Quarrying - Teachers Answer Sheet

Student Module A - 'Let nature do our work – dealing with pollution.'

1a How much fuel?

Amount of fuel in litres is 8,000,000 x 4.546 = 36,368,000 litres
$^{3}\sqrt{}$ (cube root) of 36,368,000 = 331.3
i.e. one side of the cubic tank is 331.3 litres long
1 litre is 10cm x 10cm x 10cm = 1,000 cm^3
Therefore, each side is 331.3 x 10cm = 3313cm or 33.13m

2a What are the effects?

By working into the wind so that the wind carries the vapour away. As the area is very large and quite exposed there should always be sufficient air movement to disperse the vapour. The amount of time when people are working in such areas when the air is still (use a wind gauge/anemometer) could be limited.

3a Discuss whether leaving the contaminated gravel in the ground was an option.

4a Discuss the options available to treat the contamination.

5a Now compare some costs.

Total tonnage is 30,000 x 1.8 = 54,000 tonnes
Each tonne costs £1.40 x 30km = £42 per journey to transport
Each tonne costs £35 to tip + £25 Tax = £60 to dispose of each tonne
Therefore cost per tonne is £42 + £60 = £102 for transportation and disposal
Total cost to dispose of contaminated gravel is 102 x 54,000 = £5,508,000

6a Treatment cost of bioremediation.

Cost of aeration is £3 x 30,000 = £90,000
Discuss methods of collection
Advantages: Much reduced traffic impact
No possible contamination en-route
No need to involve other sites
Reduced the need to use chemicals or containment linings
Reduced carbon footprint from less traffic

Geology and Water Flow

Discuss which beds pose the greatest problem if contaminated with hydrocarbon?

Quarrying - Teachers Answer Sheet - continued

Student Module B - 'An environmental balancing act.'

1b What was the volume of material after extraction?

Amount dug up 707,539 x 1.05 = 742,916 m³

2b What was the volume of saleable material in the whole?

Loss during processing 12%, 742,916 x 0.88 = 653,766m³ for sale

3b What is the percentage of usable material in the whole?

Percentage of usable material in the whole is 653,766 ÷ 707,539 = 92%

4b How many tonnes could be produced from the material in the ground if 1m³ weighs 1.8 tonnes?

Tonnage of usable material is 653,766 x 1.8 = 1,176,779 tonnes

5b How many houses could be built with this quantity?

1,176,799 ÷ 50 = 23,535 houses

6b If they continued to work at the same rate as in the past, for how long could they continue at Lower Farm Gravel Works?

7 ½ years

7b Discuss how to transport material to Lower Farm.

Group A

A1 If a lorry carries on average 18 tonnes, how many journeys would this require?

1,176,799 ÷ 18 = 65,378 journeys

A2 What would be the fuel costs?

Fuel costs – 65,378 x 0.4 x ZZZZ kms = £ XXXX

A3 How many houses/families are affected along the lorries route?

Answer?

A4 Can you think of a better way to get from the air base to the gravel works?

Discuss.

Quarrying - Teachers Answer Sheet - continued

Group B

B1	How many journeys would be necessary? **1,176,799 ÷ 30 = 39,227 journeys**
B2	What would be the fuel costs? **Fuel costs - 39,378 x 0.65 x 2.5 = £63,989**
B3	How many houses does the new road pass? **Answer?**
B4	Discuss how are you going to make out a case to take the haul road through the SSSI?

Group C

C1	Can you come up with any alternatives?
C2	Discuss how can you ensure that the interests of nature and particularly, biodiversity for the whole area win out in the end?
C3	Discuss what evidence you can see of the new road that was used in 1999/2000?