Question 3: Analyze an Environmental Problem and Propose a Solution (Doing Calculations) — 10 points

A **Identify** a type of surface mining the company could use to access the coal. **Point 01**

Examples of acceptable responses may include the following:

- Strip mining
- Open pit
- Mountain top removal

B **Describe** an environmental problem associated with surface mining. **Point 02**

Examples of acceptable responses may include the following:

- Removal of vegetation/soil/rock causes loss/destruction of habitat.
- (Surface mining) causes loss of habitat, which results in loss of biodiversity.
- Removal of vegetation can increase rates of erosion.
- (Surface mining) can lead to contamination of groundwater/surface water/waterways from runoff of sediments/pollutants.
- Removal of vegetation/soil/bedrock/parent material can release dust particles/methane.
- High energy/fossil fuel consumption is needed to operate equipment and leads to air pollution.

C **Describe** an environmental problem the town could experience as a result of the electricity generation at the coal-burning power plant. **Point 03**

Examples of acceptable responses may include the following:

- Release of air pollutants/toxic metals/particulates/NO_X/SO_X could lower air quality/result in respiratory problems.
- Release of air pollutants/sulfur dioxides/nitrogen oxides could cause acid rain.
- Greenhouse gas emissions/carbon dioxide/methane/water vapor could lead to altered precipitation/climate/weather/temperature patterns.

D **Propose** a realistic solution the local government could enact that would reduce the negative environmental consequences of using coal to generate electricity. **Point 04**

Examples of acceptable responses may include the following:

- Require/incentivize the plant to install scrubbers/electrostatic precipitators.
- Incentivize the use of alternative energy sources/energy efficient appliances.
- Incentivize green building design/conservation landscaping/planting trees as carbon sinks.

E **Calculate** how many pounds of coal would need to be burned to generate enough electricity to power a town with 11,000 houses for a year. **Show** your work. **Point 05**

One point for the correct setup to calculate how many pounds of coal would be needed.

Examples of acceptable responses may include the following:

- (11,000 houses x 10,640 kWh per house) / 0.88 kWh per lb of coal
- (11,000 x 10,640) / 0.88

One point for the correct calculation of how many pounds of coal would be needed. **Point 06**

Examples of acceptable responses may include the following:

- 133,000,000
- 1.33 x 10^8

F **Calculate** the percent change in bird species per hectare since the power plant was installed. **Show** your work. **Point 07**

One point for the correct setup to calculate the percent change in bird species per hectare.

Examples of acceptable responses may include the following:

- (6.0 species / ha – 7.5 species / ha) / 7.5 species / ha x 100
- (6.0 – 7.5) / 7.5 x 100

One point for the correct calculation of the percent change in bird species per hectare. **Point 08**

Examples of acceptable responses may include the following:

- -20%
- 20% decrease
- -20

G Assuming that the growth rate remains constant, **calculate** the year in which the population will reach 52,500. **Show** your work. **Point 09**

One point for the correct setup to calculate the year the population will reach 52,500.

Acceptable setup point:

- (70 / 5.38) + 2022

One point for the correct calculation of the year the population will reach 52,500. **Point 10**

Acceptable calculation point:

- 2035