

Introduction The Los Angeles Regional Transit Board has hired your company to research and recommend potential routes for a new monorail system in Los Angeles, California with the goal of enhancing local and regional connectivity to meet transit demand based on projected population growth. You have been chosen as a consultant because of your knowledge of transportation modes, GIS, and your experience with the design of the monorail systems.

Your company will present the transit route options you recommend to the Los Angeles Regional Transit Board (the class). The presentation will include charts to display data gathered and maps that show the preferred/recommended routes as well as other materials/items you choose to use.

Instructions

1. Go to the [Transportation Youth Academy](#) website. Click on the **Design Los Angeles Monorail Transit Routes Using GIS** link. Download and/or print the following documents you will be using to complete this project:
 - **Activity Guide-Patterns of Growing Population**
 - **Activity Guide-Transportation Planning Using LA GeoHub**
 - **Student Worksheet- Transportation Planning Using LA GeoHub**
 - **GIS Maps and Layers in LA GeoHub and ArcGIS**
 - **Activity Guide-Layering Maps Using LA GeoHub and ArcGIS**
 - **Student Worksheet-Monorail Route Planning**
2. Familiarize yourself with how a monorail system could operate by watching the **SMT Rail Greenest Smart Mass Transit on the planet** video on the Transportation Youth Academy website above this project.
3. First, you will learn how to use two GIS systems called ArcGIS and LA GeoHub.
 - a. If you are not already there, go to the [Transportation Youth Academy](#) website. Click on the **Patterns of Growing Population** Activity Guide link and follow the instructions.
 - If you are not already there, go to the [Transportation Youth Academy](#) website. Click on and watch the video located by the **Activity Guide-Layering Maps Using LA GeoHub and ArcGIS**. Open/download/or print the **Activity Guide-Layering Maps Using LA GeoHub and ArcGIS** link and follow the instructions.
4. Next, in this project, you will be designing routes for the new monorail system in the City of Los Angeles and greater Los Angeles area, California and you will be using and “layering” multiple maps and the two GIS tools you have learned (ArcGIS and LA GeoHub) to plan your routes. Walk through the steps in the **Activity Guide-Layering Maps Using LA GeoHub and ArcGIS** document to familiarize yourself with how to use and layer multiple maps.
5. Next pick one of the following transportation goals you would like to plan for the new monorail system.
 - a. Alleviate current traffic/transportation congestion, bottle-necks/traffic jams, safety issues, and increase overall mobility.
 - b. Increase quality of life in the region by increasing transportation to places people frequently go for entertainment, health, food, education, etc.
 - c. Increase transportation services for business, commerce, and people commuting to work.
 - d. Provide better transportation access/services to low-income, elderly, and vulnerable populations.
6. Using the **GIS Maps and Layers in LA GeoHub and ArcGIS** document. For short, we will call this the **Maps and Layers** document. Notice how the maps are organized first by source

(LA GeoHub then ArcGIS) and then by topic including for the 4 goals above.

7. Design 3 routes for the new monorail system to achieve the goal you have selected. Select maps (using the **Maps and Layers** document) that are most applicable to your goal and begin layering them to find route options. (Remember: For steps and tips on how to layer the maps, use the **Activity Guide-Layering Maps Using LA GeoHub and ArcGIS**).

Here are guidelines for creating your maps, identifying 3 routes, and completing your Monorail Route Planning Worksheet.

8. Each “layered” map should contain one or more **Transportation Options and Services Maps**. Refer to the category with this title in both the LA GeoHub Maps and the ArcGIS Layers section of the **Maps and Layers** document. Begin by selecting one or more maps from this category to use as your base map.
9. Add, on top of the transportation options/services, at least one map from your goal area. For example, if you are working on the “Increase transportation services for business, commerce, and people commuting to work” goal, add a map from the **Business, Commerce, and People Community to Work** category of the **Maps and Layers** document.
10. Determine what part of the Los Angeles area you would like to plan for: the City of Los Angeles, the County of Los Angeles, or the greater Los Angeles area. Choose one or more map layers from the **Los Angeles City, County, and Surrounding Area Boundary and other Map Layers** section of the **Maps and Layers** document.
11. You also need to estimate the number of people and describe some of their characteristics who may ride the monorail system using the route you identify. Therefore, you will need to have one of your map layers include population information. Depending on your area of focus from step #9 above, you will need to choose to include at least one map from the **Population and Households Map Layers** category that will provide information about the people living in the route area. For example, if you choose the City of Los Angeles for your route area, a good map to use will be the LACityDemographics map. If you choose the County of Los Angeles for your route area, you could use the USA ZIP Codes (2015) or the 2016 USA Population Density maps.
12. Once you have all the layers in one map you will see areas where, by adding a new monorail route(s) will help reach the goal you have chosen. List all the maps you used on your **Student Worksheet-Monorail Route Planning** in the Maps Used section.
13. Print out the map and begin drawing a potential route line(s) on the map. Once you have the line determined, go back to your map layers in ArcGIS. Make notes of anything you notice that is a special feature or something important you considered when determining your route. For example, it surrounds a large park, there are large numbers of people living in the area that would be served by the route, etc. Write/type the features/considerations on your **Student Worksheet-Monorail Route Planning** in the Special Features/Considerations section.
14. Using the population map you choose, click on the areas surrounding the route boundary and record the number of people living in each area, then add them up to determine the total number of people who will be served by the monorail route. Record this on your **Student Worksheet-Monorail Route Planning**. In the Total Population Surrounding Proposed Route section. Make notes of other information about the population in each area. For example, if you are planning for people over 64 – how many people over 64 live in areas surrounding the route. Record this information on your **Student Worksheet-Monorail Route Planning** in the Other Information About People Served by the Proposed Route section. Be sure to save your

map as you may come back and use it again later.

15. Next determine if there are any geographic limitations that could impact your proposed route. You can do so by changing the Base Map using the Imagery, Topographic or USA Topo Maps. You can also do so by adding additional map layers from the **Maps and Layers** document such as the Earthquake Faults map. Record any geographic limitations on your **Student Worksheet-Monorail Route Planning** in the Geographic Limitations section.
16. Finally, determine which (if any) existing transportation routes/modes (bus, rail, commuter line, etc.) the route should connect to. Use the maps you added in step 8. You may need to add additional maps that you may not have already chosen in step 8. Refer to the **Transportation Options and Services Maps** category of the **Maps and Layers** document,
17. Now that you have completed your first recommended route, repeat steps 8 through 15 choosing different maps in one or more of the categories, for your second and third recommended route. You may, for example, leave the Transportation Options and Services Maps the same but change the maps from your goal category.
18. In addition to the maps, develop other visual aids to use as you present your proposed route design. You will want to include information on the research materials you used to support your recommended routes; the goals, values, and interests that were considered when designing the routes; etc. Think about which kinds of information would be most helpful to support your recommendations and include that information.

