SUBMITTAL TO THE BOARD OF SUPERVISORS
COUNTY OF RIVERSIDE, STATE OF CALIFORNIA 607B

REVIEWED BY EXECUTIVE OFFICE
DATE 5/11/11 Tina Grande
Departmental Concurrence

FROM: TLMA - Planning Department

SUBMITTAL DATE:
May 5, 2011

SUBJECT: TENTATIVE PARCEL MAP NO. 30298 – Intent to Adopt a Negative Declaration – Applicant: Randy and Cindy Horton – Engineer/Representative: Southland Engineering - Third Supervisorial District – Rancho California Zoning Area - Southwest Area Plan: Rural Community: Estate Density Residential (RC: EDR) (2 Acre Minimum) – Location: Southerly of Glen Oaks Road, westerly of Calle Bellagio, and easterly of Corte Venture – 12.19 Gross Acres - Zoning: Rural Residential (R-R) - **REQUEST:** The tentative parcel map is a Schedule H subdivision of 12.19 acres into four (4) residential parcels with a minimum parcel size of two (2) acres.

RECOMMENDED MOTION:

RECEIVE AND FILE The Notice of Decision for the above referenced case acted on by the Planning Director on April 11, 2011.

The Planning Department recommended Approval; and,
THE PLANNING DIRECTOR:

ADOPTED a **NEGATIVE DECLARATION** for **ENVIRONMENTAL ASSESSMENT NO. 40617**, based on the findings incorporated in the initial study and the conclusion that the project will not have a significant effect on the environment; and,

APPROVED TENTATIVE PARCEL MAP NO. 30298, subject to the attached Conditions of Approval, and based upon the findings and conclusions incorporated in the staff report.

Carolyn Syms Luna
Planning Director

Initials:
CSL:vc

☐ Policy ☐ Policy
☒ Consent ☒ Consent
Dep't Recomm.: Per Exec. Ofc.:

MINUTES OF THE BOARD OF SUPERVISORS

On motion of Supervisor Stone, seconded by Supervisor Benoit and duly carried by unanimous vote, IT WAS ORDERED that the above matter of approval is received and filed as recommended.

Ayes:	Buster, Tavaglione, Stone, Benoit and Ashley
Nays:	None
Absent:	None
Date:	May 17, 2011
xc:	Planning, Applicant

Kecia Harper-Ihem
Clerk of the Board
By: Deputy

Prev. Agn. Ref.	District: Third	Agenda Number: 1.2

RIVERSIDE COUNTY
PLANNING DEPARTMENT

Carolyn Syms Luna
Director

Original Negative Declaration/Notice of Determination was routed to County Clerks for posting on.

6/6/11 (Date) KH (Initial)

TO: ☐ Office of Planning and Research (OPR)
P.O. Box 3044
Sacramento, CA 95812-3044
☒ County of Riverside County Clerk

FROM: Riverside County Planning Department
☒ 4080 Lemon Street, 12th Floor
P. O. Box 1409
Riverside, CA 92502-1409
☐ 38686 El Cerrito Road
Palm Desert, California 92211

SUBJECT: Filing of Notice of Determination in compliance with Section 21152 of the California Public Resources Code.

EA40617 / PM30298
Project Title/Case Numbers

Kinika Hesterly — (951) 955-1888
County Contact Person — *Phone Number*

N/A
State Clearinghouse Number (if submitted to the State Clearinghouse)

Randy Horton — 41141 Raintree Ct, Murrieta, CA 92562
Project Applicant — *Address*

The project site is located in the community of Rancho California of the Southwest Area Plan in Western Riverside County; more specifically, southerly of Glen Oaks Road, westerly of Calle Bellagio, and easterly of Corte Venture.
Project Location

The tentative parcel map is a Schedule H subdivision of 12.19 acres into four (4) residential parcels with parcels ranging from 3.0 to 3.2 gross acres. An existing single family residence is located on Parcel No. 4.
Project Description

This is to advise that the Riverside County Planning Director, as the lead agency, has approved the above-referenced project on March 28, 2011, and has made the following determinations regarding that project:

1. The project WILL NOT have a significant effect on the environment.
2. A Negative Declaration was prepared for the project pursuant to the provisions of the California Environmental Quality Act ($2,044.00 + $64.00).
3. Mitigation measures WERE NOT made a condition of the approval of the project.
4 A Mitigation Monitoring and Reporting Plan/Program WAS NOT adopted.
5. A statement of Overriding Considerations WAS NOT adopted for the project.

This is to certify that the Negative Declaration, with comments, responses, and record of project approval is available to the general public at: Riverside County Planning Department, 4080 Lemon Street, 12th Floor, Riverside, CA 92501.

Kinika Hesterly — Project Planner — _____
Signature — *Title* — *Date*

Date Received for Filing and Posting at OPR: _____

kh/rj
Revised 8/25/2009
Y:\Planning Case Files-Riverside office\PM30298\DH-PC-BOS Hearings\NOD.PM30298.docx

Please charge deposit fee case#: ZEA40617 ZCFG04067 .

FOR COUNTY CLERK'S USE ONLY MAY 17 2011 1.2

RIVERSIDE COUNTY
PLANNING DEPARTMENT

Carolyn Syms Luna
Director

NEGATIVE DECLARATION

Project/Case Number: PM30298

Based on the Initial Study, it has been determined that the proposed project will not have a significant effect upon the environment.

PROJECT DESCRIPTION, LOCATION (see Environmental Assessment).

COMPLETED/REVIEWED BY:

By: Kinika Hesterly Title: Project Planner Date: 2/23/11

Applicant/Project Sponsor: Randy Horton Date Submitted: January 10, 2006

ADOPTED BY: Planning Director

Person Verifying Adoption: Kinika Hesterly Date: March 28, 2011

The Negative Declaration may be examined, along with documents referenced in the initial study, if any, at:

Riverside County Planning Department, 4080 Lemon Street, 12th Floor, Riverside, CA 92501

For additional information, please contact Kinika Hesterly at (951) 955-1888.

Revised: 10/16/07
Y:\Planning Case Files-Riverside office\PM30298\DH-PC-BOS Hearings\ND.PM30298.docx

Please charge deposit fee case#: ZEA40617 ZCFG04067 .

FOR COUNTY CLERK'S USE ONLY MAY 17 2011 1.2

COUNTY OF RIVERSIDE J* REPRINTED * R0601506
SPECIALIZED DEPARTMENT RECEIPT
Permit Assistance Center

4080 Lemon Street	39493 Los Alamos Road	82675 Highway 111
Second Floor	Suite A	Room 209
Riverside, CA 92502	Murrieta, CA 92563	Indio, CA 92201
(951) 955-3200	(951) 694-5242	(760) 863-8271

****
****

Received from: HORTON RANDY $64.00
paid by: CK 5657
CALIFORNIA FISH AND GAME FOR EA 40617
paid towards: CFG04057 CALIF FISH & GAME: DOC FEE
at parcel: 40190 CALLE BELLAGIO TEM
appl type: CFG3

By_____ Jan 26, 2006 15:24
MGARDNER posting date Jan 26, 2006

****
****

Account Code	Description	Amount
658353120100208100	CF&G TRUST: RECORD FEES	$64.00

Overpayments of less than $5.00 will not be refunded!

COPY 2-TLMA ADMIN * REPRINTED *

COUNTY OF RIVERSIDE * REPRINTED * I1100217
SPECIALIZED DEPARTMENT RECEIPT
Permit Assistance Center

4080 Lemon Street	39493 Los Alamos Road	38686 El Cerrito Road
Second Floor	Suite A	Palm Desert, CA 92211
Riverside, CA 92502	Murrieta, CA 92563	(760) 863-8277
(951) 955-3200	(951) 600-6100	

****
****

Received from: HORTON RANDY $167.25
paid by: VI 128062
paid towards: CFG04057 CALIF FISH & GAME: DOC FEE
CALIFORNIA FISH AND GAME FOR EA 40617
at parcel #: 40190 CALLE BELLAGIO TEM
appl type: CFG3

By_____ Jan 26, 2011 08:32
JCMITCHE posting date Jan 26, 2011

****
****

Account Code	Description	Amount
658353120100208100	CF&G TRUST	$167.25

Overpayments of less than $5.00 will not be refunded!

Additional info at www.rctlma.org

COPY 1-CUSTOMER * REPRINTED *

COUNTY OF RIVERSIDE * REPRINTED * R0806920
SPECIALIZED DEPARTMENT RECEIPT
Permit Assistance Center

4080 Lemon Street	39493 Los Alamos Road	38686 El Cerrito Road
Second Floor	Suite A	Palm Desert, CA 92211
Riverside, CA 92502	Murrieta, CA 92563	(760) 863-8277
(951) 955-3200	(951) 600-6100	

****

Received from: HORTON RANDY $1,876.75
paid by: CK 6195
paid towards: CFG04057 CALIF FISH & GAME: DOC FEE
CALIFORNIA FISH AND GAME FOR EA 40617
at parcel #: 40190 CALLE BELLAGIO TEM
appl type: CFG3

By_____ Jul 03, 2008 09:22
MBRASWEL posting date Jul 03, 2008

****

Account Code	Description	Amount
6583531201002081 00	CF&G TRUST	$1,876.75

Overpayments of less than $5.00 will not be refunded!

Additional info at www.tlma.co.riverside.ca.us/lms/lms.htm

COPY 1-CUSTOMER * REPRINTED *

RIVERSIDE COUNTY
PLANNING DEPARTMENT

Carolyn Syms Luna
Director

6073

DATE: April 28, 2011

TO: Clerk of the Board of Supervisors

FROM: Planning Department - Riverside Office

SUBJECT: TENTATIVE PARCEL MAP NO. 30298 – Intent to Adopt a Negative Declaration
(Charge your time to these case numbers)

The attached item(s) require the following action(s) by the Board of Supervisors:

- ☒ Place on Administrative Action (Receive & File; EOT)
  - ☐ Labels provided If Set For Hearing
    - ☐ 10 Day ☐ 20 Day ☐ 30 day
- ☐ Place on Consent Calendar
- ☐ Place on Policy Calendar (Resolutions; Ordinances; PNC)
- ☐ Place on Section Initiation Proceeding (GPIP)
- ☐ Set for Hearing (Legislative Action Required; CZ, GPA, SP, SPA)
- ☐ Publish in Newspaper:
  - **SELECT Advertisement**
- ☐ **SELECT CEQA Determination**
  - ☐ 10 Day ☐ 20 Day ☐ 30 day
- ☐ Notify Property Owners (app/agencies/property owner labels provided)

Controversial: ☐ YES ☐ NO

Designate Newspaper used by Planning Department for Notice of Hearing:
(3rd Dist) Press Enterprise and The Californian

Need Director's signature by 5/4/11
Please schedule on the May 17, 2011 BOS Agenda

Documents to be sent to County Clerk's Office for Posting within five days:
Notice of Determination and Mit Neg Dec Forms
Fish & Game Receipt (CFG4057)

Do not send these documents to the County Clerk for posting until the Board has taken final action on the subject cases.

Riverside Office · 4080 Lemon Street, 12th Floor
P.O. Box 1409, Riverside, California 92502-1409
(951) 955-3200 · Fax (951) 955-1811

Desert Office · 38686 El Cerrito Road
Palm Desert, California 92211
(760) 863-8277 · Fax (760) 863-7555

"Planning Our Future… Preserving Our Past"

Agenda Item No.:
Area Plan: Southwest
Zoning Area: Rancho California
Supervisorial District: Third
Project Planner: Kinika Hesterly
Directors Hearing: April 11; 2011
Continued From: March 28, 2011

TENTATIVE PARCEL MAP NO. 30298
E.A. Number: 40617
Applicant: Randy Horton
Engineer/Rep.: Southland Engineering

COUNTY OF RIVERSIDE PLANNING DEPARTMENT
ADDENDUM STAFF REPORT

PROJECT DESCRIPTION AND LOCATION:

The Environmental Assessment was changed to reflect the appropriate designation for Agriculture & Forest Resources. The project is not located in an area designated Prime Farmland or Unique Farmland. Instead, it is designated Farmland of Local Importance and Other Lands.

Condition of Approval 10.Every.4 was added to reflect revisions to the language in the "Hold Harmless" condition.

Exhibit E, delineated the area surrounding the watercourse was added to the project per the Hearing Officer at Director's Hearing.

The following conditions were added to the project by the Hearing Officer at Director's Hearing and the biological section of the environmental assessment was revised:

The project site supports an approximately 0.91 acre drainage that qualifies as a Riparian/Riverine feature as defined by Section 6.1.2 of the MSHCP and thus must be avoided. No disturbance, surface alterations, or grading may occur in the feature or within the associated vegetation. To help insure protection of the feature the drainage must clearly be shown on an Environmental Constraint Sheet (ECS) and labeled Riparian/Riverine Area Not to be Disturbed (COA 10.EPD.1).

Exhibit E- PM 30298 Prior to GRADE PERMIT The approximately 0.91 acre drainage and associated vegetation as show on Exhibit E (ECS-PM30298), dated 4/18/11, is a Riparian/Riverine feature as defined by Section 6.1.2 of the MSHCP and thus must be avoided. The 0.91 acre drainage must be clearly mapped on the ECS (Environmental Constraints Sheet) and must be labeled as "Riparian/Riverine Drainage Not to be Disturbed." No grading, surface alterations or disturbance shall occur in the mapped area. No modifications to the drainage shall take place without further consultation and approval from the Environmental Programs Division of the Planning Department. The ESC shall be reviewed and approved by EPD (COA 50.EPD.1 and 60.EPD.1).

Agenda Item No.: 2.6
Area Plan: Southwest
Zoning Area: Rancho California
Supervisorial District: Third
Project Planner: Kinika Hesterly
Directors Hearing: April 11, 2011
Continued From: March 28, 2011

TENTATIVE PARCEL MAP NO. 30298
E.A. Number: 40617
Applicant: Randy Horton
Engineer/Rep.: Southland Engineering

COUNTY OF RIVERSIDE PLANNING DEPARTMENT
STAFF REPORT

PROJECT DESCRIPTION AND LOCATION:

The tentative parcel map is a Schedule H subdivision of 12.19 acres into four (4) residential parcels with parcels ranging from 3.0 to 3.2 gross acres. An existing single family residence is located on Parcel No. 4.

The project site is located in the community of Rancho California of the Southwest Area Plan in Western Riverside County; more specifically, southerly of Glen Oaks Road, westerly of Calle Bellagio, and easterly of Corte Venture.

FURTHER PLANNING CONSIDERATIONS:

The project was continued at Director's Hearing on March 28th to allow staff and the applicant to review comments submitted by Johnson & Sedlack, Attorneys at Law. As of this writing, staff has not completed this review but intends to provide a response from the review at Director's Hearing.

SUMMARY OF FINDINGS:

1. General Plan Land Use:	Rural Community: Estate Density Residential (RC: EDR) (2 Acre Minimum)
Surrounding General Plan Land Use:	Rural Community: Estate Density Residential (RC: EDR) (2 Acre Minimum)
2. Existing Zoning:	Rural Residential (R-R)
4. Surrounding Zoning:	Rural Residential (R-R) to the south and east and Residential Agricultural – 2-½ Acre Minimum (R-A-2-½) to the north and west.
5. Existing Land Use:	Single Family Residence
6. Surrounding Land Use:	Scattered Single family residences on two acres or more to the north, south, east, and west.
7. Project Data:	Total Acreage: 12.19 Gross Acres Total Proposed Lots: 4 Proposed Min. Lot Size: 2 Acres Schedule: H
8. Environmental Concerns:	See attached Environmental Assessment

DM.

RECOMMENDATIONS:

ADOPTION of a **NEGATIVE DECLARATION** for **ENVIRONMENTAL ASSESSMENT NO. 40617**, based on the findings incorporated in the initial study and the conclusion that the project will not have a significant effect on the environment; and,

APPROVAL of **TENTATIVE PARCEL MAP NO. 30298**, subject to the attached conditions of approval, and based upon the findings and conclusions incorporated in the staff report.

CONCLUSIONS:

1. The proposed project is in conformance with the Rural Community: Estate Density Residential (RC: EDR) (2 Acre Minimum) Land Use Designation, and with all other elements of the Riverside County General Plan.

2. The proposed project is consistent with the Rural Residential (R-R) zoning classification of Ordinance No. 348, and with all other applicable provisions of Ordinance No. 348.

3. The proposed project is consistent with the Schedule H map requirements of Ordinance No. 460, and with all other applicable provisions of Ordinance No. 460.

4. The public's health, safety, and general welfare are protected through project design.

5. The proposed project is compatible with the present and future logical development of the area.

6. The proposed project will not have a significant effect on the environment.

7. The proposed project will not preclude reserve design for the Western Riverside Multi-Species Habitat Conservation Plan (MSHCP).

FINDINGS: The following findings are in addition to those incorporated in the summary of findings, and in the attached Environmental Assessment, which is incorporated herein by reference.

1. The project site is designated Rural Community: Estate Density Residential (RC: EDR) (2 Acre Minimum) on the Southwest Area Plan.

2. The proposed map, four (4) residential parcels with a minimum of parcel size of two (2) acres, is permitted in the Rural Community: Estate Density Residential (RC: EDR) (2 Acre Minimum) designation.

3. The project site is surrounded by properties which are designated Rural Community: Estate Density Residential (RC: EDR) (2 Acre Minimum).

4. The zoning for the subject site is Rural Residential (R-R).

5. The proposed map, four (4) residential parcels with a minimum of parcel size of two (2) acres, is consistent with the development standards set forth in the Rural Residential (R-R) zone.

6. The project site is surrounded by properties which are zoned Rural Residential (R-R) to the north, south, and east and Residential Agricultural – 2-½ Acre Minimum (R-A-2-½) to the north and west.

7. Single family residences and vacant land are within the project vicinity.

8. Environmental Assessment No. 40617 did not identify any significant effects that the project would have on the environment.

9. This project is not located within a Criteria Area of the Western Riverside Multi-Species Habitat Conservation Plan.

INFORMATIONAL ITEMS:

1. As of this writing, comments from Johnson & Sedlack, Attorneys at Law, were submitted on March 25, 2011.

2. The project site is not located within:
   a. A city sphere of influence;
   b. A 100-year flood plain, or dam inundation area;
   c. A MSHCP Core Reserve Area; or,

3. The project site is located within:
   a. The boundaries of the Temecula Valley Unified School District;
   b. The Valley-Wide Recreation and Parks District;
   c. County Service Area No. 149;
   d. Santa Margarita Watershed;
   e. Unique Farmland;
   f. Murrieta Creek / Santa Gertrudis Valley Area Drainage Plan; and
   g. The Stephens Kangaroo Rat Fee Area.

4. The subject site is currently designated as Assessor's Parcel Number 941-080-027.

5. This project was filed with the Planning Department on January 10, 2006.

6. This project was reviewed by the Land Development Committee two (2) times on the following dates: 5/04/06 and 4/10/08.

7. Deposit Based Fees charged for this project, as of the time of staff report preparation, total $16,103.11.

KH:kh
Y:\Planning Case Files-Riverside office\PM30298\DH-PC-BOS Hearings\PM30298 Staff Report.doc
Date Prepared: 03/05/08
Date Revised: 4/04/11

Johnson & Sedlack
ATTORNEYS at LAW

Raymond W. Johnson, Esq. AICP
Abigail A. Broedling, Esq.
Kimberly Foy, Esq.
Carl T. Sedlack, Esq. Retired

26785 Camino Seco, Temecula, CA 92590

E-mail: EsqAICP@WildBlue.net
Abby.JSLaw@gmail.com
Kim.JSLaw@gmail.com
Telephone: 951-506-9925
Facsimile: 951-506-9725

March 25, 2011

VIA EMAIL AND U.S. MAIL

Riverside County Planning Department
Attn: Kinika Hesterly
Project Planner
P.O. Box 1409
Riverside, CA 92502-1409

RE: Intent to Adopt a Negative Declaration for Environmental Assessment No.40617 and Approve Tentative Parcel Map No. 30298.

Greetings:

We submit these comments on behalf of concerned citizens residing in the area regarding the intent to adopt a Negative Declaration (ND) for Environmental Assessment No. 40617 and approve Tentative Parcel Map (TPM) No. 30298 (collectively, the "project"). The project involves a subdivision of 12.19 acres into four residential parcels in the community of Rancho California of the Southwest Area Plan in Western Riverside County.

The ND fails to provide an adequate project description by failing to discuss road paving and expansion. The project will pave Calle Bellagio and Corte Venture with 24 feet of aggregate on a 32 foot graded section within a 60-ft full width dedicated right-of-way. Glen Oaks Road will be improved at the intersection of Corte Venture and Calle Bellagio with 7 feet of pavement for acceleration/deceleration lanes and 6 feet for left turn lanes. This road paving was improperly not provided in the project description or analyzed as part of the project in the ND.

The ND prepared for this project fails as an informational document. The ND generally fails to consider impacts from construction. This is improper as CEQA requires that the project as a whole be considered in determining environmental impacts. There is also no attempt to quantify many of the project's potentially significant impacts and essential studies have not been undertaken. The findings of fact are therefore almost constantly conclusory and not supported by substantial evidence in the record.

The utilization of a ND for this project is improper as there is substantial evidence in the record to support a fair argument that significant environmental impacts will result from this project. An EIR is required for any proposed project that may have a significant effect on the environment.

(Public Resources Code §21100 (a)). If a lead agency is presented with a fair argument based on substantial evidence in the record that a project may have a significant effect on the environment, an EIR must be prepared. (Cal. Code of Regs, Tit.14 ("Guidelines") §15064(f)(1), *No Oil, Inc. v. City of Los Angeles* (1974) 13 Cal.3d 68.) Substantial evidence consists of fact, reasonable assumption predicated on fact, or expert opinion supported by fact. (Public Resources Code §21080 (e)(1).) Here, as detailed below, there is a fair argument that impacts to agriculture, biological resources, cultural resources, hydrology, geology, and noise, among others, will be potentially significant. An Environmental Impact Report (EIR) must be prepared for the project.

CEQA also requires that all feasible mitigation be implemented to reduce or avoid the significant impacts of a project. Despite there being substantial evidence in the record of potentially significant impacts from this project, as discussed below, no mitigation measures have been required to reduce these impacts. This is a violation of CEQA. The ND was also not circulated to the State Clearinghouse as required.

The project is likely to have significant impacts to/from the following:

Biological Resources:

A large watercourse traverses the northern portion of the site. The watercourse has a tributary watershed of approximately 140 acres and is a natural watercourse (*See, 10 Flood RI 1.)* Yet, the ND found that this watercourse did not provide/ constitute riparian habitat. ***This finding is not supported by any facts or evidence in the record.*** Furthermore, the ND does not state whether the watercourse contains any migratory fish, whether the watercourse is a federally protected wetland, etc. Neither DFG nor US Fish and Wildlife Service were contacted to evaluate potential impacts. Any finding of a less than significant impact is conclusory and not supported in the record.

The ND also fails to consider impacts from construction noise and vibrations on biological resources. The ND also fails to consider the impacts from road expansion and paving on biological impacts. These impacts should be considered potentially significant.

Hydrology/Water Quality:

The ND again gives short shrift to the "large watercourse" onsite. Will the project alter this watercourse? Will it cause additional runoff to this watercourse or erosion which will impact downstream sites? The ND does not evaluate these potential impacts but instead concludes based on no evidence that the project will have a less than significant impact. Moreover, it is not shown that COA 10 Flood RI 1 will reduce potential impacts to downstream sites below a level of significance. For instance, additional instream flows, flow rates, and similar issues are not mitigated with this COA. Accordingly, this impact should be considered potentially significant.

Agricultural Resources:

The project will convert an area that is designated Prime Farmland, Unique Farmland, or Farmland of Statewide Importance to non-agricultural use, namely to residential uses. This should be deemed a potentially significant and unmitigated impact.

The General Plan EIR's finding of no available mitigation measures at a county-wide level does not preclude the availability of mitigation measures at a project-specific level nor support a determination that such agricultural impacts are less than significant. The General Plan EIR found that impacts to agricultural resources were significant with the land use designation but immitigable at a large-scale level. This supports a determination that project-specific agricultural impacts are potentially significant.

Such impacts are not mitigated with the project, despite the fact that feasible mitigation is available at a project specific level. Tiering does not excuse an agency from adequately analyzing the potential significant impacts of a project or requiring that all feasible mitigation be adopted. (State CEQA Guidelines § 15152) Requiring a permanent agricultural conservation easement on land or a Williamson Act contract by one of the following methods would mitigate significantly for impacts and is not shown to be infeasible at this project size:

1. The outright purchase of easements, or
2. Donation of mitigation fees to a local, regional, or statewide organization that provides for acquisition and stewardship of agricultural conservation easements.

See the attached Agricultural Mitigation Policies, pg. 2-5. See also, California Farmland Conservation Program website for Agricultural Conservation Easements for potential conservation options. <http://www.conservation.ca.gov/dlrp/cfcp/overview/Pages/index.aspx>

Likewise, the potential of the project to result in the conversion of other agricultural land in the area should be considered potentially significant and unmitigated. Increasing development pressures and the effects of urbanization on farmlands close to cities has led to a substantial reduction in farmland. The General Plan Land Use Element recognizes this issue, stating, "Many existing agricultural areas have been or are in danger of being encroached upon by uses that are negatively impacted by some agricultural operations, such as residences and schools. As agricultural lands become less productive or are encroached upon, there is a danger of these uses becoming less economically viable, becoming subdivided, or converting to other uses." This project involves the conversion of Prime Farmland, Unique Farmland, or Farmland of Statewide Importance near to other agricultural users, and will likely increase development pressures on nearby agricultural properties. This impact is potentially significant and unmitigated.

Cultural Resources:

An essential study was not undertaken to determine whether impacts to cultural resources will be significant. The ND states that the Eastern Information Center of the State Office of Historic Preservation recommends a Phase 1 cultural resources study onsite based on the potential for the

presence of cultural resources in the area. Instead of undertaking this study, the ND finds that impacts to archaeological resources will be less than significant based on the presumption that no ground disturbing activity will occur. However, *there is no prohibition on ground disturbing activities* and in fact, given the potentially expansive soils onsite, ground disturbing activities are likely to occur. The COAs seem to recognize the potential for grading and site disturbance, as numerous COAs apply to site grading/disturbance. Moreover, as no study has determined the extent and significance of archaeological resources onsite, there is no basis to determine that COA 10 Planning 2 will reduce potential impacts to a level below significance. This is a potentially significant impact which must be evaluated through the preparation of an EIR.

COA 10 Planning 2 is also uncertain to mitigate impacts. There is no requirement that an archaeological monitor onsite during grading activities in order to determine whether cultural resources are uncovered. There is also no requirement that *mitigation be concluded* prior to resuming further ground disturbance.

Alternatively, a COA should be required of the project prohibiting all ground disturbance activities on the project site.

Geology/Soils:

The project may be located on expansive soils, yet no soils/geological study was undertaken for the project to determine whether this will constitute a significant impact. This improperly defers an essential study in violation of CEQA. Moreover, the ND does not describe how CBC requirements will mitigate these impacts. Common methods of mitigation for expansive soils include over-excavation, importing non-expansive fill soils, the requirement of deepened building footings, underpinning, etc. (*See, Damage to Foundations from Expansive Soils,* J. David Rogers, Robert Olshansky, and Robert B. Rogers, available at <http://web.mst.edu/~rogersda/expansive_soils/DAMAGE%20TO%20FOUNDATIONS%20FROM%20EXPANSIVE%20SOILS.pdf>.) These measures may, in turn, result in significant impacts to cultural resources by requiring additional ground disturbing. These measures may also result in significant air quality impacts from importing fill soil to the site and additional erosion. These impacts are not evaluated or disclosed in the ND and are potentially significant. The ND thus fails as an informational document.

Likewise, impacts to/from erosion are not evaluated in the ND and only conclusory statements are made in the narrative of less than significant impact. Given that there is a "large watercourse" onsite, it is illogical and contradictory to state that the project will not alter deposition, siltation, or erosion because there are no rivers, streams, or lakes within the vicinity of the project site. This conclusory finding is not supported by any evidence.

Noise:

Impacts from construction noise are likely to be significant and are not mitigated below a level of significance through merely restricting construction to "daylight hours." The

construction of the project would still result in a substantial temporary increase in ambient noise levels above those currently existing, which is the threshold question. This is a potentially significant impact for which no mitigation has been required. An EIR is required to evaluate this impact.

The ND also does not analyze whether construction noise will result in the exceedence of noise standards and makes no attempt to quantify project construction noise levels. Documents attached to this letter detail average construction noise and its impacts. (*See, for instance,* Construction Noise Handbook Chapter 9, Table 9.1.) This project is likely to exceed the standards established in the County General Plan during construction. This is a potentially significant impact and an EIR is required.

Air Quality:

The ND fails to consider impacts from potential import of soils to the site which will result in PM emissions. The ND also fails to consider air quality impacts from construction of the road paving/ road improvements, which will result in at least PM, VOC and ROG emissions. (*See, EMEP/EEA Emission Inventory Guidebook 2009,* <http://www.eea.europa.eu/publications/emep-eea-emission-inventory-guidebook-2009/part-b-sectoral-guidance-chapters/2-industrial-processes/2-a-mineral-industry/2-a-6-road-paving-with-asphalt.pdf> and attached documents.) The ND therefore fails to consider the whole of the project in determining that impacts will be less than significant in violation of the requirements of CEQA. There has also been no attempt to quantify these construction impacts. The findings of the ND are thus conclusory and not based on substantial evidence.

Summary:

Overall, the ND fails to consider the whole of the project, fails to undertake essential studies, and fails to quantify impacts such that significance may be determined based on evidence. The narratives in the ND are, of necessity, constantly conclusory as there is no evidence on which to base determinations. An EIR must be prepared for this project to adequately evaluate and mitigate for the potentially significant impacts identified above.

Thank you for your consideration of the above comments.

Sincerely,

Raymond W. Johnson
JOHNSON & SEDLACK

To: Riverside County Planning Department
Attn: Kinika Hesterly
Project Planner
P>O> Box 1409
Riverside, CA 92592-1409

RE: Intent to Adopt a Negative Declaration for Environmental Assessment No. 40617 and Approve Tentative Parcel Map No. 30298

Greetings:

I, Randy W. Horton submit these responses to the Riverside County Planning Department with regards to the information received from Raymond W. Johnson, Johnson & Sedlack, Attorneys, on the above mentioned tentative parcel map 30298. I will respond the each item in order presented on the summation page.

1. The comments listed concerning road paving issues as presented by the attorneys are inaccurate.
   A. Calle Bellagio is and has been a paved non county, maintained road, paid for by local residents, the current project only requests eight feet of aggregate base on the eastern edge of the road for the project. No paving is required, as assumed by the attorneys.
   B. Corte Venture is not currently a road, the adjacent Parcel Map #25903 has a bond in place for the establishment of Corte Venture. It is not a requirement to have Corte Venture paved but rather to have proper grading completed and road base compacted for access and egress, for four parcels, which was a requirement listed on Parcel Map 25903. This will not be a publicly maintained road. This road is not part of the parcel map 30298 since the bond is currently in place for the completion of the grading and aggregate base for Parcel Map 25903.
   C. Glen Oaks Road will not be impacted by this project, as no improvements are required, and no turn out lane will be required as well. On Glen Oaks Road there is only one turn out lane and that is at the "T" intersection of Glen Oaks and Mesa which serves a main roadway which accesses hundreds of homes and properties.
2. The Comments listed below concern the construction noise potential.
   A. Currently all four pads are graded and have been over excavated for potential building pads in the future, the soils tests have been completed, percolation tests completed, the pads are certified for future building for when that occurs. One lot is fully built out with a primary residence, three-car garage, and a barn with guest quarters. All completed projects were fully permitted and finaled.
   B. House construction noise and impact will be minimal at best, for the remaining three lots will be built upon in the future and most likely not be constructed at the same time. **However, the parcel map approval is not requesting any building but rather to have the**

parcels split for future usage. The potential noise issue mention by the law firm is not part of this process as we are in the midst of a lot split, and not construction. This spring, the new fire department will be constructed across the street and the impacts of a commercial building are far greater than any residential construction. The remaining three lots, could possibly end up with mobile homes placed on a permanent foundation for residences, which would further reduce potential noise and impact.

C. The photographs presented by the attorney's appears to be a gross over statement of the potential noise issues, the photographs of a athletic stadium, a harbor with large cranes, a main street of a down town area have no real comparison to the application for a parcel map approval process.

3. The comments listed below concern the effects on the environment section.
   A. There has not been any evidence submitted concerning significant environmental impacts for the building of three residences on existing pads and/ the placement of mobile homes on permanent foundations.
   B. The parcel map # 25903 on the easterly edge of the proposed project was not required to complete an EIR.
   C. There will not be any impact to agriculture since the project in question has already been graded and no current agriculture, biological resources, cultural resources, hydrology, geology issues will be discovered, as all current grading is completed.
   D. CEQA issues will not be impacted since grading is completed.

4. The comments listed below concern the watercourse issue.
   A. A large watercourse does not exist on the northerly edge of the property adjacent to Glen Oaks Road. There is however a seasonal puddle that occasionally surfaces during very wet winter conditions. This location was not disturbed when the grading was accomplished and will be left undisturbed for the future, as stated on the parcel map. West of the project on Glen Oaks the County did improvements for the potential watercourse issues and it has never been a negative issue. There is no migratory fish in the seasonal water puddle. Since we have been on the property since 2004 we have noticed the seasonal puddling on only two occasions.
   B. There is continual verbiage listed in the attorney's submittal as it relates to "A Large Watercourse." This supposed large watercourse does not exist, and the impact of the seasonal underground small puddle has not been affected and will not be affected as noted on the parcel map. By the attorney's usage of the verbiage, "large watercourse," it is easy to assume that an onsite inspection has not been performed by them.
5. The comments listed below concern the Agricultural Resources comments.
   A. This project does not convert an area designated as Prime Farmland, since the grading and pads now currently existing and this location has

not been used for agricultural as it is located in a primarily rural residential area.

B. The term used by the attorney's, "A large Scale Level" with reference to agricultural impact is a serious stretch of terms at best, and demonstrates that the firm has not performed an onsite inspection.

6. The comments listed below concern the cultural resources:
   A. The parcel map in question will not disturb any cultural resources due to the fact that the grading for the parcel was completed over four years ago.
   B. Any future grading questions will need to be addressed if there are any issues with the future landowners of the lots and are not issues related to this parcel map process.
7. The comments listed below concern the Geology/Soils:
   A. As stated and restated previously, the grading for the parcel map is completed and the over-excavation is completed which was completed over five years ago.
   B. The discussion as it relates to soil disturbance is not part of this process, as we are not asking to build, but to simply complete the parcel map process. The soil disturbance is a question for the future landowners.
8. The comments listed below concern the noise issues.
   A. Since construction noise is not part of this parcel map process, due to the fact that all grading is completed, the comments listed by the attorney's is not part of this parcel map
   B. Any construction noise issues will if necessary need to be addressed with future land-owners.
   C. This project does not exceed the County General Plan noise issues.
   D. The new fire station across the street will generate a great deal more noise issues related to construction, and is approved and ready to begin construction soon. This comment is not intended to be a negative approach to the fire station, but rather a comment on potential noise only.
9. The comments listed below concern Air Quality.
   A. The mention of importing soils to the site is another stretch, as the grading and pads are finished.
   B. Road improvements are a regular part of the county maintained road system, as Mesa Road is currently undergoing renovation.

Conclusion: Overall, the issues presented by the above listed law firm, fails to consider what has been completed and approved through the permit process by the county in previous years, they continually make statements on the negative impact of items that have been completed for over five years. The continual use of the term, "Large Watercourse," is a complete fabrication as even a simple observation of Glen Oaks and the parcel map in question will reaffirm that the watercourse issue is a does not exist. The use of grossly exaggerated photographs as evidence for this process is an extreme stretch, why a photograph of a harbor with large cranes and the construction of an athletic stadium is presented as evidence for construction noise is beyond belief, since no construction is a part of this parcel map process. Any and all potential noise issues brought up by the attorneys would need to be

addressed in the future with the owners of the new lots, and our conclusion is that an EIR is not required, as it was not required for the lot split adjacent to this potential lot split

Thank you for your consideration.

Sincerely;

Randy W.Horton

Agenda Item No.: 2.6
Area Plan: Southwest
Zoning Area: Rancho California
Supervisorial District: Third
Project Planner: Kinika Hesterly
Directors Hearing: March 28, 2011

TENTATIVE PARCEL MAP NO. 30298
E.A. Number: 40617
Applicant: Randy Horton
Engineer/Rep.: Southland Engineering

COUNTY OF RIVERSIDE PLANNING DEPARTMENT
STAFF REPORT

PROJECT DESCRIPTION AND LOCATION:

The tentative parcel map is a Schedule H subdivision of 12.19 acres into four (4) residential parcels with parcels ranging from 3.0 to 3.2 gross acres. An existing single family residence is located on Parcel No. 4.

The project site is located in the community of Rancho California of the Southwest Area Plan in Western Riverside County; more specifically, southerly of Glen Oaks Road, westerly of Calle Bellagio, and easterly of Corte Venture.

SUMMARY OF FINDINGS:

1.	General Plan Land Use:	Rural Community: Estate Density Residential (RC: EDR) (2 Acre Minimum)
	Surrounding General Plan Land Use:	Rural Community: Estate Density Residential (RC: EDR) (2 Acre Minimum)
2.	Existing Zoning:	Rural Residential (R-R)
4.	Surrounding Zoning:	Rural Residential (R-R) to the south and east and Residential Agricultural – 2-½ Acre Minimum (R-A-2-½) to the north and west.
5.	Existing Land Use:	Single Family Residence
6.	Surrounding Land Use:	Scattered Single family residences on two acres or more to the north, south, east, and west.
7.	Project Data:	Total Acreage: 12.19 Gross Acres Total Proposed Lots: 4 Proposed Min. Lot Size: 2 Acres Schedule: H
8.	Environmental Concerns:	See attached Environmental Assessment

RECOMMENDATIONS:

ADOPTION of a **NEGATIVE DECLARATION** for **ENVIRONMENTAL ASSESSMENT NO. 40617**, based on the findings incorporated in the initial study and the conclusion that the project will not have a significant effect on the environment; and,

APPROVAL of **TENTATIVE PARCEL MAP NO. 30298**, subject to the attached conditions of approval, and based upon the findings and conclusions incorporated in the staff report.

CONCLUSIONS:

1. The proposed project is in conformance with the Rural Community: Estate Density Residential (RC: EDR) (2 Acre Minimum) Land Use Designation, and with all other elements of the Riverside County General Plan.

2. The proposed project is consistent with the Rural Residential (R-R) zoning classification of Ordinance No. 348, and with all other applicable provisions of Ordinance No. 348.

3. The proposed project is consistent with the Schedule H map requirements of Ordinance No. 460, and with all other applicable provisions of Ordinance No. 460.

4. The public's health, safety, and general welfare are protected through project design.

5. The proposed project is compatible with the present and future logical development of the area.

6. The proposed project will not have a significant effect on the environment.

7. The proposed project will not preclude reserve design for the Western Riverside Multi-Species Habitat Conservation Plan (MSHCP).

FINDINGS: The following findings are in addition to those incorporated in the summary of findings, and in the attached Environmental Assessment, which is incorporated herein by reference.

1. The project site is designated Rural Community: Estate Density Residential (RC: EDR) (2 Acre Minimum) on the Southwest Area Plan.

2. The proposed map, four (4) residential parcels with a minimum of parcel size of two (2) acres, is permitted in the Rural Community: Estate Density Residential (RC: EDR) (2 Acre Minimum) designation.

3. The project site is surrounded by properties which are designated Rural Community: Estate Density Residential (RC: EDR) (2 Acre Minimum).

4. The zoning for the subject site is Rural Residential (R-R).

5. The proposed map, four (4) residential parcels with a minimum of parcel size of two (2) acres, is consistent with the development standards set forth in the Rural Residential (R-R) zone.

6. The project site is surrounded by properties which are zoned Rural Residential (R-R) to the north, south, and east and Residential Agricultural – 2-½ Acre Minimum (R-A-2-½) to the north and west.

7. Single family residences and vacant land are within the project vicinity.

8. Environmental Assessment No. 40617 did not identify any significant effects that the project would have on the environment.

9. This project is not located within a Criteria Area of the Western Riverside Multi-Species Habitat Conservation Plan.

INFORMATIONAL ITEMS:

1. As of this writing, no letters, in support or opposition have been received.
2. The project site is not located within:
   a. A city sphere of influence;
   b. A 100-year flood plain, or dam inundation area;
   c. A MSHCP Core Reserve Area; or,

3. The project site is located within:
   a. The boundaries of the Temecula Valley Unified School District;
   b. The Valley-Wide Recreation and Parks District;
   c. County Service Area No. 149;
   d. Santa Margarita Watershed;
   e. Unique Farmland;
   f. Murrieta Creek / Santa Gertrudis Valley Area Drainage Plan; and
   g. The Stephens Kangaroo Rat Fee Area.

4. The subject site is currently designated as Assessor's Parcel Number 941-080-027.

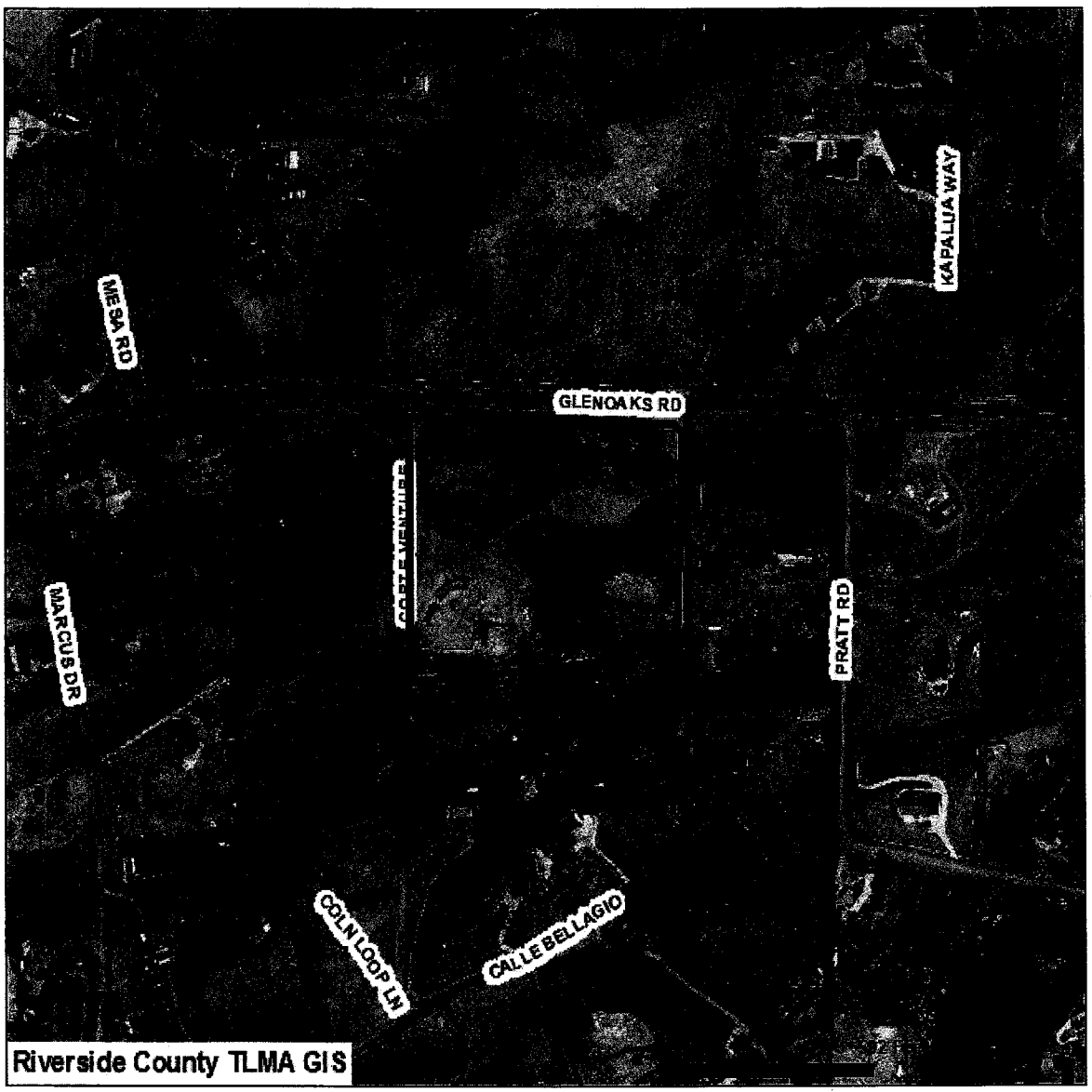
5. This project was filed with the Planning Department on January 10, 2006.

6. This project was reviewed by the Land Development Committee two (2) times on the following dates: 5/04/06 and 4/10/08.

7. Deposit Based Fees charged for this project, as of the time of staff report preparation, total $16,103.11.

KH:kh
Y:\Planning Case Files-Riverside office\PM30298\DH-PC-BOS Hearings\PM30298 Staff Report.doc
Date Prepared: 03/05/08
Date Revised: 2/23/11

Aerial



Selected parcel(s):
941-080-027

IMPORTANT
Maps and data are to be used for reference purposes only. Map features are approximate, and are not necessarily accurate to surveying or engineering standards. The County of Riverside makes no warranty or guarantee as to the content (the source is often third party), accuracy, timeliness, or completeness of any of the data provided, and assumes no legal responsibility for the information contained on this map. Any use of this product with respect to accuracy and precision shall be the sole responsibility of the user.

REPORT PRINTED ON...Wed Feb 23 16:43:45 2011
Version 101221

PM30298

Zoning

Selected parcel(s):
941-080-027

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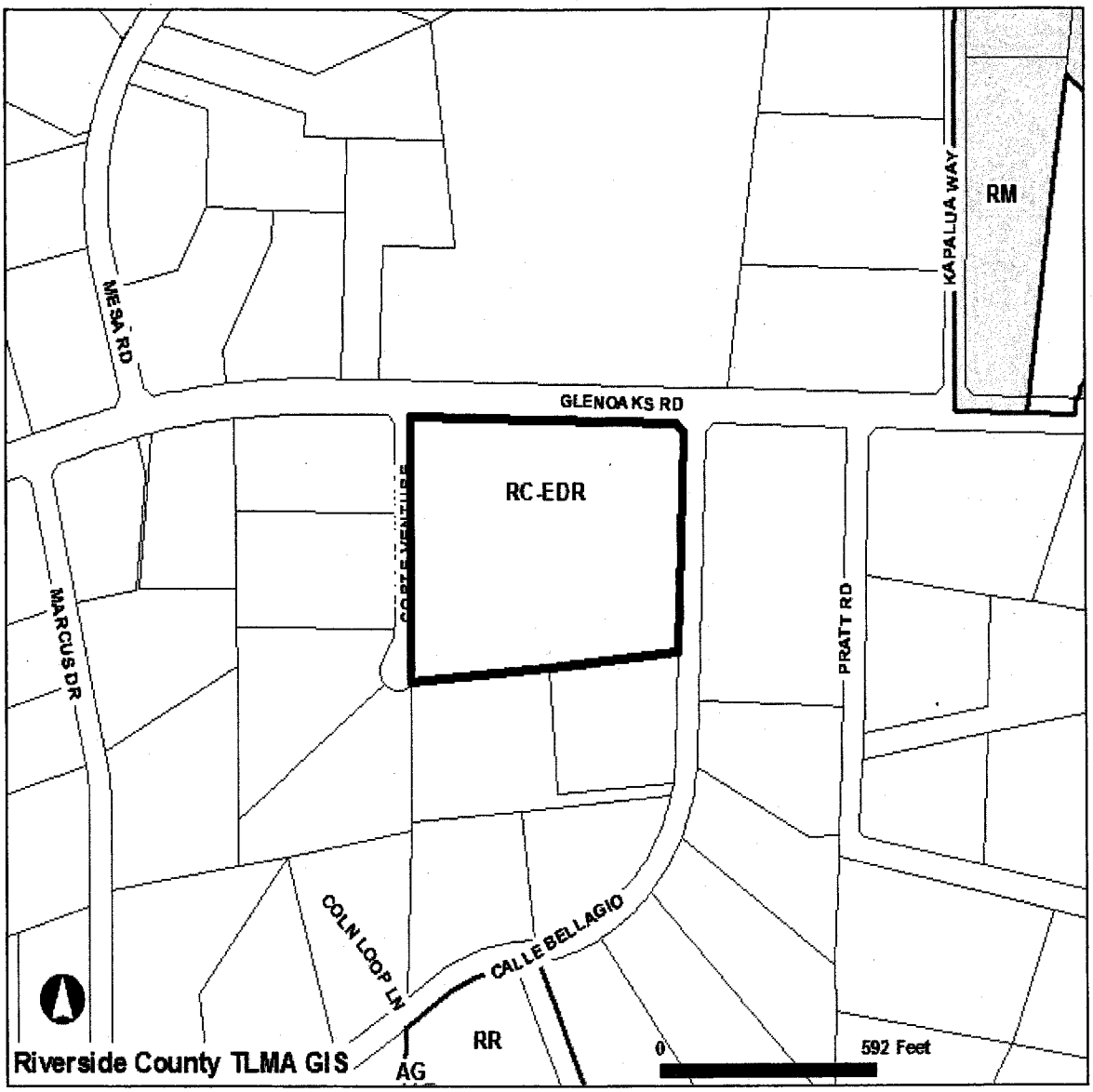
PM30298

Land Use Designation



Selected parcel(s):
941-080-027

IMPORTANT
Maps and data are to be used for reference purposes only. Map features are approximate, and are not necessarily accurate to surveying or engineering standards. The County of Riverside makes no warranty or guarantee as to the content (the source is often third party), accuracy, timeliness, or completeness of any of the data provided, and assumes no legal responsibility for the information contained on this map. Any use of this product with respect to accuracy and precision shall be the sole responsibility of the user.

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PM30298

TENTATIVE PARCEL MAP 30298 AMENDED NO. 1

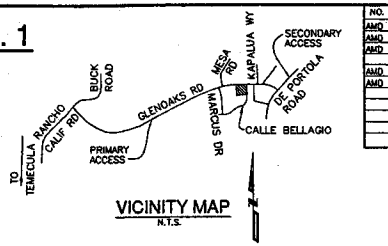
PARCEL 1 OF PARCEL MAP 6199 ON FILE IN BOOK 17, PAGE 90, OF PARCEL MAPS RECORDS OF RIVERSIDE COUNTY, CALIFORNIA, ALSO BEING IN RANCHO PAUBA, LOCATED IN SECTION 20, T.7S., R.1W.

SOUTHLAND ENGINEERING — FEBRUARY 2008

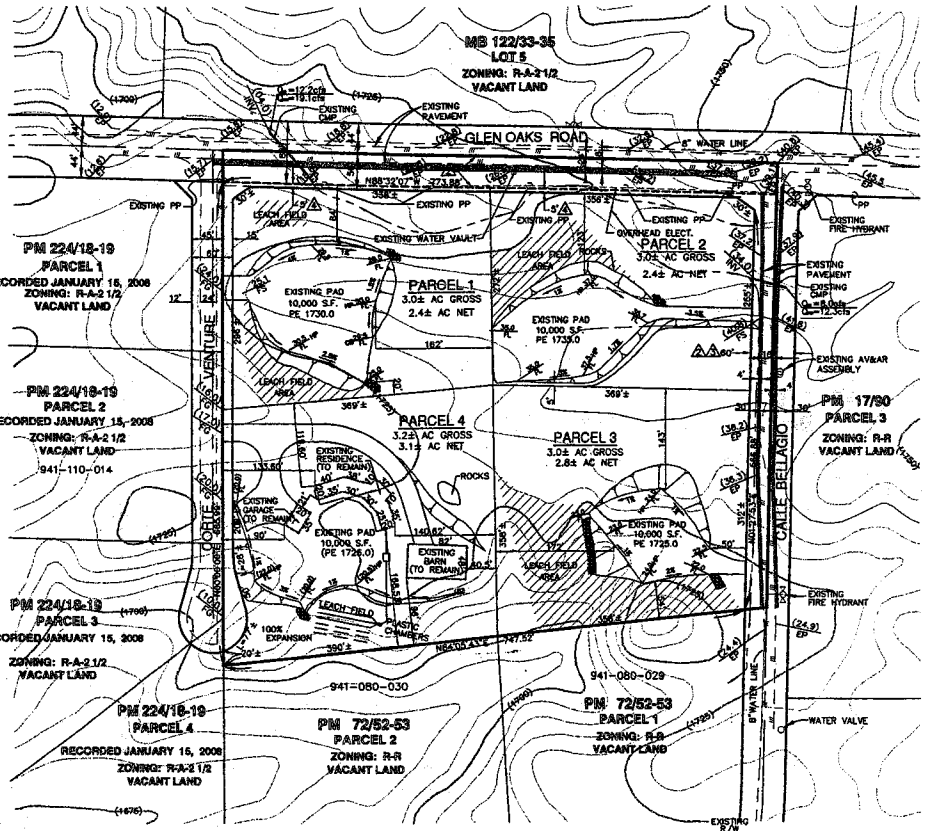
GRAPHIC SCALE 80 40 0 80 160 240

SCALE: 1" = 80'

NO.	REVISION	DESIGN	APPR'L	DATE
AMD 1	ADD SEPTIC INFORMATION			02/06
AMD 1	ADD CSA			02/06
AMD 1	ADD HOUSE DIMENSIONS & TO REMAIN			02/06
AMD 1	CHANGE MAP SCHEDULE			02/06
AMD 1	REVISE TYPICAL SECTIONS			02/06

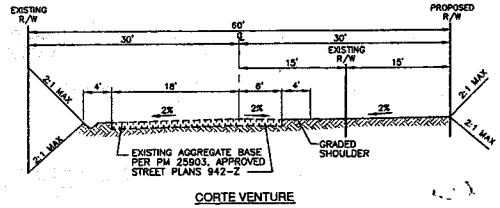


VICINITY MAP
N.T.S.

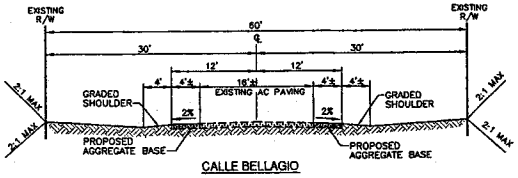


LEGEND

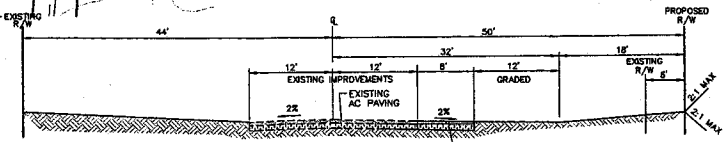
FL– FLOWLINE
GB– GRADEBREAK
EP– EDGE OF PAVEMENT
HP– HIGH POINT
– EXISTING POWER POLES (TO BE REMOVED AND ELECTRIC PLACED UNDERGROUND)
– RIPRAP
– EXISTING FIRE HYDRANT
– EDGE OF EXISTING PAVEMENT
– LEACH FIELD AREA
– PROPOSED AC PAVEMENT
– PROPOSED AGGREGATE BASE



CORTE VENTURE



CALLE BELLAGIO



GLEN OAKS ROAD

TYPICAL STREET SECTIONS
NOT TO SCALE

OWNER/APPLICANT: RANDY & CINDY HORTON AND MARCUS & CHRISTIE HORTON
41141 RAINTREE COURT
MURRIETA, CA 92562
(951) 312-5333

REPRESENTATIVE : SOUTHLAND ENGINEERING
2200 BUSINESS WAY, SUITE 100
RIVERSIDE, CA 92501
(951) 788-8488

ASSESSORS PARCEL NUMBER: 941-080-027

ZONING: EXISTING: RURAL RESIDENTIAL (RR 2.5)
PROPOSED: RURAL RESIDENTIAL (RR 2.5)

UTILITIES:
WATER – RANCHO CALIFORNIA WATER DISTRICT
SEWER – INDIVIDUAL SEPTIC SYSTEMS
ELECTRIC – SOUTHERN CALIFORNIA EDISON
GAS – PROPANE
TELEPHONE – VERIZON
CABLE – NONE AVAILABLE

ACREAGE: 12.19 ACRES GROSS ±
10.70 ACRES NET ±

NOTES:

1. THE PADS AND DRIVEWAYS ON THIS PARCEL MAP ARE NOT SUBJECT TO INUNDATION OR OVERFLOW OR 100 YEAR FLOODING.
2. THIS MAP CONTAINS THE LAND DIVIDERS ENTIRE CONTIGUOUS OWNERSHIP.
3. TOPOGRAPHY SOURCE: RANCHO CALIFORNIA WATER DISTRICT.
4. SCHOOL DISTRICT: TEMECULA VALLEY UNIFIED SCHOOL DISTRICT.
5. ALL DRIVEWAYS TO BE A MINIMUM OF 20 FEET IN WIDTH WITH A MAXIMUM 15 PERCENT GRADE.
6. ALL DRAINAGE FACILITIES AND STRUCTURES WILL BE DESIGNED TO ACCOMMODATE THE 100 YEAR STORM FLOWS DURING FINAL DESIGN.
7. THE PARCEL MAP IS NOT SUBJECT TO LIQUEFACTION OR OTHER GEOLOGIC HAZARDS OR WITHIN A SPECIAL STUDY ZONE.
8. THOMAS BROS. 2008 EDITION PAGE 930 G8
9. PROPERTY IS LOCATED WITHIN A CSA: WINE COUNTRY #149.
10. ALL SLOPES AT 2:1 RATIO UNLESS NOTED.
11. PROPERTY IS LOCATED WITHIN FLOOD ZONE C.
12. PARCEL 1 THROUGH 4 INCLUSIVE GRADED UNDER PERMIT NO. BGR030846 ISSUED ON AUGUST 13, 2003 AND FINALED JUNE 3, 2005 (NO ADDITIONAL GRADING PROPOSED)
13. PROPERTY IS NOT WITHIN A SPECIFIC PLAN.
14. PROPERTY HAS NO KNOWN EXISTING WELLS ON THE PROPERTY OR WITHIN 200 FEET OF THE PROPERTY BOUNDARY.
15. PROPERTY HAS NO COMMON AREAS, OPEN SPACE, RECREATIONAL AREAS OR TRAIL EASEMENTS.
16. THIS IS A SCHEDULE "H" PARCEL MAP.

EASEMENTS

1. AN AGREEMENT BETWEEN WALTER BURROUGHS AND RANCHO CALIFORNIA WATER DISTRICT WHICH DESIGNATES SAID DISTRICT AS EXCLUSIVE AGENT FOR THE EXTRACTION, DIVERSION, STORAGE, BLENDING AND DISTRIBUTION OF ALL LOCAL WATER, RECORDED 9/15/67 AS INSTRUMENT NO. 81268 OF OFFICIAL RECORDS. (SAID EASEMENT IS BLANKET IN NATURE)

2. AN OFFER OF DEDICATION IN FAVOR OF THE COUNTY OF RIVERSIDE FOR PUBLIC ROAD PURPOSES, PUBLIC UTILITY, PUBLIC SERVICES AND INCIDENTAL PURPOSES, RECORDED 4/2/75 AS INSTRUMENT NO. 37376 OF OFFICIAL RECORDS.

3. AN EASEMENT IN FAVOR OF RANCHO CALIFORNIA WATER DISTRICT FOR PIPELINES AND INCIDENTAL PURPOSES, RECORDED 2/23/78 AS INSTRUMENT NO. 34444 AND 4/27/78 AS INSTRUMENT NO. 82237 OF OFFICIAL RECORDS.

4. AN EASEMENT IN FAVOR OF VERIZON CALIFORNIA INC., A CORPORATION FOR TRANSMISSION OF ELECTRIC ENERGY FOR COMMUNICATIONS, TELECOMMUNICATIONS, INTERACTIVE VIDEO, INTELLIGENCE BY ELECTRIC MEANS AND/OR OTHER PURPOSES AND INCIDENTAL PURPOSES, RECORDED 1/21/05 AS INSTRUMENT NO. 2005-0057516 OF OFFICIAL RECORDS.

5. AN EASEMENT IN FAVOR OF SOUTHERN CALIFORNIA EDISON COMPANY FOR UNDERGROUND ELECTRICAL SUPPLY SYSTEMS AND COMMUNICATION SYSTEMS AND INCIDENTAL PURPOSES, RECORDED 2/23/05 AS INSTRUMENT NO. 2005-0143617 OF OFFICIAL RECORDS. (SAID EASEMENT CANNOT BE PLOTTED FROM RECORD)

24157

CASE # PM30298 AMD.#1
DATED: 3/13/08
PLANNER: A. KRIZEK..

COUNTY OF RIVERSIDE
ENVIRONMENTAL ASSESSMENT FORM: INITIAL STUDY

Environmental Assessment (E.A.) Number: 40617
Project Case Type (s) and Number(s): Tentative Parcel Map No. 30298
Lead Agency Name: County of Riverside Planning Department
Address: 4080 Lemon Street, 9th Floor, P.O. Box 1409, Riverside, CA 92502-1409
Contact Person: Kinika Hesterly, Project Planner
Telephone Number: (951) 955-1888
Applicant's Name: Randy Horton
Applicant's Address: 41141 Raintree Court Murrieta, CA 92562
Engineer's Name: Southland Engineering
Engineer's Address: 2200 Business Way, Ste 100, Riverside, CA 92501

I. PROJECT INFORMATION

A. Project Description:

The tentative parcel map is a Schedule H subdivision of 12.19 acres into four (4) residential parcels with parcels ranging from 3.0 to 3.2 gross acres. An existing single family residence is located on Parcel No. 4.

The project site is located in the community of Rancho California of the Southwest Area Plan in Western Riverside County; more specifically, southerly of Glen Oaks Road, westerly of Calle Bellagio, and easterly of Corte Venture.

B. Type of Project: Site Specific ☒; Countywide ☐; Community ☐; Policy ☐.

C. Total Project Area: 12.19 Gross Acres

Residential Acres: 12.19	**Lots:** 4	**Units:** 4	**Projected No. of Residents:** 12
Commercial Acres: N/A	**Lots:** N/A	**Sq. Ft. of Bldg. Area:** N/A	**Est. No. of Employees:** N/A
Industrial Acres: N/A	**Lots:** N/A	**Sq. Ft. of Bldg. Area:** N/A	**Est. No. of Employees:** N/A
Other: N/A			

D. Assessor's Parcel No(s): 941-080-027

E. Street References: The project site is located in the community of Rancho California of the Southwest Area Plan in Western Riverside County; more specifically, southerly of Glen Oaks Road, westerly of Calle Bellagio, and easterly of Corte Venture.

F. Section, Township & Range Description or reference/attach a Legal Description: Section 20, Township 7 South, Range 1 West

G. Brief description of the existing environmental setting of the project site and its surroundings: The project site is located on a slight ridge with a watercourse that traverses the northern portion of the site; with elevations ranging from 1,631 feet to 1,801 feet above sea level. The project site is predominantly disturbed as a result of grading permit BGR030846 which created a total of three (3) graded pads. The project site is currently vacant except for an existing house that is to remain located on proposed Parcel 4; surrounding land uses include scattered residences to the north, south, east and west.

II. APPLICABLE GENERAL PLAN AND ZONING REGULATIONS

A. **General Plan Elements/Policies:**

1. **Land Use:** The proposed project meets the requirements for the Rural Community: Estate Density Residential (RC: EDR) (2 Acre Minimum) land use designation and all applicable land use policies.

2. **Circulation:** The proposed project meets with all applicable circulation policies of the General Plan.

3. **Multipurpose Open Space:** No natural open space land was required to be preserved within the boundaries of this project. The proposed project has been conditioned to pay the appropriate park mitigation fees pursuant to the Quimby Act. The proposed project meets with all other applicable Multipurpose Open Space Element policies.

4. **Safety:** The proposed project is not located within any special hazard zone (including FEMA flood zone, fault zone, high fire hazard area, dam inundation zone, area with high liquefaction potential, etc.). The proposed project has allowed for sufficient provision of emergency response services to the future residents of this project through the project design and payment of development impact fees. The proposed project meets with all other applicable Safety Element policies.

5. **Noise:** The proposed project meets all applicable Noise Element policies.

6. **Housing:** The proposed project meets all applicable Housing Element policies.

7. **Air Quality:** The proposed project has been conditioned to control any fugitive dust during grading and construction activities. The proposed project meets all other applicable Air Quality Element policies.

B. **General Plan Area Plan(s):** Southwest Area Plan

C. **Foundation Component(s):** Rural Community

D. **Land Use Designation(s):** Estate Density Residential (EDR) (2 Acre Minimum)

E. **Overlay(s), if any:** N/A

F. **Policy Area(s), if any:** N/A

G. **Adjacent and Surrounding:** Estate Density Residential (EDR) (2 Acre Minimum)

1. **Area Plan(s):** Southwest Area Plan

2. **Foundation Component(s):** Rural Community

3. **Land Use Designation(s):** Estate Density Residential (EDR) (2 Acre Minimum)

4. **Overlay(s):** N/A

5. **Policy Area(s), if any:** N/A

H. **Adopted Specific Plan Information**

1. **Name and Number of Specific Plan, if any:** N/A

2. **Specific Plan Planning Area, and Policies, if any:** N/A

I. **Existing Zoning:** Rural Residential (R-R)

J. **Proposed Zoning, if any:** N/A

K. **Adjacent and Surrounding Zoning:** Rural Residential (R-R) to the north, south, and east Residential Agricultural – 2-½ Acre Minimum (R-A- 2-½) to the west.

III. ENVIRONMENTAL FACTORS POTENTIALLY AFFECTED

The environmental factors checked below (x) would be potentially affected by this project, involving at least one impact that is a "Potentially Significant Impact" or "Less than Significant with Mitigation Incorporated" as indicated by the checklist on the following pages.

☐ Aesthetics	☐ Hazards & Hazardous Materials	☐ Recreation
☐ Agriculture & Forest Resources	☐ Hydrology / Water Quality	☐ Transportation / Traffic
☐ Air Quality	☐ Land Use / Planning	☐ Utilities / Service Systems
☐ Biological Resources	☐ Mineral Resources	☐ Other:
☐ Cultural Resources	☐ Noise	☐ Other:
☐ Geology / Soils	☐ Population / Housing	☐ Mandatory Findings of Significance
☐ Greenhouse Gas Emissions	☐ Public Services	

IV. DETERMINATION

On the basis of this initial evaluation:

A PREVIOUS ENVIRONMENTAL IMPACT REPORT/NEGATIVE DECLARATION WAS NOT PREPARED

☒ I find that the proposed project **COULD NOT** have a significant effect on the environment, and a **NEGATIVE DECLARATION** will be prepared.

☐ I find that although the proposed project could have a significant effect on the environment, there will not be a significant effect in this case because revisions in the project, described in this document, have been made or agreed to by the project proponent. **A MITIGATED NEGATIVE DECLARATION** will be prepared.

☐ I find that the proposed project MAY have a significant effect on the environment, and an **ENVIRONMENTAL IMPACT REPORT** is required.

A PREVIOUS ENVIRONMENTAL IMPACT REPORT/NEGATIVE DECLARATION WAS PREPARED

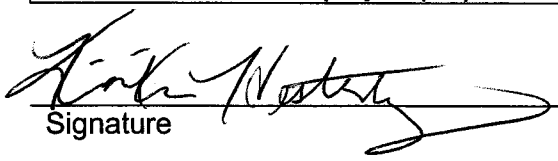
☐ I find that although the proposed project could have a significant effect on the environment, **NO NEW ENVIRONMENTAL DOCUMENTATION IS REQUIRED** because (a) all potentially significant effects of the proposed project have been adequately analyzed in an earlier EIR or Negative Declaration pursuant to applicable legal standards, (b) all potentially significant effects of the proposed project have been avoided or mitigated pursuant to that earlier EIR or Negative Declaration, (c) the proposed project will not result in any new significant environmental effects not identified in the earlier EIR or Negative Declaration, (d) the proposed project will not substantially increase the severity of the environmental effects identified in the earlier EIR or Negative Declaration, (e) no considerably different mitigation measures have been identified and (f) no mitigation measures found infeasible have become feasible.

become feasible.

☐ I find that although all potentially significant effects have been adequately analyzed in an earlier EIR or Negative Declaration pursuant to applicable legal standards, some changes or additions are necessary but none of the conditions described in California Code of Regulations, Section 15162 exist. An **ADDENDUM** to a previously-certified EIR or Negative Declaration has been prepared and will be considered by the approving body or bodies.

☐ I find that at least one of the conditions described in California Code of Regulations, Section 15162 exist, but I further find that only minor additions or changes are necessary to make the previous EIR adequately apply to the project in the changed situation; therefore a **SUPPLEMENT TO THE ENVIRONMENTAL IMPACT REPORT** is required that need only contain the information necessary to make the previous EIR adequate for the project as revised.

☐ I find that at least one of the following conditions described in California Code of Regulations, Section 15162, exist and **a SUBSEQUENT ENVIRONMENTAL IMPACT REPORT** is required: (1) Substantial changes are proposed in the project which will require major revisions of the previous EIR or negative declaration due to the involvement of new significant environmental effects or a substantial increase in the severity of previously identified significant effects; (2) Substantial changes have occurred with respect to the circumstances under which the project is undertaken which will require major revisions of the previous EIR or negative declaration due to the involvement of new significant environmental effects or a substantial increase in the severity of previously identified significant effects; or (3) New information of substantial importance, which was not known and could not have been known with the exercise of reasonable diligence at the time the previous EIR was certified as complete or the negative declaration was adopted, shows any the following:(A) The project will have one or more significant effects not discussed in the previous EIR or negative declaration;(B) Significant effects previously examined will be substantially more severe than shown in the previous EIR or negative declaration;(C) Mitigation measures or alternatives previously found not to be feasible would in fact be feasible, and would substantially reduce one or more significant effects of the project, but the project proponents decline to adopt the mitigation measures or alternatives; or,(D) Mitigation measures or alternatives which are considerably different from those analyzed in the previous EIR or negative declaration would substantially reduce one or more significant effects of the project on the environment, but the project proponents decline to adopt the mitigation measures or alternatives.



Signature

February 23, 2011
Date

Kinika Hesterly, Project Planner
Printed Name

For Carolyn Syms Luna, Planning Director

V. ENVIRONMENTAL ISSUES ASSESSMENT

In accordance with the California Environmental Quality Act (CEQA) (Public Resources Code Section 21000-21178.1), this Initial Study has been prepared to analyze the proposed project to determine any potential significant impacts upon the environment that would result from construction and implementation of the project. In accordance with California Code of Regulations, Section 15063, this Initial Study is a preliminary analysis prepared by the Lead Agency, the County of Riverside, in consultation with other jurisdictional agencies, to determine whether a Negative Declaration, Mitigated Negative Declaration, or an Environmental Impact Report is required for the proposed project. The purpose of this Initial Study is to inform the decision-makers, affected agencies, and the public of potential environmental impacts associated with the implementation of the proposed project.

	Potentially Significant Impact	Less than Significant with Mitigation Incorporated	Less Than Significant Impact	No Impact
AESTHETICS Would the project				
1. Scenic Resources a) Have a substantial effect upon a scenic highway corridor within which it is located?	☐	☐	☐	☒
b) Substantially damage scenic resources, including, but not limited to, trees, rock outcroppings and unique or landmark features; obstruct any prominent scenic vista or view open to the public; or result in the creation of an aesthetically offensive site open to public view?	☐	☐	☒	☐

Source: Riverside County General Plan Figure C-9 "Scenic Highways"

Findings of Fact: a) The project site is located southerly of Glen Oaks Road, westerly of Calle Bellagio, and easterly of Corte Venture. The Riverside County General Plan indicates that the project is not located within a designated scenic corridor.

b) The proposed project will not substantially damage scenic resources, including, but not limited to, trees, rock outcroppings and unique or landmark features, open to the public, as these features do not exist on the project site. Additionally, the project will not result in the creation of an aesthetically offensive site open to public view. The project will be developed pursuant to the Countywide Design Standards and Guidelines and therefore will not create an aesthetically offensive project.

Mitigation: No mitigation measures are required.

Monitoring: No monitoring measures are required,

2. Mt. Palomar Observatory a) Interfere with the nighttime use of the Mt. Palomar Observatory, as protected through Riverside County Ordinance No. 655?	☐	☐	☒	☐

Source: GIS database, Ord. No. 655 (Regulating Light Pollution)

Findings of Fact: According to the Riverside County General Plan, the project site is located 15.72 miles away from the Mt. Palomar Observatory; which is within the designated 45-mile (ZONE B)

	Potentially Significant Impact	Less than Significant with Mitigation Incorporated	Less Than Significant Impact	No Impact

Special Lighting Area that surrounds the Mt. Palomar Observatory. Ordinance No. 655 contains approved materials and methods of installation, definition, general requirements, requirements for lamp source and shielding, prohibition and exceptions. With incorporation of project lighting requirements of the Riverside County Ordinance No. 655 into the proposed project, this impact will be reduced to a less than significant impact. A note will be made on the Environmental Constraints Sheet that the properties are located within Zone B of County Ordinance 655 and are subject to outdoor lighting restrictions. (COA 50.PLANNING.24). This is a standard condition of approval and is not considered mitigation pursuant to CEQA.

Mitigation: No mitigation measures are required.

Monitoring: No monitoring measures are required.

3. Other Lighting Issues	☐	☐	☒	☐
a) Create a new source of substantial light or glare which would adversely affect day or nighttime views in the area?				
b) Expose residential property to unacceptable light levels?	☐	☐	☒	☐

Source: Tentative Map dated 3/13/08.

Findings of Fact: a) The project will not create substantial light or glare which would adversely affect day or nighttime views in the area, or expose residential property to unacceptable levels of light or glare.

b) Surrounding the immediate vicinity of the project site are low-density residential homes and vacant land planned for similar uses. The project proposes similar low-density residential and would therefore not generate any unacceptable light levels.

Mitigation: No mitigation measures are required.

Monitoring: No monitoring measures are required.

AGRICULTURE & FOREST RESOURCES Would the project				
4. Agriculture	☐	☐	☐	☒
a) Convert Prime Farmland, Unique Farmland, or Farmland of Statewide Importance (Farmland) as shown on the maps prepared pursuant to the Farmland Mapping and Monitoring Program of the California Resources Agency, to non-agricultural use?				
b) Conflict with existing agricultural use, or a Williamson Act (agricultural preserve) contract (Riv. Co. Agricultural Land Conservation Contract Maps)?	☐	☐	☐	☒
c) Cause development of non-agricultural uses within 300 feet of agriculturally zoned property (Ordinance No. 625 "Right-to-Farm")?	☐	☐	☐	☒

	Potentially Significant Impact	Less than Significant with Mitigation Incorporated	Less Than Significant Impact	No Impact
d) Involve other changes in the existing environment which, due to their location or nature, could result in conversion of Farmland, to non-agricultural use?	☐	☐	☐	☒

Source: Riverside County General Plan Figure OS-2 "Agricultural Resources," GIS database, and Project Application Materials.

Findings of Fact: a) The project site does not currently facilitate any agricultural activity. The site is in an area designated as Farmland of Local Importance and Other Lands. The proposed project site is not located within an area that is designated 'Prime Farmland, Farmland of Statewide Importance, or Unique Farmland. As a result, the project will have no impact on Prime Farmland, Farmland of Statewide Importance, or Unique Farmland.

b) The project is not located within an agricultural preserve and will not conflict with any existing agricultural use or a Williamson Act contract.

c) The project is not located within 300 feet of existing agriculturally zoned property.

d) The project will not contribute to the cumulative loss of farmland in the County.

Mitigation: No mitigation measures are necessary.

Monitoring: No mitigation measures are necessary.

AIR QUALITY Would the project				
5. Air Quality Impacts	☐	☐	☒	☐
a) Conflict with or obstruct implementation of the applicable air quality plan?				
b) Violate any air quality standard or contribute substantially to an existing or projected air quality violation?	☐	☐	☒	☐
c) Result in a cumulatively considerable net increase of any criteria pollutant for which the project region is non-attainment under an applicable federal or state ambient air quality standard (including releasing emissions which exceed quantitative thresholds for ozone precursors)?	☐	☐	☒	☐
d) Expose sensitive receptors which are located within 1 mile of the project site to project substantial point source emissions?	☐	☐	☐	☒
e) Involve the construction of a sensitive receptor located within one mile of an existing substantial point source emitter?	☐	☐	☐	☒
f) Create objectionable odors affecting a substantial number of people?	☐	☐	☐	☒

Source: SCAQMD CEQA Air Quality Handbook Table 6-2

Findings of Fact: a) The South Coast Air Quality Management District (SCAQMD) is responsible for developing a regional Air Quality Management Plan (AQMP) to insure compliance with state and

	Potentially Significant Impact	Less than Significant with Mitigation Incorporated	Less Than Significant Impact	No Impact

federal air quality standards. The SCAQMD has adopted the 2003 AQMP. The 2003 AQMP is based on socioeconomic forecasts (including population estimates) provided by the Southern California Association of Governments (SCAG). The County General Plan is consistent with SCAG's Regional Growth Management Plan and SCAQMD's Air Quality Management Plan. This project is consistent with the General Plan land use designations, and population estimates. The population proposed by this project will not obstruct the implementation of the 2003 AQMP.

b) Air quality impacts would occur during site preparation, including grading and equipment exhaust. Major sources of fugitive dust are a result of grading and site preparation during construction by vehicles and equipment and generated by construction vehicles and equipment traveling over exposed surfaces, as well as by soil disturbances from grading and filling. Blowing dust is also of concern where PM10 standards are exceeded by soil disturbance during grading, and vehicular travel over unpaved roads. These short-term construction related impacts will be reduced below a level of significance by dust control measures implemented during grading. (COA 10.BS GRADE.5) This is a standard Condition of Approval and is not considered mitigation pursuant to CEQA..

c) The project will not result in a cumulatively considerable net increase of any criteria pollutant for which the project region is non-attainment under an applicable federal or state ambient air quality standard.

d) Sensitive receptors (and the facilities that house them) in proximity to localized CO sources, toxic air contaminants or odors are of particular concern. High levels of CO are associated with major traffic sources, such as freeways and major intersections, and toxic air contaminants are normally associated with manufacturing and commercial operations. Land uses considered to be sensitive receptors include long-term health care facilities, rehabilitation centers, convalescent centers, retirement homes, residences, schools, playgrounds, childcare centers, and athletic facilities. Surrounding land uses include residential, which is considered a sensitive receptor, however, the project is not expected to generate substantial point source emissions. The project will not include commercial or manufacturing uses, or generate significant odors.

e) The project will not create sensitive receptors located within one mile of an existing substantial point source emitter.

f) The project will not create objectionable odors affecting a substantial number of people.

Mitigation: No mitigation measures are required.

Monitoring: No monitoring measures are required.

BIOLOGICAL RESOURCES Would the project				
6. Wildlife & Vegetation	☐	☐	☐	☒
a) Conflict with the provisions of an adopted Habitat Conservation Plan, Natural Conservation Community Plan, or other approved local, regional, or state conservation plan?				
b) Have a substantial adverse effect, either directly or through habitat modifications, on any endangered, or threatened species, as listed in Title 14 of the California	☐	☐	☒	☐

	Potentially Significant Impact	Less than Significant with Mitigation Incorporated	Less Than Significant Impact	No Impact
Code of Regulations (Sections 670.2 or 670.5) or in Title 50, Code of Federal Regulations (Sections 17.11 or 17.12)?				
c) Have a substantial adverse effect, either directly or through habitat modifications, on any species identified as a candidate, sensitive, or special status species in local or regional plans, policies, or regulations, or by the California Department of Fish and Game or U. S. Wildlife Service?	☐	☐	☐	☒
d) Interfere substantially with the movement of any native resident or migratory fish or wildlife species or with established native resident migratory wildlife corridors, or impede the use of native wildlife nursery sites?	☐	☐	☐	☒
e) Have a substantial adverse effect on any riparian habitat or other sensitive natural community identified in local or regional plans, policies, regulations or by the California Department of Fish and Game or U. S. Fish and Wildlife Service?	☐	☐	☒	☐
f) Have a substantial adverse effect on federally protected wetlands as defined by Section 404 of the Clean Water Act (including, but not limited to, marsh, vernal pool, coastal, etc.) through direct removal, filling, hydrological interruption, or other means?	☐	☐	☒	☐
g) Conflict with any local policies or ordinances protecting biological resources, such as a tree preservation policy or ordinance?	☐	☐	☐	☒

Source: GIS database, WRCMSHCP, Biologist Comments

Findings of Fact: a) The project site does not conflict with the provisions of an adopted Habitat Conservation Plan, Natural Conservation Community Plan, or other approved local, regional, or state conservation plan. The Riverside County Environmental Programs Department conducted a site visit on April 29, 2008.

b) During the site visit conducted on April 29, 2008, no species of animal or plant listed as endangered or threatened was observed or is expected on-site; therefore, no impacts related to sensitive wildlife species are anticipated.

c) The project site does not contain a persistently flowing watercourse; therefore, the project site has been completely graded under a previous legal grading permit (BGR030846); and there are no MSHCP issues associated with the site.

d) The project will not interfere substantially with the movement of any native resident or migratory fish or wildlife species or with established native resident migratory wildlife corridors, or impede the use of native wildlife nursery sites.

e-f) A large watercourse traverses the northern portion of the project site; however, the project does not propose to disturb within the watercourse.

g) The proposed project will not conflict with any local policies or ordinances protecting biological resources, such as a tree preservation policy or ordinance.

	Potentially Significant Impact	Less than Significant with Mitigation Incorporated	Less Than Significant Impact	No Impact

Mitigation: No mitigation measures are required.

Monitoring: No monitoring measures are required.

CULTURAL RESOURCES Would the project				
7. Historic Resources a) Alter or destroy an historic site?	☐	☐	☒	☐
b) Cause a substantial adverse change in the significance of a historical resource as defined in California Code of Regulations, Section 15064.5?	☐	☐	☒	☐

Source: Project Application Materials

Findings of Fact: a) No cultural resources study has been completed for the project site. According to the Eastern Information Center (EIC) of the State Office of Historic Preservation, a Phase I cultural resources study is recommended based on a potential for the presence of cultural resources in the area.

The project site contains one (1) existing residential structure that is to remain, located on proposed Parcels 4. Since ground disturbance has already occurred, and no significant disturbance is required for the project, the likelihood of the project altering or destroying an archaeological site is less than significant. If, however, during ground disturbing activities unique historical resources are discovered, all ground disturbing activities shall be halted for further review. (COA 10.PLANNING.2) This is a standard condition of approval and not considered mitigation pursuant to CEQA.

b) The proposed project will not cause a substantial adverse change in the significance of a historical resource as defined in California Code of Regulations, Section 15064.5 as no historical resources are known to be located on the project site.

Mitigation: No mitigation measures are required.

Monitoring: No monitoring measures are required.

8. Archaeological Resources a) Alter or destroy an archaeological site.	☐	☐	☒	☐
b) Cause a substantial adverse change in the significance of an archaeological resource pursuant to California Code of Regulations, Section 15064.5?	☐	☐	☒	☐
c) Disturb any human remains, including those interred outside of formal cemeteries?	☐	☐	☒	☐
d) Restrict existing religious or sacred uses within the potential impact area?	☐	☐	☐	☒

Source: Project Application Materials

	Potentially Significant Impact	Less than Significant with Mitigation Incorporated	Less Than Significant Impact	No Impact

Findings of Fact: a) No archaeological study has been completed for the project site. According to the Eastern Information Center (EIC) of the State Office of Historic Preservation, a Phase I archaeological study is recommended based on a potential for the presence of cultural resources in the area. However, the project site has been completely graded under grading permit BGR030846.

The project site contains one (1) existing residential structure that is to remain, located on proposed Parcel No. 4 and three (3) graded pads on the remaining proposed parcels. Since ground disturbance has already occurred, and no significant disturbance is required for the project, the likelihood of the project altering or destroying an archaeological site is less than significant. If, however, during ground disturbing activities unique archaeological resources are discovered, all ground disturbing activities shall be halted for further review. (COA 10.PLANNING.2) This is a standard condition of approval and not considered mitigation pursuant to CEQA.

b) The proposed project will not cause a substantial adverse change in the significance of an archaeological resource pursuant to California Code of Regulations, Section 15064.5.

c) There may be a possibility that ground disturbing activities will expose human remains. The project is subject to State Health and Safety Code 7050.5 if human remains are discovered during ground disturbing activities. (COA 10.PLANNING.1) This is a standard condition of approval and is not considered mitigation pursuant to CEQA.

d) The project will not restrict existing religious or sacred uses within the potential impact area.

Mitigation: No mitigation measures are required.

Monitoring: No monitoring measures are required.

9. Paleontological Resources a) Directly or indirectly destroy a unique paleontological resource, or site, or unique geologic feature?	☐	☐	☐	☒

Source: Riverside County General Plan Figure OS-8 "Paleontological Sensitivity"

Findings of Fact: a) According to the Riverside County General Plan, the project site is located within an area of low Paleontological sensitivity. There are no known unique paleontological resources or unique geologic features that will be impacted by development of the proposed project.

Mitigation: No mitigation measures are necessary.

Monitoring: No monitoring measures are necessary.

GEOLOGY AND SOILS Would the project				
10. Alquist-Priolo Earthquake Fault Zone or County Fault Hazard Zones a) Expose people or structures to potential substantial adverse effects, including the risk of loss, injury, or death?	☐	☐	☒	☐

	Potentially Significant Impact	Less than Significant with Mitigation Incorporated	Less Than Significant Impact	No Impact
b) Be subject to rupture of a known earthquake fault, as delineated on the most recent Alquist-Priolo Earthquake Fault Zoning Map issued by the State Geologist for the area or based on other substantial evidence of a known fault?	☐	☐	☒	☐

Source: Riverside County General Plan Figure S-2 "Earthquake Fault Study Zones," GIS database

Findings of Fact: a) There are no known active or potentially active faults that traverse the site and the site is not located within an Alquist-Priolo Earthquake Fault Zone. The principal seismic hazard that could affect the site is ground shaking resulting from an earthquake occurring along several major active or potentially active faults in southern California. California Building Code (CBC) requirements pertaining to residential development will mitigate the potential impact to less than significant. As CBC requirements are applicable to all residential development they are not considered mitigation for CEQA implementation purposes.

b) The project site is not within an Alquist-Priolo Earthquake Fault Zone. The project site is not subject to rupture of a known earthquake fault.

Mitigation: No mitigation measures are required.

Monitoring: No monitoring measures are required.

11. Liquefaction Potential Zone a) Be subject to seismic-related ground failure, including liquefaction?	☐	☐	☐	☒

Source: Riverside County General Plan Figure S-3 "Generalized Liquefaction".

Findings of Fact: a) According to the Riverside County Land Information System (RCLIS), the project is not located within an area subject to liquefaction. Thus, no impacts will occur from the proposed development.

Mitigation: No mitigation measures are required.

Monitoring: No monitoring measures are required.

12. Ground-shaking Zone Be subject to strong seismic ground shaking?	☐	☐	☒	☐

Source: Riverside County General Plan Figure S-4 "Earthquake-Induced Slope Instability Map," and Figures S-13 through S-21 (showing General Ground Shaking Risk)

Findings of Fact: There are no known active or potentially active faults that traverse the site and the site is not located within an Alquist-Priolo Earthquake Fault Zone. The principal seismic hazard that could affect the site is ground shaking resulting from an earthquake occurring along several major active or potentially active faults in southern California. California Building Code (CBC) requirements pertaining to residential development will mitigate the potential impact to less than significant. As CBC

	Potentially Significant Impact	Less than Significant with Mitigation Incorporated	Less Than Significant Impact	No Impact

requirements are applicable to all residential development, they are not considered mitigation for CEQA implementation purposes.

Mitigation: No mitigation measures are required.

Monitoring: No monitoring measures are required.

13. Landslide Risk a) Be located on a geologic unit or soil that is unstable, or that would become unstable as a result of the project, and potentially result in on- or off-site landslide, lateral spreading, collapse, or rockfall hazards?	☐	☐	☒	☐

Source: Riverside County General Plan Figure S-5 "Regions Underlain by Steep Slope"

Findings of Fact: The project site is located on a slight ridge. According to Figure S-5, the project is not located in an area with slopes greater than 25%; therefore there is no potential for landslides. The project site and surrounding area does not consist of rocky terrain; therefore the project is not subject to rockfall hazards. No impacts will occur as a result of the proposed project.

Mitigation: No mitigation measures are required.

Monitoring: No monitoring measures are required.

14. Ground Subsidence a) Be located on a geologic unit or soil that is unstable, or that would become unstable as a result of the project, and potentially result in ground subsidence?	☐	☐	☐	☒

Source: Riverside County General Plan Figure S-7 "Documented Subsidence Areas", County Geologist Review

Findings of Fact: The project site is not located in an area susceptible to subsidence or located near any documented areas of subsidence.

Mitigation: No mitigation measures are required.

Monitoring: No monitoring measures are required.

15. Other Geologic Hazards a) Be subject to geologic hazards, such as seiche, mudflow, or volcanic hazard?	☐	☐	☐	☒

Source: Project Application Materials

	Potentially Significant Impact	Less than Significant with Mitigation Incorporated	Less Than Significant Impact	No Impact

Findings of Fact: The project site is not located near any large bodies of water or in a known volcanic area; therefore, the project site is not subject to geologic hazards, such as seiche, mudflow, or volcanic hazard.

Mitigation: No mitigation measures are required.

Monitoring: No monitoring measures are required.

16. Slopes	☐	☐	☐	☒
a) Change topography or ground surface relief features?				
b) Create cut or fill slopes greater than 2:1 or higher than 10 feet?	☐	☐	☐	☒
c) Result in grading that affects or negates subsurface sewage disposal systems?	☐	☐	☐	☒

Source: Riverside County General Plan figure S-5 "Regions Underlain by Steep Slopes", Building and Safety – Grading Review, Project Application Materials

Findings of Fact a) The project site is relatively flat with elevations ranging from 1,631 to 1,801 feet above sea level. The project site has been previously graded under grading permit BGR030846 and contains one (1) residence that will remain; therefore, the project will not change topography or ground surface relief features.

b) The project site has been previously graded under grading permit BGR030841. As the pads have been developed, minimal to no additional grading is required.

c) The project will not result in grading that affects or negates subsurface sewage disposal systems as no sewage disposal systems exist on the project site.

Mitigation: No mitigation measures are required.

Monitoring: No monitoring measures are required.

17. Soils	☐	☐	☒	☐
a) Result in substantial soil erosion or the loss of topsoil?				
b) Be located on expansive soil, as defined in Table 18-1-B of the Uniform Building Code (1994), creating substantial risks to life or property?	☐	☐	☒	☐

Source: Riverside County General Plan figure S-6 "Engineering Geologic Materials Map", Flood Control review, Building and Safety Grading review, application materials

Findings of Fact: a) The development of the project site may have the potential to result in soil erosion during grading and construction. Standard Conditions of Approval have been issued regarding soil

	Potentially Significant Impact	Less than Significant with Mitigation Incorporated	Less Than Significant Impact	No Impact

erosion that will further ensure protection of public health, safety, and welfare upon final engineering of the project and are not considered mitigation for CEQA implementation purposes.

b) The project may be located on expansive soil; however, California Building Code (CBC) requirements pertaining to residential development will mitigate the potential impact to less than significant. While CBC requirements are applicable to all residential development they are not considered mitigation for CEQA implementation purposes.

Mitigation: No mitigation measures are required.

Monitoring: No monitoring measures are required.

18. Erosion a) Change deposition, siltation, or erosion that may modify the channel of a river or stream or the bed of a lake?	☐	☐	☒	☐
b) Result in any increase in water erosion either on or off site?	☐	☐	☒	☐

Source: Flood Control District review, Project Materials

Findings of Fact: a) The proposed project will not change deposition, siltation, or erosion that may modify the channel of a river or stream or the bed of a lake as no rivers, streams or lakes are located within the vicinity of the project site.

b) The development of the project site may have the potential to increase water erosion during grading and construction. Standard Conditions of Approval have been issued regarding soil erosion that will further ensure protection of public health, safety, and welfare upon final engineering of the project and are not considered mitigation for CEQA implementation purposes.

Mitigation: No mitigation measures are required.

Monitoring: No monitoring measures are required.

19. Wind Erosion and Blowsand from project either on or off site. a) Be impacted by or result in an increase in wind erosion and blowsand, either on or off site?	☐	☐	☒	☐

Source: Riverside County General Plan Figure S-8 "Wind Erosion Susceptibility Map," Ord. 460, Sec. 14.2 & Ord. 484

Findings of Fact: The project site lies within a moderate area of wind erosion. The project will decrease the amount of exposed dirt, which is subject to wind erosion, with the incorporation of concrete, asphalt, and landscaping. No changes will be made on adjacent properties that would increase wind erosion offsite that would affect this project. Current levels of wind erosion on adjacent properties that would affect this site are considered less than significant. A condition has been placed

	Potentially Significant Impact	Less than Significant with Mitigation Incorporated	Less Than Significant Impact	No Impact

on the project to control dust created during grading activities. (COA 10.BS GRADE.5) This is a standard condition of approval and is not considered mitigation pursuant to CEQA.

Mitigation: No mitigation measures are required.

Monitoring: No monitoring measures are required.

HAZARDS AND HAZARDOUS MATERIALS Would the project				
20. Hazards and Hazardous Materials	☐	☐	☐	☒
a) Create a significant hazard to the public or the environment through the routine transport, use, or disposal of hazardous materials?	☐	☐	☐	☒
b) Create a significant hazard to the public or the environment through reasonably foreseeable upset and accident conditions involving the release of hazardous materials into the environment?	☐	☐	☐	☒
c) Impair implementation of or physically interfere with an adopted emergency response plan or an emergency evacuation plan?	☐	☐	☐	☒
d) Emit hazardous emissions or handle hazardous or acutely hazardous materials, substances, or waste within one-quarter mile of an existing or proposed school?	☐	☐	☐	☒
e) Be located on a site which is included on a list of hazardous materials sites compiled pursuant to Government Code Section 65962.5 and, as a result, would it create a significant hazard to the public or the environment?	☐	☐	☐	☒

Source: Project Application Materials

Findings of Fact: a-b) The proposed subdivision will not create or require transportation of hazardous materials. However, it may result in the use and disposal of substances such as household and commercial cleaning products, fertilizers, pesticides, automotive fluids, etc, but the nature and volume of such substances associated with residential use would not present the potential to create a significant public or environmental hazard.

c) The proposed subdivision will not impair implementation of or physically interfere with an adopted emergency response plan or an emergency evacuation plan.

d) The proposed subdivision will not emit hazardous emissions or handle hazardous or acutely hazardous materials, substances, or waste within one-quarter mile of an existing or proposed school.

e) The proposed subdivision is not located on a site, which is included on a list of hazardous materials sites compiled pursuant to Government Code Section 65962.5.

Mitigation: No mitigation measures are required.

Monitoring: No monitoring measures are required.

	Potentially Significant Impact	Less than Significant with Mitigation Incorporated	Less Than Significant Impact	No Impact
GREENHOUSE GAS EMISSIONS Would the project				
21. Greenhouse Gas Emissions a) Generate greenhouse gas emissions, either directly or indirectly, that may have a significant impact on the environment?	☐	☐	☒	☐
b) Conflict with an applicable plan, policy or regulation adopted for the purpose of reducing the emissions of greenhouse gases?	☐	☐	☒	☐

Source: Application materials

Findings of Fact:

a) The Planning Department does not require a greenhouse gas numerical analysis for small projects that would not contribute cumulatively significant amounts of emissions or generate cumulatively considerable levels of GHGs from fuel combustion or involve substantial water and electricity demands. The proposed project is a subdivision and will not authorize the construction of any buildings; however, construction of single family residences are likely to be constructed in the future. The type of small-scale residential development authorized by this project would not generate enough GHG emissions from its construction or operation to be deemed cumulatively significant sufficient to warrant quantitative or qualitative GHG analysis. The impact is considered less than significant.

b) This project does not conflict with a plan, policy or regulation adopted for the purpose of reducing green house gases. This project does not conflict with the requirements of AB 32. The impact is considered less than significant.

Mitigation: No mitigation measures are required.

Monitoring: No monitoring measures are required.

22. Airports a) Result in an inconsistency with an Airport Master Plan?	☐	☐	☐	☒
b) Require review by the Airport Land Use Commission?	☐	☐	☐	☒
c) For a project located within an airport land use plan or, where such a plan has not been adopted, within two miles of a public airport or public use airport, would the project result in a safety hazard for people residing or working in the project area?	☐	☐	☐	☒
d) For a project within the vicinity of a private airstrip, or heliport, would the project result in a safety hazard for people residing or working in the project area?	☐	☐	☐	☒

Source: Riverside County General Plan Figure S-19 "Airport Locations," GIS database

	Potentially Significant Impact	Less than Significant with Mitigation Incorporated	Less Than Significant Impact	No Impact

Findings of Fact: a) The project site is not located within the vicinity of any public or private airport; therefore, the project will not result in an inconsistency with an Airport Master Plan.

b) The project site is not locate within any public or private airport; therefore, will not require review by the Airport Land Use Commission.

c) The project is not located within an Airport Land Use Plan (ALUP); therefore, it will not result in a safety hazard for people residing or working in the project area.

d) The project is not within the vicinity of a private airstrip, or heliport; therefore, it will not result in a safety hazard for people residing or working in the project area.

Mitigation: No mitigation measures are required.

Monitoring: No monitoring measures are required.

23. Hazardous Fire Area a) Expose people or structures to a significant risk of loss, injury or death involving wildland fires, including where wildlands are adjacent to urbanized areas or where residences are intermixed with wildlands?	☐	☐	☐	☒

Source: Riverside County General Plan Figure S-11 "Wildfire Susceptibility," GIS database

Findings of Fact According to GIS, the project site is not located within a high fire area. No impacts will occur as a result of the proposed project.

Mitigation: No mitigation measures are required.

Monitoring: No monitoring measures are required.

HYDROLOGY AND WATER QUALITY Would the project				
24. Water Quality Impacts a) Substantially alter the existing drainage pattern of the site or area, including the alteration of the course of a stream or river, in a manner that would result in substantial erosion or siltation on- or off-site?	☐	☐	☒	☐
b) Violate any water quality standards or waste discharge requirements?	☐	☐	☐	☒
c) Substantially deplete groundwater supplies or interfere substantially with groundwater recharge such that there would be a net deficit in aquifer volume or a lowering of the local groundwater table level (e.g., the production rate of pre-existing nearby wells would drop to a level which would not support existing land uses or planned uses for which permits have been granted)?	☐	☐	☐	☒
d) Create or contribute runoff water that would exceed	☐	☐	☐	☒

	Potentially Significant Impact	Less than Significant with Mitigation Incorporated	Less Than Significant Impact	No Impact
the capacity of existing or planned stormwater drainage systems or provide substantial additional sources of polluted runoff?				
e) Place housing within a 100-year flood hazard area, as mapped on a federal Flood Hazard Boundary or Flood Insurance Rate Map or other flood hazard delineation map?	☐	☐	☐	☒
f) Place within a 100-year flood hazard area structures which would impede or redirect flood flows?	☐	☐	☐	☒
g) Otherwise substantially degrade water quality?	☐	☐	☐	☒
h) Include new or retrofitted stormwater Treatment Control Best Management Practices (BMPs) (e.g. water quality treatment basins, constructed treatment wetlands), the operation of which could result in significant environmental effects (e.g. increased vectors and odors)?	☐	☐	☐	☒

Source: Riverside County Flood Control District Flood Hazard Report/Condition.

Findings of Fact: a) The proposed project site is located on a slight ridge with a large watercourse that traverses the northern and southern portion of the site. Except for nuisance natural local runoff that may traverse portions of the property, the project is considered free from ordinary storm flood hazard. However, a storm of unusual magnitude could cause some damage. New construction should comply with all applicable ordinances, and the natural watercourse should be kept free of buildings and obstructions in order to maintain the natural drainage patterns of the area (COA 10.FLOOD RI.1). This is a standard condition and not considered unique for the purposes of CEQA.

b) The project is not proposing more than eight (8) residential parcels; therefore, a Water Quality Management Plan (WQMP) was not required for the proposed project. The project will not violate any water quality standards or waste discharge requirements, and has been conditioned to comply with standard water quality conditions of approval.

c) The project will not substantially deplete groundwater supplies or interfere substantially with groundwater recharge.

d) The project will not create or contribute runoff water that would exceed the capacity of existing or planned storm water drainage systems.

e-f) The project is not located within a 100-year flood hazard area; therefore, the project will not place housing or structures within a 100-year flood hazard area, as mapped on a federal Flood Hazard Boundary or Flood Insurance Rate Map or other flood hazard delineation map.

g-h) The project will not degrade water quality in any manner not addressed in the above comments. The project will not include any flood control facilities which would result in significant environmental effects (e.g. increased vectors and odors).

Mitigation: No mitigation measures are required.

Monitoring: No monitoring measures are required.

	Potentially Significant Impact	Less than Significant with Mitigation Incorporated	Less Than Significant Impact	No Impact
25. Floodplains				
Degree of Suitability in 100-Year Floodplains. As indicated below, the appropriate Degree of Suitability has been checked.				
NA - Not Applicable ☒ U - Generally Unsuitable ☐ R - Restricted ☐				
a) Substantially alter the existing drainage pattern of the site or area, including through the alteration of the course of a stream or river, or substantially increase the rate or amount of surface runoff in a manner that would result in flooding on- or off-site?	☐	☐	☒	☐
b) Changes in absorption rates or the rate and amount of surface runoff?	☐	☐	☒	☐
c) Expose people or structures to a significant risk of loss, injury or death involving flooding, including flooding as a result of the failure of a levee or dam (Dam Inundation Area)?	☐	☐	☐	☒
d) Changes in the amount of surface water in any water body?	☐	☐	☐	☒

Source: Riverside County General Plan Figure S-9 "100- and 500-Year Flood Hazard Zones," Figure S-10 "Dam Failure Inundation Zone," Riverside County Flood Control District Flood Hazard Report/Condition, GIS database

Findings of Fact: a) The proposed project site is located on a slight ridge with a large watercourse that traverses the northern and southern portion of the site. The project will not substantially alter the existing drainage pattern of the site or area, including through the alteration of the course of a stream or river, or substantially increase the rate or amount of surface runoff in a manner that would result in flooding on- or off-site. (COA 10.FLOOD RI.1) This is a standard Condition of Approval and is not considered mitigation pursuant to CEQA.

b) The project will not substantially change absorption rates or the rate and amount of surface runoff.

c) The project will not expose people or structures to a significant risk of loss, injury or death involving flooding, including flooding as a result of the failure of a levee or dam as the project is not located in a dam inundation area.

d) The project will not cause changes in the amount of surface water in any water body.

Mitigation: No mitigation measures are required.

Monitoring: No monitoring measures are required.

LAND USE/PLANNING Would the project				
26. Land Use	☐	☐	☐	☒
a) Result in a substantial alteration of the present or planned land use of an area?				
b) Affect land use within a city sphere of influence and/or within adjacent city or county boundaries?	☐	☐	☐	☒

	Potentially Significant Impact	Less than Significant with Mitigation Incorporated	Less Than Significant Impact	No Impact

Source: Riverside County General Plan, GIS database, Project Application Materials

Findings of Fact: a) The proposed project is consistent with the current land use designation of Rural Community: Estate Density Residential (RC: EDR) (2 Acre Minimum) in the Southwest Area Plan.

b) The project site is not located within a city sphere of influence.

Mitigation: No mitigation measures are required.

Monitoring: No monitoring measures are required.

27. Planning	☐	☐	☐	☒
a) Be consistent with the site's existing or proposed zoning?				
b) Be compatible with existing surrounding zoning?	☐	☐	☐	☒
c) Be compatible with existing and planned surrounding land uses?	☐	☐	☐	☒
d) Be consistent with the land use designations and policies of the Comprehensive General Plan (including those of any applicable Specific Plan)?	☐	☐	☐	☒
e) Disrupt or divide the physical arrangement of an established community (including a low-income or minority community)?	☐	☐	☐	☒

Source: Riverside County General Plan Land Use Element, Staff review, GIS database

Findings of Fact: a) The proposed subdivision is consistent with the existing zoning classification of Rural Residential (R-R).

b) The surrounding zoning includes Rural Residential (R-R) to the south and east and Residential Agricultural – 2-½ Acre Minimum (R-A- 2-½) to the north and west.

c) Surrounding land uses include scattered rural residences to the north, east, south, and west. The proposed project is compatible with the planned and existing land uses.

d) The proposed project is consistent with the current land use designation of Rural Community: Estate Density Residential (RC: EDR) (2 Acre Minimum) in the Southwest Area Plan and all applicable policies of the General Plan.

e) Surrounding land uses include scattered rural residences to the north, east, south, and west. The project site will not disrupt or divide any existing community.

Mitigation: No mitigation measures are required.

Monitoring: No monitoring measures are required.

MINERAL RESOURCES Would the project

	Potentially Significant Impact	Less than Significant with Mitigation Incorporated	Less Than Significant Impact	No Impact
28. Mineral Resources	☐	☐	☐	☒
a) Result in the loss of availability of a known mineral resource in an area classified or designated by the State that would be of value to the region or the residents of the State?	☐	☐	☐	☒
b) Result in the loss of availability of a locally-important mineral resource recovery site delineated on a local general plan, specific plan or other land use plan?	☐	☐	☐	☒
c) Be an incompatible land use located adjacent to a State classified or designated area or existing surface mine?	☐	☐	☐	☒
d) Expose people or property to hazards from proposed, existing or abandoned quarries or mines?	☐	☐	☐	☒

Source: Riverside County General Plan Figure OS-5 "Mineral Resources Area"

Findings of Fact: Classification of land within California takes place according to a priority list that was established by the State Mining and Geology Board (SMGB) in 1982, or when the SMGB is petitioned to classify a specific area. The SMGB has also established Mineral Resources Zones (MRZ) to designate lands that contain mineral deposits.

a) The project site is within MRZ-3, which is defined as areas where the available geologic information indicates that mineral deposits are likely to exist; however, the significance of the deposit is undetermined.

b) The Riverside County General Plan identifies policies that encourage protections for existing mining operations and for appropriate management of mineral extraction. A significant impact that would constitute a loss of availability of a known mineral resource would include unmanaged extraction or encroach on existing extraction. No existing or abandoned quarries or mines exist in the area surrounding the Project site. The project does not propose any mineral extraction on the project site. Any mineral resources on the project site will be unavailable for the life of the project; however the project will not result in the permanent loss of significant mineral resources.

c) The project will not result in the loss of availability of a known mineral resource in an area classified or designated by the State that would be of value to the region or the residents of the State.

d) The project will not result in the loss of availability of a locally-important mineral resource recovery site delineated on a local general plan, specific plan or other land use plan.

The project will not be an incompatible land use located adjacent to a State classified or designated area or existing surface mine.

The project will not expose people or property to hazards from proposed, existing or abandoned quarries or mines.

Mitigation: No mitigation measures are required.

Monitoring: No monitoring measures are required.

	Potentially Significant Impact	Less than Significant with Mitigation Incorporated	Less Than Significant Impact	No Impact

NOISE Would the project result in

Definitions for Noise Acceptability Ratings

Where indicated below, the appropriate Noise Acceptability Rating(s) has been checked.

NA - Not Applicable A - Generally Acceptable B - Conditionally Acceptable

C - Generally Unacceptable D - Land Use Discouraged

29. Airport Noise	☐	☐	☐	☒
a) For a project located within an airport land use plan or, where such a plan has not been adopted, within two miles of a public airport or public use airport would the project expose people residing or working in the project area to excessive noise levels? NA ☒ A ☐ B ☐ C ☐ D ☐				
b) For a project within the vicinity of a private airstrip, would the project expose people residing or working in the project area to excessive noise levels? NA ☒ A ☐ B ☐ C ☐ D ☐	☐	☐	☐	☒

Source: Riverside County General Plan Figure S-19 "Airport Locations," County of Riverside Airport Facilities Map

Findings of Fact: a) The project site is not located within an airport land use plan or within two miles of a public airport or public use airport that would expose people residing on the project site to excessive noise levels.

b) The project is not located within the vicinity of a private airstrip that would expose people residing on the project site to excessive noise levels.

Mitigation: No mitigation measures are required.

Monitoring: No monitoring measures are required.

30. Railroad Noise NA ☒ A ☐ B ☐ C ☐ D ☐	☐	☐	☐	☒

Source: Riverside County General Plan Figure C-1 "Circulation Plan", GIS database

Findings of Fact: The project site is not located adjacent to a rail line. No impacts will occur as a result of the proposed project.

Mitigation: No mitigation measures are required.

Monitoring: No monitoring measures are required.

31. Highway Noise NA ☒ A ☐ B ☐ C ☐ D ☐	☐	☐	☐	☒

	Potentially Significant Impact	Less than Significant with Mitigation Incorporated	Less Than Significant Impact	No Impact

Source: Project Application Materials

Findings of Fact: The project site is not located adjacent to or near any highways. No impacts will occur as a result of the proposed project.

Mitigation: No mitigation measures are required.

Monitoring: No monitoring measures are required.

32. Other Noise NA ☒ A ☐ B ☐ C ☐ D ☐	☐	☐	☐	☒

Source: Project Application Materials, GIS database

Findings of Fact: No other noise sources have been identified near the project site that would contribute a significant amount of noise to the project.

Mitigation: No mitigation measures are required.

Monitoring: No monitoring measures are required.

33. Noise Effects on or by the Project	☐	☐	☒	☐
a) A substantial permanent increase in ambient noise levels in the project vicinity above levels existing without the project?	☐	☐	☒	☐
b) A substantial temporary or periodic increase in ambient noise levels in the project vicinity above levels existing without the project?	☐	☐	☐	☒
c) Exposure of persons to or generation of noise levels in excess of standards established in the local general plan or noise ordinance, or applicable standards of other agencies?	☐	☐	☐	☒
d) Exposure of persons to or generation of excessive ground-borne vibration or ground-borne noise levels?				

Source: Project Application Materials

Findings of Fact: a) The proposed project in itself will not create additional noise, but future single-family home construction will create unavoidable incremental noise that will be less than significant.

b) Through adherence to county regulations, grading and construction shall be restricted to daylight hours. Construction equipment shall be required to be maintained in good working order and cannot be serviced or repaired at the site. The construction of single-family residences will result in an increase of noise levels, but these increased noise levels will be less than significant.

c) Long-term noise generation from the site will not exceed standards established in the Riverside County General Plan, noise ordinance, or other applicable standards.

	Potentially Significant Impact	Less than Significant with Mitigation Incorporated	Less Than Significant Impact	No Impact

d) Excessive ground-borne vibration or ground-borne noise levels are not a typical impact of single family home construction.

Mitigation: No mitigation measures are required.

Monitoring: No monitoring measures are required.

POPULATION AND HOUSING Would the project				
34. Housing	☐	☐	☐	☒
a) Displace substantial numbers of existing housing, necessitating the construction of replacement housing elsewhere?				
b) Create a demand for additional housing, particularly housing affordable to households earning 80% or less of the County's median income?	☐	☐	☐	☒
c) Displace substantial numbers of people, necessitating the construction of replacement housing elsewhere?	☐	☐	☐	☒
d) Affect a County Redevelopment Project Area?	☐	☐	☐	☒
e) Cumulatively exceed official regional or local population projections?	☐	☐	☐	☒
f) Induce substantial population growth in an area, either directly (for example, by proposing new homes and businesses) or indirectly (for example, through extension of roads or other infrastructure)?	☐	☐	☐	☒

Source: Project Application Materials, GIS database, Riverside County General Plan Housing Element

Findings of Fact: The project proposes the creation of four (4) residential lots. This land division is consistent with the Riverside County General Plan, which is used to generate local and regional population projections.

a) The project will not displace substantial numbers of existing housing, necessitating the construction of replacement housing.

b) The project will not create a demand for additional housing.

c) The project will not displace any people.

d) The project is not in or near a County Redevelopment Project Area.

e) The project will not exceed official regional or local population projections.

f) The project will not induce substantial population growth in an area.

Mitigation: No mitigation measures are required.

	Potentially Significant Impact	Less than Significant with Mitigation Incorporated	Less Than Significant Impact	No Impact

Monitoring: No monitoring measures are required.

PUBLIC SERVICES Would the project result in substantial adverse physical impacts associated with the provision of new or physically altered government facilities or the need for new or physically altered governmental facilities, the construction of which could cause significant environmental impacts, in order to maintain acceptable service ratios, response times or other performance objectives for any of the public services:

35. Fire Services	☐	☐	☒	☐

Source: Riverside County General Plan Safety Element

Findings of Fact: The project area is serviced by the Riverside County Fire Department. Any potential significant effects will be mitigated by the payment of standard fees to the County of Riverside. The project will not directly physically alter existing facilities or result in the construction of new facilities. Any construction of new facilities required by the cumulative effects of surrounding projects would have to meet all applicable environmental standards. The project shall comply with County Ordinance No. 659 to mitigate the potential effects to fire services. (COA 10.PLANNING.14) This is a standard Condition of Approval and is not considered mitigation pursuant to CEQA.

Mitigation: No mitigation measures are required.

Monitoring: No monitoring measures are required.

36. Sheriff Services	☐	☐	☒	☐

Source: Riverside County General Plan

The proposed area is serviced by the Riverside County Sheriff's Department. The proposed project would not have an incremental effect on the level of sheriff services provided in the vicinity of the project area. Any construction of new facilities required by the cumulative effects of this project and surrounding projects would have to meet all applicable environmental standards. The project shall comply with County Ordinance No. 659 to mitigate the potential effects to sheriff services. (COA 10.PLANNING.16) This is a standard Condition of Approval and is not considered mitigation pursuant to CEQA.

Mitigation: No mitigation measures are required.

Monitoring: No monitoring measures are required.

37. Schools	☐	☐	☒	☐

Source: Temecula Valley Unified School District correspondence, GIS database

Findings of Fact: The project will not physically alter existing facilities or result in the construction of new or physically altered facilities. The proposed project is located within the Temecula Valley Unified

	Potentially Significant Impact	Less than Significant with Mitigation Incorporated	Less Than Significant Impact	No Impact

School District. Any construction of new facilities required by the cumulative effects of this project and surrounding projects would have to meet all applicable environmental standards. This project has been conditioned to comply with School Mitigation Impact fees in order to mitigate the potential effects to school services. This is a standard condition of approval and pursuant to CEQA is not considered mitigation. (COA 80.PLANNING.8) As no unique mitigation measures are identified, no additional mitigation is required.

Mitigation: No mitigation measures are required.

Monitoring: No monitoring measures are required.

38. Libraries	☐	☐	☒	☐

Source: Riverside County General Plan

Findings of Fact: The proposed project will not create a significant incremental demand for library services. The project will not require the provision of new or altered government facilities at this time. Any construction of new facilities required by the cumulative effects of surrounding projects would have to meet all applicable environmental standards. This project shall comply with County Ordinance No. 659 to mitigate the potential effects to library services. (COA 10.PLANNING.14) This is a standard Condition of Approval and pursuant to CEQA is not considered mitigation.

Mitigation: No mitigation measures are required.

Monitoring: No monitoring measures are required.

39. Health Services	☐	☐	☒	☐

Source: Riverside County General Plan

Findings of Fact: The use of the proposed 12.19-acre parcel would not cause an impact on health services. The site is located within the service parameters of County health centers. The project will not physically alter existing facilities or result in the construction of new or physically altered facilities. Any construction of new facilities required by the cumulative effects of this project and surrounding projects would have to meet all applicable environmental standards.

Mitigation: No mitigation measures are required.

Monitoring: No monitoring measures are required.

RECREATION

40. Parks and Recreation a) Would the project include recreational facilities or require the construction or expansion of recreational facilities which might have an adverse physical effect on the environment?	☐	☐	☐	☒

	Potentially Significant Impact	Less than Significant with Mitigation Incorporated	Less Than Significant Impact	No Impact
b) Would the project include the use of existing neighborhood or regional parks or other recreational facilities such that substantial physical deterioration of the facility would occur or be accelerated?	☐	☐	☒	☐
c) Is the project located within a C.S.A. or recreation and park district with a Community Parks and Recreation Plan (Quimby fees)?	☐	☐	☒	☐

Source: GIS database, Ord. No. 460, Section 10.35 (Regulating the Division of Land – Park and Recreation Fees and Dedications), Ord. No. 659 (Establishing Development Impact Fees), Parks & Open Space Department Review

Findings of Fact: a-b) The proposed project does not create a substantial increase in demand for recreational facilities.

c) The project is located within County Service Area No. 149, which is responsible for the collection of Quimby fees. With incorporation of the recommended mitigation measures, the project will not have a significant impact on parks or recreational facilities. The project has been conditioned for the payment of development impact fees and payment of Quimby fees. (COA 50.PLANNING.7, 90.PLANNING.4) Any project located within a County Service Area or recreation and park district will be conditioned to pay Quimby fees; as no unique mitigation measures are identified, no additional mitigation is required.

Mitigation: No mitigation measures are required.

Monitoring: No monitoring measures are required.

41. Recreational Trails	☐	☐	☐	☒

Source: Riverside County General Plan, Figure C-7

Findings of Fact: According to figure C-7, no county designated trails are located on or adjacent to the project site; therefore, the proposed project will not impact any regional or local trails.

Mitigation: No mitigation measures are required.

Monitoring: No monitoring measures are required.

TRANSPORTATION/TRAFFIC Would the project				
42. Circulation	☐	☐	☐	☒
a) Cause an increase in traffic which is substantial in relation to the existing traffic load and capacity of the street system (i.e., result in a substantial increase in either the number of vehicle trips, the volume to capacity ratio on roads, or congestion at intersections)?				
b) Result in inadequate parking capacity?	☐	☐	☐	☒
c) Exceed, either individually or cumulatively, a level of service standard established by the county congestion	☐	☐	☒	☐

	Potentially Significant Impact	Less than Significant with Mitigation Incorporated	Less Than Significant Impact	No Impact
management agency for designated road or highways?				
d) Result in a change in air traffic patterns, including either an increase in traffic levels or a change in location that results in substantial safety risks?	☐	☐	☐	☒
e) Alter waterborne, rail or air traffic?	☐	☐	☐	☒
f) Substantially increase hazards to a design feature (e.g., sharp curves or dangerous intersections) or incompatible uses (e.g. farm equipment)?	☐	☐	☐	☒
g) Cause an effect upon, or a need for new or altered maintenance of roads?	☐	☐	☒	☐
h) Cause an effect upon circulation during the project's construction?	☐	☐	☐	☒
i) Result in inadequate emergency access or access to nearby uses?	☐	☐	☐	☒
j) Conflict with adopted policies supporting alternative transportation (e.g. bus turnouts, bicycle racks)?	☐	☐	☐	☒

Source: Riverside County General Plan

Findings of Fact: The Transportation Department has not required a traffic study for the proposed project. It has been determined that the project is exempt from traffic study requirements.

a) The addition of four (4) residential lots will not cause a substantial increase in traffic in relation to the existing traffic load and capacity of the street system.

b) The proposed project will comply with Section 18.12 Parking Requirements; therefore, the project will not result in inadequate parking capacity.

c) According to the Western Riverside County Transportation Fee Nexus Study, future development within the Western Riverside County and the cities therein will result in traffic volumes exceeding the capacity of the Regional System, resulting in substantial traffic congestion in all parts of Western Riverside County and unacceptable levels of service throughout. In order to meet the demands of development, the Transportation Uniform Mitigation Fee (TUMF), pursuant to Ordinance No. 824, shall be collected prior to building final inspection. (COA 90.TRANS.1) This is a standard Condition of Approval and not considered mitigation pursuant to CEQA.

d) The project will not result in a change in air traffic patterns.

e) The project will not alter waterborne, rail or air traffic.

f) The project will not substantially increase hazards to a design feature.

g) Calle Bellagio and Corte Venture shall be improved with 24 feet of acceptable aggregate base on a 32 foot graded section within a 60-foot full-width dedicated right-of-way. Glen Oaks Road shall be improved at the intersection of Corte Venture and Calle Bellagio with 7 feet pavement for acceleration/deceleration lanes and 6 feet for left turn lanes. Calle Bellagio and Corte Venture are not county maintained roads and will therefore not require new maintenance of roads. The additional pavement along Glen Oaks will not require altered maintenance of the county road.

	Potentially Significant Impact	Less than Significant with Mitigation Incorporated	Less Than Significant Impact	No Impact

h) Project construction should not impede traffic flow.

i) The project has been conditioned for emergency access in the typical manner required by the Fire Department. These standard requirements are not considered mitigation for CEQA implementation purposes.

j) The project will not conflict with adopted policies supporting alternative transportation.

Mitigation: No mitigation measures are required.

Monitoring: No monitoring measures are required.

43. Bike Trails	☐	☐	☐	☒

Source: Riverside County General Plan

Findings of Fact: According to figure C-7, no county designated trails are located on or adjacent to the project site; therefore, the proposed project will not impact any regional or local trails.

Mitigation: No mitigation measures are required.

Monitoring: No monitoring measures are required.

UTILITY AND SERVICE SYSTEMS Would the project				
44. Water				
a) Require or result in the construction of new water treatment facilities or expansion of existing facilities, the construction of which would cause significant environmental effects?	☐	☐	☒	☐
b) Have sufficient water supplies available to serve the project from existing entitlements and resources, or are new or expanded entitlements needed?	☐	☐	☒	☐

Source: Department of Environmental Health Review

Findings of Fact The project will be served by Rancho California Water District (RCWD) with water facilities pursuant to the arrangement of financial agreements.

a-b) The proposed project will not require or result in the construction of new water treatment facilities or expansion of existing facilities.

45. Sewer				
a) Require or result in the construction of new wastewater treatment facilities, including septic systems, or expansion of existing facilities, the construction of which	☐	☐	☐	☒

	Potentially Significant Impact	Less than Significant with Mitigation Incorporated	Less Than Significant Impact	No Impact
would cause significant environmental effects?				
b) Result in a determination by the wastewater treatment provider that serves or may service the project that it has adequate capacity to serve the project's projected demand in addition to the provider's existing commitments?	☐	☐	☒	☐

Source: Department of Environmental Health Review

Findings of Fact: a) The Department of Environmental Health will permit Domestic Sewage Disposal from the individual lots of the subdivision as per a percolation report submitted by Lawrence Phelps, RCE dated 12/1/04. For each 100 gallons of septic tank capacity lot 1 will require 45 square feet of leach line bottom area, and lots 2 and 3 will require 20 square feet of leach line bottom area. A residence already exists on Lot 4. With incorporation of the recommended mitigation measures, the project will have a less than significant impact on the environment. Prior to issuance of grading permit, the following information shall be addressed where Subsurface Septic Sewage Disposal is intended: 1) The proposed cuts and/or fills in area of the sewage disposal systems. 2) The primary sewage disposal system and its 100% expansion area. 3) The elevation of the individual building pads in reference to the elevation of the sewage disposal system. 4) The original title line to be installed and all required expansion are shall be located in an original (natural) undisturbed soil at the depth of the percolation tests performed. 5) The appropriateness of the grading plan with regard to the soils percolation engineer's report. 6) These plans are to be submitted to the Department of Environmental Health for approval. The size of the septic tank and effluent disposal area shall be determined based upon the occupancy of each individual lot or the plumbing fixture count. (COA 10.E HEALTH.1, 60.E HEALTH.1) This is a standard condition of approval and pursuant to CEQA is not considered mitigation.

b) The Department of Environmental Health will permit the domestic Sewage Disposal from the individual lots proposed by the subdivision. Department of Environmental Health will review and approve project plans for Sewage Disposal.

Mitigation: No mitigation measures are required.

Monitoring: No monitoring measures are required.

46. Solid Waste				
a) Is the project served by a landfill with sufficient permitted capacity to accommodate the project's solid waste disposal needs?	☐	☐	☒	☐
b) Comply with federal, state, and local statutes and regulations related to solid wastes (including the CIWMP (County Integrated Waste Management Plan)?	☐	☐	☒	☐

Source: Riverside County General Plan, Riverside County Waste Management District correspondence

Findings of Fact: a-b) According to the Riverside County Waste Management Department, the proposed project has the potential to impact landfill capacity from the generation of solid waste during

	Potentially Significant Impact	Less than Significant with Mitigation Incorporated	Less Than Significant Impact	No Impact

construction. The project will not physically alter existing facilities or result in the construction of new or physically altered facilities. Any construction of new facilities required by the cumulative effects of this project and surrounding projects would have to meet all applicable environmental standards.

Mitigation: No mitigation measures are required.

Monitoring: No monitoring measures are required.

47. Utilities

Would the project impact the following facilities requiring or resulting in the construction of new facilities or the expansion of existing facilities; the construction of which could cause significant environmental effects?

a) Electricity?	☐	☐	☒	☐
b) Natural gas?	☐	☐	☒	☐
c) Communications systems?	☐	☐	☒	☐
d) Storm water drainage?	☐	☐	☒	☐
e) Street lighting?	☐	☐	☒	☐
f) Maintenance of public facilities, including roads?	☐	☐	☒	☐
g) Other governmental services?	☐	☐	☒	☐
h) Conflict with adopted energy conservation plans?	☐	☐	☒	☐

Source: Riverside County General Plan

Findings of Fact: a-g) The project is expected to create incremental impacts on the demand for the above checked facilities. However, utility services are adequate and available to serve this project. Therefore, impacts on utility services are less than significant.

h) The project design does not conflict with adopted energy conservation plans.

Mitigation: No mitigation measures are required.

Monitoring: No monitoring measures are required.

MANDATORY FINDINGS OF SIGNIFICANCE

48. Does the project have the potential to substantially degrade the quality of the environment, substantially reduce the habitat of a fish or wildlife species, cause a fish or wildlife population to drop below self-sustaining levels, threaten to eliminate a plant or animal community, reduce the number or restrict the range of a rare, or endangered plant or animal to eliminate important examples of the major periods of California history or prehistory?	☐	☐	☒	☐

Source: Staff review, Project Application Materials

	Potentially Significant Impact	Less than Significant with Mitigation Incorporated	Less Than Significant Impact	No Impact

Findings of Fact: Implementation of the proposed project would not degrade the quality of the environment, substantially reduce the habitat of fish or wildlife species, cause a fish or wildlife populations to drop below self sustaining levels, threaten to eliminate a plant or animal community, or reduce the number or restrict the range of a rare or endangered plant or animal, or eliminate important examples of the major periods of California history or prehistory.

49.	Does the project have the potential to achieve short-term environmental goals, to the disadvantage of long-term environmental goals? (A short-term impact on the environment is one that occurs in a relatively brief, definitive period of time while long-term impacts will endure well into the future.)	☐	☐	☒	☐

Source: Staff review, Project Application Materials

Findings of Fact: The proposed project does not have the potential to achieve short-term environmental goals, to the disadvantage of long-term environmental goals. Both short-term and long-term environmental goals are being met through the mitigation placed on the project and the project design.

50.	Does the project have impacts which are individually limited, but cumulatively considerable? ("Cumulatively considerable" means that the incremental effects of an individual project are considerable when viewed in connection with the effects of past projects, the effects of other current projects, and the effects of probable future projects as defined in California Code of Regulations, Section 15130)?	☐	☐	☒	☐

Source: Staff review, Project Application Materials

Findings of Fact: The project does not have impacts which are individually limited, but cumulatively considerable. All cumulative impacts resulting from this project and those around it have been evaluated as part of this Initial Study and the EIR prepared for the General Plan.

51.	Does the project have environmental effects that will cause substantial adverse effects on human beings, either directly or indirectly?	☐	☐	☐	☒

Source: Staff review, project application

Findings of Fact: The proposed project would not result in environmental effects which would cause substantial adverse effects on human beings, either directly or indirectly.

VI. EARLIER ANALYSES

Earlier analyses may be used where, pursuant to the tiering, program EIR, or other CEQA process, an effect has been adequately analyzed in an earlier EIR or negative declaration as per California Code of Regulations, Section 15063 (c) (3) (D). In this case, a brief discussion should identify the following:

Earlier Analyses Used, if any:

Location Where Earlier Analyses, if used, are available for review:

Location: County of Riverside Planning Department
4080 Lemon Street, 9th Floor
Riverside, CA 92505

Riverside County General Plan

Y:\Planning Case Files-Riverside office\PM30298\PM30298 EA40617.doc

BOUCHEE

BOUCHEE

PARCEL MAP Parcel Map #: PM30298 Parcel: 941-080-027

10. GENERAL CONDITIONS

EVERY DEPARTMENT

10. EVERY. 1 MAP - PROJECT DESCRIPTION RECOMMND

The tentative parcel map is a Schedule H subdivision of 12.19 acres into four (4) residential parcels with parcels ranging from 3.0 to 3.2 gross acres. An existing single family residence is located on Parcel No. 4.

10. EVERY. 2 MAP - DEFINITIONS RECOMMND

The words identified in the following list that appear in all capitals in the attached conditions of Tentative Parcel Map No. 30298 shall be henceforth defined as follows:

TENTATIVE MAP = Tentative Parcel Map No. 30298, Amended No. 1, dated 3/13/08.

EXHIBIT E = Environmental Constraint Sheet (ECS) for Tentative Parcel Map No. 30298, dated 4/18/11.

10. EVERY. 4 MAP - HOLD HARMLESS RECOMMND

The applicant/permittee or any successor-in-interest shall defend, indemnify, and hold harmless the County of Riverside or its agents, officers, and employees (COUNTY) from the following:

(a) any claim, action, or proceeding against the COUNTY to attack, set aside, void, or annul an approval of the COUNTY, its advisory agencies, appeal boards, or legislative body concerning the TENTATIVE MAP, which action is brought within the time period provided for in California Government Code, Section 66499.37; and,

(b) any claim, action or proceeding against the COUNTY to attack, set aside, void or annul any other decision made by the COUNTY concerning the TENTATIVE MAP, including, but not limited to, decisions made in response to California Public Records Act requests.

The COUNTY shall promptly notify the applicant/permittee of any such claim, action, or proceeding and shall cooperate fully in the defense. If the COUNTY fails to promptly notify the applicant/permittee of any such claim, action, or proceeding or fails to cooperate fully in the defense, the applicant/permittee shall not, thereafter, be

PARCEL MAP Parcel Map #: PM30298 Parcel: 941-080-027

10. GENERAL CONDITIONS

10. EVERY. 4 MAP - HOLD HARMLESS (cont.) RECOMMND

responsible to defend, indemnify or hold harmless the COUNTY.

The obligations imposed by this condition include, but are not limited to, the following: the applicant/permittee shall pay all legal services expenses the COUNTY incurs in connection with any such claim, action or proceeding, whether it incurs such expenses directly, whether it is ordered by a court to pay such expenses, or whether it incurs such expenses by providing legal services through its Office of County Counsel.

BS GRADE DEPARTMENT

10.BS GRADE. 1 MAP-GIN INTRODUCTION RECOMMND

Improvement such as grading, filling, over excavation and recompaction, and base or paving which require a grading permit are subject to the included Building and Safety Grading Division conditions of approval.

10.BS GRADE. 2 MAP-G1.2 OBEY ALL GDG REGS RECOMMND

All grading shall conform to the California Building Code, Ordinance 457, and all other relevant laws, rules and regulations governing grading in Riverside County and prior to commencing any grading which includes 50 or more cubic yards, the applicant shall obtain a grading permit from the Building & Safety Department.

10.BS GRADE. 3 MAP-G1.3 DISTURBS NEED G/PMT RECOMMND

Ordinance 457 requires a grading permit prior to clearing , grubbing or any top soil disturbances related to construction grading.

10.BS GRADE. 4 MAP-G1.5 EROS CNTRL PROTECT RECOMMND

Graded but undeveloped land shall provide, in addition to erosion control planting, any drainage facility deemed necessary to control or prevent erosion. Additional erosion protection may be required during the rainy season from October 1 to May 31.

PARCEL MAP Parcel Map #: PM30298 Parcel: 941-080-027

10. GENERAL CONDITIONS

10.BS GRADE. 5 MAP-G1.6 DUST CONTROL RECOMMND

All necessary measures to control dust shall be implemented by the developer during grading.

10.BS GRADE. 6 MAP-G2.1 GRADING BONDS RECOMMND

Grading in excess of 199 cubic yards will require performance security to be posted with the Building & Safety Department. Single family dwelling units graded one lot per permit and proposing to grade less than 5,000 cubic yards are exempt.

10.BS GRADE. 7 MAP-G2.5 2:1 MAX SLOPE RATIO RECOMMND

Grade slopes shall be limited to a maximum steepness ratio of 2:1 (horizontal to vertical) unless otherwise approved.

10.BS GRADE. 8 MAP-G2.6SLOPE STABL'TY ANLY RECOMMND

A slope stability report shall be submitted and approved by the County Geologist for all proposed cut or fill slopes steeper than 2:1 (horizontal to vertical) or over 30 feet in vertical height - unless addressed in a previous report.

10.BS GRADE. 9 MAP-G2.8MINIMUM DRNAGE GRAD RECOMMND

Minimum drainage grade shall be 1% except on portland cement concrete where 0.35% shall be the minimum.

10.BS GRADE. 10 MAP-G2.11DR WAY XING NWC RECOMMND

Lots whose access is or will be affected by natural or constructed drainage facilities, shall provide drive way drainage facilities which are adequate to allow access from the street to the house during 100 year storms.

10.BS GRADE. 11 MAP-G2.12SLOPES IN FLOODWAY RECOMMND

Graded slopes which infringe into the 100 year storm flow flood way boundaries, shall be protected from erosion, or other flood hazards, by a method acceptable to the Building & Safety Departments District Grading Engineer - which may include Riverside County flood Control & Water Conservation District's review and approval. However, no graded slope will be allowed which in the professional judgment of the District Grading Engineer blocks, concentrates or diverts drainage flows.

PARCEL MAP Parcel Map #: PM30298 Parcel: 941-080-027

10. GENERAL CONDITIONS

10.BS GRADE. 12 MAP-G2.13FIRE D'S OK ON DR. RECOMMND

Driveways shall be designed in accordance with Riverside County Fire Department standards - or the governing Fire Department if not the county - and shall require their approval prior to issuance of the grading permit. Aproval shall be in the form of a conditional approval letter addressed to the related case file or by written approval from the Fire Department.

10.BS GRADE. 13 MAP-G2.21POST & BEAM LOT RECOMMND

Any lot conditioned to use post and beam design, which involves grading in excess of that required to construct the driveway, will need the Planning Department's approval prior to the issuance of a grading permit.

10.BS GRADE. 15 MAP-G1.4 NPDES/SWPPP RECOMMND

Prior to issuance of any grading or construction permits - whichever comes first - the applicant shall provide the Building and Safety Department evidence of compliance with the following: "Effective March 10, 2003 owner operators of grading or construction projects are required to comply with the N.P.D.E.S. (National Pollutant Discharge Elimination System) requirement to obtain a construction permit from the State Water Resource Control Board (SWRCB). The permit requirement applies to grading and construction sites of "ONE" acre or larger. The owner operator can comply by submitting a "Notice of Intent" (NOI), develop and implement a STORM WATER POLLUTION PREVENTION PLAN (SWPPP) and a monitoring program and reporting plan for the construction site. For additional information and to obtain a copy of the NPDES State Construction Permit contact the SWRCB at (916) 657-1146.

Additionally, at the time the county adopts, as part of any ordinance, regulations specific to the N.P.D.E.S., this project (or subdivision) shall comply with them.

E HEALTH DEPARTMENT

10.E HEALTH. 1 MAP - PERC RPT INFO RECOMMND

The Department of Environmental Health will permit Domestic Sewage Disposal from the individual lots of the subdivision as per a percolation report submitted by Lawrence Phelps, RCE, dated 12/1/04. Additional testing may

PARCEL MAP Parcel Map #: PM30298 Parcel: 941-080-027

10. GENERAL CONDITIONS

10.E HEALTH. 1 MAP - PERC RPT INFO (cont.) RECOMMND

be required prior to grading and or building permit issuance.
Please be aware that in accordance with Assembly Bill 885, the State Water Resources Control Board will be adopting in the near future, regulations or standards for the permitting and operation of all onsite sewage treatment systems, including septic tanks. These regulations or standards may require monitoring for these treatment systems including septic tanks.

10.E HEALTH. 2 RCWD POTABLE WATER SERVICE RECOMMND

Parcel Map#30298 is proposing Rancho California Water District (RCWD) potable water service. It is the responsibility of the developer to ensure that all requirements to obtain potable water service are met with RCWD as well as all other applicable agencies.

10.E HEALTH. 3 PM#30298 - COMMENTS RECOMMND

The Department of Environmental Health (DEH) will accept for review the proposed use of an Onsite Wastewater Treatment System (OWTS) for Parcel Map#30298 based on Lawrence Phelps Soils Percolation Report dated December 1, 2004 provided that all parameters set forth by this report is maintained. Although an OWTS conceptual location has been proposed for each lot on the parcel map, the final OWTS location may change pending a site evaluation conducted by DEH staff at time of building plan submittal.

10.E HEALTH. 4 OWTS/ATU - MAINTAIN SETBACKS RECOMMND

All proposed Onsite Wastewater Treatment Systems (OWTS) and/or proposed Advanced Treatment Units (ATU) must maintain all required setbacks as specified in the Department of Environmental Health (DEH) Technical Guidance Manual, Uniform Plumbing Code, and State and Local Laws. Please note that the most restrictive minimum setback may be applied at the discretion of DEH.
In addition, no part of the proposed OWTS and/or ATU can be located within "Do Not Disturbed" areas without written consent from the appropriate regulatory agency. Moreover, no part of the proposed OWTS and/or ATU can be located within easements that are not legally dedicated for use by the proposed OWTS and/or ATU.

PARCEL MAP Parcel Map #: PM30298 Parcel: 941-080-027

10. GENERAL CONDITIONS

10.E HEALTH. 5 DEH SITE EVALUATION RECOMMND

For all proposed new Onsite Wastewater Treatment Systems (OWTS) and/or Advanced Treatment Units (ATU), a site evaluation is required by the Department of Environmental Health (DEH). The applicant must ensure that the groundwater detection boring (4 inch perforated pipe installed at a depth that extends at least 10 feet below the proposed leach line trench bottom) is installed for DEH staff to evaluate.

In addition, the applicant must ensure that the job property is clearly identified with a durable placard delineating the site address or APN# as well as ensure that all property corners are clearly staked or marked. **Please note that if groundwater encroachment is observed, further engineering as well as Regional Water Quality Control Board Clearance may be required.**

10.E HEALTH. 6 OWTS/ATU PLANS & FLOOR PLANS RECOMMND

For all proposed new Onsite Wastewater Treatment Systems (OWTS) and/or Advanced Treatment Units (ATU), the applicant must submit to the Department of Environmental Health (DEH) for review at least three copies of detailed contoured plot plans wet stamped and signed by the Professional of Record (individual or firm who is responsible for the soils percolation report) drawn to an appropriate scale showing the location of all applicable detail as required in the DEH Technical Guidance Manual.

If grading is proposed, the applicant must show all pertinent detail on scaled Precise Grading Plans wet stamped and signed by the Professional of Record. Please note that any significant grading at the proposed OWTS/ATU area may require further soils percolation testing and/or engineering.

Furthermore, a floor plan of the propsoed structure showing all proposed plumbing fixtures must also be submitted to DEH for review to ensure proper septic tank sizing.

EPD DEPARTMENT

10.EPD. 1 EPD- RRVP TO AVOID RECOMMND

The project site supports an approximately 0.91 acre drainage that qualifies as a Riparian/Riverine feature as defined by Section 6.1.2 of the MSHCP and thus must be avoided. No disturbance, surface alterations, or grading

PARCEL MAP Parcel Map #: PM30298 Parcel: 941-080-027

10. GENERAL CONDITIONS

10.EPD. 1 EPD- RRVP TO AVOID (cont.) RECOMMND

may occur in the feature or within the associated vegetation. To help insure protection of the feature the drainage must clearly be shown on an Environmental Constraint Sheet (ECS) and labeled Riparian/Riverine Area Not to be Disturbed.

FIRE DEPARTMENT

10.FIRE. 1 MAP-#50-BLUE DOT REFLECTORS RECOMMND

Blue retroreflective pavement markers shall be mounted on private streets, public streets and driveways to indicate location of fire hydrants. Prior to installation, placement of markers must be approved by the Riverside County Fire Department.

10.FIRE. 2 MAP-#13-HYDRANT SPACING RECOMMND

Schedule H fire protection. An approved standard fire hydrant (6"x4"x2 1/2") shall be located within 250 feet of any portion of the lot frontage as measured along approved vehicular travelways. Minimum fire flow shall be 1000 GPM for 2-hour duration at 20 PSI.

FLOOD RI DEPARTMENT

10.FLOOD RI. 1 MAP FLOOD HAZARD REPORT RECOMMND

Parcel Map 30298 proposes to subdivide 12 acres into four parcels in the Rancho California area. The project is located southerly of Glen Oaks Road and westerly of De Portola Road.

The project site is located on a slight ridge with a large watercourse that traverses the northern portion of the site. The watercourse has a tributary watershed of approximately 140 acres. The natural watercourse shall be kept free of buildings and obstructions in order to maintain the natural drainage patterns of the area and to prevent flood damage to new buildings. The existing pads shown on the tentative exhibit were graded prior to this parcel map and are located outside of the watercourse. The natural watercourse shall be delineated on the environmental constraint sheet with a note stating that the watercourses must be kept free of all buildings and obstructions.

PARCEL MAP Parcel Map #: PM30298 Parcel: 941-080-027

10. GENERAL CONDITIONS

10.FLOOD RI. 1 MAP FLOOD HAZARD REPORT (cont.) RECOMMND

The site is located within the bounds of the Murrieta Creek/Santa Gertrudis Valley Area Drainage Plan (ADP) for which drainage fees have been established by the Board of Supervisors. Applicable ADP fees will be due (in accordance with the Rules and Regulations for Administration of Area Drainage Plans) prior to permits for this project. Although the current fee for this ADP is $1,179 per acre (or per lot for parcels larger than one acre), the fee due will be based on the fee in effect at the time of payment. The fee is payable to the Flood Control District by cashier's check or money order only. The District will not accept personal or company checks.

PLANNING DEPARTMENT

10.PLANNING. 1 MAP - IF HUMAN REMAINS FOUND RECOMMND

If human remains are encountered, State Health and Safety Code Section 7050.5 states that no further disturbance shall occur until the Riverside County Coroner has made the necessary findings as to origin. Further, pursuant to Public Resource Code Section 5097.98(b) remains shall be left in place and free from disturbance until a final decision as to the treatment and disposition has been made. If the Riverside County Coroner determines the remains to be Native American, the Native American Heritage Commission shall be contacted within a resonable timeframe. Subsequently, the Native American Heritage Commission shall identify the "most likely descendant." The most likely descendant shall then make recommendations and engage in consultation concerning thetreatment of the remains as provided in Public Resources Code Section 5097.98.

10.PLANNING. 2 MAP - INADVERTENT ARCHAEO FIND RECOMMND

If during ground disturbance activities, unique cultural resources are discovered that were not assessed by the archaeological report(s) and/or environemntal assessment conducted prior to project approval, the following procedures shall be followed. Unique cultural resources are defined, for this condition, as being multiple artifacts in close association with each other, but may include fewer artifacts if the area of the find is determined to be of significance due to its sacred or cultural importance.

PARCEL MAP Parcel Map #: PM30298 Parcel: 941-080-027

10. GENERAL CONDITIONS

10.PLANNING. 2 MAP - INADVERTENT ARCHAEO FIND (cont.) RECOMMND

1. All ground disturbance activities within 100 feet of the discovered cultural resources shall be halted until a meeting is convened between the developer, the archaeologist, the Native American tribal respresentative and the Planning Director to discuss the significance of the find.

2. At the meeting, the significance of the discoveries shall be discussed and after consultation with the Native American tribal representative and the archaeologist, a decision shall be made, with the concurrence of the Planning Director, as to the appropriate mitigation (documentation, recovery, avoidance, etc.) for the cultural resources.

3. Grading of further ground disturbance shall not resume within the area of the discovery until an agreement has been reached by all parties as to the appropriate mitigation.

10.PLANNING. 3 MAP - MAP ACT COMPLIANCE RECOMMND

This land division shall comply with the State of California Subdivision Map Act and to all requirements of County Ordinance No. 460, Schedule H, unless modified by the conditions listed herein.

10.PLANNING. 4 MAP - FEES FOR REVIEW RECOMMND

Any subsequent review/approvals required by the conditions of approval, including but not limited to grading or building plan review or review of any mitigation monitoring requirement, shall be reviewed on an hourly basis, or other appropriate fee, as listed in ounty Ordinance No. 671. Each submittal shall be accompanied with a letter clearly indicating which condition or conditions the submittal is intended to comply with.

10.PLANNING. 6 MAP - LANDSCAPE MAINTENANCE RECOMMND

The land divider, or any successor-in-interest to the land divider, shall be responsible for maintenance and upkeep of all slopes, landscaped areas and irrigation systems within the land division until such time as those operations are the responsibility of the individual home owners, a

PARCEL MAP Parcel Map #: PM30298 Parcel: 941-080-027

10. GENERAL CONDITIONS

10.PLANNING. 6 MAP - LANDSCAPE MAINTENANCE (cont.) RECOMMND

homeowners association, or any other successor-in-interest.

10.PLANNING. 10 MAP - ZONING STANDARDS RECOMMND

Lots created by this TENTATIVE MAP shall be in conformance with the development standards of the Rural Residential (R-R) zone.

10.PLANNING. 11 MAP - 90 DAYS TO PROTEST RECOMMND

The project applicant has 90 days from the date of approval of these conditions to protest, in accordance with the procedures set forth in Government Code Section 66020, the imposition of any and all fees, dedications, reservations and/or other exactions imposed on this project as a result of the approval or conditional approval of this project.

10.PLANNING. 13 MAP - OFFSITE SIGNS ORD 679.4 RECOMMND

No offsite subdivision signs advertising this land division/development are permitted, other than those allowed under Ordinance No. 679.4. Violation of this condition of approval may result in no further permits of any type being issued for this subdivision until the unpermitted signage is removed.

10.PLANNING. 15 MAP - ORD 810 OPN SPACE FEE RECOMMND

Prior to the issuance of either a certificate of occupancy or prior to building permit final inspection, the applicant shall comply with the provisions of Riverside County Ordinance No. 810, which requires payment of the appropriate fee set forth in the Ordinance. Riverside County Ordinance No. 810 has been established to set forth policies, regulations and fees related to the funding and acquisition of open space and habitat necessary to address the direct and cumulative environmental effects generated by new development projects described and defined in this Ordinance.

The fee shall be paid for each residential unit to be constructed within this land division.

In the event Riverside County Ordinance No. 810 is rescinded, this condition will no longer be applicable. However, should Riverside County Ordinance No. 810 be

PARCEL MAP Parcel Map #: PM30298 Parcel: 941-080-027

10. GENERAL CONDITIONS

10.PLANNING. 15 MAP - ORD 810 OPN SPACE FEE (cont.) RECOMMND

rescinded and superseded by a subsequent mitigation fee ordinance, payment of the appropriate fee set forth in that ordinance shall be required.

10.PLANNING. 16 MAP - ORD NO. 659 (DIF) RECOMMND

Prior to the issuance of either a certificate of occupancy or prior to building permit final inspection, the applicant shall comply with the provisions of Riverside County Ordinance No. 659, which requires the payment of the appropriate fee set forth in the Ordinance. Riverside County Ordinance No. 659 has been established to set forth policies, regulations and fees related to the funding and construction of facilities necessary to address the direct and cummulative environmental effects generated by new development projects described and defined in this Ordinance, and it establishes the authorized uses of the fees collected.

The fee shall be paid for each residential unit to be constructed within this land division. In the event Riverside County Ordinance No. 659 is recinded, this condition will no longer be applicable. However, should Riverside County Ordinance No. 659 be rescinded and superseded by a subsequent mitigation fee ordinance, payment of the appropriate fee set forth in that ordinance shall be required.

10.PLANNING. 18 MAP - SUBMIT BUILDING PLANS RECOMMND

The developer shall cause building plans to be submitted to the TLMA- Land Use Section for review by the Department of Building and Safety - Plan Check Division. Said plans shall be in conformance with the approved TENTATIVE MAP.

TRANS DEPARTMENT

10.TRANS. 1 MAP - TS/EXEMPT RECOMMND

The Transportation Department has not required a traffic study for the subject project. It has been determined that the project is exempt from traffic study requirements.

PARCEL MAP Parcel Map #: PM30298 Parcel: 941-080-027

10. GENERAL CONDITIONS

10.TRANS. 2 MAP - DRAINAGE 1 RECOMMND

The land divider shall protect downstream properties from damages caused by alteration of the drainage patterns, i.e., concentration or diversion of flow. Protection shall be provided by constructing adequate drainage facilities including enlarging existing facilities and/or by securing a drainage easement. All drainage easements shall be shown on the final map and noted as follows: "Drainage Easement - no building, obstructions, or encroachments by landfills are allowed". The protection shall be as approved by the Transportation Department.

10.TRANS. 3 MAP - DRAINAGE 2 RECOMMND

The land divider shall accept and properly dispose of all off-site drainage flowing onto or through the site. In the event the Transportation Department permits the use of streets for drainage purposes, the provisions of Article XI of Ordinance No. 460 will apply. Should the quantities exceed the street capacity or the use of streets be prohibited for drainage purposes, the subdivider shall provide adequate drainage facilities and/or appropriate easements as approved by the Transportation Department.

10.TRANS. 4 MAP - NO ADD'L ON-SITE R-O-W RECOMMND

No additional on-site right-of-way shall be required on Calle Bellagio since adequate right-of-way exists, per PM17/90.

10.TRANS. 8 MAP - STD INTRO 3(ORD 460/461) RECOMMND

With respect to the conditions of approval for the referenced tentative exhibit, he land divider shall provide all street improvements, street improvement plans and/or road dedications set forth herein in accordance with Ordinance 460 and Riverside County Road Improvement Standards (Ordinance 461). It is understood that the tentative map correctly shows acceptable centerline elevations, all existing easements, traveled ways, and drainage courses with appropriate Q's, and that their omission or unacceptablility may require the map to be resubmitted for further consideration. These Ordinances and all conditions of approval are essential parts and a requirement occurring in ONE is as binding as though occurring in all. All questions regarding the true meaning of the conditions shall be referred to the Transportation

PARCEL MAP Parcel Map #: PM30298 Parcel: 941-080-027

10. GENERAL CONDITIONS

10.TRANS. 8 MAP - STD INTRO 3(ORD 460/461) (cont.) RECOMMND

Department.

20. PRIOR TO A CERTAIN DATE

PLANNING DEPARTMENT

20.PLANNING. 2 MAP - EXPIRATION DATE RECOMMND

The conditionally approved TENTATIVE MAP shall expire three (3) years after the ounty of Riverside Board of Supervisors original approval date, unless extended as provided by County Ordinance No. 460. Action on a minor change and/or revised map request shall not extend the time limits of the originally approved TENTATIVE MAP. A Land Management System (LMS) hold shall be placed on the TENTATIVE MAP, and a LMS hold shall be placed on any subsequent minor change or revised map, which shall be set to take effect on the expiration date. The LMS hold effective date shall be extended in accordance with any permitted extensions of time. The LMS hold shall be downgraded to a LMS notice upon recordation of the the first phase of the TENTATIVE MAP. The LMS hold or notice shall remain in effect until the recordation of the final phase of the TENTATIVE MAP. If the TENTATIVE MAP expires before the recordation of the final phase the LMS hold or notice shall remain in effect and no further FINAL MAP recordation shall be permitted.

50. PRIOR TO MAP RECORDATION

EPD DEPARTMENT

50.EPD. 1 MAP- EXHIBIT E-ECS RECOMMND

Exhibit E- PM 30298 Prior to Map Recordation
The approximately 0.91 acre drainage and associated vegetation as show on Exhibit E (ECS-PM30298), dated 4/18/11, is a Riparian/Riverine feature as defined by Section 6.1.2 of the MSHCP and thus must be avoided. The 0.91 acre drainage must be clearly mapped on the ECS (Environmental Constraints Sheet) and must be labeled as "Riparian/Riverine Drainage Not to be Disturbed." No grading, surface alterations or disturbance shall occur in the mapped area. No modifications to the drainage shall take place without further consultation and approval from the Environmental Programs Division of the Planning Department. The ESC shall be reviewed and approved by EPD

PARCEL MAP Parcel Map #: PM30298 Parcel: 941-080-027

50. PRIOR TO MAP RECORDATION

FIRE DEPARTMENT

50.FIRE. 1 MAP-#64-ECS-DRIVEWAY ACCESS RECOMMND

Ecs map must be stamped by the Riverside County Surveyor with the following note: Driveways exceeding 150' in length, but less than 800' in length, shall provide a turnout near the midpoint of the driveway. Where the driveway exceeds 800', turnouts shall be provided no more than 400' apart. Turnouts shall be a minimum of 10' wide and 30' in length, with a minimum 25' taper on each end. A approved turnaround shall be provided at all building sites on driveways over 150 feet in length, and shall be within 50' of the building.

50.FIRE. 2 MAP-#73-ECS-DRIVEWAY REQUIR RECOMMND

Ecs map must be stamped by the Riverside County Surveyor with the following note: Access will not have an up, or downgrade of more than 15%.(access will not be less than 20 feet in width per the 2001 UFC, Article 9, Section 902.2.2.1) and will have a vertical clearance of 15'. Access will be designed to withstand the weight of 60 thousand pounds over 2 axles. Access will have a turning radius of 38 feet capable of accommodating fire apparatus.

50.FIRE. 3 MAP-#53-ECS-WTR PRIOR/COMBUS RECOMMND

Ecs map must be stamped by the Riverside County Surveyor with the following note: The required water system, including fire hydrants, shall be installed and accepted by the appropriate water agency prior to any combustible building material placed on an individual lot.

50.FIRE. 4 MAP-#59-ECS-HYDR REQUIR RECOMMND

Ecs map must be stamped by the Riverside County Surveyor with the following note: Should the applicant or developer choose to defer the fire protection requirements, an Environmental Constraint Sheet shall be filed with the final map containing the following: Prior to the issuance of a building permit, the applicant or developer shall provide written certification from the water company that a standard fire hydrant(s) (6"x4"x2 1/2") exist, within 250 feet of any portion of the lot frontage as measured along approved vehicular travelways; or that financial arrangements have been made to provide hydrant(s)

PARCEL MAP Parcel Map #: PM30298 Parcel: 941-080-027

50. PRIOR TO MAP RECORDATION

FLOOD RI DEPARTMENT

50.FLOOD RI. 2 MAP SUBMIT ECS & FINAL MAP RECOMMND

A copy of the environmental constraint sheet and the final map shall be submitted to the District for review and approval. All submittals shall be date stamped by the engineer and include the appropriate plan check fee.

50.FLOOD RI. 8 MAP ADP FEES RECOMMND

A notice of drainage fees shall be placed on the environmental constraint sheet and final map. The exact wording of the note shall be as follows:

NOTICE OF DRAINAGE FEES

Notice is hereby given that this property is located in the Murrieta Creek/Santa Gertrudis Valley Area Drainage Plan which was adopted by the Board of Supervisors of the County of Riverside pursuant to Section 10.25 of Ordinance 460 and Section 66483, et seq, of the Government Code and that said property is subject to fees for said drainage area.

Notice is further given that, pursuant to Section 10.25 of Ordinance 460, payment of the drainage fees shall be paid with cashier's check or money order only to the Riverside County Flood Control and Water Conservation District at the time of issuance of the grading or building permit for said parcels, whichever occurs first, and that the owner of each parcel, at the time of issuance of either the grading or building permit, shall pay the fee required at the rate in effect at the time of issuance of the actual permit.

50.FLOOD RI. 9 MAP DELINEATE WC ON ECS (PAR) RECOMMND

The natural watercourse that traverses Parcels 1 and 2 shall be delineated and labeled on the environmental constraint sheet to accompany the final map. A note shall be placed on the environmental constraint sheet stating "The watercourses must be kept free of all buildings and obstructions".

PARCEL MAP Parcel Map #: PM30298 Parcel: 941-080-027

50. PRIOR TO MAP RECORDATION

PLANNING DEPARTMENT

50.PLANNING. 1 MAP - PREPARE A FINAL MAP RECOMMND

After the approval of the TENTATIVE MAP and prior to the expiration of said map, the land divider shall cause the real property included within the TENTATIVE MAP, or any part thereof, to be surveyed and a FINAL MAP thereof prepared in accordance with the current County Transportation Department - Survey Division requirements, the conditionally approved TENTATIVE MAP, and in accordance with Article IX of County Ordinance No. 460.

50.PLANNING. 2 MAP - SURVEYOR CHECK LIST RECOMMND

The County Transportation Department - Survey Division shall review any FINAL MAP and ensure compliance with the following:

A. All lots on the FINAL MAP shall be in substantial conformance with the approved TENTATIVE MAP relative to size and configuration.

B. All lots on the FINAL MAP shall have a minimum lot size of 2.0 gross acres.

C. All lot sizes and dimensions on the FINAL MAP shall be in conformance with the development standards of the Rural Residential (R-R) zone, and with the Riverside County Integrated Project (RCIP).

D. All lots on the FINAL MAP shall comply with the length to width ratios, as established by Section 3.8.C. of County Ordinance No. 460.

50.PLANNING. 7 MAP - QUIMBY FEES (1) RECOMMND

The land divider shall submit to the County Planning Department - Development Review Division a duly and completely executed agreement with the County Service Area No. 149 which demonstrates to the satisfaction of the County that the land divider has provided for the payment of parks and recreation fees and/or dedication of land for the TENTATIVE MAP in accordance with Section 10.35 of County Ordinance No. 460.

PARCEL MAP Parcel Map #: PM30298 Parcel: 941-080-027

50. PRIOR TO MAP RECORDATION

50.PLANNING. 13 MAP - FINAL MAP PREPARER RECOMMND

The FINAL MAP shall be prepared by a licensed land surveyor or registered civil engineer.

50.PLANNING. 14 MAP - ECS SHALL BE PREPARED RECOMMND

The land divider shall prepare an Environmental Constraints Sheet (ECS) in accordance with Section 2.2. E. & F. of County Ordinance No. 460, which shall be submitted as part of the plan check review of the FINAL MAP.

50.PLANNING. 19 MAP - COMPLY WITH ORD 457 RECOMMND

The land divider shall provide proof to the County Planning Department - Land Use Division that all structures for human occupancy presently existing and proposed for retention comply with Ordinance No. 457.

50.PLANNING. 21 MAP - FEE BALANCE RECOMMND

Prior to recordation, the Planning Department shall determine if the deposit based fees for the TENTATIVE MAP are in a negative balance. If so, any unpaid fees shall be paid by the land divider and/or the land divider's successor-in-interest.

50.PLANNING. 24 MAP - ECS NOTE MT PALOMAR LIGH RECOMMND

The following Environmental Constraint Note shall be placed on the ECS:

"This property is subject to lighting restrictions as required by County Ordinance No. 655, which are intended to reduce the effects of night lighting on the Mount Palomar Observatory. All proposed outdoor lighting systems shall be in conformance with County Ordinance No. 655."

TRANS DEPARTMENT

50.TRANS. 3 MAP - SUFFICIENT R-O-W RECOMMND

Sufficient right-of-way along Corte Venture shall be dedicated for public use to provide for a 30 foot half-width right-of-way.

Sufficient right-of-way along Glen Oaks Road shall be dedicated for public use to provide for a 50 foot

PARCEL MAP Parcel Map #: PM30298 Parcel: 941-080-027

50. PRIOR TO MAP RECORDATION

50.TRANS. 3 MAP - SUFFICIENT R-O-W (cont.) RECOMMND

half-width right-of-way.

50.TRANS. 4 MAP - AGGREGATE/32'GRADED RECOMMND

Calle Bellagio (privatley maintained) is designated as a local road and shall be improved with 8 feet graded section shoulder from Glenoaks Road to the southerly project boundary (along the project side) within a 60 foot full-width dedicated right-of-way as approved by the Transportation Department.

Corte Venture (privatley maintained) is designated as a local road and shall be improved with 24 feet of acceptable Aggregate Base (0.33' thick) on a 32 foot graded section within a 60 foot full-width dedicated right-of-way as approved by the Transportation Department.

50.TRANS. 6 MAP - EASEMENT/SUR RECOMMND

Any easement not owned by a public utility, public entity or subsidiary, not relocated or eliminated prior to final map approval, shall be delineated on the final map in addition to having the name of the easement holder, and the nature of their interests, shown on the map.

50.TRANS. 7 MAP - ACCESS RESTRICTION RECOMMND

Lot access shall be restricted on Glen Oaks Road and so noted on the final map.

50.TRANS. 10 MAP - IMP PLANS RECOMMND

Improvement plans for the required improvements must be prepared and shall be based upon a design profile extending a minimum of 300 feet beyond the project boundaries at a grade and alignment as approved by the Riverside County Transportation Department. Completion of road improvements does not imply acceptance for maintenance by County.

50.TRANS. 11 MAP - OFF-SITE INFO RECOMMND

The off-site rights-of-way required for said access road(s) shall be accepted to vest title in the name of the public if not already accepted.

PARCEL MAP Parcel Map #: PM30298 Parcel: 941-080-027

50. PRIOR TO MAP RECORDATION

50.TRANS. 13 MAP - STREET NAME SIGN RECOMMND

The land divider shall install street name sign(s) in accordance with County Standard No. 816 as directed by the Transportation Department.

50.TRANS. 14 MAP - INTERSECTION/50' TANGENT RECOMMND

All enterline intersections shall be at 90 degrees, plus or minus 5 degrees, with a minimum 50' tangent, measured from flowline/curbface or as approved by the Transportation Planning and Development Review Division Engineer.

50.TRANS. 20 MAP - ASSESSMENT DIST 1 RECOMMND

Should this project lie within any assessment/benefit district, the applicant shall, prior to recordation, make application for and pay for their reapportionment of the assessments or pay the unit fees in the benefit district.

50.TRANS. 24 MAP- CORNER CUT-BACK I/SUR RECOMMND

All corner cutbacks shall be applied per Standard 805, Ordinance 461, except for corners at Entry streets intersecting with General Plan roads, they shall be applied per Exhibit 'C' of the Countywide Design Guidelines.

60. PRIOR TO GRADING PRMT ISSUANCE

BS GRADE DEPARTMENT

60.BS GRADE. 1 MAP-G2.4GEOTECH/SOILS RPTS RECOMMND

Geotechnical soils reports, required in order to obtain a grading permit, shall be submitted to the Building and Safety Department's Grading Division for review and approval prior to issuance of a grading permit.

All grading shall be in conformance with the recommendations of the geotechnical/soils reports as approved by Riverside County.*

*The geotechnical/soils, compaction and inspection reports will be reviewed in accordance with the RIVERSIDE COUNTY GEOTECHNICAL GUIDELINES FOR REVIEW OF GEOTECHNICAL AND GEOLOGIC REPORTS.

PARCEL MAP Parcel Map #: PM30298 Parcel: 941-080-027

60. PRIOR TO GRADING PRMT ISSUANCE

60.BS GRADE. 2 MAP-G2.7DRNAGE DESIGN Q100 RECOMMND

All grading and drainage shall be designed in accordance with Riverside County Flood Control & Water Conservation District's conditions of approval regarding this application. If not specifically addressed in their conditions, drainage shall be designed to accommodate 100 year storm flows.

Additionally, the Building and Safety Department's conditional approval of this application includes an expectation that the conceptual grading plan reviewed and approved for it complies or can comply with any WQMP (Water Quality Management Plan) required by Riverside County Flood Control and Water Conservation District.

60.BS GRADE. 3 MAP-G2.14OFFSITE GDG ONUS RECOMMND

Prior to the issuance of a grading permit, it shall be the sole responsibility of the owner/applicant to obtain any and all proposed or required easements and/or permissions necessary to perform the grading herein proposed.

60.BS GRADE. 4 MAP-G1.4 NPDES/SWPPP RECOMMND

Prior to issuance of any grading or construction permits - whichever comes first - the applicant shall provide the Building and Safety Department evidence of compliance with the following: "Effective March 10, 2003 owner operators of grading or construction projects are required to comply with the N.P.D.E.S. (National Pollutant Discharge Elimination System) requirement to obtain a construction permit from the State Water Resource Control Board (SWRCB). The permit requirement applies to grading and construction sites of "ONE" acre or larger. The owner operator can comply by submitting a "Notice of Intent" (NOI), develop and implement a STORM WATER POLLUTION PREVENTION PLAN (SWPPP) and a monitoring program and reporting plan for the construction site. For additional information and to obtain a copy of the NPDES State Construction Permit contact the SWRCB at (916) 657-1146.

Additionally, at the time the county adopts, as part of any ordinance, regulations specific to the N.P.D.E.S., this project (or subdivision) shall comply with them.

PARCEL MAP Parcel Map #: PM30298 Parcel: 941-080-027

60. PRIOR TO GRADING PRMT ISSUANCE

60.BS GRADE. 5 MAP IMPORT/EXPORT RECOMMND

In instances where a grading plan involves import or export, prior to obtaining a grading permit, the applicant shall have obtained approval for the import/export location from the Building and Safety department. If an Environmental Assessment, prior to issuing a grading permit, did not previously approve either location, a Grading Environmental Assessment shall be submitted to the Planning Director and the Environmental Programs Director for review and comment and to the Building and Safety Department Director for approval. Additionally, if the movement of import/export occurs using county roads, review and approval of the haul routes by the Transportation Department will be required.

EPD DEPARTMENT

60.EPD. 1 EPD- EXHIBIT E ECS RECOMMND

Exhibit E- PM 30298 Prior to GRADE PERMIT
The approximately 0.91 acre drainage and associated vegetation as show on Exhibit E (ECS-PM30298), dated 4/18/11, is a Riparian/Riverine feature as defined by Section 6.1.2 of the MSHCP and thus must be avoided The 0.91 acre drainage must be clearly mapped on the ECS (Environmental Constraints Sheet) and must be labeled as "Riparian/Riverine Drainage Not to be Disturbed." No grading, surface alterations or disturbance shall occur in the mapped area. No modifications to the drainage shall take place without further consultation and approval from the Environmental Programs Division of the Planning Department. The ESC shall be reviewed and approved by EPD

FLOOD RI DEPARTMENT

60.FLOOD RI. 2 MAP ADP FEES RECOMMND

Parcel Map 30298 is located within the limits of the Murrieta Creek/Santa Gertrudis Valley Area Drainage Plan for which drainage fees have been adopted.

Drainage fees shall be paid with cashier's check or money order only to the District at the time of the issuance of grading permits for the approved parcels or at the time of issuance of building permits if no grading permits are issued for the parcels and may be paid, at the option of the land owner, in pro rata amounts. The amount of the

PARCEL MAP Parcel Map #: PM30298 Parcel: 941-080-027

60. PRIOR TO GRADING PRMT ISSUANCE

60.FLOOD RI. 2 MAP ADP FEES (cont.) RECOMMND

drainage fee required to be paid shall be the amount that is in effect for the particular Area Drainage Plan at the time of issuance of the grading permits or issuance of the building permits if grading permits are not issued.

PLANNING DEPARTMENT

60.PLANNING. 2 MAP - BUILDING PAD GRADING RECOMMND

All grading for any proposed new dwellings and/or accessory buildings shall occur within the approved building pad sites shown on the TENTATIVE MAP.

60.PLANNING. 4 MAP - SLOPE GRADING TECHNIQUES RECOMMND

The land divider/permit holder shall cause grading plans to be prepared which show all cut slopes located adjacent to ungraded natural terrain shall be contour-graded incorporating the following grading techniques:

1. The angle of the graded slope shall be gradually adjusted to the angle of the natural terrain.

2. Angular forms shall be discouraged. The graded form shall reflect the natural rounded terrain.

3. The toes and tops of slopes shall be rounded with curves with radii designed in proportion to the total height of the slopes where drainage and stability permit such rounding.

4. Where cut and/or fill slopes exceed 300 feet in horizontal length, the horizontal contours of the slope shall be curved in a continuous, undulating fashion.

60.PLANNING. 9 MAP - PALEONTOLOGIST REQUIRED RECOMMND

The land divider/permit holder shall retain a qualified paleontologist for consultation and comment on the proposed grading with respect to potential paleontological impacts. The developer shall submit the name, telephone number and address of the retained, qualified paleontologist to the Planning Department and the Department of Building and Safety. The paleontologist shall submit in writing to the Planning Department - Development Review Division the results of the initial consultation, and the paleontologist

PARCEL MAP Parcel Map #: PM30298 Parcel: 941-080-027

60. PRIOR TO GRADING PRMT ISSUANCE

60.PLANNING. 9 MAP - PALEONTOLOGIST REQUIRED (cont.) RECOMMND

shall include details of the fossil recovery plan, if recovery was deemed necessary. hould the paleontologist find the potential is high for impact to significant resources, a pre-grade meeting between the paleontologist and the excavation and grading contractor shall be arranged. When necessary, in the professional opinion of the retained paleontologist (and/or as determined by the Planning Director), the paleontologist or representative shall have the authority to monitor actively all project related grading and construction and shall have the authority to temporarily divert, redirect, or halt grading activity to allow recovery of paleontological resources.

60.PLANNING. 16 MAP - SKR FEE CONDITION RECOMMND

Prior to the issuance of a grading permit, the land divider/permit holder shall comply with the provisions of Riverside County Ordinance No. 663, which generally requires the payment of the appropriate fee set forth in that ordinance. The amount of the fee required to be paid may vary depending upon a variety of factors, including the type of development application submitted and the applicability of any fee reduction or exemption provisions contained in Riverside County Ordinance No. 663. Said fee shall be calculated for a single family residential development greater than one half acre, which is $250 per residential unit within the development area on the TENTATIVE MAP. In the event Riverside County Ordinance No. 663 is rescinded, this condition will no longer be applicable. However, should Riverside County Ordinance No. 663 be rescinded and superseded by a subsequent mitigation fee ordinance, payment of the appropriate fee set forth in that ordinance shall be required.

60.PLANNING. 17 MAP - FEE BALANCE RECOMMND

Prior to issuance of grading permits, the Planning Department shall determine if the deposit based fees are in a negative balance. If so, any outstanding fees shall be paid by the applicant/developer.

60.PLANNING. 18 MAP - GRADING PLAN REVIEW RECOMMND

The land divider/permit holder shall cause a plan check application for a grading plan to be submitted to the ounty T.L.M.A - Land Use Division for review by the County

PARCEL MAP Parcel Map #: PM30298 Parcel: 941-080-027

60. PRIOR TO GRADING PRMT ISSUANCE

60.PLANNING. 18 MAP - GRADING PLAN REVIEW (cont.) RECOMMND

Department of Building and Safety - Grading Division. Said grading plan shall be in conformance with the approved tentative map, in ompliance with County Ordinance No. 457, and the conditions of approval for the tentative map.

80. PRIOR TO BLDG PRMT ISSUANCE

BS GRADE DEPARTMENT

80.BS GRADE. 1 MAP-G3.1NO B/PMT W/O G/PMT RECOMMND

Prior to issuance of any building permit, the property owner shall obtain a grading permit and/or approval to construct from the Grading Divisin of the Building and Safety Department.

80.BS GRADE. 2 MAP- PRECISE GRADE REQUIRED RECOMMND

The site was rough graded and rough grade approved under BGR030846. Prior to the issuance of a building permit, the applicant shall submit re-certification of both the soils compaction report and civil engineers certification for review and approval by the Building and Safety Department. The applicant shall also obtain a precise grade permit and approval to construct from the Building and Safety Department.

E HEALTH DEPARTMENT

80.E HEALTH. 1 USE - E.HEALTH CLEARANCE REQ. RECOMMND

ENVIRONMENTAL HEALTH CLEARANCE IS REQUIRED PRIOR TO THE ISSUANCE OF THIS BUILDING PERMIT.

FIRE DEPARTMENT

80.FIRE. 1 MAP-#50B-HYDRANT SYSTEM RECOMMND

Prior to the release of your installation, site prep and/or building permits from Building and Safety. Written certification from the appropriate water district that the required fire hydrant(s) are either existing or that financial arrangements have been made to provide them.

Also a map or APN page showing the location of the fire

PARCEL MAP Parcel Map #: PM30298 Parcel: 941-080-027

80. PRIOR TO BLDG PRMT ISSUANCE

80.FIRE. 1 MAP-#50B-HYDRANT SYSTEM (cont.) RECOMMND

hydrant and access to the property.

FLOOD RI DEPARTMENT

80.FLOOD RI. 2 MAP ADP FEES RECOMMND

Parcel Map 30298 is located within the limits of the Murrieta Creek/Santa Gertrudis Valley Area Drainage Plan for which drainage fees have been adopted.

Drainage fees shall be paid with cashier's check or money order only to the District at the time of the issuance of grading permits for the approved parcels or at the time of issuance of building permits if no grading permits are issued for the parcels and may be paid, at the option of the land owner, in pro rata amounts. The amount of the drainage fee required to be paid shall be the amount that is in effect for the particular Area Drainage Plan at the time of issuance of the grading permits or issuance of the building permits if grading permits are not issued.

PLANNING DEPARTMENT

80.PLANNING. 8 MAP - SCHOOL MITIGATION RECOMMND

Impacts to the Temecula Valley Unified School District shall be mitigated in accordance with California State law.

80.PLANNING. 10 MAP - FEE BALANCE RECOMMND

Prior to issuance of building permits, the Planning Department shall determine if the deposit based fees are in a negative balance. If so, any outstanding fees shall be paid by the applicant/developer.

90. PRIOR TO BLDG FINAL INSPECTION

E HEALTH DEPARTMENT

90.E HEALTH. 1 USE- E.HEALTH CLEARANCE REQ RECOMMND

Environmental Health Clearance prior to final inspection.

PARCEL MAP Parcel Map #: PM30298 Parcel: 941-080-027

90. PRIOR TO BLDG FINAL INSPECTION

90.E HEALTH. 2 USE-FEE STATUS RECOMMND

Prior to final approval, the Environmental Health Department shall determine the status of the deposit based fees. If the fees are in a negative status, the permit holder shall pay any outstanding balances. Contact the accounting section at (951) 955-8982.

PLANNING DEPARTMENT

90.PLANNING. 4 MAP - QUIMBY FEES (2) RECOMMND

The land divider/permit holder shall present certification to the Riverside County Planning Department that payment of parks and recreation fees and/or dedication of land for park use in accordance with Section 10.35 of County Ordinance No. 460 has taken place. Paid certification shall be obtained from the County of Riverside Economic Develoment Agency (EDA) for CSA No. 149.

90.PLANNING. 6 MAP - SKR FEE CONDITION RECOMMND

Prior to the issuance of a grading permit, the land divider/permit holder shall comply with the provisions of Riverside County Ordinance No. 663, which generally requires the payment of the appropriate fee set forth in that ordinance. The amount of the fee required to be paid may vary depending upon a variety of factors, including the type of development application submitted and the applicability of any fee reduction or exemption provisions contained in Riverside County Ordinance No. 663. Said fee shall be calculated for a single family residential development greater than one half acre, which is $250 per residential unit within the development area on the TENTATIVE MAP. In the event Riverside County Ordinance No. 663 is rescinded, this condition will no longer be applicable. However, should Riverside County Ordinance No. 663 be rescinded and superseded by a subsequent mitigation fee ordinance, payment of the appropriate fee set forth in that ordinance shall be required.

TRANS DEPARTMENT

90.TRANS. 1 MAP - WRCOG TUMF RECOMMND

Prior to the issuance of an occupancy permit, the project proponent shall pay the Transportation Uniform Mitigation Fee (TUMF) in accordance with the fee schedule in effect at

PARCEL MAP Parcel Map #: PM30298 Parcel: 941-080-027

90. PRIOR TO BLDG FINAL INSPECTION

90.TRANS. 1 MAP - WRCOG TUMF (cont.) RECOMMND

the time of issuance, pursuant to Ordinance No. 824.

Hesterly, Kinika

From: Mooman, Shaheen [SMOOMAN@rcflood.org]
Sent: Tuesday, February 22, 2011 10:46 AM
To: Hesterly, Kinika
Subject: RE: PM30298 - hydrography

Hello Kinika,

Yes the stream to southeast has been reviewed and we have asked to delineate the water course and stay out. Since the pad location shown on the exhibit are not set the condition to stay out will suffice also the lot has enough buildable area to stay out of this water course. So I think the previous conditions are still good.
Let me know if you have any more question.
Regards

Shaheen Mooman
Associate Engineer
Riverside County Flood Control District
1995 Market Street
Riverside, CA 92501
Telephone Number: 951.955.1318

-----Original Message-----
From: Hesterly, Kinika
Sent: Thursday, February 17, 2011 5:24 PM
To: Mooman, Shaheen
Subject: PM30298 - hydrography

Hi Shaheen,

Can you please let me know whether the stream to the south (shown on the GIS attachment) was analyzed?

Thank you,

Kinika Hesterly - Urban Regional Planner IV

Riverside County Planning - 4080 Lemon Street, 12th Floor

Riverside, CA 92502 - Khesterl@rctlma.org

(951) 955-1888 phone - (951) 955-1811 fax

From: Derek Ramont Hull
To: Mooman, Shaheen
CC: Bahar, Mustafa; Krizek, Alisa
Date: 7/28/2008 11:10 AM
Subject: Blue Line Stream location for PM 30298

Shaheen, I am finishing up a review for PM 30298. It wanted to see the location of the Blue Line Streams and it appears that one is located in the southeastern portion of the project site. This is close to the a graded building pad shown on the site plan and I just wanted to make sure that Flood had considered the location of the Blue Line Stream in relation to the building pad. I will fax over a copy to your office.

Regards,

DRH

Make Corrections then hold until Flood & trans. respond

From: Mooman, Shaheen
To: Hull. Derek Ramont
Date: 7/29/2008 8:56 AM
Subject: RE: Blue Line Stream location for PM 30298

Hello Derek,

I reviewed the file and it appears that our conditions are still good since these pad locations are not set and there is enough building area outside the water courses. Also we have condition to delineate the watercourse and stay out.
If you have any more question please do not hesitate to write back.

Thank You

Shaheen Mooman
Associate Engineer
Riverside County Flood Control District
1995 Market Street
Riverside, CA 92501
Telephone Number: 951.955.1318

-----Original Message-----
From: Hull, Derek Ramont
Sent: Monday, July 28, 2008 11:10 AM
To: Mooman, Shaheen
Cc: Krizek, Alisa; Bahar, Mustafa
Subject: Blue Line Stream location for PM 30298

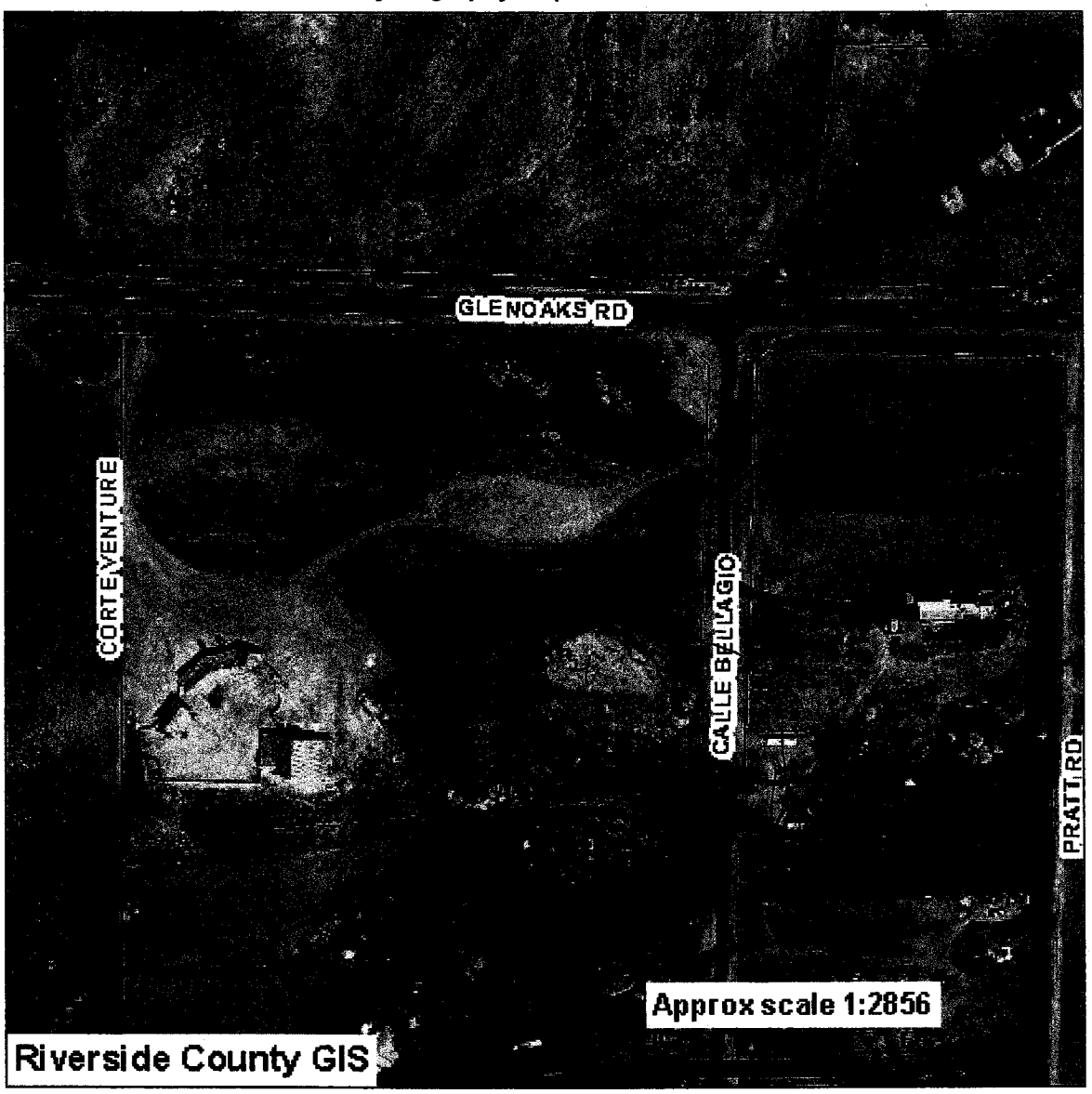
Shaheen, I am finishing up a review for PM 30298. It wanted to see the location of the Blue Line Streams and it appears that one is located in the southeastern portion of the project site. This is close to the a graded building pad shown on the site plan and I just wanted to make sure that Flood had considered the location of the Blue Line Stream in relation to the building pad. I will fax over a copy to your office.

Regards,

DRH

Shaheen - Moreno
Flood Control
951-788-9965

Hydrography Map for PM 30298



POLICY AREAS/OVERLAYS

☐ PARCELS ☐ CITY BOUNDARY

COMPREHENSIVE PROJECT REVIEW
INITIAL CASE TRANSMITTAL
RIVERSIDE COUNTY PLANNING DEPARTMENT - RIVERSIDE
P.O. Box 1409
Riverside, CA 92502-1409

DATE: April 13, 2006

TO:

Transportation Dept.
Environmental Health Dept.
Flood Control District
Fire Department
Dept. of Building & Safety (Grading)
Regional Parks & Open Space District
Co. Geologist
IT Dept. – J. Sarkissian
Environmental Programs Department
P.D. Trails Coordinator – J. Jolliffe
Commissioner Petty
Supervisor Stone
CSA# 149
Co. Waste Management Dept.
Co. Sheriff's Office
Temecula Unified School District
Caltrans #8
EIC "Attachment A"
Riverside Transit Agency
Pechanga Band of Indians
US Postal Service

TENTATIVE PARCEL MAP NO. 30298 – EA40617 – Applicant: Randy and Cindy Horton – Engineer/Representative: Southland Engineering - Third Supervisorial District – Rancho California Zoning Area - Southwest Area Plan: Rural Community: Estate Density Residential (RC-EDR) (2 Acre Minimum) – Location: Southerly of Glen Oaks Road, westerly of De Portola Road – 12.19 Gross Acres - Zoning: Rural Residential (R-R) - **REQUEST:** Schedule H subdivision of 12.19 acres into four residential parcels with a minimum lot size of 3 acres – APN: 941-080-027 - Related Cases: N/A - Concurrent Cases: N/A

Please review the attached exhibit(s) for the above-described project. This case is scheduled for a **CPR meeting on May 4, 2006**. All County Agencies and Departments, please have draft conditions in the Land Management System by the above date. If you cannot clear the exhibit, please have corrections in the system and DENY the routing. Once the route is complete, and the approval screen is approved with or without corrections, the case can be scheduled for a public hearing. All other agencies, please have your comments/conditions to the Planning Department as soon as possible. Your comments/recommendations/ conditions are requested so that they may be incorporated in the staff report for this particular case.

Should you have any questions regarding this item, please do not hesitate to contact **Kenya Huezo,** Project Planner, at **(951) 955-9075** or email at khuezo@RCTLMA.org / **MAILSTOP # 1070**.

COMMENTS:

DATE: _____ SIGNATURE: _____

PLEASE PRINT NAME AND TITLE: _____

TELEPHONE: _____

If you do not include this transmittal in your response, please include a reference to the case number and project planner's name. Thank you.

Riverside County
Waste Management Department
Hans W. Kernkamp, General Manager-Chief Engineer

May 11, 2006

Kenya Huezo, Project Planner
Riverside County Planning Department
9th Floor, CAC – P.O. Box 1409
Riverside, CA 92502-1409

RE: Tentative Parcel Map No. 30298 — Divide 12.19 Acres into 4 Lots

Dear Ms. Huezo:

The Riverside County Waste Management Department (Department) has reviewed the proposed project, located southerly of Glen Oaks Road and westerly of De Portola Road in Rancho California. This project has the potential to impact long-term landfill capacity by generating solid waste that requires disposal. In order to mitigate the project's potential solid waste impact, and to help the County's efforts to comply with State law in diverting solid waste from landfill disposal, the project's applicant should implement the following measures, as feasible:

- Recycle the project's construction and demolition (C&D) waste through a C&D recycling facility.
- Use mulch and/or compost in the development and maintenance of landscaped areas within the project boundaries. Recycle green waste through either onsite composting of grass, i.e., leaving the grass clippings on the lawn, or sending separated green waste to a composting facility.
- Consider xeriscaping and using drought tolerant/low maintenance vegetation in all landscaped areas of the project.
- Hazardous materials **are not** accepted at the Riverside County landfills. Any hazardous wastes, including paint, used during construction must be properly disposed of at a licensed facility in accordance with local, state and federal regulations. Please contact the Riverside County Health Department for further information.

Thank you for the opportunity to review this proposal. If you have any questions, please call me at (951) 486-3283.

Sincerely,

Sung Key Ma
Planner

Enclosure: Initial Case Transmittal
DM#43742

RIVERSIDE COUNTY
PLANNING DEPARTMENT

Carolyn Syms Luna
Director

Memorandum

DATE: March 28, 2011

TO: Deputy Director, Greg Neal

FROM: Kinika Hesterly, Urban Regional Planner

RE: **Tentative Parcel Map No. 30298, Item 2.6 - Director's Hearing Updates**

1. Email expressing opposition from Lisa Merrit, of Southland Engineering, dated March 24, 2011.

2. Email from Kim Foy of Johnson & Sedlack with attachments requesting an EIR.

3. Conditions removed: 50.Trans.26 requiring accel/decel lanes and a left turn lane and 50.Planning.25 regarding street sweeping which does not occur on this road.

Y:\Planning Case Files-Riverside office\PM30298\DH-PC-BOS Hearings\Memo.PM30298.docx

Riverside Office · 4080 Lemon Street, 12th Floor
P.O. Box 1409, Riverside, California 92502-1409
(951) 955-3200 · Fax (951) 955-1811

Desert Office · 38686 El Cerrito Road
Palm Desert, California 92211
(760) 863-8277 · Fax (760) 863-7555

Hesterly, Kinika

From: Kim Foy [kim.jslaw@gmail.com]
Sent: Friday, March 25, 2011 11:05 AM
To: Hesterly, Kinika
Subject: Comments on Tentative Parcel Map No. 30298
Attachments: Comment letter.doc; FinalAgMitigationPolicies.pdf; SC AQMD Final PM2.5 Calculation Methodology and PM2.5 Significance Thresholds OCT06.pdf; 3.0 Effects of Construction...pdf; 4.0 Construction Noise Crit...pdf; 9.0 Construction Equipment ...pdf

Good Morning Kinika,

Please find the attached comments for TPM 30298, as well as 6 email attachments (in 8 files). Please let me know when all attachments are received.

Hope you have a great weekend.

Thanks,
Kim

Attachments 1-3 included herein.

--
-

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Attorney
JOHNSON & SEDLACK
26785 Camino Seco
Temecula, CA 92590
(951) 506-9925
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March 25, 2011

VIA EMAIL AND U.S. MAIL

Riverside County Planning Department
Attn: Kinika Hesterly
Project Planner
P.O. Box 1409
Riverside, CA 92502-1409

RE: Intent to Adopt a Negative Declaration for Environmental Assessment No.40617 and Approve Tentative Parcel Map No. 30298.

Greetings:

We submit these comments on behalf of concerned citizens residing in the area regarding the intent to adopt a Negative Declaration (ND) for Environmental Assessment No. 40617 and approve Tentative Parcel Map (TPM) No. 30298 (collectively, the "project"). The project involves a subdivision of 12.19 acres into four residential parcels in the community of Rancho California of the Southwest Area Plan in Western Riverside County.

The ND fails to provide an adequate project description by failing to discuss road paving and expansion. The project will pave Calle Bellagio and Corte Venture with 24 feet of aggregate on a 32 foot graded section within a 60-ft full width dedicated right-of-way. Glen Oaks Road will be improved at the intersection of Corte Venture and Calle Bellagio with 7 feet of pavement for acceleration/deceleration lanes and 6 feet for left turn lanes. This road paving was improperly not provided in the project description or analyzed as part of the project in the ND.

The ND prepared for this project fails as an informational document. The ND generally fails to consider impacts from construction. This is improper as CEQA requires that the project as a whole be considered in determining environmental impacts. There is also no attempt to quantify many of the project's potentially significant impacts and essential studies have not been undertaken. The findings of fact are therefore almost constantly conclusory and not supported by substantial evidence in the record.

The utilization of a ND for this project is improper as there is substantial evidence in the record to support a fair argument that significant environmental impacts will result from this project. An EIR is required for any proposed project that may have a significant effect on the environment.

(Public Resources Code §21100 (a)). If a lead agency is presented with a fair argument based on substantial evidence in the record that a project may have a significant effect on the environment, an EIR must be prepared. (Cal. Code of Regs, Tit.14 ("Guidelines") §15064(f)(1), *No Oil, Inc. v. City of Los Angeles* (1974) 13 Cal.3d 68.) Substantial evidence consists of fact, reasonable assumption predicated on fact, or expert opinion supported by fact. (Public Resources Code §21080 (e)(1).) Here, as detailed below, there is a fair argument that impacts to agriculture, biological resources, cultural resources, hydrology, geology, and noise, among others, will be potentially significant. An Environmental Impact Report (EIR) must be prepared for the project.

CEQA also requires that all feasible mitigation be implemented to reduce or avoid the significant impacts of a project. Despite there being substantial evidence in the record of potentially significant impacts from this project, as discussed below, no mitigation measures have been required to reduce these impacts. This is a violation of CEQA. The ND was also not circulated to the State Clearinghouse as required.

The project is likely to have significant impacts to/from the following:

Biological Resources:

A large watercourse traverses the northern portion of the site. The watercourse has a tributary watershed of approximately 140 acres and is a natural watercourse (*See, 10 Flood RI 1.)* Yet, the ND found that this watercourse did not provide/ constitute riparian habitat. ***This finding is not supported by any facts or evidence in the record.*** Furthermore, the ND does not state whether the watercourse contains any migratory fish, whether the watercourse is a federally protected wetland, etc. Neither DFG nor US Fish and Wildlife Service were contacted to evaluate potential impacts. Any finding of a less than significant impact is conclusory and not supported in the record.

The ND also fails to consider impacts from construction noise and vibrations on biological resources. The ND also fails to consider the impacts from road expansion and paving on biological impacts. These impacts should be considered potentially significant.

Hydrology/Water Quality:

The ND again gives short shrift to the "large watercourse" onsite. Will the project alter this watercourse? Will it cause additional runoff to this watercourse or erosion which will impact downstream sites? The ND does not evaluate these potential impacts but instead concludes based on no evidence that the project will have a less than significant impact. Moreover, it is not shown that COA 10 Flood RI 1 will reduce potential impacts to downstream sites below a level of significance. For instance, additional instream flows, flow rates, and similar issues are not mitigated with this COA. Accordingly, this impact should be considered potentially significant.

Agricultural Resources:

The project will convert an area that is designated Prime Farmland, Unique Farmland, or Farmland of Statewide Importance to non-agricultural use, namely to residential uses. This should be deemed a potentially significant and unmitigated impact.

The General Plan EIR's finding of no available mitigation measures at a county-wide level does not preclude the availability of mitigation measures at a project-specific level nor support a determination that such agricultural impacts are less than significant. The General Plan EIR found that impacts to agricultural resources were significant with the land use designation but immitigable at a large-scale level. This supports a determination that project-specific agricultural impacts are potentially significant.

Such impacts are not mitigated with the project, despite the fact that feasible mitigation is available at a project specific level. Tiering does not excuse an agency from adequately analyzing the potential significant impacts of a project or requiring that all feasible mitigation be adopted. (State CEQA Guidelines § 15152) Requiring a permanent agricultural conservation easement on land or a Williamson Act contract by one of the following methods would mitigate significantly for impacts and is not shown to be infeasible at this project size:

1. The outright purchase of easements, or
2. Donation of mitigation fees to a local, regional, or statewide organization that provides for acquisition and stewardship of agricultural conservation easements.

See the attached Agricultural Mitigation Policies, pg. 2-5. See also, California Farmland Conservation Program website for Agricultural Conservation Easements for potential conservation options. <http://www.conservation.ca.gov/dlrp/cfcp/overview/Pages/index.aspx>

Likewise, the potential of the project to result in the conversion of other agricultural land in the area should be considered potentially significant and unmitigated. Increasing development pressures and the effects of urbanization on farmlands close to cities has led to a substantial reduction in farmland. The General Plan Land Use Element recognizes this issue, stating, "Many existing agricultural areas have been or are in danger of being encroached upon by uses that are negatively impacted by some agricultural operations, such as residences and schools. As agricultural lands become less productive or are encroached upon, there is a danger of these uses becoming less economically viable, becoming subdivided, or converting to other uses." This project involves the conversion of Prime Farmland, Unique Farmland, or Farmland of Statewide Importance near to other agricultural users, and will likely increase development pressures on nearby agricultural properties. This impact is potentially significant and unmitigated.

Cultural Resources:

An essential study was not undertaken to determine whether impacts to cultural resources will be significant. The ND states that the Eastern Information Center of the State Office of Historic Preservation recommends a Phase 1 cultural resources study onsite based on the potential for the

presence of cultural resources in the area. Instead of undertaking this study, the ND finds that impacts to archaeological resources will be less than significant based on the presumption that no ground disturbing activity will occur. However, *there is no prohibition on ground disturbing activities* and in fact, given the potentially expansive soils onsite, ground disturbing activities are likely to occur. The COAs seem to recognize the potential for grading and site disturbance, as numerous COAs apply to site grading/disturbance. Moreover, as no study has determined the extent and significance of archaeological resources onsite, there is no basis to determine that COA 10 Planning 2 will reduce potential impacts to a level below significance. This is a potentially significant impact which must be evaluated through the preparation of an EIR.

COA 10 Planning 2 is also uncertain to mitigate impacts. There is no requirement that an archaeological monitor onsite during grading activities in order to determine whether cultural resources are uncovered. There is also no requirement that *mitigation be concluded* prior to resuming further ground disturbance.

Alternatively, a COA should be required of the project prohibiting all ground disturbance activities on the project site.

Geology/Soils:

The project may be located on expansive soils, yet no soils/geological study was undertaken for the project to determine whether this will constitute a significant impact. This improperly defers an essential study in violation of CEQA. Moreover, the ND does not describe how CBC requirements will mitigate these impacts. Common methods of mitigation for expansive soils include over-excavation, importing non-expansive fill soils, the requirement of deepened building footings, underpinning, etc. (*See, Damage to Foundations from Expansive Soils,* J. David Rogers, Robert Olshansky, and Robert B. Rogers, available at <http://web.mst.edu/~rogersda/expansive_soils/DAMAGE%20TO%20FOUNDATIONS%20FROM%20EXPANSIVE%20SOILS.pdf>.) These measures may, in turn, result in significant impacts to cultural resources by requiring additional ground disturbing. These measures may also result in significant air quality impacts from importing fill soil to the site and additional erosion. These impacts are not evaluated or disclosed in the ND and are potentially significant. The ND thus fails as an informational document.

Likewise, impacts to/from erosion are not evaluated in the ND and only conclusory statements are made in the narrative of less than significant impact. Given that there is a "large watercourse" onsite, it is illogical and contradictory to state that the project will not alter deposition, siltation, or erosion because there are no rivers, streams, or lakes within the vicinity of the project site. This conclusory finding is not supported by any evidence.

Noise:

Impacts from construction noise are likely to be significant and are not mitigated below a level of significance through merely restricting construction to "daylight hours." The

construction of the project would still result in a substantial temporary increase in ambient noise levels above those currently existing, which is the threshold question. This is a potentially significant impact for which no mitigation has been required. An EIR is required to evaluate this impact.

The ND also does not analyze whether construction noise will result in the exceedence of noise standards and makes no attempt to quantify project construction noise levels. Documents attached to this letter detail average construction noise and its impacts. (*See, for instance,* Construction Noise Handbook Chapter 9, Table 9.1.) This project is likely to exceed the standards established in the County General Plan during construction. This is a potentially significant impact and an EIR is required.

Air Quality:

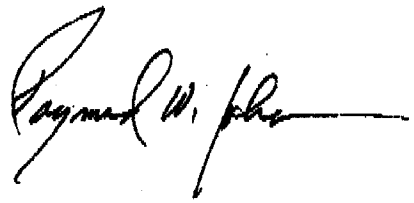
The ND fails to consider impacts from potential import of soils to the site which will result in PM emissions. The ND also fails to consider air quality impacts from construction of the road paving/ road improvements, which will result in at least PM, VOC and ROG emissions. (*See, EMEP/EEA Emission Inventory Guidebook 2009,* <http://www.eea.europa.eu/publications/emep-eea-emission-inventory-guidebook-2009/part-b-sectoral-guidance-chapters/2-industrial-processes/2-a-mineral-industry/2-a-6-road-paving-with-asphalt.pdf> and attached documents.) The ND therefore fails to consider the whole of the project in determining that impacts will be less than significant in violation of the requirements of CEQA. There has also been no attempt to quantify these construction impacts. The findings of the ND are thus conclusory and not based on substantial evidence.

Summary:

Overall, the ND fails to consider the whole of the project, fails to undertake essential studies, and fails to quantify impacts such that significance may be determined based on evidence. The narratives in the ND are, of necessity, constantly conclusory as there is no evidence on which to base determinations. An EIR must be prepared for this project to adequately evaluate and mitigate for the potentially significant impacts identified above.

Thank you for your consideration of the above comments.

Sincerely,



Raymond W. Johnson
JOHNSON & SEDLACK

Email Attachments:

1. *Agricultural Mitigation Policies*, LAFCO, effective April 4, 2007.
2. *Final-Methodology to Calculate Particulate Matter (PM) 2.5 and PM 2.5 Significance Thresholds*, SCAQMD, October 2006.
3. *Construction Noise Handbook,* U.S. Dept. of Transportation, Federal Highway Administration, Excerpted Chapters 3, 4, and 9, Final Report August 2006. Available at < http://www.fhwa.dot.gov/environment/noise/construction_noise/handbook/>.
4. *Synthesis of Noise Effects on Wildlife Populations*, U.S. Dept. of Transportation, September 2004.
5. *Noise and Its Effects,* Suter, Dr. Alice H., November 1991.
6. *Transportation Related Earthborne Vibrations,* CA Dept. of Transportation, February 2002.

U.S. Department of Transportation
Federal Highway Administration

Search | Feedback

Highway Traffic Noise

Construction Noise
Handbook
RCNM Version 1.1
Special Report
Measurement
Noise Barriers
Noise Compatible Planning
Noise Effect on Wildlife
Regulation and Guidance
Tire Pavement Noise
Traffic Noise Model
Training

Contruction Noise Handbook

4.0 Construction Noise Criteria and Descriptors

4.1 Criteria

Construction noise levels may be evaluated in terms of human response and considered in the assessment of effects on wildlife and other non-human species. Noise levels and criteria are expressed in English, metric, or both conventions, depending upon the geographic area or the policies of the controlling agency. Typically, the English convention is used mostly in the United States, with the metric convention used in Canada and other countries.

While the issue of construction noise must be addressed as part of the planning of any transportation project, there are no standardized criteria on the federal level for assessing construction noise impacts related to transportation projects. Where project-specific construction noise criteria have been developed by individual agencies or municipalities, they typically consider the following factors which form the fundamentals for defining construction noise impact:

- Difference between existing noise levels prior to construction startup and expected noise levels during construction: This takes into account specific construction operations and/or individual pieces of equipment.
- Absolute level of expected construction noise: This may constitute the combined levels of all equipment and operations at a given time or be specifically related to the absolute noise level of a specific operation and/or piece of equipment.
- Adjacent land uses: Consideration of this factor provides an indicator of the degree of sensitivity that may be expected and will likely have a major effect on the operational time restraints and the noise level increases tolerated. For example, residential areas may typically have a restriction on night operations and possibly a noise level restriction during the day. Industrial areas may have no restrictions at all, and offices may or may not have a restriction on the noise levels during the day, with possibly no restriction for night operations. Examples of absolute and relative construction noise level criteria are provided in Table 7.1.
- Duration of construction/operation: The duration of high noise levels may play a significant role in how a noise impact is perceived and/or mitigated. If the levels are of a brief nature, possibly only occurring once or twice during the project, the perceived impact could be quite different than that associated with a constant noise source. Similarly, any related noise mitigation techniques employed could be substantially different in terms of type and/or duration of application.

4.1.1.1 United States

While noise impact and abatement criteria have been established for the operation of transportation facilities in the United States, standardized criteria have not yet been established related to noise associated with the construction of such facilities. However, since the publication of the original 1977 Report[ref001], additional guidance has been disseminated (through agencies such as FHWA and FTA) and analysis tools developed to better address construction noise. For example, the FTA Transit Noise and Vibration Impact Assessment document[ref014] presents guidelines that "can be considered reasonable criteria for assessment" of construction noise impacts. In addition, a number of agencies, municipalities, and other entities have developed procedures for addressing construction noise impacts and implementing related noise mitigation for their areas of jurisdiction or on a project-specific basis.

In some instances, local entities may have developed noise ordinances that contain restrictions associated with construction noise levels. Noise practitioners and others involved in the project development process are encouraged to become familiar with such ordinances and their relationship to other State and/or municipal ordinances. In certain instances, the State jurisdiction may supersede any local noise ordinances.

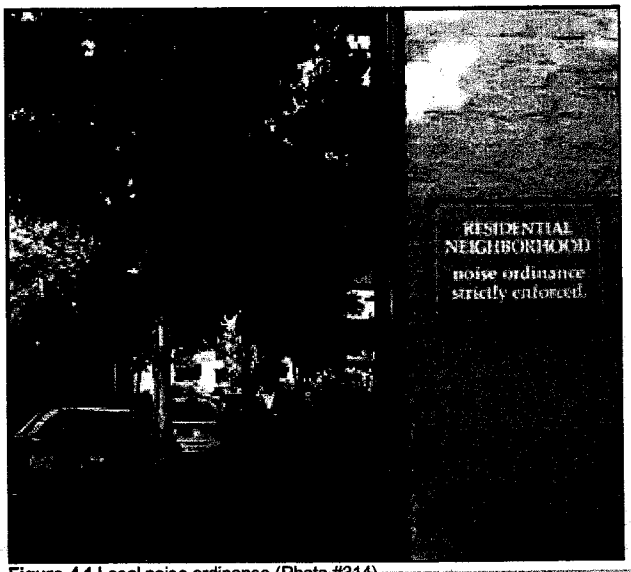


Figure 4.1 Local noise ordinance (Photo #214)

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Resource Center

Mary Ann Rondinella
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Michael Roberts
Phone: 404-562-3928

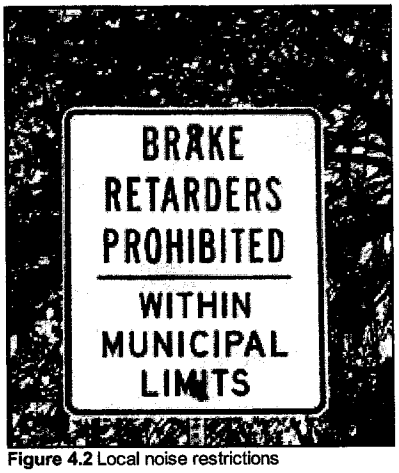

Figure 4.2 Local noise restrictions (Photo #1206)

Noise restrictions may also be imposed by local and/or State authorities to deal with specific activities or operations. An example is the growing practice of restricting the use of engine compression brakes on heavy trucks in residential areas.

Noise restrictions may also be applied within the workplace associated with employee/worker exposure to noise levels over varying durations. These criteria have been established by OSHA. However, such criteria are typically not relevant or applicable to the transportation-related project construction noise levels experienced by people residing or working in areas adjacent to such projects. As such, they are not discussed within this Handbook.

Construction noise criteria within the United States vary considerably in terms of both scope and specificity and can be broadly categorized as follows, in order of complexity:

No criteria specified;

Qualitative criteria, e.g. "Noise levels shall not cause a disturbance";

- Relative criteria, e.g. "Noise levels shall not exceed existing (or ambient, or background) noise levels by more than x dB";
- Absolute criteria, e.g. "Maximum noise levels shall not exceed xx dB";
- Criteria containing a combination absolute and relative noise level limits; and
- Combinations of the above criteria elements with additional restrictions placed on time periods and types of land uses or activities.

An example of more complex criteria is that associated with the Central Artery/Tunnel Project in Boston, MA. Data related to these criteria are discussed in Reference 023 and illustrated in Table 7.1 of this Handbook. This project established criteria that include both L_{10} and L_{max} absolute noise level limits for defined noise sensitive locations (residences, institutions, hotels, etc.) for daytime, evening, and nighttime periods. In addition, the criteria established maximum noise level increases relative to established baseline noise levels. Relative and absolute noise level limits were also established for commercial and industrial areas.

From the standpoint of construction noise criteria, the intent of this Handbook is not to address all State and local noise ordinances and/or criteria, but rather, to address the approaches and techniques that may be contained in such criteria. As such, the discussions contained within this Handbook are meant to provide a summary of considerations related to all aspects of construction noise. The reader is encouraged to refer to specific references in Table 10.1 for more detailed information on noise criteria and other factors related to construction noise.

4.1.1.2 Canada

Similar to the United States, no standardized Canadian criteria exist related to transportation project construction noise. Where project-specific analysis techniques have been employed to address and/or mitigate construction-related noise and its impacts, such methods have been similar to those employed in the United States. Examples of such efforts may be found in References 010 and 019.

4.1.1.3 Other International

While an exhaustive survey of international criteria was not conducted, several criteria are discussed here for informational use only. More specifics may be found by accessing the relative links found in the Reference Database in Chapter 10.

- The Official Journal of the European Communities' Directive 2000/14/EC of the European Parliament and of the Council of 8 May 2000[ref017] establishes legislation dictating specific noise levels for individual pieces of construction equipment. It also contains specifics related to the measurement locations and equipment operating conditions relative to the testing of individual pieces of equipment.
- The Australian EPA's Environmental Noise Control Manual[ref015] establishes the following criteria which officers may specify related to construction noise:
  - For a construction period of four (4) weeks or less, the maximum L_{10} noise level measured over a period of not less than 15 minutes when the construction site is operating must not exceed the background noise level by more than 20 dBA;
  - For a construction period greater than four (4) weeks, the maximum L_{10} noise level measured over a period of not less than 15 minutes when the construction site is operating must not exceed the background noise level by more than 10 dBA;
  - Construction limited to 0700 to 1800 time period on Monday through Friday;
  - Construction limited on Saturdays to 0700 to 1300 time period if inaudible on residential premises; otherwise, 0800 to 1300;
  - No construction work may take place on Sundays or public holidays; and
  - All possible steps should be taken to silence construction site equipment. It is particularly important that silenced equipment should be used on road or rail works where 24-hour operation is necessary.

4.2 Descriptors

While it is not the intent of this Handbook to establish criteria for evaluating construction noise impacts, it is important to stress that reasonable and defensible noise descriptors must be used to describe construction noise levels. The following are important elements related to selecting a workable noise descriptor for use in measuring and analyzing construction noise:

- Suitable for practical measuring methods;
- Accounts for temporal variations in equipm
- Accounts for temporal variations in overall

- Suitable for prediction modeling;
- Suitable for combining noise levels from various source types; and
- Relative to subjective responses.

The descriptor most commonly chosen for use is the A-weighted equivalent sound level (energy basis), L_{Aeq}. In many cases, the time average period applied to the L_{Aeq} value is one hour (designated L_{Aeq1h}). For certain projects and operations, the time period over which the L_{Aeq} is applied may need to be examined on a case-by-case basis. For several major construction projects in the United States and Canada, the L_{10} (applied generally during daytime periods) and L_{max} (applied for specific equipment and/or nighttime operations) descriptors have been used over varying time periods.

The L_{dn} descriptor has been used to assess annoyance and community reaction to construction noise. L_{dn} is an L_{Aeq}-based descriptor that applies a 10 dBA penalty to nighttime noise levels.

The L_{Aeq}-based and L_{10}-based descriptors satisfy the first four elements listed above. The L_{Aeq} satisfies the fifth element and may also satisfy the sixth element (relative to subjective responses). However, the L_{Aeq}, L_{10}, and L_{max} descriptors may not be suited for determining responses by some aquatic wildlife (where using an un-weighted sound pressure level may be more suitable) or for owls (where use of a different weighting category such as dBO or a descriptor such as SEL may be more suitable to account for effects such as air blasts associated with blasting). More detailed information related to these specific conditions might be found in documents listed in Section 3.2.6 of this document.

This page last modified on 05/21/2010

Contruction Noise Handbook

3.0 Effects of Construction Noise

3.1 Introduction

Construction noise in the community may not pose a health risk or damage peoples' sense of hearing, but it can adversely affect peoples' quality of life. To some degree, construction noise can be a contributing factor to the degradation of someone's health in that it can cause people to be irritated and stressed and can interrupt their ability to sleep - all of which may lead to higher blood pressure, anxiety, and feelings of animosity toward the people or agencies responsible for producing the noise.

In fact, several of the traditional definitions of "noise" (i.e. unwanted or undesirable sound) can be associated with construction noise. Construction noise can be considered to:

- be too loud;
- be impulsive;
- contain annoying pure tones;
- occur unexpectedly;
- occur at undesirable times of day; and/or
- interrupt people's activities.

Construction noise has the potential to disturb people at home in their residences, in office buildings or retail businesses, in public institutional buildings, at locations of religious services, while attending sporting events, or when on vacation.

Contacts

For more information, please contact:

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Adam Alexander
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Resource Center

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Stephanie Stoermer
Phone: 720-963-3218

Michael Roberts
Phone: 404-562-3928

Figure 3.1 Construction in residential area (Photo #924)

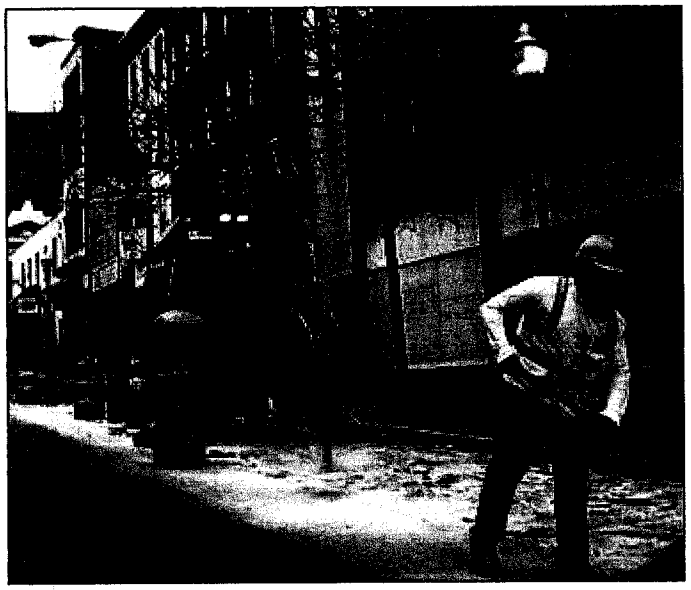

Figure 3.2 Construction in business district (Photo #714)

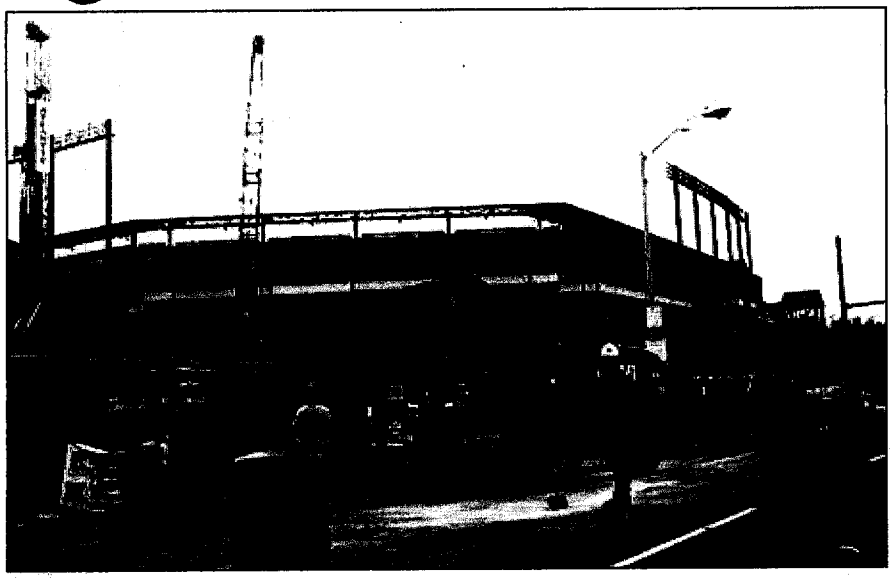

Figure 3.3 Construction in vicinity of sporting event venue (Photo #718)

Figure 3.4 Construction in paradise (Photo #1033)

While construction noise can be unwelcome during nighttime periods in residential areas when people are trying to sleep, it can be equally unwelcome during the daytime in commercial areas if it interferes with peoples' ability to conduct business. In short, construction noise has the potential to disturb people 24 hours a day, 7 days a week. If not properly addressed, specific public concerns related to a project could result in actions affecting the progress and/or cost of a project.

There is nothing particularly unique about construction noise - it's a fluctuation in air pressure oscillating above and below atmospheric pressure that is produced by construction equipment or activities with sufficient magnitude (loudness) and within a certain frequency range (audible spectrum) such that human beings can hear it - just like any other noise. Being a physical parameter, it can be measured, quantified, modeled, predicted, and in certain instances, abated to some degree.

Noise from construction-related activities can also affect non-human species such as aquatic life and land and airborne animals in a variety of ways. The non-human category includes domestic, farm-based, and creatures living in the wild. In assessing the effects of noise on non-humans, it is essential that noise analysts closely coordinate with qualified biologists in the assessment and mitigation of noise impacts.

Issues related to vibration may also be raised during project development. This is particularly true when blasting operations occur. There are no FHWA requirements directed specifically to traffic-induced or construction-related vibration. Most studies that State DOTs have done to assess the impact of operational traffic-induced vibrations have shown that both measured and predicted vibration levels are less than any known criteria for structural damage to buildings, although levels may be such as to cause various degrees of annoyance. Analysis of construction-related vibration effects is beyond the scope of this Handbook.

The intent of this Handbook is not to provide det
information regarding specific effects of constru

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3.2 Types of Effects

Physical effects related to humans are probably most applicable to the operators of construction equipment as opposed to people residing adjacent to construction projects. An exception to this would be unique situations such as scuba diving or swimming activities occurring in the vicinity of a water-based pile driving or blasting operation. The potential for hearing loss or physical damage to the human hearing mechanism is protected by Occupational Safety and Health Administration (OSHA) criteria, and as such, is not discussed herein. While resulting in the potential to annoy or disturb humans, construction noise is typically not a danger to people's hearing.

Knowledge related to the physical effects of construction noise on non-human species such as land-based animals, birds, and owls is limited. It is recognized that aquatic mammals and fish can be physically damaged by water-born sound and vibration waves caused by construction activities such as underwater blasting and pile driving. In lieu of detailed discussions within this Handbook of the variety of specialized studies related to the physical effects of construction noise on such species, references to such studies are provided in a list at the end of this chapter.

Loud noises from construction activities can create situations where people cannot effectively communicate, as documented in Tables 3.1 and 3.2. While such situations may be merely an annoyance or inconvenience in certain situations, they could be construed as a safety issue if such noises prevent people from hearing important local noises such as approaching traffic, emergency warning devices, alerts from other people, etc.

Noise from construction activities can affect humans, land-based animals, aquatic wildlife, and airborne wildlife in a variety of ways. Humans are most affected in terms of sleep deprivation and the carrying on of normal daily activities such as watching television, listening to the radio, recreational activities, and activities requiring concentration, such as reading. Special activities such as those associated with churches, schools, and libraries can also be negatively affected by construction noise. Water-based activities such as scuba diving, swimming, and boating can also be affected.

While non-humans are most likely annoyed by construction noise, there is little known about the related effects. However, the annoyance of noise on humans has been studied for some time and is documented in a 1974 EPA report commonly referred to as the "Levels Document"[ref033]. It is complementary to the 1979 EPA document, "Protective Noise Levels"[ref052].

A variety of studies have attempted to quantify the effects of noise on humans. An example is provided in the following table contained in the "Levels Document" referred to above. Note that all noise levels referred to in the "Levels Document" are A-weighted.

Table 3.1 Summary of Human Effects in Terms of Speech Communication, Community Reactions, Annoyance, and Attitude toward Area Associated with an Outdoor Day/Night Sound Level of 55 dB re 20 Micropascals.

Type of Effect	Magnitude of Effect
Speech - Indoors	100% sentence intelligibility (average) with a 5 dB margin of safety
Speech - Outdoors	100% sentence intelligibility (average) at 0.35 meters
	99% sentence intelligibility (average) at 1.0 meters
	95% sentence intelligibility (average) at 3.5 meters
Average Community Reaction	None evident; 7 dB below level of significant "complaints and threats of legal action" and at least 16 dB below "vigorous action" (attitudes and other non-level related factors may affect this result)
Complaints	1% dependent on attitude and other non-level related factors
Annoyance	1% dependent on attitude and other non-level related factors
Attitude Toward Area	Noise essentially the least important of various factors

Table 3.2. Steady A-weighted Sound Levels that Allow Communication with 95 Percent Sentence Intelligibility over Various Distances Outdoors for Different Voice Levels.

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Communication Distance (meters)	0.5	1	2	3	4	5
Normal Voice (dB)	72	66	60	56	54	52
Raised Voice (dB)	78	72	66	62	60	58

The effects of construction-related noise on non-humans are less understood and probably most related to mating, nesting, migration, and feeding activities. While data on such effects is limited as compared with information on humans, some research is available[ref031 and ref032].

For a more detailed discussion of the general effects of noise on wildlife and other non-human species, the reader is directed to references dealing with the following:

- Effects on wildlife and other animals: ref031 and ref032;
- Effects on marine mammals: ref102;
- Effects on fish: ref030, ref036, ref046, ref054, ref060, and ref061; and
- Effects on owls: research underway as of the publication date of this Handbook by Washington State DOT (WSDOT); when available, any published reports will be available through the WSDOT webpage (see Table 10.1).

In determining noise impacts and possible mitigation measures for construction projects involving non-human species, noise analysts should closely coordinate with qualified biologists.

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AGRICULTURAL MITIGATION POLICIES

Background

LAFCO's mission is to encourage orderly growth and development, discourage urban sprawl, preserve open space and prime agricultural lands, promote the efficient provision of government services and encourage the orderly formation of local agencies. LAFCO will consider impacts to agricultural lands along with other factors in its evaluation of proposals. LAFCO's Urban Service Area (USA) Amendment Policies discourage premature conversion of agricultural lands, guide development away from existing agricultural lands and require the development of existing vacant lands within city boundaries prior to conversion of additional agricultural lands. In those cases where LAFCO proposals involve conversion of agricultural lands, LAFCO's USA Amendment Policies require an explanation of why the inclusion of agricultural lands is necessary and how such loss will be mitigated.

Purpose of Policies

The purpose of these policies is to provide guidance to property owners, potential applicants and cities on how to address agricultural mitigation for LAFCO proposals and to provide a framework for LAFCO to evaluate and process in a consistent manner, LAFCO proposals that involve or impact agricultural lands.

General Policies

1. LAFCO recommends provision of agricultural mitigation as specified herein for all LAFCO applications that impact or result in a loss of prime agricultural lands as defined in Policy #6. Variation from these policies should be accompanied by information explaining the adequacy of the proposed mitigation.
2. LAFCO encourages cities with potential LAFCO applications involving or impacting agricultural lands to adopt citywide agricultural mitigation policies and programs that are consistent with these policies.
3. When a LAFCO proposal impacts or involves a loss of prime agricultural lands, LAFCO encourages property owners, cities and agricultural conservation agencies to work together as early in the process as possible to initiate and execute agricultural mitigation plans, in a manner that is consistent with these policies.
4. LAFCO will work with agricultural entities, the County, cities and other stakeholders to develop a program and public education materials to improve the community's understanding of the importance of agriculture in creating sustainable communities within Santa Clara County.

5. LAFCO will review and revise these policies as necessary.

Definition of Prime Agricultural Lands

6. "Prime agricultural land" as defined in the Cortese Knox Hertzberg Act means an area of land, whether a single parcel or contiguous parcels, that has not been developed for a use other than an agricultural use and that meets any of the following qualifications:

   a. Land that qualifies, if irrigated, for rating as class I or class II in the USDA Natural Resources Conservation Service land use capability classification, whether or not land is actually irrigated, provided that irrigation is feasible.

   b. Land that qualifies for rating 80 through 100 Storie Index Rating.

   c. Land that supports livestock used for the production of food and fiber and that has an annual carrying capacity equivalent to at least one animal unit per acre as defined by the United States Department of Agriculture in the National Handbook on Range and Related Grazing Lands, July, 1967, developed pursuant to Public Law 46, December 1935.

   d. Land planted with fruit or nut-bearing trees, vines, bushes, or crops that have a nonbearing period of less than five years and that will return during the commercial bearing period on an annual basis from the production of unprocessed agricultural plant production not less than four hundred dollars ($400) per acre.

   e. Land that has returned from the production of unprocessed agricultural plant products an annual gross value of not less than four hundred dollars ($400) per acre for three of the previous five calendar years.

Mitigation Recommendations

7. Proposals involving the conversion of prime agricultural lands should provide one of the following mitigations at a not less than 1:1 ratio (1 acre preserved for every acre converted) along with the payment of funds as determined by the city / agricultural conservation entity (whichever applies) to cover the costs of program administration, land management, monitoring, enforcement and maintenance of agriculture on the mitigation lands:

   a. The acquisition and transfer of ownership of agricultural land to an agricultural conservation entity for permanent protection of the agricultural land.

   b. The acquisition and transfer of agricultural conservation easements to an agricultural conservation entity for permanent protection of the agricultural land.

c. The payment of in-lieu fees to an agricultural conservation entity that are sufficient to fully fund*:

   1. The cost of acquisition of agricultural lands or agricultural conservation easements for permanent protection, and

   2. The cost of administering, managing, monitoring and enforcing the agricultural lands or agricultural conservation easements, as well as the costs of maintaining agriculture on the mitigation lands.

   * with provisions for adjustment of in-lieu fees to reflect potential changes in land values at the time of actual payment

8. Agricultural lands or conservation easements acquired and transferred to an agricultural conservation entity should be located in Santa Clara County and be lands deemed acceptable to the city and entity.

9. The agricultural mitigation should result in preservation of land that would be:

   a. Prime agricultural land of substantially similar quality and character as measured by the Average Storie Index rating and the Land Capability Classification rating, and

   b. Located within cities' spheres of influence in an area planned/envisioned for agriculture, and

   c. That would preferably promote the definition and creation of a permanent urban/agricultural edge.

10. Because urban/non-agricultural uses affect adjacent agricultural practices and introduce development pressures on adjacent agricultural lands, LAFCO encourages cities with LAFCO proposals impacting agricultural lands to adopt measures to protect adjoining agricultural lands, to prevent their premature conversion to other uses, and to minimize potential conflicts between the proposed urban development and adjacent agricultural uses. Examples of such measures include, but are not limited to:

    a. Establishment of an agricultural buffer on the land proposed for development. The buffer's size, location and allowed uses must be sufficient to minimize conflicts between the adjacent urban and agricultural uses.

    b. Adoption of protections such as a Right to Farm Ordinance, to ensure that the new urban residents shall recognize the rights of adjacent property owners conducting agricultural operations and practices in compliance with established standards.

    c. Development of programs to promote the continued viability of surrounding agricultural land.

Agricultural Conservation Entity Qualifications

11. The agricultural conservation entity should be a city or a public or non-profit agency. LAFCO encourages consideration of agricultural conservation entities that:

    a. Are committed to preserving local agriculture and have a clear mission along with strategic goals or programs for promoting agriculture in the areas that would be preserved through mitigation,

    b. Have the legal and technical ability to hold and administer agricultural lands and agricultural conservation easements and in-lieu fees for the purposes of conserving and maintaining lands in agricultural production and preferably have an established record for doing so, and

c. Have adopted written standards, policies and practices (such as the Land Trust Alliance's "Standards and Practices") for holding and administering agricultural lands, agricultural conservation easements and in-lieu fees and are operating in compliance with those standards.

Timing and Fulfillment of Mitigation

12. LAFCO prefers that agricultural mitigation be in place at the time of LAFCO approval or as soon as possible after LAFCO approval. The mitigation (as detailed in the Plan for Mitigation) should be fulfilled no later than at the time of city's approval of the final map, or issuance of a grading permit or building permit, whichever occurs first.

13. Cities should provide LAFCO with information on how the city will ensure that the agricultural mitigation is provided at the appropriate time.

14. Cities should provide LAFCO with a report on the status of agricultural mitigation fulfillment every year following LAFCO approval of the proposal until the agricultural mitigation commitments are fulfilled.

15. The agricultural conservation entity should report annually to LAFCO on the use of the in-lieu fees until the fees have been fully expended.

Plan for Mitigation

16. A plan for agricultural mitigation that is consistent with these policies should be submitted at the time that a proposal impacting agricultural lands is filed with LAFCO. The plan for mitigation should include all of the following:

    a. An agreement between the property owner, city and agricultural conservation entity (if such an entity is involved) that commits the property owner(s) to provide the mitigation for the loss of prime agricultural lands and establishes the specifics of the mitigation. Upon LAFCO approval of the proposal, the agreement should be recorded with

the County Recorder's office against the property to be developed. The agreement should specify:

1. The type of mitigation that will be provided in order to mitigate for conversion of agricultural lands. (purchase of fee title or easement or payment of in-lieu fees)
2. The agricultural conservation entity that will be involved in holding the lands, easements, or in-lieu fees.
3. The acreage that would be preserved through mitigation and / or the amount of in-lieu fees that would be paid (with provisions to adjust fees to reflect land values at time of payment) along with the methodology adopted by the entity for calculating the in-lieu fees.
4. The location of the mitigation lands, when possible.
5. Information on the specific measures adopted by the city as encouraged in Policy #10 (mitigation for impacts to adjacent agricultural lands)
6. The time-frame within which the mitigation will be fulfilled, which should be no later than at the time of city's approval of the final map, or issuance of the grading permit or building permit, whichever occurs first.
7. The mitigation agreement is to be contingent on LAFCO approval of the proposal.

b. Applicant should provide all other supporting documents and information to demonstrate compliance with these policies.

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Highway Traffic Noise

Construction Noise Handbook

9.0 Construction Equipment Noise Levels and Ranges

9.1 Equipment Type Inventory and Related Emission Levels

Noise levels generated by individual pieces of construction equipment and specific construction operations form the basis for the prediction of construction-related noise levels. A variety of information exists related to sound emissions related to such equipment and operations. This data transcends the period beginning in the 1970s thru 2006. This information exists for both stationary and mobile sources and for steady, intermittent, and impulse type generators of noise.

Stationary equipment consists of equipment that generates noise from one general area and includes items such as pumps, generators, compressors, etc. These types of equipment operate at a constant noise level under normal operation and are classified as non-impact equipment. Other types of stationary equipment such as pile drivers, jackhammers, pavement breakers, blasting operations, etc., produce variable and sporadic noise levels and often produce impact-type noises. Impact equipment is equipment that generates impulsive noise, where impulsive noise is defined as noise of short duration (generally less than one second), high intensity, abrupt onset, rapid decay, and often rapidly changing spectral composition. For impact equipment, the noise is produced by the impact of a mass on a surface, typically repeating over time.

Mobile equipment such as dozers, scrapers, graders, etc., may operate in a cyclic fashion in which a period of full power is followed by a period of reduced power. Other equipment such as compressors, although generally considered to be stationary when operating, can be readily relocated to another location for the next operation.

9.2 Sources of Information

Construction-related equipment and operation noise level data may be provided by numerous sources, including suppliers, manufacturers, agencies, organizations, etc. Some information is included in this document, and many web-based links are given for equipment manufacturers.

9.3 Specifics of Construction Equipment and Operation Noise Inventories

Details included in each specific inventory of construction equipment and operation noise emission levels are often variable in terms of how data is represented. Some inventories include ranges of noise levels while others present single numbers for each equipment type. Others provide levels for specific models of each type of construction equipment. Often, different noise descriptors are used, such as L_{Aeq}, L_{max}, L_{10}, sound power level, etc. As such, the array of data does not readily lend itself to being combined into a single table or easily compared. As such, this Handbook attempts to summarize a variety of such inventories and provide links to each, thereby providing the reader with a variety of sources from which to choose the appropriate levels for use in his or her respective analysis.

9.4 Summaries of Referenced Inventories

Included below are examples of several inventories of construction-related noise emission values. These and additional inventories are included on the companion CD-ROM.

Equipment and operation noise levels in this inventory are expressed in terms of L_{max} noise levels and are accompanied by a usage factor value. They have been recently updated and are based on extensive measurements taken in conjunction with the Central Artery/Tunnel (CA/T) Project. Table 9.1 summarizes the equipment noise emissions database used by the CA/T Project. While these values represent the "default" values for use in the RCNM, user-defined equipment and corresponding noise levels can be added.

Table 9.1 RCNM Default Noise Emission Reference Levels and Usage Factors.

Equipment Description	Impact Device?	Acoustical Usage Factor (%)	Spec. 721.560 L_{max} @ 50 feet (dBA, slow)	Actual Measured L_{max} @ 50 feet (dBA, slow) (Samples Averaged)	Number of Actual Data Samples (Count)
All Other Equipment > 5 HP	No	50	85	N/A	0
Auger Drill Rig	No	20	85	84	36
Backhoe	No	40	80	78	372
Bar Bender	No	20	80	N/A	0
Blasting	Yes	N/A	94	N/A	0

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Boring Jack Power Unit	No	50	80	83	1
Chain Saw	No	20	85	84	46
Clam Shovel (dropping)	Yes	20	93	87	4
Compactor (ground)	No	20	80	83	57
Compressor (air)	No	40	80	78	18
Concrete Batch Plant	No	15	83	N/A	0
Concrete Mixer Truck	No	40	85	79	40
Concrete Pump Truck	No	20	82	81	30
Concrete Saw	No	20	90	90	55
Crane	No	16	85	81	405
Dozer	No	40	85	82	55
Drill Rig Truck	No	20	84	79	22
Drum Mixer	No	50	80	80	1
Dump Truck	No	40	84	76	31
Excavator	No	40	85	81	170
Flat Bed Truck	No	40	84	74	4
Front End Loader	No	40	80	79	96
Generator	No	50	82	81	19
Generator (<25KVA, VMS Signs)	No	50	70	73	74
Gradall	No	40	85	83	70
Grader	No	40	85	N/A	0
Grapple (on backhoe)	No	40	85	87	1
Horizontal Boring Hydraulic Jack	No	25	80	82	6
Hydra Break Ram	Yes	10	90	N/A	0
Impact Pile Driver	Yes	20	95	101	11
Jackhammer	Yes	20	85	89	133
Man Lift	No	20	85	75	23
Mounted Impact Hammer (hoe ram)	Yes	20	90	90	212
Pavement Scarifier	No	20	85	90	2
Paver	No	50	85	77	9
Pickup Truck	No	40	55	75	1
Pneumatic Tools	No	50	85	85	90
Pumps	No	50	77	81	17
Refrigerator Unit	No	100	82	73	3
Rivit Buster/Chipping Gun	Yes	20	85	79	19

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Rock Drill	No	20	85	81	3
Roller	No	20	85	80	16
Sand Blasting (single nozzle)	No	20	85	96	9
Scraper	No	40	85	84	12
Sheers (on backhoe)	No	40	85	96	5
Slurry Plant	No	100	78	78	1
Slurry Trenching Machine	No	50	82	80	75
Soil Mix Drill Rig	No	50	80	N/A	0
Tractor	No	40	84	N/A	0
Vacuum Excavator (Vac-Truck)	No	40	85	85	149
Vacuum Street Sweeper	No	10	80	82	19
Ventilation Fan	No	100	85	79	13
Vibrating Hopper	No	50	85	87	1
Vibratory Concrete Mixer	No	20	80	80	1
Vibratory Pile Driver	No	20	95	101	44
Warning Horn	No	5	85	83	12
Welder/Torch	No	40	73	74	5

For each generic type of equipment listed in Table 9.1, the following information is provided:

- an indication as to whether or not the equipment is an impact device;
- the acoustical usage factor to assume for modeling purposes;
- the specification "Spec" limit for each piece of equipment expressed as an L_{max} level in dBA "slow" at a reference distance of 50 foot from the loudest side of the equipment;
- the measured "Actual" emission level at 50 feet for each piece of equipment based on hundreds of emission measurements performed on CA/T work sites; and
- the number of samples that were averaged together to compute the "Actual" emission level.

A comparison of the "Spec" emission limits against the "Actual" emission levels reveals that the Spec limits were set, in general, to realistically obtainable noise levels based on the equipment used by contractors on the CA/T Project. When measured in the field, some equipment such as pile drivers, sand blasting, demolition shears, and pumps tended to exceed their applicable emission limit. As such, these noisy devices needed to have some form of noise mitigation in place in order to comply with the Spec emission limits. Other equipment, such as clamshell shovels, concrete mixer trucks, truck-mounted drill rigs, man-lifts, chipping guns, ventilation fans, pavers, dump trucks, and flatbed trucks, easily complied. Therefore, the Spec emission limits for these devices could have been reduced somewhat further. It is recommended that the user review the RCNM User's Guide contained in Appendix A for detailed guidance regarding application of values contained in Table 9.1.

Appendix A of the 1977 Handbook provides tables of construction equipment noise levels and ranges. The majority of the data were provided by the American Road Builders Association. These data were taken during a 1973 survey in which member contractors were asked to secure readings of noise exposure to operators of various types of equipment. Additionally, the contractors were asked to take readings at 50 feet from the machinery. These 50-foot peak readings are provided in Tables 9.2 through 9.8. Though the data were produced under varying conditions and degrees of expertise, the values are relatively consistent.

Table 9.2 Construction Equipment Noise Levels Based on Limited Data Samples - Cranes.

Manufacturer	Type or Model	Peak Noise Level (dBA)	Remarks
Northwestern	80D	77	Within 15m 1958 mod
Northwestern	8	84	Within 15m 1940 mod
Northwestern	6	72	Within 15m 1965 mod
American	7260	82	Within 15m 1967 mod

American	599	76	Within 15m 1969 mod
American	5299	70	Within 15m 1972 mod
American	4210	82	Within 15m 1968 mod
Buck Eye	45C	79	Within 15m 1972 mod
Buck Eye	308	74	Within 15m 1968 mod
Buck Eye	30B	73	Within 15m 1965 mod
Buck Eye	30B	70	Within 15m 1959 mod
Link Belt	LS98	76	Within 15m 1956 mod
Manitowoc	4000	94	Within 15m 1956 mod
Grove	RF59	82	Within 15m 1973 mod
Koehr	605	76	Within 15m 1967 mod
Koehr	435	86	Within 15m 1969 mod
Koehr	405	84	Within 15m 1969 mod

Table 9.3 Construction Equipment Noise Levels Based on Limited Data Samples - Backhoes.

Manufacturer	Type or Model	Peak Noise Level (dBA)	Remarks
Link Belt	4000	92	Within 15m 1971 mod
John Deere	609A	85	Within 15m 1971 mod
Case	680C	74	Within 15m 1973 mod
Drott	40 yr.	82	Within 15m 1971 mod
Koehr	1066	81 & 84	Within 15m 2 tested

Table 9.4 Construction Equipment Noise Levels Based on Limited Data Samples - Front Loaders.

Manufacturer	Type or Model	Peak Noise Level (dBA)	Remarks
Caterpillar	980	84	Within 15m 1972 mod
Caterpillar	977K	79	Within 15m 1969 mod
Caterpillar	977	87	Within 15m 1971 mod
Caterpillar	977	94	Within 15m 1967 mod
Caterpillar	966C	84	Within 15m 1973 mod
Caterpillar	966C	85	Within 15m 1972 mod
Caterpillar	966	81	Within 15m 1972 mod
Caterpillar	966	77	Within 15m 1972 mod
Caterpillar	966	85	Within 15m 1966 mod
Caterpillar	955L	90	Within 15m ;1973 mod
Caterpillar	955K	79	Within 15m 1969 mod
Caterpillar	955H	94	Within 15m 1963 mod
Caterpillar	950	78 & 80	Within 15m 1972 mod
Caterpillar	950	75	Within 15m 1968 mod
Caterpillar	950	88	Within 15m 1967 mod
Caterpillar	950	86	Within 15m 1965 mod
Caterpillar	944A	80	Within 15m 1965 mod
Caterpillar	850	82	Within 15m 1968 mod
Michigan	75B	80	Within 15m 1969 mod

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Michigan	475A	96	Within 15m 1967 mod
Michigan	275	85	Within 15m 1971 mod
Michigan	125	87	Within 15m 1967 mod
Hough	65	82	Within 15m 1971 mod
Hough	60	91	Within 15m 1961 mod
Hough	400B	94	Within 15m 1961 mod
Hough	H90	86	Within 15m 1961 mod
Trojan	3000	85	Within 15m 1956 mod
Trojan	RT	82	Within 15m 1965 mod
Payloader	H50	85	Within 15m 1963 mod

Table 9.5 Construction Equipment Noise Levels Based on Limited Data Samples - Dozers.

Manufacturer	Type or Model	Peak Noise Level (dBA)	Remarks
Caterpillar	D5	83	Within 15m 1967 mod
Caterpillar	D6	85	Within 15m 1967 mod
Caterpillar	D6	86	Within 15m 1964 mod
Caterpillar	D6	81	Within 15m 1967 mod
Caterpillar	D6B	83	Within 15m 1967 mod
Caterpillar	D6C	82	Within 15m 1962 mod
Caterpillar	D7	85	Within 15m 1956 mod
Caterpillar	D7	86	Within 15m 1969 mod
Caterpillar	D7	84	Within 15m 1969 mod
Caterpillar	D7	78	Within 15m 1970 mod
Caterpillar	D7	78	Within 15m 1972 mod
Caterpillar	D7E	86	Within 15m 1965 mod
Caterpillar	D7E	78	Within 15m 1970 mod
Caterpillar	D7E	84	Within 15m 1973 mod
Caterpillar	D7F	80	Within 15m 1972 mod
Caterpillar	D8	92	Within 15m 1954 mod
Caterpillar	D8	95	Within 15m 1968 mod
Caterpillar	D8	86	Within 15m 1972 mod
Caterpillar	D8H	88	Within 15m 1966 mod
Caterpillar	D8H	82	Within 15m 1972 mod
Caterpillar	D9	85	Within 15m 1972 mod
Caterpillar	D9	94	Within 15m 1972 mod
Caterpillar	D9	90	Within 15m 1963 mod
Caterpillar	D9	87	Within 15m 1965 mod
Caterpillar	D9	90	Within 15m 1965 mod
Caterpillar	D9	88	Within 15m 1968 mod
Caterpillar	D9	92	Within 15m 1972 mod
Caterpillar	D9G	85	Within 15m 1965 mod
Allis Chambers	HD41	93	Within 15m 1970 mod

International	TD15	79	Within 15m 1970 mod
International	TD20	87	Within 15m 1970 mod
International	TD25	90	Within 15m 1972 mod
International	TD8	83	Within 15m 1970 mod
Case	1150	82	Within 15m 1972 mod
John Deer	350B	77	Within 15m 1971 mod
John Deer	450B	65	Within 15m 1972 mod
Terex	8230	70	Within 15m 1972 mod
Terex	8240	93	Within 15m 1969 mod
Michigan	280	85	Within 15m 1961 mod
Michigan	280	90	Within 15m 1962 mod
Caterpillar	824	90	Within 15m 1968 mod

Table 9.6 Construction Equipment Noise Levels Based on Limited Data Samples - Graders.

Manufacturer	Type or Model	Peak Noise Level (dBA)	Remarks
Caterpillar	16	91	Within 15m 1969 mod
Caterpillar	16	86	Within 15m 1968 mod
Caterpillar	140	83	Within 15m 1970 mod
Caterpillar	14E	84	Within 15m 1972 mod
Caterpillar	14E	85	Within 15m 1971 mod
Caterpillar	14C	85	Within 15m 1971 mod
Caterpillar	14B	84	Within 15m 1967 mod
Caterpillar	12F	82	Within 15m 1961-72 mod
Caterpillar	12F	72-92	Within 15m 1961-72 mod
Caterpillar	12E	81.3	Within 15m 1959-67 mod
Caterpillar	12E	80-83	Within 15m 1959-67 mod
Caterpillar	12	84.7	Within 15m 1960-67 mod
Caterpillar	12	82-88	Within 15m 1960-67 mod
Gallon	T500	84	Within 15m 1964 mod
Allis Chambers		87	Within 15m 1964 mod

Table 9.7 Construction Equipment Noise Levels Based on Limited Data Samples - Scrapers.

Manufacturer	Type or Model	Peak Noise Level (dBA)	Remarks
Caterpillar	660	92	Within 15m
Caterpillar	641B	85	Within 15m 1972 mod
Caterpillar	641B	86	Within 15m 1972 mod
Caterpillar	641	80 & 84	Within 15m 1972 mod
Caterpillar	641	83 & 89	Within 15m 1965 mod
Caterpillar	637	87	Within 15m 1971 mod
Caterpillar	633	87	Within 15m 1972 mod
Caterpillar	631C	89	Within 15m 1973 mod
Caterpillar	631C	83	Within 15m 1972 mod
Caterpillar	631B	94	Within 15m 1969 mod

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Caterpillar	631B	84-87	Within 15m 1968 mod
Caterpillar		85 avg.	Within 15m 1968 mod
Caterpillar	621	90	Within 15m 1970 mod
Caterpillar	621	86	Within 15m 1967 mod
Caterpillar	613	76	Within 15m 1972 mod
Terex	TS24	87	Within 15m 1972 mod
Terex	TS24	84-91	
Terex	TS24	82	Within 15m 1971 mod
Terex	TS24	81-83	Within 15m 1971 mod
Terex	TS24	94	Within 15m 1966 mod
Terex	TS24	92-98	Within 15m 1966 mod
Terex	TS24	94.7	Within 15m 1963 mod
Terex	TS24	94-95	Within 15m 1963 mod
Terex	TS14	82	Within 15m 1969 mod
Terex	S35E	84	Within 15m 1971 mod

Table 9.8 Noise Levels of Standard Compressors.

Manufacturer	Model	Silenced or Standard	Type Eng.	Type Comp.	Test Avg. Cond. (cfm.psi)	Avg. Cond. Noise Lev. (cfm.psi) (dBA) at 7m*
Atlas	ST-48	Standard	Diesel	Reciprocal	160,100	83.6
Atlas	ST-95	Standard	Diesel	Reciprocal	330,105	80.2
Atlas	VSS-170Dd	Silenced	Diesel	Reciprocal	170,850	70.2
Atlas	VT-85M	Standard	Gas	Reciprocal	85,100	81.4
Atlas	VS-85Dd	Silenced	Gas	Reciprocal	85,100	75.5
Atlas	VSS-125Dd	Silenced	Diesel	Reciprocal	125,100	70.1
Atlas	STS-35Dd	Silenced	Diesel	Reciprocal	125,100	73.5
Atlas	VSS-170Dd	Silenced	Diesel	Reciprocal	170,100	
Gardner-Denver	SPWDA/2	Silenced	Diesel	Rotary-Screw	1200,000	73.3
Gardner-Denver	SPQDA/2	Silenced	Diesel	Rotary-Screw	750,000	78.2
Gardner-Denver	SPHGC	Silenced	Gas	Rotary-Screw	185,000	77.1
Ingersoll-Rand	DXL 1200	Standard	Diesel	Rotary-Screw	1200,125	92.6
Ingersoll-Rand	DXL 1200 (doors open)	Standard	Diesel	Rotary-Screw	1200,125	
Ingersoll-Rand	DXL 900S	Silenced	Diesel	Rotary-Screw	900,125	76.0
Ingersoll-Rand	DXL 900S	Silenced	Diesel	Rotary-Screw	900,125	75.1
Ingersoll-Rand	DXLCU1050	Standard	Diesel	Rotary-Screw	1050,125	90.2
Ingersoll-Rand	DXL 900S	Silenced	Diesel	Rotary-Screw	900,125	75.3
Ingersoll-Rand	DXL 900S	Silenced	Diesel	Rotary-Screw	900,125	75.0
Ingersoll-Rand	DXL 900	Standard	Diesel	Rotary-Screw	900,125	89.9
Ingersoll-Rand	DXL 750	Standard	Diesel	Rotary-Screw	750,125	87.7
Jaeger	A	Standard	Gas	Rotary-Screw	175,100	88.2

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Jaeger	A(doors open)	Standard	Gas	Rotary-Screw	175,100	
Jaeger	E	Standard	Gas	Vane	85,100	81.5
Jaeger	E(doors open)	Standard	Gas	Vane	85,100	
Worthington	60 G/2Qt	Silenced	Gas	Vane	160,100	74.2
Worthington	750-QTEX	Silenced	Diesel	Rotary-Screw	750,100	74.7

*Data taken from EPA Report - EPA 550/9-76-004.

9.4.3 FTA Noise and Vibration Assessment Procedure

Chapter 12 of the FTA Transit Noise and Vibration Guidance Handbook discusses construction noise evaluation methodology and contains the noise emission levels for construction equipment displayed in Table 9.9.

Table 9.9 FTA Construction Equipment Noise Emission Levels.

Equipment	Typical Noise Level (dBA) 50 ft from Source*
Air Compressor	81
Backhoe	80
Ballast Equalizer	82
Ballast Tamper	83
Compactor	82
Concrete Mixer	85
Concrete Pump	82
Concrete Vibrator	76
Crane Derrick	88
Crane Mobile	83
Dozer	85
Generator	81
Grader	85
Impact Wrench	85
Jack Hammer	88
Loader	85
Paver	89
Pile Driver (Impact)	101
Pile Driver (Sonic)	96
Pneumatic Tool	85
Pump	76
Rail Saw	90
Rock Drill	98
Roller	74
Saw	76
Scarifier	83
Scraper	89
Shovel	82
Spike Driver	77
Tie Cutter	84

Tie Handler	80
Tie Inserter	85
Truck	88

*Table based on EPA Report, measured data from railroad construction equipment taken during Northeast Corridor improvement project and other measured data.

9.5 Links to Equipment Manufacturers

Table 9.10 contains web-based links to manufacturers of construction equipment. While few of these links contain noise-related data associated with the equipment, they provide descriptions and/or specifications related to the equipment, as well as sources for possibly obtaining additional information related to the equipment. Information in this table is by no means all-inclusive and does not represent any type of endorsement of the manufacturers, suppliers, or equipment. Users are hereby advised that the referenced websites may have certain restrictions, copyrights, etc., associated with any use of data contained therein.

Table 9.10 Equipment Manufacturers and Websites.

Equipment	Manufacturer	Website Address
Arrow Boards		
	North Star	http://northstar-traffic.com/index.cfm?SC=14&PT=1
	Trafcom	http://www.trafcon.com
	Allmand	http://www.allmand.com/MB%20AB%20page.htm
Articulated Trucks		
	Case	http://www.casece.com/products/products.asp?RL=NAE&id=196
	Hitachi	http://www.hitachi-c-m.com/global/products/articulate/index.html
	Terex	http://www.terex.com/main.php
	Caterpillar	http://www.cat.com/cda/layout?m=37840&x=7
	Volvo	http://www.volvo.com/constructionequipment/na/en-us/products/articulatedhaulers/
Asphalt Saws		
	Allied	http://www.alliedcp.com/products/rotocut.asp
Augers - See Drills / Augers		
Backhoes - See Loaders/Backhoes		
Boring Equipment - See Pile Drivers/Boring Equipment		
Compaction Equipment		
	Allied	http://www.alliedcp.com/products/compactor.asp
Compressors		
	Sullair	http://www.sullair.com/corp/details/0,10294,CLI1_DIV61_ETI5714,00.html
	Compair	http://www.compair.com/Products/Portable_Compressors.aspx
Concrete and Asphalt Batch/Mixing Plants and Equipment		
	Con-E-Co	http://www.con-e-co.com/products.cfm
	Terex	http://www.terex.com/main.php
	Gunter & Zimmerman	http://www.guntert.com/concrete_mobilebatching.asp
	Rex Con	http://www.rexcon.com
Concrete Breakers/ Hydraulic Hammers/Hydraulic Breakers		
	Drillman	http://www.drillmanindia.com/concrete-breaker.html
	Hydro Khan	http:/www.sangi.co.kr/english/e_product1_2.php
	Stanley	http://www.stanley-hydraulic-tools.com/Hand%20Held/No

	Lynx	http://www.stanley-hydraulic-tools.com/Lynx/breakers.htm
Concrete Chain Saws		
	Lynx	http://www.stanley-hydraulic-tools.com/Lynx/concrete-saws.htm
Concrete Core Drilling Machines		
	Multiquip	http://www.multiquip.com/multiquip/318_ENU_HTML.htm
Concrete Cutters		
	Vermeer	http://www.vermeermfg.com/vcom/TrenchingEquipment/Line.jsp?PrdlnID=3618
Concrete/Material Pumps		
	Multiquip	http://www.multiquip.com/multiquip/309_ENU_HTML.htm
	Reed	http://www.reedpumps.com/
Concrete Mixer Trucks		
	Oshkosh	http://www.oshkoshtruck.com/concrete/products~overview~home.cfm
	London	http://www.lmi.ca/mixers.cfm
	Terex/Advance	http://www.advancemixer.com
Concrete Saws		
	Multiquip	http://www.multiquip.com/multiquip/315_ENU_HTML.htm
	Diamond Core Cut	http://www.diamondproducts.com/dp_home.htm
Concrete Screeds		
	Multiquip	http://www.multiquip.com/multiquip/317_ENU_HTML.htm
Concrete Vibrators		
	Multiquip	http://www.multiquip.com/multiquip/313_ENU_HTML.htm
	Sullair	http://www.sullair.com/corp/details/0,10294,CLI1_DIV61_ETI5722,00.html
Cranes		
	Malcolm Drilling	www.malcolmdrilling.com
	Link-Belt	http://www.linkbelt.com/lit/products/frameproducthome.htm
	Casagrande	http://www.casagrandegroup.com
	Liebherr	http://www.liebherr.com/em/en/35381.asp
	Terex	http://www.terex.com/main.php
Crawler Tractors - See Dozers/Crawler Tractors		
Crushing and Screening Equipment		
	Cedarapids	http://www.cedarapids.com/crushscr.htm
	Hitachi	http://www.hitachi-c-m.com/
	Komatsu	http://www.komatsu.com/ce/products/mobile_crushers.html
	Terex	http://www.terex.com/main.php
Crushers/Pulverizers		
	Hydro Khan	http://www.sangi.co.kr/english/e_product3.php
Cutoff Saws		
	Multiquip	http://www.multiquip.com/multiquip/309_ENU_HTML.htm
	Lynx	http://www.stanley-hydraulic-tools.com/Lynx/cutoff%20saw.htm
Dozers/CrawlerTractors		

	John Deere	http://www.deere.com/en_US/cfd/construction/deere_const/crawlers/deere_dozer_selection.html
	Caterpillar	http://www.cat.com/cda/layout?m=37840&x=7
	Case	http://www.casece.com/products/products.asp?RL=NAE&id=2
	Komatsu	http://www.komatsu.com/ce/products/crawler_dozers.html
Dewatering Pumps		
	Multiquip	http://www.multiquip.com/multiquip/371_ENU_HTML.htm
Drills / Augers		
	Malcolm Drilling	www.malcolmdrilling.com
	Casagrande	www.casagrandegroup.com
	Soilmec	http://www.soilmec.com/_vti_g1_techno.aspx?rpstry=4
	Terex	http://www.terex.com/main.php
Excavators		
	Hitachi	http://www.hitachi-c-m.com/global/products/excavator/index.html
	Caterpiller	http://www.cat.com/cda/layout?m=37840&x=7
	Volvo	http://www.volvo.com/constructionequipment/na/en-us/products/compactexcavators/
		http://www.volvo.com/constructionequipment/na/en-us/products/wheeledexcavators/
		http://www.volvo.com/constructionequipment/na/en-us/products/crawlerexcavators/
	John Deere	http://www.deere.com/en_US/cfd/construction/deere_const/excavators/deere_excavator_selection.html
	Liebherr	http://www.liebherr.com/em/en/18891.asp
	Soilmec	http://www.soilmec.com/_vti_g1_t02.aspx?rpstry=29
	Gehl	http://www.gehl.com
	Case	http://www.casece.com/products/products.asp?RL=NAE&id=216
	Komatsu	http://www.komatsu.com/ce/products/crawler_excavators.html
		http://www.komatsu.com/ce/products/wheel_excavators.html
	Terex	http://www.terex.com/main.php
	Link-Belt	http://www.lbxco.com/lx_series.asp
	Gradall	http://www.gradall.com/
	Badger Daylighting	http://www.badgerinc.com/
Fork Lifts - See Lifts / Variable Reach Fork Lifts/ Material Handlers		
Generators		
	Terex	http://www.terex.com/main.php
	Multiquip	http://www.multiquip.com/multiquip/212_ENU_HTML.htm
	Sullair	http://www.sullair.com/corp/details/0,10294,CLI1_DIV61_ETI5714,00.html
	Baldor	http://www.baldor.com/products/generators/ts.asp
Graders		
	Case	http://www.casece.com/products/products.asp?RL=NAE&id=190
	Volvo	http://www.volvo.com/constructionequipment/na/en-us/products/MotorGraders/
	Komatsu	http://www.komatsu.com/ce/products/motor_graders.html
	Terex	htt

Hand Compaction Equipment		
	Terex	http://www.terex.com/main.php
	Multiquip	http://www.multiquip.com/multiquip/56_ENU_HTML.htm
Hydraulic Hammers/Hydraulic Breakers - See Concrete Breakers/ Hydraulic Hammers/Hydraulic Breakers		
Jackhammers - See Rock Drilling Equipment/Jackhammers		
Lifts / Variable Reach Fork Lifts/ Material Handlers		
	Genie Lift	www.genielift.com
	Sky Track	www.kirby-smith.com/
	Ingersol-Rand	www.ingersollrand.com
	Terex	http://www.terex.com/main.php
	Roadtec	http://www.roadtec.com/www/docs/102/mtv-material-transfer-vehicle/
Light Towers		
	Baldor	http://www.baldor.com/products/generators/mlt.asp
	Multiquip	http://www.multiquip.com/multiquip/293_ENU_HTML.htm
	Allmand	http://www.allmand.com/Night%20Lite%20Pro%20page.htm
Loaders/Backhoes		
	Case	http://www.casece.com/products/products.asp?RL=NAE&id=54
	Caterpillar	http://www.cat.com/cda/layout?m=37840&x=7
	Volvo	http://www.volvo.com/constructionequipment/na/en-us/products/backhoeloaders/
	John Deere	http://www.deere.com/en_US/cfd/construction/deere_const/backhoes/deere_backhoe_selection.html
	Komatsu	http://www.komatsu.com/ce/products/backhoe_loaders.html
Material Handlers - See Lifts / Variable Reach Fork Lifts/ Material Handlers		
Milling Machines		
	Wirtgen	http://www.wirtgenamerica.com/us/
Mining Trucks - See Rigid Dump Trucks/Mining Trucks		
Pans - See Scrapers/Pans		
Pavers/Paving Equipment		
	Caterpillar/ Barber Greene	http://www.cat.com/cda/layout?m=37840&x=7
	Rosco	http://www.leeboy.com/rosco/
	Bomag	http://www.bomag.com/americas/index.aspx?&Lang=478
	Gehl	http://www.gehl.com/const/prodpg_ap.html
	Leeboy	http://www.leeboy.com/leeboy/
	Terex	http://www.terex.com/main.php
	Ingersoll-Rand	http://www.road-development.irco.com/Default.aspx?MenuItemID=12
	Vogele	http://www.vogeleamerica.com/noflash.html
	GOMACO	http://www.gomaco.com/index.html
	Roadtec	http://www.roadtec.com
Pile Drivers/Boring Equipment		
	Soilmec	http://www.soilmec.com/_vti_g1_t09.aspx?rpstry=29_
	Leffer	http://www.leffer.com/hme.html

	Bauer	http://www.bauer.de/en/maschinenbau/produkte/drehbohrgeraete/bg_reihe/usbg15h.htm
Pipelayers/Trenchers		
	Liebherr	http://www.liebherr.com/em/en/18908.asp
	Caterpillar	http://www.cat.com/cda/layout?m=37840&x=7
	Case	http://www.casece.com/products/products.asp?RL=NAE&id=28&archived=1
	Vermeer	http://www.vermeermfg.com/vcom/TrenchingEquipment/trenching-equipment.htm
	Ditchwitch	http://www.ditchwitch.com/dwcom/Product/ProductView/115
	Eagle	http://www.guntert.com/trenchers_home.asp
Profilers - See Roadway Planers/Profilers		
Rammers		
	Multiquip	http://www.multiquip.com/multiquip/56_ENU_HTML.htm
Rebar Benders/Cutters		
	Multiquip	http://www.multiquip.com/multiquip/1316_ENU_HTML.htm
Recyclers - See Stabilizers/Recyclers		
Rigid Dump Trucks/Mining Trucks		
	Hitachi	http://www.hitachi-c-m.com/global/products/rigid/index.html
	Caterpillar	http://www.cat.com/cda/layout?m=37840&x=7
	Liebherr	http://www.liebherr.com/em/en/18898.asp
	Komatsu	http://www.komatsu.com/ce/products/dump_trucks.html
	Terex	http://www.terex.com/main.php
Roadway Planers/Profilers		
	Terex	http://www.terex.com/main.php
	Roadtec	http://www.roadtec.com/products/cold_planers/default.htm
Rock Drilling Equipment/Jackhammers		
	Drillman	http://www.drillmanindia.com/rock-drilling-machine.html
	Whaker	http://www.wackergroup.com/webapp/wcs/stores/servlet/
	Sullair	http://www.sullair.com/corp/details/0,10294,CLI1_DIV61_ETI5721,00.html
	Allied	http://www.alliedcp.com/products/hammers.asp
Rollers - See Tampers/Rollers		
Scrapers/Pans		
	Terex	http://www.terex.com/main.php
Screening Equipment - See Crushing and Screening Equipment		
Slabbuster		
	Allied	http://www.alliedcp.com/products/slabbuster.asp
Slip Form Pavers		
	Huron	http://www.huronmanufacturing.com/
	Guntert & Zimmerman	http://www.guntert.com/concreteSlipformPavers.asp
Stabilizers/Recyclers		
	Bomag	http://www.bomag.com/americas/index.aspx?&Lang=478

	Komatsu	http://www.komatsu.com/ce/products/mobile_crushers.html
	Terex	http://www.terex.com/main.php
	Wirtgen	http://www.wirtgenamerica.com/us/
	Roadtec	http://www.roadtec.com
Sweepers		
	Elgin	http://www.elginsweeper.com
	Johnston	http://www.johnstonsweepers.com/
Tampers/ Rollers		
	Bomag	http://www.bomag.com/americas/index.aspx?&Lang=478
	Komatsu	http://www.komatsu.com/ce/products/vibratory_rollers.html
	Whaker	http://www.wackergroup.com/webapp/wcs/stores/servlet/
	Lynx	http://www.stanley-hydraulic-tools.com/Lynx/tamper.htm
	Multiquip	http://www.multiquip.com/multiquip/181_ENU_HTML.htm
	Ingersoll-Rand	http://www.road-development.irco.com/Default.aspx?MenuItemID=15
Trenchers - See Pipelayers/Trenchers		
Trucks - See Articulated Trucks, Concrete Mixer Trucks, Rigid Dump Trucks/Mining Trucks		
Vacuum Units		
	Advanced Recycling Systems	www.arsrecycling.com/
	Vacmasters	http://www.vacmasters.com/airsystm.htm
	Vector	http://www.vector-vacuums.com/
Variable Message Signs		
	Allmand	http://www.allmand.com/MB%20only%20page.htm
	North Star	http://northstar-traffic.com/index.cfm?SC=13&PT=1
	Trafcom	http://www.trafcon.com
	Daktronics	http://www.daktronics.com/vms_prod/dak_vms_products.cfm
Vibratory Rammers		
	Whaker	http://www.wackergroup.com/webapp/wcs/stores/servlet/
Welders/Welding Equipment		
	Airgas	www.airgas.com
	Multiquip	http://www.multiquip.com/multiquip/408_ENU_HTML.htm
	Miller	http://www.millerwelds.com/products/
	Lincoln	http://www.mylincolnelectric.com/Catalog/equipmentseries.asp?browse=101|400|
Wheel Loaders		
	Hitachi	http://www.hitachi-c-m.com/global/products/loader/index.html
	Case	http://www.casece.com/products/products.asp?RL=NAE&id=30
	Caterpillar	http://www.cat.com/cda/layout?m=37840&x=7
	Volvo	http://www.volvo.com/constructionequipment/na/en-us/products/wheelloaders/
	Terex	http://www.terex.com/main.php
	Komatsu	http://www.komatsu.com/ce/products/wheel_loaders.html
	TCM	http://www.tcmglobal.net/products/main02.html

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FHWA

United States Department of Transportation - **Federal Highway Administration**

SOUTH COAST AIR QUALITY MANAGEMENT DISTRICT

Final –Methodology to Calculate Particulate Matter (PM) 2.5 and PM 2.5 Significance Thresholds

October 2006

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Introduction

In the last few years, both California and the federal governments have established ambient air quality standards for fine particulate matter (PM) less than or equal to 2.5 microns in diameter (PM2.5). As a result, there is a need to establish a methodology for calculating PM2.5 and appropriate PM2.5 significance thresholds for the purpose of analyzing local and regional PM2.5 air quality impacts in California Environmental Quality Act (CEQA) and National Environmental Policy Act (NEPA) air quality analyses. This document provides a methodology for calculating PM2.5 and recommendations for localized and regional PM2.5 significance thresholds.

Background

PM larger than 2.5 microns and less than 10 microns, often referred to as the coarse PM fraction (or PM10), is mostly produced by mechanical processes. These include automobile tire wear, industrial processes such as cutting and grinding, and re-suspension of particles from the ground or road surfaces by wind and human activities such as construction or agriculture. In contrast, PM less than or equal to PM2.5 is mostly derived from combustion sources, such as automobiles, trucks, and other vehicle exhaust, as well as from stationary combustion sources. The particles are either directly emitted or are formed in the atmosphere from the combustion of gases, such as NOx and SOx combining with ammonia. PM2.5 components from material in the earth's crust, such as dust, are also present, with the amount varying in different locations. Staff's recommendation for calculating PM2.5 focuses only on directly emitted PM2.5.

In 1997, U.S. EPA established an annual and a 24-hour standard for the finest fraction of particulates, PM2.5, to complement the existing PM10 standards. However, U.S. EPA recently modified the 24-hr PM2.5 standard and revoked the annual PM10 standard. (Table 1). The annual component of the standard was established to provide protection against typical day-to-day exposures as well as longer-term exposures, while the daily component protects against more extreme short-term events.

TABLE 1

Federal Standards for Particulate Matter

Federal Standards	PM 10	PM 2.5
Annual	Revoked[a]	15 $\mu g/m^3$
24-Hour	150 $\mu g/m^3$	35 $\mu g/m^3$ [b]

In June 2002, the California Air Resources Board (CARB) adopted new, stricter standards for particulate matter that would affect both the coarse as well as fine particulate fraction (Table 2). CARB delayed action on the proposed 24-hour PM2.5 standard in light of the

[a] U.S. EPA final rulemaking for CFR 40 Part 50.7 National Primary and Secondary Ambient Air Quality Standards at http://epa.gov/pm/pdfs/20060921_rule.pdf

[b] U.S. EPA final rulemaking for CFR 40 Part 50.13 National Primary and Secondary Ambient Air Quality Standards at http://epa.gov/pm/pdfs/20060921_rule.pdf

findings related to statistical issues in several key short-term exposure health effects studies.

TABLE 2

California Standards for Particulate Matter

California Standards	PM 10	PM 2.5
Annual	20 $\mu g/m^3$	12 $\mu g/m^3$
24-Hour	50 $\mu g/m^3$	n/a

Methodology to Calculate PM 2.5

Because there are currently few or no PM2.5 emission factors for mechanical or combustion processes, staff is recommending an indirect approach to calculating PM2.5 emissions until such time as PM2.5 factors are developed. Since PM2.5 is a subset of PM10, the current methodology for calculating PM10 from fugitive dust sources (grading, demolition, unpaved roads, open storage piles, etc.) and combustion sources (stationary combustion sources, vehicle exhaust) will continue to be used to calculate PM10 and can also be used to calculate PM2.5. Total suspended PM (TSP) emissions typically contain specific fractions of PM10 and PM2.5 that can be measured. In general, PM from fugitive dust generating sources is primarily composed of PM10 with a relatively small fraction of the fugitive PM consisting of PM2.5. Alternatively, PM from combustion sources is primarily composed of PM2.5 with a small fraction consisting of PM10.

To calculate both PM10 and PM2.5, existing PM10 calculation methodologies for both fugitive dust PM10 and combustion PM10 can be used. To determine the PM2.5 fractions of the PM10 emission results, staff is recommending that the PM10 emissions be calculated using standard PM10 calculation methodologies. The PM10 emission results for each emission source or operation would then be multiplied by the applicable PM2.5 fraction, derived by emissions source, using PM profiles in the California Emission Inventory Data and Reporting System (CEIDARS) developed by the California Air Resources Board (CARB). The CEIDARS PM profiles are used to develop emission inventories for a variety of sources and operations in the Air Quality Management Plan (AQMP). The CEIDARS PM profiles have been streamlined to be used for most types of processes that would be encountered in a CEQA or NEPA document In addition, AQMD staff has identified the PM2.5 fraction of PM10. The streamlined CEIDARS PM profiles can be found in Appendix A. The CEIDARS PM profiles may be updated as necessary to reflect updates prepared by CARB.

If the project being evaluated is not listed among the categories in Appendix A, then the closest related type of operation/process should be used. For example in analyzing construction activities, e.g., grading, earth moving, etc., if the specific activity is not located in the tables the CEQA practitioner can use the following default factors derived from the 2003 AQMP annual inventories (see Tables 3 and 4 below under the "Localized Significance Thresholds for PM2.5 Emissions" discussion). For mechanical dust generating sources, e.g., construction, the PM2.5 fraction of PM10 is 21 percent and for combustion sources the PM2.5 fraction of PM10 is 99 percent. For off-road combustions

sources, the PM2.5 fraction default would be 89 percent (Table 5). Other publicly available and peer reviewed sources of PM10 and PM2.5 emission factors can also be used if they more closely match the type of emission source than the sources identified in Appendix A. In addition, site-specific or project-specific information can be used.

Once the PM10 fractions from all emissions sources are calculated, these are summed and compared to the appropriate PM10 significance thresholds to determine whether or not a project is significant. Similarly, once the PM2.5 fractions from all emissions sources have been calculated, these are also summed (separate from the PM10 fractions) and compared to the appropriate PM2.5 significance threshold (see following discussion) to determine project significance.

The PM2.5 fraction of PM10 can be easily calculated as follows.

Step 1: Calculate PM10 emissions for each emissions source category.

Step 2: Look up the PM2.5 fraction of PM10 for the applicable source category by year that construction will occur or operation of the project will begin (Appendix A, column 6 of the appropriate table).

Step 3: Multiply the PM2.5 fraction by the PM10 emissions for each source category (PM2.5 emissions = PM10 emissions x [PM2.5 fraction])

Step 4: Sum the PM2.5 emissions from each emissions source.

Step 5: Compare PM2.5 emissions to the appropriate significance threshold.

Example:

> A project is estimated to generate 8 pounds per day of PM10 from one piece of construction equipment. The PM2.5 emissions are as follows:
> PM2.5 emissions = 8 pounds of PM10 per day x 0.89 = 7.12 pounds of PM2.5 per day.

In conjunction with establishing a methodology for calculating PM2.5, staff has developed the following recommended PM2.5 significance thresholds for both localized and regional significance for both construction and operation.

Localized Significance Thresholds for PM 2.5 Emissions

Localized significance thresholds (LSTs) were developed in response to the SCAQMD Governing Board's environmental justice (EJ) initiatives (EJ initiative I-4) in recognition of the fact that criteria pollutants, carbon monoxide (CO), oxides of nitrogen (NOx), and PM10 in particular, can have local impacts as well as regional impacts. The LST proposal went through extensive public outreach and was adopted by the Governing Board in October 2003. At the time the LST was adopted by the Governing Board, staff had not yet developed proposed LSTs for PM2.5.

Determining localized air quality impacts requires dispersion modeling. Because local lead agencies may not have the expertise or resources to perform dispersion modeling, SCAQMD created a series of look-up tables for CO, NOx, and PM10 in which staff back-calculated the mass emissions necessary to equal or exceed the construction or operation LST. The look-up tables were created for projects one to five acres in size and take into consideration location (source receptor area) and distance to the sensitive receptor. To use the look-up tables, the lead agency calculates daily emission as it normally would and then compares the results to the emissions in the applicable look-up table.

In general, the LSTs will apply primarily to construction because emissions from construction equipment occur at a fixed location compared to operation, which, for most land use projects, consists of emissions from vehicles traveling over the roadways, which, therefore, do not create impacts to a single location. To further assist lead agencies with calculating construction emissions, the SCAQMD conducted construction site surveys for each phase of construction to develop standard construction scenarios relative to construction equipment and hours of operation. Spreadsheets were developed to calculate emissions for the construction scenarios in an effort to create scenarios that would not exceed any applicable LSTs. When preparing a CEQA analysis, lead agencies could use the sample construction projects for their construction analyses, use the spreadsheets to tailor the analysis to their individual projects, or use a combination of the two.

The following subsections describe the proposed PM2.5 LSTs for both operation and construction.

Establishing LSTs

To determine the effects of PM2.5 on local (nearby) receptors, such as residents, hospitals, schools, etc., a PM2.5 localized significance threshold (LST) needs to be established. Since the Basin exceeds one or more of the state or federal ambient air quality standards for PM2.5, the process used to determine significance for attainment pollutants, i.e., NO2 and CO, developed for the LST program cannot be used[c]. Under the LST program, since PM10 is a nonattainment pollutant, the LST methodology uses a different process for determining whether localized PM10 air quality impacts are significant. To determine localized PM10 air quality impacts during operation, the LST methodology uses as a significance threshold the allowable change in concentration threshold for PM10 listed in Rule 1303, Table A-2, which is 2.5 micrograms per cubic meter ($\mu g/m^3$). The allowable change in concentration threshold is a modeled concentration that cannot be exceeded at the sensitive receptor, and determines whether or not a permit applicant will receive a permit from the SCAQMD. For the LST program staff used a dispersion model (ISCST3) to convert the 2.5 $\mu g/m^3$ concentration into mass daily PM10 emissions numbers based on the size of the project, location of the project, and distance to the sensitive receptor. The

[c] Under the LST program, to determine significance for attainment pollutants, the emissions contribution from the project expressed as a concentration is added to the highest local ambient concentration from the last three years where data are available. If the sum is equal to or greater than any applicable state or federal ambient air quality standard, the project is considered to have significant localized air quality impacts for that pollutant. More information on the LST program can be found at the following URL: http://www.aqmd.gov/ceqa/handbook/LST/LST.html.

results were then incorporated into an LST look-up table. If the mass emissions from a project exceed the applicable LST look-up tables' mass emission numbers (which are based on the 2.5 $\mu g/m^3$ concentration), then localized PM10 air quality impacts are considered to be significant.

Operational Localized Significance Thresholds

To establish operational PM2.5 localized significance thresholds, staff first reviewed the PM inventories in Appendix III of the 2003 AQMP. In particular, staff evaluated the composition of PM10 and PM2.5 from combustion processes in the 2003 AQMP to establish a general ratio of PM2.5 to PM10. Combustion processes were evaluated because, for most land use projects, mobile source combustion emissions comprise the majority of emissions. Table 3 shows the total PM10 and PM2.5 inventories for total fuel combustion process for the years 2005 through 2010. As can be seen in Table 3, over the five-year timeframe considered, the fraction of combustion PM10 that consists of PM2.5 is consistently 99 percent. Since combustion PM10 and PM2.5 fractions are essentially equivalent, staff is recommending that the operational localized significance threshold for PM2.5 be the same as the current operational localized significance threshold for PM10, i.e., 2.5 $\mu g/m^3$.

TABLE 3

Total Stationary Source Fuel Combustion Inventory (Tons/Day)

Year	PM 10	PM 2.5	Percent of PM 10 which is PM 2.5
2005	8.13	8.01	99
2006	8.21	8.10	99
2007	8.30	8.18	99
2008	8.38	8.26	99
2010	8.54	8.42	99

Source: Appendix III, 2003 AQMP, Annual Average Emission Inventory

Construction Localized Significance Thresholds

Similarly, to develop a PM2.5 construction significance threshold for localized impacts, staff considered the PM2.5 contribution from fugitive sources and the PM2.5 contribution from combustion sources (construction equipment). As discussed in more detail in the following paragraphs, combustion emissions from the construction equipment contribute a larger portion of the total PM2.5 emissions from construction operations than fugitive sources.

Staff then reviewed the 2003 AQMP, Appendix III fugitive PM inventory for construction and demolition to obtain the PM10 and PM2.5 compositions. Table 4 shows the total PM10 and PM2.5 inventories for construction activities for the years 2005 through 2010. As can be seen in Table 4, over the five-year timeframe, the fraction of PM10 that consists of PM2.5 is consistently 21 percent. Multiplying the fugitive PM2.5 percent fraction of

PM10 by the existing construction PM10 LST, 10.4 $\mu g/m^3$, produces a result of approximately 2.2 $\mu g/m^3$.

TABLE 4

Total Fugitive PM Inventory (Tons/Day)

Year	PM 10	PM 2.5	Percent of PM 10 which is PM 2.5
2005	42.7	8.91	21
2006	43.66	9.11	21
2007	44.6	9.3	21
2008	45.54	9.5	21
2010	47.44	9.9	21

Source: Appendix III, 2003 AQMP, Annual Average Emission Inventory

Off-road construction equipment, however, also contributes combustion PM as well as fugitive PM. To determine the contribution of PM2.5 from construction equipment combustion emissions, staff performed dispersion modeling using the ISCST3 dispersion model for one-, two-, and five-acre construction scenarios. The construction scenarios were developed from construction site surveys conducted in connection with staff's original LST proposal. Combustion sources were modeled as adjacent five-meter volume sources and fugitive sources were modeled as adjacent one-meter area sources. Worst-case meteorological data from the West Los Angeles source receptor area were used and receptors were placed at 25, 50, 100, 200, and 500 meter distances from the construction site. Using CARB speciation data, it was assumed that 21 percent of fugitive dust PM10 is comprised of PM2.5 and 89 percent of off-road equipment combustion PM10 emissions are comprised of PM2.5 (based 2003 AQMP inventories, see Table 5).

TABLE 5

Combustion PM Inventory from Off-Road Equipment (Tons/Day)

Year	PM 10	PM 2.5	Percent of PM 10 which is PM 2.5
2005	11.95	10.64	89
2006	11.61	10.33	89
2007	11.2	9.97	89
2008	10.93	9.71	89
2010	10.26	9.09	89

Source: Appendix III, 2003 AQMP, Annual Average Emission Inventory

The modeling results showed that combustion PM2.5 from off-road equipment comprise approximately 75 to 100 percent of the total PM2.5 emissions from construction activities. Further, the PM2.5 contribution from fugitive sources is dependant on the construction phase. For example, the modeling showed that the demolition and site preparation phases have the highest fugitive PM2.5 contribution to the overall results, whereas, the building and asphalt paving phases contribute the most combustion PM2.5 to the overall results.

The modeling results indicate that the contribution of off-road combustion PM2.5 emissions can be three to four times higher than the contribution of PM2.5 from fugitive sources. Based on this result, staff recommends that the PM2.5 fugitive dust component be adjusted upward by approximately four times to account for the PM2.5 emissions from the construction equipment. As a result, staff is recommending a PM2.5 construction LST of 10.4 $\mu g/m^3$, the same as the construction LST for PM10. Finally, an exceedance of either the PM10 construction LST or the PM2.5 construction LST is a significant adverse localized air quality impact.

Regional Emission Threshold of Significance for PM 2.5

Emissions that exceed the regional significance thresholds are mass daily emissions that may have significant adverse regional effects and are the air quality significance thresholds with which most CEQA practitioners are familiar.

Table 6
Regional Air Quality Significance Thresholds

Mass Daily Thresholds[a]		
Pollutant	**Construction**[b]	Operation[c]
NOx	100 lbs/day	55 lbs/day
VOC	75 lbs/day	55 lbs/day
PM10	150 lbs/day	150 lbs/day
SOx	150 lbs/day	150 lbs/day
CO	550 lbs/day	550 lbs/day
Lead	3 lbs/day	3 lbs/day

The following subsection describes the proposed PM2.5 regional significance thresholds for both operation and construction.

Establishing Regional Significance Thresholds

PM emissions also affect air quality on a regional basis. When fugitive dust enters the atmosphere, the larger particles of dust typically fall quickly to the ground, but smaller particles less than 10 microns in diameter may remain suspended for longer periods, giving the particles time to travel across a regional area and affecting receptors at some distance from the original emissions source. Fine PM2.5 particles have even longer atmospheric residency times. Staff is recommending a PM2.5 regional significance threshold based on a recent EPA proposal, as explained in the following paragraphs.

On September 8, 2005, EPA published in the Federal Register "Proposed Rule to Implement the Fine Particle National Ambient Air Quality Standards," which proposed a significant emission rate for PM2.5 of 10 tons per year. Staff is proposing to use EPA's

significant emission rate for PM2.5 to develop the daily mass emission regional significance threshold for PM2.5. Converting the annual rate, 10 tons, into a daily rate produces a daily rate of approximately 55 pounds per day. A similar approach was used to derive the operational regional significance thresholds for NO2 and VOC. NO2 and VOC operational regional significance thresholds were derived by using the NOx/VOC emission rate that defined a major source in the South Coast Air Basin, 10 tons per year. Converting the annual emissions rate into a daily rate resulted in a regional operational significance threshold of 55 pounds per day for each pollutant. Similar to the regional significance threshold for PM10 of 150 pounds per day, the proposed PM2.5 regional significance threshold of 55 pounds per day would apply to both construction and operation.

Conclusion

In this document staff identified a methodology to indirectly calculate PM2.5 emissions for a CEQA or NEPA air quality analysis, to be used until such time as PM2.5 emission factors are available, which will allow the CEQA practitioner to calculate PM2.5 emissions directly. In addition, PM2.5 construction and operation LSTs have been identified to address localized impacts. The PM2.5 LSTs will be used to develop look-up tables for projects five acres in size or smaller, similar to those prepared for PM10, nitrogen dioxide (NO2), and carbon monoxide (CO). As with the other pollutants, the PM2.5 look-up tables can be used as a screening procedure to determine whether or not small projects (less than or equal to five acres) will generate significant adverse localized air quality impacts. Screening procedures are by design conservative, that is, the predicted impacts tend to overestimate the actual impacts. If the predicted impacts are acceptable using the LST look-up tables, then a more detailed evaluation is not necessary. However, if the predicted impacts are significant, then the project proponent may wish to perform a more detailed emission and/or modeling analysis before concluding that the impacts are significant. Project proponents are not required to use this LST procedure; and may complete site specific modeling instead. Site-specific modeling is required for projects larger than five acres.

Hesterly, Kinika

From: Kim Foy [kim.jslaw@gmail.com]
Sent: Friday, March 25, 2011 11:17 AM
To: Hesterly, Kinika
Subject: Comments on Tentative Parcel Map No. 30298
Attachments: effect of noise on wildlife.pdf; NPC Library_ Noise and Its Effects.pdf

Please find attachments 4-5.

Thanks again.
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-

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Synthesis of Noise Effects on Wildlife Populations

Publication No. FHWA-HEP-06-016 **September 2004**

U.S. Department of Transportation
Federal Highway Administration

Synthesis of Noise Effects on Wildlife Populations

Foreword

This report contains a summary of ongoing work on the effects of noise on wildlife populations to date. Because the numbers and/or diversity of species have been used as indicators of the effects of noise, a number of studies that have indicated one or both of these factors for species alongside roads are included, although noise is not specifically mentioned in some of these reports. There is a paucity of information on the response of invertebrates to noise, particularly the levels likely to be encountered along roads. Significant populations of some species are found along rights-of-way, although others such as aquatic forms may be adversely affected; whether by the road itself or by noise is unclear. Existing information (although incomplete) would suggest that fish are unlikely to be adversely affected by noise levels from road. Reptiles and amphibians show some barrier effect due to roads, but there is no clear evidence of a noise effect alone. Recent work has suggested that behavior in burrowing toads may be affected by noise and this will require further study. Birds have received the most study and, in some cases, are strongly adversely affected both in numbers and in breeding by the proximity to roads. In other cases the effect is the opposite and there are reports of many species using roadside habitat in some areas. Large mammals may be repelled by noise, although in most cases the effect appears to be slight to moderate. Small mammals do not appear to be adversely affected by road noise occurring in significant numbers in rights-of-way. There appears to be a physical barrier effect of roads. This report also includes recommendations for future work based on the state of knowledge on the subject.

This report will be of most interest to those responsible for environmental impact assessments, road ecologists and those concerned with incorporating environmental concerns into highway planning.

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SYNTHESIS OF NOISE EFFECTS ON WILDLIFE POPULATIONS

PREFACE

This report contains a summary of ongoing work on the effects of noise on wildlife populations to date. It will hopefully provide some indication of the current state of knowledge in the area – particularly with respect to studies of birds that have spurred increased discussion of the subject. No effort was made to evaluate the methodologies applied to any individual study although a large number have appeared in peer-reviewed journals and thus have already been scrutinized. Because the numbers and/or diversity of species have been used as indicators of the effects of noise, a number of studies that have indicated one or both of these factors for species alongside roads are included although noise is not specifically mentioned in some of these. Studies that directly measure the number of individuals or breeding along roadsides provide the most direct indication of the response of populations to road noise. This is supported by those studies in which noise has been used as the best predictor of the negative response of species to roads in recent studies (see Reijnen and colleagues [41, 96-100]; Forman et al.[45]).

SI* (MODERN METRIC) CONVERSION FACTORS

SYMBOL	WHEN YOU KNOW	MULTIPLY BY	TO FIND	SYMBOL
		LENGTH		
in	inches	25.4	millimeters	mm
ft	feet	0.305	meters	m
yd	yards	0.914	meters	m
mi	miles	1.61	kilometers	km
		AREA		
in²	square inches	645.2	square millimeters	mm²
ft²	square feet	0.093	square meters	m²
yd²	square yard	0.836	square meters	m²
ac	acres	0.405	hectares	ha
mi²	square miles	2.59	square kilometers	km²
		VOLUME		
fl oz	fluid ounces	29.57	milliliters	mL
gal	gallons	3.785	liters	L
ft³	cubic feet	0.028	cubic meters	m³
yd³	cubic yards	0.765	cubic meters	m³
	NOTE: volumes greater than 1000 L shall be shown in m^3			
		MASS		
oz	ounces	28.35	grams	g
lb	pounds	0.454	kilograms	kg
T	short tons (2000 lb)	0.907	megagrams (or "metric ton")	Mg (or "t")
		TEMPERATURE (exact degrees)		
°F	Fahrenheit	5 (F-32)/9 or (F-32)/1.8	Celsius	°C
		ILLUMINATION		
fc	foot-candles	10.76	lux	lx
fl	foot-Lamberts	3.426	candela/m²	cd/m²
		FORCE and PRESSURE or STRESS		
lbf	poundforce	4.45	newtons	N
lbf/in²	poundforce per square inch	6.89	kilopascals	kPa

SYMBOL	WHEN YOU KNOW	MULTIPLY BY	TO FIND	SYMBOL
		LENGTH		
mm	millimeters	0.039	inches	in
m	meters	3.28	feet	ft
m	meters	1.09	yards	yd
km	kilometers	0.621	miles	mi
		AREA		
mm²	square millimeters	0.0016	square inches	in²
m²	square meters	10.764	square feet	ft²
m²	square meters	1.195	square yards	yd²
ha	hectares	2.47	acres	ac
km²	square kilometers	0.386	square miles	mi²
		VOLUME		
mL	milliliters	0.034	fluid ounces	fl oz
L	liters	0.264	gallons	gal
m³	cubic meters	35.314	cubic feet	ft³
m³	cubic meters	1.307	cubic yards	yd³
		MASS		
g	grams	0.035	ounces	oz
kg	kilograms	2.202	pounds	lb
Mg (or "t")	megagrams (or "metric ton")	1.103	short tons (2000 lb)	T
		TEMPERATURE (exact degrees)		
°C	Celsius	1.8C+32	Fahrenheit	°F
		ILLUMINATION		
lx	lux	0.0929	foot-candles	fc
cd/m²	candela/m²	0.2919	foot-Lamberts	fl
		FORCE and PRESSURE or STRESS		
N	newtons	0.225	poundforce	lbf
kPa	kilopascals	0.145	poundforce per square inch	lbf/in²

*SI is the symbol for the International System of Units. Appropriate rounding should be made to comply with Section 4 of ASTM E380.
(Revised March 2003)

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LIST OF ABBREVIATIONS AND SYMBOLS

SPL = sound production level
dB = decibel = unit of sound production level (logarithmic scale)
dB(A) = decibel on A-weighted scale (levels weighted according to sound frequency)

L_{eq} = equivalent continuous sound level
SEL = sound equivalent level integrated per 1 second

Hz = hertz = cycles per second (measure of sound frequency)
kHz = kilohertz (thousand hertz)

ROW = rights-of-way

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16. Abstract

This report contains a summary of ongoing work on the effects of noise on wildlife populations. There is a paucity of information on the response of invertebrates to noise, particularly the levels likely to be encountered along roads. Significant populations of some species are found along rights-of-way, although others such as aquatic forms may be adversely affected whether by the road itself or by noise is unclear. Existing information (although incomplete) would suggest that fish are unlikely to be adversely affected by noise levels from road. Reptiles and amphibians show some barrier effect due to roads, but there is no clear evidence of a noise effect alone. Recent work has suggested that behavior in burrowing toads may be affected by noise and this will require further study. Birds have received the most study and in some cases are negatively affected both in numbers and in breeding by the proximity to roads. In other cases the effect is the opposite and there are reports of many species using roadside habitat in some areas. Large mammals may be repelled by noise, although in most cases the effect appears to be slight to moderate. Small mammals do not appear to be adversely affected by road noise occurring in significant numbers in rights-of-way. There appears to be a physical barrier effect of roads for many mammals. Recommendations for future study are included.

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Noise, noise pollution, wildlife, roads , animal, fish, reptile, amphibian, bird, mammal, urban noise	No restrictions. This document is available to the public through the National Technical Information Service, Springfield, VA 22161.

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SYNTHESIS OF NOISE EFFECTS ON WILDLIFE POPULATIONS

INTRODUCTION

A recent estimate puts the area currently converted to highways, streets and rights of way (ROW) at some 20 million acres (8 million hectares).[34] As the total road area continues to increase contact with wildlife populations will likewise increase. Further, the cumulative effect of roads may reach some 20% of the total land area of the United States.[42] A number of factors have been suggested as contributing to this far-ranging impact including habitat fragmentation, landscape effects (such as water flow), air pollution, and increased mortality (See references 43,46, 69, and 115). However, recent studies have suggested that noise may have a significant and wide-ranging effect at least on some species (See references 41, 44, 97, 99, and116). Because of the pervasive nature and difficulty in mitigating noise, it may be the most significant factor impacting wildlife.[46] In this report some of the current research on the subject of noise and wildlife is reviewed, areas of incomplete knowledge are identified, and suggestions for future study are made.

MATERIALS AND METHODS

Beginning in the fall of 2003 an exhaustive search has been made of electronic and paper databases including (Infotrac, Cambridge Science, Agricola, Biological Sciences and the Biological and Agricultural Index) under the headings of wildlife, highways, noise, animal, noise pollution, roads, urban noise and the various groups of animals (fish, reptile, amphibian, bird, mammal). A search of all references was made and the bibliographies of all materials were reviewed for additional sources.

RESULTS AND DISCUSSION

Physics of Sound

Sound pressure level (SPL) is responded to in a logarithmic manner and sound levels are measured on a logarithmic decibel scale (dB), which corresponds fairly well to the human hearing response. The zero end of the scale corresponds to a pressure of about 0.00002 N/m^2 and a value of 120 dB corresponds to about 20 N/m^2 – a level at which pain will be experienced.

$$dB = 10 \text{ Log } \frac{I}{I_o}$$

where I = intensity of actual sound, I_o = intensity of sound at threshold level [89]

Human hearing extends from frequencies (perceived as pitch) from about 20 Hz (cycles per second) to about 20,000 Hz (20 kHz).[89] SPL levels are often weighted. One commonly used is the A-weighting network that assigns weights to sounds based on audibility to human hearing (low weights to low frequency sounds < 1000 Hz and higher weights to more audible high-frequency sounds). This is denoted as dB(A) in some studies. Other ways of representing levels of sound include L_{eq} = equivalent continuous sound level and SEL = sound exposure level integrated over 1 second.[16] In general sound attenuates as the square of the distance from the source and is greater at higher frequencies.

The sensitivities of various groups of wildlife can be summarized as:

Mammals < 10 Hz to 150 kHz ; sensitivity to -20 dB

Birds (more uniform than mammals) 100 Hz to 8-10 kHz; sensitivity at 0-10 dB

Reptiles (poorer than birds) 50 Hz to 2 kHz; sensitivity at 40-50 dB

Amphibians 100 Hz to 2 kHz; sensitivity from 10-60 dB

Overview

Animals rely on meaningful sounds for communication, navigation, avoiding danger and finding food against a background of noise. Here noise is defined as "any human sound that alters the behavior of animals or interferes with their functioning".[16] The level of disturbance may be qualified as damage (harming health, reproduction, survivorship, habitat use, distribution, abundance or genetic distribution) or disturbance (causing a detectable change in behavior).

An earlier review of this subject [84] contains some considerable information on the effects of acute noise on hearing loss in vertebrates (especially mammals), but concludes that, at the time, little or no knowledge of noise from roads and their effect on animals was known. A review of the effect of noise (principally from aircraft) concluded that there was no evidence of noise having a significant impact on cattle (milk production), swine, poultry (egg hatching) or mink (kits produced).[14] However, the effect on wildlife may be more significant than on domestic species. Greater behavioral and physiological responses to noise have been reviewed and studied with special emphasis on the greater noise of aircraft and sonic booms.[28,31,81] In a review of the effect of aircraft noise the authors identify a number of at least potentially, deleterious effects that accompany these sound levels in both domestic and wild species ranging from alert reactions to physiological indicators of stress (e.g. changes in hormonal levels, organ function, etc.).[81] It should be noted that noise levels in these studies are generally intermittent and occur at levels greater than that typically encountered for road traffic (i.e. aircraft sounds generally $\geq$ 100 dB). There is no significant review of materials already summarized in earlier works on the effect of aircraft noise or sonic booms except for more recent studies or when no other information on a particular group was available. Much information is available through earlier reviews on this subject.[81, 84]

The foremost difficulty in summarizing the effect of road noise on wildlife is the fact that very few studies have directly addressed the impact of noise from roads (i.e. the background sound that accompanies varying volumes of traffic). Studies of the noise from sonic booms or other sounds from aircraft utilize sounds that are louder and more

acute. Still other studies have looked the overall effect of roads noting numbers near roadsides, while failing to note the level of noise on the dispersal of animals at greater distances from the roadside (See references 75, 90, 125, and 126). Thus, the presence of significant numbers indicated by these studies can be used to indicate that there is no absolute barrier to use of roadside areas, however, these studies do not indicate how these areas compare to others further distant from the source of the noise.

Invertebrates

Little is known about the effects of noise related to roads and its effect on invertebrates. A few studies have indicated that several species are sensitive especially to low frequency vibration. Honeybees will stop moving for up to twenty minutes for sounds between 300 and 1 kHz at intensities between 107-120 dB.[51] Frings and Frings[49] reported that flies of the order *Diptera* showed a startle response at 80-800 Hz (at 80 dB) and at 120-250 Hz (from 3-18 dB above ambient levels). However, the longer term responses to these sounds are not given.

Earthworms have been shown to move toward the surface near roadways at low frequencies (~ 5 Hz) exposing them as a food source for birds.[113] Generally, roadsides have been found to provide habitat for significant numbers of invertebrates including 67 species of insects in the United Kingdom.[48] The authors reported no major distraction was evident in insect behavior related to nearby traffic. However, the significant numbers may have been due to limited forage available elsewhere. Similarly, road verges have been shown to provide significant habitat for butterfly and burnet populations with the roadway having no significant effect on movement and insignificant mortality.[88] Even on main roads (about 1,700-11,500 cars/day) there was an average of 9 species in a 100m transect and a maximum of 23 species of butterfly (40% of British species) found in one transect. A further review of roadside use in England (including county roads and larger highways found 25 of 60 butterfly species and 8 of 17 bumble bee species to breed alongside roads.[126] The utility of these areas compared to others which would help to indicate any effect of noise is not discussed specifically, but the

thesis of the article is that these rights-of–way (ROW) can provide valuable habitat should be noted.

In a study of invertebrate communities (mainly insects (arthropods) although other orders were also looked at) along a gravel road, greater numbers of individuals were found at 5 m from the road edge than at 10 or 15 m.[77] In this study the diversity of species did not differ (at the order level) up to distances of 15 m from the edge of the road. However, whether there would be an effect over greater distances or at higher traffic volumes is not known. A study of the effect of roads on aquatic macroinvertebrates (e.g. aquatic insects) showed a decline in diversity as the number of adjacent roadways increased using an index of the effective roaded area (ERA a method developed by the USDA Forest Service).[83] An ERA level above 5% was found to be significant.[83] The specific cause of this change related to roads was not given.

Mader [79] found a barrier effect of roads on carabid beetles to which he attributed a broad band of emissions as contributing including noise, exhaust and salinity. However, no attempt was made to quantify or partition these effects. Similarly, it has been reported that the orange tip butterfly (*Anthocharis cardamines* L.) was effectively barred from crossing a large roadway (~ 40,000 vehicles/day), however whether noise was a contributing factor is not indicated.

The direct effect of traffic noise on invertebrates has yet to be established by looking at community structure near roads and at varying distances and with different volumes of traffic or by simulating noise levels in controlled conditions. Knowledge of invertebrate communities may be particularly important given the importance of these organisms (e.g. as a food source for other species such as fish, amphibians, and birds).

Fish

Fish are capable of reception of sound in the water (see review by Hawkins [61]). The sensitivity of fish varies, but is generally in the range of 50-2,000 Hz and is best between 200-800 Hz.[60] The SPL underwater is usually indicated in reference to a unit (e.g. re 1 Pa = Pascal = 1 N/m^2) and many fish have threshold of 50-70 dB re 1 µPa.[60, 94] Several species have been reported to be adversely affected by sounds levels > 180 dB re 1 µPa presented for two hours or less. Hawkins[61] reports that sound perception of fish are generally below 2- 3 kHz and that they are more sensitive to low frequency sounds. In the ocean conversion of sound is usually made in reference (re 0.0002 dynes/cm^2 and 1 Hz; where 1 Pa = 1 N/m^2 = 10 µbars = 10 dynes/cm^2). [127] Background oceanic traffic was found in the range of 10-1 kHz.

A few studies have found a response by fish to noise. Naïve goldfish have altered their pattern of locomotion avoiding sounds at 30 cm distance (~2 kHz) and an intensity of 2 dynes/cm^2 (0.2 Pa).[80] Changes in pressure (2-18 Pa at a frequency of 70-200 Hz) have caused startle response in herring (*Clupea herengus* L.).[13] Banner and Hyatt[8] reported greater growth rate and fry survival of two minnow species (*Cyprinodon variegates* and *Fundulus similes*) held in quieter tanks. However, the level of noise required to have this effect on growth was greater than that normally encountered with traffic. Juvenile Atlantic salmon have shown an avoidance of low frequency sound (10 Hz), but failed to show a response at a higher frequency of 150 Hz.[70]

Simulated sonic booms have caused startle reactions in guppies.[103] Trout and salmon eggs and fry exposed to sonic booms showed no increase in mortality and there was no apparent difference in the development of fry.[103] The importance of road noise in affecting the behavior of fish populations, particularly the relationship between road traffic levels and any response is not known.

Reptiles and Amphibians

A few studies of the response of reptiles and amphibians to noise have been conducted, and, as with fish, no study investigating the impact of roads on these species has been made.

Minton [87] reported on several species in a suburban area (2 salamanders, 6 anurans, 6 turtles and 7 snakes), but did not indicate any effect of noise. However, a barrier effect of roads (city streets) to both breeding and hibernating habitats was significant. It is known that the auditory sensitivity of lizards changes with temperature and is generally greatest in those ranges they prefer for activity.[24]

A broader survey of amphibians found salamanders (woodland and stream species) to be most commonly found along roadsides (interstates) and ROW in both the southeast and northwest.[2] There is no indication of noise as a factor, however a barrier to movement by roads is indicated. Findlay and Houlihan[40] reported that reptiles and amphibians showed a reduced species richness up to 2000 m from the both two and four-lane highways with an improved diversity in areas of forest cover. The authors attribute this response to a lack of dispersal across roads and not to sound levels. A study of frogs and toads by Fahrig et al.[35], also found a decrease in numbers near roads with traffic densities of 8,500 – 13,000 vehicles/day. In this case traffic mortality is suggested as the cause. In contrast, cane toads were found to use roads with lower traffic densities as (including vehicle tracks) for dispersal.[106] In this case numbers were lower even 15 m from the edge of the road. However, whether this effect would occur at higher traffic densities is not indicated. Similarly, Rudolph et al. [104] report a reduction of up to 50% in large snake species up to a distance of 850 m from a road with the reduction attributed to increased road mortality. Indeed the effect was similar whether interstate, forest or county roads were studied indicating that the precipitating effect is not likely noise.

The study that has most specifically shown an adverse effect on amphibians related to road noise is that of Brattstrom and Bondello [18] who found spadefoot toads (*Scaphiopus couchi*) undergoing estivation to respond to motorcycle sounds (up to 95 dB(A) at 0.4-4.4

kHz) by leaving burrows, which could have a detrimental effect if it occurred at the wrong time of year. Further, "dune buggy" noise had an adverse effect on hearing in the fringe-toed lizard (*Uma scoparia*) at durations of 500 seconds or longer (95 db(A)). Whether traffic noise has a significant effect on a particular population or community of reptiles or amphibians remains to be determined. The fact that species can be disturbed by road noise makes this an area in need of further study.

Birds

In their environment birds must be able to discriminate their own and the song's and those of other species apart from any background noise.[32] Calls are important in the isolation of species, pair bond formation, pre-copulatory display, territorial defense, danger, advertisement of food sources and flock cohesion.[68] The threshold for hearing in birds is higher than for humans at all frequencies and the overlap in the discernable frequencies between species indicates that birds do not filter out other species by simply being unable to detect them (i.e. birds can hear songs of other species). Studies of budgerigars indicate that at the best frequency (2.86 kHz) sound production needs to exceed background by 18-20 dB for detection.[32] Sound production from several bird species have been measured to peaks of about 90-95 dB and are generally greater for larger birds.[17] The rate of attenuation of the sound will be affected by the surroundings, but estimates range from 5 dB/m for a bird 10 m above ground in an open field to 20 dB/m for a bird on the ground in a coniferous forest.[82] In this study height and frequency were found to affect sound transmission more than habitat type. Sounds produced at between 15cm and 1m above ground attenuated more rapidly than at greater heights. In a study of the blackbird (*Turdus merula*) high pitched sounds were found to degrade more rapidly.[30] Further, sounds were heard better on a high perch probably due to the better position rather than better projection.

The distance separating signaler and receiver at which a vocalization may be detected increases according to source intensity, amount of masking and the rate of attenuation.[32] As an example (for budgerigars) with an attenuation of 5 dB/m and a background noise

level of 45 dB SPL with about 25 dB of masking the transmission distance would be about 100 m for a level of 70 dB and would increase to about 300 m at 90 dB. A subsequent study of several species including a number of passerines (European starling, song sparrow, swamp sparrow and zebra finch) found maximum sensitivity to sounds between 2 and 5 kHz.[91] Noise in the spectral region of the signal is the most effective in masking and signals must be 18-20 dB greater at the best frequencies to be detected.[32] A study of the auditory threshold in several species including European starling, song sparrow, swamp sparrow and zebra finch found the critical ratio (the signal to noise ratio at masked threshold) is about 3 dB/octave.[91]

Early studies of the effect of noise on birds indicated no significant impairment by noise. Thus, Stadelman[111] reported that broiler chickens could be grown without loss of weight at sound levels of 110 dB (20 Hz to 10 kHz). Hens showed no effect of laying in response to conveyor noise (66-76 dB) (Scott and Moran, 1993). Frings and Jumber [50] reported that starlings could be repelled with specific distress calls at about 85 dB from a distance of 10 m. Likewise, starlings were found to be sensitive to repellent tones at 1000-7500 Hz that caused a disturbance to feeding and the level of response increased linearly in a range of 50-100 dB.[74]

Grassland and woodland birds

One of the earliest studies to find a "highway effect" on bird populations was that of Räty[95] who measured numbers of birds in forested areas at distances up to 1 km from the road. Species studied included the capercallie (*Tetrao urogullus*), black grouse (*Lyrurus tetrix*) and hazel hen (*Lagopus lagopus*). There was a 2/3 reduction in numbers up to a distance of 250 m and some reduction up to 500 m. The traffic density was 700-3000 cars/day. Unfortunately, noise levels were not measured and the cause of the effect seen was not given. Further, measurements began 25 m from the edge of the road thus precluding any effect of the ROW.

More recently, study of the effect of road noise on bird populations appears to have resumed with reevaluation of data from an early study from the Netherlands on grassland habitats (Veen, [119] c.f. van der Zande et al., [116]) that concluded some species would avoid rural roads to a distance of 500-600 m and busy highways to 1600-1800 m. The data were subsequently reviewed and it was concluded that road noise appeared to be significant in the distribution (i.e. reduced nest density) of the lapwing (*Vanellus vanellus*), black-tailed godwit (*Limosa limosa*) and, perhaps the redshank (*Haematopus ostralegus*), however the effect was not found for the oystercatcher (*Tringa tetanus*).[116] The levels of noise were not measured in this study. A further series of studies from the Netherlands has supported this argument finding that numbers of breeding birds in wooded areas declined significantly near roads and in proportion to the density of traffic on the road. Reijnen et al.[96] reported a reduction in the numbers of breeding birds adjacent to a busy highway (30,000-40,000 vehicles/day) and at a distance of 300 m. The level of noise was not measured. Reijnen and Foppen[97] studied the willow warbler (*Phylloscopus trachilus*) and found that the density of territorial males was lower distances of up to 200m than at greater distances (up to 400 m). Also, older males were more abundant further from the road. It is suggested that noise may have an important effect (predicted to have a mean of 50 dB(A) at 500 m) along the highway (traffic density 50,000 cars/day). The dispersal of the breeding males away from the road was broken down subsequently to be progressively increasing in zones of 0-200 m, 200-400 m and a >400m control zone. Reijnen and Foppen[98] found 17 of 23 species studied for three years showed some negative effect of road (40-52,000 cars/day). The effect was diminished in years in which the overall population size was large and they suggest measuring effects of several years to ensure an accurate measure of the effect. Similar reductions in grasslands were reported in a subsequent study of 12 passerine species where the density of 7 were found to be reduced and predicted by the number of cars and distance from the road.[100] The effect appears to be most significant above a noise level of about 50 dB(A) with a level of 70 dB(A) on the verge of the road. At a traffic density of 5,000 cars/day most species showed a reduction of 12-56% within 100 m of the road. At distances of > 100m only the black-tailed godwit (*Limosa limosa*) and oystercatcher (*Haematopus ostralegus*) showed reduction in density. At a traffic density of 50,000

cars/day density was reduced between 12 and 52% for all species studied at distances of up to 500 m. Sensitive species include both waterfowl (shoveler ducks) and passerine species (black-tailed godwit, oystercatcher, lapwing, skylark) that were reduced in density between 14 and 44% up to a distance of 1500 m making it difficult to determine any particular group that might be more sensitive.

A more extensive study of 43 species of woodland birds in both deciduous and coniferous forests found that 26 (60%) showed some reduction in density adjacent to the road.[99] Noise was the only factor found to be a significant predictor and the number of cars and distance from the road were significant factors in the number of breeding birds. The "effect distances" were 40-1500 m (10,000 cars/day) and 70-2800m (60,000 cars/day). There was a reduction in density at 250 m from the road of between 20 and 98%. The frequency range of road noise was 100 Hz to 10 kHz with the loudest in the range of 100-200 Hz and 0.5-4 kHz with a threshold at between 20 and 56 dB(A). The authors note that if noise were constant there was no difference between plots with high and low car visibility. Further it is noted that there is no pattern of interference with song calls and, thus, the immediate cause of the effect is not apparent. It is suggested that a supplementary aspect may be stress.

A study along an interstate highway (34,000 – 50,000 vehicles/day) in the United States supported the findings previously reported[41, 96-100], however, the results rely heavily on assumptions from the work in the Netherlands being applicable and there is limited original data that would more conclusively support the earlier findings.[44] A >100 m avoidance zone is reported for moose, deer, amphibians, forest and grassland birds. Moose corridors and grassland bird avoidance extended >100 m. However, grassland bird data are scarce and scattered in the open areas near the highway and woodland bird data is extrapolated from the earlier studies by Reijnen and colleagues [41, 96-100]. More recently, Forman et al.[45] reported that several species of grassland bird (especially the bobolink and eastern meadowlark) decreased in numbers and breeding in patches as the amount of traffic on roadways increased. At light traffic volumes of between 3,000 and 8,000 vehicles there was no effect on distribution, whereas moderate traffic levels of

between 8,000 and 15,000 vehicles/day had no effect on the presence of birds, however, breeding was reduced to 400 m. Both presence and breeding of birds was reduced at traffic levels between 15,000 – 30,000 vehicles/day to a distance of 700 m and at >30,000 vehicles/day both presence and breeding were reduced up to a distance of 1200 m. The species affected are mainly the bobolink and eastern meadowlark. The levels of noise in this study are not given although studies that manipulate noise levels are suggested.

In a nocturnal species (the stone curlew, *Burhinus oedicnemus*) in England, roads were found to reduce numbers at distances of up to 3 km .[56] The authors suggest that visual stimuli (headlights) could have a greater effect than noise alone even though traffic noise or vehicle movements are suggested as primary causes.[56] It should be noted that, in this study there was no evidence of a lessening of the effect if nearby suitable habitat (away from the road) was scarce or abundant.

The general conclusion is that some (although not all) bird species are sensitive at least during breeding to noise levels and that the distances over which this effect is seen can be considerable varying from a few meters to more than 3 km (see Appendix A - Table 1 for a summary)

In contrast to these findings, other studies have found that roadside verges to provide habitat for, at least, some birds. In a study following highway construction, Michael et al.[86] found increased food and cover offered by ROW resulted in increases in the number of birds and the number of species in the ecotone when compared to the ROW and surrounding forest at distances of up to 1 mile. It was suggested that the ROW provided additional food sources such as insects and rodents and that species requiring forest habitat would be expected to be reduced. Species that are suggested to increase (at least potentially) in numbers through the use of the ecotone as the vegetation improved would be starlings, indigo buntings, red-winged blackbird and goldfinches. ROW plantings (mainly along interstate roadways) were found to provide habitat for a number of species (red-winged blackbird, American goldfinch, song sparrow) compared to unplanted control areas.[101] In a study of the skylark (*Alauda arvensis*) conducted in

Denmark birds were found to forage more along roadsides than in adjacent fields and these areas were preferred over adjacent fields.[75] The volume of traffic is not given, although the verges varied in width from 1.3 to 4.5 m and occurred outside of major urban areas. Similar results were also found for the house sparrow (*Passer domesticus*) and the tree sparrow (*Passer montanus*). Warner[125] measured a number of grassland bird species on rural interstate and secondary roads. He reported that the density of nests to be greater on heavily trafficked interstates than on secondary roads and that both the number of nests and species increased with the width of the roadside. The majority of nests (92%) were red-winged blackbird. Further, the amount of traffic on secondary roads did not influence the density of nests. While the noise levels are not mentioned, the fact that numbers were greater on busier roads indicates that there was no obvious negative effect of associated noise. Finally, it is pointed out that in areas of row-crop farming road rights of way may be critical in providing habitat for grassland bird nesting.

Clark and Karr[26] reported that numbers of one species (red-winged blackbird, *Agelaius phoeniceus*) increased near highways especially in the later census (May/June) while another (horned lark, *Eremophila alpestris*) numbers decreased at distances of up to 500 m from the edge of the road. In these works there is no indication if the numbers of individuals or species diversity is greater when compared to still more distant areas however the indications are that, at least in some situations roadways can provide habitat for nesting along the ROW. The avoidance of the road by the horned lark is attributed to its preference for larger areas of open ground. In a more comprehensive review of the effects of highways that extended (in transects) up to 400 m from the edge of the road (both interstate and county roads) nine birds species were found to become less common near roadways, while another nine species became more common near roads and the majority of bird species showed no effect.[2] This study encompassed a number of habitat types (southeast, Midwest, Orgeon and northern California). For example, the numbers of wintering cardinals and white-throated sparrows (in the southeast) became more numerous adjacent (<80 m) from the interstate whereas blue jays became more numerous at greater distances (>80 m) from the interstate[2] (see also Appendix A - Table 1). One suggestion (although not tested) is that both the white-throated sparrow and cardinal were

using seed and fruit available between the right-of-way (ROW) and adjacent habitat. Another study of impact of highways (although not addressing noise specifically) measured forest breeding birds in transects extending 400 m from the edge of an interstate highway (I-95) and found that four species were less abundant near the road while another six became more abundant near the roadway.[38] Species that became less abundant near the road include the bay-breasted warbler (*Dendroica castanca*), blue jay (*Cyanoeitta cristata*), blackburnian warblers (*Dendroica fusca*) and winter wrens (*Troglodytes troglodytes*). The six species that became more abundant near the road included the chestnut sided warbler (*Dendroica pensylvanica*), white-throated sparrow (*Zonotrichia albicollis*), wood thrush (*Hylecichla mustelina*), common yellowthroat (*Geothylpis trichas*), robin (*Turdus migratorius*) and Tenesee warbler (*Vermivora peregrine*). While these studies do not address noise directly or to the transect distances indicated in other studies [41, 96-100] they suggest that the negative impact on birds is not universal, but also dependent upon the species in question and perhaps other landscape factors such as the use of adjacent plots. Further, roadsides have been identified as providing valuable food sources (small mammals) for a raptor; the red-tailed hawk.[38] Jackson[65] reported that populations of the endangered red-cockaded woodpecker (*Dendrocopos borealis*) are found along interstates with others reported along other roads. The ROW is suggested as a corridor for dispersal. Again, noise levels are not indicated, but colonies are known to be found frequently near roads.

The major problem is summed up in a recent discussion, "Traffic noise is interpreted as the overwhelming cause of the underlying correlations of avian patterns with roads and traffic..." .[45] That is, as yet, there is no definitive evidence to explain why noise has a profound effect on some species but not others and at distances that would seem to preclude noise-masking vocalization (up to 3 km). Further, there is no indication of any other effects or interactions that might contribute to these results.

Other possible effects include visual disturbance, air pollution, microclimatic effects, road kill or increased attraction of predators to the roadside all of which appear unlikely to have such distant effects.[45] It is known that birds vary in habitat size requirements and it may be that the patch size available in conjunction with noise has influenced

distribution patterns.[120] For example, in a study of 10 grassland species of bird areas need to be approximately 200 hectares.[120] There is a variety in the requirements ranging from 200 ha for the upland sandpiper (> 50% incidence) to 10 ha (> 50% incidence) for the savannah sparrow. Interestingly the suggestion of the use of airports as potential habitat (due to large areas of undisturbed surroundings) is made. A further difficulty in establishing a pattern between noise and birds is that on the occasions when bird vocalizations have been measured there is no obvious impairment to communication related to highway noise (i.e. masking) which would be one potential cause of the negative correlation between traffic noise and numbers. Thus, golden-cheeked warblers (*Dendroica chrysoparia*) were found to sing without regard to the level of roadway noise in a state park (near a state highway with noise levels (L_{eq} = sound equivalent per hour) from 29.7 to 58.6 dB).[11] The frequency of the song was about 5.18 kHz which is higher than that of the associated road noise. A study of California Gnatcatchers found no significant effect of background traffic noise on the rate of calling and the authors point out that the masking for a typical call would extend only about 15 m from the edge of the interstate.[7] Calls were about 50 dB and ranged from 3-6 kHz with a peak at 4 to 5 kHz. At the noisiest location measured (near Interstate 15) the sound level was 69.1 dB. Further, the authors indicate that another breeding site was located near an airport (Lindberg field) and often experienced background levels of noise about 70 dB indicating that habitat quality was as important as noise in having an effect.[7]

Raptors

A number of raptors have been looked at in response to human activities which have addressed noise to some extent. Stalmaster and Newman[112] studied wintering bald eagles (*Haliaeetus leucocephalus*) and found that human activities such as boating and fishing could disturb the birds (especially adults), however any normally occurring sounds were not particularly disturbing although gunshots elicited escape behavior. The levels of sound were not measured in this study. Similarly, another study of bald eagles found human pedestrian activity was more disturbing than overflights by aircraft.[57] Unfortunately, the sound levels of the overflights are not given. A study of several raptor

species (red-tailed hawk, Swainson's hawk, golden eagle, Ferruginous hawk) found birds to increase home range size during military activity that included vehicle activity, camps and helicopter overflights.[5] Similarly, red-tailed hawks shifted their activity away from military activity and returned when training had ceased, however, no measurement or discussion of noise as a factor is given.[4] Noise is not indicated as having a separate effect although was certainly a possible factor in affecting bird behavior. Mexican spotted owls (*Strix occidentalis lucida*) were found to flush at noises such as those from overflights at levels of 92 dB(A) or greater.[31] Chain saws were found to be more disturbing, although the average sound level was only 46 dB(A). Grubb et al.[58] reported that there was no discernable effect of logging trucks on breeding goshawk (*Accipter gentiles*) female or juevenile at a distance of 500 m. Noise levels were sporadic with peaks at ~ 50 dB(A) at a frequency of about 80 Hz.

Waterfowl

In a study of several factors that could effect waterfowl jogging and grass-mowing were found to have the greatest impact with gulls and terns, intermediate on ducks and greatest for herons, egrets and shorebirds.[21] It is also noted that supersonic overflights with sound levels of about 108 dB(A) were disturbing. It may be inferred that the presence of humans (as much as noise) at lower sound levels was responsible for the disturbance. This is supported by the findings of Anderson[6] in a study of California brown pelicans (*Pelecanus occidentalis Californicas*) that humans walking along trails negatively affected breeding at distances of up to 600 m. It should be noted that white pelicans (*Pelecanus erythrorynchos*) showed a decline in breeding in areas of low aircraft overflight.[20] In this case the about of coyote predation was also shown as having a negative effect and the noise levels were not indicated. Dark bellied Brant geese (*Branta bernicla bernicha*) were disturbed by aircraft overflights at altitudes of 500 m up to 1.5 km and also by nearby pedestrian activity.[93] Similarly, snow geese (*Chen caerulescens atlantica*) also could be disturbed by hunting and aircraft overflights. In a study of trumpeter swans (*Cygnus buccinator*) there was no significant effect of traffic as long as

vehicles did not stop.[63] However, louder vehicles are noted as causing a greater disturbance although the noise levels are not indicated.

Conomy et al.[29] found that black ducks (*Anas rubripes*) did become habituated to aircraft noise when housed in an aviary. However, wood ducks (*Aix sponsa*) did not become habituated to the noise (actual or simulated jet aircraft with a equivalent of 63.2 dB(A)). Oetting and Cassel[90] studied dabbling ducks along interstate 95 in North Dakota and found numbers of nesting mallards (*Anas platyrhynchos*), pintails (*A. acuta*) and gadwalls (*A. Strepera*) with more success in unmowed ROW. The preference may be related to fewer predators (red foxes) in the ROW. A subsequent study of the same species along the same highway found the birds preferred to nest in unmowed ROW over adjacent wetland areas, again perhaps due to a reduction in predation.[121] A field study of dabbling ducks including black ducks, American wigeon (*Anas americana*), gadwall (*A. Strepera*) and green-winged teal (*A. crecea carolinensis*) found no effect on the time-activity budgets at a mean sound level of 85dB(A) when exposed to low-flying aircraft (L_{eq} 24 hr. = 63 dB(A)).[28] Pacific eiders (*Somateria mollisima – v – nigra*) did not appear to react to aircraft overflights (mainly helicopters) and these did not have a measurable effect on the number of nests on the island.[66] Indeed the authors reported that the birds were more disturbed by experimental observers. Burger and Gochfeld[22] found that the common gallinule, Sora rail, glossy ibis, little blue heron and Lousiana heron were disturbed by the presence of visitors and that loudness was as significant as the number of people in this effect, however, loudness was measured on only a subjective scale and was not quantified.

Crested terns (*Sterna bergii*) in Australia showed escape behaviors following exposure to pre-recorded aircraft noise at levels of 85 dB(A).[19] This study also found that the visual presence of balloons could trigger an escape response. Wading birds (great egret, snowy egret, Lousiana heron, wood stork and cormorant) in Florida showed no reaction to most overflights by small aircraft.[73] The sound levels in this study were not given. Black et al.[12] also reported no significant effect of jet overflights on wading birds (egrets) at levels of 55-100 dB(A). In addition it is noted that nesting success was independent of

overflights and that humans on airboats (sound levels not given) caused greater disturbance.

Other species

Crows have been reported to make increased use of roadside verges as a source of food (worms).[113] Thus, there appears to be no deleterious effect of noise on their behavior. Ring-necked pheasants (*Phasianus colchius*) were found to nest in farming areas on undisturbed roadside cover especially if small grains along with hay were being farmed.[123] The noise levels encountered were not given in the study, however it does indicate that broader landscape factors can influence the utilization of roadside vegetation. Subsequently, Warner et al.[124] reported that ring-necked pheasants utilized roadside plots for nesting to a greater extent than adjacent control areas if the roadsides were seeded. It is suggested that such ROW plots could be used to buffer year to year variability in surrounding habitats. While noise was not addressed directly it is apparent that noise was not interfering with nesting in these areas. This confirmed the result of an earlier study which had indicated the utility of ROW seedings for pheasant nesting.[67] Further, Joselyn et al.[67] found no indication that predation was greater in ROW vegetation than adjacent hayfields eliminating this as a potential cause of the difference in nest success.

Gutzwiller and Barrow[59] studied birds in a Chihuahuan desert and found the abundance and species richness within 21 of 26 species to be reduced and that significant predictors were (generally) being within 1-2 km of the nearest road as the length of road increased, distance to the nearest road, distance to the nearest development or a two-way interaction of these variables. It is important to note that landscape factors in conjunction with the road factors were found in many models to be significant (e.g. distance to nearest development, areas covered by different types of vegetation). The traffic density was reported to be between 407-459 vehicles/day with a speed limit of 45 mph. The noise levels were not measured; however, the effect is postulated by the authors to be related to the roads or the associated development.

Noise carries many properties with it including the number, size and speed of vehicles.[100] The noise levels were about 59 dB(A) adjacent to roads and 38 dB(A) in remote areas with a threshold for response of between 27-61 dB(A).

Mammals

Large mammals

For mammals the impact of traffic noise has not been as closely studied as in birds. It has been found that various mammals will avoid roads and (in some cases) this has been attributed to noise (see overview in Liddle[76]). For example, mountain goats (*Oreamos americanus*) would hesitate to cross the road if they heard a truck changing gears over 1 km away.[108] Passing vehicles in this study were perceived as a threat (speed limit 50 mph). Interestingly, the goats did not seem to be disturbed by the noise from trains. Rost and Bailey[102] found that deer and elk avoided coming within 200 m of roads (paved, gravel and dirt). The visibility of the road alone did not appear to be the causative factor based on pellet densities (from which presence was estimated). They speculated that there may be an effect of hunting being associated with vehicles. This conclusion accords with the study of Dorrance et al.[33] that found white tailed deer (*Oedocoileus virginianus*) to avoid snowmobiles, but that they would habituate to these in areas where they had not been hunted. Elk in Rocky mountain national park were not greatly disturbed by road traffic although there was some evidence of avoidance early in the winter when food was more abundant.[107] In a study of elk movement along interstate 80 in Wyoming traffic noise was an average of 54-62 dB(A) for cars and 58-70 dB(A) for trucks with little evidence of avoidance up to distances of 300 yards.[122] At the same time there did appear to be a physical barrier imposed by the road. Adams and Geis[2] reported that elk generally avoided roads while deer showed little difference in distribution around interstate highways (monitored at distances up to 400 m from the road). A more general model of the effects of roads on elk found that as the density increased to 5.5 miles per square mile, the use declined to only 8-18%.[78] Finally, white

tailed deer have been found to use interstate 84 ROW extensively presumably due to the available forage.[36] In contrast, Forman and Deblinger[44] found some indication that white-tailed deer preferred to use habitat in areas relatively undisturbed by roads. Again there is no discussion of the effect of noise directly. The opening of Denali national park (Alaska) to traffic did not cause a decline in the numbers of large mammals found (caribou, grizzly bear, Dall sheep) with the exception of moose and grizzlies tended to be found closer to the road.[109] Taken together the evidence from large ungulates suggests that there is little evidence for a direct avoidance of roads due to noise. The presence of people was found to cause avoidance in mule deer (*Odocoileus hemionus*), however the effect of noise, if any was not measured.[47] Desert mule deer (*Odocoileus hemionus crooki*) could be habituated to low flying Cessna aircraft at an average altitude of 80 m.[72] Moutain sheep were not greatly disturbed at overflights of >50 m and moose by flights >100 m above ground.[71] Again, the specific noise level is not given.

Badgers were found to avoid higher traffic roads, but this was attributed to an avoidance of crossing without noting specific noise levels.[27] Bobcats were found to cross four-lane highways (more frequently through culverts), but the effect of noise is not discussed.[23] Coyotes (*Canis latrans*) were found to expand (if less cover was available) or reduce (if more cover available) their home range in response to military maneuvers (including overflights, vehicle and truk activity).[52] The degree to which noise was a factor in these movements is not indicated. In a study of mountain lions (*Felis concolor*) the use of areas for timber had a greater negative effect than road density.[117] However, the potential for distant machine noise to have a negative impact is suggested at distances between 100 m and < 1 km. The intensity or frequency of these sounds is not given. Wolves (*Canis lupus*) showed no clear avoidance of highways with one pack's range straddling it for several years.[114] Further, wolves were less likely to use smaller roads (to an oilfield) possibly due to a more visible human presence. For larger mammals, the barrier imposed by roads is generally indicated as the major cause of differences in animal distribution; however noise may be a component at least for some species. Further study would greatly help to elucidate the effect of noise on large mammals.

Small mammals

For small mammals the situation is more complex because, while roads do present barriers to movement [25, 92], they have also provided the means for dispersal for small rodents (voles) that utilize the continuous strips of vegetation and would otherwise be restricted to roadsides [53] and the use of areas such as the median strip has provided habitat for some species.[1] Small mammals that prefer grassland habitat were found to utilize ROW habitat and several other species preferred right of way or adjacent areas.[2] Adams[1] reported small mammal (rodent) density in an unmowed median strip was similar to that in surrounding wooded areas at distances up to 400 m. Species that preferred ROW habitat include golden mouse, dusky-footed wood rat, brush mouse and pinion mouse and more species were found in the ROW than in adjacent habitat. A number of additional species were found to be more common in ROW than adjacent areas including the eastern harvest mouse, white footed mouse, meadow vole and prairie vole. Shrews and opossums were also found along the ROW and cottontail rabbits used areas adjacent to the interstate. The presence of these small mammals is attributed to a low number of predators (foxes, raccoons, skunks, coyotes) in the ROW. However, in this study, ROW was found to inhibit movement of 11 of 40 small mammal species studied. In the case of forest dwelling species, areas of clearance appear to be more important barriers than the road surface although noise is not discussed as a factor.[92] In a study following the construction of a highway there was no effect on the distribution of several mammalian game species (rabbit, squirrel, fox, deer).[85] In any case there appears to often appear a barrier effect due to roads with noise being of lesser importance for most small mammals. However, Mader[79] reported that two species of forest mice were inhibited from crossing a two lane highway. Although noise was not specifically analyzed as a contributing factor, it is suggested as a possibility by the author. It should be noted that the presence of small mammals has been implicated as a reason for the use of roadside verges by raptors.[38]

CONCLUSIONS

It is clear that roads have definite effects on wildlife populations for a variety of reasons including habitat fragmentation, runoff, pollution, visual disturbance and increased mortality. Owing to the consistent and pervasive nature of noise and its apparent or at least potential widespread effects, it is clearly an area that needs to be addressed (see Forman and Alexander[43] Forman et al.[46] for reviews on this subject). Indeed in many cases it appears that noise may have a significant effect on both numbers of individuals, species diversity and breeding.

Invertebrates are too poorly studied at present for any definitive conclusions. Some significant use of roadside areas by some species (e.g. butterflies, bees) is indicated, but there are also many other species that should be investigated (particularly the aquatic species that may decline as road density changes). Although sparse, the studies that have looked at the response of fish would suggest that normal traffic noise would not be sufficiently great to disturb those species that have been looked at so far. Roads do provide a barrier to the movement of reptiles and amphibians; however the effect of noise is less clear. Recent work suggesting that vehicle noise can arouse toads from their burrows is of concern since this could affect survival and is one area that could be looked at in a series of controlled studies where sound levels and the associated behavioral response are more systematically studied.

The most comprehensive experimental studies on the subject [41, 96-100] demonstrate that many (although not all) species of small breeding birds in both grassland and forest habitats appear to avoid areas in proportion to the traffic noise and volume at distances up to three thousand meters. It is also important to note that the other studies that review an extensive number of species found some to be negatively affected by the presence of roads, but most species were neutral and a few species to increase in numbers presumably due to food or habitat provided by rights-of–way [2] (see also Appendix A). Further, several studies have found that roadside verges can provide breeding habitat for birds – however, without more information on the populations at greater distances from the road

it is difficult to determine if the same effect reported in the Netherlands was also present. What these studies do suggest is that the situation may be more complex than roads simply providing a barrier to all breeding. As an illustration, the review by Way[126] records that (in Britain) roadsides have been recorded as breeding habitat for 20 of 50 mammal species, all 6 reptiles, 40 of 200 bird species, 25 of 60 butterfly species, 8 of 17 bumblebee species and 5 of 6 amphibian species. Road noise would appear an unlikely impediment to species that are able to successfully breed so close to the source (it should be noted that the numbers relative to adjacent areas would be important in indicating their relative importance and this information is not provided in this study). A summary of some of the major findings with respect to birds shows little, if any contradiction in results, rather some species are negatively effected and others occur more frequently nearer roads due factors such as prey availability or vegetation type (see Appendix A).

A further example of the complexity involved is shown by the study of Gutzwiller and Barrow[59] where a number of bird species densities were influenced by the presence and/or number of roads; however, a number of landscape factors including the amount of development and vegetation type were also found to be significant predictors in many of the models.

RECOMMENDATIONS

It is clear that there are large gaps in the existing knowledge of the impact of noise on wildlife populations. In invertebrates and lower vertebrates (fish, reptiles, amphibians) there is relatively little study on the effects of road noise with no clear indication of a strong adverse response, at least for the levels of noise likely to be encountered from road traffic. For reptiles and amphibians, effects appear to be localized and likely due to mortality or a barrier to movement. Recent studies on the effect on toads in burrows near roads strongly indicate that further study on this or similar behaviors is warranted. For birds, noise can apparently have a significant effect; however, the results are not universal with some species being adversely affected, many unaffected and still others becoming more common near even interstate highways. Mammals (particularly large

species) may avoid noise, however, there is evidence (particularly for smaller species) that additional habitat and corridors for movement are provided by roadways.

The most urgent requirement is to determine why noise - the presumptive cause – has such variable effects and to determine if the effect is attributable to noise alone or if other factors and/or interactions are present. This could be addressed through introduction of appropriate noise levels into naïve areas or through studies of individual responses in controlled laboratory settings to determine where background noise is having an effect (e.g. distance of transmission of calls, ability of birds to locate others, patterns of behavior, reproductive success etc.).

Since direct masking of vocalization is unlikely to be the significant factor in many cases, future studies could also look at other indicators of stress including physiological indices such as an increase in sympathetic nerve activity affecting pupils, heart, digestive system, adrenal medulla, blood vessels and musculature (Borg and Møller c.f. Algers et al.,[3]). In stressed animals, the hypothalamus would signal an increase in ACTH (adrenocorticotropic hormone) and TSH (thyroid stimulating hormone) from the pituitary gland and the resultant changes (e.g. corticosteroid levels, blood glucose levels, electrolyte balance) could be measured either field or laboratory studies to determine the level of stress. A number of additional physiological effects of noise on animals have been summarized including changes in endocrine, digestive, blood, immune and reproductive function (see Algers et al[3]; Manci et al.[81] and references therein) and could be looked at as indicators of stress and deviations in any of these (from control or reference populations) could help to explain the results seen. This approach has been suggested as a possible course of action recently.[99]

Two important points to consider in the design of studies are 1) the density of a given species is not necessarily an absolute indicator of the best habitat (i.e. sometimes individuals are relegated in significant numbers to less desirable habitat because of territoriality by dominant individuals)[118], and 2) greater behavioral response (i.e. movement away from highway) does not necessarily indicate species that are at greatest

need of protection.[55] Thus, any plans for conservation must consider the quality of the habitat and the sensitivity of the population or community under consideration as well as the degree of the effect on a given species.

APPENDIX A

Table – Summary of some bird species found to be affected by the proximity of roads or road noise.

Negative effect = reduced density nearer roads; Positive effect = increased density near roads unless otherwise indicated

Source	Location	Species	Effect
Gutzwiller and Barrow, 2003	Breeding season (February – May) Chihuahuan desert 407-459 vehicles/day (average)	Turkrey vulture (*Cathartes aura*) Scaled quail (*Callipela squamata*) Say's phoebe (*Sayornis saya*) Ash-throated flycatcher (*Myiarchus cinerascens*) Cactus wren (*Campylorhynchus brunneica*) Bewick's wren (*Thyromanes bewickii*) *Black-throated sparrow (*Amphispiza bilineata*) House finch (*Carpodacus mexicanus*)	Negative
		Lesser nighthawk (*Chordeiles actuipennis*) Bell's vireo (*Vireo bellii*) All species showed effect for one year of three year study *Negative effect for two years of study, positive effect in one year	Positive
Adams and Geis, 1981	Breeding Season Southeast	Wood thrush (*Hylocichla mustelina*) Indigo bunting (*Passerina cyanea*) Field sparrow (*Spizella pusilla*) Blue jay * (*Cyanocitta cristata*)	Negative
	Midwest	Horned lark (*Eremophila alpestris*)	Negative
		House sparrow (*Passer domesticus*)	Positive
	Northwest	Chestnut-backed chickadee* (*Parus rufescens*) Nashville warbler (*Vermivora ruficapilla*) Hermit Warbler* (*Dendroica occidentalis*) Savannah sparrow (*Passerculus sandwichensis*)	Negative
		Song sparrow (*Melospiza melodia*)	Positive
	California	Lark sparrow (*Chondestes grammacus*)	Negative
		Brewer's blackbird (*Euphagus cyanocephalus*) Red-winged blackbird (*Agelaius phoeniceus*)	Positive

Adams and Geis, 1981 (cont.)	Non-breeding (wintering) Southeast Midwest Northwest	 Cardinal (*Cardinalis cardinalis*) White-throated sparrow (*Zonotrichia albicollis*) Blue jay (*Cyanocitta cristata*) Horned lark (*Eremophila alpestris*) House sparrow (*Passer domesticus*) Chestnut-backed chickadee* (*Parus refescens*) Golden-crowned kinglet* (*Regulus satrapa*) * = species affected by both county roads and interstates; other species only affected by interstates	 Positive Negative Positive Negative
Forman et al., 2002	Grassland Breeding season 15-30,000 vehicles/day ≥ 30,000 vehicles/day	 Bobolink (*Delichonyx oryzivorous*) Eastern meadowlark (*Sturnella magna*) (possibly- upland sandpiper (*Bartramia longicauda*), Henslow's sparrow (*Ammodramus henslowii*), grasshopper sparrow (*A. savannarum*))	 Negative to 700 m Negative to 1200 m (effect applies to all species)
Reijnen et al., 1996	Grassland Breeding season 5,000 vehicles/day 50,000 vehicles/day	 Black-tailed godwit (*Limosa limosa*) Oystercatcher (*Haematopus ostralegus*) Lapwing (*Vanellus vanellus*) Shoveler (*Anas clypeatal*) Skylark (*Alauda arvensis*) Black-tailed godwit (*Limosa limosa*) Oystercatcher (*Haematopus ostralegus*)	 Negative to 100 m Negative to 1500 m Negative to 1500 m
Reijnen and Foppen, 1994	Woodland Breeding season 50,000 vehicles/day	 Willow warbler (*Phylloscopus trochilus*)	 Negative to 200 m

Reijnen et al., 1995	Woodland Breeding season 10,000 vehicles/day 60,000 vehicles/day	Ring-necked pheasant (*Phasianus colchicus*) Common cuckoo (*Cuculus canorus*) Lesser spotted woodpecker (*Dendrocopus minor*) Marsh warbler (*Acrocephalus plaustris*) Icterine Warbler (*Hippolais icterina*) Greenish warbler (*Phylloscopus trochilus*) Gold crest kinglet (*Regulus regulus*) Golden oriole (*Oriolus oriolus*) Hawfinch (*Coccothraustes coccothraustes*)	Negative 40-1500 m Negative 70-2800 m (effects given as a range for all species at given traffic level)
van der Zande et al., 1980	Grassland Breeding season Rural road Highway	Lapwing (*Vanellus vanellus*) Black-tailed godwit (*Limosa limosa*) Redshank (*Tringa tetanus*)	Negative to 500-600 m Negative to 1600-1800 m (effects are combined for all species)
Ferris, 1979	Woodland Breeding season Interstate highway Interstate highway	Bay-breasted warbler (*Dendroica castanea*) Blue jay (*Cyanoeitta cristata*) Blackburnian warbler (*Dendroica fusca*) Winter wren (*Troglodytes troglodytes*) Chestnut sided warbler (*Dendroica pensylvanica*) White-throated sparrow (*Zonotrichia albicollis*) Wood thrush (*Hylocichla mustelina*) Common yellowthroat (*Geothlypis trichas*) Robin (*Turdus migratorius*) Tennessee warbler (*Vermivora peregrina*)	Negative to 300-400 m Positive
Clark and Karr, 1979	Row crop fields Winter and Breeding Interstate and county roads	Horned lark (*Eremophila alpestris*) Red-winged blackbird (*Agelaius phoeniceus*)	Negative to 500 m Positive to 500 m

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SYNTHESIS OF NOISE EFFECTS ON WILDLIFE POPULATIONS

ANNOTATED BIBILIOGRAPHY

1. Adams, L.W. 1984. Small mammal use of the interstate highway median strip. Journal of Applied Ecology 21:175-178.

The author reports that density of small mammals in an unmowed median strip adjacent to an interstate highway to be as great as that in wooded adjacent habitat to a distance of 400m. The report does not address noise directly, however, the relativity density of mammals adjacent to roads would argue against a similar to that reported by Reijnen and colleagues and Forman et al. (2002).

2. Adams, L.W. and A.D. Geis. 1981. Effects of highways on wildlife. Federal Highway Administration Technical Report No. FHWA/RD-81/067.

This report details the use of areas adjacent to roadways by a variety of animals. It is significant in that it covers a diverse number of species in a variety of regional habitats in the United States. Amphibians (salamanders) were found adjacent to roadsides and ROW in the southeast and northwest although they appeared not to cross indicating a barrier effect. A number of small mammal species are reported to prefer ROW habitat and, in some cases, they are more common along large interstate ROW than those of smaller county roads. It is suggested that this may be due to the low number of predators in these ROW areas. Further road size and traffic volume were not critical to deer distribution, however elk were found to avoid areas adjacent to roads.

3. Algers, B., Ekesbo, I. And S. Strömberg. 1978. The impact of continuous noise on animal health. Acta Veterinaria Scandinavica (Supplementum) 67:1-26.

The authors present a review including the sound sensitivities of many major animal species and the physiological response of animals to noise (including major organs, blood, and endocrine function). This provides a good overview of some of the responses, beyond interference with vocalization that would indicate a deleterious effect of noise exposure and explain aversion to this effect.

4. Andersen, D.E., O.J. Rongstad and W.R. Mytton. 1986. The behavioral response of red-tailed hawk to military training activity. Raptor research 20:65-68.

The authors report that red-tailed hawks shifted their activity away from military training activities returning when the activity had ceased. The levels of noise associated with these activities are not given and it is not possible to discern how much of the disturbance is due to noise and how much due to the presence of humans.

5. Andersen, D.E., O.J. Rongstaf and W.R. Mytton. 1990. Home range changes of raptors exposed to increased human activity. Wildlife Society Bulletin 18:134-142.

The authors look at four different raptor species (hawks, eagle) during periods of military activity (including vehicles, camps and helicopter overflights). The birds were found to increase home range size presumably to avoid the activity. Unfortunately, the levels of noise are not measured and it is difficult to determine the impact of the presence of persons in comparison to the noise from vehicles and flights.

6. Anderson, D.W. 1988. In my experience...Dose-response relationship between human disturbance and brown pelican breeding success. Wildlife Society Bulletin 16:339-345.

The author describes the response of breeding brown pelicans to humans walking along trails. A negative effect was reported at distances up to 600 m. The specific levels of noise are not given, however, the presence of humans may be an important factor.

7. Awbrey, F.T., D. Hunsaker and R. Church. 1995. Acoustical responses of California gnatcatchers to traffic noise. Inter-noise 65: 971-974.

The authors report on the number of breeding California gnatcatchers in a variety of locations. The calls of this species are recorded between 3 and 6 kHz with a sound level of about 50 dB. The noisiest field location where the birds were located was interstate 15 with a sound level of 69 dB. The masking distance was calculated at 15.2 m from the outer edge of the slow lane. The authors point out that one of the most successful breeding sites for this species is near an airport where noise levels often exceed 70 dB.

8. Banner, A. and M. Hyatt. 1973. Effects of noise on eggs and larvae of two estuarine fish. Transactions of the American Fisheries Society 102:134-136.

The authors measured the effect of a range of frequencies a pressure levels on the hatching and fry survival of two estuarine fish. It is significant that the authors note that this is above the levels of sound usually caused by traffic.

9. Baur, A. and B. Baur 1990. Are roads barriers to the dispersal of the land snail *Arianta arbustorum*? Canadian Journal of Zoology 68:613-617.

The authors determine that the snail will not crossed wide paved roads. This confirms that roads may pose a barrier to movement rather than repel these organisms by sound.

10. Belanger, L. and J. Bedard. 1990. Energetic cost of man-induced disturbance to staging snow geese. Journal of Wildlife Management 54:36-41.

The authors report that snow geese are disturbed by both hunting and aircraft overflights. The noise levels associated with the disturbance are not given. This is one of a number of studies that indicate human presence, with low levels of noise can also be disturbing particularly to waterfowl.

11. Benson, R.H. 1995. Unpublished. The effect of roadway traffic noise on territory selection by Golden-cheeked warblers.

The author reports on the golden-cheeked warbler in a state park in Texas. The sound equivalent per hour varied between 30 and 59 dB. The areas in which the bird sang showed no effect of noise exposure. The song of the bird was at about 5.2 kHz, a higher frequency than road noise.

12. Black, B.B., M.W. Collopy, H.F. Percival, A.A. Tiller and P.G. Bohall. 1984. Effects of low level military training flights on wading bird colonies in Florida. Florida Cooperative Fish and Wildlife Research Unit, School for Research and Conservation, University of Florida. Technical Report No. 7.

The authors report on the effect of jet fighter overflights on wading birds (egrets) in Florida. Sound levels from 55-100 dB(A) caused no significant effect. The entrance of humans and airboats are reported as more disturbing. Nesting success is also indicated as independent of overflights.

13. Blaxter, J.H.S. and D.E. Hoss. 1981. Startle response in herring Clupea harengus: The effect of sound stimulus. Journal of the Marine Biological Association of the United Kingdom. 61:871-880.

The authors report on the hearing sensitivity of herring (*Clupea harengus* L.) giving the pressure and frequency range. There is no discussion of application to levels of noise or sound encountered by this species in the field.

14. Bond, J. 1971. Noise: its effect on the physiology and behavior of animals. Agricultural Science Review 9:1-10.

The author provides a review on the effect of noise on a variety of domesticated animals. Responses to noise (primarily aircraft overflights and sonic booms) are included for cattle, poultry, mink and sheep. The report does not provide significant detail on noise levels or frequencies, but does summarize several studies and includes references to source materials.

15. Borg, E. and A.R. Møller. 1973. Våra omedvtena reaktioner på buller. Forskning och Framsteg 7:5-9.

The authors summarize findings that describe the physiological responses to stress (including noise). These results are summarized (in English) in the report by Algers et al.[3]

16. Bowles, A.E. 1995. Responses of wildlife to noise. pp. 109-156. In: Knight, R.L. and K.J. Gutzwiller. (eds.) Wildlife and Recreationists: Coexistence through Management and Research. Island Press: Washington, D.C.

The author presents a fairly comprehensive review of the responses of various wildlife groups to noise from previously published work including detailing the range of frequencies and sound intensities for terrestrial vertebrates (amphibians, reptiles, birds, mammals). The frequencies of peak sensitivity are also indicated. This provides a good overview of the areas that would be of concern for the various groups.

17. Brackenbury, J.H. 1979. Power capabilities of the avian-producing system. Journal of Experimental Biology 78:163-166.

The author reviews the sound producing capabilities of a number of bird species. It is concluded that larger birds are able to produce greater intensities. This can be important in considering the effect of noise particularly with respect to masking vocalization in birds.

18. Brattstrom, B.H. and M.C. Bondello. 1983. Effects of Off-Road vehicle noise on desert vertebrates. pp.167-204. In: Environmental Effects of Off-Road Vehicles. R.H. Webb and H.G. Wilshire (eds.) Springer-Verlag: New York.

The authors found that "dune buggy" noise can affect lizard hearing and that motorcycle noise could cause emergence of spadefoot toads during a period of estivation. The latter effect is of particular concern since emergence at the wrong time could be fatal to these species. Sustained (500 seconds) dune buggy noise was found to impair the hearing of kangaroo rats. This type of environment has not apparently been investigated elsewhere.

19. Brown, A.L. 1990. Measuring the effect of aircraft noise on sea birds. Environment International 16:587-592.

The authors report on the effect of pre-recorded aircraft noise on the crested tern in Australia. It is noted that levels of 85 dB(A) were required to cause escape behavior and that balloons (i.e. visual disturbance) could also have an effect. It is notable that both visual and auditory stimuli can trigger a similar response.

20. Bunnell, F.L., D. Dunbar, L. Koza and G. Ryder. 1981. Effects of disturbance on the productivity and numbers of white pelicans in British Columbia - observations and models. Colonial Waterbirds 4:2-11.

The authors note a decline in white pelican breeding in areas of low overflight by aircraft and also suggest that coyote predation may have played a role. There is no quantification of the level of noise or its impact on breeding although it is certainly a possible contributor to the observations.

21. Burger, T. 1981. The effect of human activity on birds at a coastal bay. Biological Conservation 21:231-241.

The author reports that human activites (jogging and lawn mowing) disturbed herons, egrets and shorebirds with some effect on ducks. Both gulls and terns are reported to show little response. The levels of noise associated with these activities are not given. The results demonstrate that responses to disturbance including noise can be species specific.

22. Burger, J. and M. Gochfield. 1998. Effects of ecotourists on bird behaviour at Loxahatchee National Wildlife Refuge, Florida. Environmental Conservation 25:13-21.

The authors report on the effect of visitors on several species of waterfowl including herons, rails and ibises. It was found that the loudness of the visitors had as great an effect as the number of people. The scale for loudness was subjective and thus cannot be quantified. The conclusion is that noise can be disturbing to these species.

23. Cain, A.T., V.R. Tuovilla, D.G. Hewitt and M.E. Tewes. 2003. Effects of a highway and mitigation projects on bobcats in Southern Texas. Biological Conservation 114:189-197.

The movement of bobcats across a four-lane highway was recorded. They were observed to cross more frequently using culverts or bridges. The effect of noise is not discussed specifically, however, the more frequent crossing suggests a barrier effect of the road itself rather than a noise induced avoidance.

24. Campbell, H.W. 1969. The effect of temperature on the auditory sensitivity of vertebrates. Physiological Zoology 42:183-210.

The author reviews the auditory sensitivity of a number of species (lizards) making the important point that this can change with ambient temperature (usually that at which activity is maximal). This is an important consideration in the study and modeling of road effects on ectotherms, particularly noise.

25. Clark, B.K., B.S. Clark, L.A. Johnson and M.T. Hayne. 2001. Influence of roads on the movements of small mammals. Southwestern Naturalist 46:338-344.

The movements of small animals in relation to roads are discussed based on a variety of techniques including radio-tracking, capture/recapture and pigment markers. The width of the roads was 6m and this was sufficient to prevent crossing, however the role of noise specifically is not given.

26. Clark, W.D. and J.R. Karr. 1979. Effects of highways on red-winged blackbird and horned lark populations. Wilson Bulletin 91:143-145.

The authors report on the number of birds at distances up to 500 m from both county roads and interstates. The horned lark increased in numbers away from both types of road and were generally more common along county roads. In contrast red-winged blackbirds were greater in numbers nearer to roads especially in May and June. This result is attributed to the horned lark requiring larger areas of open ground and the preference of blackbirds for grass habitat found along the ROW. The level of noise or its potential effect are not discussed. The juxtaposition of these two species in the same area is significant in indicating the importance of other habitat factors along with noise or traffic in the response of wildlife.

27. Clarke, G.P., P.C.L. White and S. Harris. 1998. Effects of roads on Badger *Meles meles* populations in southwest England. Biological Conservation 86:117-124.

The movement of badgers across high traffic roads in England is attributed to a barrier effect. The role of noise in the results is not discussed. This result is consistent with that of several other mammals that also tended to avoid crossing roads (e.g. Cain et al., 2003; Oxley et al., 1974)

28. Conomy, J.T., J.A. Collazo, J.A. Dubovsky and W.J. Fleming. 1998. Dabbling duck behavior and aircraft activity in coastal North Carolina. Journal of Wildlife Management 62:1127-1134.

The authors report on the effect of aircraft noise for a number of dabbling duck species (black ducks, teal, wigeon). The average sound equivalent was 63 dB(A) and did not appear to alter overall time-activity budgets. It is indicated that there is no major disturbance to normal behavior for these species.

29. Conomy, J.T., J.A. Dubovsky, J.A. Collazo and W.J. Fleming. 1998. Do black ducks and wood ducks habituate to aircraft disturbance? Journal of Wildlife Management 62:1135-1142.

The response of black ducks and wood ducks to jet aircraft overflights (both real and simulated) is discussed. Black ducks became habituated whereas wood ducks did not. The sound levels had a 24 hour equivalent of 63 dB.

30. Debelsteen, T., O.N. Larsen and S.B. Pedersen. 1993. Habitat induced degradation of sound signals: Quantifying the effects of communication sounds and bird location on blur ratio, excess attenuation and signal to noise ratio in blackbird song. Journal of the Acoustical Society of America 93:2206-2220.

This study of blackbirds reports on how quickly high-pitched sounds degrade and that this is fairly rapid. Further the sounds travel better from a high perch. This may be important information in looking at the distance sounds need to travel to the size of the birds territories.

31. Delaney, D.K., T.G. Grubb, P. Beiber, L.L. Pater and M.H. Reiser. 1999. Effects of helicopter noise on Mexican spotted owls. Journal of Wildlife Management 63:60-76.

The authors detail the response of Mexican spotted owls to aircraft and chainsaw noise. The birds were found to flush if exposed to lower sound levels from chainsaws than helicopter overflights. The reason for the difference between sound sources is not given.

32. Dooling, R.J. 1982. Auditory perception in birds. In: Acoustic communication in birds (volume 1):95-129. Academic Press, New York.

The author an expert on avian auditory systems presents an overview of perception in a number of species. It is pointed out that species must be able to discriminate their vocalizations from others and background noise and that the thresholds for hearing are greater in birds than for humans at all frequencies. The fact that masking is most effective if in the same region of the spectrum as the vocalization is also indicated. Finally, the fact that signal must exceed background by ~ 20 dB in order to be detected.

33. Dorrance, M.J., P.J. Savage and D.E. Huff. 1975. Effects of snow-mobiles on white-tailed deer. Journal of Wildlife Management 39:563-569.

The authors discuss the impact of snowmobiles on white tailed deer finding that they tended to avoid these. Because it was found that they could be habituated, but not in areas where they had been hunted it is suggested that there may be an effect of this experience. Noise is not discussed as a specific factor in causing avoidance.

34. Evink, G. 2002. Interaction between roadways and wildlife ecology: A synthesis of highway practice. National Cooperative Highway Research Program Synthesis 305. Transportation Research Board, Washington, D.C.

The authors present an NRC estimate of the amount of land in the United States that has been converted to highway, street and right of way. Their estimate is about 20 million acres.

35. Fahrig, L., J.H. Pedlar, S.E. Pope, P.D. Taylor and J.F. Wenger. 1995. Effect of road traffic on amphibian density. Biological Conservation 73:177-182.

The authors report that frog and toad density is reported to decrease with increasing traffic density between 8,500 and 13,000 vehicles per day. The authors conclusion is that this is due to increased mortality and noise is not posited as a possible cause.

36. Feldhamer, G.A., Gates, J.E., Harman, D.M., Loranger, A.J. and K.R. Dixon. 1986. Effects of interstate highway fencing on white-tailed deer activity. Journal of Wildlife Management 50:497-503.

The authors report on the distribution of white-tailed deer along interstate 84 indicating a greater amount of activity along the ROW. This is attributed to the greater amount of forage available in the ROW. The effect of noise is not discussed, however the presence of significant numbers in the ROW would suggest no strong aversion to noise.

37. Fernández-Juricic, E., Jimenez, M.D. and E. Lucas. 2001. Alert distance as an alternative measure of bird tolerance to human disturbance: implications for park design. Environmental Conservation 28:263-269.

The authors report on the response of house sparrow to human pedestrian activity along a pathway. In response they increased the alert distance. No similar effect was seen for blackbirds, woodpigeons or magpies. The level of noise is not indicated, but it does indicate that the responses of species to disturbance are not uniform.

38. Ferris, C.R. 1974. Effects of highways on red-tailed hawks and sparrow hawks. M.S. Thesis, West Virginia University, Morgantown, WV.

The author reports on the use of roadside areas by two species of raptors finding that they can make fairly extensive use of these areas as they provide habitat for several species of small rodents that are their prey. There is no indication of the levels of noise or the impact of noise on the birds.

39. Ferris, C.R. 1979. Effects of interstate 95 on breeding birds in northern Maine. Journal of Wildlife Management. 43:421-427.

The author reports on a study along an interstate highway that looked at the density of ten species of breeding birds. Four species were found to become less abundant near the road (bay-breasted warbler, blue jay, Blackburnian warbler and winter wren). Six species were found to become more abundant near the road (especially within 100 m) (chestnut-sided warbler, white-throated sparrow, wood thrush, common yellowthroat, robin and Tennessee warbler). It is noted that both the chestnut-sided warbler, yellowthroat and robin tend to prefer edge habitat and this might explain the results. It is significant that some species can show a negative relationship with the road while others due not.

40. Findley, C.S. and J. Houlahan. 1997. Anthropogenic correlates of species richness in southeastern Ontario wetlands. Conservation biology 11:1000-1009.

The authors report on the numbers of reptiles and amphibians that appear to decline in both number and diversity up to 2000m from two and four lane highways. The decline is attributed to barriers to dispersal rather than to noise, although the latter is not addressed directly.

41. Foppen, R. and R. Reijnen. 1994. The effects of car traffic on breeding bird populations in woodland. II. Breeding dispersal of male willow warblers (*Phylloscopus trochilus*) in relation to the proximity of a highway. Journal of Applied Ecology 31:95-101.

The authors continue with the second portion of a study on willow warblers near a major highway (50,000 cars/ day) (see also Reijnen and Foppen, 1994). It is reported that dispersal of the males was actively away from the road. The greatest number of individuals were found in the control zone beyond 400 m from the road.

42. Forman, R.T.T. 2000. Estimate of the area affected ecologically by the road system in the United States. Conservation Biology 14:31-35.

The research is by an authoritative worker in the field from Harvard University. The land area of the United States potentially affected by roads is given as much as one-fifth. The estimate is based on a convoluted pattern of roads and on the accuracy of sensitive zones presented by studies in the Netherlands for grassland and woodland birds (see Reijnen, Foppen and others).

43. Forman, R.T.T. and L.E. Alexander. 1998. Roads and their major ecological effects. Annual Review of Ecology and Systematics 29:207-231.

The authors review a number of the important of effects of roads on the ecology of surrounding areas. Topics discussed include the impact of noise, road

mortality, and habitat fragmentation as well as the effect on plant species, water, sediment chemicals and sections dealing with road planning and design. It does reference several major works dealing with the effect of noise.

44. Forman, R.T.T. and R.D. Deblinger. 2000. The ecological road-effect zone of a Massachusetts (U.S.A.) suburban highway. Conservation Biology 14:36-46.

The authors report on the response of various wildlife species (moose, deer, forest and grassland birds, amphibians) to a four lane highway near Boston. The traffic density is between 34,000 and 50,000 vehicles / day. There was some avoidance of by all groups up to 100 m or more. Booth moose corridors and grassland bird avoidance appears at distances up to and beyond 1 km. It is noted that the data on grassland birds are scattered and that woodland bird data are based on expectations from the studies of Reijnen et al. (see associated references). The suggestion is that the road serves as a barrier to the movement of amphibians.

45. Forman, R.T.T., B. Reineking and A.M. Hersperger. 2002. Road traffic and nearby grassland bird patterns in a suburbanizing landscape. Environmental Management 29:782-800.

The authors report on the effect of roads with varying traffic volumes on species of grassland birds in a suburban/rural area near Boston. The principle species are the bobolink and Eastern meadowlark. There was no effect on distribution in areas of low traffic volume (3,000-8,000 vehicles / day). At moderate traffic levels (8,000 – 15,000 vehicles / day) the numbers were not reduced, but the number of breeding birds was reduced up to a distance of 400 m. At higher traffic volume (15,000-30,000 vehicles / day) both the presence and breeding of birds is reduced to 700 m. At the highest traffic volume (>30,000 vehicles / day) both presence and breeding are reduced to 1,200 m). There is essentially no breeding birds found in areas near roads with >15,000 vehicles / day. The levels of noise are not given in this study although further studies that manipulate the level of noise are suggested.

46. Forman, R.T.T., D. Sperling, J.A. Bissonette, A.P. Clevenger, C.D. Cutshall, V.H. Dale, L. Fahrig, R. France, C.R. Goldman, K. Heanue, J.A. Jones, F.J. Swanson, T. Turrentine and T.C. Winter. 2003. Road Ecology: Science and Solutions. 481pp. Island Press: Washington, D.C.

A volume dealing with the developing field of road ecology including sections on roads, vegetation and wildlife, water chemicals and the atmosphere and landscape planning. It reviews the effects of noise on wildlife briefly, but does discuss the major effects found in the studies to deal with noise (especially those dealing with birds by Reijnen and colleagues).

47. Freddy, D.J., W.M. Brenough and Fowler. 1986. Responses of mule deer to disturbances by persons afoot and snowmobiles. Wildlife Society Bulletin 14:63-68.

The authors report that mule deer were more disturbed by the presence of people afoot than snowmobiles. This was shown by running and greater associated energy expenditure when responding to the presence of pedestrians. The level of noise encountered in this study is not given.

48. Free, J.B., D. Gennard, J.H. Stevenson and I. Williams 1975. Beneficial insects present on a motorway verge. Biological Conservation 8:61-72.

Collected a large number of insect species (67) on a major highway roadside verge. The authors note that passing traffic did not appear to distract the insects, however, there is no indication of the noise levels encountered.

49. Frings, H. and M. Frings. 1959. Reactions of swarms of *Pentaneura aspera* (Diptera: tendipedidae) to sound. Annals of the Entomological Society of America 52:728-733.

A report detailing the frequency and sound intensity to which a species of small fly (Diptera) are sensitive. Low frequencies are reported to cause greatest sensitivity.

50. Frings, H. and J. Jumber. 1954. Preliminary studies on the use of a specific sound to repel starlings (*Sturnus vulgaris*) from objectionable roosts. Science 119: 318-319.

The authors report that starlings can, to some extent, be repelled with distress calls from the same species. The sound level is rather high (85 dB) and indicates that this species can tolerate some significant noise without effect. The relation to highway noise is not discussed.

51. Frings, H. and F. Little. 1957. Reactions of honey bees in the hive to simple sounds. Science 125:122.

Report that details the sound frequency and levels at which honeybee activity ceases. This type of information may be important in suggesting responses of invertebrates to noise.

52. Gese, E.M., O.J. Rongstad and W.R. Mytton. 1989. Changes in coyote movements due to military activity. Journal of Wildlife Management 53:334-339.

The authors report on the response of coyotes to military activity including maneuvers by vehicles (including tanks) and overflights by helicopters and jet aircraft. Individuals with home ranges that had more cover retreated to smaller areas whereas those that were more exposed increased their range. The specific noise levels were not measured and it is difficult to determine how much of the response was due to the presence of traffic versus noise alone.

53. Getz, L.L., F.R. Cole and D.L. Gates. 1978. Interstate roadsides as dispersal routes for *Microtus Pennsylvanicus*. Journal of Mammalogy 59:208-212.

The authors report that roadside strips of vegetation could be used by a small rodent for dispersal. The roads were large interstates and, while the impact of noise is not addressed directly it can be concluded that there is no extreme barrier to the use of these areas as a result of road noise.

54. Gill, J.A., W.J. Sutherland and A.R. Watkinson. 1996. A method to quantify the effects of human disturbance on animal populations. Journal of Applied Ecology 33:786-792.

The authors report on a study of pink-footed geese that were found to be disturbed from feeding near roads. A method for quantifying the difference in amount of food consumed as an indicator of the decrease in geese presence is given. The effect of noise is not given, disturbance events ranging from overflights to farming and pedestrian activities were recorded. Only distance to the nearest road was a significant predictor of the response.

55. Gill, J.A., K. Norris and W.J. Sutherland. 2001. Why behavioural responses may not reflect the population consequences of human disturbance. Conservation Biology 97:265-268.

The authors discuss whether the degree of behavioral disturbance a population shows is a good indicator of the species that require greatest concern for conservation. The paper does not address noise specifically, but raise the important point that species showing the greatest effect are not necessarily those that need to be considered first in road planning.

56. Green, R.E., G.A. Tyler and C.G.R. Bowden. 2000. Habitat selection, ranging behaviour and diet of the stone curlew (*Burhinus oedicnemus*) in southern England. Journal of Zoology (London) 250:161-183.

The authors report on the numbers of stone curlews (nocturnal bird) near major roads. The populations were found to be diminished within 3 km of the road. The authors conclude that traffic noise or movement are the most likely cause although the levels of noise encountered are not given. Because this species it is suggested the visual stimuli could have a greater effect although this is not tested. There is no evidence of a lessening of this effect if the habitat nearby is less abundant (i.e. do not appear near the road if habitat may be more suitable than that at a distance).

57. Grubb, T.G. and R.M. King 1991. Assessing human disturbance of breeding bald eagles with classification tree models. Journal of Wildlife Management 55:500-511.

The authors look at the effect of both pedestrian activity and aircraft overflights on breeding bald eagles. They report that pedestrians were more disturbing. The levels of noise are not given, but this demonstrates that noise alone is not the only factor causing disturbance.

58. Grubb, T.G., L.L. Pater and D.K. Delaney. 1998. Logging truck noise near nesting northern goshawks. USDA Forest Research Service Note RMRS-RN-3.

The authors report on the effect of logging trucks on a breeding female and juvenile goshawk. There was no discernable effect on either bird with peak noise about 80 Hz and ~ 50 dB(A).

59. Gutzwiller, K.J. and W.C. Barrow. 2003. Influences of roads and development on bird communities in protected Chihuahuan desert landscapes. Biological Conservation 113:225-237.

The authors looked the abundance and species richness of 26 species of birds in the desert. The average number of vehicles was 400-459 per day with a speed limit of 45 mph. Both abundance and species richness were reduced for 21 of 26 species within 1-2 km of the road. Other variables were said to be controlled for in the study. The levels of noise were not measured.

60. Hastings, M.C. 1995. Physical effects of noise on fishes. Inter-noise 95, the 1995 International congress on noise control Engineering Vol 2: 979-984.

This report presents a summary of the frequencies and sound pressure levels f a number of fish species. It includes the threshold levels for sensitivity and a summary of frequencies that are best for fish sensitivity. It is a useful summary for prediction of response of species to anticipated noise levels.

61. Hawkins, A.D. 1986. Underwater sounds and fish behaviour. pp. 114-151. In: The behaviour of teleost fishes. T.J. Pitcher (ed.) The Johns Hopkins Press, Baltimore, MD. 553 pp.

The author presents a review of the levels of sound perceived by a variety of fish species. This can be useful for obtaining data to make predictions about how fish in a given area may respond to noise.

62. Hendriks, R.W. 1989. Traffic noise attenuation as a function of ground vegetation. California Department of Transportation Report FHWA/CA/TL-89/09.

The author describes the physics of noise attenuation in various types of environment (e.g. forest, open field) indicating the rate at which different environments affect distance of transmission. There is no discussion of the needs of a particular species, but does provide a useful background in considering the environment in the impact of noise.

63. Henson, P. and T.A. Grant. 1991. The effects of human disturbance on trumpeter swan breeding behavior. Wildlife Society Bulletin 19:248-257.

The authors describe the response of trumpeter swans to road traffic and report that it did not greatly alter behavior as long vehicles did not stop. Louder vehicles were reported to cause a greater disturbance. There is no measurement of the traffic or noise levels so the threshold for a response is not given.

64. Hienz, R.D. and M.B. Sachs. 1987. Effects of noise on pure-tone thresholds in blackbirds (*Agelaius phoeniceus* and *Molothrus ater*) and pigeons (*Columbia livia*). Journal of Comparative Psychology 101:16-24.

This study reports on the critical ratios (the sound level above background) required for sounds to be audible in several species of birds. It is indicated that these ratios are greater for birds than for humans at all levels. It is important to have background information on the auditory requirements of birds in assessing the impact of noise on these species.

65. Jackson, J.A. 1976. Rights-of-way management for an endangered species: the red-cockaded woodpecker. pp. 248-252 In: Symposium on environmental concerns in rights-of-way management, Mississippi State University, January 6-8.

The author discusses the fact that the red-cockaded woodpecker (an endangered species) has some populations located along interstate ROW and that many colonies are found adjacent to roads. It is suggested that interstate ROW can be used to link populations. Although the level of noise is not indicated it is clear that this population is not greatly disturbed by the adjacent noise.

66. Johnson, S.R., D.R. Herter, M.S.W. Bradstreet. 1987. Habitat use and reproductive success of Pacific eiders *Somateria mollissima v-nigra* during a period of industrial activity. Biological Conservation 41:77-89.

The authors describe the response of Pacific eiders to industrial activity and to aircraft overflights (mainly helicopters). The overflights did not appear to have any negative effect on the birds or the number of nests on the island. The presence of experimental observers appear to have a greater effect.

67. Joselyn, G.B., J.E. Warnock and S.L. Etter. 1968. Manipulation of roadside cover for nesting pheasants – a preliminary report. Journal of Wildlife Management 32:217-233.

The authors report on the use of roadsides by pheasants for nesting. They report that roadsides are more successful than other habitats (including unseeded controls) and that levels of predation were not greater in the ROW. Noise levels are not given, but a deleterious effect would be argued against by the large numbers of breeding birds found in this area.

68. Knight, T.A. 1974. A review of hearing and song in birds with comments on the significance of song in display. Emu 74:5-8.

The author reviews both hearing and vocalization in a number of bird species and discusses the various uses of vocalization in birds including isolation of species, pair-bond, pre-copulatory display, territorial defense, signaling danger, food sources and flock cohesion.

69. Knight, R.L. and K.J. Gutzwiller. 1995. Wildlife and Recreationists: Coexistence through Management and Research. 372 pp. Island Press: Washington, D.C.

The authors provide an overview of the interactions between wildlife and human activity. There is only a brief overview of the effect of roads and noise and this is probably more useful as a general reference.

70. Knudsen, F.R., P.S. Enger and O. Sand. 1992. Awareness reactions and avoidance responses to sound in juvenile Atlantic salmon. *Salmo salar* L. Journal of Fish Biology 40:523-534.

This study reports on the sensitivity of Atlantic salmon smolts to sound including the frequency and pressure levels that caused an effect and avoidance. This could be used if this or a similar species were under consideration, particularly if areas where juveniles would be found were under consideration.

71. Krausman, P.R. and J.J. Hervert. 1983. Mountain sheep responses to aerial surveys. Wildlife Society Bulletin 11:372-375.

The response of mountain sheep to overflights by small aircraft (Cessna) at altitudes of greater than 50 m was not great. Likewise, moose exposed to overflights at altitudes above 100 m showed no particular disturbance. The levels of noise are not given in this study.

72. Krausman, P.R., B.D. Leopold and D.L. Scarborough. 1986. Desert mule deer response to aircraft. Wildlife Society Bulletin 14:68-70.

The authors report that desert mule deer could become habituated to overflights by small aircraft (Cessna) at an average altitude of 80 m. The level of noise generated by these flights is not given.

73. Kushlan, J.A. 1979. Effects of helicopter censuses on wading bird colonies. Journal of Wildlife Management 43:756-760.

The author discusses the response of a number of wading birds in Florida (egrets, herons, storks, cormorants) to aircraft overflights. There are no significant responses indicated to most overflights although the sound levels are not given making it difficult to quantify the level of disturbance.

74. Langowski, D.J., H.M. Wight and J.N. Jacobson. 1969. Responses of instrumentally conditioned starlings to aversive acoustical stimuli. Journal of Wildlife Management 33:669-677.

The study details the response of starlings to sounds over a range of sound frequencies and intensities and that there is a relationship between the intensity and level of disturbance. The range of effect is between about 50-100 dB. This forms part of a body of information indicating the level of sounds that can be disturbing to birds.

75. Laurensen, K. 1981. Birds on roadside verges and the effect of mowing on frequency and distribution. Biological conservation 20:59-68.

The author reports on the use of roadside verges in Denmark by the skylark finding that the birds preferred to forage in this area as compared to adjacent fields. The ROW was also found to be a favored site for nesting when compared to adjacent areas. The roadside areas varied between 1 and 5m. A similar response is reported for the house sparrow and tree sparrow although these are not discussed to the same extent. The level of noise and traffic volume were not measured although the studies occurred outside of major urban areas.

76. Liddle, M. 1997. Recreation ecology: The ecological impact of outdoor recreation and ecotourism. 639 pp. Chapman and Hall: New York.

The author describes a wide variety of interactions between human activity and the response of all animal groups (fish, reptiles, amphibians, birds, mammals). The level of disturbance is qualified at three levels from mild to extreme. There is discussion of a variety of effects, however only a small portion is actually devoted to the effects of noise and is included under different sections for various species.

77. Luce, A. and M. Crowe. 2001. Invertebrate terrestrial diversity along a gravel road on Barrie Island, Ontario, Canada. The Great Lakes Entomologist 34:55-60.

The report looks at the numbers of terrestrial arthropods (insects) at distances up to 15 m from a gravel road finding no significant changes in numbers. This is one of the few studies that deals with invertebrate numbers at varying distances from a roadway although it does not address noise specifically.

78. Lyon, L.J. 1983. Road density models describing habitat effectiveness for elk. Journal of Forestry 81:592-595.

The authors present a method for determining the amount of elk use based on the amount of roaded area. The study does not directly address noise, but does predict significant reductions in use of areas with a density of more than 5.5 miles of road per square mile of area. The fact that roads can cause an effect is important, however the extent to which this reflects a physical barrier versus a noise effect remains to be determined.

79. Mader, H.J. 1981. Animal habitat isolation by roads and agricultural fields. Biological Conservation 29:81-96.

Report on the effect of emissions from roads (including noise) as having a potential effect on inhibiting movement of carabid beetles near the road. It is one of few studies to mention noise with respect to these invertebrates. This study also reports on two species of forest mice that were inhibited from crossing a two-lane highway. In this case noise is included in a suite of possible causes for the effect, however the specific levels of noise or traffic are not given.

80. Malar, T. and H. Kleerkoper. 1968. Observations on some effects of sound intensity on the locomotor pattern of naïve goldfish. American Zoologist 8:741-742.

This study reports on the sound frequency and pressure level that caused avoidance reaction in goldfish. The study does not detail a range of frequencies and intensities to give a broader indication of the response of this species.

81. Manci, K.M., D.N. Gladwin, R. Vilella and M.G. Cavendish. 1988. Effects of aircraft noise and sonic booms on domestic animals and wildlife: a literature synthesis. National Ecology Research Center Report# NERC-88/29.

The authors provide a review the effects of noise (mainly from aircraft or simulated sonic booms) on a variety of wildlife. The report deals with all major wildlife groups, but the sound levels are generally louder and of shorter duration than road noise. The overview of material is quite extensive.

82. Marten, K. and P. Marler. 1977. Sound transmission and its significance for animal vocalization. Behavioral Ecology and Sociobiology 2:271-290.

The authors report on factors that can effect sound transmission including the height of transmission (close to ground attenuates faster) and frequency. Thus, perch height may be important in the amount of transmission.

83. McGurk, B.J. and D.R. Fong. 1995. Equivalent roaded area as a measure of cumulative effect of logging. Environmental Mangement 19: 609-621.

Studied the effect of the effective roaded area on the numbers of aquatic invertebrates. Although the index is developed based on a model it does show a diversity decline as the effective roaded area increase above 5%.

84. Memphis State University. 1971. Effects of noise on wildlife and other animals. United States Environmental Protection Agency Office of Noise Abatement and Control Washington, D.C. Document NTID300.5.

The authors review the effect of noise on wildlife. At the date of publication most of the information dealt with domesticated birds and mammals. There is some material on the effects of noise on livestock, but much of the information deals with the sensitivities of species or the sound levels that can physical damage the hearing apparatus of species. There is very little information on roads or the sound levels that are likely to be encountered near roadways. The review of material as of the date of preparation is quite extensive.

85. Michael, E.D. 1975. Effects of highways on wildlife. West Virginia Department of Highways Report FHWA-WV-76-09.

A review of the response of vertebrate species to an adjacent highway at distances up to 1 mile into the surrounding woods. The study is able to compare distributions of species prior to and one year following the construction of a highway. The effect of noise is not addressed specifically, however, the effect on the numbers of several and species are given both before and following construction of a highway in the Appalachians. No game animal showed a difference in distribution following the road construction including rabbits, squirrels, foxes and deer. Rabbits are reported to increase in numbers near the

road. The numbers of birds and species diversity is reported to be greater in the ecotone than in either the ROW or native forest. None of the bird species were adversely affected and the authors speculate that numbers of species that prefer ecotone or ROW vegetation may increase including starlings, indigo buntings, red-winged blackbirds and goldfinches.

86. Michael, E.D., C.R. Ferris and E.G. Haverlack. 1976. Effects of highway rights of way on bird populations. Proceedings of the First National Symposium on Environmental Concern. pp. 253-261.

The authors report on the use of planted ROW habitat by bird species. More bird species were found in the ecotone compared to the surrounding forest up to one mile from the road. It is noted that the ROW supports both insects and rodents as food sources and that species requiring forest habitat would be expected to be reduced. The fact that some species occur in significant numbers indicates that noise was not sufficient to repel them.

87. Minton, Jr. S.A. 1968. The fate of amphibians and reptiles in a suburban area. Journal of Herpetology 2:113-116.

An early study of the effect of roads on a number of amphibians and reptiles (snakes, turtles). It does not address noise directly suggesting that this was not recognized as significant, but does discuss some of the initial observations of barrier effects of roads themselves.

88. Munguira, M.L. and J.A. Thomas. 1992. Use of road verges by butterfly and burnet populations and the effect of roads on adult dispersal and mortality. Journal of Applied Ecology 29:316-329.

A side ranging study of the numbers of butterfly species present on the roadside verges of major roads in England. The large number of species (23 or 40% of total found in England) suggests little effect of noise. The noise levels are not given in the study.

89. Norén, O. 1987. Noise from animal production. pp. 27-46. In: Animal Production and Environmental Health. D. Strauch (ed.). Elsevier Science Publishers: New York.

The author provides a good basic introduction to the principles of sound production and measurement. He further discusses the principles of sound propagation and attenuation. This is useful in understanding the principles that affect sound.

90. Oetting, R.B. and J.F. Cassel. 1971. Waterfowl nesting on interstate right of way in North Dakota. Journal of Wildlife Management 35:774-781.

The authors report on the use of interstate-94 ROW areas by dabbling ducks (mallard, pintails, gadwalls) for nesting. The amount of breeding was greater in unmowed ROW than in mowed areas. The level of noise is not measured and there is no comparison to control areas away from the ROW. However, numbers of birds were found to breed in the ROW and it is suggested that the road may have served as a barrier to the movement of predatory foxes.

91. Okanoya, K. and R.J. Dooling. 1987. Hearing in passerine and psittacine birds: a comparative study of absolute and masked auditory thresholds. Journal of Comparative Psychology 101:7-15.

authors measured the auditory threshold of several species (starling, sparrow, finch) and determined the critical ratio necessary for audibility over a range of frequencies. From a range of 0.4 Hz to 6 kHz the ratio rises from ~ 20-35 dB. This information may be important in determining the levels of vocalization necessary for detection against background noise.

92. Oxley, D.J., M.B. Fenton and G.R. Carmody. 1974. The effects of roads on populations of small mammals. Journal of Applied Ecology 11:51-59.

The movement of small mammals (rodents) adjacent to roads is described including 4 lane interstate highways. The results show that the large highways are as effective as bodies of water twice as wide preventing distribution of these species. The effect is described as a barrier and noise is not discussed as contributing factor.

93. Owens, N.W. 1977. Responses of wintering Brent geese to human disturbance. Wildfowl 28:5-14.

This report details the disturbance of Brant geese to overflights (at altitudes between 500 m and 1.5 km) and to human pedestrian activity. The levels of sound associated with the disturbance are not quantified. The results do indicate that human presence can be as disturbing as the much louder noise of aircraft.

94. Popper, A.N. and R.R. Fay. 1993. Sound detection and processing by fish: a critical review and major research questions. Brain, Behaviour and Evolution 41:14-39.

The authors present a review of hearing in fish. It contains a fairly extensive review of the anatomy of sound detection in fish and presents some information on the range of detection possible by fish. It provides less of an indication of the

frequencies and sound levels detected by a variety of fish species that are found in other reviews.

95. Räty, M. 1979. Effect of highway traffic on tetraonid densities. Ornis Fennica 56:169-170.

The author conducted one of the first studies to look at the distribution of birds usiung a series of transects away from a roadway. The study looked at grouse species at distances up to 1 km from a road with a traffic density of 700-3,000 cars / day. A reduction in density of two thirds was reported at a distance up to 250 m from the road and some reduction in density was found up to 500 m. The study began at a distance of 25 m from the roadway so there is no information about use of the ROW for comparison. The cause of this "highway effect" is not given and the levels of noise are not measured.

96. Reijnen, M.J.S.M., J.B.M. Thissen and G.J. Bekker. 1987. Effects of road traffic on woodland breeding bird populations. Acta Ecologia/Ecologia Generalis 8: 312-313.

This is the first study by the research group in the Netherlands that looked at the effect of traffic on nearby breeding birds. It was found that the numbers of breeding birds declined at distances up to 300 m from the road (the greatest distance measured). The road was heavily traveled with traffic levels of 30,000-40,000 vehicles / day. The level of noise was not measured in this study.

97. Reijnen, R. and R. Foppen. 1994. The effects of car traffic on breeding bird populations in woodland I. Evidence of reduced habitat quality for willow warblers (*Phylloacopus trochilus*) breeding close to a highway. Journal of Applied Ecology 31:85-94.

The authors, in the first of a series of studies, looked at willow warbler numbers and in particular, older, territorial males at distances of up to 400 m from a busy highway (50,000 cars /day). It was found that the numbers of the older birds were greatest at the farthest distance from the road (400 m) indicating a preference for this area. The authors suggest that noise may be an important factor (estimated at 50 dB(A) at a distance of 500 m) in this effect.

98. Reijnen, R. and R. Foppen. 1995. The effects of car traffic on breeding bird populations in woodland. IV. Influence of population size on the reduction of density close to the highway. Journal of Applied Ecology 32:481-491.

This study conducted in the Netherlands looked at the numbers of 43 species of woodland birds in both deciduous and coniferous forests. It is found that 26 species (60%) showed some negative effect. This study reports that noise is the best independent variable for predicting the "effect distances". The numbers of individuals were found to be reduced between 40-1,500 m at a traffic density of

10,000 cars/day and 70 -2,800 m at a density of 60,000 cars/day. The frequency range of noise was between 100 Hz and 10 kHz but loudest at 100-200 Hz and 0.5 to 4 kHz. The threshold for an effect seemed to be between 20-56 db(A). The authors note that if the level of noise is held constant there was no apparent difference in areas of high and low vehicle visibility.

99. Reijnen, R., R. Foppen, C. Ter Braak and J. Thissen. 1995. The effects of car traffic on breeding bird populations in woodland. III. Reduction in the density in relation to the proximity of main roads. Journal of Applied Ecology 32: 187-202.

The authors report on 23 species of woodland birds adjacent to a highway with relatively high density (40-52,000 cars / day). Of the total species 17 showed some reduction in numbers nearer to the road. The effect was found to be diminished in years when the overall population was high presumably due to some individuals being forced into less desirable areas. It is suggested that measurements be made over several years to increase the accuracy of this measurement. The importance of looking at more than just density is supported by other reports such as that of van Horne (1983).

100. Reijnen, R., R. Foppen and H. Meeuwsen. 1996. The effects of car traffic on the density of breeding birds in Dutch Agricultural Grasslands. Biological Conservation 75:255-260.

The authors report on the numbers of grassland bird species adjacent to roads where 7 of 12 species studied showed some effect. Roads with moderate traffic volume (5,000 cars/day) showed a 12-56% of most species within 100 m of the road beyond 100 m only the black-tailed godwit and oystercatcher showed an effect. Roads with higher density (50,000 cars/ day) showed a reduction of 12-52% at distances up to 500 m. The lapwing, shoveler, black-tailed godwit and oystercatcher were reduced between 14 and 44% at distances up to 1500 m. The authors note that noise as the best predictor of these results carries a number of factors with it including number, size and speed of vehicles. Noise levels adjacent to the road were about 59 dB(A) and 38 dB(A) in more remote areas. It is worth noting that the surrounding habitat in the study was relatively undisturbed with no farmhouses within 250 m of the measured transect.

101. Roach, G.L. and R.D. Kirkpatrick. 1985. Wildlife use of woody plantings in Indiana. Transportation Research Record 1016:11-15.

The authors report on a number of bird species (red-winged blackbird, goldfinch, and song sparrow) using plantings in ROW (mainly in interstate highways). Plantings were found to significantly increase the use of the habitat compared to control areas.

102. Rost, G.R. and J.A. Bailey. 1979. Distribution of mule deer and elk in relation to roads. Journal of Wildlife Management 43:634-641.

The authors report on the effect of roads on deer and elk distribution and looked at paved, gravel and dirt roads. Their conclusion is that both attempted to avoid areas within 200m of the road and that the effect was greater for mule deer than for elk. They also note that road visibility did not apparently play a role in the density of either species. Whether there is an effect if noise is not discussed although the potential of an effect due to experience with hunting is discussed.

103. Rucker, R.R. 1973. Effect of sonic boom on fish. Department of Transportation, Federal Aviation Admininstration Report No. FAA-RD-73-29.

The author presents the results of sonic booms on the trout and salmon eggs and fry. The report does not detail the effect of lesser sound levels and thus is probably of more use in conjunction with other findings detailing the response of these and related species.

104. Rudolph, D.C., S.J. Burgdorf, R.N. Conner and R.R. Schaefer. 1999. Preliminary evaluation of the impact of roads and associated vehicular traffic on snake populations in eastern Texas. pp. 129-136. In: Proceedings of the third international symposium on wildlife ecology and transportation. G.L. Evink, P. Garrett and D. Ziegler (eds.). Florida Department of Transportation, Tallahassee, FL. Report No. FL-ER-73-99.

The author reports on the increased mortality of large snakes crossing roads. The similarity in effect in a range of road sizes and traffic volumes from interstate to county roads suggests that noise alone is not having a significant effect.

105. Scott, G.B. and P. Moran. 1993. Effects of visual stimuli and noise on fear levels in laying hens. Applied Animal Behaviour Science 37:321-329.

The author reports that there is no significant impact of noise from conveyor belts on laying hens. Sound levels were in the range of 70 dB. This is important in providing an indication of the levels of noise that can be tolerated by various birds.

106. Seabrook, W.A. and E.B. Dettmann. 1996. Roads as activity corridors for cane toads in Australia. Journal of Wildlife Management 60:363-368.

This report details the use of roads to dispersal by cane toads in Australia. The numbers of individuals were greater near the edge of the road or vehicle track. Although the traffic density is not given it appears to have been low. The impact of noise is not discussed although it did not appear to impair the use of roads by this species.

107. Shultz, R.D. and J.A. Bailey. 1978. Responses of national park elk to human activity. Journal of Wildlife Management 42:91-100.

The authors report on a study of Elk in Rocky Mountain national park finding that the presence of traffic resulted in only a slight avoidance in early winter. The specific effect of noise is not addressed.

108. Singer, F.J. 1978. Behavior of mountain goats in relation to US Highway 2, Glacier Park, Montana. Journal of Wildlife Management 42:591-597.

The author reports on the effect of a highway crossing a national park on mountain goat distribution (speed limit 50 mph). Both vehicles and highway noise are reported as perceived threats and would prevent animals moving toward salt licks. This is one of few studies of large ungulates to address noise as having an effect as opposed to road as barrier.

109. Singer, F.J. and J.B. Beattie. 1986. The controlled traffic system and associated wildlife responses in Denali National Park. Arctic 39:195-203.

The effect on several large mammals (caribou, grizzly, Dall sheep, moose) following the opening of a national park to a roadway is detailed. There was no significant decline in the sightings of any species except moose. Grizzly bears were reported to move closer to the road after construction. The level of noise is not given, but the presence of numbers of individuals suggests that there was no significant disturbance with the possible exception of moose.

110. Stadelman, W.J. 1958. The effect of sounds of varying intensity on hatchability of chicken egg. Poultry Science 37:166-169.

The author reports that there is no measurable effect on hatchability of chicken eggs or chick quality following exposure to noise in incubators. This is significant in that potential deleterious effects of noise on birds would include those on reproductive efficiency.

111. Stadelman, W.J. 1958. Observations with growing chickens on the effects of sounds of varying intensities. Poultry Science 37:776-779.

The author indicates that broiler chickens could be grown in areas of significant noise (~120 dB) without loss of weight. The potential effects of noise on both growth and development of birds is critical in evaluating the impact on wildlife.

112. Stalmaster, M.V. and J.R. Newman 1978. Behavioral responses of bald eagles to human activity. Journal of Wildlife Management 42:506-513.

The authors studied the effect of human activities on wintering bald eagles and report that normal activities such as boating and fishing did not disturb the birds.

Normal sounds from these activities are reported as not having an effect. However, gunshots did disturb them causing flight (escape behavior). This study does not give the levels of noise encountered or the effects of greater levels of noise.

113. Tabor, R. 1974. Earthworms, crows, vibrations and motorways. New Scientist 62:482-483.

Reports on the numbers of earthworms emerging near a major motorway and provides some explanation for the behavior. The report notes that birds (crows) may be attracted to roadside verges if food is available.

114. Thurber, J.M., R.O. Peterson, T.D. Drummer and S.A. Thomasma. 1994. Gray wolf response to refuge boundaries and roads in Alaska. Wildlife Society Bulletin 22:61-68.

The authors report on a survey of several wolf packs. The presence of the road alone appeared to no have a significant effect as the home range of one pack straddled the highway for several years whereas a less traveled road to an oilfield was less used possibly due to the human presence.

115. Trombulak, S.C. and C.A. Frissell. 2000. Review of the ecological effects of roads on terrestrial and aquatic communities. Conservation Biology 14:18-30.

The authors provide a general review of the effects of roads on the ecology of a variety of species. The study does not address the impact of noise extensively and is more useful as a general overview of factors to be considered in the environmental impact of roads most particularly disruption of the physical and chemical environment including fragmentation and mortality.

116. van der Zande, A.N., W.J. ter Keurs and W.J. Van der Weijden. 1980. The impact of roads on the densities of four bird species in an open field habitat-evidence of a long distance effect. Biological Conservation 18:299-321.

The authors report on a reevaluation of data gathered originally by Veen (1973) in the Netherlands. It is found that three species (lapwing, godwit and redshank) were reduced in density and numbers of nests at distances up to 500-600m from rural road and 1,600 to 1,800 m from a busy highway. A fourth species, the oystercatcher did not appear to show the same response. The level of noise was not measured for either type of road.

117. van Dyke, F.G., R.H. Brecke, H.G. Shaw et al. 1986. Reactions of mountain lions to logging and human activity. Journal of Wildife Management 50:95-102.

The activity of mountain lions in different levels of human activity is given. Areas where timber was being harvested had a more negative effect on the

presence of individuals than the overall road density. There is a potential avoidance zone for machine noise given between 100 m and 1 km. However, the specific levels of noise are not given.

118. van Horne, B. 1983. Density as a misleading indicator of habitat quality. Journal of Wildlife Management 47:893-901.

The author discusses the importance of using more than density as an indicator of the suitability of habitat by giving examples of cases in which density was high, but habitat less desirable due to some individuals being forced into marginal areas by older, more dominant ones. This is an important consideration in studies that wish to indicate whether there is an effect of noise or roads based on density alone.

119. Veen, J. 1973. De verstoring van weidevogelpopulaties. Stedebouw en Volkshuisvesting 53:16-26.

The author published original data on four species of bird in the Netherlands and the impact of roads on their density and nesting. The data are reevaluated in English by van der Zande et al. (1980) and are discussed there.

120. Vickery, P.D., M.L. Hunter, Jr. and S.M. Melvin. 1994. Effects of habitat area on the distribution of grassland birds in Maine. Conservation Biology 8:1087-1097.

The authors report on the amount of habitat area required for ten grassland bird species. The results range from 200 ha for the upland sandpiper to 10 ha for the savanna sparrow. The effect of noise is not discussed although the potential of using airports as sites for species conservation in more developed areas is made. It is important to note that some species require larger areas of habitat and that this may effect their utilization of areas nearer roadsides. The studies by Clark and Karr (1979), Ferris (1979) and some by Reijnen and colleagues suggest that habitat factors in addition to traffic and noise may be important in the utilization of roaded areas by birds.

121. Voorhees, L.D. and F.J. Cassel. 1980. Highway right-of-way: mowing versus succession as related to duck nesting. Journal of Wildlife Management 44:155-163.

The authors report on the use of interstate 94 ROW habitat in North Dakota by dabbling ducks. The same species are looked at as in an earlier study (Oetting and Cassel, 1971) and the preference for unmowed sections is the same as the earlier study. It is noted that nest success declined in areas where the vegetation was older perhaps due to increased predation. The levels of noise encountered are not mentioned and the response to noise can only be estimated from the frequent use of the ROW for nesting.

122. Ward, A.L., J.J. Cupal, A.L. Lea et al. 1973. Elk behavior in relation to cattle grazing, forest recreation and traffic. North American Wildlife National Research Conference Transactions 38:327-337.

The authors report on the effect of interstate 80 on elk behavior indicating both the noise level for both cars and trucks. There is little effect reported within 300 yards due to noise, however the road did act as a barrier to crossing.

123. Warner, R.E. and G.B. Joselyn. 1986. Responses of Illinois ring-necked pheasant populations to block roadside management. Journal of Wildlife Management 50:525-532.

The authors report on the breeding of ring-necked pheasants using roadsides and makes the important observation that in areas where much of the landscape is being used for agriculture (especially small grains) the ROW may provide a more suitable breeding area. The noise levels along the road are not given.

124. Warner, R.E., G.B. Joselyn and S.L. Etter. 1987. Factors affecting roadside nesting by pheasants in Illinois. Wildlife Society Bulletin 15:221-228.

The authors report on ring-necked pheasants using roadside plots where nest densities exceed those found in even control areas away from the road. It is also suggested that ROW can act as a buffer for other areas that experience greater variability. The effect of noise is not directly addressed the presence of significant numbers of breeding birds argues against a significant effect in this species.

125. Warner, R.E. 1992. Nest ecology of grassland passerines on road rights-of-way in central Illinois. Biological Conservation 59:1-7.

The author studied grassland birds along a (four-lane) interstate highway and secondary ROW in rural Illinois. The number of nests and species increased with roadside width being greatest on heavily trafficked interstates. Traffic densities on secondary roads also did not influence the density of nests. The vast majority of nests belonged to red-winged blackbirds. The levels of noise were not measured. It is notable that as surrounding farmland became more diverse the numbers of nests could also vary indicating that broader landscape factors also play a role in site selection.

126. Way, J.M. 1977. Roadside verges and conservation in Britain: A review. Biological Conservation 12:65-73.

The author provides a review of the use of roadsides for breeding by all major wildlife species in England. Both county roads and major highways were included. It is reported that 20 of 50 mammal species, 40 of 200 birds, 25 of 60 butterflies, 8 of 17 bumble bees and 5 of 6 amphibian species are found to use the

roadsides. It appears that the quantity of herb-rich grassland without scrub is particularly in the importance of the utilization of ROW habitat. The specific levels of noise are not discussed, but is in agreement with studies that have found species to breed in the ROW in numbers.

127. Wenz, G.M. 1962. Acoustic ambient noise in the ocean: spectra and sources. Journal of the Acoustical Society of America 34:1936-1956.

This paper presents a review of the levels of background noise encountered in the ocean including a review of sounds from ocean traffic. It presents a potentially useful overview of levels of sound and frequencies that are often encountered for comparison to other measurements.

Hesterly, Kinika

From: Kim Foy [kim.jslaw@gmail.com]
Sent: Friday, March 25, 2011 11:20 AM
To: Hesterly, Kinika
Subject: Comments on Tentative Parcel Map No. 30298
Attachments: TRANSPORTATION_RELATED_EARTHBORNE_VIBRATIONS.pdf

Attachment #6.

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Sacramento, CA

TRANSPORTATION RELATED EARTHBORNE VIBRATIONS

(Caltrans Experiences)

Technical Advisory, Vibration
TAV-02-01-R9601

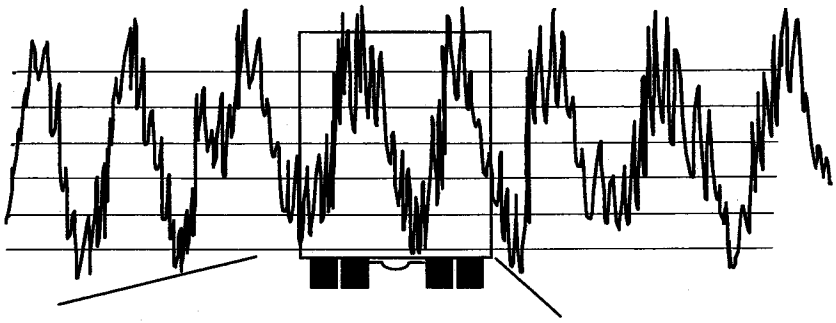
February 20, 2002

Prepared by Rudy Hendriks – Caltrans Retired Annuitant

NOTICE:

This document is a revision of technical advisory TAV-96-01-R9201 with the same title, prepared by the same author, dated June 13, 1996. This revision does not alter the basic information of the earlier version, except for the Rayleigh wave propagation equation (see eq.1 and associated eq.2), which was in error and has been corrected. The text associated with the equation as well as the text in figure 1 has also been changed. The error did not affect the vibration dropoff curve in figure 1. Some other changes were made in formatting and wording.

This document is not an official policy, standard, specification or regulation and should not be used as such. Its contents are for informational purposes only. Any views expressed in this advisory reflect those of the author, who is also responsible for the accuracy of facts and data presented herein. The latter were derived from Caltrans vibration studies from 1958 to 1994, and the author's vibration experiences from 1980 to 1994 at the Caltrans Transportation Laboratory (Translab) in Sacramento, CA.



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INTRODUCTION

This Technical Advisory is intended to give district environmental, materials, design, construction and other concerned personnel a basic understanding of transportation related earthborne vibrations. The advisory covers general vibration principles, vibrations caused by construction and operation of transportation facilities, criteria used by the California Department of Transportation (Caltrans), impacts, vibration study approaches, possible mitigation, and screening procedures to identify potential vibration problems in the field.

District personnel are usually the first to be contacted by the public when vibration problems occur. Until 1994, the district personnel in turn contacted the Caltrans laboratory (TransLab) and requested either an assesment of the problem or a vibration field study. In 1994, Translab discontinued the field studies because of a reorganization. Presently, HQ Division of Environmental Analysis, Noise, Air Quality and Hazardous Waste Management Office, Noise and Vibration Branch is responsible for providing guidance on potential vibration problems.

The information in this advisory will enable district personnel to participate in assessing and screening routine vibration complaints as well as provide background information for the oversight of more complex studies. This advisory will also be a useful source of information for developing contract specifications and oversight.

BACKGROUND

Caltrans has performed earthborne vibration studies since 1958. In 1976, a landmark TransLab vibration research report titled "Survey of Earth-borne Vibrations due to Highway Construction and Highway Traffic", Report No. CA-DOT-TL-6391-1-76-20, compiled a summary of results, findings, and conclusions of 23 studies completed in the 17 year period between 1958 and 1975. Since then many more studies have been performed. Most of these fall into the following three categories:

- Highway traffic vibrations
- Construction vibrations
- Train/light rail vibrations

The main concerns of vibrations involve:

- Annoyance
- Damage
- Disruption of vibration sensitive operations or activities
- Triggering of land slides

The sites investigated included private residences, factories, aerospace and defense plants, electronic laboratories, radio station, movie studio, etc., and even a major cake and pastry bakery.

Because of similarities between the disciplines of noise and vibrations, the former Noise Section took over the responsibilities for vibration studies from the Electrical Instrumentation Testing and Research Section in July, 1980. Almost two-thirds of the above mentioned studies were performed by the Noise Section, which, in 1994 was absorbed by the newly created Office of Environmental Engineering of the Environmental Program. The individual study reports are on file at the Office of Environmental Engineering. This advisory incorporates information and experience gained in all Caltrans vibration studies from 1958-1994.

FUNDAMENTALS OF EARTHBORNE VIBRATIONS

Vibration Sources

Sources of earthborne vibrations include natural phenomena (earthquakes, volcanic eruptions, sea waves, landslides, etc.), or manmade causes (explosions, machinery, traffic, trains, construction equipment, etc.). Vibration sources may be continuous such as factory machinery, and transient, such as explosions.

A distinction must be made between earthborne and airborne vibrations. Some sources, such as jet aircraft, rockets, explosions, sonic booms, locomotives, and even trucks under certain conditions, can create low frequency airborne noise of enough intensity to be felt, as well as heard. These low frequency airborne blasts or rumbles are often erroneously perceived as earthborne vibrations.

As is the case with airborne sound, earthborne vibrations may be described by amplitude and frequency.

Amplitude and Frequency

In airborne sound, amplitude is described by common logarithm of the square of the ratio of pressure fluctuations around mean air pressure divided by a reference pressure, and is expressed in logarithmic units of decibels. The pressure fluctuations propagate in waves of alternating compressed and rarefied air. The rate at which these waves radiate outward from their source is called the speed of sound, which is the wave velocity. Air is an elastic medium through which the waves travel.

In earthborne vibrations, amplitude is described by the local movement of soil particles. This movement must not be confused with wave velocity.

To distinguish between wave velocity and particle motion, consider the analogy of ripples on a lake and a floating cork. Wave velocity (in air, speed of sound) is analogous to the velocity of the ripples. Particle motion may be compared to the bobbing of the cork as the ripples pass by. The bobbing of the cork represents the local movement of the soil particles as earthborne vibration waves pass through the soil. The soil acts as an elastic medium.

The amplitude of particle motion may be described three ways:

1. **Particle displacement** - the distance the soil particles travel from their original position. Units are millimeters (mm). inches (in)

2. **Particle velocity** - the velocity of the soil particles. Units are inches per second (in/sec) or millimeters per second (mm/sec). Sometimes expressed logarithmically in decibels (dB) with reference to a specified unit of velocity such as .001 in/sec, or 0.001 mm/sec.

3. **Particle acceleration** - the acceleration of the soil particles. Units are inches per second per second (in/sec^2), millimeters per second per second (mm/sec^2), or g-force (g = acceleration of gravity = 32.2 feet per second per second (ft/sec^2) = 9.81 meter per second per second (m/sec^2). Sometimes expressed logarithmically in decibels (dB) with reference to a specified unit of acceleration, such as 1 g, or 0.001g.

For a perfect sine wave produced by a single vibration frequency there exists a simple relationship between the above three measures of amplitude (see Appendix). If the frequency and amplitude of one descriptor is known, the other two can easily be calculated. For waves consisting of many frequencies, and therefore not sine waves, the relationships become much more complicated.

There is a 90 degree phase shift between the three descriptors, i.e. velocity is 90 degrees out of phase with displacement, acceleration is 90 degrees out of phase with velocity, and acceleration is 180 degrees out of phase with displacement. To illustrate this, we might imagine a pendulum just released from a point furthest away from its stationary position. If we arbitrarily call this position the extreme positive (+) position of the pendulum, the stationary point 0, and the region beyond the stationary point a negative (-) position, we observe the following:

- at the point of release, the displacement (distance from stationary or 0 displacement position) is maximum and positive (+).
- the velocity at the point of release is 0.
- the acceleration at the point of release is at its maximum, in the direction towards the negative (-).

This can be worked out the same for other pendulum positions. For instance, as the pendulum swings through the stationary position, the displacement is 0, the velocity is maximum in the negative (-) direction, and the acceleration is 0. Once past the

stationary point the pendulum decelerates in the negative (-) direction which is the same as increasing acceleration in the positive (+) direction.

Vibration amplitudes are usually expressed as either "peak", as in peak particle velocity, or "rms" (root mean square), as in rms acceleration. The relationship between the two is the same as with noise. The rms value is approximately 0.71 x the peak value for a sine wave representing iether displacement, velocity, or acceleration.

Finally, the direction in which vibrations are measured, analyzed or reported should be specified (vertical, horizontal longitudinal, horizontal transverse, or the resultant of all three motions). For example, Caltrans most often uses a peak vertical particle velocity descriptor, because vibrations along the ground surface are most often (although not always) greatest in the vertical direction.

Propagation

Propagation of earthborne vibrations is complicated because of the endless variations in the soil through which waves propagate.

The relationship between frequency (**f**), period (**T**), wave length (λ), and wave velocity (**c**) is the same as that in noise, that is:

$f=1/T$ and $f=c/\lambda$

However, the wave velocity (c, sometimes also called the phase velocity) in soils varies much more than the speed of airborne sound does, and is often also frequency dependent (the speed of sound only varies with temperature). As a consequence, wavelength cannot readily be calculated when frequency is known and vice versa, unless the wave velocity happens to be known also.

There are three main wave types of concern in the propagation of earthborne vibrations:

1. **Surface or Rayleigh waves**, which as the name implies, travel along the ground surface. They carry most of their energy along an expanding cylindrical wave front, similar to the ripples produced by throwing a rock into a lake. The particle motion is retrograde elliptical, more or less perpendicular to the direction of propagation.
2. **P-waves, or compression waves.** These are body waves that carry their energy along an expanding spherical wave front. The particle motion in these waves is longitudinal, "push-pull". P-waves are analogous to airborne sound waves.
3. **S-waves, or shear waves.** These are also body waves, carrying their energy along an expanding spherical wave front. Unlike P-waves, however, the particle motion is transverse, or perpendicular to the direction of propagation.

As wave fronts move outward from a vibration source, their energy is spread over an ever increasing area. The more rapidly this area increases, the more quickly the energy intensity (energy per unit area) decreases. The areas of cylindrical Raleigh wave fronts

do not increase as rapidly with distance as do the body (P- and S-) waves. Consequently, the energy intensities of Raleigh waves attenuate at a lesser rate with distance than those of body waves.

The spreading of energy over ever increasing areas is called geometric spreading (geometric attenuation) and the difference in attenuation rates between surface and body waves is analogous to that of line sources and point sources, respectively, in airborne sound. Geometric attenuation also results of encountering more soil mass as the area of the wave front increases.

Geometric attenuation is not the only attenuation encountered with distance. Hysteretic attenuation, or material damping, results from energy losses due to internal friction, soil layering, voids, etc. The amount of hysteretic attenuation varies with soil type, condition, and frequency of the source.

These variations make it much more difficult to predict vibration levels at specific locations, than it is to predict noise levels.

In general, manmade earthborne vibrations attenuate rapidly with distance from the source. Even the more persistent Rayleigh waves decrease relatively quickly. Manmade vibration problems are therefore confined to short distances from the source.

In contrast, natural vibration problems are often wide spread. An obvious example is an earthquake which can cause damage over large areas, due to the release of enormous quantities of energy.

TRANSPORTATION RELATED EARTHBORNE VIBRATIONS

Sources

Caltrans is most commonly concerned with three types of transportation related earthborne vibration sources:

- Normal highway traffic - heavy trucks, and quite frequently buses, generate the highest earthborne vibrations of normal traffic. Vibrations from these vary with pavement conditions. Pot holes, pavement joints, differential settlement of pavement, etc., all increase the vibration levels.
- Construction equipment - pile driving, pavement breaking, blasting, and demolition of structures generate among the highest construction vibrations.
- Heavy and light rail operations - diesel locomotives, heavily loaded freight cars, and operations such as coupling create the highest rail traffic vibrations.

Of the above three types, construction vibrations are of greatest concern. The four operations mentioned under construction vibrations are potentially damaging to buildings at distances of less than 7.5 m (25 ft) from the source.

Descriptor Used By Caltrans

With the exception of some construction operations such as pile driving, pile hole drilling, and perhaps some deep excavations, all vibrations generated by construction or operation of surface transportation facilities are mainly in the form of surface or Raleigh waves. Studies have shown that the vertical components of transportation generated vibrations are the strongest and that peak particle velocity correlates best with damage and complaints. For these reasons, Caltrans adopted the Peak Vertical Particle Velocity descriptor, with units of mm/sec or in/sec.

A great advantage of using this descriptor is that for a frequency range of 1 - 80 Hz damage levels in terms of velocity tend to be independent of frequency. The same is true for complaint levels within a range of 8 - 80 Hz. Velocity is the product of frequency, displacement and a constant (see appendix). It appears that within the above frequency ranges a doubling of frequency will offset a halving of displacement and vice versa; i.e. the effects of the product of the two tend to remain equal. Typical transportation and construction vibrations fall within the above frequency ranges. They typically range from 10 - 30 Hz, and usually center around 15 Hz.

From the above we can surmise that not only the effects of displacement are frequency dependent, but also those of acceleration. The latter is related to the former by the frequency times a constant squared (see appendix). Thus, criteria levels in terms of displacement or acceleration need to be accompanied by a frequency.

Propagation of Transportation Related Vibration

Raleigh (Surface) Wave Drop-off - Surface waves generated by traffic, trains, and most construction operations tend to attenuate with distance according to the following equation:

$$V = V_0(D_0/D)^{0.5}e^{\alpha(D0-D)} \qquad \textbf{(eq. 1)}$$

where: V = Peak particle velocity at distance D
V_0 = Peak particle velocity at reference distance D_0
D_0 = Reference distance
D = Distance for which vibration level needs to be calculated
e = Base of natural logarithm = 2.718281828
α = Soil parameter

The soil parameter α can be determined by simultaneous vibration measurements at a minimum of two different distances from a source. One distance should be near the source, ideally between4.5 and 7.5 m (15 -25 ft). The other should be farther away from the source, ideally at or beyond the farthest point of interest, but at a location where the source is still measurable and not contaminated by other vibrations. A third

point in between is recommended for confirmation. Note that the value of α depends on the distance units used. The reason for this is that the exponential $(D_0 - D)\ \alpha$ needs to be a constant value while the value of $(D_0 - D)$ changes with the units used (normally, m or ft). Therefore, the relationship between α (based on m) and α (based on ft) is:

α (based on m) = 3.281α (based on ft), and
α (based on ft) = 0.305 α (based on m)

α can be calculated from the vibration measurements by rewriting eq. 1 as:

$$\alpha = (\ln V^2 + \ln D - \ln V_0^2 - \ln D_0)/2(D_0 - D) \qquad \textbf{(eq. 2)}$$

where "ln" denotes "natural logarithm"

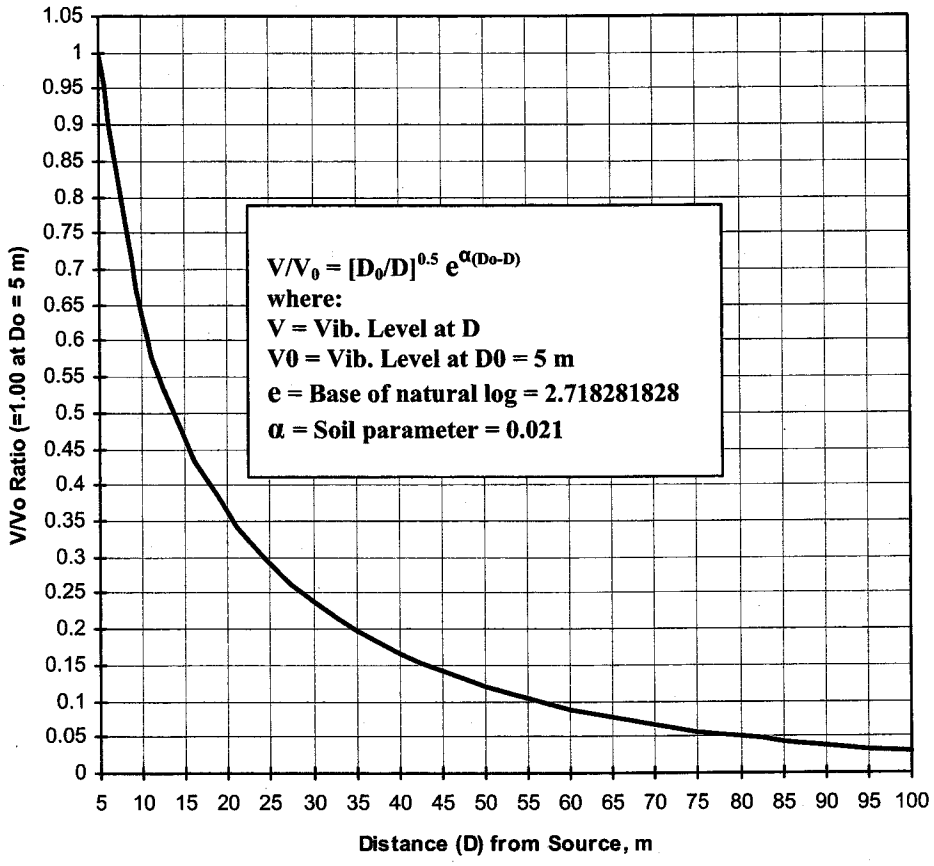
Once α is calculated from the measurements it can be used in eq. 1 to calculate vibrations for any other distance, given the same reference source.

Figure 1 shows a drop-off curve expressed as a ratio of V/V_0, using a reference distance D_0 of 5 m (16 ft). This is a normalized curve for α = **0.021** (distance in m), or α = **0.006** (distance in ft), derived from data measured in the City of Lynwood to calculate α for the LA-105 Alameda Viaduct vibration study, involving traffic effects on Westech Gear Corporation (formerly Western Gear) close tolerance manufacturing operations. The attenuation curve in Figure 1 is valid for the soils stratification derived from Caltrans boring logs for the Alameda Viaduct, shown in Table 1.

Table 1. - Soils Classifictaions for Figure 1.

Depth, m (ft)	Soil Description
0	
	Sand-Silt
1.5 (5)	
	Clayey Silt
9 (29)	
	Silty Sand
12 (40)	
	Sandy Silt
15.5 (51)	
	Sand
19.5 (64)	

Figure 1. Typical Normalized Distance Attenuation Ratio Curve of Earthborne Surface Vibrations (Reference Distance, Do = 5 m)



The curve is representative of many locations in the L.A. Basin, and also of various locations in Sacramento, and can be used for estimating traffic, train, and most construction vibration drop-offs with distance. To use the curve, the vibration level V_1 must be known at a given distance D_1 near the source, preferably between 5 and 15 m (16 and 50 ft). The vibration level V_2 at the distance of interest D_2 can then be calculated as follows:

$$V_2 = (V_2/V_0)/(V_1/V_0) \cdot V_1$$

(the ratio's V_2/V_0 and V_1/V_0 can be obtained from Figure 1)

For example, if the vibration level is known to be 3.2 mm/s (peak particle velocity) at a distance of 12 m, the vibration level at 58 m can be estimated from (0.09/0.55) x 3.2 mm/s = 0.5 mm/s.

Pile Driving Vibration Drop-off - During pile driving, vibration levels near the source depend mainly on the soil's penetration resistance. In soils such as sand and silt, this resistance is relatively low with the result that a large portion of the impact energy is used to advance the pile. Less energy is then available for generating ground vibrations. In clay soils, however, the penetration resistance is higher and more energy is available for ground vibrations. The resistance provided by the soils consists of friction along the sides of the pile as well as compressional resistance due to the transfer of energy of the pile tip to the soil. This appears to generate body waves as opposed to surface waves by other construction operations.

The energy of a pile driver is of course also influential on the vibration level at the source. There is a relationship between vibration level and energy. If pile driver energy changes from E_1 to E_2, the vibration level at a certain location changes from V_1 to V_2, where:

$$V_2 = V_1\left(\sqrt{\frac{E_2}{E_1}}\right) \qquad \textbf{(Eq. 3)}$$

Example: E_1 = 68,000 J (50,000 ft lbf)

E_2 = 111,900 J (82,500 ft lbf)

V_1 = 2.8 mm/s

Then: $V_2 = 2.8\left(\sqrt{\frac{111{,}900}{68{,}000}}\right) = 3.6$ mm/sec

Vibrations of pile driving appear to drop off differently than the Raleigh waves, probably due to the presence of a significant proportion of body waves. Pile driving vibrations tend to drop off with distance according to the following equation:

$$\mathbf{V = V_0.(D_0/D)^k} \qquad \textbf{(Eq. 4)}$$

where: V, V_0, D_0, and D are same as defined in Eq. 1, and
k = soil parameter (no units)

(Note that α and **k** are different parameters; whereas the value of α is dependent on the distance units used (m or ft), the value of k - which depends only on the ratio of distances - is independent of distance units used.)

Generally, the values of "k" lie between 1 to 1.5 (approaching 1 for sandy soils and 1.5 for clay soils), although values > 1 and < 1.5 have been encountered.

The value of "k" can be determined experimentally at different distances from a pile driver, similarly to the previously described derivation of α. For this purpose, Eq. 4 can be rewritten as:

$$k = (LogV - LogV_0)/(Log\ D_0 - LogD) \qquad \textbf{(eq. 5)}$$

Caltrans Vibration Criteria

There are no FHWA or state standards for vibrations. The traditional view has been that highway traffic and construction vibrations pose no threat to buildings and structures, and that annoyance to people is no worse than other discomforts experienced from living near highways.

Damage - A considerable amount of research has been done to correlate vibrations from single events such as dynamite blasts with architectural and structural damage. The U.S. Bureau of Mines has set a "safe blasting limit" of 50 mm/s (2 in/sec). Below this level there is virtually no risk of buiding damage.

"Safe" levels for continuous vibrations from sources such as traffic are not as well defined. The Transport and Road Research Laboratory in England has researched continuous vibrations to some extent and developed a summary of vibration levels and reactions of people and the effects on buildings (Table 2). These are the criteria used by Caltrans to evaluate the severity of vibration problems. Traffic, train, and most construction vibrations (with the exception of pile driving, blasting, and some other types of construction/demolition) are considered continuous. The "architectural damage risk level" for continuous vibrations (peak vertical particle velocity of 5 mm/sec or 0.2 in/sec) shown in Table 2 is one tenth of the maximum "safe" level of 50 mm/sec (2 in/sec) for single events.

All damage criteria for buildings are in terms of ground motion at the buildings' foundations. No allowance is included for the amplifying effects of structural components. Obviously, the way a building is constructed and the condition it is in determines how much vibration it can withstand before damage appears. Table 2 shows a recommended upper level of 2.0 mm/s (0.08 in/sec) for continuous vibrations to which "ruins and ancient monuments" should be subjected. This criterion level may also be used for historical buildings, or buildings that are in poor condition.

Relatively little information is available concerning the damaging effects of pile driving. Although technically a series of single events, pile driver blows occuring often enough in

a confined area could cause damage at a lower level than the single event criterion of 50 mm/s (2 in/sec). Caltrans has experienced some minor damage from sustained

Table 2 - Reaction of People and Damage to Buildings at Various Continuous Vibration Levels

Vibration Level (Peak Particle Velocity)*			
mm/s	in/sec	Human Reaction	Effect on Buildings
0.15-0.30	0.006-0.019	Threshold of perception; possibility of intrusion	Vibrations unlikely to cause damage of any type
2.0	0.08	Vibrations readily perceptible	Recommended upper level of the vibration to which ruins and ancient monuments should be subjected
2.5	0.10	Level at which continuous vibrations begin to annoy people	Virtually no risk of "architectural" damage to normal buildings
5.0	0.20	Vibrations annoying to people in buildings (this agrees with the levels extablished for people standing on bridges and subjected to relative short periods of vibrations)	Threshold at which there is a risk of "architectural" damage to normal dwelling - houses with plastered walls and ceilings Special types of finish such as lining of walls, flexible ceiling treatment, etc., would minimize "architectural" damage
10-15	0.4-0.6	Vibrations considered unpleasant by people subjected to continuous vibrations and unacceptable to some people walking on bridges	Vibrations at a greater level than normally expected from traffic, but would cause "architectural" damage and possibly minor structural damage.

** The vibration levels are based on peak particle velocity in the vertical direction. Where human reactions are concerned, the value is at the point at which the person is situated. For buildings, the value refers to the ground motion. No allowance is included for the amplifying effect, if any, of structural components.*

Source: "A Survey of Traffic-induced Vibrations" by Whiffen and Leonard, Transport and Road Research Laboratory, RRL Report LR418, Crowthorne, Berkshire, England, 1971.

pile driving at about 7.5 - 9 mm/s (0.30 - 0.35 in/sec) peak vertical particle velocity vibration level on the ground next to an existing parking structure. The extent of the damage was some crumbling of mortar used to fill wall joints. In that instance the distance to the pile driving was slightly greater than 5 m (17 ft). The pile driver energy and the soil conditions were unknown. It is likely that the ground vibrations were amplified by the structure, causing the damage.

On the whole, the architectural damage criterion for continuous vibrations, 5 mm/s (0.2 in/sec) appears to be conservative even for sustained pile driving. Pile driving levels often exceed 5 mm/s (0.2 in/sec) at distances of 15 m (50 ft), and 13 mm/s (0.5 in/sec) at 7.5 m (25 ft). Pile driving has been done frequently at these distances without apparent damage to buildings (with the previously mentioned exception). The criterion level for pile driving is therefore somewhere between 5 and 50 mm/s (0.2 and 2 in/sec). The 50 mm/s (2 in/sec) single event criterion is still being used by some organizations and engineering firms as a safe level for pile driving. Although never measured by Caltrans, calculations show that this level will be probably exceeded within 2 m (6 ft) from a 68,000 J (50,000 ft lbf) pile driver. This level is probably a "safe" criterion to use for well engineered and reinforced structures. For normal dwellings, however, pile driving peaks should probably not be allowed to exceed 7.5 mm/s (0.3 in/sec). In any case, **extreme care must be taken when sustained pile driving occurs within 7.5 m (25 ft) of <u>any</u> building, and 15-30 m (50-100 ft) of a historical building, or building in poor condition.**

When high levels of construction vibrations (such as from pile driving, demolition, and pavement breaking) are expected at residences or other buildings, it is recommended that a detailed "crack survey" be undertaken BEFORE the start of construction activities. The survey may be done by photographs, video tape, or visual inventory, and should include inside as well as outside locations. All existing cracks in walls, floors, driveways, etc. should be documented with sufficient detail for comparison after construction to determine whether actual vibration damage has occurred.

<u>Annoyance</u> - The annoyance levels in Table 2 should be interpreted with care. Depending on the activity (or inactivity) a person is engaged in, vibrations may be annoying at much lower levels than those shown in Table 2. Elderly, retired, or ill people staying mostly at home, people reading in a quiet environment, people involved in vibration sensitive hobbies or other activities are but a few examples of people that are potentially annoyed by much lower vibration levels. Most routine complaints of traffic vibrations come from people in these categories. To them, even vibrations near the threshold of perception may be annoying.

Frequently, low level traffic vibrations can cause irritating secondary vibrations, such as a slight rattling of doors, windows, stacked dishes, etc. These objects are often in a state of neutral equilibrium and readily respond to very low levels of vibrations. The rattling sound gives rise to exaggerated vibration complaints, even though there is very little risk of damage.

Other criteria - At times, other criteria may be necessary to address very specific concerns. For example, vibration sensitive manufacturing or calibration processes, such as close tolerance machining, laboratories calibrating sensitive electronic equipment, use of electron microscopes, etc. often require vibration criteria that are much lower than the threshold of perception level.

Determining the specific criterion level for such sites is no easy task, and requires the cooperation of the engineers, technicians, or managers involved with the operations. Frequently, even those experts do not know at what level of vibrations their operations will be disturbed, and tests involving generation of vibrations (such as running a heavy truck over 2"x4" wooden boards outside the plant), vibration monitoring equipment, and a test operation must be performed.

Typical Traffic Vibration Levels

From Figure 1 typical relationships of traffic vibrations vs. distance from a freeway can be developed. For instance, vibration data of truck passbys are characterized by peaks that are considerably higher than those generated by automobiles. These peaks last no more than a few seconds and often only a fraction of a second, indicating a rapid drop-off with distance. Figure 1 showed that at 15 m (50 ft) from the centerline of the nearest lane, truck vibrations are about half of those measured near the edge of shoulder (5 m, or about 15 ft from the centerline of the near lane). At 30 m (100 ft) they are about one fourth, at 60 m (200 ft) about one tenth, and at 90 m (300 ft) less than one twentieth. These rough estimates are supported by years of measurements throughout California.

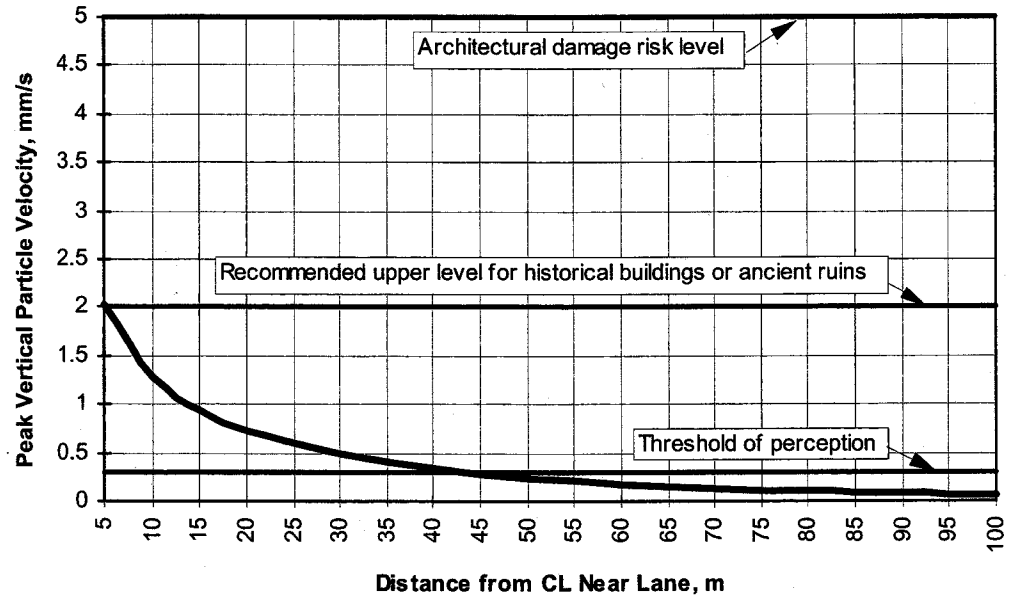
Because of the rapid dropoffs with distance, even trucks traveling close together often do not increase peak vibration levels substantially. In general, more trucks will show up as more peaks, not necessarily higher peaks. Wavefronts emanating from several trucks closely together may either cancel or partially cancel (**destructive interference**), or reinforce or partially reinforce (**constructive interference**) each other, depending on their phases and frequencies. Since traffic vibrations can be considered random, the probabilities of total destructive or constructive interference are extremely small. Coupled with the fact that two trucks cannot occupy the same space, and the rapid drop-off rates, it is understandible that two or more trucks normally do not contribute significantly to each other's peaks. It is, however, good practice to try and include the worst combinations of truck clusters with heavy loads in traffic passby vibration measurements. This obviously requires a good view of the traffic, or an observer who is in communication with the instrument operator.

Figure 2 is a plot of maximum highway truck traffic vibrations vs. distance from the centerline of the nearest freeway lane. The curve was compiled from the highest measured vibrations available from previous studies. Some of the Table 2 criteria are also plotted, for comparison. The graph indicates that the highest traffic generated vibrations measured on freeway shoulders (5 m from center line of nearest lane) have never exceeded 2.0 mm/s, with worst combinations of heavy trucks. This level coincides with the maximum recommended "safe level" for ruins and ancient monuments (and historical buildings). The graph illustrates the rapid attenuation of vibration levels, which dip below the threshold of perception for most people at about 45 m (150 ft).

Automobile traffic normally generates vibration peaks of one fifth to one tenth of truck vibrations.

Traffic vibrations generally range in frequencies from 10-30 Hz, and tend to center around 15 Hz. However, it is not uncommon to measure lower frequencies, even down to 1-2 Hz. Due to their suspension systems, city buses often generate frequencies around 3 Hz, with high velocities (indicating high displacements). It is more uncommon, but possible, to measure frequencies above 30 Hz.

Figure 2. Maximum Highway Truck Traffic Vibration Levels vs. Distance



Construction Vibration Levels

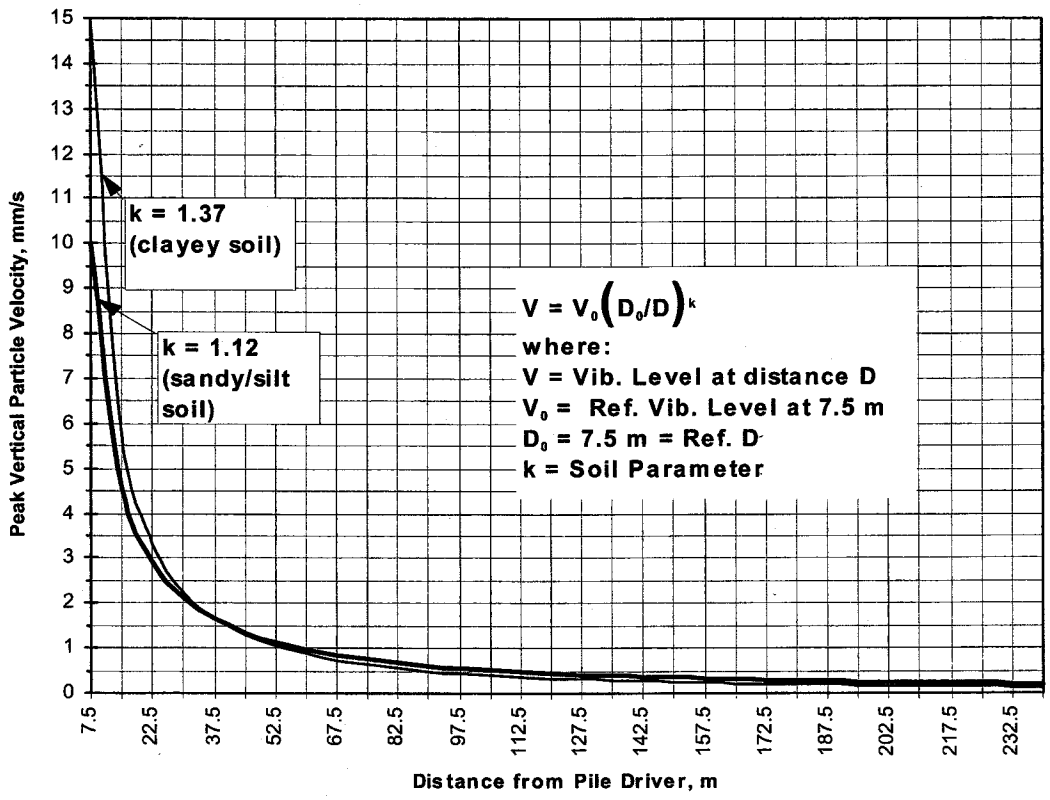
With the exception of a few instances involving pavement breaking, pile driving, all Caltrans construction vibration measurements have been below the 5 mm/s (0.2 in/sec) architectural damage risk level for continuous vibrations. The highest measured vibration level was 73.1 mm/s (2.88 in/sec) at 3 m (10 ft) from a pavement breaker. This instance marked the only time that the single event safe level of 50 mm/s (2 in/sec) was exceeded during vibration monitoring by Caltrans.

Other construction activities and equipment, such as D-8 and D-9 Caterpillars, earthmovers and haul trucks have never exceeded 2.5 mm/s (0.10 in/sec) or one half of the architectural damage risk level, at 3 m (10 ft)). Depending on the activity and the source, construction vibrations vary much more than traffic vibrations.

Figure 3 shows typical pile driving vibrations with distance, for a 68,000 J (50,000 ft lbf) energy impact pile driver, for two different soils (clayey and sandy with silt). Clay

soils provide more resistance to advancing piles and therefore generate higher vibration

Figure 3. Expected Vibration Levels Generated by a 68,000 J (50,000 ft lbf) Impact Pile Driver



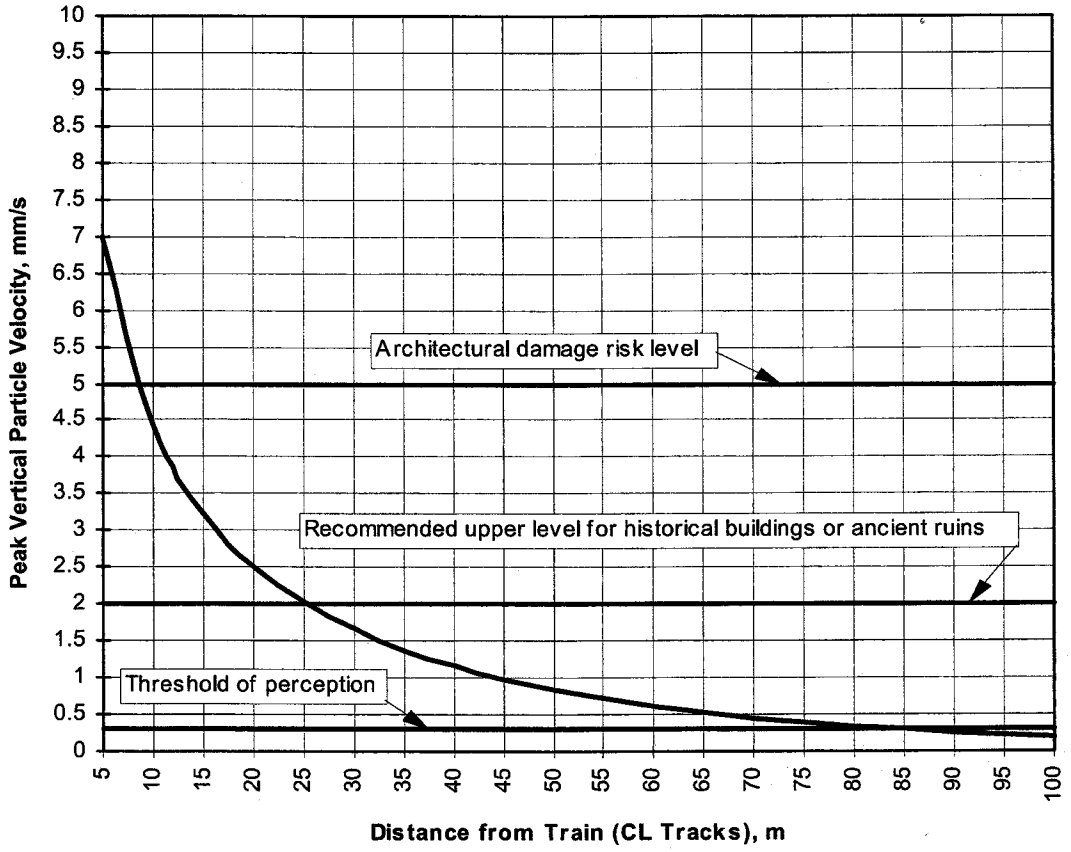
levels near the source than those in sandy soils. Vibrations in clay soils, however, tend to drop off more rapidly with distance than those in sandy soils.

Frequency ranges of construction vibrations, (including pile driving) tend to be the same as for traffic vibrations, mostly in the 10-30 Hz range, centered around 15 Hz, once in a while lower than 10 Hz, and rarely higher than 30 Hz.

Train Vibration Levels

Train vibration levels may be quite high, depending on the speeds, load, condition of track, and amount of ballast used to support the track. The highest train vibration measurement was 9.1 mm/s (0.36 in/sec) at 3 m (10 ft), in Sacramento. Using this information with the drop-off curve in Figure 1, we can construct a train vibration curve vs. distance. This is shown in Figure 4, beginning at 5 m (16 ft) where the vibration

Figure 4. Maximum Train Vibration Levels vs. Distance



level is calculated at 7 mm/s. The curve represents maximum expected levels from trains, and thus is very conservative. Measurements at various distances at other locations and different freight trains averaged about two-thirds of those shown in the curve.

Train vibrations tend to be in the same frequency ranges as traffic and construction vibrations. In some cases higher frequencies are encountered, especially in curves, caused by wheel chatter and squeal.

Impacts

Architectural and Structural Damage - The above discussions indicate that in any situation the probability of exceeding architectural damage risk levels for continuous vibrations from construction and trains is very low and from freeway traffic practically non-existent. However, if vibration concerns involve pavement breaking, extensive pile driving, or trains, 7.5 m (25 ft) or less from normal residences, buildings, or unreinforced structures, damage is a real possibility. This may also be true if these operations occur within 15 m – 30 m (50 ft- 100 ft) from historical buildings, buildings in poor condition, or buildings previously damaged in earthquakes.

Pile driving in close proximity (say within 3 m or 10 feet) of structures can cause additional problems, depending on the soils and configurations of substructures. An example was the reconstruction of San Francisco-Oakland Bay Bridge Toll Plaza in June 1987. A number of piles were driven in soft clay soils ("bay mud") close to the existing booth access tunnel underneath the freeway. Due to the large number of piles, and the proximity and configuration of the old substructure the lateral soil movement, caused by piles permanently displacing the clay, was resisted. The resulting conflict of forces was relieved by structure uplift and damage (cracks in the reinforced concrete tunnel).

Annoyance - As was discussed before, the annoyance level shown in Table 2 is highly subjective, and does not take into consideration elderly, retired, ill, and other individuals that may stay home more often than the "average" person. Nor does it account for people involved in vibration sensitive hobbies or activities, and people that like to relax in quiet surroundings without noticing vibrations. The threshold of perception, or roughly 0.25 mm/s (0.01in/sec) may be considered annoying by those people. Low level vibrations may also cause secondary vibrations and audible effects such as a slight rattling of doors, windows and dishes, resulting in additional annoyance. Annoying low frequency airborne noise can sometimes accompany earthborne vibrations.

Vibration Sensitive Operations - Aerospace and electronic laboratories, close tolerance manufacturing, calibration of sensitive instruments, radio & TV stations, etc. require additional attention. Shutting down their operations, even temporarily, could be extremely costly to the state. As was previously discussed vibration criteria for these operations are not well defined, for two main reasons. First, the operations are often classified and their precise nature is therefore not always known. Secondly, the

engineers involved in the critical operations often do not know how much vibration can be tolerated, or what operations they may be involved with in the future.

Heavy truck traffic on freeways within 30 m (100 ft), major construction within 60 m (200 ft), freight trains within 90 m (300 ft) and pile driving within 180 m (600 ft) may be potentially disruptive to sensitive operations.

Mitigation

Unlike with noise, there are no easy ways to mitigate earthborne vibrations. There are, however, a limited number of options available.

When designing new transportation facilities, reasonable amounts of care should be taken to keep these facilities away from vibration sensitive areas.

When dealing with existing transportation facilities, obvious vibration causes, such as pot holes, pavement cracks, differential settlement in bridge approaches or individual pavement slabs, etc., may be eliminated by resurfacing. In certain situations a ban of heavy trucks may be a feasible option.

The use of alternate construction methods and tools may reduce construction vibrations. Examples are predrilling of pile holes, avoiding cracking and seating methods for resurfacing concrete pavements near vibration sensitive areas, using rubber tired as opposed to tracked vehicles, placing haul roads away from vibration sensitive areas.

Scheduling construction activities (particularly pile driving) for times when it does not interfere with vibration sensitive operations (e.g. night time) may be another solution, especially in industrial areas.

Train vibrations may be reduced by using continuous, welded rails, vibration damping pads between rails and ties, and extra ballast.

Link With Historical Data

A considerable amount of effort has gone into the field measurements, reduction, documentation and reporting of vibration data since 1958. As data sets are accumulated with each vibration study, a more complete picture emerges of the generation and propagation of vibration waves under various conditions of geometry, soil, and source types.

Due to the lack of accurate prediction models for earthborne vibrations, empirical data is of utmost importance and can be used for future estimates when conditions are

alike. Historical data that can be linked to the present and future play a very important role in estimates and predictions of future vibrations.

Present and future personnel charged with the responsibility of performing vibration studies and maintaining vibration files should make every effort necessary to maintain a good correlation between any new and old instrument systems, calibration procedures, and measuring methods. The link between present and valuable historical data must be preserved.

Vibration Monitoring Equipment

During the period of 1958 - 1994 all of Caltrans vibration monitoring was performed by Translab. A transducer calibration system consisting of a shake table mounted on a concrete vibration isolation pad, and an Optron camera/amplifier system, measuring displacement allowed Translab its own transducers with traceability to the National Institute of Standards and Technology (NIST), formerly known as the National Bureau of Standards (NBS). Transducers were calibrated by mounting them on the shake table and running the latter at a known frequency and displacement.

Two types of sensors (transducers) were used by Caltrans. The first type was the **seismometer**. A seismometer measures vibrations at relatively low frequencies usually 1 - 200 Hertz (Hz), is very sensitive to low levels of vibrations and, through magnetic induction produces a voltage proportionally to velocity. It measures velocity directly via a signal conditioner, and is therefore called a velocity transducer. It is large, weighs about 7 kg (15 lbs), and, beacause of its mass, can be placed directly on the ground without further mounting attachments.

The second type of transducer was an **accelerometer**. As the name implies, this type of transducer measures acceleration directly. Used with an integrator it can also measure velocity and displacement.

The type of accelerometer used by Caltrans has a piezoelectric (pressure sensitive) crystal. As the transducer vibrates with the surface it is mounted on, acceleration changes the compression of the crystal, which in turn causes variations in the electrical charge across the crystal faces. These charge variations are proportional to acceleration.

An accelerometer is small, not as sensitive as the seismometer and has a wide frequency range, from 1 Hz to several KHz (1 KHz = 1000 Hz). Larger, more sensitive accelerometers, weighing about 1 lb, are available with a narrower frequency range from 0.1 Hz to 1KHz. Due to their small size and lack of mass, accelerometers should

not be placed directly on the ground, floor, or other vibrating surface without proper mounting. Accelerometers can be mounted various ways, depending on the surface.

For earthborne vibration work an accelerometer can be mounted via a magnet (supplied with it) to a block of steel of, say 5-10 kg (10-20 lbs). The steel block can then be placed directly on the ground, or other surface. The mass of the steel block provided adequate coupling of the accelerometer with the ground for the low frequency, low level vibrations generated by transportation facilities and construction.

Vibration Study Approach and Instrument Setup

Vibration studies can be classified into two main categories:

1. Studies involving existing transportation operations and facilities
2. Studies involving future transportation operations and facilities

Vibration Studies for Existing Construction Operations and Transportation Facilities - These studies consist of mainly addressing vibration complaints due to existing traffic, or construction operations. Understandably, pile driving near homes or businesses will normally generate many noise and vibration complaints. Other construction operations can also be responsible. Traffic vibration complaints are often due to poor pavement conditions. Other reasons may be increases in traffic, heavy trucks, buses, etc. Sudden increases in traffic vibrations may be due to opening of new transportation facilities, or redirecting traffic.

Although complaints can originate from the entire spectrum of receptors, most are from residences, or businesses that have vibration sensitive equipment or operations.

The first step in investigating complaints should be interviewing the complainant(s). The screening procedures outlined later in this document cover the most important questions to ask. For the purposes of performing a vibration study, the most important issues are:

- The type and location of the vibration source(s)
- The complainant(s)' concerns, i.e., annoyance, damage, disruption of operations.
- The location that is most sensitive, or where vibrations are most noticeable.

Vibration monitoring of existing operations or facilities ranges from simple, single location measurements to more complex multi-instrument, simultaneous measurements. The former consists of taking measurements at the most sensitive location, or location perceived by the complainant to have the worst vibrations. The latter usually involves placing a sensor close to the source as a reference, and one or more sensors at the critical location(s) ("response sensors"). Simultaneous measurements will then positively identify the vibration source, the drop-off and the response (vibration level) at the location(s) of interest. The reference sensor remains

fixed in one location near the source, while the response sensor(s) may be moved to different locations.

Sufficient data should be collected for each location. For highway traffic vibrations, 10 passbys of heavy trucks (preferably worst case combinations of several trucks) for each location should be sufficient. For pile driving, at least one pile closest to the receptor should be monitored at each location of interest.

The highest vibration level at each location can then be compared to Caltrans or other appropriate criteria.

Vibration Studies for Future Construction Operations and Transportation Facilities - Studies involving predictions of construction and operation vibrations of future transportation facilities often require vibration simulations to determine a site-specific drop-off curve. In order to generate vibrations that can still be measured at 60-90 m (200 to 300 ft) to develop the curve, the site must be free of high ambient vibrations (preferably less than 0.13 mm/s or 0.005 in/sec at the 90 m or 300 ft distance), and the generated vibrations must be relatively high. From Figure 1 we can calculate approximately how high the reference vibration V_0 at 5 m should be to detect the vibrations at 90 m. The V/V_0 ratio at that distance = 0.038; assuming we want V to be at least 0.13 mm/s; then V_0 = 1/0.038 x 0.13 = 3.4 mm/s (0.13 in/sec). If a low-vibration site cannot be found, either the distance for the drop off curve must be shortened, or the reference vibrations increased. Caution must be used to apply the drop-off curve to pile driving projections, due to the previously discussed differences in propagation characteristics.

To generate data for the drop-off curve, a heavily-loaded water truck, or dump truck (preferably 25 tons or greater GVW) is run at high speed over 2" x 4", or 2" x 6" wooden boards. Normally, five boards are laid perpendicular to the direction of travel, and spaced 7.5 m (25 ft) apart along the direction of travel. The advantage of this arrangement is that the generated vibration "signature" is normally recognizable at 90 m (300 ft).

A minimum of two sensors must be used simultaneously: one reference sensor, and one or more response sensor. The reference sensor remains fixed at 5 m (16 ft) from centerline of travel, (or any convenient distance near the source) opposite the last board to be run over (most forward in line with the direction of travel). The response sensor(s) is (are) positioned at various distances away from the source. Because of the steepness of the curve near the source it is a good idea to cover shorter distance intervals near the

source and longer ones away from the source. To adequately cover the entire range of the drop-off curve, 6 to 8 locations must be monitored, and at least 5 truck passbys per location.

Frequently it is not possible to do the simulations on the site of interest, because of space limitations. Nearby empty lots or open fields, or data from other sites known or judged to have similar soil conditions can then be used.

Once the measurements have been made, the data at each location should be averaged. Using the reference location, and at least two others (including the furthest one), the soil parameter alpha can be calculated using equation 2. Ideally, the alpha value should remain constant for each location, but in reality it will vary. The average of several values can then be used to develop a drop-off curve. The vibration levels at all measured locations should then be plotted to determine how well they fit this curve. Assuming they fit reasonably well, a normalized drop-off curve using V/V_0 ratios and distances (similar to Figure 1) can then be developed and used with any source reference level, to predict the future level at any distance within the range of the curve.

If it is possible to do the simulations at the site, inside/outside building locations should be included to measure the building amplification or attenuation ratio.

The next step is to measure ambient levels at the site. Outside as well as inside building locations should be included for these measurements.

Using all the above information, future levels can be predicted and compared to existing ambient levels, Caltrans guidelines, or any other appropriate or required standard.

Concerns for vibrations of future transportation facilities are usually raised by vibration sensitive factories, laboratories, or other vibration sensitive sites. Unless construction activities are expected to occur very close to residential or other structures, or near historical buildings, these receptors are not routinely included in vibration studies for future facilities.

Vibration field studies including simulations are expensive. Unless the consequences of transportation and construction generated vibrations may be costly to Caltrans, the curves and techniques described in this document can be used to estimate "ball park" vibration levels, in lieu of field studies.

Vibration Reports

Each vibration field study should be documented in a report. Depending on the amount of sites measured, amount of data collected, methodologies used, and the importance of the study, the report may range from a simple one or two paged memo, to

a report of twenty or more pages long. A vibration study can be considered a mini-research project, and should contain enough information for the reader to independently come to the same conclusions.

As a norm, vibration reports contain the following topics, which will be described in greater detail:

* Project title and description
* Introduction
* Objectives
* Background
* Study Approach
* Instrumentation
* Measurement Sites
* Measurements
* Data Reduction
* Measurement Results
* Data Analysis
* Results and Comparison with Standards
* Conclusions and Recommendations
* Tables showing all measured data, summaries of results, analysis and standards
* Figures showing site layouts and cross sections, instrument setups, drop-off curves, and other pertinent illustrations
* References cited

In short, simple vibration studies, the topics may be described in a few sentences in a memo. In more complex studies, a fairly extensive report is usually required.

Project Title and Description - If the report consists of a short memo this info. can be put in the "Subject:" space. In a long report it should be put on a separate title page, with the date, who did the study (Div.or District, Branch, and personnel involved), and author of report.

Introduction - Typical opening sentences: "This report (memo) presents the results of a vibration study at ..... The study was requested by ....., in response to concerns by ..... that vibrations of ..... would interfere with .....operations. The study was performed by ..... (branch or section) on ..... (dates)."

Objectives - This is often combined with the introduction. Example: "The purpose of the study was to provide baseline data for estimating vibration levels in sensitive areas of Hughes Aircraft facility generated by construction and traffic of the proposed LA-105 Freeway."

Background - Used only when their is a long and complicated history connected with the reasons for the studies. Useful for documenting all the facts leading up to the study for litigation purposes. Dates first contacted, correspondence, actions taken, and

other pertinent details may be appropriate in this section. Not necessary in most studies.

Study Approach - May be combined with other sections. A short description of how the study was done. Example:

"First, vibrations generated by a 25 ton GVW three-axle water truck driven over five 2"x4" wooden boards ..... were measured at various distances to measure the vibration attenuation with distance. This info. was then used to develop a drop-off curve....., etc." For simple studies, such as residential complaints: "The sensor was set up at four different locations where, according to the homeowner, vibrations were most noticeable. Five heavy truck passbys on Route ..... were measured at each of the locations. ..."

Instrumentation - Always include description, manufacturer, model, serial no. of each vibration equipment components used. It is also extremely important to include the date instruments were last calibrated, by whom, where the records are on file, and whether calibration was traceable to the NIST (National Institute of Standards and Technology, formerly NBS). Essential in court cases!

Measurement Sites - Include a sketch, preferably to scale, of the relationship between source and measurement locations. Plot and number the sites on the sketch. Include typical cross sections if there are significant elevation differences between source and receptors. Plot significant structures. Show enough dimensions to pinpoint each measurement location. Show detailed descriptions, and instruments or sensors used at each location in the text, or in a separate table if there are many. Once locations are numbered and described, they can be referred to by number only.

Measurements - This section may also include the study approach. Basically explains the methods used, how sensors were mounted, number of measurements taken, what sources were measured (e.g. heavy trucks on Route 5), descriptor used and why, and other pertinent information concerning the vibration measurements. When possible, include a description of soil type and structure. This info. can often be extracted from nearby boring logs. Be sure to include ambient or background measurements.

Data Reduction - A short description of how the data was reduced can effectively be combined with the measurement section. Only if the reduction method is unusual or complex should it be discussed in a separate section.

Measurement Results - May also be combined with the measurement section. Briefly summarize data in the text by giving highest values, ranges, and averages. Should be

accompanied by a table summarizing measurement run No. (or just Run No.), date and time, measurement location, source (heavy truck in N/B lane No.4), distance, vibration level, dominant frequency, and optional remarks. This table may be put in the text or in an appendix with all other tables and figures. All individual measurements should be included as part of the report, for possible future use. Ambient or background vibration measurements can be expressed as a range of vibrations, typical frequency ranges, time period during which they were measured, and if possible the range of sources and distances.

Data Analysis - Developing drop-off curves, predicting future levels, calculating levels at specific distances not measured, etc. all should be in this section. May not be necessary for simple studies involving residential complaints, monitoring for compliance with a standard, or any other study involving vibration measurements only.

Results and Comparisons to Standards - Existing measured, projected, and predicted vibration levels and frequencies are summarized and compared to pertinent standards in this section. This is usually done in tabular form, and accompanied by Table 1, which shows the vibration criteria used by Caltrans.

Conclusions and Recommendations - Conclusions are drawn from the previous comparisons with standards. Typically for highway vibration complaints would be: "Although vibrations generated by heavy trucks on I-5 may at times be felt, they are far below the 'architectural damage risk level' criterion of 0.2 in/sec used by Caltrans."

Recommendations for mitigation are rather limited (see "Mitigation" section). However, in some cases strategies such as pile driving at night may solve interference with vibration sensitive manufacturing processes during day time. When ever possible, such recommendations should be included.

References - In complex reports, relying partly on previously gathered data, it may be beneficial to cite other reports or references by number. A listing of these references should then be included at the end of the report.

Field Review and Screening of Possible Vibration Problems

The following procedures were designed to screen vibration complaints near existing transportation facilities. They are intended to accomplish two things: 1) to evaluate the severity of the vibration problem, and 2) obtain preliminary information for a vibration study, should one be necessary.

The procedures are divided in two parts: problem definition and actions to take. An outline of the steps in each part follows:

I. Problem Definition

A. Interview resident at the site of concern. Ask the following questions:

1. What is the exact problem in the resident's opinion?

Many people confuse low frequency airborne noise with earthborne vibrations.

2. What are the sources in the resident's opinion?

Trucks on freeway?; city traffic?; trains? (sources may not be our jurisdiction.)

3. What are the specific concerns?

Annoyance?, interference with activities?, damage to the residence? If damage is the main concern, ask for evidence look for stucco cracks, cracks in driveways, walkways, walls, stucco, etc. Compare with other residences further away from the transportation facility. If these also have cracks, then it is safe to assume that the facility is not responsible.

4. Where are the vibrations most noticeable?

Which room?; which part of the yard? (Let resident point out the critical locations.)

5. What time of the day and/or what day of the week does the resident feel vibrations the most?

6. When did the resident become aware of the vibrations?

Try to correlate with changes in nearby traffic patterns, due to truck bans elsewhere, new industrial development, or other reason for truck increases.

B. Feel the vibrations

1. Stand at critical locations and try to feel vibrations when trucks pass by.

Place finger tips on furniture, walls, uncarpeted floor, ground outside the residence, patio floor, etc.

2. Have someone walk nearby; feel these vibrations and compare with the traffic vibrations. Also compare other in-house generated vibrations.

Walking, air conditioners, heater blowers, and garbage disposals, etc. often generate more vibrations than traffic.

3. Stand on freeway shoulder, sidewalk next to highway, or anywhere close to the suspect source. Feel vibrations and compare with those felt at the receptor.

Place finger tips on ground or pavement surface.

4. Look for obvious causes of excessive vibrations.

Pot holes, pavement joints, sag, and pavement cracks, or anything that could cause above normal vibrations; also look for drainage or other structures transmitting vibrations to the receptor without benefit of soil attenuation.

C. Evaluate severity of the problem.

The graphs in Figures 1 - 4 show typical vibration attenuations with distance for various sources. Use these to evaluate typical relationships of near and far source vibration levels. If vibrations appear to dropoff at a significantly lesser rate, then suspect that something unusual is going on. For instance, vibrations

may be transmitted by underground structures, which can cause problems at the receptor.

1. If vibrations feel as strong (or almost as strong) at the receptor as they do near the source (such as on a freeway shoulder), consider problem severe.

2. If vibrations at the receptor are readily noticeable and appear to interfere with activities or vibration sensitive operations, consider problem severe.

3. If vibrations of any amplitude are an issue in litigation, consider the problem severe.

4. If after this screening procedure uncertainty still exists, consider problem severe.

II. Actions To Take

A. If problem is not severe:

1. If there are obvious causes for excessive vibrations, such as pot holes, etc., contact Maintenance or other departments and find out if scheduled for repair or resurfacing.

2. Write memo to resident explaining your findings.

If there are obvious solutions such as patching or resurfacing, tell the resident. If there are no obvious solutions, explain to the resident that although vibrations may be felt, they are not damaging. Use background info. in this document.

B. If problem is considered severe, or if the resident keeps insisting on actual monitoring, consider contracting out vibration monitoring or a complete vibration study.

APPENDIX
BASIC VIBRATION FORMULAE

APPENDIX

BASIC VIBRATION FORMULAE

Symbols

A = Zero-to-Peak, or Peak Acceleration (Units: m/sec^2, mm/sec^2, ft/sec^2, in/sec^2)

A_g = Zero-to-Peak, or Peak Acceleration (Units: "g" = acceleration of gravity), where:

1 g = 9.807 m/sec^2

= 9807 mm/sec^2

= 32.174 ft/sec^2

= 386.102 in/sec^2

D = Peak-to-Peak Displacement (Units: m, mm, ft, in) (Normally of interest)

D/2 = Zero-to-Peak, or Peak Displacement (Units: m, mm, ft, in)

f = Frequency (Units: Hertz)

V = Zero-to-Peak, or Peak Particle Velocity (Units: m/sec,mm/sec, in/sec)

π = 3.14159etc.....

Formulae for Sinusoidal Waves

Units need to be consistent; for example, if D is in mm, then V must be in mm/sec, and A either in mm/sec^2 or units of "g" (9807 mm/sec^2).

With **displacement**, we are normally interested in the peak-to-peak value or in other words, the total displacement (distance between the + peak and - peak) soil particles travel. Sometimes, however we may also be interested in the zero-to-peak displacement, or displacement relative to a stationary (zero) reference position. For sinusoidal waves, the + side of reference and the - side are symmetrical, and zero-to-peak values are D/2.

With **velocity** and **acceleration**, however, we are always interested in the zero-to-peak values. These give an indication of maximum value, without regard of the direction.

Acceleration is most commonly used in units of **g**.

Following are formulae expressing the relationships between displacement, velocity, and acceleration for sinusoidal vibration waves.

Velocity and Displacement:

$V = 2 \pi f(D/2)$ (Eq.A-1)

$V = \pi fD$ (Eq.A-2)

$D/2 = V/(2 \pi f)$ (Eq.A-3)

$D = V/(\pi f)$ (Eq.A-4)

Acceleration and Displacement:

$A = (2 \pi f)^2(D/2)$ (Eq.A-5)

$A = 2 \pi^2 f^2 D$ (Eq.A-6)

$A_g = (2 \pi^2 f^2 D)/g$ (Eq.A-7)

If D is in inches:

$A_g = (2 \pi^2 f^2 D)/386.102 = 0.0511 f^2 D$ (Eq.A-8)

If D is in mm:

$A_g = (2 \pi^2 f^2 D)/9807 = 0.00201 f^2 D$ (Eq.A-9)

Acceleration and Velocity:

$A = 2 \pi fV$ (Eq.A-10)

$A_g = (2 \pi fV)/g$ (Eq.A-11)

If V is in inches per second:

$A_g = (2 \pi fV)/386.102 = 0.0163 fV$ (Eq.A-12)

If V is in mm per second:

$A_g = (2 \pi fV)/9807 = 0.000641 fV$ (Eq.A-13)

Acceleration or Velocity in Decibels:

$A(dB) = 20\text{Log}(A/A_0)$; $V(dB) = 20\text{Log}(V/V_0)$ (Eq.A-14)

where A = acceleration, A_0 = reference acceleration,

V = velocity, and V_0 = reference velocity (units must be consistent)

April 2011

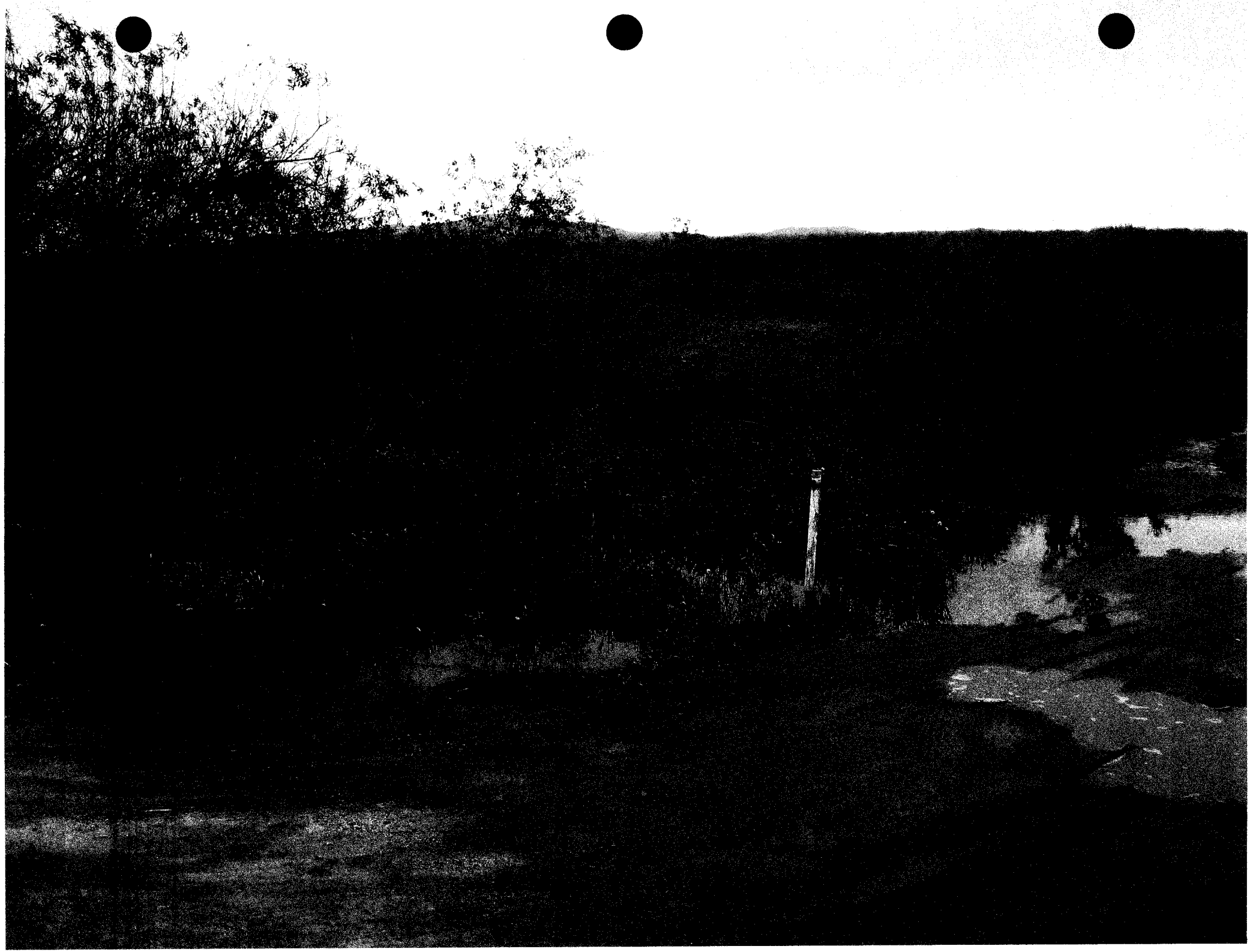
April 2011

S	M	T	W	T	F	S
					1	2
3	4	5	6	7	8	9
10	11	12	13	14	15	16
17	18	19	20	21	22	23
24	25	26	27	28	29	30

May 2011

S	M	T	W	T	F	S
1	2	3	4	5	6	7
8	9	10	11	12	13	14
15	16	17	18	19	20	21
22	23	24	25	26	27	28
29	30	31				

	Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
Mar 27 - Apr 2	**Mar 27**	**28**	**29**	**30**	**31**	**Apr 1**	**2**
Apr 3 - 9	**3**	**4**	**5**	**6**	**7**	**8**	**9**
	10:00am 12:00pm Bat Boxes - Richard & Erik Hodges (La Sierra / Cajalco)						
Apr 10 - 16	**10**	**11**	**12**	**13**	**14**	**15**	**16**
Apr 17 - 23	**17**	**18**	**19**	**20**	**21**	**22**	**23**
Apr 24 - 30	**24**	**25**	**26**	**27**	**28**	**29**	**30**



HK00516 pm.

COUNTY OF RIVERSIDE

TRANSPORTATION AND LAND MANAGEMENT AGENCY

Planning Department

Robert C. Johnson Planning Director

CC003549

APPLICATION FOR SUBDIVISION AND DEVELOPMENT

CHECK ONE AS APPROPRIATE:

- ☐ TRACT MAP
- ☐ REVISED MAP
- ☑ PARCEL MAP
- ☐ MINOR CHANGE
- ☐ REVERSION TO ACREAGE
- ☐ AMENDMENT TO FINAL MAP
- ☐ VESTING MAP
- ☐ EXPIRED RECORDABLE MAP

INCOMPLETE APPLICATIONS WILL NOT BE ACCEPTED.

CASE NUMBER: PM30298 KE DATE SUBMITTED: 1/11/06

APPLICATION INFORMATION

Applicant's Name: RANDY HORTON E-Mail:

Mailing Address: 41141 RAINTREE COURT
Street

MURRIETA, CA 92562
City *State* *ZIP*

Daytime Phone No: (951) 312-5333 Fax No: ( )

Engineer/Representative's Name: SOUTHLAND ENGINEERING E-Mail claliberty@southlandengineering.com

Mailing Address: 2200 BUSINESS WAY, STE 100
Street

RIVERSIDE, CA 92501
City *State* *ZIP*

Daytime Phone No: (951) 788-8488 Fax No: (951) 788-8538

Property Owner's Name: SEE DEED E-Mail:

Mailing Address: 41141 RAINTREE COURT
Street

MURRIETA, CA 92562
City *State* *ZIP*

Daytime Phone No: (951) 312-5333 Fax No: ( )

If additional persons have an ownership interest in the subject property in addition to that indicated above, attach a separate sheet that references the application case number and lists the names, mailing addresses, and phone numbers of those persons having an interest in the real property or properties involved in this application.

The Planning Department will primarily direct communications regarding this application to the person identified above as the Applicant. The Applicant may be the property owner, representative, or other assigned agent.

AUTHORIZATION FOR CONCURRENT FEE TRANSFER

The signature below authorizes the Planning Department and TLMA to expedite the refund and billing process by transferring monies among concurrent applications to cover processing costs as necessary. Fees collected in excess of the actual cost of providing specific services will be refunded. If additional funds are needed to complete the processing of your application, you will be billed, and processing of the application will cease until the outstanding balance is paid and sufficient funds are available to continue the processing of the application. The applicant understands the deposit fee process as described above, and that there will be NO refund of fees which have been expended as part of the application review or other related activities or services, even if the application is withdrawn or the application is ultimately denied.

All signatures must be originals ("wet-signed"). Photocopies of signatures are **not** acceptable.

RANDY HORTON
PRINTED NAME OF APPLICANT

SIGNATURE OF APPLICANT

AUTHORITY FOR THIS APPLICATION IS HEREBY GIVEN:

I certify that I am/we are the record owner(s) or authorized agent and that the information filed is true and correct to the best of my knowledge. An authorized agent must submit a letter from the owner(s) indicating authority to sign the application on the owner's behalf.

All signatures must be originals ("wet-signed"). Photocopies of signatures are **not** acceptable.

SEE ATTACHED SHEET
PRINTED NAME OF PROPERTY OWNER(S)

SIGNATURE OF PROPERTY OWNER(S)

SEE ATTACHED SHEET
PRINTED NAME OF PROPERTY OWNER(S)

SIGNATURE OF PROPERTY OWNER(S)

If the subject property is owned by persons who have not signed as owners above, attach a separate sheet that references the application case number and lists the printed names and signatures of all persons having an interest in the property.

PROPERTY INFORMATION:

Assessor's Parcel Number(s): 941-080-027

Section: 20 Township: 7 SOUTH Range: 1 WEST

Approximate Gross Acreage: 10.53 ACRES

General location (street address, cross streets, etc.): North of 40180 CALLE BELLAGIO, South of Glen Oaks Rd, East of MARCUS Dr., West of Calle Bellagio.

Thomas Brothers map, edition year, page number, and coordinates: 2002, PAGE 930 - G 6

PROPERTY OWNER(S) SIGNATURE SHEET

Randy W. Horton — Date: 10-27-04

Cindy J. Horton — Date: 10/27/04

Marcus Horton — Date: 10/27/04

Christie Horton — Date: 10/27/04

Proposal (describe project, indicate the number of proposed lots/parcels, units, and the schedule of the subdivision, whether the project is a Vesting Map or Planned Residential Development (PRD):

TO SUBDIVIDE A 10.53 ACRE PARCEL INTO FOUR (4) RESIDENTIAL PARCELS

Related cases filed in conjunction with this request:

Is there a previous development application filed on the same site: Yes ☑ No ☐

If yes, provide Case No(s). SEE ATTACHED SHEET (Parcel Map, Zone Change, etc.)

E.A. No. (if known) 356619 E.I.R. No. (if applicable): _____

Have any special studies or reports, such as a traffic study, biological report, archaeological report, geological or geotechnical reports, been prepared for the subject property? Yes ☐ No ☑

If yes, indicate the type of report(s) and provide a copy: _____

Is water service available at the project site: Yes ☑ No ☐

If "No," how far must the water line(s) be extended to provide service? (No. of feet/miles) _____

Is sewer service available at the site? Yes ☐ No ☑

If "No," how far must the sewer line(s) be extended to provide service? (No. of feet/miles) _____

Will the proposal result in cut or fill slopes steeper than 2.1 or higher than 10 feet? Yes ☐ No ☑

How much grading is proposed for the project site?

Estimated amount of cut = cubic yards: _____

Estimated amount of fill = cubic yards _____

Does the project need to import or export dirt? Yes ☐ No ☑

Import _____ Export _____ Neither _____

What is the anticipated source/destination of the import/export?

LMS Cases/Permits for 941080027

Case/Permit	Description
BGR010201	GRADING FOR SFR, BARN, RIDNG AREA, GUEST HOUSE 40190 CALLE BELLAGIO TEMECULA
BGR030846	RENEW EXPIRED PERMIT BGR010201 40190 CALLE BELLAGIO TEMECULA
BRS032154	SINGLE FAMILY RESIDENCE 40190 CALLE BELLAGIO TEMECULA
BRS032155	GUEST DWELLING 1308 SQ FT 40190 CALLE BELLAGIO TEMECULA
BXX031197	DETACHED GARAGE 40190 CALLE BELLAGIO TEMECULA
CR000292	PARCEL 1 OF PMB 17/90 40190 CALLE BELLAGIO TEMECULA
CZ06099	CHANGE ZONE FROM R-R TO R-A-2 1/2 40190 CALLE BELLAGIO TEMECULA
EA35619	EA FOR PM 26645 40190 CALLE BELLAGIO TEMECULA
EHS031435	40190 CALLE BELLAGIO TEMECULA
EHS031438	40190 CALLE BELLAGIO TEMECULA
MT011214	PM6199 LOT 1 40190 CALLE BELLAGIO TEMECULA
MT034421	PM6199 LOT 1 40190 CALLE BELLAGIO TEMECULA
MT034422	PM6199 LOT 1 40190 CALLE BELLAGIO TEMECULA
MT034423	PM6199 LOT 1 40190 CALLE BELLAGIO TEMECULA
PM26645	PM 26645 DIVIDE 12.195 ACRES INTO FOUR LOTS 40190 CALLE BELLAGIO TEMECULA

Effective: 5/10/2005 7:47

Run time: 1 seconds

Return To Previous Page

What is the anticipated route of travel for transport of the soil material?

_____

How many anticipated truckloads? _____ truck loads.

What is the square footage of usable pad area? (area excluding all slopes) _____ sq. ft.

If this is a residential subdivision, is it located in a Recreation and Park District or County Service Area authorized to collect fees for park and recreational services? Yes ☑ No ☐

If yes, does the subdivision intend to dedicate land or pay Quimby fees, or a combination of both?

Dedicate land ☐ Pay Quimby fees ☑ Combination of both ☐

Is the subdivision located within 8½ miles of March Air Reserve Base? Yes ☐ No ☑

If yes, will any structure exceed fifty-feet (50') in height (above ground level)? Yes ☐ No ☐

Does the subdivision exceed more than one acre in area? Yes ☑ No ☐

If yes, in which one of the following watersheds is it located (refer to Riverside County GIS for watershed location)?

Check answer:
☐ Santa Ana River ☑ Santa Margarita River ☐ San Jacinto River ☐ Colorado River

HAZARDOUS WASTE SITE DISCLOSURE STATEMENT

Government Code Section 65962.5 requires the applicant for any development project to consult specified state-prepared lists of hazardous waste sites and submit a signed statement to the local agency indicating whether the project is located on or near an identified site. Under the statute, no application shall be accepted as complete without this signed statement.

I (we) certify that I (we) have investigated our project with respect to its location on or near an identified hazardous waste site and that my (our) answers are true and correct to the best of my (our) knowledge. My (Our) investigation has shown that:

☑ The project is not located on or near an identified hazardous waste site.

☐ The project is located on or near an identified hazardous waste site. Please list the location of the hazardous waste site(s) on an attached sheet.

Owner/Representative (1) _____ Date 5-10-05

Owner/Representative (2) _____ Date 5-10-05

Checklist for Identifying Projects Requiring a Project-Specific Water Quality Management Plan (WQMP) within the Santa Margarita River Region

Project File No.	
Project Name:	TENTATIVE PARCEL MAP 30298
Project Location:	40190 CALLE BELLAGIO
Project Description	TO SUBDIVIDE A 10.53 ACRE PARCEL INTO FOUR RESIDENTIAL PARCELS

Proposed Project Consists of or Includes:	Yes	No
Significant Redevelopment: The addition, creation, or replacement of at least 5,000 square feet of impervious surfaces on an already developed site of a project category or location as listed below in this table. This includes, but is not limited to: the expansion of a building footprint or addition or replacement of a structure; structural development including an increase in gross floor area and/or exterior construction or remodeling; replacement of impervious surface that is not part of a routine maintenance activity; and land disturbing activities related with structural or impervious surfaces. [Note: Where redevelopment results in an increase of less than 50% of the impervious surfaces of a previously existing development, and the existing development was not subject to WQMP requirements, the requirement for treatment control BMPs [MS4 Permit requirement F.2.b(3)]. applies only to the addition, and not to the entire development.]		✔
Housing subdivisions of 10 or more dwelling units. Includes single-family homes, multi-family homes, condominiums, and apartments.		✔
Commercial development greater than 100,000 square feet. Defined as any development on private land that is not for heavy industrial or residential uses where the land area for development is greater than 100,000 square feet. Includes, but is not limited to: hospitals; laboratories and other medical facilities; educational institutions; recreational facilities; municipal facilities; commercial nurseries; multi-apartment buildings; car wash facilities; mini-malls and other business complexes; shopping malls; hotels; office buildings; public warehouses; automotive dealerships; airfields; and other light industrial facilities.		✔
Automotive repair shops. Includes facilities characterized by any one of the following Standard Industrial Classification (SIC) codes: 5013, 5014, 5541, 7532, 7533, 7534, 7536, 7537, 7538, or 7539.		✔
Restaurants. A facility that sells prepared foods and drinks for consumption, including stationary lunch counters and refreshment stands selling prepared foods and drinks for immediate consumption (SIC code 5812), where the land area for development is greater than 5,000 square feet. Restaurants where land development is less than 5,000 square feet shall meet all SUSMP requirements except for treatment control BMPs [MS4 Permit requirement F.2.b(3)] and peak flow management [MS4 Permit requirement F.2.b(2)(a)].		✔
All Hillside development greater than 5,000 square feet. Any development that creates greater than 5,000 square feet of impervious surface which is located in an area with known erosive soil conditions, where the development will include grading on any natural slope that is 25% or greater.		✔
Environmentally Sensitive Areas (ESAs)[1]. All development located within or directly adjacent to or discharging directly to an ESA (where discharges from the development or redevelopment will enter receiving waters within the ESA), which either creates 2,500 square feet of impervious surface on a proposed project site or increases the area of imperviousness of a proposed project site to 10% or more of its naturally occurring condition. "Directly adjacent" means situated within 200 feet of the ESA. "Discharging directly to" means outflow from a drainage conveyance system that is composed entirely of flows from the subject development or redevelopment site, and not commingled with flows from adjacent lands.		✔
Parking lots of 5,000 square feet or more. A land area or facility for the temporary parking or storage of motor vehicles used personally for business or commerce.		✔
Streets, roads, highways, and freeways. Includes any paved surface that is 5,000 square feet or greater used for the transportation of automobiles, trucks, motorcycles, and other vehicles.		✔
Retail Gasoline Outlets (RGOs). Includes RGOs that meet the following criteria: (a) 5,000 square feet or more, or (b) a projected Average Daily Traffic (ADT) of 100 or more vehicles.		✔

1 Areas "in which plant or animal life or their habitats are either rare or especially valuable because of their special nature or role in an ecosystem and which would easily be disturbed or degraded by human activities and developments. ESAs subject to urban runoff requirements include, but are not limited to: all CWA Section 303(d) impaired water bodies; areas designated as Areas of Special Biological Significance by the Basin Plan; water bodies designated with a RARE beneficial use in the Basin Plan; areas within the Western Riverside County Multi-Species Habitat Conservation Plan area that contain rare or especially valuable plant or animal life or their habitat; and any other equivalent environmentally sensitive areas that the Permittees have identified. The Basin Plan for the San Diego Basin (beneficial uses listed in Chapter 2) can be viewed or downloaded from www.swrcb.ca.gov/rwqcb9/programs/basinplan.html. The most recent CWA Section 303(d) list can be found at www.swrcb.ca.gov/tmdl/303d_lists.html.

DETERMINATION: Circle appropriate determination.

Any question answered "YES" Project requires a project-specific WQMP.

All questions are answered "NO" Project requires incorporation of Site Design Best Management Practices (BMPs) and Source Control BMPs imposed through Conditions of Approval or permit conditions.

NOTICE OF PUBLIC HEARING
and
INTENT TO ADOPT A NEGATIVE DECLARATION

A PUBLIC HEARING has been scheduled, pursuant to Riverside County Land Use and Subdivision Ordinance Nos. 348 460, before the **RIVERSIDE COUNTY** DIRECTOR'S HEARING to consider the project shown below:

TENTATIVE PARCEL MAP NO. 30298 – Intent to Adopt a Negative Declaration – Applicant: Randy and Cindy Horton –Engineer/Representative: Southland Engineering - Third Supervisorial District – Rancho California Zoning Area - Southwest Area Plan: Rural Community: Estate Density Residential (RC: EDR) (2 Acre Minimum) – Location: Southerly of Glen Oaks Road, westerly of Calle Bellagio, and easterly of Corte Venture – 12.19 Gross Acres - Zoning: Rural Residential (R-R) - **REQUEST:** The tentative parcel map is a Schedule H subdivision of 12.19 acres into four (4) residential parcels with a minimum parcel size of two (2) acres. – APN: 941-080-027. (Quasi-judicial)

TIME OF HEARING:	**1:30 p.m. or as soon as possible thereafter.**
DATE OF HEARING:	**March 28, 2011**
PLACE OF HEARING:	RIVERSIDE COUNTY PLANNING DEPARTMENT 4080 LEMON STREET 1st FLOOR CONFERENCE ROOM 2A RIVERSIDE, CALIFORNIA 92501

For further information regarding this project, please contact Kinika Hesterly at 951-955-1888 or e-mail khesterl@rctlma.org or go to the County Planning Department's Director's Hearing agenda web page at http://www.tlma.co.riverside.ca.us/planning/content/hearings/dh/current_dh.html

The Riverside County Planning Department has determined that the above project will not have a significant effect on the environment and has recommended adoption of a negative declaration. The Planning Director will consider the proposed project and the proposed negative declaration, at the public hearing. The case file for the proposed project and the proposed negative declaration may be viewed Monday through Thursday, 8:30 a.m. to 5:00 p.m., (with the exception of Noon-1:00 p.m. and holidays) at the County of Riverside Planning Department, 4080 Lemon Street, 9th Floor, Riverside, CA 92502. For further information or an appointment, contact the project planner.

Any person wishing to comment on a proposed project may do so, in writing, between the date of this notice and the public hearing or appear and be heard at the time and place noted above. All comments received prior to the public hearing will be submitted to the Planning Director, and the Planning Director will consider such comments, in addition to any oral testimony, before making a decision on the proposed project.

If you challenge this project in court, you may be limited to raising only those issues you or someone else raised at the public hearing, described in this notice, or in written correspondence delivered to the Planning Director at, or prior to, the public hearing. Be advised that, as a result of public hearings and comment, the Planning Director may amend, in whole or in part, the proposed project. Accordingly, the designations, development standards, design or improvements, or any properties or lands, within the boundaries of the proposed project, may be changed in a way other than specifically proposed.

Please send all written correspondence to:
COUNTY OF RIVERSIDE PLANNING DEPARTMENT
Attn: Kinika Hesterly
P.O. Box 1409, Riverside, CA 92502-1409

PROPERTY OWNERS CERTIFICATION FORM

I, VINNIE NGUYEN, certify that on 2/23/2011,

The attached property owners list was prepared by Riverside County GIS,

APN (s) or case numbers PM30298 For

Company or Individual's Name Planning Department,

Distance buffered 800'.

Pursuant to application requirements furnished by the Riverside County Planning Department, Said list is a complete and true compilation of the owners of the subject property and all other property owners within 600 feet of the property involved, or if that area yields less than 25 different owners, all property owners within a notification area expanded to yield a minimum of 25 different owners, to a maximum notification area of 2,400 feet from the project boundaries, based upon the latest equalized assessment rolls. If the project is a subdivision with identified off-site access/improvements, said list includes a complete and true compilation of the names and mailing addresses of the owners of all property that is adjacent to the proposed off-site improvement/alignment.

I further certify that the information filed is true and correct to the best of my knowledge. I understand that incorrect or incomplete information may be grounds for rejection or denial of the application.

NAME: Vinnie Nguyen

TITLE GIS Analyst

ADDRESS: 4080 Lemon Street 2nd Floor

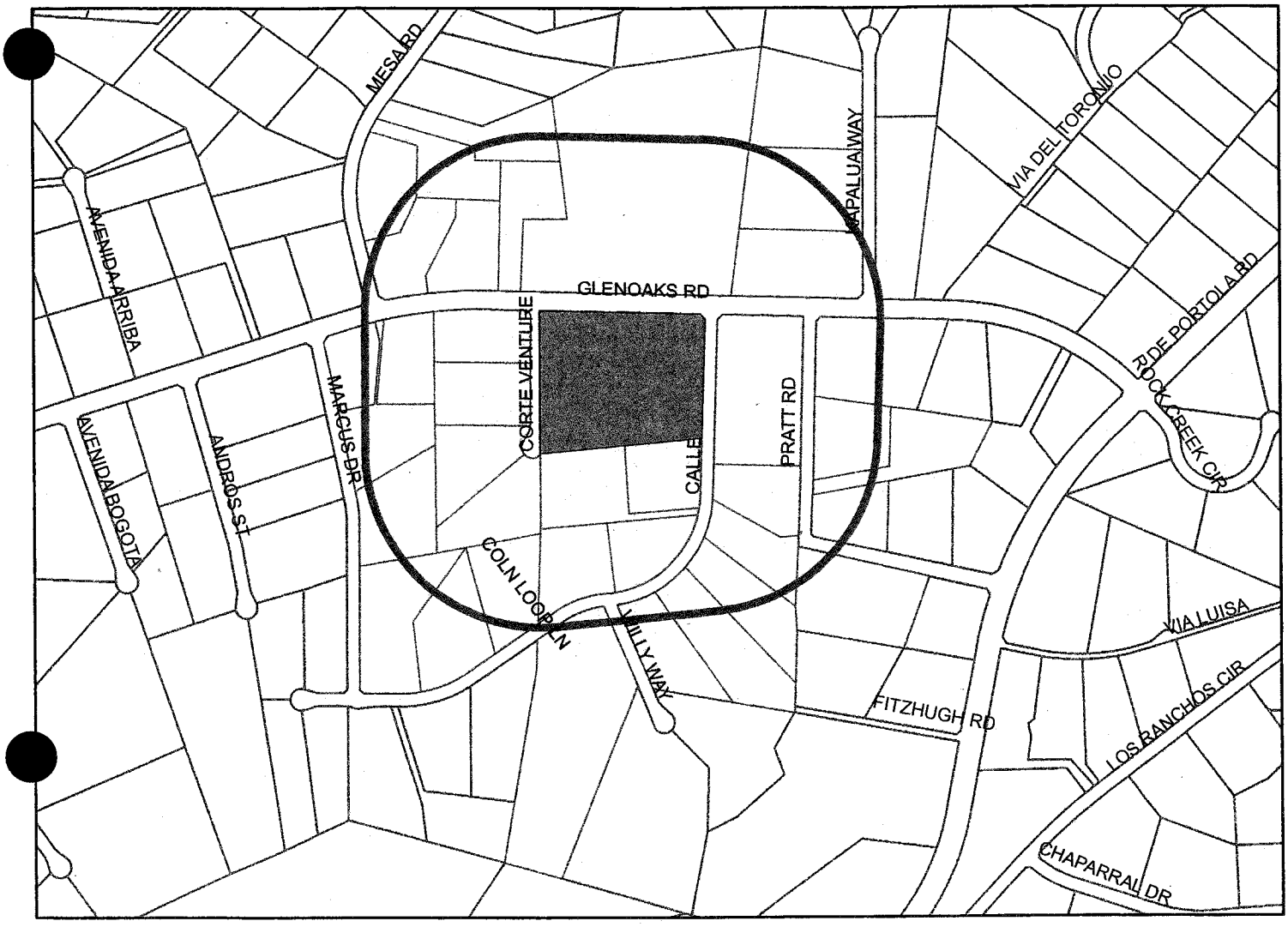
Riverside, Ca. 92502

TELEPHONE NUMBER (8 a.m. – 5 p.m.): (951) 955-8158

2/24/11 cgm

Expires: 8/24/1

800 feet buffer



Selected Parcels

941-080-045	941-120-018	941-080-032	941-080-036	924-260-006	941-080-039	941-120-019	941-080-043	941-080-023	924-250-004
941-080-046	941-110-027	941-080-031	941-080-030	941-110-024	941-080-037	941-110-026	924-250-002	941-080-027	924-250-003
941-090-002	941-080-029	941-110-028	941-120-020	924-260-010	924-250-009	941-110-031	941-110-029	941-110-032	941-110-030
924-260-012	924-260-013	924-260-014	924-260-015	924-260-011	941-080-038	941-080-047	941-080-044	941-080-042	

875 437.5 0 875 Feet

APN: 941080045, ASMT: 941080045
BERKSHIRE INV CORP
3305 W SPRING MTN RD 6033
LAS VEGAS NV 89102

APN: 941080043, ASMT: 941080043
DEUTSCHE BANK NATL TRUST CO
C/O OCWEN LOAN SERVICING
1661 WORTHINGTON STE 100
WEST PALM BEACH FL 33409

APN: 941120018, ASMT: 941120018
BERNARD J DEVENEY, ETAL
P O BOX 1374
NOVATO CA 94948

APN: 941080023, ASMT: 941080023
DON BROOKS, ETAL
37879 PRATT RD
TEMECULA CA. 92592

APN: 941080032, ASMT: 941080032
CAROL F HIGHFILL, ETAL
C/O KENNETH HIGHFILL
39760 CALLE BELLAGIO
TEMECULA CA. 92592

APN: 924250004, ASMT: 924250004
DONALD LEE DORAN, ETAL
39625 KAPALUA WAY
TEMECULA CA. 92592

APN: 941080036, ASMT: 941080036
CHRISTOPHER J STYNER, ETAL
39775 CALLE BELLAGIO
TEMECULA CA. 92592

APN: 941080046, ASMT: 941080046
GREGORY A GARCIA, ETAL
37891 GLENOAKS RD
TEMECULA CA. 92592

APN: 924260006, ASMT: 924260006
COUNTY OF RIVERSIDE
C/O DEPT OF FACILITIES MANAGEMENT
3133 MISSION INN AVE
RIVERSIDE CA 92507

APN: 941110027, ASMT: 941110027
JAMES E ROGERS, ETAL
37535 GLEN OAKS RD
TEMECULA CA. 92592

APN: 941080039, ASMT: 941080039
DENISE MILLER
32148 CALLE BALAREZA
TEMECULA CA 92592

APN: 941080031, ASMT: 941080031
JAMES W BEGG, ETAL
39890 CALLE BELLAGIO
TEMECULA CA. 92592

APN: 941120019, ASMT: 941120019
DEUTSCHE BANK NATL TRUST CO
C/O RECONTRUST CO
1800 TAPO CANYON SV2202
SIMI VALLEY CA 93063

APN: 941080030, ASMT: 941080030
JOAN F PRICE
39970 CALLE BELLAGIO
TEMECULA CA. 92592

APN: 941110024, ASMT: 941110024
KENNETH D RENCK, ETAL
52090 ELDEN CREEK RD
AGUANGA CA 92536

APN: 941080029, ASMT: 941080029
MCNALL FLORA DORA ESTATE OF
C/O DENNIS P MCNALL
P O BOX 2367
ORANGE CA 92859

APN: 941080037, ASMT: 941080037
KEVIN R WHELAN, ETAL
39797 CALLE BELLAGIO
TEMECULA CA. 92592

APN: 941110028, ASMT: 941110028
MICHAEL LEE BENDYKOWSKI, ETAL
39350 MARCUS DR
TEMECULA CA. 92592

APN: 941110026, ASMT: 941110026
KURT NICOLL, ETAL
39588 MARCUS DR
TEMECULA CA. 92592

APN: 941120020, ASMT: 941120020
MICHAEL WEISZ
39100 CALLE BELLAGIO LN
TEMECULA CA. 92592

APN: 924250002, ASMT: 924250002
MACK JONES, ETAL
39215 KAPALUA WAY
TEMECULA CA. 92592

APN: 924260010, ASMT: 924260010
OTTO N MONCADA
38940 MESA RD
TEMECULA CA. 92592

APN: 941080027, ASMT: 941080027
MARCUS HORTON, ETAL
40190 CALLE BELLAGIO
TEMECULA CA. 92592

APN: 924250009, ASMT: 924250009
PETR KUBICEK
2N 550 DIANE AVE
GLEN ELLYN IL 60137

APN: 924250003, ASMT: 924250003
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