DRAFT

Environmental Impact Report

State Clearinghouse Number: 91103064

Eastern Dublin General Plan Amendment and Specific Plan

APPENDIX

PART II

CITY OF DUBLIN
CALIFORNIA

AUGUST 28, 1992

Wallace Roberts & Todd

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APPENDIX
PART II

AUGUST 28, 1992

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APPENDIX A

Agencies and Organizations Contacted by the State Clearinghouse during the Notices of Preparation (1988, 1991)

The following agencies and organizations were contacted by the State Clearinghouse by the two Notices of Preparation (September 1988 and October 1991) to solicit comments on potential environmental impacts of the Project:

(*Note: Agencies marked with an asterisk are those which commented on at least one of the two Notices of Preparation.*)

Federal

U.S. Department of the Army, Directorate of Engineering and Housing*
U.S. Department of the Interior, Fish and Wildlife Service, Endangered Species Office (Sacramento)*

State of California

Air Resources Board
Caltrans-Division of Aeronautics
Caltrans-District 4*
California Energy Commission
Department of Conservation-Land Resources Protection Unit*
Department of General Services
Department of Health
Native American Heritage Commission
Office of Historic Preservation
Department of Parks and Recreation
California Waste Management Board
Department of Water Resources
Bay Area Air Quality Managment District*
Department of Fish and Game-Region 4 (Yountville)*
State Water Resources Control Board-Division of Water Quality
Regional Water Quality control Board-San Francisco Bay Region 2
California Archaeological Inventory*

County of Alameda

County of Alameda Planning Department*
County of Alameda Public Works Agency*
County of Alameda Congestion Management Agency*

County of Contra Costa

County of Contra Costa Community Development Department*
County of Contra Costa Public Works Department*

Other

City of San Ramon*
City of Livermore*
Alameda County Water District*
Dougherty Regional Fire Authority*
Dublin San Ramon Services District*
East Bay Regional Park District*
Livermore Valley Joint Unified School District*
Bay Area Council*
People for Open Space/Greenbelt Congress*
Bay Area Rapid Transit District (BART)
Preserve Area Ridgelands Committee (PARC)

In addition to the agencies given above, the following public and private agencies were contacted during preparation of the project and this EIR:

Regional

Metropolitan Transportation Commission

County of Alameda

Alameda County Local Agency Formation Commission (LAFCO)

Appendix B

MODIFIED MERCALLI INTENSITY SCALE OF 1931

Not felt by people, except under especially favorable circumstances. However, dizziness or nausea may be experienced. Sometimes birds and animals are uneasy or disturbed. Trees, structures, liquids, bodies of water may sway gently, and doors may swing very slowly.

-- Felt indoors by a few people, especially on upper floors of multi-story buildings, and by sensitive or nervous persons. As in Grade I, birds and animals are disturbed, and trees, structures, liquids and bodies of water may sway. Hanging objects swing, especially if they are delicately suspended.

III Felt indoors by several people, usually as a rapid vibration that may not be recognized as an earthquake at first. Vibration is similar to that of a light, or lightly loaded trucks, or heavy trucks some distance away. Duration may be estimated in some cases. Movements may be appreciable on upper levels of tall structures. Standing motor cars may rock slightly.

IV Felt indoors by many, outdoors by few. Awakens a few individuals, particularly light sleepers, but frightens no one except those apprehensive from previous experience. Vibration like that due to passing of heavy, or heavily loaded trucks. Sensation like a heavy body striking building, or the falling of heavy objects inside. Dishes, windows and doors rattle; glassware and crockery clink and clash. Walls and house frames creak, especially if intensity is in the upper range of this grade. Hanging objects often swing. Liquids in open vessels are disturbed slightly. Stationary automobiles rock noticeable.

Felt indoors by practically everyone, outdoors by most people. Direction can often be estimated by those outdoors. Awakens many, or most sleepers. Frightens a few people, with slight excitement; some persons run outdoors. Buildings tremble throughout. Dishes and glassware break to some extent. Windows crack in some cases, but not generally. Vases and small or unstable objects overturn in many instances, and a few fall. Hanging objects and doors swing generally or considerable. Pictures knock against walls, or swing out of place. Doors and shutters open or close abruptly. Pendulum clocks stop, or run fast or slow. Small objects move, and furnishings may shift to a slight extent. Small amounts of liquids spill from well-filled open containers. Trees and bushes shake slightly.

VI Felt by everyone, indoors and outdoors. Awakens all sleepers. Frightens many people; general excitement, and some persons run outdoors. Persons move unsteadily. Trees and bushes shake slightly to moderately. Liquids are set in strong motion. Small bells in churches and schools ring. Poorly built buildings may be damaged. Plaster falls in small amounts. Other plaster cracks somewhat. Many dishes and glasses, and a few windows, break. Knick-knacks, books and pictures fall. Furniture overturns in many instances. Heavy furnishings move.

I Frightens everyone. General alarm, and everyone runs outdoors. People find it difficult to stand. Persons driving cars notice shaking. Trees and bushes shake moderately to strongly. Waves form on ponds, lakes and streams. Water is muddied. Gravel or sand stream banks cave in. Large church bells ring. Suspended objects quiver. Damage is negligible in buildings of good design and construction; slight to moderate in well-built ordinary buildings; considerable in poorly built or badly designed buildings adobe houses, old walls (especially where laid up without mortar), spires, etc. Plaster and some stucco fall. Many windows and some furniture break. Loosened brickwork and tiles shake down. Weak chimneys break at the roofline. Cornices fall from towers and high buildings. Bricks and stones are dislodged. Heavy furniture overturns. Concrete irrigation ditches are considerably damaged.

II General fright, and alarm approaches panic. Persons driving cars are disturbed. Trees shake strongly, and branches and trunks break off (especially palm trees). Sand and mud erupts in small amounts. Flow of springs and wells is temporarily, and sometimes permanently, changed. Dry wells renew flow. Temperatures of spring and well waters vary. Damage slight in brick structures built especially to withstand earthquakes; considerable in ordinary substantial buildings, with some partial collapse; heavy in some wooden houses, with some tumbling down. Panel walls break away in frame structures. Decayed pilings break off. Walls fall. Solid stone walls crack and break seriously. Wet grounds and steep slopes crack to some extent. Chimneys, columns, monuments and factory stacks and towers twist and fall. Very heavy furniture moves conspicuously or overturns.

Panic is general. Ground cracks conspicuously. Damage is considerable in masonry structures built especially to withstand earthquakes; great in other masonry buildings -- some collapse in large part. Some wood frame houses built especially to withstand earthquakes are thrown out of plumb, others are shifted wholly off foundations. Reservoirs are seriously damaged and underground pipes sometimes break.

Panic is general. Ground, especially when loose and wet, cracks up to widths of several inches; fissures up to a yard in width run parallel to canal and stream banks. Landsliding is considerable from river banks and steep coasts. Sand and mud shifts horizontally on beaches and flat land. Water level changes in wells. Water is thrown on banks of canals, lakes, rivers, etc. Dams, dikes, embankments are seriously damaged. Well-built wooden structures and bridges are severely damaged, and some collapse. Dangerous cracks develop in excellent brick walls. Most masonry and frame structures, and their foundations, are destroyed. Railroad rails bend slightly. Pipe lines buried in earth tear apart or are crushed endwise. Open cracks and broad wavy folds open in cement pavements and asphalt road surfaces.

Panic is general. Disturbances in ground are many and widespread, varying with the ground material. Broad fissures, earth slumps, and land slips develop in soft, wet ground. Water charged with sand and mud is ejected in large amounts. Sea waves of significant magnitude may develop. Damage is severe to wood frame structures, especially near shock centers, great to dams, dikes and embankments, even at long distances. Few if any masonry structures remain standing. Supporting piers or pillars of large, well-built bridges are wrecked. Wooden bridges that "give" are less affected. Railroad rails bend greatly and some thrust endwise. Pipe lines buried in earth are put completely out of service.

XII Panic is general. Damage is total, and practically all works of construction are damaged greatly or destroyed. Disturbances in the ground are great and varied, and numerous shearing cracks develop. Landslides, rock falls, and slumps in river banks are numerous and extensive. Large rock masses are wrenched loose and torn off. Fault slips develop in firm rock, and horizontal and vertical offset displacements are notable. Water channels, both surface and underground, are disturbed and modified greatly. Lakes are dammed, new waterfalls are produced, rivers are deflected, etc. Surface waves are seen on ground surfaces. Lines of sight and level are distorted. Objects are thrown upward into the air.

Appendix C

SOILS, GEOLOGY AND SEISMICITY - SUMMARY OF OPPORTUNITIES AND CONSTRAINTS

The project site can be subdivided for planning purposes into the six zones listed below, from most to least constrained. These zones reflect relative differences in their development opportunities and constraints from a geotechnical standpoint. The zoning is subjective, and considers the interrelationship of geology, soils, and slope conditions. The zoning assumes that minimal grading is used for development and that a minimum level of geotechnical investigation and engineering design effort is required. It also assumes that all factors considered, it is generally preferable to avoid potentially adverse effects of impacts, where possible, by proper siting during the planning process. The zoning reflects the highest constraining condition in an area and does not account for the cumulative effects of two or more coinciding constraining conditions. The opportunities and constraints listed below were used, in conjunction with the section on Development Considerations, which discusses the potential impacts of, and general mitigations for, site conditions, to evaluate the project and formulate and access development alternatives for the site.

0. Areas of gentle slope (0 to 15 percent) underlain by non- to moderately expansive soils. Many types of development are appropriate in these areas with minimal risk if standard engineering design techniques, based on design-level geotechnical investigations are used.

1. a) Areas of gentle slopes (0 to 15 percent) underlain by colluvium, artificial fill, landslide deposits and/or highly expansive soils, and areas within 100 feet of an incised stream channel, and b) areas of moderate slopes (15 to 30 percent) underlain by non- to moderately expansive soils. Many types of development are appropriate in these areas, with generally minimal risk. Development in these areas would require detailed design-level geotechnical investigations and, in general, standard engineering design mitigation, although local special, possibly costly, engineering design mitigation might be required.

2. a) Areas of moderate slopes (15 to 30 percent) underlain by colluvium, landslide deposits less than 15 feet thick, artificial fill and/or highly expansive soils, b) areas of steep slopes (30 to 50 percent) underlain by non- to highly expansive soil, and c) ponds. Low and moderate density custom development are appropriate in these areas. Development in these areas would require detailed design-level geotechnical investigations, might require local special, and possibly costly, engineering design mitigation, and might include a low level of residual risk.

3. a) Areas underlain by moderate to steep slopes (15 to 50 percent) downslope of hillslope greater than 30 percent which are underlain by colluvium and/or landslide deposits less than 15 feet thick, and b) areas of slopes steeper than 30 percent underlain by colluvium, artificial fill, and/or landslide deposits less than 15 feet thick. Low density, custom development is one of the appropriate development types in these areas. Development in these areas would require detailed design-level geotechnical investigation, might require special and costly engineering design mitigation, and might include a moderate level of residual risk.

4. Areas underlain by dormant landslide deposits greater than 15 feet thick. Development in these areas should be avoided if possible, although roads and infrastructure could be developed across these areas if necessary. Development in these areas would require detailed geotechnical investigations, sensitive siting, and careful, possibly costly, engineering design and mitigation, and might include a moderate level of residual risk.

5. a) Areas underlain by active landslides greater than 15 feet thick, and b) areas of steep slopes greater than 50 percent. Development in these areas should be avoided if possible. The determination of development feasibility would require detailed feasibility and design-level geotechnical investigations. It is likely that development would require special and costly engineering design mitigation and include a significant level of residual risk.

DEVELOPMENT CONSIDERATIONS

Topography

The steep topography along the flanks of the major ridge crests on the project site constitute a significant constraint to development in these areas, without substantial grading. Development in these areas without substantial grading has a potential for increased surface erosion and slope instability, and would require extensive and costly foundations and retaining structures. These areas could be developed by significant grading, which would resculpture the topography to a less steep configuration.

Soils

Mapped soils on the project site consist of generally well drained loams and clays developed on bedrock, colluvium, and/or alluvium. The distribution of soils is shown on Figure 3.6-D (Soil Types); the soils are described below. Pertinent physical properties are summarized on Table 3.6-3 (Soil Classification and Estimated Pertinent Physical Properties).

Clear Lake clay (Cc, CdA, CdB) - This soil is developed on gentle slopes underlain by alluvium. It is poorly to moderately well drained and has a high shrink-swell potential. The Clear Lake clay is predominant along Tassajara Creek and in the Amador Valley in the southwestern portion of the project site. It also occurs intermittently along the drainages in the Cottonwood Creek watershed.

Diablo clay (DbC, DbD, DbE2, DmF2) - This soil dominates the uplands in the northern half of the project site and the low-lying lands of the Amador Valley in the southeastern corner of the site. It is a well-drained soil with a moderate to high shrink-swell potential, and it occurs on gentle (3-15%) to very steep (45-60%) slopes.

Linne clay loam (LaC, LaD, LaE2) - This soil is developed on poorly indurated interbedded siltstone and sandstone. It dominates the upland areas in the southern half of the site. It is a well-drained soil with a low shrink-swell potential, and it occurs on gentle (3-15%) to steep (30-45%) slopes.

Pescadero clay (Pd) - This soil occurs extensively on the relatively flat areas adjacent to Cottonwood Creek, the northern portion of Tassajara Creek, and some tributary streams draining into these areas. It is a poorly drained soil with a moderate to high expansion potential.

Rincon clay loam (RdA, RdB) - This soil is developed on alluvium derived from siltstone and sandstone. It occurs on the project site along the north-central margin of the Amador Valley and in the low-lying upland areas in the south-central portion of the site. It is a well-drained soil with a moderate to high shrink-swell potential.

Riverwash (Rh) - This material occurs locally along Tassajara Creek. It is typically very gravelly or stony and has a low shrink-swell potential.

Sunnyvale clay loam (Sm) - This soil is developed on fine-grained alluvium on nearly level valley floors in the southwestern portion of the site. It has a moderate to high shrink-swell potential.

Sycamore silt loam (So, Sy) - This soil is developed locally on alluvium along the southern portion of Tassajara Creek, on the Tassajara Creek alluvial fan in the southwestern portion of the site. It generally has a low shrink-swell potential, but locally it has a layer of material 3 to 4 feet deep with a high shrink-swell potential.

Yolo loam (Yo) - This is a well-drained soil that is developed on nearly level valley floors underlain by alluvium. It occurs in a limited area of the Amador Valley along the south-central boundary of the site.

Expansive soils (those with a high shrink-swell potential) can damage foundations, slabs, and pavements. Soils on the project site are generally moderately to highly expansive. Detailed site soil and foundation investigations will be necessary to evaluate soil conditions and to develop design mitigation in areas of expansive soils. Typical mitigation will probably require drilled pier foundations, reinforced slabs, and thicker pavement sections. Highly expansive soils may not be suitable for use in engineered fill.

Existing Fill

The existing fill on the project site consists of predominantly weak and possibly compressible sands, silts, and clays. Existing fills occur as three major types: 1) stock pond dam embankments; 2) fill in major drainages; and 3) sidecast road fill. Deposits of existing fill on the site pose a constraint to development because they are not engineered and are therefore subject to potential differential settlement, slope failure, and erosion. Any development in areas of existing un-engineered fill will require removal of the fill and its replacement with new engineered fill. Some un-engineered fill may be suitable for re-use as engineered fill. In the event of the development downstream of existing pond embankments, the embankments should be removed and reconstructed with engineered fill, and provisions should be made for seepage control; otherwise, they should be completely removed.

Bedrock Outcrops

The outcrops on the flanks and crests of some of the ridges on the project site do not generally constitute a constraint to development because they consist generally of poorly to moderately indurated rock.

Drainage

The project site drains by sheet flow, channelized flow, and shallow underground flow into major stream channels that are locally deeply incised. High flows and localized flooding can be expected along the major drainages during intense storms of long duration. Development on the site, particularly in graded areas, will require surface drainage control to mitigate the potential for erosion and sedimentation. Development of colluvium-filled swales may require surface and subsurface drainage, and possibly walls and debris barriers, to mitigate the potential for slope instability.

Development along major drainages may require setbacks from the tops of steep, unstable, or potentially unstable banks. It may also be appropriate to "channelize" some streams, including using rip-rap on slopes, headwall structures, and check dams where necessary to provide

adequate through-going drainage and to minimize the potential for bank erosion, slumping, and overtopping.

Springs, Seeps, and Wet Areas

Springs, seeps, and wet areas occur on the project site downslope of stock ponds, in colluvium-filled swales, and associated with some landslides. As noted above, surface and subsurface drainage may be required for development in areas of seasonally saturated colluvium in swales. Localized drainage improvements could mitigate the potential impacts associated with seeps and springs. The spillways of several stock ponds are being eroded by gullying, which could result in embankment failure. Adverse seepage and spillway conditions associated with stock ponds could be mitigated by the removal of the embankment or its reconstruction to engineered standards. Stock ponds should probably be removed in developed areas for general safety reasons.

Earthquake Ground Shaking

It is likely that the project site will be subjected to very strong ground shaking from a large magnitude earthquake on the Calaveras or Greenville fault zones. Future major earthquakes on the nearby Hayward and San Andreas faults are likely to produce strong ground shaking in the study area. The expected ground motion characteristics of any future earthquakes will depend on the characteristics of the generating fault, the distance to the epicenter, the magnitude of the earthquake, and the specific site geologic conditions. Strong ground shaking may cause localized stream bank sloughing, re-activation of existing landslides and the initiation of new landslides (particularly on steeper slopes), failure of cut and fill slopes, settlement of foundation materials beneath structures, and possibly failure of stock pond embankments and large fills in drainages.

The adverse effects of ground shaking can be reduced by using modern seismic design in the construction of residences and other structures. Building in accordance with code requirements should provide adequate protection against major structural damage from ground shaking.

All significant engineered slopes, including slope reconstructions for landslide mitigation, should achieve a minimum factor of safety against failure of 1.5 for static conditions (where 1.0 is failure) and 1.2 under design pseudo-static earthquake loading. Critical slopes should be analyzed for worst-case conditions of the MPE and high groundwater, and a displacement analysis performed.

Fault Ground Rupture

No known active or potentially active faults cross the project site (CDMG, 1982a, b, c: BGC, 1988a). Thus, the potential for fault ground rupture in the study area is considered nil.

Natural Slope Stability

Potential hazards associated with slope instability include ground rupture or deformation, damage to improvements and, in extreme cases, loss of life. There are numerous landslides and areas of potential slope instability on the project site, particularly in the northeastern half, and the potential for damage to future development improvements is high unless mitigated. Many of the existing landslides in the northeastern half of the site have failed on relatively moderate slopes. Many landslides are moderately deep earth flows, debris slides, and debris flows with associated soil creep. These landslides and related features occur on the flanks of ridges, especially in colluvium-filled swales. Some of the earth flows, debris slides, and debris flows are relatively shallow. There are also a number of deep-seated debris flows, debris slides, earth flows, and

bedrock slumps concentrated in the northeastern half of the study area. Most of these are dormant, but some of the deep-seated earth flows and debris slides are active. Development in landslide areas will require the repair or mitigation of some landslides. Furthermore, the numerous colluvium-filled swales in the study area present a potential for future landsliding.

Siting should be used whenever possible to avoid existing and potential landslide hazards. Alternatively, a variety of methods can be utilized to repair or stabilize existing slides, including slope reconstruction or buttressing with compacted fill and subdrainage, wall or crib-type impact and/or retention structures, and excavation of shallow slide debris. Drainage improvements and structure siting can generally be used to mitigate the potential hazard associated with colluvium-filled swales. Grading can be used to eliminate existing and potential landslide hazards by removing and/or buttressing unstable and potentially unstable material. Because of the range in the physical properties and bedding orientations of material on the project site, site-specific studies should be made to formulate proper cut slope criteria and to evaluate the potential for dip-slope failures.

Bedrock Excavation Characteristics

Conventional excavation and ripping equipment should encounter little to moderate difficulty to a depth of at least 10 feet in the Orinda Formation (Tps).

Conventional excavation and ripping equipment should encounter little difficulty to at least 10 feet in depth in the Tassajara Formation (QTt).

Cut and Fill Slope Stability/Foundations

Adequate cut slope stability can be achieved by adapting slope inclination to local geologic conditions. In some areas underlain by weaker, fine-grained bedrock materials, landslides have occurred on natural slopes of 2 horizontal to 1 vertical, or less. There are also an increasing number of failures of existing 2:1 cut slopes in these materials in the project site area. Some of the weaker bedrock materials on the project site may undergo accelerated weathering when exposed in cut slopes and develop a shallow, potentially unstable profile, subject to sloughing and erosion, in as little as about 10 to 15 years. In areas underlain by these weaker materials, the UBC standard slope configuration of 2:1 may not be satisfactory for cut slopes, and a 3:1 configuration may be necessary to achieve long-term stability. Shallower cut slopes do result in a larger area of ground disturbance which may not be desirable from a visual and vegetation standpoint and walls can be used locally to increase the cut slope inclination and reduce grading. Cut slopes steeper than 2:1 may be feasible locally, particularly in competent rock, but the use of cut slopes steeper than 2:1 should be based on site-specific, design-level geotechnical investigations. Adequate performance of cut slopes will require revegetation for erosion control and periodic maintenance. Adequate stability of colluvium can be maintained in most circumstances by drainage improvements, judicious selection of cut slope inclinations, and engineered retention structures. Conventional spread footing-type foundations should be adequate for structures on non-expansive soils/bedrock in cut pads and slopes less than about 3 horizontal to 1 vertical.

Adequate stability of fill embankments can be achieved generally by excavating any soft materials, such as organic soils, slide debris, colluvium, or existing fill and then providing subsurface drainage, placing engineered fill, and providing surface drainage. In most areas, the UBC standard slope configuration of 2:1 will be satisfactory. However, flatter slopes and/or additional compactive effort may be required locally, as determined by site-specific, design-level geotechnical investigations. Steeper fill slopes, up to 1:1 can be achieved by using geogrid-type reinforcement. The use of sensitive soils, such as some silts, in fills and the construction of

deep fills will require careful design, site preparation, and construction inspection and may require additional compactive effort to achieve proper compaction and mitigate long-term settlement. Drilled pier foundations may be required for all structures on fill. Sidehill fills can be utilized if properly keyed, drained, and compacted. Retention structures with adequate drainage may be locally required with sidehill fills on steep slopes to achieve design grade. On-site soils may be used for engineered fill, except for organically contaminated material, which may be used for topsoil and in landscape areas, and possibly highly expansive soils.

Erosion and Sedimentation

Active erosion occurs locally throughout the project site. The areas most prone to erosion include: (1) steep slopes on the ridge flanks; (2) drainage channels; (3) active landslides and oversteepened portions of older landslide deposits; (4) granular material in colluvium-filled swales; (5) existing fill on steep slopes; and (6) erodible bedrock materials exposed in steep slopes. Erosion and sedimentation can result from grading activities and the alteration of drainage patterns associated with development. Active erosion, unless mitigated, constitutes a constraint to development because it modifies topography and drainage channels, inducing the downslope deposition of eroded materials. Erosion can also oversteepen slopes, rendering them unstable and causing slumping and landsliding. Slumping of channel banks due to undercutting by flowing water, usually during and immediately after periods of heavy precipitation, is occurring along the larger drainage channels.

Erosion and sedimentation can be mitigated by the appropriate design, construction, and maintenance of graded slopes, including surface drainage and revegetation.

Mineral Resources

Bailey and Harden (1975) indicate that the bedrock underlying that portion of the project site north of Amador Valley may contain gas, oil, expansive shale, specialty sand, clay, and coal. However, no known significant mineral resources have been identified on the project site. The Amador Valley portion of the project site is classified as having mineral resource potential (MRP) 1, indicating the alluvial deposits are judged to be inadequate for use as aggregate by the State, (CDMG, 1987), and insufficient information is available to classify the remainder of the area (MR2-4).

Several small quarries for clean fill are located on the project site. One is located on the Redgwick property in the north-central portion of the site, with access off Tassajara Road. This 40-acre quarry operates under a Surface Mining and Reclamation Plan approved by Alameda County on February 16, 1982, and valid until May 11, 1992. Another quarry for clean fill is located on the Anderson property in the south-central portion of the site.

Siting Considerations

From a geotechnical standpoint, development opportunities on the project site, with the least potential impact on, or from, the geologic environment, are along the crests and upper slopes of the main and spur ridges and on the low-lying areas adjacent to larger drainages and in the Amador Valley in the southern portion of the site. From a geotechnical standpoint, the most significantly constrained portions of the site are those with slopes greater than 50 percent and those underlain by large, deep-seated, active landslides. Where possible, residential development should not be sited immediately downslope of steep, colluvium-filled swales.

Appendix D

APPENDIX D

EAST DUBLIN GENERAL PLAN AMENDMENT AND SPECIFIC AREA PLAN

DRAFT BIOLOGICAL ASSESSMENT

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August 10, 1989

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EXECUTIVE SUMMARY

The East Dublin General Plan Amendment (GPA) and Specific Plan (SP) areas provides suitable habitat for 17 special status wildlife species. Under Section 15380 of the California Environmental Quality Act (CEQA) a species not included in any formal listing identified by the state "shall nevertheless be considered rare or endangered if the species can be shown to meet the criteria" for listing. Of these 17 species the red-legged frog, western pond turtle, golden eagle, northern harrier, burrowing owl, great blue heron, great egret, and American badger are known to occur in the GPA and SP area. Habitat is unsuitable for the Alameda whipsnake (formally known as the Alameda striped racer) and bald eagle, and represents only historical foraging habitat for the peregrine falcon. Most of the GPA and SP project area represents suitable foraging habitat for the federally endangered San Joaquin kit fox. The gradually inclined, lower portions of the grassland habitat in the northeast to southeast portions of the project area represent the highest quality habitat for the kit fox. While no definitive confirmation of kit fox occurrence was found, evidence indicates that presence of the fox is likely. No rare plants were located during the course of field surveys in the plan study area. Marginal potential habitat for palmate bird's-beak and capper-fruited tropidocarpum was observed in the upper reaches or Doolan Canyon.

Adverse impacts are expected to be greatest for species associated with riparian habitats (riparian woodlands, intermittent streams, ponds, livestock impoundments, and other sources of water). Sensitive species potentially affected include red-legged frog, California tiger salamander, western pond turtle, great blue heron, and great egret. The wildlife species associated with annual grasslands also are expected to suffer from a reduction of the quality and quantity of habitat. These species include the the burrowing owl, American badger, golden eagle, northern harrier, and potentially the California horned lizard (formally known as the coast horned lizard) and San Joaquin kit fox.

Mitigation of anticipated adverse impacts focus on avoidance of conflicts by habitat protection and enhancement, and coordination and cooperation with natural resource management agencies. The primary types of mitigation that we are proposing include, designating open space at several locations (centered on annual grassland habitat), interconnecting open space by corridors of riparian woodland and intermittent stream habitats, clustering development, pre-construction surveys within 60 days prior to habitat modification, habitat protection and enhancement especially water associated habitats, and promote a livestock management program to reduce grazing pressure and encourage reestablishment of native vegetation.

1.0 INTRODUCTION

This report provides an assessment of the biological and botanical resource in the Dublin General Plan Amendment (GPA) and Specific Plan (SP) areas. The existing conditions of the resources are evaluated, the potential effects of future developments are discussed, and procedures to ameliorate adverse impacts are suggested. The environmental assessment is described in terms of sensitive wildlife and plant species and rare and unique habitat. Data from existing literature, interviews and from field surveys, were used to confirm the occurrence and assess the potential occurrence of sensitive species. Evaluation of potential impacts to vegetation and wildlife is based on a combination of species presence and suitability of habitats to sustain the species of concern. Generic and cumulative impacts to natural resources from urban and industrial development, are presented. Mitigation recommendations are suggested to avoid and minimize potential adverse impacts to species and habitats, and to compensate for impacts by protecting and enhancing habitat quality.

2.0 METHODS

2.1 BOTANICAL RESOURCES

2.1.1 Characterization and Mapping of Vegetation/Habitat Types

The habitat classification scheme of Cheatham and Haller (1975) as modified by Holland (1986) was used to characterize and map most vegetation/habitat types within the Dublin GPA and SP study area. These systems provide general classifications based upon geographic and elevational range as well as floristic, physiognomic, and ecological criteria. Further, these classifications form the basis for the California Natural Diversity Data Base (NDDB) inventory of natural communities in California. At times the classifications developed by Cheatham and Haller were not refined enough to adequately characterize those habitat types directly modified by man. In these cases, characterizations and classifications were developed based on field observations.

Initially, distinct vegetation units were identified using a black and white aerial photographs (scale 1:12,000, date April 20, 1986) of the study area. A field reconnaissance was then conducted to: (1) characterize these predefined units according to vegetation/habitat type; (2) verify or modify the boundaries of these predefined units; and (3) identify habitat types to small to map or not readily identified on the aerial photographs. Data on dominant or indicator species, slope, aspect, and substrate conditions were collected to provide vegetation type characterizations specific to the GPA and SP study area. After field verification, the photomapping data was transferred to a topographic base map of the project area (approximate scale 1" = 2000').

2.1.2 Plant Species Identification

A field survey of vascular plant species was conducted within the study area from April through mid-July 1989. These data were used in developing a vascular plant species list for the site and for characterizing each vegetation/habitat type.

Plant taxa encountered were identified to species or infraspecies using standard manuals for the California region (Abrams 1923, 1944, 1951; McMinn 1939; Hitchcock 1951; Abrams and Ferris 1960; Munz and Keck 1959; Bowerman 1944). Additional references include Hoffman (1952) for *Streptanthus*; Kruckeberg (1957, 1958) for *Streptanthus glandulosus* complex; Chuang and Heckard (1973) for *Cordylanthus*; Chuang and Constance (1969) for *Perideridia*; and Leonard and Gould (1974) for *Vulpia*. Information on recent nomenclature changes and current taxonomic status was obtained from Howell (1972) and Kartesz and Kartesz (1980). The taxonomic nomenclature used in this study

follows that of Kartesz and Kartesz (1980). Common names follow those utilized in Abrams (1923, 1944, 1951), and Abrams and Ferris (1960).

2.1.3 Characterization of Botanically Sensitive Areas

Botanically sensitive areas were identified during the characterization and mapping of vegetation/habitat types on site.

Sensitive habitats are defined "by local, state, or federal agencies with resource responsibility with the project region, or by educational institutions, museums, biological societies, or special interest groups with specific knowledge of biological resources with the project study area" (Brownell et al. 1983). These area include but are not limited to riparian corridors, wetlands, habitats for legally protected species and species of special concern, areas of high biological diversity, and areas of unusual or regionally restricted habitat types. The NDDB in Sacramento maintains a working list of high priority habitats (i.e., those habitats that are rare or endangered within the borders of California).

California Natural Areas Coordinating Council (CNACC) documents (Hood 1975-1977) were reviewed to determine if any areas identified in their inventory occur in the project region.

Literature review and field surveys were conducted for all areas identified as botanically sensitive or unique.

2.1.4 Rare Plants

Literature and Herbarium Survey

Prior to the commencement of rare plant field surveys, BioSystems botanist conducted a focused survey of rare plant literature, rare species data bases, and selected herbaria. This literature and data base search was conducted to determine the rare plant species with potential to occur in the vicinity of the GPA and SP study area.

BioSystems botanists completed a review of several rare plant data sources for this region of Alameda County, including occurrence records and maps generated by the NDDB in Sacramento (1988) and rare plant status reports (various dates) prepared by the California Native Plant Society (CNPS).

BioSystems also collected label data for selected rare plant species known to occur in the GPA region. This information was obtained during searches at the Jepson and University of California herbaria, Berkeley, and the herbarium at the California Academy of Sciences, San Francisco. Data gathered include exact (when possible) locations of rare plant species in the region, along with habitat and edaphic requirements, plant associates, flowering periods, key taxonomic characters and taxonomic problems.

In addition to these sources, several environmental documents prepared for windfarm development projects in the eastern vicinity of the GPA area were reviewed for rare plant results.

Rare plants lists consulted for current agency status information include the U.S. Fish and Wildlife Service list of plant taxa currently under review for listing as threatened or endangered species (1985), the California Department of Fish and Game List of Designated Endangered or Rare Plants (1987), and the California Native Plant Society Inventory of Rare and Endangered Vascular Plants of California (Smith and Berg 1988).

Based on information from the above literature and data sources, a preliminary working list was developed of rare plant species with potential to occur in the GPA and SP survey area (Table 1). Consultation with experts and focused literature review was conducted for each species on the working list to determine current taxonomic status, habitat or substrate preference, elevational range, and distribution.

Field Survey

1. Schedule and Methods

A field schedule was designed so that all habitats in the project study area were surveyed during the proper phenologic period of potential or known rare plants, including flowering and fruiting periods. Some habitats required two to three visits in order to identify all potential rare plants during their specific flowering periods. This was especially true for rare annual plant species.

All field surveys of potential habitat within the study area were conducted on foot. Field surveys commenced at the beginning of April and continued through mid-July 1989. A total of 6 person-days were focused on rare plant surveys of the GPA study area during 1989.

2. Documentation of Rare Plant Occurrences

Should any rare plant be encountered, a standard NDDB California Native Species Field Survey Form would be used to record pertinent ecological and abundance data and plant localities. Rare plant occurrences would be mapped at a scale of 1:24,000 on USGS 7.5 minute topographic quadrangles of the study area and at 1:2,500 on topographic base maps of the project area.

At least two voucher specimens would be collected of each rare plant species identified during the study. No collections of rare plants would be made when, in the botanist's professional judgement, the abundance and vigor of a population was such that removal of whole plants or plant parts would threaten its survival. All voucher specimens would be properly labeled and deposited in herbaria at the California Academy of Sciences in San Francisco (duplicates will be deposited in the herbaria at the University of California, Berkeley).

2.2 WILDLIFE RESOURCES

Particular consideration was given to obtaining information on "Special Animals" (CDFG 1988) with high potential for occurrence within the study area. These include sensitive species (those having special legal or management status), with emphasis on federal and California State listed threatened and endangered species, federal and State proposed or candidate threatened or endangered species, California State fully protected species, and species that may be considered endangered or rare under Section 15380(d) of California Environmental Quality Act (CEQA). Areas of high biological diversity, unique habitat and special habitat elements were identified and mapped. These included sources of free water, riparian and hardwood habitats, and areas with high habitat diversity and interspersion (edge).

2.2.1 Review of Literature and Data Sources

Publications and documents on the wildlife of the Dublin General Plan area were assembled and reviewed prior to the field studies. Literature on the wildlife of the region, including their status, habitat relationships, and management recommendations was collected from various sources, including California Department of Fish and Game (CDFG 1980, in prep.), Remsen (1978), Jenkins and Harris-Haller (1981), Williams (1986), Csuti and Kleinsmith (1982), and Verner and Boss (1980). In addition, individuals from state and federal resource agencies, and expert biologists were consulted. The field survey was supplemented with information gathered from published and unpublished literature, historical records, and interviews with personnel from the Department of Fish and Game (CDFG). A search of the California Natural Diversity Data Base (CNDDB) was conducted for a listing of known sensitive plant and animal species, and sensitive habitats occurring in the vicinity of the GPA and SP areas. Interviews were also conducted with local residents and county personnel.

2.2.2 Field Studies

Field studies consisted of a combination of general reconnaissance to characterize habitat and their associated faunal communities, and species specific surveys to focusing on several species including, San Joaquin kit fox, red-legged frog, California tiger salamander, and several species of nesting raptors. Emphasis was placed on determining the presence and habitat suitability for species listed in Table 2. The presence of a species was confirmed either by visual observation of the animal, evaluating "sign" (scats, tracks, nests, etc.), or by vocalizations of the animal. Area measurements were estimated by using a dot grid and linear measurements were estimated using a map wheel.

San Joaquin Kit Fox

Objectives of these surveys were (1) to determine presence of kit fox, (2) to evaluate kit fox habitat suitability in the project area, and (3) to characterize and delineate kit fox habitat in the GPA and SP areas. In order to adequately meet these objectives wildlife biologists followed kit fox survey methods suggested by Orloff (In press) and incorporated several additional procedures. These techniques included conducting transects to locate dens, night spotlighting surveys, scent station monitoring, photo-bait stations, artificial dens with hair traps, and analysis of hair from scats.

Den Surveys: Systematic variable-width transects to locate kit fox dens and other species were conducted throughout the most suitable habitat within the GPA and SP areas. Less formalized searches for wildlife species were conducted in portions of the study area, which have already been subjected to extensive ground disturbance and development (e.g., cultivated habitat, Santa Rita Prison, etc.). Inter-transect distance ranged from between about 50 to 500 feet, depending on vegetation height and density, and degree of topographic relief. Careful attention was given to California ground squirrel burrows which are often used by kit fox for dens. In addition, areas typically frequented by kit fox, such as dirt roads, road side ditches, berms, drainages, and game trails, would be closely examined for sign of kit fox (scats and tracks). In the portions of the proposed study site that are already developed, berms and roadsides which represent the only remaining habitat and would be searched carefully.

When a larger mammal burrow is discovered, a determination whether it was an active or inactive kit fox den, a potential kit fox den, or a den of another species. Dens can be identified by evaluating a combination of factors, such as the size and shape of the entrance, and the presence of tracks, scats, and prey remains at the entrance (Table 3). Den entrances are examined with a flashlight and their size measured. If openings range from between approximately 12 to 20 cm in diameter, at the narrowest measurable width, and they are either slightly higher than wide or somewhat circular they are considered to be suitable for kit fox. Suitable dens with recent kit fox scat, track, prey remain or fresh diggings at the entrance are classified as active kit fox dens. If the den has only old, weathered scats at the entrance and lacks evidence or recent use it is designated as inactive. Natal dens are distinguished from other burrows by the greater intensity of associated activity (disturbance). These dens show evidence of pupping activity such as, small scats, matted down vegetation, and an abundance of prey remains, and in many cases these sites have multiple entrances. Burrows with no sign of use but of suitable size and shape are considered potential kit fox dens.

Kit fox dens in the northern portion of their range and in the foothills of the southern San Joaquin Valley may not have the obvious identifying characteristics of those in the southern valley floor (Orloff et al. 1986, Orloff in press). Active kit fox dens in these outlying areas often show no sign of activity (tracks, scats, or physical disturbance) (Hall 1983a). In addition, kit fox dens are frequently used by other animals such as ground squirrels, with residency alternating within a few days of each other. This use of kit fox dens by other species, and the fact that dens in the study area might not be identifiable as active on first observation, complicate any kit fox ground survey in this portion of their range.

Positive identification of an active kit fox den can be difficult because sometimes there is little or no evidence of use at active dens (Orloff et al. 1986). Therefore, we feel it is important to identify and record potential dens, not only because kit fox could actually be using them but also potential dens provide readily available burrows for future use and can be used to help delineate potential kit fox habitat.

All dens (natal, active, inactive, and potential dens) identified during the surveys were mapped and pertinent information was recorded. Data collected on the survey forms includes the type of den, location, slope, number of entrances, measurements of den entrance, elevation, major vegetation association, soil type, and presence and type of any "sign". Data on the location of kit fox scats and tracks found away from dens are also mapped. In addition, potential prey populations also were noted and generally mapped; this included sign and burrows of ground squirrel and the forms of cottontail and
hare.

In addition to conducting systematic transects over larger areas, field personnel searched smaller azonal habitats and special habitat elements that might have a high level of use by sensitive species. These included fence lines, roadsides, washes or arroyos, berms, and rock outcrops.

Night Spotlighting: Night spotlighting surveys were conducted to detect the presence of kit fox which are primarily, a nocturnal species. Surveys were conducted by driving a vehicle, at speeds between 2 to 10 mph, along all available roads in the study area. We attempted to cover as much of the project area as possible, but concentrated our efforts in areas of suspected occurrence. Because the home range of the kit fox could extend outside the study area, adjacent areas up to one mile away was also spotlighted. One or two high beam torch (400,000 cp) per vehicle were used to scan the surrounding area. When an animal's eye-shine is observed, the vehicle was stopped, the animal(s) identified, place and time recorded, and general locations were mapped. Weather conditions, cloud cover, and phase of moon were also recorded on each night of the survey.

Scent Stations: Scent stations allow the detection of animals by identification of footprints left in a tracking medium when an animal comes to investigate a scent (food or commercial lure). Two types of scent stations were used. The first type of station consisted of a cleared area approximately one meter in diameter, covered with a thin layer (<1 cm) of a fine-grained tracking material (diatomacious earth). The layer is covered with a plastic sheet and brushed outward to spread and compact the material. Finally the plastic sheet is removed, leaving a smooth thin covering ready for track impressions.

The second type of station, uses a 1 x 1 meter thin aluminum plate heavily smoked with a kerosene flame, as the tracking surface. The scent station attractant (i.e., cat food) is placed in an elevated position at the center of the station. Tracks left on smoked plates are very detailed and can be lifted from the carboned aluminum sheet by lightly pressing down on them with a wide piece of transparent tape. These "negative" track outlines were collected and placed in notebooks for future reference. Stations were checked for visitation as early as possible each morning. Stations were re-baited and existing tracks were marked when necessary. Species leaving tracks at scent stations were identified using our own reference collection, and by using Murie (1965), Ingles (1965) or other standard field guides.

A modification of the scent station technique was used to determine the status and occupancy of suspected kit fox dens. A thin layer of tracking medium (diatomacious earth) was placed around the entrance of suspected inactive kit fox dens. The ring of tracking material was checked each day and the imprints of species using the site were recorded.

Photo-bait Stations: An inexpensive photo-bait station was used to identify and record the species consuming bait at various locations. One photo-station was established for one night, at four different locations.

Artificial Dens: Four artificial dens were fabricated and established in the project area. Two different designs were used. Both were constructed using lengths six inch (inside diameter) PVC piping. The first type of den consisted of a seven foot length of pipe placed in an appropriate location, situated along the slope contour with a cardboard box (about 2 x 2 x 2 feet in dimension) fastened over one. The second type consisted of one seven foot and one six foot length of pipe joined in the center by a cardboard box (about 2 x 2 x 2 feet). Wooden stakes were used around dens to prevent them from moving. At the entrance of each den, wide double-faced tape was affixed to the inside of the pipe at four to eight positions. The rationale for using this tape was that as an animal moved in and out of the den it would inadvertently leave some of its hair on the tape, which could be identified at a later date. Hair traps of various kinds have been used in many studies to determine the presence of other species, mainly carnivores. Four dens were established and monitored for 5 nights for a total effort of 20 den nights.

Hair Analysis: Scats were collected at den sites and hair from these scats is being analyzed to determine whether red fox hair can be distinguished from that of San Joaquin kit fox. This analysis

is based on the surface characteristics (scale patterns) of the hair and other differences in the gross structure of mammal hair, such as hair width, cortex and medulla arrangement, etc. Samples of hair were taken from scats and compared with a reference collection from red fox and San Joaquin kit fox. Impressions of hair scale patterns were made in ethyl acetate (clear fingernail polish) and mounted on glass slides. Scale patterns are then viewed under a microscope and examined for differences.

Other Special Species

Field surveys were conducted to determine the presence and distribution of amphibians and certain nesting raptors (Table 2) in the General Plan area.

Amphibians and Reptiles: The presence and location of red-legged frogs, California tiger salamanders, and western pond turtle in the GPA and SP areas was determined by conducting searches of appropriate breeding and larval habitat. A qualified wildlife biologist inspected all available free water sources for larvae and adults of these the three species. Surveys were conducted between mid April and late June, when larvae and/or adults and are most likely to be present. The biologist slowly walked all stream courses and the border of all known springs and water holding facilities from two to five times during the course of the field work. Animals were located as they escaped, entering the water and swimming for cover, or as they loafed along the waters edge. A fine meshed net was used to capture some specimens from the water. Other specimens were found by inspecting rodent burrows, turning over large debris such as wooden fence posts and rocks. All specimens that were captured were released unharmed at the capture location. Species were identified visually using binoculars and by inspecting the animals micromorphology using a 20 power hand lens. Adults, tadpoles and larvae were identified by body shape, size, coloration, mouth structure, and other characteristic features, using Stebbins and Major (1954).

Raptor nest surveys: Raptor surveys consisted of systematic searches of Tassajara Creek and other areas with potential nesting habitat. Survey guidelines suggested by Call (1978) were followed. Raptor nests in small stands of trees were usually located relatively easily. Large stick nests and cavities are fairly conspicuous. Furthermore, nesting adults of many species will respond to human intruders by flushing and circling overhead or with vociferous, defensive behavior. Although, smaller cavity nesting species are more difficult to locate, they are not the primary species of concern in this study. Data for nocturnal species were obtained from night spotlighting surveys, and burrowing owl nests were located as part of surveys conducted to locate kit fox dens, as discussed above. Raptors and their nests were located while conducting searches for amphibians and reptiles (see above).

Incidental Wildlife Observations

All incidental wildlife observations were recorded in field notebooks during all phases of field work and used to supplement data from formalized sampling and provide additional information for impact assessment and interpretation. Pertinent information on observations of any sensitive species or their sign was recorded on field survey forms. Data should include but not be limited to date, time, weather, type of animal, den activity status (active, inactive, potential), number of burrows and their dimensions, presence of any sign (diggings, scat, tracks and prey remains), habitat type, soil type, slope, vegetation density, and micro-topography. Identification of species is made from direct observation or by using a combination of procedures that rely of animal "sign", such as, identification of scats and tracks on roads and trails (Burt and Grossenheider 1964, Murie 1954, Ingles 1965, Schemnitz 1980, Garret and Dunn 1981, Stebbins and Major 1985).

3.0 RESULTS

3.1 CHARACTERIZATION AND MAPPING OF VEGETATION/HABITAT TYPES

Nine vegetation/habitat types were identified within the 7,400 acre GPA and SP study area (see Figure 1). The vegetation of the study area is largely non-native grassland. Introduced annual weedy species have replaced native grasses and herbs in the grassland habitat. The grassland in the study area is heavily grazed and nearly barren by the end of the summer. In the southern half of the GPA area the non-native grassland habitat on the lower hills and bottom land has been rotationally plowed and converted to hay crops and dryland wheat and barley. Alkali grassland habitat occurs on alkaline clay soils and seep areas along the upper reaches of Doolan Canyon and the eastern tributary of Tassajara Creek near Tassajara Road. Several alkali springs occur within the alkali grassland habitat. Northern riparian forest vegetation is well developed along Tassajara Creek and its upper tributaries. Arroyo willow riparian woodland occurs in a few scattered stands along an intermittent drainage on Fallon Road. Small patches of freshwater marsh occur along Tassajara Creek and in the lower reach of Doolan Canyon. The remaining lands in the study area are developed and ruderal (disturbed) fields which have been completely converted from native vegetation to a cover of non-native exotic escapes, crops, and weeds.

Habitat types recognized within the project survey area but not included in the Cheatham and Haller (1975) and Holland (1986) classification systems are: dry-farming rotational cropland, ruderal field and disturbed/developed areas. General characterizations of the vegetation/habitat types occurring in the GPA study area follow below.

Figure 1 shows the distribution and extent of vegetation/habitat types in the East Dublin GPA and SP study area. Table 4 lists the vascular plant species observed within the GPA and SP study area during 1989 field surveys.

Non-native Grassland

This habitat occurs throughout the northern half of the 7,400 acre East Dublin study area and along the eastern edge of the GPA area on the sides and ridgetops of the rolling terrain. It is characterized on site by an over-grazed low to moderate cover of introduced annual grasses and spring herbs (wildflowers). Herbaceous cover is seasonal with germination in the late fall and peak biomass in the mid-spring. Biomass, however, is generally low due to heavy grazing and drought. Flowering periods vary from early March through June. In the study area non-native grassland habitat has been displaced by rotational cropland and ruderal fields in the lower elevations and flat plain areas. This habitat occupies the largest portion of the study area.

The non-native grassland habitat is best developed on rolling hill sides and ridge tops on finer textured soils. Organic matter is lower then expected due to over grazing by cattle late into the summer.

Compositionally, non-native grassland supports a wide array of native and non-native grasses and herbs. Characteristic introduced grass species include slender wild oat (*Avena barbata*), ripgut grass (*Bromus diandrus*), soft chess (*Bromus mollis*), farmer's foxtail (*Hordeum leporinum*), and rattail fescue (*Vulpia myuros*). Occasional stands of the native bunchgrass nodding stipa (*Stipa pulchra*) were observed on the north-facing slopes of some of the rolling hills.

Alkali grassland

This habitat is similar in structure and appearance to non-native grassland in the study area. It differs in that it is formed on alkaline rich clay soils with moderate to saturated soil water content. As is the case for non-native grassland habitat, alkali grassland is highly impacted by grazing and housing development in Doolan Canyon.

Alkali grassland occurs primarily along the lower slopes and bottomland areas of Doolan Canyon and on the southeastern terrace above a eastern tributary to Tassajara Creek.

For the most part, the alkali grassland supports a similar array of introduced grasses to that found in the non-native grassland elsewhere in the study area. In addition, several species indicative of alkali soiled conditions occur. These include salt grass (*Distichlis spicata* var. *nana*), alkali rye grass (*Elymus triticoides*), Mediterranean barley (*Hordeum hystrix*), brass buttons (*Cotula coronopifolia*), and alkali mallow (*Sida hederacea*). This habitat type was considered potential habitat for palmate bird's beak (*Cordylanthus palmatus*) and capper-fruited tropidocarpum (*Tropidocarpum capparideum*).

Dry-farming Rotational Cropland

Farming in the East Dublin study area is primarily grain crops of wheat and barley. These croplands occur on the lower elevation hillsides and bottomlands in the southern half of the GPA area. These areas are typically cropped at various seasonal and annual rotations followed by fallow years at a rate of one in every five. Grain crops are not irrigated.

Floristic composition in fallow years is typically characterized by introduced weedy herbs and grasses along with remnant individuals of the previous grain crop species.

Ruderal Field

This habitat type occurs on parcels of land surrounding developed properties including the Santa Rita Rehabilitation Center and old army base. These lands have typically been graded and subsequently utilized by adjacent facilities for storage or other intensive land uses. As a result of continued disturbance and compaction these fallow fields support dense stands of ruderal species (defined by Frenkel, 1977, "as a broad category of plant life closely related to man and consisting of native and alien elements which occupy disturbed habitats and waste places"). In the GPA area these species are predominantly introduced weeds such as thistles, mustards, and grasses. Floristic diversity is generally low although biomass may be high.

Northern Riparian Forest

A narrow band of mixed riparian forest type vegetation occurs along the upper reaches of Tassajara Creek above the Santa Rita Sheriff Detention Facility. Large, mature trees occur scattered along this section of the creek up to Tassajara Road. The overstory is moderately closed with a dense understory of shrubs and vines. The dominant tree species along this section of the creek is coast live oak (*Quercus agrifolia*). Other tree associates include California buckeye (*Aesculus californica*), California bay (*Umbellularia californica*), sycamore (*Platanus racemosa*), valley oak (*Quercus lobata*), Fremont's cottonwood (*Populus fremontii*), red willow (*Salix laevigata*), and arroyo willow (*Salix lasiolepis*). Understory species in the less disturbed v-shaped sections of the channel support dense, closed stands poison oak (*Toxicodendron diversilobum*), California blackberry (*Rubus ursinus*), and wild cucumber (*Marah fabaceus*).

The disturbed u-shape channeled sections support a scattered tree overstory of sycamores and coast live oaks. These open channel sections contain stands of coyote brush (*Baccharis pilularis* var. *consanguinea*), fennel (*Foeniculum vulgare*), an poison hemlock (*Conium maculatum*). In portions of the stream reach where water becomes slack, stands of broad-leaved cat-tail (*Typha latifolia*) occur.

Arroyo Willow Riparian Woodland

This habitat is characterized by a dense, homogenous, thicket-like growth of arroyo willow (*Salix lasiolepis*) along a narrow, linear, intermittent drainage running from north to south along and across lower Fallon Road. Associate with the 5 to 10 meter tall stand of arroyo willows are an open understory of ruderal herbs, predominantly poison hemlock. The understory of the arroyo willows northeast of Fallon Road has been heavily grazed and is thus depraved. This drainage culminates in a small impoundment west of the road.

Freshwater Marsh

Several small freshwater marsh areas occur adjacent to drainages in Tassajara Creek, Fallon Road, and Doolan Canyon. The best developed of these is in the broad valley at the bottom of Doolan Canyon. At this point the intermittent stream draining Doolan Canyon crosses under Doolan Canyon Road from the north and floods the low relief plain. Saturated and flooded soils support a dense, green growth of Baltic rush (*Juncus balticus*), curly dock (*Rumex crispus*), common monkey flower (*Mimulus guttatus*), and tule (*Scirpus* spp.).

Most of the vegetation is closely cropped by livestock giving it a green carpeted appearance in the summer months.

Springs, Seeps and Impoundments

Water related habitats are generally few in the 7,400 acre East Dublin study area. Besides riparian and intermittent stream course there are several natural springs and seeps that support herbaceous vegetation late into the summer months. The majority of these areas support species characteristic of freshwater marsh habitat or alkali grassland habitat.

Impoundments are typically small reservoirs created for use by livestock. Some are associated with perennial springs while others occur on or adjacent to intermittent drainages. The larger of these "ponds" support perennial emergent vegetation around their banks. Most of these ponds dry in the summer and thus support a vegetation indicative of progressively drying, disturbed habitats.

Developed

These sites in the study area occur around homes, barns, and existing facilities such as the high tech park on Collier Canyon Road and the Sheriff's detention facility west of Tassajara Road. These areas are typically characterized by ruderal or horticultural plant cover with little or no native vegetation. Isolated stands of blue gum (*Eucalyptus globulus*) are typically found associated with developed sites in the study area.

3.2 BOTANICALLY SENSITIVE HABITAT AREAS

Three botanically sensitive habitats occur within the GPA study area: northern riparian forest, arroyo willow riparian woodland, and freshwater marsh. These habitats are recognized as rare and declining in the state by the California Department of Fish and Game Natural Heritage Program. These habitats are of great biotic significance in terms of wildlife habitat and as potential habitat for rare and endangered species.

The study area does not include any areas identified as natural areas by the CNACC (Hood 1975-1977). Botanically sensitive habitats in the survey area were recognized because they qualify as high

priority habitats by the NDDB and meet the Brownell et al. definition of sensitivity.

3.3 RARE PLANTS

Field surveys for rare plants were concentrated within the study area in sites with likely potential to support rare plants (i.e., alkali grassland and seeps). However, any rare plant occurrence observed during vegetation mapping and floristic surveys outside of potential habitat areas would also be documented and mapped.

No rare plants were located during the course of field surveys in the plan study area. Marginal potential habitat for palmate bird's-beak and capper-fruited tropidocarpum was observed in the upper reaches or Doolan Canyon. However, due to intensive grazing impacts and trampling of alkali springs, specific habitat requirements (i.e., alkali hardpans) were lacking.

The non-native grassland habitat was so significantly overgrazed that potential habitat for rare plant species associated with this habitat was marginal at best. No other distinctive geologic substrates such as serpentine or rock outcrops indicative of rare plant habitat occur in the study area.

3.4 WILDLIFE HABITAT

The natural wildlife habitats occurring in the Dublin GPA and SP areas include annual grasslands, riparian woodland, and springs, seeps, water impoundments and intermittent streams; disturbed and cultivated areas comprise an additional habitat element. No chaparral or rock outcrops were observed on the site. There are no areas of special biological importance found on or near the GPA or SP area, as defined and mapped by CDFG (1979).

From a regional perspective the GPA and SP areas is located in a transitional or broad ecotone in terms of topography, habitat, and urban-agricultural development. The area is located along the northern edge of the Livermore-Amador Valley and the eastern edge of the San Ramon Valley. Topographic relief generally decreases from north to south, and to a less extent, from east to west. Development (urban, industrial, and cultivation) is greatest in the south through northwesterly direction. Wildlife habitats in the GPA and SP areas are, for the most part, contiguous with relatively natural areas in the north and east. In an easterly direction, habitat is predominately annual grasslands, interspersed with small inclusions of woodland and chaparral. In the north to northeasterly directions, broadleaf-conifer savanna and woodlands, and chaparral increases with topography. Thus, the study area reflects the natural faunal elements and is influenced by land-use practices of both regions.

Annual Grasslands This short herbaceous habitat dominates the General Plan area. Most of this habitat is intensively grazed by livestock. Grazing has reduced the vigor, species diversity, and density of the annual grasslands. As a result of heavy grazing pressure, the grasslands are largely comprised of introduced annuals and perennials which are unpalatable and tolerant of heavy grazing pressure. Small stands of introduced trees are scattered throughout this habitat. These introduced trees are found in the vicinity of the existing and abandoned ranch buildings. The introduced trees included tamarisk (*Tamarix parviflora*), pepper-tree (*Schinus molle*), several eucalyptus species, and almond (*Prunus amygdalus*).

Characteristic grass species of this association include slender wild oat (*Avena barbata*), ripgut grass (*Bromus diandrus*), soft chess (*Bromus mollis*), foxtail barley (*Hordeum leporinum*), and Italian

ryegrass (*Lolium multiflorum*). Several species of introduced annual herbs are also widespread and common in this community, including milk thistle (*Silybum marianum*), Italian thistle (*Carduus pycnocephalus*), hedge-parsley (*Torilis nodosa*), white-stemmed filaree (*Erodium moschatum*), red-stemmed filaree (*E. cicutarium*), prickly sow thistle (*Sonchus asper*), and bur-clover (*Medicago polymorpha*).

Riparian Woodland A small narrow band of riparian vegetation, extends along for about 3.8 miles along Tassajara Creek (Figure 2). In terms of its uniqueness, scarcity, contrast with ambient habitats, and the distinctive food, cover and water resources that it provides, this riparian woodland is probably the most valuable habitat in the study area. Large mature trees, many with snag tops or dead branches are scattered throughout this habitat. Attributes of riparian habitat that make it so important to wildlife include a high edge to area ratio, many different habitats in close proximity, fairly diverse vegetation species composition, sharp edge contrast, the capability to provide thermal and escape cover, and movement corridors (Thomas 1979). Wildlife species richness is very likely greater in this habitat than elsewhere in the project site. Vegetation structural diversity appeared to be high and vegetation species composition diverse. The woodland included several species of oak, California bay, cottonwood, willow, California sycamore and buckeye, elderberry and blackberry. Scattered residential development dominates the east side of Tassajara Creek. The 25 acre Tassajara Creek Regional Park (East Bay Regional Park District) provides the only public access to this area. The contrast between the ungrazed habitat in the Regional Park and the heavily grazed riparian habitat in the surrounding reaches are quite astounding.

Springs, Seeps, Impoundments and Intermittent Streams Although water is not abundant anywhere in the General Plan area, free water is scattered throughout the property and plays a major role in the overall value of the site to wildlife. The availability of natural and manmade (impoundments) waters is essential to many species and is very important to most others in areas which experience regular summer drought. These water sources increase the value of surrounding areas. There are at least 13 miles of intermittent and ephemeral streams and more than 40 springs, seeps, impoundments, stock tanks, and ponds within the GPA area (Figure 2). While a few of the sites are merely "dugouts" catchment basins, or check dams and would not exist except for the efforts of livestock owners, the majority are "improvements" to naturally occurring water sources. These sites would provide surface water without human intervention. A couple of springs in the upper portion of Doolin Canyon are still protected from livestock by fencing. These relatively protected sites demonstrate how lush the vegetation at these springs can be if grazing pressure is reduced.
Willows dominate the overstory vegetation along some portions of these stream courses, especially along Cottonwood Creek, Fallon Road, and on the Redgwick property. The quality of many of these riparian sites have been further reduced by dumping garbage and other debris, streambank alterations, and inappropriate crossings. Some sites along Cottonwood and Tassajara Creek are being used as landfills and are literally being covered over and buried under debris and waste.

Cultivated Disturbed and cultivated habitat has occurred as a result of road building, development (primarily Santa Rita Prison) and dryland farming of hay. This habitat is concentrated in the flatter (southern and eastern) portions of GPA and SP areas.

3.5 WILDLIFE SPECIES

3.5.1 General Survey Results

A literature review and search of the CNDDB (CNDDB 1988) identified 20 special species that

potentially occur in or near the project area (Table 2), as residents, migrants, seasonals or accidentals. Of the 20 species the red-legged frog, western pond turtle, golden eagle, northern harrier, burrowing owl, great blue heron, great egret, and American badger are known to occur in the GPA area. However, an assessment based on available habitat indicates that suitable habitat occurs in the area for at least eight other species. Habitat is unsuitable for the Alameda whipsnake and bald eagle, and represents only historical habitat for the peregrine falcon. Wildlife field studies were conducted for 21 days during 1989. Surveys were carried out on April 18-21 and 24-28, and again on June 14-16, 19-23 and 26-29 (see Appendix A).

Interviews: Interviews with local residents revealed that there are two divergent views on the presence of kit fox in the GPA area. One group of residents is adamant that kit fox do frequent the project area. They can recount many instances when kit fox were seem crossing Doolen Road or feeding on pet food in a neighbors yard. Their accounts appear to be consistent and they generally describe the animals they observe (coyote, kit fox and red fox) accurately. The results from this study or any other field studies that we are aware of can discount the validity of these observations. Another smaller group of residents profess that kit fox do not occur in the GPA area, and to their knowledge have never inhabited the GPA area or anywhere in the general vicinity. This group also accurately describe the canids (coyote and red fox) which they have observed in the GPA study area.

Den Surveys: Systematic variable-width transects were used to locate kit fox dens and other species, were conducted in about 2,570 acres (4.0 mi^2) of the study area. The area surveyed for dens and the locations of potential dens are shown in Figure 3. A total of forty-three dens are shown in Figure 3. Seven of these dens were classified as active and inactive (Table 3). Another three dens were classified as natal sites. Two of these were being used by red fox and the occupant of the other den, just off of Doolen Road remains in question, is the size of a kit fox or red fox. Scats were collected at 12 sites and the contents are being analyzed (see above, Hair analysis). All of the dens presented as in Figure 3 are shown as potential dens because the distribution of potential sites is more important than den classification for a General Plan assessment. At least three red fox family groups and two coyote family groups were known to occur in or near the GPA study area.

Night Spotlighting: Night spotlighting surveys were conducted on nine nights, June 14, 15, 19, 20, 21, 22, 26, 27, and 28. A total of approximately 45.25 hours were spent night spotlighting, covering a distance of about 316 miles (Table 5). The survey route is shown on Figure 4. The most abundant species observed during spotlighting surveys was the stripped skunk (83 individuals) and accounted for 45% of all the observations (Table 6). Feral cats accounted for 22% of the observations followed by red fox with a relative abundance of 10% and frequency of 78%.

Scent Stations: Scent stations were established at 23 locations within the GP area and monitored for 10 nights for a total effort of 192 scent station nights (1 scent station night = 1 operational station monitored for 1 night) (Table 7). Several stations were destroyed by livestock trampling during the field work.

Stripped skunk, California ground squirrel and feral cats were the most abundant and frequently observed species to visit scent stations (Table 7). Red fox were detected on 40 percent of the monitoring nights. In contrast, tracks of coyote were never found at stations although several coyotes were known to be within 0.25 miles stations on at least 6 nights. No tracks were recorded in the tracking medium at the four dens that were monitored for activity. One set of tracks, which may have left by a kit fox, were found at a scent station located in the western part of the GPA area (see

below, Kit fox).

Photo-bait Stations: One photo-station was established for one night, at four different locations. The photo-bait station worked successfully on three of the four nights. At one location two photographs were taken of a cat eating the bait. At another location a photograph of a cat and two photographs of a skunk was taken. On the third night the camera malfunctioned, and on the last night another skunk was detected.

Artificial Dens: Four artificial dens were located in the project area and monitored for 5 nights for a total effort of 20 den nights. There was no evidence that any animal used the artificial dens. Apparently the dens were not left long enough in one location for an animal to use the site. Also there may have not been a shortage of dens during the survey period and/or in the areas sampled.

Hair Analysis: Analysis of hair from scats is not complete.

Red-legged frog The red-legged occurs within California's coastal counties and the northern Sierra foothills. Historically it occurred in parts of the Central Valley, but is now apparently absent there. Agriculture, urban developments, and intensive grazing have degraded or eliminated critical freshwater habitat for this frog over much of its former range in California. In addition, predation and competition from introduced fish and bullfrogs has also significantly contributed to the decline of this subspecies.

Preferred habitat consists of slow-moving freshwater streams which have pools of at least ± two feet deep, freshwater ponds and marshes, or coastal estuaries. Although red-legged frogs are typically associated year-round water in association with either thick growths of willows and emergent aquatic vegetation, they can also occur in ephemeral pools as long as the water lasts till late spring or early summer. Breeding occurs during the first half of the year, primarily in February. Eggs are deposited and attached to emergent and submergent vegetation.

Site specific: Red-legged frogs (adults and larvae) were detected at 11 sites in the GPA study area. The type of sites included springs, impoundments, windmill cisterns, pools and small runs in Cottonwood Creek and two tributaries of Tassajara Creek. No frogs were found in the main channel of Tassajara Creek or the lower portion of Cottonwood Creek. Pacific treefrogs appeared to be relatively abundant in most ephemeral ponds and water courses. Western toads and bullfrogs did not appear to be as widespread or as abundant as the red-legged frog in the GPA area, although they were found in some of the same site as the latter.

Potential breeding and yearlong habitat for red-legged frogs probably occurs in greater abundance than these 11 locations indicate. The GPA study area encompasses at least 13 miles of intermittent stream, about 3.8 miles of riparian woodland, and more than 40 springs, seeps, impoundments, stock tanks, and ponds. Specific locations of these frogs, **especially along linear waterways** would be expected to change somewhat from year to year, and season to season, as habitat quality and availability fluctuates. In other words, just because red-legged frogs (or some other wildlife resource) were not located at a particular site, is not to say that they will not be at that site in a year or two (see below, Mitigation Recommendation, # 4). Aquatic and riparian habitat is also expected to change with present and future land use practices (see below, Wildlife Habitat).

California tiger salamander This subspecies ranges from Sonoma County south to the Santa Rita Hills in Santa Barbara County and east to the foothills of the Sierra Nevada. Agriculture, urban developments, and intensive grazing have degraded or eliminated critical freshwater habitat for this

salamander over much of its former range in California. In addition, predation and competition from introduced fish and the larger more aggressive larvae of introduced subspecies of tiger salamanders contribute to the decline of this subspecies. Tiger salamanders frequent ponds, slow moving streams and temporary rain or vernal pools. They use shallow ponds to breed in early spring, attaching their egg mass to submergent vegetation. Adults are known to shelter in rodent burrows, emerging for short periods to breed. Preferred breeding habitat includes small ephemeral ponds and pools in low hills and valleys of grasslands or open oak woodland. The presence of predatory fish in ponds greatly reduces the sites value as breeding habitat for the salamander. They rarely use fast moving streams for reproduction. Adults spend much time underground in burrows, sometimes as much as one mile from freshwater breeding areas.

Site specific: John Brode (pers. comm.) of CDFG noted that breeding populations tend to be concentrated in regional centers and that the Livermore-Dublin Valley appears to be one of these core areas. A search of the CFGD Data Base indicated several documented occurrences of the salamander in the area surrounding the GPA and SP areas (CNDDB 1988). The two closest locations are just outside the south-eastern boundary of the GPA study area. No California tiger salamanders were located during our field studies. The lack of rainfall during the past several years has possibly contributed to a reduction in the breeding effort by these salamanders. This factor may also account for not locating the species during field studies. High quality habitat for the California tiger salamander occurs at many of the water sites throughout the GPA and SP area (see below, Wildlife Habitat).

Western pond turtle This species occurs west of the Cascade-Sierran crest in California. Populations have declined during the past century due to degradation and disturbance of many watersheds. Agriculture, urban developments, and extensive grazing have caused increased rates of siltation which has degraded many drainages. Over collecting for pet trade has also contributed to its decline.

A thoroughly aquatic turtle, it inhabits ponds, marshes, rivers, reservoirs, and irrigation ditches in grasslands woodlands or open forest habitats. It prefers quite year-round water with rocky or muddy bottoms, and deeper pools bordered by aquatic vegetation. The females lay their eggs in mud cavities generally located in the sun near the perimeter of a permanent water source. They feed on both plant and animal material.

Site specific: Western pond turtles were found at two locations along Cottonwood Creek (Figure 5). A total of eight individuals were observed basking in the sun near small pools. Several large adults were observed along with young turtles that were no more than 2 or 3 inches across. Tassajara Creek and several of the larger permanent water impoundments in the study area also represent suitable habitat for the western pond turtle (see below, Wildlife Habitat).

Alameda whipsnake (formally known as the Alameda striped racer) The Alameda whipsnake is known to occur in valleys, foothills, and low mountains in portions of Alameda and Contra Costra Counties. They are known to inhabit chaparral, grassland, open woodland habitat, and rocky slopes. The major threats to this species includes urban developments and large water impoundment projects. Not much is known about this species.

Site specific: The Alameda whipsnake was not observed, nor was any habitat found that could support its existence.

California horned lizard (formally known as the coast horned lizard) This subspecies occurs

throughout much of California west of the deserts. Ranges throughout all of the coastal counties south of Sonoma County, in the Central Valley. Not enough information is known of this subspecies to determine its status in California. This animal is of concern to the CNDDB which is currently gathering records of its occurrence and monitoring its status.

Inhabits a variety of habitats including scrubland, grassland, riparian, woodlands, and open coniferous forests where the soils are friable for digging. Common along sandy washes with low shrubs for cover. Forages on the ground in open areas for ants and other insects. Usually can be found near ant nests where they lie in wait for food. Periods of inactivity and winter hibernation are spent burrowed into the soil under surface objects such logs or rocks.

Site specific: No coast horned lizards were found in the study area. Moderately suitable habitat for the lizard probably occurs throughout most of the undeveloped portion of the GPA study area.

Bald eagle Historical breeding range of the bald eagle extended from coastal southern California northward through much of the central and northern portion of the state. Present nesting activity is confined to the northern third of the state. A decline in population, seen throughout the lower 48 states, is attributed to pesticide (DDE) contamination, loss of habitat generally through logging and human encroachment, human disturbance, shooting, and degradation of waterways.

In California, bald eagles usually nest in overstory ponderosa pine trees, in an area relatively free from human disturbance, near a large body of water supporting abundant fish and/or waterfowl. Wintering bald eagles usually require areas of open water supporting abundant fish and/or waterfowl, and rangelands yielding large mammalian carcasses.

Site specific: The GPA and SP study area is not suitable habitat for bald eagles, although several birds are known to winter in the Altamont area and birds may occasionally pass through the GPA area.

Golden eagle Throughout most of California, golden eagles are an uncommon resident or migrant species. Summer breeding distribution is correlated with nesting habitat and concentrations of diurnally active rodents. Golden eagle populations have declined since the 1940s, especially near human population centers, but are generally remaining stable, with an estimated 500 pairs nesting in California. Electrocution, shooting, human disturbance at nest sites, and conversion of grasslands to intensive agriculture are the major threats to golden eagles.

Golden eagles prefer open, sloping landscapes such as foothills and canyons, with cliffs and trees for nesting and cover. Extensive tracts of open terrain adjacent to nesting habitat is utilized for hunting. Golden eagle pairs often return to the same nest territory each year, but may switch to another territory if the previous season's breeding effort failed. Birds may routinely travel 10 to 20 miles from roosting and nesting sites to forage.
Site specific: Eagles were routinely observed soaring over various portions of the study site. during the field studies several birds have been observed feeding on ground squirrels. One active eagle nest was located in a eucalyptus in T. 2S R. 1E, NW ¼ of Section 27 (Figure 5). On 19 April one white downy chick was seen in the nest. This bird successfully fledged in June and has been observed with both parents soaring in the vicinity of the nest. Apparently the general location of this eagle nest was common knowledge to local residents and workers in the GPA study area. Several people mentioned this nest site during interviews. These data indicate that this nest site is probably a historical location.

Except for the stands of eucalyptus and riparian woodland, no suitable nesting habitat for golden eagles occurs in the study area. Annual grasslands in the GPA and SP areas represent "classic" high quality foraging habitat for the golden eagle in this region of California (Thelander pers. comm.).

Northern harrier Summer and winter distributions of northern harriers range the length of California. Breeding is concentrated in the Central Valley, the central and north coasts, northeastern California, and scattered other locations. Breeding and wintering populations of harriers have declined from former levels throughout California. This population decline is attributed to destruction of marsh habitat and grazing impacts on grassland.

Northern harriers inhabit fresh-water and salt-water marshes, grasslands, desert sinks, and mountain meadows and other habitats in the grass/forb successional stage. The short vegetation cover and insufficient wet meadow habitat on the property greatly reduces the suitability for harrier nesting habitat.

Site specific: Northern harriers were observed consistently during the field work. The rolling annual grasslands with abundant prey species, found throughout the GPA and SP areas provide good potential foraging habitat for this open country raptor.

Black shouldered kite Kites are common to uncommon year-long residents of coastal and valley lowlands, generally occurring west of the Sierra Nevada mountains and southern deserts. Black-shouldered kite populations declined in California prior to the 1940s. It is widely accepted that shooting was a major cause of this decline. Once thought to be near extinction in California, black-shouldered kite populations are now increasing due to the year-round irrigation of croplands and probably due to expansion of agricultural lands, resulting in greater amounts of kite habitat, and notably more prey.
Black-shouldered kites are considered obligate microtine predators, and respond nomadically to prey density. They inhabit open areas of grassland, agricultural fields, marshes and roadsides where rodents are common. Nests are constructed in oak, willow or other broadleaf deciduous tree stands near open areas in riparian, blue oak savannah and digger pine-oak habitats.

Site specific: Most of the GPA and SP study area is suitable potential foraging habitat and potential nesting locations are scattered throughout the project area. No kites were seen in the GPA area.

Peregrine falcon In California, peregrine falcons are breeding and winter residents, as well as migrants. Their breeding range includes the coast and coastal mountains north of Santa Barbara, and the mountains of northern California and the Sierra Nevada. Wintering peregrine falcons are found inland throughout state, primarily near wetlands. California peregrine falcon populations declined sharply in recent decades, mostly due to DDE-related egg shell thinning, loss of riparian and marsh habitat, illegal shooting, and activities of outlaw falconers. Once down to two known pairs in the mid- 1970s, the present-day population in California is approximately 80 breeding pairs.

Peregrine falcons usually nest on cliffs exceeding 100 feet in height. Suitable gravel or soil lined ledges or caves are required. The territories are principally located in open areas near water, supporting abundant bird life for prey. Wintering peregrine falcons utilize coastal and inland marsh and riparian areas.

Site specific: Historical nesting locations are known from the region north of the GPA and SP areas, but these sites have not been used for over 20 years (C. Thelander pers. comm.). Peregrine falcons

are being reintroduced to these historical sites on Mt. Diablo (G. Beeman pers. comm.).

Prairie falcon Prairie falcons are an uncommon permanent resident and migrant ranging from the southwestern deserts up the inner Coast Ranges and the Sierra Nevada to Trinity and Shasta counties, and including the north coast and the Modoc Basin of northeastern California. They are rare on the western slopes of the Sierra Nevada.

Once common throughout California, regional prairie falcon populations around the perimeter of the Central Valley showed low nest site occupancy and low recruitment during the 1960s and 1970s. Desert area populations are still very high and recent surveys indicate improvements in the Central Valley perimeter population. Reasons for decline include nest robbing by falconers, shooting, human activity disturbance, changes in land use, human control of vertebrate prey species, and possibly pesticide contamination. Prairie falcons often nest in crevices or potholes in cliffs or rock outcrops, 30 to over 400 feet high, with a view of open country for hunting. They occasionally utilize stick nests built by other raptors, usually situated on cliffs with a rock overhang above the nest. Open terrain is required for hunting.

Site specific: Historically prairie falcons were known to nest several miles north of the GPA and SP areas, but these sites have not been used for several years (Thelander pers. comm.). No suitable nesting habitat occurs in the study area however, most of the area is high quality potential foraging habitat. No prairie falcons were seen in the GPA area.

Sharp-shinned hawk This species is found throughout northern California, both as a migrant and a resident, and can be expected to occur on the project area primarily as during winter. They prefer, but are not restricted to, riparian habitats. They are usually found breeding in stands of moderate to dense canopy cover. During winter, the hawks are found in all habitats, occasionally foraging in annual grasslands. Sharp-shinned hawks feed mainly on small birds caught from rapid flight, often at forest edge. Breeding (summer) population appears greatly reduced from former levels, although data are lacking.

Site specific: Only marginal nesting and low quality foraging habitat occurs on-site, primarily along Tassajara Creek. No sharp-shinned hawks were observed during three surveys of Tassajara Creek.

Cooper's hawk Cooper's hawks are found throughout this region of northern California. Cooper's hawks are generally associated with riparian areas and other woodland habitats. Dense stands near water are preferred. The interspersion of open grassland with the mixed hardwood forest create suitable foraging habitat. Cooper's hawks mainly hunt in broken woodlands and forest edges for small birds and mammals, which are taken in the air, on the ground or in vegetation. Breeding populations of Cooper's hawks have declined sharply throughout the state. The population declines are attributed to habitat destruction (especially lowland riparian areas), human disturbance, and possibly contamination by persistent pesticides (DDE).

Site specific: Some potentially suitable, but marginal nesting habitat occurs in the study area, mainly along Tassajara Creek. No Cooper's hawks were observed during three surveys of Tassajara Creek.

Burrowing owl Burrowing owls range throughout the length of California and its large, offshore islands, except the coastal forests of the northwest, and high mountains. Populations of burrowing owls are declining throughout California. Reductions in ground squirrel populations have reduced the numbers of available burrows. Clean farming practices have reduced the available habitat through the reduction of prey species and cover. Habitat has also been lost to urban development. Burrowing

owls prefer open dry grasslands, deserts, agricultural margins, bare open areas, and rolling hills at low elevations, although they will nest in early stage alkali shrub sagebrush up to pinyon - juniper and ponderosa pine woodlands. Ground squirrel or other fossorial rodent holes are used as nesting sites by burrowing owls. Good visibility from burrows is important. Shrubs, fence posts or any high ground are used as loafing and hunting perches.

Site specific: Burrowing owl pellets were found along fence lines, which were apparently used as perches, in the north-eastern portion of the GPA area. One owl was seen during night spotlighting but, no burrows were positively identified (Table 6). Annual grasslands in the GPA and SP areas are good nesting and foraging habitat for burrowing owls.

Short-eared owl The short-eared owls were once common throughout California, in suitable habitat. The owl is migratory and are most frequently observed in California during winter months. The only known breeding locations include areas near Davis, Yolo County; Bair Island, San Mateo County; Salinas River and Moss Landing, Monterey County; and probably Honey Lake Wildlife Area. Their winter range includes the California coastal area, the Central Valley, and northeastern California at low elevations. Short-eared owls have experienced loss of nesting habitat in lowland marsh and grassland habitat due to overgrazing, water diversion projects and recreational development. In the Central Valley, cultivation and marsh drainage have been key factors in habitat loss, and shooting has also significantly reduced populations. Short-eared owls are found in open most open habitats, for example, marshes, wet meadows, grasslands, tundra, and cultivated fields. They also occur in blue oak and digger pine-oak woodland on the west slopes of the Sierra Nevada during the non-breeding season. They nest on the ground in grasslands below 2000 feet elevation.

Site specific: No short-eared owls were observed during the field work. The study site provides adequate foraging potential but, no nesting habitat for this species.

Tricolored blackbird Tricolored blackbirds occur throughout the coastal counties of California. This species has shown population declines throughout its range. Degradation or loss of riparian habitat bordered by dense aquatic vegetation is probably the primary factor responsible for this decline. Tricolored blackbirds are gregarious, colonial nesting marsh inhabitants. Optimal nesting habitat consists of marshland with dense cattails fringing open water. They breed from between April to July in large colonies located in dense stands of cattails. Colonies sometimes contain up to several hundred individuals. Foraging takes place in adjacent agricultural areas, or short grass habitats such as pastures, cattle feed lots, golf courses and airports. Tricolored blackbird nesting can be very sporadic, with large flocks occurring one year and completed absent the next. During the non-breeding season they congregate in mixed flocks in these short grass habitats, primarily in the vicinity of their breeding localities.

Site specific: There is some potential breeding habitat in the GPA and SP areas although, it appears to be only marginally suitable. No tricolored blackbirds were seen during field studies.

Great blue heron Breeding occurs locally throughout California. CNDDB is currently collecting information on this species to monitor its status. There is reason for concern over this species because it is closely associated with aquatic habitats which are rapidly declining in California. Herons frequent shallow bays and marshes along the coast and freshwater marshes, ponds, mudflats, lakeshores, and streams. Wet meadows, crop fields, and open fields are also commonly used for foraging. Great blues are usually solitary foragers, feeding mainly on fish, but also crustaceans, amphibians, reptiles, large aquatic insects and small rodents. These birds nest in colonies either by

themselves or more frequently in association with other water birds, particularly great egrets. They usually nest in the tops of large trees, in an isolated patch of riparian woodland near water. Where undisturbed they may even nest in shrubs or on the ground.

Site specific: Great blue herons were observed several times along Tassajara and Cottonwood Creeks and some of the ponds in Doolen Canyon. Many of the ponds and open riparian locations in the GPA and SP areas are probably used by herons, egrets, other waders and shorebirds. No nesting habitat or rookery sites are known to occur in the study area.

Great egret This species breeds in many areas of California, predominantly in the Central Valley and northern portions of the state. CNDDB is currently collecting information on this species to monitor its status. There is reason for concern over this species because it is closely associated with aquatic habitats which are rapidly declining in California. Egrets predominately inhabit coastal marshes and lagoons, and adjacent tidal channels and mudflats, with fewer individuals occurring inland in freshwater marshes, ponds, lakes, and streams. Open habitats such as meadows, and open fields are also used for foraging. Their food includes all types of aquatic life including fish, crustaceans, amphibians, but also take reptiles and small rodents. These birds nest in mixed colonies with other water birds, particularly with herons. They usually nest in the tops of large trees, in an isolated patch of riparian woodland or willow thickets near water. Where undisturbed they may even nest in cattails or reed beds.

Site specific: Great egrets were observed three times along Tassajara Creeks. Many of the ponds and open riparian locations in the GPA and SP areas are probably used by herons, egrets, other waders and shorebirds. No nesting habitat or rookery sites are known to occur in the study area.

San Joaquin kit fox Kit foxes inhabit the low foothills surrounding the San Joaquin Valley, portions of the San Joaquin Valley floor, and interior coast range valleys. Its range extends from the Tehachapi Mountain foothills around the southern end of the San Joaquin Valley north along the valley floor and eastern foothills to the vicinity of Visalia in Tulare County, and north along the western edge of the valley to the vicinity of Byron in Contra Costa County and extending south of Mt. Diablo and west to near Highway 680. Present populations are concentrated in western Kern and eastern San Luis Obispo counties.

Starting in the early 1900s, agricultural, industrial and urban developments in the San Joaquin Valley resulted in major losses of San Joaquin kit fox habitat that eventually led to population declines. The conversion of uncultivated land to irrigated cropland in the southern San Joaquin Valley, where the greatest kit fox densities historically occurred, was the primary factor in the decline of kit fox populations. Gross estimates of population decline are between 20 to 43 percent in the last half century.

Within their present range, kit fox occur in annual grasslands, and sparsely vegetated, shrubby habitats. They are also found in some agricultural types and urban areas. Topographic relief is usually low to moderate with slopes generally less than 40°. The native alkali sink plant community and flat topography of valley bottoms comprise the historically preferred habitat. The majority of dens are located on relatively flat terrain or the lower slopes of hills. Natal and pupping dens typically found in the flatter terrains. Common locations for dens include washes, drainages, and road side berms.

The number of suitable dens is a critical habitat requirement for kit fox, as they use several dens all year long. An individual fox may use over 20 dens during a year, although most dens are vacant at

any given time. Kit fox are reputedly poor diggers and are usually associated with loose-textured, friable soils; however, they can also be found in harder clay soils in some parts of their range. In several parts of their range, particularly in the north, kit fox often use ground squirrel (*Spermophilus beecheyi*) burrows for dens. Kit fox also commonly den in man-made structures such as culverts.

Considerable overlap between individual ranges is believed to occur. Estimates of density over the entire distribution of kit fox, range from between 2 adults/5.6 to 2 adults/1.4 square mile. Adult foxes are usually solitary during the late summer and fall. By September and October adult females start to excavate and enlarge natal dens. Mating probably occurs near the first of the year. Pups are typically born in late February or early March. Pups are weaned at about one month after birth, at which time they venture above ground. The pups disperse at about five months of age.

Kit fox are primarily carnivorous. Their foods include lagomorphs, kangaroo rats, ground squirrels, mice, insects, carrion, reptiles, and birds. Several recent studies suggest that kit fox are opportunistic feeders that can exploit a diurnal prey species such as ground squirrel for their primary food. Kit fox are thought to satisfy their water requirements from their prey and do not need sources of drinking water.

Factors limiting the distribution of kit fox within its range include: availability of den sites, adequate prey base, and competitive exclusion and predation by other canids, particularly coyotes (Snow 1973, Morrell 1975, Hall 1983b, O'Farrell 1984, Orloff et al. 1986). If local food and denning resources are not limiting they may be sufficiently partitioned to allow coexistence.

Site specific: The GPA and SP study areas are in the northwestern portion of the kit foxes' range (O'Farrell 1983). The study area appears to be ecologically well suited to support the kit fox. In the Camp Parks Training Area just west of Tassajara Creek, two surveys have failed to document the presence of kit fox (Balestreri 1981, Jones and Stokes 1983, U.S. Corps of Engineers 1986). A search of the CFGD Data Base indicated one documented occurrence of kit fox and den within the north-eastern part of the GPA (Morrel 1975). Besides the Camp Parks survey, we know of no effort to document the fox in the GPA area.

California ground squirrels would be the primary prey species for the kit fox in the GPA study area. During den searches we noted that the abundance of California ground squirrels and their dens varied considerably from area to area. Ground squirrels were almost absent from some areas which is probably due, in part, to effective rodent control measures. According to J. Gavaia (Dept. of Agric. Alameda County stationed in Livermore) during the last 10 years, ground squirrels have been poisoned using an anti-coagulant bait like chlorophazinone. The use of compound 1080 has decreased and at present has almost been completely phased out. The frequency that ground squirrels are poisoned in the Dublin GPA area depends on the individual landowner, and may occur from twice a year for consecutive years to once every five years or so.

On 16 June a set of tracks were found at a scent station in the northeastern portion of the general plan area (T. 2S R. 1E, NW ¼ of Section 25) (Table 7). The size, shape and overall configuration of the toes and heel pad resemble known reference tracks from kit fox collected in the western San Joaquin Valley. Furthermore, these tracks do not match tracks of any of the other species thought to be found in the northwestern part of the project area. We believe that these tracks could have been made by a San Joaquin kit fox, a gray fox, or a small domestic canid. These tracks were located in the same ¼ section where Morrel (1975) documented the occurrence of a kit fox and its' dens in 1975.
Systematic variable-width transects were used to locate kit fox dens and other species, were conducted

in about 2,570 acres (4.0 mi^2) of the study area. The area surveyed for dens and the locations of potential dens are shown in Figure 3. A total of forty-one potential kit fox dens were located. Analysis of hair collected at den sites has not yet been completed.

There are some indications that kit fox may be expending their range in Contra Costra County (S. Orloff pers. comm.). These data coupled with appropriate terrain and vegetation cover, historic evidence of kit fox occurrence in the study area and the fact that the GPA study area is contiguous with known population to the east (Westlar 1987, Orloff et. al 1976), strongly suggests that it is likely that kit fox inhabit the GPA and SP areas.

American badger Badgers occur throughout most of the state except the very wet coastal forests of northwestern California. They have been extirpated from many sections of southern California. Badger populations in California have declined greatly within the last century, particularly in coastal areas and in southern California. The status of badgers in California is considered poor. Primary causes of decline and extirpation of badger populations have been agricultural and urban developments resulting in loss of habitat. Other significant sources of mortality include rodent and predator poisoning, and shooting redin the name of predator control. Badgers occur in a wide variety of open uncultivated habitats, with dry friable soils and sufficient prey. Preferred habitats include, grasslands, oak savannas, openings in sparse scrub and chaparral, and mountain meadows. They are highly specialized fossorial mammals that prey primarily on burrowing rodents such as gophers, ground squirrels, and kangaroo rats.

Site specific: Badgers were seen on three occasions during spotlighting surveys (Table 6). Evidence of badger diggings was observed during the den surveys in the north-eastern region of the GPA area. All of the grassland habitat in the GPA and SP study area probably offers at least moderately suitable foraging and denning habitat for badgers.

Other species The most common bird species observed in the annual grassland habitat were; mourning dove (*Zenaida macroura*), European starling (*Sturnus vulgaris*), western meadowlark (*Sturnella neglecta*), horned lark (*Eremophia alpestris*), brewer's blackbird (*Euphagus cyanocephalus*), house sparrow (*Passer domesticus*), turkey vulture (*Cathartes aura*), red-tailed hawk (*Buteo jamaicensis*), American kestrel (*Falco sparverius*) and California quail (*Callipepla californica*). Twelve red-tailed hawk nests were located within the GPA area (Figure 5). In the riparian habitat in Tassajara Regional Park bird species observed included Nuttall's woodpecker (*Picoides nuttallii*), western wood-pewee (*Contopus sordidulus*), Steller's jay (*Cyanocitta stelleri*), house wren (*Troglodytes aedon*), rufous-sided towhee (*Pipilo erythrophthalmus*), brown towhee (*Pipilo fuscus*), dark-eyed junco (*Junco hyemalis*) and western kingbird (*Tyrannus verticalis*). Mallards (*Anus platyrhynchos*) and some Canada geese (*Branta canadensis*) were commonly seen on ponds in the GPA study area during late winter.

California ground squirrel (*Spermophilus beecheyi*) colonies appeared to be scattered throughout the grasslands. Western gray squirrel (*Sciurus griseus*) and dusky-footed woodrat (*Neotoma fuscipes*) nests were observed in the oak trees at Tassajara Regional Park. Among the reptiles and amphibians observed on site were western fence lizards (*Sceloporus occidentalis*), gopher snakes (*Pituophis melanoleucus*), Pacific Treefrog (*Hyla regilla*), Western toad (*Bufo boreas*), bullfrog (*Rana catesbeiana*), Ringneck snake (*Diadophis punctatus*), Common kingsnake (*Lampropeltis getulus*), Common garter snake (*Thamnophis sirtalis*), and Western aquatic garter snake (*Thamnophis couchi*).

4.0 IMPACTS

4.1 BOTANICAL IMPACTS

4.1.1 Direct Habitat Loss

The most significant impact on vegetation will result from removal or displacement by developments such as shopping centers, housing, roads, etc. Since no specific plans are proposed at present the full extent of this impact is unknown.

4.1.2 Indirect Impacts on Vegetation

Potentially significant indirect effects of vegetation removal include dust deposition from road and pad grading activities, increased soil erosion and sedimentation, increased potential of slope failures, and alteration of surface and subsurface drainage patterns. The extent of these impacts is dependent on the timing of the disturbance, the type of erosion control implemented, and the species and type of vegetation used for revegetation.

4.1.3 Impacts to Sensitive Habitats

Direct impacts to the stands of freshwater marsh drainage, arroyo willow riparian and northern riparian woodland could result from bridge and culvert crossings. Indirect impacts could result from increased sedimentation or spoil deposition effecting stream flow patterns and smothering young seedlings and the roots of woody plants.

4.1.4 Impacts to Rare Plants

No rare and endangered plants were documented in the study region and impacts to rare plant species in the vicinity of the study area are not anticipated.

4.2 WILDLIFE IMPACTS

Suitable habitat exists for 17 of the 20 sensitive wildlife species identified as potentially occurring in GPA and SP areas. The impacts discussed in the following section are generic, and do not reflect any site specific proposed development actions. They are presented here for general consideration, to reflect wildlife resource issues and concerns, and as a means for deriving recommendations for integrating urban development policy and natural resource conservation strategy.

4.2.1 General Impacts of Development

Urban and industrial development related impacts to the wildlife that use the GPA and SP areas include: possible direct mortality or injury to individuals; removal and modification of native habitat resulting from construction of roads, housing and other facilities; reduction in the prey base for avian and terrestrial predators and number of denning sites for reproduction and cover; disturbance to wildlife from the increased human presence, domestic pets and vehicle traffic in the vicinity; and potential degradation of on and off-site water quality or flow regimes due to run-off, erosion, and pollutants; and the construction of any utility transmission and distribution lines.

The species most immediately affected by habitat disturbance or losses are relatively sedentary species, such as small mammals, reptiles and amphibians. Other more mobile wildlife species, such as most birds and larger mammals will be able to avoid direct mortality from construction activities by moving to surrounding similar or suboptimal habitat. However, unless these adjacent habitat were somehow enhanced or existing populations in surrounding areas are below carrying capacity, most of the displaced individuals will also likely perish. Loss and modification of habitat will result in a proportional decrease in the overall carrying capacity of associated wildlife populations, and a shift in the species composition.

Because the habitat in the project area is relatively homogenous, at least at a low resolution, it is anticipated that habitat loss (except for riparian areas), will not result in loss of species diversity within the area, but rather in the density of certain species. Impacts could be compounded for wildlife species whose reproductive periods coincide with construction, as natal dens or nesting areas are typically vulnerable to disturbance. These impacts would be highest in the spring and early summer periods.

Increased vehicular traffic can cause direct mortality to many species or impede, daily or dispersal movement of some others (Luckenbach 1975, 1978, Weinstein 1978). Use of poisons to control rodents near the facilities could potentially cause local mortality to non-target animals and reduce populations of prey species (Schitoskey 1975, Wallace 1976, Hegdal et al. 1986).

4.2.2 Species Specific Impacts

Red-legged frog Red-legged frogs are restricted to small water impoundments and several stream courses in the GPA area (Figure 5). The destruction of these water sites will severely impact geographic frog populations. Conversely, the reduction of grazing pressure may allow recovery and enhancement of emergent vegetation in the remaining impoundments and adjacent grasslands, thus providing additional habitat. Increased sedimentation from run-off into the small riparian zones or water impoundments could reduce the water quality and hence the habitat suitability for these frogs. Removal or modification of the mesic vegetation (already at a minimum) in the stream courses, could reduce the suitability of adult foraging habitat. Increasing vehicle traffic on the existing roads and construction of new roads could present an increased source of direct mortality. Harassment and predation by feral dogs and cats appears to be an existing problem and represents a much greater problem with uncontrolled future development. Appropriate protection and enhancement of the stream courses and water sites (Figure 2), and their associated vegetation should maintain and may increase red-legged from habitat suitability. In contrast, reducing the amount and/or quality of stream courses and water sites will lower the habitat suitability and could easily have significant adverse impacts on the species.

California tiger salamander This salamander is generally found in the same habitat and vulnerable to many of the same activities as the red-legged frog. Although we were unable to confirm occurrence of this species, the site does have good habitat suitability and is contiguous with known occupied range. Therefore, impacts and the actions that can be taken to mitigate for the anticipated affects of development are expected to be similar to those experienced by red-legged frog.

Western pond turtle Western pond turtles were found at two locations along Cottonwood Creek (Figure 5). Other water courses and larger permanent water impoundments in the study area also represent suitable habitat for the western pond turtle. Impacts and the actions that can be taken to mitigate for the anticipated affects of development are expected to be similar to those experienced

by red-legged frog. One of the locations where the turtle was observed is being filled in with soil and rubble from construction activities. If this continues direct mortalities (to the turtle and other species) are expected.

California horned lizard Similar to many smaller species, this lizard is vulnerable to many activities which could cause direct mortality or injury. However, the distribution of the California horned lizard is fairly extensive, therefore loss of some habitat should have only a moderate affect on this species. Impacts are expected to be minimal.

Golden eagle The conversion of grasslands and the consequent reduction of potential prey species are expected to reduce the amount and quality of foraging habitat for these birds. Possible disruption in foraging activities due to noise and human activity associated with increased development could also occur. Impacts due to the reduction of foraging habitat are expected to be moderate. Construction and operation of one of the proposed roads connecting Doolen road to Tassajara Road would result in the loss of the golden eagle nesting site in Section 27 (Figure 5). This loss would constitute a significant adverse impact to the pair of breeding eagles, and to the potential productivity of the local area.

Northern harrier Impacts to northern harrier foraging habitat should be similar to those experienced by golden eagles. Impacts are expected to be minimal.

Black shouldered kite Impacts to black shouldered kite foraging habitat should be similar to those experienced by golden eagles. Impacts are expected to be minimal.

Prairie falcon Impacts to prairie falcon foraging habitat should be similar to those experienced by golden eagles. Impacts are expected to be minimal.

Sharp-shinned hawk Only marginal nesting and low quality foraging habitat occurs on-site, primarily along Tassajara Creek. Protection and enhancement of the riparian woodland habitat would avoid potential adverse impacts.

Cooper's hawk Impacts to Cooper's hawk habitat should be similar to those experienced by sharp-shinned hawk.

Burrowing owl The annual grassland habitat in the GPA area is moderately suitable habitat for burrowing owl. Some occupied owl habitat was located in the Doolen Canyon region of the GPA area. Although burrowing owls are generally adaptable to human presence, they are sensitive to burrow destruction, indirect harassment, and predation by feral dogs and cats. At present the abundance of feral animals that occur in the Doolen Canyon area may be one of the main factors reducing the habitat quality for this species. Because burrowing owls frequently nest in roadside banks, they are especially susceptible to collisions with autos and road construction and maintenance operations. Adverse impacts should be low if construction activities are able to avoid den sites, development is localized, open space is maintained, and feral animals are controlled.

Short-eared owl Impacts to short-eared owl foraging habitat should be similar to those experienced by golden eagles. Impacts are expected to be minimal.

Tricolored blackbird Protection and enhancement of ponds and stream courses, and their associated vegetation will avoid adverse impacts tricolored blackbirds.

Great blue heron Protection of ponds and stream courses will avoid adverse impacts to this species.

Great egret Protection of ponds and stream courses will avoid adverse impacts to great egrets.

San Joaquin kit fox Construction of the new roads and facilities could adversely impact kit fox by destroying dens or burying kit fox that are occupying those dens at the time of construction. Because kit fox are extremely vulnerable to predation by coyotes, a reduction in the number of potential den sites that provide escape cover, could decrease the habitat suitability for kit fox. Clearing and modifying natural habitat would also reduce their food supplies and the amount of foraging habitat. Increased vehicle traffic and human presence in the area could lead to some direct mortality, injury, or disturbance to foxes. Vehicle traffic on existing roads could cause direct mortality or injury. Vehicle traffic is the greatest cause of kit fox mortality in most parts of their range (O'Farrell 1983). Increasing the number of feral and domestic dogs in portions of the study area would also have adverse affects on the fox. If poisons are used to control rodents near the facilities it could not only reduce populations of an important prey species for kit fox, but some poisons can also kill kit fox that consume enough of the poisoned ground squirrels.

Although we were unable to observe a kit fox in the GPA area, good quality kit fox habitat does exist and there is strong circumstantial evidence in favor of not discounting the presence of fox in this portion of its range. There are some indications that kit fox may be expending their range in Contra Costra County (S. Orloff pers. comm.).

If the minimal mitigation measures proposed in this document are not enacted and development proceeds as though the area is not kit fox habitat, then there could be high adverse impacts to the species. If precautionary measures are not taken than essentially the position that is promoted that this is not kit fox habitat. Potential adverse impacts to the kit fox could be reduced if all proposed mitigation measures are followed. However, it may not be possible to reduce adverse impacts to an insignificant level if kit fox are determined to be in *development* areas.

Since impacts are anticipated to a federally listed species, and there is federal involvement, a Section 7 consultation (Endangered Species Act, as amended) will be invoked. The kit fox is also a state listed species, consequently consultation with California Department of Fish and Game, pursuant to the California Endangered Species Act, Section 2053, may also be invoked.

American badger Badgers could be directly affected by construction activities such as grading, clearing and movement of heavy equipment which could crush badgers in their burrows. Use of persistent poisons to control rodents could potentially cause local mortality of badgers that consume the poisoned prey. Badgers are fairly tolerant of human disturbance and have fairly large home ranges. Increased human activities could decrease the potential of this area to support badger populations. Adverse impacts should be low if construction activities are able to avoid den sites, development is localized, open space is maintained, and rodent control measures avoid the use of persistent poisons.

4.3 CUMULATIVE IMPACTS

The cumulative effects development are often overlooked or ignored because they are difficult to predict and quantify, and in most cases adverse impacts are not manifested within the same relatively "short" time frame as the specific development action and therefore, accountability is difficult. The long-term and off-site consequences of proposed actions increase as impacts accumulate and begin

to limit viable alternative options for wildlife resources. Cumulative impacts need be acknowledged in the formulation of mitigation plans, even if the magnitude of specific impacts cannot be completely quantified or comprehended.

The continued loss and deterioration of riparian habitat is of great concern to both federal and state authorities. The majority of sensitive species expected to occur in the study area are obligate or facultative users of riparian and aquatic habitats (Verner and Boss 1980, Thomas 1979). **Destruction of riparian habitat will severely impact geographic populations of red-legged frog, western pond turtle, and California tiger salamander.** Increased sedimentation from run-off into streams or water impoundments could reduce the water quality and hence the habitat suitability for both of these species. Degradation to the riparian community can occur during construction or in the future, as a result of mass erosion and increased sedimentation thus reducing the availability and quantity of free water.

Although direct mortality of individual animals is obviously an adverse impact, loss of habitat without compensation may be even more detrimental to the species. From the stand point of the cumulative impacts, reducing the amount and/or quality of habitat for threatened or endangered species, or species with very specific life requirements, possibly poses the greatest potential long-term threat to geographic populations. For these species potential impacts from any project, are expected to be disproportionately greater than to many other species, which are not yet restricted to remnants of their former range, or those flexible enough to exploit other options. Fragmentation and isolation of habitat can lower its quality, the effectiveness at which a species can use it and can modify movement and dispersal patterns. Highways and other developments can create barriers to natural movements and tend to isolate habitats leave them more vulnerable to perturbations.

Appendix E

Appendix E East Dublin San Joaquin Kit Fox Protection Plan

INTRODUCTION

This section provides a brief introduction to the San Joaquin kit fox, its habitat, and field studies conducted in the Eastern Dublin General Plan Amendment study area to determine their presence and habitat suitability. These topics are discussed in more detail in *Appendix D: Biological Assessment (Draft: BioSystems Analysis 1989).*

The San Joaquin kit fox is one of three subspecies of kit fox occurring in California. It is a small canid species with conspicuous, large ears and long legs in proportion to its body. Adult body length is about 20 inches with a 12-inch bushy, black tipped-tail that is often carried almost horizontally out from their body. An adult kit fox weights up to about 6 pounds.

Kit foxes occur in annual grasslands, and sparsely vegetated, shrubby habitats that allow easy mobility and good visibility of ground dwelling prey species such as California ground squirrels, black-tailed hares, and cottontails. They are also found in some agricultural and urban areas. Topography is usually of low to moderate relief, with slopes generally less than 40 degrees. Throughout their known range, preferred habitat consists of the lower slopes and flat valley bottoms, although kit fox are also known to inhabit surrounding foothill grasslands as exemplified by the eastern Dublin area. Slight to moderate grazing may increase the suitability of grassland habitats for kit foxes and their prey.

Kit foxes use many dens throughout the year for daily shelter and escape cover. An individual fox may use over 20 dens during a year. The majority of dens are located on relatively flat terrain or low slopes. Common locations for dens include washes, drainages, and roadside berms.

The number of suitable dens is a critical habitat requirement for kit foxes, as they use several dens all year long. Kit foxes are reputedly poor diggers and usually require sufficiently friable soils to allow excavation. Where hardpan layers predominate, kit foxes are able to create dens by enlarging holes started by ground squirrels or badgers. Kit foxes also commonly den in man-made structures such as culverts.

Focused surveys for kit fox were conducted by BioSystems in 1989 (*Appendix D: Biological Assessment (Draft: BioSystems Analysis 1989).* Objectives of these surveys were (1) to determine presence of kit fox, (2) to evaluate kit fox habitat suitability in the project area, and (3) to characterize and delineate kit fox habitat in the GPA and SP areas.

In order to adequately meet these objectives, wildlife biologists followed kit fox survey methods suggested by Orloff (1992) and incorporated several additional procedures. These techniques included conducting transects to locate dens, night spotlighting surveys, scent station monitoring, photo-bait stations, artificial dens with hair traps, and analysis of hair from scats. The survey methods used in this study predated the California Department of Fish and Game (CDFG) Region 4 protocol. In fact, the CDFG (1990) and U.S. Fish and Wildlife Service (USFWS) (1989) survey methods were essentially adopted from the procedures established by Orloff (1992). The Eastern Dublin surveys resulted in detecting one possible kit fox track and 41 potential dens in the GPA and SP area. USFWS (1989) defines potential dens as, "Any natural den or burrow within the species' range that has entrances of appropriate dimensions to accommodate San Joaquin kit foxes for which, however, there is little to no evidence of kit fox use". USFWS (1989) defines known dens as, "Any existing natural den or man-made structure for which conclusive evidence or strong circumstantial evidence can be shown that the den is used or has been used at any time in the past by the San Joaquin kit fox. Conclusive evidence of use may include reliable historical records, past or current radio-telemetry or spotlighting data, or any other appropriate data that, in the judgement of a qualified biologist, is reasonable proof that a given den is or has been used by the kit fox".

The East Dublin study area is located in the northwestern portion of the kit foxes' range (O'Farrell 1983). The study area appears to be ecologically well-suited to support the kit fox because; 1) the Eastern Dublin study area is contiguous with known occupied kit fox habitat located about 7 miles to the northeast (Los Vaqueros), 2) there is suitable habitat in the study area consisting of grassland, ruderal fields, and cropland areas with low to moderate relief, 3) the presence of potential dens which are a required habitat feature, 4) a moderately abundant and available prey base, primarily California ground squirrels, and 5) the type and intensity of existing land use is compatible with kit fox. Based on field surveys the highest quality potential habitat is concentrated in the gently sloping areas along the east and north quarter of the Project site.

CDFG records include one 20 year old documented occurrence of a kit fox and den within the northeastern part of the GPA area along Collier Canyon Road (Morrel 1975). In 1990 there was an unconfirmed sighting approximately 4 miles to the north of the Project area along Black Hawk Road (McGinnis: pers. comm.)

In the Camp Parks area just west of Tassajara Creek, surveys have failed to document the presence of kit fox (Balestreri 1981, Jones and Stokes 1983, U.S. Corps of Engineers 1986). Harvey and Associates (1991) conducted standardized surveys for kit fox in portions of the Eastern Dublin Specific Plan Area and found "no positive or probable sign of kit fox ... anywhere on the study area" They did locate 57 potential and possible active dens, and considered that habitat quality for kit fox on the Dublin Ranch is low to moderate (Harvey and Associates 1991) They concluded that there is "little doubt that Dublin is outside the range of the San Joaquin kit fox", and that based on the "overwhelming evidence" that the Dublin area (Dublin Ranch) is outside of the kit fox range, no significant impacts to kit fox are expected (Harvey and Associates 1992). Furthermore, they surmise that current general plan policies in Alameda and Contra Costra Counties "should ensure sufficient habitat continues to be available for kit fox in the region".

There are some indications that kit fox may be expanding their range in Contra Costa County (Sue Orloff: pers. comm.). Several recent sightings (Ron Duke, etc.) may support this conclusion. These data coupled with appropriate terrain and vegetation cover, historic evidence of kit fox occurrence in the GPA area, and the fact that the GPA area is contiguous with known populations to the east (Westlar 1987, Orloff et. al 1986, O'Farrell 1983), suggests that kit fox could potentially inhabit the GPA area. CDFG reviewed the status of the kit fox in the GPA area. Based on results of surveys conducted by Balestreri (1981), BioSystems (1989), Harvey and Associates (1991), Jones and Stokes (1983), McGinnis (pers. comm.), Morrel (1975), and U.S. Corps of Engineers (1986), the agency could not determine that development in the GPA and SP area would not negatively affect the kit fox by eliminating suitable habitat. CDFG did state their "...initial determination that the majority of the planning area, with the exception of the developed Santa Rita area of Tassajara Road, is potential kit fox habitat" (CDFG 1992).

MITIGATION MEASURES

Guidelines for avoiding, minimizing, and offsetting impacts to kit fox, are provided in the following sections. Many of these guidelines follow Standardized Recommendations for Protection of the San Joaquin Kit Fox (USFWS April 1989) and Rado (In Press).

Because of the potential impacts to kit foxes or their habitat, a USFWS Section 7 consultation (Endangered Species Act, as amended) may be invoked. Consultation with CDFG, pursuant to the California Endangered Species Act, Section 2053, may also be invoked.

Enactment of these mitigation measures does not constitute a permit for "take". Take is defined as to harass, harm, pursue or kill a listed species. If at any time during the pre-construction surveys (recommended below) or the construction activities, kit fox are found within or adjacent to the

Project site, then a "take" permit under Section 9 of the Endangered Species Act (ESA) would be required and a compensation replacement ratio could be enacted. Additional mitigation measures may also be necessary.

Most of the Eastern Dublin study area is considered potential kit fox habitat. Pre-mitigation impacts are potentially significant (see IM 3.7/D). Implementation of mitigation measures should reduce impacts to an insignificant level. Avoidance of potential significant impacts is a key element of these mitigation guidelines. Project design, especially the Rural Residential and Parks Open Space areas, effectively provides defacto compensation for potential kit fox habitat impacted in more developed areas.

APPE/1.0 Monitoring Surveys

APPE/1.0 *Annual monitoring surveys will be conducted for kit fox in the Specific Plan and General Plan Amendment areas beginning with Project approval. Survey protocol will follow accepted procedures developed by the California Department of Fish and Game for Region 4. All surveys should be conducted between May 1 and September 30. All surveys will be conducted by a qualified biologist. A written progress report will be prepared and submitted to the City Planning Department for public review. Annual surveys will be conducted for the first five years following project approval.*

APPE/2.0 Land Use and Management Practices

APPE/2.1 *Land use practices within the Open Space and Rural Residential areas should be compatible with kit fox. This includes grazing, dry land agriculture, and orchards. However, areas that are currently grassland habitat should not be converted to dry land or orchards. Any type of large scale irrigated agriculture would not be suitable.*

APPE/2.2 *Livestock grazing should be regulated within the within the open space and rural residential areas. Light to moderate grazing activities is required to maintain optimum percent ground cover and herbaceous vegetation height (approximately 6 inches high; 50% ground cover). Grazing intensity, duration, and timing should be regulated by a qualified biologist in consultation with CDFG and USFWS.*

APPE/2.3 *Development in the rural residential areas should be clustered as much as possible to preserve large portions of undisturbed habitat.*

APPE/2.4 *All areas of ground disturbance (including storage areas) should be revegetated as soon as possible (preferably immediately after construction and before winter rains begin) to reduce erosion hazards and restore lost habitat values. Hydromulching of disturbed areas with grass and forb mixes will be required. All revegetation efforts must use native, local plants. Revegetation is especially important near steep drainages.*

APPE/2.5 *The use of rodenticide or herbicides should be greatly restricted within the Project area. The following rodenticides should be banned entirely from the Project area: Compound 1080, strychnine, C<diphazinone, and fumigants such as methyl bromide. If rodenticides must be used, we recommend the use of zinc phosphide, which has a substantially reduced risk of secondary poisoning to canids compared to these other compounds (Hegdal et al. 1986, Schitoskey*

1975, Swick 1973). Poisoning programs should be done in cooperation and supervision of the Alameda County Department of Agriculture.

APPE/2.6 *The following restrictions apply to the on-site residents within 1/2 mile of rural residential areas: 1) To help minimize predation and harassment of kit foxes by dogs, the residents should restrict their dogs' movements by leashing; or enclosures. 2) Every effort should be made to enforce a 25 mph speed limit (or less), particularly at night.*

APPE/2.7 *Predator trapping activities should be strictly controlled or eliminated to minimize the potential for incidental take of kit foxes.*

APPE/3.0 Pre-Construction Conditions

APPE/3.1 *A pre-construction survey shall be conducted within 60 days prior to any habitat modification (such as, grading, clearing, and road development). The purpose of this survey is to locate known and potential kit fox dens. These den surveys should be conducted by a qualified biologist (i. e., specializes in kit fox) throughout the entire area of disturbance and a buffer zone of 500 feet beyond these areas. Due to the large size of the Project area and the need to conduct surveys within 60 feet of construction, surveys may need to be conducted sequentially in smaller portions of the Project site as they are ready to be developed.*

APPE/3.2 *In addition to pre-construction den surveys, other survey techniques (i.e., spotlighting and scent stations) should be used to reassess kit fox presence. These additional techniques will help to verify that kit fox "take" will not occur as a result of development. These additional efforts are necessary for several reasons: 1) kit fox dens are often not readily identifiable (little to no signs of use) and therefore the evaluation of kit fox occurrence could be misjudged during den surveys (Orloff 1992); 2) kit fox could be using the Project site for only foraging which would not be detected during den surveys; 3) kit fox could establish presence within the site over the time between the last survey efforts and the start of development; and 4) due to lack of confirmed kit fox presence a "take" permit will probably not be issued by USFWS or CDFG. Therefore if kit fox actually do occur on site, and a "known" den is destroyed or an animal is directly killed,the developers would be violating the federal and State Endangered Species Act. Methods employed during these surveys should follow standard CDFG Region 4 guidelines or otherwise as specified by the resource agencies. All surveys should be conducted between May 1 and September 30. If surveys cannot be conducted during this optimal period of time the surveyor shall consult with the resource agencies for an acceptable alternative approach. All surveys will be conducted by a qualified biologist. A written progress report will be prepared and submitted to the City Planning Department for public review.*

APPE/4.0 Protection Measures

APPE/4.1 *If any kit fox dens potential, known, or natal are located during the <u>pre-construction surveys</u>, implement protection in consultation with CDFG and USFWS, Such measures could include:*

APPE/5.0 Potential Dens

APPE/5.1 *If potential kit fox dens will likely be destroyed by construction or other related activities, the following procedures should be initiated prior to disturbance. First, the den should be monitored over at least three consecutive days to determine if it actually is being used by kit fox. Activity at the subject den can be monitored by placing tracking medium at the den's entrance and by spotlighting. If there is any suspected or confirmed sign of kit fox activity during the monitoring, USFWS and CDFG should be contacted immediately (see known den recommendations below).*

APPE/5.2 *If the den is thought to be unoccupied (immediately following monitoring), the entrance can then be progressively plugged with loose dirt for several days to discourage the use of the den while still allowing resident animals to escape easily. When there is no sign of activity at the den and it is deemed safe to do so by a trained biologist, the den can be dug out with hand tools to a point where it is certain no kit fox is using the den. The den should be fully excavated and then be filled with dirt and compacted to ensure that kit fox cannot reenter the den during the construction period. If,at any point a kit fox is thought to be using the den, the plugging or excavation activity will stop and USFWS and CDFG contacted immediately (see known den recommendations below). All attempts at monitoring, plugging, and excavating a den should be conducted by a biologist experienced in the biology and behavior of kit fox. All such efforts shall be fully documented.*

APPE/6.0 Known/Natal Dens

APPE/6.1 *Protective exclusion zones and fencing should be established around identified kit fox dens with the following specified distances: known dens (dens that have good evidence of kit fox use, past or present) = 300 feet; natal dens (multiple hole dens and/or dens with sign of pupping activity) = 500 feet. Any suspected known den or natal den should be given a ½ mile buffer between January and June to reduce possible adverse impacts to active natal dens and pupping activities. If an active natal den is confirmed, this buffer zone should be extended to ½ mile. Human activities should be greatly restricted within these exclusion areas; vehicle operation and construction, materials storage, or other types of surface disturbing or vibration producing activity should be prohibited.*

APPE/6.2 *Exclusion fencing should consist of large flagged stakes (4 - 5 foot metal or 1 x 1 wooden stakes) connected by heavy rope or cord. Each exclusion zone should be posted with two to three signs placed at equidistant points along the perimeter; each sign should identify the fenced zone as an environmentally sensitive area and state that no disturbance is permitted without prior authorization from the appropriate Project personnel or USFWS and CDFG. Exclusion zone fencing should be maintained until all construction-related or operational disturbance have been terminated. At that time, all fencing and signs should be removed to avoid attracting subsequent attention to the den.*

APPE/7.0 Interagency Coordination

APPE/7.1 *Prior to the on-set of construction and den destruction, the USFWS and CDFG should be notified in writing of the intent to destroy subject dens and reasons given why alternative courses of action are not possible. No activities shall occur in the exclusion zone until the USFWS and CDFG are provided the opportunity to review and comment on this proposal. These agencies may recommend alternative courses of action to avoid den destruction or reduce impacts.*

APPE/7.2 *If given permission by these agencies, excavation of known kit fox dens may then proceed following the procedures outlined above for potential dens. If there is any sign of kit fox activity during the monitoring, a period of at least 5 days should be observed to allow the animal to move to another den during its normal activities. If the animal does not change dens during the course of monitoring, use of the den can be discouraged by partial plugging for several days. If this fails the den may have to be excavated when it is temporarily vacant (e.g., at night). However, the disturbance of an known den should be avoided if at all possible and under no circumstances should a natal den be destroyed or disturbed. If excavation of a den thought to be known or natal is unavoidable, the plugging and excavation activities should not take place during the breeding season (November 1 to July 31) when most dens are being used as reproductive or pupping dens.*

APPE/7.3 *The destruction of a "known" kit fox den is considered a "take" as defined under Section 3 and prohibited under Section 9 of the Endangered Species Act, and appropriate permitting and mitigations would have to be developed in cooperation with the USFWS. If appropriate, provisions for "take" will be addressed in a Biological Opinion concerning the subject project issued by the USFWS, in which this mitigation plan will be incorporated by reference. Similar provisions exist for the CDFG.*

APPE/8.0 Construction Conditions

APPE/8.1 *In order to prevent kit fox or other animals from being injured or trapped during the construction phase of the Project, excavated steep-walled holes or trenches greater than two feet deep should be covered with plywood at the close of each working day, or provided with one or more escape ramps constructed of earth fill or wooden planks. Escape ramps should be placed at least every 100 feet along the perimeter of the excavation. In general, open trenches for pipelines, etc., should not exceed in length that which equals approximately one week's construction. All holes or trenches over 2 feet deep should be monitored daily. Before such holes or trenches are filled, they should be inspected for trapped animals.*

APPE/8.2 *The area of disturbance should be minimized as much as possible. Locations of material handling areas, construction camps, and vehicle and material storage sites, should be situated in previously disturbed areas, or selected to avoid other sensitive resources such as ponds, water courses, and riparian areas.*

APPE/8.3 *Construction vehicle traffic should be restricted to designated access roads,*

storage areas, disturbed sites, parking areas and other project related areas that are necessary for the construction of the project. Other roads, such as ranch roads, should be closed to construction traffic and off-road travel should be prohibited.

APPE/8.4 *Within construction areas every effort should be made to enforce a 20 mph speed limit or less, particularly at night. Speeds shall be controlled by posting signs, installing speed bumps, educating construction workers, and enforcing through project construction contract provisions.*

APPE/8.5 *Rock outcrops and rock piles provide shelter for many of the species which are preyed upon by kit fox, particularly cottontails. If rocks are excavated for project construction, permanent rock piles should be established at strategic locations, contingent upon staff review for aesthetics. For rock-piles to provide needed shelter, rocks need to be medium to large sized (>6 inches) and piled high enough (2 to 3 feet) to allow small prey such as cottontails to fit inside the crevices.*

APPE/8.6 *To prevent access by kit foxes, all construction pipes of 4 to 24 inches in diameter will be stacked or otherwise stored prior to use in such a manner they are elevated at least 3.5 feet above the ground. If this is not feasible, all stored pipe will be thoroughly inspected to make certain no kit foxes are using the pipe (using high beam torches) before the pipe is buried, capped, or otherwise used or moved in any way.*

APPE/8.7 *An information pamphlet should be developed by the project proponent in conjunction with the resource agencies to educate construction workers on the need to avoid accidental or intentional harm to kit foxes and other sensitive species. The pamphlet should explain restrictions on vehicle traffic along with other pertinent information on how to avoid injuring kit foxes and other sensitive species. All construction workers should be instructed to report observations of kit fox or other fox species as depicted in the information pamphlet. All observations including instances of entrapment, injury, or mortality shall be reported to their supervisors. USFWS and CDFG should be notified in writing within three working days of the finding. All independent construction company field supervisors and their employees (via a single representative), should be required to read this fact sheet before they are allowed to begin work on the proposed project. A copy of this information sheet also should be made available to each resident.*

APPE/8.8 *To prevent harassment, mortality, or destruction of kit foxes or their burrows by dogs or cats, pets should not be allowed within the construction site. No firearms should be permitted within the construction sites to avoid harassment or killing of kit foxes. These restrictions should be presented to the construction workers.*

APPE/8.9 *All food-related trash items, such as wrappers, cans, bottles, and food scraps, should be disposed of in a closed container or removed from the construction site. Food items often attract kit foxes and other wildlife into the construction zone at night, consequently exposing them to construction-related hazards.*

Appendix F

FUNDAMENTAL CONCEPTS OF ENVIRONMENTAL NOISE

This section provides background information to aid in understanding the technical aspects of this report.

Three dimensions of environmental noise are important in determining subjective response. These are:

a) The intensity or level of the sound;
b) The frequency spectrum of the sound;
c) The time-varying character of the sound.

Airborne sound is a rapid fluctuation of air pressure above and below atmospheric pressure. Sound levels are usually measured and expressed in decibels (dB), with 0 dB corresponding roughly to the threshold of hearing.

The "frequency" of a sound refers to the number of complete pressure fluctuations per second in the sound. The unit of measurement is the cycle per second (cps) or hertz (Hz). Most of the sounds which we hear in the environment do not consist of a single frequency, but of a broad band of frequencies, differing in level. The name of the frequency and level content of a sound is its sound spectrum. A sound spectrum for engineering purposes is typically described in terms of octave bands which separate the audible frequency range (for human beings, from about 20 to 20,000 Hz) into ten segments.

Many rating methods have been devised to permit comparisons of sounds having quite different spectra. Surprisingly, the simplest method correlates with human response practically as well as the more complex methods. This method consists of evaluating all of the frequencies of a sound in accordance with a weighting that progressively de-emphasizes the importance of frequency components below 1000 Hz and above 5000 Hz. This frequency weighting reflects the fact that human hearing is less sensitive at low frequencies and at extreme high frequencies relative to the mid-range.

The weighting system described above is called "A"-weighting, and the level so measured is called the "A-weighted sound level" or "A-weighted noise level." The unit of A-weighted sound level is sometimes abbreviated "dBA." In practice, the sound level is conveniently measured using a sound level meter that includes an electrical filter corresponding to the A-weighting characteristic. All U.S. and international standard sound level meters include such a filter. Typical sound levels found in the environment and in industry are shown in Figure A-1.

Although a single sound level value may adequately describe environmental noise at any instant in time, community noise levels vary continuously. Most environmental noise is a conglomeration of distant noise sources which results in a relatively steady background noise having no identifiable source. These distant sources may include traffic, wind in trees, industrial activities, etc. and are relatively constant from moment to moment. As natural forces change or as human activity follows its daily cycle, the sound level may vary slowly from hour to hour. Superimposed on this slowly varying background is a succession of identifiable noisy events of brief duration. These may include nearby activities such as single vehicle passbys, aircraft flyovers, etc. which cause the environmental noise level to vary from instant to instant.

To describe the time-varying character of environmental noise, statistical noise descriptors were developed. "L_{10}" is the A-weighted sound level equaled or exceeded during 10 percent of a stated time period. The L_{10} is considered a good measure of the maximum sound levels caused by discrete noise events. "L_{50}" is the A-weighted sound level that is equaled or exceeded 50 percent of a stated time period; it represents the median sound level. The "L_{90}" is the A-weighted sound

level equaled or exceeded during 90 percent of a stated time period and is used to describe the background noise.

As it is often cumbersome to quantify the noise environment with a set of statistical descriptors, a single number called the average sound level or "L_{eq}" is now widely used. The term "L_{eq}" originated from the concept of a so-called equivalent sound level which contains the same acoustical energy as a varying sound level during the same time period. In simple but accurate technical language, the L_{eq} is the average A-weighted sound level in a stated time period. The L_{eq} is particularly useful in describing the subjective change in an environment where the source of noise remains the same but there is change in the level of activity. Widening roads and/or increasing traffic are examples of this kind of situation.

In determining the daily measure of environmental noise, it is important to account for the different response of people to daytime and nighttime noise. During the nighttime, exterior background noise levels are generally lower than in the daytime; however, most household noise also decreases at night, thus exterior noise intrusions again become noticeable. Further, most people trying to sleep at night are more sensitive to noise.

To account for human sensitivity to nighttime noise levels, a special descriptor was developed. The descriptor is called the CNEL (Community Noise Equivalent Level) which represents the 24-hour average sound level with a penalty for noise occurring at night.

The CNEL computation divides the 24-hour day into three periods: daytime (7:00 am to 7:00 pm); evening (7:00 pm to 10:00 pm); and nighttime (10:00 pm to 7:00 am). The evening sound levels are assigned a 5 dB penalty and the nighttime sound levels are assigned a 10 dB penalty prior to averaging with daytime hourly sound levels.

For highway noise environments, the average noise level during the peak hour traffic volume is approximately equal to the CNEL.

The effects of noise on people can be listed in three general categories:

a) Subjective effects of annoyance, nuisance, dissatisfaction;
b) Interference with activities such as speech, sleep, and learning;
c) Physiological effects such as startle, hearing loss.

The sound levels associated with environmental noise usually produce effects only in the first two categories. Unfortunately, there has never been a completely predictable measure for the subjective effects of noise nor of the corresponding reactions of annoyance and dissatisfaction. This is primarily because of the wide variation in individual thresholds of annoyance and habituation to noise over time.

Thus, an important factor in assessing a person's subjective reaction is to compare the new noise environment to the existing noise environment. In general, the more a new noise exceeds the existing, the less acceptable the new noise will be judged.

With regard to increases in noise level, knowledge of the following relationships will be helpful in understanding the quantitative sections of this report:

a) Except in carefully controlled laboratory experiments, a change of only 1 dB in sound level cannot be perceived.

b) Outside of the laboratory, a 3 dB change is considered a just-noticeable difference.

c) A change in level of at least 5 dB is required before any noticeable change in community response would be expected.

d) A 10 dB change is subjectively heard as approximately a doubling in loudness, and would almost certainly cause an adverse community response.

Appendix G

TABLE 1 – Ambient Air Quality Standards

Pollutant	Averaging Time	California Standards		National Standards		
		Concentration	Method	Primary	Secondary	Method
Ozone	1 Hour	0.09 ppm (180 ug/m3)	Ultraviolet Photometry	0.12 ppm (235 ug/m3)	Same as Primary Std.	Ethylene Chemiluminescence
Carbon Monoxide	8 Hour	9.0 ppm (10 mg/m3)	Non-dispersive Infrared Spectroscopy (NDIR)	9.0 ppm (10 mg/m3)	Same as Primary Stds.	Non-dispersive Infrared Spectroscopy (NDIR)
	1 Hour	20 ppm (23 mg/m3)		35 ppm (40 mg/m3)		
Nitrogen Dioxide	Annual Average	-	Gas Phase Chemilumi-nescence	0.053 ppm (100 ug/m3)	Same as Primary Std.	Gas Phase Chemilumi-nescence
	1 Hour	0.25 ppm (470 ug/m3)		-		
Sulfur Dioxide	Annual Average	-	Ultraviolet Fluorescence	80 ug/m3 (0.03 ppm)	-	Pararosoaniline
	24 Hour	0.05 ppm (131 ug/m3)		365 ug/m3 (0.14 ppm)	-	
	3 Hour	-		-	1300 ug/m3 (0.5 ppm)	
	1 Hour	0.25 ppm (655 ug/m3)		-	-	
Suspended Particulate Matter (PM_{10})	Annual Geometric Mean	30 ug/m3	Size Selective Inlet High Volume Sampler and Gravimetric Analysis	-	-	-
	24 Hour	50 ug/m3		150 ug/m3	Same as Primary Stds.	Inertial Seperation and Gravimetric Analysis
	Annual Arithmetic Mean	-	-	50 ug/m3		
Sulfates	24 Hour	25 ug/m3	Turbidimetric Barium Sulfate	-	-	-
Lead	30 Day Average	1.5 ug/m3	Atomic Absorption	-	-	Atomic Absorption
	Calendar Quarter	-		1.5 ug/m3	Same as Primary Std.	
Hydrogen Sulfide	1 Hour	0.03 ppm (42 ug/m3)	Cadmium Hydr-oxide STRactan	-	-	-
Vinyl Chloride (chloroethene)	24 Hour	0.010 ppm (26 ug/m3)	Tedlar Bag Collection, Gas Chromatography	-	-	-
Visibility Reducing Particles	1 Observation	In sufficient amount to reduce the prevailing visibility to less than 10 miles when the relative humidity is less than 70%		-	-	-
Applicable Only in the Lake Tahoe Air Basin						
Carbon Monoxide	8 Hour	6 ppm (7 mg/m3)	NDIR	-	-	-
Visibility Reducing Particles	1 Observation	In sufficient amount to reduce the prevailing visibility to less than 30 miles when the relative humidity is less than 70%.		-	-	-

Appendix H

APPENDIX

URBEMIS3 COMPUTER MODEL

East Dublin Specific Plan

Analysis Years - 1995, 2000, 2005, 2010

Project Name : EASTERN DUBLIN

Analysis Year = 2000 Temperature = 75
EMFAC7 VERSION : EMFAC7D ...11/88

Unit Type	Trip Rate	Size	Tot Trips	Days Op.
L/M Residential	10.0/Unit	12811	128110	
M/H Residential	7.0/Unit	5159	36113	
Retail	50.0/1000 Sqf	4548	227400	1
Service	10.0/1000 Sqf	1074	10740	1
Office	15.0/1000 Sqf	3952	59280	1
Industrial	5.0/1000 Sqf	2075	10375	1
School	1.2/Student	7600	9120	1
Parks	6.0/Acre	287	1722	1

	Residential			Commercial	
	Home-Work	Home-Shop	Home-Other	Work	Non-Work
Trip Length	9.6	3.7	5.3	8.6	5.6
% Started Cold	88.3	40.2	58.3	77.4	27.2
Trip Speed	30	30	30	30	30
Percent Trip	27.3	21.2	51.5		

Vehicle Fleetmix

Vehicle Type	Percent Type	Leaded	Unleaded	Diesel
Light Duty Autos	72.8	0.2	97.3	2.5
Light Duty Trucks	14.3	0.6	96.8	2.6
Medium Duty Trucks	4.3	2.0	98.0	0.0
Heavy Duty Trucks	3.9	18.0	82.0	N/A
Heavy Duty Trucks	3.9	N/A	N/A	100.0
Motorcycles	0.9	100.0	N/A	N/A

Project Emissions Report in Lb/Day

Unit Type	TOG	CO	NOx
L/M Residential	1727.9	18598.5	2584.9
M/H Residential	487.2	5242.7	728.7
Retail	2498.0	24794.0	4171.1
Service	118.0	1171.0	197.0
Office	824.7	8528.9	1336.7
Industrial	145.7	1508.4	235.8
School	103.7	1035.8	172.3
Parks	18.9	187.8	31.6

Project Emissions Report in Lb/Day

Unit Type	FUEL USE	PM10	SOx
L/M Residential	32346.2	254.5	303.2
M/H Residential	9118.1	71.7	85.5
Retail	52709.2	1646.9	494.0
Service	2489.4	77.8	23.3
Office	17170.2	4188.6	160.9
Industrial	3031.2	733.9	28.4
School	2182.8	202.6	20.5
Parks	399.1	12.5	3.7

Project Name : EASTERN DUBLIN

Analysis Year = 2005 Temperature = 75
EMFAC7 VERSION : EMFAC7D ...11/88

Unit Type	Trip Rate	Size	Tot Trips	Days Op.
L/M Residential	10.0/Unit	12811	128110	
M/H Residential	7.0/Unit	5159	36113	
Retail	50.0/1000 Sqf	4548	227400	1
Service	10.0/1000 Sqf	1074	10740	1
Office	15.0/1000 Sqf	3952	59280	1
Industrial	5.0/1000 Sqf	2075	10375	1
School	1.2/Student	7600	9120	1
Parks	6.0/Acre	287	1722	1

	Residential			Commercial	
	Home-Work	Home-Shop	Home-Other	Work	Non-Work
Trip Length	9.6	3.7	5.3	8.6	5.6
% Started Cold	88.4	40.3	58.6	77.6	27.4
Trip Speed	30	30	30	30	30
Percent Trip	27.3	21.2	51.5		

Vehicle Fleetmix

Vehicle Type	Percent Type	Leaded	Unleaded	Diesel
Light Duty Autos	72.8	0.0	97.5	2.5
Light Duty Trucks	14.3	0.0	97.4	2.6
Medium Duty Trucks	4.3	0.0	100.0	0.0
Heavy Duty Trucks	3.9	13.6	86.4	N/A
Heavy Duty Trucks	3.9	N/A	N/A	100.0
Motorcycles	0.9	100.0	N/A	N/A

Project Emissions Report in Lb/Day

Unit Type	TOG	CO	NOx
L/M Residential	1599.9	17468.1	2518.3
M/H Residential	451.1	4924.1	709.9
Retail	2332.7	23335.0	4061.6
Service	110.2	1102.1	191.8
Office	767.6	8001.7	1302.5
Industrial	135.6	1415.0	229.8
School	96.8	974.4	167.8
Parks	17.7	176.7	30.8

Project Emissions Report in Lb/Day

Unit Type	FUEL USE	PM10	SOx
L/M Residential	30624.8	248.1	288.3
M/H Residential	8632.9	69.9	81.3
Retail	49904.3	1605.9	469.7
Service	2357.0	75.8	22.2
Office	16256.5	4084.2	153.0
Industrial	2869.9	715.6	27.0
School	2066.6	197.6	19.5
Parks	377.9	12.2	3.6

Project Name : EASTERN DUBLIN

Analysis Year = 2010 Temperature = 75
EMFAC7 VERSION : EMFAC7D ...11/88

Unit Type	Trip Rate	Size	Tot Trips	Days Op.
L/M Residential	10.0/Unit	12811	128110	
M/H Residential	7.0/Unit	5159	36113	
Retail	50.0/1000 Sqf	4548	227400	1
Service	10.0/1000 Sqf	1074	10740	1
Office	15.0/1000 Sqf	3952	59280	1
Industrial	5.0/1000 Sqf	2075	10375	1
School	1.2/Student	7600	9120	1
Parks	6.0/Acre	287	1722	1

	Residential			Commercial	
	Home-Work	Home-Shop	Home-Other	Work	Non-Work
Trip Length	9.6	3.7	5.3	8.6	5.6
% Started Cold	88.6	40.4	58.8	77.8	27.6
Trip Speed	30	30	30	30	30
Percent Trip	27.3	21.2	51.5		

Vehicle Fleetmix

Vehicle Type	Percent Type	Leaded	Unleaded	Diesel
Light Duty Autos	72.8	0.0	97.5	2.5
Light Duty Trucks	14.3	0.0	97.4	2.6
Medium Duty Trucks	4.3	0.0	100.0	0.0
Heavy Duty Trucks	3.9	11.4	88.6	N/A
Heavy Duty Trucks	3.9	N/A	N/A	100.0
Motorcycles	0.9	100.0	N/A	N/A

Project Emissions Report in Lb/Day

Unit Type	TOG	CO	NOx
L/M Residential	1575.1	17182.4	2510.0
M/H Residential	444.1	4843.6	707.6
Retail	2303.7	22938.5	4047.8
Service	108.8	1083.4	191.2
Office	756.8	7861.4	1298.2
Industrial	133.6	1390.2	229.1
School	95.5	957.7	167.2
Parks	17.4	173.7	30.7

Project Emissions Report in Lb/Day

Unit Type	FUEL USE	PM10	SOx
L/M Residential	29949.6	241.4	283.2
M/H Residential	8442.5	68.0	79.8
Retail	48803.9	1562.0	461.4
Service	2305.0	73.8	21.8
Office	15898.0	3972.6	150.3
Industrial	2806.6	696.0	26.5
School	2021.0	192.2	19.1
Parks	369.6	11.8	3.5

Project Name : EASTERN DUBLIN

Analysis Year = 1995 Temperature = 75
EMFAC7 VERSION : EMFAC7D ...11/88

Unit Type	Trip Rate	Size	Tot Trips	Days Op.
L/M Residential	10.0/Unit	12811	128110	
M/H Residential	7.0/Unit	5159	36113	
Retail	50.0/1000 Sqf	4548	227400	1
Service	10.0/1000 Sqf	1074	10740	1
Office	15.0/1000 Sqf	3952	59280	1
Industrial	5.0/1000 Sqf	2075	10375	1
School	1.2/Student	7600	9120	1
Parks	6.0/Acre	287	1722	1

	Residential			Commercial	
	Home-Work	Home-Shop	Home-Other	Work	Non-Work
Trip Length	9.6	3.7	5.3	8.6	5.6
% Started Cold	88.2	40.1	58.0	77.2	27.0
Trip Speed	30	30	30	30	30
Percent Trip	27.3	21.2	51.5		

Vehicle Fleetmix

Vehicle Type	Percent Type	Leaded	Unleaded	Diesel
Light Duty Autos	72.8	1.7	95.6	2.7
Light Duty Trucks	14.3	2.2	95.0	2.8
Medium Duty Trucks	4.3	5.3	94.7	0.0
Heavy Duty Trucks	3.9	29.8	70.3	N/A
Heavy Duty Trucks	3.9	N/A	N/A	100.0
Motorcycles	0.9	100.0	N/A	N/A

Project Emissions Report in Lb/Day

Unit Type	TOG	CO	NOx
L/M Residential	2108.7	21660.6	2782.0
M/H Residential	594.6	6105.9	784.2
Retail	3001.0	28862.2	4492.8
Service	141.7	1363.1	212.2
Office	997.0	9991.8	1437.0
Industrial	176.1	1767.5	253.5
School	124.7	1207.1	185.5
Parks	22.7	218.6	34.0

Project Emissions Report in Lb/Day

Unit Type	FUEL USE	PM10	SOx
L/M Residential	35223.2	287.9	330.5
M/H Residential	9929.1	81.2	93.2
Retail	57397.5	1863.2	538.6
Service	2710.9	88.0	25.4
Office	18697.4	4738.5	175.5
Industrial	3300.8	830.2	31.0
School	2376.9	229.2	22.3

Appendix I

ZONE 7
WATER SUPPLY UPDATE

FEBRUARY 1992

INTRODUCTION

The drought and the recent severe curtailment of water deliveries from the State Water Project have underscored the need for the Zone to review its water supply sources. This review is necessary to assure an adequate reliable water supply for our existing community and to provide the planning agencies of our purveyors with estimates of future supplies.

The State Water Project (SWP), which currently supplies 70% of the water used in the Zone 7 area, cannot meet the demands placed on it by the cities, the farms and the environment. The supply is subject to legislation in Washington D.C. and Sacramento; to regulation from the EPA, State Water Resources Control Board, Endangered Species Act and fish and wildlife agencies; to court action by anyone who thinks they are not getting their share. The eventual outcome of these events is impossible to predict. This report updates the existing and long-term water supply picture for Zone 7.

EXISTING WATER SUPPLIES

Zone 7's water supply is from three sources:

- Safe groundwater yield
- Locally stored runoff
- State Water Project

Safe groundwater yield is defined as the amount of water that can annually be pumped from the groundwater basin that will be replaced by average annual natural recharge. For Zone 7 the safe yield in the main groundwater basin is 13,200 acre-feet annually. The long-term safe yield is based on hydrologic records that have been maintained since 1974. From this safe yield the Valley's major water retailers are permitted to pump 7,200 acre-feet annually. The balance of the safe yield is pumped for agriculture and gravel mining use.

Historically, Zone 7 has artificially recharged the basin up to a rate of 13,000 acre-feet per year using local runoff and State Water Project waters. Between 1974 and 1990 Zone 7 artificially recharged 94,500 acre-feet of water. The main groundwater basin has an operational storage capacity of 240,000 acre-feet. As of January 1992, it contained approximately 200,000 acre-feet. Zone 7 conservatively estimates that at least half that amount could readily be pumped and recharged.

Locally stored runoff is water developed by the Zone under its water rights permit for the Arroyo del Valle. This water is captured and made available in the Del Valle Reservoir through operating agreements with the State Department of Water Resources. The long-term yield to Zone 7 is 7,000 acre-feet annually. This is based on records from 1969 to 1990 and includes the current drought.

State Water Project (SWP)

Zone 7, the first State Contractor to take water deliveries has a long-term contract with the SWP for delivery of 46,000 acre-feet of water by 1997. However, as noted previously, the SWP with its present configuration cannot deliver its contracted amounts.

Figure 1 shows the existing yearly water supply capability of the State Water Project which assumes the historic climatic conditions from 1922 to 1978. This 57-year period does not include the more recent five-year drought nor does it include the extremely wet years of 1982, 1983 and 1986. This period does start with the drought cycle of the 1920's and 1930's, and ends with the drought of 1976 and 1977. State Water Contractors have contracted for 4.2 million acre-feet of water per year. Zone 7's contract calls for 46,000 acre-feet by 1997. As shown on Figure 1, the State Water Project with existing facilities could only yield an average of 2.89 million acre-feet per year. This amount is 69% of the 4.2 million acre-feet contracted amounts, so Zone 7 could only expect to get an average yield of 31,700 acre-feet (69 percent of 46,000 acre-feet) from the State Water Project as it now exists. Statistically, Zone 7 would receive less than 31,700 acre-feet from the State Water Project 44% of the time (25 years out of 57), during which time water would be pumped from our groundwater reservoir; Zone 7 would receive more than 31,700 acre-feet from the State Water Project 56% (32 years out of 57), during which time the excess State water would be recharged to the groundwater basin. For the 57-year period, the amount of surplus water above the average yield of 31,700 acre-feet equals the amount of deficit below the average yield.

Statistically, these averages for safe yield, local storage and SWP are considered significant to represent the next 100 years of water supply. These statistics cannot represent changes in how the SWP may be operated in the future for reasons previously noted. The Zone and its major purveyors have, and plan to maintain, groundwater pumping capacity to meet 75% of the maximum daily demand. This pumping capacity will provide the Zone with water in case of emergency interruptions in the system.

The operational plan for Zone 7 requires the Zone to conjunctively operate its groundwater basin over the wet and dry periods. In the past it has operated by recharging in winter and pumping in summer.

Table 1 summarizes the existing water supplies of the Valley.

FUTURE WATER SUPPLIES

A number of options are available to the Zone for increasing its reliable water supply. These are discussed below and summarized in Table 2. The order is only suggestive of the probability of accomplishment.

Water Conservation. The Zone and its purveyors are committed to practice water conservation efforts that are feasible for this area. The State DWR estimates that the practices known as best management practices (BMPs) will eventually result in 10% to 15% water savings. The effect of potential water conservation efforts is shown on Figure 2 and will be discussed later in this paper.

Entitlement Until Full SWP Utilization. As noted previously estimates of sustained yield assumes full SWP deliveries to all contractors. However, current requested deliveries are only 3.4 million acre-feet per year and are not expected to reach the full delivery of 4.2 million acre-feet until 2010.

Therefore, the Zone's assessment that the average annual yield from the SWP is 31,700 acre-feet is conservative for the next 10 to 15 years. For example, in 1997, the total SWP requested delivery is 3.6 million acre-feet. The SWP average yield of 2.89 million acre-feet is 80% of the requested

deliveries, therefore Zone 7 would expect to receive 37,000 acre-feet (80% of 46,000 acre-feet) instead of 31,700 acre-feet. This water is not sustainable over time but could be used as recharge to recover from the current drought.

Additions to the State Water Project. Planned additions to the State Water Project are four additional pumps, the Kern Water Bank and Los Banos Grande (LBG) Reservoir. The four pumps and the Kern Water Bank are complete, although all permits to operate these facilities have not been obtained. The LBG is under design and environmental mitigation is underway. The State DWR hopes to begin construction in 1995.

If the State continued with the planned additional improvements to the State Water Project, then the average yield of the State Water Project would increase to 3.66 million acre-feet, which is 87% of the total contracted amounts (see Figure 1). With the additional improvements, Zone 7 would receive an annual average of 40,100 acre-feet (87% of 46,000 acre-feet) from the State Water Project. Statistically, Zone 7 would receive less than 40,100 acre-feet 37% of the time (21 years out of 57), and we would receive more than 40,100 acre-feet 63% of the time (36 years out of 57).

Recycled Water. Studies underway by the Zone indicate that it would be possible to recharge to the groundwater basin and to use as surface irrigation amounts up to 25,000 acre-feet per year with treated recycled water. The recycled water recharged to and used over the main basin would be demineralized by reverse osmosis. Legislation is currently being considered that would provide grants and other financial incentives to use recycled water. This would help defer the high cost of developing recycled water. The use of recycled water does not require new dams and transportation systems. It does not (in

Zone 7's area) reduce downstream flows. A decision to develop a recycled water source is primarily a local decision subject to state regulation. Recycled water facilities can be constructed in small units as needed. They usually do not affect environmentally sensitive issues such as habitat destruction, loss of wetlands or diversion from the Delta. The constraint on recycled water is the high cost of producing RO water.

Water Marketing. The concept of water marketing is water supplies can be purchased by water deficient agencies from agencies that have surplus by reasons of conservation, conjunctive groundwater use, change in crop patterns, and/or fallowing land in dry years. The 1991 "water bank" in which Zone 7 participated is an example of how water marketing works. A number of legislative bills are under consideration to ease the process of purchasing water. Staff believes that on a small scale water purchases will be an alternative to an additional water supply.

The amounts at this time are viewed as the amount that could be delivered through the existing state system, i.e., the full 46,000 acre-feet. The increase to the Zone's present water supply would be (46,000 minus 31,700) 14,300 acre-feet annually.

Increased local storage. Studies by Zone 7 and other South Bay Aqueduct Contractors have identified potential off-stream storage sites that could provide up to an additional 50,000 acre-feet by maximizing the delivery capability of the South Bay Aqueduct. The water supply would come from a combination of purchasing surplus water in wet years from the State and other water delivery systems, and from the water marketing concept previously mentioned. Zone 7's share of this would be approximately 20,000 acre-feet per year.

In place of constructed off-stream storage it would be possible for Zone 7 to store the additional deliveries from the South Bay Aqueduct in the underground aquifers.

WATER DEMANDS

Zone 7 supplies treated water to small institutional users (e.g., VA Medical Center, Santa Rita, Camp Parks) with a total demand of 1,100 acre-feet/year. This demand is expected to remain relatively constant for the foreseeable future. The Zone also supplies 400 acre-feet per year of untreated non-agricultural water to Oakland Scavenger and Springtown Golf Course. The current agricultural demand from Zone 7 is 3,000 acre-feet per year. For planning purposes it is assumed that the foreseeable demand in the small treated, untreated and agriculture users will be 5,000 acre-feet per year.

Figure 2 shows the municipal and industrial (M&I) water needs for various population levels assuming per capita water use consumption rates ranging from 180 to 230 gallons per day per capita. Historically, Zone 7 has used 160 to 180 gallons per day per capita until large scale commercial and industrial development came to the Valley in the early 1980's. Currently, an overall community consumption rate of 210 gallons per day per capita is used for planning purposes. The current available water supply for M&I purposes is 40,900 acre-feet per year. This is based on an average yield from the State Water Project of 31,700 acre-feet, plus 7,200 acre-feet from groundwater IQ pumpage, plus an average annual yield of 7,000 acre-feet from the Arroyo del Valle, less 5,000 acre-feet of State Water Project water to be used for agriculture (see Table 1). An average annual supply of 40,900 acre-feet of water could meet the needs of 174,000 people based on a consumption rate of 210 gallons per day per capita. As a basis for comparison the 1991 population

estimate for the Zone 7 service area by Alameda County Planning Department was 133,000. If the annual growth rate were 2% to 3%, the growth from 133,000 to 174,000 would occur in 9 to 14 years.

If Best Management Practices (BMPs) and water conservation resulted in a 10% reduction in consumption rate to 190 gallons per day per capita, then 40,900 acre-feet could meet the needs of 192,000 people. This could provide for an additional three to five years of growth over the 174,000 figure assuming a two to three percent growth rate.

If the planned facilities (Delta facilities, Kern Water Bank, and Los Banos Grandes Reservoir) are added to the State Water Project, then the average yield from the SWP to Zone 7 would increase from 31,700 acre-feet to 40,100 acre-feet, and the available water for M&I purposes would increase from 40,900 acre-feet to 49,300 acre-feet. An average annual amount of 49,300 acre-feet could meet the needs of 210,000 people, assuming a 210 gallons per day per capita consumption rate, or 231,000 people if BMPs and water conservation reduced the consumption rate to 190 gallons per day per capita. The 210,000 population level could be attained in 15 to 23 years depending on the growth rate (2% to 3% per year), while the 231,000 level would take 19 to 28 years.

In an April 1990 report prepared for the Tri-Valley Wastewater Authority (TWA), TWA's consultant presented population potentials for existing General Plans and for the "prospective" General Plans. The "prospective" General Plans include the existing General Plans plus major planning areas where the planning process has been initiated. Such areas include East Dublin, West Dublin, Pleasanton Ridge, and North Livermore. For the areas served by Zone 7 the population potential per the existing General Plans is 188,000 and the population potential per the "prospective" General Plans is 274,000.

To be consistent with TWA planning and the "prospective" General Plans being considered by the Valley's planning agencies, it would be appropriate for Zone 7 to start planning to meet the M&I water needs of 274,000 people. Assuming a 210 gallons per day per capita consumption rate, the annual M&I water needs would be 64,400 acre-feet. This is approximately 25,000 acre-feet more than the 40,900 acre-feet available through current sources (no added facilities to the State Water Project). As discussed previously, possible water sources to meet this future demand include water marketing/transfers, recycled water, and additional storage (e.g., Upper Del Valle Reservoir); these are summarized in Table 2.

CONCLUSIONS

Zone 7's current water supply can meet the needs of 174,000 to 192,000 people depending on how successful BMPs and water conservation are in reducing water demands. If DWR completes planned additions to the State Water Project, the Zone could supply the needs of 210,000 to 231,000 people.

Existing general plans have a population potential of 188,000 in the Zone 7 water service area. Prospective general plans have a potential of 274,000. To meet the needs of 274,000 people, the Zone will need to develop 25,000 acre-feet per year of new water. Possible sources of water include water marketing, recycled water, and additional storage.

TABLE 1

SUMMARY OF THE LIVERMORE-AMADOR VALLEY'S
EXISTING WATER SUPPLIES AVAILABLE TO MEET
MUNICIPAL & INDUSTRIAL (M&I) NEEDS

Source	Local Pumpers[1]	Independent Quotas[2]	Zone 7	Valley Totals	Water Available to Meet Existing M&I Demand
Safe Ground-Water Yield	6,000	7,200	---	13,200	7,200
Del Valle Reservoir Storage			7,000	7,000	7,000
State Water Project (SWP)			31,700	31,700	31,700
Less the Water Reserved for Small Systems and Agriculture					- 5,000
Totals	6,000	7,200	39,700	51,900	40,900

1 Local pumpers consist of agricultural users and gravel mining users.

2 IQ is the amount of groundwater the Zone's 4 major purveyors are permitted by contract to pump from the groundwater basin.

TABLE 2

SUMMARY OF POSSIBLE WATER SOURCES AND AMOUNTS AVAILABLE
TO MEET FUTURE VALLEY MUNICIPAL & INDUSTRIAL (M&I) DEMANDS

Existing Supply	Los Banos Grande	Water Marketing	Additional Storage	Recycled Water	Totals
40,900	---	---	---	---	40,900
40,900	8,400	---	---	---	49,300
40,900	---	14,300	---	---	55,200
40,900	---	---	20,000	---	60,900
40,900	---	---	---	25,000	65,900

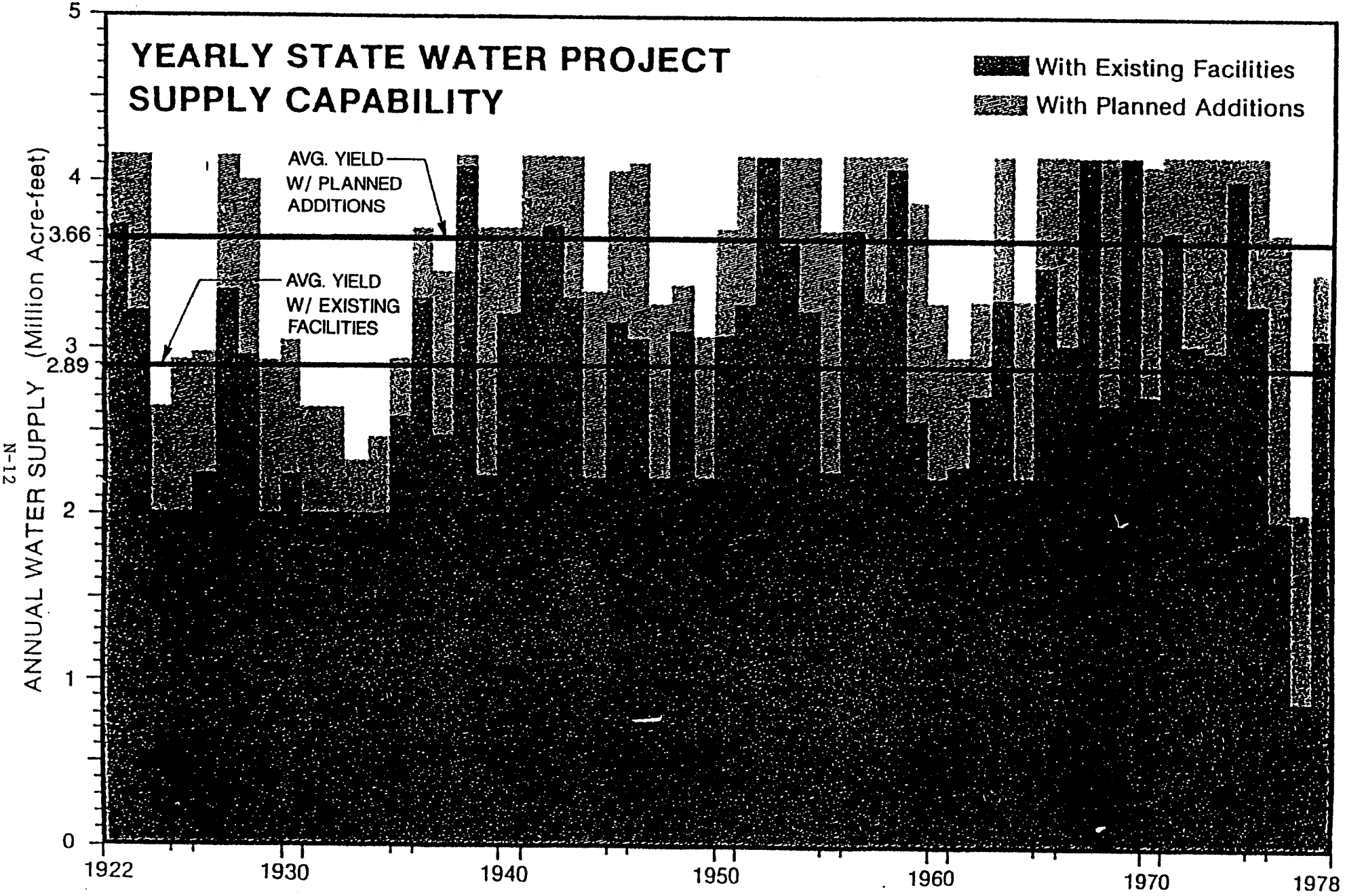

FIGURE 1

REFERENCE: "THE CALIFORNIA STATE WATER PROJECT" BROCHURE (1989) BY DEPT. OF WATER RESOURCES

ZONE 7 MUNICIPAL AND INDUSTRIAL WATER NEEDS AND POPULATION

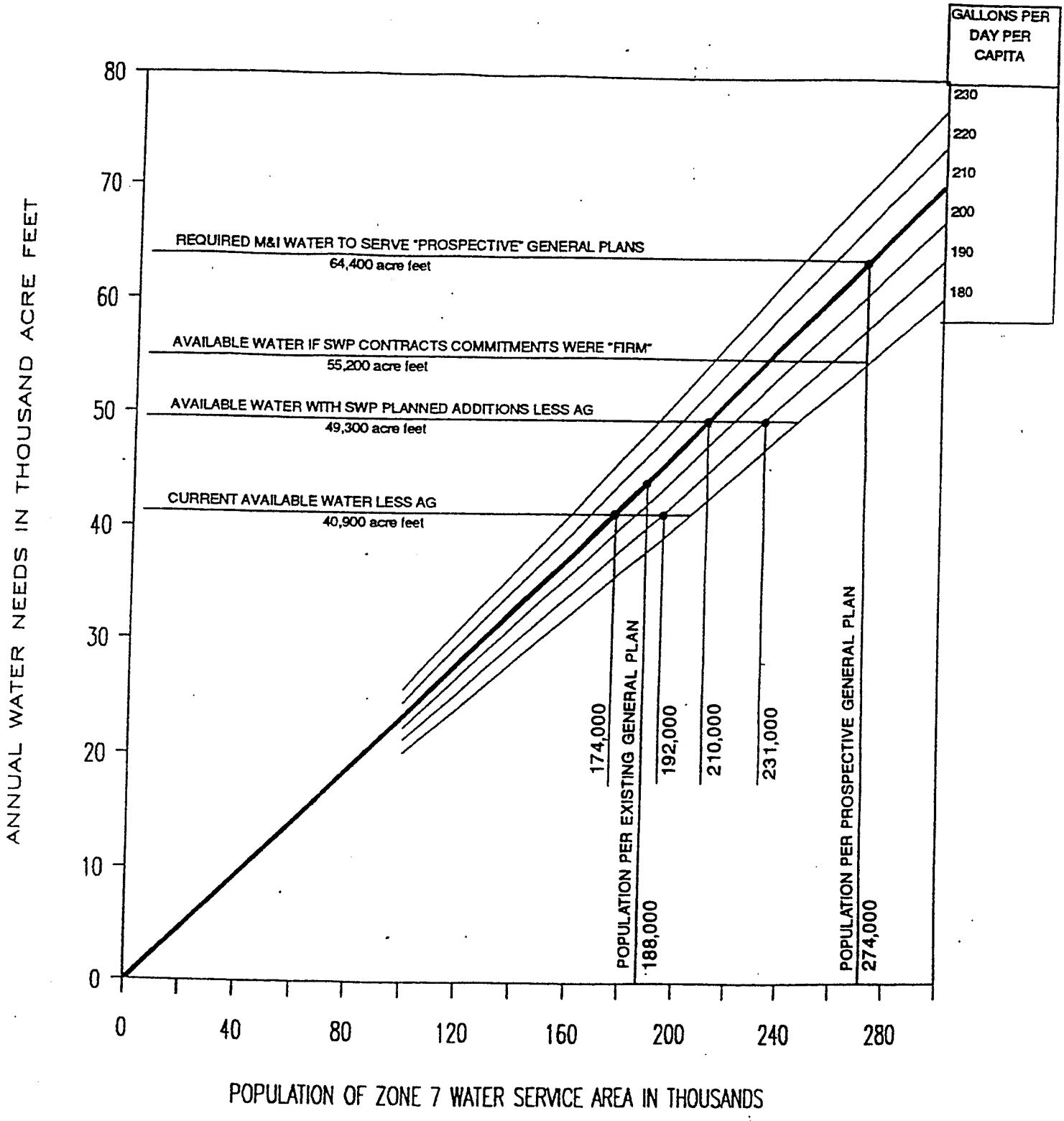

FIGURE 2