

## EXCEL Activity –

1. Have students turn on their computers and open the excel file provided.
2. Explain that the file has a list of latitude and longitude of the borders around Washington State.
3. Ask students to plot the latitude and longitude in a graph:
  - a. Click the “A” Column
  - b. Hold down the “Ctrl” Button
  - c. Click the “B” Column
  - d. Click the graph icon in the excel toolbar (“Chart Wizard”)
  - e. Click “X-Y Scatter”
  - f. In the “Chart Sub-Type” section, click the curved lines with no points. (“Scatter with data points connected by smoothed lines without markers.”)
  - g. Click “Finish” – The borders of Washington State should be plotted.
4. Ask students to quickly format the graph:
  - a. Right click the background of the graph, and click “Clear”.
  - b. Right click one of the black gridlines, and click “Clear”.
  - c. Students should be able to clearly see the borders of Washington.
  - d. Click the title and change it to say “Washington State”.
5. Ask students to plot the cities onto the same graph:
  - a. Click the Washington State plot, so that it is selected.
  - b. In the menu, click “Chart” and then “Add Data”
  - c. Select the two short columns that have city coordinates, including the headers.
  - d. Click “OK”
  - e. Make sure that the boxes are checked for “Series Name in First Row” and “Categories (X values) in First Column”
  - f. Click “OK”
  - g. Students should see a curved line going through the state.
  - h. Right click the new curved line and click “Format Data Series”
  - i. Under the “Patterns” menu, click “None” for the line and “Automatic” for the marker.
  - j. Click “OK”
  - k. Students should see the selected cities plotted on the graph.
6. Ask students to identify where each city is located. On the board, engage students to help draw a sketch of the plot they made. Make sure to plot the cities and label them! Ask students to label the cities on the similar plot provided to them on their worksheet.
7. If there is ample time students can right click their graph and adjust their “Chart Options”.
8. Students should now save their work.
9. Ask students to use the information they have to fill out the columns labeled “AIRPACT NO<sub>2</sub>” and “OMI NO<sub>2</sub>”. Explain that the large numbers can be entered by using the capital “E”. (i.e.  $1.5 \times 10^{15}$  can be typed “1.5E15”)
10. Tell students they will now use a powerful tool in Excel to calculate the difference (and ratio) between the model and the satellite.
  - a. In the first empty cell under “AIRPACT / OMI Ratio” press the equals (“=”) button.
  - b. Click the cell with the value of the AIRPACT NO<sub>2</sub> in Seattle.
  - c. Press the “/” key, which stands for division.
  - d. Click the cell with the value of the OMI NO<sub>2</sub> in Seattle.
  - e. Press the Enter Key.
  - f. Follow a similar process to calculate the difference in NO<sub>2</sub> in Seattle, but this time use the “-“ key which stands for subtraction.

11. Tell students they will now use another powerful tool in Excel, to duplicate the calculation process they just went through for Seattle, for all the other cities.
  - a. Click the cell that has the value for the Seattle NO<sub>2</sub> Ratio.
  - b. Notice that the cell is highlighted and has a cross on the bottom right hand corner.
  - c. Move the mouse cursor over the cross, click the cross and hold down the button, and then drag the corner down to the bottom of the table. (Release the mouse button).
  - d. All the ratios should now be calculated.
  - e. Follow a similar process to fill in the values for the difference column.
12. Students should now save their work.
13. Ask students to record their answers in the worksheet provided to them.
14. Discuss with students the meaning of their ratio and difference calculation. What is the significance of having a ratio equal to “1”? What is the significance of having a difference equal to “0”?
15. With time, students can make a bar graph of the AIRPACT and OMI pollution in various cities.
  - a. Select the three columns with city name, AIRPACT NO<sub>2</sub>, and OMI NO<sub>2</sub>.
  - b. Click the Graph Icon in the Excel Toolbar.
  - c. Choose “Column” or “Bar”
  - d. Click Finish
16. Students should now save their work.
17. Students should use the Bar Graph created to answer the final questions in their worksheet.
18. As an extension, students could use the “avg” function in Excel to calculate the average values obtained in their comparison.
19. Excel can be closed, and computers put away.
20. With time, review as a class over what was learned about both air pollution and excel.