# Land Values Analysis

## A Pragmatic Approach for Mass Appraisal Of Residential Properties In Los Angeles County

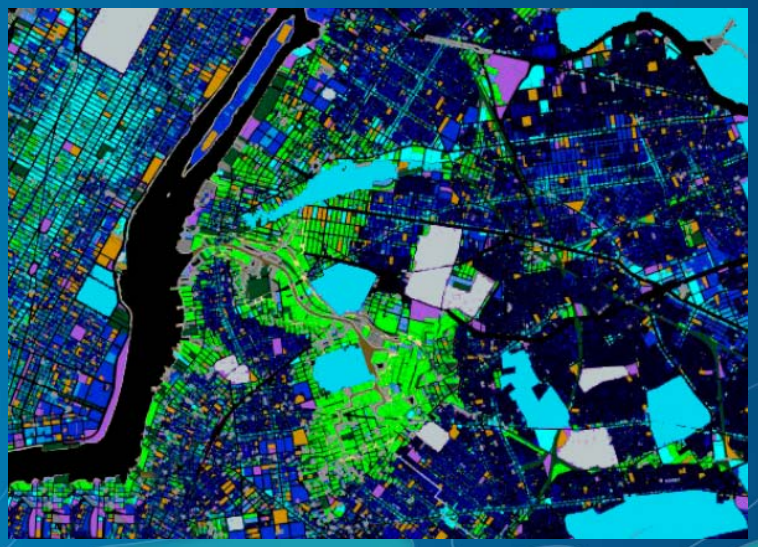
Anthony Liu

Emilio Solano

Guillermo Araujo

# WHERE IT ALL BEGAN…

- Alta California became a territory of the U.S. in 1848
- The California Land Act of 1851 sparked the revolution of Los Angeles from a rancho economy to the beginning of more sophisticated economy as land became accessible for other uses…
- The innovation of GIS and Geostatistics in 1960s…..



# OBJECTIVES

- To build a sensible land valuation model (using ArcGIS) that can provide assessors with location-specific value prediction in Los Angeles county residential market
- To select an actual dataset that is representative yet topographically complex (elevation) in the county for demonstration
- To build an effective parcel elevation model for analysis
- To present the predictions through visualizations that highlight the geographical variations of our land value predictions
- To compare the prediction results with land abstraction method traditionally used by assessors

# TODAY'S ROADMAP

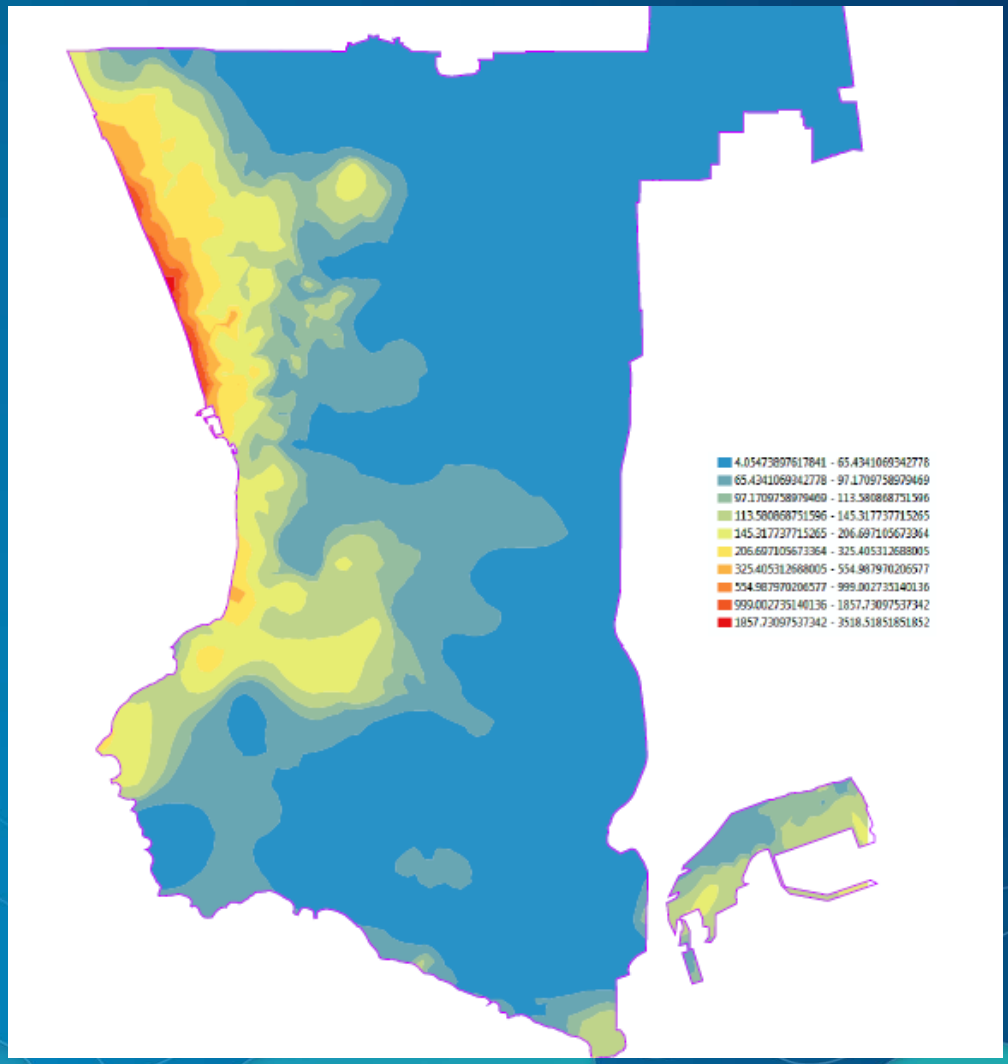
- 7 recognized Techniques in vacant land valuation
- How we do it…
- Parcel Elevation model
- Prediction results compared with *land abstraction* method
- Conclusions
- Q&A

# 7 RECOGNIZED APPROACHES IN VACANT LAND VALUATION

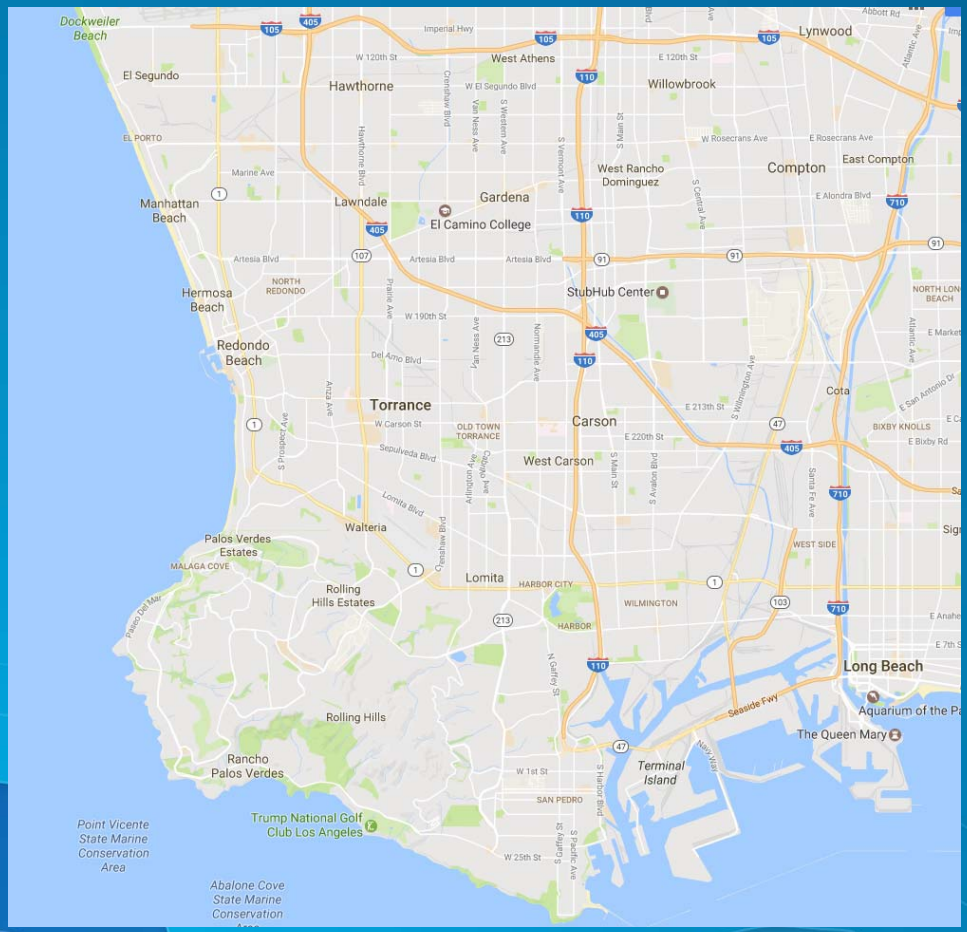
- Comparable sales analysis
  - By far the most accurate approach to land values
    - Hedonic pricing method
    - Geostatistical approach
- Extraction
- Allocation (*market-derived* ratio analysis; *extraction*-derived)
- Cost analysis
- Ground rent capitalization
- Subdivision development (land build-up approach)
- Land residual capitalization

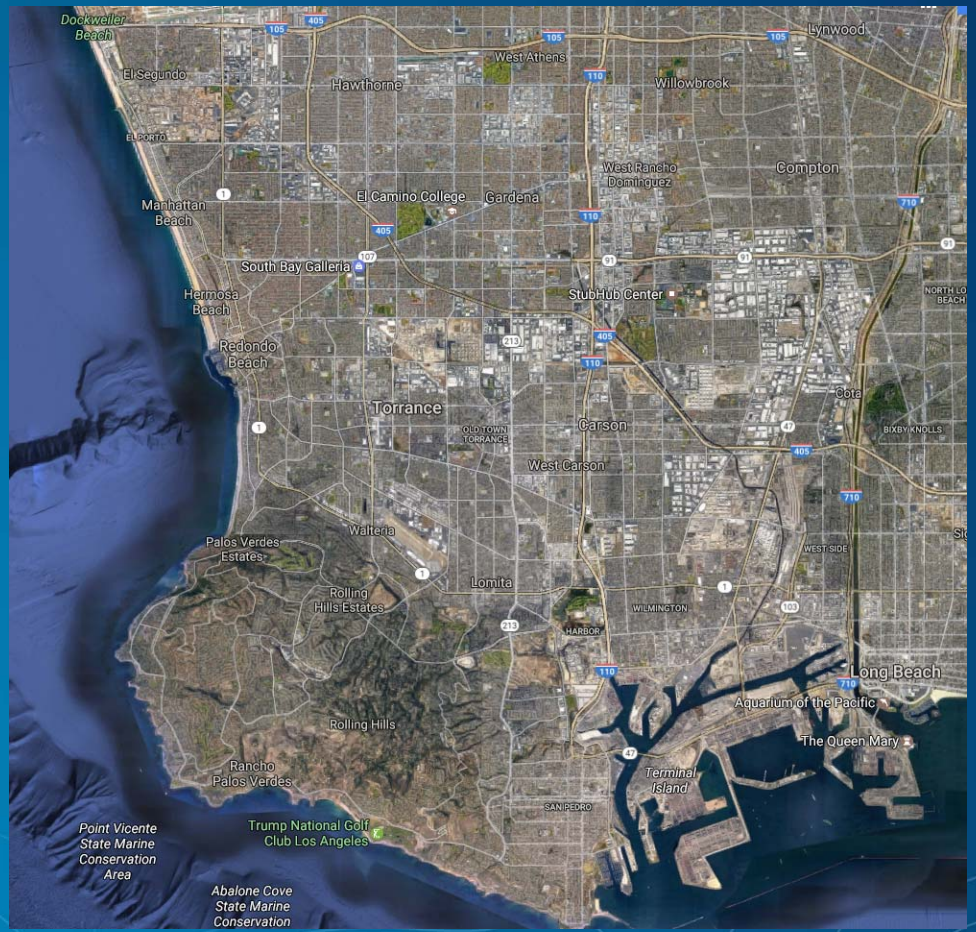
# HOW WE DO IT…

- Use ordinary/simple cokriging techniques available in ArcGIS Geostatistical Analyst (GA) Extension
- Select a test site and apply limited vacant land sales data and integrated GIS parcel information to build various valuation models for unsampled vacant land valuation
- Validate the results with traditional appraisal technique

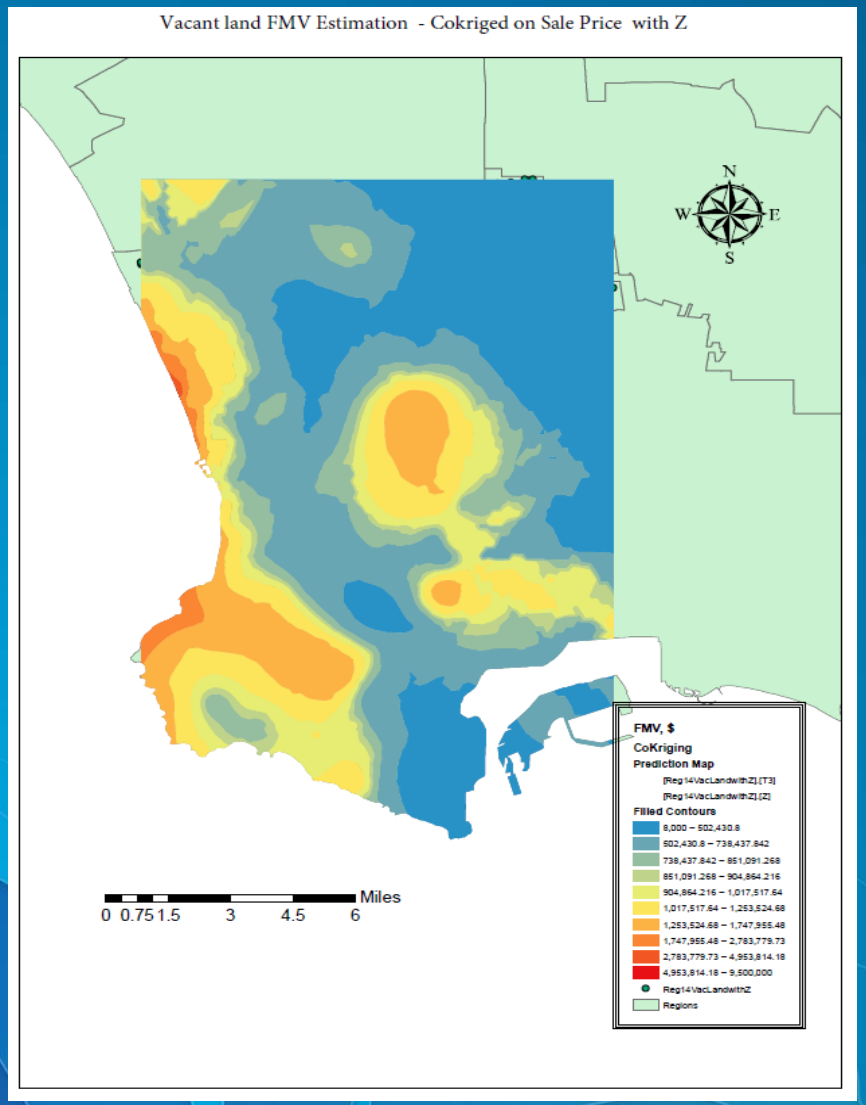


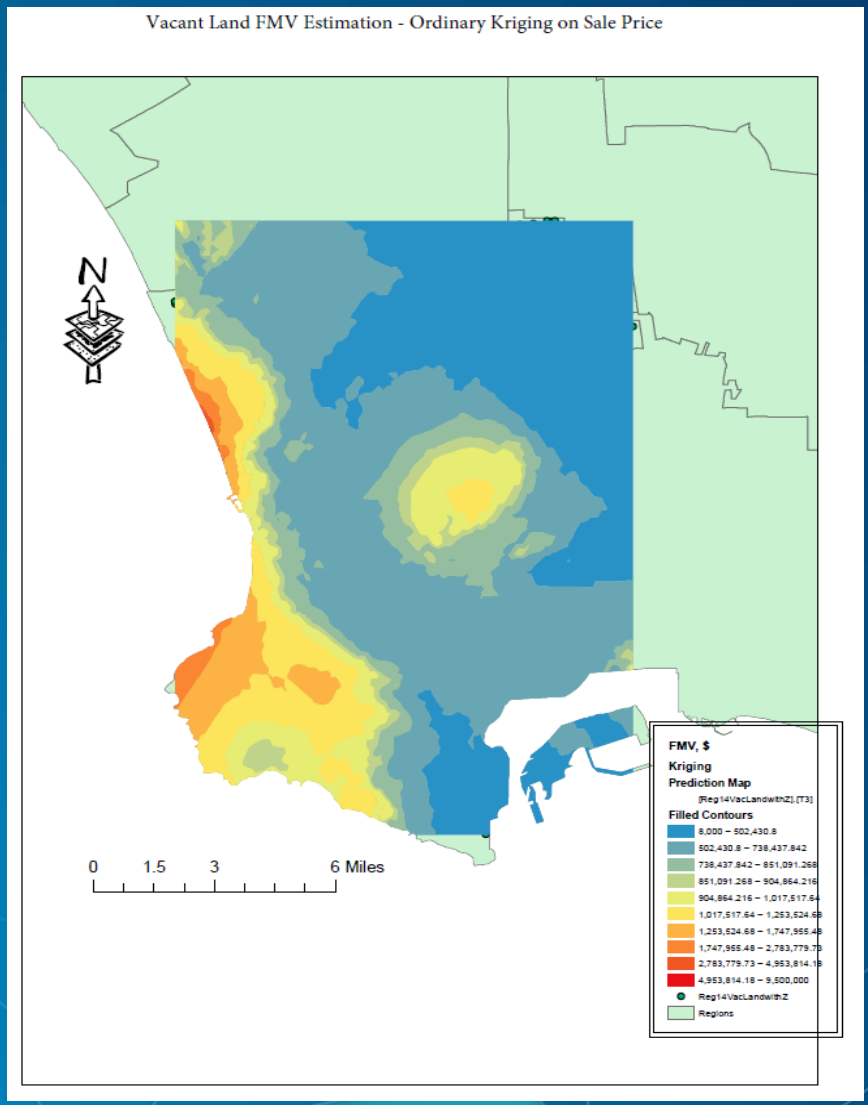
# MODEL TEST SITE SELECTION



# MODEL BUILDING: VARIABLE SELECTION EXAMPLE



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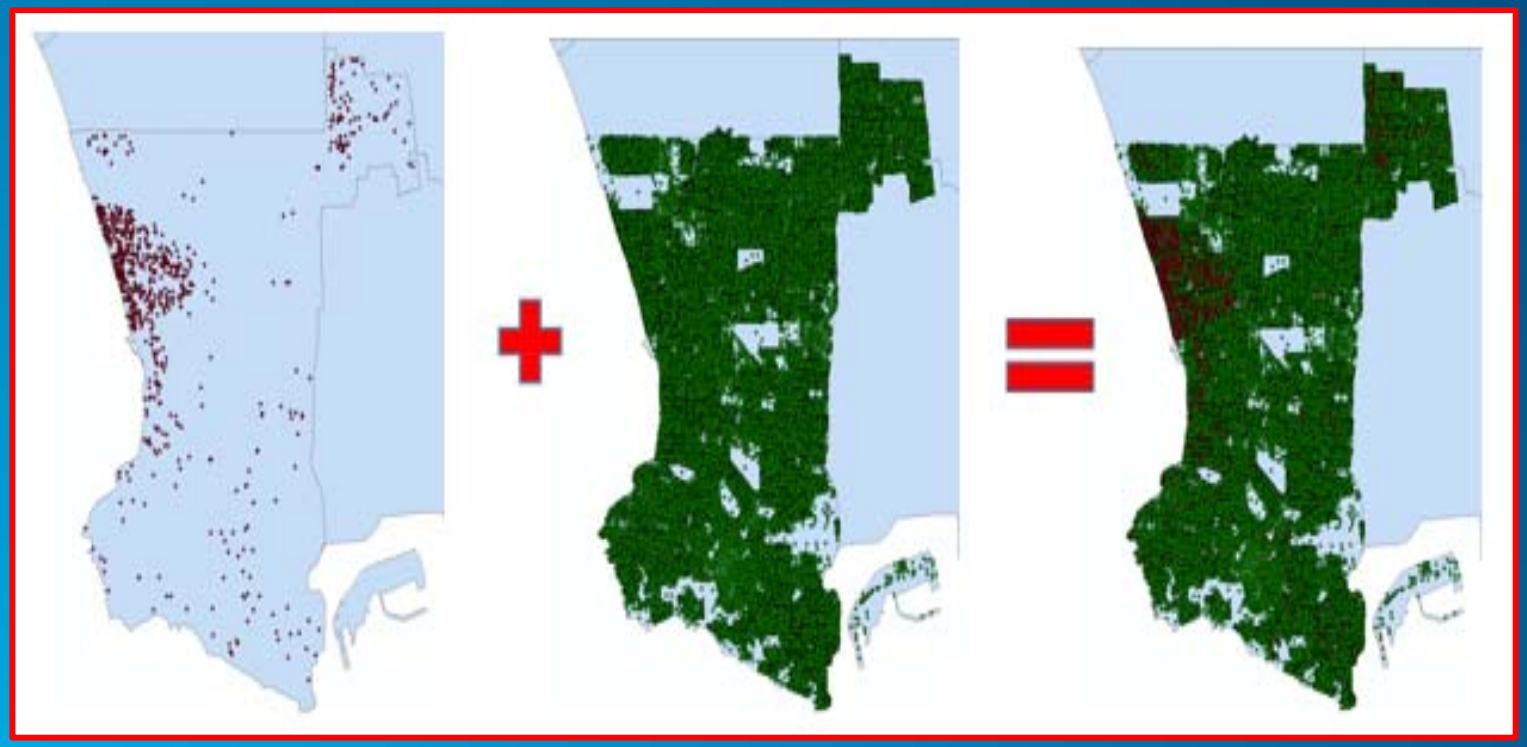
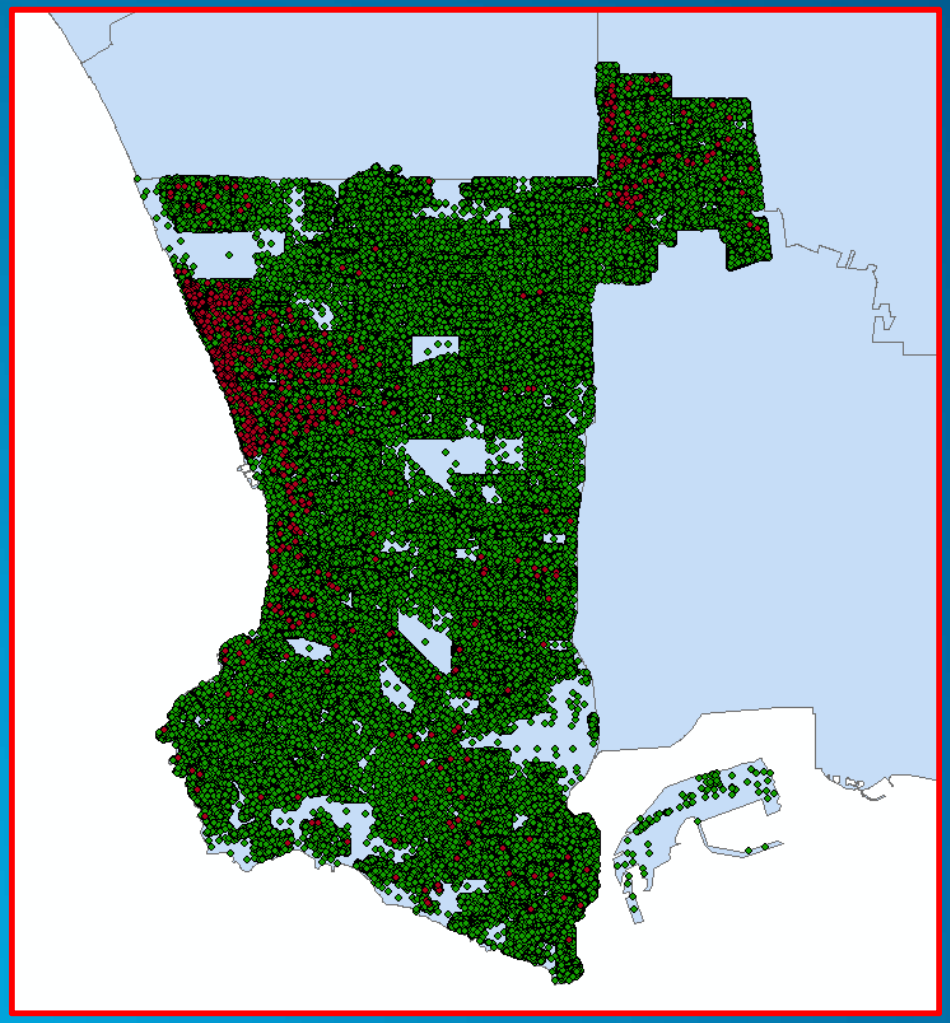


$/SF

ELEVATION

# MODEL BUILDING – VARIABLES SELECTED (A CLOSE UP)

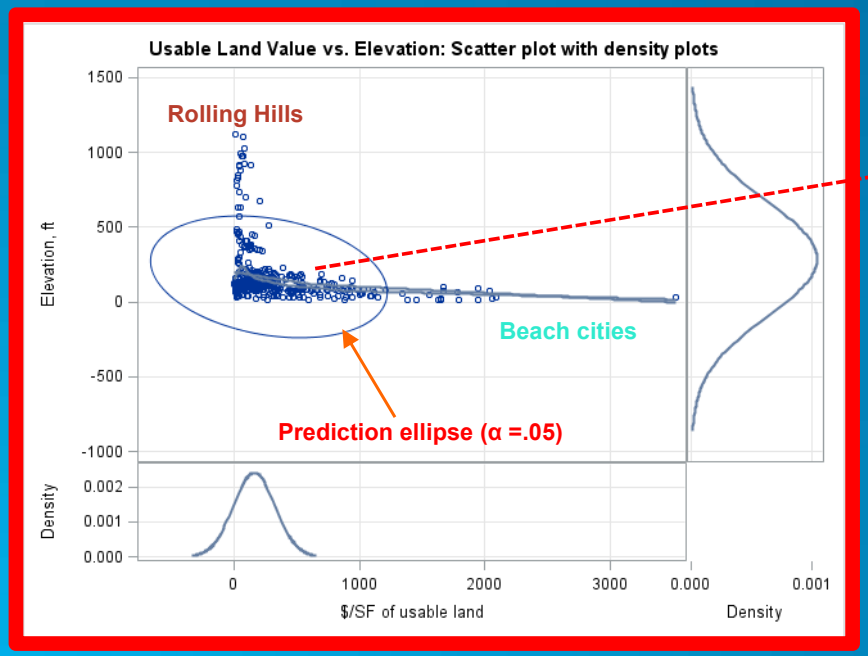


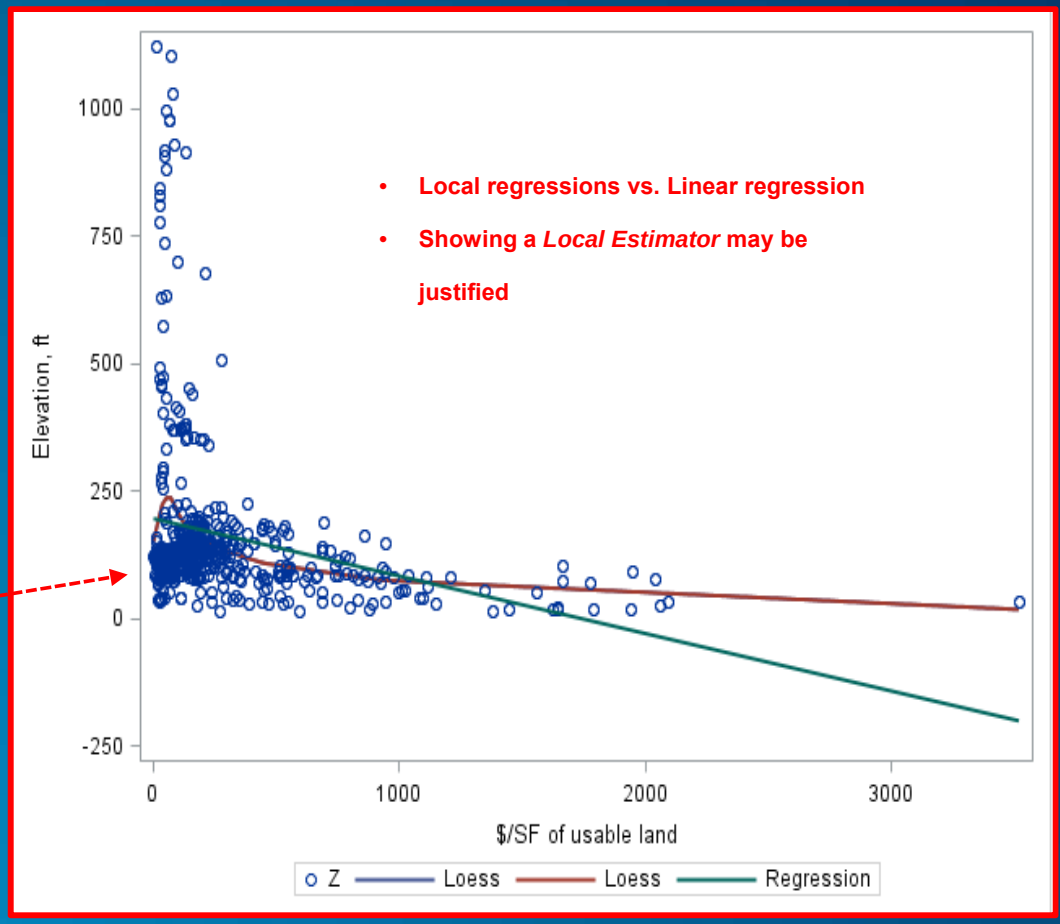
$/SF

ELEVATION

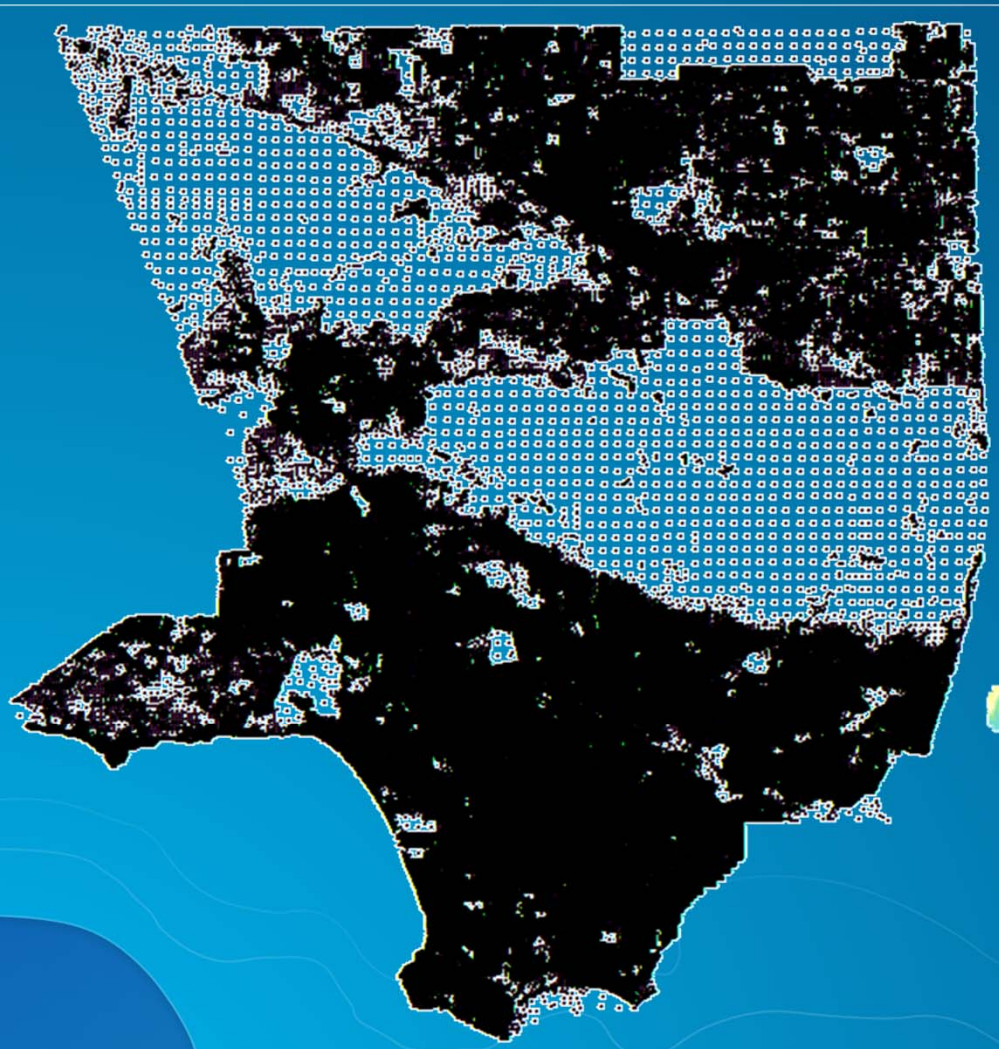
# MODEL BUILDING – PRECHECK

**Vacant land value is spatially cross-correlated with elevation @ different locations**

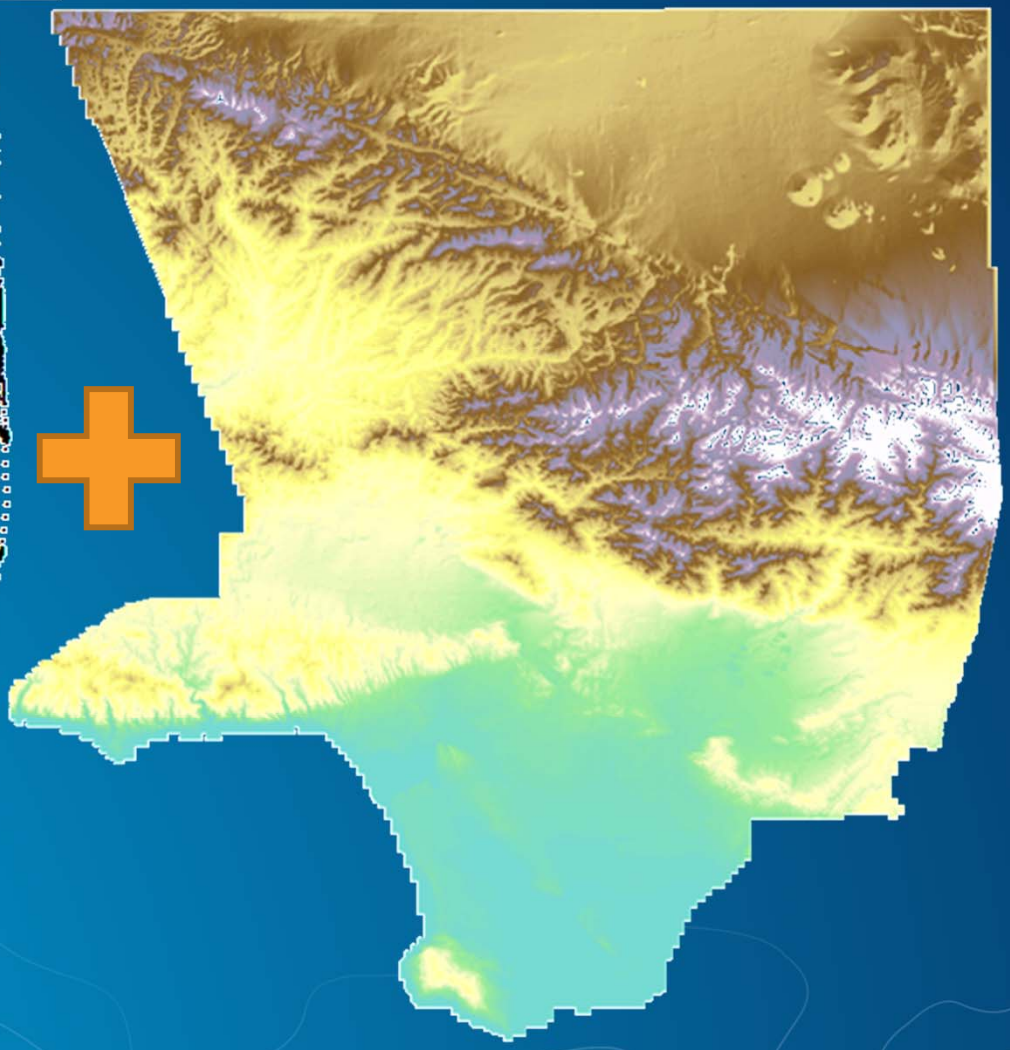


# MODEL BUILDING - ELEVATION, Z



Parcels (as points) – AIN plus X,Y coordinates



LA County Elevation Model – Z coordinates

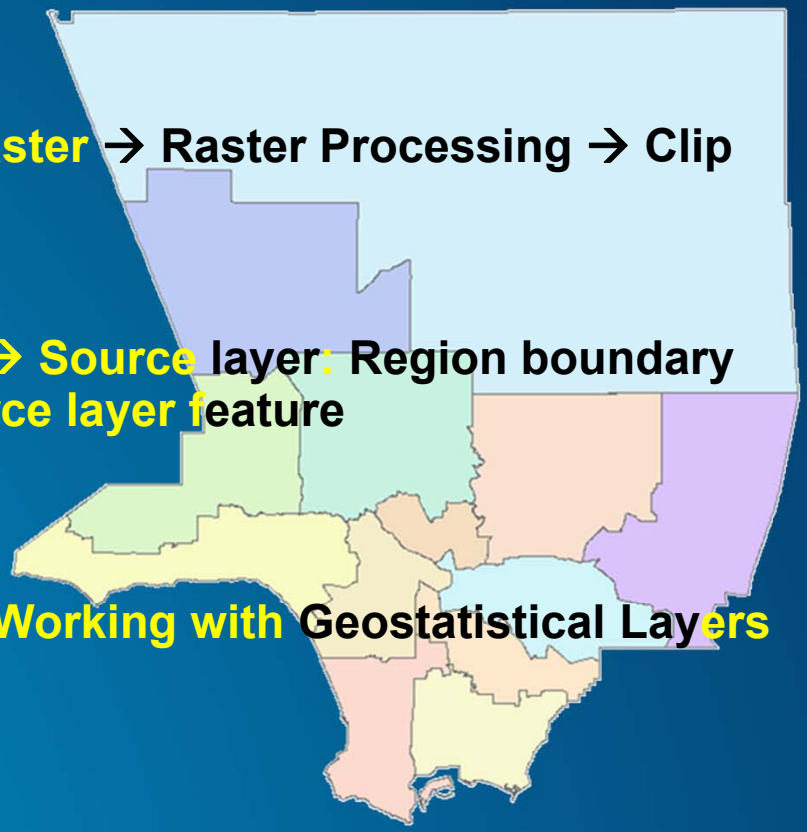
# MODEL BUILDING - ELEVATION, Z

## Clip DEM with Region boundary

- ArcToolbox → Data Management Tools → Raster → Raster Processing → Clip

## Select parcel points within region

- Selection → Target layer: parcels (as points) → Source layer: Region boundary → Spatial selection method: Intersect the source layer feature



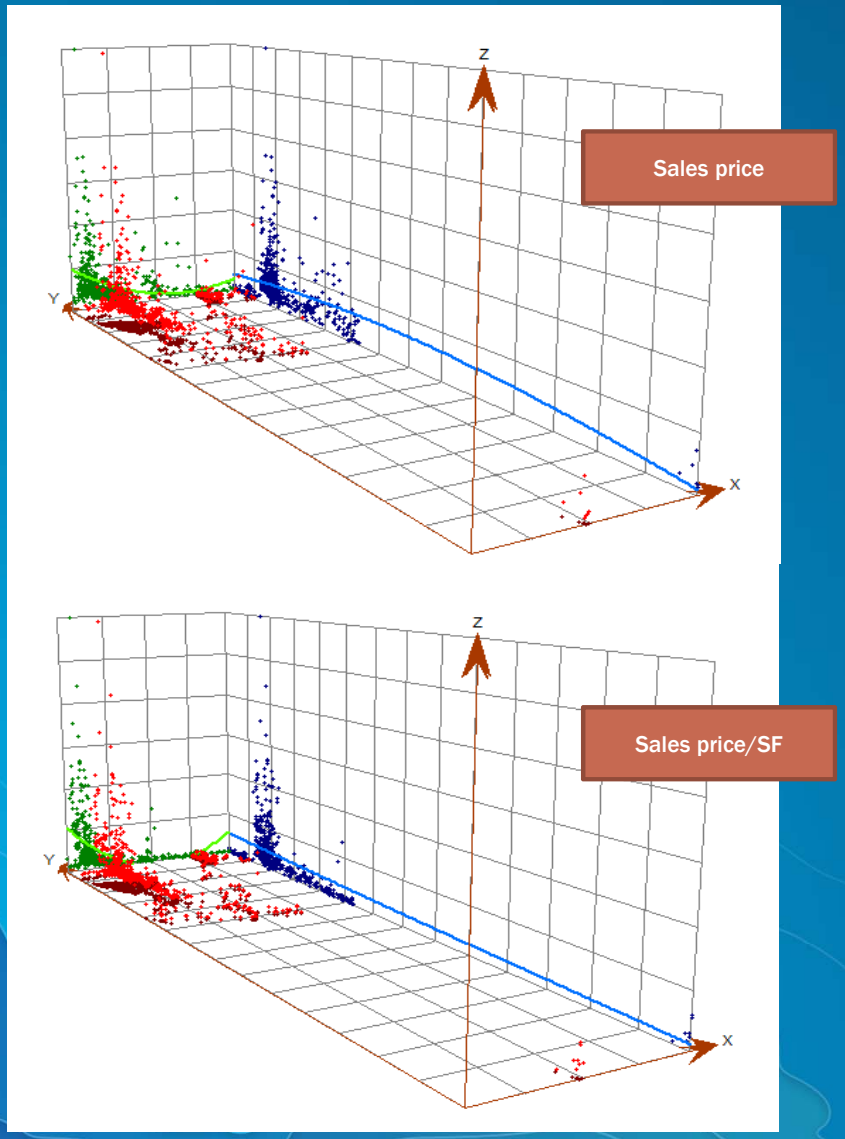
## Add Z value to points

- ArcToolbox → Geostatistical Analyst Tools → Working with Geostatistical Layers → Calculate Z-value

## Add parcel attributes to points

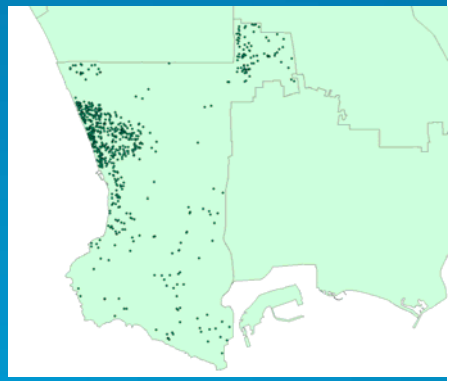
- By joining tables to parcel points

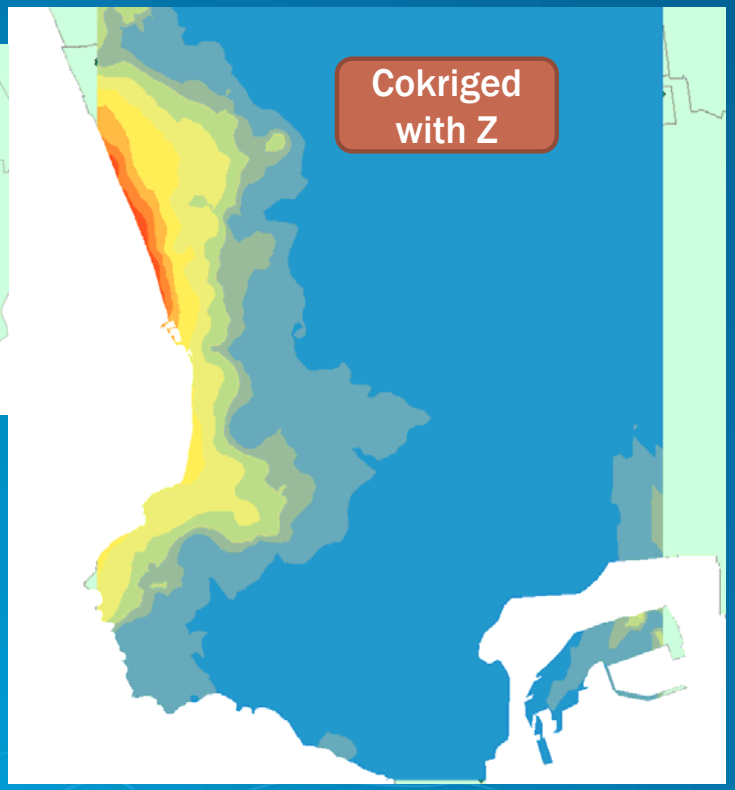
# ARCGIS GA EXTENSION - TREND ANALYSIS

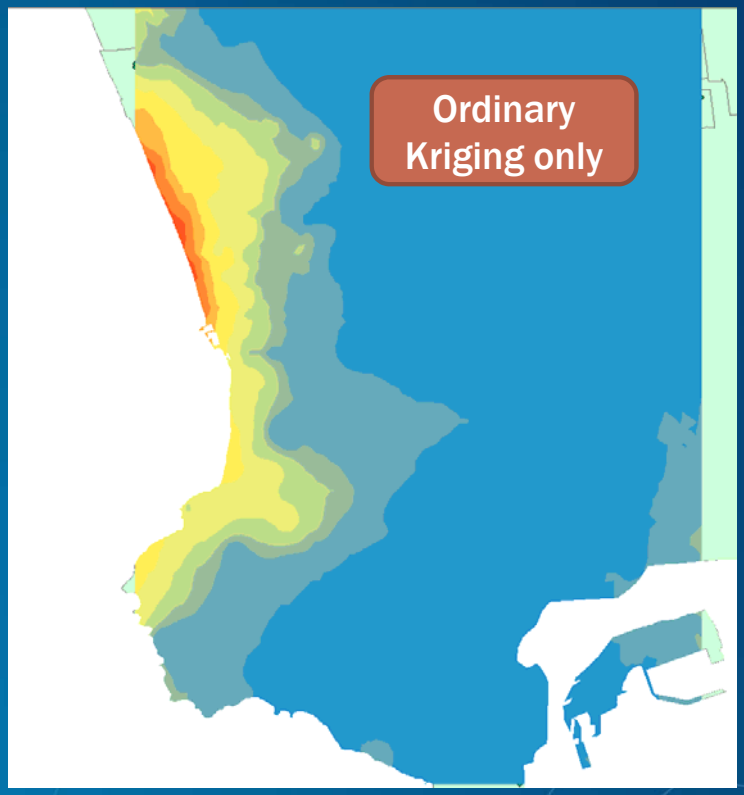



- A weak upside-down U shape on Y-Z plan (sales price)
- A weak linear trend on Y-Z (sales price/usable SF)
- A strong U shape on X-Z plan (both sales price and sales price/usable SF)
- The strong influence is from the beach region toward inner cities
- The highest values occur in the beach region

# PREDICTION RESULTS, $/SF USABLE LAND AREA





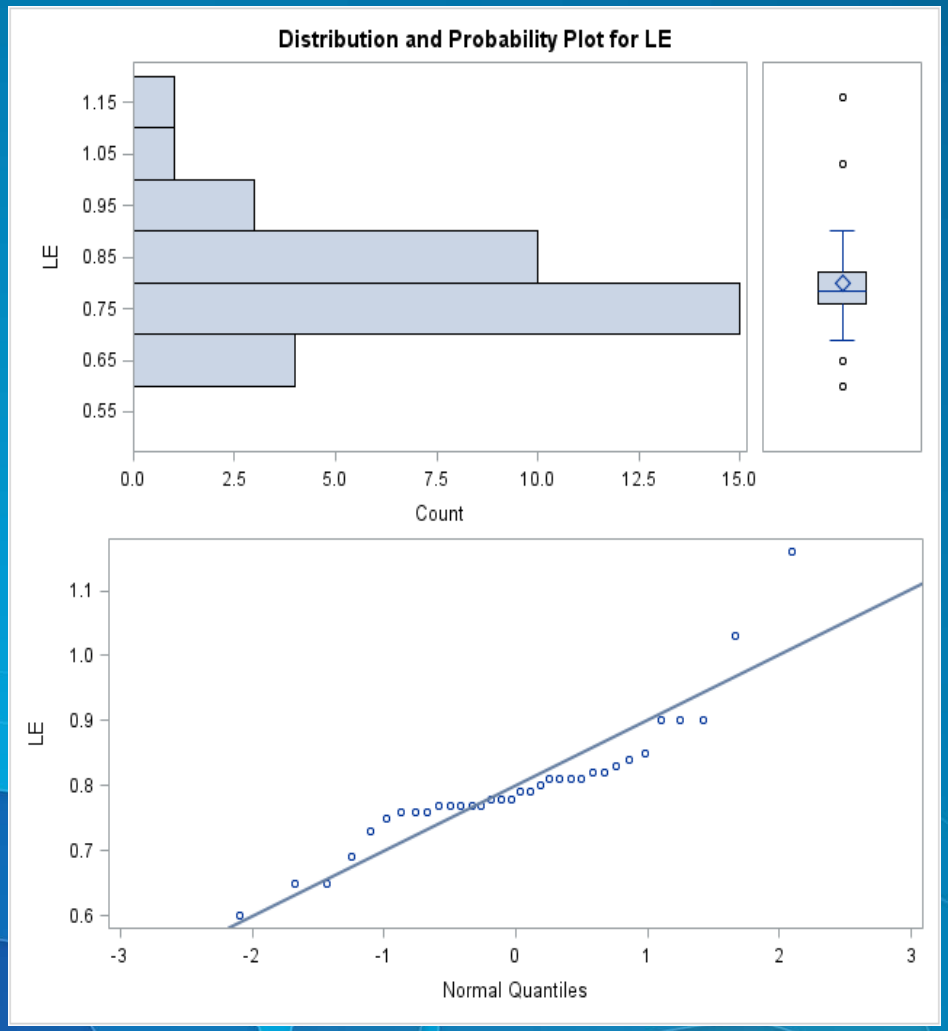
# VALIDATION - *BENCHMARK* THE RESULTS USING LAND RATIO

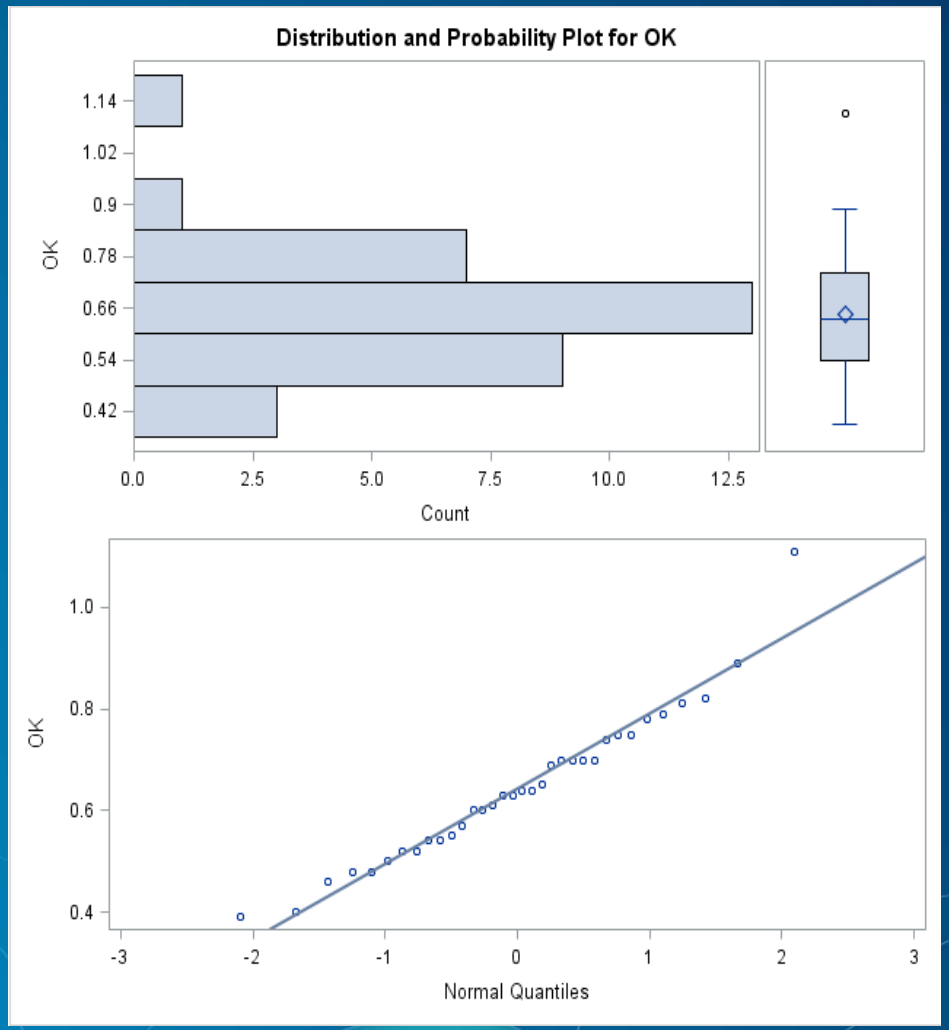
- $$LAND\ RATIO = \frac{\frac{\$}{SF} * SF\ (OF\ USABLE\ LAND\ AREA)}{TOTAL\ MARKET\ VALUE\ (LAND + IMPROVEMENT)}$$
- **$/SF is the primary variable (predicted) from the model**
- **Usable land area (SF) is from Assessor's property data records**
- **Total Market Value is based on actual market sales ($) records**
- **Compare Land Ratios generated from geostatistical model with ratios generated from traditional land abstraction approach**
- **Examine Land Ratio consistency and normality of both results for all neighborhoods**
  - **Land Ratio is independent of scale (in certain range of validity)**
  - **Normality assumption is based on *Central Limit Theorem* (large samples)**

# VALIDATION - SAMPLE AVERAGE LAND RATIO COMPARED

| Area | Classical Method (Land extraction) | Geostatistical Method (co-kriged) |
|---|---|---|
| Rolling Hill Estates | 0.76 | 0.48 |
| NW Rancho PV | 0.82 | 0.63 |
| North Torrance | 0.81 | 0.65 |
| PV Estates | 0.82 | 0.54 |
| Manhattan Bch Sand | 0.81 | 0.50 |
| Hermosa Bch | 1.16 | 0.75 |
| South Torrance | 0.73 | 0.40 |
| South Gardena | 0.77 | 0.46 |
| Torrance/Holly Riviera | 0.78 | 0.52 |
| N Redondo Bch | 0.65 | 0.60 |
| E Manhattan Bch | 0.60 | 0.52 |

# VALIDATAION - SUMMARY STATISTICS COMPARED



# CONCLUSION AND DISCUSSION

- We skipped the formalism of various Kriging models and appraisal principles due to time constraints
- We demonstrated an effective modelling technique of parcel elevation in integrated geostatistical analysis
- Kriging prediction appears to be *more normally* distributed than Land Extraction method for land allocation prediction
- Kriging improves prediction accuracy since there is no need to evaluate improvement on land
- GA extension is a valuable tool in the ArcGIS's arsenal; and Kriging processes provide an effective option in mass appraisal; an order of magnitude of processing time may be saved in mass appraisal

# QUESTIONS

## Contacts:

- aliu@assessor.lacounty.gov
- garaujo@assessor.lacounty.gov
- ejsolano@assessor.lacounty.gov

## Assessor Portal:

- http://portal.assessor.lacounty.gov

## Assessor Website:

- http://assessor.lacounty.gov

ASSESSOR

Los Angeles County

# Thank You