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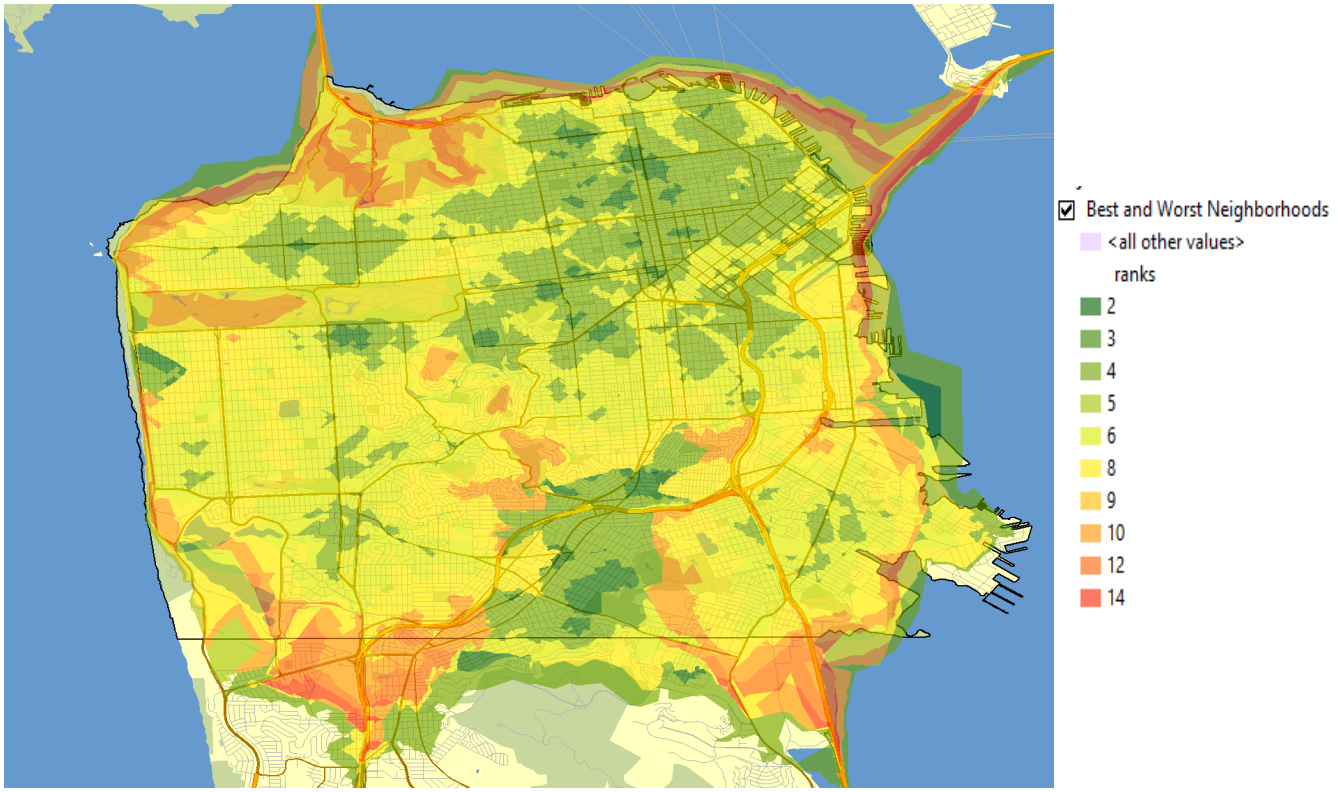
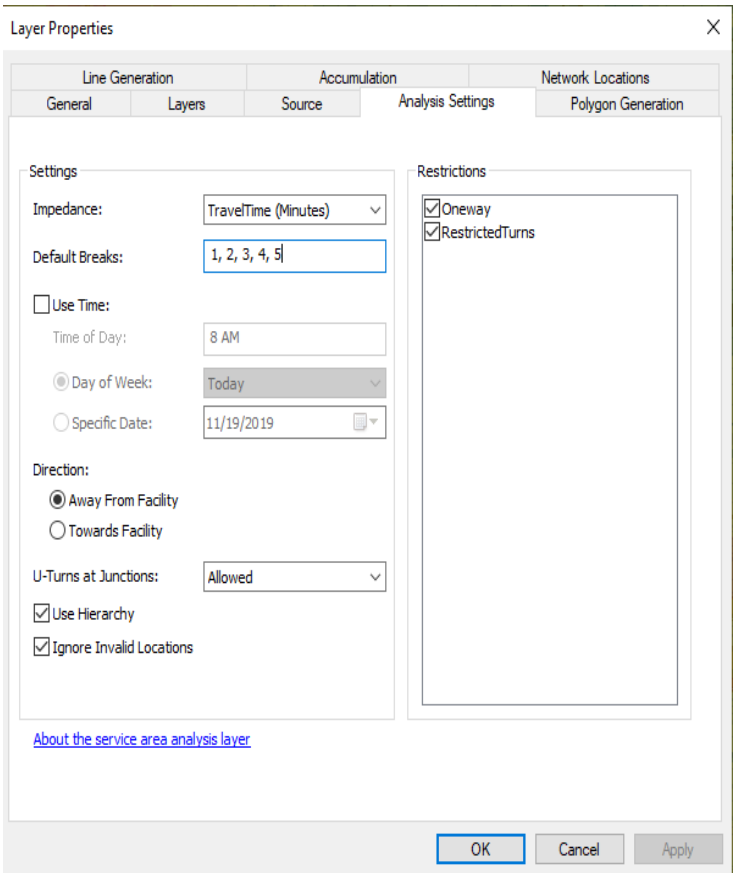
GEOG 188: Lab 102
11/16/2019

Lab 10: Spatial Computation in a Constrained Network (Network Analyst)





Question 1: Map the worst and best neighborhoods to live in using accessibility to the 3 amenities (Fire Stations, Schools, Peets').

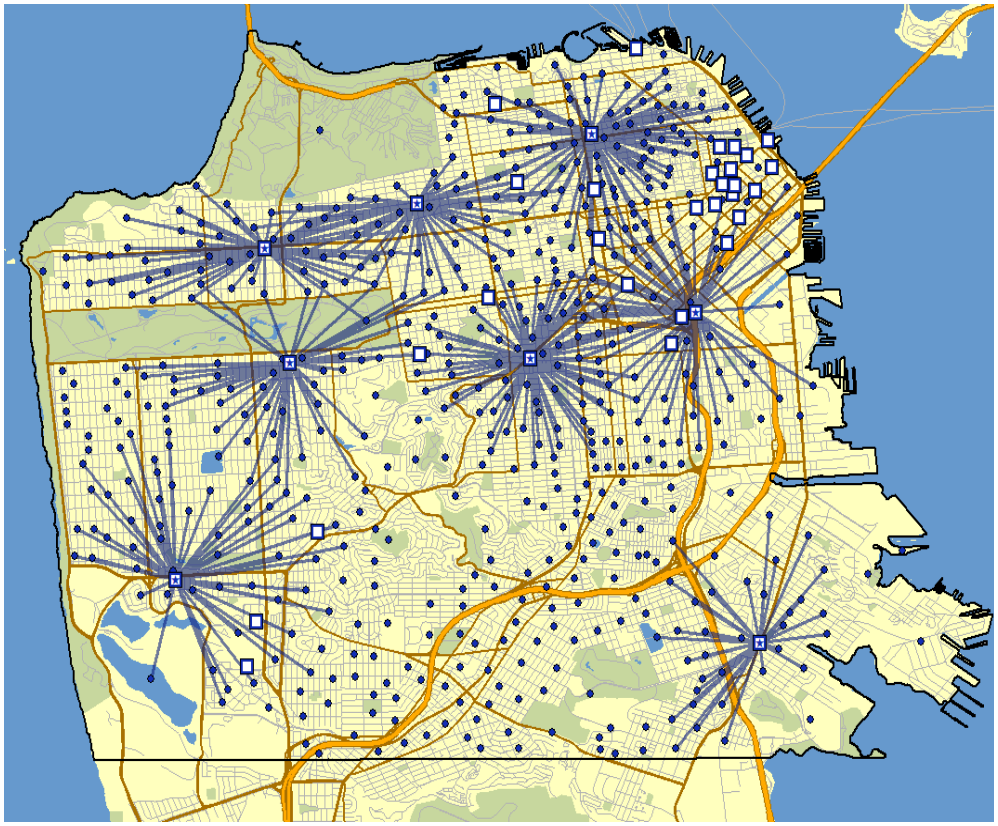
Under the New Service Area option, I generated 3 different facility layers, each layer has the facilities of Peet's, Schools (public and private), and Fire Stations. For the Fire Sattions layer, I set the break values to 1, 2, 3, 4, 5 min with direction as 'Away From Facility' because of the fire trucks are dispatched from these stations and because San Francisco is only 7x7 miles so most facilities can be reached under 5 min. Likewise, with the polygon generation set to merge by break values, schools and Peets layers are set at the break values of 0.5, 1.5, 2.5, 3.5, 4.5, and 1, 2, 3, 4, 5 respectively with direction as "Towards Facility".

I exported each layer with its calculated distances to polygon shapefiles, imported the layers back and union the layers. I created a new new field called ranks where each polygon is given a rank that is a combination of all three layers' ranks. The lower the number (higher ranks), the more suitable the region is and vice versa.

***Except for the green region on the edges (did not have all 3 amenities considered, only fire stations).

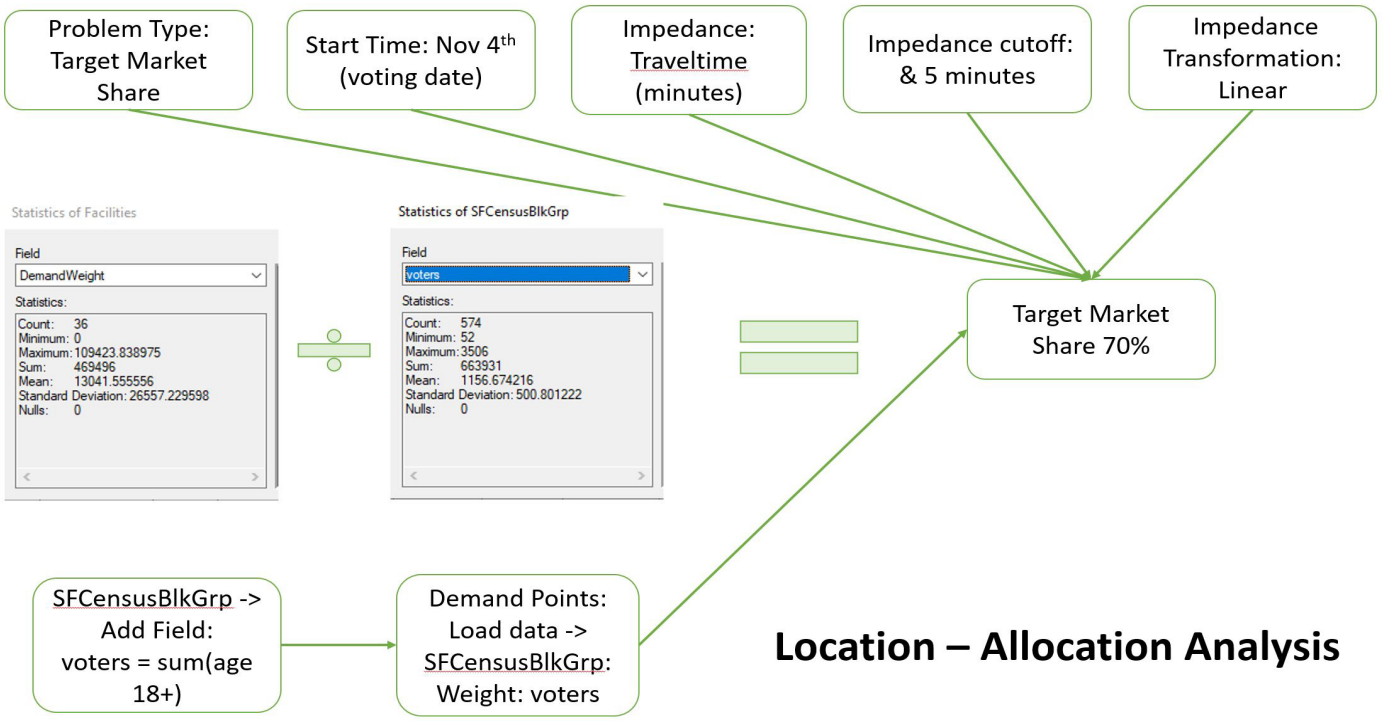
Question 2a: Locate voter registration centers (in Peet's stores) to optimally serve 70% o voters using Census

The Network Analyst ran on the following parameters,: minute traveltime impedance, 5 min cutoff in linear transformation, and demand points used the Census Block Group eligible voters for each block group as demand weight. The chosen facilities list the demand weight in the Facilities table lists the number of people that are likely to vote at the choosen Peets'. There are 8 choosen Peets to meet the market share of 70%.



Assuming the census data is up to date, I added a new field to get the sum of all eligible voters of the population. I loaded the Demand Points using the field voters that I calculated earlier as weight. With Peets' stores loaded in Facilities, I set the parameters listed in the flowchart below into the Network Analyst window.

To achieve a market share of 70%, the solution chooses 8 facilities. This number of facilities can serve 469,496 out of a total of 663,931 eligible voters, which by division, achieves a 70.1%.



Question 3: Map out season opener for the public to private school competition pairs

a. For this Find the Closest Facilities problem, finding the closest rival puclic school to private schools, I loaded the private schools as facilities, the public schools as the incidents with the direction of public school to private school and the distance cutoff value of 1 kilometers or 1000 meters. There was one private school with 2 public schools paired, however, only the closest one out of the 2 is selected. I recalculated the closest facility by increasing the Facilities to Find parameter and keep the impedance at 1000 meters but the second closest public school has no other private school to match to that is under 1000 meters, the second closest is at 1200+ meters.

- How many season opener games take place the first week? 7 games.

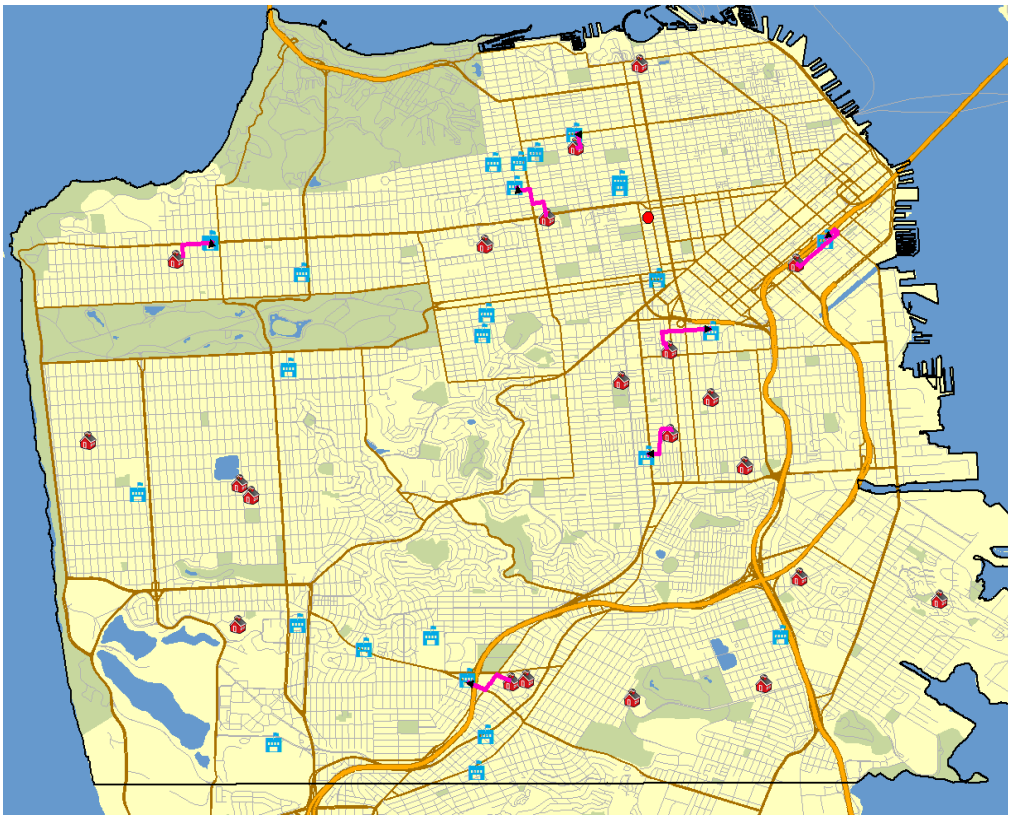


Fig 1: Allocation of Public Schools to Private School Hosts

b. For the finding which schol will need officers on site during the game, I generated service area from the police points for 4 miute as the break value. Since anything more than 4 means that the area has poor access to a police station, I reevaluated the school game pairs and found that all of the seven games are within 4 minutes to a police station. Since the officers can get on site in 4 min, there is no need for police officers to be on site. There are 1 private school to the far West and one public school to the SouthWest corner that would need officers onsite should they hold any game in the future.

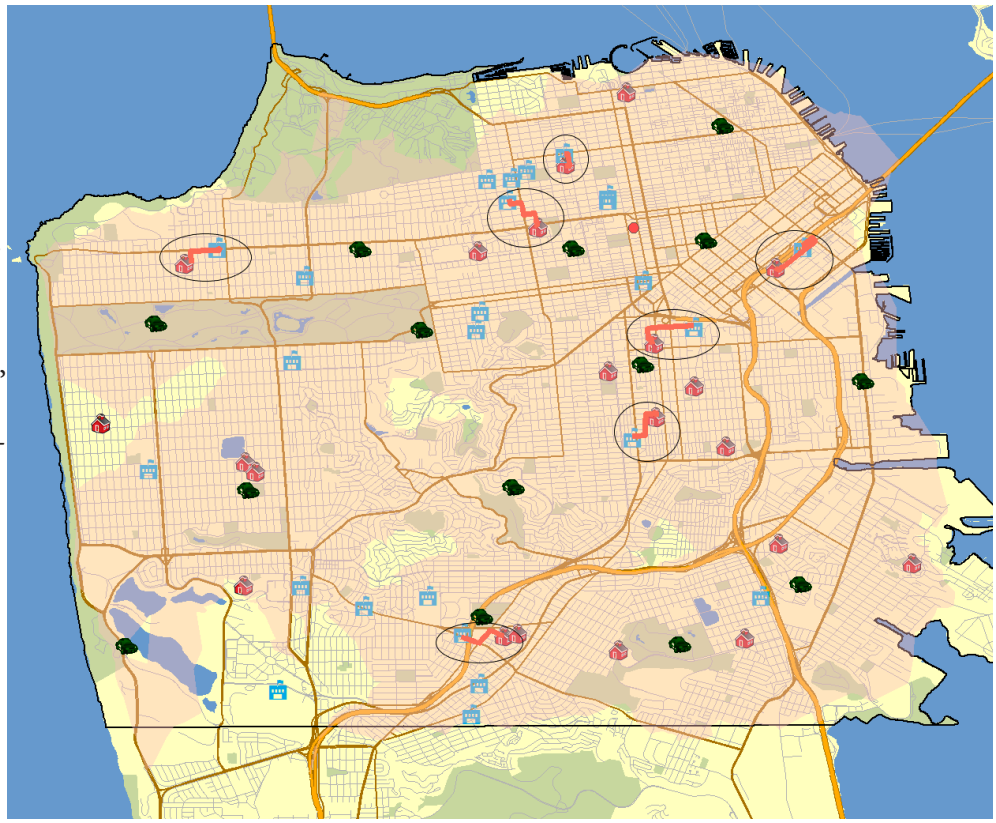


Fig 2: Season Opener Games & Police Service Area

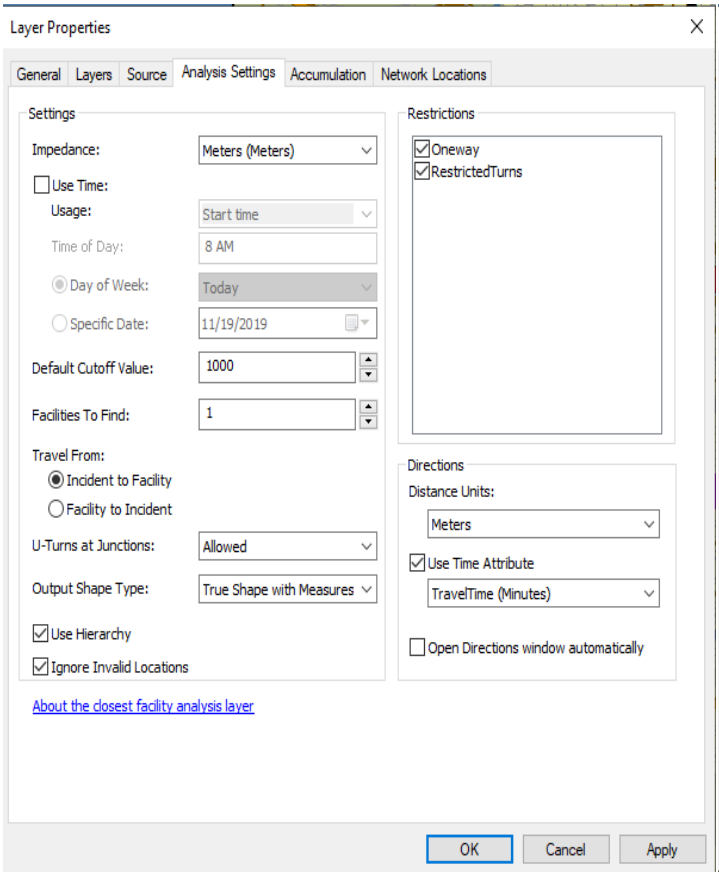


Fig 2: Processing for fig.1: private - public school pairs

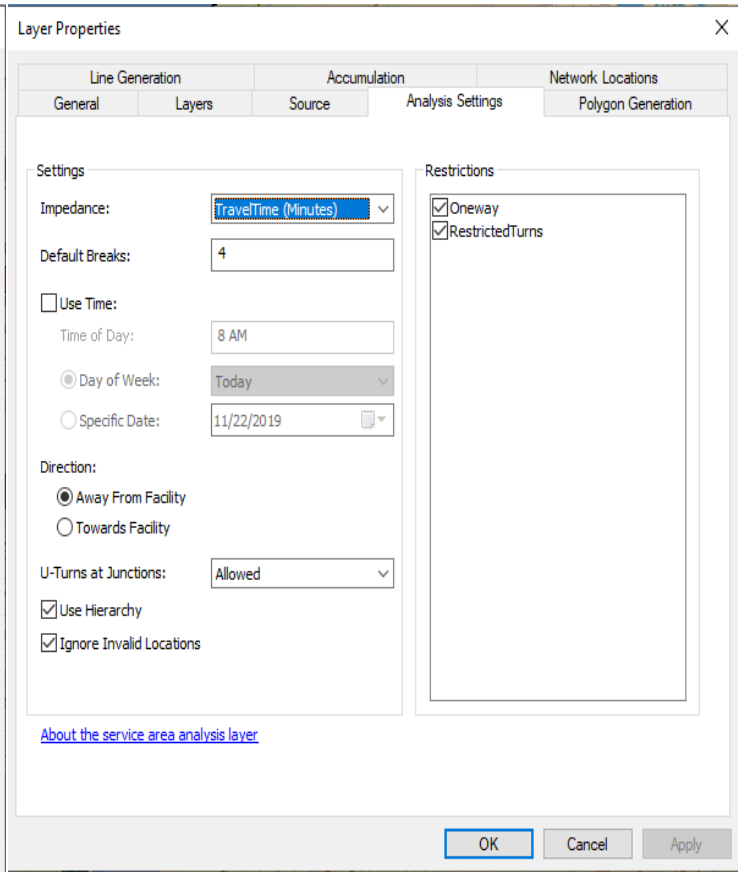


Fig 4: Processing for fig,2: