

**ASSESSMENT OF RIVER-GROUNDWATER INTERACTIONS IN THE BAROTSE
FLOODPLAIN, WESTERN ZAMBIA**

By
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A thesis submitted to the University of Zambia in fulfilment of the requirements of the
Degree in Master of Science in Integrated Water Resources Management.

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DECLARATION

I, Mulema Mataa hereby declare that this thesis has been compiled by myself and that the sources of all the material referred to has been specifically acknowledged. This work has not previously been submitted for the degree at this University or any other.

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APPROVAL

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ABSTRACT

Floodplains are among the most dynamic, productive, diverse, and threatened ecosystems in the world. Their interactions between ground and surface water is a key element in understanding the resilience of floodplains to hydrological changes, especially with the advent of climate change and variability that has affected many aquatic ecosystems. Conjunctive evaluation of ground and surface water in floodplains is critical for integrated water resources management. The main objective of this study was to evaluate groundwater-surface water interactions in the Barotse Floodplain. To achieve this objective, remote sensing was employed to identify perennial green vegetated areas with a shallow depth to groundwater table in the floodplain. Normalised Difference Vegetation Index (NDVI) and Soil Adjusted Vegetation Index (SAVI) using Sentinel-2 imagery from 2015 to 2020 using a cloud computing approach in Google Earth Engine (GEE), were used to identify riverine perennially green vegetation. Digital filtering using “EcoHydrology Library” in R statistical package was used to determine the Base Flow Index (BFI) from the hydrograph discharge data collected from the three main gauging stations (Lukulu, Matongo and Senanga) along the Zambezi River. Hydrochemistry was employed to determine the composition of the different water sources and identify the genetic link between the local and regional flow of ground water and interactions with the Zambezi River. In addition, water samples collected from various water sources were analysed for stable isotope [deuterium (^2H) and oxygen (^{18}O)] to determine the origin and identify the relationships between ground and surface water. Statistical analysis was applied to determine the significance of the correlation between remote sensed data and ground based measurements including, pH, electrical conductivity (EC) and dissolved oxygen (DO). The results of the NDVI map shows a high occurrence of groundwater dependent vegetation downstream of the floodplain. These locations have a shallow depth to groundwater table and other locations had occurrences of springs. The average baseflow index (BFI) in five hydrological years from October 2004 to September 2009 shows an average of 46.5 percent baseflow to the river flow across the wet and dry season. Furthermore, baseflow averages up to 90 percent of the flow during the dry season between August to October when the flood water has receded. The hydrochemistry shows a high concentration in calcium and the bicarbonate ion in both river and groundwater. The water was concluded to be that of a CaHCO_3 type. From the stable isotopes the results show recharge from precipitation as values plotted on the meteoric line. Both river and groundwater stable isotopes ($\delta^{18}\text{O}$: -57.4 ‰ to 1.4 ‰ and $\delta^2\text{H}$:-7.5 ‰ to 3.3 ‰) had a similar signature indicating that groundwater was discharging into the river channel. Results of statistics between base flow as an index and ground based measurements show a strong correlation between baseflow index (BFI) and dissolved oxygen (DO) indicating that an increase in baseflow increases the dissolved oxygen concentration in the river system. Overall, results show that the lower reach of the Zambezi River channel was a ‘gaining stream’ as groundwater is discharging into the river, whereas the upper reach was a ‘losing stream’ as the river channel tends to discharge into the groundwater. This study demonstrates that the Barotse Floodplain is a proportionally groundwater dependant ecosystem as its functionality in provision of ecosystem products and services requires groundwater. Conservation of this wetland requires prudent protection of groundwater aquifer systems.

Keywords: River; Groundwater; NDVI; Baseflow; Hydrochemistry; Stable isotope; Dissolved Oxygen

DEDICATION

This thesis is dedicated to my Mum and Dad for the unrelenting guidance. You both encouraged me to pursue my Masters right after completing my undergraduate studies. My young brother Sepo Mataa, My Sister Mutango M Lubinda, the husband Listeli Lubinda and my niece Limpo, you people are my inspiration.

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ACRONYMS

D.O	Dissolved oxygen
CMMU	Community Management and Monitoring Unit
DEM	Digital Elevation Model
DWRD	Department of Water Resources Development
GMWL	Global Meteoric Water Line
GRZ	Government of the Republic of Zambia
LMWL	Local Meteoric Water Line
MNDWI	Modified Normalised Difference Vegetation Index
MODIS	Moderate Resolution Imaging Spectroradiometer
NDVI	Normalised Difference Vegetation Index
NDWI	Normalised Difference Water Index
SAVI	Soil Adjusted Vegetation Index
SDG	Sustainable Development Goals
SRTM	Shuttle Radar Topography Mission
	United Nations Educational, Scientific and Cultural
UNESCO	Organization
UNZA	University of Zambia
WARMA	Water Resources Management Authority
ZRA	Zambezi River Authority

CHAPTER 1: INTRODUCTION

1.1 Background

Water is an important resource and is considered as the basis of life (Sargen, 2019). Water occurs in many forms and is stored both on surface and below ground. Water stored below ground in the saturated zone (groundwater) is the largest global store of liquid freshwater, accounting for about 96 % of all liquid freshwater (Shiklomanov, *et al* 2008). Groundwater interacts with the surface environment through springs, streams and rivers that drain the landscape. Streams and rivers are a major component of the water cycle, and they also shape landscapes, transport mass, and energy and provide ecosystem services (Brunner, *et al* 2017). Interactions between groundwater and surface water basically proceed in two ways: groundwater flows through the streambed into the stream (gaining stream), and stream water infiltrates through the sediments into the groundwater (losing stream) as described by Kalbus, *et al.*,(2006). Understanding the interconnections of groundwater and surface water is fundamental to development of effective water-resource management. As the world's concerns over water resources and the environment increase, the importance of considering groundwater and surface water as a single resource has become increasingly evident. Issues related to water supply, water quality and quantity, degradation of aquatic environments are reported on frequently (Ezugwu & Apeh, 2017). The health of many natural or man- made ecosystems is determined to a large extent by the quality and amount of fresh water (Vorosmarty, *et al.*, 2005).

Groundwater dependent ecosystems (GDEs) are ecosystems which require access to groundwater on a permanent or intermittent basis to meet all or some of their water requirements so as to maintain their communities of plants and animals, ecological processes and ecosystem services (Richardson, *et al.*, 2011). Eamus, *et al.*, (2016) discusses the three major classes of groundwater-dependent ecosystems: GWDE's that reside within groundwater (e.g., karsts; stygofauna), GDE's requiring the surface expression of groundwater (e.g., springs; wetlands), and GDE's dependent upon the sub-surface availability of groundwater within the rooting depth of vegetation (e.g., woodlands; riparian forests). Therefore, the understanding of river-groundwater interactions is essential for the protection of these ecosystems and will help attain Sustainable Development Goal number 6.6 of the United Nations that seeks to halt the degradation and destruction of water-related ecosystems and to assist the recovery of those already degraded.

Groundwater-surface water interaction is now receiving increased focus in Africa due to its importance to ecological systems and sustainability. In South Africa, Lorentz, et al., (2020) characterized groundwater surface water interactions in an ephemeral savanna catchment, Kruger National Park. They used in situ hydrometric observations, hydrochemistry, remote sensing and soil water balance model, lateral connectivity of terrestrial ecosystems to the ephemeral drainage network expressed via hydrological processes. In these savanna landscapes it is important to infer potential impacts of climate variability on the continued conservation of these ecosystems. Banda, (2019) also did a hydrogeological characteristic to establish influence of aquifer-river interaction in non-perennial river systems in the Heuningnes catchment Western Cape. The study used geological, hydrometric, hydro-chemical and environmental isotopes in order to characterize groundwater occurrence, flow system and its interaction with the river and concluded that rivers of the study area largely gain water from groundwater although the amount of groundwater discharge varies from one river reach to another in both upstream and downstream parts. In Zimbabwe Love, et al., (2007) investigated through a case study groundwater-surface water interactions and scale relationships in small alluvial aquifers in the Limpopo Basin. Small alluvial aquifers and three ephemeral rivers tributaries to the Mwenezi River were studied. In each case the hydrogeological properties of the aquifer were studied; the change in head in the aquifer was monitored over time, as well as any surface inflows It was observed that in semi-arid regions, streams that are associated with alluvial aquifers tend to vary from discharge water bodies in the dry season, to recharge water bodies during certain times of the rainy season or when there is flow in the river from managed reservoir releases.

In Namibia, a geochemical assessment of groundwater in the Kuiseb River Basin by Kalola, et al., (2020) to assess the physical and chemical quality of groundwater, indicated the dominance of rock-water interaction and the influence of anthropogenic activities as the main process controlling groundwater chemistry in the area. It was concluded that the basin was heavily used and is sensitive environment, thus required a basin-wide river management approach. In the Okavango Basin Wolski & Savenije, (2006) studied the dynamics of floodplain-island groundwater flow. To evaluate the seasonal and long-term dynamics of the surface water-groundwater interactions between the floodplains and the islands. The study demonstrated that the regular flooding dynamic nature of the floodplain island flow causes a regular

replenishment of the island groundwater storage, and the groundwater flow mechanism can account for the long term ‘memory’ of the Okavango delta hydrological system

On the Kafue Flats of Zambia, Burt, (2019), studied groundwater-surface water interconnections by using a multidisciplinary approach. His multidisciplinary approach, incorporating remote sensing and hydro-chemical analysis identified a genetic link between surface waters and numerous rock types of the region, suggesting that there is a connectivity between the surface waters of the Kafue Flats and regional groundwater flow. On the Barotse Floodplain, Zimba, et al., (2018) assessed the spatial and temporal trends in inundation and concludes that the downward trend in discharge and reduction in forest cover could negatively affect inundation extent patterns and the Barotse wetland’s ecosystem as a whole. Kabika , (2017) estimated recharge and safe yield of the Kalahari sand aquifer in the Sesheke area and found that the recharge is controlled by rainfall regimes and evaporative fluxes while the geology and vegetation characteristics influence the mechanism and magnitude of the actual recharge. This study, investigated the river groundwater interactions in the Barotse floodplains using remote sensing and mapped groundwater discharge areas by identifying perennially green areas. Furthermore, baseflow separation was used to quantify the relationship between groundwater and surface water. Finally, stable isotopes and hydrochemistry were used to determine the influence of river-groundwater interaction.

1.2 Problem statement

Hydrologically, wetlands contain surface and/or subsurface water inflows, discharges, and storages that vary spatially and temporally. Several authors have postulated the existence of large groundwater reservoirs underlying the Barotse Floodplain. However, the relative importance of groundwater in supporting the complex wetland hydrological processes or the ecology character is not known. It is not clear if groundwater is an important contributor to the hydrological regimes and if a change in the quality or quantity will affect the wetland ecosystem. Management of such a wetland under changing hydrological conditions in line with the RAMSAR convention protocols requires a critical examination of this.

1.3 Aim and objectives

The aim of this research is to evaluate river-groundwater interactions in the Barotse floodplain.

The main objectives include:

- i. To identify areas of groundwater diffuse/discharge to the floodplain region.
- ii. To determine the connectivity between the river system and underlying aquifer system
- iii. To evaluate the influence of groundwater discharge to the floodplain's hydrochemistry (if any).

1.4 Research questions

1. What areas have a perennial greenness on the Barotse Floodplain?
2. Is there connectivity between the Zambezi River and groundwater?
3. Does the hydrochemistry groundwater have the same signature as the flow of the Zambezi River?
4. What is the significance of groundwater to this ecosystem?

1.5 Significance of the study

The interaction between groundwater and surface water is a vital aspect of the wetland hydrology. As development of land and water resources increases, it is apparent that development of either of these resources affects the quantity and quality of the other. Nearly all surface water features (streams, lakes, rivers, reservoirs, wetlands, and estuaries) interact with groundwater. These interactions take many forms. In many situations, surface water bodies gain water and solutes from ground water systems and in others the surface water body is a source of groundwater recharge and causes changes in groundwater quality and quantity (Ezugwu & Apeh, 2017). As a result, withdrawal of water from the river can deplete groundwater or conversely. Pollution of surface water can cause degradation of groundwater quality and conversely pollution of groundwater can degrade surface water. Thus, effective land and water management requires a clear understanding of the linkages between groundwater and surface water as it applies to any given hydrologic setting. Thus, this study will increase the understanding of groundwater river interaction and will contribute to developing effective water resource management in monitoring and conservation strategies of the floodplain.

1.6 Description of the study area

1.6.1 Location of the study area

The Barotse Floodplain is in the Western Province of Zambia and is 597 km west of Zambia's capital City of Lusaka. The floodplain is in the Barotse sub-catchment that is part of the Upper Zambezi Basin. It is geographically located between 13-17 ° Latitude south and 22-24° Longitude East. The Barotse floodplain stretches more than 230 km from north to south. Its width is mostly about 30 km though it reaches a width of 50 km in some areas and the inundation covers more than 770,000 ha that's approximately 7,700 km² (GRZ, 2014). The actual size of the wetland is unknown but is estimated to be at 1.2 million hectares (IUCN, 2003).

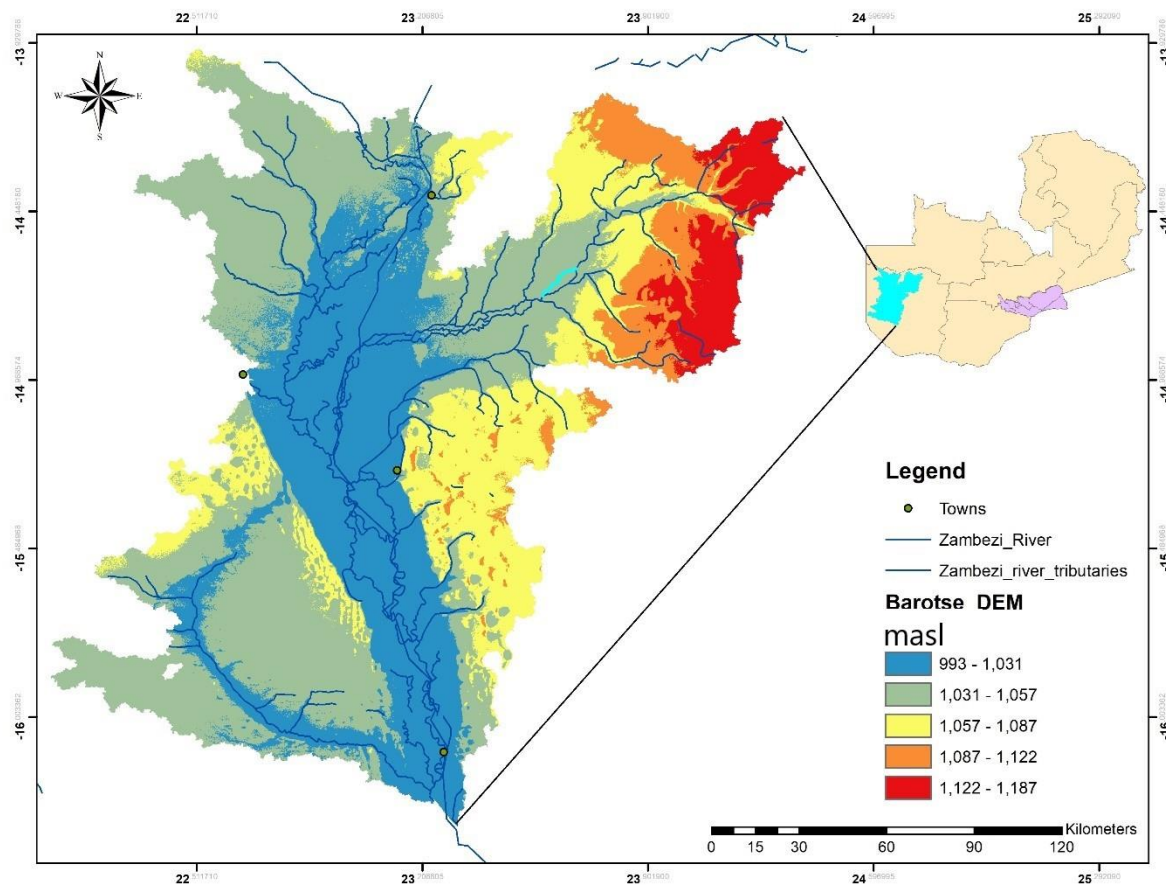


Figure 1: The location and altitude of the Barotse Floodplain, the Zambezi River and its main tributaries

1.6.2 Climate

During a year, the rainfall is characterized by a rainy season from October to April. The maximum amount of rainfall per month is recorded in average in January (more than 200 mm at Mongu). June to August is the driest period with almost no rain. September and October are the warmest months in Mongu with average low temperature of 18° (night temperature) and average high temperature of 36-37 °C (day temperature). Coolest months are from May to July where average low temperature is around 10° and average high are around 28 -30° Celsius.

1.6.3 Topography and Drainage

The Barotse Floodplain is very flat with an average slope of only 0.015 percent. The plateau which is generally covered by the Kalahari sands. The elevation over the floodplain ranges from 1187 m above sea level in the north-eastern part, at Lukulu, to about 993 m above sea level in the southern part, at Senanga. In Figure 1, the altitude of the catchment has been shown and the Zambezi River with its main tributaries as well as the main towns found within the floodplains. The drainage pattern is trellis with all major rivers/streams, which include the Luanginga, Lungwe bungo and Kabompo, being the main tributaries of the Zambezi River. Due to the slight slope, the Zambezi flows in the plain with numerous meanders. As it has changed its bed in recent history, there are many oxbow lakes and even secondary riverbeds like the “Little Zambezi”, (locally known as Malile) which is a branch of the main river connected both upstream and downstream Deneut, et al., (2014). According to Deneut, et al., 2014 there is an inflow of 845.5 m³/s from the Zambezi at Lukulu and midstream the Luanginga contributes 62.72 m³/s. Downstream at Senanga gauging station the Zambezi River releases 1029.4 m³/s. The Barotse Floodplain floods in the rain season from December to April and the peak of the flood is in March to Mid-April. The IUCN, (2003) report indicates that the Zambezi River and its tributaries account for the flooding in the Barotse Wetland.

1.6.4 Geology and Hydrogeology

The Barotse Floodplain is relatively flat and characterised by a uniform geological condition at the surface. The sediments of the Kalahari Sequence and more recent deposits overlay the entire area and are believed to have been deposited in the Cretaceous and early Tertiary of an Aeolian origin. Outcrops of underlying rocks are scarce. Kalahari Group sedimentary rocks were deposited in a large basin stretching some 2200 km from South Africa in the south northwards through Botswana and Angola into the Democratic Republic of the Congo. The

sediments were predominantly deposited by rivers in the Late Cretaceous and early Tertiary with later Aeolian reworking of the uppermost unconsolidated sands occurring during the Pliocene and Quaternary (Haddon and McCarthy, 2005). These unconsolidated sands are believed to form the largest continuous sand body on earth (Baillieul, 1975). The thickness of the Kalahari Group sediments varies from a few cm to around 450 m, with the thickest deposits along the border between Namibia and Angola, in central Angola, in south-eastern Namibia, along the border between South Africa and Botswana and to the northeast of Okavango Delta in northern Botswana (Figure. 2). In Zambia very little geological investigations on the Kalahari in the Western Province have been done. According to Haddon & McCarthy, (2005) the thickness of the Kalahari sand is in excess to 240m in the southern part of Western Province around Sesheke District.

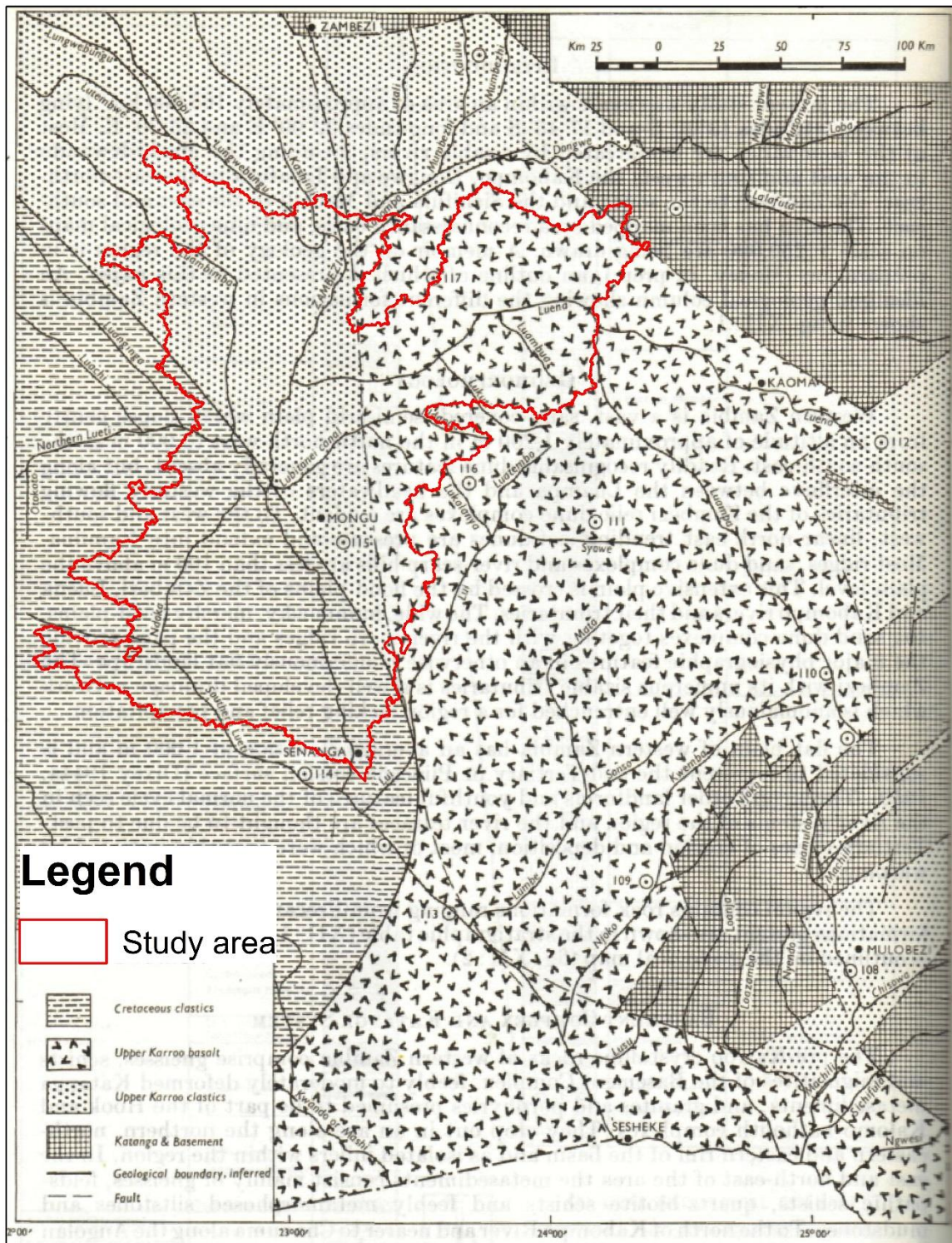


Figure 2: Geological Map of Western Province modified after Money, (1972)

The stratigraphy of the Barotse Floodplain as interpreted by Money, (1972) as the youngest of cretaceous age being the Zambezi formation, which is composed of Limestone, Clays on the

floors and duricrust pan sediments. Within the Zambezi Formation underlying the pan sediments is the Mongu sand member that has typically unconsolidated sands. The Zambezi Formation is underlain by the Barotse Formation that is divided into three Members: the Upper, Middle and Lower Barotse Members. The upper member is composed of massive sandstones and Conglomerates while the middle member consists of interbedded and ferruginous sandstones. Underlying the middle member is the lower Barotse formation that is predominantly conglomerates. Below the Barotse Formation is the Lueti Formation and underlying the Lueti Formation is the Karoo Supergroup with the Batoka Basalts at the top of the supergroup.

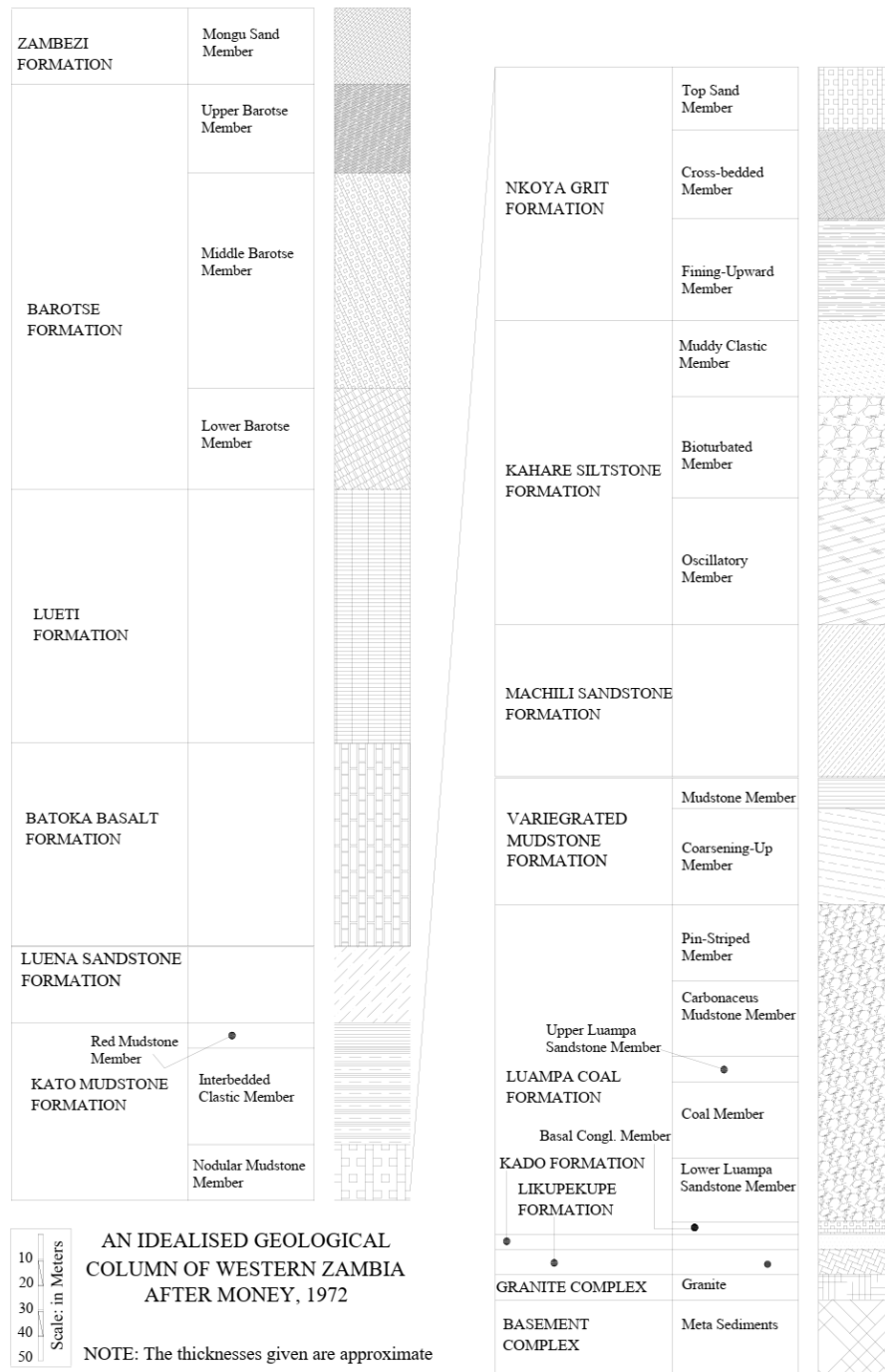


Figure 3: Idealised stratigraphy in Western Province of Zambia (After Money, 1972)

The geology of Western Province lends itself to aquifers where the intergranular flow is dominant being described as either Alluvial formations, Kalahari Supergroup or Karoo Supergroup aquifers. The Barotse is characterized mostly by Kalahari sands that are not uniform deposit but contain silt and clay layers so that although rainfall is immediately absorbed, percolation underground is delayed, and perched water table are common. The hydro-stratigraphy of Western province is (i) the Kalahari sands; and (ii) Alluvial

(JICA/NEWS-D, 1995). The main aquifer units, in order of increasing importance as groundwater resources, are (i) the weathered and/or fractured basement rocks, (ii) weathered basalts, (iii) Karoo sedimentary rocks and (iv) the unconsolidated alluvial deposits. According to Kabika, (2012) the Kalahari sand Aquifer have a hydraulic conductivity ranging from 0.01 to 1.32 m/day, a specific yield ranging from 0.038 to 0.284 and a transmissivity ranging from 0.442 m²/day to 63.34 m²/day. The hydraulic gradient appears to be about (0.001) and the average depth to the groundwater table ranged from 1 m to 29.24 m. The aquifers in the Kalahari have been described as medium to high productivity ranging from 3 -10 litres per second (JICA/NEWS-D, 1995).

1.6.5 Soils

Soils of the Barotse flood plain consist of the Bulozzi terrace (in green), outside of the flood plain soil are part of the Mongu-Kalabu terrace (in yellow) as shown in Figure 4. The Bulozzi terrace is made of the Zambezi Alluvium (seasonally flooded sands and clays called Gleysol with some mineral hydromorphic soils). Around Lubitamei source, soils are Podzols (Barotse sands). Around Musiamo, peat bogs soils (organic hydromorphic soils) are overlying deposits of sand and silt, this is the seepage zone (GRZ, 2014)

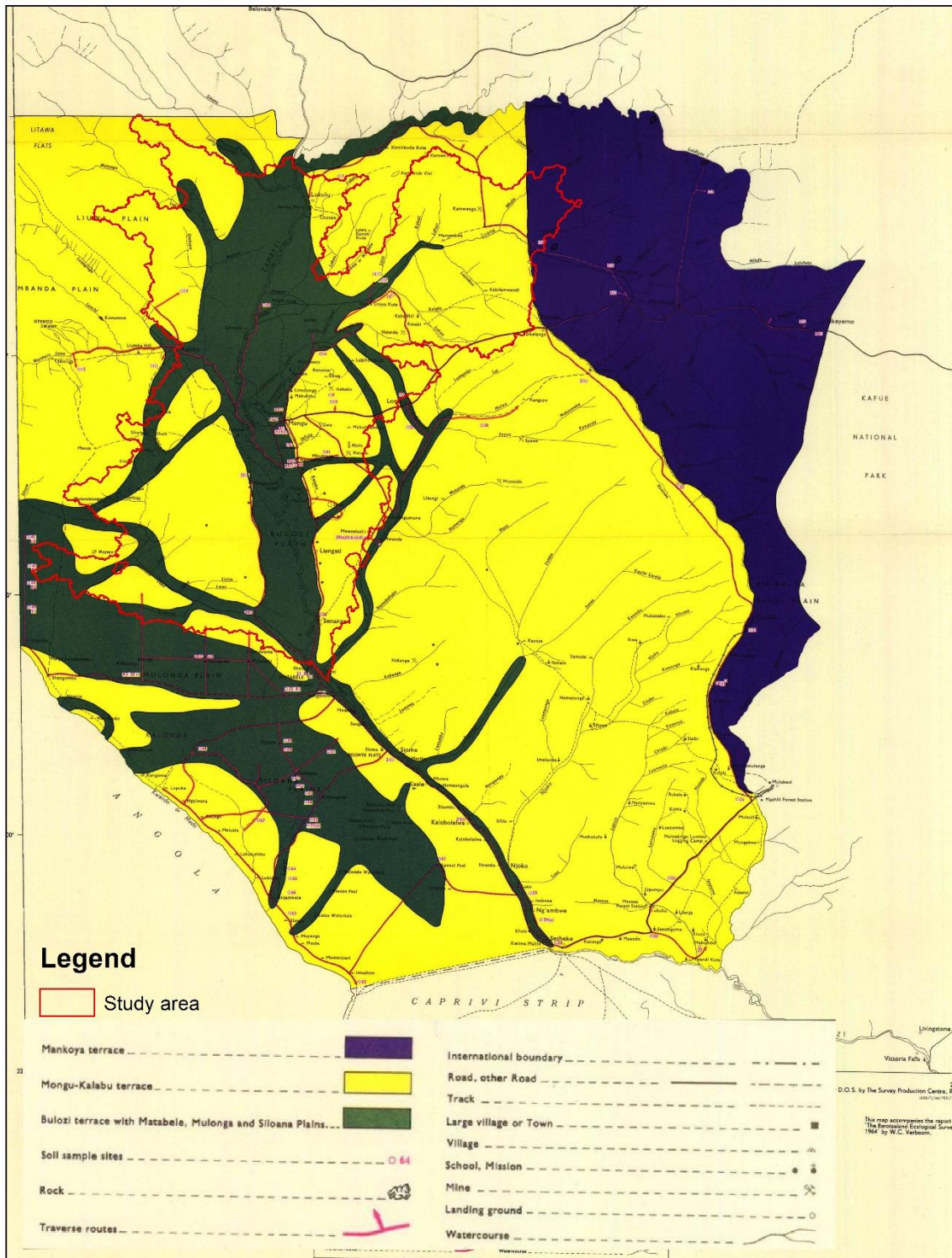


Figure 4: The Soils in Western Province of Zambia modified after GRZ, (2014).

1.6.6 Vegetation and Land use

The vegetation in the Barotse sub-basin is predominantly grassland ranging from open to closed grassland. Other natural vegetation types include moderately dense forests, low dense forests,

open dense forests, closed and open shrubland. As shown in Figure 5 which depicts land cover land use types.

The interaction between the people inhabiting the Barotse Plain and their environment has given rise to a variety of land use systems that have enabled social and economic survival. Through an elaborate process of land reclamation involving piling of soil brought in from the upland, people formed mounds for purposes of habitation, agriculture, and burial. In due course some of the mounds were abandoned and are now used as burial places while others continue to be habited and maintained with soil being heaped onto existing ground to raise the ground level (GRZ, 2014) as shown in Figure 5.

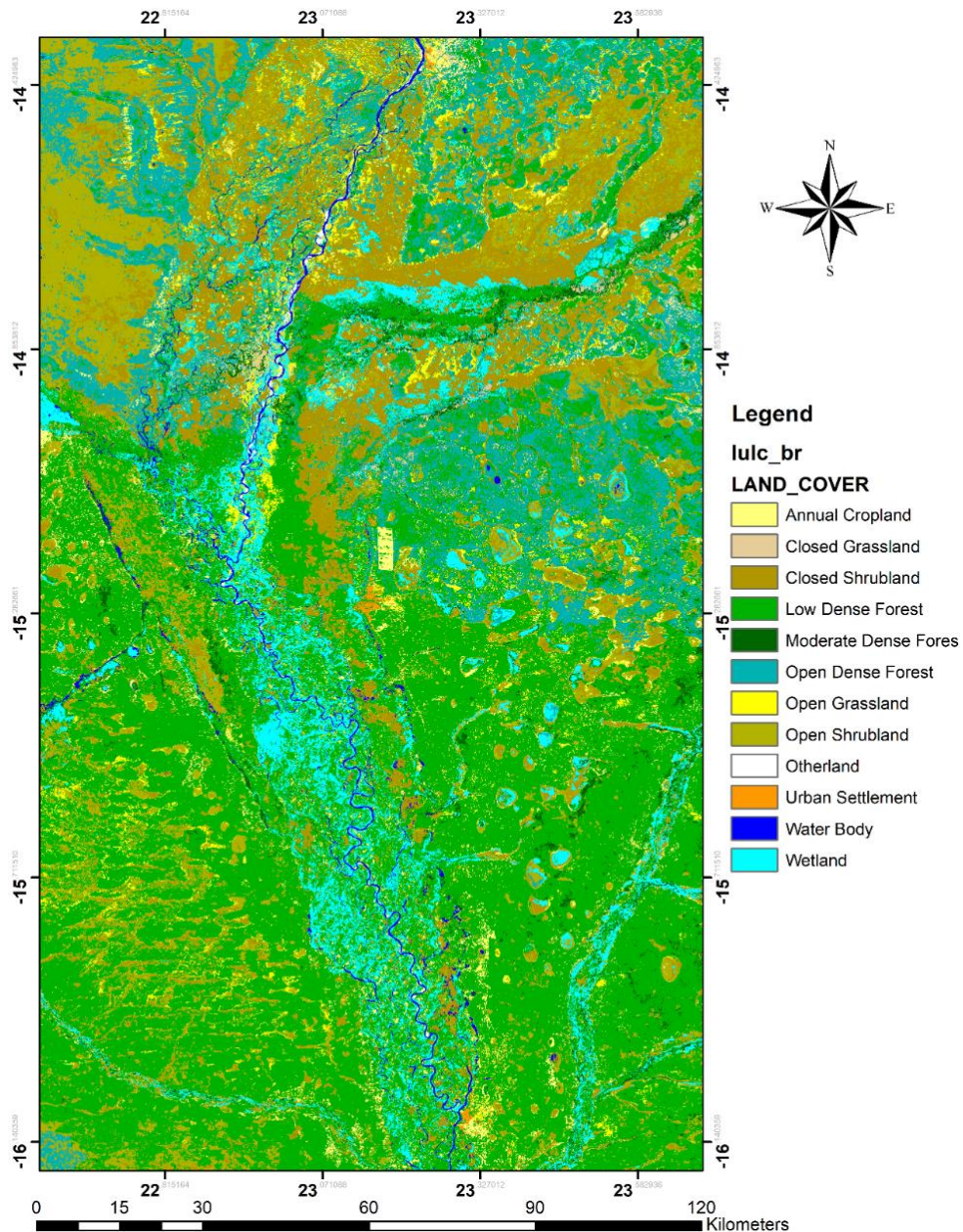


Figure 5: Land cover of the Barotse Sub Catchment in Western Zambia (Modified from Zimba et al, 2018)

1.6.7 Population and Social economic attributes

In total, the four Districts of the Barotse Floodplain are estimated to contain just under 225,000 people or 27,500 households. Population density, which is generally low in Western Province with fewer than 5 people per km², increases steeply around the floodplain (GRZ, 2014). The size of the Barotse Floodplain enables it to support several wildlife. The floodplain is covered wetland and grassland. In terms of ground coverage, tall grass and sedge covers the vast majority of the floodplains. About 403 plants have been registered in the Barotse Floodplains. The Barotse floodplain has the richest aquatic herpetofauna in the Zambezi basin with a total

of 89 species among which include lizards, snakes, crocodiles and frogs. The lack of mechanised agriculture, the lack of pesticide usage and the relative intactness of wetlands allow a great biodiversity of amphibians and reptiles to thrive. Insects of the Barotse floodplain have been poorly studied and limited information was found regarding their biodiversity, odanates such as damselflies and dragonflies are common in the Barotse Floodplains.

1.7 Outline of thesis

Chapter 1 provides a background of the current research and outlines the problem statement, objectives, research question, significance of study and a description of the study area. Chapter 2 gives a review of the types of river groundwater interactions, the assessment methods used for river groundwater interactions, the different hydrological methods that have since been applied on the Barotse Floodplain and a review of the remote sensing methods that can be applied to map water and vegetation. Chapter 2 is concluded with a summary of the literature reviewed. Chapter 3 provides the methodology used in the assessment of river groundwater interaction. Chapter 4 presents the results and discussion on the significance of the type of river groundwater interactions observed, Chapter 5 gives the conclusions on the significance of the river groundwater interaction and proposes a management approach under changing hydrological conditions. Chapter 6 gives some of the recommendations from a general perspective of the hydrogeology Barotse Floodplain and some of the gaps that can be filled by future hydrogeological studies on the Barotse Floodplain.

CHAPTER 2: LITERATURE REVIEW

River-groundwater interactions are receiving increasing focus in Africa because rivers and groundwater play a fundamental role in the functioning of riparian ecosystem and sustainability. In the past decade several studies globally and in southern Africa have studied this resource as one entity. This chapter highlights the reviewed literature on the types of interactions, the methods used for assessment, Earth observation methods for mapping vegetation and water bodies, the current scope of knowledge of the Barotse Floodplain. Through this review, the gaps in the state of knowledge were noted and this study was formulated to narrow the gap in river-groundwater interactions.

2.1 River groundwater interactions

Many scholars have different definitions of river groundwater interactions, Letsinger & Haitt, (2021), defined river groundwater interactions as a common process that occurs in the saturated portions of river corridors and floodplains. The area of saturation varies over time, which can be generated from variable source areas, becoming larger in times of runoff and streamflow generation owing to increased interflow (shallow subsurface flow along a hillslope), infiltration, increased soil moisture and saturation, and contributions from groundwater from elevated water tables as water infiltrates into the subsurface and migrates towards the basin outlet. This variable source area concept is related to the water fluxes in the stream corridor, called hyporheic exchange. Interactions between rivers and groundwater basically proceed in two ways, groundwater flows through the streambed into the stream (gaining stream), and stream water infiltrates through the sediments into the groundwater (losing stream) (Kalbus, et al., 2006). Often, a stream is gaining in some reaches and losing in other reaches depends on the hydraulic head. For groundwater to discharge into the river channel the hydraulic head in the vicinity of the river must be higher than the surface water. Conversely for river water to seep to groundwater, the hydraulic head of groundwater in the vicinity of the river must be lower than the hydraulic head of the river water. Seasonal variations in precipitation patterns as well as single precipitation events can alter groundwater tables and stream stages and thereby cause changes in the direction of exchange flows. On a smaller scale, water flow into and out of the streambed may be induced by pressure variations on the streambed caused by geomorphological features such as pool-riffle sequences, discontinuities in slope, or obstacles on the streambed (Hutchinson & Webster, 1998). Groundwater seepage into rivers can provide important nutrients and temperature regulation for aquatic organisms (Hayashi & Rosenberry,

2002). Unfortunately, locations where groundwater and river water interact can also serve as contaminant transport pathways (Chadwick, et al., 2002). Key questions in river-groundwater investigations are the location and flux of river-groundwater discharge water bodies and, conversely, surface water recharge to groundwater. These questions can be considered at various spatial and temporal scales (Taramelli, et al., 2020).

2.2 Assessment methods for river groundwater interaction

With an increasing awareness of the connected nature of surface water and groundwater, there have been many studies examining groundwater–surface water exchange in various types of water bodies. Some of the methods used to detect groundwater surface water interactions will be discussed.

2.2.1 Water balance

Water balance has been one the methods used to detect river groundwater interactions. The underlying assumption of mass balance approaches to study groundwater – surface water interactions is that any gain or loss of surface water or any change in the properties of surface water can be related to the water source, and therefore, the groundwater component can be identified and quantified (Kalbus, et al., 2006). Mass balance approaches have used water budgets to separate groundwater and surface water components both at a river-reach or catchment-wide scales (Coluccio & Morgan, 2019). If there is an increase or decrease in discharge, this can be considered as a gaining or losing reach, respectively, provided any surface inflows or outflows (e.g., tributary inflows, abstractions) are accurately quantified (Coluccio & Morgan, 2019). Measurements are generally taken in low flow conditions to avoid errors caused by river flow recession after rainfall or snowmelt (Brodie, et al, 2009). Other studies that have applied a river-reach water budgets that involves estimating the net flux of seepage in a defined river reach by measuring stream discharge in cross sections and then calculating the difference in flow between the cross sections (Kalbus, et al., 2006). Measurements should generally be taken in low flow conditions to avoid errors caused by river flow recession after rainfall or snowmelt (Brodie, et al., 2007).

Several studies have applied the river-reach water budget approach to identify gaining and losing reaches of rivers. New Zealand is one the countries, an example of the Selwyn River, which has losing and gaining reaches, and annually dries in parts, has been the focus of several studies (Larned , et al., 2008, Vincent , 2005). Both Larned, et al., (2008) and Vincent, (2005)

used flow gauging data to classify gaining and losing reaches of the river. River-reach water budgets are useful for identifying hotspots of river gains and losses at a broad scale. However, there are several issues regarding their effectiveness in rivers. This method provides estimates of the groundwater contribution to streamflow averaged over the reach length, making it insensitive to small-scale heterogeneities, which flow gauging is poor at identifying (Eamus, et al., 2006)

2.2.2 Heat tracer method

The difference in temperature between groundwater and surface water can be used to delineate groundwater discharge or recharge zones and quantify water fluxes at the groundwater – surface water interface (Kalbus, et al., 2006) Groundwater temperatures tend to be cooler in the dry season (summer) while surface water is warmer in the dry seasons of the year and vice versa in the cold season. Kalbus, et al., (2006) also states that groundwater temperature is relatively stable throughout the year. In contrast, stream temperatures vary strongly on a daily and seasonal basis. Therefore, gaining reaches are characterized by relatively stable sediment temperatures and damped diurnal variations in surface water temperatures, whereas losing reaches are characterized by highly variable sediment and surface water temperatures (Winter, et al., 1998). This permits an identification of the general character of the flow regime by recording temperature time series in the stream and the surrounding sediments (Constantz, 1998, Constantz & Stonestrom, 1998).

Globally several studies have incorporated heat tracer method in groundwater surface water interaction e.g., Ravazzani, et al., (2016), Rau, et al., (2010), Engelhardt, et al., (2011). Ravazzani, et al., (2016) used heat tracer method to assessment river groundwater interactions, heat tracer methods were used to assess the hyporheic flow during the low flow periods in the Toce River Basin of a large Alpine River in Italy. Another study done in New South Wales, Australia by Rau, et al., (2010) used two methods applying natural heat as a tracer to quantify surface water–groundwater exchange. They monitored and recorded the streambed response to diurnal temperature variations in the surface water which were deployed in arrays over a period of two months. Constantz, (2008) reviewed the use of heat as a tracer of shallow groundwater movement and described the current temperature-based approaches to estimate the streambed water exchanges. Temperature is a robust and relatively inexpensive parameter to measure. Measurements are quick and easy to perform, making temperature-based methods very attractive for detailed delineations of groundwater discharge or recharge zones with high

resolutions (Kalbus, et al., 2006). The disadvantage is that it can be time consuming over large catchment and is easily affected by day and seasonal variations.

2.2.3 Baseflow Separation

An estimation of the groundwater contribution to streamflow can be realized by separating a stream hydrograph into the different runoff components, such as base flow and quick flow e.g., Hornberger, et al., (1998), Davie, (2002). Hydrograph separation is based on the following assumption: (a) the streamflow can be divided into two components, baseflow and quick flow, whose response to hydroclimatic events is different. Baseflow is the slow component of streamflow, while quick flow is the remaining part, i.e., the quick part of streamflow Pelletier & Andréassian, (2020). This separation in two components is obviously artificial: there is generally a wider range of hydrological processes at stake that respond diversely to hydroclimatic events. The validity of the underlying assumptions of the separation techniques is critical for the performance of hydrograph separation as a tool to determine groundwater-surface water interactions (Halford & Mayer , 2000). Assuming baseflow represents groundwater discharge into the stream (Hannula, et al., 2003). Furthermore, in cases where drainage from bank storage, lakes or wetlands, soils, or snowpacks contributes to stream discharge, the assumption that baseflow discharge represents groundwater discharge may not hold (Halford and Mayer, 2000).

2.2.3.1 Graphical method

The graphic methods estimate baseflow by connecting specific low-flow points of a streamflow hydrograph (Sloto & Crouse, 1996) . This method generally consists of two steps (1) find specific low-flow points from a streamflow hydrograph; (2) connect these points into a baseflow line and limit the baseflow line under the streamflow hydrograph as the baseflow hydrograph (Xie, et al., 2020).

2.2.3.2 Digital filtering method

The digital filter methods estimate baseflow by signal analysis with the assumption that baseflow is the low-frequency part of streamflow Chapman, (1991); Eckhardt, (2005). Several methods have applied digital filtering to estimate base flow separation Eckhardt, (2005), Shao, et al., (2020) , Faraj & Scholz, (2014). Shao, et al., (2020) applied several automatic base flow separation methods including recursive digital filtering were adopted to separate the base flow from the stream flow and evaluated the adaptabilities of these methods. Faraj & Scholz, (2014)

used a generic methodology, which incorporates the flow duration curve method within digital filtering algorithms to extract the base flow time series and compute its signature to total river flow. Echardt, (2005) developed a filter algorithm that were constructed under the assumption that the outflow from an aquifer is linearly proportional to its storage. He also states that recursive digital filtering of hydrographs is a baseflow separation method that can easily be automated and has been recommended for providing reproducible results. The major limitation is that the results are usually averaged out. It is only effective for estimating how much groundwater is feeding into the river system.

2.2.4 Hydrochemistry

There are various natural physical and chemical properties of river and surface water that can serve as indications of interaction between the two systems (Coluccio & Morgan, 2019). Different types of tracers have been used to investigate river-groundwater interactions including geochemical tracers such as conductivity, chloride; stable isotopes; and radioactive isotopes such as radon.

2.2.4.1 Geochemical

Geochemical tracers, such as major chemical parameters (e.g., sodium, nitrate and silica) and trace elements (e.g., strontium), are often used to determine the fractions of water flowing along different subsurface flow paths (Cook & Herczeg, 2000). Some studies have combined two methods to investigate groundwater surface water interactions (Petelet-Giraud, et al., (2007). Kanduc, et al., (2014), Yang, et al., (2012) all used geochemical tracers and stable isotopes in groundwater surface water connectivity studies. Yang, et al., (2012) used major dissolved inorganic ions and stable isotopes in the Jialu River basin to characterise interactions between surface water and groundwater. Kanduc, et al., (2014) applied geochemical and stable isotope investigation of groundwater/surface-water interactions in the Velenje Basin, Slovenia. Petelet-Giraud, et al., (2007) aimed to characterise the relationship between surface water (channels, rivers) and the groundwater in the shallow Quaternary aquifer. He used stable isotopes ($\delta^{18}\text{O}$, $\delta^2\text{H}$) to show that two of the rivers are recharged mainly by groundwater. Petelet-Giraud, et al., (2007) concluded that Strontium isotopes ($^{87}\text{Sr}/^{86}\text{Sr}$) designate different geochemical end-members and enable the identification of mixing between natural and anthropogenic surface and groundwater. Another study that employed geochemical tracers is Wood & Sanford, (1994) they used chemical and isotopic methods to quantify groundwater recharge in a regional, semi-arid environment of Texas and New Mexico. Using a combination

of tritium and chloride to provide insight into overland runoff to the basin. They conclude that geochemical methods in arid and semi-arid environments are economical and provide insight into the nature of recharge that are difficult and expensive to obtain with physically based methods.

This type of analysis assumes there is an evenly distributed groundwater concentration between sampling locations and that there is complete mixing of water sources (Lovett, et al., 2015) To separate surface water or groundwater components, mixing models based on conservation of mass are used (Kallus et al., 2006), such as end-member mixing analysis (EMMA) or hydrograph separation.

2.2.4.2 Radon

Radon-222 (Rn-222) is another useful tracer for identifying groundwater–surface water interactions. It is a chemically and biologically inert radioactive gas part of the uranium-238 decay process and is present in nearly all rocks and soils (Rosenberry & LaBaugh, 2008). As water flows through rocks and soils it becomes enriched in Rn-222. In surface waters, radon quickly degasses, so groundwater generally has Rn-222 concentrations 3 to 4 orders of magnitude higher than surface waters, thus making it an effective tracer in many environments (Burnett et al., 2001). For example, an area of high radon concentrations in surface water would suggest groundwater inflow. It is a cost-effective, simple technique that is suitable for study areas ranging in size. Martindale , (2015), Mayer , et al., (2016) in the south-eastern part of France, Radon-222 was used to study coastal groundwater surface water interaction in the Crau Coastal Aquifer. According to Mayer, et al., (2016) results obtained were more accurate than the conventional method used, in which only water balance was calculated.

Some limitations of Rn-222 analysis, as it requires several assumptions, including that stream water is well mixed downstream of groundwater discharge areas, water fluxes are constant, the radon activity in the stream water and groundwater are known and constant, and there is no additional surface recharge from sources such as streams or stock water races (Kraemer & Genereux , 1998) It also may be difficult to distinguish between regional groundwater discharge and hyporheic zone exchange using radon analysis Lovett, (2015); Martindale, (2015). Rn-222 concentrations will also vary with different mineral compositions in the rocks present (Choubey & Ramola, 1997). Other shortcomings detecting radon comes from the expense of using sensors to constantly measure radon, efficiency and a delay of ~ 15 min to reach radioactive equilibrium between ^{222}Rn and $^{218}\text{Po}^+$ (Seo & Kim, 2021).

2.2.4.3 Environmental Isotopes

Hydrochemical tracers, such as stable oxygen and hydrogen isotopes, are used to distinguish rainfall event flow from pre-event flow, because rainwater often has a different isotope composition than water already in the catchment (Kendall & Caldwell, 1998) Oxygen, which is a key component of water, naturally occurs in three stable isotopic forms: mainly as oxygen-16, and in smaller proportions as oxygen-17 and oxygen-18 (Sharp, 2007). Due to the difference in mass between these isotopes, they undergo fractionation during evaporation and condensation (Taylor, et al., 1989) the ratio of $\delta^{16}\text{O}$ to $\delta^{18}\text{O}$ is used to identify the relative concentrations of the two most abundant stable oxygen isotopes.

Several studies have used stable water isotopes to assess groundwater surface water interactions Wood & Sanford, (1994), Londoño, et al., (2008), Zhao, et al., (2018), Lapworth, et al., (2020). Zhao, et al., (2018) used a multi environmental tracers (hydro-chemical parameters, stable hydrogen and oxygen isotopes and radioactive ^{222}Rn) were employed to investigate the interaction between groundwater and surface water along two rivers (Tiangeli River and Nomhon River) in the Nomhon area, southeast of the arid Qaidam Basin, northwest China. The study demonstrated the combined use of multi tracers and the results of the study could be useful to the integrated utilization and management of groundwater and surface water resources in this area and other similar areas. Lapworth, et al., (2020) used a combination of environmental tracers and hydrograph observations to characterise sources of recharge and groundwater-surface water interaction. In the Gandak Catchment, India. The authors were able to quantify groundwater recharge sources and processes in the mid-Gangetic basin and concluded that the understanding ground-surface water interactions is fundamental to effective management of water resources for people and nature, and for forecasting future changes. Londoño, et al., (2008) used hydro-geochemistry and stable water isotope analyses to determine groundwater recharge and flow in low-gradient catchments of the province of Buenos Aires, Argentina. The study also used environmental isotopes to differentiate zones of local flow systems like local discharge or recharge areas. Preferential recharge areas, flow path, and changes in the relationship between groundwater and surface water can be identified more accurately from these techniques.

In Southern Africa stable isotopes have been incorporated in water studies for example: (Banda, 2019) to describe the influence of aquifer river interaction in non-perennial river systems of the Heuningnes catchment, South Africa. The study demonstrates the efficacy of using an integrated approach of combining different data sets for assessing the role of groundwater in non-perennial rivers. Mahlangu, et al., (2020) used tritium and stable water isotopes in Middleburg, South Africa as tools to define the interconnection between different water resource components. The isotope results revealed the influence of rainfall and shallow groundwater contributions to streamflow, while groundwater provides baseflow as the stream level recedes. Abiye, (2013) conducted a study on surface water and groundwater interaction in the upper crocodile river basin, this study conceptualized surface water and groundwater interaction process and to explore the classification of groundwater in relation to the geological setting. The environmental isotope data revealed that the dolomitic springs contained old groundwater with depleted stable isotopes indicating high altitude recharge with deep circulation. In Zambia (Tembo & Nkhuwa, 1997) applied stable water isotopes in the study of groundwater from dolomitic aquifers of Lusaka and Kabwe. The results showed that similarities in $\delta^{18}\text{O}$ and δD , as well as radioactive isotopic compositions of the groundwater to that in recent precipitation are indicative of recharge to aquifers by direct percolation of rainfall. And further, seasonal fluctuation in the composition of stable isotopic data in groundwater indicates a rapid response of the aquifers to recharge.

Environmental Stable isotopes $\delta^{18}\text{O}$ analysis to be highly effective for understanding groundwater–surface water interactions in the catchment. Given $\delta^{18}\text{O}$ varies seasonally, they recommended sampling be carried out at various times during the year to obtain better temporal resolution, as well as on a long-term basis to consider climatic variations. (Hanson & Abraham, 2009) Found $\delta^{18}\text{O}$ to be the most reliable tracer to differentiate between land surface recharge and alpine river water. However, they pointed out that a suite of tracers would be needed to characterise.

2.3 Satellite imagery

Open sources satellite images are provided by various vendors with a minimal requirement of the user registration on the portal before downloading the images. Sentinel Open Access Hub provides sentinel-2 images, USGS Earth Explorer provides Landsat images, NASA's Earth data Search provides MODIS images, NOAA Data Access Viewer for NOAA images, Geo-Airbus Defence provides SPOT images and other vendors provide open access images for more

(<https://gisgeography.com/free-satellite-imagery-data-list/>). From the reviewed literature three satellite imageries have been in Southern Africa and around the Barotse Floodplain.

Over the years remote sensing has been adopted for various assessments in the Barotse Floodplain. (Zimba, et al., 2018) Used a remote sensing to an assess of the spatial and temporal trends in inundation extent, by applying MODIS satellite data to quantify the inundated area in each flood cycle from 2001 to 2013. (Phiri, et al., 2012) used modelled data operating on MODIS to estimate evapotranspiration. Surface Energy Balance System (SEBS) model was applied to estimate the spatial and temporal variability of actual ET (AET). The model was run using atmospherically rectified Moderate-resolution Imaging Spectroradiometer (MODIS) satellite imagery on clear-sky warm-wet, cool-dry and hot-dry days.

(Del Rio, et al., 2018) applied Landsat 8 Enhanced Thematic Mapper (ETM) images from 24th March and 14th July 2014, to calculate water levels using the Water Index (WI), Vegetation type using the Normalised Difference Vegetation Index (NDVI) and also the Normalised Burn Ratio (NBR) index to identify recently burnt areas. (Cai, et al., 2017) also used Landsat satellite imagery to assess the recent patterns of floods. He concludes that the floodplain hydrology and flooding patterns have changed, confirmed by both surveys and satellite image analysis, due to catchment development and changing climate. Hardy, et al., (2019) Applied Sentinel-1 imagery to map both open and vegetated water bodies. This was done to providing timely and accurate maps of surface water is valuable for mapping malaria risk and targeting disease control interventions.

2.3.1 Sentinel-2

Launched as part of the European Commission's Copernicus program on June 23, 2015, was designed specifically to deliver a wealth of data and imagery. The satellite is equipped with an opto-electronic multispectral sensor for surveying with a sentinel-2 resolution of 10 to 60 m in the visible, near infrared (VNIR), and short-wave infrared (SWIR) spectral zones, including 13 spectral channels, which ensures the capture of differences in vegetation state, including temporal changes, and minimizes impact on the quality of atmospheric photography. The orbit is an average height of 785 km and the presence of two satellites in the mission allow repeated surveys every 5 days at the equator and every 2-3 days at middle latitudes (<https://eos.com/find-satellite/sentinel-2/>)

2.3.2 Landsat 8

Landsat (formally the Landsat Data Continuity Mission, LDCM) was launched on an Atlas-V rocket from Vandenberg Air Force Base, California on February 11, 2013. Landsat 8 orbits the Earth in a sun-synchronous, near-polar orbit, at an altitude of 705 km (438 mi), inclined at 98.2 degrees, and completes one Earth orbit every 99 minutes. The satellite has a 16-day repeat cycle with an equatorial crossing time: 10:00 a.m. +/- 15 minutes. Landsat 8 has 9 spectral bands including a pan band with a resolution of 30 m in the visible, NIR, SWIR and a 15 m resolution in the Panchromatic band (<https://www.usgs.gov/core-science-systems/nli/landsat/landsat-8>).

2.3.3 MODIS

MODIS (or Moderate Resolution Imaging Spectroradiometer) is a key instrument aboard the Terra (originally known as EOS AM-1) and Aqua (originally known as EOS PM-1) satellites. Terra's orbit around the Earth is timed so that it passes from north to south across the equator in the morning, while Aqua passes south to north over the equator in the afternoon. Terra MODIS and Aqua MODIS are viewing the entire Earth's surface every 1 to 2 days, acquiring data in 36 spectral bands, or groups of wavelengths. It has a spatial resolution of 250m (bands 1-2) 500m (bands 3-7) and 1000m (bands 8-36). This data will improve our understanding of global dynamics and processes occurring on the land, in the oceans, and in the lower atmosphere (<https://modis.gsfc.nasa.gov/>).

Vegetation Indices (VIs) obtained from remote sensing-based canopies are quite simple and effective algorithms for quantitative and qualitative evaluations of vegetation cover, vigour, and growth dynamics, among other applications (Xue & Su, 2017). One of the major applications of remote sensing in environmental resources management and decision making is the detection and quantitative assessment of green vegetation. In this sense, vegetation analyses and detection of changes in vegetation patterns and structure are keys to natural resources assessment and monitoring (Silleos, et al., 2006). This study incorporated Sentinel-2 imagery because of its high spatial resolution of 10 m for the RGB for green vegetation identification and MODIS imagery was used for the time series data because of its high temporal resolution of 2 days to easily observe daily and seasonal changes.

2.4 Spectral indices

2.4.1 NDVI

Normalised difference vegetative index was introduced by (Rouse, et al., 1974) in order to produce a spectral vegetation index that separates green vegetation from its background soil brightness using Landsat MSS digital data. NDVI measures chlorophyll content within vegetation using the normalised difference of the red (absorbed by green vegetation) and near infrared (reflected by green vegetation). It is expressed by the difference between the red band and near infrared band and normalised by the sum of the red band and near infrared band (equation 1).

$$NDVI = \frac{NIR-Red}{NIR+Red} \dots\dots\dots \text{Equation 1}$$

NDVI has a measuring scale from -1 to 1, with 1 for healthy vegetation with high chlorophyll content, 0 approximates no vegetation and negative values for non-vegetated surfaces.

NDVI correlates directly with vegetation productivity, there are numerous possible applications of this index for ecological purposes. The NDVI provides information about the spatial and temporal distribution of vegetation communities, vegetation biomass, CO₂ fluxes, vegetation quality for herbivores (because the rate of greening can be correlated with food quality) and the extent of land degradation in various ecosystems (Pettorelli, et al., 2005).

NDVI also needs no calibration as the spectral bands from satellites are already calibrated.

The disadvantage is that NDVI tends to give a higher vegetation index value for dark soil substrates. NDVI also tends to show saturation in woodlands and high-density vegetation.

2.4.2 SAVI

The soil adjusted vegetation index was introduced by (Huete, 1988) . It is intended to minimize the effects of soil background on the vegetation signal by incorporating a constant soil adjustment factor L into the denominator of the NDVI equation. L varies with the reflectance characteristics of the soil (e.g., colour and brightness). The author provides a graph from which the values of L can be extracted. The L factor chosen depends on the density of the vegetation one wishes to analyse. In cases of very low vegetation, the use of an L factor of 1.0 is suggested, for intermediate 0.5, and for high densities 0.25. Eastman (2003) suggests that the best L value to select is where the difference between SAVI values for dark and light soil is minimal. For L = 0, SAVI equals NDVI. For L = 1, SAVI approximates PVI. (Equation 2).

$$SAVI = \frac{NIR-Red}{NIR+Red+L} (1+L) \dots\dots\dots \text{Equation 2}$$

Soil Adjusted Vegetation Index (SAVI) also has a measuring scale from -1 to +1. Positive values indicating green vegetation and the increase indicates vegetation health. 0 approximates no vegetation and the negative values for non-vegetated surfaces.

The advantages of using SAVI, is that the higher the SAVI values (the same stands for NDVI) the denser (and healthier) the vegetation. But NDVI start saturating after the value of 0.7, while SAVI at this point is only 0.3. This means that SAVI can be better used in dense vegetation because it saturates less fast. SAVI is recommended in sparsely vegetated areas and areas with different soil types.

The disadvantage is that SAVI requires local calibration because it is difficult to predict how soil effects are manifested within large pixel areas, which aggregate soils and vegetation of many different types, each of which requires, in principle, separate calibration (Pettorelli, et al., 2005). According to Huete, (1988) the use of the SAVI, instead of the NDVI, may result in a lowered vegetation index signal, particularly in studies involving a single soil type.

2.4.3 MNDWI

MNDWI was introduced by Xu (2006) as a modification to the normalised difference water index by McFeeters (1996) by substituting Middle Infrared Band (Band 5 in Landsat TM) for Near Infrared band used in the Normalised Difference Water Index (NDWI). The modified NDWI (MNDWI) can enhance open water features while efficiently suppressing and even removing built-up land noise as well as vegetation and soil noise. The enhanced water information using the NDWI is often mixed with built-up land noise and the area of extracted water is thus overestimated. Accordingly, the MNDWI is more suitable for enhancing and extracting water information for a water region with a background dominated by built-up land areas because of its advantage in reducing and even removing built-up land noise over the NDWI. (Xu, 2006) (Equation 3).

$$MNDWI = \frac{Green-MIR}{Green+MIR} \dots\dots\dots \text{Equation 3}$$

The measuring scale for MNDWI ranges from -1 to +1. The expected results are (1) water will have greater positive values than in the NDWI as it absorbs more MIR light than NIR light; (2) built-up land will have negative values as mentioned above; and (3) soil and vegetation will still have negative values as soil reflects MIR light more than NIR light (Jensen, 2004).

2.5 Hydrological studies on the Barotse Floodplain

Several studies have been undertaken to understand the hydrology of the Barotse floodplain. Some notable studies (Kabika, 2012; Zimba, et al., 2018 and Phiri, et al., 2012) that have assessed the Groundwater, inundation, and evapotranspiration on the floodplains. Kabika, (2012) did an estimation of recharge and safe yield of the Kalahari sand aquifer in the Sesheke area and found that recharge is controlled by rainfall regime and evaporative fluxes, while geology and vegetation characteristics of the area influence the mechanism and magnitude of actual recharge. Phiri, et al., (2012) used SEBS algorithm to characterize both spatial and temporal the actual evapotranspiration on the Barotse sub- basin, the flux analysis showed that water bodies and regularly flooded vegetation had the highest rates of ~6.9 and 5.9 mm day⁻¹ on warm-wet days respectively. The lowest rates occurred over mosaic vegetation/croplands and closed to open grassland with a high variation of up to 64.1 and 71.1% respectively between warm-wet and hot-dry days. And Zimba, et al., (2018) used earth observation-based assessment of spatial and temporal trends in inundation extent in the barotse wetland, western Zambia he concluded that the downward trend in discharge and reduction in forest cover could negatively affect inundation extent patterns and the Barotse wetland's ecosystem as a whole.

2.6 Gap analysis

River-groundwater interactions are at the core of a wide range of major contemporary challenges, including the provision of high-quality drinking water in sufficient quantities, the loss of biodiversity in river ecosystems, or the management of environmental flow regimes (Brunner, et al., 2017). In view of the foregoing section, it is clear that assessments of the Barotse Floodplain have focused on hydrological assessments to determine flood inundations (extent, drivers and threats), evaporation fluxes, estimation of flow in some of the data scarce tributaries and modelling flood propagation from a hydrology perspective (Zimba, et al., 2018; Phiri, et al., 2012; Kabika, 2012; Chomba , et al., 2021). Several studies Zimba, et al., 2018 and Kabika, 2012 have postulated the existence of a large unconfined aquifer beneath the floodplain for which it's interactions with the river network is poorly constrained. A review by Chomba, et al., (2021) indicated potential of applying coupled hydrologic and hydraulic models

and the opportunities present to be used in Africa especially for data scarce and large basin for floodplain. A Hydrological model coupled with Hydraulic Model of the floodplain provides improvements in floodplain model simulations and hence better information for floodplain management. The understanding of the contribution of groundwater to the hydrological regimes of the floodplain is critical in supporting integrated water resources management.

2.7 Summary

The literature review has outlined different methodologies to identify green vegetation in catchments and to assess river-groundwater interactions in wetlands. This study therefore, adopted to apply satellite images from MODIS to extract time series data because for its 1-2 days revisit time that will provide high temporal resolution. Sentinel-2 was be used to identify perennial vegetation in the Barotse sub-catchment because of its very high spatial resolution of 10 m. Surface water on the Barotse Floodplain is constantly monitored at various gauging stations but groundwater is not monitored by authorities around the catchment. As a result, hydrograph separation of baseflow using digital filtering was the best alternative to quantify the influence of groundwater to the river system. Environmental Stable isotopes $\delta^{18}\text{O}$ analysis have been documented to be highly effective for understanding groundwater–surface water interactions in the catchments (Hanson & Abraham, 2009) Therefore, stable isotopes of water and hydrochemistry of the major anions and cations have been adopted to understand the connectivity between the river system and the underlying aquifer of the Barotse Floodplain.

CHAPTER 3: METHODOLOGY

This Chapter describes the conceptual framework and methods used in the study from desktop analysis, field visits and laboratory analysis.

3.1 Conceptual Framework

In (

Figure 6) is the conceptual framework of this study. Firstly, remote sensing is used to identify potential areas of groundwater diffuse to the floodplain. Then purposive sampling for both groundwater and surface water features. For groundwater features depth to groundwater table was measured and river discharge from the gauging stations on the Barotse Floodplain. The samples from the field works were analysed and the outputs were used to assess the significance of river groundwater interactions for water resources management of the Barotse Floodplain.

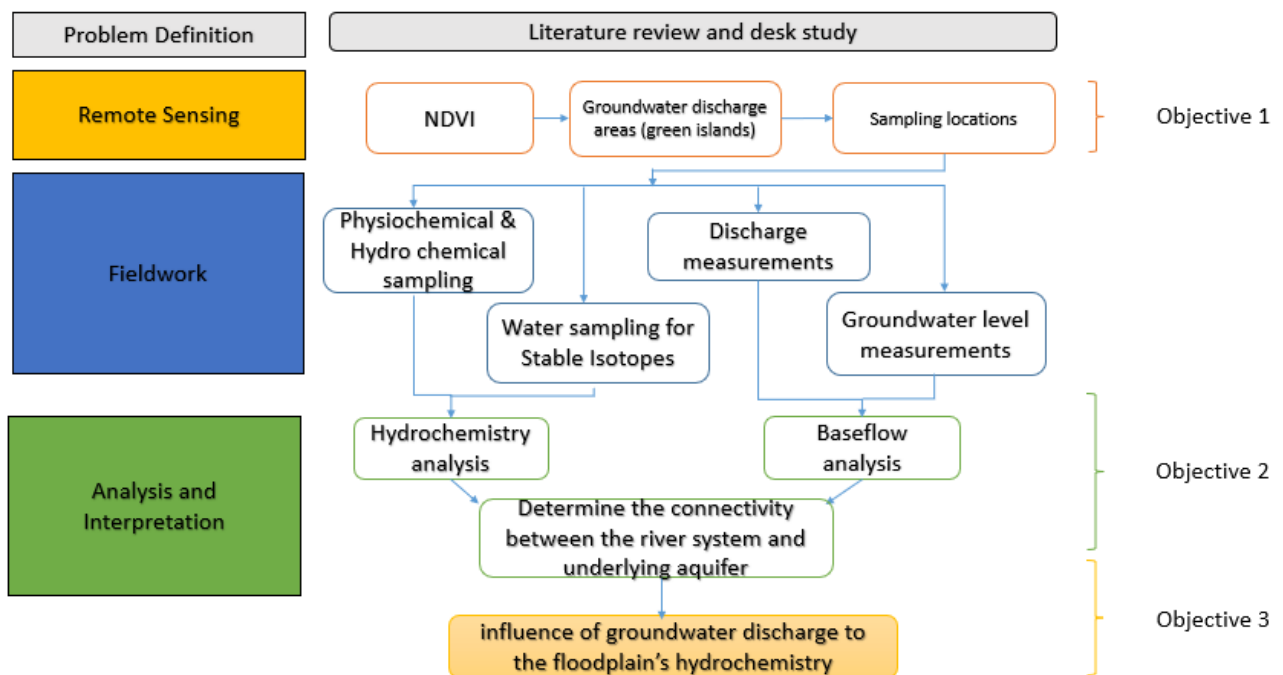


Figure 6: Conceptual framework

3.2 Image processing

An online cloud computing platform, Google Earth Engine (GEE), was adopted in this study to identify areas with a perennial greenness and thus classify areas with groundwater dependence from non-groundwater dependent locations. GEE combines a multi-petabyte

catalogue of satellite imagery and geospatial datasets with planetary-scale analysis capabilities and makes it available for scientists, researchers, and developers to detect changes, map trends, and quantify differences on the Earth's surface (<https://earthengine.google.com/>). Google Earth Engine is an innovative, free, and powerful geospatial processing service that can effectively process data without need for an expensive licensed software and computer hardware because all the data is processed in the Google cloud platform.

GEE was used to pre-process Sentinel-2 images using Sentinel 2 Top of the Atmosphere (ToA) imagery. ToA images are already pre-processed thus do not require any atmospheric and radiometric correction. In GEE, images were then filtered according to dates from 1st to 30th October 2019 and 1st to 28th February 2020 in the dry and wet season, respectively, after which images were clipped to the study area bounds. A cloud mask was then applied to remove clouds.

3.2.1 Spectral Indices

Spectral bands from remotely sensed imagery have the capability to detect vegetation that is using groundwater as a primary source, this can be used to ascertain groundwater-surface water interaction in landscapes. This detection of green vegetation via remote sensing is due to the assumption that vegetation that has access to groundwater will not experience the same soil water deficit during dry periods as vegetation that does not have access to groundwater (Eamus, et al., 2015). Two vegetation indices were used in this study to identify perennial green vegetation in the catchment. Normalised Difference Vegetation Index (NDVI) and Soil Adjusted Vegetation Index (SAVI) were both processed in Google Earth Engine and the output was exported in 'GeoTIFF' format and post-processing conducted in ArcGIS 10.1.

3.3 Field work

Field surveys were conducted in November 2019 and February 2020 during the dry and wet season respectively. Purposive sampling was adopted depending on access to the water points. Water samples were collected from various surface and groundwater features including the Zambezi River, streams, springs, water pools (dambos), handpumps, tanked boreholes, shallow wells, and rainwater (Figure 7). Tanked boreholes tap water from the ground using a pump to an overhead storage tank. The water stored in a tank is then supplied to users by gravity. Water pools are surface features from excavated areas especially in Mongu along the Mongu to Kalabo road. They were excavated during road construction. Depth to groundwater table levels were measured for some groundwater features that we could easily access. River discharge

measurements were done upstream in Lukulu District, mid-stream in Mongu District and downstream in Senanga District.

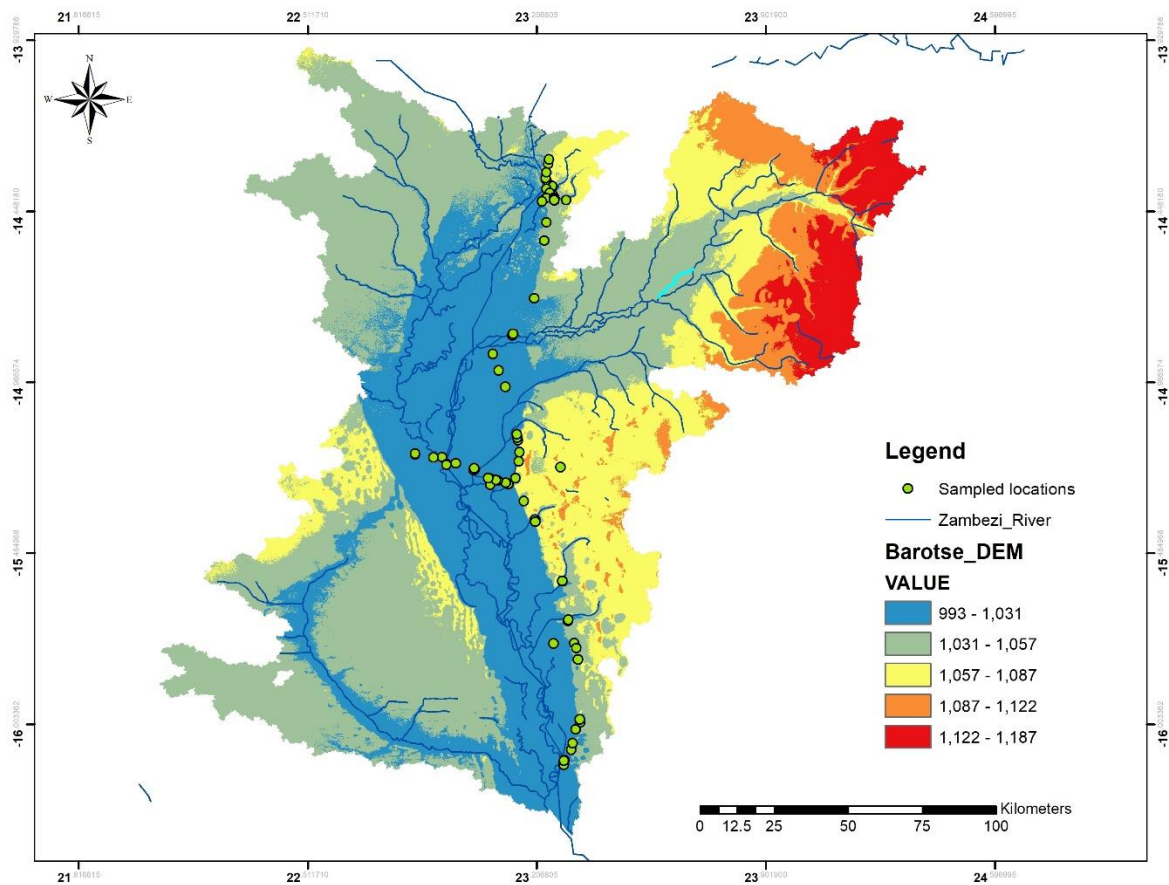


Figure 7: Sampling locations on the Barotse Floodplain

3.3.1 Water sampling

Water sampling was done in a two prone approach – first measurement of physico-chemical parameters and then collection of samples for hydrochemistry and stable isotopes.

Physiochemical parameters were measured using a WTW multi-meter probe and the attributes measured include temperature, pH, electrical conductivity (EC) and dissolved oxygen as shown in Figure 8. Before collection of groundwater samples, monitoring boreholes were purged 3 times to remove water that had settled in the casing pipe for too long. A detailed description of sampling procedures is available in IAEA, (2016) for sampling 50 mL polyethylene bottles were used. These water sampling bottles were rinsed 3 times using source water to be sampled. The bottles were clearly labelled with all the details and tightly capped (Figure 9).



Figure 8: Site A and B Onsite physiochemical measurements at Lubosi Bridge and Matongo gauge station respectively in Mongu District, Zambia.

The details were also indicated the field notebook. The samples were stored in cooler box to maintain the in-situ temperature and to avoid exposure from the sun.



Figure 9: Stable water isotope sample

3.3.2 Static groundwater level measurements

Depth to groundwater table was measured from water points including boreholes, hand pumps and shallow wells. The reference level of the boreholes was from the top of the casing pipe.

This measurement was done before purging in monitoring boreholes. A dip meter with an electrical sounder was used to record the depth (Figure 10).



Figure 10: Measurement of the static water level in a borehole at Lukulu District Hospital, Western Zambia.

3.3.3 Discharge measurements

River discharge measurements were taken from the Zambezi River upstream in Lukulu District, mid-stream in Mongu District and downstream in Senanga District. An Acoustic Doppler Current Profiler (ADCP) was used to measure discharge in m^3/s (Figure 11). Discharge measurements using the ADCP flow meter were conducted in the dry season as a means of verification for the discharge data provided by the Water Resources Management Authority (WARMA).



Figure 11: River discharge measurements using an ADCP equipment in Lukulu District, Western Zambia.

3.4 Analysis

3.4.1 Hydrochemistry and stable isotopes

Analysis of water samples for major ions was conducted by Elsenburg Laboratories under the Department of agriculture in Western Cape, South Africa. The analysis was conducted between April and June 2020. Analysis for stable isotopes was conducted by Ithemba laboratory in Johannesburg, South Africa. Stable isotopes composition was determined by isotope ratio spectrometry (IRMS). This technique measures the relative isotope ratios of molecular compounds by analysing the mass differences.

3.4.2 Groundwater flow direction

The static water levels and Shuttle Radar Topography Mission (SRTM) Digital Elevation Model (DEM) were uploaded to ArcGIS 10.1. In Arc toolbox spatial analyst tools was selected then extract values to point. The raster data input was the DEM and the static water level were points to extract the elevation. To create piezometric heads, in the attribute table select add field from the drop-down menu, the new column was named 'piezometric head' and the data type was set to float. The new field was highlighted right clicked to bring a drop-down menu then selected field calculator. The field calculator brings a new window that allows the user to select columns to make calculations. To calculate piezometric heads, static water level was subtracted from the elevation (Figure 12)

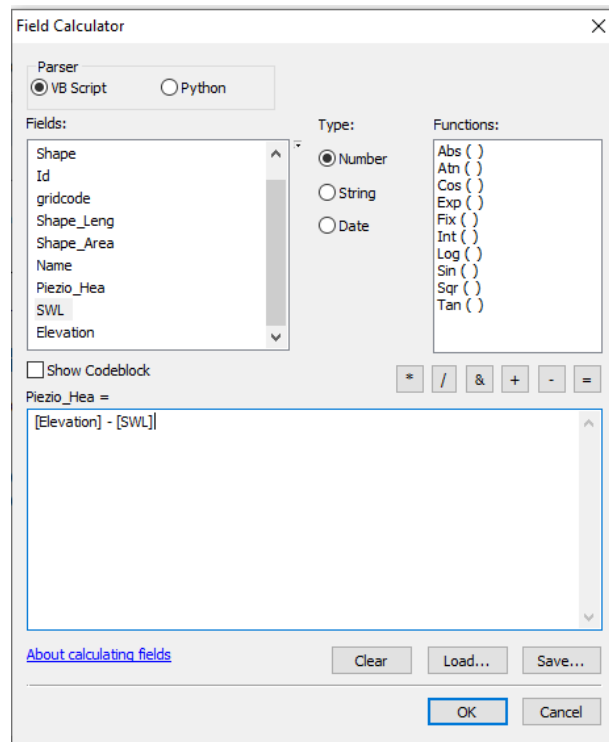


Figure 12: Calculating Piezometric heads in ArcGIS 10.1

To create contours, kriging was first applied to interpolate raster surface from the points then the contour feature in spatial analyst tools was selected at a 5 m interval to create a line feature class of contours (isolines) from the raster feature generated from Kriging. Smooth line tool in Cartography using the 'PAEK' was utilised to remove sharp angles in the lines to improve aesthetics.

3.4.3 Base flow separation

Base flow separation was conducted using the EcoHydRology library (provide a reference for this library) using R-Studio. River discharge data was obtained from the Water Resources Management Authority (WARMA) from the upstream gauging station in Lukulu District at Lukulu gauging station. Mid-stream at the Department of Water Resources Development (DWRD) and downstream at Senanga gauging station in Senanga District. The hydrographs were analysed using Digital Filtering using Master Recession Method by (Nathan & McMahon, 1990) in R statistical package using 'EcoHydRology' Library and 'BaseflowSeparation' function. Daily data from river discharge was input for base flow analysis. Using the results from the baseflow separation, a baseflow index was calculated. Baseflow index (BFI) is the ratio of baseflow to total flow calculated from a hydrograph separation procedure (either on an

annual basis or for an entire observation period, determined as the ratio of total baseflow volume to total streamflow volume (Smakhtin, 2001).

3.4.4 NDVI processing

Using cloud computing in Google Earth Engine, Sentinel-2 images from Copernicus Programme by the European Space Agency was utilised to analyse NDVI, Sentinel-2 images provide a higher spatial resolution of 10 m for the visible and near infrared bands with a temporal resolution of 10 days. The java script in GEE allows you to add a function for calculating NDVI called 'normalised difference' by selecting the image type then adding 'normlised difference' and the two bad the computation is supposed to normalise. Bands 'B8' and 'B4' for NIR and Red were added respectively. The calculated NDVI is then added to the image collection. From the image collection the NDVI bands were extracted to form an NDVI median composite image. The median was applied to reduce the effects of missing data in the final results. For visualisation of the NDVI image in GEE a colour palette was created using 'Hex colour codes'.

The output NDVI from GEE was the then exported to drive with the geometry set to the catchment shape file. The maximum pixel set to 1×10^9 pixels so as not to distort the spatial resolution. The file format was set to 'GeoTIFF' to maintain the georeferenced information of the image. To create a time series chart the 'ui.Chart.image.series' function is used to generate a Chart from an image collection. Extracts and plots the value of the specified band in each region for each image in the collection. The image type was set to Sentinel-2, the region of interest was to a point in the catchment and a reducer was applied for 'median' result. Since the normalised difference function was already applied for the identification. The 'nd' function is re-called for the time series. System time start in the time stamp is set to the nominal image acquisition time for single scenes. It is set to the nominal composite start period for temporal composites (<https://developers.google.com/earth-engine/glossary>). And system index that extracts information about the sensors path/row combination and processing level. When the script is run the time series chart appears on the console and can be downloaded as a Scalable Vector Graphic (.svg), Comma Separated Value (.csv) and Portable Graphics Format (.PNG).

3.4.5 NDVI decomposition

A method is developed to separate Normalised Difference Vegetation Index (NDVI) time series data into contributions from non-drying vegetation to slow and fast drying vegetation. R

statistical package was used to decompose NDVI data. NDVI MODIS daily data was imported in R and analysed using FTP library (<https://github.com/sckott/ftp>). To plot this data as time series from 2015 to 2020, 'forecast' library (<https://www.rdocumentation.org/packages/forecast/versions/8.15>) that provides forecast provides methods and tools for displaying and analysing univariate time series forecasts including exponential smoothing via state space models and automatic ARIMA modelling. The data was presented in 365 days cycles for a complete hydrological year. Using the forecast library, the observed data was decomposed into seasonality, trend and randomness. Thereafter, the 'plotrix' library (<https://rdrr.io/cran/plotrix/>) that is specialized for plotting accessories was used to the output of the decomposition.

3.5 Statistical Analysis

3.5.1 Regression analysis

Origin Pro 2016 Software was used to determine the relationship between NDVI and GWL data using a regression approach. The method uses a curve fitting approach using a trial-and-error method for non-linear regression equations. The fitting curve with the smallest standard error was selected as best curve.

3.5.2 Normality test

Normality test is a statistical process used to determine whether sampled data has been drawn from a normality distributed population within some tolerance. The standard normal distribution is the most important continuous probability distribution has a bell-shaped density curve described by its mean and standard deviation and extreme values in the data set have no significant impact on the mean value. If continuous data follows a normal distribution, then 68.2%, 95.4%, and 99.7% observations lie between mean \pm 1 SD, mean \pm 2 SD, and mean \pm 3 SD, respectively (Campbell, et al., 2007). Shapiro Wilk test for normality was used in SigmaPlot 12 software. Normality test was applied before correlating hydrochemical data to satellite derived indices.

3.5.3 Pearson and Spearman rank correlation

Depending on the outcome of a normality test, a Pearson or Spearman Correlation can be applied. The Pearson Correlation is a parametric test which measures the strength of association of two variables while the Spearman's Correlation is the nonparametric version of the Pearson

product-moment correlation. Spearman's correlation coefficient, (ρ , also signified by r_s) measures the strength and direction of association between two ranked variables. In terms of the strength of relationship, the value of the correlation coefficient varies between +1 and -1. A value of ± 1 indicates a perfect degree of association between the two variables. As the correlation coefficient value goes towards 0, the relationship between the two variables will be weaker. The direction of the relationship is indicated by the sign of the coefficient; a (+) sign indicates a positive relationship and a (-) sign indicates a negative relationship (<https://www.ncbi.nlm.nih.gov/pmc/articles/PMC6350423/#ref2>).

The Spearman rank correlation test does not carry any assumptions about the distribution of the data and is the appropriate correlation analysis when the variables are measured on a scale that is at least ordinal (Kendall & Gibbons, 1990). Pearson or Spearman correlation analysis can be implemented in SigmaPlot 12 software (depending on the normality test) to correlate hydrological data with satellite indices. More information on the statistical requirements for Pearson, Kendall and Spearman correlations see is provided by Bonnet & Wright, (2000).

CHAPTER 4: RESULTS

This chapter presents the results and discussion of the study with reference to the four objectives in Chapter 1.

4.1 Mapping groundwater dependant vegetation

Figure 13 median NDVI for October 2019 and February 2020 respectively. In the dry season, the NDVI values range from -0.314 to 0.699, whereas in the wet season the NDVI values range from -0.242 to 0.799. The negative values represent water bodies and bare land whereas the positive values represent green vegetation (increasing positive values represent an improving health condition).

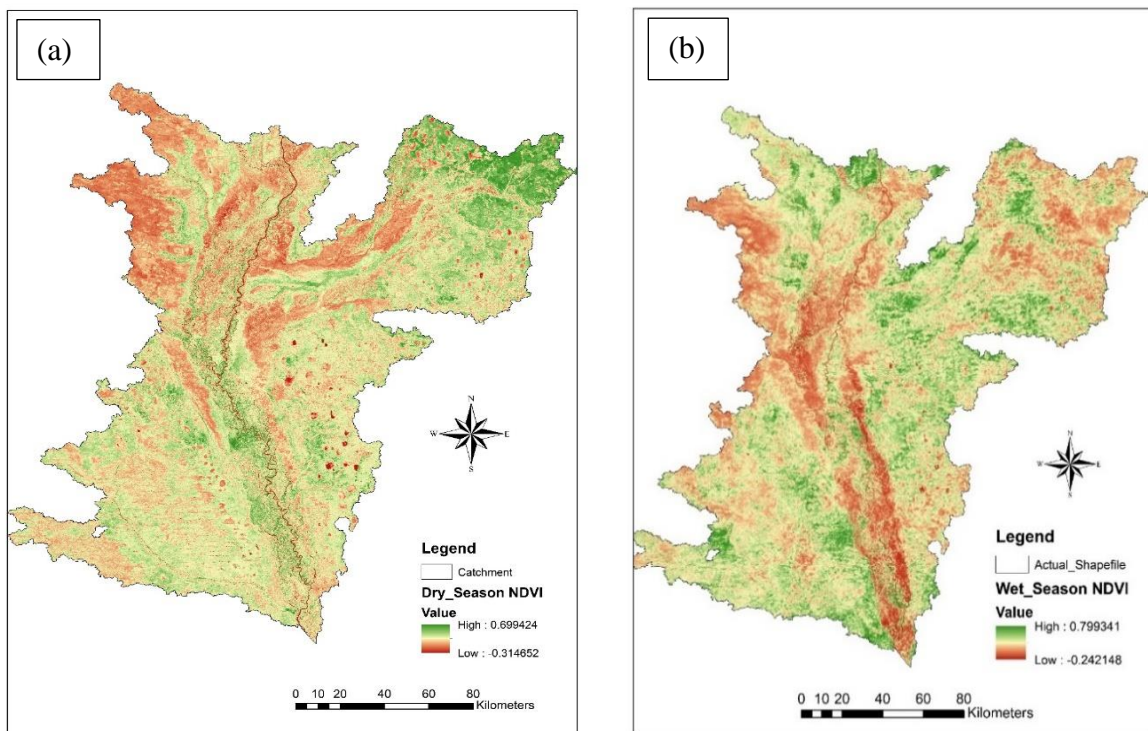


Figure 13: NDVI over the Barotse catchment for (a) the dry and (b) wet season.

Figure 14 shows the NDVI difference map for the Barotse Catchment. The NDVI difference image was made from two seasons, dry and wet season. From the NDVI difference map, five classes were defined based on a natural break histogram classification. Class 1, was 'water' and had values less than 0. Class 2 was related to 'non-groundwater dependent ecosystems' with values less than 0.1 but more than 0. Class 3 was classified as 'fast drying' vegetation and had values ranging from 0.1 to 0.2. Class 4 was called 'slow drying' vegetation

and had values from 0.2 to 0.4. Class 5 was classified as ‘non-drying’ vegetation and had values greater than 0.4.

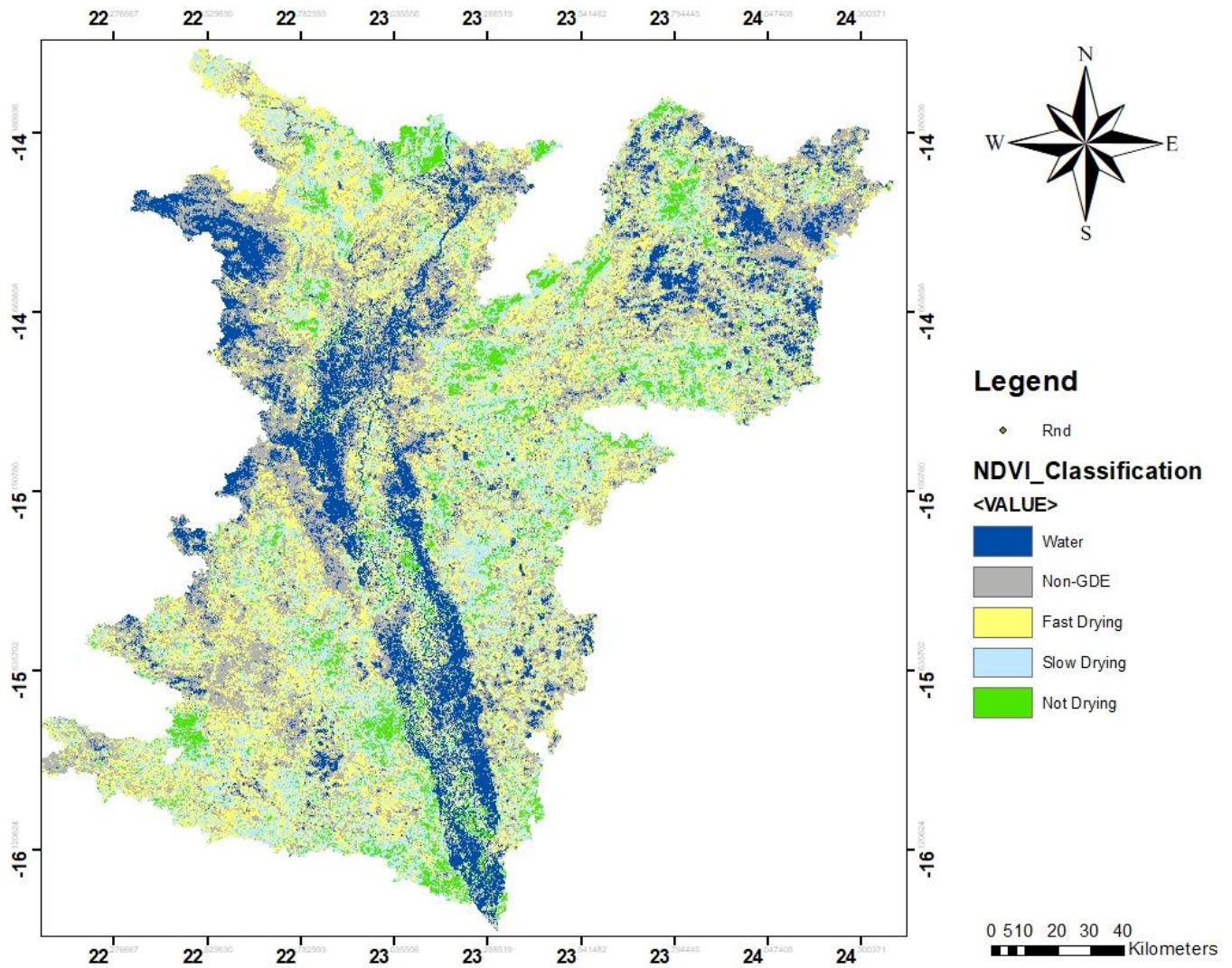


Figure 14: NDVI difference map over the Barotse Catchment, Western Zambia

Class 1, ‘water’, represents water bodies that are sustained in the dry season and areas that register high soil moisture in the dry season. This class encompasses the Zambezi River, the riparian corridor and most parts of the wetland that remain waterlogged after the floods recind. Class 2 ‘non-groundwater dependent’ had low NDVI values and does not show any changes across seasons. These were commonly settlements with sparse vegetation and bare soil. Class 3, ‘fast drying’ vegetated areas, had a sharp contrast change between dry to wet season NDVI. These areas are likely to have a deep-seated groundwater table and are commonly associated with traditional seasonal fields (Lizulu), pastured areas and settlement areas within the floodplains. Class 4, ‘slow drying’ vegetation, was related to terrestrial vegetation with a diminishing access to water during the dry season and a relatively shallow groundwater table.

These areas are within the wetland and ephemeral streams. Class 5 was the ‘non-drying’ vegetation, of which these are areas associated with shallow groundwater table. These areas are mostly found within the flood prone areas of the wetland that dry up in the dry season but remain with high soil moisture. Validation of the classifications was done using a confusion matrix. The Kappa coefficient was calculated to have an overall coefficient of 74.6 percent. The producer’s accuracy for water was (98.4 %), for non-vegetated areas (90.4 %), for grass (60 %) and for woody vegetation (41 %). This demonstrated that most of the area mapped as water and non-vegetated areas were accurately mapped.

The NDVI time series results for both upstream and downstream of the Barotse Floodplain, show low values in the dry season and high NDVI values in the wet season. The upstream area had a maximum NDVI value of 0.712 and minimum of 0.214. Downstream the highest and lowest NDVI values were 0.258 and 0.735, respectively. Figure 15 and Figure 16 show the trend for the upstream time series and the downstream time series, respectively.

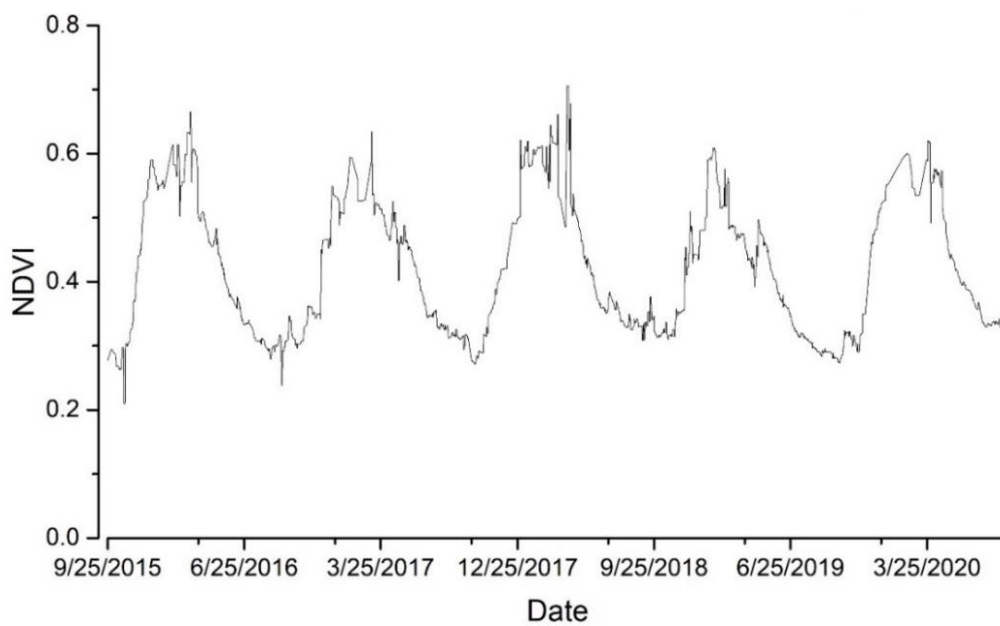


Figure 15: Upstream NDVI time series in Lukulu, location coordinates (-14.532, 23.057)

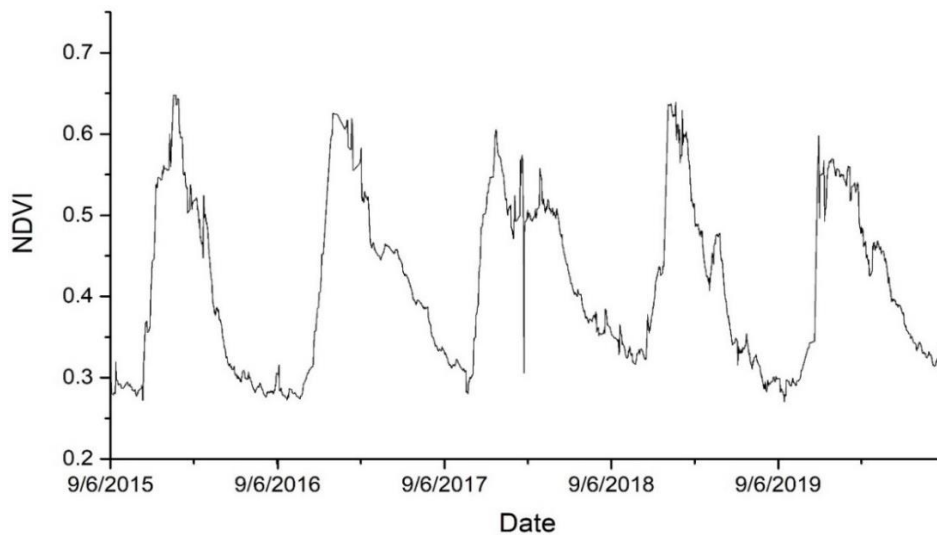


Figure 16: Downstream NDVI time series in Senanga, location coordinates (-15.687, 23.030)

4.2 Base flow analysis results

In order to establish if there is river-groundwater connectivity on the Barotse Floodplain, A quantitative approach was used to estimate groundwater in the river channel. Historical data from the Zambezi River Authority (ZRA) was applied to calculate base flow in the river system. The use of this hydrometric technique is a traditional approach and is important for identifying the role of surface water or groundwater in the hydrologic system.

4.2.1 Upstream

Daily time series discharge data from Lukulu Gauging Station (2030) on the Zambezi River, representing the upstream region of the study area as shown in Figure 17. The Zambezi River discharge is shown black and base flow in red. The results characterise data from five (5) hydrological years starting October 2004 to September 2009. The catchment receives rainfall from November to March and the dry season is from April to October. Figure 17 shows reduced baseflow contribution during the rainy season of the year and a 100 percent contribution from base flow during the driest time of the year when there is no precipitation or run off feeding the Zambezi River.

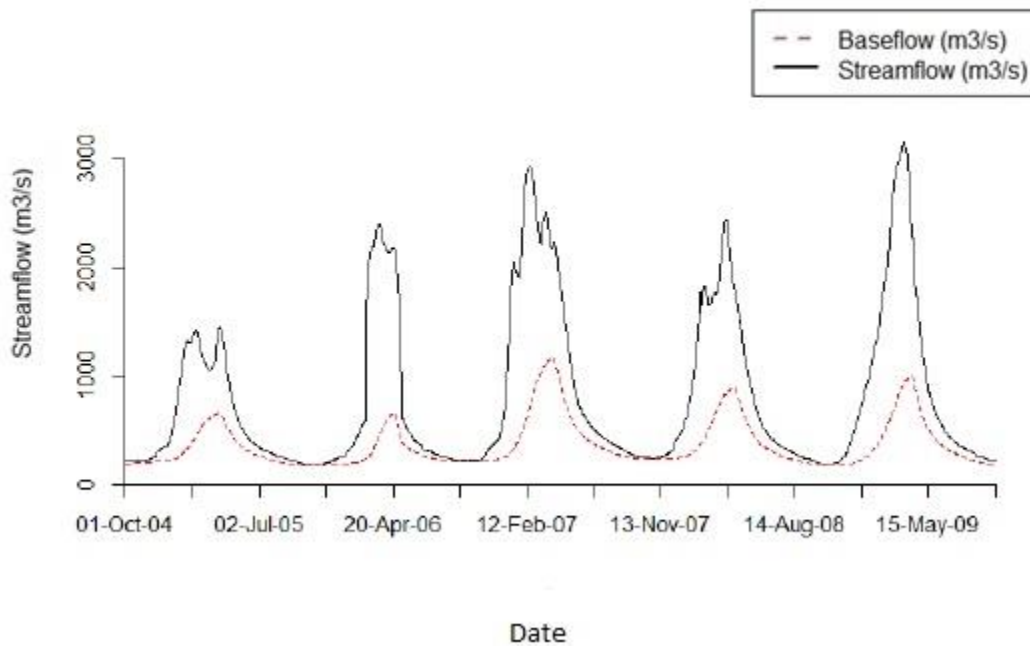


Figure 17: Base flow separation upstream at Lukulu Gauging Station (2030)

The upstream base flow characteristics in Table 1, shows the lowest baseflow contribution being 173 m³/s and the maximum 1 170 m³/s. The 25 percentile or first Quartile baseflow contribution was 216 m³/s and the 75th percentile or third quartile of the baseflow contribution was 446 m³/s. The mean base flow upstream was 366 m³/s compared to a mean river discharge of 816.06 m³/s. The mean baseflow contribution to the river flows upstream, thus, from October 2004 to September 2009 (dry season) was 0.448 or 44.8% of the total flow.

Table 1: Upstream statistics for base flow separation

Base flow (m ³ /s)	Quick flow (m ³ /s)	Total flow (m ³ /s)
Min. : 173.9	Min. : 0.00	Min:173.9
1st Qu.: 216.0	1st Qu.: 44.91	1st Qu: 260.91

Median : 262.7	Median : 136.25	Median : 398.95
Mean : 366.0	Mean : 450.06	Mean: 816.06
3rd Qu.: 446.7	3rd Qu.: 720.59	3rd Qu.: 1167.29
Max. :1170.4	Max. :2270.86	3rd Qu.: 3441.26

4.2.2 Downstream

Daily discharge from Senanga gauging station (2400), the river flow is in black while the base flow in red. The results are for Zambezi River discharge at Senanga gauging station (2400) downstream of the Floodplain. The results in Figure 18 are for five (5) hydrological years from October 2004 to September 2009. Similar to upstream the downstream base flow shows that there is a reduction in baseflow contribution to the Zambezi River during the rainy season especially at the peak of the rains and the base flow contribution to the Zambezi River starts to increase as the rainfall reduces. The highest baseflow contribution to the Zambezi River was during the driest times of the year (August to November). The Figure 18 shows a 100 percent contribution from baseflow to the river flow in October.

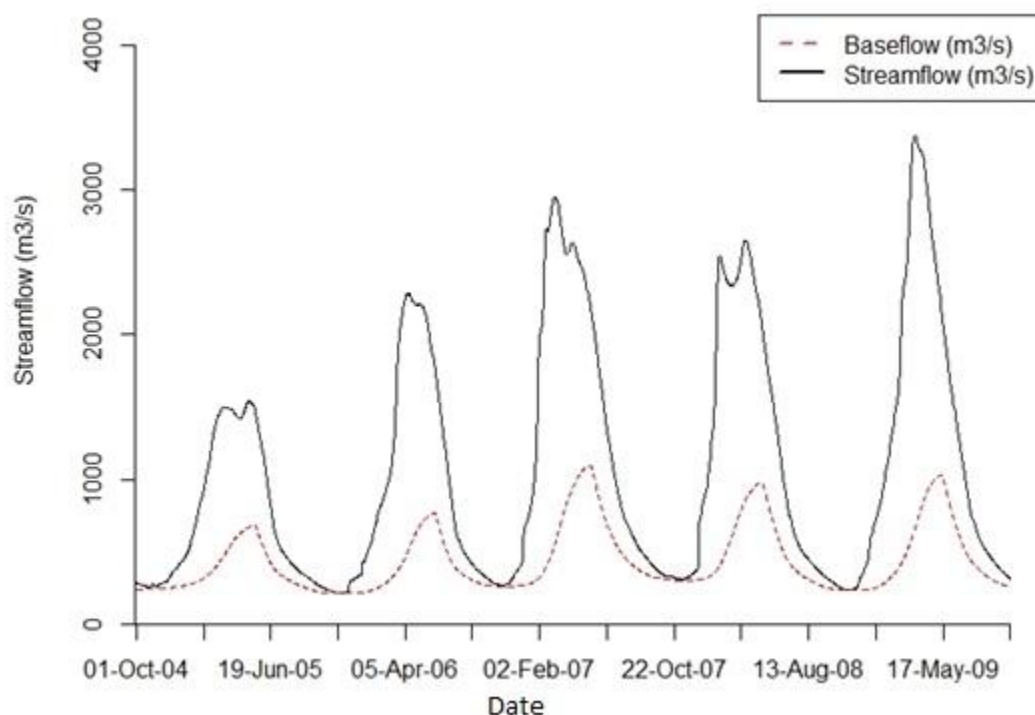


Figure 18: Base flow separation downstream at Senanga gauging station (2400)

The downstream base flow separation statistical results in Table 2, show the minimum base flow contribution is 218.3 m³/s and the maximum base flow contribution is 1401.7 m³/s. The 25th percentile or first quartile is 266.8 m³/s and the 75th percentile or third quartile is 655.8

m³/s. The mean base flow is 500 m³/s compared to a mean river discharge of 1036.93 m³/s. The mean base flow contribution to the river flow between October 2004 and September 2009 was 0.482 or 48.2 % of the total flow.

Table 2: Downstream statistics for base flow separation

Base flow (m³/s)	Quick flow (m³/s)	Total flow (m³/s)
Min. : 218.3	Min. : 0.00	Min:218.3
1st Qu.: 266.8	1st Qu.: 79.15	1st Qu: 345.95
Median : 356.1	Median : 282.97	Median : 639.07
Mean : 500.0	Mean : 536.93	Mean: 1036.93
3rd Qu.: 655.8	3rd Qu.: 829.90	3rd Qu.: 1485.7
Max. : 1401.7	Max. : 2501.21	3rd Qu.: 3902.91

4.3 Physiochemical attributes of water

4.3.1 Electrical Conductivity

Surface water electrical conductivity (EC) in the dry season had a maximum of 227 µS/cm from a borrow pit mid-stream at Lealui and a minimum of 27 µS/cm from a stream at Lui downstream towards Senanga. Average EC for surface water was 145.4 µS/cm. In the Wet season, the maximum EC was 177.8 µS/cm at a water pool mid-stream in Mongu, a minimum of 13.7 µS/cm downstream in Nalolo District and an average of 99.6 µS/cm. In the dry season groundwater had a maximum electrical conductivity of 1802 µS/cm from a hand pump mid-stream in Limulunga, a minimum of 1.8 µS/cm downstream in Nakashindi and an average of 327.9 µS/cm. The wet season groundwater had a maximum of 970 µS/cm at Lyatolo, mid-stream along the Mongu-Kalabo road, minimum 9.2 µS/cm at Lukanda Primary School and an average of 249.1 µS/cm. Table 3 shows the results of the average electrical conductivity across the Barotse Catchment.

Table 3: Average Electrical Conductivity in groundwater and surface water in the wet and dry seasons in µs/cm across the catchment.

Electrical Conductivity	Surface Water		Groundwater	
	Dry	Wet	Dry	Wet
Min ($\mu\text{S}/\text{cm}$)	17	13.7	1.8	9.2
Max ($\mu\text{S}/\text{cm}$)	227	177.8	1802	970
Average ($\mu\text{S}/\text{cm}$)	145.4	99.1	327.9	249.1

4.3.2 Dissolved Oxygen

Dry season surface water had a maximum dissolved oxygen (DO) of 8.35 mg/L from a water pool in Mongu. The minimum DO in surface water was 2.89 mg/L also recorded from a water pool along the Mongu-Kalabo road. The average DO for surface water in the dry season was 6.55 mg/L. Groundwater in the dry season had a maximum dissolved oxygen of 7.32 mg/L from the borehole at Mongu Harbor. The minimum recorded was 2.17 mg/L from a hand pump in Limulunga. The mean dissolved oxygen in the dry season was 5.69 mg/L.

Wet season surface water maximum dissolved oxygen 7.05 mg/L from a borrow pit in Mongu, the minimum dissolved oxygen in the wet season was from the Zambezi River at Lubosi Bridge 5.51 mg/L. The average dissolved oxygen recorded in the wet season was 6.18 mg/L. Groundwater in the wet season had a maximum 6.87 mg/L recorded from a borehole at Mongu Harbor. The minimum dissolved oxygen was 3.98 mg/L recorded from a borehole in Mabumbu along the Mongu- Limulunga Road. Overall, the wet season groundwater had a mean 5.40 mg/L. Table 4 presents the results of the average dissolved oxygen levels for the sampled locations across the entire catchment.

Table 4: Dissolved Oxygen in groundwater and surface water in the wet and dry seasons across the catchment

Dissolved Oxygen	Surface Water		Groundwater	
	Dry	Wet	Dry	Wet
Min (mg/L)	2.89	5.51	2.17	3.98
Max (mg/L)	8.35	7.05	7.32	6.87
Average (mg/L)	6.55	6.19	5.1	5.40

4.3.3 pH

Dry season surface water maximum pH was 10 from a borrow pit in Mongu and a minimum of 6.76 from a stream at Lui along the Mongu Senanga Road. The average dry season surface water pH was 8.36. Groundwater in the dry season had a maximum pH of 9.9 from a hand pump at Kawayia in Lukulu along the floodplains. The minimum of 5.10 from a hand pump at Sefula along the Mongu Senanga road. The average groundwater pH in the dry season was 7.10. Wet season surface water pH had maximum of 8.85 from a water pool at Lealui in Mongu. The minimum was 5.6 from a spring at Lukanda Primary school in Senanga. The average surface water pH for the wet season was 7.71. The wet season groundwater had a maximum pH of 9.34 recorded at Kawayia in Lukulu District. The minimum was 4.94 recorded from a hand pump at Mupatu Primary School in Limulunga. The average was 7.29 wet season groundwater. Table 5, Presents the summary statistics of pH in groundwater and surface water.

Table 5: pH in groundwater and surface water in the wet and dry seasons across the catchment

pH	Surface Water		Groundwater	
	Dry	Wet	Dry	Wet
Min	6.76	5.6	5.1	4.94
Max	10	8.85	9.9	9.34
Average	8.36	7.72	7.19	7.29

4.4 Major ion chemistry

Surface water in the dry season had cations in a decreasing order $\text{Ca} > \text{Na} > \text{Mg} > \text{K}$ and in the wet season $\text{Ca} > \text{K} > \text{Na} > \text{Mg}$. The major anions in both the dry and wet season had more bicarbonate (HCO_3^-) than sulphate (SO_4^{2-}). Groundwater in the dry season had cations in the decreasing order of $\text{Na} > \text{Ca} > \text{K} > \text{Mg}$ and in the wet season the cations were in the decreasing order of $\text{Ca} > \text{Na} > \text{K} > \text{Mg}$. Major anions had more bicarbonate (HCO_3^-) than sulphate (SO_4^{2-}) in both the dry and wet season. The average elements composition of groundwater and surface water are presented in Table 6. A detailed breakdown of the chemical analysis results are presented in Appendix 2.

Table 6: Hydrochemistry of the major elements in both groundwater and surface water on the Barotse Floodplain in mg/L.

Groundwater													
		Dry season						Wet season					
Location	Statistics	HCO ₃	Ca	K	Mg	Na	SO ₄	HCO ₃	Ca	K	Mg	Na	SO ₄
Upstream (Lukulu)	Min	71.2	1	1	1	2	1	112.6	2	1	1	1	3
	Max	452	76	7	10	142	47	239.2	79	3	11	46	152
	Average	248.7	27	2.28	4.4	59.1	11.7	171.6	27.73	1.82	5.0	14.4	71.2
Midstream (Mongu)	Min	48.2	3	1	1	5	3	1	1	1	1	1	1
	Max	562.8	64	92	14	357	462	172	57	7	6	5	4
	Average	240.4	32.8	16.8	5.4	88.1	93.4	44.60	7.33	1.83	2.17	1.67	1.58
Downstream (Senanga)	Min	23.2	1	1	1	1	1	1	1	1	1	1	1
	Max	110.4	48	3	19	7	8	84	47	242	54	8	3
	Average	41.95	10.76	1.31	3.08	2	1.92	20.49	8.88	31.50	10.38	1.88	1.63
Surface water													
		Dry season						Wet season					
Location	Statistics	HCO ₃	Ca	K	Mg	Na	SO ₄	HCO ₃	Ca	K	Mg	Na	SO ₄
Upstream (Lukulu)	Min	71.2	1	1	1	5	1	34.6	4	1	2	2	2
	Max	436.4	72	78	16	149	47	150.8	11	2	4	3	68
	Average	235.9	27	17.4	5.9	57	16.2	92.70	7.50	1.50	3.00	2.50	35.00
Midstream (Mongu)	Min	56.4	4	1	2	1	1	21.8	2	1	1	2	2
	Max	172	31	7	9	11	462	83	68	112	14	72	28
	Average	111.98	15.36	2.36	6.09	6.09	39.06	50.53	30.00	20.67	6.33	15.00	12.50
Downstream (Senanga)	Min	23.2	1	1	1	1	1	1	1	1	1	1	1
	Max	110.4	48	3	19	3	8	49.8	15	2	6	3	7
	Average	37.1	11.3	1.2	2.9	1.4	1.92	22.4	6.25	1.25	2.7	1.75	2.75

4.5 Stable Isotopes

The stable isotopes of $\delta^2\text{H}$ and $\delta^{18}\text{O}$ are used to infer the potential interaction between groundwater and the Zambezi River. The results are plotted relative to the local meteoric water line (LMWL) from Ndola, which is the only dataset from Zambia in the International Atomic Energy Agency (IAEA) database. The equation for the local meteoric water line is defined by the equation $\delta^2\text{H} = 7.63 \delta^{18}\text{O} + 9.14$ which does not seem to significantly deviate from the global meteoric water line that is defined by the equation $\delta^2\text{H} = 8 \delta^{18}\text{O} + 10$.

During the dry season field trip, water samples were collected from different groundwater and surface water features that including: hand pumps, shallow wells, springs, tanked boreholes, water pools (dambos), rainwater and the Zambezi River. The $\delta^{18}\text{O}$ values for surface water range from -42.9 ‰ to 65.6 ‰, whereas $\delta^2\text{H}$ values range from -6.7 ‰ to 14.20 ‰. In groundwater $\delta^{18}\text{O}$ values range between -56.3 ‰ and -18.2 ‰, whereas $\delta^2\text{H}$ values range from -8.24 ‰ to 2.33 ‰ (Figure 19).

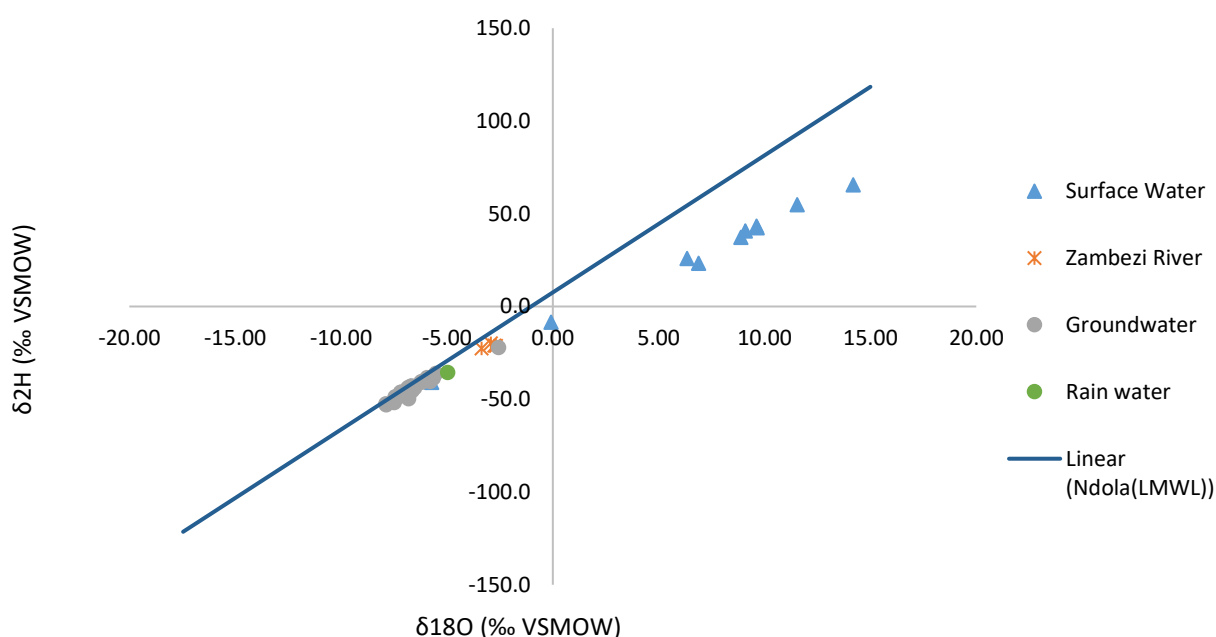


Figure 19: Stable isotopes of various water sources during the dry season plotted on the LMWL

Groundwater, surface water and rainfall samples were collected during the wet season, in early February, at the peak of the rainy season. During this period, the floodplains are almost at the maximum inundation. The Zambezi River had broken its banks and all surface water pools were connected. A graphic plot of the variation between stable isotopes of $\delta^2\text{H}$ and $\delta^{18}\text{O}$ is plotted in

Figure 20. The rainfall datasets plotted in the depleted portion of the local meteoric water line as shown in Figure 20 All groundwater samples plotted in the depleted portion of the LMWL with $\delta^{18}\text{O}$ ranging from -50.5 ‰ to -24.9 ‰ and $\delta^2\text{H}$ ranging from -7.23 ‰ to -3.93 ‰ except one anomaly from the upstream, that plotted in the enriched zone of the LMWL. The surface water samples were more spread out in the wet season compared to the dry season. Surface water samples had $\delta^{18}\text{O}$ ranged between -52.9 ‰ to 65.6 ‰ and $\delta^2\text{H}$ ranged from -7.9 ‰ to 14.2 ‰ (Figure 19)

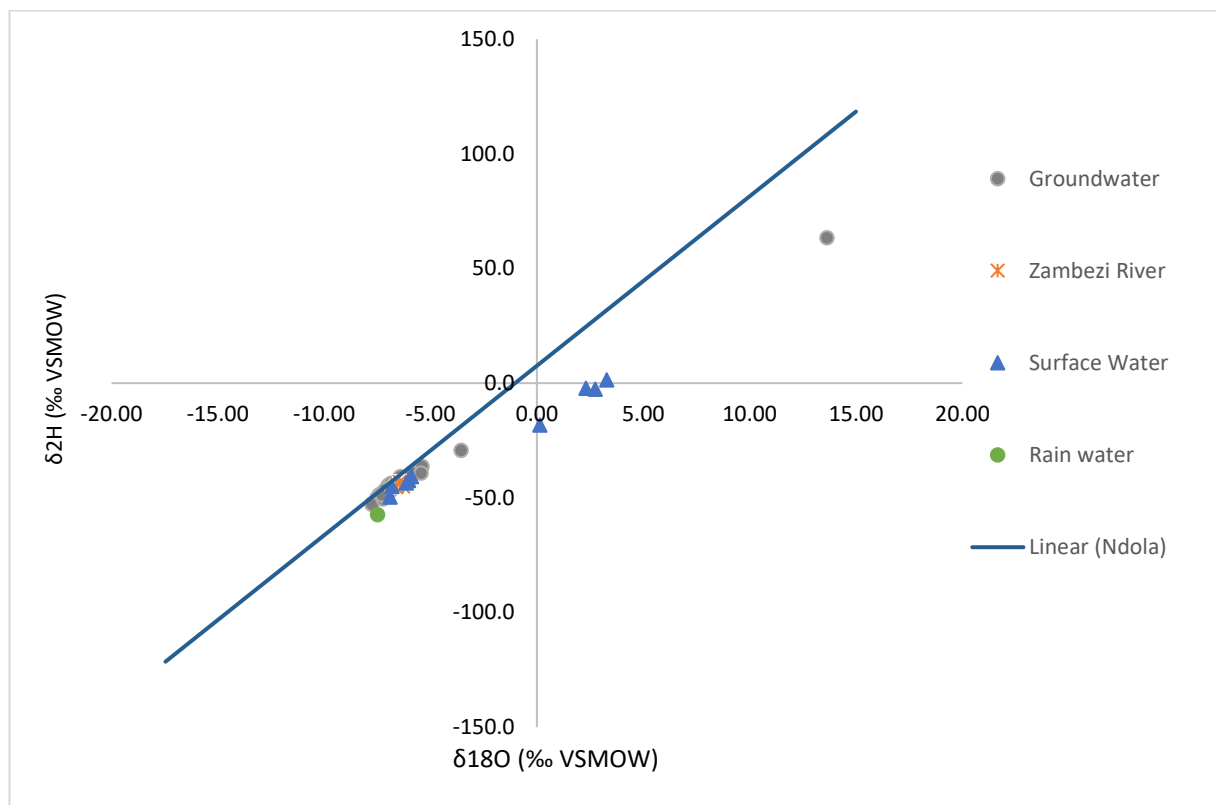


Figure 20: Stable isotopes of various water sources during the wet season plotted on the LMWL

From the physiochemical results in Chapter 4.4., DO was used to investigate the influence of groundwater discharge to the surface water. DO was used because it is not affected by abiotic conditions unlike conductivity and pH. Figure 21, presents the time series of data for DO from February 2015 to January 2021. The results showed that DO was relatively high throughout the year with the highest input in the driest time of the year.

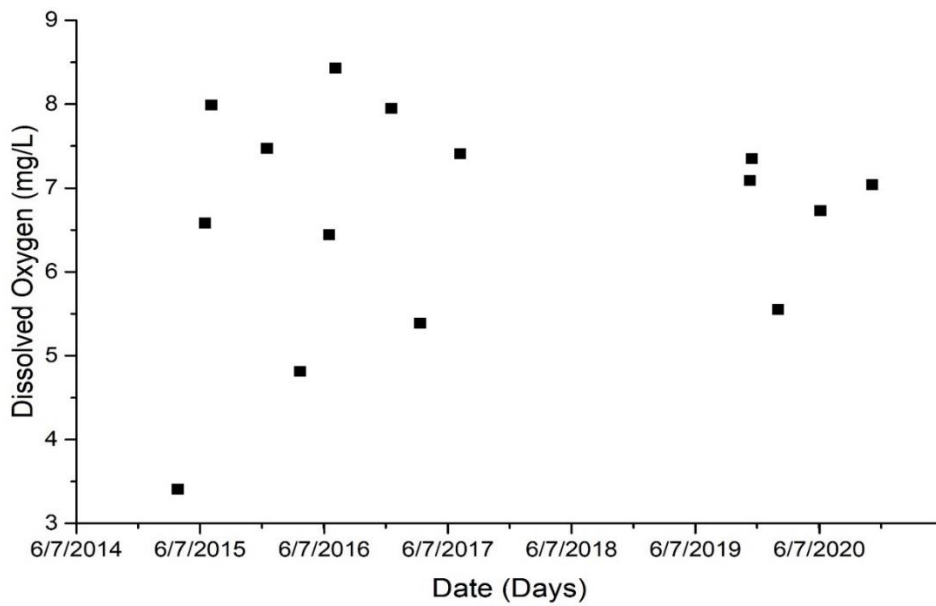


Figure 21: D O from the Zambezi River at Senanga gauging station downstream of the floodplain

Statistical correlation between dissolved oxygen and baseflow index using spearman correlation are presented in Table 7: Spearman correlation for Dissolved oxygen vs Baseflow index the results showed a 0.952 correlation coefficient in a 95 % confidence interval. The very strong relationship that exists between baseflow index and dissolved oxygen is such that when baseflow increases there is a proportional increase in dissolved oxygen and vice versa.

Table 7: Spearman correlation for Dissolved oxygen vs Baseflow index

DO	
BFI	0.952
	0.000000200
	17
	Correlation coefficient
	P value
	Sample size

CHAPTER 5: DISCUSSION

5.1.1 Discussion on mapping groundwater dependant vegetation

The method applied to classify vegetative cover in the Barotse sub-catchment is based on the greenness and wetness of the land surface over a single dry season, which in the absence of other water sources is likely to be tapping from groundwater. This approach has also been used by authors such as Elmore, et al., (2003) and Barron, et al., (2012) to map groundwater-dependent ecosystems using remote sensing. This method uses a single NDVI image for the dry season and another image in the wet season, to calculate a difference map from the two images. There are uncertainties in mapping groundwater dependent ecosystems especially towards terrestrial vegetation located in dense vegetation as they could be associated with surface water accumulation (Barron, et al., 2012). It is likely that forested areas in the north eastern part might also be associated with surface water accumulation. Barron, et al., (2012) observed similar characteristics and concluded that such an observation would be present in terrestrial environments and not wetlands.

The classification method was validated using a confusion matrix. The validation had accuracy ranging from 51-98 percent. The woody vegetation had the lowest classification accuracy and water bodies had the highest accuracy. Low accuracy of woody forests and other types of vegetation could be because visual distinction of different vegetation types can be challenging. In comparison with other vegetation types, grass had a higher accuracy than forest. Most of the groundwater dependent vegetation was mapped downstream of the floodplain, which might be due to the differences in hydrogeological conditions between upstream and downstream of the floodplain. One of the factors could be due to the increased presence of clays in the unsaturated zone downstream of the floodplain with a higher water retention capacity. The occurrence of perched aquifer systems downstream can not be dismissed. The upper reaches of the floodplain thus potentially are a high recharge region for groundwater whereas the lower reaches of the floodplain are a discharge region for groundwater into the river system. Evidence of groundwater discharge was observed at Lukanda Primary School downstream in Senanga District which has an active spring that flows to the Zambezi River throughout the year (Figure 22). A detailed hydrogeological assessment is required to map the extent of clay distribution in the catchment as they likely facilitate conveyance of groundwater to the wetland.



Figure 22: Spring at Lukanda Primary School downstream of the floodplain location coordinates (-16.017442, 23.324896).

5.1.2 Discussion on baseflow

Digital filtering to extract baseflow used a 0.98 filter parameter to extract a realistic peak of baseflow separation from surface water discharge along the river channel. Tan, et al., (2009) states that algorithm tends to produce an unrealistic sharp peak of base flow with filter values smaller than 0.96. Sujono, et al., (2004) compared different recession techniques and obtained an average of digital values varying from 0.939 to 0.992. They argue that the hydrograph recession segment was not composed of straight lines representing different flow components but a curved line reflecting the distinction between the flow components.

The results show there is an increase in the river flow downstream than there is upstream of the floodplain. The mean flow upstream is 816.06 m³/s while the mean downstream is 1036 m³/s. The World Bank Report by Deneut, et al., (2014), reports upstream flow in Lukulu of 845.5 m³/s. Furthermore, the study suggests losses from evaporation amount to 233.7 m³/s and downstream flows in Senanga of 1029.4 m³/s. Deneut, et al., (2014) work therefore agrees with observations from this study. Luanginga is the only major tributary to the Zambezi River downstream of Lukulu Gauging station and only contributes 62.72 m³/s as discharge to the Zambezi. The summation of the Lukulu and Luanginga discharge amounts to 908.22 m³/s. The difference between the summations of the two systems and the discharge at Senanga Gauging Station was 121.18 m³/s. This implies that the Zambezi River is a gaining effluent river in the lower reaches. With no other major tributary downstream. There can be many other factors that can increase river flow, but from the data collected in this study, baseflow is one of the main contributors to increased river flow. The baseflow analysis from this study show an upstream base flow contribution of 0.448 whereas the downstream contribution to the river flow was 0.482. This indicates connectivity between groundwater and surface water through the entire Zambezi River reach in the catchment. The Barotse Floodplain has an average of 46.5% groundwater contribution to the surface runoff. According to the classification by Hatton & Evans, (1998) this ecosystem is proportionally dependent on groundwater. In such ecosystems, small changes in groundwater availability or quality results in the total loss of the current ecosystem structure and function. In proportionally dependent ecosystems there is a proportional response in the ecosystem structure, function and distribution.

5.1.3 Discussion on physicochemical attributes

From the results, it can be noted that groundwater has a higher electrical conductivity than surface water. There is also a reduction in groundwater electrical conductivity from upstream to

downstream in both the wet and dry season in the Barotse Floodplain. Conductivity is primarily influenced by abiotic factors therefore the reduction in conductivity maybe due to the reduced concentration in total dissolved solids downstream of the Barotse Floodplain.

According to the results, there is an increase in the amount of dissolved oxygen in surface water than there is in groundwater. Groundwater has a reduced amount of dissolved oxygen because of reduced aeration and photosynthetic activity. According to Whistler, (1996), the main sources of dissolved oxygen are atmospheric reaeration (movement of oxygen from the air into water) and photosynthesis by algae and aquatic plants that convert CO₂ to organic matter and oxygen. Groundwater has a reduced activity in both of these processes. It was observed that there is an increase in DO in the dry season than there is in the wet season. The cause of this trend can biodegradation because of flooding in the wet season that carried organic matter is decomposed by fungi and bacteria therefore reducing the dissolved oxygen.

From the onsite measurements, it was observed that the pH in groundwater is near neutral whereas surface water has a slightly alkaline pH. It was observed that the average pH both upstream and downstream is alkaline. In cropland dominated watersheds the application of nitrogen increases the acidity of soils as hydrogen ions are released during nitrification (Fox & Bandel, 1986). The pH is also affected (raised) by application of ground limestone (liming). In addition, during the wet season algal blooms can significantly increase pH due to algal usage of bicarbonates (Salomons & Stols, 1995). But the Barotse Floodplain is a natural watershed that is not cropland dominated. There is little to no fertiliser application and no liming is done as the soils are not acidic. According to Whistler, (1996) there is no evidence that terrestrial vegetation plays a direct role in stream pH. Therefore, the pH of the Barotse Floodplains maybe largely controlled by the soils and subsurface minerals.

Baseflow has demonstrated that there is interaction between river and groundwater in the Barotse Floodplain. To understand the nature of connectivity hydrochemistry was applied using the major ions and the stable isotopes of water respectively. This was discussed in chapters 5.1.4 and 5.1.5.

5.1.4 Discussion on hydrochemistry

From the results groundwater in the Barotse Floodplain in both seasons is enriched in Ca, Mg, Na and K. Surface water on the other hand in the dry season is enriched in the order of Ca, Na, Mg and K, whereas in the wet season, it contained Ca with more K than Na and Mg. The increase in K is likely as a result of flooding over the pastureland that increases the nutrients in the surface water (Nyambe et al., 2018). Generally, both groundwater and surface water in the Barotse were composed of Ca, Na then Mg.

The results show that the water type of both surface and groundwater are a CaHCO₃ dominated which is in agreement with other in the basin such as Kabika, (2012) and Banda et al, (2019). According to Banda et al, (2019), the hydrogeochemical evolution of groundwater in this catchment is such that carbonate dissolution during recharge leads to one end-member, CaHCO₃, which further evolves along its flowpath through ion exchange and mixing. The observed CaHCO₃ in the groundwater is therefore likely due to fresh groundwater infiltration which discharges into the river channel. Section 5.1.5 therefore interrogates surface-groundwater interactions using isotopes.

5.1.5 Discussion on stable isotopes

All the groundwater samples plotted at the depleted (negative) part of the LMWL in relation to surface water samples where the majority plotted on the enriched portion (positive). This means that groundwater was not exposed to evaporation and high temperatures when recharged, hence depleted in isotopes of $\delta^2\text{H}$ and $\delta^{18}\text{O}$. The area is underlain by unconsolidated Kalahari sands which tends to have a high local recharge from precipitation (Kabika, 2019). Groundwater samples appear clustered around the same portion of the LMWL. According to Londono et al 2008, this indicates a well-mixed system. Gat, (1996) suggests that isotopic composition of groundwater in temperate climate is close to the average isotopic composition of rainwater. However, Zambia is in a tropical climate, but this fact holds for the Barotse Floodplain. Figure 19 and Figure 20 also shows that the surface water also plots on the LMWL but on the enriched side, which is attributed to evaporation. According to Craig, (1961), evaporated water can be distinguished on the basis if elevated $\delta^2\text{H}$ and $\delta^{18}\text{O}$ isotopes than prescribed by the meteoric water line. The stable isotopes of water during the rainy season were clustered around the depleted portion of the LMWL. This would occurs when there is high local infiltration from precipitation and mixing in the groundwater aquifer. Surface water datasets were spread out on

the LMWL from the depleted regions to the enriched regions. The variations in the isotopic signature indicated several combined local processes such as selective infiltration, evaporation prior to infiltration, direct percolation through preferential channels which do not alter the isotopic composition of the original rain and surface water contribution (Londono et al, 2008). River water in the rainy season plotted in the same portion as groundwater indicating similar origin.

To understand the influence of groundwater discharge to the floodplain. Statistical correlation between baseflow and dissolved oxygen. This was discussed in chapter 5.1.6.

5.1.6 Discussion on statistical results

The statistical correlation (Table 7) shows a strong relationship between DO and baseflow index representing a proportional increase in baseflow with increase in the amount of dissolved oxygen especially in the driest time of the year. Some of the factors that would increase DO in the dry season include reduced decomposition of biodegradable organics by bacteria due to reduced runoff that carries organics material, reduced nitrification that utilizes oxygen during the oxidation of ammonia and organic nitrogen to nitrates and reduced night time respiration by algae and aquatic vascular plants (Whistler, 1996). These factors tend to change the concentration in DO across seasons. According to Chapman, 1996, the variations in DO can occur seasonally, or even over 24-hour periods, in relation to temperature and biological activity. In this study, it was observed that the concentration in DO in the wetland reduces during the rainy (wet) season, likely due to increased organic matter and nutrients resulting into increased microbial activity (respiration). Table 7 suggests that the increase in DO with increased baseflow contribution. The increase in dissolved oxygen in groundwater during the rainy season can be attributed to high infiltration from precipitation and runoff that carries oxygenated water. The isotope data showed a high local infiltration from precipitation in the unconsolidated sediments of the Barotse floodplain, which reduces the residence time for precipitation to recharge groundwater.

CHAPTER 6: CONCLUSION AND RECOMMENDATION

6.1 Conclusion

The following are conclusions of this study:

- i. The Normalised Difference Vegetation Index (NDVI) showed that downstream catchment of Barotse Floodplain was a groundwater diffuse discharge zone, whereas the upper catchment was a surface water infiltration zone.
- ii. Baseflow contribution to the main channel (Zambezi River) was found to have an average of 46 % of the flow during wet season.
- iii. The water chemistry results showed a high concentration in calcium and the bicarbonate ion in both river and groundwater. The similarity in chemistry was indicative of connectivity between river and groundwater
- iv. The stable isotopes of both surface and groundwater plotted on the local meteoric water line indicating meteoric origin. Both river and groundwater were not enriched in the oxygen-18 and deuterium indicating high local infiltration from precipitation. Both river and groundwater were clustered in the depleted zone of the LMWL suggesting high mixing.
- v. The dissolved oxygen increased with baseflow indicative of the critical role that groundwater discharge has to be the main channel (the Zambezi River) in facilitating ecosystem services. This phenomenon indicates that as the floods recede, groundwater discharges highly oxygenated waters to the floodplain that helps sustain the ecosystem. Groundwater plays a critical role in the sustainability of the Barotse ecosystem.
- vi. The Barotse Floodplain is a partially groundwater dependent ecosystem with the upper reaches of the floodplain being an infiltration zone and the lower reaches of the floodplain being a groundwater discharge zone.

6.2 Recommendations

The following recommendations are made based on the experiences and challenges faced in this study.

- i. Water Resources Management Authority (WARMA) needs to install a groundwater monitoring network as it is non-existent.
- ii. The Zambezi River Authority (ZRA) and Water Resources Management Authority (WARMA) should invest in water quality monitoring in the Barotse Floodplain.
- iii. Non-governmental organisations such as WWF should advocate for citizens living around the wetland to participate in monitoring of wetland.
- iv. The Ministry of Water Development and Sanitation through WARMA must develop a statutory instrument to define protection of the upper catchment area. The upper catchment area facilitates recharge to the wetland hence critical.

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APPENDIX

Appendix 1: Dry season physiochemical measurements

X	Y	Sample ID	Sampled Feature	Location	Date	Temperature	Conductivity	pH	Dissolved Oxygen	Samples Collected	S.W.L
726959	8310831	MM001	Water Pool	Mongu	11/14/2019	33.7	155.4	8.109	8.35	3	
723498	8311767	MM002	Water Pool	Mongu	11/14/2019	30.1	190.3	8.95	2.89	3	
721280	8312421	MM003	Water Pool	Mongu	11/14/2019	28.8	120.6	7.97	7.16	3	
721720	8312321	MM004	Water Pool	Mongu	11/14/2019	28	181.8	8.5	4.84	3	
706282	8319570	MM005	Zambezi River (Mongu)	Mongu	11/15/2019	27.2	114.7	8.2	7.09	3	
727750	8310373	MM006	Borehole (Habour)	Mongu Habour	11/15/2019	25.3	106.2	5.7	7.32	3	9.1
697466	8320516	MM007	Handpump	Tapo Tall gate	11/16/2019	25.7	373	7.66	3.64	3	6.02
703312	8319473	MM008	Water Pool	East Zambezi rvr	11/16/2019	26.7	60.3	7.89	7.25	3	
716928	8315432	MM009	Borehole	Lealui M.Hospital	11/16/2019	25.8	58.4	6.75	6.8	3	4.69
721856	8310282	MM010	Little Zambezi	Mongu gauge st	11/16/2019	28.9	113.9	7.94	7.1	3	
727047	8343048	MM011	Handpump	Limulunga	11/17/2019	29.8	670	8.56	5.77	3	
724950	8348559	MM012	Handpump	Limulunga	11/17/2019	29.1	1802	7.58	2.17	3	

723107	8354066	MM013	Handpump	Limulunga	11/17/2019	29.9	674	7.44	5.19	3	
729415	8360304	MM014	Handpump	Mutungu	11/17/2019	29.9	164.9	6.59	6.69	3	
736696	8372605	MM015	Handpump	Mbanga	11/17/2019	29.8	544	7.7	6.33	3	
740258	8391882	MM016	Shallow well	Shahauta	11/17/2019	29.5	44.1	5.42	6.54	3	
743031	8407435	MM017	Shallow well	Lubosi	11/18/2019	28.2	90.4	6.12	5.89	3	
743625	8405322	MM018	Borehole	Lukulu D.Hospital	11/18/2019	28.3	360	7.54	5.16	3	9.29
743644	8405961	MM019	Handpump	lukulu	11/18/2019	28	307	8.76	6.13	3	
743553	8406338	MM020	Water Pool	Lukulu	11/18/2019	27.8	227	7.75	6.25	3	
741066	8406173	MM021	Handpump	Lukulu	11/18/2019	28	638	9	5.46	3	
742250	8407885	MM022	Borehole	Zesco Lukulu	11/18/2019	33.5	475.3	8.103	5.34	3	6.3
742958	8410266	MM023	Borehole	Substation Lukulu	11/18/2019	28.4	340	7.99	6.4	3	
741166	8412142	MM024	Handpump	Lukulu	11/18/2019	28	444	7.7	5.65	3	
740951	8412987	MM025	Handpump	Lukulu	11/18/2019	27.8	419	7.52	4.43	3	
741792	8417603	MM026	Handpump	Lukulu	11/18/2019	27.8	147	6.2	5.5	3	
742093	8419164	MM027	Handpump	Lukulu	11/18/2019	27.6	281	6.8	4.42	3	
741106	8409255	MM028	Zambezi River	Lukulu gauge st	11/18/2019	26.9	194	8.07	7.17	3	

747523	8405399	MM029	Handpump	lyande	11/19/2019	26.1	643	9.5	3.79	3	
741069	8397954	MM030	Handpump	Kawaya	11/20/2019	28.9	450	9.9	6.02	3	
729689	8360751	MM031	Shallow well	Mutungji	11/20/2019	29.1	743	8.2	5.91	3	
721859	8310207	MM032	Rain water	mongu	11/22/2019					3	
732708	8304571	MM033	Handpump	Kashembe	11/20/2019	28.3	12.3	5.69	6.28	3	
736296	8298351	MM034	Handpump	Sefula	11/20/2019	28.3	16.1	5.106	5.81	3	
744942	8277570	MM035	Water Pool	Lui	11/20/2019	28.1	17	6.76	5.89	3	
746736	8264142	MM036	Handpump	Litoya	11/20/2019	27.9	5.5	6.4	5.04	3	
741864	8256747	MM037	Handpump	Nakashindi	11/20/2019	28.2	1.8	5.83	5.28	3	
750261	8230078	MM038	Handpump	Nakogana	11/20/2019	28.4	12.9	6.1	6.33	3	
744735	8315854	MM039	Water Pool	Senanga Village	11/20/2019	24.6	142	7.95	6.52	3	
745088	8217458	MM040	Borehole	OP offices Lukulu	11/20/2019	25.2	402	8	6.5	3	
747226	8221045	MM041	Handpump	Maxanedi pri sch	11/20/2019	25.4	105.9	7.4	6.93	3	
748895	8227740	MM042	Handpump	Lukanda pri sch	11/20/2019	25.1	8.7	6.3	6.88	3	
750165	8231144	MM043	Handpump	Sikuli	20-Nov	24.8	13.5	6.5	5.02	3	
749751	8251237	MM044	Handpump	Liangati	11/20/2019	22.8	10.9	6.73	6.64	3	

744779	8216709	MM045	Senanga gauge st	Zambezi River	11/21/201 9	23.1	114.6	9	7.35	3	
707789	8317156	MM046	Handpump	Lyatolo	11/22/201 9	24.6	872	7.5	6.98	3	
716928	8315432	MM047	Water Pool	Lealui	11/22/201 9	24.7	227	9.1	6.73	3	
710644	8317406	MM048	Water Pool	Lyeneno	11/22/201 9	24.3	117.5	9.3	6.55	3	
716376	8315255	MM049	Water Pool	Mongu	11/22/201 9	24.6	205	10	7.13	3	

Appendix 2: Dry season isotope and water chemistry

X	Y	Sample ID	Sampled Feature	Location	Date	δD (‰)	$\delta^{18}O$ (‰)	Bicarbonate	Calcium	Potassium	Magnesium	Sodium	Sulphate
726959	8310831	MM001	Water Pool	Mongu	11/14/2019	55.0	11.55	133.2	11	4	7	11	2
723498	8311767	MM002	Water Pool	Mongu	11/14/2019	65.6	14.20	167.2	21	2	9	9	3
721280	8312421	MM003	Water Pool	Mongu	11/14/2019	43.3	9.63	134.8	12	2	5	7	2
721720	8312321	MM004	Water Pool	Mongu	11/14/2019	-42.9	-6.72	172	20	2	8	8	3
706282	8319570	MM005	Zambezi River (Mongu)	Mongu	11/15/2019	-22.5	-3.36	110	13	1	5	4	4
727750	8310373	MM006	Borehole (Harbour)	Mongu Harbour	11/15/2019	-49.8	-7.44	64	4	7	6	1	1
697466	8320516	MM007	Handpump	Tapo Tall gate	11/16/2019	-47.7	-6.93	220	64	1	7	5	3
703312	8319473	MM008	Water Pool	East Zambezi rvr	11/16/2019	37.3	8.89	96	5	1	2	5	3
716928	8315432	MM009	Borehole	Lealui M.Hospital	11/16/2019	-43.9	-6.52	58.8	3	3	1	5	6
721856	8310282	MM010	Little Zambezi	Mongu gauge st	11/16/2019	-21.0	-2.75	56.4	12	2	5	4	4
727047	8343048	MM011	Handpump	Limulunga	11/17/2019	-49.6	-6.81	317.6	4	3	1	141	82
724950	8348559	MM012	Handpump	Limulunga	11/17/2019	-51.7	-7.49	562.8	22	4	4	357	462

72310 7	835406 6	MM01 3	Handpum p	Limulunga	11/17/201 9	- 22. 1	-2.57	383.6	63	5	9	79	8
72941 5	836030 4	MM01 4	Handpum p	Mutungi	11/17/201 9	- 40. 7	-6.17	92	16	10	2	7	8
73669 6	837260 5	MM01 5	Handpum p	Mbanga	11/17/201 9	- 44. 8	-6.73	346.4	48	2	6	66	10
74025 8	839188 2	MM01 6	Shallow well	Shahauta	11/17/201 9	- 40. 4	-6.14	71.2	1	1	1	8	1
74303 1	840743 5	MM01 7	Shallow well	Lubosi	11/18/201 9	- 38. 4	-5.93	88.8	1	7	1	13	7
74362 5	840532 2	MM01 8	Borehole	Lukulu D.Hospital	11/18/201 9	- 44. 1	-6.80	274	3	1	1	80	1
74364 4	840596 1	MM01 9	Handpum p	lukulu	11/18/201 9	- 45. 3	-6.64	260	5	2	2	64	3
74355 3	840633 8	MM02 0	Water Pool	Lukulu	11/18/201 9	- 8.4	-0.07	159.6	27	2	7	11	1
74106 6	840617 3	MM02 1	Handpum p	Lukulu	11/18/201 9	- 48. 6	-7.45	280.4	2	1	1	140	47
74225 0	840788 5	MM02 2	Borehole	Zesco Lukulu	11/18/201 9	- 46. 2	-7.16	296.1	9	2	3	89	21
74295 8	841026 6	MM02 3	Borehole	Substatio n Lukulu	11/18/201 9	- 42. 8	-6.68	225.2	57	1	3	14	3
74116 6	841214 2	MM02 4	Handpum p	Lukulu	11/18/201 9	- 44. 0	-6.85	255.2	62	2	9	25	2
74095 1	841298 7	MM02 5	Handpum p	Lukulu	11/18/201 9	- 44. 1	-6.65	184.4	76	1	8	6	2
74179 2	841760 3	MM02 6	Handpum p	Lukulu	11/18/201 9	- 40. 6	-6.22	84	12	1	4	2	1

74209 3	841916 4	MM02 7	Handpum p	Lukulu	11/18/201 9	- 44. 0	-6.81	216.4	42	2	10	3	2
74110 6	840925 5	MM02 8	Zambezi River	Lukulu gauge st	11/18/201 9	- 19. 9	-2.93	159.6	22	2	9	5	8
74752 3	840539 9	MM02 9	Handpum p	lyande	11/19/201 9	- 40. 3	-5.79	452	4	2	2	142	20
74106 9	839795 4	MM03 0	Handpum p	Kaway	11/20/201 9	- 48. 3	-7.21	254.6	2	1	1	97	8
72968 9	836075 1	MM03 1	Shallow well	Mutung	11/20/201 9	- 43. 1	-6.43	269.8	72	78	16	14	24
72185 9	831020 7	MM03 2	Rain water	mongu	11/22/201 9	- 35. 6	-4.96	48.2					4
73270 8	830457 1	MM03 3	Handpum p	Kashemb e	11/20/201 9	- 47. 4	-6.82	33.6	1	1	1	1	1
73629 6	829835 1	MM03 4	Handpum p	Sefula	11/20/201 9	- 44. 9	-6.68	29.4	1	1	1	1	1
74494 2	827757 0	MM03 5	Water Pool	Lui	11/20/201 9	- 41. 0	-5.72	32	1	2	1	1	1
74673 6	826414 2	MM03 6	Handpum p	Litoya	11/20/201 9	- 45. 9	-6.98	25.8	1	1	1	1	1
74186 4	825674 7	MM03 7	Handpum p	Nakashin di	11/20/201 9	- 52. 9	-7.87	32	1	1	1	1	1
75026 1	823007 8	MM03 8	Handpum p	Nakogana	11/20/201 9	- 43. 9	-6.76	23.2	48	1	1	1	1
74473 5	831585 4	MM03 9	Water Pool	Senanga Village	11/20/201 9	23. 3	6.89	79.8	14	2	5	7	2
74508 8	821745 8	MM04 0	Borehole	OP offices Lukulu	11/20/201 9	- 46. 4	-7.03	110.4	43	3	19	3	8

74722 6	822104 5	MM04 1	Handpum p	Maxanedi pri sch	11/20/201 9	- 36. 1	-5.52	29.4	12	1	2	3	1
74889 5	822774 0	MM04 2	Handpum p	Lukanda pri sch	11/20/201 9	- 52. 4	-7.88	25.8	4	1	1	1	1
75016 5	823114 4	MM04 3	Handpum p	Sikuli	20-Nov	- 43. 5	-6.79	29.4	1	1	1	1	1
74975 1	825123 7	MM04 4	Handpum p	Liangati	11/20/201 9	- 46. 3	-7.18	32	1	1	1	1	1
74477 9	821670 9	MM04 5	Senanga gauge st	Zambezi River	11/21/201 9	- 21. 3	-2.69	62.6	12	1	5	4	5
70778 9	831715 6	MM04 6	Handpum p	Lyatolo	11/22/201 9	- 38. 7	-5.64	48.2	58	92	14	23	85
71692 8	831543 2	MM04 7	Water Pool	Lealui	11/22/201 9	42. 5	9.65	110.4	31	2	7	6	19
71064 4	831740 6	MM04 8	Water Pool	Lyeneno	11/22/201 9	25. 9	6.35	71.2	14	1	5	5	2
71637 6	831525 5	MM04 9	Water Pool	Mongu	11/22/201 9	40. 7	9.10	116.6	26	2	8	7	6

Appendix 3: Wet season physiochemical measurements

X	Y	Sample ID	Sampled Feature	Location	Date	Temperature (°C)	Conductivity (µs/cm)	pH	Dissolved Oxygen(mg/L)
741194	8412151	MW001	Handpump	Lukulunga, Lukulu	2/4/2020	26.1	447	7.82	4.76
740950	8412989	MW002	Handpump	Namayula H.Post	2/4/2020	26.4	428	7.79	4.53
742069	8419171	MW003	Handpump	Nkwilimba	2/4/2020	26.4	285	7.1	4.6
741239	8414826	MW004	Handpump	Kamwanya	2/4/2020	26.2	399	7.75	5.4
741106	8409255	MW005	Zambezi River	Lukulu Gauge Station	2/4/2020	26.4	92.3	7.77	6.33
742272	8407901	MW006	Borehole	ZESCO	2/4/2020	26.3	455	8.69	5.9
740832	8406141	MW007	Handpump	Mulongo H.Post	2/4/2020	26.3	520	8.8	5.9
741097	8406180	MW008	Handpump	Mulongo Sec Sch	2/4/2020	26.3	640	9.1	6.05
739641	8405165	MW009	Handpump	Katongwana	2/4/2020	26.4	624	8.92	6.1
743575	8406310	MW010	Boral pit	Lukulu	2/4/2020	26.2	142.6	7.75	6.38
743635	8405958	MW011	Handpump	Chimbanda	2/4/2020	26.2	306	8.81	5
743588	8405441	MW012	Borehole	Lukulu D.Hospital	2/4/2020	26	318	7.6	5.57
741073	8397951	MW013	Handpump	Kawaya	2/4/2020	26.1	504	9.34	5.08
731184	8317979	MW014	Borehole	Kalangu Pri Sch	2/5/2020	25.6	19.8	6.23	5.17
731430	8321023	MW015	Borehole	Mabumbu H.post	2/5/2020	25.4	24.2	6.1	3.98
731054	8324901	MW016	Handpump	Limulunga Com.Sch	2/5/2020	25.3	17	5.96	5.56
730750	8325768	MW017	Handpump	Limulunga Pri.Sch	2/5/2020	25.2	80.8	5.5	6.7

730678	8327002	MW018	Handpump	Mupatu Pri.Sch	2/5/2020	25.2	100	4.94	6.84
727723	8310376	MW019	Borehole	Mongu Habour	2/5/2020	25.2	106	5.83	6.87
726793	8310771	MW020	Water Pool	Mongu	2/5/2020	25.2	125.6	6.88	6.58
724336	8311573	MW021	Water Pool	Mongu	2/5/2020	25.2	177.8	8.12	7.05
723799	8311679	MW022	Water Pool	Mongu	2/5/2020	25.1	176.9	8.102	7.04
721151	8312380	MW023	Water Pool	Mongu	2/5/2020	25.3	89.7	8.71	5.8
707790	8317158	MW024	Handpump	Lyatolo	2/5/2020	25.2	970	7.5	5.6
707575	8316953	MW025	Zambezi River	Lubosi Bridge	2/5/2020	24.9	63.2	8.33	5.51
697462	8320513	MW026	Handpump	Tapo Pri.Sch	2/5/2020	25	360	8.56	5.02
697456	8320875	MW027	Borehole	Tapo Tall Gate	2/5/2020	25.1	283	8.81	5.7
716493	8315220	MW028	Water Pool	Lealui	2/5/2020	25.1	92.5	8.85	5.83
716686	8315817	MW029	Handpump	Lealui Pri.Sch	2/5/2020	25.2	132.1	7.45	4.89
736287	8298367	MW030	Handpump	Sefula	2/6/2020	27.1	27.4	6.15	5.48
736382	8297604	MW031	Handpump	Sefula P.O.A.G	2/6/2020	27.3	17	6.52	5.3
744914	8277616	MW032	Stream	Nalolo. Dist. Offices	2/6/2020	26.9	13.7	6.49	5.79
746863	8264573	MW033	Handpump	Lubosi Pri.Sch	2/6/2020	27	35.7	6.75	5.58
748604	8256748	MW034	Handpump	Matombo	2/6/2020	27.2	10.8	6.47	5.38
749741	8251240	MW035	Handpump	Liangati Pri.Sch	2/6/2020	27	11.9	6.33	6.04
748922	8227723	MW036	Handpump	Lukanda Pri.sch	2/6/2020	26.8	9.2	6.07	4.94
748781	8227742	MW037	Stream	Lukanda Spring	2/6/2020	26.9	15.4	5.6	6.09

747223	8221043	MW038	Handpump	Maxaneidi Pri.Sch	2/6/2020	27.1	98.8	6.8	4.33
745094	8217418	MW039	Handpump	Senanga OP ofiices	2/6/2020	27	402	7.7	6.47
744731	8215863	MW040	Zambezi River	Senanga Gauge Station	2/6/2020	27.1	136.6	8.13	5.55
744906	8217367	MW041	Water Pool	Senanga	2/6/2020	27.1	69.1	7.87	6.22
747794	8223217	MW042	Handpump	Mukuluti Village	2/6/2020	26.9	60	7.75	4.47
749312	8255001	MW043	Handpump	Business Village	2/6/2020	26.8	31.7	6.85	4.33
730062	8312389	MW044	Rain water	Mongu	2/6/2020				

Appendix 4: Wet season isotope and water chemistry

X	Y	Sample ID	Sampled Feature	Location	Date	δD (‰)	$\delta^{18}O$ (‰)	Bicarbonate	Calcium	Potassium	Magnesium	Sodium	Sulphate
74119 4	841215 1	MW00 1	Handpump	Lukulunga, Lukulu	2/4/202 0	-44.8	-6.99	112.6	64	3	9	2	26
74095 0	841298 9	MW00 2	Handpump	Namayula H.Post	2/4/202 0	-44.5	-6.94	114.6	79	2	8	2	7
74206 9	841917 1	MW00 3	Handpump	Nkwilimba	2/4/202 0	-43.7	-6.85	121	44	2	11	1	3
74123 9	841482 6	MW00 4	Handpump	Kamwanya	2/4/202 0	63.3	13.64	126	68	2	9	3	11
74110 6	840925 5	MW00 5	Zambezi River	Lukulu Gaugue Station	2/4/202 0	-43.0	-6.45	34.6	11	1	4	3	2
74227 2	840790 1	MW00 6	Borehole	ZESCO	2/4/202 0	-46.6	-7.13	186.2	9	2	3	20	97
74083 2	840614 1	MW00 7	Handpump	Mulongo H.Post	2/4/202 0	-46.6	-7.10	212	4	2	1	25	119
74109 7	840618 0	MW00 8	Handpump	Mulongo Sec Sch	2/4/202 0	-48.8	-7.40	238.8	2	1	1	45	152
73964 1	840516 5	MW00 9	Handpump	Katongwan a	2/4/202 0	-48.4	-7.32	239.2	3	1	1	46	144
74357 5	840631 0	MW01 0	Boral pit	Lukulu	2/4/202 0	-49.7	-6.90	49.2	13	4	3	1	12
74363 5	840595 8	MW01 1	Handpump	Chimbanda	2/4/202 0	-45.4	-6.66	150.8	4	2	2	2	68
74358 8	840544 1	MW01 2	Borehole	Lukulu D.Hospital	2/4/202 0	-42.6	-6.44	152.6	26	1	10	1	36
74107 3	839795 1	MW01 3	Handpump	Kawayya	2/4/202 0	-48.5	-7.20	233.8	2	2	1	12	121
73118 4	831797 9	MW01 4	Borehole	Kalangu Pri Sch	2/5/202 0	-39.3	-5.43	17	1	1	1	1	2

73143 0	832102 3	MW01 5	Borehole	Mabumbu H.post	2/5/202 0	-29.4	-3.56	14.8	1	1	1	1	2
73105 4	832490 1	MW01 6	Handpump	Limulunga Com.Sch	2/5/202 0	-47.9	-7.21		1	1	1	1	1
73075 0	832576 8	MW01 7	Handpump	Limulunga Pri.Sch	2/5/202 0	-44.0	-6.67		3	3	2	1	4
73067 8	832700 2	MW01 8	Handpump	Mupatu Pri.Sch	2/5/202 0	-40.9	-6.42		1	1	1	1	1
72772 3	831037 6	MW01 9	Borehole	Mongu Habour	2/5/202 0	-48.7	-7.28	8.6	4	7	6	1	1
72679 3	831077 1	MW02 0	Water Pool	Mongu	2/5/202 0	-2.3	2.30	52.2	10	3	6	3	9
72433 6	831157 3	MW02 1	Water Pool	Mongu	2/5/202 0	-2.6	2.75	77.4	23	2	7	2	8
72379 9	831167 9	MW02 2	Water Pool	Mongu	2/5/202 0	-18.3	0.14	83	10	4	3	4	2
72115 1	831238 0	MW02 3	Water Pool	Mongu	2/5/202 0	-42.4	-6.03	32	67	112	14	72	28
70779 0	831715 8	MW02 4	Handpump	Lyatolo	2/5/202 0	-39.2	-5.86	35	6	1	2	2	2
70757 5	831695 3	MW02 5	Zambezi River	Lubosi Bridge	2/5/202 0	-45.5	-6.61	21.8	68	1	7	3	6
69746 2	832051 3	MW02 6	Handpump	Tapo Pri.Sch	2/5/202 0	-47.2	-6.90	172	57	1	5	5	1
69745 6	832087 5	MW02 7	Borehole	Tapo Tall Gate	2/5/202 0	-46.4	-6.82	123.8	11	3	4	4	2
71649 3	831522 0	MW02 8	Water Pool	Lealui	2/5/202 0	-43.6	-6.13	36.8	2	2	1	6	22
71668 6	831581 7	MW02 9	Handpump	Lealui Pri.Sch	2/5/202 0	-45.6	-6.89	28.2	1	1	1	1	1
73628 7	829836 7	MW03 0	Handpump	Sefula	2/6/202 0	-44.4	-6.74	1	1	1	1	1	1

73638 2	829760 4	MW03 1	Handpump	Sefula P.O.A.G	2/6/202 0	-43.8	-6.68	1	1	1	1	1	1
74491 4	827761 6	MW03 2	Stream	Nalolo. Dist. Offices	2/6/202 0	-40.8	-5.89						
74686 3	826457 3	MW03 3	Handpump	Lubosi Pri.Sch	2/6/202 0	-50.2	-7.52	10.8	1	1	1	1	1
74860 4	825674 8	MW03 4	Handpump	Matombo	2/6/202 0	-52.7	-7.76	1	1	1	1	1	1
74974 1	825124 0	MW03 5	Handpump	Liangati Pri.Sch	2/6/202 0	-47.9	-7.17	1	1	1	1	1	1
74892 2	822772 3	MW03 6	Handpump	Lukanda Pri.sch	2/6/202 0	-52.9	-7.74	1	1	1	1	1	1
74878 1	822774 2	MW03 7	Stream	Lukanda Spring	2/6/202 0	-45.2	-6.80	1	1	1	1	1	1
74722 3	822104 3	MW03 8	Handpump	Maxaneidi Pri.Sch	2/6/202 0	-46.7	-6.94	17.2	11	1	3	1	3
74509 4	821741 8	MW03 9	Handpump	Senanga OP ofiices	2/6/202 0	-36.4	-5.40	84	47	3	21	8	3
74473 1	821586 3	MW04 0	Zambezi River	Senanga Gauge Station	2/6/202 0	-45.2	-6.28	24.2	8	1	3	3	2
74490 6	821736 7	MW04 1	Water Pool	Senanga	2/6/202 0	1.4	3.29	49.8	15	2	6	2	7
74779 4	822321 7	MW04 2	Handpump	Mukuluti Village	2/6/202 0	-50.5	-7.23	28.4	7	2	1	1	1
74931 2	825500 1	MW04 3	Handpump	Business Village	2/6/202 0	-49.6	-7.14		2	242	54	1	2
73006 2	831238 9	MW04 4	Rain water	Mongu	2/6/202 0	-57.4	-7.49	14.8	1	1	1	1	1

Date	NDVI	Discharge	baseflow	quickflow	BFI
10/1/2004	0.3186	224.6	187.1667	11.52285	0.833333
10/2/2004	0.3184	223	187.6827	35.31731	0.841626
10/3/2004	0.3182	220.9	188.1843	32.71565	0.851898
10/4/2004	0.3177	218.4	188.6727	29.72731	0.863886
10/5/2004	0.3172	217.8	189.1487	28.65129	0.868451
10/6/2004	0.3168	216.8	189.6131	27.18693	0.874599
10/7/2004	0.316	216	190.0663	25.93368	0.879937
10/8/2004	0.3048	215.5	190.5089	24.99105	0.884032
10/9/2004	0.3044	215.1	190.9414	24.15863	0.887687
10/10/2004	0.3009	214.4	191.364	23.03604	0.892556
10/11/2004	0.3017	213	191.7772	21.22278	0.900363
10/12/2004	0.3046	212	192.1818	19.81823	0.906518
10/13/2004	0.2979	212	192.5781	19.42186	0.908387
10/14/2004	0.2961	212.7	192.9666	19.73336	0.907224
10/15/2004	0.2906	213.4	193.3477	20.05234	0.906034
10/16/2004	0.3111	213.8	193.7216	20.07842	0.906088
10/17/2004	0.3121	214.3	194.0887	20.21127	0.905687
10/18/2004	0.3125	213.6	194.4493	19.15069	0.910343
10/19/2004	0.3152	213.3	194.8033	18.49669	0.913283
10/20/2004	0.3154	213	195.1507	17.84931	0.9162
10/21/2004	0.3156	214.6	195.4916	19.10836	0.910958
10/22/2004	0.3157	216.8	195.8268	20.97321	0.90326

10/23/2004	0.3161	218.2	196.157	22.04301	0.898978
10/24/2004	0.321	219.4	196.4827	22.91735	0.895545
10/25/2004	0.3234	219.3	196.8028	22.49718	0.897414
10/26/2004	0.3246	218.3	197.1165	21.18348	0.902962
10/27/2004	0.322	217.5	197.4238	20.07618	0.907696
10/28/2004	0.3217	216.6	197.7248	18.87517	0.912857
10/29/2004	0.3215	214.8	198.0196	16.78039	0.921879
10/30/2004	0.3217	213.9	198.3083	15.59172	0.927107
10/31/2004	0.3283	214.9	198.5909	16.30907	0.924109
11/1/2004	0.3184	214.7	198.8677	15.83233	0.926258
11/2/2004	0.3184	213.2	199.1386	14.06139	0.934046
11/3/2004	0.3161	212.4	199.4039	12.99609	0.938813
11/4/2004	0.3154	212.4	199.6638	12.73617	0.940037
11/5/2004	0.3155	213	199.9186	13.08139	0.938585
11/6/2004	0.3157	214	200.1686	13.83142	0.935367
11/7/2004	0.3155	214.5	200.4141	14.08587	0.934332
11/8/2004	0.3195	214.6	200.6555	13.94445	0.935021
11/9/2004	0.3197	215.2	200.893	14.30696	0.933518
11/10/2004	0.3226	216.7	201.1269	15.57306	0.928135
11/11/2004	0.3171	218.9	201.3579	17.54213	0.919862
11/12/2004	0.3178	219.4	201.5865	17.8135	0.918808
11/13/2004	0.3115	219.5	201.8132	17.68683	0.919422
11/14/2004	0.312	220.3	202.038	18.26199	0.917104
11/15/2004	0.3273	221.5	202.2613	19.23872	0.913143
11/16/2004	0.3273	224.2	202.4836	21.71644	0.903138

11/17/2004	0.3208	228.2	202.7059	25.49414	0.888282
11/18/2004	0.3211	228.4	202.9292	25.47083	0.888481
11/19/2004	0.3216	229.8	203.1539	26.64606	0.884047
11/20/2004	0.3217	232	203.3806	28.61944	0.87664
11/21/2004	0.3222	235.1	203.6097	31.49027	0.866056
11/22/2004	0.3005	236.8	203.8423	32.95771	0.86082
11/23/2004	0.2996	238	204.0788	33.92123	0.857474
11/24/2004	0.3436	239.5	204.3195	35.18051	0.853108
11/25/2004	0.3449	241.7	204.5648	37.13519	0.846358
11/26/2004	0.3462	244.5	204.8153	39.68467	0.837691
11/27/2004	0.3547	247	205.0718	41.92822	0.83025
11/28/2004	0.3558	249.5	205.3348	44.16516	0.822985
12/3/2004	0.4006	267.2	205.6067	61.59332	0.769486
12/4/2004	0.401	272.8	205.8912	66.90883	0.754733
12/5/2004	0.4012	291.9	206.1925	85.70749	0.706381
12/6/2004	0.4016	300.1	206.5151	93.58489	0.688154
12/7/2004	0.3911	304.1	206.862	97.23805	0.680243
12/8/2004	0.3972	306.4	207.2338	99.16621	0.67635
12/9/2004	0.3974	310.3	207.6307	102.6693	0.669129
12/10/2004	0.3975	313.1	208.0529	105.0471	0.664493
12/11/2004	0.3971	316	208.5004	107.4996	0.659811
12/12/2004	0.3972	318.6	208.9731	109.6269	0.655911
12/13/2004	0.3969	320.9	209.4709	111.4291	0.652761
12/14/2004	0.3966	323.2	209.9936	113.2064	0.649733
12/15/2004	0.3971	326.3	210.541	115.759	0.645237
12/16/2004	0.3973	328.2	211.1128	117.0872	0.643245
12/17/2004	0.3973	339	211.7098	127.2902	0.624513
12/18/2004	0.3973	342.1	212.3332	129.7668	0.620676
12/19/2004	0.3951	343	212.9837	130.0163	0.620944

12/20/2004	0.3955	344.8	213.6605	131.1395	0.619665
12/21/2004	0.3956	347.2	214.363	132.837	0.617405
12/22/2004	0.3957	351.9	215.091	136.809	0.611228
12/23/2004	0.4096	355.1	215.8448	139.2552	0.607842
12/28/2004	0.4043	383.7	216.627	167.073	0.564574
12/29/2004	0.4119	389.1	217.4427	171.6573	0.558835
12/30/2004	0.4169	395.7	218.2949	177.4051	0.551668
12/31/2004	0.4168	408.1	219.1849	188.9151	0.537086
1/1/2005	0.417	417.6	220.1149	197.4851	0.527095
1/2/2005	0.4171	440	221.0884	218.9116	0.502474
1/3/2005	0.4171	460.5	222.1107	238.3893	0.482325
1/4/2005	0.423	476	223.1874	252.8126	0.468881
1/5/2005	0.4231	492.4	224.3226	268.0774	0.45557
1/6/2005	0.4232	521.3	225.5214	295.7786	0.432614
1/7/2005	0.423	549.2	226.7909	322.4091	0.412948
1/8/2005	0.4229	567.7	228.1382	339.5618	0.401864
1/9/2005	0.4227	589.9	229.5683	360.3317	0.389165
1/10/2005	0.4227	624.8	231.0872	393.7128	0.369858
1/11/2005	0.4221	659.9	232.7035	427.1965	0.352634
1/12/2005	0.4221	692.7	234.4263	458.2737	0.338424
1/13/2005	0.4329	713.2	236.2631	476.9369	0.331272
1/14/2005	0.4295	732.3	238.2177	494.0823	0.325301
1/26/2005	0.4223	1100	240.3274	859.6726	0.218479
1/27/2005	0.4086	1142	242.6649	899.3351	0.212491
1/28/2005	0.4077	1183	245.2695	937.7305	0.207328
1/29/2005	0.4183	1210	248.1446	961.8554	0.205078
1/30/2005	0.3905	1239	251.2908	987.7092	0.202817
1/31/2005	0.3979	1259	254.7066	1004.293	0.202309
2/1/2005	0.4001	1293	258.3902	1034.61	0.199838

2/2/2005	0.3996	1309	262.34	1046.66	0.200413
2/3/2005	0.3993	1322	266.5518	1055.448	0.201628
2/4/2005	0.3989	1325	271.0179	1053.982	0.204542
2/5/2005	0.3986	1323	275.7283	1047.272	0.208411
2/6/2005	0.3986	1320	280.671	1039.329	0.21263
2/7/2005	0.3986	1314	285.8334	1028.167	0.217529
2/8/2005	0.3979	1311	291.2029	1019.797	0.222123
2/9/2005	0.3975	1310	296.7678	1013.232	0.22654
2/10/2005	0.3969	1310	302.5179	1007.482	0.23093
2/11/2005	0.3957	1313	308.4435	1004.557	0.234915
2/12/2005	0.3966	1320	314.5366	1005.463	0.238285
2/13/2005	0.4052	1332	320.7912	1011.209	0.240834
2/14/2005	0.4124	1346	327.2028	1018.797	0.243093
2/15/2005	0.4115	1361	333.7681	1027.232	0.245237
2/16/2005	0.4097	1376	340.4843	1035.516	0.247445
2/17/2005	0.4077	1381	347.3477	1033.652	0.251519
2/18/2005	0.4103	1385	354.3527	1030.647	0.25585
2/19/2005	0.4109	1393	361.493	1031.507	0.259507
2/20/2005	0.4113	1406	368.7636	1037.236	0.262279
2/21/2005	0.4116	1411	376.1604	1034.84	0.266591
2/22/2005	0.412	1418	383.6784	1034.322	0.270577
2/23/2005	0.4159	1417	391.3117	1025.688	0.276155
2/24/2005	0.4053	1409	399.0522	1009.948	0.283217
2/25/2005	0.4075	1384	406.8885	977.1115	0.293995
2/26/2005	0.405	1401	414.8095	986.1905	0.296081
2/27/2005	0.4046	1384	422.8079	961.1921	0.305497
2/28/2005	0.4025	1332	430.7667	901.2333	0.323398
3/1/2005	0.4234	1300	438.5669	861.4331	0.337359
3/2/2005	0.4295	1276	446.2029	829.7971	0.349689

3/3/2005	0.4337	1252	453.6742	798.3258	0.36236
3/4/2005	0.4334	1234	460.9804	773.0196	0.373566
3/5/2005	0.4317	1221	468.1213	752.8787	0.383392
3/6/2005	0.4307	1209	475.097	733.903	0.392967
3/7/2005	0.4336	1196	481.9075	714.0925	0.402933
3/8/2005	0.4343	1184	488.5528	695.4472	0.412629
3/9/2005	0.4351	1172	495.0334	676.9666	0.422383
3/10/2005	0.4355	1158	501.3494	656.6506	0.432944
3/11/2005	0.4284	1144	507.5012	636.4988	0.44362
3/12/2005	0.4242	1131	513.4895	617.5105	0.454014
3/13/2005	0.4488	1120	519.3147	600.6853	0.463674
3/14/2005	0.457	1112	524.9774	587.0226	0.472102
3/15/2005	0.5105	1109	530.4784	578.5216	0.478339
3/16/2005	0.52	1095	535.8183	559.1817	0.489332
3/17/2005	0.5197	1083	540.998	542.002	0.499536
3/18/2005	0.519	1071	546.0181	524.9819	0.509821
3/19/2005	0.512	1066	550.8796	515.1204	0.516773
3/20/2005	0.5117	1059	555.5834	503.4166	0.52463
3/21/2005	0.5153	1052	560.1303	491.8697	0.532443
3/22/2005	0.5156	1048	564.5213	483.4787	0.538665
3/23/2005	0.5024	1049	568.7572	480.2428	0.54219
3/24/2005	0.5022	1055	572.8389	482.1611	0.542975
3/25/2005	0.5415	1059	576.7673	482.2327	0.544634
3/26/2005	0.5216	1062	580.5431	481.4569	0.546651
3/27/2005	0.5219	1065	584.1668	480.8332	0.548513
3/28/2005	0.5577	1072	587.6391	484.3609	0.548171
3/29/2005	0.5393	1091	590.9604	500.0396	0.541669
3/30/2005	0.5336	1105	594.1312	510.8688	0.537675
3/31/2005	0.5335	1120	597.1515	522.8485	0.533171

4/1/2005	0.4657	1130	600.0213	529.9787	0.530992
4/2/2005	0.4661	1131	602.7406	528.2594	0.532927
4/3/2005	0.464	1138	605.3092	532.6908	0.531906
4/4/2005	0.466	1219	607.7266	611.2734	0.498545
4/5/2005	0.466	1252	609.9923	642.0077	0.487214
4/6/2005	0.4598	1314	612.105	701.895	0.465833
4/7/2005	0.4661	1353	614.0631	738.9369	0.453853
4/8/2005	0.456	1384	615.8648	768.1352	0.444989
4/9/2005	0.4736	1409	617.5077	791.4923	0.43826
4/10/2005	0.4611	1425	618.9892	806.0108	0.434378
4/11/2005	0.4624	1437	620.3069	816.6931	0.431668
4/12/2005	0.4595	1444	621.4577	822.5423	0.430372
4/13/2005	0.459	1441	622.4389	818.5611	0.431949
4/14/2005	0.4604	1430	623.2475	806.7525	0.435837
4/15/2005	0.4588	1418	623.8808	794.1192	0.439972
4/16/2005	0.4508	1407	624.3359	782.6641	0.443736
4/17/2005	0.4625	1393	624.6102	768.3898	0.448392
4/18/2005	0.4716	1370	624.6257	745.3743	0.455931
4/19/2005	0.4663	1339	615.2703	723.7297	0.4595
4/20/2005	0.4684	1314	605.6189	708.3811	0.460897
4/21/2005	0.4683	1298	595.6775	702.3225	0.458919
4/22/2005	0.4672	1268	585.4508	682.5492	0.461712
4/23/2005	0.4665	1211	574.9482	636.0518	0.474771
4/24/2005	0.4629	1168	564.1846	603.8154	0.483035
4/25/2005	0.4418	1118	553.1753	564.8247	0.49479
4/26/2005	0.442	1066	542.3214	523.6786	0.508744
4/27/2005	0.4367	1036	531.9402	504.0598	0.513456
4/28/2005	0.4371	1024	521.7757	502.2243	0.509547
4/29/2005	0.4321	1014	511.6282	502.3718	0.504564

4/30/2005	0.4321	981.1	501.7115	479.3885	0.511376
5/1/2005	0.4299	919.5	492.5566	426.9434	0.535679
5/2/2005	0.4295	889.5	484.1496	405.3504	0.544294
5/3/2005	0.4322	872.5	476.0506	396.4494	0.545617
5/4/2005	0.4283	851.3	468.1761	383.1239	0.549954
5/5/2005	0.4191	834	460.5338	373.4662	0.552199
5/6/2005	0.42	820.4	453.0508	367.3492	0.552232
5/7/2005	0.4191	803.6	445.7253	357.8747	0.554661
5/8/2005	0.4198	785.4	438.6075	346.7925	0.558451
5/9/2005	0.4185	760.1	431.7882	328.3118	0.568068
5/10/2005	0.4104	740.7	425.286	315.414	0.574168
5/11/2005	0.4102	723.3	419.0265	304.2735	0.579326
5/12/2005	0.4052	707.2	412.9811	294.2189	0.583967
5/13/2005	0.396	690.2	407.1501	283.0499	0.589902
5/14/2005	0.3923	674.3	401.5358	272.7642	0.595485
5/15/2005	0.3895	661.6	396.0988	265.5012	0.598698
5/16/2005	0.3915	647.2	390.8274	256.3726	0.603874
5/17/2005	0.3867	632	385.7504	246.2496	0.610365
5/18/2005	0.3868	617.8	380.8698	236.9302	0.616494
5/19/2005	0.3783	602.9	376.1865	226.7135	0.623962
5/20/2005	0.3746	583.6	371.7566	211.8434	0.637006
5/21/2005	0.3729	570.6	367.5659	203.0341	0.644174
5/22/2005	0.3784	566	363.4693	202.5307	0.642172
5/23/2005	0.3736	558.6	359.4116	199.1884	0.643415
5/24/2005	0.3648	545.2	355.4832	189.7168	0.652024
5/25/2005	0.3644	537.4	351.691	185.709	0.654431
5/26/2005	0.3632	528.5	347.9919	180.5081	0.658452
5/27/2005	0.3633	519.5	344.3999	175.1001	0.662945
5/28/2005	0.3623	513.5	340.8876	172.6124	0.663851

5/29/2005	0.357	507.2	337.4292	169.7708	0.665278
5/30/2005	0.3559	500.3	334.0349	166.2651	0.667669
5/31/2005	0.352	490.3	330.7438	159.5562	0.674574
6/1/2005	0.352	482.1	327.5712	154.5288	0.679467
6/2/2005	0.3481	474.9	324.491	150.409	0.683283
6/3/2005	0.3476	468.1	321.4909	146.6091	0.6868
6/4/2005	0.3444	460.8	318.5733	142.2267	0.691348
6/5/2005	0.3446	454.7	315.733	138.967	0.694376
6/6/2005	0.3395	448.4	312.9612	135.4388	0.697951
6/7/2005	0.338	443.5	310.2472	133.2528	0.699543
6/8/2005	0.3382	435.9	307.6053	128.2947	0.705678
6/9/2005	0.337	430.5	305.0421	125.4579	0.708576
6/10/2005	0.337	425.7	302.5307	123.1693	0.710666
6/11/2005	0.3352	421.1	300.064	121.036	0.712572
6/12/2005	0.3338	416.3	297.6428	118.6572	0.714972
6/13/2005	0.3383	411.5	295.2703	116.2297	0.717546
6/14/2005	0.337	407	292.9441	114.0559	0.719764
6/15/2005	0.3349	401.2	290.6756	110.5244	0.724516
6/16/2005	0.3345	397	288.4629	108.5371	0.726607
6/17/2005	0.334	392.4	286.2948	106.1052	0.729599
6/18/2005	0.3324	389.7	284.1569	105.5431	0.729168
6/19/2005	0.3326	384.3	282.0581	102.2419	0.733953
6/20/2005	0.3294	378.5	280.0307	98.46928	0.739843
6/21/2005	0.3292	374.2	278.065	96.13498	0.743092
6/22/2005	0.3264	370	276.1459	93.85406	0.74634
6/23/2005	0.3266	367.5	274.2561	93.24394	0.746275
6/24/2005	0.3254	364.5	272.3837	92.11627	0.74728
6/25/2005	0.3182	362	270.5293	91.47068	0.747319
6/26/2005	0.3168	359.6	268.6871	90.91294	0.747183

6/27/2005	0.3128	357	266.8582	90.14177	0.747502
6/28/2005	0.3075	353.4	265.0553	88.34467	0.750015
6/29/2005	0.3057	350.4	263.283	87.11701	0.751378
6/30/2005	0.3073	346.1	261.549	84.55103	0.755703
7/1/2005	0.3029	343	259.8551	83.14493	0.757595
7/2/2005	0.2974	340	258.1889	81.81115	0.759379
7/3/2005	0.2976	336.8	256.5519	80.24811	0.761734
7/4/2005	0.2926	333.5	254.9478	78.55215	0.764461
7/5/2005	0.2885	330.2	253.3784	76.82159	0.767348
7/6/2005	0.2803	328.6	251.827	76.77305	0.766363
7/7/2005	0.2866	327.6	250.2704	77.32964	0.763951
7/8/2005	0.2812	326.1	248.7075	77.39249	0.762673
7/9/2005	0.2869	322.8	247.1617	75.63826	0.765681
7/10/2005	0.2872	319.7	245.6497	74.05026	0.768376
7/11/2005	0.2877	317.9	244.1569	73.74312	0.76803
7/12/2005	0.288	314.4	242.6876	71.71237	0.771907
7/13/2005	0.2895	312.7	241.2415	71.45854	0.771479
7/14/2005	0.2907	311.3	239.7974	71.50259	0.77031
7/15/2005	0.2981	308.7	238.3647	70.3353	0.772156
7/16/2005	0.2976	307.4	236.9426	70.45745	0.770796
7/17/2005	0.2978	305.7	235.522	70.17801	0.770435
7/18/2005	0.2946	304.1	234.1061	69.99389	0.769833
7/19/2005	0.2948	302.1	232.6981	69.40192	0.770268
7/20/2005	0.2947	300.2	231.3011	68.8989	0.77049
7/21/2005	0.2963	298.1	229.9164	68.18357	0.771273
7/22/2005	0.2974	295.3	228.5535	66.7465	0.773971
7/23/2005	0.293	293.5	227.2097	66.29031	0.774139
7/24/2005	0.2897	292.4	225.8681	66.53195	0.772463
7/25/2005	0.2859	290.8	224.5266	66.27342	0.7721

7/26/2005	0.2859	288.4	223.1986	65.20145	0.77392
7/27/2005	0.2847	286	221.8924	64.1076	0.775848
7/28/2005	0.2846	283.8	220.6065	63.19347	0.777331
7/29/2005	0.2821	281.4	219.3414	62.05864	0.779465
7/30/2005	0.2831	279.8	218.0912	61.70882	0.779454
7/31/2005	0.2802	278.3	216.8471	61.45287	0.779185
8/1/2005	0.2781	274.3	215.6338	58.6662	0.786124
8/2/2005	0.2788	272.6	214.4539	58.14612	0.786698
8/3/2005	0.2788	272.3	213.2703	59.02972	0.783218
8/4/2005	0.2786	271.2	212.0768	59.12318	0.781994
8/5/2005	0.279	269	210.8927	58.10733	0.783988
8/6/2005	0.2782	266.7	209.7303	56.96972	0.78639
8/7/2005	0.2797	265.8	208.5768	57.22318	0.784713
8/8/2005	0.2831	263.9	207.4284	56.47162	0.786011
8/9/2005	0.2852	262.2	206.2932	55.90675	0.786778
8/10/2005	0.2857	261.7	205.1574	56.5426	0.783941
8/11/2005	0.2848	260.8	204.0127	56.78735	0.782257
8/12/2005	0.2823	259	202.8721	56.12791	0.78329
8/13/2005	0.282	257.4	201.743	55.65705	0.783772
8/14/2005	0.283	255.4	200.6275	54.7725	0.785542
8/15/2005	0.2817	253.3	199.5311	53.76888	0.787727
8/16/2005	0.2816	252.4	198.443	53.95702	0.786224
8/17/2005	0.2807	251.4	197.352	54.04798	0.785012
8/18/2005	0.2808	250.5	196.2582	54.24181	0.783466
8/19/2005	0.2802	249.6	195.1604	54.4396	0.781893
8/20/2005	0.2802	248	194.0657	53.93429	0.782523
8/21/2005	0.2792	245.9	192.9864	52.91356	0.784817
8/22/2005	0.2789	244	191.926	52.07404	0.786582
8/23/2005	0.2776	241.9	190.8847	51.01535	0.789106

8/24/2005	0.2783	240.9	189.8537	51.04627	0.788102
8/25/2005	0.277	239.2	188.8293	50.37069	0.78942
8/26/2005	0.2766	237.6	187.8177	49.78234	0.790478
8/27/2005	0.2765	236.8	186.8099	49.99014	0.788893
8/28/2005	0.2761	235.5	185.8029	49.69708	0.788972
8/29/2005	0.2757	234.2	184.802	49.39804	0.789078
8/30/2005	0.2758	232.2	183.8142	48.38576	0.79162
8/31/2005	0.2754	229.3	182.8564	46.44363	0.797455
9/1/2005	0.2731	228.5	181.9167	46.58329	0.796134
9/2/2005	0.2769	227.8	180.9732	46.82683	0.794439
9/3/2005	0.2737	227	180.0257	46.97432	0.793065
9/4/2005	0.2733	225.2	179.0854	46.11461	0.795228
9/5/2005	0.2834	223.8	178.1586	45.64144	0.796061
9/6/2005	0.284	221.6	177.2496	44.35045	0.799863
9/7/2005	0.2841	220.4	176.3567	44.04331	0.800166
9/8/2005	0.2746	218.3	175.4793	42.82073	0.803845
9/9/2005	0.2797	216.6	174.6227	41.97727	0.806199
9/10/2005	0.2779	214	173.7926	40.20742	0.812115
9/11/2005	0.2739	212.3	172.9894	39.31063	0.814835
9/12/2005	0.2732	211	172.2004	38.79963	0.816116
9/13/2005	0.2731	210.5	171.4136	39.08635	0.814317
9/14/2005	0.273	209.9	170.6221	39.27791	0.812873
9/15/2005	0.2725	208.4	169.8358	38.5642	0.814951
9/16/2005	0.2727	206.7	169.0661	37.63387	0.81793
9/17/2005	0.2677	204.8	168.3175	36.48252	0.821863
9/18/2005	0.2636	204.1	167.5801	36.51992	0.821068
9/19/2005	0.262	203.4	166.8419	36.55808	0.820265
9/20/2005	0.2601	202.6	166.104	36.496	0.819862
9/21/2005	0.263	201.2	165.3735	35.82654	0.821936

9/22/2005	0.2578	199.4	164.6607	34.73932	0.825781
9/23/2005	0.2572	198.3	163.9629	34.33706	0.826843
9/24/2005	0.2535	197.8	163.2673	34.53272	0.825416
9/25/2005	0.2473	197.1	162.5697	34.53032	0.824808
9/26/2005	0.2428	195.1	161.8854	33.21462	0.829756
9/27/2005	0.2427	193.8	161.2208	32.5792	0.831893
9/28/2005	0.2416	193.4	160.56	32.84	0.830196
9/29/2005	0.2414	192.4	159.9	32.5	0.831081
9/30/2005	0.2411	191.1	159.25	31.85	0.833333
10/1/2005	0.3259	190.3	158.5833	14.05709	0.833333
10/2/2005	0.3263	188.8	158.8467	29.95329	0.841349
10/3/2005	0.326	188	159.1032	28.8968	0.846294
10/4/2005	0.3263	187.9	159.353	28.54695	0.848074
10/5/2005	0.3262	187.4	159.5964	27.8036	0.851635
10/6/2005	0.326	186.1	159.8335	26.26655	0.858858
10/7/2005	0.3258	185.8	160.0644	25.73556	0.861488
10/8/2005	0.3274	185.3	160.2896	25.01044	0.865027
10/9/2005	0.3316	184.1	160.509	23.59099	0.871858
10/10/2005	0.3288	183.3	160.7231	22.57695	0.876831
10/11/2005	0.3564	181.8	160.932	20.86803	0.885214
10/12/2005	0.3596	181.6	161.1361	20.46395	0.887313
10/13/2005	0.3283	181.5	161.3355	20.16455	0.888901
10/14/2005	0.331	181.3	161.5303	19.76975	0.890956
10/15/2005	0.3315	180.3	161.7206	18.57942	0.896953
10/16/2005	0.3318	179	161.9067	17.09332	0.904507
10/17/2005	0.3365	177.4	162.0889	15.3111	0.913692
10/18/2005	0.3367	176.6	162.2676	14.33243	0.918842
10/19/2005	0.3377	175.9	162.443	13.45704	0.923496
10/20/2005	0.3361	175.1	162.6153	12.48471	0.9287

10/21/2005	0.3337	174.4	162.7848	11.61525	0.933399
10/22/2005	0.3378	174.1	162.9515	11.14846	0.935965
10/23/2005	0.3307	173.9	163.1158	10.78422	0.937986
10/24/2005	0.3315	173.9	163.2775	10.62245	0.938916
10/25/2005	0.3285	174	163.4369	10.56311	0.939292
10/26/2005	0.3222	174.7	163.5939	11.1061	0.936428
10/27/2005	0.3151	175.5	163.7487	11.75126	0.933041
10/28/2005	0.3244	176.3	163.9016	12.39839	0.929674
10/29/2005	0.321	176.8	164.0527	12.7473	0.9279
10/30/2005	0.3223	177.3	164.2022	13.09784	0.926126
10/31/2005	0.3226	178	164.3501	13.64987	0.923315
11/1/2005	0.3173	176.9	164.4967	12.40333	0.929885
11/2/2005	0.3175	176.7	164.6417	12.05832	0.931758
11/3/2005	0.3182	176.5	164.7851	11.71491	0.933627
11/4/2005	0.3187	176.3	164.9269	11.37314	0.93549
11/5/2005	0.3117	175.9	165.067	10.83304	0.938414
11/6/2005	0.3162	175.1	165.2053	9.894695	0.943491
11/7/2005	0.316	174.9	165.3418	9.558211	0.94535
11/8/2005	0.317	176.1	165.4764	10.62356	0.939673
11/9/2005	0.3176	176.6	165.6094	10.99057	0.937766
11/10/2005	0.3211	179.2	165.7411	13.45895	0.924894
11/11/2005	0.3253	183.9	165.8719	18.0281	0.901968
11/12/2005	0.338	186	166.0028	19.99723	0.892488
11/13/2005	0.3386	188.7	166.1343	22.56573	0.880415
11/14/2005	0.3395	194.1	166.2671	27.83292	0.856605
11/15/2005	0.3499	197.6	166.4021	31.1979	0.842116
11/16/2005	0.3508	198.4	166.54	31.86004	0.839415
11/17/2005	0.3579	199.1	166.6809	32.41912	0.837172
11/18/2005	0.359	200.6	166.8249	33.77505	0.83163

11/19/2005	0.3604	200.8	166.9723	33.82775	0.831535
11/20/2005	0.3612	201	167.1228	33.87722	0.831457
11/21/2005	0.3756	201.7	167.2765	34.42353	0.829333
11/22/2005	0.3762	203	167.4334	35.56663	0.824795
11/23/2005	0.3759	202.8	167.5935	35.20648	0.826398
11/24/2005	0.3758	204	167.7569	36.24311	0.822338
11/25/2005	0.3915	206.9	167.9237	38.97635	0.811617
11/26/2005	0.4095	208.6	168.0942	40.50585	0.80582
11/27/2005	0.4098	211.1	168.2687	42.83127	0.797104
11/28/2005	0.4165	211.6	168.4476	43.15236	0.796066
11/29/2005	0.4168	212.5	168.631	43.86905	0.793557
11/30/2005	0.4169	214	168.8187	45.18129	0.788872
12/1/2005	0.4504	219.1	169.0112	50.08875	0.771389
12/2/2005	0.4569	225.4	169.2094	56.19061	0.750707
12/3/2005	0.4578	228.3	169.4141	58.88592	0.742068
12/4/2005	0.4587	235.2	169.6262	65.57384	0.7212
12/5/2005	0.4594	239.3	169.8465	69.45349	0.709764
12/6/2005	0.4726	228.2	170.0751	58.12492	0.74529
12/7/2005	0.4733	230	170.3106	59.68936	0.740481
12/8/2005	0.5094	233	170.5527	62.44731	0.731986
12/9/2005	0.5096	236.4	170.8016	65.5984	0.722511
12/10/2005	0.5097	239.4	171.0578	68.34216	0.714527
12/11/2005	0.4833	242.7	171.3218	71.37816	0.7059
12/12/2005	0.4831	246.7	171.5941	75.10591	0.695558
12/13/2005	0.4833	248.3	171.875	76.42501	0.692207
12/14/2005	0.4833	247.8	172.1646	75.6354	0.694772
12/15/2005	0.483	245.7	172.4625	73.23748	0.701923
12/16/2005	0.4826	246	172.7682	73.23182	0.70231
12/17/2005	0.4882	246.9	173.0813	73.81875	0.701018

12/18/2005	0.4873	247	173.4016	73.59843	0.702031
12/19/2005	0.4874	247.7	173.7289	73.97106	0.701368
12/20/2005	0.4875	249.1	174.0632	75.03676	0.698769
12/21/2005	0.4876	250.9	174.4045	76.4955	0.695116
12/22/2005	0.4714	254.4	174.7529	79.6471	0.686922
12/23/2005	0.4714	253.2	175.1086	78.09141	0.691582
1/1/2006	0.5299	310.1	175.4745	134.6255	0.565864
1/2/2006	0.5303	311.2	175.8567	135.3433	0.565092
1/3/2006	0.5303	315.3	176.2581	139.0419	0.559017
1/4/2006	0.5307	320.3	176.679	143.621	0.551605
1/5/2006	0.5307	323.3	177.1194	146.1806	0.547849
1/6/2006	0.5307	327.1	177.5798	149.5202	0.542891
1/7/2006	0.5432	333.2	178.0601	155.1399	0.534394
1/8/2006	0.5561	343.3	178.5613	164.7387	0.520132
1/9/2006	0.5567	350.9	179.0845	171.8155	0.510358
1/10/2006	0.5576	357.8	179.6308	178.1692	0.502042
1/11/2006	0.5581	364	180.2008	183.7992	0.495057
1/12/2006	0.5585	376.8	180.7956	196.0044	0.479818
1/13/2006	0.5531	391.9	181.4169	210.4831	0.462916
1/14/2006	0.5533	408.7	182.0671	226.6329	0.445479
1/15/2006	0.5537	416.4	182.7485	233.6515	0.438877
1/16/2006	0.5707	420.1	183.462	236.638	0.43671
1/17/2006	0.5643	428	184.2076	243.7924	0.430392
1/18/2006	0.5631	439.1	184.9861	254.1139	0.421285
1/19/2006	0.5675	444.9	185.7983	259.1017	0.417618
1/20/2006	0.5583	450.1	186.6446	263.4554	0.414674
1/21/2006	0.5579	458.1	187.5251	270.5749	0.409354
1/22/2006	0.5578	467.6	188.4404	279.1596	0.402995
1/23/2006	0.5549	472.2	189.3909	282.8091	0.401082

1/24/2006	0.5468	476.3	190.3768	285.9232	0.399699
1/25/2006	0.5469	485.2	191.3979	293.8021	0.394472
1/26/2006	0.547	494.1	192.4547	301.6453	0.389506
1/27/2006	0.5383	504.4	193.548	310.852	0.383719
1/28/2006	0.5377	533.4	194.6797	338.7203	0.364979
1/29/2006	0.539	544.3	195.8529	348.4471	0.359825
1/30/2006	0.5383	551.6	197.0694	354.5306	0.357269
1/31/2006	0.5376	558.3	198.3294	359.9706	0.355238
2/1/2006	0.5365	564.6	199.6329	364.9671	0.353583
2/2/2006	0.5356	570.6	200.9796	369.6204	0.352225
2/3/2006	0.5347	577.1	202.3695	374.7305	0.350666
2/4/2006	0.5022	581.5	203.8021	377.6979	0.350477
2/25/2006	0.5411	1689	205.3391	1483.661	0.121574
2/26/2006	0.5411	1714	207.1033	1506.897	0.12083
2/27/2006	0.541	1782	209.1565	1572.844	0.117372
2/28/2006	0.541	1833	211.5014	1621.499	0.115385
3/1/2006	0.5413	1922	214.1435	1707.856	0.111417
3/2/2006	0.5414	1999	217.0905	1781.909	0.1086
3/3/2006	0.5416	2052	220.3494	1831.651	0.107383
3/4/2006	0.5417	2098	223.9229	1874.077	0.106732
3/5/2006	0.5419	2126	227.8107	1898.189	0.107155
3/6/2006	0.5422	2149	232.0096	1916.99	0.107962
3/7/2006	0.542	2171	236.5147	1934.485	0.108943
3/8/2006	0.5434	2185	241.3204	1943.68	0.110444
3/9/2006	0.5491	2193	246.4201	1946.58	0.112367
3/10/2006	0.5461	2193	251.8054	1941.195	0.114822
3/11/2006	0.5462	2185	257.4668	1927.533	0.117834
3/12/2006	0.5463	2188	263.3938	1924.606	0.120381
3/13/2006	0.5372	2206	269.5783	1936.422	0.122202

3/14/2006	0.5374	2256	276.0161	1979.984	0.122348
3/15/2006	0.5377	2261	282.7052	1978.295	0.125035
3/16/2006	0.5394	2285	289.6413	1995.359	0.126758
3/17/2006	0.5387	2333	296.8212	2036.179	0.127227
3/18/2006	0.5444	2362	304.2341	2057.766	0.128804
3/19/2006	0.5476	2366	311.7004	2054.3	0.131741
3/20/2006	0.5478	2368	319.049	2048.951	0.134734
3/21/2006	0.5464	2381	326.2763	2054.724	0.137033
3/22/2006	0.5353	2400	333.3788	2066.621	0.138908
3/23/2006	0.5345	2405	340.3528	2064.647	0.141519
3/24/2006	0.5143	2399	347.1949	2051.805	0.144725
3/25/2006	0.5032	2385	353.9015	2031.098	0.148386
3/26/2006	0.5384	2365	360.4692	2004.531	0.152418
3/27/2006	0.5382	2338	366.8946	1971.105	0.156927
3/28/2006	0.4871	2312	373.1745	1938.825	0.161408
3/29/2006	0.4827	2286	379.3059	1906.694	0.165926
3/30/2006	0.4771	2262	385.2857	1876.714	0.17033
3/31/2006	0.477	2241	391.1111	1849.889	0.174525
4/1/2006	0.4752	2226	396.7794	1829.221	0.178248
4/2/2006	0.4758	2216	402.2878	1813.712	0.181538
4/3/2006	0.4819	2210	407.6338	1802.366	0.18445
4/4/2006	0.4804	2205	412.8149	1792.185	0.187218
4/5/2006	0.4814	2200	417.8285	1782.171	0.189922
4/6/2006	0.4856	2191	422.6722	1768.328	0.192913
4/7/2006	0.4775	2175	427.3435	1747.657	0.19648
4/8/2006	0.4806	2151	431.84	1719.16	0.200762
4/9/2006	0.4752	2144	436.1595	1707.841	0.203433
4/10/2006	0.4784	2141	440.2997	1700.7	0.205651
4/11/2006	0.476	2142	444.2583	1697.742	0.207404

4/12/2006	0.4766	2137	448.0333	1688.967	0.209655
4/13/2006	0.4788	2134	451.6224	1682.378	0.211632
4/14/2006	0.4749	2134	455.0234	1678.977	0.213226
4/15/2006	0.4731	2135	458.2341	1676.766	0.21463
4/16/2006	0.4704	2142	461.2524	1680.748	0.215337
4/17/2006	0.4699	2153	464.0762	1688.924	0.215549
4/18/2006	0.4669	2163	466.7031	1696.297	0.215767
4/19/2006	0.467	2169	469.1309	1699.869	0.216289
4/20/2006	0.4587	2173	471.3574	1701.643	0.216916
4/21/2006	0.4578	2176	473.3803	1702.62	0.217546
4/22/2006	0.4473	2173	475.1972	1697.803	0.218683
4/23/2006	0.4459	2163	476.8058	1686.194	0.220437
4/24/2006	0.4436	2145	478.2038	1666.796	0.222939
4/25/2006	0.4391	2112	479.389	1632.611	0.226983
4/26/2006	0.4391	2074	480.3591	1593.641	0.23161
4/27/2006	0.4303	2026	481.1122	1544.888	0.237469
4/28/2006	0.4226	1970	481.6462	1488.354	0.24449
4/29/2006	0.4225	1914	481.9594	1432.041	0.251807
4/30/2006	0.4188	1850	480.67	1369.33	0.259822
5/1/2006	0.4118	1791	465.6787	1325.321	0.26001
5/2/2006	0.4073	1731	450.3847	1280.615	0.260188
5/3/2006	0.409	1677	434.7978	1242.202	0.259271
5/4/2006	0.4073	1628	418.9269	1209.073	0.257326
5/5/2006	0.4059	1597	402.7788	1194.221	0.25221
5/6/2006	0.4018	1525	386.3602	1138.64	0.253351
5/7/2006	0.408	1477	369.7169	1107.283	0.250316
5/31/2006	0.3696	603.8	359.5035	244.2965	0.595402
6/1/2006	0.3658	603.6	355.7847	247.8153	0.589438
6/2/2006	0.3625	602.6	352.0185	250.5815	0.584166

6/3/2006	0.3592	599.9	348.2231	251.6769	0.580469
6/4/2006	0.3592	593.2	344.4415	248.7585	0.58065
6/5/2006	0.3554	575.2	340.7903	234.4097	0.592473
6/6/2006	0.3553	562.9	337.3143	225.5857	0.599244
6/7/2006	0.353	550.9	333.9704	216.9296	0.606227
6/8/2006	0.3492	539.6	330.7529	208.8471	0.612959
6/9/2006	0.3479	531.9	327.6311	204.2689	0.615964
6/10/2006	0.3458	523.4	324.5851	198.8149	0.620147
6/11/2006	0.3455	514.4	321.626	192.774	0.625245
6/12/2006	0.3417	507.8	318.7407	189.0593	0.627689
6/13/2006	0.3413	501.3	315.9111	185.3889	0.630184
6/14/2006	0.3364	495.1	313.1351	181.9649	0.632468
6/15/2006	0.3347	484.7	310.4432	174.2568	0.640485
6/16/2006	0.3361	476.8	307.8497	168.9503	0.645658
6/17/2006	0.3377	465.3	305.3645	159.9355	0.656274
6/18/2006	0.3363	462.5	302.9502	159.5498	0.655027
6/19/2006	0.3343	455.6	300.5731	155.0269	0.65973
6/20/2006	0.3347	449.6	298.2579	151.3421	0.663385
6/21/2006	0.3337	441	296.0187	144.9813	0.671244
6/22/2006	0.3341	436.8	293.8428	142.9572	0.672717
6/23/2006	0.3376	432.7	291.6971	141.0029	0.674132
6/24/2006	0.3444	429	289.578	139.422	0.675007
6/25/2006	0.3434	421.5	287.5119	133.9881	0.682116
6/26/2006	0.3477	414.2	285.5271	128.6729	0.689346
6/27/2006	0.3477	408.3	283.6125	124.6875	0.694618
6/28/2006	0.3453	404.4	281.7434	122.6566	0.696695
6/29/2006	0.3456	399.1	279.9159	119.1841	0.701368
6/30/2006	0.3461	396	278.1245	117.8755	0.702335
7/1/2006	0.3446	391.9	276.3607	115.5393	0.705182

7/2/2006	0.3478	387.6	274.6339	112.9661	0.70855
7/3/2006	0.3431	383.3	272.9464	110.3536	0.712096
7/4/2006	0.3418	380.3	271.2887	109.0113	0.713354
7/5/2006	0.3391	376.5	269.6576	106.8424	0.716222
7/6/2006	0.3387	371.4	268.0693	103.3307	0.721781
7/7/2006	0.3347	368.5	266.5179	101.9821	0.723251
7/8/2006	0.3343	365.1	264.9907	100.1093	0.725803
7/9/2006	0.3297	360.9	263.4982	97.4018	0.730114
7/10/2006	0.3307	357.1	262.0439	95.05614	0.733811
7/11/2006	0.3292	353.8	260.6214	93.17857	0.736635
7/12/2006	0.3215	349.7	259.2337	90.46632	0.741303
7/13/2006	0.3212	346.2	257.8827	88.31733	0.744895
7/14/2006	0.3195	339.3	256.5903	82.70972	0.756234
7/15/2006	0.3195	320.3	255.4754	64.82459	0.797613
7/16/2006	0.3224	315.1	254.5278	60.57217	0.807768
7/17/2006	0.3226	312.3	253.6267	58.67327	0.812125
7/18/2006	0.326	310.3	252.7485	57.55155	0.814529
7/19/2006	0.3256	309.8	251.8758	57.92416	0.813027
7/20/2006	0.3266	309.4	250.9968	58.40321	0.811237
7/21/2006	0.3186	308.9	250.1112	58.78879	0.809683
7/22/2006	0.318	308.7	249.2175	59.48253	0.807313
7/23/2006	0.3187	308.4	248.3139	60.08607	0.805168
7/24/2006	0.3178	308	247.402	60.59804	0.803253
7/25/2006	0.3193	307.7	246.4814	61.21857	0.801045
7/26/2006	0.3224	307.5	245.5507	61.94931	0.798539
7/27/2006	0.3158	307.2	244.6096	62.59041	0.796255
7/28/2006	0.322	306.7	243.6602	63.03976	0.794458
7/29/2006	0.3234	305.9	242.7063	63.19366	0.793417
7/30/2006	0.3229	303.3	241.7638	61.53621	0.797111

7/31/2006	0.3245	300.9	240.845	60.05503	0.800415
8/1/2006	0.327	298.7	239.9472	58.75283	0.803305
8/2/2006	0.3249	295.8	239.0745	56.72546	0.80823
8/3/2006	0.3179	293.5	238.2282	55.27178	0.81168
8/4/2006	0.3188	291.3	237.4033	53.89673	0.814979
8/5/2006	0.3149	288.8	236.6015	52.19846	0.819257
8/6/2006	0.3151	286.1	235.8272	50.2728	0.824282
8/7/2006	0.3161	283.5	235.0814	48.41858	0.829211
8/8/2006	0.3154	279.6	234.3738	45.22623	0.838247
8/9/2006	0.3143	275.8	233.714	42.08602	0.847404
8/10/2006	0.3148	274.9	233.0799	41.82007	0.847872
8/11/2006	0.3115	274.6	232.4454	42.15464	0.846487
8/12/2006	0.3135	274	231.808	42.19202	0.846015
8/13/2006	0.3122	272.3	231.1784	41.12159	0.848984
8/14/2006	0.3123	270.7	230.5644	40.13563	0.851734
8/15/2006	0.3128	269.7	229.9608	39.73921	0.852654
8/16/2006	0.3136	268.5	229.3648	39.13524	0.854245
8/17/2006	0.3139	268.1	228.7718	39.32816	0.853308
8/18/2006	0.3124	266.7	228.1836	38.51641	0.855582
8/19/2006	0.3143	265.1	227.6092	37.49077	0.858579
8/20/2006	0.3143	263	227.0543	35.94571	0.863324
8/21/2006	0.3175	261.4	226.5191	34.88092	0.866561
8/22/2006	0.3169	260.2	225.997	34.20297	0.868551
8/23/2006	0.318	258.9	225.4861	33.41392	0.870939
8/24/2006	0.3099	258.3	224.9818	33.3182	0.87101
8/25/2006	0.3099	257.7	224.479	33.22101	0.871086
8/26/2006	0.3095	256.5	223.9822	32.51778	0.873225
8/27/2006	0.3114	254.8	223.5	31.30003	0.877158
8/28/2006	0.3126	253.6	223.0325	30.56754	0.879466

8/29/2006	0.3127	252.1	222.5784	29.52162	0.882897
8/30/2006	0.3125	249.6	222.1479	27.45215	0.890015
8/31/2006	0.3101	248.7	221.7366	26.96335	0.891583
9/1/2006	0.3102	248.6	221.3268	27.2732	0.890293
9/2/2006	0.3106	248	220.916	27.08396	0.89079
9/3/2006	0.3204	247	220.5112	26.48879	0.892758
9/4/2006	0.3183	243	220.1383	22.86172	0.905919
9/5/2006	0.3186	239.8	219.8145	19.9855	0.916658
9/6/2006	0.3157	239.2	219.5147	19.68528	0.917704
9/7/2006	0.3156	239.2	219.2149	19.98505	0.91645
9/8/2006	0.3175	238.9	218.9129	19.98711	0.916337
9/9/2006	0.3172	238.2	218.6138	19.58615	0.917774
9/10/2006	0.3171	237.3	218.3224	18.97756	0.920027
9/11/2006	0.3144	236.4	218.0403	18.35971	0.922336
9/12/2006	0.3101	235.1	217.7706	17.3294	0.926289
9/13/2006	0.3083	233.4	217.5196	15.88036	0.931961
9/14/2006	0.3105	232.2	217.2869	14.91305	0.935775
9/15/2006	0.3052	230.5	217.0728	13.42721	0.941747
9/16/2006	0.304	228.8	216.8813	11.91874	0.947908
9/17/2006	0.3027	227.8	216.7074	11.09263	0.951305
9/18/2006	0.3027	226.8	216.5461	10.25394	0.954789
9/19/2006	0.3036	225.7	216.3983	9.301716	0.958787
9/20/2006	0.2998	224.1	216.2688	7.831184	0.965055
9/21/2006	0.3009	222	216.1655	5.834451	0.973719
9/22/2006	0.3036	221.1	216.0836	5.016448	0.977311
9/23/2006	0.3035	221.4	216.0071	5.392857	0.975642
9/24/2006	0.3036	219.1	215.9448	3.155202	0.985599
9/25/2006	0.3034	217.1	215.912	1.188023	0.994528
9/26/2006	0.3033	216.1	215.9015	0.1985	0.999081

9/27/2006	0.3035	215.9	215.9	0	1
9/28/2006	0.2966	216.1	215.9	0.199989	0.999075
9/29/2006	0.2961	217.3	215.9001	1.399877	0.993558
9/30/2006	0.2915	219.6	215.9006	3.699391	0.983154
10/1/2006	0.2935	220.7	215.9018	4.798155	0.978259
10/2/2006	0.3029	221	215.9041	5.095921	0.976942
10/3/2006	0.316	220.8	215.9074	4.892635	0.977841
10/4/2006	0.3177	220	215.9116	4.08838	0.981416
10/5/2006	0.3173	219.3	215.9167	3.383326	0.984572
10/6/2006	0.3173	219.2	215.9224	3.277628	0.985047
10/7/2006	0.3172	219	215.9286	3.071367	0.985975
10/8/2006	0.3172	218.9	215.9354	2.964596	0.986457
10/9/2006	0.3171	219.9	215.9427	3.957298	0.982004
10/10/2006	0.3177	223.1	215.9508	7.149203	0.967955
10/11/2006	0.31	222.9	215.9601	6.939932	0.968865
10/12/2006	0.3095	222.5	215.9706	6.529387	0.970654
10/13/2006	0.3092	223.3	215.9824	7.317619	0.96723
10/14/2006	0.3086	222.6	215.9954	6.604639	0.97033
10/15/2006	0.3081	221.4	216.0094	5.390588	0.975652
10/16/2006	0.3077	219.8	216.0242	3.775764	0.982822
10/17/2006	0.3072	218.4	216.0395	2.360522	0.989192
10/18/2006	0.3113	217.4	216.0548	1.345179	0.993812
11/3/2006	0.4205	230.3	216.0708	14.22921	0.938214
11/4/2006	0.4207	228.8	216.0887	12.71132	0.944444
11/5/2006	0.4237	225.4	216.1088	9.291216	0.958779
11/6/2006	0.4236	225	216.1306	8.869449	0.96058
11/7/2006	0.4304	227.2	216.1538	11.04619	0.951381
11/8/2006	0.4302	228.2	216.1788	12.0212	0.947322
11/9/2006	0.4392	228.9	216.2057	12.69427	0.944542

11/10/2006	0.4393	231.2	216.2348	14.9652	0.935272
11/11/2006	0.4398	234.8	216.2665	18.53355	0.921067
11/12/2006	0.4442	238.4	216.3013	22.09867	0.907304
11/13/2006	0.4458	244.8	216.3403	28.4597	0.883743
11/14/2006	0.4466	252.1	216.3846	35.71544	0.858328
11/15/2006	0.4507	261	216.4356	44.56437	0.829255
11/16/2006	0.4514	263	216.4948	46.50518	0.823174
11/17/2006	0.4517	264.8	216.5627	48.2373	0.817835
11/18/2006	0.4625	269.5	216.6396	52.86043	0.803857
11/19/2006	0.4651	280	216.7264	63.27362	0.774023
11/20/2006	0.4658	287.9	216.8247	71.07531	0.753125
11/21/2006	0.4764	293.4	216.9359	76.46407	0.739386
11/22/2006	0.477	298.1	217.061	81.03899	0.728148
11/23/2006	0.4877	303.9	217.2007	86.69933	0.714711
11/24/2006	0.4765	313	217.3559	95.64413	0.694428
11/25/2006	0.4821	318	217.5277	100.4723	0.684049
11/26/2006	0.4862	327.1	217.7173	109.3827	0.665599
11/27/2006	0.4866	332.4	217.9256	114.4744	0.655613
11/28/2006	0.4859	330.3	218.1531	112.1469	0.66047
11/29/2006	0.4866	334	218.3994	115.6006	0.65389
11/30/2006	0.4869	338.6	218.6644	119.9356	0.64579
12/1/2006	0.4979	344.8	218.9485	125.8515	0.635002
12/2/2006	0.4983	353.2	219.2527	133.9473	0.620761
12/3/2006	0.4991	358.7	219.5778	139.1222	0.612149
12/4/2006	0.4738	363.5	219.9244	143.5756	0.605019
12/5/2006	0.4739	368	220.293	147.707	0.598622
12/6/2006	0.4743	371.4	220.6838	150.7162	0.594195
12/7/2006	0.4744	374.5	221.0969	153.4031	0.590379
12/8/2006	0.4744	376.4	221.5321	154.8679	0.588555

12/9/2006	0.4749	381.5	221.9894	159.5106	0.581886
12/10/2006	0.4853	384.9	222.4689	162.4311	0.577991
12/11/2006	0.4877	390.4	222.9708	167.4292	0.571134
12/12/2006	0.4825	396.7	223.4954	173.2046	0.563386
12/13/2006	0.4823	401.2	224.0433	177.1567	0.558433
12/14/2006	0.4827	406.7	224.6147	182.0853	0.552286
12/15/2006	0.4908	411.3	225.2101	186.0899	0.547557
12/16/2006	0.491	416.4	225.8297	190.5703	0.542338
12/17/2006	0.496	427.9	226.474	201.426	0.529269
12/18/2006	0.4962	445.7	227.1449	218.5551	0.509636
12/19/2006	0.4966	463.6	227.8449	235.7551	0.491469
12/20/2006	0.4966	485.2	228.5774	256.6226	0.471099
12/21/2006	0.4971	514.9	229.3462	285.5538	0.445419
12/22/2006	0.4972	529.5	230.1556	299.3444	0.434666
12/23/2006	0.497	550	231.0085	318.9915	0.420015
12/24/2006	0.4973	564.1	231.9074	332.1926	0.411111
1/7/2007	0.505	1398	232.9005	1165.1	0.166595
1/8/2007	0.4949	1482	234.0839	1247.916	0.157951
1/9/2007	0.4949	1591	235.5143	1355.486	0.148029
1/10/2007	0.5	1676	237.2057	1438.794	0.141531
1/11/2007	0.4996	1784	239.1718	1544.828	0.134065
1/12/2007	0.4915	1876	241.4261	1634.574	0.128692
1/13/2007	0.4921	1943	243.9796	1699.02	0.125568
1/14/2007	0.4915	2013	246.8395	1766.161	0.122623
1/15/2007	0.4916	2045	250.0095	1794.991	0.122254
1/16/2007	0.4916	2053	253.4876	1799.512	0.123472
1/17/2007	0.4915	2044	257.2661	1786.734	0.125864
1/18/2007	0.4906	2026	261.3337	1764.666	0.12899
1/19/2007	0.4904	2001	265.6767	1735.323	0.132772

1/20/2007	0.4903	1977	270.281	1706.719	0.136713
1/21/2007	0.4901	1960	275.1325	1684.867	0.140374
1/22/2007	0.4909	1951	280.2192	1670.781	0.143629
1/23/2007	0.4903	1940	285.5302	1654.47	0.147181
1/27/2007	0.4861	1918	308.8127	1609.187	0.161008
2/6/2007	0.4795	2656	315.1424	2340.858	0.118653
2/7/2007	0.4725	2718	321.7723	2396.228	0.118386
2/8/2007	0.4722	2741	328.7418	2412.258	0.119935
2/9/2007	0.4702	2782	336.0475	2445.953	0.120793
2/10/2007	0.4695	2814	343.6855	2470.315	0.122134
2/11/2007	0.4691	2851	351.6522	2499.348	0.123343
2/12/2007	0.4687	2892	359.9443	2532.056	0.124462
2/13/2007	0.473	2898	368.5572	2529.443	0.127176
2/14/2007	0.4735	2894	377.4822	2516.518	0.130436
2/15/2007	0.4741	2894	386.7079	2507.292	0.133624
2/16/2007	0.4746	2912	396.2241	2515.776	0.136066
2/17/2007	0.4755	2922	406.0225	2515.977	0.138954
2/18/2007	0.476	2925	416.0949	2508.905	0.142255
2/19/2007	0.4768	2924	426.4317	2497.568	0.145838
2/20/2007	0.4776	2919	437.0224	2481.978	0.149716
2/21/2007	0.4813	2916	447.8563	2468.144	0.153586
2/22/2007	0.4831	2912	458.923	2453.077	0.157597
2/23/2007	0.4857	2889	470.2109	2418.789	0.162759
2/24/2007	0.4904	2862	481.7068	2380.293	0.168311
2/25/2007	0.4832	2826	493.2863	2332.714	0.174553
2/26/2007	0.4838	2782	504.7593	2277.241	0.181438
2/27/2007	0.4708	2747	516.0517	2230.948	0.18786
2/28/2007	0.471	2700	527.1609	2172.839	0.195245
3/1/2007	0.4642	2652	538.0848	2113.915	0.202898

1/24/2007	0.5391	1921	291.0549	1629.945	0.151512
1/25/2007	0.5387	1917	296.7827	1620.217	0.154816
1/26/2007	0.5041	1913	302.7044	1610.296	0.158235

3/2/2007	0.4644	2595	548.8212	2046.179	0.211492
3/3/2007	0.4642	2552	559.3682	1992.632	0.219188
3/4/2007	0.4586	2513	569.7242	1943.276	0.226711
3/5/2007	0.4735	2454	579.8876	1874.112	0.236303
3/6/2007	0.4751	2395	589.8571	1805.143	0.246287
3/7/2007	0.4735	2353	599.6316	1753.368	0.254837
3/8/2007	0.4694	2340	609.21	1730.79	0.260346
3/9/2007	0.4653	2317	618.5916	1698.408	0.26698
3/10/2007	0.4692	2247	627.7755	1619.224	0.279384
3/11/2007	0.4693	2224	636.7611	1587.239	0.286313
3/12/2007	0.4703	2219	645.5479	1573.452	0.290918
3/13/2007	0.4671	2214	654.1354	1559.865	0.295454
3/14/2007	0.4674	2225	662.5233	1562.477	0.297763
3/15/2007	0.4751	2261	670.711	1590.289	0.296644
3/16/2007	0.4655	2329	678.6979	1650.302	0.291412
3/17/2007	0.4595	2404	686.4834	1717.517	0.285559
3/18/2007	0.4658	2444	694.0664	1749.934	0.283988
3/19/2007	0.4667	2469	701.4459	1767.554	0.284101
3/20/2007	0.4701	2481	708.6204	1772.38	0.285619
3/21/2007	0.4867	2495	715.5887	1779.411	0.286809
3/22/2007	0.4704	2501	722.3493	1778.651	0.288824
3/23/2007	0.4673	2501	728.9008	1772.099	0.291444
3/24/2007	0.4805	2490	735.2417	1754.758	0.295278
3/25/2007	0.481	2474	741.3706	1732.629	0.299665
3/26/2007	0.4721	2453	747.2862	1705.714	0.304642

3/27/2007	0.4739	2425	752.9869	1672.013	0.31051
3/28/2007	0.4696	2385	758.4717	1626.528	0.318017
3/29/2007	0.476	2326	763.7393	1562.261	0.328349
3/30/2007	0.4766	2308	768.7887	1539.211	0.333097
3/31/2007	0.4722	2253	773.6191	1479.381	0.343373
4/1/2007	0.4903	2242	778.2296	1463.77	0.347114
4/2/2007	0.4917	2216	782.6194	1433.381	0.353168
4/3/2007	0.4858	2202	786.7881	1415.212	0.357306
4/4/2007	0.4838	2181	790.7348	1390.265	0.362556
4/5/2007	0.4864	2176	794.4592	1381.541	0.365101
4/6/2007	0.4853	2195	797.9605	1397.04	0.363536
4/7/2007	0.4909	2220	801.2381	1418.762	0.360918
4/8/2007	0.4984	2234	804.2913	1429.709	0.360023
4/9/2007	0.5034	2245	807.1193	1437.881	0.359519
4/10/2007	0.4945	2243	809.7212	1433.279	0.360999
4/11/2007	0.4953	2218	812.0961	1405.904	0.366139
4/12/2007	0.4897	2188	814.2431	1373.757	0.37214
4/13/2007	0.4886	2155	816.1613	1338.839	0.378729
4/14/2007	0.4771	2129	817.8499	1311.15	0.384147
4/15/2007	0.4768	2081	819.3083	1261.692	0.393709
4/16/2007	0.4721	2042	820.5358	1221.464	0.401829
4/17/2007	0.4475	2000	821.5318	1178.468	0.410766
4/18/2007	0.4479	1952	822.2961	1129.704	0.421258
4/19/2007	0.453	1906	822.8283	1083.172	0.431704
4/20/2007	0.4437	1873	823.1281	1049.872	0.43947
4/21/2007	0.447	1841	819.9663	1021.034	0.445392
4/22/2007	0.4456	1807	804.6766	1002.323	0.445311
4/23/2007	0.4462	1775	789.6565	985.3435	0.444877
4/24/2007	0.4456	1742	774.9025	967.0975	0.444835

4/25/2007	0.4468	1707	760.4416	946.5584	0.445484
4/26/2007	0.4422	1672	746.2935	925.7065	0.446348
4/27/2007	0.4418	1642	732.4249	909.5751	0.446057
4/28/2007	0.447	1620	718.741	901.259	0.443667
4/29/2007	0.4408	1599	705.1762	893.8238	0.441011
4/30/2007	0.4374	1540	692.0139	847.9861	0.44936
5/1/2007	0.4374	1498	679.4202	818.5798	0.453552
5/2/2007	0.4354	1473	667.1449	805.8551	0.452916
5/3/2007	0.4383	1439	655.1318	783.8682	0.455269
5/4/2007	0.4347	1422	643.3242	778.6758	0.452408
5/5/2007	0.4363	1395	631.6718	763.3282	0.452811
5/6/2007	0.4329	1344	620.4358	723.5642	0.461634
5/7/2007	0.4342	1303	609.7293	693.2707	0.467943
5/8/2007	0.425	1267	599.4459	667.5541	0.473122
5/9/2007	0.4283	1240	589.4857	650.5143	0.475392
5/10/2007	0.4385	1199	579.8916	619.1084	0.483646
5/11/2007	0.4231	1167	570.7072	596.2928	0.489038
5/12/2007	0.4208	1135	561.8703	573.1297	0.49504
5/13/2007	0.4198	1108	553.348	554.652	0.499412
5/14/2007	0.4162	1078	545.1299	532.8701	0.505686
5/15/2007	0.418	1051	537.2207	513.7793	0.511152
5/16/2007	0.4152	1033	529.5338	503.4662	0.512617
5/17/2007	0.4123	1023	521.9429	501.0571	0.510208
5/18/2007	0.4021	1007	514.4344	492.5656	0.510858
5/19/2007	0.4023	957.8	507.308	450.492	0.52966
5/20/2007	0.4002	912.7	500.7912	411.9088	0.548692
5/21/2007	0.398	897.6	494.6334	402.9666	0.551062
5/22/2007	0.3978	873.9	488.6773	385.2227	0.559191
5/23/2007	0.3942	859	482.9244	376.0756	0.562194

5/24/2007	0.3933	847.3	477.2865	370.0135	0.563303
5/25/2007	0.3863	824.3	471.8269	352.4731	0.572397
5/26/2007	0.3875	799	466.6519	332.3481	0.584045
5/27/2007	0.3835	786.1	461.689	324.411	0.587316
5/28/2007	0.3848	765	456.9094	308.0906	0.597267
5/29/2007	0.3846	747	452.3547	294.6453	0.605562
5/30/2007	0.3808	724.5	448.039	276.461	0.618411
5/31/2007	0.3809	706.7	443.9645	262.7355	0.628222
6/1/2007	0.3791	703	439.9916	263.0084	0.625877
6/2/2007	0.375	698.8	436.0184	262.7816	0.623953
6/3/2007	0.3795	690.2	432.0821	258.1179	0.626025
6/4/2007	0.3773	681.6	428.2169	253.3831	0.628252
6/5/2007	0.3755	670.6	424.442	246.158	0.632929
6/6/2007	0.3756	661.2	420.765	240.435	0.636366
6/7/2007	0.3756	651.4	417.1782	234.2218	0.640433
6/8/2007	0.3767	642.9	413.6761	229.2239	0.643453
6/9/2007	0.3739	636.1	410.2371	225.8629	0.644926
6/10/2007	0.3726	632.6	406.8242	225.7758	0.643099
6/11/2007	0.3722	631.5	403.3944	228.1056	0.638788
6/12/2007	0.3713	628.1	399.9466	228.1534	0.636756
6/13/2007	0.3664	625.5	396.492	229.008	0.63388
6/14/2007	0.3657	621.6	393.0342	228.5658	0.632294
6/15/2007	0.3644	601.2	389.7089	211.4911	0.648218
6/16/2007	0.3648	587.1	386.5956	200.5044	0.658483
6/17/2007	0.3579	577.5	383.6153	193.8847	0.664269
6/18/2007	0.3537	567.7	380.7373	186.9627	0.670666
6/19/2007	0.345	563.8	377.9199	185.8801	0.670308
6/20/2007	0.3418	559.4	375.1227	184.2773	0.670581
6/21/2007	0.3397	552.8	372.3667	180.4333	0.673601

6/22/2007	0.3372	544.7	369.6807	175.0193	0.678687
6/23/2007	0.3368	538.2	367.0649	171.1351	0.682023
6/24/2007	0.3347	535	364.4832	170.5168	0.681277
6/25/2007	0.3343	531.6	361.9124	169.6876	0.680798
6/26/2007	0.3302	519.7	359.4189	160.2811	0.691589
6/27/2007	0.3325	508.8	357.0611	151.7389	0.701771
6/28/2007	0.3258	507	354.764	152.236	0.699732
6/29/2007	0.3306	506.3	352.451	153.849	0.696131
6/30/2007	0.3308	504.5	350.1219	154.3781	0.693998
7/1/2007	0.3311	500.8	347.7991	153.0009	0.694487
7/2/2007	0.3305	496.8	345.4996	151.3004	0.69545
7/3/2007	0.3323	492.1	343.2313	148.8687	0.697483
7/4/2007	0.3325	485.7	341.013	144.687	0.702106
7/5/2007	0.3367	480.9	338.8462	142.0538	0.704608
7/6/2007	0.3364	477.7	336.7073	140.9927	0.704851
7/7/2007	0.3333	473.5	334.5922	138.9078	0.706636
7/8/2007	0.3295	470.6	332.4989	138.1011	0.706543
7/9/2007	0.3287	465.8	330.4324	135.3676	0.709387
7/10/2007	0.3268	460.6	328.4106	132.1894	0.713006
7/11/2007	0.3259	455.6	326.4356	129.1644	0.716496
7/12/2007	0.3219	455.2	324.4717	130.7283	0.712811
7/13/2007	0.3223	453.3	322.4954	130.8046	0.711439
7/14/2007	0.3259	445.4	320.5636	124.8364	0.719721
7/15/2007	0.3164	440.5	318.6998	121.8002	0.723496
7/16/2007	0.3162	437.5	316.8678	120.6322	0.724269
7/17/2007	0.3137	434.3	315.0552	119.2448	0.725432
7/18/2007	0.3137	431.8	313.2583	118.5417	0.725471
7/19/2007	0.31	428.2	311.4805	116.7195	0.727418
7/20/2007	0.3098	425.3	309.7251	115.5749	0.728251

7/21/2007	0.3075	423.3	307.9803	115.3197	0.72757
7/22/2007	0.3143	420.4	306.2463	114.1537	0.728464
7/23/2007	0.3149	415.7	304.5437	111.1563	0.732604
7/24/2007	0.3141	413.7	302.8662	110.8338	0.732091
7/25/2007	0.3145	411.3	301.1966	110.1034	0.732304
7/26/2007	0.3168	407.2	299.5511	107.6489	0.735636
7/27/2007	0.3124	406.9	297.9141	108.9859	0.732156
7/28/2007	0.3059	404	296.2765	107.7235	0.733358
7/29/2007	0.3062	400.2	294.665	105.535	0.736294
7/30/2007	0.302	397.3	293.0799	104.2201	0.737679
7/31/2007	0.3028	395.4	291.5073	103.8927	0.737246
8/1/2007	0.3064	390.3	289.964	100.336	0.742926
8/2/2007	0.3048	388.4	288.4505	99.94952	0.742663
8/3/2007	0.3057	385	286.9543	98.04571	0.745336
8/4/2007	0.3013	384	285.4688	98.53117	0.743408
8/5/2007	0.3011	381.8	283.9851	97.8149	0.743806
8/6/2007	0.3031	379.3	282.5146	96.78543	0.744831
8/7/2007	0.3008	373.2	281.0871	92.11287	0.753181
8/8/2007	0.3005	370	279.7088	90.29124	0.75597
8/9/2007	0.301	367.8	278.3505	89.44948	0.756799
8/10/2007	0.3011	364.4	277.0142	87.38577	0.760193
8/11/2007	0.3009	362.4	275.6987	86.70129	0.760758
8/12/2007	0.2997	360.8	274.3906	86.40943	0.760506
8/13/2007	0.3048	358.7	273.0907	85.60932	0.761334
8/14/2007	0.3089	355.7	271.8098	83.89017	0.764155
8/15/2007	0.3094	354	270.5453	83.45474	0.764252
8/16/2007	0.3137	351.8	269.2911	82.50888	0.765467
8/17/2007	0.3167	348.9	268.0567	80.84328	0.768291
8/18/2007	0.3172	351.5	266.8255	84.67454	0.759105

8/19/2007	0.3174	343.2	265.6188	77.58115	0.773948
8/20/2007	0.3161	339	264.4694	74.53061	0.780146
8/21/2007	0.3004	336.1	263.3565	72.74352	0.783566
8/22/2007	0.3154	333.3	262.27	71.02997	0.786889
8/23/2007	0.3136	331.7	261.2005	70.49946	0.78746
8/24/2007	0.3134	331.3	260.13	71.17001	0.78518
8/25/2007	0.3148	329.1	259.0629	70.03706	0.787186
8/26/2007	0.3172	327.3	258.0101	69.28991	0.788298
8/27/2007	0.315	321.2	257.0014	64.19864	0.800129
8/28/2007	0.3157	317	256.0557	60.94431	0.807747
8/29/2007	0.3102	312.7	255.1603	57.53965	0.815991
8/30/2007	0.3066	310.5	254.3009	56.19914	0.819004
8/31/2007	0.3067	306.5	253.4755	53.02451	0.827
9/1/2007	0.3076	303.8	252.6886	51.11143	0.83176
9/2/2007	0.3077	301.4	251.9285	49.4715	0.835861
9/3/2007	0.3076	299.8	251.1873	48.61269	0.83785
9/4/2007	0.3077	297.4	250.4653	46.93471	0.842183
9/5/2007	0.3084	295.9	249.762	46.13803	0.844076
9/6/2007	0.3062	295	249.0662	45.93379	0.844292
9/7/2007	0.3117	294.2	248.3728	45.8272	0.844231
9/8/2007	0.3123	292.8	247.6856	45.11441	0.845921
9/9/2007	0.3119	290.5	247.0161	43.48392	0.850314
9/10/2007	0.3122	287.9	246.3737	41.52632	0.855761
9/11/2007	0.3123	286.2	245.7542	40.44575	0.85868
9/12/2007	0.3151	282.8	245.1642	37.63579	0.866917
9/13/2007	0.3152	280.5	244.6086	35.89141	0.872045
9/14/2007	0.3193	278.4	244.078	34.32199	0.876717
9/15/2007	0.3209	275.9	243.5744	32.32562	0.882836
9/16/2007	0.3211	274.3	243.0943	31.20571	0.886235

9/17/2007	0.3211	272.7	242.6313	30.06874	0.889737
9/18/2007	0.3209	267.2	242.2152	24.98476	0.906494
9/19/2007	0.3209	268.1	241.8347	26.26529	0.902032
9/20/2007	0.3209	265.4	241.4621	23.93791	0.909804
9/21/2007	0.325	263.7	241.1105	22.5895	0.914336
9/22/2007	0.3348	263	240.7718	22.22818	0.915482
9/23/2007	0.3287	261.9	240.4417	21.4583	0.918067
9/24/2007	0.3289	260.3	240.1271	20.1729	0.922501
9/25/2007	0.3322	259.1	239.829	19.27096	0.925623
9/26/2007	0.3324	258.2	239.5424	18.65757	0.92774
9/27/2007	0.3403	257	239.2674	17.73256	0.931002
9/28/2007	0.3384	255.1	239.0119	16.08813	0.936934
9/29/2007	0.3384	253.4	238.7798	14.62019	0.942304
9/30/2007	0.3446	252.9	238.561	14.33902	0.943302
10/1/2007	0.3449	252.5	238.3457	14.15434	0.943943
10/2/2007	0.3453	251.8	238.1354	13.66456	0.945733
10/3/2007	0.3458	251.1	237.9327	13.16732	0.947561
10/4/2007	0.3459	253.3	237.732	15.56796	0.938539
10/5/2007	0.3458	254.8	237.5279	17.27212	0.932213
10/6/2007	0.3516	254.4	237.3199	17.08011	0.932861
10/7/2007	0.3521	254.3	237.108	17.19203	0.932395
10/8/2007	0.3451	256.2	236.892	19.30798	0.924637
10/9/2007	0.355	257.1	236.6717	20.42829	0.920543
10/10/2007	0.355	256.9	236.4468	20.45321	0.920385
10/11/2007	0.3431	256.1	236.2172	19.88276	0.922363
10/12/2007	0.3426	256.1	235.9831	20.1169	0.921449
10/13/2007	0.3419	256.5	235.7443	20.75565	0.919081
10/14/2007	0.3438	256.3	235.5009	20.79912	0.918849
10/15/2007	0.3462	255	235.2527	19.74727	0.92256

10/16/2007	0.3389	254.2	235	19.19996	0.924469
10/17/2007	0.3393	253.3	234.743	18.55703	0.926739
10/18/2007	0.345	252	234.4817	17.51832	0.930483
10/19/2007	0.3457	249.9	234.2316	15.66839	0.937301
10/20/2007	0.3461	248.2	234.0059	14.19405	0.942812
10/21/2007	0.3462	244.9	233.8149	11.08508	0.954736
10/22/2007	0.3552	242.8	233.6621	9.137897	0.962365
10/23/2007	0.3557	241.9	233.5298	8.3702	0.965398
10/24/2007	0.3717	240.5	233.413	7.087005	0.970532
10/25/2007	0.3677	235.7	233.3416	2.35838	0.989994
10/26/2007	0.368	234.2	233.3171	0.882873	0.99623
10/27/2007	0.3598	233.8	233.3067	0.493273	0.99789
10/28/2007	0.3579	233.5	233.3015	0.1985	0.99915
10/29/2007	0.3716	233.3	233.3	0	1
10/30/2007	0.3707	235.3	233.3001	1.999888	0.991501
10/31/2007	0.369	235	233.3005	1.699458	0.992768
11/1/2007	0.3776	236.1	233.3014	2.79858	0.988147
11/2/2007	0.3912	237.1	233.3029	3.797104	0.983985
11/3/2007	0.3863	237.6	233.3052	4.294845	0.981924
11/4/2007	0.3879	237.4	233.3083	4.091727	0.982764
11/5/2007	0.3884	241.4	233.3125	8.087545	0.966497
11/6/2007	0.3933	245.1	233.3183	11.78169	0.951931
11/7/2007	0.3938	249.7	233.3267	16.3733	0.934428
11/8/2007	0.3937	252.6	233.3384	19.26157	0.923747
11/9/2007	0.3936	253.5	233.354	20.14597	0.920529
11/10/2007	0.3926	254.2	233.3737	20.82632	0.918071
11/11/2007	0.3928	253.5	233.3974	20.10264	0.9207
11/12/2007	0.4048	252.9	233.4249	19.47514	0.922993
11/13/2007	0.4034	251.8	233.4559	18.3441	0.927148

11/14/2007	0.4034	252.6	233.4902	19.10976	0.924348
11/15/2007	0.4033	253.4	233.5279	19.87213	0.921578
11/16/2007	0.4032	255	233.5689	21.43112	0.915956
11/17/2007	0.4016	261.1	233.6138	27.48624	0.894729
11/18/2007	0.3917	262.7	233.6632	29.03677	0.889468
11/19/2007	0.4135	265.2	233.7178	31.48219	0.881289
11/20/2007	0.4209	267.6	233.7778	33.82216	0.873609
11/21/2007	0.4206	268.9	233.8436	35.05637	0.86963
11/22/2007	0.4254	270.9	233.9154	36.98461	0.863475
11/23/2007	0.4252	271.2	233.9932	37.20676	0.862807
11/24/2007	0.4558	270.6	234.0771	36.52291	0.86503
11/25/2007	0.4561	276.1	234.167	41.93299	0.848124
11/26/2007	0.4569	280.7	234.2636	46.43637	0.834569
11/27/2007	0.4572	281.4	234.3676	47.03239	0.832863
11/28/2007	0.4791	284.3	234.4792	49.8208	0.82476
11/29/2007	0.481	285.1	234.5986	50.50145	0.822864
11/30/2007	0.4829	286.4	234.7257	51.67426	0.819573
12/1/2007	0.4848	288.6	234.8608	53.73918	0.813794
12/2/2007	0.4844	291.5	235.004	56.49598	0.806189
12/3/2007	0.4839	294	235.1556	58.84437	0.799849
12/4/2007	0.4834	296.6	235.316	61.28402	0.793378
12/5/2007	0.483	300.4	235.4854	64.91459	0.783906
12/8/2007	0.5393	314.7	235.665	79.03501	0.748856
12/9/2007	0.5393	328	235.857	92.14305	0.719076
12/10/2007	0.5332	336.5	236.0637	100.4363	0.701526
12/11/2007	0.514	353.7	236.2873	117.4127	0.668044
12/12/2007	0.5141	363.3	236.5303	126.7697	0.65106
12/13/2007	0.5185	386.7	236.7953	149.9047	0.612349
12/14/2007	0.5184	409.9	237.0862	172.8138	0.5784

12/15/2007	0.5186	411.8	237.4061	174.3939	0.576508
12/16/2007	0.5178	413.1	237.7556	175.3444	0.57554
12/17/2007	0.5174	419.6	238.1345	181.4655	0.567527
12/18/2007	0.5169	427.3	238.543	188.757	0.558257
12/19/2007	0.517	431.6	238.9817	192.6183	0.553711
12/20/2007	0.517	434.7	239.4505	195.2495	0.550841
12/21/2007	0.521	443.4	239.9497	203.4503	0.541158
12/22/2007	0.5212	450.8	240.4796	210.3204	0.533451
12/23/2007	0.5215	459.5	241.0412	218.4588	0.524573
12/24/2007	0.5142	473.5	241.6355	231.8645	0.510318
12/25/2007	0.5145	478.2	242.2638	235.9362	0.506616
12/26/2007	0.5149	483	242.9265	240.0735	0.502953
12/27/2007	0.5263	494.4	243.6238	250.7762	0.492767
12/28/2007	0.5264	501	244.3565	256.6435	0.487737
1/26/2008	0.6038	1207	245.1645	961.8355	0.203119
1/27/2008	0.604	1268	246.1285	1021.871	0.194108
1/28/2008	0.6041	1345	247.2947	1097.705	0.183862
1/29/2008	0.6043	1403	248.672	1154.328	0.177243
1/30/2008	0.6044	1446	250.2673	1195.733	0.173076
1/31/2008	0.6046	1509	252.0851	1256.915	0.167054
2/1/2008	0.6048	1740	254.1412	1485.859	0.146058
2/2/2008	0.6049	1761	256.4585	1504.542	0.145632
2/3/2008	0.605	1766	259.0444	1506.956	0.146684
2/4/2008	0.6068	1752	261.8913	1490.109	0.149481
2/5/2008	0.6072	1574	264.9796	1309.02	0.168348
2/6/2008	0.5342	1721	268.2886	1452.711	0.155891
2/7/2008	0.5366	1762	271.8201	1490.18	0.154268
2/8/2008	0.5469	1798	275.5814	1522.419	0.153271
2/9/2008	0.5487	1820	279.5724	1540.428	0.153611

2/10/2008	0.4934	1832	283.7907	1548.209	0.154908
2/11/2008	0.5027	1837	288.2313	1548.769	0.156903
2/12/2008	0.5027	1834	292.8878	1541.112	0.159699
2/13/2008	0.5032	1828	297.7521	1530.248	0.162884
2/14/2008	0.5271	1812	302.8154	1509.185	0.167117
2/15/2008	0.5356	1792	308.0672	1483.933	0.171913
2/16/2008	0.5374	1754	313.4956	1440.504	0.178732
2/17/2008	0.5393	1717	319.0865	1397.914	0.18584
2/18/2008	0.541	1677	324.8253	1352.175	0.193694
2/19/2008	0.5415	1657	330.6985	1326.301	0.199577
2/20/2008	0.5442	1651	336.6962	1314.304	0.203935
2/21/2008	0.5452	1647	342.811	1304.189	0.208143
2/22/2008	0.5561	1652	349.0377	1302.962	0.211282
2/23/2008	0.5558	1657	355.3722	1301.628	0.214467
2/24/2008	0.5475	1666	361.8112	1304.189	0.217174
2/25/2008	0.547	1681	368.3523	1312.648	0.219127
2/26/2008	0.5429	1690	374.9936	1315.006	0.22189
2/27/2008	0.5428	1718	381.7341	1336.266	0.222197
2/28/2008	0.5426	1743	388.5743	1354.426	0.222934
2/29/2008	0.5428	1753	395.5149	1357.485	0.225622
3/1/2008	0.528	1755	402.5537	1352.446	0.229375
3/2/2008	0.5146	1761	409.6875	1351.313	0.232645
3/3/2008	0.5145	1766	416.9129	1349.087	0.236077
3/4/2008	0.5247	1768	424.2265	1343.774	0.239947
3/5/2008	0.525	1762	431.6242	1330.376	0.244963
3/6/2008	0.5257	1761	439.1013	1321.899	0.249348
3/7/2008	0.524	1750	446.6526	1303.347	0.25523
3/8/2008	0.5198	1767	454.2269	1312.773	0.257061
3/9/2008	0.5121	1768	461.7303	1306.27	0.26116

3/10/2008	0.5123	1799	469.1169	1329.883	0.260765
3/11/2008	0.5123	1846	476.3856	1369.614	0.258064
3/12/2008	0.512	1862	483.5352	1378.465	0.259686
3/13/2008	0.5117	1878	490.5644	1387.436	0.261216
3/14/2008	0.4996	1903	497.4719	1405.528	0.261415
3/15/2008	0.5096	1991	504.2563	1486.744	0.253268
3/16/2008	0.5097	2074	510.916	1563.084	0.246343
3/17/2008	0.5388	2131	517.4491	1613.551	0.24282
3/18/2008	0.5136	2172	523.8536	1648.146	0.241185
3/19/2008	0.5123	2213	530.1272	1682.873	0.239551
3/20/2008	0.5074	2247	536.2678	1710.732	0.238659
3/21/2008	0.5106	2286	542.2728	1743.727	0.237215
3/22/2008	0.5143	2333	548.1397	1784.86	0.234951
3/23/2008	0.5085	2368	553.8659	1814.134	0.233896
3/24/2008	0.5061	2411	559.4486	1851.551	0.23204
3/25/2008	0.5117	2434	564.885	1869.115	0.232081
3/26/2008	0.5119	2441	570.1721	1870.828	0.233581
3/27/2008	0.511	2437	575.307	1861.693	0.236072
3/28/2008	0.5076	2408	580.2868	1827.713	0.240983
3/29/2008	0.5022	2378	585.1085	1792.892	0.246051
3/30/2008	0.5045	2328	589.7695	1738.231	0.253337
3/31/2008	0.5037	2271	594.2671	1676.733	0.261676
4/1/2008	0.5023	2213	598.5991	1614.401	0.270492
4/2/2008	0.4964	2163	602.7633	1560.237	0.27867
4/3/2008	0.4986	2119	606.7576	1512.242	0.286341
4/4/2008	0.494	2075	610.5802	1464.42	0.294256
4/5/2008	0.4956	2030	614.2295	1415.771	0.302576
4/6/2008	0.4844	1998	617.704	1380.296	0.309161
4/7/2008	0.4814	1955	621.0023	1333.998	0.317648

4/8/2008	0.478	1927	624.1231	1302.877	0.323883
4/9/2008	0.4656	1892	627.0653	1264.935	0.33143
4/10/2008	0.4627	1864	629.8278	1234.172	0.33789
4/11/2008	0.4602	1840	632.4096	1207.59	0.343701
4/12/2008	0.4577	1813	634.81	1178.19	0.350143
4/13/2008	0.4556	1778	637.028	1140.972	0.358283
4/14/2008	0.4596	1753	639.0629	1113.937	0.364554
4/15/2008	0.4498	1736	640.9141	1095.086	0.36919
4/16/2008	0.4465	1719	642.581	1076.419	0.373811
4/17/2008	0.4389	1701	644.0629	1056.937	0.378638
4/18/2008	0.4253	1680	645.3593	1034.641	0.384142
4/19/2008	0.4332	1659	646.4697	1012.53	0.389674
4/20/2008	0.4282	1633	647.3937	985.6063	0.396444
4/21/2008	0.4263	1600	648.1309	951.8691	0.405082
4/22/2008	0.4267	1572	648.6808	923.3192	0.412647
4/23/2008	0.4199	1532	649.0433	882.9567	0.423658
4/24/2008	0.4209	1492	649.2181	842.7819	0.435133
4/25/2008	0.4187	1510	642.1294	867.8706	0.425251
4/26/2008	0.427	1443	629.7136	813.2864	0.436392
4/27/2008	0.4225	1405	617.6179	787.3821	0.439586
4/28/2008	0.4244	1354	606.0156	747.9844	0.447574
4/29/2008	0.4247	1331	594.8001	736.1999	0.446882
4/30/2008	0.4229	1281	583.9697	697.0303	0.45587
5/1/2008	0.4222	1254	573.5606	680.4394	0.457385
5/2/2008	0.4179	1202	563.5945	638.4055	0.468881
5/3/2008	0.4258	1184	554.0096	629.9904	0.467914
5/4/2008	0.431	1166	544.5529	621.4471	0.467027
5/5/2008	0.4066	1148	535.2263	612.7737	0.466225
5/6/2008	0.4104	1122	526.0927	595.9073	0.468888

5/7/2008	0.4101	1101	517.1779	583.8221	0.469735
5/8/2008	0.4108	1074	508.4928	565.5072	0.473457
5/9/2008	0.4137	1052	500.0485	551.9515	0.475331
5/10/2008	0.4137	1034	491.7802	542.2198	0.475609
5/11/2008	0.4231	1012	483.6906	528.3094	0.477955
5/12/2008	0.4165	990	475.8128	514.1872	0.480619
5/13/2008	0.4112	971.1	468.1264	502.9736	0.482058
5/14/2008	0.4114	944.8	460.6672	484.1328	0.487582
5/15/2008	0.4114	927.7	453.4248	474.2752	0.488762
5/16/2008	0.4109	902.9	446.3912	456.5088	0.494397
5/17/2008	0.4115	887	439.5603	447.4397	0.495558
5/18/2008	0.3977	870	432.876	437.124	0.497559
5/19/2008	0.3974	841.7	426.4347	415.2653	0.506635
5/20/2008	0.3857	821.3	420.2662	401.0338	0.511709
5/21/2008	0.385	805.2	414.2817	390.9183	0.514508
5/22/2008	0.3818	787	408.4672	378.5328	0.519018
5/23/2008	0.3768	773.4	402.8063	370.5937	0.520825
5/24/2008	0.3769	767.9	397.2046	370.6954	0.517261
5/25/2008	0.3733	743.9	391.7422	352.1578	0.526606
5/26/2008	0.3738	717.1	386.5835	330.5165	0.539093
5/27/2008	0.3723	700	381.6805	318.3195	0.545258
5/28/2008	0.3651	702.6	376.8328	325.7672	0.53634
5/29/2008	0.3649	653.4	372.2661	281.1339	0.569737
5/30/2008	0.3666	666.6	367.9842	298.6158	0.552031
5/31/2008	0.3658	662.9	363.6349	299.2651	0.548552
6/1/2008	0.3715	648.4	359.2583	289.1417	0.554069
6/2/2008	0.369	631.7	354.9823	276.7177	0.561948
6/3/2008	0.3663	609.7	350.9358	258.7642	0.575588
6/4/2008	0.3636	591	347.1376	243.8624	0.587373

6/5/2008	0.3685	580.3	343.5055	236.7945	0.591945
6/6/2008	0.3793	569.3	339.9832	229.3168	0.597195
6/7/2008	0.3787	558.3	336.5748	221.7252	0.602857
6/8/2008	0.3767	546.7	333.2866	213.4134	0.609634
6/9/2008	0.377	549.8	330.0365	219.7635	0.600285
6/10/2008	0.3712	522.9	326.9181	195.9819	0.625202
6/11/2008	0.3717	515.9	323.9869	191.9131	0.628003
6/12/2008	0.3627	509.6	321.1124	188.4876	0.630126
6/13/2008	0.3683	504.3	318.2823	186.0177	0.631137
6/14/2008	0.3681	495.1	315.5196	179.5804	0.637285
6/15/2008	0.3651	490.8	312.8177	177.9823	0.637363
6/16/2008	0.3647	480.2	310.188	170.012	0.645956
6/17/2008	0.3628	474.4	307.6431	166.7569	0.648489
6/18/2008	0.3629	466.9	305.1608	161.7392	0.653589
6/19/2008	0.3625	460.5	302.7465	157.7535	0.65743
6/20/2008	0.3609	456.4	300.3754	156.0246	0.658141
6/21/2008	0.3627	454.4	298.0146	156.3854	0.655842
6/22/2008	0.3539	455.7	295.633	160.067	0.648745
6/23/2008	0.3524	437.6	293.3431	144.2569	0.670345
6/24/2008	0.3528	434	291.1737	142.8263	0.670907
6/25/2008	0.356	428.2	289.0428	139.1572	0.675018
6/26/2008	0.3557	422.8	286.9648	135.8352	0.678725
6/27/2008	0.3556	419.8	284.9191	134.8809	0.678702
6/28/2008	0.3521	416.4	282.8909	133.5091	0.679373
6/29/2008	0.3545	409.1	280.9134	128.1866	0.686662
6/30/2008	0.352	402.9	279.0085	123.8915	0.692501
7/1/2008	0.338	398.9	277.1523	121.7477	0.694791
7/2/2008	0.3358	398.9	275.2983	123.6017	0.690144
7/3/2008	0.3331	410.5	273.4154	137.0846	0.666054

7/4/2008	0.3356	390.8	271.5654	119.2346	0.694896
7/5/2008	0.3325	380.3	269.8296	110.4704	0.709518
7/6/2008	0.3302	383.8	268.1471	115.6529	0.698664
7/7/2008	0.3367	382.5	266.4385	116.0615	0.696571
7/8/2008	0.3343	379.1	264.7132	114.3868	0.698267
7/9/2008	0.3312	374.8	263.004	111.796	0.701718
7/10/2008	0.3345	371.6	261.3259	110.2741	0.703245
7/11/2008	0.3343	369.2	259.6649	109.5351	0.703318
7/12/2008	0.3318	366.8	258.0151	108.7849	0.703422
7/13/2008	0.332	361.3	256.4003	104.8997	0.709661
7/14/2008	0.3347	356.8	254.8371	101.9629	0.71423
7/15/2008	0.3326	353.7	253.308	100.392	0.716166
7/16/2008	0.3295	349.7	251.8097	97.89034	0.720073
7/17/2008	0.3268	347.4	250.3365	97.06354	0.7206
7/18/2008	0.3268	346.2	248.8675	97.33253	0.718855
7/19/2008	0.3274	344	247.402	96.598	0.719192
7/20/2008	0.3279	341.1	245.953	95.14695	0.721058
7/21/2008	0.3243	338.7	244.5224	94.17762	0.721944
7/22/2008	0.3215	335.2	243.1149	92.08514	0.725283
7/23/2008	0.3214	333.7	241.724	91.97603	0.724375
7/24/2008	0.3229	331.4	240.3408	91.05917	0.725229
7/25/2008	0.3233	328.9	238.9732	89.92682	0.726583
7/26/2008	0.3191	327.7	237.6129	90.08713	0.725093
7/27/2008	0.3193	323.6	236.2722	87.3278	0.730137
7/28/2008	0.32	322.2	234.953	87.247	0.729215
7/29/2008	0.3208	321.1	233.6327	87.46726	0.727601
7/30/2008	0.3161	319.1	232.316	86.78402	0.728035
7/31/2008	0.3149	315.2	231.0241	84.17591	0.732944
8/1/2008	0.3128	311.1	229.7734	81.32656	0.738584

8/2/2008	0.3134	309	228.551	80.44905	0.739647
8/3/2008	0.3132	306.6	227.3441	79.25588	0.741501
8/4/2008	0.3117	302.3	226.1699	76.13009	0.748164
8/5/2008	0.3124	300.6	225.0235	75.57648	0.748581
8/6/2008	0.3099	298.1	223.8916	74.20836	0.751062
8/7/2008	0.3092	300.8	222.7614	78.03859	0.740563
8/8/2008	0.305	293.7	221.6475	72.05253	0.754673
8/9/2008	0.301	291.7	220.5655	71.13455	0.756138
8/10/2008	0.2989	290.7	219.4898	71.2102	0.755039
8/11/2008	0.2988	290	218.4107	71.58929	0.75314
8/12/2008	0.2974	288.9	217.3289	71.57111	0.752263
8/13/2008	0.2994	287.8	216.2474	71.55265	0.751381
8/14/2008	0.2998	286.6	215.1669	71.43314	0.750757
8/15/2008	0.3026	283.9	214.0996	69.8004	0.754137
8/16/2008	0.3028	282.1	213.0504	69.04964	0.75523
8/17/2008	0.3046	281.7	212.0019	69.69811	0.75258
8/18/2008	0.3032	280.7	210.9481	69.75189	0.751507
8/19/2008	0.3035	277.3	209.9118	67.38822	0.756984
8/20/2008	0.3032	270.6	208.9366	61.66342	0.772123
8/21/2008	0.3025	269.4	208.0067	61.39332	0.772111
8/22/2008	0.3037	267.9	207.0832	60.81682	0.772987
8/23/2008	0.304	265.4	206.1761	59.22393	0.77685
8/24/2008	0.3051	263	205.2925	57.70754	0.78058
8/25/2008	0.3055	261.1	204.4281	56.67187	0.78295
8/26/2008	0.3078	261	203.5659	57.43413	0.779946
8/27/2008	0.3062	257.2	202.7202	54.47983	0.788181
8/28/2008	0.3082	255	201.9073	53.09272	0.791793
8/29/2008	0.3058	254	201.1064	52.89362	0.791757
8/30/2008	0.303	252.4	200.3131	52.08693	0.793633

8/31/2008	0.3038	250.3	199.5359	50.76414	0.797187
9/1/2008	0.3041	248.3	198.778	49.52197	0.800556
9/2/2008	0.2996	246.5	198.0376	48.46241	0.803398
9/3/2008	0.2964	243.2	197.3247	45.87529	0.811368
9/4/2008	0.2967	242	196.6352	45.36476	0.812542
9/5/2008	0.2967	241.8	195.9459	45.85407	0.810364
9/6/2008	0.2969	241.5	195.2499	46.25007	0.808488
9/7/2008	0.2946	240.5	194.5532	45.94677	0.808953
9/8/2008	0.3079	239.5	193.8611	45.63885	0.809441
9/9/2008	0.3047	238.8	193.1715	45.62853	0.808926
9/10/2008	0.305	238.8	192.4766	46.32338	0.806016
9/11/2008	0.3054	238.6	191.7727	46.82729	0.803741
9/12/2008	0.3058	235.2	191.0855	44.11451	0.812438
9/13/2008	0.3102	235.4	190.4137	44.98631	0.808894
9/14/2008	0.3141	222.6	189.8276	32.77241	0.852774
9/15/2008	0.3132	221	189.3407	31.6593	0.856745
9/16/2008	0.3154	220.4	188.8631	31.53685	0.856911
9/17/2008	0.3154	218.9	188.3943	30.50569	0.860641
9/18/2008	0.3172	218.1	187.9358	30.16415	0.861696
9/19/2008	0.317	216.3	187.4902	28.8098	0.866806
9/20/2008	0.3172	215	187.0614	27.93863	0.870053
9/21/2008	0.3171	213.5	186.6473	26.85267	0.874226
9/22/2008	0.3169	211.9	186.2506	25.64941	0.878955
9/23/2008	0.3298	210.6	185.8699	24.73011	0.882573
9/24/2008	0.3262	209	185.5055	23.49453	0.887586
9/25/2008	0.3108	208.2	185.1538	23.04622	0.889307
9/26/2008	0.3115	207.4	184.8089	22.59109	0.891075
9/27/2008	0.312	206	184.4755	21.52446	0.895512
9/28/2008	0.3126	204.2	184.1615	20.03853	0.901868

9/29/2008	0.3131	202.5	183.8693	18.63074	0.907996
9/30/2008	0.3102	201.1	183.5962	17.5038	0.91296
10/1/2008	0.3115	198	183.3532	14.64675	0.926026
10/2/2008	0.2949	197	183.1378	13.86219	0.929634
10/3/2008	0.2949	196.1	182.9336	13.16643	0.932859
10/4/2008	0.2949	193.4	182.7536	10.64638	0.944952
10/5/2008	0.2945	191.6	182.6052	8.9948	0.953054
10/6/2008	0.2966	191	182.4728	8.527208	0.955355
10/7/2008	0.2969	189.9	182.3513	7.548689	0.960249
10/8/2008	0.2972	188.8	182.2447	6.555268	0.965279
10/9/2008	0.307	186.9	182.1594	4.740627	0.974635
10/10/2008	0.3073	186.3	182.0917	4.208251	0.977411
10/11/2008	0.3242	185.9	182.0307	3.86929	0.979186
10/12/2008	0.3262	185.3	181.9764	3.323645	0.982063
10/13/2008	0.3269	184.6	181.9311	2.668929	0.985542
10/14/2008	0.3276	183.8	181.8965	1.903481	0.989644
10/15/2008	0.328	183.5	181.8698	1.630184	0.991116
10/16/2008	0.3285	183.2	181.8473	1.352725	0.992616
10/17/2008	0.3298	183.1	181.8274	1.272563	0.99305
10/18/2008	0.3432	182.4	181.8134	0.586612	0.996784
10/19/2008	0.3526	182.2	181.806	0.394023	0.997837
10/20/2008	0.363	182	181.8015	0.1985	0.998909
10/21/2008	0.3637	181.8	181.8	0	1
10/22/2008	0.3486	181.8	181.8	0	1
10/23/2008	0.3512	182.3	181.8	0.499972	0.997257
10/24/2008	0.3517	184.1	181.8002	2.299759	0.987508
10/25/2008	0.3535	186	181.801	4.199029	0.977425
10/26/2008	0.3538	186.7	181.8026	4.897444	0.973768
10/27/2008	0.3656	187.3	181.8052	5.49481	0.970663

10/28/2008	0.3795	187.5	181.809	5.69104	0.969648
10/29/2008	0.3794	188.6	181.8139	6.786052	0.964019
10/30/2008	0.3793	189.2	181.8203	7.379713	0.960995
10/31/2008	0.3793	189.3	181.8281	7.47193	0.960529
11/1/2008	0.3919	189.9	181.8373	8.062671	0.957543
11/2/2008	0.3923	189.8	181.8481	7.951912	0.958104
11/3/2008	0.3978	190.5	181.8604	8.639639	0.954648
11/4/2008	0.3982	191.7	181.8742	9.825759	0.948744
11/5/2008	0.3992	194	181.89	12.11002	0.937577
11/6/2008	0.4175	193.5	181.9078	11.59218	0.940092
11/7/2008	0.426	194.1	181.9278	12.17221	0.937289
11/8/2008	0.4548	193.8	181.9499	11.85014	0.938854
11/9/2008	0.456	195.8	181.9741	13.82593	0.929387
11/10/2008	0.4567	198.1	182.0007	16.09931	0.918731
11/11/2008	0.4576	197.3	182.03	15.27004	0.922605
11/12/2008	0.4582	200.4	182.062	18.33799	0.908493
11/13/2008	0.4696	205.2	182.0973	23.10267	0.887414
11/14/2008	0.4694	207.1	182.1366	24.96336	0.879462
11/15/2008	0.4705	211.4	182.1805	29.21948	0.861781
11/16/2008	0.4702	217.2	182.2298	34.97024	0.838995
11/17/2008	0.4791	222.9	182.2854	40.6146	0.81779
11/18/2008	0.479	231	182.3486	48.65135	0.789388
11/19/2008	0.4786	235.3	182.4208	52.87925	0.775269
11/20/2008	0.4786	239	182.5026	56.49743	0.763609
11/21/2008	0.4786	244.6	182.5948	62.00523	0.746504
11/22/2008	0.4731	247	182.698	64.302	0.739668
11/23/2008	0.511	249.2	182.8126	66.38739	0.733598
11/25/2008	0.5743	259.7	182.9392	76.76079	0.704425
11/26/2008	0.5562	272.7	183.0795	89.62055	0.671358

11/27/2008	0.5561	284	183.2356	100.7644	0.645196
11/28/2008	0.5561	289.5	183.4094	106.0906	0.633539
11/29/2008	0.5561	303.6	183.6024	119.9976	0.604751
11/30/2008	0.5565	315.3	183.8166	131.4834	0.582989
12/1/2008	0.5565	324.8	184.0538	140.7462	0.566668
12/2/2008	0.556	336.6	184.3157	152.2843	0.547581
12/3/2008	0.5552	348.5	184.6041	163.8959	0.529711
12/4/2008	0.555	360.6	184.9209	175.6791	0.512814
12/5/2008	0.5549	372.9	185.2677	187.6323	0.496829
12/6/2008	0.5548	385.4	185.6464	199.7536	0.481698
12/7/2008	0.5547	398.1	186.0588	212.0412	0.467367
12/8/2008	0.5546	411	186.5067	224.4933	0.453788
12/9/2008	0.5545	424.1	186.9917	237.1083	0.440914
12/10/2008	0.5469	437.4	187.5157	249.8843	0.428705
12/26/2008	0.4957	675.5	188.0929	487.4071	0.27845
12/27/2008	0.6055	692	188.7501	503.2499	0.27276
12/28/2008	0.6012	708.7	189.501	519.199	0.267392
12/29/2008	0.5678	725.5	190.3464	535.1536	0.262366
12/30/2008	0.5577	742.6	191.2871	551.3129	0.257591
12/31/2008	0.5575	759.8	192.3237	567.4763	0.253124
1/1/2009	0.5573	777.2	193.4572	583.7428	0.248916
1/2/2009	0.5571	794.8	194.6883	600.1117	0.244953
1/3/2009	0.5565	812.5	196.0178	616.4822	0.241253
1/4/2009	0.5555	830.5	197.4464	633.0536	0.237744
1/5/2009	0.5538	848.6	198.975	649.625	0.234474
1/6/2009	0.5536	867	200.6042	666.3958	0.231377
1/7/2009	0.5536	885.5	202.3348	683.1652	0.228498
1/8/2009	0.548	904.1	204.1676	699.9324	0.225824
1/9/2009	0.5484	923	206.1034	716.8966	0.223297

1/10/2009	0.5485	942.1	208.1428	733.9572	0.220935
1/11/2009	0.5424	961.3	210.2867	751.0133	0.218752
1/12/2009	0.5317	980.7	212.5357	768.1643	0.216718
1/13/2009	0.5108	1000	214.8905	785.1095	0.214891
2/2/2009	0.5337	1417	217.3743	1199.626	0.153405
2/3/2009	0.5328	1438	220.0318	1217.968	0.153012
2/4/2009	0.532	1480	222.8853	1257.115	0.150598
2/6/2009	0.557	1563	225.9391	1337.061	0.144555
2/7/2009	0.557	1599	229.2001	1369.8	0.14334
2/8/2009	0.5568	1641	232.6726	1408.327	0.141787
2/9/2009	0.5322	1695	236.3592	1458.641	0.139445
2/10/2009	0.5327	1723	240.2628	1482.737	0.139444
2/11/2009	0.5435	1754	244.3839	1509.616	0.139329
2/12/2009	0.544	1784	248.722	1535.278	0.139418
2/13/2009	0.5447	1817	253.2764	1563.724	0.139393
2/14/2009	0.5441	1854	258.0474	1595.953	0.139184
2/15/2009	0.5434	1877	263.0346	1613.965	0.140136
2/16/2009	0.5427	1894	268.2361	1625.764	0.141624
2/17/2009	0.5434	1911	273.6485	1637.352	0.143196
2/18/2009	0.5535	1936	279.2686	1656.731	0.14425
2/19/2009	0.5534	1958	285.094	1672.906	0.145605
2/20/2009	0.5533	1986	291.1226	1694.877	0.146587
2/21/2009	0.553	2026	297.3538	1728.646	0.146769
2/22/2009	0.5248	2066	303.7884	1762.212	0.147042
2/23/2009	0.5222	2121	310.4288	1810.571	0.14636
2/24/2009	0.522	2169	317.2784	1851.722	0.146279
2/25/2009	0.5491	2239	324.3419	1914.658	0.14486
2/26/2009	0.5481	2325	331.6268	1993.373	0.142635
3/4/2009	0.5328	2707	339.16	2367.84	0.12529

3/5/2009	0.5333	2742	346.9821	2395.018	0.126543
3/6/2009	0.5337	2793	355.1111	2437.889	0.127143
3/7/2009	0.5338	2838	363.5463	2474.454	0.128099
3/8/2009	0.5343	2882	372.2869	2509.713	0.129177
3/9/2009	0.5345	2909	381.3311	2527.669	0.131087
3/10/2009	0.5349	2921	390.6738	2530.326	0.133747
3/12/2009	0.5216	2940	400.3081	2539.692	0.136159
3/13/2009	0.524	2958	410.1024	2547.898	0.138642
3/14/2009	0.5234	2966	419.8358	2546.164	0.141549
3/15/2009	0.5229	2975	429.4128	2545.587	0.14434
3/16/2009	0.5266	2986	438.8294	2547.171	0.146962
3/17/2009	0.5265	3000	448.0812	2551.919	0.14936
3/18/2009	0.5674	3026	457.1642	2568.836	0.151079
3/19/2009	0.5193	3041	466.0742	2574.926	0.153263
3/20/2009	0.5107	3052	474.8069	2577.193	0.155572
3/21/2009	0.5084	3064	483.3582	2580.642	0.157754
3/22/2009	0.5039	3091	491.724	2599.276	0.159082
3/23/2009	0.5042	3104	499.8999	2604.1	0.16105
3/24/2009	0.5053	3126	507.8818	2618.118	0.16247
3/25/2009	0.5057	3143	515.6655	2627.335	0.164068
3/26/2009	0.5057	3156	523.2467	2632.753	0.165794
3/27/2009	0.5009	3160	530.6211	2629.379	0.167918
3/28/2009	0.502	3147	537.7847	2609.215	0.170888
3/29/2009	0.4969	3128	544.733	2583.267	0.174147
3/30/2009	0.495	3098	551.4622	2546.538	0.178006
3/31/2009	0.4923	3065	557.9681	2507.032	0.182045
4/1/2009	0.4921	3029	564.2471	2464.753	0.186282
4/2/2009	0.4872	2973	570.2953	2402.705	0.191825
4/3/2009	0.4811	2898	576.1093	2321.891	0.198795

4/4/2009	0.4778	2862	581.6859	2280.314	0.203245
4/5/2009	0.4697	2774	587.022	2186.978	0.211616
4/6/2009	0.4693	2695	592.1147	2102.885	0.219709
4/7/2009	0.4642	2593	596.9615	1996.038	0.23022
4/8/2009	0.4654	2523	601.5603	1921.44	0.238431
4/9/2009	0.4604	2429	605.9089	1823.091	0.249448
4/10/2009	0.4615	2404	610.0058	1793.994	0.253746
4/11/2009	0.466	2381	613.8494	1767.151	0.257812
4/12/2009	0.4654	2282	617.4384	1664.562	0.270569
4/13/2009	0.4605	2271	620.7714	1650.229	0.273347
4/14/2009	0.457	2208	623.8474	1584.153	0.28254
4/15/2009	0.441	1970	626.6654	1343.335	0.318104
4/16/2009	0.433	1916	629.2251	1286.775	0.328406
4/17/2009	0.4334	1845	631.5261	1213.474	0.342291
4/18/2009	0.4345	1809	633.5687	1175.431	0.350231
4/19/2009	0.4336	1783	635.3531	1147.647	0.356339
4/20/2009	0.4333	1748	636.8806	1111.119	0.364348
4/21/2009	0.42	1738	638.1538	1099.846	0.367177
4/22/2009	0.392	1673	639.179	1033.821	0.382056
4/23/2009	0.4099	1630	639.9667	990.0333	0.392618
4/24/2009	0.3928	1596	640.5278	955.4722	0.401333
4/25/2009	0.3794	1572	640.87	931.13	0.407678
4/26/2009	0.4062	1538	641.0002	896.9998	0.416775
4/27/2009	0.3785	1481	629.503	851.497	0.425053
4/28/2009	0.4021	1448	616.7873	831.2127	0.425958
4/29/2009	0.4008	1404	604.4643	799.5357	0.43053
4/30/2009	0.3966	1344	592.7455	751.2545	0.441031
5/1/2009	0.4041	1299	581.6477	717.3523	0.447766
5/2/2009	0.4075	1273	570.9215	702.0785	0.448485

5/3/2009	0.403	1239	560.4888	678.5112	0.452372
5/4/2009	0.4099	1200	550.4531	649.5469	0.458711
5/5/2009	0.4093	1171	540.7824	630.2176	0.461812
5/6/2009	0.4114	1142	531.406	610.594	0.465329
5/7/2009	0.4094	1110	522.3512	587.6488	0.470587
5/8/2009	0.4088	1086	513.585	572.415	0.472914
5/9/2009	0.402	1059	505.0736	553.9264	0.476934
5/10/2009	0.3964	1042	496.7676	545.2324	0.476744
5/11/2009	0.3978	1025	488.594	536.406	0.476677
5/12/2009	0.3955	992.4	480.6736	511.7264	0.484355
5/13/2009	0.3888	950.4	473.2007	477.1993	0.497896
5/14/2009	0.3877	913.7	466.2131	447.4869	0.510247
5/15/2009	0.3849	853.4	459.8577	393.5423	0.538854
5/16/2009	0.3814	846.9	453.9142	392.9858	0.535971
5/17/2009	0.3794	844.9	447.9448	396.9552	0.530175
5/18/2009	0.3748	837.3	441.9577	395.3423	0.527837
5/19/2009	0.3747	817.8	436.0858	381.7142	0.533243
5/20/2009	0.3754	800	430.4084	369.5916	0.53801
5/21/2009	0.3682	782.1	424.9164	357.1836	0.543302
5/22/2009	0.3632	761.8	419.6316	342.1684	0.550842
5/23/2009	0.3641	748.3	414.5237	333.7763	0.553954
5/24/2009	0.3693	736.3	409.5322	326.7678	0.556203
5/25/2009	0.3674	723.1	404.6565	318.4435	0.559614
5/26/2009	0.3631	707.9	399.9229	307.9771	0.564943
5/27/2009	0.3628	689.7	395.3714	294.3286	0.573251
5/28/2009	0.3599	674.2	391.0073	283.1927	0.579957
5/29/2009	0.3595	649.7	386.8813	262.8187	0.595477
5/30/2009	0.355	647.7	382.8942	264.8058	0.59116
5/31/2009	0.3636	641.1	378.9119	262.1881	0.591034

6/1/2009	0.3605	638	374.9428	263.0572	0.587685
6/2/2009	0.3588	632.1	370.9817	261.1183	0.586904
6/3/2009	0.3598	618.8	367.1066	251.6934	0.593256
6/4/2009	0.3703	608.9	363.3491	245.5509	0.59673
6/5/2009	0.3753	599.4	359.6821	239.7179	0.60007
6/6/2009	0.3783	587.7	356.1206	231.5794	0.605956
6/7/2009	0.3762	577.9	352.6686	225.2314	0.610259
6/8/2009	0.3756	570.7	349.2935	221.4065	0.612044
6/9/2009	0.3794	567.6	345.9455	221.6545	0.609488
6/10/2009	0.3811	565.5	342.586	222.914	0.605811
6/11/2009	0.3779	562.3	339.2158	223.0842	0.603265
6/12/2009	0.3722	551.1	335.9038	215.1962	0.609515
6/13/2009	0.3745	537.4	332.731	204.669	0.61915
6/14/2009	0.3714	526	329.701	196.299	0.626808
6/15/2009	0.3795	517.7	326.7749	190.9251	0.631205
6/16/2009	0.375	509.7	323.9283	185.7717	0.635527
6/17/2009	0.3758	505.1	321.1344	183.9656	0.635784
6/18/2009	0.375	496.7	318.3968	178.3032	0.641024
6/19/2009	0.3791	486.1	315.7622	170.3378	0.649583
6/20/2009	0.376	481.4	313.204	168.196	0.650611
6/21/2009	0.3749	476.7	310.6785	166.0215	0.651727
6/22/2009	0.3788	471.5	308.1898	163.3102	0.653637
6/23/2009	0.3764	464.4	305.7569	158.6431	0.658391
6/24/2009	0.383	461.2	303.3654	157.8346	0.657774
6/25/2009	0.3868	457	300.9938	156.0062	0.65863
6/26/2009	0.3849	449.5	298.6752	150.8248	0.664461
6/27/2009	0.381	441.4	296.44	144.96	0.67159
6/28/2009	0.3812	436	294.2737	141.7264	0.67494
6/29/2009	0.3792	431.5	292.1496	139.3504	0.677056

6/30/2009	0.3785	427.6	290.0573	137.5427	0.678338
7/1/2009	0.3762	422.3	288.003	134.297	0.681987
7/2/2009	0.3806	417.3	285.996	131.304	0.685349
7/3/2009	0.3838	413.9	284.0223	129.8777	0.68621
7/4/2009	0.3824	409.1	282.081	127.019	0.689516
7/5/2009	0.3824	405.5	280.1742	125.3258	0.690935
7/6/2009	0.3814	400.3	278.3052	121.9948	0.695242
7/7/2009	0.3814	396.8	276.4741	120.3259	0.696759
7/8/2009	0.3761	393.9	274.6638	119.2362	0.697293
7/9/2009	0.3789	391	272.8701	118.1299	0.697877
7/10/2009	0.3673	387.2	271.1001	116.0999	0.700155
7/11/2009	0.3626	382	269.3717	112.6283	0.705161
7/12/2009	0.3623	376.8	267.6961	109.1039	0.710446
7/13/2009	0.3632	372.6	266.0666	106.5334	0.714081
7/14/2009	0.3626	369.5	264.4679	105.0321	0.715745
7/15/2009	0.3625	365.8	262.8966	102.9034	0.718689
7/16/2009	0.364	361.8	261.36	100.44	0.722388
7/17/2009	0.3555	358	259.8594	98.14062	0.725864
7/18/2009	0.3461	355.7	258.3824	97.31764	0.726405
7/19/2009	0.338	352.5	256.9247	95.57527	0.728864
7/20/2009	0.3355	351.3	255.4784	95.82159	0.727237
7/21/2009	0.3353	348.9	254.0375	94.86253	0.72811
7/22/2009	0.3353	347	252.6073	94.39267	0.727975
7/23/2009	0.3352	344.2	251.1912	93.0088	0.729783
7/24/2009	0.3388	341.5	249.7954	91.70462	0.731465
7/25/2009	0.3407	338.5	248.4217	90.0783	0.73389
7/26/2009	0.3475	335.7	247.0713	88.62873	0.735988
7/27/2009	0.3494	332.1	245.749	86.35099	0.739985
7/28/2009	0.3477	329.3	244.4553	84.84466	0.742348

7/29/2009	0.3468	328.1	243.1724	84.92758	0.741153
7/30/2009	0.3474	326.4	241.8921	84.50794	0.741091
7/31/2009	0.3478	325.1	240.615	84.48497	0.740126
8/1/2009	0.3479	323.7	239.3391	84.36088	0.739386
8/2/2009	0.3479	322.4	238.0643	84.33567	0.738413
8/3/2009	0.3517	319	236.8059	82.19408	0.742338
8/4/2009	0.3503	317.6	235.5649	82.03511	0.741703
8/5/2009	0.35	315.9	234.3286	81.57143	0.741781
8/6/2009	0.3503	314.6	233.0963	81.50373	0.740929
8/7/2009	0.3496	310.8	231.884	78.91597	0.746088
8/8/2009	0.3498	308.6	230.699	77.90099	0.747566
8/9/2009	0.3457	305.5	229.5363	75.96369	0.751346
8/10/2009	0.3449	301.8	228.4077	73.39233	0.756818
8/11/2009	0.3455	303.1	227.2899	75.81005	0.749884
8/12/2009	0.34	297	226.1918	70.80825	0.761588
8/13/2009	0.337	296.3	225.1188	71.18122	0.759766
8/14/2009	0.3361	293	224.0599	68.94007	0.76471
8/15/2009	0.3359	289.9	223.0337	66.86631	0.769347
8/16/2009	0.3329	285.8	222.0466	63.75336	0.77693
8/17/2009	0.3362	282.9	221.0979	61.80214	0.781541
8/18/2009	0.345	276.8	220.2032	56.59685	0.795532
8/19/2009	0.3428	268.7	219.4029	49.29705	0.816535
8/20/2009	0.3399	261	218.7109	42.28914	0.837973
8/21/2009	0.3272	257	218.0973	38.90268	0.848628
8/22/2009	0.327	256	217.5125	38.48749	0.849658
8/23/2009	0.3253	255.6	216.9294	38.67055	0.848707
8/24/2009	0.3249	255.6	216.3406	39.25944	0.846403
8/25/2009	0.3241	255.5	215.7435	39.75654	0.844397
8/26/2009	0.3215	255.2	215.1403	40.05969	0.843026

8/27/2009	0.3189	255.2	214.5303	40.66973	0.840636
8/28/2009	0.3154	255.1	213.9117	41.18831	0.838541
8/29/2009	0.3148	255	213.2852	41.71478	0.836413
8/30/2009	0.3137	254.8	212.6515	42.14851	0.834582
8/31/2009	0.3129	254.6	212.0112	42.58884	0.832723
9/1/2009	0.3114	253.8	211.3687	42.43131	0.832816
9/2/2009	0.3044	253	210.7286	42.27138	0.832919
9/3/2009	0.301	251.1	210.0994	41.00064	0.836716
9/4/2009	0.306	248.5	209.4948	39.00522	0.843037
9/5/2009	0.2946	247.9	208.9054	38.99464	0.8427
9/6/2009	0.2856	245.8	208.3275	37.47247	0.847549
9/7/2009	0.2856	244.4	207.7675	36.63246	0.850113
9/8/2009	0.286	242.6	207.2234	35.37661	0.854177
9/9/2009	0.2839	240.4	206.7014	33.69859	0.859823
9/10/2009	0.2937	237.5	206.2103	31.28968	0.868254
9/11/2009	0.2932	238.2	205.7338	32.46622	0.863702
9/12/2009	0.2796	233	205.2843	27.71574	0.881048
9/13/2009	0.2794	229.5	204.8888	24.61116	0.892762
9/14/2009	0.2752	228.3	204.5232	23.77681	0.895853
9/15/2009	0.2749	228	204.1634	23.83661	0.895453
9/16/2009	0.2746	227.3	203.8057	23.49427	0.896638
9/17/2009	0.2774	226.5	203.454	23.04596	0.898252
9/18/2009	0.2898	224.5	203.1183	21.38169	0.904759
9/19/2009	0.2894	223.4	202.8011	20.59892	0.907794
9/20/2009	0.2893	222.9	202.4912	20.4088	0.90844
9/21/2009	0.289	222.4	202.1842	20.21579	0.909102
9/22/2009	0.2889	220.9	201.8878	19.01223	0.913933
9/23/2009	0.2784	219.8	201.6066	18.19338	0.917228
9/29/2009	0.3028	215.3	201.3638	13.93617	0.935271

9/30/2009	0.3025	212.8	201.1706	11.62936	0.945351
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6.2.1.1.1.1 Downstream Base flow

Date	NDVI	Discharge	Base flow	Quick flow	BFI
10/1/2004	0.3337	290.3	241.9167	24.04107	0.833333
10/2/2004	0.334	289.6	242.3987	47.20132	0.837012
10/3/2004	0.3339	287.6	242.8616	44.73845	0.844442
10/4/2004	0.3337	286.9	243.306	43.59396	0.848052
10/5/2004	0.3337	284.5	243.7329	40.7671	0.856706
10/6/2004	0.3326	282.1	244.1431	37.95687	0.865449
10/7/2004	0.3325	281.4	244.5377	36.86232	0.869004
10/8/2004	0.3284	279.1	244.9174	34.18264	0.877525
10/9/2004	0.3251	276.7	245.2831	31.41691	0.886459
10/10/2004	0.3286	276.1	245.6358	30.46418	0.889663
10/11/2004	0.3266	273.7	245.9763	27.7237	0.898708
10/12/2004	0.3265	271.4	246.3054	25.09455	0.907537
10/13/2004	0.3267	270.7	246.6242	24.07581	0.911061
10/14/2004	0.3292	269.1	246.9332	22.1668	0.917626
10/15/2004	0.3287	270.4	247.233	23.167	0.914323
10/16/2004	0.3274	268.7	247.5239	21.17609	0.921191
10/17/2004	0.3259	268.4	247.8062	20.59384	0.923272
10/18/2004	0.3261	268.1	248.08	20.01999	0.925326
10/19/2004	0.3258	266.1	248.3459	17.75414	0.93328
10/20/2004	0.3255	265.8	248.6043	17.19571	0.935306
10/21/2004	0.3264	265.8	248.8557	16.94432	0.936252
10/22/2004	0.3311	265.5	249.1002	16.39983	0.93823
10/23/2004	0.3308	263.5	249.3381	14.16185	0.946255

10/24/2004	0.3308	262.8	249.5702	13.22979	0.949658
10/25/2004	0.3278	260.9	249.797	11.103	0.957443
10/26/2004	0.3229	260.9	250.0191	10.88094	0.958295
10/27/2004	0.316	262.8	250.2369	12.56313	0.952195
10/28/2004	0.3133	263.5	250.451	13.04904	0.950478
10/29/2004	0.3244	265.8	250.6619	15.13805	0.943047
10/30/2004	0.3237	268.1	250.8706	17.22936	0.935735
10/31/2004	0.3231	268.4	251.0778	17.32225	0.935461
11/1/2004	0.3203	270.4	251.2838	19.11623	0.929304
11/2/2004	0.3253	281.5	251.4902	30.00982	0.893393
11/3/2004	0.3264	276.7	251.6988	25.00116	0.909645
11/4/2004	0.3271	271.7	251.9092	19.79079	0.927159
11/5/2004	0.3276	270.7	252.1196	18.58044	0.931362
11/6/2004	0.3278	268.7	252.3289	16.37108	0.939073
11/7/2004	0.322	268.1	252.5367	15.56332	0.94195
11/8/2004	0.3301	266.1	252.7423	13.3577	0.949802
11/9/2004	0.3307	265.8	252.9453	12.85472	0.951638
11/10/2004	0.3389	265.8	253.1454	12.6546	0.952391
11/11/2004	0.34	266.1	253.3427	12.75731	0.952058
11/12/2004	0.3394	268.1	253.5374	14.56257	0.945682
11/13/2004	0.3302	269.1	253.7302	15.36981	0.942884
11/14/2004	0.3311	273.4	253.9218	19.4782	0.928756
11/15/2004	0.343	276.4	254.1135	22.28652	0.919369
11/16/2004	0.3444	278.7	254.3064	24.39359	0.912474
11/17/2004	0.3503	279.1	254.5013	24.59873	0.911864
11/18/2004	0.3579	279.8	254.6983	25.10172	0.910287
11/19/2004	0.3592	284.2	254.8979	29.3021	0.896896
11/20/2004	0.378	286.9	255.1012	31.79883	0.889164
11/21/2004	0.4056	287.6	255.3089	32.29109	0.887722

11/22/2004	0.4157	289.6	255.5215	34.07854	0.882326
11/23/2004	0.4172	290	255.7391	34.26092	0.881859
11/24/2004	0.4293	290	255.9617	34.03826	0.882627
11/25/2004	0.4312	290.3	256.1892	34.11078	0.882498
11/26/2004	0.4606	292.7	256.4216	36.27845	0.876056
11/27/2004	0.4622	295.5	256.6592	38.84076	0.868559
11/28/2004	0.4639	298.3	256.903	41.39695	0.861224
11/29/2004	0.491	301.1	257.1538	43.94624	0.854048
11/30/2004	0.4922	303.9	257.4121	46.48788	0.847029
12/1/2004	0.5157	307	257.6789	49.32112	0.839345
12/2/2004	0.5168	312.4	257.955	54.44497	0.82572
12/3/2004	0.5363	318.1	258.242	59.85795	0.811827
12/4/2004	0.5372	323.5	258.5416	64.95838	0.799201
12/5/2004	0.5379	327.2	258.8551	68.34486	0.791122
12/6/2004	0.5385	332.3	259.1837	73.11628	0.779969
12/7/2004	0.5691	336.4	259.5284	76.87156	0.771488
12/8/2004	0.5908	345	259.8907	85.10929	0.753306
12/9/2004	0.5915	355.5	260.2729	95.22714	0.732132
12/10/2004	0.587	359.7	260.6773	99.02266	0.724708
12/11/2004	0.5874	363.2	261.1053	102.0947	0.718902
12/12/2004	0.597	368.6	261.5574	107.0426	0.709597
12/13/2004	0.5973	372.1	262.0342	110.0658	0.704204
12/14/2004	0.5976	375.6	262.5362	113.0638	0.698978
12/15/2004	0.5911	380.8	263.0637	117.7363	0.690818
12/16/2004	0.5905	381.9	263.6169	118.2831	0.690277
12/17/2004	0.5811	384.7	264.1958	120.5042	0.686758
12/18/2004	0.5805	387.9	264.7999	123.1001	0.68265
12/19/2004	0.5784	391.5	265.4294	126.0706	0.677981
12/20/2004	0.5774	397.1	266.0846	131.0154	0.67007

12/21/2004	0.5768	401.2	266.7662	134.4338	0.664921
12/22/2004	0.5762	406.9	267.4746	139.4254	0.657347
12/23/2004	0.5598	410.6	268.2106	142.3894	0.653216
12/24/2004	0.5488	414.3	268.9744	145.3256	0.649226
12/25/2004	0.5489	420.1	269.7663	150.3337	0.642148
12/26/2004	0.5385	423.8	270.5868	153.2132	0.638477
12/27/2004	0.5385	427.6	271.436	156.164	0.63479
12/28/2004	0.5382	433.9	272.3144	161.5856	0.627597
12/29/2004	0.5705	439.8	273.2225	166.5775	0.621243
12/30/2004	0.5714	441.1	274.1609	166.9391	0.621539
12/31/2004	0.5625	444.1	275.129	168.971	0.61952
1/1/2005	0.5595	447.9	276.1265	171.7735	0.616491
1/2/2005	0.5517	454.4	277.1535	177.2465	0.609933
1/3/2005	0.5514	460.9	278.2107	182.6893	0.603625
1/4/2005	0.519	465.3	279.2989	186.0011	0.600255
1/5/2005	0.5185	471.9	280.4186	191.4814	0.594233
1/6/2005	0.5183	478.9	281.5706	197.3294	0.587953
1/7/2005	0.5182	486.1	282.7559	203.3441	0.581683
1/8/2005	0.5262	493.3	283.9757	209.3243	0.575665
1/9/2005	0.5253	500.5	285.2308	215.2692	0.569892
1/10/2005	0.5254	507.8	286.5224	221.2776	0.564243
1/11/2005	0.5255	516.1	287.8515	228.2485	0.557744
1/12/2005	0.5317	529.6	289.2197	240.3803	0.54611
1/13/2005	0.5339	540.4	290.6296	249.7704	0.537805
1/14/2005	0.537	546.5	292.0832	254.4168	0.534461
1/15/2005	0.5373	560.9	293.5818	267.3182	0.523412
1/16/2005	0.5246	578.9	295.1283	283.7717	0.509809
1/17/2005	0.5195	591.2	296.7265	294.4735	0.501905
1/18/2005	0.5549	599.6	298.3788	301.2212	0.49763

1/19/2005	0.5541	608.1	300.0862	308.0138	0.493482
1/20/2005	0.5448	620.7	301.8496	318.8504	0.486305
1/21/2005	0.5451	639.2	303.6713	335.5287	0.47508
1/22/2005	0.5454	652.6	305.5546	347.0454	0.468211
1/23/2005	0.5819	665.2	307.502	357.698	0.46227
1/24/2005	0.6042	677.9	309.5154	368.3846	0.45658
1/25/2005	0.5487	690.7	311.5964	379.1036	0.451131
1/26/2005	0.529	703.6	313.7467	389.8533	0.445916
1/27/2005	0.5143	717.7	315.9678	401.7322	0.440251
1/28/2005	0.5131	738.7	318.2624	420.4376	0.430841
1/29/2005	0.5502	761	320.6345	440.3655	0.421333
1/30/2005	0.5496	782	323.0886	458.9114	0.413157
1/31/2005	0.5475	795.2	325.6283	469.5717	0.409492
2/1/2005	0.5457	813.8	328.2559	485.5441	0.403362
2/2/2005	0.5448	827.9	330.9731	496.9269	0.399774
2/3/2005	0.5544	842	333.7815	508.2185	0.396415
2/4/2005	0.5732	856.3	336.682	519.618	0.393182
2/5/2005	0.5726	873.2	339.6757	533.5243	0.389001
2/6/2005	0.573	885.3	342.7639	542.5361	0.387173
2/7/2005	0.5737	897.6	345.9467	551.6533	0.385413
2/8/2005	0.5826	912.3	349.2245	563.0755	0.382796
2/9/2005	0.5835	924.7	352.5974	572.1026	0.38131
2/10/2005	0.5774	942.3	356.0661	586.2339	0.377869
2/11/2005	0.579	960	359.632	600.368	0.374617
2/12/2005	0.582	977.8	363.2968	614.5032	0.371545
2/13/2005	0.5824	1003	367.063	635.937	0.365965
2/14/2005	0.585	1029	370.9346	658.0654	0.360481
2/15/2005	0.5657	1045	374.915	670.085	0.35877
2/16/2005	0.5652	1058	379.0056	678.9944	0.358228

2/17/2005	0.5684	1072	383.2059	688.7941	0.357468
2/18/2005	0.5667	1085	387.5152	697.4848	0.357157
2/19/2005	0.5594	1102	391.9334	710.0666	0.355656
2/20/2005	0.5418	1118	396.4604	721.5396	0.354616
2/21/2005	0.5429	1137	401.0971	735.9029	0.352768
2/22/2005	0.5404	1160	405.845	754.155	0.349866
2/23/2005	0.5416	1182	410.7064	771.2936	0.347467
2/24/2005	0.545	1205	415.6839	789.3161	0.344966
2/25/2005	0.5462	1231	420.7804	810.2196	0.34182
2/26/2005	0.544	1254	425.9988	828.0012	0.339712
2/27/2005	0.5475	1280	431.342	848.658	0.336986
2/28/2005	0.5449	1307	436.8133	870.1867	0.334211
3/1/2005	0.5452	1325	442.415	882.585	0.333898
3/2/2005	0.5516	1343	448.1479	894.8521	0.333692
3/3/2005	0.5552	1358	454.0115	903.9885	0.334324
3/4/2005	0.5558	1370	460.0042	909.9958	0.335769
3/5/2005	0.555	1382	466.1235	915.8765	0.337282
3/6/2005	0.5451	1395	472.367	922.633	0.338614
3/7/2005	0.5472	1407	478.7322	928.2678	0.34025
3/8/2005	0.5479	1419	485.2166	933.7834	0.341943
3/9/2005	0.5485	1432	491.8179	940.1821	0.343448
3/10/2005	0.554	1441	498.5334	942.4666	0.345963
3/11/2005	0.5531	1444	505.3594	938.6406	0.349972
3/12/2005	0.5486	1447	512.2905	934.7095	0.354036
3/13/2005	0.5705	1454	519.3214	934.6786	0.357167
3/14/2005	0.5752	1463	526.448	936.552	0.359841
3/15/2005	0.5599	1473	533.6671	939.3329	0.362299
3/16/2005	0.6225	1482	540.9759	941.0241	0.365031
3/17/2005	0.5736	1492	548.3719	943.6281	0.367541

3/18/2005	0.5745	1495	555.8517	939.1483	0.371807
3/19/2005	0.5813	1495	563.4106	931.5894	0.376863
3/20/2005	0.582	1495	571.0429	923.9571	0.381968
3/21/2005	0.6057	1495	578.7425	916.2575	0.387119
3/22/2005	0.5899	1498	586.504	911.496	0.391525
3/23/2005	0.5855	1501	594.3227	906.6773	0.395951
3/24/2005	0.5907	1501	602.1942	898.8058	0.401195
3/25/2005	0.5913	1501	610.1135	890.8865	0.406471
3/26/2005	0.5913	1501	618.0756	882.9244	0.411776
3/27/2005	0.5667	1501	626.0755	874.9245	0.417106
3/28/2005	0.5631	1498	634.1083	863.8917	0.423303
3/29/2005	0.5709	1495	642.1686	852.8314	0.429544
3/30/2005	0.5712	1492	650.215	841.785	0.435801
3/31/2005	0.5735	1489	658.1536	830.8464	0.44201
4/1/2005	0.5717	1489	665.9283	823.0717	0.447232
4/2/2005	0.5787	1489	673.5389	815.4611	0.452343
4/3/2005	0.5728	1489	680.985	808.015	0.457344
4/4/2005	0.568	1489	688.2662	800.7338	0.462234
4/5/2005	0.5718	1488	695.3823	792.6177	0.467327
4/6/2005	0.573	1483	702.3329	780.6671	0.473589
4/7/2005	0.572	1481	709.1178	771.8822	0.47881
4/8/2005	0.5742	1476	715.7366	760.2634	0.484916
4/9/2005	0.5711	1470	722.1891	747.8109	0.491285
4/10/2005	0.5717	1463	728.4751	734.5249	0.497932
4/11/2005	0.5725	1457	734.5943	722.4057	0.504183
4/12/2005	0.576	1451	740.5467	710.4533	0.51037
4/13/2005	0.5777	1450	746.3322	703.6678	0.514712
4/14/2005	0.5757	1444	751.9506	692.0494	0.520741
4/15/2005	0.5766	1438	757.4019	680.5981	0.526705

4/16/2005	0.57	1433	762.686	670.314	0.53223
4/17/2005	0.5669	1431	767.8028	663.1972	0.53655
4/18/2005	0.5654	1426	772.7524	653.2476	0.541902
4/19/2005	0.5656	1426	777.5347	648.4653	0.545256
4/20/2005	0.5671	1426	782.1497	643.8503	0.548492
4/21/2005	0.5587	1426	786.5973	639.4027	0.551611
4/22/2005	0.5572	1426	790.8773	635.1227	0.554612
4/23/2005	0.5502	1426	794.9898	631.0102	0.557496
4/24/2005	0.5474	1427	798.9345	628.0655	0.55987
4/25/2005	0.5317	1437	802.7113	634.2887	0.558602
4/26/2005	0.5292	1444	806.3198	637.6802	0.558393
4/27/2005	0.5218	1451	809.7597	641.2403	0.55807
4/28/2005	0.5083	1462	813.0305	648.9695	0.556108
4/29/2005	0.5063	1470	816.1317	653.8683	0.555192
4/30/2005	0.514	1478	819.0626	658.9374	0.55417
5/1/2005	0.5129	1492	821.8225	670.1775	0.550819
5/2/2005	0.5054	1501	824.4104	676.5896	0.549241
5/3/2005	0.4823	1514	826.8253	687.1747	0.54612
5/4/2005	0.4809	1524	829.066	694.934	0.544007
5/5/2005	0.4687	1530	831.1315	698.8685	0.543223
5/6/2005	0.4666	1537	833.0202	703.9798	0.541978
5/7/2005	0.4649	1543	834.7309	708.2691	0.540979
5/8/2005	0.4585	1550	836.2618	713.7382	0.539524
5/9/2005	0.4571	1550	837.6116	712.3884	0.540395
5/10/2005	0.4501	1543	838.7785	704.2215	0.543602
5/11/2005	0.4512	1540	839.7609	700.2391	0.545299
5/12/2005	0.4374	1537	840.5571	696.4429	0.546882
5/13/2005	0.4302	1533	841.1656	691.8344	0.548706
5/14/2005	0.4246	1530	841.5845	688.4155	0.550055

5/15/2005	0.4247	1524	841.8123	682.1877	0.55237
5/16/2005	0.4239	1521	838.7845	682.2155	0.551469
5/17/2005	0.4255	1517	828.9544	688.0456	0.546443
5/18/2005	0.4146	1511	818.8436	692.1564	0.541922
5/19/2005	0.4087	1504	808.4505	695.5495	0.537534
5/20/2005	0.4044	1492	797.7739	694.2261	0.534701
5/21/2005	0.3963	1476	786.8144	689.1856	0.533072
5/22/2005	0.3894	1454	775.5743	678.4257	0.533407
5/23/2005	0.3896	1429	764.0575	664.9425	0.53468
5/24/2005	0.3806	1413	752.2684	660.7316	0.532391
5/25/2005	0.3814	1398	740.2095	657.7905	0.529477
5/26/2005	0.3749	1379	727.8825	651.1175	0.527834
5/27/2005	0.3729	1364	715.2894	648.7106	0.524406
5/28/2005	0.3728	1346	702.4318	643.5682	0.521866
5/29/2005	0.3657	1322	689.5486	632.4514	0.521595
5/30/2005	0.3665	1301	676.8557	624.1443	0.520258
5/31/2005	0.3577	1280	664.3324	615.6676	0.51901
6/1/2005	0.3575	1265	651.9208	613.0792	0.515352
6/2/2005	0.3494	1254	639.5212	614.4788	0.509985
6/3/2005	0.3513	1229	627.2359	601.7641	0.510363
6/4/2005	0.3495	1205	615.1999	589.8001	0.510539
6/5/2005	0.3433	1182	603.3979	578.6021	0.510489
6/6/2005	0.343	1160	591.8142	568.1858	0.510185
6/7/2005	0.3478	1141	580.4124	560.5876	0.508687
6/8/2005	0.3475	1112	569.2678	542.7322	0.511931
6/9/2005	0.3439	1091	558.4059	532.5941	0.511829
6/10/2005	0.3446	1063	547.8224	515.1776	0.515355
6/11/2005	0.3509	1039	537.5534	501.4466	0.517376
6/12/2005	0.3438	1014	527.5749	486.4251	0.520291

6/13/2005	0.3475	988.1	517.9122	470.1878	0.52415
6/14/2005	0.344	962.5	508.5777	453.9223	0.528392
6/15/2005	0.3435	937.2	499.5722	437.6278	0.533048
6/16/2005	0.3362	912.3	490.8951	421.4049	0.538085
6/17/2005	0.3351	887.8	482.545	405.255	0.543529
6/18/2005	0.3342	864.1	474.5163	389.5837	0.549145
6/19/2005	0.3295	843.8	466.7727	377.0273	0.553179
6/20/2005	0.3274	820.8	459.313	361.487	0.559592
6/21/2005	0.3236	797	452.1786	344.8214	0.567351
6/22/2005	0.3156	771.2	445.4047	325.7953	0.577548
6/23/2005	0.3142	749.8	438.9741	310.8259	0.585455
6/24/2005	0.3117	718.3	432.9522	285.3478	0.602746
6/25/2005	0.3143	695.5	427.3614	268.1386	0.614466
6/26/2005	0.3119	677.9	422.0688	255.8312	0.622612
6/27/2005	0.3043	661.5	417.0151	244.4849	0.630408
6/28/2005	0.3033	647.9	412.1644	235.7356	0.636154
6/29/2005	0.3041	632.5	407.5106	224.9894	0.644286
6/30/2005	0.3054	619.2	403.0547	216.1453	0.650928
7/1/2005	0.3039	604.1	398.7976	205.3024	0.660152
7/2/2005	0.3004	591.7	394.7343	196.9657	0.667119
7/3/2005	0.2993	580.8	390.8258	189.9742	0.67291
7/4/2005	0.2965	574.5	387.0131	187.4869	0.673652
7/5/2005	0.298	561.4	383.3205	178.0795	0.682794
7/6/2005	0.3015	552.7	379.775	172.925	0.687127
7/7/2005	0.304	545.1	376.3235	168.7765	0.690375
7/8/2005	0.3048	537.5	372.9566	164.5434	0.693873
7/9/2005	0.3028	530	369.6751	160.3249	0.6975
7/10/2005	0.3035	522.6	366.4787	156.1213	0.70126
7/11/2005	0.3017	515.6	363.364	152.236	0.70474

7/12/2005	0.3023	511	360.3041	150.6959	0.705096
7/13/2005	0.3057	504.1	357.299	146.801	0.708786
7/14/2005	0.3049	497.3	354.3725	142.9275	0.712593
7/15/2005	0.3022	492.8	351.5015	141.2985	0.713274
7/16/2005	0.304	486.5	348.6822	137.8178	0.716716
7/17/2005	0.3057	482	345.9155	136.0845	0.717667
7/18/2005	0.3048	475.8	343.2015	132.5985	0.721315
7/19/2005	0.304	471.9	340.5352	131.3648	0.721626
7/20/2005	0.3	468.3	337.891	130.409	0.721527
7/21/2005	0.296	464.4	335.2694	129.1306	0.721941
7/22/2005	0.2969	458.3	332.6963	125.6037	0.725936
7/23/2005	0.2981	454	330.1769	123.8231	0.727262
7/24/2005	0.2952	447.9	327.7121	120.1879	0.731664
7/25/2005	0.2928	444.1	325.2981	118.8019	0.732488
7/26/2005	0.2911	440.7	322.9083	117.7917	0.732717
7/27/2005	0.2882	437.3	320.539	116.761	0.732996
7/28/2005	0.2881	433.5	318.1949	115.3051	0.734014
7/29/2005	0.2843	427.6	315.902	111.698	0.738779
7/30/2005	0.2816	423.8	313.6612	110.1388	0.740116
7/31/2005	0.2816	420.5	311.4471	109.0529	0.740659
8/1/2005	0.282	417.2	309.2552	107.9448	0.741264
8/2/2005	0.2791	413.8	307.087	106.713	0.742115
8/3/2005	0.2782	410.1	304.9469	105.1531	0.743592
8/4/2005	0.2778	404.4	302.8591	101.5409	0.74891
8/5/2005	0.2779	400.8	300.8236	99.97643	0.750558
8/6/2005	0.2791	397.5	298.8169	98.68309	0.751741
8/7/2005	0.276	394.3	296.8356	97.46438	0.752817
8/8/2005	0.2896	391.1	294.8792	96.22079	0.753974
8/9/2005	0.2915	387.9	292.9482	94.95183	0.755216

8/10/2005	0.2998	384.7	291.043	93.65697	0.756545
8/11/2005	0.3012	381.5	289.1643	92.33568	0.757967
8/12/2005	0.3059	378.4	287.3115	91.08845	0.75928
8/13/2005	0.3028	375.3	285.4842	89.81577	0.760683
8/14/2005	0.3041	372.1	283.6839	88.41609	0.762386
8/15/2005	0.3092	369	281.9111	87.08887	0.763987
8/16/2005	0.3117	365.9	280.1654	85.73456	0.765689
8/17/2005	0.314	362.8	278.4474	84.35261	0.767496
8/18/2005	0.3128	359.7	276.7575	82.94246	0.769412
8/19/2005	0.313	357.1	275.0914	82.00863	0.770348
8/20/2005	0.3126	356.3	273.4259	82.87411	0.767404
8/21/2005	0.3129	353.3	271.7652	81.53481	0.769219
8/22/2005	0.3131	348.3	270.1522	78.14776	0.775631
8/23/2005	0.3129	347.2	268.5686	78.63139	0.773527
8/24/2005	0.3086	344.6	266.9904	77.60958	0.774784
8/25/2005	0.3104	341.9	265.4341	76.4659	0.77635
8/26/2005	0.3106	341.2	263.8807	77.31929	0.77339
8/27/2005	0.311	338.6	262.3293	76.2707	0.774747
8/28/2005	0.3111	335.6	260.8034	74.79663	0.777126
8/29/2005	0.3113	332.7	259.3065	73.3935	0.7794
8/30/2005	0.3117	329.7	257.8393	71.86072	0.782042
8/31/2005	0.3118	326.8	256.4023	70.39767	0.784585
9/1/2005	0.312	323.9	254.9952	68.90477	0.787265
9/2/2005	0.3038	321	253.6186	67.38139	0.790089
9/3/2005	0.3026	318.1	252.2731	65.82693	0.793062
9/4/2005	0.3103	315.2	250.9593	64.24075	0.796191
9/5/2005	0.3039	312.7	249.6737	63.02627	0.798445
9/6/2005	0.304	312	248.3946	63.60538	0.796137
9/7/2005	0.304	309.5	247.1221	62.37794	0.798456

9/8/2005	0.3049	306.7	245.8776	60.82239	0.801688
9/9/2005	0.303	303.9	244.6649	59.23509	0.805084
9/10/2005	0.304	301.1	243.4846	57.6154	0.80865
9/11/2005	0.3013	298.3	242.3373	55.96265	0.812395
9/12/2005	0.3013	295.5	241.2238	54.27617	0.816324
9/13/2005	0.3007	292.7	240.1447	52.55528	0.820447
9/14/2005	0.3009	290	239.0997	50.90029	0.824482
9/15/2005	0.3011	287.2	238.0895	49.1105	0.829002
9/16/2005	0.3009	284.5	237.1148	47.3852	0.833444
9/17/2005	0.2965	281.8	236.1753	45.62469	0.838095
9/18/2005	0.2963	279.1	235.2717	43.82826	0.842966
9/19/2005	0.2961	276.7	234.4018	42.29822	0.847133
9/20/2005	0.2967	276.1	233.5447	42.55533	0.84587
9/21/2005	0.2968	273.7	232.7007	40.99932	0.850203
9/22/2005	0.297	271.1	231.8905	39.20951	0.855369
9/23/2005	0.2967	268.7	231.1148	37.58521	0.860122
9/24/2005	0.2926	268.1	230.3539	37.74613	0.859209
9/25/2005	0.2887	265.8	229.607	36.19299	0.863834
9/26/2005	0.2829	263.5	228.8918	34.60816	0.86866
9/27/2005	0.2845	262.8	228.1927	34.6073	0.868313
9/28/2005	0.2861	260.6	227.5089	33.09112	0.873019
9/29/2005	0.2871	258	226.8601	31.13992	0.879303
9/30/2005	0.287	255.4	226.2511	29.1489	0.88587
10/1/2005	0.286	253.1	225.6797	27.42031	0.891662
10/2/2005	0.2861	252.5	225.1262	27.37378	0.891589
10/3/2005	0.2745	250.3	224.59	25.70998	0.897283
10/4/2005	0.2744	248	224.0888	23.91121	0.903584
10/5/2005	0.2739	247.4	223.6069	23.79307	0.903828
10/6/2005	0.2735	245.2	223.1438	22.05619	0.910048

10/7/2005	0.2732	242.7	222.7192	19.98081	0.917673
10/8/2005	0.2719	240.5	222.3339	18.16613	0.924465
10/9/2005	0.2712	239.9	221.9693	17.93075	0.925257
10/10/2005	0.2686	238	221.6227	16.37729	0.931188
10/11/2005	0.2682	237.7	221.2915	16.40846	0.93097
10/12/2005	0.266	237.4	220.9597	16.44027	0.930749
10/13/2005	0.2656	235.5	220.6436	14.85639	0.936916
10/14/2005	0.2639	235.2	220.3435	14.85652	0.936835
10/15/2005	0.2627	234.9	220.0433	14.85666	0.936753
10/16/2005	0.2623	233.1	219.7585	13.34149	0.942765
10/17/2005	0.2637	232.5	219.4924	13.00764	0.944053
10/18/2005	0.2633	230.6	219.2463	11.35371	0.950764
10/19/2005	0.2604	230	219.0207	10.9793	0.952264
10/20/2005	0.2603	227.9	218.8181	9.081939	0.960149
10/21/2005	0.2614	225.8	218.6541	7.145856	0.968353
10/22/2005	0.2594	224.9	218.5175	6.382506	0.971621
10/23/2005	0.2633	221.3	218.424	2.876027	0.987004
10/24/2005	0.2638	220.7	218.3714	2.328599	0.989449
10/25/2005	0.2639	220.4	218.3269	2.07306	0.990594
10/26/2005	0.2647	218.6	218.303	0.297	0.998641
10/27/2005	0.2647	218.3	218.3	0	1
10/28/2005	0.2717	218.3	218.3	0	1
10/29/2005	0.2715	218.3	218.3	0	1
10/30/2005	0.2711	218.3	218.3	0	1
10/31/2005	0.27	218.3	218.3	0	1
11/1/2005	0.2696	218.3	218.3	0	1
11/2/2005	0.2684	218.3	218.3	0	1
11/3/2005	0.2681	218.6	218.3	0.299986	0.998628
11/4/2005	0.2685	220.1	218.3	1.799962	0.991822

11/5/2005	0.2881	218.6	218.3001	0.299947	0.998628
11/6/2005	0.2864	218.3	218.3	0	1
11/7/2005	0.2894	218.6	218.3	0.29997	0.998628
11/8/2005	0.2852	220.1	218.3003	1.799701	0.991823
11/9/2005	0.2931	218.6	218.301	0.299023	0.998632
11/10/2005	0.2954	218.6	218.3019	0.298102	0.998636
11/11/2005	0.2959	220.7	218.3031	2.396889	0.98914
11/12/2005	0.2963	223	218.3053	4.694745	0.978947
11/13/2005	0.303	225.2	218.3092	6.890817	0.969401
11/14/2005	0.3033	225.8	218.3156	7.484449	0.966854
11/15/2005	0.3033	227.9	218.3248	9.57519	0.957985
11/16/2005	0.3088	230.3	218.3376	11.96244	0.948057
11/17/2005	0.3088	232.8	218.3546	14.44539	0.937949
11/18/2005	0.3092	235.2	218.3767	16.82326	0.928473
11/19/2005	0.3093	237.7	218.4047	19.29526	0.918825
12/6/2005	0.5615	298.8	218.4452	80.35479	0.731075
12/7/2005	0.5686	300.6	218.5103	82.08971	0.726914
12/8/2005	0.5631	299	218.6053	80.39472	0.731121
12/9/2005	0.5627	300.7	218.729	81.97099	0.727399
12/10/2005	0.5624	301.1	218.8805	82.21951	0.726936
12/11/2005	0.5651	301.4	219.0588	82.34115	0.726804
12/12/2005	0.5651	303.5	219.2633	84.23674	0.722449
12/13/2005	0.5652	304.6	219.4932	85.10682	0.720595
12/14/2005	0.565	309.5	219.7484	89.75159	0.710011
12/15/2005	0.5646	314.9	220.0295	94.87052	0.698728
12/16/2005	0.5298	318.5	220.3372	98.1628	0.691797
12/17/2005	0.5667	323.2	220.6721	102.5279	0.682773
12/18/2005	0.5868	324.3	221.0344	103.2656	0.681574
12/19/2005	0.6881	326.8	221.4238	105.3762	0.677551

12/20/2005	0.687	329.4	221.8399	107.5601	0.673467
12/21/2005	0.6858	329.7	222.2824	107.4176	0.674196
12/22/2005	0.6847	330.1	222.7503	107.3497	0.674796
12/23/2005	0.6138	332.3	223.2428	109.0572	0.671811
12/24/2005	0.638	333	223.7592	109.2408	0.67195
12/25/2005	0.6392	336	224.2992	111.7008	0.667557
12/26/2005	0.6392	340.8	224.8626	115.9374	0.659808
12/27/2005	0.6392	341.9	225.4497	116.4503	0.659402
12/28/2005	0.639	344.2	226.0603	118.1397	0.65677
12/29/2005	0.639	345.3	226.6938	118.6062	0.656513
12/30/2005	0.6387	350.2	227.35	122.85	0.649201
12/31/2005	0.6388	354	228.0293	125.9707	0.644151
1/12/2006	0.5744	425.9	228.7389	197.1611	0.537072
1/13/2006	0.6363	430.5	229.4925	201.0075	0.533084
1/14/2006	0.636	433.9	230.2966	203.6034	0.53076
1/15/2006	0.6359	439.4	231.1505	208.2495	0.526059
1/16/2006	0.6376	455.7	232.0549	223.6451	0.509227
1/17/2006	0.6389	462.2	233.012	229.188	0.504137
1/18/2006	0.6402	471.9	234.0232	237.8768	0.495917
1/19/2006	0.6453	482.5	235.0896	247.4104	0.487232
1/20/2006	0.6661	492.8	236.2127	256.5873	0.479328
1/21/2006	0.6666	500.5	237.3938	263.1062	0.474313
1/22/2006	0.6669	507.8	238.6332	269.1668	0.469935
1/23/2006	0.6675	516.5	239.9314	276.5686	0.464533
1/24/2006	0.6929	531.9	241.2894	290.6106	0.453637
1/25/2006	0.6933	538	242.709	295.291	0.451132
1/26/2006	0.6935	545.1	244.1906	300.9094	0.447974
1/27/2006	0.694	552.2	245.7339	306.4661	0.445009
1/28/2006	0.7216	558	247.3385	310.6615	0.443259

1/29/2006	0.7062	571.5	249.0046	322.4954	0.435704
1/30/2006	0.706	584.8	250.7337	334.0663	0.428751
1/31/2006	0.7316	603.1	252.5285	350.5715	0.418717
2/1/2006	0.7331	619.2	254.3922	364.8078	0.41084
2/2/2006	0.7344	632.5	256.3277	376.1723	0.405261
2/3/2006	0.7358	647.4	258.3373	389.0627	0.399038
2/4/2006	0.4609	657.3	260.4223	396.8777	0.3962
2/6/2006	0.3348	678.9	262.5848	416.3152	0.38678
2/7/2006	0.331	693.9	264.8274	429.0726	0.381651
2/8/2006	0.3401	703.6	267.1524	436.4476	0.379694
2/9/2006	0.3492	712.8	269.5598	443.2402	0.37817
2/10/2006	0.6453	726.5	272.0496	454.4504	0.374466
2/11/2006	0.6436	747.6	274.6234	472.9766	0.36734
2/12/2006	0.6417	769	277.2844	491.7156	0.360578
2/13/2006	0.6412	782.6	280.036	502.564	0.357828
2/14/2006	0.6409	788.9	282.8789	506.0211	0.358574
2/15/2006	0.6406	798.7	285.812	512.888	0.357846
2/16/2006	0.6194	815	288.8347	526.1653	0.354398
2/17/2006	0.62	824.3	291.9475	532.3525	0.354176
2/18/2006	0.6203	826.7	295.1493	531.5507	0.357021
2/19/2006	0.6208	834.9	298.4375	536.4625	0.357453
2/20/2006	0.6234	843.8	301.8102	541.9898	0.35768
2/21/2006	0.6235	849.8	305.2658	544.5342	0.359221
2/22/2006	0.6336	858.1	308.8026	549.2974	0.359868
2/23/2006	0.6334	865.3	312.4189	552.8811	0.361053
2/24/2006	0.6331	884.1	316.1144	567.9856	0.357555
2/25/2006	0.6297	909.2	319.8913	589.3087	0.351838
2/26/2006	0.6285	918.5	323.7528	594.7472	0.35248
2/27/2006	0.6285	931.6	327.6997	603.9003	0.35176

2/28/2006	0.6284	942.2	331.7316	610.4684	0.352082
3/1/2006	0.6324	952.3	335.8479	616.4521	0.35267
3/2/2006	0.6326	963.1	340.0479	623.0521	0.353076
3/3/2006	0.6327	977.2	344.3312	632.8688	0.352365
3/4/2006	0.6329	988.7	348.6977	640.0023	0.352683
3/5/2006	0.6335	1003	353.1476	649.8524	0.352091
3/6/2006	0.6338	1019	357.6813	661.3187	0.351012
3/7/2006	0.6344	1034	362.3	671.7	0.350387
3/8/2006	0.6404	1048	367.0043	680.9957	0.350195
3/9/2006	0.5895	1075	371.7961	703.2039	0.345857
3/10/2006	0.5726	1095	376.6787	718.3213	0.343999
3/11/2006	0.5735	1123	381.656	741.344	0.339854
3/12/2006	0.5743	1162	386.7339	775.2661	0.332817
3/13/2006	0.5623	1185	391.9192	793.0808	0.330734
3/14/2006	0.5626	1221	397.2177	823.7823	0.325322
3/15/2006	0.5634	1259	402.6361	856.3639	0.319806
3/16/2006	0.5646	1312	408.184	903.816	0.311116
3/17/2006	0.5673	1384	413.8756	970.1244	0.299043
3/18/2006	0.5692	1469	419.7312	1049.269	0.285726
3/19/2006	0.5644	1555	425.7747	1129.225	0.27381
3/20/2006	0.5779	1652	432.0317	1219.968	0.26152
3/21/2006	0.5759	1753	438.5292	1314.471	0.250159
3/22/2006	0.5766	1837	445.2936	1391.706	0.242403
3/23/2006	0.5772	1876	452.3423	1423.658	0.241121
3/24/2006	0.5755	1919	459.6817	1459.318	0.239542
3/25/2006	0.5734	1972	467.3152	1504.685	0.236975
3/26/2006	0.5707	2006	475.2463	1530.754	0.236912
3/27/2006	0.5586	2040	483.4758	1556.524	0.236998
3/28/2006	0.5548	2065	492.001	1572.999	0.238257

3/29/2006	0.5511	2087	500.8175	1586.182	0.23997
3/30/2006	0.5573	2105	509.919	1595.081	0.242242
3/31/2006	0.5571	2133	519.2991	1613.701	0.243459
4/1/2006	0.5545	2164	528.9535	1635.047	0.244433
4/2/2006	0.5538	2192	538.8793	1653.121	0.245839
4/3/2006	0.5429	2205	549.0718	1655.928	0.249012
4/4/2006	0.5451	2225	559.5238	1665.476	0.251471
4/5/2006	0.5335	2242	570.2277	1671.772	0.254339
4/6/2006	0.5279	2257	581.1763	1675.824	0.257499
4/7/2006	0.5276	2271	592.3615	1678.638	0.260837
4/8/2006	0.525	2273	603.7741	1669.226	0.265629
4/9/2006	0.5254	2274	615.4023	1658.598	0.270625
4/10/2006	0.5203	2280	627.234	1652.766	0.275103
4/11/2006	0.5225	2281	639.2578	1641.742	0.280253
4/12/2006	0.5234	2280	651.4619	1628.538	0.285729
4/13/2006	0.5166	2276	663.8338	1612.166	0.291667
4/14/2006	0.5127	2286	676.3621	1609.638	0.295871
4/15/2006	0.5006	2281	689.0366	1591.963	0.302077
4/16/2006	0.5023	2272	701.8007	1570.199	0.308891
4/17/2006	0.5021	2257	714.4531	1542.547	0.31655
4/18/2006	0.5026	2243	726.8431	1516.157	0.32405
4/19/2006	0.5081	2235	738.9685	1496.032	0.330635
4/20/2006	0.4979	2234	750.827	1483.173	0.336091
4/21/2006	0.494	2234	762.4168	1471.583	0.341279
4/22/2006	0.4816	2233	773.7357	1459.264	0.346501
4/23/2006	0.4786	2226	784.7818	1441.218	0.352552
4/24/2006	0.473	2218	795.5533	1422.447	0.35868
4/25/2006	0.4718	2210	806.0482	1403.952	0.364728
4/26/2006	0.4687	2204	816.2648	1387.735	0.370356

4/27/2006	0.4673	2203	826.2014	1376.799	0.375035
4/28/2006	0.4614	2203	835.8563	1367.144	0.379417
4/29/2006	0.4572	2203	845.2278	1357.772	0.383671
4/30/2006	0.458	2204	854.3144	1349.686	0.38762
5/1/2006	0.4453	2208	863.1142	1344.886	0.390903
5/2/2006	0.4426	2204	871.6256	1332.374	0.395474
5/3/2006	0.4394	2204	879.8469	1324.153	0.399205
5/4/2006	0.4394	2209	887.7764	1321.224	0.401891
5/5/2006	0.4296	2210	895.4122	1314.588	0.405164
5/6/2006	0.434	2210	902.7526	1307.247	0.408485
5/7/2006	0.4258	2209	909.7958	1299.204	0.411859
5/8/2006	0.4203	2204	916.54	1287.46	0.415853
5/9/2006	0.4171	2202	922.9832	1279.017	0.419157
5/10/2006	0.4154	2195	929.1236	1265.876	0.423291
5/11/2006	0.4133	2188	934.9595	1253.041	0.427312
5/12/2006	0.4149	2186	940.4888	1245.511	0.430233
5/13/2006	0.4122	2178	945.7099	1232.29	0.43421
5/14/2006	0.4148	2164	950.6209	1213.379	0.439289
5/15/2006	0.4135	2148	955.2199	1192.78	0.444702
5/16/2006	0.411	2133	959.5054	1173.495	0.449838
5/17/2006	0.4119	2118	963.4755	1154.524	0.454899
5/18/2006	0.4101	2102	967.1288	1134.871	0.460099
5/19/2006	0.4076	2080	970.4637	1109.536	0.466569
5/20/2006	0.4046	2057	973.4788	1083.521	0.473252
5/21/2006	0.4062	2034	976.1727	1057.827	0.479928
5/22/2006	0.4038	2005	978.5442	1026.456	0.488052
5/23/2006	0.4014	1976	980.5922	995.4078	0.496251
5/24/2006	0.3973	1954	982.3157	971.6843	0.50272
5/25/2006	0.3956	1933	983.714	949.286	0.508905

5/26/2006	0.3907	1916	984.7862	931.2138	0.51398
5/27/2006	0.3869	1895	985.5316	909.4684	0.520069
5/28/2006	0.3818	1875	985.9495	889.0505	0.52584
5/29/2006	0.383	1861	982.358	878.642	0.527866
5/30/2006	0.3755	1849	965.833	883.167	0.522354
5/31/2006	0.3738	1837	948.9476	888.0524	0.516575
6/1/2006	0.3738	1823	931.6999	891.3001	0.511081
6/2/2006	0.3667	1802	914.0891	887.9109	0.507264
6/3/2006	0.364	1775	896.3173	878.6827	0.504967
6/4/2006	0.3652	1747	878.6707	868.3293	0.50296
6/5/2006	0.3629	1719	861.2354	857.7646	0.50101
6/6/2006	0.3596	1687	844.0566	842.9434	0.50033
6/7/2006	0.3564	1659	827.1393	831.8607	0.498577
6/8/2006	0.3609	1633	810.4279	822.5721	0.496282
6/9/2006	0.3606	1610	793.8754	816.1246	0.49309
6/10/2006	0.3589	1580	777.5259	802.4741	0.492105
6/11/2006	0.3565	1552	761.4346	790.5654	0.490615
6/12/2006	0.3563	1521	745.617	775.383	0.490215
6/13/2006	0.3571	1495	730.0581	764.9419	0.488333
6/14/2006	0.3527	1470	714.7022	755.2978	0.486192
6/15/2006	0.3537	1448	699.5124	748.4876	0.483089
6/16/2006	0.3557	1413	684.5943	728.4057	0.484497
6/17/2006	0.3497	1378	670.086	707.914	0.486274
6/18/2006	0.3566	1351	655.9143	695.0857	0.485503
6/19/2006	0.3563	1321	642.035	678.965	0.486022
6/20/2006	0.3562	1287	628.5255	658.4745	0.488365
6/21/2006	0.3564	1258	615.3832	642.6168	0.489176
6/22/2006	0.3512	1232	602.5339	629.4661	0.48907
6/23/2006	0.3526	1200	590.0141	609.9859	0.491678

6/24/2006	0.3479	1172	577.8512	594.1488	0.493047
6/25/2006	0.3455	1146	565.991	580.009	0.493884
6/26/2006	0.3429	1111	554.5112	556.4888	0.49911
6/27/2006	0.3441	1083	543.44	539.56	0.501791
6/28/2006	0.3424	1055	532.7143	522.2857	0.504942
6/29/2006	0.3331	1020	522.4126	497.5874	0.512169
6/30/2006	0.3333	992.6	512.5373	480.0627	0.516358
7/1/2006	0.3333	963.1	503.0411	460.0589	0.522315
7/2/2006	0.3314	936.6	493.9226	442.6774	0.527357
7/3/2006	0.337	908	485.1802	422.8198	0.534339
7/4/2006	0.3349	882.3	476.8134	405.4866	0.540421
7/5/2006	0.3339	854.6	468.8209	385.7791	0.548585
7/6/2006	0.3331	830.2	461.1968	369.0032	0.555525
7/7/2006	0.3281	806.8	453.9049	352.8951	0.562599
7/8/2006	0.3279	783.8	446.9376	336.8624	0.570219
7/9/2006	0.3266	760.5	440.3007	320.1993	0.578962
7/10/2006	0.3297	733.7	434.0395	299.6605	0.591576
7/11/2006	0.3262	705.2	428.2147	276.9853	0.607225
7/12/2006	0.327	684.3	422.7753	261.5247	0.617821
7/13/2006	0.3266	655.2	417.735	237.465	0.637569
7/14/2006	0.3212	640.2	413.0418	227.1582	0.645176
7/15/2006	0.3216	627.4	408.5365	218.8635	0.651158
7/16/2006	0.319	611.1	404.2362	206.8638	0.66149
7/17/2006	0.3198	593.2	400.1972	193.0028	0.674641
7/18/2006	0.3144	584.7	396.3451	188.3549	0.677861
7/19/2006	0.3134	583.3	392.5154	190.7846	0.672922
7/20/2006	0.3105	578.9	388.6667	190.2333	0.671388
7/21/2006	0.3105	568.6	384.8895	183.7105	0.676907
7/22/2006	0.3098	560.4	381.224	179.176	0.680271

7/23/2006	0.3087	552.7	377.6459	175.0541	0.683275
7/24/2006	0.3099	545.1	374.1509	170.9491	0.68639
7/25/2006	0.3066	537.1	370.7438	166.3562	0.69027
7/26/2006	0.3025	526.7	367.4549	159.2451	0.697655
7/27/2006	0.3013	518.8	364.2856	154.5144	0.70217
7/28/2006	0.305	511.5	361.2068	150.2932	0.706172
7/29/2006	0.3039	504.1	358.2151	145.8849	0.710603
7/30/2006	0.3034	496.9	355.3113	141.5887	0.715056
7/31/2006	0.3044	490.1	352.4911	137.6089	0.719223
8/1/2006	0.3023	485.6	349.7287	135.8713	0.720199
8/2/2006	0.2977	479.4	347.0191	132.3809	0.723861
8/3/2006	0.2944	474.9	344.3633	130.5367	0.725128
8/4/2006	0.2977	468.3	341.7667	126.5333	0.729803
8/5/2006	0.2991	461.8	339.2507	122.5493	0.734627
8/6/2006	0.2989	457.4	336.7946	120.6054	0.736324
8/7/2006	0.2996	451.4	334.3945	117.0055	0.740794
8/8/2006	0.2978	447.1	332.0505	115.0495	0.742676
8/9/2006	0.2954	441.1	329.7637	111.3363	0.747594
8/10/2006	0.2938	436.8	327.5355	109.2645	0.749852
8/11/2006	0.2925	430.9	325.3658	105.5342	0.755084
8/12/2006	0.2935	426.7	323.2549	103.4451	0.757569
8/13/2006	0.292	420.9	321.2029	99.69708	0.763134
8/14/2006	0.293	417.2	319.206	97.99396	0.765115
8/15/2006	0.2928	413.8	317.2409	96.55914	0.766653
8/16/2006	0.2931	410.1	315.308	94.79198	0.768856
8/17/2006	0.2942	404.4	313.4317	90.96835	0.775054
8/18/2006	0.2951	400.8	311.6119	89.18811	0.777475
8/19/2006	0.2961	397.5	309.8254	87.6746	0.779435
8/20/2006	0.3033	393.9	308.0729	85.82714	0.782109

8/21/2006	0.3082	388.3	306.3784	81.92157	0.789025
8/22/2006	0.3141	384.7	304.7433	79.95671	0.792158
8/23/2006	0.3151	381.5	303.1442	78.35583	0.794611
8/24/2006	0.3137	378.8	301.5726	77.22737	0.796126
8/25/2006	0.3095	378	300.0047	77.99528	0.793663
8/26/2006	0.301	375.3	298.4405	76.85947	0.795205
8/27/2006	0.2992	371.7	296.9087	74.79129	0.798786
8/28/2006	0.2979	366.3	295.4375	70.86254	0.806545
8/29/2006	0.2972	362.8	294.027	68.773	0.810438
8/30/2006	0.2969	359.7	292.6551	67.0449	0.813609
8/31/2006	0.2956	356.7	291.3174	65.38255	0.816702
9/1/2006	0.295	353.6	290.0147	63.58526	0.820177
9/2/2006	0.2949	350.6	288.7477	61.85231	0.823582
9/3/2006	0.294	347.6	287.516	60.08398	0.827146
9/4/2006	0.2962	344.6	286.3204	58.27958	0.830878
9/5/2006	0.2915	341.6	285.1617	56.43834	0.834782
9/6/2006	0.2909	338.6	284.0405	54.55953	0.838867
9/7/2006	0.2919	335.3	282.9607	52.33932	0.843903
9/8/2006	0.2935	330.5	281.9415	48.55849	0.853076
9/9/2006	0.2921	329.4	280.9617	48.43826	0.85295
9/10/2006	0.2916	326.8	279.9997	46.80026	0.856792
9/11/2006	0.2951	324.3	279.0701	45.22986	0.860531
9/12/2006	0.288	323.2	278.1583	45.04169	0.860638
9/13/2006	0.2887	318.8	277.284	41.51601	0.869774
9/14/2006	0.2873	317.7	276.4479	41.25205	0.870154
9/15/2006	0.2922	315.2	275.6316	39.56842	0.874466
9/16/2006	0.2913	312.7	274.8496	37.85043	0.878956
9/17/2006	0.2917	311.7	274.0873	37.61268	0.87933
9/18/2006	0.291	307	273.3677	33.63233	0.890448

9/19/2006	0.29	303.9	272.7129	31.18707	0.897377
9/20/2006	0.2879	300.7	272.1091	28.59089	0.904919
9/21/2006	0.2894	296.2	271.5715	24.62846	0.916852
9/22/2006	0.2891	295.1	271.0801	24.01986	0.918604
9/23/2006	0.2885	292.7	270.6144	22.08557	0.924545
9/24/2006	0.2882	290	270.1913	19.80874	0.931694
9/25/2006	0.2879	287.2	269.8156	17.38443	0.939469
9/26/2006	0.2954	284.8	269.4853	15.31472	0.946226
9/27/2006	0.2958	284.2	269.1789	15.02115	0.947146
9/28/2006	0.3121	282.1	268.8937	13.20627	0.953186
9/29/2006	0.3154	281.4	268.6314	12.76865	0.954625
9/30/2006	0.3173	279.4	268.3912	11.00882	0.960598
10/1/2006	0.3201	278.7	268.1737	10.52635	0.962231
10/2/2006	0.3202	276.7	267.9792	8.720765	0.968483
10/3/2006	0.3224	276.4	267.8043	8.595678	0.968901
10/4/2006	0.3198	276.4	267.6289	8.7711	0.968267
10/5/2006	0.3198	276.7	267.4499	9.250133	0.96657
10/6/2006	0.3196	278.4	267.2669	11.13308	0.96001
10/7/2006	0.3197	276.7	267.0798	9.620232	0.965232
10/8/2006	0.3195	276.4	266.8891	9.510935	0.96559
10/9/2006	0.3193	276.1	266.698	9.401975	0.965947
10/10/2006	0.3192	273.7	266.5306	7.169362	0.973806
10/11/2006	0.319	271.1	266.4109	4.689145	0.982703
10/12/2006	0.3172	269.1	266.3356	2.764433	0.989727
10/13/2006	0.3174	270.7	266.279	4.421014	0.983668
10/14/2006	0.3174	270.7	266.2208	4.479235	0.983453
10/15/2006	0.3174	268.7	266.1656	2.5344	0.990568
10/16/2006	0.3172	268.1	266.12	1.98	0.992615
10/17/2006	0.3151	266.1	266.1	0	1

11/7/2006	0.4211	274.7	266.1009	8.59914	0.968696
11/10/2006	0.4844	286.5	266.1054	20.39455	0.928815
11/11/2006	0.4842	284.5	266.1166	18.38337	0.935384
11/12/2006	0.4843	282.1	266.1347	15.96532	0.943405
11/13/2006	0.4842	281.8	266.1586	15.64139	0.944495
11/14/2006	0.4988	282.1	266.1879	15.91208	0.943594
11/15/2006	0.4982	284.8	266.2227	18.57734	0.934771
11/16/2006	0.4988	289.6	266.2637	23.33633	0.919419
11/17/2006	0.4999	292.7	266.3122	26.38777	0.909847
11/18/2006	0.5004	296.2	266.3695	29.83055	0.899289
11/19/2006	0.5007	303.5	266.4367	37.06328	0.87788
11/20/2006	0.5012	309.5	266.516	42.98398	0.861118
11/21/2006	0.5014	315.2	266.6094	48.59065	0.845842
11/22/2006	0.5011	320.6	266.7184	53.88161	0.831935
11/23/2006	0.514	323.9	266.8444	57.05555	0.823848
11/24/2006	0.5286	327.5	266.9884	60.51163	0.815232
11/25/2006	0.5377	335.3	267.1512	68.14879	0.796753
11/26/2006	0.5425	342.3	267.3348	74.96521	0.780996
11/27/2006	0.5432	352.5	267.5414	84.95859	0.758983
11/28/2006	0.5439	356.7	267.7732	88.92678	0.750696
11/29/2006	0.5442	360.1	268.0313	92.06865	0.744325
11/30/2006	0.5443	365.9	268.3163	97.58368	0.733305
12/1/2006	0.5353	372.1	268.6291	103.4709	0.721927
12/2/2006	0.537	378	268.9708	109.0292	0.711563
12/3/2006	0.5369	381.5	269.3424	112.1576	0.706009
12/4/2006	0.5368	385.1	269.7441	115.3559	0.700452
12/5/2006	0.5367	391.1	270.1763	120.9237	0.690811
12/6/2006	0.5367	396.7	270.6397	126.0603	0.682228
12/7/2006	0.5366	397.9	271.1348	126.7652	0.681414

12/8/2006	0.5366	401.6	271.6612	129.9388	0.676447
12/9/2006	0.6064	410.2	272.2192	137.9808	0.663626
12/10/2006	0.6831	416.7	272.8101	143.8899	0.654692
12/11/2006	0.6821	422.1	273.4351	148.6649	0.647797
12/12/2006	0.681	436	274.0956	161.9044	0.62866
12/13/2006	0.68	443.2	274.7941	168.4059	0.620023
1/1/2007	0.679	607.1	275.5479	331.5521	0.453876
1/3/2007	0.5934	637.6	276.3912	361.2088	0.433487
1/4/2007	0.5938	625.9	277.3413	348.5587	0.443108
1/5/2007	0.5927	665.2	278.3983	386.8017	0.418518
1/6/2007	0.6452	689.6	279.5667	410.0333	0.405404
1/7/2007	0.621	703	280.8518	422.1482	0.399505
1/8/2007	0.6207	712.3	282.2544	430.0456	0.396258
1/9/2007	0.6205	721	283.7734	437.2266	0.393583
1/10/2007	0.6076	730.4	285.4072	444.9928	0.390755
1/11/2007	0.6082	742.6	287.1546	455.4454	0.386688
1/12/2007	0.5681	752.6	289.0148	463.5852	0.384022
1/13/2007	0.5666	765.6	290.987	474.613	0.380077
1/14/2007	0.5665	779.8	293.0711	486.7289	0.375829
1/15/2007	0.5659	798.1	295.2678	502.8322	0.369963
1/16/2007	0.5651	819.6	297.5789	522.0211	0.363078
1/17/2007	0.5645	835.5	300.0068	535.4932	0.359075
1/18/2007	0.5646	854.5	302.553	551.947	0.35407
1/19/2007	0.5691	877.4	305.2196	572.1804	0.347868
1/20/2007	0.5689	898.2	308.0092	590.1908	0.342918
1/21/2007	0.5685	924.1	310.925	613.175	0.336463
1/22/2007	0.5711	961.9	313.9717	647.9283	0.326408
1/23/2007	0.5681	998.5	317.1569	681.3431	0.317633
1/24/2007	0.5128	1037	320.4886	716.5114	0.309054

1/25/2007	0.5393	1092	323.9767	768.0233	0.296682
1/26/2007	0.528	1146	327.6337	818.3663	0.285893
1/27/2007	0.5259	1220	331.4753	888.5247	0.271701
1/28/2007	0.4964	1324	335.5232	988.4768	0.253416
1/29/2007	0.4954	1452	339.8085	1112.191	0.234028
1/30/2007	0.494	1627	344.3737	1282.626	0.211662
1/31/2007	0.4927	1784	349.2694	1434.731	0.195779
2/1/2007	0.4953	1903	354.5414	1548.459	0.186307
2/2/2007	0.5082	1971	360.2188	1610.781	0.182759
2/3/2007	0.509	2003	366.3121	1636.688	0.182882
2/4/2007	0.5094	2019	372.8172	1646.183	0.184654
2/5/2007	0.5096	2027	379.7224	1647.278	0.187332
2/6/2007	0.5199	2038	387.0133	1650.987	0.189899
2/7/2007	0.5173	2065	394.6775	1670.322	0.191127
2/8/2007	0.5987	2095	402.7066	1692.293	0.192223
2/9/2007	0.5688	2133	411.0955	1721.904	0.192731
2/10/2007	0.5324	2221	419.846	1801.154	0.189035
2/11/2007	0.5161	2337	428.9732	1908.027	0.183557
2/12/2007	0.5079	2458	438.5027	2019.497	0.178398
2/13/2007	0.5186	2576	448.4623	2127.538	0.174093
2/14/2007	0.5182	2684	458.8775	2225.122	0.170968
2/15/2007	0.518	2725	469.7637	2255.236	0.17239
2/16/2007	0.5175	2728	481.117	2246.883	0.176363
2/17/2007	0.517	2720	492.9184	2227.082	0.18122
2/18/2007	0.5107	2706	505.1427	2200.857	0.186675
2/19/2007	0.5203	2709	517.7649	2191.235	0.191128
2/20/2007	0.5212	2735	530.7661	2204.234	0.194064
2/21/2007	0.522	2752	544.1333	2207.867	0.197723
2/22/2007	0.513	2795	557.8568	2237.143	0.199591

2/23/2007	0.5093	2816	571.9296	2244.07	0.2031
2/24/2007	0.5058	2827	586.3417	2240.658	0.207408
2/25/2007	0.4939	2846	601.0802	2244.92	0.211202
2/26/2007	0.5014	2878	616.1343	2261.866	0.214084
2/27/2007	0.5059	2906	631.4965	2274.503	0.217308
2/28/2007	0.5042	2931	647.16	2283.84	0.220798
3/1/2007	0.4882	2942	663.1153	2278.885	0.225396
3/2/2007	0.4884	2950	679.35	2270.65	0.230288
3/3/2007	0.4889	2951	695.8494	2255.151	0.235801
3/4/2007	0.4999	2951	712.5974	2238.403	0.241477
3/5/2007	0.4959	2950	729.5774	2220.423	0.247314
3/6/2007	0.506	2942	746.7725	2195.228	0.253832
3/7/2007	0.4856	2933	764.1646	2168.835	0.26054
3/8/2007	0.4861	2924	781.7356	2142.264	0.267351
3/9/2007	0.4803	2915	799.4676	2115.532	0.27426
3/10/2007	0.4913	2906	817.3437	2088.656	0.281261
3/11/2007	0.492	2895	835.3471	2059.653	0.288548
3/12/2007	0.4927	2869	853.46	2015.54	0.297476
3/13/2007	0.4968	2836	871.6611	1964.339	0.307356
3/14/2007	0.5031	2808	889.9277	1918.072	0.316926
3/15/2007	0.5028	2783	908.2384	1874.762	0.326352
3/16/2007	0.4989	2763	926.5745	1836.426	0.335351
3/17/2007	0.5006	2738	944.7406	1793.259	0.345048
3/18/2007	0.5018	2713	962.5434	1750.457	0.354789
3/19/2007	0.5026	2693	979.9757	1713.024	0.363897
3/20/2007	0.5031	2662	997.0378	1664.962	0.374545
3/21/2007	0.502	2637	1013.73	1623.27	0.384426
3/22/2007	0.5087	2624	1030.054	1593.946	0.392551
3/23/2007	0.5062	2602	1046.009	1555.991	0.402002

3/24/2007	0.5083	2584	1061.598	1522.402	0.410835
3/25/2007	0.5145	2567	1076.82	1490.18	0.419486
3/26/2007	0.508	2553	1091.677	1461.323	0.427606
3/27/2007	0.5096	2558	1106.171	1451.829	0.432436
3/28/2007	0.5102	2559	1120.302	1438.698	0.437789
3/29/2007	0.5053	2560	1134.072	1425.928	0.442997
3/30/2007	0.4995	2567	1147.482	1419.518	0.447013
3/31/2007	0.5039	2575	1160.533	1414.467	0.450692
4/1/2007	0.5052	2584	1173.225	1410.775	0.454035
4/2/2007	0.5125	2592	1185.56	1406.44	0.457392
4/3/2007	0.5121	2602	1197.538	1404.462	0.460238
4/4/2007	0.5132	2617	1209.16	1407.84	0.46204
4/5/2007	0.5118	2626	1220.425	1405.575	0.464747
4/6/2007	0.5095	2634	1231.335	1402.665	0.467477
4/7/2007	0.5105	2635	1241.889	1393.111	0.471305
4/8/2007	0.5088	2634	1252.087	1381.913	0.475356
4/9/2007	0.5089	2627	1261.929	1365.071	0.480369
4/10/2007	0.506	2625	1271.416	1353.584	0.484349
4/11/2007	0.5097	2618	1280.546	1337.454	0.489131
4/12/2007	0.5096	2607	1289.319	1317.681	0.494561
4/13/2007	0.5067	2586	1297.737	1288.263	0.501832
4/14/2007	0.5075	2575	1305.798	1269.202	0.507106
4/15/2007	0.4994	2566	1313.502	1252.498	0.511887
4/16/2007	0.4916	2550	1320.849	1229.151	0.51798
4/17/2007	0.4894	2535	1327.84	1207.16	0.523803
4/18/2007	0.4838	2525	1334.474	1190.526	0.528505
4/19/2007	0.4821	2517	1340.752	1176.248	0.532678
4/20/2007	0.4775	2508	1346.672	1161.328	0.536951
4/21/2007	0.478	2500	1352.237	1147.763	0.540895

4/22/2007	0.4722	2492	1357.444	1134.556	0.544721
4/23/2007	0.4726	2484	1362.295	1121.705	0.548428
4/24/2007	0.4741	2475	1366.788	1108.212	0.552238
4/25/2007	0.4629	2467	1370.925	1096.075	0.555705
4/26/2007	0.4612	2459	1374.704	1084.296	0.55905
4/27/2007	0.4506	2451	1378.126	1072.874	0.562271
4/28/2007	0.4482	2442	1381.191	1060.809	0.565598
4/29/2007	0.4428	2433	1383.897	1049.103	0.568803
4/30/2007	0.4407	2420	1386.245	1033.755	0.572828
5/1/2007	0.4377	2414	1388.234	1025.766	0.575076
5/2/2007	0.4362	2387	1389.864	997.1363	0.582264
5/3/2007	0.4376	2369	1391.134	977.8661	0.587224
5/4/2007	0.4219	2352	1392.044	959.9559	0.591856
5/5/2007	0.4197	2329	1392.594	936.4059	0.597936
5/6/2007	0.4158	2307	1392.783	914.2166	0.603721
5/7/2007	0.4145	2296	1375.185	920.815	0.598948
5/8/2007	0.4095	2280	1356.767	923.2325	0.595073
5/9/2007	0.4051	2258	1338.173	919.8265	0.592637
5/10/2007	0.4028	2241	1319.575	921.425	0.588833
5/11/2007	0.3997	2218	1301.005	916.9949	0.586567
5/12/2007	0.3979	2195	1282.526	912.4744	0.584294
5/13/2007	0.4008	2172	1264.138	907.8617	0.582016
5/14/2007	0.398	2149	1245.845	903.1548	0.579733
5/15/2007	0.396	2126	1227.648	898.3518	0.577445
5/16/2007	0.3942	2104	1209.539	894.461	0.574876
5/17/2007	0.3916	2087	1191.458	895.5418	0.570895
5/18/2007	0.3926	2071	1173.345	897.6549	0.56656
5/19/2007	0.3903	2043	1155.311	887.6887	0.565497
5/20/2007	0.3902	2019	1137.44	881.5599	0.563368

5/21/2007	0.3895	1991	1119.735	871.2652	0.562398
5/22/2007	0.3913	1966	1102.209	863.791	0.560635
5/23/2007	0.389	1933	1084.917	848.0827	0.561261
5/24/2007	0.3871	1910	1067.844	842.1558	0.559081
5/25/2007	0.3868	1886	1050.902	835.0978	0.557212
5/26/2007	0.3871	1847	1034.257	812.7426	0.559966
5/27/2007	0.384	1817	1017.977	799.0231	0.560251
5/28/2007	0.3856	1790	1001.946	788.0542	0.559746
5/29/2007	0.3786	1766	986.108	779.892	0.558385
5/30/2007	0.3783	1735	970.5082	764.4918	0.559371
5/31/2007	0.3759	1713	955.1308	757.8692	0.557578
6/1/2007	0.3787	1691	939.8885	751.1115	0.555818
6/2/2007	0.3734	1660	924.8761	735.1239	0.557154
6/3/2007	0.3712	1637	910.1082	726.8918	0.555961
6/4/2007	0.3757	1606	895.59	710.41	0.557653
6/5/2007	0.3773	1579	881.3674	697.6326	0.558181
6/6/2007	0.3745	1554	867.3851	686.6149	0.558163
6/7/2007	0.3739	1531	853.6072	677.3928	0.557549
6/8/2007	0.3747	1497	840.1298	656.8702	0.561209
6/9/2007	0.3699	1474	826.959	647.041	0.561031
6/10/2007	0.3669	1445	814.05	630.95	0.563356
6/11/2007	0.3652	1419	801.4388	617.5612	0.564791
6/12/2007	0.3669	1395	789.0804	605.9196	0.565649
6/13/2007	0.367	1374	776.929	597.071	0.56545
6/14/2007	0.3665	1342	765.0704	576.9296	0.570097
6/15/2007	0.3641	1322	753.5004	568.4996	0.56997
6/16/2007	0.3641	1302	742.1024	559.8976	0.569971
6/17/2007	0.36	1274	730.9617	543.0383	0.573753
6/18/2007	0.3604	1242	720.2058	521.7942	0.579876

6/19/2007	0.3593	1222	709.761	512.239	0.580819
6/20/2007	0.3618	1204	699.4908	504.5092	0.580972
6/21/2007	0.3592	1181	689.4294	491.5706	0.583767
6/22/2007	0.3581	1155	679.6626	475.3374	0.588453
6/23/2007	0.3575	1137	670.1456	466.8544	0.589398
6/24/2007	0.3552	1119	660.8016	458.1984	0.590529
6/25/2007	0.3544	1094	651.7057	442.2943	0.595709
6/26/2007	0.3537	1073	642.8936	430.1064	0.599155
6/27/2007	0.3559	1055	634.2996	420.7004	0.601232
6/28/2007	0.353	1035	625.9179	409.0821	0.604752
6/29/2007	0.3494	1019	617.7326	401.2674	0.606214
6/30/2007	0.3474	1002	609.7169	392.2831	0.6085
7/1/2007	0.3426	979.1	601.9448	377.1552	0.614794
7/2/2007	0.3418	962.5	594.4172	368.0828	0.617576
7/3/2007	0.3412	949.2	587.041	362.159	0.618459
7/4/2007	0.338	942.9	579.7143	363.1857	0.614821
7/5/2007	0.338	914.8	572.589	342.211	0.625917
7/6/2007	0.3331	896.9	565.7878	331.1122	0.630826
7/7/2007	0.3303	879.2	559.211	319.989	0.636045
7/8/2007	0.3247	867.7	552.798	314.902	0.637084
7/9/2007	0.3237	853.3	546.5183	306.7817	0.640476
7/10/2007	0.3236	835.5	540.4391	295.0609	0.646845
7/11/2007	0.3196	820.8	534.5675	286.2325	0.651276
7/12/2007	0.3165	806.8	528.8688	277.9312	0.655514
7/13/2007	0.3257	792.9	523.3386	269.5614	0.660031
7/14/2007	0.3223	779.2	517.9772	261.2228	0.664755
7/15/2007	0.3202	765.6	512.7849	252.8151	0.669782
7/16/2007	0.3202	753.2	507.7519	245.4481	0.674126
7/17/2007	0.3193	745.9	502.8172	243.0828	0.674108

7/18/2007	0.3178	731.5	498.0033	233.4967	0.680797
7/19/2007	0.3149	724.9	493.3054	231.5946	0.680515
7/20/2007	0.3154	717.2	488.6576	228.5424	0.681341
7/21/2007	0.3109	711.7	484.0496	227.6504	0.680131
7/22/2007	0.3127	704.1	479.4812	224.6188	0.680984
7/23/2007	0.3109	698.2	474.9573	223.2427	0.68026
7/24/2007	0.3105	686.9	470.5167	216.3833	0.684986
7/25/2007	0.3103	677.9	466.1925	211.7075	0.687701
7/26/2007	0.3071	669.4	461.9587	207.4413	0.690109
7/27/2007	0.307	661.5	457.8058	203.6942	0.692072
7/28/2007	0.3083	656.3	453.7018	202.5982	0.691303
7/29/2007	0.3031	648.5	449.6468	198.8532	0.693364
7/30/2007	0.302	639.1	445.6845	193.4155	0.697363
7/31/2007	0.3085	624.8	441.8831	182.9169	0.707239
8/1/2007	0.3085	616.2	438.2379	177.9621	0.711194
8/2/2007	0.3097	611.6	434.6529	176.9471	0.710682
8/3/2007	0.3108	607.6	431.0826	176.5174	0.709484
8/4/2007	0.3152	603.6	427.521	176.079	0.708285
8/5/2007	0.316	598.6	423.9786	174.6214	0.708284
8/6/2007	0.3139	588.2	420.521	167.679	0.714929
8/7/2007	0.3138	579.8	417.1847	162.6153	0.719532
8/8/2007	0.3164	572	413.9456	158.0544	0.723681
8/9/2007	0.3166	564.3	410.7986	153.5014	0.727979
8/10/2007	0.3176	557	407.7404	149.2596	0.732029
8/11/2007	0.3172	552.2	404.7433	147.4567	0.732965
8/12/2007	0.3143	545.1	401.8064	143.2936	0.737124
8/13/2007	0.3131	538	398.9545	139.0455	0.741551
8/14/2007	0.306	533.3	396.1648	137.1352	0.742855
8/15/2007	0.3055	526.7	393.4334	133.2666	0.746978

8/16/2007	0.3055	522.6	390.7556	131.8444	0.747714
8/17/2007	0.3048	518.8	388.1036	130.6964	0.748079
8/18/2007	0.3046	514.7	385.4782	129.2218	0.748938
8/19/2007	0.3058	508.3	382.9063	125.3937	0.753308
8/20/2007	0.305	504.1	380.3901	123.7099	0.754593
8/21/2007	0.3037	500	377.9073	122.0927	0.755815
8/22/2007	0.3039	493.7	375.4799	118.2201	0.760543
8/23/2007	0.3042	489.7	373.108	116.592	0.761911
8/24/2007	0.3043	486.1	370.7653	115.3347	0.762735
8/25/2007	0.3048	482.5	368.4483	114.0517	0.763623
8/26/2007	0.3043	478.9	366.1574	112.7426	0.76458
8/27/2007	0.3043	474.9	363.8974	111.0026	0.766261
8/28/2007	0.3034	468.3	361.6994	106.6006	0.772367
8/29/2007	0.2988	461.8	359.5902	102.2098	0.778671
8/30/2007	0.2999	457.9	357.5441	100.3559	0.780834
8/31/2007	0.2992	454.4	355.5317	98.8683	0.78242
9/1/2007	0.2988	450.5	353.5538	96.94622	0.784803
9/2/2007	0.2982	444.5	351.6365	92.86349	0.791083
9/3/2007	0.2975	440.2	349.7852	90.41479	0.794605
9/4/2007	0.2972	434.3	348.0002	86.29979	0.80129
9/5/2007	0.2965	430.1	346.2819	83.81815	0.805119
9/6/2007	0.2964	424.2	344.6315	79.56852	0.812427
9/7/2007	0.2945	420.1	343.0495	77.05053	0.81659
9/8/2007	0.2924	414.7	341.5321	73.16789	0.823564
9/9/2007	0.2927	413.4	340.0522	73.34784	0.822574
9/10/2007	0.2924	410.6	338.5838	72.01617	0.824607
9/11/2007	0.2929	407.3	337.1478	70.15221	0.827763
9/12/2007	0.297	404	335.7498	68.25022	0.831064
9/13/2007	0.2971	400.4	334.3937	66.00634	0.835149

9/14/2007	0.3002	394.7	333.1048	61.59525	0.843944
9/15/2007	0.2965	391.1	331.8844	59.21556	0.848592
9/16/2007	0.2967	387.5	330.7127	56.78731	0.853452
9/17/2007	0.2965	381.9	329.6109	52.28909	0.863082
9/18/2007	0.2968	378.4	328.5795	49.8205	0.868339
9/19/2007	0.297	375.3	327.5944	47.70561	0.872887
9/20/2007	0.297	372.1	326.6535	45.44654	0.877865
9/21/2007	0.2975	369	325.7576	43.24239	0.882812
9/22/2007	0.3026	365.9	324.9067	40.99325	0.887966
9/23/2007	0.3001	362.8	324.1018	38.69822	0.893335
9/24/2007	0.3003	360.1	323.3396	36.76043	0.897916
9/25/2007	0.301	359.4	322.5965	36.8035	0.897597
9/26/2007	0.3007	356.7	321.873	34.82704	0.902363
9/27/2007	0.3017	354	321.1898	32.81024	0.907316
9/28/2007	0.3039	353.3	320.5273	32.7727	0.907238
9/29/2007	0.304	350.6	319.886	30.71397	0.912396
9/30/2007	0.3037	347.6	319.2898	28.31018	0.918555
10/1/2007	0.3037	344.6	318.7427	25.85732	0.924964
10/2/2007	0.3079	341.9	318.2425	23.65747	0.930806
10/3/2007	0.3078	341.2	317.7669	23.43314	0.931321
10/4/2007	0.3079	339	317.3111	21.68892	0.936021
10/5/2007	0.3081	338.2	316.8766	21.32338	0.93695
10/6/2007	0.308	336	316.4639	19.53611	0.941857
10/7/2007	0.3111	335.6	316.0693	19.53072	0.941804
10/8/2007	0.3124	335.6	315.6707	19.92931	0.940616
10/9/2007	0.321	335.3	315.267	20.03296	0.940254
10/10/2007	0.3236	333	314.8817	18.11833	0.945591
10/11/2007	0.3306	332.7	314.515	18.18503	0.945341
10/12/2007	0.33	332.7	314.1438	18.55616	0.944226

10/13/2007	0.3299	332.7	313.7651	18.93485	0.943087
10/14/2007	0.3297	332.7	313.3787	19.32128	0.941926
10/15/2007	0.3295	332.7	312.9844	19.71559	0.940741
10/16/2007	0.3295	332.7	312.5821	20.11795	0.939531
10/17/2007	0.329	332.7	312.1715	20.52852	0.938297
10/18/2007	0.3302	332.3	311.7566	20.54339	0.938178
10/19/2007	0.3299	330.1	311.3598	18.74019	0.943229
10/20/2007	0.3299	329.7	310.9814	18.71856	0.943225
10/21/2007	0.3295	329.7	310.5994	19.10057	0.942067
10/22/2007	0.3305	329.4	310.2127	19.18732	0.941751
10/23/2007	0.3308	326.8	309.8476	16.95237	0.948126
10/24/2007	0.3304	324.3	309.5272	14.77282	0.954447
10/25/2007	0.3292	323.5	309.2339	14.26615	0.955901
10/26/2007	0.3385	321	308.9682	12.03178	0.962518
10/27/2007	0.3369	318.1	308.7523	9.347737	0.970614
10/28/2007	0.3416	315.6	308.587	7.012997	0.977779
10/29/2007	0.3414	315.6	308.4439	7.156119	0.977325
10/30/2007	0.3414	317.7	308.2976	9.402377	0.970405
10/31/2007	0.3413	318.1	308.1477	9.952299	0.968713
11/1/2007	0.3482	318.5	307.9937	10.50628	0.967013
11/2/2007	0.348	320.3	307.8353	12.4647	0.961084
11/3/2007	0.3482	317.7	307.6722	10.02775	0.968436
11/4/2007	0.3488	312.7	307.5374	5.162573	0.98349
11/5/2007	0.3477	309.9	307.4606	2.43936	0.992129
11/6/2007	0.3484	309.2	307.418	1.782	0.994237
11/7/2007	0.3599	307.4	307.4	0	1
11/8/2007	0.3511	309.5	307.4002	2.09979	0.993216
11/9/2007	0.3508	312.4	307.4013	4.998668	0.983999
11/10/2007	0.3507	314.9	307.4044	7.495632	0.976197

11/11/2007	0.3494	315.6	307.4101	8.189897	0.97405
11/12/2007	0.3507	318.1	307.4191	10.68093	0.966423
11/13/2007	0.3521	321	307.432	13.56801	0.957732
11/14/2007	0.3519	323.9	307.4498	16.45018	0.949212
11/15/2007	0.3586	326.4	307.4735	18.92651	0.942014
11/16/2007	0.3592	326.8	307.5036	19.29641	0.940953
11/17/2007	0.3721	326.8	307.5402	19.25983	0.941065
11/18/2007	0.3895	327.2	307.583	19.61696	0.940046
11/19/2007	0.3904	329.7	307.6323	22.06772	0.933067
11/20/2007	0.3916	332.7	307.6884	25.01156	0.924822
11/21/2007	0.4026	333.8	307.7522	26.04781	0.921966
11/22/2007	0.4033	328.3	307.8232	20.47682	0.937628
11/23/2007	0.4043	344.2	307.9017	36.29831	0.894543
11/24/2007	0.4229	345.3	307.9901	37.30988	0.891949
11/25/2007	0.4236	347.2	308.0901	39.10994	0.887356
11/26/2007	0.4329	348	308.2016	39.79842	0.885637
11/27/2007	0.4334	350.6	308.3248	42.27522	0.87942
11/28/2007	0.4337	353.6	308.46	45.13995	0.872342
11/29/2007	0.4338	356.7	308.608	48.09197	0.865175
11/30/2007	0.4341	360.1	308.7694	51.33059	0.857455
12/1/2007	0.4403	365.5	308.9451	56.55486	0.845267
12/2/2007	0.4409	369	309.1363	59.86366	0.837768
12/3/2007	0.4503	372.1	309.3439	62.75612	0.831346
12/4/2007	0.4492	375.3	309.5683	65.73169	0.824856
12/5/2007	0.4493	378.8	309.8102	68.98983	0.817873
12/6/2007	0.4493	384.7	310.0703	74.62971	0.806005
12/7/2007	0.4491	391.1	310.35	80.74999	0.793531
12/8/2007	0.4492	397.1	310.6509	86.44908	0.782299
12/9/2007	0.4494	401.6	310.9743	90.62566	0.774338

1/7/2008	0.6164	695	311.3501	383.6499	0.447986
1/8/2008	0.6165	715.6	311.8371	403.7629	0.43577
1/9/2008	0.6236	730.4	312.4658	417.9342	0.427801
1/10/2008	0.6236	747	313.237	433.763	0.419327
1/11/2008	0.6232	763.3	314.1511	449.1489	0.41157
1/12/2008	0.6231	791.2	315.2098	475.9902	0.398395
1/13/2008	0.6228	812	316.4162	495.5838	0.389675
1/14/2008	0.6287	833.7	317.7733	515.9267	0.38116
1/15/2008	0.629	849.8	319.2824	530.5176	0.375715
1/16/2008	0.6294	867.1	320.944	546.156	0.370135
1/17/2008	0.6297	878	322.7577	555.2423	0.367606
1/18/2008	0.6297	887.7	324.7215	562.9785	0.365801
1/19/2008	0.6295	898.1	326.8328	571.2672	0.363916
1/20/2008	0.6297	912.3	329.0895	583.2105	0.360725
1/21/2008	0.6299	926.6	331.49	595.11	0.357749
1/22/2008	0.6299	937.2	334.0331	603.1669	0.356416
1/23/2008	0.6494	947.3	336.7168	610.5832	0.355449
1/24/2008	0.6492	958.7	339.5385	619.1615	0.354166
1/26/2008	0.6447	1018	342.501	675.499	0.336445
1/27/2008	0.6445	1057	345.6143	711.3857	0.326977
1/28/2008	0.6447	1100	348.8893	751.1107	0.317172
1/29/2008	0.6445	1149	352.3356	796.6644	0.306645
2/4/2008	0.6285	1239	355.9683	883.0317	0.287303
2/5/2008	0.6207	1257	359.8031	897.1969	0.28624
2/6/2008	0.6025	1276	363.845	912.155	0.285145
2/7/2008	0.5904	1304	368.0926	935.9074	0.28228
2/8/2008	0.5342	1333	372.5465	960.4535	0.27948
2/9/2008	0.5349	1361	377.208	983.792	0.277155
2/10/2008	0.5382	1408	382.0804	1025.92	0.271364

2/11/2008	0.5616	1471	387.1719	1083.828	0.263203
2/12/2008	0.5617	1522	392.494	1129.506	0.25788
2/13/2008	0.5607	1656	398.0655	1257.935	0.240378
2/14/2008	0.5609	1795	403.92	1391.08	0.225025
2/15/2008	0.5641	1966	410.1023	1555.898	0.208597
2/16/2008	0.5289	2133	416.6618	1716.338	0.195341
2/17/2008	0.5333	2292	423.6472	1868.353	0.184837
2/18/2008	0.5337	2419	431.1001	1987.9	0.178214
2/19/2008	0.5346	2495	439.048	2055.952	0.175971
2/20/2008	0.5342	2531	447.4995	2083.5	0.176807
2/21/2008	0.5369	2548	456.4479	2091.552	0.17914
2/22/2008	0.5448	2549	465.8769	2083.123	0.182768
2/23/2008	0.5485	2542	475.7649	2066.235	0.187162
2/24/2008	0.5542	2533	486.0877	2046.912	0.191902
2/25/2008	0.5548	2524	496.8205	2027.179	0.196839
2/26/2008	0.5549	2507	507.9383	1999.062	0.202608
2/27/2008	0.5529	2487	519.4152	1967.585	0.208852
2/28/2008	0.5459	2480	531.226	1948.774	0.214204
2/29/2008	0.5547	2460	543.3472	1916.653	0.220873
3/1/2008	0.5527	2443	555.7554	1887.245	0.227489
3/2/2008	0.5529	2433	568.4278	1864.572	0.233632
3/3/2008	0.548	2419	581.3439	1837.656	0.240324
3/4/2008	0.5454	2410	594.484	1815.516	0.246674
3/5/2008	0.5453	2399	607.8298	1791.17	0.253368
3/6/2008	0.5463	2380	621.3627	1758.637	0.261077
3/7/2008	0.5449	2376	635.0647	1740.935	0.267283
3/8/2008	0.5453	2369	648.9202	1720.08	0.273922
3/9/2008	0.5464	2361	662.9149	1698.085	0.280777
3/10/2008	0.5476	2353	677.0347	1675.965	0.287733

3/11/2008	0.5509	2346	691.2658	1654.734	0.294657
3/12/2008	0.552	2344	705.5958	1638.404	0.301022
3/13/2008	0.5522	2339	720.0134	1618.987	0.30783
3/14/2008	0.5602	2344	734.5086	1609.491	0.313357
3/15/2008	0.5677	2345	749.0732	1595.927	0.319434
3/16/2008	0.5649	2344	763.6992	1580.301	0.32581
3/17/2008	0.5546	2336	778.3774	1557.623	0.33321
3/18/2008	0.5589	2335	793.0982	1541.902	0.339657
3/19/2008	0.56	2338	807.8531	1530.147	0.345532
3/20/2008	0.5609	2345	822.6362	1522.364	0.350804
3/21/2008	0.5617	2353	837.443	1515.557	0.355904
3/22/2008	0.5617	2360	852.2695	1507.73	0.361131
3/23/2008	0.5557	2362	867.1115	1494.888	0.367109
3/24/2008	0.5436	2369	881.9642	1487.036	0.372294
3/25/2008	0.5406	2377	896.8237	1480.176	0.377292
3/26/2008	0.541	2385	911.57	1473.43	0.38221
3/27/2008	0.5373	2393	926.0505	1466.949	0.386983
3/28/2008	0.5369	2403	940.2305	1462.769	0.391274
3/29/2008	0.5316	2417	954.1098	1462.89	0.39475
3/30/2008	0.5268	2427	967.688	1459.312	0.398718
3/31/2008	0.5173	2442	980.9648	1461.035	0.401705
4/1/2008	0.514	2460	993.9396	1466.06	0.40404
4/2/2008	0.518	2483	1006.612	1476.388	0.405401
4/3/2008	0.5113	2500	1018.98	1481.02	0.407592
4/4/2008	0.4995	2519	1031.044	1487.956	0.409307
4/5/2008	0.4984	2548	1042.803	1505.197	0.409263
4/6/2008	0.4942	2569	1054.254	1514.746	0.410375
4/7/2008	0.4886	2599	1065.397	1533.603	0.409926
4/8/2008	0.4881	2619	1076.23	1542.77	0.410932

4/9/2008	0.4885	2641	1086.75	1554.25	0.411492
4/10/2008	0.4849	2651	1096.956	1554.044	0.413789
4/11/2008	0.4818	2652	1106.845	1545.155	0.417362
4/12/2008	0.4779	2652	1116.415	1535.585	0.420971
4/13/2008	0.4767	2652	1125.664	1526.336	0.424458
4/14/2008	0.4736	2652	1134.589	1517.411	0.427824
4/15/2008	0.4756	2650	1143.188	1506.812	0.431392
4/16/2008	0.4768	2636	1151.458	1484.542	0.43682
4/17/2008	0.4731	2625	1159.398	1465.602	0.441676
4/18/2008	0.4628	2609	1167.006	1441.994	0.4473
4/19/2008	0.462	2592	1174.278	1417.722	0.453039
4/20/2008	0.4637	2574	1181.213	1392.787	0.458902
4/21/2008	0.4648	2551	1187.809	1363.191	0.465625
4/22/2008	0.469	2531	1194.065	1336.935	0.471776
4/23/2008	0.4693	2501	1199.978	1301.022	0.479799
4/24/2008	0.4623	2476	1205.547	1270.453	0.486893
4/25/2008	0.4555	2458	1210.771	1247.229	0.492584
4/26/2008	0.4558	2435	1215.648	1219.352	0.49924
4/27/2008	0.4518	2417	1220.178	1196.822	0.504832
4/28/2008	0.4514	2394	1224.359	1169.641	0.511428
4/29/2008	0.4525	2376	1228.19	1147.81	0.516915
4/30/2008	0.4499	2354	1231.67	1122.33	0.523224
5/1/2008	0.4489	2336	1234.798	1101.202	0.528595
5/2/2008	0.4435	2314	1237.575	1076.425	0.534821
5/3/2008	0.4389	2297	1239.998	1057.002	0.539834
5/4/2008	0.4418	2282	1242.067	1039.933	0.544289
5/5/2008	0.445	2272	1243.782	1028.218	0.547439
5/6/2008	0.441	2257	1245.142	1011.858	0.55168
5/7/2008	0.4389	2241	1246.147	994.8534	0.556067

5/8/2008	0.4393	2218	1246.794	971.2056	0.562126
5/9/2008	0.4394	2196	1247.085	948.9147	0.567889
5/10/2008	0.4393	2178	1234.856	943.1445	0.566968
5/11/2008	0.4369	2155	1216.689	938.3112	0.564589
5/12/2008	0.4389	2126	1198.14	927.8603	0.563565
5/13/2008	0.4364	2103	1179.441	923.5589	0.560837
5/14/2008	0.4333	2079	1160.838	918.1622	0.558364
5/15/2008	0.4328	2051	1142.386	908.6145	0.55699
5/16/2008	0.4311	2026	1124.097	901.9025	0.554836
5/17/2008	0.4287	1998	1105.977	892.023	0.553542
5/18/2008	0.4288	1967	1088.089	878.9112	0.553172
5/19/2008	0.4274	1933	1070.499	862.5012	0.553802
5/20/2008	0.421	1904	1053.193	850.8074	0.553147
5/21/2008	0.4162	1886	1036.013	849.9871	0.549318
5/22/2008	0.4146	1861	1018.921	842.0787	0.547513
5/23/2008	0.411	1837	1001.981	835.0191	0.545444
5/24/2008	0.4102	1811	985.205	825.795	0.544012
5/25/2008	0.4069	1788	968.5867	819.4133	0.541715
5/26/2008	0.4037	1761	952.1395	808.8605	0.540681
5/27/2008	0.4019	1734	935.9077	798.0923	0.539739
5/28/2008	0.3973	1712	919.8446	792.1554	0.537292
5/29/2008	0.3973	1687	903.9332	783.0668	0.535823
5/30/2008	0.3954	1670	888.1258	781.8742	0.531812
5/31/2008	0.3954	1639	872.4855	766.5145	0.532328
6/1/2008	0.3921	1613	857.1076	755.8924	0.531375
6/2/2008	0.3927	1592	841.8955	750.1045	0.528829
6/3/2008	0.388	1572	826.7914	745.2086	0.525949
6/4/2008	0.3867	1547	811.8381	735.1619	0.524782
6/5/2008	0.3911	1526	797.0491	728.9509	0.522313

6/6/2008	0.3915	1500	782.4379	717.5621	0.521625
6/7/2008	0.3902	1466	768.1407	697.8593	0.52397
6/8/2008	0.388	1444	754.1231	689.8769	0.522246
6/9/2008	0.3883	1420	740.2889	679.7111	0.52133
6/10/2008	0.3869	1399	726.6315	672.3685	0.519394
6/11/2008	0.3857	1372	713.1853	658.8147	0.519814
6/12/2008	0.3834	1356	699.9033	656.0967	0.516153
6/13/2008	0.382	1329	686.7891	642.2109	0.516771
6/14/2008	0.3789	1308	673.897	634.103	0.515212
6/15/2008	0.3771	1280	661.2419	618.7581	0.516595
6/16/2008	0.375	1252	648.8999	603.1001	0.518291
6/17/2008	0.3738	1229	636.8264	592.1736	0.518166
6/18/2008	0.3734	1201	625.0269	575.9731	0.520422
6/19/2008	0.3718	1179	613.4969	565.5031	0.520354
6/20/2008	0.3675	1139	602.3642	536.6358	0.528854
6/21/2008	0.3699	1110	591.7083	518.2917	0.533071
6/22/2008	0.3656	1084	581.3963	502.6037	0.536343
6/23/2008	0.3637	1064	571.3431	492.6569	0.536977
6/24/2008	0.3574	1031	561.6256	469.3744	0.544739
6/25/2008	0.3564	1004	552.3221	451.6779	0.550122
6/26/2008	0.3548	982.9	543.3195	439.5805	0.552772
6/27/2008	0.3554	961.2	534.5699	426.6301	0.556148
6/28/2008	0.3519	936	526.1203	409.8797	0.562094
6/29/2008	0.3517	928.5	517.8319	410.6681	0.557708
6/30/2008	0.3474	903.7	509.704	393.996	0.564019
7/1/2008	0.3506	881.7	501.8877	379.8123	0.569227
7/2/2008	0.3518	854.6	494.413	360.187	0.578531
7/3/2008	0.3489	830.8	487.3051	343.4949	0.586549
7/4/2008	0.3495	810.3	480.5042	329.7958	0.592995

7/5/2008	0.3436	784.9	474.0328	310.8672	0.60394
7/6/2008	0.3408	766.1	467.8805	298.2195	0.61073
7/7/2008	0.3429	753.2	461.926	291.274	0.613285
7/8/2008	0.3455	745.9	456.0561	289.8439	0.611417
7/9/2008	0.3419	730.4	450.2991	280.1009	0.61651
7/10/2008	0.3423	716.6	444.7235	271.8765	0.620602
7/11/2008	0.3414	703.1	439.3128	263.7872	0.624823
7/12/2008	0.3405	686.4	434.0998	252.3002	0.63243
7/13/2008	0.3368	669.9	429.1192	240.7808	0.640572
7/14/2008	0.331	656.3	424.3441	231.9559	0.64657
7/15/2008	0.3304	640.7	419.7695	220.9305	0.655173
7/16/2008	0.3251	628.4	415.3862	213.0138	0.661022
7/17/2008	0.3235	619.2	411.1328	208.0672	0.663974
7/18/2008	0.3224	608.1	406.9998	201.1002	0.669298
7/19/2008	0.3233	599.1	402.9876	196.1124	0.672655
7/20/2008	0.3217	588.2	399.0965	189.1035	0.678505
7/21/2008	0.3202	579.8	395.323	184.477	0.681826
7/22/2008	0.3212	572	391.6377	180.3623	0.684681
7/23/2008	0.3191	564.3	388.0354	176.2646	0.68764
7/24/2008	0.3194	556.6	384.5168	172.0832	0.690831
7/25/2008	0.3196	548.9	381.0834	167.8166	0.694268
7/26/2008	0.318	541.3	377.7362	163.5638	0.697831
7/27/2008	0.3176	533.3	374.4798	158.8202	0.702193
7/28/2008	0.3157	523	371.3436	151.6564	0.710026
7/29/2008	0.3168	515.6	368.3241	147.2759	0.71436
7/30/2008	0.3144	511.4	365.3613	146.0387	0.714434
7/31/2008	0.3174	507	362.4259	144.5741	0.714844
8/1/2008	0.3172	502.6	359.5203	143.0797	0.715321
8/2/2008	0.3165	498.2	356.6452	141.5548	0.715867

8/3/2008	0.3158	493.8	353.8012	139.9988	0.716487
8/4/2008	0.3148	489.4	350.989	138.411	0.717182
8/5/2008	0.3146	485.1	348.2081	136.8919	0.717807
8/6/2008	0.314	480.8	345.4583	135.3417	0.718507
8/7/2008	0.3095	476.5	342.7401	133.7599	0.719287
8/8/2008	0.3089	472.2	340.0542	132.1458	0.720149
8/9/2008	0.3097	467.9	337.4012	130.4988	0.721097
8/10/2008	0.3108	463.7	334.7808	128.9192	0.721977
8/11/2008	0.3114	459.4	332.1937	127.2063	0.723103
8/12/2008	0.3126	455.2	329.6405	125.5595	0.724166
8/13/2008	0.3125	451	327.1209	123.8791	0.725324
8/14/2008	0.3094	446.9	324.6346	122.2654	0.726414
8/15/2008	0.3093	442.7	322.1823	120.5177	0.727767
8/16/2008	0.3041	438.6	319.7645	118.8355	0.729057
8/17/2008	0.3017	434.5	317.3812	117.1188	0.730451
8/18/2008	0.3024	430.4	315.0328	115.3672	0.731954
8/19/2008	0.3018	426.3	312.7202	113.5798	0.733568
8/20/2008	0.3014	422.3	310.4431	111.8569	0.735125
8/21/2008	0.3006	418.3	308.2011	110.0989	0.736794
8/22/2008	0.3004	414.2	305.996	108.204	0.738764
8/23/2008	0.301	410.3	303.8276	106.4724	0.740501
8/24/2008	0.2989	406.3	301.6955	104.6045	0.742544
8/25/2008	0.2951	402.3	299.6015	102.6985	0.744722
8/26/2008	0.2938	398.4	297.5454	100.8546	0.746851
8/27/2008	0.293	394.5	295.527	98.97302	0.749118
8/28/2008	0.2917	390.6	293.5469	97.05308	0.751528
8/29/2008	0.2914	386.7	291.606	95.09396	0.754089
8/30/2008	0.2903	382.9	289.7041	93.19588	0.756605
8/31/2008	0.2912	379.1	287.8409	91.25906	0.759274

9/1/2008	0.2976	374.9	286.0214	88.87863	0.762927
9/2/2008	0.3026	369.4	284.2636	85.13636	0.769528
9/3/2008	0.3001	365.9	282.5619	83.33812	0.772238
9/4/2008	0.2991	362.8	280.8927	81.90727	0.774236
9/5/2008	0.2986	359.7	279.2528	80.44721	0.776349
9/6/2008	0.2983	356.7	277.6416	79.05838	0.778362
9/7/2008	0.2889	353.6	276.0598	77.54018	0.780712
9/8/2008	0.2885	350.6	274.508	76.09202	0.782966
9/9/2008	0.3106	347.6	272.9857	74.61431	0.785344
9/10/2008	0.308	344.9	271.4905	73.4095	0.787157
9/11/2008	0.3074	344.2	269.9995	74.20051	0.784426
9/12/2008	0.3071	341.2	268.5158	72.68419	0.786975
9/13/2008	0.3066	336	267.0855	68.91448	0.794897
9/14/2008	0.3057	332.7	265.7128	66.98723	0.798656
9/15/2008	0.3054	329.7	264.3763	65.3237	0.801869
9/16/2008	0.3045	326.8	263.0728	63.72725	0.804996
9/17/2008	0.3021	323.9	261.8018	62.09821	0.80828
9/18/2008	0.3026	321	260.5641	60.43593	0.811726
9/19/2008	0.3023	318.5	259.3562	59.14381	0.814305
9/20/2008	0.3025	317.7	258.1573	59.54266	0.812582
9/21/2008	0.3022	315.2	256.9677	58.2323	0.815253
9/22/2008	0.3022	312.4	255.8079	56.59215	0.818847
9/23/2008	0.302	309.5	254.6825	54.8175	0.822884
9/24/2008	0.3013	306.7	253.5923	53.10765	0.826842
9/25/2008	0.3054	303.9	252.5371	51.36291	0.830987
9/26/2008	0.3081	301.1	251.5174	49.58256	0.835329
9/27/2008	0.3079	298.6	250.5311	48.06894	0.839019
9/28/2008	0.3078	297.6	249.5603	48.03973	0.838576
9/29/2008	0.3076	293.1	248.6258	44.47422	0.848263

9/30/2008	0.3038	290.3	247.7467	42.55328	0.853416
10/1/2008	0.3083	289.8	246.8834	42.91662	0.85191
10/2/2008	0.3061	286.9	246.0371	40.86287	0.857571
10/3/2008	0.3059	283.1	245.242	37.85803	0.866273
10/4/2008	0.3065	279.9	244.502	35.39799	0.873533
10/5/2008	0.3064	277.7	243.802	33.89795	0.877933
10/6/2008	0.3059	274.9	243.1388	31.76118	0.884463
10/7/2008	0.3045	271	242.5304	28.46957	0.894946
10/8/2008	0.3043	268.7	241.9729	26.72711	0.900532
10/9/2008	0.3042	266.1	241.454	24.64603	0.907381
10/10/2008	0.3039	264.6	240.9663	23.6337	0.910681
10/11/2008	0.306	262.5	240.5054	21.9946	0.916211
10/12/2008	0.3059	259.8	240.0841	19.71591	0.924111
10/13/2008	0.3056	257	239.7103	17.28971	0.932725
10/14/2008	0.3058	256.3	239.3646	16.93542	0.933923
10/15/2008	0.3056	253.7	239.0455	14.65451	0.942237
10/16/2008	0.3086	252.4	238.7597	13.64031	0.945958
10/17/2008	0.3055	250.3	238.5027	11.79726	0.952868
10/18/2008	0.3135	247.8	238.2875	9.512509	0.961612
10/19/2008	0.3216	247.3	238.0985	9.20154	0.962792
10/20/2008	0.3161	246.8	237.9158	8.884224	0.964002
10/21/2008	0.316	244.3	237.76	6.540025	0.97323
10/22/2008	0.3083	242.3	237.6469	4.653086	0.980796
10/23/2008	0.3103	241	237.5652	3.434782	0.985748
10/24/2008	0.3101	240.7	237.4982	3.201818	0.986698
10/25/2008	0.3097	240.3	237.4369	2.86308	0.988085
10/26/2008	0.3094	237.8	237.404	0.396	0.998335
10/27/2008	0.3124	237.4	237.4	0	1
10/28/2008	0.3208	238.6	237.4001	1.19988	0.994971

10/29/2008	0.3207	239.2	237.4007	1.799345	0.992478
10/30/2008	0.3204	239.9	237.4019	2.498101	0.989587
10/31/2008	0.3205	241.1	237.4041	3.695857	0.984671
11/1/2008	0.3239	240.8	237.4076	3.392374	0.985912
11/2/2008	0.3242	241.4	237.4124	3.987582	0.983481
11/3/2008	0.3341	242.7	237.4187	5.281314	0.978239
11/4/2008	0.3346	243.3	237.4267	5.873253	0.97586
11/5/2008	0.3402	244.6	237.4369	7.163091	0.970715
11/6/2008	0.3405	245.8	237.4495	8.350476	0.966027
11/7/2008	0.3401	246.5	237.4649	9.035071	0.963347
11/8/2008	0.3541	247.2	237.4833	9.716661	0.960693
11/9/2008	0.355	249.4	237.5051	11.89494	0.952306
11/10/2008	0.3557	250.9	237.5306	13.3694	0.946714
11/11/2008	0.3566	255.1	237.5608	17.53925	0.931246
11/12/2008	0.3623	254.3	237.5962	16.70378	0.934315
11/13/2008	0.3782	253.8	237.637	16.163	0.936316
11/14/2008	0.3795	255.5	237.6829	17.81715	0.930266
11/15/2008	0.3805	257.8	237.7341	20.06592	0.922165
11/16/2008	0.3805	259.6	237.7912	21.80876	0.915991
11/17/2008	0.4026	261.5	237.8549	23.64512	0.909579
11/18/2008	0.4025	263.3	237.9255	25.37455	0.903629
11/24/2008	0.6069	307.7	238.0076	69.69237	0.773505
11/25/2008	0.6071	314.3	238.1107	76.18934	0.75759
11/26/2008	0.5837	320.1	238.24	81.86	0.744267
11/27/2008	0.584	325.2	238.3969	86.80311	0.733078
11/28/2008	0.5842	332.5	238.5825	93.91749	0.717541
11/29/2008	0.5964	337.7	238.7981	98.90186	0.707131
11/30/2008	0.592	345.7	239.0451	106.6549	0.691481
12/1/2008	0.5922	353.6	239.3249	114.2751	0.676824

12/2/2008	0.5917	359.7	239.6391	120.0609	0.666219
12/3/2008	0.5915	367.5	239.9891	127.5109	0.653032
12/4/2008	0.5917	375.6	240.3763	135.2237	0.63998
12/5/2008	0.5923	383.9	240.8023	143.0977	0.627253
12/6/2008	0.5926	392.2	241.2686	150.9314	0.615167
12/7/2008	0.5925	399.2	241.7767	157.4233	0.605653
12/8/2008	0.5923	408.8	242.3279	166.4721	0.592779
12/9/2008	0.5926	420.7	242.9241	177.7759	0.577428
12/10/2008	0.5675	429.7	243.5675	186.1325	0.566832
12/11/2008	0.5678	438.3	244.2599	194.0401	0.557289
12/12/2008	0.6031	449.6	245.0027	204.5973	0.544935
12/13/2008	0.6031	460.8	245.7979	215.0021	0.533416
12/14/2008	0.6031	472.6	246.6477	225.9523	0.521895
12/23/2008	0.5928	577.5	247.5635	329.9365	0.428681
12/24/2008	0.5928	587.3	248.5656	338.7344	0.423234
12/25/2008	0.5929	601.6	249.6639	351.9361	0.415
12/26/2008	0.6389	615.9	250.8594	365.0406	0.407305
12/27/2008	0.6268	624.6	252.1531	372.4469	0.403703
12/28/2008	0.6212	639.8	253.5452	386.2548	0.396288
12/29/2008	0.6067	658.9	255.0371	403.8629	0.387065
12/30/2008	0.559	669.8	256.6306	413.1694	0.383145
12/31/2008	0.5583	682.8	258.3265	424.4735	0.378334
1/1/2009	0.5594	698.6	260.1252	438.4748	0.372352
1/2/2009	0.5588	710.8	262.0278	448.7722	0.368638
1/3/2009	0.5579	719.5	264.0342	455.4658	0.366969
1/4/2009	0.557	727.4	266.1433	461.2567	0.365883
1/5/2009	0.5562	737.3	268.3535	468.9465	0.363968
1/6/2009	0.5562	748.7	270.664	478.036	0.361512
1/7/2009	0.5546	760.8	273.0742	487.7258	0.35893

1/8/2009	0.5956	774.6	275.5843	499.0157	0.355776
1/9/2009	0.5957	788.3	278.1945	510.1055	0.352904
1/10/2009	0.5955	803.3	280.9056	522.3944	0.349689
1/11/2009	0.5585	820.3	283.7184	536.5816	0.345872
1/12/2009	0.5496	834.9	286.6343	548.2657	0.343316
1/13/2009	0.5445	847.7	289.6538	558.0462	0.341694
1/14/2009	0.56	859.4	292.7769	566.6231	0.340676
1/15/2009	0.5796	874.4	296.0032	578.3968	0.338522
1/16/2009	0.5798	893.4	299.3336	594.0664	0.33505
1/17/2009	0.622	915.6	302.77	612.83	0.330679
1/18/2009	0.6216	943.6	306.316	637.284	0.324625
1/19/2009	0.6217	967.6	309.9762	657.6238	0.320356
1/20/2009	0.6213	979.6	313.7532	665.8468	0.320287
1/21/2009	0.6213	986.3	317.6465	668.6535	0.322059
1/22/2009	0.6214	1025	321.6563	703.3437	0.313811
1/23/2009	0.6208	1064	325.7886	738.2114	0.306192
1/24/2009	0.6207	1071	330.0494	740.9506	0.308169
1/25/2009	0.6206	1079	334.438	744.562	0.309952
1/26/2009	0.6205	1096	338.9514	757.0486	0.309262
1/27/2009	0.6204	1112	343.5889	768.4111	0.308983
1/28/2009	0.6202	1126	348.3499	777.6501	0.309369
1/29/2009	0.6197	1143	353.2337	789.7663	0.309041
1/30/2009	0.6196	1165	358.2406	806.7594	0.307503
2/2/2009	0.6004	1222	363.3753	858.6247	0.297361
2/3/2009	0.6002	1239	368.6462	870.3538	0.297535
2/4/2009	0.6	1262	374.0571	887.9429	0.2964
2/5/2009	0.5987	1281	379.6085	901.3915	0.296338
2/6/2009	0.6011	1302	385.3008	916.6992	0.29593
2/7/2009	0.6009	1328	391.1349	936.8651	0.294529

2/8/2009	0.601	1351	397.1123	953.8877	0.29394
2/9/2009	0.6005	1381	403.2354	977.7646	0.291988
2/10/2009	0.6011	1419	409.5079	1009.492	0.288589
2/11/2009	0.5979	1447	415.9347	1031.065	0.287446
2/12/2009	0.5983	1467	422.5187	1044.481	0.288016
2/13/2009	0.5986	1481	429.2592	1051.741	0.289844
2/14/2009	0.5984	1498	436.1538	1061.846	0.291157
2/15/2009	0.5987	1515	443.2	1071.8	0.292541
2/16/2009	0.5757	1535	450.3963	1084.604	0.293418
2/17/2009	0.5591	1559	457.7418	1101.258	0.293612
2/18/2009	0.57	1579	465.2365	1113.763	0.29464
2/19/2009	0.5696	1617	472.8818	1144.118	0.292444
2/20/2009	0.5691	1672	480.6836	1191.316	0.28749
2/21/2009	0.5646	1740	488.6543	1251.346	0.280836
2/22/2009	0.5483	1827	496.8118	1330.188	0.271928
2/23/2009	0.5501	1935	505.1805	1429.82	0.261075
2/24/2009	0.5502	2045	513.7899	1531.21	0.251242
2/25/2009	0.5506	2140	522.6693	1617.331	0.244238
2/26/2009	0.5512	2217	531.8423	1685.158	0.239893
2/27/2009	0.5362	2280	541.3246	1738.675	0.237423
2/28/2009	0.5364	2320	551.1246	1768.875	0.237554
3/1/2009	0.5365	2336	561.2417	1774.758	0.240258
3/2/2009	0.5366	2351	571.668	1779.332	0.24316
3/3/2009	0.5363	2365	582.393	1782.607	0.246255
3/4/2009	0.5395	2393	593.4078	1799.592	0.247976
3/5/2009	0.5346	2404	604.7045	1799.296	0.251541
3/6/2009	0.5341	2417	616.2737	1800.726	0.254975
3/7/2009	0.5606	2457	628.1078	1828.892	0.25564
3/8/2009	0.5622	2510	640.2062	1869.794	0.255062

3/9/2009	0.5769	2580	652.575	1927.425	0.252936
3/10/2009	0.5786	2639	665.224	1973.776	0.252074
3/11/2009	0.6287	2711	678.1628	2032.837	0.250152
3/12/2009	0.6293	2798	691.4039	2106.596	0.247106
3/13/2009	0.5589	2881	704.9629	2176.037	0.244694
3/14/2009	0.5601	2995	718.8585	2276.142	0.24002
3/15/2009	0.574	3072	733.1105	2338.889	0.238643
3/16/2009	0.5422	3154	747.7343	2406.266	0.237075
3/17/2009	0.5359	3213	762.7391	2450.261	0.237392
3/18/2009	0.5271	3264	778.1291	2485.871	0.238397
3/19/2009	0.5135	3309	793.9033	2515.097	0.239922
3/20/2009	0.5178	3334	810.057	2523.943	0.242968
3/21/2009	0.5098	3351	826.5797	2524.42	0.246667
3/22/2009	0.5103	3370	843.4581	2526.542	0.250284
3/23/2009	0.5094	3371	860.6769	2510.323	0.255318
3/24/2009	0.5041	3370	878.2178	2491.782	0.260599
3/25/2009	0.507	3361	896.06	2464.94	0.266605
3/26/2009	0.51	3339	914.1803	2424.82	0.273789
3/27/2009	0.5101	3331	932.3989	2398.601	0.279916
3/28/2009	0.5114	3317	950.3949	2366.605	0.286522
3/29/2009	0.5138	3294	968.0126	2325.987	0.293871
3/30/2009	0.5144	3286	985.2474	2300.753	0.299832
3/31/2009	0.5059	3285	1002.095	2282.905	0.305052
4/1/2009	0.5074	3283	1018.552	2264.448	0.31025
4/2/2009	0.4971	3272	1034.613	2237.387	0.316202
4/3/2009	0.4972	3270	1050.275	2219.725	0.321185
4/4/2009	0.5001	3266	1065.533	2200.467	0.32625
4/5/2009	0.5083	3263	1080.385	2182.615	0.331102
4/6/2009	0.5131	3251	1094.826	2156.174	0.336766

4/7/2009	0.5122	3246	1108.852	2137.148	0.341606
4/8/2009	0.5118	3242	1122.461	2119.539	0.346225
4/9/2009	0.5048	3211	1135.648	2075.352	0.353674
4/10/2009	0.5025	3186	1148.41	2037.59	0.360455
4/11/2009	0.4977	3154	1160.744	1993.256	0.368023
4/12/2009	0.4975	3128	1172.647	1955.353	0.374887
4/13/2009	0.4954	3109	1184.117	1924.883	0.380867
4/14/2009	0.4919	3076	1195.151	1880.849	0.38854
4/15/2009	0.4919	3036	1205.746	1830.254	0.397149
4/16/2009	0.4912	3003	1215.901	1787.099	0.404895
4/17/2009	0.4912	2970	1225.613	1744.387	0.412664
4/18/2009	0.4859	2936	1234.881	1701.119	0.4206
4/19/2009	0.4861	2900	1243.704	1656.296	0.428863
4/20/2009	0.4834	2868	1252.08	1615.92	0.436569
4/21/2009	0.4765	2836	1260.009	1575.991	0.444291
4/22/2009	0.477	2800	1267.489	1532.511	0.452674
4/23/2009	0.47	2755	1274.519	1480.481	0.46262
4/24/2009	0.4689	2734	1281.1	1452.9	0.468581
4/25/2009	0.4693	2705	1287.231	1417.769	0.475871
4/26/2009	0.4693	2671	1292.911	1378.089	0.484055
4/27/2009	0.4664	2638	1298.141	1339.859	0.492093
4/28/2009	0.4689	2606	1302.921	1303.079	0.49997
4/29/2009	0.4696	2565	1307.25	1257.75	0.509649
4/30/2009	0.4659	2544	1311.13	1232.87	0.515381
5/1/2009	0.4642	2517	1314.559	1202.441	0.522272
5/2/2009	0.472	2492	1317.54	1174.46	0.528708
5/3/2009	0.4708	2468	1320.072	1147.928	0.534875
5/4/2009	0.4757	2437	1322.156	1114.844	0.542534
5/5/2009	0.476	2411	1323.793	1087.207	0.549064

5/6/2009	0.4752	2378	1324.989	1053.011	0.557186
5/7/2009	0.4773	2355	1325.755	1029.245	0.562953
5/8/2009	0.4757	2323	1326.101	996.8992	0.570857
5/9/2009	0.4745	2309	1312.936	996.0642	0.568617
5/10/2009	0.474	2299	1292.71	1006.29	0.562292
5/11/2009	0.4695	2276	1272.408	1003.592	0.559055
5/12/2009	0.4686	2206	1252.641	953.359	0.567834
5/13/2009	0.4649	2172	1233.532	938.4683	0.567924
5/14/2009	0.4618	2152	1214.583	937.4167	0.564397
5/15/2009	0.462	2127	1195.707	931.2925	0.562157
5/16/2009	0.4595	2091	1177.069	913.9311	0.562922
5/17/2009	0.4581	2065	1158.683	906.3175	0.561105
5/18/2009	0.4553	2038	1140.462	897.5383	0.559599
5/19/2009	0.4511	2017	1122.359	894.6411	0.55645
5/20/2009	0.4503	1998	1104.295	893.7052	0.5527
5/21/2009	0.4461	1955	1086.495	868.5053	0.555752
5/22/2009	0.4402	1925	1069.076	855.9238	0.555364
5/23/2009	0.4363	1913	1051.731	861.2691	0.549781
5/24/2009	0.4352	1881	1034.48	846.5195	0.549963
5/25/2009	0.4351	1848	1017.541	830.4587	0.550618
5/26/2009	0.4322	1822	1000.858	821.1415	0.549319
5/27/2009	0.4322	1778	984.5495	793.4505	0.55374
5/28/2009	0.4275	1759	968.5505	790.4495	0.550626
5/29/2009	0.4248	1734	952.6739	781.3261	0.549408
5/30/2009	0.4221	1713	936.9428	776.0572	0.54696
5/31/2009	0.4202	1678	921.462	756.538	0.549143
6/1/2009	0.4186	1655	906.2572	748.7428	0.547587
6/2/2009	0.4167	1635	891.1808	743.8192	0.545065
6/3/2009	0.4182	1608	876.2763	731.7237	0.544948

6/4/2009	0.4145	1586	861.5677	724.4323	0.543233
6/5/2009	0.4148	1561	847.0384	713.9616	0.542626
6/6/2009	0.4126	1543	832.6515	710.3485	0.539632
6/7/2009	0.4147	1500	818.5933	681.4067	0.545729
6/8/2009	0.4134	1486	804.8299	681.1701	0.541608
6/9/2009	0.414	1473	791.0612	681.9388	0.537041
6/10/2009	0.4108	1434	777.542	656.458	0.542219
6/11/2009	0.406	1415	764.3388	650.6612	0.540169
6/12/2009	0.4053	1389	751.3253	637.6747	0.540911
6/13/2009	0.404	1364	738.5666	625.4334	0.541471
6/14/2009	0.4037	1340	726.0476	613.9524	0.541827
6/15/2009	0.4043	1316	713.7628	602.2372	0.542373
6/16/2009	0.4062	1293	701.707	591.293	0.542697
6/17/2009	0.4059	1275	689.8234	585.1766	0.541038
6/18/2009	0.4024	1246	678.177	567.823	0.544283
6/19/2009	0.4018	1225	666.803	558.197	0.544329
6/20/2009	0.3993	1206	655.6051	550.3949	0.54362
6/21/2009	0.3981	1182	644.6175	537.3825	0.545362
6/22/2009	0.3941	1162	633.8546	528.1454	0.545486
6/23/2009	0.391	1142	623.2802	518.7198	0.545779
6/24/2009	0.392	1122	612.8981	509.1019	0.546255
6/25/2009	0.3867	1100	602.7328	497.2672	0.547939
6/26/2009	0.3838	1078	592.809	485.191	0.549916
6/27/2009	0.3804	1055	583.1418	471.8582	0.552741
6/28/2009	0.3794	1042	573.6447	468.3553	0.550523
6/29/2009	0.3736	1008	564.4334	443.5666	0.559954
6/30/2009	0.3695	983.7	555.629	428.071	0.564836
7/1/2009	0.3645	961.8	547.1163	414.6837	0.568846
7/2/2009	0.3682	942.4	538.8513	403.5487	0.571786

7/3/2009	0.3615	916	530.885	385.115	0.579569
7/4/2009	0.3575	898.2	523.2071	374.9929	0.582506
7/5/2009	0.3584	885	515.6889	369.3111	0.582699
7/6/2009	0.3571	852.5	508.4836	344.0164	0.596462
7/7/2009	0.3548	829.2	501.7006	327.4994	0.605042
7/8/2009	0.3531	806.5	495.2486	311.2514	0.614071
7/9/2009	0.3573	792.2	489.0424	303.1576	0.617322
7/10/2009	0.3535	781	482.9698	298.0302	0.618399
7/11/2009	0.3485	753.1	477.1723	275.9277	0.633611
7/12/2009	0.3507	742	471.6544	270.3456	0.635653
7/13/2009	0.3509	735.8	466.2004	269.5996	0.633597
7/14/2009	0.3507	727.2	460.7861	266.4139	0.633644
7/15/2009	0.3494	721.9	455.4032	266.4968	0.63084
7/16/2009	0.3479	712.4	450.0614	262.3386	0.631754
7/17/2009	0.3496	697	444.8647	252.1353	0.638256
7/18/2009	0.3524	686.7	439.8242	246.8758	0.64049
7/19/2009	0.3507	671	434.9461	236.0539	0.648206
7/20/2009	0.3504	657.5	430.2664	227.2336	0.654398
7/21/2009	0.3497	644.3	425.7637	218.5363	0.660816
7/22/2009	0.3472	638.4	421.364	217.036	0.660031
7/23/2009	0.3479	627.2	417.0489	210.1511	0.664938
7/24/2009	0.3466	616.4	412.8703	203.5297	0.669809
7/25/2009	0.3434	609.8	408.784	201.016	0.670358
7/26/2009	0.3412	597.1	404.8113	192.2887	0.677962
7/27/2009	0.3369	588.9	400.9707	187.9293	0.680881
7/28/2009	0.3325	583.8	397.1874	186.6126	0.680348
7/29/2009	0.3321	574.6	393.4729	181.1271	0.684777
7/30/2009	0.3312	569.9	389.8244	180.0756	0.684022
7/31/2009	0.3293	564.8	386.2014	178.5986	0.683784

8/1/2009	0.3282	556.6	382.6402	173.9598	0.68746
8/2/2009	0.3238	549.7	379.1604	170.5396	0.689759
8/3/2009	0.3211	541.6	375.7627	165.8373	0.693801
8/4/2009	0.3196	536.8	372.4272	164.3728	0.693791
8/5/2009	0.3177	530.4	369.138	161.262	0.695961
8/6/2009	0.3172	522.6	365.9265	156.6735	0.700204
8/7/2009	0.3173	518.8	362.7678	156.0322	0.699244
8/8/2009	0.3168	512.6	359.6468	152.9532	0.701613
8/9/2009	0.3151	508.1	356.5712	151.5288	0.701774
8/10/2009	0.3114	502.7	353.5339	149.1661	0.70327
8/11/2009	0.3137	497.9	350.5386	147.3614	0.704034
8/12/2009	0.3166	492.9	347.5823	145.3177	0.705178
8/13/2009	0.3158	488	344.6666	143.3334	0.706284
8/14/2009	0.3146	484.5	341.7772	142.7228	0.705422
8/15/2009	0.3185	481.8	338.892	142.908	0.703387
8/16/2009	0.3165	475.7	336.0378	139.6622	0.706407
8/17/2009	0.3133	466.6	333.2804	133.3196	0.714274
8/18/2009	0.3169	461.9	330.6075	131.2925	0.715756
8/19/2009	0.3177	457.4	327.974	129.426	0.71704
8/20/2009	0.316	455.2	325.3551	129.8449	0.714752
8/21/2009	0.3161	451.5	322.743	128.757	0.714824
8/22/2009	0.3152	444.4	320.1877	124.2123	0.720494
8/23/2009	0.3152	436.8	317.7303	119.0697	0.727405
8/24/2009	0.315	433.6	315.333	118.267	0.727244
8/25/2009	0.3143	427.9	312.9775	114.9225	0.731427
8/26/2009	0.3156	425.6	310.6557	114.9443	0.729924
8/27/2009	0.3114	421.9	308.3476	113.5524	0.730855
8/28/2009	0.3116	415.6	306.0945	109.5055	0.736512

8/29/2009	0.311	409.9	303.9179	105.9821	0.741444
8/30/2009	0.3116	404.9	301.806	103.094	0.745384
8/31/2009	0.3112	399.1	299.7612	99.33881	0.751093
9/1/2009	0.3108	396.2	297.7635	98.43654	0.751548
9/2/2009	0.3135	392.1	295.7964	96.30361	0.75439
9/3/2009	0.3121	388.1	293.8718	94.22817	0.757206
9/4/2009	0.311	385	291.9804	93.01956	0.758391
9/5/2009	0.3075	381.5	290.1178	91.38221	0.760466
9/6/2009	0.306	378.8	288.2804	90.5196	0.761036
9/7/2009	0.305	374.5	286.4769	88.02306	0.764958
9/8/2009	0.3138	371.1	284.7152	86.38476	0.76722
9/9/2009	0.3121	365.8	283.0064	82.79363	0.773664
9/10/2009	0.313	364.2	281.333	82.86697	0.772469
9/11/2009	0.3129	361.6	279.6684	81.9316	0.773419
9/12/2009	0.3134	357.1	278.0422	79.05776	0.778612
9/13/2009	0.3114	352.8	276.4727	76.3273	0.783653
9/14/2009	0.3118	349.7	274.9466	74.75337	0.786236
9/15/2009	0.3112	347.8	273.4404	74.35956	0.7862
9/16/2009	0.3116	346.1	271.9402	74.15976	0.785727
9/17/2009	0.3072	344	270.4482	73.55179	0.786187
9/18/2009	0.307	338.5	269.0033	69.49673	0.794692
9/19/2009	0.3068	335.4	267.6166	67.78339	0.797903
9/20/2009	0.3066	331.5	266.2731	65.22693	0.803237
9/21/2009	0.3064	329.5	264.9623	64.53769	0.804134
9/22/2009	0.3064	326.6	263.6748	62.92519	0.807333
9/23/2009	0.3073	325.7	262.3998	63.30019	0.805649
9/29/2009	0.3562	314.1	261.2263	52.87367	0.831666
9/30/2009	0.3561	312.2	260.1667	52.03333	0.833333

