796 Cherokee Avenue
Saint Paul, MN 55107

220, 120 Pembina Road
Sherwood Park, AB T8H 0M2

May 22, 2017

Gurbir S. Nijjar, P.Eng.
Municipal Engineer, Engineering Services
Rocky View County
911 - 32 Avenue NE
Calgary, AB T2E 6X6

RE: Preliminary Design Brief – Proposed Potable Water and Wastewater Systems - Fairways at Delacour

Mr. Nijjar,

On behalf of Mcintosh Tree Farms, SD Consulting Group has prepared this report on the water and wastewater systems to serve the proposed Fairways at Delacour development in Rocky View County. The purpose of this report is to articulate the servicing intent for the development, and has been prepared in support of the design information previously submitted to Rocky View County in the conceptual scheme submittal.

Background Information

The Fairways at Delacour is an existing 18-hole golf course located in the Hamlet of Delacour in Rocky View County. The proposed development will consist of approximately 480 units along the perimeter of the golf course. A total population of 1,200 residents is planned.

A regional connection for wastewater is not currently available, so an onsite system is proposed. The current plan is to install a new secondary wastewater treatment system to service the proposed development. Potable water will be provided by a connection with a Rocky View County regional water line.

Wastewater Flow and Water Demand

The first step in the design process is the determination of the wastewater system design flow. For the purposes of this report, it has been assumed that a total population of 1,200 residents will be served by the water and wastewater system. Using a flow value of 75 imperial gallons per day (igpd) per person, the design flow for the wastewater system and the potable water demand will be 90,000 igpd (409 m^3/day) at full build-out.

Community Wastewater Systems

As shown in **Figure 1**, a community wastewater system can be divided into three components: collection, treatment and disposal. Collection consists of transmitting wastewater to the treatment location, treatment is how the wastewater is cleaned up to meet discharge standards, and disposal is how the treated wastewater is put back into the environment.

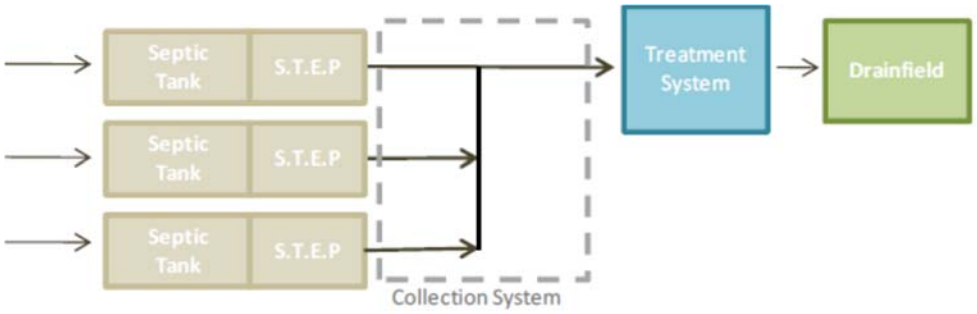


Figure 1: Community Wastewater System Schematic

An Alberta Environment and Parks (AEP) approval is required for a community wastewater system, including a setback variance, before construction and operation of this system can occur. AEP rules require a setback of 300 meters be provided between a residential unit and a wastewater treatment system. Many treatment systems, including the system discussed in this report, are enclosed within a tank and do not have an open water surface that warrants the large setback.

AEP recognizes that the 300-meter setback is not appropriate for every project, so they have developed a process to request a variance to this rule. This process begins with the local authority, in this case Rocky View County, approving a variance to this setback for the project, and then requesting that AEP concur with this variance. AEP will also ask that Alberta Health Services offer input on the variance request. Although every project is unique, AEP has previously accepted setback distances of 60 meters from the wastewater treatment system and 25 meters from the wastewater disposal system, to a residential unit.

Specific to this project, it should be noted that the nearest residence will be over 100 meters from the proposed wastewater treatment system location. In addition, the wastewater treatment process is entirely underground and not open to the environment during any part of the process. Finally, the wastewater treatment system will be fenced according to Alberta Environment and Parks (AEP) requirements so access to the wastewater treatment area is limited to maintenance staff. Rocky View County has supported the AdvanTex technology, and setback variances for the AdvanTex system in the past. For the Silverhorn project a setback of 60 meters from a residence, and for the Spring Hill RV Park project a setback of 30 meters from an RV site, were supported by Rocky View County.

Wastewater Collection:

The development will be serviced by a combination gravity/pressure sewer. Wastewater from each home will flow by gravity in 200 mm lines to community septic tanks located throughout the property as shown in **Attachment A**. Following primary treatment (solids settling) in the community septic tanks, liquid effluent will be pumped to the treatment site utilizing effluent pumps. As per requirements in County and AEP Approvals, the septic tanks will be inspected on routine basis and pumped when sludge levels exceed required standards.

Wastewater Treatment:

Following primary treatment in community septic tanks, the liquid portion of the wastewater will be pumped to a wastewater treatment system utilizing Orenco's AdvanTex technology for secondary treatment. The AdvanTex unit is considered an "attached" growth process. Unlike activated sludge (traditional package plants), which rely on bacteria "suspended" in the treatment tanks, AdvanTex units retain the bacteria on the textile media. This type of system is more robust, and has a higher tolerance for flow variation, while still providing stable treatment, than a traditional package plant or sludge blanket technology.

The AdvanTex AX MAX treatment system is well suited for cold weather conditions as it incorporates a 4.25-inch-thick exterior wall and a bottom that are embedded with 4-inches of insulation to minimize heat loss. Temperatures within the treatment process are maintained by the regular input of wastewater and the heat generated by the biological process, while being enclosed in an insulated structure.

In addition to its technological benefits, it is a commonly installed treatment system in Alberta. To date, over 500 systems utilizing AdvanTex technology have been installed in Alberta. In 2014, an AX MAX system was installed at the Spring Hill RV Park in Rocky View County as shown in **Figure 2**. An AdvanTex system was also constructed at the Silverhorn Development in Rocky View County.

The proposed UV disinfection unit will be an at-grade stainless steel channel unit. A spare module will be provided to allow for replacement of a malfunctioning unit without delay. The system will be contained in a stainless-steel channel that is fully accessible.

Figure 2: Installed AdvanTex AX MAX System at Spring Hill RV Park

Wastewater Disposal

Following treatment and disinfection, the treated wastewater will be pumped, or will flow by gravity, to onsite storage ponds for reuse on the golf course. Two new ponds, sized for 7 months of storage (approximately 19,000,000 imperial gallons), will be constructed on the golf course as shown in the drawings provided in **Attachment A**. During the winter, effluent will be dosed to the ponds for storage. During the summer, the effluent will bypass the winter storage ponds and will be dosed to a series of constructed wetlands built to drain into the existing irrigation storage pond. During the irrigation months, the winter storage pond will be drained into the existing irrigation pond for use on the golf course.

Currently, the golf course has an irrigation water demand of 38,000,000 imperial gallons per year, all of which is supplied from the Canal and the Western Irrigation District. However, this water supply is relatively unstable, and in dry years the course can be completely cut-off from an irrigation source. At full build-out, the effluent will provide up to 32,000,000 gallons of water for reuse on the course. This reduces the burden on the irrigation district and provides the Owners with a more stable water supply.

AEP Standards for Golf Course Irrigation

Prior to discharge from the treatment system, the wastewater will be disinfected and will meet secondary standards (25 mg/l BOD and TSS). In the constructed wetland, the water will be polished further prior to use as irrigation water. In addition, the treated wastewater will be stored in an onsite irrigation period for approximately seven months prior to being used for irrigation of the golf course.

The AEP requirements for irrigation systems that are summarized in their "Guidelines for Municipal Wastewater Irrigation (April 2000)" are as follow:

- Total Coliform: <1000/100 ml
- Fecal Coliform: <200/100 ml
- CBOD: <100 mg/l
- COD: <150 mg/l
- TSS: <100 mg/l
- pH: 6.5 – 8.

As mentioned previously, the proposed wastewater treatment system will produce treated wastewater with lower levels of CBOD and TSS. Following disinfection, the constructed wetland and storage pond will provide further polishing. It should be noted that it is in the Owner's best interest to supply a high-quality water to the course since a poor-quality water can result in negative impacts to the turf that are potentially harmful to the business.

Merits of the AdvanTex System for Golf Course Irrigation

Historically, the Approval standards for irrigation of golf courses utilizing treated wastewater in Alberta are 25 mg/l for CBOD, and 25 mg/l for TSS, plus disinfection. These standards were utilized in the following approvals, which were issued by AEP within the last ten years:

- Coal Creek Golf Course (Toefield) – Utilized AdvanTex Treatment
- Bingham Crossing (Rocky View County)
- Priddis Greens (Bragg Creek)

Orenco's AdvanTex technology will reliably meet these secondary requirements with the addition of UV disinfection at the end of the process.

A list of some approved projects using the Orenco technology in Alberta is provided in **Attachment B**. Each one of these projects is required to meet secondary standards. The most extensive sampling data for an AdvanTex system is available for the Habitat Acres project, which was constructed approximately 10 years ago in Strathcona County. Sampling data for this project is provided in **Attachment C.**

Constructed Wetlands

The use of the existing wetlands and the construction of additional wetlands are key elements in the wastewater and stormwater management systems proposed within the development. The constructed wetlands will be an extension of the existing pond and the new treated effluent storage pond. They are not considered part of the wastewater treatment process and all applicable limits will be met after the AdvanTex treatment. The storage ponds and wetlands will be an amenity to the golf course and provide polishing.

Community Water System

The proposed development will receive potable water service through a regional connection with Rocky View County. The existing water line is currently located along Range Road 281 as shown in the drawings provided in **Attachment A**. A new potable water pipeline will be constructed from Range Road 281 to a ground storage tank on the proposed development. High service pumps will then pressurize the water distribution system. The potable water system will be sized according to Rocky View County Standards and be fire rated. The system will consist of the following:

- Water main (200 mm) – Approximately 7,300 meters
- Ground Storage volume of 250,000 imperial gallons (1,136 m^3)
- High service pumps sized at 350 igpm at 45.7 m of Total Dynamic Head (65 psi)
- Three pumps will be provided to provide a fire flow of 1,000 igpm
- Fire hydrants as required by Rocky View County

Pressure at Tie-in

Based on a preliminary analysis, the headloss between the water reservoir at Conrich and the proposed water storage tank at the Canal at Delacour project site will be less than 25 feet (11 psi). Therefore, additional pump stations will not be required to supply the water to the proposed storage tank.

Water Demand

Based on preliminary discussions with Rocky View County, it has been confirmed that there is sufficient capacity at the Graham Creek Water Treatment facility to service the average day demand of the Fairways at Delacour development.

Reservoir Sizing and Control

A ground storage tank, will be constructed to meet the maximum day demand of the development as well as fire demands. The water storage tank will be sized to a volume of approximately 250,000 imperial gallons, or 1,136 cubic meters. In addition, the reservoir may be installed at a larger volume to allow for expansion into neighbouring developments. The tank, distribution system and hydrants will be sized according to the County's Fire Hydrant Water Suppression Bylaw. The reservoir will be controlled with a level sensing device that is connected to a control valve on the reservoir inlet line. When the water level in the reservoir reaches a certain level, the control valve will open and allow water to enter the tank. After the level rises to a full level, the valve will close.

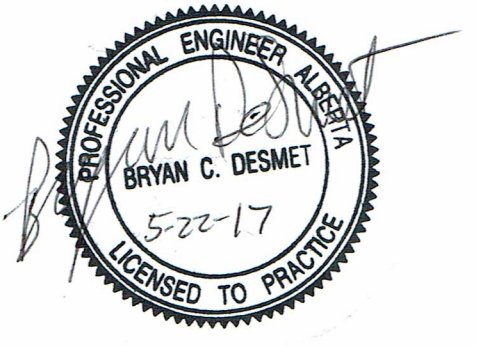
Thank you in advance for your review of this application. If you have any questions, please contact me at 612-280-9128, or by e-mail at bryan.desmet@sd-consultinggroup.com.

Sincerely,

SD Consulting Group – Canada, Inc. (APEGGA PTP #P10913)

Bryan DeSmet

Bryan DeSmet, P. Eng.
Principal



Attachment A

Preliminary Drawings

DRAFT - NOT FOR CONSTRUCTION

REV	DATE	DESCRIPTION
0	3/2017	ISSUE FOR REVIEW

CONSULTANTS

SD CONSULTING
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THE CANAL AT DELACOUR

OVERALL WATER & SEWER SYSTEM LAYOUT

C1

C01_1139_NEWv2.dwg

Plot Date: 11 May 2017 by Carla Cross_SD

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THE CANAL
AT DELACOUR

SEWER LAYOUT 1

C1a

C01_1139_NEWv2.dwg

Plot Date: 31 March 2017 by Carla Cross_SD

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THE CANAL AT DELACOUR

SEWER LAYOUT 2

C1b

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Plot Date: 31 March 2017 by Carla Cross_SD

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THE CANAL AT DELACOUR

SEWER LAYOUT 3

C1c

C01_1139_NEWv2.dwg

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THE CANAL
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SEWER LAYOUT 4

C1d

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Plot Date: 31 March 2017 by Carla Cross_SD

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THE CANAL
AT DELACOUR

WATER SYSTEM

C1e

C01_1139_NEWv2.dwg

Plot Date: 23 May 2017 by Carla Cross_SD

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Attachment B

Existing Orenco Systems in Alberta

796 Cherokee Avenue
Saint Paul, MN 55107

220, 120 Pembina Road
Sherwood Park, AB T8H 0M2

Approved Wastewater System References - Alberta

PROJECT	LOCATION	TYPE OF PROJECT	CONSTRUCTION DATE
HABITAT ACRES[1]	**Sherwood Park**	**29 Unit Subdivision**	**2006**
YMCA CAMP CHIEF HECTOR	Kananaskis Country	Youth Camp	2011
JASPER EAST CHALETS	Hinton	40 Rental Cabin	2012
THE GRANGE	**Sherwood Park**	**50 Unit Subdivision (STEP Only)**	**2011**
HERITAGE HEIGHTS SCHOOL	Okotoks	Elementary School	2007
SILVERHORN DEVELOPMENT	**Rocky View County**	**87 Unit Subdivision**	**2015**
COAL CREEK GOLF RESORT	**Toefield**	**RV Park and Golf Course**	**TBD**
NELSON FAMILY FARMS	**Raymond**	**120 Unit Subdivision**	**2015**
CROSSROADS CHURCH	Red Deer	1000 Seat Church	2013
SPRING HILL RV PARK	**Cochrane**	**RV Park**	**2014**
MEADOW PONDS ESTATES	**Rocky Mtn House**	**50 Unit Subdivision**	**2014**
MCKEEMAN ACRES	**Grande Prairie**	**9 Unit subdivision**	**2015**
FULHAM SCHOOL	Edson	School	2015
PIPESTONE SCHOOL	Wetaskiwin	School	2014
ESTATES OF LONG BAY	**Cold Lake**	**90 Unit Subdivision**	**TBD**
WORKER HOUSING FACILITIES	**Conklin**	**1500-Person Housing Facilities**	**2015**
FRONTIER LODGE	Nordegg	Outdoor Adventure Park	2016
SUMMERLAND RV RESORT	Gull Lake	40 Unit RV Park	2016

1. *Items in Bold required approvals by Alberta Environment and Parks*

Attachment C

Habitat Acres Sampling Data

System Performance Data Sheet

Project: Habitat Acres, Alberta, Canada

This System Performance Sheet records test results from effluent samples taken at key points throughout the wastewater treatment system.
In addition, here are some quick system facts and a legend for the wastewater characteristics. See the flow configuration below.

Quick Facts

Building / Facilities: Multiple Dwelling Units
Occupants: Not Applicable
Start-up: August-07
Location: Sherwood Park, Alberta
Designer / Engineer: Silvester Enterprises Ltd.
Contractor / Installer: Silvester Enterprises Ltd.
Service Provider: Silvester Enterprises Ltd.
Regulating Authority: Alberta Environment
Design Flows (gpd): 10000
Grease Tank (gal): None
Septic Tank (gal): 1,500 (at each home)
Recirc. Tank (gal): 10,000
Filter: (2) AX100's
Disinfection: None
System Configuration: Mode 1
Disposal Treatment System: Drip

# of Samples: 11
Average Loading Rate (gpd/ft2):

Notes: Permit Effluent Quality Requirements are 20 mg/L BOD & TSS. The system had a bad distributing valve that was fixed in January 2008.

Legend

BOD5: Biochemical Oxygen Demand (*5 day, uninhibited*)
cBOD5: Carbonaceous Biochemical Oxygen Demand (*5 day, inhibited*)
TSS: Total Suspended Solids
TKN: Total Kjeldahl-Nitrogen (*Organic and Ammonia Nitrogen*)
NH3-n: Ammonia-Nitrogen
NO2-n: Nitrite-Nitrogen
NO3-n: Nitrate-Nitrogen
TN: Total Nitrogen = (TKN) + (NO3-n) + (NO2-n)
DO: Dissolved Oxygen
pH: Measure of acidity, 7 is neutral. Wastewater w/value <6 or >9 are difficult to treat biologically
Alk: Alkalinity
TP: Total Phosphorus
G&O: Grease and Oil
FC: Fecal Coliform

(>) Numbers shown in italics were actually reported as greater than
Numbers shaded were actually reported as less than
Bold Non-Detect. Entered detection limit value
Dates for which lab reports have not been provided

			Septic Tank Effluent													AdvanTex Effluent													
Sample Date	Test Type	GPD	cBOD5	TSS	TURB	TKN	NH3	NO2	NO3	TN	pH	Temp	G&O	Alk	TP	FC	BOD5	TSS	TURB	TKN	NH3	NO2	NO3	TN	DO	pH	Temp	G&O	Alk	TP	FC
			mg/L	*mg/L*	*NTU*	*mg/L*	*mg/L*	*mg/L*	*mg/L*	*mg/L*		*celsius*	*mg/L*	*mg/L*	*mg/L*	*mpn/100ml*	*mg/L*	*mg/L*	*NTU*	*mg/L*	*mg/L*	*mg/L*	*mg/L*	*mg/L*	*mg/l*		*celsius*	*mg/L*	*mg/L*	*mg/L*	*mpn/100ml*
10/19/2007		4500															4	4								6.6					
10/29/2007		5150															4	4								6.6					
11/6/2007		4750															7	2								6.6					
11/14/2007																	4	2								6.5					
11/22/2007		4810															4	3								6.3				7.42	
11/30/2007		5001															8	4								6.2					
12/10/2007		5347															11	4								6.8					
12/18/2008		5815															19	8								7					
12/27/2008		6311															12	10								7					
1/3/2008		7200															13	8								7.3					
1/11/2008		7150															20	8								7.2					
1/21/2008		7700															4	10								6.8					
1/30/2008		7650															11	8								7.4					
2/7/2008		8200															8	6								6.8				8.81	

			Septic Tank Effluent													AdvanTex Effluent														
			cBOD5	TSS	TURB	TKN	NH3	NO2	NO3	TN	pH	Temp	G&O	Alk	TP	FC	BOD5	TSS	TURB	TKN	NH3	NO2	NO3	TN	DO	pH	Temp	G&O	Alk	TP	FC
			mg/L	*mg/L*	*NTU*	*mg/L*	*mg/L*	*mg/L*	*mg/L*	*mg/L*		*celsius*	*mg/L*	*mg/L*	*mg/L*	*mpn/100ml*	*mg/L*	*mg/L*	*NTU*	*mg/L*	*mg/L*	*mg/L*	*mg/L*	*mg/L*	*mg/l*		*celsius*	*mg/L*	*mg/L*	*mg/L*	*mpn/100ml*
Sample Date	**Test Type**	**GPD**																												
2/13/2008		8350															9	8								6.8					
2/22/2008		8295															8	6								6.8					
3/10/2008		8700															7	6								6.6					
3/13/2008		8355															7	9								6.7				9.73	
3/19/2008		8798															5	3								6.7					
3/27/2008		8613															10	11								6.9					
4/4/2008		8727															6	5								6.8					
4/15/2008		8645															6	3								6.5					
4/22/2008		8819															14	14								6.7				8.91	
4/30/2008		9200															11	21								6.9					
5/8/2008		9345															9	6								6.7					
5/16/2008		9285															7	6								6.9				9.32	
5/26/2008		9210															9	10								6.8					
6/3/2008		9800															6	8								6.9					
6/13/2008																	6	16								6.9					
6/19/2008		9750															4	8								6.7					
6/27/2008		9847															7	10								6.7					
7/7/2008		10019															6	7								6.6					
7/15/2008		10210															8	8								7					
7/23/2008		9645															6	7								6.8					
7/31/2008		9710															11	2								6.8					
8/9/2008		9245															6	12								7					
8/19/2008		9732															7	2								7					
8/27/2008		10512															4	4								7				11.6	
9/4/2008		10475															4	4								7.1					
9/12/2008		10950															4	6								7.1					
9/22/2008		11245															4	6								7.1					
9/30/2008		10875															4	8								7.2				10.6	
10/8/2008		11230															4	13								7.2					
10/16/2008		10951															8	5								7.2					
11/3/2008		11851															8	8								7.1				9.14	
11/12/2008		12275															5	6								7.1					
11/19/2008		12250															4	6								6.9					
11/27/2008																	4	6								7.1					
12/5/2008		12300															12	2								6.9					
12/15/2008		12200															8	6								7					
1/5/2009		12500															25	25								7				9.28	
1/13/2009		12301															14	12								6.8					
1/21/2009																	51	93								7					
1/29/2009		12326															11	6								7.3					
1/30/2009																	4	4								6.7					
2/6/2009		12401															7	10								6.6				2.04	
2/13/2009		12378															8	12								7					
2/24/2009		13903															12	12								6.9					
3/4/2009																	15	10								7.1				9.8	
3/12/2009		12305															14	8								7.1					
3/20/2009		12900															7	6								7.2					
3/31/2009		13300															10	6								7.2					

			Septic Tank Effluent													AdvanTex Effluent														
			cBOD5	TSS	TURB	TKN	NH3	NO2	NO3	TN	pH	Temp	G&O	Alk	TP	FC	BOD5	TSS	TURB	TKN	NH3	NO2	NO3	TN	DO	pH	Temp	G&O	Alk	TP	FC
			mg/L	*mg/L*	*NTU*	*mg/L*	*mg/L*	*mg/L*	*mg/L*	*mg/L*		*celsius*	*mg/L*	*mg/L*	*mg/L*	*mpn/100ml*	*mg/L*	*mg/L*	*NTU*	*mg/L*	*mg/L*	*mg/L*	*mg/L*	*mg/L*	*mg/l*		*celsius*	*mg/L*	*mg/L*	*mg/L*	*mpn/100ml*
Sample Date	**Test Type**	**GPD**																												
4/8/2009		14500															9	6								7.3				9.82	
4/16/2009		11500															6	6								7.1					
4/24/2009		19800															8	6								7.2					
5/28/2009		21000															6	6								7.2				9.95	
7/2/2009		28000															7	4								7				9.08	
7/31/2009		18900															4	6								7				8.64	
8/24/2009		12389															6	6								7.1					
9/23/2009		11870															4	3								7				10.8	
10/7/2009		10700																													
10/30/2009		11889															5	6								7.6					
11/23/2009		12400															8	4								7.8					
1/22/2010		10678															19	9								7.4				9.81	
2/23/2010		11900															14	9								7.2					
3/24/2010		12589															9	5								8					
4/23/2010		11987															9	8								7.6				8.55	
5/8/2010																															
5/21/2010		10983															24	30								7.8					
6/2/2010		14003															9	9								8.1					
7/13/2010		29467															18	19								7.7					
8/23/2010		33980															14	5								7.4					
10/27/2010		10890															14	8								7.4					
11/27/2010		17287															7	6								8					
12/21/2010		15782															194	587								7.5					
1/31/2011																	20	8								7.6					
2/28/2011																	12	6								7.5					
3/29/2011																	12	6								7.3					
5/30/2011																	23	14								7.6					
6/30/2011																	5	14								7.3					
7/26/2011																	19	13								7.4					
10/5/2011																	26	17								7.5					
10/28/2011																	25	14								7.7					
1/3/2012																	32	29								7.6					
4/3/2012																	9	5								7.8					
4/26/2012																	7	4								7.8					
5/28/2012																	11	5								7.7					
Average																	**12.1**	**15.1**								**7.1**				**9.1**	