                  | -294                  | -137                  | -46                   | -162                | 88                                |

**Table A.2. Continued.**

| <b>Date</b>     | <b>NR09<br/>61-54</b> | <b>NR09<br/>61-57</b> | <b>NR09<br/>61-56</b> | <b>NR09<br/>61-55</b> | <b>NR09<br/>61-58</b> | <b>NR09<br/>AVG</b> | <b>NR09<br/>Corrected<br/>Avg</b> |
|-----------------|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|---------------------|-----------------------------------|
| <b>09/09/03</b> |                       |                       |                       |                       |                       |                     |                                   |
| <b>09/16/03</b> | -209                  | -164                  | -227                  | -133                  | -183                  | -183                | 17                                |
| <b>09/30/03</b> | -143                  | -220                  | -269                  | -286                  | -251                  | -234                | -34                               |
| <b>10/07/03</b> | -181                  | -265                  | -261                  | -345                  | -231                  | -257                | -57                               |
| <b>10/14/03</b> | -165                  | -348                  | -315                  | -368                  | -297                  | -299                | -99                               |
| <b>10/21/03</b> | -236                  | -343                  | -159                  | -368                  | -147                  | -251                | -51                               |
| <b>10/28/03</b> | -268                  | -271                  | -237                  | -220                  | -122                  | -224                | -24                               |
| <b>11/03/03</b> | -244                  | -257                  | -281                  | -414                  | -144                  | -268                | -68                               |
| <b>11/11/03</b> | -279                  | -355                  | -253                  | -426                  | -170                  | -297                | -97                               |
| <b>11/18/03</b> | -162                  | -135                  | -365                  | -407                  | -309                  | -276                | -76                               |
| <b>11/24/03</b> | -380                  | -411                  | -213                  | -422                  | -150                  | -315                | -115                              |
| <b>12/09/03</b> | -414                  | -454                  | -281                  | -438                  | -76                   | -333                | -133                              |
| <b>12/16/03</b> | -413                  | -454                  | -266                  | -432                  | -38                   | -321                | -121                              |
| <b>12/21/03</b> | -400                  | -453                  | -257                  | -436                  | -80                   | -325                | -125                              |
| <b>12/28/03</b> | -412                  | -453                  | -264                  | -436                  | -43                   | -322                | -122                              |
| <b>01/04/04</b> | -410                  | -459                  | -276                  | -427                  | -164                  | -347                | -147                              |
| <b>01/19/04</b> | 11                    | -459                  | -298                  | -489                  | -65                   | -260                | -60                               |
| <b>02/01/04</b> | -222                  | -466                  | -278                  | -495                  | -156                  | -323                | -123                              |
| <b>02/08/04</b> | -236                  | -448                  | -238                  | -477                  | -87                   | -297                | -97                               |
| <b>02/14/04</b> | -244                  | -353                  | -198                  | -445                  | 25                    | -243                | -43                               |
| <b>02/22/04</b> | -293                  | -458                  | -224                  | -476                  | -97                   | -310                | -110                              |

**Table A.2. Continued.**

| <b>Date</b>     | <b>NR09<br/>61-54</b> | <b>NR09<br/>61-57</b> | <b>NR09<br/>61-56</b> | <b>NR09<br/>61-55</b> | <b>NR09<br/>61-58</b> | <b>NR09<br/>AVG</b> | <b>NR09<br/>Corrected<br/>Avg</b> |
|-----------------|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|---------------------|-----------------------------------|
| <b>02/28/04</b> | -317                  | -461                  | -24                   | -478                  | -75                   | -271                | -71                               |
| <b>03/07/04</b> | -277                  | -448                  | -180                  | -467                  | -102                  | -295                | -95                               |
| <b>03/12/04</b> | -344                  | -449                  | -167                  | -471                  | -105                  | -307                | -107                              |
| <b>03/20/04</b> | -358                  | -452                  | -161                  | -474                  | 7                     | -288                | -88                               |
| <b>03/28/04</b> | -370                  | -448                  | -159                  | -475                  | -91                   | -309                | -109                              |
| <b>04/04/04</b> | -381                  | -446                  | -157                  | -476                  | -116                  | -315                | -115                              |
| <b>04/10/04</b> | -452                  | -443                  | -158                  | -475                  | -122                  | -330                | -130                              |
| <b>04/25/04</b> | -405                  | -427                  | -171                  | -468                  | -137                  | -322                | -122                              |
| <b>05/09/04</b> | -367                  | -413                  | -260                  | -467                  | -141                  | -330                | -130                              |
| <b>05/16/04</b> | -479                  | -414                  | -192                  | -466                  | -149                  | -340                | -140                              |
| <b>05/23/04</b> | -500                  | -401                  | -190                  | -457                  | -141                  | -338                | -138                              |
| <b>05/31/04</b> | -226                  | -16                   | -220                  | -451                  | 31                    | -176                | 24                                |
| <b>06/06/04</b> | -398                  | 73                    | -212                  | -446                  | 69                    | -183                | 17                                |
| <b>06/16/04</b> | -358                  | -296                  | -231                  | -436                  | -126                  | -289                | -89                               |
| <b>06/27/04</b> | -421                  | -275                  | -239                  | -450                  | -75                   | -292                | -92                               |
| <b>07/20/04</b> | -225                  | -22                   | -184                  | -422                  | -58                   | -182                | 18                                |
| <b>08/02/04</b> | -423                  | -29                   | -95                   | -376                  | 2                     | -184                | 16                                |
| <b>08/08/04</b> | -429                  | -77                   | -162                  | -399                  | -55                   | -224                | -24                               |
| <b>08/15/04</b> | -402                  | -107                  | -206                  | -435                  | 12                    | -228                | -28                               |
| <b>08/22/04</b> | -324                  | -97                   | -182                  | -409                  | -23                   | -207                | -7                                |
| <b>09/12/04</b> | -336                  | 48                    | -240                  | -415                  | -82                   | -205                | -5                                |

**Table A.2. Continued.**

| <b>Date</b>     | <b>NR09<br/>61-54</b> | <b>NR09<br/>61-57</b> | <b>NR09<br/>61-56</b> | <b>NR09<br/>61-55</b> | <b>NR09<br/>61-58</b> | <b>NR09<br/>AVG</b> | <b>NR09<br/>Corrected<br/>Avg</b> |
|-----------------|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|---------------------|-----------------------------------|
| <b>09/26/04</b> | -518                  | -209                  | -270                  | -437                  | -88                   | -304                | -104                              |
| <b>10/17/04</b> | -558                  | -229                  | -319                  | -475                  | -130                  | -342                | -92                               |
| <b>10/23/04</b> | -572                  | -240                  | -327                  | -462                  | -147                  | -350                | -100                              |
| <b>11/22/04</b> | -551                  | -189                  | -394                  | -477                  | -117                  | -346                | -96                               |
| <b>11/27/04</b> | -318                  | -55                   | -132                  | -228                  | -51                   | -157                | 93                                |
| <b>12/05/04</b> | -516                  | -241                  | -370                  | -365                  | -110                  | -320                | -70                               |
| <b>12/12/04</b> | -422                  | -112                  | -264                  | -487                  | -131                  | -283                | -33                               |
| <b>12/21/04</b> | -334                  | -264                  | -360                  | -490                  | -154                  | -320                | -70                               |

**Table A.2. Continued.**

| <b>Date</b>     | <b>NR12<br/>61-52</b> | <b>NR12<br/>61-50</b> | <b>NR12<br/>61-53</b> | <b>NR12<br/>61-59</b> | <b>NR12<br/>61-51</b> | <b>NR12<br/>AVG</b> | <b>NR12<br/>Corrected<br/>Avg</b> |
|-----------------|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|---------------------|-----------------------------------|
| <b>09/09/03</b> |                       |                       |                       |                       |                       |                     |                                   |
| <b>09/16/03</b> | -45                   | 30                    | -89                   | -309                  | -140                  | -111                | 89                                |
| <b>09/30/03</b> | -158                  | -203                  | -258                  | -412                  | -198                  | -246                | -46                               |
| <b>10/07/03</b> | -158                  | -214                  | -187                  | -402                  | -240                  | -240                | -40                               |
| <b>10/14/03</b> | -269                  | -238                  | -191                  | -395                  | -293                  | -277                | -77                               |
| <b>10/21/03</b> | -152                  | -218                  | -200                  | -411                  | -205                  | -237                | -37                               |
| <b>10/28/03</b> | -197                  | -174                  | -192                  | -406                  | -194                  | -233                | -33                               |
| <b>11/03/03</b> | -183                  | -199                  | -238                  | -411                  | -211                  | -248                | -48                               |
| <b>11/11/03</b> | -156                  | -197                  | -196                  | -411                  | -198                  | -232                | -32                               |
| <b>11/18/03</b> | -141                  | -180                  | -76                   | -380                  | -100                  | -175                | 25                                |
| <b>11/24/03</b> | -149                  | -194                  | -192                  | -415                  | -202                  | -230                | -30                               |
| <b>12/09/03</b> | -153                  | -194                  | -200                  | -421                  | -213                  | -236                | -36                               |
| <b>12/16/03</b> | -159                  | -182                  | -204                  | -421                  | -214                  | -236                | -36                               |
| <b>12/21/03</b> | -160                  | -188                  | -206                  | -421                  | -214                  | -238                | -38                               |
| <b>12/28/03</b> | -160                  | -195                  | -206                  | -419                  | -215                  | -239                | -39                               |
| <b>01/04/04</b> | -130                  | -206                  | -165                  | -403                  | -197                  | -220                | -20                               |
| <b>01/19/04</b> | -187                  | -144                  | -211                  | -422                  | -229                  | -239                | -39                               |
| <b>02/01/04</b> | -198                  | -150                  | -214                  | -425                  | -233                  | -244                | -44                               |
| <b>02/08/04</b> | -207                  | -152                  | -205                  | -412                  | -214                  | -238                | -38                               |
| <b>02/14/04</b> | -147                  | -146                  | -165                  | -315                  | -184                  | -191                | 9                                 |
| <b>02/22/04</b> | -254                  | -168                  | -215                  | -221                  | -424                  | -256                | -56                               |

**Table A.2. Continued.**

| <b>Date</b>     | <b>NR12<br/>61-52</b> | <b>NR12<br/>61-50</b> | <b>NR12<br/>61-53</b> | <b>NR12<br/>61-59</b> | <b>NR12<br/>61-51</b> | <b>NR12<br/>AVG</b> | <b>NR12<br/>Corrected<br/>Avg</b> |
|-----------------|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|---------------------|-----------------------------------|
| <b>02/28/04</b> | -222                  | -174                  | -217                  | -418                  | -227                  | -252                | -52                               |
| <b>03/07/04</b> | -280                  | -137                  | -223                  | -419                  | -225                  | -257                | -57                               |
| <b>03/12/04</b> | -245                  | -163                  | -210                  | -414                  | -224                  | -251                | -51                               |
| <b>03/20/04</b> | -252                  | -174                  | -212                  | -417                  | -225                  | -256                | -56                               |
| <b>03/28/04</b> | -260                  | -181                  | -214                  | -418                  | -233                  | -261                | -61                               |
| <b>04/04/04</b> | -265                  | -189                  | -219                  | -253                  | -243                  | -234                | -34                               |
| <b>04/10/04</b> | -256                  | -53                   | -220                  | -203                  | -247                  | -196                | 4                                 |
| <b>04/25/04</b> | -219                  | -69                   | -196                  | -104                  | -257                  | -169                | 31                                |
| <b>05/09/04</b> | -271                  | -70                   | -208                  | -168                  | -275                  | -198                | 2                                 |
| <b>05/16/04</b> | 32                    | -84                   | -157                  | -53                   | -259                  | -104                | 96                                |
| <b>05/23/04</b> | 257                   | -91                   | 338                   | -34                   | 58                    | 106                 | 306                               |
| <b>05/31/04</b> | 340                   | -103                  | 344                   | -41                   | 91                    | 126                 | 326                               |
| <b>06/06/04</b> | 301                   | -108                  | 351                   | -38                   | 122                   | 126                 | 326                               |
| <b>06/16/04</b> | 479                   | -68                   | 449                   | -51                   | -18                   | 158                 | 358                               |
| <b>06/27/04</b> | 496                   | -74                   | 500                   | -46                   | 107                   | 197                 | 397                               |
| <b>07/20/04</b> | 423                   | -3                    | 546                   | -17                   | 179                   | 226                 | 426                               |
| <b>08/02/04</b> | -138                  | -232                  | -255                  | -106                  | -187                  | -184                | 16                                |
| <b>08/08/04</b> | -158                  | -216                  | -213                  | -98                   | -212                  | -179                | 21                                |
| <b>08/15/04</b> | -139                  | -225                  | -285                  | -122                  | -301                  | -214                | -14                               |
| <b>08/22/04</b> | -136                  | -180                  | -248                  | -75                   | -263                  | -180                | 20                                |
| <b>09/12/04</b> | -161                  | -212                  | -151                  | -101                  | -170                  | -159                | 41                                |

**Table A.2. Continued.**

| <b>Date</b>     | <b>NR12<br/>61-52</b> | <b>NR12<br/>61-50</b> | <b>NR12<br/>61-53</b> | <b>NR12<br/>61-59</b> | <b>NR12<br/>61-51</b> | <b>NR12<br/>AVG</b> | <b>NR12<br/>Corrected<br/>Avg</b> |
|-----------------|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|---------------------|-----------------------------------|
| <b>09/26/04</b> | -211                  | 124                   | -14                   | -110                  | -193                  | -81                 | 119                               |
| <b>10/17/04</b> | -289                  | 33                    | -279                  | -224                  | -386                  | -229                | 21                                |
| <b>10/23/04</b> | -264                  | -215                  | -217                  | -76                   | -381                  | -231                | 19                                |
| <b>11/22/04</b> | -69                   | 56                    | 488                   | -138                  | -155                  | 36                  | 286                               |
| <b>11/27/04</b> | -64                   | -66                   | -23                   | -132                  | -63                   | -70                 | 180                               |
| <b>12/05/04</b> | -411                  | -275                  | 453                   | -257                  | -299                  | -158                | 92                                |
| <b>12/12/04</b> | -456                  | -338                  | 289                   | -179                  | -329                  | -203                | 47                                |
| <b>12/21/04</b> | -452                  | -210                  | 492                   | -138                  | -291                  | -120                | 130                               |

**Table A.2. Continued.**

| <b>Date</b>     | <b>NR13<br/>61-UT1</b> | <b>NR13<br/>61-UT2</b> | <b>NR13<br/>61-UT3</b> | <b>NR13<br/>61-UT4</b> | <b>NR13<br/>61-UT5</b> | <b>NR13<br/>AVG</b> | <b>NR13<br/>Corrected<br/>Avg</b> |
|-----------------|------------------------|------------------------|------------------------|------------------------|------------------------|---------------------|-----------------------------------|
| <b>09/09/03</b> | 139                    | -187                   | -377                   | -270                   | -388                   | -217                | -17                               |
| <b>09/16/03</b> |                        |                        |                        |                        |                        |                     |                                   |
| <b>09/30/03</b> | -246                   | -157                   | -178                   | -369                   | -422                   | -274                | -74                               |
| <b>10/07/03</b> | -221                   | -177                   | -448                   | -331                   | -408                   | -317                | -117                              |
| <b>10/14/03</b> | -275                   | -335                   | -450                   | -391                   | -405                   | -371                | -171                              |
| <b>10/21/03</b> | -233                   | -309                   | -482                   | -360                   | -432                   | -363                | -163                              |
| <b>10/28/03</b> | -330                   | -374                   | -450                   | -381                   | -401                   | -387                | -187                              |
| <b>11/03/03</b> | -152                   | -217                   | -485                   | -359                   | -442                   | -331                | -131                              |
| <b>11/11/03</b> | -196                   | -213                   | -481                   | -343                   | -283                   | -303                | -103                              |
| <b>11/18/03</b> | -89                    | -177                   | -386                   | -332                   | -123                   | -221                | -21                               |
| <b>11/24/03</b> | -183                   | -138                   | -486                   | -346                   | -103                   | -251                | -51                               |
| <b>12/09/03</b> | -171                   | -166                   | -484                   | -341                   | -262                   | -285                | -85                               |
| <b>12/16/03</b> | -104                   | -144                   | -483                   | -341                   | -353                   | -285                | -85                               |
| <b>12/21/03</b> | -129                   | -161                   | -481                   | -335                   | -376                   | -296                | -96                               |
| <b>12/28/03</b> | -135                   | -185                   | -482                   | -340                   | -398                   | -308                | -108                              |
| <b>01/04/04</b> | -132                   | -188                   | -476                   | -337                   | -411                   | -309                | -109                              |
| <b>01/19/04</b> | -118                   | -225                   | -463                   | -332                   | -412                   | -310                | -110                              |
| <b>02/01/04</b> | -144                   | -298                   | -439                   | -336                   | -139                   | -271                | -71                               |
| <b>02/08/04</b> | -136                   | -238                   | -428                   | -337                   | -275                   | -283                | -83                               |
| <b>02/14/04</b> | -137                   | -183                   | -414                   | -332                   | -308                   | -275                | -75                               |
| <b>02/22/04</b> | -135                   | -220                   | -405                   | -337                   | -333                   | -286                | -86                               |

**Table A.2. Continued.**

| <b>Date</b>     | <b>NR13<br/>61-UT1</b> | <b>NR13<br/>61-UT2</b> | <b>NR13<br/>61-UT3</b> | <b>NR13<br/>61-UT4</b> | <b>NR13<br/>61-UT5</b> | <b>NR13<br/>AVG</b> | <b>NR13<br/>Corrected<br/>Avg</b> |
|-----------------|------------------------|------------------------|------------------------|------------------------|------------------------|---------------------|-----------------------------------|
| <b>02/28/04</b> | -136                   | -202                   | -392                   | -303                   | -311                   | -269                | -69                               |
| <b>03/07/04</b> | -162                   | -88                    | -387                   | -337                   | -349                   | -265                | -65                               |
| <b>03/12/04</b> | -240                   | -170                   | -377                   | -334                   | -356                   | -295                | -95                               |
| <b>03/20/04</b> | -272                   | -182                   | -350                   | -336                   | -357                   | -299                | -99                               |
| <b>03/28/04</b> | -247                   | -177                   | -321                   | -321                   | -350                   | -283                | -83                               |
| <b>04/04/04</b> | -257                   | -156                   | -295                   | -283                   | -330                   | -264                | -64                               |
| <b>04/10/04</b> | -283                   | -173                   | -306                   | -310                   | -360                   | -286                | -86                               |
| <b>04/25/04</b> | -217                   | -135                   | -257                   | -278                   | -353                   | -248                | -48                               |
| <b>05/09/04</b> | -149                   | -140                   | -267                   | -295                   | -347                   | -240                | -40                               |
| <b>05/16/04</b> | 17                     | 10                     | 8                      | 24                     | 46                     | 21                  | 221                               |
| <b>05/23/04</b> | 161                    | 32                     | 13                     | -6                     | -15                    | 37                  | 237                               |
| <b>05/31/04</b> | 148                    | 33                     | 44                     | -17                    | -4                     | 41                  | 241                               |
| <b>06/06/04</b> | 141                    | 78                     | 32                     | -24                    | -11                    | 43                  | 243                               |
| <b>06/16/04</b> | 148                    | 204                    | 50                     | -9                     | -9                     | 77                  | 277                               |
| <b>06/27/04</b> | 119                    | 336                    | 62                     | -25                    | -18                    | 95                  | 295                               |
| <b>07/20/04</b> | 107                    | 321                    | 76                     | 60                     | -12                    | 110                 | 310                               |
| <b>08/02/04</b> | 235                    | 275                    | -83                    | -64                    | 18                     | 76                  | 276                               |
| <b>08/08/04</b> | -47                    | -96                    | -195                   | -329                   | -72                    | -148                | 52                                |
| <b>08/15/04</b> | -182                   | -115                   | -269                   | -330                   | -66                    | -192                | 8                                 |
| <b>08/22/04</b> | -105                   | -70                    | -240                   | -249                   | -5                     | -134                | 66                                |
| <b>09/12/04</b> | -322                   | -246                   | -324                   | -113                   | -149                   | -231                | -31                               |

**Table A.2. Continued.**

| <b>Date</b>     | <b>NR13<br/>61-UT1</b> | <b>NR13<br/>61-UT2</b> | <b>NR13<br/>61-UT3</b> | <b>NR13<br/>61-UT4</b> | <b>NR13<br/>61-UT5</b> | <b>NR13<br/>AVG</b> | <b>NR13<br/>Corrected<br/>Avg</b> |
|-----------------|------------------------|------------------------|------------------------|------------------------|------------------------|---------------------|-----------------------------------|
| <b>09/26/04</b> | -160                   | -141                   | -173                   | -253                   | -215                   | -188                | 12                                |
| <b>10/17/04</b> | -95                    | -43                    | -130                   | -122                   | -125                   | -103                | 147                               |
| <b>10/23/04</b> | -140                   | -62                    | -160                   | -134                   | -137                   | -127                | 123                               |
| <b>11/22/04</b> | -61                    | -31                    | 108                    | 94                     | -33                    | 15                  | 265                               |
| <b>11/27/04</b> | 1                      | -18                    | 96                     | 75                     | -40                    | 23                  | 273                               |
| <b>12/05/04</b> | -27                    | -43                    | -142                   | 15                     | -52                    | -50                 | 200                               |
| <b>12/12/04</b> | -69                    | -48                    | -110                   | -156                   | -74                    | -91                 | 159                               |
| <b>12/21/04</b> | -32                    | -47                    | -123                   | -149                   | -69                    | -84                 | 166                               |

**Table A.2. Continued.**

| <b>Date</b>     | <b>NR15<br/>61-27</b> | <b>NR15<br/>61-29</b> | <b>NR15<br/>61-30</b> | <b>NR15<br/>61-24</b> | <b>NR15<br/>61-21</b> | <b>NR16<br/>AVG</b> | <b>NR16<br/>Corrected<br/>Avg</b> |
|-----------------|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|---------------------|-----------------------------------|
| <b>09/09/03</b> | -348                  | -126                  | 98                    | -179                  | -403                  | -192                | 8                                 |
| <b>09/16/03</b> |                       |                       |                       |                       |                       |                     |                                   |
| <b>09/30/03</b> | -291                  | -56                   | -148                  | -185                  | -356                  | -207                | -7                                |
| <b>10/07/03</b> | -355                  | -135                  | -260                  | -140                  | -423                  | -263                | -63                               |
| <b>10/14/03</b> | -428                  | -217                  | -74                   | -145                  | -421                  | -257                | -57                               |
| <b>10/21/03</b> | -385                  | -281                  | -209                  | -236                  | -440                  | -310                | -110                              |
| <b>10/28/03</b> | -429                  | -385                  | -372                  | -373                  | -417                  | -395                | -195                              |
| <b>11/03/03</b> | -404                  | -246                  | -343                  | -230                  | -448                  | -334                | -134                              |
| <b>11/11/03</b> | -354                  | -303                  | -337                  | -238                  | -433                  | -333                | -133                              |
| <b>11/18/03</b> | -385                  | -233                  | -384                  | -184                  | -434                  | -324                | -124                              |
| <b>11/24/03</b> | -398                  | -236                  | -386                  | -222                  | -441                  | -337                | -137                              |
| <b>12/09/03</b> | -392                  | -480                  | -406                  | -236                  | -446                  | -392                | -192                              |
| <b>12/16/03</b> | -396                  | -482                  | -404                  | -222                  | -441                  | -389                | -189                              |
| <b>12/21/03</b> | -402                  | -479                  | -408                  | -229                  | -441                  | -392                | -192                              |
| <b>12/28/03</b> | -401                  | -476                  | -414                  | -234                  | -440                  | -393                | -193                              |
| <b>01/04/04</b> | -397                  | -374                  | -408                  | -228                  | -439                  | -369                | -169                              |
| <b>01/19/04</b> | -399                  | -472                  | -416                  | -240                  | -431                  | -392                | -192                              |
| <b>02/01/04</b> | -408                  | -483                  | -428                  | -244                  | -433                  | -399                | -199                              |
| <b>02/08/04</b> | -402                  | -479                  | -425                  | -226                  | -409                  | -388                | -188                              |
| <b>02/14/04</b> | -242                  | -340                  | -302                  | -139                  | -306                  | -266                | -66                               |
| <b>02/22/04</b> | -413                  | -481                  | -425                  | -242                  | -435                  | -399                | -199                              |

**Table A.2. Continued.**

| <b>Date</b>     | <b>NR15<br/>61-27</b> | <b>NR15<br/>61-29</b> | <b>NR15<br/>61-30</b> | <b>NR15<br/>61-24</b> | <b>NR15<br/>61-21</b> | <b>NR16<br/>AVG</b> | <b>NR16</b>              |
|-----------------|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|---------------------|--------------------------|
|                 |                       |                       |                       |                       |                       |                     | <b>Corrected<br/>Avg</b> |
| <b>02/28/04</b> | -419                  | -482                  | -422                  | -237                  | -434                  | -399                | -199                     |
| <b>03/07/04</b> | -414                  | -472                  | -419                  | -228                  | -434                  | -393                | -193                     |
| <b>03/12/04</b> | -415                  | -475                  | -422                  | -233                  | -434                  | -396                | -196                     |
| <b>03/20/04</b> | -416                  | -477                  | -425                  | -228                  | -441                  | -397                | -197                     |
| <b>03/28/04</b> | -419                  | -480                  | -431                  | -243                  | -442                  | -403                | -203                     |
| <b>04/04/04</b> | -418                  | -479                  | -445                  | -242                  | -444                  | -406                | -206                     |
| <b>04/10/04</b> | -413                  | -472                  | -436                  | -229                  | -441                  | -398                | -198                     |
| <b>04/25/04</b> | -404                  | -453                  | -433                  | -215                  | -436                  | -388                | -188                     |
| <b>05/09/04</b> | -367                  | -451                  | -415                  | -248                  | -439                  | -384                | -184                     |
| <b>05/16/04</b> | -409                  | -453                  | -429                  | -247                  | -438                  | -395                | -195                     |
| <b>05/23/04</b> | -355                  | -431                  | 68                    | 202                   | -438                  | -191                | 9                        |
| <b>05/31/04</b> | 157                   | 175                   | 20                    | 318                   | 8                     | 136                 | 336                      |
| <b>06/06/04</b> | 2                     | 238                   | 17                    | 333                   | -11                   | 116                 | 316                      |
| <b>06/16/04</b> | 52                    | 167                   | 147                   | 355                   | -4                    | 143                 | 343                      |
| <b>06/27/04</b> | 19                    | 280                   | 275                   | 486                   | 3                     | 213                 | 413                      |
| <b>07/20/04</b> | 283                   | 400                   | 453                   | 596                   | 5                     | 347                 | 547                      |
| <b>08/02/04</b> | 272                   | 292                   | 385                   | 139                   | -71                   | 203                 | 403                      |
| <b>08/08/04</b> | -350                  | -158                  | -212                  | -54                   | -110                  | -177                | 23                       |
| <b>08/15/04</b> | -330                  | -102                  | -286                  | -22                   | -88                   | -166                | 34                       |
| <b>08/22/04</b> | -297                  | -149                  | -259                  | -38                   | -67                   | -162                | 38                       |
| <b>09/12/04</b> | -153                  | -62                   | -80                   | -258                  | -104                  | -131                | 69                       |

**Table A.2. Continued.**

| <b>Date</b>     | <b>NR15<br/>61-27</b> | <b>NR15<br/>61-29</b> | <b>NR15<br/>61-30</b> | <b>NR15<br/>61-24</b> | <b>NR15<br/>61-21</b> | <b>NR16<br/>AVG</b> | <b>NR16<br/>Corrected<br/>Avg</b> |
|-----------------|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|---------------------|-----------------------------------|
| <b>09/26/04</b> | -333                  | -538                  | -42                   | -275                  | -282                  | -294                | -94                               |
| <b>10/17/04</b> | -336                  | -493                  | -265                  | -215                  | -200                  | -302                | -52                               |
| <b>10/23/04</b> | -334                  | -484                  | -282                  | -192                  | -197                  | -298                | -48                               |
| <b>11/22/04</b> | -47                   | -9                    | 46                    | 339                   | -56                   | 55                  | 305                               |
| <b>11/27/04</b> | -92                   | -103                  | -22                   | 138                   | -63                   | -28                 | 222                               |
| <b>12/05/04</b> | -121                  | -296                  | -256                  | -146                  | -100                  | -184                | 66                                |
| <b>12/12/04</b> | -137                  | -292                  | -318                  | -161                  | -128                  | -207                | 43                                |
| <b>12/21/04</b> | -140                  | -309                  | -272                  | -211                  | -126                  | -212                | 38                                |

**Table A.2. Continued.**

| <b>Date</b>     | <b>NR16<br/>61-36</b> | <b>NR16<br/>61-64</b> | <b>NR16<br/>61-32</b> | <b>NR16<br/>61-63</b> | <b>NR16<br/>61-66</b> | <b>NR16<br/>AVG</b> | <b>NR16<br/>Corrected<br/>Avg</b> |
|-----------------|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|---------------------|-----------------------------------|
| <b>09/09/03</b> |                       |                       |                       |                       |                       |                     |                                   |
| <b>09/16/03</b> |                       |                       |                       |                       |                       |                     |                                   |
| <b>09/30/03</b> | -243                  | -268                  | -464                  | -299                  | -250                  | -305                | -105                              |
| <b>10/07/03</b> | -331                  | -289                  | -471                  | -310                  | -270                  | -334                | -134                              |
| <b>10/14/03</b> | -264                  | -323                  | -430                  | -244                  | -313                  | -315                | -115                              |
| <b>10/21/03</b> | -328                  | -270                  | -448                  | -236                  | -134                  | -283                | -83                               |
| <b>10/28/03</b> | -272                  | -258                  | -389                  | -115                  | -232                  | -253                | -53                               |
| <b>11/03/03</b> | -340                  | -350                  | -448                  | -300                  | -212                  | -330                | -130                              |
| <b>11/11/03</b> | -334                  | -334                  | -456                  | -219                  | -197                  | -308                | -108                              |
| <b>11/18/03</b> | -271                  | -339                  | -448                  | -231                  | -231                  | -304                | -104                              |
| <b>11/24/03</b> | -313                  | -334                  | -447                  | -185                  | -111                  | -278                | -78                               |
| <b>12/09/03</b> | -443                  | -357                  | -450                  | -254                  | -236                  | -348                | -148                              |
| <b>12/16/03</b> | -421                  | -366                  | -440                  | -304                  | -256                  | -357                | -157                              |
| <b>12/21/03</b> | -436                  | -365                  | -435                  | -305                  | -228                  | -354                | -154                              |
| <b>12/28/03</b> | -396                  | -358                  | -432                  | -310                  | -239                  | -347                | -147                              |
| <b>01/04/04</b> | -358                  | -358                  | -411                  | -308                  | -244                  | -336                | -136                              |
| <b>01/19/04</b> | -336                  | -384                  | -406                  | -306                  | -254                  | -337                | -137                              |
| <b>02/01/04</b> | -316                  | -385                  | -393                  | -301                  | -253                  | -330                | -130                              |
| <b>02/08/04</b> | -299                  | -382                  | -372                  | -296                  | -253                  | -320                | -120                              |
| <b>02/14/04</b> | -207                  | -185                  | -318                  | -157                  | -130                  | -199                | 1                                 |
| <b>02/22/04</b> | -280                  | -384                  | -366                  | -274                  | -264                  | -314                | -114                              |

**Table A.2. Continued.**

| <b>Date</b>     | <b>NR16<br/>61-36</b> | <b>NR16<br/>61-64</b> | <b>NR16<br/>61-32</b> | <b>NR16<br/>61-63</b> | <b>NR16<br/>61-66</b> | <b>NR16<br/>AVG</b> | <b>NR16<br/>Corrected<br/>Avg</b> |
|-----------------|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|---------------------|-----------------------------------|
| <b>02/28/04</b> | -284                  | -376                  | -358                  | -266                  | -270                  | -311                | -111                              |
| <b>03/07/04</b> | -276                  | -196                  | -346                  | -221                  | -30                   | -214                | -14                               |
| <b>03/12/04</b> | -291                  | -327                  | -347                  | -278                  | -221                  | -293                | -93                               |
| <b>03/20/04</b> | -266                  | -349                  | -329                  | -278                  | -242                  | -293                | -93                               |
| <b>03/28/04</b> | -236                  | -357                  | -331                  | -287                  | -263                  | -295                | -95                               |
| <b>04/04/04</b> | -240                  | -356                  | -329                  | -284                  | -275                  | -297                | -97                               |
| <b>04/10/04</b> | -251                  | -352                  | -323                  | -283                  | -199                  | -282                | -82                               |
| <b>04/25/04</b> | -262                  | -307                  | -314                  | -255                  | -211                  | -270                | -70                               |
| <b>05/09/04</b> | -245                  | -312                  | -319                  | -290                  | -173                  | -268                | -68                               |
| <b>05/16/04</b> | -257                  | -285                  | -313                  | -260                  | -214                  | -266                | -66                               |
| <b>05/23/04</b> | -256                  | -319                  | -307                  | -305                  | -262                  | -290                | -90                               |
| <b>05/31/04</b> | -302                  | -196                  | 5                     | -284                  | -200                  | -195                | 5                                 |
| <b>06/06/04</b> | 142                   | 111                   | 7                     | -229                  | 138                   | 34                  | 234                               |
| <b>06/16/04</b> | -215                  | -162                  | -145                  | -243                  | -197                  | -192                | 8                                 |
| <b>06/27/04</b> | -212                  | 152                   | -99                   | -296                  | -72                   | -105                | 95                                |
| <b>07/20/04</b> | 220                   | 251                   | -31                   | 236                   | 241                   | 183                 | 383                               |
| <b>08/02/04</b> | -212                  | 29                    | -94                   | -170                  | -177                  | -125                | 75                                |
| <b>08/08/04</b> | -212                  | -57                   | -108                  | -212                  | -180                  | -154                | 46                                |
| <b>08/15/04</b> | -83                   | -162                  | -121                  | -248                  | -223                  | -167                | 33                                |
| <b>08/22/04</b> | -196                  | -155                  | -90                   | -228                  | -284                  | -191                | 9                                 |
| <b>09/12/04</b> | -180                  | -206                  | -169                  | -273                  | -204                  | -206                | -6                                |

**Table A.2. Continued.**

| <b>Date</b>     | <b>NR16<br/>61-36</b> | <b>NR16<br/>61-64</b> | <b>NR16<br/>61-32</b> | <b>NR16<br/>61-63</b> | <b>NR16<br/>61-66</b> | <b>NR16<br/>AVG</b> | <b>NR16<br/>Corrected<br/>Avg</b> |
|-----------------|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|---------------------|-----------------------------------|
| <b>09/26/04</b> | -391                  | -379                  | -326                  | -430                  | -391                  | -383                | -183                              |
| <b>10/17/04</b> | -283                  | -246                  | -279                  | -332                  | -283                  | -285                | -35                               |
| <b>10/23/04</b> | -300                  | -301                  | -403                  | -346                  | -307                  | -331                | -81                               |
| <b>11/22/04</b> | -306                  | -312                  | -405                  | -325                  | -298                  | -329                | -79                               |
| <b>11/27/04</b> | -214                  | -161                  | -383                  | -172                  | -102                  | -206                | 44                                |
| <b>12/05/04</b> | -294                  | -316                  | -370                  | -283                  | -288                  | -310                | -60                               |
| <b>12/12/04</b> | -308                  | -321                  | -406                  | -324                  | -280                  | -328                | -78                               |
| <b>12/21/04</b> | -305                  | -256                  | -400                  | -313                  | -296                  | -314                | -64                               |

**Table A.2. Continued.**

| <b>Date</b>     | <b>NR17<br/>61-75</b> | <b>NR17<br/>61-71</b> | <b>NR17<br/>61-76</b> | <b>NR17<br/>61-70</b> | <b>NR17<br/>61-74</b> | <b>NR17<br/>AVG</b> | <b>NR17<br/>Corrected<br/>Avg</b> |
|-----------------|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|---------------------|-----------------------------------|
| <b>09/09/03</b> |                       |                       |                       |                       |                       |                     |                                   |
| <b>09/16/03</b> |                       |                       |                       |                       |                       |                     |                                   |
| <b>09/30/03</b> | -154                  | -222                  | -40                   | -87                   | -84                   | -117                | 83                                |
| <b>10/07/03</b> | -416                  | -202                  | -228                  | -241                  | -180                  | -253                | -53                               |
| <b>10/14/03</b> | -428                  | -325                  | -378                  | -242                  | -302                  | -335                | -135                              |
| <b>10/21/03</b> | -431                  | -87                   | -267                  | -207                  | -199                  | -238                | -38                               |
| <b>10/28/03</b> | -386                  | -205                  | -295                  | -293                  | -287                  | -293                | -93                               |
| <b>11/03/03</b> | -410                  | -50                   | -217                  | -214                  | -176                  | -213                | -13                               |
| <b>11/11/03</b> | -404                  | -43                   | -227                  | -215                  | -181                  | -214                | -14                               |
| <b>11/18/03</b> | -360                  | -43                   | -220                  | -195                  | -175                  | -199                | 1                                 |
| <b>11/24/03</b> | -345                  | -10                   | -230                  | -205                  | -177                  | -193                | 7                                 |
| <b>12/09/03</b> | -324                  | -90                   | -230                  | -231                  | -182                  | -211                | -11                               |
| <b>12/16/03</b> | -318                  | -95                   | -222                  | -228                  | -185                  | -210                | -10                               |
| <b>12/21/03</b> | -301                  | -110                  | -172                  | -212                  | -180                  | -195                | 5                                 |
| <b>12/28/03</b> | -315                  | -104                  | -231                  | -225                  | -186                  | -212                | -12                               |
| <b>01/04/04</b> | -307                  | -119                  | -238                  | -214                  | -187                  | -213                | -13                               |
| <b>01/19/04</b> | -309                  | -116                  | -267                  | -242                  | -204                  | -228                | -28                               |
| <b>02/01/04</b> | -303                  | -132                  | -219                  | -231                  | -250                  | -227                | -27                               |
| <b>02/08/04</b> | -296                  | -166                  | -217                  | -243                  | -225                  | -229                | -29                               |
| <b>02/14/04</b> | -213                  | -80                   | -122                  | -113                  | -110                  | -128                | 72                                |
| <b>02/22/04</b> | -309                  | -190                  | -203                  | -308                  | -251                  | -252                | -52                               |

**Table A.2. Continued.**

| <b>Date</b>     | <b>NR17<br/>61-75</b> | <b>NR17<br/>61-71</b> | <b>NR17<br/>61-76</b> | <b>NR17<br/>61-70</b> | <b>NR17<br/>61-74</b> | <b>NR17<br/>AVG</b> | <b>NR17<br/>Corrected<br/>Avg</b> |
|-----------------|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|---------------------|-----------------------------------|
| <b>02/28/04</b> | -286                  | -179                  | -161                  | -316                  | -233                  | -235                | -35                               |
| <b>03/07/04</b> | -288                  | -198                  | -142                  | -237                  | -117                  | -196                | 4                                 |
| <b>03/12/04</b> | -314                  | -177                  | -192                  | -279                  | -227                  | -238                | -38                               |
| <b>03/20/04</b> | -302                  | -207                  | -183                  | -278                  | -240                  | -242                | -42                               |
| <b>03/28/04</b> | -306                  | -229                  | -191                  | -259                  | -234                  | -244                | -44                               |
| <b>04/04/04</b> | -304                  | -240                  | -194                  | -255                  | -232                  | -245                | -45                               |
| <b>04/10/04</b> | -279                  | -234                  | -182                  | -251                  | -251                  | -239                | -39                               |
| <b>04/25/04</b> | -238                  | -225                  | -151                  | -189                  | -236                  | -208                | -8                                |
| <b>05/09/04</b> | -289                  | -264                  | -161                  | -188                  | -234                  | -227                | -27                               |
| <b>05/16/04</b> | -290                  | -331                  | -144                  | 43                    | -2                    | -145                | 55                                |
| <b>05/23/04</b> | 16                    | -13                   | 107                   | 360                   | -5                    | 93                  | 293                               |
| <b>05/31/04</b> | 34                    | 13                    | 197                   | 417                   | 18                    | 136                 | 336                               |
| <b>06/06/04</b> | 46                    | 28                    | 236                   | 480                   | 34                    | 165                 | 365                               |
| <b>06/16/04</b> | 40                    | 26                    | 210                   | 531                   | 27                    | 167                 | 367                               |
| <b>06/27/04</b> | 67                    | 51                    | 202                   | 498                   | 72                    | 178                 | 378                               |
| <b>07/20/04</b> | 266                   | 22                    | 281                   | 496                   | 46                    | 222                 | 422                               |
| <b>08/02/04</b> | 215                   | 39                    | 140                   | 170                   | 68                    | 126                 | 326                               |
| <b>08/08/04</b> | -185                  | -65                   | -137                  | 127                   | -69                   | -66                 | 134                               |
| <b>08/15/04</b> | -182                  | -210                  | -252                  | -211                  | -236                  | -218                | -18                               |
| <b>08/22/04</b> | -45                   | -69                   | -126                  | 18                    | -26                   | -50                 | 150                               |
| <b>09/12/04</b> | -119                  | -119                  | -120                  | -63                   | -122                  | -109                | 91                                |

**Table A.2. Continued.**

| <b>Date</b>     | <b>NR17<br/>61-75</b> | <b>NR17<br/>61-71</b> | <b>NR17<br/>61-76</b> | <b>NR17<br/>61-70</b> | <b>NR17<br/>61-74</b> | <b>NR17<br/>AVG</b> | <b>NR17<br/>Corrected<br/>Avg</b> |
|-----------------|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|---------------------|-----------------------------------|
| <b>09/26/04</b> | 25                    | 1                     | -6                    | -141                  | 22                    | -20                 | 180                               |
| <b>10/17/04</b> | -68                   | -31                   | -115                  | -219                  | -32                   | -93                 | 157                               |
| <b>10/23/04</b> | -25                   | -11                   | -57                   | -214                  | -107                  | -83                 | 167                               |
| <b>11/22/04</b> | 7                     | -17                   | 4                     | 468                   | -28                   | 87                  | 337                               |
| <b>11/27/04</b> | -74                   | -112                  | -102                  | 231                   | -106                  | -33                 | 217                               |
| <b>12/05/04</b> | -103                  | -61                   | -61                   | 435                   | -90                   | 24                  | 274                               |
| <b>12/12/04</b> | -87                   | -162                  | -63                   | -33                   | -104                  | -90                 | 160                               |
| <b>12/21/04</b> | -50                   | -27                   | -36                   | -235                  | -105                  | -91                 | 159                               |

**Table A.3. Reference station water table depths (cm) from ground surface.**

| Date     | REF01         |               |               |               |                       | REF02         |               |               |               |                       |
|----------|---------------|---------------|---------------|---------------|-----------------------|---------------|---------------|---------------|---------------|-----------------------|
|          | REF01<br>PZ01 | REF01<br>PZ02 | REF01<br>PZ03 | REF01<br>PZ04 | SHALLOWEST<br>READING | REF02<br>PZ01 | REF02<br>PZ02 | REF02<br>PZ03 | REF02<br>PZ04 | SHALLOWEST<br>READING |
| 9/30/03  |               |               | -35           | -32           | -32                   | -5            | -6            | -2            | -5            | -2                    |
| 10/7/03  |               |               | -50           | -50           | -50                   | -19           | -21           | -16           | -16           | -16                   |
| 10/14/03 | -20           | -19           | -24           | -19           | -19                   | 4             | 2             | 5             | -2            | 5                     |
| 10/21/03 |               |               | -34           | -30           | -30                   | -4            | -5            | -1            | -3            | -1                    |
| 10/28/03 |               |               | -38           | -34           | -34                   | -7            | -8            | -10           | -11           | -7                    |
| 11/11/03 |               |               | -36           | -32           | -32                   | -5            | -7            | -6            | -5            | -5                    |
| 11/18/03 |               |               | -49           | -46           | -46                   | -15           | -16           | -15           | -13           | -13                   |
| 11/24/03 |               |               | -42           | -38           | -38                   | -15           | -10           | -7            | -11           | -7                    |
| 12/9/03  |               |               | -31           | -27           | -27                   | -2            | -4            | -2            | -4            | -2                    |
| 12/16/03 | -16           | -14           | -19           | -16           | -14                   | 9             | 5             | 7             | 3             | 9                     |
| 12/21/03 | -25           | -23           | -28           | -24           | -23                   | 1             | -2            | -1            | 1             | 1                     |
| 12/28/03 | -21           | -20           | -23           | -21           | -20                   | 3             | 1             | 3             | 2             | 3                     |
| 1/4/04   |               |               | -31           | -29           | -29                   | -5            | -7            | -4            | -1            | -1                    |
| 1/19/04  |               |               | -33           | -29           | -29                   | -2            | -4            | -4            | -7            | -2                    |
| 2/1/04   |               |               | -35           | -32           | -32                   | -4            | -6            | -5            | -6            | -4                    |
| 2/8/04   |               |               | -42           | -38           | -38                   | -9            | -11           | -10           | -9            | -9                    |
| 2/14/04  |               |               | -31           | -26           | -26                   | -1            | -3            | -2            | -9            | -1                    |
| 2/22/04  |               |               | -32           | -32           | -32                   | -1            | -3            | -3            | -3            | -1                    |
| 2/28/04  | -24           | -23           | -27           | -23           | -23                   | 3             | 1             | 1             | 1             | 3                     |
| 3/7/04   |               |               | -37           | -33           | -33                   | -5            | -7            | -7            | -4            | -4                    |

**Table A.3. Continued.**

| Date    | REF01         |               |               |               |                       | REF02         |               |               |               |                       |
|---------|---------------|---------------|---------------|---------------|-----------------------|---------------|---------------|---------------|---------------|-----------------------|
|         | REF01<br>PZ01 | REF01<br>PZ02 | REF01<br>PZ03 | REF01<br>PZ04 | SHALLOWEST<br>READING | REF02<br>PZ01 | REF02<br>PZ02 | REF02<br>PZ03 | REF02<br>PZ04 | SHALLOWEST<br>READING |
| 3/12/04 |               |               | -36           | -32           | -32                   | -5            | -6            | -6            | -8            | -5                    |
| 3/20/04 |               |               | -30           | -26           | -26                   | -1            | -2            | -1            | -4            | -1                    |
| 3/28/04 |               |               | -44           | -40           | -40                   | -11           | -12           | -12           | -9            | -9                    |
| 4/4/04  |               |               | -48           | -44           | -44                   | -14           | -16           | -13           | -9            | -9                    |
| 4/10/04 |               |               | -57           | -54           | -54                   | -22           | -23           | -23           | -19           | -19                   |
| 4/25/04 |               |               | -63           | -59           | -59                   |               |               | -27           | -21           | -27                   |
| 5/9/04  |               |               | -77           | -73           | -73                   |               |               | -39           | -33           | -33                   |
| 5/16/04 |               |               | -98           | -100          | -98                   |               |               | -91           | -60           | -60                   |
| 5/23/04 |               |               |               |               |                       |               |               | -88           | -86           | -86                   |
| 5/31/04 |               |               | -101          | -101          | -101                  |               |               | -88           | -93           | -88                   |
| 6/6/04  |               |               |               |               |                       |               |               |               |               |                       |
| 6/16/04 |               |               |               |               |                       |               |               |               |               |                       |
| 6/27/04 |               |               |               |               |                       |               |               |               |               |                       |
| 7/20/04 |               |               |               |               |                       |               |               |               |               |                       |
| 8/2/04  |               |               |               |               |                       |               |               |               | -95           | -95                   |
| 8/8/04  |               |               | -43           | -40           | -40                   | -9            | -10           | -11           | -13           | -9                    |
| 8/15/04 | -13           | -12           | -17           | -12           | -12                   | 9             | 7             | 8             | 6             | 9                     |
| 8/22/04 |               |               | -40           | -36           | -36                   | -9            | -10           | -5            | -13           | -5                    |
| 9/3/04  |               |               |               |               |                       |               |               |               |               |                       |
| 9/12/04 |               |               | -56           | -53           | -53                   | -19           | -19           | -20           | -22           | -19                   |

**Table A.3. Continued.**

| <b>Date</b>     | <b>REF01</b>          |                       |                       |                       |                               | <b>REF02</b>          |                       |                       |                       |                               |     |
|-----------------|-----------------------|-----------------------|-----------------------|-----------------------|-------------------------------|-----------------------|-----------------------|-----------------------|-----------------------|-------------------------------|-----|
|                 | <b>REF01<br/>PZ01</b> | <b>REF01<br/>PZ02</b> | <b>REF01<br/>PZ03</b> | <b>REF01<br/>PZ04</b> | <b>SHALLOWEST<br/>READING</b> | <b>REF02<br/>PZ01</b> | <b>REF02<br/>PZ02</b> | <b>REF02<br/>PZ03</b> | <b>REF02<br/>PZ04</b> | <b>SHALLOWEST<br/>READING</b> |     |
| <b>9/18/04</b>  |                       |                       | -83                   | -83                   | -83                           |                       |                       |                       | -80                   | -79                           | -79 |
| <b>9/26/04</b>  |                       |                       | -98                   | -97                   | -97                           |                       |                       |                       | -58                   | -60                           | -58 |
| <b>10/12/04</b> |                       |                       | -76                   | -75                   | -75                           |                       |                       |                       | -84                   | -82                           | -82 |
| <b>10/17/04</b> |                       |                       |                       | -97                   | -97                           |                       |                       |                       | -56                   | -58                           | -56 |
| <b>10/23/04</b> |                       |                       | -85                   | -80                   | -80                           |                       |                       |                       | -41                   | -43                           | -41 |
| <b>11/22/04</b> |                       |                       |                       |                       |                               |                       |                       |                       | -64                   | -66                           | -64 |
| <b>11/27/04</b> |                       |                       | -66                   | -62                   | -62                           |                       |                       |                       | -28                   | -29                           | -28 |
| <b>12/5/04</b>  |                       |                       | -51                   | -47                   | -47                           | -17                   | -17                   |                       | -18                   | -20                           | -17 |
| <b>12/12/04</b> |                       |                       | -51                   | -47                   | -47                           | -17                   | -17                   |                       | -19                   | -21                           | -17 |
| <b>12/21/04</b> |                       |                       | -60                   | -55                   | -55                           | -23                   | -25                   |                       | -26                   | -27                           | -23 |

**Table A.3. Continued.**

| Date     | REF05         |               |               |               |                       | REF06         |               |               |               |                       |
|----------|---------------|---------------|---------------|---------------|-----------------------|---------------|---------------|---------------|---------------|-----------------------|
|          | REF05<br>PZ01 | REF05<br>PZ02 | REF05<br>PZ03 | REF05<br>PZ04 | SHALLOWEST<br>READING | REF06<br>PZ01 | REF06<br>PZ02 | REF06<br>PZ03 | REF06<br>PZ04 | SHALLOWEST<br>READING |
| 9/30/03  | 6             | 6             | 6             | 6             | 6                     | -17           |               | -20           | -20           | -20                   |
| 10/7/03  | -7            | -5            | -5            | -8            | -5                    |               |               | -34           | -34           | -34                   |
| 10/14/03 | 9             | 9             | 9             | 9             | 9                     | -10           | -11           | -12           | -12           | -10                   |
| 10/21/03 | 6             | 6             | 6             | 6             | 6                     | -16           | -15           | -19           | -19           | -15                   |
| 10/28/03 | 2             | 5             | 0             |               | 5                     | -20           | -18           | -23           | -22           | -18                   |
| 11/11/03 | 5             | 7             | 6             | 5             | 5                     | -18           | -17           | -24           | -23           | -17                   |
| 11/18/03 | -3            | -3            | -1            | -5            | -1                    |               |               | -31           | -31           | -31                   |
| 11/24/03 | -1            | 2             | 1             | 4             | 4                     | -21           | -21           | -26           | -26           | -21                   |
| 12/9/03  | 11            | 7             | 9             | 7             | 11                    | -14           | -13           | -19           | -18           | -13                   |
| 12/16/03 | 9             | 9             | 9             | 9             | 9                     | -8            | -8            | -13           | -12           | -8                    |
| 12/21/03 | 10            | 12            | 14            | 9             | 9                     | -13           | -12           | -17           | -17           | -12                   |
| 12/28/03 | 11            | 13            | 13            | 12            | 13                    | -12           | -10           | -16           | -16           | -10                   |
| 1/4/04   | 4             | 9             | 5             | 6             | 9                     | -16           | -15           | -21           | -21           | -15                   |
| 1/19/04  | 5             | 7             | 7             | 6             | 7                     | -16           | -15           | -20           | -20           | -15                   |
| 2/1/04   | 5             | 7             | 7             | 6             | 7                     | -18           | -17           | -22           | -22           | -17                   |
| 2/8/04   | 0             | 3             | 1             | -1            | 3                     | -22           | -21           | -26           | -26           | -21                   |
| 2/14/04  | 7             | 10            | 8             | 8             | 10                    | -15           | -13           | -20           | -19           | -13                   |
| 2/22/04  | 7             | 9             | 8             | 7             | 9                     | -16           | -14           | -20           | -20           | -14                   |
| 2/28/04  | 10            | 12            | 10            | 9             | 12                    | -4            | -2            | -17           | -17           | -2                    |
| 3/7/04   | 2             | 6             | 3             | 3             | 6                     | -20           | -19           | -24           | -24           | -19                   |

**Table A.3. Continued.**

| Date    | REF05         |               |               |               |                       | REF06         |               |               |               |                       |
|---------|---------------|---------------|---------------|---------------|-----------------------|---------------|---------------|---------------|---------------|-----------------------|
|         | REF05<br>PZ01 | REF05<br>PZ02 | REF05<br>PZ03 | REF05<br>PZ04 | SHALLOWEST<br>READING | REF06<br>PZ01 | REF06<br>PZ02 | REF06<br>PZ03 | REF06<br>PZ04 | SHALLOWEST<br>READING |
| 3/12/04 | 3             | 5             | 4             | 3             | 5                     | -19           | -18           | -24           | -23           | -18                   |
| 3/20/04 | 7             | 9             | 8             | 7             | 9                     | -16           | -15           | -20           | -20           | -15                   |
| 3/28/04 | -2            | 1             | -1            | -3            | 1                     | -23           | -23           | -29           | -29           | -23                   |
| 4/4/04  | -5            | -3            | -5            | -7            | -3                    |               |               | -33           | -32           | -32                   |
| 4/10/04 | -13           | -11           | -13           | -15           | -11                   |               |               | -40           | -40           | -40                   |
| 4/25/04 | -14           | -15           | -14           | -17           | -14                   |               |               | -43           | -42           | -42                   |
| 5/9/04  | -23           | -19           | -24           | -26           | -19                   |               |               | -51           | -51           | -51                   |
| 5/16/04 |               |               | -47           | -49           | -47                   |               |               | -72           | -72           | -72                   |
| 5/23/04 |               |               | -71           | -74           | -71                   |               |               | -95           | -95           | -95                   |
| 5/31/04 |               |               | -88           | -96           | -88                   |               |               | -98           | -98           | -98                   |
| 6/6/04  |               |               |               |               |                       |               |               |               |               |                       |
| 6/16/04 |               |               |               |               |                       |               |               |               |               |                       |
| 6/27/04 |               |               |               |               |                       |               |               |               |               |                       |
| 7/20/04 |               |               |               |               |                       |               |               |               |               |                       |
| 8/2/04  |               |               | -86           | -90           | -86                   |               |               |               |               |                       |
| 8/8/04  | -1            | 2             | 1             | -3            | 2                     | -22           | -23           | -29           | -29           | -22                   |
| 8/15/04 | 16            | 17            | 15            | 14            | 17                    | -8            | -6            | -12           | -12           | -6                    |
| 8/22/04 | 3             | 4             | 3             | 3             | 4                     | -21           | -19           | -25           | -25           | -19                   |
| 9/3/04  |               |               |               |               |                       |               |               |               |               |                       |
| 9/12/04 | -9            | -7            | -9            | -11           | -7                    |               |               | -36           | -36           | -36                   |

**Table A.3. Continued.**

| <b>Date</b>     | <b>REF05</b>          |                       |                       |                       |                               | <b>REF06</b>          |                       |                       |                       |                               |
|-----------------|-----------------------|-----------------------|-----------------------|-----------------------|-------------------------------|-----------------------|-----------------------|-----------------------|-----------------------|-------------------------------|
|                 | <b>REF05<br/>PZ01</b> | <b>REF05<br/>PZ02</b> | <b>REF05<br/>PZ03</b> | <b>REF05<br/>PZ04</b> | <b>SHALLOWEST<br/>READING</b> | <b>REF06<br/>PZ01</b> | <b>REF06<br/>PZ02</b> | <b>REF06<br/>PZ03</b> | <b>REF06<br/>PZ04</b> | <b>SHALLOWEST<br/>READING</b> |
| <b>9/18/04</b>  |                       |                       | -83                   | -81                   | -81                           |                       |                       | -82                   | -84                   | -82                           |
| <b>9/26/04</b>  |                       |                       | -37                   | -41                   | -37                           |                       |                       | -65                   | -64                   | -64                           |
| <b>10/12/04</b> |                       |                       | -72                   | -74                   | -72                           |                       |                       | -83                   | -86                   | -83                           |
| <b>10/17/04</b> |                       |                       | -40                   | -40                   | -40                           |                       |                       | -55                   | -64                   | -55                           |
| <b>10/23/04</b> |                       |                       | -30                   | -33                   | -30                           |                       |                       | -55                   | -55                   | -55                           |
| <b>11/22/04</b> |                       |                       | -50                   | -53                   | -50                           |                       |                       | -75                   | -75                   | -75                           |
| <b>11/27/04</b> | -18                   | -15                   | -18                   | -19                   | -15                           |                       |                       | -44                   | -44                   | -44                           |
| <b>12/5/04</b>  | -6                    | -2                    | -4                    | -8                    | -2                            |                       |                       | -34                   | -34                   | -34                           |
| <b>12/12/04</b> | -5                    | -2                    | -4                    | -7                    | -2                            |                       |                       | -34                   | -34                   | -34                           |
| <b>12/21/04</b> | -12                   | -9                    | -9                    | -14                   | -9                            |                       |                       | -39                   | -39                   | -39                           |

**Table A.4. Treatment station water table depths (cm) from ground surface.**

| <b>Date</b>     | <b>NR01</b>          |                      |                      |                      |                               | <b>NR02</b>          |                      |                      |                      |                               |
|-----------------|----------------------|----------------------|----------------------|----------------------|-------------------------------|----------------------|----------------------|----------------------|----------------------|-------------------------------|
|                 | <b>NR01<br/>PZ01</b> | <b>NR01<br/>PZ02</b> | <b>NR01<br/>PZ03</b> | <b>NR01<br/>PZ04</b> | <b>SHALLOWEST<br/>READING</b> | <b>NR02<br/>PZ01</b> | <b>NR02<br/>PZ02</b> | <b>NR02<br/>PZ03</b> | <b>NR02<br/>PZ04</b> | <b>SHALLOWEST<br/>READING</b> |
| <b>9/30/03</b>  | -15.3                | -13.7                | -14.5                | -13.8                | -13.7                         |                      |                      | -20.8                | -22.9                | -18.8                         |
| <b>10/7/03</b>  |                      |                      | -42.5                | -41.8                | -41.8                         |                      |                      | -44.8                | -46.9                | -44.8                         |
| <b>10/14/03</b> | -5.8                 | -0.7                 | -4.5                 | -0.3                 | -0.3                          |                      |                      | -1.3                 | -3.4                 | 0.4                           |
| <b>10/21/03</b> | -17.8                | -15.7                | -16.5                | -15.8                | -15.7                         | -19.1                | -19.8                | -22.3                | -24.4                | -19.1                         |
| <b>10/28/03</b> | -10.8                | -8.7                 | -11.5                | -9.3                 | -8.7                          | -14.6                | -14.3                | -17.3                | -19.4                | -14.3                         |
| <b>11/11/03</b> | -13.0                | -12.8                | -12.9                | -12.4                | -12.4                         | -15.6                | -16.1                | -18.7                | -20.9                | -15.6                         |
| <b>11/18/03</b> |                      |                      | -30.5                | -28.8                | -28.8                         |                      |                      | -36.8                | -36.4                | -36.4                         |
| <b>11/24/03</b> | -13.8                | -12.7                | -9.0                 | -12.3                | -9.0                          | -15.1                | -16.3                | -19.3                | -21.4                | -15.1                         |
| <b>12/9/03</b>  | -9.8                 | -4.7                 | -4.5                 | -3.8                 | -3.8                          | -7.6                 | -7.8                 | -10.8                | -12.4                | -7.6                          |
| <b>12/16/03</b> | -2.8                 | -0.7                 | 0.5                  | 0.2                  | 0.5                           | 0.4                  | 0.2                  | -2.8                 | -4.4                 | 0.2                           |
| <b>12/21/03</b> | -4.8                 | -4.7                 | -2.5                 | -3.8                 | -2.5                          | -7.6                 | -7.8                 | -11.8                | -13.4                | -7.6                          |
| <b>12/28/03</b> | -7.8                 | -3.7                 | -5.5                 | -2.8                 | -2.8                          | -5.1                 | -5.3                 | -8.3                 | -9.9                 | -5.1                          |
| <b>1/4/04</b>   | -10.7                | -8.6                 | -8.4                 | -6.4                 | -6.4                          | -11.8                | -12.0                | -14.1                | -17.3                | -11.8                         |
| <b>1/19/04</b>  | -7.8                 | -4.7                 | -5.5                 | -3.8                 | -3.8                          | -7.6                 | -7.8                 | -10.8                | -12.9                | -7.6                          |
| <b>2/1/04</b>   | -9.8                 | -8.7                 | -13.5                | -13.8                | -8.7                          | -8.6                 | -9.8                 | -7.8                 | -9.4                 | -7.8                          |
| <b>2/8/04</b>   | -8.8                 | -6.7                 | -7.5                 | -6.8                 | -6.7                          | -10.6                | -10.8                | -13.8                | -16.4                | -10.6                         |
| <b>2/14/04</b>  | -4.8                 | -0.7                 | -2.5                 | 0.2                  | 0.2                           | 1.4                  | 1.2                  | -2.8                 | -4.4                 | 1.4                           |
| <b>2/22/04</b>  | -6.8                 | -3.7                 | -5.5                 | -2.8                 | -2.8                          | -6.6                 | -6.8                 | -9.8                 | -11.4                | -6.6                          |
| <b>2/28/04</b>  | -2.8                 | -1.7                 | -4.5                 | -0.8                 | -0.8                          | -2.6                 | -2.8                 | -6.8                 | -8.4                 | -2.6                          |

**Table A.4. Continued.**

| <b>Date</b>    | <b>NR01</b>          |                      |                      |                      |                               | <b>NR02</b>          |                      |                      |                      |                               |
|----------------|----------------------|----------------------|----------------------|----------------------|-------------------------------|----------------------|----------------------|----------------------|----------------------|-------------------------------|
|                | <b>NR01<br/>PZ01</b> | <b>NR01<br/>PZ02</b> | <b>NR01<br/>PZ03</b> | <b>NR01<br/>PZ04</b> | <b>SHALLOWEST<br/>READING</b> | <b>NR02<br/>PZ01</b> | <b>NR02<br/>PZ02</b> | <b>NR02<br/>PZ03</b> | <b>NR02<br/>PZ04</b> | <b>SHALLOWEST<br/>READING</b> |
| <b>3/7/04</b>  | -10.3                | -8.7                 | -8.5                 | -7.8                 | -7.8                          | -11.1                | -11.3                | -14.3                | -16.4                | -11.1                         |
| <b>3/12/04</b> | -6.8                 | -5.7                 | -6.5                 | -4.8                 | -4.8                          | -9.6                 | -8.8                 | -12.8                | -14.4                | -8.8                          |
| <b>3/20/04</b> | -8.3                 | -2.7                 | -3.0                 | -1.8                 | -1.8                          | -4.6                 | -4.8                 | -7.8                 | -9.9                 | -4.6                          |
| <b>3/28/04</b> | -18.8                | -16.7                | -19.0                | -16.8                | -16.7                         | -19.1                | -19.3                | -22.8                | -24.9                | -19.1                         |
| <b>4/4/04</b>  | -19.8                | -17.7                | -18.5                | -18.3                | -17.7                         | -20.6                | -20.8                | -24.3                | -26.4                | -20.6                         |
| <b>4/10/04</b> |                      |                      | -37.5                | -36.8                | -36.8                         |                      |                      | -41.3                | -43.4                | -41.3                         |
| <b>4/25/04</b> |                      |                      | -37.5                | -36.8                | -36.8                         |                      |                      | -41.3                | -43.4                | -41.3                         |
| <b>5/9/04</b>  |                      |                      | -42.0                | -41.3                | -41.3                         |                      |                      | -46.8                | -49.4                | -46.8                         |
| <b>5/16/04</b> |                      |                      | -71.5                | -70.8                | -70.8                         |                      |                      | -77.8                | -79.9                | -77.8                         |
| <b>5/23/04</b> |                      |                      | -87.5                | -85.8                | -85.8                         |                      |                      | -91.8                | -94.4                | -91.8                         |
| <b>5/31/04</b> |                      |                      | -97.5                | -95.8                | -95.8                         |                      |                      | -97.8                | -99.4                | -97.8                         |
| <b>6/6/04</b>  |                      |                      |                      |                      |                               |                      |                      |                      |                      |                               |
| <b>6/16/04</b> |                      |                      |                      |                      |                               |                      |                      |                      |                      |                               |
| <b>6/27/04</b> |                      |                      |                      |                      |                               |                      |                      |                      |                      |                               |
| <b>7/20/04</b> |                      |                      |                      |                      |                               |                      |                      |                      |                      |                               |
| <b>8/2/04</b>  | -23.8                | -20.7                | -23.0                | -22.3                | -20.7                         | -22.6                | -23.3                | -26.3                | -28.4                | -22.6                         |
| <b>8/8/04</b>  | -4.8                 | -2.7                 | -3.5                 | -2.3                 | -2.3                          | -5.6                 | -5.8                 | -8.8                 | -10.4                | -5.6                          |
| <b>8/15/04</b> | -2.8                 | 0.8                  | -0.5                 | -17.8                | 0.8                           | 7.4                  | 6.2                  | 5.2                  | 2.6                  | 7.4                           |
| <b>8/22/04</b> | -15.3                | -13.7                | -14.5                | -13.8                | -13.7                         | -15.6                | -16.8                | -20.3                | -22.4                | -15.6                         |

**Table A.4. Continued.**

| <b>Date</b>     | <b>NR01</b>          |                      |                      |                      |                               | <b>NR02</b>          |                      |                      |                      |                               |
|-----------------|----------------------|----------------------|----------------------|----------------------|-------------------------------|----------------------|----------------------|----------------------|----------------------|-------------------------------|
|                 | <b>NR01<br/>PZ01</b> | <b>NR01<br/>PZ02</b> | <b>NR01<br/>PZ03</b> | <b>NR01<br/>PZ04</b> | <b>SHALLOWEST<br/>READING</b> | <b>NR02<br/>PZ01</b> | <b>NR02<br/>PZ02</b> | <b>NR02<br/>PZ03</b> | <b>NR02<br/>PZ04</b> | <b>SHALLOWEST<br/>READING</b> |
| <b>9/3/04</b>   |                      |                      |                      |                      |                               |                      |                      |                      |                      |                               |
| <b>9/12/04</b>  | -18.8                | -16.7                | -17.5                | -16.3                | -16.3                         | -21.1                | -21.3                | -24.8                | -26.9                | -21.1                         |
| <b>9/18/04</b>  |                      |                      | -86.5                | -83.8                | -83.8                         |                      |                      | -80.8                | -84.4                | -80.8                         |
| <b>9/26/04</b>  |                      |                      | -58.5                | -57.8                | -57.8                         |                      |                      | -62.8                | -64.4                | -62.8                         |
| <b>10/12/04</b> |                      |                      | -86.5                | -84.8                | -84.8                         |                      |                      | -85.8                | -89.4                | -85.8                         |
| <b>10/17/04</b> |                      |                      | -22.5                | -31.8                | -22.5                         |                      |                      | -37.8                | -39.4                | -37.8                         |
| <b>10/23/04</b> |                      |                      | -39.5                | -38.8                | -38.8                         |                      |                      | -45.3                | -46.9                | -45.3                         |
| <b>11/22/04</b> |                      |                      | -63.5                | -69.8                | -63.5                         |                      |                      | -78.3                | -80.0                | -78.3                         |
| <b>11/27/04</b> | -13.8                | -11.2                | -17.5                | -11.8                | -11.2                         | -18.6                | -18.8                | -22.8                | -24.4                | -18.6                         |
| <b>12/5/04</b>  | -17.8                | -15.7                | -18.5                | -14.8                | -14.8                         | -17.6                | -18.3                | -20.8                | -23.9                | -17.6                         |
| <b>12/12/04</b> | -8.3                 | -6.2                 | -9.5                 | -6.8                 | -6.2                          | -9.6                 | -9.8                 | -13.8                | -15.4                | -9.6                          |
| <b>12/21/04</b> | -16.8                | -15.7                | -18.0                | -13.8                | -13.8                         | -17.6                | -18.3                | -22.8                | -24.4                | -17.6                         |

**Table A.4. Continued.**

| <b>Date</b>     | <b>NR03</b>          |                      |                      |                      |                               | <b>NR06</b>          |                      |                      |                      |                               |
|-----------------|----------------------|----------------------|----------------------|----------------------|-------------------------------|----------------------|----------------------|----------------------|----------------------|-------------------------------|
|                 | <b>NR03<br/>PZ01</b> | <b>NR03<br/>PZ02</b> | <b>NR03<br/>PZ03</b> | <b>NR03<br/>PZ04</b> | <b>SHALLOWEST<br/>READING</b> | <b>NR06<br/>PZ01</b> | <b>NR06<br/>PZ02</b> | <b>NR06<br/>PZ03</b> | <b>NR06<br/>PZ04</b> | <b>SHALLOWEST<br/>READING</b> |
| <b>9/30/03</b>  | -13.3                | -18.7                | -18.0                | -16.5                | -13.3                         | -14.0                | -13.5                | -20.1                | -18.6                | -13.5                         |
| <b>10/7/03</b>  |                      |                      | -44.0                | -42.5                | -42.5                         | -24.0                | -31.0                | -49.1                | -46.6                | -24.0                         |
| <b>10/14/03</b> | -1.8                 | -3.2                 | -2.0                 | -0.5                 | -0.5                          | -0.5                 | 1.0                  | -8.6                 | -6.6                 | 1.0                           |
| <b>10/21/03</b> | -18.8                | -22.7                | -22.0                | -20.5                | -18.8                         | -19.0                | -18.0                | -26.1                | -23.6                | -18.0                         |
| <b>10/28/03</b> | -9.8                 | -12.7                | -10.0                | -8.5                 | -8.5                          | -7.0                 | -6.0                 | -13.1                | -11.6                | -6.0                          |
| <b>11/11/03</b> |                      | -18.4                | -16.8                | -15.9                | -15.9                         | -16.6                | -15.4                | -23.1                | -20.8                | -15.4                         |
| <b>11/18/03</b> |                      |                      | -34.0                | -32.5                | -32.5                         |                      |                      | -42.1                | -43.6                | -42.1                         |
| <b>11/24/03</b> | -15.8                | -18.2                | -15.0                | -19.5                | -15.0                         | -20.5                | -20.0                | -26.6                | -24.6                | -20.0                         |
| <b>12/9/03</b>  | -6.8                 | -9.7                 | -6.5                 | -5.5                 | -5.5                          | -6.0                 | -6.0                 | -12.6                | -10.6                | -6.0                          |
| <b>12/16/03</b> | -1.8                 | -3.7                 | -2.0                 | 0.5                  | 0.5                           | 0.0                  | 1.0                  | -6.1                 | -3.6                 | 1.0                           |
| <b>12/21/03</b> | -6.8                 | -8.7                 | -6.0                 | -5.5                 | -5.5                          | -5.0                 | -3.0                 | -10.1                | -7.6                 | -3.0                          |
| <b>12/28/03</b> | -4.8                 | -7.2                 | -4.5                 | -3.5                 | -3.5                          | -2.5                 | -2.5                 | -9.1                 | -6.6                 | -2.5                          |
| <b>1/4/04</b>   | -12.3                | -15.0                | -12.6                | -12.2                | -12.2                         | -5.8                 | -5.3                 | -14.8                | -15.1                | -5.3                          |
| <b>1/19/04</b>  | -5.3                 | -7.7                 | -5.0                 | -4.0                 | -4.0                          | -6.0                 | -5.0                 | -11.1                | -9.1                 | -5.0                          |
| <b>2/1/04</b>   | -8.8                 | -10.7                | -8.0                 | -2.5                 | -2.5                          | -9.0                 | -8.0                 | -15.1                | -12.6                | -8.0                          |
| <b>2/8/04</b>   | -10.8                | -12.7                | -10.0                | -9.5                 | -9.5                          | -9.0                 | -8.0                 | -14.1                | -12.6                | -8.0                          |
| <b>2/14/04</b>  | 0.2                  | -2.7                 | -1.0                 | 0.5                  | 0.5                           |                      |                      |                      |                      |                               |
| <b>2/22/04</b>  | -5.8                 | -8.7                 | -6.0                 | -5.5                 | -5.5                          | -4.0                 | -3.0                 | -10.1                | -7.6                 | -3.0                          |
| <b>2/28/04</b>  | -2.8                 | -5.7                 | -3.0                 | -1.5                 | -1.5                          | -2.0                 | -1.0                 | -8.1                 | -5.6                 | -1.0                          |

**Table A.4. Continued.**

| <b>Date</b>    | <b>NR03</b>          |                      |                      |                      |                               | <b>NR06</b>          |                      |                      |                      |                               |
|----------------|----------------------|----------------------|----------------------|----------------------|-------------------------------|----------------------|----------------------|----------------------|----------------------|-------------------------------|
|                | <b>NR03<br/>PZ01</b> | <b>NR03<br/>PZ02</b> | <b>NR03<br/>PZ03</b> | <b>NR03<br/>PZ04</b> | <b>SHALLOWEST<br/>READING</b> | <b>NR06<br/>PZ01</b> | <b>NR06<br/>PZ02</b> | <b>NR06<br/>PZ03</b> | <b>NR06<br/>PZ04</b> | <b>SHALLOWEST<br/>READING</b> |
| <b>3/7/04</b>  | -13.8                | -16.2                | -13.0                | -12.5                | -12.5                         | -5.0                 | -4.5                 | -8.1                 | -11.6                | -4.5                          |
| <b>3/12/04</b> | -8.8                 | -12.7                | -9.0                 | -8.5                 | -8.5                          | -6.0                 | -7.0                 | -12.1                | -10.6                | -6.0                          |
| <b>3/20/04</b> | -4.8                 | -6.7                 | -4.5                 | -4.0                 | -4.0                          | -2.5                 | -2.0                 | -8.6                 | -6.1                 | -2.0                          |
| <b>3/28/04</b> |                      |                      | -23.0                | -22.5                | -22.5                         | -13.5                | -12.5                | -20.1                | -18.1                | -12.5                         |
| <b>4/4/04</b>  |                      |                      | -25.0                | -24.5                | -24.5                         | -20.0                | -19.5                | -29.1                | -26.6                | -19.5                         |
| <b>4/10/04</b> |                      |                      | -42.5                | -41.5                | -41.5                         |                      |                      | -50.1                | -48.1                | -48.1                         |
| <b>4/25/04</b> |                      |                      | -43.0                | -42.5                | -42.5                         |                      |                      | -45.6                | -42.0                | -42.0                         |
| <b>5/9/04</b>  |                      |                      | -46.0                | -45.5                | -45.5                         |                      |                      | -59.6                | -57.6                | -57.6                         |
| <b>5/16/04</b> |                      |                      | -77.0                | -76.5                | -76.5                         |                      |                      | -90.1                | -88.6                | -88.6                         |
| <b>5/23/04</b> |                      |                      | -93.5                | -92.5                | -92.5                         |                      |                      | -97.1                | -102.6               | -97.1                         |
| <b>5/31/04</b> |                      |                      | -100.0               | -95.5                | -95.5                         |                      |                      |                      |                      |                               |
| <b>6/6/04</b>  |                      |                      |                      |                      |                               |                      |                      |                      |                      |                               |
| <b>6/16/04</b> |                      |                      |                      |                      |                               |                      |                      |                      |                      |                               |
| <b>6/27/04</b> |                      |                      |                      |                      |                               |                      |                      |                      |                      |                               |
| <b>7/20/04</b> |                      |                      |                      |                      |                               |                      |                      |                      |                      |                               |
| <b>8/2/04</b>  |                      |                      | -24.5                | -23.5                | -23.5                         | -21.0                | -21.0                | -31.6                | -28.1                | -21.0                         |
| <b>8/8/04</b>  | -4.8                 | -6.7                 | -5.0                 | -3.5                 | -3.5                          | -2.0                 | -1.0                 | -8.1                 | -5.6                 | -1.0                          |
| <b>8/15/04</b> | 0.2                  | -1.7                 | 1.0                  |                      | 1.0                           | 2.0                  | 3.0                  | -4.1                 | -1.6                 | 3.0                           |
| <b>8/22/04</b> | -15.3                | -17.7                | -15.0                | -14.5                | -14.5                         | -6.0                 | -5.0                 | -12.6                | -9.6                 | -5.0                          |

**Table A.4. Continued.**

| <b>Date</b>     | <b>NR03</b>          |                      |                      |                      |                               | <b>NR06</b>          |                      |                      |                      |                               |
|-----------------|----------------------|----------------------|----------------------|----------------------|-------------------------------|----------------------|----------------------|----------------------|----------------------|-------------------------------|
|                 | <b>NR03<br/>PZ01</b> | <b>NR03<br/>PZ02</b> | <b>NR03<br/>PZ03</b> | <b>NR03<br/>PZ04</b> | <b>SHALLOWEST<br/>READING</b> | <b>NR06<br/>PZ01</b> | <b>NR06<br/>PZ02</b> | <b>NR06<br/>PZ03</b> | <b>NR06<br/>PZ04</b> | <b>SHALLOWEST<br/>READING</b> |
| <b>9/3/04</b>   |                      |                      |                      |                      |                               |                      |                      |                      |                      |                               |
| <b>9/12/04</b>  |                      | -21.7                | -19.0                | -18.0                | -18.0                         | -16.5                | -16.0                | -23.6                | -21.6                | -16.0                         |
| <b>9/18/04</b>  |                      |                      | -94.0                | -88.5                | -88.5                         |                      |                      |                      | -93.6                | -93.6                         |
| <b>9/26/04</b>  |                      |                      | -58.5                | -57.5                | -57.5                         |                      |                      | -70.1                | -67.6                | -67.6                         |
| <b>10/12/04</b> |                      |                      | -92.0                | -86.5                | -86.5                         |                      |                      | -85.1                | -87.6                | -85.1                         |
| <b>10/17/04</b> |                      |                      | -33.0                | -32.5                | -32.5                         |                      |                      | -42.1                | -40.1                | -40.1                         |
| <b>10/23/04</b> |                      |                      | -39.0                | -38.5                | -38.5                         |                      |                      | -50.1                | -47.6                | -47.6                         |
| <b>11/22/04</b> |                      |                      | -73.5                | -72.5                | -72.5                         |                      |                      | -86.1                | -83.6                | -83.6                         |
| <b>11/27/04</b> | -14.3                | -16.2                | -13.0                | -12.5                | -12.5                         | -12.0                | -11.5                | -18.6                | -15.6                | -11.5                         |
| <b>12/5/04</b>  |                      | -21.7                | -20.0                | -14.5                | -14.5                         | -20.0                | -19.0                | -26.1                | -23.1                | -19.0                         |
| <b>12/12/04</b> | -8.8                 | -11.2                | -8.5                 | -7.5                 | -7.5                          | -9.0                 | -8.5                 | -11.1                | -12.6                | -8.5                          |
| <b>12/21/04</b> | -13.8                | -17.2                | -13.5                | -13.5                | -13.5                         | -19.5                | -16.0                | -22.1                | -19.1                | -16.0                         |

**Table A.4. Continued.**

| <b>Date</b>     | <b>NR07</b>          |                      |                      |                      |                               | <b>NR08</b>          |                      |                      |                      |                               |
|-----------------|----------------------|----------------------|----------------------|----------------------|-------------------------------|----------------------|----------------------|----------------------|----------------------|-------------------------------|
|                 | <b>NR07<br/>PZ01</b> | <b>NR07<br/>PZ02</b> | <b>NR07<br/>PZ03</b> | <b>NR07<br/>PZ04</b> | <b>SHALLOWEST<br/>READING</b> | <b>NR08<br/>PZ01</b> | <b>NR08<br/>PZ02</b> | <b>NR08<br/>PZ03</b> | <b>NR08<br/>PZ04</b> | <b>SHALLOWEST<br/>READING</b> |
| <b>9/30/03</b>  | -19.3                | -10.0                | -31.5                | -23.5                | -10.0                         | -0.2                 | 0.2                  | -1.8                 | -2.2                 | 0.2                           |
| <b>10/7/03</b>  |                      |                      | -56.0                | -48.5                | -48.5                         | -19.7                | -20.3                | -33.8                | -34.2                | -19.7                         |
| <b>10/14/03</b> | -1.3                 | 4.0                  | -16.0                | -11.0                | 4.0                           | 5.1                  | 5.1                  | 5.1                  | 5.1                  | 5.1                           |
| <b>10/21/03</b> | -19.3                | -11.0                | -33.0                | -25.5                | -11.0                         | -9.2                 | -7.8                 | -12.3                | -12.7                | -7.8                          |
| <b>10/28/03</b> | -13.3                | -5.0                 | -26.0                | -19.5                | -5.0                          | 0.8                  | 0.2                  | 2.7                  | 3.3                  | 3.3                           |
| <b>11/11/03</b> | -15.1                | -7.4                 | -30.2                |                      | -7.4                          | -1.4                 | -1.0                 | -1.7                 | -1.9                 | -1.0                          |
| <b>11/18/03</b> |                      |                      | -49.0                | -42.5                | -42.5                         | -17.2                | -15.8                | -24.3                | -24.7                | -15.8                         |
| <b>11/24/03</b> | -19.3                | -11.0                | -34.0                | -26.5                | -11.0                         | -1.7                 | -1.3                 | -1.3                 | -1.7                 | -1.3                          |
| <b>12/9/03</b>  | -9.3                 | -2.0                 | -25.0                | -17.5                | -2.0                          | 4.8                  | 3.2                  | 3.7                  | 4.3                  | 4.8                           |
| <b>12/16/03</b> | -1.3                 | 6.0                  | -16.0                | -9.5                 | 6.0                           | 4.8                  | 5.2                  | 6.7                  | 6.3                  | 6.7                           |
| <b>12/21/03</b> | -8.3                 | -1.0                 | -24.0                | -17.5                | -1.0                          | 2.8                  | 3.2                  | 4.7                  | 4.3                  | 4.7                           |
| <b>12/28/03</b> | -6.3                 | 1.5                  | -12.0                | -15.0                | 1.5                           | 2.8                  | 3.2                  | 5.7                  | 5.3                  | 5.7                           |
| <b>1/4/04</b>   | -10.7                | -4.3                 | -22.0                | -20.8                | -4.3                          | -1.7                 | -1.3                 | 0.1                  | -0.2                 | 0.1                           |
| <b>1/19/04</b>  | -4.8                 | 2.5                  | -20.5                | -13.0                | 2.5                           | 2.8                  | 4.2                  | 5.7                  | 5.3                  | 5.7                           |
| <b>2/1/04</b>   | -12.3                | -3.0                 | -27.0                | -20.5                | -3.0                          | 1.8                  | 2.2                  | 4.7                  | 4.3                  | 4.7                           |
| <b>2/8/04</b>   | -12.3                | -4.0                 | -27.0                | -20.5                | -4.0                          | 2.8                  | 3.2                  | 3.7                  | 3.3                  | 3.7                           |
| <b>2/14/04</b>  | 0.7                  | 8.0                  | -15.0                | -9.5                 | 8.0                           | 5.8                  | 6.2                  | 8.7                  | 9.3                  | 9.3                           |
| <b>2/22/04</b>  | -7.3                 | 2.0                  | -23.0                | -15.5                | 2.0                           | 3.8                  | 4.2                  | 4.7                  | 4.3                  | 4.7                           |
| <b>2/28/04</b>  | -5.3                 | 3.0                  | -20.0                | -12.5                | 3.0                           | 3.8                  | 4.2                  | 5.7                  | 6.3                  | 6.3                           |

**Table A.4. Continued.**

| <b>Date</b>    | <b>NR07</b>          |                      |                      |                      |                               | <b>NR08</b>          |                      |                      |                      |                               |
|----------------|----------------------|----------------------|----------------------|----------------------|-------------------------------|----------------------|----------------------|----------------------|----------------------|-------------------------------|
|                | <b>NR07<br/>PZ01</b> | <b>NR07<br/>PZ02</b> | <b>NR07<br/>PZ03</b> | <b>NR07<br/>PZ04</b> | <b>SHALLOWEST<br/>READING</b> | <b>NR08<br/>PZ01</b> | <b>NR08<br/>PZ02</b> | <b>NR08<br/>PZ03</b> | <b>NR08<br/>PZ04</b> | <b>SHALLOWEST<br/>READING</b> |
| <b>3/7/04</b>  | -10.3                | -2.5                 | -25.5                | -18.5                | -2.5                          | -2.2                 | -1.8                 | -1.3                 | -1.7                 | -1.3                          |
| <b>3/12/04</b> | -7.3                 | -1.0                 | -25.0                | -16.5                | -1.0                          | 2.8                  | 1.2                  | 2.7                  | 2.3                  | 2.8                           |
| <b>3/20/04</b> | -5.3                 | 2.0                  | -21.5                | -14.5                | 2.0                           | 3.8                  | 4.2                  | 4.7                  | 5.3                  | 5.3                           |
| <b>3/28/04</b> | -16.3                | -8.5                 | -31.5                | -23.5                | -8.5                          | -13.2                | -13.8                | -13.8                | -14.7                | -13.2                         |
| <b>4/4/04</b>  | -21.3                | -14.5                | -36.0                | -28.5                | -14.5                         | -14.7                | -14.3                | -18.5                | -21.7                | -14.3                         |
| <b>4/10/04</b> |                      |                      | -57.0                | -49.5                | -49.5                         | -19.7                | -19.8                | -39.3                | -39.7                | -19.7                         |
| <b>4/25/04</b> |                      |                      | -58.5                | -50.5                | -50.5                         |                      |                      | -42.3                | -42.7                | -42.3                         |
| <b>5/9/04</b>  |                      |                      | -64.5                | -57.5                | -57.5                         |                      |                      | -45.3                | -45.7                | -45.3                         |
| <b>5/16/04</b> |                      |                      | -96.0                | -88.5                | -88.5                         |                      |                      | -76.3                | -75.7                | -75.7                         |
| <b>5/23/04</b> |                      |                      |                      |                      |                               |                      |                      | -91.3                | -92.7                | -91.3                         |
| <b>5/31/04</b> |                      |                      |                      |                      |                               |                      |                      | -92.3                | -95.7                | -92.3                         |
| <b>6/6/04</b>  |                      |                      |                      |                      |                               |                      |                      |                      |                      |                               |
| <b>6/16/04</b> |                      |                      |                      |                      |                               |                      |                      |                      |                      |                               |
| <b>6/27/04</b> |                      |                      |                      |                      |                               |                      |                      | -91.3                | -93.7                | -91.3                         |
| <b>7/20/04</b> |                      |                      |                      |                      |                               |                      |                      |                      |                      |                               |
| <b>8/2/04</b>  |                      | -16.0                | -38.0                | -31.5                | -16.0                         | -3.2                 | -2.8                 | -5.3                 | -5.2                 | -2.8                          |
| <b>8/8/04</b>  | -7.8                 | 1.0                  | -22.5                | -15.0                | 1.0                           | 4.8                  | 3.2                  | 4.7                  | 5.3                  | 5.3                           |
| <b>8/15/04</b> | 2.7                  | 10.0                 | -13.0                | -5.5                 | 10.0                          | 7.8                  | 8.2                  | 9.7                  | 10.3                 | 10.3                          |
| <b>8/22/04</b> |                      | -12.0                | -35.0                | -28.5                | -12.0                         | -7.2                 | -6.8                 | -8.3                 | -7.7                 | -7.2                          |

**Table A.4. Continued.**

| <b>Date</b>     | <b>NR07</b>          |                      |                      |                      |                               | <b>NR08</b>          |                      |                      |                      |                               |
|-----------------|----------------------|----------------------|----------------------|----------------------|-------------------------------|----------------------|----------------------|----------------------|----------------------|-------------------------------|
|                 | <b>NR07<br/>PZ01</b> | <b>NR07<br/>PZ02</b> | <b>NR07<br/>PZ03</b> | <b>NR07<br/>PZ04</b> | <b>SHALLOWEST<br/>READING</b> | <b>NR08<br/>PZ01</b> | <b>NR08<br/>PZ02</b> | <b>NR08<br/>PZ03</b> | <b>NR08<br/>PZ04</b> | <b>SHALLOWEST<br/>READING</b> |
| <b>9/3/04</b>   |                      |                      |                      |                      |                               |                      |                      |                      |                      |                               |
| <b>9/12/04</b>  | -19.3                | -11.0                | -34.0                | -27.5                | -11.0                         | -0.2                 | -0.3                 | -0.3                 | -0.7                 | -0.2                          |
| <b>9/18/04</b>  |                      |                      | -99.0                | -91.5                | -91.5                         |                      |                      | -84.3                | -80.7                | -80.7                         |
| <b>9/26/04</b>  |                      |                      | -76.0                | -108.5               | -76.0                         |                      |                      | -50.3                | -50.7                | -50.3                         |
| <b>10/12/04</b> |                      |                      | -90.0                | -84.5                | -84.5                         |                      |                      | -87.3                | -84.7                | -84.7                         |
| <b>10/17/04</b> |                      |                      | -48.0                | -41.0                | -41.0                         | -15.2                | -17.8                | -24.3                | -24.7                | -15.2                         |
| <b>10/23/04</b> |                      |                      | -53.0                | -46.5                | -46.5                         | -19.2                | -22.8                | -29.3                | -29.7                | -19.2                         |
| <b>11/22/04</b> |                      |                      | -91.0                | -83.5                | -83.5                         |                      |                      | -62.3                | -62.7                | -62.3                         |
| <b>11/27/04</b> | -14.8                | -6.5                 | -30.0                | -23.5                | -6.5                          | -0.2                 | 0.2                  | 2.7                  | 2.3                  | 2.7                           |
| <b>12/5/04</b>  | -18.3                | -9.0                 | -32.0                | -25.5                | -9.0                          | -4.2                 | -3.8                 | -3.8                 | -4.2                 | -3.8                          |
| <b>12/12/04</b> | -11.3                | -3.0                 | -26.5                | -19.5                | -3.0                          | 4.8                  | 5.2                  | 6.7                  | 5.3                  | 6.7                           |
| <b>12/21/04</b> | -18.3                | -10.0                | -33.0                | -26.0                | -10.0                         | -9.2                 | -9.8                 | -3.8                 | -6.0                 | -3.8                          |

**Table A.4. Continued.**

| <b>Date</b>     | <b>NR09</b>          |                      |                      |                      |                               | <b>NR12</b>          |                      |                      |                      |                               |
|-----------------|----------------------|----------------------|----------------------|----------------------|-------------------------------|----------------------|----------------------|----------------------|----------------------|-------------------------------|
|                 | <b>NR09<br/>PZ01</b> | <b>NR09<br/>PZ02</b> | <b>NR09<br/>PZ03</b> | <b>NR09<br/>PZ04</b> | <b>SHALLOWEST<br/>READING</b> | <b>NR12<br/>PZ01</b> | <b>NR12<br/>PZ02</b> | <b>NR12<br/>PZ03</b> | <b>NR12<br/>PZ04</b> | <b>SHALLOWEST<br/>READING</b> |
| <b>9/30/03</b>  | -4.8                 | -5.5                 | -10.3                | -10.7                | -4.8                          | -23.3                | -18.8                | -27.7                | -29.5                | -18.8                         |
| <b>10/7/03</b>  |                      |                      | -38.8                | -38.7                | -38.7                         |                      |                      | -62.2                | -58.0                | -58.0                         |
| <b>10/14/03</b> | 1.2                  | 0.5                  | -2.8                 | -2.7                 | 0.5                           | -1.3                 | -3.8                 | -9.2                 | -6.5                 | -1.3                          |
| <b>10/21/03</b> | -7.3                 | -6.5                 | -9.3                 | -15.2                | -6.5                          |                      |                      | -38.7                | -40.0                | -38.7                         |
| <b>10/28/03</b> | -1.3                 | -4.0                 | -8.8                 | -8.7                 | -1.3                          | -8.8                 | -8.8                 | -14.7                | -15.0                | -8.8                          |
| <b>11/11/03</b> | -3.8                 | -4.2                 | -7.8                 | -7.6                 | -3.8                          |                      |                      | -30.7                | -32.1                | -30.7                         |
| <b>11/18/03</b> |                      |                      | -27.8                | -27.7                | -27.7                         |                      |                      | -52.2                | -53.0                | -52.2                         |
| <b>11/24/03</b> | -13.3                | -13.0                | -14.3                | -14.7                | -13.0                         |                      |                      | -33.2                | -33.0                | -33.0                         |
| <b>12/9/03</b>  | 1.7                  | 0.0                  | -3.8                 | -3.7                 | 1.7                           | -17.3                | -17.8                | -20.2                | -21.0                | -17.3                         |
| <b>12/16/03</b> | 2.7                  | 2.0                  | -0.8                 | -1.7                 | 2.7                           | -2.3                 | -0.8                 | -5.2                 | -7.0                 | -0.8                          |
| <b>12/21/03</b> | 1.7                  | -1.0                 | -3.8                 | -3.7                 | 1.7                           | -17.3                | -17.8                | -21.2                | -22.0                | -17.3                         |
| <b>12/28/03</b> | 1.7                  | 0.0                  | -2.8                 | -3.7                 | 1.7                           | -12.3                | -11.8                | -17.2                | -18.0                | -11.8                         |
| <b>1/4/04</b>   | -1.0                 | -1.7                 | -5.2                 | -5.4                 | -1.0                          | -24.9                | 0.0                  | -27.7                | -27.2                | -24.9                         |
| <b>1/19/04</b>  | -1.3                 | -3.0                 | -5.8                 | -6.2                 | -1.3                          | -1.3                 | -3.8                 | -8.7                 | -10.0                | -1.3                          |
| <b>2/1/04</b>   | -0.3                 | -4.0                 | -6.8                 | -6.7                 | -0.3                          | -24.8                | -23.8                | -27.2                | -26.5                | -23.8                         |
| <b>2/8/04</b>   | 0.7                  | -4.0                 | -6.8                 | -5.7                 | 0.7                           | -25.3                | -21.8                | -30.2                | -31.0                | -21.8                         |
| <b>2/14/04</b>  | 2.7                  | 1.0                  | -0.8                 | -0.7                 | 1.0                           | -0.3                 | 0.2                  | -5.2                 | -6.0                 | 0.2                           |
| <b>2/22/04</b>  | 1.7                  | -1.0                 | -3.8                 | -4.7                 | 1.7                           | -17.3                | -16.8                | -20.2                | -21.0                | -16.8                         |
| <b>2/28/04</b>  | 2.7                  | 1.0                  | -2.8                 | -1.7                 | 2.7                           | -6.3                 | -6.8                 | -12.2                | -13.0                | -6.3                          |

**Table A.4. Continued.**

| <b>Date</b>    | <b>NR09</b>          |                      |                      |                      |                               | <b>NR12</b>          |                      |                      |                      |                               |
|----------------|----------------------|----------------------|----------------------|----------------------|-------------------------------|----------------------|----------------------|----------------------|----------------------|-------------------------------|
|                | <b>NR09<br/>PZ01</b> | <b>NR09<br/>PZ02</b> | <b>NR09<br/>PZ03</b> | <b>NR09<br/>PZ04</b> | <b>SHALLOWEST<br/>READING</b> | <b>NR12<br/>PZ01</b> | <b>NR12<br/>PZ02</b> | <b>NR12<br/>PZ03</b> | <b>NR12<br/>PZ04</b> | <b>SHALLOWEST<br/>READING</b> |
| <b>3/7/04</b>  | -3.3                 | -2.5                 | -4.8                 | -4.7                 | -2.5                          | -26.3                | -24.8                | -31.2                | -32.0                | -24.8                         |
| <b>3/12/04</b> | -1.3                 | -3.0                 | -6.8                 | -6.7                 | -1.3                          | -17.3                | -15.8                | -22.2                | -23.0                | -15.8                         |
| <b>3/20/04</b> | 1.7                  | -1.0                 | -1.8                 | -2.7                 | 1.7                           | -18.3                | -18.8                | -20.7                | -21.0                | -18.3                         |
| <b>3/28/04</b> | -11.8                | -15.0                | -11.8                | -12.7                | -11.8                         |                      |                      | -41.2                | -41.5                | -41.2                         |
| <b>4/4/04</b>  | -19.3                | -19.0                | -17.8                | -17.7                | -17.7                         |                      |                      | -44.2                | -46.0                | -44.2                         |
| <b>4/10/04</b> |                      |                      | -40.8                | -41.7                | -41.7                         |                      |                      | -64.2                | -65.0                | -64.2                         |
| <b>4/25/04</b> |                      |                      | -35.3                |                      | -35.3                         |                      |                      | -68.2                | -69.0                | -68.2                         |
| <b>5/9/04</b>  |                      |                      | -44.8                | -44.7                | -44.7                         |                      |                      | -67.2                | -68.5                | -67.2                         |
| <b>5/16/04</b> |                      |                      | -72.3                | -73.7                | -72.3                         |                      |                      | -92.2                | -92.0                | -92.0                         |
| <b>5/23/04</b> |                      |                      | -88.8                | -92.7                | -88.8                         |                      |                      | -103.2               | -104.0               | -103.2                        |
| <b>5/31/04</b> |                      |                      |                      | -95.7                | -95.7                         |                      |                      | -103.2               | -104.0               | -103.2                        |
| <b>6/6/04</b>  |                      |                      |                      |                      |                               |                      |                      |                      |                      |                               |
| <b>6/16/04</b> |                      |                      | -78.8                | -79.7                | -78.8                         |                      |                      | -89.2                | -89.5                | -89.2                         |
| <b>6/27/04</b> |                      |                      | -74.8                | -75.2                | -74.8                         |                      |                      | -92.2                | -93.0                | -92.2                         |
| <b>7/20/04</b> |                      |                      |                      |                      |                               |                      |                      |                      |                      |                               |
| <b>8/2/04</b>  | -0.3                 | 0.0                  | -4.3                 | -4.2                 | 0.0                           |                      | -18.8                | -29.2                | -23.0                | -18.8                         |
| <b>8/8/04</b>  | 2.7                  | 3.5                  | -0.8                 | -1.7                 | 3.5                           | -4.3                 | -1.8                 | -6.7                 | 2.0                  | 2.0                           |
| <b>8/15/04</b> | 4.7                  | 7.5                  | 2.2                  | 1.8                  | 7.5                           | 3.7                  | 3.2                  | -1.2                 | -8.0                 | 3.7                           |
| <b>8/22/04</b> | -3.8                 | -2.0                 | -7.8                 | -7.7                 | -2.0                          |                      | -21.3                | -20.7                | -19.0                | -19.0                         |

**Table A.4. Continued.**

| <b>Date</b>     | <b>NR09</b>          |                      |                      |                      |                               | <b>NR12</b>          |                      |                      |                      |                               |
|-----------------|----------------------|----------------------|----------------------|----------------------|-------------------------------|----------------------|----------------------|----------------------|----------------------|-------------------------------|
|                 | <b>NR09<br/>PZ01</b> | <b>NR09<br/>PZ02</b> | <b>NR09<br/>PZ03</b> | <b>NR09<br/>PZ04</b> | <b>SHALLOWEST<br/>READING</b> | <b>NR12<br/>PZ01</b> | <b>NR12<br/>PZ02</b> | <b>NR12<br/>PZ03</b> | <b>NR12<br/>PZ04</b> | <b>SHALLOWEST<br/>READING</b> |
| <b>9/3/04</b>   |                      |                      | -56.8                | -60.7                | -56.8                         |                      |                      | -80.2                | -81.0                | -80.2                         |
| <b>9/12/04</b>  | -12.8                | -9.0                 | -12.8                | -13.2                | -9.0                          | -23.3                | -18.3                | -31.2                | -19.0                | -18.3                         |
| <b>9/18/04</b>  |                      |                      |                      | -86.7                | -86.7                         |                      |                      |                      | -92.0                | -92.0                         |
| <b>9/26/04</b>  |                      |                      | -54.8                | -56.2                | -54.8                         |                      |                      | -67.2                | -58.0                | -58.0                         |
| <b>10/12/04</b> |                      |                      | -79.8                | -86.7                | -79.8                         |                      |                      | -92.2                | -94.0                | -92.2                         |
| <b>10/17/04</b> |                      | -20.0                | -23.8                | -23.7                | -20.0                         |                      |                      | -43.2                | -33.0                | -33.0                         |
| <b>10/23/04</b> |                      |                      | -34.8                | -34.7                | -34.7                         |                      | -20.8                | -44.7                | -34.0                | -20.8                         |
| <b>11/22/04</b> |                      |                      | -62.3                | -63.7                | -62.3                         |                      |                      | -70.7                | -68.0                | -70.7                         |
| <b>11/27/04</b> | -11.3                | -12.0                | -13.8                | -14.7                | -11.3                         | -21.3                | -16.8                | -26.2                | -19.0                | -16.8                         |
| <b>12/5/04</b>  | -1.8                 | -0.5                 | -5.8                 | -5.7                 | -0.5                          | -21.3                | -19.8                | -33.7                | -24.5                | -19.8                         |
| <b>12/12/04</b> | -1.3                 | 0.0                  | -5.3                 | -6.2                 | 0.0                           | -14.3                | -12.8                | -20.2                | -12.0                | -12.0                         |
| <b>12/21/04</b> | -12.3                | -12.0                | -13.8                | -13.7                | -12.0                         |                      |                      | -34.2                | -29.5                | -29.5                         |

**Table A.4. Continued.**

| <b>Date</b>     | <b>NR13</b>          |                      |                      |                      |                               | <b>NR15</b>          |                      |                      |                      |                               |
|-----------------|----------------------|----------------------|----------------------|----------------------|-------------------------------|----------------------|----------------------|----------------------|----------------------|-------------------------------|
|                 | <b>NR13<br/>PZ01</b> | <b>NR13<br/>PZ02</b> | <b>NR13<br/>PZ03</b> | <b>NR13<br/>PZ04</b> | <b>SHALLOWEST<br/>READING</b> | <b>NR15<br/>PZ01</b> | <b>NR15<br/>PZ02</b> | <b>NR15<br/>PZ03</b> | <b>NR15<br/>PZ04</b> | <b>SHALLOWEST<br/>READING</b> |
| <b>9/30/03</b>  |                      |                      | -37.0                | -37.9                | -37.0                         | -20.5                | -21.5                | -18.4                | -18.0                | -18.0                         |
| <b>10/7/03</b>  |                      |                      | -65.0                | -65.9                | -65.0                         |                      |                      | -40.4                | -42.0                | -40.4                         |
| <b>10/14/03</b> | -1.9                 | -1.4                 | -1.0                 | -2.9                 | -1.0                          | 0.5                  | -0.5                 | 1.6                  | -5.5                 | 1.6                           |
| <b>10/21/03</b> |                      |                      | -29.5                | -30.9                | -29.5                         | -18.5                | -19.5                | -17.4                | -15.0                | -15.0                         |
| <b>10/28/03</b> | -17.9                | -17.4                | -17.5                | -19.9                | -17.4                         | -0.5                 | -1.5                 | -1.4                 | -4.5                 | -0.5                          |
| <b>11/11/03</b> |                      |                      | -29.3                | -30.4                | -29.3                         | -15.5                | -16.6                | -13.5                | -13.2                | -13.2                         |
| <b>11/18/03</b> |                      |                      | -52.0                | -53.9                | -52.0                         |                      |                      | -24.4                | -25.5                | -24.4                         |
| <b>11/24/03</b> |                      |                      | -32.5                | -32.9                | -32.5                         | -13.0                | -13.5                | -10.9                | -13.0                | -10.9                         |
| <b>12/9/03</b>  | -18.4                | -18.4                | -17.5                | -18.4                | -17.5                         | -11.0                | -11.5                | -9.4                 | -9.5                 | -9.4                          |
| <b>12/16/03</b> | -9.4                 | -9.4                 | -8.0                 | -8.9                 | -8.0                          | -3.5                 | -4.5                 | -1.4                 | -1.5                 | -1.4                          |
| <b>12/21/03</b> | -18.4                | -17.9                | -18.0                | -18.9                | -17.9                         | -8.5                 | -10.0                | -8.4                 | -7.5                 | -7.5                          |
| <b>12/28/03</b> | -14.4                | -13.9                | -14.0                | -14.9                | -13.9                         | -6.5                 | -7.5                 | -6.4                 | -6.5                 | -6.4                          |
| <b>1/4/04</b>   | -23.6                | -25.3                | -23.9                | -24.4                | -23.6                         | -9.7                 | -9.8                 | -8.0                 | -10.9                | -8.0                          |
| <b>1/19/04</b>  | -12.4                | -11.4                | -11.0                | -11.9                | -11.0                         | -3.5                 | -5.0                 | -2.4                 | -2.5                 | -2.4                          |
| <b>2/1/04</b>   | -22.4                | -22.4                | -22.0                | -23.9                | -22.0                         | -10.5                | -12.5                | -9.4                 | -10.5                | -9.4                          |
| <b>2/8/04</b>   |                      |                      | -30.0                | -30.9                | -30.0                         | -14.5                | -15.5                | -13.4                | -11.5                | -11.5                         |
| <b>2/14/04</b>  | -2.4                 | -1.4                 | -1.0                 | -2.9                 | -1.0                          | 1.5                  | -0.5                 | 1.6                  | -2.5                 | 1.6                           |
| <b>2/22/04</b>  | -18.4                | -17.4                | -17.0                | -17.9                | -17.0                         | -9.5                 | -11.5                | -9.4                 | -8.5                 | -8.5                          |
| <b>2/28/04</b>  | -11.4                | -11.4                | -11.0                | -11.9                | -11.0                         | -6.5                 | -7.5                 | -5.4                 | -4.5                 | -4.5                          |

**Table A.4. Continued.**

| Date    | NR13         |              |              |              |                       | NR15         |              |              |              |                       |
|---------|--------------|--------------|--------------|--------------|-----------------------|--------------|--------------|--------------|--------------|-----------------------|
|         | NR13<br>PZ01 | NR13<br>PZ02 | NR13<br>PZ03 | NR13<br>PZ04 | SHALLOWEST<br>READING | NR15<br>PZ01 | NR15<br>PZ02 | NR15<br>PZ03 | NR15<br>PZ04 | SHALLOWEST<br>READING |
| 3/7/04  |              |              | -26.5        | -28.4        | -26.5                 | -13.5        | -14.5        | -11.9        | -10.5        | -10.5                 |
| 3/12/04 | -24.4        | -22.4        | -23.0        | -24.9        | -22.4                 | -9.5         | -11.5        | -8.4         | -6.5         | -6.5                  |
| 3/20/04 | -17.9        | -16.9        | -17.0        | -17.9        | -16.9                 | -9.5         | -11.5        | -8.9         | -8.5         | -8.5                  |
| 3/28/04 |              |              | -40.0        | -40.9        | -40.0                 | -18.5        | -19.5        | -16.4        | -17.5        | -16.4                 |
| 4/4/04  |              |              | -49.0        | -48.9        | -48.9                 | -24.5        | -26.5        | -23.4        | -21.5        | -21.5                 |
| 4/10/04 |              |              | -69.0        | -69.9        | -69.0                 |              |              | -40.4        | -39.5        | -39.5                 |
| 4/25/04 |              |              | -71.0        | -71.4        | -71.0                 |              |              | -41.9        | -43.5        | -41.9                 |
| 5/9/04  |              |              | -74.5        | -74.9        | -74.5                 |              |              | -46.4        | -46.5        | -46.4                 |
| 5/16/04 |              |              | -97.0        | -97.9        | -97.0                 |              |              | -81.4        | -80.5        | -80.5                 |
| 5/23/04 |              |              |              |              |                       |              |              | -91.4        | -92.5        | -91.4                 |
| 5/31/04 |              |              |              |              |                       |              |              | -90.4        | -90.5        | -90.4                 |
| 6/6/04  |              |              |              |              |                       |              |              |              |              |                       |
| 6/16/04 |              |              |              |              |                       |              |              | -84.4        | -83.5        | -83.5                 |
| 6/27/04 |              |              |              |              |                       |              |              |              |              |                       |
| 7/20/04 |              |              |              |              |                       |              |              |              |              |                       |
| 8/2/04  |              |              | -77.0        | -77.9        | -77.0                 |              |              | -71.4        | -69.5        | -69.5                 |
| 8/8/04  | -23.4        | -22.4        | -24.0        | -22.9        | -22.4                 | -12.5        | -14.0        | -11.9        | -12.0        | -12.0                 |
| 8/15/04 | -0.9         | -0.9         | -1.0         | 0.1          | 0.1                   | 1.5          | 0.5          | 1.6          | 0.5          | 1.6                   |
| 8/22/04 |              |              | -36.0        | -36.9        | -36.0                 | -19.0        | -20.0        | -17.9        | -17.5        | -17.5                 |

**Table A.4. Continued.**

| <b>Date</b>     | <b>NR13</b>          |                      |                      |                      |                               | <b>NR15</b>          |                      |                      |                      |                               |
|-----------------|----------------------|----------------------|----------------------|----------------------|-------------------------------|----------------------|----------------------|----------------------|----------------------|-------------------------------|
|                 | <b>NR13<br/>PZ01</b> | <b>NR13<br/>PZ02</b> | <b>NR13<br/>PZ03</b> | <b>NR13<br/>PZ04</b> | <b>SHALLOWEST<br/>READING</b> | <b>NR15<br/>PZ01</b> | <b>NR15<br/>PZ02</b> | <b>NR15<br/>PZ03</b> | <b>NR15<br/>PZ04</b> | <b>SHALLOWEST<br/>READING</b> |
| <b>9/3/04</b>   |                      |                      |                      |                      |                               |                      |                      | -91.4                | -91.5                | -91.4                         |
| <b>9/12/04</b>  | -23.4                | -23.4                | -22.0                | -18.9                | -18.9                         |                      |                      | -37.9                | -38.5                |                               |
| <b>9/18/04</b>  |                      |                      | -88.0                | -83.9                | -83.9                         |                      |                      | -83.4                | -83.5                | -83.4                         |
| <b>9/26/04</b>  |                      |                      | -82.0                | -82.9                | -82.0                         |                      |                      | -74.4                | -73.5                | -73.5                         |
| <b>10/12/04</b> |                      |                      | -82.0                | -81.9                | -81.9                         |                      |                      | -72.4                | -74.5                | -72.4                         |
| <b>10/17/04</b> |                      |                      | -66.0                | -66.9                | -66.0                         |                      |                      | -54.4                | -52.5                | -52.5                         |
| <b>10/23/04</b> |                      |                      | -67.0                | -67.9                | -67.0                         |                      |                      | -55.4                | -55.5                | -55.4                         |
| <b>11/22/04</b> |                      |                      | -95.0                | -94.9                | -94.9                         |                      |                      | -89.9                | -90.5                | -89.9                         |
| <b>11/27/04</b> |                      |                      | -46.0                | -46.9                | -46.0                         |                      |                      | -34.4                | -35.0                | -34.4                         |
| <b>12/5/04</b>  |                      |                      | -39.0                | -40.4                | -39.0                         |                      |                      | -24.4                | -25.5                | -24.4                         |
| <b>12/12/04</b> |                      |                      | -36.0                | -38.4                | -36.0                         | -22.5                | -22.5                | -22.4                | -22.5                | -22.4                         |
| <b>12/21/04</b> |                      |                      | -49.0                | -50.9                | -49.0                         |                      |                      | -28.4                | -29.0                | -28.4                         |

**Table A.4. Continued.**

| <b>Date</b>     | <b>NR16</b>          |                      |                      |                      | <b>SHALLOWEST<br/>READING</b> | <b>NR17</b>          |                      |                      |                      |
|-----------------|----------------------|----------------------|----------------------|----------------------|-------------------------------|----------------------|----------------------|----------------------|----------------------|
|                 | <b>NR16<br/>PZ01</b> | <b>NR16<br/>PZ02</b> | <b>NR16<br/>PZ03</b> | <b>NR16<br/>PZ04</b> |                               | <b>NR17<br/>PZ01</b> | <b>NR17<br/>PZ02</b> | <b>NR17<br/>PZ03</b> | <b>NR17<br/>PZ04</b> |
| <b>9/30/03</b>  | -2.3                 | -1.0                 | 1.5                  | 2.0                  | 2.0                           |                      |                      | -32.0                | -35.0                |
| <b>10/7/03</b>  | -26.3                |                      | -15.5                | -21.5                | -15.5                         |                      |                      | -65.0                | -66.5                |
| <b>10/14/03</b> | 3.2                  | 4.0                  | 2.0                  | 16.0                 | 16.0                          | -3.0                 | -4.7                 | -10.0                | -7.5                 |
| <b>10/21/03</b> | 1.3                  | 1.3                  | 1.3                  | 1.3                  | 1.3                           | -22.0                | -21.7                | -24.5                | -27.5                |
| <b>10/28/03</b> | 0.2                  | 0.0                  | -3.0                 | -2.0                 | 0.2                           |                      |                      | -32.0                | -26.5                |
| <b>11/11/03</b> | 1.6                  | 2.5                  | 4.5                  | 5.1                  | 5.1                           |                      |                      | -28.9                | -30.7                |
| <b>11/18/03</b> | -14.8                | -13.0                | -7.0                 | -9.0                 | -7.0                          |                      |                      | -53.0                | -54.5                |
| <b>11/24/03</b> | -1.3                 | 0.0                  | 0.0                  | 1.5                  | 1.5                           |                      |                      | -36.0                | -36.0                |
| <b>12/9/03</b>  | 1.2                  | 3.0                  | 4.0                  | 6.0                  | 6.0                           | -14.0                | -15.7                | -18.5                | -18.5                |
| <b>12/16/03</b> | 6.2                  | 7.0                  | 8.0                  | 11.0                 | -6.2                          | -1.0                 | -1.7                 | -4.0                 | -4.5                 |
| <b>12/21/03</b> | 5.2                  | 5.0                  | 7.0                  | 9.0                  | 9.0                           | -7.0                 | -7.7                 | -11.0                | -10.5                |
| <b>12/28/03</b> | 3.2                  | 4.0                  | 7.0                  | 8.0                  | 8.0                           | -5.0                 | -6.2                 | -9.0                 | -9.0                 |
| <b>1/4/04</b>   | 3.1                  | 3.4                  | 7.9                  | 7.3                  | 7.9                           | -17.5                | -17.6                | -22.7                | -21.2                |
| <b>1/19/04</b>  | -2.8                 | 0.0                  | 5.0                  | 6.0                  | 6.0                           | -22.0                | -21.7                | -26.0                | -26.5                |
| <b>2/1/04</b>   | 1.2                  | 3.0                  | 3.0                  | 4.0                  | 4.0                           |                      |                      | -33.0                | -33.5                |
| <b>2/8/04</b>   | -1.8                 | -1.0                 | 2.0                  | 2.0                  | 2.0                           |                      |                      | -41.0                | -41.5                |
| <b>2/14/04</b>  | 4.2                  | 5.0                  | 1.0                  | 4.0                  | 4.2                           | -6.0                 | -13.7                | -11.0                | -9.5                 |
| <b>2/22/04</b>  | 2.2                  | 4.0                  | 6.0                  | 7.0                  | 7.0                           | -16.0                | -16.7                | -20.0                | -19.5                |
| <b>2/28/04</b>  | 4.2                  | 5.0                  | 7.0                  | 8.0                  | 8.0                           | -10.0                | -12.7                | -14.0                | -14.5                |

**Table A.4. Continued.**

| <b>Date</b>    | <b>NR16</b>          |                      |                      |                      | <b>SHALLOWEST<br/>READING</b> | <b>NR17</b>          |                      |                      |                      |
|----------------|----------------------|----------------------|----------------------|----------------------|-------------------------------|----------------------|----------------------|----------------------|----------------------|
|                | <b>NR16<br/>PZ01</b> | <b>NR16<br/>PZ02</b> | <b>NR16<br/>PZ03</b> | <b>NR16<br/>PZ04</b> |                               | <b>NR17<br/>PZ01</b> | <b>NR17<br/>PZ02</b> | <b>NR17<br/>PZ03</b> | <b>NR17<br/>PZ04</b> |
| <b>3/7/04</b>  | 1.2                  | 2.0                  | 5.0                  | 5.0                  | 5.0                           |                      |                      | -32.0                | -32.0                |
| <b>3/12/04</b> | -1.8                 | 1.0                  | 7.0                  | 6.0                  | 7.0                           |                      |                      | -33.0                | -33.5                |
| <b>3/20/04</b> | 2.2                  | 4.0                  | 5.0                  | 6.0                  | 6.0                           | -17.0                | -16.2                | -17.0                | -14.0                |
| <b>3/28/04</b> | -8.8                 | -8.0                 | -1.0                 | -2.0                 | -1.0                          |                      |                      | -47.0                | -46.5                |
| <b>4/4/04</b>  | -17.3                | -16.0                |                      |                      | -16.0                         |                      |                      | -55.0                | -59.5                |
| <b>4/10/04</b> | -28.8                | -26.0                | -24.0                | -27.0                | -24.0                         |                      |                      | -71.0                | -71.5                |
| <b>4/25/04</b> |                      |                      | -21.0                | -25.0                | -21.0                         |                      |                      | -68.0                | -71.5                |
| <b>5/9/04</b>  |                      |                      | -28.0                | -33.0                | -28.0                         |                      |                      | -76.0                | -77.0                |
| <b>5/16/04</b> |                      |                      | -53.5                | -61.0                | -53.5                         |                      |                      | -94.5                | -92.0                |
| <b>5/23/04</b> |                      |                      | -75.0                | -81.0                | -75.0                         |                      |                      | -103.0               | -94.5                |
| <b>5/31/04</b> |                      |                      | -96.0                | -98.0                | -96.0                         |                      |                      | -103.0               | -94.5                |
| <b>6/6/04</b>  |                      |                      |                      |                      |                               |                      |                      |                      |                      |
| <b>6/16/04</b> |                      |                      |                      | -68.0                | -68.0                         |                      |                      | -94.0                | -94.5                |
| <b>6/27/04</b> |                      |                      | -86.0                | -88.0                | -86.0                         |                      |                      |                      |                      |
| <b>7/20/04</b> |                      |                      |                      |                      |                               |                      |                      |                      |                      |
| <b>8/2/04</b>  |                      |                      | -60.0                | -55.0                | -55.0                         |                      |                      | -89.5                | -91.0                |
| <b>8/8/04</b>  | -1.8                 | 4.0                  | -1.0                 | 6.0                  | 6.0                           | -8.0                 | -9.7                 | -12.0                | -12.5                |
| <b>8/15/04</b> | 8.2                  | 9.0                  | 7.0                  | 11.0                 | 11.0                          | 1.0                  | 0.3                  | -2.5                 | -2.5                 |
| <b>8/22/04</b> | 3.2                  | 4.0                  | 7.0                  | 7.0                  | 7.0                           | -15.5                | -16.7                | -17.5                | -18.5                |

**Table A.4. Continued.**

| <b>Date</b>     | <b>NR16</b>          |                      |                      |                      | <b>SHALLOWEST<br/>READING</b> | <b>NR17</b>          |                      |                      |                      |
|-----------------|----------------------|----------------------|----------------------|----------------------|-------------------------------|----------------------|----------------------|----------------------|----------------------|
|                 | <b>NR16<br/>PZ01</b> | <b>NR16<br/>PZ02</b> | <b>NR16<br/>PZ03</b> | <b>NR16<br/>PZ04</b> |                               | <b>NR17<br/>PZ01</b> | <b>NR17<br/>PZ02</b> | <b>NR17<br/>PZ03</b> | <b>NR17<br/>PZ04</b> |
| <b>9/3/04</b>   |                      |                      | -82.0                | -82.0                | -82.0                         |                      |                      | -84.0                | -84.5                |
| <b>9/12/04</b>  | -14.8                | -15.0                | -10.0                | -7.0                 | -15.0                         |                      |                      | -50.0                | -52.0                |
| <b>9/18/04</b>  |                      |                      | -82.0                | -83.0                | -82.0                         |                      |                      | -90.0                | -90.5                |
| <b>9/26/04</b>  |                      |                      | -44.0                | -46.0                | -44.0                         |                      |                      | -83.0                | -90.5                |
| <b>10/12/04</b> |                      |                      | 46.0                 |                      | 46.0                          |                      |                      | -83.0                | -82.5                |
| <b>10/17/04</b> |                      |                      | -41.0                | -38.0                | -38.0                         |                      |                      | -83.0                | -82.5                |
| <b>10/23/04</b> |                      |                      | -40.0                | -39.0                | -39.0                         |                      |                      | -76.0                | -80.5                |
| <b>11/22/04</b> |                      |                      | -68.0                | -68.0                | -68.0                         |                      |                      | -101.0               | -94.5                |
| <b>11/27/04</b> |                      |                      | -33.0                | -23.0                | -23.0                         |                      |                      | -62.0                | -62.0                |
| <b>12/5/04</b>  | -13.8                | -13.0                | -9.0                 | -9.0                 | -9.0                          |                      |                      | -45.0                | -45.0                |
| <b>12/12/04</b> | -6.8                 | -11.0                | -9.0                 | -5.0                 | -5.0                          |                      |                      | -43.0                | -42.5                |
| <b>12/21/04</b> | -17.8                | -16.0                | -19.5                | -20.0                | -16.0                         |                      |                      | -59.0                | -58.5                |

**Table A.5. Field pH data from reference and treatment stations.**

| Station      | 3/12/2004             | 6/16/2004 | Mean | 3/12/2004             | 6/16/2004 | Mean |
|--------------|-----------------------|-----------|------|-----------------------|-----------|------|
|              | -----25-cm Depth----- |           |      | -----61-cm Depth----- |           |      |
| <b>REF01</b> | 4.52                  | 3.99      | 4.26 | 6.30                  | 5.54      | 5.92 |
| <b>REF02</b> | 6.18                  | 5.85      | 6.02 | 6.47                  | 6.28      | 6.38 |
| <b>REF05</b> | 5.27                  | 4.75      | 5.01 | 5.38                  | 4.83      | 5.11 |
| <b>REF06</b> | 4.80                  | 4.19      | 4.50 | 5.02                  | 4.44      | 4.73 |
| <b>NR01</b>  | 5.31                  | 4.30      | 4.81 | 5.27                  | 4.49      | 4.88 |
| <b>NR02</b>  | 5.02                  | 4.59      | 4.81 | 5.02                  | 4.45      | 4.74 |
| <b>NR03</b>  | 4.94                  | 4.40      | 4.67 | 4.83                  | 4.48      | 4.66 |
| <b>NR06</b>  | 4.91                  | 4.45      | 4.68 | 4.86                  | 4.29      | 4.58 |
| <b>NR07</b>  | 5.35                  | 4.30      | 4.83 | 4.95                  | 4.45      | 4.70 |
| <b>NR08</b>  | 4.87                  | 4.53      | 4.70 | 4.78                  | 4.54      | 4.66 |
| <b>NR09</b>  | 5.22                  | 4.70      | 4.96 | 5.12                  | 4.56      | 4.84 |
| <b>NR12</b>  | 4.55                  | 5.06      | 4.81 | 4.74                  | 4.69      | 4.72 |
| <b>NR13</b>  | 5.09                  | 4.50      | 4.80 | 4.87                  | 4.60      | 4.74 |
| <b>NR15</b>  | 4.75                  | 4.67      | 4.71 | 4.85                  | 4.69      | 4.77 |
| <b>NR16</b>  | 4.72                  | 4.56      | 4.64 | 5.10                  |           | 5.10 |
| <b>NR17</b>  | 4.64                  | 5.58      | 5.11 | 4.94                  | 4.66      | 4.80 |

## **APPENDIX B**

### Monthly Antecedent Precipitation Tables

Table B.1. Monthly antecedent precipitation evaluation using DAREM method (USDA, NRCS, 1997).

**March 2003**

|  | Month | 30 <sup>th</sup> percentile (mm) | 70 <sup>th</sup> percentile (mm) | Rain-fall (mm) | Condition (dry, wet, or normal) | Conditional Value | Month Weight Value | Product of Previous Two Columns |
|--|-------|----------------------------------|----------------------------------|----------------|---------------------------------|-------------------|--------------------|---------------------------------|
| 1 <sup>st</sup> prior month  | Feb   | 61                               | 113                              | 74             | normal                          | 2                 | 3                  | 6                               |
| 2 <sup>nd</sup> prior month  | Jan   | 100                              | 158                              | 52             | dry                             | 1                 | 2                  | 2                               |
| 3 <sup>rd</sup> prior month  | Dec   | 75                               | 138                              |                |                                 |                   | 1                  |                                 |
| <i>Sum</i>   |       |                                  |                                  |                |                                 |                   |                    | <i>14</i>                       |
| <i>Antecedent Rainfall Condition: (drier than normal = 6-9, normal = 10-14, or wetter than normal = 15-18)</i> |       |                                  |                                  |                |                                 |                   |                    | <i>normal</i>                   |

**April 2003**

|  | Month | 30 <sup>th</sup> percentile (mm) | 70 <sup>th</sup> percentile (mm) | Rain-fall (mm) | Condition (dry, wet, or normal) | Conditional Value | Month Weight Value | Product of Previous Two Columns |
|--|-------|----------------------------------|----------------------------------|----------------|---------------------------------|-------------------|--------------------|---------------------------------|
| 1 <sup>st</sup> prior month  | Mar   | 80                               | 124                              | 289            | wet                             | 3                 | 3                  | 9                               |
| 2 <sup>nd</sup> prior month  | Feb   | 61                               | 113                              | 74             | normal                          | 2                 | 2                  | 4                               |
| 3 <sup>rd</sup> prior month  | Jan   | 100                              | 158                              | 52             | dry                             | 1                 | 1                  | 1                               |
| <i>Sum</i>   |       |                                  |                                  |                |                                 |                   |                    | <i>14</i>                       |
| <i>Antecedent Rainfall Condition: (drier than normal = 6-9, normal = 10-14, or wetter than normal = 15-18)</i> |       |                                  |                                  |                |                                 |                   |                    | <i>normal</i>                   |

Table B.1. continued

**May 2003**

|  | <b>Month</b> | <b>30<sup>th</sup><br/>percentile<br/>(mm)</b> | <b>70<sup>th</sup><br/>percentile<br/>(mm)</b> | <b>Rain-<br/>fall<br/>(mm)</b> | <b>Condition<br/>(dry, wet,<br/>or<br/>normal)</b> | <b>Conditional<br/>Value</b> | <b>Month<br/>Weight<br/>Value</b> | <b>Product of<br/>Previous<br/>Two<br/>Columns</b> |
|--|--------------|--|--|--------------------------------|--|------------------------------|-----------------------------------|--|
| 1 <sup>st</sup> prior month  | Apr          | 42   | 97   | 188                            | wet  | 3                            | 3                                 | 9  |
| 2 <sup>nd</sup> prior month  | Mar          | 80   | 124  | 289                            | wet  | 3                            | 2                                 | 6  |
| 3 <sup>rd</sup> prior month  | Feb          | 61   | 113  | 74                             | normal   | 2                            | 1                                 | 2  |
| <i>Sum</i>   |              |  |  |                                |  |                              |                                   | <i>17</i>  |
| <i>Antecedent Rainfall Condition: (drier than normal = 6-9, normal = 10-14, or wetter than normal = 15-18)</i> |              |  |  |                                |  |                              |                                   | <i>wetter than normal</i>                          |

**June 2003**

|  | <b>Month</b> | <b>30<sup>th</sup><br/>percentile<br/>(mm)</b> | <b>70<sup>th</sup><br/>percentile<br/>(mm)</b> | <b>Rain-<br/>fall<br/>(mm)</b> | <b>Condition<br/>(dry, wet,<br/>or<br/>normal)</b> | <b>Conditional<br/>Value</b> | <b>Month<br/>Weight<br/>Value</b> | <b>Product of<br/>Previous<br/>Two<br/>Columns</b> |
|--|--------------|--|--|--------------------------------|--|------------------------------|-----------------------------------|--|
| 1 <sup>st</sup> prior month  | May          | 76   | 143  | 313                            | wet  | 3                            | 3                                 | 9  |
| 2 <sup>nd</sup> prior month  | Apr          | 42   | 97   | 188                            | wet  | 3                            | 2                                 | 6  |
| 3 <sup>rd</sup> prior month  | Mar          | 80   | 124  | 289                            | wet  | 3                            | 1                                 | 3  |
| <i>Sum</i>   |              |  |  |                                |  |                              |                                   | <i>18</i>  |
| <i>Antecedent Rainfall Condition: (drier than normal = 6-9, normal = 10-14, or wetter than normal = 15-18)</i> |              |  |  |                                |  |                              |                                   | <i>wetter than normal</i>                          |

**July 2003**

|  | <b>Month</b> | <b>30<sup>th</sup><br/>percentile<br/>(mm)</b> | <b>70<sup>th</sup><br/>percentile<br/>(mm)</b> | <b>Rain-<br/>fall<br/>(mm)</b> | <b>Condition<br/>(dry, wet,<br/>or<br/>normal)</b> | <b>Conditional<br/>Value</b> | <b>Month<br/>Weight<br/>Value</b> | <b>Product of<br/>Previous<br/>Two<br/>Columns</b> |
|--|--------------|--|--|--------------------------------|--|------------------------------|-----------------------------------|--|
| 1 <sup>st</sup> prior month  | Jun          | 72   | 136  | 173                            | wet  | 3                            | 3                                 | 9  |
| 2 <sup>nd</sup> prior month  | May          | 76   | 143  | 313                            | wet  | 3                            | 2                                 | 6  |
| 3 <sup>rd</sup> prior month  | Apr          | 42   | 97   | 188                            | wet  | 3                            | 1                                 | 3  |
| <i>Sum</i>   |              |  |  |                                |  |                              |                                   | <i>18</i>  |
| <i>Antecedent Rainfall Condition: (drier than normal = 6-9, normal = 10-14, or wetter than normal = 15-18)</i> |              |  |  |                                |  |                              |                                   | <i>wetter than normal</i>                          |

Table B.1. continued

**August 2003**

|  | Month | 30 <sup>th</sup><br>percentile<br>(mm) | 70 <sup>th</sup><br>percentile<br>(mm) | Rain-<br>fall<br>(mm) | Condition<br>(dry, wet,<br>or<br>normal) | Conditional<br>Value | Month<br>Weight<br>Value | Product of<br>Previous<br>Two<br>Columns |
|--|-------|--|--|-----------------------|--|----------------------|--------------------------|--|
| 1 <sup>st</sup> prior<br>month   | Jul   | 104                                    | 182                                    | 167                   | normal                                   | 2                    | 3                        | 6  |
| 2 <sup>nd</sup> prior<br>month   | Jun   | 72                                     | 136                                    | 173                   | wet                                      | 3                    | 2                        | 6  |
| 3 <sup>rd</sup> prior<br>month   | May   | 76                                     | 143                                    | 313                   | wet                                      | 3                    | 1                        | 3  |
| <i>Sum</i>   |       |  |  |                       |  |                      |                          | <i>15</i>                                |
| <i>Antecedent Rainfall Condition: (drier than normal = 6-9, normal = 10-14, or wetter than normal = 15-18)</i> |       |  |  |                       |  |                      |                          | <i>wetter than normal</i>                |

**September 2003**

|  | Month | 30 <sup>th</sup><br>percentile<br>(mm) | 70 <sup>th</sup><br>percentile<br>(mm) | Rain-<br>fall<br>(mm) | Condition<br>(dry, wet,<br>or<br>normal) | Conditional<br>Value | Month<br>Weight<br>Value | Product of<br>Previous<br>Two<br>Columns |
|--|-------|--|--|-----------------------|--|----------------------|--------------------------|--|
| 1 <sup>st</sup> prior<br>month   | Aug   | 121                                    | 228                                    | 161                   | normal                                   | 2                    | 3                        | 6  |
| 2 <sup>nd</sup> prior<br>month   | Jul   | 104                                    | 182                                    | 167                   | normal                                   | 2                    | 2                        | 4  |
| 3 <sup>rd</sup> prior<br>month   | Jun   | 72                                     | 136                                    | 173                   | wet                                      | 3                    | 1                        | 3  |
| <i>Sum</i>   |       |  |  |                       |  |                      |                          | <i>13</i>                                |
| <i>Antecedent Rainfall Condition: (drier than normal = 6-9, normal = 10-14, or wetter than normal = 15-18)</i> |       |  |  |                       |  |                      |                          | <i>normal</i>                            |

**October 2003**

|  | Month | 30 <sup>th</sup><br>percentile<br>(mm) | 70 <sup>th</sup><br>percentile<br>(mm) | Rain-<br>fall<br>(mm) | Condition<br>(dry, wet,<br>or<br>normal) | Conditional<br>Value | Month<br>Weight<br>Value | Product of<br>Previous<br>Two<br>Columns |
|--|-------|--|--|-----------------------|--|----------------------|--------------------------|--|
| 1 <sup>st</sup> prior<br>month   | Sept  | 97                                     | 220                                    | 230                   | wet                                      | 3                    | 3                        | 9  |
| 2 <sup>nd</sup> prior<br>month   | Aug   | 121                                    | 228                                    | 161                   | normal                                   | 2                    | 2                        | 4  |
| 3 <sup>rd</sup> prior<br>month   | Jul   | 104                                    | 182                                    | 167                   | normal                                   | 2                    | 1                        | 2  |
| <i>Sum</i>   |       |  |  |                       |  |                      |                          | <i>15</i>                                |
| <i>Antecedent Rainfall Condition: (drier than normal = 6-9, normal = 10-14, or wetter than normal = 15-18)</i> |       |  |  |                       |  |                      |                          | <i>wetter than normal</i>                |

Table B.1. continued

**November 2003**

|  | Month | 30 <sup>th</sup><br>percentile<br>(mm) | 70 <sup>th</sup><br>percentile<br>(mm) | Rain-<br>fall<br>(mm) | Condition<br>(dry, wet,<br>or<br>normal) | Conditional<br>Value | Month<br>Weight<br>Value | Product of<br>Previous<br>Two<br>Columns |
|--|-------|--|--|-----------------------|--|----------------------|--------------------------|--|
| 1 <sup>st</sup> prior<br>month   | Oct   | 62                                     | 139                                    | 166                   | wet                                      | 3                    | 3                        | 9  |
| 2 <sup>nd</sup> prior<br>month   | Sept  | 97                                     | 220                                    | 230                   | wet                                      | 3                    | 2                        | 6  |
| 3 <sup>rd</sup> prior<br>month   | Aug   | 121                                    | 228                                    | 161                   | normal                                   | 2                    | 1                        | 2  |
| <i>Sum</i>   |       |  |  |                       |  |                      |                          | <i>17</i>                                |
| <i>Antecedent Rainfall Condition: (drier than normal = 6-9, normal = 10-14, or wetter than normal = 15-18)</i> |       |  |  |                       |  |                      |                          | <i>wetter than normal</i>                |

**December 2003**

|  | Month | 30 <sup>th</sup><br>percentile<br>(mm) | 70 <sup>th</sup><br>percentile<br>(mm) | Rain-<br>fall<br>(mm) | Condition<br>(dry, wet,<br>or<br>normal) | Conditional<br>Value | Month<br>Weight<br>Value | Product of<br>Previous<br>Two<br>Columns |
|--|-------|--|--|-----------------------|--|----------------------|--------------------------|--|
| 1 <sup>st</sup> prior<br>month   | Nov   | 67                                     | 120                                    | 96                    | normal                                   | 2                    | 3                        | 6  |
| 2 <sup>nd</sup> prior<br>month   | Oct   | 62                                     | 139                                    | 166                   | wet                                      | 3                    | 2                        | 6  |
| 3 <sup>rd</sup> prior<br>month   | Sept  | 97                                     | 220                                    | 230                   | wet                                      | 3                    | 1                        | 3  |
| <i>Sum</i>   |       |  |  |                       |  |                      |                          | <i>15</i>                                |
| <i>Antecedent Rainfall Condition: (drier than normal = 6-9, normal = 10-14, or wetter than normal = 15-18)</i> |       |  |  |                       |  |                      |                          | <i>wetter than normal</i>                |

**January 2004**

|  | Month | 30 <sup>th</sup><br>percentile<br>(mm) | 70 <sup>th</sup><br>percentile<br>(mm) | Rain-<br>fall<br>(mm) | Condition<br>(dry, wet,<br>or<br>normal) | Conditional<br>Value | Month<br>Weight<br>Value | Product of<br>Previous<br>Two<br>Columns |
|--|-------|--|--|-----------------------|--|----------------------|--------------------------|--|
| 1 <sup>st</sup> prior<br>month   | Dec   | 75                                     | 138                                    | 185                   | wet                                      | 3                    | 3                        | 9  |
| 2 <sup>nd</sup> prior<br>month   | Nov   | 67                                     | 120                                    | 96                    | normal                                   | 2                    | 2                        | 4  |
| 3 <sup>rd</sup> prior<br>month   | Oct   | 62                                     | 139                                    | 166                   | wet                                      | 3                    | 1                        | 3  |
| <i>Sum</i>   |       |  |  |                       |  |                      |                          | <i>16</i>                                |
| <i>Antecedent Rainfall Condition: (drier than normal = 6-9, normal = 10-14, or wetter than normal = 15-18)</i> |       |  |  |                       |  |                      |                          | <i>wetter than normal</i>                |

Table B.1. continued

**February 2004**

|  | Month | 30 <sup>th</sup><br>percentile<br>(mm) | 70 <sup>th</sup><br>percentile<br>(mm) | Rain-<br>fall<br>(mm) | Condition<br>(dry, wet,<br>or<br>normal) | Conditional<br>Value | Month<br>Weight<br>Value | Product of<br>Previous<br>Two<br>Columns |
|--|-------|--|--|-----------------------|--|----------------------|--------------------------|--|
| 1 <sup>st</sup> prior<br>month   | Jan   | 100                                    | 158                                    | 57                    | dry                                      | 1                    | 3                        | 3  |
| 2 <sup>nd</sup> prior<br>month   | Dec   | 75                                     | 138                                    | 96                    | wet                                      | 3                    | 2                        | 6  |
| 3 <sup>rd</sup> prior<br>month   | Nov   | 67                                     | 120                                    | 96                    | normal                                   | 2                    | 1                        | 2  |
| <i>Sum</i>   |       |  |  |                       |  |                      |                          | <i>11</i>                                |
| <i>Antecedent Rainfall Condition: (drier than normal = 6-9, normal = 10-14, or wetter than normal = 15-18)</i> |       |  |  |                       |  |                      |                          | <i>normal</i>                            |

**March 2004**

|  | Month | 30 <sup>th</sup><br>percentile<br>(mm) | 70 <sup>th</sup><br>percentile<br>(mm) | Rain-<br>fall<br>(mm) | Condition<br>(dry, wet,<br>or<br>normal) | Conditional<br>Value | Month<br>Weight<br>Value | Product of<br>Previous<br>Two<br>Columns |
|--|-------|--|--|-----------------------|--|----------------------|--------------------------|--|
| 1 <sup>st</sup> prior<br>month   | Feb   | 61                                     | 113                                    | 105                   | normal                                   | 2                    | 3                        | 6  |
| 2 <sup>nd</sup> prior<br>month   | Jan   | 100                                    | 158                                    | 57                    | dry                                      | 1                    | 2                        | 2  |
| 3 <sup>rd</sup> prior<br>month   | Dec   | 75                                     | 138                                    | 96                    | wet                                      | 3                    | 1                        | 3  |
| <i>Sum</i>   |       |  |  |                       |  |                      |                          | <i>11</i>                                |
| <i>Antecedent Rainfall Condition: (drier than normal = 6-9, normal = 10-14, or wetter than normal = 15-18)</i> |       |  |  |                       |  |                      |                          | <i>normal</i>                            |

**April 2004**

|  | Month | 30 <sup>th</sup><br>percentile<br>(mm) | 70 <sup>th</sup><br>percentile<br>(mm) | Rain-<br>fall<br>(mm) | Condition<br>(dry, wet,<br>or<br>normal) | Conditional<br>Value | Month<br>Weight<br>Value | Product of<br>Previous<br>Two<br>Columns |
|--|-------|--|--|-----------------------|--|----------------------|--------------------------|--|
| 1 <sup>st</sup> prior<br>month   | Mar   | 80                                     | 124                                    | 67                    | dry                                      | 1                    | 3                        | 3  |
| 2 <sup>nd</sup> prior<br>month   | Feb   | 61                                     | 113                                    | 105                   | normal                                   | 2                    | 2                        | 4  |
| 3 <sup>rd</sup> prior<br>month   | Jan   | 100                                    | 158                                    | 57                    | dry                                      | 1                    | 1                        | 1  |
| <i>Sum</i>   |       |  |  |                       |  |                      |                          | <i>8</i>                                 |
| <i>Antecedent Rainfall Condition: (drier than normal = 6-9, normal = 10-14, or wetter than normal = 15-18)</i> |       |  |  |                       |  |                      |                          | <i>drier than normal</i>                 |

Table B.1. continued

**May 2004**

|  | Month | 30 <sup>th</sup><br>percentile<br>(mm) | 70 <sup>th</sup><br>percentile<br>(mm) | Rain-<br>fall<br>(mm) | Condition<br>(dry, wet,<br>or<br>normal) | Conditional<br>Value | Month<br>Weight<br>Value | Product of<br>Previous<br>Two<br>Columns |
|--|-------|--|--|-----------------------|--|----------------------|--------------------------|--|
| 1 <sup>st</sup> prior<br>month   | Apr   | 42                                     | 97                                     | 61                    | normal                                   | 2                    | 3                        | 6  |
| 2 <sup>nd</sup> prior<br>month   | Mar   | 80                                     | 124                                    | 67                    | dry                                      | 1                    | 2                        | 2  |
| 3 <sup>rd</sup> prior<br>month   | Feb   | 61                                     | 113                                    | 105                   | normal                                   | 2                    | 1                        | 2  |
| <i>Sum</i>   |       |  |  |                       |  |                      |                          | <b>10</b>                                |
| <i>Antecedent Rainfall Condition: (drier than normal = 6-9, normal = 10-14, or wetter than normal = 15-18)</i> |       |  |  |                       |  |                      |                          | <i>normal</i>                            |

**June 2004**

|  | Month | 30 <sup>th</sup><br>percentile<br>(mm) | 70 <sup>th</sup><br>percentile<br>(mm) | Rain-<br>fall<br>(mm) | Condition<br>(dry, wet,<br>or<br>normal) | Conditional<br>Value | Month<br>Weight<br>Value | Product of<br>Previous<br>Two<br>Columns |
|--|-------|--|--|-----------------------|--|----------------------|--------------------------|--|
| 1 <sup>st</sup> prior<br>month   | May   | 76                                     | 143                                    | 39                    | dry                                      | 1                    | 3                        | 3  |
| 2 <sup>nd</sup> prior<br>month   | Apr   | 42                                     | 97                                     | 61                    | normal                                   | 2                    | 2                        | 4  |
| 3 <sup>rd</sup> prior<br>month   | Mar   | 80                                     | 124                                    | 67                    | dry                                      | 1                    | 1                        | 1  |
| <i>Sum</i>   |       |  |  |                       |  |                      |                          | <b>8</b>                                 |
| <i>Antecedent Rainfall Condition: (drier than normal = 6-9, normal = 10-14, or wetter than normal = 15-18)</i> |       |  |  |                       |  |                      |                          | <i>drier than normal</i>                 |

**July 2004**

|  | Month | 30 <sup>th</sup><br>percentile<br>(mm) | 70 <sup>th</sup><br>percentile<br>(mm) | Rain-<br>fall<br>(mm) | Condition<br>(dry, wet,<br>or<br>normal) | Conditional<br>Value | Month<br>Weight<br>Value | Product of<br>Previous<br>Two<br>Columns |
|--|-------|--|--|-----------------------|--|----------------------|--------------------------|--|
| 1 <sup>st</sup> prior<br>month   | Jun   | 72                                     | 136                                    | 150                   | wet                                      | 3                    | 3                        | 9  |
| 2 <sup>nd</sup> prior<br>month   | May   | 76                                     | 143                                    | 39                    | dry                                      | 1                    | 2                        | 2  |
| 3 <sup>rd</sup> prior<br>month   | Apr   | 42                                     | 97                                     | 61                    | normal                                   | 2                    | 1                        | 2  |
| <i>Sum</i>   |       |  |  |                       |  |                      |                          | <b>13</b>                                |
| <i>Antecedent Rainfall Condition: (drier than normal = 6-9, normal = 10-14, or wetter than normal = 15-18)</i> |       |  |  |                       |  |                      |                          | <i>normal</i>                            |

Table B.1. continued

**August 2004**

|  | Month | 30 <sup>th</sup><br>percentile<br>(mm) | 70 <sup>th</sup><br>percentile<br>(mm) | Rain-<br>fall<br>(mm) | Condition<br>(dry, wet,<br>or<br>normal) | Conditional<br>Value | Month<br>Weight<br>Value | Product of<br>Previous<br>Two<br>Columns |
|--|-------|--|--|-----------------------|--|----------------------|--------------------------|--|
| 1 <sup>st</sup> prior<br>month   | Jul   | 104                                    | 182                                    | 174                   | normal                                   | 2                    | 3                        | 6  |
| 2 <sup>nd</sup> prior<br>month   | Jun   | 72                                     | 136                                    | 150                   | wet                                      | 3                    | 2                        | 6  |
| 3 <sup>rd</sup> prior<br>month   | May   | 76                                     | 143                                    | 39                    | dry                                      | 1                    | 1                        | 1  |
| <i>Sum</i>   |       |  |  |                       |  |                      |                          | <i>13</i>                                |
| <i>Antecedent Rainfall Condition: (drier than normal = 6-9, normal = 10-14, or wetter than normal = 15-18)</i> |       |  |  |                       |  |                      |                          | <i>normal</i>                            |

**September 2004**

|  | Month | 30 <sup>th</sup><br>percentile<br>(mm) | 70 <sup>th</sup><br>percentile<br>(mm) | Rain-<br>fall<br>(mm) | Condition<br>(dry, wet,<br>or<br>normal) | Conditional<br>Value | Month<br>Weight<br>Value | Product of<br>Previous<br>Two<br>Columns |
|--|-------|--|--|-----------------------|--|----------------------|--------------------------|--|
| 1 <sup>st</sup> prior<br>month   | Aug   | 121                                    | 228                                    | 297                   | wet                                      | 3                    | 3                        | 9  |
| 2 <sup>nd</sup> prior<br>month   | Jul   | 104                                    | 182                                    | 174                   | wet                                      | 3                    | 2                        | 6  |
| 3 <sup>rd</sup> prior<br>month   | Jun   | 72                                     | 136                                    | 150                   | wet                                      | 3                    | 1                        | 3  |
| <i>Sum</i>   |       |  |  |                       |  |                      |                          | <i>18</i>                                |
| <i>Antecedent Rainfall Condition: (drier than normal = 6-9, normal = 10-14, or wetter than normal = 15-18)</i> |       |  |  |                       |  |                      |                          | <i>wetter than normal</i>                |

**October 2004**

|  | Month | 30 <sup>th</sup><br>percentile<br>(mm) | 70 <sup>th</sup><br>percentile<br>(mm) | Rain-<br>fall<br>(mm) | Condition<br>(dry, wet,<br>or<br>normal) | Conditional<br>Value | Month<br>Weight<br>Value | Product of<br>Previous<br>Two<br>Columns |
|--|-------|--|--|-----------------------|--|----------------------|--------------------------|--|
| 1 <sup>st</sup> prior<br>month   | Sept  | 97                                     | 220                                    | 116                   | normal                                   | 2                    | 3                        | 6  |
| 2 <sup>nd</sup> prior<br>month   | Aug   | 121                                    | 228                                    | 297                   | wet                                      | 3                    | 2                        | 6  |
| 3 <sup>rd</sup> prior<br>month   | Jul   | 104                                    | 182                                    | 174                   | wet                                      | 3                    | 1                        | 3  |
| <i>Sum</i>   |       |  |  |                       |  |                      |                          | <i>15</i>                                |
| <i>Antecedent Rainfall Condition: (drier than normal = 6-9, normal = 10-14, or wetter than normal = 15-18)</i> |       |  |  |                       |  |                      |                          | <i>wetter than normal</i>                |

Table B.1. continued

**November 2004**

|  | <b>Month</b> | <b>30<sup>th</sup><br/>percentile<br/>(mm)</b> | <b>70<sup>th</sup><br/>percentile<br/>(mm)</b> | <b>Rain-<br/>fall<br/>(mm)</b> | <b>Condition<br/>(dry, wet,<br/>or<br/>normal)</b> | <b>Conditional<br/>Value</b> | <b>Month<br/>Weight<br/>Value</b> | <b>Product of<br/>Previous<br/>Two<br/>Columns</b> |
|--|--------------|--|--|--------------------------------|--|------------------------------|-----------------------------------|--|
| 1 <sup>st</sup> prior<br>month   | Oct          | 62   | 139  | 68                             | normal   | 2                            | 3                                 | 6  |
| 2 <sup>nd</sup> prior<br>month   | Sept         | 97   | 220  | 116                            | normal   | 2                            | 2                                 | 4  |
| 3 <sup>rd</sup> prior<br>month   | Aug          | 121  | 228  | 297                            | wet  | 3                            | 1                                 | 3  |
| <i>Sum</i>   |              |  |  |                                |  |                              |                                   | <i>13</i>  |
| <i>Antecedent Rainfall Condition: (drier than normal = 6-9, normal = 10-14, or wetter than normal = 15-18)</i> |              |  |  |                                |  |                              |                                   | <i>normal</i>                                      |

**December 2004**

|  | <b>Month</b> | <b>30<sup>th</sup><br/>percentile<br/>(mm)</b> | <b>70<sup>th</sup><br/>percentile<br/>(mm)</b> | <b>Rain-<br/>fall<br/>(mm)</b> | <b>Condition<br/>(dry, wet,<br/>or<br/>normal)</b> | <b>Conditional<br/>Value</b> | <b>Month<br/>Weight<br/>Value</b> | <b>Product of<br/>Previous<br/>Two<br/>Columns</b> |
|--|--------------|--|--|--------------------------------|--|------------------------------|-----------------------------------|--|
| 1 <sup>st</sup> prior<br>month   | Nov          | 67   | 120  | 103                            | normal   | 2                            | 3                                 | 6  |
| 2 <sup>nd</sup> prior<br>month   | Oct          | 62   | 139  | 68                             | normal   | 2                            | 2                                 | 4  |
| 3 <sup>rd</sup> prior<br>month   | Sept         | 97   | 220  | 116                            | normal   | 2                            | 1                                 | 2  |
| <i>Sum</i>   |              |  |  |                                |  |                              |                                   | <i>12</i>  |
| <i>Antecedent Rainfall Condition: (drier than normal = 6-9, normal = 10-14, or wetter than normal = 15-18)</i> |              |  |  |                                |  |                              |                                   | <i>normal</i>                                      |

## **APPENDIX C**

### Hydric Soil Technical Standard Data Sheets

## Technical Standard Data Sheet

REF 01 Shallow (25 cm) Redox Probes

To begin, determine the critical redox potential value that indicates when the soil should be anaerobic using the following equation:  $Eh_{\text{anaerobic}} = 595 - 60(\text{pH})$

$$Eh_{\text{anaerobic}} = 595 - 60(3.83) = 595 - \underline{230} = \underline{365}$$

**Circle the redox potentials that are anaerobic, and complete the table.**

| Date     | Antecedent Condition | Depth to water in piezometer (cm) | Redox Potentials by Electrode |            |            |            |             | Is soil anaerobic? | Saturated and anaerobic? |
|----------|----------------------|-----------------------------------|-------------------------------|------------|------------|------------|-------------|--------------------|--------------------------|
|          |                      |                                   | 1                             | 2          | 3          | 4          | 5           |                    |                          |
|          |                      |                                   | -----mv-----                  |            |            |            |             |                    |                          |
| 09/30/03 | normal               | -77.0                             | 601                           | 831        | <b>155</b> | <b>105</b> | <b>299</b>  | yes                | no                       |
| 10/07/03 | wetter               | -49.5                             | 800                           | 816        | <b>251</b> | 780        | 816         | no                 | no                       |
| 10/14/03 | wetter               | -18.5                             | <b>327</b>                    | 540        | <b>269</b> | <b>290</b> | <b>335</b>  | yes                | yes                      |
| 10/21/03 | wetter               | -29.5                             | 426                           | 849        | <b>166</b> | <b>183</b> | <b>230</b>  | yes                | no                       |
| 10/28/03 | wetter               | -33.5                             | 758                           | 798        | <b>208</b> | 707        | 772         | no                 | no                       |
| 11/11/03 | wetter               | -31.9                             | 791                           | 855        | <b>256</b> | <b>290</b> | <b>266</b>  | yes                | no                       |
| 11/18/03 | wetter               | -45.5                             | 800                           | 594        | <b>232</b> | 801        | 797         | no                 | no                       |
| 11/24/03 | wetter               | -37.5                             | 833                           | 808        | <b>244</b> | 786        | 813         | no                 | no                       |
| 12/09/03 | wetter               | -26.5                             | 749                           | 806        | <b>199</b> | 372        | 738         | no                 | no                       |
| 12/16/03 | wetter               | -13.5                             | <b>297</b>                    | <b>293</b> | <b>186</b> | <b>266</b> | <b>363</b>  | yes                | yes                      |
| 12/21/03 | wetter               | -22.5                             | <b>263</b>                    | 421        | <b>182</b> | <b>214</b> | <b>337</b>  | yes                | yes                      |
| 12/28/03 | wetter               | -19.5                             | <b>243</b>                    | 569        | <b>188</b> | <b>223</b> | <b>312</b>  | yes                | yes                      |
| 01/04/04 | wetter               | -29.4                             | 747                           | 856        | <b>260</b> | <b>182</b> | <b>301</b>  | yes                | no                       |
| 01/19/04 | wetter               | -28.5                             | 841                           | 857        | <b>253</b> | 599        | 811         | no                 | no                       |
| 02/01/04 | normal               | -77.5                             | 817                           | 859        | <b>241</b> | 708        | 831         | no                 | no                       |
| 02/08/04 | normal               | -37.5                             | 833                           | 854        | <b>231</b> | 699        | 830         | no                 | no                       |
| 02/14/04 | normal               | -25.5                             | 747                           | 843        | <b>236</b> | 703        | 801         | no                 | no                       |
| 02/22/04 | normal               | -31.5                             | 618                           | 843        | <b>172</b> | <b>288</b> | 782         | no                 | no                       |
| 02/28/04 | normal               | -22.5                             | 589                           | 588        | <b>189</b> | <b>224</b> | 517         | no                 | no                       |
| 03/07/04 | normal               | -33.0                             | 816                           | 861        | <b>256</b> | <b>197</b> | <b>-345</b> | yes                | no                       |
| 03/12/04 | normal               | -31.5                             | 824                           | 877        | <b>268</b> | 696        | 853         | no                 | no                       |
| 03/20/04 | normal               | -25.5                             | 779                           | 797        | <b>195</b> | <b>258</b> | 793         | no                 | no                       |
| 03/28/04 | normal               | -39.5                             | 845                           | 868        | <b>247</b> | 701        | 825         | no                 | no                       |
| 04/04/04 | drier                | -44.0                             | 847                           | 867        | <b>230</b> | 743        | 861         | no                 | no                       |
| 04/10/04 | drier                | -53.5                             | 839                           | 869        | <b>235</b> | 757        | 866         | no                 | no                       |

## Technical Standard Data Sheet

REF 01 Shallow (25 cm) Redox Probes

| Date     | Antecedent Condition | Depth to water in piezometer (cm) | Redox Potentials by Electrode |            |            |     |     | Is soil anaerobic? | Saturated and anaerobic? |
|----------|----------------------|-----------------------------------|-------------------------------|------------|------------|-----|-----|--------------------|--------------------------|
|          |                      |                                   | 1                             | 2          | 3          | 4   | 5   |                    |                          |
|          |                      |                                   | -----mv-----                  |            |            |     |     |                    |                          |
| 04/25/04 | drier                | -58.5                             | 844                           | 862        | <b>250</b> | 767 | 858 | no                 | no                       |
| 05/09/04 | normal               | -72.5                             | 818                           | 855        | <b>238</b> | 775 | 835 | no                 | no                       |
| 05/16/04 | normal               | -97.5                             | 849                           | 804        | <b>247</b> | 796 | 865 | no                 | no                       |
| 05/23/04 | normal               | dry                               | 792                           | 807        | <b>251</b> | 800 | 862 | no                 | no                       |
| 05/31/04 | normal               | -100.5                            | 842                           | 829        | <b>258</b> | 810 | 864 | no                 | no                       |
| 06/06/04 | drier                | dry                               | 554                           | 825        | <b>270</b> | 816 | 862 | no                 | no                       |
| 06/16/04 | drier                | dry                               | <b>353</b>                    | 829        | <b>273</b> | 817 | 865 | no                 | no                       |
| 06/27/04 | drier                | dry                               | <b>265</b>                    | 832        | <b>332</b> | 813 | 863 | no                 | no                       |
| 07/20/04 | normal               | dry                               | <b>245</b>                    | 815        | 401        | 812 | 856 | no                 | no                       |
| 08/02/04 | normal               | dry                               | <b>246</b>                    | 832        | 370        | 814 | 727 | no                 | no                       |
| 08/08/04 | normal               | -39.5                             | 812                           | 869        | <b>343</b> | 583 | 842 | no                 | no                       |
| 08/15/04 | normal               | -11.5                             | 601                           | <b>273</b> | <b>208</b> | 771 | 563 | no                 | no                       |
| 08/22/04 | normal               | -35.5                             | 823                           | 866        | <b>152</b> | 340 | 508 | no                 | no                       |
| 09/12/04 | wetter               | -52.5                             | 578                           | 766        | <b>304</b> | 816 | 778 | no                 | no                       |
| 09/26/04 | wetter               | -96.5                             | 639                           | 806        | <b>302</b> | 796 | 878 | no                 | no                       |
| 10/17/04 | wetter               | 96.5                              | 634                           | 756        | <b>255</b> | 742 | 837 | no                 | no                       |
| 10/23/04 | wetter               | -79.5                             | 653                           | 758        | <b>280</b> | 744 | 834 | no                 | no                       |
| 11/22/04 | normal               | dry                               | 596                           | 694        | <b>283</b> | 739 | 835 | no                 | no                       |
| 11/27/04 | normal               | -61.5                             | 579                           | 677        | <b>275</b> | 739 | 830 | no                 | no                       |
| 12/05/04 | normal               | -46.5                             | 572                           | 706        | <b>295</b> | 700 | 832 | no                 | no                       |
| 12/12/04 | normal               | -46.5                             | 577                           | 703        | <b>279</b> | 737 | 830 | no                 | no                       |
| 12/21/04 | normal               | -54.5                             | 620                           | 703        | <b>290</b> | 732 | 828 | no                 | no                       |

## Technical Standard Data Sheet

REF 02 Shallow (25 cm) Redox Probes

To begin, determine the critical redox potential value that indicates when the soil should be anaerobic using the following equation:  $Eh_{\text{anaerobic}} = 595 - 60(\text{pH})$

$$Eh_{\text{anaerobic}} = 595 - 60(4.85) = 595 - \underline{291} = \underline{304}$$

**Circle the redox potentials that are anaerobic, and complete the table.**

| Date     | Antecedent Condition | Depth to water in piezometer (cm) | Redox Potentials by Electrode |            |             |             |             | Is soil anaerobic? | Saturated and anaerobic? |
|----------|----------------------|-----------------------------------|-------------------------------|------------|-------------|-------------|-------------|--------------------|--------------------------|
|          |                      |                                   | 1                             | 2          | 3           | 4           | 5           |                    |                          |
|          |                      |                                   | -----mv-----                  |            |             |             |             |                    |                          |
| 09/30/03 | normal               | -2.0                              | <b>-94</b>                    | <b>102</b> | <b>8</b>    | <b>82</b>   | <b>-162</b> | yes                | yes                      |
| 10/07/03 | wetter               | -15.5                             | <b>-131</b>                   | <b>48</b>  | <b>-5</b>   | <b>6</b>    | <b>-149</b> | yes                | yes                      |
| 10/14/03 | wetter               | 4.5                               | <b>-50</b>                    | <b>73</b>  | <b>17</b>   | <b>114</b>  | <b>80</b>   | yes                | yes                      |
| 10/21/03 | wetter               | -0.5                              | <b>45</b>                     | <b>-50</b> | <b>0</b>    | <b>-80</b>  | <b>-154</b> | yes                | yes                      |
| 10/28/03 | wetter               | -6.5                              | <b>96</b>                     | <b>-3</b>  | <b>-4</b>   | <b>-150</b> | <b>-142</b> | yes                | yes                      |
| 11/11/03 | wetter               | -4.7                              | <b>85</b>                     | <b>27</b>  | <b>-94</b>  | <b>-191</b> | <b>-172</b> | yes                | yes                      |
| 11/18/03 | wetter               | -12.9                             | <b>92</b>                     | <b>26</b>  | <b>-29</b>  | <b>-224</b> | <b>-195</b> | yes                | yes                      |
| 11/24/03 | wetter               | -6.5                              | <b>-65</b>                    | <b>98</b>  | <b>-48</b>  | <b>-259</b> | <b>-173</b> | yes                | yes                      |
| 12/09/03 | wetter               | -1.5                              | <b>69</b>                     | <b>51</b>  | <b>-86</b>  | <b>-273</b> | <b>-103</b> | yes                | yes                      |
| 12/16/03 | wetter               | 8.5                               | <b>39</b>                     | <b>96</b>  | <b>-40</b>  | <b>-281</b> | <b>-80</b>  | yes                | yes                      |
| 12/21/03 | wetter               | 1.1                               | <b>36</b>                     | <b>21</b>  | <b>-93</b>  | <b>-258</b> | <b>-153</b> | yes                | yes                      |
| 12/28/03 | wetter               | 2.5                               | <b>33</b>                     | <b>49</b>  | <b>-110</b> | <b>-290</b> | <b>-44</b>  | yes                | yes                      |
| 01/04/04 | wetter               | -1.2                              | <b>25</b>                     | <b>1</b>   | <b>-112</b> | <b>-272</b> | <b>-164</b> | yes                | yes                      |
| 01/19/04 | wetter               | -1.5                              | <b>24</b>                     | <b>113</b> | <b>-110</b> | <b>-278</b> | <b>-164</b> | yes                | yes                      |
| 02/01/04 | normal               | -4                                | <b>-13</b>                    | <b>-9</b>  | <b>-114</b> | <b>-292</b> | <b>-173</b> | yes                | yes                      |
| 02/08/04 | normal               | -8.9                              | <b>-17</b>                    | <b>-18</b> | <b>-118</b> | <b>-285</b> | <b>-209</b> | yes                | yes                      |
| 02/14/04 | normal               | -0.5                              | <b>65</b>                     | <b>80</b>  | <b>-84</b>  | <b>-118</b> | <b>-48</b>  | yes                | yes                      |
| 02/22/04 | normal               | -0.5                              | <b>-27</b>                    | <b>-27</b> | <b>-117</b> | <b>-301</b> | <b>-170</b> | yes                | yes                      |
| 02/28/04 | normal               | 2.5                               | <b>-29</b>                    | <b>-23</b> | <b>-110</b> | <b>-296</b> | <b>-174</b> | yes                | yes                      |
| 03/07/04 | normal               | -4.4                              | <b>-41</b>                    | <b>-39</b> | <b>-108</b> | <b>-292</b> | <b>-191</b> | yes                | yes                      |
| 03/12/04 | normal               | -4.5                              | <b>-49</b>                    | <b>-37</b> | <b>-111</b> | <b>-291</b> | <b>-204</b> | yes                | yes                      |
| 03/20/04 | normal               | -0.5                              | <b>-51</b>                    | <b>-35</b> | <b>-116</b> | <b>-295</b> | <b>-193</b> | yes                | yes                      |
| 03/28/04 | normal               | -9.4                              | <b>-60</b>                    | <b>-34</b> | <b>-172</b> | <b>-297</b> | <b>-205</b> | yes                | yes                      |
| 04/04/04 | drier                | -8.5                              | <b>-78</b>                    | <b>-52</b> | <b>-207</b> | <b>-296</b> | <b>-200</b> | yes                | yes                      |
| 04/10/04 | drier                | -19.4                             | <b>-79</b>                    | <b>-66</b> | <b>-196</b> | <b>-288</b> | 352         | yes                | yes                      |

## Technical Standard Data Sheet

REF 02 Shallow (25 cm) Redox Probes

| Date     | Antecedent Condition | Depth to water in piezometer (cm) | Redox Potentials by Electrode |            |             |             |            | Is soil anaerobic? | Saturated and anaerobic? |
|----------|----------------------|-----------------------------------|-------------------------------|------------|-------------|-------------|------------|--------------------|--------------------------|
|          |                      |                                   | 1                             | 2          | 3           | 4           | 5          |                    |                          |
|          |                      |                                   | -----mv-----                  |            |             |             |            |                    |                          |
| 04/25/04 | drier                | -27.0                             | <b>-76</b>                    | <b>-91</b> | <b>-225</b> | <b>-282</b> | <b>-49</b> | yes                | no                       |
| 05/09/04 | normal               | -32.9                             | <b>72</b>                     | <b>234</b> | <b>-218</b> | <b>-33</b>  | 574        | yes                | no                       |
| 05/16/04 | normal               | -59.9                             | <b>210</b>                    | <b>255</b> | <b>155</b>  | 405         | 604        | yes                | no                       |
| 05/23/04 | normal               | -85.9                             | <b>225</b>                    | <b>254</b> | <b>143</b>  | 473         | 615        | yes                | no                       |
| 05/31/04 | normal               | -88.0                             | <b>212</b>                    | <b>270</b> | <b>282</b>  | 480         | 620        | yes                | no                       |
| 06/06/04 | drier                | dry                               | <b>214</b>                    | <b>264</b> | 324         | 508         | 626        | no                 | no                       |
| 06/16/04 | drier                | dry                               | <b>168</b>                    | <b>282</b> | 351         | 506         | 603        | no                 | no                       |
| 06/27/04 | drier                | dry                               | 319                           | 431        | 385         | 538         | 616        | no                 | no                       |
| 07/20/04 | normal               | dry                               | <b>228</b>                    | 463        | 370         | 516         | 570        | no                 | no                       |
| 08/02/04 | normal               | -94.9                             | <b>91</b>                     | <b>270</b> | <b>44</b>   | <b>-117</b> | 420        | yes                | no                       |
| 08/08/04 | normal               | -8.5                              | <b>-25</b>                    | <b>268</b> | <b>216</b>  | <b>233</b>  | <b>272</b> | yes                | yes                      |
| 08/15/04 | normal               | 8.5                               | <b>103</b>                    | <b>199</b> | <b>76</b>   | <b>-27</b>  | 442        | yes                | yes                      |
| 08/22/04 | normal               | -4.5                              | <b>2</b>                      | <b>20</b>  | <b>82</b>   | <b>-24</b>  | <b>123</b> | yes                | yes                      |
| 09/12/04 | wetter               | -18.5                             | <b>-114</b>                   | <b>-65</b> | <b>-116</b> | <b>27</b>   | <b>301</b> | yes                | yes                      |
| 09/26/04 | wetter               | -57.5                             | <b>198</b>                    | 466        | <b>172</b>  | 381         | 608        | no                 | no                       |
| 10/17/04 | wetter               | -56.0                             | <b>140</b>                    | 453        | <b>142</b>  | <b>243</b>  | 582        | yes                | no                       |
| 10/23/04 | wetter               | -40.5                             | <b>132</b>                    | 451        | <b>138</b>  | <b>237</b>  | 589        | yes                | no                       |
| 11/22/04 | normal               | -63.5                             | <b>129</b>                    | 477        | <b>154</b>  | <b>261</b>  | 510        | yes                | no                       |
| 11/27/04 | normal               | -27.5                             | <b>122</b>                    | 436        | <b>143</b>  | <b>199</b>  | 536        | yes                | no                       |
| 12/05/04 | normal               | -16.5                             | <b>32</b>                     | 428        | <b>47</b>   | <b>27</b>   | <b>79</b>  | yes                | yes                      |
| 12/12/04 | normal               | -16.5                             | <b>39</b>                     | <b>169</b> | <b>62</b>   | <b>6</b>    | <b>160</b> | yes                | yes                      |
| 12/21/04 | normal               | -22.5                             | <b>35</b>                     | 362        | <b>80</b>   | <b>-4</b>   | 612        | yes                | yes                      |

## Technical Standard Data Sheet

REF 05 Shallow (25 cm) Redox Probes

To begin, determine the critical redox potential value that indicates when the soil should be anaerobic using the following equation:  $Eh_{\text{anaerobic}} = 595 - 60(\text{pH})$

$$Eh_{\text{anaerobic}} = 595 - 60( 5.01 ) = 595 - \underline{301} = \underline{294}$$

**Circle the redox potentials that are anaerobic, and complete the table.**

| Date     | Antecedent Condition | Depth to water in piezometer (cm) | Redox Potentials by Electrode |             |             |             |             | Is soil anaerobic? | Saturated and anaerobic? |
|----------|----------------------|-----------------------------------|-------------------------------|-------------|-------------|-------------|-------------|--------------------|--------------------------|
|          |                      |                                   | 1                             | 2           | 3           | 4           | 5           |                    |                          |
|          |                      |                                   | -----mv-----                  |             |             |             |             |                    |                          |
| 09/30/03 | normal               | -.4                               | <b>106</b>                    | <b>113</b>  | <b>105</b>  | <b>101</b>  | <b>138</b>  | yes                | yes                      |
| 10/07/03 | wetter               | -5.4                              | <b>52</b>                     | <b>-91</b>  | <b>-17</b>  | <b>45</b>   | <b>104</b>  | yes                | yes                      |
| 10/14/03 | wetter               | -.9                               | <b>87</b>                     | <b>154</b>  | <b>27</b>   | <b>84</b>   | <b>109</b>  | yes                | yes                      |
| 10/21/03 | wetter               | 6.4                               | <b>42</b>                     | <b>-93</b>  | <b>-112</b> | <b>84</b>   | <b>69</b>   | yes                | yes                      |
| 10/28/03 | wetter               | 4.6                               | <b>199</b>                    | <b>-114</b> | <b>86</b>   | <b>55</b>   | <b>57</b>   | yes                | yes                      |
| 11/11/03 | wetter               | 4.8                               | <b>12</b>                     | <b>-124</b> | <b>-121</b> | <b>29</b>   | <b>-6</b>   | yes                | yes                      |
| 11/18/03 | wetter               | -1.4                              | <b>14</b>                     | <b>-115</b> | <b>-119</b> | <b>-75</b>  | <b>27</b>   | yes                | yes                      |
| 11/24/03 | wetter               | 3.5                               | <b>69</b>                     | <b>-121</b> | <b>-84</b>  | <b>-106</b> | <b>22</b>   | yes                | yes                      |
| 12/09/03 | wetter               | 11.2                              | <b>11</b>                     | <b>-106</b> | <b>-81</b>  | <b>-54</b>  | <b>22</b>   | yes                | yes                      |
| 12/16/03 | wetter               | 8.9                               | <b>4</b>                      | <b>-115</b> | <b>-89</b>  | <b>-71</b>  | <b>15</b>   | yes                | yes                      |
| 12/21/03 | wetter               | 8.5                               | <b>13</b>                     | <b>-113</b> | <b>-82</b>  | <b>-67</b>  | <b>20</b>   | yes                | yes                      |
| 12/28/03 | wetter               | 12.6                              | <b>1</b>                      | <b>-73</b>  | <b>-89</b>  | <b>-91</b>  | <b>12</b>   | yes                | yes                      |
| 01/04/04 | wetter               | 8.5                               | <b>-2</b>                     | <b>-68</b>  | <b>-70</b>  | <b>-82</b>  | <b>28</b>   | yes                | yes                      |
| 01/19/04 | wetter               | 6.6                               | <b>102</b>                    | <b>-50</b>  | <b>-97</b>  | <b>-107</b> | <b>4</b>    | yes                | yes                      |
| 02/1/04  | normal               | 6.6                               | <b>60</b>                     | <b>59</b>   | <b>-200</b> | <b>7</b>    | <b>50</b>   | yes                | yes                      |
| 02/08/04 | normal               | 2.6                               | <b>-14</b>                    | <b>-74</b>  | <b>-107</b> | <b>-131</b> | <b>-3</b>   | yes                | yes                      |
| 02/14/04 | normal               | 9.6                               | <b>-5</b>                     | <b>-67</b>  | <b>-91</b>  | <b>-128</b> | <b>10</b>   | yes                | yes                      |
| 02/22/04 | normal               | 8.6                               | <b>-13</b>                    | <b>-75</b>  | <b>-107</b> | <b>-137</b> | <b>-2</b>   | yes                | yes                      |
| 02/28/04 | normal               | 11.6                              | <b>-10</b>                    | <b>-71</b>  | <b>-101</b> | <b>0</b>    | <b>-134</b> | yes                | yes                      |
| 03/07/04 | normal               | 5.6                               | <b>-18</b>                    | <b>-81</b>  | <b>-104</b> | <b>-9</b>   | <b>-142</b> | yes                | yes                      |
| 03/12/04 | normal               | 4.6                               | <b>-14</b>                    | <b>-82</b>  | <b>-113</b> | <b>-7</b>   | <b>-145</b> | yes                | yes                      |
| 03/20/04 | normal               | 8.6                               | <b>-5</b>                     | <b>-87</b>  | <b>-116</b> | <b>-156</b> | <b>-12</b>  | yes                | yes                      |
| 03/28/04 | normal               | 0.6                               | <b>-5</b>                     | <b>-100</b> | <b>-116</b> | <b>-13</b>  | <b>-153</b> | yes                | yes                      |
| 04/04/04 | drier                | -3.4                              | <b>-16</b>                    | <b>-104</b> | <b>-121</b> | <b>-12</b>  | <b>-159</b> | yes                | yes                      |
| 04/10/04 | drier                | -10.9                             | <b>-22</b>                    | <b>-124</b> | <b>-124</b> | <b>-164</b> | <b>-18</b>  | yes                | yes                      |

## Technical Standard Data Sheet

REF 05 Shallow (25 cm) Redox Probes

| Date     | Antecedent Condition | Depth to water in piezometer (cm) | Redox Potentials by Electrode |             |             |             |            | Is soil anaerobic? | Saturated and anaerobic? |
|----------|----------------------|-----------------------------------|-------------------------------|-------------|-------------|-------------|------------|--------------------|--------------------------|
|          |                      |                                   | 1                             | 2           | 3           | 4           | 5          |                    |                          |
|          |                      |                                   | -----mv-----                  |             |             |             |            |                    |                          |
| 04/25/04 | drier                | -13.8                             | <b>-24</b>                    | <b>-112</b> | <b>-128</b> | <b>-167</b> | <b>-13</b> | yes                | yes                      |
| 05/09/04 | normal               | -19.4                             | <b>-28</b>                    | <b>-98</b>  | <b>-113</b> | <b>-178</b> | <b>-14</b> | yes                | yes                      |
| 05/16/04 | normal               | -46.9                             | <b>-20</b>                    | <b>324</b>  | <b>220</b>  | <b>-174</b> | <b>61</b>  | yes                | no                       |
| 05/23/04 | normal               | -71.4                             | 318                           | 507         | <b>215</b>  | <b>257</b>  | 340        | no                 | no                       |
| 05/31/04 | normal               | -88.4                             | <b>270</b>                    | 550         | <b>235</b>  | <b>237</b>  | 441        | yes                | no                       |
| 06/06/04 | drier                | dry                               | <b>235</b>                    | 605         | 396         | <b>247</b>  | 472        | no                 | no                       |
| 06/16/04 | drier                | dry                               | <b>209</b>                    | 564         | 506         | <b>234</b>  | 472        | no                 | no                       |
| 06/27/04 | drier                | dry                               | 451                           | 494         | 518         | <b>217</b>  | 489        | no                 | no                       |
| 07/20/04 | normal               | dry                               | <b>240</b>                    | 367         | 585         | <b>198</b>  | 499        | no                 | no                       |
| 08/02/04 | normal               | -85.9                             | <b>241</b>                    | 432         | 655         | <b>239</b>  | 525        | no                 | no                       |
| 08/08/04 | normal               | 1.6                               | <b>92</b>                     | <b>76</b>   | <b>259</b>  | <b>154</b>  | <b>131</b> | yes                | yes                      |
| 08/15/04 | normal               | 16.6                              | <b>140</b>                    | <b>116</b>  | <b>125</b>  | <b>103</b>  | <b>73</b>  | yes                | yes                      |
| 08/22/04 | normal               | 3.6                               | <b>72</b>                     | <b>116</b>  | <b>82</b>   | <b>92</b>   | <b>86</b>  | yes                | yes                      |
| 09/12/04 | wetter               | -6.9                              | <b>84</b>                     | <b>7</b>    | <b>-40</b>  | <b>32</b>   | <b>-14</b> | yes                | yes                      |
| 09/26/04 | wetter               | -37.4                             | <b>-2</b>                     | <b>-10</b>  | <b>188</b>  | <b>77</b>   | <b>24</b>  | yes                | no                       |
| 10/17/04 | wetter               | -40.0                             | <b>154</b>                    | <b>227</b>  | <b>189</b>  | <b>172</b>  | <b>249</b> | yes                | no                       |
| 10/23/04 | wetter               | -29.9                             | <b>-7</b>                     | <b>64</b>   | <b>56</b>   | <b>96</b>   | <b>7</b>   | yes                | no                       |
| 11/22/04 | normal               | -50.4                             | 340                           | <b>280</b>  | 317         | <b>191</b>  | 336        | no                 | no                       |
| 11/27/04 | normal               | -14.9                             | <b>-28</b>                    | <b>9</b>    | <b>27</b>   | <b>109</b>  | <b>-40</b> | yes                | yes                      |
| 12/05/04 | normal               | -2.4                              | <b>-112</b>                   | <b>84</b>   | <b>22</b>   | <b>97</b>   | <b>-52</b> | yes                | yes                      |
| 12/12/04 | normal               | -2.4                              | <b>-114</b>                   | <b>49</b>   | <b>47</b>   | <b>112</b>  | <b>-59</b> | yes                | yes                      |
| 12/21/04 | normal               | -8.5                              | <b>-161</b>                   | <b>10</b>   | <b>36</b>   | <b>103</b>  | <b>-7</b>  | yes                | yes                      |

# Technical Standard Data Sheet

REF 06 Shallow (25 cm) Redox Probes

To begin, determine the critical redox potential value that indicates when the soil should be anaerobic using the following equation:  $Eh_{\text{anaerobic}} = 595 - 60(\text{pH})$

$$Eh_{\text{anaerobic}} = 595 - 60(4.50) = 595 - \underline{270} = \underline{325}$$

**Circle the redox potentials that are anaerobic, and complete the table.**

| Date     | Antecedent Condition | Depth to water in piezometer (cm) | Redox Potentials by Electrode |             |             |             |             | Is soil anaerobic? | Saturated and anaerobic? |
|----------|----------------------|-----------------------------------|-------------------------------|-------------|-------------|-------------|-------------|--------------------|--------------------------|
|          |                      |                                   | 1                             | 2           | 3           | 4           | 5           |                    |                          |
|          |                      |                                   | -----mv-----                  |             |             |             |             |                    |                          |
| 09/30/03 | normal               | -20.0                             | <b>74</b>                     | <b>29</b>   | <b>16</b>   | <b>92</b>   | <b>4</b>    | yes                | yes                      |
| 10/07/03 | wetter               | -33.6                             | <b>88</b>                     | <b>-83</b>  | <b>289</b>  | <b>138</b>  | <b>286</b>  | yes                | no                       |
| 10/14/03 | wetter               | -9.7                              | <b>62</b>                     | <b>44</b>   | <b>32</b>   | <b>76</b>   | <b>242</b>  | yes                | yes                      |
| 10/21/03 | wetter               | -14.5                             | <b>55</b>                     | <b>18</b>   | <b>0</b>    | <b>52</b>   | <b>34</b>   | yes                | yes                      |
| 10/28/03 | wetter               | -18.0                             | <b>38</b>                     | <b>119</b>  | <b>-27</b>  | <b>42</b>   | <b>271</b>  | yes                | yes                      |
| 11/11/03 | wetter               | -16.5                             | <b>43</b>                     | <b>-10</b>  | <b>-120</b> | <b>27</b>   | <b>-22</b>  | yes                | yes                      |
| 11/18/03 | wetter               | -31.0                             | <b>127</b>                    | 537         | <b>-2</b>   | 424         | <b>99</b>   | yes                | no                       |
| 11/24/03 | wetter               | -20.5                             | <b>90</b>                     | <b>121</b>  | <b>-71</b>  | <b>320</b>  | 389         | yes                | yes                      |
| 12/09/03 | wetter               | -13.0                             | <b>99</b>                     | <b>98</b>   | <b>-163</b> | <b>36</b>   | <b>25</b>   | yes                | yes                      |
| 12/16/03 | wetter               | <b>-7.7</b>                       | <b>84</b>                     | <b>78</b>   | <b>-212</b> | <b>15</b>   | <b>79</b>   | yes                | yes                      |
| 12/21/03 | wetter               | -11.5                             | <b>115</b>                    | <b>104</b>  | <b>-166</b> | <b>43</b>   | <b>107</b>  | yes                | yes                      |
| 12/28/03 | wetter               | -10.0                             | <b>89</b>                     | <b>84</b>   | <b>-165</b> | <b>22</b>   | <b>68</b>   | yes                | yes                      |
| 01/04/04 | wetter               | -15.0                             | <b>74</b>                     | <b>75</b>   | <b>-198</b> | <b>22</b>   | <b>64</b>   | yes                | yes                      |
| 01/19/04 | wetter               | -14.5                             | <b>42</b>                     | <b>15</b>   | <b>-188</b> | <b>21</b>   | <b>60</b>   | yes                | yes                      |
| 02/01/04 | normal               | -16.5                             | <b>60</b>                     | <b>59</b>   | <b>-200</b> | <b>7</b>    | <b>50</b>   | yes                | yes                      |
| 02/08/04 | normal               | -21.0                             | <b>-170</b>                   | <b>-132</b> | <b>-389</b> | <b>-189</b> | <b>-141</b> | yes                | yes                      |
| 02/14/04 | normal               | -13.0                             | <b>-187</b>                   | <b>-155</b> | <b>-375</b> | <b>-213</b> | <b>-160</b> | yes                | yes                      |
| 02/22/04 | normal               | -14.0                             | <b>-177</b>                   | <b>-135</b> | <b>-370</b> | <b>-196</b> | <b>-138</b> | yes                | yes                      |
| 02/28/04 | normal               | -2.0                              | <b>-177</b>                   | <b>-146</b> | <b>-387</b> | <b>-215</b> | <b>-153</b> | yes                | yes                      |
| 03/07/04 | normal               | -18.5                             | <b>-207</b>                   | <b>-150</b> | <b>-374</b> | <b>-207</b> | <b>-151</b> | yes                | yes                      |
| 03/12/04 | normal               | -18.0                             | <b>-210</b>                   | <b>-152</b> | <b>-374</b> | <b>-210</b> | <b>-154</b> | yes                | yes                      |
| 03/20/04 | normal               | -14.5                             | <b>-222</b>                   | <b>-161</b> | <b>-380</b> | <b>-215</b> | <b>-163</b> | yes                | yes                      |
| 03/28/04 | normal               | -23.0                             | <b>-219</b>                   | <b>-178</b> | <b>-324</b> | <b>-196</b> | <b>-163</b> | yes                | yes                      |
| 04/04/04 | drier                | -32.0                             | <b>-232</b>                   | <b>-186</b> | <b>-328</b> | <b>-202</b> | <b>-205</b> | yes                | no                       |
| 04/10/04 | drier                | -39.5                             | <b>-8</b>                     | <b>-184</b> | <b>-326</b> | <b>-189</b> | <b>-229</b> | yes                | no                       |

## Technical Standard Data Sheet

REF 06 Shallow (25 cm) Redox Probes

| Date     | Antecedent Condition | Depth to water in piezometer (cm) | Redox Potentials by Electrode |             |            |             |             | Is soil anaerobic? | Saturated and anaerobic? |
|----------|----------------------|-----------------------------------|-------------------------------|-------------|------------|-------------|-------------|--------------------|--------------------------|
|          |                      |                                   | 1                             | 2           | 3          | 4           | 5           |                    |                          |
|          |                      |                                   | -----mv-----                  |             |            |             |             |                    |                          |
| 04/25/04 | drier                | -42.0                             | <b>13</b>                     | <b>-186</b> | <b>189</b> | <b>-174</b> | <b>-272</b> | yes                | no                       |
| 05/09/04 | normal               | -50.5                             | <b>47</b>                     | <b>-67</b>  | <b>84</b>  | <b>-159</b> | 542         | yes                | no                       |
| 05/16/04 | normal               | -71.5                             | <b>47</b>                     | 496         | <b>77</b>  | <b>155</b>  | 609         | no                 | no                       |
| 05/23/04 | normal               | -94.5                             | <b>70</b>                     | 557         | <b>61</b>  | <b>187</b>  | 625         | yes                | no                       |
| 05/31/04 | normal               | -98.0                             | <b>102</b>                    | 561         | <b>56</b>  | <b>297</b>  | 646         | yes                | no                       |
| 06/06/04 | drier                | dry                               | <b>90</b>                     | 520         | <b>11</b>  | 345         | 635         | no                 | no                       |
| 06/16/04 | drier                | dry                               | <b>84</b>                     | 540         | <b>168</b> | 524         | 633         | no                 | no                       |
| 06/27/04 | drier                | dry                               | <b>302</b>                    | 737         | 440        | 752         | 842         | no                 | no                       |
| 07/20/04 | normal               | dry                               | 398                           | 710         | 516        | 741         | 833         | no                 | no                       |
| 08/02/04 | normal               | dry                               | <b>315</b>                    | 750         | 454        | 760         | 830         | no                 | no                       |
| 08/08/04 | normal               | -21.7                             | <b>185</b>                    | 813         | <b>263</b> | <b>79</b>   | <b>44</b>   | yes                | yes                      |
| 08/15/04 | normal               | -6.0                              | <b>152</b>                    | 386         | <b>280</b> | <b>13</b>   | <b>39</b>   | yes                | yes                      |
| 08/22/04 | normal               | -19.0                             | <b>91</b>                     | 724         | <b>146</b> | <b>-14</b>  | <b>-39</b>  | yes                | yes                      |
| 09/12/04 | wetter               | -36.0                             | 524                           | 765         | 549        | 483         | 795         | no                 | no                       |
| 09/26/04 | wetter               | -64.0                             | 475                           | 756         | 472        | 509         | 833         | no                 | no                       |
| 10/17/04 | wetter               | -54.6                             | 414                           | 754         | 431        | 383         | 797         | no                 | no                       |
| 10/23/04 | wetter               | -55.0                             | 469                           | 729         | 412        | 423         | 806         | no                 | no                       |
| 11/22/04 | normal               | -74.5                             | 597                           | 639         | 577        | 351         | 786         | no                 | no                       |
| 11/27/04 | normal               | -44.0                             | 645                           | 626         | 520        | 384         | 612         | no                 | no                       |
| 12/05/04 | normal               | -34.0                             | <b>216</b>                    | <b>217</b>  | <b>166</b> | 386         | 718         | yes                | no                       |
| 12/12/04 | normal               | -34.0                             | <b>179</b>                    | <b>129</b>  | <b>102</b> | 365         | 709         | yes                | no                       |
| 12/21/04 | normal               | -39.0                             | <b>179</b>                    | 347         | <b>266</b> | 411         | 635         | no                 | no                       |

# Technical Standard Data Sheet

NR 01 Shallow (25 cm) Redox Probes  
Micro-topography High

To begin, determine the critical redox potential value that indicates when the soil should be anaerobic using the following equation:  $E_{h_{\text{anaerobic}}} = 595 - 60(\text{pH})$

$$E_{h_{\text{anaerobic}}} = 595 - 60(4.55) = 595 - \underline{273} = \underline{322}$$

**Circle the redox potentials that are anaerobic, and complete the table.**

| Date     | Antecedent Condition | Depth to water in piezometer (cm) | Redox Potentials by Electrode |             |             |            |             | Is soil anaerobic? | Saturated and anaerobic? |
|----------|----------------------|-----------------------------------|-------------------------------|-------------|-------------|------------|-------------|--------------------|--------------------------|
|          |                      |                                   | 1                             | 2           | 3           | 4          | 5           |                    |                          |
|          |                      |                                   | -----mv-----                  |             |             |            |             |                    |                          |
| 09/30/03 | normal               | -13.7                             | <b>12</b>                     | <b>-128</b> | <b>-52</b>  | <b>-9</b>  | <b>141</b>  | yes                | yes                      |
| 10/07/03 | wetter               | -41.8                             | <b>-31</b>                    | <b>-83</b>  | <b>-40</b>  | <b>5</b>   | <b>-22</b>  | yes                | no                       |
| 10/14/03 | wetter               | -0.3                              | <b>-3</b>                     | <b>-119</b> | <b>-92</b>  | <b>-73</b> | <b>98</b>   | yes                | yes                      |
| 10/21/03 | wetter               | -15.7                             | <b>19</b>                     | <b>-121</b> | <b>-63</b>  | <b>-52</b> | <b>30</b>   | yes                | yes                      |
| 10/28/03 | wetter               | -8.7                              | <b>34</b>                     | <b>-150</b> | <b>-54</b>  | <b>-71</b> | <b>145</b>  | yes                | yes                      |
| 11/11/03 | wetter               | -12.4                             | <b>16</b>                     | <b>-100</b> | <b>-55</b>  | <b>-80</b> | <b>112</b>  | yes                | yes                      |
| 11/18/03 | wetter               | -28.8                             | <b>9</b>                      | <b>-130</b> | <b>-35</b>  | <b>-62</b> | <b>115</b>  | yes                | no                       |
| 11/24/03 | wetter               | -9.0                              | <b>1</b>                      | <b>-139</b> | <b>-31</b>  | <b>-68</b> | <b>115</b>  | yes                | yes                      |
| 12/09/03 | wetter               | -3.8                              | <b>-12</b>                    | <b>-150</b> | <b>-41</b>  | <b>-13</b> | <b>72</b>   | yes                | yes                      |
| 12/16/03 | wetter               | 0.5                               | <b>32</b>                     | <b>-157</b> | <b>-186</b> | <b>-6</b>  | <b>88</b>   | yes                | yes                      |
| 12/21/03 | wetter               | -2.5                              | <b>-17</b>                    | <b>-152</b> | <b>-169</b> | <b>-1</b>  | <b>71</b>   | yes                | yes                      |
| 12/28/03 | wetter               | -2.8                              | <b>-4</b>                     | <b>-150</b> | <b>-138</b> | <b>-5</b>  | <b>111</b>  | yes                | yes                      |
| 01/04/04 | wetter               | -6.4                              | <b>-32</b>                    | <b>-145</b> | <b>-134</b> | <b>-20</b> | <b>139</b>  | yes                | yes                      |
| 01/19/04 | wetter               | -3.8                              | <b>-38</b>                    | <b>-151</b> | <b>-107</b> | <b>-12</b> | <b>104</b>  | yes                | yes                      |
| 02/01/04 | normal               | -8.7                              | <b>-168</b>                   | <b>-203</b> | <b>-180</b> | <b>29</b>  | <b>-210</b> | yes                | yes                      |
| 02/08/04 | normal               | -6.7                              | <b>-41</b>                    | <b>-157</b> | <b>-96</b>  | <b>-16</b> | <b>41</b>   | yes                | yes                      |
| 02/14/04 | normal               | 0.2                               | <b>-1</b>                     | <b>-136</b> | <b>-80</b>  | <b>-19</b> | <b>156</b>  | yes                | yes                      |
| 02/22/04 | normal               | -2.8                              | <b>-44</b>                    | <b>-160</b> | <b>-91</b>  | <b>-22</b> | <b>-12</b>  | yes                | yes                      |
| 02/28/04 | normal               | -0.8                              | <b>-48</b>                    | <b>-169</b> | <b>-87</b>  | <b>-27</b> | <b>17</b>   | yes                | yes                      |
| 03/07/04 | normal               | -7.8                              | <b>-37</b>                    | <b>-168</b> | <b>-93</b>  | <b>-24</b> | <b>-63</b>  | yes                | yes                      |
| 03/12/04 | normal               | -4.8                              | <b>-49</b>                    | <b>-176</b> | <b>-92</b>  | <b>-26</b> | <b>-11</b>  | yes                | yes                      |
| 03/20/04 | normal               | -1.8                              | <b>-53</b>                    | <b>-181</b> | <b>-97</b>  | <b>-26</b> | <b>59</b>   | yes                | yes                      |
| 03/28/04 | normal               | -16.7                             | <b>-49</b>                    | <b>-180</b> | <b>-91</b>  | <b>-28</b> | <b>18</b>   | yes                | yes                      |
| 04/04/04 | drier                | -17.7                             | <b>15</b>                     | <b>-194</b> | <b>-95</b>  | <b>-37</b> | <b>-61</b>  | yes                | yes                      |

# Technical Standard Data Sheet

NR 01 Shallow (25 cm) Redox Probes  
Micro-topography High

| Date     | Antecedent Condition | Depth to water in piezometer (cm) | Redox Potentials by Electrode |             |             |            |             | Is soil anaerobic? | Saturated and anaerobic? |
|----------|----------------------|-----------------------------------|-------------------------------|-------------|-------------|------------|-------------|--------------------|--------------------------|
|          |                      |                                   | 1                             | 2           | 3           | 4          | 5           |                    |                          |
|          |                      |                                   | -----mv-----                  |             |             |            |             |                    |                          |
| 04/10/04 | drier                | -36.8                             | <b>-51</b>                    | <b>-187</b> | <b>-84</b>  | <b>-30</b> | <b>-82</b>  | yes                | no                       |
| 04/25/04 | drier                | -36.8                             | <b>-50</b>                    | <b>-187</b> | <b>-74</b>  | <b>-39</b> | <b>-121</b> | yes                | no                       |
| 05/09/04 | normal               | -41.3                             | <b>-215</b>                   | <b>-195</b> | <b>-85</b>  | <b>-44</b> | <b>-64</b>  | yes                | no                       |
| 05/16/04 | normal               | -70.8                             | <b>-69</b>                    | <b>-171</b> | <b>-55</b>  | <b>111</b> | <b>40</b>   | yes                | no                       |
| 05/23/04 | normal               | -85.8                             | <b>-77</b>                    | <b>-196</b> | <b>419</b>  | <b>217</b> | <b>190</b>  | yes                | no                       |
| 05/31/04 | normal               | -95.8                             | <b>-70</b>                    | <b>-184</b> | <b>467</b>  | <b>299</b> | <b>306</b>  | yes                | no                       |
| 06/06/04 | drier                | dry                               | <b>-64</b>                    | <b>-181</b> | 448         | 343        | <b>303</b>  | yes                | no                       |
| 06/16/04 | drier                | dry                               | <b>-45</b>                    | <b>-166</b> | 493         | 420        | 364         | no                 | no                       |
| 06/27/04 | drier                | dry                               | <b>1</b>                      | <b>301</b>  | 570         | 520        | 461         | no                 | no                       |
| 07/20/04 | normal               | dry                               | 437                           | <b>269</b>  | 691         | 552        | 680         | no                 | no                       |
| 08/02/04 | normal               | -20.7                             | <b>139</b>                    | <b>117</b>  | <b>146</b>  | 377        | <b>-3</b>   | yes                | yes                      |
| 08/08/04 | normal               | -2.3                              | <b>141</b>                    | <b>156</b>  | <b>-19</b>  | <b>262</b> | <b>53</b>   | yes                | yes                      |
| 08/15/04 | normal               | 0.8                               | <b>81</b>                     | <b>100</b>  | <b>-45</b>  | <b>27</b>  | <b>167</b>  | yes                | yes                      |
| 08/22/04 | normal               | -13.7                             | <b>101</b>                    | <b>112</b>  | <b>-5</b>   | <b>163</b> | <b>147</b>  | yes                | no                       |
| 09/12/04 | wetter               | -16.3                             | <b>57</b>                     | <b>82</b>   | <b>-14</b>  | <b>32</b>  | <b>142</b>  | yes                | yes                      |
| 09/26/04 | wetter               | -57.8                             | <b>26</b>                     | <b>55</b>   | <b>-31</b>  | <b>-8</b>  | <b>49</b>   | yes                | no                       |
| 10/17/04 | wetter               | -22.5                             | <b>-20</b>                    | <b>17</b>   | <b>-61</b>  | <b>-9</b>  | <b>40</b>   | yes                | yes                      |
| 10/23/04 | wetter               | -38.8                             | <b>-49</b>                    | <b>-19</b>  | <b>-105</b> | <b>-69</b> | <b>193</b>  | yes                | no                       |
| 11/22/04 | normal               | -63.5                             | <b>-15</b>                    | <b>159</b>  | 685         | 479        | <b>225</b>  | yes                | no                       |
| 11/27/04 | normal               | -11.2                             | <b>236</b>                    | <b>146</b>  | <b>75</b>   | <b>52</b>  | <b>195</b>  | yes                | yes                      |
| 12/05/04 | normal               | -14.8                             | <b>-3</b>                     | <b>33</b>   | <b>-44</b>  | <b>106</b> | <b>84</b>   | yes                | yes                      |
| 12/12/04 | normal               | -6.2                              | <b>-3</b>                     | <b>28</b>   | <b>-32</b>  | <b>117</b> | <b>96</b>   | yes                | yes                      |
| 12/21/04 | normal               | -13.8                             | <b>3</b>                      | <b>40</b>   | <b>12</b>   | <b>123</b> | <b>57</b>   | yes                | yes                      |

## Technical Standard Data Sheet

NR 02 Shallow (25 cm) Redox Probes  
Micro-topography Low

To begin, determine the critical redox potential value that indicates when the soil should be anaerobic using the following equation:  $E_{h_{\text{anaerobic}}} = 595 - 60(\text{pH})$

$$E_{h_{\text{anaerobic}}} = 595 - 60(4.51) = 595 - \underline{271} = \underline{324}$$

**Circle the redox potentials that are anaerobic, and complete the table.**

| Date     | Antecedent Condition | Depth to water in piezometer (cm) | Redox Potentials by Electrode |             |             |            |             | Is soil anaerobic? | Saturated and anaerobic? |
|----------|----------------------|-----------------------------------|-------------------------------|-------------|-------------|------------|-------------|--------------------|--------------------------|
|          |                      |                                   | 1                             | 2           | 3           | 4          | 5           |                    |                          |
|          |                      |                                   | -----mv-----                  |             |             |            |             |                    |                          |
| 09/30/03 | normal               | -18.8                             | <b>-99</b>                    | <b>-73</b>  | <b>-87</b>  | <b>57</b>  | <b>-223</b> | yes                | yes                      |
| 10/07/03 | wetter               | -44.8                             | <b>-51</b>                    | <b>-111</b> | <b>-218</b> | <b>27</b>  | <b>-81</b>  | yes                | no                       |
| 10/14/03 | wetter               | 0.4                               | <b>-94</b>                    | <b>-153</b> | <b>-179</b> | <b>11</b>  | <b>146</b>  | yes                | yes                      |
| 10/21/03 | wetter               | -19.1                             | <b>-91</b>                    | <b>-153</b> | <b>-188</b> | <b>49</b>  | <b>-234</b> | yes                | yes                      |
| 10/28/03 | wetter               | -14.3                             | <b>-78</b>                    | <b>-123</b> | <b>-137</b> | <b>54</b>  | <b>78</b>   | yes                | yes                      |
| 11/11/03 | wetter               | -15.6                             | <b>-94</b>                    | <b>-148</b> | <b>-172</b> | <b>46</b>  | <b>-220</b> | yes                | yes                      |
| 11/18/03 | wetter               | -36.4                             | <b>-97</b>                    | <b>-165</b> | <b>-134</b> | <b>44</b>  | <b>-217</b> | yes                | no                       |
| 11/24/03 | wetter               | -15.1                             | <b>-93</b>                    | <b>-142</b> | <b>-161</b> | <b>48</b>  | <b>-164</b> | yes                | yes                      |
| 12/09/03 | wetter               | -7.6                              | <b>-56</b>                    | <b>-179</b> | <b>-168</b> | <b>45</b>  | <b>-193</b> | yes                | yes                      |
| 12/16/03 | wetter               | 0.2                               | <b>-80</b>                    | <b>-205</b> | <b>-168</b> | <b>40</b>  | <b>-185</b> | yes                | yes                      |
| 12/21/03 | wetter               | -7.6                              | <b>-113</b>                   | <b>-214</b> | <b>-164</b> | <b>47</b>  | <b>-183</b> | yes                | yes                      |
| 12/28/03 | wetter               | -5.1                              | <b>-99</b>                    | <b>-231</b> | <b>-177</b> | <b>36</b>  | <b>-211</b> | yes                | yes                      |
| 01/04/04 | wetter               | -11.8                             | <b>-107</b>                   | <b>-225</b> | <b>-179</b> | <b>27</b>  | <b>-218</b> | yes                | yes                      |
| 01/19/04 | wetter               | -7.6                              | <b>-98</b>                    | <b>-214</b> | <b>-176</b> | <b>30</b>  | <b>-185</b> | yes                | yes                      |
| 02/01/04 | normal               | -7.8                              | <b>-47</b>                    | <b>-155</b> | <b>-91</b>  | <b>-12</b> | <b>43</b>   | yes                | yes                      |
| 02/08/04 | normal               | -10.6                             | <b>-121</b>                   | <b>-187</b> | <b>-182</b> | <b>27</b>  | <b>-202</b> | yes                | yes                      |
| 02/14/04 | normal               | 1.4                               | <b>43</b>                     | <b>-10</b>  | <b>-76</b>  | <b>22</b>  | <b>-48</b>  | yes                | yes                      |
| 02/22/04 | normal               | -6.6                              | <b>-116</b>                   | <b>-165</b> | <b>-191</b> | <b>15</b>  | <b>-211</b> | yes                | yes                      |
| 02/28/04 | normal               | -2.6                              | <b>-122</b>                   | <b>-150</b> | <b>-190</b> | <b>5</b>   | <b>-166</b> | yes                | yes                      |
| 03/07/04 | normal               | -11.1                             | <b>-103</b>                   | <b>-142</b> | <b>-189</b> | <b>9</b>   | <b>-220</b> | yes                | yes                      |
| 03/12/04 | normal               | -8.8                              | <b>-114</b>                   | <b>-128</b> | <b>-186</b> | <b>6</b>   | <b>-221</b> | yes                | yes                      |
| 03/20/04 | normal               | -4.6                              | <b>-114</b>                   | <b>-117</b> | <b>-199</b> | <b>2</b>   | <b>-225</b> | yes                | yes                      |
| 03/28/04 | normal               | -19.1                             | <b>-97</b>                    | <b>-99</b>  | <b>-195</b> | <b>2</b>   | <b>-205</b> | yes                | yes                      |
| 04/04/04 | drier                | -20.6                             | <b>-101</b>                   | <b>-94</b>  | <b>-198</b> | <b>-1</b>  | <b>-227</b> | yes                | yes                      |

## Technical Standard Data Sheet

NR 02 Shallow (25 cm) Redox Probes  
Micro-topography Low

| Date     | Antecedent Condition | Depth to water in piezometer (cm) | Redox Potentials by Electrode |             |             |            |             | Is soil anaerobic? | Saturated and anaerobic? |
|----------|----------------------|-----------------------------------|-------------------------------|-------------|-------------|------------|-------------|--------------------|--------------------------|
|          |                      |                                   | 1                             | 2           | 3           | 4          | 5           |                    |                          |
|          |                      |                                   | -----mv-----                  |             |             |            |             |                    |                          |
| 04/10/04 | drier                | -41.3                             | <b>-88</b>                    | <b>-85</b>  | <b>-194</b> | <b>2</b>   | <b>-221</b> | yes                | no                       |
| 04/25/04 | drier                | -41.3                             | <b>-89</b>                    | <b>-126</b> | <b>-179</b> | <b>-12</b> | <b>-207</b> | yes                | no                       |
| 05/09/04 | normal               | -46.8                             | <b>-90</b>                    | <b>-170</b> | <b>-189</b> | <b>-32</b> | <b>-221</b> | yes                | no                       |
| 05/16/04 | normal               | -77.8                             | <b>-92</b>                    | <b>-146</b> | <b>-183</b> | <b>-31</b> | <b>-215</b> | yes                | no                       |
| 05/23/04 | normal               | -91.8                             | <b>-87</b>                    | <b>-121</b> | <b>-176</b> | <b>-34</b> | <b>-207</b> | yes                | no                       |
| 05/31/04 | normal               | -97.8                             | <b>273</b>                    | <b>217</b>  | <b>-171</b> | <b>-30</b> | <b>273</b>  | yes                | no                       |
| 06/06/04 | drier                | dry                               | 387                           | 360         | <b>-160</b> | <b>11</b>  | 325         | no                 | no                       |
| 06/16/04 | drier                | dry                               | 440                           | 367         | <b>35</b>   | <b>-21</b> | <b>316</b>  | yes                | no                       |
| 06/27/04 | drier                | dry                               | 522                           | 511         | <b>293</b>  | <b>248</b> | <b>323</b>  | yes                | no                       |
| 07/20/04 | normal               | dry                               | 688                           | 733         | <b>288</b>  | <b>185</b> | <b>269</b>  | yes                | no                       |
| 08/02/04 | normal               | -22.6                             | <b>163</b>                    | <b>135</b>  | <b>118</b>  | <b>225</b> | <b>-5</b>   | yes                | yes                      |
| 08/08/04 | normal               | -5.6                              | <b>118</b>                    | <b>117</b>  | <b>93</b>   | <b>222</b> | <b>-48</b>  | yes                | yes                      |
| 08/15/04 | normal               | -7.4                              | <b>100</b>                    | <b>106</b>  | <b>85</b>   | <b>218</b> | <b>-20</b>  | yes                | yes                      |
| 08/22/04 | normal               | -15.6                             | <b>105</b>                    | <b>106</b>  | <b>92</b>   | <b>229</b> | <b>-41</b>  | yes                | yes                      |
| 09/12/04 | wetter               | -21.1                             | <b>71</b>                     | <b>93</b>   | <b>61</b>   | <b>244</b> | <b>73</b>   | yes                | yes                      |
| 09/26/04 | wetter               | -62.8                             | <b>36</b>                     | <b>68</b>   | <b>29</b>   | <b>238</b> | <b>-36</b>  | yes                | no                       |
| 10/17/04 | wetter               | -37.8                             | <b>10</b>                     | <b>27</b>   | <b>-17</b>  | <b>201</b> | <b>-220</b> | yes                | no                       |
| 10/23/04 | wetter               | -45.3                             | <b>-52</b>                    | <b>7</b>    | <b>-71</b>  | <b>150</b> | <b>-225</b> | yes                | no                       |
| 11/22/04 | normal               | -78.3                             | 382                           | 369         | <b>235</b>  | <b>192</b> | <b>170</b>  | yes                | no                       |
| 11/27/04 | normal               | -18.6                             | <b>202</b>                    | <b>129</b>  | <b>114</b>  | <b>181</b> | <b>6</b>    | yes                | yes                      |
| 12/05/04 | normal               | -17.6                             | <b>160</b>                    | <b>124</b>  | <b>109</b>  | <b>199</b> | <b>50</b>   | yes                | yes                      |
| 12/12/04 | normal               | -9.6                              | <b>152</b>                    | <b>112</b>  | <b>106</b>  | <b>204</b> | <b>-31</b>  | yes                | yes                      |
| 12/21/04 | normal               | -17.6                             | <b>129</b>                    | <b>92</b>   | <b>86</b>   | <b>189</b> | <b>-118</b> | yes                | yes                      |

## Technical Standard Data Sheet

NR 03 Shallow (25 cm) Redox Probes  
Control

To begin, determine the critical redox potential value that indicates when the soil should be anaerobic using the following equation:  $E_{h_{\text{anaerobic}}} = 595 - 60(\text{pH})$

$$E_{h_{\text{anaerobic}}} = 595 - 60(4.67) = 595 - \underline{280} = \underline{315}$$

**Circle the redox potentials that are anaerobic, and complete the table.**

| Date     | Antecedent Condition | Depth to water in piezometer (cm) | Redox Potentials by Electrode |            |            |             |            | Is soil anaerobic? | Saturated and anaerobic? |
|----------|----------------------|-----------------------------------|-------------------------------|------------|------------|-------------|------------|--------------------|--------------------------|
|          |                      |                                   | 1                             | 2          | 3          | 4           | 5          |                    |                          |
|          |                      |                                   | -----mv-----                  |            |            |             |            |                    |                          |
| 09/30/03 | normal               | -13.3                             | <b>133</b>                    | <b>131</b> | <b>76</b>  | <b>-201</b> | <b>101</b> | yes                | yes                      |
| 10/07/03 | wetter               | -42.5                             | <b>172</b>                    | <b>140</b> | <b>-97</b> | <b>-97</b>  | <b>9</b>   | yes                | no                       |
| 10/14/03 | wetter               | -0.5                              | <b>157</b>                    | <b>105</b> | <b>21</b>  | <b>-33</b>  | <b>66</b>  | yes                | yes                      |
| 10/21/03 | wetter               | -18.8                             | <b>103</b>                    | <b>138</b> | <b>145</b> | <b>-38</b>  | <b>51</b>  | yes                | yes                      |
| 10/28/03 | wetter               | -8.5                              | <b>172</b>                    | <b>149</b> | <b>-56</b> | <b>-39</b>  | <b>117</b> | yes                | yes                      |
| 11/11/03 | wetter               | -15.9                             | <b>65</b>                     | <b>149</b> | <b>131</b> | <b>-185</b> | <b>117</b> | yes                | yes                      |
| 11/18/03 | wetter               | -32.5                             | <b>87</b>                     | <b>152</b> | <b>99</b>  | <b>-63</b>  | <b>60</b>  | yes                | no                       |
| 11/24/03 | wetter               | -15.0                             | <b>77</b>                     | <b>155</b> | <b>88</b>  | <b>15</b>   | <b>90</b>  | yes                | yes                      |
| 12/09/03 | wetter               | -5.5                              | <b>33</b>                     | <b>73</b>  | <b>83</b>  | <b>-57</b>  | <b>62</b>  | yes                | yes                      |
| 12/16/03 | wetter               | 0.5                               | <b>74</b>                     | <b>70</b>  | <b>107</b> | <b>-7</b>   | <b>83</b>  | yes                | yes                      |
| 12/21/03 | wetter               | -5.5                              | <b>32</b>                     | <b>81</b>  | <b>79</b>  | <b>-43</b>  | <b>50</b>  | yes                | yes                      |
| 12/28/03 | wetter               | -3.5                              | <b>48</b>                     | <b>78</b>  | <b>90</b>  | <b>-21</b>  | <b>76</b>  | yes                | yes                      |
| 01/04/04 | wetter               | -12.2                             | <b>24</b>                     | <b>62</b>  | <b>76</b>  | <b>43</b>   | <b>83</b>  | yes                | yes                      |
| 01/19/04 | wetter               | -4.0                              | <b>26</b>                     | <b>37</b>  | <b>72</b>  | <b>14</b>   | <b>79</b>  | yes                | yes                      |
| 02/01/04 | normal               | -2.5                              | <b>27</b>                     | <b>23</b>  | <b>73</b>  | <b>-121</b> | <b>93</b>  | yes                | yes                      |
| 02/08/04 | normal               | -9.5                              | <b>26</b>                     | <b>12</b>  | <b>88</b>  | <b>-126</b> | <b>103</b> | yes                | yes                      |
| 02/14/04 | normal               | 0.5                               | <b>109</b>                    | <b>2</b>   | <b>86</b>  | <b>-103</b> | <b>150</b> | yes                | yes                      |
| 02/22/04 | normal               | -5.5                              | <b>26</b>                     | <b>-16</b> | <b>77</b>  | <b>-153</b> | <b>101</b> | yes                | yes                      |
| 02/28/04 | normal               | -1.5                              | <b>17</b>                     | <b>-17</b> | <b>67</b>  | <b>-169</b> | <b>115</b> | yes                | yes                      |
| 03/07/04 | normal               | -12.5                             | <b>31</b>                     | <b>-16</b> | <b>62</b>  | <b>-160</b> | <b>70</b>  | yes                | yes                      |
| 03/12/04 | normal               | -8.5                              | <b>26</b>                     | <b>-16</b> | <b>68</b>  | <b>-179</b> | <b>48</b>  | yes                | yes                      |
| 03/20/04 | normal               | -4.0                              | <b>35</b>                     | <b>-26</b> | <b>62</b>  | <b>-191</b> | <b>94</b>  | yes                | yes                      |
| 03/28/04 | normal               | -22.5                             | <b>34</b>                     | <b>-28</b> | <b>55</b>  | <b>-184</b> | <b>128</b> | yes                | yes                      |
| 04/04/04 | drier                | -24.5                             | <b>60</b>                     | <b>-31</b> | <b>62</b>  | <b>-190</b> | <b>100</b> | yes                | yes                      |

## Technical Standard Data Sheet

NR 03 Shallow (25 cm) Redox Probes  
Control

| Date     | Antecedent Condition | Depth to water in piezometer (cm) | Redox Potentials by Electrode |            |            |             |            | Is soil anaerobic? | Saturated and anaerobic? |
|----------|----------------------|-----------------------------------|-------------------------------|------------|------------|-------------|------------|--------------------|--------------------------|
|          |                      |                                   | 1                             | 2          | 3          | 4           | 5          |                    |                          |
|          |                      |                                   | -----mv-----                  |            |            |             |            |                    |                          |
| 04/10/04 | drier                | -41.5                             | <b>31</b>                     | <b>-37</b> | <b>44</b>  | <b>-189</b> | <b>99</b>  | yes                | no                       |
| 04/25/04 | drier                | -42.5                             | <b>38</b>                     | <b>-30</b> | <b>8</b>   | <b>-175</b> | <b>72</b>  | yes                | no                       |
| 05/09/04 | normal               | -45.5                             | <b>38</b>                     | <b>55</b>  | <b>33</b>  | <b>-67</b>  | <b>94</b>  | yes                | no                       |
| 05/16/04 | normal               | -76.5                             | 481                           | 363        | 476        | <b>155</b>  | 423        | no                 | no                       |
| 05/23/04 | normal               | -92.5                             | 624                           | 321        | 687        | <b>258</b>  | 590        | no                 | no                       |
| 05/31/04 | normal               | -95.5                             | 646                           | <b>272</b> | 775        | <b>237</b>  | 618        | no                 | no                       |
| 06/06/04 | drier                | dry                               | 661                           | <b>267</b> | 770        | <b>239</b>  | 661        | no                 | no                       |
| 06/16/04 | drier                | dry                               | 674                           | <b>261</b> | 797        | <b>224</b>  | 704        | no                 | no                       |
| 06/27/04 | drier                | dry                               | 718                           | <b>274</b> | 820        | 434         | 713        | no                 | no                       |
| 07/20/04 | normal               | dry                               | 690                           | <b>270</b> | 802        | <b>266</b>  | 773        | no                 | no                       |
| 08/02/04 | normal               | -23.5                             | 335                           | <b>-20</b> | 425        | <b>69</b>   | <b>282</b> | yes                | yes                      |
| 08/08/04 | normal               | -3.5                              | <b>285</b>                    | <b>26</b>  | <b>247</b> | <b>81</b>   | <b>265</b> | yes                | yes                      |
| 08/15/04 | normal               | 1.0                               | <b>165</b>                    | <b>103</b> | <b>248</b> | <b>141</b>  | <b>249</b> | yes                | yes                      |
| 08/22/04 | normal               | -14.5                             | <b>272</b>                    | <b>57</b>  | <b>288</b> | <b>168</b>  | <b>204</b> | yes                | yes                      |
| 09/12/04 | wetter               | -18.0                             | 344                           | <b>-19</b> | <b>168</b> | <b>126</b>  | <b>186</b> | yes                | yes                      |
| 09/26/04 | wetter               | -57.5                             | 711                           | 455        | 619        | <b>133</b>  | 511        | no                 | no                       |
| 10/17/04 | wetter               | -32.5                             | 682                           | <b>-19</b> | 556        | <b>51</b>   | <b>251</b> | yes                | no                       |
| 10/23/04 | wetter               | -38.5                             | 654                           | <b>100</b> | 592        | <b>41</b>   | 545        | no                 | no                       |
| 11/22/04 | normal               | -72.5                             | 682                           | <b>171</b> | 750        | <b>165</b>  | 661        | no                 | no                       |
| 11/27/04 | normal               | -12.5                             | 435                           | <b>75</b>  | 553        | <b>182</b>  | <b>284</b> | yes                | yes                      |
| 12/05/04 | normal               | -14.5                             | 638                           | <b>25</b>  | <b>266</b> | <b>56</b>   | <b>220</b> | yes                | yes                      |
| 12/12/04 | normal               | -7.5                              | 640                           | <b>27</b>  | <b>231</b> | <b>71</b>   | <b>120</b> | yes                | yes                      |
| 12/21/04 | normal               | -13.5                             | 669                           | <b>17</b>  | <b>193</b> | <b>60</b>   | <b>93</b>  | yes                | yes                      |

## Technical Standard Data Sheet

NR 06 Shallow (25 cm) Redox Probes  
Crown Removal

To begin, determine the critical redox potential value that indicates when the soil should be anaerobic using the following equation:  $Eh_{\text{anaerobic}} = 595 - 60(\text{pH})$

$$Eh_{\text{anaerobic}} = 595 - 60(4.54) = 595 - \underline{272} = \underline{323}$$

**Circle the redox potentials that are anaerobic, and complete the table.**

| Date     | Antecedent Condition | Depth to water in piezometer (cm) | Redox Potentials by Electrode |             |             |             |            | Is soil anaerobic? | Saturated and anaerobic? |
|----------|----------------------|-----------------------------------|-------------------------------|-------------|-------------|-------------|------------|--------------------|--------------------------|
|          |                      |                                   | 1                             | 2           | 3           | 4           | 5          |                    |                          |
|          |                      |                                   | -----mv-----                  |             |             |             |            |                    |                          |
| 09/30/03 | normal               | -13.5                             | <b>-62</b>                    | <b>26</b>   | <b>-103</b> | <b>-211</b> | <b>25</b>  | yes                | yes                      |
| 10/07/03 | wetter               | -24.0                             | <b>-138</b>                   | <b>-9</b>   | <b>-28</b>  | <b>-197</b> | <b>153</b> | yes                | yes                      |
| 10/14/03 | wetter               | 1.0                               | <b>-48</b>                    | <b>-245</b> | <b>-138</b> | <b>-253</b> | <b>-40</b> | yes                | yes                      |
| 10/21/03 | wetter               | -18.0                             | <b>12</b>                     | <b>-79</b>  | <b>-108</b> | <b>-196</b> | <b>92</b>  | yes                | yes                      |
| 10/28/03 | wetter               | -6.0                              | <b>75</b>                     | <b>50</b>   | <b>-97</b>  | <b>-192</b> | <b>80</b>  | yes                | yes                      |
| 11/11/03 | wetter               | -15.4                             | <b>54</b>                     | <b>-31</b>  | <b>-81</b>  | <b>-214</b> | <b>-15</b> | yes                | yes                      |
| 11/18/03 | wetter               | -42.1                             | <b>206</b>                    | <b>34</b>   | <b>-55</b>  | <b>-174</b> | <b>13</b>  | yes                | no                       |
| 11/24/03 | wetter               | -20.0                             | <b>95</b>                     | <b>1</b>    | <b>-70</b>  | <b>-32</b>  | <b>9</b>   | yes                | yes                      |
| 12/09/03 | wetter               | -6.0                              | <b>65</b>                     | <b>-203</b> | <b>-68</b>  | <b>-70</b>  | <b>9</b>   | yes                | yes                      |
| 12/16/03 | wetter               | 1.0                               | <b>117</b>                    | <b>-151</b> | <b>-66</b>  | <b>-53</b>  | <b>10</b>  | yes                | yes                      |
| 12/21/03 | wetter               | -3.0                              | <b>83</b>                     | <b>-81</b>  | <b>-61</b>  | <b>-136</b> | <b>13</b>  | yes                | yes                      |
| 12/28/03 | wetter               | -2.5                              | <b>97</b>                     | <b>-4</b>   | <b>-56</b>  | <b>-141</b> | <b>13</b>  | yes                | yes                      |
| 01/04/04 | wetter               | -5.3                              | <b>107</b>                    | <b>6</b>    | <b>-87</b>  | <b>-164</b> | <b>9</b>   | yes                | yes                      |
| 01/19/04 | wetter               | -5.0                              | <b>136</b>                    | <b>26</b>   | <b>-67</b>  | <b>24</b>   | <b>11</b>  | yes                | yes                      |
| 02/01/04 | normal               | -8.0                              | <b>35</b>                     | <b>30</b>   | <b>-65</b>  | <b>-123</b> | 12         | yes                | yes                      |
| 02/08/04 | normal               | -8.0                              | <b>25</b>                     | <b>34</b>   | <b>-64</b>  | <b>-81</b>  | 11         | yes                | yes                      |
| 02/14/04 | normal               | data lost                         | <b>158</b>                    | <b>-110</b> | <b>-2</b>   | <b>141</b>  | 26         | yes                | yes                      |
| 02/22/04 | normal               | -3.0                              | <b>13</b>                     | <b>-222</b> | <b>-60</b>  | <b>-141</b> | 19         | yes                | yes                      |
| 02/28/04 | normal               | -1.0                              | <b>61</b>                     | <b>-215</b> | <b>-66</b>  | <b>-116</b> | 12         | yes                | yes                      |
| 03/07/04 | normal               | -4.5                              | <b>12</b>                     | <b>-161</b> | <b>-73</b>  | <b>-144</b> | 39         | yes                | yes                      |
| 03/12/04 | normal               | -6.0                              | <b>13</b>                     | <b>-137</b> | <b>-72</b>  | <b>-172</b> | 19         | yes                | yes                      |
| 03/20/04 | normal               | -2.0                              | <b>15</b>                     | <b>-270</b> | <b>-76</b>  | <b>-183</b> | 20         | yes                | yes                      |
| 03/28/04 | normal               | -12.5                             | <b>16</b>                     | <b>-277</b> | <b>-97</b>  | <b>-194</b> | 13         | yes                | yes                      |
| 04/04/04 | drier                | -19.5                             | <b>8</b>                      | <b>-278</b> | <b>-92</b>  | <b>-198</b> | 19         | yes                | yes                      |

## Technical Standard Data Sheet

NR 06 Shallow (25 cm) Redox Probes  
Crown Removal

| Date     | Antecedent Condition | Depth to water in piezometer (cm) | Redox Potentials by Electrode |             |             |             |            | Is soil anaerobic? | Saturated and anaerobic? |
|----------|----------------------|-----------------------------------|-------------------------------|-------------|-------------|-------------|------------|--------------------|--------------------------|
|          |                      |                                   | 1                             | 2           | 3           | 4           | 5          |                    |                          |
|          |                      |                                   | -----mv-----                  |             |             |             |            |                    |                          |
| 04/10/04 | drier                | -48.1                             | <b>226</b>                    | <b>-244</b> | <b>-78</b>  | <b>-153</b> | 26         | yes                | no                       |
| 04/25/04 | drier                | -42.0                             | <b>192</b>                    | <b>-276</b> | <b>-91</b>  | <b>-210</b> | 30         | yes                | no                       |
| 05/09/04 | normal               | -57.6                             | 463                           | <b>18</b>   | <b>-104</b> | <b>-195</b> | 268        | yes                | no                       |
| 05/16/04 | normal               | -88.6                             | 601                           | <b>271</b>  | <b>-115</b> | <b>60</b>   | 609        | yes                | no                       |
| 05/23/04 | normal               | -97.1                             | 631                           | <b>262</b>  | <b>298</b>  | <b>255</b>  | 603        | no                 | no                       |
| 05/31/04 | normal               | dry                               | 596                           | 335         | 463         | 424         | 627        | no                 | no                       |
| 06/06/04 | drier                | dry                               | 603                           | 343         | 528         | 456         | 597        | no                 | no                       |
| 06/16/04 | drier                | dry                               | 622                           | 427         | 513         | 471         | 646        | no                 | no                       |
| 06/27/04 | drier                | dry                               | 377                           | 449         | 488         | 490         | 635        | no                 | no                       |
| 07/20/04 | normal               | dry                               | 398                           | 444         | 231         | 432         | 678        | no                 | no                       |
| 08/02/04 | normal               | -21.0                             | <b>-4</b>                     | <b>170</b>  | <b>63</b>   | <b>134</b>  | <b>-21</b> | yes                | yes                      |
| 08/08/04 | normal               | 1.0                               | <b>-71</b>                    | <b>58</b>   | <b>86</b>   | <b>65</b>   | <b>-15</b> | yes                | yes                      |
| 08/15/04 | normal               | 3.0                               | <b>22</b>                     | <b>29</b>   | <b>88</b>   | <b>62</b>   | <b>169</b> | yes                | yes                      |
| 08/22/04 | normal               | -5.0                              | <b>-30</b>                    | <b>94</b>   | <b>96</b>   | <b>85</b>   | <b>14</b>  | yes                | yes                      |
| 09/12/04 | wetter               | -16.0                             | <b>-81</b>                    | <b>110</b>  | <b>74</b>   | <b>44</b>   | <b>12</b>  | yes                | yes                      |
| 09/26/04 | wetter               | -67.6                             | <b>263</b>                    | 355         | <b>48</b>   | <b>33</b>   | 671        | yes                | no                       |
| 10/17/04 | wetter               | -40.1                             | <b>154</b>                    | 329         | <b>-10</b>  | <b>28</b>   | <b>28</b>  | yes                | no                       |
| 10/23/04 | wetter               | -47.6                             | <b>129</b>                    | 381         | <b>-18</b>  | <b>-3</b>   | 607        | yes                | no                       |
| 11/22/04 | normal               | -83.6                             | <b>182</b>                    | 336         | <b>169</b>  | <b>183</b>  | <b>203</b> | yes                | no                       |
| 11/27/04 | normal               | -11.5                             | <b>141</b>                    | <b>202</b>  | <b>140</b>  | <b>89</b>   | <b>37</b>  | yes                | yes                      |
| 12/05/04 | normal               | -19.0                             | <b>-5</b>                     | <b>75</b>   | <b>14</b>   | <b>36</b>   | <b>-25</b> | yes                | yes                      |
| 12/12/04 | normal               | -8.5                              | <b>-92</b>                    | <b>82</b>   | <b>9</b>    | <b>31</b>   | <b>-69</b> | yes                | yes                      |
| 12/21/04 | normal               | -16.0                             | <b>180</b>                    | <b>253</b>  | <b>27</b>   | <b>78</b>   | <b>42</b>  | yes                | yes                      |

## Technical Standard Data Sheet

NR 07 Shallow (25 cm) Redox Probes  
Micro-topography High

To begin, determine the critical redox potential value that indicates when the soil should be anaerobic using the following equation:  $Eh_{\text{anaerobic}} = 595 - 60(\text{pH})$

$$Eh_{\text{anaerobic}} = 595 - 60(4.30) = 595 - \underline{258} = \underline{337}$$

**Circle the redox potentials that are anaerobic, and complete the table.**

| Date     | Antecedent Condition | Depth to water in piezometer (cm) | Redox Potentials by Electrode |             |             |             |             | Is soil anaerobic? | Saturated and anaerobic? |
|----------|----------------------|-----------------------------------|-------------------------------|-------------|-------------|-------------|-------------|--------------------|--------------------------|
|          |                      |                                   | 1                             | 2           | 3           | 4           | 5           |                    |                          |
|          |                      |                                   | -----mv-----                  |             |             |             |             |                    |                          |
| 09/30/03 | normal               | -10.0                             | <b>-139</b>                   | <b>-124</b> | <b>-146</b> | <b>-126</b> | <b>-132</b> | yes                | yes                      |
| 10/07/03 | wetter               | -48.5                             | <b>-276</b>                   | <b>-121</b> | <b>-47</b>  | <b>-118</b> | <b>-132</b> | yes                | no                       |
| 10/14/03 | wetter               | 4.0                               | <b>-295</b>                   | <b>-195</b> | <b>-177</b> | <b>-51</b>  | <b>-303</b> | yes                | yes                      |
| 10/21/03 | wetter               | -11.0                             | <b>-228</b>                   | <b>-94</b>  | <b>-113</b> | <b>-125</b> | <b>-124</b> | yes                | yes                      |
| 10/28/03 | wetter               | -5.0                              | <b>-233</b>                   | <b>-108</b> | <b>-126</b> | <b>-110</b> | <b>-61</b>  | yes                | yes                      |
| 11/11/03 | wetter               | -7.4                              | <b>-28</b>                    | <b>-113</b> | <b>-115</b> | <b>-133</b> | <b>-132</b> | yes                | yes                      |
| 11/18/03 | wetter               | -42.5                             | <b>187</b>                    | <b>-58</b>  | <b>-91</b>  | <b>-60</b>  | <b>-108</b> | yes                | no                       |
| 11/24/03 | wetter               | -11.0                             | <b>232</b>                    | <b>-100</b> | <b>-113</b> | <b>-117</b> | <b>-122</b> | yes                | yes                      |
| 12/09/03 | wetter               | -2.0                              | <b>250</b>                    | <b>-112</b> | <b>-126</b> | <b>-205</b> | <b>-129</b> | yes                | yes                      |
| 12/16/03 | wetter               | 6.0                               | <b>243</b>                    | <b>-116</b> | <b>-122</b> | <b>-192</b> | <b>-122</b> | yes                | yes                      |
| 12/21/03 | wetter               | -1.0                              | <b>250</b>                    | <b>2</b>    | <b>-114</b> | <b>-183</b> | <b>-118</b> | yes                | yes                      |
| 12/28/03 | wetter               | 1.5                               | <b>245</b>                    | <b>36</b>   | <b>-116</b> | <b>-182</b> | <b>-119</b> | yes                | yes                      |
| 01/04/04 | wetter               | -4.3                              | <b>178</b>                    | <b>-98</b>  | <b>-120</b> | <b>-175</b> | <b>-123</b> | yes                | yes                      |
| 01/19/04 | wetter               | 2.5                               | <b>239</b>                    | <b>-109</b> | <b>-115</b> | <b>-181</b> | <b>-120</b> | yes                | yes                      |
| 02/01/04 | normal               | -3.0                              | <b>242</b>                    | <b>-30</b>  | <b>-108</b> | <b>-165</b> | <b>-114</b> | yes                | yes                      |
| 02/08/04 | normal               | -4.0                              | <b>237</b>                    | <b>-108</b> | <b>-111</b> | <b>-170</b> | <b>-127</b> | yes                | yes                      |
| 02/14/04 | normal               | 8.0                               | <b>162</b>                    | <b>-88</b>  | <b>-79</b>  | <b>-118</b> | <b>-61</b>  | yes                | yes                      |
| 02/22/04 | normal               | 2.0                               | <b>241</b>                    | <b>-107</b> | <b>-101</b> | <b>-164</b> | <b>-118</b> | yes                | yes                      |
| 02/28/04 | normal               | 3.0                               | <b>238</b>                    | <b>-13</b>  | <b>-115</b> | <b>-158</b> | <b>-123</b> | yes                | yes                      |
| 03/07/04 | normal               | -2.5                              | <b>212</b>                    | <b>-101</b> | <b>-98</b>  | <b>-155</b> | <b>-111</b> | yes                | yes                      |
| 03/12/04 | normal               | -1.0                              | <b>196</b>                    | <b>-115</b> | <b>-109</b> | <b>-148</b> | <b>-123</b> | yes                | yes                      |
| 03/20/04 | normal               | 2.0                               | <b>178</b>                    | <b>-244</b> | <b>-111</b> | <b>-161</b> | <b>-124</b> | yes                | yes                      |
| 03/28/04 | normal               | -8.5                              | <b>106</b>                    | <b>-174</b> | <b>-112</b> | <b>-154</b> | <b>-122</b> | yes                | yes                      |
| 04/04/04 | drier                | -14.5                             | <b>125</b>                    | <b>-193</b> | <b>-114</b> | <b>-153</b> | <b>19</b>   | yes                | yes                      |

## Technical Standard Data Sheet

NR 07 Shallow (25 cm) Redox Probes  
Micro-topography High

| Date     | Antecedent Condition | Depth to water in piezometer (cm) | Redox Potentials by Electrode |             |             |             |             | Is soil anaerobic? | Saturated and anaerobic? |
|----------|----------------------|-----------------------------------|-------------------------------|-------------|-------------|-------------|-------------|--------------------|--------------------------|
|          |                      |                                   | 1                             | 2           | 3           | 4           | 5           |                    |                          |
|          |                      |                                   | -----mv-----                  |             |             |             |             |                    |                          |
| 04/10/04 | drier                | -49.5                             | <b>114</b>                    | <b>-184</b> | <b>-90</b>  | <b>-163</b> | <b>-118</b> | yes                | no                       |
| 04/25/04 | drier                | -50.5                             | <b>-11</b>                    | <b>-129</b> | <b>-106</b> | <b>-149</b> | <b>-97</b>  | yes                | no                       |
| 05/09/04 | normal               | -57.5                             | <b>-46</b>                    | <b>-122</b> | <b>-116</b> | <b>-120</b> | <b>-171</b> | yes                | no                       |
| 05/16/04 | normal               | -88.5                             | <b>-61</b>                    | <b>-175</b> | <b>187</b>  | <b>-169</b> | <b>-100</b> | yes                | no                       |
| 05/23/04 | normal               | dry                               | <b>19</b>                     | <b>-78</b>  | <b>148</b>  | <b>-141</b> | <b>-70</b>  | yes                | no                       |
| 05/31/04 | normal               | dry                               | <b>313</b>                    | 598         | 435         | <b>332</b>  | 424         | no                 | no                       |
| 06/06/04 | drier                | dry                               | 383                           | 660         | 507         | <b>336</b>  | 546         | no                 | no                       |
| 06/16/04 | drier                | dry                               | 254                           | 662         | 398         | <b>315</b>  | 565         | no                 | no                       |
| 06/27/04 | drier                | dry                               | <b>215</b>                    | 640         | 589         | 435         | 559         | no                 | no                       |
| 07/20/04 | normal               | dry                               | <b>77</b>                     | 582         | 554         | <b>290</b>  | 543         | no                 | no                       |
| 08/02/04 | normal               | -16.0                             | <b>121</b>                    | <b>204</b>  | <b>178</b>  | <b>133</b>  | <b>180</b>  | yes                | yes                      |
| 08/08/04 | normal               | 1.0                               | <b>98</b>                     | <b>182</b>  | <b>178</b>  | <b>61</b>   | <b>186</b>  | yes                | yes                      |
| 08/15/04 | normal               | 10.0                              | <b>52</b>                     | <b>121</b>  | <b>54</b>   | <b>57</b>   | <b>67</b>   | yes                | yes                      |
| 08/22/04 | normal               | -12.0                             | <b>36</b>                     | <b>110</b>  | <b>88</b>   | <b>20</b>   | <b>49</b>   | yes                | yes                      |
| 09/12/04 | wetter               | -11.0                             | <b>67</b>                     | <b>108</b>  | <b>94</b>   | <b>26</b>   | <b>94</b>   | yes                | yes                      |
| 09/26/04 | wetter               | -76.0                             | <b>172</b>                    | <b>-26</b>  | <b>170</b>  | <b>-15</b>  | 422         | yes                | no                       |
| 10/17/04 | wetter               | -41.0                             | <b>88</b>                     | <b>-160</b> | <b>76</b>   | <b>-63</b>  | <b>63</b>   | yes                | no                       |
| 10/23/04 | wetter               | -46.5                             | <b>26</b>                     | <b>-170</b> | <b>52</b>   | <b>-64</b>  | <b>41</b>   | yes                | no                       |
| 11/22/04 | normal               | -83.5                             | <b>186</b>                    | <b>32</b>   | <b>195</b>  | <b>244</b>  | 482         | yes                | no                       |
| 11/27/04 | normal               | -6.5                              | <b>209</b>                    | <b>11</b>   | <b>197</b>  | <b>246</b>  | 352         | yes                | yes                      |
| 12/05/04 | normal               | -9.0                              | <b>182</b>                    | <b>-69</b>  | <b>8</b>    | <b>226</b>  | 384         | yes                | yes                      |
| 12/12/04 | normal               | -3.0                              | <b>118</b>                    | <b>-168</b> | <b>87</b>   | <b>152</b>  | <b>125</b>  | yes                | yes                      |
| 12/21/04 | normal               | -10.0                             | <b>102</b>                    | <b>-169</b> | <b>106</b>  | <b>131</b>  | <b>70</b>   | yes                | yes                      |

## Technical Standard Data Sheet

NR 08 Shallow (25 cm) Redox Probes  
Micro-topography Low

To begin, determine the critical redox potential value that indicates when the soil should be anaerobic using the following equation:  $Eh_{\text{anaerobic}} = 595 - 60(\text{pH})$

$$Eh_{\text{anaerobic}} = 595 - 60 ( 4.55 ) = 595 - \underline{273} = \underline{322}$$

**Circle the redox potentials that are anaerobic, and complete the table.**

| Date     | Antecedent Condition | Depth to water in piezometer (cm) | Redox Potentials by Electrode |             |             |             |           | Is soil anaerobic? | Saturated and anaerobic? |
|----------|----------------------|-----------------------------------|-------------------------------|-------------|-------------|-------------|-----------|--------------------|--------------------------|
|          |                      |                                   | 1                             | 2           | 3           | 4           | 5         |                    |                          |
|          |                      |                                   | -----mv-----                  |             |             |             |           |                    |                          |
| 09/30/03 | normal               | 0.2                               | <b>104</b>                    | <b>-13</b>  | <b>-121</b> | <b>-209</b> | <b>29</b> | yes                | yes                      |
| 10/07/03 | wetter               | -19.7                             | <b>97</b>                     | <b>-33</b>  | <b>-156</b> | <b>-206</b> | <b>25</b> | yes                | yes                      |
| 10/14/03 | wetter               | 5.1                               | <b>83</b>                     | <b>-60</b>  | <b>-160</b> | <b>-207</b> | <b>12</b> | yes                | yes                      |
| 10/21/03 | wetter               | -7.8                              | <b>91</b>                     | <b>-86</b>  | <b>-210</b> | <b>-208</b> | <b>46</b> | yes                | yes                      |
| 10/28/03 | wetter               | 3.3                               | <b>15</b>                     | <b>-149</b> | <b>-157</b> | <b>-219</b> | <b>35</b> | yes                | yes                      |
| 11/11/03 | wetter               | -1.0                              | <b>34</b>                     | <b>-182</b> | <b>-203</b> | <b>-219</b> | <b>45</b> | yes                | yes                      |
| 11/18/03 | wetter               | -15.8                             | <b>38</b>                     | <b>-195</b> | <b>-216</b> | <b>-196</b> | <b>99</b> | yes                | yes                      |
| 11/24/03 | wetter               | -1.3                              | <b>47</b>                     | <b>-208</b> | <b>-211</b> | <b>-215</b> | <b>67</b> | yes                | yes                      |
| 12/09/03 | wetter               | 4.8                               | <b>41</b>                     | <b>-211</b> | <b>-213</b> | <b>-203</b> | <b>65</b> | yes                | yes                      |
| 12/16/03 | wetter               | 6.7                               | <b>41</b>                     | <b>-220</b> | <b>-223</b> | <b>-210</b> | <b>61</b> | yes                | yes                      |
| 12/21/03 | wetter               | 4.7                               | <b>38</b>                     | <b>-214</b> | <b>-215</b> | <b>-214</b> | <b>63</b> | yes                | yes                      |
| 12/28/03 | wetter               | 5.7                               | <b>38</b>                     | <b>-216</b> | <b>-216</b> | <b>-221</b> | <b>51</b> | yes                | yes                      |
| 01/04/04 | wetter               | 0.1                               | <b>34</b>                     | <b>-216</b> | <b>-209</b> | <b>-204</b> | <b>41</b> | yes                | yes                      |
| 01/19/04 | wetter               | 5.7                               | <b>35</b>                     | <b>-204</b> | <b>-182</b> | <b>-230</b> | <b>37</b> | yes                | yes                      |
| 02/01/04 | normal               | 4.7                               | <b>32</b>                     | <b>-205</b> | <b>-176</b> | <b>-232</b> | <b>10</b> | yes                | yes                      |
| 02/08/04 | normal               | 3.7                               | <b>28</b>                     | <b>-207</b> | <b>-175</b> | <b>-228</b> | <b>10</b> | yes                | yes                      |
| 02/14/04 | normal               | 9.3                               | <b>60</b>                     | <b>-181</b> | <b>-125</b> | <b>-184</b> | <b>29</b> | yes                | yes                      |
| 02/22/04 | normal               | 4.7                               | <b>20</b>                     | <b>-206</b> | <b>-139</b> | <b>-228</b> | <b>7</b>  | yes                | yes                      |
| 02/28/04 | normal               | 6.3                               | <b>18</b>                     | <b>-214</b> | <b>-183</b> | <b>-226</b> | <b>3</b>  | yes                | yes                      |
| 03/07/04 | normal               | -1.3                              | <b>-11</b>                    | <b>-220</b> | <b>-210</b> | <b>-215</b> | <b>20</b> | yes                | yes                      |
| 03/12/04 | normal               | 2.8                               | <b>-62</b>                    | <b>-219</b> | <b>-191</b> | <b>-236</b> | <b>3</b>  | yes                | yes                      |
| 03/20/04 | normal               | 5.3                               | <b>-139</b>                   | <b>-228</b> | <b>-207</b> | <b>-237</b> | <b>4</b>  | yes                | yes                      |
| 03/28/04 | normal               | -13.2                             | <b>-147</b>                   | <b>-222</b> | <b>-197</b> | <b>-237</b> | <b>6</b>  | yes                | yes                      |
| 04/04/04 | drier                | -14.3                             | <b>-172</b>                   | <b>-218</b> | <b>-191</b> | <b>-237</b> | <b>5</b>  | yes                | yes                      |

# Technical Standard Data Sheet

NR 08 Shallow (25 cm) Redox Probes  
Micro-topography Low

| Date     | Antecedent Condition | Depth to water in piezometer (cm) | Redox Potentials by Electrode |             |             |             |             | Is soil anaerobic? | Saturated and anaerobic? |
|----------|----------------------|-----------------------------------|-------------------------------|-------------|-------------|-------------|-------------|--------------------|--------------------------|
|          |                      |                                   | 1                             | 2           | 3           | 4           | 5           |                    |                          |
|          |                      |                                   | -----mv-----                  |             |             |             |             |                    |                          |
| 04/10/04 | drier                | -19.7                             | <b>224</b>                    | <b>-222</b> | <b>-200</b> | <b>-237</b> | <b>-55</b>  | yes                | yes                      |
| 04/25/04 | drier                | -42.3                             | <b>-122</b>                   | <b>-225</b> | <b>-209</b> | <b>-223</b> | <b>17</b>   | yes                | no                       |
| 05/09/04 | normal               | -45.3                             | <b>-163</b>                   | <b>-218</b> | <b>-194</b> | <b>-225</b> | <b>52</b>   | yes                | no                       |
| 05/16/04 | normal               | -75.7                             | <b>244</b>                    | <b>181</b>  | <b>-210</b> | <b>-205</b> | <b>179</b>  | yes                | no                       |
| 05/23/04 | normal               | -91.3                             | <b>220</b>                    | <b>226</b>  | <b>237</b>  | <b>-213</b> | <b>244</b>  | yes                | no                       |
| 05/31/04 | normal               | -92.3                             | <b>198</b>                    | <b>229</b>  | <b>232</b>  | <b>230</b>  | <b>249</b>  | yes                | no                       |
| 06/06/04 | drier                | dry                               | <b>180</b>                    | <b>201</b>  | <b>224</b>  | <b>217</b>  | <b>296</b>  | yes                | no                       |
| 06/16/04 | drier                | dry                               | <b>181</b>                    | <b>208</b>  | <b>229</b>  | <b>225</b>  | 480         | yes                | no                       |
| 06/27/04 | drier                | -91.3                             | 474                           | <b>195</b>  | <b>218</b>  | <b>217</b>  | 612         | yes                | no                       |
| 07/20/04 | normal               | dry                               | 627                           | <b>156</b>  | <b>204</b>  | <b>195</b>  | 580         | yes                | no                       |
| 08/02/04 | normal               | -2.8                              | <b>-115</b>                   | <b>153</b>  | <b>157</b>  | <b>168</b>  | <b>-114</b> | yes                | yes                      |
| 08/08/04 | normal               | 5.3                               | <b>-136</b>                   | <b>159</b>  | <b>144</b>  | <b>125</b>  | <b>-142</b> | yes                | yes                      |
| 08/15/04 | normal               | 10.3                              | <b>-146</b>                   | <b>166</b>  | <b>138</b>  | <b>119</b>  | <b>-184</b> | yes                | yes                      |
| 08/22/04 | normal               | -7.2                              | <b>-91</b>                    | <b>210</b>  | <b>164</b>  | <b>148</b>  | <b>-169</b> | yes                | yes                      |
| 09/12/04 | wetter               | -0.2                              | <b>-55</b>                    | <b>194</b>  | <b>203</b>  | <b>138</b>  | <b>47</b>   | yes                | yes                      |
| 09/26/04 | wetter               | -50.3                             | <b>-79</b>                    | <b>130</b>  | <b>99</b>   | <b>92</b>   | <b>-53</b>  | yes                | no                       |
| 10/17/04 | wetter               | -15.2                             | <b>-116</b>                   | <b>136</b>  | <b>120</b>  | <b>97</b>   | <b>-99</b>  | yes                | yes                      |
| 10/23/04 | wetter               | -19.2                             | <b>-125</b>                   | <b>126</b>  | <b>98</b>   | <b>91</b>   | <b>-234</b> | yes                | yes                      |
| 11/22/04 | normal               | -62.3                             | <b>61</b>                     | <b>159</b>  | <b>173</b>  | <b>166</b>  | <b>170</b>  | yes                | no                       |
| 11/27/04 | normal               | 2.7                               | <b>83</b>                     | <b>171</b>  | <b>157</b>  | <b>125</b>  | <b>115</b>  | yes                | yes                      |
| 12/05/04 | normal               | -3.8                              | <b>-35</b>                    | <b>138</b>  | <b>120</b>  | <b>108</b>  | <b>33</b>   | yes                | yes                      |
| 12/12/04 | normal               | 6.7                               | <b>-7</b>                     | <b>148</b>  | <b>127</b>  | <b>127</b>  | <b>29</b>   | yes                | yes                      |
| 12/21/04 | normal               | -3.8                              | <b>10</b>                     | <b>155</b>  | <b>129</b>  | <b>131</b>  | <b>59</b>   | yes                | yes                      |

## Technical Standard Data Sheet

NR 09 Shallow (25 cm) Redox Probes  
Crown Removal

To begin, determine the critical redox potential value that indicates when the soil should be anaerobic using the following equation:  $E_{h_{\text{anaerobic}}} = 595 - 60(\text{pH})$

$$E_{h_{\text{anaerobic}}} = 595 - 60(5.22) = 595 - \underline{313} = \underline{282}$$

**Circle the redox potentials that are anaerobic, and complete the table.**

| Date     | Antecedent Condition | Depth to water in piezometer (cm) | Redox Potentials by Electrode |             |             |             |             | Is soil anaerobic? | Saturated and anaerobic? |
|----------|----------------------|-----------------------------------|-------------------------------|-------------|-------------|-------------|-------------|--------------------|--------------------------|
|          |                      |                                   | 1                             | 2           | 3           | 4           | 5           |                    |                          |
|          |                      |                                   | -----mv-----                  |             |             |             |             |                    |                          |
| 09/30/03 | normal               | -4.8                              | <b>-143</b>                   | <b>-158</b> | <b>-153</b> | <b>-142</b> | <b>-138</b> | yes                | yes                      |
| 10/07/03 | wetter               | -38.7                             | <b>-142</b>                   | <b>-158</b> | <b>-135</b> | <b>-138</b> | <b>-118</b> | yes                | no                       |
| 10/14/03 | wetter               | 0.5                               | <b>-147</b>                   | <b>-152</b> | <b>-150</b> | <b>-101</b> | <b>-240</b> | yes                | yes                      |
| 10/21/03 | wetter               | -6.5                              | <b>-102</b>                   | <b>-123</b> | <b>-150</b> | <b>-87</b>  | <b>-194</b> | yes                | yes                      |
| 10/28/03 | wetter               | -1.3                              | <b>-132</b>                   | <b>-124</b> | <b>-185</b> | <b>-128</b> | <b>-195</b> | yes                | yes                      |
| 11/11/03 | wetter               | -3.8                              | <b>-133</b>                   | <b>-145</b> | <b>-126</b> | <b>-86</b>  | <b>-220</b> | yes                | yes                      |
| 11/18/03 | wetter               | -27.7                             | <b>-212</b>                   | <b>-256</b> | <b>-243</b> | <b>-115</b> | <b>-208</b> | yes                | no                       |
| 11/24/03 | wetter               | -13.0                             | <b>-124</b>                   | <b>-129</b> | <b>-104</b> | <b>-111</b> | <b>-121</b> | yes                | yes                      |
| 12/09/03 | wetter               | 1.7                               | <b>-135</b>                   | <b>-134</b> | <b>-113</b> | <b>-123</b> | <b>-129</b> | yes                | yes                      |
| 12/16/03 | wetter               | 2.7                               | <b>-110</b>                   | <b>-123</b> | <b>-105</b> | <b>-119</b> | <b>-62</b>  | yes                | yes                      |
| 12/21/03 | wetter               | 1.7                               | <b>-109</b>                   | <b>-129</b> | <b>-122</b> | <b>-124</b> | <b>-116</b> | yes                | yes                      |
| 12/28/03 | wetter               | 1.7                               | <b>-129</b>                   | <b>-130</b> | <b>-141</b> | <b>-263</b> | <b>-120</b> | yes                | yes                      |
| 01/04/04 | wetter               | -1.0                              | <b>-131</b>                   | <b>-141</b> | <b>-163</b> | <b>-264</b> | <b>-123</b> | yes                | yes                      |
| 01/19/04 | wetter               | -1.3                              | <b>-115</b>                   | <b>-132</b> | <b>-188</b> | <b>-265</b> | <b>-116</b> | yes                | yes                      |
| 02/01/04 | normal               | -0.3                              | <b>-122</b>                   | <b>-131</b> | <b>-199</b> | <b>-267</b> | <b>-125</b> | yes                | yes                      |
| 02/08/04 | normal               | 0.7                               | <b>-122</b>                   | <b>-199</b> | <b>-199</b> | <b>-258</b> | <b>-122</b> | yes                | yes                      |
| 02/14/04 | normal               | 1.0                               | <b>-73</b>                    | <b>-91</b>  | <b>-138</b> | <b>-171</b> | <b>-65</b>  | yes                | yes                      |
| 02/22/04 | normal               | 1.7                               | <b>-131</b>                   | <b>-138</b> | <b>-259</b> | <b>-267</b> | <b>-124</b> | yes                | yes                      |
| 02/28/04 | normal               | 2.7                               | <b>-126</b>                   | <b>-243</b> | <b>-233</b> | <b>-274</b> | <b>-122</b> | yes                | yes                      |
| 03/07/04 | normal               | -2.5                              | <b>-134</b>                   | <b>-148</b> | <b>-185</b> | <b>-260</b> | <b>-115</b> | yes                | yes                      |
| 03/12/04 | normal               | -1.3                              | <b>-124</b>                   | <b>-186</b> | <b>-229</b> | <b>-269</b> | <b>-119</b> | yes                | yes                      |
| 03/20/04 | normal               | 1.7                               | <b>-135</b>                   | <b>-208</b> | <b>-239</b> | <b>-271</b> | <b>-124</b> | yes                | yes                      |
| 03/28/04 | normal               | -11.8                             | <b>-116</b>                   | <b>-151</b> | <b>-239</b> | <b>-268</b> | <b>-122</b> | yes                | yes                      |
| 04/04/04 | drier                | -17.7                             | <b>-130</b>                   | <b>-152</b> | <b>-241</b> | <b>-269</b> | <b>-121</b> | yes                | yes                      |

## Technical Standard Data Sheet

NR 09 Shallow (25 cm) Redox Probes  
Crown Removal

| Date     | Antecedent Condition | Depth to water in piezometer (cm) | Redox Potentials by Electrode |             |             |             |             | Is soil anaerobic? | Saturated and anaerobic? |
|----------|----------------------|-----------------------------------|-------------------------------|-------------|-------------|-------------|-------------|--------------------|--------------------------|
|          |                      |                                   | 1                             | 2           | 3           | 4           | 5           |                    |                          |
|          |                      |                                   | -----mv-----                  |             |             |             |             |                    |                          |
| 04/10/04 | drier                | -41.7                             | <b>-132</b>                   | <b>-178</b> | <b>-237</b> | <b>-265</b> | <b>-89</b>  | yes                | no                       |
| 04/25/04 | drier                | -35.3                             | <b>-150</b>                   | <b>-143</b> | <b>-207</b> | <b>-259</b> | <b>-121</b> | yes                | no                       |
| 05/09/04 | normal               | -44.7                             | <b>-134</b>                   | <b>-130</b> | <b>-203</b> | <b>-218</b> | <b>-129</b> | yes                | no                       |
| 05/16/04 | normal               | -72.3                             | <b>-151</b>                   | <b>-141</b> | <b>-212</b> | <b>-246</b> | <b>-126</b> | yes                | no                       |
| 05/23/04 | normal               | -88.8                             | <b>274</b>                    | 408         | 430         | <b>-136</b> | <b>-91</b>  | yes                | no                       |
| 05/31/04 | normal               | -95.7                             | 446                           | 646         | 568         | 458         | 452         | no                 | no                       |
| 06/06/04 | drier                | dry                               | 455                           | 691         | 700         | 458         | 499         | no                 | no                       |
| 06/16/04 | drier                | -78.8                             | 486                           | 653         | 590         | 387         | <b>20</b>   | no                 | no                       |
| 06/27/04 | drier                | -74.8                             | 558                           | 699         | 710         | 363         | 451         | no                 | no                       |
| 07/20/04 | normal               | dry                               | 515                           | 736         | 732         | 706         | 674         | no                 | no                       |
| 08/02/04 | normal               | 0.0                               | <b>101</b>                    | <b>30</b>   | <b>142</b>  | <b>50</b>   | <b>12</b>   | yes                | yes                      |
| 08/08/04 | normal               | 3.5                               | <b>91</b>                     | <b>76</b>   | <b>185</b>  | <b>38</b>   | <b>71</b>   | yes                | yes                      |
| 08/15/04 | normal               | 7.5                               | <b>32</b>                     | <b>13</b>   | <b>14</b>   | <b>-12</b>  | <b>-18</b>  | yes                | yes                      |
| 08/22/04 | normal               | -2.0                              | <b>113</b>                    | <b>9</b>    | <b>35</b>   | <b>33</b>   | <b>-2</b>   | yes                | yes                      |
| 09/12/04 | wetter               | -9.0                              | <b>34</b>                     | <b>-14</b>  | <b>-50</b>  | <b>2</b>    | <b>-64</b>  | yes                | yes                      |
| 09/26/04 | wetter               | -54.8                             | <b>10</b>                     | <b>-16</b>  | <b>-77</b>  | <b>-22</b>  | <b>-74</b>  | yes                | no                       |
| 10/17/04 | wetter               | -20.0                             | <b>-19</b>                    | <b>-12</b>  | <b>-78</b>  | <b>-97</b>  | <b>-10</b>  | yes                | yes                      |
| 10/23/04 | wetter               | -34.7                             | <b>-29</b>                    | <b>-20</b>  | <b>-81</b>  | <b>-90</b>  | <b>-93</b>  | yes                | no                       |
| 11/22/04 | normal               | -62.3                             | <b>-13</b>                    | <b>176</b>  | <b>-5</b>   | <b>-86</b>  | <b>76</b>   | yes                | no                       |
| 11/27/04 | normal               | -11.3                             | <b>98</b>                     | <b>150</b>  | <b>139</b>  | <b>100</b>  | <b>196</b>  | yes                | yes                      |
| 12/05/04 | normal               | -0.5                              | <b>-70</b>                    | <b>-99</b>  | <b>-95</b>  | <b>-125</b> | <b>-167</b> | yes                | yes                      |
| 12/12/04 | normal               | 0.0                               | <b>-26</b>                    | <b>-30</b>  | <b>4</b>    | <b>-53</b>  | <b>-5</b>   | yes                | yes                      |
| 12/21/04 | normal               | -12.0                             | <b>-17</b>                    | <b>-24</b>  | <b>3</b>    | <b>-70</b>  | <b>-53</b>  | yes                | yes                      |

## Technical Standard Data Sheet

NR 12 Shallow (25 cm) Redox Probes  
Control

To begin, determine the critical redox potential value that indicates when the soil should be anaerobic using the following equation:  $Eh_{\text{anaerobic}} = 595 - 60(\text{pH})$

$$Eh_{\text{anaerobic}} = 595 - 60(4.55) = 595 - \underline{273} = \underline{322}$$

**Circle the redox potentials that are anaerobic, and complete the table.**

| Date     | Antecedent Condition | Depth to water in piezometer (cm) | Redox Potentials by Electrode |            |            |            |            | Is soil anaerobic? | Saturated and anaerobic? |
|----------|----------------------|-----------------------------------|-------------------------------|------------|------------|------------|------------|--------------------|--------------------------|
|          |                      |                                   | 1                             | 2          | 3          | 4          | 5          |                    |                          |
|          |                      |                                   | -----mv-----                  |            |            |            |            |                    |                          |
| 09/30/03 | normal               | -18.8                             | <b>143</b>                    | <b>-7</b>  | <b>3</b>   | <b>87</b>  | 382        | yes                | yes                      |
| 10/07/03 | wetter               | -58                               | <b>258</b>                    | <b>233</b> | 470        | <b>232</b> | 512        | yes                | no                       |
| 10/14/03 | wetter               | -1.3                              | <b>159</b>                    | <b>-44</b> | <b>18</b>  | <b>95</b>  | <b>214</b> | yes                | yes                      |
| 10/21/03 | wetter               | -38.7                             | <b>204</b>                    | <b>-22</b> | <b>24</b>  | <b>103</b> | <b>156</b> | yes                | no                       |
| 10/28/03 | wetter               | -8.8                              | <b>131</b>                    | <b>-55</b> | <b>100</b> | <b>133</b> | 564        | yes                | yes                      |
| 11/11/03 | wetter               | -30.7                             | <b>46</b>                     | <b>21</b>  | <b>74</b>  | <b>103</b> | <b>332</b> | yes                | no                       |
| 11/18/03 | wetter               | -52.2                             | <b>102</b>                    | <b>168</b> | <b>260</b> | <b>225</b> | <b>502</b> | yes                | no                       |
| 11/24/03 | wetter               | -33                               | <b>55</b>                     | <b>71</b>  | <b>52</b>  | <b>131</b> | 705        | yes                | no                       |
| 12/09/03 | wetter               | -17.3                             | <b>42</b>                     | <b>92</b>  | <b>120</b> | <b>106</b> | <b>120</b> | yes                | yes                      |
| 12/16/03 | wetter               | -0.8                              | <b>38</b>                     | <b>77</b>  | <b>112</b> | <b>102</b> | <b>186</b> | yes                | yes                      |
| 12/21/03 | wetter               | -17.3                             | <b>42</b>                     | <b>72</b>  | <b>118</b> | <b>106</b> | <b>30</b>  | yes                | yes                      |
| 12/28/03 | wetter               | -11.8                             | <b>44</b>                     | <b>64</b>  | <b>116</b> | <b>105</b> | <b>164</b> | yes                | yes                      |
| 01/04/04 | wetter               | -24.9                             | <b>39</b>                     | <b>64</b>  | <b>111</b> | <b>106</b> | <b>173</b> | yes                | yes                      |
| 01/19/04 | wetter               | -1.3                              | <b>65</b>                     | <b>75</b>  | <b>49</b>  | <b>97</b>  | <b>149</b> | yes                | yes                      |
| 02/01/04 | normal               | -23.8                             | <b>57</b>                     | <b>61</b>  | <b>112</b> | <b>106</b> | <b>139</b> | yes                | yes                      |
| 02/08/04 | normal               | -21.8                             | <b>51</b>                     | <b>60</b>  | <b>102</b> | <b>99</b>  | <b>116</b> | yes                | yes                      |
| 02/14/04 | normal               | 0.2                               | <b>48</b>                     | <b>68</b>  | <b>105</b> | <b>111</b> | <b>184</b> | yes                | yes                      |
| 02/22/04 | normal               | -16.8                             | <b>51</b>                     | <b>60</b>  | <b>104</b> | <b>125</b> | <b>138</b> | yes                | yes                      |
| 02/28/04 | normal               | -6.3                              | <b>45</b>                     | <b>57</b>  | <b>106</b> | <b>115</b> | <b>224</b> | yes                | yes                      |
| 03/07/04 | normal               | -24.8                             | <b>49</b>                     | <b>54</b>  | <b>91</b>  | <b>108</b> | <b>144</b> | yes                | yes                      |
| 03/12/04 | normal               | -15.8                             | <b>52</b>                     | <b>55</b>  | <b>119</b> | <b>144</b> | <b>106</b> | yes                | yes                      |
| 03/20/04 | normal               | -18.3                             | <b>122</b>                    | <b>57</b>  | <b>98</b>  | <b>116</b> | <b>141</b> | yes                | yes                      |
| 03/28/04 | normal               | -41.2                             | <b>129</b>                    | <b>94</b>  | <b>18</b>  | <b>112</b> | <b>199</b> | yes                | no                       |
| 04/04/04 | drier                | -44.2                             | <b>118</b>                    | <b>124</b> | <b>49</b>  | <b>120</b> | <b>146</b> | yes                | no                       |

## Technical Standard Data Sheet

NR 12 Shallow (25 cm) Redox Probes  
Control

| Date     | Antecedent Condition | Depth to water in piezometer (cm) | Redox Potentials by Electrode |             |             |             |            | Is soil anaerobic? | Saturated and anaerobic? |
|----------|----------------------|-----------------------------------|-------------------------------|-------------|-------------|-------------|------------|--------------------|--------------------------|
|          |                      |                                   | 1                             | 2           | 3           | 4           | 5          |                    |                          |
|          |                      |                                   | -----mv-----                  |             |             |             |            |                    |                          |
| 04/10/04 | drier                | -64.2                             | <b>180</b>                    | <b>165</b>  | <b>142</b>  | <b>208</b>  | <b>318</b> | yes                | no                       |
| 04/25/04 | drier                | -68.2                             | <b>172</b>                    | <b>125</b>  | <b>136</b>  | <b>179</b>  | <b>328</b> | yes                | no                       |
| 05/09/04 | normal               | -67.2                             | <b>253</b>                    | <b>116</b>  | <b>125</b>  | <b>202</b>  | 336        | yes                | no                       |
| 05/16/04 | normal               | -92.0                             | <b>298</b>                    | <b>185</b>  | <b>302</b>  | <b>208</b>  | 394        | yes                | no                       |
| 05/23/04 | normal               | -103.2                            | <b>280</b>                    | 389         | 441         | <b>232</b>  | 425        | no                 | no                       |
| 05/31/04 | normal               | -103.2                            | 360                           | 478         | 442         | <b>282</b>  | 414        | no                 | no                       |
| 06/06/04 | drier                | dry                               | 410                           | 501         | 376         | <b>290</b>  | 377        | no                 | no                       |
| 06/16/04 | drier                | -89.2                             | 466                           | 479         | 354         | 329         | 361        | no                 | no                       |
| 06/27/04 | drier                | -92.2                             | 481                           | 472         | 367         | <b>183</b>  | 401        | no                 | no                       |
| 07/20/04 | normal               | dry                               | 449                           | 392         | 489         | <b>196</b>  | 413        | no                 | no                       |
| 08/02/04 | normal               | -18.8                             | <b>-19</b>                    | <b>-110</b> | <b>-98</b>  | <b>-25</b>  | <b>-74</b> | yes                | yes                      |
| 08/08/04 | normal               | 2.0                               | <b>-124</b>                   | <b>-96</b>  | <b>-94</b>  | <b>6</b>    | <b>-48</b> | yes                | yes                      |
| 08/15/04 | normal               | 3.7                               | <b>11</b>                     | <b>-127</b> | <b>-101</b> | <b>-1</b>   | <b>63</b>  | yes                | yes                      |
| 08/22/04 | normal               | -19.0                             | <b>-123</b>                   | <b>-109</b> | <b>-90</b>  | <b>30</b>   | <b>-58</b> | yes                | yes                      |
| 09/12/04 | wetter               | -18.3                             | <b>230</b>                    | <b>-125</b> | <b>-83</b>  | <b>-106</b> | <b>-71</b> | yes                | yes                      |
| 09/26/04 | wetter               | -58.0                             | 413                           | 330         | <b>172</b>  | <b>306</b>  | <b>266</b> | yes                | no                       |
| 10/17/04 | wetter               | -33.0                             | 344                           | <b>-40</b>  | <b>-87</b>  | <b>29</b>   | <b>211</b> | yes                | no                       |
| 10/23/04 | wetter               | -20.8                             | <b>234</b>                    | <b>-101</b> | <b>-70</b>  | <b>45</b>   | <b>133</b> | yes                | yes                      |
| 11/22/04 | normal               | -70.7                             | 380                           | <b>121</b>  | <b>233</b>  | <b>150</b>  | <b>120</b> | yes                | no                       |
| 11/27/04 | normal               | -16.8                             | <b>263</b>                    | <b>81</b>   | <b>145</b>  | <b>89</b>   | <b>142</b> | yes                | yes                      |
| 12/05/04 | normal               | -19.8                             | <b>283</b>                    | <b>-153</b> | <b>149</b>  | <b>50</b>   | <b>81</b>  | yes                | yes                      |
| 12/12/04 | normal               | -12.0                             | <b>200</b>                    | <b>-212</b> | <b>-58</b>  | <b>-81</b>  | <b>53</b>  | yes                | yes                      |
| 12/21/04 | normal               | -29.5                             | <b>254</b>                    | <b>-102</b> | <b>131</b>  | <b>137</b>  | <b>108</b> | yes                | no                       |

## Technical Standard Data Sheet

NR 13 Shallow (25 cm) Redox Probes  
Control

To begin, determine the critical redox potential value that indicates when the soil should be anaerobic using the following equation:  $Eh_{\text{anaerobic}} = 595 - 60(\text{pH})$

$$Eh_{\text{anaerobic}} = 595 - 60(4.78) = 595 - \underline{287} = \underline{308}$$

**Circle the redox potentials that are anaerobic, and complete the table.**

| Date     | Antecedent Condition | Depth to water in piezometer (cm) | Redox Potentials by Electrode |            |             |            |            | Is soil anaerobic? | Saturated and anaerobic? |
|----------|----------------------|-----------------------------------|-------------------------------|------------|-------------|------------|------------|--------------------|--------------------------|
|          |                      |                                   | 1                             | 2          | 3           | 4          | 5          |                    |                          |
|          |                      |                                   | -----mv-----                  |            |             |            |            |                    |                          |
| 09/30/03 | normal               | -37.0                             | <b>26</b>                     | <b>45</b>  | <b>24</b>   | <b>84</b>  | <b>189</b> | yes                | no                       |
| 10/07/03 | wetter               | -65.0                             | 625                           | 411        | <b>164</b>  | <b>182</b> | <b>187</b> | yes                | no                       |
| 10/14/03 | wetter               | -1.0                              | <b>-15</b>                    | <b>81</b>  | <b>52</b>   | <b>162</b> | <b>137</b> | yes                | yes                      |
| 10/21/03 | wetter               | -29.5                             | <b>24</b>                     | <b>73</b>  | <b>35</b>   | <b>70</b>  | <b>107</b> | yes                | no                       |
| 10/28/03 | wetter               | -17.4                             | <b>188</b>                    | <b>102</b> | <b>82</b>   | <b>108</b> | <b>62</b>  | yes                | yes                      |
| 11/11/03 | wetter               | -29.3                             | <b>90</b>                     | <b>76</b>  | <b>43</b>   | <b>56</b>  | <b>74</b>  | yes                | no                       |
| 11/18/03 | wetter               | -52.0                             | <b>234</b>                    | <b>122</b> | <b>188</b>  | <b>53</b>  | <b>71</b>  | yes                | no                       |
| 11/24/03 | wetter               | -32.5                             | <b>186</b>                    | <b>125</b> | <b>55</b>   | <b>54</b>  | <b>57</b>  | yes                | no                       |
| 12/09/03 | wetter               | -17.5                             | <b>114</b>                    | <b>50</b>  | <b>32</b>   | <b>58</b>  | <b>49</b>  | yes                | yes                      |
| 12/16/03 | wetter               | -8.0                              | <b>108</b>                    | <b>35</b>  | <b>28</b>   | <b>57</b>  | <b>-81</b> | yes                | yes                      |
| 12/21/03 | wetter               | -17.9                             | <b>71</b>                     | <b>75</b>  | <b>28</b>   | <b>61</b>  | <b>-87</b> | yes                | yes                      |
| 12/28/03 | wetter               | -13.9                             | <b>114</b>                    | <b>57</b>  | <b>26</b>   | <b>56</b>  | <b>-71</b> | yes                | yes                      |
| 01/04/04 | wetter               | -23.6                             | <b>103</b>                    | <b>28</b>  | <b>28</b>   | <b>58</b>  | <b>-44</b> | yes                | yes                      |
| 01/19/04 | wetter               | -11.0                             | <b>81</b>                     | <b>-24</b> | <b>20</b>   | <b>60</b>  | <b>11</b>  | yes                | yes                      |
| 02/01/04 | normal               | -22.0                             | <b>42</b>                     | <b>-35</b> | <b>-2</b>   | <b>54</b>  | <b>11</b>  | yes                | yes                      |
| 02/08/04 | normal               | -30.0                             | <b>59</b>                     | <b>-28</b> | <b>0</b>    | <b>53</b>  | <b>20</b>  | yes                | no                       |
| 02/14/04 | normal               | -1.0                              | <b>288</b>                    | <b>70</b>  | <b>10</b>   | <b>51</b>  | <b>40</b>  | yes                | yes                      |
| 02/22/04 | normal               | -17.0                             | <b>44</b>                     | <b>-88</b> | <b>-45</b>  | <b>47</b>  | <b>-11</b> | yes                | yes                      |
| 02/28/04 | normal               | -11.0                             | <b>59</b>                     | <b>4</b>   | <b>-46</b>  | <b>49</b>  | <b>-12</b> | yes                | yes                      |
| 03/07/04 | normal               | -26.5                             | <b>24</b>                     | <b>3</b>   | <b>-94</b>  | <b>62</b>  | <b>-11</b> | yes                | no                       |
| 03/12/04 | normal               | -22.4                             | <b>67</b>                     | <b>-71</b> | <b>-167</b> | <b>35</b>  | <b>-13</b> | yes                | yes                      |
| 03/20/04 | normal               | -16.9                             | <b>46</b>                     | <b>-57</b> | <b>-193</b> | <b>35</b>  | <b>-80</b> | yes                | yes                      |
| 03/28/04 | normal               | -40.0                             | 495                           | <b>-38</b> | <b>58</b>   | <b>43</b>  | <b>8</b>   | yes                | no                       |
| 04/04/04 | drier                | -48.9                             | 578                           | <b>-4</b>  | <b>215</b>  | <b>63</b>  | <b>22</b>  | yes                | no                       |

## Technical Standard Data Sheet

NR 13 Shallow (25 cm) Redox Probes  
Control

| Date     | Antecedent Condition | Depth to water in piezometer (cm) | Redox Potentials by Electrode |            |            |            |            | Is soil anaerobic? | Saturated and anaerobic? |
|----------|----------------------|-----------------------------------|-------------------------------|------------|------------|------------|------------|--------------------|--------------------------|
|          |                      |                                   | 1                             | 2          | 3          | 4          | 5          |                    |                          |
|          |                      |                                   | -----mv-----                  |            |            |            |            |                    |                          |
| 04/10/04 | drier                | -69.0                             | 623                           | <b>281</b> | <b>174</b> | <b>201</b> | <b>264</b> | yes                | no                       |
| 04/25/04 | drier                | -71.0                             | 659                           | <b>276</b> | <b>183</b> | <b>185</b> | <b>467</b> | yes                | no                       |
| 05/09/04 | normal               | -74.5                             | 694                           | 625        | <b>214</b> | <b>195</b> | 659        | no                 | no                       |
| 05/16/04 | normal               | -97.0                             | 716                           | 628        | <b>219</b> | <b>172</b> | 644        | no                 | no                       |
| 05/23/04 | normal               | dry                               | 571                           | 646        | <b>218</b> | <b>206</b> | 683        | no                 | no                       |
| 05/31/04 | normal               | dry                               | 596                           | 633        | <b>289</b> | <b>225</b> | 660        | no                 | no                       |
| 06/06/04 | drier                | dry                               | 551                           | 602        | <b>243</b> | <b>212</b> | 699        | no                 | no                       |
| 06/16/04 | drier                | dry                               | 397                           | 636        | 321        | <b>267</b> | 772        | no                 | no                       |
| 06/27/04 | drier                | dry                               | 385                           | 580        | 321        | <b>241</b> | 767        | no                 | no                       |
| 07/20/04 | normal               | dry                               | 496                           | 599        | <b>304</b> | <b>279</b> | 736        | no                 | no                       |
| 08/02/04 | normal               | -77.0                             | 409                           | 724        | 347        | 346        | 803        | no                 | no                       |
| 08/08/04 | normal               | -22.4                             | <b>-26</b>                    | <b>68</b>  | <b>8</b>   | <b>5</b>   | 337        | yes                | yes                      |
| 08/15/04 | normal               | 0.1                               | <b>97</b>                     | <b>81</b>  | <b>-12</b> | <b>-13</b> | <b>237</b> | yes                | yes                      |
| 08/22/04 | normal               | -36.0                             | 330                           | <b>-10</b> | <b>-69</b> | <b>70</b>  | <b>303</b> | yes                | no                       |
| 09/12/04 | wetter               | -18.9                             | <b>13</b>                     | <b>97</b>  | <b>57</b>  | 121        | 134        | yes                | yes                      |
| 09/26/04 | wetter               | -82.0                             | <b>33</b>                     | 579        | <b>199</b> | <b>233</b> | 618        | yes                | no                       |
| 10/17/04 | wetter               | -66.0                             | <b>128</b>                    | 684        | <b>254</b> | 315        | 713        | no                 | no                       |
| 10/23/04 | wetter               | -67.0                             | <b>114</b>                    | 680        | <b>295</b> | 310        | 707        | no                 | no                       |
| 11/22/04 | normal               | -94.9                             | <b>155</b>                    | 653        | 314        | 324        | 679        | no                 | no                       |
| 11/27/04 | normal               | -46.0                             | <b>209</b>                    | 516        | <b>255</b> | <b>196</b> | 569        | yes                | no                       |
| 12/05/04 | normal               | -39.0                             | <b>192</b>                    | <b>-26</b> | <b>188</b> | <b>79</b>  | 640        | yes                | no                       |
| 12/12/04 | normal               | -36.0                             | <b>-87</b>                    | <b>-59</b> | <b>145</b> | <b>-14</b> | 672        | yes                | no                       |
| 12/21/04 | normal               | -49.0                             | <b>154</b>                    | 618        | <b>236</b> | 334        | 669        | no                 | no                       |

## Technical Standard Data Sheet

NR 15 Shallow (25 cm) Redox Probes  
Micro-topography High

To begin, determine the critical redox potential value that indicates when the soil should be anaerobic using the following equation:  $E_{h_{\text{anaerobic}}} = 595 - 60(\text{pH})$

$$E_{h_{\text{anaerobic}}} = 595 - 60(4.40) = 595 - \underline{264} = \underline{331}$$

**Circle the redox potentials that are anaerobic, and complete the table.**

| Date     | Antecedent Condition | Depth to water in piezometer (cm) | Redox Potentials by Electrode |             |             |             |             | Is soil anaerobic? | Saturated and anaerobic? |
|----------|----------------------|-----------------------------------|-------------------------------|-------------|-------------|-------------|-------------|--------------------|--------------------------|
|          |                      |                                   | 1                             | 2           | 3           | 4           | 5           |                    |                          |
|          |                      |                                   | -----mv-----                  |             |             |             |             |                    |                          |
| 09/30/03 | normal               | -18.0                             | <b>-190</b>                   | <b>76</b>   | <b>-91</b>  | <b>-17</b>  | <b>-237</b> | yes                | yes                      |
| 10/07/03 | wetter               | -40.4                             | <b>50</b>                     | <b>53</b>   | <b>20</b>   | <b>-18</b>  | <b>20</b>   | yes                | no                       |
| 10/14/03 | wetter               | 1.6                               | <b>22</b>                     | <b>32</b>   | <b>-140</b> | <b>-173</b> | <b>-186</b> | yes                | yes                      |
| 10/21/03 | wetter               | -15.0                             | <b>55</b>                     | <b>-88</b>  | <b>23</b>   | <b>-19</b>  | <b>-182</b> | yes                | yes                      |
| 10/28/03 | wetter               | -0.5                              | <b>18</b>                     | <b>-46</b>  | <b>-156</b> | <b>-204</b> | <b>-212</b> | yes                | yes                      |
| 11/11/03 | wetter               | -13.2                             | <b>41</b>                     | <b>62</b>   | <b>24</b>   | <b>37</b>   | <b>-186</b> | yes                | yes                      |
| 11/18/03 | wetter               | -24.4                             | <b>44</b>                     | <b>63</b>   | <b>27</b>   | <b>71</b>   | <b>-187</b> | yes                | yes                      |
| 11/24/03 | wetter               | -10.9                             | <b>45</b>                     | <b>68</b>   | <b>30</b>   | <b>78</b>   | <b>-177</b> | yes                | yes                      |
| 12/09/03 | wetter               | -9.4                              | <b>39</b>                     | <b>68</b>   | <b>44</b>   | <b>-57</b>  | <b>-202</b> | yes                | yes                      |
| 12/16/03 | wetter               | -1.4                              | <b>34</b>                     | <b>68</b>   | <b>29</b>   | <b>25</b>   | <b>-200</b> | yes                | yes                      |
| 12/21/03 | wetter               | -7.5                              | <b>38</b>                     | <b>72</b>   | <b>31</b>   | <b>-58</b>  | <b>-201</b> | yes                | yes                      |
| 12/28/03 | wetter               | -6.4                              | <b>39</b>                     | <b>21</b>   | <b>30</b>   | <b>-6</b>   | <b>-249</b> | yes                | yes                      |
| 01/04/04 | wetter               | -8.0                              | <b>42</b>                     | <b>12</b>   | <b>26</b>   | <b>-38</b>  | <b>-165</b> | yes                | yes                      |
| 01/19/04 | wetter               | -2.4                              | <b>38</b>                     | <b>143</b>  | <b>32</b>   | <b>-8</b>   | <b>-142</b> | yes                | yes                      |
| 02/01/04 | normal               | -9.4                              | <b>28</b>                     | <b>-11</b>  | <b>23</b>   | <b>-43</b>  | <b>-195</b> | yes                | yes                      |
| 02/08/04 | normal               | -11.5                             | <b>38</b>                     | <b>1</b>    | <b>29</b>   | <b>-30</b>  | <b>-184</b> | yes                | yes                      |
| 02/14/04 | normal               | 1.6                               | <b>66</b>                     | <b>14</b>   | <b>2</b>    | <b>9</b>    | <b>22</b>   | yes                | yes                      |
| 02/22/04 | normal               | -8.5                              | <b>34</b>                     | <b>-8</b>   | <b>26</b>   | <b>-31</b>  | <b>-178</b> | yes                | yes                      |
| 02/28/04 | normal               | -4.5                              | <b>31</b>                     | <b>-17</b>  | <b>28</b>   | <b>-39</b>  | <b>-173</b> | yes                | yes                      |
| 03/07/04 | normal               | -10.5                             | <b>35</b>                     | <b>-14</b>  | <b>51</b>   | <b>-25</b>  | <b>-122</b> | yes                | yes                      |
| 03/12/04 | normal               | -6.5                              | <b>34</b>                     | <b>-34</b>  | <b>28</b>   | <b>-43</b>  | <b>-145</b> | yes                | yes                      |
| 03/20/04 | normal               | -8.5                              | <b>35</b>                     | <b>-30</b>  | <b>28</b>   | <b>-34</b>  | <b>-154</b> | yes                | yes                      |
| 03/28/04 | normal               | -16.4                             | <b>38</b>                     | <b>-30</b>  | <b>30</b>   | <b>-38</b>  | <b>-171</b> | yes                | yes                      |
| 04/04/04 | drier                | -21.5                             | <b>31</b>                     | <b>-107</b> | <b>27</b>   | <b>-39</b>  | <b>-165</b> | yes                | yes                      |

## Technical Standard Data Sheet

NR 15 Shallow (25 cm) Redox Probes  
Micro-topography High

| Date     | Antecedent Condition | Depth to water in piezometer (cm) | Redox Potentials by Electrode |            |            |            |             | Is soil anaerobic? | Saturated and anaerobic? |
|----------|----------------------|-----------------------------------|-------------------------------|------------|------------|------------|-------------|--------------------|--------------------------|
|          |                      |                                   | 1                             | 2          | 3          | 4          | 5           |                    |                          |
|          |                      |                                   | -----mv-----                  |            |            |            |             |                    |                          |
| 04/10/04 | drier                | -39.5                             | <b>35</b>                     | <b>-40</b> | <b>48</b>  | <b>-31</b> | <b>-152</b> | yes                | no                       |
| 04/25/04 | drier                | -41.9                             | <b>35</b>                     | <b>-89</b> | <b>27</b>  | <b>-23</b> | <b>-173</b> | yes                | no                       |
| 05/09/04 | normal               | -46.4                             | <b>129</b>                    | <b>-33</b> | <b>31</b>  | <b>69</b>  | <b>-32</b>  | yes                | no                       |
| 05/16/04 | normal               | -80.5                             | <b>235</b>                    | <b>224</b> | <b>244</b> | 565        | <b>250</b>  | yes                | no                       |
| 05/23/04 | normal               | -91.4                             | <b>271</b>                    | <b>288</b> | 374        | 529        | <b>268</b>  | yes                | no                       |
| 05/31/04 | normal               | -90.4                             | 390                           | <b>307</b> | 418        | 752        | <b>284</b>  | no                 | no                       |
| 06/06/04 | drier                | dry                               | 457                           | <b>314</b> | 415        | 765        | 503         | no                 | no                       |
| 06/16/04 | drier                | -83.5                             | 636                           | 335        | 462        | 741        | <b>258</b>  | no                 | no                       |
| 06/27/04 | drier                | dry                               | 590                           | 339        | 519        | 801        | <b>288</b>  | no                 | no                       |
| 07/20/04 | normal               | dry                               | 587                           | 403        | 558        | 777        | <b>258</b>  | no                 | no                       |
| 08/02/04 | normal               | -69.5                             | 633                           | 367        | 554        | 810        | <b>295</b>  | no                 | no                       |
| 08/08/04 | normal               | -12.0                             | <b>96</b>                     | <b>-38</b> | <b>97</b>  | <b>159</b> | <b>57</b>   | yes                | yes                      |
| 08/15/04 | normal               | 1.6                               | <b>177</b>                    | <b>71</b>  | <b>104</b> | <b>201</b> | <b>64</b>   | yes                | yes                      |
| 08/22/04 | normal               | -17.5                             | <b>-29</b>                    | <b>74</b>  | <b>169</b> | <b>244</b> | <b>149</b>  | yes                | yes                      |
| 09/12/04 | wetter               | -37.5                             | <b>307</b>                    | <b>25</b>  | <b>135</b> | <b>22</b>  | 640         | yes                | no                       |
| 09/26/04 | wetter               | -73.5                             | 474                           | <b>191</b> | <b>270</b> | 594        | <b>128</b>  | yes                | no                       |
| 10/17/04 | wetter               | -52.5                             | 509                           | <b>263</b> | <b>321</b> | 703        | <b>210</b>  | yes                | no                       |
| 10/23/04 | wetter               | -55.4                             | 468                           | <b>265</b> | 337        | 714        | <b>232</b>  | no                 | no                       |
| 11/22/04 | normal               | -89.9                             | 417                           | <b>301</b> | <b>322</b> | 719        | <b>225</b>  | yes                | no                       |
| 11/27/04 | normal               | -34.4                             | 538                           | <b>273</b> | 346        | 506        | <b>219</b>  | no                 | no                       |
| 12/05/04 | normal               | -24.4                             | <b>94</b>                     | <b>168</b> | <b>137</b> | 636        | <b>120</b>  | yes                | yes                      |
| 12/12/04 | normal               | -22.4                             | <b>-42</b>                    | <b>-71</b> | <b>104</b> | <b>317</b> | <b>58</b>   | yes                | yes                      |
| 12/21/04 | normal               | -28.4                             | 582                           | <b>-45</b> | <b>294</b> | 614        | <b>97</b>   | yes                | no                       |

## Technical Standard Data Sheet

NR 16 Shallow (25 cm) Redox Probes  
Micro-topography Low

To begin, determine the critical redox potential value that indicates when the soil should be anaerobic using the following equation:  $E_{h_{\text{anaerobic}}} = 595 - 60(\text{pH})$

$$E_{h_{\text{anaerobic}}} = 595 - 60(4.34) = 595 - \underline{260} = \underline{335}$$

**Circle the redox potentials that are anaerobic, and complete the table.**

| Date     | Antecedent Condition | Depth to water in piezometer (cm) | Redox Potentials by Electrode |             |            |            |             | Is soil anaerobic? | Saturated and anaerobic? |
|----------|----------------------|-----------------------------------|-------------------------------|-------------|------------|------------|-------------|--------------------|--------------------------|
|          |                      |                                   | 1                             | 2           | 3          | 4          | 5           |                    |                          |
|          |                      |                                   | -----mv-----                  |             |            |            |             |                    |                          |
| 09/30/03 | normal               | 2.0                               | <b>85</b>                     | <b>106</b>  | <b>147</b> | <b>123</b> | <b>162</b>  | yes                | yes                      |
| 10/07/03 | wetter               | -15.5                             | <b>17</b>                     | <b>-124</b> | <b>-7</b>  | <b>24</b>  | <b>-34</b>  | yes                | yes                      |
| 10/14/03 | wetter               | 16.0                              | <b>21</b>                     | <b>-63</b>  | <b>13</b>  | <b>56</b>  | <b>-60</b>  | yes                | yes                      |
| 10/21/03 | wetter               | 1.3                               | <b>1</b>                      | <b>-94</b>  | <b>12</b>  | <b>39</b>  | <b>-162</b> | yes                | yes                      |
| 10/28/03 | wetter               | 0.2                               | <b>59</b>                     | <b>-57</b>  | <b>-2</b>  | <b>1</b>   | <b>-72</b>  | yes                | yes                      |
| 11/11/03 | wetter               | 5.1                               | <b>25</b>                     | <b>-50</b>  | <b>12</b>  | <b>-6</b>  | <b>-136</b> | yes                | yes                      |
| 11/18/03 | wetter               | -7.0                              | <b>25</b>                     | <b>-95</b>  | <b>25</b>  | <b>-4</b>  | <b>-114</b> | yes                | yes                      |
| 11/24/03 | wetter               | 1.5                               | <b>27</b>                     | <b>-102</b> | <b>24</b>  | <b>65</b>  | <b>-134</b> | yes                | yes                      |
| 12/09/03 | wetter               | 6.0                               | <b>5</b>                      | <b>-51</b>  | <b>28</b>  | <b>2</b>   | <b>-152</b> | yes                | yes                      |
| 12/16/03 | wetter               | -6.2                              | <b>-3</b>                     | <b>-61</b>  | <b>29</b>  | <b>1</b>   | <b>-153</b> | yes                | yes                      |
| 12/21/03 | wetter               | 9.0                               | <b>34</b>                     | <b>-63</b>  | <b>38</b>  | <b>13</b>  | <b>-161</b> | yes                | yes                      |
| 12/28/03 | wetter               | 8.0                               | <b>27</b>                     | <b>-55</b>  | <b>37</b>  | <b>9</b>   | <b>-165</b> | yes                | yes                      |
| 01/04/04 | wetter               | 7.9                               | <b>43</b>                     | <b>-57</b>  | <b>37</b>  | <b>12</b>  | <b>-149</b> | yes                | yes                      |
| 01/19/04 | wetter               | 6.0                               | <b>29</b>                     | <b>-110</b> | <b>50</b>  | <b>9</b>   | <b>-177</b> | yes                | yes                      |
| 02/01/04 | normal               | 4.0                               | <b>41</b>                     | <b>-61</b>  | <b>55</b>  | <b>14</b>  | <b>-173</b> | yes                | yes                      |
| 02/08/04 | normal               | 2.0                               | <b>-29</b>                    | <b>-43</b>  | <b>52</b>  | <b>7</b>   | <b>-165</b> | yes                | yes                      |
| 02/14/04 | normal               | 4.2                               | <b>129</b>                    | <b>15</b>   | <b>108</b> | <b>105</b> | <b>-32</b>  | yes                | yes                      |
| 02/22/04 | normal               | 7.0                               | <b>33</b>                     | <b>-43</b>  | <b>58</b>  | <b>3</b>   | <b>-166</b> | yes                | yes                      |
| 02/28/04 | normal               | 8.0                               | <b>24</b>                     | <b>-40</b>  | <b>56</b>  | <b>-3</b>  | <b>-185</b> | yes                | yes                      |
| 03/07/04 | normal               | 5.0                               | <b>49</b>                     | <b>-22</b>  | <b>71</b>  | <b>7</b>   | <b>-156</b> | yes                | yes                      |
| 03/12/04 | normal               | 7.0                               | <b>29</b>                     | <b>-28</b>  | <b>50</b>  | <b>-1</b>  | <b>-173</b> | yes                | yes                      |
| 03/20/04 | normal               | 6.0                               | <b>37</b>                     | <b>-5</b>   | <b>60</b>  | <b>6</b>   | <b>-170</b> | yes                | yes                      |
| 03/28/04 | normal               | -1.0                              | <b>31</b>                     | <b>-3</b>   | <b>54</b>  | <b>-2</b>  | <b>-157</b> | yes                | yes                      |
| 04/04/04 | drier                | -16.0                             | <b>30</b>                     | <b>-4</b>   | <b>52</b>  | <b>8</b>   | <b>-167</b> | yes                | yes                      |

# Technical Standard Data Sheet

NR 16 Shallow (25 cm) Redox Probes  
Micro-topography Low

| Date     | Antecedent Condition | Depth to water in piezometer (cm) | Redox Potentials by Electrode |            |            |             |             | Is soil anaerobic? | Saturated and anaerobic? |
|----------|----------------------|-----------------------------------|-------------------------------|------------|------------|-------------|-------------|--------------------|--------------------------|
|          |                      |                                   | 1                             | 2          | 3          | 4           | 5           |                    |                          |
|          |                      |                                   | -----mv-----                  |            |            |             |             |                    |                          |
| 04/10/04 | drier                | -24.0                             | <b>28</b>                     | <b>0</b>   | <b>59</b>  | <b>-28</b>  | <b>-154</b> | yes                | yes                      |
| 04/25/04 | drier                | -21.0                             | <b>28</b>                     | <b>40</b>  | <b>50</b>  | <b>15</b>   | <b>-136</b> | yes                | yes                      |
| 05/09/04 | normal               | -28.0                             | <b>39</b>                     | <b>63</b>  | <b>37</b>  | <b>-158</b> | <b>-132</b> | yes                | no                       |
| 05/16/04 | normal               | -53.5                             | <b>50</b>                     | <b>41</b>  | <b>67</b>  | <b>1</b>    | <b>-115</b> | yes                | no                       |
| 05/23/04 | normal               | -75.0                             | <b>492</b>                    | <b>459</b> | <b>72</b>  | <b>217</b>  | <b>70</b>   | yes                | no                       |
| 05/31/04 | normal               | -96.0                             | 612                           | 485        | <b>303</b> | 512         | <b>200</b>  | no                 | no                       |
| 06/06/04 | drier                | dry                               | 686                           | 515        | 415        | 709         | 453         | no                 | no                       |
| 06/16/04 | drier                | -68.0                             | 675                           | 489        | <b>286</b> | 641         | 433         | no                 | no                       |
| 06/27/04 | drier                | -86.0                             | 708                           | 501        | <b>306</b> | 715         | 451         | no                 | no                       |
| 07/20/04 | normal               | dry                               | 739                           | 454        | <b>242</b> | 701         | 473         | no                 | no                       |
| 08/02/04 | normal               | -55.0                             | 735                           | <b>301</b> | <b>125</b> | 614         | 381         | no                 | no                       |
| 08/08/04 | normal               | 6.0                               | <b>-23</b>                    | <b>61</b>  | <b>81</b>  | <b>159</b>  | <b>85</b>   | yes                | yes                      |
| 08/15/04 | normal               | 11.0                              | <b>82</b>                     | <b>5</b>   | <b>100</b> | <b>164</b>  | <b>105</b>  | yes                | yes                      |
| 08/22/04 | normal               | 7.0                               | <b>134</b>                    | <b>84</b>  | <b>146</b> | <b>228</b>  | <b>121</b>  | yes                | yes                      |
| 09/12/04 | wetter               | -15.0                             | <b>90</b>                     | <b>47</b>  | <b>71</b>  | <b>188</b>  | <b>60</b>   | yes                | yes                      |
| 09/26/04 | wetter               | -44.0                             | <b>1</b>                      | <b>-59</b> | <b>-46</b> | <b>-13</b>  | <b>-87</b>  | yes                | no                       |
| 10/17/04 | wetter               | -38.0                             | <b>158</b>                    | <b>16</b>  | <b>40</b>  | <b>33</b>   | <b>-22</b>  | yes                | no                       |
| 10/23/04 | wetter               | -39.0                             | <b>180</b>                    | <b>2</b>   | <b>21</b>  | <b>17</b>   | <b>-36</b>  | yes                | no                       |
| 11/22/04 | normal               | -68.0                             | 707                           | 421        | <b>258</b> | 383         | <b>237</b>  | no                 | no                       |
| 11/27/04 | normal               | -23.0                             | <b>260</b>                    | <b>222</b> | <b>178</b> | <b>211</b>  | <b>153</b>  | yes                | yes                      |
| 12/05/04 | normal               | -9.0                              | <b>23</b>                     | <b>76</b>  | <b>111</b> | <b>16</b>   | <b>85</b>   | yes                | yes                      |
| 12/12/04 | normal               | -5.0                              | <b>0</b>                      | <b>87</b>  | <b>83</b>  | <b>71</b>   | <b>31</b>   | yes                | yes                      |
| 12/21/04 | normal               | -16.0                             | <b>105</b>                    | <b>98</b>  | <b>85</b>  | <b>102</b>  | <b>41</b>   | yes                | yes                      |

## Technical Standard Data Sheet

NR 17 Shallow (25 cm) Redox Probes  
Crown Removal

To begin, determine the critical redox potential value that indicates when the soil should be anaerobic using the following equation:  $Eh_{\text{anaerobic}} = 595 - 60(\text{pH})$

$$Eh_{\text{anaerobic}} = 595 - 60(5.58) = 595 - \underline{335} = \underline{260}$$

**Circle the redox potentials that are anaerobic, and complete the table.**

| Date     | Antecedent Condition | Depth to water in piezometer (cm) | Redox Potentials by Electrode |             |             |            |            | Is soil anaerobic? | Saturated and anaerobic? |
|----------|----------------------|-----------------------------------|-------------------------------|-------------|-------------|------------|------------|--------------------|--------------------------|
|          |                      |                                   | 1                             | 2           | 3           | 4          | 5          |                    |                          |
|          |                      |                                   | -----mv-----                  |             |             |            |            |                    |                          |
| 09/30/03 | normal               | -3.0                              | <b>-240</b>                   | <b>-24</b>  | <b>-31</b>  | <b>-29</b> | <b>36</b>  | yes                | yes                      |
| 10/07/03 | wetter               | -21.7                             | <b>109</b>                    | <b>-2</b>   | <b>200</b>  | <b>207</b> | 309        | yes                | yes                      |
| 10/14/03 | wetter               | -26.5                             | <b>-74</b>                    | <b>-165</b> | <b>-73</b>  | <b>-28</b> | <b>109</b> | yes                | no                       |
| 10/21/03 | wetter               | -15.6                             | <b>76</b>                     | <b>8</b>    | <b>119</b>  | <b>108</b> | <b>110</b> | yes                | yes                      |
| 10/28/03 | wetter               | -32.0                             | <b>13</b>                     | <b>-3</b>   | <b>65</b>   | <b>74</b>  | <b>171</b> | yes                | no                       |
| 11/03/03 | wetter               | -15.6                             | <b>-147</b>                   | <b>9</b>    | <b>103</b>  | <b>116</b> | <b>86</b>  | yes                | yes                      |
| 11/18/03 | wetter               | -53.0                             | 295                           | <b>30</b>   | <b>-257</b> | <b>201</b> | 274        | yes                | no                       |
| 11/24/03 | wetter               | -36.0                             | <b>137</b>                    | <b>-2</b>   | 623         | <b>161</b> | <b>96</b>  | yes                | no                       |
| 12/09/03 | wetter               | -14.0                             | <b>195</b>                    | <b>-24</b>  | <b>127</b>  | <b>107</b> | <b>128</b> | yes                | yes                      |
| 12/16/03 | wetter               | -1.0                              | <b>164</b>                    | <b>-32</b>  | <b>113</b>  | <b>100</b> | <b>130</b> | yes                | yes                      |
| 12/21/03 | wetter               | -7.0                              | <b>171</b>                    | <b>-44</b>  | <b>101</b>  | <b>95</b>  | <b>127</b> | yes                | yes                      |
| 12/28/03 | wetter               | -5.0                              | <b>144</b>                    | <b>-58</b>  | <b>98</b>   | <b>93</b>  | <b>119</b> | yes                | yes                      |
| 01/04/04 | wetter               | -17.5                             | <b>44</b>                     | <b>-52</b>  | <b>104</b>  | <b>88</b>  | <b>117</b> | yes                | yes                      |
| 01/19/04 | wetter               | -21.7                             | <b>104</b>                    | <b>-9</b>   | <b>89</b>   | <b>131</b> | <b>232</b> | yes                | yes                      |
| 02/01/04 | normal               | -33.0                             | <b>163</b>                    | <b>48</b>   | <b>199</b>  | 342        | <b>182</b> | yes                | no                       |
| 02/08/04 | normal               | -41.0                             | <b>208</b>                    | <b>109</b>  | 662         | 573        | <b>242</b> | yes                | no                       |
| 02/14/04 | normal               | -10.1                             | <b>207</b>                    | <b>172</b>  | <b>173</b>  | <b>100</b> | <b>199</b> | yes                | yes                      |
| 02/22/04 | normal               | -16.0                             | <b>85</b>                     | <b>63</b>   | <b>206</b>  | <b>104</b> | <b>118</b> | yes                | yes                      |
| 02/28/04 | normal               | -12.7                             | <b>86</b>                     | <b>71</b>   | <b>174</b>  | <b>101</b> | <b>123</b> | yes                | yes                      |
| 03/07/04 | normal               | -32.0                             | <b>58</b>                     | <b>56</b>   | <b>166</b>  | <b>104</b> | <b>147</b> | yes                | no                       |
| 03/12/04 | normal               | -33.0                             | <b>143</b>                    | <b>67</b>   | <b>139</b>  | <b>133</b> | <b>211</b> | yes                | no                       |
| 03/20/04 | normal               | -14.0                             | <b>125</b>                    | <b>96</b>   | <b>149</b>  | <b>118</b> | <b>162</b> | yes                | yes                      |
| 03/28/04 | normal               | -46.5                             | 268                           | <b>247</b>  | 661         | 330        | <b>248</b> | no                 | no                       |
| 04/04/04 | drier                | -55.0                             | 265                           | 661         | 746         | 553        | <b>236</b> | no                 | no                       |

## Technical Standard Data Sheet

NR 17 Shallow (25 cm) Redox Probes  
Crown Removal

| Date     | Antecedent Condition | Depth to water in piezometer (cm) | Redox Potentials by Electrode |            |            |            |            | Is soil anaerobic? | Saturated and anaerobic? |
|----------|----------------------|-----------------------------------|-------------------------------|------------|------------|------------|------------|--------------------|--------------------------|
|          |                      |                                   | 1                             | 2          | 3          | 4          | 5          |                    |                          |
|          |                      |                                   | -----mv-----                  |            |            |            |            |                    |                          |
| 04/10/04 | drier                | -71.0                             | 267                           | 695        | 798        | 500        | <b>245</b> | no                 | no                       |
| 04/25/04 | drier                | -68.0                             | 279                           | 710        | 814        | 512        | 276        | no                 | no                       |
| 05/09/04 | normal               | -76.0                             | 308                           | 606        | 732        | 418        | 290        | no                 | no                       |
| 05/16/04 | normal               | -92.0                             | 300                           | 731        | 812        | 453        | 288        | no                 | no                       |
| 05/23/04 | normal               | -94.5                             | 363                           | 762        | 812        | 568        | 305        | no                 | no                       |
| 05/31/04 | normal               | -94.5                             | 441                           | 779        | 840        | 577        | 303        | no                 | no                       |
| 06/06/04 | drier                | dry                               | 494                           | 782        | 854        | 504        | 296        | no                 | no                       |
| 06/16/04 | drier                | -94.0                             | 513                           | 787        | 852        | 555        | 320        | no                 | no                       |
| 06/27/04 | drier                | dry                               | 533                           | 797        | 856        | 530        | 313        | no                 | no                       |
| 07/20/04 | normal               | dry                               | 582                           | 793        | 740        | 628        | 358        | no                 | no                       |
| 08/02/04 | normal               | -89.5                             | 694                           | 790        | 821        | 610        | 335        | no                 | no                       |
| 08/08/04 | normal               | -8.0                              | <b>138</b>                    | 347        | <b>239</b> | <b>-6</b>  | <b>57</b>  | yes                | no                       |
| 08/15/04 | normal               | 1.0                               | <b>4</b>                      | <b>55</b>  | <b>18</b>  | <b>-79</b> | <b>-14</b> | yes                | no                       |
| 08/22/04 | normal               | -15.5                             | <b>130</b>                    | <b>258</b> | <b>157</b> | <b>-60</b> | <b>52</b>  | yes                | yes                      |
| 09/12/04 | wetter               | -50.0                             | 741                           | 766        | 775        | 705        | 483        | no                 | no                       |
| 09/26/04 | wetter               | -83.0                             | 743                           | 793        | 816        | 721        | 278        | no                 | no                       |
| 10/17/04 | wetter               | -82.5                             | 716                           | 752        | 782        | 698        | 281        | no                 | no                       |
| 10/23/04 | wetter               | -76.0                             | 691                           | 743        | 795        | 693        | 285        | no                 | no                       |
| 11/22/04 | normal               | -94.5                             | 699                           | 737        | 756        | 685        | 277        | no                 | no                       |
| 11/27/04 | normal               | -62.0                             | 474                           | 529        | 562        | 474        | 261        | no                 | no                       |
| 12/05/04 | normal               | -45.0                             | 658                           | 716        | 777        | 668        | 298        | no                 | no                       |
| 12/12/04 | normal               | -42.5                             | 687                           | 720        | 787        | 694        | 386        | no                 | no                       |
| 12/21/04 | normal               | -58.5                             | 614                           | 711        | 780        | 669        | 328        | no                 | no                       |