

Reuse/Recycling, Sustainability - Teachers Answer Sheet

Section 2

Task B

Area of runway in m²? (Length x width)

$$(3.6\text{km} \times 0.26\text{km} = 0.936\text{km}^2 \times 1,000,000 [\text{m}^2 \text{ in km}^2] = 936,000 \text{ m}^2)$$

Cubic capacity of concrete and tarmac in runway? (Area x thickness)

$$(936,000\text{m}^2 \times 0.3\text{m} [\text{average thickness in m not mm}] = 280,800\text{m}^3)$$

Tonnes of concrete and tarmac in runway? (Cubic capacity x tonnage per cubic metre)

$$(280,800\text{m}^3 \times 2.4 \text{ tonnes/m}^3 = 673,920 \text{ tonnes})$$

Land saved from excavation for sand and gravel? (Recycled material divided by sand and gravel tonnage per hectare)

$$(673,920 \text{ tonnes} \div 50,000 [\text{tonnes per hectare}] = 13.48 \text{ Hectares})$$

Task C

Proportion of void filled by imported soil (160,000m³)? (Size of void is equal to the amount of concrete and tarmac removed (for recycling), proportion is amount imported divided by amount removed)

$$(160,000 \div 280,800 = 0.569, \text{ i.e. just over half the void was filled})$$

Task D

Recycled material (concrete and tarmac) of 673,920 tonnes apportioned to each of the places named.

$$\begin{aligned} \text{(Each area - Newbury by-pass} &= 37.5/100 \times 673,920 = 252,720 \text{ tonnes} \\ \text{Newbury} &= 12.5/100 \times 673,920 = 84,240 \text{ tonnes} \\ \text{Thatcham, Reading, Winchester, Basingstoke and Oxford} & \\ \text{(10\% each)} &= 10/100 \times 673,920 = 67,392 \text{ tonnes each} \end{aligned}$$

Task F

How many lorry loads to transport all the recycled material (concrete and tarmac)?

$$(673,920 \div 18 = 37,440)$$

How many train journeys to transport all the recycled material?

$$(673,920 \div 1500 = 449.3 \text{ journeys})$$

Using Oxford as an example – 64 kms distance by rail, 67,392 tonnes to go to Oxford (Task D). The minimum quantity (i.e to be economic for the train company) that can be moved the 64kms distance to Oxford is 350,000 tonnes, therefore there would be no movement of materials by train to Oxford.