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**WEST QUESNEL LAND STABILITY PROGRAM  
ANNUAL MONITORING REPORT - 2008**

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Figure 1      Summary Plan of Movement Hubs, Drill Hole and Instrument Locations

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## **1.0 INTRODUCTION**

AMEC Earth & Environmental, a division of AMEC Americas Limited, (AMEC) has carried out instrumentation monitoring in West Quesnel as part of the ongoing West Quesnel Land Stability Program. The purpose of the instrumentation monitoring was to track landslide related ground movements, groundwater conditions and precipitation.

Various sets of Global Positioning System (GPS) ground surface movement hubs have been established in the field between 1998 and 2008. Beginning in the year 2000, AMEC has installed several phases of slope inclinometers, piezometers, trial pumping wells and horizontal drains. Urban Systems, from Kamloops, BC, has also installed a weather station in West Quesnel, which measures precipitation and temperature data.

This report is intended to summarize the data collected during 2008 and provide an update on any observed trends or interpretations that have developed or changed since the last data report. For detailed background information including geology and project history, the reader is referred to previous AMEC reports including: Trial Dewatering dated May 2008 and West Quesnel Land Stability Study Report dated May 2007.

## **2.0 GPS MOVEMENT HUBS**

Beginning in September 1998, Terasen Gas (formerly BC Gas) installed and monitored a series of GPS surface movement hubs. Subsequently, in 2001, 2006, and 2008, the GPS hub network has been expanded and modified such that a current total of 52 hubs are monitored. The monitoring consists of comparing changes in the specific positions of the defined survey reference points versus time as measured periodically by survey contractors (most recently McElhanney Consultants Limited), retained by both Terasen and AMEC on behalf of the City of Quesnel. Full surveys are typically conducted on a quarterly basis with the results forwarded to AMEC. During 2008, two new hubs were installed (08-01 and 08-02) to replace two destroyed hubs. A summary table listing the GPS hub locations and plots of the movements at each hub can be found in Appendix A.

During 2008, full quarterly GPS monitoring was carried out in March, June, August, and November. AMEC noted a significant spike or acceleration in movement rates when reviewing the initial March to June 2008 survey results. This acceleration appeared to be greater than that typically experienced over most previous spring monitoring periods. An additional survey was carried out at the end of July to confirm the results. The July survey was only conducted for a select set of the fastest moving hubs. The purpose of the July survey was to confirm AMEC's initial opinion that this observed rate increase was short-term and likely related to spring movement effects, and that this pattern did not represent an unexpected change in overall movement characteristics of the landslide. This opinion was subsequently confirmed by the July survey, as well as the August and November monitoring surveys; however, it is important to note that the rate of movement recorded in the spring of 2008 was higher than has been seen in recent years and was approaching that observed during the late 1990's.

An overall summary table and detailed individual plots of movements for all GPS hubs are provided in Appendix A. Please note that while both horizontal and vertical movement data is recorded, typically vertical GPS survey data has at least one order of magnitude less accuracy than the horizontal data. Accordingly, while there are some general trends that can be observed regarding vertical and/or the resultant of both horizontal and vertical movement, the following report discussions of movement refer primarily to horizontal movement information.

The GPS movement hubs can be broken into 4 general categories based upon their location and displacement. The first category represents benchmark hubs, which are used to provide reference control for the survey. These benchmarks are theoretically located outside the slide area on stable ground and have recorded little, if any, movement since installation. The exceptions to this are survey tolerance variations that may suggest minor movement (typically less than 15 mm of total horizontal movement over the life of the survey). While there have been as many as seven hubs in this category, typically only two (GPS Water Tank: City concrete water tank and GPS 01-38: Terasen Pump Station, Red Bluff) are utilized to gauge the tolerance of the survey data.

The second category consists of 14 hubs that are at or near the eastern extremity of the slide area and are used to define the approximate toe area or likely eastern boundary of active landslide movement. Generally, total horizontal movement less than 15-20 mm is interpreted to mean that the location is beyond the toe area of active movement. Higher values suggest that the hub is on or very near the toe of the slide.

The third category consists of three hubs that are located at or near the upper west portion of the slide, in order to try and confirm the western extent or crest of the slide. Similar to the toe area, total horizontal displacement less than 15-20 mm typically represents areas outside the area of active movement.

The fourth category involves the remaining 33 GPS hubs that are interpreted to be within the main body of the landslide. These hubs have shown significant movements over the course of the 10 years that the fifteen oldest hubs have been monitored. The total horizontal movement, measured since September 1998 for these fifteen oldest hubs, ranged from 226 to 506 mm, with an average rate of movement of up to approximately 50 mm/year, depending on location.

During the spring of 2008, a significant increase in the rate of horizontal movement was observed, with short-term incremental annualized rates of movement in the order of 80 to 225 mm/year recorded, depending on location. Total horizontal displacement for the year ranged up to 79 mm, depending on the hub location. This is typically much more than the long term average or amounts of movements observed in more recent years.

Figure 1 provides an updated vector movement map for GPS hubs monitored in the West Quesnel area.

### **3.0 SLOPE INCLINOMETERS**

A total of fifteen slope inclinometer (SI) casings were installed by AMEC in West Quesnel, between November 2000 and August 2006, to monitor depths and rates of subsurface lateral ground movements. Installation details and the results of previous SI monitoring are described in previous AMEC reporting. At the beginning of 2008, eight of the original fifteen SI's were non-operational, having been disrupted by ground movement to the point that they could no longer be monitored.

During 2008, quarterly monitoring (April, June, September and November) was attempted by AMEC for seven surviving installations (SI-1, SI-8, SI-9, SI-11, SI-13, SI-14 and SI-15). During 2008 monitoring, two more SI's (SI-1 and SI-13) were also found to be disrupted at depth. Currently, there are only five remaining functional installations. A summary table of the SI's

installations can be found in Appendix B. All of the SI data plots from 2008 are also presented in Appendix B. A brief discussion on monitoring results follows.

SI-1 was found to be blocked at a depth of approximately 39.6 m between the April and June 2008 monitoring events, likely corresponding with the depth of the lower observed landslide slip surface. The cumulative lateral displacement, measured at this depth, up to April 2008, was approximately 23 mm. A second slip surface was detected in this SI at approximately 27 m depth. This upper slip surface had approximately 19 mm of measured displacement, up to April 2008. The maximum overall lateral displacement observed in the SI casing, since installation in November 2000, was in the order of 55 mm.

SI-8 was measured quarterly in 2008 and no discernable lateral deflection was noted. It has been interpreted that at approximately 72 m in length, SI-8 is not deep enough to penetrate through the underlying landslide slip surface and as such can not record any differential movement across the surface.

SI-9 was measured quarterly and demonstrated a distinct slip surface at approximately 65.0 m depth. A total of approximately 110 mm of lateral displacement has been monitored at this location, since installation in April 2005. The total lateral displacement observed in 2008 was approximately 46 mm. A significant movement rate acceleration, to approximately 124 mm/year, was detected in the spring, 2008. Since the spring, the movement rate slowed to the order of 18 mm/year.

SI-11 was measured quarterly in 2008 and no discernable lateral slip deflection was noted. It has been interpreted that at approximately 72 m in length, SI-11 is not deep enough to penetrate through the underlying landslide slip surface and as such can not record any differential movement across the surface. However, SI-11 measurements do exhibit a sinusoidal deflection wave that appears to suggest that the casing has undergone some vertical compression loading.

SI-13 was found to be blocked at a depth of approximately 13.4 m, between the June and September 2008 monitoring events. This is likely corresponding with movements along the previously observed lateral slip surface at a depth of approximately 15 m. The cumulative lateral displacement measured, between installation in April 2005 and June 2008, was approximately 72 mm. The total lateral displacement observed in 2008, up until the installation became inoperable, was approximately 27 mm. A significant acceleration, to a rate of approximately 108 mm/year, was detected in the spring.

SI-14 was measured quarterly and demonstrated a distinct slip surface at approximately 20.0 m depth. To date, approximately 62 mm of lateral displacement has been monitored at this location, since installation in August 2006. The total lateral displacement observed in 2008 was approximately 40 mm. A significant acceleration, to a rate of approximately 139 mm/year, was detected in the spring. Since the spring, the movement rate has slowed to less than 15 mm/year.

SI-15 was measured quarterly and demonstrated a distinct slip surface at approximately 18.0 m depth. To date, approximately 46 mm of lateral displacement has been monitored at this location, since installation in August 2006. The total lateral displacement observed in 2008 was approximately 28 mm. A significant acceleration, to a rate of approximately 85 mm/year, was detected in the spring. Since the spring, the movement rate has slowed to less than 13 mm/year.

In summary, the slope inclinometer monitoring detected trends in movement similar to that which has been observed in previous years, with increased rates of movement corresponding with the spring and early summer time period. However, this spring the movement rates were significantly greater than experienced in recent years, similar to or exceeding rates monitored by previous SI installations back in 2000-2001. As ground movement continues, it is expected that the three remaining useful installations (SI-9, SI-14, and SI-15) will in turn be disrupted by ground movement and will require replacement.

Generally, it has been observed that the rates and directions of movement in slope inclinometers match those in nearby surface GPS hubs.

Figure 1 provides an updated vector movement map for the slope inclinometer monitoring.

#### **4.0 PIEZOMETERS**

Two general types of piezometers (alternately referred to as monitoring wells) installed using three different installation methods have been installed in the ground in West Quesnel to monitor groundwater levels. There are nine standpipe piezometers, which are read quarterly using a manual water level dip tape. There are four standpipes that have been retrofitted with vibrating wire piezometers installed inside the standpipes. Another 48 vibrating wire piezometers were grouted directly in the ground at various depths and at 21 different locations. All of the piezometers in West Quesnel are active and are currently being read, although some intermittently go dry. A summary table of the piezometers, along with the water level plots, can be found in Appendix C.

All of the vibrating wire piezometers are connected to Campbell Scientific dataloggers, with the exception of VWP 4B, which is connected to a Slope Indicator MiniLogger. Dataloggers are used to record readings at set intervals and can store large quantities of data, so that near real time data can be collected remotely. All of the dataloggers are connected to cellular modems and are accessed directly from AMEC's office in Prince George.

The following piezometers are situated near trial pumping wells: BH 3, BH 3 ABC, BH 4 ABC, VWP 12, VWP 17, VWP 18, VWP 19, and VWP 20. Generally, the piezometers nearest the pumping wells showed continued declining water levels, as the trial dewatering pumps continued to operate after the formal test period that was documented in May 2008. BH 3, BH 3 ABC, VWP 12 ABC, VWP 17, VWP 19 and VWP 20 all showed a decrease in water level in response to pumping. BH 3 and VWP 17 also showed response to seasonal groundwater trends, as increases in water level were observed in the spring. The other piezometers near pumping wells, BH 4 ABC, VWP 12 D and VWP 18 did not show the decrease in water level, as they may be outside of the zone of influence of the individual pumping wells. BH 4C, VWP 12D and VWP 18A remained at constant water levels. BH 4A and B observed sharp spikes and drops in water levels, approximately 4 times during 2008. This may be linked to direct infiltration into the standpipe installation in response to precipitation events. VWP 18B observed a slight rise in water level over the course of 2008.

VWP 21, 22, 23, 24 and 25 are located in the vicinity of the trial horizontal drain installations HD1 and HD4. Around HD1, VWP 23A, 24 and 25 went dry soon after installation of HD1 and VWP 23B has shown a steady decline during 2008. During 2008, VWP 21 and 22, around HD4, indicated a spike in water level in early spring, followed by a gradual decrease in water level for the rest of the year.

The remaining piezometers in West Quesnel are in locations that are judged to be unlikely to be affected by trial dewatering efforts, and are more reflective of general subsurface groundwater patterns in West Quesnel. Depending on the local geology, depth of installation, etc., some of these other installations appear sensitive to seasonal snow melt trends and/or storm events while others do not. VWP 7, 9, 10, 14A and 15A appear to be sensitive to seasonal groundwater trends. These piezometers showed an increase in groundwater levels during spring with a steady decrease in levels for the rest of 2008. VWP 14B and C are generally at constant levels but showed a slight increase in water level during June 2008. VWP 15B and C observed a steady, slight decrease in water level during 2008. The water level in standpipe BH 4A has been decreasing since a high in April 2008 and no consistent trend has been observed in this piezometer. The water level in VWP 4B remained fairly constant during 2008, with a couple of short-term spikes observed during the year. The following piezometers have indicated relatively constant water levels during 2008: BH 2, BH 2 ABC, BH 6A-1 (dry), BH 6A-2 and BH 11 ABC.

The dataloggers at VWP 8, 13 and 16 have had problems retaining data and as such, data is not continuous from these piezometers. At VWP 8 and 16, power issues are to blame for the discontinuous data sets. With the cell modems being set up at these stations, too much power is needed from the batteries in between site visits. At VWP 8, three batteries have been set up to provide longer life but it may need to be hooked up to BC Hydro's grid if this is unsuccessful. A solar panel was installed at VWP 16 in late 2008 to provide more power. Different software programs have also been installed on the modems so that they use less power. The intermittent data sets collected at VWP 8 and 16 show generally constant water levels. At VWP 13, it was determined that a loose ground connection was causing issues and the datalogger has only been reading continuously since June 2008. From the data set, it appears that the water levels have dropped slightly, by about 0.5 m, since last year.

## **5.0 PUMPING WELLS**

Four pumping wells were set up in West Quesnel as part of the 2007-2008 trial dewatering program, reported on by AMEC in May 2008. PW1 is on Flamingo Street and has a 75 mm by 0.75 horsepower (hp) pump restricted to 15 L/min. PW2, on Abbott Drive, has a 75 mm by 0.75 hp pump restricted to 15 L/min. PW4, on Panagrot Ave., has a 75 mm 2 hp pump restricted to 75 L/min. PW5 is located on Adam Street, with a 100 mm 0.75 hp pump restricted to 15 L/min. PW1, PW2 and PW5 have electronic level controls to start and stop the pumps. PW4 is controlled by an ammeter that shuts off just prior to the pump cavitating (low head level) and restarts after a pre-set time period (20 min). The water pumped from the wells enters the West Quesnel storm drainage system. A summary table of the wells can be found in Appendix D.

PW1 has been pumping at a rate of between 80 and 140 L/day since the pump was started in December 2007, with the exception of July and August 2008 when 20 to 60 L/day was pumped. The total volume of water pumped, since installation to the end of 2008, was approximately 41,500 L. The water level in the well has mostly remained between 27.5 and 30 m depth, as defined by the well level controls.

PW2 pumped at a rate of between 25 and 30 L/day between December 2007 and June 2008 and between September and December 2008. During July and August, PW2 pumped approximately 12 L/day. The total volume pumped, from October 2007 to December 2008, was approximately 12,000 L. The water level in the well is between 38 to 41 m depth, as defined by the well level controls.

PW4 has been the most productive well, with average pump rates between 10,000 to 30,000 L/day for all of 2008, except July, which was below 10,000 L/day. To the end of 2008, approximately 7.9 million L of water has been pumped from this well. The water level in the well remained between 23 to 28 m depth, as defined by the well level controls.

PW5 has been the least productive well, with rates averaging below 1 L/day and a number of months where nothing was pumped. To date, only 341 L of water has been pumped. The water level in the well remains between 62 to 65 m depth, as defined by the well level controls.

## 6.0 HORIZONTAL DRAINS

Four test horizontal drains were installed during the fall of 2007 into the slope underlying West Quesnel at two different locations. This was part of the 2007-2008 trial dewatering program, reported on by AMEC in May 2008. Two of the drains (HD1a and HD1b) are located adjacent to SI-13 on the utility corridor south of the Sikh Temple, and have been dry since installation. The other two drains (HD4a and HD4b) were installed west of Adam Street, near PW5. These drains have been producing water since installation. A summary table of the drains can be found in Appendix E, along with a production table for HD4. The production table for HD4 is based on intermittent manual readings taken. These readings are then averaged to produce the plot and calculate assumed volumes. A magnetic flow meter, to provide real-time data, was installed in late 2008. The magnetic flow meter replaced a previously installed paddle-wheel type flow meter that worked only intermittently.

HD4 has produced a combined flow from the two drains ranging between approximately 2,000 to 4,000 L/day since installation, with the maximum flow occurring during May to July. To date, over 1.2 million L of water has been removed through the drains. HD4a, inclined at +2° into the slope, consistently has a higher flow than HD4b. HD4b, inclined at -2°, has a dramatic increase in flow during wet seasons (i.e. spring).

## 7.0 PRECIPITATION DATA

Appendix F contains various historical precipitation data charts for the Quesnel area. The primary source of information was precipitation data collected from Environment Canada (EC), for station Quesnel AWOS<sup>1</sup>, which is located approximately 6 km north of the project site at the Quesnel airport. Total monthly and daily precipitation records, including 30 year climate normals, were obtained for the EC station. A secondary source of precipitation data was from the custom-installed local weather station on the roof of an apartment building within the West Quesnel Land Stability Program area by Urban Systems Ltd. Daily total precipitation data has been available from the Urban Systems' station only on an intermittent basis since June 2006.

The intention of installing the custom local weather station was to try and discern if there were significant differences in total precipitation patterns between the EC station and the West Quesnel area. The first two charts in Appendix F present comparisons of total daily precipitation for the two weather stations. It appears that generally the EC station recorded a higher level of total precipitation. This is likely mostly due to equipment outages at the Urban Systems station and a non-standard layout for capture of snowfall precipitation (being on an apartment roof) as compared to that used for the EC station. However, when one looks at the graphed curves of cumulative precipitation over time for the two stations (over matching serviceable periods

<sup>1</sup> Environment Canada, 2009. Canadian Climate Data Search On-line - Canada's National Climate Archive.  
<http://www.climate.weatheroffice.ec.gc.ca/climateData/canadae.html> Last visited January 5, 2009.

available to date) the curves appear generally parallel, suggesting that there is not much difference in precipitation patterns between the two areas. Consequently, AMEC has decided to rely on the more complete EC total precipitation data for analysis of the West Quesnel area for the current period.

Total precipitation recorded at the EC weather station for 2008 was 530 mm, very close to the historical normal<sup>2</sup> (1971 to 2000) which is approximately 540mm. For the eight months (winter and spring) preceding the accelerated spring ground movements detected in June 2008, the total precipitation was 332 mm, which is only slightly more than the expected normal of 308 mm for the same period. This information suggests that 2008 was approximately normal to only slightly wetter, in terms of precipitation. The calendar year of 2008 was not as wet as previous springs, particularly those years when significant ground movements were noted (those typically being 1996-1997, 1999-2000 and 2004-2005).

## 8.0 TRENDS

Selected data from different types of instrumentation was plotted to determine if any general trends were apparent. While 2007-2008 still represents the early stages of availability of relatively comprehensive data sets across the study area, several trends were visible. Charts of these comparisons can be found in Appendix G.

The comparisons in different types of data, to be discussed below, are as follows:

- Total daily precipitation vs. groundwater elevation
- Cumulative total daily precipitation vs. groundwater elevation
- Incremental ground movement rate vs. groundwater elevation
- Incremental ground movement rate vs. total daily precipitation
- Incremental ground movement rate vs. total monthly precipitation
- Incremental ground movement rate vs. cumulative difference total monthly precipitation

When total daily precipitation is compared to general groundwater elevation (as determined from selected vibrating wire piezometers unlikely to have been affected by trial dewatering), it is difficult to discern if a specific precipitation event caused any of the changes in water level. However it is apparent that rises in groundwater level do occur just after winter each year. Also, just prior to the winter of 2007-2008, a number of high precipitation days occurred and a rise in water level was observed in two of the plotted piezometers.

When these same groundwater elevations are plotted against cumulative total daily precipitation, it is easier to observe trends. A steep rise in the cumulative precipitation is often followed by a steep rise in groundwater levels in some of the piezometers. In AMEC's May 2007 report, it was observed that long term piezometer trends matched the cumulative difference precipitation trend and this most recent comparison supports this observation.

A plot of groundwater elevation versus ground movement rates (as determined from selected representative SI and horizontal GPS movement data) was also made. Peaks in movement rates occurred in the late spring or early summer and the lowest rates occurred in the winter. There is a time lag between the increase in groundwater levels and the maximum movement rate and this time lag appears relatively consistent (approximately 2 months) within the two

<sup>2</sup> Environment Canada, 2008. Canadian Climate Normals and Averages 1971-2000 – Canada's National Climate Archive.  
[http://www.climate.weatheroffice.ec.gc.ca/climate\\_normals/index\\_e.html](http://www.climate.weatheroffice.ec.gc.ca/climate_normals/index_e.html) Last visited March 5, 2009.

years of data plotted. It is important to note that this time lag is not absolute, as the movement data is collected only quarterly and thus provides only very coarse resolution. In the May 2007 report, AMEC observed that groundwater elevations correlated to slide movement rates and similar correlations are present in the current data set.

Ground movement rate data was also plotted against total daily precipitation, total monthly precipitation and cumulative difference total monthly precipitation. The correlation between ground movement and total daily precipitation is not easy to see. However, on the plot of ground movement versus total monthly precipitation, a general correlation of increased movement rates with greater precipitation is more visible, generally peaking in the late spring/early summer. The plot of ground movement rate versus cumulative difference generally shows high rates of movement corresponding with wetter periods (sustained upwards slopes on cumulative difference plot), with the exception of 2008, where higher rates of movement were observed but the precipitation trend is considered normal. These trends support the hypothesis made in the May 2007 report, with respect to higher rates of movement during higher precipitation periods. Note that there has been an increase in precipitation going into the winter of 2008-2009 and it will be interesting to see the effect on early 2009 groundwater levels and movement rates.

## **9.0 CLOSURE**

This report presents the results of the annual monitoring carried out by AMEC for the 2008 calendar year. It is recommended and anticipated that monitoring will continue through 2009 and beyond. AMEC will be providing a work plan and estimate for the 2009 annual monitoring program under separate cover.

This report has been prepared for the exclusive use of the City of Quesnel and their representatives for specific application to West Quesnel Land Stability Program. Any use which a third party makes of this report, or any reliance on or decisions made based on it, are the responsibility of such third parties. AMEC accepts no responsibility for damages, if any, suffered by any third party as a result of decisions made or actions based on this report.

This report was prepared in accordance with generally accepted geotechnical engineering principles and practice. No other warranty, expressed or implied, is made.

Please do not hesitate to contact the undersigned at (250) 564-3243 should you have any questions or require further information.

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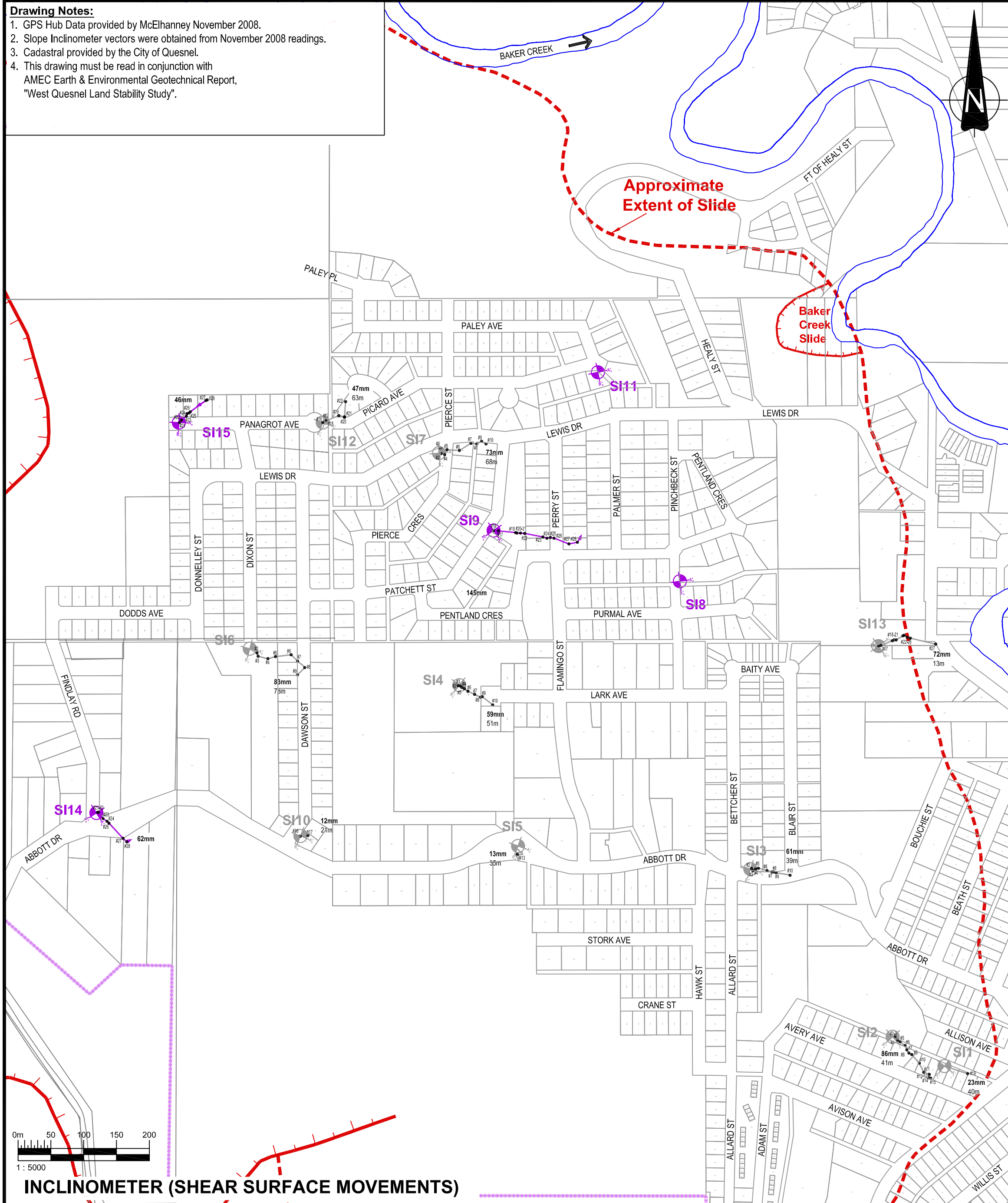


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**Drawing Notes:**  
1. GPS Hub Data provided by McElhanney November 2008.  
2. Slope Inclinator vectors were obtained from November 2008 readings.  
3. Cadastral provided by the City of Quesnel.  
4. This drawing must be read in conjunction with  
AMEC Earth & Environmental Geotechnical Report,  
"West Quesnel Land Stability Study".



| SI Monitoring Schedule |             |             |             |             |             |             |                |              |              |             |             |             |             |             |             |
|------------------------|-------------|-------------|-------------|-------------|-------------|-------------|----------------|--------------|--------------|-------------|-------------|-------------|-------------|-------------|-------------|
| Dates                  | SI1         | SI2         | SI3         | SI4         | SI5         | SI6         | SI7            | SI8          | SI9          | SI10        | SI11        | SI12        | SI13        | SI14        | SI15        |
| Initial                | 21 Nov 2000 | 21 Nov 2000 | 21 Nov 2000 | 03 Nov 2000 | 28 Oct 2000 | 22 Nov 2000 | 22 Nov 2000    | 03 Jun 2005  | 27 Apr 2005  | 27 Apr 2005 | 31 May 2005 | 28 Apr 2005 | 28 Apr 2005 | 08 Nov 2006 | 08 Nov 2006 |
| #1                     | 07 Dec 2000 | 07 Dec 2000 | 06 Dec 2000 | 06 Dec 2000 | 06 Dec 2000 | 06 Dec 2000 | 07 Dec 2000    |              |              |             |             |             |             |             |             |
| #3                     | 12 Jan 2001 | 11 Jan 2001 | 12 Jan 2001 | 12 Jan 2001 | 12 Jan 2001 | 12 Jan 2001 | 12 Jan 2001    |              |              |             |             |             |             |             |             |
| #4                     | 05 Mar 2001 | 05 Mar 2001 | 05 Mar 2001 | 05 Mar 2001 | 05 Mar 2001 | 05 Mar 2001 | 05 Mar 2001    |              |              |             |             |             |             |             |             |
| #5                     | 02 Apr 2001 | 02 Apr 2001 | 02 Apr 2001 | 02 Apr 2001 | 02 Apr 2001 | 02 Apr 2001 | 02 Apr 2001    |              |              |             |             |             |             |             |             |
| #6                     | 28 Apr 2001 | 28 Apr 2001 | 28 Apr 2001 | 28 Apr 2001 | 28 Apr 2001 | 28 Apr 2001 | 28 Apr 2001    |              |              |             |             |             |             |             |             |
| #7                     | 18 Jun 2001 | 13 Jun 2001 | 14 Jun 2001 | 14 Jun 2001 | 14 Jun 2001 | 13 Jun 2001 | 14 Jun 2001    |              |              |             |             |             |             |             |             |
| #8                     | 04 Oct 2001 | 04 Oct 2001 | 04 Oct 2001 | 04 Oct 2001 | 04 Oct 2001 | 04 Oct 2001 | 28 Sep 2001    |              |              |             |             |             |             |             |             |
| #9                     | 20 Nov 2001 | 19 Nov 2001 | 19 Nov 2001 | 19 Nov 2001 | 19 Nov 2001 | 19 Nov 2001 | 20 Nov 2001    |              |              |             |             |             |             |             |             |
| #10                    | 06 May 2002 | 06 May 2002 | 06 May 2002 | 06 May 2002 | 06 May 2002 | 06 May 2002 | 06 May 2002    |              |              |             |             |             |             |             |             |
| #11                    | 19 Nov 2002 | 19 Nov 2002 | blocked 39m | blocked 51m | 19 Nov 2002 |             | blocked 68m    |              |              |             |             |             |             |             |             |
| #12                    | 15 Aug 2003 | 15 Aug 2003 |             |             | 15 Aug 2003 |             |                |              |              |             |             |             |             |             |             |
| #13                    | 02 Dec 2003 | 02 Dec 2003 |             |             | 02 Dec 2003 |             |                |              |              |             |             |             |             |             |             |
| #14                    | 24 Jun 2004 | 24 Jun 2004 |             |             | blocked 35m |             |                |              |              |             |             |             |             |             |             |
| #15                    | 10 Nov 2004 | 10 Nov 2004 |             |             | 10 Nov 2004 |             |                |              |              |             |             |             |             |             |             |
| #16                    | 27 Apr 2005 | blocked 41m |             |             |             |             |                |              |              |             |             |             |             |             |             |
| #17                    |             |             |             |             |             |             |                |              |              |             |             |             |             |             |             |
| #18                    |             |             |             |             |             |             |                |              |              |             |             |             |             |             |             |
| #19                    | 18 May 2006 |             |             |             |             |             | 18 May 2006    | 18 May 2006  | 18 May 2006  |             |             |             |             |             |             |
| #20                    | 29 Aug 2006 |             |             |             |             |             | 29 Aug 2006    | 29 Aug 2006  | 29 Aug 2006  |             |             |             |             |             |             |
| #21                    | 08 Nov 2006 |             |             |             |             |             | 09/21 Nov 2006 | 08 Nov 2006  | 21 Nov 2006  |             |             |             |             |             |             |
| #22                    | 08 Mar 2007 |             |             |             |             |             | 08 Mar 2007    | 08 Mar 2007  | 08 Mar 2007  |             |             |             |             |             |             |
| #23                    | 29 May 2007 |             |             |             |             |             | 29 May 2007    | 30 May 2007  | 30 May 2007  |             |             |             |             |             |             |
| #24                    | 30 Aug 2007 |             |             |             |             |             | 28 Aug 2007    | 30 Aug 2007  | 30 Aug 2007  |             |             |             |             |             |             |
| #25                    | 22 Nov 2007 |             |             |             |             |             | 22 Nov 2007    | 22 Nov 2007  | 22 Nov 2007  |             |             |             |             |             |             |
| #26                    | 04 Apr 2008 |             |             |             |             |             | 04 Apr 2008    | 04 Apr 2008  | 04 Apr 2008  |             |             |             |             |             |             |
| #27                    | blocked 40m |             |             |             |             |             | 24 June 2008   | 24 June 2008 | 24 June 2008 |             |             |             |             |             |             |
| #28                    |             |             |             |             |             |             | 09 Sept 2008   | 09 Sept 2008 | 10 Sept 2008 |             |             |             |             |             |             |
| #29                    |             |             |             |             |             |             | 11 Nov 2008    | 10 Nov 2008  | 10 Nov 2008  |             |             |             |             |             |             |

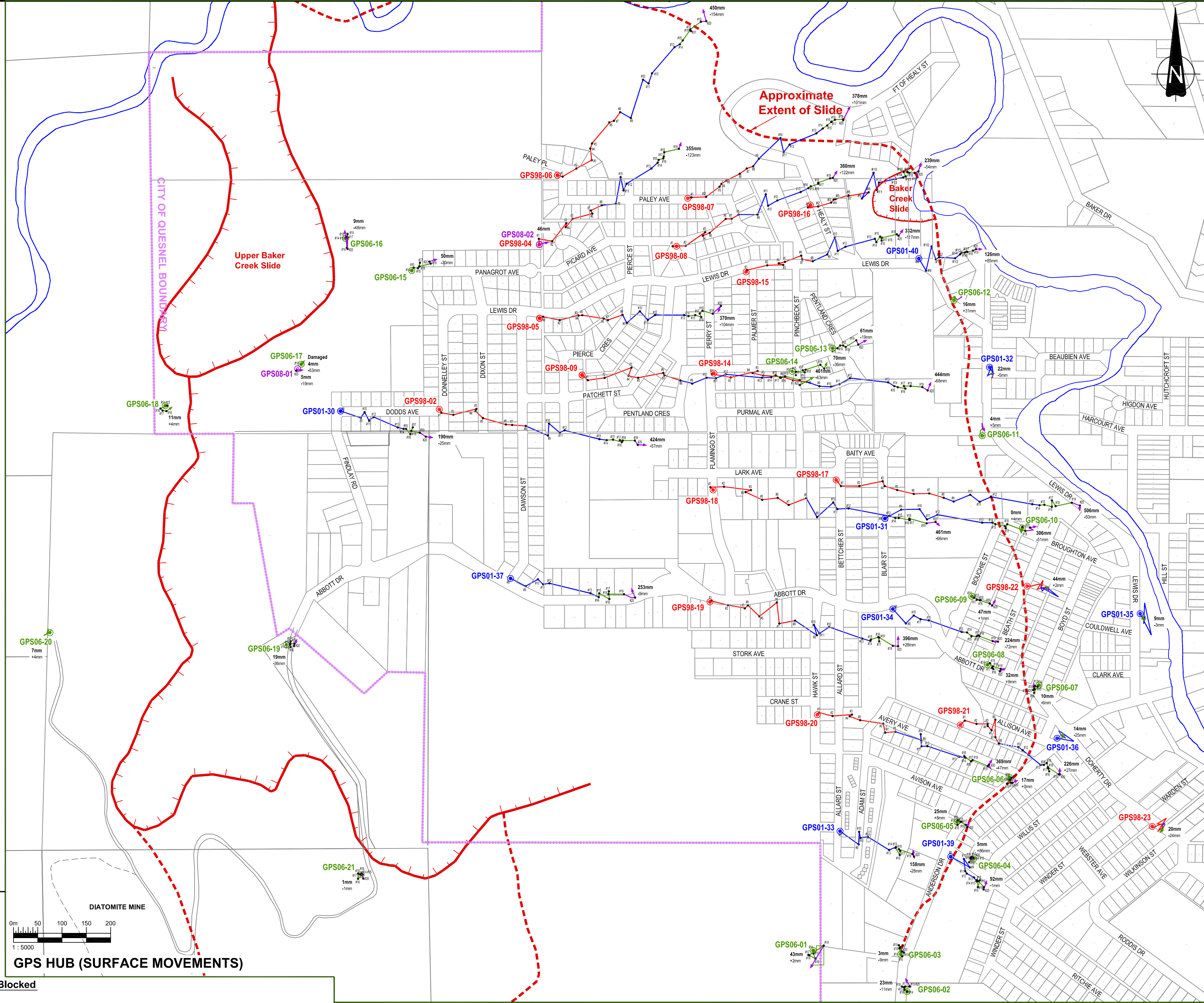
Slope Inclinator - Blocked

SI7  
#1  
#2  
#3  
#4  
73mm - Total shear displacement at slide surface, in millimetres  
68m - Depth SI blocked below ground surface, in metres  
Note: Total shear displacement measured across slide surface, from initial reading to present or until blocked.

Slope Inclinator - Operational

SI9  
#15  
#16  
#17  
36mm

Vector Scale:  
0mm 50 100 150 200  
1 : 5000



GPS Monitoring Dates

Initial September 1998  
#1 December 1998  
#2 April 1999  
#3 December 1999  
#4 February 2000  
#5 May 2000  
#6 December 2000  
#7 May 2001  
#8 December 2001  
#9 May 2002  
#10 October 2002  
#11 November 2003  
#12 January 2005

GPS Hub installed September 1998

GPS98-02  
#1  
#2  
#3  
#4  
#5  
#6  
#7  
#8  
#9  
#10  
#11  
#12

GPS Hub installed December 2001

GPS01-34  
#1  
#2  
#3  
#4  
#5  
#6  
#7  
#8  
#9  
#10  
#11  
#12  
#13  
#14  
#15  
#16  
#17  
#18  
#19  
#20

GPS Hub installed November 2006

GPS06-05  
#14  
#15  
#16  
#17  
#18  
#19  
#20

West Quesnel  
Land Stability Program

CITY OF QUESNEL  
AMEC Earth & Environmental  
Prince George, BC, CANADA V2N 2P9  
Tel: (250) 664-3243 Fax: (250) 562-7045

DATUM: NAD83  
PROJECTION: UTM Zone 10  
DRAWN BY: S.Ruiz  
REVIEWED BY: S.Kelly  
ORIGINAL SCALE: 1:5000

TITLE: SUMMARY PLAN OF MOVEMENT HUBS, DRILL HOLE AND INSTRUMENT LOCATIONS  
PROJECT: WEST QUESNEL LAND STABILITY STUDY  
QUESNEL, BC

PROJECT NO.: KX04397  
REVISION NO.: A  
DATE: FEBRUARY 2009  
FIGURE NO.: FIGURE 1  
SHEET NO.: 1 of 1

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This drawing was originally produced in colour.

**Appendix A**  
**GPS Movement Hubs - Summary Table and Survey Data**

## APPENDIX A - GPS Movement Hubs Information

| Hub       | Location                                        | Initial Survey Date | Status                                   |
|-----------|-------------------------------------------------|---------------------|------------------------------------------|
| 98-02     | Donnelly/Dodds Intersection                     | September 1998      | Active                                   |
| 98-04     | Picard Place (Lane)                             | September 1998      | Destroyed - replaced by 08-02            |
| 98-05     | East of Dawson/Lewis Intersection               | September 1998      | Active                                   |
| 98-06     | Paley West                                      | September 1998      | Active                                   |
| 98-07     | Paley East                                      | September 1998      | Active - minor disturbance/deterioration |
| 98-08     | Picard Avenue                                   | September 1998      | Active                                   |
| 98-09     | Lane between Patchett/Pierce                    | September 1998      | Active                                   |
| 98-14     | Pentland/Flamingo Intersection                  | September 1998      | Active                                   |
| 98-15     | Palmer/Lewis Intersection                       | September 1998      | Active                                   |
| 98-16     | Healy Road                                      | September 1998      | Active                                   |
| 98-17     | Bettcher/Lark Intersection                      | September 1998      | Active                                   |
| 98-18     | Lark/Flamingo Intersection                      | September 1998      | Active                                   |
| 98-19     | Abbott/Flamingo Intersection                    | September 1998      | Active                                   |
| 98-20     | Hawk Street @ Crane Ave.                        | September 1998      | Active                                   |
| 98-21     | Lane between Avery/Allison                      | September 1998      | Active                                   |
| 98-22     | Lane between Beath/Bouchie                      | September 1998      | Active                                   |
| 98-23     | Doherty Dr. - BM                                | September 1998      | Active                                   |
| 98-24     | Salton Road (Hixon Road)                        | September 1998      | Not Currently Read                       |
| 98-26     | Benchmark by Airport - BM                       | September 1998      | Not Currently Read                       |
| 98-28     | Red Bluff Pump Station - BM                     | September 1998      | Not Currently Read                       |
| 98-29     | Quesnel Hill                                    | September 1998      | Not Currently Read                       |
| 01-30     | West End of Dodds Avenue at Finley Road         | December 2001       | Active                                   |
| 01-31     | Blair Street                                    | December 2001       | Active                                   |
| 01-32     | Lewis Drive/Beabien Avenue                      | December 2001       | Active                                   |
| 01-33     | South End of Allard Street                      | December 2001       | Active                                   |
| 01-34     | Abbott Road and Blair Street                    | December 2001       | Active                                   |
| 01-35     | Lewis Drive North of Couldwell Street           | December 2001       | Active                                   |
| 01-36     | Anderson Drive at Abbott Drive                  | December 2001       | Active                                   |
| 01-37     | Dawson Street at Abbott Drive                   | December 2001       | Active                                   |
| 01-38     | Quesnel No. 1 Station - BM                      | December 2001       | Active - Benchmark Station               |
| 01-39     | Anderson Avenue at Wade Avenue                  | December 2001       | Active                                   |
| 01-40     | Lewis Drive East of Healy Street                | December 2001       | Active                                   |
| 82C256    | Government Benchmark at Airport                 | December 1998       | Not Currently Read                       |
| WaterTank | Water Tank                                      | March 2006          | Active - Benchmark Station               |
| 06-01     | End alley E. of Anderson Dr., opposite school   | November 2006       | Active                                   |
| 06-02     | East side Anderson Drive by school              | November 2006       | Active                                   |
| 06-03     | West side Anderson Dr., opposite school yard    | November 2006       | Active                                   |
| 06-04     | North side Wade Ave, one lot E. Anderson Dr.    | November 2006       | Active                                   |
| 06-05     | Anderson Drive west side, one lot S. of Avison  | November 2006       | Active                                   |
| 06-06     | North corner Avery Ave / Anderson Drive         | November 2006       | Active - minor disturbance/deterioration |
| 06-07     | NE. corner Boyd Street / Abbott Rd.             | November 2006       | Active                                   |
| 06-08     | North side Abbott Road., alley E. Beath Street  | November 2006       | Active                                   |
| 06-09     | East side Bouchie Street                        | November 2006       | Active - minor disturbance/deterioration |
| 06-10     | South side Broughton Avenue                     | November 2006       | Active - minor disturbance/deterioration |
| 06-11     | East side Lewis Road, opposite house # 391      | November 2006       | Active                                   |
| 06-12     | East side Lewis Road, opposite house # 547      | November 2006       | Active                                   |
| 06-13     | NW. corner Pentland Crescent                    | November 2006       | Active                                   |
| 06-14     | SW. corner Pinchbeck Street / Pentland Crescent | November 2006       | Active                                   |
| 06-15     | By trail, NW unnamed Rd. N. Dixon St.           | November 2006       | Active - minor disturbance/deterioration |
| 06-16     | By end trail, NW unnamed road N. Dixon St.      | November 2006       | Active                                   |
| 06-17     | In clearing, NW of end Findlay Road             | November 2006       | Disturbed - replaced by 08-01            |
| 06-18     | On upper bench by trail, off end Findlay Road   | November 2006       | Destroyed                                |
| 06-19     | West side Abbott Dr. 100m south last house      | November 2006       | Active                                   |
| 06-20     | End of trail, by BH 16, off end Abbott Drive    | November 2006       | Active                                   |
| 06-21     | 100m past gate, off end Abbott Drive            | November 2006       | Active                                   |
| 08-01     | In clearing, NW of end Findlay Road             | June 2008           | Active                                   |
| 08-02     | Picard Place (Lane)                             | August 2008         | Active                                   |





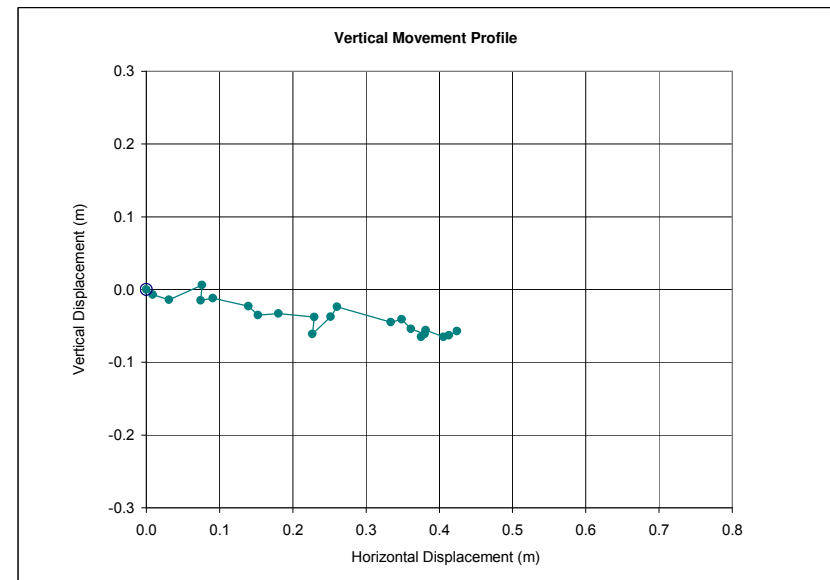
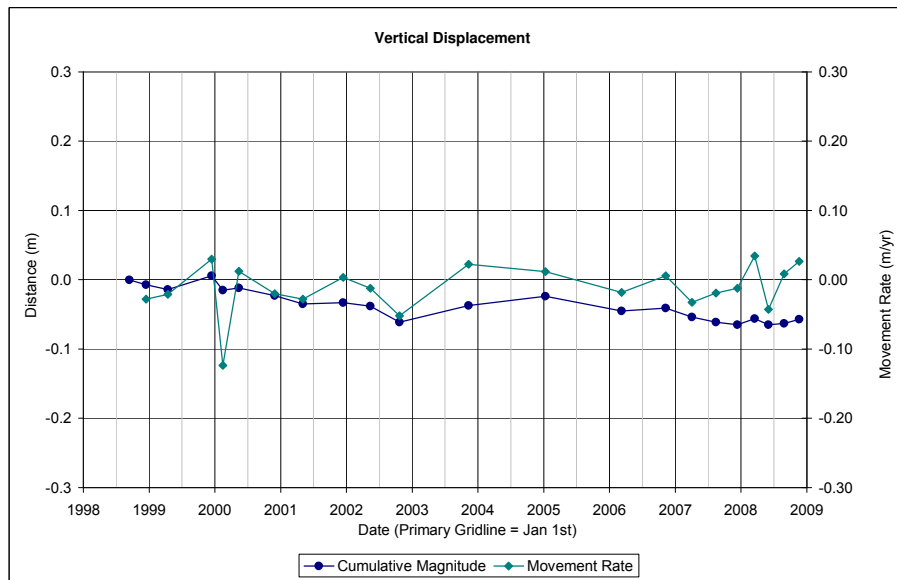
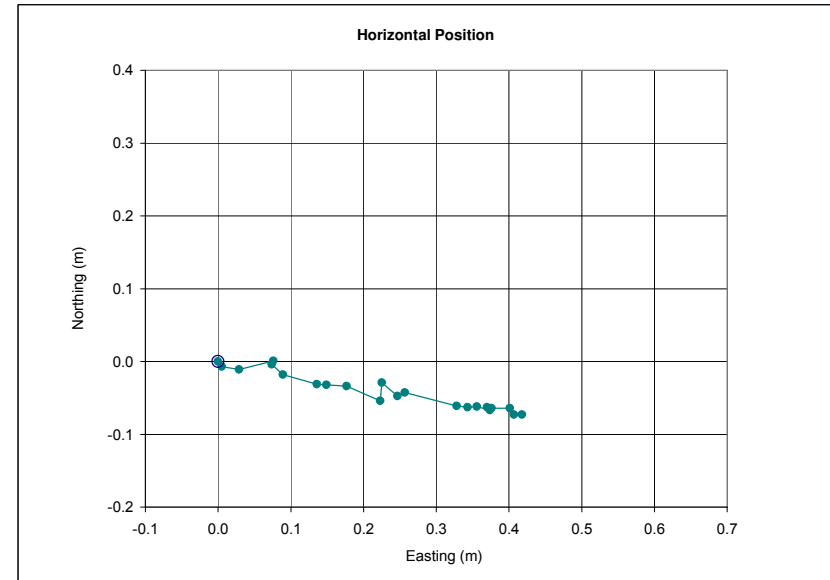
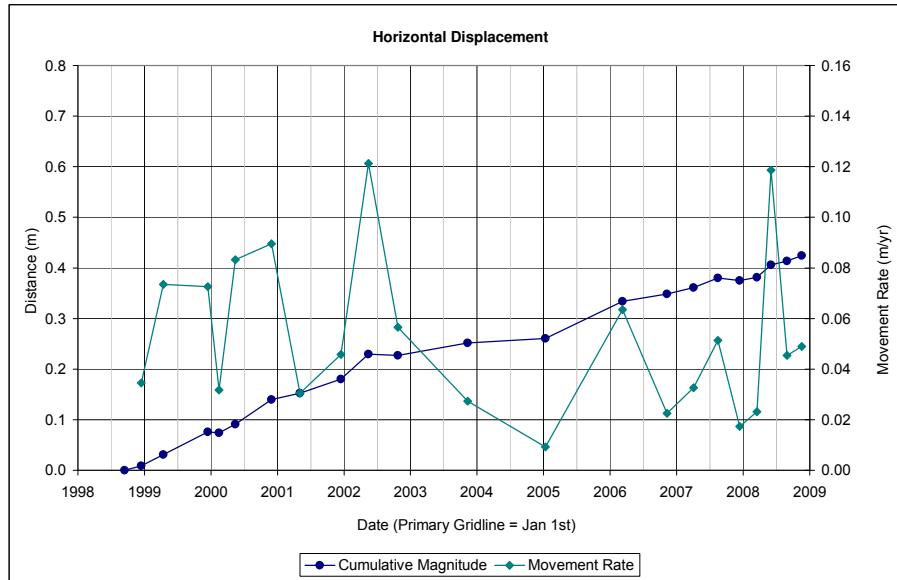


| Date       | Surveyed Position |            |         | Total Change in Position |        |        |                 |               |              |             | Overall Rates (m/yr) |                  | Incremental Change in Position |        |        |                 |               |              |             | Incremental Rates  |                  |
|------------|-------------------|------------|---------|--------------------------|--------|--------|-----------------|---------------|--------------|-------------|----------------------|------------------|--------------------------------|--------|--------|-----------------|---------------|--------------|-------------|--------------------|------------------|
|            | N<br>m            | E<br>m     | Z<br>m  | Time<br>yrs              | N<br>m | E<br>m | Horizontal<br>m | Vertical<br>m | Azimuth<br>° | Plunge<br>° | Horizontal<br>m/yr   | Vertical<br>m/yr | Time<br>yrs                    | N<br>m | E<br>m | Horizontal<br>m | Vertical<br>m | Azimuth<br>° | Plunge<br>° | Horizontal<br>m/yr | Vertical<br>m/yr |
| 9/15/1998  | 5869992.878       | 531420.902 | 563.021 | 0.00                     | 0.000  | 0.000  | 0.000           | 0.000         | 0.0          | 0.0         |                      |                  | 0.00                           | 0.000  | 0.000  | 0.000           | 0.000         | 0.0          | 0.0         |                    |                  |
| 12/15/1998 | 5869992.871       | 531420.907 | 563.014 | 0.25                     | -0.007 | 0.005  | 0.009           | -0.007        | 144.5        | -39.1       | 0.035                | -0.028           | 0.25                           | -0.007 | 0.005  | 0.009           | -0.007        | 144.5        | -39.1       | 0.035              | -0.028           |
| 4/15/1999  | 5869992.867       | 531420.931 | 563.007 | 0.58                     | -0.011 | 0.029  | 0.031           | -0.014        | 110.8        | -24.3       | 0.053                | -0.024           | 0.33                           | -0.004 | 0.024  | 0.024           | -0.007        | 99.5         | -16.1       | 0.073              | -0.021           |
| 12/15/1999 | 5869992.879       | 531420.978 | 563.027 | 1.25                     | 0.001  | 0.076  | 0.076           | 0.006         | 89.2         | 4.5         | 0.061                | 0.005            | 0.67                           | 0.012  | 0.047  | 0.049           | 0.020         | 75.7         | 22.4        | 0.073              | 0.030            |
| 2/15/2000  | 5869992.874       | 531420.976 | 563.006 | 1.42                     | -0.004 | 0.074  | 0.074           | -0.015        | 93.1         | -11.4       | 0.052                | -0.011           | 0.17                           | -0.005 | -0.002 | 0.005           | -0.021        | 201.8        | -75.6       | 0.032              | -0.124           |
| 5/15/2000  | 5869992.860       | 531420.991 | 563.009 | 1.66                     | -0.018 | 0.089  | 0.091           | -0.012        | 101.4        | -7.5        | 0.055                | -0.007           | 0.25                           | -0.014 | 0.015  | 0.021           | 0.003         | 133.0        | 8.3         | 0.083              | 0.012            |
| 11/30/2000 | 5869992.847       | 531421.038 | 562.998 | 2.21                     | -0.031 | 0.136  | 0.139           | -0.023        | 102.8        | -9.4        | 0.063                | -0.010           | 0.54                           | -0.013 | 0.047  | 0.049           | -0.011        | 105.5        | -12.7       | 0.090              | -0.020           |
| 5/5/2001   | 5869992.846       | 531421.051 | 562.986 | 2.64                     | -0.032 | 0.149  | 0.152           | -0.035        | 102.1        | -12.9       | 0.058                | -0.013           | 0.43                           | -0.001 | 0.013  | 0.013           | -0.012        | 94.4         | -42.6       | 0.031              | -0.028           |
| 12/15/2001 | 5869992.844       | 531421.079 | 562.988 | 3.25                     | -0.034 | 0.177  | 0.180           | -0.033        | 100.9        | -10.4       | 0.055                | -0.010           | 0.61                           | -0.002 | 0.028  | 0.028           | 0.002         | 94.1         | 4.1         | 0.046              | 0.003            |
| 5/15/2002  | 5869992.824       | 531421.125 | 562.983 | 3.66                     | -0.054 | 0.223  | 0.229           | -0.038        | 103.6        | -9.4        | 0.063                | -0.010           | 0.41                           | -0.020 | 0.046  | 0.050           | -0.005        | 113.5        | -5.7        | 0.121              | -0.012           |
| 10/24/2002 | 5869992.849       | 531421.127 | 562.960 | 4.11                     | -0.029 | 0.225  | 0.227           | -0.061        | 97.3         | -15.1       | 0.055                | -0.015           | 0.44                           | 0.025  | 0.002  | 0.025           | -0.023        | 4.6          | -42.5       | 0.057              | -0.052           |
| 11/12/2003 | 5869992.830       | 531421.149 | 562.984 | 5.16                     | -0.048 | 0.247  | 0.251           | -0.037        | 100.9        | -8.5        | 0.049                | -0.007           | 1.05                           | -0.019 | 0.022  | 0.029           | 0.024         | 130.2        | 39.4        | 0.027              | 0.022            |
| 1/11/2005  | 5869992.835       | 531421.159 | 562.997 | 6.32                     | -0.043 | 0.257  | 0.260           | -0.024        | 99.5         | -5.2        | 0.041                | -0.004           | 1.17                           | 0.005  | 0.010  | 0.011           | 0.014         | 64.1         | 51.6        | 0.009              | 0.012            |
| 3/10/2006  | 5869992.817       | 531421.230 | 562.976 | 7.48                     | -0.061 | 0.328  | 0.334           | -0.045        | 100.5        | -7.7        | 0.045                | -0.006           | 1.16                           | -0.018 | 0.071  | 0.074           | -0.021        | 104.3        | -16.1       | 0.064              | -0.018           |
| 11/10/2006 | 5869992.815       | 531421.245 | 562.980 | 8.15                     | -0.063 | 0.343  | 0.349           | -0.041        | 100.4        | -6.7        | 0.043                | -0.005           | 0.67                           | -0.002 | 0.015  | 0.015           | 0.004         | 97.6         | 14.8        | 0.023              | 0.006            |
| 4/5/2007   | 5869992.816       | 531421.258 | 562.967 | 8.55                     | -0.062 | 0.356  | 0.361           | -0.054        | 99.9         | -8.5        | 0.042                | -0.006           | 0.40                           | 0.001  | 0.013  | 0.013           | -0.013        | 85.6         | -44.9       | 0.033              | -0.033           |
| 8/16/2007  | 5869992.811       | 531421.276 | 562.960 | 8.92                     | -0.067 |        |                 |               |              |             |                      |                  |                                |        |        |                 |               |              |             |                    |                  |

**Displacement Graphs - Hub 98-02**  
Donnelly/Dodds Intersection

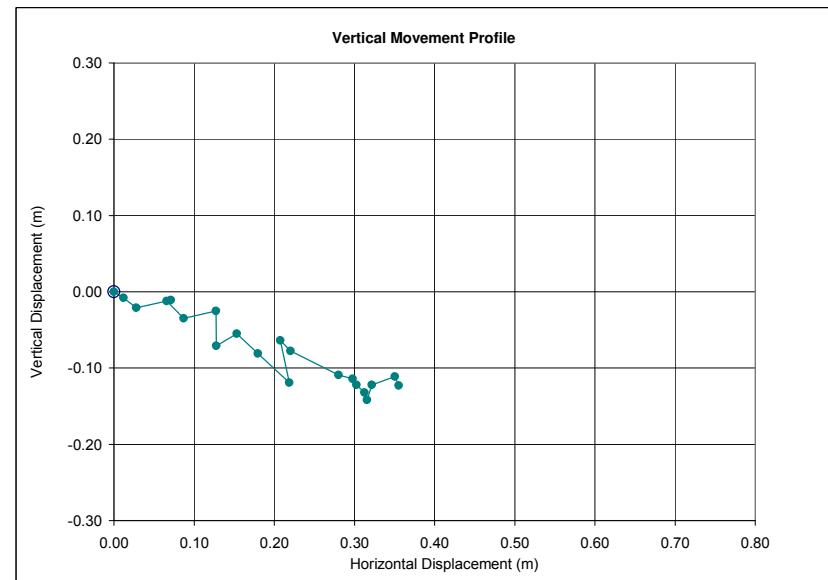
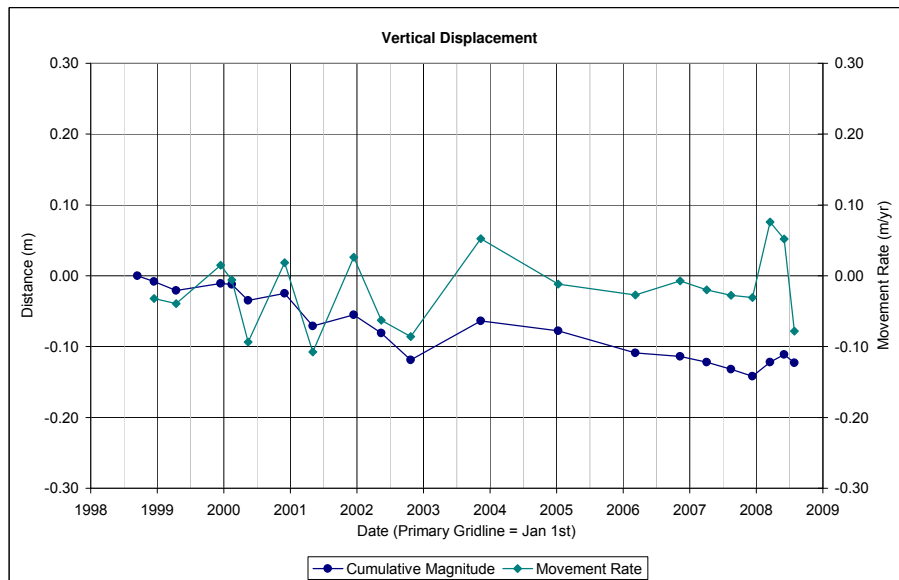
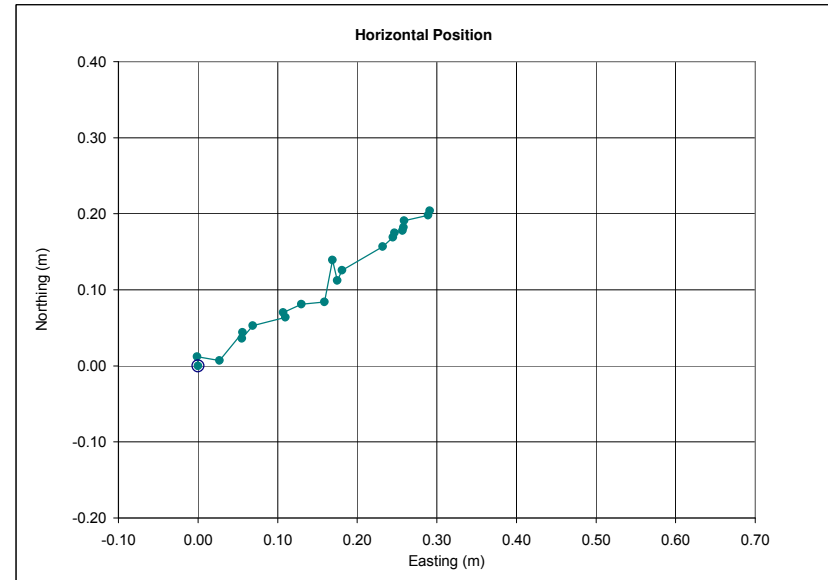
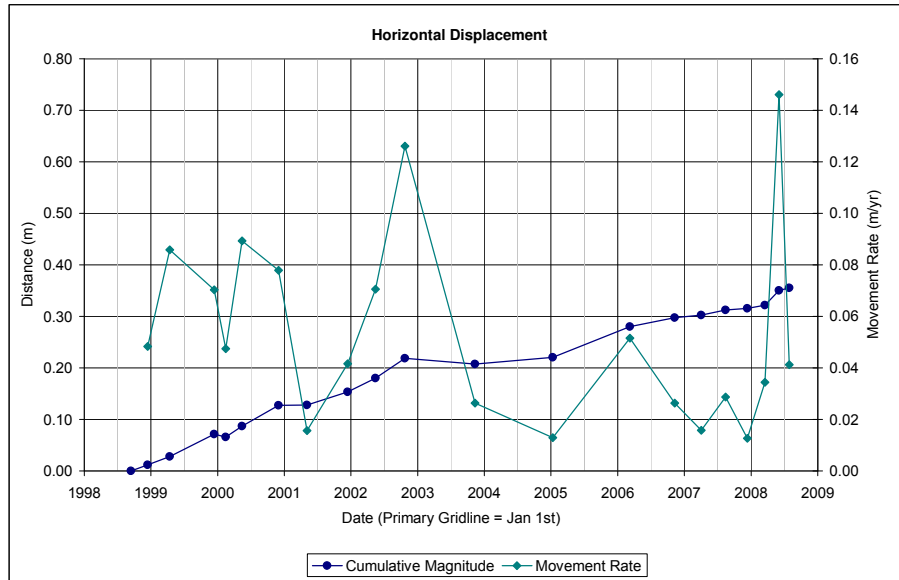


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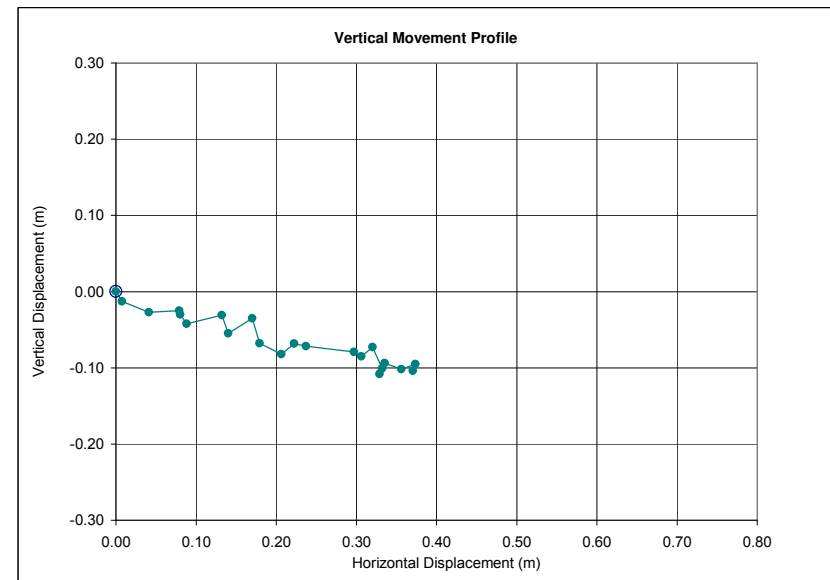
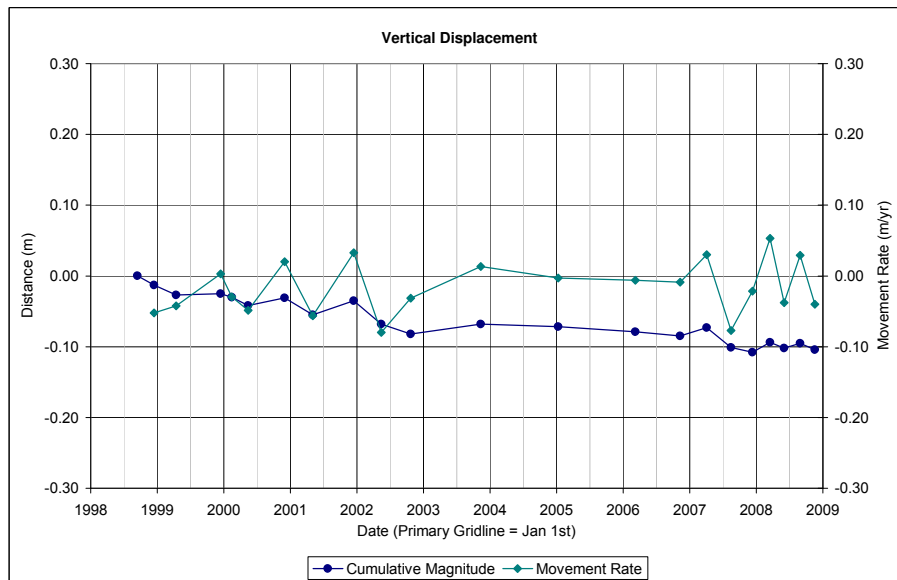
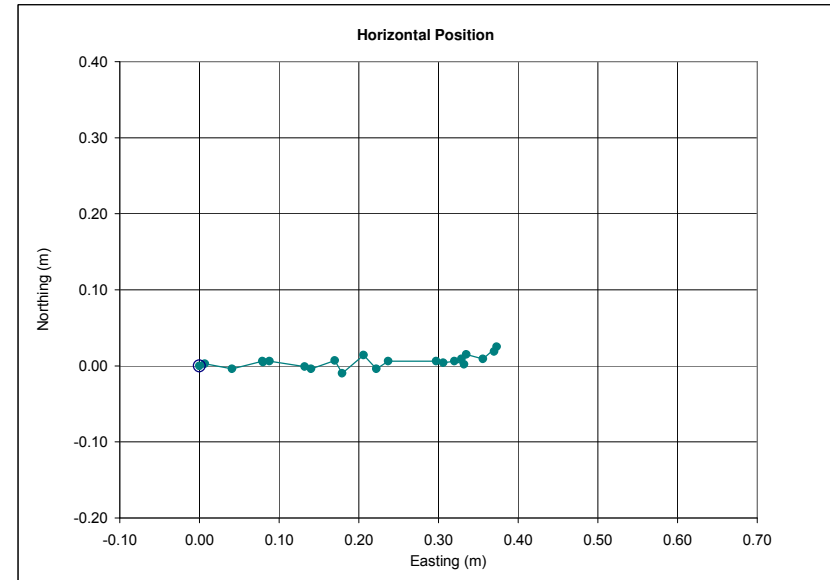
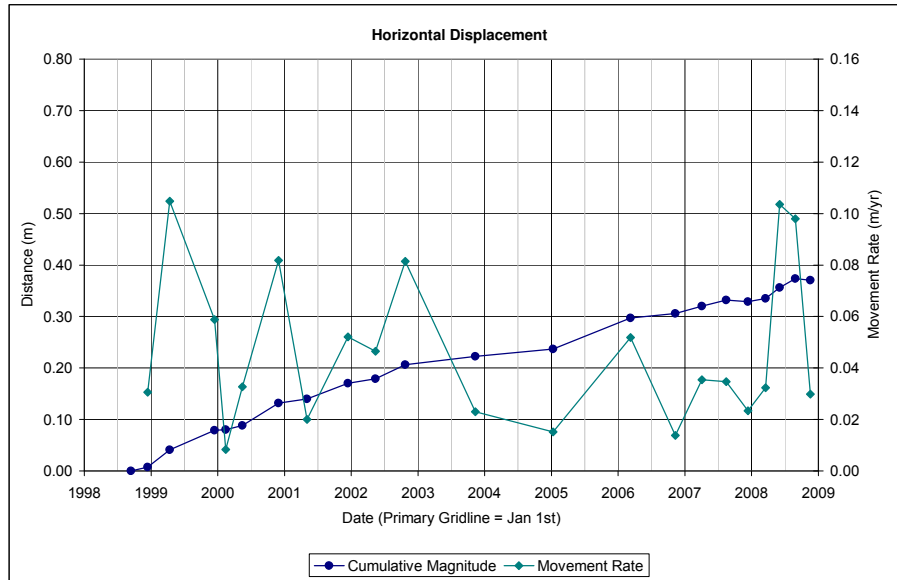
| Date       | Surveyed Position |            |         | Total Change in Position |        |        |                 |               |              |             | Overall Rates (m/yr) |                  | Incremental Change in Position |        |        |                 |               |              |             | Incremental Rates  |                  |
|------------|-------------------|------------|---------|--------------------------|--------|--------|-----------------|---------------|--------------|-------------|----------------------|------------------|--------------------------------|--------|--------|-----------------|---------------|--------------|-------------|--------------------|------------------|
|            | N<br>m            | E<br>m     | Z<br>m  | Time<br>yrs              | N<br>m | E<br>m | Horizontal<br>m | Vertical<br>m | Azimuth<br>° | Plunge<br>° | Horizontal<br>m/yr   | Vertical<br>m/yr | Time<br>yrs                    | N<br>m | E<br>m | Horizontal<br>m | Vertical<br>m | Azimuth<br>° | Plunge<br>° | Horizontal<br>m/yr | Vertical<br>m/yr |
| 9/15/1998  | 5870331.949       | 531626.829 | 557.171 | 0.00                     | 0.000  | 0.000  | 0.000           | 0.000         | 0.0          | 0.0         |                      |                  | 0.00                           | 0.000  | 0.000  | 0.000           | 0.000         | 0.0          | 0.0         |                    |                  |
| 12/15/1998 | 5870331.961       | 531626.828 | 557.163 | 0.25                     | 0.012  | -0.001 | 0.012           | -0.008        | 355.2        | -33.6       | 0.048                | -0.032           | 0.25                           | 0.012  | -0.001 | 0.012           | -0.008        | 355.2        | -33.6       | 0.048              | -0.032           |
| 4/15/1999  | 5870331.956       | 531626.856 | 557.150 | 0.58                     | 0.007  | 0.027  | 0.028           | -0.021        | 75.5         | -37.0       | 0.048                | -0.036           | 0.33                           | -0.005 | 0.028  | 0.028           | -0.013        | 100.1        | -24.6       | 0.086              | -0.039           |
| 12/15/1999 | 5870331.993       | 531626.885 | 557.160 | 1.25                     | 0.044  | 0.056  | 0.071           | -0.011        | 51.8         | -8.8        | 0.057                | -0.009           | 0.67                           | 0.037  | 0.029  | 0.047           | 0.010         | 38.1         | 12.0        | 0.070              | 0.015            |
| 2/15/2000  | 5870331.985       | 531626.884 | 557.159 | 1.42                     | 0.036  | 0.055  | 0.066           | -0.012        | 56.8         | -10.3       | 0.046                | -0.008           | 0.17                           | -0.008 | -0.001 | 0.008           | -0.001        | 187.1        | -7.1        | 0.047              | -0.006           |
| 5/15/2000  | 5870332.002       | 531626.898 | 557.136 | 1.66                     | 0.053  | 0.069  | 0.087           | -0.035        | 52.5         | -21.9       | 0.052                | -0.021           | 0.25                           | 0.017  | 0.014  | 0.022           | -0.023        | 39.5         | -46.2       | 0.089              | -0.093           |
| 11/30/2000 | 5870332.013       | 531626.939 | 557.146 | 2.21                     | 0.064  | 0.110  | 0.127           | -0.025        | 59.8         | -11.1       | 0.058                | -0.011           | 0.54                           | 0.011  | 0.041  | 0.042           | 0.010         | 75.0         | 13.3        | 0.078              | 0.018            |
| 5/5/2001   | 5870332.019       | 531626.936 | 557.100 | 2.64                     | 0.070  | 0.107  | 0.128           | -0.071        | 56.8         | -29.0       | 0.048                | -0.027           | 0.43                           | 0.006  | -0.003 | 0.007           | -0.046        | 333.4        | -81.7       | 0.016              | -0.108           |
| 12/15/2001 | 5870332.030       | 531626.959 | 557.116 | 3.25                     | 0.081  | 0.130  | 0.153           | -0.055        | 58.1         | -19.8       | 0.047                | -0.017           | 0.61                           | 0.011  | 0.023  | 0.025           | 0.016         | 64.4         | 32.1        | 0.042              | 0.026            |
| 5/15/2002  | 5870332.033       | 531626.988 | 557.090 | 3.66                     | 0.084  | 0.159  | 0.180           | -0.081        | 62.2         | -24.2       | 0.049                | -0.022           | 0.41                           | 0.003  | 0.029  | 0.029           | -0.026        | 84.1         | -41.7       | 0.071              | -0.063           |
| 10/24/2002 | 5870332.088       | 531626.998 | 557.052 | 4.11                     | 0.139  | 0.169  | 0.219           | -0.119        | 50.6         | -28.5       | 0.053                | -0.029           | 0.44                           | 0.055  | 0.010  | 0.056           | -0.038        | 10.3         | -34.2       | 0.126              | -0.086           |
| 11/12/2003 | 5870332.061       | 531627.004 | 557.107 | 5.16                     | 0.112  | 0.175  | 0.208           | -0.064        | 57.4         | -17.1       | 0.040                | -0.012           | 1.05                           | -0.027 | 0.006  | 0.028           | 0.055         | 167.8        | 63.4        | 0.026              | 0.052            |
| 1/11/2005  | 5870332.075       | 531627.010 | 557.093 | 6.32                     | 0.126  | 0.181  | 0.221           | -0.078        | 55.3         | -19.4       | 0.035                | -0.012           | 1.17                           | 0.014  | 0.006  | 0.015           | -0.014        | 24.9         | -42.4       | 0.013              | -0.012           |
| 3/10/2006  | 5870332.106       | 531627.061 | 557.062 | 7.48                     | 0.157  | 0.232  | 0.280           | -0.109        | 55.9         | -21.3       | 0.037                | -0.015           | 1.16                           | 0.031  | 0.051  | 0.060           | -0.031        | 58.4         | -27.7       | 0.052              | -0.027           |
| 11/10/2006 | 5870332.118       | 531627.074 | 557.057 | 8.15                     | 0.169  | 0.245  | 0.298           | -0.114        | 55.4         | -21.0       | 0.037                | -0.014           | 0.67                           | 0.012  | 0.013  | 0.018           | -0.005        | 47.3         | -15.8       | 0.026              | -0.007           |
| 4/5/2007   | 5870332.124       | 531627.076 | 557.049 | 8.55                     | 0.175  | 0.247  | 0.303           | -0.122        | 54.7         | -22.0       | 0.035                | -0.014           | 0.40                           | 0.006  | 0.002  | 0.006           | -0.008        | 18.4         | -51.7       | 0.016              | -0.020           |
| 8/16/2007  | 5870332.127       | 531627.086 | 557.039 | 8.92                     | 0.178  |        |                 |               |              |             |                      |                  |                                |        |        |                 |               |              |             |                    |                  |

# Displacement Graphs - Hub 98-04 Picard Place (Lane)



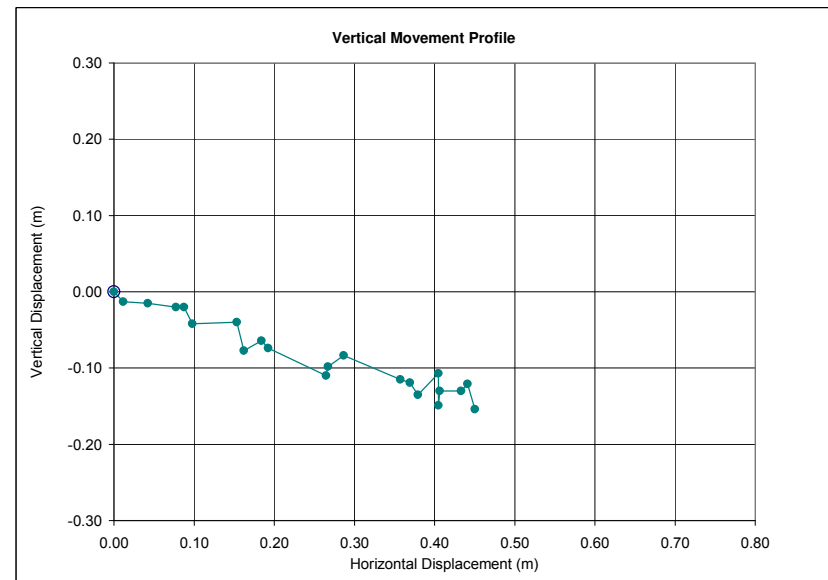
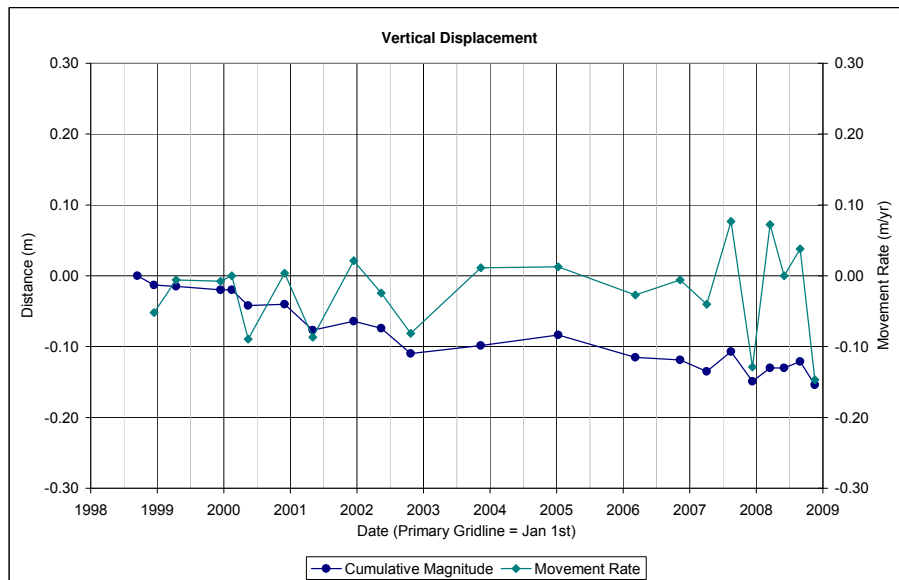
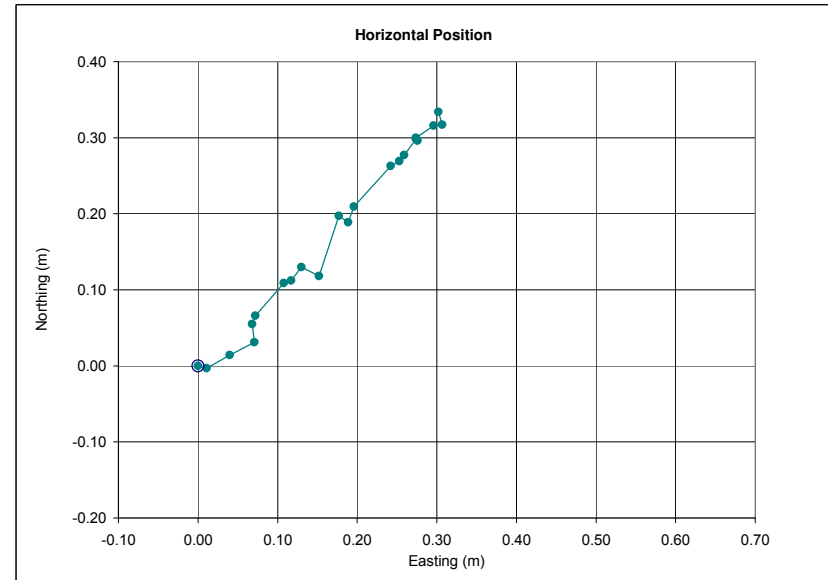
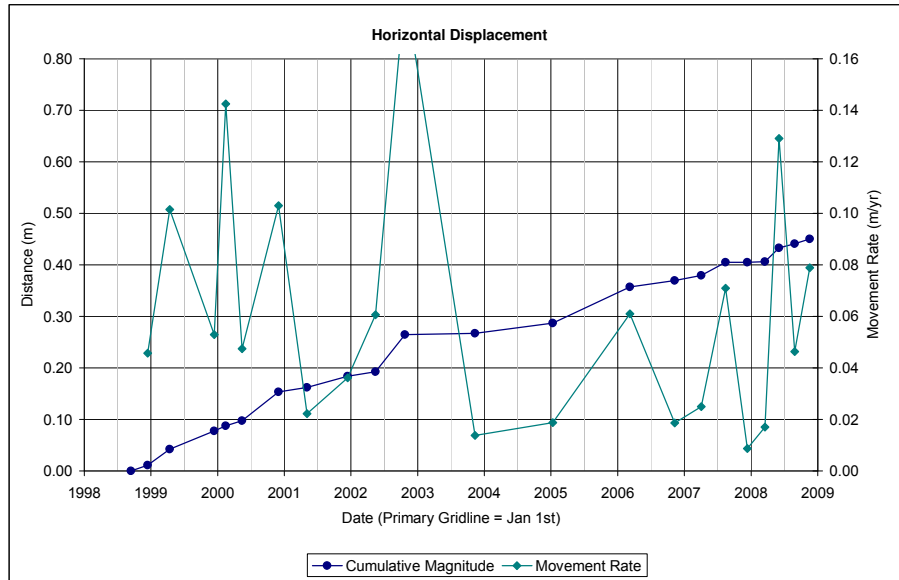
| Date       | Surveyed Position |            |         | Total Change in Position |        |        |                 |               |              |             | Overall Rates (m/yr) |                  | Incremental Change in Position |        |        |                 |               |              |             |                    | Incremental Rates |  |
|------------|-------------------|------------|---------|--------------------------|--------|--------|-----------------|---------------|--------------|-------------|----------------------|------------------|--------------------------------|--------|--------|-----------------|---------------|--------------|-------------|--------------------|-------------------|--|
|            | N<br>m            | E<br>m     | Z<br>m  | Time<br>yrs              | N<br>m | E<br>m | Horizontal<br>m | Vertical<br>m | Azimuth<br>° | Plunge<br>° | Horizontal<br>m/yr   | Vertical<br>m/yr | Time<br>yrs                    | N<br>m | E<br>m | Horizontal<br>m | Vertical<br>m | Azimuth<br>° | Plunge<br>° | Horizontal<br>m/yr | Vertical<br>m/yr  |  |
| 9/15/1998  | 5870180.442       | 531627.209 | 551.978 | 0.00                     | 0.000  | 0.000  | 0.000           | 0.000         | 0.0          | 0.0         |                      |                  | 0.00                           | 0.000  | 0.000  | 0.000           | 0.000         | 0.0          | 0.0         |                    |                   |  |
| 12/15/1998 | 5870180.445       | 531627.216 | 551.965 | 0.25                     | 0.003  | 0.007  | 0.008           | -0.013        | 66.8         | -59.6       | 0.031                | -0.052           | 0.25                           | 0.003  | 0.007  | 0.008           | -0.013        | 66.8         | -59.6       | 0.031              | -0.052            |  |
| 4/15/1999  | 5870180.438       | 531627.250 | 551.951 | 0.58                     | -0.004 | 0.041  | 0.041           | -0.027        | 95.6         | -33.2       | 0.071                | -0.047           | 0.33                           | -0.007 | 0.034  | 0.035           | -0.014        | 101.6        | -22.0       | 0.105              | -0.042            |  |
| 12/15/1999 | 5870180.448       | 531627.288 | 551.953 | 1.25                     | 0.006  | 0.079  | 0.079           | -0.025        | 85.7         | -17.5       | 0.063                | -0.020           | 0.67                           | 0.010  | 0.038  | 0.039           | 0.002         | 75.3         | 2.9         | 0.059              | 0.003             |  |
| 2/15/2000  | 5870180.447       | 531627.289 | 551.948 | 1.42                     | 0.005  | 0.080  | 0.080           | -0.030        | 86.4         | -20.5       | 0.057                | -0.021           | 0.17                           | -0.001 | 0.001  | 0.001           | -0.005        | 135.0        | -74.2       | 0.008              | -0.029            |  |
| 5/15/2000  | 5870180.448       | 531627.297 | 551.936 | 1.66                     | 0.006  | 0.088  | 0.088           | -0.042        | 86.1         | -25.5       | 0.053                | -0.025           | 0.25                           | 0.001  | 0.008  | 0.008           | -0.012        | 82.9         | -56.1       | 0.033              | -0.049            |  |
| 11/30/2000 | 5870180.441       | 531627.341 | 551.947 | 2.21                     | -0.001 | 0.132  | 0.132           | -0.031        | 90.4         | -13.2       | 0.060                | -0.014           | 0.54                           | -0.007 | 0.044  | 0.045           | 0.011         | 99.0         | 13.9        | 0.082              | 0.020             |  |
| 5/5/2001   | 5870180.438       | 531627.349 | 551.923 | 2.64                     | -0.004 | 0.140  | 0.140           | -0.055        | 91.6         | -21.4       | 0.053                | -0.021           | 0.43                           | -0.003 | 0.008  | 0.009           | -0.024        | 110.6        | -70.4       | 0.020              | -0.056            |  |
| 12/15/2001 | 5870180.449       | 531627.379 | 551.943 | 3.25                     | 0.007  | 0.170  | 0.170           | -0.035        | 87.6         | -11.6       | 0.052                | -0.011           | 0.61                           | 0.011  | 0.030  | 0.032           | 0.020         | 69.9         | 32.0        | 0.052              | 0.033             |  |
| 5/15/2002  | 5870180.432       | 531627.388 | 551.910 | 3.66                     | -0.010 | 0.179  | 0.179           | -0.068        | 93.2         | -20.8       | 0.049                | -0.019           | 0.41                           | -0.017 | 0.009  | 0.019           | -0.033        | 152.1        | -59.8       | 0.047              | -0.080            |  |
| 10/24/2002 | 5870180.456       | 531627.415 | 551.896 | 4.11                     | 0.014  | 0.206  | 0.206           | -0.082        | 86.1         | -21.7       | 0.050                | -0.020           | 0.44                           | 0.024  | 0.027  | 0.036           | -0.014        | 48.4         | -21.2       | 0.081              | -0.032            |  |
| 11/12/2003 | 5870180.438       | 531627.431 | 551.910 | 5.16                     | -0.004 | 0.222  | 0.222           | -0.068        | 91.0         | -17.0       | 0.043                | -0.013           | 1.05                           | -0.018 | 0.016  | 0.024           | 0.014         | 137.7        | 29.9        | 0.023              | 0.013             |  |
| 1/11/2005  | 5870180.448       | 531627.446 | 551.906 | 6.32                     | 0.006  | 0.237  | 0.237           | -0.072        | 88.5         | -16.8       | 0.037                | -0.011           | 1.17                           | 0.010  | 0.015  | 0.018           | -0.004        | 56.0         | -11.4       | 0.015              | -0.003            |  |
| 3/10/2006  | 5870180.448       | 531627.506 | 551.899 | 7.48                     | 0.006  | 0.297  | 0.297           | -0.079        | 88.8         | -14.9       | 0.040                | -0.011           | 1.16                           | 0.000  | 0.060  | 0.060           | -0.007        | 90.0         | -6.9        | 0.052              | -0.006            |  |
| 11/10/2006 | 5870180.446       | 531627.515 | 551.893 | 8.15                     | 0.004  | 0.306  | 0.306           | -0.085        | 89.3         | -15.5       | 0.038                | -0.010           | 0.67                           | -0.002 | 0.009  | 0.009           | -0.006        | 102.5        | -33.1       | 0.014              | -0.009            |  |
| 4/5/2007   | 5870180.448       | 531627.529 | 551.905 | 8.55                     | 0.006  | 0.320  | 0.320           | -0.073        | 88.9         | -12.8       | 0.037                | -0.009           | 0.40                           | 0.002  | 0.014  | 0.014           | 0.012         | 81.9         | 40.3        | 0.035              | 0.030             |  |
| 8/16/2007  | 5870180.444       | 531627.541 | 551.877 | 8.92                     | 0.002  |        |                 |               |              |             |                      |                  |                                |        |        |                 |               |              |             |                    |                   |  |

**Displacement Graphs - Hub 98-05**  
East of Dawson/Lewis Intersection



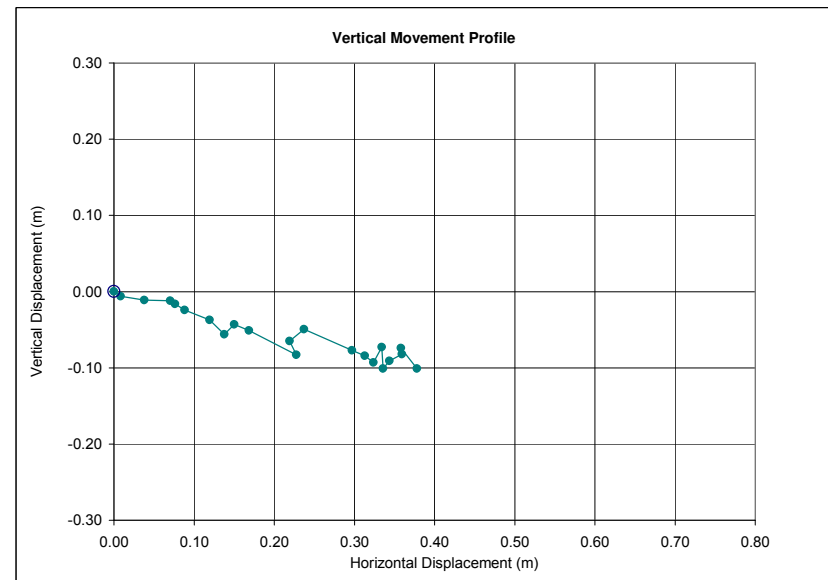
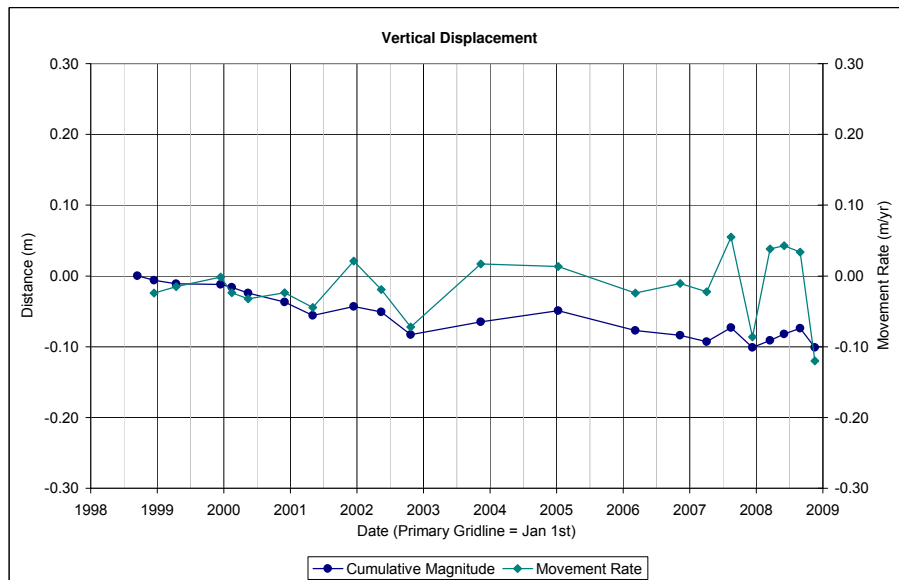
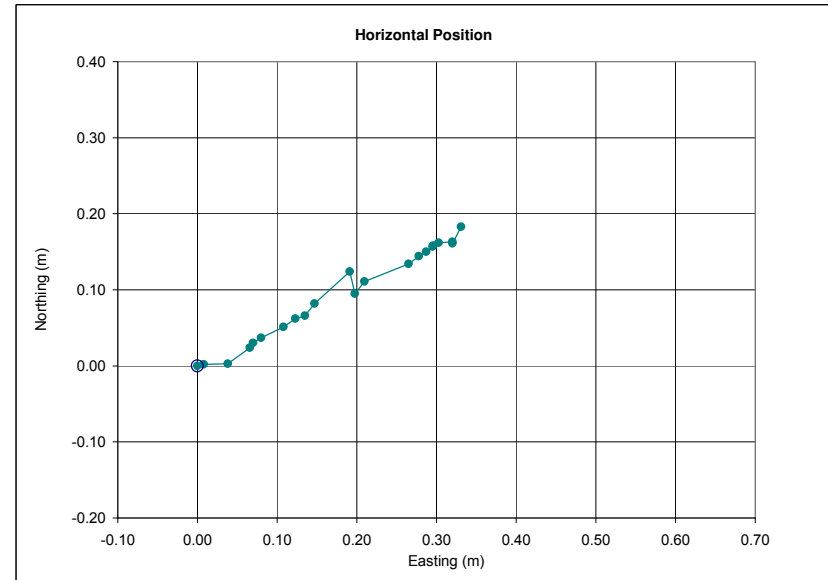
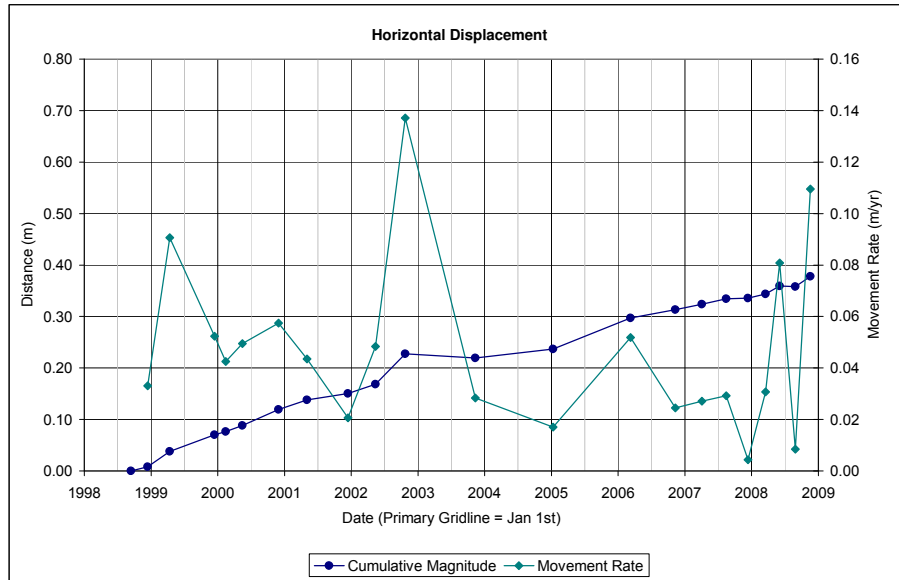
| Date       | Surveyed Position |            |         | Total Change in Position |        |        |                 |               |              |             | Overall Rates (m/yr) |                  | Incremental Change in Position |        |        |                 |               |              |             | Incremental Rates  |                  |
|------------|-------------------|------------|---------|--------------------------|--------|--------|-----------------|---------------|--------------|-------------|----------------------|------------------|--------------------------------|--------|--------|-----------------|---------------|--------------|-------------|--------------------|------------------|
|            | N<br>m            | E<br>m     | Z<br>m  | Time<br>yrs              | N<br>m | E<br>m | Horizontal<br>m | Vertical<br>m | Azimuth<br>° | Plunge<br>° | Horizontal<br>m/yr   | Vertical<br>m/yr | Time<br>yrs                    | N<br>m | E<br>m | Horizontal<br>m | Vertical<br>m | Azimuth<br>° | Plunge<br>° | Horizontal<br>m/yr | Vertical<br>m/yr |
| 9/15/1998  | 5870474.774       | 531664.168 | 539.628 | 0.00                     | 0.000  | 0.000  | 0.000           | 0.000         | 0.0          | 0.0         |                      |                  | 0.00                           | 0.000  | 0.000  | 0.000           | 0.000         | 0.0          | 0.0         |                    |                  |
| 12/15/1998 | 5870474.771       | 531664.179 | 539.615 | 0.25                     | -0.003 | 0.011  | 0.011           | -0.013        | 105.3        | -48.7       | 0.046                | -0.052           | 0.25                           | -0.003 | 0.011  | 0.011           | -0.013        | 105.3        | -48.7       | 0.046              | -0.052           |
| 4/15/1999  | 5870474.788       | 531664.208 | 539.613 | 0.58                     | 0.014  | 0.040  | 0.042           | -0.015        | 70.7         | -19.5       | 0.073                | -0.026           | 0.33                           | 0.017  | 0.029  | 0.034           | -0.002        | 59.6         | -3.4        | 0.101              | -0.006           |
| 12/15/1999 | 5870474.805       | 531664.239 | 539.608 | 1.25                     | 0.031  | 0.071  | 0.077           | -0.020        | 66.4         | -14.5       | 0.062                | -0.016           | 0.67                           | 0.017  | 0.031  | 0.035           | -0.005        | 61.3         | -8.0        | 0.053              | -0.007           |
| 2/15/2000  | 5870474.829       | 531664.236 | 539.608 | 1.42                     | 0.055  | 0.068  | 0.087           | -0.020        | 51.0         | -12.9       | 0.062                | -0.014           | 0.17                           | 0.024  | -0.003 | 0.024           | 0.000         | 352.9        | 0.0         | 0.142              | 0.000            |
| 5/15/2000  | 5870474.840       | 531664.240 | 539.586 | 1.66                     | 0.066  | 0.072  | 0.098           | -0.042        | 47.5         | -23.3       | 0.059                | -0.025           | 0.25                           | 0.011  | 0.004  | 0.012           | -0.022        | 20.0         | -62.0       | 0.048              | -0.089           |
| 11/30/2000 | 5870474.883       | 531664.276 | 539.588 | 2.21                     | 0.109  | 0.108  | 0.153           | -0.040        | 44.7         | -14.6       | 0.069                | -0.018           | 0.54                           | 0.043  | 0.036  | 0.056           | 0.002         | 39.9         | 2.0         | 0.103              | 0.004            |
| 5/5/2001   | 5870474.886       | 531664.285 | 539.551 | 2.64                     | 0.112  | 0.117  | 0.162           | -0.077        | 46.3         | -25.4       | 0.061                | -0.029           | 0.43                           | 0.003  | 0.009  | 0.009           | -0.037        | 71.6         | -75.6       | 0.022              | -0.087           |
| 12/15/2001 | 5870474.904       | 531664.298 | 539.564 | 3.25                     | 0.130  | 0.130  | 0.184           | -0.064        | 45.0         | -19.2       | 0.057                | -0.020           | 0.61                           | 0.018  | 0.013  | 0.022           | 0.013         | 35.8         | 30.3        | 0.036              | 0.021            |
| 5/15/2002  | 5870474.892       | 531664.320 | 539.554 | 3.66                     | 0.118  | 0.152  | 0.192           | -0.074        | 52.2         | -21.0       | 0.053                | -0.020           | 0.41                           | -0.012 | 0.022  | 0.025           | -0.010        | 118.6        | -21.8       | 0.061              | -0.024           |
| 10/24/2002 | 5870474.971       | 531664.345 | 539.518 | 4.11                     | 0.197  | 0.177  | 0.265           | -0.110        | 41.9         | -22.6       | 0.064                | -0.027           | 0.44                           | 0.079  | 0.025  | 0.083           | -0.036        | 17.6         | -23.5       | 0.187              | -0.081           |
| 11/12/2003 | 5870474.963       | 531664.357 | 539.530 | 5.16                     | 0.189  | 0.189  | 0.267           | -0.098        | 45.0         | -20.2       | 0.052                | -0.019           | 1.05                           | -0.008 | 0.012  | 0.014           | 0.012         | 125.2        | 38.8        | 0.014              | 0.011            |
| 1/11/2005  | 5870474.983       | 531664.364 | 539.544 | 6.32                     | 0.209  | 0.196  | 0.287           | -0.084        | 43.1         | -16.3       | 0.045                | -0.013           | 1.17                           | 0.021  | 0.007  | 0.022           | 0.015         | 18.8         | 34.0        | 0.019              | 0.013            |
| 3/10/2006  | 5870475.037       | 531664.410 | 539.513 | 7.48                     | 0.263  | 0.242  | 0.357           | -0.115        | 42.6         | -17.8       | 0.048                | -0.015           | 1.16                           | 0.054  | 0.046  | 0.071           | -0.031        | 40.7         | -23.9       | 0.061              | -0.027           |
| 11/10/2006 | 5870475.043       | 531664.421 | 539.509 | 8.15                     | 0.269  | 0.253  | 0.369           | -0.119        | 43.2         | -17.9       | 0.045                | -0.015           | 0.67                           | 0.006  | 0.011  | 0.013           | -0.004        | 61.4         | -17.7       | 0.019              | -0.006           |
| 4/5/2007   | 5870475.051       | 531664.427 | 539.493 | 8.55                     | 0.277  | 0.259  | 0.379           | -0.135        | 43.1         | -19.6       | 0.044                | -0.016           | 0.40                           | 0.008  | 0.006  | 0.010           | -0.016        | 36.9         | -58.0       | 0.025              | -0.040           |
| 8/16/2007  | 5870475.072       | 531664.442 | 539.521 | 8.92                     | 0.298  | 0.     |                 |               |              |             |                      |                  |                                |        |        |                 |               |              |             |                    |                  |

# Displacement Graphs - Hub 98-06 Paley West



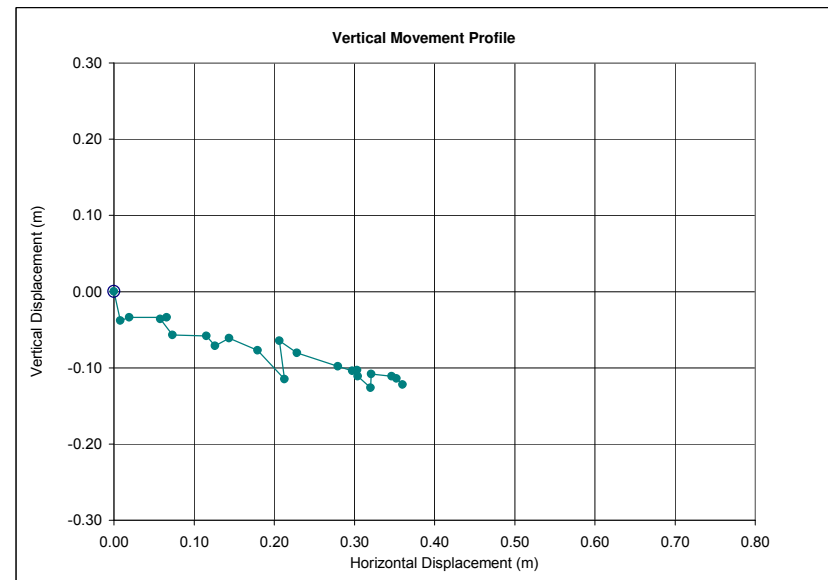
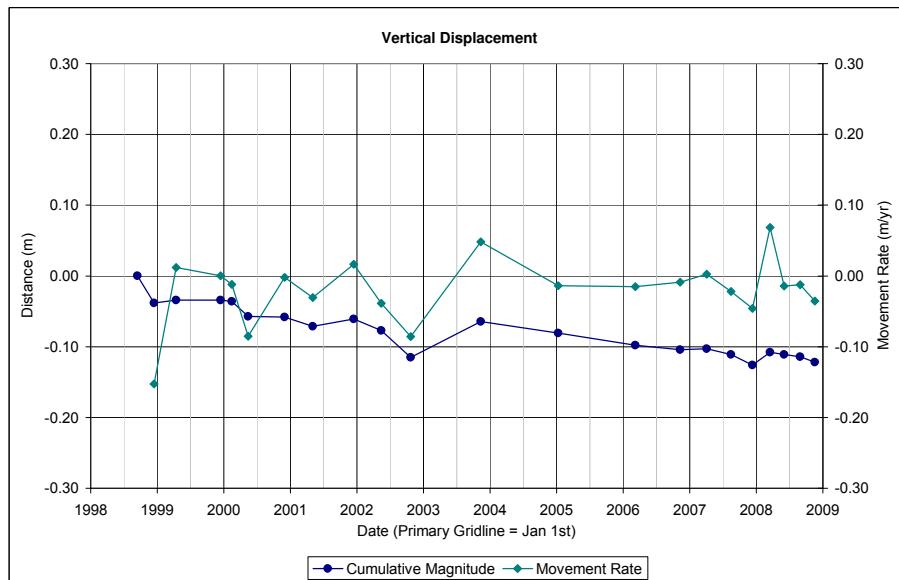
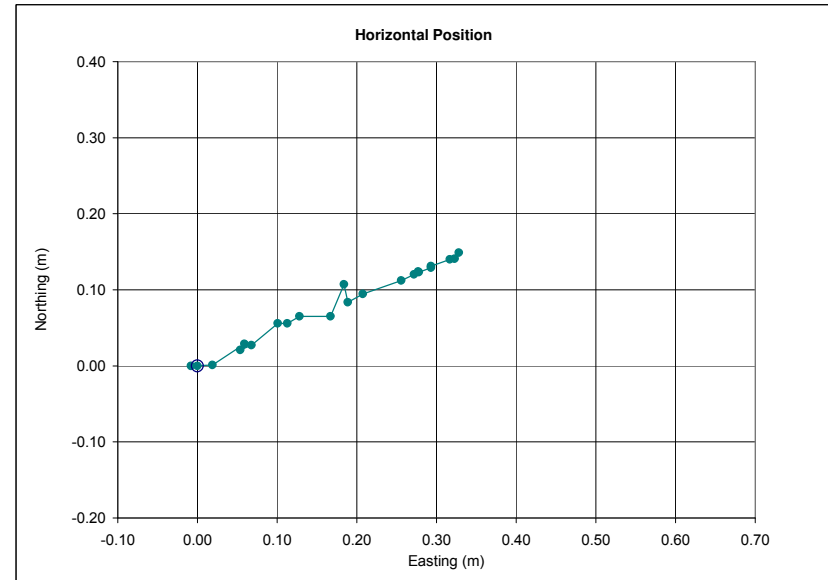
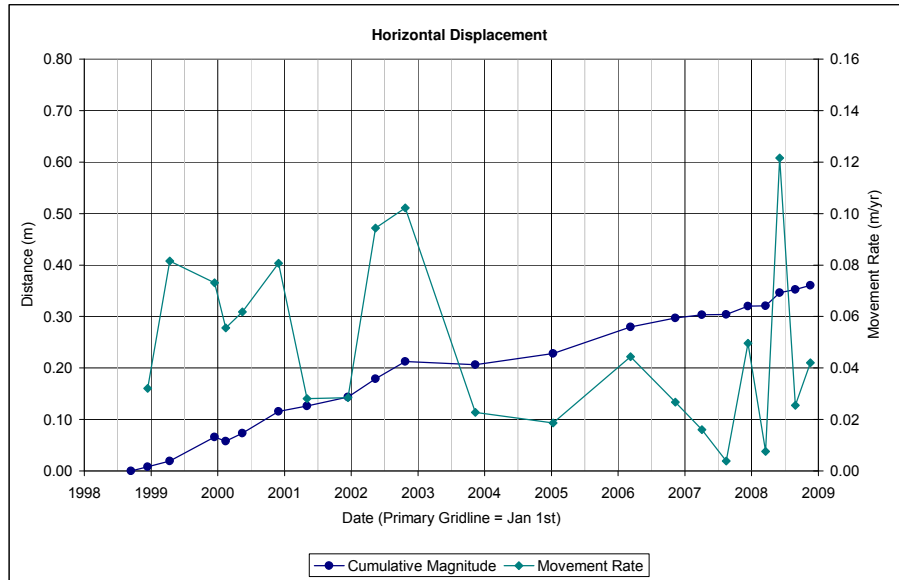
| Date       | Surveyed Position |            |         | Total Change in Position |        |        |                 |               |              |             | Overall Rates (m/yr) |                  | Incremental Change in Position |        |        |                 |               |              |             | Incremental Rates  |                  |
|------------|-------------------|------------|---------|--------------------------|--------|--------|-----------------|---------------|--------------|-------------|----------------------|------------------|--------------------------------|--------|--------|-----------------|---------------|--------------|-------------|--------------------|------------------|
|            | N<br>m            | E<br>m     | Z<br>m  | Time<br>yrs              | N<br>m | E<br>m | Horizontal<br>m | Vertical<br>m | Azimuth<br>° | Plunge<br>° | Horizontal<br>m/yr   | Vertical<br>m/yr | Time<br>yrs                    | N<br>m | E<br>m | Horizontal<br>m | Vertical<br>m | Azimuth<br>° | Plunge<br>° | Horizontal<br>m/yr | Vertical<br>m/yr |
| 9/15/1998  | 5870427.297       | 531932.241 | 533.473 | 0.00                     | 0.000  | 0.000  | 0.000           | 0.000         | 0.0          | 0.0         |                      |                  | 0.00                           | 0.000  | 0.000  | 0.000           | 0.000         | 0.0          | 0.0         |                    |                  |
| 12/15/1998 | 5870427.299       | 531932.249 | 533.467 | 0.25                     | 0.002  | 0.008  | 0.008           | -0.006        | 76.0         | -36.0       | 0.033                | -0.024           | 0.25                           | 0.002  | 0.008  | 0.008           | -0.006        | 76.0         | -36.0       | 0.033              | -0.024           |
| 4/15/1999  | 5870427.300       | 531932.279 | 533.462 | 0.58                     | 0.003  | 0.038  | 0.038           | -0.011        | 85.5         | -16.1       | 0.066                | -0.019           | 0.33                           | 0.001  | 0.030  | 0.030           | -0.005        | 88.1         | -9.5        | 0.091              | -0.015           |
| 12/15/1999 | 5870427.321       | 531932.307 | 533.461 | 1.25                     | 0.024  | 0.066  | 0.070           | -0.012        | 70.0         | -9.7        | 0.056                | -0.010           | 0.67                           | 0.021  | 0.028  | 0.035           | -0.001        | 53.1         | -1.6        | 0.052              | -0.001           |
| 2/15/2000  | 5870427.327       | 531932.311 | 533.457 | 1.42                     | 0.030  | 0.070  | 0.076           | -0.016        | 66.8         | -11.9       | 0.054                | -0.011           | 0.17                           | 0.006  | 0.004  | 0.007           | -0.004        | 33.7         | -29.0       | 0.042              | -0.024           |
| 5/15/2000  | 5870427.334       | 531932.321 | 533.449 | 1.66                     | 0.037  | 0.080  | 0.088           | -0.024        | 65.2         | -15.2       | 0.053                | -0.014           | 0.25                           | 0.007  | 0.010  | 0.012           | -0.008        | 55.0         | -33.2       | 0.050              | -0.032           |
| 11/30/2000 | 5870427.348       | 531932.349 | 533.436 | 2.21                     | 0.051  | 0.108  | 0.119           | -0.037        | 64.7         | -17.2       | 0.054                | -0.017           | 0.54                           | 0.014  | 0.028  | 0.031           | -0.013        | 63.4         | -22.6       | 0.057              | -0.024           |
| 5/5/2001   | 5870427.359       | 531932.364 | 533.417 | 2.64                     | 0.062  | 0.123  | 0.138           | -0.056        | 63.2         | -22.1       | 0.052                | -0.021           | 0.43                           | 0.011  | 0.015  | 0.019           | -0.019        | 53.7         | -45.6       | 0.044              | -0.044           |
| 12/15/2001 | 5870427.363       | 531932.376 | 533.430 | 3.25                     | 0.066  | 0.135  | 0.150           | -0.043        | 63.9         | -16.0       | 0.046                | -0.013           | 0.61                           | 0.004  | 0.012  | 0.013           | 0.013         | 71.6         | 45.8        | 0.021              | 0.021            |
| 5/15/2002  | 5870427.379       | 531932.388 | 533.422 | 3.66                     | 0.082  | 0.147  | 0.168           | -0.051        | 60.8         | -16.9       | 0.046                | -0.014           | 0.41                           | 0.016  | 0.012  | 0.020           | -0.008        | 36.9         | -21.8       | 0.048              | -0.019           |
| 10/24/2002 | 5870427.421       | 531932.432 | 533.390 | 4.11                     | 0.124  | 0.191  | 0.228           | -0.083        | 57.0         | -20.0       | 0.055                | -0.020           | 0.44                           | 0.042  | 0.044  | 0.061           | -0.032        | 46.3         | -27.7       | 0.137              | -0.072           |
| 11/12/2003 | 5870427.392       | 531932.439 | 533.408 | 5.16                     | 0.095  | 0.198  | 0.219           | -0.065        | 64.3         | -16.5       | 0.043                | -0.013           | 1.05                           | -0.029 | 0.007  | 0.030           | 0.018         | 167.1        | 31.3        | 0.028              | 0.017            |
| 1/11/2005  | 5870427.408       | 531932.451 | 533.424 | 6.32                     | 0.111  | 0.210  | 0.237           | -0.049        | 62.1         | -11.7       | 0.037                | -0.008           | 1.17                           | 0.016  | 0.012  | 0.020           | 0.016         | 37.0         | 38.4        | 0.017              | 0.014            |
| 3/10/2006  | 5870427.431       | 531932.506 | 533.396 | 7.48                     | 0.134  | 0.265  | 0.297           | -0.077        | 63.2         | -14.5       | 0.040                | -0.010           | 1.16                           | 0.023  | 0.055  | 0.060           | -0.028        | 67.4         | -24.9       | 0.052              | -0.024           |
| 11/10/2006 | 5870427.441       | 531932.519 | 533.389 | 8.15                     | 0.144  | 0.278  | 0.313           | -0.084        | 62.6         | -15.0       | 0.038                | -0.010           | 0.67                           | 0.010  | 0.013  | 0.016           | -0.007        | 52.4         | -23.1       | 0.024              | -0.010           |
| 4/5/2007   | 5870427.447       | 531932.528 | 533.380 | 8.55                     | 0.150  | 0.287  | 0.324           | -0.093        | 62.4         | -16.0       | 0.038                | -0.011           | 0.40                           | 0.006  | 0.009  | 0.011           | -0.009        | 56.3         | -39.8       | 0.027              | -0.023           |
| 8/16/2007  | 5870427.454       | 531932.536 | 533.400 | 8.92                     | 0.157  | 0.295  |                 |               |              |             |                      |                  |                                |        |        |                 |               |              |             |                    |                  |

Displacement Graphs - Hub 98-07  
Paley East



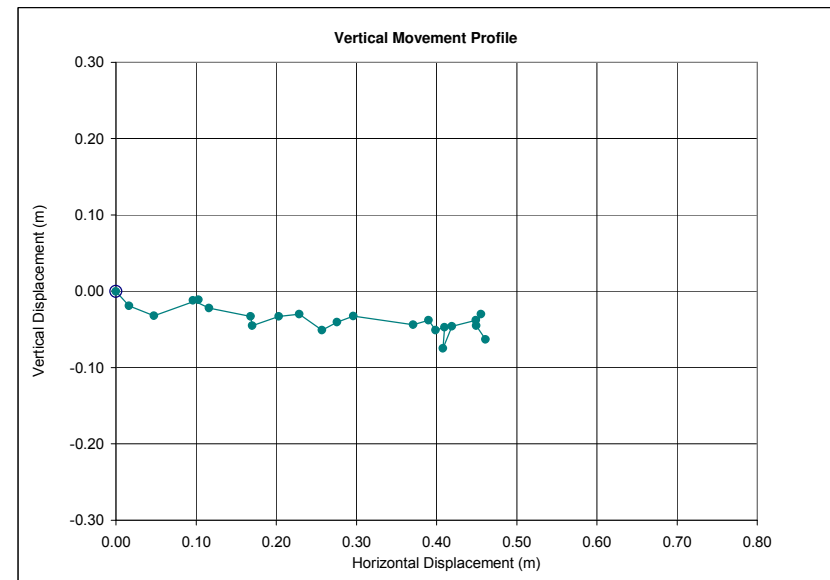
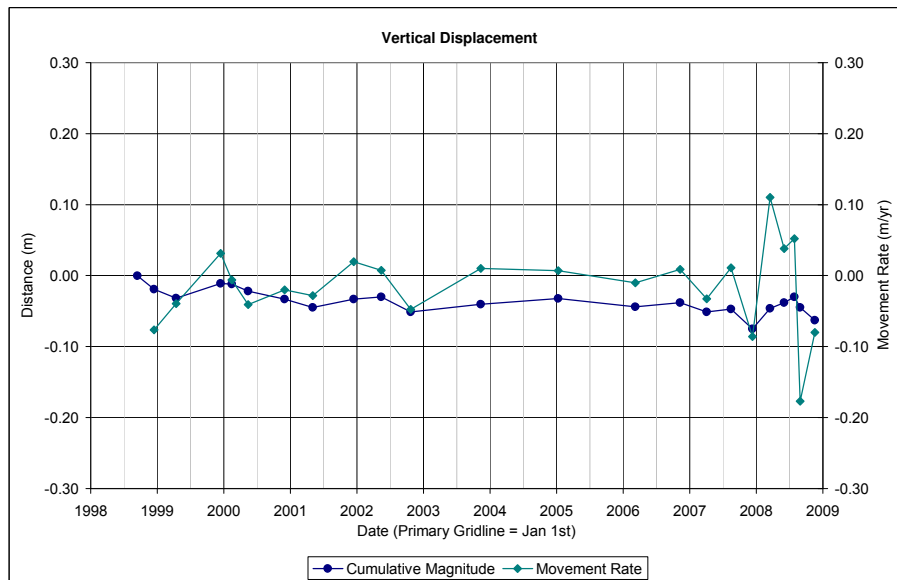
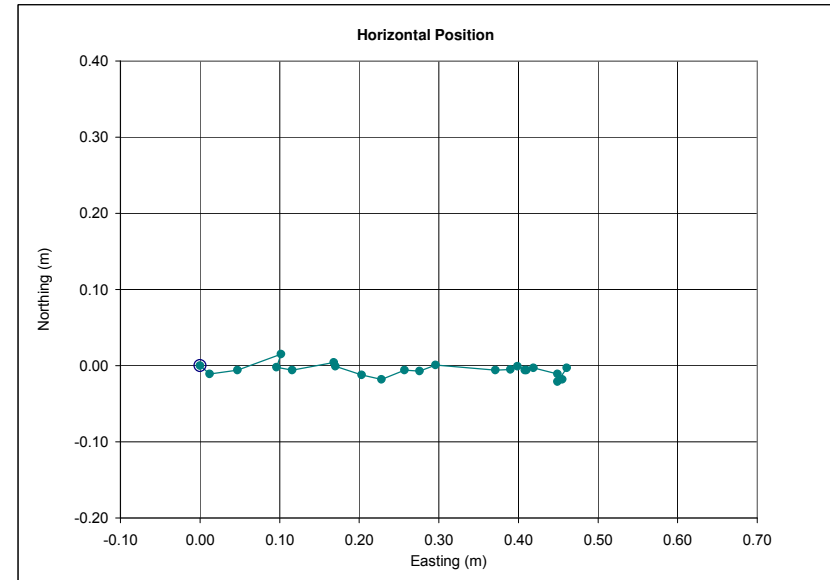
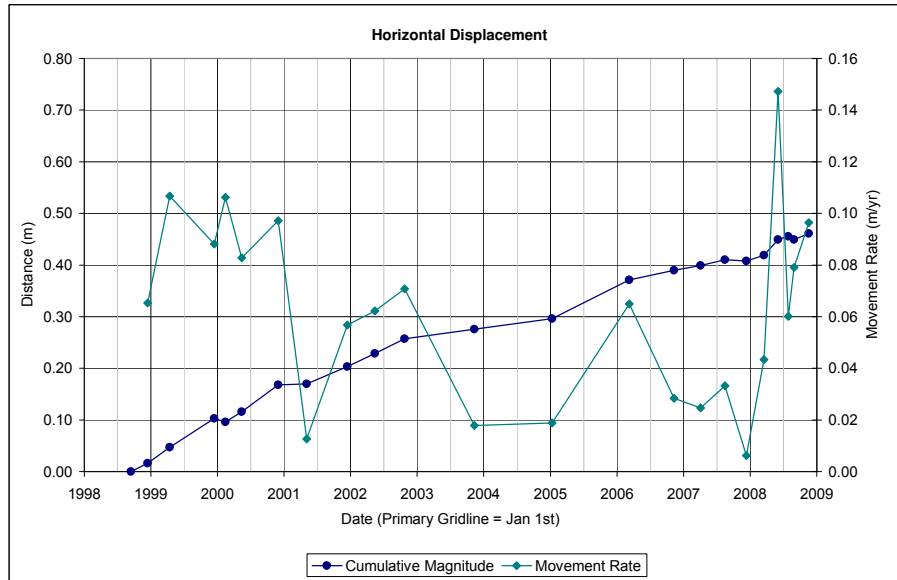
| Date       | Surveyed Position |            |         | Total Change in Position |        |        |                 |               |              |             | Overall Rates (m/yr) |                  | Incremental Change in Position |        |        |                 |               |              |             |                    | Incremental Rates |  |
|------------|-------------------|------------|---------|--------------------------|--------|--------|-----------------|---------------|--------------|-------------|----------------------|------------------|--------------------------------|--------|--------|-----------------|---------------|--------------|-------------|--------------------|-------------------|--|
|            | N<br>m            | E<br>m     | Z<br>m  | Time<br>yrs              | N<br>m | E<br>m | Horizontal<br>m | Vertical<br>m | Azimuth<br>° | Plunge<br>° | Horizontal<br>m/yr   | Vertical<br>m/yr | Time<br>yrs                    | N<br>m | E<br>m | Horizontal<br>m | Vertical<br>m | Azimuth<br>° | Plunge<br>° | Horizontal<br>m/yr | Vertical<br>m/yr  |  |
| 9/15/1998  | 5870328.580       | 531909.295 | 536.943 | 0.00                     | 0.000  | 0.000  | 0.000           | 0.000         | 0.0          | 0.0         |                      |                  | 0.00                           | 0.000  | 0.000  | 0.000           | 0.000         | 0.0          | 0.0         |                    |                   |  |
| 12/15/1998 | 5870328.580       | 531909.287 | 536.905 | 0.25                     | 0.000  | -0.008 | 0.008           | -0.038        | 270.0        | -78.1       | 0.032                | -0.153           | 0.25                           | 0.000  | -0.008 | 0.008           | -0.038        | 270.0        | -78.1       | 0.032              | -0.153            |  |
| 4/15/1999  | 5870328.581       | 531909.314 | 536.909 | 0.58                     | 0.001  | 0.019  | 0.019           | -0.034        | 87.0         | -60.8       | 0.033                | -0.059           | 0.33                           | 0.001  | 0.027  | 0.027           | 0.004         | 87.9         | 8.4         | 0.082              | 0.012             |  |
| 12/15/1999 | 5870328.609       | 531909.354 | 536.909 | 1.25                     | 0.029  | 0.059  | 0.066           | -0.034        | 63.8         | -27.3       | 0.053                | -0.027           | 0.67                           | 0.028  | 0.040  | 0.049           | 0.000         | 55.0         | 0.0         | 0.073              | 0.000             |  |
| 2/15/2000  | 5870328.601       | 531909.349 | 536.907 | 1.42                     | 0.021  | 0.054  | 0.058           | -0.036        | 68.7         | -31.9       | 0.041                | -0.025           | 0.17                           | -0.008 | -0.005 | 0.009           | -0.002        | 212.0        | -12.0       | 0.056              | -0.012            |  |
| 5/15/2000  | 5870328.607       | 531909.363 | 536.886 | 1.66                     | 0.027  | 0.068  | 0.073           | -0.057        | 68.3         | -37.9       | 0.044                | -0.034           | 0.25                           | 0.006  | 0.014  | 0.015           | -0.021        | 66.8         | -54.0       | 0.062              | -0.085            |  |
| 11/30/2000 | 5870328.636       | 531909.396 | 536.885 | 2.21                     | 0.056  | 0.101  | 0.115           | -0.058        | 61.0         | -26.7       | 0.052                | -0.026           | 0.54                           | 0.029  | 0.033  | 0.044           | -0.001        | 48.7         | -1.3        | 0.081              | -0.002            |  |
| 5/5/2001   | 5870328.636       | 531909.408 | 536.872 | 2.64                     | 0.056  | 0.113  | 0.126           | -0.071        | 63.6         | -29.4       | 0.048                | -0.027           | 0.43                           | 0.000  | 0.012  | 0.012           | -0.013        | 90.0         | -47.3       | 0.028              | -0.030            |  |
| 12/15/2001 | 5870328.645       | 531909.423 | 536.882 | 3.25                     | 0.065  | 0.128  | 0.144           | -0.061        | 63.1         | -23.0       | 0.044                | -0.019           | 0.61                           | 0.009  | 0.015  | 0.017           | 0.010         | 59.0         | 29.8        | 0.029              | 0.016             |  |
| 5/15/2002  | 5870328.645       | 531909.462 | 536.866 | 3.66                     | 0.065  | 0.167  | 0.179           | -0.077        | 68.7         | -23.3       | 0.049                | -0.021           | 0.41                           | 0.000  | 0.039  | 0.039           | -0.016        | 90.0         | -22.3       | 0.094              | -0.039            |  |
| 10/24/2002 | 5870328.687       | 531909.479 | 536.828 | 4.11                     | 0.107  | 0.184  | 0.213           | -0.115        | 59.8         | -28.4       | 0.052                | -0.028           | 0.44                           | 0.042  | 0.017  | 0.045           | -0.038        | 22.0         | -40.0       | 0.102              | -0.086            |  |
| 11/12/2003 | 5870328.664       | 531909.484 | 536.879 | 5.16                     | 0.084  | 0.189  | 0.206           | -0.064        | 66.1         | -17.3       | 0.040                | -0.012           | 1.05                           | -0.023 | 0.005  | 0.024           | 0.051         | 168.3        | 64.7        | 0.023              | 0.048             |  |
| 1/11/2005  | 5870328.674       | 531909.503 | 536.862 | 6.32                     | 0.094  | 0.208  | 0.228           | -0.081        | 65.6         | -19.5       | 0.036                | -0.013           | 1.17                           | 0.011  | 0.019  | 0.022           | -0.016        | 60.0         | -36.7       | 0.019              | -0.014            |  |
| 3/10/2006  | 5870328.692       | 531909.551 | 536.845 | 7.48                     | 0.112  | 0.256  | 0.279           | -0.098        | 66.4         | -19.3       | 0.037                | -0.013           | 1.16                           | 0.018  | 0.048  | 0.051           | -0.017        | 70.0         | -18.7       | 0.044              | -0.015            |  |
| 11/10/2006 | 5870328.700       | 531909.567 | 536.839 | 8.15                     | 0.120  | 0.272  | 0.297           | -0.104        | 66.2         | -19.3       | 0.036                | -0.013           | 0.67                           | 0.008  | 0.016  | 0.018           | -0.006        | 63.4         | -18.5       | 0.027              | -0.009            |  |
| 4/5/2007   | 5870328.704       | 531909.572 | 536.840 | 8.55                     | 0.124  | 0.277  | 0.303           | -0.103        | 65.9         | -18.7       | 0.035                | -0.012           | 0.40                           | 0.004  | 0.005  | 0.006           | 0.001         | 51.3         | 8.9         | 0.016              | 0.003             |  |
| 8/16/2007  | 5870328.703       | 531909.573 | 536.832 | 8.92                     | 0.123  | 0.2    |                 |               |              |             |                      |                  |                                |        |        |                 |               |              |             |                    |                   |  |

Displacement Graphs - Hub 98-08  
Picard Avenue



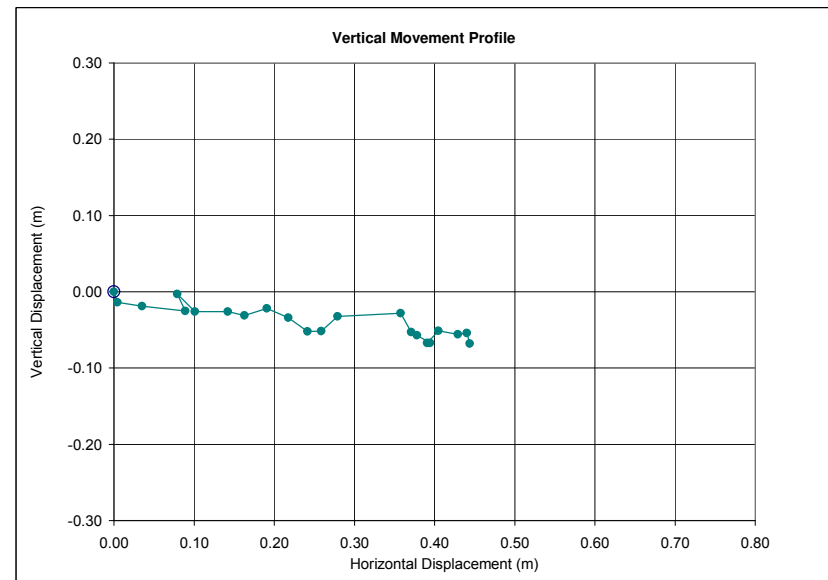
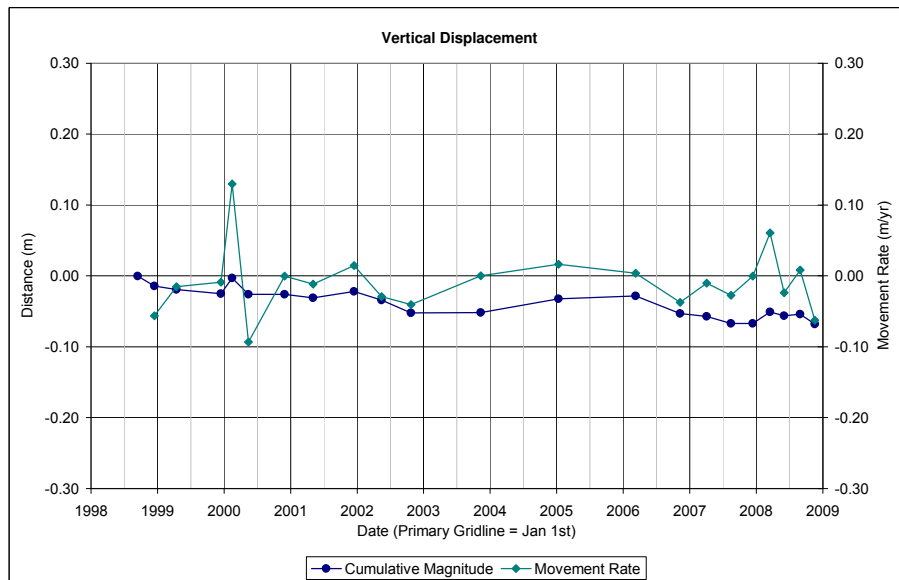
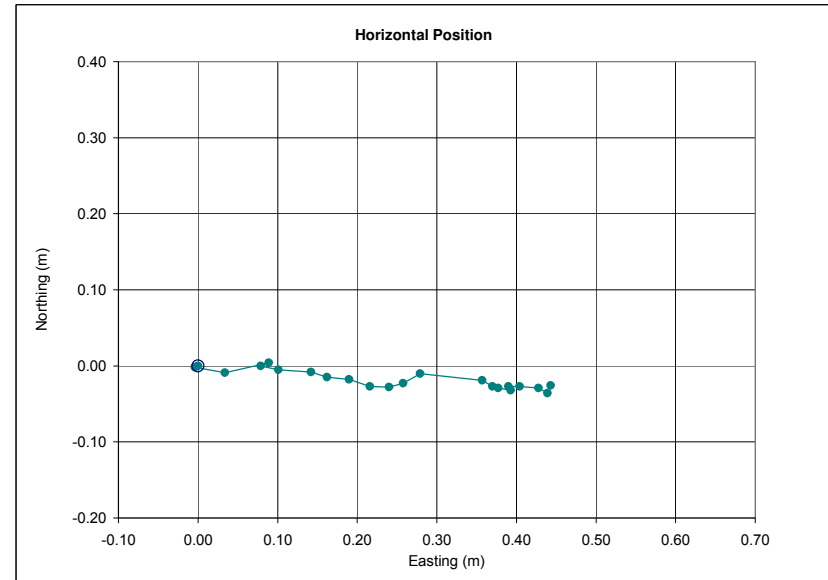
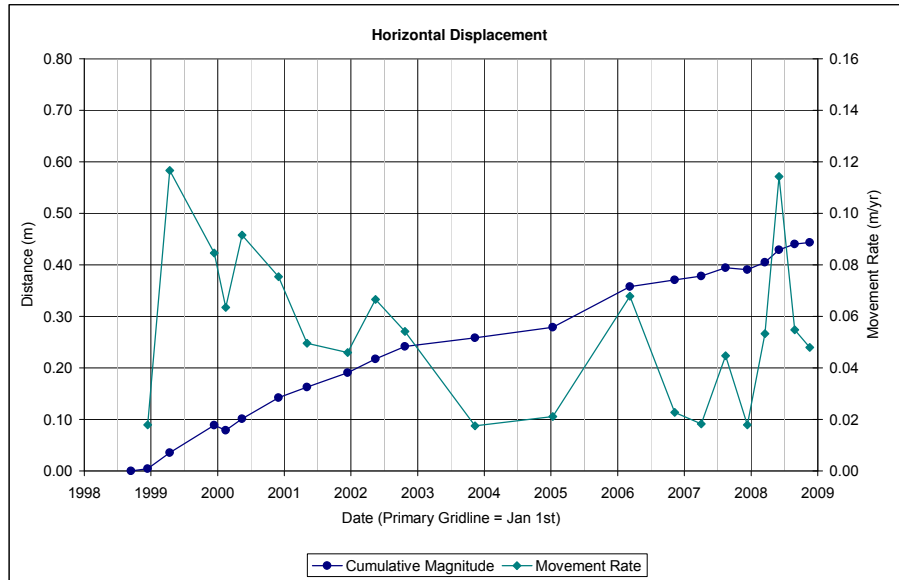
| Date       | Surveyed Position |            |         | Total Change in Position |        |        |                 |               |              |             | Overall Rates (m/yr) |                  | Incremental Change in Position |        |        |                 |               |              |             | Incremental Rates  |                  |
|------------|-------------------|------------|---------|--------------------------|--------|--------|-----------------|---------------|--------------|-------------|----------------------|------------------|--------------------------------|--------|--------|-----------------|---------------|--------------|-------------|--------------------|------------------|
|            | N<br>m            | E<br>m     | Z<br>m  | Time<br>yrs              | N<br>m | E<br>m | Horizontal<br>m | Vertical<br>m | Azimuth<br>° | Plunge<br>° | Horizontal<br>m/yr   | Vertical<br>m/yr | Time<br>yrs                    | N<br>m | E<br>m | Horizontal<br>m | Vertical<br>m | Azimuth<br>° | Plunge<br>° | Horizontal<br>m/yr | Vertical<br>m/yr |
| 9/15/1998  | 5870063.599       | 531714.863 | 549.785 | 0.00                     | 0.000  | 0.000  | 0.000           | 0.000         | 0.0          | 0.0         |                      |                  | 0.00                           | 0.000  | 0.000  | 0.000           | 0.000         | 0.0          | 0.0         |                    |                  |
| 12/15/1998 | 5870063.588       | 531714.875 | 549.766 | 0.25                     | -0.011 | 0.012  | 0.016           | -0.019        | 132.5        | -49.4       | 0.065                | -0.076           | 0.25                           | -0.011 | 0.012  | 0.016           | -0.019        | 132.5        | -49.4       | 0.065              | -0.076           |
| 4/15/1999  | 5870063.593       | 531714.910 | 549.753 | 0.58                     | -0.006 | 0.047  | 0.047           | -0.032        | 97.3         | -34.0       | 0.082                | -0.055           | 0.33                           | 0.005  | 0.035  | 0.035           | -0.013        | 81.9         | -20.2       | 0.107              | -0.039           |
| 12/15/1999 | 5870063.614       | 531714.965 | 549.774 | 1.25                     | 0.015  | 0.102  | 0.103           | -0.011        | 81.6         | -6.1        | 0.083                | -0.009           | 0.67                           | 0.021  | 0.055  | 0.059           | 0.021         | 69.1         | 19.6        | 0.088              | 0.031            |
| 2/15/2000  | 5870063.597       | 531714.959 | 549.773 | 1.42                     | -0.002 | 0.096  | 0.096           | -0.012        | 91.2         | -7.1        | 0.068                | -0.008           | 0.17                           | -0.017 | -0.006 | 0.018           | -0.001        | 199.4        | -3.2        | 0.106              | -0.006           |
| 5/15/2000  | 5870063.593       | 531714.979 | 549.763 | 1.66                     | -0.006 | 0.116  | 0.116           | -0.022        | 93.0         | -10.7       | 0.070                | -0.013           | 0.25                           | -0.004 | 0.020  | 0.020           | -0.010        | 101.3        | -26.1       | 0.083              | -0.041           |
| 11/30/2000 | 5870063.603       | 531715.031 | 549.752 | 2.21                     | 0.004  | 0.168  | 0.168           | -0.033        | 88.6         | -11.1       | 0.076                | -0.015           | 0.54                           | 0.010  | 0.052  | 0.053           | -0.011        | 79.1         | -11.7       | 0.097              | -0.020           |
| 5/5/2001   | 5870063.598       | 531715.033 | 549.740 | 2.64                     | -0.001 | 0.170  | 0.170           | -0.045        | 90.3         | -14.8       | 0.064                | -0.017           | 0.43                           | -0.005 | 0.002  | 0.005           | -0.012        | 158.2        | -65.8       | 0.013              | -0.028           |
| 12/15/2001 | 5870063.587       | 531715.066 | 549.752 | 3.25                     | -0.012 | 0.203  | 0.203           | -0.033        | 93.4         | -9.2        | 0.063                | -0.010           | 0.61                           | -0.011 | 0.033  | 0.035           | 0.012         | 108.4        | 19.0        | 0.057              | 0.020            |
| 5/15/2002  | 5870063.581       | 531715.091 | 549.755 | 3.66                     | -0.018 | 0.228  | 0.229           | -0.030        | 94.5         | -7.5        | 0.062                | -0.008           | 0.41                           | -0.006 | 0.025  | 0.026           | 0.003         | 103.5        | 6.7         | 0.062              | 0.007            |
| 10/24/2002 | 5870063.593       | 531715.120 | 549.734 | 4.11                     | -0.006 | 0.257  | 0.257           | -0.051        | 91.3         | -11.2       | 0.063                | -0.012           | 0.44                           | 0.012  | 0.029  | 0.031           | -0.021        | 67.5         | -33.8       | 0.071              | -0.047           |
| 11/12/2003 | 5870063.592       | 531715.139 | 549.745 | 5.16                     | -0.007 | 0.276  | 0.276           | -0.040        | 91.5         | -8.3        | 0.053                | -0.008           | 1.05                           | -0.001 | 0.019  | 0.019           | 0.011         | 93.3         | 29.4        | 0.018              | 0.010            |
| 1/11/2005  | 5870063.600       | 531715.159 | 549.753 | 6.32                     | 0.001  | 0.296  | 0.296           | -0.032        | 89.8         | -6.2        | 0.047                | -0.005           | 1.17                           | 0.008  | 0.020  | 0.022           | 0.008         | 68.6         | 20.1        | 0.019              | 0.007            |
| 3/10/2006  | 5870063.593       | 531715.234 | 549.741 | 7.48                     | -0.006 | 0.371  | 0.371           | -0.044        | 90.9         | -6.8        | 0.050                | -0.006           | 1.16                           | -0.007 | 0.075  | 0.075           | -0.012        | 95.3         | -8.8        | 0.065              | -0.010           |
| 11/10/2006 | 5870063.594       | 531715.253 | 549.747 | 8.15                     | -0.005 | 0.390  | 0.390           | -0.038        | 90.7         | -5.6        | 0.048                | -0.005           | 0.67                           | 0.001  | 0.019  | 0.019           | 0.006         | 87.0         | 17.5        | 0.028              | 0.009            |
| 4/5/2007   | 5870063.598       | 531715.262 | 549.734 | 8.55                     | -0.001 | 0.399  | 0.399           | -0.051        | 90.1         | -7.3        | 0.047                | -0.006           | 0.40                           | 0.004  | 0.009  | 0.010           | -0.013        | 66.0         | -52.9       | 0.025              | -0.033           |
| 8/16/2007  | 5870063.593       | 531715.273 | 549.738 | 8.92                     | -0.006 | 0.410  |                 |               |              |             |                      |                  |                                |        |        |                 |               |              |             |                    |                  |

**Displacement Graphs - Hub 98-09**  
Lane between Patchett/Pierce



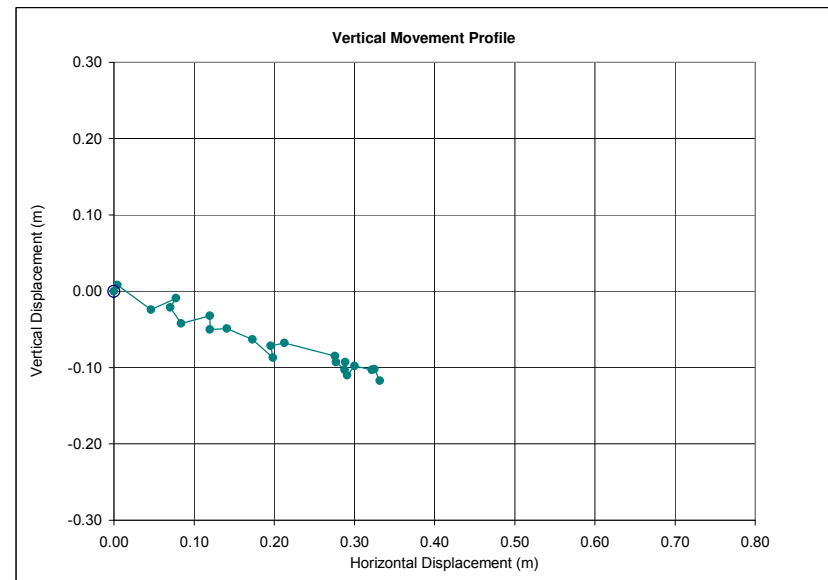
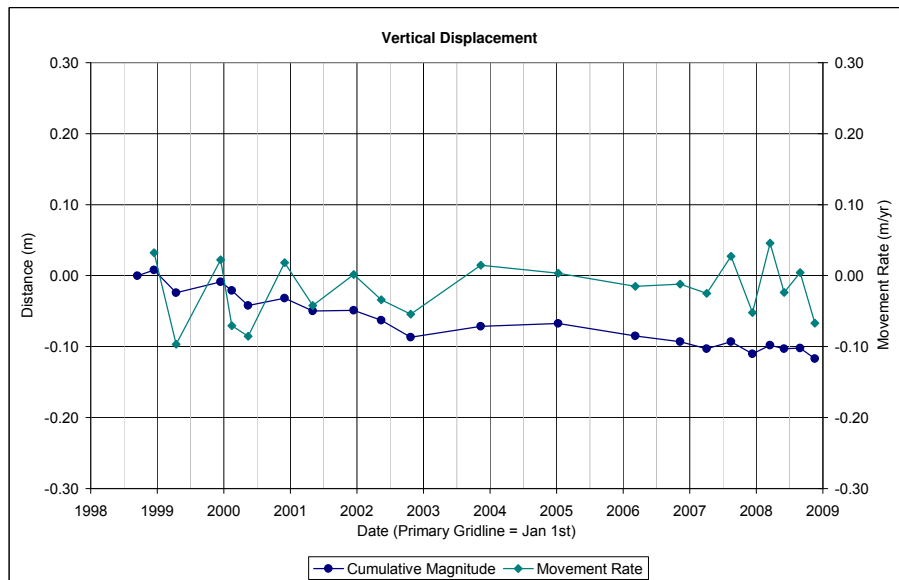
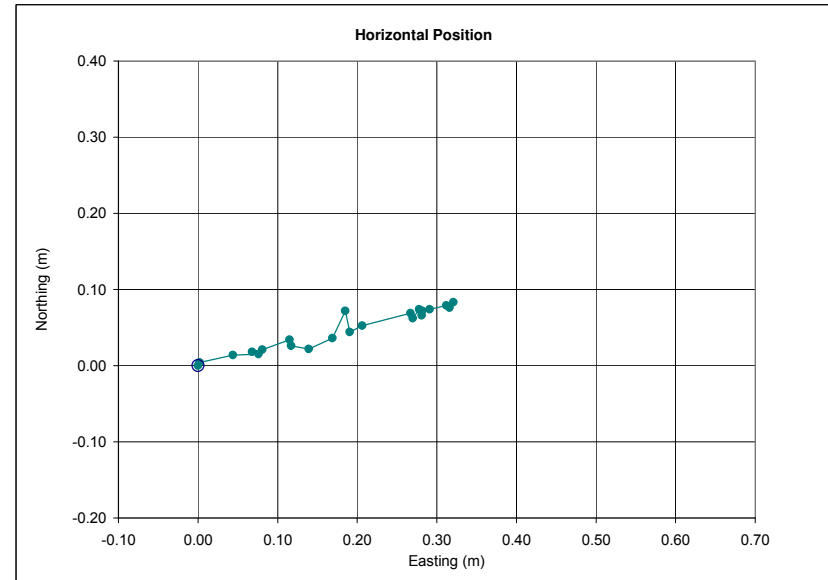
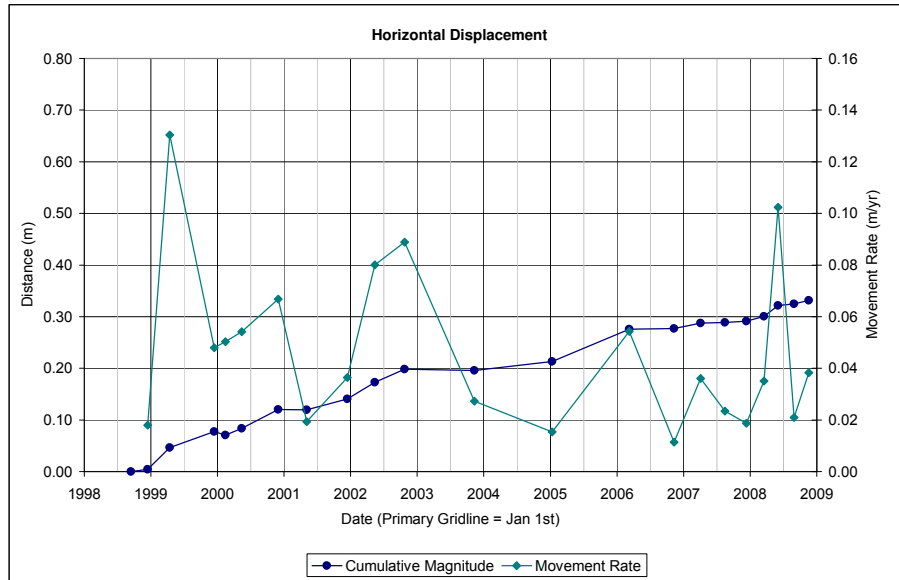
| Date       | Surveyed Position |            |         | Total Change in Position |        |        |                 |               |              |             | Overall Rates (m/yr) |                  | Incremental Change in Position |        |        |                 |               |              |             |                    | Incremental Rates |  |
|------------|-------------------|------------|---------|--------------------------|--------|--------|-----------------|---------------|--------------|-------------|----------------------|------------------|--------------------------------|--------|--------|-----------------|---------------|--------------|-------------|--------------------|-------------------|--|
|            | N<br>m            | E<br>m     | Z<br>m  | Time<br>yrs              | N<br>m | E<br>m | Horizontal<br>m | Vertical<br>m | Azimuth<br>° | Plunge<br>° | Horizontal<br>m/yr   | Vertical<br>m/yr | Time<br>yrs                    | N<br>m | E<br>m | Horizontal<br>m | Vertical<br>m | Azimuth<br>° | Plunge<br>° | Horizontal<br>m/yr | Vertical<br>m/yr  |  |
| 9/15/1998  | 5870067.437       | 531986.027 | 531.224 | 0.00                     | 0.000  | 0.000  | 0.000           | 0.000         | 0.0          | 0.0         |                      |                  | 0.00                           | 0.000  | 0.000  | 0.000           | 0.000         | 0.0          | 0.0         |                    |                   |  |
| 12/15/1998 | 5870067.435       | 531986.023 | 531.210 | 0.25                     | -0.002 | -0.004 | 0.004           | -0.014        | 243.4        | -72.3       | 0.018                | -0.056           | 0.25                           | -0.002 | -0.004 | 0.004           | -0.014        | 243.4        | -72.3       | 0.018              | -0.056            |  |
| 4/15/1999  | 5870067.428       | 531986.061 | 531.205 | 0.58                     | -0.009 | 0.034  | 0.035           | -0.019        | 104.8        | -28.4       | 0.061                | -0.033           | 0.33                           | -0.007 | 0.038  | 0.039           | -0.005        | 100.4        | -7.4        | 0.117              | -0.015            |  |
| 12/15/1999 | 5870067.441       | 531986.116 | 531.199 | 1.25                     | 0.004  | 0.089  | 0.089           | -0.025        | 87.4         | -15.7       | 0.071                | -0.020           | 0.67                           | 0.013  | 0.055  | 0.057           | -0.006        | 76.7         | -6.1        | 0.085              | -0.009            |  |
| 2/15/2000  | 5870067.437       | 531986.106 | 531.221 | 1.42                     | 0.000  | 0.079  | 0.079           | -0.003        | 90.0         | -2.2        | 0.056                | -0.002           | 0.17                           | -0.004 | -0.010 | 0.011           | 0.022         | 248.2        | 63.9        | 0.063              | 0.130             |  |
| 5/15/2000  | 5870067.432       | 531986.128 | 531.198 | 1.66                     | -0.005 | 0.101  | 0.101           | -0.026        | 92.8         | -14.4       | 0.061                | -0.016           | 0.25                           | -0.005 | 0.022  | 0.023           | -0.023        | 102.8        | -45.6       | 0.092              | -0.093            |  |
| 11/30/2000 | 5870067.429       | 531986.169 | 531.198 | 2.21                     | -0.008 | 0.142  | 0.142           | -0.026        | 93.2         | -10.4       | 0.064                | -0.012           | 0.54                           | -0.003 | 0.041  | 0.041           | 0.000         | 94.2         | 0.0         | 0.075              | 0.000             |  |
| 5/5/2001   | 5870067.422       | 531986.189 | 531.193 | 2.64                     | -0.015 | 0.162  | 0.163           | -0.031        | 95.3         | -10.8       | 0.062                | -0.012           | 0.43                           | -0.007 | 0.020  | 0.021           | -0.005        | 109.3        | -13.3       | 0.050              | -0.012            |  |
| 12/15/2001 | 5870067.419       | 531986.217 | 531.202 | 3.25                     | -0.018 | 0.190  | 0.191           | -0.022        | 95.4         | -6.6        | 0.059                | -0.007           | 0.61                           | -0.003 | 0.028  | 0.028           | 0.009         | 96.1         | 17.7        | 0.046              | 0.015             |  |
| 5/15/2002  | 5870067.410       | 531986.243 | 531.190 | 3.66                     | -0.027 | 0.216  | 0.218           | -0.034        | 97.1         | -8.9        | 0.059                | -0.009           | 0.41                           | -0.009 | 0.026  | 0.028           | -0.012        | 109.1        | -23.6       | 0.067              | -0.029            |  |
| 10/24/2002 | 5870067.409       | 531986.267 | 531.172 | 4.11                     | -0.028 | 0.240  | 0.242           | -0.052        | 96.7         | -12.1       | 0.059                | -0.013           | 0.44                           | -0.001 | 0.024  | 0.024           | -0.018        | 92.4         | -36.8       | 0.054              | -0.041            |  |
| 11/12/2003 | 5870067.414       | 531986.285 | 531.172 | 5.16                     | -0.023 | 0.258  | 0.259           | -0.052        | 95.1         | -11.3       | 0.050                | -0.010           | 1.05                           | 0.005  | 0.018  | 0.018           | 0.000         | 73.5         | 0.6         | 0.018              | 0.000             |  |
| 1/11/2005  | 5870067.427       | 531986.306 | 531.192 | 6.32                     | -0.010 | 0.279  | 0.279           | -0.032        | 92.1         | -6.6        | 0.044                | -0.005           | 1.17                           | 0.012  | 0.021  | 0.025           | 0.019         | 59.8         | 38.3        | 0.021              | 0.017             |  |
| 3/10/2006  | 5870067.418       | 531986.384 | 531.196 | 7.48                     | -0.019 | 0.357  | 0.358           | -0.028        | 93.0         | -4.5        | 0.048                | -0.004           | 1.16                           | -0.009 | 0.078  | 0.079           | 0.004         | 96.3         | 3.2         | 0.068              | 0.004             |  |
| 11/10/2006 | 5870067.410       | 531986.397 | 531.171 | 8.15                     | -0.027 | 0.370  | 0.371           | -0.053        | 94.2         | -8.1        | 0.046                | -0.007           | 0.67                           | -0.008 | 0.013  | 0.015           | -0.025        | 121.6        | -58.6       | 0.023              | -0.037            |  |
| 4/5/2007   | 5870067.408       | 531986.404 | 531.167 | 8.55                     | -0.029 | 0.377  | 0.378           | -0.057        | 94.4         | -8.6        | 0.044                | -0.007           | 0.40                           | -0.002 | 0.007  | 0.007           | -0.004        | 105.9        | -28.8       | 0.018              | -0.010            |  |
| 8/16/2007  | 5870067.405       | 531986.420 | 531.157 | 8.92                     | -0.032 | 0.393  |                 |               |              |             |                      |                  |                                |        |        |                 |               |              |             |                    |                   |  |

# Displacement Graphs - Hub 98-14 Pentland/Flamingo Intersection



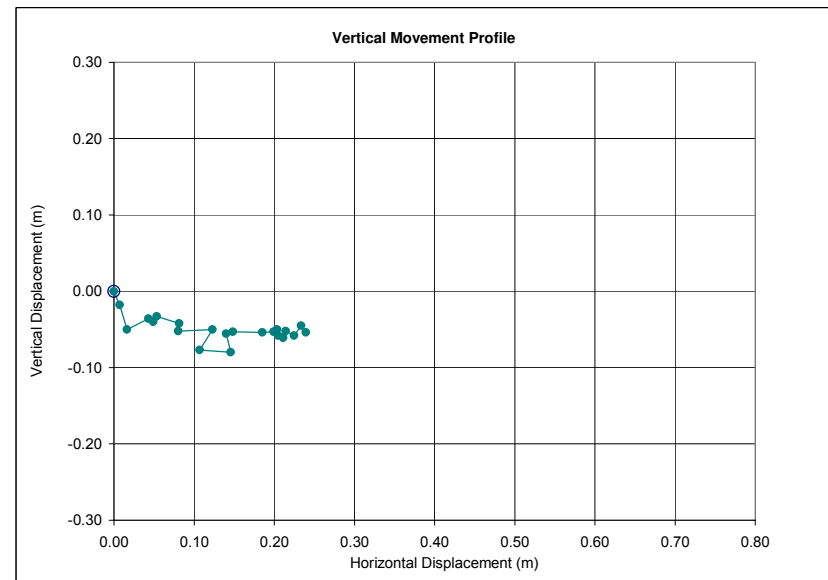
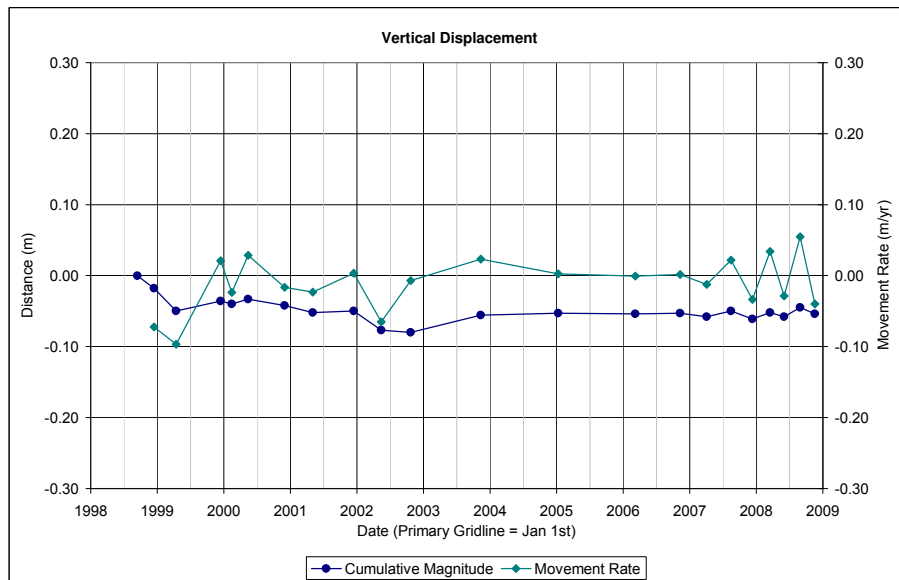
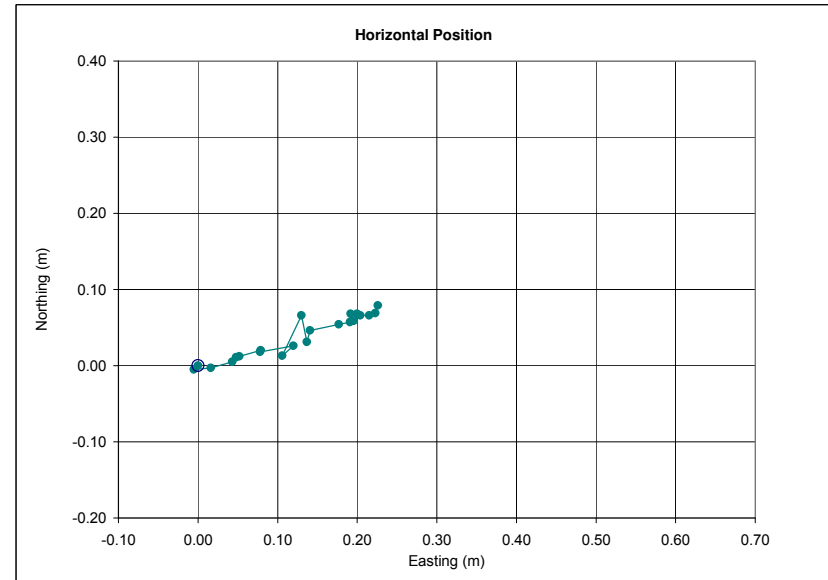
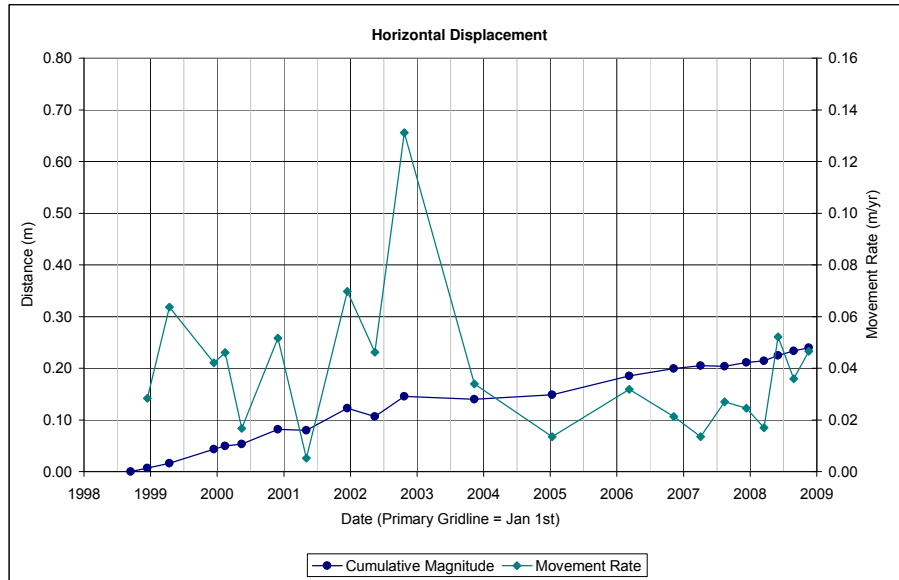
| Date       | Surveyed Position |            |         | Total Change in Position |        |        |                 |               |              |             | Overall Rates (m/yr) |                  | Incremental Change in Position |        |        |                 |               |              |             | Incremental Rates  |                  |
|------------|-------------------|------------|---------|--------------------------|--------|--------|-----------------|---------------|--------------|-------------|----------------------|------------------|--------------------------------|--------|--------|-----------------|---------------|--------------|-------------|--------------------|------------------|
|            | N<br>m            | E<br>m     | Z<br>m  | Time<br>yrs              | N<br>m | E<br>m | Horizontal<br>m | Vertical<br>m | Azimuth<br>° | Plunge<br>° | Horizontal<br>m/yr   | Vertical<br>m/yr | Time<br>yrs                    | N<br>m | E<br>m | Horizontal<br>m | Vertical<br>m | Azimuth<br>° | Plunge<br>° | Horizontal<br>m/yr | Vertical<br>m/yr |
| 9/15/1998  | 5870275.888       | 532052.513 | 524.385 | 0.00                     | 0.000  | 0.000  | 0.000           | 0.000         | 0.0          | 0.0         |                      |                  | 0.00                           | 0.000  | 0.000  | 0.000           | 0.000         | 0.0          | 0.0         |                    |                  |
| 12/15/1998 | 5870275.892       | 532052.515 | 524.393 | 0.25                     | 0.004  | 0.002  | 0.004           | 0.008         | 26.6         | 60.8        | 0.018                | 0.032            | 0.25                           | 0.004  | 0.002  | 0.004           | 0.008         | 26.6         | 60.8        | 0.018              | 0.032            |
| 4/15/1999  | 5870275.902       | 532052.557 | 524.361 | 0.58                     | 0.014  | 0.044  | 0.046           | -0.024        | 72.3         | -27.5       | 0.080                | -0.041           | 0.33                           | 0.010  | 0.042  | 0.043           | -0.032        | 76.6         | -36.5       | 0.130              | -0.097           |
| 12/15/1999 | 5870275.903       | 532052.589 | 524.376 | 1.25                     | 0.015  | 0.076  | 0.077           | -0.009        | 78.8         | -6.6        | 0.062                | -0.007           | 0.67                           | 0.001  | 0.032  | 0.032           | 0.015         | 88.2         | 25.1        | 0.048              | 0.022            |
| 2/15/2000  | 5870275.906       | 532052.581 | 524.364 | 1.42                     | 0.018  | 0.068  | 0.070           | -0.021        | 75.2         | -16.6       | 0.050                | -0.015           | 0.17                           | 0.003  | -0.008 | 0.009           | -0.012        | 290.6        | -54.5       | 0.050              | -0.071           |
| 5/15/2000  | 5870275.909       | 532052.594 | 524.343 | 1.66                     | 0.021  | 0.081  | 0.084           | -0.042        | 75.5         | -26.7       | 0.050                | -0.025           | 0.25                           | 0.003  | 0.013  | 0.013           | -0.021        | 77.0         | -57.6       | 0.054              | -0.085           |
| 11/30/2000 | 5870275.922       | 532052.628 | 524.353 | 2.21                     | 0.034  | 0.115  | 0.120           | -0.032        | 73.5         | -14.9       | 0.054                | -0.014           | 0.54                           | 0.013  | 0.034  | 0.036           | 0.010         | 69.1         | 15.4        | 0.067              | 0.018            |
| 5/5/2001   | 5870275.914       | 532052.630 | 524.335 | 2.64                     | 0.026  | 0.117  | 0.120           | -0.050        | 77.5         | -22.6       | 0.045                | -0.019           | 0.43                           | -0.008 | 0.002  | 0.008           | -0.018        | 166.0        | -65.4       | 0.019              | -0.042           |
| 12/15/2001 | 5870275.910       | 532052.652 | 524.336 | 3.25                     | 0.022  | 0.139  | 0.141           | -0.049        | 81.0         | -19.2       | 0.043                | -0.015           | 0.61                           | -0.004 | 0.022  | 0.022           | 0.001         | 100.3        | 2.6         | 0.036              | 0.002            |
| 5/15/2002  | 5870275.924       | 532052.682 | 524.322 | 3.66                     | 0.036  | 0.169  | 0.173           | -0.063        | 78.0         | -20.0       | 0.047                | -0.017           | 0.41                           | 0.014  | 0.030  | 0.033           | -0.014        | 65.0         | -22.9       | 0.080              | -0.034           |
| 10/24/2002 | 5870275.960       | 532052.698 | 524.298 | 4.11                     | 0.072  | 0.185  | 0.199           | -0.087        | 68.7         | -23.7       | 0.048                | -0.021           | 0.44                           | 0.036  | 0.016  | 0.039           | -0.024        | 24.0         | -31.4       | 0.089              | -0.054           |
| 11/12/2003 | 5870275.932       | 532052.704 | 524.314 | 5.16                     | 0.044  | 0.191  | 0.196           | -0.071        | 77.0         | -20.1       | 0.038                | -0.014           | 1.05                           | -0.028 | 0.006  | 0.029           | 0.016         | 168.5        | 28.4        | 0.027              | 0.015            |
| 1/11/2005  | 5870275.941       | 532052.719 | 524.317 | 6.32                     | 0.053  | 0.206  | 0.213           | -0.068        | 75.7         | -17.6       | 0.034                | -0.011           | 1.17                           | 0.009  | 0.016  | 0.018           | 0.004         | 61.0         | 12.3        | 0.015              | 0.003            |
| 3/10/2006  | 5870275.957       | 532052.780 | 524.300 | 7.48                     | 0.069  | 0.267  | 0.276           | -0.085        | 75.5         | -17.1       | 0.037                | -0.011           | 1.16                           | 0.016  | 0.061  | 0.063           | -0.017        | 74.9         | -15.5       | 0.054              | -0.015           |
| 11/10/2006 | 5870275.950       | 532052.783 | 524.292 | 8.15                     | 0.062  | 0.270  | 0.277           | -0.093        | 77.1         | -18.6       | 0.034                | -0.011           | 0.67                           | -0.007 | 0.003  | 0.008           | -0.008        | 156.8        | -46.4       | 0.011              | -0.012           |
| 4/5/2007   | 5870275.962       | 532052.791 | 524.282 | 8.55                     | 0.074  | 0.278  | 0.288           | -0.103        | 75.1         | -19.7       | 0.034                | -0.012           | 0.40                           | 0.012  | 0.008  | 0.014           | -0.010        | 33.7         | -34.7       | 0.036              | -0.025           |
| 8/16/2007  | 5870275.954       | 532052.794 | 524.292 | 8.92                     | 0.066  |        |                 |               |              |             |                      |                  |                                |        |        |                 |               |              |             |                    |                  |

# Displacement Graphs - Hub 98-15 Palmer/Lewis Intersection



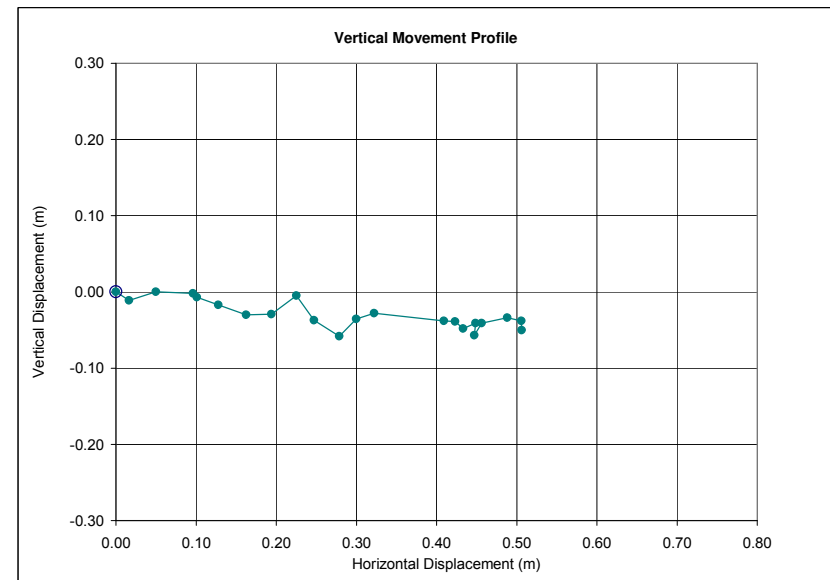
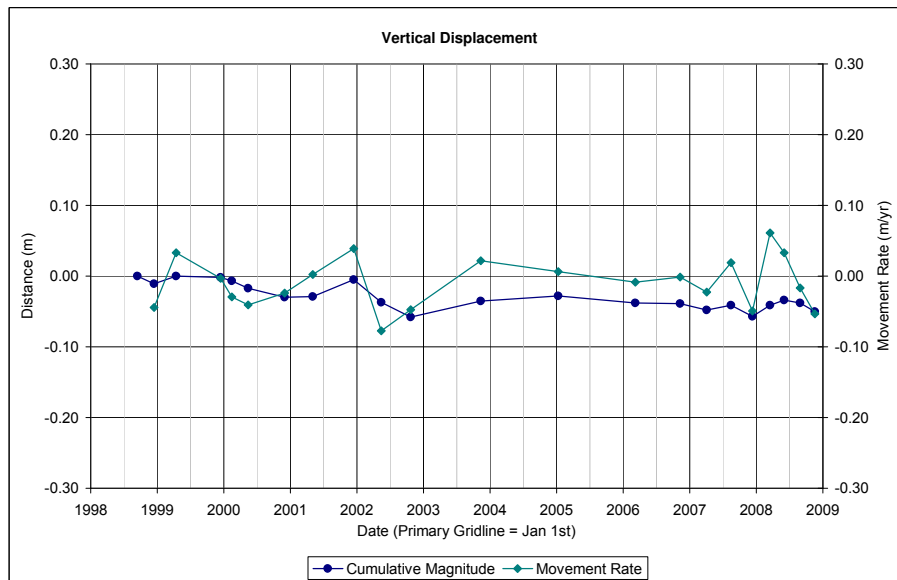
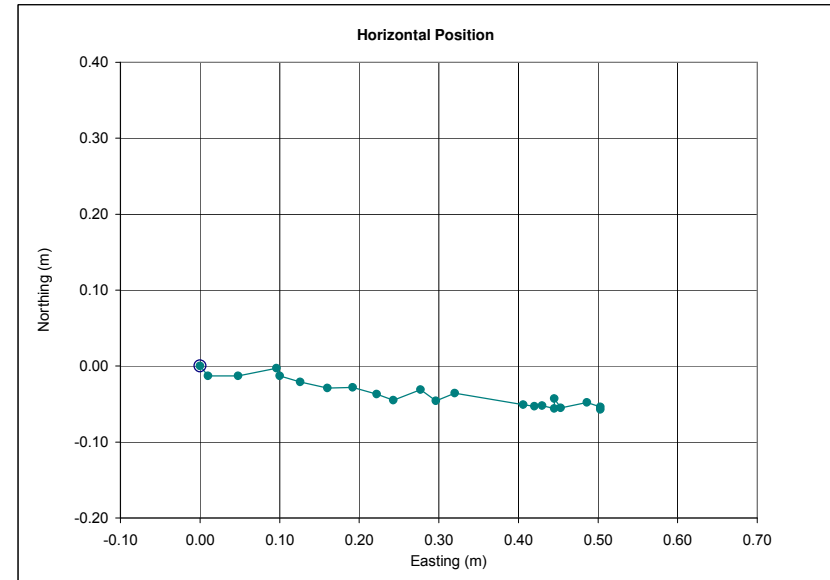
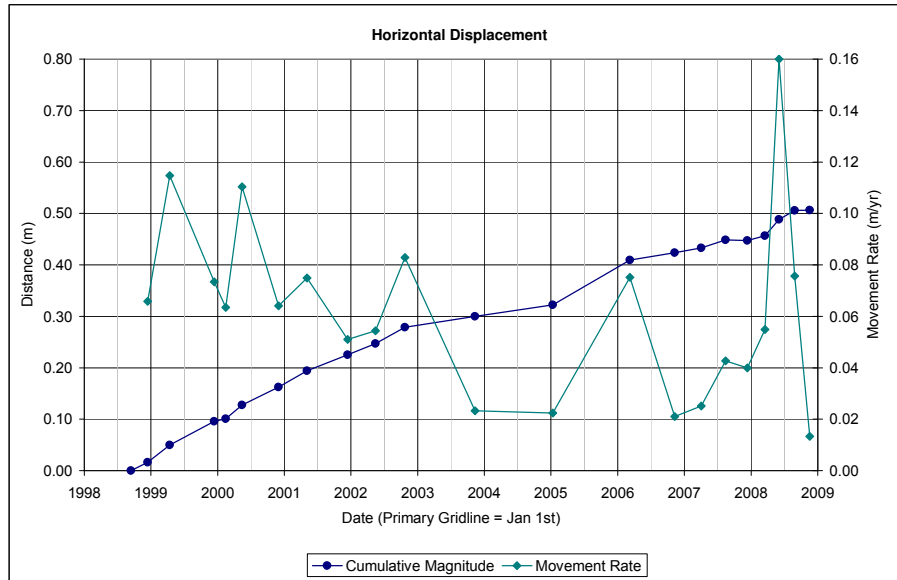
| Date       | Surveyed Position |            |         | Total Change in Position |        |        |                 |               |              |             | Overall Rates (m/yr) |                  | Incremental Change in Position |        |        |                 |               |              |             |                    | Incremental Rates |  |
|------------|-------------------|------------|---------|--------------------------|--------|--------|-----------------|---------------|--------------|-------------|----------------------|------------------|--------------------------------|--------|--------|-----------------|---------------|--------------|-------------|--------------------|-------------------|--|
|            | N<br>m            | E<br>m     | Z<br>m  | Time<br>yrs              | N<br>m | E<br>m | Horizontal<br>m | Vertical<br>m | Azimuth<br>° | Plunge<br>° | Horizontal<br>m/yr   | Vertical<br>m/yr | Time<br>yrs                    | N<br>m | E<br>m | Horizontal<br>m | Vertical<br>m | Azimuth<br>° | Plunge<br>° | Horizontal<br>m/yr | Vertical<br>m/yr  |  |
| 9/15/1998  | 5870413.504       | 532184.864 | 509.104 | 0.00                     | 0.000  | 0.000  | 0.000           | 0.000         | 0.0          | 0.0         |                      |                  | 0.00                           | 0.000  | 0.000  | 0.000           | 0.000         | 0.0          | 0.0         |                    |                   |  |
| 12/15/1998 | 5870413.499       | 532184.859 | 509.086 | 0.25                     | -0.005 | -0.005 | 0.007           | -0.018        | 225.0        | -68.6       | 0.028                | -0.072           | 0.25                           | -0.005 | -0.005 | 0.007           | -0.018        | 225.0        | -68.6       | 0.028              | -0.072            |  |
| 4/15/1999  | 5870413.501       | 532184.880 | 509.054 | 0.58                     | -0.003 | 0.016  | 0.016           | -0.050        | 100.6        | -72.0       | 0.028                | -0.086           | 0.33                           | 0.002  | 0.021  | 0.021           | -0.032        | 84.6         | -56.6       | 0.064              | -0.097            |  |
| 12/15/1999 | 5870413.509       | 532184.907 | 509.068 | 1.25                     | 0.005  | 0.043  | 0.043           | -0.036        | 83.4         | -39.7       | 0.035                | -0.029           | 0.67                           | 0.008  | 0.027  | 0.028           | 0.014         | 73.5         | 26.4        | 0.042              | 0.021             |  |
| 2/15/2000  | 5870413.515       | 532184.912 | 509.064 | 1.42                     | 0.011  | 0.048  | 0.049           | -0.040        | 77.1         | -39.1       | 0.035                | -0.028           | 0.17                           | 0.006  | 0.005  | 0.008           | -0.004        | 39.8         | -27.1       | 0.046              | -0.024            |  |
| 5/15/2000  | 5870413.516       | 532184.916 | 509.071 | 1.66                     | 0.012  | 0.052  | 0.053           | -0.033        | 77.0         | -31.7       | 0.032                | -0.020           | 0.25                           | 0.001  | 0.004  | 0.004           | 0.007         | 76.0         | 59.5        | 0.017              | 0.028             |  |
| 11/30/2000 | 5870413.524       | 532184.943 | 509.062 | 2.21                     | 0.020  | 0.079  | 0.081           | -0.042        | 75.8         | -27.3       | 0.037                | -0.019           | 0.54                           | 0.008  | 0.027  | 0.028           | -0.009        | 73.5         | -17.7       | 0.052              | -0.017            |  |
| 5/5/2001   | 5870413.522       | 532184.942 | 509.052 | 2.64                     | 0.018  | 0.078  | 0.080           | -0.052        | 77.0         | -33.0       | 0.030                | -0.020           | 0.43                           | -0.002 | -0.001 | 0.002           | -0.010        | 206.6        | -77.4       | 0.005              | -0.023            |  |
| 12/15/2001 | 5870413.530       | 532184.984 | 509.054 | 3.25                     | 0.026  | 0.120  | 0.123           | -0.050        | 77.8         | -22.2       | 0.038                | -0.015           | 0.61                           | 0.008  | 0.042  | 0.043           | 0.002         | 79.2         | 2.7         | 0.070              | 0.003             |  |
| 5/15/2002  | 5870413.517       | 532184.970 | 509.027 | 3.66                     | 0.013  | 0.106  | 0.107           | -0.077        | 83.0         | -35.8       | 0.029                | -0.021           | 0.41                           | -0.013 | -0.014 | 0.019           | -0.027        | 227.1        | -54.7       | 0.046              | -0.065            |  |
| 10/24/2002 | 5870413.570       | 532184.994 | 509.024 | 4.11                     | 0.066  | 0.130  | 0.146           | -0.080        | 63.1         | -28.8       | 0.036                | -0.019           | 0.44                           | 0.053  | 0.024  | 0.058           | -0.003        | 24.4         | -3.0        | 0.131              | -0.007            |  |
| 11/12/2003 | 5870413.535       | 532185.001 | 509.048 | 5.16                     | 0.031  | 0.137  | 0.140           | -0.056        | 77.2         | -21.7       | 0.027                | -0.011           | 1.05                           | -0.035 | 0.007  | 0.036           | 0.024         | 169.1        | 34.3        | 0.034              | 0.023             |  |
| 1/11/2005  | 5870413.550       | 532185.005 | 509.051 | 6.32                     | 0.046  | 0.141  | 0.148           | -0.053        | 71.9         | -19.7       | 0.023                | -0.008           | 1.17                           | 0.015  | 0.004  | 0.016           | 0.003         | 15.7         | 9.5         | 0.014              | 0.002             |  |
| 3/10/2006  | 5870413.558       | 532185.041 | 509.050 | 7.48                     | 0.054  | 0.177  | 0.185           | -0.054        | 73.0         | -16.3       | 0.025                | -0.007           | 1.16                           | 0.008  | 0.036  | 0.037           | -0.001        | 77.8         | -1.6        | 0.032              | -0.001            |  |
| 11/10/2006 | 5870413.561       | 532185.055 | 509.051 | 8.15                     | 0.057  | 0.191  | 0.199           | -0.053        | 73.4         | -14.9       | 0.024                | -0.007           | 0.67                           | 0.003  | 0.014  | 0.014           | 0.001         | 77.9         | 4.0         | 0.021              | 0.001             |  |
| 4/5/2007   | 5870413.563       | 532185.060 | 509.046 | 8.55                     | 0.059  | 0.196  | 0.205           | -0.058        | 73.2         | -15.8       | 0.024                | -0.007           | 0.40                           | 0.002  | 0.005  | 0.005           | -0.005        | 68.2         | -42.9       | 0.013              | -0.013            |  |
| 8/16/2007  | 5870413.572       | 532185.056 | 509.054 | 8.92                     | 0.068  | 0.     |                 |               |              |             |                      |                  |                                |        |        |                 |               |              |             |                    |                   |  |

# Displacement Graphs - Hub 98-16 Healy Road



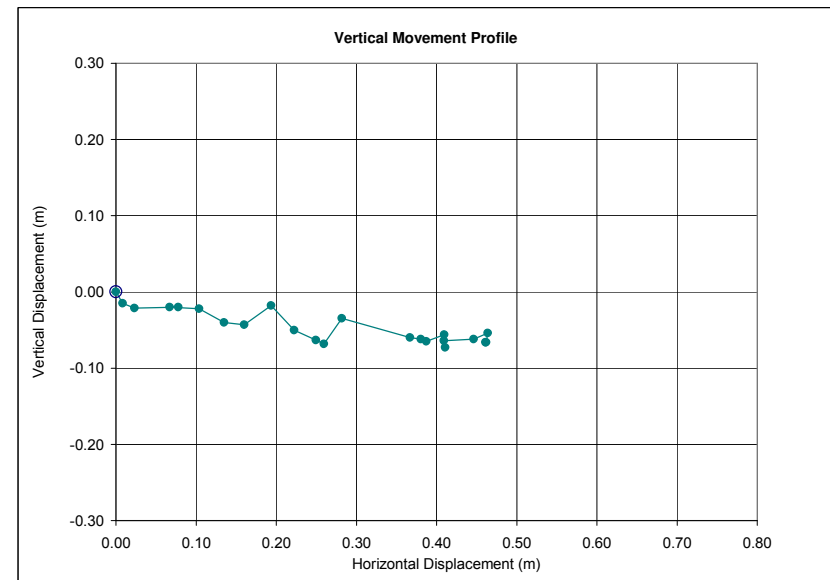
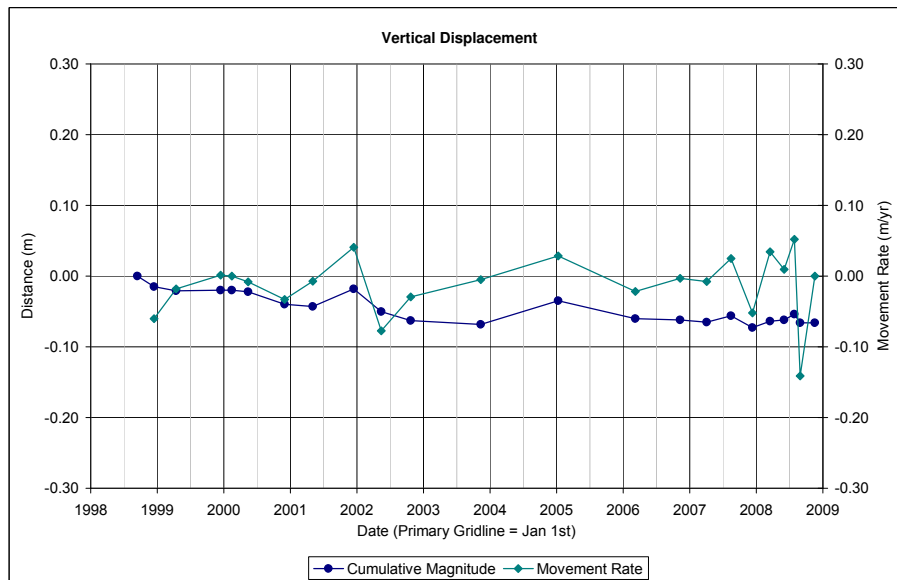
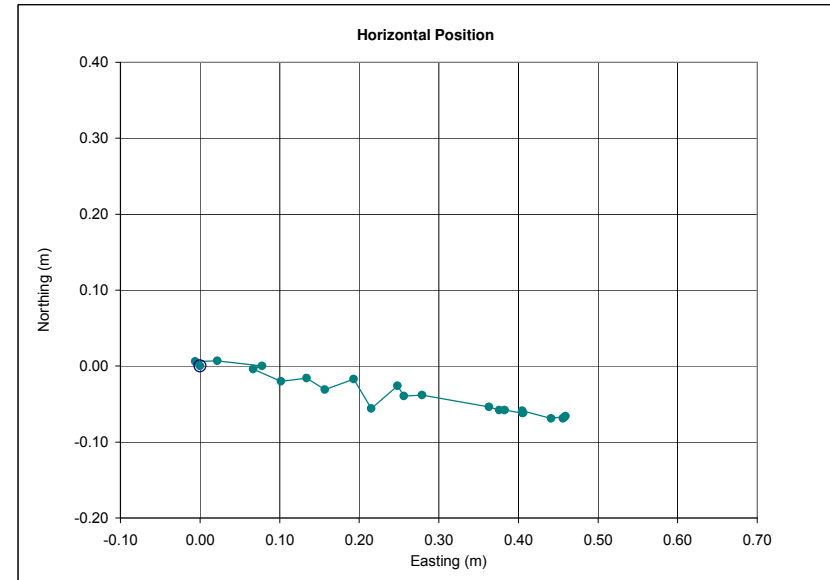
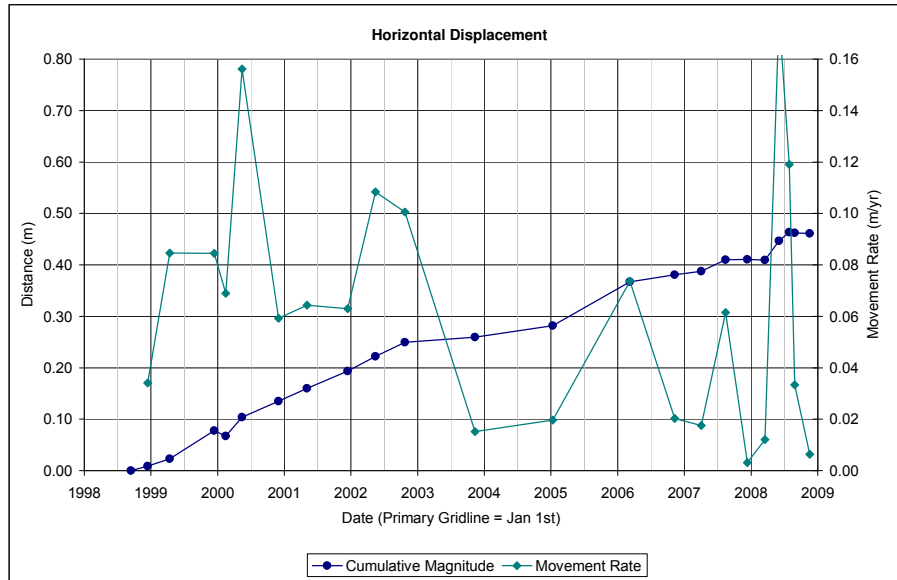
| Date       | Surveyed Position |            |         | Total Change in Position |        |        |                 |               |              |             | Overall Rates (m/yr) |                  | Incremental Change in Position |        |        |                 |               |              |             |                    | Incremental Rates |  |
|------------|-------------------|------------|---------|--------------------------|--------|--------|-----------------|---------------|--------------|-------------|----------------------|------------------|--------------------------------|--------|--------|-----------------|---------------|--------------|-------------|--------------------|-------------------|--|
|            | N<br>m            | E<br>m     | Z<br>m  | Time<br>yrs              | N<br>m | E<br>m | Horizontal<br>m | Vertical<br>m | Azimuth<br>° | Plunge<br>° | Horizontal<br>m/yr   | Vertical<br>m/yr | Time<br>yrs                    | N<br>m | E<br>m | Horizontal<br>m | Vertical<br>m | Azimuth<br>° | Plunge<br>° | Horizontal<br>m/yr | Vertical<br>m/yr  |  |
| 9/15/1998  | 5869847.647       | 532237.862 | 519.610 | 0.00                     | 0.000  | 0.000  | 0.000           | 0.000         | 0.0          | 0.0         |                      |                  | 0.00                           | 0.000  | 0.000  | 0.000           | 0.000         | 0.0          | 0.0         |                    |                   |  |
| 12/15/1998 | 5869847.634       | 532237.872 | 519.599 | 0.25                     | -0.013 | 0.010  | 0.016           | -0.011        | 142.4        | -33.8       | 0.066                | -0.044           | 0.25                           | -0.013 | 0.010  | 0.016           | -0.011        | 142.4        | -33.8       | 0.066              | -0.044            |  |
| 4/15/1999  | 5869847.634       | 532237.910 | 519.610 | 0.58                     | -0.013 | 0.048  | 0.050           | 0.000         | 105.2        | 0.0         | 0.086                | 0.000            | 0.33                           | 0.000  | 0.038  | 0.038           | 0.011         | 90.0         | 16.1        | 0.115              | 0.033             |  |
| 12/15/1999 | 5869847.644       | 532237.958 | 519.608 | 1.25                     | -0.003 | 0.096  | 0.096           | -0.002        | 91.8         | -1.2        | 0.077                | -0.002           | 0.67                           | 0.010  | 0.048  | 0.049           | -0.002        | 78.2         | -2.3        | 0.073              | -0.003            |  |
| 2/15/2000  | 5869847.634       | 532237.962 | 519.603 | 1.42                     | -0.013 | 0.100  | 0.101           | -0.007        | 97.4         | -4.0        | 0.071                | -0.005           | 0.17                           | -0.010 | 0.004  | 0.011           | -0.005        | 158.2        | -24.9       | 0.063              | -0.029            |  |
| 5/15/2000  | 5869847.626       | 532237.988 | 519.593 | 1.66                     | -0.021 | 0.126  | 0.128           | -0.017        | 99.5         | -7.6        | 0.077                | -0.010           | 0.25                           | -0.008 | 0.026  | 0.027           | -0.010        | 107.1        | -20.2       | 0.110              | -0.041            |  |
| 11/30/2000 | 5869847.618       | 532238.022 | 519.580 | 2.21                     | -0.029 | 0.160  | 0.163           | -0.030        | 100.3        | -10.5       | 0.074                | -0.014           | 0.54                           | -0.008 | 0.034  | 0.035           | -0.013        | 103.2        | -20.4       | 0.064              | -0.024            |  |
| 5/5/2001   | 5869847.619       | 532238.054 | 519.581 | 2.64                     | -0.028 | 0.192  | 0.194           | -0.029        | 98.3         | -8.5        | 0.074                | -0.011           | 0.43                           | 0.001  | 0.032  | 0.032           | 0.001         | 88.2         | 1.8         | 0.075              | 0.002             |  |
| 12/15/2001 | 5869847.610       | 532238.084 | 519.605 | 3.25                     | -0.037 | 0.222  | 0.225           | -0.005        | 99.5         | -1.3        | 0.069                | -0.002           | 0.61                           | -0.009 | 0.030  | 0.031           | 0.024         | 106.7        | 37.5        | 0.051              | 0.039             |  |
| 5/15/2002  | 5869847.602       | 532238.105 | 519.573 | 3.66                     | -0.045 | 0.243  | 0.247           | -0.037        | 100.5        | -8.5        | 0.067                | -0.010           | 0.41                           | -0.008 | 0.021  | 0.022           | -0.032        | 110.9        | -54.9       | 0.054              | -0.077            |  |
| 10/24/2002 | 5869847.616       | 532238.139 | 519.552 | 4.11                     | -0.031 | 0.277  | 0.279           | -0.058        | 96.4         | -11.8       | 0.068                | -0.014           | 0.44                           | 0.014  | 0.034  | 0.037           | -0.021        | 67.6         | -29.7       | 0.083              | -0.047            |  |
| 11/12/2003 | 5869847.601       | 532238.158 | 519.575 | 5.16                     | -0.046 | 0.296  | 0.300           | -0.035        | 98.8         | -6.7        | 0.058                | -0.007           | 1.05                           | -0.015 | 0.019  | 0.024           | 0.023         | 127.6        | 42.7        | 0.023              | 0.022             |  |
| 1/11/2005  | 5869847.611       | 532238.182 | 519.582 | 6.32                     | -0.036 | 0.320  | 0.322           | -0.028        | 96.3         | -4.9        | 0.051                | -0.004           | 1.17                           | 0.010  | 0.024  | 0.026           | 0.007         | 66.6         | 16.0        | 0.022              | 0.006             |  |
| 3/10/2006  | 5869847.596       | 532238.268 | 519.572 | 7.48                     | -0.051 | 0.406  | 0.409           | -0.038        | 97.2         | -5.3        | 0.055                | -0.005           | 1.16                           | -0.015 | 0.086  | 0.087           | -0.010        | 100.2        | -6.6        | 0.075              | -0.009            |  |
| 11/10/2006 | 5869847.594       | 532238.282 | 519.571 | 8.15                     | -0.053 | 0.420  | 0.423           | -0.039        | 97.2         | -5.3        | 0.052                | -0.005           | 0.67                           | -0.002 | 0.014  | 0.014           | -0.001        | 98.1         | -4.0        | 0.021              | -0.001            |  |
| 4/5/2007   | 5869847.595       | 532238.292 | 519.562 | 8.55                     | -0.052 | 0.430  | 0.433           | -0.048        | 96.9         | -6.3        | 0.051                | -0.006           | 0.40                           | 0.001  | 0.010  | 0.010           | -0.009        | 84.3         | -41.8       | 0.025              | -0.023            |  |
| 8/16/2007  | 5869847.591       | 532238.307 | 519.569 | 8.92                     | -0.056 | 0.445  |                 |               |              |             |                      |                  |                                |        |        |                 |               |              |             |                    |                   |  |

# Displacement Graphs - Hub 98-17 Bettcher/Lark Intersection



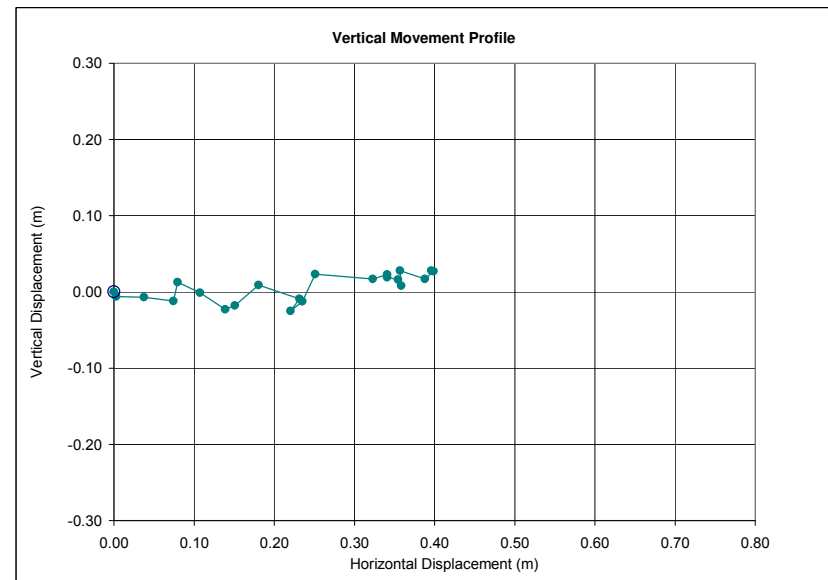
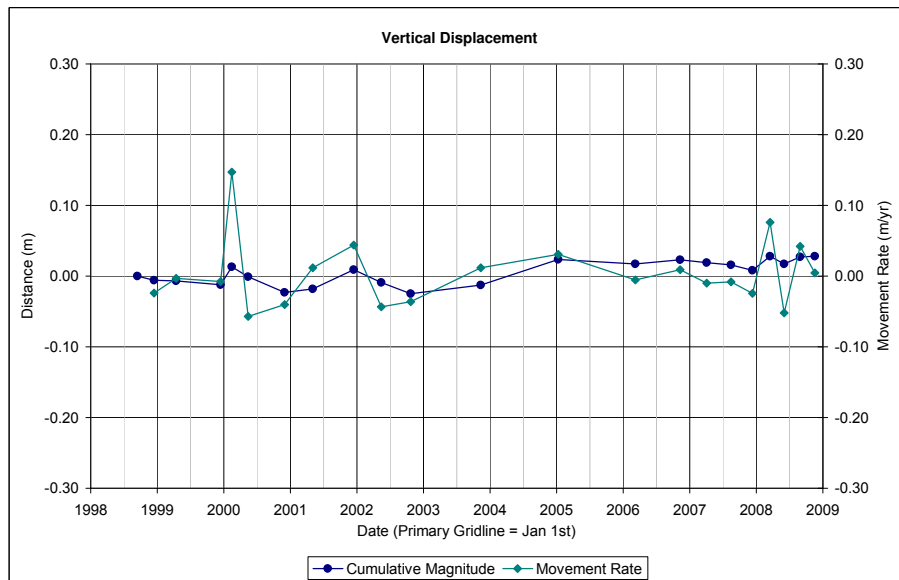
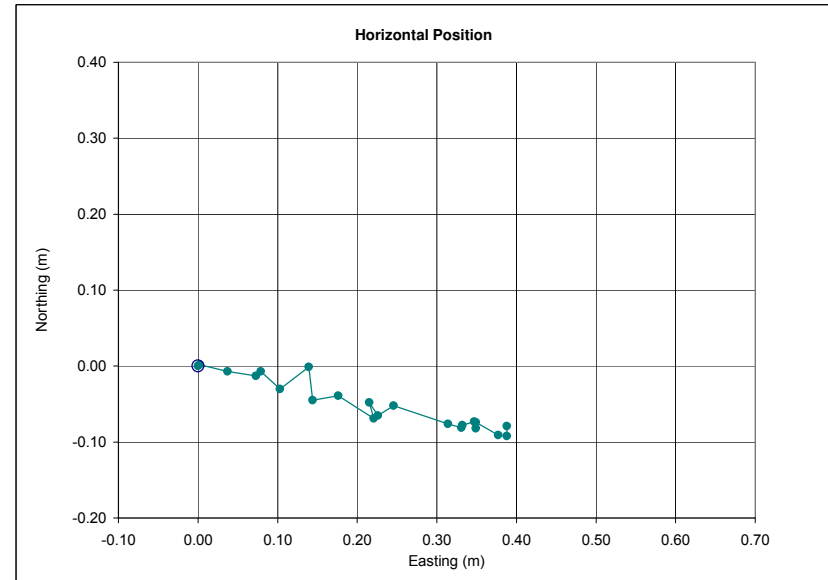
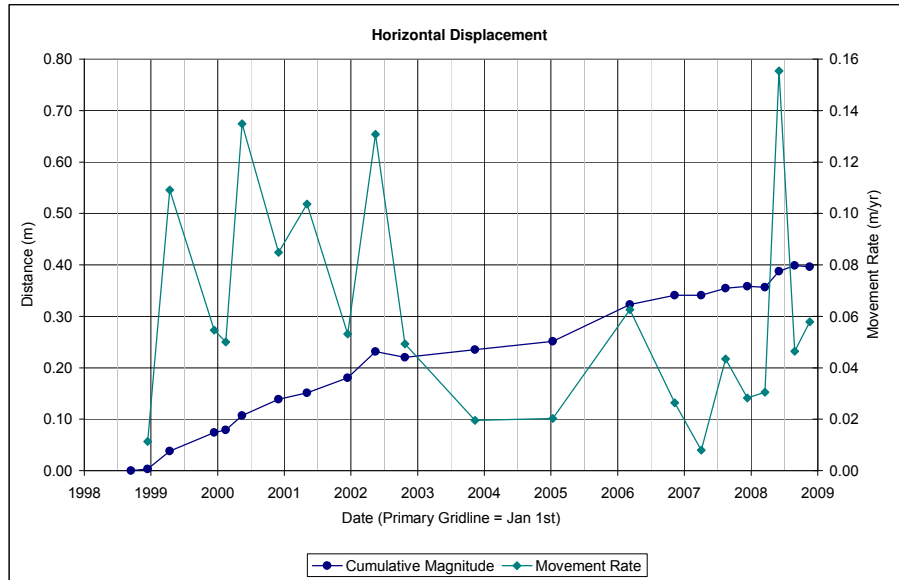
| Date       | Surveyed Position |            |         | Total Change in Position |        |        |                 |               |              |             | Overall Rates (m/yr) |                  | Incremental Change in Position |        |        |                 |               |              |             | Incremental Rates  |                  |
|------------|-------------------|------------|---------|--------------------------|--------|--------|-----------------|---------------|--------------|-------------|----------------------|------------------|--------------------------------|--------|--------|-----------------|---------------|--------------|-------------|--------------------|------------------|
|            | N<br>m            | E<br>m     | Z<br>m  | Time<br>yrs              | N<br>m | E<br>m | Horizontal<br>m | Vertical<br>m | Azimuth<br>° | Plunge<br>° | Horizontal<br>m/yr   | Vertical<br>m/yr | Time<br>yrs                    | N<br>m | E<br>m | Horizontal<br>m | Vertical<br>m | Azimuth<br>° | Plunge<br>° | Horizontal<br>m/yr | Vertical<br>m/yr |
| 9/15/1998  | 5869826.923       | 531984.617 | 524.147 | 0.00                     | 0.000  | 0.000  | 0.000           | 0.000         | 0.0          | 0.0         |                      |                  | 0.00                           | 0.000  | 0.000  | 0.000           | 0.000         | 0.0          | 0.0         |                    |                  |
| 12/15/1998 | 5869826.929       | 531984.611 | 524.132 | 0.25                     | 0.006  | -0.006 | 0.008           | -0.015        | 315.0        | -60.5       | 0.034                | -0.060           | 0.25                           | 0.006  | -0.006 | 0.008           | -0.015        | 315.0        | -60.5       | 0.034              | -0.060           |
| 4/15/1999  | 5869826.930       | 531984.639 | 524.126 | 0.58                     | 0.007  | 0.022  | 0.023           | -0.021        | 72.3         | -42.3       | 0.040                | -0.036           | 0.33                           | 0.001  | 0.028  | 0.028           | -0.006        | 88.0         | -12.1       | 0.085              | -0.018           |
| 12/15/1999 | 5869826.923       | 531984.695 | 524.127 | 1.25                     | 0.000  | 0.078  | 0.078           | -0.020        | 90.0         | -14.4       | 0.062                | -0.016           | 0.67                           | -0.007 | 0.056  | 0.056           | 0.001         | 97.1         | 1.0         | 0.084              | 0.001            |
| 2/15/2000  | 5869826.919       | 531984.684 | 524.127 | 1.42                     | -0.004 | 0.067  | 0.067           | -0.020        | 93.4         | -16.6       | 0.047                | -0.014           | 0.17                           | -0.004 | -0.011 | 0.012           | 0.000         | 250.0        | 0.0         | 0.069              | 0.000            |
| 5/15/2000  | 5869826.903       | 531984.719 | 524.125 | 1.66                     | -0.020 | 0.102  | 0.104           | -0.022        | 101.1        | -12.0       | 0.062                | -0.013           | 0.25                           | -0.016 | 0.035  | 0.038           | -0.002        | 114.6        | -3.0        | 0.156              | -0.008           |
| 11/30/2000 | 5869826.907       | 531984.751 | 524.107 | 2.21                     | -0.016 | 0.134  | 0.135           | -0.040        | 96.8         | -16.5       | 0.061                | -0.018           | 0.54                           | 0.004  | 0.032  | 0.032           | -0.018        | 82.9         | -29.2       | 0.059              | -0.033           |
| 5/5/2001   | 5869826.892       | 531984.774 | 524.104 | 2.64                     | -0.031 | 0.157  | 0.160           | -0.043        | 101.2        | -15.0       | 0.061                | -0.016           | 0.43                           | -0.015 | 0.023  | 0.027           | -0.003        | 123.1        | -6.2        | 0.064              | -0.007           |
| 12/15/2001 | 5869826.906       | 531984.810 | 524.129 | 3.25                     | -0.017 | 0.193  | 0.194           | -0.018        | 95.0         | -5.3        | 0.060                | -0.006           | 0.61                           | 0.014  | 0.036  | 0.039           | 0.025         | 68.7         | 32.9        | 0.063              | 0.041            |
| 5/15/2002  | 5869826.867       | 531984.832 | 524.097 | 3.66                     | -0.056 | 0.215  | 0.222           | -0.050        | 104.6        | -12.7       | 0.061                | -0.014           | 0.41                           | -0.039 | 0.022  | 0.045           | -0.032        | 150.6        | -35.6       | 0.108              | -0.077           |
| 10/24/2002 | 5869826.897       | 531984.865 | 524.084 | 4.11                     | -0.026 | 0.248  | 0.249           | -0.063        | 96.0         | -14.2       | 0.061                | -0.015           | 0.44                           | 0.030  | 0.033  | 0.045           | -0.013        | 47.7         | -16.3       | 0.101              | -0.029           |
| 11/12/2003 | 5869826.883       | 531984.873 | 524.079 | 5.16                     | -0.040 | 0.256  | 0.259           | -0.068        | 98.8         | -14.7       | 0.050                | -0.013           | 1.05                           | -0.014 | 0.008  | 0.016           | -0.005        | 148.3        | -18.0       | 0.015              | -0.005           |
| 1/11/2005  | 5869826.885       | 531984.896 | 524.112 | 6.32                     | -0.038 | 0.279  | 0.282           | -0.035        | 97.8         | -7.0        | 0.045                | -0.005           | 1.17                           | 0.001  | 0.023  | 0.023           | 0.033         | 86.6         | 55.7        | 0.020              | 0.029            |
| 3/10/2006  | 5869826.869       | 531984.980 | 524.087 | 7.48                     | -0.054 | 0.363  | 0.367           | -0.060        | 98.5         | -9.3        | 0.049                | -0.008           | 1.16                           | -0.016 | 0.084  | 0.085           | -0.025        | 100.7        | -16.5       | 0.074              | -0.022           |
| 11/10/2006 | 5869826.865       | 531984.993 | 524.085 | 8.15                     | -0.058 | 0.376  | 0.380           | -0.062        | 98.8         | -9.3        | 0.047                | -0.008           | 0.67                           | -0.004 | 0.013  | 0.014           | -0.002        | 107.1        | -8.4        | 0.020              | -0.003           |
| 4/5/2007   | 5869826.865       | 531985.000 | 524.082 | 8.55                     | -0.058 | 0.383  | 0.387           | -0.065        | 98.6         | -9.5        | 0.045                | -0.008           | 0.40                           | 0.000  | 0.007  | 0.007           | -0.003        | 90.0         | -23.2       | 0.018              | -0.008           |
| 8/16/2007  | 5869826.861       | 531985.022 | 524.091 | 8.92                     | -0.062 | 0      |                 |               |              |             |                      |                  |                                |        |        |                 |               |              |             |                    |                  |

# Displacement Graphs - Hub 98-18 Lark/Flamingo Intersection



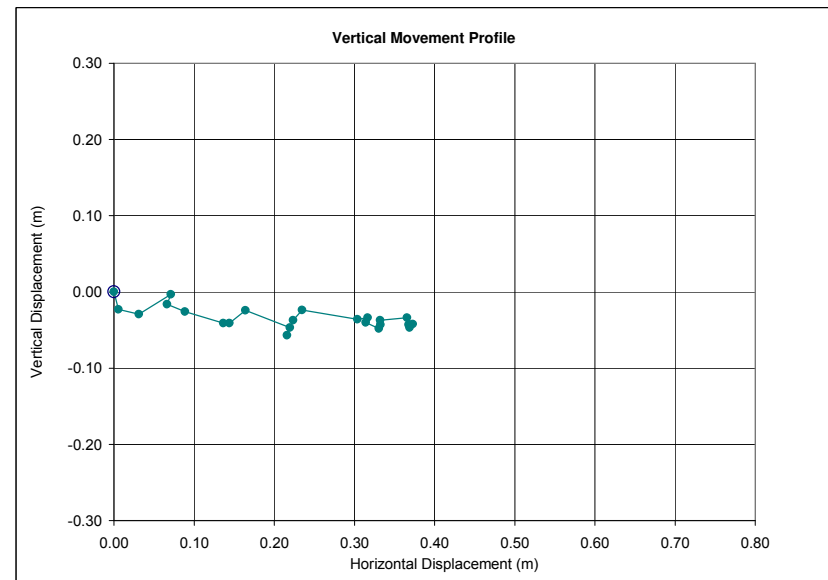
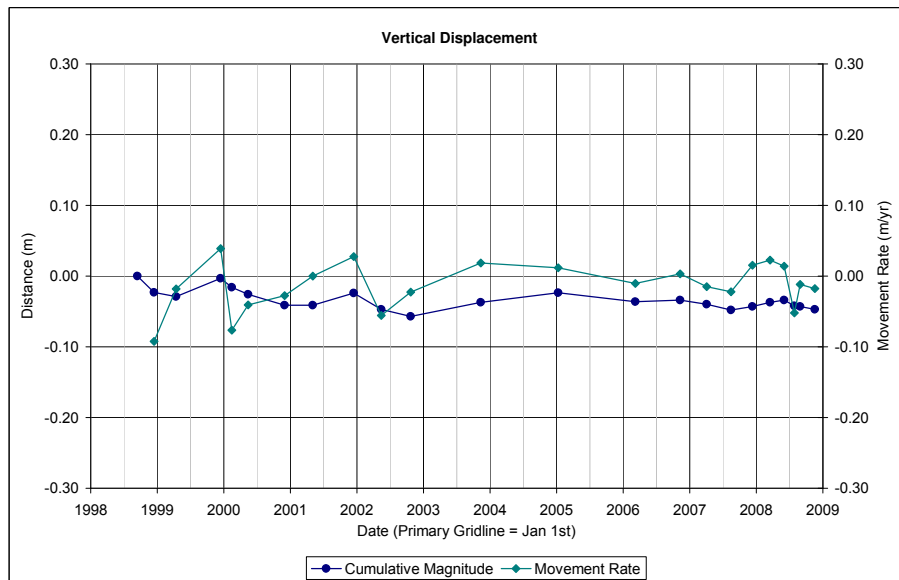
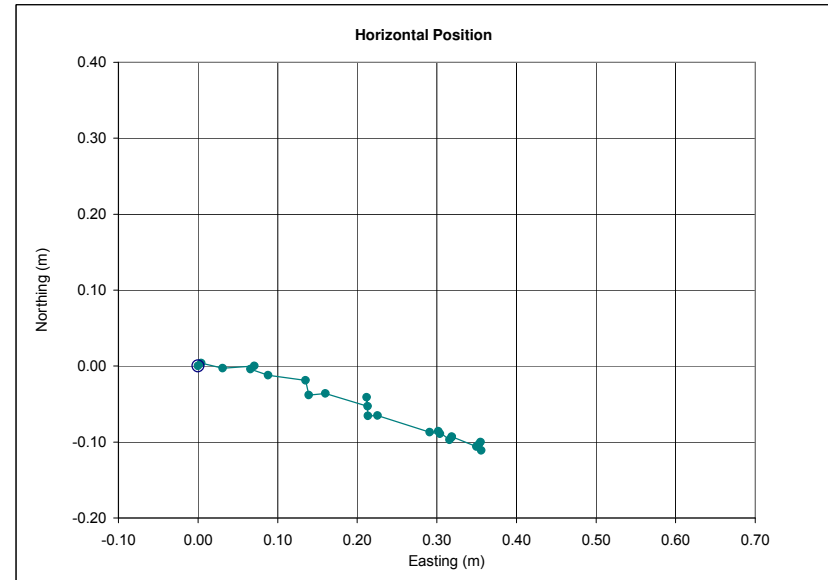
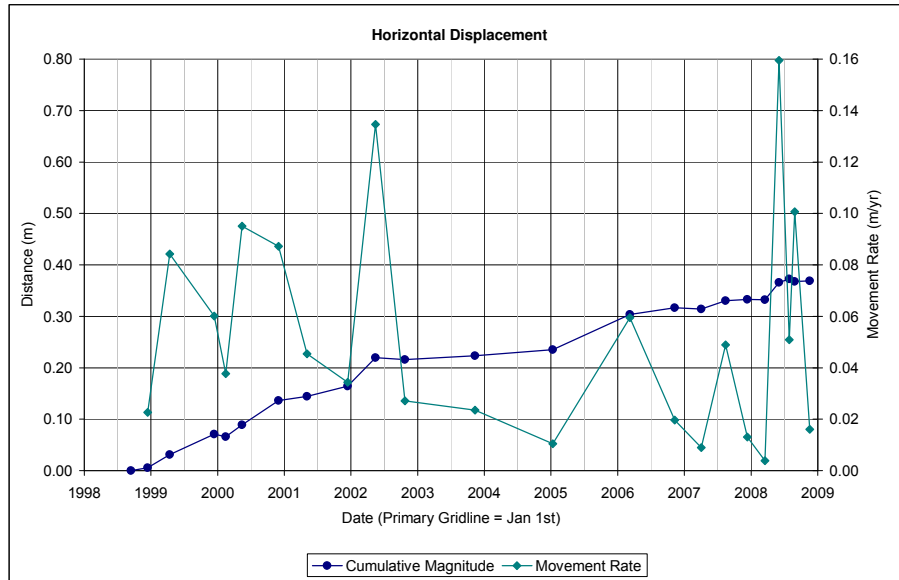
| Date       | Surveyed Position |            |         | Total Change in Position |        |        |                 |               |              |             | Overall Rates (m/yr) |                  | Incremental Change in Position |        |        |                 |               |              |             |                    | Incremental Rates |  |
|------------|-------------------|------------|---------|--------------------------|--------|--------|-----------------|---------------|--------------|-------------|----------------------|------------------|--------------------------------|--------|--------|-----------------|---------------|--------------|-------------|--------------------|-------------------|--|
|            | N<br>m            | E<br>m     | Z<br>m  | Time<br>yrs              | N<br>m | E<br>m | Horizontal<br>m | Vertical<br>m | Azimuth<br>° | Plunge<br>° | Horizontal<br>m/yr   | Vertical<br>m/yr | Time<br>yrs                    | N<br>m | E<br>m | Horizontal<br>m | Vertical<br>m | Azimuth<br>° | Plunge<br>° | Horizontal<br>m/yr | Vertical<br>m/yr  |  |
| 9/15/1998  | 5869596.532       | 531978.061 | 517.225 | 0.00                     | 0.000  | 0.000  | 0.000           | 0.000         | 0.0          | 0.0         |                      |                  | 0.00                           | 0.000  | 0.000  | 0.000           | 0.000         | 0.0          | 0.0         |                    |                   |  |
| 12/15/1998 | 5869596.534       | 531978.063 | 517.219 | 0.25                     | 0.002  | 0.002  | 0.003           | -0.006        | 45.0         | -64.8       | 0.011                | -0.024           | 0.25                           | 0.002  | 0.002  | 0.003           | -0.006        | 45.0         | -64.8       | 0.011              | -0.024            |  |
| 4/15/1999  | 5869596.525       | 531978.098 | 517.218 | 0.58                     | -0.007 | 0.037  | 0.038           | -0.007        | 100.7        | -10.5       | 0.065                | -0.012           | 0.33                           | -0.009 | 0.035  | 0.036           | -0.001        | 104.4        | -1.6        | 0.109              | -0.003            |  |
| 12/15/1999 | 5869596.519       | 531978.134 | 517.213 | 1.25                     | -0.013 | 0.073  | 0.074           | -0.012        | 100.1        | -9.2        | 0.059                | -0.010           | 0.67                           | -0.006 | 0.036  | 0.036           | -0.005        | 99.5         | -7.8        | 0.055              | -0.007            |  |
| 2/15/2000  | 5869596.525       | 531978.140 | 517.238 | 1.42                     | -0.007 | 0.079  | 0.079           | 0.013         | 95.1         | 9.3         | 0.056                | 0.009            | 0.17                           | 0.006  | 0.006  | 0.008           | 0.025         | 45.0         | 71.3        | 0.050              | 0.147             |  |
| 5/15/2000  | 5869596.502       | 531978.164 | 517.224 | 1.66                     | -0.030 | 0.103  | 0.107           | -0.001        | 106.2        | -0.5        | 0.064                | -0.001           | 0.25                           | -0.023 | 0.024  | 0.033           | -0.014        | 133.8        | -22.8       | 0.135              | -0.057            |  |
| 11/30/2000 | 5869596.531       | 531978.200 | 517.202 | 2.21                     | -0.001 | 0.139  | 0.139           | -0.023        | 90.4         | -9.4        | 0.063                | -0.010           | 0.54                           | 0.029  | 0.036  | 0.046           | -0.022        | 51.1         | -25.5       | 0.085              | -0.040            |  |
| 5/5/2001   | 5869596.487       | 531978.205 | 517.207 | 2.64                     | -0.045 | 0.144  | 0.151           | -0.018        | 107.4        | -6.8        | 0.057                | -0.007           | 0.43                           | -0.044 | 0.005  | 0.044           | 0.005         | 173.5        | 6.4         | 0.104              | 0.012             |  |
| 12/15/2001 | 5869596.493       | 531978.237 | 517.234 | 3.25                     | -0.039 | 0.176  | 0.180           | 0.009         | 102.5        | 2.9         | 0.055                | 0.003            | 0.61                           | 0.006  | 0.032  | 0.033           | 0.027         | 79.4         | 39.7        | 0.053              | 0.044             |  |
| 5/15/2002  | 5869596.463       | 531978.282 | 517.216 | 3.66                     | -0.069 | 0.221  | 0.232           | -0.009        | 107.3        | -2.2        | 0.063                | -0.002           | 0.41                           | -0.030 | 0.045  | 0.054           | -0.018        | 123.7        | -18.4       | 0.131              | -0.044            |  |
| 10/24/2002 | 5869596.484       | 531978.276 | 517.200 | 4.11                     | -0.048 | 0.215  | 0.220           | -0.025        | 102.6        | -6.5        | 0.054                | -0.006           | 0.44                           | 0.021  | -0.006 | 0.022           | -0.016        | 344.1        | -36.2       | 0.049              | -0.036            |  |
| 11/12/2003 | 5869596.467       | 531978.287 | 517.212 | 5.16                     | -0.065 | 0.226  | 0.235           | -0.013        | 106.1        | -3.1        | 0.046                | -0.002           | 1.05                           | -0.017 | 0.011  | 0.021           | 0.012         | 147.5        | 31.3        | 0.020              | 0.012             |  |
| 11/11/2005 | 5869596.480       | 531978.307 | 517.249 | 6.32                     | -0.052 | 0.246  | 0.251           | 0.024         | 102.0        | 5.3         | 0.040                | 0.004            | 1.17                           | 0.013  | 0.020  | 0.024           | 0.036         | 56.0         | 56.8        | 0.020              | 0.031             |  |
| 3/10/2006  | 5869596.456       | 531978.375 | 517.242 | 7.48                     | -0.076 | 0.314  | 0.323           | 0.017         | 103.6        | 3.0         | 0.043                | 0.002            | 1.16                           | -0.024 | 0.068  | 0.072           | -0.007        | 109.3        | -5.1        | 0.063              | -0.006            |  |
| 11/10/2006 | 5869596.451       | 531978.392 | 517.248 | 8.15                     | -0.081 | 0.331  | 0.341           | 0.023         | 103.8        | 3.9         | 0.042                | 0.003            | 0.67                           | -0.005 | 0.017  | 0.018           | 0.006         | 106.4        | 18.7        | 0.026              | 0.009             |  |
| 4/5/2007   | 5869596.454       | 531978.393 | 517.244 | 8.55                     | -0.078 | 0.332  | 0.341           | 0.019         | 103.2        | 3.2         | 0.040                | 0.002            | 0.40                           | 0.003  | 0.001  | 0.003           | -0.004        | 18.4         | -51.7       | 0.008              | -0.010            |  |
| 8/16/2007  | 5869596.459       | 531978.408 | 517.241 | 8.92                     | -0.073 |        |                 |               |              |             |                      |                  |                                |        |        |                 |               |              |             |                    |                   |  |

# Displacement Graphs - Hub 98-19 Abbott/Flamingo Intersection



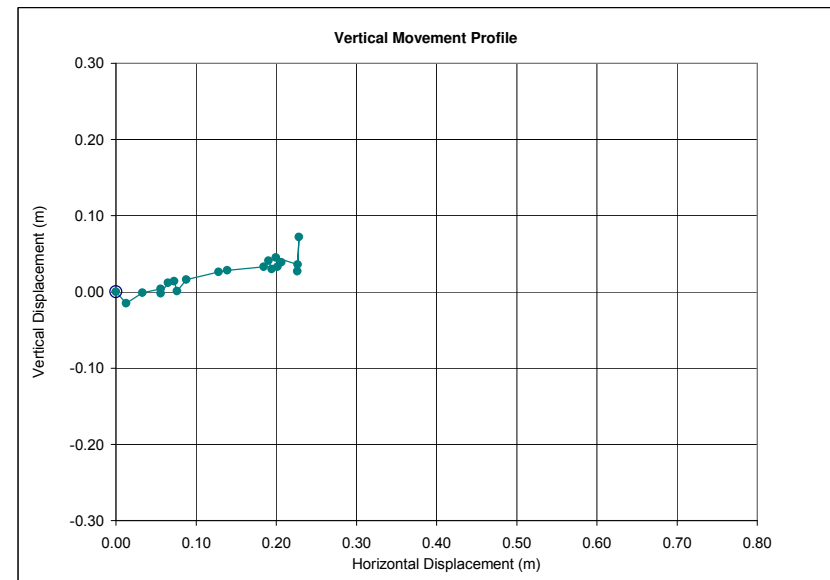
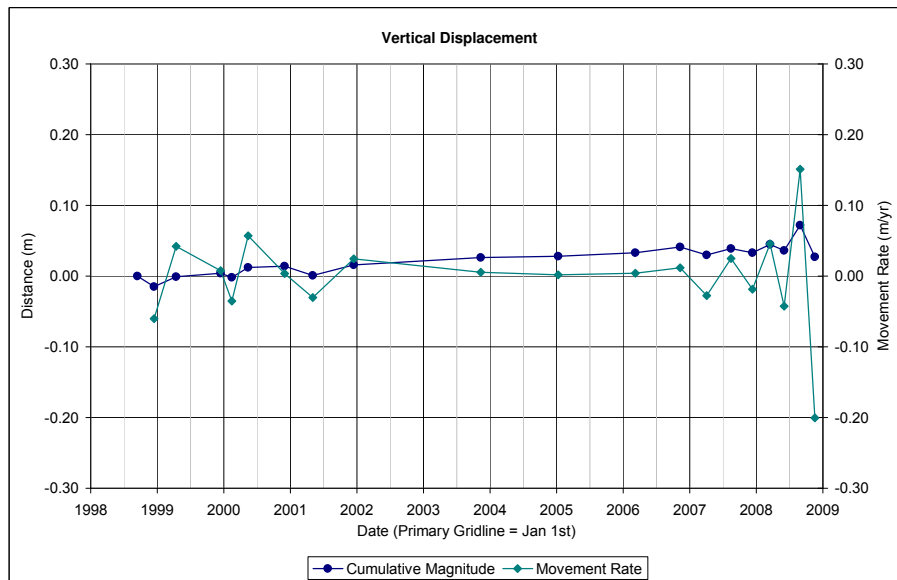
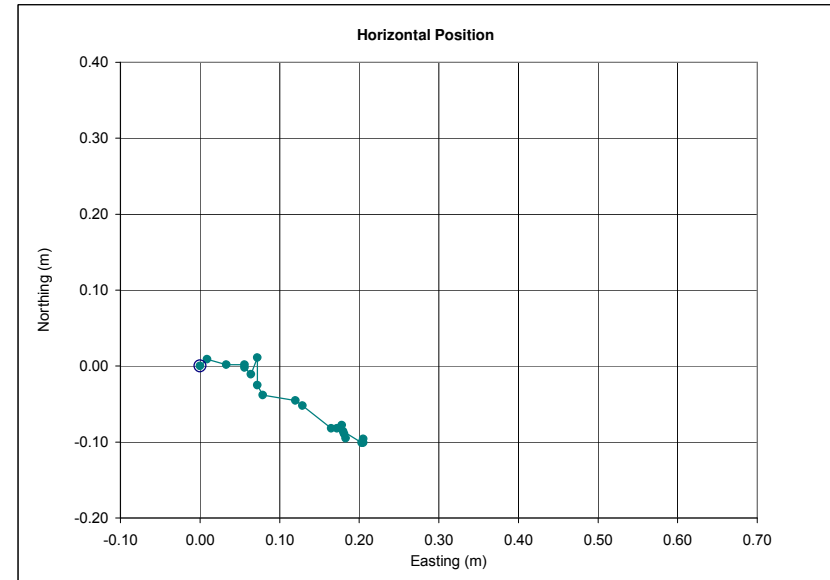
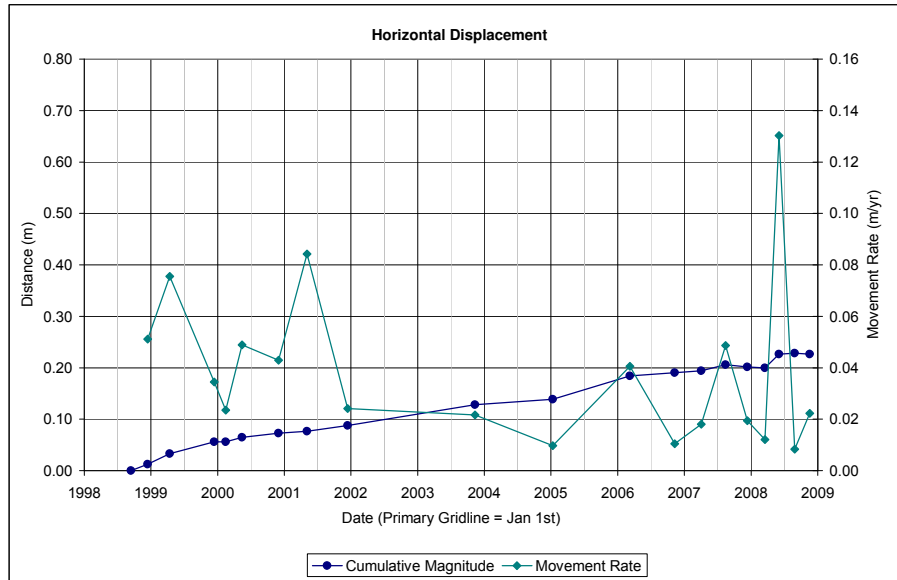
| Date       | Surveyed Position |            |         | Total Change in Position |        |        |                 |               |              |             | Overall Rates (m/yr) |                  | Incremental Change in Position |        |        |                 |               |              |             | Incremental Rates  |                  |
|------------|-------------------|------------|---------|--------------------------|--------|--------|-----------------|---------------|--------------|-------------|----------------------|------------------|--------------------------------|--------|--------|-----------------|---------------|--------------|-------------|--------------------|------------------|
|            | N<br>m            | E<br>m     | Z<br>m  | Time<br>yrs              | N<br>m | E<br>m | Horizontal<br>m | Vertical<br>m | Azimuth<br>° | Plunge<br>° | Horizontal<br>m/yr   | Vertical<br>m/yr | Time<br>yrs                    | N<br>m | E<br>m | Horizontal<br>m | Vertical<br>m | Azimuth<br>° | Plunge<br>° | Horizontal<br>m/yr | Vertical<br>m/yr |
| 9/15/1998  | 5869364.259       | 532199.105 | 504.356 | 0.00                     | 0.000  | 0.000  | 0.000           | 0.000         | 0.0          | 0.0         |                      |                  | 0.00                           | 0.000  | 0.000  | 0.000           | 0.000         | 0.0          | 0.0         |                    |                  |
| 12/15/1998 | 5869364.263       | 532199.109 | 504.333 | 0.25                     | 0.004  | 0.004  | 0.006           | -0.023        | 45.0         | -76.2       | 0.023                | -0.092           | 0.25                           | 0.004  | 0.004  | 0.006           | -0.023        | 45.0         | -76.2       | 0.023              | -0.092           |
| 4/15/1999  | 5869364.256       | 532199.136 | 504.327 | 0.58                     | -0.003 | 0.031  | 0.031           | -0.029        | 95.5         | -43.0       | 0.054                | -0.050           | 0.33                           | -0.007 | 0.027  | 0.028           | -0.006        | 104.5        | -12.1       | 0.084              | -0.018           |
| 12/15/1999 | 5869364.259       | 532199.176 | 504.353 | 1.25                     | 0.000  | 0.071  | 0.071           | -0.003        | 90.0         | -2.4        | 0.057                | -0.002           | 0.67                           | 0.003  | 0.040  | 0.040           | 0.026         | 85.7         | 33.0        | 0.060              | 0.039            |
| 2/15/2000  | 5869364.255       | 532199.171 | 504.340 | 1.42                     | -0.004 | 0.066  | 0.066           | -0.016        | 93.5         | -13.6       | 0.047                | -0.011           | 0.17                           | -0.004 | -0.005 | 0.006           | -0.013        | 231.3        | -63.8       | 0.038              | -0.077           |
| 5/15/2000  | 5869364.247       | 532199.193 | 504.330 | 1.66                     | -0.012 | 0.088  | 0.089           | -0.026        | 97.8         | -16.3       | 0.053                | -0.016           | 0.25                           | -0.008 | 0.022  | 0.023           | -0.010        | 110.0        | -23.1       | 0.095              | -0.041           |
| 11/30/2000 | 5869364.240       | 532199.240 | 504.315 | 2.21                     | -0.019 | 0.135  | 0.136           | -0.041        | 98.0         | -16.7       | 0.062                | -0.019           | 0.54                           | -0.007 | 0.047  | 0.048           | -0.015        | 98.5         | -17.5       | 0.087              | -0.028           |
| 5/5/2001   | 5869364.221       | 532199.244 | 504.315 | 2.64                     | -0.038 | 0.139  | 0.144           | -0.041        | 105.3        | -15.9       | 0.055                | -0.016           | 0.43                           | -0.019 | 0.004  | 0.019           | 0.000         | 168.1        | 0.0         | 0.045              | 0.000            |
| 12/15/2001 | 5869364.223       | 532199.265 | 504.332 | 3.25                     | -0.036 | 0.160  | 0.164           | -0.024        | 102.7        | -8.3        | 0.050                | -0.007           | 0.61                           | 0.002  | 0.021  | 0.021           | 0.017         | 84.6         | 38.9        | 0.034              | 0.028            |
| 5/15/2002  | 5869364.206       | 532199.318 | 504.309 | 3.66                     | -0.053 | 0.213  | 0.219           | -0.047        | 104.0        | -12.1       | 0.060                | -0.013           | 0.41                           | -0.017 | 0.053  | 0.056           | -0.023        | 107.8        | -22.5       | 0.135              | -0.056           |
| 10/24/2002 | 5869364.218       | 532199.317 | 504.299 | 4.11                     | -0.041 | 0.212  | 0.216           | -0.057        | 100.9        | -14.8       | 0.053                | -0.014           | 0.44                           | 0.012  | -0.001 | 0.012           | -0.010        | 355.2        | -39.7       | 0.027              | -0.023           |
| 11/12/2003 | 5869364.193       | 532199.318 | 504.319 | 5.16                     | -0.066 | 0.213  | 0.223           | -0.037        | 107.1        | -9.5        | 0.043                | -0.007           | 1.05                           | -0.025 | 0.001  | 0.025           | 0.020         | 176.6        | 38.5        | 0.024              | 0.019            |
| 1/11/2005  | 5869364.194       | 532199.331 | 504.332 | 6.32                     | -0.065 | 0.226  | 0.235           | -0.024        | 106.1        | -5.8        | 0.037                | -0.004           | 1.17                           | 0.000  | 0.012  | 0.012           | 0.014         | 87.8         | 48.1        | 0.010              | 0.012            |
| 3/10/2006  | 5869364.172       | 532199.396 | 504.320 | 7.48                     | -0.087 | 0.291  | 0.304           | -0.036        | 106.6        | -6.8        | 0.041                | -0.005           | 1.16                           | -0.022 | 0.065  | 0.069           | -0.012        | 108.5        | -10.1       | 0.059              | -0.011           |
| 11/10/2006 | 5869364.170       | 532199.409 | 504.322 | 8.15                     | -0.089 | 0.304  | 0.317           | -0.034        | 106.3        | -6.1        | 0.039                | -0.004           | 0.67                           | -0.002 | 0.013  | 0.013           | 0.002         | 98.7         | 8.6         | 0.020              | 0.003            |
| 4/5/2007   | 5869364.173       | 532199.407 | 504.316 | 8.55                     | -0.086 | 0.302  | 0.314           | -0.040        | 105.9        | -7.3        | 0.037                | -0.005           | 0.40                           | 0.003  | -0.002 | 0.004           | -0.006        | 326.3        | -59.0       | 0.009              | -0.015           |
| 8/16/2007  | 5869364.162       | 532199.421 | 504.308 | 8.92                     | -0.09  |        |                 |               |              |             |                      |                  |                                |        |        |                 |               |              |             |                    |                  |

# Displacement Graphs - Hub 98-20 Hawk Street @ Crane Ave.



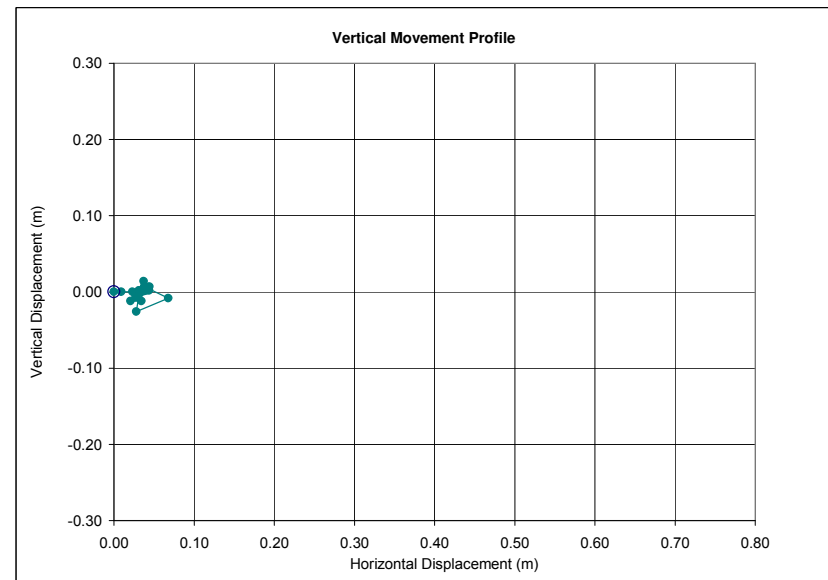
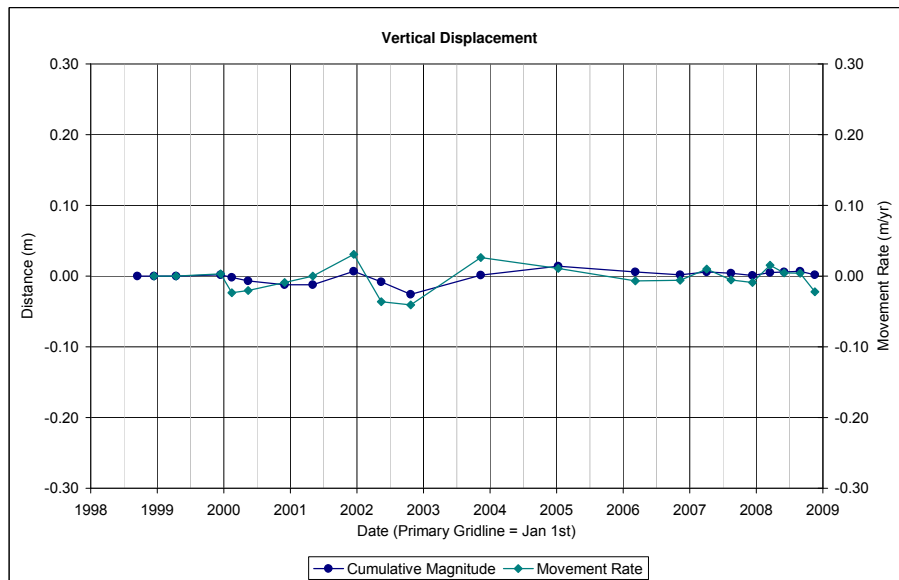
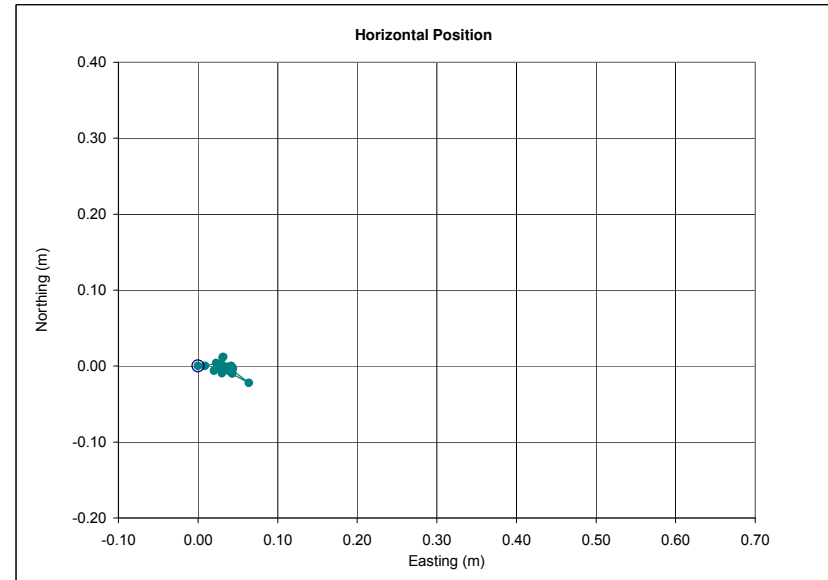
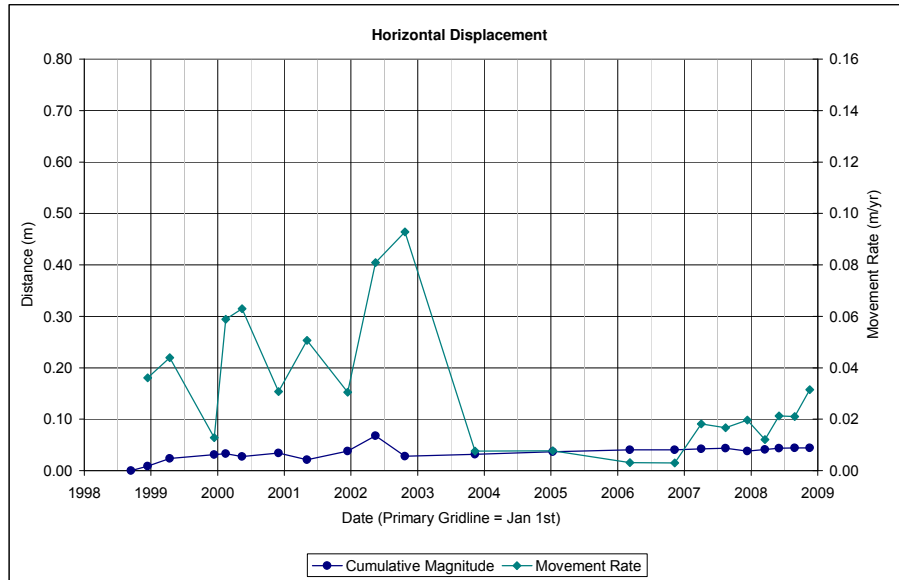
| Date       | Surveyed Position |            |         | Total Change in Position |        |        |                 |               |              |             | Overall Rates (m/yr) |                  | Incremental Change in Position |        |        |                 |               |              |             | Incremental Rates  |                  |
|------------|-------------------|------------|---------|--------------------------|--------|--------|-----------------|---------------|--------------|-------------|----------------------|------------------|--------------------------------|--------|--------|-----------------|---------------|--------------|-------------|--------------------|------------------|
|            | N<br>m            | E<br>m     | Z<br>m  | Time<br>yrs              | N<br>m | E<br>m | Horizontal<br>m | Vertical<br>m | Azimuth<br>° | Plunge<br>° | Horizontal<br>m/yr   | Vertical<br>m/yr | Time<br>yrs                    | N<br>m | E<br>m | Horizontal<br>m | Vertical<br>m | Azimuth<br>° | Plunge<br>° | Horizontal<br>m/yr | Vertical<br>m/yr |
| 9/15/1998  | 5869342.996       | 532493.483 | 485.474 | 0.00                     | 0.000  | 0.000  | 0.000           | 0.000         | 0.0          | 0.0         |                      |                  | 0.00                           | 0.000  | 0.000  | 0.000           | 0.000         | 0.0          | 0.0         |                    |                  |
| 12/15/1998 | 5869343.005       | 532493.492 | 485.459 | 0.25                     | 0.009  | 0.009  | 0.013           | -0.015        | 45.0         | -49.7       | 0.051                | -0.060           | 0.25                           | 0.009  | 0.009  | 0.013           | -0.015        | 45.0         | -49.7       | 0.051              | -0.060           |
| 4/15/1999  | 5869342.998       | 532493.516 | 485.473 | 0.58                     | 0.002  | 0.033  | 0.033           | -0.001        | 86.5         | -1.7        | 0.057                | -0.002           | 0.33                           | -0.007 | 0.024  | 0.025           | 0.014         | 106.3        | 29.2        | 0.075              | 0.042            |
| 12/15/1999 | 5869342.998       | 532493.539 | 485.478 | 1.25                     | 0.002  | 0.056  | 0.056           | 0.004         | 88.0         | 4.1         | 0.045                | 0.003            | 0.67                           | 0.000  | 0.023  | 0.023           | 0.005         | 90.0         | 12.3        | 0.034              | 0.007            |
| 2/15/2000  | 5869342.994       | 532493.539 | 485.472 | 1.42                     | -0.002 | 0.056  | 0.056           | -0.002        | 92.0         | -2.0        | 0.040                | -0.001           | 0.17                           | -0.004 | 0.000  | 0.004           | -0.006        | 180.0        | -56.3       | 0.024              | -0.035           |
| 5/15/2000  | 5869342.985       | 532493.547 | 485.486 | 1.66                     | -0.011 | 0.064  | 0.065           | 0.012         | 99.8         | 10.5        | 0.039                | 0.007            | 0.25                           | -0.009 | 0.008  | 0.012           | 0.014         | 138.4        | 49.3        | 0.049              | 0.057            |
| 11/30/2000 | 5869343.007       | 532493.555 | 485.488 | 2.21                     | 0.011  | 0.072  | 0.073           | 0.014         | 81.3         | 10.9        | 0.033                | 0.006            | 0.54                           | 0.022  | 0.008  | 0.023           | 0.002         | 20.0         | 4.9         | 0.043              | 0.004            |
| 5/5/2001   | 5869342.971       | 532493.555 | 485.475 | 2.64                     | -0.025 | 0.072  | 0.076           | 0.001         | 109.1        | 0.8         | 0.029                | 0.000            | 0.43                           | -0.036 | 0.000  | 0.036           | -0.013        | 180.0        | -19.9       | 0.084              | -0.030           |
| 12/15/2001 | 5869342.958       | 532493.562 | 485.490 | 3.25                     | -0.038 | 0.079  | 0.088           | 0.016         | 115.7        | 10.3        | 0.027                | 0.005            | 0.61                           | -0.013 | 0.007  | 0.015           | 0.015         | 151.7        | 45.5        | 0.024              | 0.024            |
| 11/12/2003 | 5869342.951       | 532493.603 | 485.500 | 5.16                     | -0.045 | 0.120  | 0.128           | 0.026         | 110.7        | 11.5        | 0.025                | 0.005            | 1.91                           | -0.007 | 0.041  | 0.041           | 0.010         | 100.2        | 13.7        | 0.022              | 0.005            |
| 1/11/2005  | 5869342.944       | 532493.612 | 485.502 | 6.32                     | -0.052 | 0.129  | 0.139           | 0.028         | 112.1        | 11.5        | 0.022                | 0.004            | 1.17                           | -0.007 | 0.009  | 0.011           | 0.002         | 127.8        | 10.5        | 0.010              | 0.002            |
| 3/10/2006  | 5869342.914       | 532493.648 | 485.507 | 7.48                     | -0.082 | 0.165  | 0.184           | 0.033         | 116.4        | 10.2        | 0.025                | 0.004            | 1.16                           | -0.030 | 0.036  | 0.047           | 0.005         | 129.3        | 5.8         | 0.040              | 0.004            |
| 11/10/2006 | 5869342.914       | 532493.655 | 485.515 | 8.15                     | -0.082 | 0.172  | 0.191           | 0.041         | 115.5        | 12.1        | 0.023                | 0.005            | 0.67                           | 0.000  | 0.007  | 0.007           | 0.008         | 90.0         | 48.8        | 0.010              | 0.012            |
| 4/5/2007   | 5869342.918       | 532493.661 | 485.504 | 8.55                     | -0.078 | 0.178  | 0.194           | 0.030         | 113.7        | 8.8         | 0.023                | 0.004            | 0.40                           | 0.004  | 0.006  | 0.007           | -0.011        | 56.3         | -56.8       | 0.018              | -0.028           |
| 8/16/2007  | 5869342.901       | 532493.666 | 485.513 | 8.92                     | -0.095 | 0.183  | 0.206           | 0.039         | 117.4        | 10.7        | 0.023                | 0.004            | 0.36                           | -0.017 | 0.005  | 0.018           | 0.009         | 163.6        | 26.9        | 0.049              | 0.025            |
| 12/13/2007 | 5869342.907       | 532493.664 | 485.507 | 9.24                     | -0.089 | 0.181  | 0.202           | 0.033         | 116.2        | 9.3         | 0.022                | 0.004            | 0.33                           | 0.006  | -0.002 | 0.006           | -0.006        | 341.6        | -43.5       | 0.019              | -0.018           |
| 3/18/2008  | 5869342.910       | 532493.663 | 485.519 | 9.51                     | -0.    |        |                 |               |              |             |                      |                  |                                |        |        |                 |               |              |             |                    |                  |

# Displacement Graphs - Hub 98-21 Lane between Avery/Allison



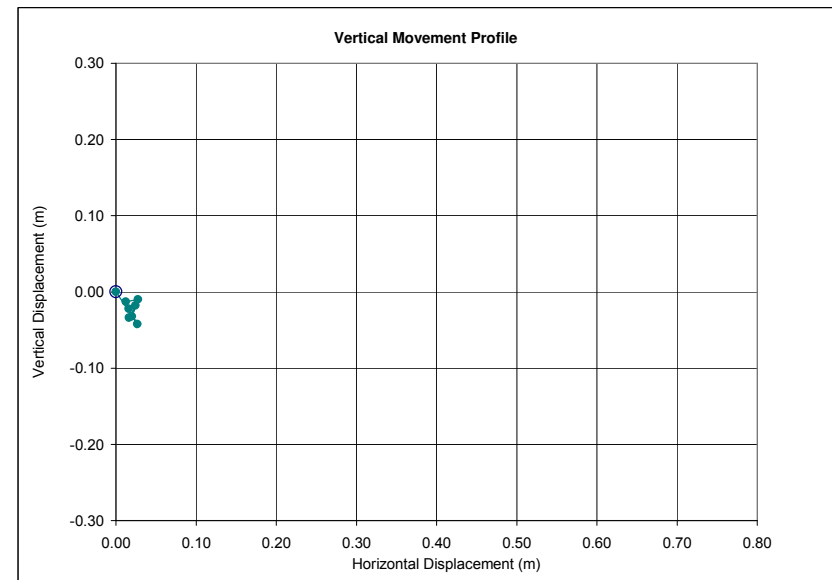
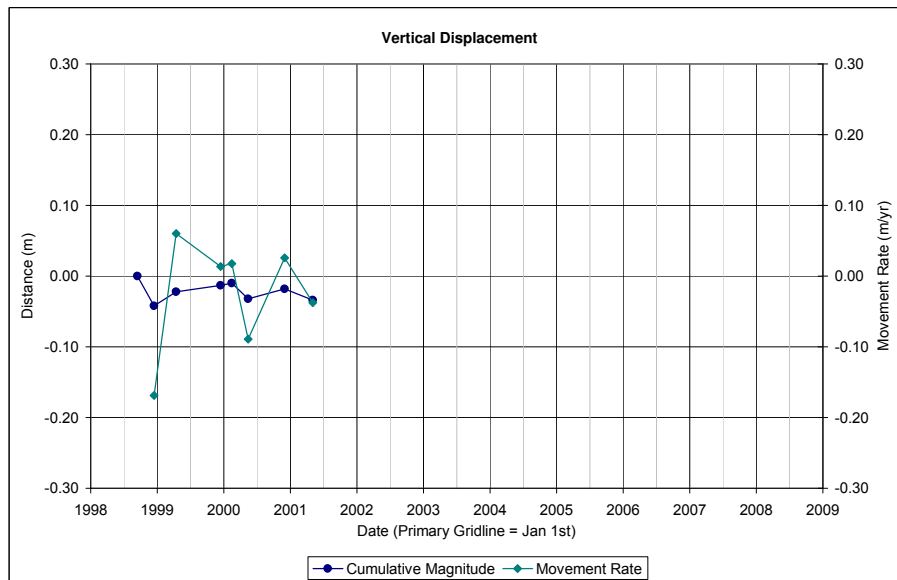
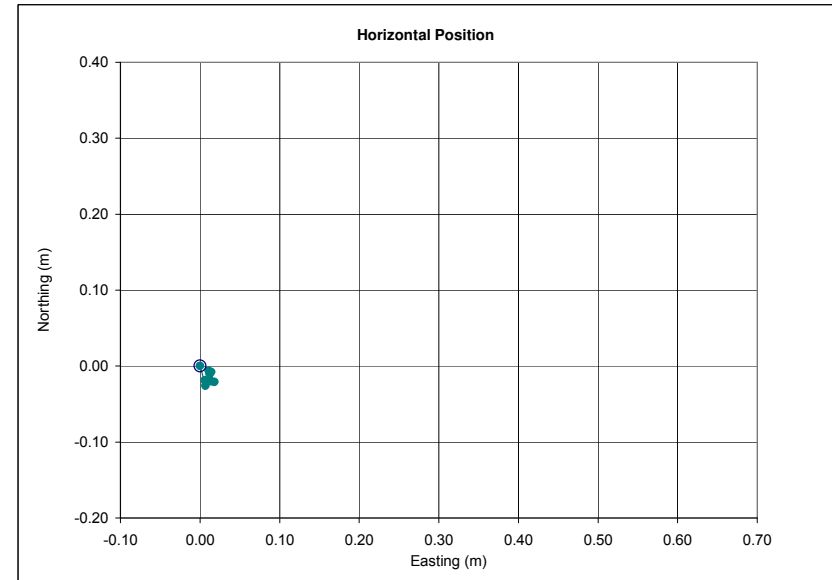
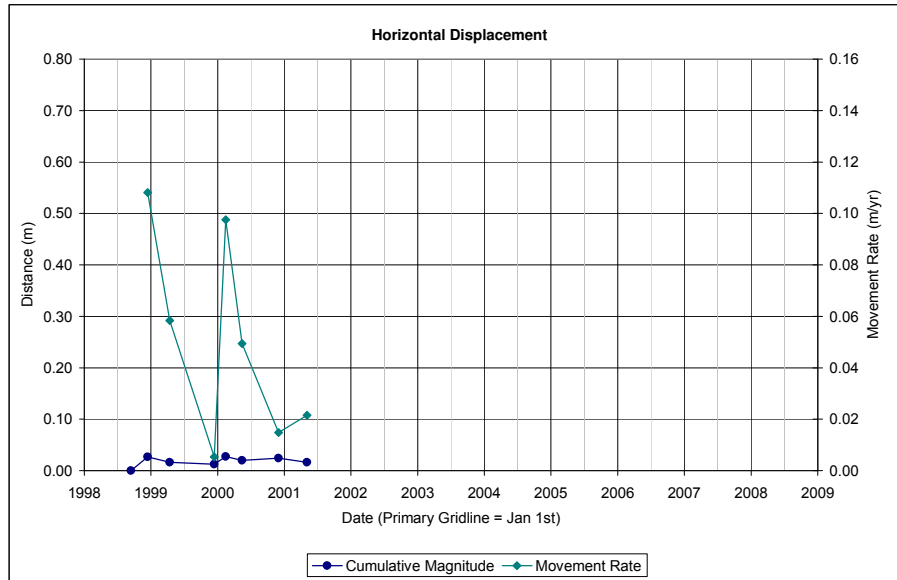
| Date       | Surveyed Position |            |         | Total Change in Position |        |        |                 |               |              |             | Overall Rates (m/yr) |                  | Incremental Change in Position |        |        |                 |               |              |             | Incremental Rates  |                  |
|------------|-------------------|------------|---------|--------------------------|--------|--------|-----------------|---------------|--------------|-------------|----------------------|------------------|--------------------------------|--------|--------|-----------------|---------------|--------------|-------------|--------------------|------------------|
|            | N<br>m            | E<br>m     | Z<br>m  | Time<br>yrs              | N<br>m | E<br>m | Horizontal<br>m | Vertical<br>m | Azimuth<br>° | Plunge<br>° | Horizontal<br>m/yr   | Vertical<br>m/yr | Time<br>yrs                    | N<br>m | E<br>m | Horizontal<br>m | Vertical<br>m | Azimuth<br>° | Plunge<br>° | Horizontal<br>m/yr | Vertical<br>m/yr |
| 9/15/1998  | 5869628.968       | 532631.086 | 478.920 | 0.00                     | 0.000  | 0.000  | 0.000           | 0.000         | 0.0          | 0.0         |                      |                  | 0.00                           | 0.000  | 0.000  | 0.000           | 0.000         | 0.0          | 0.0         |                    |                  |
| 12/15/1998 | 5869628.968       | 532631.095 | 478.920 | 0.25                     | 0.000  | 0.009  | 0.009           | 0.000         | 90.0         | 0.0         | 0.036                | 0.000            | 0.25                           | 0.000  | 0.009  | 0.009           | 0.000         | 90.0         | 0.0         | 0.036              | 0.000            |
| 4/15/1999  | 5869628.972       | 532631.109 | 478.920 | 0.58                     | 0.004  | 0.023  | 0.023           | 0.000         | 80.1         | 0.0         | 0.040                | 0.000            | 0.33                           | 0.004  | 0.014  | 0.015           | 0.000         | 74.1         | 0.0         | 0.044              | 0.000            |
| 12/15/1999 | 5869628.969       | 532631.117 | 478.922 | 1.25                     | 0.001  | 0.031  | 0.031           | 0.002         | 88.2         | 3.7         | 0.025                | 0.002            | 0.67                           | -0.003 | 0.008  | 0.009           | 0.002         | 110.6        | 13.2        | 0.013              | 0.003            |
| 2/15/2000  | 5869628.979       | 532631.117 | 478.918 | 1.42                     | 0.011  | 0.031  | 0.033           | -0.002        | 70.5         | -3.5        | 0.023                | -0.001           | 0.17                           | 0.010  | 0.000  | 0.010           | -0.004        | 0.0          | -21.8       | 0.059              | -0.024           |
| 5/15/2000  | 5869628.964       | 532631.113 | 478.913 | 1.66                     | -0.004 | 0.027  | 0.027           | -0.007        | 98.4         | -14.4       | 0.016                | -0.004           | 0.25                           | -0.015 | -0.004 | 0.016           | -0.005        | 194.9        | -17.9       | 0.063              | -0.020           |
| 11/30/2000 | 5869628.980       | 532631.118 | 478.908 | 2.21                     | 0.012  | 0.032  | 0.034           | -0.012        | 69.4         | -19.3       | 0.015                | -0.005           | 0.54                           | 0.016  | 0.005  | 0.017           | -0.005        | 17.4         | -16.6       | 0.031              | -0.009           |
| 5/5/2001   | 5869628.962       | 532631.106 | 478.908 | 2.64                     | -0.006 | 0.020  | 0.021           | -0.012        | 106.7        | -29.9       | 0.008                | -0.005           | 0.43                           | -0.018 | -0.012 | 0.022           | 0.000         | 213.7        | 0.0         | 0.051              | 0.000            |
| 12/15/2001 | 5869628.967       | 532631.124 | 478.927 | 3.25                     | -0.001 | 0.038  | 0.038           | 0.007         | 91.5         | 10.4        | 0.012                | 0.002            | 0.61                           | 0.005  | 0.018  | 0.019           | 0.019         | 74.5         | 45.5        | 0.030              | 0.031            |
| 5/15/2002  | 5869628.946       | 532631.150 | 478.912 | 3.66                     | -0.022 | 0.064  | 0.068           | -0.008        | 109.0        | -6.7        | 0.018                | -0.002           | 0.41                           | -0.021 | 0.026  | 0.033           | -0.015        | 128.9        | -24.2       | 0.081              | -0.036           |
| 10/24/2002 | 5869628.966       | 532631.114 | 478.894 | 4.11                     | -0.002 | 0.028  | 0.028           | -0.026        | 94.1         | -42.8       | 0.007                | -0.006           | 0.44                           | 0.020  | -0.036 | 0.041           | -0.018        | 299.1        | -23.6       | 0.093              | -0.041           |
| 11/12/2003 | 5869628.958       | 532631.116 | 478.922 | 5.16                     | -0.010 | 0.030  | 0.032           | 0.002         | 107.7        | 2.8         | 0.006                | 0.000            | 1.05                           | -0.008 | 0.002  | 0.008           | 0.028         | 162.9        | 73.8        | 0.008              | 0.026            |
| 1/11/2005  | 5869628.965       | 532631.123 | 478.934 | 6.32                     | -0.003 | 0.037  | 0.037           | 0.014         | 95.1         | 20.9        | 0.006                | 0.002            | 1.17                           | 0.006  | 0.006  | 0.009           | 0.013         | 45.4         | 54.2        | 0.008              | 0.011            |
| 3/10/2006  | 5869628.963       | 532631.126 | 478.926 | 7.48                     | -0.005 | 0.040  | 0.040           | 0.006         | 97.1         | 8.5         | 0.005                | 0.001            | 1.16                           | -0.002 | 0.003  | 0.004           | -0.008        | 118.0        | -65.9       | 0.003              | -0.007           |
| 11/10/2006 | 5869628.961       | 532631.126 | 478.922 | 8.15                     | -0.007 | 0.040  | 0.041           | 0.002         | 99.9         | 2.8         | 0.005                | 0.000            | 0.67                           | -0.002 | 0.000  | 0.002           | -0.004        | 180.0        | -63.4       | 0.003              | -0.006           |
| 4/5/2007   | 5869628.968       | 532631.128 | 478.926 | 8.55                     | 0.000  | 0.042  | 0.042           | 0.006         | 90.0         | 8.1         | 0.005                | 0.001            | 0.40                           | 0.007  | 0.002  | 0.007           | 0.004         | 15.9         | 28.8        | 0.018              | 0.010            |
| 8/16/2007  | 5869628.962       | 532631.129 | 478.924 | 8.92                     | -0.006 | 0.043  |                 |               |              |             |                      |                  |                                |        |        |                 |               |              |             |                    |                  |

**Displacement Graphs - Hub 98-22**  
Lane between Beath/Bouchie



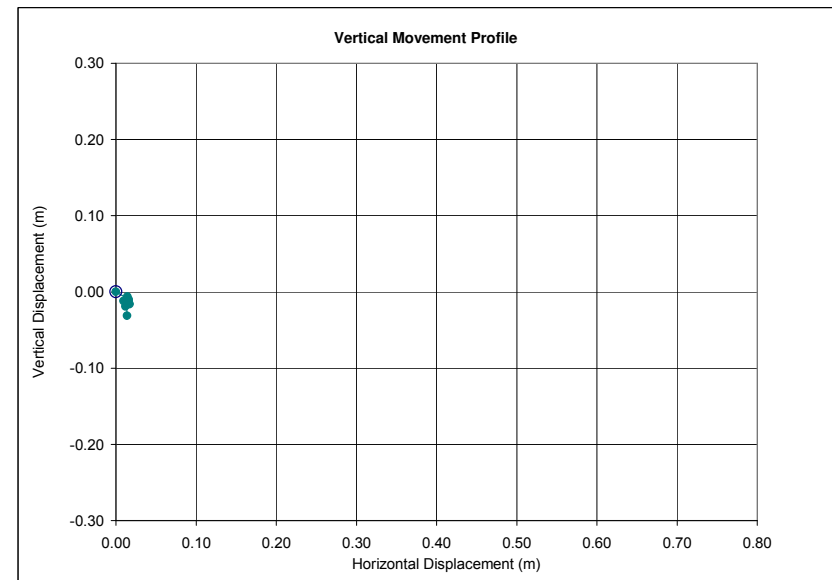
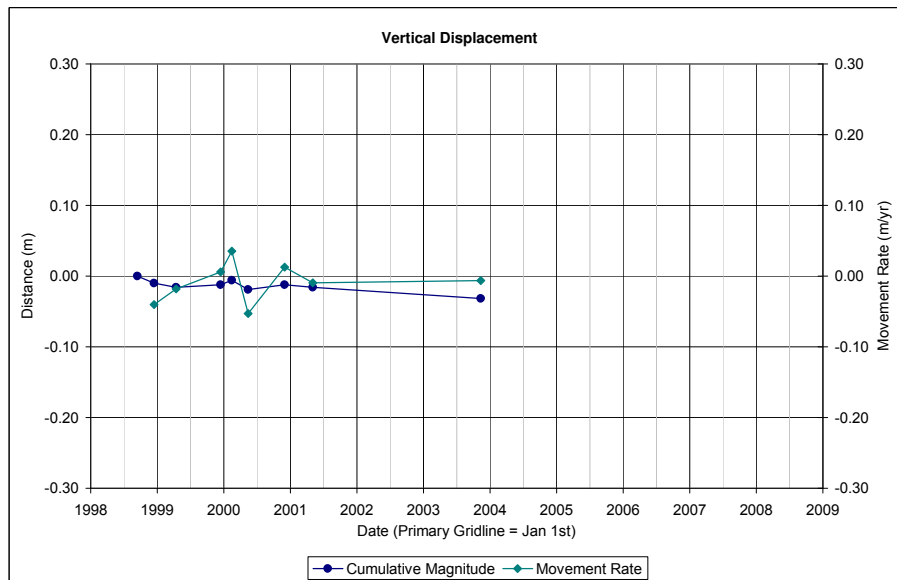
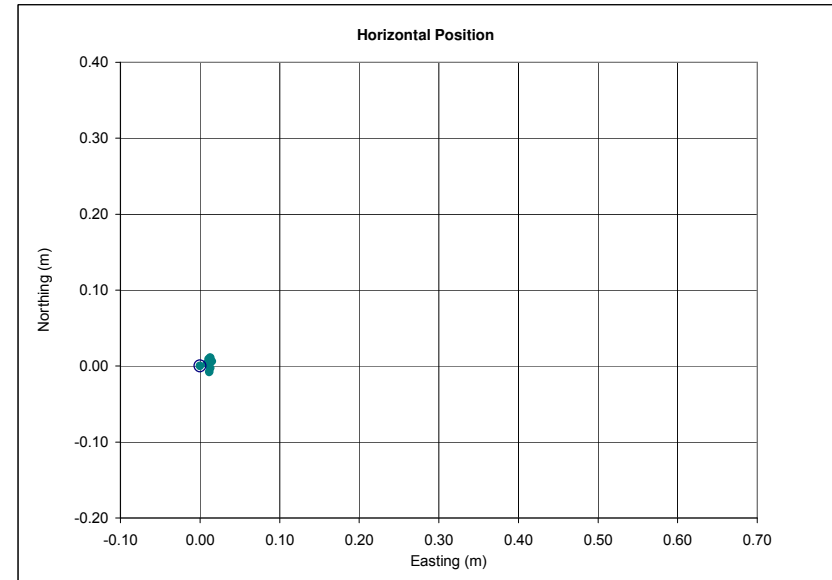
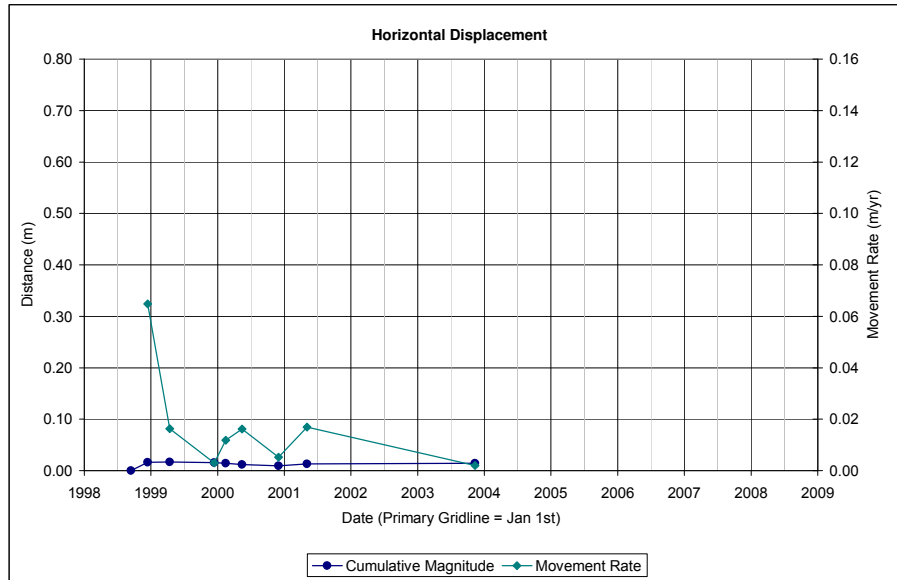
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**Displacement Graphs - Hub 98-24**  
Salton Road (Hixon Road)



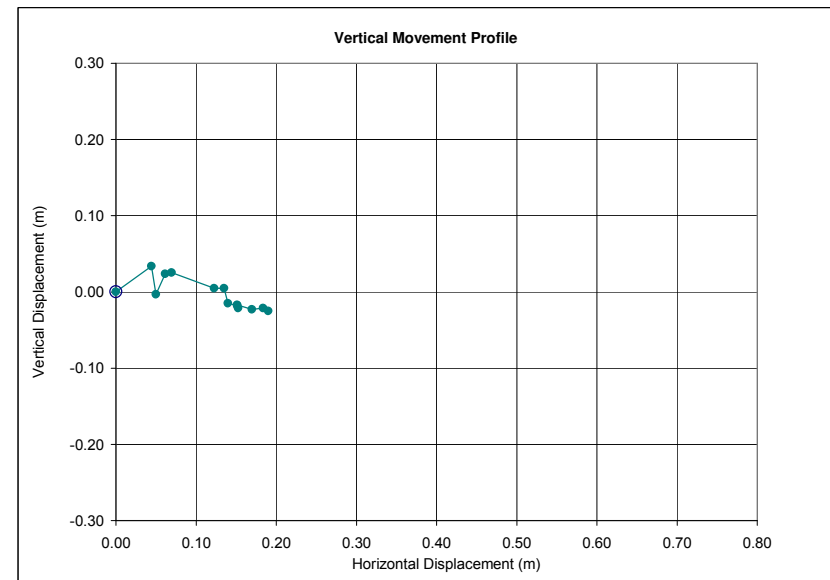
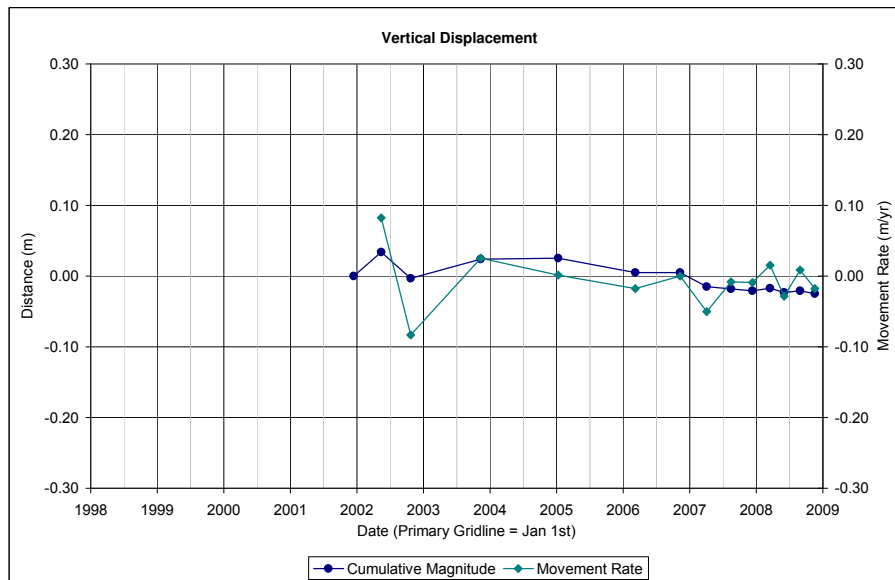
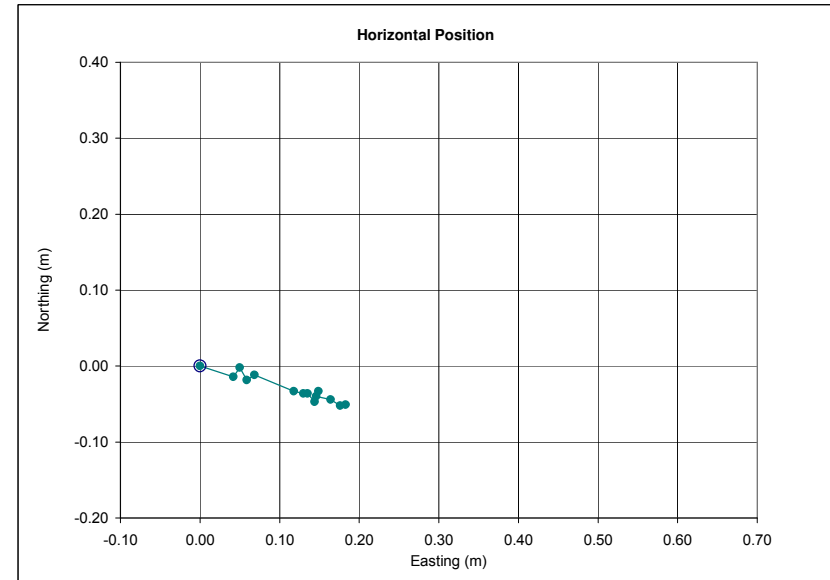
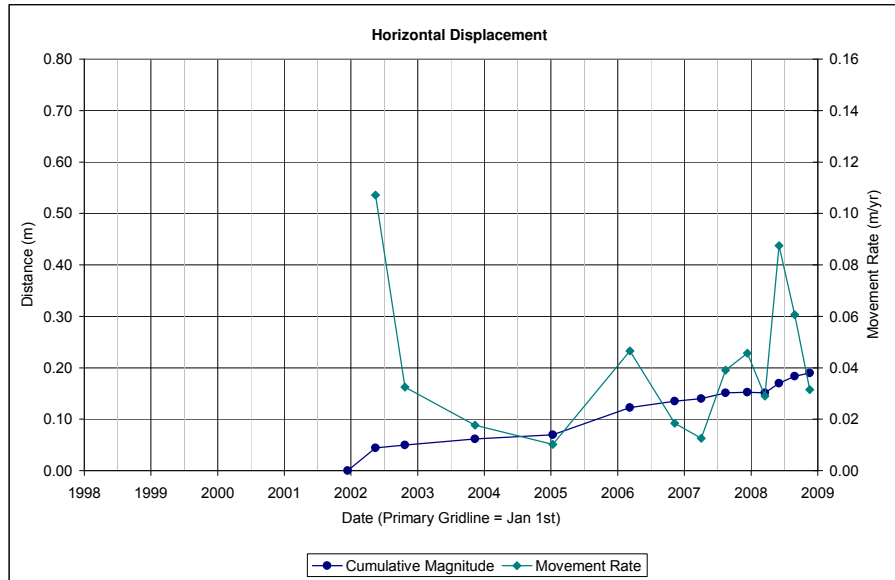
[illegible]

Displacement Graphs - Hub 98-29  
Quesnel Hill



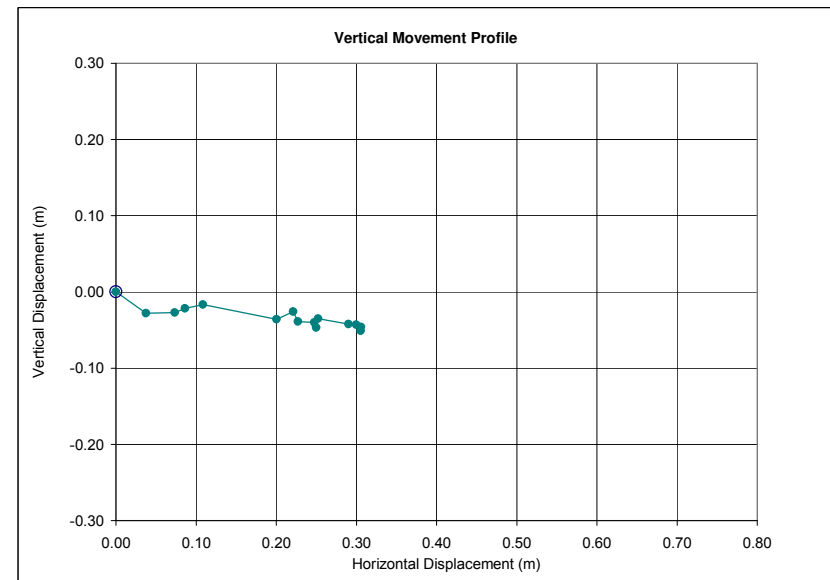
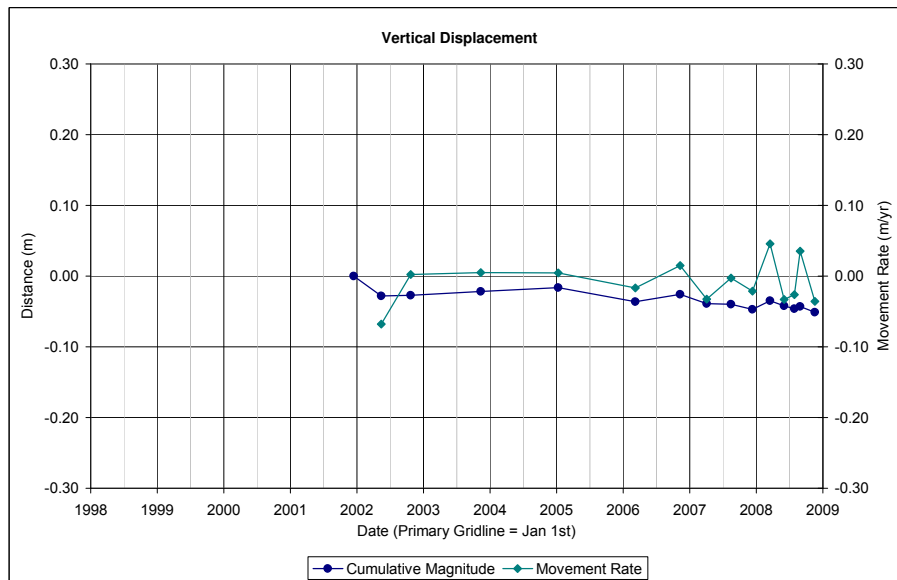
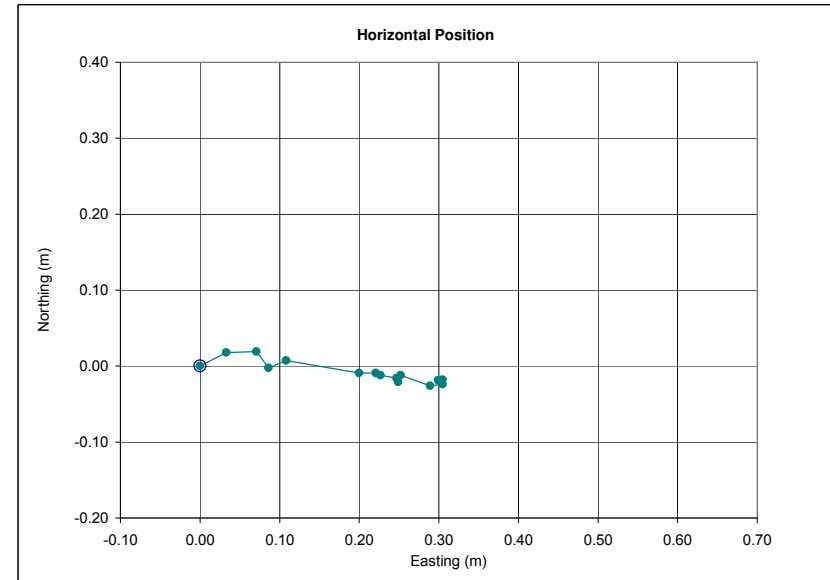
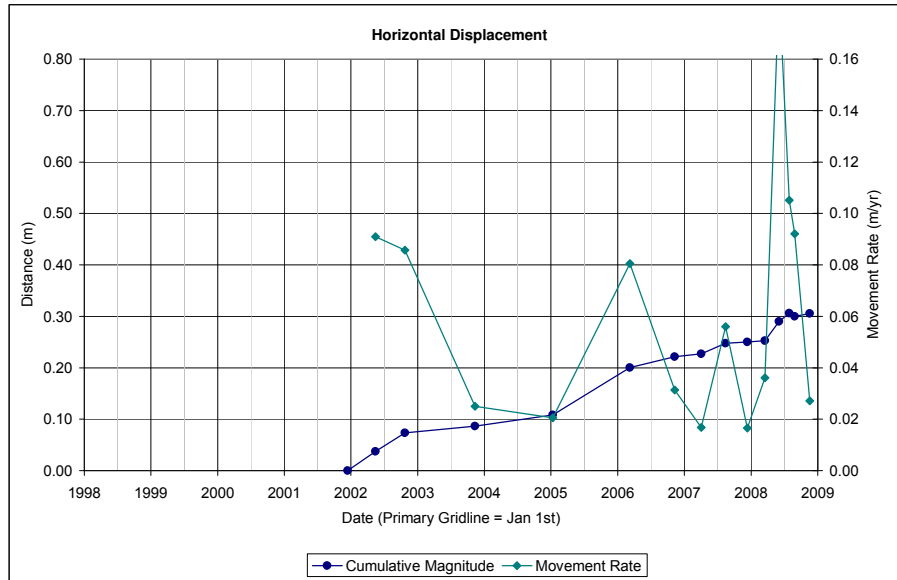
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**Displacement Graphs - Hub 01-30**  
West End of Dodds Avenue at Finley Road



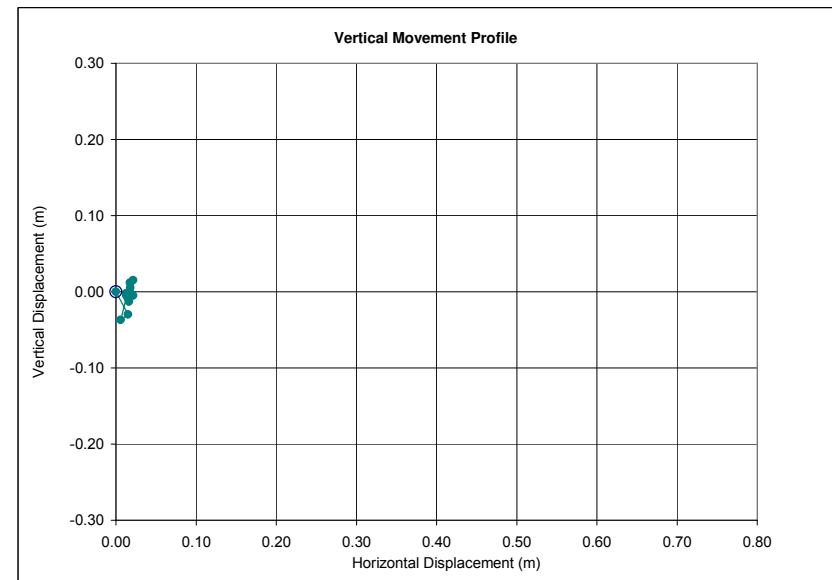
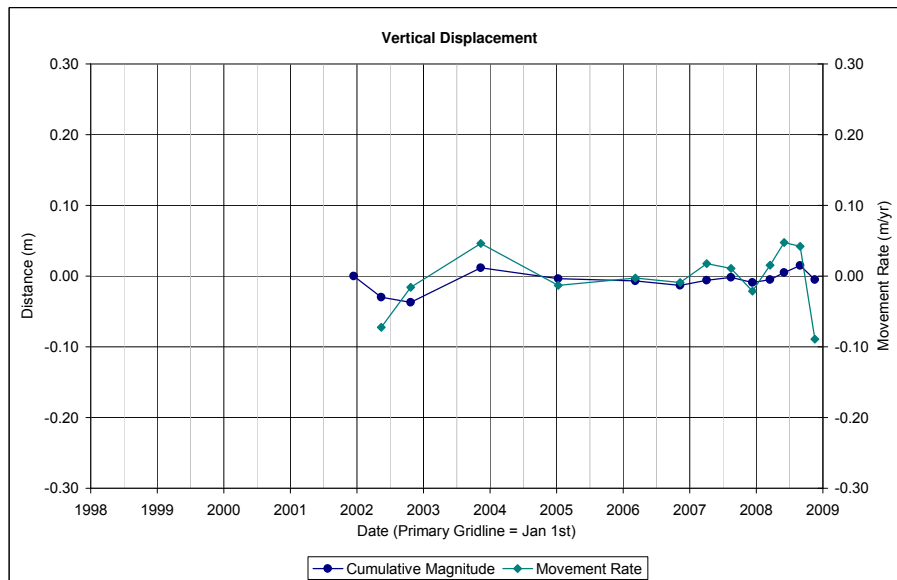
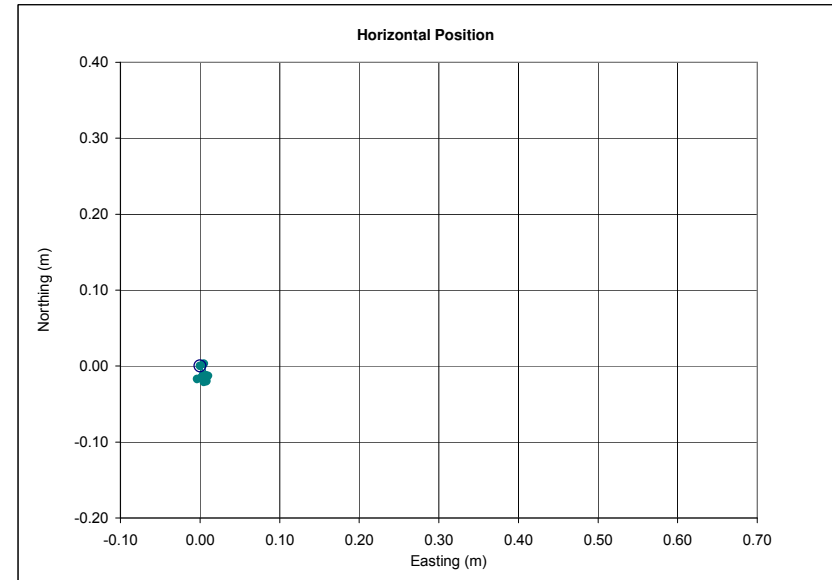
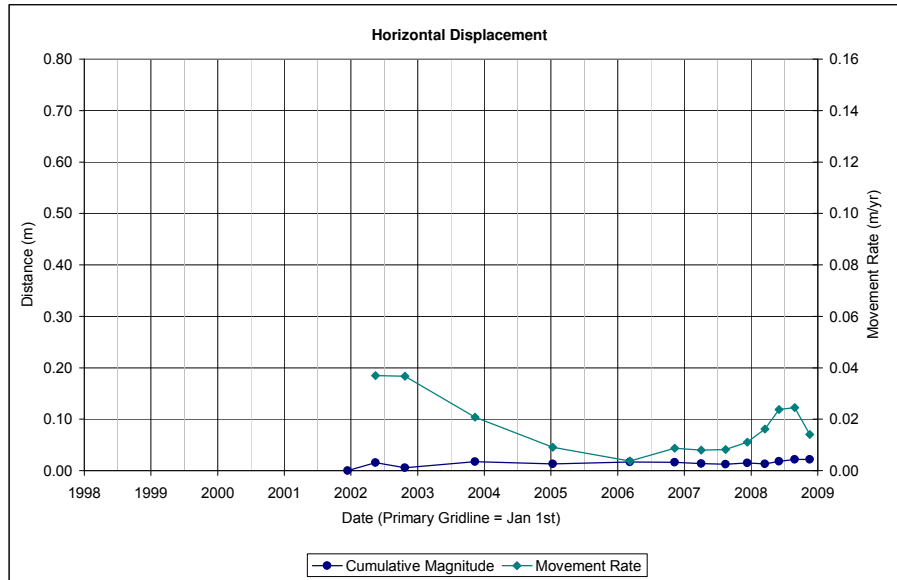
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# Displacement Graphs - Hub 01-31 Blair Street



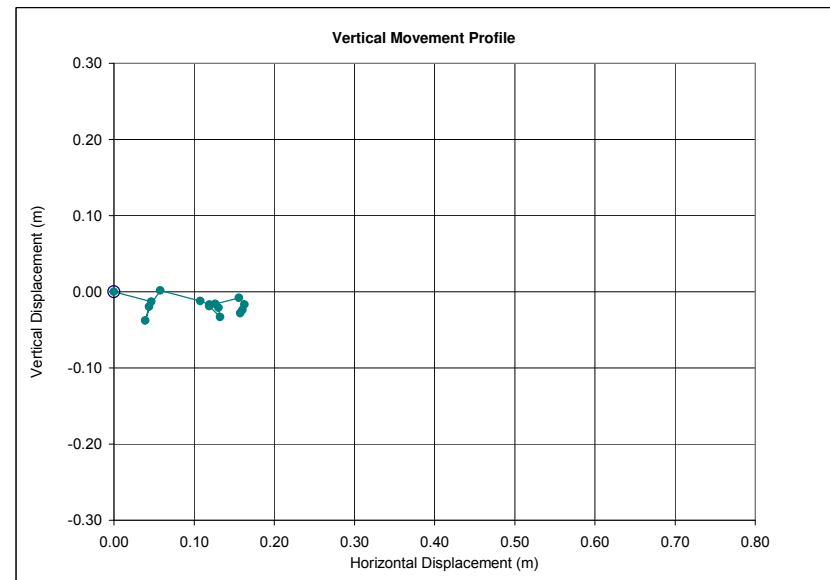
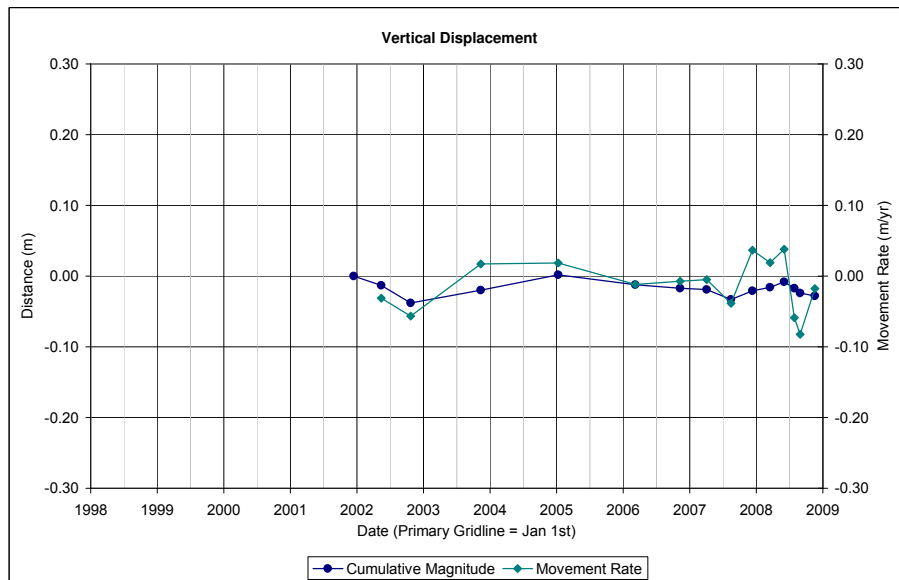
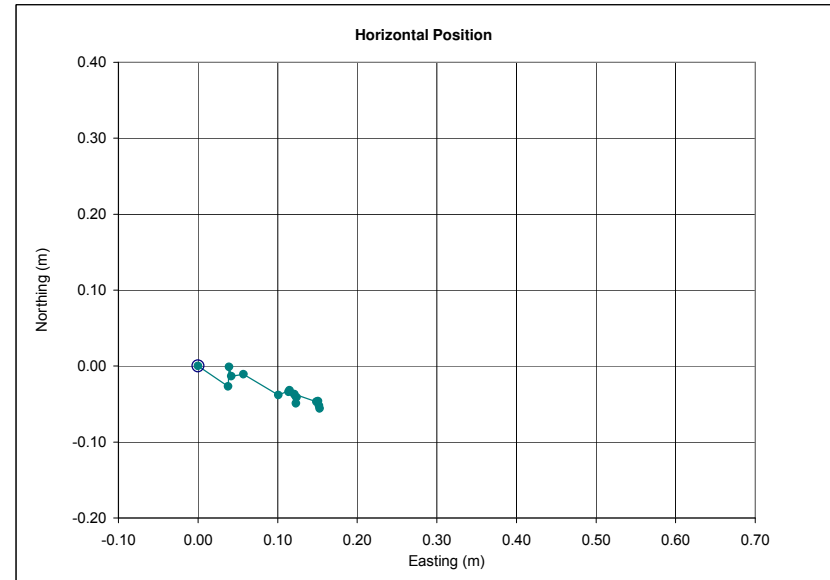
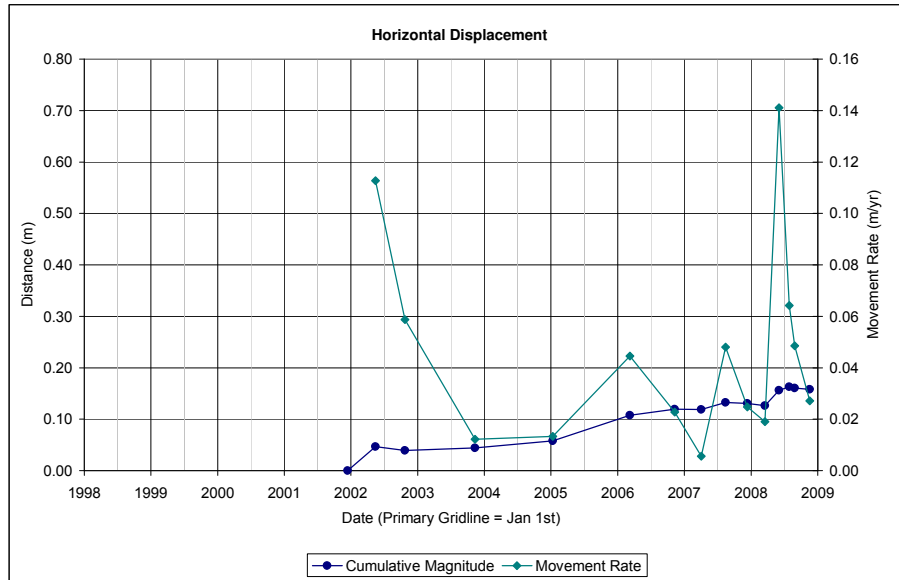
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**Displacement Graphs - Hub 01-32**  
Lewis Drive/Beabien Avenue



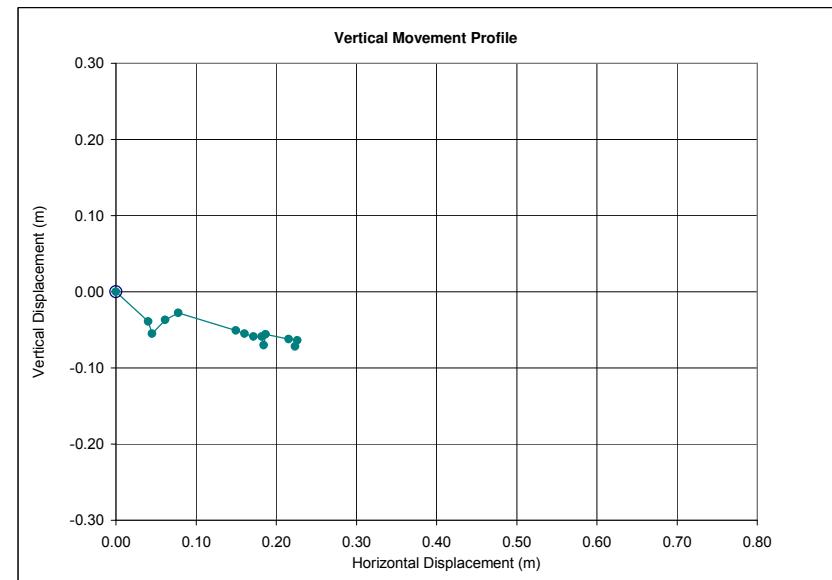
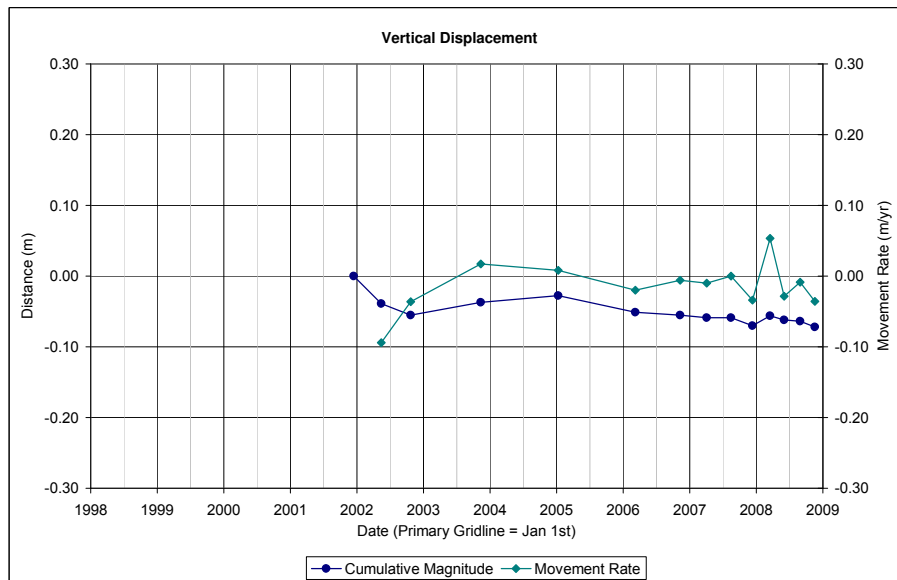
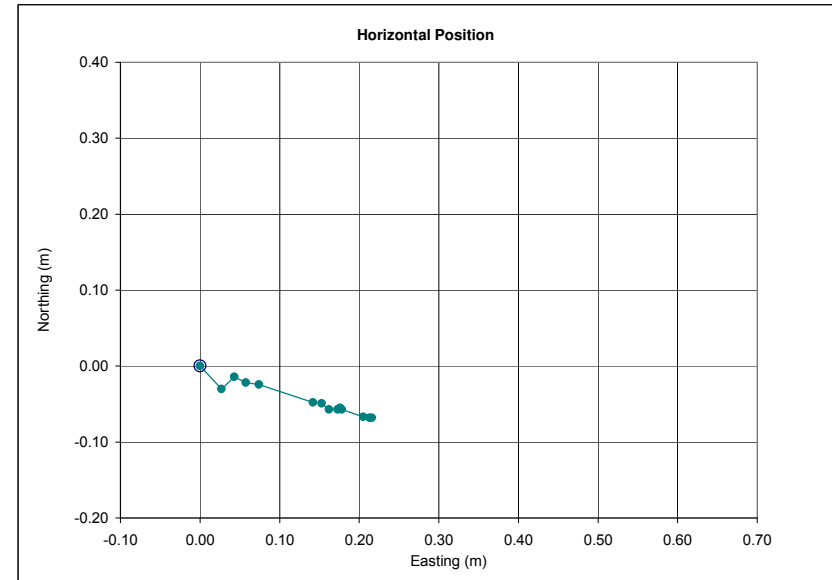
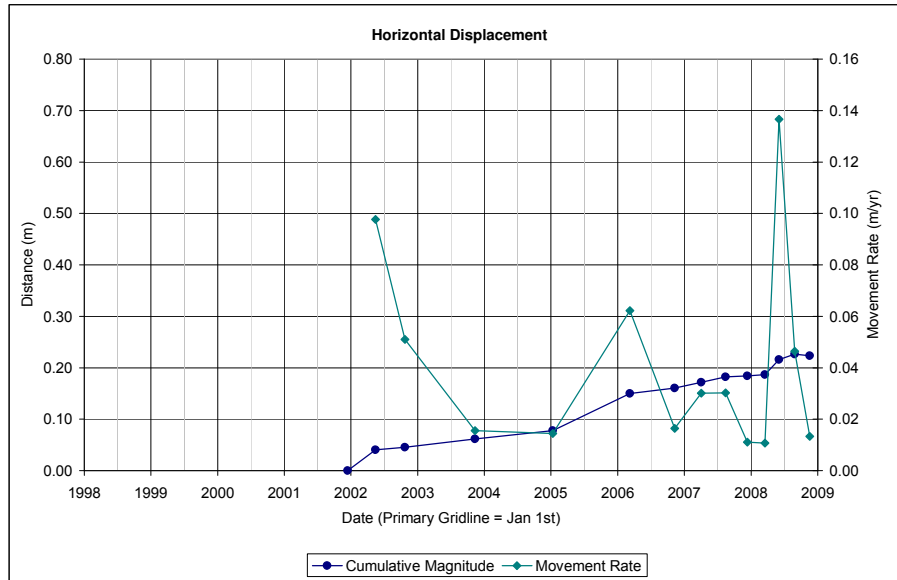
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**Displacement Graphs - Hub 01-33**  
South End of Allard Street



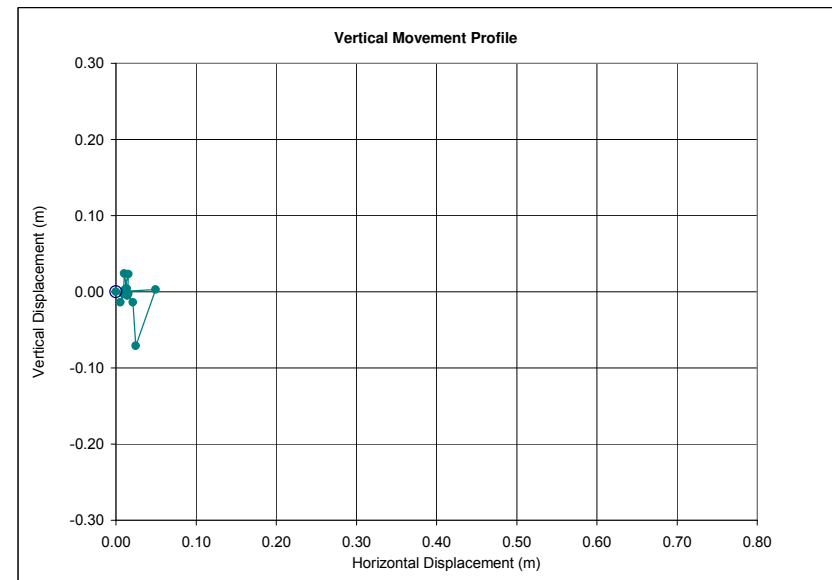
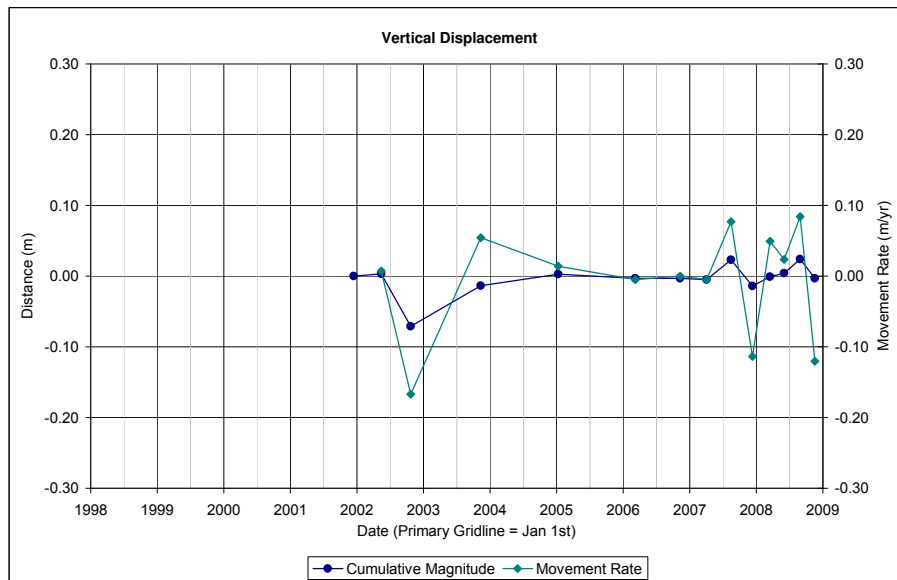
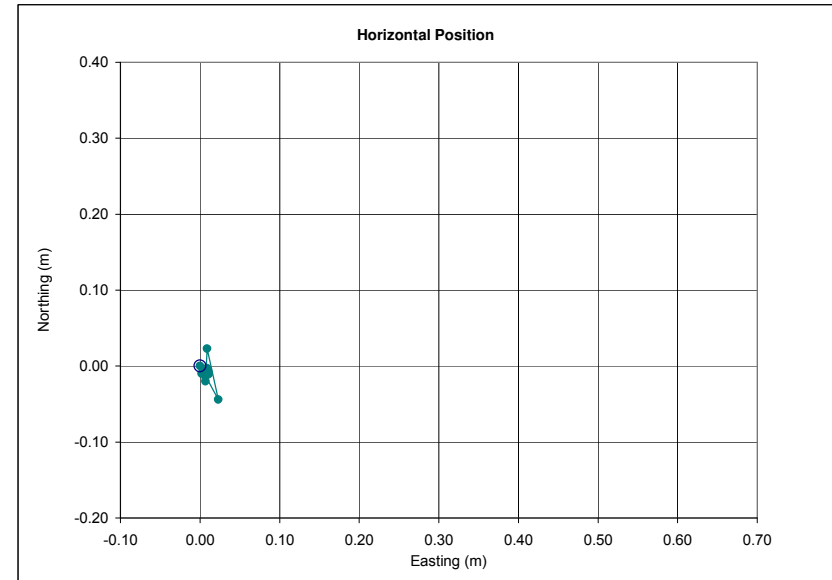
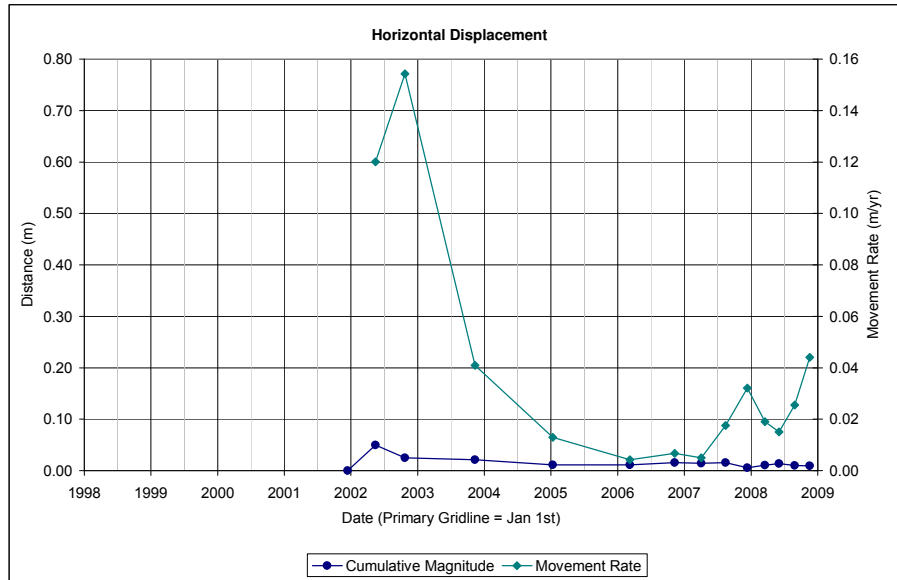
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**Displacement Graphs - Hub 01-34**  
Abbott Road and Blair Street



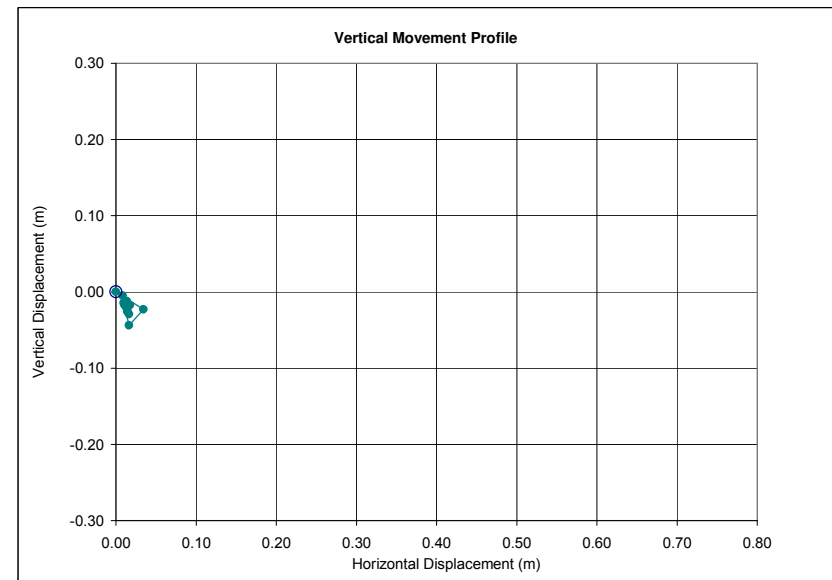
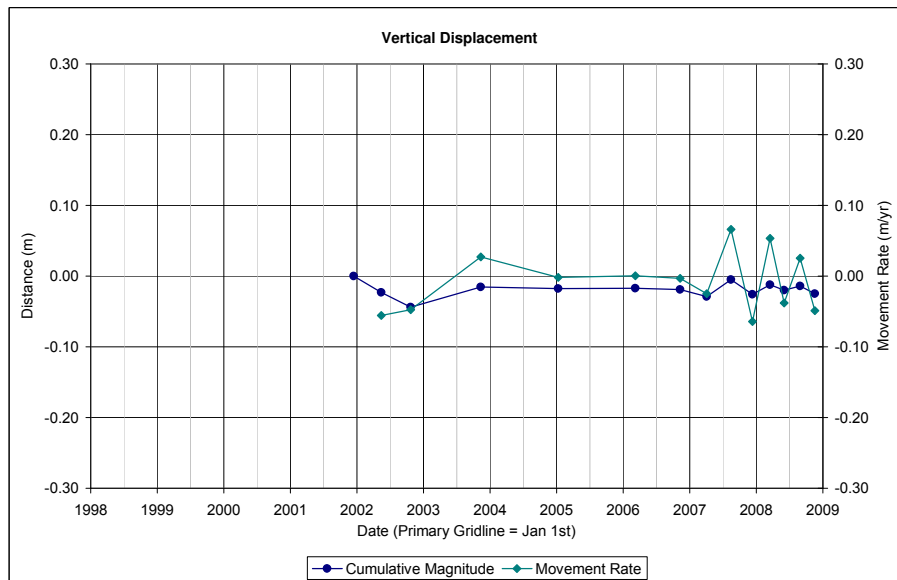
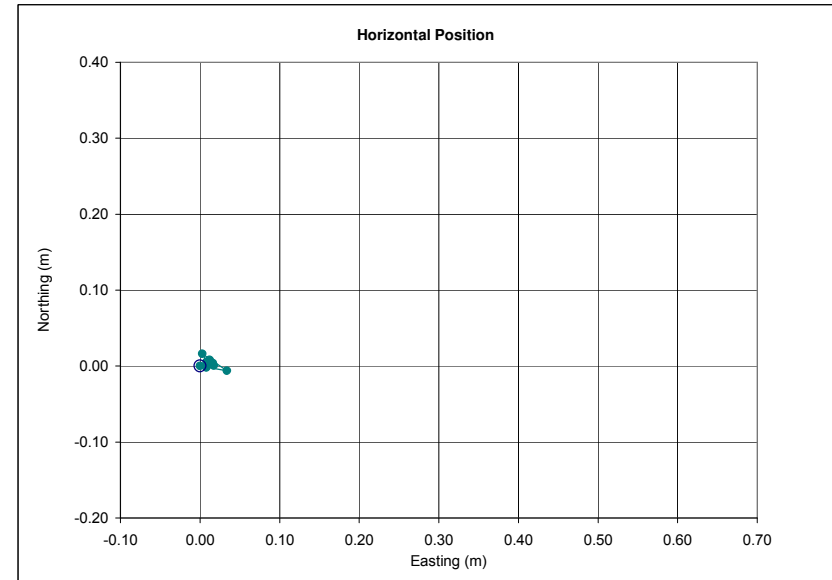
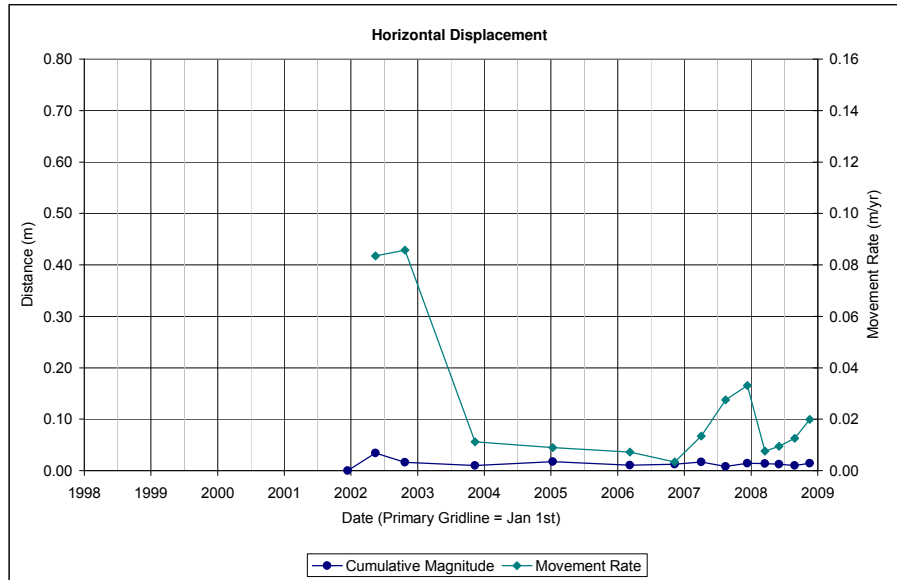
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**Displacement Graphs - Hub 01-35**  
Lewis Drive North of Couldwell Street



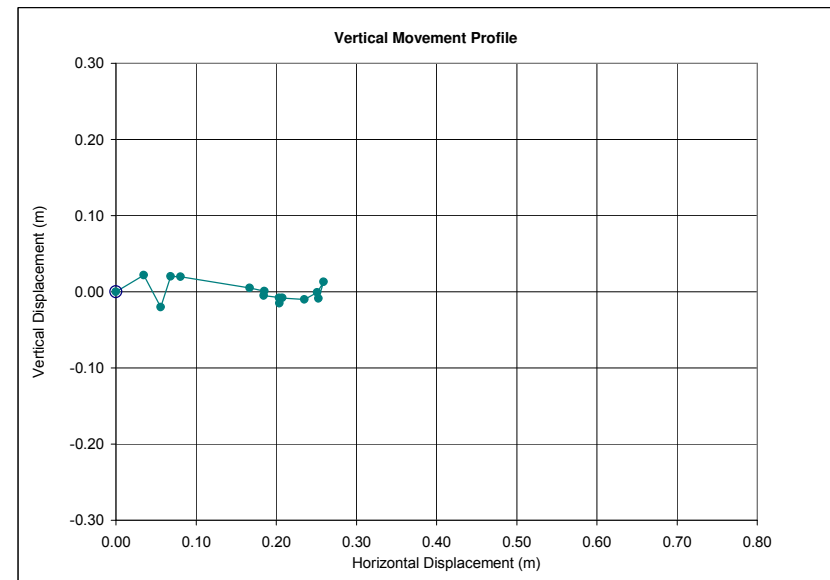
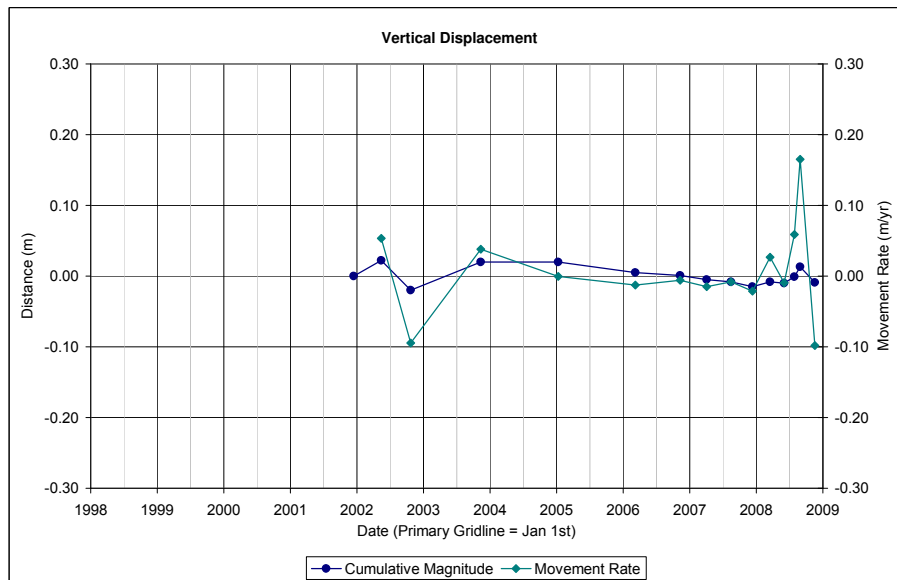
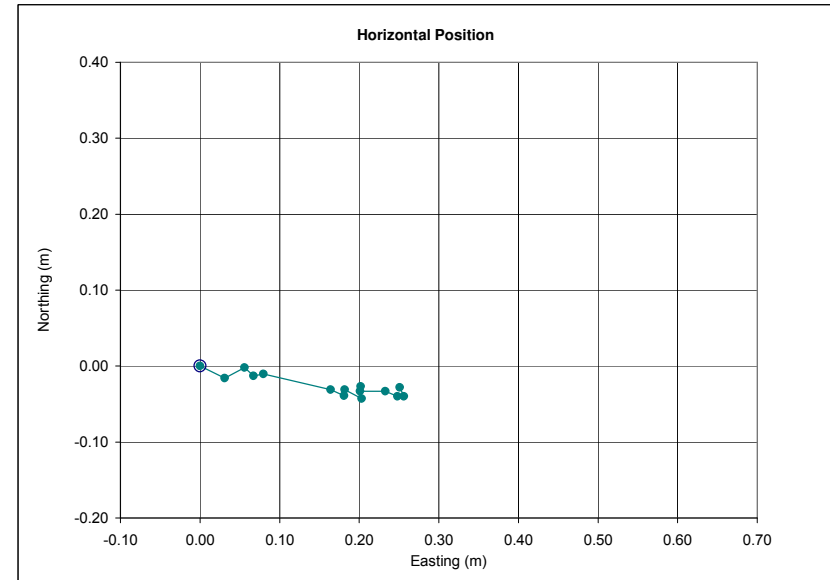
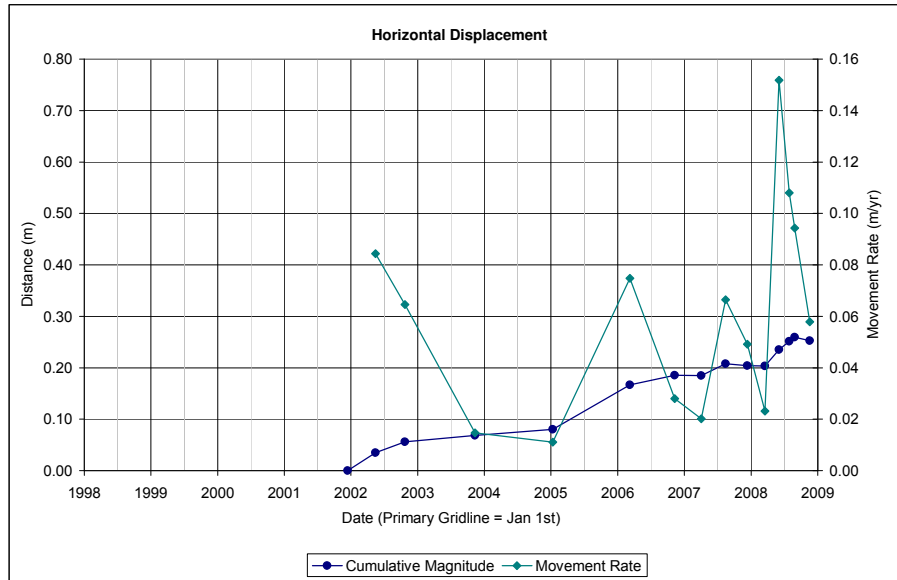
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**Displacement Graphs - Hub 01-36**  
Anderson Drive at Abbott Drive



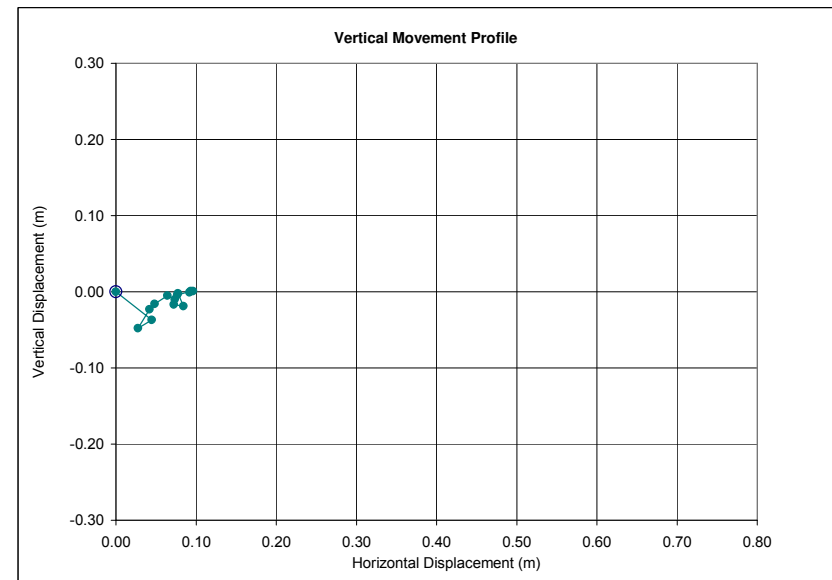
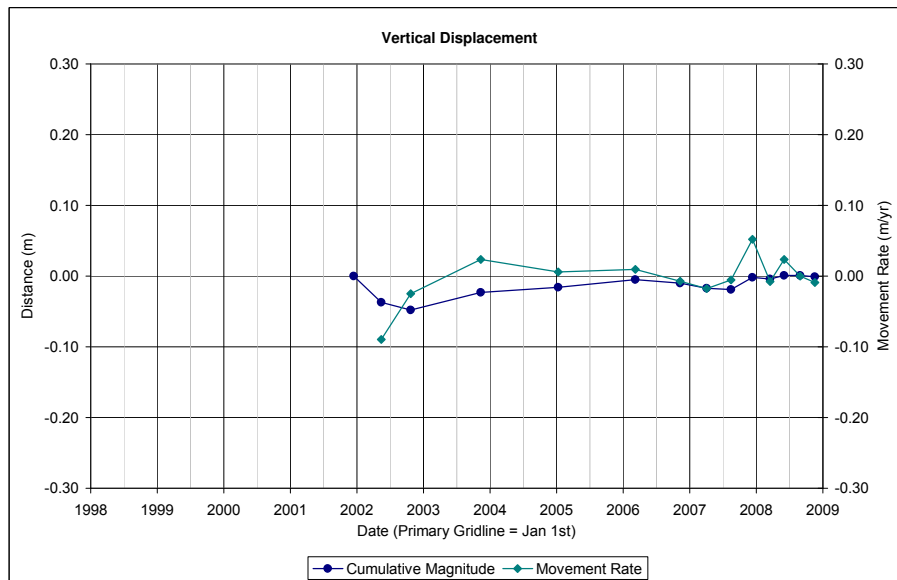
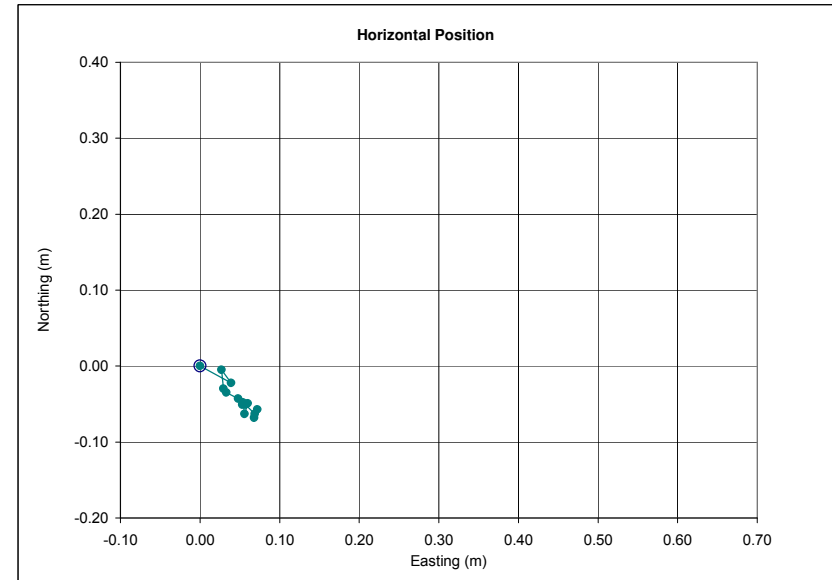
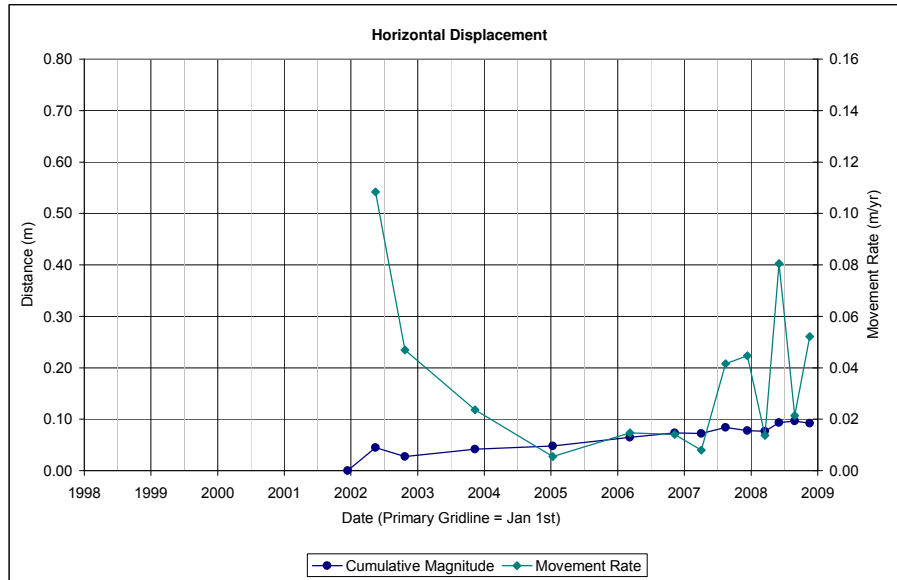
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# Displacement Graphs - Hub 01-37 Dawson Street at Abbott Drive



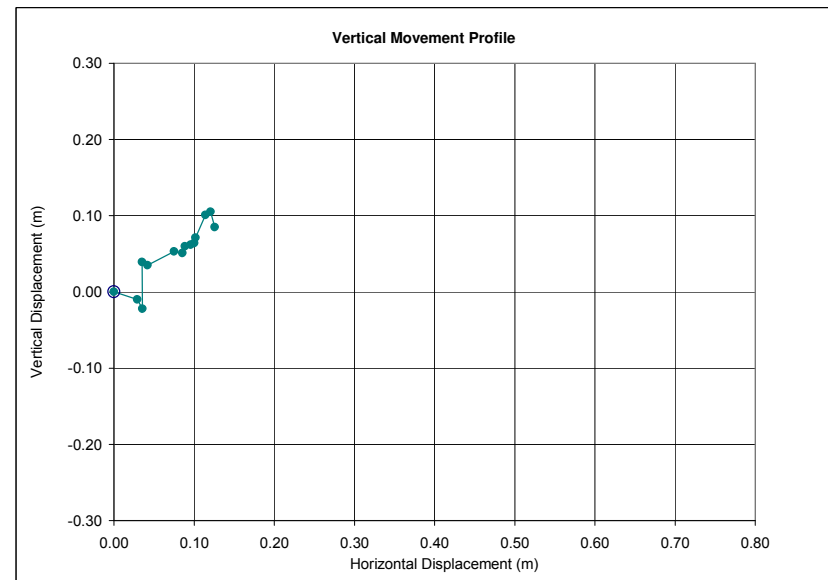
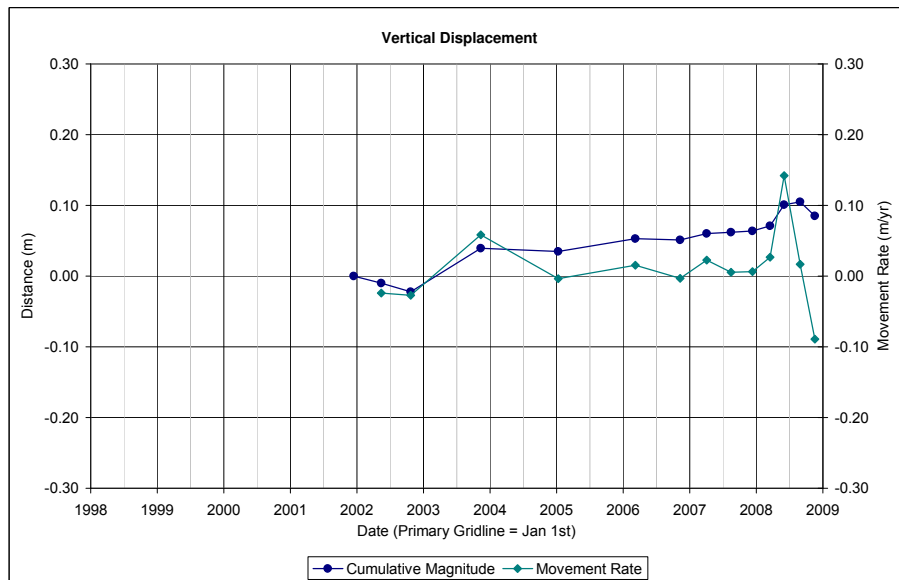
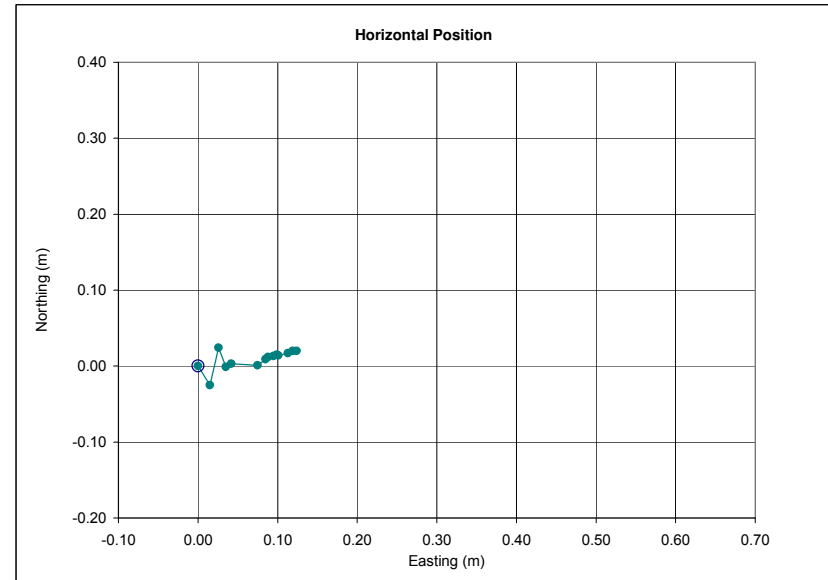
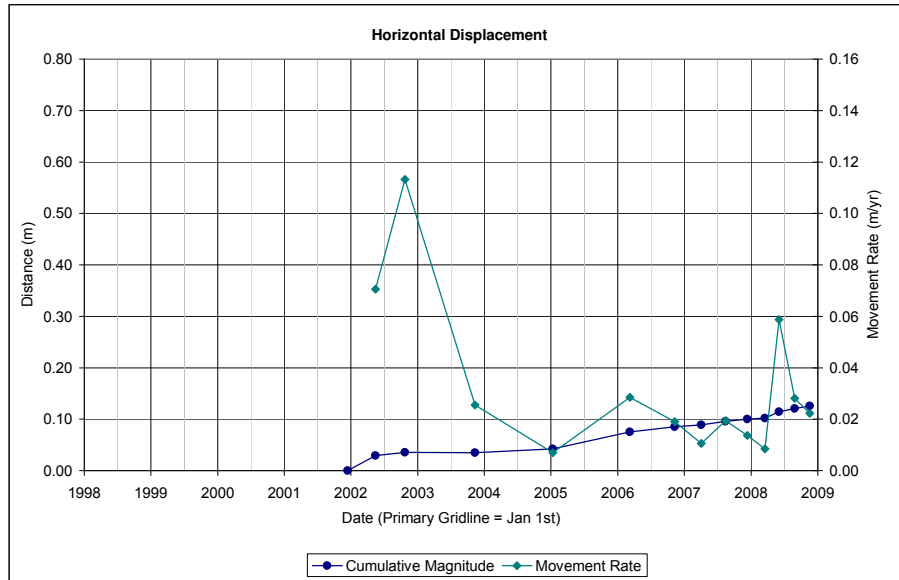
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**Displacement Graphs - Hub 01-39**  
Anderson Avenue at Wade Avenue



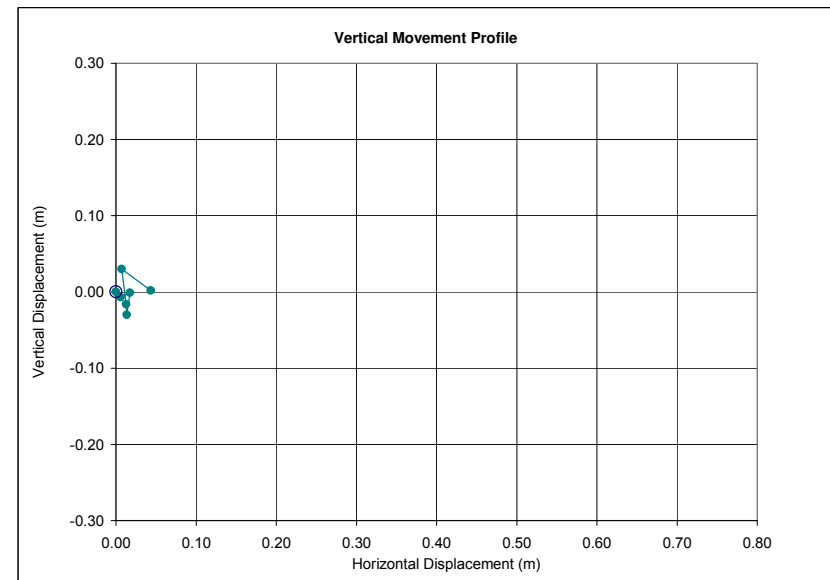
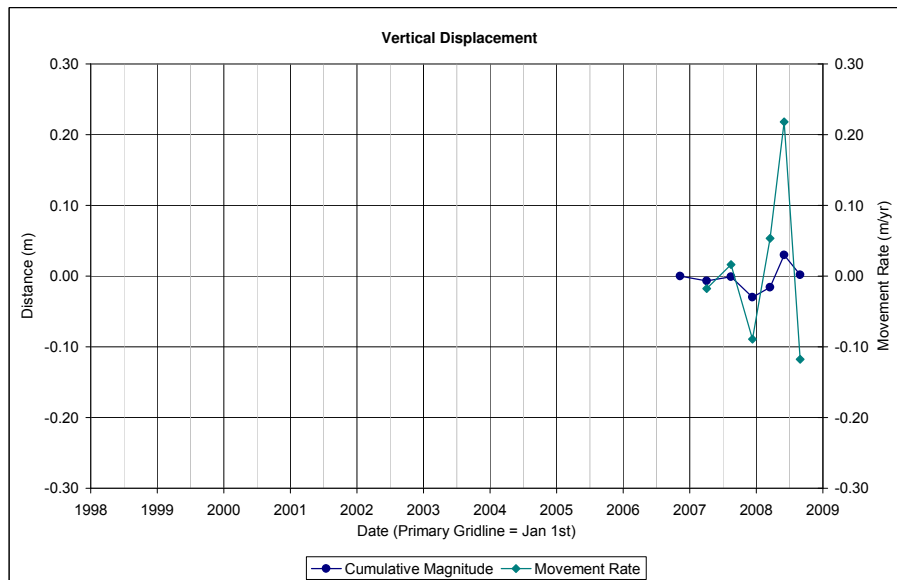
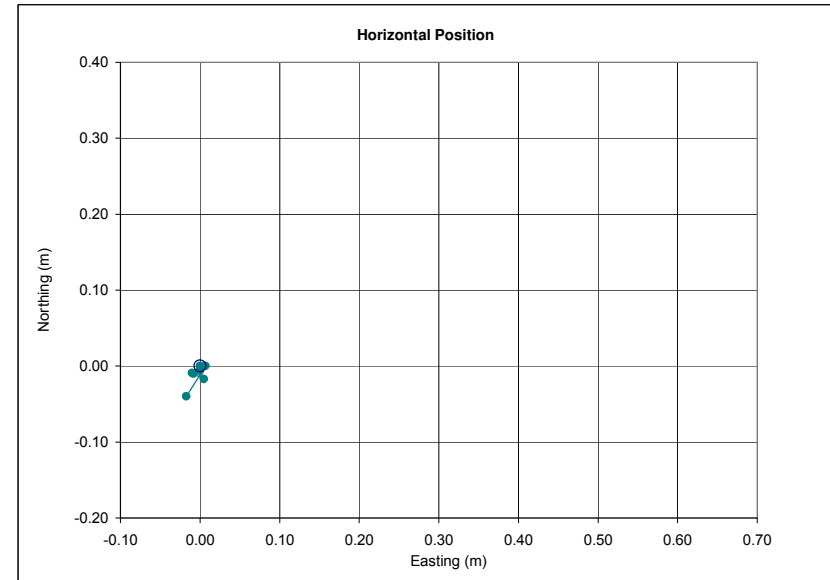
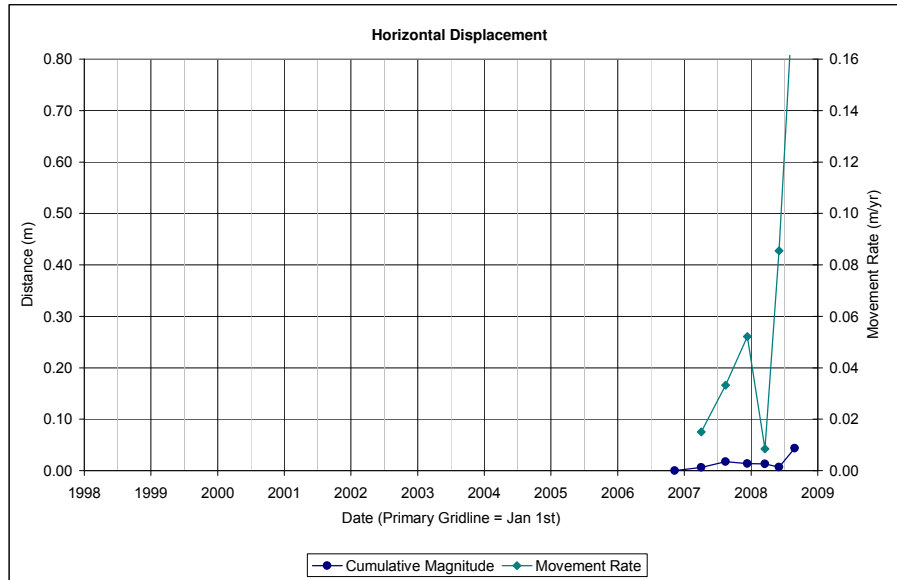
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**Displacement Graphs - Hub 01-40**  
Lewis Drive East of Healy Street



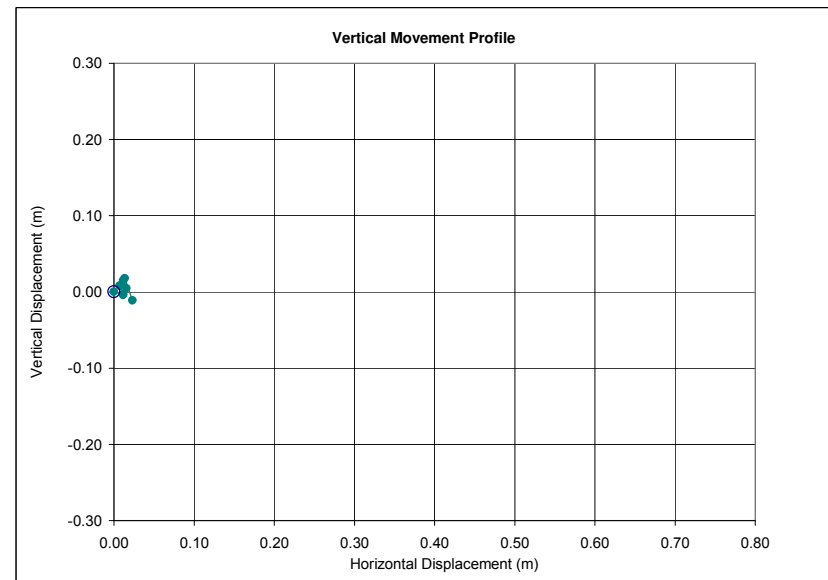
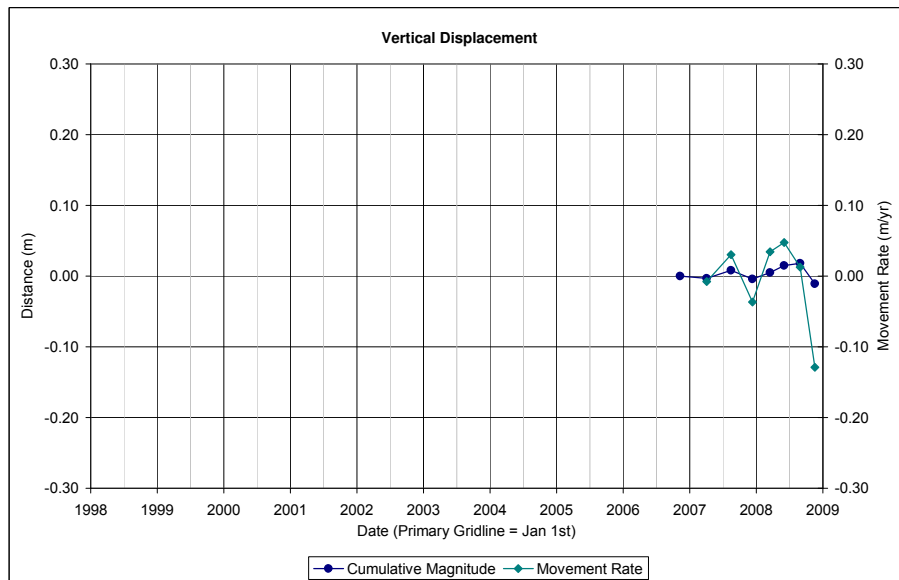
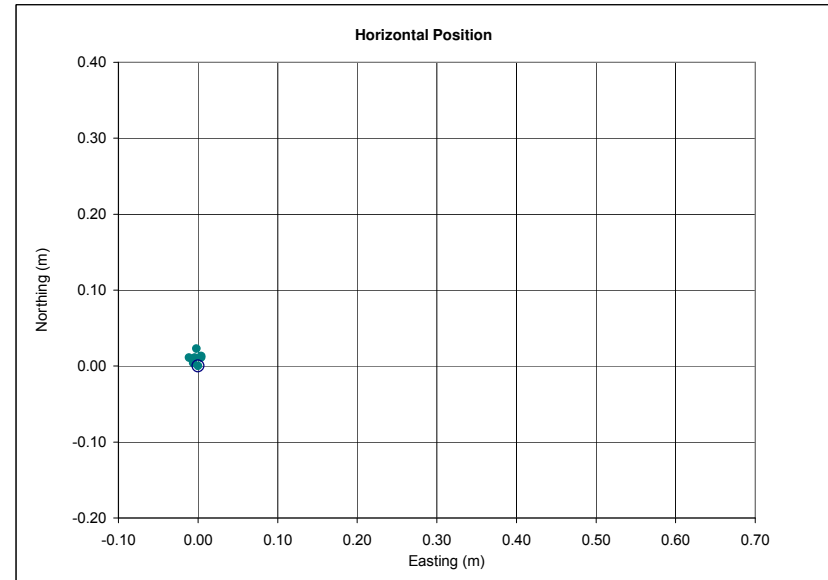
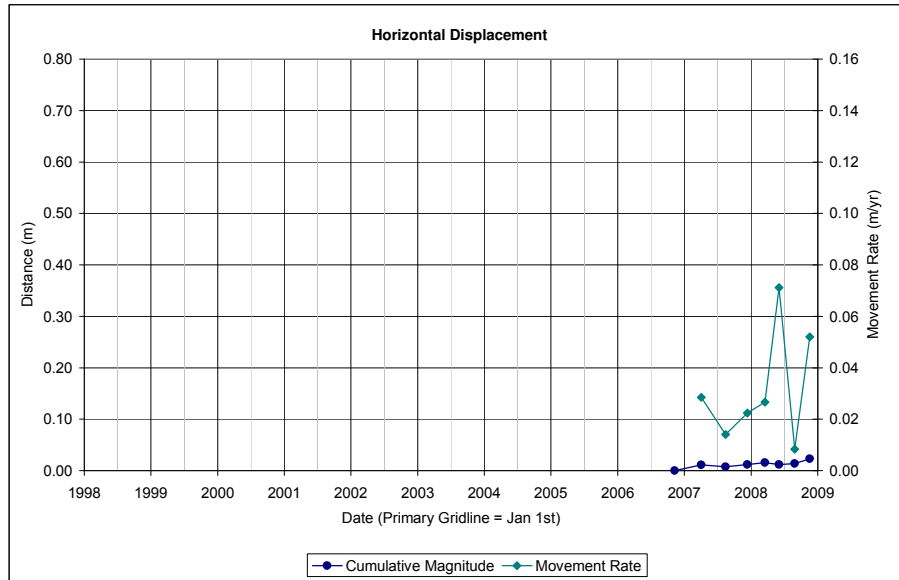
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**Displacement Graphs - Hub 06-01**  
End alley E. of Anderson Dr., opposite school



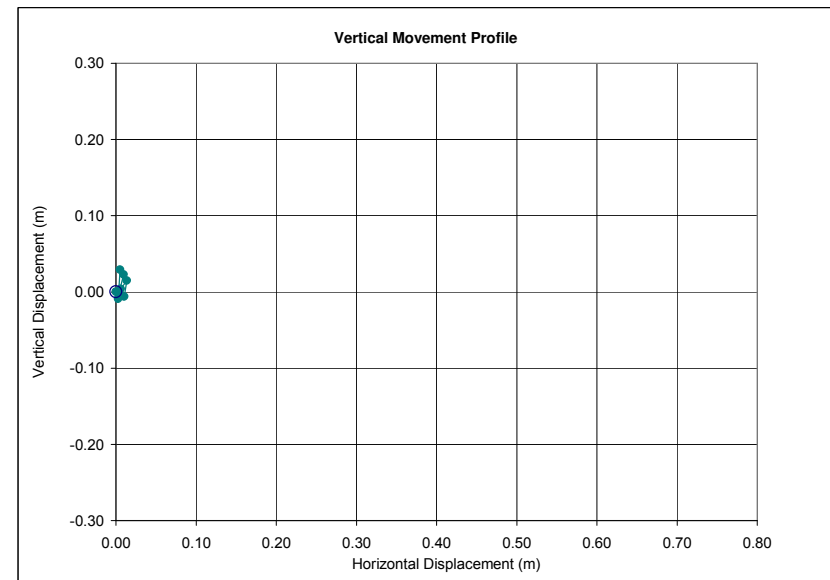
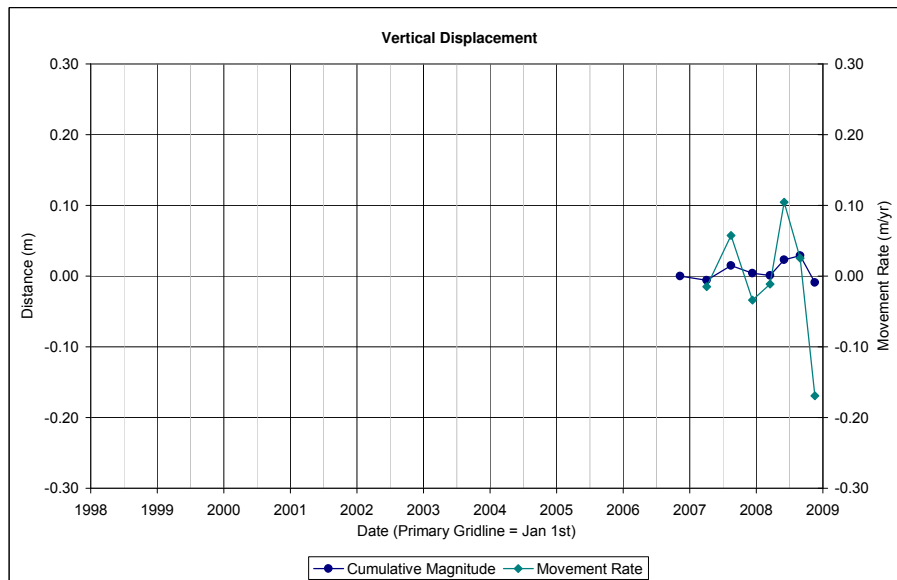
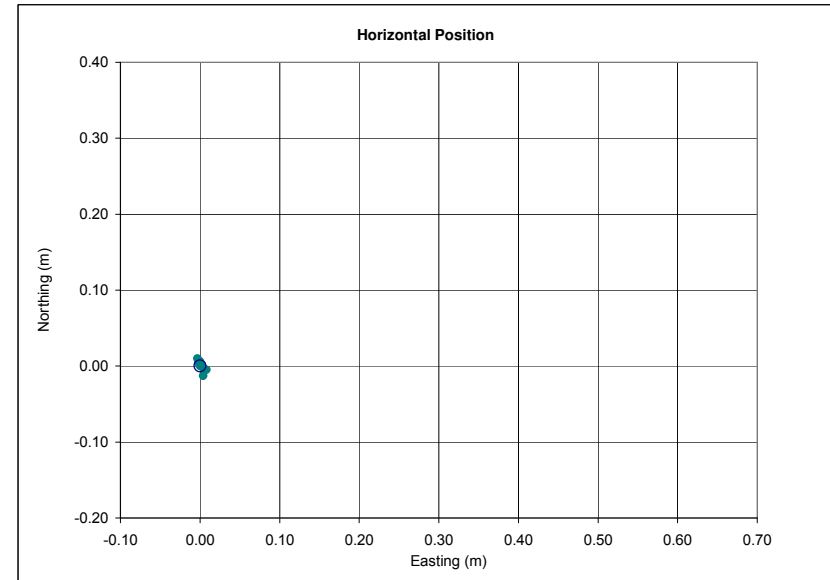
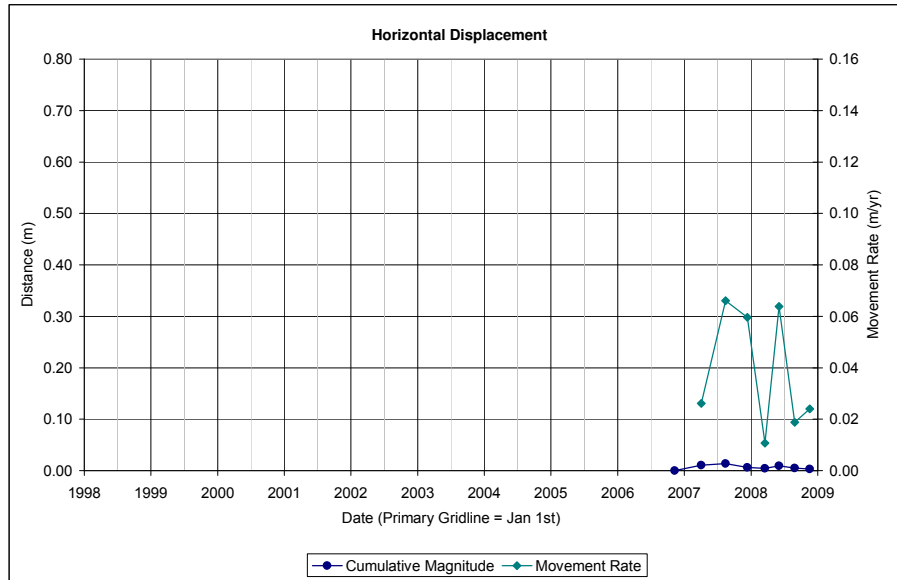
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**Displacement Graphs - Hub 06-02**  
East side Anderson Drive by school



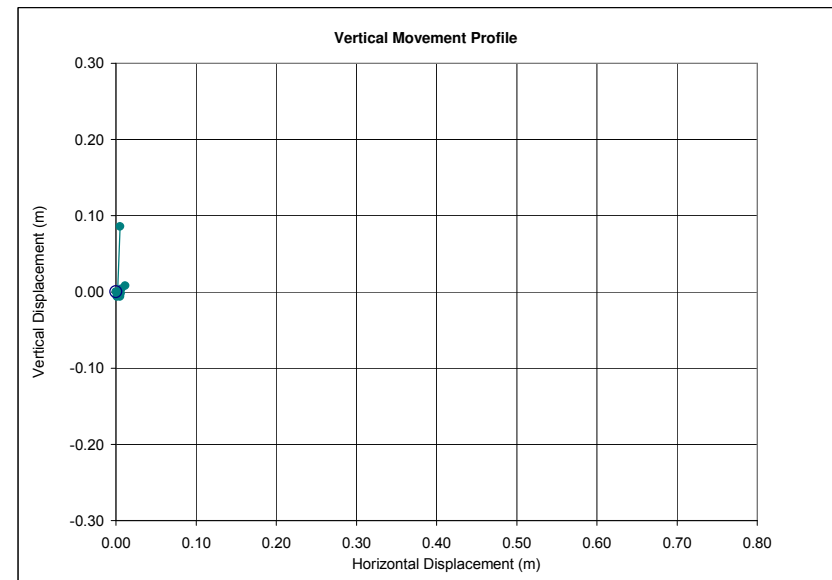
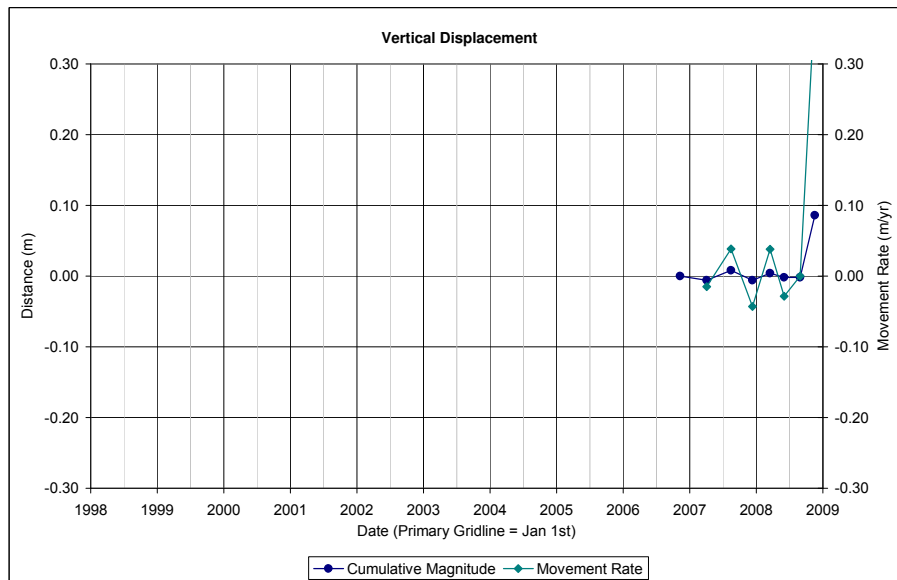
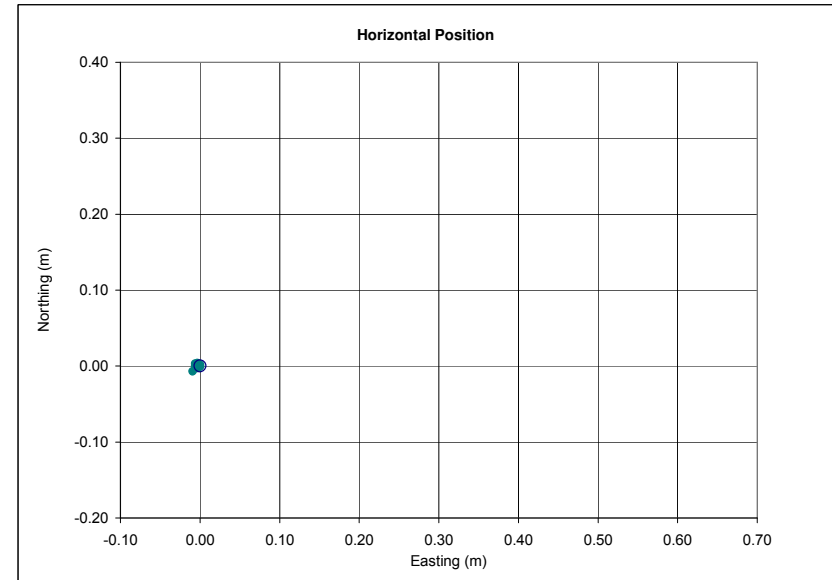
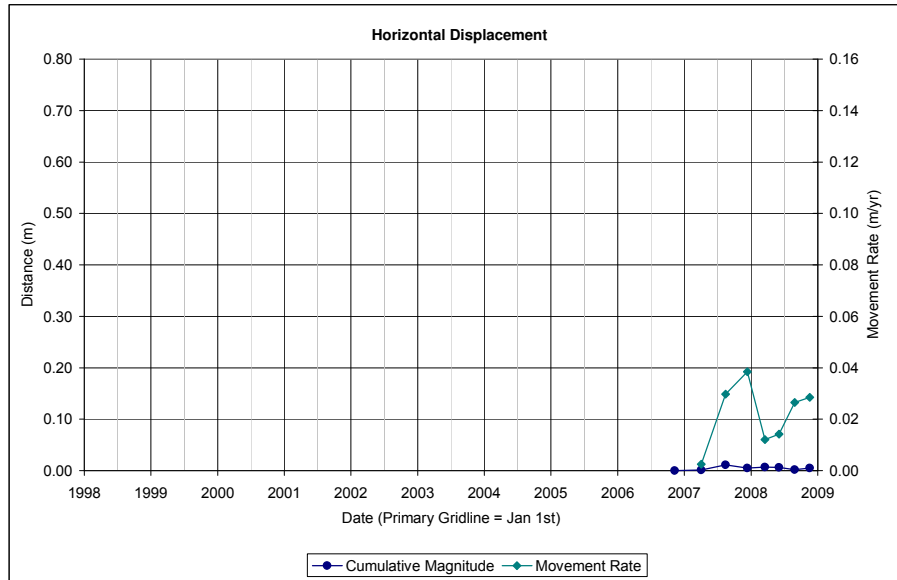
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**Displacement Graphs - Hub 06-03**  
West side Anderson Dr., opposite school yard



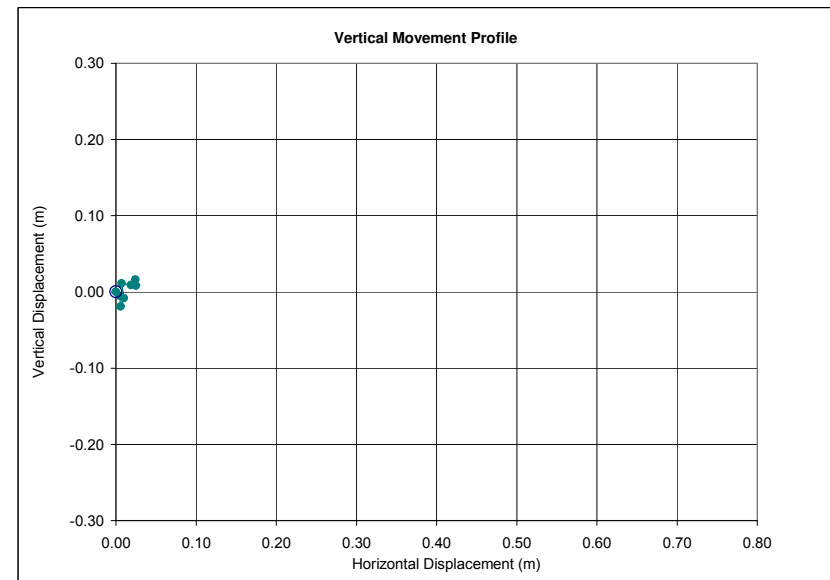
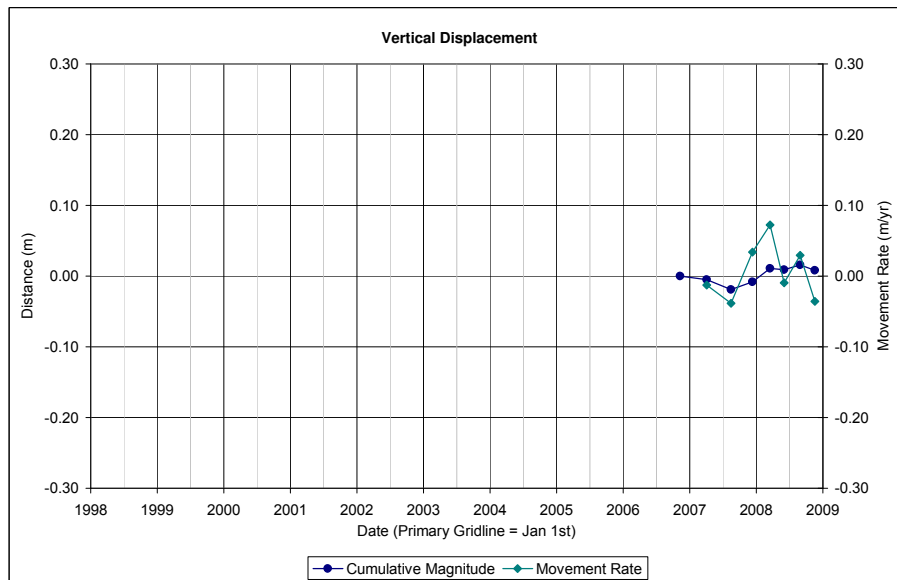
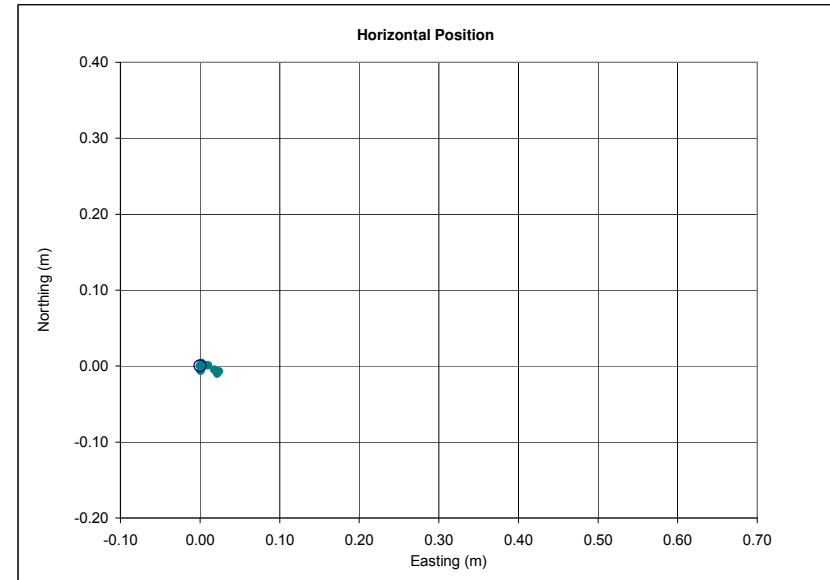
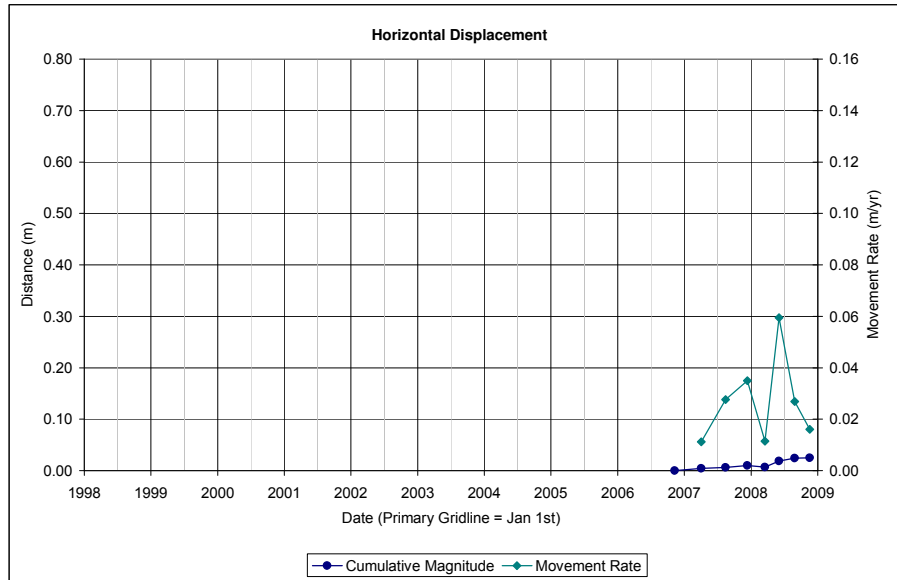


**Displacement Graphs - Hub 06-04**  
North side Wade Ave, one lot E. Anderson Dr.



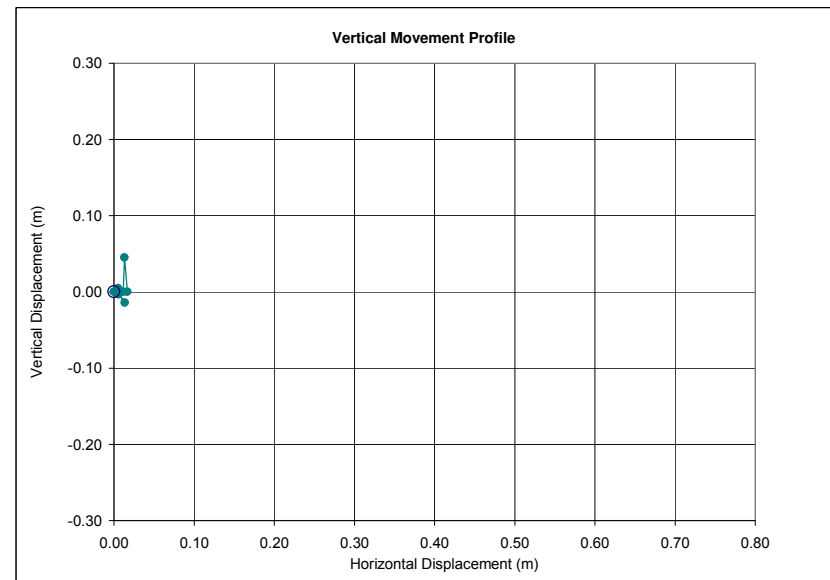
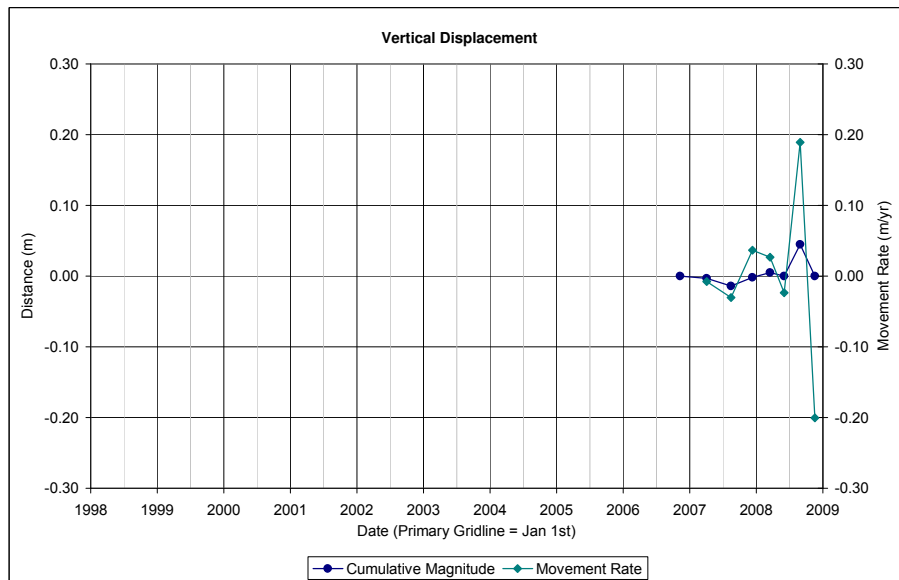
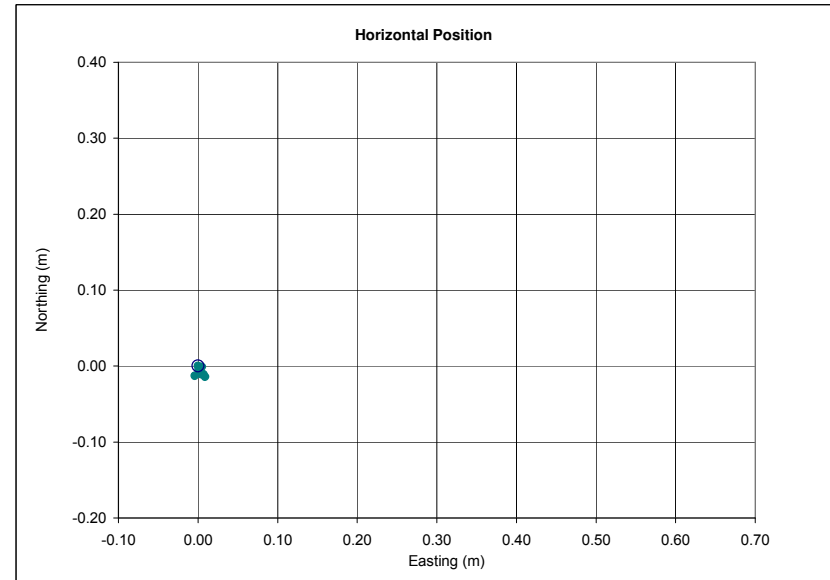
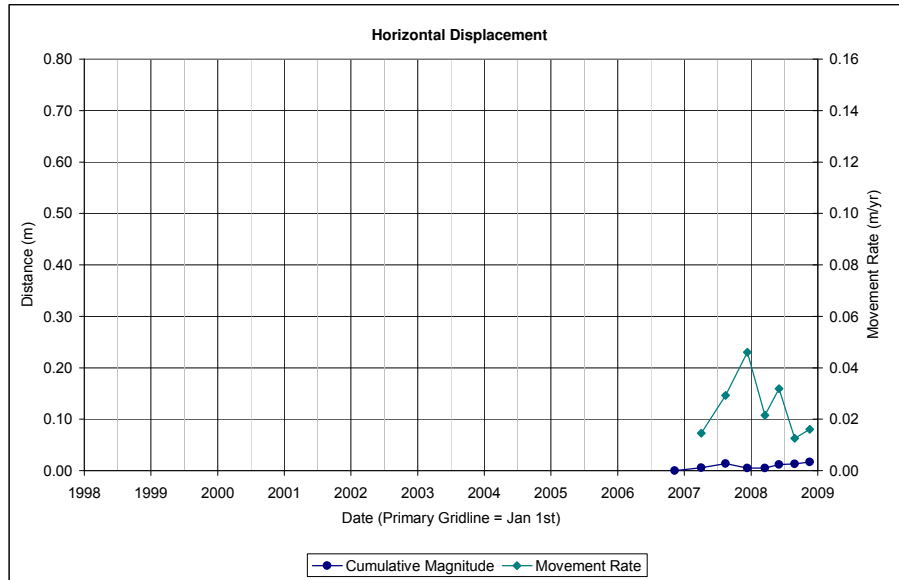


**Displacement Graphs - Hub 06-05**  
Anderson Drive west side, one lot S. of Avison



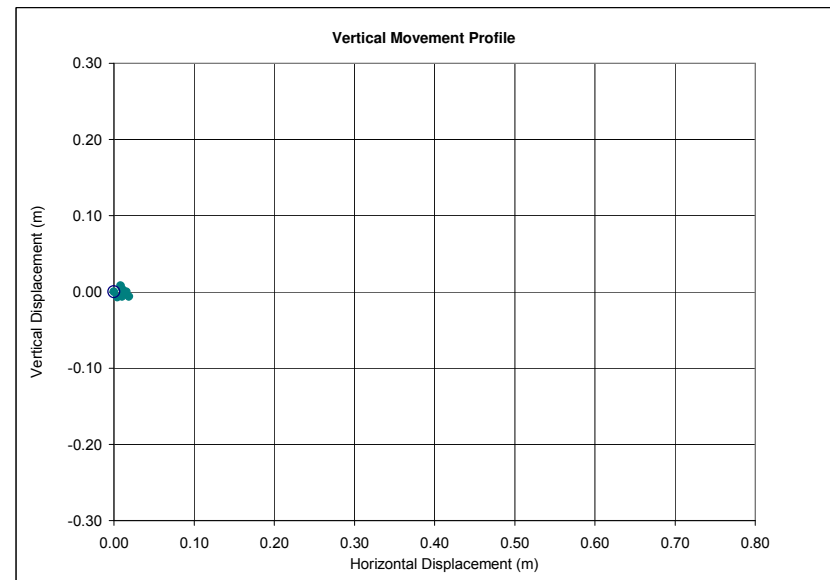
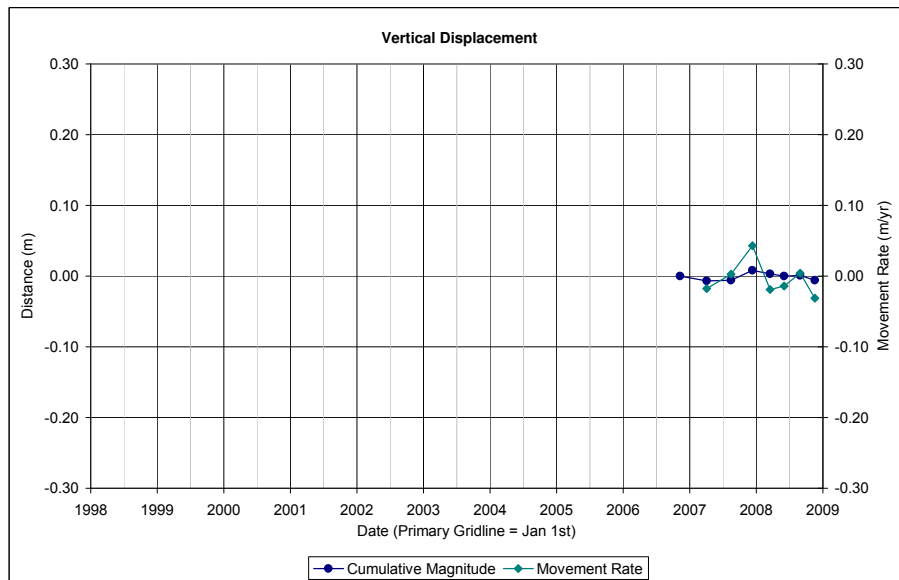
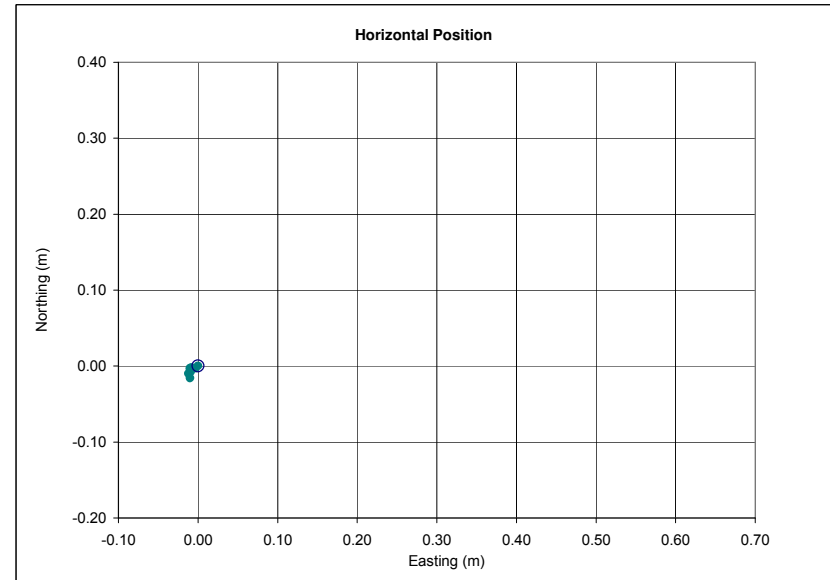
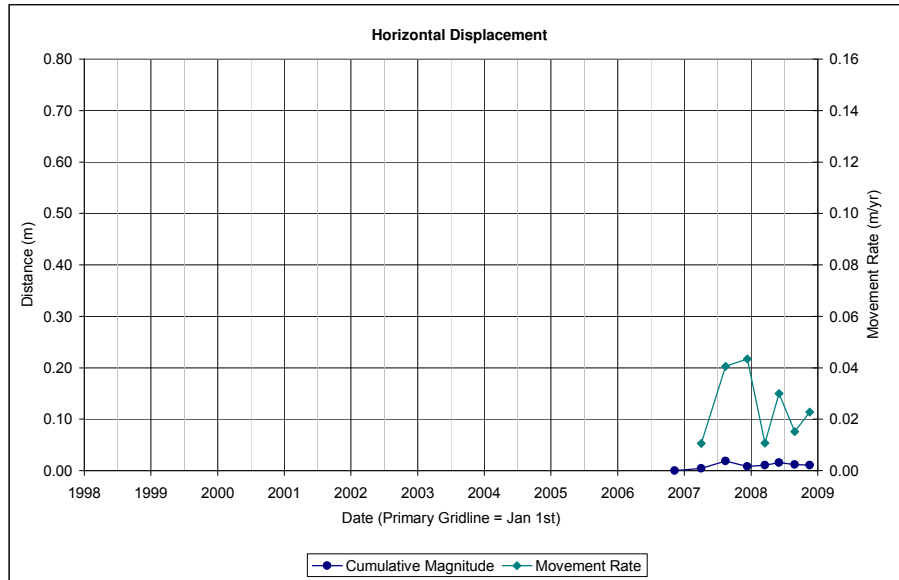


**Displacement Graphs - Hub 06-06**  
North corner Avery Ave / Anderson Drive



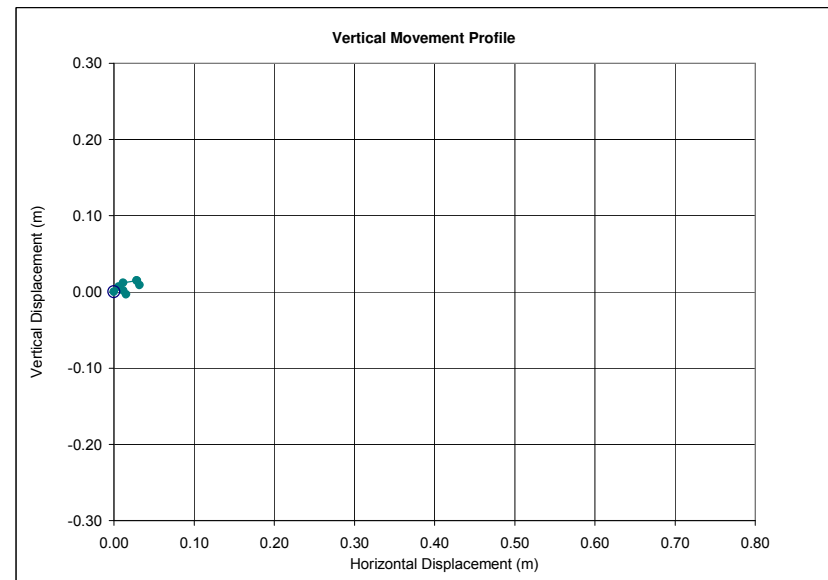
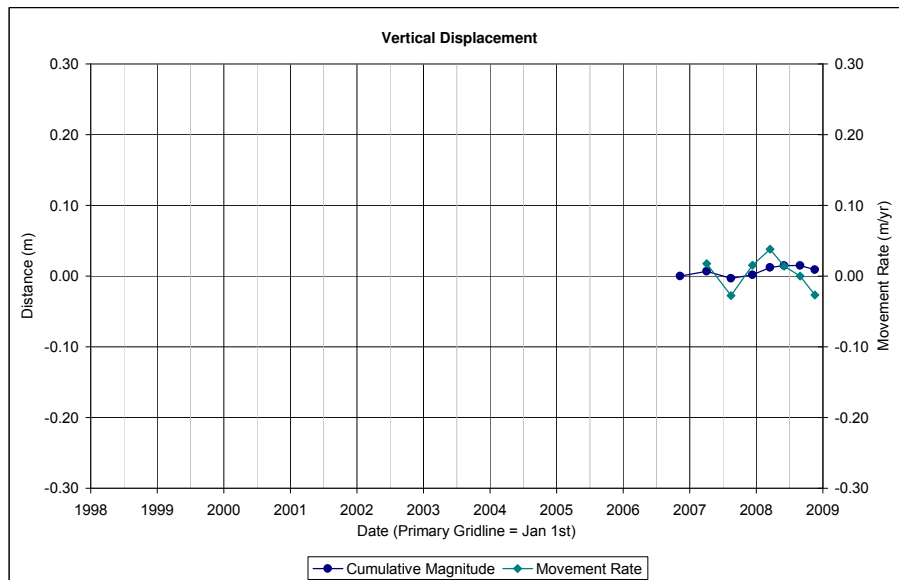
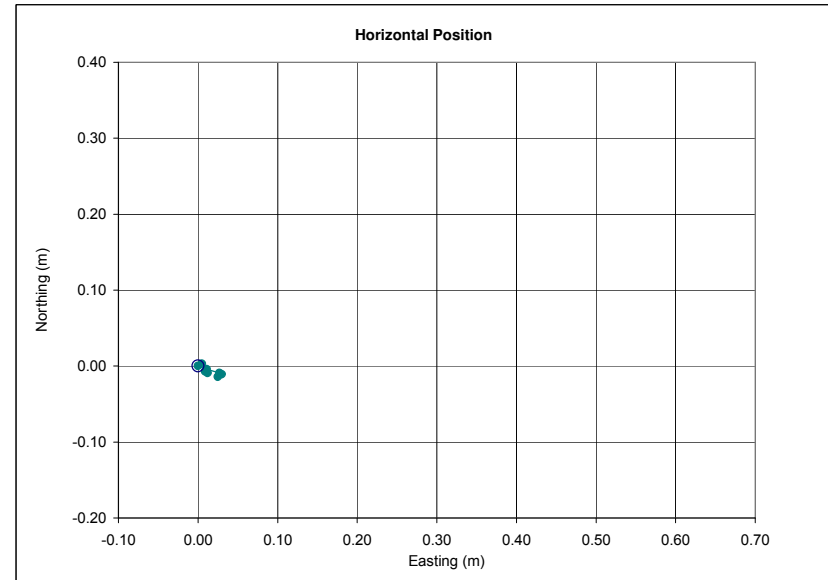
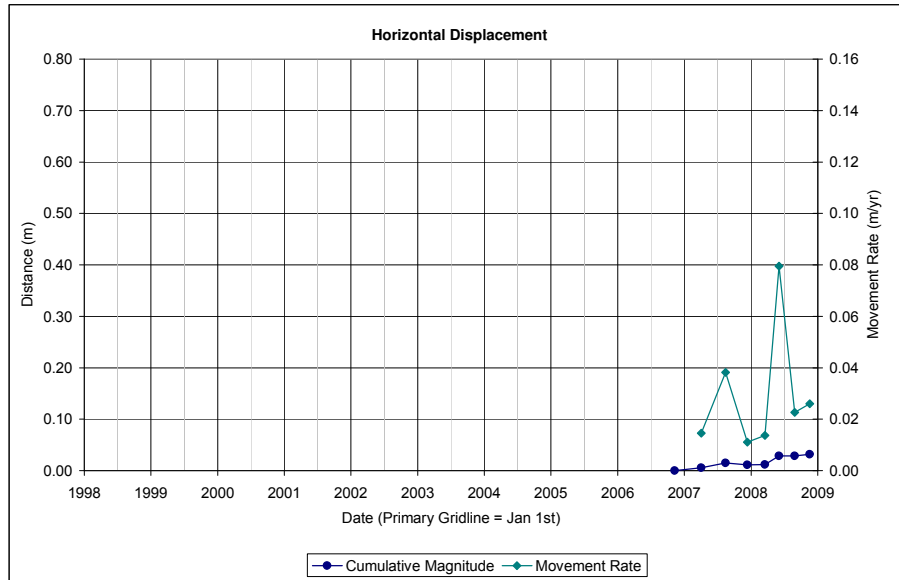
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**Displacement Graphs - Hub 06-07**  
NE. corner Boyd Street / Abbott Rd.



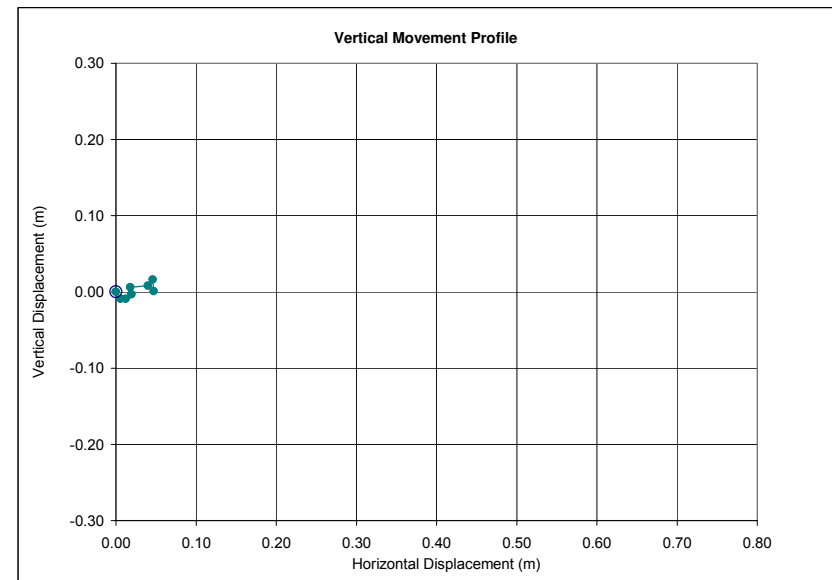
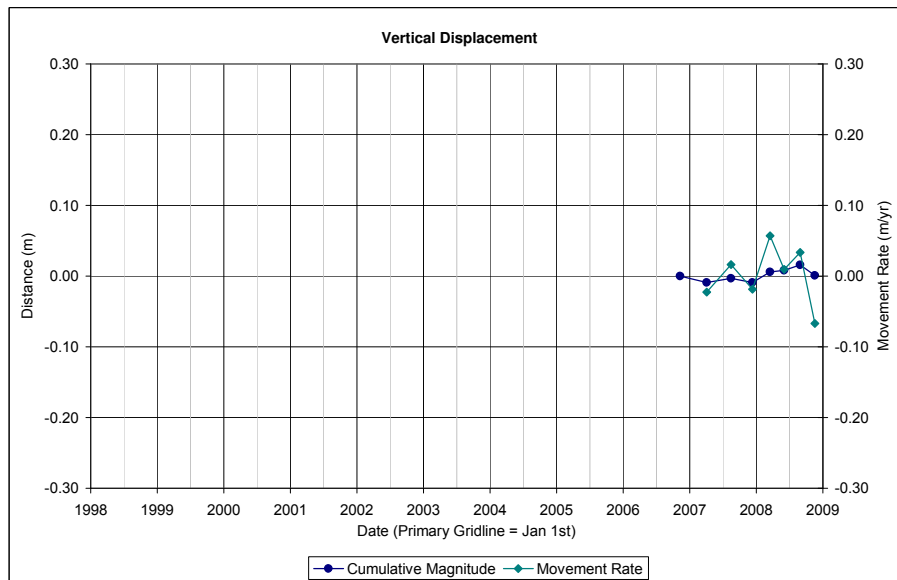
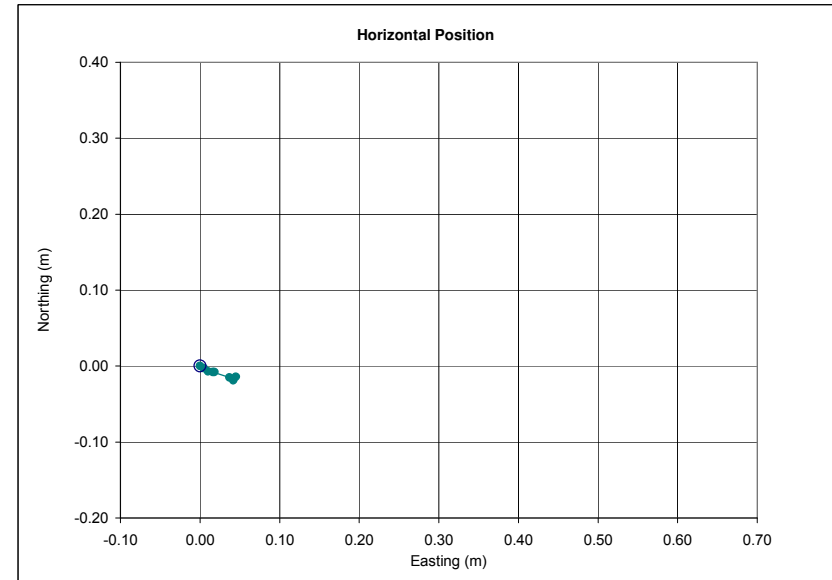
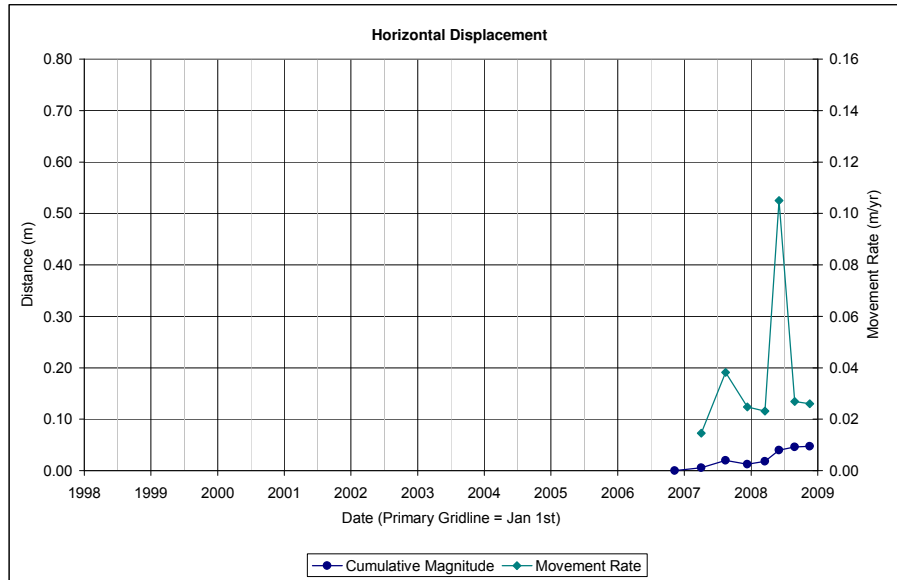
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**Displacement Graphs - Hub 06-08**  
North side Abbott Road., alley E. Beath Street



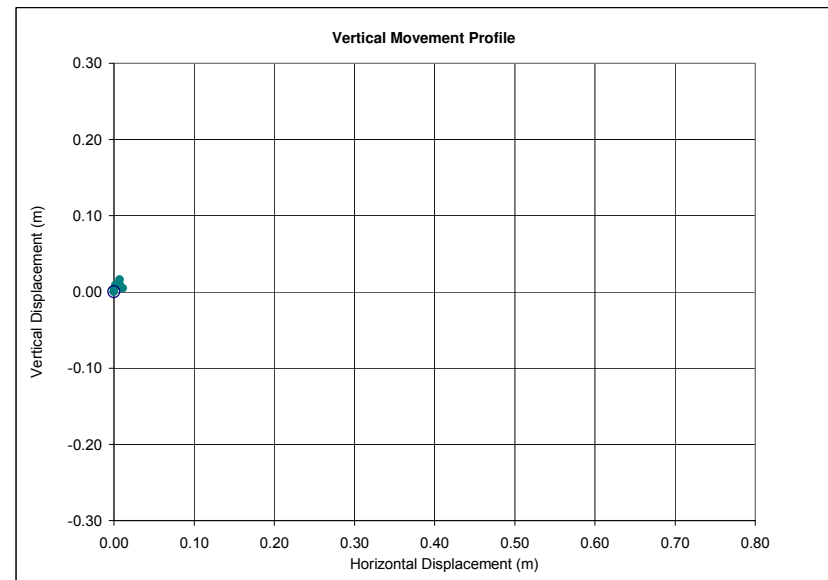
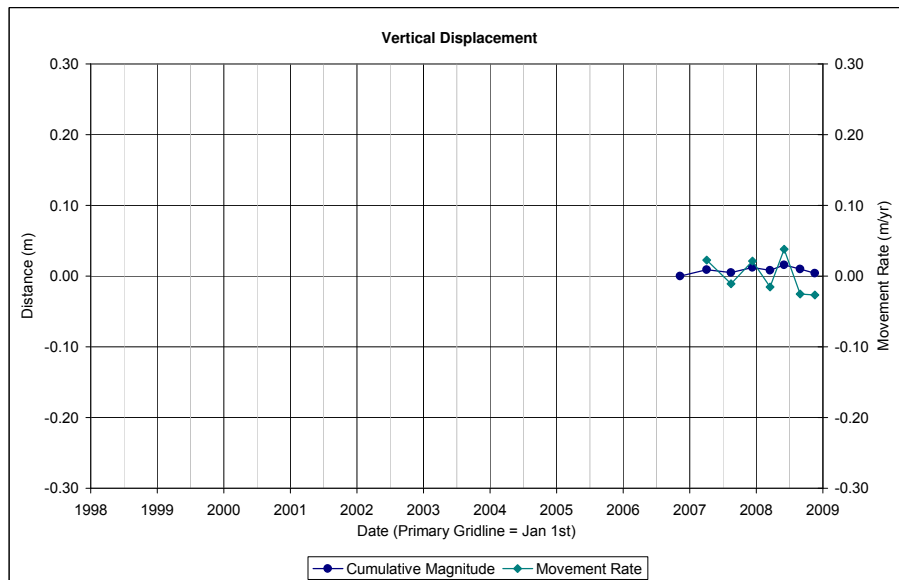
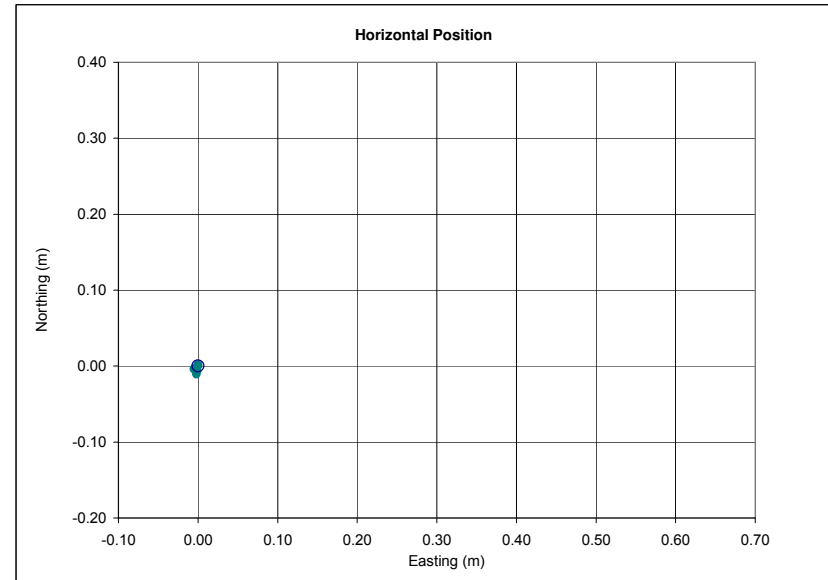
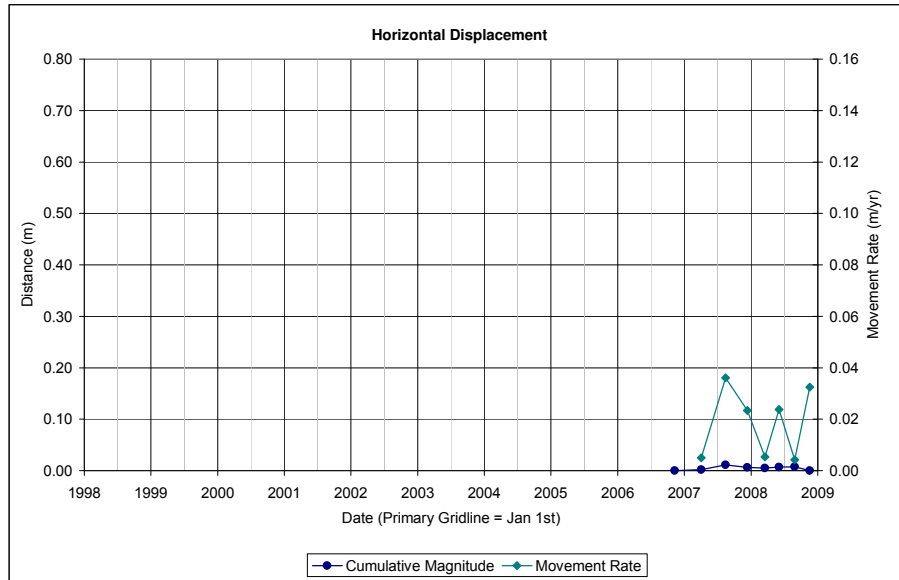
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**Displacement Graphs - Hub 06-09**  
East side Bouchie Street



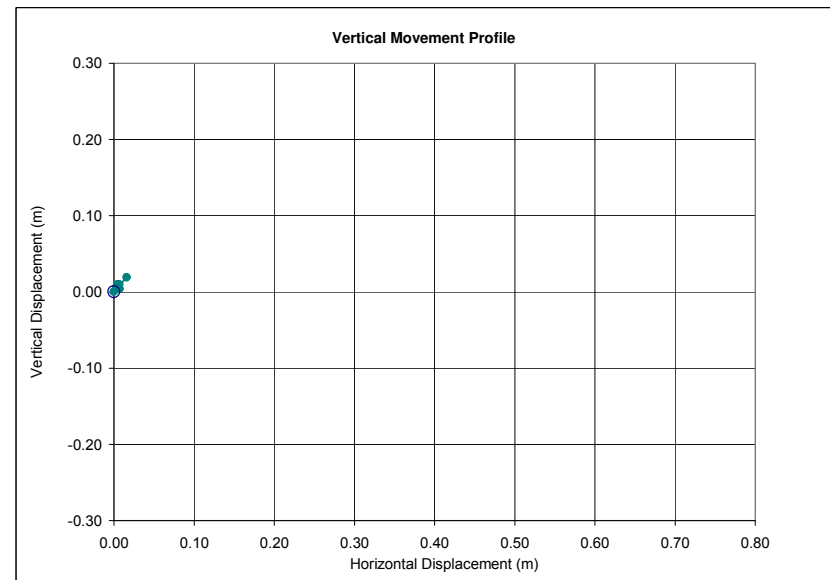
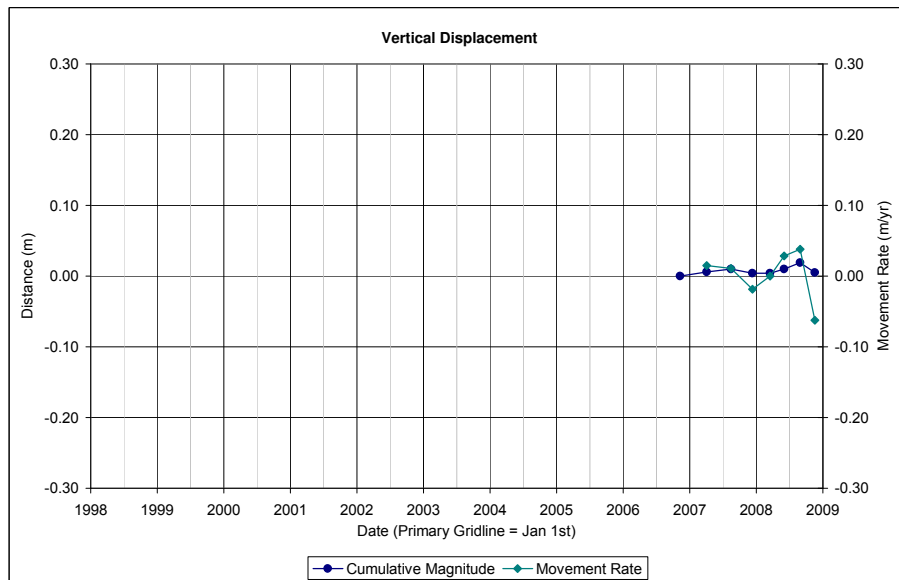
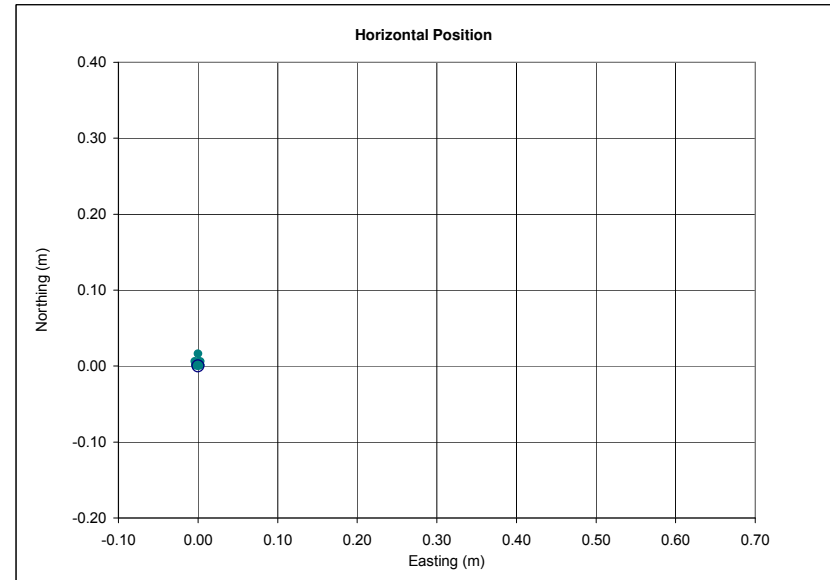
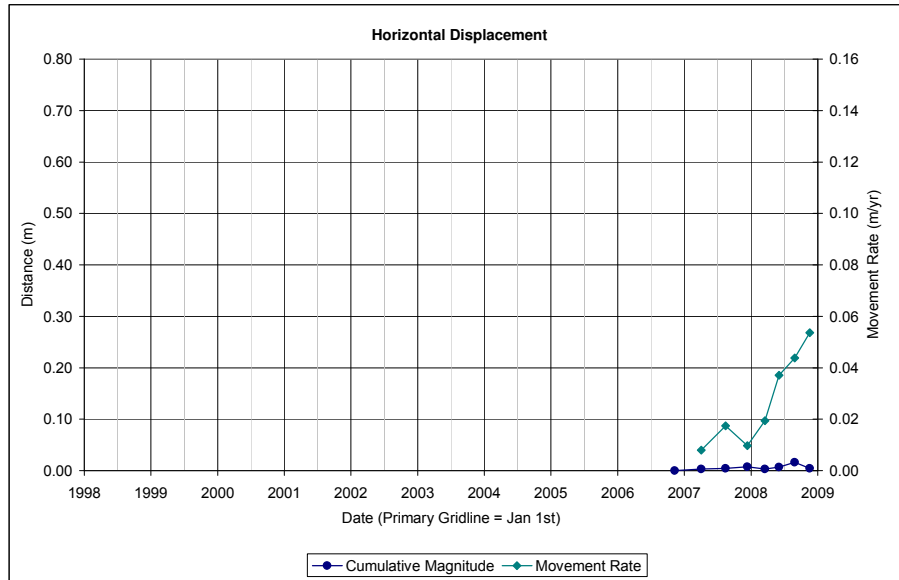
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**Displacement Graphs - Hub 06-10**  
South side Broughton Avenue



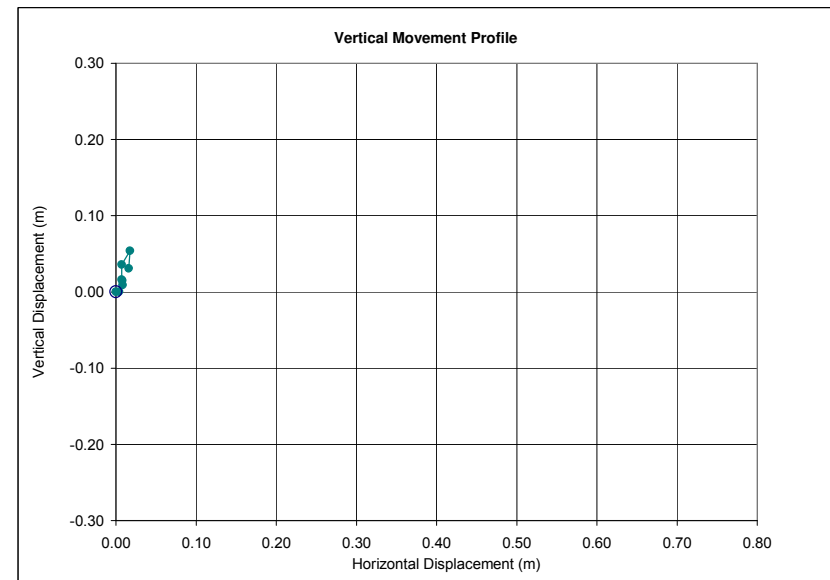
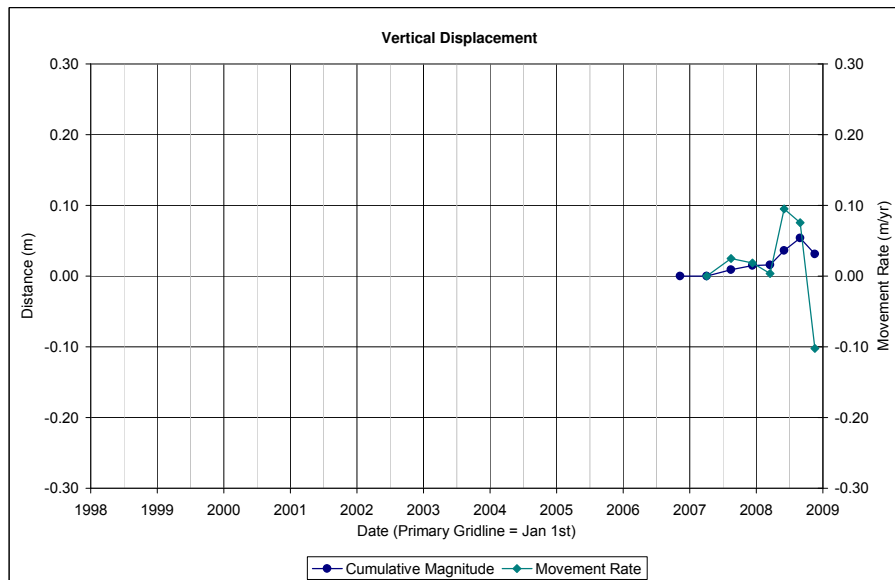
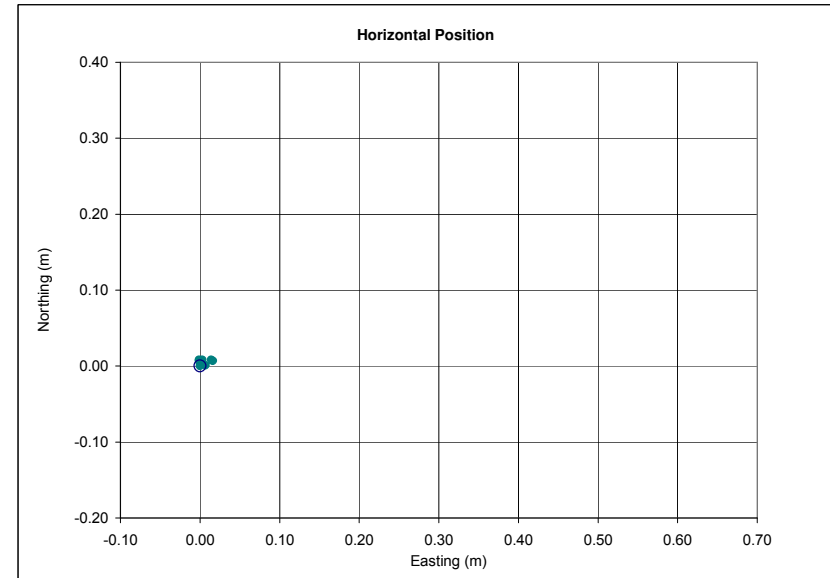
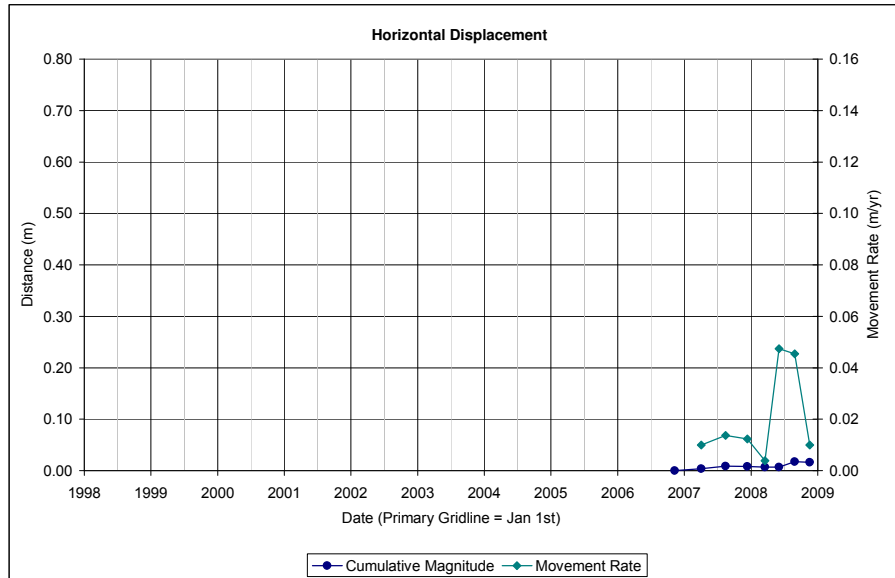
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**Displacement Graphs - Hub 06-11**  
East side Lewis Road, opposite house # 391



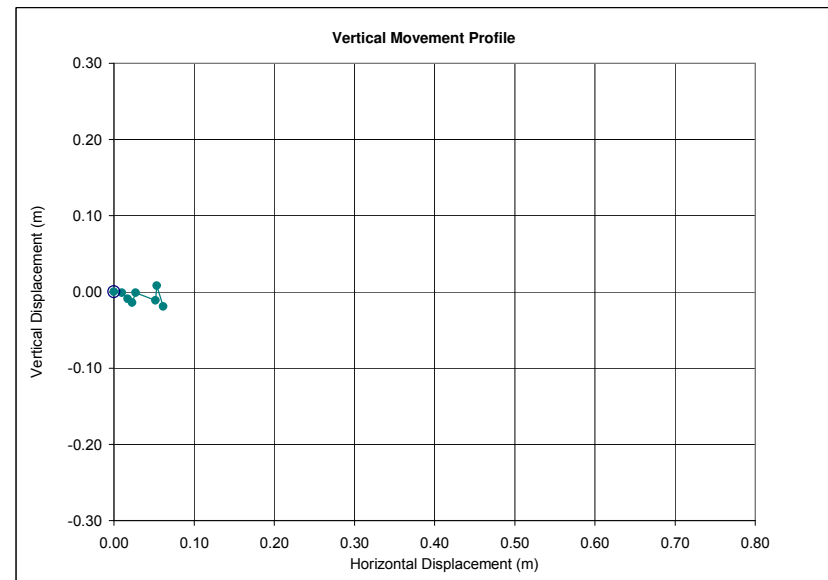
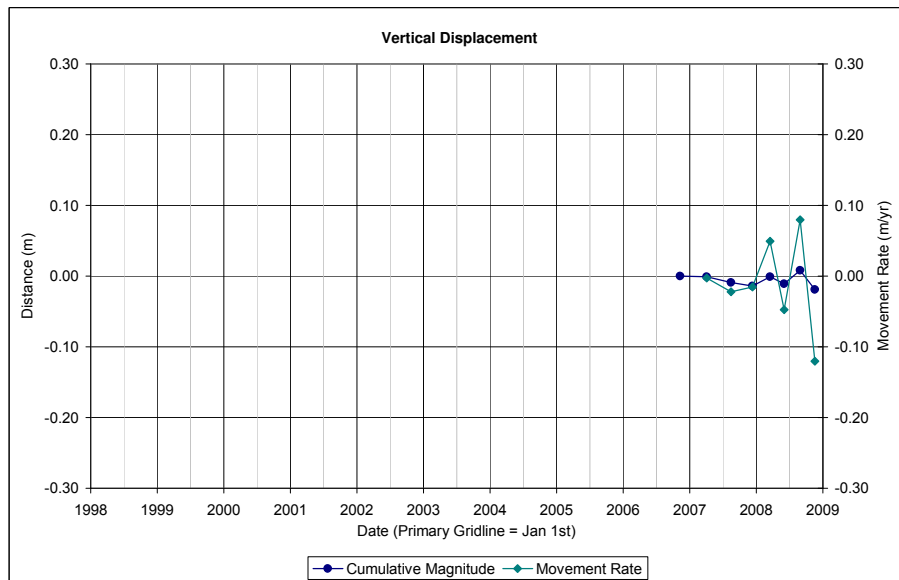
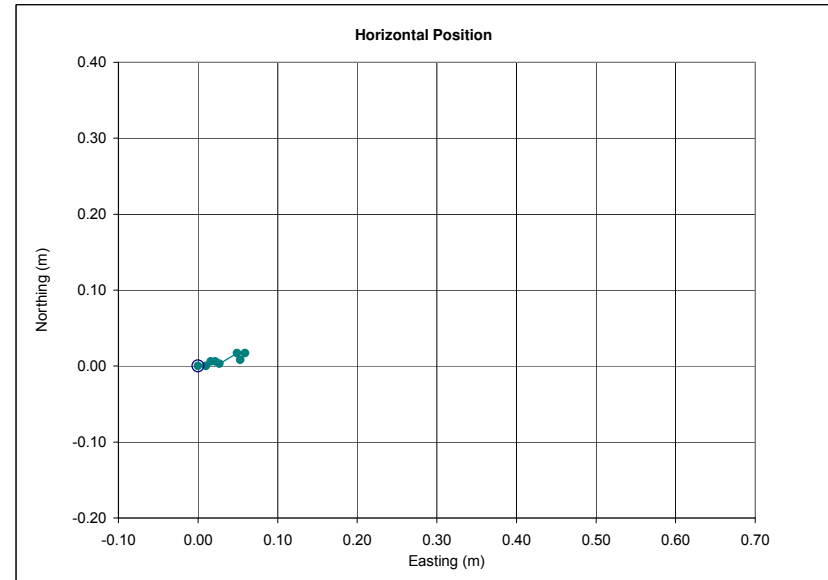
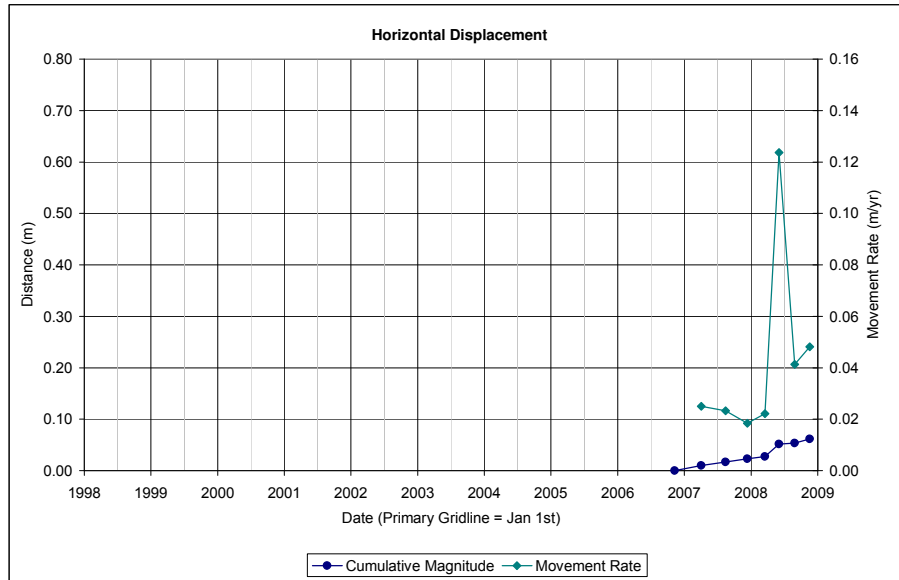
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**Displacement Graphs - Hub 06-12**  
East side Lewis Road, opposite house # 547



[illegible]

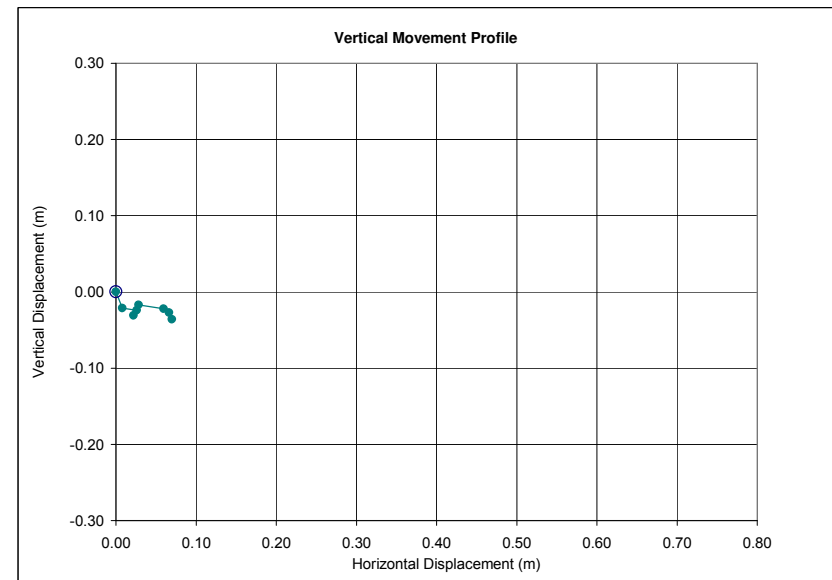
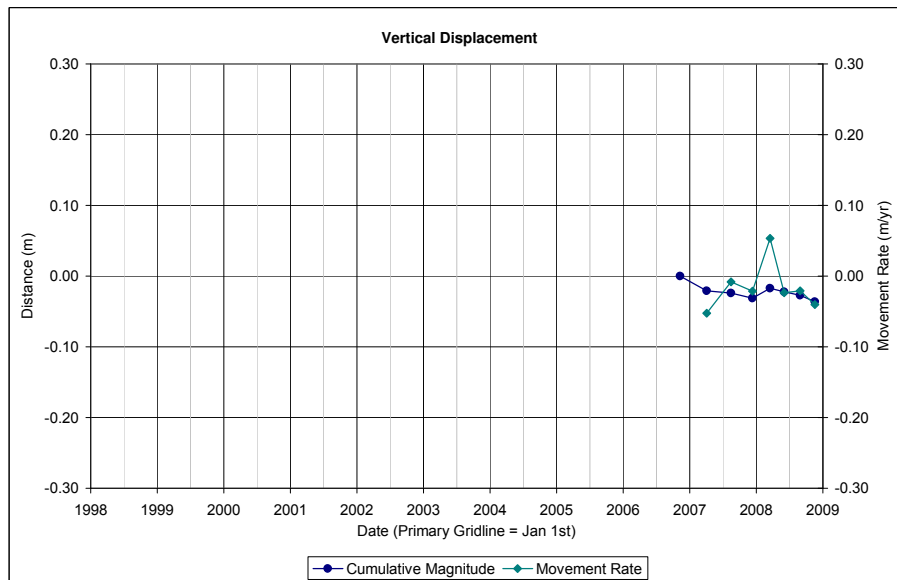
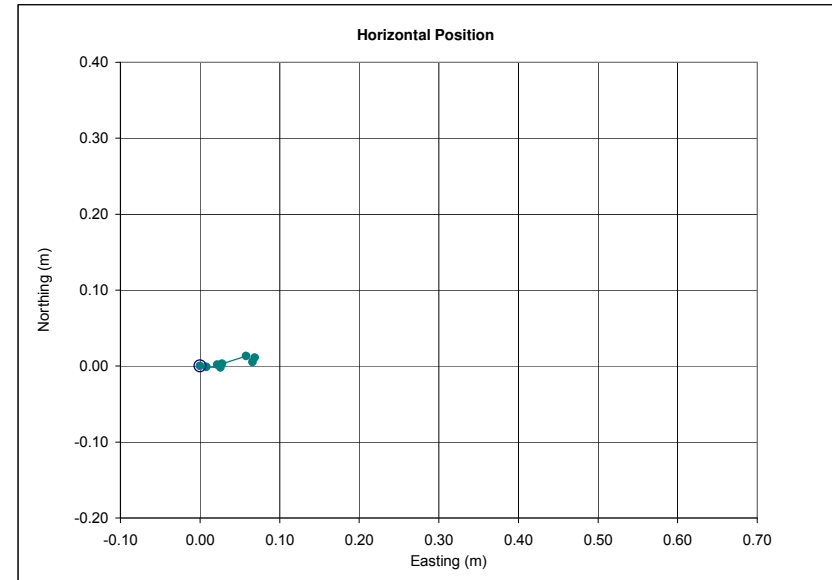
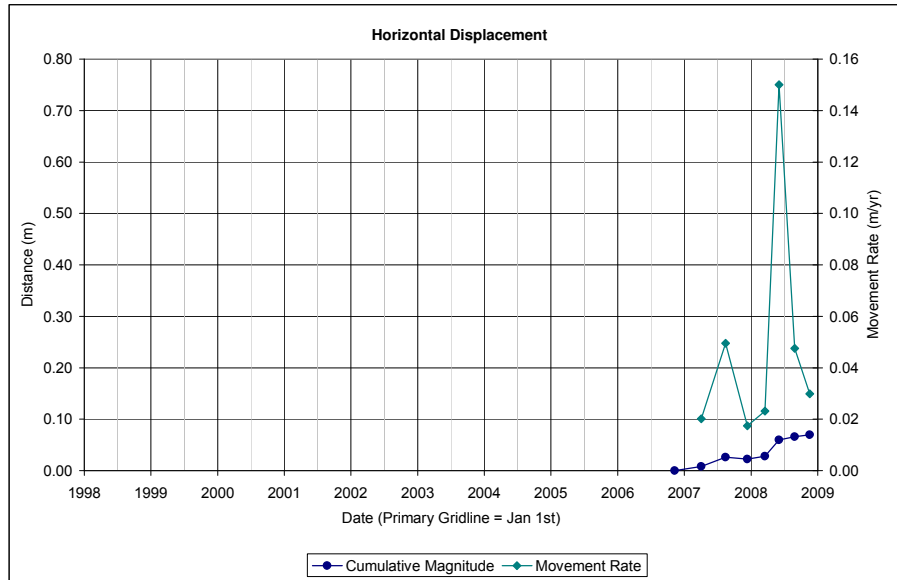
**Displacement Graphs - Hub 06-13**  
NW. corner Pentland Crescent



**Survey and Displacement Data - Hub 06-14**  
SW. corner Pinchbeck Street / Pentland Crescent

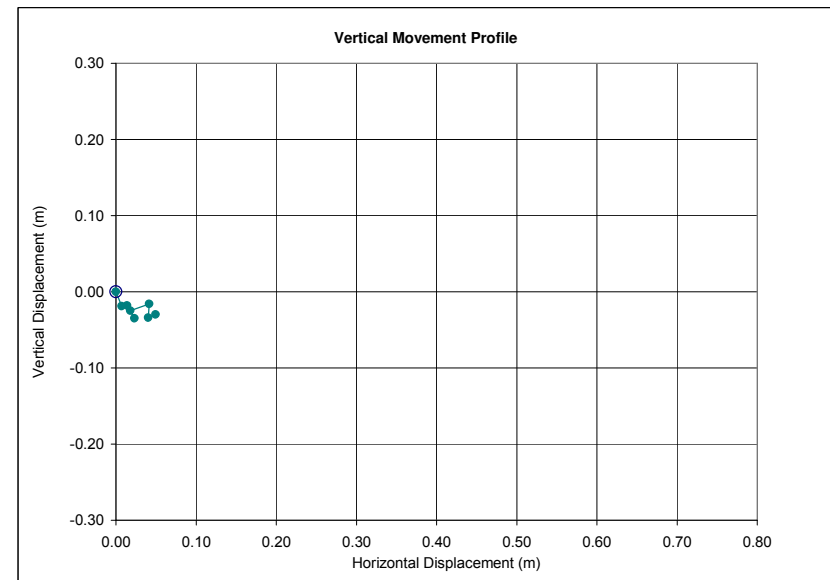
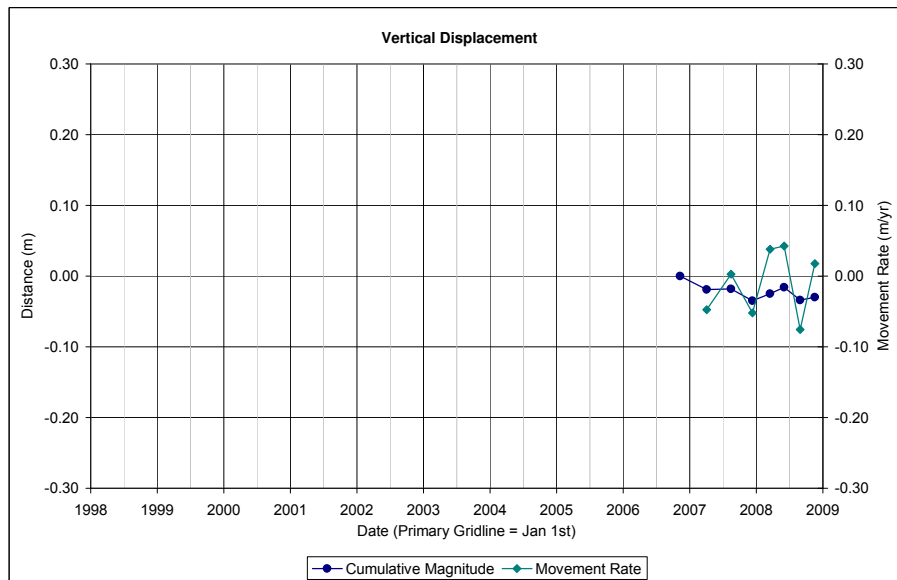
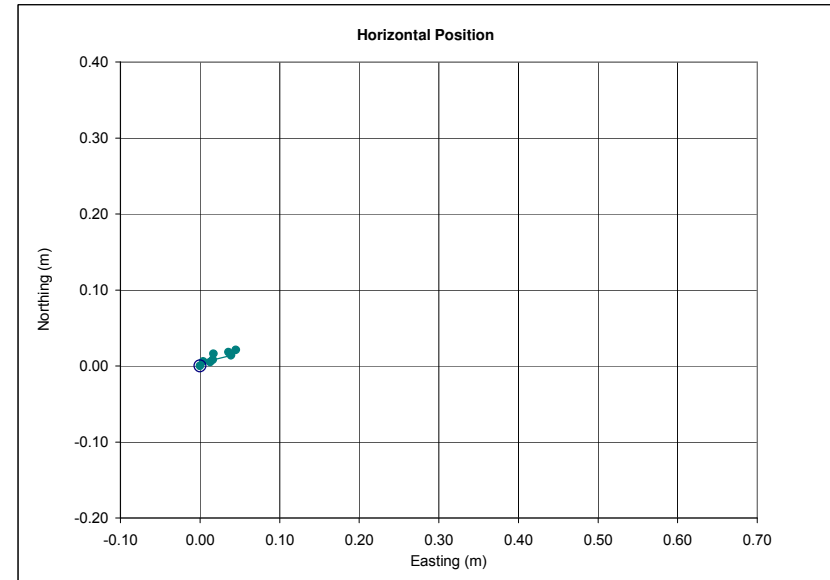
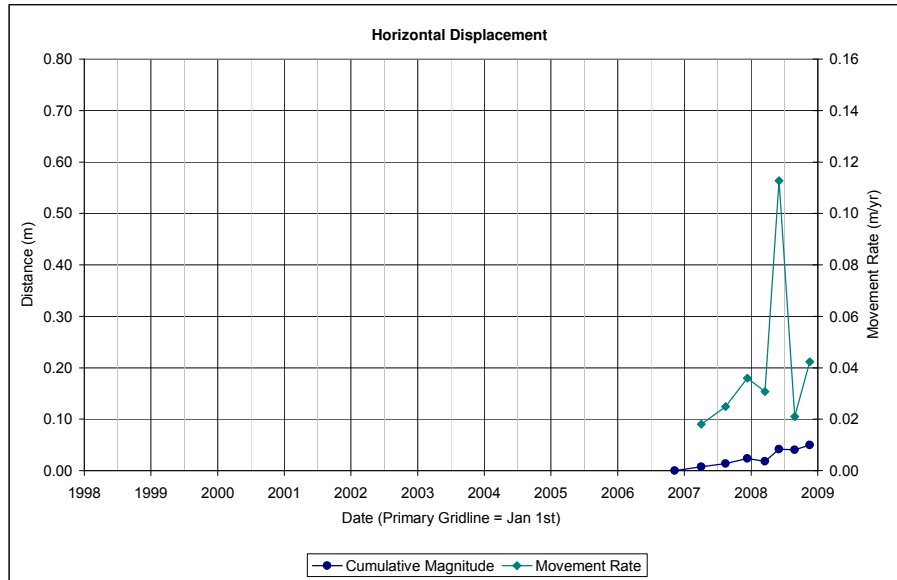
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**Displacement Graphs - Hub 06-14**  
SW. corner Pinchbeck Street / Pentland Crescent



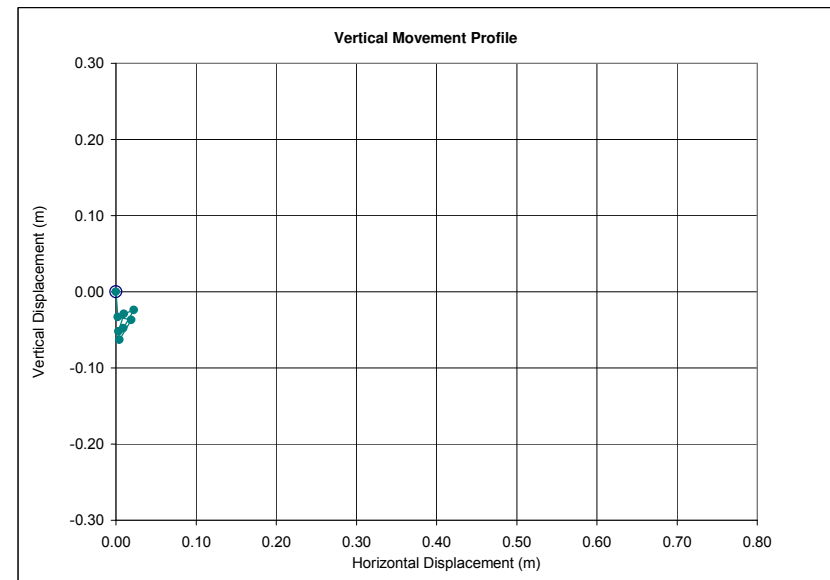
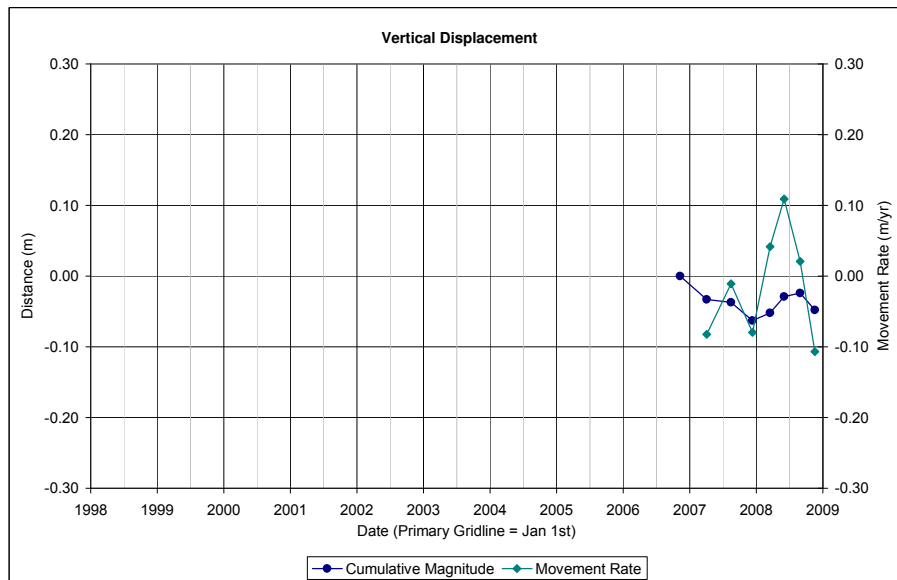
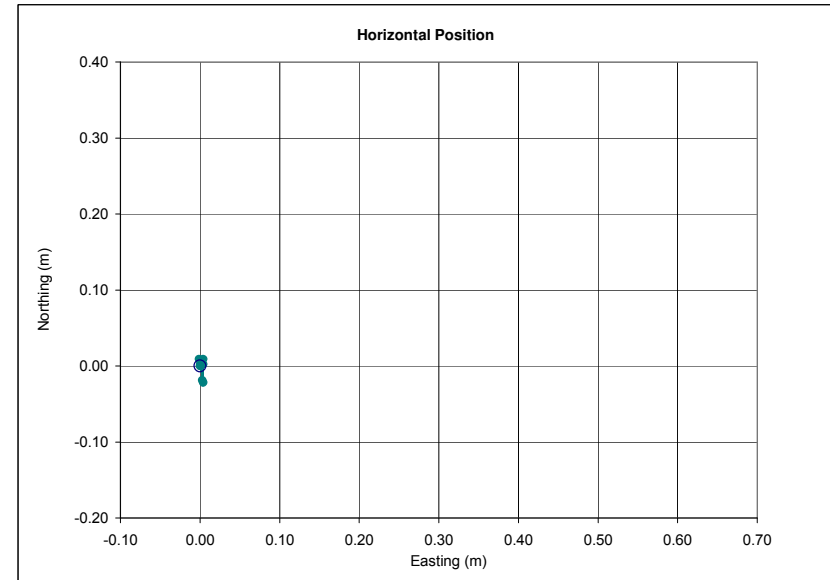
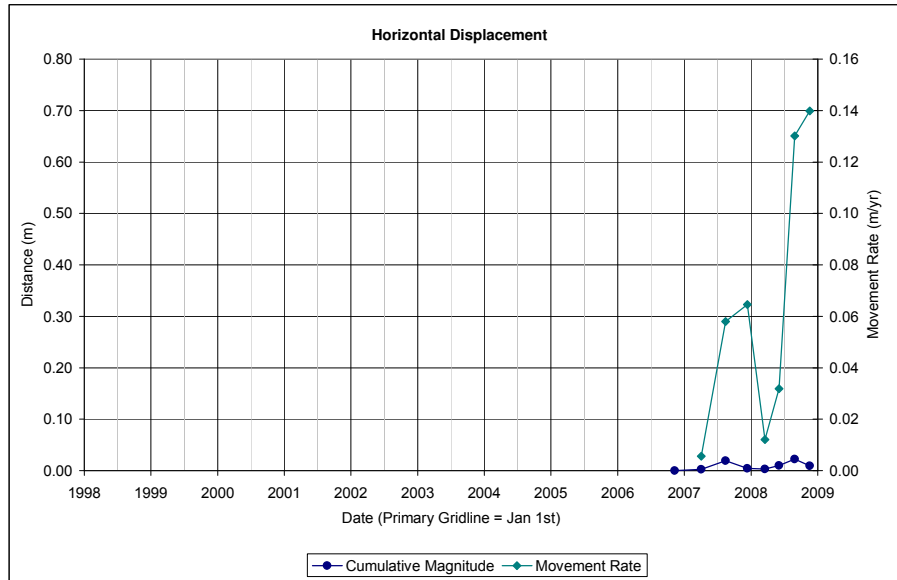


**Displacement Graphs - Hub 06-15**  
By trail, NW unnamed Rd. N. Dixon St.



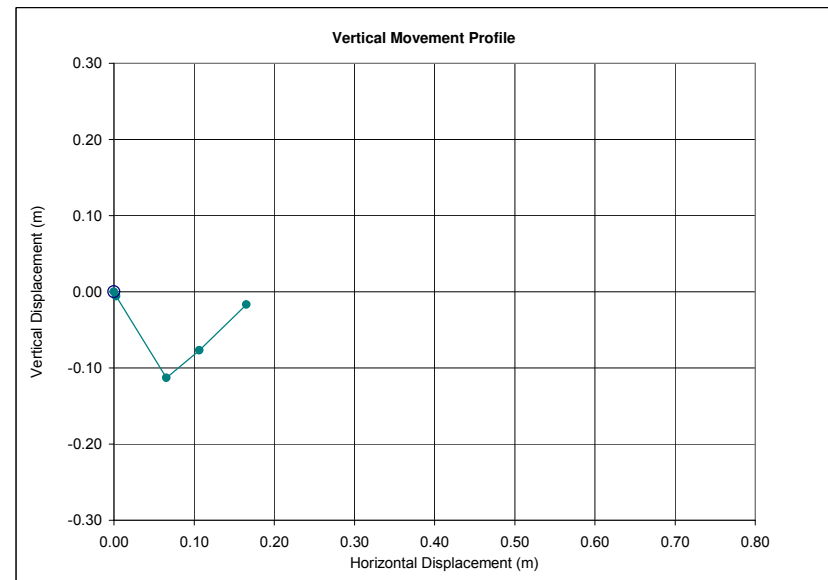
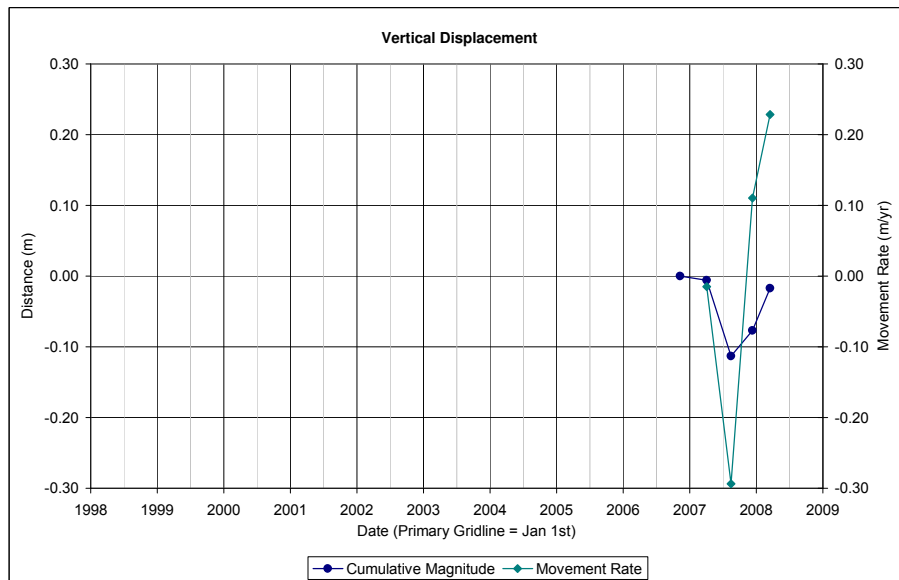
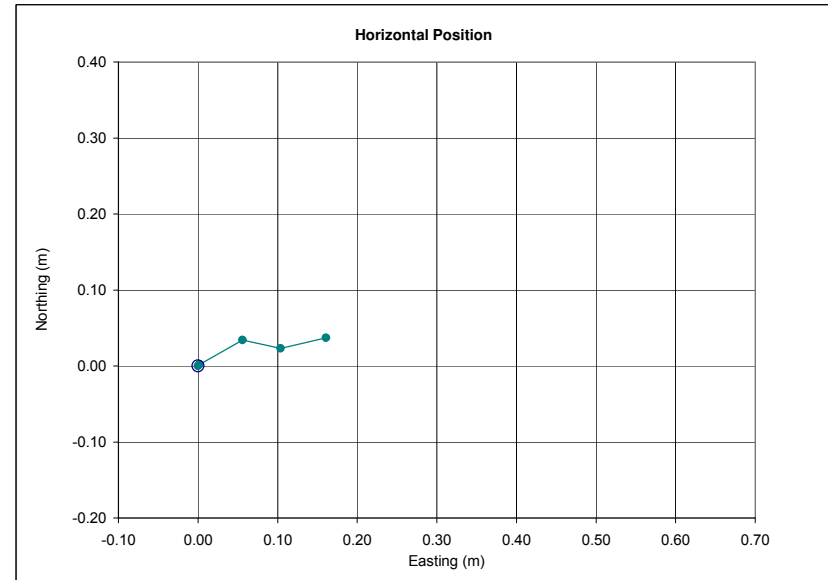
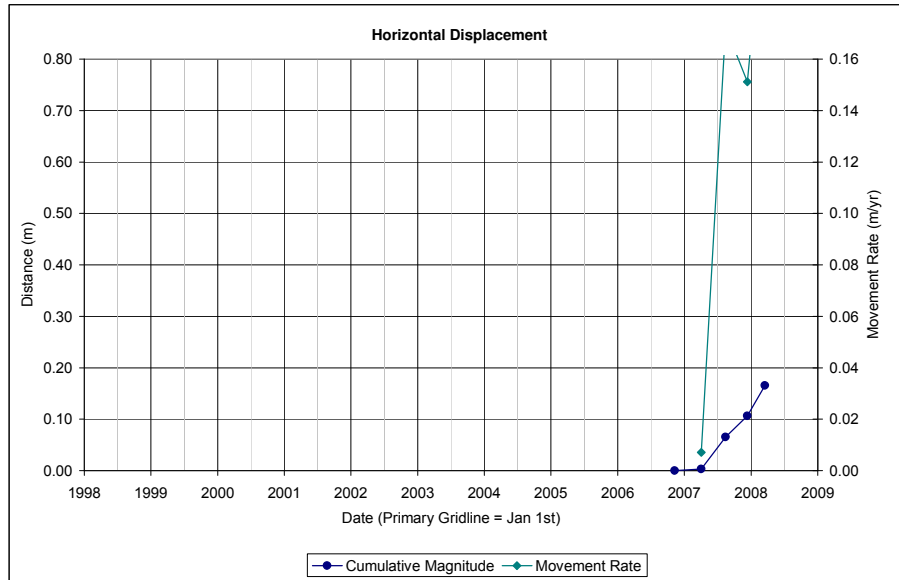


**Displacement Graphs - Hub 06-16**  
By end trail, NW unnamed road N. Dixon St.



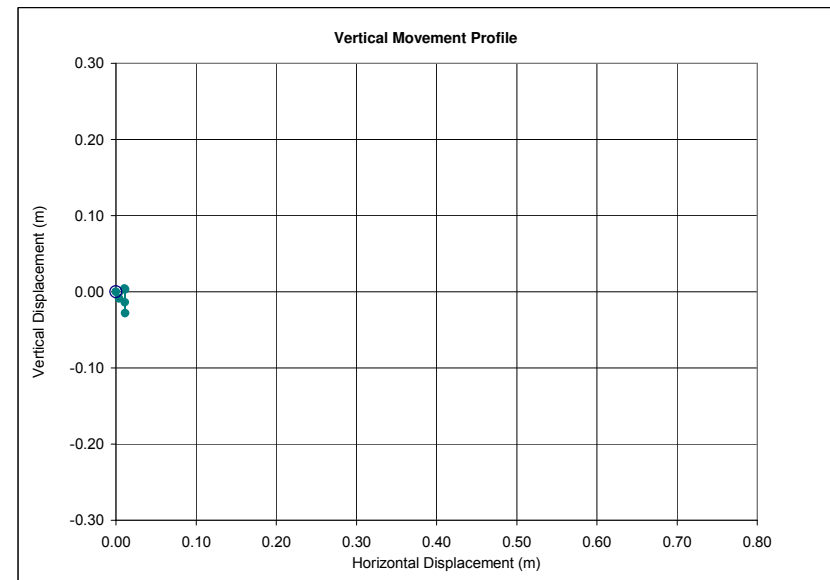
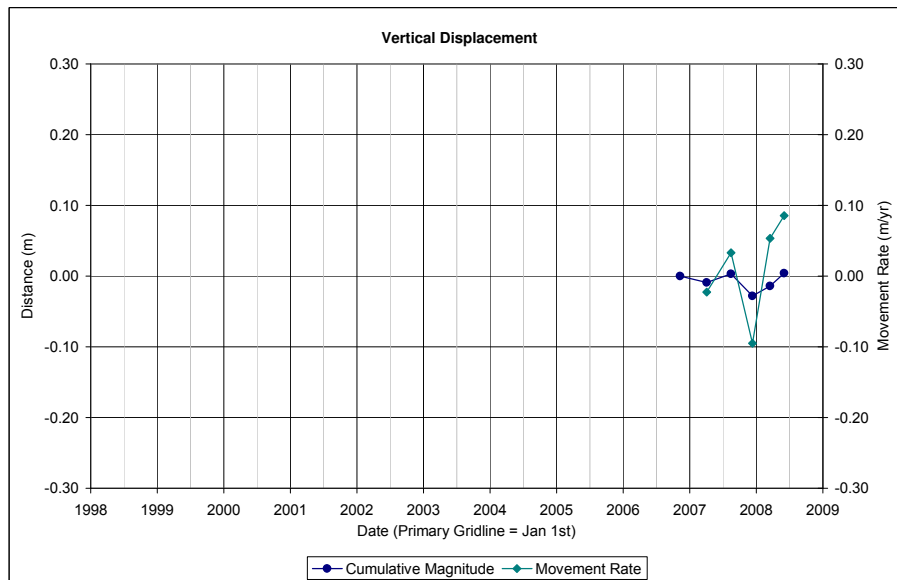
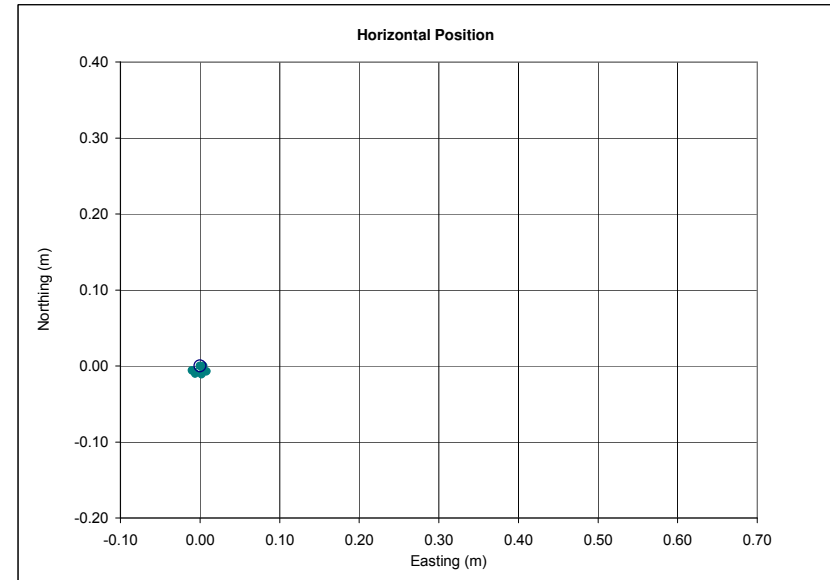
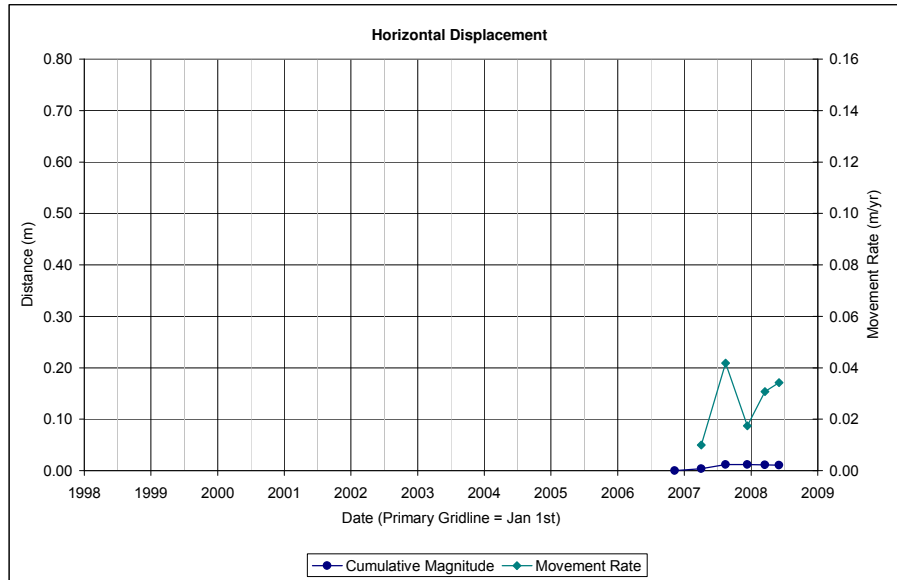


**Displacement Graphs - Hub 06-17**  
In clearing, NW of end Findlay Road



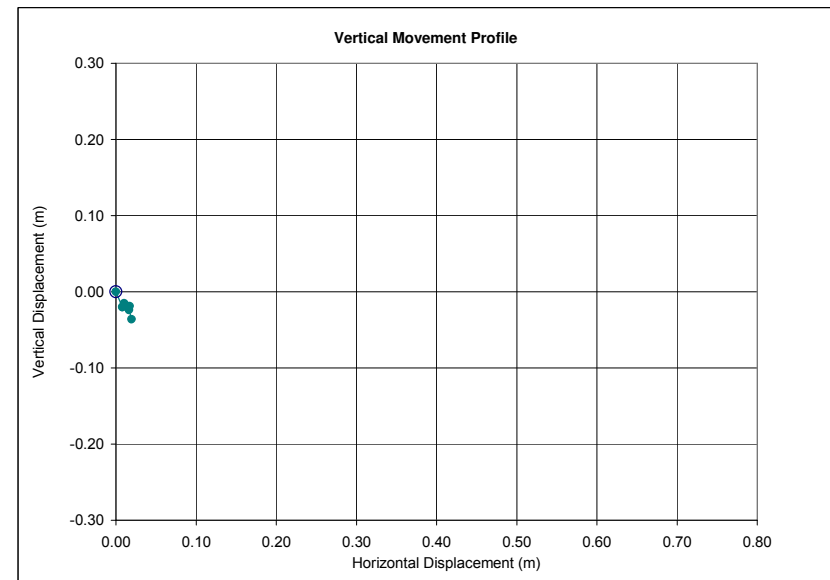
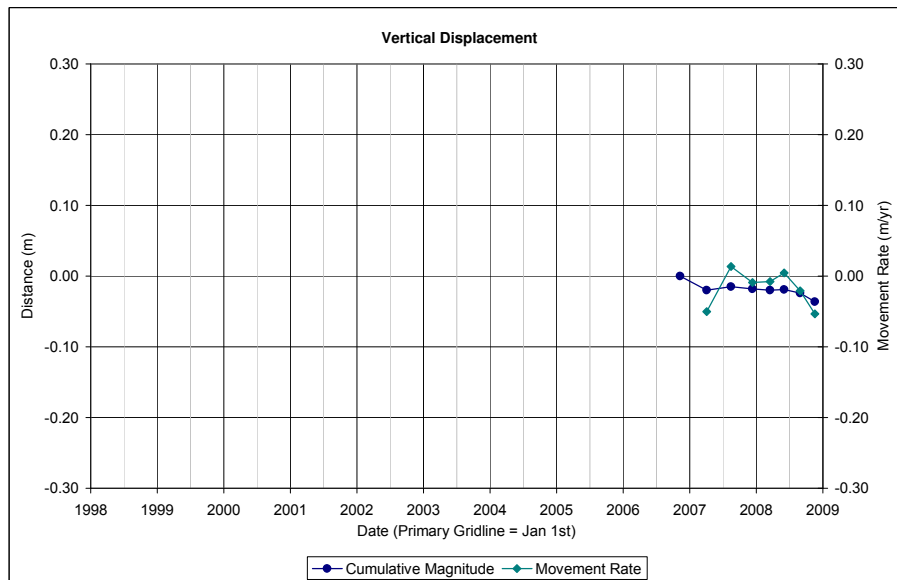
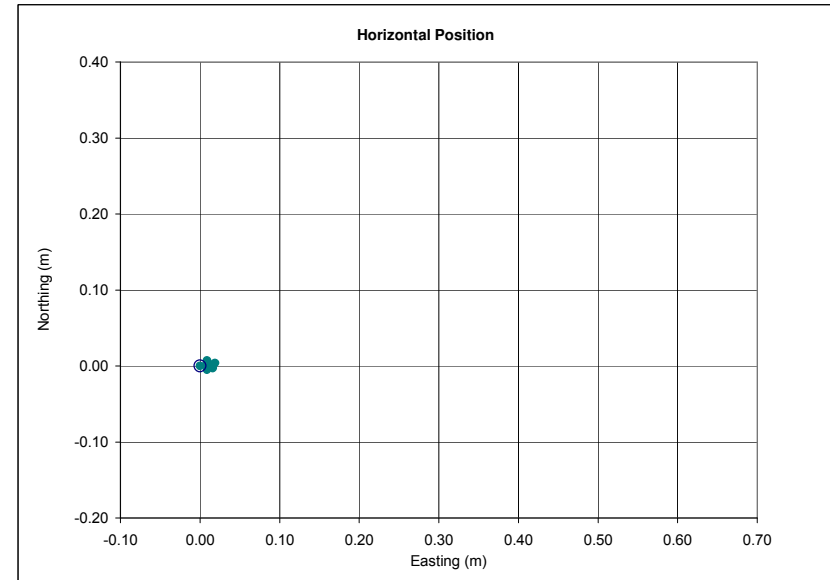
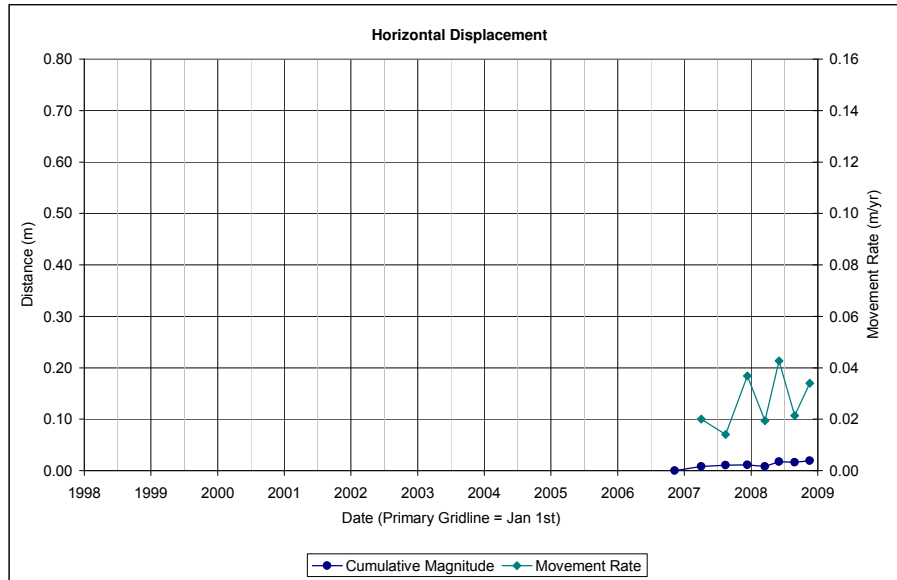


**Displacement Graphs - Hub 06-18**  
On upper bench by trail, off end Findlay Road



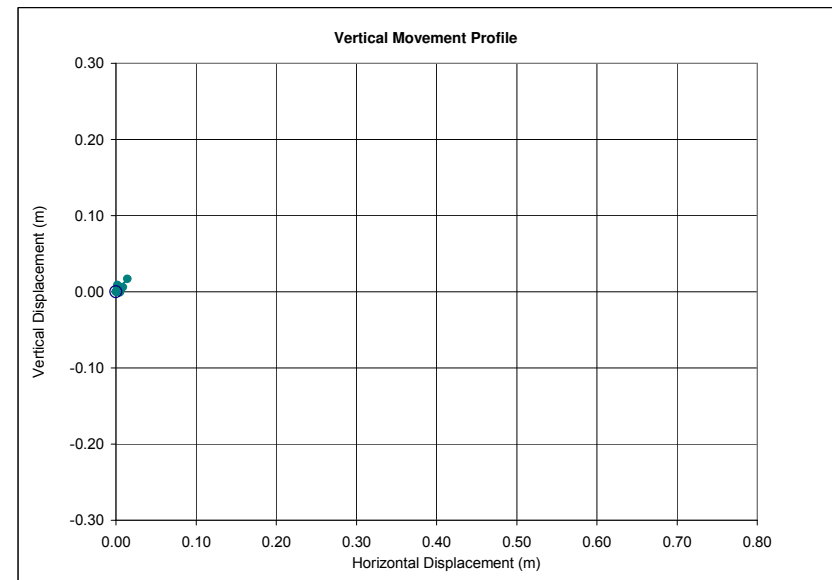
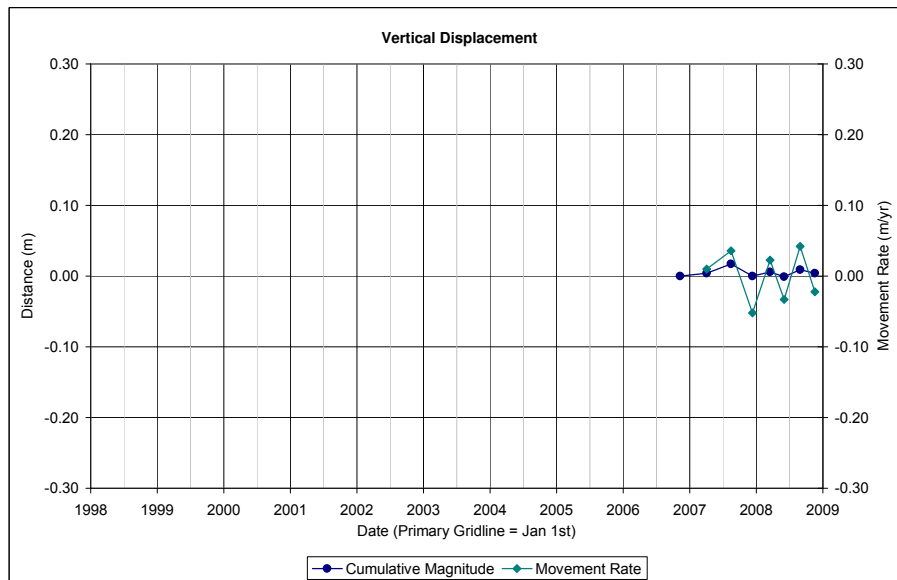
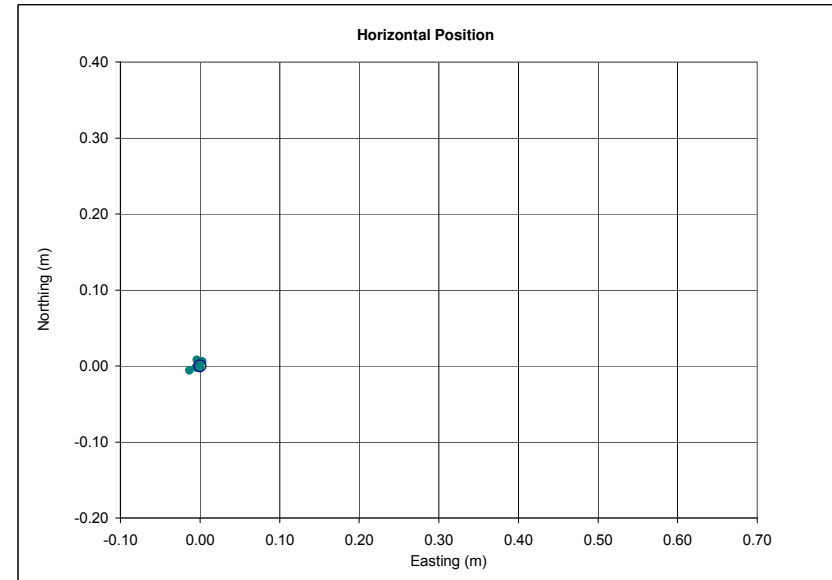
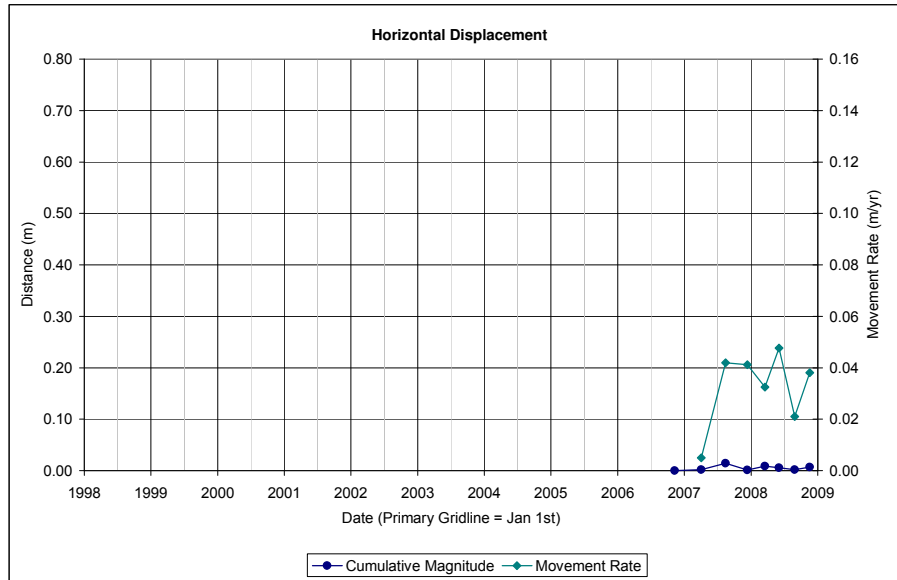


**Displacement Graphs - Hub 06-19**  
West side Abbott Dr. 100m south last house



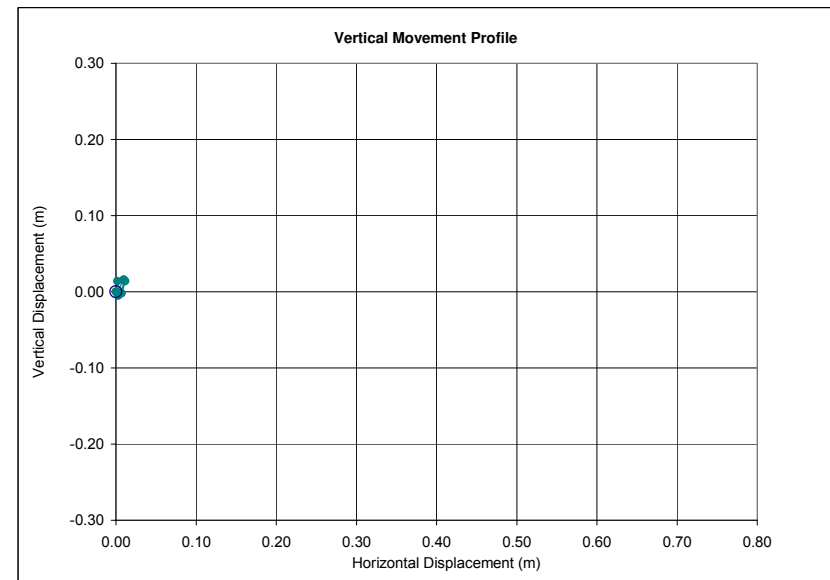
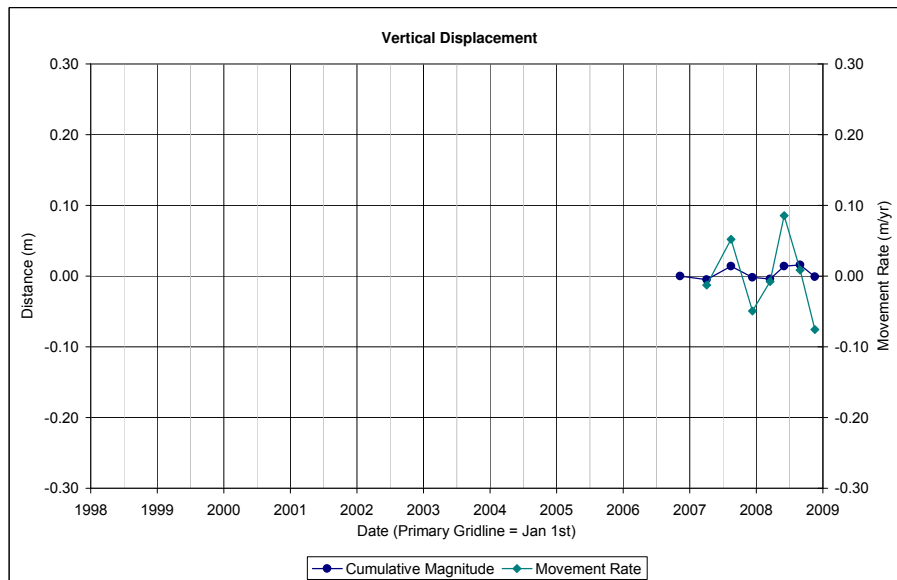
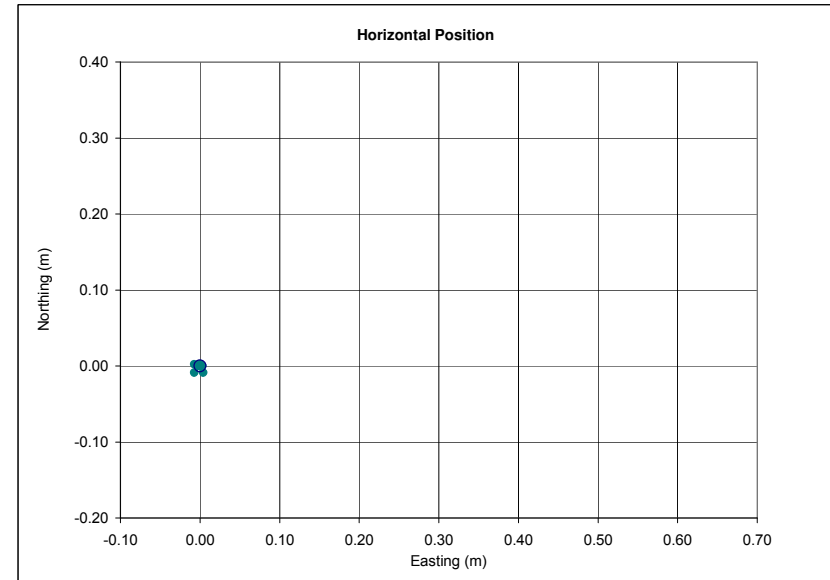
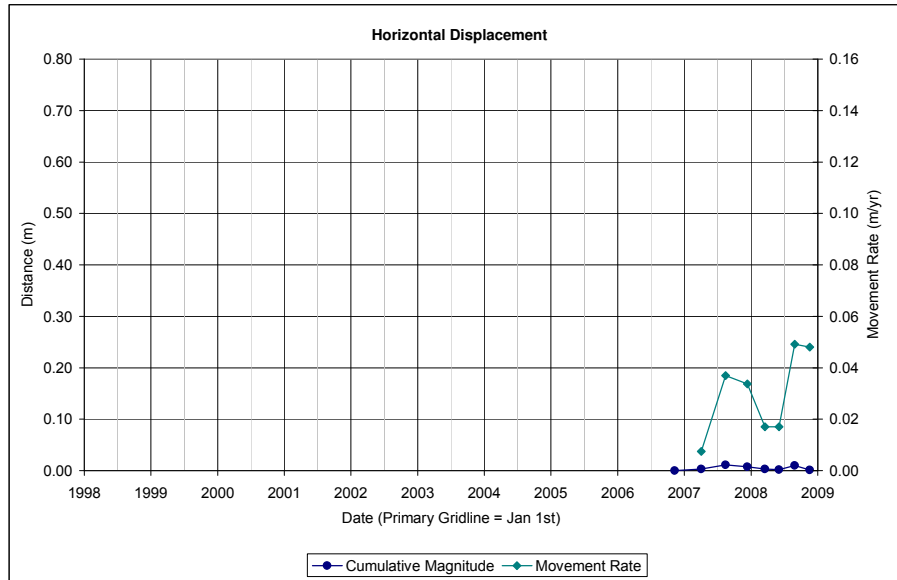


**Displacement Graphs - Hub 06-20**  
End of trail, by BH 16, off end Abbott Drive



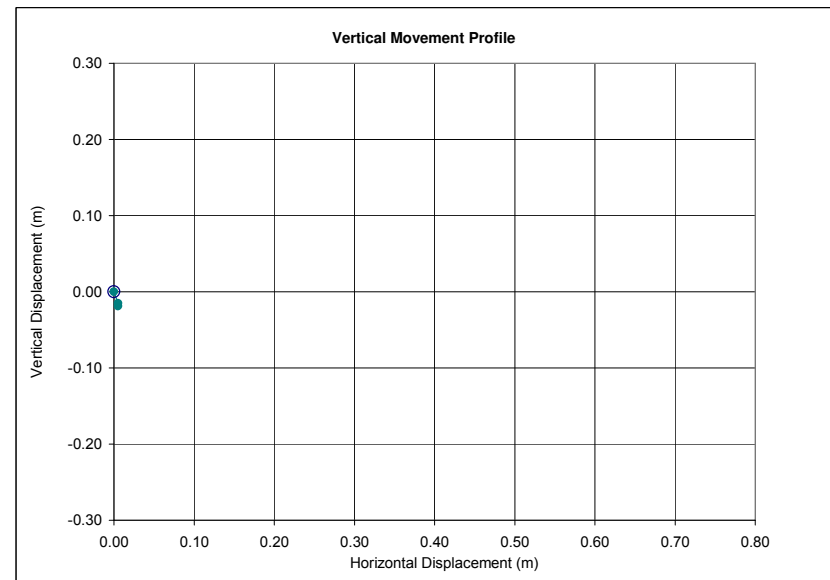
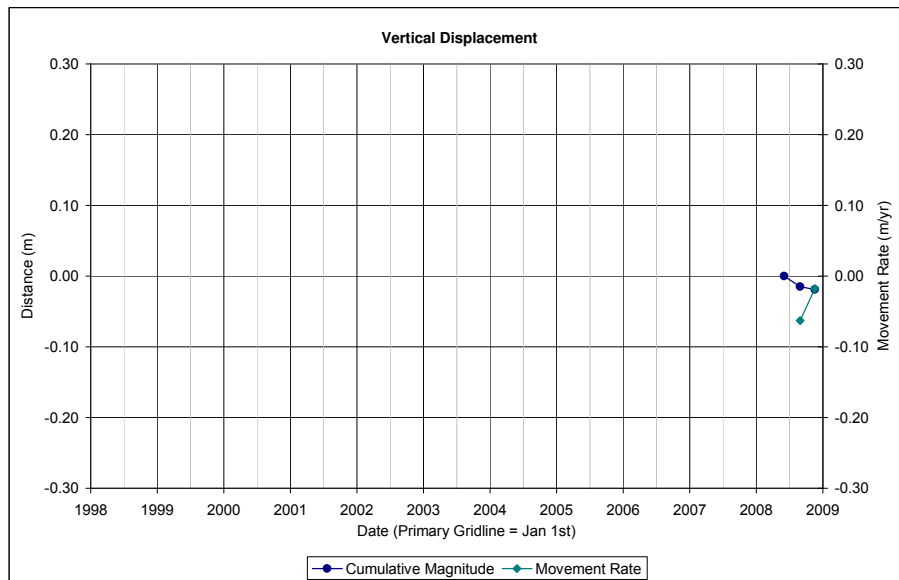
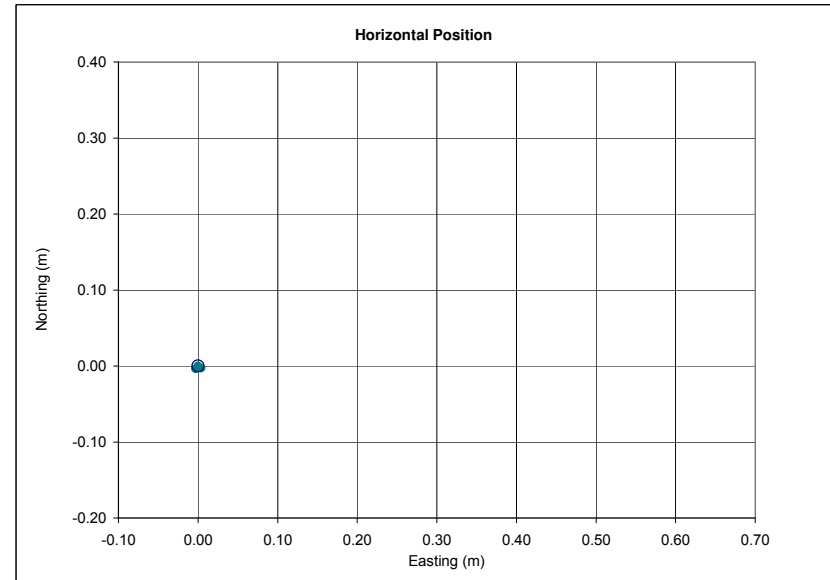
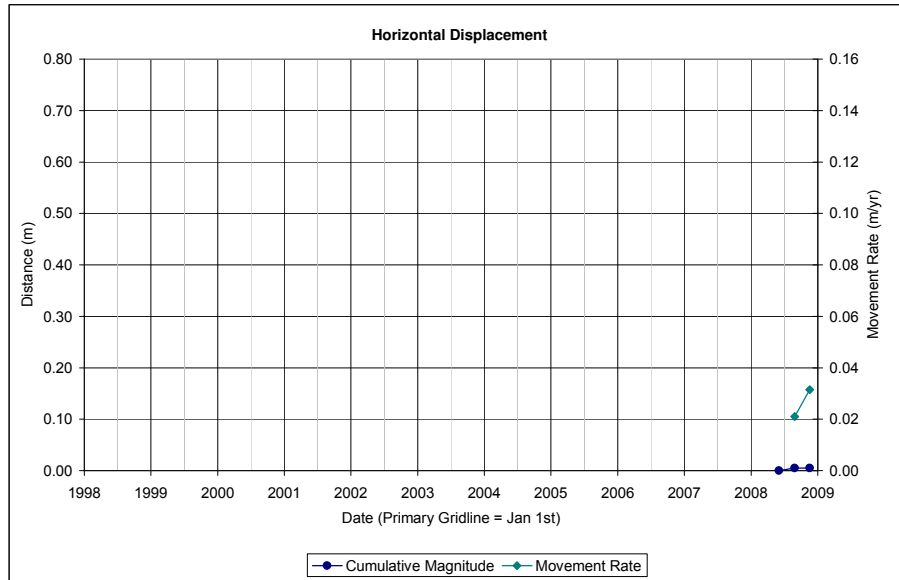


**Displacement Graphs - Hub 06-21**  
100m past gate, off end Abbott Drive



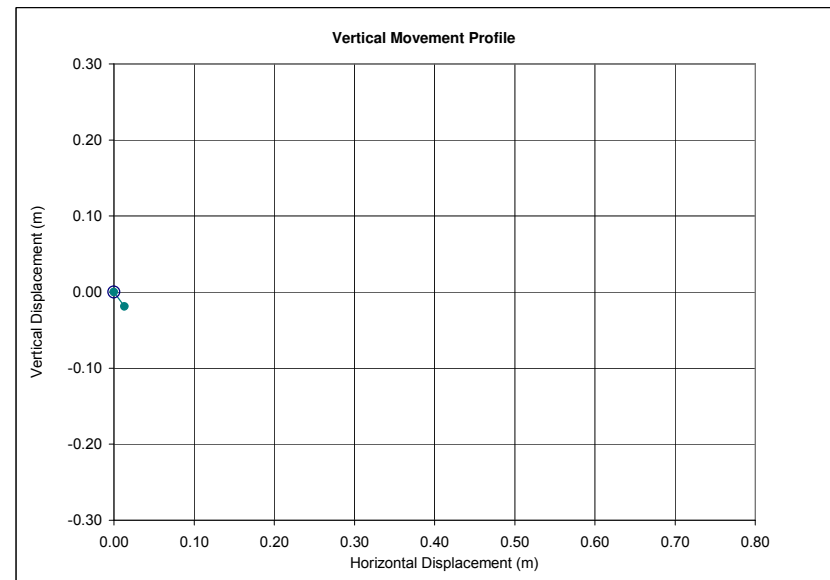
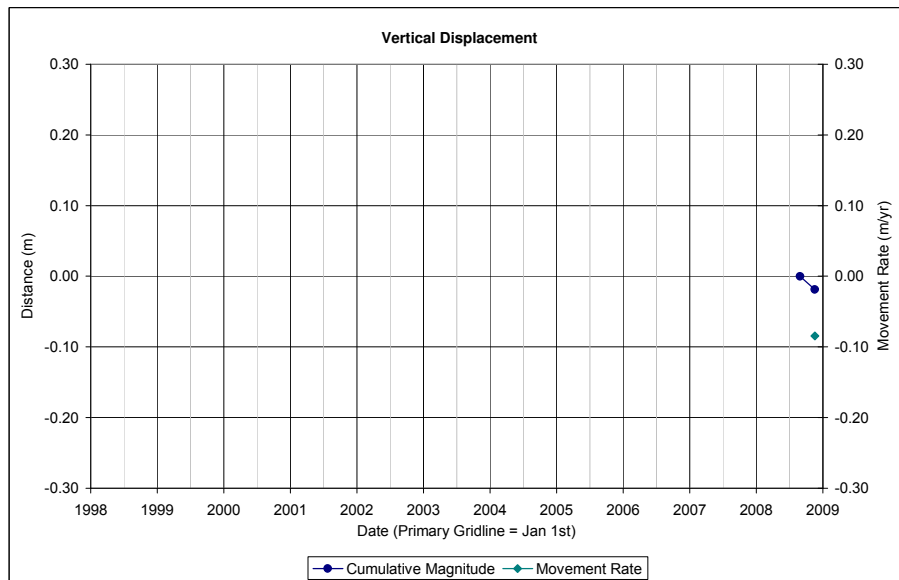
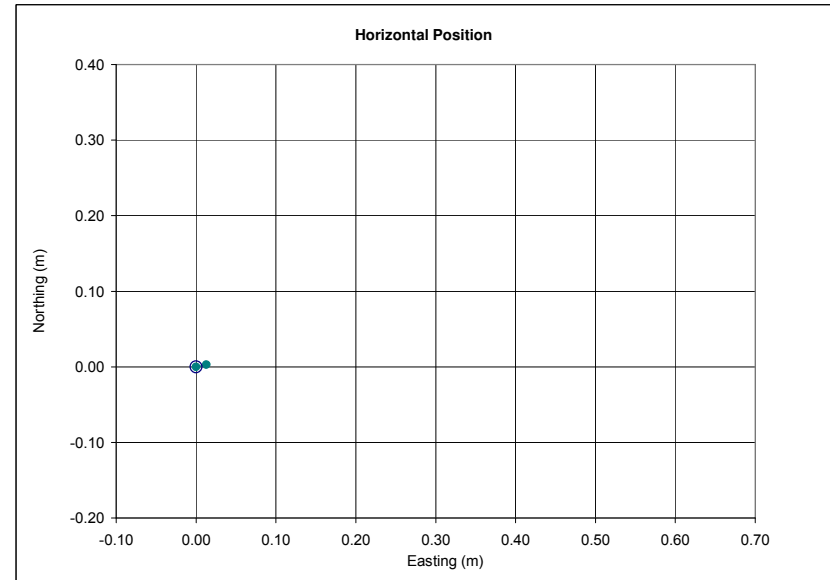
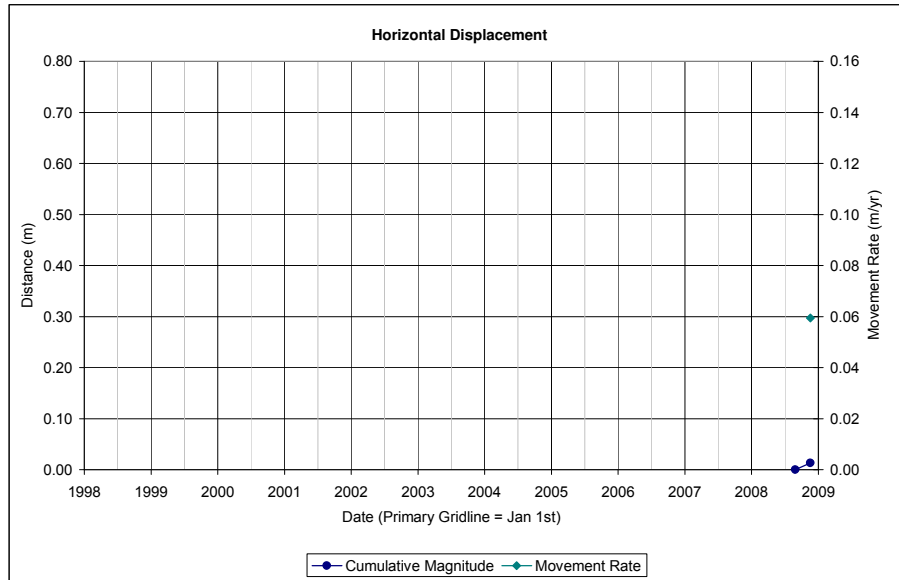


**Displacement Graphs - Hub 08-01**  
Replacement for 06-17



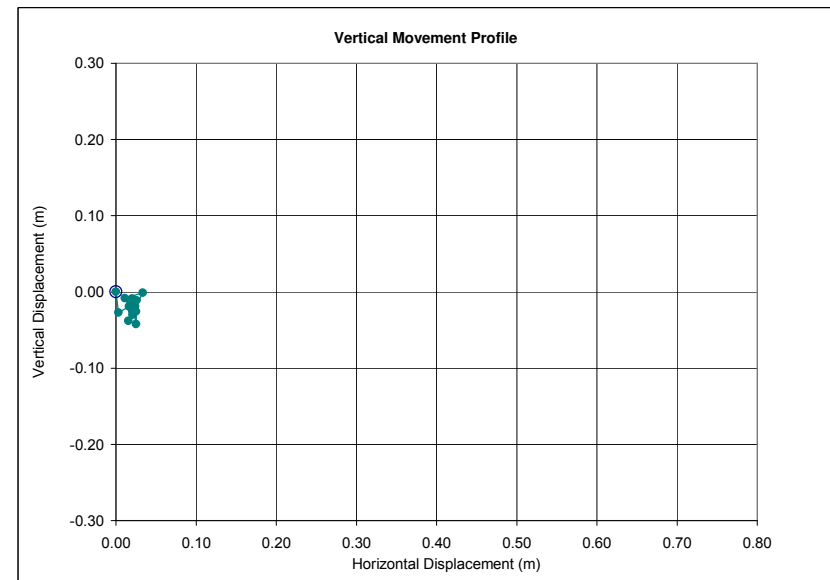
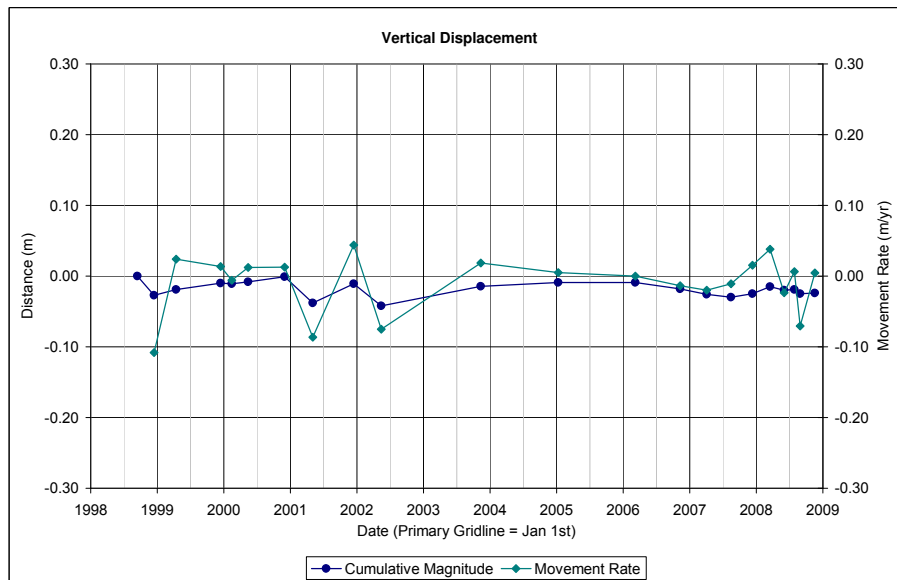
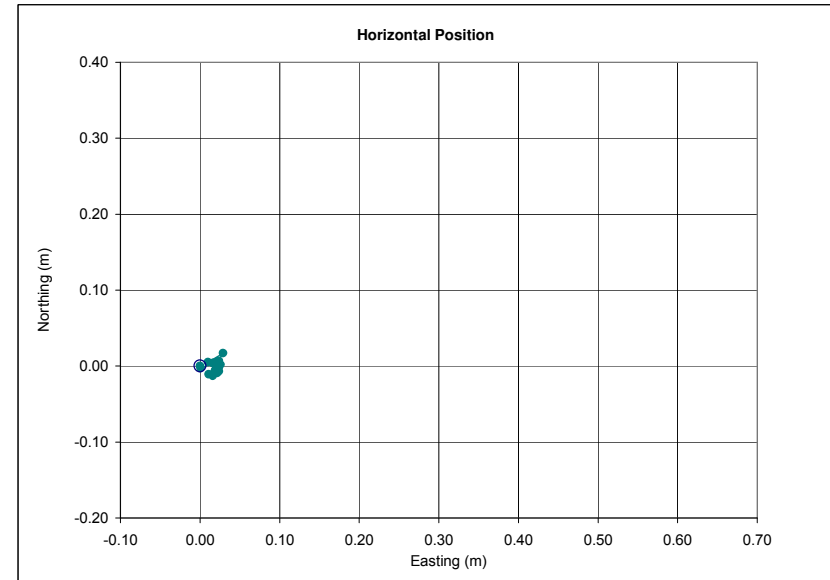
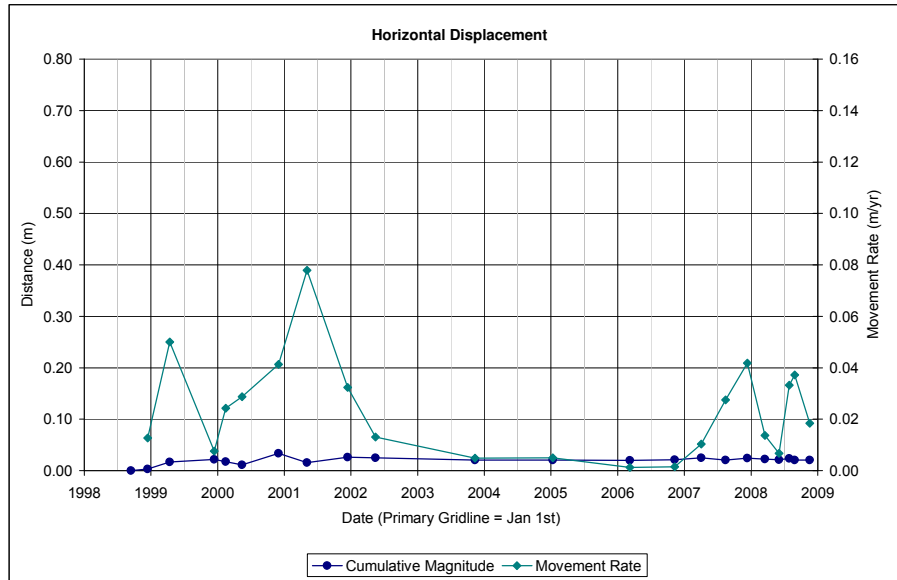


**Displacement Graphs - Hub 08-02**  
Very near 98-04



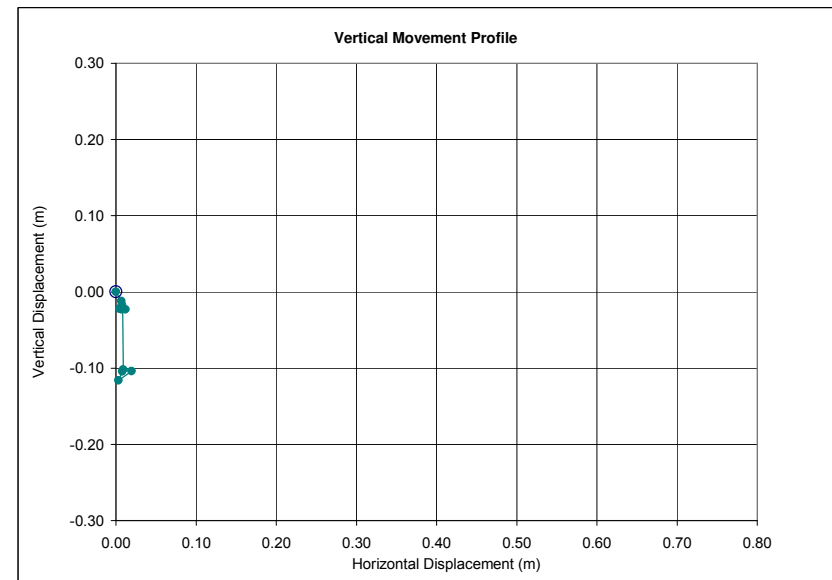
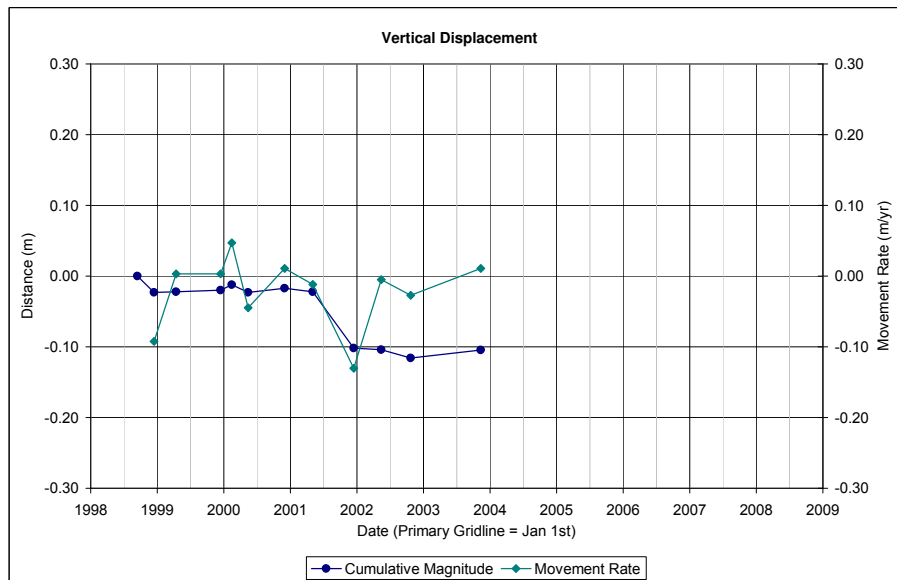
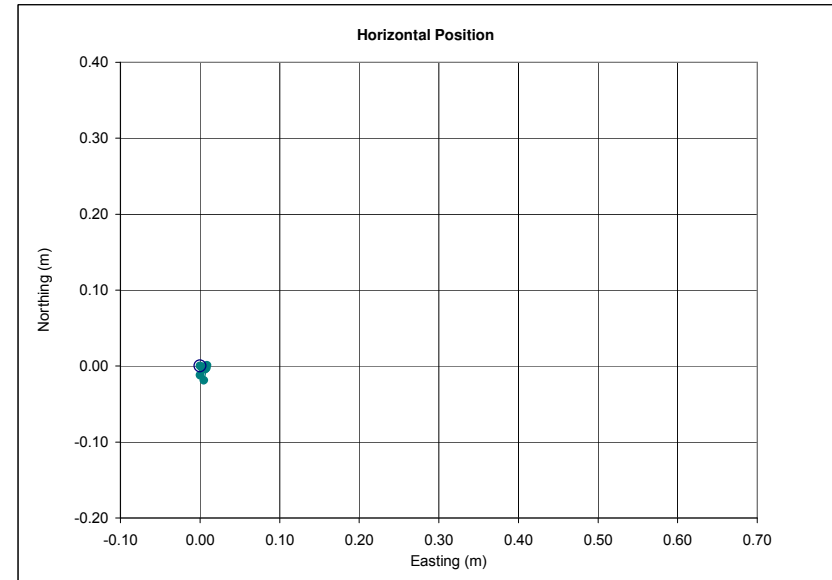
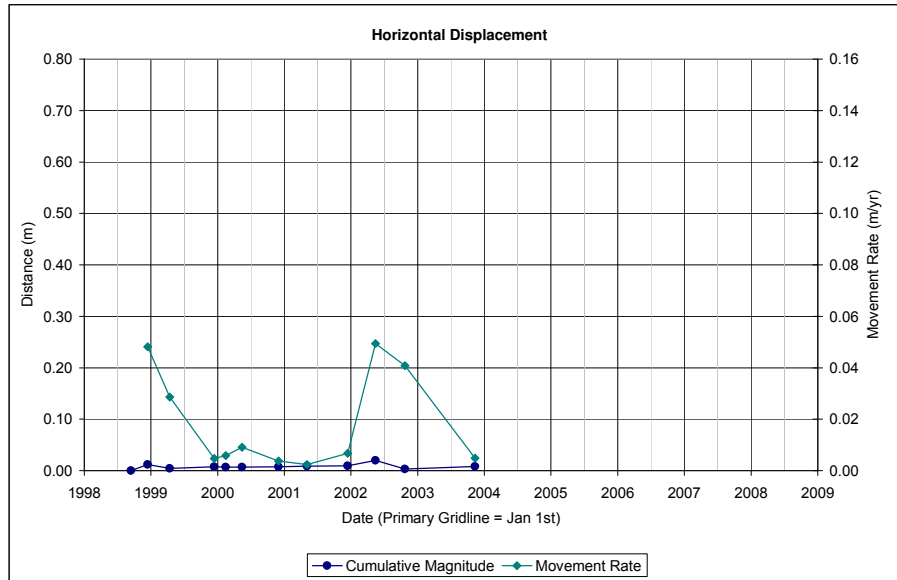


**Displacement Graphs - Hub 98-23**  
Benchmark - Doherty Dr.



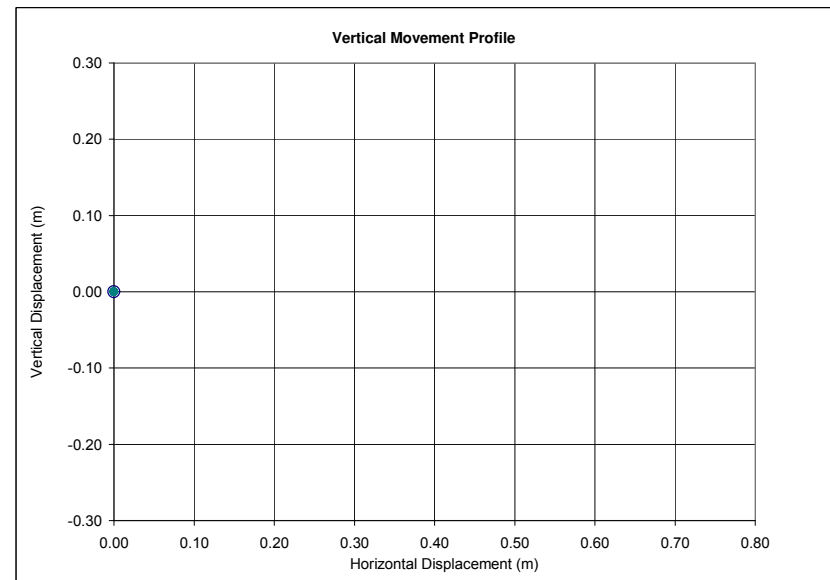
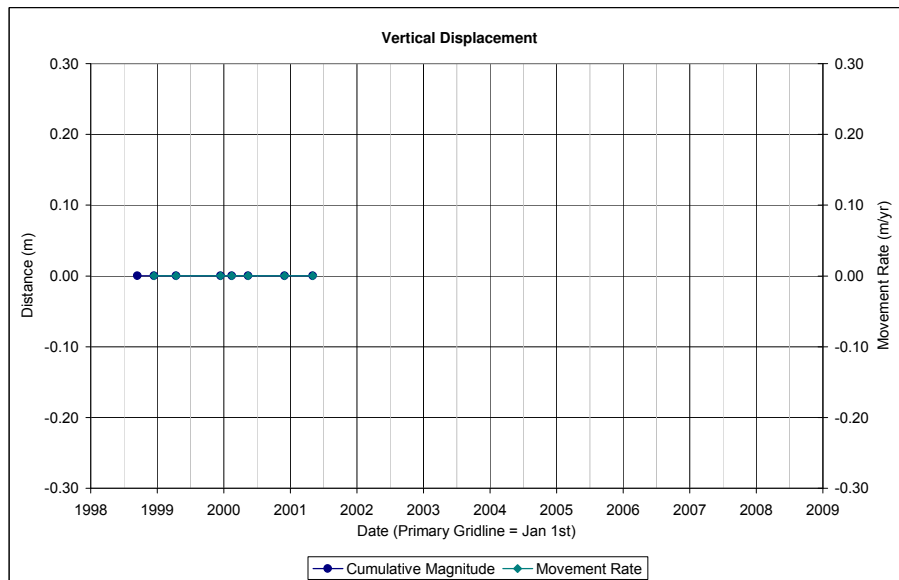
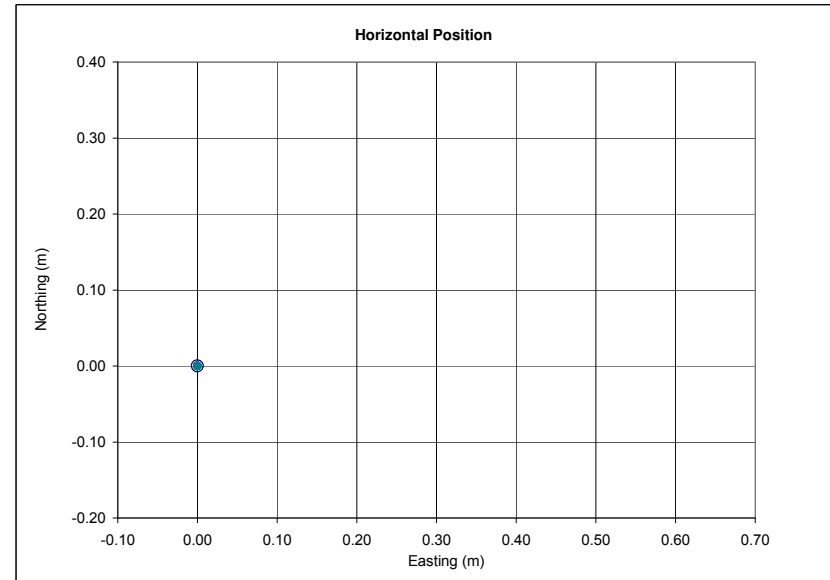
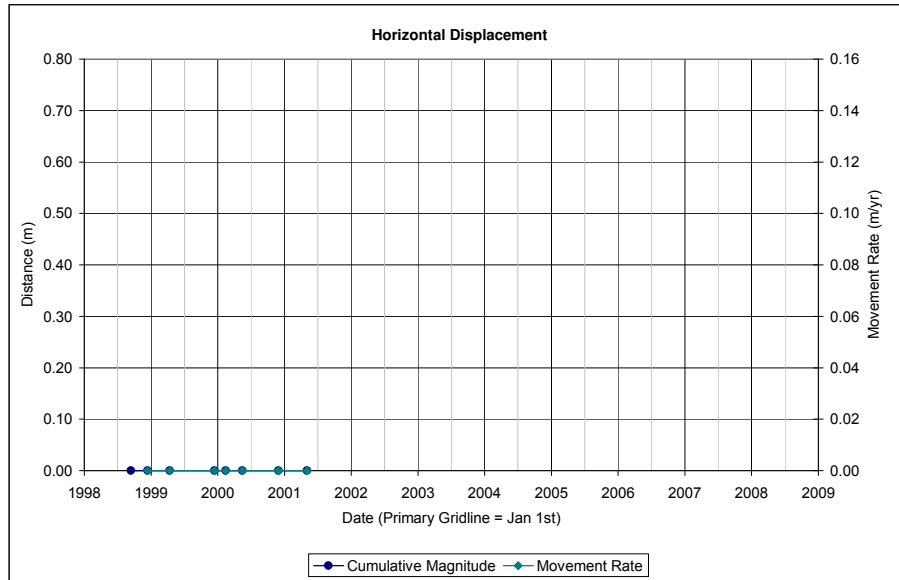
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**Displacement Graphs - Hub 98-26**  
Benchmark - Near Quesnel Airport



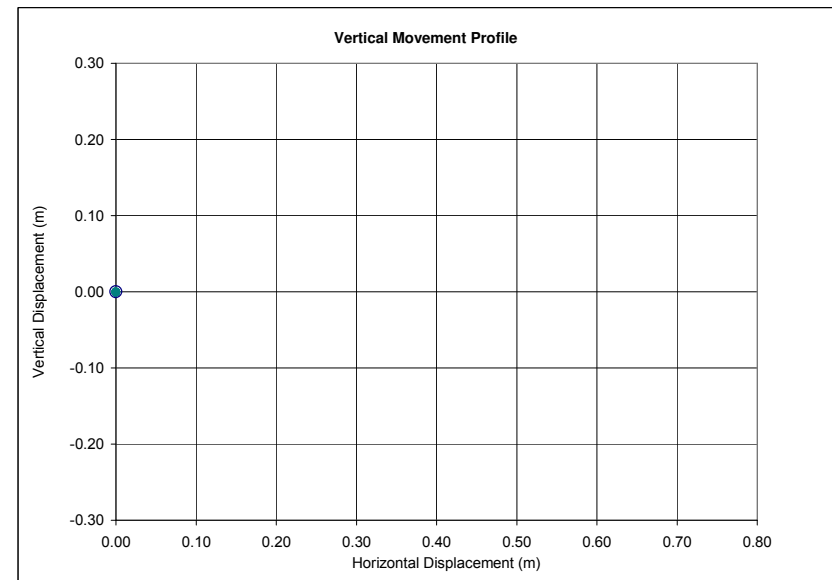
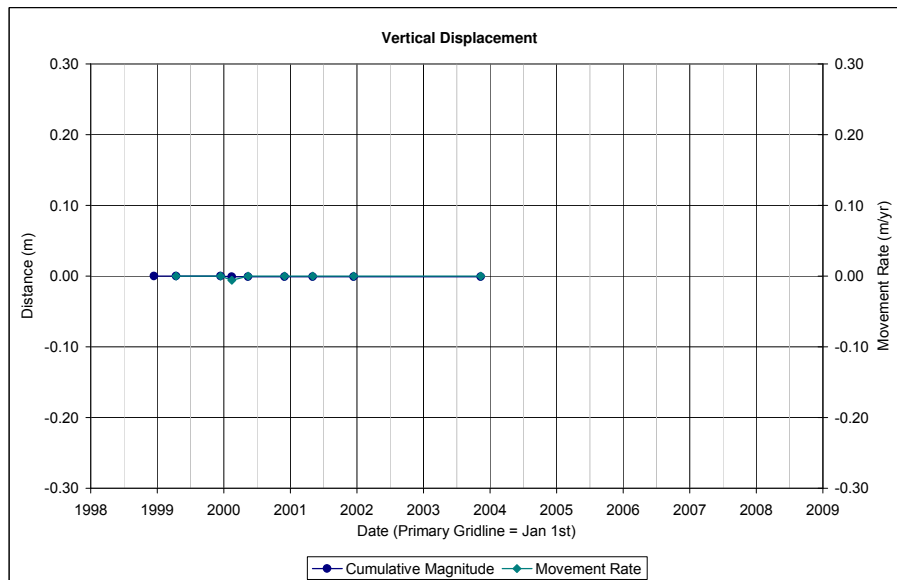
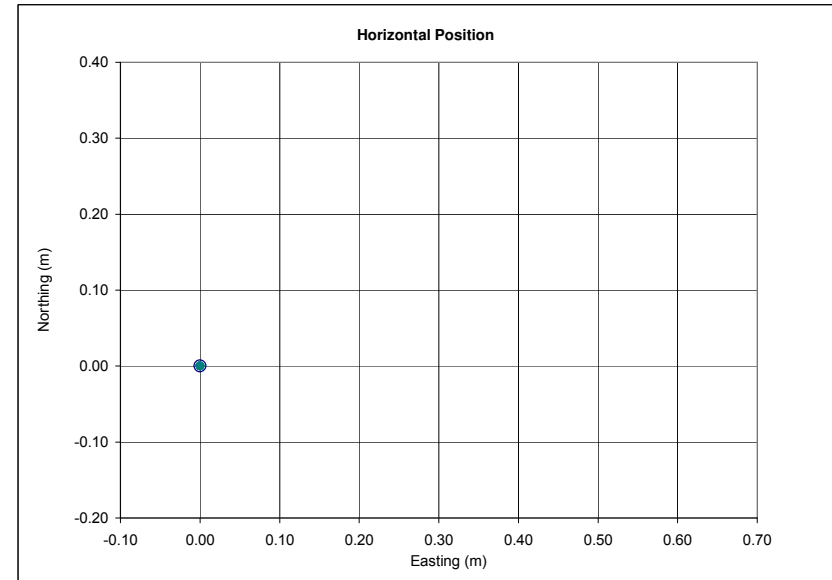
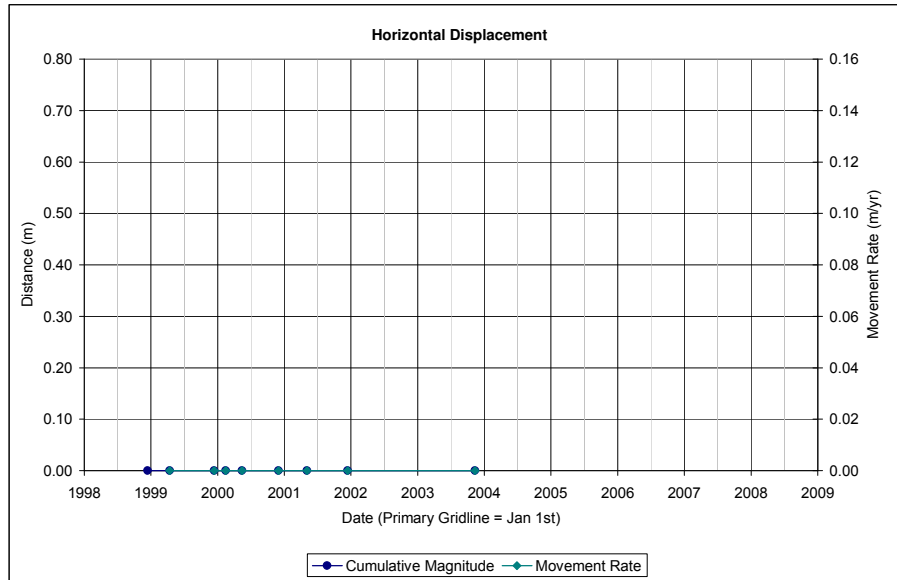
[illegible]

**Displacement Graphs - Hub 98-28**  
Benchmark - Red Bluff Pump Station



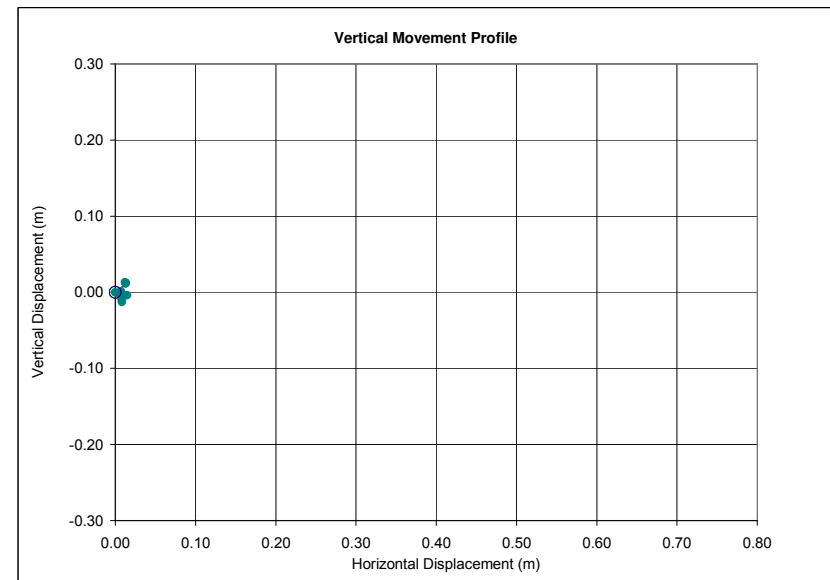
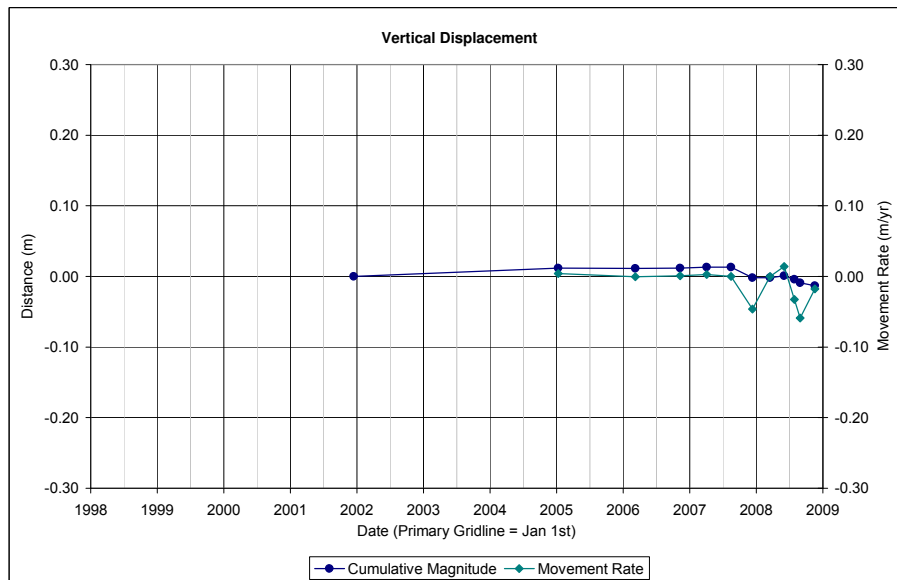
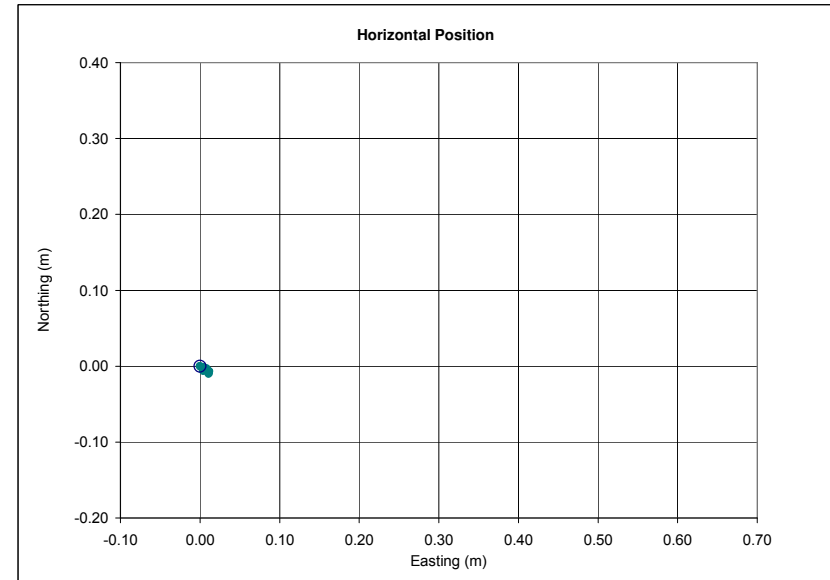
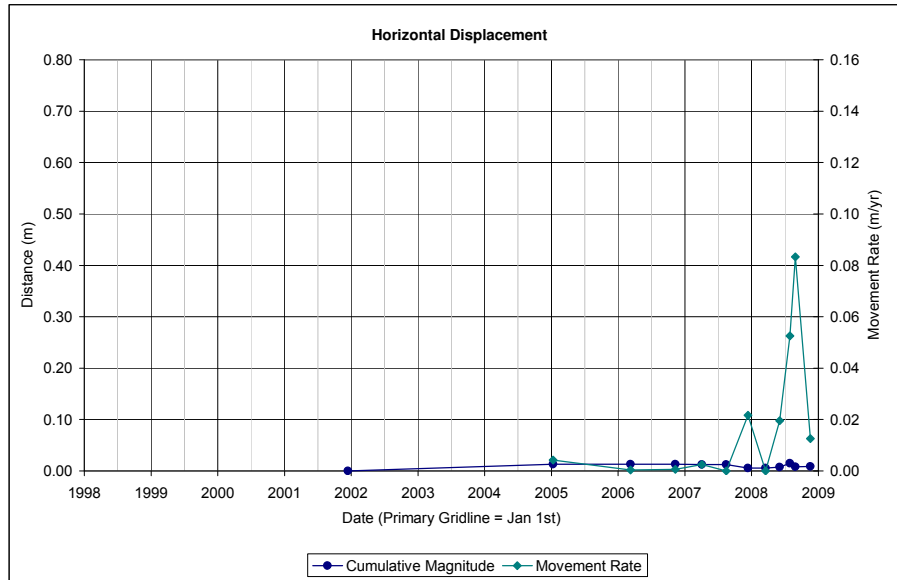
[illegible]

**Displacement Graphs - Hub 82C256**  
Benchmark - Gov't Monument at Quesnel Airport



[illegible]

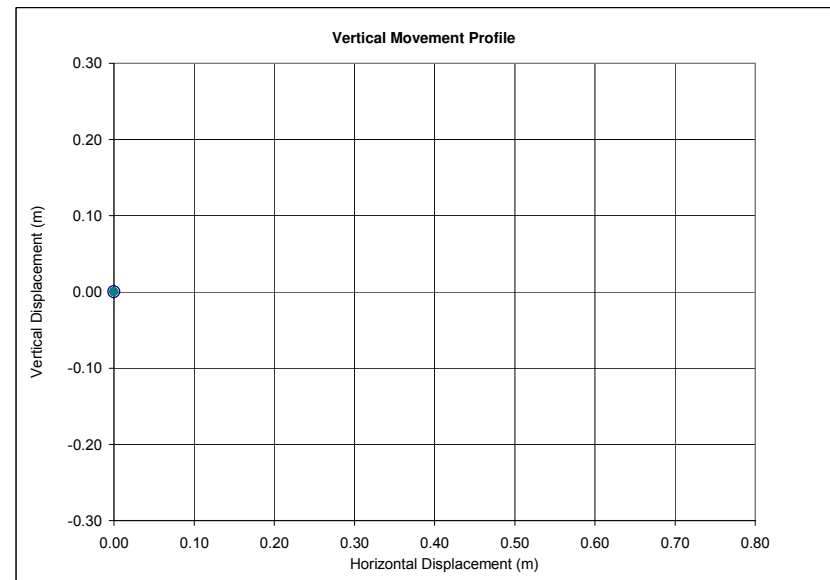
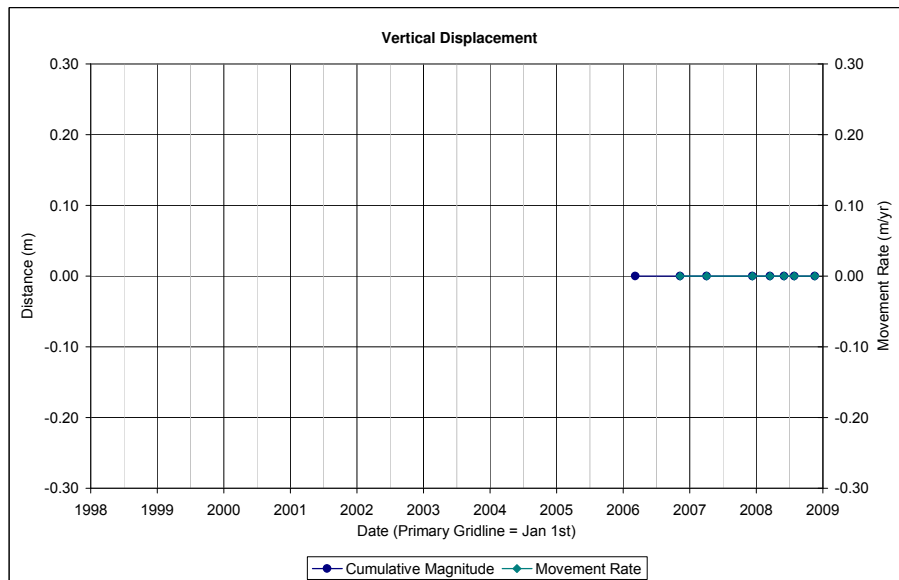
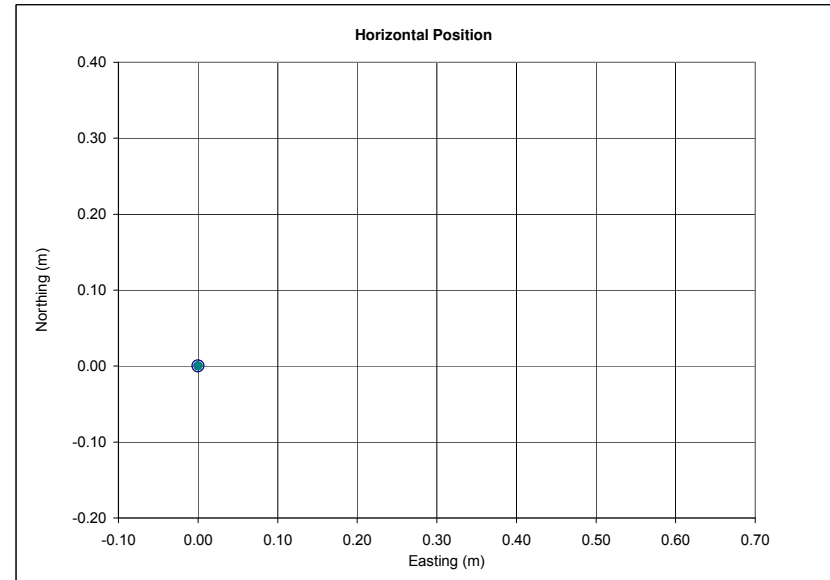
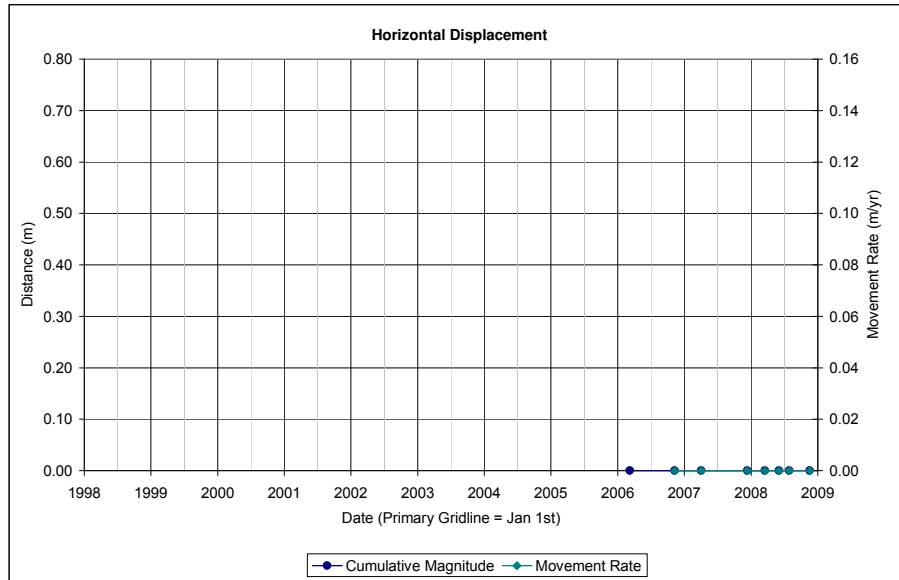
**Displacement Graphs - Hub 01-38**  
Benchmark - Quesnel No. 1 Station



[illegible]

# Displacement Graphs - Hub WaterTank

## Benchmark - Water Tank



**Appendix B**  
**Slope Inclinometers - Summary Table and Survey Plots**

## APPENDIX B - Slope Inclinometer Information

| SI    | Location                   | Initial Reading Date | Status                                    | Displacement |
|-------|----------------------------|----------------------|-------------------------------------------|--------------|
| SI-1  | Avery Lane                 | November 2000        | Blocked at 40m between Apr-June 2008      | 23mm*        |
| SI-2  | Avery Lane                 | November 2000        | Blocked at 41m between Nov. 04-Apr. 05    | 86mm*        |
| SI-3  | Abbott Dr. & Bettcher St.  | November 2000        | Blocked at 39m between May-Nov. 2002      | 61mm*        |
| SI-4  | Voyager School             | November 2000        | Blocked at 51m between May-Nov. 2002      | 59mm*        |
| SI-5  | Abbott Dr. (near Flamingo) | October 2000         | Blocked at 35m between Dec. 03-June 04    | 13mm*        |
| SI-6  | Dixon St.                  | November 2000        | Blocked at 78m between Nov 01-May 02      | 83mm*        |
| SI-7  | Pierce Cres.               | November 2000        | Blocked at 68m between May-Nov. 2002      | 73mm*        |
| SI-8  | Pinchbeck St.              | June 2005            | Active - no movement (SI not deep enough) | 0mm          |
| SI-9  | Patchett St.               | April 2005           | Active - slip surface at 65m              | 110mm        |
| SI-10 | Dawson St.                 | April 2005           | Blocked at 21m between June 05-May 06     | 12mm*        |
| SI-11 | Picard Ave.                | May 2005             | Active - no movement (SI not deep enough) | 0mm          |
| SI-12 | Panagrot Ave. (east end)   | April 2005           | Blocked at 63m between Mar.-May 2007      | 47mm*        |
| SI-13 | Lewis Dr. (at Sikh Temple) | April 2005           | Blocked at 13m between June-Sept. 2008    | 72mm*        |
| SI-14 | Findlay Rd.                | November 2006        | Active - slip surface at 20m              | 62mm         |
| SI-15 | Panagrot Ave. (west end)   | November 2006        | Active - slip surface at 18m              | 46mm         |

\* Displacements are reported from last reading before SI blocked

KX04397

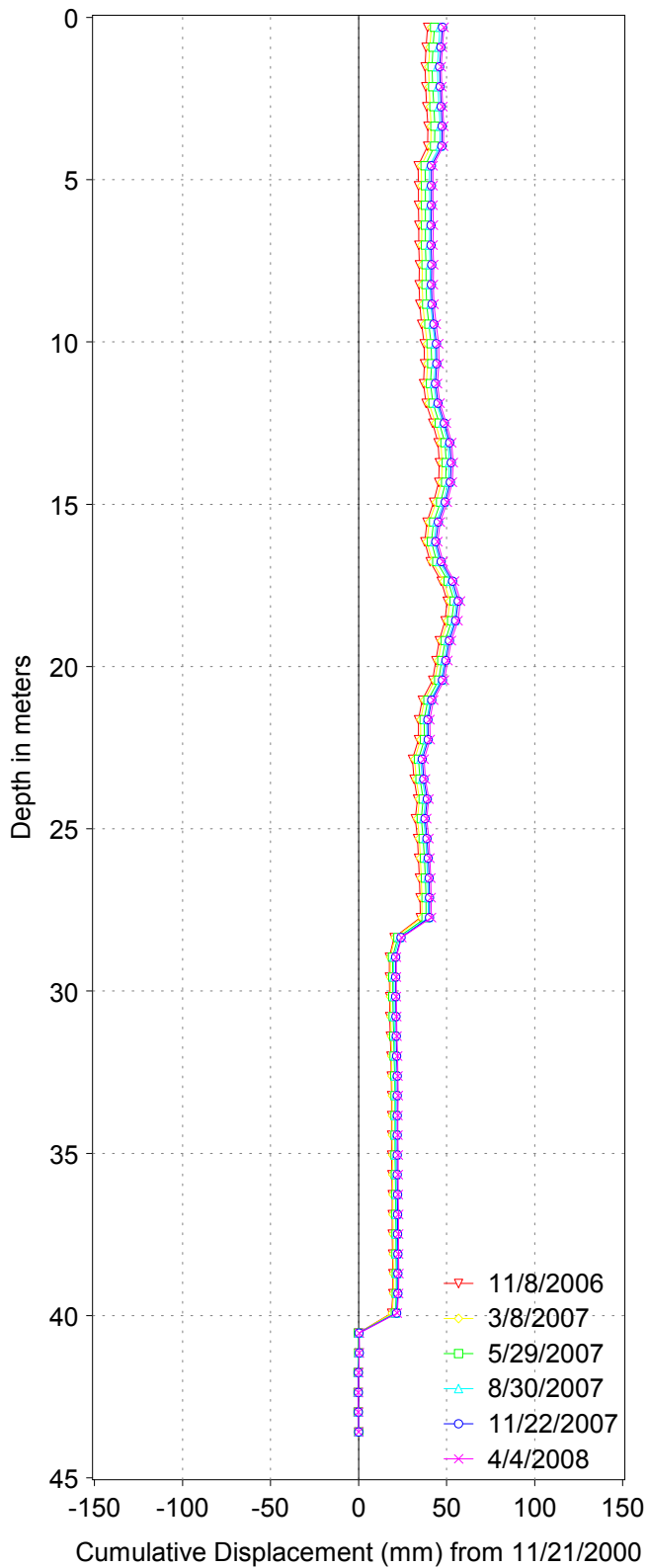
WEST QUESNEL LAND STABILITY MONITORING

CUMULATIVE & INCREMENTAL DISPLACEMENTS

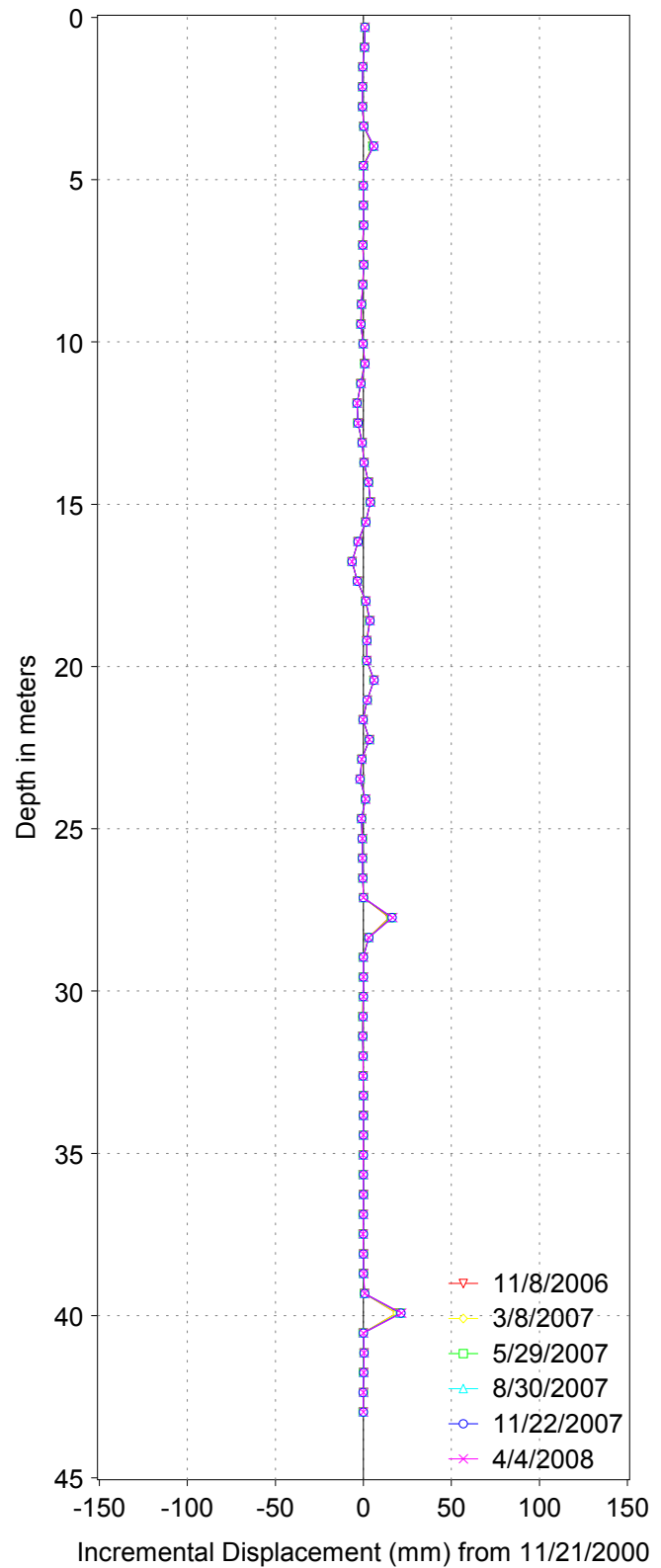
**SI-1**

BLOCKED AT 39.6 m BETWEEN APRIL 4 AND JUNE 25 2008

QUES SI-1, A-Axis, Cumulative



QUES SI-1, A-Axis, Incremental



KX04397

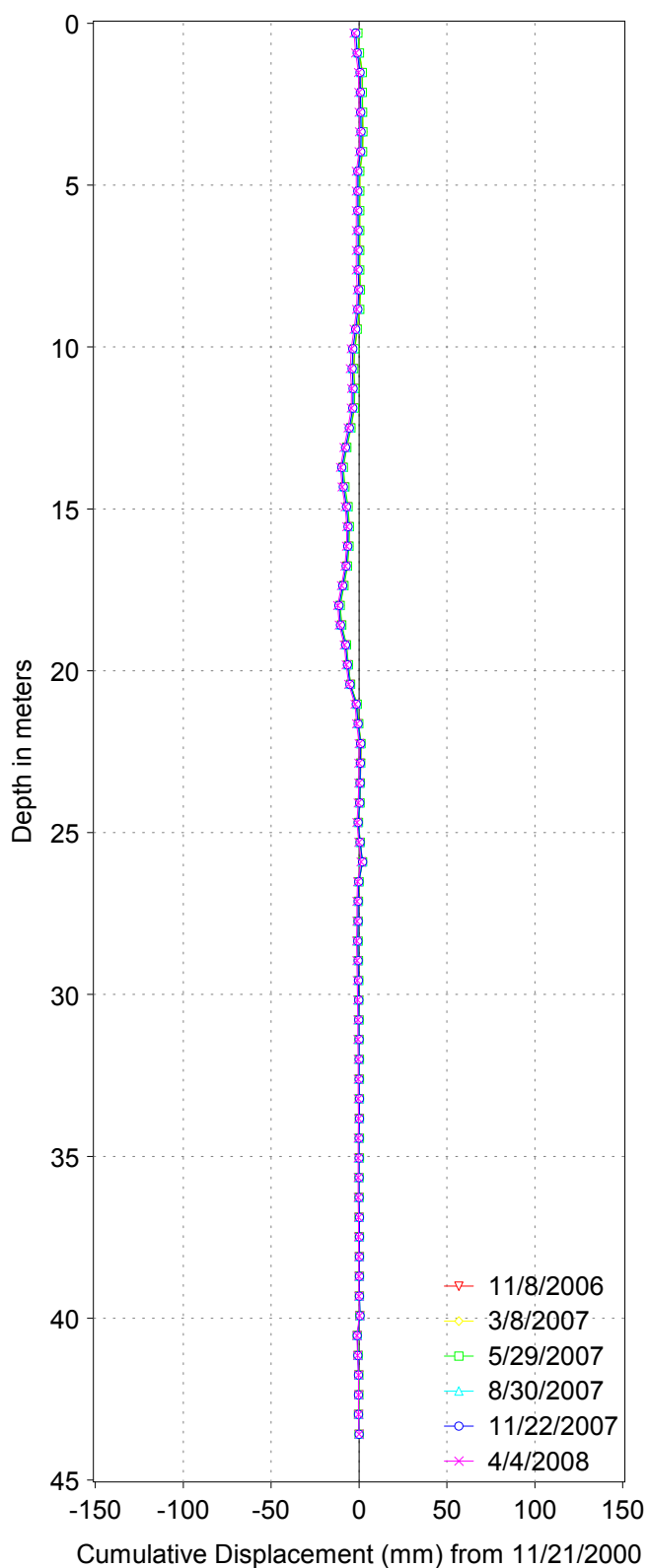
WEST QUESNEL LAND STABILITY MONITORING

CUMULATIVE & INCREMENTAL DISPLACEMENTS

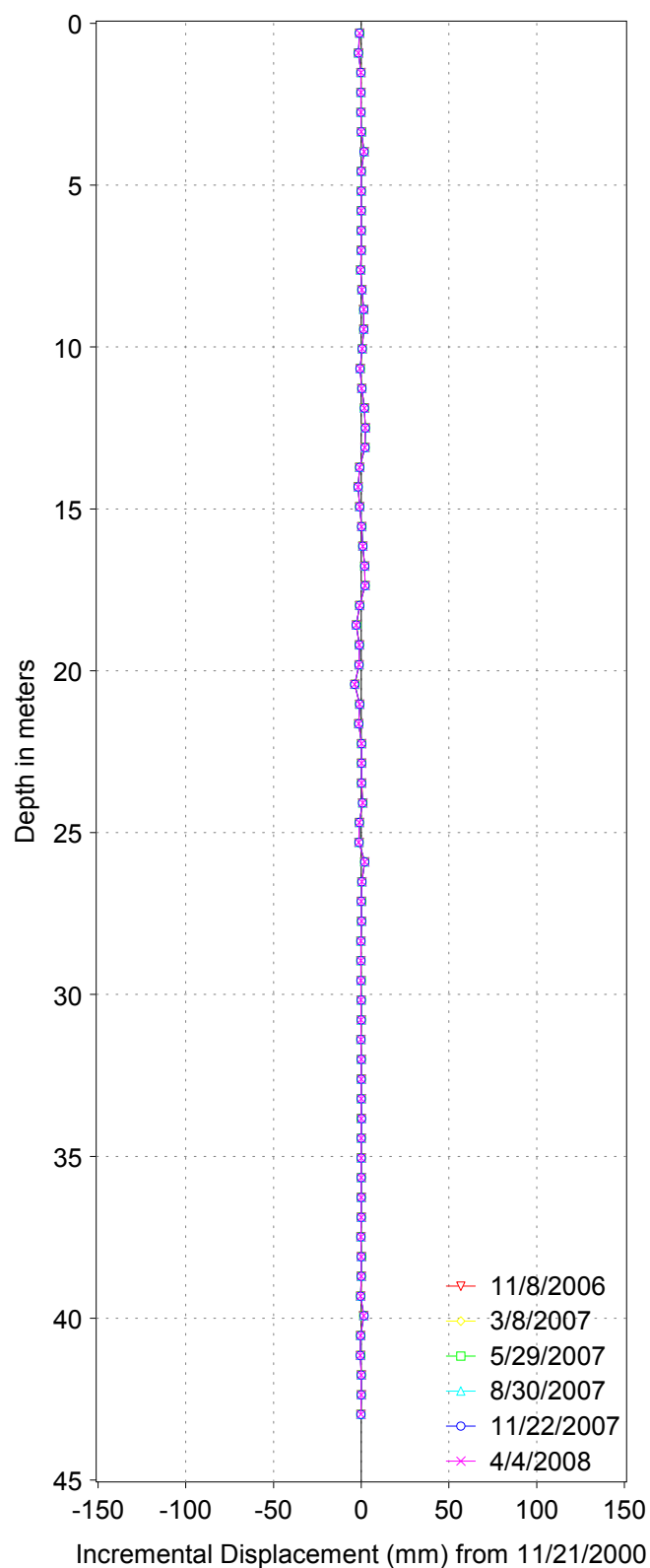
**SI-1**

BLOCKED AT 39.6 m BETWEEN APRIL 4 AND JUNE 25 2008

QUES SI-1, B-Axis, Cumulative



QUES SI-1, B-Axis, Incremental



KX04397

WEST QUESNEL LAND STABILITY MONITORING

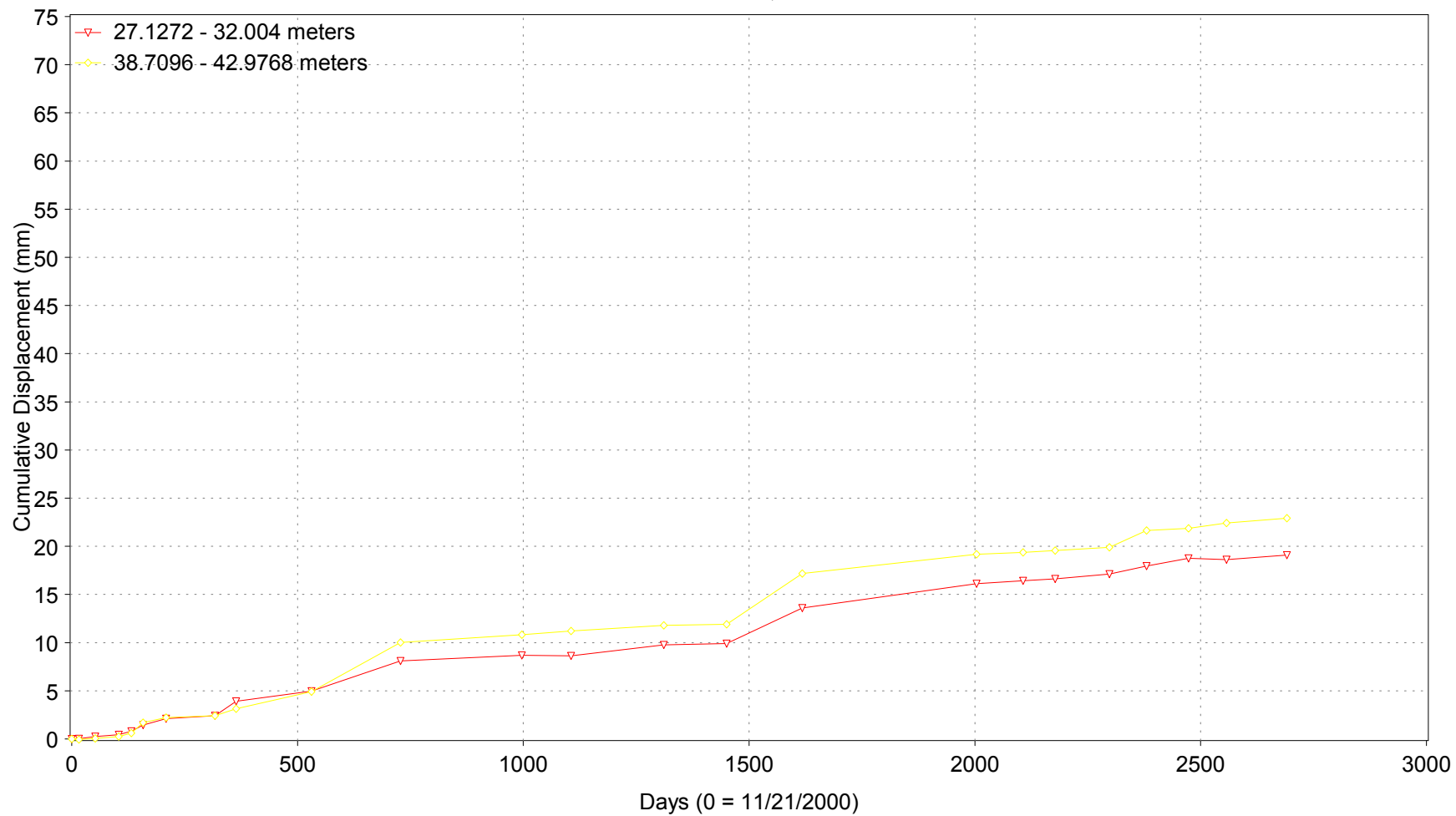
TIME DISPLACEMENT (METRIC)

SI-1

BLOCKED AT 39.6 m BETWEEN APRIL 4 AND JUNE 25 2008



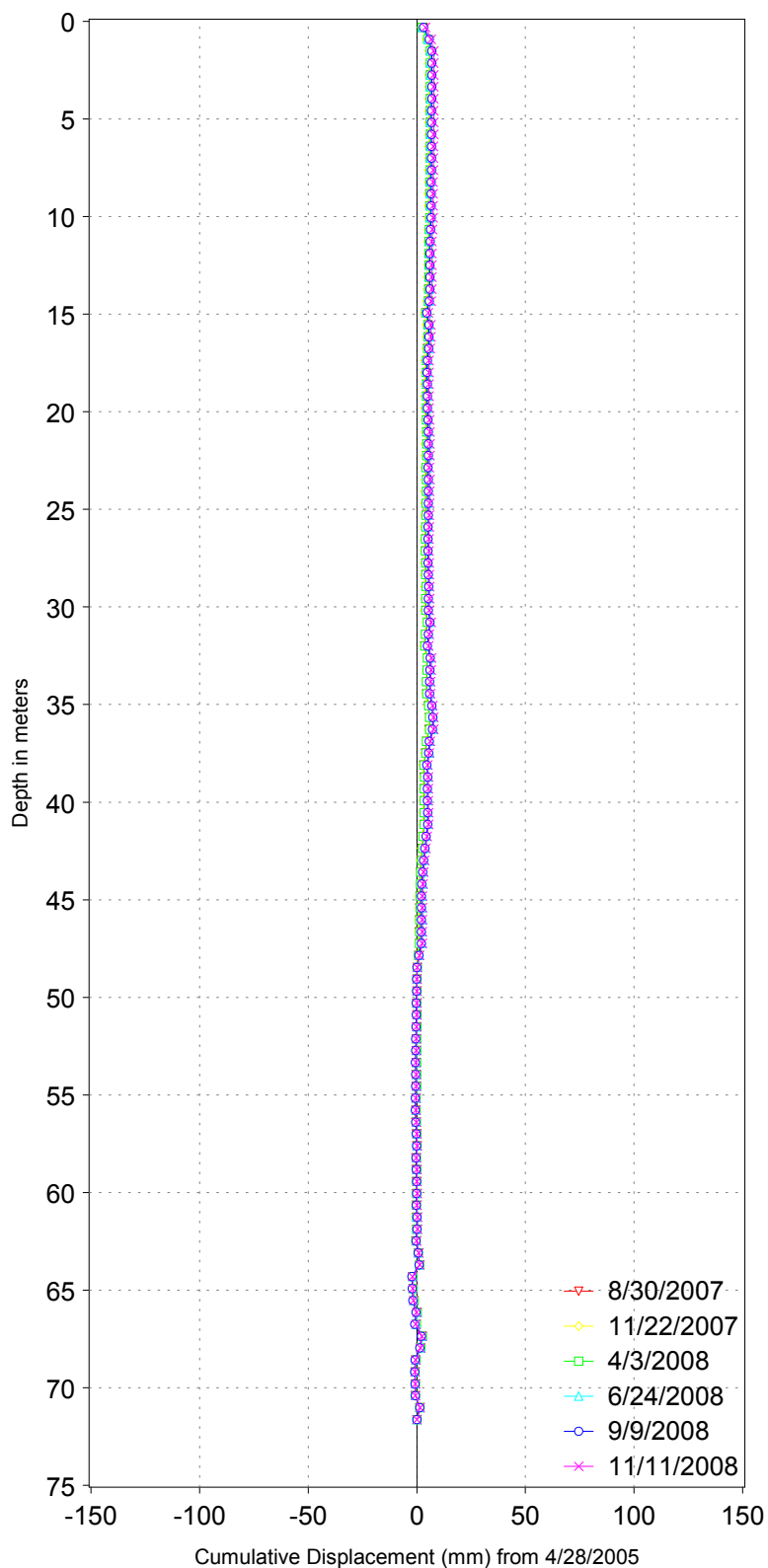
### QUES SI-1, A-Axis



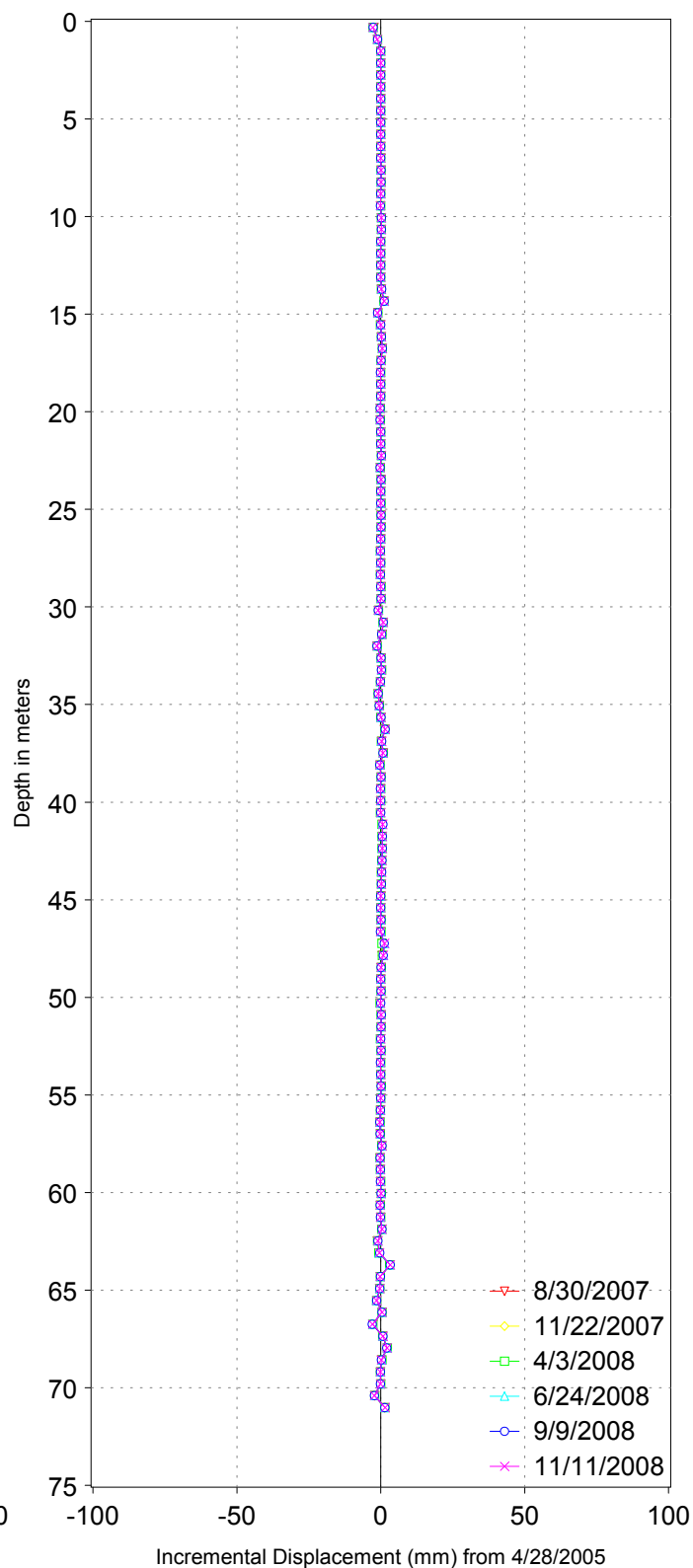
KX04397  
WEST QUESNEL LAND STABILITY MONITORING  
CUMMULATIVE & INCREMENTAL DISPLACEMENTS  
SI-8



SI-8, A-Axis, Cumulative



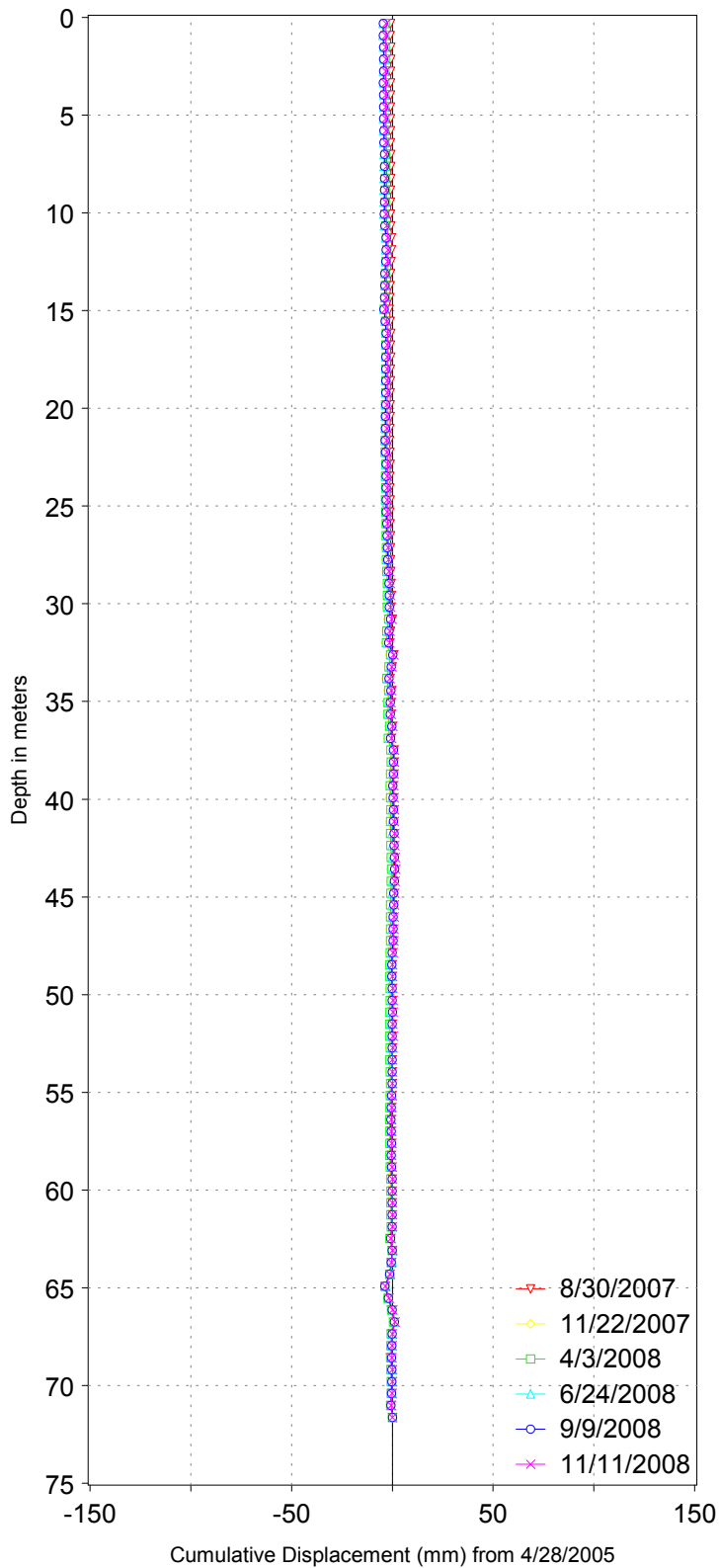
SI8, A-Axis, Incremental



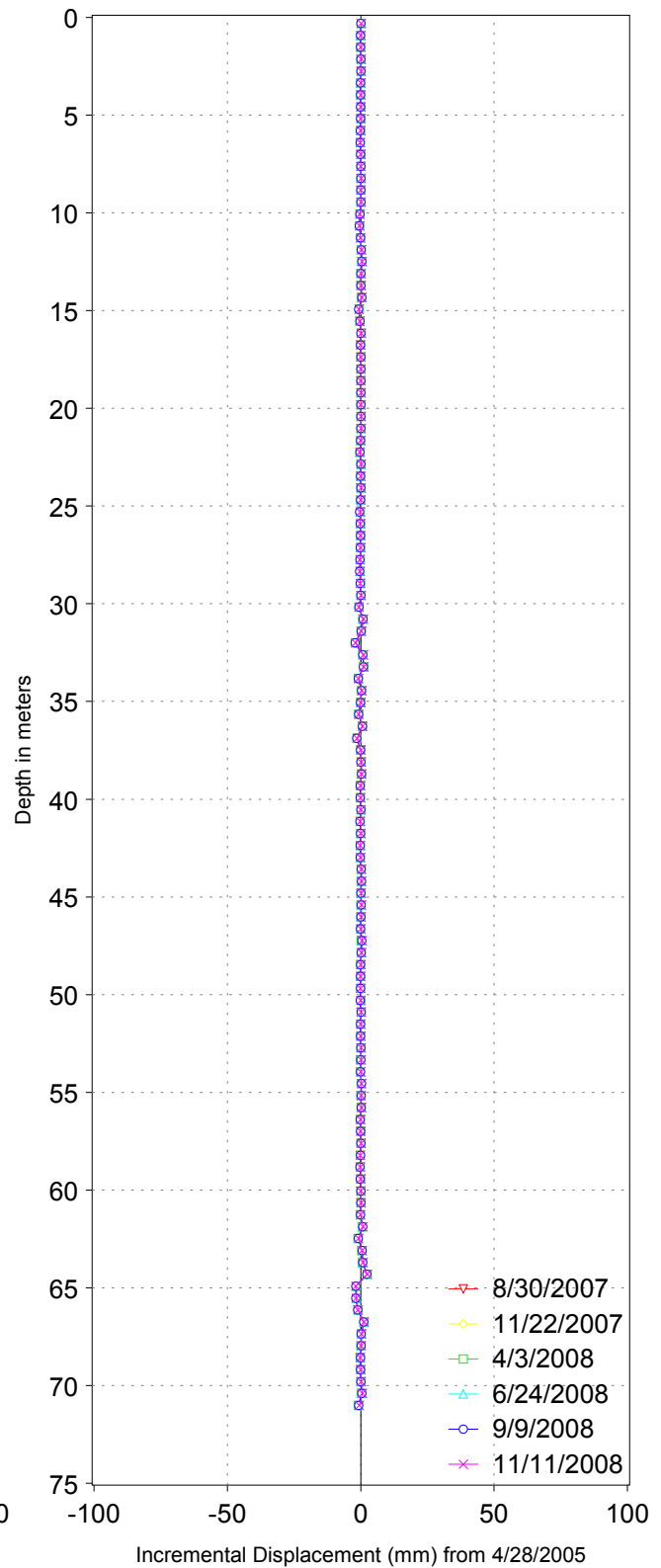


KX04397  
WEST QUESNEL LAND STABILITY Study  
CUMULATIVE & INCREMENTAL DISPLACEMENTS  
SI8

SI8, B-Axis, Cumulative



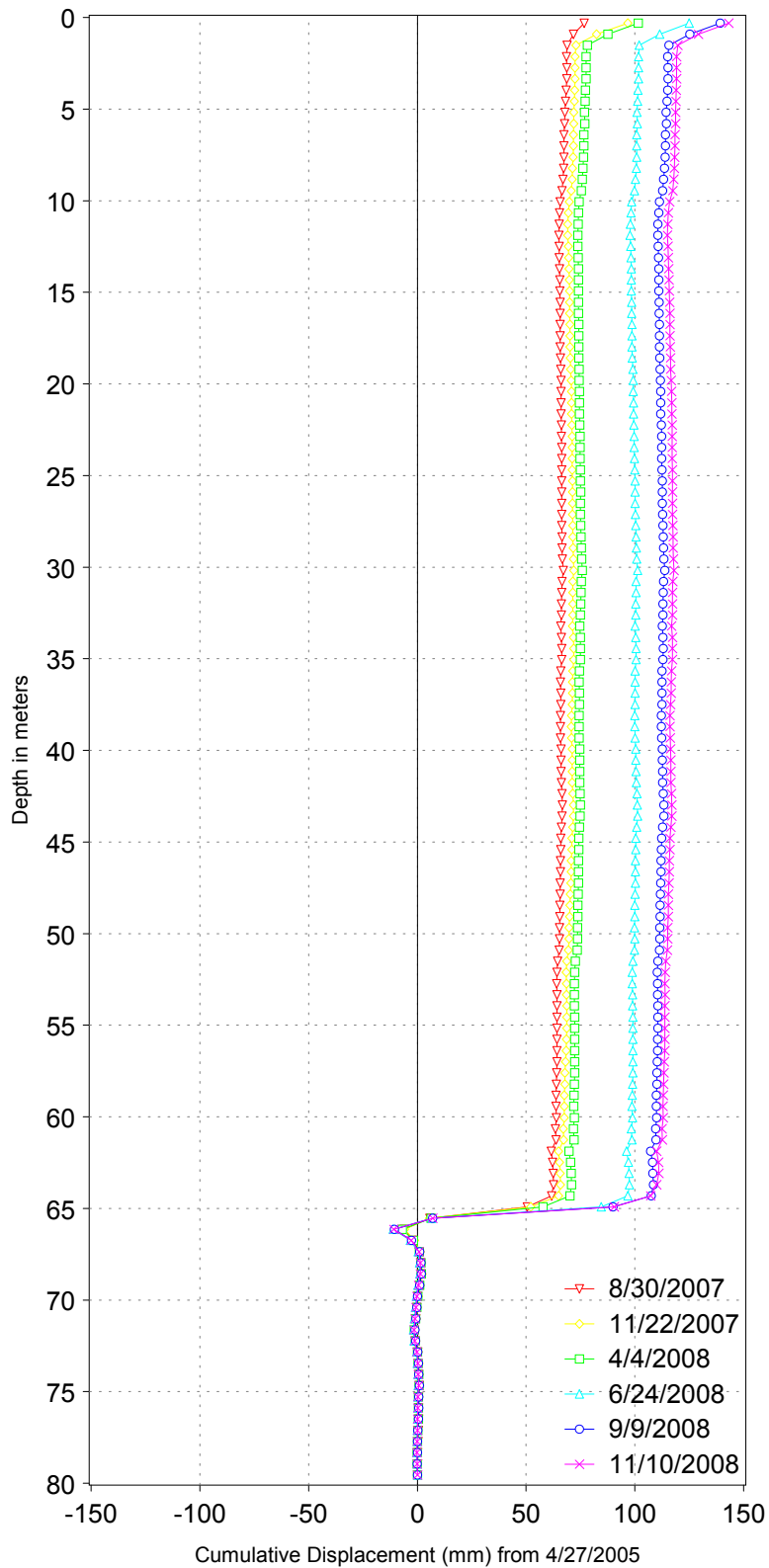
SI8, B-Axis, Incremental



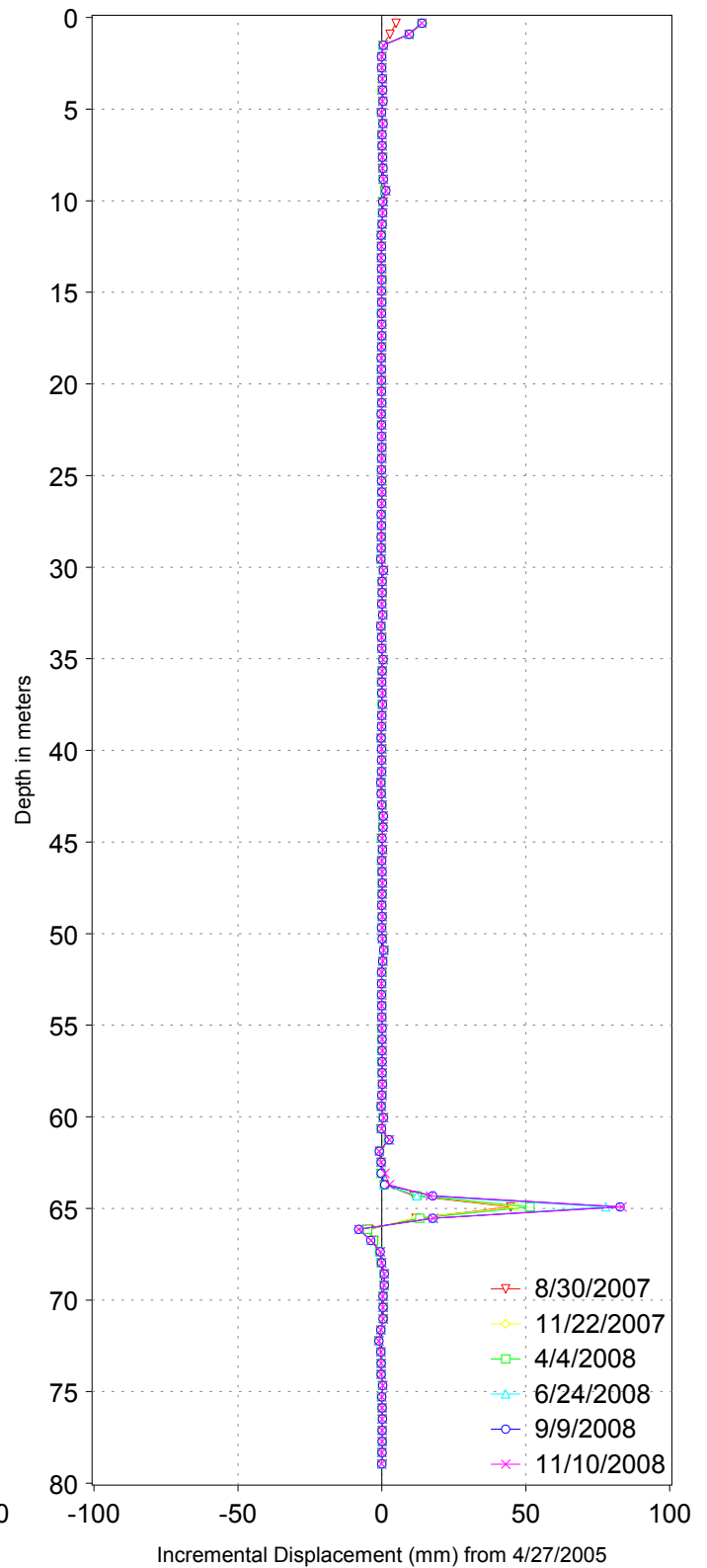
KX09397  
 WEST QUESNEL LAND STABILITY STUDY  
 CUMULATIVE & INCREMENTAL DISPLACEMENTS  
**SI9**



SI9, A-Axis, Cumulative



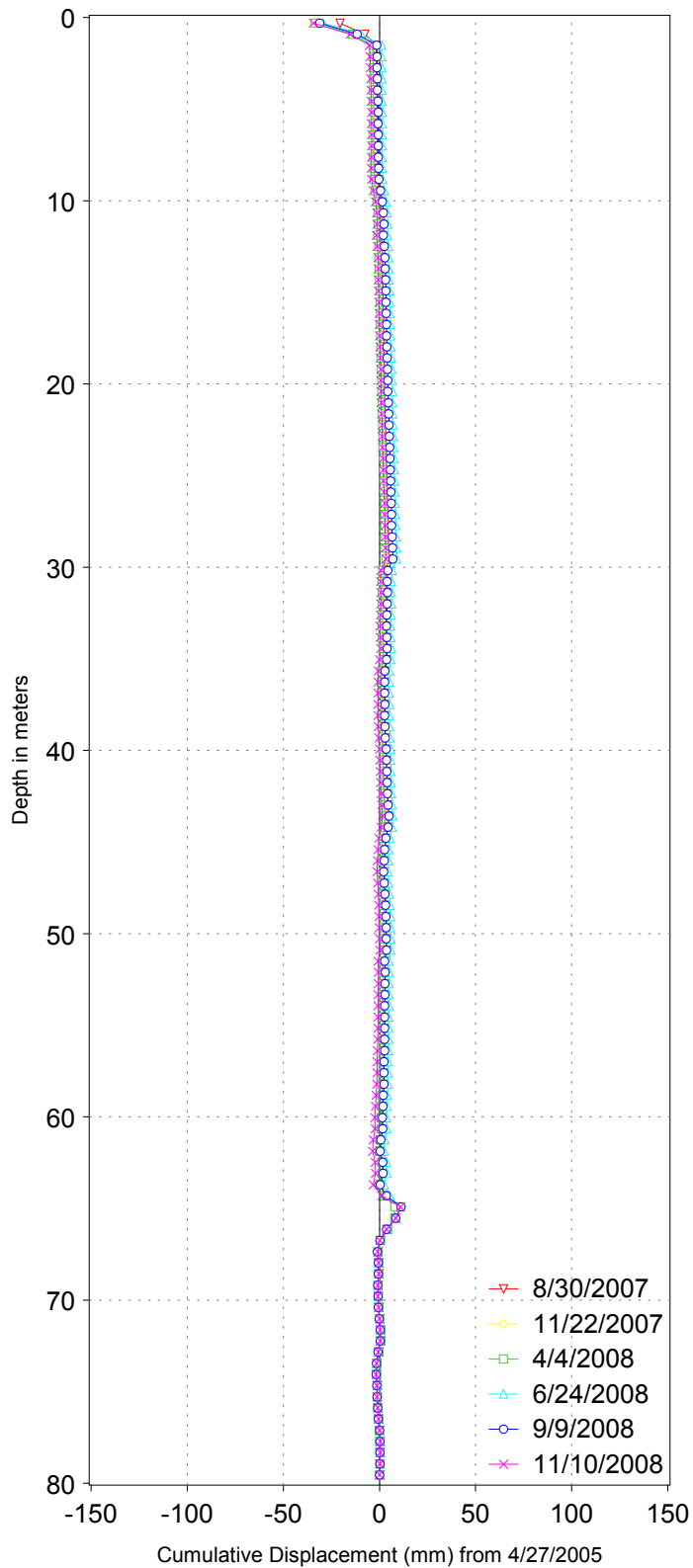
SI9, A-Axis, Incremental



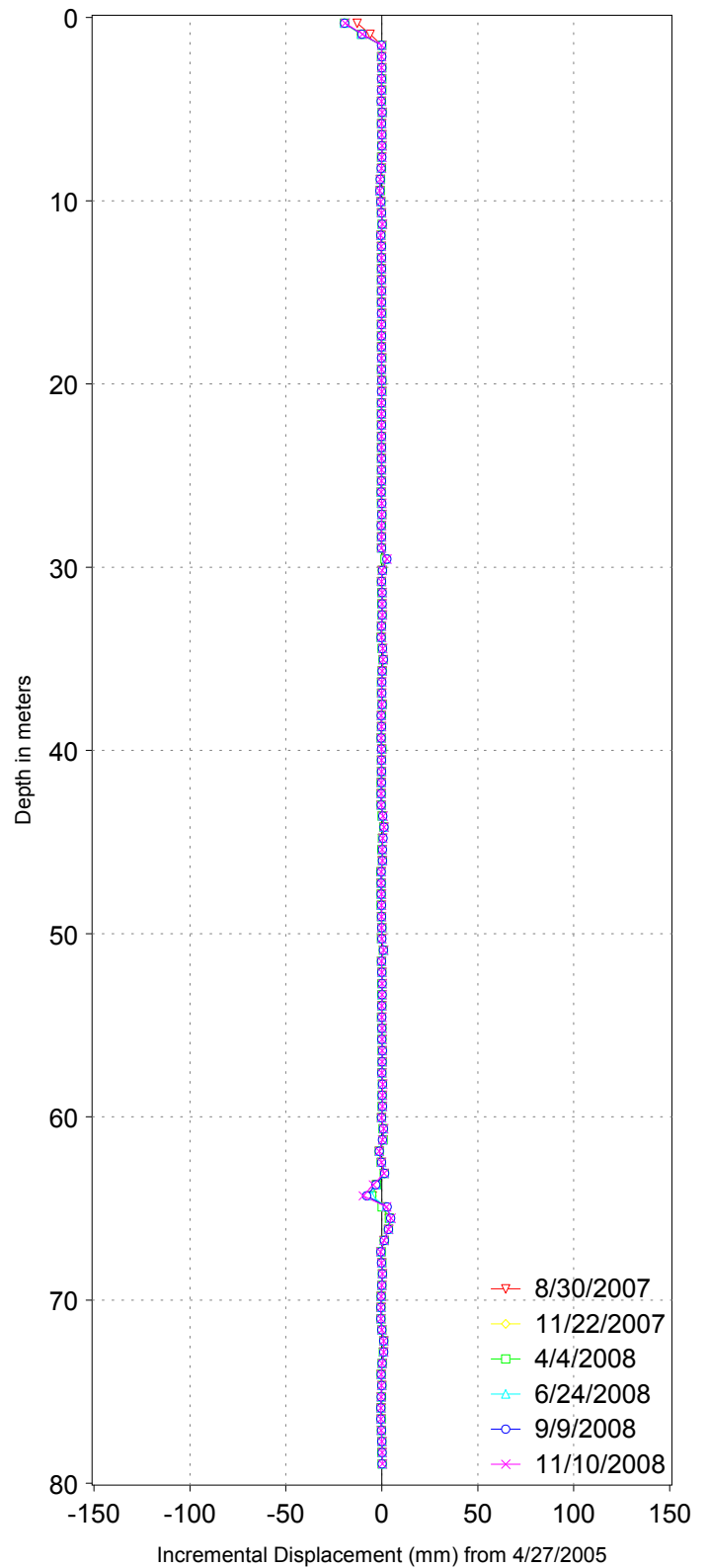
KX09397  
 WEST QUESNEL LAND STABILITY STUDY  
 CUMULATIVE & INCREMENTAL DISPLACEMENTS  
**SI9**



SI9, B-Axis, Cumulative



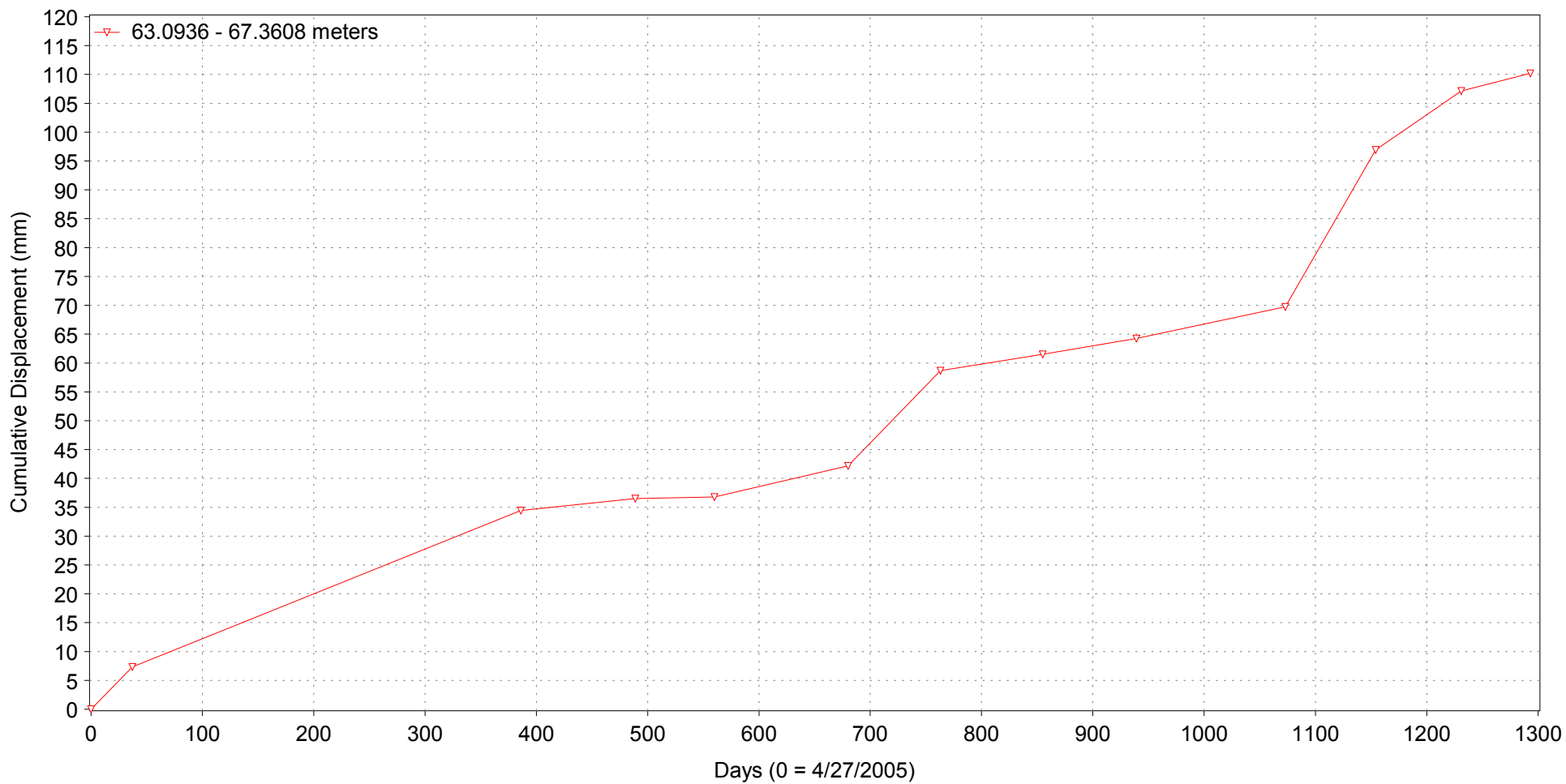
SI9, B-Axis, Incremental



KX04397  
WEST QUESNEL LAND STABILITY MONITORING  
TIME DISPLACEMENT (METRIC)  
**SI-9**



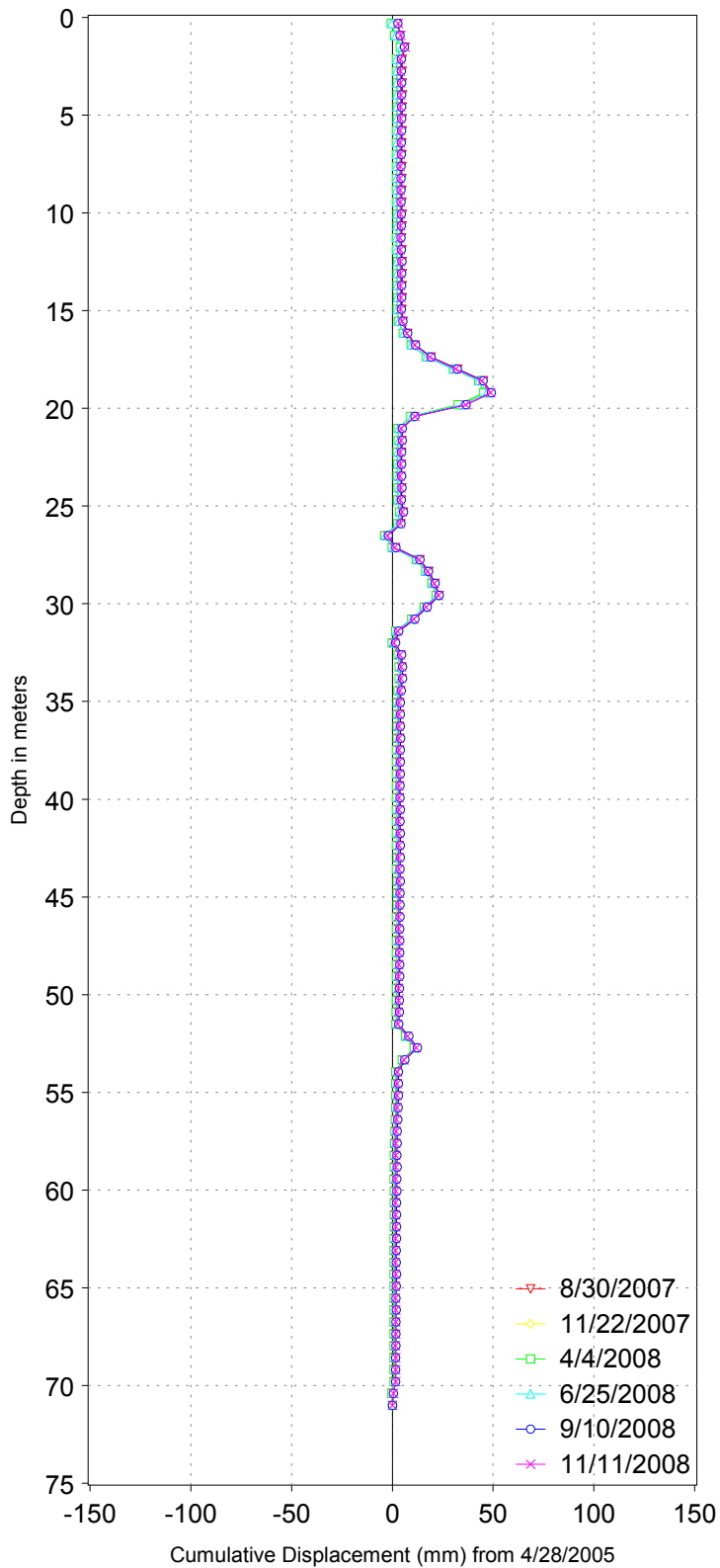
QUES SI-9, A-Axis



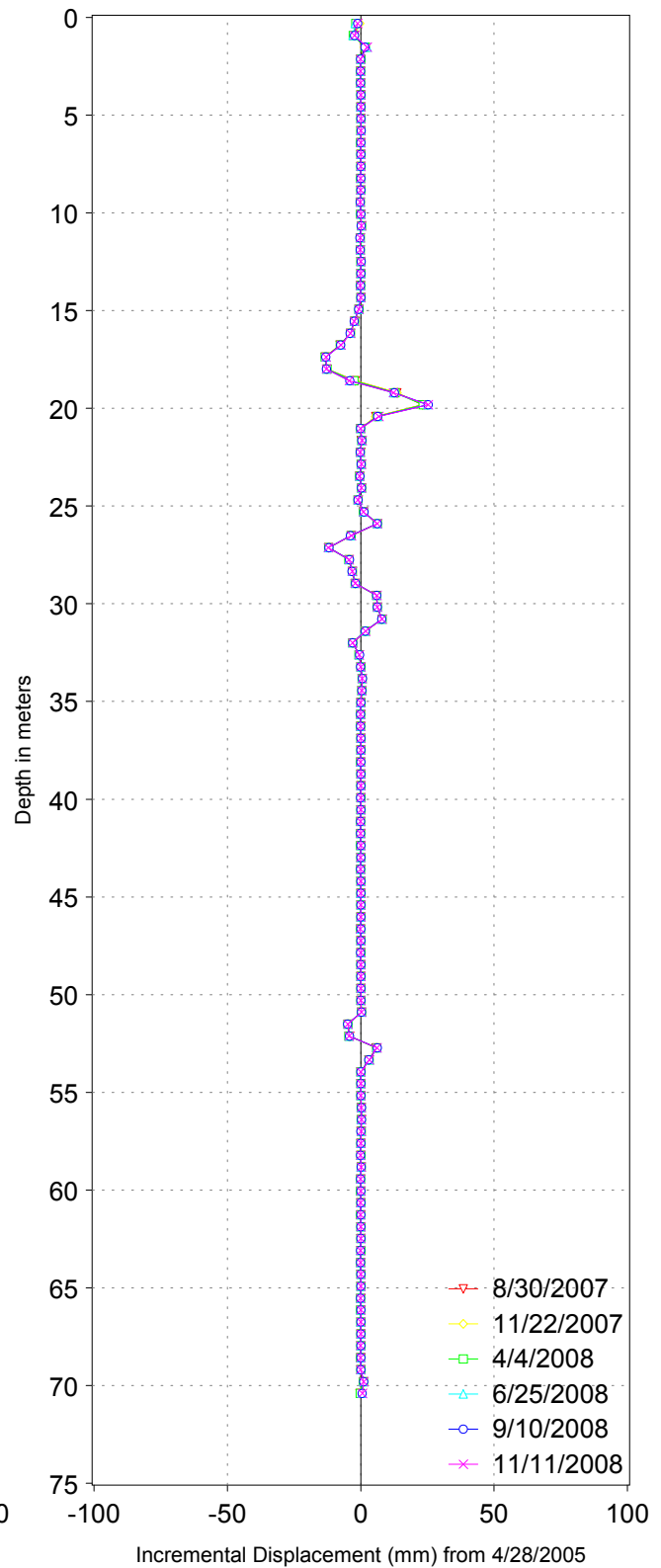
KX04397  
 WEST QUESNEL LAND STABILITY STABILITY  
 CUMULATIVE & INCREMENTAL DISPLACEMENTS  
**SI11**



SI11, A-Axis, Cumulative



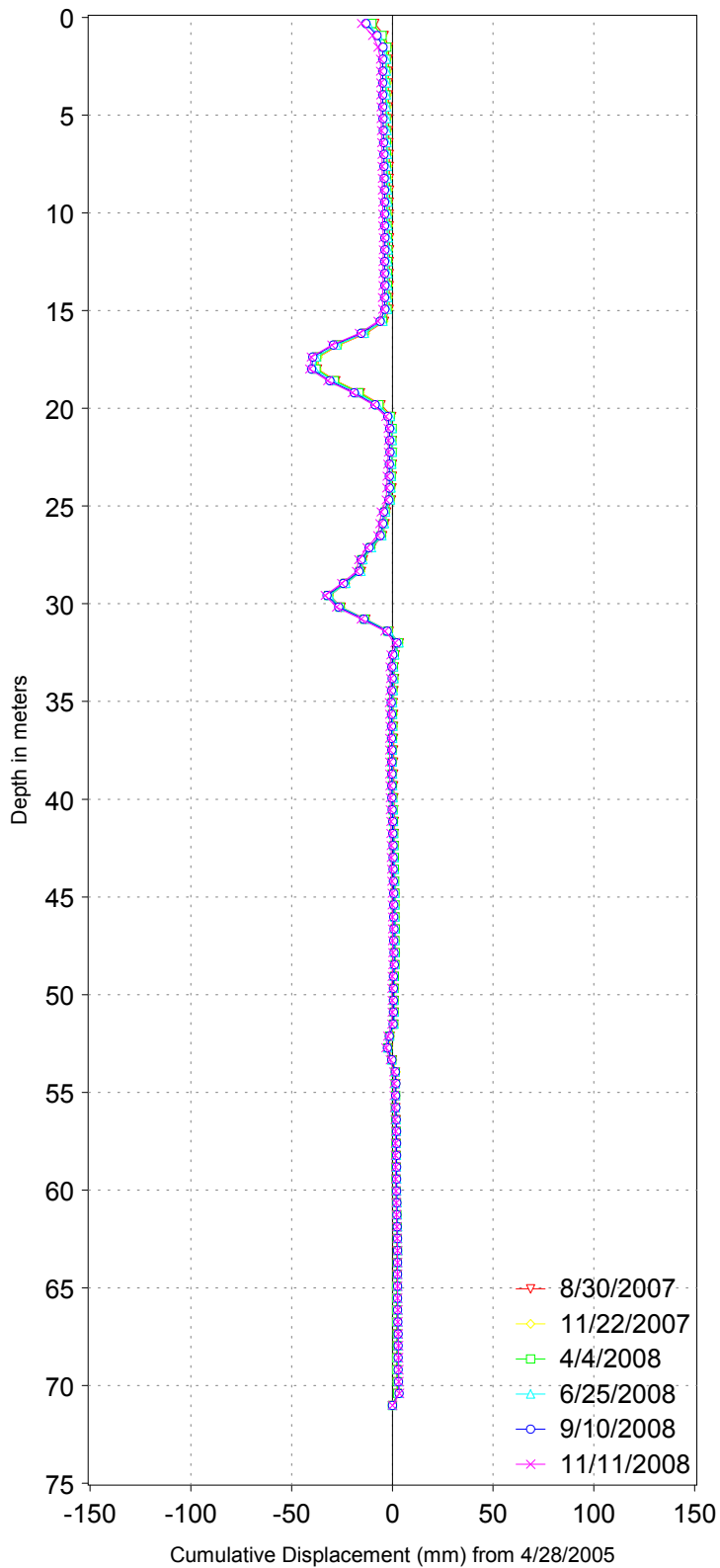
SI11, A-Axis, Incremental



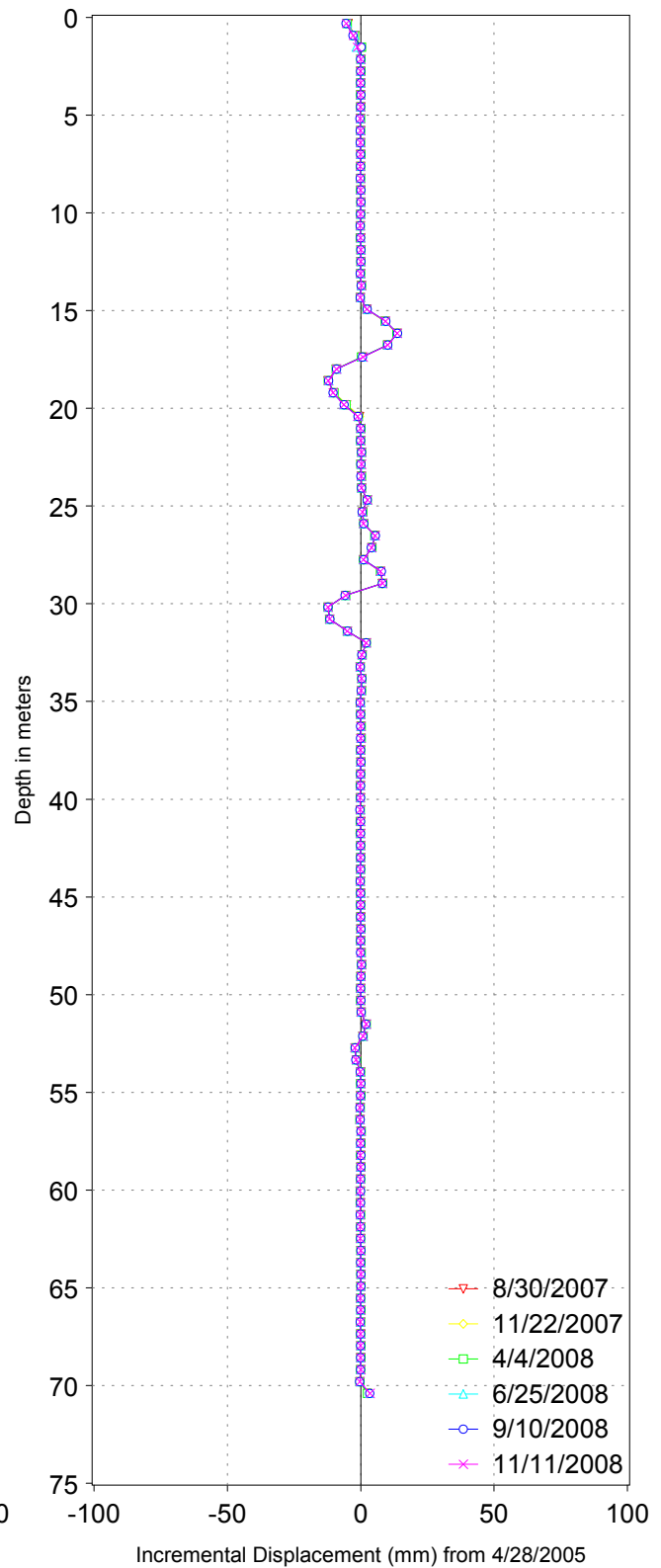
KX04397  
 WEST QUESNEL LAND STABILITY STUDY  
 CUMULATIVE & INCREMENTAL DISPLACEMENTS  
**SI11**



SI11, B-Axis, Cumulative



SI11, B-Axis, Incremental



KX04397

WEST QUESNEL LAND STABILITY STUDY

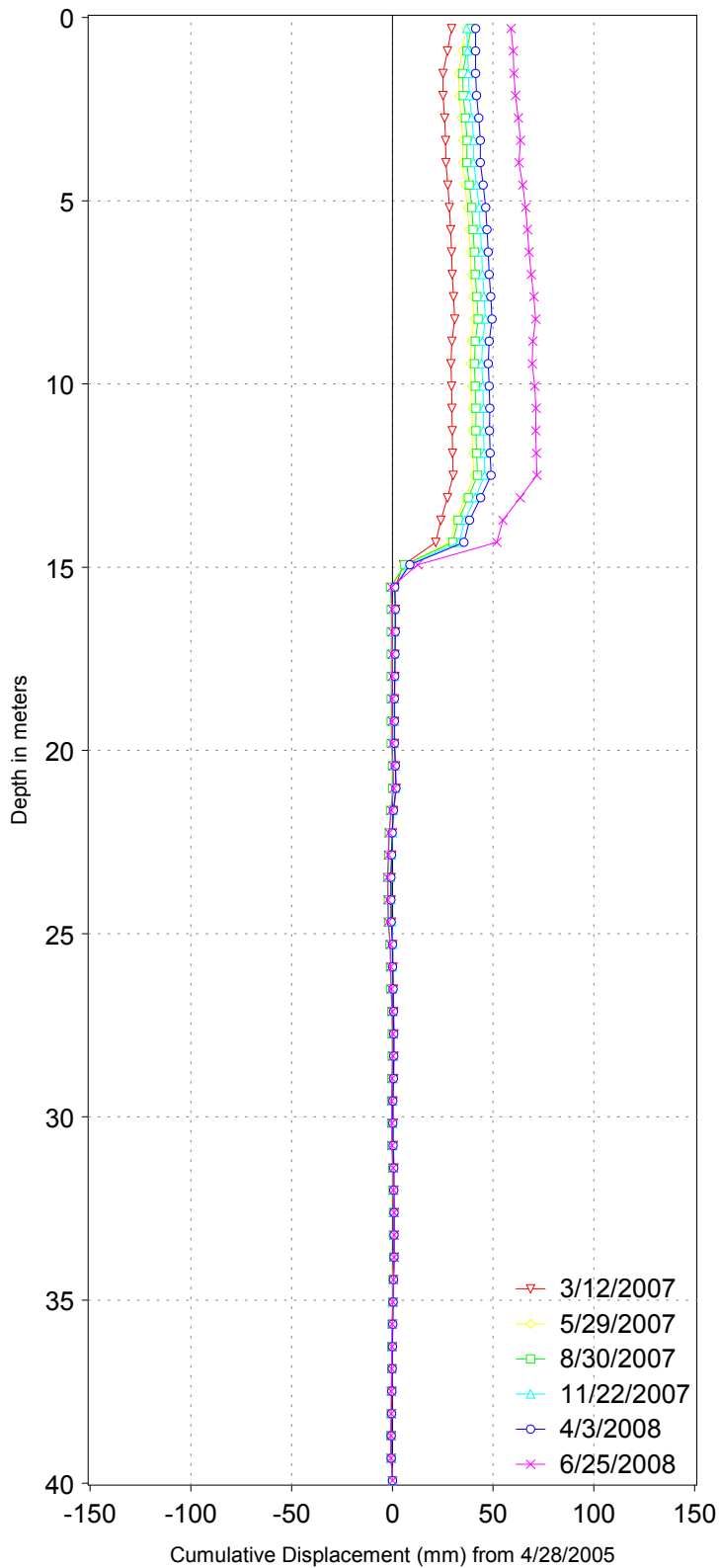
CUMULATIVE & INCREMENTAL DISPLACEMENTS

**SI13**

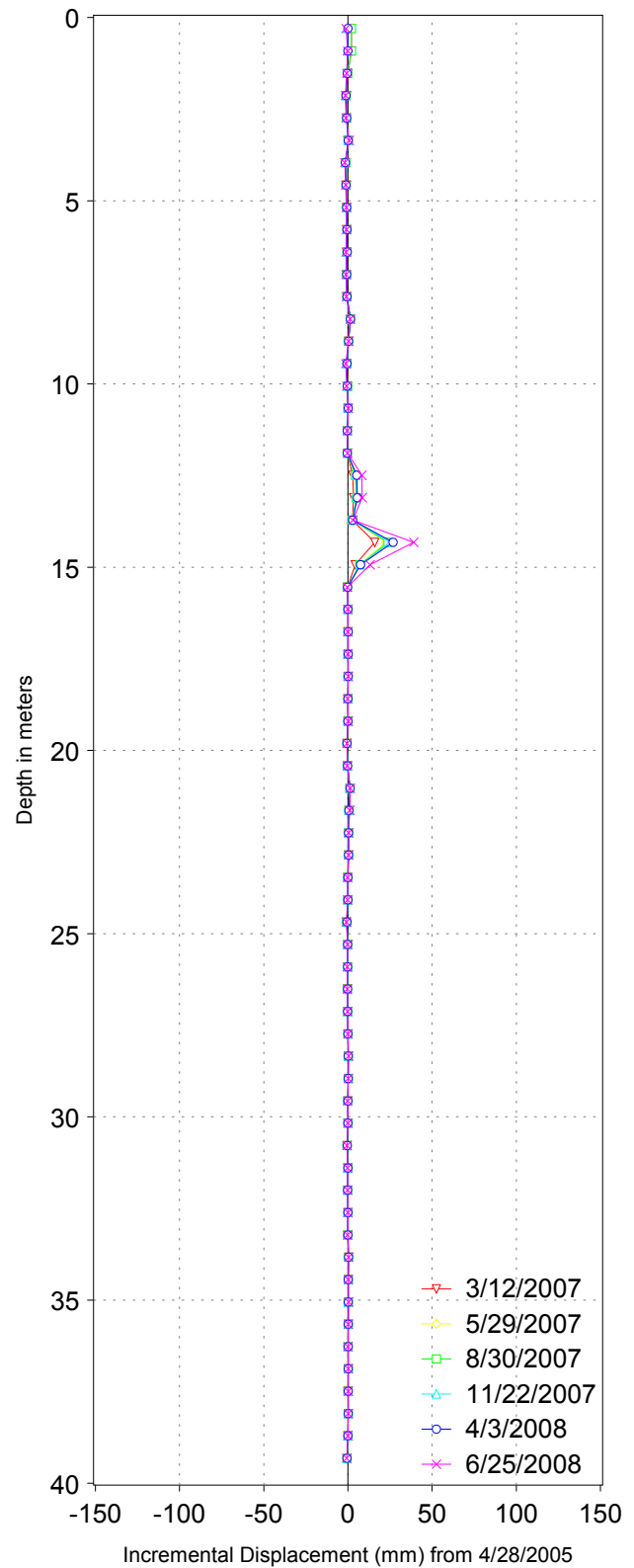
BLOCKED AT 13.4 m BETWEEN JUNE 25 AND SEPTEMBER 10 2008



SI13, A-Axis, Cumulative



SI13, A-Axis, Incremental



KX04397

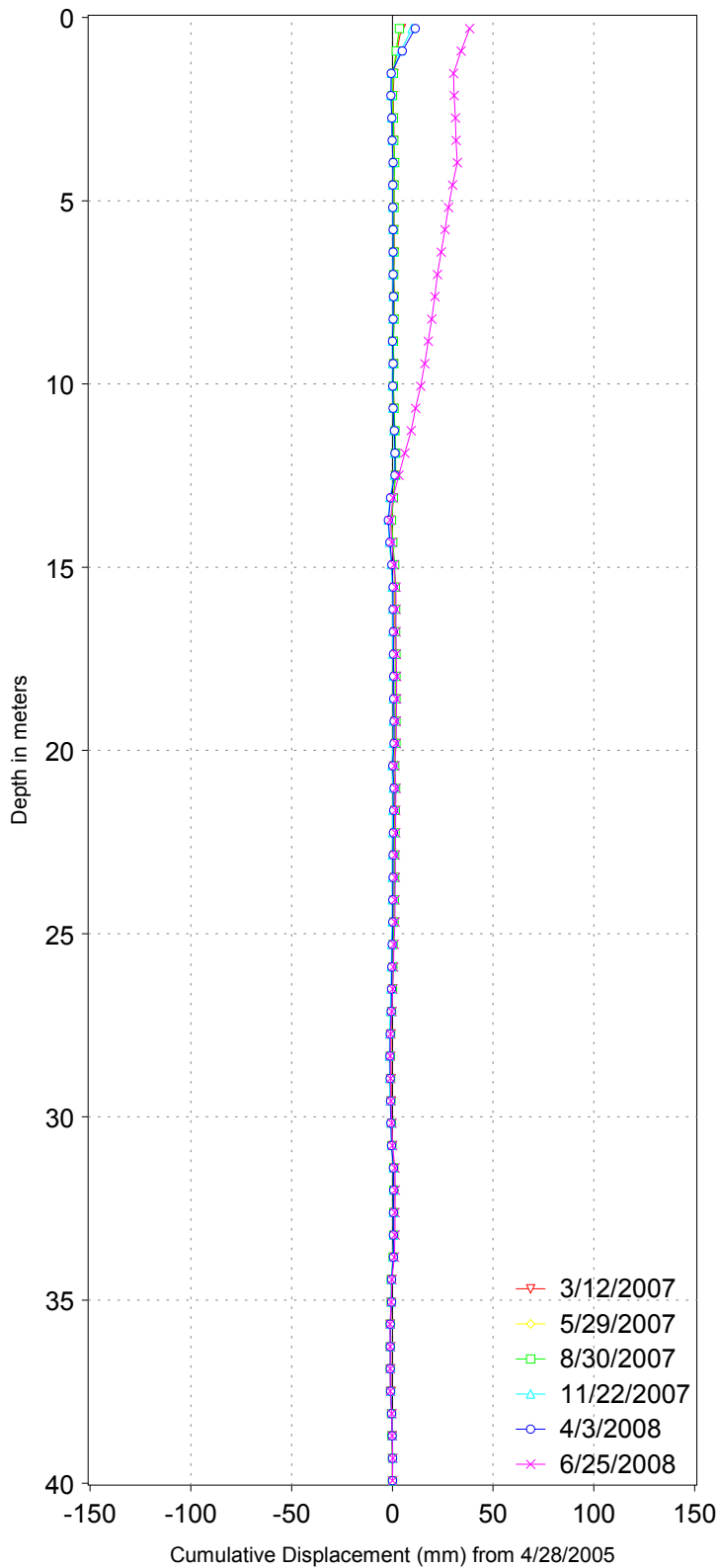
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CUMULATIVE & INCREMENTAL DISPLACEMENTS

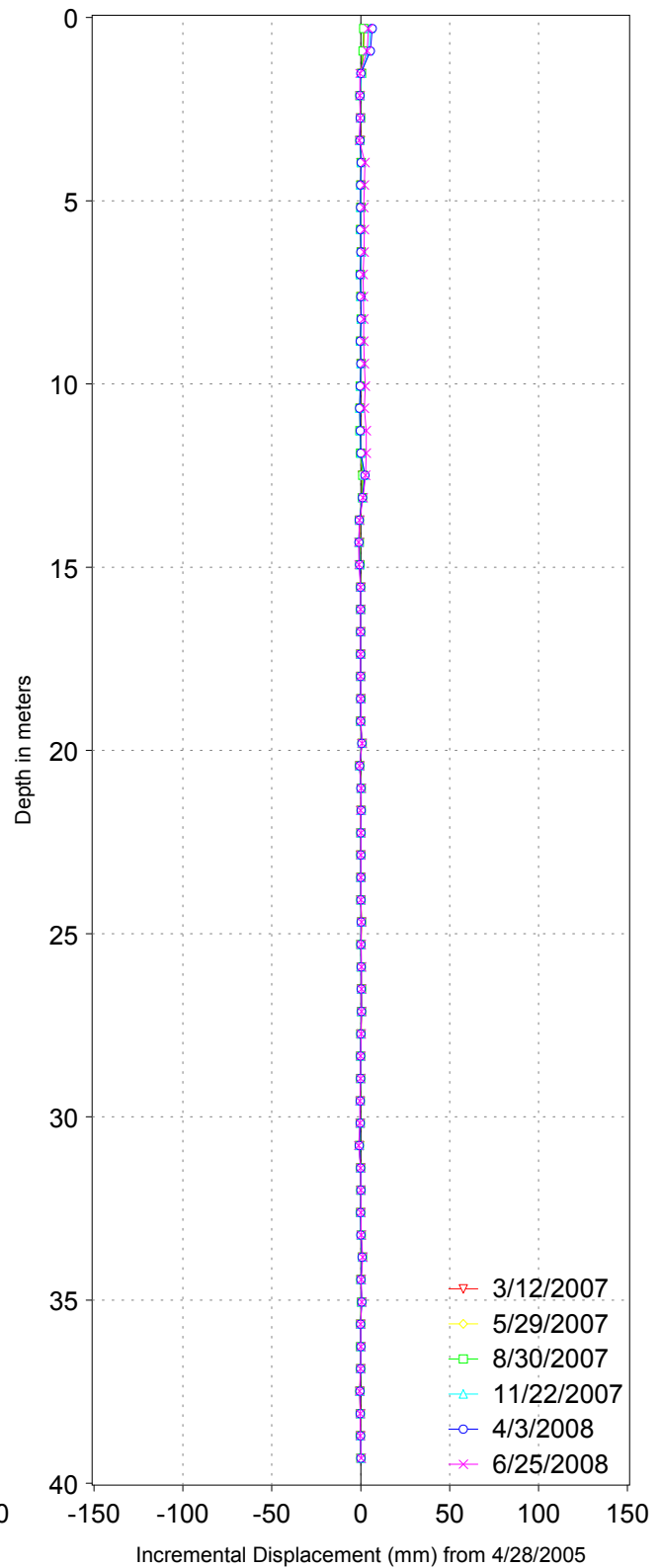
**SI13**

BLOCKED AT 13.4 m BETWEEN JUNE 25 AND SEPTEMBER 10 2008

SI13, B-Axis, Cumulative



SI13, B-Axis, Incremental



KX04397

WEST QUESNEL LAND STABILITY MONITORING

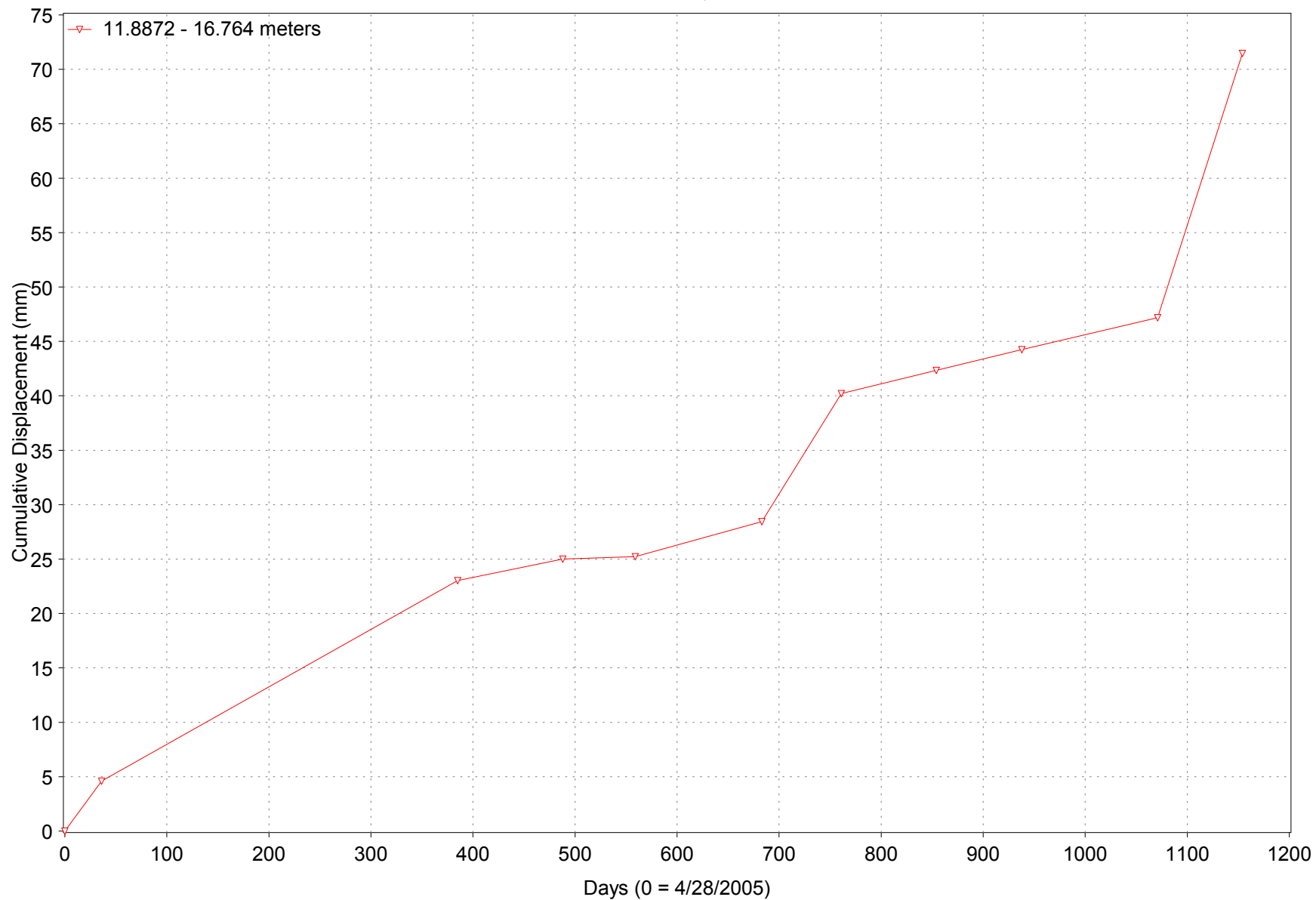
TIME DISPLACEMENT (METRIC)

**SI-13**

BLOCKED AT 13.4 m BETWEEN JUNE 25 AND SEPTEMBER 10 2008



### QUES SI-13, A-Axis



KX04397

WEST QUESNEL STABILITY STUDY

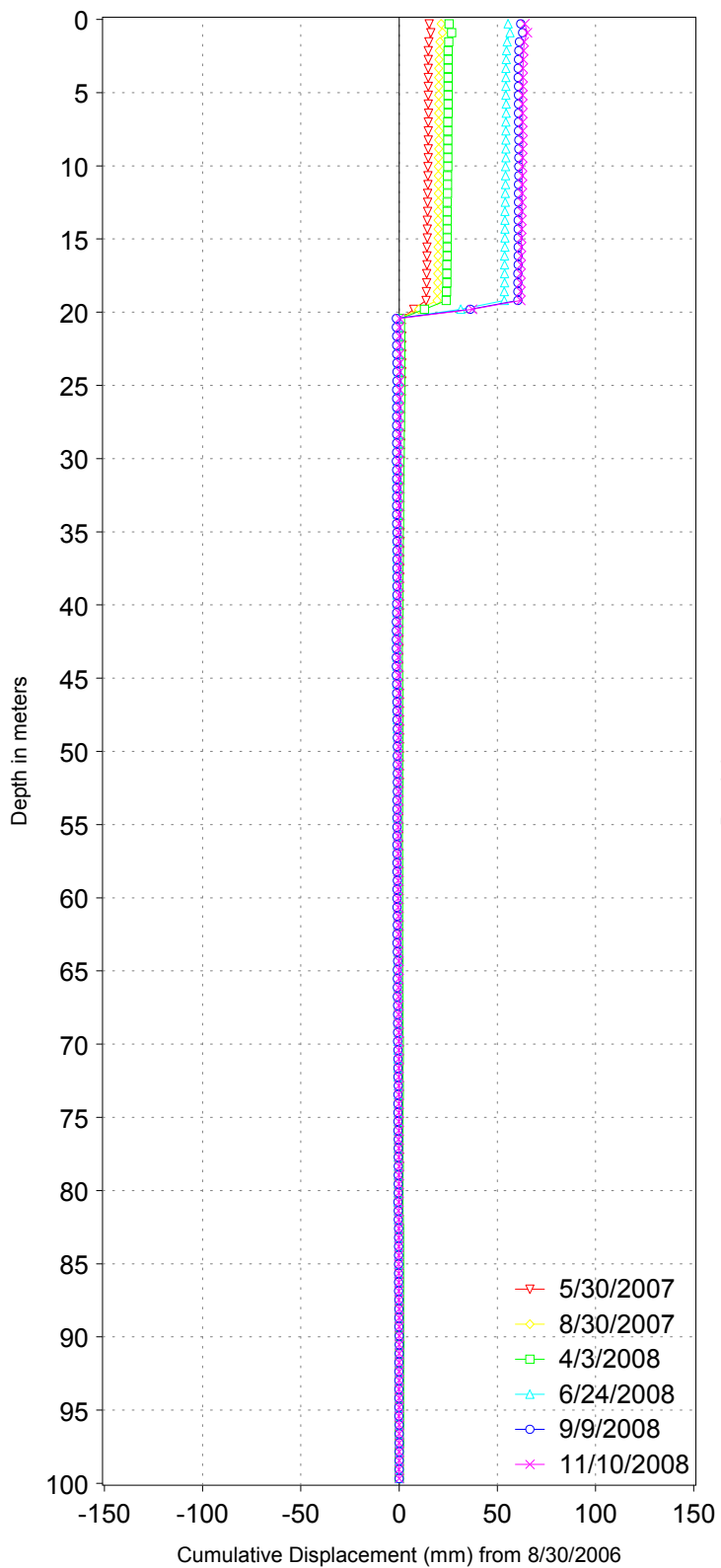
CUMULATIVE & INCREMENTAL DISPLACEMENTS

SI14

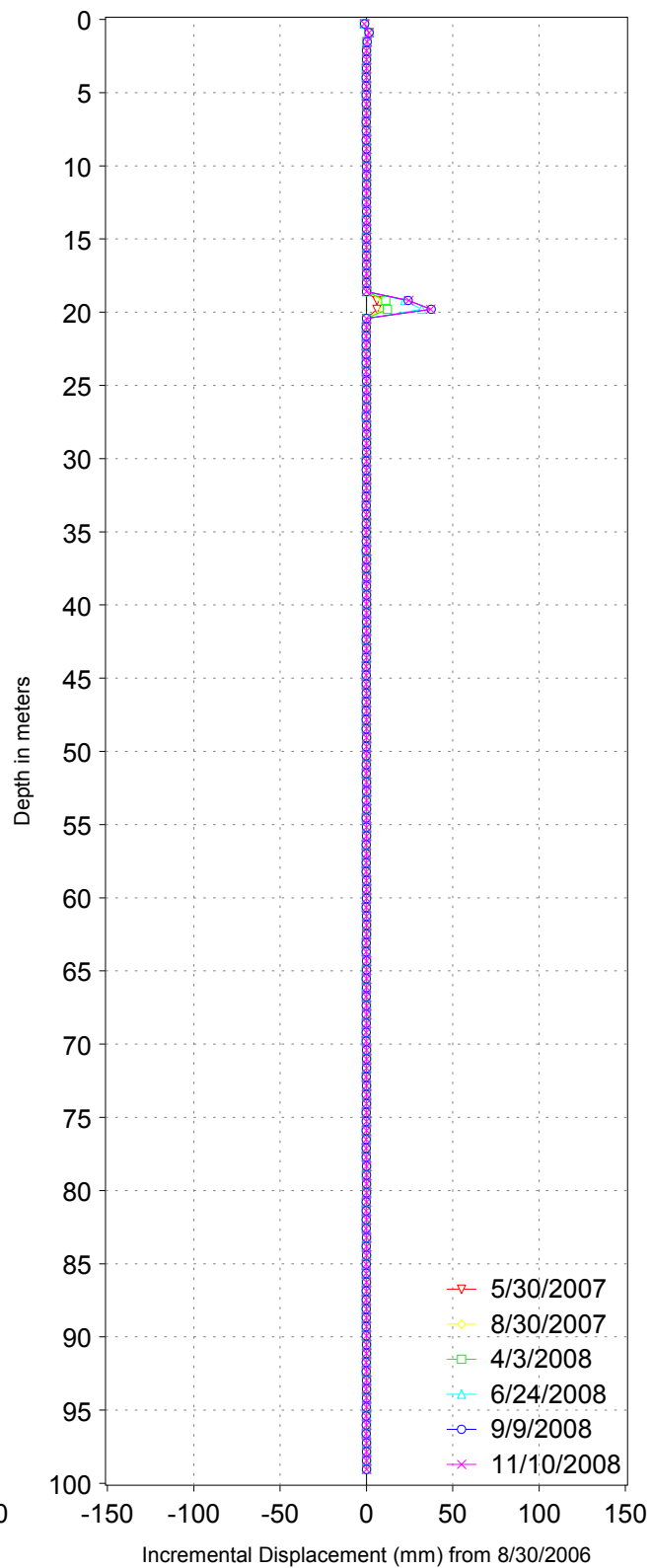
INITIAL READINGS



SI14, A-Axis, Cumulative



SI14, A-Axis, Incremental

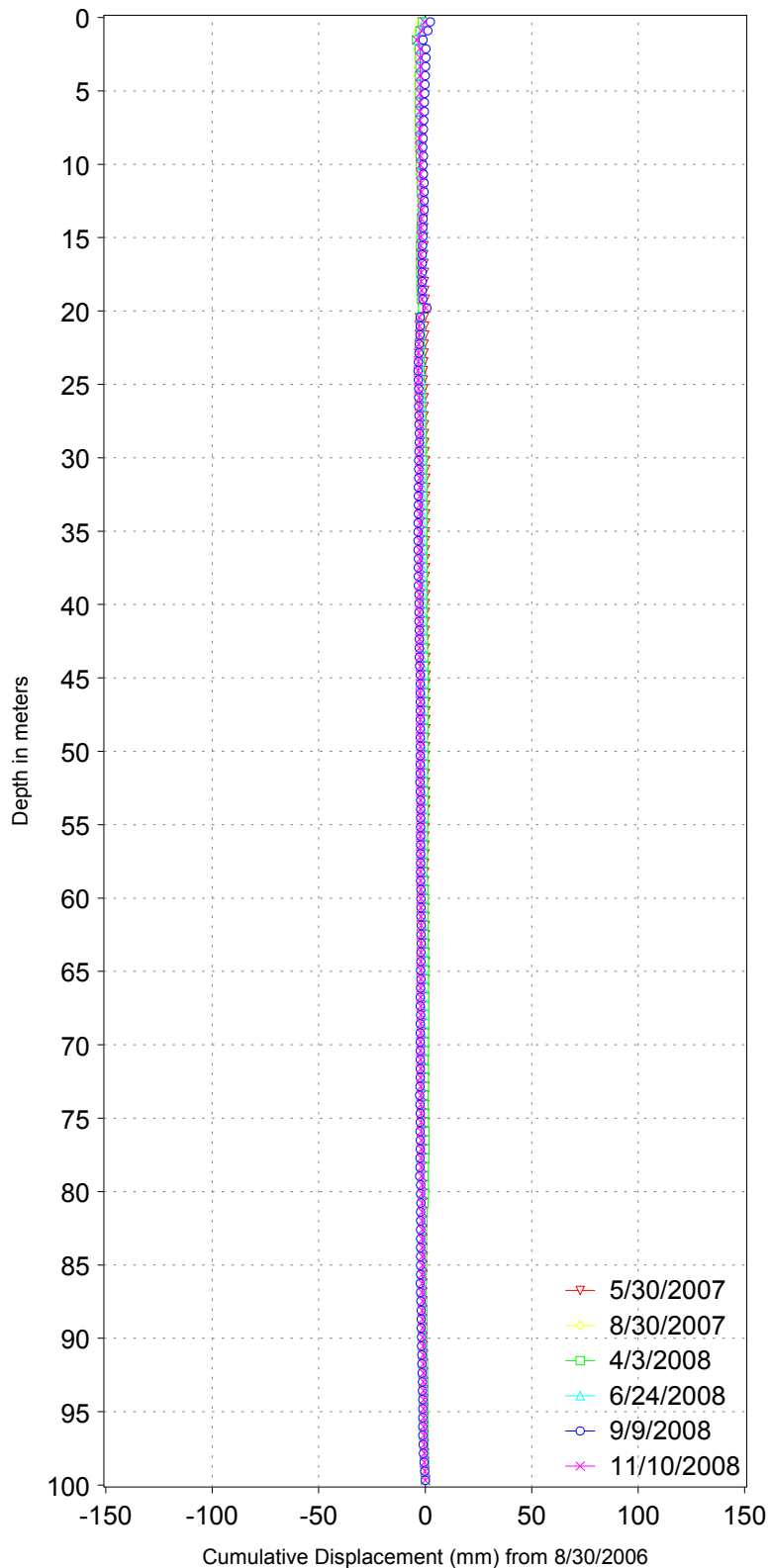


KX04397  
WEST QUESNEL STABILITY STUDY  
CUMULATIVE & INCREMENTAL DISPLACEMENTS  
**SI14**

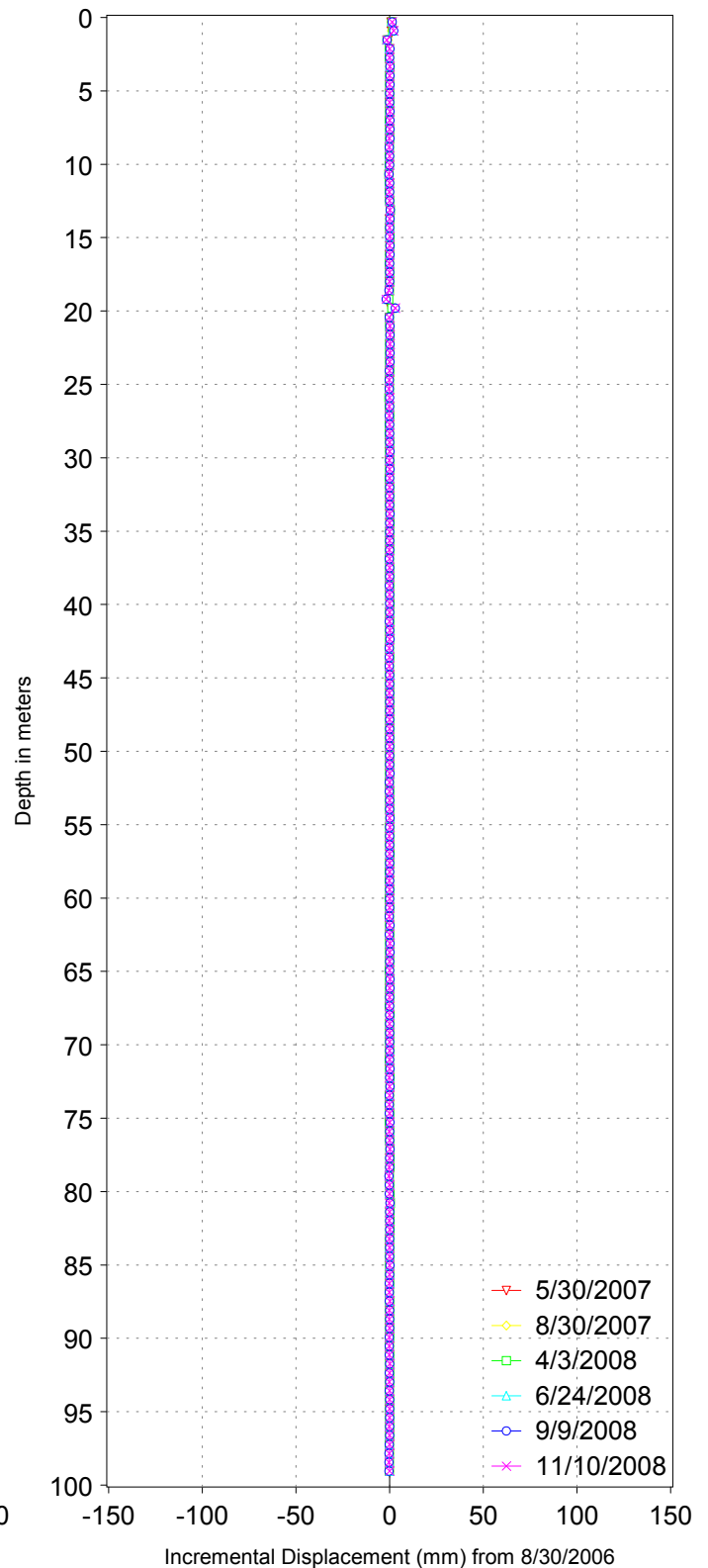


INITIAL READINGS

SI14, B-Axis, Cumulative



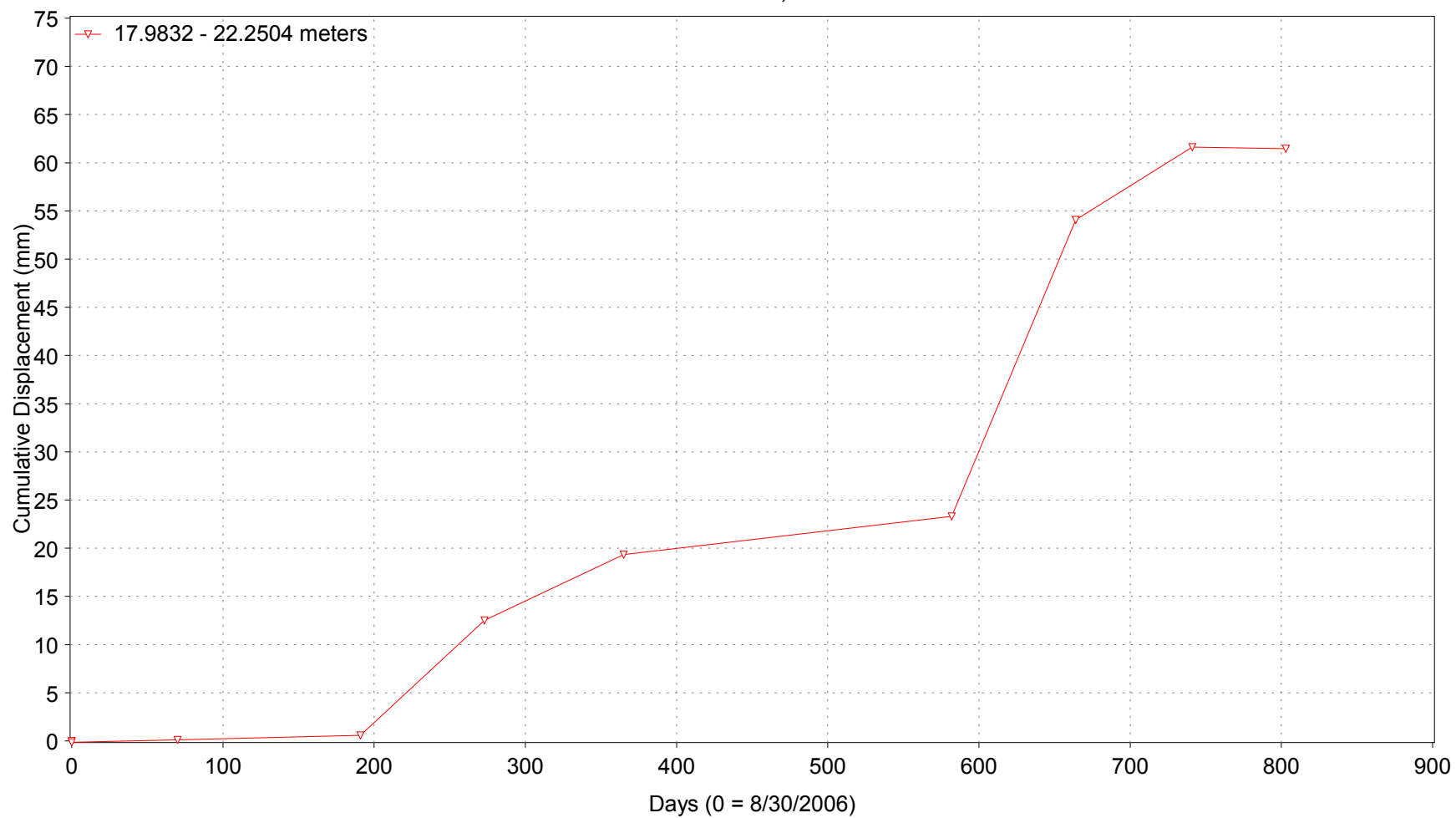
SI14, B-Axis, Incremental



KX04397  
WEST QUESNEL LAND STABILITY MONITORING  
TIME DISPLACEMENT (METRIC)  
**SI-14**



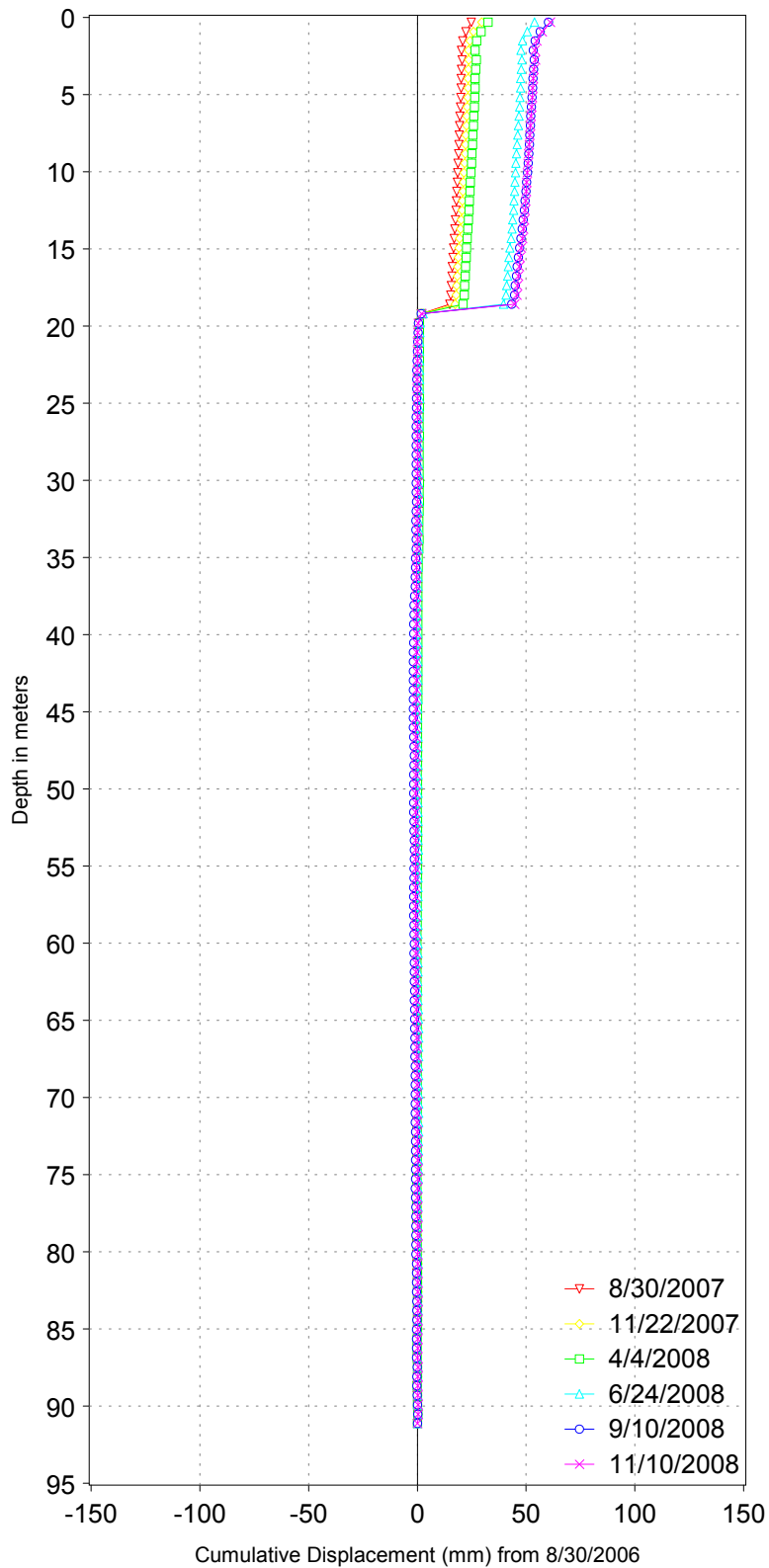
QUES SI-14, A-Axis



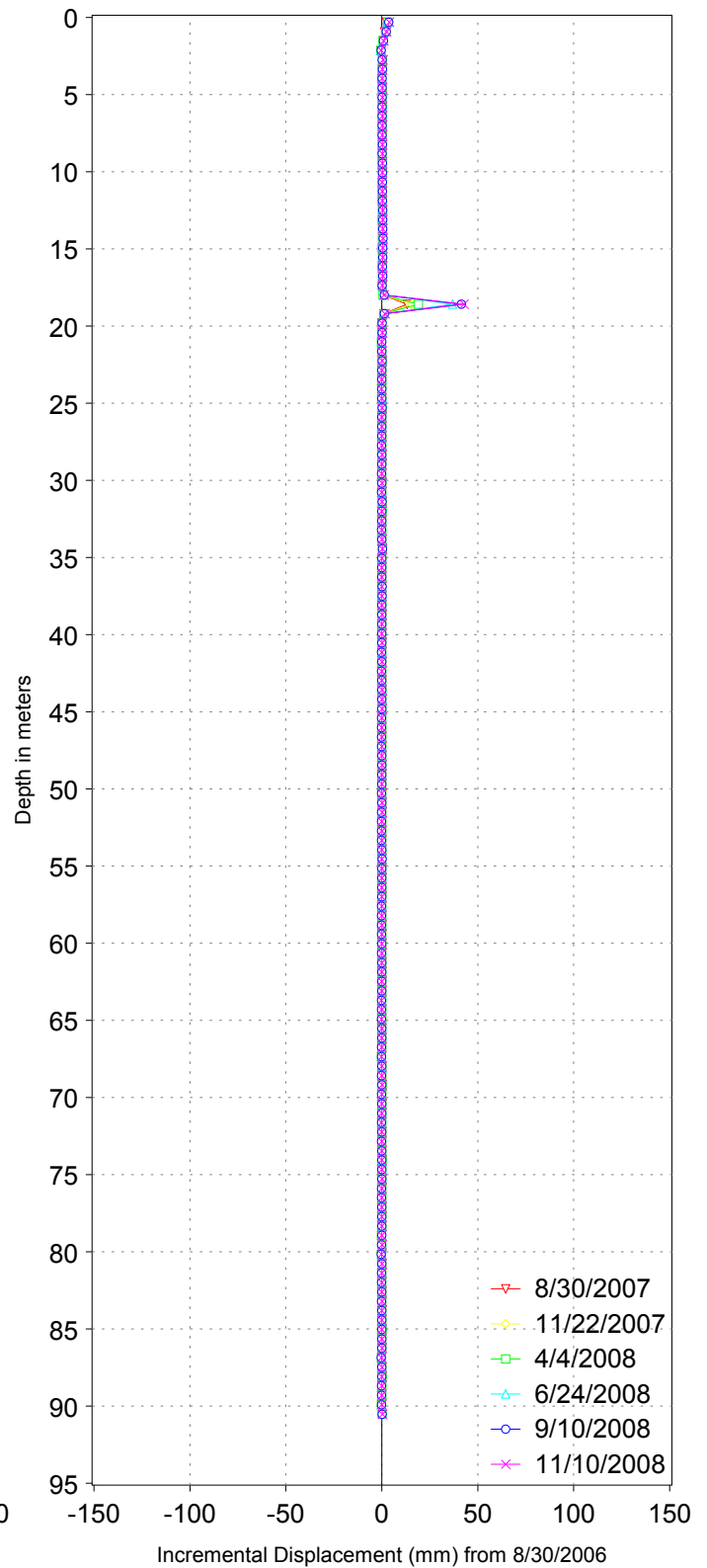
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 WEST QUESNEL LAND STABILITY STUDY  
 CUMULATIVE & INCREMENTAL DISPLACEMENTS  
**SI15**



SI15, A-Axis, Cumulative



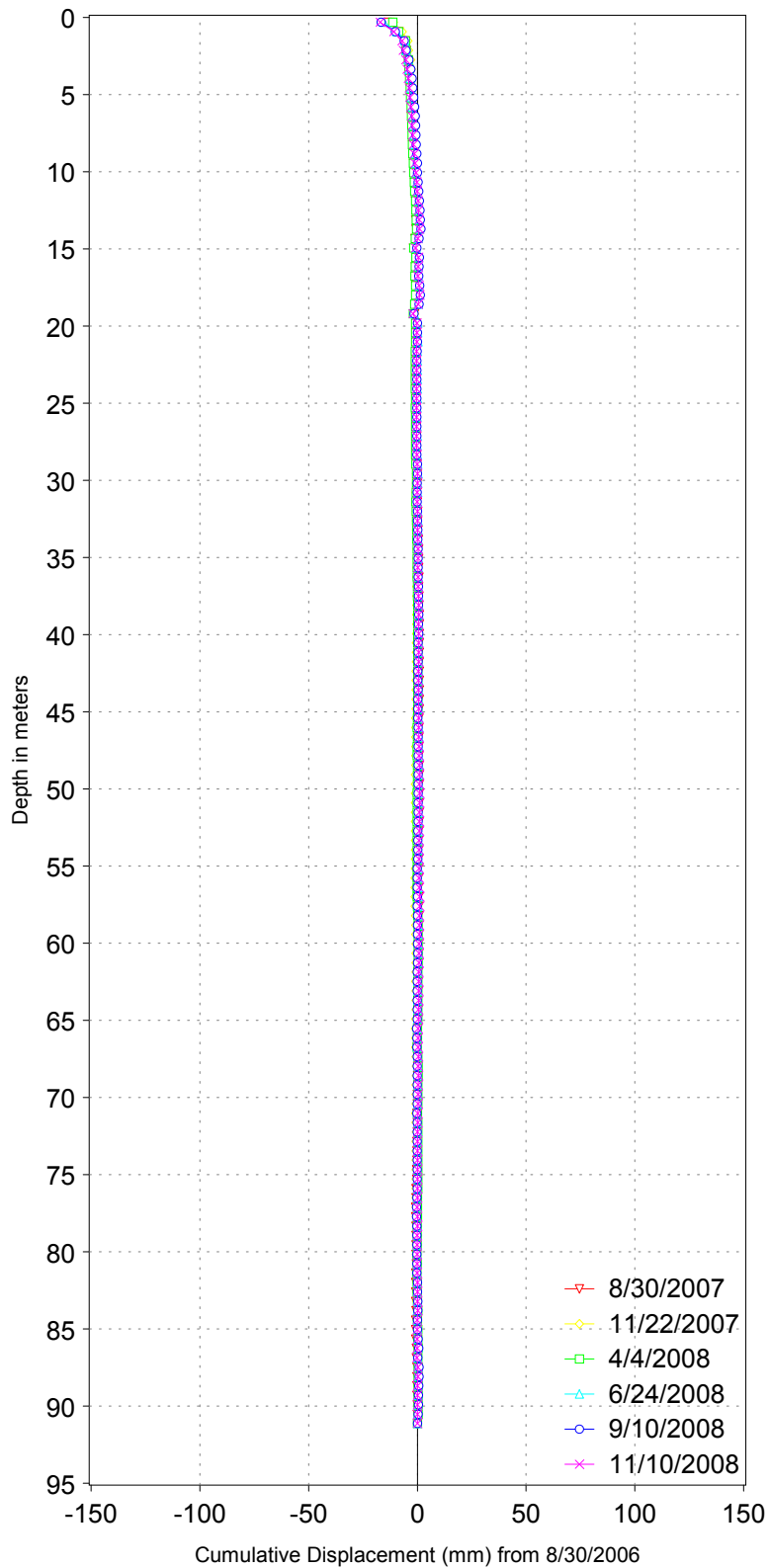
SI15, A-Axis, Incremental



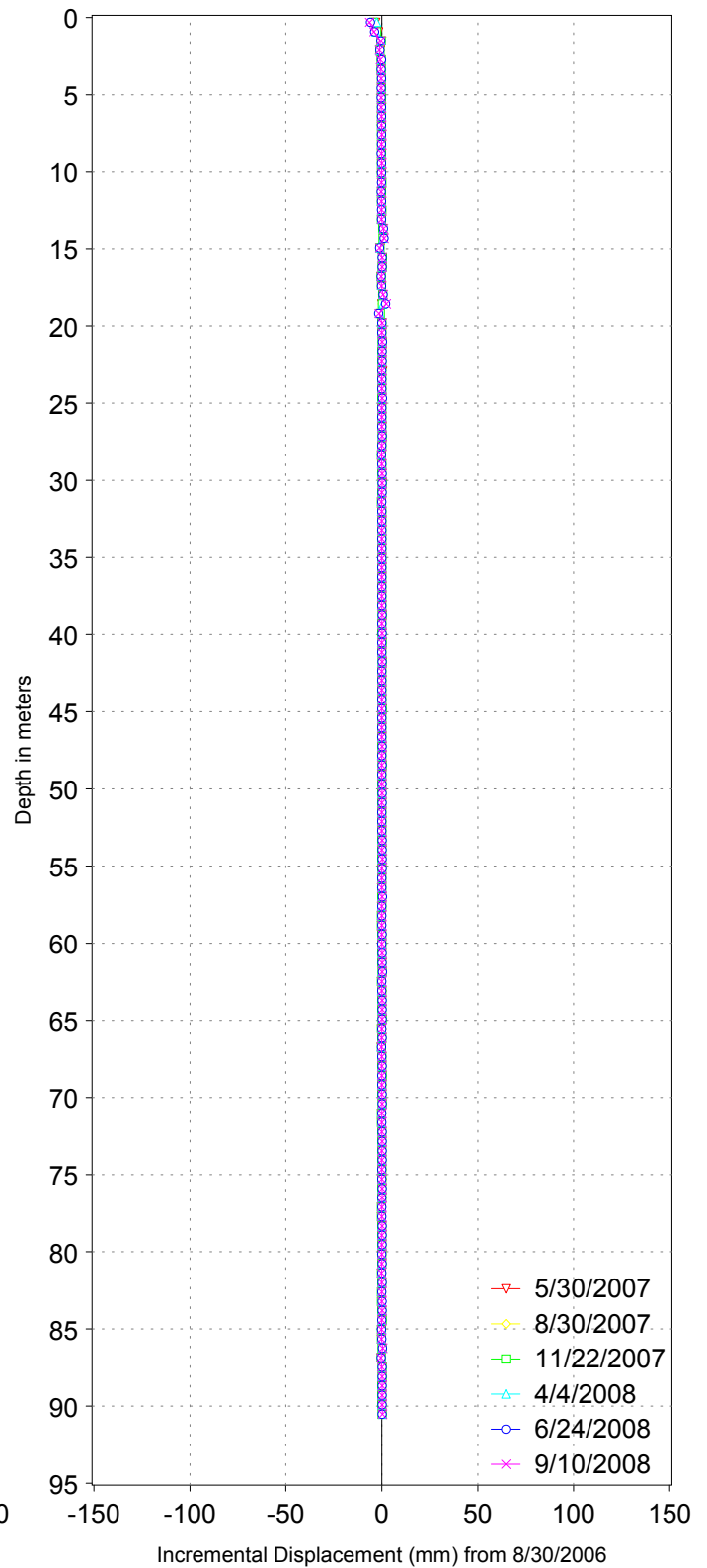
KX04397  
 WEST QUESNEL LAND STABILITY STUDY  
 CUMULATIVE & INCREMENTAL DISPLACEMENTS  
**SI15**



SI15, B-Axis, Cumulative



SI15, B-Axis, Incremental



**Appendix C**  
**Piezometers - Summary Table and Groundwater Elevation Plots**

## APPENDIX C - Piezometer Information

| Standpipe Piezometers |                |                   |                |                        |
|-----------------------|----------------|-------------------|----------------|------------------------|
| Piezometer            | Location       | Installation Date | Depth (screen) | Status                 |
| BH2                   | Avery Lane     | November 2001     | 54.2 to 60.2m  | Active                 |
| BH2a                  | Bettcher St.   | August 2003       | 86.9-88.4m     | Active                 |
| BH2b                  | Bettcher St.   | August 2003       | 47.4-48.2m     | Active                 |
| BH2c                  | Bettcher St.   | August 2003       | 25.3-25.9m     | Active                 |
| BH3a                  | Flamingo St.   | July 2003         | 50.0-50.6m     | Active                 |
| BH4c                  | Flamingo St.   | July 2003         | 22.9-23.5m     | Active                 |
| BH4-a                 | Voyager School | December 2001     | 39.6-39.9m     | Active                 |
| BH6a-1                | Dixon St.      | December 2001     | 44.0-45.2m     | Active - standpipe dry |
| BH6b-1                | Dixon St.      | December 2001     | 26.4-27.8m     | Active                 |

| Standpipe Piezometers with Vibrating Wires |              |                   |             |                             |
|--------------------------------------------|--------------|-------------------|-------------|-----------------------------|
| Piezometer                                 | Location     | Installation Date | Depth (tip) | Status                      |
| BH3b                                       | Flamingo St. | August 2003       | 40.0m       | Connected to PW1 datalogger |
| BH3c                                       | Flamingo St. | August 2003       | 31.0m       | Connected to PW1 datalogger |
| BH4a                                       | Flamingo St. | July 2003         | 40.0m       | Connected to PW1 datalogger |
| BH4b                                       | Flamingo St. | July 2003         | 23.0m       | Connected to PW1 datalogger |

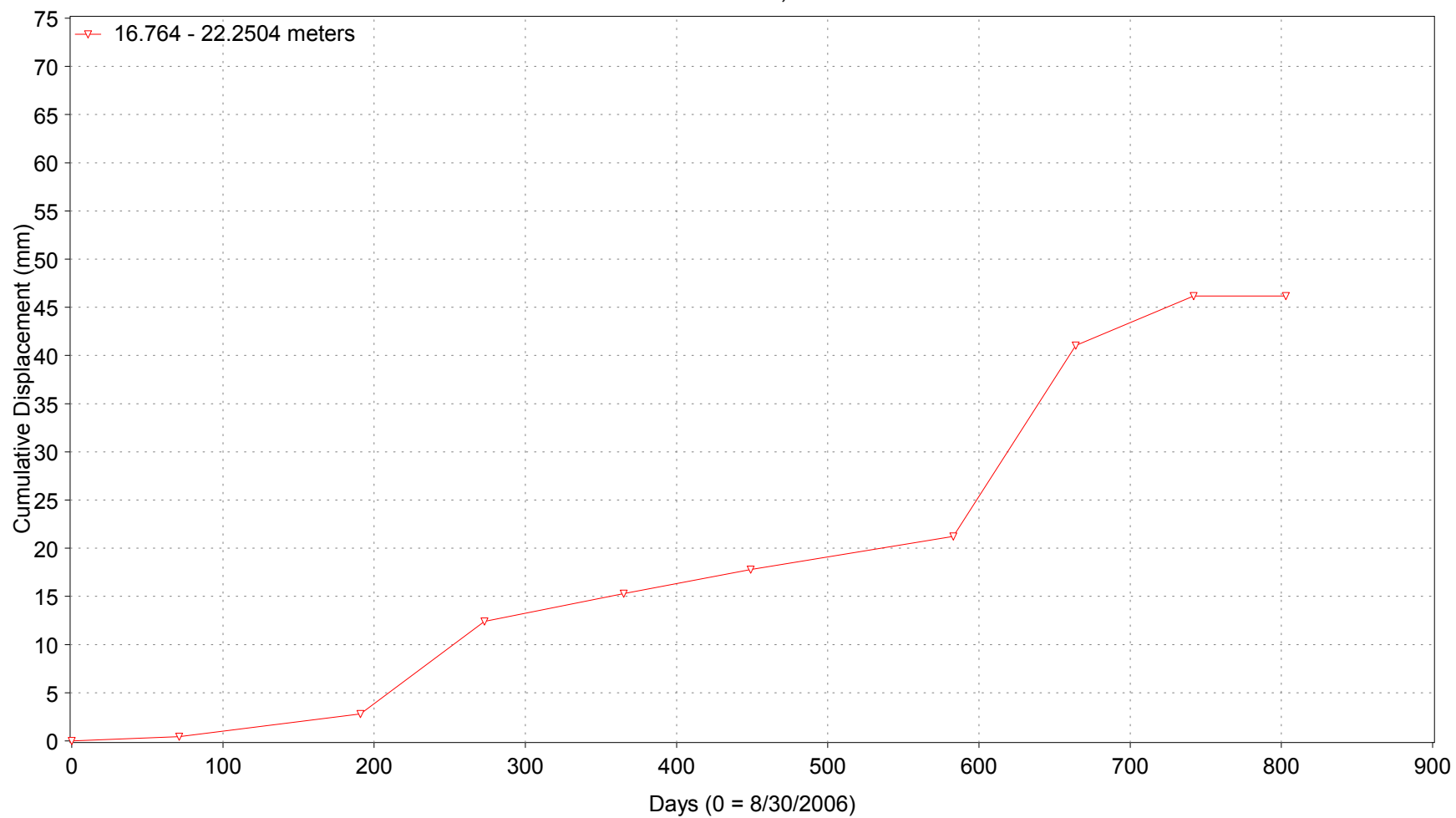
| Vibrating Wire Piezometers |                            |                   |             |                                                              |
|----------------------------|----------------------------|-------------------|-------------|--------------------------------------------------------------|
| Piezometer                 | Location                   | Installation Date | Depth (tip) | Status                                                       |
| BH3                        | Abbott Dr.                 | November 2001     | 37.5m       | Connected to PW2 datalogger                                  |
| BH4-b                      | Voyager School             | December 2001     | 49.0m       | Connected to a minilogger                                    |
| BH7a                       | Pierce Cres.               | July 2005         | 27.0m       | Connected to BH7 datalogger                                  |
| BH7b                       | Pierce Cres.               | July 2005         | 64.9m       | Connected to BH7 datalogger                                  |
| BH8a                       | Pinchbeck St.              | June 2005         | 13.1m       | Connected to BH8 datalogger<br>VW tip above phreatic surface |
| BH8b                       | Pinchbeck St.              | June 2005         | 13.0m       | Connected to BH8 datalogger<br>VW tip above phreatic surface |
| BH8c                       | Pinchbeck St.              | June 2005         | 28.0m       | Connected to BH8 datalogger                                  |
| BH8d                       | Pinchbeck St.              | June 2005         | 56.2m       | Connected to BH8 datalogger                                  |
| BH9a                       | Patchett St.               | June 2005         | 15.1m       | Connected to BH9 datalogger                                  |
| BH9b                       | Patchett St.               | June 2005         | 30.6m       | Connected to BH9 datalogger                                  |
| BH9c                       | Patchett St.               | June 2005         | 50.1m       | Connected to BH9 datalogger                                  |
| BH10a                      | Dawson St.                 | July 2005         | 11.6m       | Connected to BH10 datalogger                                 |
| BH10b                      | Dawson St.                 | July 2005         | 20.4m       | Connected to BH10 datalogger                                 |
| BH10c                      | Dawson St.                 | July 2005         | 48.6m       | Connected to BH10 datalogger                                 |
| BH11a                      | Picard Ave.                | June 2005         | 14.3m       | Connected to BH11 datalogger                                 |
| BH11b                      | Picard Ave.                | June 2005         | 32.0m       | Connected to BH11 datalogger                                 |
| BH11c                      | Picard Ave.                | June 2005         | 50.3m       | Connected to BH11 datalogger                                 |
| BH12a                      | Panagrot Ave. (east end)   | June 2005         | 18.0m       | Connected to PW4 datalogger                                  |
| BH12b                      | Panagrot Ave. (east end)   | June 2005         | 22.9m       | Connected to PW4 datalogger                                  |
| BH12c                      | Panagrot Ave. (east end)   | June 2005         | 26.5m       | Connected to PW4 datalogger                                  |
| BH12d                      | Panagrot Ave. (east end)   | June 2005         | 54.9m       | Connected to PW4 datalogger                                  |
| BH13a                      | Lewis Dr. (at Sikh Temple) | July 2005         | 51.m        | Connected to BH13 datalogger                                 |
| BH13b                      | Lewis Dr. (at Sikh Temple) | July 2005         | 14.4m       | Connected to BH13 datalogger                                 |
| BH14a                      | Findlay Rd.                | June 2006         | 20.1m       | Connected to BH14 datalogger                                 |
| BH14b                      | Findlay Rd.                | June 2006         | 65.9m       | Connected to BH14 datalogger                                 |
| BH14c                      | Findlay Rd.                | June 2006         | 98.7m       | Connected to BH14 datalogger                                 |
| BH15a                      | Panagrot Ave. (west end)   | July 2006         | 8.8m        | Connected to BH15 datalogger                                 |

|       |                          |              |        |                              |
|-------|--------------------------|--------------|--------|------------------------------|
| BH15b | Panagrot Ave. (west end) | July 2006    | 63.3m  | Connected to BH15 datalogger |
| BH15c | Panagrot Ave. (west end) | July 2006    | 83.2m  | Connected to BH15 datalogger |
| BH16a | Diatomite Mine           | October 2006 | 42.7m  | Connected to BH16 datalogger |
| BH16b | Diatomite Mine           | October 2006 | 85.5m  | Connected to BH16 datalogger |
| BH16c | Diatomite Mine           | October 2006 | 139.1m | Connected to BH16 datalogger |
| BH16d | Diatomite Mine           | October 2006 | 214.9m | Connected to BH16 datalogger |
| BH17a | Adams St.                | July 2007    | 37.7m  | Connected to PW5 datalogger  |
| BH17b | Adams St.                | July 2007    | 57.4m  | Connected to PW5 datalogger  |
| BH18a | Adams St.                | July 2007    | 38.2m  | Connected to PW5 datalogger  |
| BH18b | Adams St.                | July 2007    | 60.1m  | Connected to PW5 datalogger  |
| BH19a | Panagrot Ave. (east end) | July 2007    | 16.5m  | Connected to PW4 datalogger  |
| BH19b | Panagrot Ave. (east end) | July 2007    | 22.3m  | Connected to PW4 datalogger  |
| BH20  | Panagrot Ave. (east end) | July 2007    | 21.4m  | Connected to PW4 datalogger  |
| BH21a | Crane St.                | July 2007    | 12.6m  | Connected to HD4 datalogger  |
| BH21b | Crane St.                | July 2007    | 21.3m  | Connected to HD4 datalogger  |
| BH22  | Crane St.                | July 2007    | 18.3m  | Connected to HD4 datalogger  |
| BH23a | Baity Ave.               | July 2007    | 22.4m  | Connected to HD1 datalogger  |
| BH23b | Baity Ave.               | July 2007    | 33.1m  | Connected to HD1 datalogger  |
| BH24  | Baity Ave.               | July 2007    | 22.9m  | Connected to HD1 datalogger  |
| BH25a | Baity Ave.               | July 2007    | 16.8m  | Connected to HD1 datalogger  |
| BH25b | Baity Ave.               | July 2007    | 30.2m  | Connected to HD1 datalogger  |

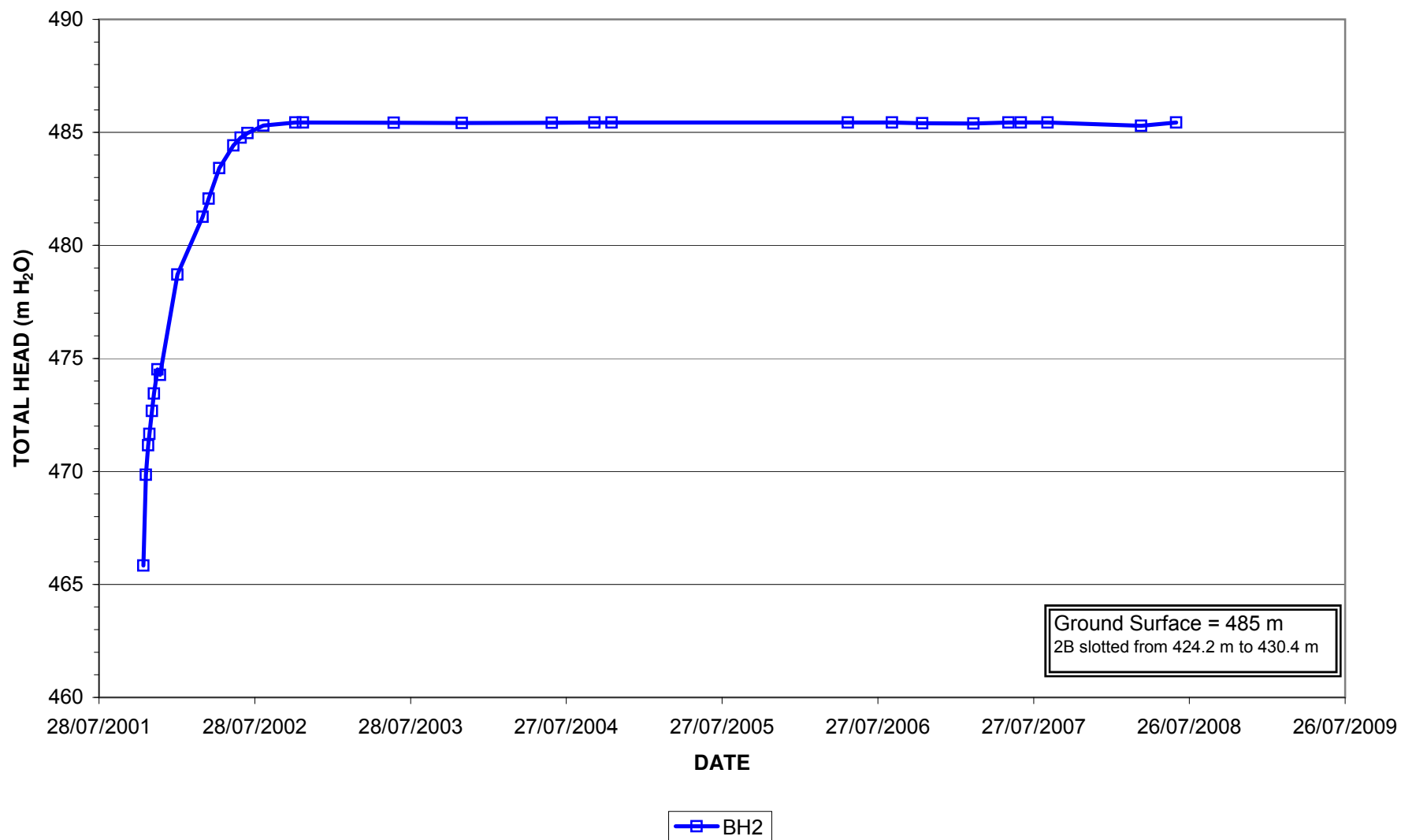
KX04397  
WEST QUESNEL LAND STABILITY MONITORING  
TIME DISPLACEMENT (METRIC)  
**SI-15**



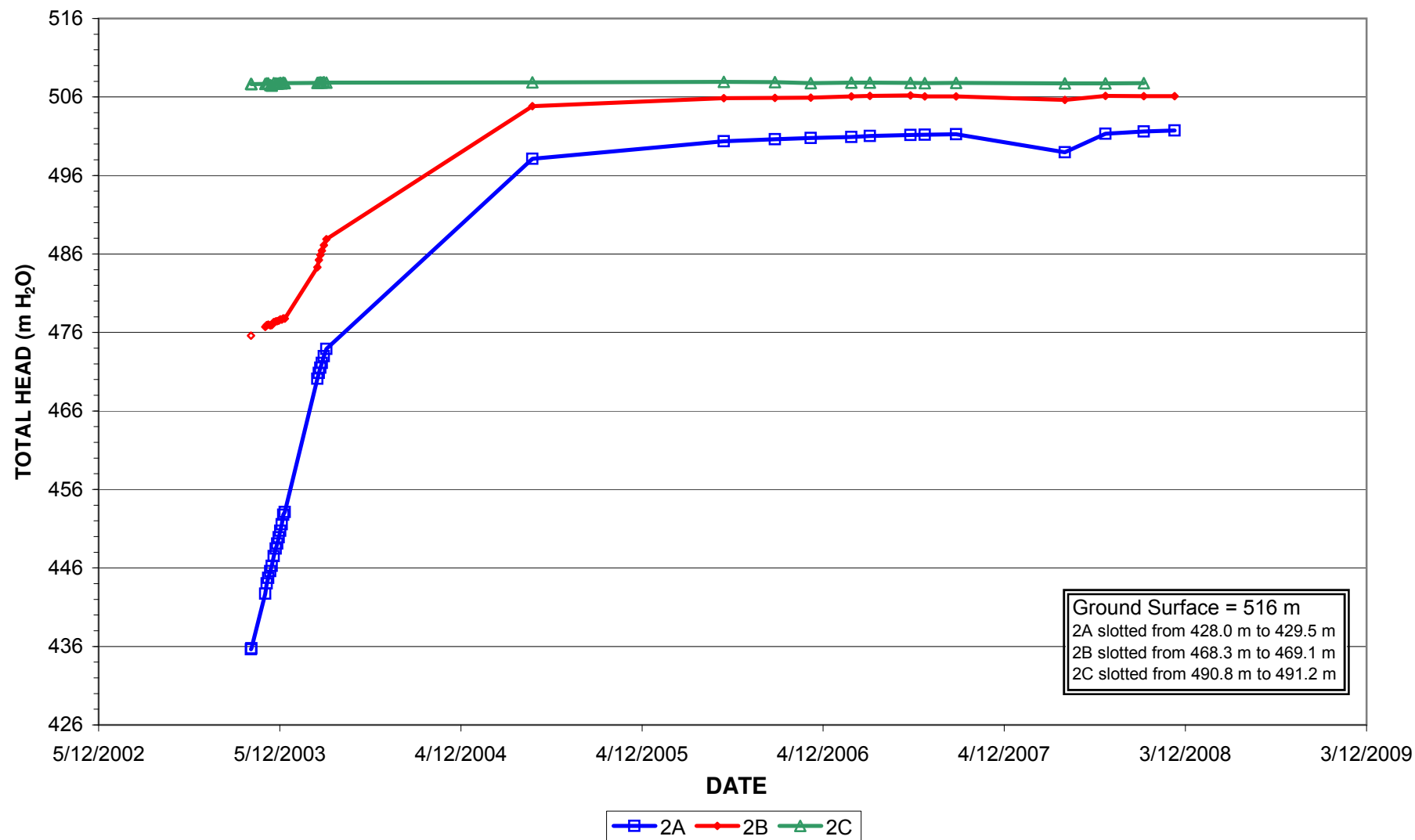
QUES SI-15, A-Axis



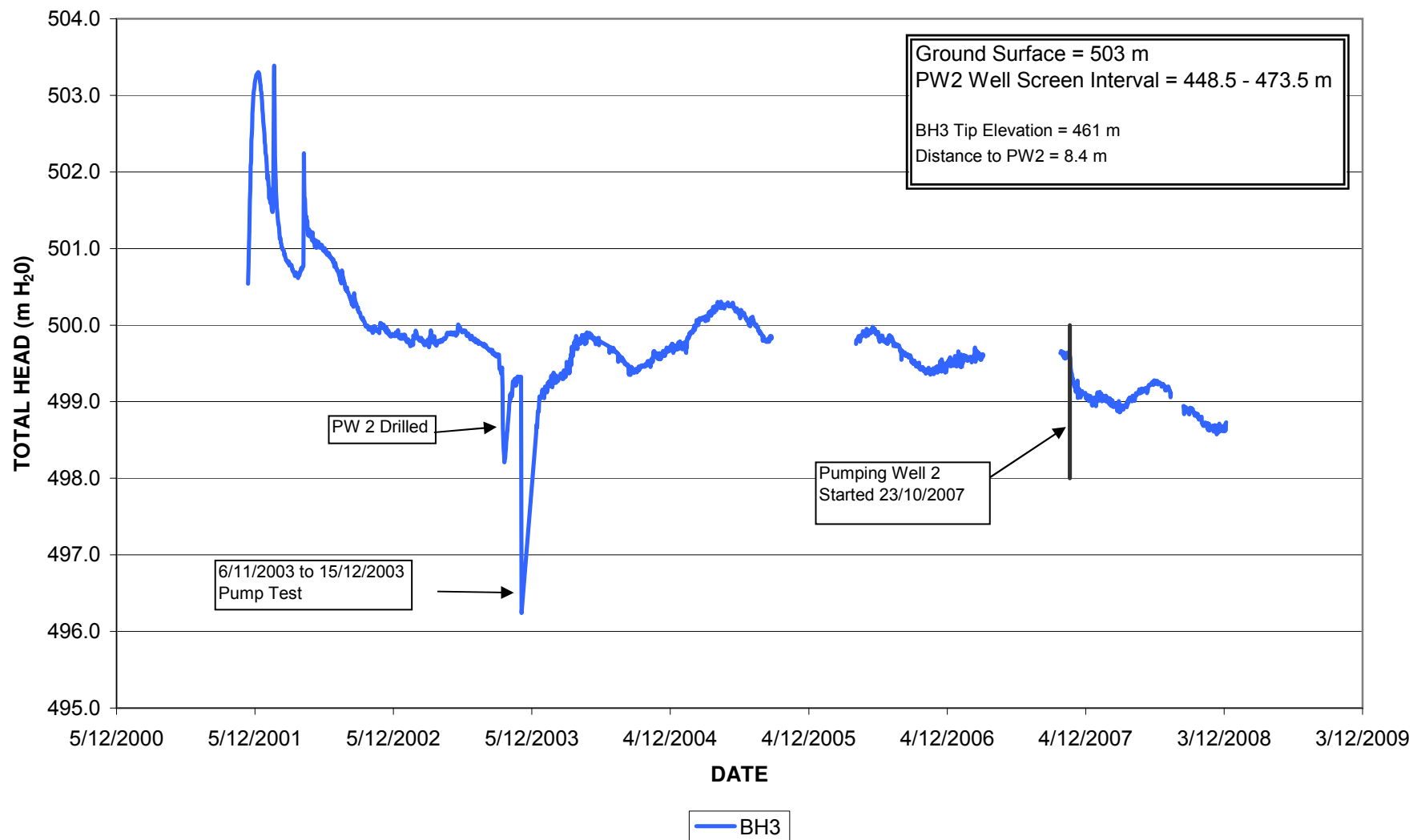
# Groundwater Monitoring TOTAL HEAD - BH2 STANDPIPE



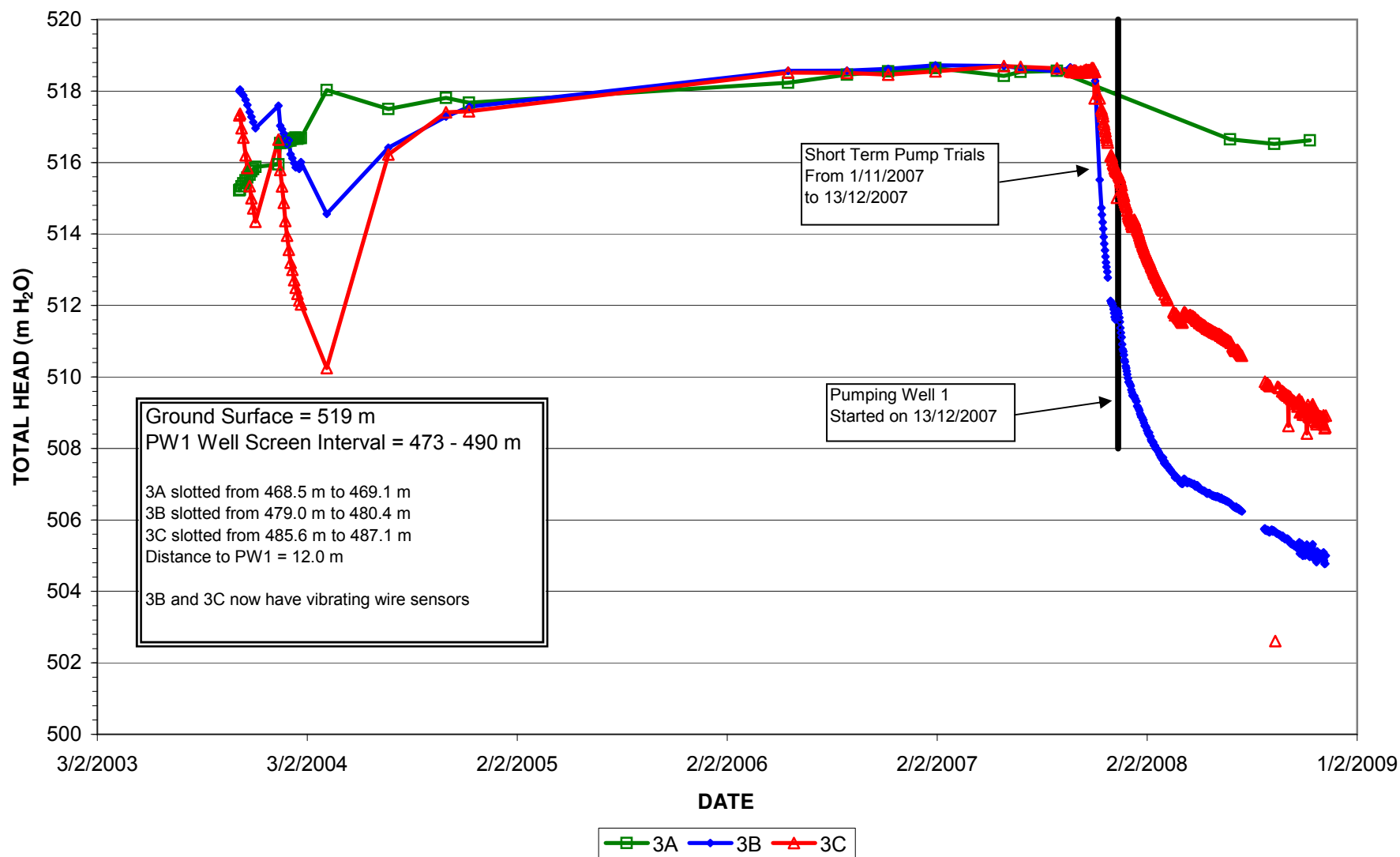
# Groundwater Monitoring TOTAL HEAD - BH2A, B, C STANDPIPES



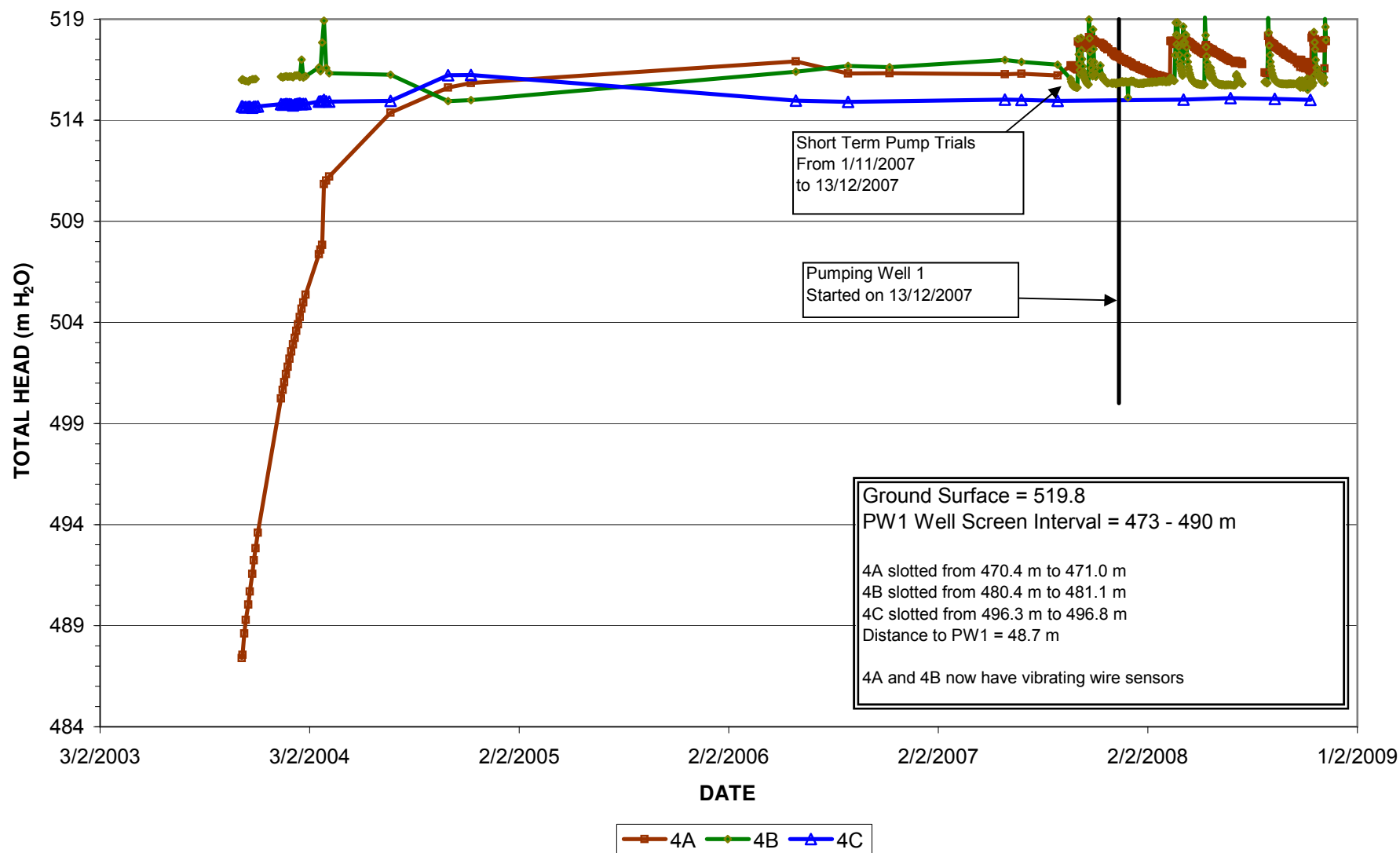
### Groundwater Monitoring TOTAL HEAD - BH3 (near PW2)



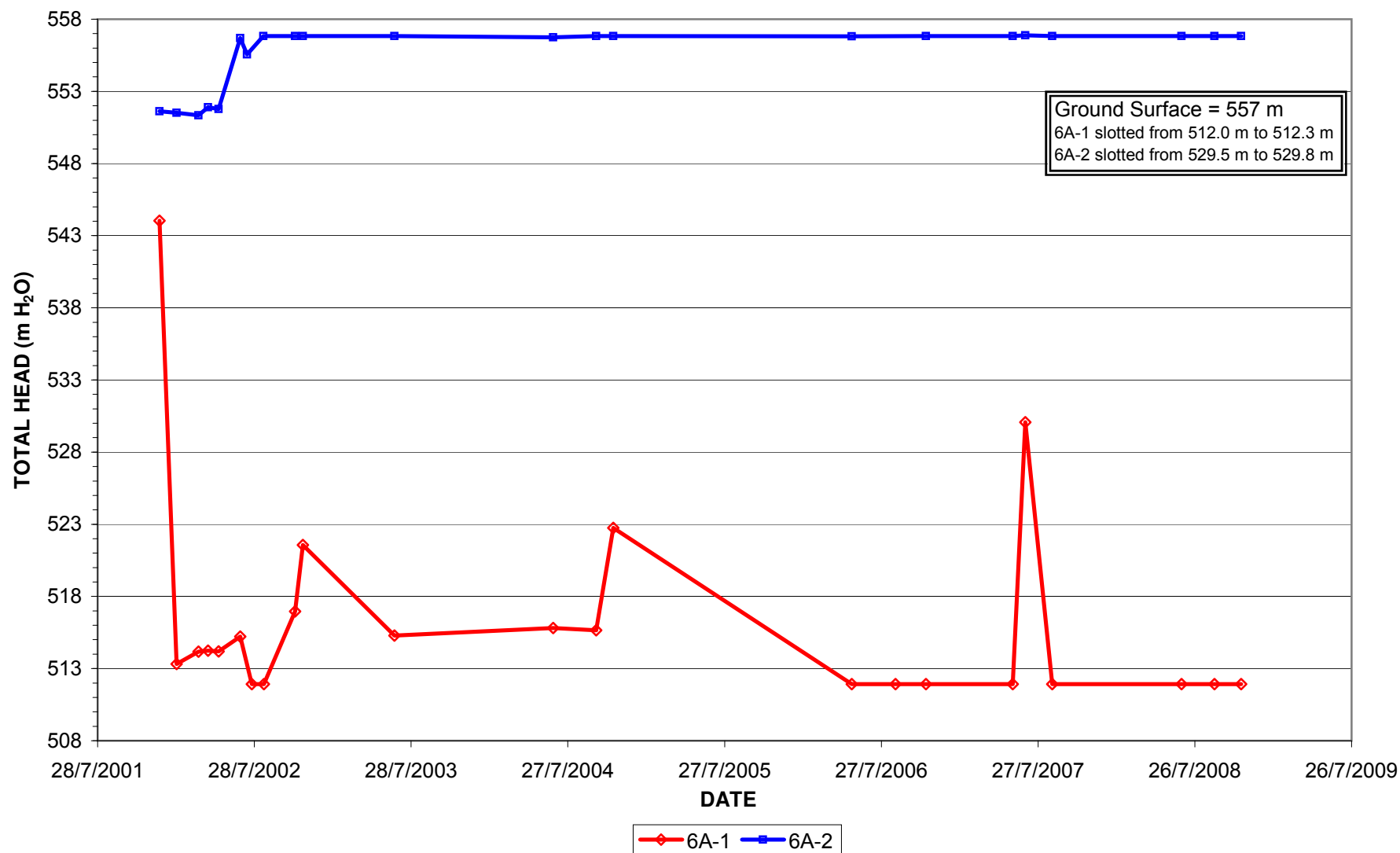
# Groundwater Monitoring TOTAL HEAD - BH3A, B and C STANDPIPES (near PW1)



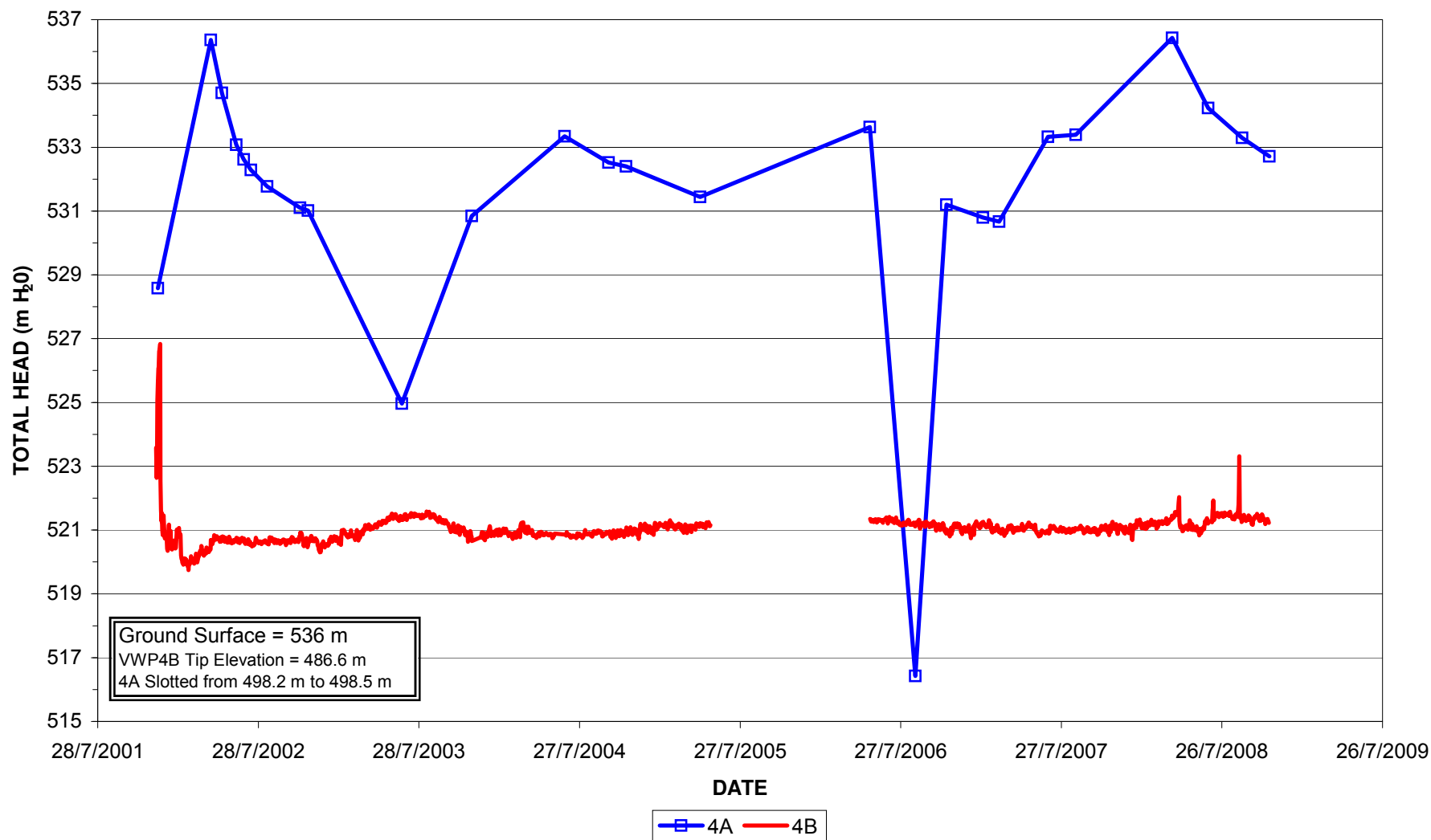
# Groundwater Monitoring TOTAL HEAD - BH4A, B and C STANDPIPES (near PW1)



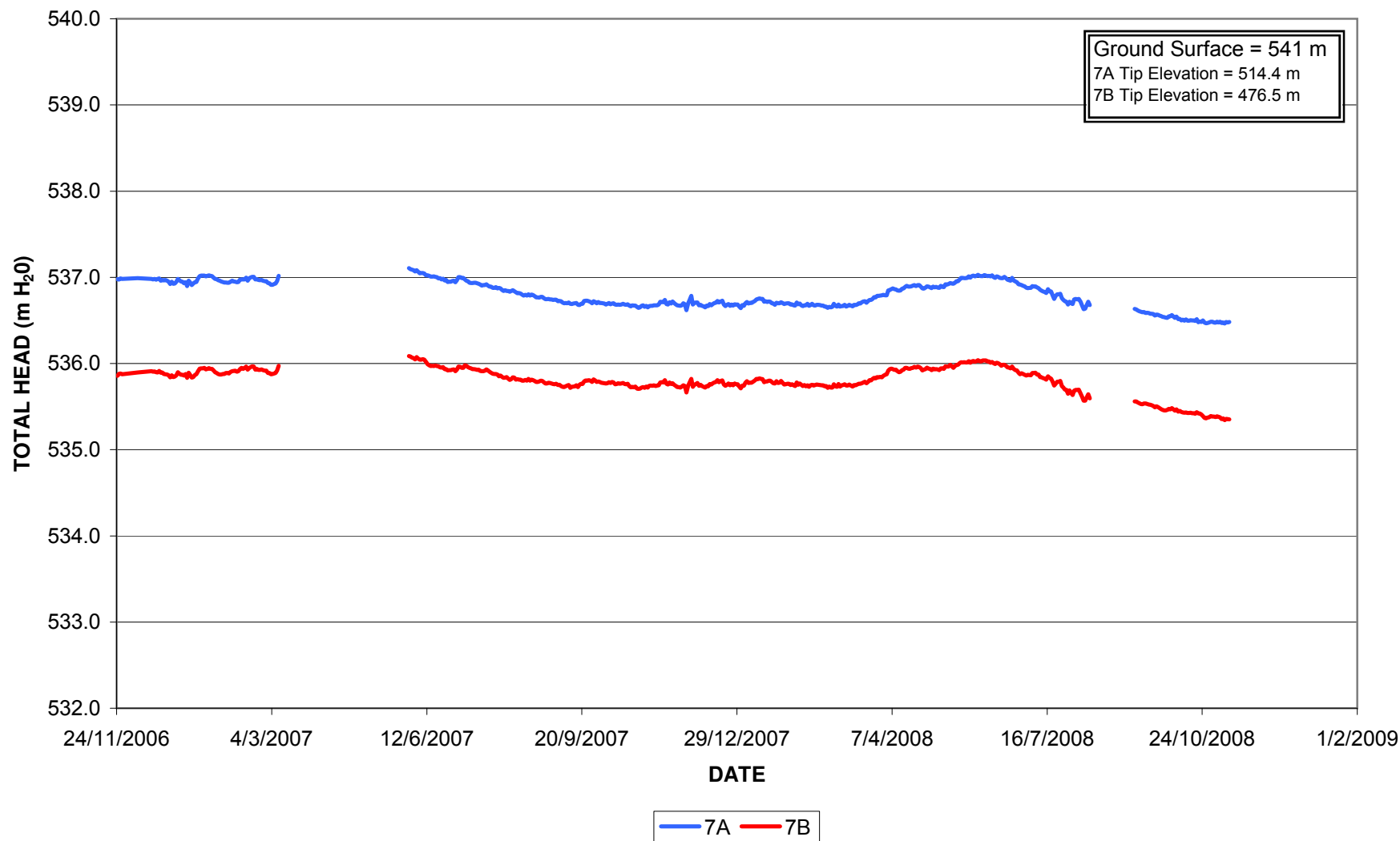
### Groundwater Monitoring TOTAL HEAD - BH6 STANDPIPES



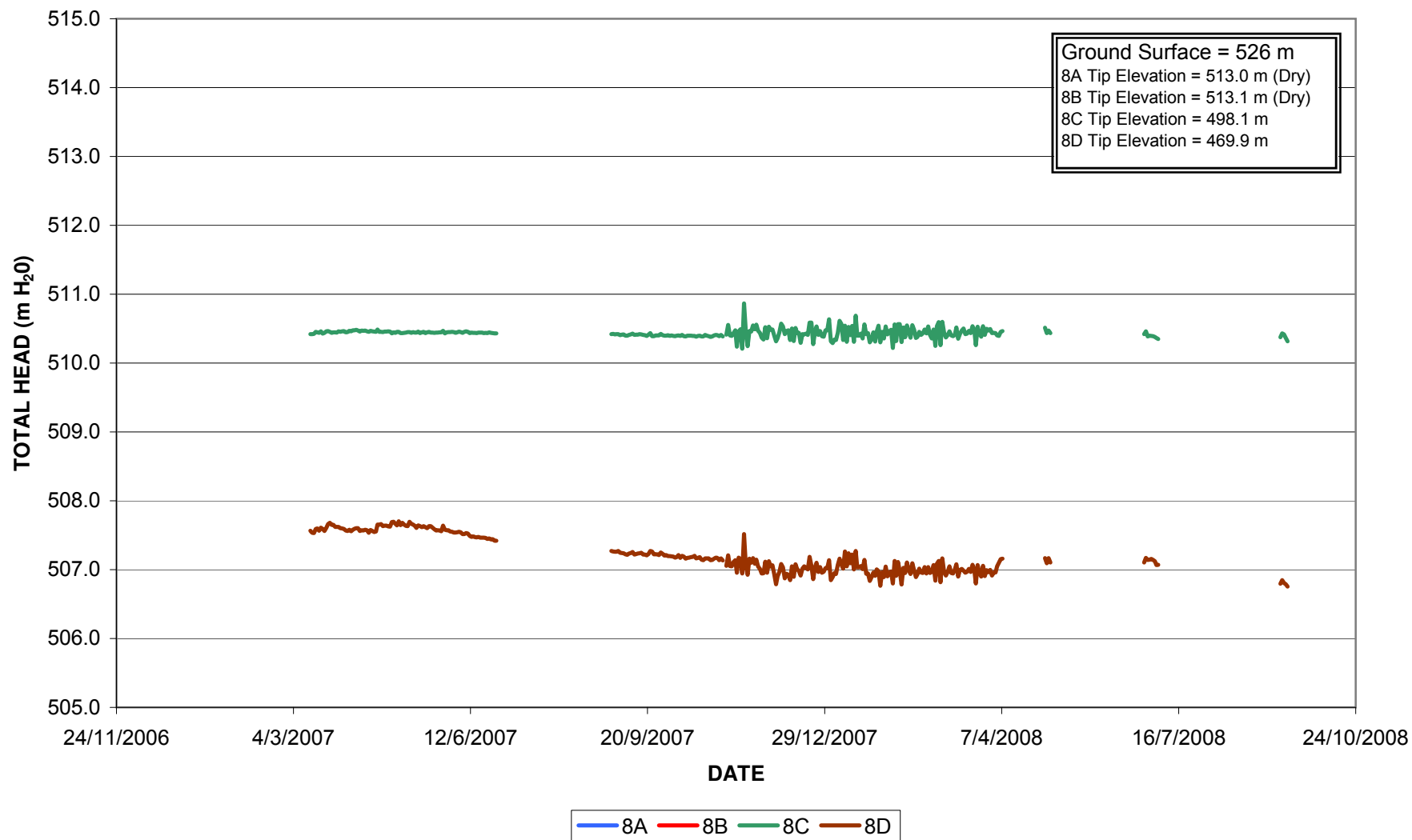
# Groundwater Monitoring TOTAL HEAD - BH4A STANDPIPE / VWP 4B



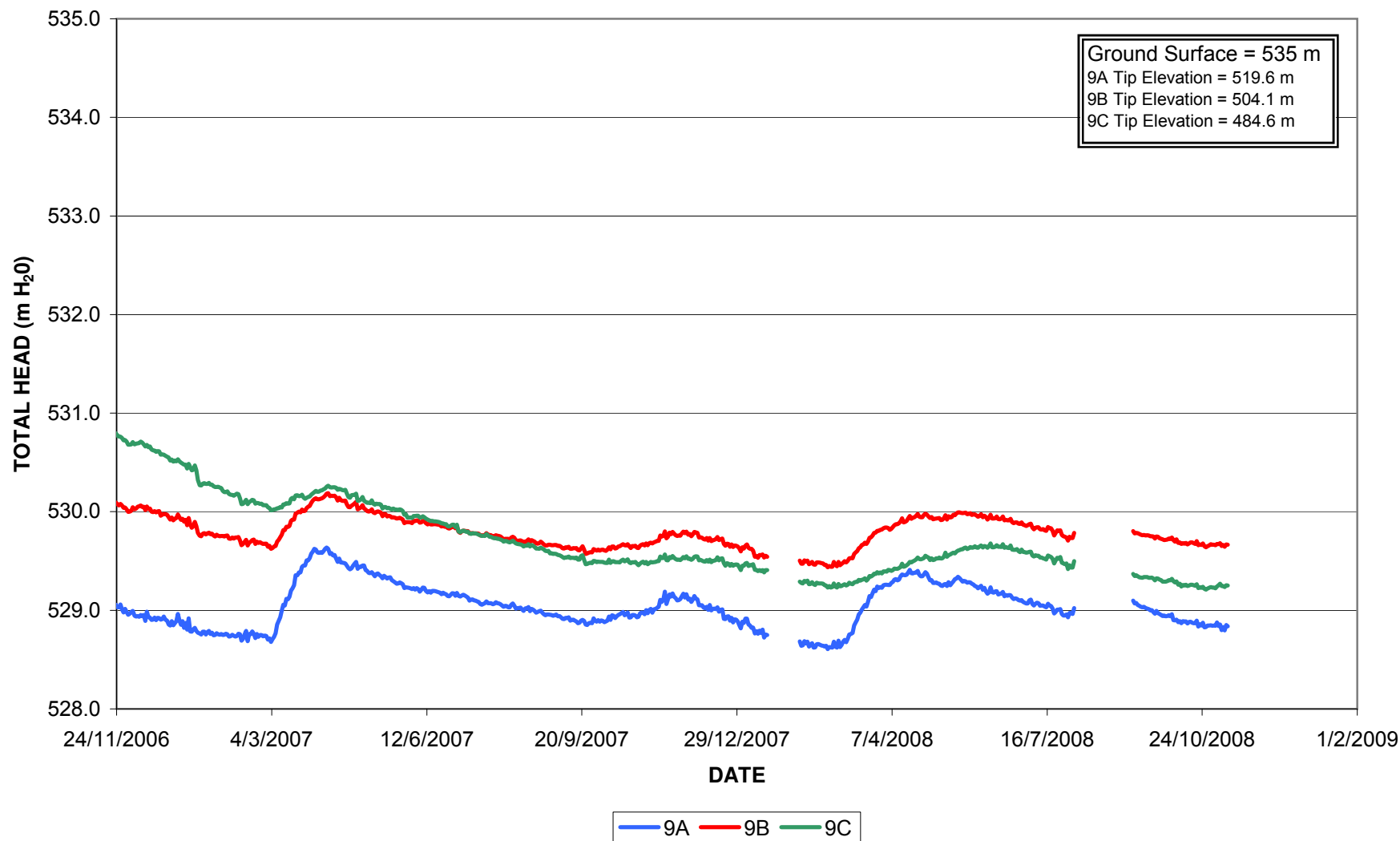
# Groundwater Monitoring TOTAL HEAD - VWP7



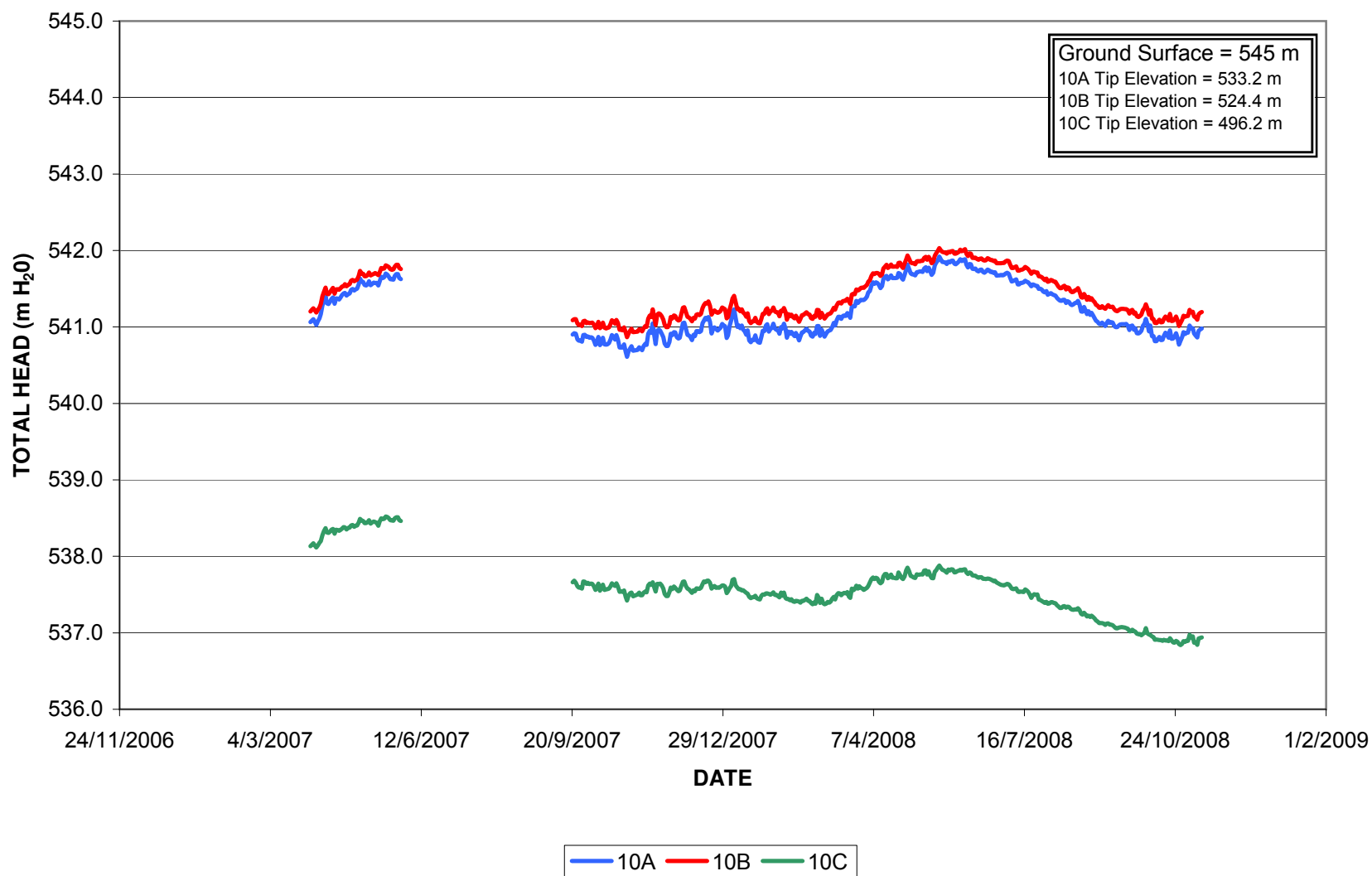
## Groundwater Monitoring TOTAL HEAD - VWP8



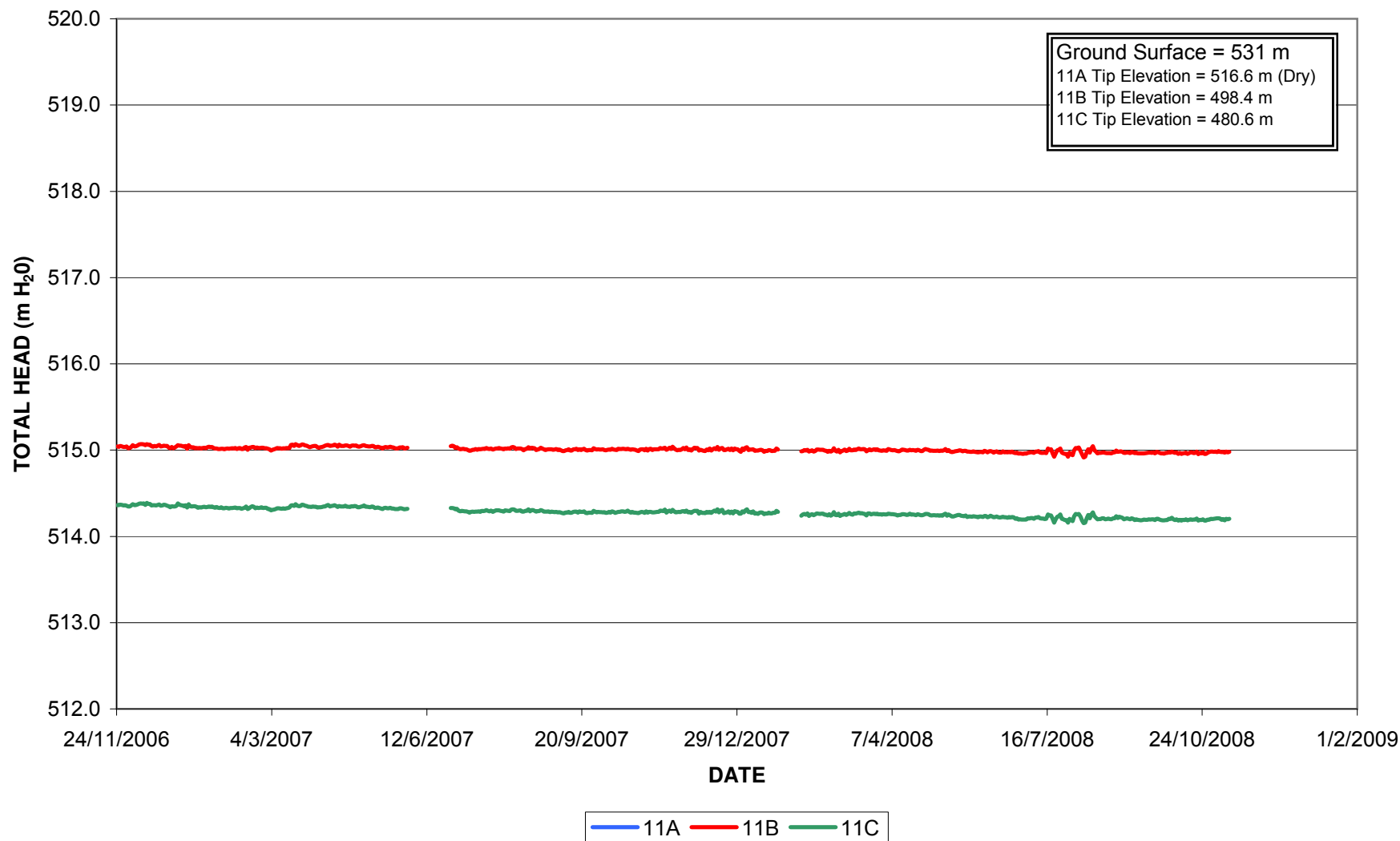
# Groundwater Monitoring TOTAL HEAD - VWP9



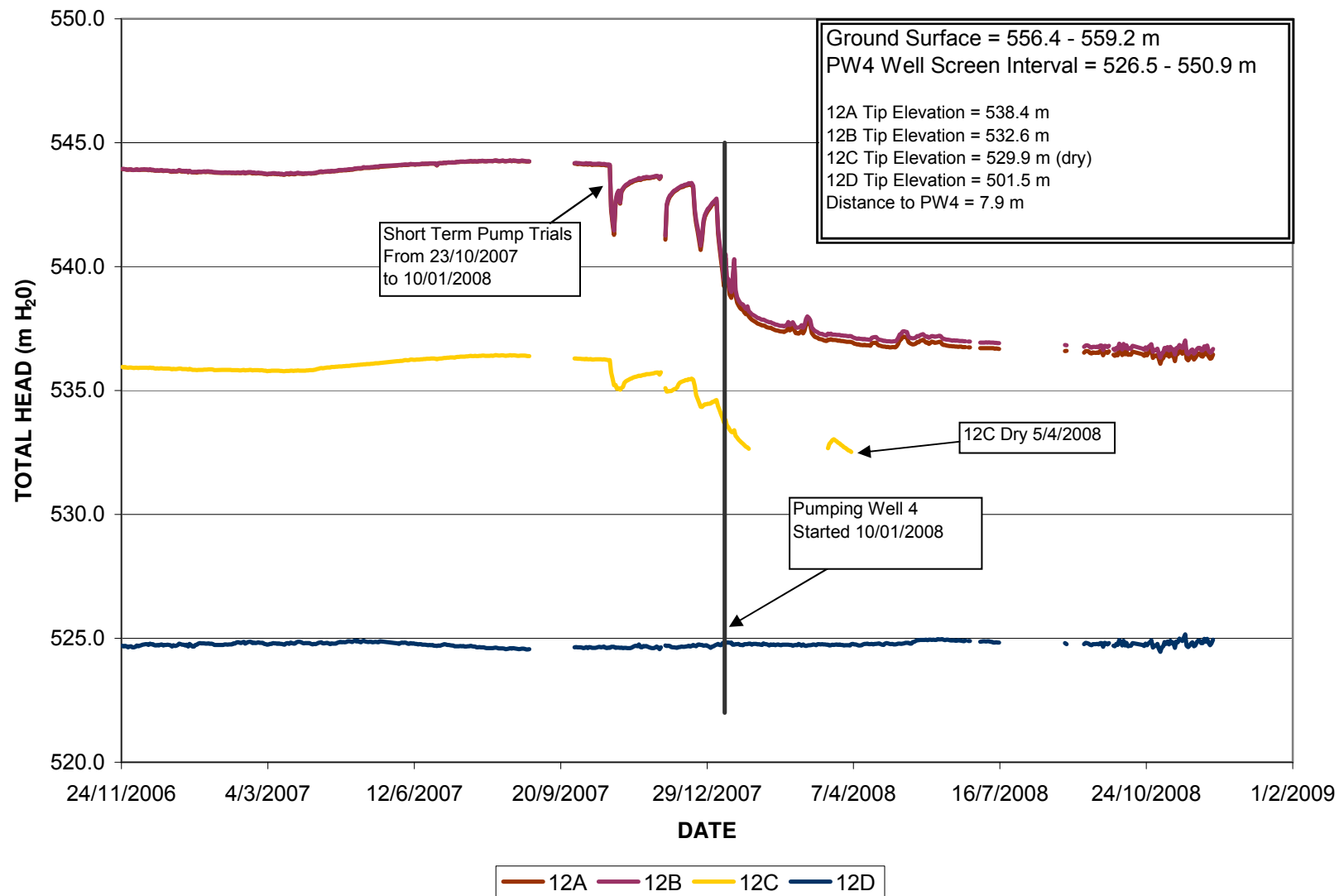
## Groundwater Monitoring TOTAL HEAD - VWP10



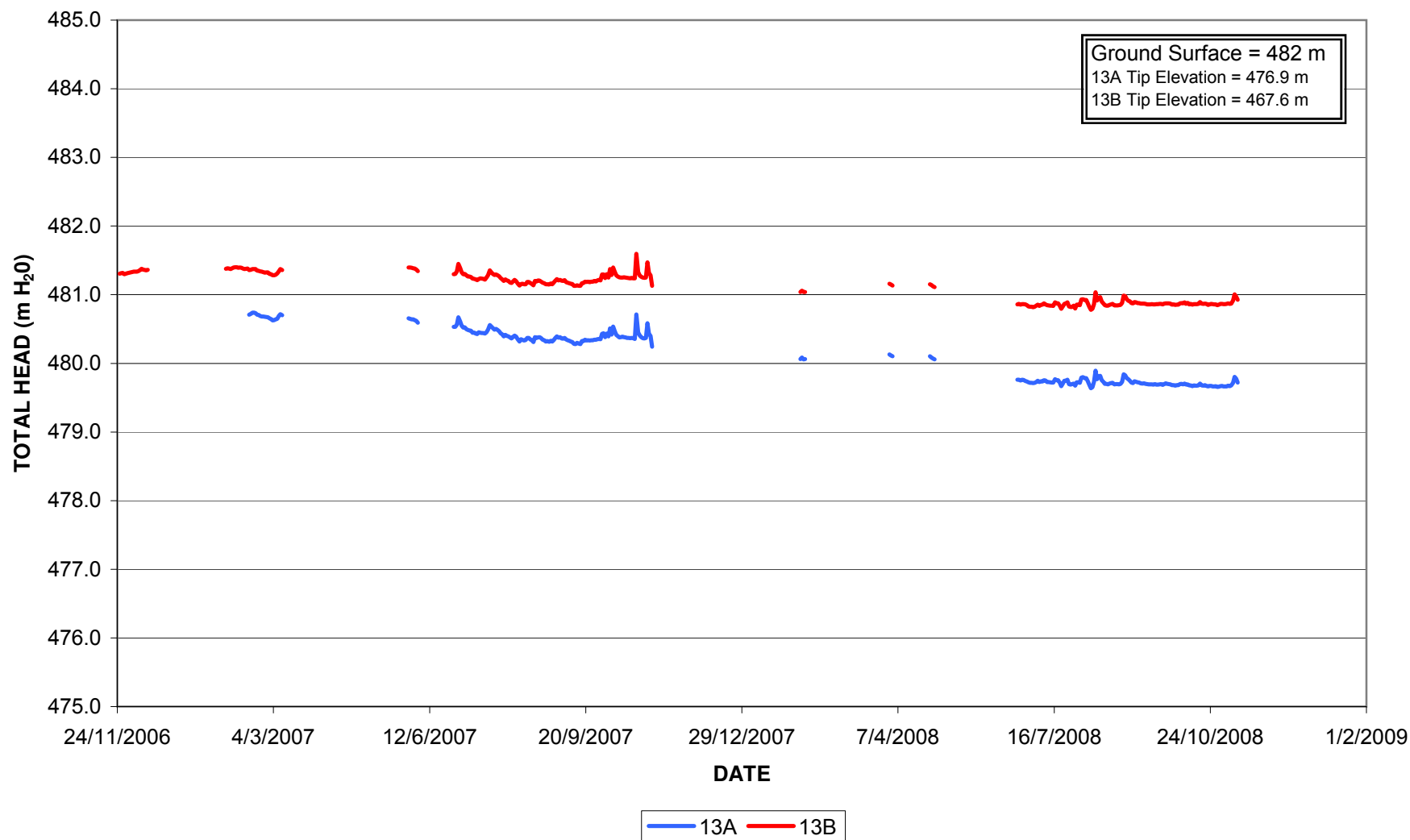
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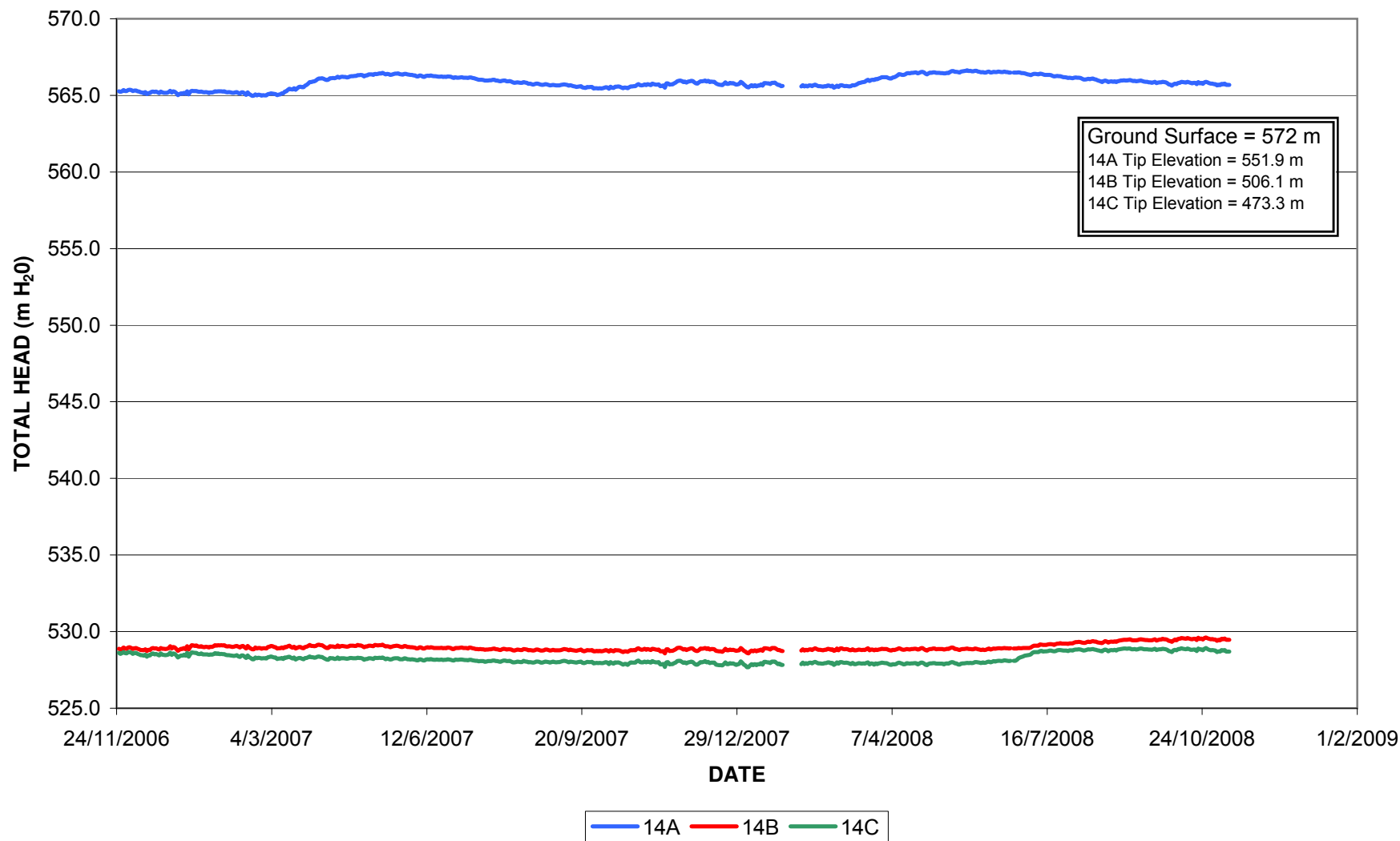
## Groundwater Monitoring TOTAL HEAD - VWP12 (near PW4)



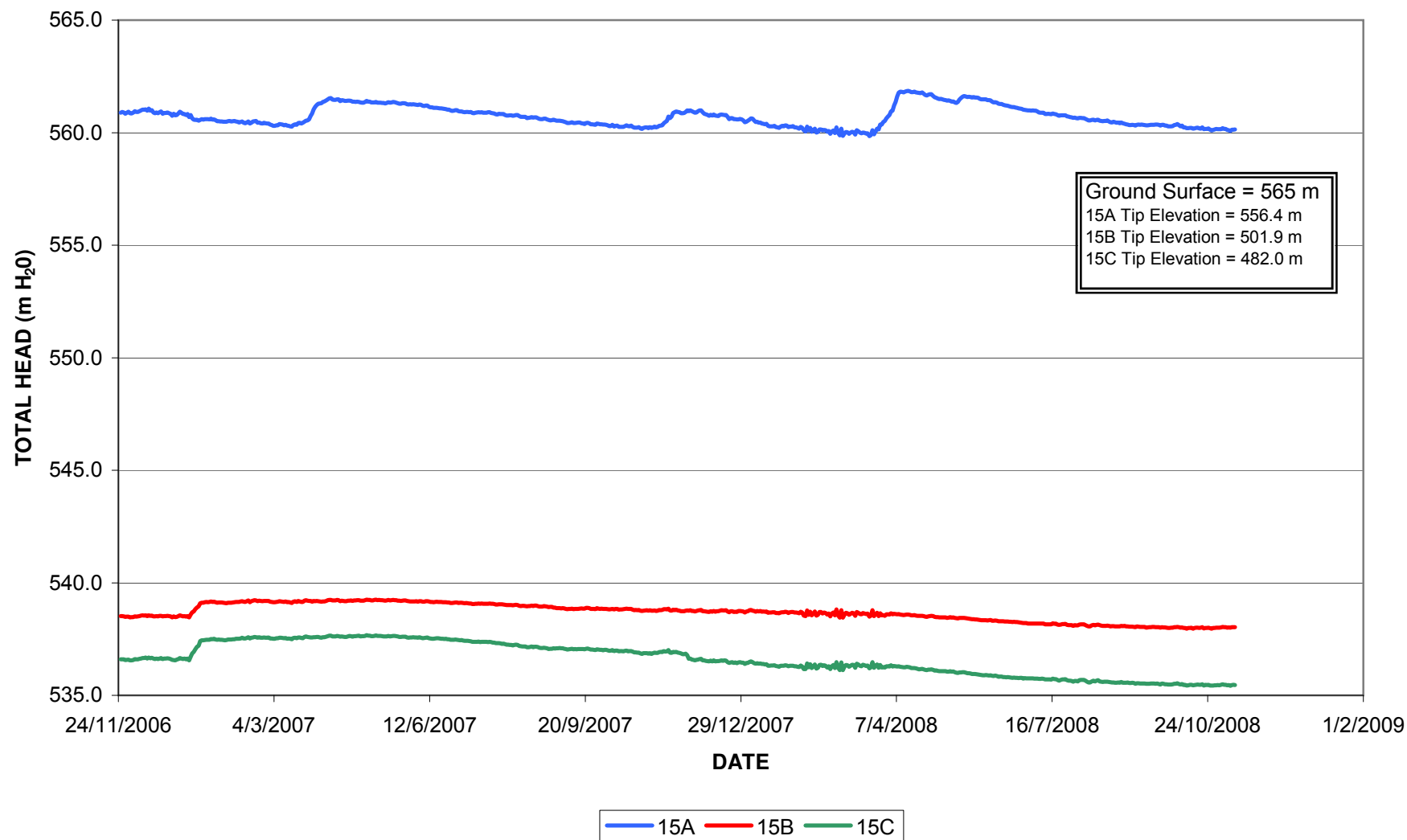
# Groundwater Monitoring TOTAL HEAD - VWP13



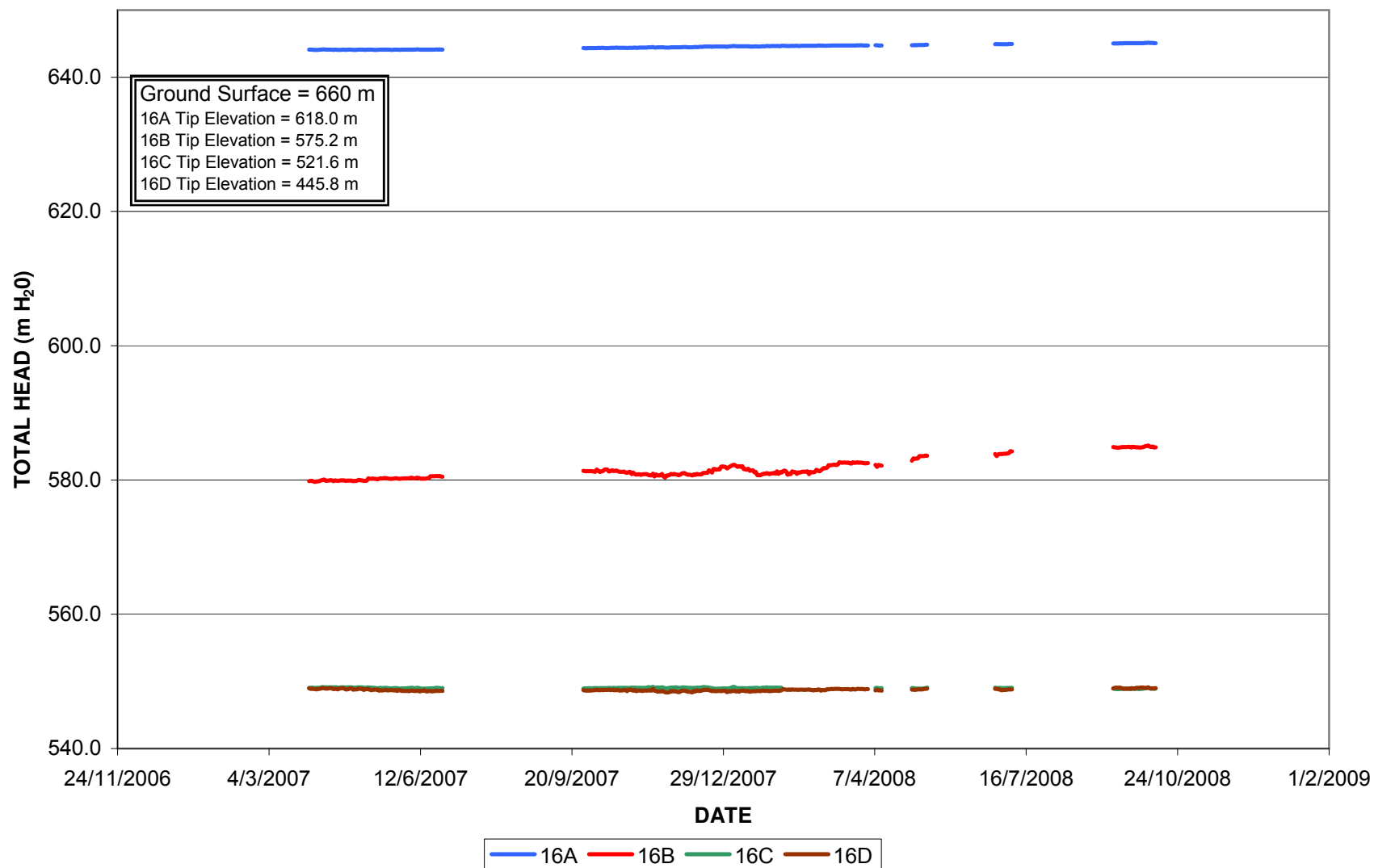
## Groundwater Monitoring TOTAL HEAD - VWP14



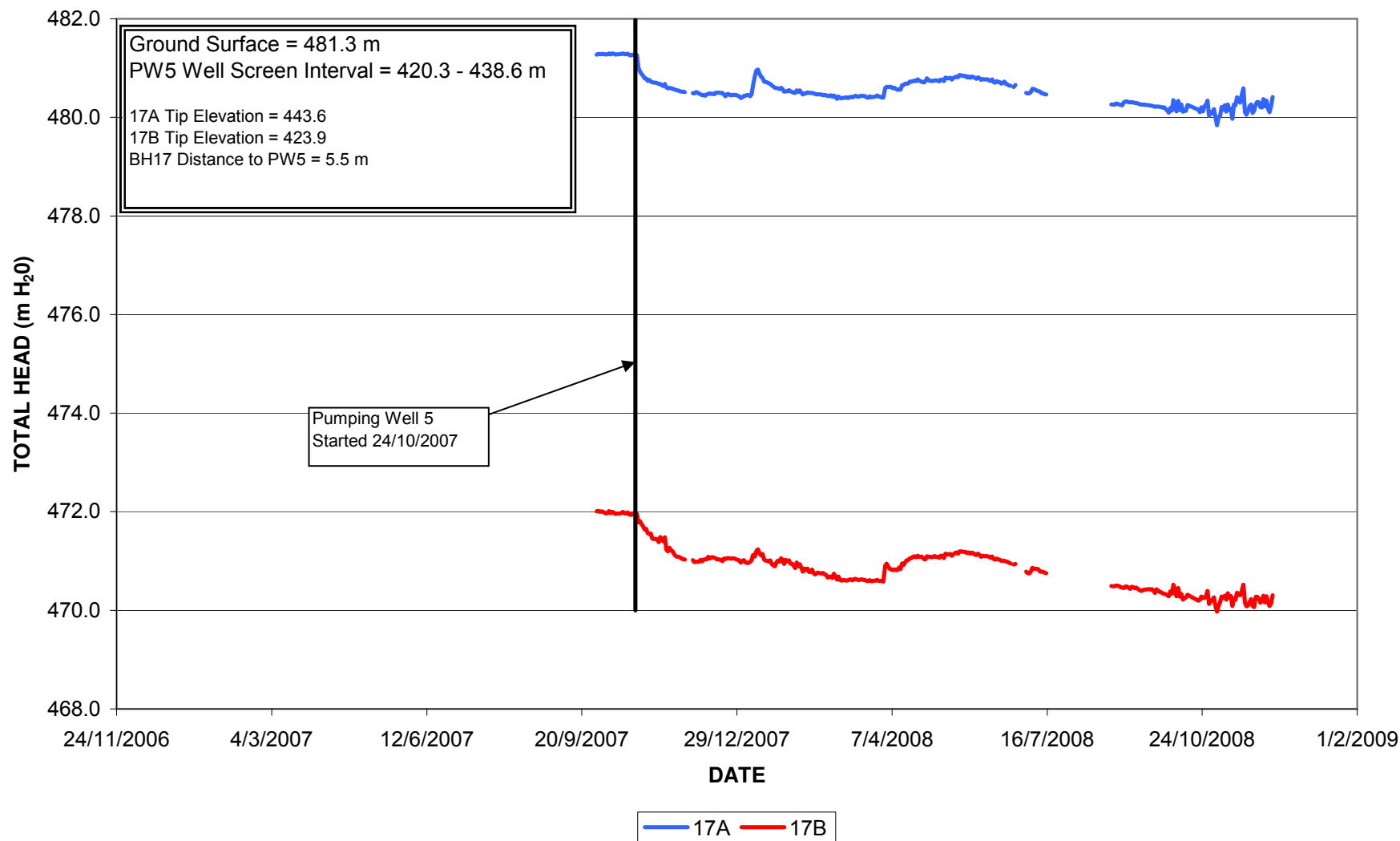
## Groundwater Monitoring TOTAL HEAD - VWP15



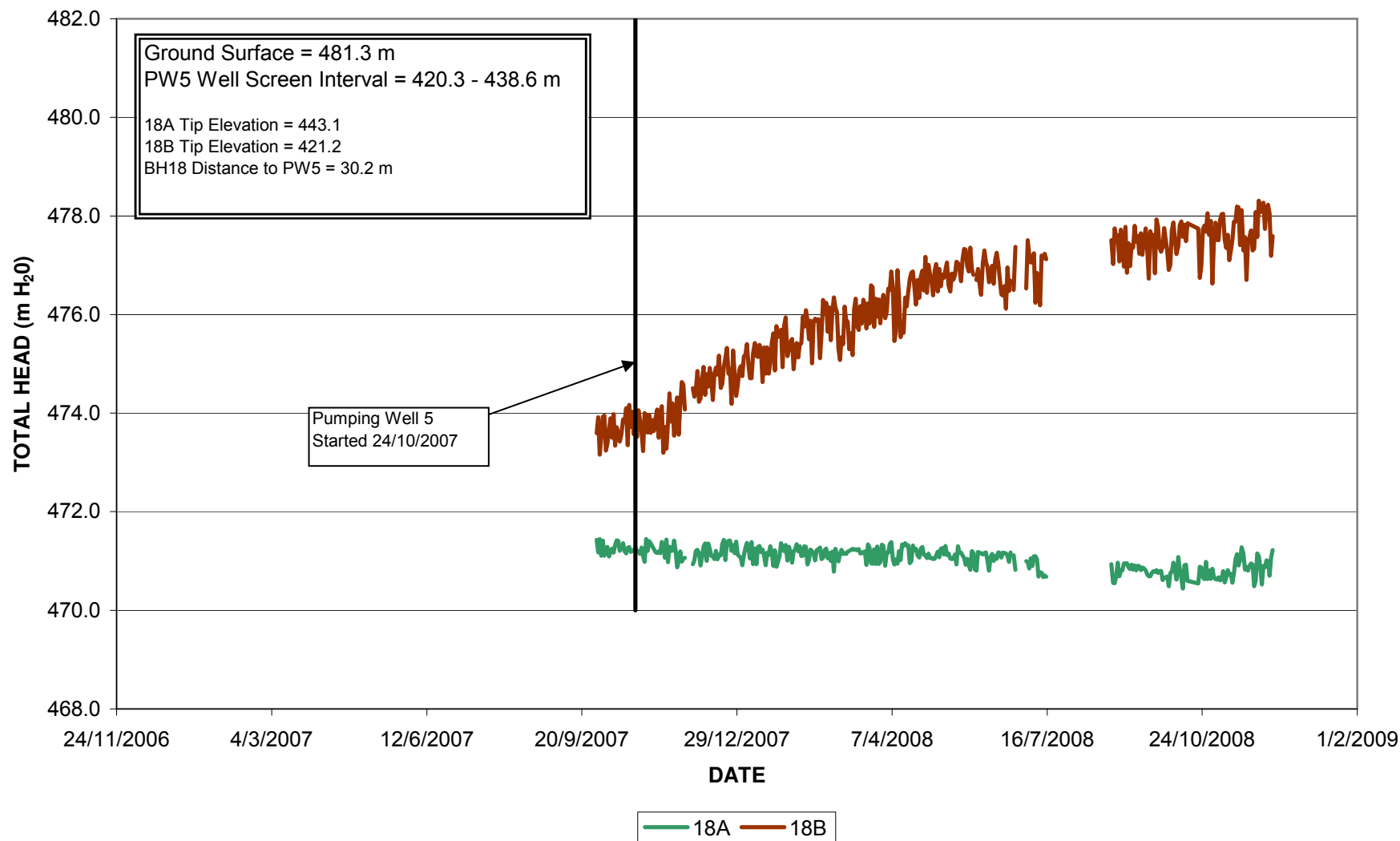
## Groundwater Monitoring TOTAL HEAD - VWP16



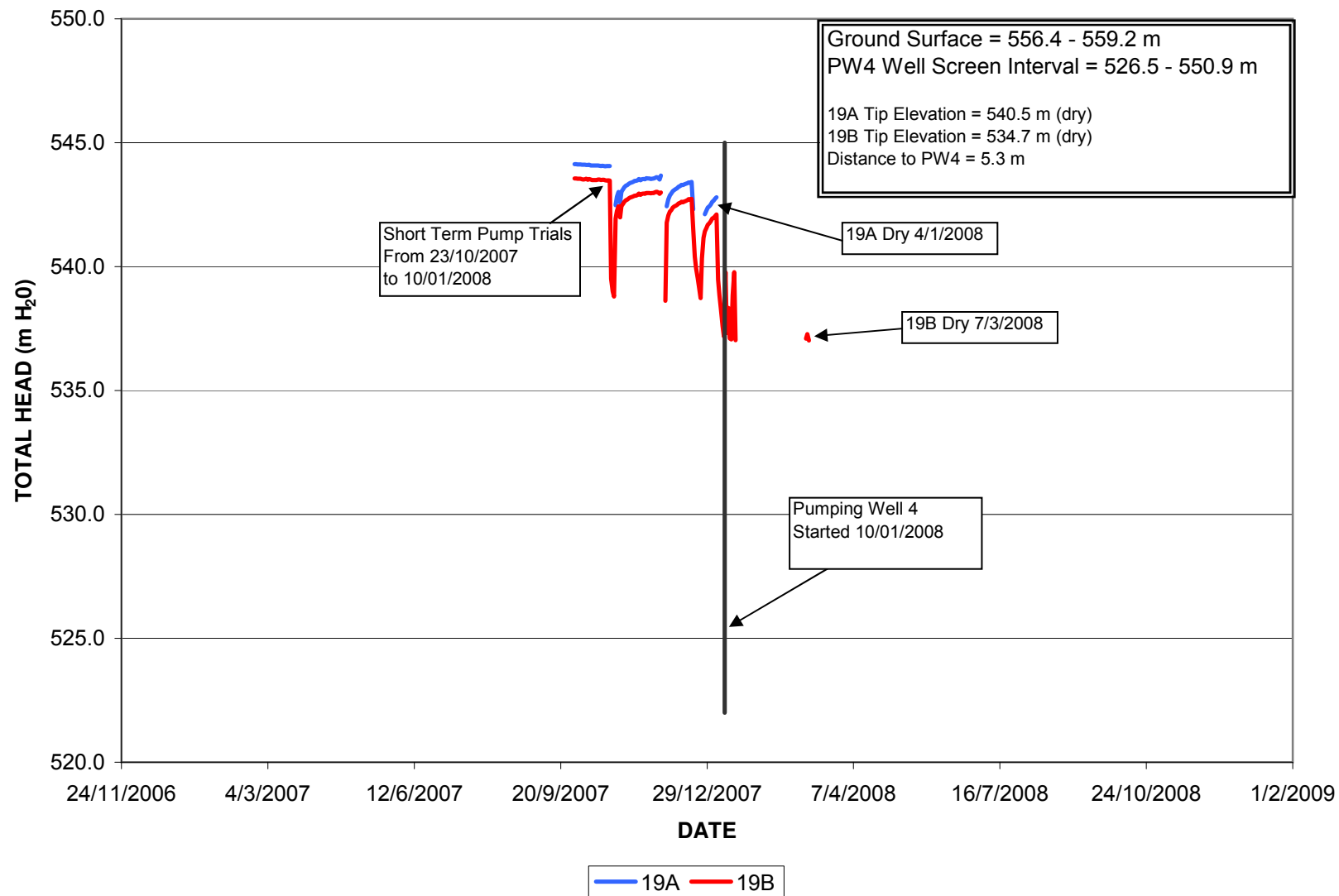
### Groundwater Monitoring TOTAL HEAD - VWP17 (near PW5)



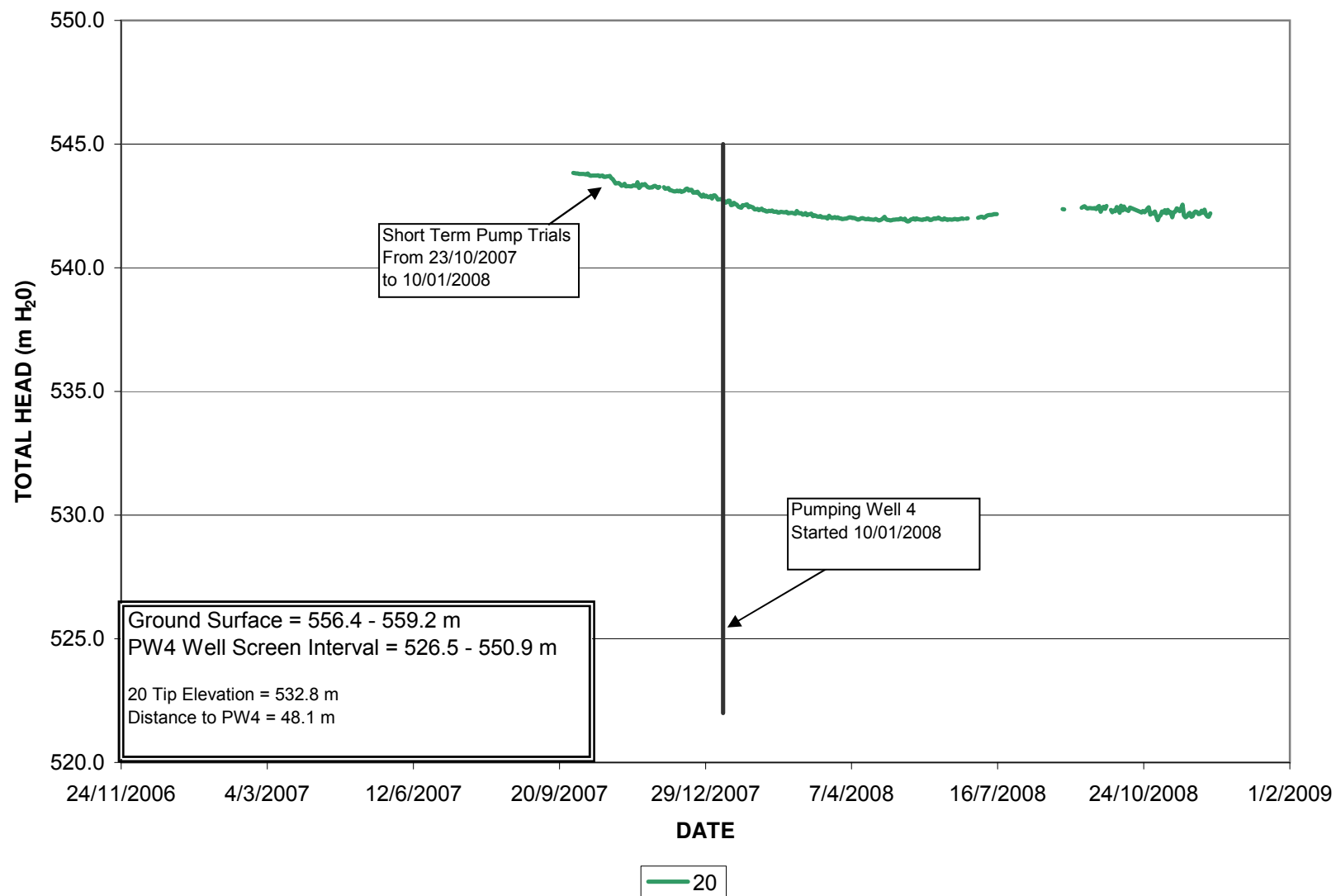
### Groundwater Monitoring TOTAL HEAD - VWP18 (near PW5)



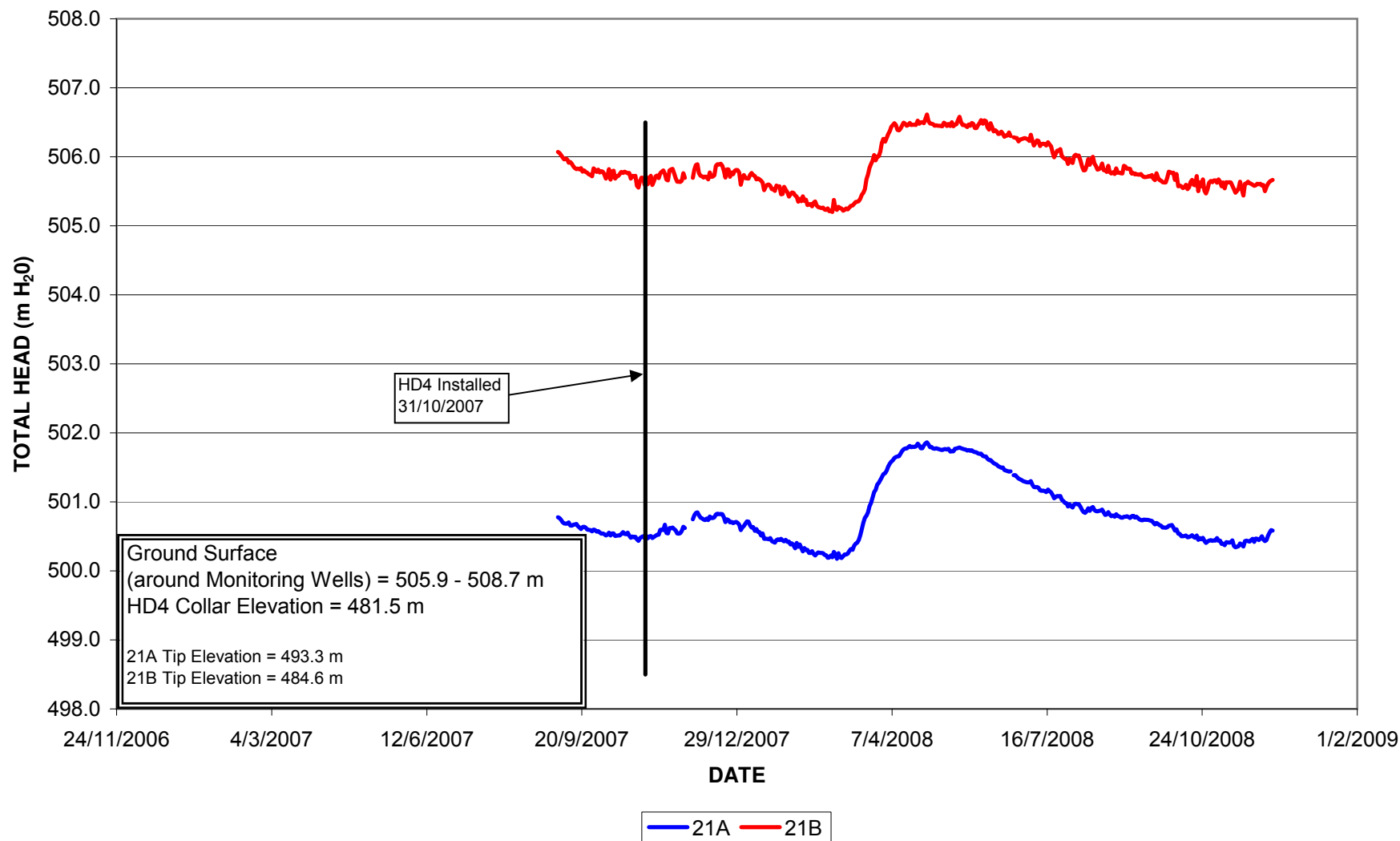
# Groundwater Monitoring TOTAL HEAD - VWP19 (near PW4)



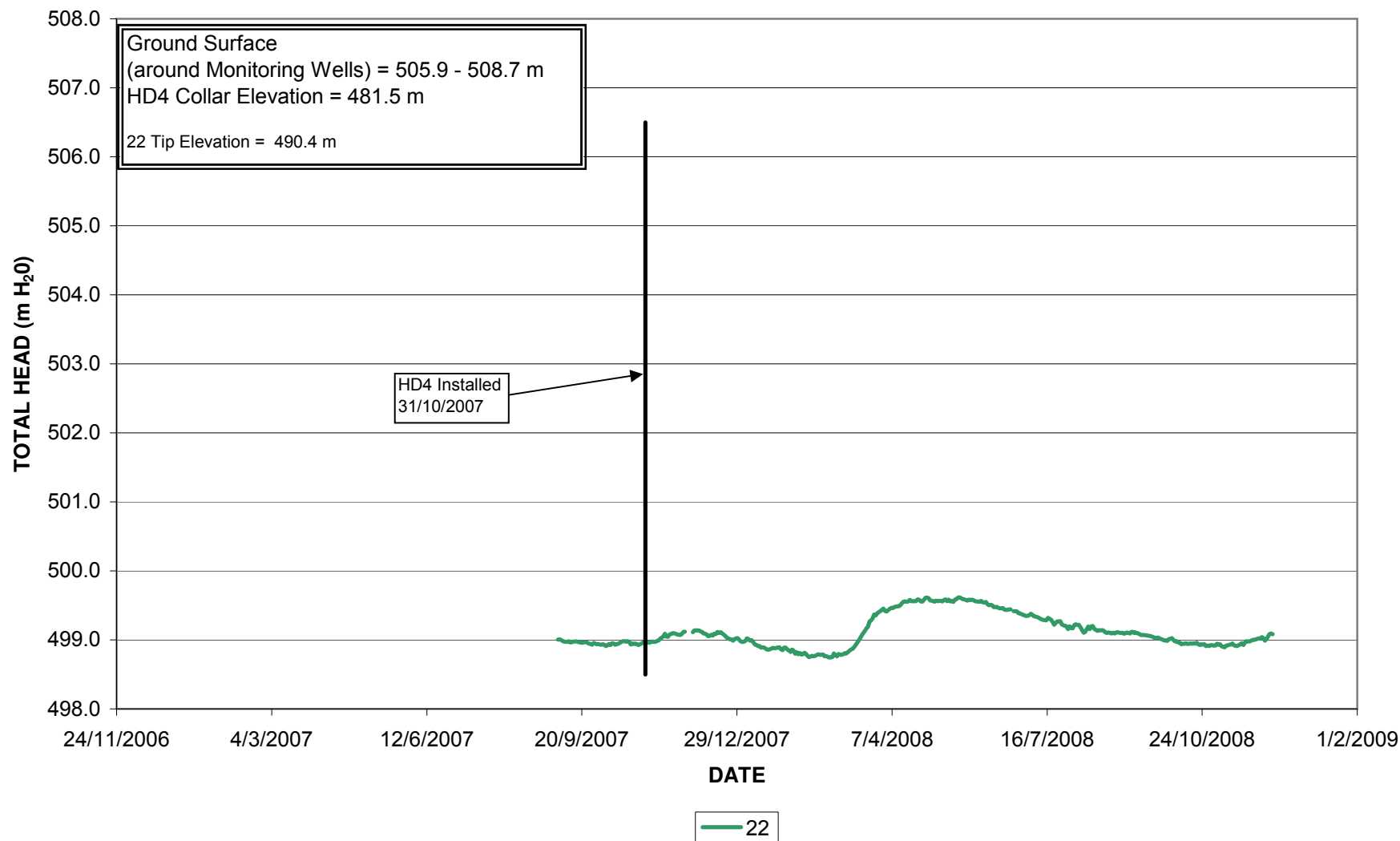
### Groundwater Monitoring TOTAL HEAD - VWP20 (near PW4)



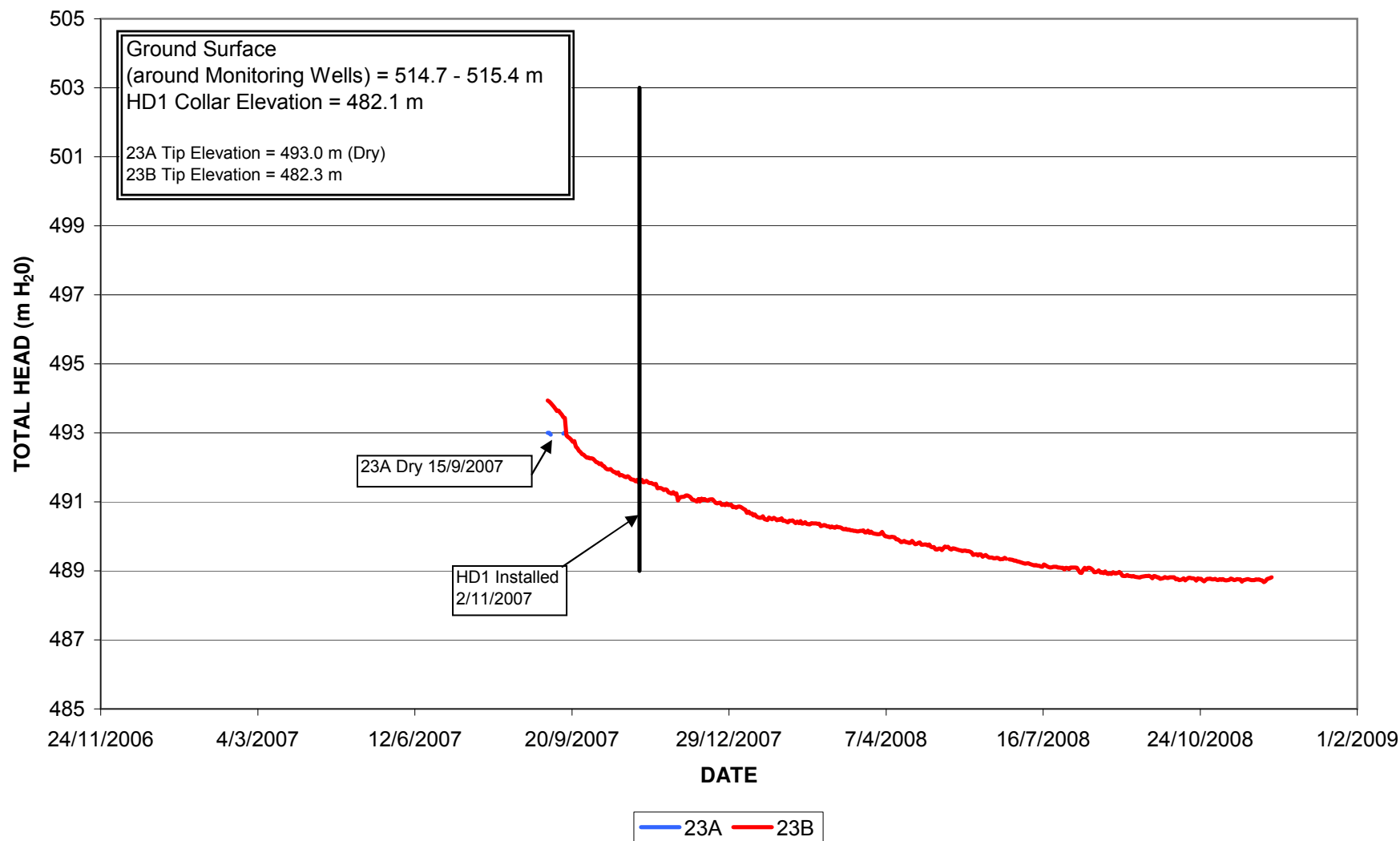
# Groundwater Monitoring TOTAL HEAD - VWP21 (near HD4)



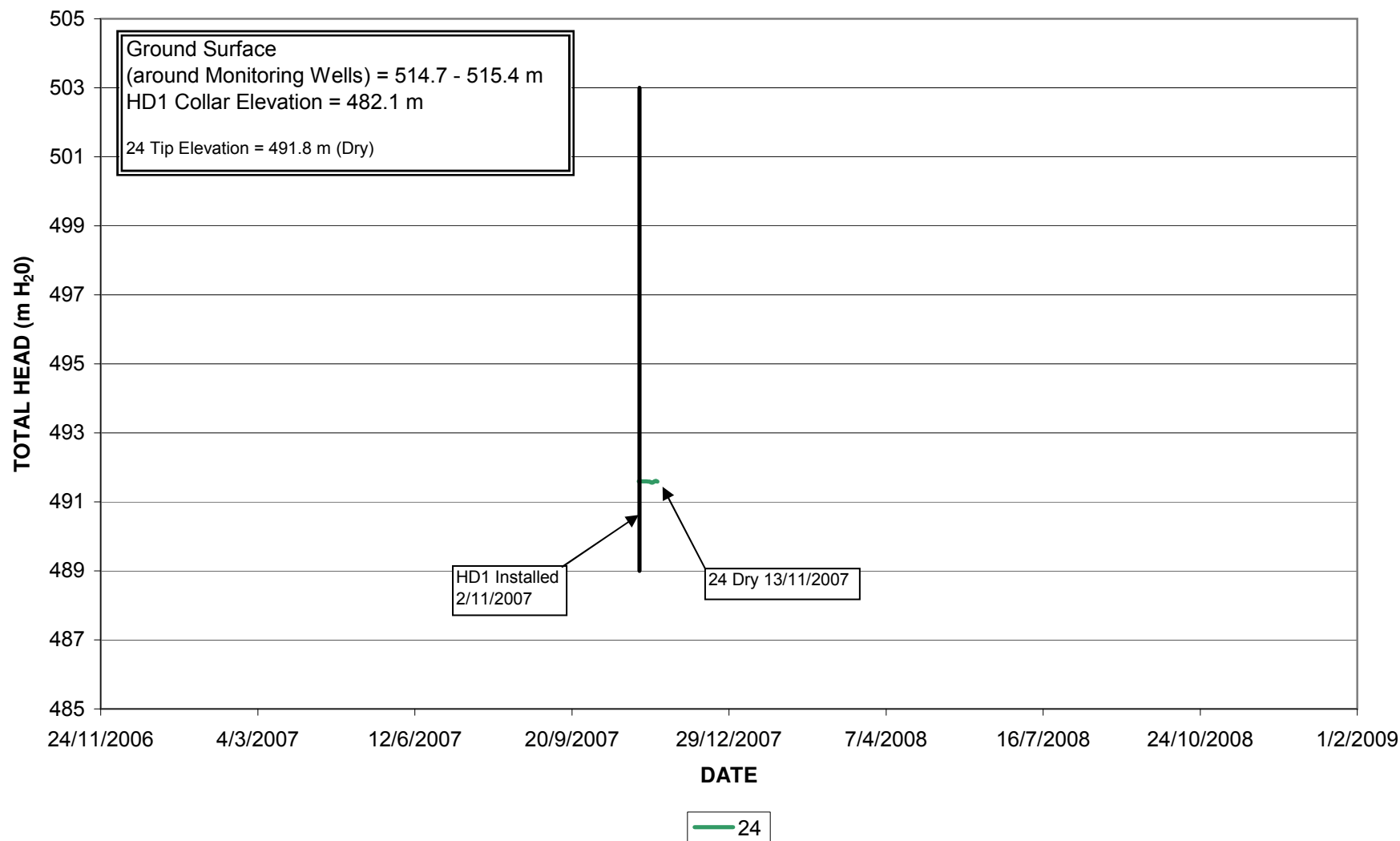
# Groundwater Monitoring TOTAL HEAD - VWP22 (near HD4)



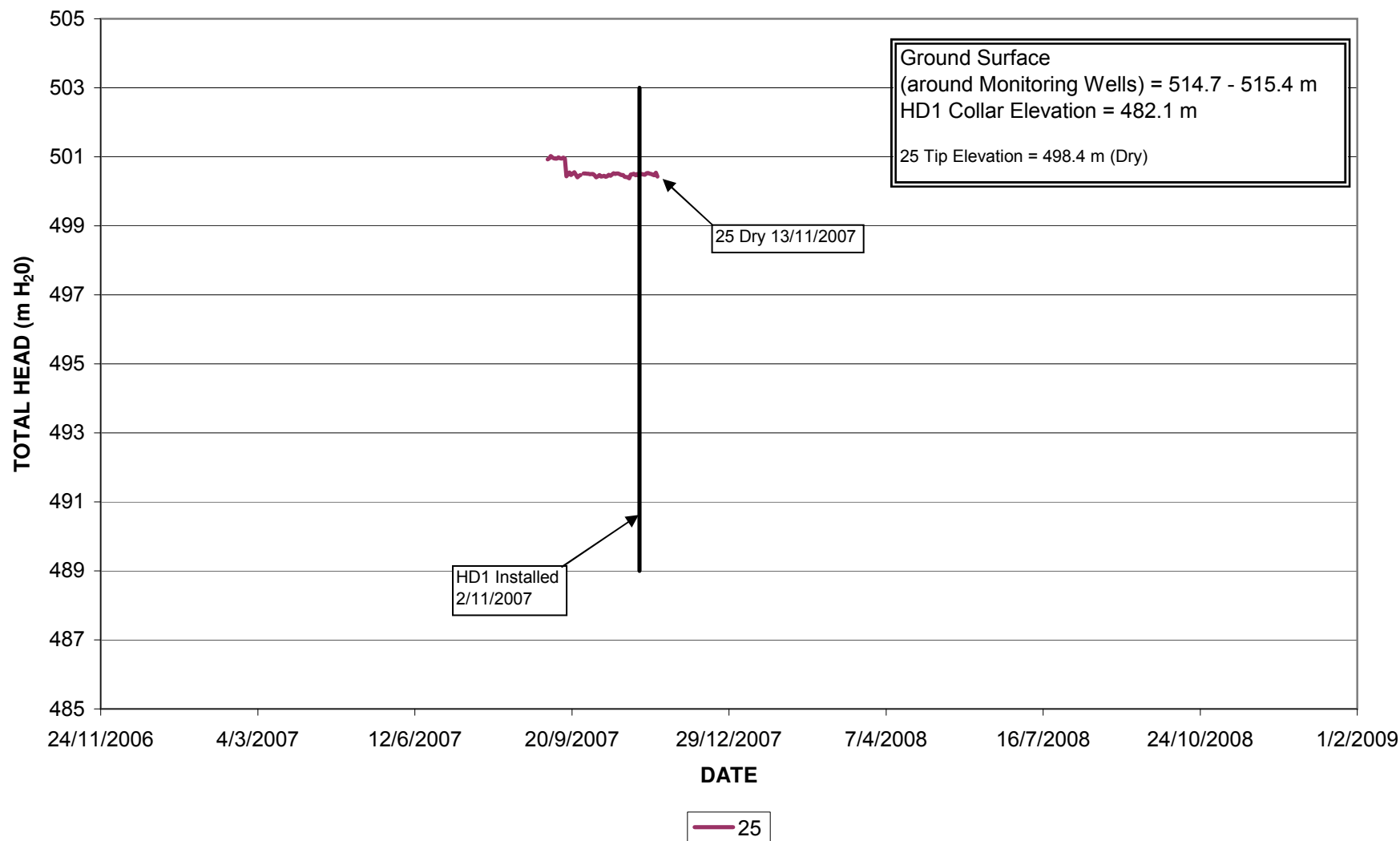
# Groundwater Monitoring TOTAL HEAD - VWP23 (near HD1)



# Groundwater Monitoring TOTAL HEAD - VWP24 (near HD1)



# Groundwater Monitoring TOTAL HEAD - VWP25 (near HD1)

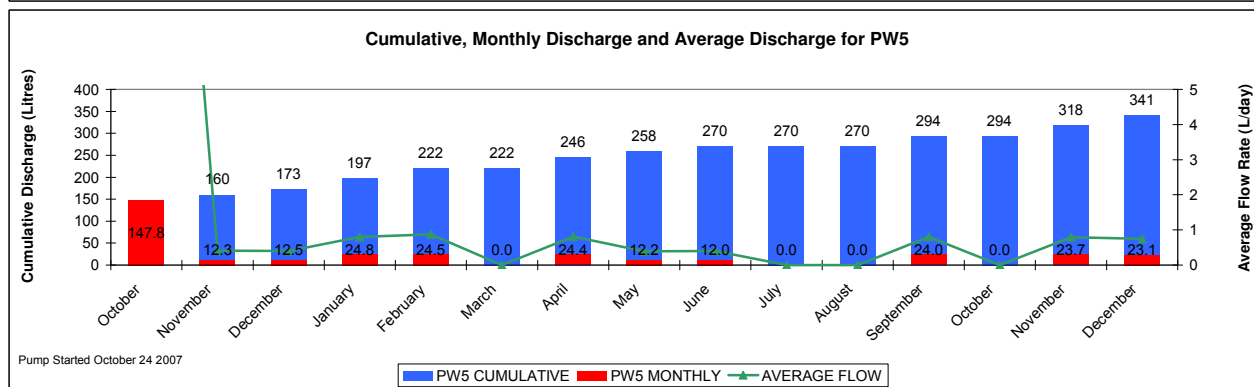
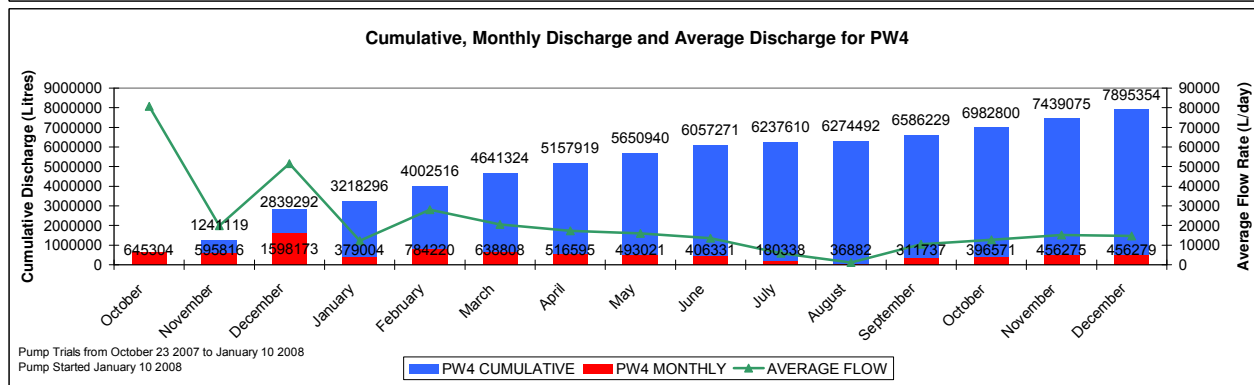
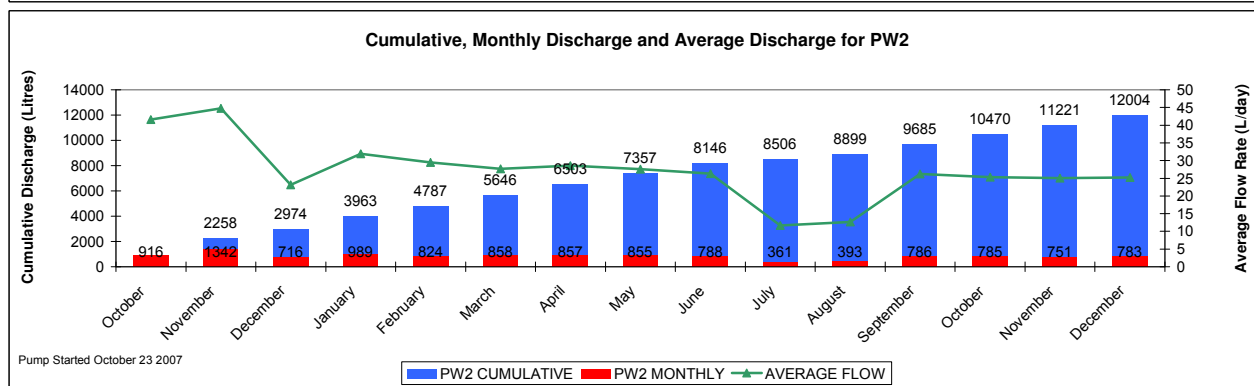
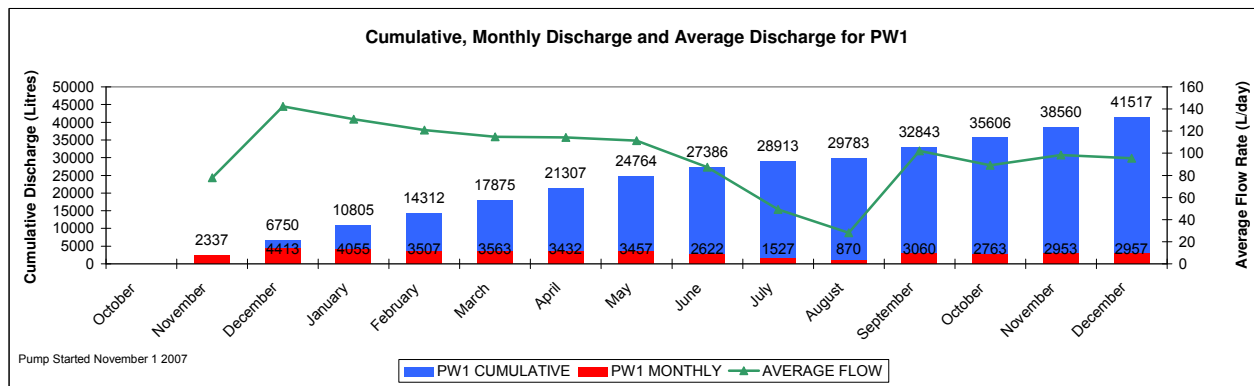


**Appendix D**  
**Pumping Wells - Summary Table and Production Charts**

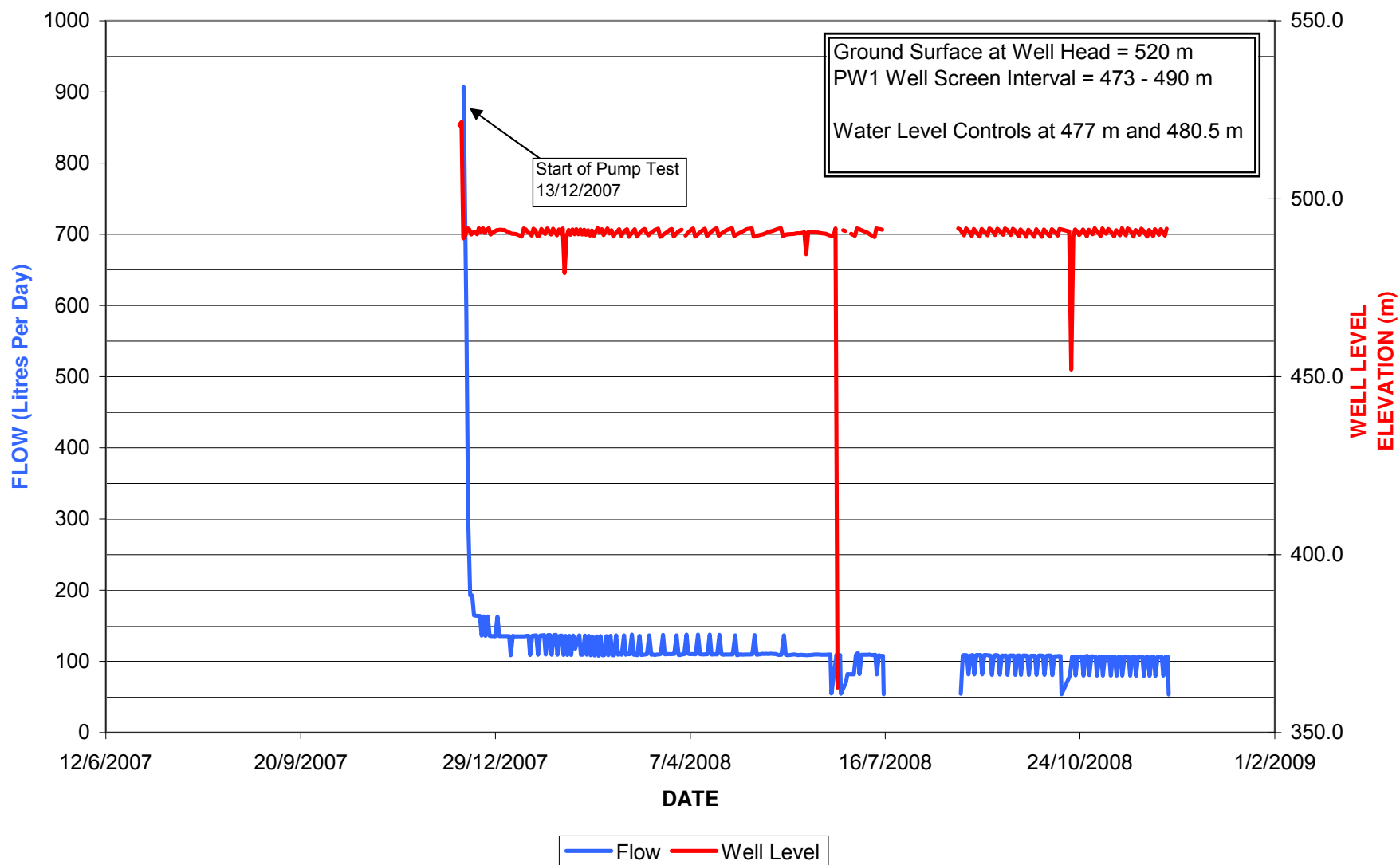
#### APPENDIX D - Pumping Well Information

| Well | Location                 | Installation Date | Depth (Screen) | Depth (Pump) | Depth (VW tip) | Monitoring Wells | Status                                     |
|------|--------------------------|-------------------|----------------|--------------|----------------|------------------|--------------------------------------------|
| PW1  | Flamingo St.             | September 2003    | 29.9-47.5m     | 45.0m        | 44.3m          | BH3bc, BH4ab     | Active - water controls at 39.5m and 42.0m |
| PW2  | Abbott Dr.               | September 2003    | 30.0-55.0m     | 43.0m        | 42.4m          | BH3              | Active - water controls at 38.6m and 41.2m |
| PW4  | Panagrot Ave. (east end) | June 2007         | 6.1-30.5m      | 29.0m        | 28.3m          | BH12, BH19, BH20 | Active - pump controlled by ammeter        |
| PW5  | Adam St.                 | June 2007         | 42.7-61.0m     | 58.5m        | 57.9m          | BH17, BH18       | Active - water controls at 54.7m and 57.0m |

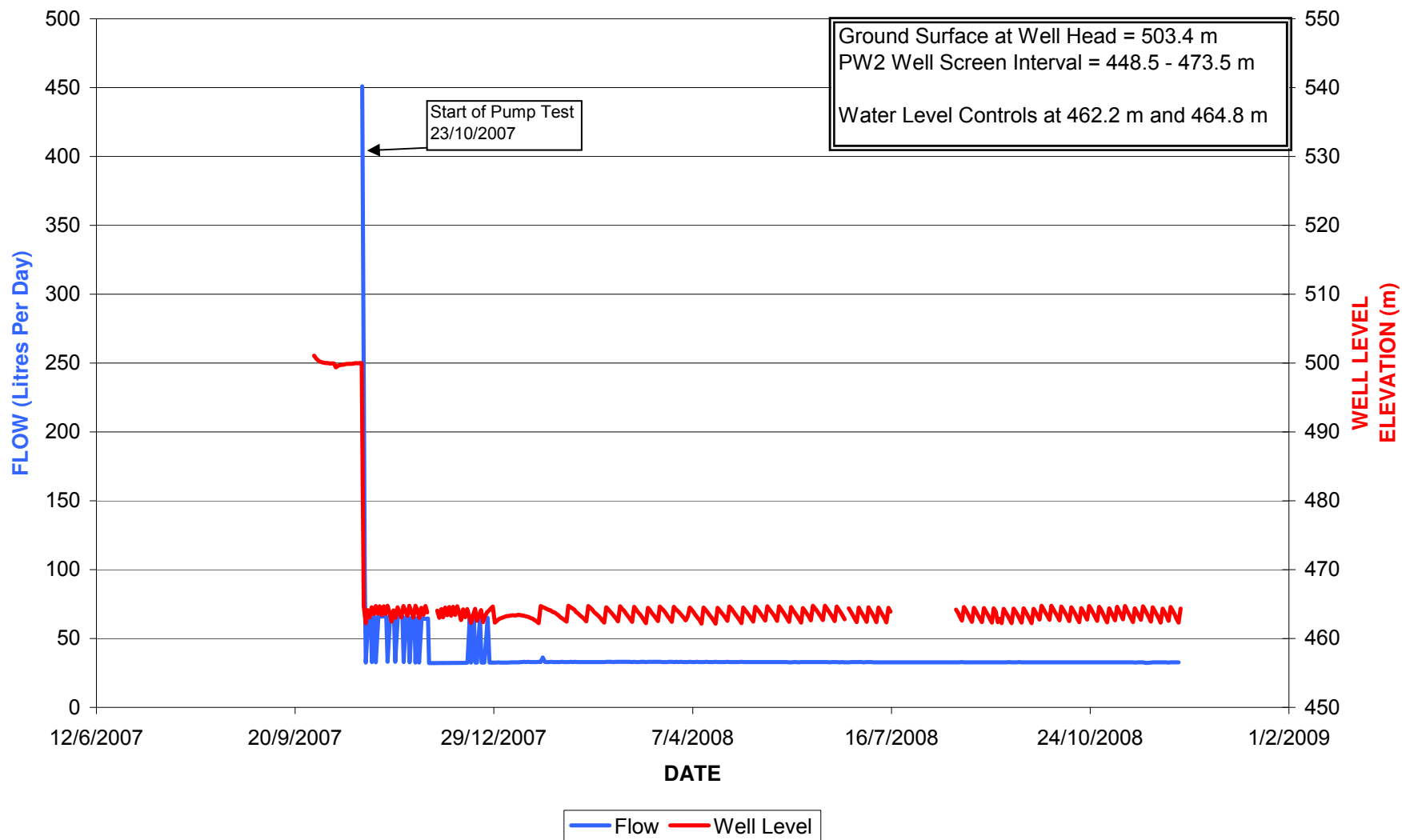
## Pumping Well Flow vs. Time



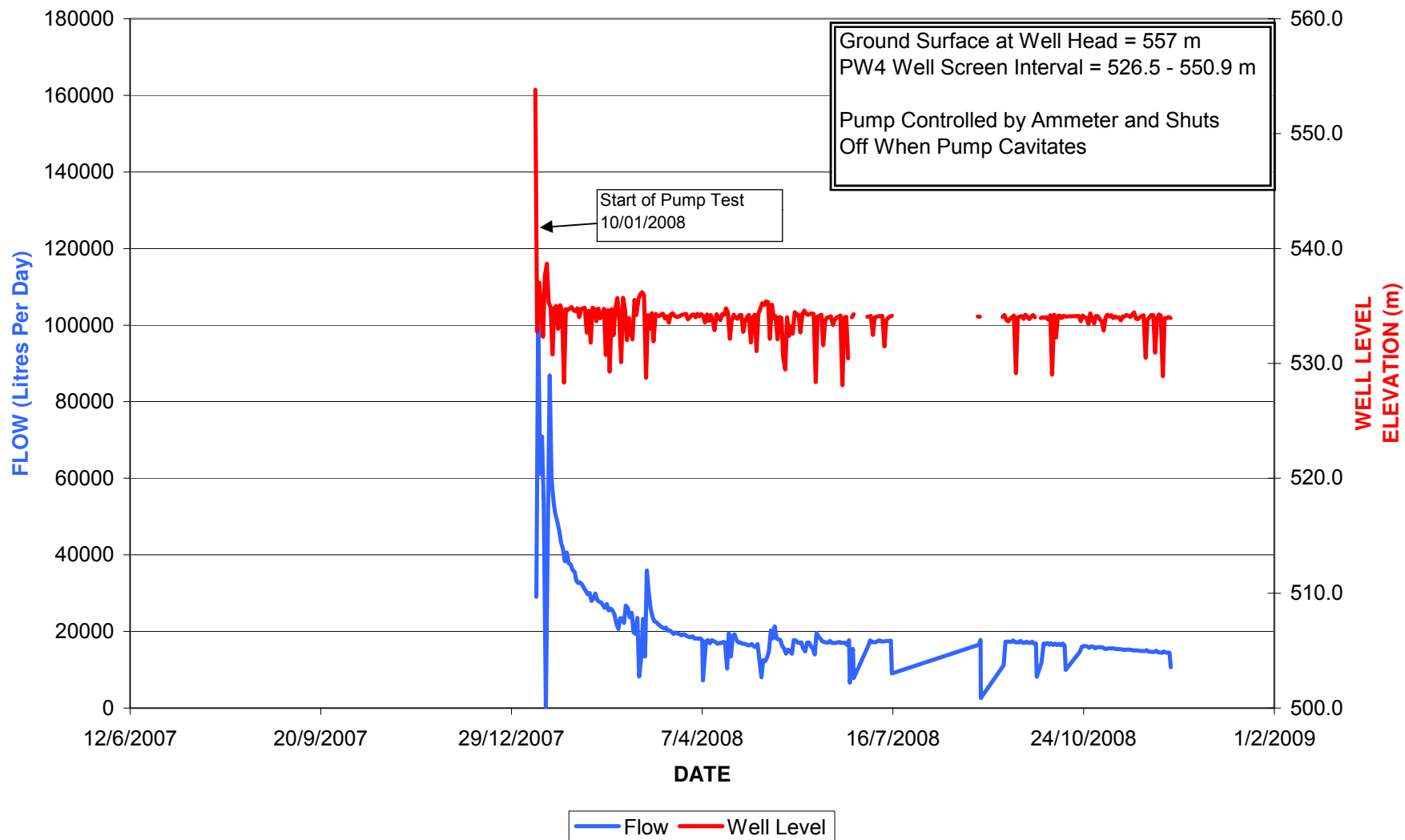
### Test Well Monitoring PW1 - TOTAL DAILY FLOW AND WELL LEVEL



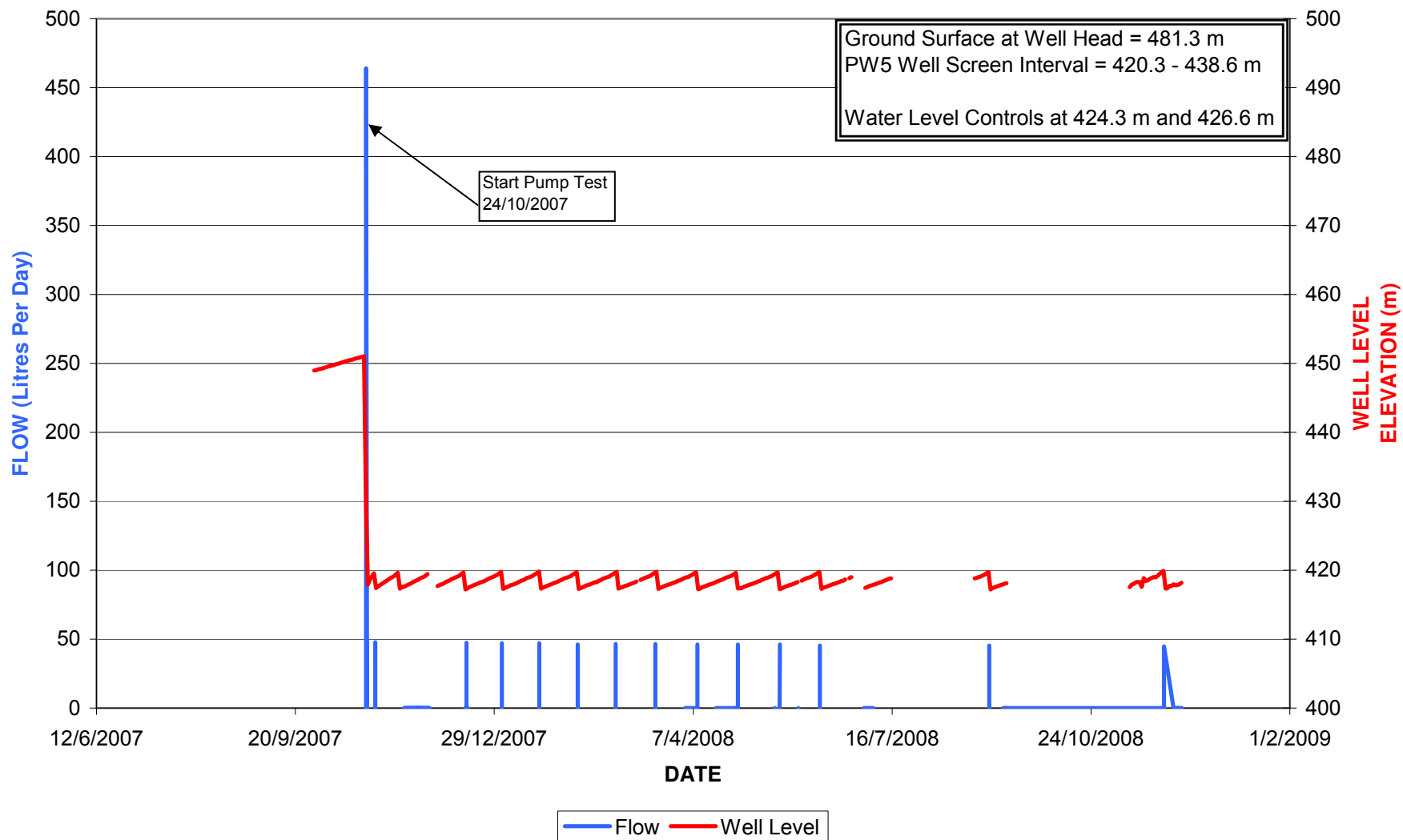
## Test Well Monitoring PW2 - TOTAL DAILY FLOW AND WELL LEVEL



# Test Well Monitoring PW4 - TOTAL DAILY FLOW AND WELL LEVEL



### Test Well Monitoring PW5 - TOTAL DAILY FLOW AND WELL LEVEL

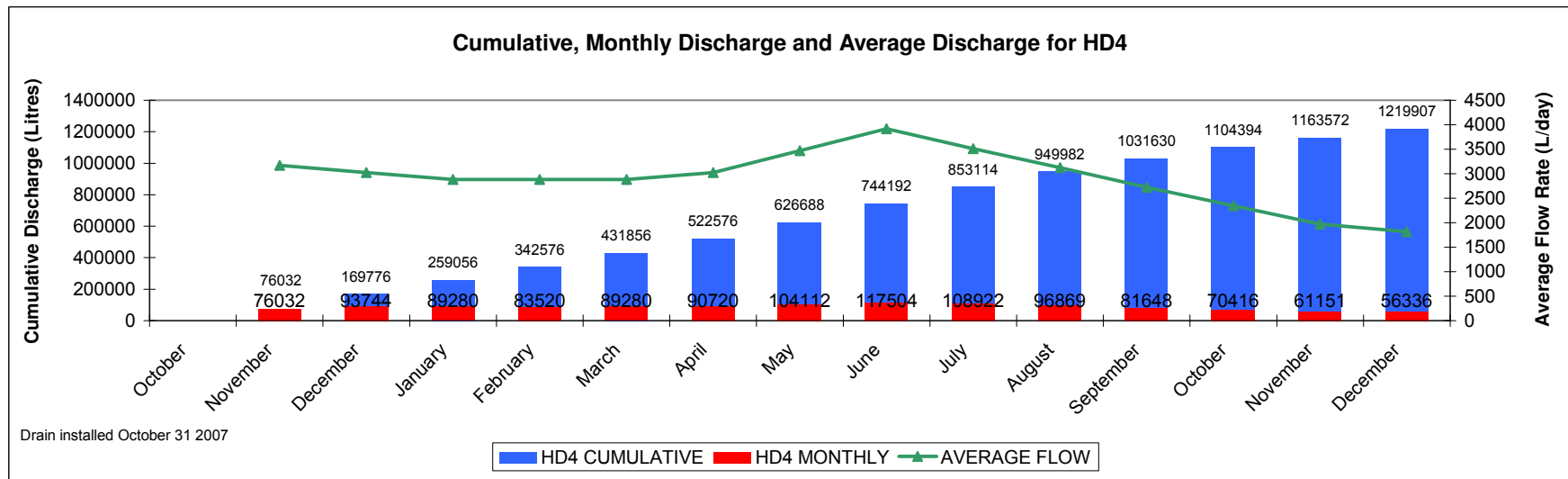


**Appendix E**  
**Horizontal Drains - Summary Table and Production Chart**

### APPENDIX E - Horizontal Drain Information

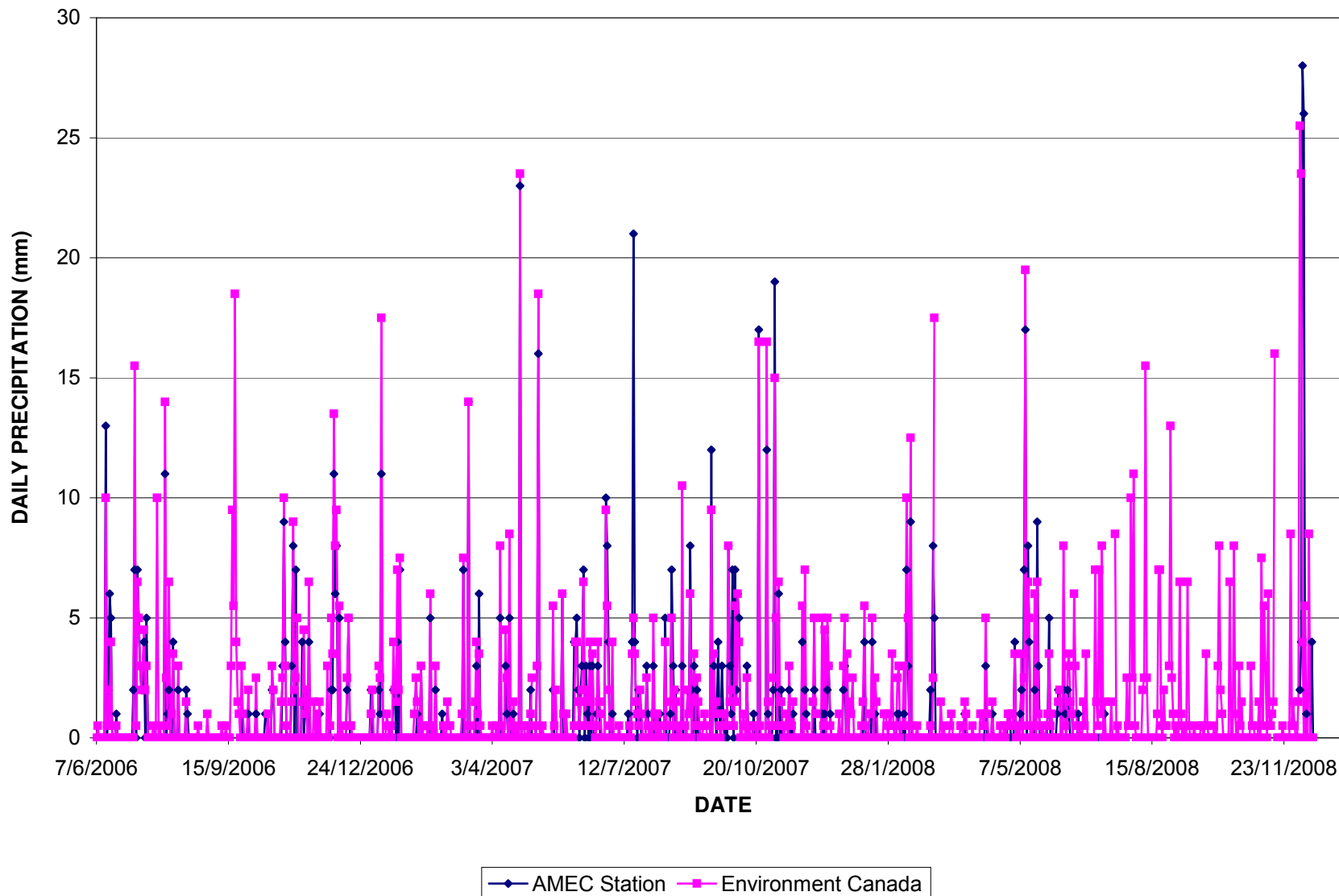
| HD   | Location                   | Installation Date | Length (total/slotted) | Azimuth | Inclination | Monitoring Wells | Status       |
|------|----------------------------|-------------------|------------------------|---------|-------------|------------------|--------------|
| HD1a | Lewis Dr. (at Sikh Temple) | November 2007     | 64.0m/57.9m            | 271     | +2°         | BH23, BH24, BH25 | Active - dry |
| HD1b | Lewis Dr. (at Sikh Temple) | November 2007     | 48.8m/42.7m            | 241     | +1°         | BH23, BH24, BH26 | Active - dry |
| HD4a | Adam St.                   | October 2007      | 135.6m/129.5m          | 271     | +2°         | BH21, BH22       | Active       |
| HD4b | Adam St.                   | October 2007      | 45.7m/39.6m            | 271     | -2°         | BH21, BH22       | Active       |

## Horizontal Drain Flow vs. Time

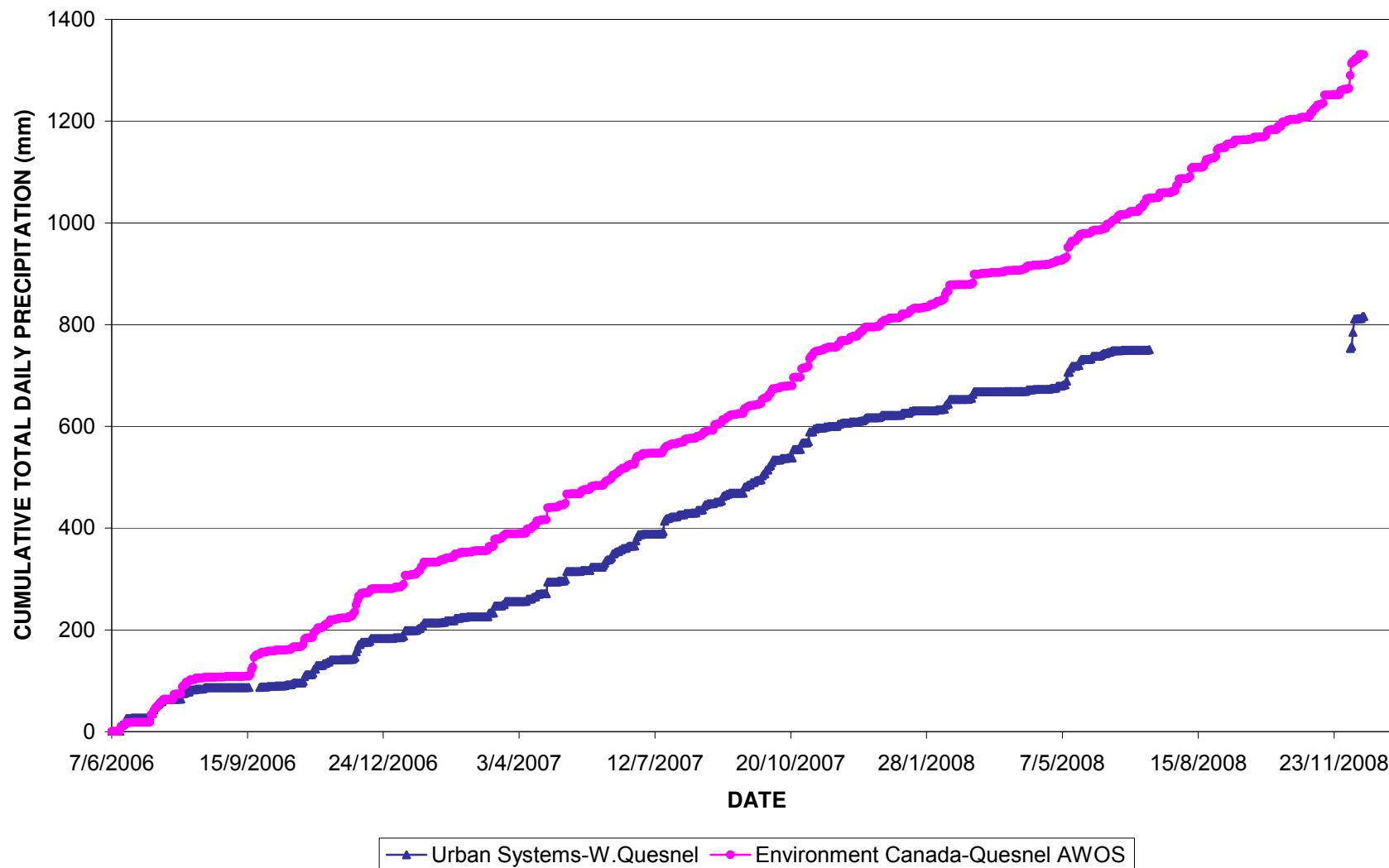


**Appendix F**  
**Various Historical Precipitation Data Charts for the Quesnel Area**

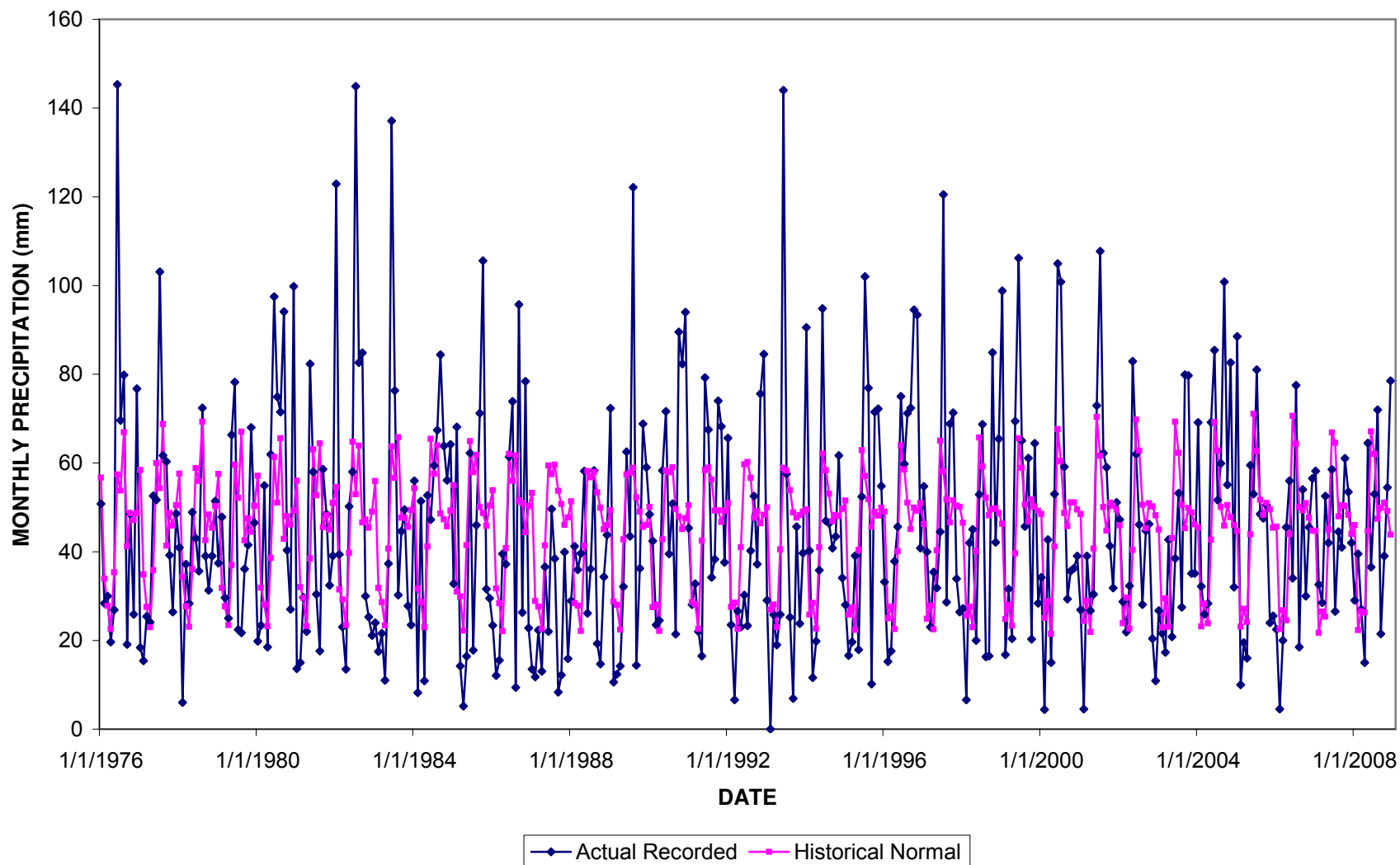
### Total Daily Precipitation (Urban Systems-West Quesnel vs. Environment Canada-Quesnel AWOS Stations)



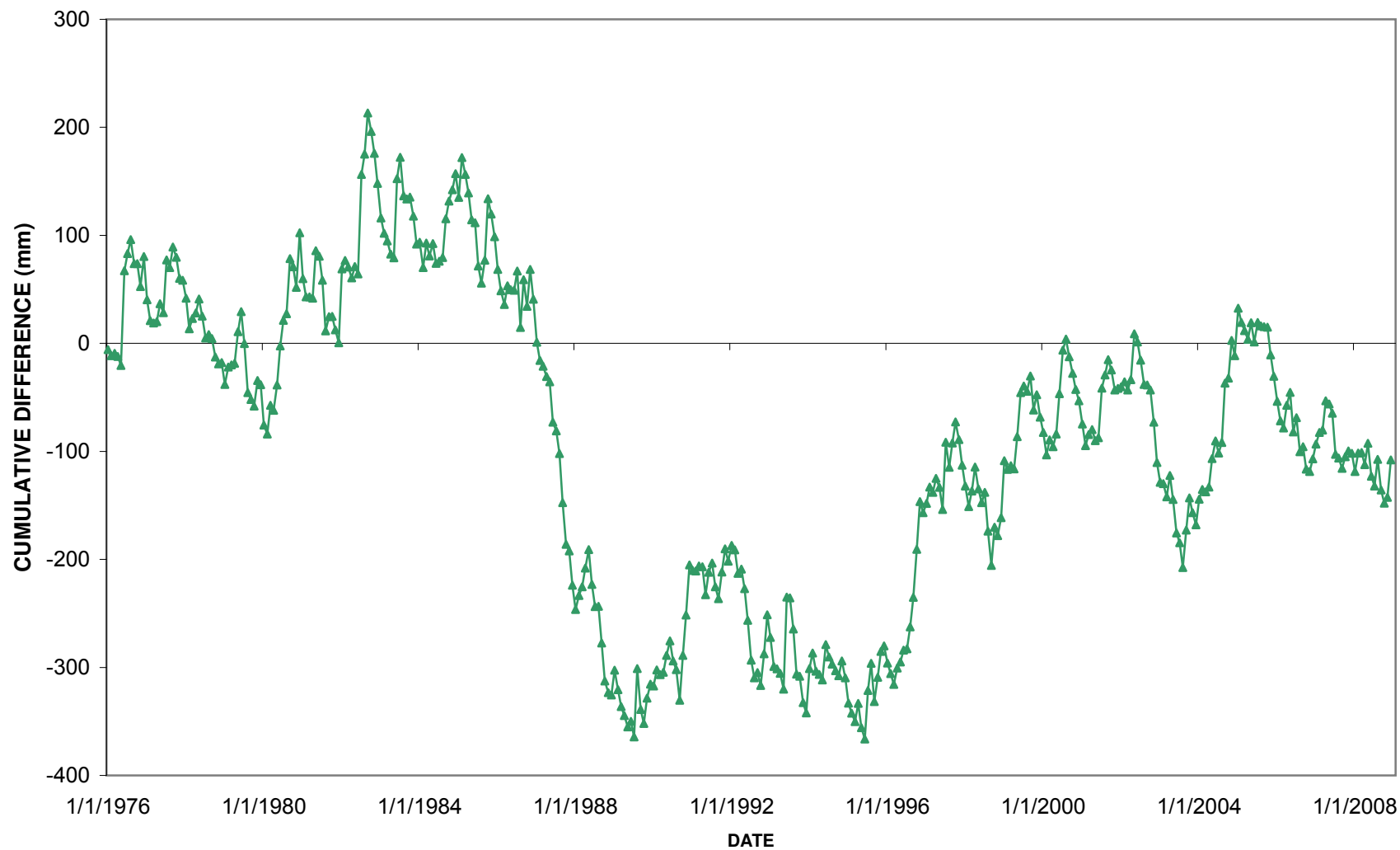
### Cumulative Total Daily Precipitation (Urban Systems-West Quesnel vs. Environment Canada-Quesnel AWOS Stations)



**Total Monthly Precipitation - 1976 to 2008**  
**(Environment Canada - Quesnel AWOS)**

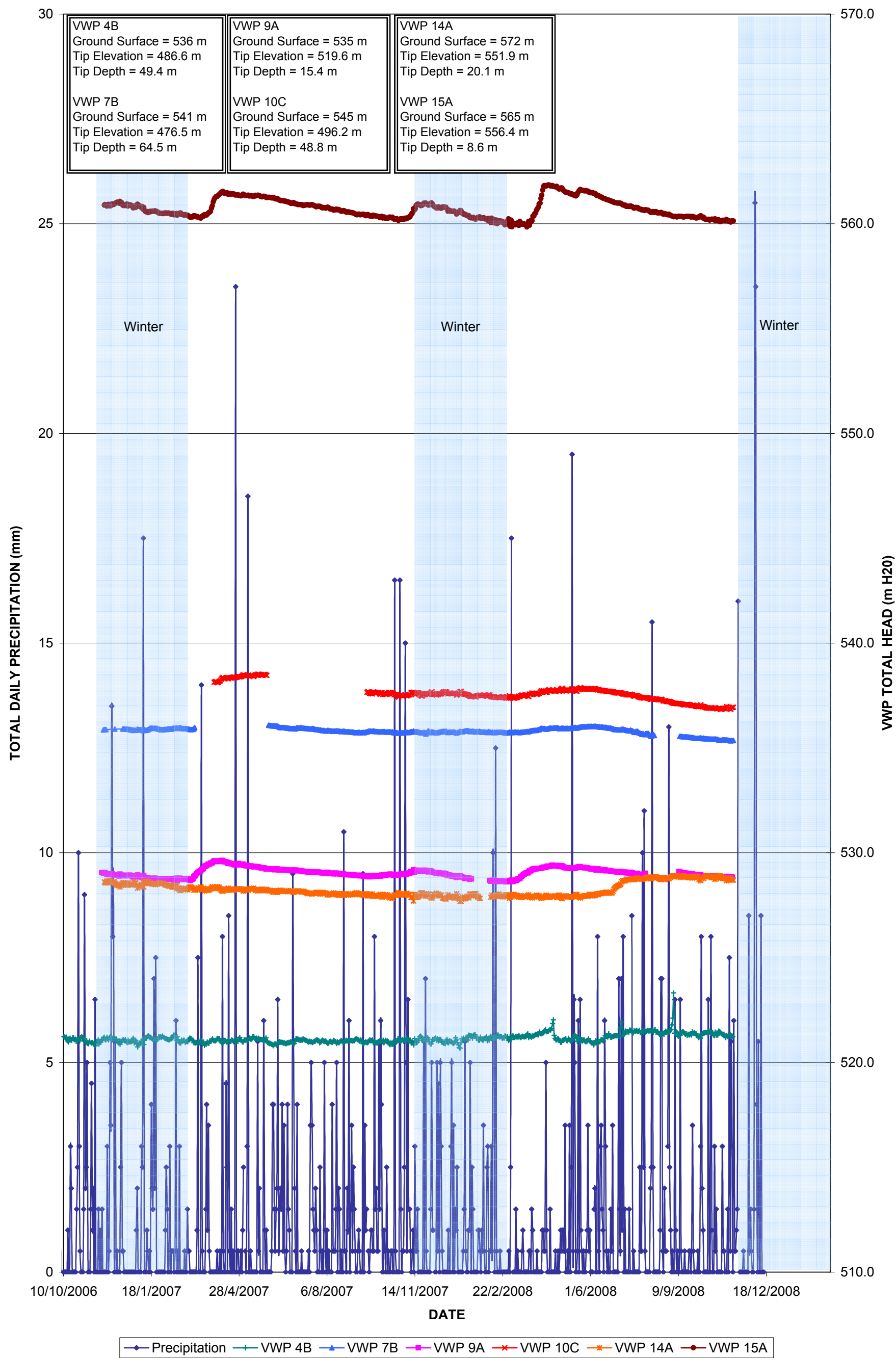


**Total Monthly Precipitation - Cumulative Difference - 1976 to 2008**  
**(Environment Canada - Quesnel AWOS)**

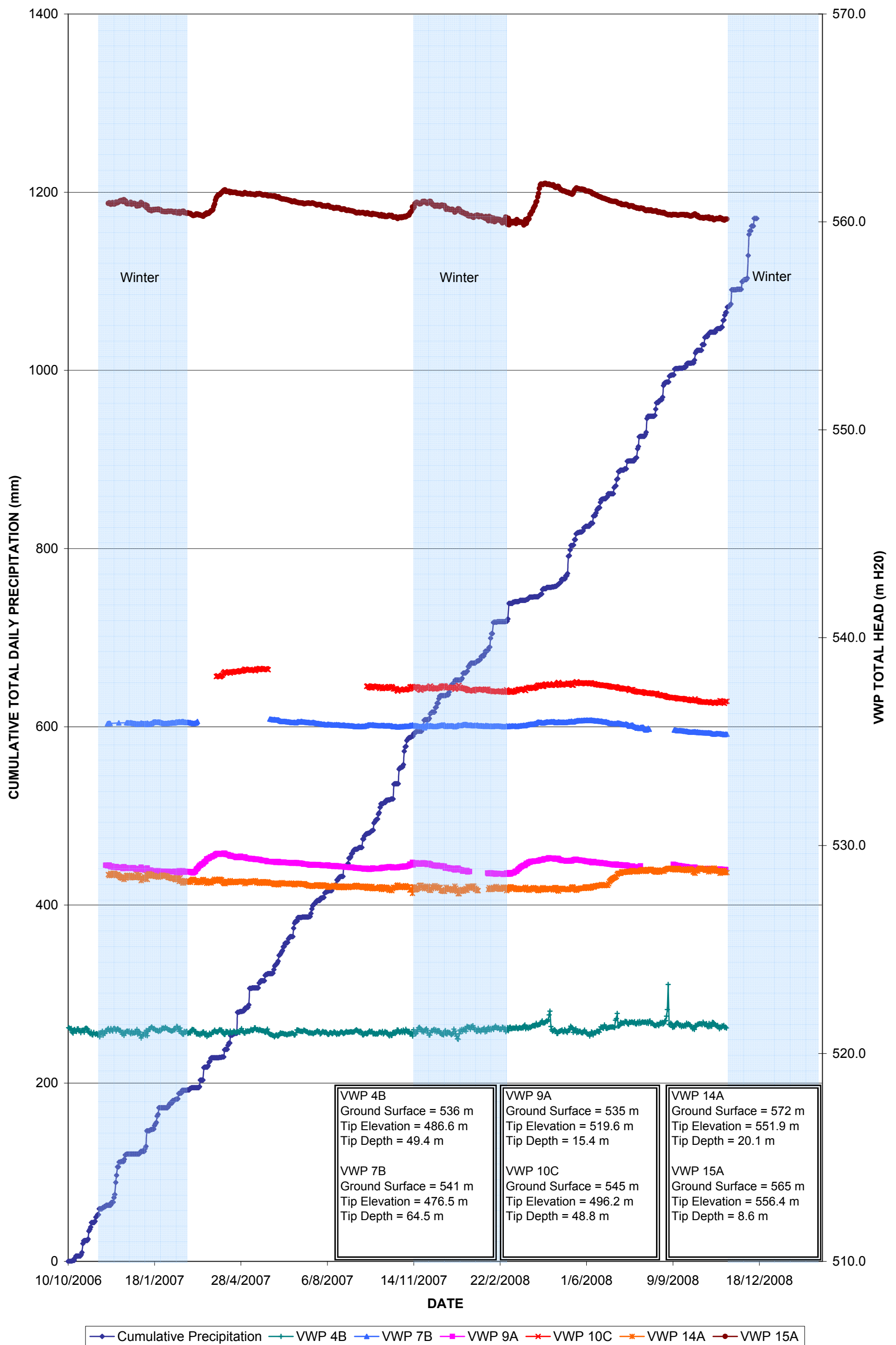


**Appendix G**  
**Data Comparison Charts**

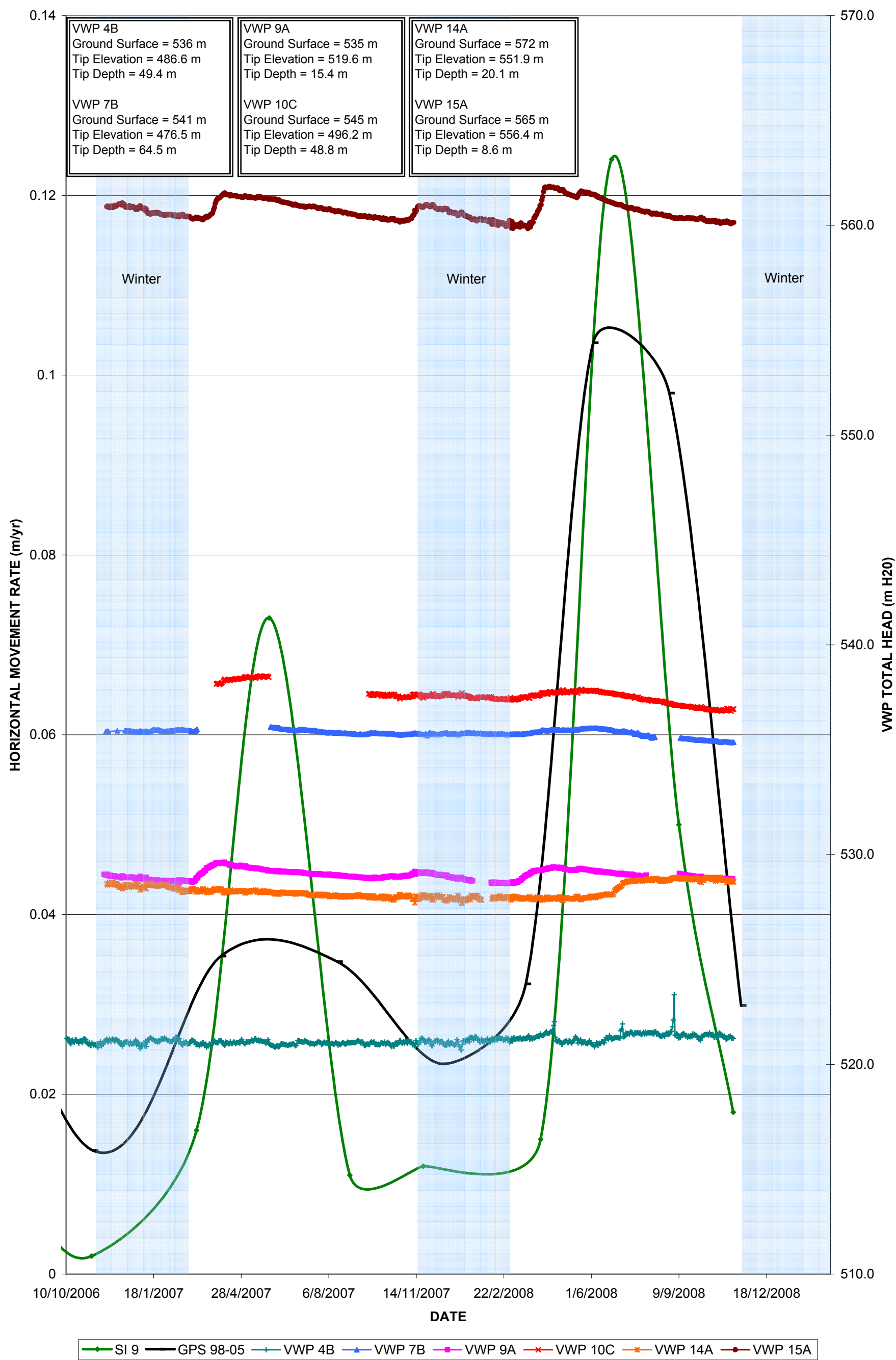
Total Daily Precipitation (Quesnel AWOS) vs. Groundwater Elevation



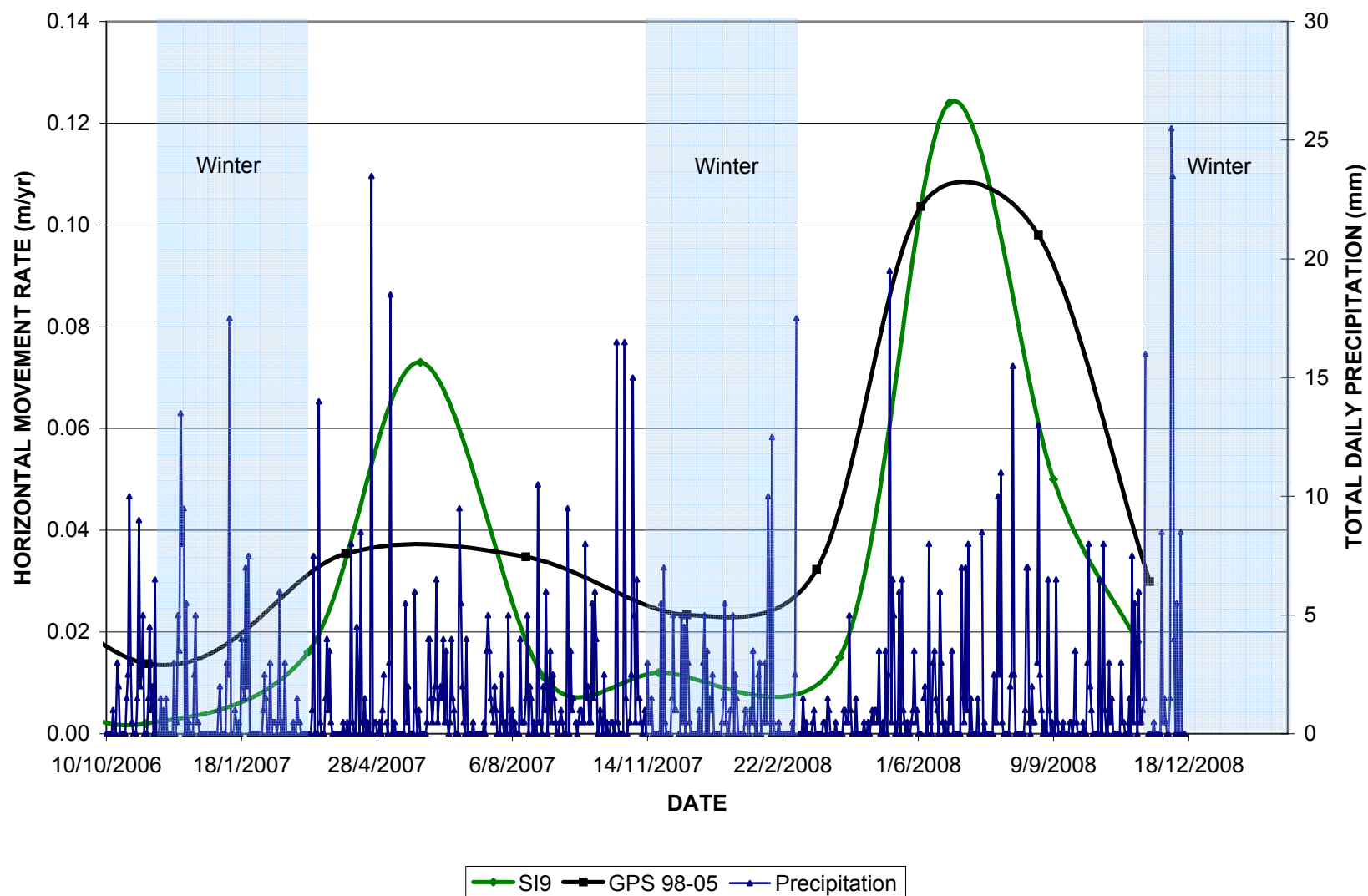
## Cumulative Total Daily Precipitation (Quesnel AWOS) vs. Groundwater Elevation



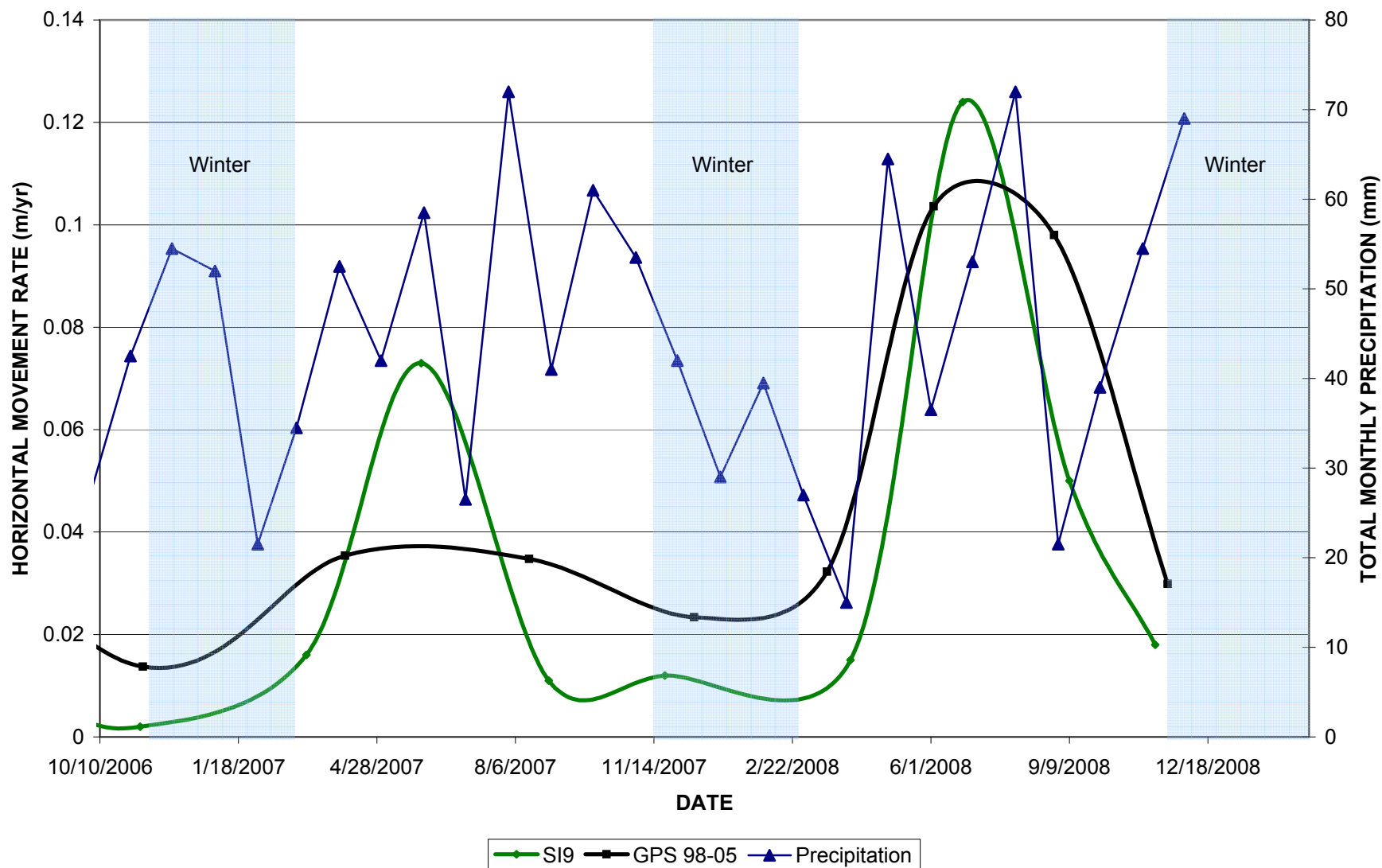
# Incremental Ground Movement Rate vs. Groundwater Elevation



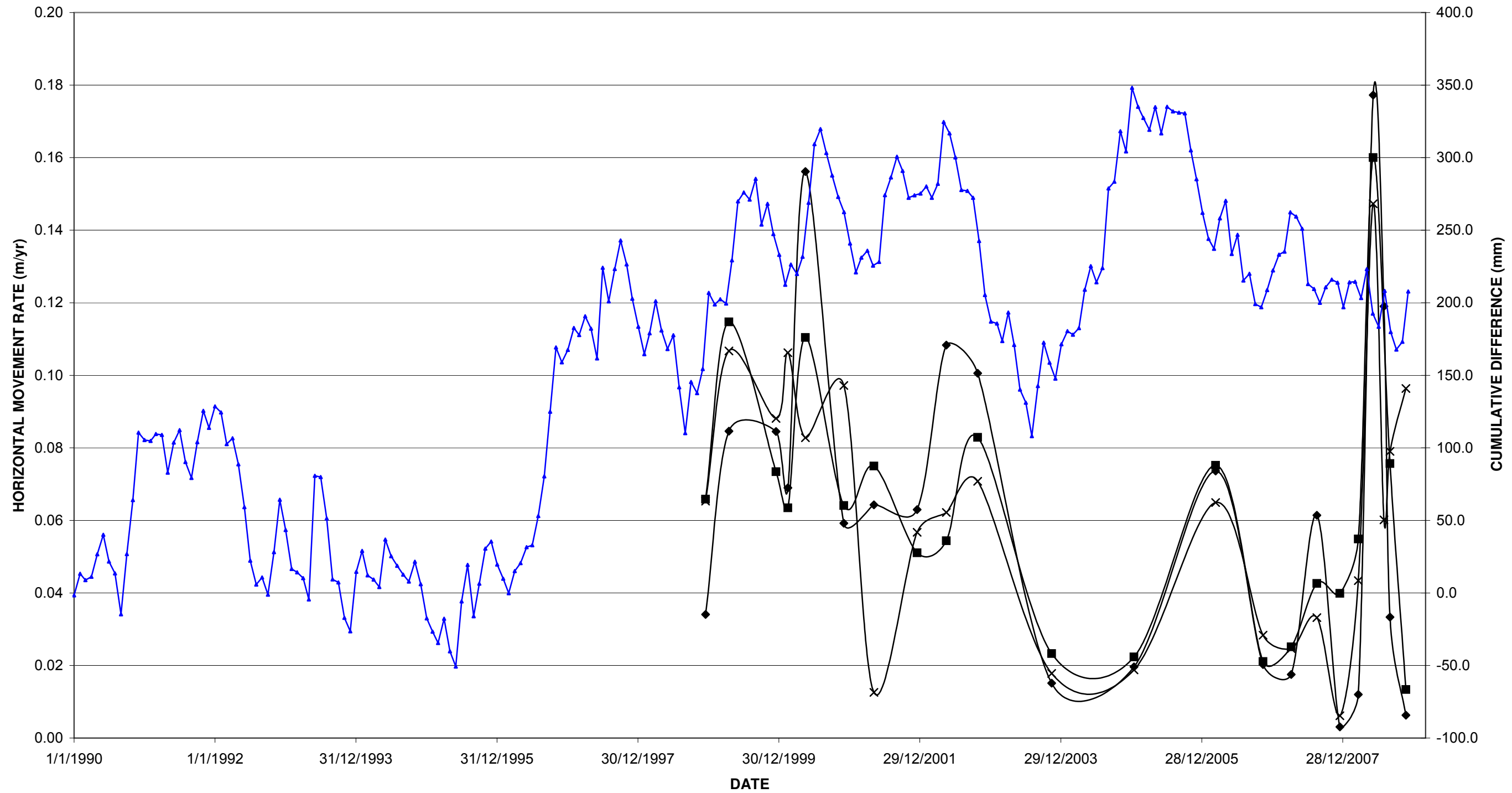
# Incremental Ground Movement Rate vs. Total Daily Precipitation (Quesnel AWOS)



# Incremental Ground Movement Rate vs. Total Monthly Precipitation (Quesnel AWOS)



# Incremental Ground Movement Rate vs. Cumulative Difference - Total Monthly Precipitation (Quesnel AWOS)



—x— GPS 98-09 —■— GPS 98-17 —◆— GPS 98-18 —▲— Cumulative Difference