*3a. Describe and justify the measures you took to minimise the health and safety risks involved in this investigation.*

There were several health and safety measures we took in the course of our investigation and these are as follows. One risk was the occurrence of sprains and injuries, especially those to the ankles or feet area. Sprains could occur when walking on the rough terrain going down into the river valley which was also very steep, as well as on the slippery rocks and the bottom of the river. The measures we took to minimise these risks was to wear suitable footwear, primarily wellington boots and walking boots. In addition each group carrying a first aid kit with essentials such as bandages and plasters, which would not solve the problem of sprains or injuries directly, but aims to sooth the pain, and not allow the injury to get any worse, as well as stopping the likelihood of infection to open wounds or injuries.

Another risk was in relation to the ever-changing weather up in the Lake District, changing very rapidly from hot to cold temperatures as well as the weather being erratic. On the day of our investigation the weather happened to be very hot with almost no clouds. The possible risks from this heat and exposure to the sun were sunburn, heatstroke as well as dehydration. The measures taken involved wearing sunscreen the covered all exposed surface of skin as well as making sure that everyone had plenty of water and constantly stayed hydrated. The weather and climate however could also have taken a turn in the other direction, bringing with it very cold winds as well as heavy rainfall. A precaution taken in relation to this weather was to take waterproofs as well as many thin layers, to protect from the cold as well as minimising the chances of catching hypothermia.

Another risk relating to the weather was that if it was to rain very suddenly, especially with our investigation based in the upper course, the river could easily have reached bankful or at least raised to height of the water level, and this could create very strong currents. A precaution taken was to stay out of deep water and to carry with each group a line which would be used to through to someone who was being washed downstream. In addition every member of the group was educated on the possible diseases the could be present in the water, so special care was taken to cover cuts or damaged skin, as well as been cautious not to swallow any of the water.

*3b. Explain how one method of the data collection you used was suitable for the investigation.*

One method of data collection was of the gradient of different sections of the rivers channel. This would be done by first establishing the section of the river that we would be investigating. Then from the midpoint of the river the member of the group with the clinometer would walk around five metres downstream whilst the other member would walk about five metres upstream. The member with the clinometer gun would then look downstream towards the other member and focus on a point on that person which, on ground level, was roughly to their height. For example on our fieldtrip those measuring the gradient were roughly the same size and so the member of the group with the clinometer would focus on their eyes. When a point of focus was established you were to wait for the dial on the right of the clinometer to stop moving and then gather a reading form this. The reading would be positive as you were looking upstream.

This method was suitable to the investigation for many reasons. Firstly the clinometer was to a relative degree of accuracy that was required for our investigation. We could have gone for a digital clinometer which would have been more accurate and realistic yet with all the walking we were doing, something more expensive could have been damaged. The clinometer was also lightweight which made it easy to carry as well as waterproof which helpful especially due to being around the flowing river. Also the decision was made to not use ranging poles in the investigation and collection of the gradient and this was simply to reduce the load that we were carrying as we had around a forty five minute walk before reaching the first site of the rives, across rocky and unstable terrain. Also, especially in our thirst site which was just below a small waterfall the water was very fast flowing to accurate placing of ranging poles could have been difficult. again especially in the thirds site of investigation, large boulders which were glacial till sometimes covered large amount of the bottom of the river and this would affect the placement of ranging poles which had to be pushed into the ground.

*5a. Describe one technique of the data analysis you used and explain how far the data you collected made this technique appropriate to your investigation.*

One technique we used to analyse data was Spearman’s Rank. Spearman’s rank was used to test for a significant relationship between two variables. These two variables were the distance downstream and the power-shape index of the rocks found on the river bed. First we thought of a null hypothesis which was that ‘there was no significant correlation between distance downstream and power shape index’ which, from our results, we would be able to either accept or reject. With the two sets of 12 values we put them each into a ranking order. The difference between the two ranks, at each site would then be squared, all the squared values would then be added giving us the number of 244. This value was then put into an equation to give a result between 1 and -1. Our result was 0.147 once rounded up.

This value was then compared to a chart from which a confidence level could be established. Our result however did not reach 90% confidence level and so from this we cannot reject our null hypothesis that there is no significant relationship between distance downstream and the power shape index of bed load.

This technique was appropriate to the data collected as we had two values that we wanted to compare and contrast and spearman’s rank was able to give a confidence level as to the relationship. Also spearman’s rank was within our maths range as an A level geography class and we had done it before. Furthermore this stats test and the result it gave us, which was a the inability to reject our null hypothesis allowed us to question or inquire into our initial geographical understanding, as we clearly expected rocks to become more rounded as we progressed downstream, yet our result contradicts this slightly. So this also suggests that if we were to do our investigation again we should do the investigation from source to mouth and then perhaps the result would be more in correspondence with our geographical theory.

*6b. In the light of your result, suggest how the investigation could be further developed or extended.*

To further develop our investigation we could, as our aim suggested, do our investigation from the source to the mouth, instead of just staying in the upper course. (Spend more time to complete investigation) This would create a much more general view of the changing channel characteristics as the water flows downstream. We would also be able to see, if we took measurements from the source to mouth, the difference between lower, middle and upper course and the features associated with them.

Moreover we could conduct the investigation in other seasons also. Our investigation was conducted during the summer with the river at its least capacity which would have an effect on the results for the depth and wetted perimeter we collected, in spring or winter, a time of higher rainfall, we could examine how the seasons affect the channel characteristics as it flows downstream. If we were to conduct the same investigation once in spring, winter and autumn also, we could compare factors such as the velocity and depth that would be most affected by the seasons. Furthermore by getting results across the different seasons, we would have a more general view of the river as averages could be made, and this perhaps would result in less anomalous results.

Furthermore instead of stratified sampling based on the stream order, and at these sites doing systematic sampling, we could just use systematic sampling from source to mouth as to make the investigation completely unbiased and unaffected by human interference, e.g. manoeuvring around waterfalls. In addition we could perhaps do the same investigation yet this time on a river in an urban location, for example a river close to us would be the river Roding, and we could compare the results. From the comparison we could see which river has greatest efficiency and if the surrounding…