SCENARIO PLANNING WITH GIS: IMPLICATIONS FOR REGIONAL SERVICES

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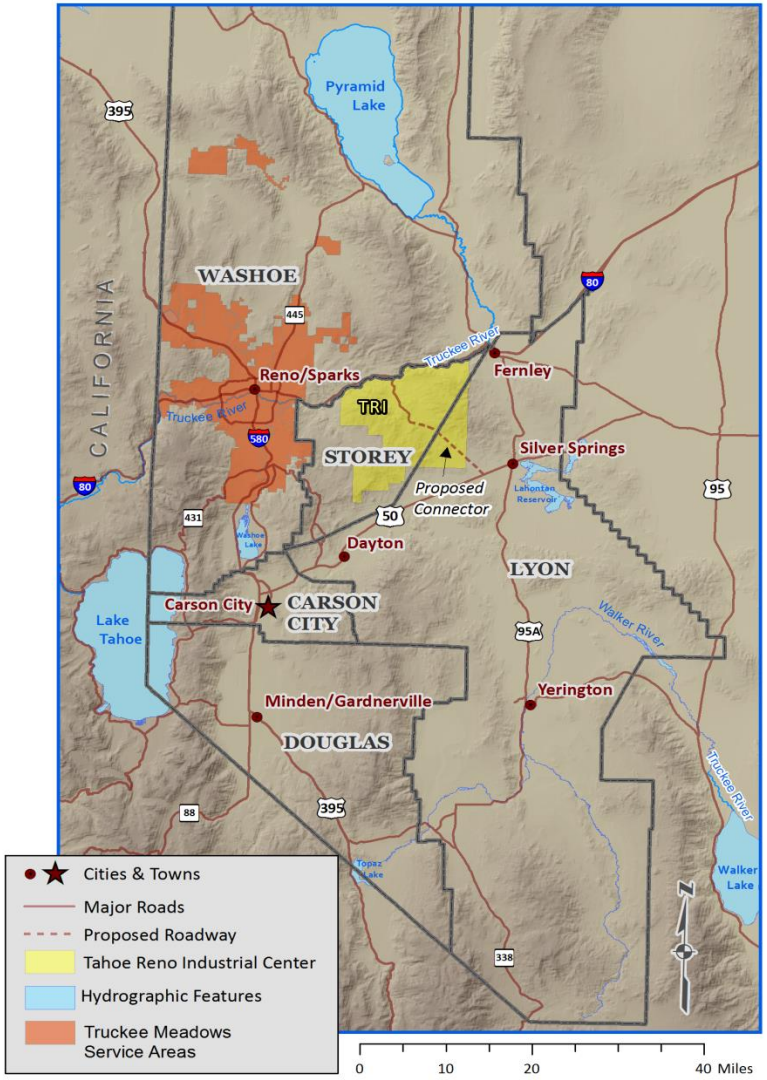
Outline

- Who we are/what we do
- Development Tracking
- Projections and Spatial Allocations
- Scenario Planning
- Application to Regional Services
- Conclusions

Who We Are/What We Do

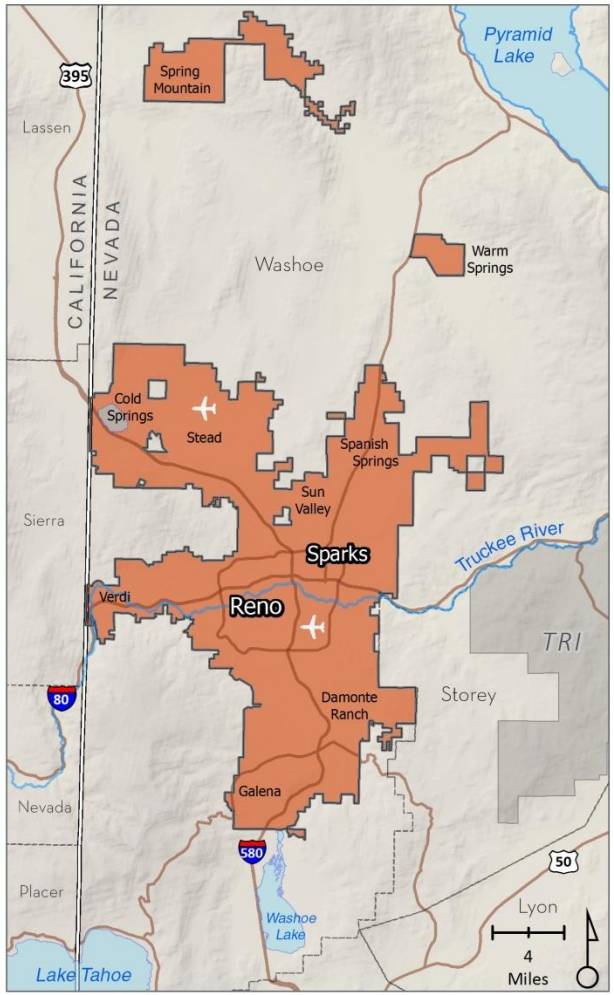
TMRPA

- Created in 1989 to foster coordination among the three local governments: Reno, Sparks, Washoe County
- Support comprehensive and innovative approaches for economic development and community planning
- Facilitating land-use, infrastructure provision, and resource management throughout the region
- Collaborative information and data warehouse, coordinating regional data collection and delivering advanced geospatial analytics



Truckee Meadows Region

- Northeast of Lake Tahoe
- Situated in a ‘bowl’ between two mountain ranges
- The TMSA is the developed area that the Truckee Meadows Regional Planning Agency focuses on



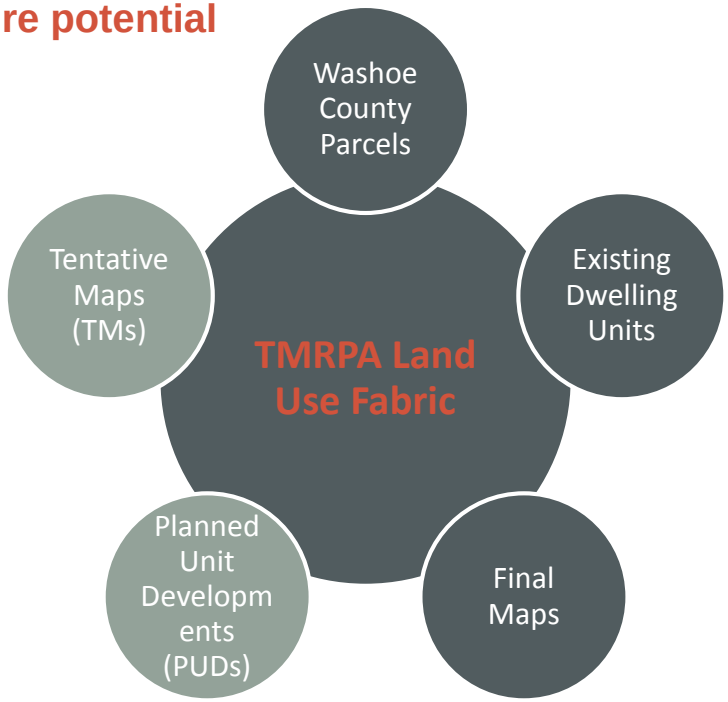
Truckee Meadows Services Area (TMSA)

DEVELOPMENT TRACKING

Parcel-level Data

Tracking Current and Future Land Use

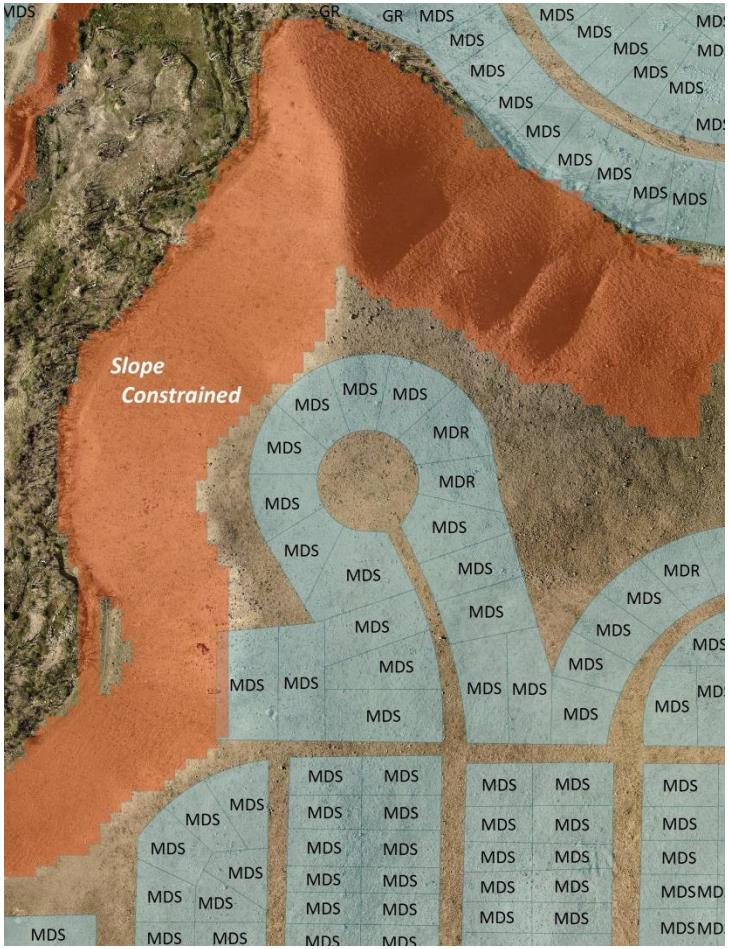
Tracking residential development present and future potential



Tracking employees by business location

Monthly Process for Updating Land Use Fabric

Parcel Data



- **Identify existing land use and zoning designation**
  - Is it already developed?
- **Identify vacant parcels**
  - Unconstrained areas are buildable (remove slopes, public land, water bodies, flood)
- **Estimate capacity of that land**
  - Future housing units based on zoning and development approvals
  - Future employment based on existing employment mix and zoning

PROJECTIONS AND SPATIAL ALLOCATIONS

Population and Employment Modeling

Washoe County Consensus Forecast

- Assessment of forecasted population and employment growth; performed every 2 years by TMRPA to inform planning efforts across the region.

- **Sources**
  - Nevada State Demographer
  - Truckee Meadows Water Authority
  - Woods and Poole
  - IHS – Global Insight

Spatial Allocation of Predicted Growth

- Translate time series projections to spatial allocation of housing units and employment

- Rule-based allocation model that uses an overall suitability score
  - Parcel-based
  - Dual-mode suitability model
    - Population
    - Employment
  - Written in Python

- Model results can be aggregated to any geography
  - Traffic analysis zones
  - Wastewater treatment facility service areas
  - Etc.

SCENARIO PLANNING

Truckee Meadows Housing Study

Population Growth

Historical (1990–2014)

181,000 new people
7,500 new people per year

Forecast (2015–2035)

128,000 new people
6,400 new people per year

Convert estimated population to necessary housing units:

- Divide by US Census Person Per Household multipliers (roughly 2.5 people per unit)
- Account for vacancy rate of around 11% (US Census)

Equates to roughly 50,600 new housing units needed by 2035

Develop Scenarios

- **Classic Scenario (1)**
  - Based on spatial pattern of recent home building, since 2000
  - More development on the fringe of the community
  - Allowed for very limited redevelopment
  - Housing Type mix based on historic development percentages
- **McCarran Scenario (2)**
  - Change in spatial pattern with more emphasis on core of our region
  - 25% of new homes modeled within the McCarran Ring
  - Increased redevelopment on currently built parcels
  - Housing Type mix varied to increase higher density types

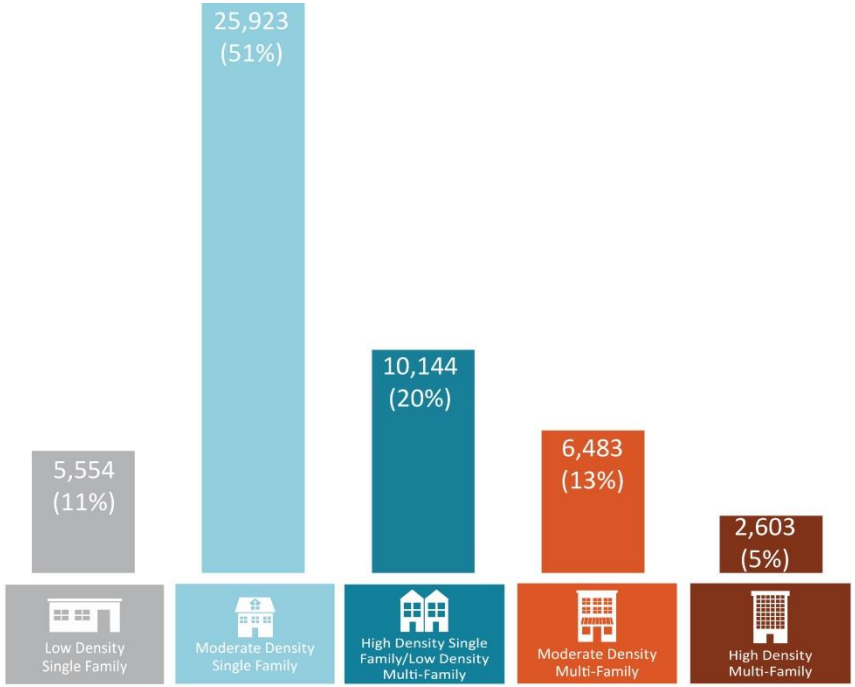
Employment projections held constant in both scenarios

Current Housing Types

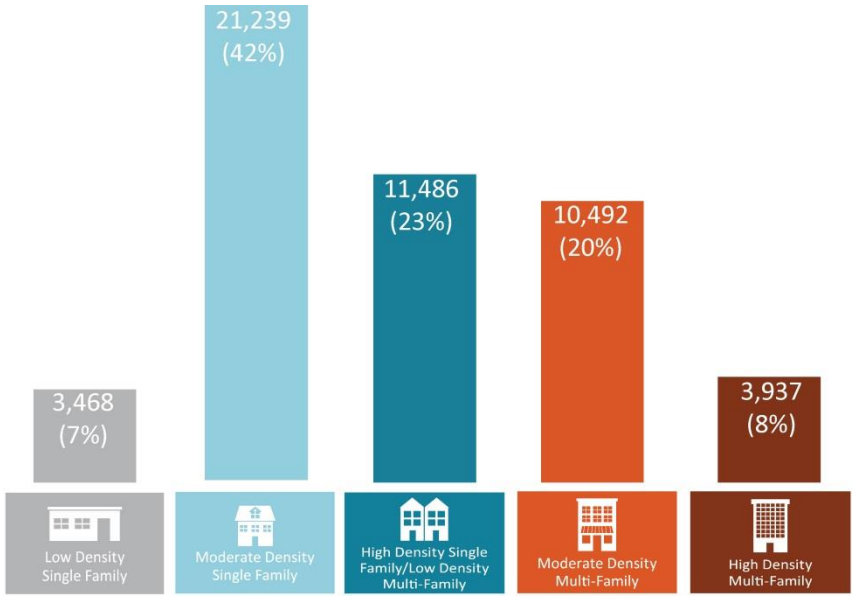
Housing Type	Example Housing Types	Existing Housing Stock in the Region	Examples in the Truckee Meadows
Low Density Single Family	▪ Single family detached unit on a lot of 20,000 square feet and larger	▪ 9% of Total Housing Stock ▪ 15,000 housing units	 
Moderate Density Single Family	▪ Single family detached unit on a lot between 6,000 and 20,000 square feet	▪ 45% of Total Housing Stock ▪ 80,000 housing units	 
High Density Single Family/Low Density Multi-Family	▪ Single-family detached unit on a 4,500 square foot lot ▪ Townhouse on a 4,000 square foot lot ▪ Tri-Plex with 3,000 square feet per unit	▪ 18% of Total Housing Stock ▪ 31,000 housing units	 
Moderate Density Multi-Family	▪ Two or three story garden or walk-up apartment building with about 15 to 30 dwelling units per acre	▪ 19% of Total Housing Stock ▪ 34,000 housing units	 
High Density Multi-Family	▪ Multi-story apartment or condominium building with more than 30 dwelling units per acre	▪ 9% of Total Housing Stock ▪ 15,000 housing units	 

Housing Type Mix

Forecasted growth of 50,600 new dwelling units in TMSA 2015-2035

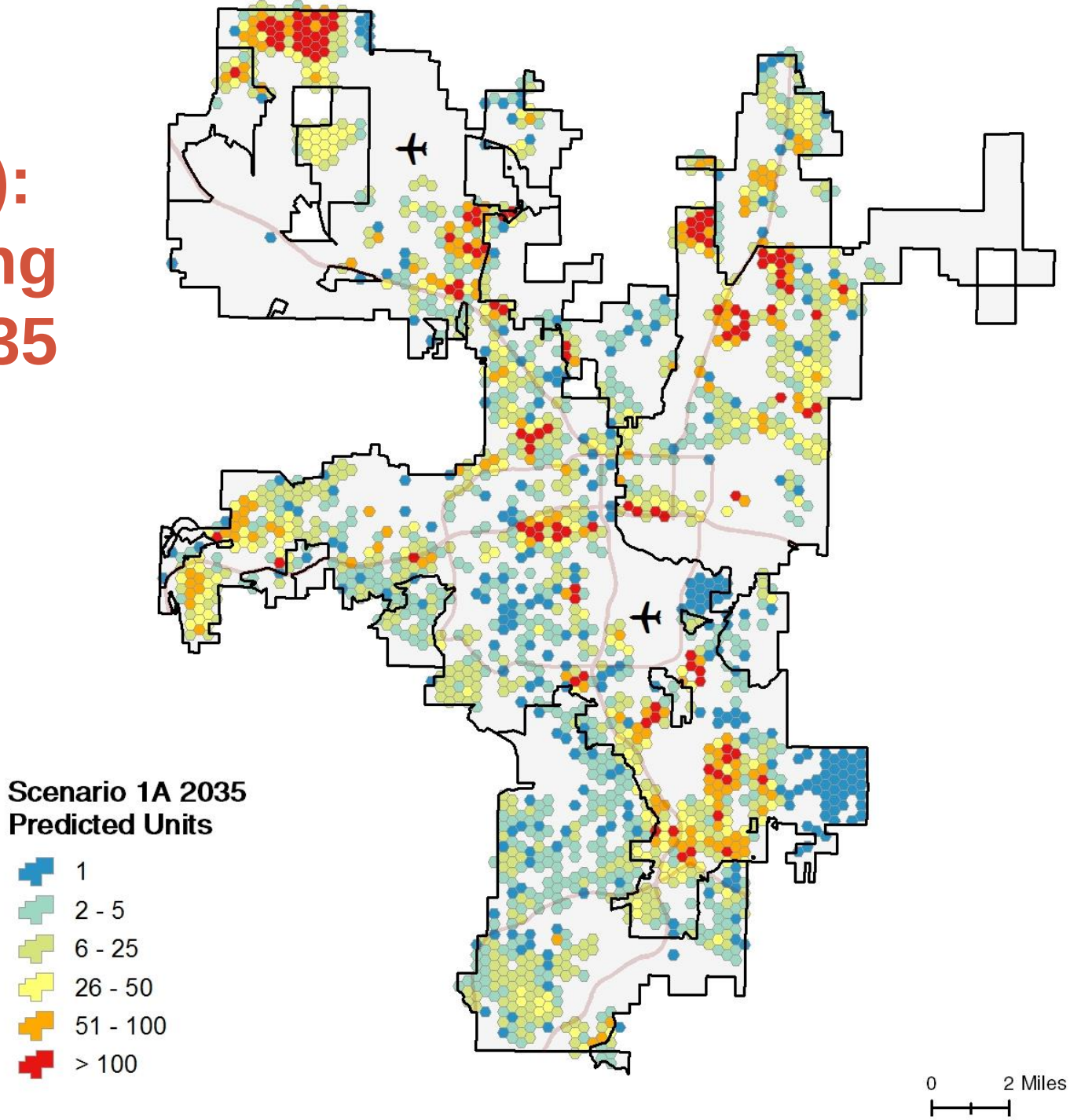


Classic Scenario (1)

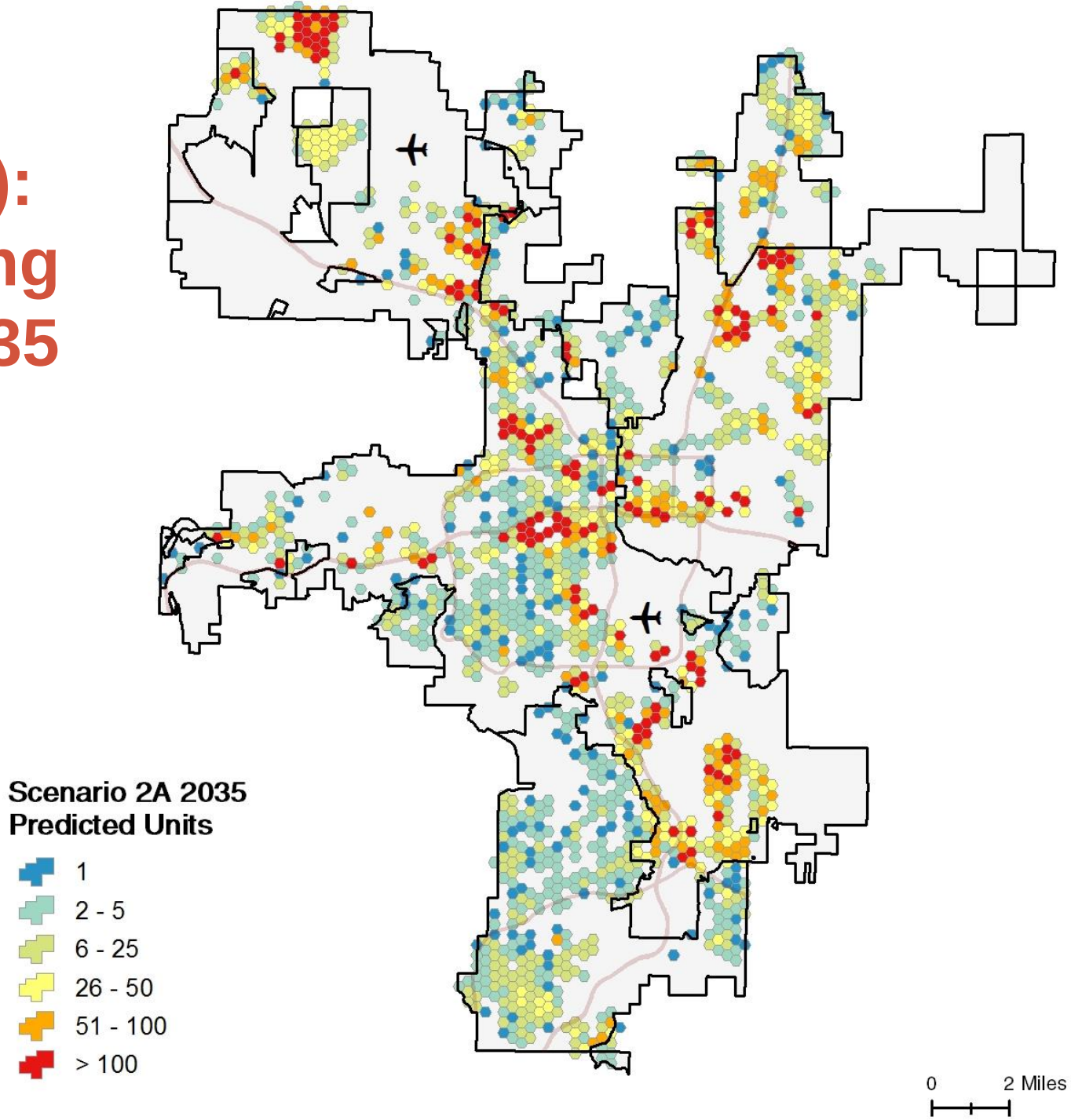


McCarran Scenario (2)

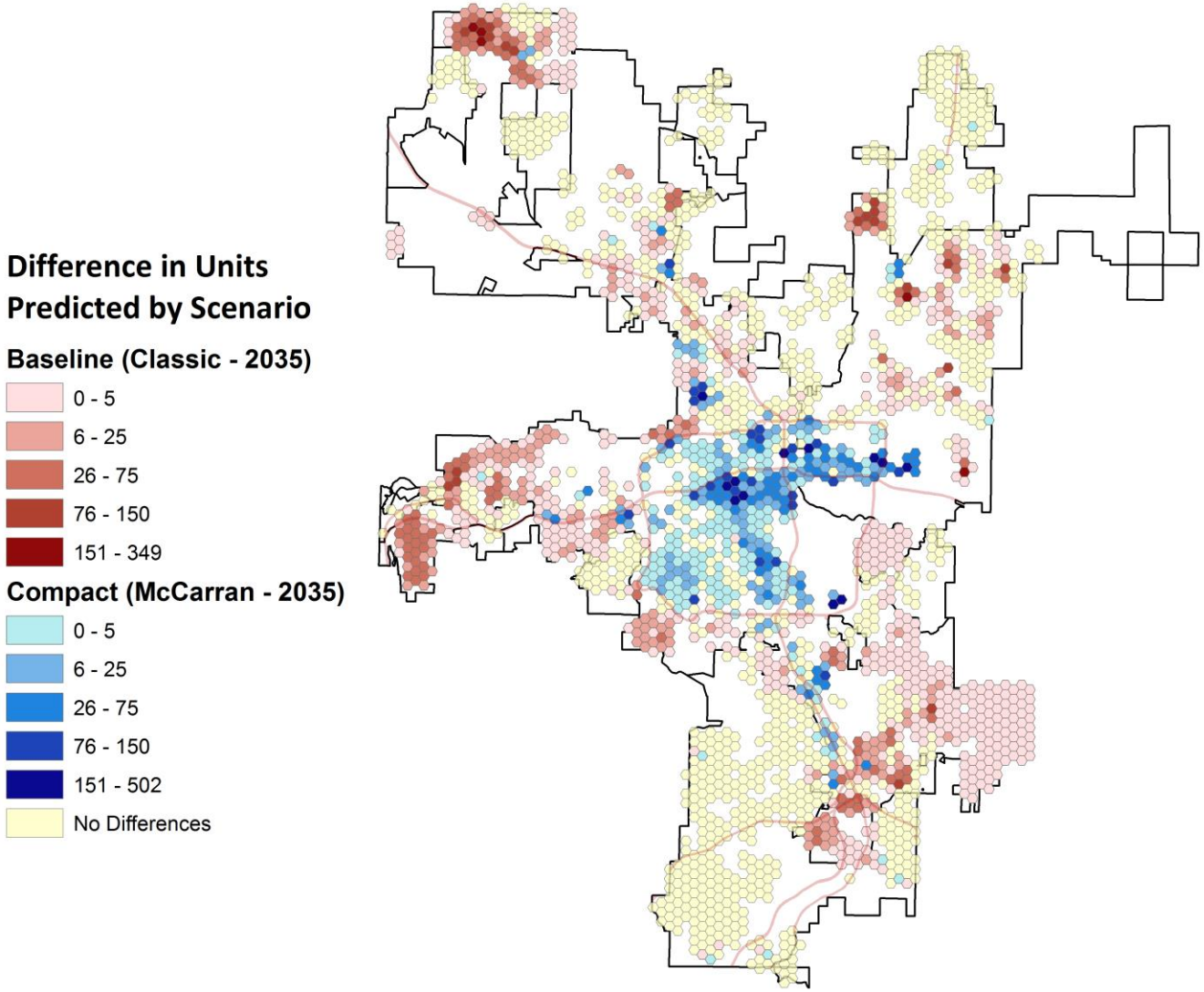
Classic Scenario (1): New Dwelling Units by 2035



McCarran Scenario (2): New Dwelling Units by 2035



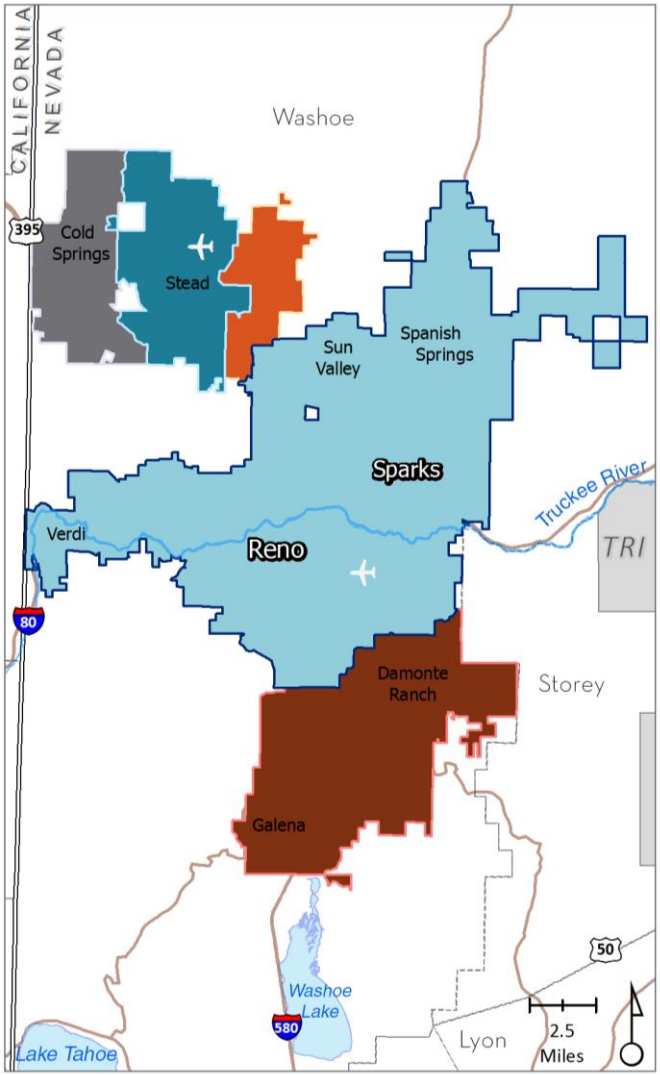
Scenario Differences (2020 - 2035)



APPLICATION TO REGIONAL SERVICES

Wastewater

Wastewater Reclamation Facility (WRF) Boundaries



- 5 WRF boundaries within our region
- Wastewater estimates by parcel are aggregated up to these boundaries
- Ability to estimate future impacts to facilities based on projected growth

Wastewater Reclamation Facility Areas

- Cold Springs Service Area
- Lemmon Valley Service Area
- Reno-Stead Service Area
- STMWRF Service Area
- TMWRF Service Area

TMWA Indoor Water Use Coefficients

Indoor Water Usage (1,000 gal)							
Hydro-basin	Annual Indoor Usage						
	GMWS	GMWS Meters	MMW (per customer)	MMW (per unit)*	Multi-Family Units	RMWS	Single-Family Units
83	170.4	-	-	-	3		213
85	265.8	206	325.1	32.5	944	51.5	17407
86	201.9	19	193.5	19.4	234	64.4	6079
87	481.5	5646	356.5	35.7	49501	55.4	78137
088E	-	-	-	-	8	36.0	2093
088W	116.2	-	-	-	8	30.5	2093
89	101.6	-	-	-	33	24.0	1898
92	397.5	270	415.8	41.6	1231	55.3	11710
Average	247.8	-	322.7	32.3	-	45.3	-
Weighted Average	469.67	-	-	35.7	-	54.0	-

*Assumes an average of 10 units per service

- Water use coefficients are derived from billing records from 2009-2015
- Indoor usage only
- Winter months from December - March
- Weighted Average gives more weight to hydrobasins that have more units or meters in them

Methods – Wastewater Generation Calculations

Residential

Dwelling Unit Type	Dwelling Units (Dus)	(DUs×Coefficient ×Gallons)÷365 days	Total Wastewater Generation (GPD)
Single Family (weighted)	1	(1×**53.992**×1000) ÷365 =	**148**
Multi-Family (weighted)	1	(1×**35.661**×1000) ÷365 =	**98**

Non - Residential

Non-Residential (GMWS)	Unit	(Units×Coefficient ×Gallons)÷365 days	Total Wastewater Generation (GPD)
Non-Residential (employee-weighted)	1 Employee	(1employee×**0.075** ×**0.49**)(**469.67**×1000) ÷365 =	**47 Gallons Per Employee**

Weighted Average Factors		Straight Average Factors	
Businesses Per Employee	**0.0750**	Businesses Per Employee	**0.06055**
Meters Per Business	**0.4862**	Meters Per Business	**0.3578**

- We chose a weighted-average approach to reflect the impact that more dwelling units and/or employees have on the overall average of water demand or wastewater generation
- Our initial calculations indicate that the weighted approaches had produced results more in line with observed flows

Regional Wastewater Generation – Validation with Observed (2015)

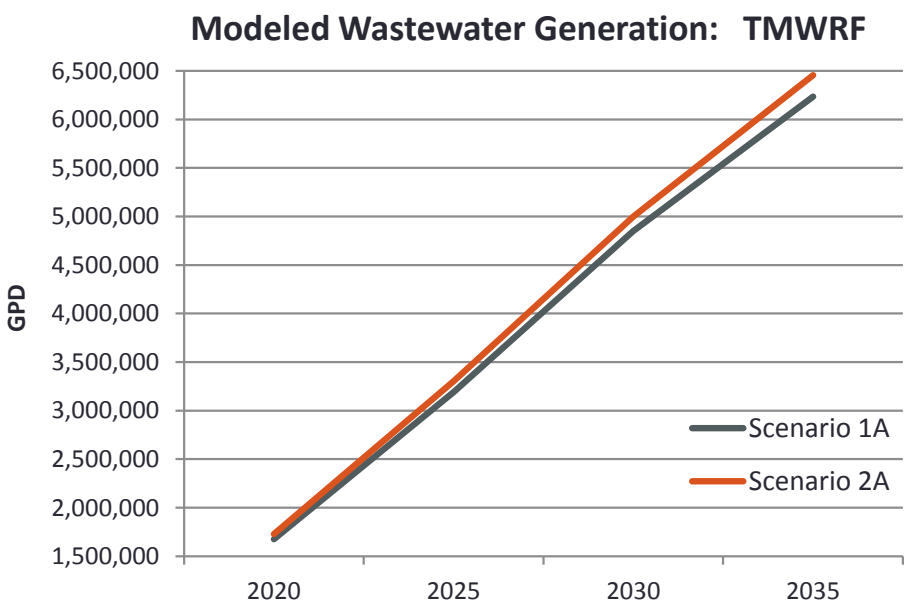
Water Reclamation Facility (method)	Total Wastewater Generation - Employee Factors Weighted (GPD) (Calculated)	Average Day Annual Flow (GPD) (Observed)
TMWRF	26,787,640	26,330,000
STMWRF	3,339,401	3,000,000
RSWRF	1,459,302	1,400,000
CSWRF	325,080	297,000
LVWRF	182,921	260,000
Totals	**32,094,344**	**31,287,000**

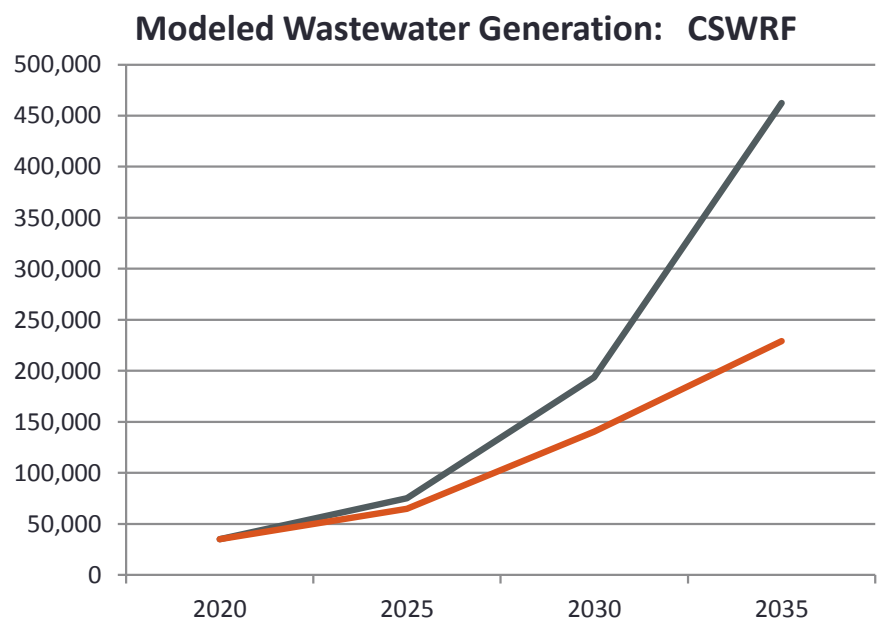
Comparison

Percentage of ADAF
102.58%

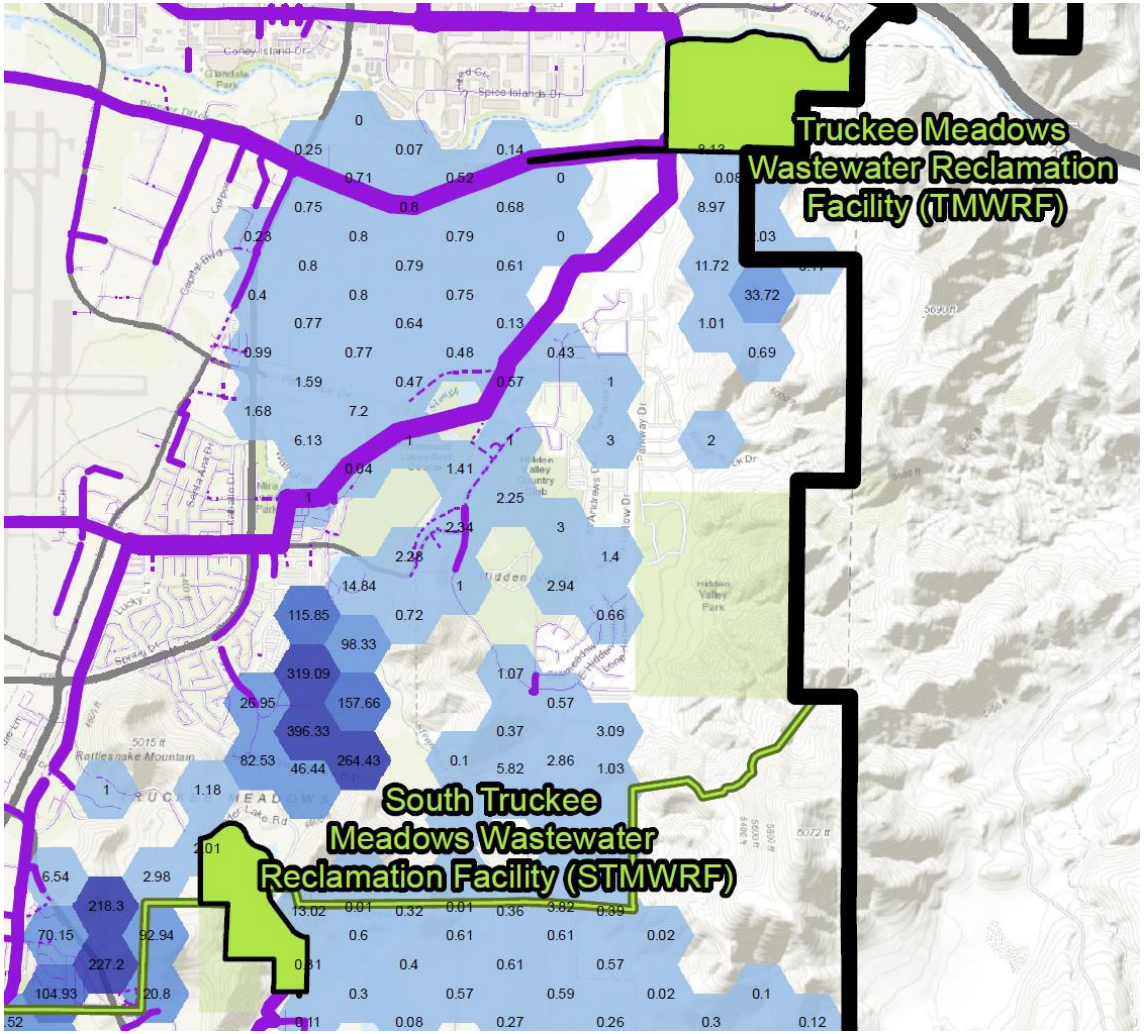
Comparison – Classic Scenario (1A) vs. McCarran Scenario (2A)

1A vs 2A	TMWRF		STMWRF		RSWRF		LVWRF		CSWRF		TOTAL	
Scenario	1	2	1	2	1	2	1	2	1	2	1	2
2020	1,676,938	1,727,897	803,689	385,541	279,546	258,876	75,878	42,728	35,123	35,123	2,871,174	2,450,165
2025	3,193,791	3,303,387	1,326,118	814,603	591,609	483,545	228,011	202,810	75,303	64,677	5,414,831	4,869,021
2030	4,851,328	4,998,543	1,361,689	1,266,568	938,902	807,347	423,068	399,827	193,845	140,464	7,768,832	7,612,749
2035	6,232,927	6,455,611	1,798,665	1,637,415	1,135,789	1,020,746	499,504	505,412	462,476	229,209	10,129,362	9,848,394





Comprehensive Approach



- **Examined wastewater infrastructure at 3 levels:**
  - Reclamation facility
  - Trunk/Interceptors
  - Collection pipes

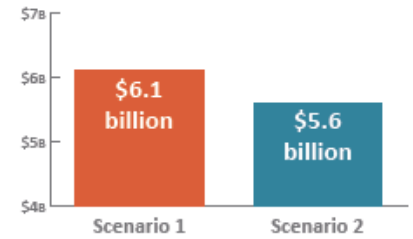
Regional Service Costs

- Collaborative effort with service providers
  - Transportation
  - School District
  - Water Service
  - Wastewater Service

- Ten percent (10%) reduction in capital costs in the McCarran Scenario (2)

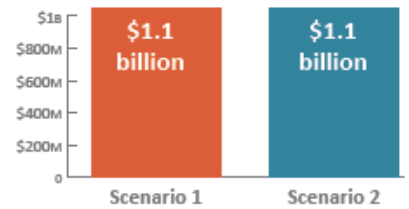
Transportation - Regional Transportation Commission

New roads in Scenario 2 cost about 9% or $560 million less than in Scenario 1.



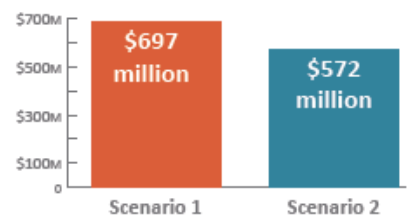
Schools - Washoe County School District

Capital costs for schools will cost about the same in both scenarios.



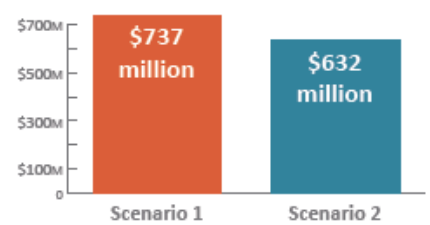
Potable Water - Truckee Meadows Water Authority

New water facilities in Scenario 2 cost about 17% or $115 million less than Scenario 1.



Wastewater - Reno, Sparks, and Washoe County

New wastewater facilities in Scenario 2 costs about 14% or $105 million less than in Scenario 1.



CONCLUSIONS

TMRPA Value Add Using GIS

- TMRPA has used GIS analysis to go beyond its statutory requirements as a regulatory agency
- Development of a regional data warehouse assures all relevant data is centralized and accessible by local and regional entities
- The ability to manage existing and future land use development data at the parcel level in a GIS enables sophisticated simulation of different futures
- Scenario planning allows us to assess how variation in future development patterns will trigger different community impacts – which leads to informed policy discussion

Housing Study Takeaways

- Local governments and service providers all face pressing fiscal challenges to provide services and infrastructure
- Location of housing is very important: servicing land in more compact development scenario is less expensive
- Capital costs for infrastructure in the McCarran Scenario is $780 million less than Classic Scenario
- Over $100 million potential savings in wastewater service alone
- Learn more at www.tmrpa.org

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Questions?