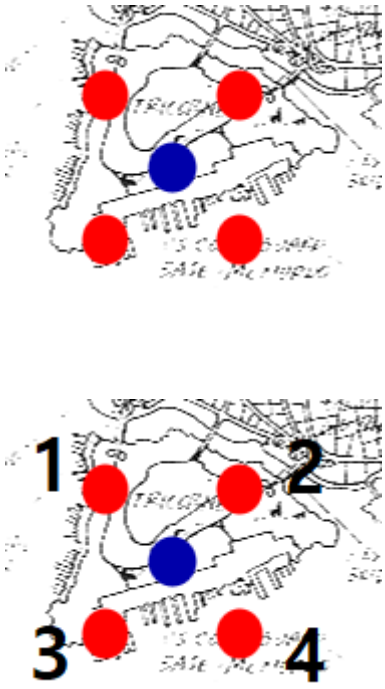
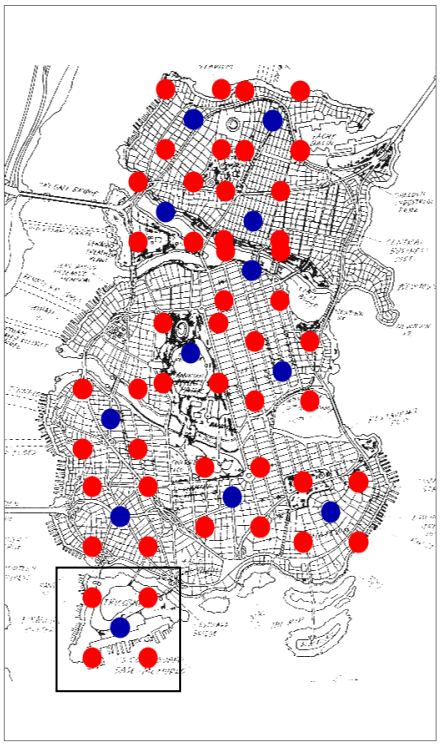
Extra Cell phone receiver

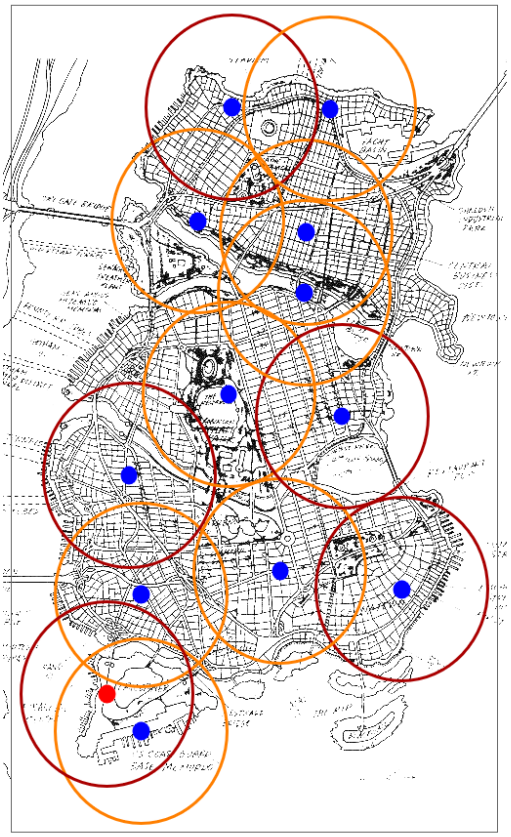
By optimizing the solution, we have shown that we only need 5 receivers to cover all the area of city. Naturally, next question is that the solution is still true if we can move around the location of the radar. Because of the current administration of Gotham City's monetary policy create rapid change of the land, and increasing demand of cell phone signal at the harbor area, we want to see that we can move the tower location, but still converge to 5 receivers.

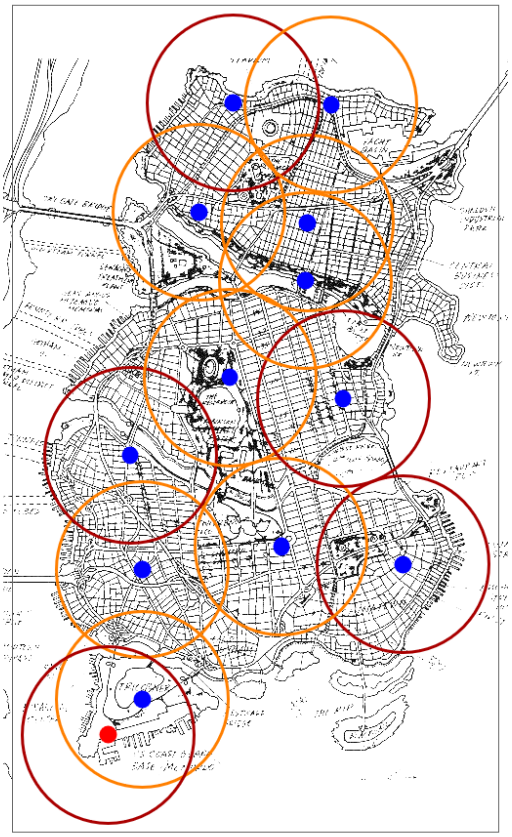
To optimize the solution, we are optimized 13 (12+1) graph where we include one extra location.

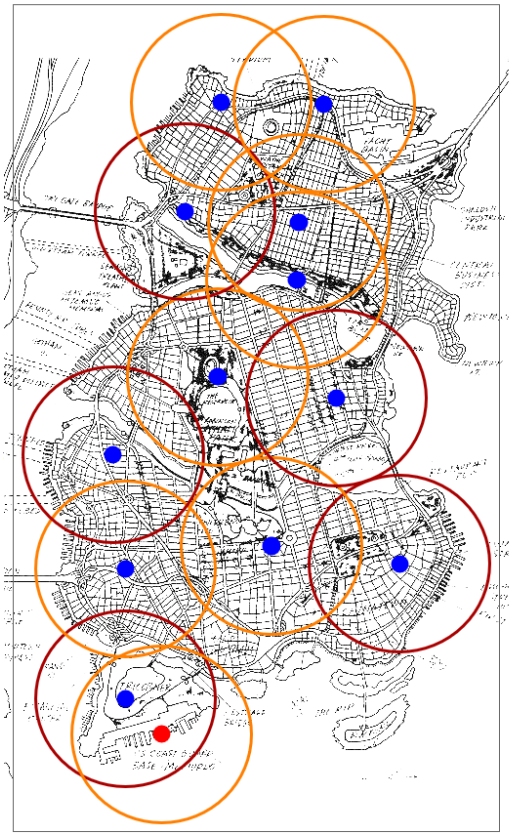


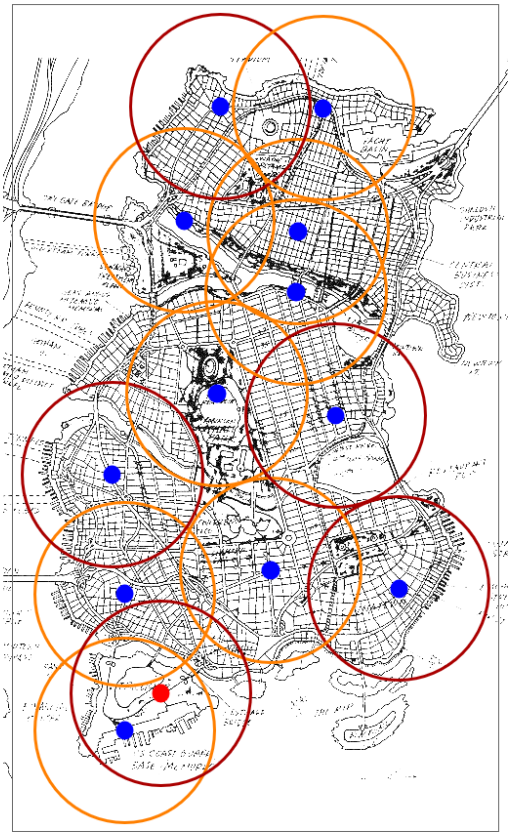


As shown in the figure above, blue represent original tower location, and we add one of the four deviation from the original tower location shown in red. Therefore, we have 48 possible deviation from the original location. Using this, we solved 48 optimization problems, and see the results. (see next figure)

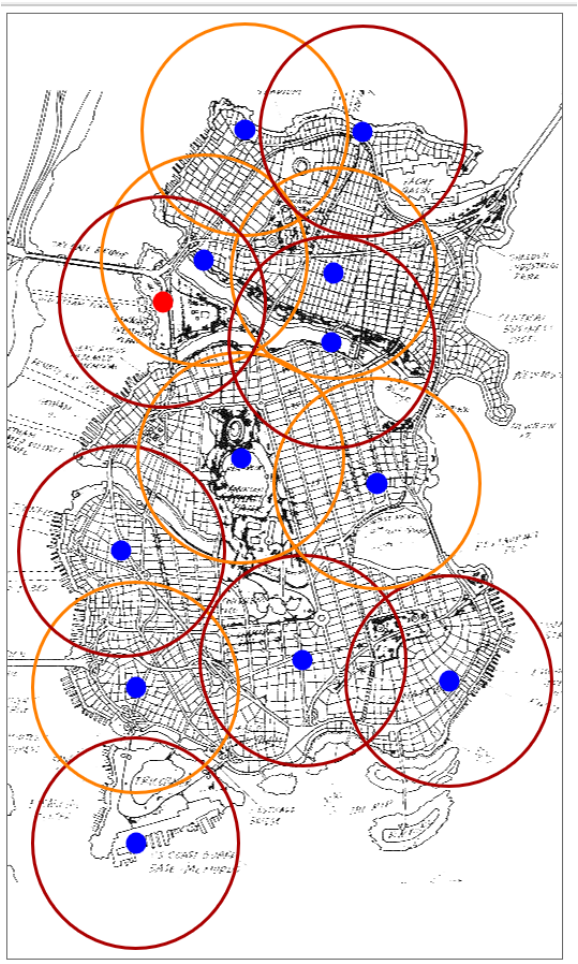








We can take a look at the first result. This is the four result among 48 total possible results. Since all the solutions have degeneracy, so there are other solutions that is same with the original tower locations, but this suggests that there is room for relocating cell phone tower.

- Among 192 possible solution, we found that 55 new optimized location. This give increase of mobility by 28%, which can further optimized once we know the location of interest.

Second result is quite interesting, We found **one location** that actually increase the number of the cell tower. In the highway interaction located at the Arkham Island, If we want to cover this area, Optimum solution increased to 5 tower. This conclude that For full coverage of Gotham city, we need to either sacrifice the location of Arkham Island, or increase number of tower. Since this location mainly serve Asylum for the criminally insane, our team suggest to abandon this location for optimizing the profit of company.