Geography

ORGANISATIONAL DETAILS

Aim of fieldwork

To look at the impacts of limestone quarrying in a protected landscape, to consider opposing views about the extension of Broadwood Quarry and to assess the potential for future reclamation.

Target Group

Key Stage 3 and 4 geography.

Location

Broadwood Quarry, Frosterley, Weardale, County The fieldwork day is based around Broadwood Quarry at Frosterley. The introductory session will involve a circular walk on public rights of way and permissive paths around Harehope Quarry (GR: NY 036365) and Broadwood Quarry (GR: NY 034367) and along the River Wear. The second part of the day will focus on the same area but will involve using environmental monitoring techniques and looking at options for reclamation. There is also the option of extending the fieldwork by undertaking a survey of residents' views in the nearby village of Frosterley (GR: NY 028369).

Practical Details

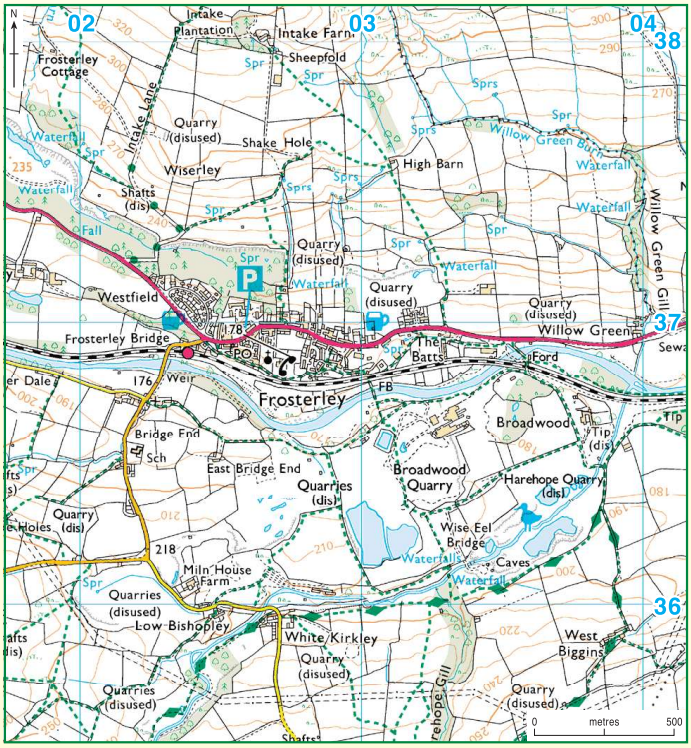
- Parking – Coaches can drop students off just to the east of Frosterley where there is a lorry park. There is a lay-by on the north side of the A689 (GR: NY 044370) where coaches can park.
- Toilet facilities – The nearest public toilets are close to the Market Place in Wolsingham and at the Durham Dales Centre in Stanhope.
- Useful maps – Ordnance Survey 1:25 000 Explorer OL31 North Pennines Teesdale and Weardale.

Safety Issues

- The lorry park is used regularly and so close supervision of students getting on and off the bus will be required.
- Broadwood Quarry is a working quarry so please stay on the footpaths and do not cross any fence boundaries.
- Refer to the Hazard Identification Sheet.

Limestone quarrying and reclamation of Broadwood Quarry, Frosterley

Fieldwork Outline - Teacher Resource Sheet



HAZARDS IDENTIFICATION SHEET

The following notes will help teachers conduct their own risk assessments. This is not a risk assessment and teachers should follow guidelines from the Department of Children, Schools and Families.

Hazard Identified	Risk and to whom	Control measures
Getting on and off the coach or minibus	Caution needed when getting off the coach or minibus als the lorry park is used regularly All students and staff.	Supervise students getting off the coach or minibus and gather in a safe place.
Railway crossing	Caution needed when crossing the railway.	Supervise students and follow instructions of the crossing patrol.
Quarry traffic	There is regular quarry traffic entering and leaving Broadwood and special care should be taken crossing the bridge over the river Wear, near to the quarry entrance and when walking along the footpath that runs through the quarry. All students and staff.	Supervise students and accordingly warn the students of the hazards. Hard hats to be worn at all times while in the quarry.
Uneven paths	Paths are uneven and may be slippery in wet weather. Students may slip and fall. All students and staff.	Warn about conditions.
Narrow footpath	The path to the south of Harehope Quarry is narrow in places and the fences have barbed wire on them. All students and staff.	Warn about conditions.
Quarry faces	The viewing circle at Harehope Quarry is close to quarry faces. Ensure that students stay within the fenced area. All students and staff.	Supervise warn about conditions.
Footpath through the quarry	The public footpath runs through Broadwood Quarry at the western end. Quarry vehicles will be operating in this area. Stop and supervise movement across the quarry road. All students and staff.	Strictly Supervise students and warn about conditions.
Unfenced sections of river	The river is unfenced in certain sections – Kenneth's Bridge and road crossing on the River Wear. All students and staff.	Close supervision needed along the section of footpath Warn about conditions.
The footpath from Kenneth's Bridge to the Broadwood Quarry offices	There are sections of this footpath that have steep drops to the river and the fence is in a bad state of repair. All students and staff.	Close supervision needed along the section of footpath Warn about conditions.
The footpath from Broadwood Quarry offices to the road bridge at Broadwood	The footpath here is along the quarry road. There will be quarry traffic. All students and staff.	Close supervision needed and warn about conditions.

UNDERTAKING THE FIELDWORK

1. Introducing the area, Broadwood Quarry and the issues.

The table below provides information about each stop on the walk and students can record the information on Student Resource Sheet 1

Location and grid reference	Background information
1. Entrance to Broadwood Quarry (GR: NY 035368)	Having been dropped off on the A689, cross the River Wear and the Weardale Railway line. The entrance to Broadwood Quarry is to the east. Complete activity 1 on Student Resource Sheet 1.
2. Looking north across Harehope Quarry (GR: NY 037362)	Follow the tarmac road south-east past Broadwood Farm, across the Bollihope Burn and follow the track in a southerly direction. At grid reference 039364 take the footpath to the east that runs along the southern perimeter of Harehope Quarry. The next stopping point is at the second field boundary. The view in front of you is of Weardale, one of the eastern dales on the North Pennines. The North Pennines is an Area of Outstanding Natural Beauty (AONB) and a European Geopark. An AONB is a 'precious landscape whose distinctive character and natural beauty are so outstanding that it is in the nation's interest to safeguard them. The main purpose of AONB designation is to conserve and enhance the natural beauty of the landscape but also to meet the need for quiet enjoyment of the countryside and to have regard for the interests of those who live and work there. Often these 3 aims conflict. The area is also a European Geopark, which reflects its world-class geological heritage and the way this is used to support sustainable development. Looking north across Weardale you can see that the valley sides are stepped and the hills have flat tops. This is due to the geology of the area. The rocks of the North Pennines were laid down in the Carboniferous Period (350 - 290 million years ago) when this area was close to the equator. The rocks that formed were laid down in horizontal beds of limestone, sandstone and shale. The limestone and sandstone beds are harder and are more resistant to weathering and erosion and so stand out as steps in the landscape. The shale is a soft, crumbly rock and so is easily weathered and eroded. The shale creates the gentler slopes in the landscape. Complete activity 2 on Student Resource Sheet 1.
3. The viewing circle (GR: NY 03561)	Continue to follow the footpath west. Take the permissive path through the field. At the bottom of the steps go right through the gate to the viewing circle. From the viewing circle you can see the rocks in the quarry face. From the quarry floor to the top of the first bench is limestone. This particular band of limestone is known as the Great Limestone. The limestone was formed in a shallow tropical sea, where the skeletons of sea creatures accumulated as a limey ooze on the sea floor. In time the limey ooze was compacted to form limestone. The rocks above the limestone are layers of limestone and shale and then sandstone and shale. The sandstone and shale were formed from muds and sands washed into the sea by rivers. The sandstone and shale in this quarry had no economic value and so these rocks were part of the 'overburden' that needed to be removed before the limestone could be quarried. Large scale quarrying of the limestone started here at the beginning of the 20th century. The quarry closed in 1931 but was re-opened and quarried again by different companies from the 1954 until 1987. The limestone was used in the process of refining iron from iron ore at Consett, Tyneside and Teesside. More recently the limestone has been used in the construction of roads. Complete activity 3 on Student Resource Sheet 1.
4. The footbridge (GR: NY 034362)	Retrace your route to the bottom of the steps. Bear right over the footbridge. The rock in the bed of the Bollihope Burn below the footbridge is Frosterley Marble. This is a bed of the Great Limestone that is rich in fossil corals and polishes well. It is thought that the Frosterley Marble from the riverbed of the Bollihope Burn was used in the pillars of the Chapel of the Nine Altars in Durham Cathedral. Complete activity 4 on Student Resource Sheet 1.

Location and grid reference	Background information
5. Broadwood Quarry (GR: NY 032364)	Follow the permissive path to rejoin the main right of way. Follow this path north to a kissing gate that crosses into the Broadwood Quarry workings. Just to the left of the path there is a higher area of spoil. Stand on the top of this to get a view west up Weardale. Between Frosterley and Stanhope there are outcrops of the Great Limestone both to the north and south of the river. The name Stanhope comes from old English words meaning 'stone side valley'. Knowledge of these limestone outcrops has meant this area has seen large scale quarrying since the 1850s. Broadwood Quarry is the last remaining working quarry in the area. Looking west up towards Stanhope you can see the old quarries along the valley sides. Directly north on the north side of the valley is Frosterley Quarry which closed in 1921 and moving west, the wooded area now hides Rogerley Quarry. On the south side of the valley Parson's Byers can be seen, which closed in 1958 and in the near distance North Bishopley Quarry can be seen. Complete activity 5 on Student Resource Sheet 1.
6. Broadwood Quarry (GR: NY 032364)	Staying in the same place look east to view the Broadwood Quarry workings. Broadwood Quarry has been in operation since 1920. The exposures of Great Limestone at Frosterley are at the same elevation as the railway and so it was more economical to extract than elsewhere. As a result Frosterley is surrounded by limestone quarries. Since 1920 the quarry has been run by a number of different quarrying companies. In 1975 it was taken over by Swiss Aluminium who used it as a fluorspar processing plant, taking fluorspar from the rest of Weardale. Fluorspar is still periodically processed here. The quarry is currently run by Durham Industrial Minerals. In the past the limestone quarried at Broadwood was used in steel making but most of the limestone today is used for road stone or to make concrete. We all use the products of limestone in one way or another. The fluorspar that was processed here was used as a flux in the steel industry, in the production of hydrofluoric acid and as a flux in welding rods. The quarry directly employs 15 people. The majority of employees live in Frosterley, with the remainder living in other villages in Weardale. The quarry also creates other jobs indirectly – this known as the multiplier factor. Other indirect jobs include hauliers and contractors who come to the quarry to carry out specific jobs. Complete Activity 6 on Student Resource Sheet 1.
7. Gateway on 'The Lonnen' (GR: NY 035365)	The quarry company applied to re-activate the quarry at Broadwood in 1999, as the site was originally granted an Interim Development Order Permission (IDO) for quarry undertaking in 1947. This permission has been preserved by successive Planning Acts as a valid permission until 2042. However since 1991 any new quarrying undertaken under IDOs now has to submit information on schemes of working and restoration conditions. The company obtained planning permission in 2000 to extract approximately 125,000 tonnes of limestone and Frosterley Marble per year. The extraction is to take place in 3 phases over 26 years. Phase I is now complete and is the area viewed, Phase II is just underway (April 2007) and is the area to the west of Phase I and phase III is yet to be started and will occupy the south eastern area of the site. Complete activity 7 on Student Resource Sheet 1.

2. Investigating the environmental impact of quarrying at Broadwood

The table below provides information about each stop for the environmental impact investigation aspects of the fieldwork. The environmental impact investigations are divided into air pollution, noise pollution, visual pollution, water pollution and remedial action taken by the quarrying company. Students can record information on Student Resource Sheet 2.

Location and grid reference	Background information
1. End of 'The Lonnen' (GR: NY 038367)	At the junction of the 'Lonnen' with the track at Broadwood there is a dust and noise monitoring machine in the field. Complete activity 1 on Student Resource Sheet 2. During this section of fieldwork also record the remedial measures that the quarrying company has made to reduce the environmental impact of the quarry. This can be completed in activity 4 on Student Resource Sheet 2.
2. Gateway on 'The Lonnen' (GR: NY 035365)	Return to the gateway on the 'Lonnen' and complete a visual impact assessment of this view of a working area of the quarry. The visual impact assessment assesses an individual's response to a landscape through a set of adjective-pairs. Some of the pairs are not used in the calculations at the end so that the impact of the weather etc is excluded. Complete the visual impact assessment for this site as part of activity 2 on Student Resource Sheet 2.
3. The viewing circle (GR: NY 035361)	Return to the viewing circle and complete a visual impact assessment for a quarry that has undergone reclamation. Complete the visual impact assessment for this site as part of activity 2 on Student Resource Sheet 2.
4. Kissing gate at Broadwood Quarry (GR: NY 032364)	Return to the kissing gate that crosses into the Broadwood Quarry workings. Complete a visual impact assessment for the view south-east towards West Biggins Farm. This is a typical view of Weardale. Complete the visual impact assessment for this site as part of activity 2 on Student Resource Sheet 2.
5. Broadwood Quarry (GR: NY 032364)	From the track complete a visual impact assessment looking east across the workings of Broadwood Quarry. Complete the visual impact assessment for this site as part of activity 2 on student resource Sheet 2.
6. Broadwood Quarry (GR: NY 032364)	Continue along the track that takes you through the quarry workings. On reaching a quarry road, cross the road and bear left along a footpath that follows a fence. At this point if you look over the spoil heaps to the far north-west corner of the workings you will see the second dust and noise monitor. Point out the location of the noise and dust monitor. Complete activity 1 on Student Resource Sheet 2.
7. Above Kenneth's Bridge (GR: NY 031367)	Follow the footpath north until you come to a stile, which is above Kenneth's Bridge. Complete a visual impact assessment looking west up the River Wear. Complete the visual impact assessment for this site as part of activity 2 on Student Resource Sheet 2. Come down the steps to Kenneth's Bridge. This is a good stopping point for lunch.
8. Kenneth's Bridge (GR: NY 031368)	Broadwood Quarry has a discharge into the River Wear. The water that they discharge comes from the quarry site and from the wheel wash and sprinkler system that helps to reduce the dust dispersed into the air by moving vehicles. The water from the site is first collected in a clean water lagoon before any excess water is discharged into the river. Kenneth's Bridge is upstream of the discharge point and so the water quality will not have been affected by it. The aim of this investigation is to sample the river here and then below the discharge to see if there is any change in the quality of the water. The organisms in the water can be used as indicators of how clean the water is. Student Information Sheet 1 is the pollution detective sheet. To sample the river divide the group up and give each group a sample tray and net. The sample tray should be filled with water from the river. Two sampling techniques can be used in a shallow area of the river. The first technique is called a kick sample. A member of each group places the net on the bed of the river with the open side of the net facing upstream. Standing upstream of the net the sampler kicks or shuffles their feet on the bed of the river for 3 minutes. The organisms in this area of the river will be disturbed and float into the net. The net can then be washed into the sample tray and the organisms identified. The second technique is to pick up the rocks on the bed of the river immediately above the net and to wash the rocks in the sample tray to sample the organisms attached to them. The organisms found can be compared with the pollution indicator sheet to show how polluted the river is. Record the water quality levels in activity 3 on Student Resource Sheet 2.
9. The ford at Broadwood (GR: NY 035369)	Follow the footpath from Kenneth's Bridge along the River Wear to the ford at Broadwood. Part of this route follows the edge of the Broadwood Quarry site and you will see the discharge points to the left of the path. At the ford you are downstream of the discharge points and the river can be sampled again to see if the discharge is having any effect on the water quality of the river. Record the water quality levels in activity 3 on Student Resource Sheet 2.

Fieldwork equipment

The following equipment will be required|:

White sampling tray

Pond net

3. Harehope Quarry – an example of reclamation of a limestone quarry

Harehope Quarry is a redundant limestone quarry that is being reclaimed by the Harehope Quarry Project Ltd. The site can best be viewed from the interpretation panel near the entrance (GR: NY 038367). Use Student Information Sheet 2 to explain the work that has been done to reclaim and re-use the quarry.

4. A survey of people's views

A survey of people's views could be undertaken in Frosterley village. The questionnaires should be designed in advance. Student information Sheet 3 will help students to design their questionnaire. The centre of the village is the best place to conduct the survey.

FOLLOWING UP THE FIELDWORK

1. The area, Broadwood Quarry and the issues

Go over Student Resource Sheet 1 to ensure you have recorded all the information required.

2. Investigating the environmental impact of quarrying at Broadwood

a. Go over Student Resource Sheet 2 to ensure you have recorded all the information required.

b. For either the whole class or in groups, calculate the visual impact assessment for each site using the visual impact assessment summary on Student Resource Sheet 3.

3. Quarry Reclamation

a. Look at another example of quarry reclamation. The European Geopark Case Study section of this pack provides information on the reclamation of Ladycross Quarry at Slaley in the North Pennines European Geopark.

b. In 4 groups use the aerial photograph provided in Student Resource Sheet 4 to show how you would reclaim Broadwood Quarry. Think about how you can improve it for wildlife and make it a better landscape to look at, what benefits you can build into your plans for people using the site and how the site may have an economic future.

4. People's views

Put together the questionnaire results for the whole class and analyse the information from them.

5. Public inquiry

Conduct a public inquiry into the future of Broadwood Quarry. The question to be answered by the inquiry is 'should the 3 phase extension underway at Broadwood Quarry have been given planning permission?'. Appoint someone to be the inquiry chair person. Divide into 4 groups. Each group will represent a different interest group in terms of their views on the future of Broadwood Quarry. The groups will represent 'conservationists', 'the quarry company', 'an access group' and 'local residents'.

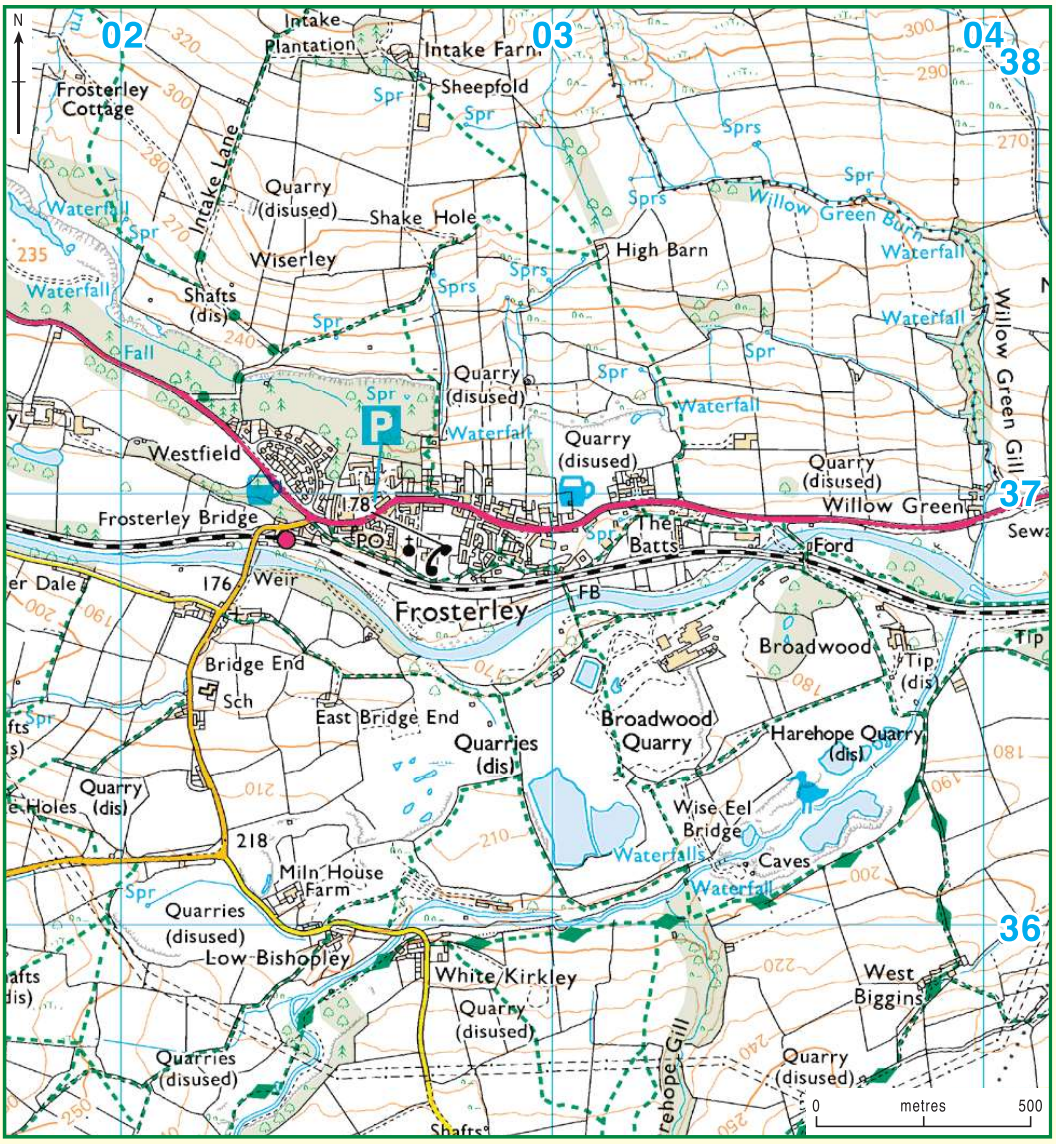
a. For the interest group that you represent, consider the view that they may take to the extension of Broadwood Quarry. For example you could use the internet to research the views of certain interest groups. The 'conservationists' could look at the views of the North Pennines AONB Partnership, Natural England, the Council for the Protection of Rural England (CPRE) and Durham Wildlife Trust. The 'access group' could look at the Ramblers' Association or access issues highlighted on Natural England's website. 'Local residents' will have to weigh up the balance of views in the local community. The 'quarry company' could look at a company website such as Lafarge, Tarmac or other large quarrying companies. Paul Allison from Sherburn Stone, who run Broadwood Quarry, can also be contacted on 0191 3720636.

b. Use all the information you have collected in the field to support your group's views.

c. Use the newspaper articles on Student Information Sheet 4 to inform your argument.

d. Use your ideas for the reclamation of the quarry to support your group's views.

e. Use the internet to gather further information to support your views.



O.S. Map of Broadwood Quarry



Ordnance Survey Map Symbols

ROADS AND PATHS

- M1 or A6 (M) — Motorway
- A35 — Dual carriageway
- A30 — Main road
- B3074 — Secondary road
- Narrow road with passing places
- Road under construction
- Road generally more than 4m wide
- Road generally less than 4m wide
- Other road, drive or track, fenced and unfenced
- Path

RAILWAYS

- Multiple track
- Single track

PUBLIC RIGHTS OF WAY

- Footpath
- Bridleway

BOUNDARIES

- National
- County (England)
- Civil Parish (CP)
- National Park boundary

SELECTED TOURIST AND LEISURE INFORMATION

- P — Parking
- Information centre
- PC — Public convenience
- Telephone
- Campsite / caravan site
- Golf course or links
- Public house
- Walks
- Viewpoint
- Picnic site
- Country park

GENERAL FEATURES

- \+ — Place of worship
- Building
- Bus or coach station
- Triangulation pillar
- Windmill
- BP/BS — Boundary post / stone
- CH — Clubhouse
- FB — Footbridge
- Mon — Monument
- PO — Post Office
- Pol Sta — Police station
- Sch — School
- TH — Town hall



Limestone quarrying and reclamation of Broadwood Quarry, Frosterley

Student Resource Sheet 1

THE AREA, BROADWOOD QUARRY AND THE ISSUES

Activity 1.

Use the O.S. map and the information from your walk to describe the location of Broadwood Quarry noting the river, railway line, access to the main road and any housing.

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Activity 2.

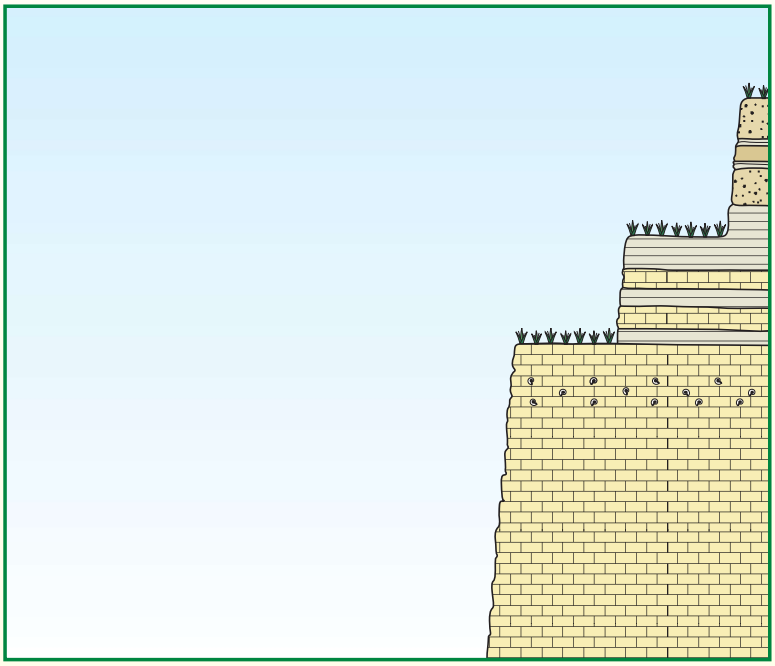
Draw a field sketch of the view to the north and add the following labels:

Flat topped hill **Step in the slope** **Gentle slope** **Sandstone or limestone bed** **Shale bed**

Activity 3.

a) Add the following labels to the sketch of the quarry face:

Great Limestone **Sandstone** **Shale** **Frosterley Marble (fossil-rich band in the Great Limestone)** **Limestone** **Overburden**



b) What was the quarried limestone used for?

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Activity 4.

a) What is the rock in the bed of the river below the footbridge?

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b) What has this rock been used for?

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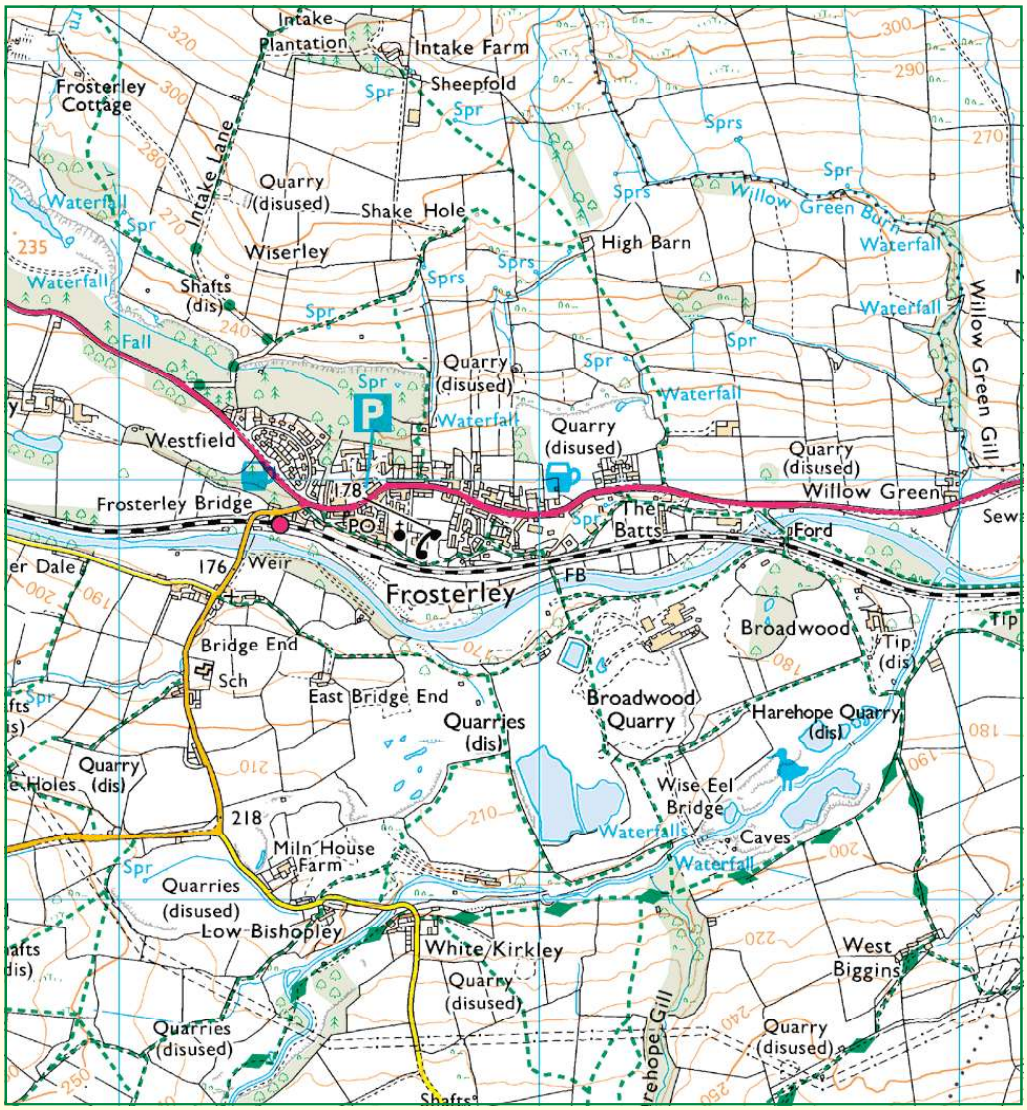
Activity 5.
On the O.S. map shade and name the following quarries:

Frosterley Quarry **Rogerley Quarry** **Parson's Byers Quarry**
North Bishopley Quarry **Harehope Quarry**

Shade any other quarries you can find on the map



Activity 6.

a) Write a paragraph outlining the history of Broadwood Quarry:

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b) What is the quarried limestone from Broadwood used for?

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c) How many people are at the quarry and where do they live?

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Activity 7.

On the aerial photograph below label the shaded areas with the following terms:

Phase I extension (complete) **Phase II extension (complete)** **Phase III extenstion (planned)**

INVESTIGATING THE ENVIRONMENTAL IMPACT OF QUARRYNG AT BROADWOOD QUARRY

The investigation into the environmental impact of quarrying at Broadwood is divided into air pollution, noise pollution, visual pollution and water pollution.

Activity 1 - Air and noise pollution

The table below provides secondary information on the noise and dust levels from the monitors at Broadwood Quarry. Complete the table by adding the grid references of both the monitors and description of the siting of each of the monitors in relation to the quarry workings and the prevailing wind direction.

Site	Grid reference	Description of location of the monitoring devices	Noise levels (This is measured in decibels (dB). The recommended average noise level is 55 db and is equivalent to the noise of a person talking normally)		Dust levels (Predicted number of days that dust will be a nuisance - greater than 200mg / m^2 per day
			Predicted average noise level over a 1 hour period	Predicted number of days when noise level is 10db above the recommended average	
1			58dB	10	28
2			34dB	0	0

Activity 2 – Visual impact assessment

Complete the visual impact assessment grids below for each of the sites identified. The purpose of these grids is to measure your spontaneous response to the views by means of adjective-pairs. Circle a number between 1 and 7 for each adjective pair to indicate how strongly you feel these words describe the view. Go down the list in order; do not leave any blank.

View of the working area of Broadwood Quarry								
Wet	1	2	3	4	5	6	7	Dry
Unemotional	1	2	3	4	5	6	7	Emotional
Ugly	1	2	3	4	5	6	7	Beautiful
Interesting	1	2	3	4	5	6	7	Boring
Bright	1	2	3	4	5	6	7	Dull
Obvious	1	2	3	4	5	6	7	Mysterious
Harmony	1	2	3	4	5	6	7	Discord
Cold	1	2	3	4	5	6	7	Warm
Soft	1	2	3	4	5	6	7	Hard
Frustrating	1	2	3	4	5	6	7	Satisfying
Private	1	2	3	4	5	6	7	Public
Static	1	2	3	4	5	6	7	Dynamic
Dislike	1	2	3	4	5	6	7	Like
Unstimulating	1	2	3	4	5	6	7	Stimulating
Full	1	2	3	4	5	6	7	Empty
Pleasant	1	2	3	4	5	6	7	Unpleasant
Weak	1	2	3	4	5	6	7	Strong
Disruptive	1	2	3	4	5	6	7	Peaceful
Colourful	1	2	3	4	5	6	7	Colourless
Disordered	1	2	3	4	5	6	7	Ordered
Simple	1	2	3	4	5	6	7	Complex

View of Harehope Quarry - a reclaimed quarry								
Wet	1	2	3	4	5	6	7	Dry
Unemotional	1	2	3	4	5	6	7	Emotional
Ugly	1	2	3	4	5	6	7	Beautiful
Interesting	1	2	3	4	5	6	7	Boring
Bright	1	2	3	4	5	6	7	Dull
Obvious	1	2	3	4	5	6	7	Mysterious
Harmony	1	2	3	4	5	6	7	Discord
Cold	1	2	3	4	5	6	7	Warm
Soft	1	2	3	4	5	6	7	Hard
Frustrating	1	2	3	4	5	6	7	Satisfying
Private	1	2	3	4	5	6	7	Public
Static	1	2	3	4	5	6	7	Dynamic
Dislike	1	2	3	4	5	6	7	Like
Unstimulating	1	2	3	4	5	6	7	Stimulating
Full	1	2	3	4	5	6	7	Empty
Pleasant	1	2	3	4	5	6	7	Unpleasant
Weak	1	2	3	4	5	6	7	Strong
Disruptive	1	2	3	4	5	6	7	Peaceful
Colourful	1	2	3	4	5	6	7	Colourless
Disordered	1	2	3	4	5	6	7	Ordered
Simple	1	2	3	4	5	6	7	Complex

View of the working area of Weardale to the south-east								
Wet	1	2	3	4	5	6	7	Dry
Unemotional	1	2	3	4	5	6	7	Emotional
Ugly	1	2	3	4	5	6	7	Beautiful
Interesting	1	2	3	4	5	6	7	Boring
Bright	1	2	3	4	5	6	7	Dull
Obvious	1	2	3	4	5	6	7	Mysterious
Harmony	1	2	3	4	5	6	7	Discord
Cold	1	2	3	4	5	6	7	Warm
Soft	1	2	3	4	5	6	7	Hard
Frustrating	1	2	3	4	5	6	7	Satisfying
Private	1	2	3	4	5	6	7	Public
Static	1	2	3	4	5	6	7	Dynamic
Dislike	1	2	3	4	5	6	7	Like
Unstimulating	1	2	3	4	5	6	7	Stimulating
Full	1	2	3	4	5	6	7	Empty
Pleasant	1	2	3	4	5	6	7	Unpleasant
Weak	1	2	3	4	5	6	7	Strong
Disruptive	1	2	3	4	5	6	7	Peaceful
Colourful	1	2	3	4	5	6	7	Colourless
Disordered	1	2	3	4	5	6	7	Ordered
Simple	1	2	3	4	5	6	7	Complex

View of Broadwood Quarry working								
Wet	1	2	3	4	5	6	7	Dry
Unemotional	1	2	3	4	5	6	7	Emotional
Ugly	1	2	3	4	5	6	7	Beautiful
Interesting	1	2	3	4	5	6	7	Boring
Bright	1	2	3	4	5	6	7	Dull
Obvious	1	2	3	4	5	6	7	Mysterious
Harmony	1	2	3	4	5	6	7	Discord
Cold	1	2	3	4	5	6	7	Warm
Soft	1	2	3	4	5	6	7	Hard
Frustrating	1	2	3	4	5	6	7	Satisfying
Private	1	2	3	4	5	6	7	Public
Static	1	2	3	4	5	6	7	Dynamic
Dislike	1	2	3	4	5	6	7	Like
Unstimulating	1	2	3	4	5	6	7	Stimulating
Full	1	2	3	4	5	6	7	Empty
Pleasant	1	2	3	4	5	6	7	Unpleasant
Weak	1	2	3	4	5	6	7	Strong
Disruptive	1	2	3	4	5	6	7	Peaceful
Colourful	1	2	3	4	5	6	7	Colourless
Disordered	1	2	3	4	5	6	7	Ordered
Simple	1	2	3	4	5	6	7	Complex

View of Weardale looking west up the River Wear								
Wet	1	2	3	4	5	6	7	Dry
Unemotional	1	2	3	4	5	6	7	Emotional
Ugly	1	2	3	4	5	6	7	Beautiful
Interesting	1	2	3	4	5	6	7	Boring
Bright	1	2	3	4	5	6	7	Dull
Obvious	1	2	3	4	5	6	7	Mysterious
Harmony	1	2	3	4	5	6	7	Discord
Cold	1	2	3	4	5	6	7	Warm
Soft	1	2	3	4	5	6	7	Hard
Frustrating	1	2	3	4	5	6	7	Satisfying
Private	1	2	3	4	5	6	7	Public
Static	1	2	3	4	5	6	7	Dynamic
Dislike	1	2	3	4	5	6	7	Like
Unstimulating	1	2	3	4	5	6	7	Stimulating
Full	1	2	3	4	5	6	7	Empty
Pleasant	1	2	3	4	5	6	7	Unpleasant
Weak	1	2	3	4	5	6	7	Strong
Disruptive	1	2	3	4	5	6	7	Peaceful
Colourful	1	2	3	4	5	6	7	Colourless
Disordered	1	2	3	4	5	6	7	Ordered
Simple	1	2	3	4	5	6	7	Complex

Activity 3 – Water pollution

Use the Pollution detective sheet to note your water quality recordings below:

Location of sample	Position in relation to quarry discharge	Organisms found	Water pollution level (A-3E)
Kenneth's Bridge			
Broadwood Ford			

Activity 4 – Remedial measures

Note any remedial measures the quarry company has made to reduce the environmental impact of the quarrying below:

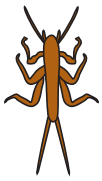
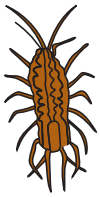
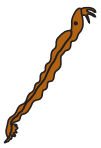
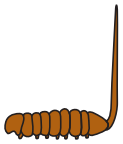
Remedial measures	Grid reference where observed	Are these measures satisfactory?
Tree planting		
Hedge planting		
Landscaping of areas no longer in use		
Soil screening bunds		
Wheel wash for vehicles		
Water sprinklers to reduce dust		
Other		

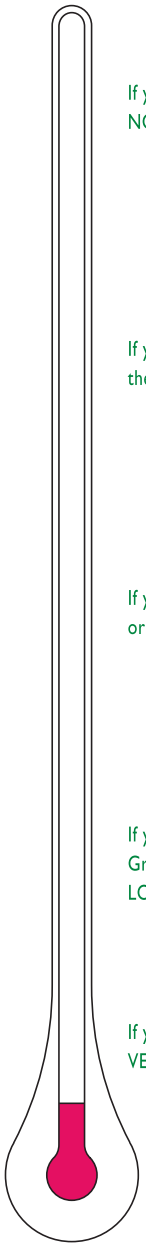


Limestone quarrying and reclamation of Broadwood Quarry, Frosterley

Student Information Sheet 1

POLLUTION DETECTIVE SHEET

Pollution level	Pollution detective	
A	 Mayfly nymph  Stonefly nymph	If you find these mini-beasts then there is NO POLLUTION
B	 Caddisfly larva  Freshwater shrimp	If you find these mini-beasts, but none from Group A then there is a SLIGHT POLLUTION
C	 Water louse  Bloodworm	If you find these mini-beasts, but none from Group A or Group B then there is MEDIUM POLLUTION
D	 Sludgeworm  Rat-tailed maggot	If you find these mini-beasts, but none from Group A, Group B or Group C then there is a LOT OF POLLUTION
E	NO LIFE	If you find no mini-beasts at all then the water is VERY POLLUTED





Limestone quarrying and reclamation of Broadwood Quarry, Frosterley

Student Information Sheet 2

RECLAIMING HAREHOPE QUARRY

The Harehope Quarry Project aims to practically demonstrate a more sustainable way of living. This is being achieved by adopting a range of social, economic and environmental projects that together promote integrated and sustainable rural development. Through the development of these projects Harehope Quarry will be reclaimed and will provide access and information to visitors, improve the environment and provide an economic future.

The project has been developed with four phases in mind:

• Phase I - The carp farm. Ponds of one hectare in area have been created where carp are grown. Carp will feed on algae in the ponds with additional grain provided to supplement their diet. They do not require a high protein diet (for example fish waste from the fishing industry) like trout. The ponds are emptied through a reed bed treatment system so that the water returned to the river is non-polluting. The carp will provide an income for the project and the ponds will also provide a wildlife habitat.

• Phase II – The nature reserve. The western end of the quarry, the area to the south of the Bollihope Burn and the 'Tip End', form the nature reserve. Wildlife is being encouraged in the nature reserve through a programme of tree planting, the installation of an otter holt, the establishment of a bird feeding station and the introduction of a grazing regime for the limestone grassland. Access has also been provided to the nature reserve through the creation of permissive paths at the eastern and western ends of the quarry. These paths provide access to the bird hide, geology garden, viewing circle and Frosterley Marble exposures to the west of Wise Eel Bridge.

• Phase III – The Eco-classroom. The Eco-classroom has been built entirely by volunteers and provides the focus for education, training, community events and the stimulus for new sustainability projects. The Eco-classroom has been built using environmentally-friendly techniques and materials. It has the following features:

- South-facing to make the most of passive solar heating,
- Energy generated from solar, wind and hydro power,
- Heated by a ceramic stove,
- Water supplied from a bore-hole and heated by solar panels,
- Composting toilets,
- Grey water treated by a constructed reed bed,
- A living roof of stonecrop and
- Recycled newspaper insulation.

Phase III – The smallholding. An organic smallholding is being developed. The project already has a flock of chickens that provide eggs for a local egg round and it is planned to bring allotments into production and to introduce livestock.

It is hoped that these projects will improve the environment of Harehope Quarry, provide access opportunities for people through a range of community events and generate an income to ensure that the project has an economic future.



Limestone quarrying and reclamation of Broadwood Quarry, Frosterley

Student Resource Sheet 3

DESIGNING A QUESTIONNAIRE

You are going to carry out a survey of people's views to quarrying at Broadwood and the proposed new phases of development. You cannot interview all residents in Frosterley and so will conduct the survey on a sample population.

1. Designing the questionnaire

The design of the questionnaire is important as it will affect how respondents answer and how well you analyse or interpret your results.

'The Dos'

Do:
- Know what problem or issue you are tackling.
- Know what questions you want to ask.
- Keep the questionnaire short.
- Start with the easy questions.
- Ask questions about the person to start with as it will help to interpret the information later and indicate if your sample is representative. For example age, sex, where they live.
- Ask if the person is aware of the problem or issue you are investigating.
- Ask questions that require a 'tick box' answer rather than opinions.
- Ask simple 'yes' or 'no' questions rather than questions that have 'but', 'if' or 'maybe'.

'The Don'ts'

Don't:
- Ask offensive questions regarding age or income. For example ask which age category they are in rather than their age.
- Ask questions that 'expect' a certain response. For example do you shop here because it is cheaper?
- Ask long-winded questions. Keep it simple.

2. Using the questionnaire

Always do the following when using your questionnaire:
- Conduct a pilot survey first to test your questionnaire.
- Think about where you will conduct your survey as it will affect your results.
- Introduce yourself and explain who you are and what you are doing.
- Make sure you are polite and let the person see the sheet you are completing.



VISUAL IMPACT ASSESSMENT SUMMARY SHEET

In groups or as a whole class calculate the overall 'attractiveness' score for each of the sites that you completed a visual impact assessment for. Use the visual impact assessment summary tables below to complete your calculations.

Visual impact assessment summary –View of the working area of Broadwood Quarry

	Number of responses									
Scale values	1	2	3	4	5	6	7	Mean value	Weighting factor	Score
Unemotional / Emotional									8-m	
Ugly / Beautiful									5(m)	
Obvious / Mysterious									3(m)	
Harmony / Discord									5(8-m)	
Cold / Warm									4(m)	
Soft / Hard									3(8-m)	
Frustrating / Satisfying									5(m)	
Private / Public									2(8-m)	
Dislike / Like									5(m)	
Unstimulating / Stimulating									3(m)	
Full / Empty									8-(m)	
Pleasant / Unpleasant									5(8-m)	
Disruptive / Peaceful									4(m)	
Disordered / Ordered									3(m)	
									Total score:	
									Total score divided by 3.43:	

After you have calculated the mean value of the responses, multiply each by the corresponding weighting factor to obtain the score. For example, in row 1, subtract the mean from 8; in row 2, multiply by 5.

View scores are obtained by adding together the weighted means, which can range from 49 - least attractive, to a maximum of 343 – most attractive. The total score is then divided by 3.43 to give a value relative to a maximum of 100. The closer the score is to 100 the more attractive the view.

Repeat this process for the other views that you carried a visual impact assessment on so that you can compare their relative attractiveness.

Visual impact assessment summary –View of Harehope Quarry, a reclaimed quarry

	Number of responses									
Scale values	1	2	3	4	5	6	7	Mean value	Weighting factor	Score
Unemotional / Emotional									8-m	
Ugly / Beautiful									5(m)	
Obvious / Mysterious									3(m)	
Harmony / Discord									5(8-m)	
Cold / Warm									4(m)	
Soft / Hard									3(8-m)	
Frustrating / Satisfying									5(m)	
Private / Public									2(8-m)	
Dislike / Like									5(m)	
Unstimulating / Stimulating									3(m)	
Full / Empty									8-(m)	
Pleasant / Unpleasant									5(8-m)	
Disruptive / Peaceful									4(m)	
Disordered / Ordered									3(m)	
									Total score:	
									Total score divided by 3.43:	

Visual impact assessment summary –View of Weardale to the southeast

	Number of responses									
Scale values	1	2	3	4	5	6	7	Mean value	Weighting factor	Score
Unemotional / Emotional									8-m	
Ugly / Beautiful									5(m)	
Obvious / Mysterious									3(m)	
Harmony / Discord									5(8-m)	
Cold / Warm									4(m)	
Soft / Hard									3(8-m)	
Frustrating / Satisfying									5(m)	
Private / Public									2(8-m)	
Dislike / Like									5(m)	
Unstimulating / Stimulating									3(m)	
Full / Empty									8-(m)	
Pleasant / Unpleasant									5(8-m)	
Disruptive / Peaceful									4(m)	
Disordered / Ordered									3(m)	
									Total score:	
									Total score divided by 3.43:	

Visual impact assessment summary –View of Broadwood Quarry, a reclaimed quarry

	Number of responses									
Scale values	1	2	3	4	5	6	7	Mean value	Weighting factor	Score
Unemotional / Emotional									8-m	
Ugly / Beautiful									5(m)	
Obvious / Mysterious									3(m)	
Harmony / Discord									5(8-m)	
Cold / Warm									4(m)	
Soft / Hard									3(8-m)	
Frustrating / Satisfying									5(m)	
Private / Public									2(8-m)	
Dislike / Like									5(m)	
Unstimulating / Stimulating									3(m)	
Full / Empty									8-(m)	
Pleasant / Unpleasant									5(8-m)	
Disruptive / Peaceful									4(m)	
Disordered / Ordered									3(m)	
									Total score:	
									Total score divided by 3.43:	

Visual impact assessment summary –View of Weardale looking west up the River Wear

	Number of responses									
Scale values	1	2	3	4	5	6	7	Mean value	Weighting factor	Score
Unemotional / Emotional									8-m	
Ugly / Beautiful									5(m)	
Obvious / Mysterious									3(m)	
Harmony / Discord									5(8-m)	
Cold / Warm									4(m)	
Soft / Hard									3(8-m)	
Frustrating / Satisfying									5(m)	
Private / Public									2(8-m)	
Dislike / Like									5(m)	
Unstimulating / Stimulating									3(m)	
Full / Empty									8-(m)	
Pleasant / Unpleasant									5(8-m)	
Disruptive / Peaceful									4(m)	
Disordered / Ordered									3(m)	
									Total score:	
									Total score divided by 3.43:	

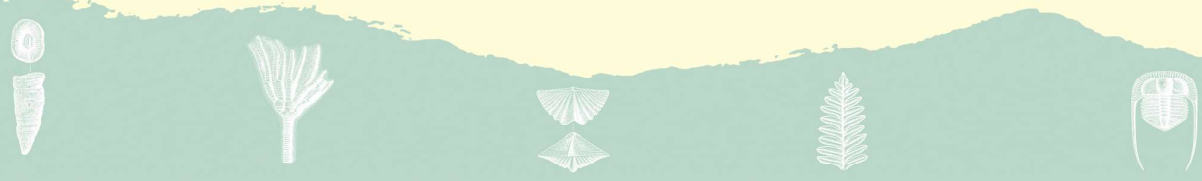
Activity 3 – Water pollution
Use the Pollution detective sheet to note your water quality recordings below:

Activity 4 – Remedial measures
Note any remedial measures the quarry company has made to reduce the environmental impact of the quarrying below:

Limestone quarrying and reclamation of Broadwood Quarry, Frosterley

Student Resource Sheet 4

AERIAL PHOTOGRAPH OF BROADWOOD QUARRY



Limestone quarrying and reclamation of Broadwood Quarry, Frosterley

Student Resource Sheet 5

LAW LORDS MAY DECIDE QUARRY ROW

From the Northern Echo, first published Tuesday 20th February 2001

A LONG-RUNNING legal battle over resumption of mining activities at a dormant quarry in Durham could end up in the House of Lords.

Leave is being sought from the Law Lords to appeal against an Appeal Court ruling last year, which effectively blocked resumption of mining at the site.

However, the application has been put on hold to allow the owner of a house near the quarry to object to the appeal bid.

Lords Slynn, Hoffman and Millett have agreed that Rodney Huddleston, who has lived close to Broadwood Quarry, at Frosterley, for about 18 years, should be allowed to challenge the latest moves by Sherburn Stone Co.

In the Appeal Court last March, Mr Huddleston won the opportunity to be consulted over the plan. Lord Justice Brooke said he was entitled to the opportunity to take part in an informed consultation over an extraction project which would detrimentally affect his home and environment.

Sherburn Stone Co held a dormant planning permission for mineral extraction at the quarry.

Then Sherburn gave notice to planning authority Durham County Council that it intended to resume quarrying at Frosterley, and applied for consent and details of conditions to which permission would be subject.

Durham council failed to deal with the application within the three-month statutory period though, and in those circumstances the High Court took the view in 1999 that Sherburn's application should be viewed as being deemed to have been granted.

However, Robert McCracken, counsel for Mr Huddleston, successfully argued in the Court of Appeal that the High Court approach to the matter was not compatible with UN or European law.

That decision was overturned by the Appeal Court where it was held that that Mr Huddleston was entitled to insist that, even if the delays meant the county council was not in a position to act, the Environment Department should.

The Law Lords are expected to give their decision on the latest moves in the next two months and an appeal could be heard later this year.

CURTAIN IS BROUGHT DOWN ON QUARRY ROW

From the Northern Echo, first published Tuesday 1st May 2001

THE House of Lords drew the final curtain on a long-running battle over rights to reopen a dormant limestone quarry yesterday.

Their decision is a landmark ruling which could have implications for planning laws.

But for Broadwood Quarry owners, Sherburn Stone Company, it could mean higher costs and fewer jobs in Weardale, County Durham.

Rodney Huddleston, a former quarry manager, who has lived next to Broadwood for 18 years, challenged the company when it wanted to invoke a 1947 planning agreement on the 90-acre site.

He argued that workings over the next 40 years should comply with modern day restoration conditions and was forced to go to court when a legal loophole barred planning authority Durham County Council from taking action.

In the Appeal Court last March, Mr Huddleston won the opportunity to be consulted over extraction work which he said could detrimentally affect his home and environment.

Now, Lords Steyn, Cooke and Scott have refused the Environment Secretary leave for an appeal against the Appeal Court ruling. They gave no reasons for their decision.

Mr Huddleston declined to comment last night.

But quarry owner Geoffrey Allison said that extra restrictions would hamper his operations and mean there would be fewer job opportunities.

Turn over page

QUARRY PLANNING WRANGLE 'PUTTING JOBS IN JEOPARDY'

From the Northern Echo, first published Tuesday 2nd September 2002

QUARRY bosses have diverted investment out of a depressed dale, putting jobs at risk, over a planning dispute.

Sherburn Stone Company director Paul Allison is threatening to cut overtime at Broadwood Quarry, in Frosterley, and blames County Durham's "stifling planning regime" for the move.

The risk to jobs could not come at a worse time for Weardale, which is losing 147 posts with the ending of production at Lafarge UK's 37-year-old cement plant at Eastgate.

Mr Allison said yesterday his company had invested in increasing production at its limestone quarry in Cumbria instead of Frosterley.

He said the change in strategy came after Durham County Council failed to respond in any substantive way to his application for a change in conditions at Broadwood to allow it to dig out more aggregates.

He also claimed that the council's economic development and planning department had ignored the company's correspondence and requests for information.

Although the council insists that Sherburn Stone was aware it had not made a valid planning application for the changes, Mr Allison said he was not told this until he received a letter on Friday morning.

He said: "The last year has been difficult enough for Weardale without more jobs being at risk.

"As a result of Durham County Council's inaction in processing our application, and the inappropriate enforcement regime at Frosterley, the site will be put on to short-working.

"The resulting shortfall in aggregates production will be made up from our quarry in Cumbria. I am disappointed, but I lost faith and trust in Durham County Council some time ago. I have a duty to the people who work for us to preserve their employment."

A council spokesman said: "We were made aware of the proposal by the company some time ago and suggested it would be helpful to have discussions to try to identify the best way forward. These discussions have not taken place and we have not received a valid planning application from the company."

ORGANISATIONAL DETAILS

Aim of fieldwork

To look at the size, function and sphere of influence of settlements in Weardale and to consider the implications for the Stanhope Market Town initiative.

Target Group

Key Stage 4 geography.

Location

This fieldwork day is based in Weardale and will involve the recording of services and a survey in each of the villages. The area covers the villages of Wolsingham and Thornley in the west of the area (GR: NY 076373) to Lanehead in the east (GR: NY 843417) and also takes in Rookhope to the north (GR: NY 939428). A more detailed survey will be carried in Stanhope (GR: NY 997393).

Practical Details

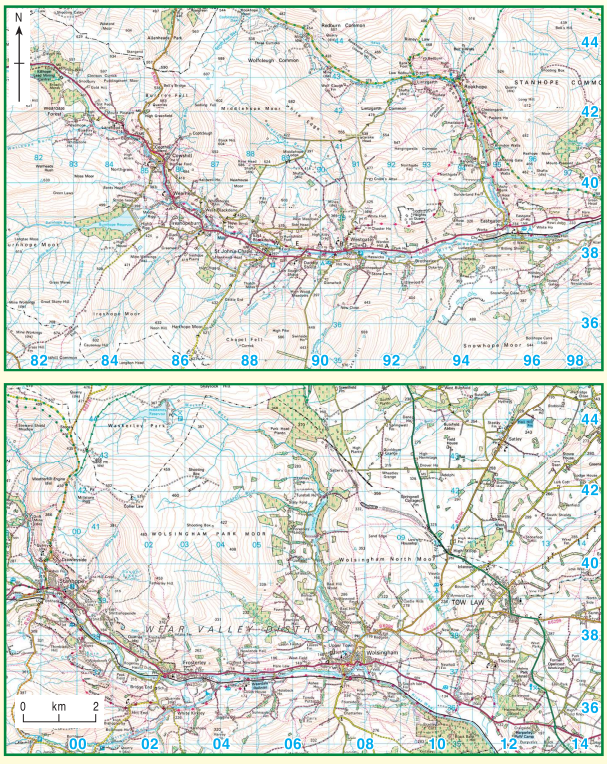
- Parking – Coaches or minibuses can drop students off in all of the settlements in Weardale and find a temporary waiting place before picking students up. In Stanhope coaches or minbuses can park in the Durham Dales Centre (GR: NY 997393).
- Toilet facilities – Public toilets can be found close to the Market Place in Wolsingham and at the Durham Dales Centre in Stanhope.
- Useful maps – Ordnance Survey 1:25 000 Explorer maps OL31 North Pennines Teesdale and Weardale and 307 Consett and Derwent Reservoir.

Safety Issues

- Special care should be taken getting on and off the coach or minibus in each of the villages.
- Stanhope is a busy town and care should be taken when undertaking the fieldwork.
- Refer to the Hazard Identification Sheet.

Settlement and Rural Development in Weardale

Student Resource Sheet 2



HAZARDS IDENTIFICATION SHEET

The following notes will help teachers conduct their own risk assessments. This is not a risk assessment and teachers should follow guidelines from the Department of Children, Schools and Families.

Hazard Identified	Risk and to whom	Control measures
Getting on and off the coach or minibus	Caution needed when getting off the coach or minibus in all the settlements in Weardale All students and staff	Supervise students getting off the coach or minibus and gather in a safe place
Traffic	Stanhope in particular is a busy town and traffic will be a hazard whilst undertaking the fieldwork All students and staff	Warn about traffic
Narrow footpaths	The footpaths in some of the settlements are narrow All students and staff	Warn about conditions

INTRODUCING THE FIELDWORK

Purpose and aims of the visit:

The main purpose of the fieldwork is to look at the size, function and sphere of influence of settlements in Weardale and to see if these factors have implications for Weardale's 'market town'.

The aims of the fieldwork are:

- To see if there is a hierarchical structure of settlement size and function in Weardale.
- To see if the sphere of influence of settlements reflects the number and type of services they have.
- To determine if Stanhope acts as a market town for Weardale.
- To look at the impact of the Stanhope Market Town Initiative.

Background information

Weardale is a rural dale in the North Pennines. Weardale has settlements that vary in size, but Stanhope and Wolsingham are the largest. The villages and the larger settlements in Weardale have all suffered from the loss of services over the years through the closure of post offices, public houses, banks and other retail services. Stanhope was selected by One North East, the regional development agency, to be included in the Market Towns' Initiative. The aims set out in the Market Town Initiative's action plan for Stanhope are to use the environment as an asset, to strengthen the local economy, to develop the social and community infrastructure and to improve transport and accessibility. An introduction to Weardale and rural settlements can be given in advance using Student Information Sheet 1.

Having introduced the background to the area and the aims of the fieldwork, set hypotheses based on the following:

- Will there be more settlements with a large population or more settlements with a small population?
- Will there be more settlements with a few services or more settlements with a lot of services?
- Will the number of services depend upon the size of the settlement?
- Will the sphere of influence depend upon settlement size?
- Does Stanhope act as a market town for Weardale?
- Has the Market Town Initiative helped to make Stanhope a better market town?

Introducing Fieldwork Methods

The study area covers Wolsingham and Thornley in the east to Lanehead in the west. There are 15 settlements in the study area. Use the Ordnance Survey map extract to look at the study area. Introduce each of the fieldwork methods needed to test the hypotheses. Some of the methods use primary data collection techniques, whilst others use secondary data.

1. Settlement size

The size of each settlement in the study area can be determined from the population figures from the 2001 Census. See Student Information Sheet 2.

2. Settlement services

The functional status of the villages can be measured by recording all the services present in each of the villages. The services in each village can be recorded on Student Resource Sheet 1.

3. Sphere of influence of settlements

The sphere of influence of the settlements will be determined through the survey carried out in each settlement with a retail outlet. One of the questions in the survey will determine where the person interviewed lives. From this information the size of the sphere of influence can be determined. Student Information Sheet 3 provides information on designing a questionnaire and Student Resource Sheet 2 provides an outline questionnaire. If designing your own questionnaire this will need to be completed before the fieldwork is undertaken.

4. Weardale's market town and shopping habits

The settlement that serves as Weardale's market town will be established through the survey carried out in each

settlement. Questions in the survey will relate to where people shop on a daily and weekly basis, what types of goods they buy, whether they view Stanhope as the market town for Weardale and whether they think Stanhope has enough services to operate as an effective market town. Student Information Sheet 3 provides information on designing a questionnaire and Student Resource Sheet 2 provides an outline questionnaire.

UNDERTAKING THE FIELDWORK

Either in groups or as a class, visit and complete the fieldwork in the 15 settlements in Weardale, leaving Stanhope to do as a class. The 15 settlements are as follows:

- Thornley
- Wolsingham
- Frosterley (including Hill End and White Kirkley)
- Stanhope
- Crawleyside
- Rookhope
- Eastgate
- Westgate (including Brotherlee)
- Daddry Shield
- St. John's Chapel
- Ireshopeburn (including New House)
- Wearhead
- Cowshill
- West Blackdene
- Lanehead

1. Settlement services

In each settlement record all the services that are present on Student Resource Sheet 1.

2. Settlement survey

In each settlement with a retail outlet, conduct a survey of people passing. In most cases this will be best done close to the local shop or post office. Complete surveys for the same amount of time in each settlement (i.e. for half an hour or an hour). Collect your results on copies of the outline questionnaire given on Student Resource Sheet 2 or on the questionnaire you have designed.

3. Fieldwork in Stanhope

For Stanhope the whole class could record the services or the town could be divided up, with groups recording the services in different areas. The questionnaire could be conducted in a number of places along the main street.

FOLLOWING UP THE FIELDWORK

1. Settlement size

This section looks at settlement size and hierarchy. If you find that a hierarchy exists you can see where Stanhope is within the size hierarchy.

a. Draw a table showing the settlement, its population and the rank of its population (the settlement with the highest population should have a rank of 1 and the settlement with the lowest population a rank of 15).

b. Look at the population size for each settlement and see if you think you could group the settlements according to their size. Describe the results.

c. Draw a graph of population size (on a logarithmic scale) against the rank of the population. This can be done using logarithmic graph paper or on the computer. If settlements show a hierarchy of settlement size the graph will have steps in it. The steps in the graph can be used to divide your settlements into size groups. Do the groups correspond with the groups you divided them into from just the population data?

d. Where is Stanhope in the hierarchy?

2. Settlement services

This section looks at settlement services or function and hierarchy. If you find that a hierarchy exists you can see where Stanhope is within the functional hierarchy.

a. Using the data collected on Student Resource Sheet 1 for each settlement, group the retail services into high order or low order. Having decided which retail services are high or low order, total the number of high and low order services for each settlement.

b. Construct a table that shows the settlements and all the services you have recorded for the settlements based upon your results recorded on Student Resource Sheet 1. Use your high order and low order totals to reduce the number of service categories in your table.

c. Look at your results and describe the distribution of services in Weardale. Do you think there is a hierarchy of settlements based on their service provision, (i.e. are there few settlements with lots of services and a lot of settlements with a few services?).

d. Where is Stanhope in the hierarchy?

e. How do the number and type of services in Stanhope compare to those in Wolsingham?

3. Sphere of influence of settlements

This section looks at the sphere of influence of the settlements in Weardale.

a. Construct a table that shows the settlement, places that the people interviewed live, the number of people from each place and the distance to that place. Describe your results.

b. Draw rose diagrams for each of the settlements where surveys were conducted. This will show how far people have travelled, the number of people from each place and the direction that they have come from.

c. Compare the sphere of influence of each settlement with the services it provides.

4. Weardale's market town and shopping habits

This section looks at the shopping habits of people in Weardale and whether they consider Stanhope as their market town.

a. Construct a table to show the settlements where surveys were conducted, the percentage of residents that shop locally, the percentage buying low order goods, the percentage buying high order goods and the percentage buying both. Present these results graphically and describe the results.

b. Present your results graphically to show the other places that people shop on a weekly basis. Describe your results.

c. From your survey results, do people consider Stanhope to be their market town?

d. Do your results suggest that Stanhope has enough services to be an effective market town?

e. What additional services would people like to see in Stanhope?

f. Student Information Sheet 4 shows the main action plan projects for the Stanhope Market Town Initiative. Are these the projects people are looking for to make Stanhope a better market town?

g. From your results and your work in Weardale what do you consider the main function or functions of Stanhope to be? Do you think the function of Stanhope has changed over the years?

h. What are the main functions of Wolsingham? Are these different to Stanhope? How might this impact on Stanhope?

ADDITIONAL WORK

1. Functional hierarchy - The same method used for looking at settlement hierarchy based on settlement size can be applied to settlement function.

In section 2 of the 'Following up fieldwork' section you decided whether settlements in Weardale showed a hierarchy based upon the number of services they provide. A more accurate determination of hierarchy can be achieved by calculating the Functional Index of each settlement, which provides a single overall figure of functional status. To do this complete the following:

• Calculate the Location Co-efficient of each function by:

a. Totalling the number of establishments in each class of function for the whole fieldwork sample.

b. Functional classes with a high overall frequency are considered to be of less importance than the infrequently occurring types. Each function is therefore ascribed a weighting or locational co-efficient (LC).

c. LCt = 1/T x 100

Where LCt = the location co-efficient of function t

T = the total number of outlets of function t in the study area

d. Construct a table showing the functional class, the frequency of that function or service in the fieldwork area and the Location Co-efficient.

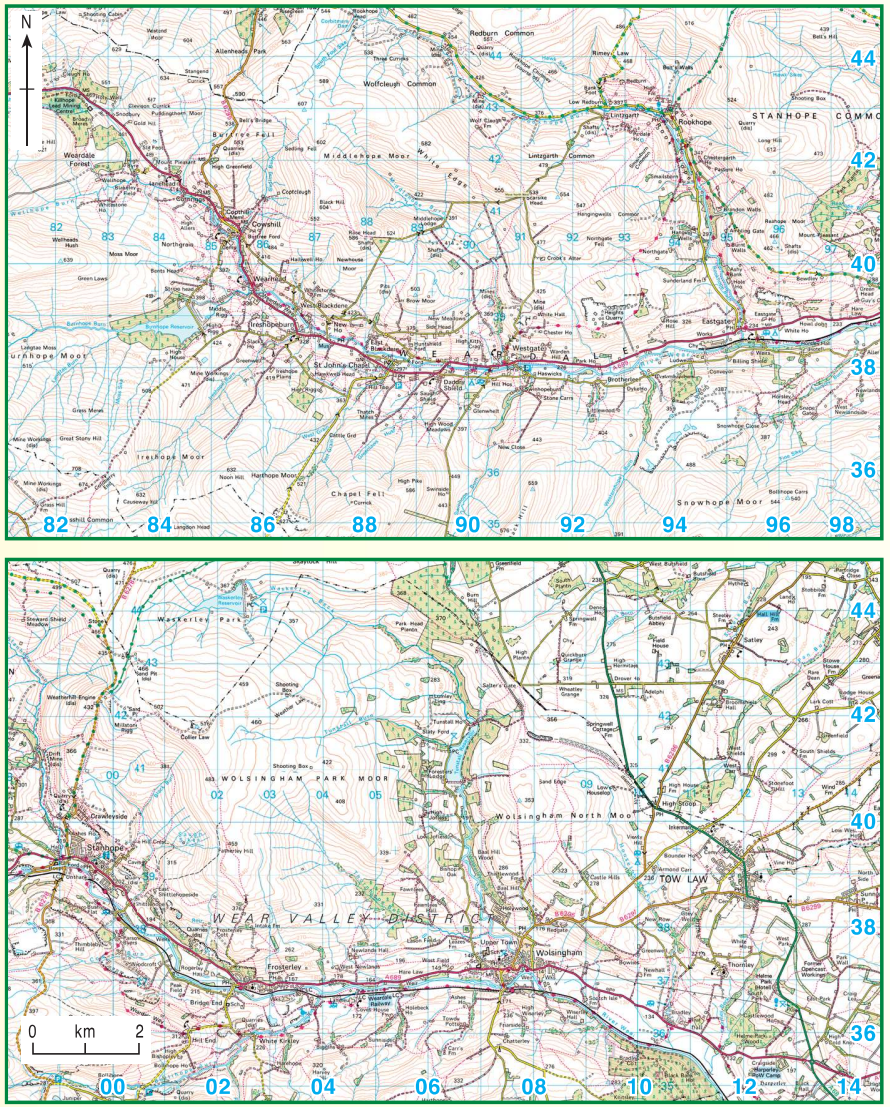
• Calculate the Centrality Value (CV) for each settlement. The functional classes in each settlement are considered in turn and the Centrality Value calculated by multiplying the number of establishments in a particular class by the Location Co-efficient for that function.

• Construct a table showing each settlement and the Centrality Value for each functional class. Add an extra column at the end for the Functional Index to be added.

• Calculate the Functional Index by totalling the Centrality Values for each settlement. Add these values to the table.

• As you did for settlement size produce a table that shows the settlements, the Functional Index of each settlement and then rank of the Functional Index (the settlement with the highest Functional Index should have a rank of 1 and the settlement with the lowest Functional Index a rank of 15).

• Draw a graph of Functional Index (on a logarithmic scale) against the rank of the Functional Index. This can be done using logarithmic graph paper or on the computer. If settlements show a hierarchy of settlement function the graph will have steps in it. The steps in the graph can be used to divide your settlements into settlement function groups. Do the groups correspond with the groups you divided them into from just the services data? Where is Stanhope in the hierarchy? Do the groups correspond to the groups for the settlement population?



O.S. Map of Weardale



Ordnance Survey Map Symbols

ROADS AND PATHS

M1 or A6 (M) — Motorway

A35 — Dual carriageway

A30 — Main road

B3074 — Secondary road

Narrow road with passing places

Road under construction

Road generally more than 4m wide

Road generally less than 4m wide

Other road, drive or track, fenced and unfenced

Path

RAILWAYS

Multiple track

Single track

PUBLIC RIGHTS OF WAY

Footpath

Bridleway

BOUNDARIES

National

County (England)

Civil Parish (CP)

National Park boundary

SELECTED TOURIST AND LEISURE INFORMATION

P — Parking

Information centre

PC — Public convenience

Telephone

Campsite / caravan site

Golf course or links

Public house

Walks

Viewpoint

Picnic site

Country park

GENERAL FEATURES

\+ — Place of worship

Building

Bus or coach station

Triangulation pillar

Windmill

BP/BS — Boundary post / stone

CH — Clubhouse

FB — Footbridge

Mon — Monument

PO — Post Office

Pol Sta — Police station

Sch — School

TH — Town hall



Settlement and Rural Development in Weardale

Student Information Sheet 1

AN INTRODUCTION TO WEARDALE AND RURAL SETTLEMENT STUDIES

1. Weardale – the study area

• **Location** – Weardale is situated in north east England in County Durham, on the eastern side of the North Pennines Area of Outstanding Natural Beauty. This eastern dale in the North Pennines is drained by the River Wear, which rises at 600m above sea level. The linear nature of the dale has produced a corresponding linear settlement distribution. There is only one main tributary valley to Weardale, which is drained by the Rookhope Burn. The village of Rookhope is located in this valley and is to the north of the main settlements in Weardale.

• **Geology and geomorphology** – The rocks of the North Pennines were formed during the Carboniferous Period (350 – 290 million years ago). During this period Britain lay close to the equator and the rocks were deposited in a warm, shallow sea. The limestones were formed from the shells of dead marine animals, the shales and sandstones from the deposition of mud and sand from great rivers flowing in from the north and as these delta deposits rose out of the sea, great swamps were created that eventually formed coal. As sea levels rose and fell this pattern of rocks was repeated time and time again. The North Pennines was created when these rocks were uplifted to form the Alston Block. Into these uplands a network of river valleys have been cut, forming a variety of dales landscapes, including Weardale. During the last million years, Britain has been covered from time to time by great sheets of ice, which advanced and retreated as the climate changed. The ice streamed down Weardale from Cross Fell (the highest point on the North Pennines) smoothing and rounding the hillsides, widening the valley floor and leaving deposits of clay, sand and gravel.

• **Landscapes and habitats** – Physical and climatic conditions, together with the influence of human activities, have created a variety of semi-natural habitats on the North Pennines including moorlands, meadows, wetlands and woodlands.

• **History** – Weardale and the North Pennines have been greatly modified by human activity, particularly through farming, lead mining and quarrying. Originally the area would have been covered in woodland, but since 7000 years BC, when nomadic hunters first visited the area, the land has been modified. Successive periods of settlement have cleared the woodland for grazing land, the cultivation of crops and building of settlements. The Bishopric of Durham defined a great hunting forest in Weardale with two new settlements at the east and west gates. Lead and other minerals have been exploited with the main period of extraction between the 14th and 19th centuries. As a result the population of Weardale grew and more woodland was cleared. More recently large scale quarrying of the limestone has taken place, with the greatest number of quarries located between Frosterley and Stanhope in Weardale.

• **Socio-economic conditions** – The structure of settlements in Weardale are dispersed loose-knit villages and hamlets with outlying farmsteads and smallholdings. Most of the villages have developed on the valley floor near the River Wear where there is more shelter. The main service centres in the dale are St. John's Chapel, Stanhope and Wolsingham. These provide services for the smaller villages and outlying farms. During the period 1951 – 1991 the population of Weardale fell by 22%. Changes in agriculture and mining alongside the loss of services and lack of affordable housing have contributed to this rural depopulation. Since 1991 the population decline has slowed and some villages have experienced growth.

2. Rural settlements and services

Describing rural settlements – Settlements are often described in relation to their site, situation, function and pattern.

• **Settlement site and situation** – Settlement **site** describes the characteristics of the actual point at which a settlement is located. These factors could include water supply, building materials, arable land for crops, grazing land for animals, good communication links, avoids natural hazards, good for defence or access to a fuel supply. The **situation** describes the location of a place relative to its surroundings.

• **Settlement function** – As early settlements grew in size each one developed a specific function or functions. The **function** of a settlement relates to its economic and social development and refers it its main activities. For example an agricultural or market centre or a tourist resort.

• **Settlement pattern** – This refers to the shape of a settlement. Settlements can be isolated (an individual building usually found in extreme conditions), dispersed (a scatter of individual farms and houses), nucleated (grouped together), loose-knit (similar to nucleated but more spread out), linear or ribbon (strung out along a main line of communication), ring and green villages (built around a central area) or planned.

Settlement size and services – A central place is a settlement that provides goods and services. The area that a settlement serves is known as its **sphere of influence** or **hinterland**. The size of a settlement's sphere of influence will depend on its size, number and range of services or functions it provides and the location of other settlements. Settlements show a **hierarchy** in terms of their size and number and type of functions. This means:

• the larger the settlements are in size the fewer there will be (i.e. there are many small villages but fewer large cities)

• there will be many settlements with a few functions and only a few settlements with many functions

As a settlement increases in size, the number of higher-order services will also increase. **High Order** services are specialist services and goods for example electrical and luxury goods. **Low Order** services are those that are bought regularly, for example food and household goods.

Settlement and Rural Development in Weardale

Student Information Sheet 2

POPULATION FIGURES FOR SETTLEMENTS IN WEARDALE

Settlement	Population (census 2001)
Thornley	184
Wolsingham	2061
Frosterley (including White Kirkley and Hill End)	705
Stanhope	1633
Crawleyside	170
Rookhope	267
Eastgate	163
Westgate (including Brotherlee)	298
Daddry Shield	177
St. John's Chapel	307
Ireshopeburn (including New House)	112
Wearhead	210
Cowshill	156
Lanehead	40
West Blackdene	37



Settlement and Rural Development in Weardale

Student Resource Sheet 1

RECORDING SHEET FOR SETTLEMENT SERVICES IN WEARDALE

Settlement name: _____

Service	Tally	Total
Post box		
Telephone box		
Public house / hotel		
Church / chapel		
Garage / car sales		
Village hall		
Builder / plumber etc		
Newsagents		
Primary school		
Betting office		
Argricultural engineer		
Books / stationary		
Antiques		
Butcher		
Café / retaurant		
Chemist		
Cinema		
Clothes / fabrics		
Coal merchant		
Estate agent		
Fishmonger		
Funeral services		
Furniture / carpets		
Garden / pet supplies		
Gifts / crafts		
Greengrocer		
Hairdresser		
Hardware / D.I.Y.		
Household / electrical		
Hospital		
Jewellery / watches		
Library		
Local government office / job centre		
Dry cleaners		
Market		
Baker		
Off licence		
Optician		
Plant hire / coach operator		
Police / fire / ambulance station		
Records / music / videos		
Bank / building society		
Secondary school		
Solicitor		
Sports shop		
Sports centre		
Supermarket		
Doctor		
Dentist		
Building supplies		
Travel agent		
Veterinary surgeon		
Post office		
General store		



Settlement and Rural Development in Weardale

Student Information Sheet 3

DESIGNING A QUESTIONNAIRE

You are going to carry out a survey of people's views to quarrying at Broadwood and the proposed new phases of development. You cannot interview all residents in Frosterley and so will conduct the survey on a sample population.

1. Designing the questionnaire

The design of the questionnaire is important as it will affect how respondents answer and how well you analyse or interpret your results.

'The Dos'

Do:
- Know what problem or issue you are tackling.
- Know what questions you want to ask.
- Keep the questionnaire short.
- Start with the easy questions.
- Ask questions about the person to start with as it will help to interpret the information later and indicate if your sample is representative. For example age, sex, where they live.
- Ask if the person is aware of the problem or issue you are investigating.
- Ask questions that require a 'tick box' answer rather than opinions.
- Ask simple 'yes' or 'no' questions rather than questions that have 'but', 'if' or 'maybe'.

'The Don'ts'

Don't:
- Ask offensive questions regarding age or income. For example ask which age category they are in rather than their age.
- Ask questions that 'expect' a certain response. For example do you shop here because it is cheaper?
- Ask long-winded questions. Keep it simple.

2. Using the questionnaire

Always do the following when using your questionnaire:
- Conduct a pilot survey first to test your questionnaire.
- Think about where you will conduct your survey as it will affect your results.
- Introduce yourself and explain who you are and what you are doing.
- Make sure you are polite and let the person see the sheet you are completing.



Settlement and Rural Development in Weardale

Student Resource Sheet 3

SPHERE OF INFLUENCE AND SHOPPING HABITS QUESTIONNAIRE FOR WEARDALE

Settlement: _____ **Day:** _____

Date: _____ **Time:** _____

1. Are you a resident of Weardale or are you a visitor to the area?

Resident ☐ Visitor ☐

2. Where do you live? _____

3. How far away is this?

Within half a mile ☐ Half a mile to 1 mile away ☐ 1-5 miles away ☐

5-10 miles away ☐ 10-40 miles away ☐ More than 40 miles away ☐

4. Do you use the local services in this village / town?

Yes ☐ No ☐

5. If yes, what goods do you buy?

Low order good *(e.g. food, houshold goods)* ☐ High order goods *(e.g. electrical or luxury items)* ☐

6. Do you shop elsewhere on a weekly basis?

Yes ☐ No ☐

b. If yes, where? Please specify: _____

c. If yes, what goods do you buy?

Low order good *(e.g. food, houshold goods)* ☐ High order goods *(e.g. electrical or luxury items)* ☐

7. Do you view Stanhope as the market town for Weardale?

Yes ☐ No ☐

8. Do you think Stanhope has enough services to operate as an effective market town?
(i.e. does it meet the needs of its residents and the surrounding area)

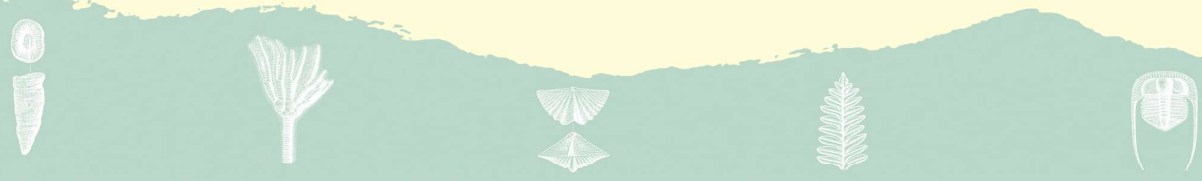
Yes ☐ No ☐

9. If not, what services would you like to see? Please specify:

_____

_____

Thank you for your co-operation



Settlement and Rural Development in Weardale

Student Resource Sheet 4

STANHOPE MARKET TOWN INITIATIVE - ACTION PLAN

Strategic objective 1: The environment as an asset

Projects within this objective include:

- Nature reserve – along the river (3)
- Enhancement of the town centre and the built environment – improvement to premises and parking (2)
- Enhancement and preservation of scenery – mitigation of quarrying scars (3)
- Physical improvements to river access – improvements to footpaths, footbridges and access points (1)
- Tourism trail – town centre and outlying areas (2)

Strategic objective 2: Strengthening the local economy

Projects within this objective include:

- Social enterprise and strategy worker – study of intermediate labour market models and community businesses (3)
- Business advisor – business support and targeted work with the farming sector (2)
- Tourism promotion and visitor management strategy (1)
- Education and skills development bursary (4)
- Social enterprise and strategy worker (3)
- Development of ICT Broadband (1)
- Development of business premises (1)
- Retail improvement grant (5)
- Research and feasibility study on promotion of affordable housing (4)
- Community access to education and lifelong learning – schools and community venues as access points (2)
- Weardale Community Partnership – promotion and development of community participation in decision-making (2)

Strategic objective 3: Developing the social and community infrastructure

Projects within this objective include:

- Upgrading of outdoor play areas and sport facilities with emphasis on people with mobility problems (3)
- Health education programme and services review (3)
- Youth shelter and play area (2)
- Community transport strategy for Stanhope and Weardale (1)
- Dial-a-ride service (1)
- Refurbishment of Stanhope Town Hall and Stanhope Community Centre (1)
- Careers and training support (2)

Numbers in brackets indicate the level of priority of the project (1 = high, 5 = low).



Settlement and Rural Development in Weardale

Signposting of places of interest and information at Talkin Tarn and in the surrounding area

1. Killhope, the North of England Lead Mining Museum – Killhope tells the story of lead mining in the North Pennines. The museum is the most complete lead mining site in Britain, and includes mine tours, waterwheels, miners' accommodation, washing floor where children worked, mineral and spar box displays, woodland walks with red squirrels, shop and café. The museum has a national reputation for hands-on activities, first person interpretation and welcoming staff.

Further details including information about educational visits can be found at www.killhope.com, or by calling 01388 537505. Further details can also be found in the section on 'Other educational opportunities in the North Pennines'.

2. Harehope Quarry Project Ltd – The Harehope Quarry Project runs educational day visits for schools and a range of community events and activities. The eco-classroom that provides the focus for visits is based in a redundant limestone quarry in Frosterley. The site provides excellent opportunities for environmental education, field studies and education for sustainable development.

Further details, including information about educational visits can be found on www.harehopequarry.org or by calling 01388 528633. Further details can also be found in the section on 'Other educational opportunities in the North Pennines'.

3. The Weardale Museum - The Weardale Museum at Ireshopeburn is an independent charity run entirely by volunteers. Its galleries provide information about life in the upper dale including domestic life, mining, quarrying and the railway. High House Chapel, next door, is the oldest Methodist Chapel in continuous weekly use and the Museum tells the story of John Wesley's visits and the part played by the early evangelist preachers in spreading Methodism through the North Pennines. The Museum houses a powerful genealogical research database including family tree information and all census records of Stanhope Parish from 1841 - 1901.

Further details can be found on www.weardalemuseum.co.uk or from the Museum Secretary, 01388 517433 or email dheatherington@ormail.co.uk.

4. Tourist Information Centre – The Durham Dales Centre and Castle Gardens is in Stanhope and provides a wide range of facilities for residents and visitors.

Further details can be found on www.durhamdalescentre.co.uk, or by calling 01388 527650/526393.