TRACKING PAINTED PEBBLES ON A MOJAVE DESERT PIEDMONT: ANNUAL RATES OF SEDIMENT MOVEMENT AND THE IMPACT OF OFF-ROAD VEHICLES

A Thesis Presented by

by

Lyman Parker Persico

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Evaluation of the College Honors Thesis Defense

This form should be completed by the Thesis Committee Chairperson and submitted to both the chairperson of the Honors and IDM Committee and the Dean's Office of the College of Arts and Sciences upon completion of the Honors thesis defense.

A. Information

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The decision of the thesis committee is that this student: (check one)

☑ Passed the defense on the Honors level

☐ Passed the defense on the Readings and Research level

☐ Failed the defense

C. Grade and Signatures

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The preparation of pebbles and the data entry of the pebbles also required the help of many others. Thanks to Jen, Chris, Laurie, and Angie for reading hours of mind numbing numbers to me. Thanks to Nick for helping me pound tags and listening to me talk incessantly about my thesis for 8 months, and Noah for helping me paint and label pebbles in the beginning. I would like to thank Ruth for keeping us out of tank's way and to Doug and the staff at Instrumentation and Model facilities who answered all of my questions about glue and metal.

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Chapter 1 - Introduction

Desert piedmonts and the processes that formed them have remained an enigma to geomorphologists for many years. Desert piedmonts are the long, low angle slopes that extend from steep mountain fronts down to flat basin centers or to outlet rivers. Sediment transport rates on these and other desert landforms are slow due to little and variable rainfall (Abrahams, 1984). Scant rainfall allows disturbance of desert soils by wheeled and tracked vehicles (Figure 1.1) to persist for more than a hundred years (Iverson, 1979; Iverson et al., 1981; Webb et al., 1986; Nichols and Bierman, 2002).

Using painted pebbles as tracers, this study determines short-term sediment transport rates in order to understand better how piedmont surfaces work and to provide environmentally relevant information. I use experimentally determined infiltration rates, centimeter-scale GPS mapping, on-site rainfall data, and land-use histories to explain rates of pebble movement and to infer the mechanism of pebble transport on piedmonts at four sites in the Mojave Desert. Furthermore, this study provides a quantitative measurement of how vehicle activity affects desert surfaces. Such an understanding will allow land managers to make informed decisions as they govern military training exercises and off-road vehicle (ORV) access in order to minimize environmental impact.

Tracer studies are a commonly used method of calculating sediment transport rates in large rivers as well as ephemeral channels (Hubbell and Sayre, 1964, 1965; Sayre and Hubbell, 1965; Laronne and Carlson, 1976; Ergenzinger and Custer, 1983; Abrahams et al., 1984; Hassan et al., 1984, 1999; Hassan 1987, 1984, 1993; Hassan and Church 1991, 1992, 1994; Slattery et al., 1995; Lekach and Schick, 1995; Fergueson and Wathen, 1998). Sediment tracing follows the movement history of individual grains during a

transport period. The individual grains are assumed to be representative of the larger populations of which they are part. Therefore, it is essential that the tracer sample is in fact representative of the population as a whole. The ability to relocate tracer pebbles after transport events is critical. Many methods have been used to relocate tracers including paint (Abrahams et al.; 1984, Laronne and Carson, 1976; Lekach and Schick, 1995), radioactivity (Hubbell and Sayre, 1964, 1965), and magnetic tagging (Hassan et al., 1984, 1999; Hassan 1987, 1984, 1993; Hassan and Church, 1991, 1992, 1994; Fergueson and Wathen, 1998). Tracer techniques have never been used to determine rates of pebble transport across desert piedmonts; this is the first study of its kind.

A variety of field methods were used in this study. Perpendicular 20 m long lines of pebbles were laid out at four sites in the Mojave Desert (Figures 1.2, 1.3). Repeated surveys over two years (May 2000, November 2000, March 2001, May 2001, October 2001, and April 2002) of the 1600 painted tracer pebbles were used to determine rates of pebble transport. Pebble movement rates were compared to long-term piedmont sediment transport speeds as determined by Nichols et al. (in press). Infiltration rates were determined using sprinkling infiltrometers on small plots (~0.6 m^2) in order to characterize the ability of soils to absorb rainfall and generate runoff (Figure 1.4). Rain data were collected at 3 of 4 sites with automatically recording rain gauges (Figure 1.5) and were supplemented with weather station data from other areas in order to correlate pebble movement with the timing and intensity of rainfall. Channel surveys along a 0.3- to 0.5 km long line centered on the plots, were also performed by counting and measuring the width of channels in order to characterize better the desert surface. Background

topography surrounding the pebble sites was mapped using a differential global positioning system (GPS) with centimeter accuracy (Figure 1.6).

The U.S. Army is a major desert landholder and off road vehicles used in training disturb the desert surface and alter soil hydrology (Prose, 1985). Most army maneuvers occur on desert piedmonts. Tank, Humvee, and ORV traffic disturbs and compacts soil, decreases infiltration, and increases surface runoff, potentially increasing sediment transport (Prose, 1985). This study compares sites along a gradient of disturbance to determine if pebble transport on impacted surfaces differs from pebble transport in undisturbed areas.

Field Sites

I conducted research at four sites in the Mojave Desert of southern California (Figure 1.2). The Mojave Desert is bounded by the Colorado River to the East, the San Andreas Fault to the West, and the Garlock Fault to the North. Two sites, Goldstone and East Range Road, are located within the Ft. Irwin Military Complex near Barstow, California. The other two sites are located further south, adjacent to the Iron and Chemehuevi Mountains.

There are many landforms common to all of the field sites. All sites are located on piedmonts at varying distances from the range front. The surface material is dominantly clasts of dissaggregated granite. Some of the surfaces are punctuated by isolated granite tors, or other nearby bedrock outcrops. Tors are large rock hills that protrude from the desert surface away from the range front.

The field sites were chosen to be geologically and geomorphically similar, but to represent four distinct land uses. *East Range Road* is heavily and continually impacted by

many off road Army vehicles. *Iron Mountain* was a heavily impacted army-training base during World War II but is now off limits to vehicles (BLM, 1986). General Patton established it and 12 other camps as part of the Desert Training Center (DTC) in 1942. Camps of the DTC were located throughout the Mojave Desert, and used to train soldiers for battle in northern Africa. Thousands of troops lived and trained at these camps, greatly disturbing the surfaces (Figure 1.7). Some of these disturbances can still be seen today including dirt roads, road berms, and walkways outlined by rocks. The *Chemehuevi* site is located deep within the Mojave Desert and receives little vehicular traffic. *Goldstone*, the control plot, is located within the Goldstone Deep Space Communications Complex and is off limits to all vehicles.

The rocks surrounding Goldstone are granite. The source material at East Range Road is reworked Tertiary alluvial sediment containing granite. The Iron Mountains are comprised of Cretaceous age granites (Miller et al., 1981). The Chemehuevi Mountains contain many different lithologies including eruptive igneous rocks and crystalline metamorphic rocks and younger Cretaceous and Tertiary basaltic dikes (Miller et al., 1999).

The piedmonts near the Chemehuevi Mountains have well developed pavements where clasts on interfluves are coated with rock varnish. The pebble line was not placed on one of these well-developed pavements; rather, it was placed on an active wash surface further down gradient. Goldstone, Iron Mountain, and East Range Road have neither pavements nor rock varnish. All of the sites have Creosote bushes *(Larrea tridentata)* and desert sage *(Salvia Dorrii)*, as well as evidence of animal burrowing activity (Figure 1.8).

East Range Road-

East Range Road (Figure 1.9) is located on a piedmont 3 km from the range front on the Fort Irwin Military complex. The local gradient is 4.74°. The site is a heavily used training range and many different types of vehicular traffic, including tanks and humvees, frequently cross the surface. The vegetation is very sparse consisting almost entirely of creosote bushes. Most soil here appears to be disturbed; it is compacted and stirred from repeated tank and vehicle traffic.

Iron Mountains-

The Iron Mountains are granitic and surrounded by low gradient piedmonts (Figure 1.10). This field site is 3 km from the range front where the local gradient is 3.36° Sediment size on piedmont surface is mostly between 0.5 - 1.0 mm (Nichols et al., in press). This site was compacted by intense vehicular and foot traffic fifty-five to sixty years ago (Prose, 1985), but is now fenced preventing entrance of motorized vehicles. There is also some foot traffic as tourists occasionally visit the site. There was some animal burrowing activity in the mounds underneath creosote bushes (Figure 1.8).

Chemehuevi-

The Chemeheuvi Mountains are granitic and surrounded by low gradient piedmonts (Figure 1.11). Chemehuevi is the furthest of the four field sites from the range front. It is 12 kilometers from the Chemehuevi Mountains, and 5 km from the wash between the Turtle Mountains and the Chemehuevi Mountains. The local gradient is 1.69°. This field site is protected from use and development because of desert tortoise activity. The vegetation consists mostly of creosote bushes, barrel cacti (*Ferocactus)*,

and beavertail cacti (*Opuntia basilaris)*. There are many animal burrows that cave in when walked upon. The silt-rich, vesicular, Av soil horizon crumbles when walked upon leaving depressions up to 5 cm thick. The soil below the Av horizon is dark. This site has an extensive ephemeral channel network. Many of these channels are active. There is little evidence of vehicular traffic. There are relic tank track scars further up the piedmont from tank movement during the days of DTC from 1942 to 1944.

Goldstone

The mountain range above Goldstone is granite and surrounded by a low gradient piedmont (Figure 1.12). This is the closest site to the range front, 0.14 km. The local gradient is 3.96° and this site is located on the Goldstone Deep Space Communications Complex operated by the National Aeronautics and Space Administration. The area is closed to the public and the site is not disturbed. There are no channels on the site; however, very large channels begin 50 meters down slope of the site. Some of these channels are deeper than 35 centimeters. The channels appear to head on power line roads. There is extensive vegetation at this site, and there are large, 2-meter-diameter, creosote bushes. Animal activity, including burrows, is frequent at this site and is concentrated around creosote bushes (Figure 1.8).

Significance of Research

The research quantifies short-term sediment transport across broad desert piedmonts, something that has never been done. The measurements reflect the history of 1600 pebbles, tracked and surveyed five times over the course of two years. I compare my data to long-term rates calculated over millenia by Nichols et al., 2001. I quantify off road vehicle impacts on pebble movement, and have collected rainfall data in the Mojave

Desert, where such data are sparse, including quantity, duration, time, and intensity of rainfall at three of the four field locations. Not only were these measurements essential to the success of my research, they help to fill a gap in our understanding of arid climates.

Structure of Thesis

This thesis is divided into five chapters. The second chapter will follow with a detailed literature survey. Chapter Three is extended methods. Chapter Four includes all results and interpretations in a paper that will be submitted for publication in the refereed journal, *Water Resources Research*. Chapter Five presents conclusions and suggestions for future work. All primary data are presented in the appendix.

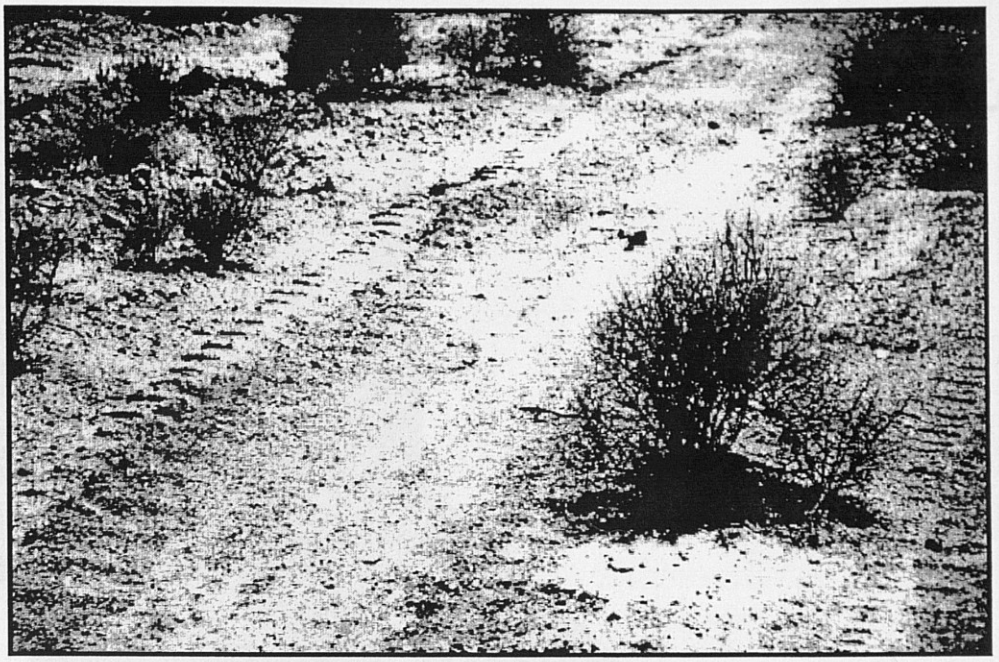


Figure 1.1 - The desert has been used for Army training for many years. Tanks and other heavy machinery greatly affect the surfaces on which they drive. This picture illustrates how clearly tank tracks can be seen. The site of this picture is East Range Road.

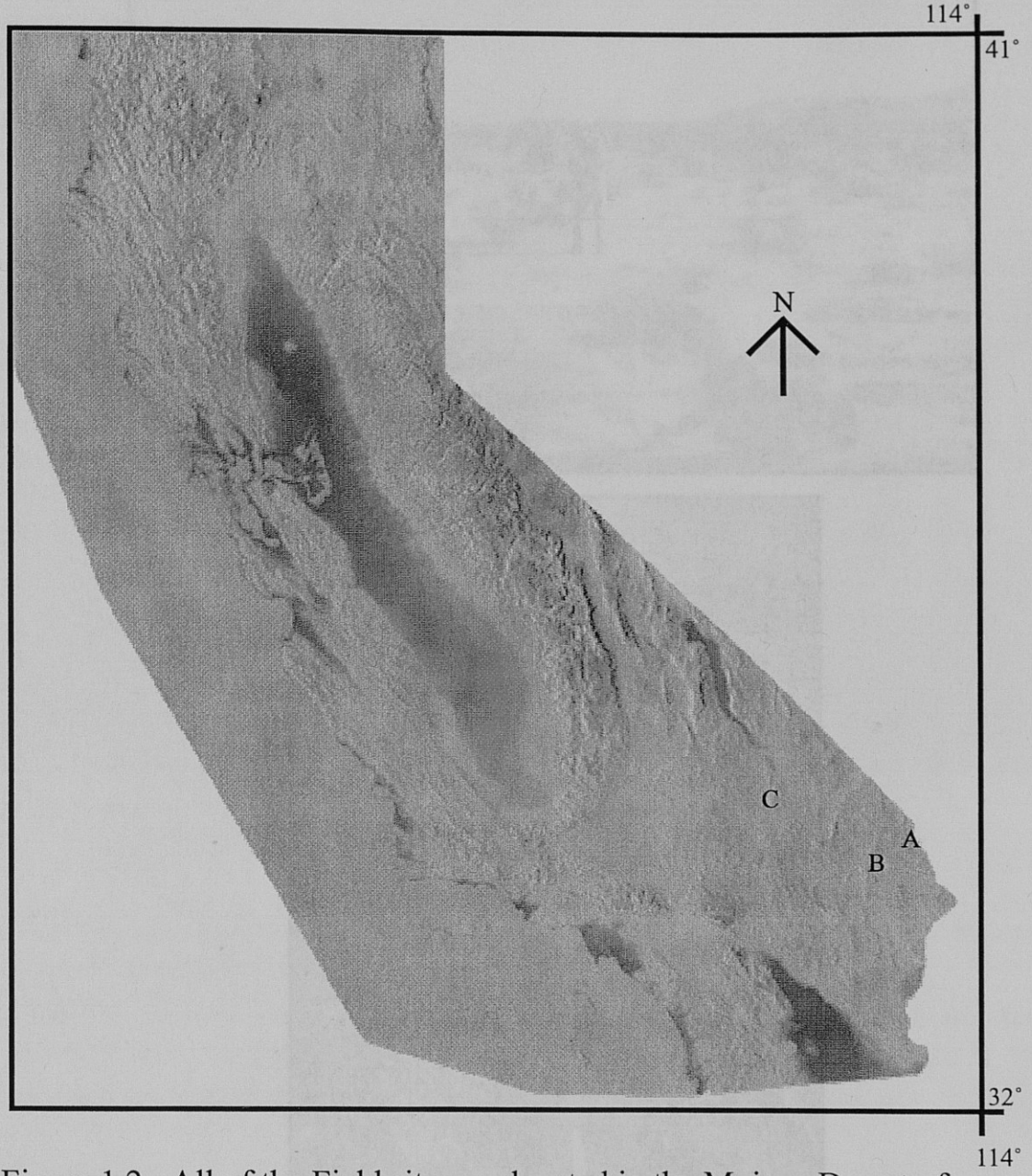


Figure 1.2 - All of the Field sites are located in the Mojave Desert of Southern California. A is the location of the Chemehuevi Mountains, B is the Iron Mountains, and C is the location of both East Range Road and Goldstone.

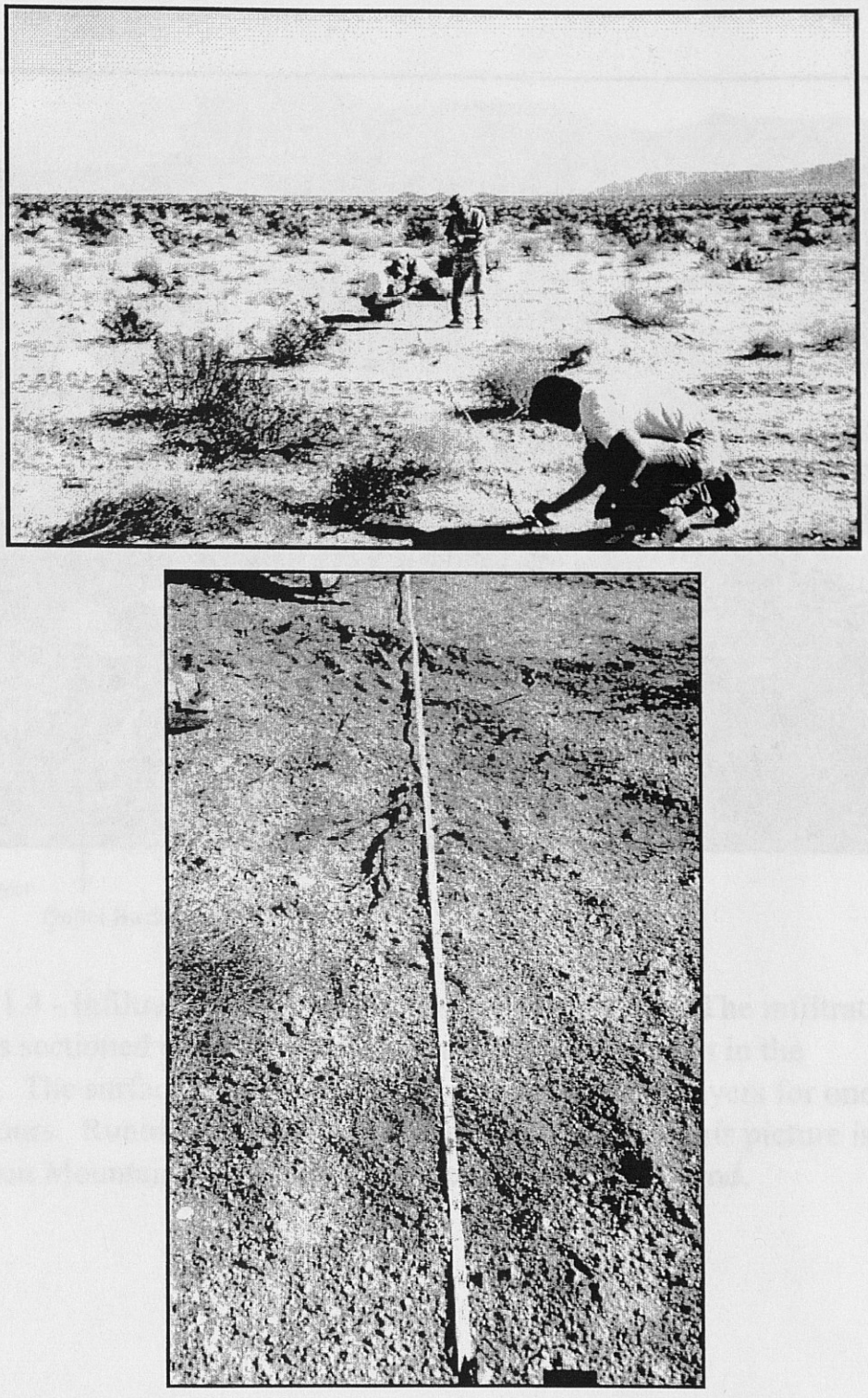


Figure 1.3 - Pebbles were spaced every 10 cm on a 20 meter line. Blue and green pebbles were used, one color for each line. Both pictures are of pebble deployment on East Range Road in Februay 2000.

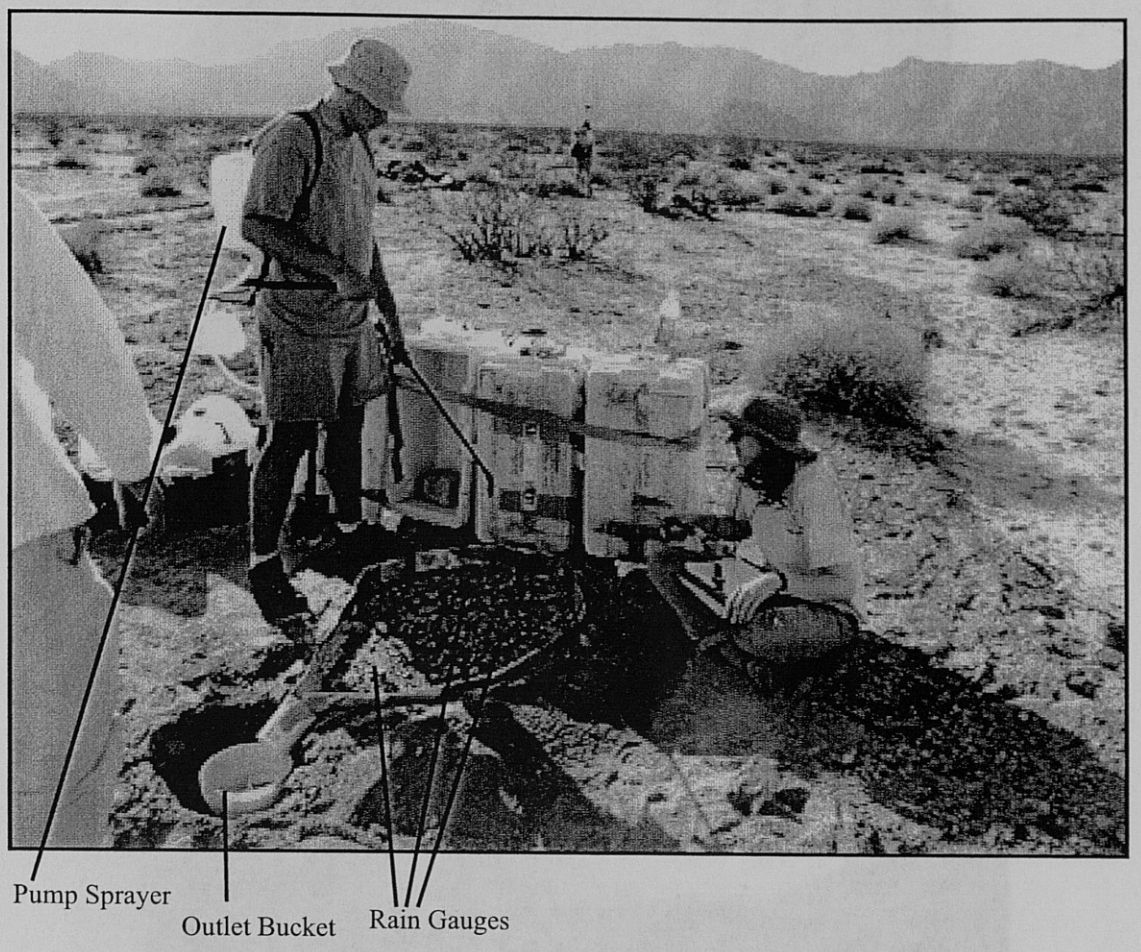
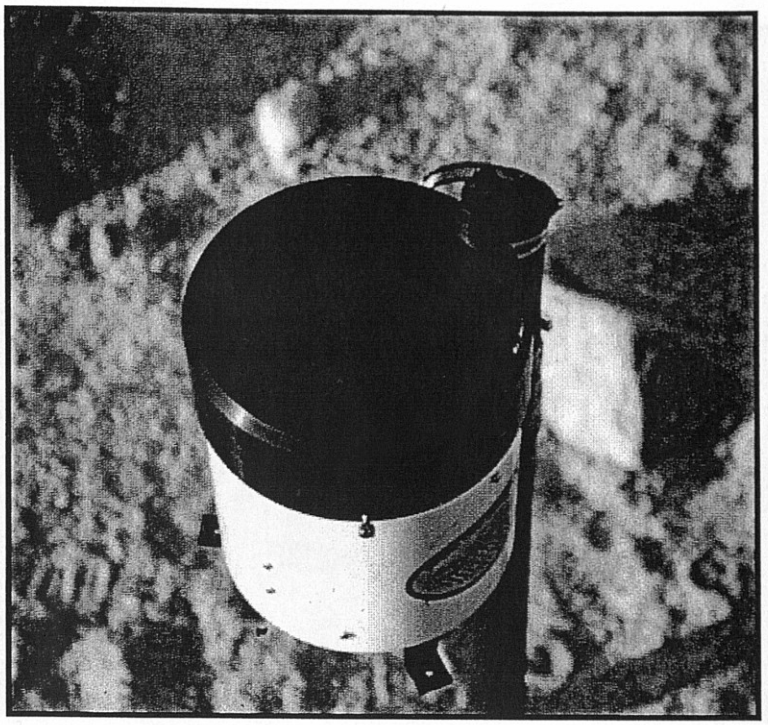


Figure 1.4 - Infiltration rates were measured at each site. The infiltration site was sectioned off with metal, and rain gauges were put in the middle. The surfaces were wetted with manual pump sprayers for one to three hours. Runoff was collected in the outlet bucket. This picture is from Iron Mountain; the white barricade is to block the wind.



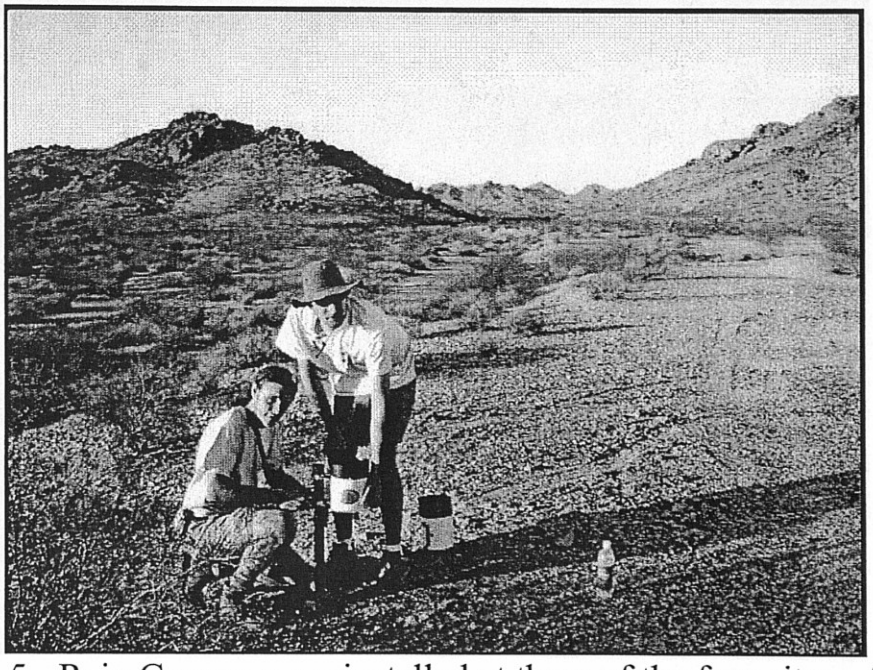


Figure 1.5 - Rain Gauges were installed at three of the four sites. All gauges were installed vertically on a metal pole East Range Road did not receive a rain gauge. Data from the rain gauges were downloaded by laptop computer.

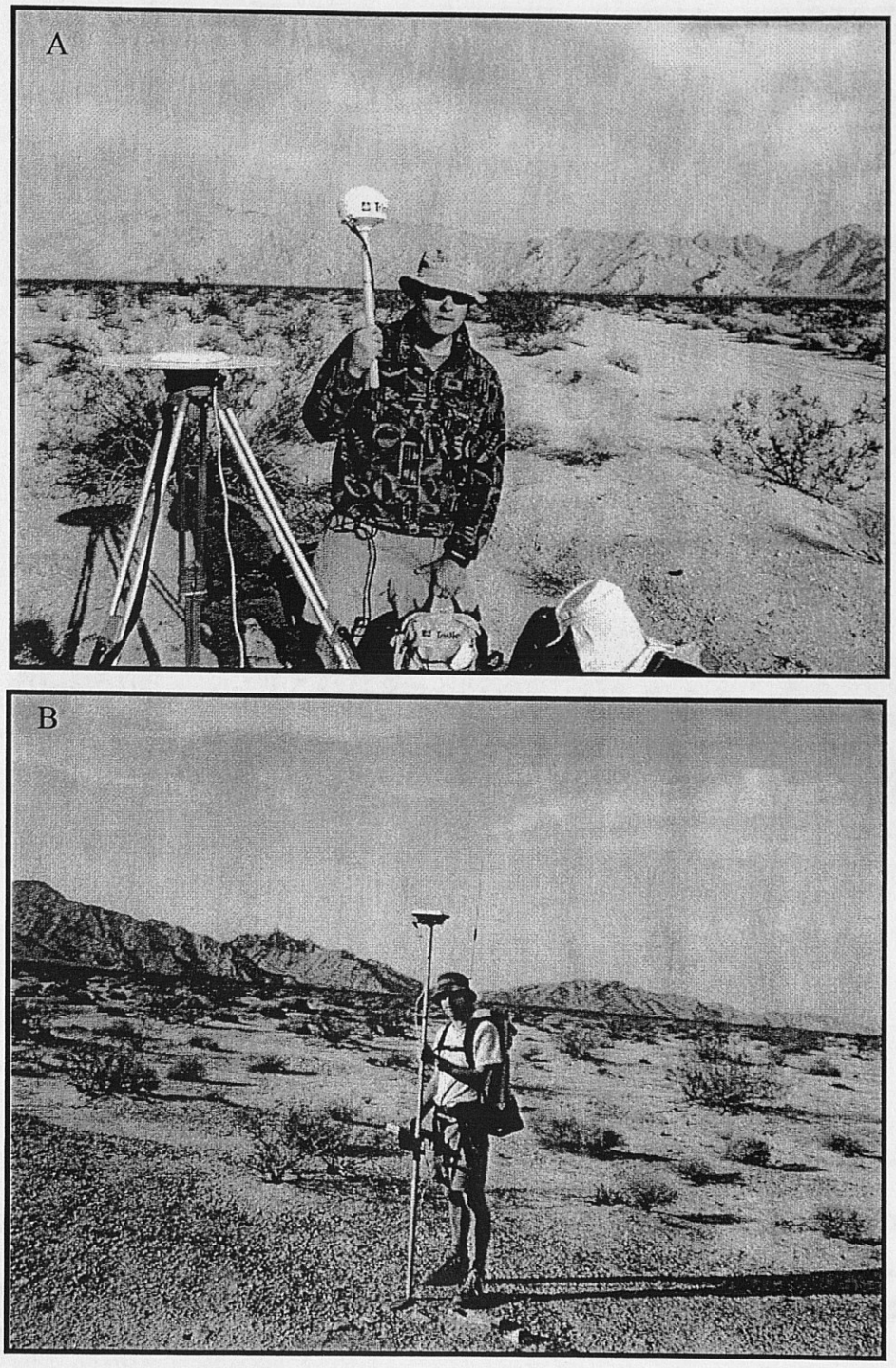


Figure 1.6 - A differential GPS was used to survey background topography and bushes. The base unit can be seen in Picture A. The rover unit, Picture B, was used to survey the features. Background topography was surveyed in a 40x40 m square. The pebble cross was located in the middle of each square. Bushes were surveyed and thier diameters were measured.

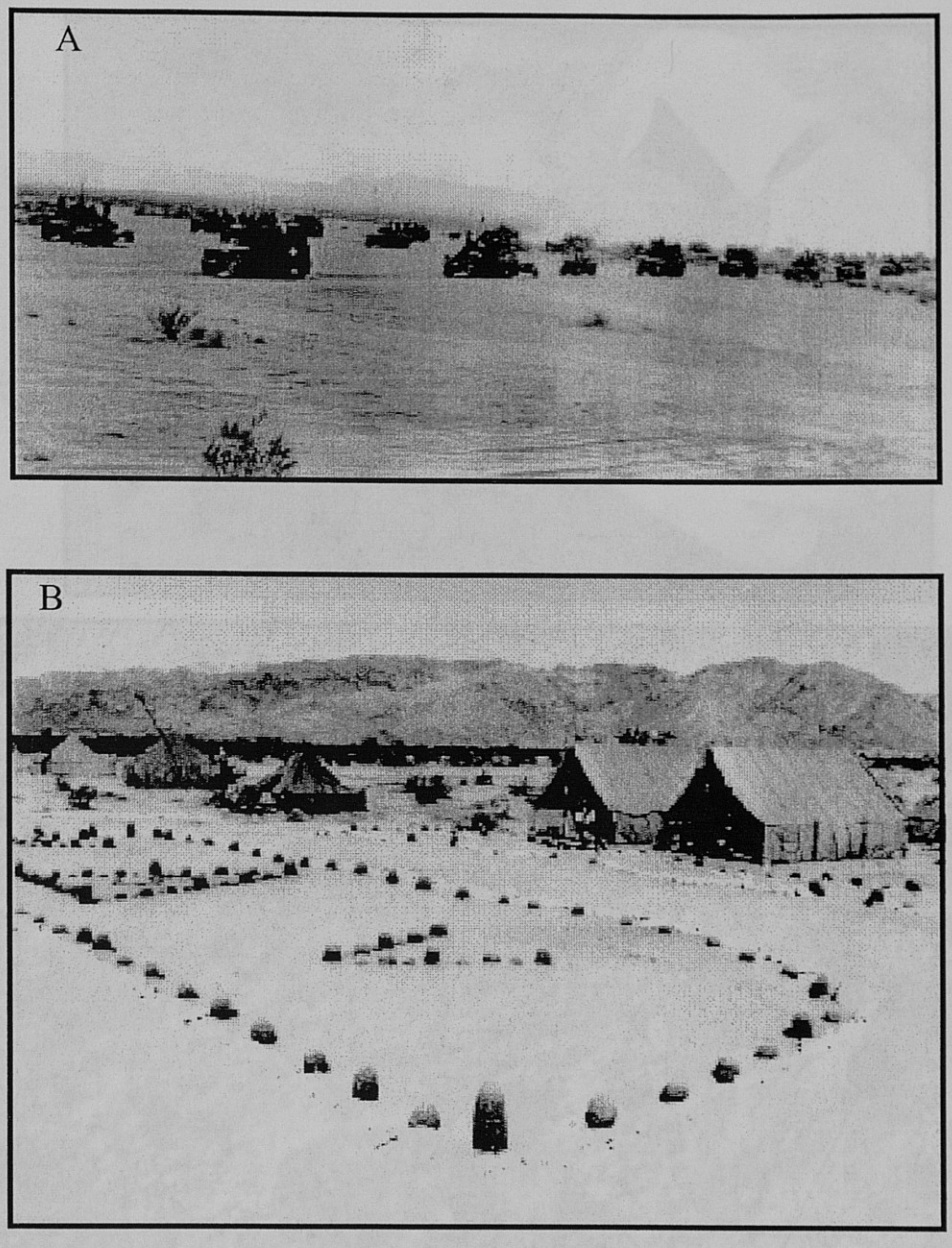


Figure 1.7 - Thousands of troups trained at Camp Iron Mountain for desert fighting in World War II. The soldiers trained, Picture A and lived, Picture B, at many camps in the desert. Currently only road berms and rock outlines remain, Picture B.

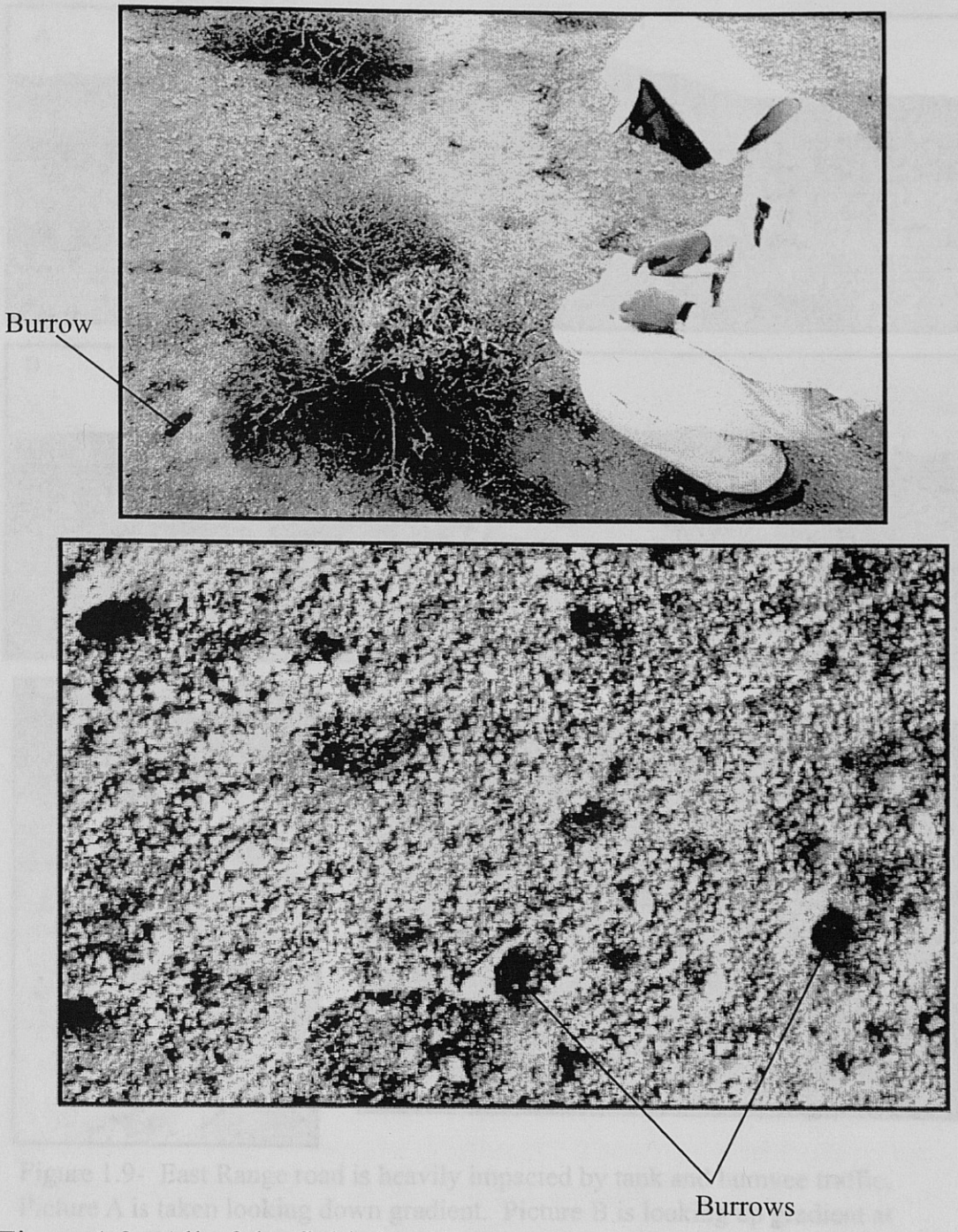


Figure 1.8 - All of the field sites show some evidence of animal activity, mostly in the form of burrows. The burrows concentrate around bushes but can be found throughout the plots.

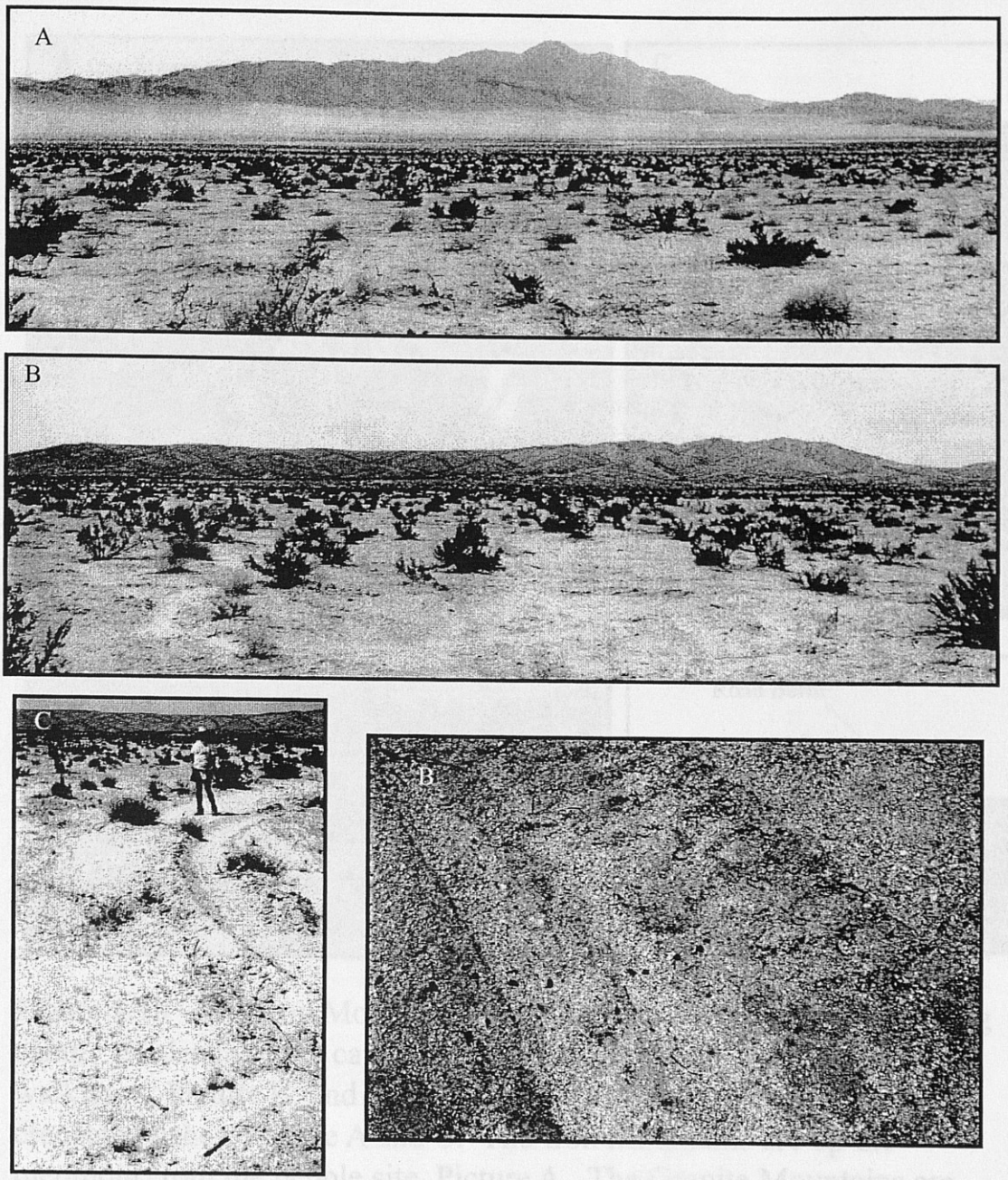


Figure 1.9- East Range road is heavily impacted by tank and humvee traffic. Picture A is taken looking down gradient. Picture B is looking up gradient at reworked alluvial sediment. The lack of vegetation can clearly be seen in pictures A and B. Pictures C and D show tank tracks, which greatly disturb the surface.

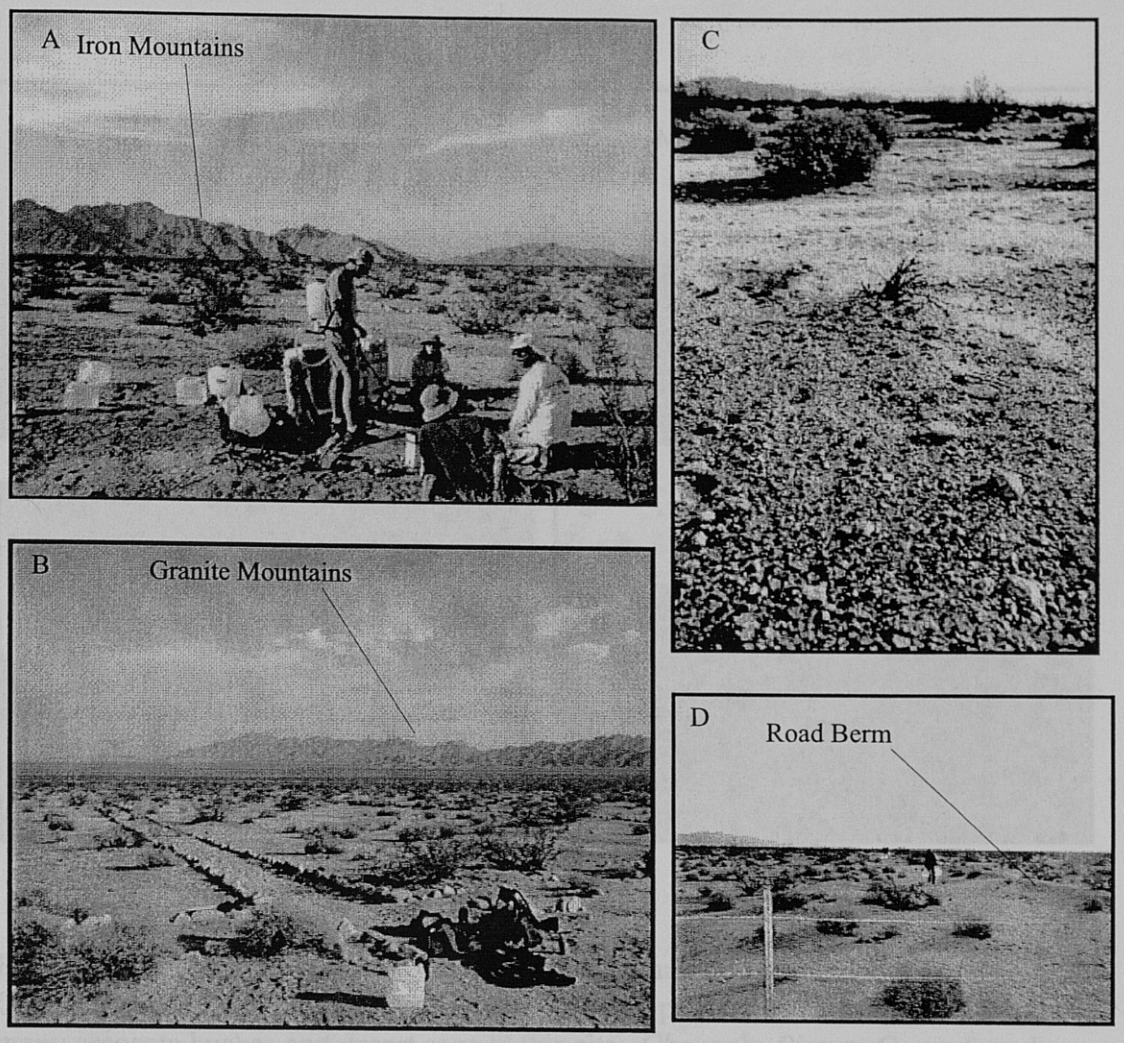


Figure 1.10 - The Iron Mountain site is located on an old Patton training camp. Evidence of the camp can still be seen by the outline of walkways, Picture B, and road berms, Picture D. The surface has some creosote bushes, Picture A and C. The Iron Mountains are up the piedmont from the pebble site, Picture A. The Granite Mountains are located down the piedmont and across the wash, Picture B.

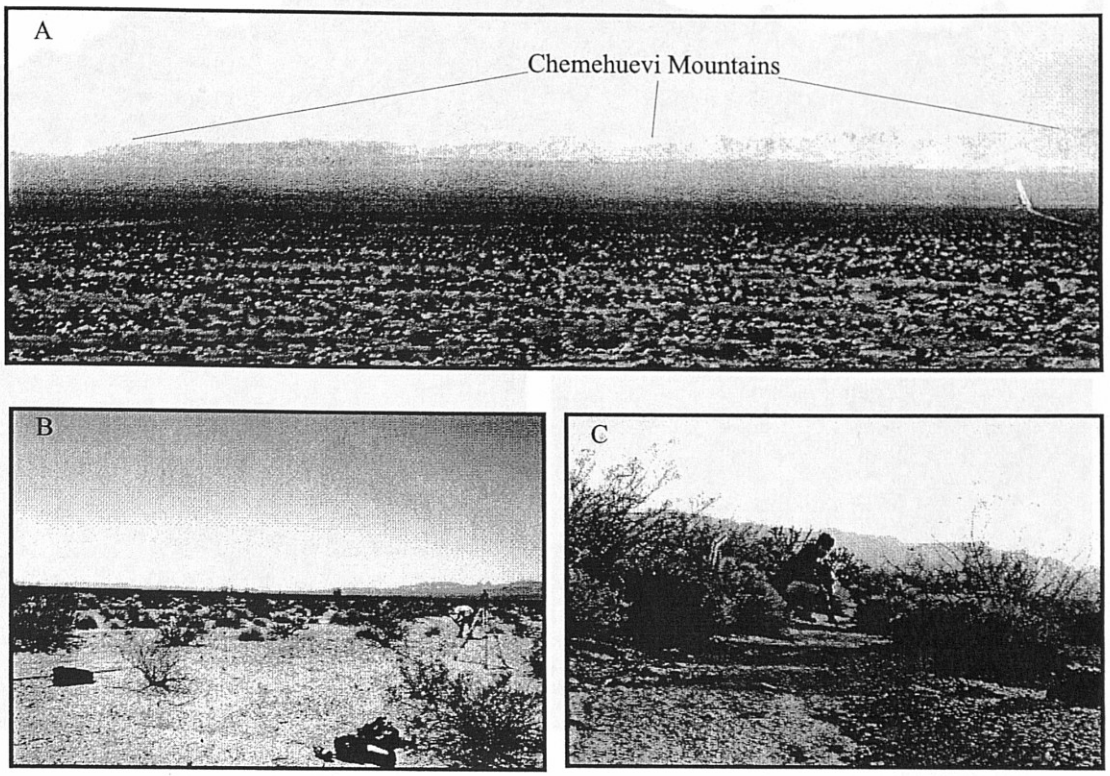


Figure 1.11 - The Chemehuevi Mountain field site has very little disturbance. The Chemehuevi Mountains can be seen looking up the piedmont, Picture A. There are many creosote bushes and desert sage at this site. Channels, Picture C, are found throughout the site. Pebbles have moved over 30 meters in two flow events in one of these channels. The cross was placed in an area with few bushes, Picture B. In Picture C the geologist is marking a pebble that has moved down gradient in an ephemeral channel.

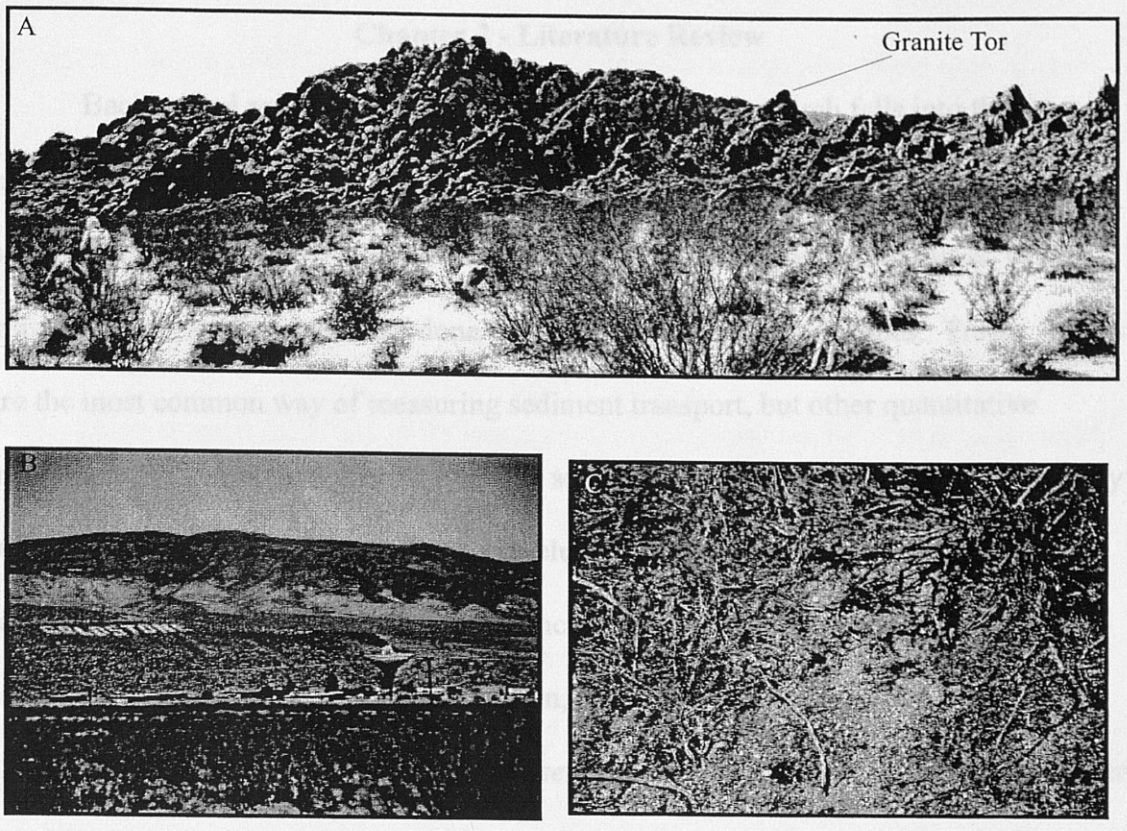


Figure 1.12 - Goldstone is located on the Goldstone Deep Space Communications Complex of Fort Irwin. The site is not affected by human activity. Large Creosote bushes cover surface, Picture A and B. Granite tors are located 140 meters behind the site, Picture A. Animal burrows can be seen nearly everywhere, especially near creosote bushes, Picture C. Looking down gradient, the satellite communications center can be seen, Picture B.

Chapter 2 - Literature Review

Background material considered important for this research falls into three categories. The first category is *sediment transport*. It should be noted that short-term sediment transport rates have never been measured on desert piedmonts and all of the transport studies referenced were done in fluvial systems or on hillslopes. Tracer studies are the most common way of measuring sediment transport, but other quantitative measuring devices such as erosion pins and scour chains have also been used to quantify transport. Some papers were qualitative, including visual descriptions of storms and runoff. The second category, *infiltration*, includes research on several topics including soil penetration, rainfall and flow infiltration, rainfall simulation, soil compaction, and stone cover studies. The third category, *desert climate,* included papers describing desert rainfall qualitatively and quantitatively.

Sediment Transport

Scientists have used a variety of tracer techniques to understand how sediment moves, including painted sediment, magnetic particles, dye tracers, radioactive tracers, and flume studies (Hubbell and Sayre, 1964, 1965; Hubbell, 1965; Laronne and Carson, 1976; Ergenzinger and Custer, 1983; Abrahams et al., 1984; Hassan et al., 1984; Hassan 1987, 1984, 1993; Hassan and Church, 1991, 1992, 1994; Lekach and Schick, 1995; Slattery et al., 1995; Fergueson and Wathen, 1998; Hassan et al., 1999).

Hassan (1992) provides an excellent review of tracer studies in streams, summarizing and analyzing all of the streambed tracing studies of recent years. The studies were conducted in many places including Japan, Germany, Israel, and Wales. The article does not present any new data, but does a very good job of explaining the

experiments that have been done and tries to correlate them in order to understand stream dynamics. Hassan (1992) confirms the lack of correlation between pebble movement distance and pebble size, suggesting that when channels do become active, they are able to transport most if not all of the sediment in them. Ephemeral channels in the desert infiltrate water quickly when they are active. There is no size dependency for small stones because flow does not last long enough to sort the sediment into different particle sizes. Some studies show that when larger stones are monitored, the distances traveled decline rapidly with increasing particle size. Hassan and Church (1992) recommend using large sample populations to overcome the problem of noise.

One of the main sites for desert research is in Israel at the Nahal Yael research watershed. Schick (1970) summarizes some of the results of the work done there. Fifteen minutes of rain with an average intensity of 30 mm/hr is enough to produce runoff. The rates of infiltration range from 10-30mm/hr. Bedload travels an average of 50 meters per event. One per cent of the particles break during movement.

Magnetic Tracers

The use of magnetic tracers to study ephemeral channels in arid regions (Hassan et al., 1984, 1999; Hassan and Church, 1991, 1992, 1994; Fergueson and Wathen, 1998; Hassan, 1987, 1984, 1993) is popular and applicable to other environments as well.

Hassan et al. (1984) performed the first magnetic tracer study. This tracer study was performed in the arid watershed of Nahel Yael, which is located in the Southern Negev Desert. The paper is valuable in that it describes in detail the methods used to prepare pebbles for magnetic tracing. The magnetic tracing method produced recovery rates of 93%. The study does not make conclusions about sediment transport; rather, it

describes the reliability of magnetic tracing. It is interesting to note that Hassan et al. (1984) detected a thick active layer where sediment is well mixed, 42 cm, during fluvial sediment transport events.

Hassan and Church (1991) tracked magnetically tagged particles to determine mean coarse particle movement distances in ephemeral streams in Israel. They concluded that bedload movement is complex, but controlled by three variables: sedimentological characteristics of the bed, hydraulic conditions of the flow, and characteristics of individual moving particles. Several hundred magnetically tagged cobbles and pebbles were placed in two streams and tracked for 21 flow events over five years. The introduction of their paper explains the difficulties in tracking pebbles in natural, uncontrolled environments. Particles move in a stop and go pattern. Entrainments from the bed occur at random and the path of the particle, once entrained, is random. There is no conflict between this conclusion and a correlation between flow conditions and 'bulk' sediment movement because even if the path of the particle is unknown, the total distance of movement is known.

Next, in the course of their sediment transport studies, Hassan and Church (1992) investigated relations between travel distances of pebble-size material and stream power in gravel-bed rivers. They present data from several studies from Israel, England, Canada, Japan, and Hungary. The paper focuses on two questions, the relation between the mean distance of movement observed after a flow event and the event magnitude, and the relation between the virtual rate of travel and the magnitude of the sediment mobilizing event. The paper concludes that grain size has only a minor influence on the

distance traveled by a clast. It appears there are mechanisms that tend to equalize travel distances for the varying clast sizes.

Hassan and Church (1992) reinforces the idea that bedload transport is characterized by movement and rest periods of particles. There are two velocities, the actual velocity a particle moves during a single event and the average virtual rate of travel. The actual velocity is determined by the distance and speed a particle moves during a single step; the virtual rate of travel considers the average travel during several steps, which includes at least one rest period. The mean distance of movement increases with an increase in the sediment discharge, meaning that either the actual velocity or duration of the event must increase if there is an increase in sediment transport. Hassan and Church (1992) also identify two types of bed structures, hard beds with sporadic movement and soft beds with a thick moving layer. They also make the point that pebbles placed on the channel surface might move more easily than pebbles incorporated into the bed, meaning that initial events might have larger movements than succeeding events. The fact that only recovered stones are measured is important. It might be the case that the recovered stones represent a subset with a singular behavior, because the movement history of lost pebbles is unknown.

Hassan, Schick, and Shaw (1999) record movement of particles directly after every flood in the ephemeral sandbed river, the Metsemotlahaba, located in semi-arid South Africa. There is an absence of large clasts in the riverbed. The researchers tried to record pebble movement after every flood, but this proved impossible because the water table rose to cover the bed surface. At the end of the first season, not a single pebble was found at the surface. The pebble recovery rate was very low, indicating the pebbles were

buried deeper than 1 m, which is the maximum depth to which their magnetic method could detect buried particles. Many of the pebbles found were near islands and low point bars, places where the energy of the stream dissipated and can no longer move relatively large pebbles.

Hassan, Schick, and Shaw (1990) found that many pebbles were located near islands and low point bars. They concluded that the hydraulic geometry of these features, reduced stream power and allowed the deposition of particles. As in Hassan and Church (1991), there was an examination of only particles that moved. Another conclusion is that during small events, the movement of wave-like bedforms dominates mixing, and particle size has little effect. On the other hand, during high flows, particles move in suspension and are incorporated in bedforms.

The experiment by Fergueson and Wathen (1998) was one of the largest tracer pebble studies ever done, 1400 pebbles. This study was conducted in Allt Bubhaig, Scotland. This experiment is very different from all of the other magnetic tracer studies because it was conducted in a perennial river, not an ephemeral stream. It was the first study aimed at tracing pebbles in a downstream fining environment. Pebble movement was size selective in all parts of the river. This is a very different conclusion than that of Hassan (1992). Hassan and Church (1991) there was only a weak correlation between pebble size and pebble movement. Within reaches, the decrease in mean travel with increasing grain size was the strongest correlation. Particle shape had only a minor affect (Fergueson and Wathen,1998). Flowing rivers have enough of an energy gradient and flow long enough to sort particle sizes whereas ephemeral streams cannot.

Ergenzinger and Custer (1983) report a different way of tracing pebbles in streams using naturally occurring magnetic tracers. This is different from Hassan (1984, 1993) who used artificial magnetic tracers implanted into pebbles by drilling. The study took place in Squaw Creek near Bozeman, Montana. A detector recorded the passage of magnetic particles larger than 32 mm. The study concluded that 66% of the total stream transport was included in bedload transport. This paper does not provide many results but rather reports the use of a new tracing technique. The results appear promising for streams that have naturally occurring magnetic particles.

Hassan (1993) uses several methods to characterize pebble movement in ephemeral channels, magnetically tagged particles, scour chains, erosion pins, bed-elevation cross sections, and bed material samples. The tests were conducted in the Negeve and Judean deserts of Israel. Again, the results do not show a strong relationship between transport distance and particle size (Hassan and Church, 1991). This is different than the results produced in flowing rivers by Ergenzinger and Custer (1983). Vertical tracing in the active layer adds another way that pebble movement can be analyzed. Most of the particles relocated after the first event were located in bars. Burial depth of the particles was not related to any of the particle characteristics. Both streams show that a high percentage of particles are buried or are exposed in each event.

Hassan and Church (1994) focused on the vertical distribution of magnetically tagged particles in arid region ephemeral channels. Most of the previous magnetic tracing studies do not focus on particle movement in the third dimension. Hassan and Church found that there was no simple relationship between burial depth and particle size. A controlling factor in the depth of particle burial is the thickness of the layer that is moving

during each event. Scour of the buried pebbles occurs only after surface particles and other overlying particles are removed. Vertical mixing increases with time. Burial depth is greater in bars than in pools and riffles. Vertical mixing in sand bed rivers is dictated by the movement of ripples and dunes while in gravel bed rivers the movement is random, and the mixing results from local scour and fill. Particle recovery varied greatly between different events, from 25 % to 93%. There was no simple relation between burial depth and grain size.

Hassan (1990) and Hassan and Church (1994) both used magnetic tracers to determine the burial depth in different river features including bars, pools, and thalwegs. The paper (Hassan, 1990) qualifies the type of burial experienced by particles. The maximum burial depth was located in bars but a difference in mean depth between the features studied was insignificant. Some tracers were not even transported, just buried in situ. Shallowly buried particles have a higher probability of movement than deeply buried ones. Particles become buried in 5 ways: by advancing bed forms, by deposition of small particles around larger clasts, by scour around a large particle, moving in a traction carpet, or by covering of particles with other particles after the initial grain stops moving. The three-dimensional aspect of the study indicates that most of the missing pebbles are probably buried deeper than 1 meter. It is possible for pebbles missing at one survey time to appear later.

A paper with a very different, almost opposite approach to sediment tracing is Slattery et al. (1995). This paper tries to determine sediment source by measuring properties of the sediment in Oxford, England. It is similar to Ergenzinger and Custer (1983) in that it uses natural tracers but traces sediment upstream instead of down. The

technique provides an alternative approach to monitoring techniques such as erosion pins. The samples were subjected to nondestructive magnetic measurements. These tests clearly distinguished between the different source areas. The results showed that cultivated fields provided much of the sediment especially during storm runoff.

Painted Tracers

Another tracing method involves tracking painted sediment. Ferguson and Wathen (1998) used painted pebbles in conjunction with magnetic pebbles (magnetically tagged particles were painted) which provided much higher recovery rates than just painted pebbles (Laronne and Carson, 1976). Laronne and Carson (1976) included 250 tracer pebbles in Seale's Brook, Canada. Lekach and Schick (1995) also used magnetic and painted pebbles in the Nahal Yahel catchement in the southern Negev Desert. The difference is that Lekach and Schick (1995) had separate particles for painting and magnetizing. They found that short pebble movements are associated with a burial episode and long movements are associated with movement within the active layer. The interchangeability of surficial and buried material helps to explain the simple morphology of braided channels.

Tracing particles for long term monitoring of sediment is also possible (Abrahams et al.,1984). In this study, particles were tracked on desert hillslopes, not ephemeral channels, located in arid regions of northern New Mexico. The stones were monitored for sixteen years. The goal of the project was to determine if creep or hydraulic action was the dominant process on hillslopes. Unlike Hassan (1993), this study found that the distance moved was inversely related to particle size. The paper concludes that on most

hillslopes hydraulic action is the dominant process. Only at higher elevations, where winter is more severe, is creep the dominant process.

Radioactive Tracers

Another form of particle tracing uses radioactivity to relocate particles. For example, Hubbell and Sayre (1964, 1965) traced radioactive sand in the flowing North Loup River, Nebraska. Consideration of sediment movement is possible in two ways. The first technique, Eulerian description, focuses on a cross section of the channel and describes the concentration, discharge, and characteristics of the sediment moving past the cross section. The second technique, Lagrangian description, focuses on the movement of individual particles dosed with Iridium-192 and then placed on the river channel via a funnel in two-pound packages. The study verified the step motion of particle movement. Mean particle velocity in the river ranged between three and seven feet per hour. This method is helpful because it measures the displacement of individual particles or groups of particles.

Sayre and Hubbell (1965) uses the same design as the other radioactive studies. The study was also conducted in the North Loup River in Nebraska. This paper emphasizes the importance of sediment tracing in solving environmental problems. Sorption of radioactive wastes by clay, silt, and sand is a common occurrence. Transport and dispersion of waste can be affected by the transport and dispersion of the individual sediment particles. Discharge was calculated with a continuity-type equation, which states that discharge is the product of the mean velocity of the particles and the cross-sectional area through which they move.

Dye Tracers

Another method of tracing includes the use of dyes. These methods use colored dye injected into water and tracked. They do not trace individual sediment particles. Although sediment transport is not directly measured, dye tracing is important in characterizing the way in which water moves through streams, which does affect sediment transport.

Lange et al. (1997) used three dye tracers to follow an artificial flood produced in an ephemeral stream, Nahal Shahmon, Israel. At the end of the flow, exfiltration occurred. The conclusions of the study are that channel alluvium plays a dual role in floods. First, the alluvium absorbs water and then as flow decreases water exits the alluvium; this phenomena could be due to the steep channel slope. The study suggests that infiltration is lower at the beginning and higher at the end of a flow.

Flume Experiments

It is possible to trace sediment in artificial environments such as a flume. Such data can provide invaluable information for calculating transport capability and sediment yield.

Einstein did the first studies done on individual particle movement in 1937. He concluded that movement of stone is a statistically random event. The factors affecting movement fall into one of three categories: channel morphology, pebble material, and the characteristics of flow.

Abrahams et al. (1998) used a flume to determine what factors contribute to sediment transport. The paper attempts to identify all variables and determine their importance in sediment transport. The studies were performed on a flume at different

slope angles. The difference between the transport capacity and the influx of sediment from up slope control both the rate of bed erosion and the rate of sediment deposition.

Gover and Rauws (1986) studied the transport capacity of thin flows on irregular as well as plane-bed surfaces. Both cases clearly showed the relationship between grain shear velocity and unit stream power (which is defined as the product of mean velocity and slope). This is calculated from simple measurements of slope and depth, making it a very useful tool to estimate stream sediment transport capacity.

Li and Abrahams (1999) investigated controls on soil erosion using flume experiments. Transport capacity is related positively to rainfall intensity during low intensities of rainfall. Interestingly, transport capacity is negatively related to rainfall intensity during high intensity rainfall. These conclusions agree with Abrahams et al. (1998).

Hassan and Church (2000) experimented with flumes to determine information that they could not glean from natural systems. They conclude that when transport does occur, the bed is only partially mobilized. The flume experiments suggested that bed load transport was equal to or exceeded the supply except at the highest supply rate. Bed transport is sensitive to surface structure and grain size.

Bagnold (1966) approached the problem experimentally and theoretically in an attempt to define sediment transport from a general physics perspective. He begins by arguing that no agreement has been reached on the effect of flow quantity on sediment transport, discharge, mean velocity, tractive force, or energy dissipation. He concludes that transport conditions are easier to quantify at high flow where the process is much simpler than over the lower transitional phases. Bagnold concludes that more studies

must be done on the quantitative aspect of sediment transport. Such study has been slowed by a refusal to appreciate the significance of experimental results, which may appear superficially to be unpractical.

Stone Cover

Stone cover on hillslopes is a very important variable that affects sediment transport during overland flow (Abrahams and Parsons, 1994; Abrahams et al., 2000). Stones are very important in creating roughness in sheet flow (Abrahams and Parson, 1994). Interrill overland flow is a sheet of water moving across the desert surface with threads of deeper, faster flows moving around stones. The result of these diverging and converging threads is varying velocity and flow depth over short distances. All runoff models (Abrahams, et al., 1992; Einstein, 1950; Govers, 1990; Harelman and Rumer, 1961) contain a variable for stone cover, which reflects its importance in determining flow resistance.

Abrahams et al. (2000) expanded upon their previous work (Abrahams and Parsons, 1994) and used a flume to quantify how stone cover affects sediment transport. They investigated sediment transport capability as a function of stone cover. This paper explores sediment transport capacity of interrill overland flow and how capacity varies with the amount of stone cover at two flow intensities. The ability of overland flow to transport sediment is positively related to surface stone cover size and the relationship strengthens when the stone cover increases and flow intensity decreases. This positive relationship is attributed to flow resistance decreasing and the size of horseshoe vortices increasing as stone size increases.

Event Studies

McGee (1897) experienced and wrote about the torrential sheetfloods that occur in the Amercian Southwest. While surveying land for the U.S. Government, McGee encountered a large runoff event he experienced while traveling through the Sonoran desert in Arizona. A light rain fell on the party, about half a centimeter, and then stopped. Within a half an hour, a wave of water came out of the mountains. The wall of water was low and lobate, 15 to 30 cm high. The depth of water was up to ~50 cm in some places. McGee does a wonderful job of describing the flood and providing a detailed geologic and geographic description of the area.

Asher Schick is another person who experienced a rare flow event in the southern Negev Desert, but was not fortunate to have any equipment to quantify the storm. This did not stop Schick (1986) from sharing his results, qualitatively, with the rest of the community. In a wonderfully written paper that is very entertaining and educational, Schick describes a rainstorm he experienced while trying to dig a hole in an ephemeral channel to try and locate bedrock. As the rainstorm begins, the hole that Schick is digging begins to fill in with water and sediment. The hole was completely filled with sediment by the end of the rainstorm and the depth to bedrock was never determined. Before flooding in arid regions occurs, Schick argues there must be three stages of storage filled. First is wetting of the surface, second wetting of colluvial areas, and third and most important, alluvial storage of floodwater in the channel system.

Schick and Lechack (1981) used very different methods to quantify sediment transport rates during a runoff event. The runoff event occurred in the hyper-arid region of the southeastern Sinai Mountains. They used high water marks, which helped them to

evaluate peak discharge. The paper was focused on a very large storm that created an entirely new alluvial fan at the outlet of the watershed. They compared the storm to other storms in the previous 15 years to determine probable hydrographs. They computed bedload yield by measuring the amount of sediment deposited on an alluvial fan, because direct measurement of transport of coarse bedload in heavy floods is "impossible to accomplish." This paper verifies previous data suggesting the use of the 3/2-power rule to calculate bedload transport, which states that "the bedload transport rate is proportional to unit stream power in excess of that necessary for initial motion, raised to the 3/2 power."

Another quantitative study was performed by Abrahams et al. (1986) and examined the relationship between friction and the Reynolds number for overland flow on desert hillslopes in semi-arid southern Arizona. Normally overland flow on these hillslopes consists of a shallow sheet of water with rivulets of deeper, faster flowing water. Rivulets normally occur around vegetation or rocks. Runoff plots in southern Arizona were the site of the experiments. As overland flow increased, roughness elements, which interrupted overland flow, were inundated, lowering flow resistance.

Infiltration

Another way to characterize desert surfaces is by measuring the permeability of the soil. Many variables, including stone cover, animal burrowing, and raindrops, influence the permeability of soil. Infiltration rates, penetration resistance, and bulk density are all related to permeability and the distribution and connectivity of macropores Webb et al. (1986).

Desert rainfall is rare and spatially variable; therefore, it is necessary to create artificial rain to simulate runoff. Rainfall simulators are very important in determining sediment yield, rainfall infiltration rates, and sediment transport speeds. Luk et al. (1986) explain how to set up a low cost, less than six hundred dollars, portable rainfall simulator that can be operated by a small group. Its design characteristics included the ability to simulate drop size, fall velocity, kinetic energy, and drop frequency. It has a low fall height to minimize wind disturbance. This simulator requires a pumping system and large amounts of water.

Another simpler type of rainfall simulator can be used to determine infiltration rates (Kurfis et al., 2001). This system involves sectioning off a small portion, ~1 m^2, of soil on a hillslope using a continuous boundary of roofing tin. The down gradient section of the plot is dug out and small buckets inserted to collect runoff. Rainfall gauges are placed at different areas in the plot. The plot is then sprayed with water from a manual backpack sprayer until the soil is saturated and the runoff rates stabilize, between 30 minutes and 3 hours. Runoff that is produced is collected as it exits the plot and drains into a collection bucket. As each bucket fills, it is replaced with another and the water volume measured in a graduated cylinder before being discarded. Rainfall on the plot is also measured. With these data, it is possible to calculate the infiltration rate of the plot by difference.

Compaction by humans affects the permeability of desert soils. Compaction can occur by road building, military training, and infrastructure building. Disturbance of desert soils due to wheeled and tracked vehicles can affect desert landscapes for more than a hundred years (Nichols and Bierman, 2001; Webb et al., 1986). Webb et al.

(1986) studied how compacted soils of Mojave ghost towns in southern California recover through time. They used compaction measurements including penetration depth, penetration resistance, bulk density, and peak shear strength. Their tests indicated that only one site had completely recovered after 75 years. Recovery times average around 100 years and relate to elevation, which suggests that freeze-thaw cycles play a critical role in loosening compacted soils.

Many years after military maneuvers, Mojave Desert soils still show signs of disturbance (Prose, 1985). Prose studied an area located on a Patton Desert Training Camp. During the late 1940's, General Patton set up huge desert training centers throughout the Mojave desert to train soldiers for northern Africa. Thousands of troops lived and trained at these camps, greatly disturbing the surfaces. Some of these disturbances can still be seen today. Prose found that some segments of tank track show a 73% increase in penetrometer resistance over undisturbed soils. Some roadways could not be penetrated more than 10 cm due to extreme compaction. Prose also trenched below tank tracks and found that modifications of the substrate can extend 25 cm down and 50 cm out from a tank track. Compaction from tanks is also detrimental to plant life in the Mojave Desert (Prose, 1987). The compaction of soil and alteration of drainage channel density changes the perennial plant cover, density, and species composition. In these experiments, Prose estimated porosity by measuring the bulk density.

Stone cover is another important variable determining permeability of desert surfaces. Dunkerley (1995) describes a process to quantify stone cover. The study was done in New South Wales, Australia, at the Fowlers Gap Arid Zone Research Station. Surface stones of varying size cover desert hillslopes. These stones influence surface

cover fraction, infiltration rates, and geometric packing. They also have impacts on sheet flow behavior. This study analyzed two study sites in Australia using photographs. This study determines the most efficient technique to characterize stony surfaces. The most important characteristics are stone count, surface area, edge length, and stone volume or mass.

Dunkerely (1995) suggests how stones influence run off and infiltration. Stones provide places for surface detention storage, which varies by stone size, sorting, and rubble depth. He concludes that simple cover percentage may not provide sufficient information for understanding slope hydrological processes. Currently there is no uniform procedure for stone cover description.

Abrahams and Parson (1991) attempted to identify how stone cover affects infiltration in southern Arizona. They found that infiltration rates are highest under shrubs. High infiltration rates are caused by animals digging as they mix much of sand in the near surface soil. The study concludes that infiltration rates are negatively correlated with stone cover and that infiltration rates are positively correlated with shrub canopy.

Shanan and Schick (1980) created a computer model that incorporates many of the variables thought to influence permeability. The computer model incorporated relationships between "infiltration rates of soils, effects of slope angle on runoff, stone cover, rainfall intensity, antecedent rainfall, basin size, soil crust, overland flow and channel losses." Infiltration rates were calculated by releasing a thin sheet of water onto a narrow strip of sample area. The results of this experiment and rain data were used to predict infiltration rates on different surfaces with variable slope. Mid-slopes receive twice the amount of falling rain as the peaks of hilltops. This pattern was also recorded

by Sharon (1970). The pattern is most likely caused by raindrops drifting away from the exposed ridges and high altitudes and falling on more protected sites at lower altitudes.

Shanan's and Schick's model (1980) reaches several interesting conclusions. Cleared plots produce more runoff than stone-covered plots in small rainfall events, 10 to 12 mm/day. In larger storms, the opposite proved true. Infiltration rates were greater on steeper slopes than on moderate slopes. Autumn infiltration rates were higher on all plots than infiltration rates during winter months. Temperature, evaporation, vegetation and biological activity explain infiltration variability. The results of Shanan and Schick (1980) suggest that infiltration rates are a function of hillside slope and moderate slopes with the low infiltration rates are the principal contributors to runoff. Stone clearing has a significant effect on runoff, as runoff increases with a loss in stone cover. This model is important because in contributes to an understanding of basin processes and can predict contribution of first, second, and third order catchments, as well as human impact.

Biological activity affects infiltration rates as well. Elkins (1983) studied how termites can effect the hydrological responses of small plots to simulated rainfall in Arizona. He concluded that under low vegetative density, the eradication of termites might initialize or accelerate desertification processes because termites churn soils and make them more permeable.

Desert Climate

In arid regions, such as the Mojave Desert, precipitation data are scarce and/or incomplete due to the low number of weather stations and great spatial variability in precipitation amounts. For example, in Barstow, California, near our field sites, the mean annual precipitation is only 100 to 200 millimeters (Abrahams, 1984). What rain occurs

is often spotty. A desert surface might receive centimeters of rain in a single storm event; yet, adjacent areas less than one kilometer away, might not receive any precipitation (Prose, 1985).

Sharon (1972) identifies and explains how difficult it is to track storms in the desert. Most of the rainfall occurring in southern Israel is from highly localized small convective cells. Time and space separate most cells from each other. This means that on any given stormy day, only 20 percent of a basin could be receiving rainfall. Spottiness mostly occurs in late spring and fall, and rainfall is more spatially uniform in the mid-winter. This paper does a very good job at summarizing the problems with understanding precipitation in arid environments. Sharon found no cells smaller than 1 km. The paper quantifies the degree of spottiness observed.

Even when a rain gauge is located in a rainstorm, it might not always record the correct amount of rainfall. Rainfall does not always fall directly perpendicular to the surface (Sharon, 1980). During windy storms, rain falls at an angle, thus affecting the amount of water recorded by a rain gauge. The angle effectively reduces the area of the gauge orifice thus throwing off the calculations of total water depth. A tilted rain gauge can minimize this affect by enabling the raindrops to hit the entire orifice.

Osborn and Renard (1970) tried to qualify desert rainfall spottiness and determine the rainstorm spatial and temporal relationships in a controlled watershed. Runoff in the Walnut Gulch Watershed, Arizona, occurs mostly in summer thunderstorms. Rainfall variability in time and space dominates the rainfall-runoff relationship. Infiltration rates start high, 25 cm/hour and decrease to 12 to 5 cm/hour. Osborne and Renard (1970) conclude that the largest runoff events occur after dry periods. They are uncertain if this

relationship is by chance or whether there is a real correlation between the size of events, runoff, and the length of the intervening dry period.

Osborne and Renard (1969) were able to use Walnut Gulch watershed to obtain very accurate information about rainstorms in arid environments. This paper analyses the precipitation and runoff of two 10-year recurrence storms in southeastern Arizona. The paper agrees with Sharon (1970) that recording rain gauges are widely scattered and do not provide satisfactory information on thunderstorm activity. Warm air in the Pacific during the late summer and early fall creates storms that are generally longer duration and lower intensity than winter storms. The paper does a good job at describing the sequence of events in storms using isohyetal rainfall maps. Individual large storms produce more surface runoff than several years of smaller, more-common storms.

Synthesis

The main method of my study is sediment tracing using 1 cm pebbles. It is important that the techniques that I have used will characterize the surface accurately and provide the necessary results. Our chosen pebble size is slightly larger than the average grain size of the surfaces. Hassan and Church (1992) and Fergueson and Wathen (1998) explain that particle size and shape are not correlated with the distance a particle moves. Therefore the discrepancy in grain size in our study should have no effect. Our pebble movment data can be compared to those measured by Nichols et al. (in press) and Abrahams et al. (1984). Previous infiltration tests were important in determining the appropriate sprinkling rates. We are able to compare our infiltration rates to those already published (Schick, 1970; Webb et al., 1986). Background information on desert

storms is important for comparison with our onsite rainfall data (Osborne and Renard, 1969, 1970).

Chapter 3 - Methods

Three distinct field procedures were used to collect the data necessary to characterize and explain sediment movement for this study. These included measuring sediment transport rates directly by repeatedly surveying painted and numbered pebbles, measuring infiltration rates using sprinkler infiltration tests, and recording precipitation using data-logging, tipping-bucket rain gauges. Data collection and analysis methods differed for each data set. The data were combined to explain and quantify piedmont sediment transport processes and rates.

Pebble Tracing

In order to determine how sediment moves over short time and spatial scales, I placed pairs of perpendicular, 20-m-long pebble lines across four piedmonts. The stones were then placed at 10 cm intervals along the lines to produce an orthogonal cross shape. One line was placed parallel to contour and the other was oriented down gradient.

These pebble lines are constructed from 1 cm crushed granite (Figure 3.1) obtained from Pike Industries in Barre, Vermont. Half of the stones were painted blue and the other half painted green with a high-gloss latex paint; one color was used for each line. The stones were individually labeled in batches from 1 to 200. The stones were then sprayed with a UV-resistant coating to prevent fading. However, the painted stones faded and had to be relabeled several times in the field. On the final trip (April 2002), the stones were permanently tagged with a small aluminum marker with the number imprinted on it. The tags were attached to the stones with all-weather, high-temperature epoxy, Devcon HP-250 (Figure 3.2). This will allow for future relocation of pebbles using a metal detector. In addition the metal tags may allow for location of buried

Mountain and Chemehuevi, the initial pebble locations were surveyed with the total station. Two data sets, Goldstone and East Range Road of November 2000 were corrupted by a zero-set rotational error and have not, as yet, been rectified.

The pebbles have been resurveyed 5 times, November 2000, March 2001, May 2001, October 2001, and April 2002. Each trip produced up to 1600 data points for a total of nearly 9600 pebble data points. Not every field site was resurveyed each time. East Range Road and Chemehuevi were not surveyed in March 2001 due to conflicts with the military schedule and a chemical spill, which prevented us from driving to the Chemehuevi Mountains.

Infiltration

Infiltration rates were measured using a sprinkler infiltrometer (Figure 3.5, Kurfis et al., 2001). Infiltration rates were calculated by sprinkling a ~0.6 m^2 plot at each site while measuring surface runoff. The amount of runoff was recorded over time.

The sprinkled area was enclosed with sheet metal flashing to collect surface runoff. The downstream end of the plot was dug out and plastered to collect surface runoff and to stop erosion of the outlet. The runoff was collected in a bucket, which was placed below the plaster outlet (Figure 3.5). Three rain gauges were placed in the plot to record the amount of water being sprinkled on the plot (Figure 3.5). The plots were sprinkled with backpack pump sprayers normally used for fertilizers or pesticides, (Solo Backpack Sprayer 425). We used approximately 1 L/min of water to create runoff on the meter plots; some plots did not produce runoff. The water was applied over the time span of one to several hours. The final infiltration rate was calculated after infiltration had stabilized.

Rainfall Data

Flowing water moves sediment and comes from infrequent but severe rainstorms. In arid regions, such as the Mojave desert, precipitation data are scarce and/or incomplete due to the wide distribution of weather stations and the great spatial variability in precipitation amounts (Abrahams, 1984). Thus, we used recording rain gauges (Figure 1.5) to document precipitation over time determining how much rain fell and when it fell at each of the pebble sites. We used these data to determine if there was a relationship between rainfall and pebble movement.

Precipitation was measured with 0.25 mm precision using tipping-bucket rain gauges and digital rainfall loggers (Hobo Event Logger made by Onset). With these collectors, I recorded the quantity, duration, and time of rainfall at each of the field locations. In the Chemeheuvi Mountains, I installed two gauges, one at the pebble cross, 12 km down the piedmont and the other only 4 km from the range front. This was done to compare rainfall amounts 8 km apart and to determine the spatial variability of rainfall. The rain collectors were mounted 0.5 m above the surface on metal poles 5 cm in diameter, pounded into the soil. The collectors were leveled and did not use windshields.

Site Characterization

Each of the four sites was analyzed using five additional characteristics: soil density, soil description, plant description and count, background topography, and channel count. Background topography was surveyed at each site. This was done using a Trimble 4400 Real Time Kinematic Differential GPS for accuracy and speed (Figure 1.6). The survey area was roughly four times the size of the pebble cross. Bushes,

mounds, boundaries, and channels were surveyed. At each site, between 600 and 900 data points were collected to characterize background topography, channels, and bushes. In order to characterize the broader piedmont surfaces on which the pebbles were placed, the number and width of ephemeral channels were counted along a transect. This was done by walking a 0.3-0.5 kilometer transect that included the pebble line. Shrubs were counted and measured to create a percent cover of woody vegetation on the plots. Bush center points were surveyed with differential GPS, and their diameters measured with a tape. Soil descriptions were made in shallow soil pits at each site. Soil descriptions characterized the texture, color, and structure of the different layers within the pits (<50 cm).

Data Analysis

The survey data were written by hand in the field and entered manually into a spread sheet, then plotted to check for data entry error. In order to ascertain the precision with which the pebbles were measured, the control pin data were analyzed. Each time the pebbles were surveyed, the pins were surveyed twice, once at the beginning and once at the end of the survey. The average northing and easting of every East, West, South and North pin was calculated individually for each site. The average standard deviation of the pin location was then calculated, and this value (2.3 cm, 1σ) is used to estimate the long term precision of our survey measurements.

Pebble movement distance was calculated for each pebble and for each survey period. First, we compared the location of each pebble to its previous location. Second, we compared the location of every pebble during every survey period to its original placement location. Both incremental and integrated movement distances were then

calculated. For example, the first method compared May 2000 to November 2000, then November 2000 to March 2001, and so on. The second method compared May 2000 to November 2000, then May 2000 to March 2001, then May 2000 to May 2001, and so on.

The Pythagorean theorem was used to calculate the movement distance. The following equation was used:

$$((\text{Original Easting} - \text{New Easting})^2 + (\text{Original Northing} - \text{New Northing})^2)^{1/2}$$

This calculation produces the gross movement of every pebble. It does not take into account whether the pebbles moved up or down, or left or right, from the line.

Pebbles that were arranged on the contour parallel line were analyzed differently than pebbles on the line oriented down gradient. Pebbles on the contour parallel line were characterized as moving either up or down gradient. Net pebble movement assigns a negative or positive value to movement depending on whether the pebble moved up or down from the line. Net movement is used to determine pebble speed down piedmont. Gross movement characterizes the dispersion of pebbles over time.

Pebbles on the line oriented down gradient were used to examine pebble dispersion. Gross movement away from the original line for each set was calculated. Net movement away from the original line was also calculated for each set.

The rain data were downloaded using a laptop computer and download cable directly linked to the recording unit in the rain gauge. The rain gauges were installed in November, 2000. Information was downloaded from the gauges in May 2001, October 2001, and April 2002. The data were then divided into rain per day and displayed in bar graph form. Rainfall intensities were then calculated for each storm to correlate intensity

to pebble movement. The data were compared to a long-term monitoring station in Barstow, California.

Figure 3.1 and 3.2 - Pebbles are made from 1-cm crushed granite and spaced every 10-cm, Picture B. The pebbles were painted with latex paint and then numbered. A metal tag was epoxied to the pebbles during the April 2000 trip, Picture A.

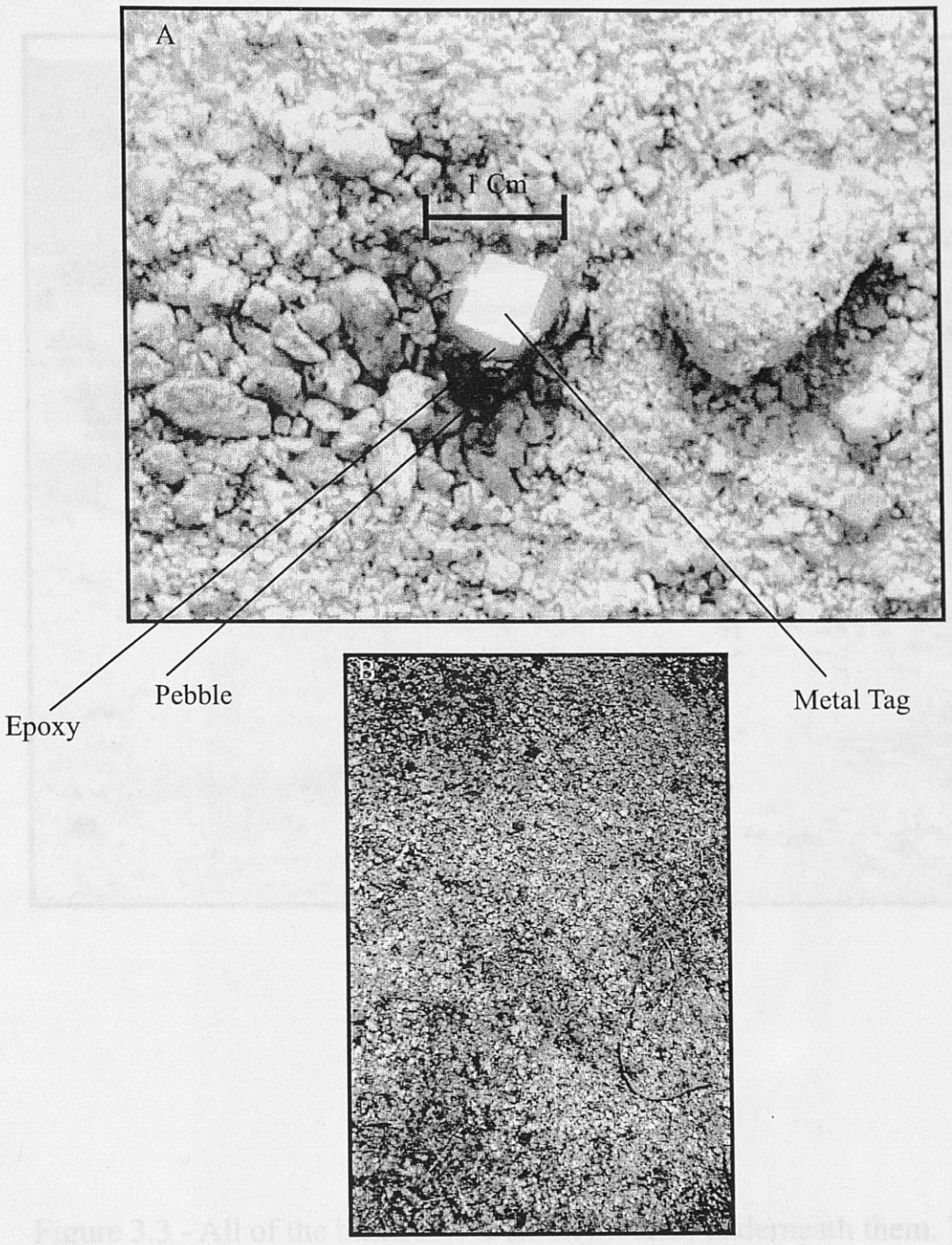


Figure 3.1 and 3.2 - Pebbles are made from 1-cm crushed granite and spaced every 10-cm, Picture B. The pebbles were painted with latex paint and then numbered. A metal tag was epoxied to the pebbles during the April 2000 trip, Picture A.

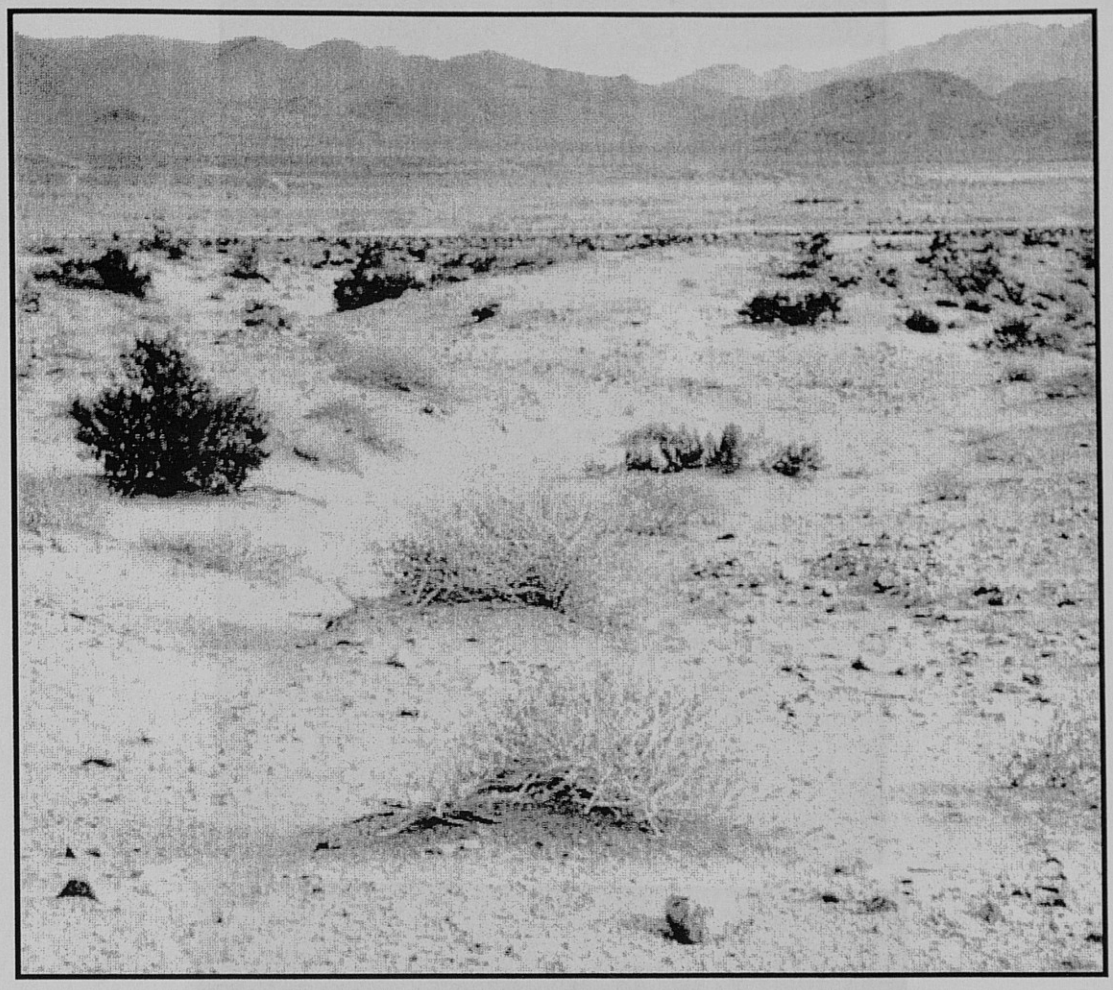


Figure 3.3 - All of the bushes have small mounds underneath them. The mounds have have looser soil that is varied in texture. The mounds concentrate the animal activity. There is not much vegetation which is characteristic of East Range Road where this picture was taken.

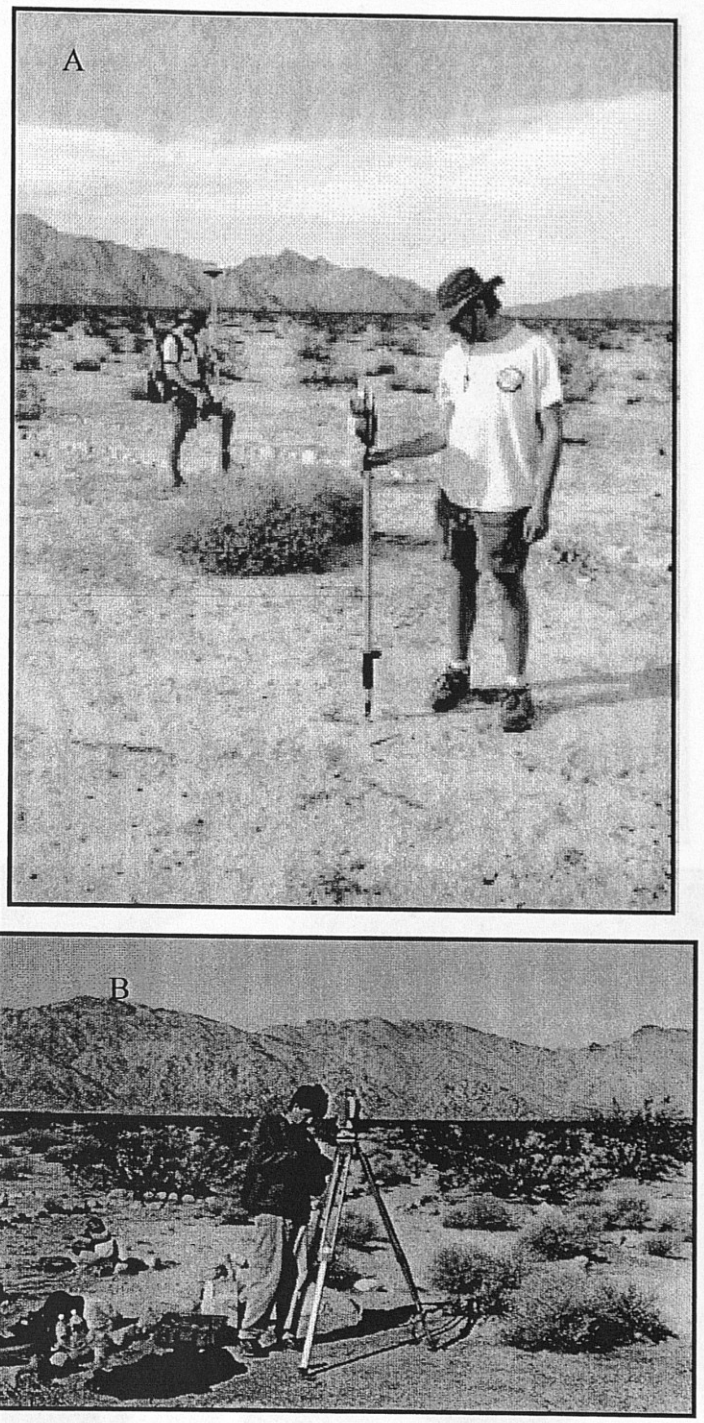


Figure 3.4 - The pebbles were individually surveyed during each trip producing ~1600 measurements, Picture A. The survey rod was placed to one side of the stone. Measurements were recorded manually, Picture B, and later entered into a computer spreadsheet. Both pictures are from Iron Mountain.

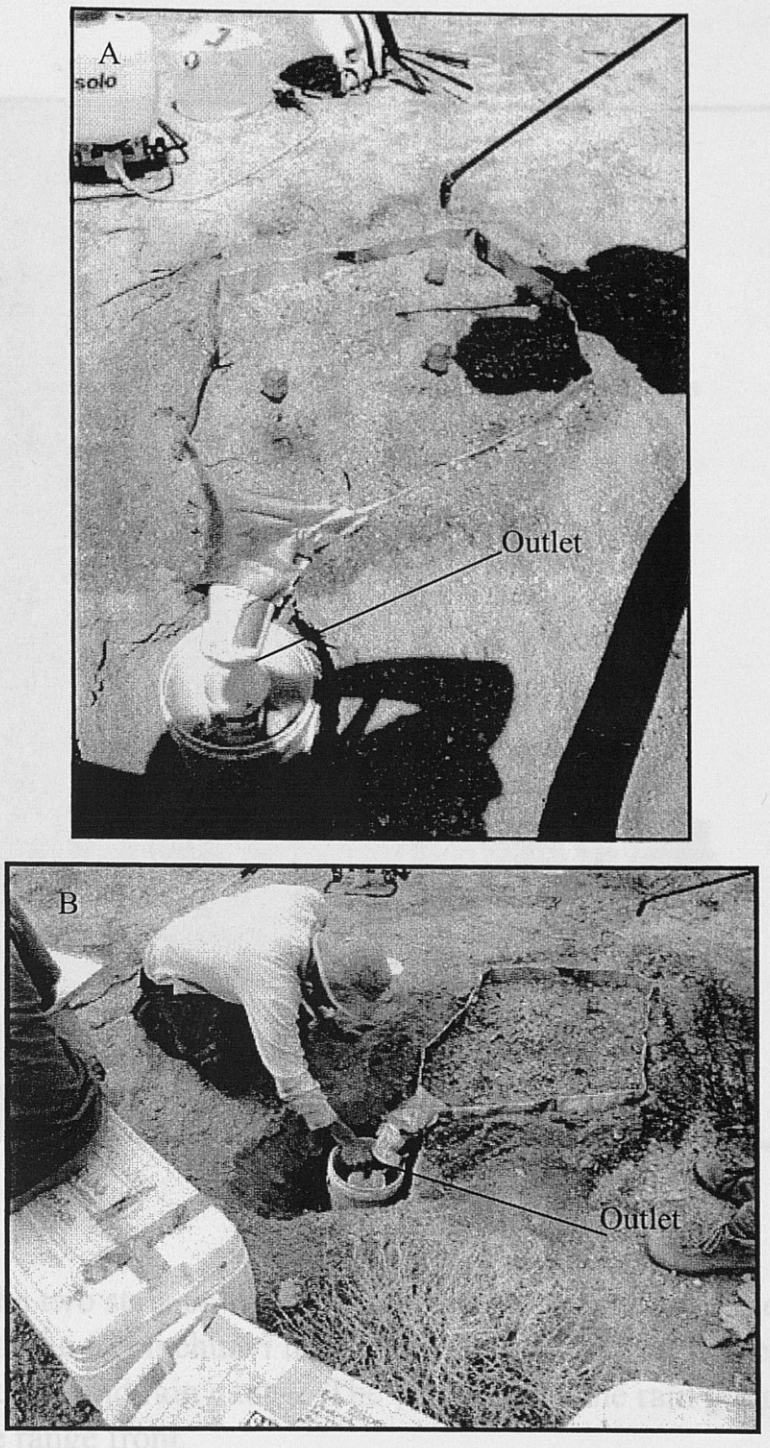


Figure 3.5 - Infiltration measurements were taken at each field site. The infiltration tests were performed by sprinkling water from manual pump backpacks. The outlet where runoff was collected can by seen in Pictures A and B. Both pictures are from East Range Road.

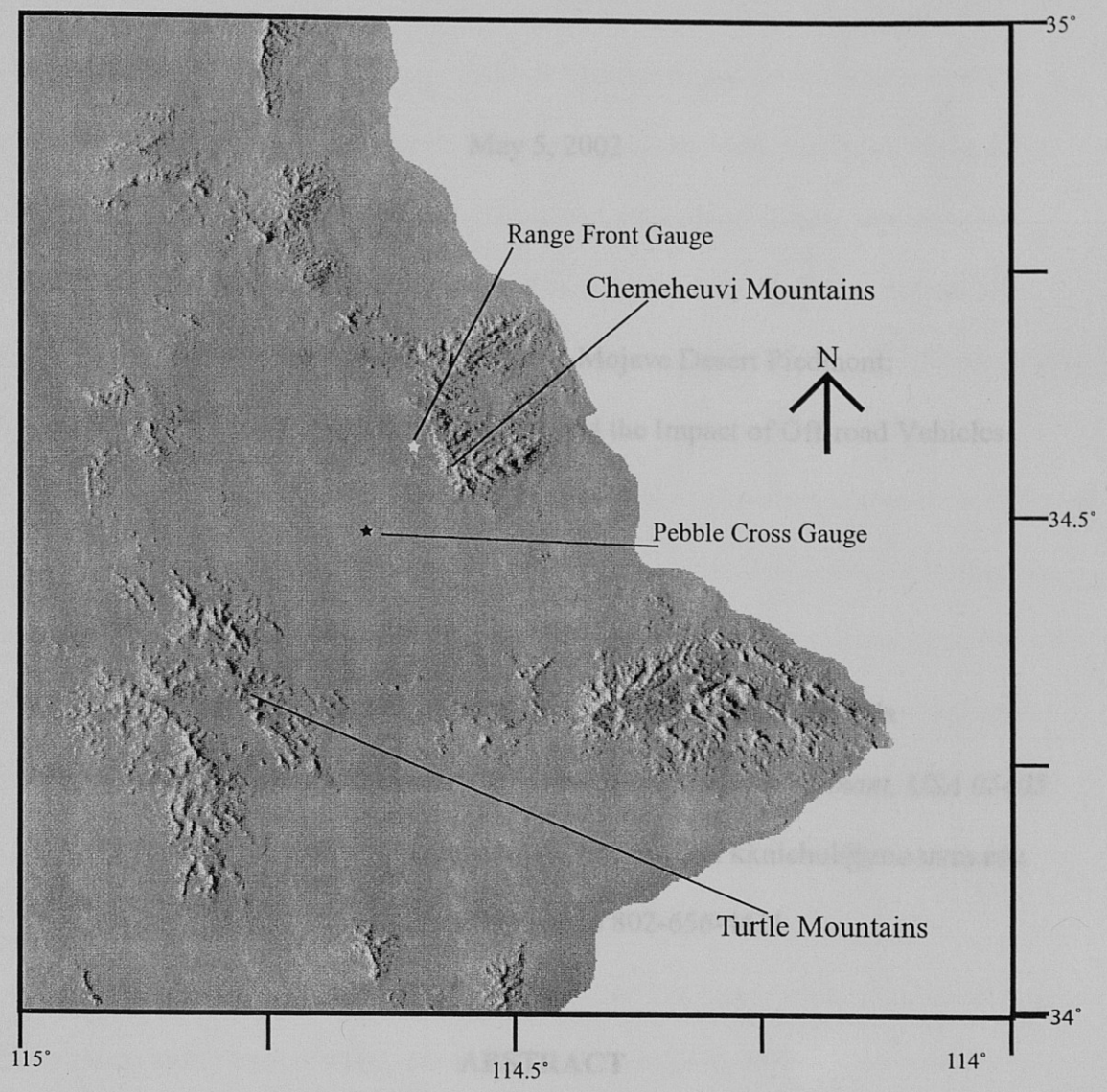


Figure 3.6 - The two stars on this map indicate the positions of the two range gauges at the Chemehuevi Mountains. The black star is the location of the pebble cross and rain gauge. The white star is the rain gauge installed at the range front.

Chapter 4 - Journal article for submission to Water Resources Research

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Tracking Painted Pebbles on a Mojave Desert Piedmont: Annual Rates of Sediment Movement and the Impact of Off-road Vehicles

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ABSTRACT

To quantify short-term sediment movement rates across low gradient Mojave Desert piedmonts, 1600 painted and numbered pebbles were surveyed 6 times at four sites over 2 years. The four sites represent geomorphically similar surfaces with different land use histories. Two sites are located on surfaces currently (*East Range Road*) or previously (*Iron Mountain*) impacted by military training activities including the use of

wheeled and tracked vehicles. The two other sites, *Goldstone* and *Chemehuevi*, are in mostly undisturbed areas.

There are three distinct mechanisms for pebble transport: ephemeral channels transport a few pebbles long distances (m) down gradient, bioturbation moves most pebbles small distances (cm) in any direction, and vehicular disturbance transports pebbles varying distances in any direction. The recovery rate of pebbles in natural systems after two years was 98% and 93% (Chemehuevi and Goldstone). At East Range Road, where vehicles currently disturb the surface, recovery was only 76%. At Iron Mountain, where impact ceased nearly 60 years ago, the recovery rate was 87%. Off-road vehicle use is coincident with accelerated pebble movement. Pebbles move further and faster down gradient at the disturbed Iron Mountain and East Range Road sites, (0.71 m yr^{-1} and 0.29 m yr^{-1}, respectively) than at the undisturbed Chemehuevi and Goldstone sites, (0.18 m yr^{-1} and 0.04 m yr^{-1}, respectively).

INTRODUCTION

Desert piedmonts, the long, low angle slopes that extend from steep mountain fronts down to flat basin centers, are still an enigma to geomorphologists after many years of research (Oberlander, 1974; Lecce, 1990). Processes that form and change these landforms are so episodic that only rarely can they be observed directly (McGee, 1897; Schick, 1986). Sediment movement rates on piedmonts and other desert landforms have rarely been quantified because they are slow and irregular due to scant as well as temporally and spatially variable rainfall (Abrahams, 1984). The rarity of run off and vegetation allows disturbance of desert soils by wheeled and tracked vehicles to persist

for more than a hundred years (Nichols and Bierman, 2001; Webb et al., 1986; Iverson et al., 1981; Iverson, 1980).

Pebble tracing, which follows the movement history of individual grains during a transport period, has been used to study sediment primarily in fluvial systems (Hassan et al., 1984, 1999; Hassan and Church, 1991, 1992, 1994; Fergueson and Wathen, 1998; Hassan, 1990, 1993; Ergenzinger and Custer, 1983; Slattery et al., 1995; Laronne and Carlson, 1976; Schick and Lekach, 1995; Abrahams et al., 1984; Hubbell and Sayre, 1964, 1965; Sayre and Hubbell, 1965). Most studies have been done in confined channels such as flowing or ephemeral rivers. One study tracked pebbles and clasts down desert hillslopes (Abrahams, 1984). Never has sediment been tracked across the unconfined drainage network of desert piedmonts despite the ubiquity of this landform in arid regions.

This study analyzes the movement of 1600 painted and numbered pebbles over 29 months on 4 piedmonts in the Mojave Desert, California (figure 4.1). Our measurements include over 10,000 data points in order to overcome the problem of noise and to ensure that the individual grains are representative of the larger population of which they are part (Hassan and Church, 1992). We use rainfall and infiltration data collected from each site to determine if pebble movement correlates with the local rainfall and infiltration.

PREVIOUS RESEARCH

Desert piedmonts, ubiquitous landforms in the arid regions world wide, are large-scale features (10^0 to 10^2 km). Some piedmonts are erosional near the mountain front and are termed "pediments," others are depositional and are termed "alluvial fans" (Hadley, 1967). Some piedmonts are a surface of transport where there is no net erosion or

deposition. Although piedmonts usually have gently sloping topography, complex interactions of climate change, tectonic activity, lithology, and drainage basin characteristics and networks make piedmont processes difficult to model and quantify (Bull, 1977; Lecce, 1990; Oberlander, 1974). The sites which we studied are surfaces of deposition (Nichols et al., 2001; Nichols et al., in press).

Sediment movement rates can be influenced by particle size (Abrahams et al., 1984). It is well established that particle size and distance traveled are correlated in flowing rivers, (e.g., Furgueson and Wathen, 1998). However, in ephemeral arid region streams, particle size and distance traveled are often unrelated (Hassan, 1992; Hassan and Church, 1991; Laronne and Reid, 1993) because flows do not last long enough to sort the sediment and transport grains selectively. We used cm-size clasts to track sediment movement because they were large enough to see and similar in size to pebbles naturally occurring on our four sites.

Many years after human disturbance, Mojave Desert soils still show signs of disturbance demonstrating the fragility of these environments (Nichols and Bierman, 2001; Webb et al., 1986; Iverson et al., 1981; Iverson, 1980). Vehicle-induced disturbances include compaction, decreased infiltration, vegetation change, channel loss, and redirection of drainage networks. Desert surfaces receive little rainfall. The lack of runoff slows sediment transport, and slows the mixing of the soils, thus allowing disturbance to persist for many years.

STUDY AREA

All four study sites are located in the Mojave Desert (figures 4.1 and 4.2). In Barstow, California, west of the field sites, average annual precipitation is 10.3 cm (National Weather Service). The vegetation at all sites is predominantly creosote bush *(Larrea tridentata)* and desert sage *(Salvia Dorrii)*. Field sites are located on surfaces dominated by coarse sand and fine gravel. Source lithologies for all sites are dominantly granitic or coarse crystalline metamorphic rocks.

The field sites were chosen to be geologically and geomorphically similar, but to represent four distinct land uses. *East Range Road piedmont* is an active Army training range, which is heavily and continually impacted by off-road Army vehicle use including tanks and humvees. The site has sparse vegetation, 12% plant cover (table 4.1), and is 3 km from the range front. There are no distinguishable channels at this field site (table 4.2 and figure 4.1 D).

Iron Mountain piedmont was a heavily impacted army base and training facility during World War II. This site was compacted by intense vehicular and foot traffic from 1942 to 1944 (Prose, 1985), but is now fenced preventing entrance of motorized vehicles. There is some foot traffic as tourists occasionally visit the site. The Iron Mountain piedmont has sparse vegetation, 14% plant cover (table 4.1 and figure 4.1 E), and is 3 km from the range front.

The *Chemehuevi Mountain piedmont* is remotely located and receives no vehicular traffic today. There are a few World War II vintage tank tracks several kilometers up the piedmont. Vegetation covers 25% of the surface at the site (table 4.1),

which is 12 km from the range front. This site has an extensive ephemeral channel network that appears to have been active recently (figure 4.1 F).

The *Goldstone* Piedmont is located within the Goldstone Deep Space Communications Complex (DSCC), operated by the National Aeronautics and Space Administration. The study location is ~0.5 km from the road. There is no disturbance on this site because vehicle use is prohibited and the public is restricted from entering the DSCC. The Goldstone piedmont has extensive vegetation, 39% plant cover, and the study site is only 0.14 km from the range front (table 4.1). There are no channels at the field site (figure 4.1 G).

METHODS

Pebble surveys, infiltration rates measured by sprinkling, and rainfall data were used to characterize each site. These data were supplemented with soil density, soil description, plant description and enumeration, background topography, and a channel count to characterize further the surfaces on which the pebbles sit. Background topography was surveyed at each site using a Trimble 4400 Real Time Kinematic Differential GPS at cm resolution.

In order to determine how sediment moves on short time and spatial scales, we placed 1600 painted and individually numbered pebbles of 1-cm-sized crushed angular granite on the desert surfaces. The pebbles were placed at 10-cm intervals along 20-meter long orthogonal pebble lines to produce a cross shape at each of the four sites. One line was placed parallel to contour and the other was oriented down gradient. Repeated surveys of 4 rebar control pins at each site, pounded 1 m into the desert surface, suggest long-term survey precision of 0.021 m (1σ, table 4.3).

In February, 2000, we laid out two crosses, one at East Range Road, the other at the Goldstone Deep Space Communications Complex. In May 2000, two additional crosses were laid out, one on the Chemehuevi Mountain piedmont, and one at Iron Mountain. To determine the amount and direction of movement of these 1600 pebbles over time, we repeatedly resurveyed each pebble using a Pentax 2cs electronic total station, which provided cm-scale accuracy. The pebbles have been resurveyed 5 times, November 2000, March 2001, May 2001, October 2001, and April 2002 (tables 4.4 and Appendix 1).

Infiltration rates were estimated by sprinkling a ~0.6 m^2 plot at each site and measuring surface runoff. The sprinkled area was enclosed with sheet metal flashing. The downstream end of the plot was dug out and plastered to collect surface runoff and to stop erosion of the outlet. The runoff was collected in a bucket placed below the plaster outlet. Three rain gauges placed in the plot recorded the amount of water being sprinkled. On average, we sprinkled about 1 liter of water per minute (from a backpack sprayer) to create runoff. Some plots did not produce runoff. The water was applied over a time span of one to several hours at rates between 7 and 23.8 cm h^{-1} (table 4.5).

Precipitation amounts and intensities were measured using tipping-bucket rain gauges (0.25-mm precision) and digital rainfall loggers to record the quantity, duration, and time of rainfall at each of the field locations except East Range Road where such data were available from the Army (tables 4.6 and 4.7). In the Chemehuevi Mountains, we installed two rain gauges, one at the pebble cross, 12 km down the piedmont, and the other, 4 km from the range front. This was done to compare rainfall amounts at two sites 8 kilometers apart.

Movement distances were calculated for each pebble and for each survey period. First, we compared the location of each pebble to its previous location; second, we compared the location of every pebble during every survey period to its original placement location. Both incremental and integrated movement distances were then calculated.

The Pythagorean theorem was used to calculate the movement distance where E_0= original easting, E_n= new easting, N_0= original northing, and N_n= new northing:

$$((E_0 - E_n)^2 + (N_0 - N_n)^2)^{1/2} \quad \text{(eq. 1)}$$

Such a calculation indicates the gross movement of every pebble. It does not take into account the direction pebbles moved. Pebbles on the contour-parallel line were characterized as moving either up or down gradient. Pebbles on the line oriented down gradient were characterized as moving right or left and the gross movement used to examine pebble dispersion. Down gradient pebble speed was calculated using the time interval between each measurement and net pebble movement.

Pebbles that move great distances and then disappear greatly affect average movement rates because most pebbles move only centimeters. For this reason, when a pebble was lost, the last known position of the pebble was used to determine travel distance. By only recording the last known locations of each pebble, we calculate minimum pebble movements. It is likely that the lost pebbles are either buried or are transported further down gradient. Although some pebbles move centimeters up slope due to animal activity, it is unlikely that lost pebbles moved up slope any significant distance by natural means. In fact, there were survey periods where we did not find a

pebble but located it during the following survey. Each time these pebbles were further down gradient than the previous observation.

RESULTS

Survey data demonstrate that piedmont sediment moves and that such movement can be traced over time. Either net or gross pebble movement can be considered; both increase over time. At all sites but Golstone, pebbles move in a step progression characterized by long periods of rest and short periods of fast movement.

Pebbles on the lines oriented down gradient were analyzed separately from pebbles on the lines oriented parallel to contour. At each site, during every survey interval, the mean gross pebble movement was higher on the lines oriented parallel to contour (table 4.4) than the lines oriented down gradient. Average net movement also differs according to line orientation. On the lines oriented parallel to contour, net movement increases overtime. On the lines oriented down gradient, the mean net movement increased with time at Iron Mountain and Goldstone but was constant within survey precision at the East Range Road and Chemehuevi sites.

Mean pebble movements varied between sites and between lines (tables 4.4). Mean gross down gradient movement of pebbles on the line parallel to contour over 23 months from May 2000 to April 2002 was greatest at the human-impacted sites of East Road and Iron Mountain, 0.80 meters and 1.41 m, respectively. At the unimpacted sites, Goldstone and Chemehuevi, the mean gross movement on the lines parallel to contour was smaller, 0.09m and 0.37 m, respectively. The human-influenced sites have distinct jumps in the values of average gross and net pebble movement on both lines (figures 4.3, 4.4, 4.5, and 4.6) reflecting transport events. At the undisturbed sites, the average gross

and net movement values progress in near linear trends (figures 4.3, 4.4, 4.5, 4.6, 4.7, 4.8, 4.9, and 4.10).

At each site, average movement was always greater than median movement because a few pebbles moved great distances in channels, right skewing the distribution (e.g., figure 4.13). Median gross values are greater than median net values indicating that pebbles are moving both up and down gradient and side to side. Median values remain similar through time indicating that most pebbles are moving only small amounts between each survey period.

Pebble recovery rates varied greatly between sites (figure 4.11). Pebble recovery rates at sites not affected by off road vehicles are high; after two years, we found 98% of the pebbles at Chemehuevi and 93% at Goldstone. At sites impacted by off-road vehicles, recovery rates are lower, 87% at Iron Mountain and 75% at East Range Road.

Infiltration rates differ between sites (table 4.5) although soil densities are similar (table 4.2). The highest infiltration rate was measured at Goldstone (>23.8 cm h^{-1}) where runoff could not be produced. The lowest infiltration rate was measured at Chemehuevi (4.7 cm h^{-1}). The two infiltration tests at East Range Road gave very different results. The first test produced no run off due to detention storage in tank tracks and a collapsed animal burrow, which captured the little runoff that started to form. The second test, made less than 5 meters away, indicated a much lower rate of infiltration, 6.7 cm h^{-1}. The infiltration rate at the Iron Mountain site was similar to second test at the East Range Road site, 6.5 cm h^{-1} (table 4.5).

The rain gauges at Goldstone, Chemehuevi near the mountains, Chemehuevi near the pebble site, and Iron Mountain measured similar rainfall totals over one year, 2001,

14.32 cm, 10.71 cm, 9.57 cm, and 9.37 cm respectively (table 4.6). These amounts are similar to that measured at Fort Irwin, the location of the East Range Road site, 10.35 cm. In 2001, our gauge at Goldstone measured 2.18 cm more precipitation than the permanent gauge installed 5 km away. The three largest maximum 1-day events occurred at Goldstone (3/6/01, 1.80 cm; 1/11/01, 1.68 cm; 2/26/01, 1.45 cm; table 4.7). The two highest 1 hour intensities occurred at Iron Mountain (7/6/01, 1.35 cm h^{-1}) and (3/9/01, 0.94 cm/ h^{-1}); the third highest intensity was Goldstone (11/24/01, 0.85 cm/ h^{-1}).

DISCUSSION

Pebble-Moving Processes

Three distinct processes move pebbles across piedmonts: flow in ephemeral channels, bioturbation, and human activity (figure 4.12). The process moving pebbles affects the recovery rate. Pebbles moved by bioturbation are easily found unless they are buried by burrowing such as we observed at Goldstone (figure 4.12). Pebbles moving in channels can often be traced down channels, but can be buried during flow. Pebbles disturbed by off-road vehicles get caught in treads, scattered varying distances in any direction, and may be buried, making recovery difficult. Subsequent rain or wind events can uncover some of the more shallowly buried pebbles.

The process moving pebbles affects the mean and median movement values. Far moving pebbles inflate the mean values but make little difference to medians. Median values better reflect the most common movement distance. Pebbles located in ephemeral channels have the potential to move great distances down gradient, because during rainstorms water is concentrated into the established channels. At Chemehuevi, one pebble in a channel moved 25.1 meters in two or more events over 12 months. At all sites

except Goldstone, pebbles are located in both channels and interfluves and there are more pebbles on interfluves than in channels. Pebbles incorporated into channel flow are sometimes buried. However, not all site-crossing channels are active during any one event.

Bioturbation appears to move more pebbles than channel flows, but bioturbated pebbles move shorter distances, <10 cm. Bioturbation, which includes burrowing, is important and appears to move pebbles up, down, or across the slope. Increasing average gross movement on down gradient lines indicates continued pebble scattering or dispersion. At each site, the median net movement on the line oriented down gradient increases gradually over time (advection), indicating that our lines were not laid out exactly down gradient and thus, there is a small preference for movement to one side of the line.

Pebble Recovery

The number of pebbles recovered over time appears to reflect land use. Sites impacted by human activity have lower pebble recovery rates than the pristine sites (figure 4.11). Pebbles on impacted sites have recovery rates that drop sharply whereas the pebbles on pristine sites are lost gradually (figure 4.5). For example, the number of pebbles recovered drops sharply in October 2001 at Iron Mountain (figure 4.11) because a large storm event moved and presumably buried many pebbles in channels. At East Range Road, a sharp drop occurs in November 2000 after many off road vehicles had traversed the site (figure 4.2).

The patterns of pebble loss are similar at the two human-disturbed sites, but the process by which pebbles are lost differed. For example, Iron Mountain pebbles are lost

due to flows in channels. At East Range Road, pebbles are lost by the direct action of tank tracks, which can move many pebbles over a large area as well as bury them. Iron Mountain, the recovering site, has larger channels than the other three sites (table 4.2) meaning that more pebbles will move when channels are activated by rainstorms. In contrast, at the unimpacted Goldstone site, which has almost no channels, pebble loss is due entirely to animals burrowing and burying pebbles (figure 4.12).

Distribution of Pebble Movement and Processes

Mean pebble travel distances and speeds consistently exceed median values because the distribution of pebble movements is strongly right skewed (figure 4.13). Mean values primarily reflect the effect of pebbles moved large distances in channels by flow and median values represent pebbles moving on interfluves by bioturbation.

Some pebbles are lost when channels flow and then reappear in subsequent surveys potentially biasing the interpretation of why and when pebbles moved. For example, at the Iron Mountain site, the gross average movement on both lines increased between October 2001 and April 2002 even though there was very little rain during this period (figure 4.5 and figure 4.6). Nine of the large movements in measured April are pebbles that were lost or buried in a channel during the October survey (they were most likely buried in the high intensity storm on 7/6/02, 1.35 cm h^{-1}) and then resurfaced before the April survey. This is an example of survivorship bias influencing movement calculations. This bias, first described by Hassan and Church (1992), reflects movement rates of found particles when in fact, lost particles exhibit a different behavior. Magnetic particles in the <1km^2 Nahel Yael basin, were buried as deeply as 0.5 m in ephemeral channels leading Hassan et al. (1984) to conclude that channels must have a thick active

layer in which sediment is well mixed. The high recovery and resurfacing rates for channel-transported pebbles in our study indicates that the active layer is very thin, perhaps only cm, when the channel becomes active.

A very different process moves pebbles at the currently impacted East Range Road site. Pebbles were found meters down gradient on interfluves, indicating that the pebbles were transported by tank tracks and not channel flow. There are more resurfaced particles at Iron Mountain than East Range Road. It is likely that the pebbles at East Range Road were not lost in channelized flow; rather, they were scattered great distances or buried by the tanks, decreasing the likelihood that they would ever be found.

Relation of Pebble Movement to Rainfall and Infiltration

Pebble movements can be correlated to rainfall occurrence and intensity. The largest average movement at Iron Mountain occurred between May 2001 and October 2001, which correlates with the largest and most intense rainstorm (July 7, 2001; figure 4.7). At Iron Mountain a rainfall event produced flow in two channels that moved 18 pebbles further than 5 m from their previous positions. In contrast, at all of the sites, only small movements were recorded between October 2001 and April 2002. This period of stability correlates with the lack of rain over this time period at all of the sites.

The infiltration and rainfall intensity data indicate that the storms we measured were not of sufficient intensity to initiate runoff during our monitoring period (table 4.5 and 4.6). The highest one-hour intensity of any storm was 1.35 cm h^{-1}. The lowest infiltration rate, measured at Chemehuevi, was 4.7 cm h^{-1}. However, our data suggest at least one period of channel runoff at the Chemehuevi, Iron Mountain, and East Range Road sites. The runoff filling channels indicates the importance of surfaces up gradient.

Rainfall data from the two Chemehuevi gauges indicates that mountain ranges receive more precipitation than areas further down the piedmont. Heavy rain in less permeable rocky mountain ranges is not able to infiltrate and flows down the piedmont (McGee, 1897). Because only pebbles in channels moved great distances at our sites, we infer that flow of sufficient depth and velocity to move 1-cm clasts was restricted to channels. Because precipitation intensities were much less than measured infiltration rates, we infer that flows originated up gradient.

Infiltration rates vary greatly between sites and are not related to average pebble movement or speed. Chemehuevi had the lowest measured infiltration rates and the second lowest gross and net average movement of pebbles (table 4.5). East Range Road infiltration rates vary because of the surface heterogeneity caused by off-road traffic. Goldstone has the highest infiltration rates indicating that the soil is kept loose by plant roots and animal burrowing which enable water to percolate quickly and not concentrate in channels. This is reflected in the lowest gross and net average movements observed at any of the sites. In contrast, East Range Road has little vegetation (table 4.2) and significant tank traffic, which compacts the surface thus greatly decreases infiltration (Webb et al., 1986).

Mojave Desert summer monsoons are known for their high intensity of rainfall (Osborne and Renard, 1970) reaching 14.6 cm h^{-1} (Osborne and Renard, 1969). These intensities were produced during the largest thunderstorms in a ten-year period, 1959-1969. Based on our measured infiltration tests, intensities of this magnitude would create runoff at the Chemehuevi, East Range Road, and Iron Mountain. The largest 10 year storms still do not produce enough water to create runoff at Goldstone, meaning that the

surface at Goldstone rarely experiences overland flow. These rare but high intensity summer rains must play an important role in filling channels and moving pebbles great distances.

The spottiness of desert rain (Sharon, 1972) means that the entire mountainous drainage basin and piedmont rarely receive the same storm. The typical diameter of desert thunderstorms is estimated to be ~ 5 km (Sharon, 1972), meaning that not all of the channels on the piedmont surface have flowing water from one storm. Our two gauges at Chemehuevi (table 4.6) indicate that more rain falls at the range front than down piedmont; therefore, it is possible that channels near the range front fill more often than those down gradient thus moving sediment near the range front more often. This would mean that sediment movement rates vary with distance to the range front with rates being highest on surfaces closest to the range. In contrast, our data indicate that Goldstone, closest to the range front, has the slowest movement rates. This is most likely the result of the comparatively small drainage basin up gradient of Goldstone which does not generate as much runoff as the other sites.

Comparison to Previous Research

At Iron Mountain, pebble speeds measured by tracing compare well with those measured by Nichols et al. (in press), using in situ produced ^{10}Be. Cosmogenic data and interpretive models suggest pebbles move decimeters to up to a meter per year at Iron Mountain. Net down gradient speed determined by pebble tracing at Iron Mountain is 7.0 m yr^{-1}.

Stones traced on hillslopes (Abrahams et al., 1984) move far less than the piedmont stones we traced at our field sites. The hillslopes are steeper, (7°-23°) than our

field sites (<1°-5°) and the size of the particles used on hillslopes ranged from 8 to 70 mm. The distances that particles move on hillslopes was smaller, 1- 100 cm over 16 years averaging 10 cm. Our piedmont movements measured over a 2.5 year period are much higher than these. Abrahams et al. (1984) conclude that creep is the dominant process moving pebbles, whereas we concluded that far moving pebbles on piedmonts move primarily in channels.

CONCLUSIONS

Using 1600 painted pebbles, we measure short-term particle movement rates across low gradient desert piedmonts. Higher speeds down gradient were measured on human-influenced surfaces (East Range Road 0.29 m y^{-1}) and sites previously impacted by off-road vehicles (Iron Mountain 0.71 m y^{-1}) than on pristine sites, Goldstone and Chemehuevi, 0.04 m y^{-1} and 0.18 m y^{-1}, respectively. Impacted sites have lower pebble recovery rates than pristine sites.

Significant pebble transport occurs in channels. On the interfluves, pebbles move only small amounts, presumably the result of animal activity. None of the rainfall events we measured had anywhere near the intensity of precipitation necessary to initiate overland flow on any of the four sites; yet, flow occurred in channels at three of the sites moving pebbles down gradient. Thus, it appears that the size and permeability of the steep, mountainous drainage basins supplying runoff to the piedmont are an important control on pebble speeds.

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FIGURE CAPTIONS

Figure 4.1 - All field sites are located in the Mojave Desert, of southern California. A, Chemehuevi Mountans; B, Iron Mountains; and C, East Range Road and Goldstone.

Figure 4.1 D - Site Map of East Range. The contour interval of these maps is 20 cm. The line corner pins are labeled as N, S, E, W and PEN. The total station pin is TS PIN. The gray circles are creosote bushes and desert sage.

Figure 4.1 E- Site Map of Iron Mountain. The line corner pins are labeled N, S, E, W, PEN. The dark boxes are channels and the light boxes are walkways.

Figure 4.1 F - Site Map of Chemehuevi. The symbols here are the same as figure 4.1 E.

Figure 4.1 G - Site map of Goldstone. The symbols here are the same as figure 4.1 E

Figure 4.2 - A is the East Range Road field site located on Ft. Irwin. The surface is highly impacted by off-road vehicles including tanks and humvees. K. Nichols in tank track for scale. Iron Mountain, is a former G.S. Patton tank corps training camp. Distance between the two rock lines is approximately 1 m; B. Chemehuevi site received little vehicular traffic of any kind, C. The field site is located 12 km from the range front.

D. Goldstone is close to the range front and because access is restricted is used as a control.

Figure 4.3 - Integrated pebble movement and speed at East Range Road. The top graph is monthly rainfall averages for Ft. Irwin. The second graph is pebble movement on the line oriented parallel to contour. The third graph is pebble movement on the line oriented parallel to slope. The fourth graph is pebble speed on the line oriented parallel to contour. The fifth graph is pebble speed on the line oriented parallel to slope. Each graph has average and median gross and net values.

Figure 4.4 - Interval pebble movement and speed at East Range Road. These diagrams represent the step movement of pebbles at each survey interval. Each survey period is compared to the one directly preceding it. Graphs are in same order as 4.3.

Figure 4.5 - Integrated pebble movement and speed at Iron Mountain. The first graph is rainfall data collected on site. Graphs are in same order as figure 4.3.

Figure 4.6 - Interval pebble movement and speed at Iron Mountain. The first graph is rainfall data collected on site. Graphs are in same order as figure 4.3.

Figure 4.7 - Integrated pebble movement and speed at Goldstone. The first graph is rainfall data collected on site. Graphs are in same order as figure 4.3.

Figure 4.8- Interval pebble movement and speed at Goldstone. Graphs are in same order as figure 4.3.

Figure 4.9 - Integrated pebble movement and speed at Chemehuevi. The first graph is rainfall data collected at the pebble site and 12 km up slope at the range front. Graphs are in the same order as figure 4.3.

Figure 4.10- Interval pebble movement and speed at Chemehuevi. Graphs are in same order as figure 4.3.

Figure 4.11 - Pristine sites (Goldstone and Chemehuevi) have the highest pebble recovery rates. East Range Road has low rates because of tanks scattering pebbles great distances. The drop at Iron Mountain between may and October was flow in channels.

Figure 4.12 - Three distinct types of movement can be seen at the field site. A. Bioturbation is characterized by small movements in any direction. Each pebble is approximately 1-cm. The line is not strait and a pebble is missing indicating the presence of animal activity. B. Channel movement, is characterized by pebbles moving down gradient great distances Nichols for scale. C. Human disturbance, is characterized by large or small movements in any direction. The picture is the cross gradient pebble line at East range road. The pebbles are approximately 1-cm. The tank track was not present when the pebble line was set out.

Figure 4.13 - Log-normal cumulative frequency plots show the great variation in pebble movements and right skewed distribution for all but goldstone.

Figure 4.6 - Interval pebble movement and speed at Iron Mountain. The graphs are similar to those at East Range Road B.

Figure 4.14 -A. Pebbles moving past 1 σ RMS survey precision is sensitivity a test for pebble movement. B. Pebbles moving past 2 σ RMS survey precision.

Table 4.1
Vegetation Characteristics of the four field sites

Vegetation Characteristics	East Range Road	Iron Mountain	Chemehuevi Mountains	Goldstone
number of plants	153	138	226	340
number of sage	99	101	158	269
number of creosote	47	30	58	63
average bush area (m^2)	1.3	1.7	1.8	1.9
median bush area (m^2)	1.1	1.3	1.3	1.4
maximum bush area (m^2)	3.6	5.2	12.6	7.1
total bush area (m^2)	191	226	392	617
percent of surface covered by bushes	12%	14%	25%	39%

Table 4.2

Site Characteristics

Site	Soil Density g/cm^3	Distance To Range Front (km)	Channels		Slope	
			Percent of Surface	Average Width (cm)	Field Site (degrees)	Piedmont (degrees)
East Range Road	1.43	3	No Distinguishable Channels		2.71	5.24
Iron Mountain	1.55 [1]	3	11%	117	1.92	0.21
Chemehuevi	1.44	12	15%	106	0.97	0.32
Goldstone	1.46	0.14	2%	90	2.26	4.57

[1] Value taken from Nichols et al., in press

Table 4.3
Survey Precision

	Standard Deviations of Pin Data (m)[1]							
	East Range Road		Iron Mountain		Chemehuevi		Goldstone	
	northing	easting	northing	easting	northing	easting	northing	easting
N Pin[2]	0.028	0.003	0.012	0.038	0.013	0.005	0.025	0.007
E Pin[3]	0.013	0.027	0.026	0.027	0.010	0.014	0.011	0.020
S pin[4]	0.015	0.004	0.009	0.011	0.011	0.012	0.016	0.016
W Pin[5]	0.008	0.011	0.016	0.017	0.014	0.006	0.009	0.017
Site Averages	**0.016**	**0.011**	**0.015**	**0.023**	**0.012**	**0.009**	**0.015**	**0.015**
Root Mean square	**0.019**		**0.028**		**0.015**		**0.022**	
Total Average northing	**0.015**							
Total Average easting	**0.016**							
Root Mean Square Average	**0.021**							

Notes:

[1] We estimate this precision by calculating the standard deviation of all measurements made of each control pin and then averaging all of these standard deviations. This produced an average standard deviation for the easting and the northing coordinates at each site from which we calculated a root mean square precision.

[2] N = 9, 12, 8, 10
[3] N = 9, 12, 8, 10
[4] N = 9, 12, 8, 10
[5] N = 9, 12, 8, 10

Table 4.4 A1
East Range Road Integrated Movement and Speeds[1]

Pebble Movement (m)

Survey Interval	Gross Movement				Net Movement			
	LINE PARALLEL TO CONTOUR		LINE ORIENTED DOWNGRADIENT		LINE PARALLEL TO CONTOUR		LINE ORIENTED DOWNGRADIENT	
	Mean	Median	Mean	Median	Mean	Median	Mean	Median
May 00- May 01	0.555	0.020	0.147	0.025	0.441	-0.014	0.086	0.022
May 00- Oct 01	0.631	0.030	0.146	0.041	0.471	-0.021	0.095	0.033
May 00- Apr 02	0.802	0.040	0.122	0.052	0.565	-0.024	0.087	0.044

Pebble Speeds (m yr^{-1})

Survey Interval	Gross Speed				Net Speed				
	LINE PARALLEL TO CONTOUR		LINE ORIENTED DOWNGRADIENT		LINE PARALLEL TO CONTOUR		LINE ORIENTED DOWNGRADIENT		Day from May 1 2000
	Mean	Median	Mean	Median	Mean	Median	Mean	Median	
May 00- May 01	0.555	0.020	0.147	0.025	0.441	-0.014	0.086	0.022	365
May 00- Oct 01	0.444	0.021	0.103	0.029	0.331	-0.015	0.067	0.023	519
May 00- Apr 02	0.417	0.021	0.063	0.027	0.294	-0.012	0.046	0.023	701

Notes:

[1] The pebbles were layed out in February 00, but not surveyed. Distances moved and speeds are calculated from the May 2000 survey data set.

Table 4.4 A2
East Range Road Incremental Movement and Speeds[1]

Pebble Movement (m)

Survey Interval	Gross Movement				Net Movement			
	LINE PARALLEL TO CONTOUR		LINE ORIENTED DOWNGRADIENT		LINE PARALLEL TO CONTOUR		LINE ORIENTED DOWNGRADIENT	
	Mean	Median	Mean	Median	Mean	Median	Mean	Median
May 00- May 01	0.555	0.020	0.146	0.025	0.441	-0.014	0.085	0.022
May 01- Oct 01	0.255	0.014	0.121	0.030	0.150	-0.008	0.052	0.020
Oct 01- Apr 02	0.262	0.029	0.063	0.018	-0.038	-0.026	0.008	0.017

Pebble Speeds (m yr^{-1})

Survey Interval	Gross Speed				Net Speed				Day from May 1 2000
	LINE PARALLEL TO CONTOUR		LINE ORIENTED DOWNGRADIENT		LINE PARALLEL TO CONTOUR		LINE ORIENTED DOWNGRADIENT		
	Mean	Median	Mean	Median	Mean	Median	Mean	Median	
May 00- May 01	0.555	0.020	0.146	0.025	0.441	-0.014	0.085	0.022	365
May 01- Oct 01	0.179	0.010	0.085	0.021	0.105	-0.006	0.036	0.014	519
Oct 01- Apr 02	0.136	0.015	0.033	0.010	-0.020	-0.013	0.004	0.009	701

Notes:
[1] Incremental movement and speeds were calculated by comparing each data set to the previous data set.

Table 4.4 B1
Iron Mountain Integrated Movement and Speeds[1]

Pebble Movement (m)

Survey Interval	Gross Movement				Net Movement			
	LINE PARALLEL TO CONTOUR		LINE ORIENTED DOWNGRADIENT		LINE PARALLEL TO CONTOUR		LINE ORIENTED DOWNGRADIENT	
	Mean	Median	Mean	Median	Mean	Median	Mean	Median
May 00- Nov 00	0.034	0.031	0.037	0.031	0.007	0.022	-0.017	-0.026
May 00- Mar 01	0.036	0.022	0.030	0.018	0.005	0.008	-0.013	-0.012
May 00- May 01	0.040	0.028	0.042	0.029	0.005	0.015	-0.022	-0.021
May 00- Oct 01	1.138	0.038	0.364	0.039	1.099	0.018	-0.344	-0.031
May 00- Apr 02	1.405	0.048	0.562	0.055	1.366	0.026	-0.542	-0.047

Pebble Speeds (m yr^{-1})

Survey Interval	Gross Speed				Net Speed				Day from May 1 2000
	LINE PARALLEL TO CONTOUR		LINE ORIENTED DOWNGRADIENT		LINE PARALLEL TO CONTOUR		LINE ORIENTED DOWNGRADIENT		
	Mean	Median	Mean	Median	Mean	Median	Mean	Median	
May 00- Nov 00	0.066	0.061	0.073	0.061	0.014	0.043	-0.034	-0.050	185
May 00- Mar 01	0.043	0.026	0.036	0.021	0.006	0.009	-0.016	-0.014	305
May 00- May 01	0.040	0.028	0.042	0.029	0.005	0.015	-0.022	-0.021	365
May 00- Oct 01	0.800	0.027	0.256	0.027	0.773	0.013	-0.242	-0.022	519
May 00- Apr 02	0.731	0.025	0.293	0.028	0.711	0.014	-0.282	-0.025	701

Notes:

[1] Movement and speed calculations for Iron Mountain. The pebbles were layed out in May 00.

Table 4.4 B2
Iron Mountain Incremental Movement and Speeds[1]

Pebble Movement (m)

Survey Interval	Gross Movement				Net Movement			
	LINE PARALLEL TO CONTOUR		LINE ORIENTED DOWNGRADIENT		LINE PARALLEL TO CONTOUR		LINE ORIENTED DOWNGRADIENT	
	Mean	Median	Mean	Median	Mean	Median	Mean	Median
May 00- Nov 00	0.034	0.031	0.037	0.031	0.007	0.022	-0.017	-0.025
Nov 00- Mar 01	0.033	0.020	0.031	0.025	-0.012	-0.015	-0.016	-0.021
Mar 01- May 01	0.029	0.014	0.024	0.015	0.006	0.005	-0.011	-0.012
May 01- Oct 01	1.122	0.021	0.346	0.020	1.094	0.007	-0.330	-0.012
Oct 01- Apr 02	0.301	0.024	0.220	0.026	0.271	0.012	-0.210	-0.017

Pebble Speeds (m yr^{-1})

Survey Interval	Gross Speed				NetSpeed				Day from May 1 2000
	LINE PARALLEL TO CONTOUR		LINE ORIENTED DOWNGRADIENT		LINE PARALLEL TO CONTOUR		LINE ORIENTED DOWNGRADIENT		
	Mean	Median	Mean	Median	Mean	Median	Mean	Median	
May 00- Nov 00	0.060	0.073	0.062	0.014	0.043	-0.033	-0.050	185	185
Nov 00- Mar 01	0.060	0.094	0.077	-0.036	-0.047	-0.051	-0.063	119	305
Mar 01- May 01	0.088	0.146	0.091	0.035	0.028	-0.065	-0.074	60	365
May 01- Oct 01	0.051	0.825	0.047	2.609	0.016	-0.788	-0.029	153	519
Oct 01- Apr 02	0.048	0.444	0.053	0.547	0.023	-0.423	-0.034	181	701

Notes:

[1] Incremental movement and speeds were calculated by comparing each data set to the previous data set, not the initial survey

Table 4.4 C1
Chemehuevi Integrated Movement and Speeds[1]

Survey Interval	Pebble Movement (m)							
	Gross Movement				Net Movement			
	LINE PARALLEL TO CONTOUR		LINE ORIENTED DOWNGRADIENT		LINE PARALLEL TO CONTOUR		LINE ORIENTED DOWNGRADIENT	
	Mean	Median	Mean	Median	Mean	Median	Mean	Median
May 00- Nov 00	0.201	0.019	0.056	0.030	0.174	0.006	0.001	0.015
May 00- May 01	0.329	0.027	0.066	0.036	0.296	0.014	-0.001	0.021
May 00- Oct 01	0.359	0.027	0.071	0.033	0.312	-0.014	-0.028	0.019
May 00- Apr 02	0.371	0.029	0.068	0.047	0.342	0.015	0.014	0.032

Survey Interval	Pebble Speeds (m yr^{-1})								
	Gross Speed				Net Speed				
	LINE PARALLEL TO CONTOUR		LINE ORIENTED DOWNGRADIENT		LINE PARALLEL TO CONTOUR		LINE ORIENTED DOWNGRADIENT		Day from May 1 2000
	Mean	Median	Mean	Median	Mean	Median	Mean	Median	
May 00- Nov 00	0.396	0.037	0.111	0.060	0.344	0.012	0.001	0.030	185
May 00- May 01	0.329	0.027	0.066	0.036	0.296	0.014	-0.001	0.021	365
May 00- Oct 01	0.253	0.019	0.050	0.023	0.220	-0.010	-0.020	0.013	519
May 00- Apr 02	0.193	0.015	0.035	0.025	0.178	0.008	0.007	0.017	701

Notes:

[1] Movement and speed calculations for Chemehuevi. The pebbles were layed out in May 00.

Table 4.4 C2
Chemehuevi Incremental Movement and Speeds[1]

Survey Interval	Pebble Movement (m)							
	Gross Movement				Net Movement			
	LINE PARALLEL TO CONTOUR		LINE ORIENTED DOWNGRADIENT		LINE PARALLEL TO CONTOUR		LINE ORIENTED DOWNGRADIENT	
	Mean	Median	Mean	Median	Mean	Median	Mean	Median
May 00- Nov 00	0.201	0.019	0.056	0.030	0.174	0.006	0.001	0.015
Nov 00- May 01	0.212	0.033	0.038	0.017	0.181	0.019	0.004	0.013
May 01- Oct 01	0.082	0.012	0.051	0.015	0.057	0.003	-0.012	0.009
Oct 01- Apr 02	0.070	0.024	0.055	0.023	0.046	0.015	0.024	0.016

Survey Interval	Pebble Speeds (m yr^{-1})								
	Gross Speed				Net Speed				Day from May 1 2000
	LINE PARALLEL TO CONTOUR		LINE ORIENTED DOWNGRADIENT		LINE PARALLEL TO CONTOUR		LINE ORIENTED DOWNGRADIENT		
	Mean	Median	Mean	Median	Mean	Median	Mean	Median	
May 00- Nov 00	0.396	0.037	0.111	0.060	0.344	0.012	0.001	0.030	185
Nov 00- May 01	0.430	0.068	0.078	0.034	0.367	0.039	0.007	0.026	365
May 01- Oct 01	0.195	0.029	0.122	0.036	0.136	0.008	-0.029	0.022	519
Oct 01- Apr 02	0.140	0.048	0.110	0.046	0.093	0.031	0.049	0.033	701

Notes:

[1] Incremental movement and speeds were calculated by comparing each data set to the previous data set, not the initial survey

Table 4.4 D1
Goldstone Integrated Movement and Speeds[1]

Survey Interval	Pebble Movement (m)							
	Gross Movement				Net Movement			
	LINE PARALLEL TO CONTOUR		LINE ORIENTED DOWNGRADIENT		LINE PARALLEL TO CONTOUR		LINE ORIENTED DOWNGRADIENT	
	Mean	Median	Mean	Median	Mean	Median	Mean	Median
May 00- Mar 01	0.047	0.037	0.032	0.021	0.025	0.026	-0.024	-0.018
May 00- May 01	0.050	0.032	0.037	0.023	0.018	0.014	-0.028	-0.021
May 00- Oct 01	0.078	0.040	0.046	0.032	0.032	0.022	-0.024	-0.024
May 00- Apr 02	0.087	0.042	0.067	0.045	0.067	0.033	-0.037	-0.035

Survey Interval	Pebble Speeds (m yr^{-1})								
	Gross Speed				Net Speed				
	LINE PARALLEL TO CONTOUR		LINE ORIENTED DOWNGRADIENT		LINE PARALLEL TO CONTOUR		LINE ORIENTED DOWNGRADIENT		Day from May 1 2000
	Mean	Median	Mean	Median	Mean	Median	Mean	Median	
May 00- Mar 01	0.056	0.045	0.038	0.025	0.029	0.031	-0.029	-0.021	305
May 00- May 01	0.050	0.032	0.037	0.023	0.018	0.014	-0.028	-0.021	365
May 00- Oct 01	0.055	0.028	0.032	0.023	0.023	0.015	-0.017	-0.017	519
May 00- Apr 02	0.045	0.022	0.035	0.023	0.035	0.017	-0.019	-0.018	701

Notes:

[1] Movement and speed calculations for Goldstone. The pebbles were layed out in February but not surveyed. Distances are only calculated from the May 2000 data set.

Table 4.4 D2
Goldstone Incremental Movement and Speeds[1]

Survey Interval	Pebble Movement (m)							
	Gross Movement				Net Movement			
	LINE PARALLEL TO CONTOUR		LINE ORIENTED DOWNGRADIENT		LINE PARALLEL TO CONTOUR		LINE ORIENTED DOWNGRADIENT	
	Mean	Median	Mean	Median	Mean	Median	Mean	Median
May 00- Mar 01	0.047	0.037	0.032	0.021	0.025	0.026	-0.024	-0.018
Mar 00- May 01	0.033	0.018	0.025	0.018	0.009	0.010	-0.016	-0.016
May 01- Oct 01	0.059	0.020	0.032	0.016	0.014	0.008	-0.010	-0.011
Oct 01- Apr 02	0.021	0.021	0.043	0.027	0.021	0.013	-0.022	-0.021

Survey Interval	Pebble Speeds (m yr^{-1})								
	Gross Speed				Net Speed				Day from May 1 2000
	LINE PARALLEL TO CONTOUR		LINE ORIENTED DOWNGRADIENT		LINE PARALLEL TO CONTOUR		LINE ORIENTED DOWNGRADIENT		
	Mean	Median	Mean	Median	Mean	Median	Mean	Median	
May 00- Mar 01	0.056	0.045	0.038	0.025	0.029	0.031	-0.029	-0.021	305
Mar 00- May 01	0.033	0.018	0.025	0.018	0.009	0.010	-0.016	-0.016	365
May 01- Oct 01	0.041	0.014	0.022	0.011	0.010	0.006	-0.007	-0.008	519
Oct 01- Apr 02	0.011	0.011	0.022	0.014	0.011	0.007	-0.012	-0.011	701

Notes:
[1] Incremental movement and speeds were calculated by comparing each data set to the previous data set, not the initial survey

Table 4.5
Infiltration rates of Mojave field sites.

	Sprinkling Intensity ($cm\ hr^{-1}$)	Plot Size (m^2)	Duration (minutes)	Final Rate ($cm\ hr^{-1}$)	First Run off (minutes)
Iron	7.0	0.624	180	6.5	33
Chem	7.9	0.662	150	4.7	16
Goldstone	8.2/23.8[1]	0.637	130	>23.8	NA
East Rang Road - A[2]	10.3	0.617	60	>10.3	NA
East Range Road - B[3]	10.9	0.635	66	6.7	2

Notes:
[1] Sprinkling rate increased after 60 minutes without run off
[2] Collapse of burrow under plot ended test
[3] Plot area not recorded; average of other plots used
NA = Not Applicable

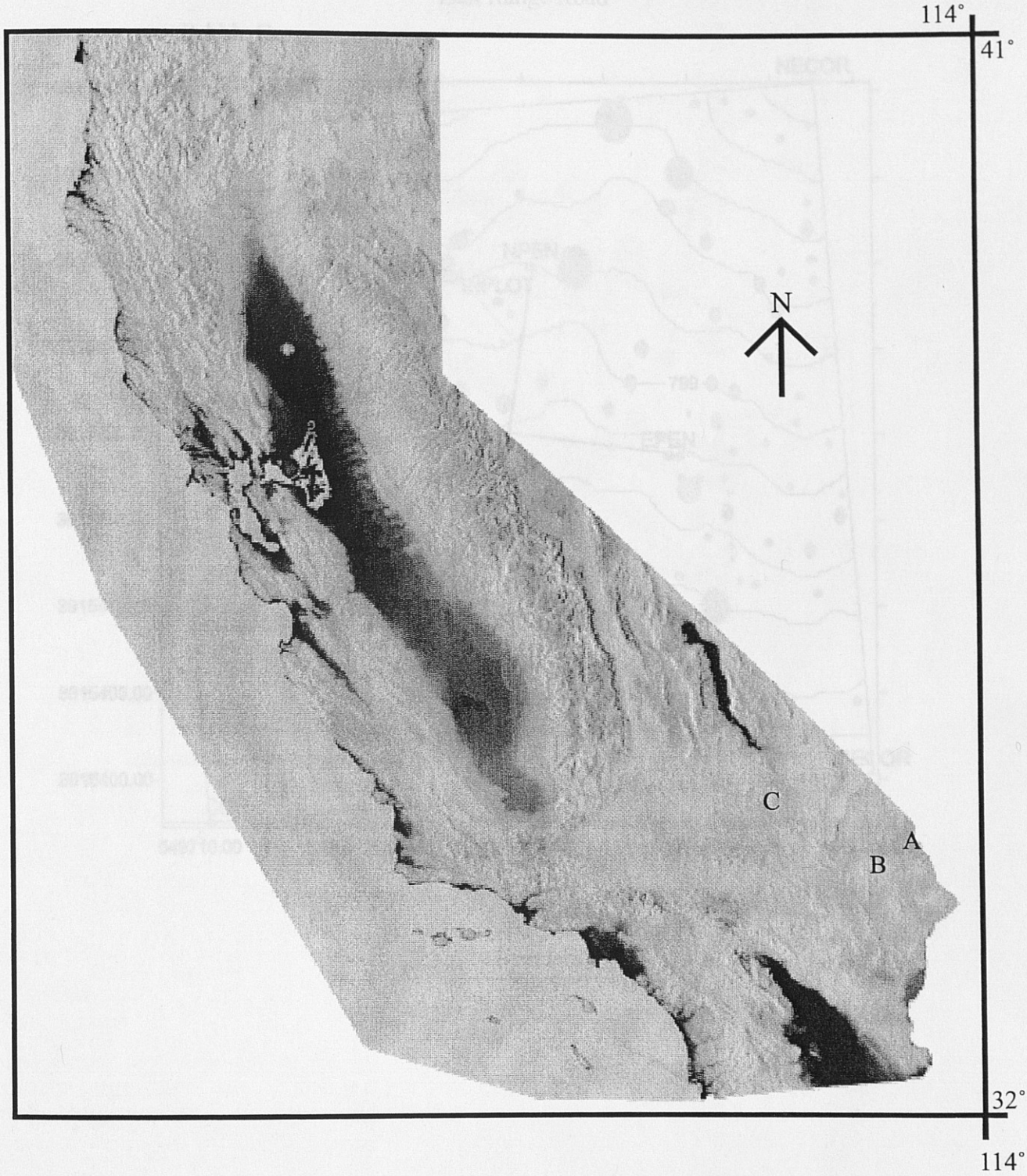
Table 4.6
Precipitation Comparision[1]

	Rain Gauge Comparison					
	Fort Irwin Data		Data from rain gauges at field sites			
	Irwin Average[1] 2001	Goldstone 2001	Goldstone 2001	Chem M 2001	Chem W 2001	Iron 2001
Month	**Average (cm)**	**Average (cm)**	**Average (cm)**	**Average (cm)**	**Average (cm)**	**Average (cm)**
JAN	2.15	2.41	2.39	3.38	2.46	1.75
FEB	3.76	3.76	4.90	3.15	3.20	2.64
MAR	2.18	2.92	3.12	2.57	2.62	2.92
APR	0.23	0.76	0.84	0.46	0.08	0.10
MAY	0.00	0.00	0.08	0.00	0.00	1.40
JUN	0.00	0.00	0.00	0.00	0.00	0.00
JUL	0.66	0.64	0.99	0.43	0.00	0.00
AUG	0.05	0.00	0.00	0.15	0.79	0.00
SEP	0.30	0.03	0.10	0.00	0.00	0.00
OCT	0.12	0.15	0.18	0.00	0.00	0.00
NOV	0.70	1.22	1.42	0.23	0.10	0.00
DEC	0.20	0.25	0.30	0.36	0.33	0.56
TOTAL PRECIPITATION	**10.36**	**12.14**	**14.33**	**10.72**	**9.58**	**9.37**

Notes:
[1] Irwin data is averaged from 15 separate rain gauges.

Table 4.7
Maximum hourly intensity of rainstorms measured at field sites

Site	*Storm Date*	*Total Rainfall (cm)*	*Maximum hourly Intensity (cm/hr)*
Iron	7/6/01	1.40	1.35
Iron	3/9/01	0.94	0.94
Gold	11/24/01	0.99	0.86
Iron	3/6/01	1.22	0.79
Chem W	2/28/01	1.30	0.74
Chem W	8/12/01	0.74	0.71
Chem W	3/7/01	1.19	0.64
Chem M	3/7/01	1.14	0.58
Gold	3/6/01	1.80	0.56
Gold	7/6/01	0.91	0.53
Gold	1/11/01	1.68	0.48
Chem W	1/11/01	1.45	0.46
Chem M	1/11/01	1.32	0.46
Chem W	3/6/01	1.42	0.46
Chem M	2/28/01	1.17	0.43
Chem M	3/6/01	1.40	0.43
Gold	4/21/01	0.58	0.36
Chem M	2/13/01	0.43	0.33
Gold	2/12/01	0.51	0.30
Chem W	2/13/01	0.36	0.25
Iron	2/27/01	0.61	0.25
Iron	1/9/01	0.61	0.23
Gold	2/8/01	0.36	0.23
Iron	2/13/01	0.33	0.23
Gold	2/13/01	0.79	0.23
Gold	2/27/01	0.48	0.23
Gold	3/7/01	1.19	0.23
Gold	1/8/01	0.64	0.20
Gold	2/25/01	0.64	0.20
Gold	2/26/01	1.45	0.20
Chem W	2/26/01	1.19	0.20
Chem M	2/26/01	1.17	0.20
Iron	3/7/01	0.46	0.20
Gold	3/18/02	0.25	0.20
Chem W	1/9/01	0.66	0.18
Iron	1/11/01	0.66	0.18
Iron	2/26/01	1.17	0.18
Chem M	7/7/01	0.25	0.18
Chem W	3/18/02	0.28	0.18
Chem M	1/9/01	0.61	0.15
Chem M	1/27/01	0.89	0.15
Iron	12/14/01	0.25	0.15
Gold	4/7/01	0.25	0.13
Chem W	2/27/01	0.28	0.10
Gold	1/27/01	0.41	0.08
Gold	2/24/01	0.38	0.08
Iron	2/25/01	0.43	0.08
Chem M	12/29/01	0.25	0.08



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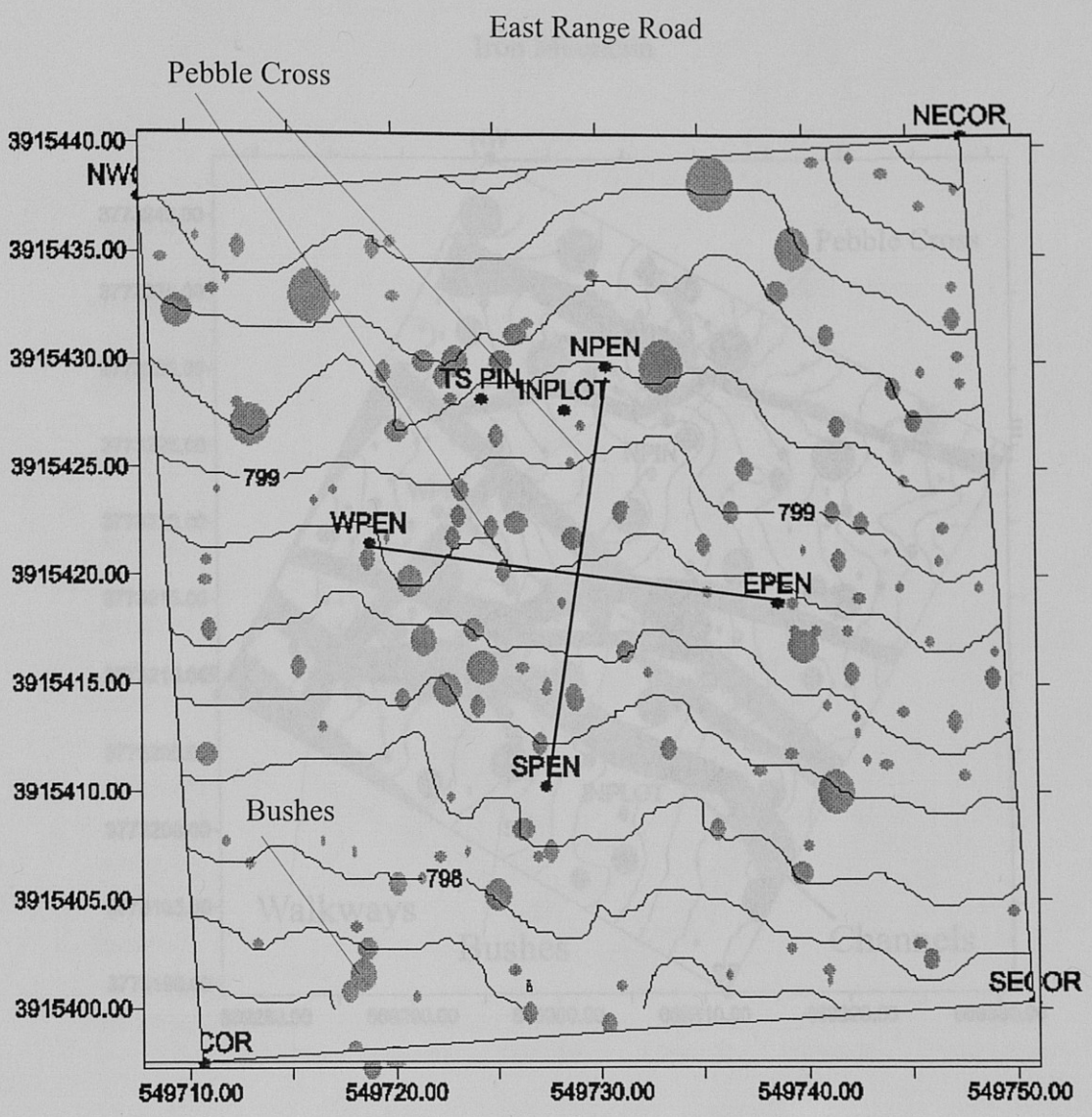
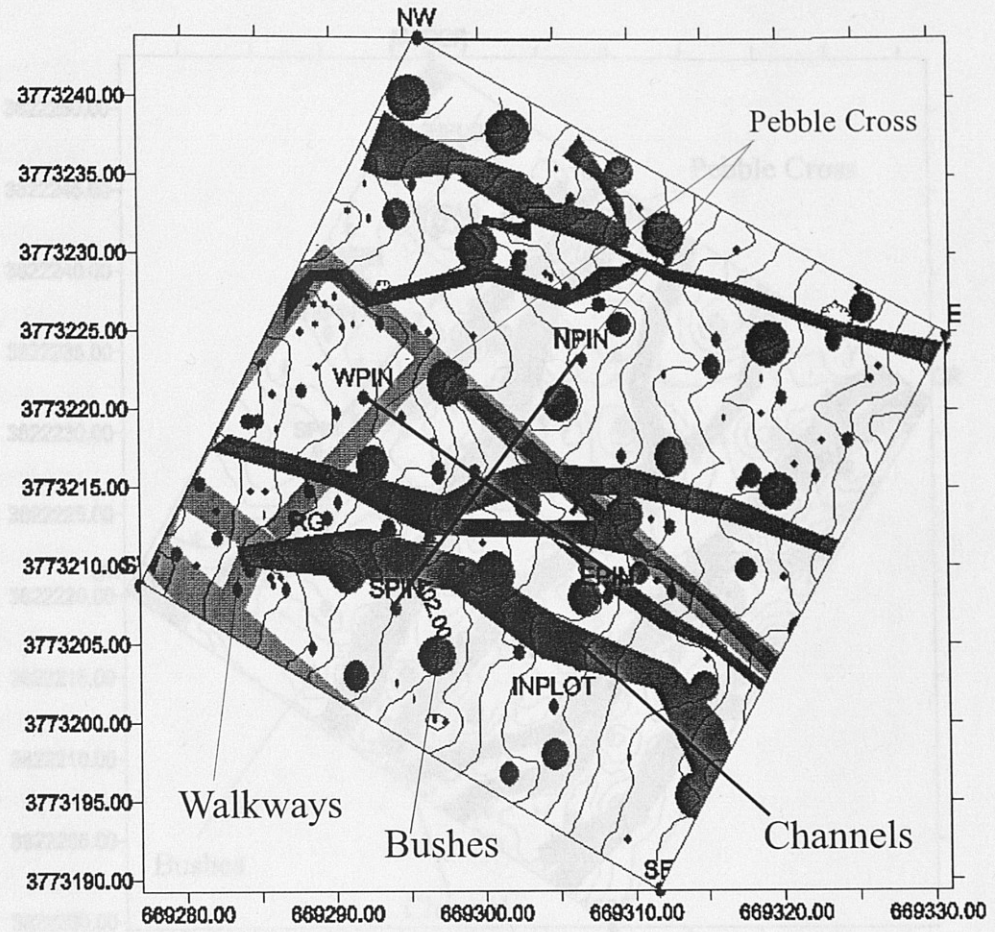


Scale
10 meters

Figure 4.1 D Persico et al.

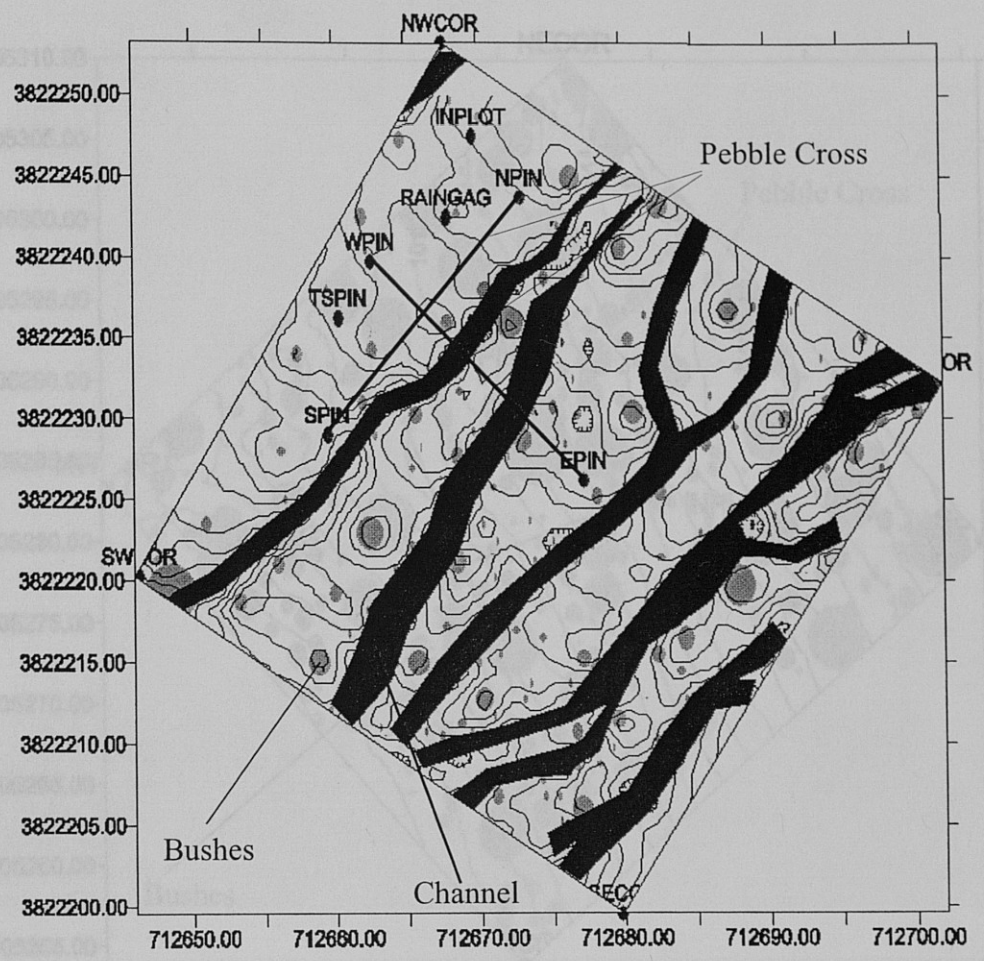
Iron Mountain



Scale
10 meters

Figure 4.1 E Persico et al.

Chemehuevi



Scale

10 meters

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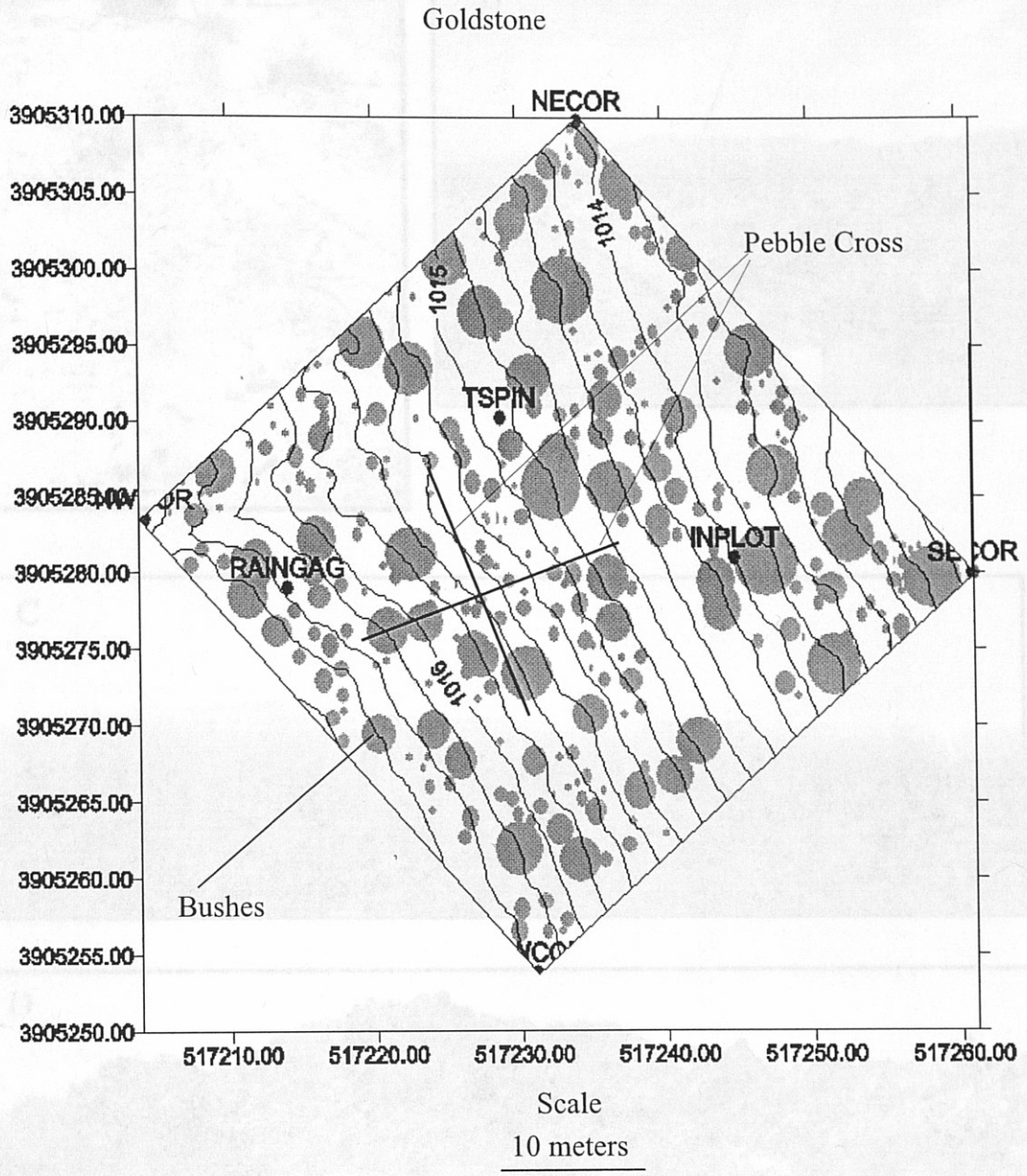

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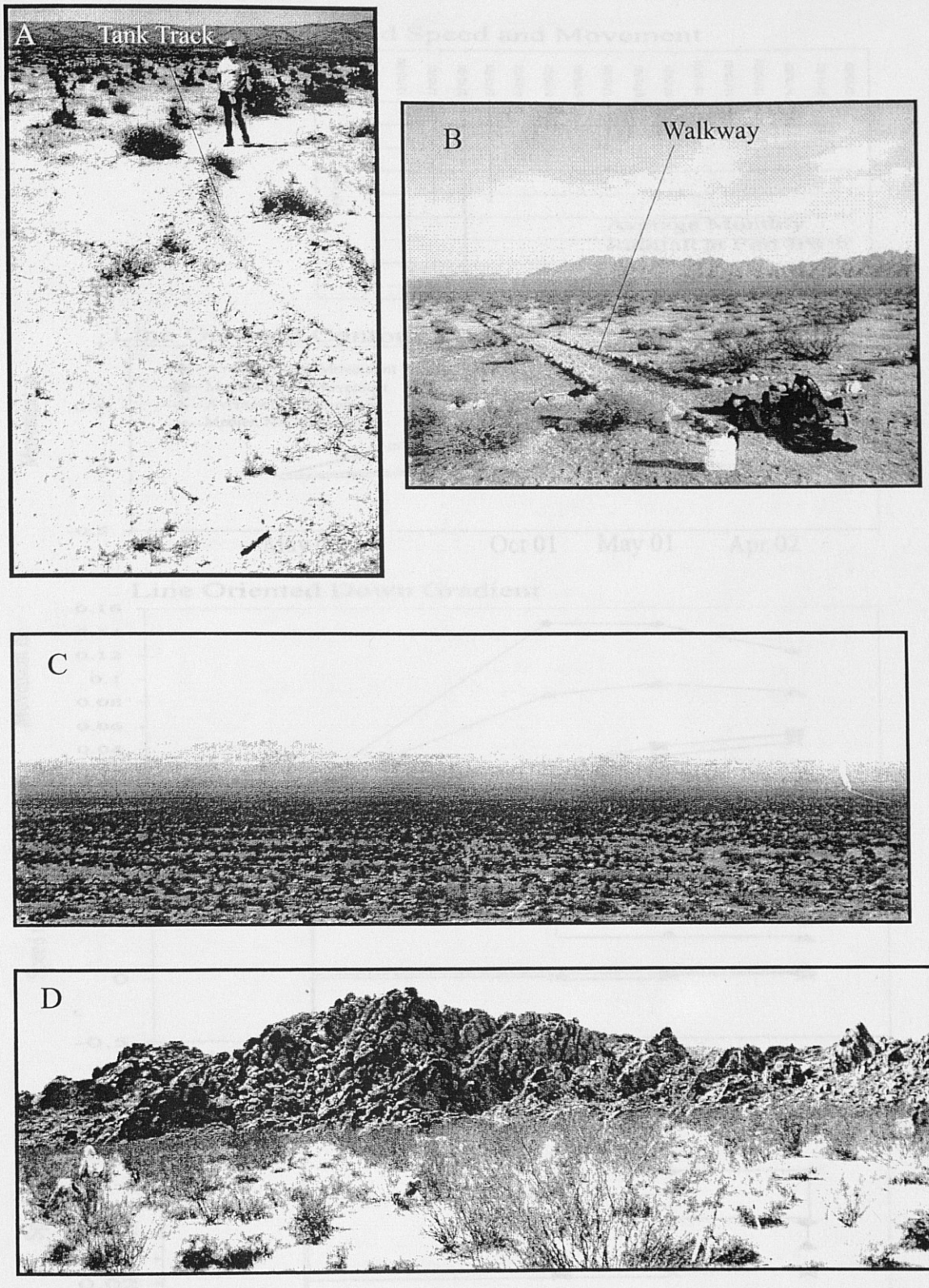

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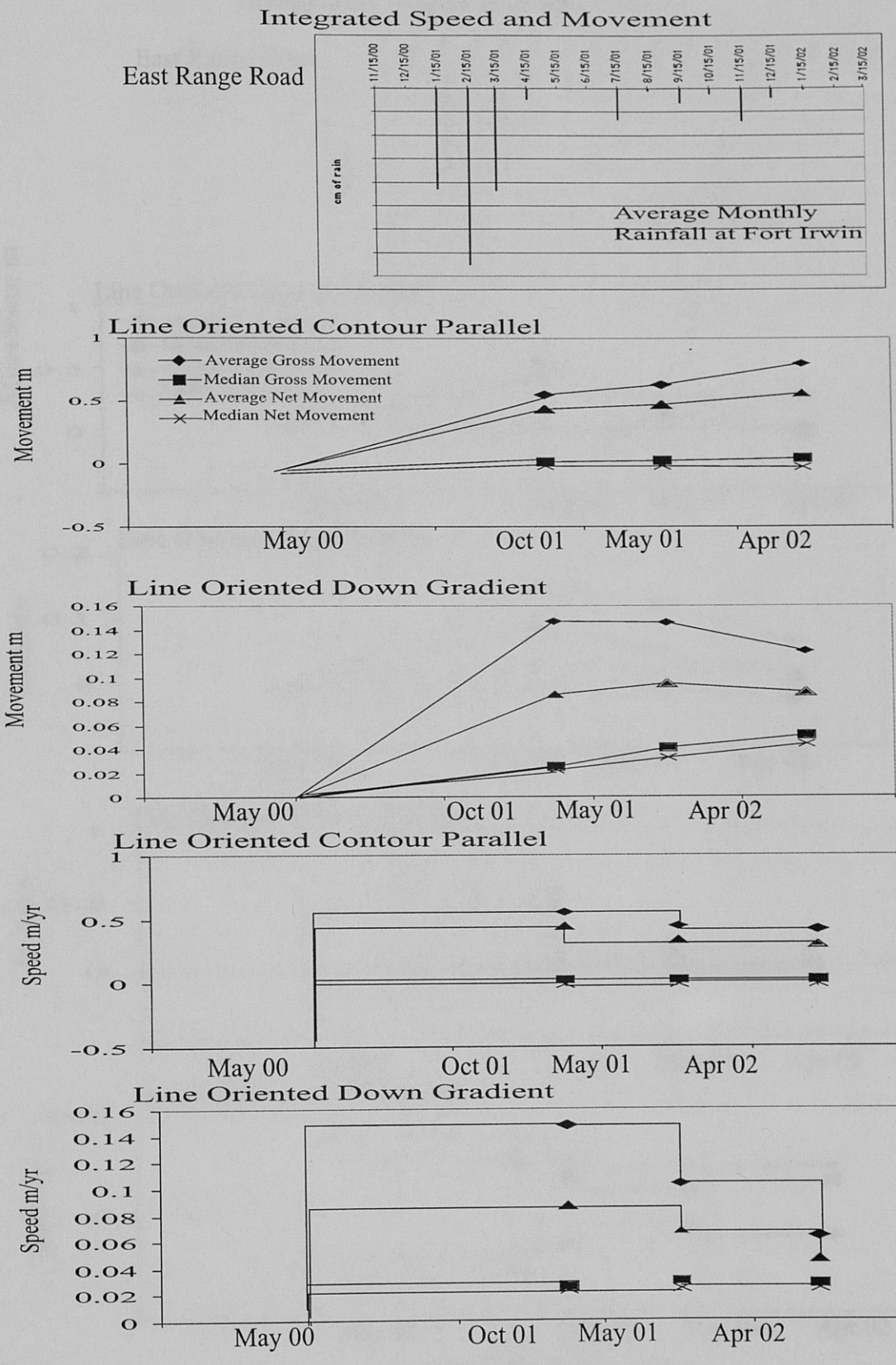

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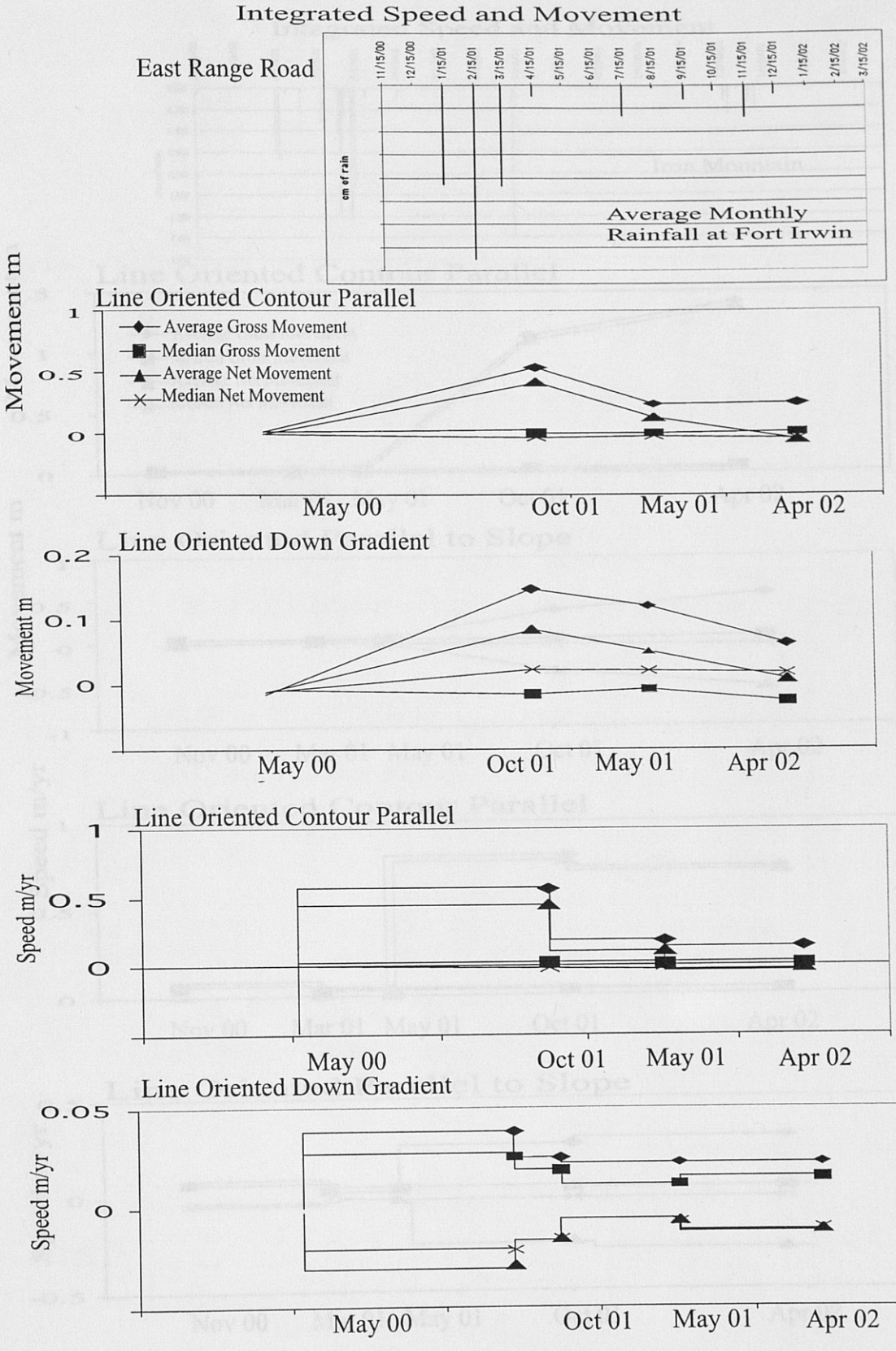

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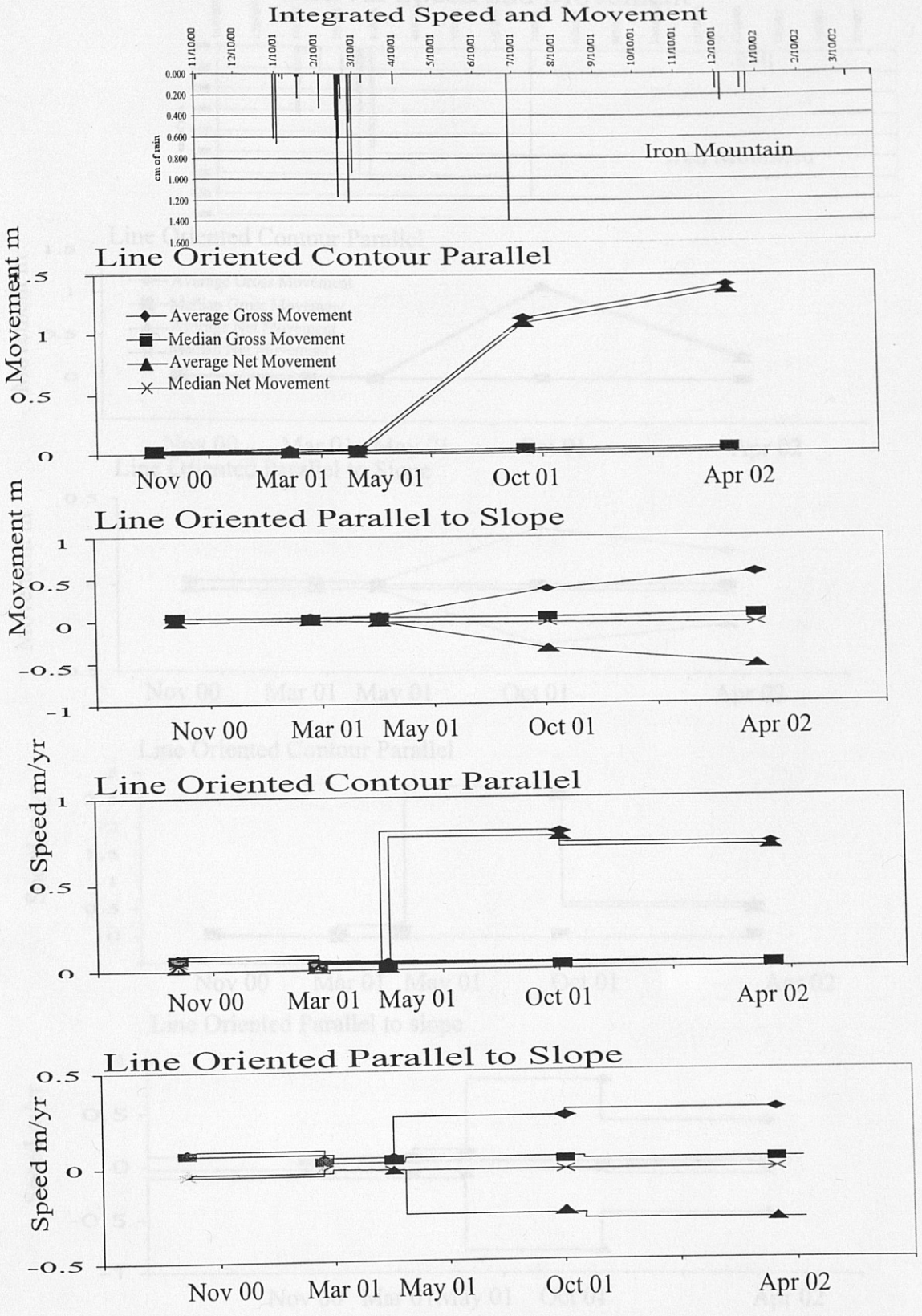

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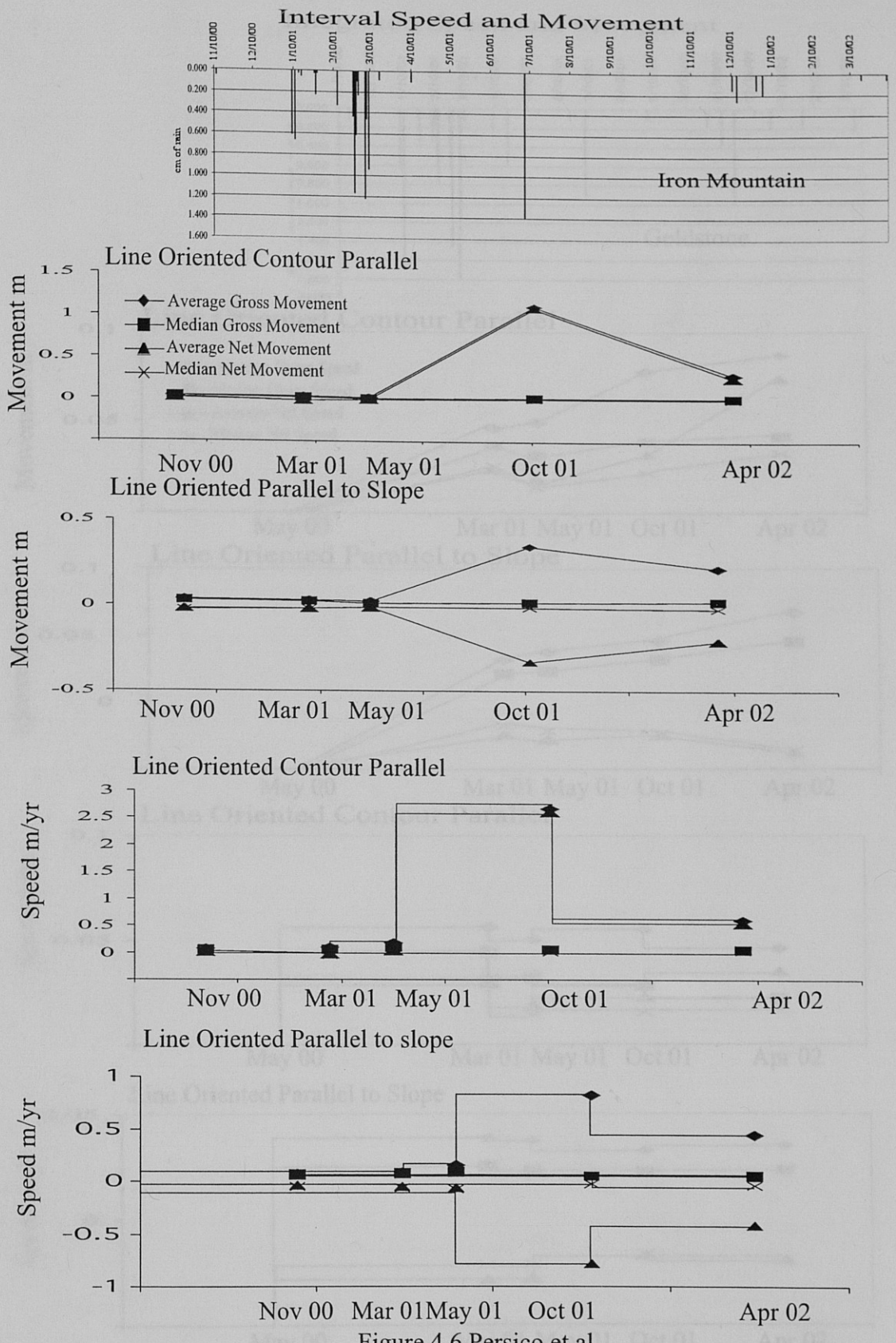

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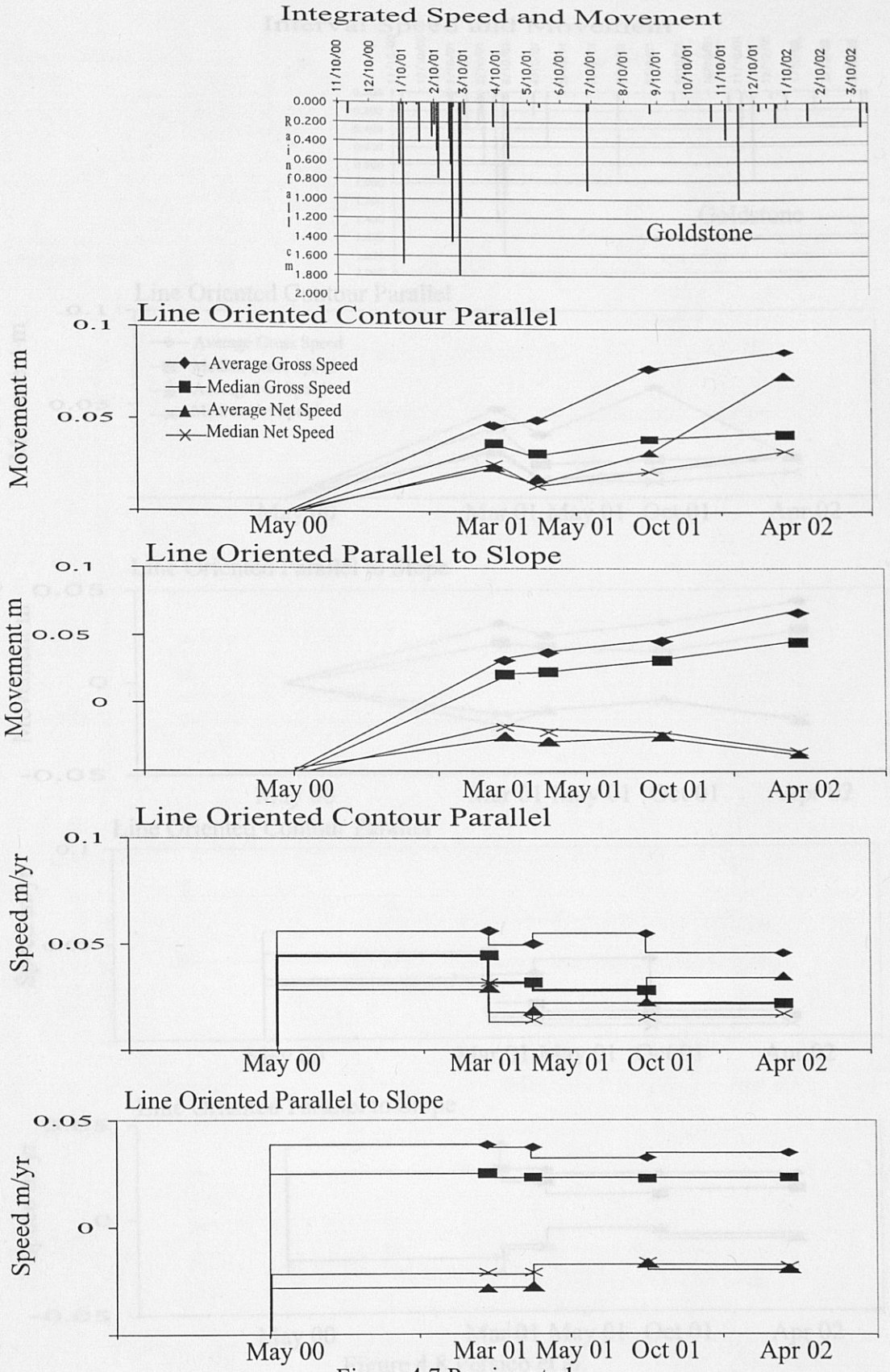

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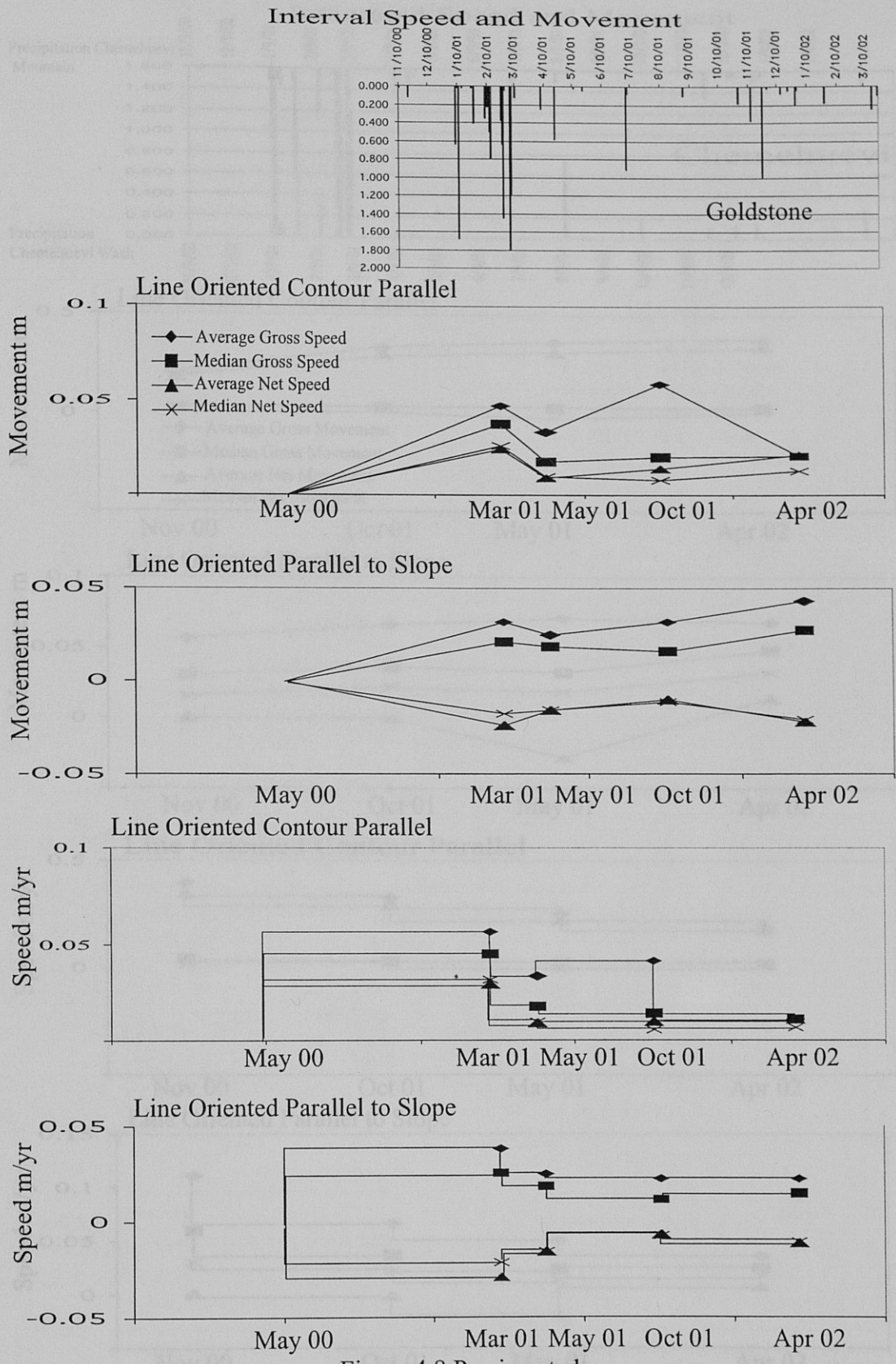

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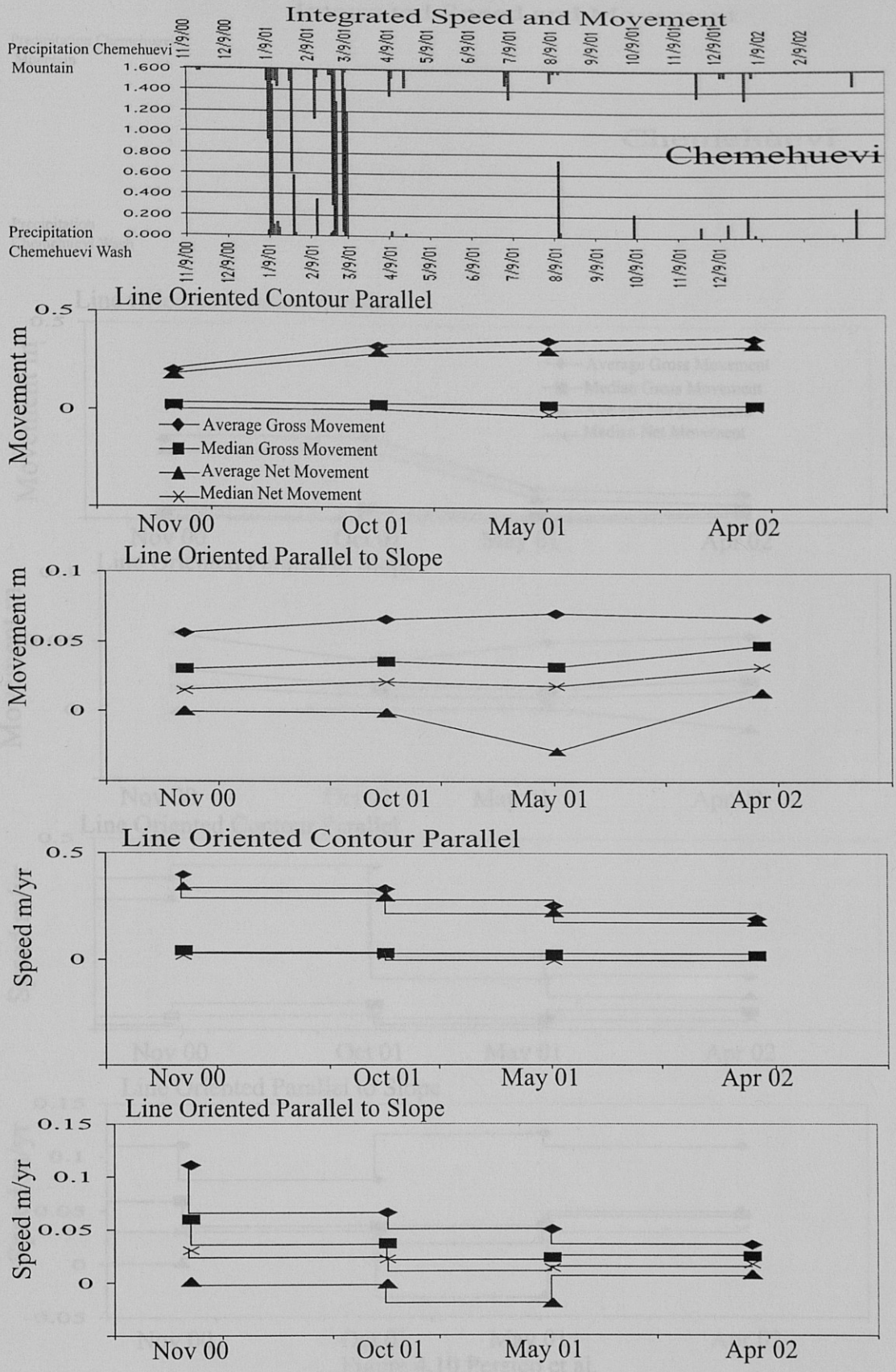

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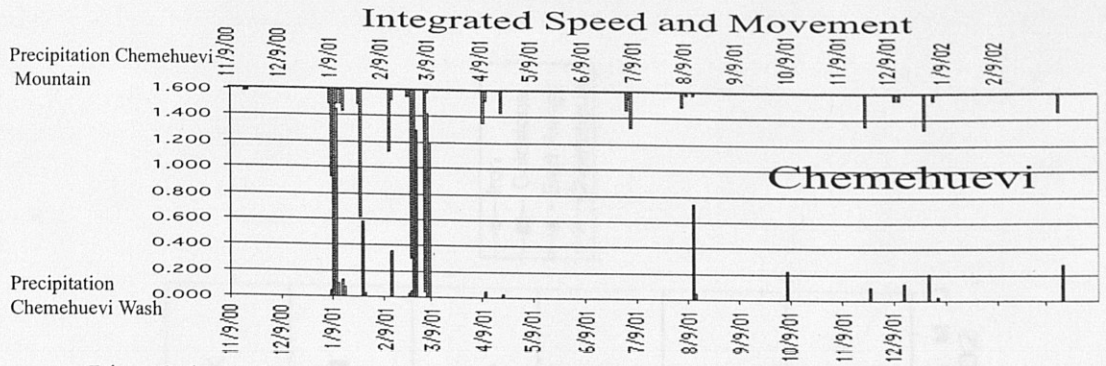

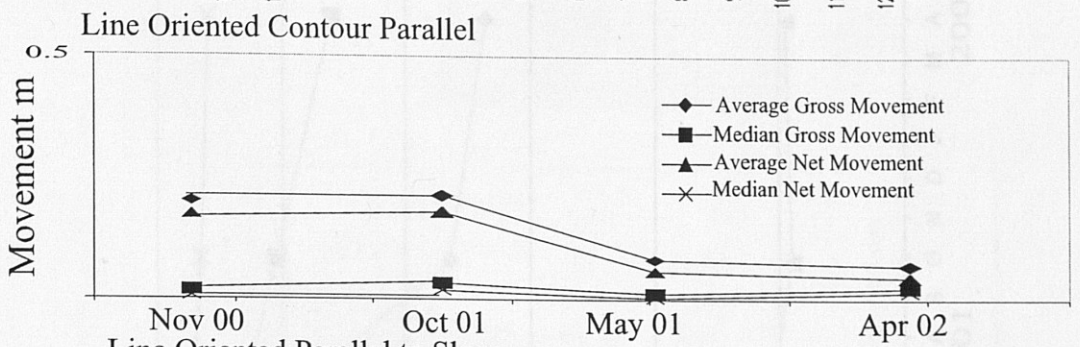

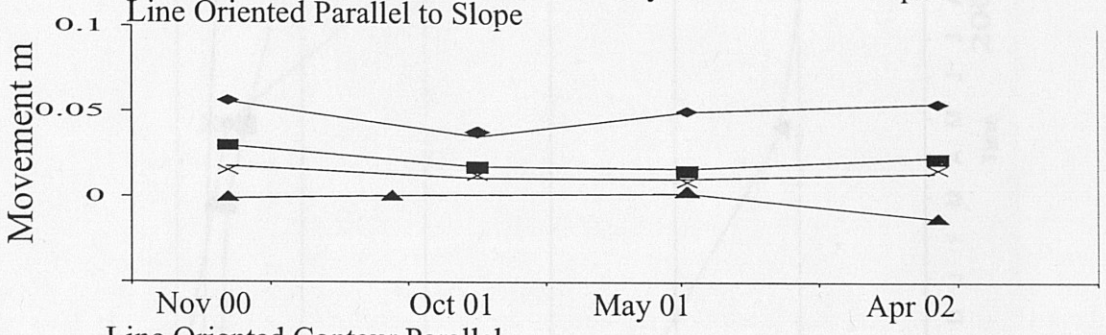

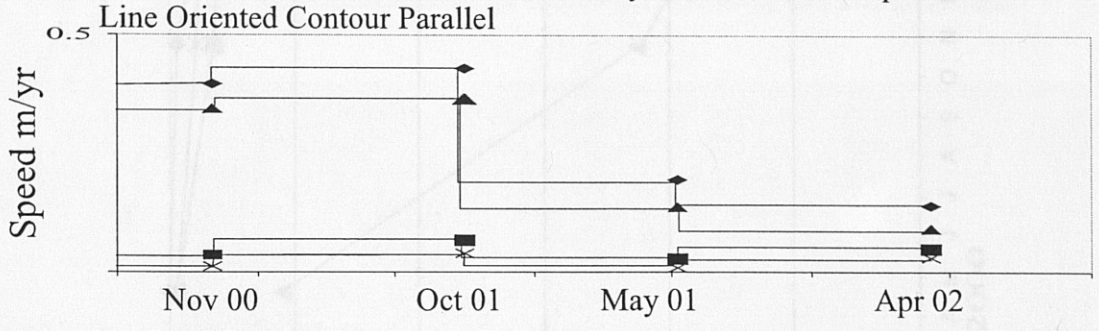

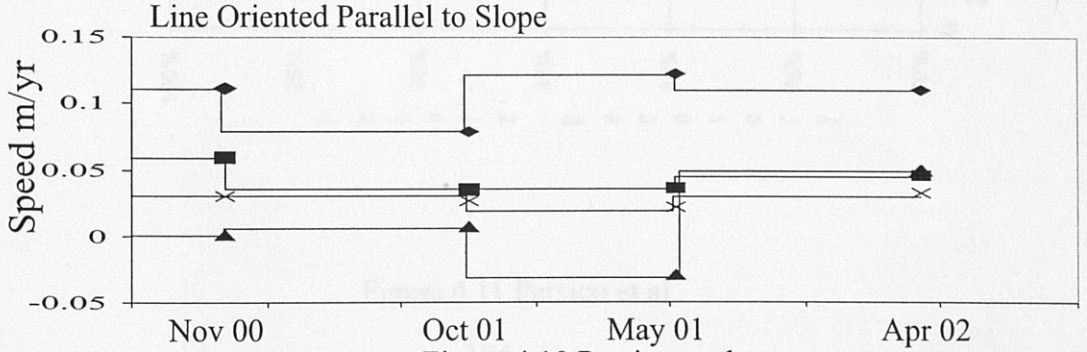

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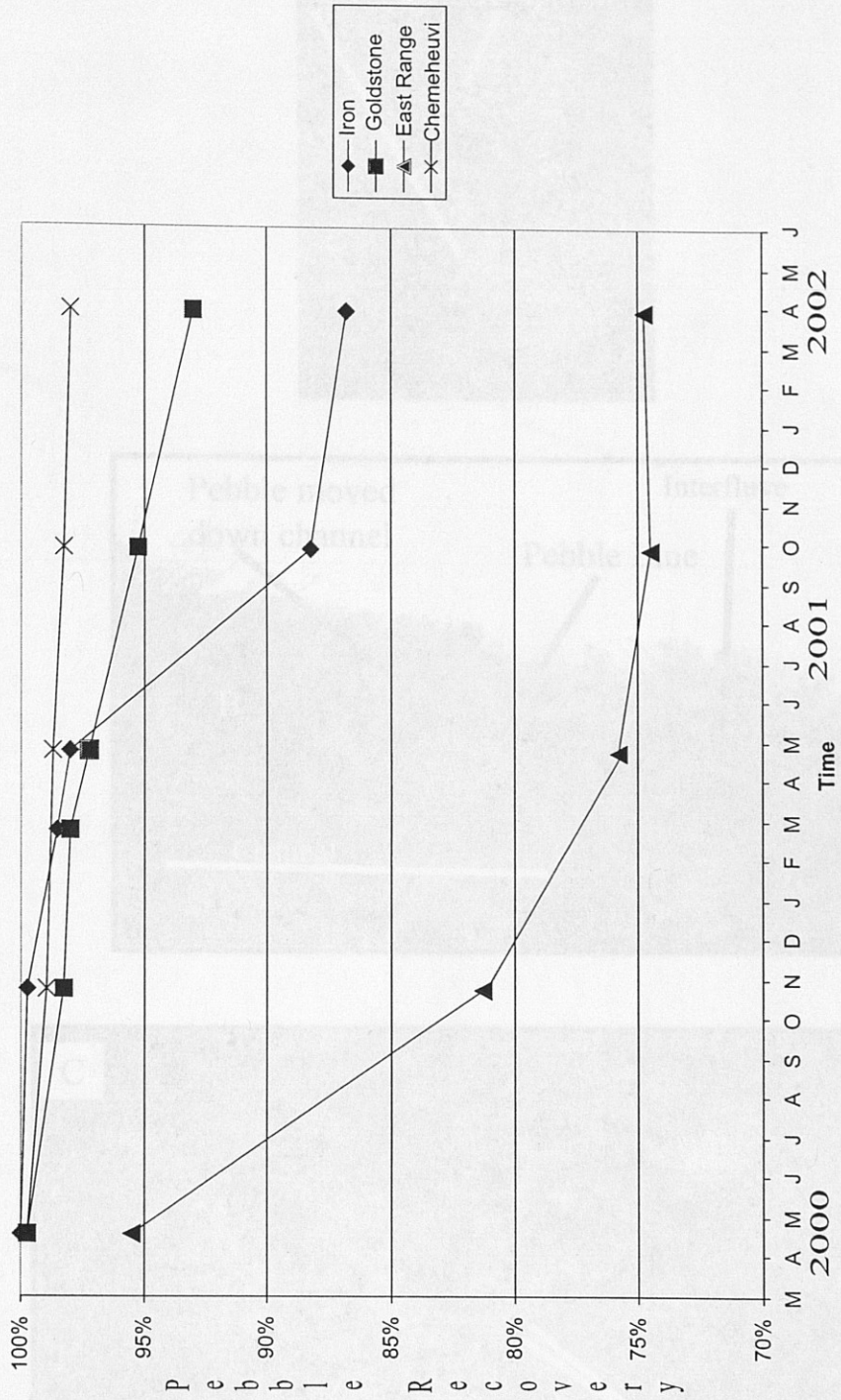

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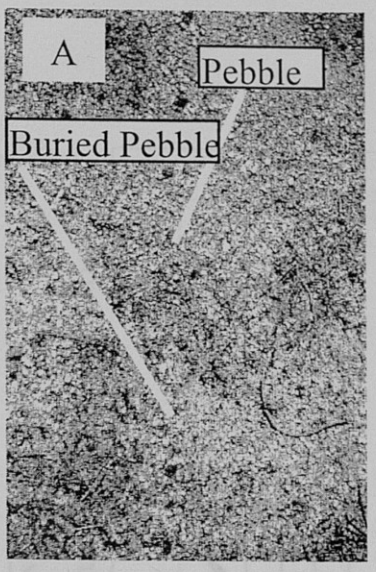

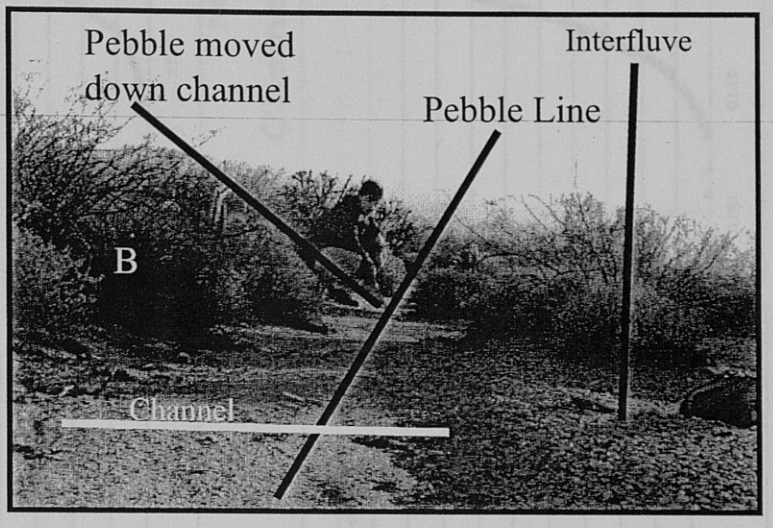

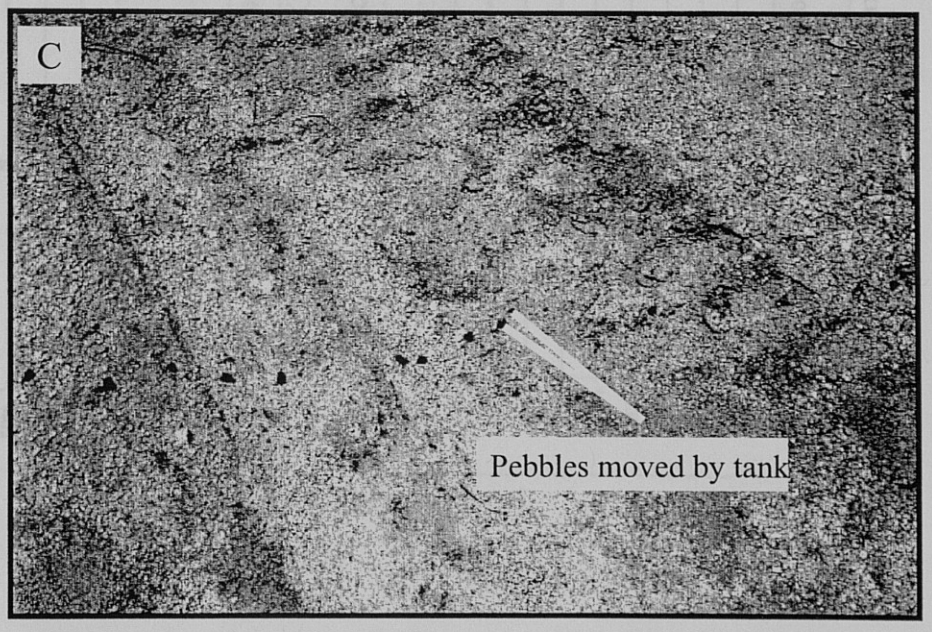

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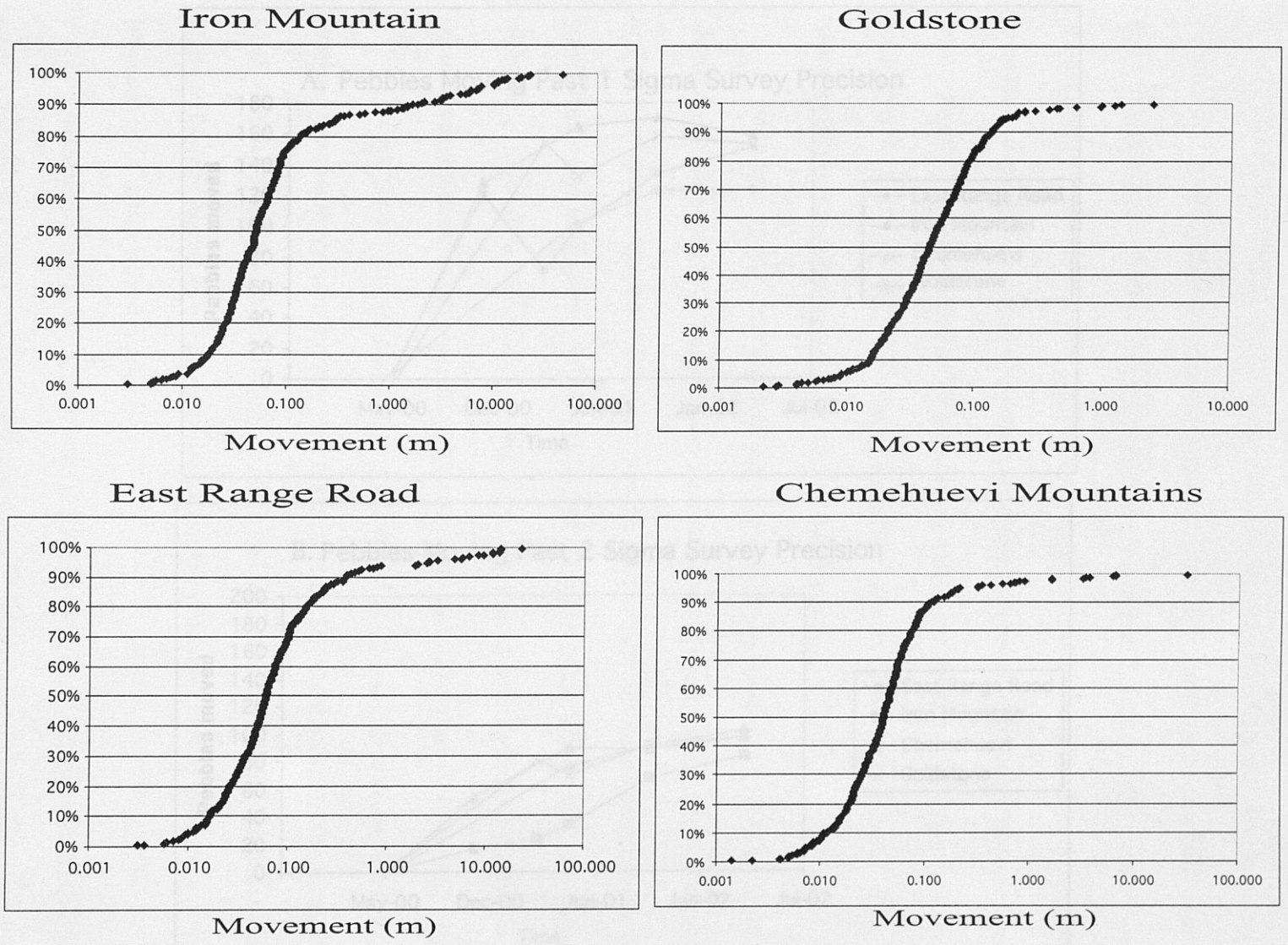

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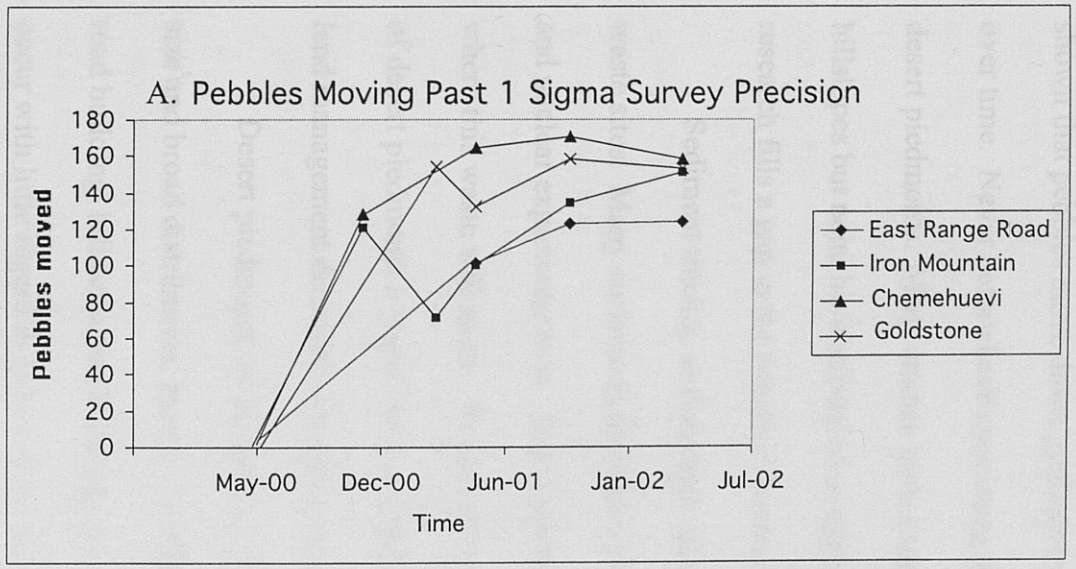

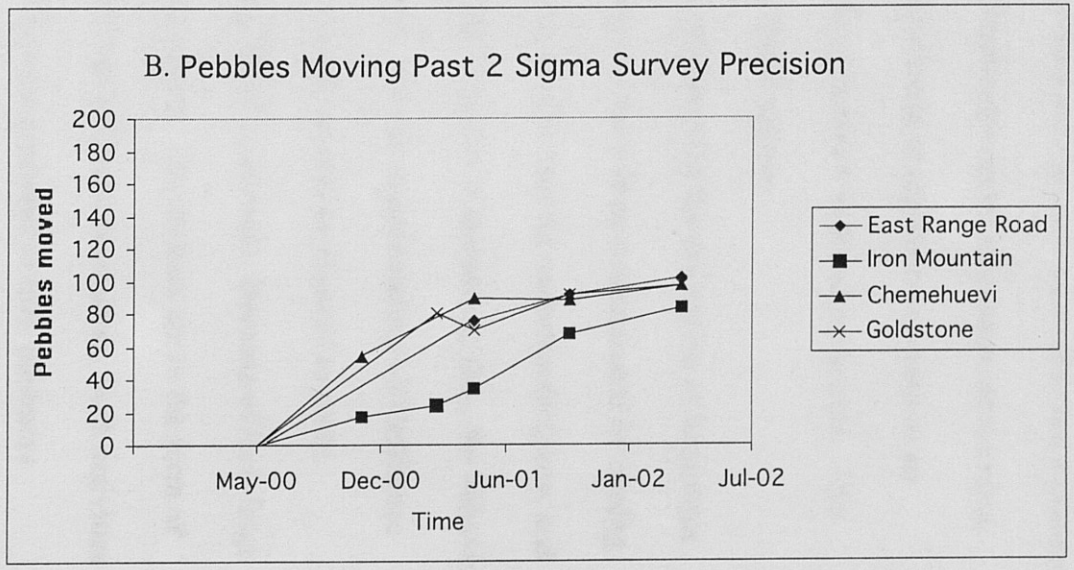

Figure 4.14 Persico et al.

Chapter 5 - Conclusions and Future Research

The pebble tracing method used in this experiment was successful in tracking pebbles and quantifying pebble movement over time. The transport rates reflect over eight thousand individual pebble measurements made over 2.5 years. The analysis has shown that pebbles move down gradient over time and that movement distance increases over time. Never before have short-term sediment movement rates been measured on desert piedmonts. Many studies have traced sediment in ephemeral streams or on hillslopes but none have attempted to apply these methods to broad piedmonts. This research fills a gap in the research literature of arid regions.

Sediment tracing, as done here, has applications in the evaluation of hazardous waste sites. Many surfaces in the desert Southwest have been contaminated by mining and nuclear experimentation. Sediment tracing is important for understanding how and where this waste will move. Population in desert regions is increasing; thus, the behavior of desert piedmonts is important to understand. Such an understanding will influence land management decisions, including where people should be allowed to settle.

Desert piedmonts are ubiquitous in the desert Southwest. Because of their large size and broad distribution, humans will impact them. The impacts are in the form of road building, infrastructure building, and off-road vehicular recreation. Such activities occur with little regard as to how they will affect the piedmont or how piedmont processes will affect infrastructure.

Understanding piedmont processes is fundamental to protecting and rehabilitating these surfaces. In order to protect piedmonts, one needs to quantify and understand the effects of human disturbance. This research makes advances both fundamental and

applied by providing a new means to characterize piedmonts and evaluate of the many factors that need to be included when assessing piedmont behavior. These factors include sediment transport, surface infiltration, surface compaction, plant activity, and animal activity. Only when all these factors are understood and that understanding integrated fully, will it be possible to quantify human disturbance and make wise land management policies to protect these surfaces.

Many piedmonts are recovering from army use in the 1940's. Studies, including this one, have shown that these piedmonts function differently than pristine surfaces. Not all of the impacts that humans have on piedmonts are known. Pristine piedmonts must be protected so that they are not destroyed, as some were 60 years ago. Recovering piedmonts, such as Iron Mountain, must be protected so that we can understand how they recover to their original pristine state.

Future Research

One conclusion of this research is that up-piedmont surfaces are very important in determining how and when sediment moves. Future studies can analyze the size and permeability of the steep mountain ranges and the runoff that they generate. There is potential to characterize further individual piedmonts by classifying the different surfaces on them, and by measuring them individually.

Further studies could include-

- *Pebble movement rates on different surfaces on one piedmont.* This approach would reveal systematic differences across a single piedmont. Surfaces would include hillslopes, pediments, large channels near the rangefront, interfluves and washes.

- *Quantification of channel network.* I would map channels across one piedmont and place a few pebbles in the ephemeral channels at many places on the piedmont. I would install many rain gauges all over the piedmont to correlate precipitation with flow in different parts of the ephemeral channel network.
- *Large-scale infiltration tests on army impacted surface.* This study would clarify how tank traffic impacts surfaces by the compacting soil and creating detention storage in tank tracks. This would show if runoff is increased by compaction, or if runoff is decreased by detention storage.
- *The effect of size and relief of mountain ranges on sediment transport rates.* This study could use pebble crosses on several piedmonts with varying mountain sizes. The crosses would be placed on geomorphically similar surfaces at the same distance from the range front.

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Appendix 1 Integrated Pebble Movement

Caculations for Pebble data East Range Road

These calculations compare movement from orginal positions. The pebbles are seperated into Line countour parallel and Line oriented down gradient pebbles.

The countour parallel line pebbles move up and down and the line oriented down gradient pebbles move north and south.

The calculations include gross movement and net movement. Gross movement does not take into account that some pebbles move up from the line and some move down from the line.

The maximum, minimum, average, standard deviation and median of gross and net pebble movment is shown at the bottom of the spread sheet. A sensitivity test is also included to determine how many pebbles are actually moving.

Gross movement accounts for all movement not just movment in downslope direction
Should we also figure out the down slope movement?

LINE PARALLEL TO CONTOUR NORTHING = -4.13305930(EASTING) + 41446.363475901

LINE ORIENTED DOWN GRADIENT NORTHING = 0.247408463(EASTING) + 1125.892681083

	May--00				May--01										
	LINE PARALLEL TO CONTOUR		LINE ORIENTED DOWNGRADIENT		LINE PARALLEL TO CONTOUR		LINE ORIENTED DOWNGRADIENT		LINE PARALLEL TO CONTOUR	LINE ORIENTED DOWNGRADIENT			LINE PARALLEL TO CONTOUR	LINE ORIENTED DOWNGRADIENT	
	e	n	e	n	e	n	e	n	UP vs DOWN MOVEMENT	NORTH vs SOUTH MOVEMENT		GROSS movement	GROSS movement	NET movement	NET movement
1	9649.101	5622.085	9644.091	5635.276	9649.110	5622.094	9644.091	5635.276	UP	south	0.183	0.009	0.000	-0.009	0.000	-0.174
2	9649.155	5622.163	9644.141	5635.180	9649.149	5622.186	9644.152	5635.113	UP	south	0.343	0.024	0.068	-0.024	0.068	-0.319
3	9649.198	5622.257	9644.213	5635.103	9649.203	5622.274	9644.217	5635.063	UP	south	0.345	0.018	0.040	-0.018	0.040	-0.327
4	9649.244	5622.364	9644.368	5635.156	9649.236	5622.344	9644.366	5635.156	UP	south	0.360	0.013	0.000	-0.013	0.000	-0.338
5	9649.29	5622.444	9644.35	5635.087	9649.280	5622.435	9644.350	5634.979	UP	south	0.349	0.013	0.108	-0.013	0.108	-0.335
6	9649.308	5622.537	9644.441	5635.061	9649.337	5622.526	9644.437	5635.002	UP	south	0.349	0.030	0.059	-0.030	0.059	-0.319
7	9649.354	5622.609	9644.517	5635.023	9649.428	5622.543	9644.612	5635.014	UP	south	0.329	0.098	0.010	-0.098	0.010	-0.231
8	9649.419	5622.548	9644.702	5634.995	9649.399	5622.599	9644.717	5634.996	UP	south	0.179	0.055	0.015	-0.055	0.015	-0.125
9	9649.413	5622.746	9644.784	5634.945	9649.394	5622.750	9644.788	5634.936	UP	south	0.282	0.019	0.010	-0.019	0.010	-0.263
10	9649.506	5622.883	9644.881	5634.910	9649.517	5622.884	9644.887	5634.891	UP	south	0.330	0.011	0.032	-0.011	0.032	-0.319
11	9649.543	5622.992	9644.982	5634.886	9649.538	5622.981	9644.972	5634.865	UP	south	0.353	0.019	0.023	-0.019	0.023	-0.334
12	9649.557	5623.102	9645.053	5634.819	9649.536	5623.166	9645.061	5634.812	UP	south	0.382	0.069	0.007	-0.069	0.007	-0.293
13	9649.664	5623.209	9645.159	5634.775	9649.711	5623.233	9645.159	5634.771	UP	south	0.386	0.053	0.004	-0.053	0.004	-0.333
14	9649.64	5623.306	9645.227	5634.735	9649.691	5623.383	9645.251	5634.736	UP	south	0.382	0.092	0.024	-0.092	0.024	-0.290
15	9649.664	5623.369	9645.266	5634.695	9649.724	5623.455	9645.342	5634.679	UP	south	0.352	0.105	0.058	-0.105	0.058	-0.248
16	9649.711	5623.461	9645.431	5634.644	9649.735	5623.573	9645.412	5634.602	UP	south	0.353	0.115	0.046	-0.115	0.046	-0.238
17	9649.745	5623.557	9645.484	5634.579	9649.821	5623.640	9645.490	5634.584	UP	south	0.364	0.113	0.016	-0.113	0.016	-0.244
18	9649.782	5623.649	9645.612	5634.558	9649.803	5623.750	9645.595	5634.539	UP	south	0.356	0.103	0.025	-0.103	0.025	-0.253
19	9649.81	5623.754	9645.671	5634.529	9649.862	5623.833	9645.676	5634.519	UP	south	0.369	0.095	0.011	-0.095	0.011	-0.275
20	9649.887	5623.83	9645.741	5634.496	9649.933	5623.941	9645.762	5634.491	UP	south	0.363	0.129	0.022	-0.129	0.022	-0.224
21	9649.904	5623.927	9645.885	5634.446	9649.904	5623.927	9645.901	5634.437	UP	south	0.358	0.009	0.018	0.000	0.018	-0.358
22	9649.963	5624.001	9645.956	5634.417	9649.963	5624.001	9645.981	5634.367	UP	south	0.341	0.000	0.056	0.000	0.056	-0.341
23	9649.972	5624.11	9646.038	5634.377	9650.047	5624.125	9646.041	5634.371	UP	south	0.357	0.078	0.007	-0.078	0.007	-0.281
24	9650.283	5623.071	9646.113	5634.335	9650.265	5624.018	9646.158	5634.309	Down	south	0.299	0.050	0.052	0.050	0.052	-0.249
25	9650.051	5624.3	9646.236	5634.279	9650.050	5624.317	9647.326	5634.179	UP	south	0.363	0.017	1.092	-0.017	1.092	-0.346
26	9650.085	5624.362	9646.354	5634.227	9650.085	5624.395	9646.321	5634.209	UP	south	0.323	0.043	0.038	-0.043	0.038	-0.280
27	9650.13	5624.456	9646.406	5634.192	9650.156	5624.488	9646.431	5634.178	UP	south	0.335	0.041	0.029	-0.041	0.029	-0.294
28	9650.165	5624.546	9646.478	5634.180	9650.193	5624.557	9646.491	5634.185	UP	south	0.335	0.029	0.020	-0.029	0.020	-0.306
29	9650.23	5624.651	9646.509	5634.127	9650.230	5624.636	9646.509	5634.127	UP	south	0.346	0.017	0.000	-0.017	0.000	-0.329
30	9650.269	5624.73	9646.687	5634.114	9650.274	5624.715	9646.726	5634.109	UP	south	0.353	0.015	0.039	-0.015	0.039	-0.318
31	9650.29	5624.829	9646.763	5634.087	9650.281	5624.840	9646.789	5634.090	UP	south	0.340	0.014	0.007	-0.014	0.007	-0.325
32	9650.321	5624.924	9646.872	5634.077	9650.342	5624.930	9646.860	5634.078	UP	north	0.343	0.022	0.012	-0.022	-0.012	-0.321
33	9650.512	5624.948	9647.065	5634.199	9650.488	5624.846	9647.111	5634.098	Down	north	0.312	0.024	0.115	0.024	-0.115	-0.288
34	9650.476	5625.087	9647.091	5634.040	9650.444	5625.123	9647.167	5634.050	UP	north	0.330	0.048	0.077	-0.048	-0.077	-0.281
35	9650.449	5625.087	9647.149	5634.006	9650.434	5625.230	9646.196	5634.302	UP	north	0.330	0.144	0.998	-0.144	-0.998	-0.086
36	9650.493	5625.291	9647.264	5633.878	9650.489	5625.286	9647.190	5633.979	UP	north	0.342	0.005	0.125	-0.005	-0.125	-0.337
37	9650.534	5625.414	9647.348	5633.860	9650.540	5625.386	9647.348	5633.860	UP	south	0.373	0.032	0.000	-0.032	0.000	-0.341
38	9650.554	5625.514	9647.524	5633.763	9650.574	5625.549	9647.524	5633.763	UP	south	0.380	0.040	0.000	-0.040	0.000	-0.340
39	9650.589	5625.578	9647.533	5633.751	9650.622	5625.616	9650.618	5632.797	UP	south	0.352	0.050	3.229	-0.050	3.229	-0.302
40	9650.636	5625.687	9647.656	5633.718	9650.584	5625.722	9650.285	5633.238	UP	south	0.369	0.064	2.672	-0.064	2.672	-0.305
41	9650.661	5625.787	9647.747	5633.678	9650.685	5625.774	9647.718	5633.617	UP	south	0.358	0.025	0.068	-0.025	0.068	-0.333
42	9650.846	5625.802	9647.777	5633.606	9650.597	5625.880	9650.383	5633.341	UP	south	0.308	0.092	2.600	-0.092	2.600	-0.216
43	9650.731	5625.913	9647.865	5633.580	9650.731	5625.913	9648.806	5633.245	UP	south	0.329	0.000	1.870	0.000	1.870	-0.329
44	9650.784	5626.002	9648.022	5633.558	9650.789	5625.984	9647.961	5633.537	UP	south	0.316	0.019	0.064	-0.019	0.064	-0.298
45	9650.835	5626.112	9646.084	5633.452	9650.845	5625.170	9648.084	5633.452	Down	south	0.334	0.942	0.000	0.942	0.000	0.508
46	9650.855	5626.236	9648.204	5633.478	9650.844	5626.279	9648.213	5633.452	UP	south	0.368	0.042	0.027	-0.042	0.027	-0.326
47	9650.914	5626.369	9648.2	5633.336	9650.842	5626.351	9648.264	5633.365	UP	south	0.407	0.033	0.067	-0.033	0.067	-0.374
48	9650.961	5626.449	9648.405	5633.283	9650.889	5626.453	9648.417	5633.264	UP	south	0.395	0.028	0.021	-0.028	0.021	-0.367
49	9650.975	5626.544	9648.485	5633.241	9650.988	5626.551	9648.570	5633.239	UP	south	0.398	0.015	0.085	-0.015	0.085	-0.383
50	9651.078	5626.596	9648.518	5633.254	9651.078	5626.596	9648.548	5633.275	UP	south	0.361	0.000	0.037	0.000	0.037	-0.361
51	9651.082	5626.73	9648.623	5633.237	9651.797	5626.438	9648.638	5633.231	UP	south	0.409	0.772	0.016	-0.772	0.016	0.373
52	9651.146	5626.808	9648.734	5633.195	9651.146	5626.824	9648.755	5633.206	UP	south	0.407	0.000	0.016	0.000	0.016	-0.407
53	9651.104	5626.89	9648.832	5633.169	9654.562	5623.775	9648.831	5633.161	Down	south	0.378	4.654	0.006	4.654	0.006	4.276
54	9651.165	5627.002	9648.901	5633.130	9651.165	5627.002	9648.902	5633.147	UP	south	0.396	0.000	0.017	0.000	0.017	-0.396
55	9651.234	5627.011	9648.962	5633.091	9651.234	5627.011	9648.977	5633.097	UP	south	0.313	0.000	0.016	0.000	0.016	-0.313
56	9651.259	5627.114	9649.048	5633.062	9653.478	5625.747	9649.047	5633.068	Down	south	0.323	2.606	0.006	2.606	0.006	2.283
57	9651.277	5627.253	9649.121	5633.003	9656.838	5623.594	9649.129	5633.025	Down	south	0.371	5.846	0.022	5.846	0.022	5.475
58	9651.354	5627.327	9649.254	5632.998	9651.399	5627.335	9649.252	5632.986	UP	south	0.352	0.046	0.012	-0.046	0.012	-0.307
59	9651.371	5627.432	9649.357	5632.929	9651.389	5627.411	9649.353	5632.925	UP	south	0.365	0.028	0.006	-0.028	0.006	-0.338
60	9651.446	5627.518	9649.446	5632.896	9651.446	5627.518	9649.455	5632.849	UP	south	0.360	0.000	0.048	0.000	0.048	-0.360
61	9651.458	5627.615	9649.523	5632.835	9651.435	5627.590	9649.545	5632.871	UP	south	0.355	0.109	0.042	-0.109	0.042	-0.256
62	9651.47	5627.683	9649.606	5632.804	9651.444	5627.601	9649.616	5632.803	UP	south	0.342	0.086	0.010	-0.086	0.010	-0.256
63	9651.524	5627.796	9649.695	5632.757	9651.541	5627.795	9649.724	5632.779	UP	south	0.361	0.017	0.036	-0.017	0.036	-0.344
64	9651.569	5627.891	9649.805	5632.706	9651.580	5627.916	9649.818	5632.737	UP	south	0.364	0.027	0.034	-0.027	0.034	-0.337
65	9651.622	5627.992	9650.056	5632.793	9651.601	5627.982	9650.053	5632.804	UP	north	0.373	0.023	0.011	-0.023	-0.011	-0.350
66	9651.654	5628.096	9650.016	5632.627	9651.618	5628.082	9650.026	5632.620	UP	south	0.366	0.045	0.011	-0.045	0.011	-0.350
67	9651.699	5628.251	9650.112	5632.581	9651.668	5628.217	9650.112	5632.584	UP	south	0.448	0.046	0.003	-0.046	0.003	-0.402
68	9651.727	5628.339	9650.173	5632.560	9651.674	5628.380	9650.151	5632.561	UP	south	0.444	0.067	0.022	-0.067	0.022	-0.377
69	9651.76	5628.361	9650.288	5632.516	9651.820	5628.435	9650.287	5632.508	UP	south	0.374	0.095	0.008	-0.095	0.008	-0.279
70	9651.812	5628.46	9650.388	5632.442	9651.817	5628.464	9650.420	5632.475	UP	south	0.381	0.008	0.034	-0.008	0.034	-0.374
71	9651.827	5628.519	9650.462	5632.728	9651.842	5628.577	9650.457	5632.415	UP	south	0.349	0.060	0.314	-0.060	0.314	-0.289
72	9651.886	5628.621	9650.542	5632.392	9651.930	5628.611	9650.464	5632.417	UP	south	0.358	0.045	0.082	-0.045	0.082	-0.313
73	9651.912	5628.706	9650.64	5632.357	9651.961	5628.747	9650.658	5632.330	UP	south	0.351	0.084	0.025	-0.084	0.025	-0.267
74	9651.957	5628.791	9650.723	5632.305	9651.957	5628.791	9650.729	5632.304	UP	south	0.344	0.000	0.006	0.000	0.006	-0.344
75	9652.099	5628.847	9650.806	5632.373	9651.099	5628.764	9650.815	5632.254	UP	south	0.307	1.010	0.021	-1.010	0.021	0.703
76	9652.45	5628.982	9650.897	5632.244	9652.071	5628.962	9650.907	5632.232	Down	south	0.531	0.380	0.016	0.380	0.016	-0.151
77	9652.078	5629.099	9651.027	5632.182	9652.064	5629.097	9651.031	5632.187	UP	south	0.376	0.014	0.006	-0.014	0.006	-0.361
78	9652.13	5629.185	9651.098	5632.151	9652.132	5629.211	9651.083	5632.209	UP	south	0.349	0.046	0.060	-0.046	0.060	-0.303
79	9652.156	5629.238	9651.175	5632.124	9652.152	5629.244	9651.200	5632.111	UP	south	0.330	0.007	0.026	-0.007	0.026	-0.323
80	9652.297	5629.346	9651.251	5632.082	9652.199	5629.321	9651.244	5632.072	UP	south	0.348	0.027	0.012	-0.027	0.012	-0.319
81	9652.45	5629.43	9651.317	5632.037	9652.255	5629.446	9651.308	5632.044	Down	south	0.394	0.196	0.011	0.196	0.011	-0.199
82	9652.274	5629.551	9651.402	5632.020	9652.274	5629.551	9651.392	5632.028	UP	south	0.367	0.000	0.013	0.000	0.013	-0.367
83	9652.345	5629.627	9651.528	5631.952	9652.345	5629.627	9651.603	5631.972	UP	south	0.352	0.000	0.078	0.000	0.078	-0.352
84	9652.347	5629.726	9651.764	5631.894	9652.347	5629.726	9651.786	5631.894	UP	north	0.358	0.000	0.038	0.000	0.038	-0.358
85	9652.416	5629.803	9651.752	5631.875	9652.416	5629.803	9651.799	5631.890	UP	south	0.343	0.000	0.048	0.000	0.048	-0.343
86	9652.424	5629.955	9651.880	5631.880	9652.424	5629.955	9651.828	5631.722	UP	south	0.403	0.000	0.161	0.000	0.161	-0.403
87	9652.481	5630.012	9651.917	5631.807	9652.481	5630.012	9651.914	5631.826	UP	south	0.368	0.000	0.019	0.000	0.019	-0.368
88	9652.504	5630.094	9652.04	5631.724	9652.504	5630.094	9651.981	5631.774	UP	south	0.358	0.000	0.060	0.000	0.060	-0.358
89	9652.548	5630.189	9652.112	5631.660	9652.548	5630.189	9652.072	5631.660	UP	south	0.361	0.000	0.050	0.000	0.050	-0.361
90	9652.598	5630.271	9652.179	5631.639	9652.598	5630.271	9652.220	5631.641	UP	south	0.351	0.000	0.041	0.000	0.041	-0.351
91	9652.651	5630.351	9652.274	5631.623	9652.641	5630.321	9652.285	5631.645	UP	south	0.339	0.032	0.025	-0.032	0.025	-0.307
92	9652.7	5630.45	9652.371	5631.574	9652.719	5630.432	9652.366	5631.579	UP	south	0.348	0.026	0.016	-0.026	0.016	-0.320
93	9652.724	5630.545	9652.45	5631.536	9652.641	5630.538	9652.542	5631.537	UP	south	0.346	0.083	0.092	-0.083	0.092	-0.262
94	9652.757	5630.289	9652.521	5631.494	9652.682	5630.648	9652.574	5631.487	UP	south	0.000	0.367	0.053	-0.367	0.053	0.367
95	9652.808	5630.736	9652.607	5631.440	9652.808	5630.736	9652.669	5631.439	UP	south	0.356	0.000	0.062	0.000	0.062	-0.356
96	9652.842	5630.838	9652.714	5631.412	9652.842	5630.838	9652.734	5631.406	UP	south	0.365	0.000	0.021	0.000	0.021	-0.365
97	9652.896	5630.915	9652.813	5631.357	9652.896	5630.915	9652.832	5631.359	UP	south	0.351	0.000	0.019	0.000	0.019	-0.351
98	9652.932	5630.818	9652.295	5631.343	9652.932	5630.916	9652.818	5631.321	UP	south	0.262	0.000	0.823	0.000	0.823	-0.262
99	9652.988	5631.1	9652.986	5631.294	9652.974	5631.107	9653.016	5631.292	UP	south	0.352	0.000	0.030	-0.000	0.030	-0.342
100	9653.032	5631.183	9653.099	5631.242	9653.057	5631.193	9653.120	5631.256	UP	south	0.344	0.027	0.025	-0.027	0.025	-0.318
101	9653.056	5631.266	9653.22	5631.210	9653.074	5631.260	9653.231	5631.230	UP	south	0.336	0.020	0.023	-0.020	0.023	-0.316
102	9653.065	5631.356	9653.272	5631.194	9653.101	5631.350	9653.293	5631.197	UP	south	0.333	0.018	0.021	-0.018	0.021	-0.316
103	9653.162	5631.448	9653.365	5631.164	9653.159	5631.443	9653.364	5631.141	UP	south	0.335	0.006	0.023	-0.006	0.023	-0.329
104	9653.176	5631.554	9653.46	5631.097	9653.190	5631.552	9653.491	5631.102	UP	south	0.346	0.014	0.031	-0.014	0.031	-0.332
105	9653.214	5631.658	9653.555	5631.072	9653.283	5631.599	9653.469	5631.087	UP	south	0.358	0.077	0.066	-0.077	0.066	-0.281
106	9653.245	5631.737	9653.652	5631.024	9653.254	5631.716	9653.642	5631.018	UP	south	0.344	0.023	0.009	-0.023	0.009	-0.321
107	9653.321	5631.853	9653.736	5630.989	9653.313	5631.784	9653.742	5631.683	UP	north	0.341	0.030	0.994	-0.030	-0.994	-0.302
108	9653.354	5631.93	9653.834	5630.931	9653.422	5631.871	9653.841	5630.908	UP	south	0.356	0.090	0.024	-0.090	0.024	-0.266
109	9653.401	5632.018	9653.914	5630.890	9653.401	5632.018	9653.925	5630.889	UP	south	0.361	0.000	0.011	0.000	0.011	-0.353
110	9653.402	5632.124	9654.001	5630.856	9653.402	5632.124	9654.001	5630.856	UP	south	0.363	0.000	0.000	0.000	0.000	-0.363
111	9653.456	5632.183	9654.093	5630.821	9653.456	5632.183	9654.089	5630.823	UP	south	0.331	0.000	0.004	0.000	0.004	-0.331
112	9653.488	5632.278	9654.183	5630.758	9653.488	5632.278	9654.179	5630.765	UP	south	0.334	0.000	0.008	0.000	0.008	-0.334
113	9653.562	5632.448	9654.285	5630.720	9653.562	5632.448	9654.267	5630.701	UP	south	0.415	0.000	0.019	0.000	0.019	-0.415
114	9653.588	5632.483	9654.372	5630.693	9653.588	5632.483	9654.407	5630.720	UP	south	0.354	0.000	0.044	0.000	0.044	-0.354
115	9653.619	5632.541	9654.46	5630.661	9653.619	5632.541	9654.466	5630.667	UP	south	0.322	0.000	0.008	0.000	0.008	-0.322
116	9653.643	5632.637	9654.534	5630.628	9653.643	5632.637	9654.519	5630.627	UP	south	0.324	0.000	0.115	0.000	0.115	-0.324
117	9653.703	5632.739	9654.624	5630.595	9667.875	5631.761	9654.844	5630.585	Down	south	0.336	14.206	0.220	14.206	0.220	13.870
118	9653.727	5632.841	9654.754	5630.544	9653.727	5632.841	9654.076	5630.309	UP	south	0.344	0.000	0.265	0.000	0.265	-0.344
119	9653.791	5632.942	9654.857	5630.472	9653.791	5632.942	9655.139	5630.372	UP	south	0.356	0.000	0.299	0.000	0.299	-0.356
120	9653.819	5633.018	9654.941	5630.455	9653.808	5633.014	9655.517	5630.807	UP	north	0.339	0.012	0.575	-0.012	-0.575	-0.327
121	9653.884	5633.102	9654.958	5630.394	9653.857	5633.085	9655.410	5630.193	UP	south	0.332	0.018	0.495	-0.018	0.495	-0.313
122	9653.903	5633.192	9655.148	5630.383	9653.921	5633.164	9655.475	5630.252	UP	south	0.330	0.033	0.352	-0.033	0.352	-0.298
123	9653.94	5633.29	9655.242	5630.402	9654.127	5633.434	9655.463	5630.185	UP	south	0.335	0.236	0.309	-0.236	0.309	-0.099
124	9653.986	5633.373	9655.391	5630.195	9653.986	5633.373	9655.524	5630.131	UP	south	0.327	0.000	0.148	0.000	0.148	-0.327
125	9654.033	5633.479	9655.4	5630.270	9654.980	5633.927	9655.574	5630.100	UP	south	0.342	1.048	0.243	-1.048	0.243	0.706
126	9654.06	5633.557	9655.437	5630.184	9654.06	5633.557	9655.437	5630.184	UP	south	0.330	0.000	0.000	0.000	0.000	-0.330
127	9654.108	5633.617	9655.516	5630.134	9676.428	5630.329	9655.516	5630.134	Down	south	0.296	22.561	0.000	22.561	0.000	22.265
128	9654.121	5633.756	9655.578	5630.121	9654.121	5633.756	9655.578	5630.121	UP	south	0.339	0.000	0.000	0.000	0.000	-0.339
129	9654.171	5633.864	9655.705	5630.111	9654.171	5633.864	9656.716	5630.109	UP	south	0.356	0.000	1.011	0.000	1.011	-0.356
130	9654.175	5633.979	9655.797	5630.083	9654.175	5633.979	9655.774	5630.100	UP	south	0.377	0.000	0.044	0.000	0.044	-0.377
131	9654.243	5634.082	9655.885	5630.026	9654.243	5634.082	9656.875	5630.020	UP	south	0.369	0.000	0.990	0.000	0.990	-0.369
132	9654.288	5634.118	9656.028	5629.967	9654.288	5634.118	9656.018	5630.019	UP	south	0.334	0.000	0.053	0.000	0.053	-0.334
133	9654.311	5634.201	9656.156	5630.002	9654.311	5634.201	9656.156	5630.002	UP	south	0.323	0.000	0.000	0.000	0.000	-0.323

134	9654.369	5634.28	9656.248	5629.962	9654.369	5634.28	9656.248	5629.962	UP	south	0.312	0.000	0.000	0.000	0.000	-0.312
135	9654.446	5634.391	9656.330	5629.922	9654.446	5634.391	9656.330	5629.922	UP	south	0.338	0.000	0.000	0.000	0.000	-0.338
136	9654.486	5634.494	9656.430	5629.882	9654.486	5634.494	9656.430	5629.882	UP	south	0.349	0.000	0.000	0.000	0.000	-0.349
137	9654.505	5634.582	9656.522	5629.842	9667.686	5631.914	9656.522	5629.842	Down	south	0.341	13.448	0.000	13.448	0.000	13.107
138	9654.537	5634.657	9656.578	5629.758	9654.537	5634.657	9656.578	5629.758	UP	south	0.323	0.000	0.000	0.000	0.000	-0.323
139	9654.567	5634.766	9656.624	5629.689	9665.702	5631.930	9656.615	5630.666	Down	north	0.338	11.490	0.999	11.490	+0.999	11.152
140	9654.621	5634.836	9656.689	5629.653	9654.621	5634.836	9656.675	5629.633	UP	south	0.321	0.000	0.024	0.000	0.024	-0.321
141	9654.653	5634.953	9656.774	5629.680	9654.653	5634.953	9656.743	5629.699	UP	south	0.342	0.000	0.036	0.000	0.036	-0.342
142	9654.736	5635.047	9656.98	5629.549	9654.736	5635.047	9656.98	5629.549	UP	south	0.353	0.000	0.000	0.000	0.000	-0.353
143	9654.722	5635.145	9657.029	5629.577	9654.722	5635.145	9657.029	5629.577	UP	south	0.349	0.000	0.000	0.000	0.000	-0.349
144	9654.753	5635.244	9657.12	5629.820	9654.753	5635.244	9657.137	5629.597	UP	south	0.356	0.000	0.313	0.000	0.313	-0.356
145	9654.806	5635.288	9657.185	5629.476	9654.806	5635.288	9657.210	5629.500	UP	south	0.309	0.000	0.035	0.000	0.035	-0.309
146	9654.87	5635.475	9657.27	5629.414	9654.87	5635.475	9657.269	5629.426	UP	south	0.407	0.000	0.012	0.000	0.012	-0.407
147	9654.908	5635.504	9657.393	5629.352	9654.908	5635.504	9657.425	5629.338	UP	south	0.344	0.000	0.035	0.000	0.035	-0.344
148	9654.9	5635.568	9657.49	5629.322	9654.9	5635.568	9657.515	5629.317	UP	south	0.310	0.000	0.025	0.000	0.025	-0.310
149	9654.914	5635.619	9657.576	5629.279	9654.914	5635.619	9657.577	5629.266	UP	south	0.288	0.000	0.013	0.000	0.013	-0.288
150	9655.004	5635.765	9657.710	5629.323	9655.004	5635.765	9657.710	5629.323	UP	south	0.326	0.000	0.000	0.000	0.000	-0.326
151	9655.043	5635.823	9657.853	5629.980	9656.043	5635.823	9657.818	5629.958	UP	south	0.292	0.000	0.041	0.000	0.041	-0.292
152	9655.101	5635.938	9657.893	5629.243	9656.101	5635.938	9657.893	5629.243	UP	south	0.318	0.000	0.000	0.000	0.000	-0.318
153	9655.143	5636.047	9657.984	5629.203	9656.143	5636.047	9657.984	5629.203	UP	south	0.335	0.000	0.000	0.000	0.000	-0.335
154	9655.195	5636.164	9658.076	5629.163	9655.179	5636.129	9658.131	5629.042	UP	south	0.363	0.039	0.133	-0.039	0.133	-0.324
155	9655.214	5636.22	9658.112	5629.089	9656.231	5636.201	9658.233	5629.011	UP	south	0.323	0.025	0.134	-0.025	0.134	-0.297
156	9655.262	5636.313	9658.249	5628.995	9656.273	5636.287	9658.355	5628.959	UP	south	0.326	0.028	0.112	-0.028	0.112	-0.297
157	9655.289	5636.428	9658.36	5628.974	9655.293	5636.410	9658.415	5628.944	UP	south	0.346	0.018	0.063	-0.018	0.063	-0.327
158	9655.346	5636.504	9658.42	5628.927	9655.350	5636.480	9658.526	5628.920	UP	south	0.334	0.015	0.106	-0.015	0.106	-0.319
159	9655.366	5636.59	9658.53	5628.926	9655.376	5636.586	9658.613	5628.879	UP	south	0.324	0.009	0.085	-0.009	0.085	-0.315
160	9655.406	5636.706	9658.616	5628.878	9655.435	5636.684	9658.714	5628.827	UP	south	0.346	0.036	0.110	-0.036	0.110	-0.311
161	9655.443	5636.776	9658.699	5628.846	9655.457	5636.774	9658.829	5628.802	UP	south	0.327	0.015	0.138	-0.015	0.138	-0.313
162	9655.436	5636.876	9658.792	5628.792	9655.558	5636.837	9658.792	5628.792	UP	south	0.328	0.126	0.138	-0.126	0.138	-0.202
163	9655.517	5636.951	9658.895	5628.764	9655.558	5636.883	9658.895	5628.764	UP	south	0.316	0.079	0.000	-0.079	0.000	-0.236
164	9655.575	5637.027	9658.973	5628.737	9655.727	5636.633	9658.918	5628.736	Down	south	0.304	0.422	0.864	0.422	0.864	0.119
165	9655.626	5637.16	9659.053	5628.699	9655.826	5637.16	9659.058	5628.691	UP	south	0.346	0.000	0.009	0.000	0.009	-0.346
166	9655.647	5637.237	9659.173	5628.653	9655.647	5637.237	9659.232	5628.812	UP	north	0.328	0.000	0.170	0.000	-0.170	-0.328
167	9655.68	5637.333	9659.254	5628.597	9655.68	5637.333	9659.256	5628.600	UP	south	0.330	0.000	0.004	0.000	0.004	-0.330
168	9655.721	5637.436	9659.321	5628.546	9655.721	5637.435	9659.328	5628.541	UP	south	0.340	0.000	0.000	0.000	0.000	-0.340
169	9655.748	5637.527	9659.389	5628.530	9655.845	5637.539	9659.389	5628.539	UP	south	0.336	0.096	0.000	-0.096	0.000	-0.241
170	9655.79	5637.611	9659.485	5628.482	9656.277	5637.471	9659.472	5628.480	UP	south	0.331	0.507	0.013	-0.507	0.013	0.176
171	9655.817	5637.69	9659.605	5628.408	9655.917	5637.668	9659.806	5628.386	UP	south	0.316	0.100	0.022	-0.100	0.022	-0.216
172	9655.878	5637.728	9659.697	5628.355	9655.934	5637.759	9659.703	5628.380	UP	south	0.267	0.064	0.036	-0.064	0.036	-0.203
173	9655.885	5637.858	9659.816	5628.345	9656.046	5637.887	9659.851	5628.360	UP	south	0.300	0.163	0.036	-0.163	0.036	-0.137
174	9655.928	5637.969	9659.92	5628.311	9656.003	5637.917	9659.951	5628.301	UP	south	0.318	0.091	0.033	-0.091	0.033	-0.227
175	9655.989	5638.062	9660.063	5628.283	9655.989	5638.082	9660.058	5628.404	UP	north	0.342	0.000	0.142	0.000	-0.142	-0.342
176	9655.99	5638.18	9660.096	5628.255	9667.717	5631.503	9660.215	5628.230	Down	south	0.324	13.485	0.123	13.485	0.123	13.161
177	9656.044	5638.256	9660.228	5628.204	9656.044	5638.256	9660.228	5628.204	UP	south	0.329	0.000	0.000	0.000	0.000	-0.329
178	9656.069	5638.342	9660.318	5628.151	9656.069	5638.342	9660.316	5628.151	UP	south	0.322	0.000	0.000	0.000	0.000	-0.322
179	9656.114	5638.452	9660.393	5628.087	9656.114	5638.452	9660.393	5628.087	UP	south	0.340	0.000	0.000	0.000	0.000	-0.340
180	9656.156	5638.553	9660.446	5628.070	9656.156	5638.553	9660.501	5628.056	UP	south	0.349	0.000	0.056	0.000	0.056	-0.349
181	9656.255	5638.618	9660.502	5628.064	9656.255	5638.618	9660.502	5628.064	UP	south	0.332	0.000	0.000	0.000	0.000	-0.332
182	9656.285	5638.738	9660.625	5628.004	9656.931	5640.527	9660.676	5628.079	UP	north	0.354	1.909	0.876	-1.909	-0.876	1.555
183	9656.291	5638.816	9660.721	5627.942	9665.236	5636.529	9660.730	5627.964	Down	south	0.338	9.233	0.024	9.233	0.024	8.895
184	9656.364	5638.928	9660.819	5627.955	9656.421	5638.987	9660.810	5627.955	UP	south	0.362	0.089	0.000	-0.089	0.000	-0.274
185	9656.362	5639.015	9660.907	5627.792	9656.347	5638.685	9660.900	5627.890	UP	south	0.351	0.046	0.098	-0.046	0.098	-0.305
186	9656.361	5639.103	9661.01	5627.851	9656.384	5639.079	9661.01	5627.851	UP	south	0.346	0.040	0.000	-0.040	0.000	-0.306
187	9656.415	5639.182	9661.111	5627.807	9656.421	5639.179	9660.105	5627.802	UP	south	0.333	0.007	1.006	-0.007	1.006	-0.326
188	9656.456	5639.313	9661.66	5627.768	9656.493	5639.357	9661.192	5627.958	UP	north	0.372	0.057	0.714	-0.057	-0.714	-0.314
189	9656.498	5639.406	9661.295	5627.727	9656.557	5639.436	9661.285	5627.725	UP	south	0.373	0.068	0.010	-0.068	0.010	-0.305
190	9656.519	5639.492	9661.398	5627.685	9656.555	5639.544	9661.420	5627.673	UP	south	0.367	0.063	0.025	-0.063	0.025	-0.303
191	9656.585	5639.577	9661.491	5627.678	9656.613	5639.505	9661.491	5627.678	UP	north	0.360	0.077	0.000	-0.077	0.000	-0.283
192	9656.632	5639.672	9661.553	5627.660	9656.633	5639.694	9661.543	5627.637	UP	south	0.364	0.022	0.025	-0.022	0.025	-0.342
193	9656.685	5639.72	9661.64	5627.664	9656.669	5639.721	9661.651	5627.599	UP	south	0.319	0.024	0.066	-0.024	0.066	-0.295
194	9656.686	5639.837	9661.724	5627.564	9656.696	5639.777	9661.746	5627.554	UP	south	0.344	0.061	0.037	-0.061	0.037	-0.282
195	9656.732	5639.932	9661.822	5627.539	9656.759	5639.949	9661.800	5627.517	UP	south	0.347	0.032	0.031	-0.032	0.031	-0.315
196	9656.801	5640.026	9661.937	5627.494	9656.801	5640.026	9661.926	5627.479	UP	north	0.351	0.000	0.017	0.000	-0.017	-0.351
197	9656.801	5640.126	9662.028	5627.440	9656.662	5640.297	9662.019	5627.461	UP	north	0.358	0.187	0.023	-0.187	-0.023	-0.171
198	9656.56	5640.206	9662.095	5627.429	9656.632	5640.267	9662.069	5627.443	UP	north	0.442	0.377	0.015	-0.377	-0.015	-0.065
199	9656.853	5640.283	9662.184	5627.412	9656.853	5640.283	9662.184	5627.402	UP	north	0.330	0.000	0.010	0.000	-0.010	-0.330
200	9656.88	5640.329	9662.265	5627.348	9656.88	5640.329	9662.265	5627.337	UP	north	0.285	0.000	0.011	0.000	-0.011	-0.285

UP	165	21	NORTH	
DOWN	15	179	SOUTH	
This is number of pebbles moving different ways				

	22.561	3.220	22.561	3.220 max (m)
	-	-	(1.909)	(0.999) min (m)
	0.555	0.147	0.441	0.086 avg (m)
	2.556	0.418	2.579	0.435 stdv (m)
	0.020	0.025	(0.014)	0.022 median (m)

LINE PARALLEL TO CONTOUR GROSS movement	LINE ORIENTED DOWNGRADIENT GROSS movement	LINE PARALLEL TO CONTOUR NET movement	LINE ORIENTED DOWNGRADIENT NET movement

pebbles moving > than	101	1 SIGMA	0.019 m
uncertainty of measure	75	2 SIGMA	0.036 m

ASSUMING 0.019 RMS UNCERTAINTY

THIS IS THE SENSITIVITY TEST FOR HOW MANY PEBBLES REALLY MOVED

Caculations for Pebble data East Range Road

These calculations compare movement from orginal positions. The pebbles are seperated into Line countour parallel and Line oriented down gradient pebbles.

The countour parallel line pebbles move up and down and the line oriented down gradient pebbles move north and south.

The calculations include gross movement and net movement. Gross movement does not take into account that some pebbles move up from the line and some move down from the line.

The maximum, minimum, average, standard deviation and median of gross and net pebble movment is shown at the bottom of the spread sheet. A sensitivity test is also included to determine how many pebbles are actually moving.

Gross movement accounts for all movement not just movment in downslope direction
Should we also figure out the down slope movement?

LINE PARALLEL TO CONTOUR NORTHING = -4.133059306(EASTING) + 41446.363475601

LINE ORIENTED DOWN GRADIENT NORHTING = 0.247408463(EASTING) + 1125.893581063

	May--00 LINE PARALLEL TO CONTOUR e	n	May--00 LINE ORIENTED DOWNGRADIENT e	n	Oct--01 LINE PARALLEL TO CONTOUR e	n	Oct--01 LINE ORIENTED DOWNGRADIENT e	n	LINE PARALLEL TO CONTOUR UP vs DOWN MOVEMENT	LINE ORIENTED DOWNGRADIENT NORTH vs SOUTH MOVEMENT		LINE PARALLEL TO CONTOUR GROSS movement	LINE ORIENTED DOWNGRADIENT GROSS movement	LINE PARALLEL TO CONTOUR NET movement	LINE ORIENTED DOWNGRADIENT NET movement	
1	9649.101	5622.095	9644.091	5635.276	9649.125	5622.102	9644.091	5635.276	UP	south	0.182	0.025	0.000	-0.025	0.000	-0.157
2	9649.155	5622.163	9644.141	5635.180	9649.175	5622.173	9644.129	5635.137	UP	south	0.366	0.022	0.045	-0.022	0.045	-0.344
3	9649.198	5622.257	9644.213	5635.103	9649.146	5622.172	9644.203	5635.106	UP	south	0.362	0.100	0.010	-0.100	0.010	-0.263
4	9649.244	5622.354	9644.366	5635.156	9649.227	5622.324	9644.366	5635.156	UP	south	0.340	0.034	0.000	-0.034	0.000	-0.306
5	9649.29	5622.444	9644.35	5635.067	9649.28	5622.427	9644.312	5635.013	UP	south	0.339	0.020	0.083	-0.020	0.083	-0.320
6	9649.308	5622.537	9644.441	5635.061	9649.339	5622.51	9644.4	5634.999	UP	south	0.341	0.041	0.074	-0.041	0.074	-0.300
7	9649.354	5622.609	9644.617	5635.023	9649.452	5622.543	9644.609	5635.023	UP	south	0.275	0.118	0.008	-0.118	0.008	-0.157
8	9649.419	5622.548	9644.702	5634.995	9649.4	5622.623	9644.711	5634.988	UP	south	0.227	0.077	0.011	-0.077	0.011	-0.150
9	9649.413	5622.746	9644.784	5634.945	9649.398	5622.744	9644.793	5634.948	UP	south	0.287	0.015	0.009	-0.015	0.009	-0.272
10	9649.506	5622.883	9644.861	5634.910	9649.461	5622.825	9644.855	5634.921	UP	south	0.332	0.073	0.013	-0.073	0.013	-0.259
11	9649.543	5622.999	9644.982	5634.886	9649.534	5622.974	9644.95	5634.872	UP	south	0.335	0.027	0.035	-0.027	0.035	-0.306
12	9649.567	5623.102	9645.053	5634.819	9649.524	5623.1	9645.063	5634.812	UP	south	0.428	0.033	0.012	-0.033	0.012	-0.395
13	9649.664	5623.209	9645.159	5634.775	9649.7	5623.235	9645.144	5634.813	UP	north	0.421	0.044	0.041	-0.044	-0.041	-0.377
14	9649.64	5623.306	9645.227	5634.735	9649.618	5623.302	9645.214	5634.746	UP	south	0.464	0.022	0.017	-0.022	0.017	-0.442
15	9649.664	5623.369	9645.286	5634.695	9649.729	5623.457	9645.351	5634.661	UP	south	0.443	0.109	0.073	-0.109	0.073	-0.334
16	9649.711	5623.461	9645.431	5634.644	9649.825	5623.641	9645.432	5634.615	UP	south	0.466	0.213	0.029	-0.213	0.029	-0.253
17	9649.745	5623.557	9645.484	5634.579	9649.808	5623.737	9645.492	5634.578	UP	south	0.447	0.191	0.008	-0.191	0.008	-0.257
18	9649.782	5623.649	9645.612	5634.558	9649.818	5623.822	9645.594	5634.532	UP	south	0.458	0.177	0.032	-0.177	0.032	-0.281
19	9649.81	5623.754	9645.671	5634.529	9649.877	5623.941	9645.682	5634.481	UP	south	0.451	0.199	0.049	-0.199	0.049	-0.252
20	9649.867	5623.83	9645.741	5634.496	9649.933	5623.941	9645.772	5634.482	UP	south	0.471	0.129	0.034	-0.129	0.034	-0.342
21	9649.904	5623.927	9645.885	5634.446	9650.044	5624.099	9645.895	5634.436	UP	south	0.358	0.222	0.014	-0.222	0.014	-0.137
22	9649.963	5624.001	9645.956	5634.417	9649.963	5624.001	9645.961	5634.367	UP	south	0.341	0.000	0.039	0.000	0.039	-0.341
23	9649.972	5624.11	9646.038	5634.377	9645.662	5624.96	9646.048	5634.358	UP	south	0.379	4.393	0.021	-4.393	0.021	4.014
24	9650.283	5623.971	9646.113	5634.335	9650.176	5623.993	9646.141	5634.312	Down	south	0.307	0.109	0.036	0.109	0.036	-0.198
25	9650.051	5624.3	9646.239	5634.279	9650.038	5624.292	9646.194	5634.258	UP	south	0.380	0.015	0.050	-0.015	0.050	-0.365
26	9650.085	5624.352	9646.354	5634.227	9650.109	5624.387	9646.345	5634.177	UP	south	0.366	0.042	0.051	-0.042	0.051	-0.323
27	9650.13	5624.456	9646.406	5634.192	9650.13	5624.479	9646.446	5634.15	UP	south	0.368	0.023	0.058	-0.023	0.058	-0.345
28	9650.165	5624.546	9646.476	5634.180	9650.199	5624.576	9646.5	5634.149	UP	south	0.345	0.044	0.038	-0.044	0.038	-0.301
29	9650.23	5624.651	9646.609	5634.127	9650.227	5624.644	9646.609	5634.127	UP	south	0.332	0.008	0.000	-0.008	0.000	-0.325
30	9650.269	5624.73	9646.687	5634.114	9650.273	5624.702	9646.66	5634.106	UP	south	0.319	0.028	0.028	-0.028	0.028	-0.291
31	9650.29	5624.829	9646.783	5634.067	9650.285	5624.83	9646.802	5634.088	UP	south	0.351	0.005	0.019	-0.005	0.019	-0.346
32	9650.321	5624.924	9646.872	5634.077	9650.315	5624.904	9646.87	5634.078	UP	north	0.349	0.021	0.002	-0.021	-0.002	-0.328
33	9650.512	5624.948	9647.065	5634.199	9650.499	5624.958	9646.971	5634.029	Down	north	0.299	0.016	0.190	0.016	-0.190	-0.283
34	9650.476	5625.087	9647.091	5634.040	9650.473	5625.139	9647.178	5634.056	UP	north	0.360	0.052	0.088	-0.052	-0.088	-0.308
35	9650.449	5625.087	9647.149	5634.006	9650.407	5625.332	9647.214	5634.026	UP	north	0.373	0.249	0.068	-0.249	-0.068	-0.124
36	9650.493	5625.291	9647.264	5633.878	9650.528	5625.298	9647.313	5634.241	UP	north	0.336	0.036	0.366	-0.036	-0.366	-0.303
37	9650.534	5625.414	9647.348	5633.860	9650.549	5625.391	9647.348	5633.860	UP	north	0.345	0.027	0.000	-0.027	0.000	-0.318
38	9650.554	5625.514	9647.524	5633.763	9650.563	5625.544	9647.524	5633.763	UP	south	0.416	0.031	0.000	-0.031	0.000	-0.384
39	9650.589	5625.578	9647.533	5633.751	9650.631	5625.614	9650.618	5632.797	UP	south	0.391	0.055	3.229	-0.055	3.229	-0.336
40	9650.638	5625.687	9647.656	5633.718	9650.588	5625.724	9650.254	5633.257	UP	south	0.408	0.062	2.639	-0.062	2.639	-0.346
41	9650.661	5625.767	9647.747	5633.678	9650.65	5625.786	9647.671	5633.761	UP	north	0.364	0.022	0.128	-0.022	-0.128	-0.342
42	9650.646	5625.802	9647.777	5633.608	9650.64	5625.906	9650.245	5633.302	UP	south	0.397	0.104	2.487	-0.104	2.487	-0.293
43	9650.731	5625.913	9647.865	5633.560	9650.731	5625.913	9649.86	5633.131	UP	south	0.320	0.000	2.045	0.000	2.045	-0.320
44	9650.784	5626.002	9648.022	5633.558	9650.844	5625.974	9649.697	5633.582	UP	north	0.298	0.066	1.676	-0.066	-1.676	-0.232
45	9650.835	5626.112	9648.084	5633.452	9650.84	5626.169	9648.084	5633.452	UP	south	0.608	0.077	0.000	-0.077	0.000	-0.531
46	9650.855	5626.238	9648.204	5633.478	9650.857	5626.259	9648.061	5633.503	UP	north	0.410	0.021	0.146	-0.021	-0.146	-0.389
47	9650.914	5626.369	9648.2	5633.336	9650.885	5626.313	9648.175	5633.392	UP	south	0.390	0.063	0.061	-0.063	0.061	-0.327
48	9650.961	5626.449	9648.405	5633.283	9650.957	5626.436	9648.326	5633.307	UP	south	0.400	0.012	0.082	-0.012	0.082	-0.389
49	9650.975	5626.544	9648.485	5633.241	9650.993	5626.609	9648.367	5633.267	UP	south	0.405	0.067	0.121	-0.067	0.121	-0.337
50	9651.078	5626.596	9648.518	5633.254	9651.078	5626.596	9648.449	5633.257	UP	south	0.361	0.000	0.069	0.000	0.069	-0.361
51	9651.082	5626.73	9648.623	5633.237	9651.797	5626.436	9648.629	5633.21	UP	south	0.734	0.772	0.028	-0.772	0.028	0.036
52	9651.146	5626.828	9648.743	5633.195	9651.146	5626.828	9648.733	5633.17	UP	south	0.407	0.000	0.027	0.000	0.027	-0.407
53	9651.104	5626.89	9648.832	5633.169	9655.664	5623.734	9648.833	5633.171	Down	south	4.376	5.546	0.002	5.546	0.002	1.169
54	9651.165	5627.002	9648.901	5633.130	9651.165	5627.002	9648.893	5633.12	UP	south	0.398	0.000	0.013	0.000	0.013	-0.398
55	9651.234	5627.011	9648.962	5633.091	9651.234	5627.011	9648.984	5633.102	UP	south	0.313	0.000	0.025	0.000	0.025	-0.313
56	9651.259	5627.114	9649.048	5633.062	9653.478	5625.747	9649.04	5633.064	Down	south	2.445	2.606	0.008	2.606	0.008	0.161
57	9651.277	5627.253	9649.121	5633.003	9651.716	5626.474	9649.123	5633.027	Down	south	5.598	0.894	0.024	0.894	0.024	-4.704
58	9651.354	5627.327	9649.254	5632.998	9651.37	5627.331	9649.276	5632.98	UP	south	0.364	0.016	0.028	-0.016	0.028	-0.348
59	9651.371	5627.432	9649.357	5632.929	9651.387	5627.43	9649.351	5632.925	UP	south	0.344	0.016	0.007	-0.016	0.007	-0.328
60	9651.446	5627.518	9649.446	5632.896	9651.446	5627.518	9649.444	5632.945	UP	north	0.360	0.000	0.049	0.000	-0.049	-0.360
61	9651.456	5627.616	9649.523	5632.835	9651.415	5627.516	9649.529	5632.849	UP	south	0.260	0.107	0.015	-0.107	0.015	-0.153
62	9651.47	5627.683	9649.606	5632.804	9651.452	5627.594	9649.655	5632.796	UP	south	0.265	0.091	0.050	-0.091	0.050	-0.174
63	9651.524	5627.796	9649.695	5632.757	9651.54	5627.808	9649.823	5632.739	UP	south	0.360	0.020	0.129	-0.020	0.129	-0.340
64	9651.569	5627.891	9649.805	5632.706	9651.574	5627.893	9649.935	5632.674	UP	south	0.389	0.005	0.134	-0.005	0.134	-0.384
65	9651.622	5627.992	9650.056	5632.793	9651.585	5627.97	9650.027	5632.759	UP	north	0.363	0.043	0.045	-0.043	-0.045	-0.320
66	9651.658	5628.106	9650.018	5632.627	9651.598	5628.048	9649.992	5632.674	UP	south	0.377	0.083	0.054	-0.083	0.054	-0.294
67	9651.699	5628.251	9650.112	5632.581	9651.657	5628.206	9650.107	5632.617	UP	south	0.415	0.062	0.036	-0.062	0.036	-0.353
68	9651.727	5628.339	9650.173	5632.560	9651.631	5628.373	9650.593	5632.701	UP	north	0.469	0.102	0.443	-0.102	-0.443	-0.387
69	9651.76	5628.361	9650.288	5632.516	9651.81	5628.422	9650.397	5632.519	UP	south	0.450	0.079	0.109	-0.079	0.109	-0.371
70	9651.812	5628.46	9650.398	5632.449	9651.804	5628.46	9650.444	5632.451	UP	south	0.385	0.008	0.046	-0.008	0.046	-0.377
71	9651.827	5628.519	9650.482	5632.728	9651.854	5628.557	9650.494	5632.432	UP	south	0.406	0.047	0.296	-0.047	0.296	-0.359
72	9651.866	5628.621	9650.542	5632.392	9651.891	5628.673	9650.585	5632.411	UP	south	0.349	0.052	0.047	-0.052	0.047	-0.297
73	9651.912	5628.706	9650.64	5632.357	9651.957	5628.742	9650.656	5632.361	UP	south	0.393	0.058	0.016	-0.058	0.016	-0.335
74	9651.957	5628.791	9650.723	5632.305	9651.957	5628.791	9650.737	5632.313	UP	south	0.344	0.000	0.016	0.000	0.016	-0.344
75	9652.009	5628.847	9650.806	5632.273	9651.975	5628.837	9650.844	5632.257	UP	south	1.045	0.035	0.041	-0.035	0.041	-1.009
76	9652.45	5628.962	9650.897	5632.244	9652.016	5628.917	9650.913	5632.237	Down	south	0.331	0.437	0.017	0.437	0.017	0.106
77	9652.078	5629.099	9651.027	5632.182	9652.06	5629.064	9651.007	5632.201	UP	south	0.374	0.039	0.028	-0.039	0.028	-0.335
78	9652.13	5629.165	9651.098	5632.151	9652.123	5629.184	9651.052	5632.193	UP	south	0.395	0.020	0.062	-0.020	0.062	-0.375
79	9652.156	5629.236	9651.175	5632.124	9652.15	5629.258	9651.181	5632.128	UP	south	0.337	0.021	0.007	-0.021	0.007	-0.316
80	9652.207	5629.346	9651.251	5632.082	9652.197	5629.318	9651.249	5632.084	UP	south	0.321	0.030	0.003	-0.030	0.003	-0.292
81	9652.45	5629.43	9651.317	5632.037	9652.218	5629.424	9651.333	5632.04	Down	south	0.354	0.232	0.016	0.232	0.016	-0.122
82	9652.274	5629.551	9651.402	5632.020	9652.274	5629.551	9651.44	5632.024	UP	south	0.367	0.000	0.038	0.000	0.038	-0.367
83	9652.345	5629.627	9651.528	5631.952	9652.345	5629.627	9651.679	5631.928	UP	south	0.352	0.000	0.153	0.000	0.153	-0.352
84	9652.347	5629.726	9651.764	5631.958	9652.347	5629.726	9651.768	5631.948	UP	north	0.358	0.000	0.011	0.000	-0.011	-0.358
85	9652.416	5629.803	9651.752	5631.875	9652.416	5629.803	9651.859	5631.997	UP	north	0.343	0.000	0.162	0.000	-0.162	-0.343
86	9652.424	5629.955	9651.860	5631.860	9652.424	5629.955	9651.817	5631.72	UP	south	0.403	0.000	0.166	0.000	0.166	-0.403
87	9652.481	5630.012	9651.917	5631.807	9652.481	5630.012	9651.932	5631.697	UP	south	0.368	0.000	0.111	0.000	0.111	-0.368
88	9652.504	5630.094	9652.04	5631.724	9652.504	5630.094	9651.981	5631.714	UP	south	0.358	0.000	0.060	0.000	0.060	-0.358
89	9652.548	5630.189	9652.112	5631.690	9652.548	5630.189	9652.021	5631.679	UP	south	0.361	0.000	0.092	0.000	0.092	-0.361
90	9652.598	5630.271	9652.179	5631.639	9652.598	5630.271	9652.234	5631.675	UP	south	0.351	0.000	0.066	0.000	0.066	-0.351
91	9652.651	5630.351	9652.274	5631.623	9652.657	5630.301	9652.296	5631.658	UP	south	0.309	0.050	0.041	-0.050	0.041	-0.258
92	9652.7	5630.45	9652.371	5631.574	9652.683	5630.379	9652.404	5631.602	UP	south	0.330	0.073	0.043	-0.073	0.043	-0.257
93	9652.724	5630.542	9652.45	5631.536	9652.652	5630.522	9652.608	5631.562	UP	south	0.349	0.075	0.160	-0.075	0.160	-0.274
94	9652.757	5630.289	9652.521	5631.494	9652.723	5630.626	9652.597	5631.486	UP	south	0.367	0.339	0.076	-0.339	0.076	-0.028
95	9652.808	5630.736	9652.607	5631.440	9652.808	5630.736	9652.65	5631.43	UP	south	0.356	0.000	0.044	0.000	0.044	-0.356
96	9652.842	5630.838	9652.714	5631.412	9652.842	5630.838	9652.759	5631.4	UP	south	0.365	0.000	0.047	0.000	0.047	-0.365
97	9652.896	5630.915	9652.813	5631.357	9652.896	5630.915	9650.839	5631.354	UP	south	0.351	0.000	1.974	0.000	1.974	-0.351
98	9652.932	5630.918	9652.295	5631.343	9652.932	5630.918	9652.924	5631.329	UP	south	0.262	0.000	0.629	0.000	0.629	-0.262
99	9652.968	5631.1	9652.986	5631.294	9653.074	5631.064	9652.995	5631.29	UP	south	0.359	0.112	0.010	-0.112	0.010	-0.247
100	9653.032	5631.183	9653.009	5631.242	9653.057	5631.184	9653.096	5631.267	UP	south	0.358	0.025	0.025	-0.025	0.025	-0.333
101	9653.056	5631.268	9653.22	5631.210	9653.067	5631.247	9653.223	5631.233	UP	south	0.330	0.024	0.023	-0.024	0.023	-0.306
102	9653.085	5631.358	9653.272	5631.194	9653.104	5631.349	9653.302	5631.185	UP	south	0.326	0.021	0.031	-0.021	0.031	-0.305
103	9653.162	5631.448	9653.365	5631.164	9653.156	5631.425	9653.365	5631.116	UP	south	0.330	0.024	0.048	-0.024	0.048	-0.306
104	9653.176	5631.554	9653.46	5631.097	9653.183	5631.548	9653.476	5631.096	UP	south	0.345	0.009	0.016	-0.009	0.016	-0.336
105	9653.214	5631.658	9653.555	5631.072	9653.258	5631.592	9653.598	5631.031	UP	south	0.307	0.079	0.059	-0.079	0.059	-0.228
106	9653.245	5631.737	9653.652	5631.024	9653.246	5631.721	9653.677	5631.006	UP	south	0.324	0.016	0.031	-0.016	0.031	-0.308
107	9653.321	5631.822	9653.738	5630.989	9653.318	5631.777	9653.75	5630.963	UP	south	0.302	0.045	0.013	-0.045	0.013	-0.257
108	9653.354	5631.93	9653.834	5630.931	9653.42	5631.867	9653.835	5630.902	UP	south	0.316	0.091	0.029	-0.091	0.029	-0.225
109	9653.401	5632.018	9653.914	5630.890	9653.401	5632.018	9653.974	5630.866	UP	south	0.353	0.000	0.065	0.000	0.065	-0.353
110	9653.402	5632.124	9654.001	5630.856	9653.402	5632.124	9654.001	5630.856	UP	south	0.363	0.000	0.000	0.000	0.000	-0.363
111	9653.456	5632.183	9654.093	5630.821	9653.456	5632.183	9654.081	5630.831	UP	south	0.331	0.000	0.016	0.000	0.016	-0.331
112	9653.488	5632.278	9654.183	5630.759	9653.488	5632.278	9654.21	5630.759	UP	south	0.334	0.000	0.029	0.000	0.029	-0.334
113	9653.562	5632.446	9654.265	5630.720	9653.562	5632.446	9654.268	5630.751	UP	south	0.415	0.000	0.031	0.000	0.031	-0.415
114	9653.568	5632.483	9654.372	5630.693	9653.568	5632.483	9654.37	5630.709	UP	south	0.354	0.000	0.016	0.000	0.016	-0.354
115	9653.619	5632.541	9654.46	5630.661	9653.619	5632.541	9654.496	5630.68	UP	south	0.322	0.000	0.041	0.000	0.041	-0.322
116	9653.643	5632.637	9654.534	5630.626	9667.739	5631.585	9654.61	5630.606	Down	south	0.324	14.135	0.079	14.135	0.079	13.811
117	9653.703	5632.739	9654.624	5630.595	9667.883	5631.798	9654.844	5630.585	Down	south	14.230	14.211	0.220	14.211	0.220	-0.019
118	9653.727	5632.841	9654.754	5630.544	9653.727	5632.841	9654.976	5630.399	UP	south	0.344	0.000	0.265	0.000	0.265	-0.344
119	9653.791	5632.942	9654.857	5630.472	9653.791	5632.942	9654.91	5630.456	UP	south	0.356	0.000	0.055	0.000	0.055	-0.356
120	9653.819	5633.018	9654.941	5630.455	9653.807	5633.003	9654.971	5630.367	UP	south	0.334	0.019	0.093	-0.019	0.093	-0.314
121	9653.864	5633.102	9654.956	5630.394	9653.871	5633.058	9655.042	5630.321	UP	south	0.314	0.045	0.111	-0.045	0.111	-0.269
122	9653.903	5633.192	9655.148	5630.383	9653.918	5633.165	9657.575	5630.252	UP	south	0.305	0.031	2.431	-0.031	2.431	-0.274
123	9653.94	5633.29	9655.242	5630.402	9654.127	5633.434	9655.443	5630.262	UP	south	0.530	0.236	0.245	-0.236	0.245	-0.294
124	9653.986	5633.373	9655.391	5630.195	9654.136	5633.394	9655.4	5630.18	UP	south	0.327	0.151	0.017	-0.151	0.017	-0.176
125	9654.035	5633.479	9655.4	5630.270	9653.981	5633.932	9655.443	5630.152	UP	south	1.277	0.456	0.126	-0.456	0.126	-0.821
126	9654.08	5633.557	9655.437	5630.194	9654.08	5633.557	9655.519	5630.106	UP	south	0.330	0.000	0.120	0.000	0.120	-0.330
127	9654.108	5633.617	9655.518	5630.134	9676.428	5630.329	9655.589	5630.095	Down	south	22.576	22.561	0.081	22.561	0.081	-0.015
128	9654.121	5633.756	9655.578	5630.121	9654.121	5633.756	9655.578	5630.121	UP	south	0.339	0.000	0.000	0.000	0.000	-0.339
129	9654.171	5633.864	9655.705	5630.111	9654.171	5633.864	9655.761	5630.083	UP	south	0.356	0.000	0.063	0.000	0.063	-0.356
130	9654.175	5633.979	9655.797	5630.063	9654.175	5633.979	9655.832	5630.082	UP	south	0.377	0.000	0.040	0.000	0.040	-0.377
131	9654.243	5634.062	9655.885	5630.026	9654.243	5634.062	9655.931	5630.042	UP	south	0.369	0.000	0.049	0.000	0.049	-0.369
132	9654.288	5634.118	9656.026	5629.967	9654.288	5634.118	9655.976	5630.013	UP	south	0.334	0.000	0.069	0.000	0.069	-0.334
133	9654.311	5634.201	9656.156	5630.002	9654.311	5634.201	9656.875	5630.020	UP	north	0.323	0.000	0.719	0.000	-0.719	-0.323
134	9654.369	5634.28	9656.248	5629.962	9654.369	5634.28	9656.248	5629.962	UP	south	0.312	0.000	0.000	0.000	0.000	-0.312
135	9654.446	5634.391	9656.339	5629.922	9654.446	5634.391	9656.339	5629.922	UP	south	0.338	0.000	0.000	0.000	0.000	-0.338
136	9654.486	5634.494	9656.430	5629.882	9654.486	5634.494	9656.430	5629.882	UP	south	0.349	0.000	0.000	0.000	0.000	-0.349

137	9654.505	5634.582	9656.522	5629.842	9667.742	5631.875	9656.522	5629.842	Down	south	13.445	13.511	0.000	13.511	0.000	0.065	
138	9654.537	5634.657	9656.578	5629.758	9654.537	5634.657	9656.578	5629.758	UP	south	0.323	0.000	0.000	0.000	0.000	-0.323	
139	9654.567	5634.766	9656.624	5629.669	9666.713	5631.913	9656.606	5629.667	Down	south	11.456	11.505	0.018	11.505	0.018	0.048	
140	9654.621	5634.838	9656.669	5629.653	9654.621	5634.836	9656.657	5629.626	UP	south	0.321	0.000	0.042	0.000	0.042	-0.321	
141	9654.653	5634.953	9656.774	5629.660	9654.653	5634.953	9656.714	5629.624	UP	south	0.342	0.000	0.062	0.000	0.062	-0.342	
142	9654.736	5635.047	9656.98	5629.549	9654.736	5635.047	9656.98	5629.549	UP	south	0.353	0.000	0.000	0.000	0.000	-0.353	
143	9654.722	5635.145	9657.029	5629.577	9654.722	5635.145	9657.029	5629.577	UP	south	0.349	0.000	0.000	0.000	0.000	-0.349	
144	9654.753	5635.244	9657.12	5629.820	9654.753	5635.244	9657.123	5629.51	UP	south	0.355	0.000	0.310	0.000	0.310	-0.355	
145	9654.805	5635.288	9657.185	5629.476	9654.805	5635.288	9657.201	5629.478	UP	south	0.309	0.000	0.016	0.000	0.016	-0.309	
146	9654.87	5635.475	9657.27	5629.414	9654.87	5635.475	9657.248	5629.403	UP	south	0.407	0.000	0.025	0.000	0.025	-0.407	
147	9654.908	5635.504	9657.393	5629.352	9654.908	5635.504	9657.427	5629.31	UP	south	0.344	0.000	0.054	0.000	0.054	-0.344	
148	9654.9	5635.566	9657.40	5629.322	9654.9	5635.566	9657.524	5629.279	UP	south	0.310	0.000	0.055	0.000	0.055	-0.310	
149	9654.914	5635.619	9657.576	5629.279	9661.449	5633.552	9657.535	5629.22	Down	south	0.268	6.854	0.072	6.854	0.072	6.586	
150	9655.004	5635.765	9657.710	5629.323	9655.004	5635.765	9657.710	5629.323	UP	south	0.328	0.000	0.000	0.000	0.000	-0.328	
151	9655.043	5635.823	9657.853	5629.360	9655.043	5635.823	9657.826	5629.060	UP	south	0.292	0.000	0.093	0.000	0.093	-0.292	
152	9655.101	5635.938	9657.893	5629.243	9655.101	5635.938	9657.893	5629.243	UP	south	0.318	0.000	0.000	0.000	0.000	-0.318	
153	9655.143	5636.047	9657.984	5629.203	9655.143	5636.047	9657.984	5629.203	UP	south	0.335	0.000	0.000	0.000	0.000	-0.335	
154	9655.196	5636.164	9658.076	5629.163	9655.173	5636.144	9658.111	5628.955	UP	south	0.325	0.030	0.211	-0.030	0.211	-0.294	
155	9655.214	5636.22	9658.112	5629.069	9656.247	5636.222	9658.233	5629.011	UP	south	0.306	0.033	0.134	-0.033	0.134	-0.275	
156	9655.262	5636.313	9658.240	5628.996	9655.307	5636.261	9658.355	5628.959	UP	south	0.303	0.069	0.112	-0.069	0.112	-0.234	
157	9655.289	5636.428	9658.36	5628.974	9655.31	5636.396	9658.37	5628.845	UP	south	0.329	0.038	0.031	-0.038	0.031	-0.290	
158	9655.345	5636.504	9658.42	5628.927	9655.369	5636.494	9658.521	5628.974	UP	south	0.321	0.025	0.111	-0.025	0.111	-0.296	
159	9655.366	5636.59	9658.53	5628.926	9656.407	5636.564	9658.471	5628.91	UP	south	0.322	0.047	0.061	-0.047	0.061	-0.275	
160	9655.406	5636.705	9658.616	5628.878	9655.477	5636.668	9658.574	5628.895	UP	south	0.332	0.080	0.045	-0.080	0.045	-0.252	
161	9655.443	5636.778	9658.690	5628.848	9655.523	5636.752	9658.721	5628.813	UP	south	0.326	0.084	0.041	-0.084	0.041	-0.242	
162	9655.436	5636.876	9658.792	5628.792	9655.574	5636.867	9658.88	5628.783	UP	south	0.318	0.136	0.092	-0.136	0.092	-0.182	
163	9655.517	5636.951	9658.895	5628.764	9655.624	5636.901	9658.927	5628.769	UP	south	0.281	0.118	0.032	-0.118	0.032	-0.143	
164	9655.575	5637.027	9658.972	5628.737	9655.681	5636.86	9658.988	5628.737	Down	south	0.245	0.382	0.016	0.382	0.016	0.137	
165	9655.626	5637.16	9659.053	5628.699	9655.626	5637.16	9659.037	5628.715	UP	south	0.346	0.000	0.023	0.000	0.023	-0.346	
166	9655.647	5637.237	9659.173	5628.653	9655.647	5637.237	9659.253	5628.575	UP	south	0.326	0.000	0.112	0.000	0.112	-0.326	
167	9655.68	5637.333	9659.254	5628.597	9655.68	5637.333	9659.291	5628.515	UP	south	0.330	0.000	0.098	0.000	0.098	-0.330	
168	9655.721	5637.436	9659.321	5628.546	9655.721	5637.435	9659.327	5628.507	UP	south	0.340	0.000	0.039	0.000	0.039	-0.340	
169	9655.748	5637.527	9659.388	5628.530	9656.847	5637.576	9659.405	5628.486	UP	south	0.376	0.110	0.047	-0.110	0.047	-0.266	
170	9655.79	5637.611	9659.485	5628.482	9656.281	5637.456	9659.481	5628.484	UP	south	0.570	0.515	0.013	-0.515	0.013	-0.055	
171	9655.817	5637.69	9659.606	5628.408	9655.950	5637.716	9659.602	5628.397	UP	south	0.351	0.145	0.013	-0.145	0.013	-0.208	
172	9655.878	5637.728	9659.697	5628.355	9655.934	5637.759	9659.717	5628.385	UP	south	0.313	0.064	0.036	-0.064	0.036	-0.249	
173	9655.885	5637.859	9659.816	5628.345	9655.981	5637.783	9659.865	5628.345	UP	south	0.378	0.136	0.049	-0.136	0.049	-0.242	
174	9655.928	5637.959	9659.92	5628.311	9656.008	5637.928	9659.964	5628.311	UP	south	0.286	0.091	0.044	-0.091	0.044	-0.195	
175	9655.989	5638.062	9659.983	5628.263	9655.990	5638.062	9660.068	5628.396	UP	north	0.342	0.000	0.156	0.000	-0.156	-0.342	
176	9655.99	5638.16	9660.095	5628.255	9667.717	5631.503	9660.216	5628.230	Down	south	13.342	13.485	0.123	13.485	0.123	0.142	
177	9656.044	5638.256	9660.226	5628.204	9656.022	5637.994	9660.228	5628.204	Down	south	12.501	0.263	0.000	0.263	0.000	-12.236	
178	9656.099	5638.342	9660.316	5628.151	9656.063	5637.905	9660.316	5628.151	Down	south	0.322	0.437	0.000	0.437	0.000	0.115	
179	9656.114	5638.452	9660.393	5628.087	9656.192	5638.06	9660.393	5628.087	Down	south	0.340	0.400	0.000	0.400	0.000	0.060	
180	9656.156	5638.553	9660.446	5628.070	9656.156	5638.553	9660.516	5628.048	UP	south	0.349	0.000	0.073	0.000	0.073	-0.349	
181	9656.255	5638.618	9660.502	5628.064	9656.255	5638.618	9660.502	5628.064	UP	south	0.332	0.000	0.000	0.000	0.000	-0.332	
182	9656.295	5638.736	9660.625	5628.004	9656.899	5640.486	9660.585	5627.977	UP	south	2.257	1.896	0.066	-1.896	0.066	-0.361	
183	9656.291	5638.816	9660.721	5627.942	9654.44	5636.969	9660.744	5627.996	Down	south	8.197	2.801	0.059	2.801	0.059	-5.507	
184	9656.354	5638.929	9660.819	5627.955	9656.458	5638.999	9660.819	5627.955	UP	south	0.435	0.125	0.000	-0.125	0.000	-0.310	
185	9656.352	5639.015	9660.907	5627.792	9656.4	5638.988	9660.941	5627.868	UP	south	0.326	0.055	0.083	-0.055	0.083	-0.271	
186	9656.361	5639.103	9661.01	5627.851	9656.436	5639.066	9661.096	5627.811	UP	south	0.313	0.084	0.095	-0.084	0.095	-0.230	
187	9656.415	5639.162	9661.111	5627.807	9656.421	5639.162	9661.217	5627.785	UP	south	0.330	0.021	0.108	-0.021	0.108	-0.309	
188	9656.456	5639.313	9661.88	5627.768	9656.499	5639.373	9661.192	5627.958	UP	north	0.419	0.074	0.714	-0.074	-0.714	-0.345	
189	9656.496	5639.406	9661.295	5627.727	9656.556	5639.451	9661.348	5627.598	UP	south	0.409	0.075	0.060	-0.075	0.060	-0.334	
190	9656.619	5639.482	9661.398	5627.685	9656.555	5639.557	9661.406	5627.686	UP	south	0.420	0.074	0.008	-0.074	0.008	-0.348	
191	9656.585	5639.577	9661.491	5627.676	9656.606	5639.599	9661.491	5627.678	UP	north	0.292	0.030	0.000	-0.030	0.000	-0.262	
192	9656.632	5639.672	9661.553	5627.660	9656.659	5639.679	9661.525	5627.642	UP	south	0.386	0.028	0.033	-0.028	0.033	-0.358	
193	9656.665	5639.72	9661.64	5627.664	9656.6666	5639.737	9661.617	5627.588	UP	south	0.323	0.017	0.079	-0.017	0.079	-0.306	
194	9656.686	5639.837	9661.724	5627.584	9656.76	5639.776	9661.744	5627.522	UP	south	0.284	0.096	0.065	-0.096	0.065	-0.188	
195	9656.732	5639.932	9661.822	5627.539	9656.769	5639.903	9661.814	5627.505	UP	south	0.366	0.047	0.035	-0.047	0.035	-0.319	
196	9656.801	5640.026	9661.937	5627.484	9656.801	5640.026	9661.921	5627.47	UP	south	0.351	0.000	0.029	0.000	0.029	-0.351	
197	9656.801	5640.128	9662.028	5627.440	9656.878	5640.29	9662.015	5627.504	UP	north	0.534	0.179	0.065	-0.179	-0.065	-0.355	
198	9656.56	5640.206	9662.095	5627.429	9656.952	5640.305	9662.064	5627.437	UP	north	0.416	0.404	0.014	-0.404	-0.014	-0.012	
199	9656.853	5640.283	9662.184	5627.412	9656.853	5640.283	9662.177	5627.396	UP	north	0.330	0.000	0.017	0.000	-0.017	-0.330	
200	9656.88	5640.329	9662.265	5627.348	9656.88	5640.329	9662.254	5627.34	UP	north	0.285	0.000	0.014	0.000	-0.014	-0.285	

UP	161	23	NORTH	
DOWN	19	177	SOUTH	

This is number of pebbles moving different ways

	22.561	3.229	22.561	3.229	max (m)
	-	-	(4.383)	(1.676)	min (m)
	0.631	0.146	0.471	0.085	avg (m)
	2.695	0.442	2.726	0.456	stdv (m)
	0.030	0.041	(0.021)	0.033	median (m)

	LINE PARALLEL TO CONTOUR GROSS movement	LINE ORIENTED DOWNGRADIENT GROSS movement	LINE PARALLEL TO CONTOUR NET movement	LINE ORIENTED DOWNGRADIENT NET movement	
140.367	126.150	20.278	94.212	19.052	(54.226)

pebbles moving > than	123	1 SIGMA	0.019 m
uncertainty of measure	91	2 SIGMA	0.036 m

ASSUMING 0.019 RMS UNCERTAINTY

THIS IS THE SENSITIVITY TEST FOR HOW MANY PEBBLES REALLY MOVED

Caculations for Pebble data East Range Road

These calculations compare movement from orginal positions. The pebbles are seperated into Line countour parallel and Line oriented down gradient pebbles.

The countour parallel line pebbles move up and down and the line oriented down gradient pebbles move north and south.

The calculations include gross movement and net movement. Gross movement does not take into account that some pebbles move up from the line and some move down from the line.

The maximum, minimum, average, standard deviation and median of gross and net pebble movment is shown at the bottom of the spread sheet. A sensitivity test is also included to determine how many pebbles are actually moving.

Gross movement accounts for all movement not just movment in downslope direction
Should we also figure out the down slope movement?

LINE PARALLEL TO CONTOUR NORTHING = -4.133059306(EASTING) + 41446.363475601

LINE ORIENTED DOWN GRADIENT NORHTING = 0.247408463(EASTING) + 1125.893581063

	May--00 LINE PARALLEL TO CONTOUR e	May--00 LINE PARALLEL TO CONTOUR n	May--00 LINE ORIENTED DOWNGRADIENT e	May--00 LINE ORIENTED DOWNGRADIENT n	Apr--02 LINE PARALLEL TO CONTOUR e	Apr--02 LINE PARALLEL TO CONTOUR n	Apr--02 LINE ORIENTED DOWNGRADIENT e	Apr--02 LINE ORIENTED DOWNGRADIENT n	LINE PARALLEL TO CONTOUR UP vs DOWN MOVEMENT	LINE ORIENTED DOWNGRADIENT NORTH vs SOUTH MOVEMENT		LINE PARALLEL TO CONTOUR GROSS movement	LINE ORIENTED DOWNGRADIENT GROSS movement	LINE PARALLEL TO CONTOUR NET movement	LINE ORIENTED DOWNGRADIENT NET movement	
1	9649.101	5622.095	9644.091	5635.276	9649.116	5622.091	9644.091	5635.276	UP	south	0.191	0.016	0.000	-0.016	0.000	-0.175
2	9649.155	5622.163	9644.141	5635.180	9649.196	5622.201	9644.150	5635.133	UP	south	0.354	0.056	0.048	-0.056	0.048	-0.298
3	9649.198	5622.257	9644.213	5635.103	9649.194	5622.221	9644.215	5635.112	UP	south	0.263	0.036	0.009	-0.036	0.009	-0.227
4	9649.244	5622.354	9644.366	5635.156	9649.247	5622.343	9644.366	5635.156	UP	south	0.320	0.011	0.000	-0.011	0.000	-0.309
5	9649.29	5622.444	9644.35	5635.067	9649.296	5622.440	9644.312	5634.991	UP	south	0.331	0.007	0.103	-0.007	0.103	-0.324
6	9649.308	5622.537	9644.441	5635.061	9649.371	5622.515	9644.433	5635.021	UP	south	0.324	0.067	0.041	-0.067	0.041	-0.257
7	9649.354	5622.609	9644.617	5635.023	9649.466	5622.547	9644.617	5635.002	UP	south	0.284	0.148	0.021	-0.148	0.021	-0.136
8	9649.419	5622.546	9644.702	5634.995	9649.437	5622.645	9644.701	5634.998	UP	south	0.251	0.099	0.003	-0.099	0.003	-0.153
9	9649.413	5622.746	9644.784	5634.945	9649.426	5622.753	9644.800	5634.939	UP	south	0.281	0.015	0.017	-0.015	0.017	-0.266
10	9649.506	5622.883	9644.861	5634.910	9649.491	5622.827	9644.869	5634.913	UP	south	0.269	0.058	0.009	-0.058	0.009	-0.211
11	9649.543	5622.999	9644.982	5634.886	9649.560	5622.968	9644.974	5634.867	UP	south	0.327	0.028	0.021	-0.028	0.021	-0.299
12	9649.557	5623.102	9645.053	5634.819	9649.566	5623.173	9645.084	5634.818	UP	south	0.360	0.072	0.031	-0.072	0.031	-0.288
13	9649.664	5623.209	9645.159	5634.775	9649.717	5623.251	9645.154	5634.812	UP	north	0.420	0.068	0.037	-0.068	-0.037	-0.352
14	9649.64	5623.306	9645.227	5634.735	9649.633	5623.327	9645.247	5634.725	UP	south	0.378	0.022	0.022	-0.022	0.022	-0.355
15	9649.664	5623.369	9645.286	5634.695	9649.782	5623.501	9645.354	5634.674	UP	south	0.446	0.177	0.071	-0.177	0.071	-0.269
16	9649.711	5623.461	9645.431	5634.644	9649.836	5623.665	9645.430	5634.611	UP	south	0.547	0.239	0.033	-0.239	0.033	-0.308
17	9649.745	5623.557	9645.484	5634.579	9649.823	5623.802	9645.504	5634.567	UP	south	0.541	0.257	0.023	-0.257	0.023	-0.284
18	9649.782	5623.649	9645.612	5634.558	9649.841	5623.870	9645.590	5634.509	UP	south	0.531	0.229	0.054	-0.229	0.054	-0.302
19	9649.81	5623.754	9645.671	5634.529	9649.891	5623.949	9645.693	5634.477	UP	south	0.560	0.211	0.056	-0.211	0.056	-0.349
20	9649.867	5623.83	9645.741	5634.496	9654.592	5623.784	9645.796	5634.457	UP	south	0.471	4.725	0.067	-4.725	0.067	4.254
21	9649.904	5623.927	9645.885	5634.446	9650.061	5624.173	9645.961	5634.437	UP	south	0.551	0.292	0.096	-0.292	0.096	-0.259
22	9649.963	5624.001	9645.956	5634.417	9649.963	5624.001	9645.968	5634.385	UP	south	0.341	0.000	0.045	0.000	0.045	-0.341
23	9649.972	5624.11	9646.036	5634.377	9655.705	5624.883	9646.065	5634.377	UP	south	4.476	5.785	0.017	-5.785	0.017	1.309
24	9650.283	5623.971	9646.113	5634.335	9650.135	5624.061	9646.147	5634.304	Down	south	0.221	0.173	0.046	0.173	0.046	-0.048
25	9650.051	5624.3	9646.239	5634.279	9650.043	5624.310	9646.193	5634.241	UP	south	0.355	0.013	0.060	-0.013	0.060	-0.342
26	9650.085	5624.352	9646.354	5634.227	9650.130	5624.356	9646.362	5634.186	UP	south	0.358	0.045	0.042	-0.045	0.042	-0.313
27	9650.13	5624.456	9646.406	5634.192	9650.158	5624.467	9646.447	5634.147	UP	south	0.358	0.042	0.061	-0.042	0.061	-0.316
28	9650.165	5624.548	9646.478	5634.180	9650.220	5624.597	9646.531	5634.160	UP	south	0.364	0.074	0.057	-0.074	0.057	-0.290
29	9650.23	5624.651	9646.609	5634.127	9650.246	5624.655	9646.609	5634.127	UP	south	0.339	0.016	0.000	-0.016	0.000	-0.323
30	9650.269	5624.73	9646.687	5634.114	9650.283	5624.721	9646.687	5634.094	UP	south	0.306	0.017	0.020	-0.017	0.020	-0.289
31	9650.29	5624.829	9646.783	5634.087	9650.305	5624.847	9646.800	5634.097	UP	south	0.341	0.023	0.020	-0.023	0.020	-0.317
32	9650.321	5624.924	9646.872	5634.077	9650.335	5624.917	9646.887	5634.047	UP	south	0.323	0.016	0.034	-0.016	0.034	-0.307
33	9650.512	5624.948	9647.055	5634.199	9650.523	5624.978	9646.976	5634.035	Down	north	0.315	0.032	0.181	0.032	-0.181	-0.283
34	9650.476	5625.087	9647.091	5634.040	9650.483	5625.164	9647.187	5634.046	UP	north	0.380	0.077	0.096	-0.077	-0.096	-0.303
35	9650.449	5625.087	9647.149	5634.006	9650.426	5625.370	9647.229	5634.027	UP	north	0.476	0.284	0.063	-0.284	-0.063	-0.192
36	9650.493	5625.291	9647.264	5633.878	9650.570	5625.324	9647.308	5634.227	UP	north	0.351	0.084	0.352	-0.084	-0.352	-0.268
37	9650.534	5625.414	9647.348	5633.860	9650.561	5625.402	9647.348	5633.860	UP	north	0.350	0.030	0.000	-0.030	0.000	-0.321
38	9650.554	5625.514	9647.524	5633.763	9650.579	5625.562	9647.524	5633.763	UP	south	0.410	0.054	0.000	-0.054	0.000	-0.356
39	9650.589	5625.578	9647.533	5633.751	9650.655	5625.633	9650.618	5632.797	UP	south	0.390	0.086	3.229	-0.086	3.229	-0.304
40	9650.638	5625.687	9647.656	5633.718	9650.597	5625.756	9650.254	5633.257	UP	south	0.409	0.080	2.639	-0.080	2.639	-0.329
41	9650.661	5625.767	9647.747	5633.678	9650.679	5625.807	9647.693	5633.767	UP	north	0.377	0.044	0.104	-0.044	-0.104	-0.333
42	9650.646	5625.802	9647.777	5633.608	9650.657	5625.981	9650.245	5633.302	UP	south	0.411	0.179	2.487	-0.179	2.487	-0.232
43	9650.731	5625.913	9647.865	5633.580	9650.728	5625.918	9649.86	5633.131	UP	south	0.320	0.006	2.045	-0.006	2.045	-0.314
44	9650.784	5626.002	9648.022	5633.556	9650.854	5625.995	9647.904	5633.597	UP	north	0.292	0.070	0.124	-0.070	-0.124	-0.222
45	9650.835	5626.112	9648.084	5633.452	9650.865	5626.231	9648.084	5633.452	UP	south	0.411	0.123	0.000	-0.123	0.000	-0.288
46	9650.856	5626.238	9648.204	5633.478	9650.892	5626.245	9648.049	5633.504	UP	north	0.389	0.038	0.158	-0.038	-0.158	-0.352
47	9650.914	5626.369	9648.2	5633.336	9650.906	5626.289	9648.186	5633.377	UP	south	0.352	0.080	0.043	-0.080	0.043	-0.272
48	9650.961	5626.449	9648.405	5633.283	9651.004	5626.496	9648.348	5633.293	UP	south	0.384	0.064	0.058	-0.064	0.058	-0.320
49	9650.975	5626.544	9648.465	5633.241	9651.066	5626.662	9648.379	5633.255	UP	south	0.463	0.177	0.107	-0.177	0.107	-0.286
50	9651.078	5626.596	9648.518	5633.254	9651.078	5626.596	9648.407	5633.253	UP	south	0.361	0.000	0.111	0.000	0.111	-0.361
51	9651.082	5626.73	9648.623	5633.237	9651.797	5626.438	9648.636	5633.187	UP	south	0.734	0.772	0.052	-0.772	0.052	0.038
52	9651.146	5626.828	9648.743	5633.195	9651.146	5626.828	9648.752	5633.166	UP	south	0.407	0.000	0.030	0.000	0.030	-0.407
53	9651.104	5626.89	9648.832	5633.169	9655.658	5623.773	9648.856	5633.163	Down	south	5.303	5.519	0.025	5.519	0.025	0.216
54	9651.165	5627.002	9648.901	5633.130	9651.165	5627.002	9648.899	5633.119	UP	south	0.396	0.000	0.011	0.000	0.011	-0.396
55	9651.234	5627.011	9648.962	5633.091	9651.234	5627.011	9648.973	5633.083	UP	south	0.313	0.000	0.014	0.000	0.014	-0.313
56	9651.259	5627.114	9649.048	5633.062	9653.478	5625.747	9649.037	5633.052	Down	south	2.445	2.606	0.015	2.606	0.015	0.161
57	9651.277	5627.253	9649.121	5633.003	9651.663	5626.485	9649.115	5633.017	Down	south	0.579	0.860	0.015	0.860	0.015	0.281
58	9651.354	5627.327	9649.254	5632.998	9651.377	5627.366	9649.259	5632.982	UP	south	0.357	0.045	0.017	-0.045	0.017	-0.312
59	9651.371	5627.432	9649.357	5632.929	9651.422	5627.454	9649.353	5632.938	UP	south	0.363	0.056	0.010	-0.056	0.010	-0.308
60	9651.446	5627.518	9649.446	5632.896	9651.436	5627.544	9649.438	5632.928	UP	south	0.360	0.028	0.033	-0.028	0.033	-0.332
61	9651.458	5627.616	9649.523	5632.835	9651.476	5627.640	9649.546	5632.861	UP	south	0.271	0.030	0.035	-0.030	0.035	-0.241
62	9651.47	5627.663	9649.606	5632.804	9651.486	5627.655	9649.639	5632.830	UP	south	0.256	0.032	0.042	-0.032	0.042	-0.224
63	9651.524	5627.796	9649.695	5632.757	9651.545	5627.824	9649.763	5632.757	UP	south	0.373	0.035	0.068	-0.035	0.068	-0.338
64	9651.569	5627.891	9649.805	5632.706	9651.600	5627.966	9649.869	5632.719	UP	south	0.366	0.081	0.065	-0.081	0.065	-0.285
65	9651.622	5627.992	9650.056	5632.793	9651.598	5628.008	9650.035	5632.749	UP	north	0.353	0.029	0.049	-0.029	-0.049	-0.324
66	9651.658	5628.106	9660.018	5632.627	9651.571	5628.036	9649.966	5632.646	UP	south	0.342	0.110	0.055	-0.110	0.055	-0.232
67	9651.699	5628.251	9650.112	5632.581	9651.664	5628.245	9650.025	5632.612	UP	south	0.405	0.036	0.092	-0.036	0.092	-0.369
68	9651.727	5628.339	9650.173	5632.560	9651.661	5628.470	9650.100	5632.584	UP	south	0.489	0.147	0.077	-0.147	0.077	-0.343
69	9651.76	5628.361	9650.288	5632.516	9651.819	5628.449	9650.310	5632.504	UP	south	0.436	0.106	0.025	-0.106	0.025	-0.330
70	9651.812	5628.46	9650.398	5632.449	9651.825	5628.460	9650.441	5632.482	UP	south	0.381	0.024	0.064	-0.024	0.054	-0.357
71	9651.827	5628.519	9650.482	5632.728	9651.869	5628.580	9650.500	5632.415	UP	south	0.386	0.074	0.314	-0.074	0.314	-0.312
72	9651.886	5628.621	9650.542	5632.392	9651.916	5628.716	9650.590	5632.412	UP	south	0.410	0.100	0.052	-0.100	0.052	-0.310
73	9651.912	5628.706	9650.64	5632.357	9651.984	5628.732	9650.661	5632.350	UP	south	0.387	0.077	0.022	-0.077	0.022	-0.311
74	9651.957	5628.791	9650.723	5632.305	9651.957	5628.791	9650.746	5632.312	UP	south	0.344	0.000	0.024	0.000	0.024	-0.344
75	9652.009	5628.847	9650.806	5632.273	9651.986	5628.865	9650.848	5632.259	UP	south	0.300	0.028	0.044	-0.028	0.044	-0.272
76	9652.45	5628.962	9650.897	5632.244	9652.034	5628.923	9650.929	5632.227	Down	south	0.287	0.420	0.036	0.420	0.036	0.133
77	9652.078	5629.099	9651.027	5632.182	9652.065	5629.059	9651.013	5632.194	UP	south	0.342	0.041	0.018	-0.041	0.018	-0.301
78	9652.13	5629.165	9651.098	5632.151	9652.154	5629.220	9651.043	5632.160	UP	south	0.368	0.060	0.062	-0.060	0.062	-0.308
79	9652.156	5629.238	9651.175	5632.124	9652.190	5629.273	9651.190	5632.092	UP	south	0.351	0.049	0.035	-0.049	0.035	-0.302
80	9652.207	5629.346	9651.251	5632.082	9652.232	5629.347	9651.265	5632.104	UP	south	0.316	0.025	0.026	-0.025	0.026	-0.293
81	9652.45	5629.43	9651.317	5632.037	9652.248	5629.429	9651.381	5632.026	Down	south	0.333	0.202	0.065	0.202	0.065	-0.131
82	9652.274	5629.551	9651.402	5632.020	9652.274	5629.551	9651.543	5632.060	UP	south	0.367	0.000	0.147	0.000	0.147	-0.367
83	9652.345	5629.627	9651.528	5631.952	9652.345	5629.627	9651.686	5631.948	UP	south	0.352	0.000	0.158	0.000	0.158	-0.352
84	9652.347	5629.726	9651.764	5631.958	9652.347	5629.726	9651.788	5631.944	UP	north	0.358	0.000	0.026	0.000	-0.026	-0.358
85	9652.416	5629.803	9651.752	5631.875	9652.416	5629.803	9651.860	5631.993	UP	north	0.343	0.000	0.174	0.000	-0.174	-0.343
86	9652.424	5629.955	9651.860	5631.880	9652.424	5629.955	9651.823	5631.767	UP	south	0.403	0.000	0.119	0.000	0.119	-0.403
87	9652.481	5630.012	9651.917	5631.807	9652.481	5630.012	9651.930	5631.699	UP	south	0.368	0.000	0.109	0.000	0.109	-0.368
88	9652.504	5630.094	9652.04	5631.724	9652.504	5630.094	9651.981	5631.714	UP	south	0.358	0.000	0.060	0.000	0.060	-0.358
89	9652.548	5630.189	9652.112	5631.690	9652.548	5630.189	9652.032	5631.682	UP	south	0.361	0.000	0.080	0.000	0.080	-0.361
90	9652.598	5630.271	9652.179	5631.639	9652.596	5630.271	9652.252	5631.706	UP	south	0.351	0.000	0.099	0.000	0.099	-0.351
91	9652.651	5630.351	9652.274	5631.623	9652.658	5630.350	9652.294	5631.651	UP	south	0.289	0.007	0.034	-0.007	0.034	-0.282
92	9652.7	5630.45	9652.371	5631.574	9652.684	5630.410	9652.467	5631.533	UP	south	0.275	0.043	0.104	-0.043	0.104	-0.232
93	9652.724	5630.542	9652.45	5631.536	9652.653	5630.555	9652.599	5631.537	UP	south	0.332	0.072	0.149	-0.072	0.149	-0.260
94	9652.757	5630.289	9652.521	5631.494	9652.754	5630.673	9652.583	5631.469	UP	south	0.339	0.385	0.062	-0.385	0.062	0.045
95	9652.808	5630.736	9652.607	5631.440	9652.808	5630.736	9652.657	5631.425	UP	south	0.356	0.000	0.052	0.000	0.052	-0.356
96	9652.842	5630.838	9652.714	5631.412	9652.842	5630.838	9652.749	5631.393	UP	south	0.365	0.000	0.040	0.000	0.040	-0.365
97	9652.896	5630.915	9652.813	5631.357	9652.896	5630.915	9652.811	5631.354	UP	south	0.351	0.000	0.004	0.000	0.004	-0.351
98	9652.932	5630.918	9652.295	5631.343	9652.932	5630.918	9652.936	5631.310	UP	south	0.262	0.000	0.642	0.000	0.642	-0.262
99	9652.968	5631.1	9652.966	5631.294	9653.061	5631.110	9653.002	5631.274	UP	south	0.338	0.094	0.026	-0.094	0.026	-0.244
100	9653.032	5631.183	9653.099	5631.242	9653.069	5631.211	9653.117	5631.223	UP	south	0.349	0.046	0.026	-0.046	0.026	-0.303
101	9653.056	5631.266	9653.22	5631.210	9653.064	5631.281	9653.186	5631.202	UP	south	0.316	0.015	0.035	-0.015	0.035	-0.301
102	9653.085	5631.358	9653.272	5631.194	9653.100	5631.397	9653.296	5631.170	UP	south	0.326	0.042	0.034	-0.042	0.034	-0.284
103	9653.162	5631.448	9653.365	5631.164	9653.161	5631.461	9653.361	5631.104	UP	south	0.311	0.013	0.060	-0.013	0.060	-0.298
104	9653.176	5631.554	9653.46	5631.097	9653.187	5631.565	9653.468	5631.083	UP	south	0.341	0.016	0.016	-0.016	0.016	-0.325
105	9653.214	5631.658	9653.555	5631.072	9653.260	5631.619	9653.543	5631.022	UP	south	0.299	0.060	0.051	-0.060	0.051	-0.239
106	9653.245	5631.737	9653.652	5631.024	9653.250	5631.748	9653.657	5630.994	UP	south	0.328	0.012	0.030	-0.012	0.030	-0.316
107	9653.321	5631.822	9653.738	5630.989	9653.309	5631.822	9653.755	5630.953	UP	south	0.296	0.012	0.040	-0.012	0.040	-0.284
108	9653.354	5631.93	9653.834	5630.931	9653.449	5631.932	9653.838	5630.878	UP	south	0.311	0.095	0.053	-0.095	0.053	-0.216
109	9653.401	5632.018	9653.914	5630.890	9653.401	5632.018	9653.992	5630.852	UP	south	0.353	0.000	0.087	0.000	0.087	-0.353
110	9653.402	5632.124	9654.001	5630.856	9653.402	5632.124	9654.001	5630.856	UP	south	0.363	0.000	0.000	0.000	0.000	-0.363
111	9653.456	5632.183	9654.093	5630.821	9653.776	5631.976	9654.096	5630.812	UP	south	0.331	0.381	0.009	-0.381	0.009	0.050
112	9653.488	5632.278	9654.183	5630.758	9653.488	5632.278	9654.208	5630.767	UP	south	0.334	0.000	0.027	0.000	0.027	-0.334
113	9653.562	5632.448	9654.265	5630.720	9653.562	5632.448	9654.267	5630.736	UP	south	0.415	0.000	0.016	0.000	0.016	-0.415
114	9653.566	5632.483	9654.372	5630.693	9653.568	5632.483	9654.382	5630.705	UP	south	0.354	0.000	0.016	0.000	0.016	-0.354
115	9653.619	5632.541	9654.46	5630.661	9653.619	5632.541	9654.520	5630.655	UP	south	0.322	0.000	0.060	0.000	0.060	-0.322
116	9653.643	5632.637	9654.534	5630.628	9667.699	5631.641	9654.603	5630.590	Down	south	14.138	14.091	0.079	14.091	0.079	-0.046
117	9653.703	5632.739	9654.624	5630.595	9667.868	5631.858	9654.844	5630.585	Down	south	14.237	14.192	0.220	14.192	0.220	-0.044
118	9653.727	5632.841	9654.754	5630.544	9653.727	5632.841	9654.976	5630.399	UP	south	0.344	0.000	0.265	0.000	0.265	-0.344
119	9653.791	5632.942	9654.857	5630.472	9653.791	5632.942	9654.807	5630.442	UP	south	0.356	0.000	0.058	0.000	0.058	-0.356
120	9653.819	5633.018	9654.941	5630.455	9653.795	5633.039	9654.976	5630.360	UP	south	0.323	0.032	0.101	-0.032	0.101	-0.291
121	9653.864	5633.102	9654.958	5630.394	9653.841	5633.106	9655.037	5630.328	UP	south	0.289	0.024	0.103	-0.024	0.103	-0.266
122	9653.903	5633.192	9655.148	5630.383	9653.902	5633.198	9655.156	5630.283	UP	south	0.306	0.006	0.100	-0.006	0.100	-0.299
123	9653.94	5633.29	9655.242	5630.402	9654.127	5633.434	9655.140	5630.242	UP	south	0.530	0.236	0.189	-0.236	0.189	-0.294
124	9653.986	5633.373	9655.391	5630.195	9654.114	5633.449	9655.4	5630.18	UP	south	0.399	0.149	0.017	-0.149	0.017	-0.250
125	9654.033	5633.479	9655.4	5630.270	9653.966	5633.945	9655.447	5630.114	UP	south	0.790	0.471	0.163	-0.471	0.163	-0.319
126	9654.08	5633.557	9655.437	5630.194	9654.08	5633.557	9655.515	5630.098	UP	south	0.330	0.000	0.124	0.000	0.124	-0.330
127	9654.108	5633.617	9655.518	5630.134	9676.712	5630.574	9655.571	5630.123	Down	south	22.576	22.808	0.054	22.808	0.054	0.232
128	9654.121	5633.756	9655.578	5630.121	9654.121	5633.756	9656.016	5630.367	UP	north	0.339	0.000	0.502	0.000	-0.502	-0.339
129	9654.171	5633.864	9655.705	5630.111	9665.666	5631.989	9655.775	5630.075	Down	south	0.356	11.647	0.079	11.647	0.079	11.291
130	9654.175	5633.979	9655.797	5630.063	9654.175	5633.979	9655.842	5630.053	UP	south	0.377	0.000	0.046	0.000	0.046	-0.377
131	9654.243	5634.062	9655.885	5630.026	9654.243	5634.062	9655.955	5630.000	UP	south	0.369	0.000	0.075	0.000	0.075	-0.369
132	9654.288	5634.118	9656.028	5629.967	9654.288	5634.118	9655.996	5630.008	UP	south	0.334	0.000	0.052	0.000	0.052	-0.334
133	9654.311	5634.201	9656.156	5630.002	9654.311	5634.201	9656.875	5630.020	UP	north	0.323	0.000	0.719	0.000	-0.719	-0.323
134	9654.369	5634.28	9656.248	5629.962	9654.369	5634.28	9656.248	5629.962	UP	south	0.312	0.000	0.000	0.000	0.000	-0.312
135	9654.446	5634.391	9656.339	5629.922	9654.446	5634.391	9656.339	5629.922	UP	south	0.338	0.000	0.000	0.000	0.000	-0.338
136	9654.486	5634.494	9656.430	5629.882	9654.486	5634.494	9656.430	5629.882	UP	south	0.349	0.000	0.000	0.000	0.000	-0.349

137	9654.505	5634.582	9656.522	5629.842	9667.733	5631.945	9656.522	5629.842	Down	south	13.508	13.488	0.000	13.488	0.000	-0.020	
138	9654.537	5634.657	9656.578	5629.758	9654.537	5634.657	9656.578	5629.758	UP	south	0.323	0.000	0.000	0.000	0.000	-0.323	
139	9654.567	5634.766	9656.624	5629.689	9665.713	5631.913	9656.613	5629.684	Down	south	11.470	11.505	0.012	11.505	0.012	0.035	
140	9654.621	5634.838	9656.680	5629.653	9653.443	5625.515	9656.622	5629.590	Down	south	0.321	9.397	0.092	9.397	0.092	9.076	
141	9654.653	5634.953	9656.774	5629.680	9654.653	5634.953	9656.715	5629.711	UP	south	0.342	0.000	0.067	0.000	0.067	-0.342	
142	9654.736	5635.047	9656.96	5629.549	9654.736	5635.047	9656.96	5629.549	UP	south	0.353	0.000	0.000	0.000	0.000	-0.353	
143	9654.722	5635.145	9657.020	5629.577	9654.722	5635.145	9657.029	5629.577	UP	south	0.349	0.000	0.000	0.000	0.000	-0.349	
144	9654.753	5635.244	9657.12	5629.820	9654.753	5635.244	9657.069	5629.466	UP	south	0.355	0.000	0.358	0.000	0.358	-0.355	
145	9654.806	5635.288	9657.165	5629.476	9654.806	5635.288	9657.204	5629.482	UP	south	0.309	0.000	0.024	0.000	0.024	-0.309	
146	9654.87	5635.475	9657.27	5629.414	9654.87	5635.475	9657.246	5629.389	UP	south	0.407	0.000	0.051	0.000	0.051	-0.407	
147	9654.908	5635.504	9657.303	5629.352	9654.908	5635.504	9657.428	5629.301	UP	south	0.344	0.000	0.062	0.000	0.062	-0.344	
148	9654.9	5635.568	9657.49	5629.322	9654.9	5635.568	9657.526	5629.262	UP	south	0.310	0.000	0.070	0.000	0.070	-0.310	
149	9654.914	5635.810	9657.576	5629.279	9661.426	5633.670	9657.624	5629.197	Down	south	6.778	6.797	0.095	6.797	0.095	0.020	
150	9655.004	5635.765	9657.710	5629.323	9655.004	5635.765	9657.710	5629.323	UP	south	0.328	0.000	0.000	0.000	0.000	-0.328	
151	9655.043	5635.823	9657.853	5629.980	9655.043	5635.823	9657.892	5629.016	UP	south	0.292	0.000	0.054	0.000	0.054	-0.292	
152	9655.101	5635.938	9657.893	5629.243	9655.101	5635.938	9657.893	5629.243	UP	south	0.318	0.000	0.000	0.000	0.000	-0.318	
153	9655.143	5636.047	9657.984	5629.203	9655.143	5636.047	9657.984	5629.203	UP	south	0.335	0.000	0.000	0.000	0.000	-0.335	
154	9655.196	5636.164	9658.076	5629.163	9655.151	5636.162	9658.154	5628.976	UP	south	0.338	0.045	0.203	-0.045	0.203	-0.293	
155	9655.214	5636.22	9658.112	5629.069	9655.285	5636.236	9658.233	5629.011	UP	south	0.333	0.073	0.134	-0.073	0.134	-0.260	
156	9655.262	5636.313	9658.249	5628.996	9655.303	5636.289	9658.355	5628.959	UP	south	0.290	0.048	0.112	-0.048	0.112	-0.243	
157	9655.289	5636.428	9658.36	5628.974	9655.259	5636.424	9658.446	5628.919	UP	south	0.319	0.030	0.102	-0.030	0.102	-0.289	
158	9655.346	5636.504	9658.42	5628.927	9655.308	5636.530	9658.478	5628.912	UP	south	0.330	0.048	0.060	-0.048	0.060	-0.284	
159	9655.368	5636.59	9658.53	5628.926	9655.378	5636.621	9658.573	5628.957	UP	south	0.309	0.033	0.053	-0.033	0.053	-0.276	
160	9655.406	5636.705	9658.616	5628.878	9655.462	5636.790	9658.587	5628.870	UP	south	0.331	0.046	0.050	-0.046	0.050	-0.285	
161	9655.443	5636.778	9658.699	5628.848	9655.462	5636.783	9658.702	5628.794	UP	south	0.327	0.039	0.054	-0.039	0.054	-0.287	
162	9655.438	5636.878	9658.792	5628.792	9655.534	5636.900	9658.853	5628.750	UP	south	0.362	0.088	0.074	-0.088	0.074	-0.253	
163	9655.517	5636.951	9658.895	5628.764	9655.561	5636.943	9658.941	5628.748	UP	south	0.306	0.045	0.049	-0.045	0.049	-0.262	
164	9655.575	5637.027	9658.972	5628.737	9655.630	5636.655	9658.990	5628.706	Down	south	0.182	0.378	0.036	0.378	0.036	0.184	
165	9655.626	5637.16	9659.063	5628.699	9655.626	5637.16	9659.099	5628.684	UP	south	0.348	0.000	0.048	0.000	0.048	-0.348	
166	9655.647	5637.237	9659.173	5628.653	9655.647	5637.237	9659.251	5628.585	UP	south	0.328	0.000	0.103	0.000	0.103	-0.328	
167	9655.66	5637.333	9659.254	5628.597	9655.66	5637.333	9659.252	5628.548	UP	south	0.330	0.000	0.049	0.000	0.049	-0.330	
168	9655.721	5637.435	9659.321	5628.546	9655.721	5637.435	9659.352	5628.485	UP	south	0.340	0.000	0.068	0.000	0.068	-0.340	
169	9655.748	5637.527	9659.389	5628.530	9655.845	5637.536	9659.426	5628.477	UP	south	0.411	0.147	0.064	-0.147	0.064	-0.264	
170	9655.79	5637.611	9659.485	5628.482	9655.237	5637.507	9659.479	5628.478	UP	south	0.569	0.459	0.008	-0.459	0.008	-0.110	
171	9655.817	5637.69	9659.606	5628.408	9655.952	5637.763	9659.801	5628.384	UP	south	0.387	0.153	0.025	-0.153	0.025	-0.233	
172	9655.878	5637.728	9659.697	5628.365	9655.948	5637.815	9659.705	5628.361	UP	south	0.313	0.112	0.010	-0.112	0.010	-0.202	
173	9655.885	5637.859	9659.816	5628.345	9655.661	5637.763	9659.875	5628.331	UP	south	0.238	0.136	0.061	-0.136	0.061	-0.102	
174	9655.928	5637.969	9659.92	5628.311	9655.983	5637.951	9659.985	5628.301	UP	south	0.296	0.058	0.046	-0.058	0.046	-0.238	
175	9655.889	5638.062	9659.983	5628.283	9655.889	5638.062	9660.158	5628.422	UP	north	0.342	0.000	0.223	0.000	0.223	-0.342	
176	9655.99	5638.16	9660.096	5628.255	9667.717	5631.503	9660.216	5628.230	Down	south	13.342	13.485	0.123	13.485	0.123	0.142	
177	9656.044	5638.256	9660.228	5628.204	9656.871	5638.037	9660.228	5628.204	UP	south	0.056	0.231	0.000	-0.231	0.000	0.165	
178	9656.069	5638.342	9660.316	5628.151	9656.049	5637.959	9660.316	5628.151	Down	south	0.116	0.354	0.000	0.354	0.000	0.237	
179	9656.114	5638.452	9660.393	5628.087	9656.186	5638.086	9660.393	5628.087	Down	south	0.114	0.373	0.000	0.373	0.000	0.259	
180	9656.156	5638.563	9660.446	5628.070	9656.156	5638.563	9660.516	5628.049	UP	south	0.349	0.000	0.073	0.000	0.073	-0.349	
181	9656.255	5638.618	9660.502	5628.064	9656.255	5638.618	9660.502	5628.064	UP	south	0.332	0.000	0.000	0.000	0.000	-0.332	
182	9656.286	5638.736	9660.625	5628.004	9656.858	5640.537	9660.808	5627.981	UP	south	2.241	1.928	0.029	-1.928	0.029	-0.313	
183	9656.291	5638.815	9660.721	5627.942	9664.405	5636.894	9660.849	5627.948	Down	south	2.344	8.339	0.072	8.339	0.072	5.994	
184	9656.354	5638.929	9660.819	5627.956	9656.443	5639.039	9660.819	5627.955	UP	south	0.459	0.141	0.000	-0.141	0.000	-0.317	
185	9656.352	5639.015	9660.907	5627.792	9656.363	5639.033	9660.951	5627.836	UP	south	0.331	0.021	0.052	-0.021	0.052	-0.310	
186	9656.361	5639.103	9661.01	5627.851	9656.412	5639.109	9661.078	5627.795	UP	south	0.317	0.051	0.087	-0.051	0.087	-0.265	
187	9656.415	5639.182	9661.111	5627.807	9656.362	5639.216	9661.229	5627.750	UP	south	0.313	0.063	0.131	-0.063	0.131	-0.250	
188	9656.456	5639.313	9661.86	5627.768	9656.464	5639.400	9661.360	5627.679	UP	north	0.435	0.087	0.537	-0.087	-0.537	-0.348	
189	9656.496	5639.406	9661.295	5627.727	9656.536	5639.530	9661.348	5627.598	UP	south	0.424	0.130	0.060	-0.130	0.060	-0.294	
190	9656.519	5639.492	9661.398	5627.685	9656.512	5639.579	9661.403	5627.663	UP	south	0.433	0.087	0.023	-0.087	0.023	-0.346	
191	9656.585	5639.577	9661.491	5627.678	9656.567	5639.649	9661.491	5627.678	UP	north	0.384	0.074	0.000	-0.074	0.000	-0.310	
192	9656.632	5639.672	9661.563	5627.660	9656.634	5639.710	9661.588	5627.573	UP	south	0.374	0.038	0.084	-0.038	0.084	-0.336	
193	9656.665	5639.72	9661.64	5627.664	9656.647	5639.775	9661.645	5627.522	UP	south	0.337	0.058	0.142	-0.058	0.142	-0.279	
194	9656.686	5639.837	9661.724	5627.584	9656.706	5639.834	9661.741	5627.502	UP	south	0.294	0.020	0.084	-0.020	0.084	-0.273	
195	9656.732	5639.932	9661.822	5627.539	9656.736	5639.940	9661.843	5627.451	UP	south	0.321	0.009	0.090	-0.009	0.090	-0.312	
196	9656.801	5640.026	9661.937	5627.494	9656.801	5640.026	9661.914	5627.439	UP	south	0.351	0.000	0.060	0.000	0.060	-0.351	
197	9656.801	5640.128	9662.026	5627.440	9656.896	5640.337	9662.020	5627.436	UP	north	0.527	0.230	0.008	-0.230	-0.008	-0.297	
198	9656.56	5640.206	9662.096	5627.429	9656.923	5640.335	9662.113	5627.415	UP	north	0.458	0.385	0.023	-0.385	-0.023	-0.073	
199	9656.853	5640.283	9662.184	5627.412	9656.853	5640.283	9662.179	5627.390	UP	north	0.330	0.000	0.023	0.000	-0.023	-0.330	
200	9656.88	5640.329	9662.265	5627.346	9656.88	5640.329	9662.247	5627.323	UP	south	0.285	0.000	0.031	0.000	0.031	-0.285	

UP	160	20	NORTH	22.808	3.220	22.808	3.220	max (m)
DOWN	20	160	SOUTH	-	-	(0.765)	(0.719)	min (m)
This is number of pebbles moving different ways				0.802	0.122	0.565	0.067	avg (m)
				2.947	0.373	3.002	0.382	stdv (m)
				0.040	0.052	(0.024)	0.044	median (m)

	LINE PARALLEL TO CONTOUR	LINE ORIENTED DOWNGRADIENT	LINE PARALLEL TO CONTOUR	LINE ORIENTED DOWNGRADIENT
	GROSS movement	GROSS movement	NET movement	NET movement
178.662	160.516			

pebbles moving > than uncertainty of measure	124	1 SIGMA	0.019 m
	102	2 SIGMA	0.038 m

ASSUMING 0.019 RMS UNCERTAINTY

THIS IS THE SENSITIVITY TEST FOR HOW MANY PEBBLES REALLY MOVED

Caculations for Pebble data Iron Mountain

These calculations compare movement from orginal positions. The pebbles are seperated into Line countour parallel and Line oriented down gradient pebbles.

The countour parallel line pebbles move up and down and the line oriented down gradient pebbles move north and south.

The calculations include gross movement and net movement. Gross movement does not take into account that some pebbles move up from the line and some move down from the line.

The maximum, minimum, average, standard deviation and median of gross and net pebble movement is shown at the bottom of the spread sheet. A sensitivity test is also included to determine how many pebbles are actually moving.

Gross movement accounts for all movement not just movment in downslope direction
Should we also figure out the down slope movement?

LINE PARALLEL TO CONTOUR NORTHING1 = -4.13305930*EASTING1 + 41446.363475801

LINE ORIENTED DOWN GRADIENT NORTHING = 0.24740846*EASTING1 + 1125.890561063

	May--00				Nov--00									
	LINE PARALLEL TO CONTOUR		LINE ORIENTED DOWNGRADIENT		LINE PARALLEL TO CONTOUR		LINE ORIENTED DOWNGRADIENT		LINE PARALLEL TO CONTOUR	LINE ORIENTED DOWNGRADIENT			LINE PARALLEL TO CONTOUR	LINE ORIENTED DOWNGRADIENT
	e	n	e	n	e	n	e	n	UP vs DOWN MOVEMENT	NORTH vs SOUTH MOVEMENT	GROSS movement	GROSS movement	NET movement	NET movement
1	9202.030	3413.817	9195.012	3400.884	9202.013	3413.830	9194.978	3400.846	DOWN	NORTH	0.021	0.052	0.021	-0.052
2	9202.040	3413.723	9195.126	3400.875	9201.994	3413.746	9195.087	3400.863	UP	NORTH	0.051	0.041	-0.051	-0.041
3	9202.070	3413.624	9195.223	3400.895	9202.058	3413.639	9195.179	3400.894	UP	NORTH	0.019	0.044	-0.019	-0.044
4	9202.109	3413.525	9195.313	3400.930	9202.085	3413.532	9195.279	3400.917	DOWN	NORTH	0.025	0.045	0.025	-0.045
5	9202.123	3413.425	9195.405	3400.932	9202.093	3413.454	9195.379	3400.933	DOWN	NORTH	0.042	0.028	0.042	-0.028
6	9202.150	3413.323	9195.508	3400.967	9202.122	3413.345	9195.472	3400.966	DOWN	NORTH	0.036	0.036	0.036	-0.036
7	9202.166	3413.232	9195.585	3401.003	9202.144	3413.255	9195.535	3400.990	UP	NORTH	0.032	0.051	-0.032	-0.051
8	9202.184	3413.126	9195.693	3401.015	9202.182	3413.146	9195.661	3401.010	UP	NORTH	0.023	0.032	-0.023	-0.032
9	9202.224	3413.024	9195.787	3401.038	9202.210	3413.044	9195.703	3401.026	DOWN	NORTH	0.024	0.085	0.024	-0.085
10	9202.245	3412.932	9195.887	3401.062	9202.255	3412.932	9195.853	3401.067	UP	NORTH	0.010	0.034	-0.010	-0.034
11	9202.269	3412.851	9195.996	3401.067	9202.233	3412.860	9195.957	3401.077	DOWN	NORTH	0.037	0.040	0.037	-0.040
12	9202.287	3412.748	9196.097	3401.101	9202.256	3412.761	9196.062	3401.120	UP	NORTH	0.034	0.040	-0.034	-0.040
13	9202.315	3412.647	9196.196	3401.120	9202.305	3412.650	9196.161	3401.133	DOWN	NORTH	0.010	0.030	0.010	-0.030
14	9202.329	3412.553	9196.291	3401.137	9202.319	3412.574	9196.264	3401.152	UP	NORTH	0.023	0.031	-0.023	-0.031
15	9202.359	3412.447	9196.385	3401.164	9202.331	3412.468	9196.349	3401.166	DOWN	NORTH	0.036	0.038	0.036	-0.038
16	9202.376	3412.352	9196.500	3401.180	9202.358	3412.372	9196.460	3401.193	UP	NORTH	0.028	0.042	-0.028	-0.042
17	9202.407	3412.258	9196.591	3401.206	9202.399	3412.267	9196.577	3401.216	UP	NORTH	0.012	0.017	-0.012	-0.017
18	9202.421	3412.157	9196.697	3401.235	9202.398	3412.173	9196.711	3401.228	UP	SOUTH	0.026	0.018	-0.026	0.018
19	9202.458	3412.054	9196.778	3401.252	9202.450	3412.083	9196.758	3401.245	DOWN	SOUTH	0.021	0.023	0.021	0.023
20	9202.474	3411.969	9196.875	3401.267	9202.437	3411.978	9196.849	3401.280	UP	NORTH	0.041	0.029	-0.041	-0.029
21	9202.508	3411.873	9196.996	3401.301	9202.467	3411.883	9196.964	3401.267	DOWN	NORTH	0.042	0.270	0.042	-0.270
22	9202.496	3411.773	9197.070	3401.323	9202.506	3411.789	9197.024	3401.315	UP	SOUTH	0.019	0.047	-0.019	0.047
23	9202.524	3411.674	9197.162	3401.326	9202.524	3411.696	9197.126	3401.337	UP	SOUTH	0.022	0.037	-0.022	0.037
24	9202.541	3411.586	9197.253	3401.343	9202.549	3411.595	9197.249	3401.364	UP	SOUTH	0.012	0.021	-0.012	0.021
25	9202.555	3411.476	9197.362	3401.351	9202.573	3411.510	9197.326	3401.322	UP	SOUTH	0.036	0.063	-0.036	0.063
26	9202.601	3411.393	9197.458	3401.349	9202.599	3411.407	9197.420	3401.367	UP	SOUTH	0.014	0.045	-0.014	0.045
27	9202.617	3411.294	9197.571	3401.410	9202.634	3411.281	9197.488	3401.446	UP	SOUTH	0.021	0.090	-0.021	0.090
28	9202.628	3411.193	9197.643	3401.459	9202.641	3411.216	9197.604	3401.461	UP	SOUTH	0.026	0.039	-0.026	0.039
29	9202.665	3411.103	9197.743	3401.485	9202.656	3411.110	9197.695	3401.516	UP	SOUTH	0.010	0.057	-0.010	-0.057
30	9202.679	3410.958	9197.849	3401.496	9202.723	3411.010	9197.815	3401.517	UP	SOUTH	0.068	0.039	-0.068	0.039
31	9202.724	3410.912	9197.942	3401.512	9202.743	3410.928	9197.902	3401.535	UP	SOUTH	0.025	0.046	-0.025	0.046
32	9202.727	3410.803	9198.040	3401.536	9202.734	3410.810	9198.006	3401.540	UP	SOUTH	0.010	0.032	-0.010	0.032
33	9202.754	3410.711	9198.131	3401.557	9202.714	3410.665	9198.109	3401.563	UP	SOUTH	0.046	0.023	-0.046	0.023
34	9202.775	3410.610	9198.234	3401.592	9202.779	3410.645	9198.200	3401.612	UP	SOUTH	0.035	0.039	-0.035	0.039
35	9202.795	3410.520	9198.336	3401.606	9202.820	3410.501	9198.291	3401.665	UP	NORTH	0.031	0.074	-0.031	-0.074
36	9202.831	3410.426	9198.437	3401.631	9202.850	3410.445	9198.395	3401.640	UP	SOUTH	0.027	0.043	-0.027	0.043
37	9202.847	3410.326	9198.549	3401.665	9202.867	3410.340	9198.510	3401.669	UP	SOUTH	0.024	0.041	-0.024	0.041
38	9202.880	3410.236	9198.626	3401.672	9202.884	3410.236	9198.583	3401.693	UP	SOUTH	0.004	0.048	-0.004	0.048
39	9202.897	3410.133	9198.730	3401.695	9202.939	3410.160	9198.696	3401.701	UP	SOUTH	0.050	0.035	-0.050	0.035
40	9202.924	3410.031	9198.816	3401.730	9202.941	3410.050	9198.769	3401.755	UP	SOUTH	0.025	0.037	-0.025	0.037
41	9202.937	3409.938	9198.899	3401.750	9202.997	3409.936	9198.883	3401.775	UP	SOUTH	0.030	0.030	-0.030	0.030
42	9202.975	3409.855	9199.004	3401.788	9202.889	3409.859	9198.984	3401.807	UP	NORTH	0.088	0.028	-0.088	-0.028
43	9203.005	3409.766	9199.112	3401.806	9203.014	3409.766	9199.077	3401.835	UP	NORTH	0.009	0.045	-0.009	-0.045
44	9203.020	3409.664	9199.218	3401.842	9203.035	3409.670	9199.204	3401.839	UP	SOUTH	0.016	0.014	-0.016	0.014
45	9203.054	3409.558	9199.305	3401.867	9203.074	3409.567	9199.280	3401.867	UP	SOUTH	0.022	0.025	-0.022	0.025
46	9203.074	3409.467	9199.401	3401.887	9203.105	3409.457	9199.371	3401.906	UP	NORTH	0.033	0.036	-0.033	-0.036
47	9203.107	3409.356	9199.498	3401.906	9203.130	3409.362	9199.455	3401.911	UP	SOUTH	0.024	0.043	-0.024	0.043
48	9203.126	3409.274	9199.593	3401.933	9203.143	3409.285	9199.564	3401.943	UP	SOUTH	0.020	0.031	-0.020	0.031
49	9203.159	3409.167	9199.706	3401.955	9203.160	3409.172	9199.662	3401.971	DOWN	SOUTH	0.022	0.047	0.022	0.047
50	9203.167	3409.078	9199.779	3401.976	9203.177	3409.070	9199.765	3401.997	UP	NORTH	0.013	0.025	-0.013	-0.025
51	9203.225	3408.971	9199.872	3402.009	9203.199	3408.978	9199.848	3402.016	DOWN	SOUTH	0.027	0.025	0.027	0.025
52	9203.255	3408.879	9199.974	3402.020	9203.221	3408.891	9199.945	3402.036	DOWN	SOUTH	0.036	0.033	0.036	0.033
53	9203.281	3408.787	9200.075	3402.062	9203.262	3408.799	9200.049	3402.061	DOWN	SOUTH	0.022	0.026	0.022	0.026
54	9203.309	3408.681	9200.183	3402.077	9203.289	3408.695	9200.158	3402.105	DOWN	NORTH	0.025	0.038	0.025	-0.038
55	9203.323	3408.580	9200.283	3402.098	9203.307	3408.596	9200.240	3402.132	DOWN	NORTH	0.024	0.055	0.024	-0.055
56	9203.362	3408.483	9200.377	3402.126	9203.349	3408.486	9200.350	3402.142	DOWN	SOUTH	0.013	0.031	0.013	0.031
57	9203.375	3408.382	9200.464	3402.142	9203.364	3408.400	9200.440	3402.160	DOWN	SOUTH	0.021	0.030	0.021	0.030
58	9203.401	3408.282	9200.566	3402.159	9203.374	3408.298	9200.527	3402.184	DOWN	SOUTH	0.031	0.061	0.031	0.061
59	9203.422	3408.192	9200.663	3402.200	9203.392	3408.209	9200.628	3402.216	DOWN	NORTH	0.034	0.036	0.034	-0.036
60	9203.436	3408.080	9200.764	3402.227	9203.401	3408.096	9200.742	3402.226	DOWN	SOUTH	0.038	0.022	0.038	0.022
61	9203.439	3407.997	9200.834	3402.252	9203.431	3407.978	9200.792	3402.280	UP	NORTH	0.021	0.050	-0.021	-0.050
62	9203.469	3407.904	9200.947	3402.265	9203.444	3407.910	9200.925	3402.281	DOWN	SOUTH	0.026	0.027	0.026	0.027
63	9203.505	3407.826	9201.053	3402.316	9203.481	3407.834	9201.025	3402.310	DOWN	SOUTH	0.025	0.029	0.025	0.029
64	9203.527	3407.669	9201.141	3402.327	9203.504	3407.704	9201.133	3402.376	DOWN	NORTH	0.042	0.050	0.042	-0.050
65	9203.560	3407.613	9201.243	3402.366	9203.533	3407.634	9201.214	3402.372	DOWN	NORTH	0.034	0.030	0.034	-0.030
66	9203.580	3407.498	9201.330	3402.380	9203.570	3407.525	9201.300	3402.409	DOWN	NORTH	0.033	0.042	0.033	-0.042
67	9203.609	3407.418	9201.431	3402.416	9203.572	3407.434	9201.389	3402.412	DOWN	NORTH	0.040	0.042	0.040	-0.042
68	9203.644	3407.314	9201.524	3402.430	9203.621	3407.331	9201.485	3402.453	DOWN	NORTH	0.029	0.045	0.029	-0.045
69	9203.649	3407.231	9201.632	3402.456	9203.646	3407.239	9201.604	3402.465	DOWN	NORTH	0.009	0.029	0.009	-0.029
70	9203.672	3407.111	9201.724	3402.491	9203.658	3407.134	9201.690	3402.520	DOWN	NORTH	0.027	0.045	0.027	-0.045
71	9203.699	3407.016	9201.819	3402.501	9203.677	3407.030	9201.790	3402.518	DOWN	NORTH	0.026	0.034	0.026	-0.034
72	9203.727	3406.914	9201.914	3402.527	9203.703	3406.933	9201.910	3402.530	DOWN	NORTH	0.031	0.005	0.031	-0.005
73	9203.750	3406.831	9201.999	3402.560	9203.720	3406.850	9201.889	3402.571	DOWN	NORTH	0.036	0.015	0.036	-0.015
74	9203.770	3406.714	9202.096	3402.584	9203.759	3406.730	9202.078	3402.599	DOWN	NORTH	0.019	0.023	0.019	-0.023
75	9203.797	3406.619	9202.179	3402.593	9203.790	3406.643	9202.140	3402.627	DOWN	NORTH	0.025	0.052	0.025	-0.052
76	9203.829	3406.547	9202.257	3402.636	9203.798	3406.575	9202.255	3402.694	DOWN	NORTH	0.043	0.058	0.043	-0.058
77	9203.814	3406.442	9202.410	3402.667	9203.805	3406.464	9202.372	3402.683	DOWN	NORTH	0.024	0.041	0.024	-0.041
78	9203.852	3406.392	9202.493	3402.682	9203.835	3406.365	9202.459	3402.685	DOWN	NORTH	0.041	0.034	0.041	-0.034
79	9203.895	3406.248	9202.605	3402.711	9203.811	3406.238	9202.582	3402.739	DOWN	NORTH	0.085	0.036	0.085	-0.036
80	9203.899	3406.135	9202.684	3402.739	9203.956	3406.079	9202.669	3402.756	UP	NORTH	0.060	0.023	-0.060	-0.023
81	9203.921	3406.037	9202.774	3402.756	9203.903	3406.049	9202.766	3402.764	DOWN	NORTH	0.022	0.011	0.022	-0.011
82	9203.950	3405.946	9202.861	3402.760	9203.942	3405.980	9202.837	3402.782	DOWN	NORTH	0.035	0.033	0.035	-0.033
83	9203.976	3405.847	9202.951	3402.784	9203.952	3405.878	9202.945	3402.809	DOWN	NORTH	0.030	0.028	0.030	-0.028
84	9203.998	3405.757	9203.065	3402.800	9203.998	3405.779	9203.056	3402.820	DOWN	NORTH	0.022	0.022	0.022	-0.022
85	9204.017	3405.662	9203.179	3402.836	9204.001	3405.665	9203.151	3402.858	DOWN	NORTH	0.028	0.036	0.028	-0.036
86	9204.038	3405.556	9203.289	3402.835	9204.014	3405.579	9203.268	3402.874	DOWN	NORTH	0.033	0.044	0.033	-0.044
87	9204.064	3405.461	9203.378	3402.870	9204.047	3405.467	9203.368	3402.904	DOWN	NORTH	0.031	0.035	0.031	-0.035
88	9204.086	3405.367	9203.466	3402.904	9204.108	3405.384	9203.541	3402.970	DOWN	NORTH	0.026	0.098	0.026	-0.098
89	9204.103	3405.280	9203.560	3402.952	9204.122	3405.301	9203.600	3402.983	DOWN	NORTH	0.026	0.023	0.026	-0.023
90	9204.113	3405.159	9203.669	3402.980	9204.119	3405.200	9203.683	3402.987	UP	NORTH	0.032	0.008	-0.032	-0.008
91	9204.176	3405.077	9203.736	3403.001	9204.154	3405.109	9203.783	3403.030	DOWN	NORTH	0.040	0.054	0.040	-0.054
92	9204.182	3404.969	9203.836	3403.014	9204.182	3405.004	9203.830	3403.030	DOWN	NORTH	0.035	0.018	0.035	-0.018
93	9204.211	3404.884	9203.933	3403.050	9204.188	3404.940	9203.924	3403.059	DOWN	NORTH	0.061	0.013	0.061	-0.013
94	9204.224	3404.789	9204.040	3403.061	9204.214	3404.830	9204.034	3403.093	DOWN	NORTH	0.042	0.033	0.042	-0.033
95	9204.256	3404.684	9204.133	3403.104	9204.239	3404.695	9204.126	3403.126	DOWN	NORTH	0.018	0.023	0.018	-0.023
96	9204.294	3404.585	9204.232	3403.108	9204.266	3404.592	9204.214	3403.130	DOWN	NORTH	0.028	0.028	0.028	-0.028
97	9204.296	3404.477	9204.326	3403.121	9204.238	3404.485	9204.319	3403.145	DOWN	NORTH	0.059	0.025	0.059	-0.025
98	9204.316	3404.380	9204.428	3403.164	9204.226	3404.423	9204.418	3403.171	DOWN	NORTH	0.102	0.012	0.102	-0.012
99	9204.322	3404.284	9204.552	3403.186	9204.324	3404.309	9204.530	3403.146	UP	SOUTH	0.025	0.046	-0.025	0.046
100	9204.365	3404.205	9204.623	3403.202	9204.360	3404.220	9204.603	3403.219	DOWN	NORTH	0.021	0.026	0.021	-0.026
101	9204.389	3404.109	9204.706	3403.231	9204.385	3404.138	9204.682	3403.252	DOWN	NORTH	0.029	0.033	0.029	-0.033
102	9204.418	3404.010	9204.817	3403.266	9204.386	3404.045	9204.797	3403.274	DOWN	NORTH	0.047	0.022	0.047	-0.022
103	9204.430	3403.916	9204.904	3403.279	9204.464	3403.936	9204.903	3403.310	DOWN	NORTH	0.032	0.031	0.032	-0.031
104	9204.470	3403.814	9205.011	3403.232	9204.454	3403.823	9204.993	3403.332	DOWN	NORTH	0.017	0.102	0.017	-0.102
105	9204.504	3403.715	9205.096	3403.361	9204.475	3403.741	9205.081	3403.330	DOWN	NORTH	0.039	0.034	0.039	-0.034
106	9204.512	3403.608	9205.221	3403.370	9204.480	3403.636	9205.201	3403.387	DOWN	NORTH	0.043	0.026	0.043	-0.026
107	9204.542	3403.510	9205.299	3403.393	9204.519	3403.539	9205.289	3403.404	DOWN	NORTH	0.037	0.015	0.037	-0.015
108	9204.574	3403.396	9205.436	3403.395	9204.552	3403.418	9205.329	3403.417	DOWN	NORTH	0.031	0.109	0.031	-0.109
109	9204.604	3403.318	9205.500	3403.429	9204.575	3403.333	9205.429	3403.440	DOWN	NORTH	0.033	0.072	0.033	-0.072
110	9204.601	3403.219	9205.591	3403.441	9204.592	3403.256	9205.577	3403.459	DOWN	NORTH	0.040	0.023	0.040	-0.023
111	9204.632	3403.120	9205.688	3403.484	9204.612	3403.164	9205.673	3403.491	DOWN	NORTH	0.039	0.017	0.039	-0.017
112	9204.646	3403.040	9205.787	3403.507	9204.622	3403.065	9205.784	3403.508	DOWN	NORTH	0.035	0.003	0.035	-0.003
113	9204.684	3402.947	9205.893	3403.524	9204.660	3402.950	9205.877	3403.542	DOWN	NORTH	0.024	0.024	0.024	-0.024
114	9204.697	3402.857	9205.988	3403.541	9204.697	3402.857	9205.972	3403.571	DOWN	NORTH	0.000	0.034	0.000	-0.034
115	9204.713	3402.761	9206.081	3403.576	9204.676	3402.906	9206.062	3403.591	DOWN	NORTH	0.150	0.024	0.150	-0.024
116	9204.740	3402.650	9206.176	3403.598	9204.721	3402.670	9206.174	3403.608	DOWN	NORTH	0.028	0.012	0.028	-0.012
117	9204.787	3402.542	9206.287	3403.664	9204.751	3402.562	9206.263	3403.672	DOWN	NORTH	0.041	0.025	0.041	-0.025
118	9204.805	3402.454	9206.379	3403.641	9204.784	3402.461	9206.369	3403.659	DOWN	NORTH	0.022	0.021	0.022	-0.021
119	9204.816	3402.356	9206.469	3403.664	9204.811	3402.467	9206.456	3403.724	DOWN	NORTH	0.111	0.061	0.111	-0.061
120	9204.839	3402.282	9206.569	3403.685	9204.818	3402.299	9206.560	3403.700	DOWN	NORTH	0.043	0.017	0.043	-0.017
121	9204.850	3402.161	9206.682	3403.730	9204.832	3402.219	9206.666	3403.743	DOWN	NORTH	0.061	0.019	0.061	-0.019
122	9204.884	3402.068	9206.780	3403.735	9204.848	3402.085	9206.745	3403.757	DOWN	NORTH	0.040	0.027	0.040	-0.027
123	9204.901	3401.963	9206.856	3403.776	9204.886	3401.978	9206.826	3403.781	DOWN	NORTH	0.020	0.028	0.020	-0.028
124	9204.932	3401.870	9206.963	3403.788	9204.889	3401.879	9206.938	3403.806	DOWN	NORTH	0.044	0.031	0.044	-0.031
125	9204.958	3401.760	9207.069	3403.803	9204.929	3401.781	9207.054	3403.823	DOWN	NORTH	0.036	0.025	0.036	-0.025
126	9204.988	3401.657	9207.149	3403.832	9204.944	3401.670	9207.135	3403.847	DOWN	NORTH	0.046	0.021	0.046	-0.021
127	9204.986	3401.564	9207.260	3403.871	9204.966	3401.586	9207.236	3403.882	UP	NORTH	0.030	0.026	-0.030	-0.026
128	9205.029	3401.463	9207.354	3403.883	9204.994	3401.476	9207.384	3403.769	DOWN	SOUTH	0.037	0.099	0.037	0.099
129	9205.062	3401.361	9207.446	3403.900	9205.028	3401.402	9207.411	3403.919	DOWN	NORTH	0.032	0.040	0.032	-0.040
130	9205.062	3401.276	9207.526	3403.926	9205.040	3401.302	9207.522	3403.944	DOWN	NORTH	0.034	0.019	0.034	-0.019
131	9205.103	3401.186	9207.637	3403.966	9205.062	3401.224	9207.629	3403.962	DOWN	NORTH	0.042	0.018	0.042	-0.018
132	9205.113	3401.083	9207.728	3403.974	9205.100	3401.112	9207.722	3403.998	DOWN	NORTH	0.023	0.025	0.023	-0.025
133	9205.159	3401.000	9207.820	3404.001	9205.129	3401.018	9207.816	3404.020	DOWN	NORTH	0.035	0.019	0.035	-0.019
134	9205.171	3400.900	9207.924	3404.031	9205.142	3400.911	9207.916	3404.051	DOWN	NORTH	0.031	0.022	0.031	-0.022
135	9205.202	3400.799	9208.031	3404.049	9205.185	3400.815	9208.029	3404.093	DOWN	NORTH	0.023	0.044	0.023	-0.044
136	9205.226	3400.709	9208.107	3404.075	9205.196	3400.720	9208.102	3404.089	DOWN	NORTH	0.032	0.015	0.032	-0.015

137	9205.238	3400.595	9208.220	3404.098	9205.205	3400.600	9208.202	3404.129	DOWN	NORTH	0.033	0.036	0.033	-0.036
138	9205.263	3400.489	9208.315	3404.126	9205.233	3400.510	9208.307	3404.138	DOWN	NORTH	0.037	0.014	0.037	-0.014
139	9205.292	3400.391	9208.414	3404.146	9205.248	3400.408	9208.501	3404.126	DOWN	SOUTH	0.047	0.089	0.047	0.089
140	9205.305	3400.311	9208.507	3404.164	9205.301	3400.334	9208.497	3404.186	DOWN	NORTH	0.023	0.024	0.023	-0.024
141	9205.327	3400.212	9208.611	3404.189	9205.301	3400.226	9208.576	3404.187	DOWN	NORTH	0.030	0.035	0.030	-0.035
142	9205.344	3400.117	9208.714	3404.199	9205.323	3400.138	9208.590	3404.224	DOWN	NORTH	0.030	0.035	0.030	-0.035
143	9205.373	3400.015	9208.817	3404.231	9205.357	3400.033	9208.762	3404.176	DOWN	SOUTH	0.024	0.078	0.024	0.078
144	9205.394	3399.925	9208.890	3404.259	9205.374	3399.947	9208.876	3404.269	DOWN	NORTH	0.030	0.017	0.030	-0.017
145	9205.410	3399.825	9208.993	3404.281	9205.395	3399.834	9208.996	3404.328	UP	NORTH	0.017	0.045	-0.017	-0.045
146	9205.435	3399.714	9209.075	3404.304	9205.420	3399.731	9209.086	3404.342	UP	NORTH	0.023	0.040	-0.023	-0.040
147	9205.467	3399.622	9209.187	3404.332	9205.436	3399.641	9209.164	3404.351	DOWN	NORTH	0.036	0.030	0.036	-0.030
148	9205.495	3399.514	9209.314	3404.362	9205.460	3399.543	9209.281	3404.363	DOWN	NORTH	0.045	0.035	0.045	-0.035
149	9205.505	3399.420	9209.382	3404.363	9205.492	3399.432	9209.376	3404.382	UP	NORTH	0.018	0.020	-0.018	-0.020
150	9205.526	3399.323	9209.477	3404.380	9205.518	3399.363	9209.461	3404.401	UP	NORTH	0.041	0.026	-0.041	-0.026
151	9205.563	3399.244	9209.567	3404.410	9205.546	3399.250	9209.559	3404.430	DOWN	NORTH	0.018	0.022	0.018	-0.022
152	9205.592	3399.142	9209.674	3404.440	9205.571	3399.152	9209.568	3404.408	DOWN	SOUTH	0.023	0.111	0.023	0.111
153	9205.599	3399.052	9209.780	3404.464	9205.579	3399.064	9209.710	3404.399	UP	SOUTH	0.023	0.096	-0.023	0.096
154	9205.623	3398.944	9209.876	3404.479	9205.646	3398.964	9209.805	3404.464	UP	SOUTH	0.030	0.077	-0.030	0.077
155	9205.636	3398.856	9209.973	3404.515	9205.619	3398.859	9209.951	3404.536	UP	NORTH	0.021	0.032	-0.021	-0.032
156	9205.652	3398.755	9210.060	3404.534	9205.651	3398.765	9210.065	3404.551	UP	NORTH	0.010	0.018	-0.010	-0.018
157	9205.664	3398.645	9210.172	3404.563	9205.678	3398.650	9210.160	3404.609	UP	NORTH	0.008	0.048	-0.008	-0.048
158	9205.713	3398.548	9210.271	3404.590	9205.690	3398.564	9210.248	3404.609	UP	NORTH	0.028	0.030	-0.028	-0.030
159	9205.741	3398.445	9210.362	3404.616	9205.729	3398.481	9210.350	3404.632	UP	NORTH	0.038	0.016	-0.038	-0.016
160	9205.755	3398.340	9210.436	3404.636	9205.730	3398.373	9210.446	3404.636	UP	NORTH	0.035	0.008	-0.035	-0.008
161	9205.798	3398.256	9210.566	3404.664	9205.781	3398.280	9210.530	3404.609	DOWN	SOUTH	0.019	0.058	0.019	0.058
162	9205.808	3398.167	9210.652	3404.680	9205.785	3398.187	9210.643	3404.712	UP	NORTH	0.030	0.025	-0.030	-0.025
163	9205.829	3398.056	9210.754	3404.699	9205.938	3398.098	9210.733	3404.737	UP	NORTH	0.117	0.043	-0.117	-0.043
164	9205.845	3397.963	9210.836	3404.726	9205.826	3397.999	9210.833	3404.750	UP	NORTH	0.023	0.022	-0.023	-0.022
165	9205.879	3397.868	9210.931	3404.755	9205.846	3397.890	9210.925	3404.781	UP	NORTH	0.040	0.027	-0.040	-0.027
166	9205.905	3397.763	9211.027	3404.774	9205.920	3397.788	9211.035	3404.780	UP	NORTH	0.029	0.010	-0.029	-0.010
167	9205.925	3397.669	9211.129	3404.808	9205.912	3397.696	9211.121	3404.930	UP	NORTH	0.030	0.122	-0.030	-0.122
168	9205.948	3397.555	9211.231	3404.828	9205.930	3397.589	9211.220	3404.851	UP	NORTH	0.038	0.025	-0.038	-0.025
169	9205.982	3397.475	9211.330	3404.864	9205.929	3397.508	9211.306	3404.881	UP	NORTH	0.047	0.029	-0.047	-0.029
170	9205.982	3397.374	9211.419	3404.878	9205.959	3397.390	9211.406	3404.880	UP	NORTH	0.028	0.011	-0.028	-0.011
171	9206.014	3397.284	9211.526	3404.896	9205.995	3397.311	9211.523	3404.914	UP	NORTH	0.033	0.018	-0.033	-0.018
172	9206.039	3397.177	9211.634	3404.901	9206.021	3397.219	9211.616	3404.940	UP	NORTH	0.046	0.043	-0.046	-0.043
173	9206.075	3397.092	9211.719	3404.939	9206.057	3397.116	9211.719	3404.952	DOWN	NORTH	0.030	0.013	0.030	-0.013
174	9206.092	3396.995	9211.800	3404.963	9206.069	3397.029	9211.796	3404.899	UP	NORTH	0.033	0.026	-0.033	-0.026
175	9206.113	3396.899	9211.900	3404.991	9206.102	3396.925	9211.903	3405.021	UP	NORTH	0.028	0.030	-0.028	-0.030
176	9206.160	3396.808	9212.002	3405.014	9206.101	3396.825	9211.970	3405.054	DOWN	NORTH	0.061	0.051	0.061	-0.051
177	9206.164	3396.687	9212.113	3405.031	9206.157	3396.701	9212.091	3405.063	UP	NORTH	0.015	0.039	-0.015	-0.039
178	9206.181	3396.609	9212.211	3405.055	9206.152	3396.631	9212.180	3405.088	UP	SOUTH	0.036	0.034	-0.036	0.034
179	9206.203	3396.529	9212.299	3405.084	9206.186	3396.539	9212.286	3405.111	UP	NORTH	0.024	0.029	-0.024	-0.029
180	9206.231	3396.410	9212.392	3405.102	9206.212	3396.455	9212.374	3405.121	UP	NORTH	0.049	0.026	-0.049	-0.026
181	9206.268	3396.312	9212.484	3405.132	9206.244	3396.316	9212.464	3405.155	DOWN	NORTH	0.024	0.036	0.024	-0.036
182	9206.281	3396.218	9212.580	3405.157	9206.265	3396.247	9212.569	3405.176	UP	NORTH	0.033	0.022	-0.033	-0.022
183	9206.318	3396.124	9212.680	3405.191	9206.307	3396.132	9212.662	3405.211	DOWN	NORTH	0.014	0.027	0.014	-0.027
184	9206.338	3396.015	9212.780	3405.201	9206.326	3396.040	9212.761	3405.195	DOWN	SOUTH	0.028	0.020	0.028	0.020
185	9206.353	3395.918	9212.866	3405.241	9206.293	3395.956	9212.867	3405.310	UP	NORTH	0.071	0.072	-0.071	-0.072
186	9206.387	3395.804	9212.974	3405.290	9206.362	3395.842	9212.958	3405.270	DOWN	NORTH	0.045	0.026	0.045	-0.026
187	9206.397	3395.719	9213.084	3405.283	9206.405	3395.760	9213.067	3405.285	UP	SOUTH	0.042	0.017	-0.042	0.017
188	9206.411	3395.630	9213.164	3405.308	9206.328	3395.642	9213.146	3405.327	UP	NORTH	0.084	0.026	-0.084	-0.026
189	9206.432	3395.532	9213.264	3405.325	9206.425	3395.565	9213.266	3405.356	UP	NORTH	0.034	0.036	-0.034	-0.036
190	9206.470	3395.436	9213.366	3405.347	9206.442	3395.463	9213.356	3405.374	UP	NORTH	0.037	0.030	-0.037	-0.030
191	9206.484	3395.342	9213.439	3405.374	9206.437	3395.380	9213.450	3405.381	UP	NORTH	0.060	0.013	-0.060	-0.013
192	9206.525	3395.246	9213.550	3405.381	9206.490	3395.202	9213.562	3405.448	UP	NORTH	0.056	0.066	-0.056	-0.066
193	9206.539	3395.147	9213.647	3405.409	9206.523	3395.174	9213.632	3405.432	UP	NORTH	0.031	0.027	-0.031	-0.027
194	9206.564	3395.036	9213.741	3405.446	9206.579	3395.118	9213.753	3405.468	DOWN	NORTH	0.083	0.025	0.083	-0.025
195	9206.595	3394.956	9213.862	3405.457	9206.590	3394.996	9213.839	3405.501	DOWN	NORTH	0.038	0.050	0.038	-0.050
196	9206.634	3394.857	9213.933	3405.501	9206.618	3394.865	9213.926	3405.537	DOWN	NORTH	0.032	0.037	0.032	-0.037
197	9206.662	3394.763	9214.019	3405.505	9206.642	3394.773	9214.010	3405.537	DOWN	NORTH	0.022	0.032	0.022	-0.032
198	9206.669	3394.669	9214.138	3405.550	9206.662	3394.678	9214.144	3405.576	DOWN	NORTH	0.019	0.027	0.019	-0.027
199	9206.688	3394.561	9214.247	3405.559	9206.684	3394.593	9214.241	3405.577	DOWN	NORTH	0.032	0.019	0.032	-0.019
200	9206.695	3394.461	9214.323	3405.561	9206.715	3394.498	9214.295	3405.555	UP	SOUTH	0.042	0.029	-0.042	0.029

UP	83	164	NORTH	
DOWN	117	46	SOUTH	

This is number of pebbles moving different ways

	0.150	0.370	0.150	0.111 max (m)
	-	0.003	(0.117)	(0.270) min (m)
	0.034	0.037	0.007	(0.017) avg (m)
	0.019	0.026	0.038	0.042 stdv (m)
	0.031	0.031	0.022	(0.026) median (m)

LINE PARALLEL TO CONTOUR	LINE ORIENTED DOWNGRADIENT	LINE PARALLEL TO CONTOUR	LINE ORIENTED DOWNGRADIENT
GROSS movement	GROSS movement	NET movement	NET movement
4.735			

pebble moving > than uncertainty of measure	121	1 SIGMA	0.026 m
	17	2 SIGMA	0.056 m

ASSUMING 0.026 RMS UNCERTAINTY

THIS IS THE SENSITIVITY TEST FOR HOW MANY PEBBLES REALLY MOVED

Caculations for Pebble data Iron Mountain

These calculations compare movement from orginal positions. The pebbles are seperated into Line countour parallel and Line oriented down gradient pebbles.

The countour parallel line pebbles move up and down and the line oriented down gradient pebbles move north and south.

The calculations include gross movement and net movement. Gross movement does not take into accouint that some pebbles move up from the line and some move down from the line.

The maximum, minimum, average, standard deviation and median of gross and net pebble movment is shown at the bottom of the spread sheet. A sensitivity test is also included to determine how many pebbles are actually moving.

Gross movement accounts for all movement not just movment in downslope direction
Should we also figure out the down slope movement?

LINE PARALLEL TO CONTOUR NORTHING = -4.13305930X(EASTING1 + 41446.36475601

LINE ORIENTED DOWN GRADIENT NORTHING = 0.24740845X(EASTING1 + 1125.893681083

May--00

	LINE PARALLEL TO CONTOUR		LINE ORIENTED DOWNGRADIENT	
	e	n	e	n
1	9202.032	3413.817	9195.012	3400.884
2	9202.040	3413.723	9195.126	3400.875
3	9202.070	3413.624	9195.223	3400.895
4	9202.109	3413.525	9195.313	3400.930
5	9202.123	3413.425	9195.405	3400.932
6	9202.150	3413.323	9195.506	3400.957
7	9202.166	3413.232	9195.585	3401.003
8	9202.194	3413.126	9195.693	3401.015
9	9202.224	3413.024	9195.787	3401.036
10	9202.245	3412.932	9195.887	3401.062
11	9202.269	3412.851	9195.996	3401.087
12	9202.287	3412.746	9196.097	3401.101
13	9202.316	3412.647	9196.196	3401.120
14	9202.329	3412.553	9196.291	3401.137
15	9202.359	3412.447	9196.385	3401.164
16	9202.378	3412.352	9196.500	3401.180
17	9202.407	3412.256	9196.591	3401.206
18	9202.421	3412.157	9196.697	3401.235
19	9202.458	3412.064	9196.778	3401.252
20	9202.474	3411.960	9196.875	3401.267
21	9202.508	3411.873	9196.996	3401.301
22	9202.496	3411.773	9197.070	3401.323
23	9202.524	3411.674	9197.162	3401.328
24	9202.541	3411.586	9197.253	3401.343
25	9202.555	3411.476	9197.362	3401.361
26	9202.601	3411.393	9197.456	3401.343
27	9202.617	3411.274	9197.571	3401.410
28	9202.628	3411.193	9197.643	3401.459
29	9202.665	3411.103	9197.743	3401.485
30	9202.679	3410.958	9197.849	3401.498
31	9202.724	3410.812	9197.942	3401.512
32	9202.727	3410.603	9198.040	3401.536
33	9202.754	3410.711	9198.131	3401.557
34	9202.775	3410.610	9198.234	3401.592
35	9202.795	3410.520	9198.336	3401.606
36	9202.831	3410.426	9198.437	3401.631
37	9202.847	3410.326	9198.540	3401.655
38	9202.880	3410.236	9198.626	3401.672
39	9202.897	3410.133	9198.730	3401.695
40	9202.924	3410.031	9198.816	3401.730
41	9202.937	3409.936	9198.899	3401.750
42	9202.975	3409.855	9199.004	3401.788
43	9203.005	3409.766	9199.112	3401.806
44	9203.020	3409.664	9199.216	3401.842
45	9203.054	3409.559	9199.305	3401.867
46	9203.074	3409.467	9199.401	3401.887
47	9203.107	3409.356	9199.496	3401.906
48	9203.126	3409.274	9199.593	3401.933
49	9203.159	3409.167	9199.706	3401.955
50	9203.167	3409.078	9199.778	3401.976
51	9203.225	3408.971	9199.872	3402.009
52	9203.255	3408.879	9199.974	3402.020
53	9203.281	3408.787	9200.075	3402.062
54	9203.309	3408.681	9200.183	3402.077
55	9203.323	3408.580	9200.283	3402.096
56	9203.352	3408.483	9200.377	3402.126
57	9203.375	3408.382	9200.464	3402.142
58	9203.401	3408.282	9200.586	3402.160
59	9203.422	3408.182	9200.663	3402.200
60	9203.435	3408.080	9200.764	3402.227
61	9203.439	3407.997	9200.834	3402.252
62	9203.469	3407.904	9200.947	3402.265
63	9203.505	3407.828	9201.053	3402.316
64	9203.527	3407.669	9201.141	3402.327
65	9203.560	3407.613	9201.243	3402.366
66	9203.589	3407.498	9201.330	3402.380
67	9203.609	3407.418	9201.431	3402.416
68	9203.644	3407.314	9201.524	3402.430
69	9203.649	3407.231	9201.632	3402.456
70	9203.672	3407.111	9201.724	3402.491
71	9203.699	3407.016	9201.819	3402.501
72	9203.727	3406.914	9201.914	3402.527
73	9203.750	3406.831	9201.999	3402.560
74	9203.770	3406.714	9202.096	3402.584
75	9203.797	3406.619	9202.179	3402.593
76	9203.829	3406.547	9202.257	3402.636
77	9203.814	3406.442	9202.410	3402.667
78	9203.852	3406.362	9202.493	3402.682
79	9203.895	3406.248	9202.605	3402.711
80	9203.899	3406.135	9202.664	3402.739
81	9203.921	3406.037	9202.774	3402.756
82	9203.950	3405.946	9202.861	3402.760
83	9203.976	3405.847	9202.951	3402.784
84	9203.998	3405.757	9203.065	3402.800
85	9204.017	3405.662	9203.179	3402.836
86	9204.036	3405.556	9203.269	3402.835
87	9204.064	3405.461	9203.376	3402.870
88	9204.085	3405.367	9203.466	3402.904
89	9204.103	3405.280	9203.580	3402.952
90	9204.113	3405.169	9203.650	3402.980
91	9204.178	3405.077	9203.738	3403.001
92	9204.182	3404.969	9203.838	3403.014
93	9204.211	3404.884	9203.933	3403.050
94	9204.224	3404.789	9204.040	3403.061
95	9204.255	3404.689	9204.133	3403.104
96	9204.294	3404.585	9204.232	3403.108
97	9204.296	3404.477	9204.326	3403.121
98	9204.318	3404.380	9204.428	3403.164
99	9204.322	3404.284	9204.562	3403.166
100	9204.365	3404.205	9204.623	3403.202
101	9204.389	3404.109	9204.708	3403.231
102	9204.418	3404.010	9204.817	3403.266
103	9204.439	3403.918	9204.904	3403.279
104	9204.470	3403.816	9205.011	3403.232
105	9204.504	3403.715	9205.096	3403.361
106	9204.512	3403.608	9205.221	3403.370
107	9204.542	3403.510	9205.299	3403.393
108	9204.574	3403.396	9205.436	3403.396
109	9204.604	3403.318	9205.509	3403.429
110	9204.601	3403.219	9205.501	3403.441
111	9204.632	3403.120	9205.668	3403.484
112	9204.646	3403.040	9205.787	3403.507
113	9204.684	3402.947	9205.893	3403.524
114	9204.697	3402.857	9205.986	3403.541
115	9204.713	3402.761	9206.081	3403.576
116	9204.740	3402.650	9206.178	3403.596
117	9204.767	3402.542	9206.287	3403.664
118	9204.805	3402.454	9206.370	3403.641
119	9204.816	3402.356	9206.469	3403.664
120	9204.839	3402.262	9206.569	3403.685
121	9204.850	3402.161	9206.682	3403.730
122	9204.884	3402.068	9206.760	3403.735
123	9204.901	3401.963	9206.856	3403.776
124	9204.932	3401.870	9206.953	3403.768
125	9204.958	3401.760	9207.069	3403.803
126	9204.988	3401.657	9207.149	3403.832
127	9204.986	3401.564	9207.260	3403.871
128	9205.029	3401.463	9207.354	3403.863
129	9205.052	3401.381	9207.446	3403.900
130	9205.062	3401.276	9207.528	3403.926
131	9205.103	3401.186	9207.637	3403.966
132	9205.113	3401.093	9207.728	3403.974
133	9205.159	3401.000	9207.820	3404.001
134	9205.171	3400.900	9207.924	3404.031
135	9205.202	3400.799	9208.031	3404.049
136	9205.226	3400.709	9208.107	3404.075

Mar--01

	LINE PARALLEL TO CONTOUR		LINE ORIENTED DOWNGRADIENT	
	e	n	e	n
	9202.034	3413.813	9194.997	3400.855
	9201.897	3413.889	9195.115	3400.866
	9202.058	3413.639	9195.202	3400.919
	9202.085	3413.532	9195.302	3400.926
	9202.093	3413.454	9195.401	3400.939
	9202.122	3413.345	9195.469	3400.966
	9202.162	3413.257	9195.577	3400.992
	9202.186	3413.142	9195.681	3401.018
	9202.209	3413.036	9195.762	3401.035
	9202.217	3412.926	9195.883	3401.07
	9202.242	3412.853	9195.973	3401.093
	9202.275	3412.753	9196.079	3401.119
	9202.309	3412.643	9196.19	3401.122
	9202.329	3412.564	9196.293	3401.149
	9202.349	3412.454	9196.389	3401.163
	9202.367	3412.363	9196.491	3401.187
	9202.412	3412.256	9196.608	3401.228
	9202.407	3412.165	9196.733	3401.228
	9202.451	3412.079	9196.762	3401.263
	9202.417	3412.055	9196.898	3401.304
	9202.457	3411.880	9196.961	3401.276
	9202.513	3411.829	9197.054	3401.332
	9202.529	3412.462	9197.157	3401.334
	9202.569	3411.845	9197.277	3401.368
	9202.573	3411.501	9197.362	3401.375
	9202.604	3411.424	9197.455	3401.363
	9202.636	3411.271	9197.513	3401.441
	9202.650	3411.199	9197.636	3401.475
	9202.658	3411.098	9197.748	3401.506
	9202.728	3411.001	9197.909	3401.541
	9202.748	3410.916	9197.927	3401.521
	9202.722	3410.809	9196.03	3401.545
	9202.706	3410.690	9198.12	3401.553
	9202.790	3410.643	9198.211	3401.62
	9202.823	3410.521	9198.313	3401.672
	9202.796	3410.436	9198.418	3401.643
	9202.891	3410.346	9198.536	3401.677
	9202.897	3410.229	9198.614	3401.664
	9202.921	3410.093	9198.715	3401.713
	9202.972	3410.038	9198.811	3401.756
	9202.970	3409.936	9198.904	3401.771
	9202.999	3409.840	9199.015	3401.792
	9203.025	3409.760	9199.108	3401.824
	9203.020	3409.712	9199.225	3401.847
	9203.070	3409.564	9199.299	3401.856
	9203.066	3409.464	9199.399	3401.891
	9203.124	3409.362	9199.49	3401.917
	9203.144	3409.270	9199.585	3401.940
	9203.173	3409.159	9199.695	3401.962
	9203.190	3409.065	9199.77	3401.989
	9203.210	3408.963	9199.88	3402.076
	9203.231	3408.879	9199.97	3402.034
	9203.281	3408.791	9200.071	3402.066
	9203.282	3408.690	9200.177	3402.107
	9203.468	3408.340	9200.265	3402.124
	9203.336	3408.480	9200.364	3402.149
	9203.365	3408.380	9200.458	3402.151
	9203.387	3408.297	9200.561	3402.19
	9203.401	3408.198	9200.658	3402.212
	9203.401	3408.093	9200.753	3402.237
	9203.435	3407.961	9200.802	3402.266
	9203.451	3407.910	9200.955	3402.27
	9203.466	3407.815	9201.045	3402.3
	9203.570	3407.706	9201.171	3402.464
	9203.542	3407.615	9201.234	3402.373
	9203.573	3407.513	9201.33	3402.392
	9203.590	3407.424	9201.425	3402.431
	9203.616	3407.326	9201.513	3402.455
	9203.642	3407.233	9201.631	3402.476
	9203.679	3407.128	9201.714	3402.499
	9203.696	3407.028	9201.812	3402.514
	9203.713	3406.921	9201.934	3402.532
	9203.736	3406.834	9202.008	3402.567
	9203.745	3406.720	9202.105	3402.58
	9203.788	3406.631	9202.166	3402.609
	9203.812	3406.561	9202.262	3402.687
	9203.801	3406.449	9202.405	3402.675
	9203.825	3406.345	9202.487	3402.694
	9203.821	3406.224	9202.628	3402.733
	9203.946	3406.050	9202.689	3402.752
	9203.920	3406.044	9202.795	3402.759
	9203.938	3405.954	9202.853	3402.775
	9203.949	3405.857	9202.972	3402.79
	9203.987	3405.763	9203.074	3402.818
	9204.003	3405.666	9203.162	3402.846
	9204.074	3405.526	9203.27	3402.863
	9204.053	3405.477	9203.372	3402.893
	9204.119	3405.372	9203.579	3403.001
	9204.109	3405.282	9203.615	3402.982
	9204.114	3405.188	9203.671	3402.985
	9204.154	3405.102	9203.802	3403.031
	9204.194	3404.997	9203.853	3403.027
	9204.200	3404.925	9203.943	3403.063
	9204.222	3404.818	9203.93	3403.141
	9204.261	3404.695	9204.116	3403.107
	9204.274	3404.599	9204.194	3403.131
	9204.273	3404.474	9204.288	3403.111
	9204.226	3404.407	9204.437	3403.192
	9204.328	3404.302	9204.538	3403.188
	9204.358	3404.200	9204.636	3403.237
	9204.385	3404.106	9204.696	3403.248
	9204.404	3404.034	9204.799	3403.266
	9204.429	3403.943	9204.903	3403.29
	9204.463	3403.828	9205.013	3403.315
	9204.477	3403.723	9205.094	3403.313
	9204.521	3403.665	9205.21	3403.365
	9204.542	3403.516	9205.299	3403.397
	9204.556	3403.406	9205.345	3403.407
	9204.584	3403.328	9205.499	3403.434
	9204.610	3403.233	9205.585	3403.451
	9204.626	3403.142	9205.683	3403.484
	9204.638	3403.045	9205.784	3403.506
	9204.671	3402.952	9205.877	3403.525
	9204.697	3402.857	9205.993	3403.554
	9204.671	3402.877	9206.088	3403.585
	9204.746	3402.696	9206.182	3403.603
	9204.779	3402.550	9206.279	3403.656
	9204.750	3402.461	9206.379	3403.644
	9204.821	3402.376	9206.474	3403.709
	9204.827	3402.297	9206.563	3403.712
	9204.743	3402.205	9206.669	3403.735
	9204.877	3402.078	9206.775	3403.745
	9204.923	3401.976	9206.847	3403.774
	9204.926	3401.877	9206.955	3403.781
	9204.948	3401.770	9207.084	3403.806
	9204.975	3401.668	9207.245	3403.892
	9204.983	3401.576	9207.262	3403.862
	9205.023	3401.483	9207.369	3403.754
	9205.053	3401.398	9207.43	3403.926
	9205.074	3401.289	9207.523	3403.936
	9205.106	3401.210	9207.649	3403.97
	9205.118	3401.100	9207.728	3403.986
	9205.152	3401.019	9207.846	3404.018
	9205.151	3400.909	9207.937	3404.045
	9205.192	3400.803	9208.142	3404.079
	9205.223	3400.725	9208.118	3404.074

	LINE PARALLEL TO CONTOUR	LINE ORIENTED DOWNGRADIENT	
	UP vs DOWN MOVEMENT	NORTH vs SOUTH MOVEMENT	
			GROSS movement
	UP	NORTH	0.0214
	DOWN	NORTH	0.0514
	UP	NORTH	0.0192
	DOWN	NORTH	0.0250
	DOWN	NORTH	0.0417
	DOWN	NORTH	0.0356
	UP	NORTH	0.0318
	UP	NORTH	0.0233
	DOWN	NORTH	0.0244
	UP	NORTH	0.0100
	DOWN	NORTH	0.0371
	UP	NORTH	0.0344
	UP	NORTH	0.0104
	UP	NORTH	0.0233
	UP	NORTH	0.0356
	UP	NORTH	0.0263
	UP	NORTH	0.0120
	UP	NORTH	0.0280
	DOWN	NORTH	0.0206
	DOWN	NORTH	0.0411
	DOWN	NORTH	0.0422
	UP	NORTH	0.0189
	DOWN	SOUTH	0.0220
	UP	SOUTH	0.0120
	UP	SOUTH	0.0385
	UP	SOUTH	0.0141
	UP	SOUTH	0.0214
	UP	NORTH	0.0264
	UP	NORTH	0.0099
	UP	NORTH	0.0120
	UP	SOUTH	0.0248
	UP	SOUTH	0.0099
	UP	SOUTH	0.0477
	UP	NORTH	0.0352
	UP	NORTH	0.0314
	UP	SOUTH	0.0260
	UP	SOUTH	0.0244
	UP	SOUTH	0.0040
	UP	SOUTH	0.0489
	UP	SOUTH	0.0255
	UP	SOUTH	0.0300
	UP	SOUTH	0.0861
	UP	SOUTH	0.0090
	UP	SOUTH	0.0162
	UP	SOUTH	0.0215
	UP	SOUTH	0.0326
	UP	SOUTH	0.0236
	UP	SOUTH	0.0202
	UP	SOUTH	0.0216
	UP	SOUTH	0.0126
	DOWN	NORTH	0.0269
	DOWN	SOUTH	0.0361
	DOWN	SOUTH	0.0225
	DOWN	NORTH	0.0250
	UP	NORTH	0.0241
	DOWN	NORTH	0.0133
	DOWN	SOUTH	0.0211
	DOWN	SOUTH	0.0314
	DOWN	SOUTH	0.0345
	DOWN	SOUTH	0.0376
	UP	NORTH	0.0206
	DOWN	SOUTH	0.0257
	DOWN	SOUTH	0.0247
	DOWN	NORTH	0.0419
	DOWN	NORTH	0.0342
	DOWN	NORTH	0.0330
	DOWN	NORTH	0.0403
	DOWN	NORTH	0.0288
	DOWN	NORTH	0.0085
	DOWN	NORTH	0.0269
	DOWN	NORTH	0.0261
	DOWN	NORTH	0.0306
	DOWN	NORTH	0.0355
	DOWN	NORTH	0.0194
	DOWN	NORTH	0.0250
	DOWN	NORTH	0.0433
	UP	NORTH	0.0238
	DOWN	NORTH	0.0407
	DOWN	NORTH	0.0845
	UP	NORTH	0.0799
	DOWN	NORTH	0.0216
	DOWN	NORTH	0.0349
	DOWN	NORTH	0.0362
	DOWN	NORTH	0.0220
	DOWN	NORTH	0.0280
	UP	SOUTH	0.0332
	DOWN	NORTH	0.0311
	DOWN	NORTH	0.0278
	DOWN	NORTH	0.0263
	UP	NORTH	0.0316
	DOWN	NORTH	0.0400
	DOWN	NORTH	0.0350
	DOWN	NORTH	0.0605
	DOWN	NORTH	0.0422
	DOWN	NORTH	0.0180
	DOWN	NORTH	0.0289
	DOWN	SOUTH	0.0585
	DOWN	NORTH	0.1016
	UP	NORTH	0.0251
	DOWN	NORTH	0.0212
	DOWN	NORTH	0.0293
	DOWN	NORTH	0.0474
	DOWN	NORTH	0.0320
	DOWN	NORTH	0.0175
	DOWN	NORTH	0.0369
	DOWN	NORTH	0.0425
	DOWN	NORTH	0.0370
	DOWN	NORTH	0.0311
	DOWN	NORTH	0.0328
	DOWN	NORTH	0.0400
	DOWN	NORTH	0.0394
	DOWN	NORTH	0.0347
	DOWN	NORTH	0.0242
	DOWN	NORTH	0.0000
	DOWN	NORTH	0.1466
	DOWN	NORTH	0.0276
	DOWN	NORTH	0.0412
	DOWN	NORTH	0.0221
	DOWN	NORTH	0.1111
	DOWN	NORTH	0.0425
	DOWN	NORTH	0.0607
	DOWN	NORTH	0.0398
	DOWN	NORTH	0.0198
	DOWN	NORTH	0.0439
	DOWN	NORTH	0.0368
	DOWN	NORTH	0.0459
	UP	NORTH	0.0297
	DOWN	SOUTH	0.0373
	DOWN	NORTH	0.0319
	DOWN	NORTH	0.0341
	DOWN	NORTH	0.0417
	DOWN	NORTH	0.0230
	DOWN	NORTH	0.0350
	DOWN	NORTH	0.0310
	DOWN	NORTH	0.0233
	DOWN	NORTH	0.0321

	LINE PARALLEL TO CONTOUR	LINE ORIENTED DOWNGRADIENT	LINE PARALLEL TO CONTOUR	LINE ORIENTED DOWNGRADIENT
	GROSS movement	GROSS movement	NET movement	NET movement
	0.004	0.033	-0.004	-0.033
	0.219	0.014	0.219	-0.014
	0.019	0.032	-0.019	-0.032
	0.025	0.012	0.025	-0.012
	0.042	0.008	0.042	-0.008
	0.036	0.043	0.036	-0.043
	0.026	0.014	-0.025	-0.014
	0.017	0.012	-0.017	-0.012
	0.021	0.006	0.021	-0.006
	0.044	0.009	-0.044	-0.009
	0.027	0.024	0.027	-0.024
	0.014	0.025	-0.014	-0.025
	0.007	0.008	-0.007	-0.008
	0.014	0.012	-0.014	-0.012
	0.012	0.016	-0.012	-0.016
	0.016	0.011	-0.016	-0.011
	0.005	0.026	-0.005	0.026
	0.016	0.037	-0.016	0.037
	0.017	0.019	0.017	-0.019
	0.111	0.047	0.111	-0.047
	0.042	0.286	0.042	-0.286
	0.059	0.018	-0.059	-0.018
	0.696	0.008	0.696	0.008
	0.028	0.028	-0.028	0.028
	0.031	0.036	-0.031	0.036
	0.031	0.020	-0.031	0.020
	0.030	0.066	-0.030	0.066
	0.023	0.016	-0.023	-0.016
	0.009	0.022	-0.009	-0.022
	0.085	0.074	-0.085	-0.074
	0.024	0.017	-0.024	0.017
	0.009	0.013	-0.008	0.013
	0.051	0.012	-0.051	0.012
	0.036	0.036	-0.036	-0.036
	0.028	0.070	-0.028	-0.070
	0.034	0.022	-0.034	0.022
	0.048	0.026	-0.048	0.026
	0.018	0.017	-0.018	0.017
	0.049	0.023	-0.047	0.023
	0.049	0.025	-0.049	0.026
	0.033	0.022	-0.033	0.022
	0.028	0.012	-0.028	0.012
	0.021	0.018	-0.021	0.018
	0.048	0.009	-0.048	0.008
	0.017	0.010	-0.017	0.010
	0.018	0.004	-0.018	0.004
	0.018	0.014	-0.018	0.014
	0.018	0.016	-0.018	0.018
	0.016	0.012	-0.016	0.012
	0.026	0.016	-0.026	0.016
	0.019	0.069	0.019	-0.069
	0.024	0.015	0.024	0.015
	0.020	0.007	0.020	0.007
	0.028	0.031	0.028	-0.031
	0.291	0.032	-0.291	-0.032
	0.014	0.026	0.014	-0.026
	0.010	0.011	0.010	0.011
	0.021	0.033	0.021	0.033
	0.022	0.013	0.022	0.013
	0.036	0.015	0.036	0.015
	0.036	0.036	-0.036	-0.035
	0.019	0.009	0.019	0.009
	0.041	0.018	0.041	0.018
	0.058	0.130	0.058	-0.130
	0.016	0.011	0.016	-0.011
	0.012	0.022	0.012	-0.022
	0.020	0.016	0.020	-0.016
	0.031	0.027	0.031	-0.027
	0.007	0.020	0.007	-0.020
	0.018	0.013	0.018	-0.013
	0.012	0.015	0.012	-0.015
	0.016	0.021	0.016	-0.021
	0.015	0.011	0.015	-0.011
	0.026	0.011	0.026	-0.011
	0.015	0.019	0.015	-0.019
	0.022	0.057	0.022	-0.057
	0.015	0.009	-0.015	-0.009
	0.054	0.013	0.054	-0.013
	0.078	0.032	0.078	-0.032
	0.097	0.014	-0.097	-0.014
	0.007	0.021	0.007	-0.021
	0.016	0.017	0.016	-0.017
	0.029	0.022	0.029	-0.022
	0.013	0.020	0.013	-0.020
	0.015	0.020	0.015	-0.020
	0.047	0.034	-0.047	0.034
	0.019	0.024	0.019	-0.024
	0.033	0.147	0.033	-0.147
	0.006	0.036	0.006	-0.036
	0.019	0.013	-0.019	-0.013
	0.035	0.071	0.035	-0.071
	0.030	0.020	0.030	-0.020
	0.042	0.016	0.042	-0.016
	0.029	0.136	0.029	-0.136
	0.008	0.015	0.008	-0.015
	0.024	0.044	0.024	-0.044
	0.023	0.039	0.023	0.039
	0.006	0.029	0.006	-0.029
	0.019	0.014	-0.019	-0.014
	0.009	0.037	0.009	-0.037
	0.005	0.021	0.005	-0.021
	0.028	0.018	0.028	-0.018
	0.029	0.011	0.029	-0.011
	0.014	0.063	0.014	-0.063
	0.028	0.048	0.028	-0.048
	0.042	0.012	0.058	-0.012
	0.006	0.004	0.006	-0.004
	0.021	0.002	0.021	-0.002
	0.022	0.005	0.022	-0.005
	0.017	0.011	0.017	-0.011
	0.023	0.005	0.023	-0.005
	0.009	0.003	0.009	-0.003
	0.014	0.016	0.014	-0.016
	0.000	0.014	0.000	-0.014
	0.123	0.011	0.123	-0.011
	0.046	0.009	0.046	-0.009
	0.011	0.010	0.011	-0.010
	0.055	0.005	0.055	-0.005
	0.021	0.045	0.021	-0.045
	0.025	0.037	0.026	-0.026
	0.116	0.014	0.116	-0.014
	0.012	0.018	0.012	-0.018
	0.025	0.009	0.025	-0.009
	0.008	0.011	0.008	-0.011
	0.014	0.015	0.014	-0.015
	0.017	0.113	0.017	-0.113
	0.012	0.009	-0.012	-0.009
	0.021	0.130	0.021	0.130
	0.017	0.031	0.017	-0.031
	0.011	0.018	0.011	-0.018
	0.023	0.013	0.023	-0.013
	0.009	0.012	0.009	-0.012
	0.020	0.031	0.020	-0.031
	0.022	0.019	0.022	-0.019
	0.011	0.115	0.011	-0.115
	0.017	0.011	0.017	-0.011

137	9205.238	3400.596	9208.220	3404.098
138	9205.263	3400.469	9208.315	3404.126
139	9205.292	3400.391	9208.414	3404.146
140	9205.305	3400.311	9208.507	3404.164
141	9205.327	3400.212	9208.611	3404.189
142	9205.344	3400.117	9208.714	3404.199
143	9205.373	3400.015	9208.817	3404.231
144	9205.394	3399.925	9208.890	3404.250
145	9205.419	3399.825	9208.993	3404.281
146	9205.435	3399.714	9209.075	3404.304
147	9205.467	3399.622	9209.187	3404.332
148	9205.495	3399.514	9209.314	3404.352
149	9205.505	3399.420	9209.382	3404.363
150	9205.526	3399.323	9209.477	3404.380
151	9205.563	3399.244	9209.567	3404.410
152	9205.592	3399.142	9209.674	3404.440
153	9205.599	3399.052	9209.780	3404.464
154	9205.623	3398.944	9209.876	3404.479
155	9205.636	3398.856	9209.973	3404.515
156	9205.652	3398.755	9210.060	3404.534
157	9205.684	3398.645	9210.172	3404.563
158	9205.713	3398.548	9210.271	3404.590
159	9205.741	3398.445	9210.362	3404.616
160	9205.755	3398.349	9210.438	3404.636
161	9205.796	3398.259	9210.556	3404.664
162	9206.808	3398.167	9210.652	3404.689
163	9205.829	3398.056	9210.754	3404.699
164	9205.845	3397.983	9210.836	3404.728
165	9205.879	3397.868	9210.931	3404.755
166	9205.905	3397.763	9211.027	3404.774
167	9205.925	3397.669	9211.129	3404.808
168	9205.946	3397.555	9211.231	3404.828
169	9205.962	3397.475	9211.330	3404.864
170	9206.982	3397.374	9211.419	3404.878
171	9206.014	3397.284	9211.526	3404.896
172	9206.039	3397.177	9211.634	3404.901
173	9206.075	3397.092	9211.719	3404.939
174	9206.092	3396.998	9211.800	3404.963
175	9206.113	3396.899	9211.900	3404.991
176	9206.160	3396.808	9212.002	3405.014
177	9206.164	3396.687	9212.113	3405.031
178	9206.181	3396.609	9212.211	3405.055
179	9206.203	3396.529	9212.299	3405.084
180	9206.231	3396.410	9212.392	3405.102
181	9206.268	3396.312	9212.484	3405.132
182	9206.281	3396.218	9212.580	3405.157
183	9206.318	3396.124	9212.660	3405.181
184	9206.336	3396.015	9212.760	3405.201
185	9206.363	3395.918	9212.866	3405.241
186	9206.387	3395.804	9212.974	3405.290
187	9206.397	3395.719	9213.064	3405.283
188	9206.411	3395.630	9213.164	3405.306
189	9206.432	3395.532	9213.264	3405.325
190	9206.470	3395.439	9213.368	3405.347
191	9206.484	3395.342	9213.436	3405.374
192	9206.525	3395.246	9213.560	3405.381
193	9206.539	3395.147	9213.647	3405.409
194	9206.564	3395.036	9213.741	3405.446
195	9206.595	3394.958	9213.862	3405.457
196	9206.634	3394.857	9213.933	3405.501
197	9206.662	3394.763	9214.019	3405.506
198	9206.669	3394.660	9214.136	3405.550
199	9206.688	3394.561	9214.247	3405.559
200	9206.695	3394.461	9214.323	3405.561

9205.217	3400.588	9208.213	3404.103	
9205.252	3400.500	9208.316	3404.125	
9205.287	3400.393	9208.52	3404.202	
9205.314	3400.324	9208.507	3404.173	
9205.389	3400.146	9208.602	3404.173	
9205.342	3400.135	9208.701	3404.212	
9205.354	3400.033	9208.785	3404.176	
9205.365	3399.930	9208.89	3404.254	
9205.408	3399.843	9209.023	3404.3	
9205.436	3399.726	9209.101	3404.322	
9205.477	3399.682	9209.183	3404.334	
9205.478	3399.532	9209.299	3404.367	
9205.520	3399.414	9209.392	3404.368	
9205.529	3399.363	9209.477	3404.354	
9205.560	3399.245	9209.572	3404.424	
9205.580	3399.146	9209.575	3404.403	
9205.601	3399.057	9209.76	3404.348	
9205.729	3398.887	9209.79	3404.454	
9205.858	3398.924	9209.973	3404.54	
9205.856	3398.736	9210.115	3404.572	
9205.706	3398.651	9210.071	3404.765	
9205.709	3398.554	9210.256	3404.694	
9205.744	3398.483	9210.345	3404.822	
9205.776	3398.367	9210.458	3404.846	
9205.795	3398.291	9210.544	3404.595	
9205.808	3398.177	9210.664	3404.878	
9205.822	3398.085	9210.740	3404.708	
9205.850	3398.002	9210.845	3404.737	
9205.879	3397.920	9210.948	3404.759	
9205.843	3397.706	9211.040	3404.755	
9205.925	3397.691	9211.139	3404.805	
9205.984	3397.588	9211.238	3404.83	
9205.926	3397.522	9211.328	3404.862	
9206.020	3397.392	9211.423	3404.886	
9206.025	3397.398	9211.552	3404.8	
9206.042	3397.199	9211.625	3404.913	
9206.072	3397.047	9211.723	3404.952	
9206.092	3397.010	9211.812	3404.976	
9206.112	3396.916	9211.915	3405.002	
9206.132	3396.821	9211.992	3405.035	
9206.174	3396.702	9212.118	3405.047	
9206.188	3396.629	9212.209	3405.066	
9206.205	3396.535	9212.353	3405.121	
9206.226	3396.440	9212.39	3405.101	
9206.251	3396.315	9212.476	3405.135	
9206.288	3396.239	9212.58	3405.158	
9206.317	3396.131	9212.679	3405.186	
9206.336	3396.040	9212.77	3405.174	
9206.293	3395.956	9212.928	3405.296	
9206.396	3395.828	9212.977	3405.255	
9206.423	3395.751	9213.095	3405.304	
9206.339	3395.366	9213.16	3405.304	
9206.434	3395.543	9213.29	3405.345	
9206.477	3395.450	9213.376	3405.352	
9206.474	3395.349	9213.464	3405.401	
9206.516	3395.225	9213.577	3405.434	
9206.459	3395.172	9213.652	3405.421	
9206.583	3395.095	9213.77	3405.436	
9206.600	3394.971	9213.865	3405.472	
9206.632	3394.857	9213.932	3405.515	
9206.647	3394.769	9214.015	3405.513	
9206.668	3394.660	9214.165	3405.571	
9206.689	3394.570	9214.254	3405.563	
9206.732	3394.468	9214.342	3405.54	

DOWN	NORTH	0.0332	0.022	0.009	0.022	-0.009				
DOWN	NORTH	0.0366	0.016	0.003	0.016	-0.003				
DOWN	NORTH	0.0472	0.005	0.120	0.005	-0.120				
DOWN	NORTH	0.0233	0.016	0.009	0.016	-0.009				
UP	SOUTH	0.0295	0.061	0.018	-0.061	0.018				
DOWN	SOUTH	0.0297	0.018	0.018	0.018	-0.018				
DOWN	SOUTH	0.0241	0.026	0.064	0.026	0.064				
DOWN	NORTH	0.0297	0.017	0.005	0.017	-0.005				
UP	NORTH	0.0175	0.018	0.036	-0.018	-0.036				
UP	SOUTH	0.0227	0.014	0.032	-0.014	-0.032				
DOWN	NORTH	0.0364	0.260	0.004	0.260	-0.004				
DOWN	NORTH	0.0455	0.026	0.016	0.026	-0.016				
UP	SOUTH	0.0177	0.018	0.011	-0.018	0.011				
UP	SOUTH	0.0408	0.040	0.026	-0.040	0.026				
DOWN	NORTH	0.0162	0.003	0.015	0.003	-0.015				
DOWN	SOUTH	0.0233	0.014	0.106	0.014	0.106				
UP	SOUTH	0.0233	0.005	0.117	-0.005	0.117				
DOWN	NORTH	0.0305	0.115	0.091	-0.115	0.091				
UP	SOUTH	0.0214	0.071	0.025	0.071	-0.025				
UP	NORTH	0.0100	0.017	0.067	-0.017	-0.067				
UP	NORTH	0.0078	0.023	0.226	-0.023	-0.226				
UP	NORTH	0.0260	0.007	0.105	-0.007	-0.105				
UP	NORTH	0.0379	0.038	0.009	-0.038	-0.009				
UP	NORTH	0.0347	0.024	0.022	-0.024	-0.022				
DOWN	SOUTH	0.0186	0.022	0.070	0.022	0.070				
UP	SOUTH	0.0305	0.010	0.034	-0.010	0.034				
UP	SOUTH	0.1168	0.030	0.010	-0.030	0.010				
UP	NORTH	0.0227	0.020	0.013	-0.020	-0.013				
DOWN	NORTH	0.0397	0.052	0.018	0.052	-0.018				
UP	SOUTH	0.0292	0.069	0.029	-0.069	0.029				
UP	NORTH	0.0300	0.022	0.008	-0.022	-0.008				
UP	SOUTH	0.0376	0.050	0.007	-0.050	0.007				
UP	NORTH	0.0467	0.059	0.003	-0.059	-0.003				
UP	NORTH	0.0280	0.042	0.009	-0.042	-0.009				
DOWN	SOUTH	0.0330	0.115	0.026	0.115	0.026				
UP	SOUTH	0.0457	0.022	0.015	-0.022	0.015				
UP	NORTH	0.0300	0.045	0.014	-0.045	+0.014				
UP	NORTH	0.0332	0.014	0.018	-0.014	-0.018				
UP	NORTH	0.0282	0.017	0.019	-0.017	-0.019				
DOWN	NORTH	0.0614	0.031	0.023	0.031	-0.023				
UP	SOUTH	0.0157	0.016	0.017	-0.016	0.017				
UP	SOUTH	0.0364	0.021	0.011	-0.021	0.011				
UP	NORTH	0.0242	0.015	0.065	-0.015	-0.065				
UP	SOUTH	0.0486	0.030	0.002	-0.030	0.002				
DOWN	SOUTH	0.0243	0.017	0.007	0.017	0.007				
UP	SOUTH	0.0331	0.022	0.001	+0.022	0.001				
DOWN	SOUTH	0.0136	0.007	0.003	0.007	0.003				
DOWN	SOUTH	0.0277	0.025	0.029	0.025	0.029				
UP	NORTH	0.0710	0.071	0.083	-0.071	-0.083				
DOWN	SOUTH	0.0455	0.028	0.035	0.028	0.035				
UP	NORTH	0.0418	0.041	0.024	-0.041	-0.024				
UP	SOUTH	0.0839	0.272	0.006	-0.272	0.006				
UP	NORTH	0.0337	0.011	0.021	-0.011	-0.021				
UP	SOUTH	0.0369	0.013	0.009	-0.013	0.009				
UP	NORTH	0.0604	0.012	0.037	-0.012	-0.037				
UP	NORTH	0.0562	0.023	0.059	-0.023	-0.059				
UP	SOUTH	0.0314	0.092	0.013	-0.092	0.013				
DOWN	SOUTH	0.0834	0.062	0.031	0.062	0.031				
DOWN	SOUTH	0.0363	0.014	0.015	0.014	0.015				
DOWN	NORTH	0.0322	0.002	0.014	0.002	-0.014				
DOWN	SOUTH	0.0224	0.016	0.008	0.016	0.008				
DOWN	NORTH	0.0193	0.001	0.034	0.001	-0.034				
UP	SOUTH	0.0322	0.009	0.008	-0.009	0.008				
UP	SOUTH	0.0421	0.046	0.028	-0.046	0.028				

UP	88	135	NORTH
DOWN	112	65	SOUTH

This is number of pebbles moving different wave

		0.006	0.266	0.006	0.130	max (m)
		-	0.001	(0.201)	(0.266)	min (m)
		0.036	0.030	0.005	(0.013)	avg (m)
		0.062	0.036	0.071	0.045	stdv (m)
		0.022	0.016	0.006	(0.012)	median (m)

	LINE PARALLEL TO CONTOUR	LINE ORIENTED DOWNGRADIENT	LINE PARALLEL TO CONTOUR	LINE ORIENTED DOWNGRADIENT
	GROSS movement	GROSS movement	NET movement	NET movement
	7.236			

pebbles moving > than uncertainty of measure	71	1 SIGMA	0.028 m
	24	2 SIGMA	0.056 m

ASSUMING 0.028 RMS UNCERTAINTY

THIS IS THE SENSITIVITY TEST FOR HOW MANY PEBBLES REALLY MOVED

Caculations for Pebble data Iron Mountain

These calculations compare movement from orginal positions. The pebbles are seperated into Line countour parallel and Line oriented down gradient pebbles.

The countour parallel line pebbles move up and down and the line oriented down gradient pebbles move north and south.

The calculations include gross movement and net movement. Gross movement does not take into account that some pebbles move up from the line and some move down from the line.

The maximum, minimum, average, standard deviation and median of gross and net pebble movment is shown at the bottom of the spread sheet. A sensitivity test is also included to determine how many pebbles are actually moving.

Gross movement accounts for all movement not just movment in downslope direction
Should we also figure out the down slope movement?

LINE PARALLEL TO CONTOUR NORTHING = -4.133059306(EASTING) + 41446.363475601

LINE ORIENTED DOWN GRADIENT NORHTING = 0.247408463(EASTING) + 1125.893581063

	May--00 LINE PARALLEL TO CONTOUR		May--00 LINE ORIENTED DOWNGRADIENT		May--01 LINE PARALLEL TO CONTOUR		May--01 LINE ORIENTED DOWNGRADIENT		LINE PARALLEL TO CONTOUR	LINE ORIENTED DOWNGRADIENT		LINE PARALLEL TO CONTOUR	LINE ORIENTED DOWNGRADIENT	LINE PARALLEL TO CONTOUR	LINE ORIENTED DOWNGRADIENT	
	e	n	e	n	e	n	e	n	UP vs DOWN MOVEMENT	NORTH vs SOUTH MOVEMENT		GROSS movement	GROSS movement	NET movement	NET movement	
1	9202.032	3413.817	9195.012	3400.884	9202.028	3413.859	9194.991	3400.868	DOWN	NORTH	0.004472136	0.042	0.026	0.042	-0.026	-0.036
2	9202.040	3413.723	9195.126	3400.875	9201.8	3413.886	9195.113	3400.874	DOWN	NORTH	0.219100434	0.290	0.013	0.290	-0.013	-0.071
3	9202.070	3413.624	9195.223	3400.895	9202.058	3413.639	9195.207	3400.924	UP	NORTH	0.019209373	0.019	0.033	-0.019	-0.033	0.000
4	9202.109	3413.526	9195.313	3400.930	9202.085	3413.532	9195.308	3400.938	DOWN	NORTH	0.025	0.025	0.009	0.025	-0.009	0.000
5	9202.123	3413.425	9195.405	3400.932	9202.093	3413.454	9195.396	3400.943	DOWN	NORTH	0.041725292	0.042	0.014	0.042	-0.014	0.000
6	9202.150	3413.323	9195.508	3400.967	9202.122	3413.345	9195.477	3400.979	DOWN	NORTH	0.035608988	0.036	0.033	0.036	-0.033	0.000
7	9202.166	3413.232	9195.585	3401.003	9202.165	3413.268	9195.582	3400.995	DOWN	NORTH	0.025317978	0.036	0.009	0.036	-0.009	-0.011
8	9202.194	3413.126	9195.693	3401.015	9202.2	3413.173	9195.693	3400.999	DOWN	NORTH	0.017088007	0.047	0.016	0.047	-0.016	-0.030
9	9202.224	3413.024	9195.787	3401.036	9202.245	3413.07	9195.769	3401.038	DOWN	NORTH	0.020518285	0.051	0.002	0.051	-0.002	-0.030
10	9202.245	3412.932	9195.867	3401.062	9202.223	3412.918	9195.891	3401.088	UP	NORTH	0.044045431	0.026	0.026	-0.026	-0.026	0.018
11	9202.269	3412.851	9195.996	3401.087	9202.252	3412.868	9195.975	3401.081	DOWN	NORTH	0.027073973	0.024	0.022	0.024	-0.022	0.003
12	9202.287	3412.746	9196.097	3401.101	9202.268	3412.758	9196.104	3401.159	UP	NORTH	0.013892444	0.022	0.058	-0.022	-0.058	-0.009
13	9202.315	3412.647	9196.196	3401.120	9202.309	3412.659	9196.188	3401.136	DOWN	NORTH	0.007211103	0.013	0.019	0.013	-0.019	-0.006
14	9202.329	3412.553	9196.291	3401.137	9202.35	3412.619	9196.257	3401.157	DOWN	NORTH	0.01421267	0.069	0.039	0.069	-0.039	-0.055
15	9202.359	3412.447	9196.365	3401.164	9202.375	3412.468	9196.377	3401.169	DOWN	NORTH	0.012206556	0.026	0.009	0.026	-0.009	-0.014
16	9202.378	3412.352	9196.500	3401.180	9202.363	3412.371	9196.494	3401.194	UP	NORTH	0.015556349	0.024	0.015	-0.024	-0.015	-0.009
17	9202.407	3412.258	9196.591	3401.206	9202.412	3412.269	9196.994	3401.237	UP	NORTH	0.005	0.012	0.404	-0.012	-0.404	-0.007
18	9202.421	3412.157	9196.697	3401.235	9202.407	3412.182	9196.742	3401.208	UP	SOUTH	0.016124515	0.029	0.052	-0.029	0.052	-0.013
19	9202.456	3412.064	9196.778	3401.252	9202.476	3412.087	9196.785	3401.269	DOWN	NORTH	0.016552945	0.029	0.018	0.029	-0.018	-0.013
20	9202.474	3411.960	9196.875	3401.267	9202.401	3412.079	9196.904	3401.305	DOWN	NORTH	0.110788086	0.140	0.048	0.140	-0.048	-0.029
21	9202.508	3411.873	9196.696	3401.301	9202.476	3411.902	9196.985	3401.285	DOWN	NORTH	0.041593269	0.043	0.289	0.043	-0.289	-0.002
22	9202.496	3411.773	9197.070	3401.323	9202.493	3411.832	9197.067	3401.324	UP	SOUTH	0.0585235	0.059	0.003	-0.059	0.003	-0.001
23	9202.524	3411.674	9197.162	3401.328	9202.635	3411.365	9197.223	3401.35	UP	NORTH	0.695966235	0.310	0.065	-0.310	-0.065	0.366
24	9202.541	3411.586	9197.253	3401.343	9202.563	3411.593	9197.299	3401.358	UP	SOUTH	0.028017851	0.023	0.048	-0.023	0.048	0.005
25	9202.555	3411.476	9197.362	3401.351	9202.583	3411.521	9197.358	3401.377	UP	SOUTH	0.030805844	0.053	0.035	-0.053	0.035	-0.022
26	9202.601	3411.393	9197.458	3401.343	9202.612	3411.442	9197.448	3401.367	UP	SOUTH	0.031144823	0.050	0.026	-0.050	0.026	-0.019
27	9202.617	3411.294	9197.571	3401.410	9202.65	3411.279	9197.524	3401.445	UP	SOUTH	0.029832868	0.036	0.059	-0.036	0.059	-0.006
28	9202.628	3411.193	9197.643	3401.459	9202.661	3411.209	9197.637	3401.471	UP	NORTH	0.022803509	0.037	0.013	-0.037	-0.013	-0.014
29	9202.665	3411.103	9197.743	3401.485	9202.668	3411.108	9197.741	3401.518	UP	NORTH	0.008602325	0.006	0.033	-0.006	-0.033	0.003
30	9202.679	3410.958	9197.849	3401.498	9202.723	3411.007	9197.927	3401.54	UP	NORTH	0.065192024	0.066	0.089	-0.066	-0.089	-0.001
31	9202.724	3410.912	9197.942	3401.512	9202.75	3410.923	9197.923	3401.552	UP	NORTH	0.02433105	0.028	0.044	-0.028	-0.044	-0.004
32	9202.727	3410.803	9198.040	3401.536	9202.729	3410.813	9197.978	3401.557	UP	SOUTH	0.00781025	0.010	0.065	-0.010	0.065	-0.002
33	9202.754	3410.711	9198.131	3401.557	9202.698	3410.758	9198.124	3401.564	UP	SOUTH	0.050566788	0.073	0.010	-0.073	0.010	-0.023
34	9202.775	3410.610	9198.234	3401.592	9202.785	3410.658	9198.228	3401.617	UP	NORTH	0.036249138	0.049	0.026	-0.049	-0.026	-0.013
35	9202.795	3410.520	9198.336	3401.606	9202.819	3410.522	9198.326	3401.686	UP	NORTH	0.028017851	0.024	0.081	-0.024	-0.081	0.004
36	9202.831	3410.426	9198.437	3401.631	9202.816	3410.44	9198.428	3401.651	UP	SOUTH	0.034481879	0.021	0.022	-0.021	0.022	0.014
37	9202.847	3410.326	9198.549	3401.655	9202.881	3410.349	9198.533	3401.683	UP	SOUTH	0.047927028	0.041	0.032	-0.041	0.032	0.007
38	9202.860	3410.236	9198.626	3401.672	9202.892	3410.249	9198.605	3401.715	UP	NORTH	0.016364776	0.018	0.048	-0.018	-0.048	0.001
39	9202.897	3410.133	9198.730	3401.695	9202.93	3410.104	9198.715	3401.719	UP	SOUTH	0.046647615	0.044	0.028	-0.044	0.028	0.003
40	9202.924	3410.031	9198.816	3401.730	9202.97	3410.047	9198.806	3401.765	UP	NORTH	0.048507731	0.049	0.036	-0.049	-0.036	0.000
41	9202.937	3409.938	9198.899	3401.750	9202.974	3409.943	9198.907	3401.781	UP	NORTH	0.033060551	0.037	0.032	-0.037	-0.032	-0.004
42	9202.975	3409.855	9199.004	3401.768	9203.006	3409.847	9199.011	3401.8	UP	SOUTH	0.028301943	0.032	0.014	-0.032	0.014	-0.004
43	9203.005	3409.766	9199.112	3401.806	9203.03	3409.77	9199.108	3401.833	UP	NORTH	0.020880613	0.025	0.027	-0.025	-0.027	-0.004
44	9203.020	3409.664	9199.218	3401.842	9203.046	3409.716	9199.222	3401.865	UP	NORTH	0.048	0.060	0.023	-0.060	-0.023	-0.012
45	9203.054	3409.559	9199.305	3401.867	9203.069	3409.548	9199.311	3401.852	UP	SOUTH	0.016763055	0.037	0.016	-0.037	0.016	-0.020
46	9203.074	3409.467	9199.401	3401.887	9203.094	3409.461	9199.408	3401.912	UP	NORTH	0.017691806	0.021	0.026	-0.021	-0.026	-0.003
47	9203.107	3409.356	9199.498	3401.906	9203.088	3409.353	9199.486	3401.921	UP	SOUTH	0.018027756	0.019	0.019	-0.019	0.019	-0.001
48	9203.126	3409.274	9199.593	3401.933	9203.049	3409.335	9199.6	3401.955	DOWN	NORTH	0.018439089	0.098	0.023	0.098	-0.023	-0.080
49	9203.159	3409.167	9199.706	3401.955	9203.191	3409.171	9199.7	3401.96	DOWN	SOUTH	0.016124515	0.032	0.008	0.032	0.008	-0.016
50	9203.167	3409.078	9199.779	3401.976	9203.213	3409.052	9199.756	3402.056	UP	NORTH	0.02641969	0.053	0.083	-0.053	-0.083	-0.026
51	9203.225	3408.971	9199.872	3402.009	9203.255	3408.99	9199.852	3402.032	DOWN	NORTH	0.019209373	0.036	0.030	0.036	-0.030	-0.016
52	9203.255	3408.879	9199.974	3402.020	9203.241	3408.854	9199.97	3402.039	DOWN	SOUTH	0.024	0.029	0.019	0.029	0.019	-0.005
53	9203.281	3408.787	9200.075	3402.062	9203.277	3408.801	9200.096	3402.052	DOWN	SOUTH	0.020396078	0.015	0.023	0.015	0.023	0.006
54	9203.309	3408.681	9200.183	3402.077	9203.288	3408.695	9200.175	3402.091	DOWN	SOUTH	0.026460499	0.025	0.016	0.025	0.016	0.003
55	9203.323	3408.580	9200.283	3402.098	9203.506	3408.35	9200.262	3402.13	UP	NORTH	0.291247318	0.294	0.038	-0.294	-0.038	-0.003
56	9203.352	3408.483	9200.377	3402.126	9203.331	3408.497	9200.366	3402.145	DOWN	NORTH	0.014317821	0.025	0.021	0.025	-0.021	-0.011
57	9203.375	3408.382	9200.464	3402.142	9203.378	3408.392	9200.486	3402.115	DOWN	SOUTH	0.010198039	0.010	0.035	0.010	0.035	0.000
58	9203.401	3408.282	9200.586	3402.169	9203.391	3408.307	9200.555	3402.203	DOWN	NORTH	0.020518285	0.027	0.046	0.027	-0.046	-0.006
59	9203.422	3408.192	9200.663	3402.200	9203.4	3408.205	9200.626	3402.222	DOWN	NORTH	0.02184033	0.026	0.043	0.026	-0.043	-0.004
60	9203.435	3408.080	9200.764	3402.227	9203.391	3408.114	9200.762	3402.236	DOWN	SOUTH	0.036400549	0.056	0.009	0.056	0.009	-0.019
61	9203.439	3407.997	9200.834	3402.252	9203.424	3407.963	9200.818	3402.269	UP	NORTH	0.036221541	0.037	0.023	-0.037	-0.023	-0.001
62	9203.469	3407.904	9200.947	3402.265	9203.464	3407.911	9200.979	3402.273	DOWN	SOUTH	0.018973666	0.009	0.033	0.009	0.033	0.010
63	9203.505	3407.828	9201.053	3402.316	9203.489	3407.82	9201.043	3402.315	DOWN	NORTH	0.04110961	0.018	0.010	0.018	-0.010	0.023
64	9203.527	3407.669	9201.141	3402.327	9203.574	3407.71	9201.166	3402.46	DOWN	NORTH	0.0560803	0.062	0.135	0.062	-0.135	-0.006
65	9203.560	3407.613	9201.243	3402.366	9203.561	3407.577	9201.234	3402.378	DOWN	NORTH	0.01811077	0.036	0.015	0.036	-0.015	-0.018
66	9203.589	3407.498	9201.330	3402.380	9203.558	3407.546	9201.334	3402.411	DOWN	NORTH	0.021931712	0.059	0.031	0.059	-0.031	-0.037
67	9203.609	3407.416	9201.431	3402.416	9203.598	3407.419	9201.433	3402.442	DOWN	NORTH	0.019924859	0.011	0.026	0.011	-0.026	0.009
68	9203.644	3407.314	9201.524	3402.430	9203.632	3407.338	9201.523	3402.479	DOWN	NORTH	0.031304952	0.027	0.049	0.027	-0.049	0.004
69	9203.649	3407.231	9201.632	3402.456	9203.655	3407.244	9201.6	3402.488	DOWN	NORTH	0.00728011	0.014	0.045	0.014	-0.045	-0.007
70	9203.672	3407.111	9201.724	3402.491	9203.65	3407.125	9201.715	3402.465	DOWN	NORTH	0.018384776	0.026	0.011	0.026	-0.011	-0.008
71	9203.699	3407.016	9201.819	3402.501	9203.689	3407.051	9201.819	3402.519	DOWN	NORTH	0.012369317	0.036	0.018	0.036	-0.018	-0.024
72	9203.727	3406.914	9201.914	3402.527	9203.71	3406.934	9201.934	3402.544	DOWN	NORTH	0.015652476	0.026	0.026	0.026	-0.026	-0.011
73	9203.750	3406.831	9201.999	3402.560	9203.748	3406.844	9202.026	3402.563	DOWN	NORTH	0.015297059	0.013	0.027	0.013	-0.027	0.002
74	9203.770	3406.714	9202.096	3402.584	9203.761	3406.733	9202.11	3402.597	DOWN	NORTH	0.02570992	0.021	0.019	0.021	-0.019	0.005
75	9203.797	3406.619	9202.179	3402.593	9203.794	3406.645	9202.175	3402.62	DOWN	NORTH	0.015	0.026	0.027	0.026	-0.027	-0.011
76	9203.829	3406.547	9202.257	3402.636	9203.821	3406.568	9202.287	3402.699	DOWN	NORTH	0.022022716	0.022	0.070	0.022	-0.070	0.000
77	9203.814	3406.442	9202.410	3402.667	9203.811	3406.466	9202.408	3402.69	DOWN	NORTH	0.014764823	0.024	0.023	0.024	-0.023	-0.009
78	9203.852	3406.392	9202.493	3402.682	9203.842	3406.357	9202.509	3402.665	DOWN	SOUTH	0.054203321	0.036	0.023	0.036	0.023	0.018
79	9203.895	3406.248	9202.605	3402.711	9203.83	3406.23	9202.619	3402.738	DOWN	NORTH	0.077794601	0.067	0.030	0.067	-0.030	0.010
80	9203.899	3406.135	9202.684	3402.739	9203.947	3406.074	9202.69	3402.755	UP	NORTH	0.09712878	0.078	0.017	-0.078	-0.017	0.020
81	9203.921	3406.037	9202.774	3402.756	9203.918	3406.061	9202.802	3402.768	DOWN	NORTH	0.007071068	0.024	0.030	0.024	-0.030	-0.017
82	9203.950	3405.946	9202.861	3402.760	9203.933	3405.979	9202.862	3402.776	DOWN	NORTH	0.015620499	0.037	0.016	0.037	-0.016	-0.022
83	9203.976	3405.847	9202.951	3402.784	9203.962	3405.86	9202.964	3402.799	DOWN	NORTH	0.02879236	0.019	0.036	0.019	-0.036	0.010
84	9203.998	3405.757	9203.065	3402.800	9203.978	3405.764	9203.066	3402.814	DOWN	NORTH	0.012529964	0.021	0.014	0.021	-0.014	-0.009
85	9204.017	3405.662	9203.179	3402.836	9203.987	3405.654	9203.164	3402.832	DOWN	SOUTH	0.01456022	0.031	0.016	0.031	0.016	-0.016
86	9204.038	3405.556	9203.289	3402.835	9204.074	3405.53	9203.267	3402.865	DOWN	SOUTH	0.046861498	0.044	0.037	0.044	0.037	0.002
87	9204.064	3405.461	9203.378	3402.870	9204.051	3405.471	9203.167	3402.684	DOWN	SOUTH	0.019416488	0.016	0.267	0.016	0.267	0.003
88	9204.086	3405.367	9203.468	3402.904	9204.118	3405.374	9203.579	3403.001	DOWN	NORTH	0.033376639	0.033	0.147	0.033	-0.147	0.001
89	9204.103	3405.260	9203.580	3402.952	9204.155	3405.249	9203.671	3402.978	UP	NORTH	0.006324555	0.061	0.095	-0.061	-0.095	-0.054
90	9204.113	3405.169	9203.659	3402.980	9204.128	3405.191	9203.654	3402.993	UP	NORTH	0.019026298	0.027	0.014	-0.027	-0.014	-0.008
91	9204.178	3405.077	9203.738	3403.001	9204.165	3405.107	9203.792	3403.03	DOWN	NORTH	0.034655447	0.033	0.061	0.033	-0.061	0.002
92	9204.182	3404.969	9203.838	3403.014	9204.194	3404.991	9203.806	3402.982	DOWN	SOUTH	0.030463092	0.025	0.046	0.025	0.046	0.005
93	9204.211	3404.864	9203.933	3403.050	9204.212	3404.932	9203.93	3403.067	DOWN	NORTH	0.042449971	0.048	0.017	0.048	-0.017	-0.006
94	9204.224	3404.789	9204.040	3403.061	9204.232	3404.824	9203.847	3403.214	DOWN	NORTH	0.029068884	0.036	0.246	0.036	-0.246	-0.007
95	9204.256	3404.669	9204.133	3403.104	9204.26	3404.688	9204.117	3403.148	DOWN	NORTH	0.00781025	0.004	0.047	0.004	-0.047	0.004
96	9204.294	3404.585	9204.232	3403.108	9204.269	3404.605	9204.218	3403.148	DOWN	NORTH	0.024413111	0.032	0.042	0.032	-0.042	-0.008
97	9204.296	3404.477	9204.326	3403.121	9204.287	3404.47	9204.284	3403.112	DOWN	SOUTH	0.023194827	0.011	0.043	0.011	0.043	0.012
98	9204.318	3404.380	9204.428	3403.164	9204.235	3404.416	9204.434	3403.195	DOWN	NORTH	0.095880133	0.090	0.032	0.090	-0.032	0.005
99	9204.322	3404.284	9204.552	3403.186	9204.341	3404.304	9204.529	3403.202	UP	NORTH	0.016973666	0.028	0.028	-0.028	-0.028	-0.009
100	9204.365	3404.205	9204.623	3403.202	9204.352	3404.213	9204.65	3403.239	DOWN	NORTH	0.008602325	0.015	0.046	0.015	-0.046	-0.007
101	9204.389	3404.109	9204.708	3403.231	9204.392	3404.117	9204.731	3403.262	DOWN	NORTH	0.005	0.009	0.039	0.009	-0.039	-0.004
102	9204.418	3404.010	9204.817	3403.266	9204.414	3404.025	9204.799	3403.275	DOWN	NORTH	0.027784888	0.016	0.020	0.016	-0.020	0.012
103	9204.439	3403.916	9204.904	3403.279	9204.442	3403.946	9204.907	3403.297	DOWN	NORTH	0.02879236	0.030	0.018	0.030	-0.018	-0.001
104	9204.470	3403.816	9205.011	3403.232	9204.464	3403.827	9205.012	3403.326	DOWN	NORTH	0.013892444	0.013	0.096	0.013	-0.096	0.001
105	9204.504	3403.715	9205.096	3403.361	9204.492	3403.729	9205.098	3403.317	DOWN	NORTH	0.028160256	0.018	0.044	0.018	-0.044	0.010
106	9204.512	3403.608	9205.221	3403.370	9204.527	3403.667	9205.218	3403.374	DOWN	NORTH	0.057706152	0.061	0.005	0.061	-0.005	-0.003
107	9204.542	3403.510	9205.299	3403.393	9204.54	3403.519	9205.301	3403.391	DOWN	NORTH	0.006	0.009	0.003	0.009	-0.003	-0.003
108	9204.574	3403.396	9205.436	3403.396	9204.569	3403.423	9205.342	3403.42	DOWN	NORTH	0.02059126	0.027	0.097	0.027	-0.097	-0.007
109	9204.604	3403.318	9205.500	3403.429	9204.587	3403.33	9205.498	3403.441	DOWN	NORTH	0.02236068	0.021	0.012	0.021	-0.012	0.002
110	9204.601	3403.219	9205.591	3403.441	9204.602	3403.24	9205.591	3403.457	DOWN	NORTH	0.016643317	0.021	0.016	0.021	-0.016	-0.004
111	9204.632	3403.120	9205.688	3403.464	9204.617	3403.15	9205.694	3403.494	DOWN	NORTH	0.022803509	0.034	0.012	0.034	-0.012	-0.011
112	9204.646	3403.040	9205.787	3403.507	9204.632	3403.061	9205.79	3403.525	DOWN	NORTH	0.009433981	0.025	0.018	0.025	-0.018	-0.016
113	9204.684	3402.947	9205.893	3403.524	9204.662	3402.921	9205.892	3403.543	DOWN	NORTH	0.013928388	0.034	0.019	0.034	-0.019	-0.020
114	9204.697	3402.857	9205.988	3403.541	9204.697	3402.857	9205.966	3403.558	DOWN	NORTH	0	0.000	0.017	0.000	-0.017	0.000
115	9204.713	3402.761	9206.081	3403.576	9204.679	3402.849	9206.062	3403.597	DOWN	NORTH	0.123369364	0.094	0.021	0.094	-0.021	0.029
116	9204.740	3402.650	9206.176	3403.596	9204.743	3402.695	9206.166	3403.607	DOWN	NORTH	0.046389654	0.045	0.015	0.045	-0.015	0.001
117	9204.787	3402.542	9206.267	3403.664	9204.773	3402.566	9206.279	3403.666	DOWN	NORTH	0.011313708	0.028	0.008	0.028	-0.008	-0.016
118	9204.805	3402.454	9206.379	3403.641	9204.793	3402.474	9206.379	3403.652	DOWN	NORTH	0.055443665	0.023	0.011	0.023	-0.011	0.032
119	9204.816	3402.356	9206.469	3403.664	9204.816	3402.379	9206.468	3403.714	DOWN	NORTH	0.020615528	0.023	0.050	0.023	-0.050	-0.002
120	9204.839	3402.262	9206.569	3403.685	9204.805	3402.296	9206.569	3403.74	DOWN	NORTH	0.037	0.048	0.055	0.048	-0.055	-0.011
121	9204.850	3402.161	9206.682	3403.730	9204.849	3402.215	9206.673	3403.758	DOWN	NORTH	0.115693561	0.054	0.029	0.054	-0.029	0.062
122	9204.884	3402.068	9206.760	3403.735	9204.895	3402.115	9206.769	3403.767	DOWN	NORTH	0.012206556	0.048	0.033	0.048	-0.033	-0.036
123	9204.901	3401.963	9206.856	3403.776	9204.915	3401.977	9206.869	3403.767	DOWN	NORTH	0.025059928	0.020	0.016	0.020	-0.016	0.005
124	9204.932	3401.870	9206.963	3403.788	9204.937	3401.876	9206.952	3403.8	DOWN	NORTH	0.008062258	0.008	0.016	0.008	-0.016	0.000
125	9204.958	3401.760	9207.069	3403.803	9204.951	3401.772	9207.068	3403.82	DOWN	NORTH	0.014142136	0.014	0.017	0.014	-0.017	0.000
126	9204.988	3401.657	9207.149	3403.832	9204.983	3401.675	9207.251	3403.875	DOWN	NORTH	0.017029386	0.019	0.111	0.019	-0.111	-0.002
127	9204.986	3401.564	9207.260	3403.871	9204.986	3401.579	9207.245	3403.888	UP	NORTH	0.012369317	0.015	0.023	-0.015	-0.023	-0.003
128	9205.029	3401.463	9207.354	3403.883	9205.019	3401.484	9207.371	3403.766	DOWN	SOUTH	0.020880613	0.023	0.118	0.023	0.118	-0.002
129	9205.052	3401.381	9207.446	3403.900	9205.053	3401.394	9207.412	3403.932	DOWN	NORTH	0.017029386	0.013	0.047	0.013	-0.047	0.004
130	9205.062	3401.276	9207.528	3403.926	9205.05	3401.312	9207.526	3403.938	DOWN	NORTH	0.017691806	0.038	0.012	0.038	-0.012	-0.020
131	9205.103	3401.188	9207.637	3403.966	9205.105	3401.222	9207.642	3403.98	DOWN	NORTH	0.022561028	0.034	0.015	0.034	-0.015	-0.011
132	9205.113	3401.093	9207.728	3403.974	9205.147	3401.088	9207.718	3404.01	DOWN	NORTH	0.008602325	0.034	0.037	0.034	-0.037	-0.026
133	9205.159	3401.000	9207.820	3404.001	9205.158	3401.003	9207.86	3404.034	DOWN	NORTH	0.020248457	0.003	0.052	0.003	-0.052	0.017
134	9205.171	3400.900	9207.924	3404.031	9205.164	3400.91	9207.954	3404.061	DOWN	NORTH	0.021931712	0.012	0.042	0.012	-0.042	0.010
135	9205.202	3400.799	9208.031	3404.049	9205.183	3400.819	9208.044	3404.089	DOWN	NORTH	0.01077033	0.028	0.042	0.028	-0.042	-0.017
136	9205.226	3400.709	9208.107	3404.075	9205.226	3400.755	9208.126	3404.08	DOWN	NORTH	0.016573774	0.046	0.020	0.046	-0.020	-0.030

137	9205.238	3400.595	9208.220	3404.098
138	9205.263	3400.489	9208.315	3404.126
139	9205.292	3400.391	9208.414	3404.146
140	9205.305	3400.311	9208.507	3404.164
141	9205.327	3400.212	9208.611	3404.189
142	9205.344	3400.117	9208.714	3404.199
143	9205.373	3400.015	9208.817	3404.231
144	9205.394	3399.925	9208.890	3404.259
145	9205.410	3399.826	9208.993	3404.281
146	9205.435	3399.714	9209.075	3404.304
147	9205.467	3399.622	9209.187	3404.332
148	9205.495	3399.514	9209.314	3404.352
149	9205.505	3399.420	9209.362	3404.363
150	9205.526	3399.323	9209.477	3404.380
151	9205.563	3399.244	9209.567	3404.410
152	9205.592	3399.142	9209.674	3404.440
153	9205.599	3399.052	9209.780	3404.464
154	9205.623	3398.944	9209.878	3404.479
155	9205.636	3398.856	9209.973	3404.515
156	9205.652	3398.755	9210.060	3404.534
157	9205.684	3398.645	9210.172	3404.563
158	9205.713	3398.548	9210.271	3404.590
159	9205.741	3398.446	9210.352	3404.616
160	9205.755	3398.348	9210.436	3404.636
161	9205.795	3398.269	9210.556	3404.664
162	9205.808	3398.167	9210.662	3404.689
163	9205.829	3398.056	9210.754	3404.699
164	9205.845	3397.963	9210.836	3404.728
165	9205.879	3397.866	9210.931	3404.755
166	9205.905	3397.763	9211.027	3404.774
167	9205.925	3397.669	9211.129	3404.808
168	9205.946	3397.555	9211.231	3404.826
169	9205.982	3397.475	9211.330	3404.864
170	9205.982	3397.374	9211.419	3404.878
171	9206.014	3397.284	9211.526	3404.896
172	9206.039	3397.177	9211.634	3404.901
173	9206.075	3397.092	9211.719	3404.939
174	9206.092	3396.995	9211.809	3404.953
175	9206.113	3396.899	9211.900	3404.991
176	9206.160	3396.806	9212.002	3405.014
177	9206.164	3396.667	9212.113	3405.031
178	9206.181	3396.609	9212.211	3405.065
179	9206.203	3396.520	9212.299	3405.084
180	9206.231	3396.410	9212.392	3405.102
181	9206.268	3396.312	9212.464	3405.132
182	9206.281	3396.218	9212.580	3405.157
183	9206.318	3396.124	9212.660	3405.191
184	9206.338	3396.015	9212.760	3405.201
185	9206.353	3395.918	9212.866	3405.241
186	9206.387	3395.804	9212.974	3405.290
187	9206.397	3395.719	9213.064	3405.263
188	9206.411	3395.630	9213.164	3405.308
189	9206.432	3395.532	9213.264	3405.325
190	9206.470	3395.430	9213.368	3405.347
191	9206.484	3395.342	9213.439	3405.374
192	9206.525	3395.246	9213.550	3405.381
193	9206.539	3395.147	9213.647	3405.409
194	9206.564	3395.036	9213.741	3405.446
195	9206.595	3394.958	9213.862	3405.457
196	9206.634	3394.857	9213.933	3405.501
197	9206.662	3394.763	9214.019	3405.506
198	9206.669	3394.660	9214.136	3405.550
199	9206.688	3394.561	9214.247	3405.559
200	9206.695	3394.461	9214.323	3405.561

9205.206	3400.593	9208.226	3404.106	
9205.255	3400.51	9208.316	3404.135	
9205.289	3400.398	9208.516	3404.208	
9205.31	3400.327	9208.563	3404.162	
9205.326	3400.192	9208.606	3404.191	
9205.379	3400.166	9208.714	3404.221	
9205.371	3400.056	9208.764	3404.184	
9205.394	3399.962	9208.883	3404.277	
9205.41	3399.873	9209.024	3404.305	
9205.464	3399.865	9209.107	3404.336	
9205.452	3399.74	9209.178	3404.356	
9205.475	3399.529	9209.31	3404.36	
9205.519	3399.416	9209.387	3404.373	
9205.534	3399.365	9209.486	3404.39	
9205.542	3399.266	9209.57	3404.398	
9205.504	3399.224	9209.587	3404.431	
9205.623	3399.05	9209.742	3404.36	
9205.58	3398.933	9209.782	3404.473	
9205.737	3398.91	9209.985	3404.549	
9205.856	3398.744	9210.079	3404.559	
9205.705	3398.651	9210.071	3404.765	
9205.707	3398.536	9210.259	3404.587	
9205.696	3398.388	9210.348	3404.62	
9205.778	3398.355	9210.473	3404.657	
9205.846	3398.323	9210.562	3404.607	
9205.805	3398.176	9210.692	3404.59	
9205.82	3398.074	9210.746	3404.709	
9205.842	3398.002	9210.845	3404.752	
9205.901	3397.86	9210.964	3404.775	
9205.847	3397.667	9211.05	3404.765	
9206.045	3397.685	9211.154	3404.797	
9205.98	3397.604	9211.222	3404.871	
9205.925	3397.526	9211.334	3404.878	
9206.021	3397.392	9211.441	3404.895	
9206.02	3397.301	9211.588	3404.937	
9206.046	3397.202	9211.626	3404.927	
9206.069	3397.106	9211.733	3404.948	
9206.086	3397.011	9211.82	3404.98	
9206.109	3396.915	9211.924	3405.038	
9206.123	3396.826	9211.997	3405.051	
9206.167	3396.704	9212.141	3405.091	
9206.176	3396.635	9212.223	3405.082	
9206.198	3396.536	9212.351	3405.127	
9206.269	3396.432	9212.361	3405.116	
9206.263	3396.345	9212.502	3405.142	
9206.293	3396.243	9212.522	3405.107	
9206.29	3396.136	9212.656	3405.208	
9206.324	3396.036	9212.806	3405.24	
9206.293	3395.956	9212.939	3405.303	
9206.384	3395.83	9213.019	3405.245	
9206.42	3395.758	9213.143	3405.357	
9206.31	3395.636	9213.17	3405.312	
9206.434	3395.56	9213.299	3405.366	
9206.471	3395.457	9213.386	3405.356	
9206.459	3395.318	9213.462	3405.403	
9206.521	3395.232	9213.56	3405.443	
9206.529	3395.169	9213.662	3405.448	
9206.604	3395.103	9213.786	3405.47	
9206.594	3394.976	9213.875	3405.467	
9206.625	3394.855	9213.959	3405.552	
9206.635	3394.779	9214.027	3405.514	
9206.665	3394.665	9214.174	3405.571	
9206.679	3394.598	9214.265	3405.569	
9206.623	3394.44	9214.437	3405.575	

DOWN	NORTH	0.022472205	0.030	0.010	0.030	-0.010	-0.008				
DOWN	NORTH	0.015556349	0.022	0.009	0.022	-0.009	-0.007				
DOWN	NORTH	0.005385185	0.008	0.119	0.008	-0.119	-0.002				
DOWN	NORTH	0.015811388	0.017	0.058	0.017	-0.058	-0.001				
UP	NORTH	0.090553851	0.020	0.005	-0.020	-0.005	0.071				
DOWN	NORTH	0.01811077	0.060	0.022	0.060	-0.022	-0.042				
DOWN	SOUTH	0.026172505	0.041	0.057	0.041	0.057	-0.015				
DOWN	NORTH	0.016543317	0.037	0.016	0.037	-0.016	-0.020				
DOWN	NORTH	0.01811077	0.048	0.030	0.048	-0.030	-0.030				
DOWN	NORTH	0.014035669	0.159	0.045	0.159	-0.045	-0.145				
DOWN	NORTH	0.260192237	0.119	0.026	0.119	-0.026	0.141				
DOWN	NORTH	0.026172505	0.026	0.009	0.026	-0.009	0.001				
UP	NORTH	0.016155494	0.015	0.011	-0.015	-0.011	0.002				
UP	SOUTH	0.040112342	0.043	0.013	-0.043	0.013	-0.003				
DOWN	SOUTH	0.003162278	0.030	0.012	0.030	0.012	-0.027				
DOWN	SOUTH	0.013892444	0.117	0.087	0.117	0.087	-0.103				
UP	SOUTH	0.005385165	0.024	0.111	-0.024	0.111	-0.019				
UP	NORTH	0.115104301	0.068	0.096	-0.068	0.096	0.057				
UP	NORTH	0.071470274	0.115	0.036	-0.115	-0.036	-0.043				
UP	NORTH	0.017262677	0.012	0.031	-0.012	-0.031	0.006				
UP	NORTH	0.022803509	0.022	0.226	-0.022	-0.226	0.001				
UP	SOUTH	0.007211103	0.013	0.012	-0.013	0.012	-0.006				
UP	NORTH	0.036116237	0.073	0.009	-0.073	-0.009	-0.036				
UP	NORTH	0.024351591	0.024	0.041	-0.024	-0.041	0.001				
DOWN	SOUTH	0.022022716	0.074	0.057	0.074	0.057	-0.052				
UP	NORTH	0.01	0.009	0.037	-0.009	-0.037	0.001				
UP	SOUTH	0.029832868	0.020	0.012	-0.020	0.012	0.010				
UP	NORTH	0.018946883	0.019	0.028	-0.019	-0.028	0.000				
UP	NORTH	0.052	0.028	0.030	-0.028	-0.030	0.024				
UP	SOUTH	0.089339743	0.105	0.025	-0.105	0.025	-0.035				
UP	SOUTH	0.022	0.121	0.027	-0.121	0.027	-0.099				
UP	NORTH	0.050329918	0.060	0.044	-0.060	-0.044	-0.009				
UP	NORTH	0.05920304	0.063	0.015	-0.063	-0.015	-0.004				
UP	NORTH	0.042047582	0.043	0.028	-0.043	-0.028	-0.001				
UP	NORTH	0.114529472	0.018	0.074	-0.018	-0.074	0.097				
UP	SOUTH	0.022203603	0.026	0.027	-0.026	0.027	-0.004				
UP	SOUTH	0.045099889	0.017	0.017	-0.017	0.017	0.028				
UP	NORTH	0.014	0.018	0.026	-0.018	-0.026	-0.002				
UP	NORTH	0.017029386	0.016	0.053	-0.016	-0.053	0.001				
DOWN	NORTH	0.030870698	0.041	0.037	0.041	-0.037	-0.010				
UP	NORTH	0.016027756	0.017	0.066	-0.017	-0.066	0.001				
UP	NORTH	0.02118962	0.026	0.030	-0.026	-0.030	-0.005				
UP	NORTH	0.015132746	0.017	0.067	-0.017	-0.067	-0.002				
UP	SOUTH	0.030413813	0.044	0.018	-0.044	0.018	-0.013				
DOWN	NORTH	0.017262677	0.033	0.021	0.033	-0.021	-0.016				
UP	SOUTH	0.022135044	0.028	0.076	-0.028	0.076	-0.006				
DOWN	NORTH	0.007071068	0.030	0.029	0.030	-0.029	-0.023				
DOWN	NORTH	0.025079872	0.024	0.047	0.024	-0.047	0.001				
UP	NORTH	0.071021124	0.071	0.096	-0.071	-0.096	0.000				
DOWN	SOUTH	0.025632011	0.026	0.064	0.026	0.064	-0.001				
UP	NORTH	0.041231056	0.045	0.095	-0.045	-0.095	-0.004				
UP	NORTH	0.271713084	0.101	0.007	-0.101	-0.007	0.170				
UP	NORTH	0.01118034	0.028	0.046	-0.028	-0.046	-0.017				
UP	SOUTH	0.013038405	0.014	0.022	-0.014	0.022	-0.005				
UP	NORTH	0.012206556	0.035	0.052	-0.035	-0.052	-0.022				
UP	NORTH	0.022847319	0.015	0.074	-0.015	-0.074	0.008				
UP	NORTH	0.092244578	0.024	0.045	-0.024	-0.045	0.068				
DOWN	NORTH	0.061983869	0.076	0.053	0.076	-0.053	-0.016				
DOWN	SOUTH	0.013928388	0.018	0.018	0.018	0.018	-0.004				
DOWN	NORTH	0.002	0.009	0.057	0.009	-0.057	-0.007				
DOWN	SOUTH	0.016155494	0.031	0.011	0.031	0.011	-0.015				
DOWN	NORTH	0.001	0.006	0.042	0.006	-0.042	-0.005				
DOWN	SOUTH	0.009055385	0.038	0.030	0.038	0.030	-0.029				
UP	SOUTH	0.04580393	0.075	0.115	-0.075	0.115	-0.029				

UP	70	151	NORTH	
DOWN	121	40	SOUTH	

This is number of pebbles moving different ways

	0.310	0.404	0.200	0.267	max (m)
	-	0.002	(0.310)	(0.404)	min (m)
	0.040	0.042	0.005	(0.022)	avg (m)
	0.041	0.044	0.057	0.061	stdv (m)
	0.028	0.028	0.015	(0.021)	median (m)

LINE PARALLEL TO CONTOUR	LINE ORIENTED DOWNGRADIENT	LINE PARALLEL TO CONTOUR	LINE ORIENTED DOWNGRADIENT
GROSS movement	GROSS movement	NET movement	NET movement
7.021			

pebbles moving > than uncertainty of measure	100	1 SIGMA	0.028 m
	34	2 SIGMA	0.056 m

ASSUMING 0.028 RMS UNCERTAINTY

THIS IS THE SENSITIVITY TEST FOR HOW MANY PEBBLES REALLY MOVED

Caculations for Pebble data Iron Mountain

These calculations compare movement from orginal positions. The pebbles are seperated into Line countour parallel and Line oriented down gradient pebbles.

The countour parallel line pebbles move up and down and the line oriented down gradient pebbles move north and south.

The calculations include gross movement and net movement. Gross movement does not take into account that some pebbles move up from the line and some move down from the line.

The maximum, minimum, average, standard deviation and median of gross and net pebble movement is shown at the bottom of the spread sheet. A sensitivity test is also included to determine how many pebbles are actually moving.

Gross movement accounts for all movement not just movment in downslope direction
Should we also figure out the down slope movement?

LINE PARALLEL TO CONTOUR NORTHING = -4.13305930N(EASTING) + 41446.365475901

LINE ORIENTED DOWN GRADIENT NORTHING = 0.247408463(EASTING) + 1125.893681063

	May--00					Oct--01				LINE PARALLEL TO CONTOUR	LINE ORIENTED DOWNGRADIENT						
	LINE PARALLEL TO CONTOUR		LINE ORIENTED DOWNGRADIENT			LINE PARALLEL TO CONTOUR		LINE ORIENTED DOWNGRADIENT		UP vs DOWN MOVEMENT	NORTH vs SOUTH MOVEMENT	LINE PARALLEL TO CONTOUR		LINE ORIENTED DOWNGRADIENT		LINE PARALLEL TO CONTOUR	LINE ORIENTED DOWNGRADIENT
	e	n	e	n		e	n	e	n			GROSS movement		GROSS movement		NET movement	NET movement
1	9202.032	3413.617	9195.012	3400.884		9202.036	3413.658	9195.028	3400.845	DOWN	NORTH	0.042	0.041	0.042	0.041	-0.042	-0.001
2	9202.040	3413.723	9195.126	3400.875		9201.766	3413.677	9195.115	3400.865	DOWN	NORTH	0.290	0.297	0.015	0.297	-0.015	0.007
3	9202.070	3413.624	9195.223	3400.896		9213.725	3415.617	9195.199	3400.913	DOWN	NORTH	0.019	11.824	0.030	11.824	-0.030	11.805
4	9202.109	3413.525	9195.313	3400.930		9202.065	3413.532	9195.298	3400.921	DOWN	NORTH	0.025	0.025	0.017	0.025	-0.017	0.000
5	9202.123	3413.425	9195.405	3400.932		9202.093	3413.454	9195.388	3400.932	DOWN	NORTH	0.042	0.042	0.017	0.042	-0.017	0.000
6	9202.150	3413.323	9195.508	3400.967		9202.122	3413.345	9195.479	3400.983	DOWN	NORTH	0.036	0.036	0.033	0.036	-0.033	0.000
7	9202.166	3413.232	9196.585	3401.003		9202.177	3413.273	9195.569	3400.999	DOWN	NORTH	0.035	0.042	0.076	0.042	-0.076	0.006
8	9202.194	3413.125	9195.693	3401.016		9202.200	3413.145	9195.695	3400.998	UP	NORTH	0.047	0.029	0.019	-0.020	-0.019	-0.027
9	9202.224	3413.024	9195.767	3401.038		9202.225	3413.049	9195.788	3401.039	DOWN	NORTH	0.051	0.025	0.001	0.025	-0.001	-0.026
10	9202.245	3412.932	9195.867	3401.062		9202.199	3412.917	9195.887	3401.064	UP	NORTH	0.026	0.048	0.002	-0.048	-0.002	0.022
11	9202.269	3412.851	9195.996	3401.087		9202.242	3412.926	9195.980	3401.100	DOWN	NORTH	0.024	0.082	0.021	0.082	-0.021	0.058
12	9202.287	3412.748	9196.097	3401.101		9202.265	3412.754	9196.062	3401.186	UP	NORTH	0.022	0.023	0.092	-0.023	-0.092	0.001
13	9202.315	3412.647	9196.198	3401.120		9202.263	3412.650	9196.181	3401.130	DOWN	NORTH	0.013	0.032	0.020	0.032	-0.020	0.019
14	9202.329	3412.553	9196.291	3401.137		9202.342	3412.539	9196.300	3401.152	DOWN	NORTH	0.069	0.087	0.017	0.087	-0.017	0.018
15	9202.359	3412.447	9196.385	3401.164		9202.333	3412.525	9196.374	3401.167	DOWN	NORTH	0.026	0.082	0.011	0.082	-0.011	0.056
16	9202.378	3412.352	9196.500	3401.160		9202.362	3412.363	9196.424	3401.191	UP	NORTH	0.024	0.012	0.013	-0.012	-0.013	-0.013
17	9202.407	3412.258	9196.581	3401.206		9202.380	3412.246	9196.584	3401.236	UP	NORTH	0.012	0.030	0.031	-0.030	-0.031	0.017
18	9202.421	3412.157	9196.697	3401.235		9202.441	3412.155	9196.751	3401.229	UP	SOUTH	0.029	0.020	0.054	-0.020	0.054	-0.009
19	9202.458	3412.064	9196.776	3401.252		9202.469	3412.067	9196.765	3401.251	DOWN	SOUTH	0.029	0.011	0.013	0.011	0.013	-0.018
20	9202.474	3411.969	9196.875	3401.267		9202.412	3412.069	9196.911	3401.307	DOWN	NORTH	0.140	0.125	0.054	0.125	-0.054	-0.014
21	9202.508	3411.873	9196.696	3401.301		9202.458	3411.880	9196.983	3401.303	DOWN	NORTH	0.043	0.050	0.287	0.050	-0.287	0.007
22	9202.496	3411.773	9197.070	3401.323		9202.469	3411.820	9197.062	3401.339	UP	NORTH	0.059	0.048	0.018	-0.048	-0.018	-0.012
23	9202.524	3411.674	9197.162	3401.328		9202.358	3412.676	9197.182	3401.359	DOWN	NORTH	0.310	1.016	0.030	1.016	-0.030	0.706
24	9202.541	3411.586	9197.253	3401.343		9202.526	3411.320	9197.292	3401.361	UP	SOUTH	0.023	0.266	0.043	-0.266	0.043	0.243
25	9202.555	3411.476	9197.362	3401.351		9202.578	3411.504	9197.350	3401.368	UP	SOUTH	0.053	0.036	0.036	-0.036	0.036	-0.017
26	9202.601	3411.393	9197.458	3401.343		9202.607	3411.432	9197.504	3401.354	UP	SOUTH	0.050	0.039	0.047	-0.039	0.047	-0.011
27	9202.617	3411.294	9197.571	3401.410		9202.646	3411.305	9197.526	3401.458	UP	NORTH	0.036	0.031	0.066	-0.031	-0.066	-0.005
28	9202.628	3411.193	9197.643	3401.459		9202.652	3411.224	9197.583	3401.473	UP	NORTH	0.037	0.039	0.042	-0.039	-0.042	0.003
29	9202.666	3411.103	9197.743	3401.465		9202.575	3411.074	9197.766	3401.515	UP	NORTH	0.006	0.095	0.039	-0.095	-0.039	0.089
30	9202.679	3410.958	9197.849	3401.498		9202.688	3410.984	9197.889	3401.507	UP	NORTH	0.066	0.028	0.116	-0.028	-0.116	-0.038
31	9202.724	3410.912	9197.842	3401.512		9202.746	3410.920	9197.867	3401.566	UP	NORTH	0.028	0.023	0.094	-0.023	-0.094	-0.005
32	9202.727	3410.803	9198.040	3401.536		9202.647	3410.842	9198.031	3401.518	UP	NORTH	0.010	0.082	0.082	-0.082	-0.082	0.079
33	9202.754	3410.711	9198.131	3401.557		9202.712	3410.795	9198.120	3401.555	UP	SOUTH	0.073	0.044	0.011	-0.044	0.011	0.021
34	9202.775	3410.610	9198.234	3401.592		9202.789	3410.660	9198.225	3401.611	UP	SOUTH	0.049	0.052	0.021	-0.052	0.021	0.003
35	9202.795	3410.520	9198.336	3401.606		9202.804	3410.514	9198.301	3401.679	UP	NORTH	0.024	0.011	0.081	-0.011	-0.081	-0.013
36	9202.831	3410.426	9198.437	3401.631		9202.779	3410.436	9198.369	3401.651	UP	SOUTH	0.021	0.053	0.043	-0.053	0.043	0.032
37	9202.847	3410.326	9198.549	3401.655		9202.829	3410.331	9198.523	3401.694	UP	NORTH	0.041	0.018	0.047	-0.018	-0.047	-0.022
38	9202.880	3410.236	9198.626	3401.672		9202.897	3410.195	9198.619	3401.710	UP	SOUTH	0.018	0.044	0.039	-0.044	0.039	0.027
39	9202.897	3410.133	9198.730	3401.695		9202.922	3410.076	9198.699	3401.760	UP	NORTH	0.044	0.062	0.072	-0.062	-0.072	0.018
40	9202.924	3410.031	9198.816	3401.730		9202.956	3410.025	9198.779	3401.790	UP	NORTH	0.048	0.033	0.070	-0.033	-0.070	-0.016
41	9202.937	3409.938	9198.899	3401.750		9202.963	3409.925	9198.884	3401.803	UP	NORTH	0.037	0.029	0.053	-0.029	-0.053	-0.008
42	9202.975	3409.855	9199.004	3401.788		9203.011	3409.843	9198.994	3401.803	UP	SOUTH	0.032	0.038	0.018	-0.038	0.018	0.008
43	9203.005	3409.766	9199.112	3401.806		9203.022	3409.758	9199.045	3401.853	UP	NORTH	0.025	0.019	0.082	-0.019	-0.082	-0.007
44	9203.020	3409.664	9199.216	3401.842		9203.135	3409.611	9199.108	3401.863	UP	NORTH	0.060	0.127	0.114	-0.127	-0.114	0.067
45	9203.054	3409.559	9199.305	3401.867		9203.049	3409.541	9199.268	3401.877	UP	SOUTH	0.037	0.012	0.020	-0.012	0.020	-0.018
46	9203.074	3409.467	9199.401	3401.887		9203.086	3409.435	9199.464	3401.907	UP	NORTH	0.021	0.034	0.020	-0.034	-0.020	0.013
47	9203.107	3409.366	9199.498	3401.906		9203.043	3409.306	9199.494	3401.933	UP	NORTH	0.019	0.061	0.027	-0.061	-0.027	0.062
48	9203.126	3409.274	9199.593	3401.933		9203.111	3409.339	9199.579	3401.964	DOWN	NORTH	0.098	0.067	0.034	0.067	-0.034	-0.032
49	9203.159	3409.167	9199.706	3401.955		9203.210	3409.161	9199.665	3401.960	DOWN	SOUTH	0.032	0.053	0.022	0.053	0.022	0.021
50	9203.167	3409.078	9199.779	3401.976		9203.201	3409.050	9199.714	3402.073	UP	NORTH	0.053	0.044	0.117	-0.044	-0.117	-0.009
51	9203.225	3408.971	9199.872	3402.009		9203.223	3408.989	9199.843	3402.007	DOWN	SOUTH	0.036	0.018	0.029	0.018	0.029	-0.017
52	9203.255	3408.879	9199.974	3402.020		9203.271	3408.879	9199.964	3402.090	DOWN	NORTH	0.029	0.018	0.071	0.018	-0.071	-0.013
53	9203.281	3408.787	9200.075	3402.062		9203.264	3408.810	9200.102	3402.059	DOWN	SOUTH	0.015	0.029	0.027	0.029	0.027	0.014
54	9203.309	3408.681	9200.183	3402.077		9203.293	3408.673	9200.174	3402.100	DOWN	NORTH	0.025	0.018	0.025	0.018	-0.025	-0.007
55	9203.323	3408.580	9200.283	3402.098		9203.528	3408.459	9200.266	3402.124	UP	NORTH	0.294	0.238	0.030	-0.238	-0.030	-0.056
56	9203.352	3408.483	9200.377	3402.126		9203.390	3408.479	9200.343	3402.130	DOWN	SOUTH	0.025	0.038	0.034	0.038	0.034	0.013
57	9203.375	3408.382	9200.464	3402.142		9203.391	3408.395	9200.474	3402.132	DOWN	SOUTH	0.010	0.021	0.014	0.021	0.014	0.010
58	9203.401	3408.282	9200.566	3402.169		9203.365	3408.301	9200.546	3402.205	DOWN	NORTH	0.027	0.020	0.054	0.020	-0.054	-0.007
59	9203.422	3408.192	9200.663	3402.200		9203.431	3408.200	9200.564	3402.145	DOWN	SOUTH	0.026	0.012	0.113	0.012	0.113	-0.014
60	9203.435	3408.080	9200.764	3402.227		9203.373	3408.106	9200.751	3402.264	DOWN	NORTH	0.058	0.067	0.039	0.067	-0.039	0.012
61	9203.439	3407.997	9200.834	3402.252		9203.456	3407.966	9200.834	3402.267	UP	NORTH	0.037	0.034	0.015	-0.034	-0.015	-0.004
62	9203.459	3407.904	9200.947	3402.255		9203.459	3407.919	9200.925	3402.258	DOWN	SOUTH	0.009	0.016	0.024	0.016	0.024	0.009
63	9203.505	3407.828	9201.053	3402.316		9203.469	3407.841	9201.051	3402.325	DOWN	NORTH	0.018	0.018	0.009	0.018	-0.009	0.000
64	9203.527	3407.669	9201.141	3402.327		9203.594	3407.689	9201.177	3402.469	DOWN	NORTH	0.062	0.070	0.146	0.070	-0.146	0.008
65	9203.560	3407.613	9201.243	3402.366		9203.605	3407.597	9201.223	3402.343	DOWN	SOUTH	0.036	0.048	0.030	0.048	0.030	0.012
66	9203.589	3407.498	9201.330	3402.380		9203.596	3407.585	9201.387	3402.420	DOWN	NORTH	0.059	0.067	0.070	0.067	-0.070	0.009
67	9203.609	3407.416	9201.431	3402.416		9203.634	3407.364	9201.438	3402.437	DOWN	NORTH	0.011	0.060	0.022	0.060	-0.022	0.048
68	9203.644	3407.314	9201.524	3402.430		9203.604	3407.405	9201.525	3402.478	DOWN	NORTH	0.027	0.099	0.048	0.099	-0.048	0.073
69	9203.649	3407.231	9201.632	3402.456		9203.656	3407.241	9201.579	3402.497	DOWN	NORTH	0.014	0.012	0.067	0.012	-0.067	-0.002
70	9203.672	3407.111	9201.724	3402.491		9203.665	3407.127	9201.595	3402.474	DOWN	SOUTH	0.026	0.017	0.034	0.017	0.034	-0.009
71	9203.699	3407.016	9201.819	3402.501		9203.666	3407.080	9201.845	3402.521	DOWN	NORTH	0.036	0.054	0.033	0.054	-0.033	0.017
72	9203.727	3406.914	9201.914	3402.527		9203.716	3406.927	9201.947	3402.544	DOWN	NORTH	0.026	0.017	0.037	0.017	-0.037	-0.009
73	9203.750	3406.831	9201.999	3402.560		9203.759	3406.833	9202.036	3402.587	DOWN	NORTH	0.013	0.009	0.036	0.009	-0.036	-0.004
74	9203.770	3406.714	9202.096	3402.584		9203.787	3406.719	9202.114	3402.586	DOWN	NORTH	0.021	0.018	0.018	0.018	-0.018	-0.003
75	9203.797	3406.619	9202.179	3402.593		9203.818	3406.631	9202.166	3402.613	DOWN	NORTH	0.028	0.024	0.023	0.024	-0.023	-0.002
76	9203.829	3406.547	9202.257	3402.636		9203.819	3406.562	9202.269	3402.694	DOWN	NORTH	0.022	0.018	0.059	0.018	-0.059	-0.004
77	9203.814	3406.442	9202.410	3402.667		9203.676	3406.494	9202.407	3402.670	DOWN	NORTH	0.024	0.147	0.004	0.147	-0.004	0.123
78	9203.852	3406.392	9202.493	3402.682		9203.879	3406.309	9202.497	3402.700	DOWN	NORTH	0.036	0.087	0.018	0.087	-0.018	0.051
79	9203.895	3406.248	9202.605	3402.711		9203.836	3406.231	9202.651	3402.730	DOWN	NORTH	0.067	0.061	0.050	0.061	-0.050	-0.006
80	9203.899	3406.135	9202.664	3402.736		9203.984	3406.080	9202.703	3402.732	UP	NORTH	0.076	0.101	0.020	-0.101	-0.020	0.024
81	9203.921	3406.032	9202.774	3402.758		9203.911	3406.041	9202.775	3402.751	DOWN	NORTH	0.024	0.011	0.005	0.011	-0.005	-0.013
82	9203.950	3405.946	9202.881	3402.760		9203.932	3405.987	9202.844	3402.773	DOWN	NORTH	0.062	0.046	0.021	0.046	-0.021	0.008
83	9203.976	3405.847	9202.951	3402.784		9203.964	3405.873	9202.952	3402.790	DOWN	NORTH	0.019	0.029	0.006	0.029	-0.006	0.010
84	9203.996	3405.757	9203.065	3402.800		9203.971	3405.762	9203.061	3402.815	DOWN	NORTH	0.021	0.027	0.016	0.027	-0.016	0.006
85	9204.017	3405.662	9203.179	3402.836		9203.993	3405.641	9203.164	3402.832	DOWN	SOUTH	0.031	0.032	0.016	0.032	0.016	0.001
86	9204.038	3405.556	9203.282	3402.835		9204.101	3405.515	9203.267	3402.855	UP	SOUTH	0.064	0.037	0.075	0.037	-0.075	0.031
87	9204.064	3405.461	9203.378	3402.870		9204.077	3405.477	9203.202	3402.807	DOWN	SOUTH	0.016	0.021	0.316	0.021	0.316	0.004
88	9204.086	3405.367	9203.456	3402.904		9204.126	3405.368	9204.496	3404.174	DOWN	NORTH	0.033	0.040	1.634	0.040	-1.634	0.007
89	9204.103	3405.280	9203.580	3402.952		9204.165	3405.251	9204.465	3404.248	UP	NORTH	0.061	0.068	1.569	-0.068	-1.569	0.008
90	9204.113	3405.182	9203.659	3402.980		9204.144	3405.171	9204.629	3404.161	UP	NORTH	0.027	0.031	1.467	-0.031	-1.467	0.004
91	9204.178	3405.077	9203.738	3403.001		9204.198	3405.114	9204.420	3404.214	DOWN	NORTH	0.033	0.042	1.362	0.042	-1.362	0.009
92	9204.182	3404.969	9203.838	3403.014		9204.205	3404.985	9204.749	3404.172	DOWN	NORTH	0.025	0.028	1.473	0.028	-1.473	0.003
93	9204.211	3404.884	9203.933	3403.050		9204.210	3404.960	9203.863	3403.031	DOWN	NORTH	0.048	0.076	0.073	0.076	-0.073	0.028
94	9204.224	3404.789	9204.040	3403.061		9204.196	3404.838	9203.945	3403.070	DOWN	NORTH	0.036	0.056	0.095	0.056	-0.095	0.021
95	9204.256	3404.689	9204.133	3403.104		9204.189	3404.851	9204.013	3403.116	DOWN	NORTH	0.024	0.089	0.121	0.089	-0.121	0.064
96	9204.294	3404.585	9204.232	3403.108		9204.258	3404.160	9204.186	3403.237	UP	NORTH	0.032	0.416	0.137	-0.416	-0.137	0.386
97	9204.296	3404.477	9204.326	3403.121		9204.801	3406.421	9204.191	3403.437	DOWN	NORTH	0.011	2.009	0.344	2.009	-0.344	1.997
98	9204.318	3404.380	9204.428	3403.164		9204.235	3404.416	9204.360	3403.337	DOWN	NORTH	0.080	0.090	0.183	0.090	-0.183	0.000
99	9204.322	3404.284	9204.552	3403.186		9204.341	3404.304	9204.529	3403.202	UP	NORTH	0.028	0.028	0.028	-0.028	-0.028	0.000
100	9204.365	3404.205	9204.623	3403.202		9205.362	3407.792	9204.65	3403.236	DOWN	NORTH	0.015	3.728	0.046	3.728	-0.046	3.713
101	9204.389	3404.109	9204.708	3403.231		9204.392	3404.117	9210.571	3404.604	DOWN	NORTH	0.009	0.009	6.022	0.009	-6.022	0.000
102	9204.416	3404.010	9204.817	3403.266		9204.414	3404.025	9206.699	3409.795	DOWN	NORTH	0.016	0.016	6.795	0.016	-6.795	0.000
103	9204.439	3403.916	9204.904	3403.279		9204.443	3403.941	9207.061	3410.077	DOWN	NORTH	0.030	0.025	7.132	0.025	-7.132	-0.005
104	9204.470	3403.816	9205.017	3403.232		9210.597	3418.855	9204.012	3403.328	DOWN	NORTH	0.013	21.197	1.004	21.197	-1.004	21.185
105	9204.504	3403.715	9205.096	3403.361		9204.492	3403.729	9204.098	3403.317	DOWN	NORTH	0.018	0.018	0.999	0.018	-0.999	0.000
106	9204.512	3403.608	9205.221	3403.370	old 107	9212.774	3413.001	9205.218	3403.374	DOWN	NORTH	0.061	12.510	0.005	12.510	-0.005	12.449
107	9204.542	3403.510	9205.299	3403.393		9204.54	3403.519	9211.773	3412.083	DOWN	NORTH	0.009	0.009	10.836	0.009	-10.836	0.000
108	9204.574	3403.396	9205.436	3403.396		9204.559	3403.423	9211.039	3411.559	DOWN	NORTH	0.027	0.027	9.901	0.027	-9.901	0.000
109	9204.604	3403.318	9205.500	3403.429		9204.561	3403.429	9205.471	3403.444	DOWN	NORTH	0.021	0.503	0.033	0.503	-0.033	0.482
110	9204.601	3403.219	9205.591	3403.441		9204.602	3403.24	9205.615	3403.477	DOWN	NORTH	0.021	0.021	0.043	0.021	-0.043	0.000
111	9204.632	3403.120	9205.688	3403.484		9204.689	3405.218	9205.670	3403.488	DOWN	NORTH	0.034	3.099	0.010	3.099	-0.010	3.065
112	9204.646	3403.040	9205.787	3403.507		9204.601	3404.125	9205.780	3403.519	DOWN	NORTH	0.025	1.086	0.012	1.086	-0.012	1.061
113	9204.684	3402.945	9205.893	3403.524		9219.590	3418.401	9205.897	3403.529	DOWN	NORTH	0.034	21.471	0.006	21.471	-0.006	21.437
114	9204.697	3402.857	9205.968	3403.541		9204.697	3402.857	9205.981	3403.575	DOWN	NORTH	0.000	0.000	0.035	0.000	-0.035	0.000
115	9204.713	3402.761	9206.081	3403.576		9204.679	3402.849	9206.074	3403.584	DOWN	NORTH	0.094	0.094	0.011	0.094	-0.011	0.000
116	9204.740	3402.650	9206.176	3403.596		9204.743	3402.695	9206.185	3403.623	DOWN	NORTH	0.045	0.045	0.028	0.045	-0.028	0.000
117	9204.767	3402.542	9206.287	3403.664	old 116	9216.334	3416.547	9206.282	3403.668	DOWN	NORTH	0.028	18.151	0.006	18.151	-0.006	18.124
118	9204.805	3402.454	9206.379	3403.641		9205.772	3408.142	9206.379	3403.654	DOWN	NORTH	0.023	5.770	0.013	5.770	-0.013	5.746
119	9204.816	3402.356	9206.469	3403.664		9205.736	3408.106	9206.474	3403.710	DOWN	NORTH	0.023	5.824	0.046	5.824	-0.046	5.801
120	9204.839	3402.262	9206.569	3403.685		9242.689	3429.467	9206.546	3403.739	DOWN	NORTH	0.048	46.613	0.059	46.613	-0.059	46.565
121	9204.850	3402.161	9206.662	3403.730		9204.849	3402.215	9206.671	3403.762	DOWN	NORTH	0.054	0.054	0.034	0.054	-0.034	0.000
122	9204.864	3402.068	9206.760	3403.735		9204.906	3402.101	9206.774	3403.764	DOWN	NORTH	0.048	0.040	0.032	0.040	-0.032	-0.009
123	9204.901	3401.963	9206.856	3403.776		9204.911	3401.992	9206.841	3403.771	DOWN	NORTH	0.020	0.031	0.016	0.031	-0.016	0.011
124	9204.932	3401.870	9206.953	3403.788		9204.951	3401.874	9206.952	3403.8	DOWN	NORTH	0.008	0.019	0.016	0.019	-0.016	0.012
125	9204.958	3401.760	9207.059	3403.803		9204.952	3401.775	9207.068	3403.82	DOWN	NORTH	0.014	0.016	0.017	0.016	-0.017	0.002
126	9204.988	3401.657	9207.149	3403.832		9204.984	3401.672	9207.172	3403.971	DOWN	NORTH	0.019	0.016	0.141	0.016	-0.141	-0.003
127	9204.988	3401.564	9207.260	3403.871		9205.011	3401.579	9207.237	3403.902	UP	NORTH	0.015	0.029	0.039	-0.029	-0.039	0.014
128	9205.029	3401.463	9207.354	3403.893		9205.028	3401.484	9208.171	3404.958	DOWN	NORTH	0.023	0.031	1.350	0.031	-1.350	0.008
129	9205.052	3401.381	9207.446	3403.900		9205.047	3401.403	9207.409	3403.935	DOWN	NORTH	0.013	0.023	0.051	0.023	-0.051	0.010
130	9205.062	3401.276	9207.526	3403.926		9205.072	3401.312	9207.526	3403.936	DOWN	NORTH	0.038	0.037	0.012	0.037	-0.012	-0.001
131	9205.103	3401.188	9207.637	3403.966		9205.100	3401.217	9207.588	3403.934	DOWN	SOUTH	0.034	0.029	0.076	0.029	0.076	-0.005
132	9205.113	3401.093	9207.728	3403.974		9205.193	3401.140	9207.718	3404.01	DOWN	NORTH	0.034	0.093	0.037	0.093	-0.037	0.058
133	9205.159	3401.000	9207.820	3404.001		9205.158	3401.003	9207.86	3404.034	DOWN	NORTH	0.003	0.003	0.052	0.003	-0.052	0.000
134	9205.171	3400.900	9207.924	3404.031		9205.164	3400.91	9207.954	3404.061	DOWN	NORTH	0.012	0.012	0.042	0.012	-0.042	0.000
135	9205.202	3400.799	9208.031	3404.049		9205.183	3400.819	9208.044	3404.089	DOWN	NORTH	0.028	0.028	0.042	0.028	-0.042	0.000
136	9205.226	3400.709	9208.107	3404.075		9205.226	3400.755	9208.126	3404.08	DOWN	NORTH	0.046	0.046	0.020	0.046	-0.020	0.000

137	9205.238	3400.596	9208.220	3404.098	9225.466	3410.217	9208.226	3404.106	DOWN	NORTH	0.030	22.369	0.010	22.369	-0.010	22.369	
138	9205.263	3400.469	9208.315	3404.126	9205.255	3400.51	9208.316	3404.135	DOWN	NORTH	0.022	0.022	0.009	0.022	-0.009	0.000	
139	9205.292	3400.391	9208.414	3404.146	9218.461	3407.507	9210.492	3404.636	DOWN	NORTH	0.008	13.243	2.135	13.243	-2.135	13.236	
140	9205.305	3400.311	9208.507	3404.164	9205.31	3400.327	9208.583	3404.162	DOWN	NORTH	0.017	0.017	0.058	0.017	-0.058	0.000	
141	9205.327	3400.212	9208.611	3404.189	9210.568	3404.686	9208.606	3404.191	DOWN	NORTH	0.020	6.891	0.005	6.891	-0.005	6.871	
142	9205.344	3400.117	9208.714	3404.199	9205.379	3400.166	9208.714	3404.221	DOWN	NORTH	0.060	0.060	0.022	0.060	-0.022	0.000	
143	9205.373	3400.015	9208.817	3404.231	9214.043	3406.354	9208.784	3404.184	DOWN	SOUTH	0.041	10.740	0.057	10.740	0.057	10.599	
144	9205.394	3399.925	9208.890	3404.259	9212.215	3407.107	9208.883	3404.277	DOWN	NORTH	0.037	9.905	0.019	9.905	-0.019	9.868	
145	9205.410	3399.825	9208.993	3404.281	9205.435	3399.833	9209.024	3404.305	UP	NORTH	0.048	0.026	0.039	-0.026	-0.039	-0.022	
146	9205.435	3399.714	9209.075	3404.304	9205.398	3399.706	9209.053	3404.370	UP	NORTH	0.159	0.038	0.070	-0.038	-0.070	-0.121	
147	9205.457	3399.622	9209.187	3404.332	9205.490	3399.863	9209.178	3404.345	DOWN	NORTH	0.119	0.242	0.016	0.242	-0.016	0.123	
148	9205.485	3399.514	9209.314	3404.352	9205.494	3399.539	9209.269	3404.383	DOWN	NORTH	0.025	0.025	0.027	0.025	-0.027	0.000	
149	9205.505	3399.420	9209.362	3404.363	9205.511	3399.403	9212.154	3405.657	UP	NORTH	0.015	0.018	3.059	-0.018	-3.059	0.003	
150	9205.526	3399.323	9209.477	3404.380	9205.545	3399.356	9210.328	3404.789	UP	NORTH	0.043	0.038	0.944	-0.038	-0.944	-0.005	
151	9205.563	3399.244	9209.567	3404.410	9205.535	3399.266	9209.57	3404.398	DOWN	SOUTH	0.030	0.036	0.012	0.036	0.012	0.005	
152	9205.592	3399.142	9209.674	3404.440	9205.531	3399.221	9209.587	3404.431	DOWN	SOUTH	0.117	0.100	0.087	0.100	0.087	-0.017	
153	9205.599	3399.052	9209.780	3404.464	9205.527	3399.036	9209.742	3404.36	UP	SOUTH	0.024	0.032	0.111	-0.032	0.111	0.008	
154	9205.623	3398.944	9209.878	3404.479	9205.667	3398.977	9214.182	3406.342	UP	NORTH	0.058	0.055	4.690	-0.055	-4.690	-0.003	
155	9205.636	3398.856	9209.973	3404.515	9205.727	3398.925	9209.985	3404.549	DOWN	NORTH	0.115	0.114	0.036	0.114	-0.036	0.000	
156	9205.662	3398.755	9210.060	3404.534	9205.662	3398.718	9210.079	3404.559	UP	NORTH	0.012	0.038	0.031	-0.038	-0.031	0.027	
157	9205.684	3398.645	9210.172	3404.563	9205.718	3398.623	9210.071	3404.765	UP	NORTH	0.022	0.040	0.226	-0.040	-0.226	0.019	
158	9205.713	3398.548	9210.271	3404.590	9205.730	3398.558	9210.374	3404.854	UP	NORTH	0.013	0.020	0.121	-0.020	-0.121	0.006	
159	9205.741	3398.445	9210.362	3404.616	9205.000	3398.666	9210.348	3404.62	DOWN	NORTH	0.073	0.355	0.008	0.355	-0.008	0.283	
160	9205.755	3398.349	9210.436	3404.636	9205.778	3398.355	9211.514	3405.341	UP	NORTH	0.024	0.024	1.286	-0.024	-1.286	0.000	
161	9205.795	3398.269	9210.556	3404.664	9205.855	3398.330	9210.562	3404.607	DOWN	SOUTH	0.074	0.085	0.057	0.085	0.057	0.011	
162	9205.806	3398.167	9210.652	3404.689	9205.812	3398.183	9210.689	3404.69	UP	NORTH	0.009	0.016	0.037	-0.016	-0.037	0.007	
163	9205.829	3398.058	9210.754	3404.699	9205.843	3398.080	9210.748	3404.709	UP	SOUTH	0.020	0.028	0.012	-0.028	0.012	0.008	
164	9205.845	3397.983	9210.836	3404.726	9205.850	3397.999	9210.848	3404.783	UP	NORTH	0.019	0.017	0.037	-0.017	-0.037	-0.002	
165	9205.879	3397.866	9210.931	3404.755	9205.899	3397.847	9210.978	3404.777	UP	NORTH	0.026	0.029	0.052	-0.029	-0.052	0.001	
166	9205.905	3397.763	9211.027	3404.774	9208.185	3397.872	9211.039	3404.793	DOWN	NORTH	0.105	0.300	0.022	0.300	-0.022	0.186	
167	9205.925	3397.659	9211.129	3404.808	9205.974	3397.747	9211.085	3404.880	DOWN	NORTH	0.121	0.092	0.084	0.092	-0.084	-0.029	
168	9205.946	3397.555	9211.231	3404.828	9206.983	3397.506	9211.295	3404.873	UP	NORTH	0.060	0.057	0.078	-0.057	-0.078	-0.003	
169	9205.962	3397.475	9211.330	3404.864	9206.135	3397.566	9211.341	3404.882	DOWN	NORTH	0.063	0.211	0.021	0.211	-0.021	0.148	
170	9205.982	3397.374	9211.419	3404.878	9206.022	3397.408	9211.460	3404.875	UP	SOUTH	0.043	0.052	0.041	-0.052	0.041	0.010	
171	9206.014	3397.284	9211.526	3404.898	9206.026	3397.313	9211.568	3404.928	UP	NORTH	0.018	0.031	0.053	-0.031	-0.053	0.013	
172	9206.039	3397.177	9211.634	3404.901	9206.046	3397.214	9211.634	3404.915	UP	SOUTH	0.026	0.038	0.014	-0.038	0.014	0.012	
173	9206.075	3397.092	9211.719	3404.939	9205.040	3397.104	9211.732	3404.945	UP	SOUTH	0.017	0.037	0.014	-0.037	0.014	0.020	
174	9206.092	3396.996	9211.800	3404.963	9206.113	3397.019	9211.817	3404.974	UP	NORTH	0.016	0.031	0.020	-0.031	-0.020	0.015	
175	9206.113	3396.899	9211.900	3404.991	9206.107	3396.930	9211.920	3405.039	UP	NORTH	0.016	0.032	0.052	-0.032	-0.052	0.015	
176	9206.160	3396.808	9212.002	3405.014	9206.134	3396.820	9211.951	3405.015	DOWN	SOUTH	0.041	0.029	0.051	0.029	0.051	-0.013	
177	9206.164	3396.687	9212.113	3405.031	9206.157	3396.707	9212.127	3405.092	UP	NORTH	0.017	0.021	0.063	-0.021	-0.063	0.004	
178	9206.181	3396.609	9212.211	3405.055	9206.207	3396.608	9212.214	3405.079	UP	NORTH	0.026	0.026	0.024	-0.026	-0.024	0.000	
179	9206.203	3396.520	9212.299	3405.084	9206.172	3396.556	9212.353	3405.136	UP	NORTH	0.017	0.048	0.074	-0.048	-0.074	0.031	
180	9206.231	3396.410	9212.392	3405.102	9206.260	3396.386	9212.361	3405.148	UP	NORTH	0.044	0.036	0.047	-0.036	-0.047	-0.008	
181	9206.268	3396.312	9212.484	3405.132	9206.273	3396.356	9212.489	3405.167	DOWN	NORTH	0.033	0.044	0.035	0.044	-0.035	0.011	
182	9206.281	3396.218	9212.580	3405.157	9206.306	3396.244	9212.532	3405.165	UP	SOUTH	0.028	0.035	0.048	-0.035	0.048	0.008	
183	9206.318	3396.124	9212.680	3405.191	9206.293	3396.181	9212.719	3405.288	DOWN	NORTH	0.030	0.062	0.105	0.062	-0.105	0.032	
184	9206.338	3396.015	9212.780	3405.201	9206.322	3396.049	9212.891	3405.437	DOWN	NORTH	0.024	0.036	0.261	0.036	-0.261	0.013	
185	9206.363	3395.916	9212.866	3405.241	9206.293	3395.956	9212.953	3405.254	UP	NORTH	0.071	0.071	0.068	-0.071	-0.068	0.000	
186	9206.387	3395.804	9212.974	3405.290	9206.378	3395.834	9213.019	3405.212	DOWN	SOUTH	0.026	0.031	0.090	0.031	0.090	0.005	
187	9206.397	3395.719	9213.084	3405.283	9206.414	3395.766	9213.202	3405.283	UP	SOUTH	0.045	0.052	0.118	-0.052	0.118	0.007	
188	9206.411	3395.630	9213.164	3405.306	9206.336	3395.636	9213.112	3405.422	UP	NORTH	0.101	0.075	0.125	-0.075	-0.125	-0.026	
189	9206.432	3395.532	9213.264	3405.325	9206.456	3395.423	9213.304	3405.336	UP	SOUTH	0.028	0.112	0.023	-0.112	0.023	0.084	
190	9206.470	3395.439	9213.368	3405.347	9206.423	3395.493	9213.397	3405.391	DOWN	NORTH	0.016	0.072	0.053	0.072	-0.053	0.054	
191	9206.484	3395.342	9213.439	3405.374	9206.465	3395.327	9213.471	3405.403	UP	NORTH	0.035	0.024	0.043	-0.024	-0.043	-0.010	
192	9206.525	3395.246	9213.550	3405.381	9206.533	3395.233	9213.566	3405.442	UP	NORTH	0.015	0.015	0.072	-0.015	-0.072	0.001	
193	9206.539	3395.147	9213.647	3405.409	9206.537	3395.146	9213.647	3405.432	UP	NORTH	0.024	0.002	0.023	-0.002	-0.023	-0.022	
194	9206.564	3395.036	9213.741	3405.446	9206.612	3395.097	9213.770	3405.466	DOWN	NORTH	0.078	0.078	0.035	0.078	-0.035	0.000	
195	9206.595	3394.958	9213.862	3405.457	9206.564	3394.972	9213.871	3405.476	DOWN	SOUTH	0.016	0.014	0.021	0.014	0.021	-0.004	
196	9206.634	3394.857	9213.933	3405.501	9206.630	3394.858	9213.945	3405.552	DOWN	NORTH	0.009	0.004	0.052	0.004	-0.052	-0.005	
197	9206.662	3394.763	9214.019	3405.506	9206.626	3394.781	9214.021	3405.541	DOWN	NORTH	0.031	0.040	0.035	0.040	-0.035	0.009	
198	9206.669	3394.660	9214.138	3405.550	9206.664	3394.691	9214.152	3405.581	DOWN	NORTH	0.006	0.034	0.018	0.034	-0.018	0.028	
199	9206.688	3394.561	9214.247	3405.559	9206.694	3394.567	9214.261	3405.564	DOWN	SOUTH	0.038	0.027	0.015	0.027	0.015	-0.011	
200	9206.695	3394.461	9214.323	3405.561	9206.723	3394.496	9214.467	3405.594	UP	SOUTH	0.075	0.038	0.167	-0.038	0.167	-0.037	

UP	75	169	NORTH
DOWN	125	41	SOUTH

This is number of pebbles moving different ways

	46.613	10.836	46.613	0.316	max (m)
	-	0.001	(9.418)	(10.836)	min (m)
	1.136	0.364	1.089	(0.344)	avg (m)
	4.748	1.376	4.757	1.381	stdv (m)
	0.036	0.030	0.018	(0.031)	median (m)

	LINE PARALLEL TO CONTOUR	LINE ORIENTED DOWNGRADIENT	LINE PARALLEL TO CONTOUR	LINE ORIENTED DOWNGRADIENT
	GROSS movement	GROSS movement	NET movement	NET movement
	227.503			

pebbles moving > than uncertainty of measure	135	1 SIGMA	0.028 m
	67	2 SIGMA	0.056 m

ASSUMING 0.028 RMS UNCERTAINTY

THIS IS THE SENSITIVITY TEST FOR HOW MANY PEBBLES REALLY MOVED

Caculations for Pebble data Iron Mountain

These calculations compare movement from orginal positions. The pebbles are seperated into Line countour parallel and Line oriented down gradient pebbles.

The countour parallel line pebbles move up and down and the line oriented down gradient pebbles move north and south.

The calculations include gross movement and net movement. Gross movement does not take into account that some pebbles move up from the line and some move down from the line.

The maximum, minimum, average, standard deviation and median of gross and net pebble movment is shown at the bottom of the spread sheet. A sensitivity test is also included to determine how many pebbles are actually moving.

Gross movement accounts for all movement not just movment in downslope direction. Should we also figure out the down slope movement?

LINE PARALLEL TO CONTOUR, NORTHING = -4.133059306(EASTING) + 41446.363475601

	May--00 LINE PARALLEL TO CONTOUR e	n	LINE ORIENTED DOWNGRADIENT e	n	Apr--02 LINE PARALLEL TO CONTOUR e	n	LINE ORIENTED DOWNGRADIENT e	n	LINE PARALLEL TOCONTOUR UP vs DOWN MOVEMENT	LINE ORIENTED DOWNGRADIENT NORTH vs SOUTH MOVEMENT	LINE PARALLEL TO CONTOUR GROSS movement	LINE ORIENTED DOWNGRADIENT GROSS movement	LINE PARALLEL TOCONTOUR NET movement	LINE ORIENTED DOWNGRADIENT NET movement	
1	9202.032	3413.817	9195.012	3400.884	9201.992	3413.887	9195.036	3400.875	DOWN	NORTH	0.081	0.025	0.081	-0.025	0.081
2	9202.040	3413.723	9195.126	3400.875	9201.786	3413.877	9195.123	3400.875	DOWN	NORTH	0.297	0.003	0.297	-0.003	0.297
3	9202.070	3413.624	9195.225	3400.895	9213.627	3415.633	9195.203	3400.940	DOWN	NORTH	11.730	0.049	11.730	-0.049	11.730
4	9202.109	3413.525	9195.313	3400.930	9202.085	3413.532	9195.269	3400.975	DOWN	NORTH	0.025	0.051	0.025	-0.051	0.025
5	9202.123	3413.425	9195.405	3400.932	9211.843	3416.179	9195.366	3400.989	DOWN	NORTH	10.103	0.058	10.103	-0.058	10.103
6	9202.150	3413.323	9195.506	3400.967	9202.122	3413.345	9195.474	3400.981	DOWN	NORTH	0.036	0.037	0.036	-0.037	0.036
7	9202.166	3413.232	9195.545	3401.003	9202.160	3413.245	9195.516	3401.009	UP	NORTH	0.019	0.069	-0.019	-0.069	0.019
8	9202.194	3413.126	9195.693	3401.015	9202.201	3413.123	9195.725	3401.017	UP	NORTH	0.008	0.032	-0.008	-0.032	0.008
9	9202.224	3413.024	9195.787	3401.036	9202.243	3413.053	9195.835	3401.042	DOWN	NORTH	0.035	0.048	0.035	-0.048	0.035
10	9202.245	3412.932	9195.887	3401.062	9202.199	3412.917	9195.915	3401.066	UP	NORTH	0.048	0.029	-0.048	-0.029	0.048
11	9202.269	3412.851	9196.096	3401.087	9202.237	3412.911	9196.007	3401.232	DOWN	NORTH	0.068	0.145	0.068	-0.145	0.068
12	9202.287	3412.746	9196.097	3401.101	9202.258	3412.775	9196.061	3401.209	DOWN	NORTH	0.042	0.114	0.042	-0.114	0.042
13	9202.315	3412.647	9196.198	3401.120	9202.325	3412.655	9196.213	3401.169	DOWN	NORTH	0.013	0.051	0.013	-0.051	0.013
14	9202.329	3412.553	9196.291	3401.137	9202.362	3412.567	9196.297	3401.172	UP	NORTH	0.041	0.036	-0.041	-0.036	0.041
15	9202.359	3412.447	9196.365	3401.164	9202.367	3412.370	9196.374	3401.186	UP	NORTH	0.077	0.025	-0.077	-0.025	0.077
16	9202.378	3412.362	9196.500	3401.180	9202.382	3412.363	9196.497	3401.204	UP	NORTH	0.012	0.024	-0.012	-0.024	0.012
17	9202.407	3412.258	9196.591	3401.206	9202.399	3412.266	9196.586	3401.258	DOWN	NORTH	0.031	0.052	0.031	-0.052	0.031
18	9202.421	3412.157	9196.697	3401.235	9202.416	3412.147	9196.691	3401.268	UP	NORTH	0.011	0.034	-0.011	-0.034	0.011
19	9202.458	3412.064	9196.776	3401.252	9202.463	3412.069	9196.770	3401.289	DOWN	NORTH	0.005	0.038	0.005	-0.038	0.005
20	9202.474	3411.960	9196.875	3401.267	9202.400	3412.042	9196.917	3401.317	DOWN	NORTH	0.110	0.065	0.110	-0.065	0.110
21	9202.508	3411.873	9196.696	3401.301	9202.458	3411.934	9197.055	3401.325	DOWN	NORTH	0.079	0.360	0.079	-0.360	0.079
22	9202.496	3411.773	9197.070	3401.323	9202.516	3411.832	9197.049	3401.370	UP	NORTH	0.062	0.051	-0.062	-0.051	0.062
23	9202.524	3411.674	9197.162	3401.328	9202.665	3412.365	9197.198	3401.370	DOWN	NORTH	0.710	0.056	0.710	-0.055	0.710
24	9202.541	3411.586	9197.253	3401.343	9202.551	3411.651	9197.331	3401.352	UP	SOUTH	0.066	0.079	-0.066	0.079	0.066
25	9202.555	3411.476	9197.362	3401.361	9202.560	3411.513	9197.372	3401.395	UP	SOUTH	0.037	0.045	-0.037	0.045	0.037
26	9202.601	3411.393	9197.456	3401.343	9202.610	3411.441	9197.546	3401.370	UP	SOUTH	0.049	0.091	-0.049	0.091	0.049
27	9202.617	3411.294	9197.571	3401.410	9202.644	3411.338	9197.555	3401.456	UP	NORTH	0.052	0.049	-0.052	-0.049	0.052
28	9202.628	3411.193	9197.643	3401.459	9202.647	3411.232	9197.684	3401.467	UP	SOUTH	0.043	0.042	-0.043	0.042	0.043
29	9202.665	3411.103	9197.743	3401.485	9202.587	3411.111	9197.755	3401.526	UP	NORTH	0.078	0.043	-0.078	-0.043	0.078
30	9202.679	3410.956	9197.849	3401.498	9202.677	3410.986	9197.906	3401.640	UP	NORTH	0.030	0.153	-0.030	-0.153	0.030
31	9202.724	3410.912	9197.942	3401.512	9202.746	3410.920	9197.886	3401.542	UP	SOUTH	0.023	0.064	-0.023	0.064	0.023
32	9202.727	3410.803	9198.040	3401.536	9202.701	3410.850	9198.016	3401.662	UP	NORTH	0.054	0.128	-0.064	-0.128	0.054
33	9202.754	3410.711	9198.131	3401.557	9202.709	3410.767	9198.137	3401.585	UP	SOUTH	0.072	0.029	-0.072	0.029	0.072
34	9202.775	3410.610	9198.234	3401.592	9202.794	3410.639	9198.214	3401.606	UP	SOUTH	0.036	0.024	-0.036	0.024	0.036
35	9202.795	3410.520	9198.336	3401.606	9202.836	3410.527	9198.309	3401.677	UP	NORTH	0.044	0.076	-0.044	-0.076	0.044
36	9202.831	3410.426	9198.437	3401.631	9202.799	3410.422	9198.405	3401.640	UP	SOUTH	0.032	0.033	-0.032	0.033	0.032
37	9202.847	3410.326	9198.549	3401.655	9202.820	3410.336	9198.545	3401.672	UP	SOUTH	0.030	0.017	-0.030	0.017	0.030
38	9202.860	3410.236	9198.626	3401.672	9202.901	3410.169	9198.628	3401.763	UP	NORTH	0.070	0.091	-0.070	-0.091	0.070
39	9202.897	3410.139	9198.730	3401.695	9202.941	3410.070	9198.725	3401.885	UP	NORTH	0.077	0.190	-0.077	-0.190	0.077
40	9202.924	3410.031	9198.816	3401.730	9202.948	3410.011	9198.817	3401.757	UP	SOUTH	0.031	0.027	-0.031	0.027	0.031
41	9202.937	3409.936	9198.899	3401.750	9202.970	3409.955	9198.889	3401.815	UP	NORTH	0.037	0.066	-0.037	-0.066	0.037
42	9202.975	3409.856	9199.004	3401.788	9202.999	3409.831	9199.003	3401.821	UP	NORTH	0.034	0.033	-0.034	-0.033	0.034
43	9203.005	3409.766	9199.112	3401.806	9202.993	3409.766	9199.037	3401.873	UP	NORTH	0.012	0.101	-0.012	-0.101	0.012
44	9203.020	3409.664	9199.218	3401.842	9203.137	3409.624	9199.132	3401.877	UP	NORTH	0.124	0.093	-0.124	-0.093	0.124
45	9203.054	3409.559	9199.305	3401.867	9203.066	3409.541	9199.306	3401.893	UP	NORTH	0.022	0.026	-0.022	-0.026	0.022
46	9203.074	3409.467	9199.401	3401.887	9203.088	3409.452	9199.420	3401.946	UP	NORTH	0.021	0.062	-0.021	-0.062	0.021
47	9203.107	3409.356	9199.496	3401.906	9203.044	3409.341	9199.477	3401.984	UP	NORTH	0.065	0.081	-0.065	-0.081	0.065
48	9203.126	3409.274	9199.593	3401.933	9203.075	3409.203	9199.586	3401.979	UP	NORTH	0.087	0.047	-0.087	-0.047	0.087
49	9203.159	3409.167	9199.706	3401.955	9203.210	3409.181	9199.661	3401.954	DOWN	SOUTH	0.053	0.025	0.053	0.025	0.053
50	9203.167	3409.076	9199.779	3401.976	9203.183	3409.060	9199.723	3402.101	UP	NORTH	0.018	0.137	-0.018	-0.137	0.018
51	9203.225	3408.971	9199.872	3402.009	9203.213	3408.984	9199.856	3402.037	DOWN	NORTH	0.018	0.033	0.018	-0.033	0.018
52	9203.255	3408.879	9199.974	3402.020	9203.240	3408.905	9199.974	3402.085	DOWN	NORTH	0.030	0.065	0.030	-0.065	0.030
53	9203.281	3408.787	9200.075	3402.062	9203.251	3408.830	9200.069	3402.052	DOWN	SOUTH	0.052	0.012	0.052	0.012	0.052
54	9203.309	3408.661	9200.183	3402.077	9203.276	3408.662	9200.232	3402.114	DOWN	NORTH	0.033	0.061	0.033	-0.061	0.033
55	9203.323	3408.560	9200.283	3402.096	9203.511	3408.412	9200.275	3402.111	UP	SOUTH	0.252	0.015	-0.252	0.015	0.252
56	9203.352	3408.463	9200.377	3402.126	9203.316	3408.525	9200.345	3402.135	DOWN	SOUTH	0.055	0.033	0.055	0.033	0.055
57	9203.375	3408.362	9200.464	3402.142	9203.346	3408.447	9200.480	3402.120	DOWN	SOUTH	0.070	0.027	0.070	0.027	0.070
58	9203.401	3408.262	9200.566	3402.169	9203.390	3408.330	9200.555	3402.149	DOWN	SOUTH	0.049	0.037	0.049	0.037	0.049
59	9203.422	3408.192	9200.663	3402.200	9203.411	3408.205	9200.580	3402.147	DOWN	SOUTH	0.017	0.098	0.017	0.098	0.017
60	9203.436	3408.080	9200.764	3402.227	9203.367	3408.113	9200.726	3402.230	DOWN	SOUTH	0.076	0.038	0.076	0.038	0.076
61	9203.430	3407.997	9200.834	3402.252	9203.416	3407.959	9200.821	3402.235	UP	SOUTH	0.043	0.021	-0.043	0.021	0.043
62	9203.469	3407.904	9200.947	3402.265	9203.446	3407.928	9200.934	3402.287	DOWN	NORTH	0.033	0.026	0.033	-0.026	0.033
63	9203.505	3407.828	9201.053	3402.318	9203.469	3407.833	9201.065	3402.366	DOWN	NORTH	0.017	0.071	0.017	-0.071	0.017
64	9203.527	3407.669	9201.141	3402.327	9203.608	3407.668	9201.184	3402.482	DOWN	NORTH	0.083	0.161	0.083	-0.161	0.083
65	9203.560	3407.613	9201.243	3402.368	9203.583	3407.594	9201.226	3402.395	DOWN	NORTH	0.030	0.033	0.030	-0.033	0.030
66	9203.589	3407.496	9201.330	3402.380	9203.566	3407.566	9201.364	3402.495	DOWN	NORTH	0.072	0.127	0.072	-0.127	0.072
67	9203.609	3407.418	9201.431	3402.416	9203.649	3407.357	9201.433	3402.466	DOWN	NORTH	0.073	0.050	0.073	-0.050	0.073
68	9203.644	3407.314	9201.524	3402.430	9203.587	3407.461	9201.528	3402.508	DOWN	NORTH	0.158	0.078	0.158	-0.078	0.158
69	9203.649	3407.231	9201.632	3402.458	9203.639	3407.264	9201.578	3402.531	DOWN	NORTH	0.034	0.092	0.034	-0.092	0.034
70	9203.672	3407.111	9201.724	3402.491	9203.658	3407.147	9201.660	3402.463	DOWN	SOUTH	0.039	0.052	0.039	0.052	0.039
71	9203.699	3407.016	9201.819	3402.501	9203.642	3407.066	9201.875	3402.469	DOWN	SOUTH	0.077	0.064	0.077	0.064	0.077
72	9203.727	3406.914	9201.914	3402.527	9203.639	3406.937	9201.927	3402.561	DOWN	NORTH	0.091	0.036	0.091	-0.036	0.091
73	9203.750	3406.831	9201.999	3402.560	9203.720	3406.832	9202.071	3402.550	DOWN	NORTH	0.030	0.073	0.030	-0.073	0.030
74	9203.770	3406.714	9202.096	3402.584	9203.747	3406.757	9202.137	3402.556	DOWN	SOUTH	0.049	0.049	0.049	0.049	0.049
75	9203.797	3406.619	9202.179	3402.593	9203.792	3406.650	9202.175	3402.563	DOWN	SOUTH	0.031	0.030	0.031	0.030	0.031
76	9203.829	3406.547	9202.257	3402.636	9203.787	3406.572	9202.284	3402.717	DOWN	NORTH	0.049	0.085	0.049	-0.085	0.049
77	9203.814	3406.442	9202.410	3402.667	9203.898	3406.509	9202.364	3402.661	DOWN	NORTH	0.134	0.030	0.134	-0.030	0.134
78	9203.852	3406.392	9202.493	3402.682	9203.851	3406.335	9202.488	3402.704	DOWN	NORTH	0.057	0.023	0.067	-0.023	0.057
79	9203.895	3406.248	9202.605	3402.711	9203.877	3406.203	9202.666	3402.677	DOWN	SOUTH	0.048	0.068	0.048	0.068	0.048
80	9203.899	3406.136	9202.684	3402.739	9203.985	3406.086	9202.707	3402.694	UP	SOUTH	0.099	0.051	-0.099	0.051	0.099
81	9203.921	3406.037	9202.774	3402.756	9203.917	3406.064	9202.802	3402.765	DOWN	NORTH	0.027	0.029	0.027	-0.029	0.027
82	9203.950	3405.946	9202.861	3402.760	9203.933	3405.996	9202.880	3402.772	DOWN	NORTH	0.053	0.022	0.053	-0.022	0.053
83	9203.976	3405.847	9202.951	3402.784	9203.949	3405.877	9202.991	3402.788	DOWN	NORTH	0.040	0.040	0.040	-0.040	0.040
84	9203.998	3405.757	9203.065	3402.800	9203.967	3405.787	9203.072	3402.810	DOWN	NORTH	0.043	0.012	0.043	-0.012	0.043
85	9204.017	3405.662	9203.179	3402.836	9204.036	3405.659	9203.164	3402.832	DOWN	SOUTH	0.019	0.016	0.019	0.016	0.019
86	9204.038	3405.556	9203.289	3402.835	9204.081	3405.550	9203.267	3402.865	DOWN	SOUTH	0.043	0.037	0.043	0.037	0.043
87	9204.064	3405.461	9203.378	3402.870	9204.087	3405.458	9203.142	3402.993	DOWN	SOUTH	0.023	0.314	0.023	0.314	0.023
88	9204.086	3405.367	9203.468	3402.904	9204.144	3405.358	9204.796	3404.192	DOWN	NORTH	0.059	1.850	0.059	-1.850	0.059
89	9204.103	3405.280	9203.580	3402.952	9204.182	3405.243	9204.474	3404.291	UP	NORTH	0.087	1.610	-0.087	-1.610	0.087
90	9204.113	3405.169	9203.659	3402.980	9204.145	3405.205	9204.541	3404.132	UP	NORTH	0.048	1.451	-0.048	-1.451	0.048
91	9204.178	3405.077	9203.738	3403.001	9204.187	3405.118	9204.405	3404.221	DOWN	NORTH	0.042	1.390	0.042	-1.390	0.042
92	9204.182	3404.969	9203.838	3403.014	9204.187	3404.999	9204.749	3404.172	DOWN	NORTH	0.030	1.473	0.030	-1.473	0.030
93	9204.211	3404.884	9203.933	3403.050	9204.158	3404.951	9203.846	3403.058	DOWN	NORTH	0.085	0.087	0.085	-0.087	0.085
94	9204.224	3404.789	9204.040	3403.061	9204.202	3404.821	9203.910	3403.083	DOWN	NORTH	0.039	0.132	0.039	-0.132	0.039
95	9204.258	3404.689	9204.133	3403.104	9204.224	3404.621	9204.068	3403.116	UP	NORTH	0.075	0.066	-0.075	-0.066	0.075
96	9204.294	3404.585	9204.232	3403.106	9204.283	3405.144	9204.185	3403.269	DOWN	NORTH	0.560	0.168	0.560	-0.168	0.560
97	9204.298	3404.477	9204.326	3403.121	9204.816	3406.426	9204.188	3403.399	DOWN	NORTH	2.017	0.310	2.017	-0.310	2.017
98	9204.318	3404.380	9204.428	3403.164	9204.235	3404.419	9204.371	3403.363	DOWN	NORTH	0.090	0.207	0.090	-0.207	0.090
99	9204.322	3404.284	9204.552	3403.186	9204.341	3404.364	9203.928	3403.768	UP	NORTH	0.028	0.853	-0.028	-0.853	0.028
100	9204.365	3404.205	9204.623	3403.202	9205.416	3407.813	9210.994	3411.561	DOWN	NORTH	3.758	10.510	3.758	-10.510	3.758
101	9204.389	3404.109	9204.708	3403.231	9204.392	3404.117	9210.575	3404.609	DOWN	NORTH	0.009	6.027	0.009	-6.027	0.009
102	9204.418	3404.010	9204.817	3403.266	9204.414	3404.025	9206.666	3409.748	DOWN	NORTH	0.016	6.747	0.016	-6.747	0.016
103	9204.430	3403.916	9204.904	3403.279	9204.470	3403.954	9207.096	3410.053	DOWN	NORTH	0.049	7.120	0.049	-7.120	0.049
104	9204.470	3403.816	9205.011	3403.232	9219.621	3418.604	9205.086	3406.263	DOWN	NORTH	21.172	3.032	21.172	-3.032	21.172
105	9204.504	3403.715	9205.096	3403.361	9204.492	3403.729	9204.096	3403.317	DOWN	NORTH	0.018	0.999	0.018	-0.999	0.018
106	9204.512	3403.608	9205.221	3403.370	9212.774	3413.001	9206.218	3403.374	DOWN	NORTH	12.510	0.005	12.510	-0.005	12.510
107	9204.542	3403.510	9205.299	3403.393	9207.079	3410.255	9211.773	3412.083	DOWN	NORTH	7.206	10.836	7.206	-10.836	7.206
108	9204.574	3403.396	9205.436	3403.396	9204.560	3403.423	9211.039	3411.559	DOWN	NORTH	0.027	9.901	0.027	-9.901	0.027
109	9204.604	3403.318	9205.500	3403.429	9204.568	3403.822	9205.496	3403.451	DOWN	NORTH	0.505	0.022	0.505	-0.022	0.505
110	9204.601	3403.219	9205.591	3403.441	9204.278	3406.278	9205.610	3403.475	DOWN	NORTH	3.076	0.039	3.076	-0.039	3.076
111	9204.632	3403.120	9205.688	3403.484	9204.694	3406.241	9205.680	3403.468	DOWN	NORTH	3.122	0.009	3.122	-0.009	3.122
112	9204.646	3403.040	9205.787	3403.507	9204.598	3404.191	9205.785	3403.524	DOWN	NORTH	1.152	0.017	1.152	-0.017	1.152
113	9204.664	3402.947	9205.893	3403.524	9219.670	3418.434	9205.901	3403.525	DOWN	NORTH	21.551	0.008	21.551	-0.008	21.551
114	9204.697	3402.857	9205.986	3403.541	9204.697	3402.857	9206.090	3403.576	DOWN	NORTH	0.000	0.108	0.000	-0.108	0.000
115	9204.713	3402.761	9206.081	3403.576	9204.679	3402.849	9206.084	3403.593	DOWN	NORTH	0.094	0.017	0.094	-0.017	0.094
116	9204.740	3402.650	9206.176	3403.599	9215.737	3416.084	9206.186	3403.628	DOWN	NORTH	17.361	0.032	17.361	-0.032	17.361
117	9204.787	3402.542	9206.287	3403.664	9216.334	3416.547	9206.283	3403.659	DOWN	NORTH	18.151	0.006	18.151	-0.006	18.151
118	9204.805	3402.454	9206.379	3403.641	9205.772	3408.142	9206.384	3403.655	DOWN	NORTH	5.770	0.015	5.770	-0.015	5.770
119	9204.816	3402.358	9206.469	3403.664	9205.739	3408.106	9206.479	3403.719	DOWN	NORTH	5.824	0.056	5.824	-0.056	5.824
120	9204.830	3402.262	9206.569	3403.665	9242.709	3429.374	9206.507	3403.776	DOWN	NORTH	46.575	0.110	46.575	-0.110	46.575
121	9204.850	3402.161	9206.662	3403.730	9204.849	3402.215	9206.671	3403.740	DOWN	NORTH	0.054	0.015	0.054	-0.015	0.054
122	9204.884	3402.068	9206.760	3403.735	9204.883	3402.075	9206.765	3403.758	DOWN	NORTH	0.007	0.024	0.007	-0.024	0.007
123	9204.901	3401.963	9206.856	3403.779	9204.908	3401.953	9206.854	3403.762	UP	NORTH	0.012	0.014	-0.012	-0.014	0.012
124	9204.932	3401.870	9206.963	3403.788	9204.953	3401.913	9207.178	3403.959	DOWN	NORTH	0.048	0.275	0.048	-0.275	0.048
125	9204.958	3401.760	9207.069	3403.803	9204.946	3401.778	9207.238	3403.938	DOWN	NORTH	0.022	0.216	0.022	-0.216	0.022
126	9204.986	3401.657	9207.149	3403.832	9205.067	3401.706	9207.455	3403.945	DOWN	NORTH	0.094	0.326	0.094	-0.326	0.094
127	9204.966	3401.564	9207.260	3403.871	9204.995	3401.589	9207.558	3403.923	UP	NORTH	0.036	0.301	-0.036	-0.301	0.036
128	9205.029	3401.463	9207.354	3403.883	9205.028	3401.514	9208.184	3404.951	DOWN	NORTH	0.051	1.340	0.051	-1.340	0.051
129	9205.052	3401.361	9207.446	3403.900	9205.065	3401.400	9207.409	3403.935	DOWN	NORTH	0.019	0.051	0.019	-0.051	0.019
130	9205.062	3401.276	9207.528	3403.926	9205.065	3401.322	9211.563	3407.328	DOWN	NORTH	0.046	5.278	0.046	-5.278	0.046
131	9205.103	3401.188	9207.637	3403.966	9205.102	3401.245	9207.566	3403.934	DOWN	SOUTH	0.057	0.076	0.057	0.076	0.057
132	9205.113	3401.093	9207.728	3403.974	9205.137	3401.112	9204.100	3406.177	DOWN	NORTH	0.031	5.552	0.031	-5.552	0.031
133	9205.160	3401.000	9207.820	3404.001	9210.436	3406.258	9207.86	3404.034	DOWN	NORTH	7.449	0.052	7.449	-0.052	7.449
134	9205.171	3400.900	9207.924	3404.031	9205.164	3400.91	9207.954	3404.061	DOWN	NORTH	0.012	0.042	0.012	-0.042	0.012
135	9205.202	3400.799	9208.031	3404.049	9205.183	3400.819	9210.023	3405.774	DOWN	NORTH	0.028	2.635	0.028	-2.635	0.028
136	9205.226	3400.709	9208.107	3404.075	9210.344	3406.294	9209.613	3406.650	DOWN	NORTH	7.576	3.157	7.576	-3.157	7.576
137	9205.236	3400.596	9208.220	3404.098	9225.525	3410.220	9211.080	3406.032	DOWN	NORTH	22.454	3.453	22.454	-3.453	22.454
138	9205.263	3400.489	9208.315	3404.126	9205.265	3400.51	9208.284	3407.565	DOWN	NORTH	0.022	3.439	0.022	-3.439	0.022
139	9205.282	3400.391	9208.414	3404.146	9216.445	3407.474	9210.492	3404.838	DOWN	NORTH	13.212	2.135	13.212	-2.135	13.212
140	9205.306	3400.311	9208.507	3404.164	9205.31	3400.327	9208.563	3404.162	DOWN	NORTH	0.017	0.056	0.017	-0.056	0.017
141	9205.327	3400.212	9208.611	3404.189	9210.551	3404.727	9208.606	3404.191	DOWN	NORTH	6.905	0.005	6.905	-0.005	6.905
142	9205.344	3400.117	9208.714	3404.199	9205.432	3399.829	9208.714	3404.221	UP	NORTH	0.301	0.022	-0.301	-0.022	0.301
143	9205.373	3400.015	9208.817	3404.231	9214.076	3406.423	9208.784	3404.184	DOWN	SOUTH	10.808	0.057	10.808	0.057	10.808
144	9205.394	3399.925	9208.890	3404.259	9212.160	3407.110	9208.883	3404.277	DOWN	NORTH	9.876	0.019	9.876	-0.019	9.876
145	9205.410	3399.825	9208.993	3404.281	9205.436	3399.833	9209.024	3404.305	UP	NORTH	0.026	0.039	-0.026	-0.039	0.026
146	9205.435	3399.714	9209.075	3404.304	9205.414	3399.704	9209.045	3404.362	UP	NORTH	0.023	0.065	-0.023	-0.065	0.023
147	9205.467	3399.622	9209.187	3404.332	9205.499	3399.870	9209.252	3404.380	DOWN	NORTH	0.259	0.081	0.259	-0.081	0.259
148	9205.486	3399.514	9209.314	3404.352	9205.494	3399.505	9209.287	3404.385	UP	NORTH	0.009	0.043	-0.009	-0.043	0.009
149	9205.505	3399.420	9209.382	3404.363	9205.505	3399.415	9212.154	3406.630	UP	NORTH	0.005	3.048	-0.005	-3.048	0.005
150	9205.526	3399.323	9209.477	3404.380	9205.548	3399.306	9210.328	3404.789	UP	NORTH	0.028	0.944	-0.028	-0.944	0.028
151	9205.563	3399.244	9209.567	3404.410	9205.559	3399.259	9209.57	3404.398	DOWN	SOUTH	0.016	0.012	0.016	0.012	0.016
152	9205.592	3399.142	9209.674	3404.440	9205.602	3399.201	9209.587	3404.431	DOWN	SOUTH	0.060	0.087	0.060	0.087	0.060
153	9205.599	3399.052	9209.760	3404.464	9205.657	3399.028	9209.742	3404.36	UP	SOUTH	0.063	0.111	-0.063	0.111	0.063
154	9205.623	3398.944	9209.878	3404.479	9205.713	3398.968	9214.200	3408.317	UP	NORTH	0.093	4.697	-0.093	-4.697	0.093
155	9205.636	3398.856	9209.973	3404.515	9205.685	3398.974	9209.985	3404.549	DOWN	NORTH	0.128	0.036	0.128	-0.036	0.128
156	9205.652	3398.755	9210.060	3404.534	9205.631	3398.736	9210.079	3404.559	UP	NORTH	0.028	0.031	-0.028	-0.031	0.028
157	9205.664	3398.645	9210.172	3404.563	9205.684	3398.631	9210.071	3404.765	UP	NORTH	0.014	0.226	-0.014	-0.226	0.014

158	9205.713	3398.548	9210.271	3404.590	9205.722	3398.590	9210.397	3404.655		UP	NORTH	0.033	0.140	-0.033	-0.140	0.033
159	9205.741	3398.445	9210.362	3404.516	9206.072	3398.666	9210.348	3404.62		DOWN	NORTH	0.398	0.000	0.398	-0.000	0.398
160	9205.755	3398.342	9210.438	3404.536	9206.778	3398.365	9211.514	3405.341		UP	NORTH	0.024	1.286	-0.024	-1.286	0.024
161	9205.798	3398.269	9210.558	3404.564	9206.856	3398.330	9210.562	3404.607		DOWN	SOUTH	0.085	0.057	0.085	0.057	0.085
162	9206.806	3398.167	9210.662	3404.668	9205.521	3398.170	9210.669	3404.69		UP	NORTH	0.013	0.037	-0.013	-0.037	0.013
163	9205.829	3398.056	9210.764	3404.699	9205.817	3398.094	9210.728	3404.606		UP	NORTH	0.040	0.110	-0.040	-0.110	0.040
164	9205.845	3397.983	9210.836	3404.728	9205.822	3398.025	9210.869	3404.733		UP	NORTH	0.048	0.053	-0.048	-0.053	0.048
165	9205.879	3397.868	9210.931	3404.755	9205.864	3397.935	9210.878	3404.781		UP	NORTH	0.036	0.054	-0.036	-0.054	0.036
166	9205.905	3397.763	9211.027	3404.774	9206.168	3397.882	9211.033	3404.803		DOWN	NORTH	0.290	0.250	0.290	-0.050	0.290
167	9205.925	3397.666	9211.129	3404.808	9206.000	3397.770	9211.068	3404.862		DOWN	NORTH	0.126	0.083	0.126	-0.083	0.126
168	9205.946	3397.555	9211.231	3404.828	9205.860	3397.828	9211.281	3404.890		UP	NORTH	0.081	0.080	-0.081	-0.080	0.081
169	9205.982	3397.476	9211.350	3404.864	9206.133	3397.581	9211.333	3404.810		DOWN	NORTH	0.201	0.046	0.201	-0.046	0.201
170	9205.982	3397.374	9211.419	3404.874	9206.010	3397.415	9211.440	3404.865		UP	SOUTH	0.050	0.025	-0.050	0.025	0.050
171	9206.014	3397.284	9211.528	3404.896	9206.022	3397.319	9211.560	3404.907		UP	SOUTH	0.036	0.024	-0.036	0.024	0.036
172	9206.039	3397.177	9211.634	3404.921	9206.032	3397.149	9211.629	3404.912		UP	SOUTH	0.029	0.012	-0.029	0.012	0.029
173	9206.076	3397.082	9211.719	3404.959	9206.062	3397.109	9211.721	3404.945		UP	SOUTH	0.029	0.016	-0.029	0.016	0.029
174	9209.092	3395.995	9211.850	3404.963	9206.097	3397.026	9211.792	3404.986		UP	NORTH	0.032	0.024	-0.032	-0.024	0.032
175	9206.113	3396.899	9211.900	3404.991	9206.114	3396.921	9211.827	3405.063		UP	NORTH	0.022	0.066	-0.022	-0.066	0.022
176	9206.160	3396.808	9212.002	3405.014	9206.100	3396.824	9211.988	3405.029		DOWN	NORTH	0.063	0.022	0.063	-0.022	0.063
177	9206.184	3396.687	9212.113	3405.031	9206.136	3396.709	9212.115	3405.096		UP	NORTH	0.034	0.067	-0.034	-0.067	0.034
178	9206.181	3396.609	9212.211	3405.055	9206.256	3396.597	9212.229	3405.069		UP	SOUTH	0.071	0.023	-0.071	0.023	0.071
179	9206.209	3396.520	9212.289	3405.064	9206.217	3396.464	9212.314	3405.136		UP	NORTH	0.067	0.054	-0.067	-0.054	0.067
180	9206.231	3396.410	9212.382	3405.102	9206.251	3396.412	9212.382	3405.135		UP	NORTH	0.020	0.034	-0.020	-0.034	0.020
181	9206.268	3396.312	9212.484	3405.132	9206.277	3396.361	9212.475	3405.160		DOWN	NORTH	0.040	0.036	0.040	-0.036	0.040
182	9206.281	3396.218	9212.580	3405.167	9206.312	3396.254	9212.534	3405.180		UP	NORTH	0.048	0.052	-0.048	-0.052	0.048
183	9206.318	3396.124	9212.680	3405.191	9206.279	3396.200	9212.730	3405.292		DOWN	NORTH	0.065	0.087	0.065	-0.087	0.065
184	9209.338	3395.015	9212.780	3405.291	9206.321	3396.043	9212.857	3405.460		DOWN	NORTH	0.033	0.270	0.033	-0.270	0.033
185	9206.353	3395.918	9212.869	3405.241	9206.293	3395.956	9212.836	3406.283		UP	NORTH	0.071	0.082	-0.071	-0.082	0.071
186	9206.367	3395.804	9212.974	3405.290	9206.367	3395.837	9212.998	3406.191		DOWN	SOUTH	0.033	0.102	0.033	0.102	0.033
187	9206.397	3395.719	9213.084	3405.283	9206.406	3395.799	9213.161	3406.308		DOWN	NORTH	0.061	0.110	0.061	-0.110	0.061
188	9206.411	3395.630	9213.184	3405.308	9206.360	3395.648	9213.088	3406.429		UP	NORTH	0.056	0.135	-0.056	-0.135	0.056
189	9206.432	3395.532	9213.284	3405.325	9206.430	3395.428	9213.314	3406.360		UP	NORTH	0.104	0.030	-0.104	-0.030	0.104
190	9206.470	3395.439	9213.368	3405.347	9206.418	3395.503	9213.406	3406.394		DOWN	NORTH	0.082	0.060	0.082	-0.060	0.082
191	9206.484	3395.342	9213.439	3405.374	9206.460	3395.323	9213.504	3406.431		UP	NORTH	0.024	0.096	-0.024	-0.096	0.024
192	9206.525	3395.246	9213.560	3405.381	9209.515	3395.220	9213.565	3406.439		UP	NORTH	0.028	0.068	-0.028	-0.068	0.028
193	9206.539	3395.147	9213.647	3405.409	9206.514	3395.155	9213.630	3406.448		UP	NORTH	0.026	0.043	-0.026	-0.043	0.026
194	9206.564	3395.036	9213.741	3405.448	9206.503	3395.104	9213.758	3406.466		DOWN	NORTH	0.078	0.020	0.078	-0.020	0.078
195	9206.595	3394.958	9213.852	3405.457	9206.590	3394.878	9213.852	3406.467		DOWN	NORTH	0.018	0.050	0.018	-0.050	0.018
196	9206.594	3394.857	9213.939	3405.501	9206.630	3394.878	9213.944	3406.566		DOWN	NORTH	0.021	0.068	0.021	-0.068	0.021
197	9206.662	3394.765	9214.019	3405.508	9206.618	3394.783	9214.012	3406.541		DOWN	NORTH	0.048	0.036	0.048	-0.036	0.048
198	9206.669	3394.660	9214.138	3406.550	9206.663	3394.678	9214.147	3406.608		DOWN	NORTH	0.019	0.060	0.019	-0.060	0.019
199	9206.688	3394.561	9214.247	3405.559	9206.677	3394.610	9214.257	3406.584		DOWN	NORTH	0.050	0.027	0.050	-0.027	0.050
200	9206.695	3394.461	9214.323	3406.561	9206.716	3394.532	9214.471	3406.623		UP	NORTH	0.074	0.180	-0.074	-0.180	0.074

UP	78	189
DOWN	122	46

46.676	16.836	46.575	9.814	max (m)
-	9.993	(0.991)	(19.836)	min (m)
1.465	8.642	1.344	(5.542)	avg (m)
4.976	1.877	4.967	1.883	stdv (m)
0.844	8.855	0.879	(8.847)	median (m)

LINE PARALLEL TO CONTOUR GROSS movement	LINE ORIENTED DOWNGRADIENT GROSS movement	LINE PARALLEL TO CONTOUR NET movement	LINE ORIENTED DOWNGRADIENT NET movement
986.891			

151	1 SIGMA	0.026 m
83	2 SIGMA	0.056 m
0.026	RMS UNCERTAINTY	

Caculations for Pebble data Chemehuevi

These calculations compare movement from orginal positions. The pebbles are seperated into Line countour parallel and Line oriented down gradient pebbles.

The countour parallel fine pebbles move up and down and the line oriented down gradient pebbles move north and south.

The calculations include gross movement and net movement. Gross movement does not take into account that some pebbles move up from the line and some move down from the line.

The maximum, minimum, average, standard deviation and median of gross and net pebble movement is shown at the bottom of the spread sheet. A sensitivity test is also included to determine how many pebbles are actually moving.

Gross movement accounts for all movement not just movment in downslope direction
Should we also figure out the down slope movement?

LINE PARALLEL TO CONTOUR NORTHING = -4.13305930X(EASTING\) + 41446.36347580\

LINE ORIENTED DOWN GRADIENT NORTHING = 0.24740463X(EASTING\) + 1125.893581083

May--00

	LINE PARALLEL TO CONTOUR		LINE ORIENTED DOWNGRADIENT	
	e	n	e	n
1	2674.179	2248.657	2662.071	2234.669
2	2674.095	2248.614	2662.952	2234.767
3	2674.000	2248.585	2662.921	2234.884
4	2673.917	2248.549	2662.889	2234.985
5	2673.811	2248.523	2662.826	2235.076
6	2673.722	2248.480	2662.807	2235.169
7	2673.634	2248.451	2662.770	2235.270
8	2673.546	2248.408	2662.764	2235.369
9	2673.439	2248.385	2662.703	2235.457
10	2673.341	2248.352	2662.677	2235.513
11	2673.254	2248.370	2662.661	2235.636
12	2673.185	2248.391	2662.643	2235.720
13	2673.084	2248.278	2662.595	2235.817
14	2672.976	2248.251	2662.551	2235.919
15	2672.871	2248.200	2662.537	2236.009
16	2672.776	2248.188	2662.525	2236.100
17	2672.566	2248.143	2662.469	2236.226
18	2672.567	2248.099	2662.454	2236.319
19	2672.464	2248.055	2662.402	2236.414
20	2672.350	2248.027	2662.364	2236.504
21	2672.308	2248.012	2662.350	2236.590
22	2672.224	2247.982	2662.322	2236.660
23	2672.123	2247.954	2662.281	2236.763
24	2672.015	2247.908	2662.237	2236.862
25	2671.914	2247.871	2662.225	2236.976
26	2671.823	2247.849	2662.185	2237.066
27	2671.729	2247.813	2662.157	2237.167
28	2671.632	2247.789	2662.151	2237.260
29	2671.539	2247.750	2662.073	2237.338
30	2671.432	2247.717	2662.068	2237.436
31	2671.341	2247.701	2662.029	2237.496
32	2671.255	2247.666	2662.019	2237.622
33	2671.154	2247.636	2661.984	2237.726
34	2671.058	2247.605	2661.934	2237.823
35	2670.949	2247.585	2661.906	2237.907
36	2670.856	2247.534	2661.888	2238.028
37	2670.767	2247.492	2661.870	2238.127
38	2670.667	2247.474	2661.839	2238.215
39	2670.563	2247.437	2661.819	2238.301
40	2670.483	2247.403	2661.774	2238.391
41	2670.358	2247.380	2661.731	2238.468
42	2670.297	2247.356	2661.711	2238.569
43	2670.191	2247.327	2661.672	2238.672
44	2670.104	2247.295	2661.645	2238.792
45	2670.028	2247.259	2661.605	2238.867
46	2669.904	2247.235	2661.590	2238.962
47	2669.806	2247.209	2661.572	2239.055
48	2669.711	2247.171	2661.508	2239.160
49	2669.627	2247.162	2661.505	2239.258
50	2669.527	2247.115	2661.456	2239.344
51	2669.435	2247.055	2661.416	2239.436
52	2669.359	2247.007	2661.384	2239.529
53	2669.263	2247.006	2661.359	2239.623
54	2669.161	2246.985	2661.345	2239.739
55	2669.063	2246.940	2661.320	2239.829
56	2668.986	2246.912	2661.279	2239.940
57	2668.883	2246.886	2661.264	2240.036
58	2668.764	2246.842	2661.227	2240.112
59	2668.680	2246.811	2661.185	2240.207
60	2668.592	2246.784	2661.158	2240.328
61	2668.491	2246.743	2661.131	2240.396
62	2668.410	2246.718	2661.109	2240.494
63	2668.330	2246.695	2661.078	2240.595
64	2668.230	2246.673	2661.046	2240.707
65	2668.137	2246.634	2661.007	2240.795
66	2668.017	2246.593	2660.998	2240.894
67	2667.918	2246.556	2660.958	2240.964
68	2667.823	2246.547	2660.942	2241.064
69	2667.744	2246.524	2660.889	2241.156
70	2667.644	2246.489	2660.844	2241.257
71	2667.545	2246.451	2660.843	2241.356
72	2667.444	2246.419	2660.801	2241.461
73	2667.359	2246.384	2660.801	2241.546
74	2667.257	2246.366	2660.734	2241.630
75	2667.166	2246.344	2660.716	2241.750
76	2667.052	2246.303	2660.700	2241.842
77	2666.957	2246.267	2660.671	2241.915
78	2666.870	2246.250	2660.626	2242.016
79	2666.793	2246.217	2660.666	2242.128
80	2666.673	2246.191	2660.574	2242.232
81	2666.595	2246.153	2660.530	2242.305
82	2666.471	2246.118	2660.511	2242.407
83	2666.411	2246.093	2660.452	2242.494
84	2666.311	2246.067	2660.451	2242.594
85	2666.204	2246.023	2660.415	2242.697
86	2666.108	2245.991	2660.374	2242.786
87	2666.007	2245.956	2660.398	2242.886
88	2665.896	2245.955	2660.319	2242.956
89	2665.811	2245.908	2660.302	2243.066
90	2665.737	2245.887	2660.274	2243.159
91	2665.642	2245.850	2660.274	2243.240
92	2665.566	2245.803	2660.201	2243.343
93	2665.441	2245.781	2660.183	2243.530
94	2665.349	2245.744	2660.155	2243.543
95	2665.261	2245.738	2660.140	2243.664
96	2665.121	2245.702	2660.107	2243.732
97	2665.039	2245.659	2660.068	2243.836
98	2664.936	2245.635	2660.041	2243.909
99	2664.850	2245.603	2660.009	2244.027
100	2664.759	2245.576	2659.996	2244.128
101	2664.665	2245.553	2659.968	2244.220
102	2664.591	2245.513	2659.925	2244.323
103	2664.480	2245.474	2659.885	2244.418
104	2664.396	2245.457	2659.885	2244.492
105	2664.287	2245.438	2659.824	2244.586
106	2664.194	2245.394	2659.799	2244.692
107	2664.112	2245.364	2659.781	2244.783
108	2664.020	2245.329	2659.753	2244.885
109	2663.932	2245.298	2659.720	2244.971
110	2663.815	2245.278	2659.685	2245.067
111	2663.741	2245.239	2659.650	2245.179
112	2663.644	2245.227	2659.616	2245.254
113	2663.546	2245.191	2659.606	2245.363
114	2663.450	2245.162	2659.570	2245.463
115	2663.350	2245.141	2659.552	2245.550
116	2663.248	2245.102	2659.514	2245.651
117	2663.126	2245.085	2659.488	2245.742
118	2663.035	2245.042	2659.445	2245.848
119	2662.920	2245.009	2659.430	2245.941
120	2662.827	2244.986	2659.389	2246.039
121	2662.750	2244.971	2659.345	2246.132
122	2662.662	2244.939	2659.338	2246.221
123	2662.571	2244.903	2659.303	2246.330
124	2662.479	2244.877	2659.283	2246.416
125	2662.368	2244.814	2659.244	2246.511
126	2662.290	2244.802	2659.228	2246.606
127	2662.182	2244.789	2659.184	2246.700
128	2662.087	2244.748	2659.160	2246.810
129	2661.997	2244.712	2659.126	2246.909
130	2661.901	2244.697	2659.108	2246.991
131	2661.823	2244.650	2659.080	2247.095
132	2661.722	2244.638	2659.036	2247.167
133	2661.614	2244.595	2659.020	2247.262
134	2661.516	2244.594	2658.976	2247.373
135	2661.417	2244.554	2658.956	2247.459
136	2661.318	2244.528	2658.926	2247.566

Nov--00

	LINE PARALLEL TO CONTOUR		LINE ORIENTED DOWNGRADIENT	
	e	n	e	n
	2674.183	2248.669	2662.992	2234.653
	2674.103	2248.600	2662.988	2234.748
	2674.004	2248.588	2662.957	2234.896
	2673.899	2248.551	2662.877	2235.000
	2673.829	2248.522	2662.815	2235.128
	2673.726	2248.460	2662.830	2235.135
	2673.634	2248.464	2662.789	2235.248
	2673.564	2248.416	2662.767	2235.339
	2673.447	2248.381	2662.714	2235.447
	2673.326	2248.346	2662.709	2235.518
	2673.229	2248.322	2662.681	2235.582
	2673.140	2248.296	2662.649	2235.695
	2673.081	2248.269	2662.627	2235.797
	2672.958	2248.246	2662.581	2235.887
	2672.856	2248.204	2662.566	2235.979
	2672.742	2248.182	2662.543	2236.108
	2672.653	2248.141	2662.496	2236.189
	2672.561	2248.099	2662.337	2236.545
	2672.449	2248.059	2662.441	2236.366
	2672.356	2248.023	2662.387	2236.464
	2672.361	2248.076	2662.363	2236.545
	2672.207	2247.978	2662.336	2236.627
	2672.085	2247.961	2662.306	2236.741
	2672.018	2247.916	2662.217	2236.813
	2671.910	2247.913	2662.232	2236.937
	2671.804	2247.882	2662.229	2237.046
	2671.697	2247.821	2662.269	2237.190
	2671.609	2247.783	2662.190	2237.162
	2671.445	2247.722	2662.121	2237.328
	2671.422	2247.727	2662.137	2237.423
	2671.336	2247.701	2662.004	2237.493
	2671.247	2247.677	2662.042	2237.564
	2671.156	2247.644	2661.969	2237.714
	2671.044	2247.608	2661.969	2237.798
	2670.945	2247.569	2661.932	2237.898
	2670.840	2247.535	2661.908	2237.969
	2670.749	2247.499	2661.882	2238.095
	2670.658	2247.467	2661.859	2238.206
	2670.574	2247.450	2661.841	2238.284
	2670.484	2247.429	2661.795	2238.369
	2670.390	2247.377	2661.756	2238.464
	2670.275	2247.381	2661.730	2238.517
	2670.185	2247.339	2661.691	2238.657
	2670.089	2247.309	2661.620	2238.778
	2670.001	2247.270	2661.624	2238.844
	2669.891	2247.222	2661.579	2238.870
	2669.801	2247.204	2661.575	2239.040
	2669.713	2247.179	2661.520	2239.146
	2669.612	2247.147	2661.510	2239.240
	2669.503	2247.103	2661.465	2239.322
	2669.395	2247.088	2661.440	2239.427
	2669.364	2247.013	2661.403	2239.544
	2669.210	2246.985	2661.406	2239.583
	2669.113	2246.968	2661.367	2239.716
	2669.030	2246.947	2661.320	2239.815
	2668.946	2246.904	2661.305	2239.902
	2668.876	2246.868	2661.289	2240.021
	2668.748	2246.842	2661.251	2240.087
	2668.594	2243.756	2661.157	2240.196
	2671.215	2240.292	2661.187	2240.284
	2671.070	2240.719	2661.151	2240.370
	2669.852	2243.664	2661.123	2240.476
	2668.662	2246.443	2661.081	2240.576
	2669.814	2243.294	2661.081	2240.683
	2670.956	2240.792	2661.030	2240.771
	2668.017	2246.593	2661.013	2240.875
	2668.796	2245.372	2660.988	2240.955
	2667.823	2246.547	2660.945	2241.051
	2668.635	2245.074	2660.905	2241.159
	2667.697	2246.367	2660.867	2241.264
	2667.550	2246.457	2660.869	2241.336
	2667.436	2246.427	2660.837	2241.450
	2667.355	2246.378	2660.822	2241.540
	2667.232	2246.359	2660.735	2241.603
	2667.157	2246.342	2660.743	2241.733
	2667.050	2246.315	2660.731	2241.793
	2666.941	2246.266	2660.668	2241.922
	2666.865	2246.252	2660.656	2242.017
	2666.773	2246.220	2660.671	2242.126
	2666.668	2246.179	2660.584	2242.223
	2666.579	2246.146	2660.594	2242.299
	2666.464	2246.120	2660.516	2242.397
	2666.380	2246.032	2660.452	2242.486
	2666.313	2246.055	2660.456	2242.583
	2666.185	2246.030	2660.423	2242.683
	2666.092	2245.993	2660.366	2242.774
	2665.993	2245.917	2660.360	2242.867
	2666.899	2245.952	2660.337	2242.964
	2665.777	2245.879	2660.316	2243.073
	2665.732	2245.886	2660.310	2243.171
	2665.627	2245.846	2660.266	2243.230
	2665.552	2245.812	2660.216	2243.352
	2665.423	2245.791	2660.202	2243.452
	2665.317	2245.747	2660.166	2243.538
	2665.235	2245.737	2660.143	2243.648
	2665.112	2245.713	2660.117	2243.742
	2665.034	2245.672	2660.110	2243.780
	2664.918	2245.640	2660.035	2243.929
	2664.801	2245.615	2660.013	2244.026
	2664.783	2245.567	2659.988	2244.078
	2664.654	2245.543	2659.953	2244.219
	2664.583	2245.515	2659.941	2244.310
	2664.466	2245.488	2659.910	2244.429
	2664.335	2245.549	2659.841	2244.500
	2664.282	2245.424	2659.834	2244.572
	2664.161	2245.387	2659.818	2244.679
	2664.097	2245.349	2659.774	2244.792
	2664.010	2245.321	2659.748	2244.869
	2663.918	2245.299	2659.717	2244.975
	2663.803	2245.258	2659.697	2245.102
	2663.731	2245.240	2659.654	2245.166
	2663.625	2245.234	2659.626	2245.247
	2663.512	2245.183	2659.587	2245.360
	2663.430	2245.150	2659.573	2245.462
	2663.379	2245.185	2659.547	2245.519
	2663.226	2245.110	2659.507	2245.646
	2663.123	2245.071	2659.486	2245.745
	2663.022	2245.061	2659.447	2245.847
	2662.969	2245.018	2659.421	2245.937
	2662.870	2244.998	2659.383	2246.025
	2662.783	2244.997	2659.344	2246.096
	2662.698	2244.925	2659.771	2245.330
	2662.608	2244.891	2659.297	2246.331
	2662.453	2244.860	2659.276	2246.403
	2662.386	2244.839	2659.240	2246.507
	2662.235	2244.750	2659.202	2246.600
	2662.176	2244.770	2659.183	2246.690
	2662.102	2244.819	2659.155	2246.792
	2661.997	2244.713	2659.127	2246.903
	2661.880	2244.687	2659.102	2246.943
	2661.814	2244.674	2659.087	2247.040
	2661.707	2244.633	2659.059	2247.159
	2661.588	2244.609	2659.011	2247.262
	2661.509	2244.579	2658.981	2247.351
	2661.418	2244.549	2658.956	2247.464
	2661.335	2244.522	2658.949	2247.552

	LINE PARALLEL TO CONTOUR	LINE ORIENTED DOWNGRADIENT	UP vs DOWN MOVEMENT	NORTH vs SOUTH MOVEMENT	LINE PARALLEL TO CONTOUR	LINE ORIENTED DOWNGRADIENT	LINE PARALLEL TO CONTOUR	LINE ORIENTED DOWNGRADIENT
					GROSS movement	GROSS movement	NET movement	NET movement
			UP	NORTH	0.012	0.027	-0.012	-0.027
			UP	NORTH	0.016	0.040	-0.016	-0.040
			UP	NORTH	0.005	0.048	-0.005	-0.048
			UP	NORTH	0.018	0.037	-0.018	-0.037
			UP	NORTH	0.018	0.053	-0.018	-0.053
			UP	NORTH	0.020	0.041	-0.020	-0.041
			UP	NORTH	0.013	0.029	-0.013	-0.029
			UP	NORTH	0.019	0.032	-0.019	-0.032
			UP	NORTH	0.009	0.015	-0.009	-0.015
			UP	NORTH	0.016	0.032	-0.016	-0.032
			UP	NORTH	0.054	0.059	-0.054	-0.059
			UP	NORTH	0.025	0.025	-0.025	-0.025
			UP	NORTH	0.009	0.037	-0.009	-0.037
			UP	NORTH	0.019	0.043	-0.019	-0.043
			UP	NORTH	0.013	0.041	-0.013	-0.041
			UP	NORTH	0.037	0.019	-0.037	-0.019
			UP	NORTH	0.035	0.046	-0.035	-0.046
			UP	NORTH	0.006	0.255	-0.006	-0.255
			UP	NORTH	0.015	0.049	-0.015	-0.049
			UP	SOUTH	0.009	0.031	-0.009	0.031
			UP	NORTH	0.083	0.055	-0.083	-0.055
			UP	NORTH	0.017	0.037	-0.017	-0.037
			UP	SOUTH	0.036	0.035	-0.036	0.035
			UP	SOUTH	0.009	0.053	-0.009	0.053
			UP	SOUTH	0.042	0.040	-0.042	0.040
			UP	SOUTH	0.023	0.049	-0.023	0.049
			UP	NORTH	0.033	0.134	-0.033	-0.134
			UP	SOUTH	0.027	0.105	-0.027	0.105
			Down	SOUTH	0.098	0.049	0.098	0.049
			UP	SOUTH	0.014	0.070	-0.014	0.070
			UP	SOUTH	0.006	0.025	-0.006	0.025
			UP	SOUTH	0.014	0.062	-0.014	0.062
			UP	SOUTH	0.008	0.019	-0.008	0.019
			UP	SOUTH	0.015	0.043	-0.015	0.043
			UP	SOUTH	0.006	0.028	-0.006	0.028
			UP	SOUTH	0.016	0.042	-0.016	0.042
			UP	NORTH	0.019	0.034	-0.019	-0.034
			UP	NORTH	0.011	0.022	-0.011	-0.022
			UP	NORTH	0.017	0.028	-0.017	-0.028
			UP	SOUTH	0.026	0.030	-0.026	0.030
			UP	SOUTH	0.032	0.027	-0.032	0.027
			UP	SOUTH	0.033	0.055	-0.033	0.055
			UP	SOUTH	0.014	0.024	-0.014	0.024
			UP	SOUTH	0.021	0.029	-0.021	0.029
			UP	SOUTH	0.029	0.030	-0.029	0.030
			Down	SOUTH	0.018	0.013	0.018	0.013
			UP	SOUTH	0.007	0.015	-0.007	0.015
			UP	SOUTH	0.008	0.019	-0.008	0.019
			UP	SOUTH	0.021	0.019	-0.021	0.019
			Down	SOUTH	0.027	0.024	0.027	0.024
			UP	SOUTH	0.052	0.026	-0.052	0.026
			Down	SOUTH	0.008	0.024	0.008	0.024
			Down	SOUTH	0.057	0.062	0.057	0.062
			Down	SOUTH	0.050	0.026	0.050	0.026
			Down	SOUTH	0.045	0.014	0.045	0.014
			Down	SOUTH	0.041	0.046	0.041	0.046
			Down	SOUTH	0.021	0.029	0.021	0.029
			Down	SOUTH	0.016	0.035	0.016	0.035
			Down	SOUTH	3.189	0.030	3.189	0.030
			Down	SOUTH	7.011	0.053	7.011	0.053
			Down	SOUTH	6.553	0.033	6.553	0.033
			Down	SOUTH	3.377	0.022	3.377	0.022
			Down	SOUTH	1.361	0.020	1.361	0.020
			Down	SOUTH	3.732	0.028	3.732	0.028
			Down	SOUTH	6.487	0.033	6.487	0.033
			Down	SOUTH	0.000	0.025	0.000	0.025
			Down	SOUTH	1.474	0.020	1.474	0.020
			Down	SOUTH	0.000	0.013	0.000	0.013
			Down	SOUTH	1.702	0.016	1.702	0.016
			Down	SOUTH	0.133	0.024	0.133	0.024
			Down	SOUTH	0.008	0.033	0.008	0.033
			Down	SOUTH	0.010	0.038	0.010	0.038
			Down	SOUTH	0.006	0.022	0.006	0.022
			Down	SOUTH	0.025	0.027	0.025	0.027
			Down	SOUTH	0.011	0.032	0.011	0.032
			Down	SOUTH	0.012	0.058	0.012	0.058
			Down	SOUTH	0.016	0.016	0.016	0.016
			Down	SOUTH	0.006	0.030	0.006	0.030
			Down	NORTH	0.020	0.004	0.020	-0.004
			Down	SOUTH	0.012	0.013	0.012	0.013
			Down	SOUTH	0.017	0.065	0.017	0.065
			Down	SOUTH	0.007	0.012	0.007	0.012
			Down	SOUTH	0.005	0.005	0.005	0.005
			Down	SOUTH	0.012	0.012	0.012	0.012
			Down	SOUTH	0.020	0.016	0.020	0.016
			Down	SOUTH	0.017	0.015	0.017	0.015
			Down	NORTH	0.041	0.040	0.041	-0.040
			Down	SOUTH	0.005	0.020	0.005	0.020
			Down	SOUTH	0.045	0.016	0.045	0.016
			Down	SOUTH	0.005	0.036	0.005	0.036
			Down	SOUTH	0.015	0.013	0.015	0.013
			Down	SOUTH	0.018	0.017	0.018	0.017
			Down	SOUTH	0.021	0.080	0.021	0.080
			Down	SOUTH	0.032	0.012	0.032	0.012
			Down	SOUTH	0.026	0.016	0.026	0.016
			Down	SOUTH	0.014	0.015	0.014	0.015
			Down	SOUTH	0.014	0.072	0.014	0.072
			Down	SOUTH	0.019	0.021	0.019	0.021
			Down	SOUTH	0.051	0.005	0.051	0.005
			Down	SOUTH	0.011	0.051	0.011	0.051
			Down	SOUTH	0.032	0.015	0.032	0.015
			Down	SOUTH	0.008	0.021	0.008	0.021
			Down	SOUTH	0.018	0.027	0.018	0.027
			UP	SOUTH	0.127	0.025	-0.127	0.025
			Down	SOUTH	0.015	0.017	0.015	0.017
			Down	SOUTH	0.015	0.023	0.015	0.023
			Down	SOUTH	0.016	0.012	0.016	0.012
			Down	SOUTH	0.013	0.006	0.013	0.006
			Down	SOUTH	0.016	0.005	0.016	0.005
			Down	SOUTH	0.016	0.037	0.016	0.037
			Down	SOUTH	0.010	0.014	0.010	0.014
			Down	SOUTH	0.021	0.012	0.021	0.012
			Down	SOUTH	0.035	0.009	0.035	0.009
			Down	SOUTH	0.024	0.003	0.024	0.003
			UP	SOUTH	0.053	0.032	-0.053	0.032
			Down	SOUTH	0.023	0.009	0.023	0.009
			Down	SOUTH	0.007	0.003	0.007	0.003
			Down	SOUTH	0.023	0.002	0.023	0.002
			Down	SOUTH	0.050	0.010	0.050	0.010
			Down	SOUTH	0.069	0.016	0.069	0.016
			UP	SOUTH	0.042	0.034	-0.042	0.034
			Down	SOUTH	0.056	0.002	0.056	0.002
			Down	SOUTH	0.030	0.006	0.030	0.006
			Down	SOUTH	0.027	0.015	0.027	0.015
			Down	SOUTH	0.025	0.005	0.025	0.005
			Down	SOUTH	0.076	0.027	0.076	0.027
			Down	SOUTH	0.020	0.010	0.020	0.010
			UP	SOUTH	0.073	0.022	-0.073	0.022
			Down	SOUTH	0.001	0.007	0.001	0.007
			Down	SOUTH	0.023	0.046	0.023	0.046
			Down	SOUTH	0.026	0.056	0.026	0.056
			Down	SOUTH	0.016	0.022	0.016	0.022
			Down	SOUTH	0.030	0.009	0.030	0.009
			Down	SOUTH	0.017	0.023	0.017	0.023
			Down	SOUTH	0.005	0.005	0.005	0.005
			Down	SOUTH	0.018	0.027	0.018	0.027

137	2661.223	2244.501	2658.894	2247.659	2661.224	2244.505	2658.890	2247.661	UP	SOUTH	0.004	0.005	-0.004	0.005
138	2661.123	2244.476	2658.976	2247.743	2661.110	2244.465	2658.851	2247.736	Down	NORTH	0.018	0.125	0.018	-0.125
139	2661.034	2244.440	2658.956	2247.846	2661.039	2244.441	2658.831	2247.820	Down	NORTH	0.005	0.127	0.005	-0.127
140	2660.935	2244.416	2658.926	2247.944	2660.935	2244.419	2658.803	2247.934	UP	NORTH	0.003	0.123	-0.003	-0.123
141	2660.851	2244.384	2658.894	2248.042	2660.838	2244.391	2658.774	2248.059	UP	NORTH	0.015	0.122	-0.015	-0.122
142	2660.747	2244.358	2658.876	2248.144	2660.740	2244.368	2658.746	2248.149	UP	NORTH	0.013	0.130	-0.013	-0.130
143	2660.664	2244.314	2658.838	2248.229	2660.650	2244.328	2658.726	2248.230	Down	NORTH	0.020	0.112	0.020	-0.112
144	2660.564	2244.300	2658.811	2248.327	2660.567	2244.300	2658.690	2248.327	UP	NORTH	0.003	0.121	-0.003	-0.121
145	2660.462	2244.270	2658.779	2248.425	2660.449	2244.272	2658.652	2248.416	UP	NORTH	0.013	0.128	-0.013	-0.128
146	2660.362	2244.240	2658.751	2248.522	2660.360	2244.234	2658.618	2248.509	UP	NORTH	0.006	0.134	-0.006	-0.134
147	2660.269	2244.212	2658.725	2248.613	2660.250	2244.208	2658.629	2248.597	UP	NORTH	0.019	0.098	-0.019	-0.098
148	2660.018	2244.160	2658.687	2248.707	2660.182	2244.182	2658.544	2248.717	UP	NORTH	0.164	0.143	-0.164	-0.143
149	2660.076	2244.143	2658.644	2248.799	2660.057	2244.126	2658.544	2248.807	Down	NORTH	0.026	0.101	0.026	-0.101
150	2659.979	2244.091	2658.612	2248.873	2659.971	2244.066	2658.516	2248.879	Down	NORTH	0.026	0.096	0.026	-0.096
151	2659.894	2244.076	2658.588	2249.000	2659.870	2244.063	2658.490	2248.969	Down	NORTH	0.027	0.098	0.027	-0.098
152	2659.796	2244.055	2658.560	2249.081	2659.766	2244.044	2658.462	2249.101	Down	NORTH	0.032	0.100	0.032	-0.100
153	2659.704	2244.035	2658.563	2249.166	2659.682	2244.033	2658.444	2249.163	UP	NORTH	0.022	0.121	-0.022	-0.121
154	2659.602	2243.985	2658.520	2249.927	2659.581	2243.971	2658.414	2249.230	Down	NORTH	0.025	0.705	0.025	-0.705
155	2659.511	2243.953	2658.503	2249.375	2659.503	2243.952	2658.363	2249.346	Down	NORTH	0.008	0.124	0.008	-0.124
156	2659.421	2243.911	2658.483	2249.465	2659.409	2243.926	2658.300	2249.451	Down	NORTH	0.019	0.186	0.019	-0.186
157	2659.324	2243.901	2658.441	2249.560	2659.318	2243.869	2658.305	2249.563	Down	NORTH	0.013	0.136	0.013	-0.136
158	2659.220	2243.860	2658.409	2249.674	2659.232	2243.827	2658.267	2249.672	Down	NORTH	0.035	0.142	0.035	-0.142
159	2659.121	2243.859	2658.368	2249.773	2659.113	2243.850	2658.244	2249.753	UP	NORTH	0.012	0.126	-0.012	-0.126
160	2659.028	2243.805	2658.336	2249.867	2659.015	2243.808	2658.220	2249.863	Down	NORTH	0.013	0.116	0.013	-0.116
161	2658.930	2243.788	2658.322	2249.966	2658.920	2243.786	2658.203	2249.947	UP	NORTH	0.011	0.121	-0.011	-0.121
162	2658.843	2243.762	2658.294	2250.056	2658.822	2243.754	2658.169	2250.061	Down	NORTH	0.023	0.125	0.023	-0.125
163	2658.741	2243.736	2658.251	2250.150	2658.723	2243.722	2658.143	2250.117	Down	NORTH	0.022	0.113	0.022	-0.113
164	2658.643	2243.705	2658.223	2250.231	2658.624	2243.679	2658.064	2250.247	Down	NORTH	0.032	0.139	0.032	-0.139
165	2658.541	2243.673	2658.194	2250.333	2658.521	2243.654	2658.084	2250.338	Down	NORTH	0.028	0.111	0.028	-0.111
166	2658.455	2243.645	2658.180	2250.447	2658.427	2243.629	2658.044	2250.427	Down	NORTH	0.032	0.138	0.032	-0.138
167	2658.351	2243.605	2658.046	2250.534	2658.348	2243.591	2657.994	2250.553	Down	NORTH	0.014	0.055	0.014	-0.055
168	2658.259	2243.565	2658.001	2250.624	2658.250	2243.575	2657.966	2250.619	UP	SOUTH	0.013	0.035	-0.013	0.035
169	2658.175	2243.546	2657.967	2250.728	2658.164	2243.527	2657.934	2250.720	Down	SOUTH	0.024	0.034	0.024	0.034
170	2658.067	2243.516	2657.848	2250.816	2658.056	2243.526	2657.930	2250.802	UP	SOUTH	0.015	0.063	-0.015	0.063
171	2657.978	2243.506	2657.923	2250.919	2657.969	2243.512	2657.896	2250.869	UP	SOUTH	0.010	0.057	-0.010	0.057
172	2657.506	2243.461	2657.894	2251.005	2657.901	2243.516	2657.860	2250.960	UP	SOUTH	0.396	0.056	-0.396	0.056
173	2657.794	2243.448	2657.861	2251.108	2657.794	2243.393	2657.846	2251.061	Down	SOUTH	0.055	0.049	0.055	0.049
174	2657.695	2243.423	2657.812	2251.197	2657.676	2243.419	2657.801	2251.199	UP	SOUTH	0.019	0.011	-0.019	0.011
175	2657.617	2243.396	2657.777	2251.301	2657.608	2243.384	2657.769	2251.291	UP	SOUTH	0.017	0.013	-0.017	0.013
176	2657.500	2243.371	2657.749	2251.402	2657.494	2243.357	2657.750	2251.385	UP	SOUTH	0.015	0.017	-0.015	0.017
177	2657.365	2243.335	2657.736	2251.487	2657.378	2243.324	2657.716	2251.491	UP	SOUTH	0.013	0.020	-0.013	0.020
178	2657.299	2243.262	2657.692	2251.587	2657.283	2243.268	2657.675	2251.584	Down	SOUTH	0.017	0.017	0.017	0.017
179	2657.181	2243.255	2657.677	2251.692	2657.216	2243.255	2657.675	2251.729	UP	NORTH	0.035	0.037	-0.035	-0.037
180	2657.112	2243.230	2657.659	2251.768	2657.124	2243.209	2657.633	2251.779	Down	NORTH	0.024	0.028	0.024	-0.028
181	2657.041	2243.214	2657.606	2251.873	2657.069	2243.218	2657.591	2251.838	UP	SOUTH	0.028	0.038	-0.028	0.038
182	2656.936	2243.187	2657.578	2251.961	2656.942	2243.177	2657.569	2251.924	UP	SOUTH	0.012	0.038	-0.012	0.038
183	2656.852	2243.170	2657.564	2252.060	2656.856	2243.176	2657.535	2252.042	UP	SOUTH	0.007	0.034	-0.007	0.034
184	2656.741	2243.141	2657.531	2252.163	2656.755	2243.138	2657.531	2252.162	UP	SOUTH	0.015	0.001	-0.015	0.001
185	2656.627	2243.106	2657.465	2252.271	2656.649	2243.094	2657.494	2252.233	UP	SOUTH	0.025	0.039	-0.025	0.039
186	2656.546	2243.060	2657.446	2252.347	2656.559	2243.061	2657.439	2252.340	UP	SOUTH	0.013	0.011	-0.013	0.011
187	2656.448	2243.055	2657.426	2252.461	2656.459	2243.047	2657.416	2252.434	UP	SOUTH	0.014	0.048	-0.014	0.048
188	2656.341	2243.002	2657.383	2252.539	2656.350	2242.995	2657.382	2252.526	UP	SOUTH	0.011	0.013	-0.011	0.013
189	2656.253	2242.973	2657.360	2252.643	2656.277	2242.952	2657.338	2252.633	UP	SOUTH	0.032	0.024	-0.032	0.024
190	2656.145	2242.949	2657.334	2252.723	2656.156	2242.942	2657.339	2252.734	UP	SOUTH	0.013	0.012	-0.013	0.012
191	2656.071	2242.933	2657.304	2252.830	2656.077	2242.922	2657.300	2252.813	UP	SOUTH	0.013	0.018	-0.013	0.018
192	2655.973	2242.903	2657.279	2252.924	2655.909	2242.828	2657.247	2252.925	Down	SOUTH	0.098	0.032	0.098	0.032
193	2655.870	2242.875	2657.259	2253.007	2655.860	2242.857	2657.249	2252.946	UP	SOUTH	0.021	0.062	-0.021	0.062
194	2655.775	2242.834	2657.220	2253.111	2655.714	2242.766	2657.206	2253.061	Down	SOUTH	0.076	0.033	0.076	0.033
195	2655.655	2242.810	2657.183	2253.214	2655.680	2242.789	2657.171	2253.190	UP	SOUTH	0.033	0.027	-0.033	0.027
196	2655.376	2242.787	2657.154	2253.311	2655.571	2242.764	2657.131	2253.292	UP	SOUTH	0.195	0.030	-0.195	0.030
197	2655.476	2242.751	2657.128	2253.126	2655.471	2242.737	2657.094	2253.400	UP	SOUTH	0.015	0.274	-0.015	0.274
198	2655.375	2242.725	2657.104	2253.104	2655.388	2242.730	2657.104	2253.104	UP	SOUTH	0.014	0.000	-0.014	0.000
199	2655.267	2242.703	2657.038	2253.038	2655.287	2242.707	2657.038	2253.038	UP	SOUTH	0.021	0.000	-0.021	0.000
200	2655.169	2242.685	2657.032	2253.032	2655.175	2242.674	2657.057	2253.699	UP	SOUTH	0.013	0.667	-0.013	0.667

UP	91	59	NORTH
DOWN	109	141	SOUTH

This is number of pebbles moving different ways

LINE PARALLEL TO CONTOUR GROSS movement	LINE ORIENTED DOWNGRADIENT GROSS movement	LINE PARALLEL TO CONTOUR NET movement	LINE ORIENTED DOWNGRADIENT NET movement	
7.011	0.992	7.011	0.992	max (m)
-	-	(0.396)	(0.705)	min (m)
0.201	0.056	0.174	0.001	avg (m)
0.921	0.102	0.927	0.117	stdv (m)
0.010	0.030	0.006	0.015	medien (m)

pebbles moving > than uncertainty of measure	128	1 SIGMA	0.015 m
	54	2 SIGMA	0.030 m

ASSUMING 0.015 RMS UNCERTAINTY

THIS IS THE SENSITIVITY TEST FOR HOW MANY PEBBLES REALLY MOVED

Caculations for Pebble data Chemehuevi

These calculations compare movement from orginal positions. The pebbles are seperated into Line countour parallel and Line oriented down gradient pebbles.

The countour parallel line pebbles move up and down and the line oriented down gradient pebbles move north and south.

The calculations include gross movement and net movement. Gross movement does not take into account that some pebbles move up from the line and some move down from the line.

The maximum, minimum, average, standard deviation and median of gross and net pebble movment is shown at the bottom of the spread sheet. A sensitivity test is also included to determine how many pebbles are actually moving.

Gross movement accounts for all movement not just movment in downslope direction
Should we also figure out the down slope movement?

LINE PARALLEL TO CONTOUR NORTHING = -4.13305*900N/EASTING1 + 41446.363475901

LINE ORIENTED DOWN GRADIENT NORTHING = 0.247408463/EASTING1 + 1125.923681983

	May--00		May--01								
	LINE PARALLEL TO CONTOUR	LINE ORIENTED DOWNGRADIENT	LINE PARALLEL TO CONTOUR	LINE ORIENTED DOWNGRADIENT	LINE PARALLEL TO CONTOUR	LINE ORIENTED DOWNGRADIENT			LINE PARALLEL TO CONTOUR	LINE ORIENTED DOWNGRADIENT	LINE PARALLEL TO CONTOUR	LINE ORIENTED DOWNGRADIENT
	e	n	e	n	UP vs DOWN MOVEMENT	NORTH vs SOUTH MOVEMENT			GROSS movement	GROSS movement	NET movement	NET movement
1	2674.179	2248.857	2662.971	2234.869	2674.213	2248.662	2662.981	2234.644	UP	NORTH	0.034	0.027	-0.034	-0.027
2	2674.095	2248.814	2662.952	2234.767	2674.118	2248.609	2662.971	2234.749	UP	NORTH	0.024	0.026	-0.024	-0.026
3	2674.000	2248.585	2662.921	2234.864	2674.030	2248.582	2662.950	2234.890	UP	NORTH	0.030	0.039	-0.030	-0.039
4	2673.917	2248.549	2662.889	2234.965	2673.926	2248.544	2662.865	2234.979	UP	NORTH	0.010	0.028	-0.010	-0.028
5	2673.811	2248.523	2662.826	2235.076	2673.835	2248.504	2662.839	2235.029	UP	NORTH	0.031	0.048	-0.031	-0.048
6	2673.722	2248.480	2662.807	2235.169	2673.734	2248.438	2662.823	2235.120	UP	NORTH	0.044	0.052	-0.044	-0.052
7	2673.634	2248.451	2662.770	2235.270	2673.639	2248.445	2662.780	2235.237	UP	NORTH	0.008	0.034	-0.008	-0.034
8	2673.546	2248.408	2662.754	2235.369	2673.567	2248.404	2662.744	2235.336	UP	NORTH	0.021	0.033	-0.021	-0.033
9	2673.439	2248.385	2662.703	2235.457	2673.467	2248.351	2662.707	2235.437	UP	NORTH	0.044	0.020	-0.044	-0.020
10	2673.341	2248.352	2662.677	2235.513	2673.355	2248.354	2662.680	2235.509	UP	NORTH	0.014	0.005	-0.014	-0.005
11	2673.254	2248.370	2662.661	2235.636	2673.257	2248.298	2662.652	2235.573	UP	NORTH	0.072	0.066	-0.072	-0.066
12	2673.165	2248.301	2662.643	2235.720	2673.166	2248.299	2662.630	2235.663	UP	NORTH	0.011	0.039	-0.011	-0.039
13	2673.084	2248.278	2662.595	2235.817	2673.105	2248.080	2662.597	2235.784	Down	NORTH	0.199	0.107	0.199	-0.107
14	2672.976	2248.251	2662.551	2235.919	2672.957	2248.233	2662.561	2235.887	UP	NORTH	0.020	0.034	-0.020	-0.034
15	2672.871	2248.200	2662.537	2236.009	2672.855	2248.184	2662.540	2235.980	UP	NORTH	0.023	0.029	-0.023	-0.029
16	2672.776	2248.166	2662.525	2236.100	2672.772	2248.161	2662.529	2236.104	UP	SOUTH	0.008	0.996	-0.008	0.996
17	2672.668	2248.143	2662.469	2236.226	2672.676	2248.136	2662.580	2236.173	UP	NORTH	0.014	0.123	-0.014	-0.123
18	2672.567	2248.099	2662.454	2236.319	2672.582	2248.088	2662.455	2236.234	UP	NORTH	0.019	0.085	-0.019	-0.085
19	2672.464	2248.055	2662.402	2236.414	2672.468	2248.052	2662.420	2236.372	UP	NORTH	0.005	0.048	-0.005	-0.048
20	2672.360	2248.027	2662.364	2236.504	2672.395	2248.061	2662.375	2236.470	UP	SOUTH	0.056	0.036	-0.056	0.036
21	2672.308	2248.012	2662.350	2236.590	2672.390	2248.007	2662.370	2236.538	UP	NORTH	0.082	0.056	-0.082	-0.056
22	2672.224	2247.982	2662.322	2236.660	2672.244	2247.969	2662.325	2236.624	UP	NORTH	0.024	0.036	-0.024	-0.036
23	2672.123	2247.954	2662.281	2236.763	2672.126	2247.934	2662.297	2236.631	UP	SOUTH	0.020	0.133	-0.020	0.133
24	2672.015	2247.899	2662.237	2236.852	2672.049	2247.868	2662.278	2236.820	UP	SOUTH	0.035	0.069	-0.035	0.069
25	2671.914	2247.871	2662.225	2236.976	2671.945	2247.898	2662.234	2236.940	UP	NORTH	0.041	0.037	-0.041	-0.037
26	2671.823	2247.869	2662.185	2237.066	2671.825	2247.874	2662.215	2237.022	UP	SOUTH	0.005	0.053	-0.005	0.053
27	2671.729	2247.613	2662.157	2237.167	2671.723	2247.808	2662.272	2237.180	UP	NORTH	0.006	0.116	-0.008	-0.116
28	2671.632	2247.756	2662.151	2237.280	2671.635	2247.770	2662.186	2237.153	UP	SOUTH	0.003	0.113	-0.003	0.113
29	2671.539	2247.750	2662.073	2237.336	2671.543	2247.744	2662.103	2237.327	UP	SOUTH	0.007	0.032	-0.007	0.032
30	2671.432	2247.717	2662.066	2237.436	2671.444	2247.714	2662.129	2237.430	UP	SOUTH	0.012	0.062	-0.012	0.062
31	2671.341	2247.701	2662.029	2237.496	2671.376	2247.673	2661.987	2237.501	Down	SOUTH	0.045	0.042	0.045	0.042
32	2671.255	2247.666	2662.019	2237.622	2671.266	2247.661	2662.029	2237.557	UP	SOUTH	0.012	0.066	-0.012	0.066
33	2671.154	2247.636	2661.984	2237.726	2671.181	2247.633	2661.958	2237.707	UP	SOUTH	0.027	0.032	-0.027	0.032
34	2671.058	2247.605	2661.934	2237.823	2671.079	2247.602	2661.974	2237.779	UP	SOUTH	0.021	0.059	-0.021	0.059
35	2670.949	2247.565	2661.906	2237.907	2670.979	2247.562	2661.937	2237.886	UP	SOUTH	0.030	0.037	-0.030	0.037
36	2670.856	2247.634	2661.866	2238.026	2670.879	2247.532	2661.909	2237.994	UP	SOUTH	0.023	0.038	-0.023	0.038
37	2670.767	2247.492	2661.870	2238.127	2670.781	2247.449	2661.868	2238.090	Down	NORTH	0.014	0.041	0.014	-0.041
38	2670.667	2247.474	2661.839	2238.215	2670.690	2247.460	2661.860	2238.193	Down	NORTH	0.033	0.030	0.033	-0.030
39	2670.563	2247.437	2661.819	2238.301	2670.600	2247.425	2661.847	2238.274	Down	NORTH	0.039	0.039	0.039	-0.039
40	2670.483	2247.403	2661.774	2238.391	2670.522	2247.435	2661.787	2238.357	UP	SOUTH	0.050	0.036	-0.050	0.036
41	2670.358	2247.360	2661.791	2238.466	2670.411	2247.378	2661.756	2238.445	UP	SOUTH	0.053	0.035	-0.053	0.035
42	2670.297	2247.356	2661.711	2238.569	2670.301	2247.366	2661.731	2238.503	UP	SOUTH	0.014	0.069	-0.014	0.069
43	2670.191	2247.327	2661.672	2238.672	2670.180	2247.325	2661.685	2238.643	UP	SOUTH	0.011	0.032	-0.011	0.032
44	2670.104	2247.295	2661.645	2238.792	2670.121	2247.291	2661.628	2238.765	UP	SOUTH	0.017	0.032	-0.017	0.032
45	2670.028	2247.259	2661.605	2238.867	2670.030	2247.258	2661.623	2238.832	Down	SOUTH	0.002	0.039	0.002	0.039
46	2669.904	2247.236	2661.580	2238.962	2669.926	2247.266	2661.577	2238.961	Down	NORTH	0.030	0.999	0.030	-0.999
47	2669.806	2247.209	2661.572	2239.055	2669.830	2247.193	2661.589	2239.025	Down	SOUTH	0.029	0.034	0.029	0.034
48	2669.711	2247.171	2661.508	2239.160	2669.752	2247.182	2661.524	2239.136	Down	SOUTH	0.042	0.029	0.042	0.029
49	2669.627	2247.162	2661.505	2239.256	2669.634	2247.127	2661.513	2239.220	Down	SOUTH	0.036	0.039	0.036	0.039
50	2669.527	2247.115	2661.456	2239.344	2669.544	2247.077	2661.505	2239.335	Down	SOUTH	0.019	0.050	0.019	0.050
51	2669.436	2247.055	2661.416	2239.436	2669.432	2247.092	2661.451	2239.410	UP	SOUTH	0.037	0.044	-0.037	0.044
52	2669.359	2247.007	2661.384	2239.526	2669.396	2247.058	2661.418	2239.493	Down	SOUTH	0.037	0.050	0.037	0.050
53	2669.263	2247.006	2661.359	2239.623	2669.228	2246.993	2661.431	2239.580	Down	SOUTH	0.037	0.084	0.037	0.084
54	2669.161	2246.985	2661.345	2239.730	2669.131	2246.958	2661.367	2239.720	Down	SOUTH	0.040	0.029	0.040	0.029
55	2669.083	2246.940	2661.320	2239.829	2669.074	2246.927	2661.336	2239.801	Down	SOUTH	0.016	0.032	0.016	0.032
56	2668.986	2246.912	2661.279	2239.940	2668.950	2246.883	2661.309	2239.880	Down	SOUTH	0.046	0.067	0.046	0.067
57	2668.883	2246.888	2661.264	2240.036	2668.896	2246.869	2661.293	2240.006	Down	SOUTH	0.024	0.042	0.024	0.042
58	2668.764	2246.842	2661.227	2240.112	2668.777	2246.829	2661.269	2240.086	Down	SOUTH	0.018	0.049	0.018	0.049
59	2668.680	2246.811	2661.185	2240.207	2668.636	2243.660	2661.160	2240.186	Down	SOUTH	3.273	0.031	3.273	0.031
60	2668.592	2246.784	2661.158	2240.328	2668.593	2219.361	2661.181	2240.270	Down	SOUTH	31.500	0.062	31.500	0.062
61	2668.491	2246.743	2661.131	2240.396	2671.087	2240.885	2661.157	2240.371	Down	SOUTH	8.591	0.036	8.591	0.036
62	2668.410	2246.718	2661.109	2240.494	2669.852	2243.664	2661.132	2240.467	Down	SOUTH	3.377	0.035	3.377	0.035
63	2668.330	2246.695	2661.078	2240.596	2670.667	2240.757	2661.089	2240.562	Down	SOUTH	8.497	0.036	8.497	0.036
64	2668.230	2246.673	2661.046	2240.707	2669.814	2243.294	2661.060	2240.685	Down	SOUTH	3.732	0.049	3.732	0.049
65	2668.137	2246.634	2661.007	2240.796	2668.971	2245.189	2661.056	2240.769	Down	SOUTH	1.686	0.056	1.686	0.056
66	2668.017	2246.593	2660.998	2240.894	2668.017	2246.593	2661.023	2240.856	Down	SOUTH	0.000	0.045	0.000	0.045
67	2667.918	2246.556	2660.968	2240.964	2668.822	2245.288	2660.996	2240.949	Down	SOUTH	1.557	0.032	1.557	0.032
68	2667.823	2246.547	2660.942	2241.064	2667.904	2246.417	2660.940	2241.036	Down	SOUTH	0.153	0.026	0.153	0.026
69	2667.744	2246.524	2660.886	2241.156	2668.210	2245.953	2660.914	2241.141	Down	SOUTH	0.737	0.029	0.737	0.029
70	2667.644	2246.489	2660.844	2241.257	2667.729	2246.350	2660.885	2241.245	Down	SOUTH	0.163	0.043	0.163	0.043
71	2667.545	2246.451	2660.843	2241.356	2667.584	2246.457	2660.872	2241.336	Down	SOUTH	0.039	0.035	0.039	0.035
72	2667.444	2246.419	2660.801	2241.461	2667.474	2246.410	2660.843	2241.444	Down	SOUTH	0.031	0.045	0.031	0.045
73	2667.369	2246.384	2660.801	2241.546	2667.398	2246.387	2660.828	2241.530	Down	SOUTH	0.034	0.031	0.034	0.031
74	2667.257	2246.356	2660.734	2241.630	2667.271	2246.348	2660.731	2241.593	Down	SOUTH	0.016	0.037	0.016	0.037
75	2667.166	2246.344	2660.716	2241.750	2667.188	2246.338	2660.747	2241.740	Down	SOUTH	0.023	0.033	0.023	0.033
76	2667.052	2246.303	2660.700	2241.842	2667.077	2246.299	2660.737	2241.757	Down	SOUTH	0.025	0.003	0.025	0.003
77	2666.967	2246.287	2660.671	2241.915	2666.975	2246.261	2660.679	2241.904	Down	SOUTH	0.019	0.014	0.019	0.014
78	2666.870	2246.250	2660.626	2242.016	2666.896	2246.243	2660.659	2242.011	Down	SOUTH	0.027	0.033	0.027	0.033
79	2666.793	2246.217	2660.668	2242.128	2666.808	2246.207	2660.667	2242.088	Down	NORTH	0.016	0.040	0.016	-0.040
80	2666.673	2246.191	2660.574	2242.232	2666.691	2246.161	2660.593	2242.213	Down	SOUTH	0.035	0.027	0.035	0.027
81	2666.595	2246.153	2660.530	2242.305	2666.613	2246.143	2660.562	2242.279	Down	SOUTH	0.021	0.041	0.021	0.041
82	2666.471	2246.118	2660.511	2242.407	2666.497	2246.117	2660.526	2242.351	Down	SOUTH	0.026	0.058	0.026	0.058
83	2666.411	2246.093	2660.452	2242.494	2666.418	2246.022	2660.465	2242.987	Down	NORTH	0.071	0.493	0.071	-0.493
84	2666.311	2246.067	2660.451	2242.594	2666.344	2246.042	2660.468	2242.581	Down	SOUTH	0.041	0.021	0.041	0.021
85	2666.204	2246.023	2660.415	2242.697	2666.213	2246.034	2660.430	2242.665	Down	SOUTH	0.014	0.019	0.014	0.019
86	2666.108	2245.991	2660.374	2242.786	2666.127	2245.986	2660.362	2242.785	Down	SOUTH	0.020	0.012	0.020	0.012
87	2666.007	2245.954	2660.398	2242.886	2666.025	2245.807	2660.373	2242.901	Down	NORTH	0.052	0.029	0.052	-0.029
88	2665.896	2245.955	2660.319	2242.956	2665.932	2245.936	2660.348	2242.959	Down	SOUTH	0.041	0.029	0.041	0.029
89	2665.811	2245.908	2660.302	2243.066	2665.813	2245.866	2660.331	2243.064	Down	SOUTH	0.042	0.029	0.042	0.029
90	2665.737	2245.887	2660.274	2243.169	2665.762	2245.867	2660.324	2243.159	Down	SOUTH	0.032	0.051	0.032	0.051
91	2665.642	2245.850	2660.274	2243.240	2665.662	2245.839	2660.276	2243.226	Down	SOUTH	0.023	0.012	0.023	0.012
92	2665.568	2245.803	2660.291	2243.343	2665.582	2245.807	2660.228	2243.356	Down	SOUTH	0.015	0.031	0.015	0.031
93	2665.441	2245.781	2660.183	2243.530	2665.460	2245.780	2660.207	2243.450	Down	SOUTH	0.019	0.084	0.019	0.084
94	2665.349	2245.744	2660.155	2243.642	2665.341	2245.727	2660.166	2243.528	Down	SOUTH	0.019	0.019	0.019	0.019
95	2665.261	2245.738	2660.140	2243.664	2665.270	2245.726	2660.144	2243.652	Down	SOUTH	0.013	0.013	0.013	0.013
96	2665.121	2245.702	2660.107	2243.732	2665.153	2245.691	2660.120	2243.731	Down	SOUTH	0.034	0.013	0.034	0.013
97	2665.039	2245.659	2660.068	2243.836	2665.069	2245.657	2660.091	2243.825	Down	SOUTH	0.030	0.026	0.030	0.026
98	2664.936	2245.635	2660.041	2243.909	2664.985	2245.655	2660.041	2243.918	Down	SOUTH	0.053	0.009	0.053	0.009
99	2664.850	2245.603	2660.009	2244.027	2664.828	2245.604	2660.028	2244.017	Down	SOUTH	0.022	0.021	0.022	0.021
100	2664.759	2245.576	2659.996	2244.128	2664.775	2245.572	2659.985	2244.077	Down	SOUTH	0.016	0.052	0.016	0.052
101	2664.685	2245.553	2659.964	2244.220	2664.696	2245.553	2659.969	2244.195	Down	SOUTH	0.011	0.025	0.011	0.025
102	2664.591	2245.513	2659.925	2244.323	2664.606	2245.511	2659.941	2244.325	Down	SOUTH	0.015	0.016	0.015	0.016
103	2664.480	2245.474	2659.885	2244.418	2664.489	2245.479	2659.915	2244.419	Down	SOUTH	0.010	0.030	0.010	0.030
104	2664.396	2245.457	2659.886	2244.499	2664.361	2245.576	2659.851	2244.463	UP	SOUTH	0.124	0.022	-0.124	0.022
105	2664.287	2245.436	2659.824	2244.586	2664.344	2245.425	2659.838	2244.574	Down	SOUTH	0.058	0.018	0.058	0.018
106	2664.194	2245.394	2659.799	2244.692	2664.168	2245.361	2659.818	2244.682	Down	SOUTH	0.042	0.021	0.042	0.021
107	2664.112	2245.354	2659.781	2244.783	2664.116	2245.348	2659.783	2244.785	Down	SOUTH	0.007	0.003	0.007	0.003
108	2664.020	2245.329	2659.753	2244.885	2664.039	2245.303	2659.752	2244.876	Down	SOUTH	0.032	0.009	0.032	0.009
109	2663.932	2245.298	2659.720	2244.971	2663.945	2245.271	2659.733	2244.970	Down	SOUTH	0.030	0.013	0.030	0.013
110	2663.815	2245.278	2659.685	2245.067	2663.857	2245.265	2659.692	2245.101	Down	SOUTH	0.044	0.035	0.044	0.035
111	2663.741	2245.239	2659.650	2245.179	2663.764	2245.227	2659.648	2245.157	Down	SOUTH	0.026	0.022	0.026	0.022
112	2663.644	2245.227	2659.616	2245.254	2663.652	2245.215	2659.639	2245.230	Down	SOUTH	0.014	0.033	0.014	0.033
113	2663.546	2245.191	2659.606	2245.363	2663.538	2245.183	2659.613	2245.363	Down	SOUTH	0.011	0.007	0.011	0.007
114	2663.450	2245.162	2659.570	2245.483	2663.469	2245.139	2659.587	2245.449	Down	SOUTH	0.025	0.022	0.025	0.022
115	2663.350	2245.141	2659.552	2245.550	2663.409	2245.172	2659.558	2245.509	UP	SOUTH	0.067	0.041	-0.067	0.041
116	2663.248	2245.102	2659.514	2245.651	2663.251	2245.091	2659.511	2245.640	Down	SOUTH	0.011	0.011	0.011	0.011
117	2663.126	2245.065	2659.488	2245.742	2663.189	2245.058	2659.498	2245.743	Down	SOUTH	0.063	0.010	0.063	0.010
118	2663.035	2245.042	2659.445	2245.848	2663.058	2245.033	2659.458	2245.835	Down	SOUTH	0.025	0.016	0.025	0.016
119	2662.920	2245.009	2659.430	2245.941	2662.995	2245.012	2659.441	2245.931	Down	SOUTH	0.075	0.015	0.075	0.015
120	2662.827	2244.998	2659.389	2246.039	2662.870	2244.998	2659.391	2246.010	Down	SOUTH	0.069	0.029	0.069	0.029
121	2662.750	2244.971	2659.345	2246.132	2662.808	2244.986	2659.354	2246.100	UP	SOUTH	0.060	0.033	-0.060	0.033
122	2662.662	2244.939	2659.336	2246.221	2662.633	2244.926	2659.342	2246.217	Down	SOUTH	0.032	0.007	0.032	0.007
123	2662.571	2244.903	2659.303	2246.330	2662.628	2244.863	2659.310	2246.319	Down	SOUTH	0.059	0.013	0.059	0.013
124	2662.479	2244.877	2659.283	2246.416	2662.489	2244.866	2659.289	2246.407	Down	SOUTH	0.015	0.011	0.015	0.011
125	2662.388	2244.814	2659.244	2246.511	2662.417	2244.837	2659.247	2246.512	Down	SOUTH	0.037	0.003	0.037	0.003
126	2662.290	2244.802	2659.228	2246.606	2662.270	2244.743	2659.219	2246.606	Down	SOUTH	0.062	0.009	0.062	0.009
127	2662.182	2244.780	2659.184	2246.700	2662.228	2244.785	2659.201	2246.683	Down	SOUTH	0.046	0.024	0.046	0.024
128	2662.087	2244.748	2659.160	2246.810	2662.121	2244.825	2659.174	2246.769	UP	SOUTH	0.084	0.043	-0.084	0.043
129	2661.997	2244.712	2659.126	2246.909	2662.030	2244.714	2659.154	2246.883	Down	SOUTH	0.033	0.038	0.033	0.038
130	2661.901	2244.697	2659.108	2246.991	2661.940	2244.674	2659.122	2246.933	Down	SOUTH	0.045	0.060	0.045	0.060
131	2661.823	2244.650	2659.080	2247.095	2661.844	2244.676	2659.103	2247.024	Down	SOUTH	0.033	0.075	0.033	0.075
132	2661.722	2244.638	2659.036	2247.167	2661.738	2244.628	2659.071	2247.142	Down	SOUTH	0.019	0.041	0.019	0.041
133	2661.614	2244.595	2659.020	2247.252	2661.624	2244.619	2659.032	2247.238	Down	SOUTH	0.026	0.013	0.026	0.013
134	2661.516	2244.594	2658.976	2247.373	2661.540	2244.587	2658.985	2247.353	Down	SOUTH	0.025	0.022	0.025	0.022
135	2661.417	2244.554	2658.956	2247.459	2661.440	2244.554	2658.977	2247.467	Down	SOUTH	0.023	0.022	0.023	0.022
136	2661.318	2244.526	2658.926	2247.566	2661.364	2244.520	2658.970	2247.547	Down	SOUTH	0.047	0.048	0.047	0.048

137	2661.223	2244.501	2658.894	2247.659	
138	2661.123	2244.478	2658.976	2247.743	
139	2661.034	2244.440	2658.956	2247.646	
140	2660.935	2244.416	2658.928	2247.944	
141	2660.851	2244.364	2658.894	2248.042	
142	2660.747	2244.368	2658.876	2248.144	
143	2660.664	2244.314	2658.838	2248.229	
144	2660.564	2244.300	2658.811	2248.327	
145	2660.462	2244.270	2658.779	2248.425	
146	2660.362	2244.240	2658.751	2248.522	
147	2660.269	2244.212	2658.725	2248.613	
148	2660.018	2244.160	2658.687	2248.707	
149	2660.076	2244.143	2658.644	2248.799	
150	2659.979	2244.091	2658.612	2248.873	
151	2659.894	2244.076	2658.588	2249.000	
152	2659.795	2244.055	2658.560	2249.061	
153	2659.704	2244.036	2658.563	2249.166	
154	2659.602	2243.985	2658.520	2249.027	
155	2659.511	2243.953	2658.503	2249.375	
156	2659.421	2243.911	2658.483	2249.485	
157	2659.324	2243.901	2658.441	2249.560	
158	2659.220	2243.869	2658.409	2249.674	
159	2659.121	2243.859	2658.366	2249.773	
160	2659.028	2243.805	2658.336	2249.867	
161	2658.930	2243.786	2658.322	2249.966	
162	2658.843	2243.762	2658.294	2250.056	
163	2658.741	2243.736	2658.251	2250.150	
164	2658.643	2243.705	2658.223	2250.231	
165	2658.541	2243.673	2658.194	2250.333	
166	2658.455	2243.645	2658.180	2250.447	
167	2658.351	2243.605	2658.046	2250.534	
168	2658.259	2243.585	2658.001	2250.624	
169	2658.175	2243.548	2657.967	2250.728	
170	2658.087	2243.516	2657.846	2250.816	
171	2657.976	2243.506	2657.923	2250.919	
172	2657.506	2243.481	2657.894	2251.005	
173	2657.794	2243.448	2657.861	2251.106	
174	2657.695	2243.423	2657.812	2251.197	
175	2657.617	2243.398	2657.777	2251.301	
176	2657.500	2243.371	2657.749	2251.402	
177	2657.385	2243.335	2657.736	2251.487	
178	2657.299	2243.282	2657.692	2251.587	
179	2657.181	2243.255	2657.677	2251.692	
180	2657.112	2243.230	2657.659	2251.786	
181	2657.041	2243.214	2657.606	2251.873	
182	2656.936	2243.187	2657.578	2251.961	
183	2656.852	2243.170	2657.564	2252.060	
184	2656.741	2243.141	2657.531	2252.163	
185	2656.627	2243.106	2657.485	2252.271	
186	2656.546	2243.060	2657.448	2252.347	
187	2656.448	2243.055	2657.426	2252.461	
188	2656.341	2243.002	2657.383	2252.539	
189	2656.253	2242.973	2657.360	2252.643	
190	2656.145	2242.949	2657.334	2252.723	
191	2656.071	2242.933	2657.304	2252.830	
192	2655.973	2242.903	2657.279	2252.924	
193	2655.870	2242.875	2657.259	2253.007	
194	2655.775	2242.834	2657.220	2253.111	
195	2655.655	2242.810	2657.183	2253.214	
196	2655.376	2242.787	2657.154	2253.311	
197	2655.476	2242.751	2657.128	2253.128	
198	2655.375	2242.725	2657.104	2253.104	
199	2655.267	2242.703	2657.036	2253.036	
200	2655.169	2242.665	2657.032	2253.032	

	2661.263	2244.479	2658.870	2247.873	
	2661.142	2244.458	2658.867	2247.726	
	2661.019	2244.423	2658.855	2247.815	
	2660.947	2244.417	2658.813	2247.932	
	2660.660	2244.372	2658.786	2248.065	
	2660.729	2244.349	2658.756	2248.151	
	2660.671	2244.315	2658.732	2248.260	
	2660.587	2244.197	2658.686	2248.333	
	2660.482	2244.258	2658.667	2248.426	
	2660.390	2244.232	2658.626	2248.526	
	2660.275	2244.216	2658.627	2248.600	
	2660.224	2244.180	2658.552	2248.724	
	2660.098	2244.148	2658.560	2248.820	
	2659.991	2244.100	2658.531	2248.885	
	2659.918	2244.082	2658.528	2248.978	
	2659.800	2244.057	2658.470	2249.119	
	2659.724	2244.050	2658.451	2249.172	
	2659.613	2243.977	2658.406	2249.238	
	2659.543	2243.972	2658.401	2249.346	
	2659.452	2243.936	2658.357	2249.469	
	2659.359	2243.910	2658.319	2249.567	
	2659.245	2243.874	2658.277	2249.674	
	2659.143	2243.766	2658.252	2249.746	
	2659.046	2243.824	2658.227	2249.865	
	2658.958	2243.799	2658.215	2249.946	
	2658.861	2243.763	2658.184	2250.052	
	2658.782	2243.741	2658.153	2250.126	
	2658.666	2243.702	2658.103	2250.236	
	2658.560	2243.666	2658.079	2250.336	
	2658.464	2243.642	2658.056	2250.425	
	2658.394	2243.617	2658.005	2250.554	
	2658.288	2243.588	2657.988	2250.630	
	2658.204	2243.532	2657.959	2250.719	
	2658.089	2243.542	2657.956	2250.802	
	2658.001	2243.519	2657.914	2250.870	
	2657.932	2243.622	2657.840	2250.986	
	2657.825	2243.396	2657.861	2251.080	
	2657.717	2243.435	2657.803	2251.198	
	2657.597	2243.375	2657.773	2251.286	
	2657.521	2243.373	2657.769	2251.393	
	2657.412	2243.346	2657.721	2251.492	
	2657.321	2243.284	2657.701	2251.590	
	2657.255	2243.259	2657.692	2251.733	
	2657.131	2243.227	2657.643	2251.780	
	2657.075	2243.231	2657.600	2251.836	
	2656.958	2243.163	2657.643	2251.961	
	2656.873	2243.188	2657.545	2252.050	
	2656.752	2243.163	2657.530	2252.190	
	2656.645	2243.112	2657.502	2252.219	
	2656.580	2243.082	2657.456	2252.347	
	2656.470	2243.064	2657.431	2252.450	
	2656.360	2243.017	2657.414	2252.539	
	2656.274	2242.975	2657.373	2252.648	
	2656.160	2242.960	2657.371	2252.731	
	2656.088	2242.945	2657.296	2252.856	
	2655.925	2242.879	2657.280	2252.947	
	2655.873	2242.897	2657.304	2252.947	
	2655.794	2242.845	2657.242	2253.090	
	2655.693	2242.815	2657.205	2253.198	
	2655.571	2242.819	2657.143	2253.311	
	2655.465	2242.745	2657.129	2253.415	
	2655.377	2242.749	2657.104	2253.104	
	2655.293	2242.717	2657.036	2253.036	
	2655.177	2242.666	2657.073	2253.711	

	Down	SOUTH	0.046	0.026	0.046	0.026
	Down	NORTH	0.026	0.110	0.026	-0.110
	Down	NORTH	0.023	0.106	0.023	-0.106
	UP	NORTH	0.012	0.114	-0.012	-0.114
	Down	NORTH	0.015	0.110	0.015	-0.110
	Down	NORTH	0.020	0.118	0.020	-0.118
	Down	NORTH	0.007	0.118	0.007	-0.118
	Down	NORTH	0.106	0.125	0.106	-0.125
	Down	NORTH	0.022	0.112	0.022	-0.112
	Down	NORTH	0.029	0.126	0.029	-0.126
	UP	NORTH	0.007	0.099	-0.007	-0.099
	UP	NORTH	0.207	0.136	-0.207	-0.136
	UP	NORTH	0.023	0.087	-0.023	-0.087
	Down	NORTH	0.015	0.082	0.015	-0.082
	Down	NORTH	0.025	0.064	0.025	-0.064
	UP	NORTH	0.004	0.098	-0.004	-0.098
	UP	NORTH	0.025	0.113	-0.025	-0.113
	Down	NORTH	0.014	0.898	0.014	-0.898
	UP	NORTH	0.037	0.106	-0.037	-0.106
	Down	NORTH	0.040	0.127	0.040	-0.127
	UP	NORTH	0.036	0.122	-0.036	-0.122
	Down	NORTH	0.029	0.132	0.029	-0.132
	Down	NORTH	0.098	0.119	0.098	-0.119
	UP	NORTH	0.026	0.109	-0.026	-0.109
	UP	NORTH	0.030	0.109	-0.030	-0.109
	UP	NORTH	0.018	0.110	-0.018	-0.110
	UP	NORTH	0.022	0.101	-0.022	-0.101
	UP	NORTH	0.023	0.120	-0.023	-0.120
	UP	NORTH	0.020	0.115	-0.020	-0.115
	UP	NORTH	0.009	0.126	-0.009	-0.126
	UP	NORTH	0.045	0.045	-0.045	-0.045
	UP	SOUTH	0.029	0.014	-0.029	0.014
	Down	SOUTH	0.033	0.012	0.033	0.012
	UP	SOUTH	0.034	0.109	-0.034	0.109
	UP	SOUTH	0.026	0.050	-0.026	0.050
	UP	SOUTH	0.428	0.049	-0.428	0.049
	Down	SOUTH	0.061	0.048	0.061	0.048
	UP	SOUTH	0.025	0.000	-0.025	0.000
	UP	SOUTH	0.030	0.016	-0.030	0.016
	UP	SOUTH	0.021	0.022	-0.021	0.022
	UP	SOUTH	0.029	0.016	-0.029	0.016
	UP	SOUTH	0.031	0.009	-0.031	0.009
	UP	NORTH	0.075	0.044	-0.075	-0.044
	UP	SOUTH	0.019	0.020	-0.019	-0.020
	UP	SOUTH	0.038	0.037	-0.038	0.037
	UP	SOUTH	0.022	0.005	-0.022	0.005
	UP	SOUTH	0.028	0.021	-0.028	0.021
	UP	NORTH	0.025	0.027	-0.025	-0.027
	UP	SOUTH	0.019	0.055	-0.019	0.055
	UP	SOUTH	0.040	0.008	-0.040	0.008
	UP	SOUTH	0.024	0.031	-0.024	0.031
	UP	SOUTH	0.024	0.031	-0.024	0.031
	UP	SOUTH	0.021	0.014	-0.021	0.014
	UP	SOUTH	0.015	0.038	-0.015	0.038
	UP	SOUTH	0.021	0.027	-0.021	0.027
	UP	SOUTH	0.054	0.023	-0.054	0.023
	UP	SOUTH	0.022	0.075	-0.022	0.075
	UP	SOUTH	0.022	0.030	-0.022	0.030
	UP	SOUTH	0.038	0.027	-0.038	0.027
	UP	SOUTH	0.198	0.011	-0.198	0.011
	UP	SOUTH	0.013	0.287	-0.013	0.287
	UP	SOUTH	0.024	0.000	-0.024	0.000
	UP	SOUTH	0.030	0.000	-0.030	0.000
	UP	SOUTH	0.000	0.680	-0.000	0.680

UP	81	62	NORTH	
DOWN	100	136	SOUTH	

This is number of pebbles moving different ways

	31.500	0.000	31.500	0.000 max (m)
	-	-	(0.428)	(0.000) min (m)
	0.329	0.066	0.296	(0.001) avg (m)
	2.350	0.124	2.354	0.141 stdv (m)
	0.027	0.036	0.014	0.021 median (m)

LINE PARALLEL TO CONTOUR GROSS movement	LINE ORIENTED DOWNGRADIENT GROSS movement	LINE PARALLEL TO CONTOUR NET movement	LINE ORIENTED DOWNGRADIENT NET movement

pebbles moving > than uncertainty of measure	164	1 SIGMA	0.015 m
	82	2 SIGMA	0.030 m
ASSUMING	0.015	RMS UNCERTAINTY	

THIS IS THE SENSITIVITY TEST FOR HOW MANY PEBBLES REALLY MOVED

Caculations for Pebble data Chemehuevi

These calculations compare movement from orginel positions. The pebbles are seperated into Line countour parallel and Line oriented down gradient pebbles.

The countour parallel line pebbles move up and down and the line oriented down gradient pebbles move north and south.

The calculations include gross movement and net movement. Gross movement does not take into account that some pebbles move up from the line and some move down from the line.

The maximum, minimum, average, standard deviation and median of gross and net pebble movment is shown at the bottom of the spread sheet. A sensitivity test is also included to determine how many pebbles are actually moving.

Gross movement accounts for all movement not just movment in downslope direction
Should we also figure out the down slope movement?

LINE PARALLEL TO CONTOUR NORTHING = 4.13305930*EASTING1 + 41446.363475801

LINE ORIENTED DOWN GRADIENT NORTHING = 0.24740845*EASTING1 + 1125.893681983

May--00

	LINE PARALLEL TO CONTOUR		LINE ORIENTED DOWNGRADIENT	
	e	n	e	n
1	2674.179	2248.657	2662.871	2234.669
2	2674.095	2248.614	2662.952	2234.767
3	2674.000	2248.585	2662.921	2234.864
4	2673.917	2248.549	2662.889	2234.965
5	2673.811	2248.523	2662.826	2235.076
6	2673.722	2248.480	2662.807	2235.169
7	2673.634	2248.451	2662.770	2235.270
8	2673.546	2248.408	2662.754	2235.369
9	2673.439	2248.365	2662.703	2235.457
10	2673.341	2248.352	2662.677	2235.513
11	2673.254	2248.370	2662.661	2235.536
12	2673.166	2248.301	2662.643	2235.720
13	2673.084	2248.278	2662.595	2235.817
14	2672.976	2248.251	2662.551	2235.919
15	2672.871	2248.200	2662.537	2236.009
16	2672.776	2248.168	2662.525	2236.100
17	2672.686	2248.143	2662.469	2236.226
18	2672.587	2248.099	2662.454	2236.319
19	2672.464	2248.055	2662.402	2236.414
20	2672.350	2248.027	2662.364	2236.504
21	2672.308	2248.012	2662.350	2236.590
22	2672.224	2247.982	2662.322	2236.660
23	2672.123	2247.954	2662.281	2236.763
24	2672.015	2247.908	2662.237	2236.862
25	2671.914	2247.871	2662.225	2236.978
26	2671.823	2247.869	2662.185	2237.066
27	2671.729	2247.813	2662.157	2237.167
28	2671.632	2247.769	2662.151	2237.260
29	2671.539	2247.750	2662.073	2237.336
30	2671.432	2247.717	2662.068	2237.436
31	2671.341	2247.701	2662.029	2237.495
32	2671.255	2247.666	2662.019	2237.622
33	2671.154	2247.636	2661.984	2237.726
34	2671.058	2247.605	2661.934	2237.823
35	2670.949	2247.565	2661.906	2237.907
36	2670.856	2247.534	2661.868	2238.026
37	2670.767	2247.492	2661.870	2238.127
38	2670.667	2247.474	2661.830	2238.215
39	2670.563	2247.437	2661.819	2238.301
40	2670.483	2247.403	2661.774	2238.391
41	2670.358	2247.380	2661.731	2238.468
42	2670.297	2247.356	2661.711	2238.562
43	2670.191	2247.327	2661.672	2238.672
44	2670.104	2247.295	2661.645	2238.792
45	2670.028	2247.259	2661.605	2238.867
46	2669.904	2247.236	2661.590	2238.952
47	2669.806	2247.209	2661.572	2239.055
48	2669.711	2247.171	2661.508	2239.160
49	2669.627	2247.152	2661.505	2239.258
50	2669.527	2247.115	2661.456	2239.344
51	2669.435	2247.085	2661.416	2239.436
52	2669.369	2247.097	2661.384	2239.529
53	2669.263	2247.006	2661.359	2239.623
54	2669.161	2246.985	2661.345	2239.739
55	2669.083	2246.940	2661.320	2239.829
56	2668.986	2246.912	2661.279	2239.940
57	2668.883	2246.888	2661.264	2240.036
58	2668.764	2246.842	2661.227	2240.112
59	2668.680	2246.811	2661.185	2240.207
60	2668.592	2246.794	2661.158	2240.328
61	2668.491	2246.743	2661.131	2240.396
62	2668.410	2246.718	2661.109	2240.494
63	2668.330	2246.695	2661.078	2240.596
64	2668.230	2246.673	2661.046	2240.707
65	2668.137	2246.634	2661.007	2240.796
66	2668.017	2246.593	2660.998	2240.894
67	2667.918	2246.556	2660.968	2240.964
68	2667.823	2246.547	2660.942	2241.064
69	2667.744	2246.524	2660.889	2241.156
70	2667.644	2246.489	2660.844	2241.257
71	2667.545	2246.451	2660.843	2241.356
72	2667.444	2246.419	2660.801	2241.461
73	2667.359	2246.364	2660.801	2241.546
74	2667.257	2246.356	2660.734	2241.630
75	2667.166	2246.344	2660.716	2241.750
76	2667.062	2246.303	2660.700	2241.842
77	2666.967	2246.257	2660.671	2241.915
78	2666.879	2246.259	2660.628	2242.016
79	2666.793	2246.217	2660.668	2242.128
80	2666.673	2246.191	2660.574	2242.232
81	2666.595	2246.153	2660.530	2242.305
82	2666.471	2246.118	2660.511	2242.407
83	2666.411	2246.083	2660.452	2242.494
84	2666.311	2246.057	2660.451	2242.594
85	2666.204	2246.023	2660.415	2242.697
86	2666.108	2245.991	2660.374	2242.786
87	2666.007	2245.958	2660.368	2242.886
88	2665.895	2245.955	2660.319	2242.958
89	2665.811	2245.908	2660.302	2243.056
90	2665.737	2245.887	2660.274	2243.159
91	2665.642	2245.850	2660.274	2243.240
92	2665.568	2245.803	2660.201	2243.343
93	2665.441	2245.781	2660.183	2243.530
94	2665.349	2245.744	2660.155	2243.542
95	2665.261	2245.736	2660.140	2243.664
96	2665.121	2245.702	2660.107	2243.732
97	2665.039	2245.659	2660.068	2243.838
98	2664.936	2245.635	2660.041	2243.909
99	2664.850	2245.603	2660.009	2244.027
100	2664.759	2245.576	2659.996	2244.128
101	2664.685	2245.553	2659.968	2244.220
102	2664.591	2245.513	2659.925	2244.323
103	2664.480	2245.474	2659.885	2244.418
104	2664.396	2245.457	2659.866	2244.499
105	2664.287	2245.438	2659.824	2244.586
106	2664.194	2245.384	2659.799	2244.692
107	2664.112	2245.354	2659.781	2244.783
108	2664.020	2245.329	2659.753	2244.885
109	2663.932	2245.298	2659.720	2244.971
110	2663.815	2245.278	2659.686	2245.067
111	2663.741	2245.239	2659.650	2245.179
112	2663.644	2245.227	2659.616	2245.254
113	2663.546	2245.191	2659.606	2245.363
114	2663.460	2245.182	2659.570	2245.463
115	2663.350	2245.141	2659.552	2245.550
116	2663.248	2245.102	2659.514	2245.651
117	2663.126	2245.085	2659.488	2245.742
118	2663.035	2245.042	2659.445	2245.846
119	2662.920	2245.009	2659.430	2245.941
120	2662.827	2244.986	2659.389	2246.039
121	2662.750	2244.971	2659.345	2246.132
122	2662.662	2244.939	2659.336	2246.221
123	2662.571	2244.903	2659.303	2246.330
124	2662.479	2244.877	2659.283	2246.415
125	2662.368	2244.814	2659.244	2246.511
126	2662.290	2244.802	2659.228	2246.606
127	2662.182	2244.789	2659.184	2246.700
128	2662.087	2244.748	2659.160	2246.810
129	2661.997	2244.712	2659.126	2246.900
130	2661.901	2244.687	2659.108	2246.991
131	2661.823	2244.650	2659.080	2247.095
132	2661.722	2244.636	2659.036	2247.167
133	2661.614	2244.595	2659.020	2247.262
134	2661.516	2244.594	2658.976	2247.373
135	2661.417	2244.554	2658.956	2247.458
136	2661.316	2244.526	2658.926	2247.566

Oct--01

	LINE PARALLEL TO CONTOUR		LINE ORIENTED DOWNGRADIENT	
	e	n	e	n
	2674.207	2248.654	2662.983	2234.647
	2674.108	2248.618	2662.975	2234.755
	2674.032	2248.588	2662.965	2234.886
	2673.926	2248.549	2662.866	2235.004
	2673.836	2248.507	2662.863	2235.040
	2673.736	2248.441	2662.811	2235.133
	2673.641	2248.456	2662.774	2235.239
	2673.571	2248.405	2662.755	2235.355
	2673.469	2248.349	2662.710	2235.452
	2673.364	2248.350	2662.696	2235.513
	2673.256	2248.309	2662.662	2235.591
	2673.158	2248.287	2662.654	2235.699
	2673.111	2248.268	2662.618	2235.800
	2672.970	2248.231	2662.563	2235.897
	2672.889	2248.194	2662.555	2235.987
	2672.789	2248.157	2662.530	2236.114
	2672.681	2248.131	2662.488	2236.186
	2672.584	2248.089	2662.465	2236.278
	2672.475	2248.058	2662.430	2236.363
	2672.407	2248.044	2662.388	2236.463
	2672.372	2248.035	2662.367	2236.544
	2672.258	2247.974	2662.321	2236.620
	2672.146	2247.954	2662.316	2236.736
	2672.067	2247.924	2662.294	2236.819
	2671.943	2247.904	2662.228	2236.939
	2671.828	2247.844	2662.225	2237.041
	2671.701	2247.816	2662.197	2237.159
	2671.633	2247.775	2662.282	2237.192
	2671.559	2247.759	2662.110	2237.311
	2671.447	2247.712	2662.155	2237.306
	2671.376	2247.678	2662.004	2237.507
	2671.274	2247.652	2662.028	2237.559
	2671.185	2247.636	2661.967	2237.713
	2671.071	2247.613	2661.963	2237.806
	2670.980	2247.575	2661.926	2237.889
	2670.675	2247.549	2661.899	2237.961
	2670.783	2247.503	2661.867	2238.108
	2670.686	2247.467	2661.846	2238.189
	2670.588	2247.447	2661.840	2238.278
	2670.543	2247.443	2661.780	2238.380
	2670.395	2247.385	2661.749	2238.451
	2670.301	2247.374	2661.729	2238.508
	2670.183	2247.323	2661.666	2238.652
	2670.127	2247.301	2661.615	2238.772
	2670.014	2247.266	2661.620	2238.858
	2669.922	2247.225	2661.617	2238.985
	2669.834	2247.196	2661.579	2239.031
	2669.742	2247.173	2661.536	2239.165
	2669.636	2247.139	2661.496	2239.226
	2669.548	2247.115	2661.488	2239.340
	2669.430	2247.089	2661.436	2239.418
	2669.383	2247.028	2661.432	2239.496
	2669.210	2247.019	2661.425	2239.582
	2669.132	2246.970	2661.356	2239.717
	2669.055	2246.949	2661.317	2239.818
	2668.950	2246.845	2661.302	2239.891
	2668.866	2246.854	2661.282	2240.017
	2668.758	2246.838	2661.259	2240.097
	2669.626	2243.649	2661.195	2240.189
	2663.969	2219.317	2661.175	2240.273
	2671.080	2240.891	2661.155	2240.373
	2669.852	2243.664	2661.139	2240.473
	2668.972	2245.206	2661.088	2240.576
	2669.814	2243.294	2661.063	2240.666
	2670.983	2240.776	2661.031	2240.769
	2667.904	2240.416	2661.019	2240.864
	2668.857	2245.237	2660.982	2240.958
	2667.904	2240.417	2660.937	2241.045
	2668.216	2246.960	2660.907	2241.162
	2667.717	2246.379	2660.859	2241.246
	2667.569	2246.466	2660.870	2241.324
	2667.483	2246.427	2660.848	2241.434
	2667.383	2246.387	2660.813	2241.526
	2667.263	2246.395	2660.729	2241.602
	2667.167	2246.363	2660.735	2241.746
	2667.074	2246.306	2660.729	2241.783
	2666.974	2246.271	2660.667	2241.907
	2666.890	2246.250	2660.646	2242.012
	2666.797	2246.223	2660.656	2242.080
	2666.699	2246.168	2660.562	2242.204
	2666.607	2246.158	2660.564	2242.266
	2666.496	2246.129	2660.522	2242.400
	2666.407	2246.039	2660.451	2242.472
	2666.341	2246.071	2660.455	2242.574
	2666.203	2246.034	2660.427	2242.671
	2666.126	2245.982	2660.358	2242.764
	2666.031	2245.916	2660.365	2242.883
	2665.930	2245.834	2660.343	2242.951
	2665.813	2245.870	2660.326	2243.054
	2665.762	2245.878	2660.328	2243.159
	2665.655	2245.846	2660.277	2243.214
	2665.581	2245.808	2660.228	2243.340
	2665.466	2245.776	2660.201	2243.430
	2665.359	2245.730	2660.168	2243.526
	2665.273	2245.725	2660.144	2243.647
	2665.149	2245.697	2660.121	2243.722
	2665.060	2245.670	2660.085	2243.824
	2664.985	2245.641	2660.029	2243.918
	2664.823	2245.610	2660.016	2244.020
	2664.774	2245.596	2659.971	2244.091
	2664.666	2245.570	2659.950	2244.232
	2664.620	2245.505	2659.920	2244.300
	2664.489	2245.497	2659.932	2244.412
	2664.364	2245.564	2659.856	2244.477
	2664.369	2245.432	2659.839	2244.565
	2664.156	2245.381	2659.824	2244.659
	2664.125	2245.346	2659.780	2244.774
	2664.027	2245.313	2659.750	2244.881
	2663.928	2245.269	2659.727	2244.968
	2663.853	2245.266	2659.699	2245.107
	2663.757	2245.233	2659.671	2245.143
	2663.656	2245.234	2659.648	2245.208
	2663.549	2245.199	2659.616	2245.342
	2663.462	2245.165	2659.585	2245.452
	2663.421	2245.177	2659.558	2245.519
	2663.283	2245.122	2659.517	2245.633
	2663.203	2245.070	2659.489	2245.725
	2663.067	2245.010	2659.455	2245.827
	2663.020	2245.014	2659.446	2245.934
	2662.870	2244.908	2659.389	2246.003
	2662.808	2244.912	2659.343	2246.082
	2662.647	2244.959	2659.345	2246.212
	2662.669	2244.885	2659.301	2246.319
	2662.492	2244.873	2659.292	2246.391
	2662.408	2244.839	2659.255	2246.507
	2662.274	2244.774	2659.206	2246.599
	2662.225	2244.815	2659.196	2246.694
	2662.124	2244.822	2659.171	2246.796
	2662.028	2244.731	2659.136	2246.900
	2661.943	2244.674	2659.117	2246.937
	2661.875	2244.654	2659.102	2247.046
	2661.732	2244.657	2659.083	2247.163
	2661.629	2244.628	2659.020	2247.258
	2661.539	2244.581	2659.004	2247.356
	2661.438	2244.564	2658.977	2247.453
	2661.366	2244.530	2658.981	2247.530

	LINE PARALLEL TO CONTOUR	LINE ORIENTED DOWNGRADIENT	LINE PARALLEL TO CONTOUR	LINE ORIENTED DOWNGRADIENT	LINE PARALLEL TO CONTOUR	LINE ORIENTED DOWNGRADIENT
	UP vs DOWN MOVEMENT	NORTH vs SOUTH MOVEMENT	GROSS movement	GROSS movement	NET movement	NET movement
1	UP	NORTH	0.029	0.025	-0.029	-0.025
2	UP	NORTH	0.013	0.026	-0.013	-0.026
3	UP	NORTH	0.032	0.049	-0.032	-0.049
4	UP	NORTH	0.009	0.045	-0.009	-0.045
5	UP	NORTH	0.030	0.052	-0.030	-0.052
6	UP	NORTH	0.042	0.036	-0.042	-0.036
7	UP	NORTH	0.009	0.031	-0.009	-0.031
8	UP	NORTH	0.025	0.014	-0.025	-0.014
9	UP	NORTH	0.047	0.009	-0.047	-0.009
10	UP	NORTH	0.023	0.019	-0.023	-0.019
11	UP	NORTH	0.081	0.047	-0.081	-0.047
12	UP	NORTH	0.016	0.024	-0.016	-0.024
13	UP	NORTH	0.029	0.029	-0.029	-0.029
14	UP	NORTH	0.021	0.025	-0.021	-0.025
15	UP	NORTH	0.019	0.028	-0.019	-0.028
16	UP	NORTH	0.017	0.015	-0.017	-0.015
17	UP	NORTH	0.014	0.044	-0.014	-0.044
18	UP	NORTH	0.020	0.042	-0.020	-0.042
19	UP	NORTH	0.011	0.042	-0.011	-0.042
20	UP	SOUTH	0.050	0.079	-0.050	0.079
21	UP	NORTH	0.068	0.049	-0.068	-0.049
22	UP	SOUTH	0.045	0.040	-0.045	0.040
23	UP	SOUTH	0.023	0.044	-0.023	0.044
24	UP	SOUTH	0.054	0.071	-0.054	0.071
25	UP	NORTH	0.044	0.037	-0.044	-0.037
26	UP	SOUTH	0.018	0.047	-0.018	0.047
27	UP	NORTH	0.028	0.041	-0.028	-0.041
28	UP	NORTH	0.006	0.148	-0.006	-0.148
29	UP	SOUTH	0.022	0.046	-0.022	0.046
30	UP	SOUTH	0.016	0.097	-0.016	0.097
31	UP	SOUTH	0.042	0.027	-0.042	0.027
32	UP	SOUTH	0.024	0.064	-0.024	0.064
33	UP	SOUTH	0.031	0.021	-0.031	0.021
34	UP	SOUTH	0.015	0.034	-0.015	0.034
35	UP	SOUTH	0.033	0.026	-0.033	0.026
36	UP	SOUTH	0.024	0.066	-0.024	0.066
37	UP	NORTH	0.019	0.025	-0.019	-0.025
38	Down	SOUTH	0.025	0.027	0.025	0.027
39	UP	NORTH	0.027	0.033	-0.027	-0.033
40	UP	SOUTH	0.072	0.013	-0.072	0.013
41	UP	SOUTH	0.037	0.025	-0.037	0.025
42	UP	SOUTH	0.018	0.064	-0.018	0.064
43	UP	SOUTH	0.009	0.024	-0.009	0.024
44	UP	SOUTH	0.024	0.036	-0.024	0.036
45	UP	SOUTH	0.030	0.017	-0.030	0.017
46	Down	SOUTH	0.021	0.035	0.021	0.035
47	UP	SOUTH	0.031	0.025	-0.031	0.025
48	UP	SOUTH	0.031	0.026	-0.031	0.026
49	UP	SOUTH	0.024	0.033	-0.024	0.033
50	UP	SOUTH	0.021	0.032	-0.021	0.032
51	UP	SOUTH	0.034	0.028	-0.034	0.028
52	Down	SOUTH	0.032	0.056	0.032	0.056
53	Down	SOUTH	0.055	0.078	0.055	0.078
54	Down	SOUTH	0.033	0.025	0.033	0.025
55	Down	SOUTH	0.029	0.011	0.029	0.011
56	Down	SOUTH	0.076	0.054	0.076	0.054
57	Down	SOUTH	0.034	0.026	0.034	0.026
58	Down	SOUTH	0.007	0.035	0.007	0.035
59	Down	SOUTH	3.300	0.021	3.300	0.021
60	Down	SOUTH	31.487	0.058	31.487	0.058
61	Down	SOUTH	6.583	0.033	6.583	0.033
62	Down	SOUTH	3.377	0.029	3.377	0.029
63	Down	SOUTH	1.622	0.022	1.622	0.022
64	Down	SOUTH	3.732	0.027	3.732	0.027
65	Down	SOUTH	6.513	0.036	6.513	0.036
66	Down	SOUTH	6.178	0.037	6.178	0.037
67	Down	SOUTH	1.819	0.015	1.819	0.015
68	Down	SOUTH	0.153	0.020	0.153	0.020
69	UP	SOUTH	0.643	0.019	-0.643	0.019
70	Down	SOUTH	0.132	0.017	0.132	0.017
71	UP	SOUTH	0.042	0.042	-0.042	0.042
72	Down	SOUTH	0.040	0.054	0.040	0.054
73	Down	SOUTH	0.024	0.023	0.024	0.023
74	Down	SOUTH	0.011	0.028	0.011	0.028
75	Down	SOUTH	0.023	0.019	0.023	0.019
76	Down	SOUTH	0.022	0.066	0.022	0.066
77	Down	SOUTH	0.017	0.009	0.017	0.009
78	Down	SOUTH	0.020	0.020	0.020	0.020
79	Down	NORTH	0.007	0.049	0.007	-0.049
80	Down	SOUTH	0.035	0.030	0.035	0.030
81	Down	SOUTH	0.013	0.052	0.013	0.052
82	Down	SOUTH	0.027	0.013	0.027	0.013
83	Down	SOUTH	0.054	0.022	0.054	0.022
84	Down	SOUTH	0.030	0.020	0.030	0.020
85	Down	SOUTH	0.011	0.029	0.011	0.029
86	Down	SOUTH	0.020	0.027	0.020	0.027
87	Down	NORTH	0.047	0.033	0.047	-0.033
88	Down	SOUTH	0.040	0.025	0.040	0.025
89	Down	SOUTH	0.038	0.027	0.038	0.027
90	Down	SOUTH	0.027	0.055	0.027	0.055
91	Down	SOUTH	0.014	0.026	0.014	0.026
92	Down	SOUTH	0.014	0.027	0.014	0.027
93	Down	SOUTH	0.025	0.102	0.025	0.102
94	Down	SOUTH	0.005	0.021	0.005	0.021
95	Down	SOUTH	0.017	0.017	0.017	0.017
96	Down	SOUTH	0.028	0.017	0.028	0.017
97	Down	SOUTH	0.024	0.022	0.024	0.022
98	Down	SOUTH	0.049	0.015	0.049	0.015
99	Down	SOUTH	0.026	0.010	0.026	0.010
100	Down	SOUTH	0.025	0.045	0.025	0.045
101	Down	SOUTH	0.017	0.022	0.017	0.022
102	Down	SOUTH	0.030	0.024	0.030	0.024
103	Down	SOUTH	0.025	0.047	0.025	0.047
104	UP	SOUTH	0.131	0.024	-0.131	0.024
105	Down	SOUTH	0.102	0.026	0.102	0.026
106	Down	SOUTH	0.040	0.041	0.040	0.041
107	Down	SOUTH	0.015	0.013	0.015	0.013
108	Down	SOUTH	0.017	0.005	0.017	0.005
109	Down	SOUTH	0.029	0.008	0.029	0.008
110	Down	SOUTH	0.040	0.042	0.040	0.042
111	Down	SOUTH	0.017	0.042	0.017	0.042
112	Down	SOUTH	0.014	0.057	0.014	0.057
113	Down	SOUTH	0.009	0.023	0.009	0.023
114	Down	SOUTH	0.012	0.012	0.012	0.012
115	UP	SOUTH	0.080	0.032	-0.080	0.032
116	Down	SOUTH	0.025	0.018	0.025	0.018
117	Down	SOUTH	0.077	0.017	0.077	0.017
118	Down	SOUTH	0.045	0.021	0.045	0.021
119	Down	SOUTH	0.100	0.017	0.100	0.017
120	Down	SOUTH	0.089	0.036	0.089	0.036
121	UP	SOUTH	0.071	0.050	-0.071	0.050
122	UP	SOUTH	0.025	0.013	-0.025	0.013
123	Down	SOUTH	0.100	0.011	0.100	0.011
124	Down	SOUTH	0.014	0.027	0.014	0.027
125	Down	SOUTH	0.032	0.012	0.032	0.012
126	Down	SOUTH	0.032	0.023	0.032	0.023
127	UP	SOUTH	0.050	0.013	-0.050	0.013
128	UP	SOUTH	0.083	0.018	-0.083	0.018
129	Down	SOUTH	0.036	0.013	0.036	0.013
130	Down	SOUTH	0.048	0.055	0.048	0.055
131	Down	SOUTH	0.052	0.054	0.052	0.054
132	Down	SOUTH	0.021	0.025	0.021	0.025
133	UP	SOUTH	0.036	0.004	-0.036	0.004
134	Down	SOUTH	0.026	0.033	0.026	0.033
135	Down	SOUTH	0.023	0.022	0.023	0.022
136	Down	SOUTH	0.048	0.066	0.048	0.066

137	2661.223	2244.501	2658.894	2247.659	2661.257	2244.487	2658.872	2247.664	Down	SOUTH	0.037	0.023	0.037	0.023	
138	2661.123	2244.478	2658.976	2247.743	2661.150	2244.464	2658.859	2247.725	Down	NORTH	0.030	0.109	0.030	-0.109	
139	2661.034	2244.440	2658.956	2247.846	2661.028	2244.425	2658.842	2247.816	Down	NORTH	0.016	0.118	0.016	-0.118	
140	2660.935	2244.416	2658.926	2247.944	2660.955	2244.398	2658.810	2247.971	Down	NORTH	0.027	0.119	0.027	-0.119	
141	2660.851	2244.384	2658.894	2248.042	2660.855	2244.391	2658.775	2248.080	UP	NORTH	0.016	0.125	-0.016	-0.125	
142	2660.747	2244.358	2658.876	2248.144	2660.728	2244.363	2658.767	2248.139	UP	NORTH	0.020	0.109	-0.020	-0.109	
143	2660.664	2244.314	2658.836	2248.229	2660.670	2244.318	2658.729	2248.215	Down	NORTH	0.007	0.110	0.007	-0.110	
144	2660.564	2244.300	2658.811	2248.327	2660.592	2244.299	2658.681	2248.333	UP	NORTH	0.028	0.130	-0.028	-0.130	
145	2660.462	2244.270	2658.779	2248.425	2660.474	2244.269	2658.682	2248.406	UP	NORTH	0.012	0.099	-0.012	-0.099	
146	2660.362	2244.240	2658.751	2248.522	2660.402	2244.240	2658.661	2248.516	UP	NORTH	0.040	0.080	-0.040	-0.080	
147	2660.269	2244.212	2658.725	2248.613	2660.278	2244.201	2658.631	2248.510	Down	NORTH	0.014	0.139	0.014	-0.139	
148	2660.018	2244.180	2658.687	2248.707	2660.227	2244.189	2658.561	2248.732	UP	NORTH	0.210	0.128	-0.210	-0.128	
149	2660.076	2244.143	2658.644	2248.799	2660.108	2244.156	2658.531	2248.809	UP	NORTH	0.035	0.113	-0.035	-0.113	
150	2659.979	2244.091	2658.612	2248.873	2659.998	2244.099	2658.537	2248.908	Down	NORTH	0.021	0.082	0.021	-0.082	
151	2659.894	2244.076	2658.586	2249.000	2659.911	2244.090	2658.537	2248.961	UP	NORTH	0.022	0.064	-0.022	-0.064	
152	2659.796	2244.055	2658.560	2249.081	2659.815	2244.057	2658.481	2249.104	UP	NORTH	0.019	0.082	-0.019	-0.082	
153	2659.704	2244.035	2658.563	2249.186	2659.712	2244.063	2658.465	2249.072	UP	NORTH	0.029	0.150	-0.029	-0.150	
154	2659.602	2243.985	2658.520	2249.927	2659.615	2243.986	2658.417	2249.257	Down	NORTH	0.013	0.678	0.013	-0.678	
155	2659.511	2243.953	2658.503	2249.375	2659.542	2243.981	2658.409	2249.339	UP	NORTH	0.042	0.101	-0.042	-0.101	
156	2659.421	2243.911	2658.483	2249.485	2659.446	2243.939	2658.384	2249.461	UP	NORTH	0.038	0.121	-0.038	-0.121	
157	2659.324	2243.901	2658.441	2249.560	2659.355	2243.917	2658.317	2249.547	UP	NORTH	0.035	0.125	-0.035	-0.125	
158	2659.220	2243.860	2658.409	2249.674	2659.244	2243.886	2658.276	2249.715	UP	NORTH	0.035	0.139	-0.035	-0.139	
159	2659.121	2243.858	2658.368	2249.773	2659.137	2243.861	2658.303	2249.752	UP	NORTH	0.016	0.088	-0.016	-0.088	
160	2659.028	2243.806	2658.336	2249.867	2658.972	2243.821	2658.248	2249.853	UP	NORTH	0.047	0.086	-0.047	-0.086	
161	2658.930	2243.788	2658.322	2249.966	2658.949	2243.803	2658.216	2249.951	UP	NORTH	0.024	0.107	-0.024	-0.107	
162	2658.843	2243.762	2658.294	2250.056	2658.846	2243.771	2658.179	2250.058	UP	NORTH	0.009	0.115	-0.009	-0.115	
163	2658.741	2243.736	2658.251	2250.150	2658.752	2243.741	2658.149	2250.118	UP	NORTH	0.012	0.107	-0.012	-0.107	
164	2658.643	2243.706	2658.223	2250.231	2658.661	2243.698	2658.093	2250.255	UP	NORTH	0.019	0.132	-0.019	-0.132	
165	2658.541	2243.673	2658.194	2250.333	2658.556	2243.668	2658.086	2250.337	UP	NORTH	0.018	0.108	-0.018	-0.108	
166	2658.455	2243.645	2658.180	2250.447	2658.464	2243.636	2658.057	2250.422	Down	NORTH	0.013	0.126	0.013	-0.126	
167	2658.351	2243.605	2658.046	2250.534	2658.386	2243.662	2658.001	2250.565	UP	NORTH	0.067	0.055	-0.067	-0.055	
168	2658.259	2243.585	2658.001	2250.624	2658.287	2243.621	2658.003	2250.628	UP	SOUTH	0.046	0.004	-0.046	0.004	
169	2658.175	2243.548	2657.967	2250.728	2658.189	2243.512	2657.959	2250.718	Down	SOUTH	0.039	0.013	0.039	0.013	
170	2658.067	2243.516	2657.848	2250.816	2658.080	2243.540	2657.952	2250.803	UP	SOUTH	0.027	0.195	-0.027	0.195	
171	2657.978	2243.506	2657.923	2250.919	2658.005	2243.523	2657.922	2250.871	UP	SOUTH	0.032	0.048	-0.032	0.048	
172	2657.896	2243.481	2657.894	2251.005	2657.930	2243.526	2657.857	2250.965	UP	SOUTH	0.426	0.054	-0.426	0.054	
173	2657.794	2243.448	2657.861	2251.108	2657.817	2243.391	2657.877	2251.063	Down	SOUTH	0.061	0.046	0.061	0.046	
174	2657.695	2243.423	2657.812	2251.197	2657.709	2243.429	2657.800	2251.203	UP	SOUTH	0.015	0.013	-0.015	0.013	
175	2657.617	2243.398	2657.777	2251.301	2657.598	2243.361	2657.778	2251.291	UP	SOUTH	0.025	0.010	-0.025	0.010	
176	2657.500	2243.371	2657.749	2251.402	2657.521	2243.367	2657.741	2251.365	UP	SOUTH	0.026	0.011	-0.026	0.011	
177	2657.385	2243.335	2657.736	2251.487	2657.404	2243.330	2657.716	2251.489	UP	SOUTH	0.020	0.020	-0.020	0.020	
178	2657.299	2243.282	2657.692	2251.587	2657.321	2243.284	2657.690	2251.574	UP	SOUTH	0.031	0.013	-0.031	0.013	
179	2657.181	2243.255	2657.677	2251.692	2657.237	2243.270	2657.697	2251.729	UP	NORTH	0.056	0.042	-0.056	-0.042	
180	2657.112	2243.230	2657.659	2251.768	2657.122	2243.217	2657.639	2251.774	UP	NORTH	0.016	0.021	-0.016	-0.021	
181	2657.041	2243.214	2657.606	2251.873	2657.059	2243.207	2657.613	2251.837	UP	SOUTH	0.019	0.037	-0.019	0.037	
182	2656.936	2243.187	2657.578	2251.951	2656.951	2243.185	2657.591	2251.962	UP	SOUTH	0.015	0.013	-0.015	0.013	
183	2656.852	2243.170	2657.564	2252.060	2656.871	2243.186	2657.551	2252.037	UP	SOUTH	0.025	0.026	-0.025	0.026	
184	2656.741	2243.141	2657.531	2252.163	2656.744	2243.162	2657.530	2252.146	UP	SOUTH	0.021	0.019	-0.021	0.019	
185	2656.627	2243.106	2657.485	2252.271	2656.662	2243.113	2657.511	2252.236	UP	SOUTH	0.036	0.044	-0.036	0.044	
186	2656.546	2243.080	2657.448	2252.347	2656.573	2243.081	2657.446	2252.349	UP	SOUTH	0.034	0.003	-0.034	0.003	
187	2656.448	2243.055	2657.428	2252.461	2656.467	2243.052	2657.424	2252.434	UP	SOUTH	0.019	0.047	-0.019	0.047	
188	2656.341	2243.002	2657.383	2252.539	2656.352	2243.016	2657.429	2252.530	UP	SOUTH	0.018	0.047	-0.018	0.047	
189	2656.253	2242.973	2657.360	2252.643	2656.267	2242.971	2657.364	2252.622	UP	SOUTH	0.014	0.021	-0.014	0.021	
190	2656.145	2242.949	2657.334	2252.723	2656.166	2242.955	2657.356	2252.733	UP	SOUTH	0.022	0.034	-0.022	0.034	
191	2656.071	2242.933	2657.304	2252.830	2656.094	2242.942	2657.285	2252.844	UP	SOUTH	0.025	0.024	-0.025	0.024	
192	2655.973	2242.903	2657.279	2252.924	2655.921	2242.876	2657.278	2252.936	UP	SOUTH	0.059	0.014	-0.059	0.014	
193	2655.870	2242.875	2657.259	2253.007	2655.866	2242.900	2657.297	2252.944	UP	SOUTH	0.025	0.074	-0.025	0.074	
194	2655.775	2242.834	2657.220	2253.111	2655.787	2242.837	2657.226	2253.077	UP	SOUTH	0.012	0.035	-0.012	0.035	
195	2655.655	2242.810	2657.183	2253.214	2655.690	2242.803	2657.203	2254.162	UP	NORTH	0.036	0.966	-0.036	-0.966	
196	2655.376	2242.787	2657.164	2253.311	2655.563	2242.784	2657.162	2254.308	UP	NORTH	0.187	0.997	-0.187	-0.997	
197	2655.476	2242.751	2657.128	2253.128	2655.472	2242.751	2657.126	2254.415	UP	NORTH	0.004	1.287	-0.004	-1.287	
198	2655.375	2242.725	2657.104	2253.104	2655.380	2242.746	2657.104	2253.104	UP	SOUTH	0.022	0.000	-0.022	0.000	
199	2655.267	2242.703	2657.038	2253.038	2655.288	2242.720	2657.038	2253.038	UP	SOUTH	0.025	0.000	-0.025	0.000	
200	2655.169	2242.685	2657.032	2253.032	2655.157	2242.662	2657.082	2254.708	UP	NORTH	0.026	1.677	-0.026	-1.677	

UP	111	63	NORTH	
DOWN	89	137	SOUTH	
This is number of pebbles moving different ways				

31.467	1.677	31.467	0.105	max (m)
0.004	-	(0.643)	(1.677)	min (m)
0.350	0.071	0.312	(0.026)	avg (m)
2.385	0.180	2.392	0.192	stdv (m)
0.027	0.033	(0.014)	0.019	median (m)

LINE PARALLEL TO CONTOUR	LINE ORIENTED DOWNGRADIENT	LINE PARALLEL TO CONTOUR	LINE ORIENTED DOWNGRADIENT
GROSS movement	GROSS movement	NET movement	NET movement

71.874

pebbles moving > than uncertainty of measure	171	1 SIGMA	0.015 m
	88	2 SIGMA	0.030 m

ASSUMING 0.015 RMS UNCERTAINTY

THIS IS THE SENSITIVITY TEST FOR HOW MANY PEBBLES REALLY MOVED

Caculations for Pebble data Chemehuevi

These calculations compare movement from orginal positions. The pebbles are seperated into Line countour parallel and Line oriented down gradient pebbles.

The countour parallel line pebbles move up and down and the line oriented down gradient pebbles move north and south.

The calculations include gross movement and net movement. Gross movement does not take into account that some pebbles move up from the line and some move down from the line.

The maximum, minimum, average, standard deviation and median of gross and net pebble movement is shown at the bottom of the spread sheet. A sensitivity test is also included to determine how many pebbles are actually moving.

Gross movement accounts for all movement not just movement in downslope direction
Should we also figure out the down slope movement?

LINE PARALLEL TO CONTOUR NORTHING = -4.133059399(EASTING) + 41446.363475601

LINE ORIENTED DOWN GRADIENT NORTHING = 0.247406463(EASTING) + 1125.863561063

	May--00 LINE PARALLEL TO CONTOUR e	n	May--00 LINE ORIENTED DOWNGRADIENT e	n	Apr--02 LINE PARALLEL TO CONTOUR e	n	Apr--02 LINE ORIENTED DOWNGRADIENT e	n	LINE PARALLEL TO CONTOUR UP vs DOWN MOVEMENT	LINE ORIENTED DOWNGRADIENT NORTH vs SOUTH MOVEMENT	LINE PARALLEL TO CONTOUR GROSS movement	LINE ORIENTED DOWNGRADIENT GROSS movement	LINE PARALLEL TO CONTOUR NET movement	LINE ORIENTED DOWNGRADIENT NET movement
1	2674.179	2248.657	2662.871	2234.669	2674.205	2248.616	2662.960	2234.646	UP	NORTH	0.049	0.025	-0.049	-0.025
2	2674.095	2248.614	2662.852	2234.767	2674.069	2248.580	2662.971	2234.733	UP	NORTH	0.043	0.038	-0.043	-0.038
3	2674.000	2248.585	2662.821	2234.864	2674.012	2248.566	2662.929	2234.861	UP	NORTH	0.022	0.009	-0.022	-0.009
4	2673.917	2248.549	2662.888	2234.965	2673.902	2248.524	2662.845	2234.987	UP	NORTH	0.029	0.049	-0.029	-0.049
5	2673.811	2248.523	2662.826	2235.076	2673.812	2248.484	2662.844	2235.007	UP	NORTH	0.039	0.071	-0.039	-0.071
6	2673.722	2248.490	2662.867	2235.169	2673.717	2248.431	2662.815	2235.116	UP	NORTH	0.049	0.054	-0.049	-0.054
7	2673.634	2248.451	2662.770	2235.270	2673.611	2248.425	2662.770	2235.211	UP	NORTH	0.035	0.059	-0.035	-0.059
8	2673.546	2248.408	2662.754	2235.369	2673.549	2248.389	2662.763	2235.312	UP	NORTH	0.019	0.058	-0.019	-0.058
9	2673.439	2248.385	2662.703	2235.457	2673.438	2248.326	2662.684	2235.429	Down	NORTH	0.059	0.029	0.059	-0.029
10	2673.341	2248.352	2662.677	2235.513	2673.327	2248.327	2662.688	2235.490	UP	NORTH	0.029	0.025	-0.029	-0.025
11	2673.254	2248.370	2662.661	2235.638	2673.230	2248.287	2662.666	2235.561	UP	NORTH	0.084	0.077	-0.084	-0.077
12	2673.165	2248.301	2662.643	2235.720	2673.132	2248.279	2662.635	2235.669	UP	NORTH	0.040	0.052	-0.040	-0.052
13	2673.084	2248.279	2662.595	2235.817	2673.089	2248.265	2662.624	2235.799	UP	NORTH	0.014	0.049	-0.014	-0.049
14	2672.976	2248.251	2662.551	2235.919	2672.947	2248.217	2662.543	2235.865	UP	SOUTH	0.045	0.055	-0.045	0.055
15	2672.871	2248.200	2662.537	2236.009	2672.858	2248.175	2662.544	2235.959	UP	NORTH	0.028	0.050	-0.028	-0.050
16	2672.776	2248.168	2662.525	2236.100	2672.758	2248.148	2662.531	2236.096	UP	NORTH	0.027	0.007	-0.027	-0.007
17	2672.688	2248.143	2662.469	2236.226	2672.654	2248.109	2662.494	2236.160	UP	NORTH	0.048	0.071	-0.048	-0.071
18	2672.567	2248.099	2662.454	2236.319	2672.560	2248.079	2662.479	2236.254	UP	NORTH	0.021	0.069	-0.021	-0.069
19	2672.464	2248.055	2662.402	2236.414	2672.444	2248.033	2662.423	2236.371	UP	NORTH	0.030	0.048	-0.030	-0.048
20	2672.350	2248.027	2662.364	2236.504	2672.405	2248.020	2662.405	2236.430	UP	SOUTH	0.055	0.085	-0.055	0.085
21	2672.308	2248.012	2662.350	2236.590	2672.345	2248.007	2662.373	2236.516	UP	SOUTH	0.037	0.077	-0.037	0.077
22	2672.224	2247.982	2662.322	2236.660	2672.241	2247.949	2662.321	2236.609	Down	SOUTH	0.037	0.052	0.037	0.052
23	2672.123	2247.984	2662.281	2236.763	2672.140	2247.936	2662.316	2236.702	UP	SOUTH	0.025	0.076	-0.025	0.076
24	2672.015	2247.900	2662.237	2236.862	2672.051	2247.911	2662.273	2236.799	UP	SOUTH	0.036	0.081	-0.036	0.081
25	2671.914	2247.871	2662.225	2236.976	2671.950	2247.900	2662.230	2236.926	UP	SOUTH	0.046	0.050	-0.046	0.050
26	2671.823	2247.869	2662.185	2237.066	2671.819	2247.863	2662.231	2237.000	UP	SOUTH	0.007	0.080	-0.007	0.080
27	2671.729	2247.813	2662.157	2237.167	2671.693	2247.785	2662.203	2237.112	Down	SOUTH	0.046	0.072	0.046	0.072
28	2671.632	2247.768	2662.151	2237.260	2671.608	2247.744	2662.276	2237.178	Down	SOUTH	0.035	0.149	0.035	0.149
29	2671.539	2247.756	2662.073	2237.338	2671.544	2247.726	2662.095	2237.298	Down	SOUTH	0.025	0.046	0.025	0.046
30	2671.432	2247.717	2662.066	2237.436	2671.424	2247.706	2662.161	2237.395	UP	SOUTH	0.012	0.121	-0.012	0.121
31	2671.341	2247.761	2662.029	2237.496	2671.335	2247.662	2662.011	2237.482	Down	SOUTH	0.039	0.023	0.039	0.023
32	2671.255	2247.666	2662.019	2237.622	2671.270	2247.642	2662.027	2237.535	Down	SOUTH	0.028	0.087	0.028	0.087
33	2671.154	2247.636	2661.984	2237.726	2671.174	2247.616	2661.966	2237.693	Down	SOUTH	0.028	0.038	0.028	0.038
34	2671.058	2247.605	2661.934	2237.823	2671.073	2247.590	2661.971	2237.782	UP	SOUTH	0.021	0.055	-0.021	0.055
35	2670.949	2247.565	2661.906	2237.907	2670.966	2247.555	2661.943	2237.865	UP	SOUTH	0.020	0.043	-0.020	0.043
36	2670.856	2247.534	2661.880	2238.026	2670.862	2247.544	2661.921	2237.944	UP	SOUTH	0.012	0.088	-0.012	0.088
37	2670.767	2247.492	2661.870	2238.127	2670.774	2247.486	2661.909	2238.079	Down	SOUTH	0.009	0.062	0.009	0.062
38	2670.667	2247.474	2661.839	2238.215	2670.683	2247.452	2661.885	2238.174	Down	SOUTH	0.027	0.062	0.027	0.062
39	2670.563	2247.437	2661.819	2238.301	2670.483	2247.434	2661.847	2238.261	UP	NORTH	0.080	0.049	-0.080	-0.049
40	2670.483	2247.403	2661.774	2238.391	2670.517	2247.430	2661.802	2238.343	UP	SOUTH	0.043	0.046	-0.043	0.046
41	2670.358	2247.380	2661.731	2238.468	2670.385	2247.377	2661.750	2238.431	UP	SOUTH	0.027	0.046	-0.027	0.046
42	2670.297	2247.366	2661.711	2238.569	2670.290	2247.368	2661.747	2238.505	UP	SOUTH	0.014	0.073	-0.014	0.073
43	2670.191	2247.327	2661.672	2238.672	2670.186	2247.295	2661.687	2238.640	Down	SOUTH	0.032	0.041	0.032	0.041
44	2670.104	2247.295	2661.645	2238.792	2670.118	2247.284	2661.616	2238.766	Down	SOUTH	0.019	0.039	0.019	0.039
45	2670.029	2247.250	2661.605	2238.867	2670.013	2247.263	2661.626	2238.879	Down	SOUTH	0.016	0.024	0.016	0.024
46	2669.904	2247.235	2661.590	2238.962	2669.901	2247.217	2661.632	2238.967	Down	SOUTH	0.018	0.042	0.018	0.042
47	2669.806	2247.200	2661.572	2239.055	2669.818	2247.192	2661.583	2239.031	Down	SOUTH	0.021	0.032	0.021	0.032
48	2669.711	2247.171	2661.508	2239.160	2669.736	2247.157	2661.539	2239.149	Down	SOUTH	0.029	0.033	0.029	0.033
49	2669.627	2247.162	2661.505	2239.258	2669.627	2247.131	2661.490	2239.179	Down	SOUTH	0.031	0.081	0.031	0.081
50	2669.527	2247.115	2661.456	2239.344	2669.548	2247.111	2661.516	2239.309	UP	SOUTH	0.021	0.069	-0.021	0.069
51	2669.435	2247.055	2661.416	2239.436	2669.421	2247.070	2661.454	2239.399	Down	SOUTH	0.021	0.053	0.021	0.053
52	2669.350	2247.007	2661.384	2239.529	2669.379	2247.013	2661.427	2239.489	Down	SOUTH	0.021	0.059	0.021	0.059
53	2669.263	2247.006	2661.350	2239.623	2669.204	2246.985	2661.429	2239.569	Down	SOUTH	0.063	0.088	0.063	0.088
54	2669.161	2246.985	2661.345	2239.739	2669.132	2246.951	2661.370	2239.707	Down	SOUTH	0.045	0.041	0.045	0.041
55	2669.083	2246.940	2661.320	2239.829	2669.056	2246.905	2661.333	2239.800	Down	SOUTH	0.045	0.032	0.045	0.032
56	2668.986	2246.912	2661.279	2239.940	2668.832	2246.848	2661.318	2239.893	Down	SOUTH	0.167	0.065	0.167	0.065
57	2668.883	2246.888	2661.264	2240.036	2668.877	2246.848	2661.292	2239.997	Down	SOUTH	0.040	0.048	0.040	0.048
58	2668.764	2246.842	2661.227	2240.112	2668.743	2246.836	2661.266	2240.115	Down	SOUTH	0.022	0.039	0.022	0.039
59	2668.690	2246.811	2661.185	2240.207	2668.621	2243.701	2661.162	2240.158	Down	SOUTH	3.249	0.054	3.249	0.054
60	2668.592	2246.794	2661.156	2240.329	2683.960	2219.257	2661.179	2240.260	Down	SOUTH	31.535	0.071	31.535	0.071
61	2668.491	2246.743	2661.131	2240.396	2671.063	2240.680	2661.165	2240.351	Down	SOUTH	6.586	0.056	6.586	0.056
62	2668.410	2246.718	2661.109	2240.494	2669.852	2243.664	2661.137	2240.463	Down	SOUTH	3.377	0.042	3.377	0.042
63	2668.330	2246.695	2661.078	2240.596	2668.003	2245.202	2661.034	2240.534	Down	SOUTH	1.638	0.076	1.638	0.076
64	2668.230	2246.673	2661.046	2240.707	2669.814	2243.294	2661.072	2240.673	Down	SOUTH	3.732	0.043	3.732	0.043
65	2668.137	2246.634	2661.007	2240.796	2671.020	2240.771	2661.036	2240.757	Down	SOUTH	6.533	0.050	6.533	0.050
66	2668.017	2246.593	2660.998	2240.894	2667.904	2240.416	2661.046	2240.858	Down	SOUTH	6.178	0.059	6.178	0.059
67	2667.918	2246.556	2660.968	2240.964	2668.966	2245.240	2661.001	2240.945	Down	SOUTH	1.622	0.038	1.622	0.038
68	2667.823	2246.547	2660.942	2241.064	2667.885	2246.442	2660.954	2241.020	Down	SOUTH	0.122	0.045	0.122	0.045
69	2667.744	2246.524	2660.889	2241.156	2668.200	2245.951	2660.918	2241.138	Down	SOUTH	0.732	0.034	0.732	0.034
70	2667.644	2246.489	2660.844	2241.257	2667.705	2246.375	2660.862	2241.260	Down	SOUTH	0.129	0.018	0.129	0.018
71	2667.545	2246.451	2660.843	2241.354	2667.562	2246.493	2660.882	2241.322	UP	SOUTH	0.045	0.052	-0.045	0.052
72	2667.444	2246.419	2660.801	2241.461	2667.480	2246.414	2660.847	2241.433	Down	SOUTH	0.036	0.054	0.036	0.054
73	2667.359	2246.384	2660.801	2241.546	2667.379	2246.378	2660.822	2241.529	Down	SOUTH	0.021	0.027	0.021	0.027
74	2667.257	2246.356	2660.734	2241.630	2667.251	2246.348	2660.731	2241.596	Down	SOUTH	0.010	0.034	0.010	0.034
75	2667.166	2246.344	2660.716	2241.750	2667.176	2246.347	2660.762	2241.729	Down	SOUTH	0.010	0.051	0.010	0.051
76	2667.052	2246.303	2660.790	2241.842	2667.058	2246.304	2660.734	2241.763	Down	SOUTH	0.007	0.086	0.007	0.086
77	2666.957	2246.267	2660.671	2241.915	2666.960	2246.264	2660.676	2241.870	Down	SOUTH	0.004	0.045	0.004	0.045
78	2666.870	2246.250	2660.626	2242.016	2666.883	2246.245	2660.675	2241.987	Down	SOUTH	0.014	0.053	0.014	0.053
79	2666.793	2246.217	2660.648	2242.128	2666.769	2246.206	2660.670	2242.074	Down	NORTH	0.012	0.054	0.012	-0.054
80	2666.673	2246.191	2660.574	2242.232	2666.696	2246.154	2660.598	2242.200	Down	SOUTH	0.044	0.040	0.044	0.040
81	2666.595	2246.153	2660.530	2242.305	2666.601	2246.133	2660.566	2242.270	Down	SOUTH	0.021	0.050	0.021	0.050
82	2666.471	2246.118	2660.511	2242.407	2666.479	2246.113	2660.542	2242.384	Down	SOUTH	0.009	0.039	0.009	0.039
83	2666.411	2246.093	2660.452	2242.494	2666.404	2246.028	2660.476	2242.477	Down	SOUTH	0.065	0.029	0.065	0.029
84	2666.311	2246.067	2660.451	2242.594	2666.340	2246.023	2660.400	2242.562	Down	SOUTH	0.053	0.043	0.053	0.043
85	2666.204	2246.023	2660.415	2242.697	2666.196	2246.027	2660.450	2242.681	Down	SOUTH	0.009	0.038	0.009	0.038
86	2666.108	2245.991	2660.374	2242.786	2666.117	2245.982	2660.377	2242.766	Down	SOUTH	0.013	0.020	0.013	0.020
87	2666.007	2245.956	2660.398	2242.866	2666.027	2245.919	2660.381	2242.868	Down	NORTH	0.042	0.017	0.042	-0.017
88	2665.896	2245.955	2660.310	2242.956	2665.926	2245.934	2660.357	2242.953	Down	SOUTH	0.037	0.038	0.037	0.038
89	2665.811	2245.908	2660.302	2243.066	2665.781	2245.869	2660.330	2243.063	Down	SOUTH	0.049	0.028	0.049	0.028
90	2665.737	2245.887	2660.274	2243.160	2665.708	2245.881	2660.336	2243.157	Down	SOUTH	0.029	0.062	0.029	0.062
91	2665.642	2245.850	2660.274	2243.249	2665.647	2245.847	2660.292	2243.214	Down	SOUTH	0.006	0.032	0.006	0.032
92	2665.568	2245.803	2660.201	2243.343	2665.571	2245.817	2660.233	2243.364	Down	SOUTH	0.014	0.038	0.014	0.038
93	2665.441	2245.781	2660.183	2243.530	2665.446	2245.776	2660.200	2243.435	Down	SOUTH	0.007	0.098	0.007	0.098
94	2665.349	2245.744	2660.155	2243.542	2665.345	2245.759	2660.183	2243.527	Down	SOUTH	0.016	0.032	0.016	0.032
95	2665.261	2245.738	2660.140	2243.664	2665.251	2245.736	2660.162	2243.652	Down	SOUTH	0.010	0.025	0.010	0.025
96	2665.121	2245.702	2660.107	2243.732	2665.122	2245.696	2660.142	2243.709	Down	SOUTH	0.006	0.042	0.006	0.042
97	2665.038	2245.658	2660.068	2243.838	2665.034	2245.660	2660.101	2243.835	Down	SOUTH	0.005	0.033	0.005	0.033
98	2664.936	2245.636	2660.041	2243.909	2664.963	2245.655	2660.045	2243.912	Down	SOUTH	0.034	0.005	0.034	0.005
99	2664.850	2245.603	2660.009	2244.027	2664.801	2245.612	2660.032	2244.015	Down	SOUTH	0.050	0.026	0.050	0.026
100	2664.750	2245.576	2659.996	2244.120	2664.750	2245.612	2659.987	2244.065	Down	SOUTH	0.037	0.064	0.037	0.064
101	2664.685	2245.553	2659.968	2244.220	2664.668	2245.581	2659.555	2244.278	Down	NORTH	0.033	0.417	0.033	-0.417
102	2664.591	2245.513	2659.925	2244.323	2664.594	2245.498	2659.950	2244.213	Down	SOUTH	0.016	0.113	0.015	0.113
103	2664.490	2245.474	2659.865	2244.418	2664.466	2245.491	2659.944	2244.409	Down	SOUTH	0.022	0.060	0.022	0.060
104	2664.396	2245.457	2659.866	2244.499	2664.330	2245.567	2659.862	2244.485	UP	SOUTH	0.124	0.015	-0.124	0.015
105	2664.287	2245.436	2659.824	2244.586	2664.328	2245.419	2659.855	2244.568	Down	SOUTH	0.045	0.036	0.045	0.036
106	2664.194	2245.394	2659.799	2244.692	2664.137	2245.373	2659.831	2244.675	Down	SOUTH	0.061	0.036	0.061	0.036
107	2664.112	2245.354	2659.781	2244.783	2664.101	2245.342	2659.798	2244.787	Down	SOUTH	0.016	0.017	0.016	0.017
108	2664.020	2245.329	2659.753	2244.885	2664.002	2245.310	2659.758	2244.896	Down	SOUTH	0.026	0.006	0.026	0.006
109	2663.932	2245.298	2659.720	2244.971	2663.883	2245.274	2659.736	2244.964	Down	SOUTH	0.056	0.017	0.056	0.017
110	2663.815	2245.278	2659.685	2245.067	2663.864	2245.255	2659.716	2245.061	Down	SOUTH	0.054	0.034	0.054	0.034
111	2663.741	2245.239	2659.650	2245.179	2663.749	2245.237	2659.679	2245.149	Down	SOUTH	0.008	0.042	0.008	0.042
112	2663.644	2245.227	2659.616	2245.254	2663.642	2245.234	2659.656	2245.254	Down	SOUTH	0.007	0.040	0.007	0.040
113	2663.546	2245.181	2659.606	2245.363	2663.524	2245.197	2659.622	2245.361	Down	SOUTH	0.023	0.020	0.023	0.020
114	2663.450	2245.162	2659.570	2245.463	2663.465	2245.159	2659.584	2245.445	Down	SOUTH	0.015	0.023	0.015	0.023
115	2663.350	2245.141	2659.552	2245.550	2663.304	2245.155	2659.560	2245.500	Down	SOUTH	0.046	0.053	0.046	0.053
116	2663.248	2245.102	2659.514	2245.651	2663.230	2245.118	2659.527	2245.640	Down	SOUTH	0.025	0.013	0.025	0.013
117	2663.120	2245.065	2659.498	2245.742	2663.174	2245.090	2659.511	2245.745	Down	SOUTH	0.054	0.023	0.054	0.023
118	2663.035	2245.042	2659.445	2245.846	2663.063	2245.004	2659.479	2245.825	Down	SOUTH	0.047	0.040	0.047	0.040
119	2662.920	2245.009	2659.430	2245.941	2662.896	2245.007	2659.449	2245.956	Down	SOUTH	0.076	0.024	0.076	0.024
120	2662.827	2244.986	2659.389	2246.039	2662.870	2244.900	2659.416	2246.015	Down	SOUTH	0.089	0.036	0.089	0.036
121	2662.750	2244.971	2659.345	2246.132	2662.806	2245.007	2659.363	2246.100	UP	SOUTH	0.067	0.037	-0.067	0.037
122	2662.662	2244.939	2659.336	2246.221	2662.633	2244.956	2659.346	2246.219	UP	SOUTH	0.035	0.010	-0.035	0.010
123	2662.571	2244.903	2659.303	2246.330	2662.603	2244.882	2659.325	2246.337	Down	SOUTH	0.038	0.023	0.038	0.023
124	2662.479	2244.877	2659.283	2246.416	2662.465	2244.866	2659.310	2246.398	Down	SOUTH	0.018	0.032	0.018	0.032
125	2662.388	2244.814	2659.244	2246.511	2662.395	2244.831	2659.262	2246.512	Down	SOUTH	0.018	0.018	0.018	0.018
126	2662.290	2244.802	2659.229	2246.606	2662.246	2244.750	2659.240	2246.593	Down	SOUTH	0.068	0.018	0.068	0.018
127	2662.182	2244.789	2659.184	2246.700	2662.201	2244.779	2659.209	2246.690	Down	SOUTH	0.021	0.032	0.021	0.032
128	2662.087	2244.749	2659.160	2246.810	2662.118	2244.822	2659.171	2246.788	UP	SOUTH	0.080	0.025	-0.080	0.025
129	2661.987	2244.712	2659.126	2246.909	2662.040	2244.681	2659.160	2246.900	Down	SOUTH	0.053	0.035	0.053	0.035
130	2661.901	2244.687	2659.109	2246.991	2661.992	2244.649	2659.126	2246.932	Down	SOUTH	0.103	0.062	0.103	0.062
131	2661.823	2244.650	2659.080	2247.085	2661.885	2244.617	2659.133	2247.061	Down	SOUTH	0.079	0.063	0.079	0.063
132	2661.722	2244.638	2659.038	2247.167	2661.760	2244.600	2659.085	2247.165	Down	SOUTH	0.054	0.047	0.054	0.047
133	2661.614	2244.595	2659.020	2247.262	2661.636	2244.586	2659.040	2247.250	Down	SOUTH	0.024	0.021	0.024	0.021
134	2661.516	2244.594	2658.976	2247.373	2661.541	2244.548	2659.019	2247.365	Down	SOUTH	0.052	0.043	0.052	0.043
135	2661.417	2244.554	2658.956	2247.459	2661.450	2244.514	2658.995	2247.453	Down	SOUTH	0.052	0.039	0.052	0.039
136	2661.318	2244.529	2658.926	2247.566	2661.371	2244.497	2658.983	2247.540	Down	SOUTH	0.061	0.063	0.061	0.063
137	2661.223	2244.501	2658.894	2247.659	2661.251	2244.453	2658.899	2247.641	Down	SOUTH	0.056	0.005	0.056	0.005
138	2661.123	2244.478	2658.976	2247.743	2661.430	2244.417	2658.882	2247.710	Down	NORTH	0.313	0.087	0.313	-0.087
139	2661.034	2244.440	2658.956	2247.846	2661.029	2244.381	2658.857	2247.870	Down	NORTH	0.059	0.102	0.059	-0.102
140	2660.935	2244.416	2658.926	2247.944	2660.957	2244.350	2658.831	2247.985	Down	NORTH	0.070	0.103	0.070	-0.103
141	2660.851	2244.384	2658.894	2248.042	2660.869	2244.340	2658.797	2248.059	Down	NORTH	0.048	0.098	0.048	-0.098
142	2660.747	2244.358	2658.876	2248.144	2660.749	2244.313	2658.792	2248.153	Down	NORTH	0.045	0.084	0.045	-0.084
143	2660.664	2244.314	2658.838	2248.229	2660.676	2244.274	2658.742	2248.230	Down	NORTH	0.042	0.096	0.042	-0.096
144	2660.564	2244.300	2658.811	2248.327	2660.596	2244.262	2658.740	2248.358	Down	NORTH	0.050	0.071	0.050	-0.071
145	2660.462	2244.270	2658.779	2248.425	2660.476	2244.207	2658.699	2248.408	Down	NORTH	0.065	0.083	0.065	-0.083
146	2660.362	2244.240	2658.751	2248.522	2660.417	2244.178	2658.656	2248.518	Down	NORTH	0.083	0.095	0.083	-0.095
147	2660.269	2244.212	2658.725	2248.613	2660.278	2244.171	2658.661	2248.580	Down	NORTH	0.042	0.072	0.042	-0.072
148	2660.018	2244.180	2658.687	2248.707	2660.225	2244.152	2658.566	2248.726	UP	NORTH	0.209	0.122	-0.209	-0.122
149	2660.076	2244.143	2658.644	2248.799	2660.106	2244.099	2658.560	2248.814	Down	NORTH	0.053	0.085	0.053	-0.085
150	2659.979	2244.091	2658.612	2248.873	2659.976	2244.105	2658.556	2248.927	Down	NORTH	0.014	0.078	0.014	-0.078
151	2659.894	2244.076	2658.588	2249.000	2659.894	2244.076	2658.543	2248.963	Down	NORTH	0.000	0.058	0.000	-0.058
152	2659.796	2244.055	2658.560	2249.081	2659.791	2244.051	2658.476	2249.100	Down	NORTH	0.006	0.086	0.006	-0.086
153	2659.704	2244.036	2658.563	2249.186	2659.702	2244.058	2658.474	2249.050	UP	NORTH	0.023	0.163	-0.023	-0.163
154	2659.602	2243.985	2658.520	2249.927	2659.595	2243.986	2658.499	2249.282	Down	NORTH	0.007	0.645	0.007	-0.645
155	2659.511	2243.953	2658.503	2249.375	2659.517	2243.967	2658.418	2249.398	Down	NORTH	0.015	0.088	0.015	-0.088
156	2659.421	2243.911	2658.483	2249.465	2659.435	2243.934	2658.399	2249.487	Down	NORTH	0.027	0.084	0.027	-0.084
157	2659.324	2243.901	2658.441	2249.560	2659.332	2243.915	2658.336	2249.560	UP	NORTH	0.016	0.105	-0.016	-0.105
158	2659.220	2243.860	2658.400	2249.674	2659.226	2243.874	2658.316	2249.724	Down	NORTH	0.015	0.106	0.015	-0.106
159	2659.121	2243.859	2658.368	2249.773	2659.133	2243.874	2658.291	2249.840	UP	NORTH	0.019	0.102	-0.019	-0.102
160	2659.028	2243.805	2658.336	2249.867	2659.032	2243.806	2658.209	2250.001	Down	NORTH	0.004	0.165	0.004	-0.165
161	2658.930	2243.798	2658.322	2249.966	2658.934	2243.798	2658.200	2250.054	UP	NORTH	0.011	0.150	-0.011	-0.150
162	2658.843	2243.762	2658.294	2250.056	2658.849	2243.753	2658.140	2250.132	Down	NORTH	0.010	0.172	0.010	-0.172
163	2658.741	2243.736	2658.251	2250.150	2658.744	2243.728	2658.096	2250.254	UP	NORTH	0.009	0.187	-0.009	-0.187
164	2658.643	2243.705	2658.223	2250.231	2658.664	2243.684	2658.101	2250.341	Down	NORTH	0.030	0.164	0.030	-0.164
165	2658.541	2243.673	2658.194	2250.333	2658.559	2243.667	2658.073	2250.446	UP	NORTH	0.018	0.167	-0.018	-0.167
166	2658.455	2243.645	2658.180	2250.447	2658.458	2243.630	2658.015	2250.562	Down	NORTH	0.015	0.201	0.015	-0.201
167	2658.351	2243.605	2658.046	2250.534	2658.363	2243.593	2658.003	2250.629	Down	NORTH	0.017	0.104	0.017	-0.104
168	2658.259	2243.565	2658.001	2250.624	2658.273	2243.602	2658.182	2249.847	UP	SOUTH	0.022	0.800	-0.022	0.800
169	2658.175	2243.548	2657.967	2250.729	2658.168	2243.529	2657.987	2250.710	Down	SOUTH	0.020	0.027	0.020	0.027
170	2658.067	2243.516	2657.848	2250.816	2658.048	2243.545	2657.973	2250.820	UP	SOUTH	0.029	0.125	-0.029	0.125

171	2657.978	2243.546	2657.925	2250.918
172	2657.506	2243.491	2657.894	2251.005
173	2657.784	2243.448	2657.861	2251.108
174	2657.695	2243.423	2657.812	2251.197
175	2657.617	2243.398	2657.777	2251.301
176	2657.596	2243.371	2657.748	2251.402
177	2657.385	2243.335	2657.736	2251.487
178	2657.299	2243.762	2657.692	2251.547
179	2657.181	2243.255	2657.677	2251.692
180	2657.112	2243.230	2657.659	2251.768
181	2657.041	2243.214	2657.606	2251.873
182	2656.936	2243.187	2657.578	2251.961
183	2656.852	2243.179	2657.564	2252.066
184	2656.741	2243.141	2657.531	2252.163
185	2656.627	2243.106	2657.495	2252.271
186	2656.546	2243.060	2657.448	2252.347
187	2656.448	2243.650	2657.428	2252.481
188	2656.341	2243.002	2657.383	2252.530
189	2656.253	2242.973	2657.360	2252.645
190	2656.145	2242.948	2657.334	2252.723
191	2656.071	2242.933	2657.304	2252.830
192	2655.973	2242.903	2657.279	2252.924
193	2655.878	2242.875	2657.259	2253.007
194	2655.775	2242.834	2657.229	2253.111
195	2655.659	2242.819	2657.183	2253.214
196	2655.376	2242.787	2657.164	2253.311
197	2655.476	2242.751	2657.126	2253.126
198	2655.375	2242.725	2657.104	2253.104
199	2655.267	2242.703	2657.038	2253.038
200	2655.168	2242.685	2657.032	2253.032

2657.907	2243.534	2657.932	2250.871	
2657.826	2243.483	2657.891	2251.001	
2657.805	2243.310	2657.891	2251.075	
2657.694	2243.424	2657.818	2251.217	
2657.663	2243.385	2657.784	2251.295	
2657.598	2243.365	2657.758	2251.464	
2657.449	2243.353	2657.724	2251.478	
2657.321	2243.294	2657.706	2251.588	
2657.236	2243.277	2657.711	2251.736	
2657.184	2243.212	2657.654	2251.764	
2657.047	2243.209	2657.589	2251.784	
2656.844	2243.186	2657.656	2251.960	
2656.860	2243.172	2657.563	2252.050	
2656.734	2243.161	2657.531	2252.137	
2656.652	2243.113	2657.505	2252.279	
2656.567	2243.058	2657.469	2252.346	
2656.455	2243.055	2657.448	2252.429	
2656.328	2243.003	2657.427	2252.337	
2656.263	2242.960	2657.399	2252.639	
2656.141	2242.932	2657.368	2252.731	
2656.065	2242.844	2657.309	2252.893	
2655.899	2242.854	2657.329	2252.932	
2655.351	2242.365	2657.321	2252.848	
2655.776	2242.836	2657.243	2253.095	
2655.691	2242.784	2657.198	2253.253	
2655.563	2242.784	2657.176	2253.396	
2655.456	2242.734	2657.156	2253.466	
2655.364	2242.731	2657.104	2253.104	
2655.279	2242.687	2657.038	2253.038	
2655.152	2242.656	2657.090	2253.578	

UP	SOUTH			
UP	NORTH			
Down	SOUTH			
UP	SOUTH			
UP	SOUTH			
UP	SOUTH			
UP	SOUTH			
UP	SOUTH			
UP	NORTH			
Down	NORTH			
UP	SOUTH			
UP	SOUTH			
UP	SOUTH			
UP	SOUTH			
UP	SOUTH			
UP	SOUTH			
UP	SOUTH			
UP	SOUTH			
Down	SOUTH			
Down	SOUTH			
UP	SOUTH			
UP	SOUTH			
UP	SOUTH			
UP	SOUTH			
UP	SOUTH			
UP	SOUTH			
UP	SOUTH			
UP	SOUTH			

UP	73	88	NORTH
DOWN	127	148	SOUTH

This is number of switches between different lanes

0.073	0.049	-0.073	0.049
0.314	0.005	-0.314	-0.005
0.137	0.045	0.137	0.045
0.001	0.021	-0.001	0.021
0.019	0.018	-0.018	0.018
0.011	0.010	-0.011	0.010
0.058	0.015	-0.058	0.015
0.031	0.014	-0.031	0.014
0.054	0.009	-0.054	-0.009
0.020	0.017	0.020	-0.017
0.009	0.001	-0.009	0.001
0.011	0.009	-0.011	0.009
0.008	0.010	-0.008	0.010
0.021	0.026	-0.021	0.026
0.026	0.026	-0.026	0.026
0.021	0.021	-0.021	0.021
0.007	0.065	-0.007	0.065
0.013	0.267	-0.013	0.267
0.016	0.038	-0.016	0.038
0.005	0.035	-0.005	0.035
0.013	0.063	-0.013	0.063
0.075	0.042	0.075	0.042
0.714	0.073	0.714	0.073
0.002	0.044	-0.002	0.044
0.031	0.038	-0.031	0.038
0.187	0.025	-0.187	0.025
0.026	0.341	-0.026	0.341
0.011	0.000	-0.011	0.000
0.029	0.000	-0.029	0.000
0.034	0.348	-0.034	0.348
11.536	0.000	11.536	0.000
-	-	(0.314)	(0.049)
0.371	0.000	0.348	0.014
0.388	0.000	3.388	0.112
0.029	0.047	0.016	0.033

LINE PARALLEL TO CONTOUR	LINE ORIENTED DOWNGRADIENT	LINE PARALLEL TO CONTOUR	LINE ORIENTED DOWNGRADIENT
GROSS movement	GROSS movement	NET movement	NET movement
74.114			

[illegible]	158	1 SIGMA	0.015 m
than uncertainty of movement	87	2 SIGMA	0.030 m
ASSUMING	0.015	mm UNCERTAINTY	

THIS IS THE SENSITIVITY TEST FOR HOW MANY POINTS REALLY MOVED

Caculations for Pebble data Goldstone

These calculations compares movement from orginal positions. The pebbles are seperated into Line countour parallel and Line oriented down gradient pebbles.

The countour parallel line pebbles move up and down and the line oriented down gradient pebbles move north and south.

The calculations include gross movement and net movement. Gross movement does not take into account that some pebbles move up from the line and some move down from the line.

The maximum, minimum, average, standard deviation and median of gross and net pebble movment is shown at the bottom of the spread sheet. A sensativity test is also included to determine how many pebbles are actually moving.

Gross movement accounts for all movement not just movement in downslope direction
Should we also figure out the down slope movement?

LINE PARALLEL TO CONTOUR NORTHING = -4.13305930X(EASTING) + 41448.353475901

LINE ORIENTED DOWN GRADIENT NORTHING = 0.24740846X(EASTING) + 1125.893581063

	May--00		Mar--01									
	LINE PARALLEL TO CONTOUR	LINE ORIENTED DOWNGRADIENT	LINE PARALLEL TO CONTOUR	LINE ORIENTED DOWNGRADIENT	LINE PARALLEL TO CONTOUR	LINE ORIENTED DOWNGRADIENT	LINE PARALLEL TO CONTOUR	LINE ORIENTED DOWNGRADIENT	LINE PARALLEL TO CONTOUR	LINE ORIENTED DOWNGRADIENT
	e n	e n	e n	e n	UP vs DOWN MOVEMENT	NORTH vs SOUTH MOVEMENT	GROSS movement	GROSS movement	NET movement	NET movement
1	7134.292 5492.648	7145.982 5500.116	7134.265 5492.597	7145.985 5500.116	UP	NORTH	0.058	0.003	-0.058	-0.003
2	7134.307 5492.746	7145.845 5500.119	7134.279 5492.718	7145.835 5500.154	UP	NORTH	0.040	0.036	-0.040	-0.036
3	7134.333 5492.827	7145.726 5500.146	7134.314 5492.778	7145.733 5500.134	Down	NORTH	0.053	0.012	0.053	-0.012
4	7134.343 5492.909	7145.663 5500.163	7134.342 5492.878	7145.659 5500.17	UP	NORTH	0.031	0.008	-0.031	-0.008
5	7134.346 5493.026	7145.542 5500.198	7134.35 5492.993	7145.557 5500.204	UP	NORTH	0.033	0.017	-0.033	-0.017
6	7134.367 5493.131	7145.428 5500.197	7134.397 5493.065	7145.434 5500.202	Down	SOUTH	0.046	0.008	0.046	0.006
7	7134.420 5493.213	7145.340 5500.239	7134.41 5493.21	7145.353 5500.239	UP	NORTH	0.010	0.013	-0.010	-0.013
8	7134.417 5493.324	7145.224 5500.232	7134.415 5493.283	7145.187 5500.253	Down	NORTH	0.041	0.043	0.041	-0.043
9	7134.445 5493.434	7145.146 5500.291	7134.436 5493.373	7145.144 5500.311	UP	NORTH	0.062	0.020	-0.062	-0.020
10	7134.474 5493.523	7145.045 5500.267	7134.465 5493.463	7145.046 5500.27	Down	NORTH	0.041	0.003	0.041	-0.003
11	7134.482 5493.619	7144.959 5500.293	7134.482 5493.562	7144.961 5500.308	Down	NORTH	0.027	0.016	0.027	-0.016
12	7134.503 5493.695	7144.883 5500.341	7134.516 5493.676	7144.874 5500.33	Down	NORTH	0.023	0.014	0.023	-0.014
13	7134.510 5493.823	7144.751 5500.333	7134.501 5493.767	7144.762 5500.335	Down	NORTH	0.057	0.002	0.057	-0.002
14	7134.535 5493.919	7144.652 5500.377	7134.522 5493.887	7144.652 5500.375	Down	NORTH	0.035	0.002	0.035	-0.002
15	7134.560 5494.025	7144.541 5500.394	7134.606 5493.905	7144.56 5500.385	Down	NORTH	0.128	0.021	0.128	-0.021
16	7134.577 5494.112	7144.454 5500.412	7134.587 5494.096	7144.466 5500.409	Down	NORTH	0.019	0.012	0.019	-0.012
17	7134.594 5494.211	7144.345 5500.428	7134.598 5494.175	7144.35 5500.423	Down	NORTH	0.036	0.007	0.036	-0.007
18	7134.626 5494.307	7144.253 5500.467	7134.626 5494.307	7144.293 5500.435	Down	NORTH	0.000	0.051	0.000	-0.051
19	7134.631 5494.395	7144.115 5500.456	7134.633 5494.359	7144.127 5500.464	Down	NORTH	0.036	0.014	0.036	-0.014
20	7134.647 5494.501	7144.046 5500.482	7134.553 5494.295	7144.066 5500.476	Down	SOUTH	0.226	0.021	0.226	0.021
21	7134.662 5494.601	7143.953 5500.512	7134.701 5494.525	7143.963 5500.513	Down	NORTH	0.078	0.010	0.078	-0.010
22	7134.702 5494.700	7143.871 5500.531	7134.7 5494.683	7143.886 5500.517	Down	NORTH	0.017	0.015	0.017	-0.015
23	7134.719 5494.810	7143.772 5500.545	7134.721 5494.765	7143.784 5500.549	Down	NORTH	0.045	0.013	0.045	-0.013
24	7134.730 5494.901	7143.680 5500.595	7134.736 5494.864	7143.691 5500.575	Down	NORTH	0.037	0.023	0.037	-0.023
25	7134.753 5494.994	7143.584 5500.612	7134.726 5494.934	7143.578 5500.591	Down	NORTH	0.040	0.024	0.040	-0.024
26	7134.784 5495.110	7143.455 5500.615	7134.795 5495.067	7143.471 5500.626	Down	NORTH	0.025	0.019	0.025	-0.019
27	7134.793 5495.175	7143.363 5500.630	7134.789 5495.135	7143.413 5500.624	Down	NORTH	0.040	0.050	0.040	-0.050
28	7134.833 5495.301	7143.271 5500.656	7134.833 5495.232	7143.265 5500.667	Down	SOUTH	0.069	0.013	0.069	0.013
29	7134.839 5495.374	7143.180 5500.666	7134.824 5495.323	7143.201 5500.598	Down	NORTH	0.053	0.073	0.053	-0.073
30	7134.853 5495.459	7143.085 5500.709	7134.847 5495.431	7143.083 5500.719	Down	NORTH	0.032	0.010	0.032	-0.010
31	7134.862 5495.550	7142.978 5500.719	7134.853 5495.513	7143.017 5500.71	Down	NORTH	0.047	0.040	0.047	-0.040
32	7134.890 5495.646	7142.902 5500.734	7134.913 5495.656	7143.01 5500.655	Down	NORTH	0.025	0.134	0.025	-0.134
33	7134.916 5495.730	7142.780 5500.755	7134.932 5495.704	7142.764 5500.772	Down	NORTH	0.031	0.023	0.031	-0.023
34	7134.912 5495.882	7142.676 5500.772	7134.9 5495.822	7142.666 5500.762	Down	NORTH	0.042	0.015	0.042	-0.015
35	7134.874 5495.951	7142.588 5500.800	7134.874 5495.951	7142.588 5500.800	Down	NORTH	0.000	0.000	0.000	0.000
36	7134.958 5496.046	7142.487 5500.827	7134.993 5496.005	7142.637 5500.678	Down	NORTH	0.055	0.211	0.055	-0.211
37	7134.958 5496.106	7142.391 5500.884	7134.993 5496.1	7142.391 5500.843	Down	NORTH	0.075	0.041	0.075	-0.041
38	7134.976 5496.246	7142.303 5500.895	7134.989 5496.231	7142.308 5500.79	Down	NORTH	0.020	0.075	0.020	-0.075
39	7135.003 5496.353	7142.203 5500.889	7135.016 5496.364	7142.184 5500.886	Down	NORTH	0.017	0.019	0.017	-0.019
40	7134.977 5496.414	7142.041 5500.944	7135.013 5496.394	7142.012 5500.926	Down	NORTH	0.041	0.034	0.041	-0.034
41	7135.016 5496.561	7141.986 5500.883	7135.058 5496.530	7141.988 5500.892	Down	NORTH	0.047	0.009	0.047	-0.009
42	7134.962 5496.640	7141.906 5500.945	7134.977 5496.597	7141.922 5500.923	Down	NORTH	0.043	0.027	0.043	-0.027
43	7135.035 5496.751	7141.801 5500.862	7135.113 5496.771	7141.813 5500.943	Down	NORTH	0.081	0.015	0.081	-0.015
44	7135.069 5496.896	7141.715 5500.988	7134.845 5496.883	7141.722 5500.957	Down	NORTH	0.224	0.032	0.224	-0.032
45	7134.875 5496.922	7141.617 5501.015	7135.078 5496.87	7141.631 5501.004	Down	NORTH	0.210	0.018	0.210	-0.018
46	7135.122 5497.066	7141.524 5501.040	7135.128 5496.948	7141.581 5500.945	Down	NORTH	0.116	0.111	0.116	-0.111
47	7135.135 5497.140	7141.384 5501.094	7135.164 5497.087	7141.388 5501.089	Down	NORTH	0.065	0.008	0.065	-0.006
48	7135.145 5497.236	7141.349 5501.081	7135.104 5496.78	7141.331 5501.063	Down	NORTH	0.456	0.033	0.456	-0.033
49	7135.151 5497.332	7141.227 5501.116	7135.089 5497.356	7141.226 5501.119	Down	NORTH	0.066	0.003	0.066	-0.003
50	7135.161 5497.446	7141.123 5501.152	7135.164 5497.397	7141.14 5501.146	Down	NORTH	0.049	0.018	0.049	-0.018
51	7135.198 5497.534	7141.048 5501.148	7135.246 5497.496	7141.129 5501.051	Down	NORTH	0.061	0.126	0.061	-0.126
52	7135.201 5497.633	7140.936 5501.166	7135.212 5497.573	7141.019 5501.076	Down	NORTH	0.061	0.123	0.061	-0.123
53	7135.220 5497.706	7140.836 5501.177	7135.239 5497.636	7140.851 5501.089	Down	NORTH	0.073	0.069	0.073	-0.069
54	7135.230 5497.826	7140.755 5501.189	7135.239 5497.802	7140.781 5501.143	Down	NORTH	0.026	0.053	0.026	-0.053
55	7135.239 5497.911	7140.661 5501.226	7135.254 5497.904	7140.665 5501.234	Down	NORTH	0.017	0.009	0.017	-0.009
56	7135.238 5498.033	7140.518 5501.244	7135.264 5497.993	7140.505 5501.242	Down	NORTH	0.046	0.013	0.046	-0.013
57	7135.276 5498.091	7140.469 5501.267	7135.393 5498.036	7140.448 5501.282	Down	NORTH	0.129	0.025	0.129	-0.025
58	7135.312 5498.233	7140.352 5501.290	7135.379 5498.186	7140.337 5501.3	Down	NORTH	0.082	0.018	0.082	-0.018
59	7135.380 5498.281	7140.279 5501.333	7135.405 5498.259	7140.266 5501.304	Down	NORTH	0.033	0.031	0.033	-0.031
60	7135.377 5498.417	7140.149 5501.331	7135.401 5498.4	7140.171 5501.211	Down	NORTH	0.029	0.122	0.029	-0.122
61	7135.397 5498.514	7140.046 5501.366	7135.415 5498.484	7140.054 5501.252	Down	NORTH	0.035	0.116	0.035	-0.116
62	7135.423 5498.594	7139.978 5501.377	7135.406 5498.545	7139.973 5501.383	Down	NORTH	0.058	0.008	0.058	-0.008
63	7135.427 5498.695	7139.878 5501.398	7135.426 5498.64	7139.837 5501.387	Down	NORTH	0.055	0.042	0.055	-0.042
64	7135.441 5498.814	7139.726 5501.432	7135.416 5498.74	7139.729 5501.421	Down	NORTH	0.077	0.011	0.077	-0.011
65	7135.506 5498.850	7139.680 5501.468	7135.492 5498.842	7139.647 5501.426	Down	NORTH	0.016	0.053	0.016	-0.053
66	7135.513 5498.957	7139.582 5501.467	7135.526 5498.928	7139.541 5501.459	Down	NORTH	0.057	0.022	0.057	-0.022
67	7135.540 5499.079	7139.467 5501.597	7135.528 5499.051	7139.439 5501.481	Down	NORTH	0.030	0.126	0.030	-0.126
68	7135.561 5499.193	7139.426 5501.542	7135.548 5499.174	7139.426 5501.542	Down	NORTH	0.023	0.000	0.023	0.000
69	7135.583 5499.281	7139.286 5501.544	7135.56 5499.258	7139.292 5501.532	Down	NORTH	0.033	0.027	0.033	-0.027
70	7135.611 5499.370	7139.173 5501.585	7135.596 5499.292	7139.173 5501.585	Down	NORTH	0.076	0.000	0.079	0.000
71	7135.599 5499.482	7139.066 5501.593	7135.672 5499.456	7139.122 5501.559	Down	SOUTH	0.036	0.048	0.036	0.048
72	7135.636 5499.583	7138.967 5501.602	7135.648 5499.545	7138.978 5501.425	Down	NORTH	0.039	0.177	0.039	-0.177
73	7135.736 5499.656	7138.878 5501.645	7135.707 5499.64	7138.908 5501.62	Down	SOUTH	0.033	0.039	0.033	0.039
74	7135.667 5499.810	7138.754 5501.650	7135.674 5499.772	7138.796 5501.616	Down	NORTH	0.039	0.054	0.039	-0.054
75	7135.702 5499.893	7138.669 5501.671	7135.666 5499.846	7138.71 5501.669	Down	NORTH	0.040	0.021	0.040	-0.021
76	7135.717 5499.956	7138.575 5501.705	7135.733 5499.897	7138.574 5501.703	Down	NORTH	0.061	0.002	0.061	-0.002
77	7135.717 5500.062	7138.477 5501.745	7135.746 5500.005	7138.507 5501.731	Down	NORTH	0.064	0.033	0.064	-0.033
78	7135.770 5500.154	7138.436 5501.727	7135.775 5500.117	7138.44 5501.667	Down	NORTH	0.037	0.060	0.037	-0.060
79	7135.774 5500.268	7138.274 5501.755	7135.789 5500.263	7138.28 5501.746	Down	NORTH	0.016	0.017	0.016	-0.017
80	7135.667 5499.810	7138.197 5501.787	7135.842 5499.786	7138.178 5501.788	Down	NORTH	0.035	0.021	0.035	-0.021
81	7135.817 5500.446	7138.114 5501.808	7135.864 5500.373	7138.05 5501.797	Down	NORTH	0.067	0.055	0.067	-0.055
82	7135.837 5500.518	7138.007 5501.820	7135.806 5500.463	7138.012 5501.824	Down	NORTH	0.063	0.006	0.063	-0.006
83	7135.845 5500.623	7137.920 5501.867	7135.85 5500.541	7137.907 5501.85	Down	NORTH	0.082	0.021	0.082	-0.021
84	7135.872 5500.714	7137.819 5501.873	7135.856 5500.672	7137.814 5501.871	Down	NORTH	0.045	0.004	0.045	-0.004
85	7135.893 5500.856	7137.728 5501.871	7135.926 5500.799	7137.738 5501.859	Down	NORTH	0.066	0.016	0.066	-0.016
86	7135.935 5500.933	7137.615 5501.935	7135.953 5500.879	7137.617 5501.926	Down	NORTH	0.057	0.009	0.057	-0.009
87	7135.944 5501.029	7137.515 5501.932	7135.959 5500.982	7137.508 5501.926	Down	NORTH	0.049	0.009	0.049	-0.009
88	7135.975 5501.151	7137.414 5501.960	7135.998 5501.128	7137.397 5501.852	Down	NORTH	0.024	0.109	0.024	-0.109
89	7136.008 5501.249	7137.298 5501.993	7136.037 5501.211	7137.308 5501.912	Down	NORTH	0.048	0.081	0.048	-0.081
90	7136.002 5501.334	7137.192 5502.025	7136.007 5501.31	7137.211 5501.946	Down	NORTH	0.025	0.081	0.025	-0.081
91	7136.032 5501.424	7137.138 5502.017	7136.146 5501.4	7137.127 5502.013	Down	NORTH	0.116	0.012	0.116	-0.012
92	7136.062 5501.534	7137.029 5502.041	7136.048 5501.517	7137.002 5502.02	Down	NORTH	0.022	0.034	0.022	-0.034
93	7136.091 5501.635	7136.958 5502.066	7136.099 5501.556	7136.936 5502.039	Down	NORTH	0.086	0.036	0.086	-0.036
94	7136.128 5501.704	7136.878 5502.088	7136.12 5501.668	7136.819 5502.026	Down	NORTH	0.037	0.084	0.037	-0.084
95	7136.130 5501.746	7136.788 5502.093	7136.11 5501.725	7136.776 5502.088	Down	NORTH	0.029	0.013	0.029	-0.013
96	7136.163 5501.805	7136.648 5502.101	7136.168 5501.858	7136.637 5502.081	Down	NORTH	0.042	0.023	0.042	-0.023
97	7136.161 5502.019	7136.536 5502.153	7136.197 5501.913	7136.548 5502.159	Down	NORTH	0.112	0.012	0.112	-0.012
98	7136.182 5502.099	7136.461 5502.164	7136.194 5502.064	7136.464 5502.171	Down	NORTH	0.037	0.008	0.037	-0.008
99	7136.186 5502.238	7136.365 5502.182	7136.196 5502.178	7136.352 5502.207	Down	NORTH	0.061	0.028	0.061	-0.028
100	7136.220 5502.296	7136.253 5502.227	7136.223 5502.275	7136.284 5502.216	Down	NORTH	0.021	0.016	0.021	-0.016
101	7136.215 5502.402	7136.169 5502.245	7136.219 5502.368	7136.178 5502.232	Down	NORTH	0.034	0.016	0.034	-0.016
102	7136.244 5502.487	7136.059 5502.250	7136.309 5502.423	7136.07 5502.21	Down	NORTH	0.091	0.041	0.091	-0.041
103	7136.278 5502.620	7135.973 5502.291	7136.269 5502.528	7135.983 5502.294	Down	NORTH	0.092	0.010	0.092	-0.010
104	7136.277 5502.685	7135.865 5502.308	7136.285 5502.664	7135.844 5502.339	UP	NORTH	0.022	0.037	-0.022	-0.037
105	7136.306 5502.799	7135.756 5502.346	7136.304 5502.77	7135.737 5502.342	Down	NORTH	0.029	0.022	0.029	-0.022
106	7136.320 5502.906	7135.649 5502.376	7136.351 5502.824	7135.651 5502.382	UP	NORTH	0.088	0.006	-0.088	-0.006
107	7136.361 5503.016	7135.561 5502.403	7136.431 5502.93	7135.564 5502.398	UP	NORTH	0.119	0.006	0.119	-0.006
108	7136.350 5503.095	7135.458 5502.428	7136.364 5503.051	7135.457 5502.436	UP	NORTH	0.048	0.008	-0.048	-0.008
109	7136.400 5503.204	7135.362 5502.451	7136.404 5503.13	7135.365 5502.45	UP	NORTH	0.053	0.003	-0.053	-0.003
110	7136.419 5503.294	7135.269 5502.443	7136.422 5503.284	7135.256 5502.449	Down	NORTH	0.010	0.034	0.010	-0.034
111	7136.412 5503.355	7135.172 5502.498	7136.415 5503.325	7135.182 5502.475	Down	NORTH	0.030	0.025	0.030	-0.025
112	7136.345 5503.451	7135.091 5502.501	7136.528 5503.287	7135.101 5502.482	Down	NORTH	0.246	0.021	0.246	-0.021
113	7136.479 5503.568	7134.980 5502.532	7136.45 5503.519	7134.998 5502.536	UP	NORTH	0.057	0.018	-0.057	-0.018
114	7136.477 5503.655	7134.981 5502.495	7136.48 5503.64	7134.983 5502.481	Down	NORTH	0.015	0.014	0.015	-0.014
115	7136.495 5503.766	7134.764 5502.551	7136.512 5503.74	7134.776 5502.558	Down	NORTH	0.031	0.013	0.031	-0.013
116	7136.505 5503.881	7134.695 5502.573	7136.502 5503.843	7134.699 5502.574	Down	NORTH	0.038	0.001	0.038	-0.001
117	7136.517 5503.961	7134.608 5502.599	7136.521 5503.94	7134.578 5502.568	Down	NORTH	0.021	0.043	0.021	-0.043
118	7136.551 5504.079	7134.324 5502.411	7136.531 5504.034	7134.307 5502.353	Down	NORTH	0.049	0.060	0.049	-0.060
119	7136.550 5504.260	7134.503 5502.550	7136.551 5504.229	7134.5 5502.557	Down	NORTH	0.031	0.008	0.031	-0.008
120	7136.593 5504.261	7134.281 5502.626	7136.59 5504.253	7134.273 5502.666	Down	NORTH	0.009	0.043	0.009	-0.043
121	7136.583 5504.354	7134.203 5502.721	7136.586 5504.343	7134.19 5502.71	UP	NORTH	0.011	0.017	-0.011	-0.017
122	7136.639 5504.471	7134.089 5502.729	7136.636 5504.457	7134.09 5502.715	Down	NORTH	0.014	0.017	0.014	-0.017
123	7136.660 5504.558	7134.000 5502.773	7136.664 5504.539	7134.019 5502.757	UP	NORTH	0.019	0.019	-0.019	-0.019
124	7136.699 5504.674	7133.925 5502.804	7136.696 5504.662	7133.936 5502.79	UP	NORTH	0.012	0.018	-0.012	-0.018
125	7136.687 5504.755	7133.812 5502.823	7136.693 5504.727	7133.81 5502.830	UP	NORTH	0.029	0.016	-0.029	-0.016
126	7136.726 5504.854	7133.719 5502.839	7136.715 5504.845	7133.708 5502.822	UP	NORTH	0.014	0.020	-0.014	-0.020
127	7136.737 5504.952	7133.632 5502.866	7136.744 5504.926	7133.634 5502.836	UP	NORTH	0.027	0.030	-0.027	-0.030
128	7136.757 5505.033	7133.509 5502.900	7136.749 5505.031	7133.515 5502.892	UP	NORTH	0.008	0.010	-0.008	-0.010
129	7136.779 5505.115	7133.409 5502.914	7136.784 5505.107	7133.407 5502.905	UP	NORTH	0.009	0.009	-0.009	-0.009
130	7136.780 5505.222	7133.334 5502.913	7136.775 5505.153	7133.329 5502.881	Down	NORTH	0.068	0.032	0.068	-0.032
131	7136.816 5505.317	7133.258 5502.952	7136.802 5505.309	7133.249 5502.933	UP	NORTH	0.016	0.021	-0.016	-0.021
132	7136.842 5505.437	7133.159 5502.961	7136.852 5505.43	7133.148 5502.952	UP	NORTH	0.012	0.014	-0.012	-0.014
133	7136.844 5505.519	7133.059 5502.990	7136.85 5505.493	7133.051 5502.969	UP	NORTH	0.027	0.022	-0.027	-0.022
134	7136.885 5505.619	7132.940 5503.009	7136.871 5505.56	7132.932 5502.991	UP	NORTH	0.059	0.020	-0.059	-0.020
135	7136.879 5505.667	7132.816 5503.028	7136.877 5505.673	7132.811 5503.027	UP	NORTH	0.014	0.005	-0.014	-0.005
136	7136.903 5505.808	7132.741 5503.054	7136.858 5505.789	7132.731 5503.04	UP	NORTH	0.049	0.017	-0.049	-0.017

137	7136.903	5505.899	7132.832	5503.068	7136.849	5505.893	7132.631	5503.05	UP	NORTH	0.054	0.018	-0.054	-0.018
138	7136.913	5506.000	7132.537	5503.089	7136.914	5505.962	7132.551	5503.091	UP	NORTH	0.036	0.014	-0.036	-0.014
139	7137.030	5506.058	7132.452	5503.107	7136.932	5506.066	7132.499	5503.098	UP	NORTH	0.099	0.048	-0.099	-0.048
140	7136.934	5506.176	7132.375	5503.135	7136.956	5506.165	7132.339	5503.116	UP	NORTH	0.026	0.041	-0.026	-0.041
141	7136.991	5506.319	7132.255	5503.156	7136.952	5506.261	7132.247	5503.147	UP	NORTH	0.054	0.020	-0.054	-0.020
142	7136.996	5506.398	7132.170	5503.169	7136.974	5506.363	7132.174	5503.096	Down	NORTH	0.041	0.073	0.041	-0.073
143	7137.031	5505.479	7132.116	5503.247	7137.069	5506.461	7132.103	5503.278	UP	NORTH	0.042	0.034	-0.042	-0.034
144	7137.046	5506.598	7131.962	5503.218	7137.056	5506.543	7131.999	5503.156	Down	NORTH	0.056	0.072	0.056	-0.072
145	7137.069	5506.679	7131.890	5503.228	7137.073	5506.659	7131.883	5503.195	Down	NORTH	0.020	0.034	0.020	-0.034
146	7137.097	5506.769	7131.805	5503.207	7137.115	5506.732	7131.799	5503.179	Down	NORTH	0.033	0.029	0.033	-0.029
147	7137.133	5506.850	7131.670	5503.278	7137.144	5506.846	7131.641	5503.237	Down	NORTH	0.012	0.050	0.012	-0.050
148	7137.161	5506.987	7131.584	5503.293	7137.184	5506.973	7131.53	5503.283	UP	NORTH	0.027	0.047	-0.027	-0.047
149	7137.179	5507.047	7131.484	5503.329	7137.194	5507.033	7131.466	5503.323	UP	NORTH	0.021	0.018	-0.021	-0.018
150	7137.158	5506.924	7131.340	5503.363	7137.178	5506.913	7131.466	5503.289	Down	NORTH	0.021	0.143	0.021	-0.143
151	7137.225	5507.275	7131.291	5503.371	7137.215	5507.246	7131.29	5503.359	UP	NORTH	0.031	0.012	-0.031	-0.012
152	7137.263	5507.371	7131.190	5503.374	7137.247	5507.356	7131.17	5503.407	UP	NORTH	0.022	0.039	-0.022	-0.039
153	7137.235	5507.437	7131.104	5503.399	7137.266	5507.49	7131.106	5503.403	UP	NORTH	0.062	0.004	-0.062	-0.004
154	7137.266	5507.536	7130.976	5503.429	7137.289	5507.583	7130.984	5503.416	UP	NORTH	0.050	0.014	-0.050	-0.014
155	7137.309	5507.637	7130.894	5503.456	7137.309	5507.637	7130.892	5503.443	UP	NORTH	0.000	0.013	0.000	-0.013
156	7137.328	5507.750	7130.788	5503.459	7137.331	5507.728	7130.799	5503.457	Down	NORTH	0.022	0.011	0.022	-0.011
157	7137.353	5507.829	7130.671	5503.486	7137.363	5507.795	7130.689	5503.458	Down	NORTH	0.036	0.033	0.036	-0.033
158	7137.375	5507.901	7130.595	5503.511	7137.363	5507.863	7130.605	5503.454	Down	NORTH	0.020	0.058	0.020	-0.058
159	7137.360	5508.066	7130.465	5503.486	7137.4	5508.005	7130.439	5503.347	Down	NORTH	0.058	0.122	0.058	-0.122
160	7137.410	5508.131	7130.392	5503.557	7137.426	5508.111	7130.379	5503.474	Down	NORTH	0.026	0.084	0.026	-0.084
161	7137.462	5508.255	7130.261	5503.589	7137.449	5508.217	7130.266	5503.563	Down	NORTH	0.038	0.030	0.038	-0.030
162	7137.478	5508.350	7130.206	5503.611	7137.473	5508.327	7130.232	5503.586	UP	NORTH	0.024	0.035	-0.024	-0.035
163	7137.515	5508.461	7130.119	5503.650	7137.472	5508.441	7130.104	5503.625	UP	SOUTH	0.059	0.029	-0.059	0.029
164	7137.516	5508.530	7129.999	5503.664	7137.505	5508.504	7129.986	5503.674	UP	NORTH	0.028	0.016	-0.028	-0.016
165	7137.528	5508.616	7129.929	5503.698	7137.523	5508.606	7129.904	5503.7	UP	NORTH	0.011	0.025	-0.011	-0.025
166	7137.541	5508.718	7129.834	5503.727	7137.571	5508.661	7129.809	5503.732	UP	NORTH	0.054	0.025	-0.054	-0.025
167	7137.584	5508.835	7129.720	5503.742	7137.567	5508.781	7129.695	5503.754	UP	SOUTH	0.054	0.028	-0.054	0.028
168	7137.593	5508.922	7129.628	5503.765	7137.6	5508.896	7129.617	5503.766	UP	NORTH	0.027	0.011	-0.027	-0.011
169	7137.608	5509.042	7129.540	5503.788	7137.622	5509.016	7129.542	5503.787	UP	NORTH	0.030	0.011	-0.030	-0.011
170	7137.638	5509.125	7129.468	5503.810	7137.646	5509.111	7129.47	5503.789	UP	NORTH	0.016	0.021	-0.016	-0.021
171	7137.649	5509.201	7129.344	5503.827	7137.645	5509.192	7129.336	5503.826	UP	NORTH	0.010	0.008	-0.010	-0.008
172	7137.658	5509.297	7129.246	5503.862	7137.65	5509.29	7129.236	5503.849	UP	NORTH	0.011	0.015	-0.011	-0.015
173	7137.704	5509.425	7129.136	5503.864	7137.668	5509.325	7129.135	5503.852	UP	SOUTH	0.106	0.002	-0.106	0.002
174	7137.723	5509.493	7129.033	5503.914	7137.723	5509.493	7129.028	5503.897	UP	NORTH	0.000	0.018	0.000	-0.018
175	7137.736	5509.593	7128.936	5503.920	7137.721	5509.592	7128.952	5503.935	UP	NORTH	0.017	0.021	-0.017	-0.021
176	7137.773	5509.705	7128.853	5503.935	7137.757	5509.692	7128.834	5503.917	UP	SOUTH	0.021	0.026	-0.021	0.026
177	7137.792	5509.779	7128.760	5503.954	7137.801	5509.741	7128.796	5503.948	UP	SOUTH	0.039	0.025	-0.039	0.025
178	7137.805	5509.864	7128.695	5503.995	7137.805	5509.864	7128.685	5503.977	UP	NORTH	0.000	0.021	0.000	-0.021
179	7137.822	5510.091	7128.537	5504.039	7137.805	5509.984	7128.527	5504.027	UP	NORTH	0.024	0.016	-0.024	-0.016
180	7137.837	5510.101	7128.473	5504.024	7137.821	5510.089	7128.452	5504.03	UP	NORTH	0.020	0.022	-0.020	-0.022
181	7137.863	5510.174	7128.319	5504.036	7137.855	5510.162	7128.3	5504.032	UP	NORTH	0.014	0.019	-0.014	-0.019
182	7137.892	5510.235	7128.272	5504.053	7137.887	5510.219	7128.256	5504.052	UP	SOUTH	0.017	0.016	-0.017	0.016
183	7137.892	5510.313	7128.171	5504.070	7137.922	5510.312	7128.137	5504.064	UP	NORTH	0.030	0.037	-0.030	-0.037
184	7137.940	5510.465	7128.077	5504.107	7137.892	5510.439	7128.053	5504.102	UP	SOUTH	0.055	0.025	-0.055	0.025
185	7136.003	5510.415	7127.936	5504.117	7136.031	5510.353	7127.916	5504.093	UP	SOUTH	0.068	0.033	-0.068	0.033
186	7137.965	5510.621	7127.850	5504.147	7137.938	5510.56	7127.837	5504.113	UP	SOUTH	0.067	0.040	-0.067	0.040
187	7137.996	5510.722	7127.749	5504.178	7137.999	5510.725	7127.737	5504.165	UP	SOUTH	0.004	0.018	-0.004	0.018
188	7136.016	5510.875	7127.696	5504.178	7136.021	5510.847	7127.684	5504.163	UP	SOUTH	0.028	0.010	-0.028	0.010
189	7136.025	5510.959	7127.577	5504.193	7136.063	5510.946	7127.573	5504.171	UP	SOUTH	0.040	0.022	-0.040	0.022
190	7136.033	5511.032	7127.486	5504.237	7136.03	5511.037	7127.476	5504.188	Down	NORTH	0.006	0.050	0.006	-0.050
191	7136.076	5511.116	7127.366	5504.223	7136.094	5511.147	7127.351	5504.24	UP	SOUTH	0.036	0.039	-0.036	0.039
192	7136.093	5511.250	7127.271	5504.239	7136.093	5511.241	7127.261	5504.226	Down	SOUTH	0.018	0.016	0.018	0.016
193	7136.126	5511.358	7127.189	5504.273	7136.132	5511.336	7127.194	5504.249	Down	SOUTH	0.022	0.025	0.022	0.025
194	7136.144	5511.454	7127.094	5504.295	7136.161	5511.409	7127.08	5504.275	Down	SOUTH	0.048	0.024	0.048	0.024
195	7136.155	5511.541	7126.997	5504.297	7136.204	5511.472	7126.992	5504.292	Down	SOUTH	0.085	0.016	0.085	0.016
196	7136.165	5511.636	7126.878	5504.330	7136.174	5511.587	7126.848	5504.31	Down	SOUTH	0.050	0.036	0.050	0.036
197	7136.186	5511.749	7126.793	5504.323	7136.171	5511.706	7126.76	5504.196	Down	SOUTH	0.046	0.129	0.046	0.129
198	7136.218	5511.852	7126.692	5504.377	7136.241	5511.809	7126.686	5504.355	Down	SOUTH	0.049	0.023	0.049	0.023
199	7136.236	5511.934	7126.590	5504.400	7136.27	5511.9	7126.569	5504.379	Down	SOUTH	0.048	0.030	0.048	0.030
200	7136.262	5512.023	7126.495	5504.366	7136.281	5512.006	7126.469	5504.392	Down	SOUTH	0.024	0.027	0.024	0.027

UP	67	173	NORTH
DOWN	133	27	SOUTH

This is number of pebbles moving different ways

	0.456	0.211	0.456	0.129 max (m)
	-	-	(0.196)	(0.211) min (m)
	0.047	0.032	0.025	(0.024) avg (m)
	0.047	0.033	0.062	0.030 stdv (m)
	0.037	0.021	0.026	(0.018) median (m)
	LINE PARALLEL TO CONTOUR GROSS movement	LINE ORIENTED DOWNGRADIENT GROSS movement	LINE PARALLEL TO CONTOUR NET movement	LINE ORIENTED DOWNGRADIENT NET movement

pebbles moving > than	154	1 SIGMA	0.022 m
uncertainty of measure	80	2 SIGMA	0.044 m

ASSUMING 0.022 RMS UNCERTAINTY

THIS IS THE SENSITIVITY TEST FOR HOW MANY PEBBLES REALLY MOVED

Caculations for Pebble data Goldstone

These calculations compare movement from orginal positions. The pebbles are seperated into Line countour parallel and Line oriented down gradient pebbles.

The countour parallel line pebbles move up and down and the line oriented down gradient pebbles move north and south.

The calculations include gross movement and net movement. Gross movement does not take into account that some pebbles move up from the line and some move down from the line.

The maximum, minimum, average, standard deviation and median of gross and net pebble movment is shown at the bottom of the spread sheet. A sensitivity test is also included to determine how many pebbles are actually moving.

Gross movement accounts for all movement not just movment in downslope direction
Should we also figure out the down slope movement?

LINE PARALLEL TO CONTOUR NORTHING = -4.13305930N(EASTING1 + 41446.363475601

LINE ORIENTED DOWN GRADIENT NORTHING = 0.24740846(EASTING1 + 1125.893681063

	May--00				May--01									
	LINE PARALLEL TO CONTOUR		LINE ORIENTED DOWNGRADIENT		LINE PARALLEL TO CONTOUR		LINE ORIENTED DOWNGRADIENT		LINE PARALLEL TO CONTOUR	LINE ORIENTED DOWNGRADIENT		LINE PARALLEL TO CONTOUR	LINE ORIENTED DOWNGRADIENT	
	e	n	e	n	e	n	e	n	UP vs DOWN MOVEMENT	NORTH vs SOUTH MOVEMENT	GROSS movement	GROSS movement	NET movement	NET movement
1	7134.292	5492.648	7145.982	5500.116	7134.272	5492.612	7145.99	5500.139	UP	NORTH	0.041	0.024	-0.041	-0.024
2	7134.307	5492.746	7145.845	5500.119	7134.284	5492.717	7145.842	5500.145	UP	NORTH	0.037	0.026	-0.037	-0.026
3	7134.333	5492.827	7145.728	5500.145	7134.335	5492.815	7145.734	5500.135	Down	NORTH	0.012	0.012	0.012	-0.012
4	7134.343	5492.908	7145.663	5500.163	7134.357	5492.866	7145.663	5500.163	Down	NORTH	0.025	0.000	0.025	0.000
5	7134.346	5493.026	7145.542	5500.196	7134.315	5493.014	7145.558	5500.202	UP	NORTH	0.033	0.017	-0.033	-0.017
6	7134.367	5493.131	7145.426	5500.197	7134.407	5493.103	7145.44	5500.198	Down	NORTH	0.030	0.012	0.030	-0.012
7	7134.420	5493.213	7145.340	5500.239	7134.416	5493.22	7145.381	5500.232	Down	NORTH	0.008	0.022	0.008	-0.022
8	7134.417	5493.324	7145.224	5500.232	7134.409	5493.295	7145.201	5500.238	Down	NORTH	0.030	0.024	0.030	-0.024
9	7134.445	5493.434	7145.146	5500.291	7134.441	5493.366	7145.155	5500.303	UP	NORTH	0.048	0.015	-0.048	-0.015
10	7134.474	5493.523	7145.045	5500.267	7134.482	5493.462	7145.062	5500.264	Down	NORTH	0.032	0.017	0.032	-0.017
11	7134.482	5493.619	7144.959	5500.293	7134.49	5493.616	7144.957	5500.298	Down	NORTH	0.009	0.005	0.009	-0.005
12	7134.503	5493.695	7144.863	5500.341	7134.515	5493.695	7144.87	5500.332	Down	NORTH	0.012	0.018	0.012	-0.018
13	7134.515	5493.823	7144.751	5500.333	7134.522	5493.781	7144.762	5500.337	Down	NORTH	0.034	0.012	0.034	-0.012
14	7134.535	5493.919	7144.652	5500.377	7134.536	5493.905	7144.674	5500.365	Down	NORTH	0.014	0.025	0.014	-0.025
15	7134.560	5494.025	7144.541	5500.394	7134.603	5493.935	7144.57	5500.374	Down	NORTH	0.100	0.035	0.100	-0.035
16	7134.577	5494.112	7144.454	5500.412	7134.586	5494.109	7144.459	5500.415	Down	NORTH	0.009	0.008	0.009	-0.008
17	7134.594	5494.211	7144.345	5500.426	7134.609	5494.196	7144.363	5500.421	Down	NORTH	0.021	0.019	0.021	-0.019
18	7134.625	5494.307	7144.253	5500.467	7134.626	5494.307	7144.301	5500.423	Down	NORTH	0.000	0.065	0.000	-0.065
19	7134.631	5494.395	7144.115	5500.456	7134.663	5494.355	7144.133	5500.456	Down	NORTH	0.051	0.018	0.051	-0.018
20	7134.647	5494.501	7144.046	5500.482	7134.553	5494.269	7144.074	5500.471	Down	SOUTH	0.250	0.030	0.250	0.030
21	7134.662	5494.601	7143.953	5500.512	7134.712	5494.542	7143.958	5500.512	Down	NORTH	0.066	0.005	0.066	-0.005
22	7134.702	5494.700	7143.871	5500.531	7134.702	5494.69	7143.866	5500.513	Down	NORTH	0.010	0.023	0.010	-0.023
23	7134.719	5494.810	7143.772	5500.546	7134.788	5494.785	7143.788	5500.55	Down	NORTH	0.081	0.015	0.081	-0.015
24	7134.730	5494.901	7143.680	5500.595	7134.751	5494.872	7143.7	5500.571	Down	NORTH	0.036	0.031	0.036	-0.031
25	7134.753	5494.964	7143.584	5500.612	7134.734	5494.949	7143.591	5500.588	Down	NORTH	0.024	0.036	0.024	-0.036
26	7134.784	5495.110	7143.465	5500.615	7134.799	5495.094	7143.471	5500.606	Down	NORTH	0.022	0.018	0.022	-0.018
27	7134.793	5495.175	7143.363	5500.630	7134.795	5495.171	7143.417	5500.61	Down	NORTH	0.004	0.058	0.004	-0.058
28	7134.833	5495.301	7143.271	5500.656	7134.741	5495.256	7143.264	5500.671	Down	NORTH	0.102	0.017	0.102	-0.017
29	7134.830	5495.374	7143.180	5500.668	7134.645	5495.372	7143.212	5500.691	Down	NORTH	0.006	0.074	0.006	-0.074
30	7134.863	5495.459	7143.085	5500.709	7134.677	5495.478	7143.088	5500.718	Down	NORTH	0.022	0.009	0.022	-0.009
31	7134.862	5495.559	7142.978	5500.719	7134.759	5495.547	7143.033	5500.705	Down	NORTH	0.104	0.057	0.104	-0.057
32	7134.890	5495.646	7142.902	5500.734	7134.882	5495.647	7143.006	5500.663	Down	NORTH	0.008	0.126	0.008	-0.126
33	7134.916	5495.730	7142.780	5500.755	7134.916	5495.696	7142.764	5500.779	Down	NORTH	0.032	0.029	0.032	-0.029
34	7134.912	5495.862	7142.678	5500.772	7134.909	5495.832	7142.667	5500.786	Down	NORTH	0.030	0.011	0.030	-0.011
35	7134.874	5495.951	7142.586	5500.800	7134.866	5495.964	7142.654	5500.672	Down	NORTH	0.015	0.144	0.015	-0.144
36	7134.958	5496.048	7142.487	5500.827	7134.966	5495.99	7142.637	5500.878	Down	NORTH	0.058	0.211	0.058	-0.211
37	7134.958	5496.166	7142.391	5500.884	7134.983	5496.07	7142.396	5500.848	Down	NORTH	0.099	0.036	0.099	-0.036
38	7134.976	5496.246	7142.303	5500.865	7134.981	5496.239	7142.312	5500.799	Down	NORTH	0.009	0.067	0.009	-0.067
39	7136.003	5496.353	7142.203	5500.869	7136.016	5496.364	7142.193	5500.9	Down	NORTH	0.017	0.015	0.017	-0.015
40	7134.977	5496.414	7142.041	5500.944	7134.975	5496.384	7142.029	5500.932	Down	NORTH	0.031	0.017	0.031	-0.017
41	7135.016	5496.561	7141.968	5500.883	7134.971	5496.512	7142.001	5500.897	Down	NORTH	0.067	0.019	0.067	-0.019
42	7134.982	5496.640	7141.906	5500.945	7134.947	5496.59	7141.939	5500.928	Down	NORTH	0.061	0.037	0.061	-0.037
43	7136.035	5496.751	7141.891	5500.952	7135.091	5496.767	7141.819	5500.945	Down	NORTH	0.058	0.019	0.058	-0.019
44	7136.069	5496.896	7141.715	5500.988	7136.075	5496.844	7141.743	5500.957	Down	NORTH	0.052	0.042	0.052	-0.042
45	7134.875	5496.922	7141.617	5501.015	7135.813	5496.891	7141.662	5501	Down	NORTH	0.939	0.036	0.939	-0.036
46	7135.122	5497.066	7141.524	5501.040	7135.123	5496.969	7141.594	5500.939	Down	NORTH	0.097	0.123	0.097	-0.123
47	7135.135	5497.149	7141.384	5501.094	7135.135	5497.109	7141.383	5501.082	Down	NORTH	0.040	0.012	0.040	-0.012
48	7135.145	5497.236	7141.349	5501.091	7135.085	5496.78	7141.358	5501.062	Down	NORTH	0.460	0.030	0.460	-0.030
49	7135.151	5497.332	7141.227	5501.118	7135.135	5497.371	7141.238	5501.122	Down	NORTH	0.042	0.013	0.042	-0.013
50	7135.161	5497.446	7141.123	5501.152	7135.16	5497.419	7141.161	5501.148	Down	NORTH	0.027	0.036	0.027	-0.036
51	7135.198	5497.534	7141.048	5501.148	7135.219	5497.51	7141.151	5501.059	Down	NORTH	0.032	0.136	0.032	-0.136
52	7135.201	5497.633	7140.938	5501.168	7135.206	5497.559	7141.022	5501.08	Down	NORTH	0.074	0.122	0.074	-0.122
53	7135.220	5497.706	7140.836	5501.177	7135.226	5497.639	7140.884	5501.087	Down	NORTH	0.067	0.102	0.067	-0.102
54	7135.230	5497.826	7140.755	5501.192	7135.22	5497.811	7140.799	5501.138	Down	NORTH	0.018	0.067	0.018	-0.067
55	7135.239	5497.911	7140.661	5501.226	7135.239	5497.91	7140.678	5501.235	Down	NORTH	0.001	0.019	0.001	-0.019
56	7135.238	5498.033	7140.518	5501.244	7135.315	5498.052	7140.522	5501.237	Down	NORTH	0.079	0.008	0.079	-0.008
57	7135.276	5498.091	7140.469	5501.267	7135.393	5498.036	7140.453	5501.272	Down	NORTH	0.129	0.017	0.129	-0.017
58	7135.312	5498.233	7140.352	5501.290	7135.372	5498.192	7140.353	5501.248	Down	NORTH	0.069	0.042	0.069	-0.042
59	7135.380	5498.281	7140.279	5501.333	7135.351	5498.267	7140.267	5501.3	Down	NORTH	0.032	0.035	0.032	-0.035
60	7135.377	5498.417	7140.149	5501.331	7135.361	5498.411	7140.174	5501.228	Down	NORTH	0.007	0.106	0.007	-0.106
61	7136.397	5498.514	7140.046	5501.368	7135.393	5498.501	7140.058	5501.337	Down	NORTH	0.014	0.033	0.014	-0.033
62	7135.423	5498.596	7139.978	5501.377	7135.414	5498.552	7139.972	5501.382	Down	NORTH	0.045	0.008	0.045	-0.008
63	7135.427	5498.695	7139.878	5501.398	7135.437	5498.68	7139.871	5501.376	Down	NORTH	0.036	0.023	0.036	-0.023
64	7135.441	5498.814	7139.726	5501.432	7135.444	5498.744	7139.736	5501.434	Down	NORTH	0.070	0.012	0.070	-0.012
65	7135.506	5498.850	7139.680	5501.466	7135.52	5498.849	7139.662	5501.43	Down	NORTH	0.014	0.042	0.014	-0.042
66	7135.513	5498.984	7139.562	5501.467	7135.531	5498.942	7139.545	5501.457	Down	NORTH	0.046	0.020	0.046	-0.020
67	7136.540	5499.079	7139.467	5501.527	7135.548	5499.082	7139.439	5501.461	Down	NORTH	0.009	0.126	0.009	-0.126
68	7135.561	5499.193	7139.426	5501.542	7135.547	5499.181	7139.428	5501.503	Down	NORTH	0.018	0.039	0.018	-0.039
69	7135.583	5499.281	7139.266	5501.544	7135.58	5499.275	7139.29	5501.51	Down	NORTH	0.007	0.040	0.007	-0.040
70	7136.811	5499.370	7139.173	5501.565	7135.81	5499.317	7139.141	5501.517	Down	NORTH	0.053	0.075	0.053	-0.075
71	7135.899	5499.482	7139.086	5501.593	7135.671	5499.45	7139.122	5501.559	Down	SOUTH	0.043	0.046	0.043	0.046
72	7136.838	5499.583	7138.997	5501.602	7135.678	5499.58	7138.993	5501.411	Down	NORTH	0.044	0.193	0.044	-0.193
73	7135.736	5499.956	7136.878	5501.645	7135.727	5499.946	7136.919	5501.618	Down	SOUTH	0.013	0.049	0.013	0.049
74	7135.667	5499.810	7136.754	5501.650	7135.684	5499.781	7136.79	5501.625	Down	NORTH	0.034	0.044	0.034	-0.044
75	7135.702	5499.883	7136.669	5501.671	7135.699	5499.846	7136.712	5501.669	Down	NORTH	0.037	0.023	0.037	-0.023
76	7135.717	5499.956	7136.575	5501.705	7135.742	5499.9	7136.583	5501.707	Down	NORTH	0.061	0.008	0.061	-0.008
77	7135.717	5500.052	7136.477	5501.745	7135.736	5500.036	7136.516	5501.73	Down	NORTH	0.033	0.042	0.033	-0.042
78	7135.770	5500.154	7136.438	5501.727	7135.913	5500.426	7136.445	5501.664	Down	NORTH	0.307	0.063	0.307	-0.063
79	7135.774	5500.268	7136.274	5501.755	7135.801	5500.264	7136.26	5501.747	Down	NORTH	0.027	0.018	0.027	-0.018
80	7135.667	5499.810	7136.197	5501.787	7135.655	5499.786	7136.166	5501.786	Down	NORTH	0.027	0.031	0.027	-0.031
81	7135.617	5500.446	7136.114	5501.808	7135.655	5500.38	7136.146	5501.769	Down	NORTH	0.069	0.050	0.069	-0.050
82	7135.837	5500.516	7136.007	5501.820	7135.816	5500.495	7136.009	5501.842	Down	NORTH	0.030	0.022	0.030	-0.022
83	7135.845	5500.623	7137.920	5501.867	7135.863	5500.548	7137.929	5501.876	Down	NORTH	0.077	0.013	0.077	-0.013
84	7135.872	5500.714	7137.818	5501.873	7135.867	5500.668	7137.818	5501.89	Down	NORTH	0.026	0.017	0.026	-0.017
85	7135.893	5500.856	7137.728	5501.871	7135.931	5500.806	7137.73	5501.879	Down	NORTH	0.053	0.008	0.053	-0.008
86	7135.936	5500.933	7137.615	5501.935	7135.935	5500.914	7137.621	5501.946	Down	NORTH	0.019	0.013	0.019	-0.013
87	7135.944	5501.029	7137.515	5501.932	7135.965	5500.986	7137.514	5501.922	Down	NORTH	0.048	0.010	0.048	-0.010
88	7135.975	5501.151	7137.414	5501.980	7135.967	5501.131	7137.432	5501.865	Down	NORTH	0.022	0.007	0.022	-0.007
89	7136.008	5501.240	7137.298	5501.993	7136.037	5501.217	7137.307	5501.917	Down	NORTH	0.043	0.077	0.043	-0.077
90	7136.002	5501.334	7137.192	5502.025	7136.011	5501.319	7137.199	5501.95	Down	NORTH	0.017	0.075	0.017	-0.075
91	7136.032	5501.424	7137.138	5502.017	7136.084	5501.431	7137.129	5502.015	Down	NORTH	0.052	0.009	0.052	-0.009
92	7136.062	5501.534	7137.029	5502.041	7136.062	5501.53	7137.005	5502.038	Down	NORTH	0.004	0.024	0.004	-0.024
93	7136.091	5501.642	7136.958	5502.068	7136.101	5501.565	7136.935	5502.05	Down	NORTH	0.076	0.029	0.076	-0.029
94	7136.128	5501.704	7136.876	5502.088	7136.131	5501.666	7136.818	5502.041	Down	NORTH	0.018	0.075	0.018	-0.075
95	7136.130	5501.746	7136.788	5502.093	7136.105	5501.736	7136.779	5502.106	Down	NORTH	0.027	0.016	0.027	-0.016
96	7136.153	5501.805	7136.648	5502.101	7136.177	5501.865	7136.642	5502.096	Down	NORTH	0.038	0.008	0.038	-0.008
97	7136.161	5502.019	7136.536	5502.153	7136.195	5501.929	7136.551	5502.186	Down	NORTH	0.096	0.020	0.096	-0.020
98	7136.182	5502.099	7136.461	5502.164	7136.195	5502.076	7136.455	5502.184	Down	NORTH	0.025	0.021	0.025	-0.021
99	7136.186	5502.236	7136.365	5502.182	7136.2	5502.176	7136.374	5502.205	Down	NORTH	0.064	0.025	0.064	-0.025
100	7136.220	5502.296	7136.253	$602.227	7136.228	5502.288	7136.249	5502.244	Down	NORTH	0.011	0.017	0.011	-0.017
101	7136.215	5502.402	7136.169	$502.245	7136.204	5502.365	7136.181	5502.257	Down	NORTH	0.039	0.017	0.039	-0.017
102	7136.244	5502.487	7136.059	$502.250	7136.318	5502.429	7136.138	5502.246	Down	NORTH	0.094	0.079	0.094	-0.079
103	7136.276	5502.620	7135.973	$502.291	7136.265	5502.533	7135.991	5502.282	Down	NORTH	0.068	0.034	0.068	-0.034
104	7136.277	5502.685	7135.865	$502.308	7136.281	5502.573	7135.884	5502.336	UP	NORTH	0.013	0.034	-0.013	-0.034
105	7136.306	5502.799	7135.759	$502.346	7136.314	5502.786	7135.754	5502.352	Down	NORTH	0.015	0.008	0.015	-0.008
106	7136.320	5502.906	7135.649	$502.376	7136.362	5502.826	7136.648	5502.394	UP	NORTH	0.060	0.018	-0.060	-0.018
107	7136.351	5503.018	7135.561	$502.403	7136.443	5502.943	7135.588	5502.412	UP	NORTH	0.119	0.011	-0.119	-0.011
108	7136.350	5503.095	7135.458	$502.428	7136.366	5503.066	7135.465	5502.439	UP	NORTH	0.031	0.013	-0.031	-0.013
109	7136.400	5503.204	7135.342	$502.451	7136.392	5503.166	7135.372	5502.464	UP	NORTH	0.039	0.016	-0.039	-0.016
110	7136.419	5503.294	7135.269	$502.443	7136.39	5503.267	7135.275	5502.459	Down	NORTH	0.040	0.021	0.040	-0.021
111	7136.412	5503.355	7135.172	$502.496	7136.407	5503.326	7135.2	5502.485	Down	NORTH	0.029	0.031	0.029	-0.031
112	7136.345	5503.451	7135.091	$502.501	7136.549	5503.324	7136.116	5502.515	UP	NORTH	0.240	0.029	-0.240	-0.029
113	7135.479	5503.568	7134.980	$502.532	7136.461	5503.536	7134.994	5502.544	UP	NORTH	0.037	0.022	-0.037	-0.022
114	7136.477	5503.655	7134.981	$502.495	7136.48	5503.635	7134.997	5502.512	Down	NORTH	0.020	0.023	0.020	-0.023
115	7136.495	5503.766	7134.764	$502.551	7136.508	5503.748	7134.792	5502.574	Down	NORTH	0.022	0.036	0.022	-0.036
116	7136.505	5503.881	7134.695	$502.573	7136.502	5503.85	7134.716	5502.597	UP	NORTH	0.031	0.032	-0.031	-0.032
117	7136.517	5503.961	7134.608	$502.599	7136.515	5503.927	7134.598	5502.63	UP	NORTH	0.034	0.105	-0.034	-0.105
118	7136.551	5504.078	7134.324	$502.411	7136.524	5504.043	7134.318	5502.373	Down	NORTH	0.045	0.038	0.045	-0.036
119	7136.550	5504.260	7134.503	$502.550	7136.562	5504.249	7134.486	5502.553	Down	NORTH	0.016	0.017	0.016	-0.017
120	7136.593	5504.261	7134.281	$502.626	7136.587	5504.266	7134.273	5502.582	Down	NORTH	0.009	0.057	0.009	-0.057
121	7136.583	5504.364	7134.203	$502.721	7136.579	5504.346	7134.21	5502.725	UP	NORTH	0.009	0.008	-0.009	-0.008
122	7136.630	5504.471	7134.080	$502.729	7136.635	5504.458	7134.105	5502.721	Down	NORTH	0.014	0.026	0.014	-0.026
123	7136.660	5504.558	7134.009	$502.773	7136.675	5504.552	7134.016	5502.796	UP	NORTH	0.016	0.024	-0.016	-0.024
124	7136.699	5504.674	7133.925	$502.804	7136.706	5504.66	7133.937	5502.814	UP	NORTH	0.016	0.016	-0.016	-0.016
125	7136.687	5504.755	7133.812	$502.823	7136.701	5504.727	7133.808	5502.732	Down	NORTH	0.031	0.091	0.031	-0.091
126	7136.726	5504.854	7133.719	$502.839	7136.729	5504.859	7133.728	5502.851	UP	NORTH	0.008	0.015	-0.008	-0.015
127	7136.737	5504.952	7133.632	$502.866	7136.736	5504.937	7133.632	5502.865	UP	NORTH	0.015	0.001	-0.015	-0.001
128	7136.757	5505.033	7133.509	$502.900	7136.756	5505.047	7133.526	5502.92	UP	NORTH	0.014	0.026	-0.014	-0.026
129	7136.779	5505.115	7133.409	$502.914	7136.784	5505.112	7133.419	5502.931	UP	NORTH	0.006	0.020	-0.006	-0.020
130	7136.780	5505.222	7133.334	$502.913	7136.779	5505.148	7133.335	5502.903	UP	NORTH	0.073	0.010	-0.073	-0.010
131	7136.816	5505.317	7133.256	$502.952	7136.812	5505.297	7133.257	5502.937	UP	NORTH	0.020	0.015	-0.020	-0.015
132	7136.842	5505.437	7133.159	$502.961	7136.847	5505.423	7133.157	5502.974	UP	NORTH	0.015	0.013	-0.015	-0.013
133	7136.844	5505.519	7133.059	$502.990	7136.841	5505.491	7133.039	5502.958	UP	NORTH	0.028	0.038	-0.028	-0.038
134	7136.885	5505.619	7132.940	$503.009	7136.884	5505.557	7132.926	5503.004	UP	NORTH	0.065	0.015	-0.065	-0.015
135	7136.879	5505.687	7132.816	$503.028	7136.871	5505.663	7132.815	5502.974	Down	NORTH	0.025	0.054	0.025	-0.054
136	7136.903	5505.808	7132.741	$503.054	7136.881	5505.795	7132.741	5503.051	UP	NORTH	0.026	0.003	-0.026	-0.003

137	7136.903	5505.899	7132.632	5503.068	7136.904	5505.878	7132.636	5503.071	UP	NORTH	0.021	0.005	-0.021	-0.005
138	7136.913	5506.000	7132.537	5503.089	7136.91	5506.985	7132.588	5503.105	UP	NORTH	0.035	0.035	-0.035	-0.035
139	7137.030	5506.058	7132.452	5503.107	7136.909	5506.061	7132.516	5503.115	UP	NORTH	0.121	0.064	-0.121	-0.064
140	7136.934	5506.178	7132.375	5503.135	7136.956	5506.165	7132.347	5503.128	UP	NORTH	0.026	0.029	-0.026	-0.029
141	7136.991	5506.319	7132.265	5503.156	7136.945	5506.305	7132.252	5503.167	UP	NORTH	0.048	0.017	-0.048	-0.017
142	7136.996	5506.398	7132.170	5503.169	7136.925	5506.373	7132.187	5503.118	Down	NORTH	0.075	0.054	0.075	-0.054
143	7137.031	5506.478	7132.116	5503.247	7137.071	5506.467	7132.111	5503.294	UP	NORTH	0.041	0.047	-0.041	-0.047
144	7137.046	5506.586	7131.992	5503.216	7137.051	5506.561	7132.013	5503.18	Down	NORTH	0.037	0.064	0.037	-0.064
145	7137.069	5506.679	7131.890	5503.228	7137.061	5506.674	7131.906	5503.206	Down	NORTH	0.013	0.026	0.013	-0.026
146	7137.097	5506.760	7131.805	5503.207	7137.103	5506.733	7131.824	5503.215	Down	NORTH	0.028	0.021	0.028	-0.021
147	7137.133	5506.850	7131.670	5503.278	7137.147	5506.847	7131.659	5503.256	Down	NORTH	0.014	0.025	0.014	-0.025
148	7137.161	5506.987	7131.584	5503.293	7137.184	5506.981	7131.522	5503.303	UP	NORTH	0.024	0.063	-0.024	-0.063
149	7137.179	5507.047	7131.484	5503.329	7137.169	5507.044	7131.482	5503.354	UP	NORTH	0.010	0.025	-0.010	-0.025
150	7137.158	5506.924	7131.340	5503.353	7137.162	5506.911	7131.459	5503.317	Down	NORTH	0.027	0.124	0.027	-0.124
151	7137.225	5507.275	7131.291	5503.371	7137.197	5507.236	7131.289	5503.386	UP	NORTH	0.049	0.015	-0.049	-0.015
152	7137.263	5507.371	7131.190	5503.374	7137.25	5507.361	7131.18	5503.426	UP	NORTH	0.016	0.055	-0.016	-0.055
153	7137.235	5507.437	7131.104	5503.399	7137.265	5507.499	7131.118	5503.429	UP	NORTH	0.069	0.033	-0.069	-0.033
154	7137.266	5507.536	7130.976	5503.429	7137.301	5507.573	7130.987	5503.426	UP	NORTH	0.049	0.011	-0.049	-0.011
155	7137.300	5507.637	7130.894	5503.456	7137.34	5507.752	7130.816	5503.456	UP	NORTH	0.122	0.022	-0.122	-0.022
156	7137.328	5507.750	7130.768	5503.459	7137.363	5507.773	7130.809	5503.455	Down	NORTH	0.042	0.021	0.042	-0.021
157	7137.353	5507.829	7130.671	5503.486	7137.414	5507.888	7130.7	5503.483	Down	NORTH	0.085	0.029	0.085	-0.029
158	7137.375	5507.901	7130.596	5503.511	7137.402	5508.054	7130.613	5503.473	Down	NORTH	0.155	0.042	0.155	-0.042
159	7137.360	5508.056	7130.465	5503.466	7137.421	5508.111	7130.459	5503.372	Down	NORTH	0.084	0.094	0.084	-0.094
160	7137.410	5508.131	7130.392	5503.557	7137.45	5508.211	7130.383	5503.477	Down	NORTH	0.089	0.081	0.089	-0.081
161	7137.452	5508.255	7130.281	5503.589	7137.461	5508.311	7130.307	5503.58	UP	NORTH	0.057	0.028	-0.057	-0.028
162	7137.476	5508.350	7130.206	5503.611	7137.495	5508.445	7130.252	5503.634	UP	NORTH	0.097	0.058	-0.097	-0.058
163	7137.515	5508.461	7130.119	5503.650	7137.499	5508.537	7130.127	5503.659	UP	NORTH	0.058	0.012	-0.058	-0.012
164	7137.516	5508.530	7129.999	5503.644	7137.534	5508.619	7130.006	5503.691	UP	NORTH	0.091	0.010	-0.091	-0.010
165	7137.526	5508.616	7129.929	5503.696	7137.563	5508.678	7129.935	5503.691	UP	NORTH	0.071	0.009	-0.071	-0.009
166	7137.541	5508.718	7129.834	5503.727	7137.567	5508.798	7129.838	5503.733	UP	NORTH	0.092	0.007	-0.092	-0.007
167	7137.584	5508.835	7129.720	5503.742	7137.593	5508.906	7129.709	5503.776	UP	NORTH	0.072	0.038	-0.072	-0.038
168	7137.593	5508.922	7129.628	5503.765	7137.624	5509.029	7129.626	5503.773	UP	NORTH	0.111	0.008	-0.111	-0.008
169	7137.608	5509.042	7129.540	5503.798	7137.641	5509.119	7129.543	5503.804	UP	NORTH	0.084	0.007	-0.084	-0.007
170	7137.638	5509.125	7129.466	5503.810	7137.646	5509.111	7129.463	5503.764	UP	NORTH	0.016	0.046	-0.016	-0.046
171	7137.649	5509.201	7129.344	5503.827	7137.644	5509.222	7129.336	5503.843	UP	NORTH	0.022	0.017	-0.022	-0.017
172	7137.658	5509.297	7129.246	5503.862	7137.641	5509.305	7129.267	5503.869	UP	NORTH	0.019	0.022	-0.019	-0.022
173	7137.704	5509.425	7129.136	5503.864	7137.667	5509.343	7129.135	5503.871	UP	SOUTH	0.084	0.007	-0.084	0.007
174	7137.723	5509.493	7129.033	5503.914	7137.723	5509.493	7129.022	5503.899	UP	NORTH	0.000	0.019	0.000	-0.019
175	7137.738	5509.593	7128.938	5503.920	7137.739	5509.573	7128.951	5503.933	UP	NORTH	0.020	0.018	-0.020	-0.018
176	7137.773	5509.705	7128.853	5503.935	7137.766	5509.724	7128.842	5503.916	UP	NORTH	0.021	0.022	-0.021	-0.022
177	7137.792	5509.779	7128.760	5503.954	7137.804	5509.774	7128.753	5503.953	UP	SOUTH	0.013	0.007	-0.013	0.007
178	7137.805	5509.894	7128.695	5503.995	7137.805	5509.894	7128.703	5503.996	UP	NORTH	0.000	0.008	0.000	-0.008
179	7137.822	5510.001	7128.537	5504.039	7137.813	5509.997	7128.535	5504.026	UP	NORTH	0.010	0.013	-0.010	-0.013
180	7137.837	5510.101	7128.473	5504.024	7137.867	5510.102	7128.495	5504.091	UP	NORTH	0.030	0.071	-0.030	-0.071
181	7137.863	5510.174	7128.319	5504.036	7137.648	5510.174	7128.187	5504.131	UP	NORTH	0.014	0.183	-0.014	-0.183
182	7137.882	5510.236	7128.272	5504.053	7137.882	5510.219	7128.265	5504.039	UP	SOUTH	0.016	0.016	-0.016	0.016
183	7137.892	5510.313	7128.171	5504.070	7137.926	5510.317	7128.159	5504.09	UP	NORTH	0.034	0.023	-0.034	-0.023
184	7137.940	5510.465	7128.077	5504.107	7137.927	5510.455	7128.062	5504.113	UP	SOUTH	0.016	0.016	-0.016	0.016
185	7138.003	5510.415	7127.936	5504.117	7138.031	5510.353	7127.911	5504.1	UP	SOUTH	0.068	0.032	-0.068	0.032
186	7137.965	5510.521	7127.859	5504.147	7137.941	5510.546	7127.852	5504.125	UP	SOUTH	0.079	0.023	-0.079	0.023
187	7137.996	5510.722	7127.749	5504.178	7137.998	5510.726	7127.733	5504.189	UP	SOUTH	0.010	0.019	-0.010	0.019
188	7138.016	5510.875	7127.696	5504.178	7138.029	5510.853	7127.704	5504.175	UP	SOUTH	0.026	0.009	-0.026	0.009
189	7138.025	5510.959	7127.577	5504.193	7138.056	5510.958	7127.577	5504.176	UP	SOUTH	0.031	0.017	-0.031	0.017
190	7138.033	5511.032	7127.466	5504.237	7138.032	5511.034	7127.476	5504.226	UP	NORTH	0.002	0.014	-0.002	-0.014
191	7138.076	5511.116	7127.366	5504.223	7138.082	5511.155	7127.374	5504.237	UP	SOUTH	0.039	0.018	-0.039	0.018
192	7138.093	5511.259	7127.271	5504.239	7138.09	5511.25	7127.259	5504.227	Down	SOUTH	0.009	0.017	0.009	0.017
193	7138.128	5511.358	7127.189	5504.273	7138.115	5511.347	7127.213	5504.281	UP	SOUTH	0.017	0.025	-0.017	0.025
194	7138.144	5511.464	7127.094	5504.296	7138.142	5511.415	7127.106	5504.26	UP	SOUTH	0.039	0.019	-0.039	0.019
195	7138.155	5511.541	7126.907	5504.297	7138.196	5511.482	7126.859	5504.167	Down	SOUTH	0.072	0.120	0.072	0.120
196	7138.165	5511.636	7126.878	5504.330	7138.146	5511.587	7126.865	5504.35	UP	SOUTH	0.053	0.024	-0.053	0.024
197	7138.188	5511.749	7126.793	5504.323	7138.19	5511.722	7126.781	5504.214	Down	SOUTH	0.027	0.110	0.027	0.110
198	7138.218	5511.852	7126.692	5504.377	7138.237	5511.816	7126.694	5504.379	UP	SOUTH	0.041	0.003	-0.041	0.003
199	7138.236	5511.934	7126.590	5504.409	7138.264	5511.91	7126.577	5504.367	Down	SOUTH	0.037	0.287	0.037	0.287
200	7138.262	5512.023	7126.495	5504.386	7138.275	5512.027	7126.469	5504.407	Down	SOUTH	0.014	0.022	0.014	0.022

UP	74	174	NORTH
DOWN	126	22	SOUTH

This is number of pebbles moving different ways

	0.039	0.287	0.039	0.287 max (m)
	-	-	(0.240)	(0.211) min (m)
	0.060	0.037	0.014	(0.026) avg (m)
	0.081	0.039	0.003	0.046 stdv (m)
	0.032	0.023	0.014	(0.021) median (m)

LINE PARALLEL TO CONTOUR	LINE ORIENTED DOWN/GRADIENT	LINE PARALLEL TO CONTOUR	LINE ORIENTED DOWN/GRADIENT
GROSS movement	GROSS movement	NET movement	NET movement

pebbles moving > than	132	1 SIGMA	0.022 m
uncertainty of measure	70	2 SIGMA	0.044 m

ASSUMING 0.022 RMS UNCERTAINTY

THIS IS THE SENSITIVITY TEST FOR HOW MANY PEBBLES REALLY MOVED

Caculations for Pebble data Goldstone

These calculations compare movement from orginal positions. The pebbles are seperated into Line countour parallel and Line oriented down gradient pebbles.

The countour parallel line pebbles move up and down and the line oriented down gradient pebbles move north and south.

The calculations include gross movement and net movement. Gross movement does not take into account that some pebbles move up from the line and some move down from the line.

The maximum, minimum, average, standard deviation and median of gross and net pebble movment is shown at the bottom of the spreed sheet. A sensitivity test is also included to determine how many pebbles are actually moving.

Gross movement accounts for all movement not just movment in downslope direction
Should we also figure out the down slope movement?

LINE PARALLEL TO CONTOUR NORTHING = -4.133052936(EASTING1 + 41446.363475601

LINE ORIENTED DOWN GRADIENT NORTHING = 0.247408463(EASTING1 + 1125.892681083

	May--00		Oct--01								
	LINE PARALLEL TO CONTOUR	LINE ORIENTED DOWNGRADIENT	LINE PARALLEL TO CONTOUR	LINE ORIENTED DOWNGRADIENT	LINE PARALLEL TO CONTOUR	LINE ORIENTED DOWNGRADIENT	LINE PARALLEL TO CONTOUR	LINE ORIENTED DOWNGRADIENT	LINE PARALLEL TO CONTOUR	LINE ORIENTED DOWNGRADIENT
	e n	e n	e n	e n	UP vs DOWN MOVEMENT	NORTH vs SOUTH MOVEMENT	GROSS movement	GROSS movement	NET movement	NET movement
1	7134.292 5492.648	7145.982 $500.116	7134.261 5492.613	7145.995 $500.089	UP	NORTH	0.047	0.021	-0.047	-0.021
2	7134.307 5492.746	7145.845 $500.119	7134.248 5492.724	7145.843 $500.155	UP	NORTH	0.063	0.036	-0.063	-0.036
3	7134.333 5492.827	7145.728 $500.145	7134.322 5492.819	7145.741 $500.136	Down	NORTH	0.014	0.016	0.014	+0.016
4	7134.343 5492.908	7145.663 $500.163	7134.352 5492.88	7145.661 $500.157	Down	NORTH	0.030	0.008	0.030	-0.008
5	7134.346 5493.026	7145.542 $500.196	7134.353 5493.007	7145.564 $500.205	UP	NORTH	0.020	0.024	-0.020	-0.024
6	7134.367 5493.131	7145.428 $500.197	7134.406 5493.105	7145.436 $500.205	Down	NORTH	0.028	0.011	0.028	-0.011
7	7134.420 5493.213	7145.340 $500.239	7134.407 5493.221	7145.351 $500.239	UP	NORTH	0.015	0.011	-0.015	-0.011
8	7134.417 5493.324	7145.224 $500.232	7134.407 5493.298	7145.203 $500.254	Down	NORTH	0.028	0.030	0.028	+0.030
9	7134.445 5493.434	7145.146 $500.291	7134.433 5493.365	7145.144 $500.303	UP	NORTH	0.050	0.012	-0.050	-0.012
10	7134.474 5493.523	7145.045 $500.267	7134.409 5493.425	7145.051 $500.259	Down	SOUTH	0.118	0.010	0.118	0.010
11	7134.482 5493.619	7144.959 $500.293	7134.483 5493.609	7144.973 $500.292	Down	NORTH	0.010	0.014	0.010	+0.014
12	7134.509 5493.695	7144.863 $500.341	7134.51 5493.7	7144.861 $500.323	Down	NORTH	0.009	0.028	0.009	+0.028
13	7134.510 5493.823	7144.751 $500.333	7134.517 5493.786	7144.759 $500.35	Down	NORTH	0.036	0.019	0.036	+0.019
14	7134.535 5493.919	7144.652 $500.377	7134.522 5493.906	7144.679 $500.351	Down	NORTH	0.018	0.037	0.018	+0.037
15	7134.560 5494.025	7144.541 $500.394	7134.595 5493.934	7144.546 $500.359	Down	NORTH	0.097	0.035	0.097	+0.035
16	7134.577 5494.112	7144.454 $500.412	7134.573 5494.113	7144.46 $500.415	Down	NORTH	0.004	0.007	0.004	-0.007
17	7134.594 5494.211	7144.345 $500.428	7134.601 5494.183	7144.363 $500.426	Down	NORTH	0.029	0.018	0.029	+0.018
18	7134.625 5494.307	7144.235 $500.467	7134.626 5494.307	7144.288 $500.433	Down	NORTH	0.000	0.049	0.000	+0.049
19	7134.631 5494.395	7144.115 $500.456	7134.655 5494.347	7144.122 $500.463	Down	NORTH	0.054	0.010	0.054	+0.010
20	7134.647 5494.501	7144.046 $500.482	7134.588 5494.303	7144.072 $500.466	Down	SOUTH	0.207	0.031	0.207	0.031
21	7134.662 5494.601	7143.953 $500.512	7134.684 5494.534	7143.963 $500.507	Down	NORTH	0.067	0.011	0.067	+0.011
22	7134.702 5494.709	7143.871 $500.531	7134.589 5494.685	7143.878 $500.517	Down	NORTH	0.020	0.016	0.020	+0.016
23	7134.719 5494.810	7143.772 $500.545	7134.786 5494.786	7143.776 $500.554	Down	NORTH	0.081	0.000	0.081	-0.000
24	7134.730 5494.901	7143.680 $500.595	7134.751 5494.872	7143.667 $500.578	Down	NORTH	0.036	0.018	0.036	+0.018
25	7134.753 5494.984	7143.584 $500.612	7134.727 5494.943	7143.586 $500.583	Down	NORTH	0.033	0.038	0.033	+0.038
26	7134.784 5495.110	7143.455 $500.615	7134.763 5495.07	7143.46 $500.616	Down	NORTH	0.045	0.005	0.045	-0.005
27	7134.793 5495.175	7143.363 $500.630	7134.788 5495.154	7143.429 $500.606	Down	NORTH	0.022	0.020	0.022	+0.020
28	7134.833 5495.301	7143.271 $500.656	7134.776 5495.305	7143.257 $500.683	Down	NORTH	0.057	0.030	0.057	+0.030
29	7134.836 5495.374	7143.180 $500.668	7134.804 5495.346	7143.217 $500.598	Down	NORTH	0.045	0.079	0.045	+0.079
30	7134.863 5495.459	7143.085 $500.709	7134.888 5495.481	7143.084 $500.715	Down	NORTH	0.033	0.006	0.033	-0.006
31	7134.882 5495.559	7142.976 $500.719	7134.85 5495.537	7143.03 $500.701	Down	NORTH	0.032	0.055	0.032	+0.055
32	7134.890 5495.648	7142.902 $500.734	7134.885 5495.641	7142.988 $500.649	Down	NORTH	0.007	0.121	0.007	-0.121
33	7134.916 5495.730	7142.780 $500.755	7134.911 5495.686	7142.75 $500.778	Down	NORTH	0.044	0.036	0.044	+0.036
34	7134.912 5495.862	7142.676 $500.772	7134.902 5495.878	7142.668 $500.765	Down	NORTH	0.010	0.011	0.010	+0.011
35	7134.874 5495.951	7142.586 $500.800	7134.839 5495.935	7142.523 $500.598	Down	NORTH	0.036	0.016	0.036	+0.016
36	7134.958 5496.048	7142.487 $500.827	7134.967 5495.96	7142.537 $500.678	Down	NORTH	0.088	0.211	0.088	+0.211
37	7134.958 5496.166	7142.391 $500.864	7136.013 5496.035	7142.361 $500.839	Down	NORTH	0.142	0.054	0.142	-0.054
38	7134.976 5496.246	7142.303 $500.865	7134.976 5496.214	7142.323 $500.8	Down	NORTH	0.032	0.068	0.032	+0.068
39	7136.003 5496.353	7142.203 $500.869	7135.016 5496.364	7142.205 $500.811	Down	NORTH	0.017	0.078	0.017	+0.078
40	7134.977 5496.414	7142.041 $500.844	7135.085 5496.773	7142 $500.823	Down	NORTH	0.375	0.046	0.375	+0.046
41	7135.016 5496.561	7141.988 $500.883	7134.856 5496.536	7141.999 $500.804	Down	NORTH	0.162	0.016	0.162	+0.016
42	7134.962 5496.640	7141.906 $500.945	7134.915 5496.545	7141.946 $500.926	Down	NORTH	0.116	0.044	0.116	+0.044
43	7135.035 5496.751	7141.801 $500.952	7135.05 5496.754	7141.806 $500.946	Down	NORTH	0.015	0.009	0.015	+0.009
44	7135.069 5496.896	7141.715 $500.946	7136.046 5496.837	7141.795 $500.936	Down	NORTH	0.063	0.054	0.063	-0.054
45	7134.875 5496.922	7141.617 $501.015	7135.813 5496.891	7141.635 $501.004	Down	NORTH	0.930	0.021	0.930	+0.021
46	7136.122 5497.066	7141.524 $501.040	7135.116 5497.006	7141.596 $500.95	Down	NORTH	0.056	0.115	0.058	-0.115
47	7136.135 5497.149	7141.364 $501.094	7136.125 5497.087	7141.386 $501.071	Down	NORTH	0.063	0.023	0.063	-0.023
48	7136.145 5497.236	7141.349 $501.091	7134.715 5497.004	7141.352 $501.056	Down	NORTH	0.489	0.035	0.482	-0.035
49	7136.151 5497.332	7141.227 $501.116	7135.138 5497.357	7141.258 $501.124	Down	NORTH	0.028	0.032	0.028	+0.032
50	7135.161 5497.446	7141.123 $501.152	7134.701 5497.501	7141.155 $501.155	Down	NORTH	0.463	0.032	0.463	-0.032
51	7135.198 5497.534	7141.046 $501.148	7135.168 5497.389	7141.09 $501.054	Down	NORTH	0.148	0.103	0.148	-0.103
52	7135.201 5497.633	7140.936 $501.168	7135.206 5497.559	7140.975 $501.125	Down	NORTH	0.074	0.057	0.074	-0.057
53	7135.220 5497.706	7140.836 $501.177	7135.146 5497.611	7140.863 $501.094	Down	NORTH	0.022	0.070	0.022	+0.070
54	7135.230 5497.826	7140.755 $501.189	7135.237 5497.73	7140.763 $501.132	Down	NORTH	0.096	0.058	0.096	+0.058
55	7135.239 5497.911	7140.661 $501.226	7135.217 5497.915	7140.657 $501.228	Down	NORTH	0.022	0.004	0.022	-0.004
56	7135.238 5498.033	7140.518 $501.244	7135.242 5498.021	7140.52 $501.239	Down	NORTH	0.013	0.005	0.013	-0.005
57	7135.276 5498.091	7140.469 $501.267	7135.31 5498.036	7140.445 $501.263	Down	NORTH	0.065	0.024	0.065	-0.024
58	7135.312 5498.208	7140.352 $501.290	7135.329 5498.193	7140.34 $501.286	Down	NORTH	0.042	0.013	0.042	+0.013
59	7135.380 5498.281	7140.279 $501.333	7135.368 5498.23	7140.263 $501.291	Down	NORTH	0.052	0.045	0.052	+0.045
60	7135.377 5498.417	7140.149 $501.331	7135.356 5498.412	7140.182 $501.249	Down	NORTH	0.022	0.088	0.022	+0.088
61	7135.397 5498.514	7140.046 $501.368	7135.36 5498.499	7140.072 $501.331	Down	NORTH	0.023	0.045	0.023	+0.045
62	7135.423 5498.596	7139.978 $501.377	7135.405 5498.542	7139.986 $501.366	Down	NORTH	0.057	0.013	0.057	+0.013
63	7135.427 5498.695	7139.878 $501.396	7135.457 5498.649	7139.866 $501.35	Down	NORTH	0.055	0.049	0.055	+0.049
64	7135.441 5498.814	7139.725 $501.432	7135.436 5498.736	7139.729 $501.429	Down	NORTH	0.078	0.004	0.078	+0.004
65	7135.506 5498.850	7139.680 $501.466	7135.521 5498.875	7139.649 $501.433	Down	NORTH	0.029	0.047	0.029	+0.047
66	7135.513 5498.984	7139.562 $501.467	7135.536 5498.936	7139.537 $501.45	Down	NORTH	0.053	0.030	0.053	-0.030
67	7135.540 5499.079	7139.487 $501.507	7135.547 5499.073	7139.42 $501.506	Down	NORTH	0.009	0.113	0.009	+0.113
68	7135.561 5499.193	7139.426 $501.542	7135.55 5499.177	7139.239 $501.497	Down	NORTH	0.019	0.192	0.019	+0.192
69	7135.583 5499.281	7139.268 $501.544	7135.581 5499.262	7139.13 $501.514	Down	NORTH	0.019	0.141	0.019	+0.141
70	7135.611 5499.370	7139.173 $501.585	7135.618 5499.291	7139.043 $501.443	Down	NORTH	0.079	0.193	0.079	+0.193
71	7135.599 5499.482	7139.068 $501.593	7135.658 5499.437	7138.947 $501.567	Down	SOUTH	0.061	0.143	0.061	0.143
72	7135.638 5499.532	7139.007 $501.602	7133.597 5499.557	7138.776 $501.602	Down	SOUTH	2.452	0.191	2.452	0.191
73	7135.736 5499.656	7138.878 $501.645	7135.71 5499.693	7138.919 $501.618	Down	NORTH	0.045	0.049	0.045	-0.049
74	7135.667 5499.810	7138.754 $501.650	7135.696 5499.782	7138.79 $501.625	Down	NORTH	0.040	0.044	0.040	-0.044
75	7135.702 5499.883	7138.680 $501.671	7135.714 5499.834	7138.738 $501.661	Down	NORTH	0.050	0.050	0.050	-0.050
76	7135.717 5499.956	7138.575 $501.705	7135.736 5499.894	7138.567 $501.695	Down	NORTH	0.065	0.013	0.065	-0.013
77	7135.717 5500.062	7138.477 $501.745	7135.739 5500.029	7138.515 $501.731	Down	NORTH	0.040	0.040	0.040	-0.040
78	7135.770 5500.154	7138.436 $501.727	7135.945 5500.473	7138.374 $501.702	Down	NORTH	0.364	0.069	0.364	-0.069
79	7135.774 5500.258	7138.274 $501.755	7135.783 5500.276	7138.265 $501.753	Down	NORTH	0.012	0.009	0.012	-0.009
80	7135.667 5499.810	7138.197 $501.767	7136.635 5499.79	7138.185 $501.778	Down	NORTH	0.036	0.033	0.036	+0.033
81	7135.817 5500.446	7138.114 $501.808	7135.8 5500.391	7138.046 $501.775	Down	NORTH	0.056	0.075	0.056	+0.075
82	7135.837 5500.518	7138.007 $501.820	7135.808 5500.477	7138.009 $501.842	Down	NORTH	0.050	0.022	0.050	-0.022
83	7135.845 5500.623	7137.920 $501.867	7135.874 5500.56	7137.913 $501.842	Down	NORTH	0.069	0.026	0.069	-0.026
84	7135.872 5500.714	7137.818 $501.873	7135.855 5500.691	7137.799 $501.857	Down	NORTH	0.029	0.025	0.029	-0.025
85	7135.893 5500.816	7137.726 $501.871	7135.927 5500.787	7137.72 $501.87	Down	NORTH	0.068	0.008	0.068	-0.008
86	7135.936 5500.933	7137.615 $501.935	7135.925 5500.904	7137.621 $501.946	Down	NORTH	0.031	0.013	0.031	-0.013
87	7135.944 5501.029	7137.515 $501.932	7135.962 5500.992	7137.526 $501.925	Down	NORTH	0.041	0.013	0.041	-0.013
88	7135.975 5501.151	7137.414 $501.960	7135.955 5501.127	7137.417 $501.871	Down	NORTH	0.031	0.089	0.031	-0.089
89	7136.008 5501.249	7137.298 $501.993	7136.007 5501.232	7137.323 $501.92	Down	NORTH	0.017	0.077	0.017	-0.077
90	7136.002 5501.334	7137.192 $502.025	7136.037 5501.353	7137.206 $501.956	Down	NORTH	0.036	0.070	0.036	-0.070
91	7136.032 5501.424	7137.138 $502.017	7136.088 5501.438	7137.131 $502.017	Down	NORTH	0.056	0.007	0.056	-0.007
92	7136.062 5501.534	7137.029 $502.041	7136.067 5501.523	7137 $502.043	Down	NORTH	0.012	0.029	0.012	-0.029
93	7136.091 5501.642	7136.958 $502.068	7136.108 5501.564	7136.945 $502.034	Down	NORTH	0.080	0.036	0.080	-0.036
94	7136.128 5501.704	7136.876 $502.088	7136.132 5501.678	7136.822 $502.026	Down	NORTH	0.027	0.082	0.027	-0.082
95	7136.130 5501.746	7136.788 $502.093	7136.109 5501.729	7136.772 $502.104	Down	NORTH	0.027	0.019	0.027	-0.019
96	7136.153 5501.895	7136.648 $502.101	7136.179 5501.86	7136.634 $502.128	Down	NORTH	0.044	0.030	0.044	-0.030
97	7136.161 5502.010	7136.536 $502.153	7136.207 5501.917	7136.543 $502.164	Down	NORTH	0.112	0.013	0.112	-0.013
98	7136.162 5502.099	7136.481 $502.164	7136.212 5502.047	7136.483 $502.201	Down	NORTH	0.050	0.043	0.050	-0.043
99	7136.186 5502.239	7136.365 $502.192	7136.183 5502.195	7136.374 $502.21	Down	NORTH	0.043	0.029	0.043	-0.029
100	7136.220 5502.296	7136.253 $602.227	7136.227 5502.292	7136.245 $502.263	UP	NORTH	0.008	0.037	-0.008	-0.037
101	7136.215 5502.402	7136.169 $502.245	7136.216 5502.345	7136.19 $502.245	Down	NORTH	0.037	0.021	0.037	-0.021
102	7136.244 5502.487	7136.059 $502.250	7136.318 5502.421	7136.118 $502.237	Down	NORTH	0.099	0.060	0.099	-0.060
103	7136.276 5502.620	7135.973 $502.291	7136.263 5502.524	7135.989 $502.296	Down	NORTH	0.097	0.017	0.097	-0.017
104	7136.277 5502.665	7135.885 $502.308	7136.281 5502.658	7135.892 $502.287	Down	NORTH	0.027	0.034	0.027	-0.034
105	7136.306 5502.799	7135.759 $502.346	7136.311 5502.774	7135.745 $502.339	Down	NORTH	0.025	0.016	0.025	-0.016
106	7136.320 5502.906	7135.640 $502.376	7136.343 5502.831	7135.589 $502.348	Down	NORTH	0.076	0.066	0.076	-0.066
107	7136.351 5503.018	7135.561 $502.403	7136.434 5502.941	7135.569 $502.375	Down	NORTH	0.113	0.029	0.113	-0.029
108	7136.350 5503.095	7135.458 $502.428	7136.35 5503.062	7135.458 $502.418	Down	NORTH	0.033	0.010	0.033	-0.010
109	7136.400 5503.204	7135.362 $502.451	7136.39 5503.157	7135.371 $502.46	UP	NORTH	0.048	0.013	-0.048	-0.013
110	7136.419 5503.294	7135.289 $502.443	7136.377 5503.252	7135.273 $502.474	UP	NORTH	0.059	0.035	-0.059	-0.035
111	7136.412 5503.365	7135.172 $502.498	7136.403 5503.316	7135.21 $502.484	UP	NORTH	0.040	0.038	-0.040	-0.038
112	7136.346 5503.451	7135.091 $502.501	7136.538 5503.306	7135.104 $502.507	UP	NORTH	0.241	0.041	-0.241	-0.041
113	7136.479 5503.514	7134.980 $502.532	7136.431 5503.502	7134.999 $502.546	UP	NORTH	0.082	0.021	-0.082	-0.021
114	7136.477 5503.655	7134.981 $502.495	7136.558 5503.573	7134.986 $502.5	Down	NORTH	0.115	0.007	0.115	-0.007
115	7136.495 5503.766	7134.784 $502.551	7136.512 5503.749	7134.783 $502.582	UP	NORTH	0.024	0.036	-0.024	-0.036
116	7136.505 5503.881	7134.695 $502.573	7136.493 5503.838	7134.721 $502.589	Down	NORTH	0.045	0.031	0.045	+0.031
117	7136.517 5503.961	7134.606 $502.599	7136.503 5503.909	7134.525 $502.624	UP	NORTH	0.054	0.087	-0.054	-0.087
118	7136.551 5504.079	7134.324 $502.411	7136.509 5504.049	7134.352 $502.435	Down	NORTH	0.052	0.037	0.052	-0.037
119	7136.550 5504.260	7134.503 $502.550	7136.55 5504.23	7134.45 $502.526	Down	NORTH	0.030	0.072	0.030	-0.072
120	7136.593 5504.261	7134.281 $502.626	7136.582 5504.291	7134.352 $502.687	UP	NORTH	0.032	0.094	-0.032	-0.094
121	7136.583 5504.354	7134.203 $502.721	7136.579 5504.346	7134.211 $502.719	UP	NORTH	0.009	0.008	-0.009	-0.008
122	7136.630 5504.471	7134.080 $502.729	7136.617 5504.464	7134.082 $502.706	Down	NORTH	0.023	0.023	0.023	-0.023
123	7136.660 5504.558	7134.009 $502.779	7136.666 5504.558	7134.036 $502.798	UP	NORTH	0.006	0.037	-0.006	-0.037
124	7136.699 5504.674	7133.925 $502.804	7136.679 5504.64	7133.936 $502.817	UP	NORTH	0.039	0.017	-0.039	-0.017
125	7136.687 5504.755	7133.812 $502.823	7136.691 5504.72	7133.818 $502.816	UP	NORTH	0.035	0.008	-0.035	-0.008
126	7136.726 5504.854	7133.719 $502.839	7136.701 5504.847	7133.729 $502.852	UP	NORTH	0.025	0.016	-0.025	-0.016
127	7136.737 5504.952	7133.632 $502.866	7136.726 5504.931	7133.636 $502.858	UP	NORTH	0.024	0.009	-0.024	-0.009
128	7136.757 5505.033	7133.509 $502.900	7136.740 5505.023	7133.513 $502.916	UP	NORTH	0.013	0.016	-0.013	-0.016
129	7136.779 5505.115	7133.409 $502.914	7136.778 5505.114	7133.400 $502.907	UP	NORTH	0.001	0.007	-0.001	-0.007
130	7136.780 5505.222	7133.334 $502.913	7136.783 5505.145	7133.305 $502.861	Down	NORTH	0.077	0.060	0.077	-0.060
131	7136.818 5505.317	7133.258 $502.952	7136.745 5505.34	7133.233 $502.846	UP	NORTH	0.075	0.026	-0.075	-0.026
132	7136.842 5505.437	7133.159 $502.961	7136.845 5505.416	7133.133 $502.97	UP	NORTH	0.021	0.028	-0.021	-0.028
133	7136.844 5505.519	7133.050 $502.990	7136.843 5505.507	7133.038 $502.978	UP	NORTH	0.012	0.024	-0.012	-0.024
134	7136.865 5505.619	7132.940 $503.009	7136.849 5505.556	7132.935 $503.003	UP	NORTH	0.065	0.008	-0.065	-0.008
135	7136.879 5505.667	7132.816 $503.028	7136.866 5505.695	7132.813 $502.973	Down	NORTH	0.015	0.055	0.015	+0.055
136	7136.903 5505.808	7132.741 $503.054	7136.852 5505.773	7132.729 $503.043	UP	NORTH	0.052	0.016	-0.052	-0.016

137	7136.903	5505.899	7132.632	5503.068	7136.889	5505.867	7132.635	5503.077	UP	NORTH	0.035	0.009	-0.035	-0.009
138	7136.913	5506.090	7132.537	5503.089	7135.759	5505.282	7132.572	5503.112	UP	SOUTH	1.359	0.042	-1.359	0.042
139	7137.030	5506.058	7132.452	5503.107	7136.093	5506.05	7132.513	5503.112	UP	SOUTH	0.038	0.061	-0.038	0.061
140	7136.934	5506.178	7132.375	5503.135	7136.956	5506.185	7132.332	5503.141	UP	NORTH	0.026	0.043	-0.026	-0.043
141	7136.991	5506.319	7132.285	5503.156	7136.905	5506.27	7132.23	5503.167	UP	NORTH	0.099	0.037	-0.099	-0.037
142	7136.996	5506.396	7132.170	5503.169	7136.912	5506.378	7132.181	5503.121	Down	NORTH	0.088	0.049	0.088	-0.049
143	7137.031	5506.479	7132.116	5503.247	7137.03	5506.488	7132.111	5503.293	UP	NORTH	0.009	0.046	-0.009	-0.046
144	7137.046	5506.598	7131.982	5503.218	7137.05	5506.56	7132.016	5503.179	Down	NORTH	0.038	0.086	0.038	-0.086
145	7137.059	5506.679	7131.890	5503.228	7137.09	5506.667	7131.901	5503.216	UP	NORTH	0.024	0.016	-0.024	-0.016
146	7137.097	5506.780	7131.805	5503.207	7137.102	5506.722	7131.819	5503.213	Down	NORTH	0.038	0.015	0.038	-0.015
147	7137.133	5506.850	7131.670	5503.278	7137.155	5506.847	7131.627	5503.255	Down	NORTH	0.022	0.049	0.022	-0.049
148	7137.161	5506.947	7131.584	5503.293	7137.193	5506.985	7131.602	5503.316	UP	NORTH	0.039	0.029	-0.039	-0.029
149	7137.179	5507.047	7131.484	5503.329	7137.118	5507.05	7131.476	5503.362	UP	NORTH	0.061	0.024	-0.061	-0.024
150	7137.158	5506.924	7131.340	5503.353	7137.178	5506.923	7131.448	5503.293	Down	NORTH	0.020	0.124	0.020	-0.124
151	7137.225	5507.275	7131.291	5503.371	7137.194	5507.198	7131.282	5503.378	UP	NORTH	0.083	0.011	-0.083	-0.011
152	7137.263	5507.371	7131.190	5503.374	7137.25	5507.361	7131.151	5503.429	UP	NORTH	0.016	0.067	-0.016	-0.067
153	7137.235	5507.437	7131.104	5503.399	7137.253	5507.358	7131.119	5503.306	Down	NORTH	0.081	0.094	0.081	-0.094
154	7137.266	5507.539	7130.976	5503.429	7137.278	5507.466	7130.981	5503.449	UP	NORTH	0.054	0.021	-0.054	-0.021
155	7137.300	5507.637	7130.894	5503.456	7137.319	5507.592	7130.916	5503.452	UP	NORTH	0.049	0.025	-0.049	-0.025
156	7137.328	5507.750	7130.788	5503.459	7137.321	5507.66	7130.797	5503.466	UP	NORTH	0.070	0.013	-0.070	-0.013
157	7137.353	5507.829	7130.671	5503.486	7137.354	5507.756	7130.694	5503.48	Down	NORTH	0.073	0.024	0.073	-0.024
158	7137.375	5507.901	7130.596	5503.511	7137.381	5507.866	7130.555	5503.46	Down	NORTH	0.038	0.065	0.038	-0.065
159	7137.350	5508.056	7130.465	5503.466	7137.358	5508.048	7130.468	5503.362	Down	NORTH	0.020	0.104	0.020	-0.104
160	7137.410	5508.131	7130.392	5503.557	7137.393	5508.114	7130.373	5503.496	Down	NORTH	0.024	0.064	0.024	-0.064
161	7137.452	5508.255	7130.281	5503.589	7137.456	5508.228	7130.286	5503.583	UP	NORTH	0.027	0.008	-0.027	-0.008
162	7137.478	5508.360	7130.206	5503.611	7137.444	5508.28	7130.264	5503.615	UP	NORTH	0.078	0.058	-0.078	-0.058
163	7137.515	5508.481	7130.119	5503.650	7137.462	5508.42	7130.152	5503.672	UP	SOUTH	0.081	0.040	-0.081	0.040
164	7137.516	5508.530	7129.999	5503.664	7137.484	5508.496	7130.013	5503.694	UP	NORTH	0.047	0.017	-0.047	-0.017
165	7137.528	5508.616	7129.929	5503.696	7137.517	5508.596	7129.934	5503.698	UP	NORTH	0.023	0.005	-0.023	-0.005
166	7137.541	5508.718	7129.834	5503.727	7137.542	5508.663	7129.825	5503.737	UP	NORTH	0.055	0.013	-0.055	-0.013
167	7137.564	5508.835	7129.720	5503.742	7137.561	5508.767	7129.696	5503.774	UP	SOUTH	0.072	0.040	-0.072	0.040
168	7137.593	5508.922	7129.628	5503.765	7137.587	5508.906	7129.578	5503.796	UP	NORTH	0.017	0.059	-0.017	-0.059
169	7137.608	5509.042	7129.540	5503.798	7137.6	5509.022	7129.528	5503.796	UP	NORTH	0.022	0.012	-0.022	-0.012
170	7137.638	5509.125	7129.466	5503.810	7137.625	5509.093	7129.47	5503.788	UP	NORTH	0.036	0.022	-0.036	-0.022
171	7137.649	5509.201	7129.344	5503.827	7137.605	5509.2	7129.383	5503.851	UP	NORTH	0.044	0.046	-0.044	-0.046
172	7137.656	5509.297	7129.246	5503.862	7137.637	5509.259	7129.254	5503.854	UP	NORTH	0.043	0.011	-0.043	-0.011
173	7137.704	5509.425	7129.136	5503.864	7137.67	5509.337	7129.133	5503.873	UP	SOUTH	0.094	0.009	-0.094	0.009
174	7137.723	5509.493	7129.033	5503.914	7137.723	5509.403	7129.024	5503.916	UP	NORTH	0.000	0.009	0.000	-0.009
175	7137.738	5509.593	7128.938	5503.920	7137.706	5509.564	7128.962	5503.940	UP	NORTH	0.043	0.038	-0.043	-0.038
176	7137.773	5509.705	7128.853	5503.935	7137.737	5509.707	7128.844	5503.940	UP	SOUTH	0.036	0.017	-0.036	0.017
177	7137.792	5509.779	7128.760	5503.954	7137.772	5509.788	7128.751	5503.956	UP	SOUTH	0.022	0.009	-0.022	0.009
178	7137.805	5509.894	7128.695	5503.995	7137.805	5509.894	7128.705	5503.979	UP	NORTH	0.000	0.019	0.000	-0.019
179	7137.822	5510.001	7128.537	5504.039	7137.797	5510.006	7128.562	5504.11	UP	NORTH	0.025	0.075	-0.025	-0.075
180	7137.837	5510.101	7128.473	5504.024	7137.864	5510.092	7128.401	5504.1	UP	NORTH	0.028	0.078	-0.028	-0.078
181	7137.863	5510.174	7128.319	5504.038	7137.81	5510.13	7128.165	5504.11	UP	SOUTH	0.069	0.171	-0.069	0.171
182	7137.862	5510.236	7128.272	5504.053	7137.906	5510.18	7128.132	5504.111	UP	SOUTH	0.060	0.152	-0.060	0.152
183	7137.892	5510.313	7128.171	5504.070	7137.936	5510.301	7128.065	5504.12	UP	SOUTH	0.046	0.117	-0.046	0.117
184	7137.940	5510.485	7128.077	5504.107	7137.94	5510.442	7127.936	5504.119	UP	SOUTH	0.023	0.142	-0.023	0.142
185	7138.003	5510.415	7127.938	5504.117	7138.031	5510.363	7127.837	5504.151	UP	SOUTH	0.068	0.107	-0.068	0.107
186	7137.965	5510.621	7127.859	5504.147	7137.923	5510.552	7127.734	5504.186	UP	SOUTH	0.081	0.131	-0.081	0.131
187	7137.996	5510.722	7127.749	5504.178	7138.009	5510.698	7127.786	5504.185	UP	SOUTH	0.027	0.036	-0.027	0.036
188	7138.016	5510.875	7127.696	5504.178	7138.024	5510.856	7127.75	5504.208	UP	SOUTH	0.019	0.062	-0.019	0.062
189	7138.025	5510.959	7127.577	5504.193	7138.038	5510.938	7127.447	5504.241	UP	SOUTH	0.025	0.130	-0.025	0.130
190	7138.033	5511.032	7127.466	5504.237	7138.024	5511.059	7127.348	5504.251	UP	NORTH	0.028	0.141	-0.028	-0.141
191	7138.078	5511.116	7127.386	5504.223	7138.062	5511.155	7127.243	5504.229	UP	SOUTH	0.039	0.143	-0.039	0.143
192	7138.093	5511.250	7127.271	5504.239	7138.024	5511.268	7127.259	5504.227	Down	SOUTH	0.070	0.017	0.070	0.017
193	7138.128	5511.358	7127.189	5504.273	7138.115	5511.347	7127.196	5504.292	UP	SOUTH	0.017	0.020	-0.017	0.020
194	7138.144	5511.454	7127.094	5504.295	7138.113	5511.394	7127.094	5504.271	Down	SOUTH	0.068	0.024	0.068	0.024
195	7138.155	5511.541	7126.907	5504.297	7138.169	5511.481	7126.851	5504.238	Down	SOUTH	0.062	0.081	0.062	0.081
196	7138.165	5511.636	7126.878	5504.330	7138.112	5511.587	7126.841	5504.342	UP	SOUTH	0.072	0.030	-0.072	0.030
197	7138.186	5511.749	7126.793	5504.323	7138.181	5511.697	7126.798	5504.225	Down	SOUTH	0.052	0.098	0.052	0.098
198	7138.216	5511.852	7126.692	5504.377	7138.208	5511.821	7126.709	5504.361	UP	SOUTH	0.033	0.017	-0.033	0.017
199	7138.236	5511.934	7126.590	5504.400	7138.252	5511.915	7126.532	5504.36	UP	SOUTH	0.025	0.059	-0.025	0.059
200	7138.262	5512.023	7126.496	5504.366	7138.258	5512.014	7126.469	5504.389	Down	SOUTH	0.010	0.007	0.010	0.007

UP	76	170	NORTH
DOWN	124	30	SOUTH

This is number of pebbles moving different ways

	LINE PARALLEL TO CONTOUR GROSS movement	LINE ORIENTED DOWNGRADIENT GROSS movement	LINE PARALLEL TO CONTOUR NET movement	LINE ORIENTED DOWNGRADIENT NET movement	
	2.452	0.212	2.452	0.181	max (m)
	-	0.004	(1.359)	(0.212)	min (m)
	0.076	0.046	0.032	(0.024)	avg (m)
	0.212	0.043	0.223	0.044	stdv (m)
	0.040	0.032	0.022	(0.024)	median (m)

pebbles moving > than uncertainty of measure	158	1 SIGMA	0.022 m
	62	2 SIGMA	0.044 m

ASSUMING 0.022 RMS UNCERTAINTY

THIS IS THE SENSITIVITY TEST FOR HOW MANY PEBBLES REALLY MOVED

Caculations for Pebble data Goldstone

These calculations compare movement from orginal positions. The pebbles are seperated into Line countour parallel and Line oriented down gradient pebbles.

The countour parallel line pebbles move up and down and the line oriented down gradient pebbles move north and south.

The calculations include gross movement and net movement. Gross movement does not take into account that some pebbles move up from the line and some move down from the line.

The maximum, minimum, average, standard deviation and median of gross and net pebble movment is shown at the bottom of the spread sheet. A sensitivity test is also included to determine how many pebbles are actually moving.

Gross movement accounts for all movement not just movment in downslope direction
Should we also figure out the down slope movement?

LINE PARALLEL TO CONTOUR NORTHING = -
4.133059306*EASTING1 + 41446.363475501

LINE ORIENTED DOWN GRADIENT NORTHING =
0.247408463*EASTING1 + 1125.893681083

	May--00				Apr--02									
	LINE PARALLEL TO CONTOUR		LINE ORIENTED DOWNGRADIENT		LINE PARALLEL TO CONTOUR		LINE ORIENTED DOWNGRADIENT		LINE PARALLEL TO CONTOUR	LINE ORIENTED DOWNGRADIENT			LINE PARALLEL TO CONTOUR	LINE ORIENTED DOWNGRADIENT
	e	n	e	n	e	n	e	n	UP vs DOWN MOVEMENT	NORTH vs SOUTH MOVEMENT	GROSS movement	GROSS movement	NET movement	NET movement
1	7134.292	5492.648	7145.982	5500.116	7134.256	5492.606	7145.990	5500.090	Down	NORTH	0.048	0.054	0.027	0.054	-0.027
2	7134.307	5492.746	7145.845	5500.119	7134.265	5492.750	7145.853	5500.156	UP	NORTH	0.077	0.042	0.038	-0.042	-0.036
3	7134.333	5492.827	7145.728	5500.145	7134.331	5492.825	7145.741	5500.128	Down	NORTH	0.024	0.003	0.021	0.003	-0.021
4	7134.343	5492.909	7145.663	5500.163	7134.345	5492.893	7145.656	5500.16	Down	NORTH	0.046	0.016	0.008	0.016	-0.008
5	7134.346	5493.026	7145.542	5500.196	7134.340	5493.011	7145.556	5500.197	UP	NORTH	0.034	0.016	0.014	-0.016	-0.014
6	7134.367	5493.131	7145.428	5500.197	7134.405	5493.115	7145.439	5500.233	UP	NORTH	0.014	0.016	0.038	-0.016	-0.038
7	7134.429	5493.213	7145.340	5500.239	7134.413	5493.227	7145.435	5500.235	Down	NORTH	0.017	0.016	0.005	0.016	-0.005
8	7134.417	5493.324	7145.224	5500.232	7134.419	5493.301	7145.207	5500.234	Down	NORTH	0.039	0.024	0.017	0.024	-0.017
9	7134.445	5493.434	7145.146	5500.291	7134.414	5493.392	7145.143	5500.301	UP	NORTH	0.039	0.052	0.010	-0.052	-0.010
10	7134.474	5493.523	7145.045	5500.267	7134.380	5493.333	7145.060	5500.252	Down	SOUTH	0.111	0.212	0.021	0.212	0.021
11	7134.482	5493.619	7144.959	5500.293	7134.485	5493.619	7144.998	5500.278	Down	NORTH	0.020	0.003	0.042	0.003	-0.042
12	7134.503	5493.695	7144.883	5500.341	7134.512	5493.707	7144.865	5500.327	Down	NORTH	0.012	0.015	0.023	0.015	-0.023
13	7134.510	5493.823	7144.751	5500.333	7134.326	5493.735	7144.767	5500.330	Down	NORTH	0.028	0.204	0.016	0.204	-0.016
14	7134.535	5493.919	7144.652	5500.377	7134.522	5493.906	7144.677	5500.346	Down	NORTH	0.040	0.016	0.040	0.016	-0.040
15	7134.560	5494.025	7144.541	5500.394	7134.595	5493.934	7144.574	5500.369	Down	NORTH	0.062	0.097	0.041	0.097	-0.041
16	7134.577	5494.112	7144.454	5500.412	7134.573	5494.113	7144.468	5500.408	Down	NORTH	0.035	0.004	0.015	0.004	-0.015
17	7134.594	5494.211	7144.345	5500.428	7134.601	5494.183	7144.377	5500.398	Down	NORTH	0.021	0.029	0.044	0.029	-0.044
18	7134.628	5494.307	7144.253	5500.467	7134.626	5494.307	7144.291	5500.428	Down	NORTH	0.025	0.000	0.054	0.000	-0.054
19	7134.631	5494.395	7144.115	5500.456	7134.655	5494.347	7144.136	5500.427	Down	NORTH	0.037	0.054	0.036	0.054	-0.036
20	7134.647	5494.501	7144.046	5500.482	7134.588	5494.303	7144.167	5500.220	Down	SOUTH	0.200	0.207	0.289	0.207	0.289
21	7134.682	5494.601	7143.953	5500.512	7134.684	5494.534	7143.932	5500.480	Down	NORTH	0.047	0.067	0.038	0.067	-0.038
22	7134.702	5494.700	7143.871	5500.531	7134.756	5494.610	7143.876	5500.477	Down	NORTH	0.032	0.110	0.054	0.110	-0.054
23	7134.719	5494.810	7143.772	5500.545	7134.786	5494.765	7143.799	5500.541	Down	NORTH	0.047	0.081	0.027	0.081	-0.027
24	7134.730	5494.901	7143.680	5500.595	7134.751	5494.672	7143.583	5500.540	Down	NORTH	0.008	0.036	0.112	0.036	-0.112
25	7134.753	5494.984	7143.564	5500.612	7134.727	5494.943	7143.592	5500.586	Down	NORTH	0.057	0.033	0.036	0.033	-0.036
26	7134.784	5495.119	7143.455	5500.615	7134.832	5495.114	7143.467	5500.596	Down	NORTH	0.036	0.048	0.037	0.048	-0.037
27	7134.793	5495.175	7143.363	5500.630	7134.813	5495.135	7143.430	5500.612	Down	NORTH	0.031	0.046	0.069	0.046	-0.069
28	7134.833	5495.301	7143.271	5500.656	7134.791	5495.229	7143.346	5500.605	Down	SOUTH	0.077	0.083	0.091	0.083	0.091
29	7134.830	5495.374	7143.180	5500.666	7134.729	5495.302	7143.217	5500.577	Down	NORTH	0.055	0.131	0.098	0.131	-0.098
30	7134.863	5495.459	7143.085	5500.709	7134.843	5495.476	7143.064	5500.664	Down	NORTH	0.029	0.026	0.033	0.026	-0.033
31	7134.862	5495.559	7142.978	5500.719	7134.846	5495.562	7143.041	5500.684	Down	NORTH	0.049	0.017	0.072	0.017	-0.072
32	7134.869	5495.646	7142.902	5500.734	7134.903	5495.672	7142.972	5500.644	Down	NORTH	0.033	0.029	0.114	0.029	-0.114
33	7134.916	5495.730	7142.780	5500.755	7134.923	5495.721	7142.741	5500.706	Down	NORTH	0.065	0.011	0.063	0.011	-0.063
34	7134.912	5495.862	7142.676	5500.772	7134.884	5495.534	7143.032	5500.480	Down	NORTH	0.065	0.051	0.076	0.051	-0.076
35	7134.874	5495.951	7142.588	5500.800	7134.850	5495.967	7142.523	5500.598	Down	NORTH	0.137	0.021	0.212	0.021	-0.212
36	7134.958	5496.048	7142.487	5500.827	7134.990	5495.983	7142.497	5500.678	Down	NORTH	0.083	0.072	0.211	0.072	-0.211
37	7134.956	5496.168	7142.391	5500.884	7136.022	5496.038	7142.368	5500.815	Down	NORTH	0.100	0.143	0.073	0.143	-0.073
38	7134.976	5496.246	7142.303	5500.895	7134.994	5496.236	7142.336	5500.779	Down	NORTH	0.059	0.021	0.002	0.021	-0.002
39	7135.003	5496.363	7142.203	5500.888	7134.917	5496.577	7142.219	5500.891	Down	NORTH	0.052	0.240	0.016	0.240	-0.016
40	7134.977	5496.414	7142.041	5500.944	7135.077	5496.777	7142.067	5500.882	Down	NORTH	0.047	0.377	0.067	0.377	-0.067
41	7135.018	5496.561	7141.988	5500.883	7134.864	5496.549	7142.025	5500.838	Down	NORTH	0.239	0.152	0.058	0.152	-0.058
42	7134.962	5496.640	7141.906	5500.945	7134.915	5496.545	7141.961	5500.941	Down	NORTH	0.214	0.116	0.055	0.116	-0.055
43	7135.036	5496.751	7141.801	5500.952	7135.102	5496.773	7141.815	5500.932	Down	NORTH	0.091	0.071	0.024	0.071	-0.024
44	7135.060	5496.896	7141.715	5500.988	7136.058	5496.848	7141.745	5500.952	Down	NORTH	0.110	0.040	0.047	0.040	-0.047
45	7134.875	5496.922	7141.617	5501.015	7135.813	5496.891	7141.659	5501.004	Down	NORTH	0.640	0.930	0.043	0.930	-0.043
46	7135.122	5497.065	7141.524	5501.040	7135.123	5497.023	7141.614	5500.927	Down	NORTH	0.078	0.043	0.144	0.043	-0.144
47	7135.135	5497.149	7141.384	5501.094	7135.142	5497.122	7141.384	5501.104	Down	NORTH	0.091	0.028	0.010	0.028	-0.010
48	7135.145	5497.236	7141.349	5501.091	7134.797	5496.877	7141.359	5501.071	Down	NORTH	0.556	0.434	0.022	0.434	-0.022
49	7135.151	5497.332	7141.227	5501.116	7135.145	5497.356	7141.264	5501.138	Down	NORTH	0.127	0.025	0.043	0.025	-0.043
50	7135.181	5497.446	7141.123	5501.152	7134.717	5497.515	7141.155	5501.156	Down	NORTH	0.580	0.449	0.032	0.449	-0.032
51	7135.198	5497.534	7141.048	5501.148	7135.156	5497.395	7141.114	5501.056	Down	NORTH	0.164	0.145	0.113	0.145	-0.113
52	7135.201	5497.633	7140.938	5501.166	7135.212	5497.576	7140.986	5501.123	Down	NORTH	0.112	0.058	0.066	0.058	-0.066
53	7135.220	5497.706	7140.836	5501.177	7135.131	5497.603	7140.881	5501.115	Down	NORTH	0.202	0.136	0.077	0.136	-0.077
54	7135.230	5497.826	7140.755	5501.189	7135.229	5497.744	7140.768	5501.147	Down	NORTH	0.129	0.082	0.044	0.082	-0.044
55	7136.230	5497.911	7140.661	5501.226	7136.214	5497.926	7140.667	5501.226	Down	NORTH	0.157	0.029	0.026	0.029	-0.026
56	7135.238	5498.033	7140.518	5501.244	7136.256	5498.042	7140.534	5501.228	Down	NORTH	0.164	0.020	0.023	0.020	-0.023
57	7135.276	5498.091	7140.469	5501.267	7135.312	5498.048	7140.467	5501.266	Down	NORTH	0.110	0.056	0.002	0.056	-0.002
58	7135.312	5498.233	7140.352	5501.290	7136.333	5498.199	7140.333	5501.299	Down	NORTH	0.108	0.021	0.021	0.021	-0.021
59	7135.380	5498.281	7140.279	5501.333	7135.345	5498.228	7140.275	5501.305	Down	NORTH	0.094	0.063	0.028	0.063	-0.028
60	7135.377	5498.417	7140.149	5501.331	7135.387	5498.442	7140.214	5501.284	Down	NORTH	0.121	0.027	0.080	0.027	-0.080
61	7135.397	5498.514	7140.046	5501.366	7135.385	5498.513	7140.095	5501.350	Down	NORTH	0.114	0.012	0.052	0.012	-0.052
62	7135.423	5498.596	7139.978	5501.377	7135.429	5498.546	7139.965	5501.379	Down	NORTH	0.107	0.050	0.007	0.050	-0.007
63	7135.427	5498.695	7139.878	5501.398	7135.457	5498.614	7139.889	5501.351	Down	NORTH	0.074	0.068	0.048	0.068	-0.048
64	7135.441	5498.814	7139.726	5501.432	7135.478	5498.761	7139.747	5501.427	Down	NORTH	0.116	0.065	0.022	0.065	-0.022
65	7135.506	5498.850	7139.680	5501.468	7135.525	5498.871	7139.662	5501.451	Down	NORTH	0.050	0.028	0.025	0.028	-0.025
66	7135.513	5498.984	7139.562	5501.467	7135.583	5499.048	7139.566	5501.455	Down	NORTH	0.056	0.095	0.013	0.095	-0.013
67	7135.540	5499.079	7139.487	5501.597	7135.547	5499.073	7139.448	5501.476	Down	NORTH	0.064	0.009	0.127	0.009	-0.127
68	7135.561	5499.193	7139.428	5501.542	7135.594	5499.087	7139.250	5501.471	Down	NORTH	0.082	0.130	0.190	0.130	-0.190
69	7135.583	5499.281	7139.268	5501.544	7136.609	5499.170	7139.132	5501.499	Down	NORTH	0.058	0.114	0.143	0.114	-0.143
70	7135.611	5499.370	7139.173	5501.585	7136.610	5499.308	7139.028	5501.439	Down	NORTH	0.073	0.082	0.206	0.082	-0.206
71	7135.699	5499.482	7139.088	5501.593	7135.674	5499.438	7138.950	5501.546	Down	SOUTH	0.030	0.051	0.136	0.051	0.136
72	7135.636	5499.583	7138.987	5501.602	7133.597	5498.224	7138.791	5501.614	Down	SOUTH	2.487	2.452	0.176	2.452	0.176
73	7135.736	5499.656	7138.878	5501.645	7135.731	5499.713	7138.919	5501.618	Down	NORTH	0.058	0.057	0.049	0.057	-0.049
74	7135.667	5499.810	7136.754	5501.650	7135.716	5499.789	7138.79	5501.625	Down	NORTH	0.069	0.055	0.044	0.055	-0.044
75	7135.702	5499.883	7136.719	5501.671	7135.719	5499.842	7138.703	5501.654	Down	NORTH	0.052	0.044	0.022	0.044	-0.022
76	7135.717	5499.956	7136.575	5501.705	7135.868	5499.994	7138.554	5501.691	Down	NORTH	0.082	0.156	0.025	0.156	-0.025
77	7135.717	5500.062	7136.477	5501.745	7135.758	5500.071	7138.519	5501.735	Down	NORTH	0.067	0.040	0.043	0.040	-0.043
78	7135.770	5500.154	7136.438	5501.727	7136.945	5500.473	7138.404	5501.718	Down	NORTH	0.369	1.218	0.035	1.218	-0.035
79	7135.774	5500.266	7136.274	5501.755	7136.788	5500.238	7138.274	5501.750	Down	NORTH	0.083	0.033	0.005	0.033	-0.005
80	7135.667	5499.810	7136.197	5501.787	7135.642	5499.727	7138.172	5501.772	Down	NORTH	0.576	0.028	0.020	0.028	-0.020
81	7135.817	5500.446	7136.114	5501.808	7135.826	5500.378	7138.070	5501.773	Down	NORTH	0.088	0.069	0.058	0.069	-0.058
82	7135.837	5500.518	7138.007	5501.820	7135.957	5500.473	7138.018	5501.809	Down	NORTH	0.103	0.128	0.016	0.128	-0.016
83	7135.845	5500.623	7137.920	5501.867	7136.855	5500.589	7137.933	5501.836	Down	NORTH	0.071	0.035	0.034	0.035	-0.034
84	7135.872	5500.714	7137.818	5501.873	7136.855	5500.697	7137.820	5501.837	Down	NORTH	0.090	0.024	0.036	0.024	-0.036
85	7135.893	5500.856	7137.726	5501.871	7135.938	5500.820	7137.745	5501.852	Down	NORTH	0.038	0.058	0.025	0.058	-0.025
86	7135.936	5500.933	7137.615	5501.935	7135.932	5500.915	7137.614	5501.950	UP	NORTH	0.059	0.018	0.015	-0.018	-0.015
87	7135.944	5501.029	7137.515	5501.932	7136.963	5500.998	7137.468	5501.856	Down	NORTH	0.042	0.036	0.081	0.036	-0.081
88	7136.975	5501.151	7137.414	5501.960	7136.973	5501.147	7137.432	5501.840	Down	NORTH	0.075	0.004	0.121	0.004	-0.121
89	7136.008	5501.249	7137.298	5501.993	7135.995	5501.188	7137.320	5501.918	Down	NORTH	0.052	0.052	0.078	0.052	-0.078
90	7136.002	5501.334	7137.192	5502.025	7136.032	5501.331	7137.206	5501.943	Down	NORTH	0.043	0.030	0.083	0.030	-0.083
91	7136.032	5501.424	7137.138	5502.017	7136.069	5501.409	7137.095	5502.030	Down	NORTH	0.050	0.040	0.045	0.040	-0.045
92	7136.062	5501.534	7137.029	5502.041	7136.078	5501.521	7137.001	5502.048	Down	NORTH	0.051	0.021	0.028	0.021	-0.028
93	7136.091	5501.642	7136.958	5502.088	7136.094	5501.550	7136.945	5502.048	Down	NORTH	0.023	0.042	0.023	0.042	-0.023
94	7136.128	5501.704	7136.876	5502.088	7136.129	5501.680	7136.825	5502.039	Down	NORTH	0.025	0.024	0.071	0.024	-0.071
95	7136.130	5501.746	7136.788	5502.093	7136.113	5501.738	7136.775	5502.107	Down	NORTH	0.071	0.019	0.019	0.019	-0.019
96	7136.153	5501.895	7136.648	5502.101	7136.176	5501.862	7136.619	5502.137	Down	NORTH	0.015	0.040	0.046	0.040	-0.046
97	7136.161	5502.019	7136.536	5502.153	7136.102	5501.898	7136.553	5502.161	Down	NORTH	0.055	0.135	0.019	0.135	-0.019
98	7136.182	5502.099	7136.461	5502.164	7136.237	5502.007	7136.478	5502.190	Down	NORTH	0.024	0.107	0.031	0.107	-0.031
99	7136.186	5502.238	7136.365	5502.182	7136.270	5502.185	7136.392	5502.221	Down	NORTH	0.064	0.099	0.047	0.099	-0.047
100	7136.220	5502.296	7136.253	5502.227	7136.232	5502.371	7136.248	5502.239	Down	NORTH	0.043	0.076	0.013	0.076	-0.013
101	7136.215	5502.402	7136.169	5502.245	7136.235	5502.368	7136.180	5502.231	Down	NORTH	0.064	0.041	0.018	0.041	-0.018
102	7136.244	5502.467	7136.059	5502.250	7136.230	5502.457	7136.138	5502.244	Down	NORTH	0.042	0.033	0.077	0.033	-0.077
103	7136.276	5502.620	7135.973	5502.291	7136.262	5502.537	7136.025	5502.248	Down	NORTH	0.085	0.084	0.067	0.084	-0.067
104	7136.277	5502.685	7136.885	5502.306	7136.271	5502.666	7135.875	5502.280	Down	NORTH	0.058	0.020	0.030	0.020	-0.030
105	7136.306	5502.799	7135.759	5502.346	7136.300	5502.784	7135.750	5502.339	Down	NORTH	0.053	0.016	0.011	0.016	-0.011
106	7136.320	5502.908	7135.649	5502.376	7136.366	5502.849	7135.621	5502.371	Down	NORTH	0.039	0.073	0.028	0.073	-0.028
107	7136.351	5503.018	7135.561	5502.403	7136.435	5502.947	7135.496	5502.366	Down	NORTH	0.036	0.110	0.051	0.110	-0.051
108	7136.350	5503.095	7135.458	5502.428	7136.352	5503.073	7135.443	5502.434	UP	NORTH	0.071	0.022	0.016	-0.022	-0.016
109	7136.400	5503.204	7135.362	5502.451	7136.398	5503.170	7135.405	5502.409	Down	NORTH	0.051	0.034	0.060	0.034	-0.060
110	7136.419	5503.294	7135.289	5502.443	7136.383	5503.263	7135.245	5502.435	Down	NORTH	0.082	0.048	0.045	0.048	-0.045
111	7136.412	5503.355	7135.172	5502.488	7136.404	5503.331	7135.185	5502.534	UP	NORTH	0.076	0.025	0.037	-0.025	-0.037
112	7136.345	5503.461	7135.091	5502.501	7136.540	5503.552	7134.132	5502.475	Down	NORTH	0.132	0.239	0.859	0.239	-0.859
113	7136.479	5503.588	7134.980	5502.532	7136.434	5503.552	7135.001	5502.532	UP	NORTH	0.090	0.048	0.021	-0.048	-0.021
114	7136.477	5503.655	7134.881	5502.495	7136.536	5503.594	7134.987	5502.494	Down	NORTH	0.057	0.085	0.006	0.085	-0.006
115	7136.495	5503.786	7134.764	5502.551	7136.504	5503.752	7134.800	5502.534	Down	NORTH	0.051	0.017	0.040	0.017	-0.040
116	7136.505	5503.881	7134.695	5502.573	7136.497	5503.854	7134.708	5502.588	Down	NORTH	0.085	0.028	0.020	0.028	-0.020
117	7136.517	5503.961	7134.608	5502.599	7136.499	5503.939	7134.614	5502.614	UP	NORTH	0.083	0.037	0.065	-0.037	-0.065
118	7136.551	5504.079	7134.324	5502.411	7136.525	5504.055	7134.370	5502.429	Down	NORTH	0.112	0.035	0.049	0.035	-0.049
119	7136.550	5504.260	7134.503	5502.550	7136.532	5504.225	7134.453	5502.602	Down	NORTH	0.145	0.039	0.072	0.039	-0.072
120	7136.593	5504.261	7134.281	5502.626	7136.583	5504.283	7134.355	5502.664	Down	NORTH	0.109	0.024	0.084	0.024	-0.084
121	7136.583	5504.364	7134.203	5502.721	7136.579	5504.348	7134.198	5502.702	Down	NORTH	0.103	0.009	0.020	0.009	-0.020
122	7136.630	5504.471	7134.080	5502.729	7136.609	5504.458	7134.096	5502.671	Down	NORTH	0.098	0.033	0.060	0.033	-0.060
123	7136.660	5504.558	7134.009	5502.773	7136.657	5504.561	7134.062	5502.763	UP	NORTH	0.074	0.004	0.054	-0.004	-0.054
124	7136.699	5504.674	7133.925	5502.804	7136.701	5504.653	7133.940	5502.800	UP	NORTH	0.069	0.021	0.016	-0.021	-0.016
125	7136.667	5504.755	7133.812	5502.823	7136.684	5504.735	7133.817	5502.807	UP	NORTH	0.067	0.020	0.017	-0.020	-0.017
126	7136.726	5504.854	7133.719	5502.839	7136.720	5504.842	7133.716	5502.833	UP	NORTH	0.090	0.013	0.007	-0.013	-0.007
127	7136.737	5504.952	7133.632	5502.866	7136.725	5504.927	7133.642	5502.855	UP	NORTH	0.078	0.028	0.015	-0.028	-0.015
128	7136.757	5505.033	7133.509	5502.900	7136.759	5505.043	7133.513	5502.916	UP	NORTH	0.073	0.010	0.016	-0.010	-0.016
129	7136.770	5505.115	7133.409	5502.914	7136.785	5505.103	7133.401	5502.881	UP	NORTH	0.062	0.013	0.034	-0.013	-0.034
130	7136.780	5505.222	7133.334	5502.913	7136.777	5505.172	7133.258	5502.870	Down	NORTH	0.079	0.050	0.087	0.050	-0.087
131	7136.818	5505.317	7133.258	5502.952	7136.750	5505.343	7133.216	5502.946	UP	NORTH	0.141	0.071	0.042	-0.071	-0.042
132	7136.842	5505.437	7133.159	5502.961	7136.837	5505.434	7133.155	5502.973	UP	NORTH	0.061	0.006	0.013	-0.006	-0.013
133	7136.844	5505.519	7133.059	5502.990	7136.846	5505.510	7133.033	5502.976	UP	NORTH	0.076	0.009	0.030	-0.009	-0.030
134	7136.865	5505.619	7132.940	5503.009	7136.875	5505.585	7132.931	5503.010	UP	NORTH	0.084	0.035	0.009	-0.035	-0.009
135	7136.879	5505.687	7132.816	5503.028	7136.887	5505.721	7132.802	5502.999	Down	NORTH	0.089	0.035	0.032	0.035	-0.032
136	7136.903	5505.808	7132.741	5503.054	7136.862	5505.785	7132.803	5502.918	Down	NORTH	0.119	0.047	0.149	0.047	-0.149

137	7136.993	5505.899	7132.632	5503.068	7136.889	5505.867	7132.699	5503.036	Down	NORTH	0.102	0.035	0.073	0.035	-0.073
138	7136.913	5506.000	7132.537	5503.089	7136.761	5505.268	7132.599	5503.036	Down	SOUTH	1.424	1.365	0.082	1.365	0.082
139	7137.030	5506.058	7132.462	5503.107	7136.993	5506.05	7132.535	5503.059	Down	SOUTH	0.038	0.038	0.096	0.038	0.096
140	7136.934	5506.178	7132.375	5503.135	7136.905	5506.148	7132.346	5503.112	UP	NORTH	0.084	0.042	0.037	-0.042	-0.037
141	7136.991	5506.319	7132.285	5503.158	7136.914	5506.264	7132.270	5503.134	UP	NORTH	0.166	0.085	0.023	-0.085	-0.023
142	7136.996	5506.396	7132.170	5503.169	7136.934	5506.368	7132.245	5503.070	Down	NORTH	0.180	0.068	0.124	0.068	-0.124
143	7137.031	5506.479	7132.116	5503.247	7137.166	5506.499	7132.082	5503.259	UP	NORTH	0.089	0.138	0.036	-0.138	-0.036
144	7137.046	5506.598	7131.962	5503.218	7137.072	5506.572	7131.991	5503.180	Down	NORTH	0.080	0.037	0.048	0.037	-0.048
145	7137.069	5506.679	7131.890	5503.228	7137.092	5506.658	7131.887	5503.152	Down	NORTH	0.064	0.031	0.076	0.031	-0.076
146	7137.097	5506.760	7131.805	5503.207	7137.131	5506.755	7131.831	5503.156	Down	NORTH	0.092	0.034	0.057	0.034	-0.057
147	7137.133	5506.850	7131.670	5503.278	7137.116	5506.885	7131.666	5503.270	UP	NORTH	0.035	0.039	0.009	-0.039	-0.009
148	7137.161	5506.987	7131.584	5503.293	7137.194	5506.984	7131.602	5503.251	Down	NORTH	0.035	0.033	0.046	0.033	-0.046
149	7137.179	5507.047	7131.484	5503.329	7137.099	5507.071	7131.479	5503.236	Down	NORTH	0.111	0.084	0.093	0.084	-0.093
150	7137.158	5506.924	7131.340	5503.353	7137.166	5506.926	7131.467	5503.253	Down	NORTH	0.217	0.006	0.182	0.006	-0.182
151	7137.225	5507.275	7131.291	5503.371	7137.193	5507.150	7131.369	5503.362	UP	NORTH	0.078	0.129	0.079	-0.129	-0.079
152	7137.283	5507.371	7131.190	5503.374	7137.25	5507.361	7131.157	5503.283	Down	NORTH	0.053	0.016	0.097	0.016	-0.097
153	7137.235	5507.437	7131.104	5503.399	7137.223	5507.353	7131.161	5503.371	Down	NORTH	0.082	0.085	0.064	0.085	-0.064
154	7137.266	5507.539	7130.976	5503.429	7137.262	5507.501	7130.973	5503.414	Down	NORTH	0.058	0.038	0.015	0.038	-0.015
155	7137.300	5507.637	7130.894	5503.456	7137.324	5507.570	7130.909	5503.421	Down	NORTH	0.038	0.071	0.036	0.071	-0.036
156	7137.328	5507.750	7130.788	5503.459	7137.354	5507.665	7130.889	5503.380	Down	NORTH	0.055	0.070	0.113	0.070	-0.113
157	7137.353	5507.829	7130.671	5503.466	7137.379	5507.770	7130.858	5503.441	Down	NORTH	0.062	0.064	0.047	0.064	-0.047
158	7137.375	5507.901	7130.596	5503.511	7137.404	5507.861	7130.575	5503.416	Down	NORTH	0.043	0.040	0.097	0.040	-0.097
159	7137.350	5508.066	7130.465	5503.466	7137.381	5508.072	7130.506	5503.318	Down	NORTH	0.080	0.032	0.154	0.032	-0.154
160	7137.410	5508.131	7130.362	5503.557	7137.425	5508.083	7130.991	5503.471	Down	NORTH	0.054	0.050	0.805	0.050	-0.805
161	7137.452	5508.255	7130.281	5503.582	7137.476	5508.178	7130.307	5503.515	Down	NORTH	0.031	0.081	0.078	0.081	-0.078
162	7137.478	5508.350	7130.206	5503.611	7137.461	5508.292	7130.270	5503.565	Down	NORTH	0.044	0.060	0.079	0.060	-0.079
163	7137.515	5508.481	7130.119	5503.650	7137.519	5508.429	7130.145	5503.598	Down	SOUTH	0.050	0.061	0.058	0.061	0.058
164	7137.516	5508.530	7129.999	5503.684	7137.507	5508.476	7130.023	5503.672	UP	NORTH	0.040	0.066	0.027	-0.066	-0.027
165	7137.528	5508.616	7129.929	5503.698	7137.541	5508.603	7129.920	5503.674	UP	NORTH	0.026	0.018	0.026	-0.018	-0.026
166	7137.541	5508.718	7129.834	5503.727	7137.566	5508.680	7129.864	5503.726	UP	NORTH	0.031	0.045	0.030	-0.045	-0.030
167	7137.584	5508.835	7129.720	5503.742	7137.591	5508.757	7129.873	5503.757	UP	SOUTH	0.027	0.078	0.049	-0.078	0.049
168	7137.593	5508.922	7129.628	5503.765	7137.607	5508.812	7129.564	5503.676	Down	NORTH	0.031	0.017	0.110	0.017	-0.110
169	7137.608	5509.042	7129.540	5503.798	7137.624	5509.028	7129.570	5503.778	UP	NORTH	0.050	0.021	0.036	-0.021	-0.036
170	7137.638	5509.125	7129.468	5503.810	7137.644	5509.134	7129.478	5503.766	UP	NORTH	0.026	0.011	0.043	-0.011	-0.043
171	7137.649	5509.201	7129.344	5503.827	7137.645	5509.209	7129.405	5503.922	UP	NORTH	0.064	0.004	0.113	-0.004	-0.113
172	7137.658	5509.297	7129.246	5503.852	7137.653	5509.258	7129.258	5503.846	UP	NORTH	0.046	0.046	0.018	-0.046	-0.018
173	7137.704	5509.425	7129.136	5503.864	7137.674	5509.338	7129.192	5503.842	UP	SOUTH	0.043	0.092	0.060	-0.092	0.060
174	7137.723	5509.493	7129.033	5503.914	7137.723	5509.493	7129.045	5503.898	UP	NORTH	0.030	0.000	0.020	0.000	-0.020
175	7137.736	5509.593	7128.936	5503.929	7137.726	5509.566	7129.000	5503.912	UP	NORTH	0.035	0.030	0.063	-0.030	-0.063
176	7137.773	5509.705	7128.853	5503.936	7137.752	5509.673	7128.828	5503.963	UP	SOUTH	0.055	0.038	0.038	-0.038	0.038
177	7137.792	5509.779	7128.760	5503.954	7137.811	5509.772	7128.773	5503.981	UP	SOUTH	0.034	0.020	0.030	-0.020	0.030
178	7137.805	5509.894	7128.695	5503.995	7137.805	5509.894	7128.671	5503.986	UP	NORTH	0.042	0.000	0.026	0.000	-0.026
179	7137.822	5510.001	7128.537	5504.039	7137.838	5509.972	7128.640	5504.077	UP	NORTH	0.061	0.033	0.110	-0.033	-0.110
180	7137.837	5510.101	7128.473	5504.024	7137.836	5510.033	7128.475	5504.047	UP	NORTH	0.051	0.068	0.023	-0.068	-0.023
181	7137.863	5510.174	7128.319	5504.036	7137.830	5510.142	7128.170	5504.117	UP	SOUTH	0.052	0.046	0.170	-0.046	0.170
182	7137.882	5510.235	7126.272	5504.053	7137.919	5510.187	7128.123	5504.107	UP	SOUTH	0.067	0.061	0.158	-0.061	0.158
183	7137.892	5510.313	7126.171	5504.070	7137.946	5510.297	7128.071	5504.129	UP	SOUTH	0.063	0.068	0.116	-0.068	0.116
184	7137.940	5510.465	7126.077	5504.107	7137.960	5510.486	7127.960	5504.176	UP	SOUTH	0.022	0.029	0.136	-0.029	0.136
185	7136.003	5510.415	7127.938	5504.117	7136.031	5510.353	7127.870	5504.148	UP	SOUTH	0.203	0.068	0.075	-0.068	0.075
186	7137.965	5510.621	7127.859	5504.147	7137.956	5510.532	7127.754	5504.197	UP	SOUTH	0.087	0.089	0.116	-0.089	0.116
187	7137.996	5510.722	7127.749	5504.178	7137.992	5510.715	7127.800	5504.207	UP	SOUTH	0.043	0.008	0.059	-0.008	0.059
188	7136.016	5510.875	7127.606	5504.178	7137.995	5510.802	7127.667	5504.253	UP	SOUTH	0.042	0.076	0.080	-0.076	0.080
189	7136.025	5510.959	7127.577	5504.193	7138.044	5510.921	7127.442	5504.270	UP	SOUTH	0.025	0.042	0.155	-0.042	0.155
190	7136.033	5511.032	7127.466	5504.237	7138.048	5511.059	7127.338	5504.252	UP	NORTH	0.041	0.031	0.149	-0.031	-0.149
191	7136.076	5511.116	7127.386	5504.223	7138.057	5511.142	7127.283	5504.193	Down	SOUTH	0.045	0.032	0.107	0.032	0.107
192	7136.093	5511.259	7127.271	5504.239	7136.077	5511.262	7127.259	5504.227	Down	SOUTH	0.075	0.016	0.017	0.016	0.017
193	7136.128	5511.358	7127.189	5504.273	7136.126	5511.339	7127.215	5504.256	UP	SOUTH	0.039	0.019	0.031	-0.019	0.031
194	7136.144	5511.454	7127.094	5504.295	7136.169	5511.392	7127.147	5504.242	Down	SOUTH	0.018	0.067	0.075	0.067	0.075
195	7136.155	5511.541	7126.997	5504.297	7138.204	5511.471	7126.797	5504.192	Down	SOUTH	0.042	0.085	0.152	0.085	0.152
196	7136.185	5511.636	7126.878	5504.330	7138.162	5511.598	7126.763	5504.303	Down	SOUTH	0.047	0.038	0.099	0.038	0.099
197	7136.186	5511.749	7126.793	5504.323	7138.146	5511.673	7126.763	5504.208	Down	SOUTH	0.007	0.086	0.119	0.086	0.119
198	7136.218	5511.852	7126.692	5504.377	7138.258	5511.807	7126.666	5504.363	Down	SOUTH	0.025	0.060	0.015	0.060	0.015
199	7136.236	5511.934	7126.599	5504.400	7136.293	5511.908	7126.545	5504.318	Down	SOUTH	0.042	0.063	0.094	0.063	0.094
200	7136.262	5512.023	7126.495	5504.366	7138.279	5512.013	7126.433	5504.356	Down	SOUTH	0.031	0.020	0.069	0.020	0.069

UP	52	169	NORTH	2.452	0.950	2.452	0.288	max (m)
DOWN	148	31	SOUTH	-	0.002	(0.136)	(0.950)	min (m)
This is number of pebbles moving different ways				0.067	0.067	0.067	(0.037)	avg (m)
				0.224	0.066	0.233	0.104	stdv (m)
				0.042	0.045	0.033	(0.035)	median (m)

	LINE PARALLEL TO CONTOUR GROSS movement	LINE ORIENTED DOWNGRADIENT GROSS movement	LINE PARALLEL TO CONTOUR NET movement	LINE ORIENTED DOWNGRADIENT NET movement
	20.147	17.477		

pebbles moving > than uncertainty of measure	153	1 SIGMA	0.022 m
	97	2 SIGMA	0.044 m
ASSUMING	0.022	RMS UNCERTAINTY	

THIS IS THE SENSITIVITY TEST FOR HOW MANY PEBBLES REALLY MOVED