Zone 4

Zone 5

I-210

SR-710

Del Mar Blvd

Arroyo Pkwy

Sierra Madre Blvd

California Blvd

EAST RAYMOND FAULT

RAYMOND FAULT

Huntington Drive

Santa Anita Wash

Rosemead Blvd

San Gabriel Blvd

Rubio Wash

Arcadia Wash

Santa Anita Ave

Arrow Hwy

Las Tunas Dr

Peck Rd

Rio Hondo River

San Gabriel River

I-605

Eaton Wash

Lower Azusa Rd

Fair Oaks Ave

San Pascual Wash

Alhambra Wash

Fremont Ave

Mission Rd

Main St

West Mission Rd

Valley Blvd

Atlantic Blvd

I-10

I-710

Structural Bedrock Discontinuity (CH2M HILL, 2009c)

ALHAMBRA WASH FAULT

RAYMOND HILL FAULT

WORKMAN HILL FAULT

EAST MONTEBELLO FAULT

5.9 magnitude earthquake epicenter, 10-1-87

PASADENA

ARCADIA

MONROVIA

DUARTE

SAN MARINO

SOUTH PASADENA

SAN GABRIEL

TEMPLE CITY

ROSEMEAD

EL MONTE

SOUTH EL MONTE

MONTEREY PARK

ALHAMBRA

BALDWIN PARK

Legend

(All Locations are Approximate)

- R-09-Z1B8 — Continuous Core Boring (CH2M HILL, this study)
- W12ASMW2 — Facility Monitoring Well (CH2M HILL, 2009)
- 4077B — Water Production Well; Location for which only Groundwater Data is Available (LACDPW, 2009)
- Caltrans As-built LOTB's, (Various Locations)
- ERP-15 — Groundwater Monitoring Well (CDM, 2008a)
- ERP-16 — Groundwater Monitoring Well (CDM, 2008b)
- EMI-1 — Continuous Core Boring (EMI, 2006)
- ERP-14 — Groundwater Monitoring Well (CDM, 2006)
- MW-17 — Groundwater Monitoring Well (CH2M HILL, 2006)
- CDEM-5 — Groundwater Monitoring Well (Geosyntec, 2006b)
- DCMW-1 — Monitoring Well (Geosyntec, 2006a)
- CA-OSW — Water Production Well (Geoscience, 2004)
- MW 1-6 — Groundwater Monitoring Well (CH2M HILL, 2003)
- NM-B1 — Boring (Ninyo and Moore, 1999)
- MW2-02 — Groundwater Monitoring Well (CDM, 1998)
- 90 — Geotechnical Boring (Law/Crandall, 1993)
- C-65/C-23f — Boring (Caltrans, 1974a)
- ES-1 — Geotechnical Boring (Caltrans, 1974b
- 9D2 — Water Production Well (CDWR, 1966)
- -1400- Structural Contour Line, Elevation at Top of Bedrock in Feet (MSL) (CDWR, 1966 and Geoscience, 2004)
- ~220~ Groundwater Elevation in Feet (MSL) (San Gabriel Basin - MSGW, 2006 and Raymond Basin - RBMB, 2006 and 2007)
- Z2-G2 — Seismic Reflection Line (CH2M HILL, this study)
- Zone 4 Limits
- Zone 5 Limits

Source of Base Map: Dibblee, 1989b, 1989c, 1998, 1999

GEOLOGIC SYMBOLS

not all symbols shown on each map

FORMATION CONTACT — dashed where inferred or indefinite, dotted where concealed

MEMBER CONTACT between units of a formation — Prominent bed

CONTACT BETWEEN SURFICIAL SEDIMENTS — located only approximately in places

FAULT: Dashed where indefinite or inferred, dotted where concealed, queried where existence is doubtful. Parallel arrows indicate inferred relative lateral movement. Relative vertical movement is shown by U/D (U=upthrown side, D=downthrown side). Short arrow indicates dip of fault plane. Sawteeth are on upper plate of low angle thrust fault.

FOLDS: overturned; ANTICLINE; SYNCLINE — arrow on axial trace of fold indicates direction of plunge; dotted where concealed by surficial sediments

Strike and dip of sedimentary rocks: inclined; inclined (approximate); overturned; horizontal; vertical

Strike and dip of metamorphic or igneous rock foliation or flow banding or compositional layers: inclined; inclined (approximate); vertical; overturned

OTHER SYMBOLS: Direction of landslide movement; outline of water bodies shown on map; water well; oil well; springs

Geologic Units - From Dibblee 1989b and 1999

— UNCONFORMITY —

FERNANDO FORMATION
Marine and nonmarine; age, early to late (?) Pliocene

Tfsc *Nonmarine sandstone and conglomerate; tan, semi-friable sandstone and bedded arkosic conglomerate of mostly granitic pebbles and cobbles in sandstone matrix; late (?) Pliocene age*

Tfr *Marine claystone (Repetto Member): gray, soft, vaguely bedded claystone, early Pliocene age (Repettian Stage) in lower part, middle and late (?) Pliocene age (Wheelerian Stage) in upper third*

UNNAMED SHALE
(Verba Member of Puente Formation of Schoellhamer, et al., 1965; included in Puente Formation by Lamar, 1970, and Weber, 1980; equivalent to Upper Modelo Formation of Hoots, 1931, in Santa Monica Mtns., and to Sespe/ Shale of Ventura Basin) Martinez age, late Miocene ("Delmontian" and late Mohnian Stages)

Tvsh *Gray to light brown, thin bedded, silty clay shale, locally contains scattered large calcareous nodules; in places contains thin interbeds of fine-grained sandstone; lower part locally contains thin lenses of light tan, platy, semi-siliceous or diatomaceous shale*

Tvss *Light gray to tan semi-friable sandstone, with thin interbeds of silty shale*

MONTEREY FORMATION
(La Vida and Soquel Members of Puente Formation of Schoellhamer, et al., 1965; Puente Formation of Lamar, 1970; Weber, 1980) Marine age, middle (?) and late Miocene

Tmsh *White-weathering, thin bedded, platy, siliceous shale, locally porcelaneous and silty; Mohnian Stage*

Tmss *Tan to light gray, semi-friable arkosic sandstone; includes some interbedded silty shale*

Tmsl *Gray, micaceous silty shale and siltstone; includes some semi-siliceous to siliceous shale and thin sandstone beds; Mohnian and Luisian Stages (includes upper part of Topanga Formation of Lamar, 1970)*

TOPANGA (?) FORMATION
(Topanga Formation of Lamar, 1970, Webber, 1980; may be equivalent To Calabasas Formation of Yerkes and Campbell, 1979) Marine age, middle(?) and/or late Miocene

Ttopc *Gray to brown, crudely bedded conglomerate and breccia, all composed of biotite hornblende quartz diorite in sandstone matrix*

Ttsc *Light gray to brown semi-friable sandstone, and interbedded brown sandy to silty shale, semi-siliceous shale, and pebble-cobble conglomerate of quartz diorite detritus*

Ttqdb *Gray to brown, massive to vaguely bedded breccia with a few cobbles and boulders, all of biotite quartz diorite; probably overlies biotite quartz diorite basement rocks*

SURFICIAL SEDIMENTS *undissected alluvial deposits*

af *artificial fill, and cut and fill areas*

Qg *gravel and sand of major streams, and alluvial fan detritus from San Gabriel Mountains, grades southward into alluvium*

(Qa) *as sizes of clasts decrease*

Qa *alluvial gravel, sand and silt of valleys and floodplains*

LANDSLIDE DEBRIS

Qls

OLDER DISSECTED SURFICIAL SEDIMENTS

Qof *alluvial fan sediments derived from San Gabriel Mountains*

Qae *slightly elevated and locally dissected alluvial gravel and sand at base of hill areas; shown as* **Qa** *on adjacent Los Angeles (Dibblee, 1989) and on Mt. Wilson/Azusa (Dibblee, 1998) quadrangles*

Qoa *uplifted remnants of alluvial sand and gravel, north of hill areas*

Qog *uplifted remnants of alluvial gravel, south of Montebello Hills*

N

0 2,000 4,000 Feet

0 750 1,500 Meters

Plate 2
Geotechnical Map Zones 4 and 5

SR-710 Tunnel Technical Study
Los Angeles County, California

SCO \\CALT\PROJ\CALIFORNIADOT\378312\710MAPFILES\GEO\GEOTECHNICAL_ZONE4-5_D_V3.MXD RANHORN 10/12/2009 09:55:58