

SBX2 1

Nitrate in Groundwater Report to the Legislature

ALTERNATIVE WATER SUPPLY

SBX2 1 ITF Meeting
December 1, 2011



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Outline

- Susceptibility Breakdown
- Community Public Water Systems Delivering Water Exceeding the MCL
- CASTING Domestic Well Nitrate Concentrations
- Estimated Domestic Well Locations
- Alternative Water Supply Option Cost Ranges
- Least Cost Solutions for the Highly Susceptible Population
- Summary of Major Findings and Recommendations

Total Study Area *₁
2,647,200 people

**HIGHER
VULNERABILITY**

Household Self-Supplied or Local Small Water System *₂

245,500 people
~74,391 systems

Community Public or State-Small Water System with Only 1 Well *₃

8,800 people
105 systems

High Likelihood of NO₃ in Groundwater (Nearby NO₃ MCL Exceedances) *₈

3,400 – 37,500 people
34 CPWS/SSWS
0 – 9,896 private or local small systems

Low Likelihood of NO₃ in Groundwater (No Nearby NO₃ MCL Exceedances) *₉

5,400 – 217,200 people
71 CPWS/SSWS
0 – 59,805 private or local small systems

**LOWER
VULNERABILITY**

Community Public Water System with > 1 Well *₄

2,339,400 people
264 systems

Treating or Blending for NO₃ *₆

325,000 people
13 systems

Not Treating or Blending for NO₃ *₇

2,014,400 people
251 systems

NO₃ MCL Exceedances *₁₀

670,000 people
39 systems

No NO₃ MCL Exceedances *₁₁

1,665,500 people
212 systems

No NO₃ Data *₁₂

3,900 people
13 systems

**NO
VULNERABILITY**

Only Surface Water Sources *₅

64,500 people
32 systems

HIGH SUSCEPTIBILITY

670,000 – 708,00 people
73 CPWS/SSWS
9,896 private or local small systems

LOW SUSCEPTIBILITY

1,665,500 – 1,882,700 people
283 CPWS/SSWS
59,805 private or local small systems

UNKNOWN SUSCEPTIBILITY

3,900 people
13 systems

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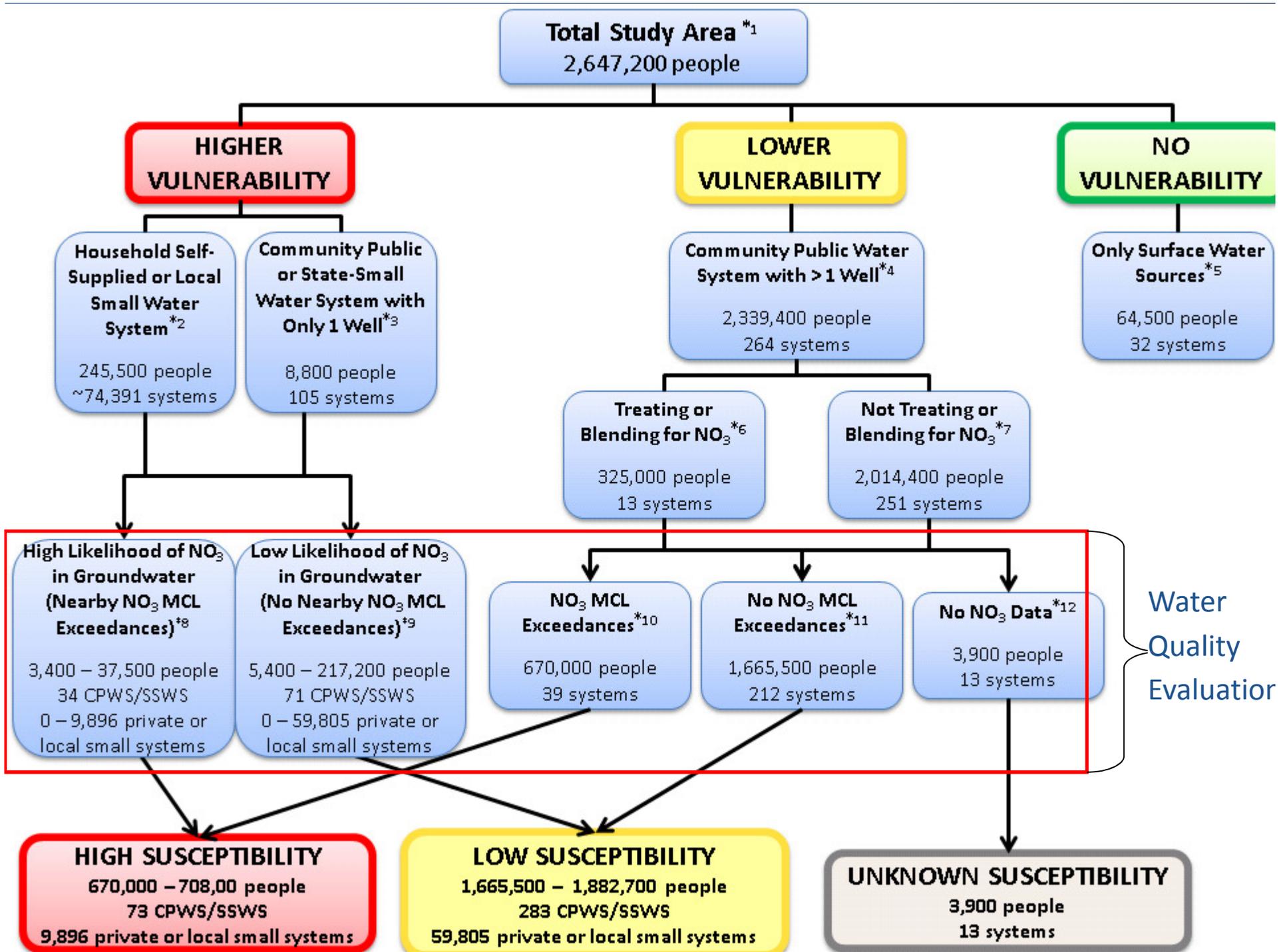
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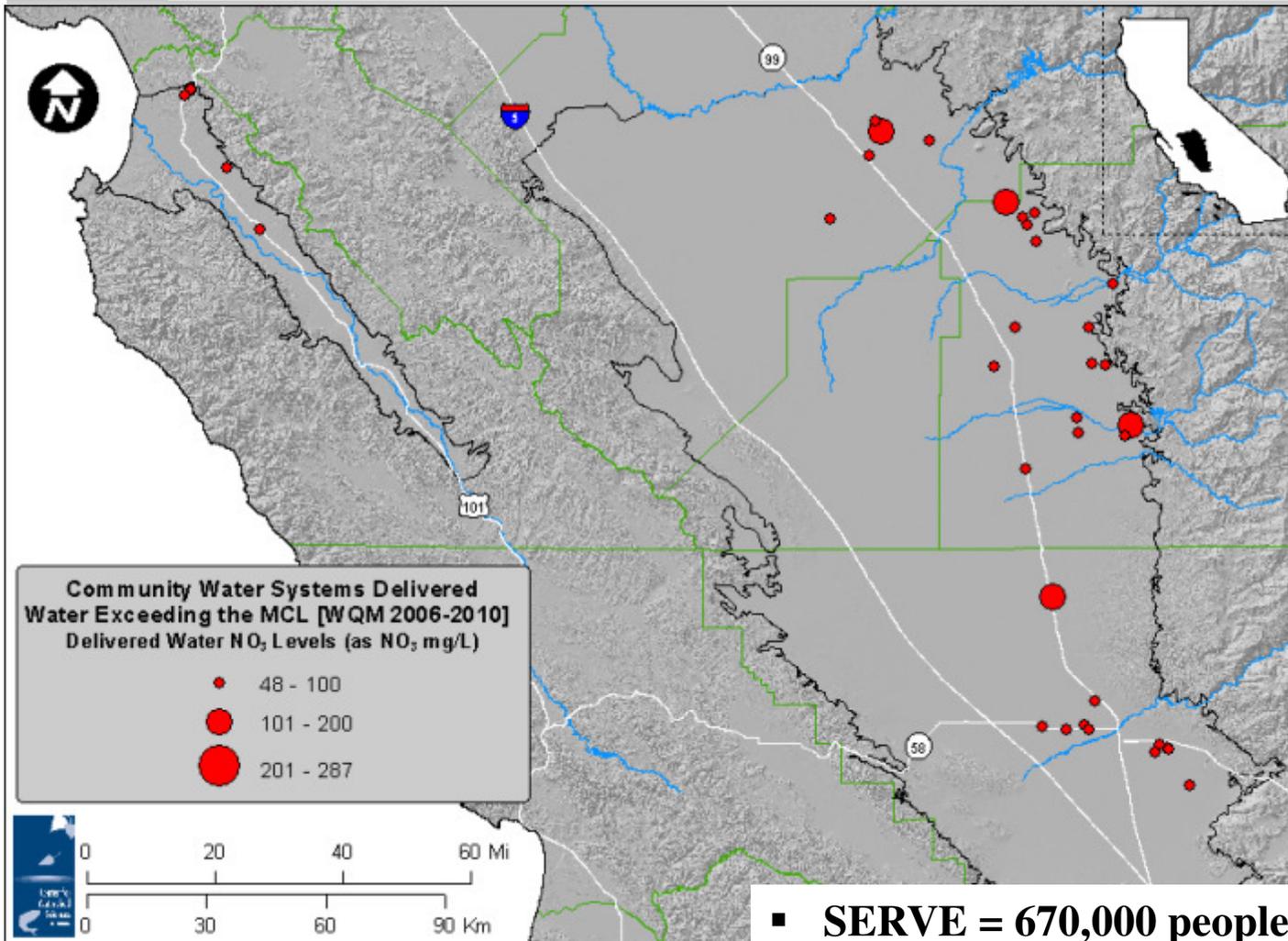
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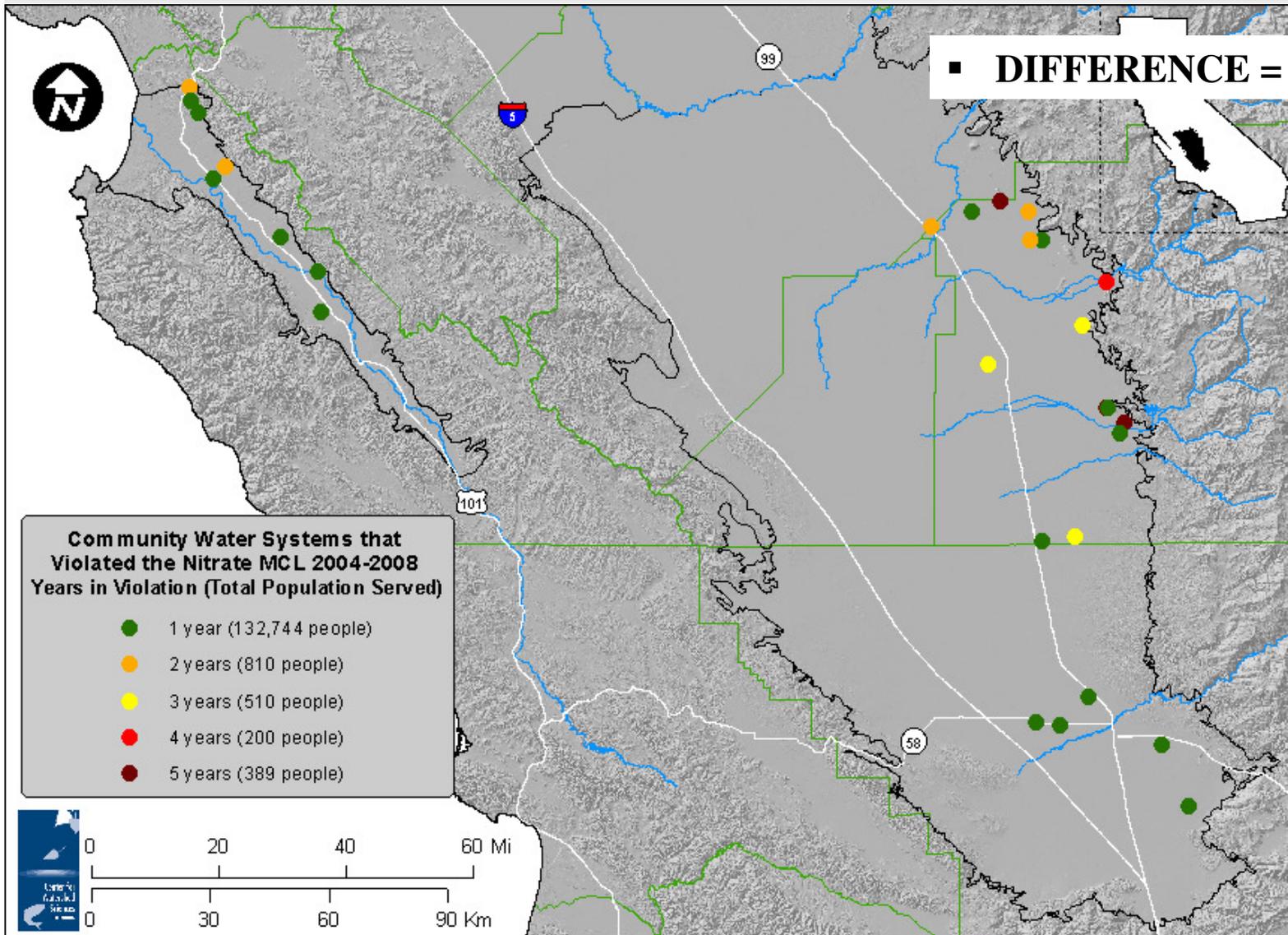
Multiple Source CPWSs: Delivered Water Levels Exceeding the MCL [CDPH 2006-2010]



- Exceedance vs. “Violation”
- 15% of the systems have exceeded the MCL since 2006
- Serve 25% of the total CPWS/SSWS population

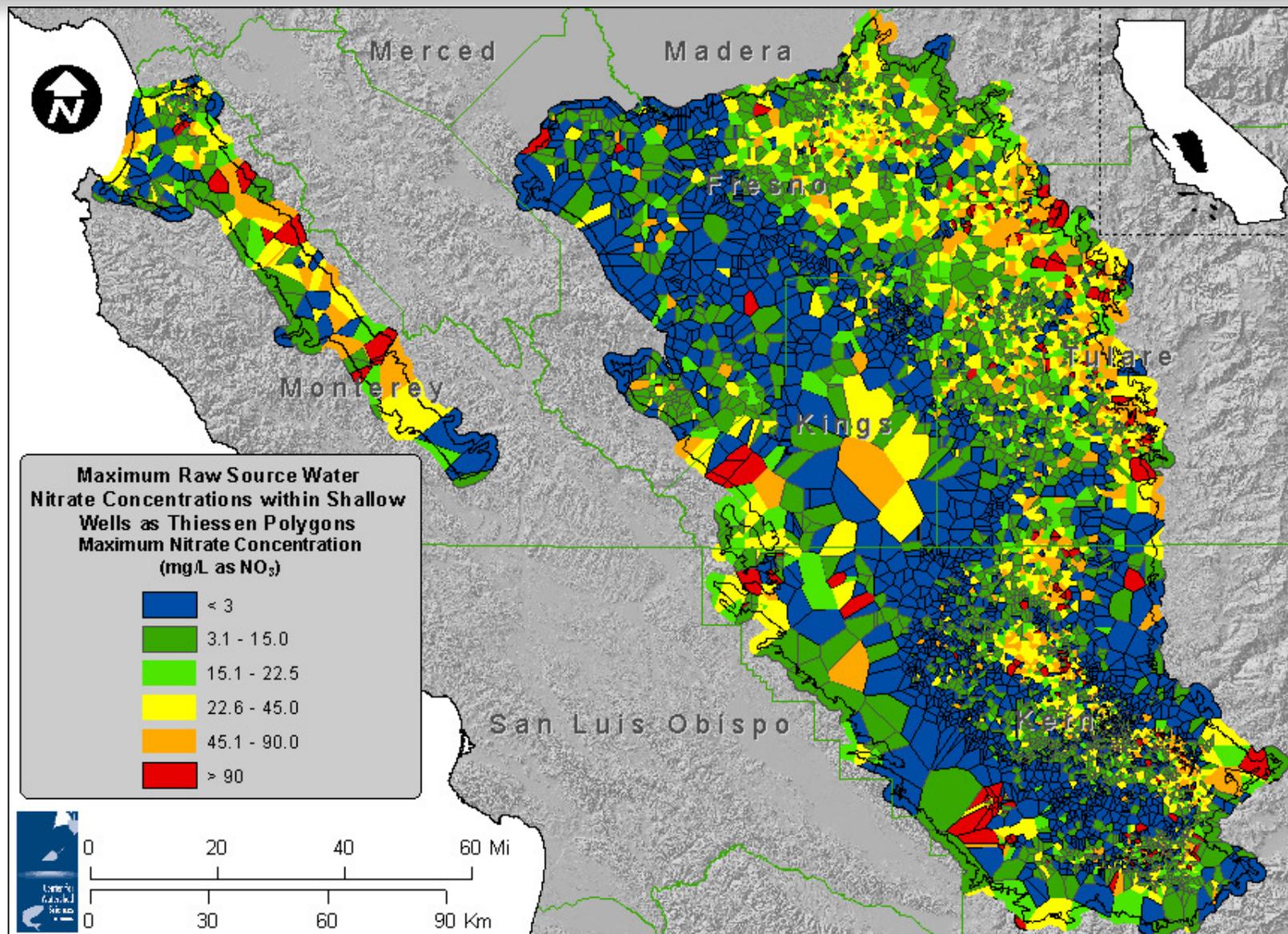


Community Public Water Systems Violating the MCL [ACRs 2004 - 2008]



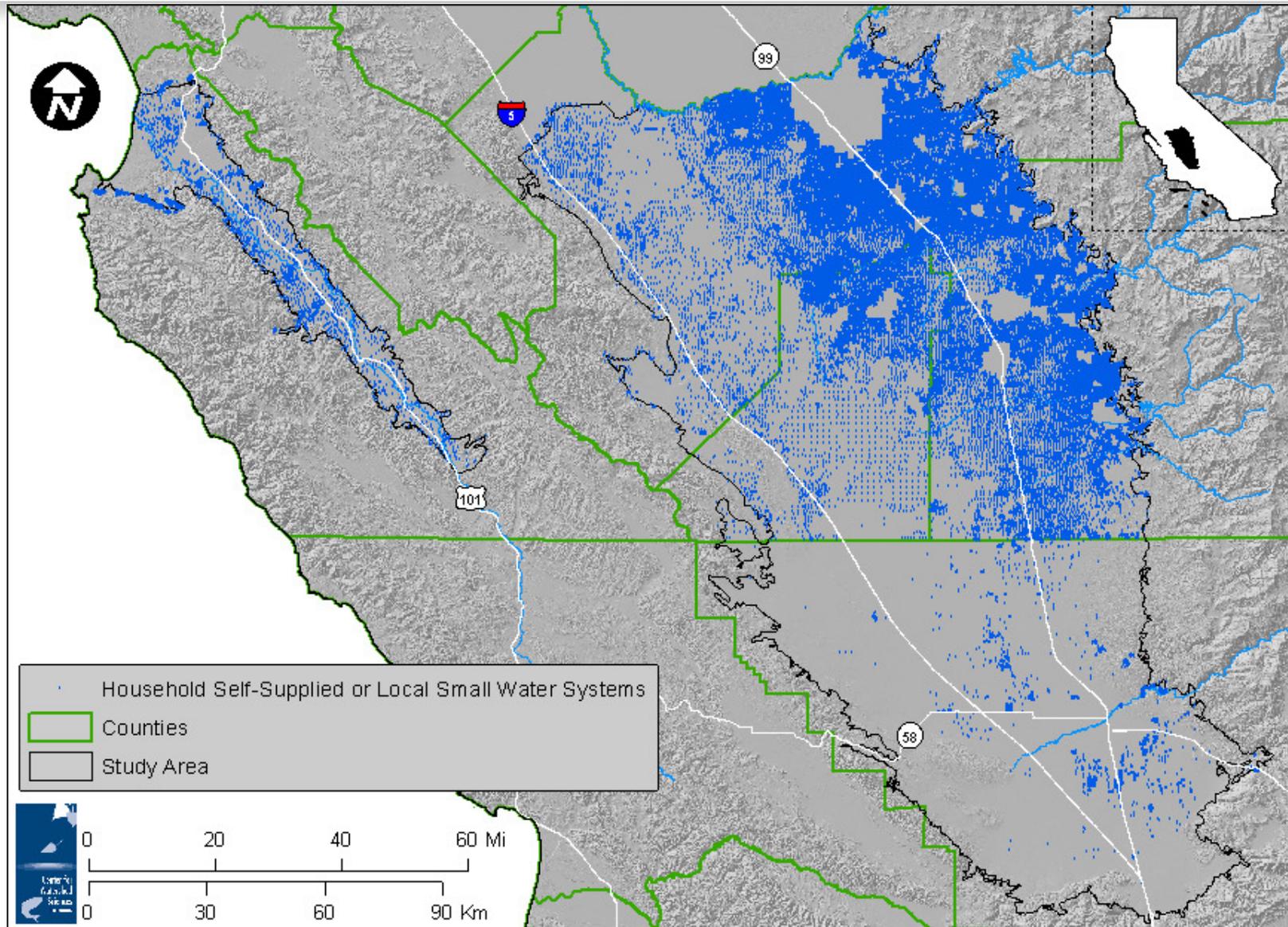
■ **DIFFERENCE = 540,000 people**

Maximum Raw Source Nitrate Concentrations in Wells $\leq 300'$



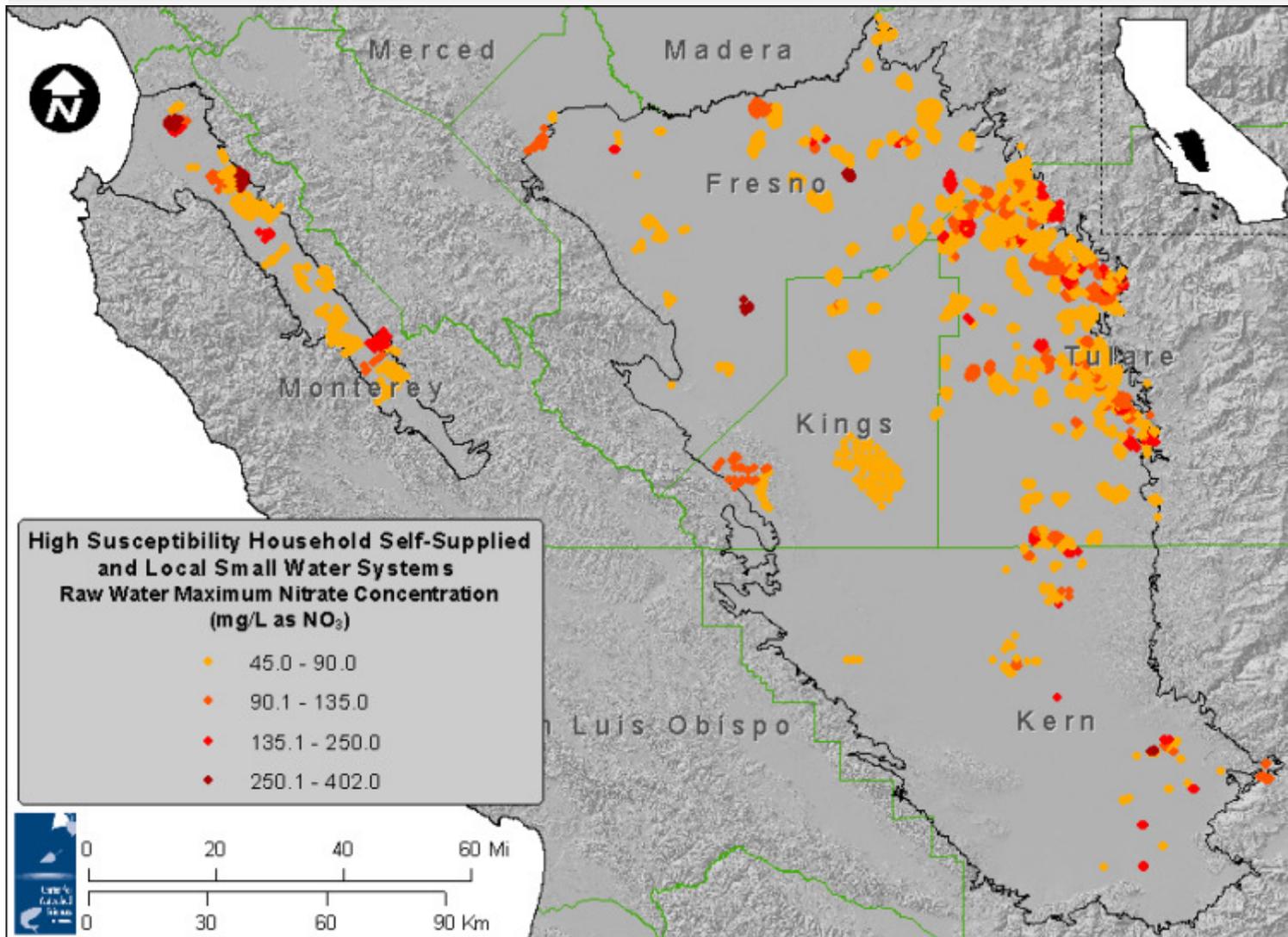


Household Self-Supplied Systems





Susceptible Household Self-Supplied Systems



- ~ 10,000 households
- ~ 34,000 people

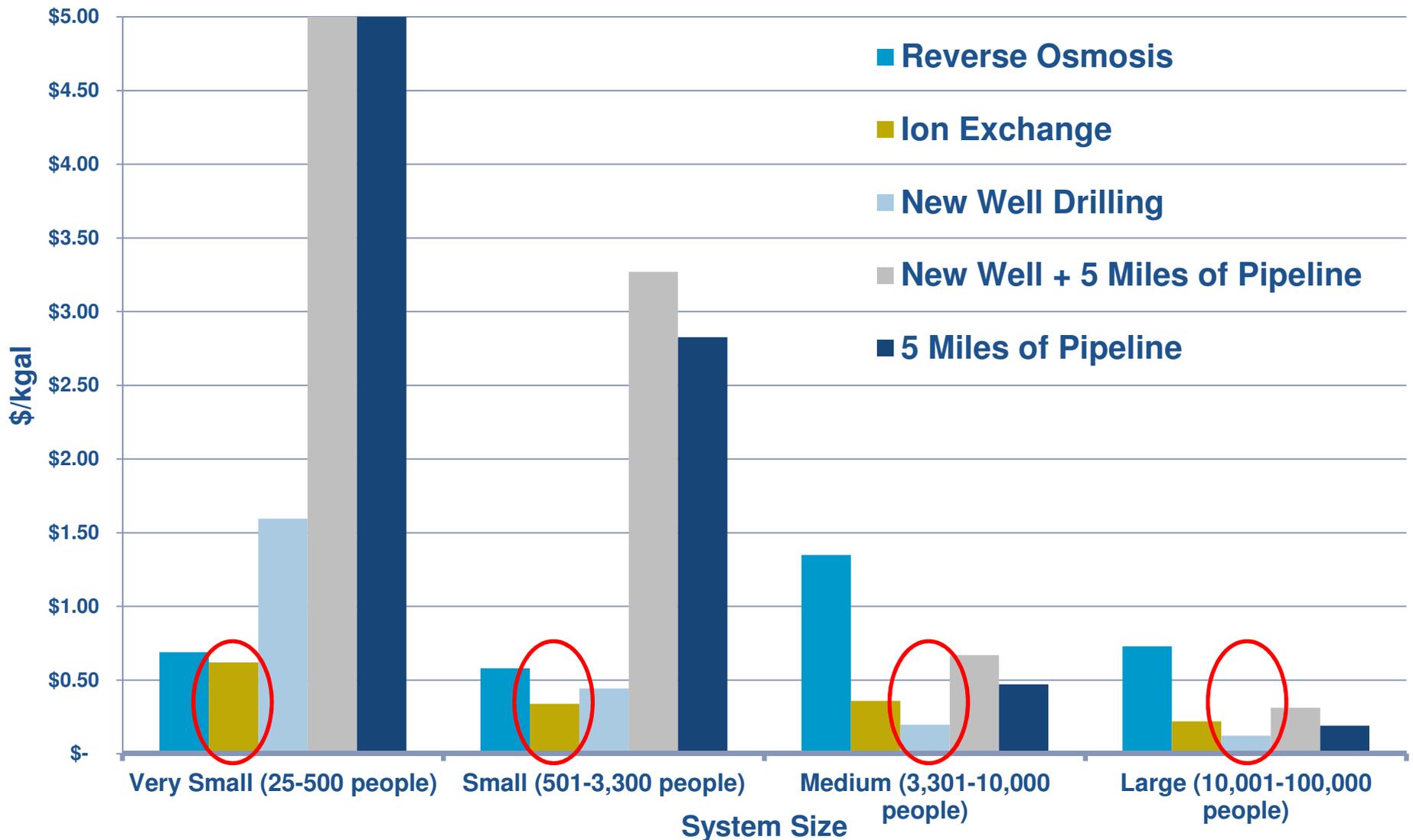


Alternative Water Supply Option Cost Estimates

| OPTION | ESTIMATED ANNUAL COST RANGE (\$/year) | |
|--|---------------------------------------|-------------------------------|
| | Self-Supplied Household | Small CPWS (1,000 households) |
| IMPROVE EXISTING WATER SOURCE | | |
| Blending | N/A | \$200,000 - \$365,000 |
| Drill Deeper Well | \$860 - \$3,300 | \$80,000 - \$100,000 |
| Drill a New Well | \$2,100 - \$3,100 | \$40,000 - \$290,000 |
| Community Supply Treatment | N/A | \$95,000 - \$105,000 |
| Household Supply Treatment | \$250 - \$360 | \$223,000 |
| ALTERNATIVE SUPPLIES | | |
| Piped Connection to an Existing System | \$52,400 - \$185,500 | \$59,700 - \$192,800 |
| Trucked Water | \$575 | \$2,850 |
| Bottled Water | \$1,339 | \$1.34 M |
| RELOCATE HOUSEHOLDS | \$15,090 | \$15.1 M |
| ANCILLARY ACTIVITIES | | |
| Well Water Quality Testing | \$15 - \$50 | N/A |
| Dual System | \$575 - \$1,580 | \$550,000 - \$900,000 |



Estimated Alternative Supply Costs for Community Public Water System





Cost Range for High Susceptibility CPWS/SSWS

LOW ESTIMATE

| Least Cost Option (LCO) | Number of Systems Using LCO | Population Served by Systems Using LCO | Total Cost for LCO (\$/year) |
|---|------------------------------------|---|-------------------------------------|
| Drill New Well | 5 | 621,388 | \$15,002,322 |
| POU Device for Potable Use | 64 | 9,777 | \$587,613 |
| Pipeline to a Nearby System (10,000+ system) | 5 | 25,323 | \$549,549 |
| Groundwater Treatment Facility | 12 | 20,984 | \$1,662,280 |
| TOTAL | 86 | 677,472 | \$17,801,764 |



Cost Range for High Susceptibility CPWS/SSWS

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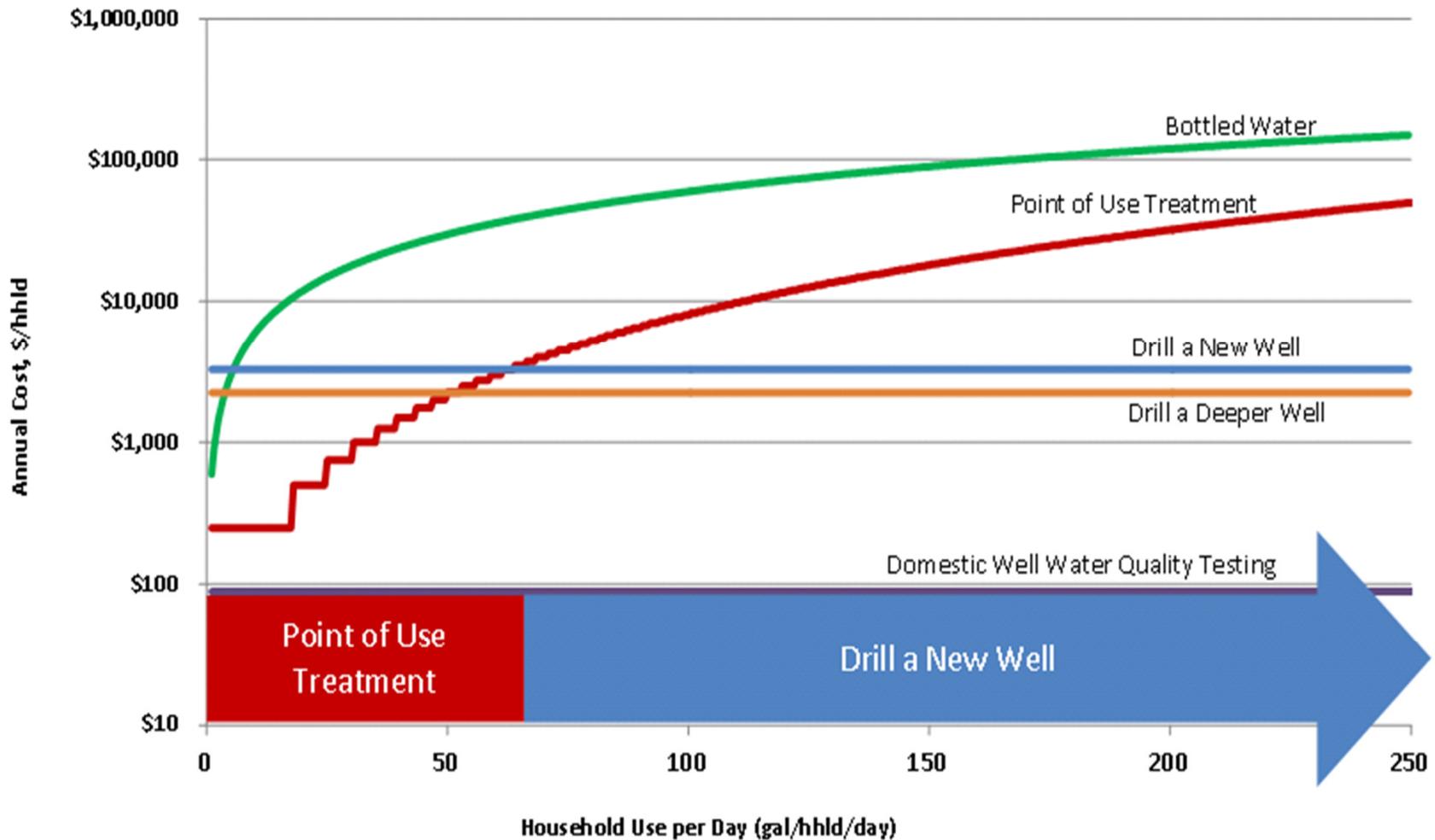
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HIGH ESTIMATE

| Least Cost Option (LCO) | Number of Systems Using LCO | Population Served by Systems Using LCO | Total Cost for LCO (\$/year) |
|--|------------------------------------|---|-------------------------------------|
| Drill New Well | 16 | 635,791 | \$17,295,149 |
| Pipeline to a Nearby System (10,000+ system) | 26 | 35,526 | \$2,515,397 |
| Groundwater Treatment Facility | 44 | 6,155 | \$2,134,040 |
| TOTAL | 86 | 677,472 | \$21,944,586 |



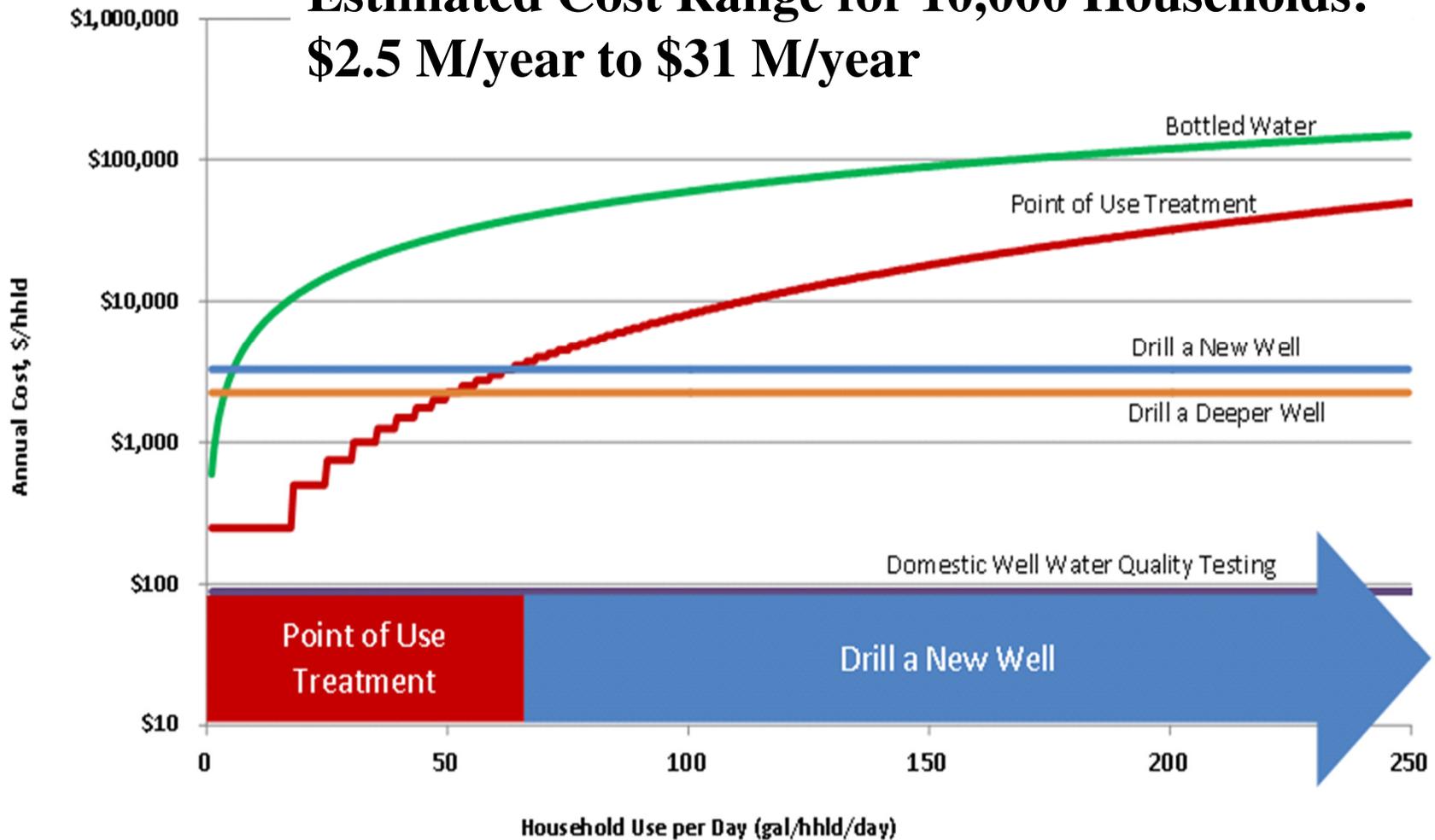
Estimated Alternative Supply Costs for Household Self-Supplied Water Systems





Estimated Alternative Supply Costs for Household Self-Supplied Water Systems

**Estimated Cost Range for 10,000 Households:
\$2.5 M/year to \$31 M/year**





Major Findings

- **In the Tulare Lake Basin and Salinas Valley, 712,000 people have drinking water supplies susceptible or potentially susceptible to nitrate contamination.**
- **About 57% of the current population uses a community public water system with raw nitrate levels exceeding the MCL.**
- **Alternative water supplies is the major short-term solution and could be the main long-term solution.**
- **Each susceptible water system will need individual engineering and financial analyses.**
- **There is significant potential for consolidating small systems.**



Major Findings

- **Promising Options for Community Public Water Systems:**
 - Consolidate with a larger system
 - Consolidate nearby small systems into a larger system
 - Ion exchange community water treatment
 - Drilling a new well
 - Blending of contaminated wells (at least temporarily)
- **Promising Options for Self-Supplied Households:**
 - Reverse osmosis point of use treatment systems
 - Drilling a new well
- **Overall Cost = \$20 - \$25 million/year**
 - \$28-\$35/year per SUSCEPTIBLE PERSON
 - \$5-\$7/year per IRRIGATED ACRE
 - \$100-\$125 per TON OF FERTILIZER
 - \$8-\$10/year per PERSON



Major Recommendations

- **A feasibility analysis should occur for individual systems to determine the most suitable alternative water supply option.**
- **For any solution, consider lifecycle costs.**
- **Alternative water supplies is the major short-term solution and could be the main long-term solution.**
- **Regionalize and consolidate.**
- **Construct, populate, and maintain a statewide publicly accessible comprehensive water quality database for groundwater and public water supply systems.**
- **Create a Water and Wastewater Task Force for integrating water and wastewater treatment projects and efforts.**
- **Require domestic wells water quality monitoring.**



Cost Assumptions

- All water uses:
 - 250 gpd
 - 850 gal/hhld/day
- Potable water uses only:
 - 0.7 gpd
 - 2.25 gal/hhld/day



Alternative Water Supply Options

- **Improve Existing Source**
 - Blending +
 - Drill Deeper or New Well +
 - Community Treatment
 - Household Treatment *
- **Create Alternative Supplies**
 - Switch to Treated Surface Water
 - Piped Connection to a Better System
 - Existing system
 - New system
 - Regionalization and Consolidation
 - Trucked Water *
 - Bottled Water
- **Relocate Households**

Ancillary Activities:

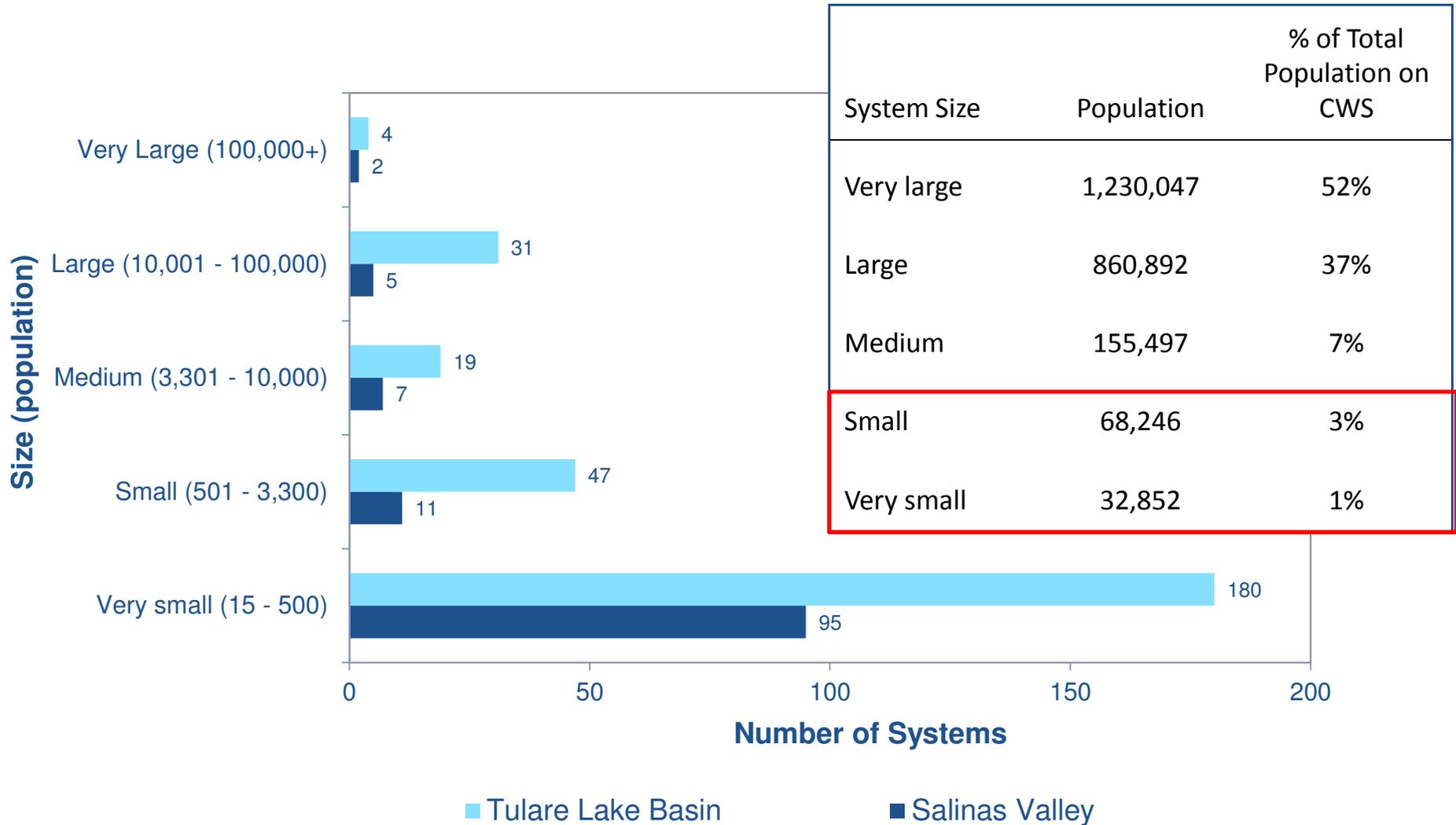
+ Well Water Quality Testing

* Dual System



Regionalization/Consolidation

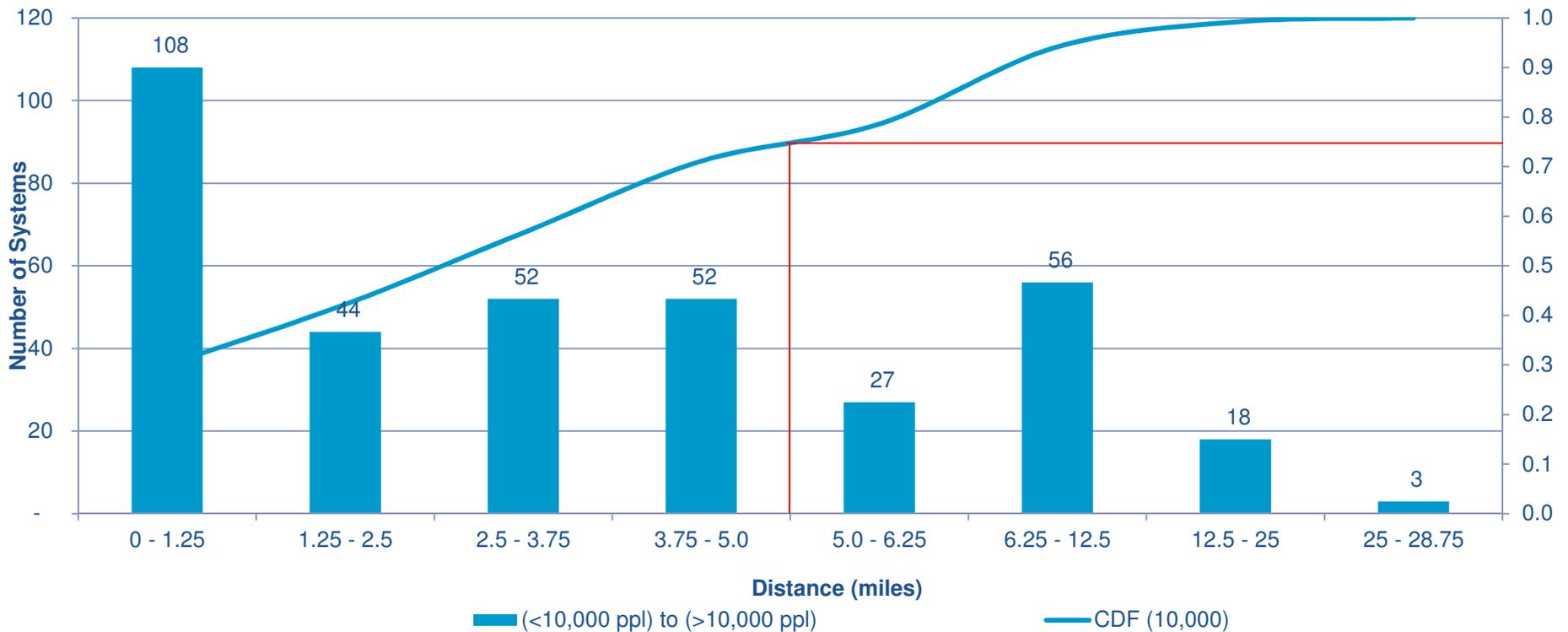
System Distribution by Population Served





Piped Connection to an Existing System

Cumulative Distribution of the Minimum Distance from a Small System to a Larger System
[Source: PICME 2010]





Cost Range for High Susceptibility CPWS/SSWS (no new wells)

LOW ESTIMATE without DRILLING A NEW WELL

| Least Cost Option (LCO) | Number of Systems Using LCO | Population Served by Systems Using LCO | Total Cost for LCO (\$/year) |
|--|-----------------------------|--|------------------------------|
| POU Device for Potable Use | 64 | 9,777 | \$587,613 |
| Pipeline to a Nearby System (10,000+ system) | 5 | 25,323 | \$549,549 |
| Groundwater Treatment Facility | 14 | 58,526 | \$4,822,272 |
| Surface Water Treatment Facility | 3 | 583,846 | \$42,663,797 |
| TOTAL | 86 | 677,472 | \$48,623,231 |

HIGH ESTIMATE without POU DEVICES and without DRILLING A NEW WELL

| Least Cost Option (LCO) | Number of Systems Using LCO | Population Served by Systems Using LCO | Total Cost for LCO (\$/year) |
|--|-----------------------------|--|------------------------------|
| Pipeline to a Nearby System (10,000+ system) | 29 | 36,577 | \$3,027,109 |
| Groundwater Treatment Facility | 51 | 8,057 | \$3,246,021 |
| Surface Water Treatment Facility | 6 | 632,838 | \$50,060,226 |
| TOTAL | 86 | 677,472 | \$56,333,356 |