

Survey Report
of the
Portuguese Landslide Monitoring Survey
September 14, 2012 Full & April 18, 2013 Partial Monitoring
for the
City of Rancho Palos Verdes
by
McGee Surveying Consulting

INDEX

Page Subject

2	PROJECT OVERVIEW
3	HISTORY
3	PROJECT DATUMS, REFERENCE SYSTEM
4	FIELD SURVEYS, DATA COLLECTION, EQUIPMENT & PROCESSING
5	NETWORK
6	MAPS OF GNSS NETWORK
7	MONITORING POINT HISTORY & STATUS
8	ADJUSTMENTS & ANALYSIS
9	ACCURACY
10	QAQC ANALYSIS (QUALITY CONTROL - QUALITY ASSURANCE)
10	DEFLECTION ANALYSIS
10	SUMMARY
11	RECOMMENDATIONS
APPENDIX	
12	Contours of Horizontal Movements –
13	Aerial Photo View of Monitoring Points
13	Oblique Aerial View of Monitoring Points
14	Monitoring Point Status
15	Coordinate List- September 14, 2012 (Current NAD83 Geodetic, Grid Coordinates, NAVD88 Heights)
16	Addendum Report for the April 18, 2013 Partial Monitoring Survey

ATTACHMENT: FULL DATA POSTING (Monitoring points: overall movements and periodical movements)

Survey Report
for the
Portuguese Landslide Monitoring Survey
September 14, 2012
(See Page 16 for the April 18, 2013 Partial Monitoring)
for the
City of Rancho Palos Verdes
by
McGee Surveying Consulting

Client: City of Rancho Palos Verdes;

Surveyed by: McGee Surveying Consulting

Project Name: Portuguese Bend Landslide Monitoring Program

Location: City of Rancho Palos Verdes, California; **County:** Los Angeles; **State:** California

PROJECT OVERVIEW:

On behalf of the City of Rancho Palos Verdes, McGee Surveying Consulting performed slide monitoring and control surveys at Portuguese Bend in September 2012 and a partial monitoring in April 2013. The purpose of the survey was to establish accurate positions on monitoring points to determine overall and periodic movements. The results of the survey are described in this Report and reported on attached spreadsheets titled "Full Data Posting". The April 2013 partial monitoring is addressed at the end of this Report.

The field survey was planned, coordinated and executed by Michael McGee, PLS3945 of McGee Surveying Consulting. Michael McGee, PLS is responsible for the final processing of the observations, network adjustments, analysis and reports. The monitoring points cover approximately a 1½ mile square area and are measured annually or more often as necessary to determine the rate and extent of ground movement. Global Navigation Satellite System (GNSS formerly referred to as GPS) technology was used to measure positions based on the North American Datum of 1983 (NAD83) and the North American Vertical Datum of 1988 (NAVD 88). This survey is referenced to the California CGPS (Continuous GPS) Stations in the region which are permanently mounted GNSS receivers used for monitoring seismic activity. The CGPS in California are similar to the national CORS (Continuously Operated Reference Stations).

Many of the points move a few inches or less per year; therefore, the requirement is to meet an accuracy standard of one centimeter (0.033 feet) at the 95% Level of Confidence. In the active slide area where the movements approach a foot or more per year (PB and UB points in the central portion), the accuracy standard is two centimeters (0.066 feet). Field procedures are designed to accomplish this purpose and Quality Control-Quality Assurance (QAQC) processes discussed hereafter are incorporated to verify these accuracies are attained.

The movements reported between October 3, 2011 and September 14, 2012 (11.4 months) statistically attained an overall average accuracy of 0.027 feet at the 95% Level of Confidence. The actual accuracies of these measurements is estimated to be 0.02 feet as demonstrated by the measured vector residuals, repeatability of measurements at points considered stable, and the analysis of movement deflections. Refer to the sections titled ACCURACY, DEFLECTION ANALYSIS and SUMMARY at the end of this Report for more information.

HISTORY

This survey is a continuation of a monitoring survey program initiated by the County of Los Angeles and taken over by the City of Rancho Palos Verdes circa 1994. McGee Surveying Consulting has conducted the field surveys and reporting since September 2007. See the September 2007 Survey Report for a history of the previous survey process between 1994 and 2007. See the subsequent Survey Reports for the December 2008, November 2009, October 2010 and October 2011 campaigns.

PROJECT DATUMS, REFERENCE SYSTEM

Horizontal Datum: North American Datum of 1983 (NAD83) established by the National Geodetic Survey (NGS); **Epoch:** 2007.00 referred to as NAD83(2007).; **Units:** Feet

Reference Network: The survey is referenced to the CGPS Stations (continuously operating GNSS receivers) mounted on a stable platform. For more information see NGS Data Sheets for the PID's listed below (no data sheet exists for PVE3). The positions listed below were obtained in September 2007 from the California Spatial Reference Center (CSRC). The CSRC provides CA Public resources Code sanctioned positions for the California CGPS Stations.

CGPS	Latitude (dms)			Longitude (dms)			EH (feet)	NGS PID	NAME
PVE3	33	44	35.853290	-118	24	15.269036	235.42	none	PALOS VERDES CORS
PVHS*	33	46	46.020150	-118	22	19.741258	853.99	AJ1915	PENINSULA HIGH SCH
PVRS**	33	46	25.891904	-118	19	14.067218	198.63	AJ1916	PALOS VERDES RES
VTIS	33	42	45.489584	-118	17	37.712290	197.52	AJ1936	MARINE EXCHANGE

* Station not operating during this survey

** Falls in the proximity of a Fault Line as shown below but appears unaffected to date



Vertical Datum: North American Vertical Datum of 1988 (NAVD88) established by the NGS
Geoid Model: Geoid 03; note Geoid09 became available from the NGS in 2009 and Geoid12A in 2012; however, Geoid03 is retained to be consistent with prior reported heights and the primary purpose of determining relative changes over time.

Reference Network: CGPS Station VTIS is also a Second Order leveled benchmark and the original basis for the heights by this survey (see NGS Data Sheets, PID's listed above)

CGPS	NAVD 88 Ht (feet)	
PVE3	none	
PVHS	972.1	Based on a Refined Geoid Model
PVRS	316.37	Based on Second Order Leveling by CSRC
VTIS	315.26	Based on Second Order Leveling by CSRC and original basis for this survey

Projection: NAD83 California State Plane Coordinates Zone 5: The State Plane Coordinate Parameters follow. The average Scale Factor is 1.00007543, the Ellipsoid Height Reduction Factor based on the average ellipsoid heights is 0.99999092, and the average Combined Grid Factor is 1.00006635. Distances in this survey are grid. To obtain ground distances divide grid distances by the Combined Grid Factor. Grid bearings resulting from this survey must be rotated by a Convergence Angle to obtain geodetic (true) bearings. The average convergence angle is -0-12-30± (rotate left 0-12-30).

Datum Stability: The NAD83(2007), 2007.00 Epoch adjustment is one of a series of adjustments of NAD83 since its adoption in 1986 and is the datum used for the monitoring surveys since 2007. Rancho Palos Verdes sits on the Pacific Plate which is moving west-northwesterly relative to the North American Plate about 4 centimeters (0.14 feet) per year. The area southwesterly of the Fault Line shown on the above map includes the City and is moving at a constant rate as exhibited by the N, E, Up velocities of the CGPS Stations listed below. These CGPS Stations provide a rigid reference frame for the Portuguese Landslide Monitoring Program that is validated during each monitoring campaign. See the Adjustment results on Page 8 and the September 2007 Monitoring Survey Report by McGee Surveying Consulting for additional information.

Annual Velocities in Feet Reference Epoch 2012.7			
CGPS	North	East	Up
PVE3	0.061	-0.134	-0.004
PVHS	0.059	-0.130	-0.007
PVRS	0.057	-0.131	0.001
VTIS	0.061	-0.131	-0.004

FIELD SURVEYS, DATA COLLECTION, EQUIPMENT & PROCESSING

72 monitoring points were occupied and reported in this survey. Site photographs and recovery sheets detailing the location, character of the monuments and obstructions were updated. See the Appendix for "Monitoring Point Status for 2013 Prepared 12/09/2012"

Monument AB61 was established in September 2007 on Portuguese Point and is used as the primary base station for Monitoring Surveys. The location is secured behind a locked gate, has a mostly clear horizon above 10 degrees, and sits on a stable basalt geological formation. A 5/8" x 2' rebar with a plastic cap and tack named "AB61ECC" was set for a reference monument on 10/23/2010 to test the local stability of AB61.

The field survey commenced each day by setting a GNSS receiver on a fixed height pole on AB61 and AB20 while a GNSS receiver roamed freely collecting observations on a fixed height pole at 71 points. This results in two measured vectors to each point. Beginning this year, points in the active central area with annual movements greater than 0.3' (PB and UB areas) were occupied a single time and a linear comparison was made with movements from prior years to verify the accuracy meets the 0.07 foot requirement. Otherwise, all other points were occupied twice under a different constellation of satellites on a different day. If the two measurements were within 0.03 feet they were accepted, otherwise a third measurement was obtained.

Many of the points are over-shadowed by mature trees and shrubberies which interfere with signals received from satellites and can affect the quality of measurements. To obtain the best possible accuracies, the satellite constellation is compared with obstruction diagrams to estimate the best time for observing a point. On site, those satellites obstructed by foliage and trees are either turned off or noted for removal in post-processing. If six or more un-obstructed satellites with a GDOP (measure of the geometry of the constellation) of 4 or less are available, then the measurement commenced for a minimum of 15 minutes of data collection. If the geometry and number of satellites are insufficient then the receiver is moved to the next point and returned later when satellite availability improves

Three Leica geodetic GNSS receivers and antennas listed below were utilized to collect, and store satellite signal data. Three, 2 meter fixed height poles were set at the base stations and for the observations of the monitoring points. Prior to initiating the field observations a calibration of the fixed height poles was conducted with a theodolite to verify their heights and plumb. The top of the poles were found to be plumb within 0.004 feet of the bottom consistent with prior years. Additional checks were made each day. There were no equipment failures.

GNSS Survey Parameters:

Date of Field Surveys: 09/10/12 to 09/16/12 (09/14/2012 mean date) 0600-1800 PDST (+7 hrs for UTC).

Constellation: 30 NAVSTAR GPS satellites and 23 GLONASS satellites.

Observables: L1 & L2 Carrier Waves and Codes

Epoch Rate & Occupation Times: 10 seconds for 15 minutes and 4-11 hours for CGPS connections.

Minimum Satellites: 11; GDOP < 4 ; Elevation Mask for Data Collection and Processing: 15 degrees;

Ephemeris: Rapid for Static Post-Processing for CGPS connections and Broadcast for on site.

Weather conditions: Generally clear skies and mild temperatures.

Space Weather: Boulder K Index was 1-3 on a scale of 0-9 (<5 preferred) which gauges ionospheric activity.

Equipment:

GNSS Base Receiver Unit No.: M5, Operator: M. McGee, PLS; Station Occupied: AB61 (Base1)

Make & Model: Leica GS15; Antenna Leica GS15; Mount: Fixed Height Pole #2; Antenna Height: 2.086m

GNSS Rover Receiver Unit No.: M6, Operator: M. McGee, PLS;

Make & Model: Leica GS15; Antenna Leica GS15; Mount: Fixed Height Pole #1; Antenna Height: 2.087m

GNSS Rover Receiver Unit No.: M7, Operator: M. McGee, PLS, Station Occupied: AB20 (Base2)

Make & Model: Leica GS15; Antenna Leica GS15; Mount: Fixed Height Pole #3; Antenna Height: 2.085m

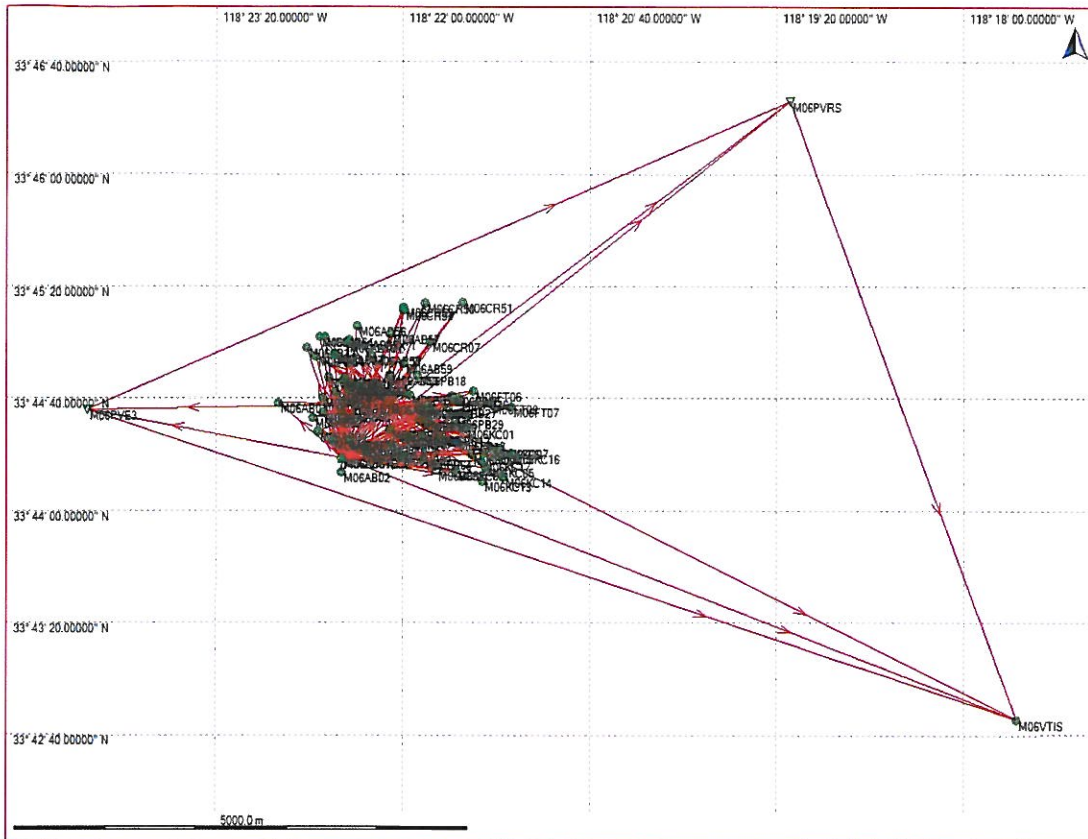
Vectors were processed using Leica LGO v8.1 post processing software. Analysis of residuals led to the rejection of 3 out of 47 vectors connecting the CGPS Stations and AB61, and 6 out of 251 vectors connecting monitoring points. Network adjustments and analysis were performed with "Starnet-PRO" version 7.0 software. Rinex files of the satellite measurements for the CGPS Stations were downloaded from the SOPAC website. The Rapid Ephemeris and Absolute Antenna Models were downloaded from the NGS website. The Absolute Antenna Models published by the NGS replaced the Relative Models used prior to 2011.

NETWORK

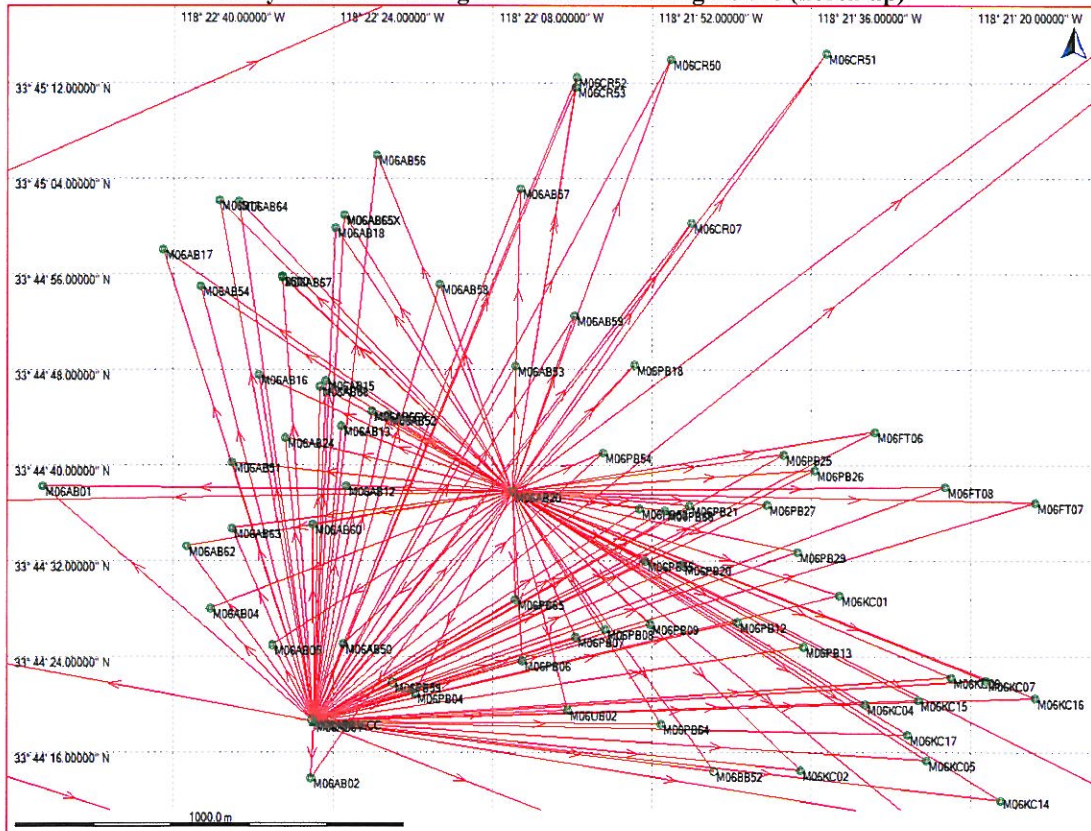
AB61, the primary Base Station, sits on Portuguese Point and is the focal point of the static network connecting the monitoring points and CGPS Stations. 72 on site points and 3 CGPS Stations were connected with 298 vectors measured 1-3 times. See the Network Maps on the next page and the Aerial View in the Appendix.

The monitoring plan uses the CGPS Stations to verify the stability of the reference frame. During the time of this survey PVHS was not available. The primary CGPS Station used to control this survey is PVE3 located just south of City Hall and 1.8 miles west-northwest of the Base Station AB61. CGPS Station PVRS is 3.9 miles northeast, and VTIS is 4.9 miles east-southeast of AB61 as shown on the Network diagram.

Survey Network with CGPS Stations (north up)



Survey Network Enlargement of Monitoring Points (north up)



MONITORING POINT HISTORY and STATUS

For data management purposes during the field survey and data processing, the point names were prefixed with "M06" to distinguish between different monitoring surveys i.e. AB61 was named M06AB61. M06 indicates this survey is the sixth monitoring since the initial September 2007 Monitoring Survey. The prefix is stripped in the final Report.

Between 1994 and 2006, 149 monitoring points were established to monitor the Portuguese Bend Landslides, many of which are lost or destroyed. Sixty of the original points were recovered in 2007. Eight of the 60 points were deleted because they were in close proximity of other points better suited for GNSS leaving 52 points monitored and reported between September 2006 and September 2007. Three of the 52 points (AB09, KC11, PB51) were monitored in September 2007 for the last time because they were replaced by new points, set nearby and better suited for satellite observations. Eighteen new points were set in 2007 and had their movements reported for the first time in the following December 2008 survey. Therefore, in December 2008, 49 original and 18 new points were surveyed for a total of 67 monitoring points.

In the September 2007 Report, it was noted that KC01 was previously reported by others on 9/14/2006 to have moved N 29°E 1.24' from its 12/9/2005 position. In the 2008 survey, a buried partially illegible brass cap in concrete stamped "COUNTY ENGINEER RE8869 1956 STA ??IELDS" was found S31°29'W 1.48 feet from the 1" IP that was used in the initial September 2007 and subsequent surveys. The original 1994 position of KC01 was re-referenced to the 1" IP, resulting in correct overall reported movements.

In the December 2008 Report, it was noted that AB05 had been disturbed by a mowing machine. AB05 was found chipped and leaning to southerly about 0.4'. The movement reporting resumed in 2009. Analysis of the movement and historic data made it possible to estimate the disturbance to within 0.05'. The original 1995 position of AB05 was re-referenced S14°02'E 0.29' to be consistent with the disturbed position, resulting in correct overall reported movements.

In 2009, PB64 was set east of the Archery Range to replace PB63 (set 2007) which had become unsafe to access and was lost in 2010.

In 2010, points AB03 and BB25 were discontinued. AB03 is on the edge of a cliff 192 feet west-southwest of AB61 making it redundant, and BB25 is on an unstable rock disturbed by wave action. In the summer of 2010, PB62 was destroyed by road construction. In October 2010, PB65 was set 24' south-southwest of PB62 and reported for the first time in October 2011. The following points may have been disturbed as of October 2010. AB05 appears to have been disturbed by mower machinery, AB15 (½" GIP in a meter box) is being driven over by vehicles occasionally accessing an adjacent field, and KC02 (½" GIP in a meter box) is occasionally parked on by vehicles accessing the beach.

In October 2011, new points AB62R and AB63R (now referred to as AB62 and AB63) were set to replace AB06 and AB07 which were hazardous to occupy due to their location near the traveled way of Palos Verde Drive South. A deep set permanent monument is planned to be constructed in the future near AB62 and AB63.

Prior to initiating the September 2012 survey, eight new monuments AB64, AB65, AB66, AB67, AB68, CR53, KC17 and PB66 were constructed to replace AB54, AB18, AB52, AB55, AB15, CR52, KC04 and PB53 respectively. The monuments were replaced because of poor sky visibility except for KC04 which was difficult to access and AB55 which was destroyed by trenching in the past year. Interim monuments were set with the following design. Monuments set in soil are 1" x 5' GIP driven flush with a 6" PVC pipe sitting on a concrete collar down about 18". Monuments set in asphalt are 1/2" x 2' rebar driven below the surface inside a free floating concrete collar. See the "Monitoring Point Status for 2013 Prepared December 09, 2012" in the Appendix.

ADJUSTMENTS & ANALYSIS

Adjustment 1: Minimally Constrained Adjustment processed to develop NAD83 (2007) 2007.00 Epoch Geodetic, Ellipsoid and State Plane Coordinates.

Fixed Control: CGPS Station PVE3 was fixed at its published NAD83 (2007) position in a Minimally Constrained Adjustment to determine positions of points in this survey and to check its stability relative to other CGPS stations. PVE3 is located 2 miles west of the slide area has been fixed in all adjustments since 2007. The CSRC publishes a Time Series for the horizontal and vertical stability of PVE3 which indicate the position has been stable over a ten year period to date. The primary base station AB61 and two other CGPS Stations were measured relative to PVE3 and used to assess stability of the reference frame. The positions are based on 9 to 11 hour measurements collected on six days. The coordinate differences at the CGPS Stations from previous positions to the present are listed below in feet.

10/2011 Positions to 09/2012					9/2007 Positions to 09/2012			
Station	dN	dE	dZ		Station	dN	dE	dZ
PVE3	0.000	0.000	0.000	< Fixed >	PVE3	0.000	0.000	0.000
PVRS	0.000	0.000	0.015		PVRS	-0.003	0.013	0.039
VTIS	-0.008	-0.006	-0.005		VTIS	-0.009	0.004	0.012
AB61	0.011	0.005	0.017	<Base Station>	AB61	-0.011	0.006	-0.015

The following is noted: (1) the two dimensional (2D) differences in the measured positions from the October 3, 2011 to the September 14, 2012 of the two CGPS Stations range 0.000 to 0.010 feet and 0.012 feet at AB61; (2) the 2D differences of the CGPS Stations since the initial 2007 survey to the present, range 0.012 to 0.013 feet and 0.012 feet at AB61; and (3) points AB17, CR50, FT08, KC07 and KC16 have a stable history when comparing their 2007 positions with this survey indicating a repeatability of less than 0.02 feet as listed in the attached "FULL DATA POSTING". The vertical components are within 0.02 feet.

Therefore, the survey reference frame is deemed stable and successfully recovered at the level of 0.01 feet horizontally by 0.02 feet vertically as indicated. An adjustment constrained to the CGPS Stations is not preferred or necessary because the purpose here is to track their relative positions over time to test the stability of the reference frame. See the attached file "COORDINATE LIST – September 14, 2012" for a list of coordinates resulting from this adjustment. See prior Reports for coordinates resulting from earlier surveys.

Adjustment 2: Minimally Constrained Adjustment to develop Orthometric Heights (Elevations) in NAVD88

Fixed Control: The CGPS Station PVE3 was fixed horizontally and vertically at its NAVD88 orthometric height determined in the September 2007 survey. The 2007 height was based on the published 2nd Order NAVD88 Height of CGPS Station VTIS. This Adjustment combined the measured ellipsoid height differences with the NGS Geoid 03 (models the separation between the ellipsoid and geoid surfaces) to determine NAVD88 orthometric heights of the other CGPS Stations and the monitoring points. The differences from the previous survey to the heights determined in the present survey are listed below in feet.

10/2011 to 09/2012		
PVE3	0.000	Fixed
PVRS	0.015	
VTIS	-0.005	

Note: This survey's measurements from PVE3 to VTIS check the 2011 height -0.005 feet, same as the ellipsoid height check above and very acceptable for GNSS considering the distance. In October 2011, the NGS First Order Benchmark S1053 located at the intersection of Rancho Palos Verdes South with Hawthorne Boulevard was found -0.016 feet from its records position validating the height of PVE3 based on VTIS and the Geoid03 Model. See the attached file "COORDINATE LIST - September 14, 2012" Survey" for a list of heights resulting from this survey.

ACCURACY

These surveys conform to the intent of the Federal Geodetic Control Subcommittee (FGCS) “Specifications for GPS Relative Positioning” (1988) and the California Geodetic Control Committee (CGCC) “Specifications for High-Production GPS Surveying Techniques” (1993). The vector residuals at each point and the closures on stable control points discussed in “Adjustment 1” are good indications of the accuracies obtained by this survey

Vector Residuals: The two dimensional vector residuals and the absolute value of the vertical residuals resulting from Adjustment #1 are listed below in feet.

	No.	Two Dimensional Residuals			Vertical Residuals (absolute values)		
		Average	Std.Dev.	Maximum	Average	Std.Dev.	Range
Monitoring Pts	245	0.008	0.006	0.035	0.010	0.008	-0.03 to +0.03
CGPS Stations	44	0.008	0.006	0.022	0.010	0.008	-0.03 to +0.02

Vector Accuracy: The lengths, precisions and relative distance errors resulting from the adjustment at the 95% Level of Confidence for the vectors (baselines) are listed below in feet.

	Lengths		PPM Precisions		Relative Dist.Error		
	Vary	Average	Vary	Average	Average	Maximum	Precision
Monitoring Pts	479-7182	3191	0.7-25	4.1 ppm	0.010	0.030	1: 319,000
CGPS Stations	9397-26102	18357	0.2-0.4	0.3 ppm	0.004	0.005	1:4,589,000

The precision ratio based on the averages for the vectors connecting the Monitoring Points exceeds the criteria for a First Order (C-1) by a factor of 3.2, and the vectors connecting AB61 and the CGPS Stations exceeds the criteria for a B Order survey by a factor of 4.6 per the FGCS requirements for the former classification system.

Coordinate Accuracy: The Standard Deviations (68% Level of Confidence) of the coordinates derived from Adjustment #1, relative to the CGPS Station PVE3 follow in feet.

	Monitoring Point			CGPS Stations		
	North	East	Up	North	East	Up
Average Standard Deviation	0.004	0.004	0.012	0.002	0.002	0.006
Maximum Standard Deviation	0.011	0.011	0.046	0.002	0.002	0.006

Absolute Coordinate Accuracy: The network accuracy is expected to be less than 0.02 feet horizontal relative to the NAD83 Datum based on the CGPS Station PVE3 fixed in Adjustment #1.

NAVD88 Heights: The North American Vertical Datum of 1988 orthometric heights resulting from Adjustment #2 are derived from the difference in ellipsoid heights combined with the Geoid 03 model and constrained to the height of PVE3 determined in 2007 based on VTIS. The measured ellipsoid heights relative to PVE3 are expected to be within 0.03 feet but may be greater at obstructed sites. The absolute accuracy of the heights relative to the datum is dependent on the published value on the CGPS Station VTIS.

Although relative elevation accuracies can be within 0.03 feet, up until October 2011 there were no requirements for vertical accuracies. In October 2011, a preference of 0.03 foot relative vertical accuracy was instigated for the following points: AB17, AB57, CR07, CR50 and CR51. In this survey campaign, the criteria has been extended to all points.

Movement Accuracy: For this period, 48 points moved less than 0.30 feet with an average of 0.06 feet. The relative error at the 95% Level of Confidence averaged 0.024 feet with a standard deviation of 0.008 feet and a range of 0.006 to 0.039 feet and one at 0.057 feet at a severely obstructed site. Overall, the relative error averaged 0.027 feet with a standard deviation of 0.009 feet and a range of 0.006 to 0.058 feet. No movement is considered detected unless the movement exceeds the 95% Error for individual points. See Page 6 of the attached “FULL DATA POSTING” for the estimated relative error at the 95% Level of Confidence for individual points.

QUALITY CONTROL - QUALITY ASSURANCE (QAQC) ANALYSIS

To ensure the accuracy and validity of the systems used to obtain the accuracies reported in these GNSS control surveys, an independent test was made using conventional terrestrial based instruments as reported in the “QAQC ANALYSIS” section of the September 2007 Monitoring Survey Report. Comparing the results of the GNSS systems with conventional instrumentation found horizontal measurements agreed 0.01 feet on average. In November of 2011 the GNSS instruments and fixed height poles used in this survey were calibrated on the Santa Maria National Geodetic Survey Baseline and found to agree with published values 0.003 to 0.006 feet.

To validate the radial survey method used in these surveys to position points from a single base station (AB61), independent GNSS cross connections were measured and compared with the computed inverse distances in the 2007, 2008 and 2009 surveys. The results found the two dimensional accuracy to agree 0.01 feet on average, indicating the radial method of measurements is reliable and the extra labor cost of measuring cross connection between points is not warranted. See the “QAQC ANALYSIS” section of the September 2007 and the December 2008 Monitoring Survey Reports for detailed analysis.

DEFLECTION ANALYSIS

Deflection Analysis is a method established by this surveyor to assess the consistency of the direction of movements reported from period to period. Assuming that movements are generally linear, the separation or the deflection between the direction of the previous and present periods taken over the moved distance, is an implied indication of the accuracy obtained with the current measurement technology and a method to detect blunders. Analysis of individual deflections in this survey campaign indicates that for points with multiple occupations the separations varied 0.01 to 0.02 feet, and for single occupied points the separations varied 0.03 to 0.04 feet.

SUMMARY

Prior to September 2007, successive coordinate differences were used to compute movements which did not provide statistical information about the relative accuracies. An upgrading of field procedures and processing techniques began with the initial September 2007 survey. Thereafter, measurement of temporal movements are based on a rigorous simultaneous least squares adjustment of multiple observations at two different epochs for each point.

The results of the October 3, 2011 to September 14, 2012 monitoring period indicates the relative accuracy of the reported movements average 0.027 feet at the 95% Level of Confidence. Statistically, the probability at the 95% level of confidence is that movement (signal) has occurred at a point when the horizontal distance between two epochs is greater than the 95% Error (noise). See the “Full Data Posting” for a listing of the 95% Error estimates (range 0.006 to 0.058 feet). Applying this criteria, 12 points have not moved.

Between October 3, 2011 to September 14, 2012 (11.4 months), points in the Portuguese Bend Landslide (PB points) moved 0.08 to 23.57 feet; points in the Abalone Cove Landslide (AB points) west of the Portuguese Bend Landslide moved 0.04 to 0.10 feet; and points in the Klondike Canyon (KC points) east of the Portuguese Bend Landslide moved 0.04 and 0.08 feet. See the Contours of Horizontal Movement in the Appendix for a graphical representation of the movements across the site.

Velocity Analysis: Overall in the present period (11.4 month), points with an indicated movement greater than 0.04 feet except for PB64 have moved on average 54% of the previous period (11.3 months). PB64 moved 108%. The City Geologist should be referred to for assessment and interpretation of the movements.

See the attached "FULL DATA POSTING" spreadsheet for overall and periodic movements of each point. The movements are given in north, east and up or down as well as a vector of distance and direction relative to north. The direction is given as an azimuth in degrees where 0° is north and increases clockwise (180° is south). The overall movements are from the beginning position of each point which varies between 1994 and 2011.

The present listing and status of monitored points is provided in the Appendix under "Monitoring Point Status for 2013 Prepared 12/09/2012". The historical status of all monitoring points is provided in the September 2007 Survey Report. The historical 1994-2006 positions of all points are listed in the Charles Abbott Associates Inc. file "ALL POINTS MOST RECENT OBSERVED POSITION AS OF SEPTEMBER 15, 2006.xls" attached as an electronic file to the 2007 Report.

RECOMMENDATION

An ongoing re-location program for monuments has long term benefits resulting in better accuracy lower cost surveys. In this survey seven monuments were re-located for improved sky visibility for tracking satellites. A program agreed on in the 2011 Planning Meeting calls for the establishment or replacement of monitoring points with deep set monuments to better detect sub-surface movements. These monuments are expected to be as deep as 10 feet with the upper 4 feet separated from surface motion.

Attachment: Find the following document as an attached to this Report.

"FULL DATA POSTING" lists the coordinates of the initial positions and the overall and periodic movements of monitoring point since 2007 in NAD83(2007.00) State Plane Coordinates and NAVD88 Heights.

SURVEYOR'S STATEMENT

This Report on the criteria, procedures and results of the September 2012 Rancho Palos Verdes Portuguese Landslide Monitoring Survey was prepared by me January 10, 2013 and revised to include the April 2013 Partial Monitoring on March 12, 2014 at the request of Ron Dragoo, Assistant City Engineer of the City of Rancho Palos Verdes.

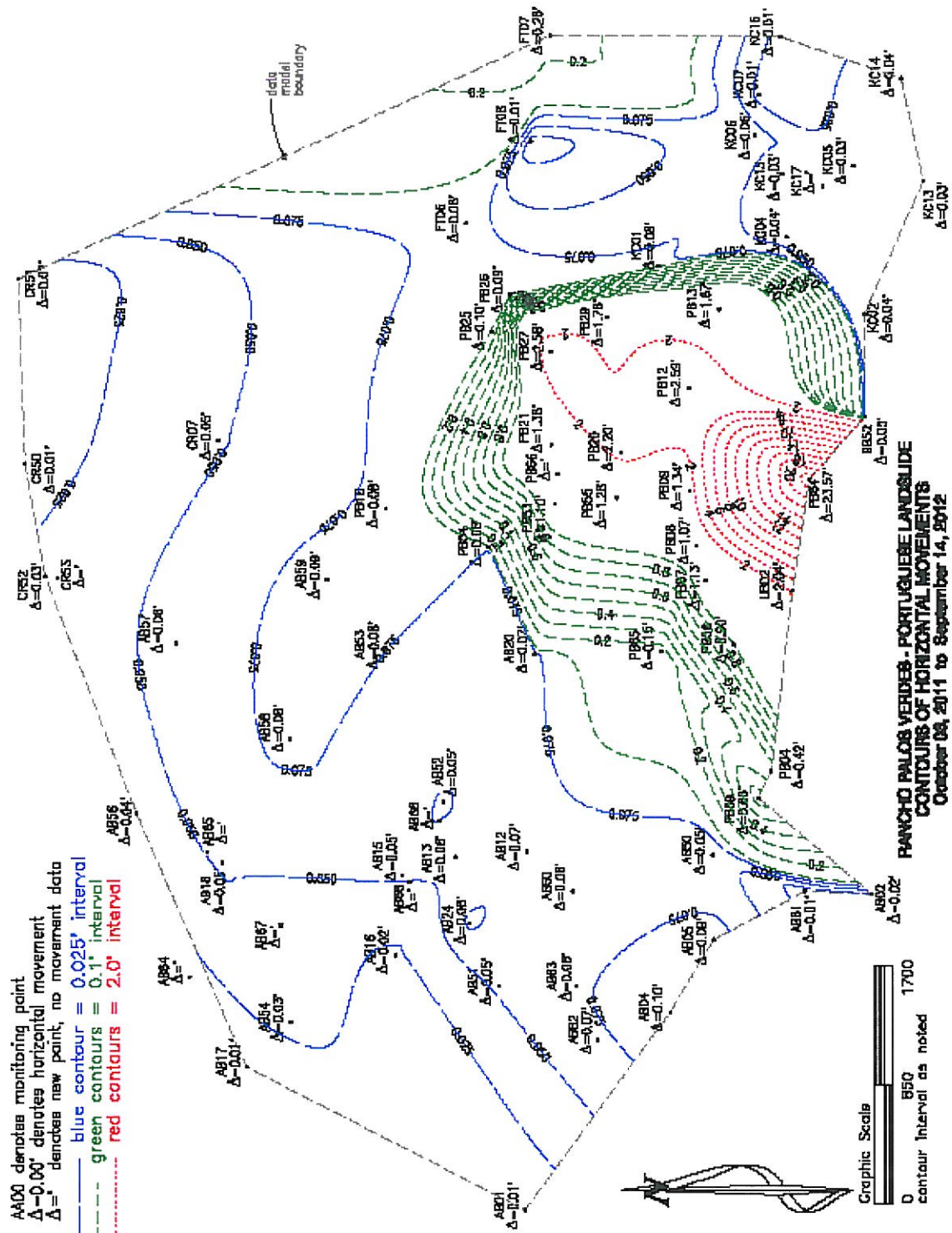

Michael R. McGee P.L.S. 3945



APPENDIX

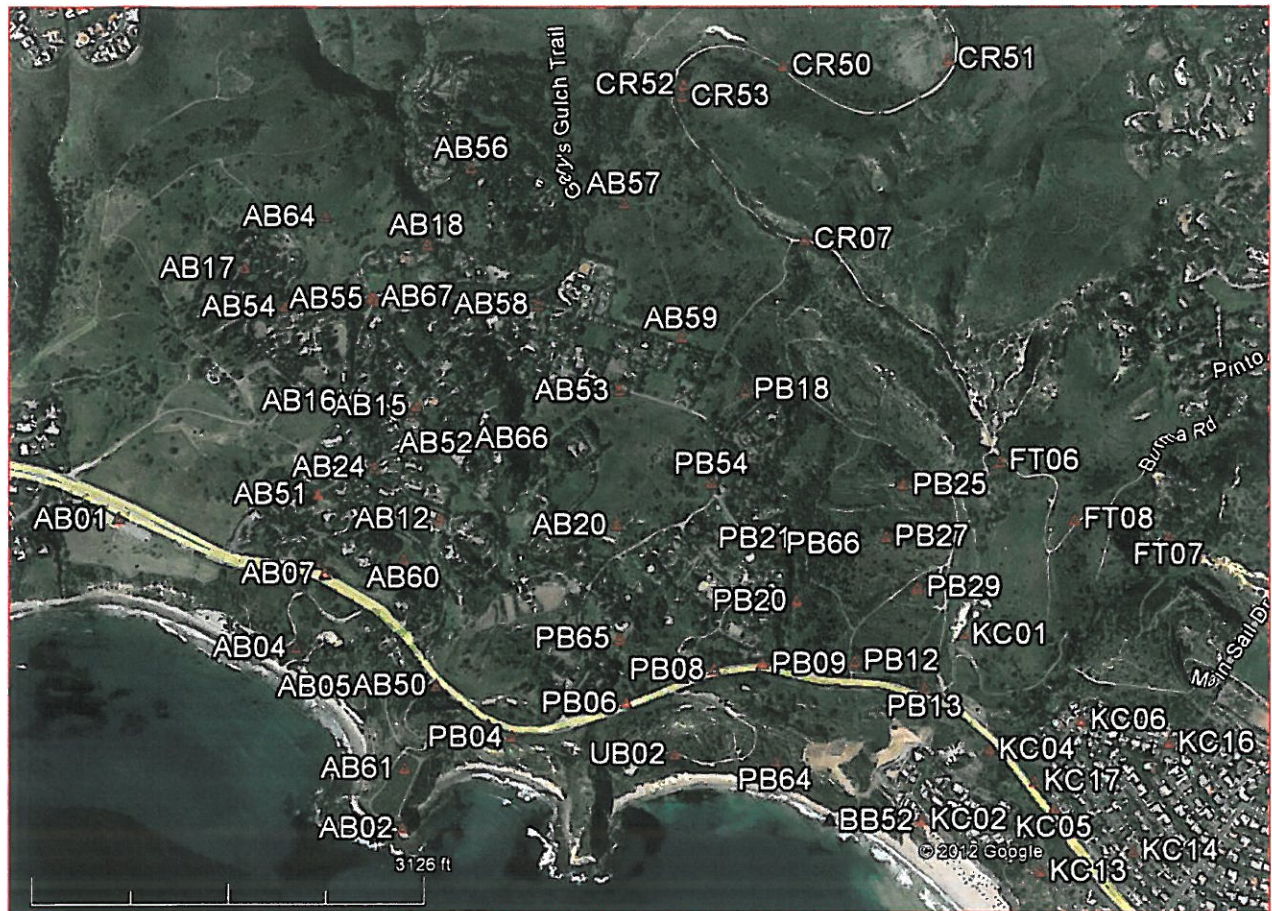
- 12- Contours of Horizontal Movements
- 13- Aerial Photo and Oblique Aerial View of Monitoring Points
- 14- Monitoring Point Status
- 15- Coordinate List- Sept. 14, 2012 Survey NAD83(2007) Geodetic, Grid Coordinates, NAVD88
- 16- Addendum Report for the April 18, 2013 Partial Monitoring Survey

1- Contours of Horizontal Movements (north is left) Oct. 2011 to Sept. 2012 (Contours at 0.025, 0.10 and 2.00 feet provide a general graphical representation of movements; see the Full Data Posting for actual movements; see the City Geologist for interpretation of movements)

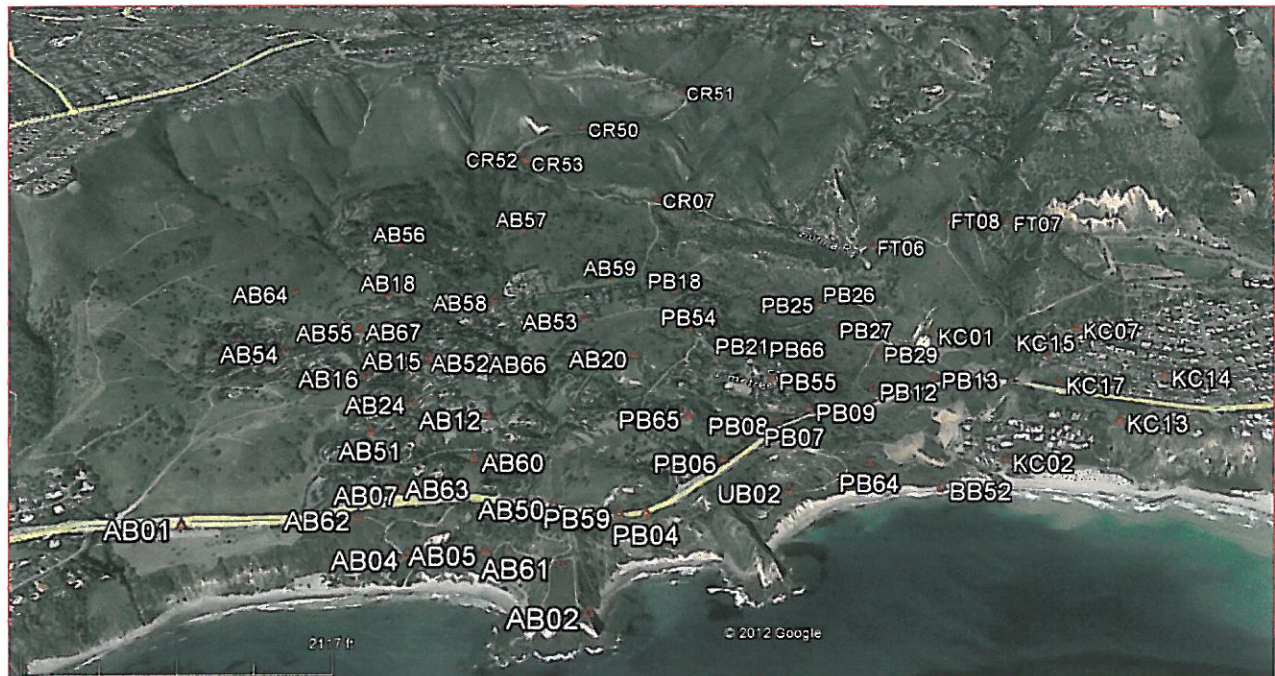


2- Aerial Photo View of Monitoring Points – (Photography Dated 03/07/2011) (north up)

2- Aerial Photo View of Monitoring Points – (Photography Dated 03/07/2011) (north up)



3- Oblique Aerial View of Monitoring Points (looking north)



Monitoring Point Status for 2013 Prepared 12/09/2012

RANCHO PALOS VERDES - PORTUGUESE LAND SLIDE MONITORING

Notes:		162+/- Monitoring Points established since 1994					
09/01/07	71 Points Surveyed	60 old points found with 52 monitored plus 19 new points					
12/01/08	67 Points Surveyed	AB09, KC11, PB51 discontinued; BB53 destroyed; AB05 disturbed					
11/01/09	68 Points Surveyed	Set PB64 to replace PB63 destroyed subsequently					
10/01/10	65 Points Surveyed	Discontinued AB03, BB25; set PB65 to replace PB62 destroyed by paving					
10/03/11	69 Points Surveyed	Set AB62 & AB63 to replace AB06 & AB07					
09/14/12	72 Points Surveyed	Discontinued AB06, AB07; AB55 destroyed by trenching; Added 8 new points					
2013	65 Points to Survey	Discontinue AB15, AB18, AB52, AB54, CR52, KC04, PB53					
Pt ID	Last Obs'd	Comments	GNSS	Pt ID	Last Obs'd	Comments	GNSS
AB01	9/14/2012	Base 1994-2006	G	FT06	9/14/2012		G
AB02	9/14/2012		G	FT07	9/14/2012		G
AB04	9/14/2012		G	FT08	9/14/2012		G
AB05	9/14/2012		G				
AB12	9/14/2012		G	KC01	9/14/2012	NE'ly of 2 pipes 1.5' apart	G
AB13	9/14/2012		F	KC02	9/14/2012		G
AB15	9/14/2012	Discontinued	F	KC04	9/14/2012	Discontinued	G
AB16	9/14/2012		P	KC05	9/14/2012		G
AB17	9/14/2012		F	KC06	9/14/2012		G
AB18	9/14/2012	Discontinued	P	KC07	9/14/2012		G
AB20	9/14/2012	NE'ly of 2 pipes	G	KC13	9/14/2012		G
AB24	9/14/2012		F	KC14	9/14/2012		G
AB50	9/14/2012		G	KC15	9/14/2012		F
AB51	9/14/2012		G	KC16	9/14/2012		G
AB52	9/14/2012	Discontinued	P	KC17	9/14/2012	Replaced KC04	G
AB53	9/14/2012		F				
AB54	9/14/2012	Discontinued	P	PB04	9/14/2012		G
AB55	10/3/2011	Destroyed by trenching	G	PB06	9/14/2012		G
AB56	9/14/2012		F	PB07	9/14/2012		G
AB57	9/14/2012		G	PB08	9/14/2012		G
AB58	9/14/2012		P	PB09	9/14/2012		G
AB59	9/14/2012		G	PB12	9/14/2012		G
AB60	9/14/2012		G	PB13	9/14/2012		G
AB61	9/14/2012	BASE since 2007	G	PB18	9/14/2012		G
AB62	9/14/2012	Replaced AB06	G	PB20	9/14/2012	S'ly of 2 pipes 5.3' apart	G
AB63	9/14/2012	Replaced AB07	G	PB21	9/14/2012		F
AB64	9/14/2012	Replaced AB54	G	PB25	9/14/2012		G
AB65	9/14/2012	Replaced AB18	G	PB26	9/14/2012		F
AB66	9/14/2012	Replaced AB52	G	PB27	9/14/2012		G
AB67	9/14/2012	Replaced AB55	G	PB29	9/14/2012		G
AB68	9/14/2012	Replaced AB15	G	PB53	9/14/2012	Discontinued	P
				PB54	9/14/2012		F
BB52	9/14/2012		G	PB55	9/14/2012		F
				PB59	9/14/2012		G
CR07	9/14/2012		F	PB64	9/14/2012	Replaced PB63	G
CR50	9/14/2012		G	PB65	9/14/2012	Replaced PB62	G
CR51	9/14/2012		G	PB66	9/14/2012	Replaced PB53	G
CR52	9/14/2012	Discontinued	P				
CR53	9/14/2012	Replaced CR52	F	UB02	9/14/2012		G

GNSS column indicates site is Good, Fair or Poor for Satellite Visibility Conditions

McGEE SURVEYING CONSULTING

COORDINATE LIST

Portuguese Landslide 09/14/2012 Monitoring Survey
Prepared by McGee Surveying Consulting Document Date: 12/15/2012

Datum Horizontal & EH NAD83 (2007) Epoch, California State Plane Zone 5, Vertical NAVD88
Note, Fixed CGPS Station PVE3 at Record 3D Position & Orthometric Height per 09/2007 Survey, See 2007 and subsequent Survey Reports

Point	Latitude	Longitude	EH (ft)	North (ft)	East (ft)	OrthoHt(ft)	Description
AB01	33-44-38 30242	118-22-53 05149	60.060	1729427 541	6445709 588	178 542	Punched 1/2" GIP in meter box
AB02	33-44-13 84878	118-22-26 19251	-2.021	1726946 974	6447968 678	116 473	4" BC "SAN PEDRO 1936" on conc block
AB04	33-44-28 09149	118-22-36 28683	-51.253	1728389 969	6447121 523	67 205	BC "CO ENG STA Q2 " on 2"GIP in mass of conc
AB05	33-44-24 99032	118-22-30 09048	-37.942	1728074 511	6447643 663	80 504	BC "CO ENG STA Q3 " on 2"GIP in mass of conc
AB12	33-44-38 27561	118-22-22 72035	164.848	1729415 219	6448271 095	283 192	BC "CO ENG STA 7A " in mass of conc
AB13	33-44-43 34581	118-22-23 16100	246.150	1729927 908	6448235 784	364 471	Punched 1/2" GIP in meter box
AB15	33-44-47 13339	118-22-24 79453	278.514	1730311 311	6448099 254	396 825	Punched 1/2" GIP in meter box
AB16	33-44-47 57981	118-22-31 51207	258.077	1730358 553	6447532 132	376 414	Punched 1/2" GIP in meter box
AB17	33-44-58 06056	118-22-41 08430	324.466	1731421 092	6446727 750	442 799	Punched 1/2" GIP in meter box
AB18	33-44-59 90513	118-22-23 80495	338.604	1731602 107	6448187 619	456 855	Punched spike in center cul-de-sac
AB20	33-44-37 77599	118-22-05 96566	277.949	1729359 494	6449685 872	396 220	BC "CO ENG STA W. FIX 1956 " in mass of conc
AB24	33-44-42 35433	118-22-28 79462	217.396	1729829 448	6447759 649	335 748	Cotton spindle in conc In road
AB25	33-44-25 11172	118-22-22 94461	63.607	1728084 537	6448247 217	182 026	Nail & shiner in conc collar of well
AB51	33-44-40 23022	118-22-34 15182	186.778	1729616 410	6447306 427	305 161	PK mag nail in plastic plug "LS6957" in 1"GIP
AB52	33-44-44 22592	118-22-18 56492	250.035	1730015 441	6448624 253	368 332	Punched spike in center cul-de-sac
AB53	33-44-48 36912	118-22-05 70004	234.635	1730430 282	6449712 228	352 856	Chisled + on s edge conc. Vault
AB54	33-44-55 01385	118-22-37 27969	289.054	1731111 890	6447047 880	407 383	Cotton spindle in intersection
AB56	33-45-05 97072	118-22-19 59323	453.358	1732213 964	6448545 550	571 566	6" mag nail & washer in conc in 2"x 36" GIP
AB57	33-45-03 17109	118-22-05 20574	446.626	1731926 474	6449759 450	564 783	6" mag nail & washer in conc in 2"x 36" GIP
AB58	33-44-55 14474	118-22-13 27657	287.423	1731117 587	6449074 921	405 648	Punched RR spike on s side road
AB59	33-44-52 54214	118-21-59 79431	316.079	1730850 314	6450212 499	434 256	6" mag nail & washer in conc in 2"x 36" GIP
AB60	33-44-35 04165	118-22-26 06508	60.998	1729089 344	6447987 410	179 373	6" mag nail & washer in conc in 2"x 28" GIP
AB61	33-44-18 57309	118-22-25 95798	21.983	1727424 486	6447990 263	140 451	6" mag nail & washer in conc in 2"x 24" GIP
AB61Ecc	33-44-18 71691	118-22-26 13993	22.638	1727439 082	6447974 950	141 106	Tack in plastic plug in 5/8 x 24" rebar
AB62	33-44-33 23117	118-22-38 63182	24.579	1728910 287	6446925 429	143 018	6" mag nail & washer in conc in 1"x 24" GIP
AB63	33-44-34 71870	118-22-34 12043	62.410	1729059 235	6447306 992	180 820	Punched 1/2 x 48" rebar
AB64	33-45-02 13623	118-22-33 46062	413.970	1731830 690	6447373 082	532 251	2" mag nail on NE side 2' conc Collar/Well B12
AB65	33-45-00 93242	118-22-22 90422	340.291	1731705 674	6448264 066	458 533	2" mag nail & washer in conc in 1"x 60" GIP
AB66	33-44-44 53603	118-22-20 14975	255.980	1730047 285	6448490 530	374 283	1/2" x 24" punched rebar 1" below AC conc collar
AB67	33-44-55 71730	118-22-29 06609	287.034	1731180 409	6447741 759	405 326	1/2" x 24" punched rebar 1" below AC conc collar
AB68	33-44-46 61289	118-22-25 31193	275.128	1730258 855	6448055 365	393 445	1/2" x 24" punched rebar 1" below AC conc collar
BB52	33-44-14 45696	118-21-45 75380	-114.435	1726995 940	6451384 295	3 872	PK mag nail in drill hole top large rock mass
CR07	33-45-00 27016	118-21-48 09434	514.075	1731627 959	6451203 359	632 171	6" mag nail & washer in conc in old 1" IP
CR50	33-45-13 97909	118-21-50 11946	754.562	1733013 597	6451037 361	872 617	Tack & shiner on lower rock wall
CR51	33-45-14 49687	118-21-34 43623	858.158	1733062 003	6452361 871	976 151	Tack & shiner on conc pad
CR52	33-45-12 49701	118-21-59 56435	661.502	1732867 499	6450239 274	779 601	Tackail & shiner on rock retaining wall
CR53	33-45-11 63365	118-21-59 73918	662.622	1732780 275	6450224 193	780 724	2" mag nail & washer in conc in 1"x 60" GIP
FT06	33-44-42 78714	118-21-29 58523	370.636	1729854 972	6452760 074	488 720	6" mag nail & washer in conc in 2"x 36" GIP
FT07	33-44-36 87144	118-21-13 65695	470.626	1729252 184	6454103 120	588 669	6" mag nail & washer in conc in 2"x 36" GIP
FT08	33-44-38 19523	118-21-22 57445	540.361	1729388 667	6453350 493	658 435	6" mag nail & washer in conc in 2"x 36" GIP
KC01	33-44-29 13482	118-21-33 10787	194.161	1728475 907	6452457 653	312 338	6" mag nail & washer in conc in old 1" IP
KC02	33-44-14 54805	118-21-37 05718	-104.538	1727002 507	6452118 831	13 729	Punched 1/2" GIP in meter box
KC04	33-44-20 07495	118-21-30 59091	120.218	1727559 275	6452666 955	238 428	BC "CO ENG STA K6 " on 2"GIP in mass of conc
KC05	33-44-15 37073	118-21-24 50939	109.289	1727081 893	6453178 893	227 491	Punched 1/2" GIP in meter box
KC06	33-44-22 33201	118-21-21 96577	181.724	1727784 854	6453396 216	299 880	Punched 1/2" GIP in meter box
KC07	33-44-22 09021	118-21-18 55897	195.343	1727759 393	6453683 854	313 485	Punched 1/2" GIP in meter box
KC13	33-44-10 41224	118-21-25 78264	72.871	1726581 015	6453069 576	191 103	Cotton spindle in AC turnout
KC14	33-44-12 03461	118-21-17 07050	141.724	1726742 416	6453805 978	259 909	Punched spike in center road
KC15	33-44-20 39801	118-21-25 21681	168.883	1727590 318	6453120 951	287 062	Cotton spindle in cul-de-sac
KC16	33-44-20 55004	118-21-13 64604	208.742	1727602 232	6454098 234	326 870	Punched spike in intersection
KC17	33-44-17 55021	118-21-26 32392	97.055	1727302 764	6453026 424	215 253	2" mag nail & washer in conc in 1"x 50" GIP
PB04	33-44-20 98188	118-22-15 80602	48.399	1727664 816	6448848 568	166 808	Nail & tag "RCE26120" in conc in 3" pipe
PB06	33-44-23 68685	118-22-05 04904	58.889	1727934 924	6449758 067	177 236	Punched cap on 2" GIP
PB07	33-44-25 67320	118-21-59 68316	79.173	1728134 071	6450211 979	197 485	Brass tag "LA CO DPW" in conc in 2" GIP
PB08	33-44-26 31413	118-21-56 71665	75.948	1728197 950	6450462 752	194 243	Punched cap on 2" GIP
PB09	33-44-26 78362	118-21-52 15018	70.512	1728244 010	6450848 586	188 785	Punched cap on 2" GIP in cable box
PB12	33-44-26 91503	118-21-43 44847	65.972	1728254 638	6451583 537	184 205	Punched cap on 2" GIP in cable box
PB13	33-44-24 82988	118-21-36 76019	88.452	1728041 819	6452147 640	206 666	Punched cap on 2" GIP in cable box
PB18	33-44-48 41130	118-21-53 76765	244.840	1730430 871	6450719 921	363 009	Punched 1/2" GIP in meter box
PB20	33-44-31 71070	118-21-48 90695	113.935	1728741 102	6451124 295	232 159	Punched cap on 2" GIP in cable box
PB21	33-44-36 65608	118-21-48 28533	153.971	1729240 846	6451178 600	272 169	Punched cap on 2" GIP in cable box
PB25	33-44-40 93311	118-21-38 73996	207.836	1729670 312	6451986 280	325 972	Punched cap on 2" GIP in cable box
PB26	33-44-39 63904	118-21-35 58666	164.797	1729538 538	6452252 111	282 926	Brass tag "LA CO DPW" in conc in 2" GIP
PB27	33-44-36 69991	118-21-40 42526	153.050	1729242 884	6451842 417	271 213	Punched cap on 2" GIP in cable box
PB29	33-44-32 72992	118-21-37 44352	52.239	1728840 649	6452092 792	170 408	Brass tag "LA CO DPW" in conc in 2" GIP
PB53	33-44-36 40318	118-21-53 30186	171.681	1729216 815	6450754 850	289 903	PK mag nail in plastic plug "LS6957" in 1"GIP
PB54	33-44-41 08033	118-21-56 95000	239.489	1729690 752	6450448 477	357 704	PK mag nail in plastic plug "LS6957" in 1"GIP
PB55	33-44-32 02454	118-21-52 73423	121.312	1728774 009	6450801 182	239 552	PK mag nail in plastic plug "LS6957" in 1"GIP
PB59	33-44-21 89377	118-22-18 04845	40.505	1727757 700	6448659 521	158 919	PK mag nail in plastic plug "LS7" in 1" GIP
PB64	33-44-18 38396	118-21-51 11477	-54.630	1727394 562	6450932 955	63 681	2" alum cap "MCGEE SURVEYING " on 1"x36"GIP
PB65	33-44-28 82169	118-22-05 66754	169.369	1728454 202	6449707 733	287 692	2" alum cap "MCGEE SURVEY " on 5/8"x24"rebar
PB66	33-44-36 22129	118-21-50 75440	170.114	1729197 647	6450969 922	288 325	2" mag nail & washer in conc in 1"x 60" GIP
UB02	33-44-19 56843	118-22-00 47541	-55.689	1727517 176	6450142 818	62 658	PK mag nail in plastic plug "7" in 1"GIP
PVE3	33-44-35 85329	118-24-15 26904	235.421	1729207 091	6438765 184	354 360	CGPS Pos Determined 09/14/2012 Survey
PVRS	33-46-25 89206	118-19-14 06720	198.635	1740239 306	6464237 890	316 342	CGPS Pos Determined 09/14/2012 Survey
VTIS	33-42-45 48958	118-17-37 71227	197.525	1717933 676	6472307 224	315 271	CGPS Pos Determined 09/14/2012 Survey

Addendum Report
for the
April 18, 2013 Partial Monitoring Survey
of the
Portuguese Landslide
for the
City of Rancho Palos Verdes
by
McGee Surveying Consulting

Overview:

This Addendum Report describes a mid-year partial monitoring survey in April 2013 at Portuguese Bend. A sub-set of 27 monitoring points were included in this survey. This survey follows the procedures described in the above Report on the September 14, 2012 full monitoring. The results of the survey are reported in the attached spreadsheet titled "FULL DATA POSTING" listing the coordinates, overall and periodic movements of points listed on Page 7.

The movements reported between September 14, 2012 and April 18, 2013 (7.0 months) statistically attained an overall average accuracy of 0.014 feet at the 95% Level of Confidence as demonstrated by the measured vector residuals, repeatability of measurements at points considered stable, and the analysis of movement deflections. For a detailed history of the program and surveys see "History" above. The field survey took place April 16-19 and on April 26, 2013. The Field Surveys, Equipment, Data Collection and Network Design were as described in the above Report. The survey included 27 on site points and 3 CGPS Stations each connected with two to eight vectors for a total of 124 vectors. The Adjustments followed the process as described above with similar results.

Adjustments

Adjustment 1: Minimally Constrained Adjustment processed to develop NAD83 (2007) 2007.00 Epoch Geodetic, Ellipsoid and State Plane Coordinates in feet. **Fixed Control:** CGPS Station PVE3. Difference are in feet from the previous positions shown.

09/2012 Positions to 04/2013				
Station	dN	dE	dZ	
PVE3	0.000	0.000	0.000	< Fixed >
PVRS	-0.019	-0.006	-0.046	
VTIS	-0.006	-0.004	-0.034	
AB61	0.004	-0.002	0.044	<Base Station>

The survey reference frame was deemed stable and successfully recovered.

Summary of Movements: Between September 14, 2012 and April 18, 2013 (7.0 months) points in the Portuguese Bend Landslide (PB points) moved 0.07 to 12.63 feet; points in the Abalone Cove Landslide (AB points) west of the Portuguese Bend Landslide moved 0.01 to 0.06 feet; and points in the Klondike Canyon (KC points) east of the Portuguese Bend Landslide moved 0.01 and 0.02 feet. See the attached "FULL DATA POSTING".

Prepared by McGee Surveying Consulting - Document Date: 9/30/2013, Page 7 Rev.03/05/14

MONITORING POINTS

NAD83 (2007) STATE PLANE COORDINATES & NAVD88 ELEVATIONS of Original Positions, 2007 & Post 2007 Positions

Notes: # Indicates stable points, not moving

* Indicates no signal of horizontal movement detected in the last period at the 95% level of confidence

1= 2005 and prior surveys used a nearby monument S31-29W 1.48', the original position is adjusted here to be

relative to the 1" IP used presently, resulting in correct Overall Movements, see Reports 2/24/2007/1004). Further, the 2007 model was used successfully in the 2011, 2012, 2013, 2014, 2015, 2016, 2017, 2018, 2019, 2020, 2021, 2022, 2023, 2024, 2025, 2026, 2027, 2028, 2029, 2030, 2031, 2032, 2033, 2034, 2035, 2036, 2037, 2038, 2039, 2040, 2041, 2042, 2043, 2044, 2045, 2046, 2047, 2048, 2049, 2050, 2051, 2052, 2053, 2054, 2055, 2056, 2057, 2058, 2059, 2060, 2061, 2062, 2063, 2064, 2065, 2066, 2067, 2068, 2069, 2070, 2071, 2072, 2073, 2074, 2075, 2076, 2077, 2078, 2079, 2080, 2081, 2082, 2083, 2084, 2085, 2086, 2087, 2088, 2089, 2090, 2091, 2092, 2093, 2094, 2095, 2096, 2097, 2098, 2099, 2100, 2101, 2102, 2103, 2104, 2105, 2106, 2107, 2108, 2109, 2110, 2111, 2112, 2113, 2114, 2115, 2116, 2117, 2118, 2119, 2120, 2121, 2122, 2123, 2124, 2125, 2126, 2127, 2128, 2129, 2130, 2131, 2132, 2133, 2134, 2135, 2136, 2137, 2138, 2139, 2140, 2141, 2142, 2143, 2144, 2145, 2146, 2147, 2148, 2149, 2150, 2151, 2152, 2153, 2154, 2155, 2156, 2157, 2158, 2159, 2160, 2161, 2162, 2163, 2164, 2165, 2166, 2167, 2168, 2169, 2170, 2171, 2172, 2173, 2174, 2175, 2176, 2177, 2178, 2179, 2180, 2181, 2182, 2183, 2184, 2185, 2186, 2187, 2188, 2189, 2190, 2191, 2192, 2193, 2194, 2195, 2196, 2197, 2198, 2199, 2200, 2201, 2202, 2203, 2204, 2205, 2206, 2207, 2208, 2209, 2210, 2211, 2212, 2213, 2214, 2215, 2216, 2217, 2218, 2219, 2220, 2221, 2222, 2223, 2224, 2225, 2226, 2227, 2228, 2229, 2230, 2231, 2232, 2233, 2234, 2235, 2236, 2237, 2238, 2239, 2240, 2241, 2242, 2243, 2244, 2245, 2246, 2247, 2248, 2249, 2250, 2251, 2252, 2253, 2254, 2255, 2256, 2257, 2258, 2259, 2260, 2261, 2262, 2263, 2264, 2265, 2266, 2267, 2268, 2269, 2270, 2271, 2272, 2273, 2274, 2275, 2276, 2277, 2278, 2279, 2280, 2281, 2282, 2283, 2284, 2285, 2286, 2287, 2288, 2289, 2290, 2291, 2292, 2293, 2294, 2295, 2296, 2297, 2298, 2299, 2300, 2301, 2302, 2303, 2304, 2305, 2306, 2307, 2308, 2309, 2310, 2311, 2312, 2313, 2314, 2315, 2316, 2317, 2318, 2319, 2320, 2321, 2322, 2323, 2324, 2325, 2326, 2327, 2328, 2329, 2330, 2331, 2332, 2333, 2334, 2335, 2336, 2337, 2338, 2339, 2340, 2341, 2342, 2343, 2344, 2345, 2346, 2347, 2348, 2349, 2350, 2351, 2352, 2353, 2354, 2355, 2356, 2357, 2358, 2359, 2360, 2361, 2362, 2363, 2364, 2365, 2366, 2367, 2368, 2369, 2370, 2371, 2372, 2373, 2374, 2375, 2376, 2377, 2378, 2379, 2380, 2381, 2382, 2383, 2384, 2385, 2386, 2387, 2388, 2389, 2390, 2391, 2392, 2393, 2394, 2395, 2396, 2397, 2398, 2399, 2400, 2401, 2402, 2403, 2404, 2405, 2406, 2407, 2408, 2409, 2410, 2411, 2412, 2413, 2414, 2415, 2416, 2417, 2418, 2419, 2420, 2421, 2422, 2423, 2424, 2425, 2426, 2427, 2428, 2429, 2430, 2431, 2432, 2433, 2434, 2435, 2436, 2437, 2438, 2439, 2440, 2441, 2442, 2443, 2444, 2445, 2446, 2447, 2448, 2449, 2450, 2451, 2452, 2453, 2454, 2455, 2456, 2457, 2458, 2459, 2460, 2461, 2462, 2463, 2464, 2465, 2466, 2467, 2468, 2469, 2470, 2471, 2472, 2473, 2474, 2475, 2476, 2477, 2478, 2479, 2480, 2481, 2482, 2483, 2484, 2485, 2486, 2487, 2488, 2489, 2490, 2491, 2492, 2493, 2494, 2495, 2496, 2497, 2498, 2499, 2500, 2501, 2502, 2503, 2504, 2505, 2506, 2507, 2508, 2509, 2510, 2511, 2512, 2513, 2514, 2515, 2516, 2517, 2518, 2519, 2520, 2521, 2522, 2523, 2524, 2525, 2526, 2527, 2528, 2529, 2530, 2531, 2532, 2533, 2534, 2535, 2536, 2537, 2538, 2539, 2540, 2541, 2542, 2543, 2544, 2545, 2546, 2547, 2548, 2549, 2550, 2551, 2552, 2553, 2554, 2555, 2556, 2557, 2558, 2559, 2560, 2561, 2562, 2563, 2564, 2565, 2566, 2567, 2568, 2569, 2570, 2571, 2572, 2573, 2574, 2575, 2576, 2577, 2578, 2579, 2580, 2581, 2582, 2583, 2584, 2585, 2586, 2587, 2588, 2589, 2590, 2591, 2592, 2593, 2594, 2595, 2596, 2597, 2598, 2599, 2600, 2601, 2602, 2603, 2604, 2605, 2606, 2607, 2608, 2609, 2610, 2611, 2612, 2613, 2614, 2615, 2616, 2617, 2618, 2619, 2620, 2621, 2622, 2623, 2624, 2625, 2626, 2627, 2628, 2629, 2630, 2631, 2632, 2633, 2634, 2635, 2636, 2637, 2638, 2639, 2640, 2641, 2642, 2643, 2644, 2645, 2646, 2647, 2648, 2649, 2650, 2651, 2652, 2653, 2654, 2655, 2656, 2657, 2658, 2659, 2660, 2661, 2662, 2663, 2664, 2665, 2666, 2667, 2668, 2669, 2670, 2671, 2672, 2673, 2674, 2675, 2676, 2677, 2678, 2679, 2680, 2681, 2682, 2683, 2684,

9/24/2007(1994)		Indicates the 2007 position was used for overall; see the 2011 Report for original positions in 1994											
		Original Positions			Sept. 24, 2007 Positions			Overall Movements (US Feet)					
Point	Date	NAD83 SFC Zone 5 (Ft)		NAVD88	NAD83 SFC Zone 5 (Ft)		NAVD88	Original Position to Sept. 24, 2007					
		North (ft)	East (ft)	Elev(ft)	North (ft)	East (ft)	Elev(ft)	North	East	Height	Azim.°	Dist.	Note
AB01	12/1/1994	1729427.58	6445709.61	178.62	1729427.55	6445709.64	178.62	-0.03	0.03	0.00	138	0	#
AB02	9/24/2007(1994)	1726946.98	6447968.69	116.48	1726946.98	6447968.69	116.48						
AB03	12/1/1994	1727338.34	6447818.82	139.60	1727338.39	6447818.81	139.59	0.04	-0.01	-0.01	351	0.04	#
AB04	11/30/1994	1728391.99	6447123.34	67.57	1728390.55	6447122.03	67.31	-1.44	-1.32	-0.26	222	1.95	
AB05	3/14/1995	1728075.72	6447645.17	80.90	Disturbed between 2007-2008								
AB06	4/27/1995	1729059.73	6446976.26	165.28	1729058.58	6446975.91	164.91	-1.15	-0.35	-0.37	197	1.21	
AB07	11/30/1994	1728982.79	6447358.41	159.92	1728981.51	6447357.74	159.40	-1.28	-0.67	-0.52	208	1.44	
AB12	11/30/1994	1729416.49	6448271.64	283.43	1729415.67	6448271.30	283.19	-0.82	-0.35	-0.24	203	0.89	
AB13	11/30/1994	1729928.90	6448236.04	365.03	1729928.25	6448235.90	364.54	-0.65	-0.13	-0.49	192	0.66	
AB15	11/30/1994	1730312.09	6448099.38	397.28	1730311.64	6448099.31	396.90	-0.45	-0.07	-0.38	189	0.45	
AB16	11/30/1994	1730358.19	6447532.12	376.62	1730358.70	6447532.17	376.44	-0.19	0.04	-0.18	168	0.19	
AB17	9/24/2007(1994)	173421.12	6446727.77	442.80	1731421.12	6446727.77	442.80						
AB18	12/1/1994	1731602.62	6448187.49	457.19	1731602.37	6448187.58	456.93	-0.26	0.09	-0.26	162	0.27	
AB20	3/16/1995	1729360.63	6449686.27	396.43	1729360.00	6449686.03	396.23	-0.62	-0.23	-0.20	201	0.67	
AB24	3/12/1997	1729830.35	6447759.96	335.92	1729829.83	6447759.82	335.74	-0.52	-0.14	-0.18	196	0.54	
AB50	1/16/1998	1728085.00	6448248.18	181.98	1728084.71	6448247.54	182.03	-0.29	-0.65	0.05	246	0.71	
AB51	3/22/2002	1729617.01	6447306.54	305.42	1729616.73	6447306.52	305.25	-0.28	-0.02	-0.17	184	0.28	
AB52	3/22/2002	1730016.10	6448624.44	368.61	1730015.79	6448624.36	368.39	-0.31	-0.08	-0.22	195	0.32	
AB53	3/22/2002	1730431.11	6449712.37	353.13	1730430.77	6449712.33	352.90	-0.34	-0.04	-0.23	187	0.34	
AB54	9/24/2007	1731111.94	6447047.87	407.31	1731111.94	6447047.87	407.31						
AB55	9/24/2007	1731174.77	6447753.57	405.38	1731174.77	6447753.57	405.38						
AB56	9/24/2007	1732214.31	6448545.46	571.65	1732214.31	6448545.46	571.65						
AB57	9/24/2007	1731926.91	6449759.36	564.93	1731926.91	6449759.36	564.93						
AB58	9/24/2007	1731118.02	6449074.93	405.67	1731118.02	6449074.93	405.67						
AB59	9/24/2007	1730850.87	6450212.56	434.37	1730850.87	6450212.56	434.37						
AB60	9/24/2007	1729089.70	6447987.57	179.45	1729089.70	6447987.57	179.45						
AB61	9/24/2007	1727424.50	6447990.26	140.47	1727424.50	6447990.26	140.47						
AB62	11/13/2011	1728910.35	6446925.46	143.01	Replacement for AB06								
AB63	11/13/2011	1729059.30	6447307.03	180.84	Replacement for AB07								
AB64	9/14/2012	1731830.69	6447373.08	532.25	Replacement for AB54								
AB65	9/14/2012	1731705.674	6448264.07	458.53	Replacement for AB18								
AB66	9/14/2012	1730047.285	6448490.53	374.28	Replacement for AB52								
AB67	9/14/2012	1731180.409	6447741.76	405.33	Replacement for AB55								
AB68	9/14/2012	1730258.855	6448055.37	393.45	Replacement for AB15								
BB25	11/4/1998	1727200.54	6449932.73	3.81	1727200.25	6449932.73	4.12	-0.29	-0.01	0.31	182	0.29	
BB52	9/24/2007	1726996.36	6451384.38	3.83	1726996.36	6451384.38	3.83						
BB53	9/24/2007	1726831.16	6451840.89	13.81	1726831.16	6451840.89	13.81						
CR07	11/30/1994	1731628.78	6451203.19	633.28	1731628.37	6451203.29	632.48	-0.41	0.10	-0.80	166	0.42	
CR50	9/24/2007(1998)	1733013.62	6451037.38	872.66	1733013.62	6451037.38	872.66						
CR51	9/24/2007(1998)	1733062.03	6452361.86	976.25	1733062.03	6452361.86	976.25						
CR52	9/24/2007(1998)	1732867.58	6450239.32	779.63	1732867.58	6450239.32	779.63						
CR53	9/14/2012	1732780.275	6450224.19	780.72	Replacement for CR52								
FT06	9/24/2007	1729855.61	6452760.21	489.06	1729855.61	6452760.21	489.06						
FT07	9/24/2007	1729253.24	6454104.75	589.01	1729253.24	6454104.75	589.01						
FT08	9/24/2007	1729388.68	6453350.51	658.44	1729388.68	6453350.51	658.44						
KC01	11/30/1994	1728476.36	6452457.91	312.88	1728476.36	6452457.91	312.42	-0.42	-0.32	-0.46	217	0.52	1
KC02	3/14/1995	1727002.89	6452118.99	13.74	1727002.74	6452118.89	13.74	-0.15	-0.11	-0.10	216	0.18	
KC04	3/14/1995	1727559.56	6452667.24	238.84	1727559.46	6452667.09	238.51	-0.10	-0.15	-0.33	236	0.18	
KC05	11/30/1994	1727082.00	6453178.94	227.86	1727082.01	6453178.94	227.53	0.01	-0.15	-0.33	273	0.15	
KC06	11/30/1994	1727784.91	6453396.67	300.35	1727784.94	6453396.40	299.97	0.03	-0.26	-0.38	276	0.26	
KC07	11/30/1994	1727759.19	6453683.92	313.83	1727759.37	6453683.85	313.51	0.18	-0.07	-0.32	340	0.19	
KC13	9/24/2007	1726581.16	6453069.63	191.20	1726581.16	6453069.63	191.20						
KC14	9/24/2007	1726742.44	6453806.05	259.94	1726742.44	6453806.05	259.94						
KC15	9/24/2007	1727590.45	6453121.10	287.10	1727590.45	6453121.10	287.10						
KC16	9/24/2007	1727602.25	6454098.23	326.90	1727602.25	6454098.23	326.90						
KC17	9/14/2012	1727302.764	6453086.42	215.25	Replacement for KC04								
PB04	11/30/1994	1727675.94	6448841.74	170.52	1727667.25	6448849.17	167.49	-8.69	-2.57	-3.03	196	9.06	
PB06	3/15/1995	1727968.45	6449761.84	183.06	1727941.12	6449758.81	178.25	-27.33	-3.03	-4.81	186	27.50	
PB07	3/14/1995	1728175.93	6450219.76	200.21	1728141.60	6450213.44	198.02	-34.32	-6.32	-2.19	190	34.90	
PB08	12/1/1994	1728237.51	6450469.80	193.68	1728204.81	6450463.98	194.09	-32.70	-5.82	0.41	190	33.21	
PB09	11/30/1994	1728288.58	6450851.02	192.52	1728252.20	6450849.11	189.84	-36.38	-1.91	-2.68	183	36.43	
PB12	11/30/1994	1728330.49	6451604.57	193.29	1728268.52	6451587.83	186.93	-61.97	-16.74	-6.36	195	64.19	
PB13	3/14/1995	1728085.97	6452164.34	210.54	1728050.44	6452151.18	207.21	-35.53	-13.16	-3.33	200	37.89	
PB18	3/15/1995	1730446.88	6450711.00	367.58	1730431.80	6450719.76	363.24	-15.08	8.77	-4.34	150	17.44	
PB20	3/14/1995	1728812.77	6451135.67	243.54	1728753.50	6451126.52	234.48	-59.27	-9.16	-9.06	189	59.97	
PB21	3/14/1995	1729298.22	6451172.05	280.02	1729249.90	6451177.92	273.29	-48.32	5.87	-6.73	173	48.68	
PB25	12/1/1994	1729702.31	6451985.65	328.99	1729671.12	6451986.48	326.10	-31.19	0.83	-2.89	178	31.20	
PB26	3/14/1995	1729562.65	6452449.56	285.34	1729539.22	6452252.23	282.95	-23.42	2.67	-2.39	174	23.58	
PB27	3/14/1995	1729339.33	6451836.06	284.42	1729257.91	6451842.02	273.51	-81.43	5.96	-10.91	176	81.65	
PB29	3/15/1995	1728888.95	6452120.49	185.93	1728849.86	6452097.03	173.29	-39.08	-23.46	-12.64	211	45.58	
PB53	12/4/1997	1729252.77	6452533.92	297.75	1729224.25	6450754.60	291.85	-28.52	0.67	-5.90	179	28.53	
PB54	12/4/1997	1729694.90	6450448.69	358.62	1729691.38	6450448.62	357.73	-3.52	-0.07	-0.89	181	3.52	
PB55	1/21/1998	1728812.28	6450804.61	246.33	1728782.51	6450801.87	241.07	-29.77	-2.18	-5.26	184	29.85	
PB59	6/26/2001	1727766.36	6448661.67	163.39	1727761.30	6448660.42	160.61	-5.07	-1.24	-2.78	194	5.22	
PB62	9/24/2007	1728476.64	6449717.56	287.25	1728476.64	6449717.56	287.25						
PB63	9/24/2007	1727734.04	6451488.11	126.06	1727734.04	6451488.11	126.06						
PB64	11/18/2009	1727466.29	6450946.95	72.76	Replacement for PB63								
PB65	10/25/2010	1728454.67	6449707.82	287.75	Replacement for PB62								
PB66	9/14/2012	1729197.647	6450969.92	288.33	Replacement for PB53								
UB02	7/23/1997	1727581.11	6450133.78	67.15	1727534.46	6450140.57	63.20	-46.66	6.78	-3.95	172	47.15	

PORTUGUESE POINT LANDSLIDE MONITORING - FULL DATA POSTING as of Dec.2008
Prepared by McGee Surveying Consulting - Document Date: 9/30/2013

Page 2/7

Notes:

Indicates stable points, not moving

* Indicates no signal of horizontal movement detected in the last period

2 = Hit by mower sometime between 09/07 and 12/08 with an estimated displacement S14E 0.29', the original position is adjusted here to be relative to monitored position used presently, resulting in correct Overall Movements, see Rpt

Point	Dec. 10, 2008 Positions			Overall Movements (US Feet)						Periodic (14.5 months) Movements (US Feet)						
	NAD83 SPC Zone 5 (Ft)		NAVD88	Original Position to Dec. 10, 2008						Sept. 24, 2007 Position to Dec. 10, 2008						
	North	East	Elev(ft)	North	East	Height	Azim.°	Dist.	Note	North	East	Height	Azimuth°	Distance	95%Error	Note
AB01	1729427.54	6445709.63	178.59	-0.05	0.02	-0.03	161	0.05	#	-0.01	-0.01	-0.03	231	0.02	0.017	#
AB02	1726946.99	6447968.68	116.46	0.00	-0.01	-0.02	297	0.01	#	0.00	-0.01	-0.02	297	0.01	0.016	#
AB03	1727338.39	6447818.81	139.58	0.04	-0.01	-0.02	348	0.04	#	0.00	0.00	-0.01	270	0.00	0.015	#
AB04	1728390.43	6447121.92	67.27	-1.56	-1.43	-0.30	222	2.12		-0.12	-0.11	-0.04	222	0.16	0.016	
AB05	1728074.86	6447644.04	80.59	-0.86	-1.13	-0.31	233	1.42	2							2
AB06	1729058.49	6446975.88	164.85	-1.24	-0.38	-0.43	197	1.30		-0.09	-0.03	-0.06	198	0.09	0.019	
AB07	1728981.40	6447357.70	159.34	-1.39	-0.71	-0.58	207	1.56		-0.11	-0.04	-0.06	202	0.12	0.021	
AB12	1729415.57	6448271.26	283.19	-0.92	-0.38	-0.24	203	0.99		-0.10	-0.03	0.00	199	0.11	0.018	
AB13	1729928.17	6448235.89	364.54	-0.73	-0.15	-0.49	192	0.74		-0.08	-0.01	0.00	191	0.08	0.019	
AB15	1730311.56	6448099.30	396.88	-0.53	-0.08	-0.40	189	0.53		-0.08	-0.01	-0.02	188	0.08	0.024	
AB16	1730358.65	6447532.17	376.46	-0.24	0.05	-0.16	168	0.24		-0.05	0.01	0.02	170	0.05	0.024	
AB17	1731421.12	6446727.77	442.79	0.00	0.00	-0.01	194	0.00	#	0.00	0.00	-0.01	194	0.00	0.020	#
AB18	1731602.31	6448187.61	456.91	-0.32	0.11	-0.28	160	0.34		-0.06	0.03	-0.02	155	0.07	0.023	
AB20	1729359.84	6449685.99	396.23	-0.79	-0.28	-0.20	199	0.83		-0.16	-0.04	0.00	195	0.17	0.012	
AB24	1729829.75	6447759.77	335.76	-0.61	-0.19	-0.16	197	0.63		-0.09	-0.04	0.02	205	0.10	0.022	
AB50	1728084.66	6448247.47	181.98	-0.34	-0.71	0.00	245	0.79		-0.05	-0.07	-0.05	235	0.08	0.019	
AB51	1729616.65	6447306.51	305.26	-0.36	-0.03	-0.16	185	0.36		-0.09	-0.01	0.01	190	0.09	0.019	
AB52	1730015.70	6448624.32	368.38	-0.40	-0.12	-0.23	196	0.42		-0.10	-0.03	-0.01	200	0.10	0.028	
AB53	1730430.62	6449712.30	352.90	-0.49	-0.07	-0.23	188	0.50		-0.15	-0.03	0.00	189	0.15	0.028	
AB54	1731111.93	6447047.87	407.30	-0.01	0.00	-0.01	165	0.01	*	-0.01	0.00	-0.01	165	0.01	0.028	*
AB55	1731174.72	6447753.58	405.39	-0.05	0.01	0.01	166	0.05		-0.05	0.01	0.01	166	0.05	0.018	
AB56	1732214.21	6448545.49	571.64	-0.10	0.03	-0.01	161	0.11		-0.10	0.03	-0.01	161	0.11	0.018	
AB57	1731926.78	6449759.40	564.90	-0.13	0.03	-0.03	166	0.13		-0.13	0.03	-0.03	166	0.13	0.018	
AB58	1731117.90	6449074.93	405.65	-0.12	0.00	-0.02	178	0.12		-0.12	0.00	-0.02	178	0.12	0.020	
AB59	1730850.70	6450212.53	434.35	-0.17	-0.02	-0.02	188	0.17		-0.17	-0.02	-0.02	188	0.17	0.020	
AB60	1729089.63	6447987.54	179.39	-0.08	-0.03	-0.06	200	0.08		-0.08	-0.03	-0.06	200	0.08	0.021	
AB61	1727424.49	6447990.27	140.43	-0.01	0.01	-0.04	114	0.01	*	-0.01	0.01	-0.04	114	0.01	0.003	#
BB25	1727200.25	6449932.58	4.15	-0.29	-0.16	0.34	208	0.33		0.00	-0.15	0.03	269	0.15	0.017	
BB52	1726996.24	6451384.35	3.83	-0.12	-0.03	0.00	194	0.13		-0.12	-0.03	0.00	194	0.13	0.024	
BB53	Destroyed															
CR07	1731628.24	6451203.32	632.36	-0.54	0.13	-0.92	166	0.55		-0.13	0.03	-0.12	168	0.13	0.024	
CR50	1733013.62	6451037.38	872.71	0.01	0.01	0.05	45	0.01		0.01	0.01	0.05	45	0.01	0.017	*
CR51	1733062.02	6452361.86	976.24	-0.01	0.00	-0.01	171	0.01		-0.01	0.00	-0.01	171	0.01	0.019	*
CR52	1732867.58	6450239.31	779.64	0.00	-0.01	0.01	258	0.01		0.00	-0.01	0.01	258	0.01	0.023	*
FT06	1729855.42	6452760.17	488.97	-0.19	-0.04	-0.09	192	0.19		-0.19	-0.04	-0.09	192	0.19	0.025	
FT07	1729253.01	6454104.39	588.99	-0.23	-0.36	-0.02	237	0.43		-0.23	-0.36	-0.02	237	0.43	0.015	
FT08	1729388.67	6453350.53	658.47	-0.01	0.02	0.03	114	0.02		-0.01	0.02	0.03	114	0.02	0.015	*
KC01	1728476.25	6452457.85	312.38	-0.53	-0.38	-0.50	215	0.66	1	-0.12	-0.06	-0.04	208	0.13	0.020	
KC02	1727002.67	6452118.88	13.72	-0.22	-0.11	-0.12	207	0.25		-0.07	-0.01	-0.02	185	0.07	0.021	
KC04	1727559.42	6452667.06	238.47	-0.14	-0.18	-0.37	233	0.23		-0.04	-0.04	-0.04	223	0.05	0.017	
KC05	1727081.98	6453178.94	227.52	-0.02	-0.15	-0.34	261	0.15		-0.03	0.00	-0.01	180	0.03	0.020	
KC06	1727784.92	6453396.36	299.93	0.01	-0.30	-0.42	273	0.30		-0.01	-0.04	-0.04	252	0.05	0.021	
KC07	1727759.38	6453683.87	313.50	0.18	-0.05	-0.33	346	0.19		0.00	0.02	-0.01	84	0.02	0.018	*
KC13	1726581.12	6453069.62	191.23	-0.04	-0.01	0.03	194	0.04		-0.04	-0.01	0.03	194	0.04	0.018	
KC14	1726742.44	6453806.04	259.91	0.00	-0.02	-0.03	259	0.02	*	0.00	-0.02	-0.03	259	0.02	0.020	*
KC15	1727590.41	6453121.06	287.13	-0.05	-0.04	0.03	220	0.06		-0.05	-0.04	0.03	220	0.06	0.022	
KC16	1727602.24	6454098.24	326.92	-0.01	0.00	0.02	135	0.01	*	-0.01	0.00	0.02	135	0.01	0.016	*
PB04	1727666.83	6448849.07	167.37	-9.10	-2.67	-3.15	196	9.49		-0.41	-0.10	-0.12	194	0.43	0.017	
PB06	1727939.65	6449758.62	177.96	-28.80	-3.22	-5.10	186	28.98		-1.47	-0.18	-0.29	187	1.48	0.021	
PB07	1728139.82	6450213.09	197.88	-36.10	-6.67	-2.33	190	36.72		-1.78	-0.35	-0.14	191	1.82	0.020	
PB08	1728203.20	6450463.68	194.13	-34.31	-6.12	0.45	190	34.85		-1.61	-0.30	0.04	190	1.64	0.024	
PB09	1728250.32	6450848.98	189.58	-38.26	-2.04	-2.94	183	38.31		-1.88	-0.13	-0.26	184	1.88	0.021	
PB12	1728265.36	6451586.81	186.31	-65.13	-17.76	-6.98	195	67.51		-3.16	-1.03	-0.62	198	3.32	0.019	
PB13	1728048.48	6452150.38	207.09	-37.49	-13.96	-3.45	200	40.01		-1.96	-0.80	-0.12	202	2.12	0.019	
PB18	1730431.47	6450719.84	363.18	-15.41	8.85	-4.40	150	17.77		-0.33	0.08	-0.06	166	0.34	0.020	
PB20	1728750.65	6451126.05	233.99	-62.12	-9.63	-9.55	189	62.86		-2.85	-0.47	-0.49	189	2.89	0.020	
PB21	1729247.73	6451178.08	273.02	-50.49	6.03	-7.00	173	50.85		-2.17	0.16	-0.27	176	2.17	0.021	
PB25	1729670.88	6451986.42	326.07	-31.44	0.77	-2.92	179	31.45		-0.25	-0.07	-0.03	195	0.26	0.019	
PB26	1729539.03	6452252.21	282.94	-23.62	2.65	-2.40	174	23.77		-0.20	-0.02	-0.01	187	0.20	0.018	
PB27	1729254.41	6451842.14	272.98	-84.93	6.08	-11.44	176	85.15		-3.50	0.13	-0.53	178	3.50	0.023	
PB29	1728847.75	6452096.03	172.60	-41.20	-24.46	-13.33	211	47.91		-2.11	-1.01	-0.69	205	2.34	0.020	
PB53	1729222.48	6450754.60	291.44	-30.28	0.68	-6.31	179	30.29		-1.76	0.00	-0.41	180	1.76	0.024	
PB54	1729691.20	6450448.58	357.73	-3.70	-0.11	-0.89	182	3.70		-0.18	-0.04	0.00	193	0.18	0.019	
PB55	1728780.51	6450801.66	240.62	-31.77	-2.38	-5.71	184	31.86		-2.01	-0.21	-0.45	186	2.02	0.031	
PB59	1727760.70	6448660.28	160.34	-5.66	-1.39	-3.05	194	5.83		-0.59	-0.15	-0.27	194	0.61	0.017	
PB62	1728476.42	6449717.52	287.22	-0.21	-0.04	-0.03	192	0.22		-0.21	-0.04	-0.03	192	0.22	0.016	
PB63	1727724.58	6451485.79	121.78	-9.45	-2.32	-4.28	194	9.73		-9.45	-2.32	-4.28	194	9.73	0.020	
UB02	1727530.48	6450141.10	63.00	-50.63	7.31	-4.15	172	51.16		-3.97	0.53	-0.20	172	4.01	0.023	

* Indicates no signal of horizontal movement detected in the last period

Point	Nov. 18, 2009 Positions			Overall Movements (US Feet)							Periodic (11.3 months) Movements (US Feet)						
	NAD83 SFC Zone 5 (Ft)			NAVD88			Original Position to Nov. 18, 2009				Dec. 10, 2008 Position to Nov. 18, 2009						
	North	East	Elev (ft)	North	East	Height	Azim.°	Dist.	Note	North	East	Height	Azim.°	Dist.	95%Error	Note	
AB01	1729427.54	6445709.62	178.540	-0.04	0.01	-0.08	167	0.04		0.00	-0.01	-0.05	304	0.01	0.020	#	
AB02	1726946.97	6447968.68	116.460	-0.02	0.00	-0.02	198	0.02	*	-0.02	0.00	0.00	171	0.02	0.020	#	
AB03	1727338.38	6447818.82	139.570	0.04	0.00	-0.03	4	0.04		-0.01	0.01	-0.01	117	0.01	0.017	#	
AB04	1728390.36	6447121.86	67.250	-1.63	-1.48	-0.32	222	2.20		-0.07	-0.05	-0.02	217	0.09	0.019		
AB05	1728074.78	6447643.96	80.570	-0.94	-1.21	-0.33	232	1.53		-0.08	-0.08	-0.02	226	0.11	0.018		
AB06	1729058.43	6446975.87	164.840	-1.31	-0.39	-0.44	197	1.36		-0.06	-0.01	-0.01	191	0.06	0.019		
AB07	1728981.35	6447357.67	159.330	-1.44	-0.74	-0.59	207	1.62		-0.05	-0.03	-0.01	207	0.06	0.022		
AB12	1729415.50	6448271.24	283.190	-0.98	-0.41	-0.24	203	1.07		-0.07	-0.03	0.00	202	0.07	0.019		
AB13	1729928.13	6448235.87	364.540	-0.77	-0.16	-0.49	192	0.78		-0.04	-0.02	0.00	201	0.04	0.020		
AB15	1730311.51	6448099.30	396.880	-0.57	-0.08	-0.40	188	0.58		-0.05	0.00	0.00	180	0.05	0.026		
AB16	1730358.64	6447532.17	376.450	-0.25	0.04	-0.17	170	0.25		-0.01	-0.01	-0.01	203	0.02	0.021	*	
AB17	1731421.11	6446727.77	442.800	-0.01	0.00	0.00	186	0.01	*	0.00	0.00	0.01	180	0.00	0.019	#	
AB18	1731602.26	6448187.60	456.870	-0.36	0.11	-0.32	163	0.38		-0.04	-0.01	-0.04	189	0.04	0.025		
AB20	1729359.78	6449685.97	396.230	-0.85	-0.30	-0.20	199	0.90		-0.06	-0.02	0.00	200	0.06	0.013		
AB24	1729829.68	6447759.75	335.760	-0.67	-0.21	-0.16	197	0.70		-0.06	-0.02	0.00	198	0.07	0.024		
AB50	1728084.64	6448247.44	182.000	-0.36	-0.74	0.02	244	0.83		-0.02	-0.03	0.02	238	0.04	0.024		
AB51	1729616.60	6447306.48	305.250	-0.41	-0.06	-0.17	188	0.41		-0.04	-0.02	-0.01	208	0.05	0.020		
AB52	1730015.65	6448624.32	368.350	-0.45	-0.12	-0.26	195	0.47		-0.05	0.00	-0.03	181	0.05	0.031		
AB53	1730430.55	6449712.28	352.890	-0.55	-0.09	-0.24	189	0.56		-0.06	-0.02	-0.01	198	0.06	0.026		
AB54	1731111.92	6447047.87	407.360	-0.03	0.00	0.05	178	0.03		-0.02	0.00	0.06	187	0.02	0.029	*	
AB55	1731174.68	6447753.58	405.390	-0.09	0.02	0.01	169	0.09		-0.04	0.01	0.00	171	0.04	0.017		
AB56	1732214.16	6448545.51	571.690	-0.15	0.05	0.04	162	0.16		-0.05	0.02	0.05	164	0.05	0.024		
AB57	1731926.73	6449759.41	564.860	-0.18	0.04	-0.07	166	0.18		-0.05	0.01	-0.04	167	0.05	0.022		
AB58	1731117.85	6449074.94	405.640	-0.17	0.01	-0.03	175	0.17		-0.05	0.01	-0.01	168	0.05	0.022		
AB59	1730850.64	6450212.52	434.340	-0.23	-0.03	-0.03	188	0.23		-0.06	-0.01	-0.01	190	0.06	0.022		
AB60	1729089.58	6447987.53	179.390	-0.12	-0.04	-0.06	199	0.13		-0.04	-0.01	0.00	196	0.05	0.019		
AB61	1727424.49	6447990.27	140.420	-0.01	0.01	-0.05	128	0.02	*	0.00	0.00	-0.01	158	0.01	0.004	#	
											</						

Notes:

* Indicates no signal of horizontal movement detected in the last period

Point	Oct. 25, 2010 Positions			Overall Movements (US Feet)						Periodic (11.1 months) Movements (US Feet)					
	NAD83 SPC Zone 5 (ft)			Original Position to Oct. 25, 2010						Nov. 18, 2009 Position to Oct. 25, 2010					
	North (ft)	East (ft)	Elev(ft)	North	East	Height	Azim.°	Dist.	Note	North	East	Height	Azim.°	Dist.	95%Error Note
AB01	1729427.53	6445709.61	178.52	-0.05	-0.01	-0.10	187	0.05		-0.01	-0.02	-0.02	241	0.02	0.032 *
AB02	1726946.97	6447968.66	116.45	-0.02	-0.03	-0.03	243	0.03	*	0.00	-0.02	-0.01	270	0.02	0.024 *
AB03	Discontinued														
AB04	1728390.27	6447121.79	67.25	-1.72	-1.56	-0.32	222	2.32		-0.09	-0.08	0.00	220	0.12	0.023
AB05	1728074.67	6447643.89	80.53	-1.05	-1.28	-0.37	231	1.66		-0.12	-0.07	-0.04	211	0.14	0.026
AB06	1729058.36	6446975.83	164.82	-1.37	-0.43	-0.46	197	1.44		-0.07	-0.03	-0.02	207	0.07	0.026
AB07	1728981.28	6447357.64	159.31	-1.51	-0.77	-0.61	207	1.70		-0.07	-0.03	-0.02	207	0.08	0.032
AB12	1729415.46	6448271.20	283.20	-1.03	-0.44	-0.23	203	1.12		-0.04	-0.04	0.01	219	0.06	0.017
AB13	1729928.09	6448235.85	364.53	-0.81	-0.19	-0.50	193	0.83		-0.04	-0.02	-0.01	208	0.05	0.021
AB15	1730311.47	6448099.25	396.86	-0.62	-0.14	-0.42	192	0.63		-0.04	-0.05	-0.02	232	0.07	0.023
AB16	1730358.61	6447532.16	376.46	-0.28	0.03	-0.16	173	0.28		-0.03	-0.01	0.01	197	0.03	0.028 *
AB17	1731421.10	6446727.76	442.80	-0.02	-0.01	0.00	205	0.02		-0.01	-0.01	0.00	217	0.01	0.021 *
AB18	1731602.22	6448187.61	456.82	-0.40	0.12	-0.37	164	0.42		-0.04	0.01	-0.05	165	0.04	0.031
AB20	1729359.72	6449685.94	396.23	-0.90	-0.32	-0.20	200	0.96		-0.06	-0.02	0.00	203	0.06	0.012
AB24	1729829.65	6447759.73	335.77	-0.71	-0.23	-0.15	198	0.75		-0.04	-0.02	0.01	212	0.04	0.024
AB50	1728084.62	6448247.38	182.00	-0.38	-0.80	0.02	244	0.89		-0.02	-0.06	0.00	247	0.06	0.031
AB51	1729616.56	6447306.49	305.24	-0.45	-0.05	-0.18	186	0.45		-0.05	0.01	-0.01	172	0.05	0.022
AB52	1730015.61	6448624.30	368.38	-0.49	-0.14	-0.23	196	0.51		-0.04	-0.02	0.03	209	0.04	0.037
AB53	1730430.49	6449712.26	352.91	-0.61	-0.11	-0.22	190	0.62		-0.06	-0.02	0.02	196	0.07	0.027
AB54	1731111.92	6447047.87	407.34	-0.02	0.00	0.03	182	0.02		0.00	0.00	-0.02	326	0.00	0.036 *
AB55	1731174.66	6447753.58	405.40	-0.11	0.02	0.02	171	0.11		-0.02	0.00	0.01	183	0.02	0.018 *
AB56	1732214.12	6448545.51	571.63	-0.19	0.05	-0.02	165	0.20		-0.04	0.00	-0.06	179	0.04	0.028
AB57	1731926.67	6449759.42	564.92	-0.23	0.06	-0.01	165	0.24		-0.05	0.01	0.06	164	0.06	0.027
AB58	1731117.80	6449074.93	405.69	-0.22	0.00	0.02	180	0.22		-0.05	-0.01	0.05	196	0.05	0.026
AB59	1730850.56	6450212.51	434.35	-0.31	-0.04	-0.02	188	0.31		-0.08	-0.01	0.01	185	0.08	0.028
AB60	1729089.53	6447987.50	179.42	-0.17	-0.07	-0.03	201	0.18		-0.05	-0.02	0.03	207	0.06	0.020
AB61	1727424.48	6447990.27	140.47	-0.02	0.01	0.00	150	0.02	*	-0.01	0.00	0.05	193	0.01	0.005 *
BB25	Discontinued														
BB52	1726996.13	6451384.34	3.85	-0.23	-0.04	0.02	190	0.24		-0.05	0.00	-0.01	180	0.05	0.029
BB53	Destroyed														
CR07	1731628.12	6451203.32	632.33	-0.66	0.13	-0.95	169	0.67		-0.06	-0.02	-0.06	202	0.06	0.027
CR50	1733013.59	6451037.37	872.67	-0.03	0.00	0.01	184	0.03		-0.02	-0.02	-0.02	217	0.03	0.023
CR51	1733062.01	6452361.88	976.18	-0.02	0.02	-0.07	144	0.03		0.00	0.01	-0.04	98	0.01	0.026 *
CR52	1732867.55	6450239.31	779.65	-0.03	-0.01	0.02	207	0.03	*	-0.01	0.00	-0.08	186	0.01	0.031 *
FT06	1729855.25	6452760.13	488.89	-0.35	-0.08	-0.17	193	0.36		-0.08	-0.03	-0.03	199	0.09	0.019
FT07	1729252.76	6454104.00	588.85	-0.49	-0.75	-0.16	237	0.90		-0.16	-0.25	-0.05	237	0.30	0.026
FT08	1729388.66	6453350.51	658.43	-0.02	0.00	-0.01	166	0.02	*	-0.02	-0.01	-0.05	206	0.03	0.028 *
KC01	1728476.12	6452457.77	312.38	-0.67	-0.46	-0.50	215	0.81		-0.06	-0.04	0.03	216	0.07	0.023
KC02	1727002.62	6452118.86	13.72	-0.28	-0.14	-0.12	206	0.31		-0.02	-0.01	0.03	197	0.02	0.033 *
KC04	1727559.36	6452667.01	238.44	-0.20	-0.23	-0.40	228	0.30		-0.03	-0.02	-0.01	215	0.04	0.027
KC05	1727081.96	6453178.92	227.47	-0.04	-0.17	-0.39	256	0.18		-0.01	0.00	-0.04	180	0.01	0.029 *
KC06	1727784.89	6453396.32	299.89	-0.02	-0.35	-0.46	266	0.35		-0.01	-0.02	-0.02	233	0.02	0.027 *
KC07	1727759.39	6453683.87	313.47	0.19	-0.04	-0.36	347	0.20		0.01	0.01	0.00	32	0.01	0.031 *
KC13	1726581.08	6453069.61	191.18	-0.07	-0.02	-0.02	195	0.08		-0.03	-0.01	0.00	204	0.03	0.021
KC14	1726742.43	6453806.02	259.89	-0.01	-0.03	-0.05	258	0.03	*	0.00	0.00	-0.03	333	0.00	0.036 *
KC15	1727590.38	6453121.02	287.10	-0.07	-0.07	0.00	227	0.10		0.00	-0.01	0.01	265	0.01	0.027 *
KC16	1727602.23	6454098.24	326.88	-0.02	0.01	-0.02	148	0.02	*	-0.01	0.01	0.01	139	0.01	0.023 *
PB04	1727665.94	6448848.86	167.11	-9.99	-2.88	-3.41	196	10.40		-0.62	-0.13	-0.20	192	0.63	0.030
PB06	1727937.25	6449758.35	177.58	-31.19	-3.49	-5.48	186	31.39		-1.55	-0.17	-0.24	186	1.56	0.032
PB07	1728137.00	6450212.58	197.66	-38.93	-7.18	-2.55	190	39.58		-1.83	-0.32	-0.14	190	1.86	0.030
PB08	1728200.66	6450463.24	194.16	-36.85	-6.56	0.48	190	37.43		-1.65	-0.28	0.04	190	1.67	0.033
PB09	1728247.35	6450848.79	189.24	-41.23	-2.24	-3.28	183	41.29		-1.95	-0.13	-0.22	184	1.95	0.032
PB12	1728260.50	6451585.29	185.30	-69.99	-19.28	-7.99	195	72.60		-3.20	-0.96	-0.64	197	3.35	0.027
PB13	1728045.47	6452149.17	206.87	-40.50	-15.17	-3.67	201	43.25		-1.96	-0.81	-0.11	202	2.12	0.025
PB18	1730431.24	6450719.88	363.10	-15.64	8.89	-4.48	150	17.99		-0.11	0.02	-0.04	169	0.11	0.024
PB20	1728746.32	6451125.33	233.20	-66.45	-10.35	-10.34	189	67.25		-2.86	-0.49	-0.49	190	2.91	0.038
PB21	1729244.44	6451178.35	272.60	-53.78	6.30	-7.42	173	54.14		-2.15	0.18	-0.24	175	2.16	0.029
PB25	1729670.68	6451986.36	326.01	-31.64	0.71	-2.98	179	31.64		-0.10	-0.03	-0.03	196	0.11	0.021
PB26	1729538.86	6452252.16	282.99	-23.79	2.60	-2.35	174	23.93		-0.08	-0.03	0.06	200	0.08	0.028
PB27	1729249.12	6451842.31	272.17	-90.22	6.25	-12.25	176	90.44		-3.47	0.11	-0.56	178	3.47	0.029
PB29	1728844.53	6452094.53	171.59	-44.42	-25.96	-14.34	210	51.45		-2.10	-0.97	-0.64	205	2.31	0.032
PB53	1729219.81	6450754.71	290.67	-32.96	0.78	-7.08	179	32.97		-1.73	0.10	-0.53	177	1.74	0.035
PB54	1729691.04	6450448.55	357.73	-3.86	-0.13	-0.89	182	3.87		-0.08	-0.02	0.02	191	0.08	0.026
PB55	1728777.36	6450801.45	240.18	-34.92	-2.59	-6.15	184	35.02		-2.05	-0.13	-0.32	184	2.05	0.044
PB59	1727759.39	6448659.97	159.70	-6.98	-1.69	-3.69	194	7.18		-0.93	-0.21	-0.47	193	0.95	0.032
PB62	Destroyed														
PB63	Destroyed														
PB64	1727439.04	6450942.07	69.69	-27.25	-4.88	-3.08	190	27.68		-27.25	-4.88	-3.08	190	27.68	0.031
PB65	1728454.67	6449707.82	287.75	Replacement for PB62											
UB02	1727522.77	6450142.13	62.75	-58.34	8.34	-4.40	172	58.94		-5.10	0.67	-0.17	173	5.14	0.030

PORTUGUESE POINT LANDSLIDE MONITORING - FULL DATA POSTING as of Oct. 03, 2011
 Prepared by McGee Surveying Consulting - Document Date: 9/30/2013

Page 5/7

Notes:

* Indicates no signal of horizontal movement detected in the last period

Point	Oct. 03, 2011 Positions			Overall Movements (US Feet)						Periodic (11.3 months) Movements (US Feet)					
	NAD83 SPC Zone 5 (Ft)			Original Position to Oct. 03, 2011						Oct. 25, 2010 Position to Oct. 03, 2011					
	North (ft)	East (ft)	Elev(ft)	North	East	Height	Azim.°	Dist.	Note	North	East	Height	Azim.°	Dist.	95%Error Note
AB01	1729427.55	6445709.59	178.50	-0.04	-0.02	-0.12	213	0.04		0.02	-0.02	-0.02	313	0.02	0.030 *
AB02	1726946.97	6447968.70	116.45	-0.01	0.01	-0.03	124	0.01		0.01	0.04	0.00	81	0.04	0.023
AB04	1728390.04	6447121.59	67.21	-1.95	-1.75	-0.36	222	2.62		-0.23	-0.20	-0.03	221	0.30	0.025
AB05	1728074.57	6447643.73	80.49	-1.15	-1.45	-0.41	232	1.84		-0.09	-0.16	-0.04	240	0.19	0.027
AB06	1729058.21	6446975.77	164.77	-1.53	-0.49	-0.51	198	1.60		-0.16	-0.06	-0.05	202	0.17	0.031
AB07	1728981.13	6447357.52	159.24	-1.66	-0.89	-0.68	208	1.88		-0.15	-0.12	-0.06	218	0.19	0.041
AB12	1729415.28	6448271.12	283.19	-1.21	-0.52	-0.24	203	1.32		-0.18	-0.08	-0.01	204	0.20	0.026
AB13	1729927.96	6448235.79	364.50	-0.93	-0.25	-0.53	195	0.97		-0.12	-0.06	-0.03	205	0.14	0.033
AB15	1730311.37	6448099.26	396.87	-0.72	-0.13	-0.41	190	0.73		-0.10	0.01	0.00	174	0.10	0.032
AB16	1730358.55	6447532.15	376.44	-0.34	0.03	-0.18	175	0.34		-0.06	0.00	-0.02	185	0.06	0.029
AB17	1731421.09	6446727.74	442.78	-0.03	-0.04	-0.02	228	0.05		-0.01	-0.03	-0.02	246	0.03	0.036 *
AB18	1731602.16	6448187.62	456.84	-0.46	0.13	-0.35	165	0.48		-0.06	0.01	0.01	173	0.06	0.032
AB20	1729359.56	6449685.89	396.23	-1.07	-0.38	-0.20	200	1.13		-0.16	-0.06	0.00	199	0.17	0.026
AB24	1729829.52	6447759.68	335.77	-0.84	-0.28	-0.15	198	0.88		-0.13	-0.04	0.01	200	0.13	0.024
AB50	1728084.56	6448247.27	182.01	-0.44	-0.92	0.03	244	1.02		-0.06	-0.11	0.02	243	0.13	0.027
AB51	1729616.46	6447306.45	305.17	-0.55	-0.09	-0.25	189	0.56		-0.10	-0.04	-0.07	200	0.11	0.025
AB52	1730015.49	6448624.26	368.35	-0.61	-0.18	-0.26	197	0.64		-0.12	-0.04	-0.03	200	0.13	0.036
AB53	1730430.36	6449712.24	352.87	-0.75	-0.13	-0.26	190	0.76		-0.14	-0.02	-0.04	189	0.14	0.028
AB54	1731111.92	6447047.87	407.31	-0.02	0.01	0.00	164	0.03	*	0.00	0.01	-0.02	97	0.01	0.033 *
AB55	1731174.61	6447753.58	405.37	-0.15	0.02	-0.01	173	0.16		-0.04	0.00	-0.03	179	0.04	0.027
AB56	1732214.00	6448545.55	571.57	-0.31	0.09	-0.08	164	0.32		-0.12	0.04	-0.06	162	0.12	0.026
AB57	1731926.54	6449759.46	564.83	-0.37	0.09	-0.10	166	0.38		-0.14	0.03	-0.10	166	0.14	0.026
AB58	1731117.67	6449074.94	405.64	-0.35	0.00	-0.03	179	0.35		-0.13	0.00	-0.05	178	0.13	0.038
AB59	1730850.40	6450212.51	434.27	-0.47	-0.05	-0.10	186	0.47		-0.16	-0.01	-0.07	182	0.16	0.030
AB60	1729089.38	6447987.45	179.39	-0.32	-0.12	-0.06	200	0.34		-0.15	-0.05	-0.03	199	0.16	0.025
AB61	1727424.48	6447990.26	140.43	-0.02	0.00	-0.04	177	0.02	*	0.00	-0.01	-0.04	259	0.01	0.008 *
AB62	1728910.35	6446925.46	143.01	Replacement for AB06											
AB63	1729059.30	6447307.03	180.84	Replacement for AB07											
BB52	1726995.98	6451384.32	3.89	-0.38	-0.06	0.06	188	0.39		-0.15	-0.01	0.04	185	0.15	0.032
CR07	1731628.00	6451203.34	632.26	-0.78	0.15	-1.02	169	0.79		-0.12	0.02	-0.07	171	0.12	0.034
CR50	1733013.59	6451037.37	872.65	-0.03	-0.01	-0.01	197	0.03		0.00	-0.01	-0.02	254	0.01	0.032 *
CR51	1733062.00	6452361.87	976.18	-0.04	0.01	-0.07	164	0.04		-0.01	-0.01	0.00	216	0.01	0.031 *
CR52	1732867.53	6450239.26	779.68	-0.05	-0.06	0.05	232	0.08		-0.02	-0.05	0.02	247	0.05	0.047
FT06	1729855.05	6452760.09	488.79	-0.55	-0.12	-0.27	192	0.57		-0.20	-0.04	-0.11	191	0.20	0.027
FT07	1729252.33	6454103.33	588.72	-0.91	-1.42	-0.29	237	1.69		-0.43	-0.67	-0.13	238	0.79	0.027
FT08	1729388.67	6453350.48	658.45	-0.01	-0.02	0.01	251	0.02	*	0.01	-0.03	0.02	293	0.03	0.024 *
KC01	1728475.98	6452457.69	312.35	-0.80	-0.54	-0.53	214	0.97		-0.14	-0.08	-0.03	211	0.16	0.028
KC02	1727002.55	6452118.84	13.73	-0.34	-0.16	-0.11	205	0.38		-0.07	-0.02	0.01	199	0.07	0.030
KC04	1727559.31	6452666.95	238.46	-0.25	-0.29	-0.38	229	0.38		-0.05	-0.06	0.02	230	0.08	0.030
KC05	1727081.92	6453178.90	227.47	-0.08	-0.19	-0.39	248	0.21		-0.03	-0.02	0.00	210	0.04	0.028
KC06	1727784.89	6453396.26	299.88	-0.02	-0.41	-0.47	268	0.41		0.01	-0.06	-0.01	277	0.06	0.030
KC07	1727759.39	6453683.87	313.48	0.20	-0.05	-0.35	346	0.21		0.01	-0.01	0.01	315	0.01	0.034 *
KC13	1726581.05	6453069.58	191.13	-0.11	-0.05	-0.07	206	0.12		-0.04	-0.03	-0.05	222	0.05	0.029
KC14	1726742.44	6453806.00	259.92	0.00	-0.05	-0.02	271	0.05		0.01	-0.02	0.02	288	0.02	0.032 *
KC15	1727590.34	6453120.97	287.06	-0.11	-0.13	-0.04	229	0.17		-0.04	-0.05	-0.04	233	0.07	0.025
KC16	1727602.24	6454098.22	326.88	-0.01	-0.01	-0.02	233	0.02	*	0.01	-0.02	0.00	288	0.02	0.031 *
PB04	1727665.23	6448848.66	166.92	-10.71	-3.08	-3.60	196	11.14		-0.71	-0.21	-0.19	196	0.74	0.042
PB06	1727935.82	6449758.16	177.36	-32.63	-3.68	-5.70	186	32.84		-1.44	-0.20	-0.22	188	1.45	0.042
PB07	1728135.18	6450212.21	197.54	-40.74	-7.55	-2.67	190	41.44		-1.82	-0.37	-0.12	191	1.86	0.035
PB08	1728199.00	6450462.93	194.19	-38.50	-6.87	0.51	190	39.11		-1.66	-0.31	0.03	191	1.69	0.035
PB09	1728245.34	6450848.65	188.99	-43.24	-2.37	-3.53	183	43.30		-2.01	-0.13	-0.25	184	2.01	0.036
PB12	1728257.11	6451584.30	184.73	-73.38	-20.27	-8.56	195	76.13		-3.39	-0.99	-0.57	196	3.53	0.037
PB13	1728043.37	6452148.28	206.76	-42.60	-16.06	-3.78	201	45.53		-2.10	-0.89	-0.11	203	2.28	0.030
PB18	1730430.95	6450719.94	363.04	-15.94	8.95	-4.54	151	18.28		-0.30	0.06	-0.06	169	0.30	0.033
PB20	1728743.25	6451124.73	232.60	-69.51	-10.95	-10.95	189	70.37		-3.06	-0.60	-0.60	191	3.12	0.042
PB21	1729242.22	6451178.53	272.35	-55.99	6.48	-7.67	173	56.37		-2.22	0.18	-0.25	175	2.23	0.041
PB25	1729670.41	6451986.30	326.01	-31.90	0.65	-2.98	179	31.91		-0.27	-0.06	0.01	193	0.28	0.029
PB26	1729538.62	6452252.15	282.96	-24.02	2.59	-2.38	174	24.16		-0.23	-0.02	-0.03	184	0.23	0.044
PB27	1729245.47	6451842.40	271.66	-93.87	6.34	-12.76	176	94.09		-3.65	0.09	-0.51	179	3.65	0.062
PB29	1728842.25	6452093.51	170.88	-46.69	-26.98	-15.05	210	53.93		-2.28	-1.02	-0.71	204	2.49	0.039
PB53	1729217.92	6450754.81	290.10	-34.85	0.89	-7.65	179	34.86		-1.89	0.10	-0.57	177	1.89	0.047
PB54	1729690.83	6450448.49	357.73	-4.07	-0.20	-0.89	183	4.08		-0.21	-0.06	0.00	197	0.22	0.029
PB55	1728775.28	6450801.26	239.73	-37.00	-2.78	-6.60	184	37.11		-2.08	-0.19	-0.45	185	2.09	0.039
PB59	1727758.34	6448659.68	159.21	-8.02	-1.99	-4.18	194	8.27		-1.04	-0.30	-0.48	196	1.09	0.040
PB64	1727417.65	6450937.67	67.14	-48.64	-9.27	-5.62	191	49.51		-21.39	-4.40	-2.55	192	21.83	0.038
PB65	1728454.34	6449707.76	287.70	-0.32	-0.06	-0.05	191	0.33		-0.32	-0.06	-0.05	191	0.33	0.025
UB02	1727519.20	6450142.56	62.65	-61.91	8.78	-4.51	172	62.53		-3.57	0.44	-0.10	173	3.60	0.039

PORTUGUESE POINT LANDSLIDE MONITORING - FULL DATA POSTING as of September 14, 2012
 Prepared by McGee Surveying Consulting - Document Date: 9/30/2013
 Monitoring Point Movements

Page 6/7

Notes:

* Indicates no signal of horizontal movement detected in the last period

Point	Sept. 14, 2012 Positions			Overall Movements (US Feet)						Periodic (11.4 months) Movements (US Feet)					
	NAD83 SPC Zone 5 (Ft)			Original Position to Sept. 14, 2012						Oct. 03, 2011 Position to Sept. 14, 2012					
	North (ft)	East (ft)	Elev(ft)	North	East	Height	Azim.°	Dist.	Year	North	East	Height	Azim.°	Dist.	95%Error Note
AB01	1729427.54	6445709.59	178.54	-0.04	-0.02	-0.08	209	0.05	1994	-0.01	0.00	0.04	180	0.01	0.025 *
AB02	1726946.97	6447968.68	116.47	-0.01	-0.01	-0.01	221	0.01	2007	0.00	-0.02	0.02	270	0.02	0.015 *
AB04	1728389.97	6447121.52	67.21	-2.02	-1.82	-0.36	222	2.72	1994	-0.07	-0.07	-0.01	223	0.10	0.020
AB05	1728074.51	6447643.66	80.50	-1.21	-1.51	-0.40	231	1.93	1994	-0.06	-0.06	0.01	225	0.09	0.020
AB12	1729415.22	6448271.10	283.19	-1.27	-0.55	-0.24	203	1.38	1994	-0.06	-0.03	0.01	203	0.07	0.022
AB13	1729927.91	6448235.78	364.47	-0.99	-0.25	-0.56	194	1.02	1994	-0.05	-0.01	-0.03	188	0.06	0.030
AB15	1730311.31	6448099.25	396.83	-0.77	-0.13	-0.45	190	0.78	1994	-0.05	0.00	-0.04	183	0.05	0.028
AB16	1730358.55	6447532.13	376.41	-0.33	0.01	-0.21	179	0.33	1994	0.00	-0.02	-0.03	281	0.02	0.025 *
AB17	1731421.09	6446727.75	442.80	-0.03	-0.02	0.00	219	0.04	2007	0.00	0.01	0.01	72	0.01	0.033 *
AB18	1731602.11	6448187.62	456.86	-0.52	0.13	-0.33	166	0.53	1994	-0.05	0.00	0.02	181	0.05	0.030
AB20	1729359.49	6449685.87	396.22	-1.13	-0.39	-0.21	199	1.20	1995	-0.07	-0.02	-0.01	194	0.07	0.020
AB24	1729829.45	6447759.65	335.75	-0.91	-0.31	-0.17	199	0.96	1997	-0.07	-0.04	-0.03	206	0.08	0.018
AB50	1728084.54	6448247.22	182.03	-0.46	-0.96	0.05	244	1.07	1998	-0.02	-0.05	0.01	246	0.05	0.020
AB51	1729616.41	6447306.43	305.16	-0.60	-0.11	-0.26	191	0.61	2002	-0.05	-0.02	-0.01	208	0.05	0.019
AB52	1730015.44	6448624.25	368.33	-0.66	-0.19	-0.28	196	0.68	2002	-0.05	-0.01	-0.02	187	0.05	0.035
AB53	1730430.28	6449712.23	352.86	-0.82	-0.14	-0.27	190	0.84	2002	-0.07	-0.01	-0.01	191	0.08	0.025
AB54	1731111.89	6447047.88	407.38	-0.05	0.01	0.07	165	0.06	2007	-0.03	0.01	0.07	166	0.03	0.038 *
AB56	1732213.96	6448545.55	571.57	-0.35	0.09	-0.08	165	0.36	2007	-0.04	0.00	0.00	173	0.04	0.021
AB57	1731926.47	6449759.45	564.78	-0.43	0.09	-0.15	169	0.44	2007	-0.06	-0.01	-0.04	187	0.06	0.022
AB58	1731117.59	6449074.92	405.65	-0.43	-0.01	-0.02	181	0.43	2007	-0.08	-0.01	0.01	190	0.08	0.036
AB59	1730850.31	6450212.50	434.26	-0.55	-0.06	-0.11	186	0.56	2007	-0.08	-0.01	-0.02	187	0.09	0.025
AB60	1729089.34	6447987.41	179.37	-0.36	-0.16	-0.08	204	0.39	2007	-0.04	-0.04	-0.02	226	0.06	0.017
AB61	1727424.49	6447990.26	140.45	-0.01	0.01	-0.02	145	0.01	2007	0.01	0.01	0.02	29	0.01	0.006 *
AB62	1728910.29	6446925.43	143.02	-0.06	-0.03	0.01	206	0.07	2011	-0.06	-0.03	0.01	206	0.07	0.017
AB63	1729059.24	6447306.99	180.82	-0.06	-0.04	-0.02	214	0.07	2011	-0.06	-0.04	-0.02	214	0.07	0.016
AB64	1731830.69	6447373.08	532.25	Replacement for AB54											
AB65	1731705.67	6448264.07	458.53	Replacement for AB18											
AB66	1730047.29	6448490.53	374.28	Replacement for AB52											
AB67	1731180.41	6447741.76	405.33	Replacement for AB55											
AB68	1730258.86	6448055.37	393.45	Replacement for AB15											
BB52	1726995.94	6451384.30	3.87	-0.42	-0.08	0.04	191	0.43	2007	-0.04	-0.03	-0.02	214	0.05	0.026
CR07	1731627.96	6451203.36	632.17	-0.82	0.17	-1.11	168	0.84	1994	-0.04	0.02	-0.09	153	0.05	0.030
CR50	1733013.60	6451037.36	872.62	-0.02	-0.01	-0.04	218	0.02	1998	0.01	-0.01	-0.03	336	0.01	0.027 *
CR51	1733062.00	6452361.87	976.15	-0.03	0.01	-0.10	162	0.03	1998	0.01	0.00	-0.03	0	0.01	0.024 *
CR52	1732867.50	6450239.27	779.60	-0.08	-0.05	-0.03	212	0.09	1998	-0.03	0.01	-0.08	161	0.03	0.057 *
CR53	1732780.28	6450224.19	780.72	Replacement for CR52											
FT06	1729854.97	6452760.07	488.72	-0.64	-0.14	-0.34	192	0.65	2007	-0.08	-0.01	-0.07	190	0.08	0.023
FT07	1729252.18	6454103.12	588.67	-1.06	-1.63	-0.34	237	1.95	2007	-0.15	-0.21	-0.05	235	0.26	0.022
FT08	1729388.67	6453350.49	658.44	-0.02	-0.01	-0.01	219	0.02	2007	-0.01	0.01	-0.01	122	0.01	0.018 *
KC01	1728475.91	6452457.65	312.34	-0.87	-0.58	-0.54	213	1.05	1994	-0.07	-0.03	-0.01	205	0.08	0.024
KC02	1727002.51	6452118.83	13.73	-0.39	-0.16	-0.11	203	0.42	1995	-0.04	0.00	0.00	185	0.04	0.017
KC04	1727559.28	6452666.96	238.43	-0.29	-0.28	-0.41	225	0.40	1995	-0.04	0.00	-0.03	178	0.04	0.024
KC05	1727081.89	6453178.89	227.49	-0.11	-0.20	-0.37	242	0.23	1994	-0.03	-0.01	0.02	196	0.03	0.021
KC06	1727784.85	6453396.22	299.88	-0.06	-0.45	-0.47	263	0.45	1994	-0.04	-0.04	0.00	228	0.06	0.023
KC07	1727759.39	6453683.85	313.49	0.20	-0.06	-0.34	342	0.21	1994	0.00	-0.01	0.01	278	0.01	0.025 *
KC13	1726581.02	6453069.58	191.10	-0.14	-0.05	-0.10	201	0.15	2007	-0.03	0.00	-0.03	182	0.03	0.025
KC14	1726742.42	6453805.98	259.91	-0.02	-0.07	-0.03	252	0.08	2007	-0.03	-0.02	-0.01	224	0.03	0.024
KC15	1727590.32	6453120.95	287.06	-0.13	-0.14	-0.04	227	0.20	2007	-0.02	-0.02	0.00	216	0.03	0.018
KC16	1727602.23	6454098.23	326.87	-0.01	0.00	-0.03	180	0.01	2007	0.00	0.01	-0.01	113	0.01	0.025 *
KC17	1727302.76	6453026.42	215.25	Replacement for KC04											
PB04	1727664.82	6448848.57	166.81	-11.12	-3.17	-3.71	196	11.56	1994	-0.41	-0.09	-0.12	192	0.42	0.036
PB06	1727934.92	6449758.07	177.24	-33.52	-3.77	-5.82	186	33.73	1995	-0.89	-0.09	-0.12	186	0.90	0.035
PB07	1728134.07	6450211.98	197.49	-41.85	-7.78	-2.72	191	42.57	1995	-1.11	-0.23	-0.05	192	1.13	0.028
PB08	1728197.95	6450462.75	194.24	-39.56	-7.05	0.56	190	40.18	1994	-1.05	-0.18	0.05	190	1.07	0.027
PB09	1728244.01	6450848.59	188.79	-44.57	-2.44	-3.74	183	44.64	1994	-1.33	-0.07	-0.20	183	1.33	0.029
PB12	1728254.64	6451583.54	184.21	-75.85	-21.03	-9.08	195	78.71	1994	-2.47	-0.76	-0.53	197	2.59	0.031
PB13	1728041.82	6452147.64	206.67	-44.15	-16.70	-3.87	201	47.20	1995	-1.55	-0.64	-0.10	202	1.67	0.023
PB18	1730430.87	6450719.92	363.01	-16.01	8.93	-4.57	151	18.33	1995	-0.07	-0.02	-0.03	197	0.08	0.030
PB20	1728741.10	6451124.30	232.16	-71.67	-11.38	-11.38	189	72.56	1995	-2.15	-0.43	-0.44	191	2.20	0.028
PB21	1729240.85	6451178.60	272.17	-57.37	6.55	-7.85	173	57.74	1995	-1.38	0.07	-0.18	177	1.38	0.034
PB25	1729670.31	6451986.28	325.97	-32.00	0.63	-3.02	179	32.01	1994	-0.10	-0.02	-0.04	192	0.10	0.026
PB26	1729538.54	6452252.11	282.93	-24.11	2.55	-2.41	174	24.24	1995	-0.09	-0.03	-0.03	202	0.09	0.039
PB27	1729242.88	6451842.42	271.21	-96.46	6.36	-13.21	176	96.67	1995	-2.58	0.02	-0.45	180	2.58	0.058
PB29	1728840.65	6452092.79	170.41	-48.30	-27.70	-15.52	210	55.67	1995	-1.60	-0.72	-0.48	204	1.76	0.030
PB53	1729216.82	6450754.85	289.90	-35.95	0.93	-7.85	179	35.96	1997	-1.10	0.04	-0.20	178	1.10	0.048
PB54	1729690.75	6450448.48	357.70	-4.15	-0.21	-0.92	183	4.15	1997	-0.07	-0.01	-0.02	191	0.08	0.024
PB55	1728774.00	6450801.18	239.55	-38.28	-2.86	-6.78	184	38.39	1998	-1.28	-0.08	-0.18	183	1.28	0.029
PB59	1727757.70	6448659.52	158.92	-8.66	-2.15	-4.47	194	8.93	2001	-0.64	-0.16	-0.29	194	0.66	0.033
PB64	1727394.56	6450932.96	63.68	-71.73	-13.99	-9.08	191	73.08	2009	-23.09	-4.72	-3.46	192	23.57	0.032
PB65	1728454.20	6449707.73	287.69	-0.47	-0.09	-0.06	191	0.47	2010	-0.14	-0.03	-0.01	191	0.14	0.021
PB66	1729197.65	6450969.92	288.33	Replacement for PB53											
UB02	1727517.18	6450142.82	62.66	-63.94	9.03	-4.43	172	64.57	1997	-2.02	0.26	0.01	173	2.04	0.034

PORTUGUESE POINT LANDSLIDE MONITORING - FULL DATA POSTING as of April 18, 2013

Page 7/7

Prepared by McGee Surveying Consulting - Document Date: 9/30/2013 Rev.03/05/14

Monitoring Point Movements

PARTIAL MID-YEAR MONITORING

Notes:

* Indicates no signal of horizontal movement detected in the last period at the 95% level of confidence

Revised 03/05/14

Point	April 18, 2013 Positions			Overall Movements (US Feet)						Periodic (7.1 months) Movements (US Feet)						
	NAD83 SPC Zone 5 (ft)			Original Position to April 18, 2013						Sept. 14, 2012 Position to April 18, 2013						
	North (ft)	East (ft)	Elev(ft)	North	East	Ht #	Azim.°	Dist.	Year	North	East	Ht #	Azim.°	Dist.	95%Error	Note
AB04	1728389.95	6447121.48	67.17	-2.04	-1.86	-0.40	222	2.76	1994	-0.02	-0.04	-0.04	246	0.04	0.01	
AB12	1729415.20	6448271.07	283.17	-1.29	-0.58	-0.26	204	1.41	1994	-0.02	-0.03	-0.02	232	0.03	0.01	
AB16	1730358.57	6447532.13	376.44	-0.32	0.01	-0.18	178	0.32	1994	0.01	0.00	0.02	8	0.02	0.02	*
AB17	1731421.09	6446727.75	442.78	-0.03	-0.02	-0.02	219	0.03	2007	0.00	0.00	-0.02	45	0.00	0.01	*
AB20	1729359.43	6449685.84	396.21	-1.19	-0.42	-0.22	200	1.26	1995	-0.06	-0.03	-0.01	205	0.07	0.01	
AB50	1728084.51	6448247.18	182.00	-0.49	-1.01	0.02	244	1.12	1998	-0.03	-0.04	-0.03	236	0.05	0.01	
AB59	1730850.25	6450212.49	434.24	-0.62	-0.07	-0.13	186	0.62	2007	-0.06	-0.01	-0.01	192	0.07	0.01	
AB60	1729089.33	6447987.40	179.32	-0.37	-0.17	-0.13	204	0.41	2007	-0.02	-0.01	-0.05	215	0.02	0.01	
AB61	1727424.49	6447990.26	140.41	-0.01	0.00	-0.06	135	0.01	2007	0.00	0.00	-0.04	338	0.01	0.00	*
AB65	1731705.66	6448264.06	458.53	-0.01	0.00	-0.01	194	0.01	2012	-0.01	0.00	-0.01	194	0.01	0.02	*
CR07	1731627.92	6451203.36	632.18	-0.86	0.17	-1.10	169	0.87	1994	-0.04	0.00	0.01	183	0.04	0.02	
CR50	1733013.59	6451037.36	872.66	-0.02	-0.01	0.00	214	0.03	1998	0.00	0.00	0.05	194	0.00	0.01	*
FT06	1729854.91	6452760.05	488.68	-0.70	-0.16	-0.38	193	0.72	2007	-0.06	-0.02	-0.04	201	0.07	0.01	
FT07	1729252.14	6454103.03	588.65	-1.10	-1.72	-0.36	237	2.04	2007	-0.04	-0.09	-0.02	246	0.10	0.02	
KC06	1727784.86	6453396.20	299.84	-0.05	-0.47	-0.51	264	0.47	1994	0.00	-0.02	-0.04	284	0.02	0.01	
KC07	1727759.41	6453683.87	313.46	0.22	-0.05	-0.37	346	0.23	1994	0.02	0.01	-0.02	31	0.02	0.01	
KC13	1726581.02	6453069.56	191.09	-0.14	-0.07	-0.11	208	0.16	2007	0.00	-0.02	-0.02	276	0.02	0.01	
KC16	1727602.23	6454098.23	326.88	-0.02	0.00	-0.02	188	0.02	2007	0.00	0.00	0.01	243	0.00	0.01	*
KC17	1727302.74	6453026.40	215.23	-0.02	-0.02	-0.02	229	0.03	2012	-0.02	-0.02	-0.02	229	0.03	0.01	
PB04	1727664.58	6448848.49	166.69	-11.36	-3.25	-3.83	196	11.82	1994	-0.24	-0.08	-0.12	198	0.25	0.02	
PB12	1728253.25	6451583.09	183.84	-77.23	-21.48	-9.45	196	80.17	1994	-1.39	-0.45	-0.37	198	1.46	0.01	
PB13	1728040.95	6452147.25	206.54	-45.02	-17.10	-4.00	201	48.16	1995	-0.87	-0.39	-0.13	204	0.95	0.02	
PB18	1730430.79	6450719.89	362.96	-16.09	8.89	-4.62	151	18.39	1995	-0.08	-0.03	-0.05	200	0.09	0.02	
PB26	1729538.46	6452252.09	282.90	-24.18	2.53	-2.44	174	24.32	1995	-0.07	-0.02	-0.03	197	0.08	0.01	
PB59	1727757.34	6448659.41	158.71	-9.03	-2.25	-4.68	194	9.30	2001	-0.36	-0.11	-0.21	197	0.38	0.07	
PB64	1727382.15	6450930.51	60.16	-84.14	-16.44	-12.60	191	85.73	2009	-12.41	-2.45	-3.53	191	12.65	0.02	
PB66	1729197.003	6450969.91	288.22	-0.64	-0.01	-0.10	181	0.64	2012	-0.64	-0.01	-0.10	181	0.64	0.01	