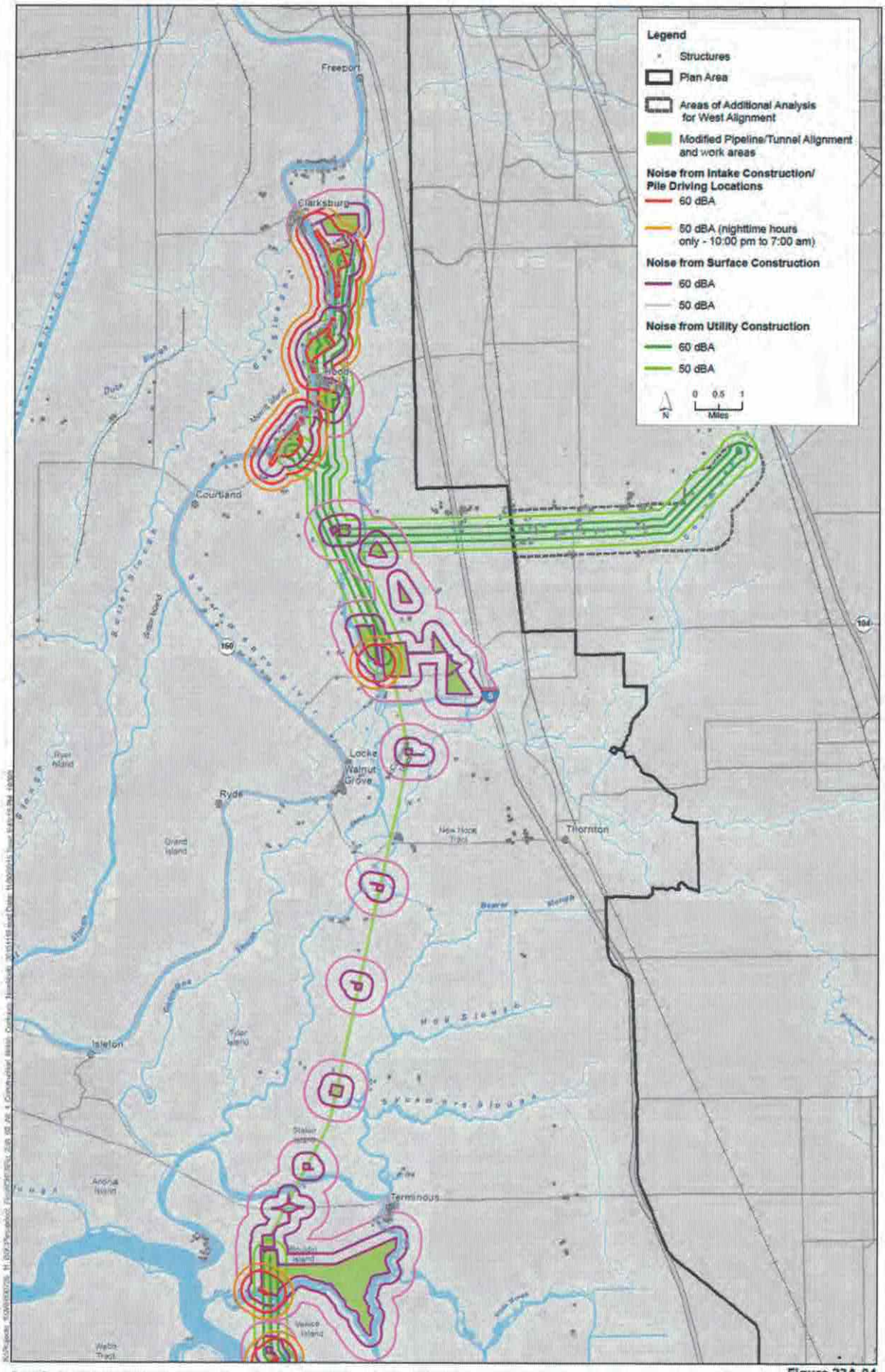
SWRCB-102, FEIR/S, Fig. 23A-04; cited in LAND-135, p. 4, line 22.



Sources: Plan Area, IOP 2013; Constructability (Rev 10d), DHCCP DWR 2012; Constructability (Rev 35), DHCCP DWR 2012; Constructability (Rev 43c), DHCCP DWR 2013

Figure 23A-04
Alternative 4 - Modified Pipeline/Tunnel Option
Construction Noise Contours (North)

SWRCB-102, FEIR/S, Fig. 23A-04; cited in LAND-135, p. 4, line 22

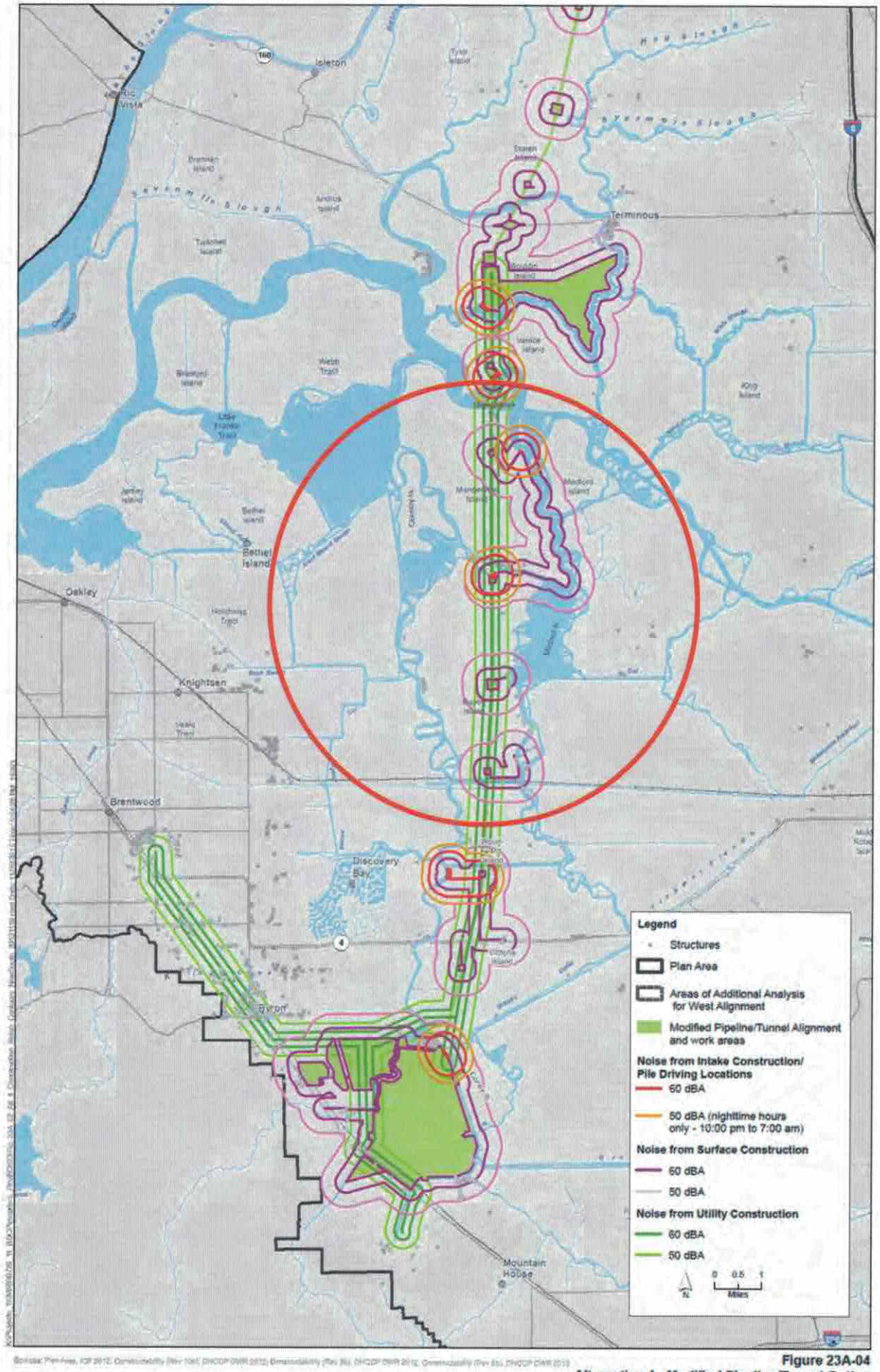


Figure 23A-04
Alternative 4 - Modified Pipeline/Tunnel Option
Construction Noise Contours (South)

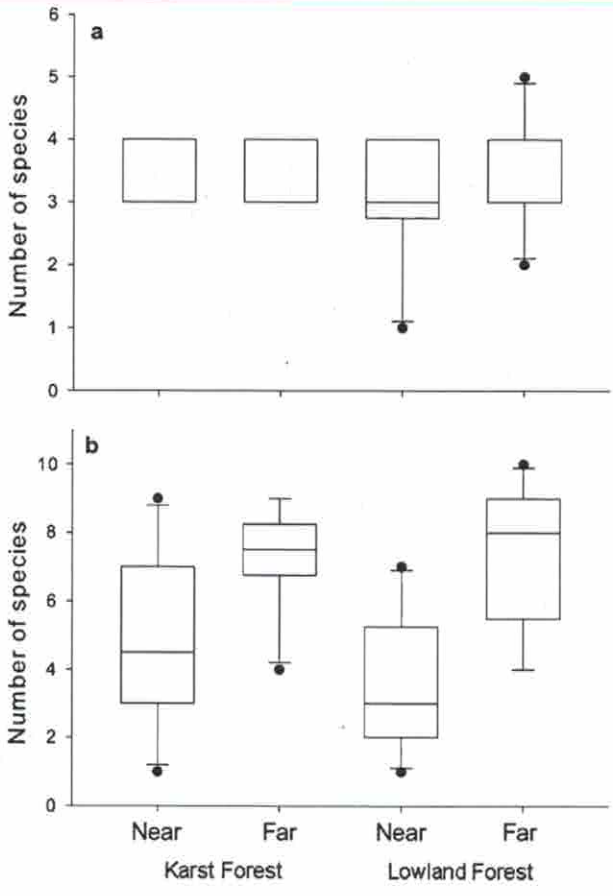


Fig. 4 Species richness near and far from the highway in karst forest and lowland forest in Puerto Rico. **a** Amphibians and **b** birds

have vocalizations below 6 kHz and diurnal vocal activity, with the exception of the Puerto Rican Screech-Owl (*M. nudipes*), which calls at night.

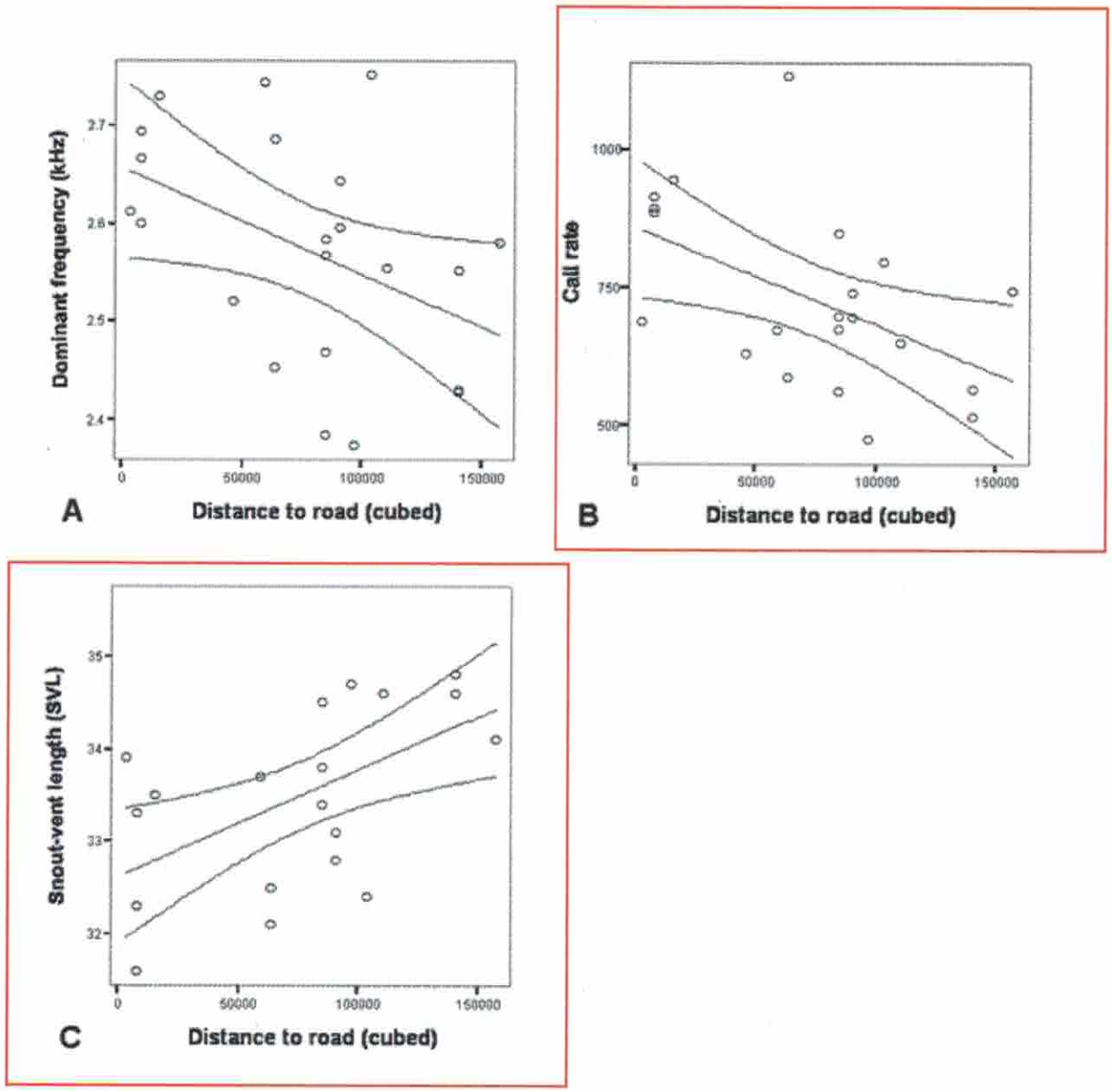
Discussion

In both the karst and moist forest bird community composition was affected by traffic noise, but amphibian community composition was not. In sites near the road, bird species richness and bird species occurrence were lower than in sites far from the road, and the community composition was also different. The differences in response to anthropogenic noise between anurans and birds are probably related to differences in their ecology and communication behavior.

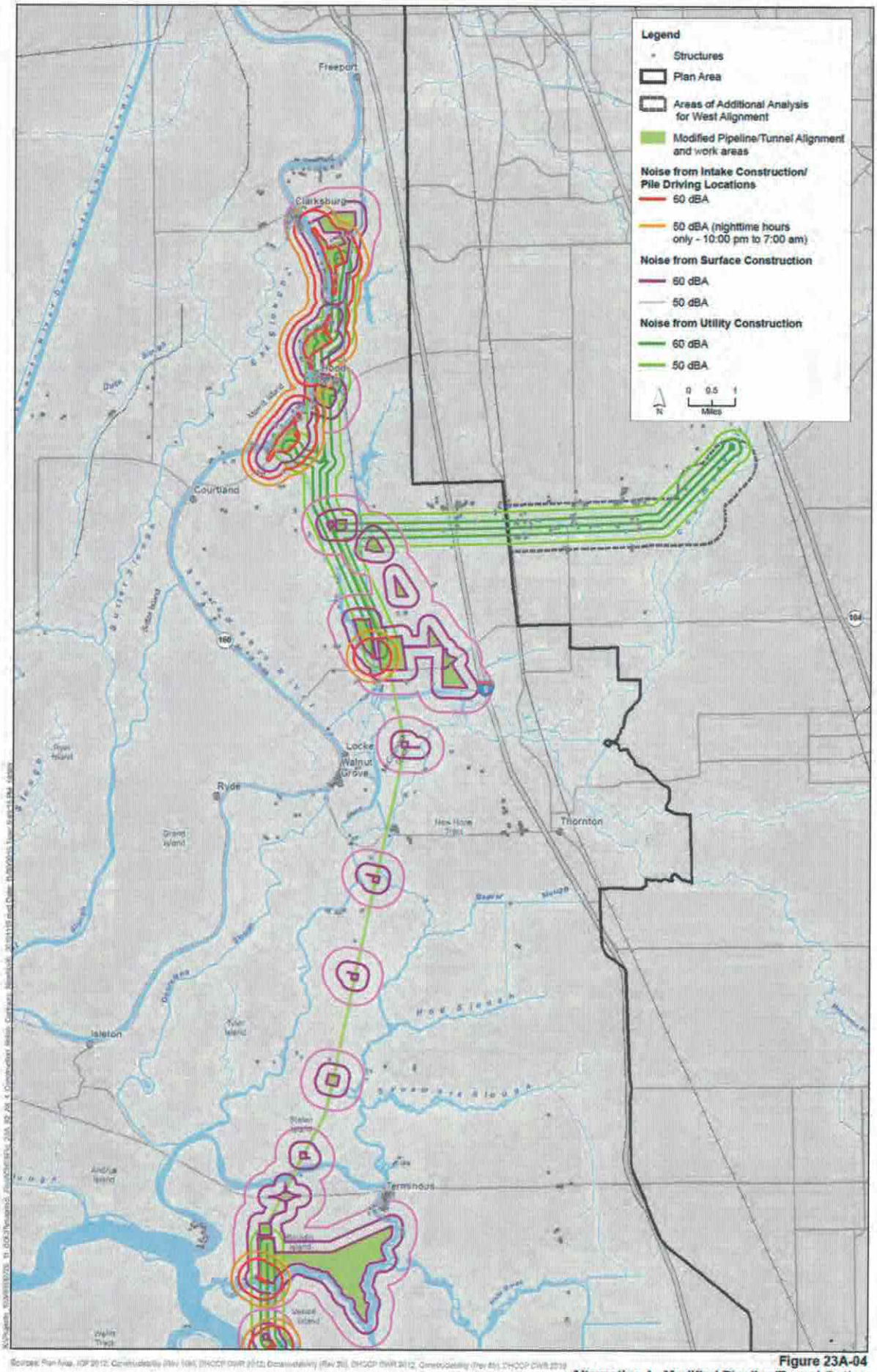
Anuran species in Puerto Rico are nocturnal and although they can call during the day, the majority of their activity begins after dusk (18–19 h), and there is a little overlap with traffic noise. In contrast, most of the bird singing activity is during the daylight hours (6–18 h), and this overlaps with high levels of traffic noise in the metropolitan area (Fig. 1). The combination of high levels of traffic noise overlapping with the period of calling activity is making birds more vulnerable to the masking effect of traffic noise (Slabbekoorn and Ripmeester 2008). However, if background noise masks a bird's song, they can move

Ecology and Society **15**(3): 15
http://www.ecologyandsociety.org/vol15/iss3/art15/

Fig. 4. The relationship between (A) dominant frequency, (B) call rate, and (C) body size, and perpendicular distance to the road for *L. rheocola* within 55 m of the road on the upstream Streets Creek transect. Graphs show the regression line with upper and lower 95% confidence limits. The x-axis shows cubed distance to the road; the range of the untransformed data is 15-54 m.



SWRCB-102, FEIR/S, Fig. 23A-04; cited in LAND-135, p. 4, line 22.



Sources: Plan Area, IOP 2012; Constructability (Rev 1bb), DHCCP DWR 2012; Constructability (Rev 3b), DHCCP DWR 2012; Constructability (Rev 4b), DHCCP DWR 2013

Figure 23A-04
Alternative 4 - Modified Pipeline/Tunnel Option
Construction Noise Contours (North)

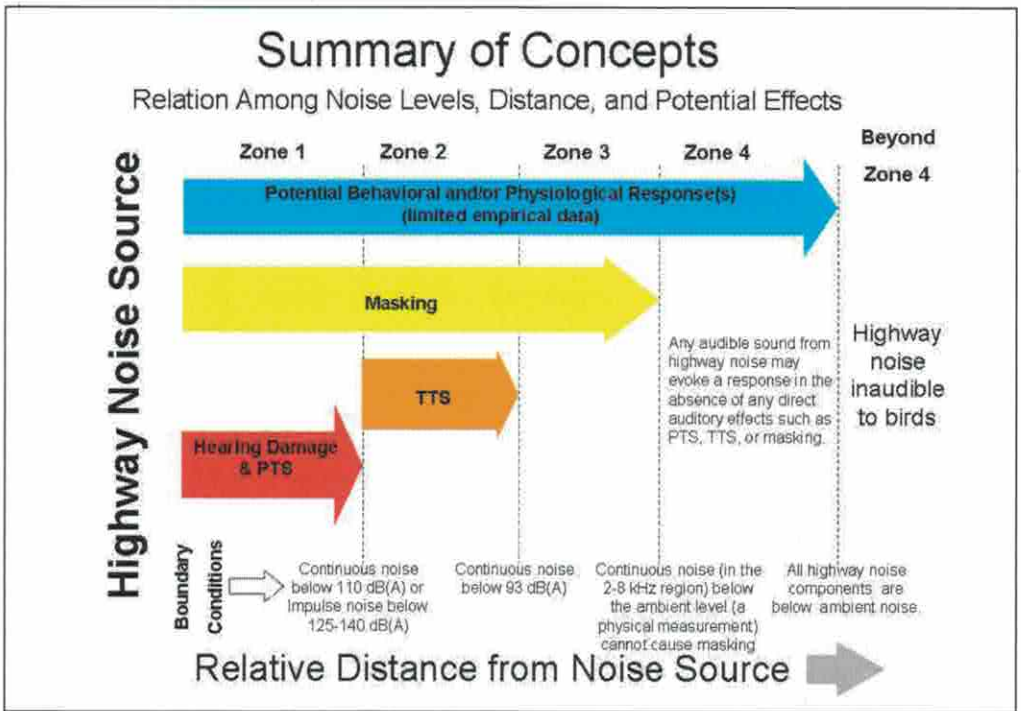


Figure 5: Effects of Highway Noise on Birds

Categories of highway noise effects on birds with distance from the source. Zone 1 is closest to the source while Zone 4 is furthest away. Sound level decreases further from the source. See text for discussion.

Table 3: Recommended Interim Guidelines for Potential Effects from Different Noise Sources

Noise Source Type	Hearing Damage	TTS	Masking	Potential Behavioral/ Physiological Effects
Single Impulse (e.g., blast)	140 dB(A)[1]	NA[3]	NA[7]	Any audible component of highway noise has the potential of causing behavioral and/or physiological effects independent of any direct effects on the auditory system of PTS, TTS, or masking
Multiple Impulse (e.g., jackhammer, pile driver)	125 dB(A)[1]	NA[3]	ambient dB(A)[5]	
Non-Strike Continuous (e.g., construction noise)	None[2]	93 dB(A)[4]	ambient dB(A)[5]	
Highway Noise	None[2]	93 dB(A)[4]	ambient dB(A)[5]	
Alarms (97 dB/100 ft)	None[2]	NA[2]	NA[6]	

[1] Estimates based on bird data from Hashino et al.1988 and other impulse noise exposure studies in small mammals.

[2] Noise levels from these sources do not reach levels capable of causing auditory damage and/or permanent threshold shift based on empirical data on hearing loss in birds from the laboratory.

[3] No data available on TTS in birds caused by impulse noises.

[4] Estimates based on study of TTS by continuous noise in the budgerigar and similar studies in small mammals.

[5] Conservative estimate based on addition of two uncorrelated noises. Above ambient noise levels, critical ratio data from 14 bird species, well documented short term behavioral adaptation strategies, and a background of ambient noise typical of a quiet suburban area would suggest noise guidelines in the range of 50—60 dB(A).

[6] Alarms are non-continuous and therefore unlikely to cause masking effects.

[7] Cannot have masking to a single impulse.

Table 1. Number of species affected by traffic in different taxonomic groups

Taxonomic group[a]	Number of species investigated in woodland		Number of species investigated in agricultural grassland	
	Total	Affected	Total	Affected
Anatidae	1	0	4	1
Accipitridae	1	1	–	–
Phasianidae	1	1	–	–
Rallidae	–[b]	–	1	1
Haematopodidae	–	–	1	1
Charadriidae	–	–	1	1
Scolopacidae	1	1	2	1
Columbidae	3	2	–	–
Cuculidae	1	1	–	–
Picidae	3	2	–	–
Alaudidae	–	–	1	1
Motacillidae	1	1	2	1
Troglodytidae	1	1	–	–
Prunellidae	1	0	–	–
Turdidae	4	3	–	–
Sylviidae	8	8	–	–
Muscicapidae	2	1	–	–
Aegithalidae	1	0	–	–
Paridae	6	4	–	–
Sittidae	1	0	–	–
Certhidae	1	1	–	–
Oriolidae	1	1	–	–
Corvidae	3	2	–	–
Sturnidae	1	0	–	–
Fringillidae	2	2	–	–
Emberizidae	1	1	–	–
Total	45	33	12	7

[a]Nomenclature follows Voous (1973, 1977).
[b]No species present.
Source: Reijnen *et al.* (1995b, 1996), Reijnen and Foppen (1995).

range of threshold values in dB(A) for species and for all species combined now becomes very similar in both types of habitat (Table 3).

The reduction of the density over the disturbance distances varies greatly between species, but is never smaller than 30%. In both types of habitat several species even show a density reduction of almost 100%. This means that dense traffic, in particular, can cause an important loss of numbers of species. Because many species are affected, there is also a significant reduction of the total density: in open agricultural grassland 39%, and in woodland 35%.

In some previous studies higher densities of breeding birds close to roads were also found (Clark and Karr, 1979; Ferris, 1979; Adams and Geis, 1981). However, this can be explained by habitat conditions being much more favourable close to roads than farther

SWRCB-102, FEIR/S, Fig. 23A-04; cited in LAND-135, p. 4, line 22.

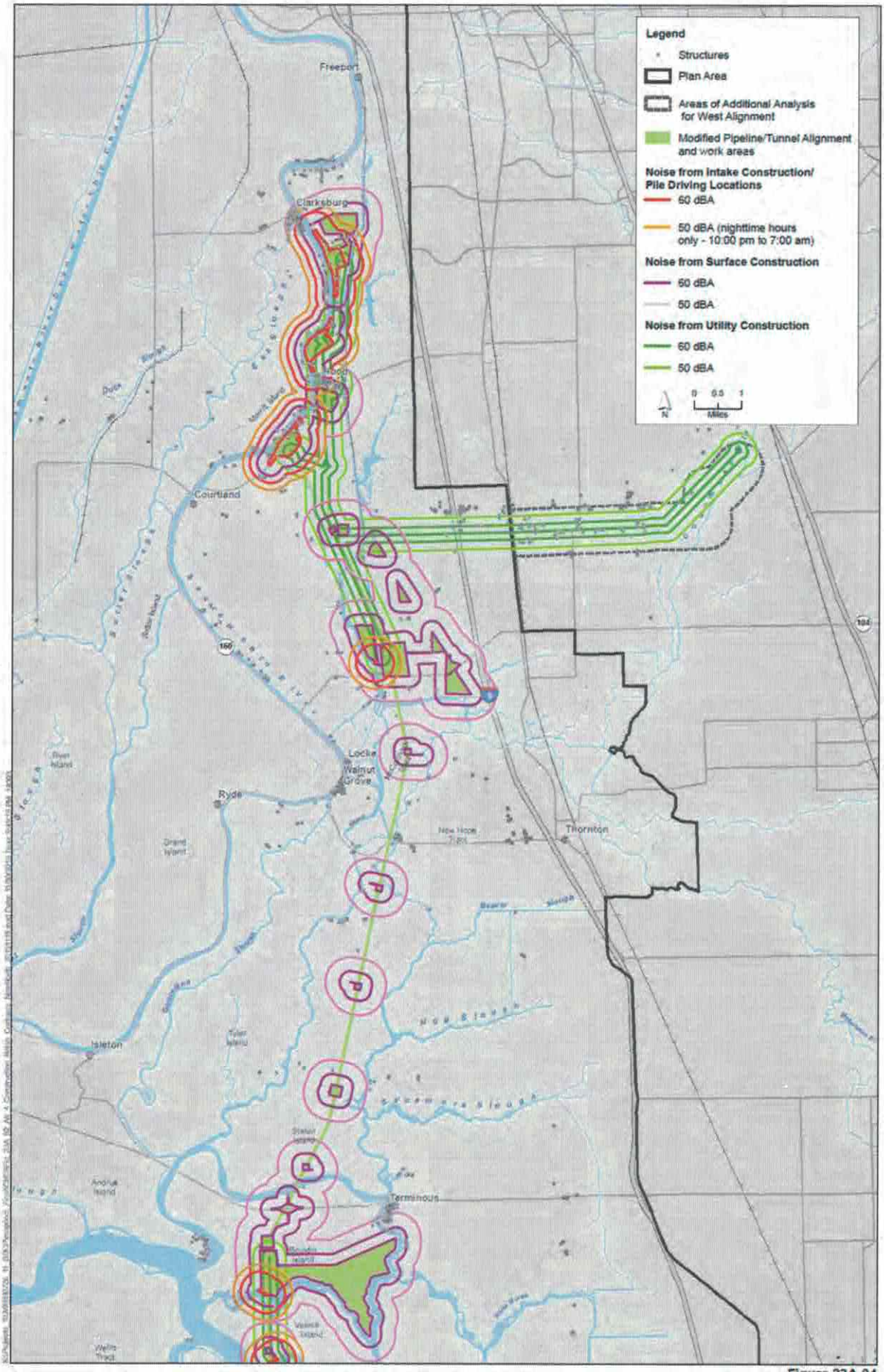


Figure 23A-04
Alternative 4 - Modified Pipeline/Tunnel Option
Construction Noise Contours (North)

SWRCB-102, FEIR/S, Fig. 23A-11; cited in LAND-135, p. 4, line 22

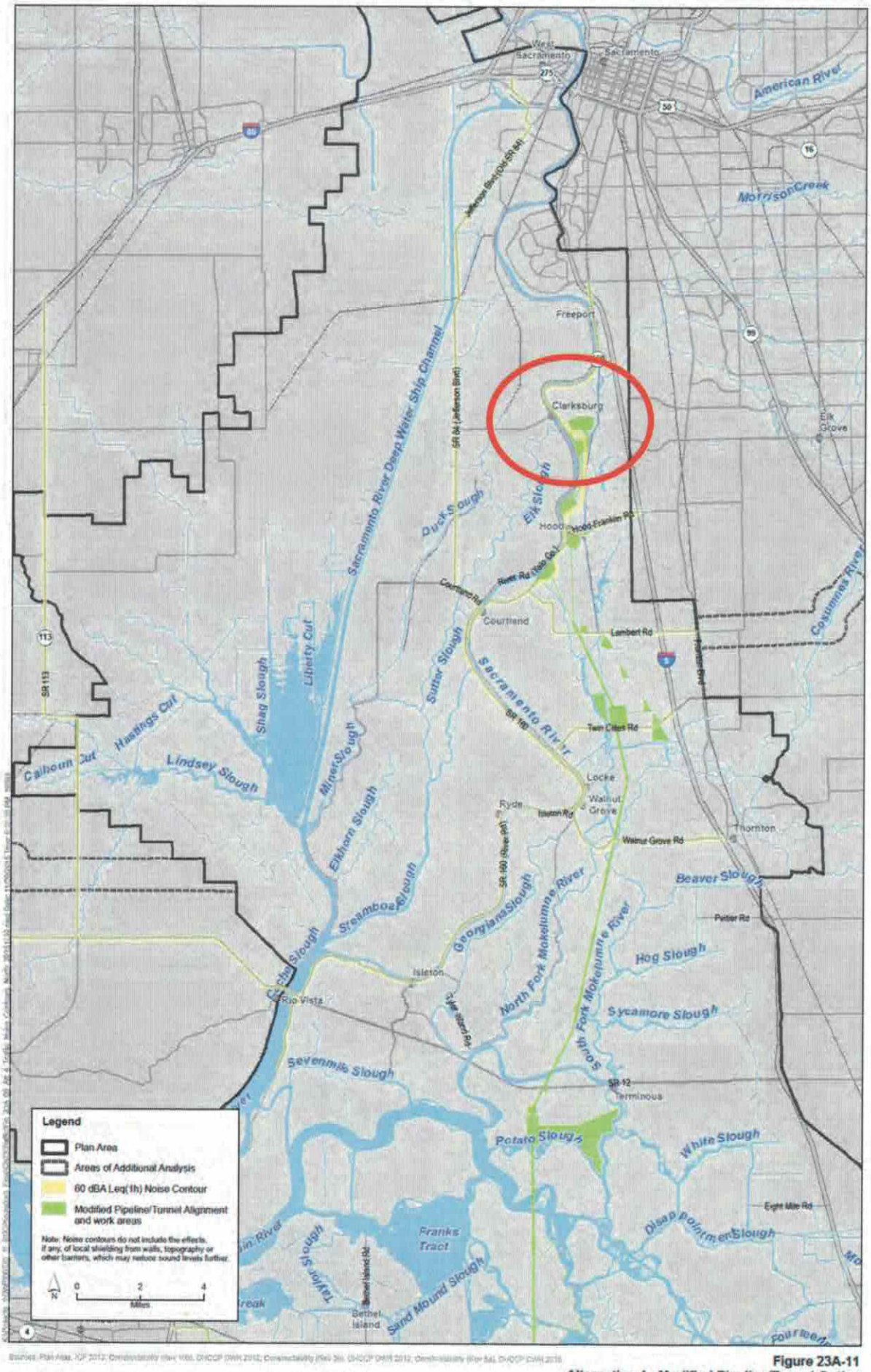
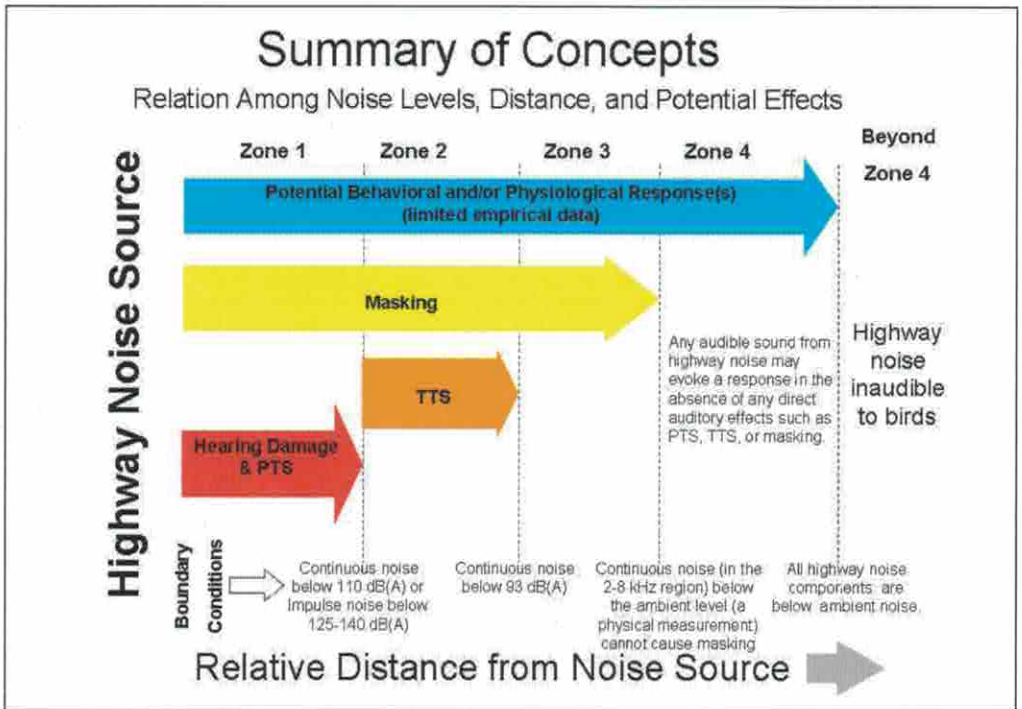


Figure 23A-11
Alternative 4 - Modified Pipeline/Tunnel Option
Traffic Noise Contours on
Worker Commuter Roads and Haul Routes (North)

Cited in LAND-135, p. 3, line 22.



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[6] Alarms are non-continuous and therefore unlikely to cause masking effects.

[7] Cannot have masking to a single impulse.

receptors, a temporary sound wall shall be constructed between the outdoor use area and the construction related noise source.

At buildings where people normally sleep, where it is determined that construction-related noise will cause noise levels to exceed the nighttime ambient level by 5 dBA, or 50 dBA L_{eq}, whichever is greater, a temporary sound wall shall be constructed between the sensitive area and the construction related noise source.

In the event of complaints by affected residents due to on-site construction noise generated during nighttime hours, the contractor will monitor noise levels intermittently (between 10:00 p.m. and 7:00 a.m.) at the dwelling unit of the person lodging the complaint. If measured construction noise during nighttime hours exceeds 50 dBA interior L_{max} (70 dBA exterior L_{max}) or 5 dB above ambient noise, whichever is greater, at the dwelling unit, the construction contractor will implement additional sound-attenuating mitigation measures where site conditions allow, such as limitations on the use of noise-generating equipment, or installation of additional temporary barriers or enclosures. Where the above-described strategies are ineffective in reducing noise to the identified levels or where site conditions prohibit the ability to do so, the affected residents shall be offered short-term relocation assistance for the duration of the time that nighttime noise levels are expected to exceed the specified levels. Exceptions to this commitment can be made for legally-mandated warning devices, such as back-up alarms and warning horns.

To the extent feasible, route and schedule truck traffic in order to reduce construction noise impacts and traffic noise levels at noise-sensitive land uses (e.g., schools, libraries, and places of worship).

To the extent feasible (e.g., where required by haul permits), limit off-site trucking activities (e.g., deliveries, export of materials) to the hours of 7:00 a.m. to 10:00 p.m. to minimize noise impacts on nearby residences.

A vegetation screen or other type of screen will be installed or planted on the south side of Hood Franklin Road along the length of Stone Lakes National Wildlife Refuge Property to reduce disturbance to Greater Sandhill Cranes and to visitors.

Blasting at excavation sites will be conducted at a distance of at least 1,000 feet from the nearest noise-sensitive land use or temporary relocation will be provided.

Operations

Pump station buildings will be designed and constructed such that operation noise levels at nearby residential receptors do not exceed 50 L_{eq} during daytime hours (7:00 a.m. to 10:00 p.m.) and 45 dBA L_{eq} during nighttime hours (10 p.m. to 7 a.m.). Acoustical measures such as terrain shielding, pump enclosures, and acoustical building treatments may be incorporated into the facility design in order to meet this performance standard.

As additional background, *Supplemental Information for the EIR/EIS: Bay–Delta Conservation Plan* (California Department of Water Resources 2010a) identifies the following plan for controlling noise.

TRAFFIC CONTROL/NOISE ABATEMENT/LIGHTING PLAN

The Contractor shall minimize noise impacts to the extent feasible by preparing, before construction begins, and implementing a Noise Abatement Plan. The Noise Abatement Plan must be prepared in consultation with the Engineer and State Regulatory agencies, and subject to final approval by DWR. The following components shall be included in the plan:

1. In the event of complaints by nearby residents due to nighttime construction activities, the Contractor shall monitor noise levels. Noise shall be measured at the property line of nearby residential uses. In the event that construction noise exceeds the applicable limits specified in the Noise Element of the applicable County General Plan, the responsible construction activity shall cease until feasible measures, such as temporary sound walls, are implemented to reduce nighttime noise levels to compliance with the County General Plan.

3. Results

3.1. Pavement, speed and traffic composition

A preliminary analysis of the data, intra and inter-participants, revealed a high consistency of annoyance rates as a function of the main variables (pavement, speed and traffic composition). The results were also similar across all age groups: the juvenile had a mean annoyance of 5.59; the early adults had a mean of 5.79; middle adults had 5.47; and late adults had 5.60. These results did not differ significantly. Therefore, unless otherwise stated, the following data analyses are based upon the pooled data of the trials of all participants.

The pooled data per pavements, 3840 trials, points to a small difference of mean annoyance between the dense asphalt and open asphalt rubber pavements. The cobblestones pavement induces the highest rate of annoyance. Percentile 85 indicates the same trend with annoyance values of seven for both dense asphalt and open asphalt rubber, and 10 for the cobblestones pavement. Cumulative frequencies analysis also suggests that annoyance rises steeply for the cobblestone pavement, while both the dense and open asphalt rubber pavements follow a smoother and similar path (Fig. 1).

The analysis of the speed–pavement interactions reveals a linear increase of the mean annoyance as a function of speed (Fig. 2) with similar slopes for all pavements (cobblestones, 0.07; dense asphalt, 0.06; open asphalt rubber, 0.05). Again, the cobble pavement shows the highest rates of annoyance. The dense asphalt and open asphalt rubber pavements have similar rates (mean differences not exceeding 0.5); but with a consistent lower level of annoyance for the open asphalt rubber pavement.

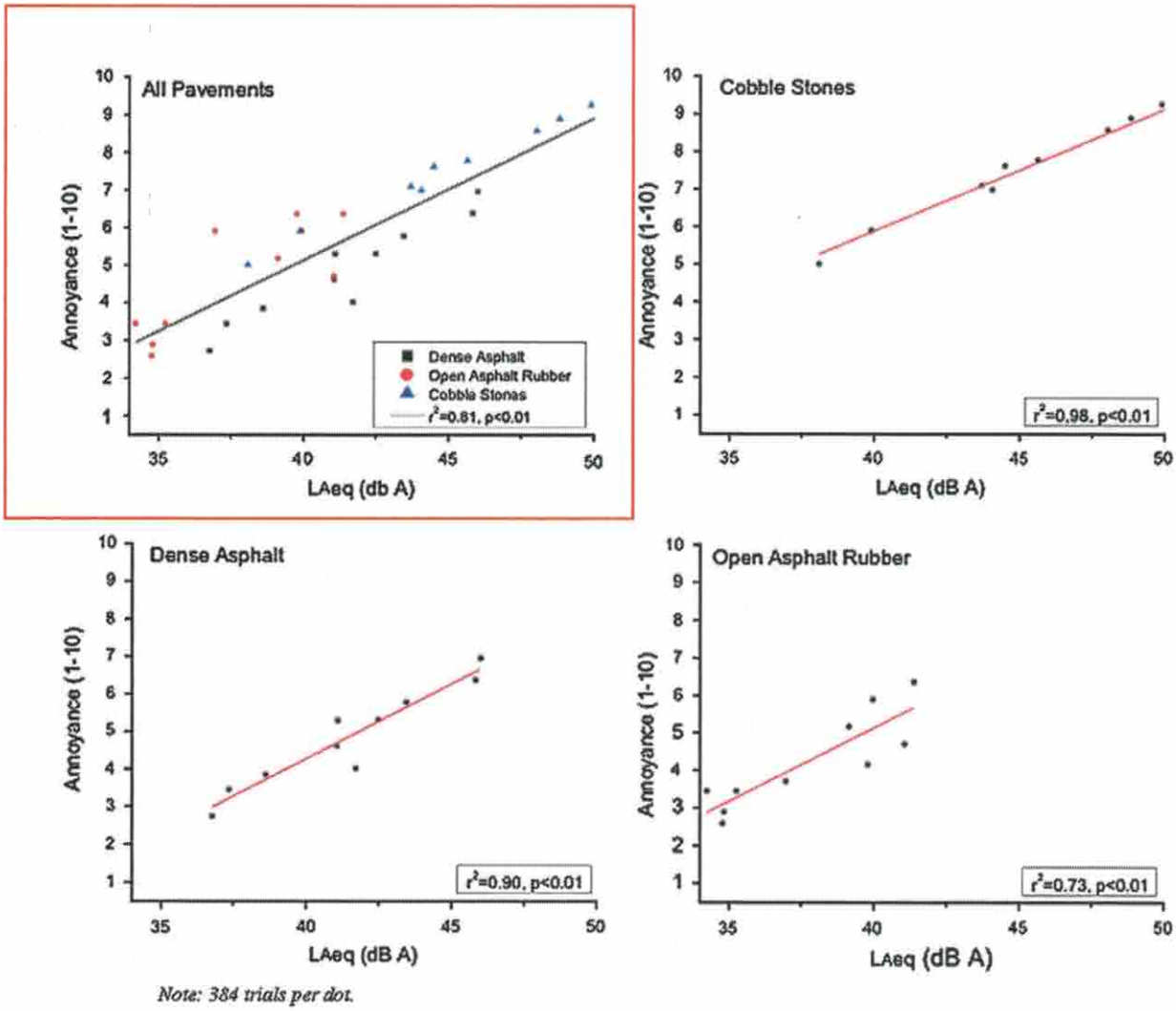


Fig. 3. Linear regressions of LAeq values and the corresponding annoyance rates for all pavements separately for various types of pavement.

LAND-135, p. 4, line 12.

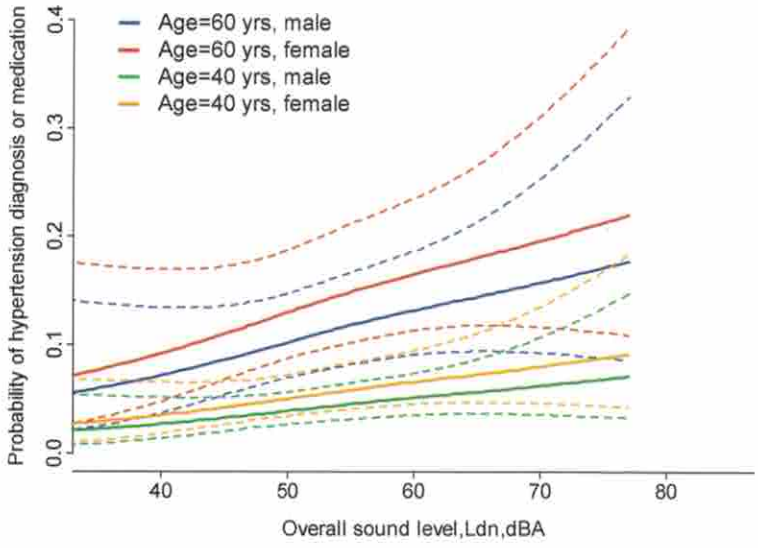


Figure 2: Hypertension diagnosis/treatment: Exposure-response for overall sound exposure (road & rail traffic) by age and sex. Adjusted for health status, weather and noise sensitivity, work noise and vibration, distance to highway and rail – [UIT-1 study, 1998]

Cited in LAND-135, p. 4, line 12.

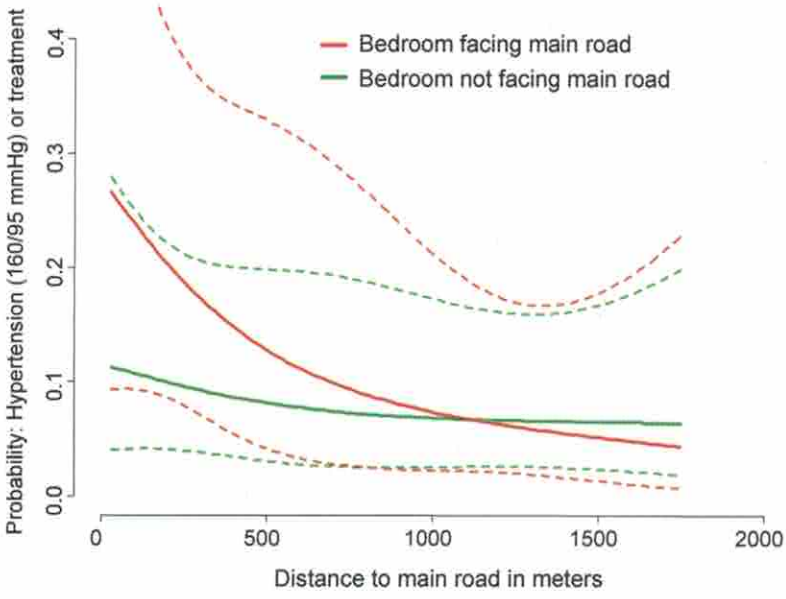


Figure 6: Hypertension/treatment: Exposure-response with distance to main road (highway model) by bedroom location. Adjusted for age, sex, bmi, family history, health, health worry, education, weather sensitivity, work noise, nightshift, heart medication, heart rate, night disturbance rail, level highway – [UIT-2 study, 1998]

Cited in LAND-135, p. 6, line 12.

> To successfully advance in solving global problems, we need to develop new methods of thinking, to elaborate new moral and value criteria, and, no doubt, new patterns of behaviour.
>
> Mankind is on the threshold of a new stage in its development. We should not only promote the expansion of its material, scientific, and technical basis, but, what is most important, the formation of new value and humanistic aspirations in human psychology, since wisdom and humaneness are the 'eternal truths' that make the basis of humanity. We need new social, moral, scientific, and ecological concepts, which should be determined by new conditions for the life of mankind today and in the future.
>
> I.T. Frolov
> Editor-in-Chief, Communist Magazine
> WCED Public Hearing
> Moscow, 6 Dec 1986

46. In the past, responsibility for environmental matters has been placed in environmental ministries and institutions that often have had little or no control over destruction caused by agricultural, industrial, urban development, forestry, and transportation policies and practices. Society has failed to give the responsibility for preventing environmental damage to the 'sectoral' ministries and agencies whose policies cause it. Thus our environmental management practices have focused largely upon after-the-fact repair of damage: reforestation, reclaiming desert lands, rebuilding urban environments, restoring natural habitats, and rehabilitating wild lands. The ability to anticipate and prevent environmental damage will require that the ecological dimensions of policy be considered at the same time as the economic, trade, energy, agricultural, and other dimensions.

47. In most countries, environmental policies are directed at the symptoms of harmful growth; these policies have brought progress and rewards and must be continued and strengthened. But that will not be enough. What is required is a new approach in which all nations aim at a type of development that integrates production with resource conservation and enhancement, and that links both to the provision for all of an adequate livelihood base and equitable access to resources.

48. The concept of sustainable development provides a framework for the integration of environment policies and development strategies - the term 'development' being used here in its broadest sense. The word is often taken to refer to the processes of economic and social change in the Third World. But the integration of environment and development is required in all countries, rich and poor. The pursuit of sustainable development requires changes in the domestic and international policies of every nation.

> You talk very little about life, you talk too much about survival. It is very important to remember that when the possibilities for life are over, the possibilities for survival start. And there are peoples here in Brazil, especially in the Amazon region, who still live, and these peoples that still live don't want to reach down to the level of survival.
>
> Speaker from the floor
> WCED Public Hearing

Box 5-1 Uncertainty, Risk, and Sustainability

Uncertainty. Uncertainty is what we do not know about the system. For example, engineers do not know the foundation conditions under all California levees. Uncertainty can be decreased by reducing data gaps to increase knowledge.

Risk. Most risks originate from such hazards as floods, earthquakes, and droughts that would occur even if all uncertainty could be eliminated. Reducing uncertainty provides a clearer view of what the risks to the system are.

Risk is the probability of the occurrence (multiplied by) consequences of the occurrence over a range of potential events.

Sustainability. A sustainable system or process has longevity and resilience. A sustainable system manages risk but cannot eliminate it. A sustainable system generally provides for the economy, the ecosystem, and social equity. Water sustainability is the dynamic state of water use and supply that meets today's needs without compromising the long-term capacity of the natural and human aspects of the water system to meet the needs of future generations. For example, planning ways to eventually eliminate drafting more groundwater than can be recharged over the long term is one approach for improving sustainability.

Traditional Planning Approach — The Past Is a Model for the Future

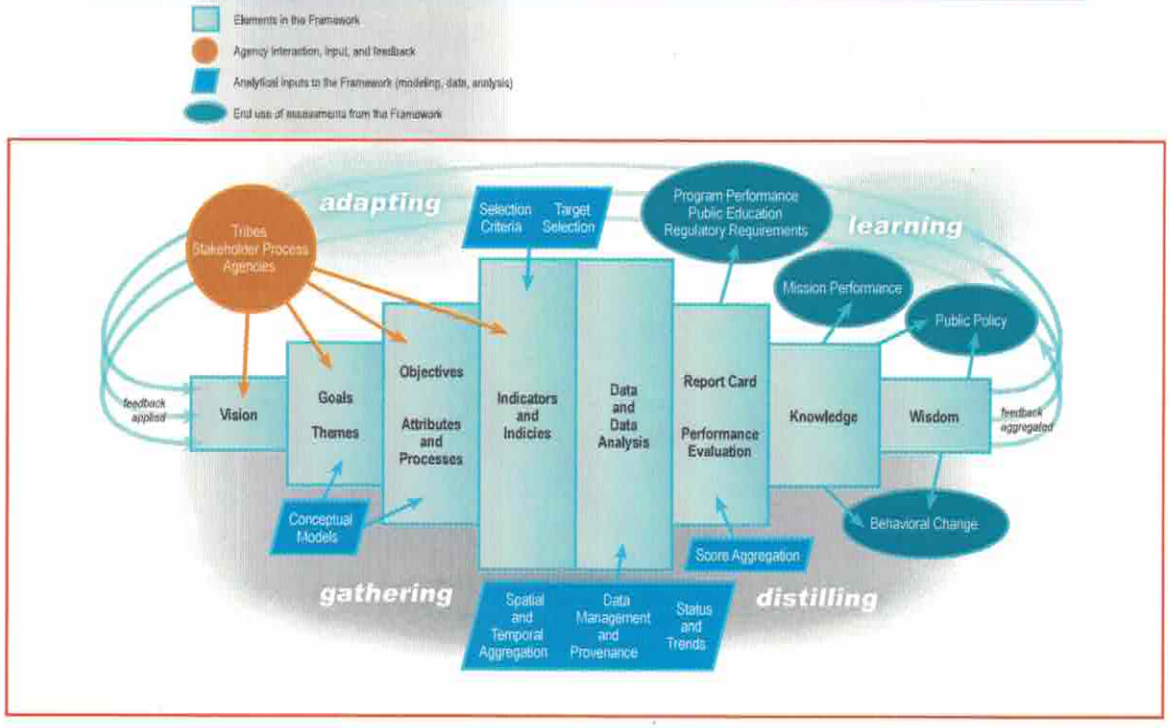
Water managers recognize the variable nature of water flow in California's streams and rivers during wet and dry periods spanning from seasons to multiple years. Having too little water or too much water — droughts or floods — were often primary reasons that Californians built early water projects. Early in California's water development history, personal observations and experience were often used to help size water facilities because of the limited availability of recorded data.

A system to record water flow conditions over time gradually improved information available to water managers. However, the main assumption governing water planning and management for much of California's history has been that past records were a good indication of the frequency, duration, and severity of future floods and droughts, and these records were used as predictors of potential future conditions. In addition, historical records were generally used to establish trends, such as population growth, which were assumed to continue into the future.

This static view of the range of possible future conditions based on past records worked fairly well when the demands on the resources were considerably lower than now. Early designers of water facilities may have understood the variability of storm events and the range of streamflows that could occur, as well as the likelihood that a reservoir would refill in a given year, but generally they did not fully understand or consider the interrelationships among ecosystem functions, flood management, water availability, water use, and water quality.

The past approach to flood planning focused on flood damage reduction and public safety. Projects were designed to control and capture flood flows by using such facilities as dams, levee systems, bypasses, and channel enlargements. Although these projects provided significant flood protection benefits, some of these early structural projects caused unintended or redirected consequences of higher peak flows, conflicts with environmental resources, and increased flood risks. These experiences have prompted flood planners to look more comprehensively at flood systems to gain

Figure 5-25 Details of the California Water Sustainability Indicators Framework



period, methyl tertiary butyl ether (MTBE) was added as an oxygenate to automotive gasoline to reduce air pollution, especially ground-level ozone and smog. By the end of 2002, however, MTBE was banned in California because it was detected in groundwater aquifers around the state. MTBE was replaced with ethanol in 2003. This change, as shown in Figure 5-27, led to a four-fold increase in California's Energy Water Footprint.

In 2008, the most recent year of analysis, the total Energy Water Footprint was 5.6 maf. More than two-thirds of this amount (4.0 maf) was green water, and the remainder (1.6 maf) was blue water. The green water portion of California's Energy Water Footprint is entirely attributable to bioethanol, most of which is blended with gasoline. The blue water portion of bioethanol adds a smaller, yet still significant, amount to California's Energy Water Footprint (0.4 maf). The process of increased blending of bioethanol in California's gasoline has also accelerated an externalization of the state's Energy Water Footprint. Figure 5-28 shows that, from 1990 to 2002, about half of California's Energy Water Footprint was external. In 2008, nearly 90 percent was external. The import of bioethanol from the U.S. Midwest is the primary driver of this phenomenon, though increased imports of other fuels, such as oil and natural gas, have also played a minor role.

Water Quality

Water Quality Index. There are many ways to measure water quality, including physical (e.g., temperature), chemical (e.g., pesticides), and biological (e.g., healthy algal communities) attributes. Water quality is affected by land and water development, as well as by natural processes. Land development leads to runoff of pollutants into local waterways and contributes to the degradation of water quality. One indicator of potential water quality is "impervious cover," which is the proportion of a watershed that has been covered by structures and related

Table 1-1 Progress Report on Implementation of Update 2009

Update 2009 Objective	Status	Trend
1. Expand Integrated Regional Water Management	Good	Neutral
2. Use and Reuse Water More Efficiently	Requires attention	Good
3. Expand Conjunctive Management of Multiple Supplies	Requires attention	Good
4. Protect Surface Water and Groundwater Quality	Requires attention	Good
5. Expand Environmental Stewardship	Requires attention	Neutral
6. Practice Integrated Flood Management	Good	Good
7. Manage a Sustainable California Delta	Good	Good
8. Prepare Prevention, Response, and Recovery Plans	Neutral	Requires attention
9. Reduce Energy Consumption of Water Systems and Uses	Neutral	Neutral
10. Improve Data and Analysis for Decision-making	Good	Good
11. Invest in New Water Technology	Good	Good
12. Improve Tribal Water and Natural Resources	Neutral	Requires attention
13. Ensure Equitable Distribution of Benefits	Unavailable	Unavailable

In addition to progress made specifically toward implementing the Update 2009 objectives and related actions, many related significant accomplishments have been made or are ongoing since 2009. For example, the 2009 water legislation package (described further in Chapter 3 of this volume, "California Water Today") represents major steps toward ensuring a reliable water supply for future generations, as well as restoring the Delta and other ecologically sensitive areas. There has been significant progress in implementing this legislation. Regional water management groups and water communities have continued to advance IRWM through the development of 48 regional planning entities, and since 2009 a large portion of the more than $10 billion in State GO bonds has been invested in IRWM activities. State agencies have continued to seek alignment of data, plans, policies, and regulation. Almost universally across all programs, data and technology have greatly improved Californians' ability to better manage water resources and plan for future improvements. More complete descriptions of implementation progress can be found in the Progress Report; in Chapter 3, "California Water Today"; in Chapter 4, "Strengthening Government Alignment"; and in Volume 4, *Reference Guide*.

- General Obligation (GO) bond debt levels that are near an all-time high.
- Misaligned, complex, and often internally inconsistent government planning, policy, and regulation.
- Conflicting roles and responsibilities related to overlapping and narrow authorities and governance.

- ***Reduce flood risk Statewide.***
- ***Provide safe drinking water.***
- ***Improve water quality for fisheries and recreation.***
- ***Clean, safe water supplies.***
- ***Enhance Bay-Delta ecosystem.***
- ***Restore terrestrial and aquatic habitats.***
- ***Improve watershed management.***
- ***Raise awareness and increase stewardship.***
- ***Enhance State economic output.***
- ***Contribute to job creation and security.***
- ***Promote food production security.***
- ***Provide stable funding for infrastructure.***

These issues place significant risks on public safety, unique ecosystems, and the vital California economy. Everyone in California is affected to some degree by these issues and will benefit from system improvements that reduce impacts. For example, even if a given home is not inundated during a flood, the home's owner may not be able to get to work or may experience a disruption in services. Also, as ratepayers and taxpayers, California's citizens are affected by damages and business disruptions as the State invests to recover from the disaster.

The stakes are immense, as future investment decisions will significantly affect:

- Types and levels of economic activity (including the fates of existing businesses, as well as the fates of employees and their families).
- Future levels of flood risk to people's lives and assets.
- The sustainability of natural resources (including the potential prosperity or extinction of species/habitats and the ecosystem services they provide society).
- The sustainability and efficiency of surface water reservoirs and groundwater basins to provide reliable water supply to meet municipal and agricultural demands, and support ecosystem services.
- California's $2 trillion economy, which has significant value both nationally and globally but is dependent on effective local, State, federal, and private natural resource policies and practices.

In recent years, regional and local entities have been investing in water resources management at a rate of about $18 billion per year. This constitutes the majority of the statewide investments, which total about $22 billion per year in local, State, federal, and private expenditures (more information and citations to source materials can be found in Chapters 2 and 7 within this volume and in Volume 4). This regional focus for water resource planning and implementation begs for a better definition of the role of State government in supporting regional activities and in promoting statewide policies and initiatives that recognize differences in needs from region to region. Investments in innovation and infrastructure (water and flood systems, as well as ecosystems)

Cited in LAND-135, p. 7, line 12.

Figure 4-1 Integrated Regional Water Management Planning Regions Accepted or Conditionally Accepted by DWR as of Publication

Cited in LAND-135, p. 7, line 12.

Box 2-1 Failure to Act

"Of all the infrastructure types, water is the most fundamental to life, and is irreplaceable. ... Much of the drinking-water infrastructure is old and in need of replacement. ...

"Failures in drinking-water infrastructure can result in water disruptions, impediments to emergency response, and damage to other types of essential infrastructure."

Source: American Society of Civil Engineers 2013

- Sustainable development and water use, as well as environmental stewardship, foster a strong economy, protect public health and the environment, and enhance quality of life. Managing for sustainability relies on the full consideration of social, economic, and environmental values in all phases of planning and policy- and decision-making. Sustainable water use ensures development and management of surface water and groundwater and related resources in a way that meets present needs while protecting and enhancing watersheds and the environment, and assures the ability to meet the needs of the future.
- IWM on regional and statewide scales is the basis of planning for California's water future with actions that provide multiple benefits. Reducing uncertainties and assessing risks to the surface water and groundwater supply and flood systems are essential for developing plans that also allow for sustainability of water uses, systems, and resources.
- Californians face an unacceptable risk of flooding. California must invest to help prevent flood disasters and to reduce the impacts of flooding, or billions more will be needed to recover from inevitable flooding. All levels of government should work toward implementing the recommendations identified in California's Flood Future Report.
- A diversified portfolio of resource management strategies improves system flexibility and resiliency for changing and extreme hydrologic conditions.
- Solutions to California's water and flood management challenges are best planned and carried out on a regional basis. Hydrologic, demographic, geopolitical, socioeconomic, and other differences among California's regions demand that the mix of water management strategies be suited to meet each region's needs for the long term.
- Water conservation, recycling, and greater system efficiency in California must continue to be a fundamental strategy for all regions and individual water users in California. The cumulative effect of each decision to use water more efficiently has an enormous impact on future water supplies and water quality.
- California can better prepare for future droughts and climate change, as well as improve water supply reliability and water quality, by taking advantage of the extensive water storage capacity of groundwater basins when managed in closer coordination with surface storage and other water supply sources, when available. These supplies include, but are not limited to, recycled municipal water, surface runoff and flood flows, urban runoff and stormwater, imported water, water transfers, and desalination of brackish and sea water.
- California must protect the quality of its surface water and groundwater and use available supplies with greater care because water will always be a precious resource.
- California needs additional groundwater and surface water storage capacity. Storage gives water managers tremendous flexibility to invest in a greater number of resource management strategies, meet multiple needs, and provide vital reserves in drier years. In many cases, storage is necessary for benefits from other resource management strategies to occur, such

What is IRWM?

Integrated Regional Water Management (IRWM) is a collaborative effort to identify and implement water management solutions on a regional scale that increase regional self-reliance, reduce conflict, and manage water to concurrently achieve social, environmental, and economic objectives. IRWM is the application of Integrated Water Management (IWM) principles on a regional scale.

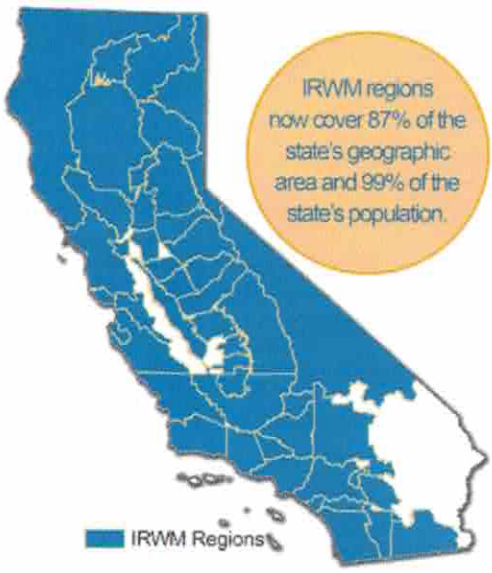
To learn more about IRWM, please view the IRWM-related publications available through our Publications page.

How does IRWM support water management in California?

IRWM enables self-identified regions to integrate and implement water management solutions for their region, which is a foundation of Action 2: "Increase regional self-reliance and integrated water management across all levels of government," in the California Water Plan. For more information about the California Water Action Plan, click on the following link Resources Agency California Water Action Plan . The fundamental principle of IRWM is that regional water managers, who are organized into regional water management groups (RWMGs), are best suited and best positioned to manage water resources to meet regional needs. While large inter-regional water management systems, such as the State Water Project, Central Valley Project, and flood management systems, are important, the majority of California's water resource management investments are made at the local and regional level. IRWM has been critical in helping meet California's water management challenges, including the 2014 drought.

How does DWR support IRWM?

Numerous IRWM planning grants have helped RWMGs develop and adopt IRWM plans for their regions. IRWM implementation grants have helped make more than 800+ IRWM projects identified in IRWM plans a reality across the state. Key technical support to RWMGs is provided by DWR's four Region Offices, located in Glendale, Fresno, West Sacramento, and Red Bluff.



Background

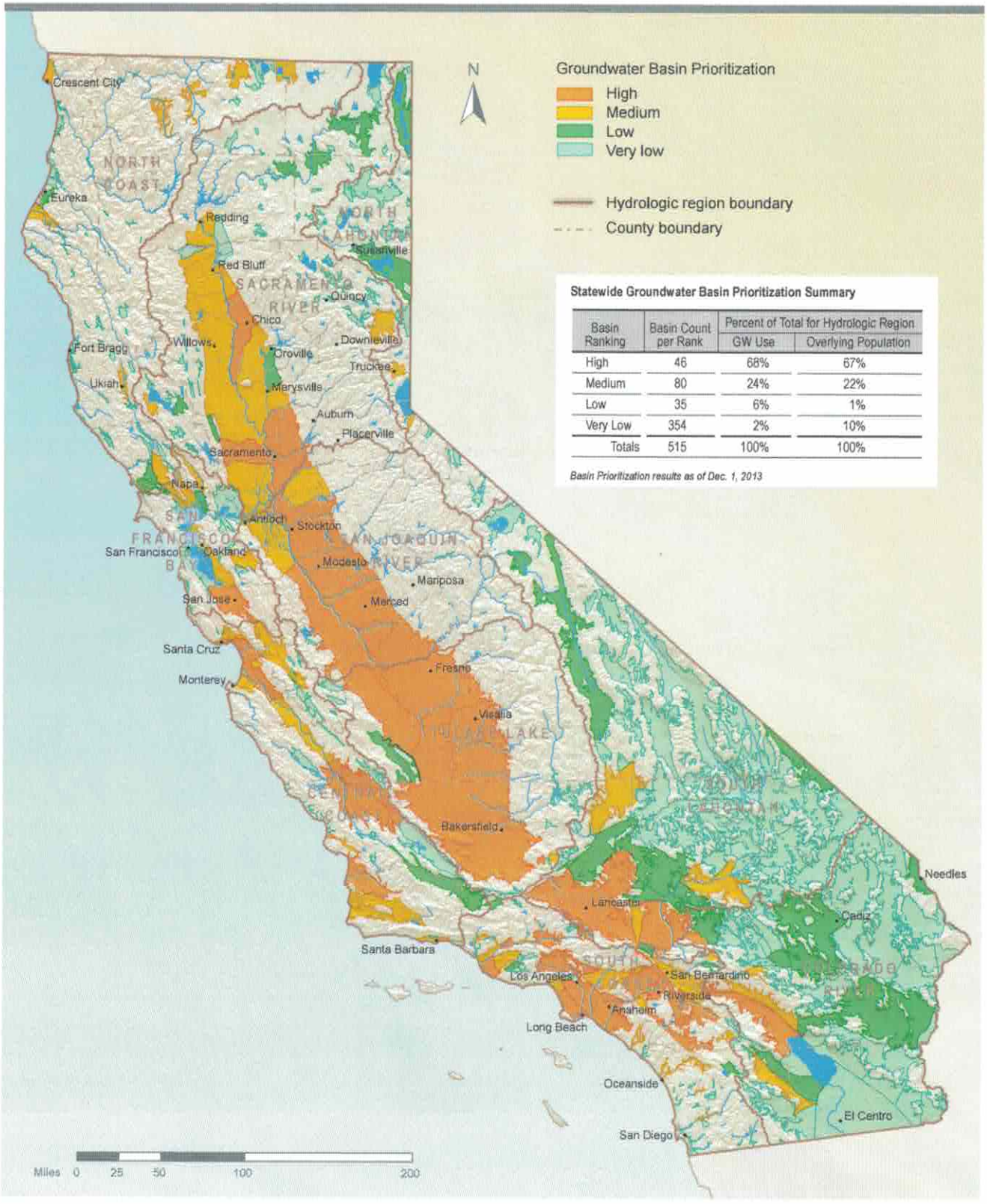
DWR's IRWM story began in 2002 when the Regional Water Management Planning Act (SB 1672) was passed by the Legislature. Since then, various bond acts approved by California voters have provided over $1.5 billion in State funding to support and advance integrated, multi-benefit regional projects. The local match on the State resources has been impressive; often on the order of 4:1. Cities, counties, water districts, community/environmental groups and others across the State have worked collaboratively to organize and establish 48 regional water management groups, covering over 87 percent of the State's area and 99 percent of its population.

IRWM HOME

- REGIONAL RESOURCES
- IRWM GRANT PROGRAMS
- FUTURE OF IRWM
- IRWM RELATED RESOURCES
- TOOLS
  - Water Mgmt. Planning Tool
  - Disadvantaged Communities Mapping Tool
  - Economically Distressed Area Mapping Tool
- PUBLICATIONS
- ARCHIVES

Follow DWR on:

Figure 3-31 CASGEM Final Basin Prioritization Results



Statewide Groundwater Basin Prioritization Summary

Basin Ranking	Basin Count per Rank	Percent of Total for Hydrologic Region	
		GW Use	Overlying Population
High	46	68%	67%
Medium	80	24%	22%
Low	35	6%	1%
Very Low	354	2%	10%
Totals	515	100%	100%

Basin Prioritization results as of Dec. 1, 2013

Cited in LAND-135, p. 7, line 12.

Vision

California has healthy, resilient watersheds and reliable and secure water resources and management systems. Public health, safety, and quality of life in rural, suburban, and urban communities are significantly improved as a result of advancements in IWM. The water system provides the certainty needed for quality of life, sustainable economic growth, business vitality, and agricultural productivity. California's unique biological diversity, ecological values, and cultural heritage are protected and have substantially recovered.

Mission

Updating the CWP provides federal, State, tribal, regional, and local governments and organizations with a continuous planning forum to collaboratively:

- Recommend strategic goals, objectives, and near-term and long-term actions that would conserve, manage, develop, and sustain California's watersheds, water resources, and management systems.
- Prepare response plans for floods, droughts, and catastrophic events that would threaten water resources and management systems, the environment, and property, as well as the health, welfare, and livelihood of the people of California.
- Evaluate current and future watershed and water conditions, challenges, and opportunities.

Goals

1. California's water supplies are adequate, reliable, secure, affordable, sustainable, and of suitable quality for beneficial uses to protect, preserve, and enhance watersheds, communities, cultural resources and practices, environmental and agricultural resources, and recreation.
2. State government supports integrated water resources planning and management through leadership, assistance, oversight, and public funding.
3. Regional and interregional partnerships play a pivotal role in California water resources planning, water management for sustainable water use and resources, and increasing regional self-reliance.
4. Water resource and land use planners make informed and collaborative decisions and implement integrated actions to increase water supply reliability, use water more efficiently, protect water quality, improve flood protection, promote environmental stewardship, and ensure environmental justice and public access to water bodies, in light of drivers of change and catastrophic events.
5. California is prepared for climate uncertainty by developing adaptation strategies and investing in a diverse set of actions that reduce the risk and consequences posed by climate change, which make the system more resilient to change and increase the sustainability of water and flood management systems and the ecosystems they depend on.
6. Integrated flood management, as a part of IWM, increases flood protection, improves preparedness and emergency response, enhances floodplain ecosystems, and promotes sustainable flood management systems.

7. The benefits and consequences of water decisions and access to State government resources are equitable across all communities.

Guiding Principles

1. **Manage California's water resources and management systems with ecosystem health and water supply and quality reliability as equal goals, with full consideration of public trust uses.** Healthy, functioning ecosystems and reliable, quality water supplies are primary and equal goals for water management to help sustain water resources and management systems. Protect public trust uses whenever feasible, and consider public trust values in the planning and allocation of water resources. State government protects the public's rights to commerce, navigation, fisheries, recreation, ecological preservation, and related beneficial uses, including those of its Native American tribes and other communities that depend on these resources for subsistence and cultural practices.

2. **Use a broad, stakeholder-based, long-view perspective for water management.** Promote multi-objective planning with a regional focus, and coordinate local, regional, interregional, and statewide initiatives. Recognize distinct regional problems, resources, assets, and priorities. Emphasize long-term planning (30- to 50-year horizon) while identifying near-term actions needed to achieve the plan.

3. **Promote sustainable resource management on a watershed basis.** Wisely use natural resources to ensure their availability for future generations. Promote activities with the greatest multiple benefits regionally and statewide. Consider the interrelationship between water uses and supplies, water conservation, water quality, water infrastructure, flood protection, land use, energy generation and consumption, recreation, economic prosperity, and environmental stewardship on a watershed or ecosystem basis.

4. **Increase system flexibility and resiliency.** Evaluate and implement strategies that reduce the impacts of droughts and floods in the region. In California, drought contingency planning and integrated flood management are important components of regional water planning.

5. **Increase regional self-reliance.** Implement resource management strategies that reduce dependence on long-term imports of water from other hydrologic regions for meeting additional future water demands and during times of limited supply, such as a drought or interrupted supply after a catastrophic event (e.g., an earthquake or fire). Reduce reliance on the Sacramento-San Joaquin Delta (Delta) in meeting California's future water demands. Increase regional self-reliance for water by investing in water use efficiency, water recycling, advanced water technologies, local and regional water-supply projects, improved regional coordination of local and regional water supplies, and other strategies. As part of a diverse water portfolio, short-term water transfers between regions that are environmentally, economically, and socially sound can also help increase regional self-reliance overall.

6. **Determine values for economic, environmental, and social benefits; costs; and tradeoffs so as to base investment decisions on sustainability indicators.** Evaluate programs and projects recognizing economic growth, environmental quality, social equity, and sustainability as coequal objectives. When comparing alternatives, determine the value of potential economic, environmental, and social benefits; beneficiaries; costs; and tradeoffs. Include a plan that avoids, minimizes, and mitigates for adverse impacts of IWM projects.

7. **Incorporate future variability, uncertainties, and risk in the decision-making process.** Use multiple future scenarios to consider drivers of change and emerging conditions, such as population growth, land use development patterns, and climate change, when making planning, management, and policy decisions.

8. **Apply California's water rights laws, including the long-standing constitutional principles of reasonable use and public trust, as the foundation for public policy-making, planning, and management decisions on California water resources.** Recognize that certain natural resources — including water, tides, and submerged lands; the beds and banks of navigable rivers; and fish and wildlife resources — are owned by the public and held in trust for present and future generations of Californians. Native American tribes also depend on these natural resources for subsistence and cultural heritage. Effectively applying existing water rights laws and the twin principles of reasonable use and public trust will provide water for future generations while protecting ecosystem values.

9. **Promote environmental justice — the fair treatment of people of all races, cultures, and incomes.** Include meaningful community participation in decision-making for State-sponsored or public-funded resource management projects, and consider such factors as community demographics, potential or actual adverse health or environmental impacts, and benefits and burdens of the project on communities.

10. **Use science, best data, and local and traditional ecological knowledge in a transparent and documented process.** When appropriate and possible, use data, information, planning methods, and analytical techniques that have undergone scientific review.

Objectives and Related Actions

The objectives and related actions presented in this roadmap were developed in part from companion State plans and the Tribal Engagement Plan (refer to Chapter 4, "Strengthening Government Alignment"). Meeting the 17 objectives, shown in Box 8-2, will help achieve Update 2013 goals. Planning and investing in the more than 300 related actions and sub-actions will provide greater system resiliency and help California deal with climate conditions and other future uncertainties and risks.

In addition, performance measures, lead entities, the current funding status, and whether legislation is required to complete the related action have been identified. This supporting information is presented in a table in Volume 4, *Reference Guide*, titled "California Water Plan Related Actions and Performance Measures," and will be used to track the future progress of each related action. (Note that numbering of the objectives and related actions, below, is for ease of identification and does not represent priority.)