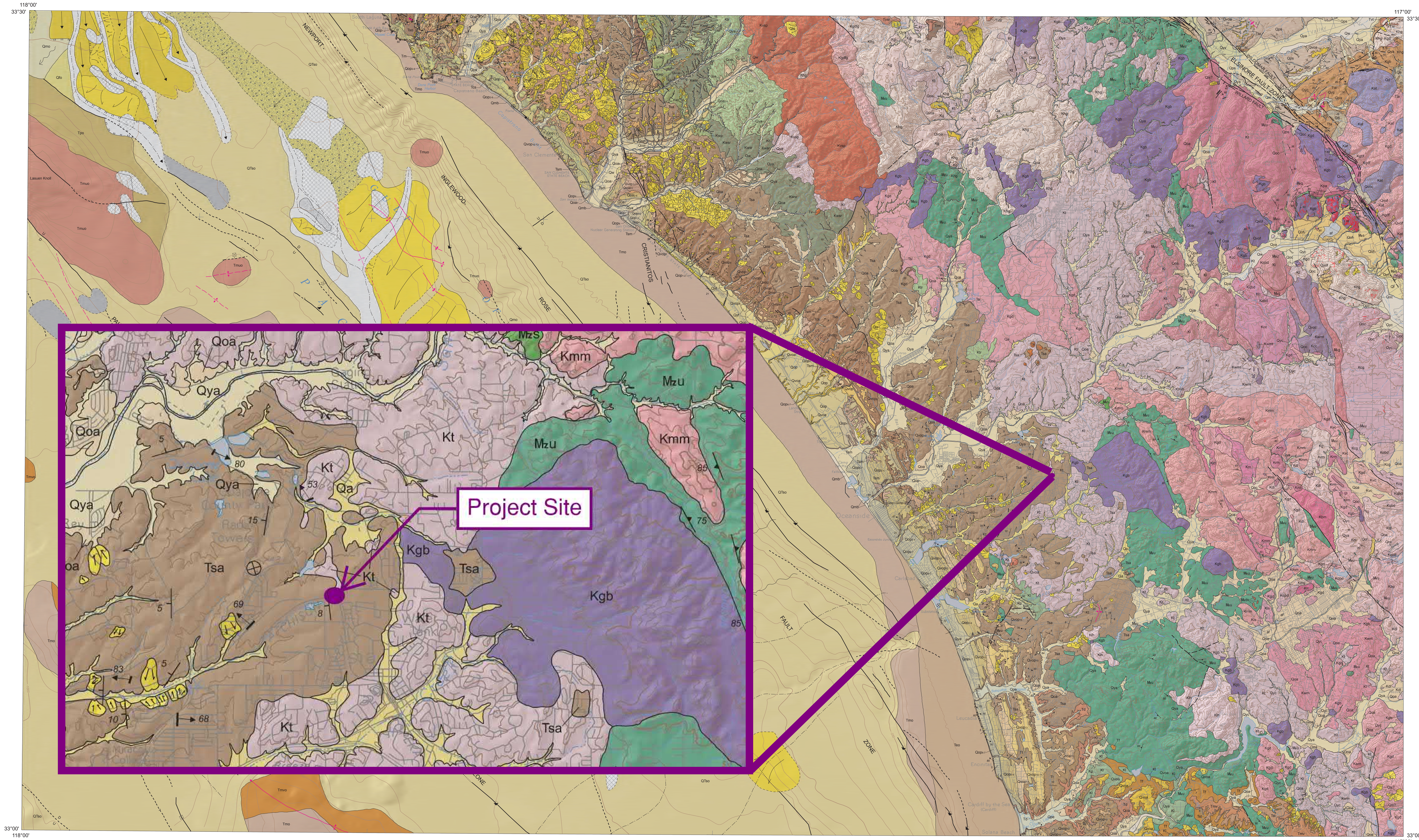


SCALE 1:100,000

Contour Interval: 50 meters (approximately 164 feet)
Bathymetric Contour Interval: 50 meters (approximately 164 feet)

APPROXIMATE MEAN DECLINATION, 2007 (13° 231 MILS)

Base Map

Onshore base (hypsography, hydrography, and transportation) from U.S.G.S. digital line graph (DLG) data, Oceanside 30' x 60' metric quadrangle. Shaded topographic base from U.S.G.S. digital elevation models (DEM's). Offshore bathymetric contours and shaded bathymetry from N.O.A.A. single and multibeam data. Projection is UTM, zone 11, North American Datum 1927.

This map was funded in part by the U.S. Geological Survey National Cooperative Geologic Mapping Program, STATEMAP Award no. 01NQAG0092.

Prepared in cooperation with the U.S. Geological Survey, Southern California Areal Mapping Project.

GEOLOGIC MAP OF THE OCEANSIDE 30' × 60' QUADRANGLE, CALIFORNIA

Compiled by
Michael P. Kennedy[1] and Siang S. Tan[1]
2007
Digital preparation by
Kelly R. Bovard[2], Rachel M. Alvarez[2], Michael J. Watson[2], and Carlos I. Gutierrez[1]

1. Department of Conservation, California Geological Survey
2. U.S. Geological Survey, Department of Earth Sciences, University of California, Riverside

ABBREVIATED EXPLANATION

Approximate stratigraphic relationships only;
see pamphlet and CMU (Plate 2) for more detailed information

MODERN SURFICIAL DEPOSITS

Holocene
- af — Artificial fill (late Holocene)
- Qw — Wash deposits (late Holocene)
- Qf — Alluvial fan deposits (late Holocene)
- Qa — Alluvial flood-plain deposits (late Holocene)
- Qls — Landslide deposits, undivided (Holocene and Pleistocene)
- Qmb — Marine beach deposits (late Holocene)
- Qpe — Paralic estuarine deposits (late Holocene)
- Qmo — Undivided marine deposits in offshore region (late Holocene)
- Qfo — Marine fan deposits (late Holocene)

YOUNG SURFICIAL DEPOSITS

- Qyf — Young alluvial fan deposits (Holocene and late Pleistocene)
- Qya — Young alluvial flood-plain deposits (Holocene and late Pleistocene)
- Qyc — Young colluvial deposits (Holocene and late Pleistocene)
- Qyv — Young alluvial valley deposits (Holocene and late Pleistocene)

OLD SURFICIAL DEPOSITS

Pleistocene
- Qof — Old alluvial fan deposits, undivided (late to middle Pleistocene)
  - Qof_2 — Unit 2
  - Qof_1 — Unit 1
- Qoa — Old alluvial flood-plain deposits, undivided (late to middle Pleistocene)
  - Qoa_7 — Unit 7
  - Qoa_6 — Unit 6
  - Qoa_5 — Unit 5
  - Qoa_{2-6} — Unit 2-6
  - Qoa_{1-2} — Units 1-2
- Qoc — Old colluvial deposits (late to middle Pleistocene)
- Qop — Old paralic deposits, undivided (late to middle Pleistocene)
  - Qop_7 — Unit 7
  - Qop_6 — Unit 6
  - Qop_4 — Unit 4
  - Qop_3 — Unit 3
  - Qop_1 — Unit 1
  - Qop_{6-7} — Units 6-7
  - Qop_{4-6} — Units 4-6
  - Qop_{2-4} — Units 2-4
  - Qop_{1-2} — Units 1-2
  - Qop_{7-8} — Units 7-8
  - Qop_{2-6} — Units 2-6
  - Qop_1-$Qvop_{13}$ — Units Qop_1 -$Qvop_{13}$

VERY OLD SURFICIAL UNITS

- Qvof — Very old alluvial fan deposits (middle to early Pleistocene)
- Qvoa — Very old alluvial flood-plain deposits, undivided (middle to early Pleistocene)
  - $Qvoa_{13}$ — Unit 13
  - $Qvoa_{12}$ — Unit 12
  - $Qvoa_{11}$ — Unit 11
- Qvoc — Very old colluvial deposits, undivided (middle to early Pleistocene)
- Qvop — Very old paralic deposits, undivided (middle to early Pleistocene)
  - $Qvop_{13}$ — Unit 13
  - $Qvop_{12}$ — Unit 12
  - $Qvop_{11}$ — Unit 11
  - $Qvop_{10}$ — Unit 10
  - $Qvop_9$ — Unit 9
  - $Qvop_8$ — Unit 8
  - $Qvop_7$ — Unit 7
  - $Qvop_5$ — Unit 5
  - $Qvop_4$ — Unit 4
  - $Qvop_3$ — Unit 3
  - $Qvop_2$ — Unit 2
  - $Qvop_1$ — Unit 1
  - $Qvop_{11-12}$ — Units 11-12
  - $Qvop_{10-11}$ — Units 10-11
  - $Qvop_{9-10}$ — Units 9-10
  - $Qvop_{8-9}$ — Units 8-9
  - $Qvop_{7-8}$ — Units 7-8
  - $Qvop_{2-3}$ — Units 2-3
  - $Qvop_{10-13}$ — Units 10-13

SEDIMENTARY AND VOLCANIC BEDROCK UNITS

- Qps / Qpf — Pauba Formation (early Pleistocene)
  - Qps - sandstone facies
  - Qpf - fanglomerate facies
- Qd — Dripping Springs Formation (early Pleistocene)
- QTso — Undivided sediments and sedimentary rocks in offshore region (Holocene, Pleistocene, Pliocene and Miocene)

Pliocene
- Tta — Temecula Arkose (late Pliocene)
- Tn — Niguel Formation (late Pliocene)
- Tpo — Undivided sedimentary rocks in offshore region (Pliocene)
- Tcs / Tct — Capistrano Formation (early Pliocene and late Miocene)
  - Tcs - siltstone facies
  - Tct - turbidite facies

Miocene
- Tsm — San Mateo Formation (early Pliocene and late Miocene)
- Tvsr — Santa Rosa basalt of Mann (1955) (late Miocene)
- Tda — Dacite stock (Miocene)
- Tv — Volcanic rocks, undivided (Miocene)
- Tvt — Basalt of Temecula area (Miocene)
- Tm — Monterey Formation (middle and late Miocene)
- Tso / Tsoss — San Onofre Breccia (middle Miocene)
  - Tso - breccia
  - Tsoss - sandstone
- Tto — Topanga Formation (middle Miocene)
- Tmo — Undivided sedimentary rocks in offshore region (Miocene)
- Tmvo — Undivided volcanic rocks in offshore region (Miocene)
- Tmuo — Undivided volcanic and sedimentary rocks in offshore region (Miocene)—Tmo or Tmvo

Oligocene
- Tsv — Sespe and Vaqueros Formations, undivided (early Miocene, Oligocene and late Eocene)

Eocene
- Trm — Sandstone of Redonda Mesa (Paleogene)
- Tmv — Mission Valley Formation (middle Eocene)
- Tst — Stadium Conglomerate (middle Eocene)
- Tf — Friars Formation (middle Eocene)
- Tt — Torrey Sandstone (middle Eocene)
- Td — Delmar Formation (middle Eocene)
- Tsa — Santiago Formation (middle Eocene)
- Teo — Undivided Eocene rocks in the offshore area (Eocene)

Paleocene
- Tsi — Silverado Formation (Paleocene)

Cretaceous
- Kp — Point Loma Formation (Upper Cretaceous)
- Kwp / Kwsr — Williams Formation (Upper Cretaceous)
  - Kwp - Pleasants Sandstone Member
  - Kwsr - Schulz Ranch Sandstone Member
- Kl — Lusardi Formation (Upper Cretaceous)
- Ktr — Trabuco Formation (Upper Cretaceous)

UNNAMED CRETACEOUS ROCKS OF THE PENINSULAR RANGES BATHOLITH

- Kgp — Granite pegmatite dike (mid-Cretaceous)
- Kg — Granite, undivided (mid-Cretaceous)
- Kmg — Monzogranite, undivided (mid-Cretaceous)
- Kgd — Granodiorite, undivided (mid-Cretaceous)
- Kgdfg — Granodiorite (fine-grained), undivided (mid-Cretaceous)
- Kt — Tonalite, undivided (mid-Cretaceous)
- Kqbd — Quartz-bearing diorite, undivided (mid-Cretaceous)
- Kd — Diorite, undivided (mid-Cretaceous)
- Kgb — Gabbro, undivided (mid-Cretaceous)
- Khg — Heterogeneous granitic rocks (Cretaceous)

NAMED CRETACEOUS ROCKS OF THE PENINSULAR RANGES BATHOLITH

- Kdl — Granite of Dixon Lake (mid-Cretaceous)
- Kbp — Granite of Bottle Peak (mid-Cretaceous)
- Kis — Granite of Indian Springs (mid-Cretaceous)
- Klh — Leucogranodiorite of Lake Hodges (mid-Cretaceous)
- Kvc — Monzogranite of Valley Center (mid-Cretaceous)
- Kmm — Monzogranite of Merriam Mountain (mid-Cretaceous)
- Kwm — Granodiorite of Woodson Mountain (mid-Cretaceous)
- Kjd — Granodiorite of Jesmond Dean (mid-Cretaceous)
- Kbm — Granodiorite of Burnt Mountain (mid-Cretaceous)
- Km — Granodiorite of Mountain Meadows (mid-Cretaceous)
- Krr — Granodiorite of Rimrock (mid-Cretaceous)
- Ki — Granodiorite of Indian Mountain (mid-Cretaceous)
- Kr — Granodiorite of Rainbow (mid-Cretaceous)
- Kpa — Granodiorite of Pala (mid-Cretaceous)
- Kgdf — Granodiorite, undivided within the Elsinore Fault Zone (mid-Cretaceous)
- Kcg — Tonalite of Cole Grade (mid-Cretaceous)
- Kcc — Tonalite of Couser Canyon (mid-Cretaceous)
- Krm — Quartz-bearing diorite of Red Mountain (mid-Cretaceous)
- Kat — Gabbro of the Agua Tibia Mountains (mid-Cretaceous)
- Kwmt — Gabbro of Weaver Mountain (mid-Cretaceous)
- Kgbf — Gabbro, undivided within the Elsinore Fault Zone (mid-Cretaceous)
- Kvsp — Santiago Peak Volcanics (Cretaceous)

PREBATHOLITHIC AND SYNBATHOLITHIC METAMORPHIC ROCKS

Jurassic
- Mzu — Metasedimentary and metavolcanic rocks, undivided (Mesozoic)
- Mzd — Metavolcanic dikes (Mesozoic)
- Mzg — Metagranitic rocks (Mesozoic)
- Mzq — Quartzite and quartz conglomerate (Mesozoic)
- Mzs — Schist with minor amphibolite and marble (Mesozoic)

ONSHORE MAP SYMBOLS

Contact - Contact between geologic units; generally approximately located; dotted where concealed.

Fault - Solid where accurately located; dashed where approximately located; dotted where concealed. U = upthrown block, D = downthrown block. Arrow and number indicate direction and angle of dip of fault plane.

Anticline - Solid where accurately located; dotted where concealed.

Syncline - Solid where accurately located; dotted where concealed.

Kgp - Granite pegmatite dike.

Closed depression - Closed depression in Elsinore fault zone.

Landslide - Arrows indicate principal direction of movement. Queried where existence is questionable.

Strike and dip of beds
- Inclined
- Overturned
- Vertical
- Horizontal

Strike and dip of igneous foliation
- Inclined
- Vertical

Strike and dip of igneous joints
- Inclined
- Vertical

Strike and dip of metamorphic foliation
- Inclined

Strike and dip of sedimentary joints
- Vertical

OFFSHORE MAP SYMBOLS

Contacts

Contact - All contacts are extrapolated from a combination of seismic reflection data, samples and bathymetry, and are approximate in location.

Faults

Fault - Solid where well defined; short dash where inferred; dotted where concealed; queried where uncertain. Where fault offsets sea floor, age symbol is shown on bar on downthrown side. Where age was determined, age symbol is shown astride fault and relative offset if known is shown by "D" and "U" on downthrown and upthrown sides. Ages of faults are indicated as follows:
- cuts strata of Holocene age
- cuts strata of Pleistocene age
- cuts strata of Quaternary age
- cuts Miocene or older strata

Fault zone - Area of extensively sheared rock within a zone defined by multiple faults.

Folds

Anticline - Dashed where inferred. Solid arrow indicates direction of axial plunge.

Syncline - Solid where well defined, dashed where inferred.

Major Structural Features

Structural High - Dashed line is approximate axis of elongated bedrock highs depicted from deep (>2 sec.) seismic reflection data.

Channels

Active - Dash-dot line marks axis, arrow indicates direction of paleo-sediment transport.

Filled - Dash-dot line marks axis, arrow indicates direction of paleo-sediment transport. Channel boundary solid where well defined, dashed where inferred.

Buried - Dash-dot line marks axis, arrow indicates direction of paleo-sediment transport. Channel boundary dotted.

Levees

Levees - Solid where well defined, dashed where inferred.

Landslides

Creep - Solid where well defined, dashed where inferred.

Creep (noted on single survey line) - Arrow indicates apparent direction of sediment movement.

Slump - Solid where well defined, dashed where inferred. Arrows indicate direction of movement.

Slump Scarp - Solid where well defined, dashed where inferred.

Erosional scarp - Solid where well defined. Generally associated with active channels.

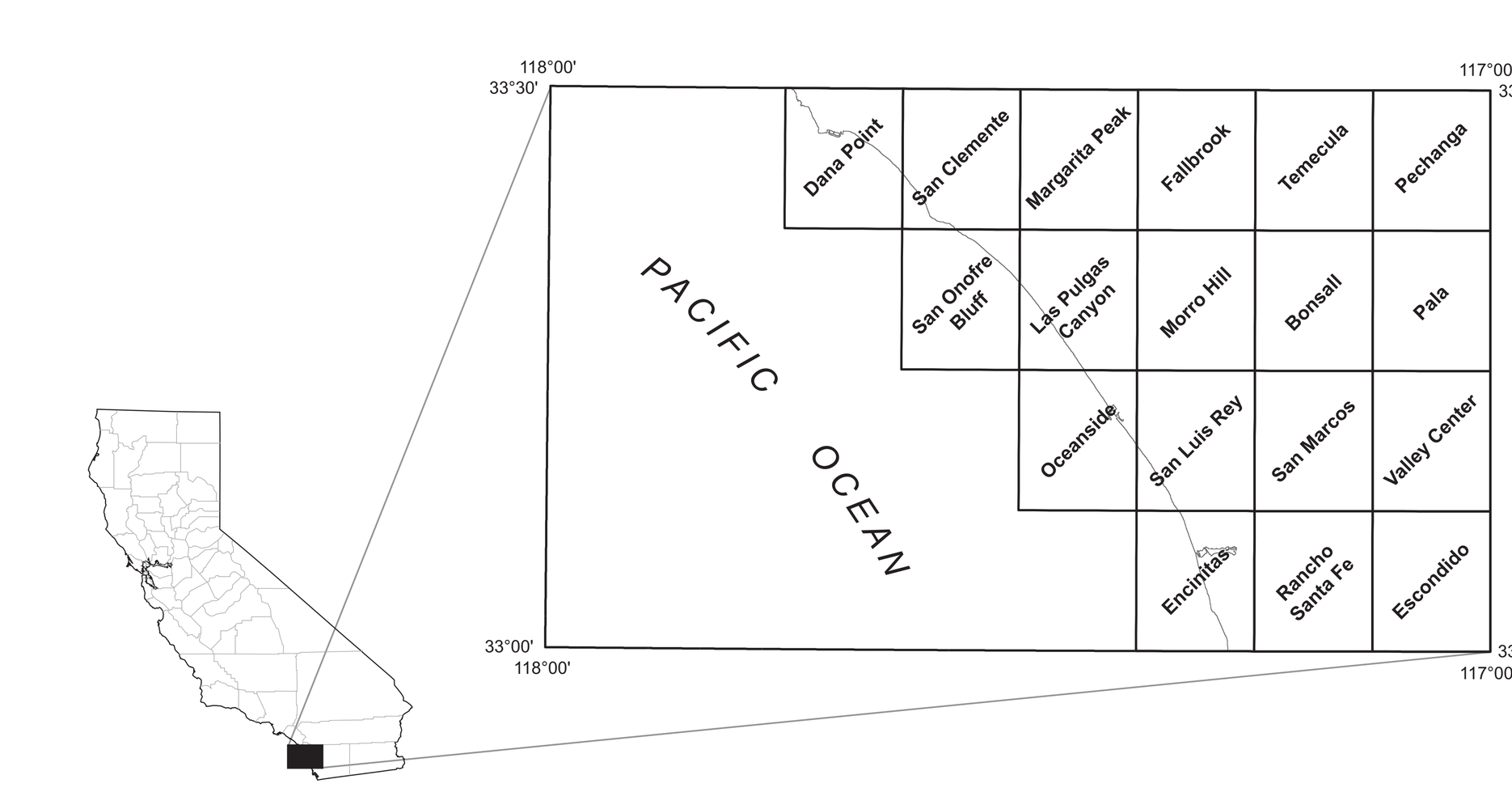
Block Glide - Solid where well defined, dashed where inferred. Arrow indicates direction of movement.

Sediment Flow - Solid where well defined, dashed where inferred. Arrow indicates direction of movement.

Gas

Oil and/or gas seep

Area of acoustic anomaly (possibly indicating trapped shallow gas) - Solid where well defined, dashed where inferred.



ABBREVIATED INDEX TO GEOLOGIC SOURCE DATA

(Primary compilation sources shown in bold type)

See pamphlet for complete citation

Bonsall Quadrangle
Larsen, 1948; **Tan, 2000a**; Weber, 1963.

Dana Point Quadrangle
Edgington, 1974; Kern, 1996a; Kern and others, 1996; Morton and Miller, 1981; Tan, 1984; **Tan, 1999a**; Tan and Weber, 1984; Vedder, 1975.

Encinitas Quadrangle
Kern, 1996a; Tan, 1986; **Tan and Kennedy, 1996**; Tan and Giffen, 1995; Wilson, 1972.

Escondido Quadrangle
Kennedy and Peterson, 1975; Larsen, 1948; Tan and Giffen, 1995; **Tan and Kennedy, 1999**; Weber, 1963.

Fallbrook Quadrangle
Tan, 2000b; Larsen, 1948; Weber, 1963.

Las Pulgas Canyon Quadrangle
Boss and others, 1958; Craig, 1984; Cranham and others, 1994; Ehlig and Farley, 1976; Kern, 1996a; Kern, 1996b; **Kennedy, 2001**.

Margarita Peak Quadrangle
Boss and others, 1958; **Tan, 2001a**; Larsen, 1948.

Morro Hill Quadrangle
Boss and others, 1958; Elliot, 1985; Larsen, 1948; **Tan, 2001b**; Weber, 1963.

Oceanside Quadrangle
Kern, 1996a; **Tan and Kennedy, 1996**; Tan and Giffen, 1995; Weber, 1982.

Pala Quadrangle
Hanley and Jahns, 1950; Irwin and Greene, 1970; Jahns and Wright, 1951; **Kennedy, 2000a**; Larsen, 1948.

Pechanga Quadrangle
Hanley and Jahns, 1950; Irwin and Greene, 1970; Jahns and Wright, 1951; Kennedy, 1977; **Kennedy, 2000b**; Larsen, 1948.

Rancho Santa Fe Quadrangle
Larsen, 1948; Nordstrom, 1970; Tan, 1987; Tan and Giffen, 1995; **Tan and Kennedy, 1996**; Weber, 1963.

San Clemente Quadrangle
Blanc and Cleveland, 1968; Boss and others,1958; Ehlig and Farley, 1976; Kern, 1996a; Kern, 1996b; Morton and Miller, 1981; **Tan, 1999b**; Tan and Weber, 1984; Vedder, 1975.

San Luis Rey Quadrangle
Tan and Kennedy, 1996; Tan and Giffen, 1995; Weber, 1982; Wilson, 1972.

San Marcos Quadrangle
Herzig, 1991; **Tan and Kennedy, 1996**; Larsen, 1948; Tan and Giffen, 1995; Weber, 1963, 1982.

San Onofre Bluff Quadrangle
Boss and others, 1958; Ehlig and Farley, 1976; Kern, 1996a; Kern, 1996b; **Tan, 1999c**.

Temecula Quadrangle
Kennedy, 1977; Larsen, 1948; Mann, 1955; **Tan and Kennedy, 2000**.

Valley Center Quadrangle
Kennedy, 1999; Larsen, 1948; Merriam, 1953.

Offshore Region
Clarke and others, 1987; Ryan and others, in preparation; Ryan and others, in review.

Table H.1-2: Land Cover Grouping for SanGIS Ecology-Vegetation Data Set

Id	SanGIS Legend	SanGIS Grouping	Land Cover Grouping
1	42000 Valley and Foothill Grassland	Grasslands, Vernal Pools, Meadows, and Other Herb Communities	Agricultural/Grass
2	42100 Native Grassland		Agricultural/Grass
3	42110 Valley Needlegrass Grassland		Agricultural/Grass
4	42120 Valley Sacaton Grassland		Agricultural/Grass
5	42200 Non-Native Grassland	Grasslands, Vernal Pools, Meadows, and Other Herb Communities	Agricultural/Grass
6	42300 Wildflower Field		Agriculture/Grass
7	42400 Foothill/Mountain Perennial Grassland		Agriculture/Grass
8	42470 Transmontane Dropseed Grassland		Agriculture/Grass
9	45000 Meadow and Seep		Agriculture/Grass
10	45100 Montane Meadow		Agriculture/Grass
11	45110 Wet Montane Meadow		Agriculture/Grass
12	45120 Dry Montane Meadows		Agriculture/Grass
13	45300 Alkali Meadows and Seeps		Agriculture/Grass
14	45320 Alkali Seep		Agriculture/Grass
15	45400 Freshwater Seep		Agriculture/Grass
16	46000 Alkali Playa Community		Agriculture/Grass
17	46100 Badlands/Mudhill Forbs		Agriculture/Grass
18	Non-Native Grassland		Agriculture/Grass
19	18000 General Agriculture	Non-Native Vegetation, Developed Areas, or Unvegetated Habitat	Agriculture/Grass
20	18100 Orchards and Vineyards		Agriculture/Grass
21	18200 Intensive Agriculture		Agriculture/Grass
22	18200 Intensive Agriculture - Dairies, Nurseries, Chicken Ranches		Agriculture/Grass
23	18300 Extensive Agriculture - Field/Pasture, Row Crops		Agriculture/Grass
24	18310 Field/Pasture		Agriculture/Grass
25	18310 Pasture		Agriculture/Grass
26	18320 Row Crops		Agriculture/Grass
27	12000 Urban/Developed		Developed
28	12000 Urban/Develpoed		Developed
29	81100 Mixed Evergreen Forest	Forest	Forest
30	81300 Oak Forest		Forest
31	81310 Coast Live Oak Forest		Forest
32	81320 Canyon Live Oak Forest		Forest
33	81340 Black Oak Forest		Forest

FID	23857
LEGEND	42000 Valley and Foothill Grassland
HOLLAND95	42000
ACRES	5.454182
HISTORICAL	
DISTURBSRC	0
DATASRC	0
EDIT_DATE	1/1/2002
EDITOR	PWD
SCALE	500
DISTURBANC	0
SOURCE	2
CATEGORY	Grasslands, Vernal Pools, Meadows, and Other Herb Communities
Shape_STAr	237583.187313
Shape_STLe	2244.069231

6.2.2 Downstream systems Sensitivity to Course Sediment

Downstream Systems Sensitivity to Course Sediment		Form I-10	
When it has been determined that potential critical coarse sediment yield areas exist within the project site, the next step is to determine whether downstream systems would be sensitive to reduction of coarse sediment yield from the project site. Use this form to document the evaluation of downstream systems requirements for preservation of coarse sediment supply.			
Project Name:			
Project Tracking Number / Permit Application Number:			
1	Will the project discharge runoff to a hardened MS4 system (pipe or lined channel) or an un-lined channel?	☐ Hardened MS4 system	Go to 2
		☒ Un-lined channel	Go to 4
2	Will the hardened MS4 system convey sediment (e.g., a concrete-lined channel with steep slope and cleansing velocity) or sink sediment (e.g., flat slopes, constrictions, treatment BMPs, or ponds with restricted outlets within the system will trap sediment and not allow conveyance of coarse sediment from the project site to an un-lined system).	☐ Convey	Go to 3
		☐ Sink	Go to 7
3	What kind of receiving water will the hardened MS4 system convey the sediment to?	☐ Un-lined channel	Go to 4
		☐ Lake ☐ Reservoir ☐ Bay	Go to 7
		☐ Lagoon ☐ Ocean	Go to 6
4	Is the un-lined channel impacted by deposition of sediment? This condition must be documented by the local agency.	☐ Yes	Go to 7
		☒ No	Go to 5

Form I-10 Page 2 of 2	
5	End – Preserve coarse sediment supply to protect un-lined channels from accelerated erosion due to reduction of coarse sediment yield from the project site unless further investigation determines the sediment is not critical to the receiving stream. Sediment that is critical to receiving streams is the sediment that is a significant source of bed material to the receiving stream (bed sediment supply) (see Section 6.2.3 and Appendix H.2 of the manual).
6	End – Provide management measures for preservation of coarse sediment supply (protect beach sand supply).
7	End – Downstream system does not warrant preservation of coarse sediment supply, no measures for protection of critical coarse sediment yield areas onsite are necessary. Use the space below to describe the basis for this finding for the project.

Further investigation based on additional optional analysis per appendix H.2 of the manual determined that the sediment is not critical for the receiving streams. See 6.2.3 on the following page

Placeholder – **6.2.3 Additional Analysis of Potential Critical Coarse Sediment Yield Areas Onsite** (Optional)

Replace placeholder with required calculations/documentation.

Leave placeholder intact if not applicable.

☐Not Applicable

Kimley»Horn

OPTIONAL ADDITIONAL ANALYSIS WHEN POTENTIAL CRITICAL COARSE SEDIMENT YIELD AREAS ARE PRESENT ONSITE

The following steps will be completed to determine whether the project site is a Significant Source of Bed Sediment Supply to the channel receiving runoff and includes the following components:

A. **Site soil assessment, including an analysis and comparison of the Bed Sediment in the receiving channel and the onsite channel**
B. **Determination of the capability of the channels on the project site to deliver the site Bed Sediment (if present) to the receiving channel**
C. **Present and potential future condition of the receiving channel**

A. Site soil Assessment, including an analysis and comparison of the Bed Sediment in the channel receiving runoff and the onsite channels

A geotechnical analysis was done to assess the soils onsite and in the offsite channel to meet the requirements of conditions of step A. The analysis showed presence of coarse clayey sand and fine sandy clay. The geotechnical engineer determined that the similarity of the onsite sediment to the channel bed sediment is medium and the analysis and results are included in this report. The sample locations onsite GLUs and channels are also included in the geotechnical engineer's report.

B. Determination of the capacity of the channels on the project site to deliver the site Bed Sediment to the receiving channel.

The GLU analysis and subsequent soil analysis showed the presence of critical coarse sediment areas onsite. The site was observed to determine the sediment delivery potential of the site to convey bed material to the receiving stream (bed material sediment delivery potential or ratio). The sediment transport potential is affected by sediment source, proximity to the receiving stream, onsite channel density, project watershed area, slope, length, land use, land cover, and rainfall intensity.

The existing site surface drains to three discharge locations. Each location is collected in the City of Vista's storm drain system and conveyed through pipes, headwalls, lined ditches, and culverts to the downstream offsite channel. The process for stormwater to flow all the way to the downstream channel limits the potential for sediment transport. As storm drains tend to collect sediment at junctions, bends, and manholes, the existing storm drain system inhibits the transport of sediments. A site observation showed the ground cover is vegetated increasing onsite channel roughness, resulting in reduced velocities, limiting the erosion potential, and discouraging sediment transport. Additionally, the areas tributary to coarse grained material is minimal further reducing chance of erosion. Coarse grained samples were found in the flatter areas onsite further reducing potential to deliver sediment to downstream channels. Therefore, in our opinion, the potential to deliver sediment to the downstream receiving waters is low.

C. Present and potential future condition of the channel receiving runoff from the project site.

The receiving channel was visually inspected for bank stability and degradation of bed material. The channel is covered with vegetative cover increasing channel roughness. The vegetative cover reduces velocities, limits erosion potential, and inhibits sediment transport. Observation of this area indicated no signs of instability due to sediment deposition or scour, nor signs of sensitivity to changes in bed material load. Hydromodification (low flow control) and detention (peak flow control) management measures included in the project design assure decreased flow rates through the channel in the future. Therefore, the condition of the receiving channel is expected to remain stable and the potential for adverse response based on a change in bed sediment load due to onsite development is low.

Conclusion

The evaluation using the BMP Manual provide the following results:

A. Site Soil Assessment – **Medium**

B. Sediment Delivery Capacity – **Low**

C. Present and Future Condition – **Low**

The overall score is **Low** and the project site is not a significant source of bed sediment material for the receiving channel. Site design considerations are not recommended for the site to mitigate for CCSYAs. The site is not a critical source of coarse sediment and the proposed development will not have impacts downstream.

INVESTIGATION OF POTENTIAL CRITICAL COARSE SEDIMENT YIELD AREAS

MODERA MELROSE
OCEANSIDE, CALIFORNIA

GEOCON
INCORPORATED

GEOTECHNICAL
ENVIRONMENTAL
MATERIALS

PREPARED FOR

MCRT INVESTMENTS INC.
COSTA MESA, CALIFORNIA

DECEMBER 7, 2021
PROJECT NO. 07647-32-04

Project No. 07647-32-04
December 7, 2021

MCRT Investments LLC
949 South Coast Drive, Suite 400
Costa Mesa, California 92626

Attention: Mr. John Colletti

Subject: INVESTIGATION OF POTENTIAL CRITICAL
COARSE SEDIMENT YIELD AREAS
CITY OF OCEANSIDE BMP DESIGN MANUAL
APPENDIX H: STEP 1A – SITE SOIL ASSESSMENT
MODERA MELROSE
OCEANSIDE, CALIFORNIA

Dear Mr. Colletti:

In accordance with the request of Mr. Bryan Nord with Kimley-Horn Incorporated, we have performed a site soil assessment for the Modera Melrose project located in Oceanside, California. This evaluation is part of an investigation of potential critical coarse sediment yield areas in accordance with the City of Oceanside's storm water management guidelines.

The site is located southeast of the intersection of Oceanside Boulevard and North Melrose Drive, in Oceanside, California, as presented on the Vicinity Map, Figure 1. The property is bounded by Oceanside Boulevard to the north, North Melrose Drive to the west, residential homes and an open space lot to the east, and a bike path and railroad easement to the south. The subject property is undeveloped with gentle southward sloping terrain and a small drainage course near the south-central portion. This drainage course has been partially in-filled with undocumented fill. Existing elevations vary from approximately 424 Mean Sea Level (MSL) in the south-central portion to approximately 455 MSL in the northern portion of the property.

The scope of our services included collecting soil samples, performing laboratory testing, and preparing this report. The soil assessment was performed in accordance with *Appendix H – Guidance for Investigating Potential Critical Coarse Sediment Yield Areas* of the *City of Oceanside BMP Manual*, dated February 2016.

STEP 1A – SITE SOIL ASSESSMENT

Sieve Analysis Results

We collected 8 soil samples (GR-1 through GR-8) on both sides of the south-central drainage. We also collected 2 soil samples from the receiving channel (GR-9 and GR-10). We performed laboratory gradation tests on the samples in accordance with ASTM D 6913. The samples were collected within the upper 3 feet of the existing surface using hand excavation equipment. The locations of Samples GR-1 through GR-10 are presented on Geologic Map, Figure 2. The soil samples are indicated on Table 1 as coarse-grained soils (consisting of less than 50 percent fines) or fine-grained soils (consisting of 50 percent or greater fines). The laboratory test results are summarized in Table 1 and presented in Appendix A.

TABLE 1
SUMMARY OF LABORATORY GRAIN SIZE DISTRIBUTION TEST RESULTS
(ASTM D 6913)

Sample No.	% Gravel	% Sand	% Fines	USCS Classification	Storm Water Classification
GR-1	0	58	42	Clayey SAND (SC)	Coarse Grained
GR-2	0	63	37	Clayey SAND (SC)	Coarse Grained
GR-3	0	63	37	Clayey SAND (SC)	Coarse Grained
GR-4	0	46	54	Sandy, lean CLAY (CL)	Fine Grained
GR-5	0	46	54	Sandy, lean CLAY (CL)	Fine Grained
GR-6	0	42	58	Sandy, lean CLAY (CL)	Fine Grained
GR-7	0	55	45	Silty SAND (SM)	Coarse Grained
GR-8	0	41	59	Sandy, lean CLAY (CL)	Fine Grained
GR-9	0	66	34	Silty, Clayey SAND (SC)	Coarse Grained
GR-10	2	62	36	Silty, Clayey SAND (SC)	Coarse Grained

Soil Erodibility (K) Factor

The State Water Resources Control Board maps the area with a K factor of 0.43 for Santiago Formation (Tsa) and 0.2 for Granitic Rock (Kb/Kt). Our testing of the onsite surface soil generally indicates that the Santiago Formation (Tsa) is relatively fine-grained and the granitic rock (shown as Kb on Figure 2, identified as map symbol Kt on the regional geologic map) is coarse-grained. The distribution of these two geologic formations are shown on the Geologic Map, Figure 2. The onsite coarse-grained soils may be potential generators of sand materials within the downstream drainage. Table 2 presents the estimated soil erodibility K factor based on the laboratory gradation test results and the USDA nomograph (Erikson 1977 as referenced in Goldman et al, 1986).

TABLE 2
SUMMARY OF SITE SPECIFIC SOIL ERODIBILITY K FACTOR

Sample No.	% Gravel	% Sand	% Fines	USCS Classification	Estimated Soil Erodibility K Factor
GR-1	0	58	42	Clayey SAND (SC)	0.20
GR-2	0	63	37	Clayey SAND (SC)	0.16
GR-3	0	63	37	Clayey SAND (SC)	0.16
GR-4	0	46	54	Sandy, lean CLAY (CL)	0.22
GR-5	0	46	54	Sandy, lean CLAY (CL)	0.22
GR-6	0	42	58	Sandy, lean CLAY (CL)	0.26
GR-7	0	55	45	Silty SAND (SM)	0.19
GR-8	0	41	59	Sandy, lean CLAY (CL)	0.26
GR-9	0	66	34	Silty, Clayey SAND (SC)	0.16
GR-10	2	62	36	Silty, Clayey SAND (SC)	0.16

Classification of the Soils on the Project Site

The USCS Classification of the soil samples are presented in Table 1.

Topographic Relief of the Project Area

The property gently slopes towards the south. The perimeter slopes along Melrose Drive and Oceanside Boulevard are 2:1 (H:V), or 50 percent slope. Within the development limits, the existing gradients generally range between 5 to 15 percent. For ease of reference, we are presenting the slope exhibit provided by Kimley Horn as Figure 3.

Site Soil Assessment Rating

In accordance with Appendix H of the SWS, the *user should rate the similarity of onsite Bed Sediment and Bed Sediment collected in the receiving channel as high, medium, or low.*

We reviewed the grain size distributions from the on-site soils (GR-1 through GR-8) and the off-site receiving channel (GR-9 and GR-10). It is our opinion that the soil in the receiving channel is generally similar to the granitic rock (Kb/Kt). Therefore, it is our opinion that a rating of **"medium"** is appropriate.

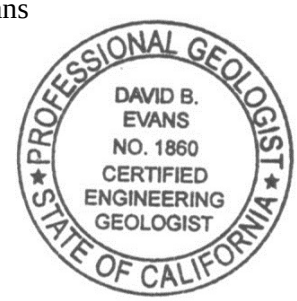
Should you have questions regarding this report, or if we may be of further service, please contact the undersigned at your convenience.

Very truly yours,

GEOCON INCORPORATED

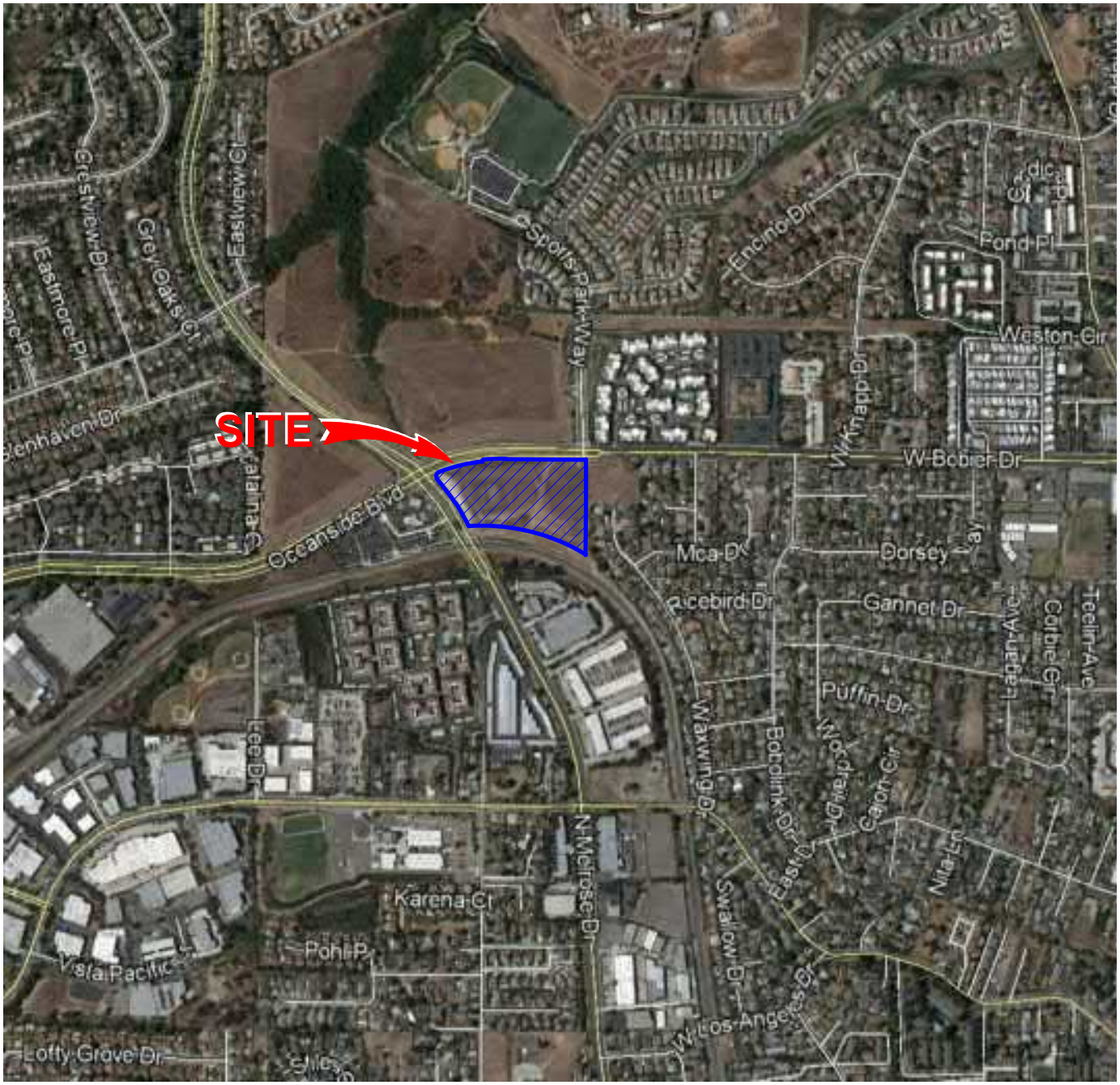
Trevor E. Myers
RCE 63773

David B. Evans
CEG 1860



TEM:DBE:am

(e-mail) Addressee



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N

NO SCALE

VICINITY MAP

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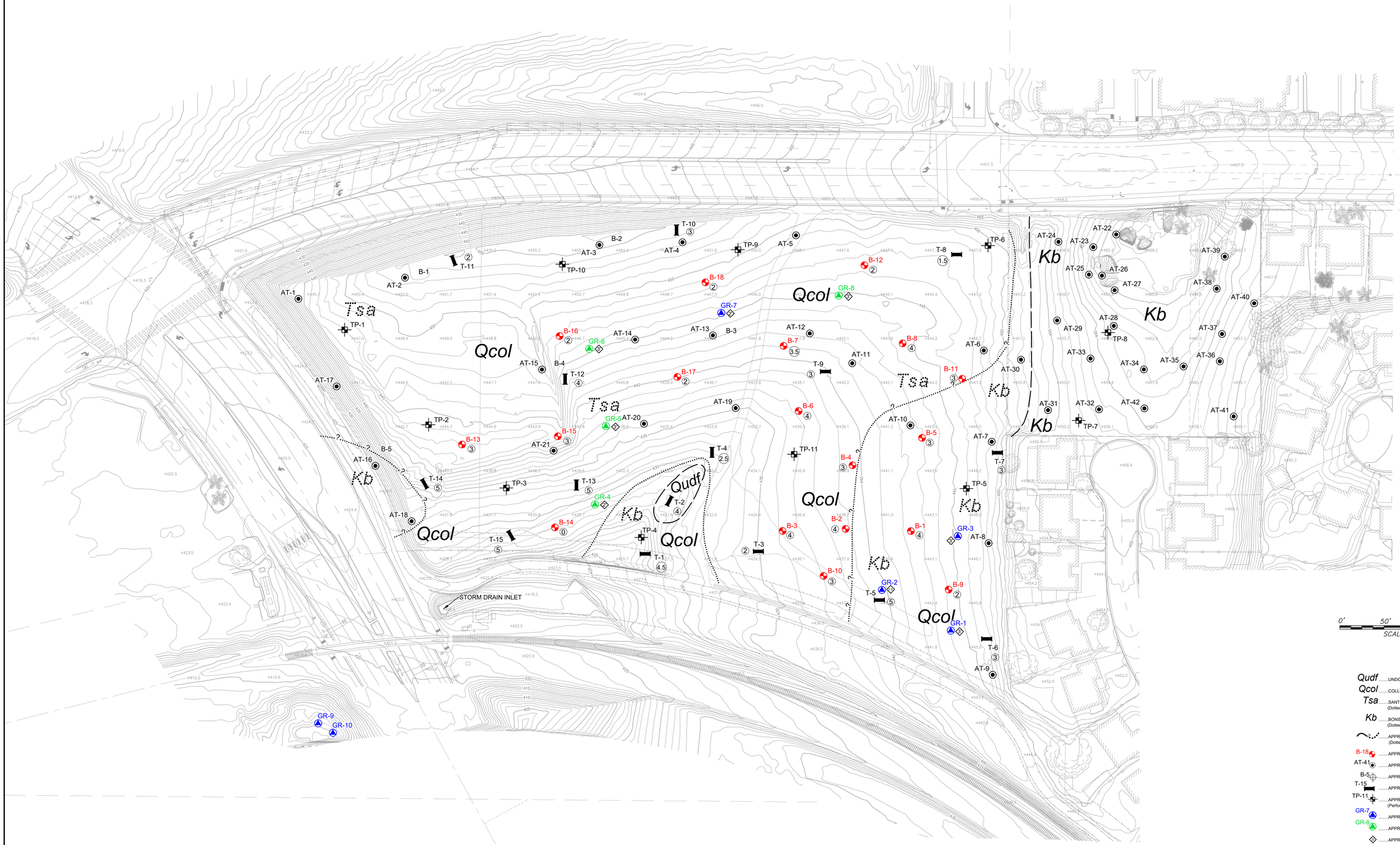
RM / AML		DSK/GTYPD

MODERA MELROSE
OCEANSIDE, CALIFORNIA

DATE 12 - 07 - 2021	PROJECT NO. 07647 - 32 - 04	FIG. 1

Plotted:12/07/2021 7:32AM | By:JONATHAN WILKINS | File Location:Y:\PROJECTS\07647-32-04 (Modera Melrose)\DETAILS\07647-32-04 Vic Map.dwg



0' 50' 100' 150' 200'

SCALE 1"=50' (On 36x24)

GEOCON LEGEND

- Qudf ..... UNDOCUMENTED FILL
- Qcol ..... COLLUVIUM
- Tsa ..... SANTIAGO FORMATION (Dotted Where Buried)
- Kb ..... BONSALL TONALITE (Dotted Where Buried)
- ..... APPROX. LOCATION OF GEOLOGIC CONTACT (Dotted Where Buried,Queried Where Uncertain)
- B-18 ..... APPROX. LOCATION OF EXPLORATORY BORING (2011)
- AT-4 ..... APPROX. LOCATION OF AIR TRACK BORING
- B-5 ..... APPROX. LOCATION OF VERIFICATION BORING
- T-15 ..... APPROX. LOCATION OF EXPLORATORY TRENCH
- TP-11 ..... APPROX. LOCATION OF EXPLORATORY TEST PIT (Performed by EEI)
- GR-7 ..... APPROX. LOCATION OF COARSE GRAIN SAMPLE (CL)
- GR-9 ..... APPROX. LOCATION OF FINE GRAIN SAMPLE (SM on SC)
- ..... APPROX. DEPTH OF SAMPLE
- (5) ..... ESTIMATED THICKNESS OF SURFICIAL DEPOSIT REQUIRING REMEDIAL GRADING

GEOLOGIC MAP

MODERA MELROSE
OCEANSIDE, CALIFORNIA

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SCALE 1" = 50'	DATE 12 - 07 - 2021
PROJECT NO. 07647 - 32 - 04	FIGURE 2
SHEET 1 OF 1	

Plotted:12/07/2021 7:36AM | By:JONATHAN WILKINS | File Location:Y:\PROJECTS\07647-32-04 (Modera Melrose)\SHEETS\07647-32-04 Geologic Map.dwg

MODERA MELROSE
OCEANSIDE, CALIFORNIA

Slopes Table				
Number	Minimum Slope	Maximum Slope	Area	Color
1	10.00%	20.00%	177424.14	
2	20.00%	40.00%	97582.44	
3	40.00%	100.00%	71605.47	

LEGEND

POTENTIAL GORYA PER MAXA 2018 DATA

0’ 100’ 200’

SCALE 1”= 100’ (On 11x17)

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PROJECT NO. 07647 - 32 - 04
FIGURE 3
DATE 12 - 07 - 2021

SLOPE EXHIBIT

Kimley»Horn

GLU SLOPE ANALYSIS EXHIBIT
MODERA MELROSE

Plotted:12/07/2021 7:10AM | By:JONATHAN WILKINS | File Location:Y:\PROJECTS\07647-32-04 (Modera Melrose)\SHEETS\07647-32-04 Slope Exhibit.dwg

APPENDIX A

APPENDIX A

LABORATORY TEST RESULTS

FOR

MODERA MELROSE
OCEANSIDE, CALIFORNIA

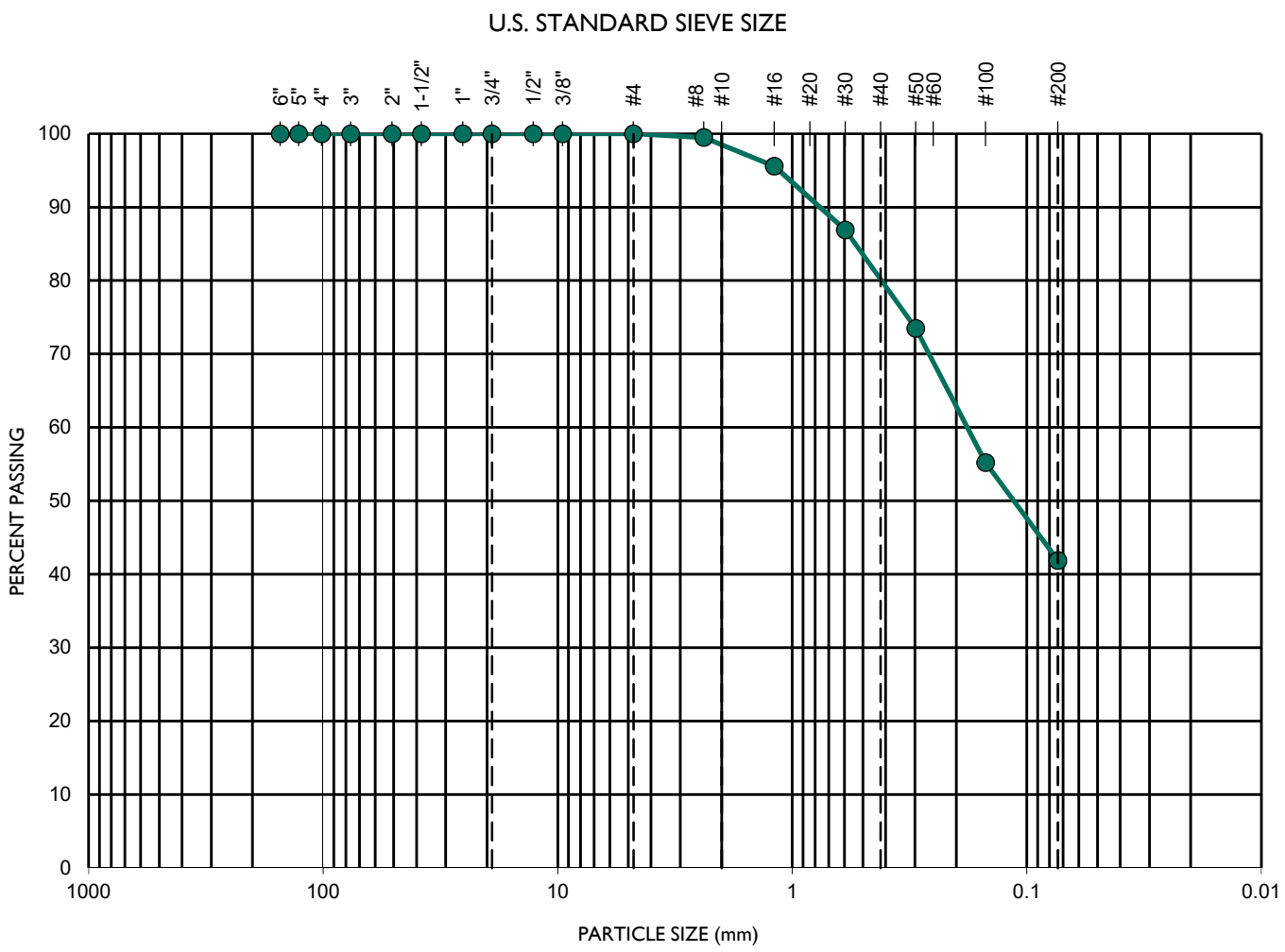
PROJECT NO. 07647-32-04

SAMPLE NO.: **GR-1**

SAMPLE DEPTH (FT.): **3**

GEOLOGIC UNIT: **Kb**

GRAVEL		SAND			SILT OR CLAY
COARSE	FINE	COARSE	MEDIUM	FINE	



TEST DATA					
D_{10} (mm)	D_{30} (mm)	D_{60} (mm)	C_c	C_u	SOIL DESCRIPTION
0.018	0.053	0.189	0.8	10.7	SC - Clayey SAND

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MODERA MELROSE

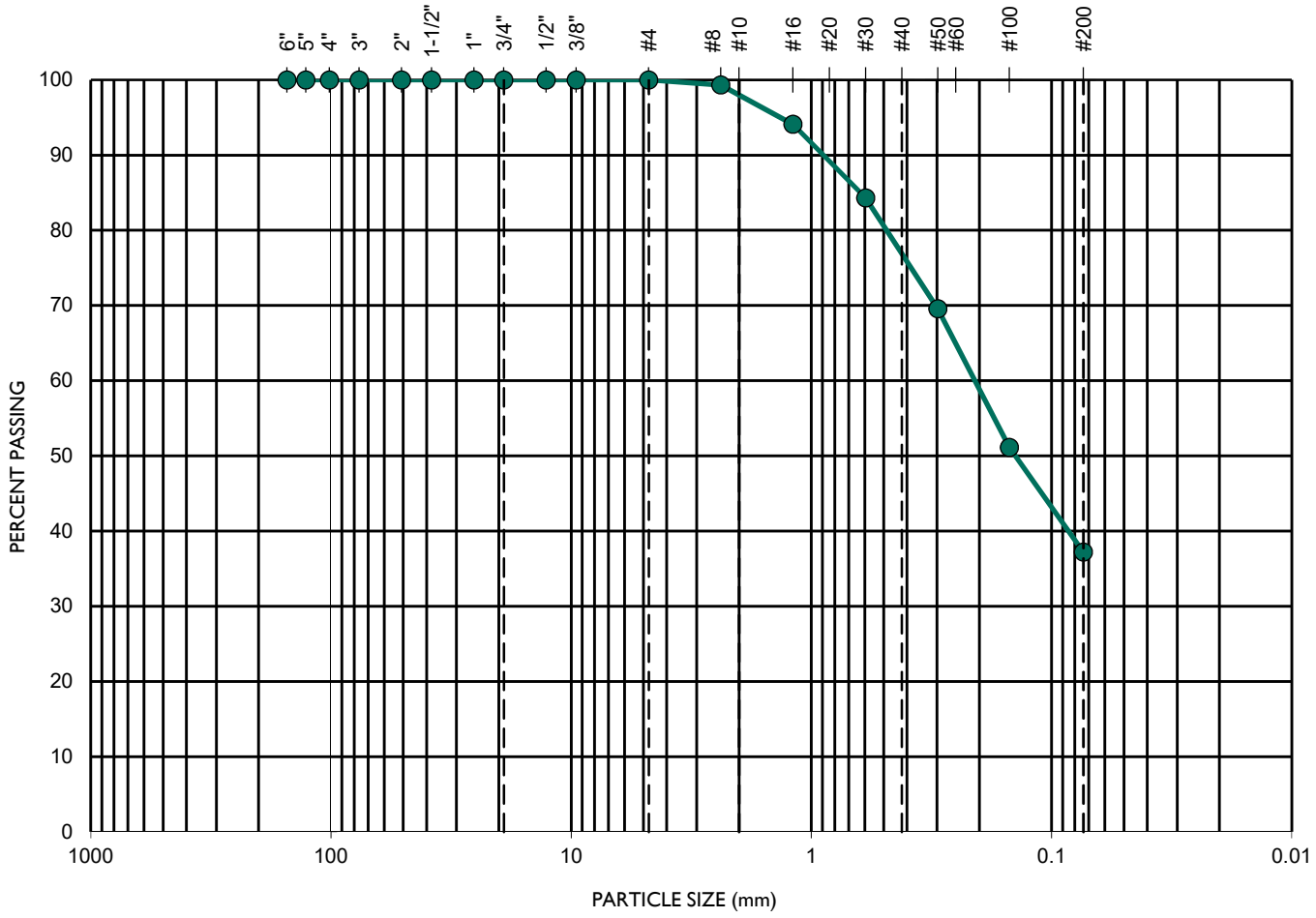
PROJECT NO.: 7647-32-04

SAMPLE NO.: **GR-2**

SAMPLE DEPTH (FT.): **2.5**

GEOLOGIC UNIT: **Kb**

GRAVEL		SAND			SILT OR CLAY
COARSE	FINE	COARSE	MEDIUM	FINE	



TEST DATA					
D_{10} (mm)	D_{30} (mm)	D_{60} (mm)	C_c	C_u	SOIL DESCRIPTION
0.020	0.059	0.221	0.8	11.1	SC - Clayey SAND

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MODERA MELROSE

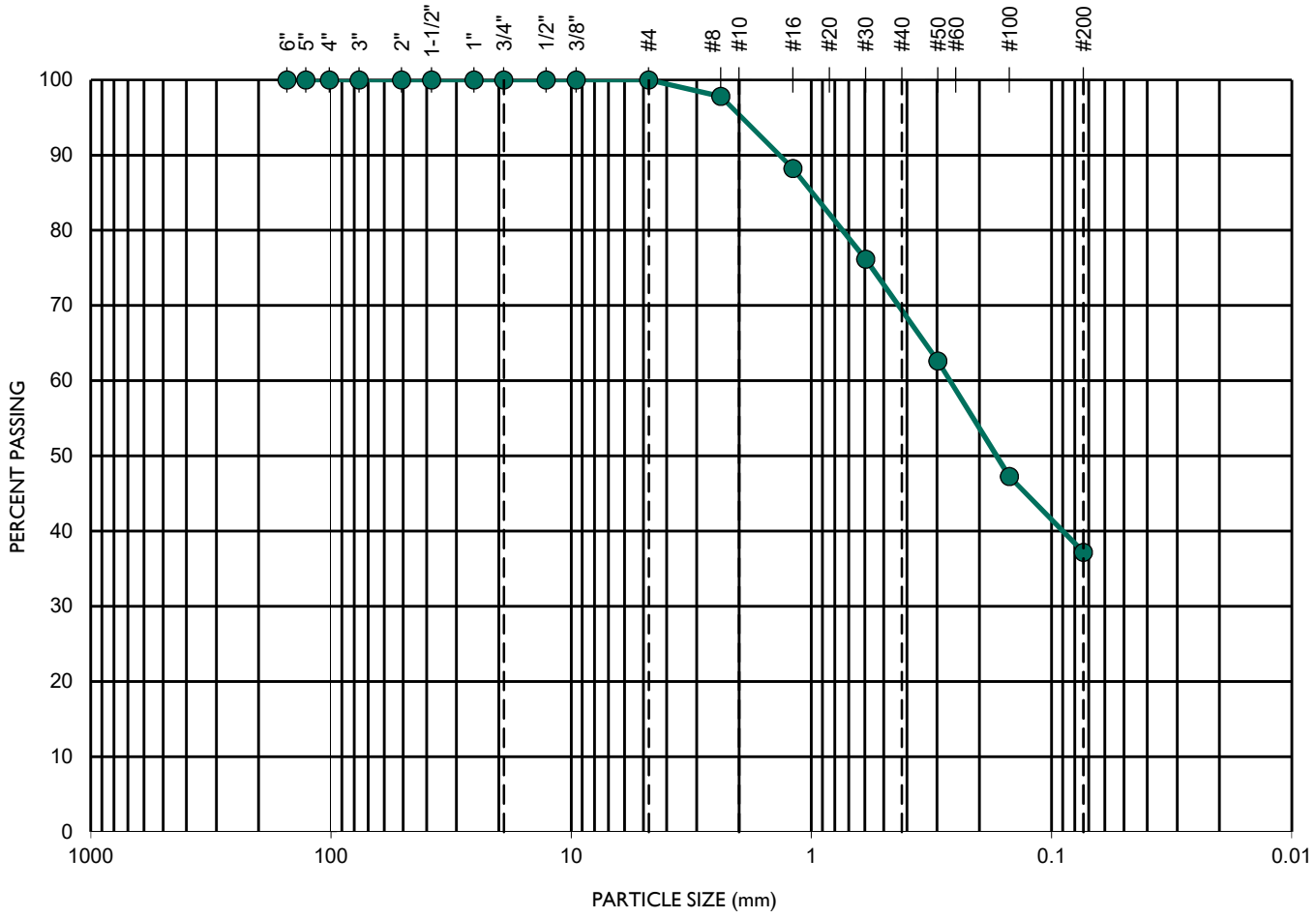
PROJECT NO.: 7647-32-04

SAMPLE NO.: **GR-3**

SAMPLE DEPTH (FT.): **3**

GEOLOGIC UNIT: **Kb**

GRAVEL		SAND			SILT OR CLAY
COARSE	FINE	COARSE	MEDIUM	FINE	



TEST DATA					
D_{10} (mm)	D_{30} (mm)	D_{60} (mm)	C_c	C_u	SOIL DESCRIPTION
0.020	0.059	0.272	0.7	13.7	SC - Clayey SAND

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MODERA MELROSE

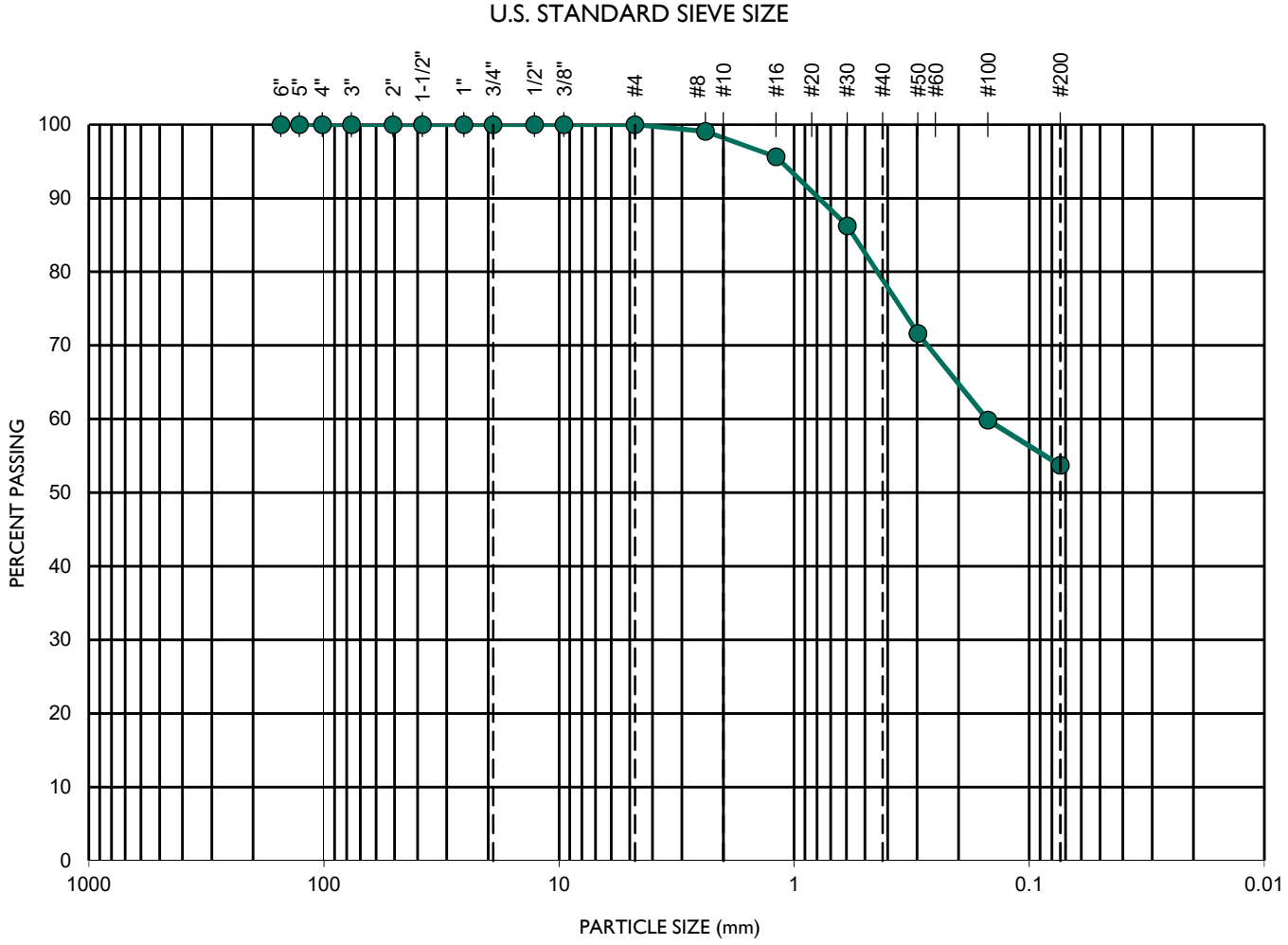
PROJECT NO.: 7647-32-04

SAMPLE NO.: **GR-4**

SAMPLE DEPTH (FT.): **2**

GEOLOGIC UNIT: **Tsa**

GRAVEL		SAND			SILT OR CLAY
COARSE	FINE	COARSE	MEDIUM	FINE	



TEST DATA					
D_{10} (mm)	D_{30} (mm)	D_{60} (mm)	C_c	C_u	SOIL DESCRIPTION
0.014	0.041	0.152	0.8	11.0	CL - Sandy, lean CLAY

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MODERA MELROSE

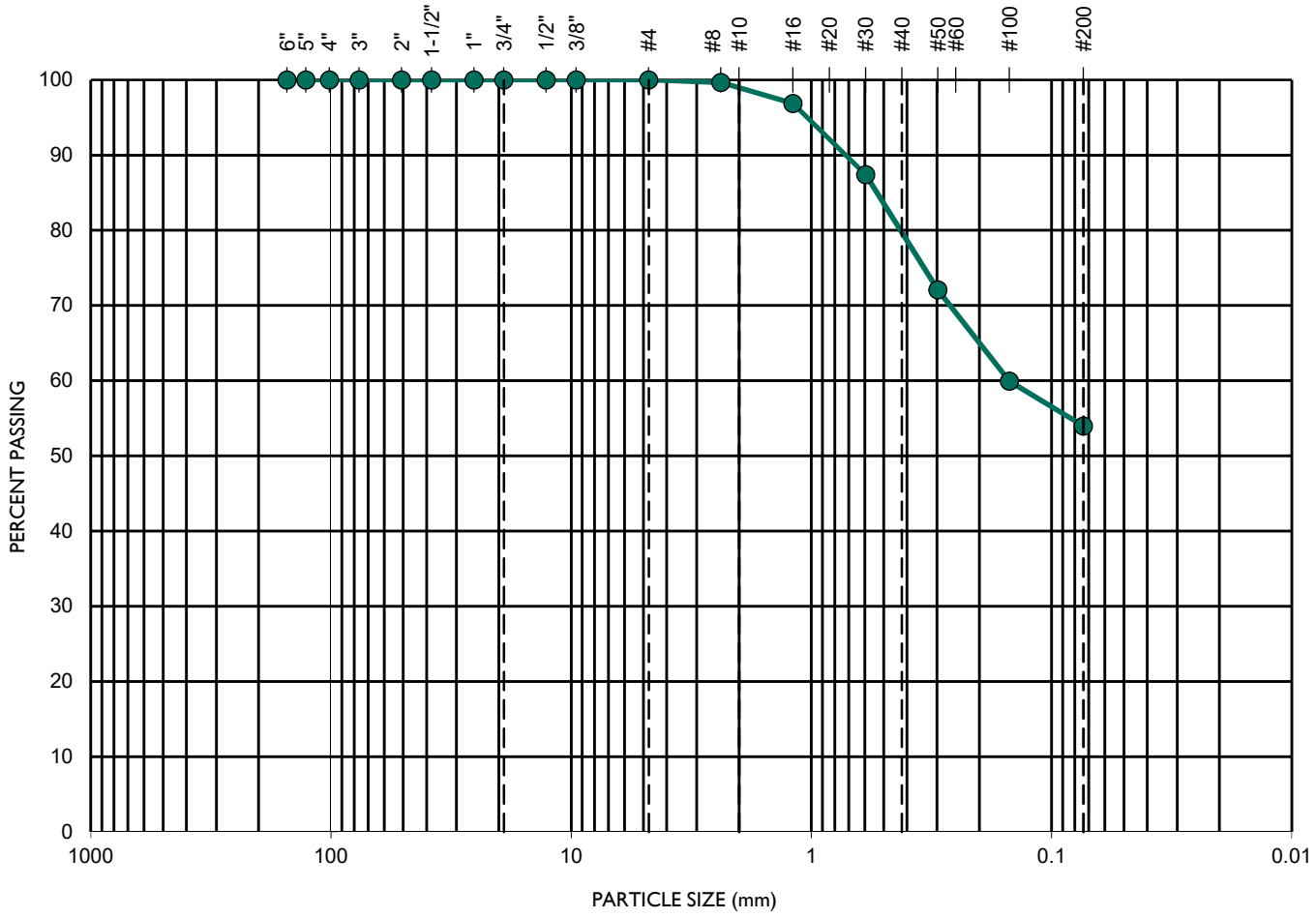
PROJECT NO.: 7647-32-04

SAMPLE NO.: **GR-5**

SAMPLE DEPTH (FT.): **3**

GEOLOGIC UNIT: **Tsa**

GRAVEL		SAND			SILT OR CLAY
COARSE	FINE	COARSE	MEDIUM	FINE	



TEST DATA					
D_{10} (mm)	D_{30} (mm)	D_{60} (mm)	C_c	C_u	SOIL DESCRIPTION
0.014	0.041	0.151	0.8	11.0	CL - Sandy, lean CLAY

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MODERA MELROSE

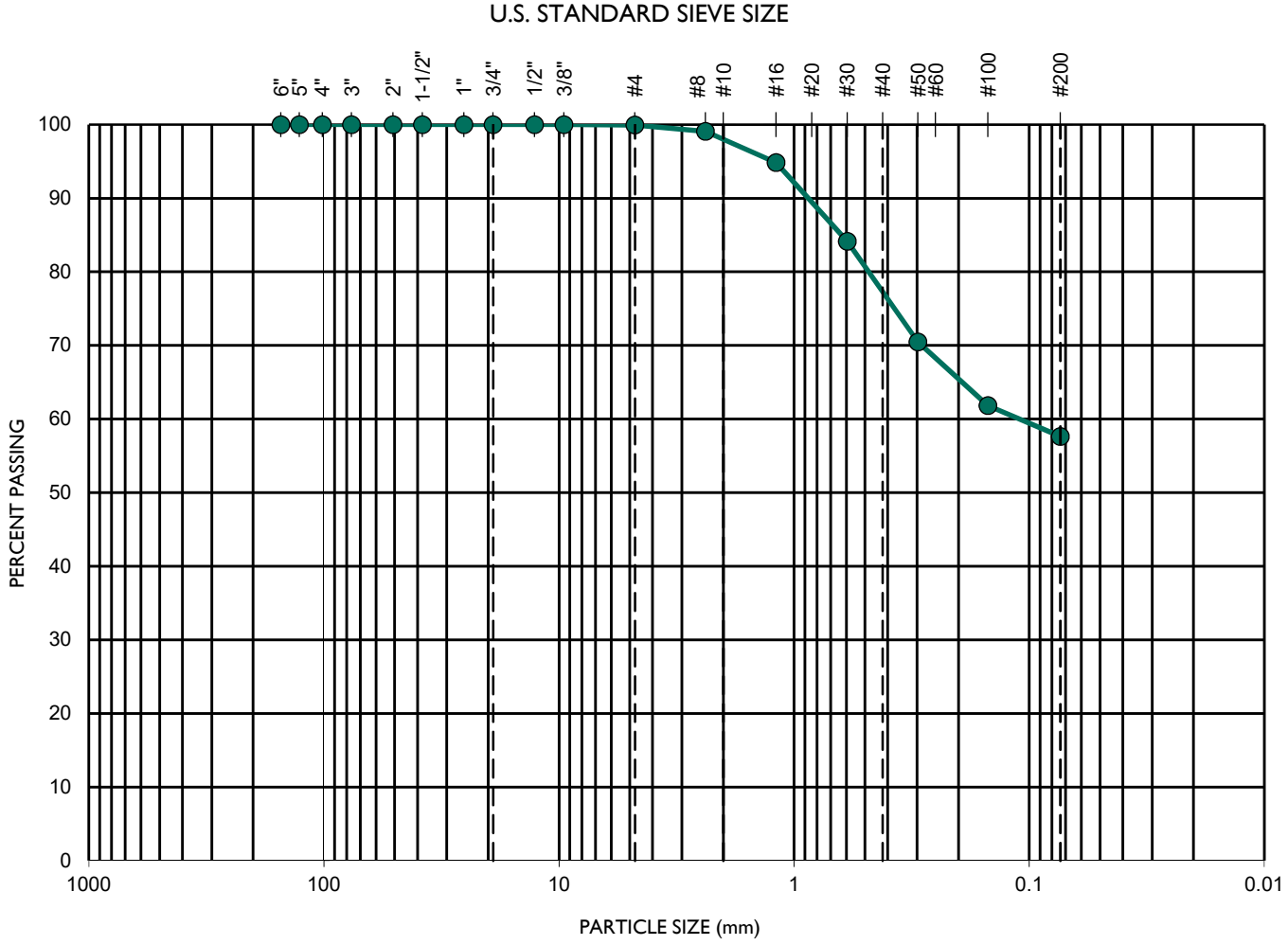
PROJECT NO.: 7647-32-04

SAMPLE NO.: **GR-6**

SAMPLE DEPTH (FT.): **3**

GEOLOGIC UNIT: **Tsa**

GRAVEL		SAND			SILT OR CLAY
COARSE	FINE	COARSE	MEDIUM	FINE	



TEST DATA					
D_{10} (mm)	D_{30} (mm)	D_{60} (mm)	C_c	C_u	SOIL DESCRIPTION
0.013	0.038	0.117	1.0	9.1	CL - Sandy, lean CLAY

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MODERA MELROSE

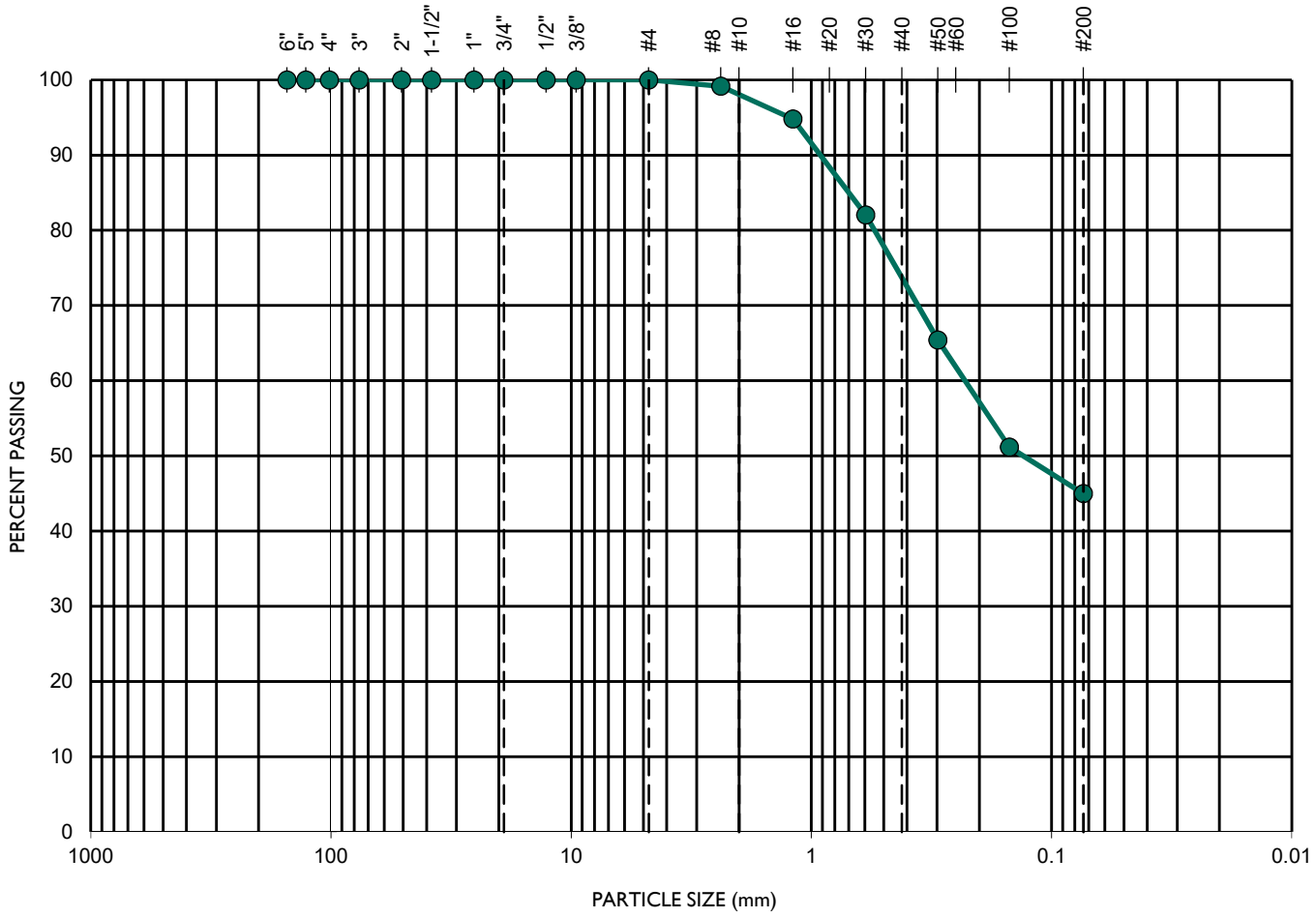
PROJECT NO.: 7647-32-04

SAMPLE NO.: **GR-7**

SAMPLE DEPTH (FT.): **2**

GEOLOGIC UNIT: **Tsa**

GRAVEL		SAND			SILT OR CLAY
COARSE	FINE	COARSE	MEDIUM	FINE	



TEST DATA					
D_{10} (mm)	D_{30} (mm)	D_{60} (mm)	C_c	C_u	SOIL DESCRIPTION
0.016	0.049	0.241	0.6	14.7	SM - Silty SAND

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MODERA MELROSE

PROJECT NO.: 7647-32-04

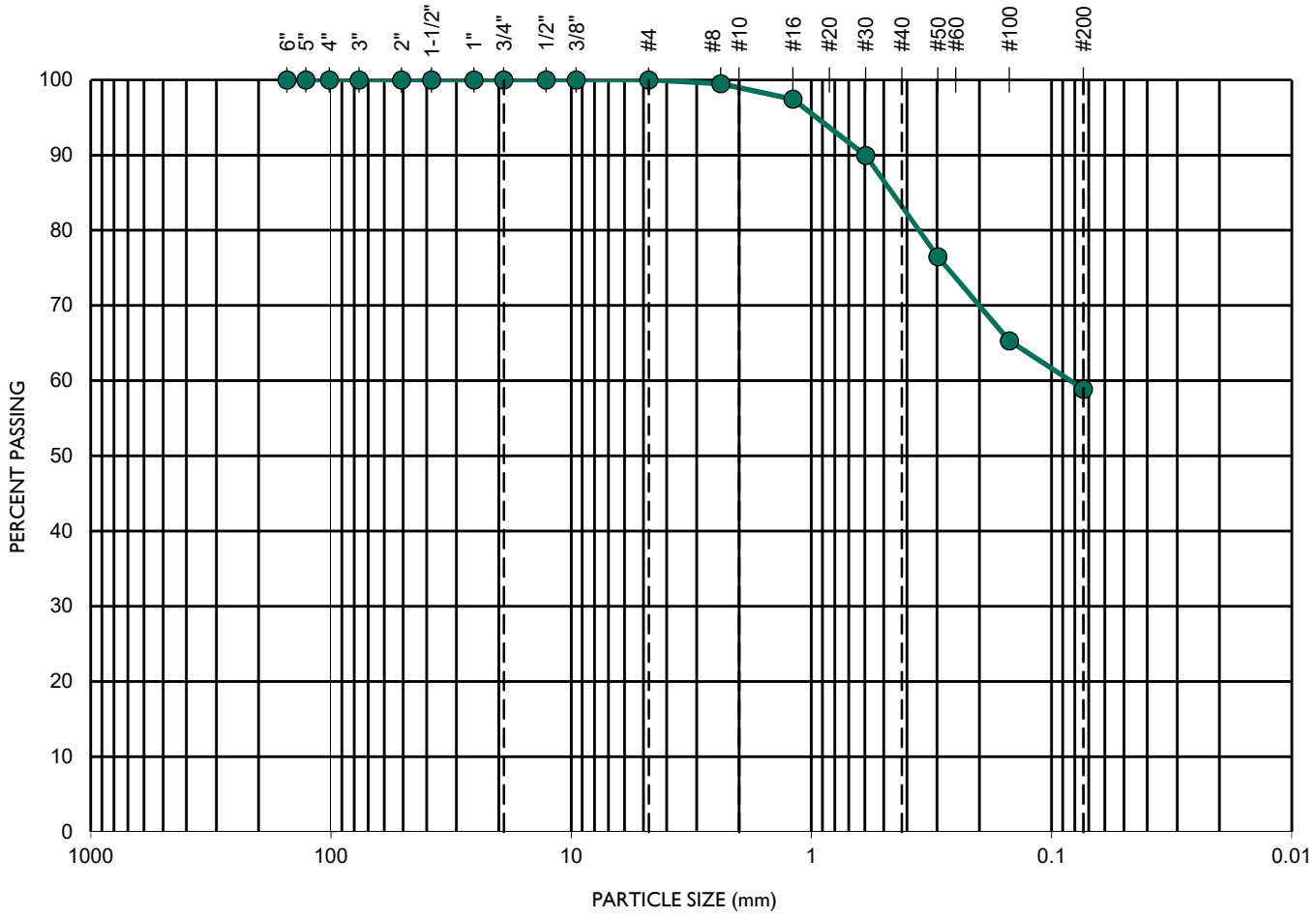
SAMPLE NO.: **GR-8**

SAMPLE DEPTH (FT.): **3**

GEOLOGIC UNIT: **Tsa**

GRAVEL		SAND			SILT OR CLAY
COARSE	FINE	COARSE	MEDIUM	FINE	

U.S. STANDARD SIEVE SIZE



TEST DATA					
D_{10} (mm)	D_{30} (mm)	D_{60} (mm)	C_c	C_u	SOIL DESCRIPTION
0.013	0.038	0.087	1.3	6.9	CL - Sandy, lean CLAY

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MODERA MELROSE

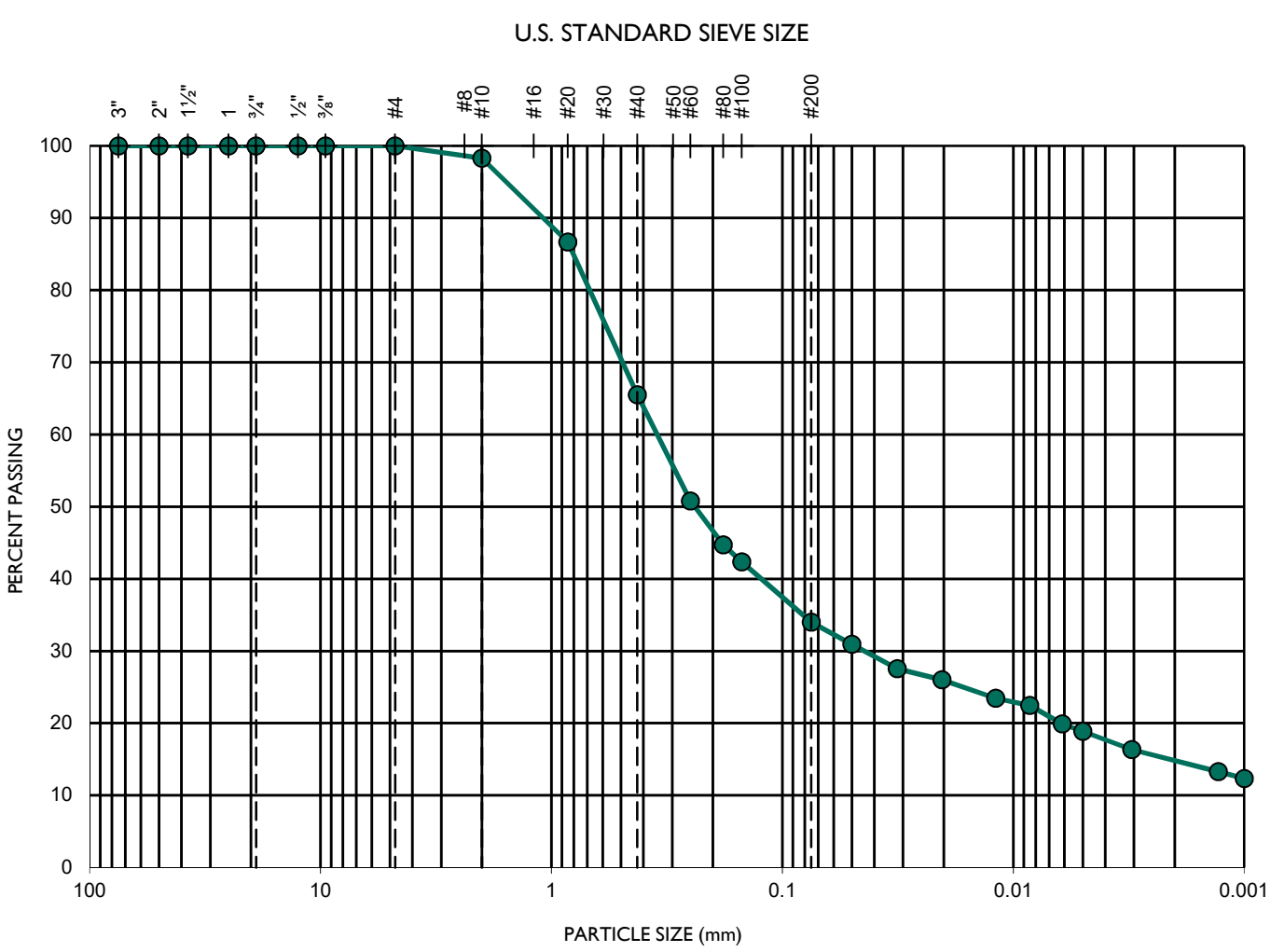
PROJECT NO.: 7647-32-04

SAMPLE NO.: **GR-9**

SAMPLE DEPTH (FT.): **0**

GEOLOGIC UNIT: **Tsa**

GRAVEL		SAND			SILT OR CLAY
COARSE	FINE	COARSE	MEDIUM	FINE	



TEST DATA					
D_{10} (mm)	D_{30} (mm)	D_{60} (mm)	C_c	C_u	SOIL DESCRIPTION
0.00025	0.04492	0.35971	22.5	1441.5	Silty Clayey SAND

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MODERA MELROSE

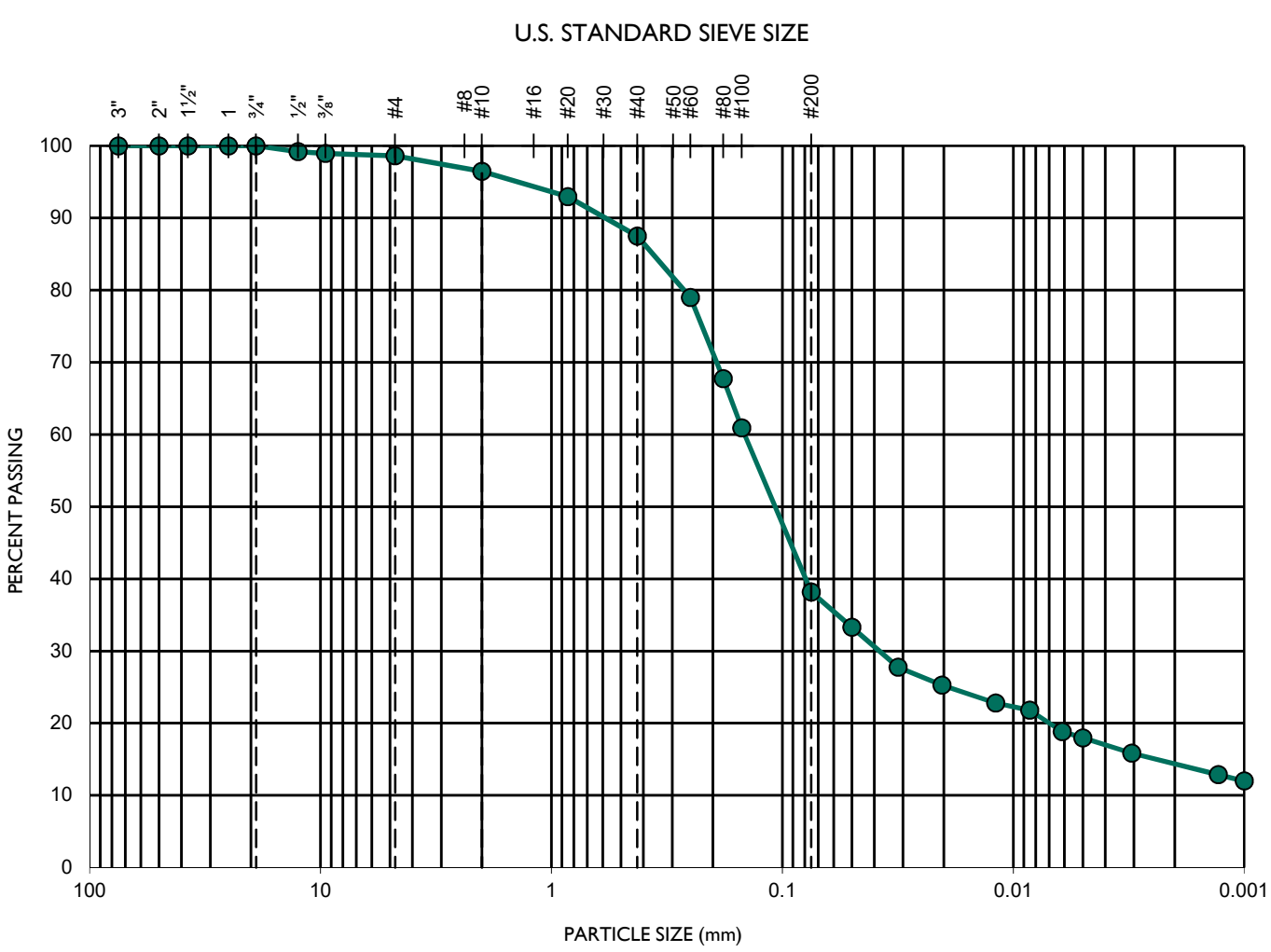
PROJECT NO.: 7647-32-04

SAMPLE NO.: **GR-10**

SAMPLE DEPTH (FT.): **0**

GEOLOGIC UNIT: **Tsa**

GRAVEL		SAND			SILT OR CLAY
COARSE	FINE	COARSE	MEDIUM	FINE	



TEST DATA					
D_{10} (mm)	D_{30} (mm)	D_{60} (mm)	C_c	C_u	SOIL DESCRIPTION
0.00034	0.03901	0.14704	30.0	427.0	Silty Clayey SAND

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MODERA MELROSE

PROJECT NO.: 7647-32-04

Placeholder – **6.3.4 Geomorphic Assessment of Receiving Channels** (Optional)

Replace placeholder with required calculations/documentation.

Leave placeholder intact if not applicable.

☒Not Applicable

Placeholder - **Flow Control Facility Design and Structural BMP Drawdown Calculations**

Replace placeholder with required calculations/documentation.

See Chapter 6 and Appendix G of the BMP Design Manual

BMP Sizing Spreadsheet V3.1			
Project Name:	Modera Melrose	Hydrologic Unit:	Carlsbad
Project Applicant:	Mill Creek Residential Trust	Rain Gauge:	Oceanside
Jurisdiction:	City of Oceanside	Total Project Area:	319,919
Parcel (APN):	161-030-23-00, 161-030-24-00	Low Flow Threshold:	0.1Q2
BMP Name:	BMP A	BMP Type:	Cistern
BMP Native Soil Type:	D	BMP Infiltration Rate (in/hr):	NA

Areas Draining to BMP						HMP Sizing Factors	Minimum BMP Size
DMA Name	Area (sf)	Pre Project Soil Type	Pre-Project Slope	Post Project Surface Type	Area Weighted Runoff Factor (Table G.2-1)[1]	Volume	Volume (CF)
DMA 1a-9b	319,919	D	Moderate	Concrete	0.95	0.12	36471
						0	0
						0	0
						0	0
						0	0
						0	0
						0	0
						0	0
						0	0
						0	0
						0	0
						0	0
						0	0
						0	0
						0	0
BMP Tributary Area	319,919					Minimum BMP Size	36471
						Proposed BMP Size*	49864

* Assumes standard configuration

Standard Cistern Depth (Overflow Elevation)	3.5	ft
Provided Cistern Depth (Overflow Elevation)	7.0	ft
Minimum Required Cistern Footprint)	5210	CF

Notes:

1. Runoff factors which are used for hydromodification management flow control (Table G.2-1) are different from the runoff factors used for pollutant control BMP sizing (Table B.1-1). Table references are taken from the San Diego Region Model BMP Design Manu

Describe the BMP's in sufficient detail in your PDP SWQMP to demonstrate the area, volume, and other criteria can be met within the constraints of the site.

BMP's must be adapted and applied to the conditions specific to the development project such as unstable slopes or the lack of available head.
Designated Staff have final review and approval authority over the project design.

This BMP Sizing Spreadsheet has been updated in conformance with the San Diego Region Model BMP Design Manual, May 2018. For questions or concerns please contact the jurisdiction in which your project is located.

BMP Sizing Spreadsheet V3.1			
Project Name:	Modera Melrose	Hydrologic Unit:	Carlsbad
Project Applicant:	Mill Creek Residential Trust	Rain Gauge:	Oceanside
Jurisdiction:	City of Oceanside	Total Project Area:	319,919
Parcel (APN):	161-030-23-00, 161-030-24-00	Low Flow Threshold:	0.1Q2
BMP Name	BMP A	BMP Type:	Cistern

DMA Name	Rain Gauge	Pre-developed Condition		Unit Runoff Ratio (cfs/ac)	DMA Area (ac)	Orifice Flow - $\%Q_2$ (cfs)	Orifice Area (in^2)
		Soil Type	Slope				
DMA 1a-9b	Oceanside	D	Moderate	0.575	7.344	0.422	4.41

7.00	0.422	4.41	2.37
Max Orifice Head (feet)	Max Tot. Allowable Orifice Flow (cfs)	Max Tot. Allowable Orifice Area (in^2)	Max Orifice Diameter (in)

Provide Hand Calc.	0.416	4.34	2.350
Average outflow during surface drawdown (cfs)	Max Orifice Outflow (cfs)	Actual Orifice Area (in^2)	Selected Orifice Diameter (in)

Drawdown (Hrs)	Provide Hand Calculation

Worksheet G.2-1: Sizing Factor Worksheet

Site Information			
Project Name:	Modera Melrose	**Hydrologic Unit**	Carlsbad
Project Applicant:	Bryan Nord	**Rain: Gauge:**	Oceanside
Jurisdiction:	City of Oceanside	**Total Project Area:**	319,919
Assessor's Parcel Number :	161-030-23-00 161-030-24-00	**Low Flow Threshold:**	0.1Q2
BMP Name:	BMP A	**BMP Type:**	Cistern

Areas Draining to BMP						Sizing Factors			Minimum BMP Size		
DMA Name	**Area (sf)**	**Soil Type**	**Pre-Project Slope**	**Post Project Surface Type**	**Runoff Factor (From Table G.2-1)**	**Surface Area**	**Surface Volume**	**Subsurface Volume**	**Surface Area (sf)**	**Surface Volume (cf)**	**Subsurface Volume (cf)**
DMA 1a-9b	319,919	D	Moderate	Concrete	0.95		0.12			36471	
Total DMA Area								**Minimum BMP Size***		36471	
								Proposed BMP Size*		49864	

***Minimum BMP Size = Total of rows above.**

***Proposed BMP Size ≥ Minimum BMP size.**

BASIN DRAWDOWN CALCULATIONS

	LOW FLOW HYDROMOD Q2 (CFS)	ORIFICE DIAMETER (IN)	WEIR HEIGHT (FT)	DISCHARGE FROM ORIFICE (CFS)	DISCHARGE FROM ORIFICE (CF/HR)	PROPOSED BASIN VOLUME (CF)	TIME TO DISCHARGE BASIN VOLUME (HR)	LESS THAN 48 HRS?
BMP A	0.42	2.3	7.0	0.42	1512.00	49864	33	YES

Placeholder – **Vector Control Plan** (required when structural BMPs will drain in 96 hours)

Replace placeholder with required documentation.

Leave placeholder intact if not applicable.

☒Not Applicable

ATTACHMENT 3
STRUCTURAL BMP MAINTENANCE INFORMATION

This is the cover sheet for Attachment 3.

Indicate which Items are Included:

Attachment Sequence	Contents	Checklist
Attachment 3a	Structural BMP Maintenance Thresholds and Actions (Required)	☒Included See Structural BMP Maintenance Information Checklist.
Attachment 3b	Draft Maintenance Agreement (when applicable)	☒Included ☐Not Applicable ☐To be Provided during final design

RECORDING REQUESTED BY AND
WHEN RECORDED RETURN TO:

CITY OF OCEANSIDE
OFFICE OF THE CITY CLERK
300 NORTH COAST HIGHWAY
OCEANSIDE, CA 92054

Above Space for Recorder's Use

STORMWATER FACILITIES MAINTENANCE AGREEMENT WITH ACCESS RIGHTS AND COVENANTS

Modera Melrose
Permit Application No. D21-00011

This AGREEMENT for the maintenance and repair of certain Stormwater Management Facilities is entered into between Mill Creek Residential Trust, LLC (hereinafter referred to as "OWNER") and the City of Oceanside (hereinafter referred to as "CITY") for the benefit of the CITY, the OWNER, the successors in interest to the CITY or the OWNER, and the public generally.

RECITALS

A. OWNER is the owner of certain real property located in the City of Oceanside, California, more particularly described in Exhibit "A" attached hereto and made a part of (hereinafter referred to as the "PROPERTY"), and has proposed that the PROPERTY be developed as a mixed-use multifamily building complex in accordance with applications for Site Development Plan No. D21-00011 and Grading Plan (Permit) No. xxxx which are on file with the CITY. This Agreement is required as a condition of approval for such development as set forth in Resolution No. xxxxxxxx .

B. In accordance with the City of Oceanside's Urban Runoff Regulations, Oceanside City Code, Chapter 40 (the "Stormwater Ordinance"), the City of Oceanside Subdivision Ordinance, the City of Oceanside Zoning Ordinance, The City of Oceanside Grading Ordinance and/or other ordinances or regulations of CITY which regulate land development and urban runoff, OWNER has prepared and submitted to CITY, a Stormwater Quality Mitigation Plan (hereinafter referred to as SWQMP), which is on file at the CITY. The SWQMP proposes that stormwater runoff from the PROPERTY be managed by the use of Stormwater Management Facilities which are identified in the SWQMP as "Best Management Practices" or "BMPs".

The precise location(s) and extent of the post construction BMPs are indicated in the approved SWQMP dated [xxxxx]. The SWQMP specifies the manner and standards by which the BMP's must be repaired and maintained in order to retain their effectiveness, as set forth in the Operation Maintenance Plan (hereinafter referred to as "O&M PLAN"). The approved SWQMP and O&M PLAN containing any revisions thereto are on file with the CITY.

C. The information contained in the SWQMP and OWNER's representations that the BMPs will be maintained pursuant to the SWQMP have been relied upon by CITY in approving OWNER's development applications. It is the purpose of this Agreement to assure that the BMPs are maintained, by creating obligations which are enforceable against the OWNER and the OWNER's successors in interest in the PROPERTY. It is intended that these obligations be enforceable notwithstanding other provisions related to BMP maintenance which are provided by law.

AGREEMENT

NOW, THEREFORE, for consideration of (a) CITY's approval of the above development applications and (b) the mutual covenants set forth herein, IT IS HEREBY AGREED AS FOLLOWS:

1. **Maintenance of Stormwater Management Facilities.** OWNER agrees, for itself and its successors in interest, to all or any portion of the PROPERTY, to comply in all respects with the requirements of the Stormwater Ordinance and the SWQMP with regards to the maintenance of BMPs designated in the SWQMP, and in particular agrees to perform, at its sole cost, expense and liability, the following "MAINTENANCE ACTIVITIES": all inspections, cleaning, repairs, servicing, maintenance and other actions specified in the O&M PLAN, with respect to all of the BMPs listed at Recital "B" above, at the times and in the manner specified in the O&M PLAN. OWNER shall initiate, perform and complete all MAINTENANCE ACTIVITIES at the required time, without request or demand from CITY or any other agency. OWNER further agrees that "MAINTENANCE ACTIVITIES" shall include replacement or modification of the BMPs in the event that said BMPs do not function as intended. Replacement shall be with an identical type, size and model of BMP, except that:

(a) The CITY Engineer may authorize substitution of an alternative BMP if he or she determines that it will function as well or better than the original BMP; and

(b) Pursuant to Section 40.2.3(c) of the Stormwater Ordinance, if the failure of the BMP, in the judgment of the CITY Engineer indicates that the BMP in use is inappropriate or inadequate to the circumstances, the BMP must be modified or replaced with an upgraded BMP to prevent future failure.

2. **Notices.** OWNER further agrees that it shall, prior to transferring ownership of any land on which any of the above BMPs are located, and also prior to transferring ownership of any such BMP, provide clear written notice of the above maintenance obligations associated with that BMP to the transferee. OWNER further agrees to provide evidence to CITY that OWNER has requested the California Department of Real Estate to include in the public report issued for the development of the PROPERTY, a notification regarding the BMP maintenance requirements described herein.

3. **CITY's Right to Perform Maintenance.** It is agreed that CITY shall have the right, but not the obligation, to elect to perform any or all of the MAINTENANCE ACTIVITIES if, in the CITY's sole judgment, OWNER has failed to perform the same. It is recognized and understood that the CITY makes no representation that it intends to or will perform any of the MAINTENANCE ACTIVITIES and any election by CITY to perform any of the MAINTENANCE ACTIVITIES, shall in no way relieve OWNER of its continuing maintenance obligations under this agreement. If CITY elects to perform any of the MAINTENANCE ACTIVITIES, it is understood that CITY shall be deemed to be acting as the agent of the OWNER and said work shall be without warranty or representation by CITY as to safety or effectiveness, shall be deemed to be accepted by OWNER "as is", and shall be covered by OWNER's indemnity provisions below.

If CITY performs any of the MAINTENANCE ACTIVITIES, after CITY has demanded that OWNER perform the same and OWNER has failed to do so within a reasonable time stated in the CITY's demand, then OWNER shall pay all of CITY's costs incurred in performing the MAINTENANCE ACTIVITIES. OWNER's obligation to pay CITY's costs of performing MAINTENANCE ACTIVITIES is a continuing obligation and shall apply whether or not CITY has utilized all or any portion of the security provided pursuant to Paragraph 5.

4. **CITY'S Access Rights.** OWNER hereby authorizes the CITY to access perpetually over, under and across [insert either "all of the PROPERTY" or "that portion of the PROPERTY described in Exhibit "B" hereto"] , for purposes of accessing the BMPs and performing any of the MAINTENANCE ACTIVITIES specified in Paragraph 1 above. CITY shall have the right, at any time and without prior notice to OWNER, to enter upon any part of said area as may be necessary or convenient for such purposes. OWNER shall at all times maintain the PROPERTY so as to make CITY's access clear and unobstructed.

5. **Security.** OWNER has provided CITY with non-refundable security to assure the faithful performance of the obligations of this agreement. The security is in the form of a Cash Deposit in the amount of $_____. CITY may utilize the security to provide funding for the cost of CITY performing any of the MAINTENANCE ACTIVITIES under Paragraph 3 above. CITY may utilize all or any part of the security at any time pursuant to this Agreement. Should any portion of the security be used by CITY,

OWNER or a Subsequent Owner, as applicable, shall deposit additional funds in the amount utilized by CITY, thereby restoring the security to the amount initially deposited by OWNER.

6. **Administration of Agreement for CITY.** CITY hereby designates its Engineer as the officer charged with responsibility and authority to administer this Agreement on behalf of CITY. Any notice or communication related to the implementation of this Agreement desired or required to be delivered to CITY shall be addressed to:

City Engineer
City of Oceanside
300 North Coast Highway
Oceanside, CA 92054

The City Engineer is also granted authority to enter into appropriate amendments to this Agreement on behalf of CITY, provided that the amendment is consistent with the purposes of this Agreement as set forth above.

7. **Defense and Indemnity.** CITY shall not be liable for, and OWNER and its successors in interest shall defend and indemnify CITY and the employees and agents of CITY (collectively "CITY PARTIES") against any and all claims, demands, liability, judgments, awards, fines, mechanics' liens or other liens, labor disputes, losses, damages, expenses, charges or costs of any kind or character, including attorneys' fees and court costs (hereinafter collectively referred to as "CLAIMS"), related to this Agreement and arising either directly or indirectly from any act, error, omission or negligence of OWNER, OWNER's successors, or their contractors, licensees, agents, servants or employees, including, without limitation, claims caused by the concurrent negligent act, error or omission, whether active or passive, of CITY PARTIES. OWNER shall have no obligation, however, to defend or indemnify CITY PARTIES from a claim if it is determined by a court of competent jurisdiction that such claim was caused by the sole negligence or willful misconduct of CITY PARTIES. Nothing in this Agreement, CITY's approval of the subdivision or other applications or plans and specifications, or inspection of the work, is intended to acknowledge responsibility for any such matter, and CITY PARTIES shall have absolutely no responsibility or liability therefor unless otherwise provided by applicable law.

8. **Common Interest Developments.** If the PROPERTY is developed as a "Common Interest Development" as defined in Civil Code section 1351(c) which will include membership in or ownership of an "ASSOCIATION" as defined in Civil Code section 1351(a), then the following provisions of this Paragraph 8 shall apply during such time as the PROPERTY is encumbered by a "DECLARATION" as defined in Civil Code section 1351(h), and the Common Area, as "Common Area" is defined in Civil Code section 1351(b), of the PROPERTY is managed and controlled by the ASSOCIATION:

(a) The ASSOCIATION, through its Board of Directors, shall assume full responsibility to perform the MAINTENANCE ACTIVITIES pursuant to this Agreement, and shall undertake all actions and efforts necessary to accomplish the MAINTENANCE ACTIVITIES, including but not limited to, levying regular or special assessments against each member of the ASSOCIATION sufficient to provide funding for the MAINTENANCE ACTIVITIES, conducting a vote of the membership related to such assessments if required by law. In the event insufficient votes have been obtained to authorize an assessment, the ASSOCIATION shall seek authority from a court of competent jurisdiction for a reduced percentage of affirmative votes necessary to authorize the assessment, re-conducting the vote of the membership in order to obtain the votes necessary to authorize an assessment, and the ASSOCIATION shall take all action authorized by the DECLARATION or California law to collect delinquent assessments, including but not limited to, the recording and foreclosure of assessment liens.

(b) No provision of the DECLARATION, nor any other governing document of the ASSOCIATION or grant of authority to its members, shall grant or recognize a right of any member or other person to alter, improve, maintain or repair any of the PROPERTY in any manner which would impair the functioning of the BMPs to manage drainage or stormwater runoff as described in the SWQMP. In the event of any conflict between the terms of this Agreement and the DECLARATION or other ASSOCIATION governing documents, the provisions of this Agreement shall prevail.

9. **Agreement Binds Successors and Runs with the PROPERTY.** It is understood and agreed that the terms, covenants and conditions herein contained shall constitute covenants running with the land and shall be binding upon the heirs, executors, administrators, successors and assigns of OWNER and CITY, shall be deemed to be for the benefit of all persons owning any interest in the PROPERTY (including the interest of CITY or its successors in the Access Rights authorized herein). It is the intent of the parties hereto that this Agreement may be recorded and shall be binding upon all persons purchasing or otherwise acquiring all or any lot, unit or other portion of the PROPERTY, who shall be deemed to have consented to and become bound by all the provisions hereof.

10. **OWNER's Continuing Responsibilities Where Work Commenced or Permit Obtained.** Notwithstanding any other provision of this Agreement, no transfer or conveyance of the PROPERTY or any portion thereof shall in any way relieve OWNER of

or otherwise affect OWNER's responsibilities for installation or maintenance of BMPs which may have arisen under the ordinances or regulations of CITY referred to in Recital B above, or other federal, state or CITY laws, on account of OWNER having obtained a permit which creates such obligations or having commenced grading, construction or other land disturbance work.

11. **Amendment and Release.** The terms of this Agreement may be modified only by a written amendment approved and signed by the City Council or the CITY Engineer acting on behalf of CITY and by OWNER or OWNER's successor(s) in interest. This Agreement may be terminated and OWNER and the PROPERTY released from the covenants set forth herein, by a Release which CITY may execute if it determines that another mechanism will assure the ongoing maintenance of the BMPs or that it is no longer necessary to assure such maintenance.

12. **Governing Law and Severability.** This Agreement shall be governed by the laws of the State of California. Venue in any action related to this Agreement shall be in the Superior Court of the State of California, County of San Diego, North County Division. In the event that any of the provisions of this Agreement are held to be unenforceable or invalid by any court of competent jurisdiction, the validity, and enforceability of the remaining provisions shall not be affected thereby.

IN WITNESS WHEREOF, the parties hereto for themselves, their heirs, executors, administrators, successors and assigns do hereby agree to the full performance of the covenants herein contained and have caused this Agreement to be executed by setting hereunto their signatures on the dates indicated below:

OWNER(s):

By: _____
Name/Title

Date: _____

By: _____
Name/Title

Date: _____

CITY OF OCEANSIDE:

By: _____
City Engineer

Date: _____

APPROVED AS TO FORM:

_____
City Attorney

NOTARY ACKNOWLEDGEMENT MUST BE ATTACHED

I:\City Attorney\SWFMA-Stormwater Facilities Maintenance Agreement FORMAT(Rev September 2018)

Use this checklist to ensure the required information has been included in the Structural BMP Maintenance Information Attachment:

Preliminary Design / Planning / CEQA level submittal:

- Attachment 3a must identify:

☒Typical maintenance indicators and actions for proposed structural BMP(s) based on Section 7.7 of the BMP Design Manual

- Attachment 3b is not required for preliminary design / planning / CEQA level submittal.

Final Design level submittal:

Attachment 3a must identify:

☐Specific maintenance indicators and actions for proposed structural BMP(s). This shall be based on Section 7.7 of the BMP Design Manual and enhanced to reflect actual proposed components of the structural BMP(s)
☐How to access the structural BMP(s) to inspect and perform maintenance
☐Features that are provided to facilitate inspection (e.g., observation ports, cleanouts, silt posts, or other features that allow the inspector to view necessary components of the structural BMP and compare to maintenance thresholds)
☐Manufacturer and part number for proprietary parts of structural BMP(s) when applicable
☐Maintenance thresholds specific to the structural BMP(s), with a location-specific frame of reference (e.g., level of accumulated materials that triggers removal of the materials, to be identified based on viewing marks on silt posts or measured with a survey rod with respect to a fixed benchmark within the BMP)
☐Recommended equipment to perform maintenance
☐When applicable, necessary special training or certification requirements for inspection and maintenance personnel such as confined space entry or hazardous waste management
Attachment 3b: For private entity operation and maintenance, Attachment 3b shall include a draft maintenance agreement in the local jurisdiction's standard format (PDP applicant to contact the City Engineer to obtain the current maintenance agreement forms).

Biofiltration Raised Planters O&M	
Typical Maintenance Indicators for Vegetated BMPs	Maintenance Actions
Accumulation of sediment, litter, or debris	Remove and properly dispose of accumulated materials, without damage to the vegetation.
Poor vegetation establishment	Re-seed, re-plant, or re-establish vegetation per original plans
Overgrown vegetation	Mow or trim as appropriate, but not less than the design height of the vegetation per original plans when applicable (e.g. a vegetated swale may require a minimum vegetation height).
Erosion due to concentrated storm water runoff flow	Repair/re-seed/re-plant eroded areas, and make appropriate corrective measures such as adding erosion control blankets, adding stone at flow entry points, or minor re-grading to restore proper drainage according to the original plan. If the issue is not corrected by restoring the BMP to the original plan and grade, the City Engineer shall be contacted prior to any additional repairs or reconstruction.
Standing water in bioretention, biofiltration with partial retention, or biofiltration areas, or flow-through planter boxes for longer than 96 hours following a storm event*	Make appropriate corrective measures such as adjusting irrigation system, removing obstructions of debris or invasive vegetation, clearing underdrains (where applicable), or repairing/replacing clogged or compacted soils.
Obstructed inlet or outlet structure	Clear obstructions.
Damage to structural components such as weirs, inlet or outlet structures	Repair or replace as applicable.

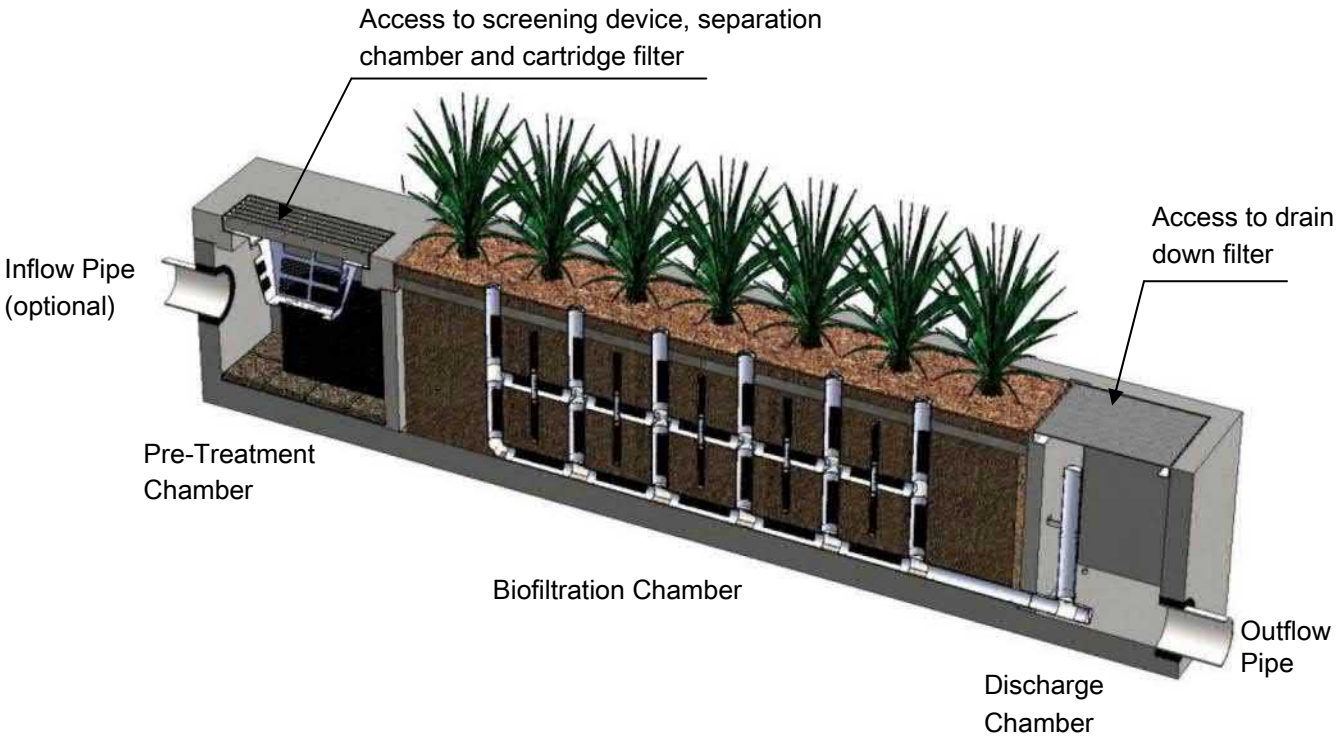
Detention Tank O&M	
Accumulation of sediment, litter, or debris	Remove and properly dispose of accumulated materials.
Standing water	Make appropriate corrective measures such as adjusting irrigation system, removing obstructions of debris or invasive vegetation, or minor re-grading for proper drainage.
Obstructed inlet or outlet structure	Clear obstructions.
Damage to structural components such as weirs, inlet or outlet structures	Repair or replace as applicable.

Maintenance Guidelines for Modular Wetland System - Linear

Maintenance Summary

- Remove Trash from Screening Device – average maintenance interval is 6 to 12 months.
  - (*5 minute average service time*).
- Remove Sediment from Separation Chamber – average maintenance interval is 12 to 24 months.
  - (*10 minute average service time*).
- Replace Cartridge Filter Media – average maintenance interval 12 to 24 months.
  - (*10-15 minute per cartridge average service time*).
- Replace Drain Down Filter Media – average maintenance interval is 12 to 24 months.
  - (*5 minute average service time*).
- Trim Vegetation – average maintenance interval is 6 to 12 months.
  - (*Service time varies*).

System Diagram



Maintenance Procedures

Screening Device

1. Remove grate or manhole cover to gain access to the screening device in the Pre-Treatment Chamber. Vault type units do not have screening device. Maintenance can be performed without entry.
2. Remove all pollutants collected by the screening device. Removal can be done manually or with the use of a vacuum truck. The hose of the vacuum truck will not damage the screening device.
3. Screening device can easily be removed from the Pre-Treatment Chamber to gain access to separation chamber and media filters below. Replace grate or manhole cover when completed.

Separation Chamber

1. Perform maintenance procedures of screening device listed above before maintaining the separation chamber.
2. With a pressure washer spray down pollutants accumulated on walls and cartridge filters.
3. Vacuum out Separation Chamber and remove all accumulated pollutants. Replace screening device, grate or manhole cover when completed.

Cartridge Filters

1. Perform maintenance procedures on screening device and separation chamber before maintaining cartridge filters.
2. Enter separation chamber.
3. Unscrew the two bolts holding the lid on each cartridge filter and remove lid.
4. Remove each of 4 to 8 media cages holding the media in place.
5. Spray down the cartridge filter to remove any accumulated pollutants.
6. Vacuum out old media and accumulated pollutants.
7. Reinstall media cages and fill with new media from manufacturer or outside supplier. Manufacturer will provide specification of media and sources to purchase.
8. Replace the lid and tighten down bolts. Replace screening device, grate or manhole cover when completed.

Drain Down Filter

1. Remove hatch or manhole cover over discharge chamber and enter chamber.
2. Unlock and lift drain down filter housing and remove old media block. Replace with new media block. Lower drain down filter housing and lock into place.
3. Exit chamber and replace hatch or manhole cover.

Maintenance Notes

1. Following maintenance and/or inspection, it is recommended the maintenance operator prepare a maintenance/inspection record. The record should include any maintenance activities performed, amount and description of debris collected, and condition of the system and its various filter mechanisms.

2. The owner should keep maintenance/inspection record(s) for a minimum of five years from the date of maintenance. These records should be made available to the governing municipality for inspection upon request at any time.

3. Transport all debris, trash, organics and sediments to approved facility for disposal in accordance with local and state requirements.

4. Entry into chambers may require confined space training based on state and local regulations.

5. No fertilizer shall be used in the Biofiltration Chamber.

6. Irrigation should be provided as recommended by manufacturer and/or landscape architect. Amount of irrigation required is dependent on plant species. Some plants may require irrigation.

Maintenance Procedure Illustration

Screening Device

The screening device is located directly under the manhole or grate over the Pre-Treatment Chamber. It's mounted directly underneath for easy access and cleaning. Device can be cleaned by hand or with a vacuum truck.

Separation Chamber

The separation chamber is located directly beneath the screening device. It can be quickly cleaned using a vacuum truck or by hand. A pressure washer is useful to assist in the cleaning process.

Cartridge Filters

The cartridge filters are located in the Pre-Treatment chamber connected to the wall adjacent to the biofiltration chamber. The cartridges have removable tops to access the individual media filters. Once the cartridge is open media can be easily removed and replaced by hand or a vacuum truck.

Drain Down Filter

The drain down filter is located in the Discharge Chamber. The drain filter unlocks from the wall mount and hinges up. Remove filter block and replace with new block.

Trim Vegetation

Vegetation should be maintained in the same manner as surrounding vegetation and trimmed as needed. No fertilizer shall be used on the plants. Irrigation per the recommendation of the manufacturer and or landscape architect. Different types of vegetation requires different amounts of irrigation.

Inspection Form

Modular Wetland System, Inc.
P. 760.433-7640
F. 760-433-3176
E. Info@modularwetlands.com

www.modularwetlands.com

Inspection Report
Modular Wetlands System

Project Name _____

Project Address _____
(city) (Zip Code)

Owner / Management Company _____

Contact _____ Phone ( ) –

Inspector Name _____ Date ___/___/___ Time _____ AM / PM

For Office Use Only
(Reviewed By)
(Date)
Office personnel to complete section to the left.

Type of Inspection ☐ Routine ☐ Follow Up ☐ Complaint ☐ Storm Storm Event in Last 72-hours? ☐ No ☐ Yes

Weather Condition _____ Additional Notes _____

Inspection Checklist

Modular Wetland System Type (Curb, Grate or UG Vault): _____ Size (22', 14' or etc.): _____

Structural Integrity:	**Yes**	**No**	**Comments**
Damage to pre-treatment access cover (manhole cover/grate) or cannot be opened using normal lifting pressure?			
Damage to discharge chamber access cover (manhole cover/grate) or cannot be opened using normal lifting pressure?			
Does the MWS unit show signs of structural deterioration (cracks in the wall, damage to frame)?			
Is the inlet/outlet pipe or drain down pipe damaged or otherwise not functioning properly?			
Working Condition:			
Is there evidence of illicit discharge or excessive oil, grease, or other automobile fluids entering and clogging the unit?			
Is there standing water in inappropriate areas after a dry period?			
Is the filter insert (if applicable) at capacity and/or is there an accumulation of debris/trash on the shelf system?			
Does the depth of sediment/trash/debris suggest a blockage of the inflow pipe, bypass or cartridge filter? If yes, specify which one in the comments section. Note depth of accumulation in in pre-treatment chamber.			Depth:
Does the cartridge filter media need replacement in pre-treatment chamber and/or discharge chamber?			Chamber:
Any signs of improper functioning in the discharge chamber? Note issues in comments section.			
Other Inspection Items:			
Is there an accumulation of sediment/trash/debris in the wetland media (if applicable)?			
Is it evident that the plants are alive and healthy (if applicable)? Please note Plant Information below.			
Is there a septic or foul odor coming from inside the system?			

Waste:	**Yes**	**No**
Sediment / Silt / Clay		
Trash / Bags / Bottles		
Green Waste / Leaves / Foliage		

Recommended Maintenance	
No Cleaning Needed	
Schedule Maintenance as Planned	
Needs Immediate Maintenance	

Plant Information	
Damage to Plants	
Plant Replacement	
Plant Trimming	

Additional Notes:

2972 San Luis Rey Road, Oceanside, CA 92058 P (760) 433-7640 F (760) 433-3176

Maintenance Report

Modular Wetland System, Inc.
P. 760.433-7640
F. 760-433-3176
E. Info@modularwetlands.com

www.modularwetlands.com

Cleaning and Maintenance Report
Modular Wetlands System

Project Name _____

Project Address _____
(city) (Zip Code)

Owner / Management Company _____

Contact _____ Phone ( ) –

Inspector Name _____ Date ____/____/____ Time _____ AM / PM

Type of Inspection ☐ Routine ☐ Follow Up ☐ Complaint ☐ Storm Storm Event in Last 72-hours? ☐ No ☐ Yes

Weather Condition _____ Additional Notes _____

For Office Use Only
(Reviewed By)
(Date)
Office personnel to complete section to the left.

Site Map #	GPS Coordinates of Insert	Manufacturer / Description / Sizing	Trash Accumulation	Foliage Accumulation	Sediment Accumulation	Total Debris Accumulation	Condition of Media 25/50/75/100 (will be changed @ 75%)	Operational Per Manufactures' Specifications (If not, why?)
	Lat: Long:	MWS Catch Basins						
		MWS Sedimentation Basin						
		Media Filter Condition						
		Plant Condition						
		Drain Down Media Condition						
		Discharge Chamber Condition						
		Drain Down Pipe Condition						
		Inlet and Outlet Pipe Condition						

Comments:

2972 San Luis Rey Road, Oceanside, CA 92058 P. 760.433.7640 F. 760.433.3176

Placeholder – **Structural BMP Maintenance Information**

Replace placeholder with required documentation.

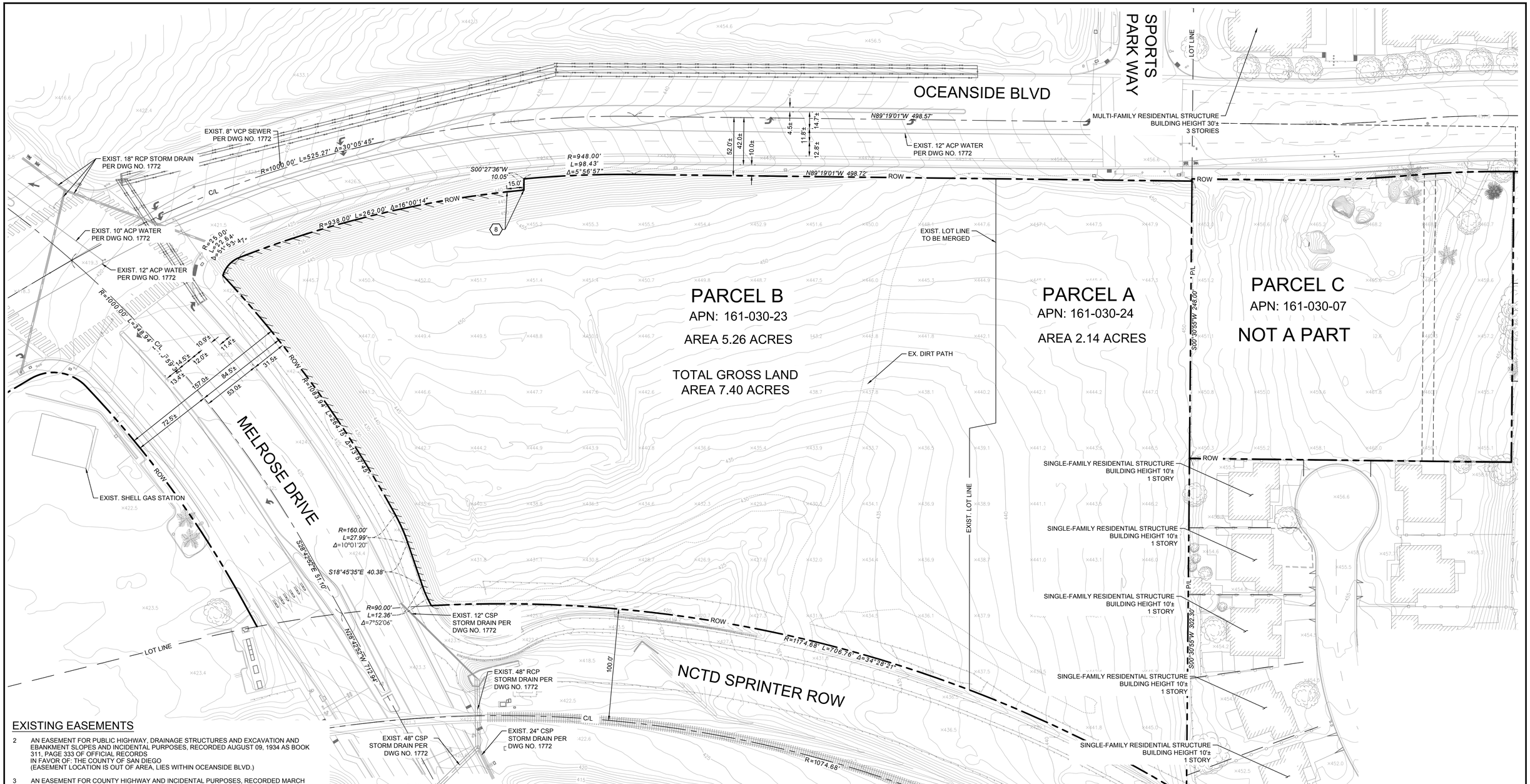
ATTACHMENT 4
Copy of Plan Sheets Showing Permanent Storm Water BMPs

This is the cover sheet for Attachment 4.

Use this checklist to ensure the required information has been included on the plans:

The plans must identify:

☒Structural BMP(s) with ID numbers matching Form I-6 Summary of PDP Structural BMPs
☒The grading and drainage design shown on the plans must be consistent with the delineation of DMAs shown on the DMA exhibit
☒Details and specifications for construction of structural BMP(s)
☒Signage indicating the location and boundary of structural BMP(s) as required by the City Engineer
☒How to access the structural BMP(s) to inspect and perform maintenance
☒Features that are provided to facilitate inspection (e.g., observation ports, cleanouts, silt posts, or other features that allow the inspector to view necessary components of the structural BMP and compare to maintenance thresholds)
☒Manufacturer and part number for proprietary parts of structural BMP(s) when applicable
☒Maintenance thresholds specific to the structural BMP(s), with a location-specific frame of reference (e.g., level of accumulated materials that triggers removal of the materials, to be identified based on viewing marks on silt posts or measured with a survey rod with respect to a fixed benchmark within the BMP)
☒Recommended equipment to perform maintenance
☒When applicable, necessary special training or certification requirements for inspection and maintenance personnel such as confined space entry or hazardous waste management
☒Include landscaping plan sheets showing vegetation requirements for vegetated structural BMP(s)
☒All BMPs must be fully dimensioned on the plans
☒When proprietary BMPs are used, site specific cross section with outflow, inflow and model number shall be provided. Brochure photocopies are not allowed.



EXISTING EASEMENTS

2 AN EASEMENT FOR PUBLIC HIGHWAY, DRAINAGE STRUCTURES AND EXCAVATION AND EBANKMENT SLOPES AND INCIDENTAL PURPOSES, RECORDED AUGUST 09, 1934 AS BOOK 311, PAGE 333 OF OFFICIAL RECORDS
IN FAVOR OF: THE COUNTY OF SAN DIEGO
(EASEMENT LOCATION IS OUT OF AREA, LIES WITHIN OCEANSIDE BLVD.)

3 AN EASEMENT FOR COUNTY HIGHWAY AND INCIDENTAL PURPOSES, RECORDED MARCH 11, 1980 AS INSTRUMENT NO. 80-083354 OF OFFICIAL RECORDS.
IN FAVOR OF: THE COUNTY OF SAN DIEGO
(EASEMENT LOCATION IS OUT OF AREA, LIES WITHIN WEST OCEANSIDE BLVD.)

5 AN EASEMENT FOR RIGHT TO EXTEND AND MAINTAIN DRAINAGE STRUCTURES AND EXCAVATION AND EMBANKMENT SLOPES BEYOND THE LIMITS OF THE RIGHT OF WAY GRANTED THEREIN WHERE REQUIRED FOR CONSTRUCTION AND MAINTENANCE AND INCIDENTAL PURPOSES, RECORDED MARCH 11, 1980 AS INSTRUMENT NO. 80-083354 OF OFFICIAL RECORDS. IN FAVOR OF: COUNTY OF SAN DIEGO
(EASEMENT LOCATION IS OUT OF AREA, LIES WITHIN MELROSE DRIVE AND OCEANSIDE BLVD.)

⑧ A 30' WIDE DRIVEWAY ACCESS EASEMENT & RIGHTS INCIDENTAL THERETO PER PARCEL MAP NO. 17266. PLOTTED.

9 ABUTTER'S RIGHTS OF INGRESS AND EGRESS TO OR FROM MELROSE DRIVE AND OCEANSIDE BOULEVARD HAVE BEEN DEDICATED OR RELINQUISHED ON THE MAP OF PARCEL MAP NO. 17266 OF MAPS RECORDED DECEMBER 03, 1993.
(PLOTTED AS: //////)

BENCHMARK STATEMENT

CITY OF OCEANSIDE BENCHMARK NO. GPS 1049
ELEV: 417.22 NAVD88
DESCRIBED AS: 2.5" BRASS DISK SET IN CURB INLET. ON TOP OF WESTERLY CURB INLET OF MELROSE DRIVE (+/-) 150' SOUTH OF SPRINTER RAIL ROAD TRACKS.

CITY PROJECT# D21-00011

LAND SURVEYOR:
C&V CONSULTING, INC. CIVIL ENGINEERING LAND PLANNING AND SURVEYING
6 ORCHARD, SUITE 200, LAKE FOREST, CA 92630
(949) 916-3800

GEOTECHNICAL ENGINEER:
GEOCON INCORPORATED
6960 FLANDERS DRIVE, SAN DIEGO, CA, 92121
(858) 558.6159

REVISIONS

SHT.	DESCRIPTION	DATE	BY	APRD

APPROVALS

	INITIAL	DATE
PROJECT ENG.		

Kimley»Horn

401 B STREET, SUITE 600, SAN DIEGO, CA 92101
PHONE: 619-234-9411

PREPARED BY: _____ R.C.E. NO.: _____
FIRST LASTNAME DATE: 4/5/2022

REGISTERED PROFESSIONAL ENGINEER
ERWIN L. LEE
No. 92949
CIVIL
STATE OF CALIFORNIA

SCALE:	AS SHOWN
DESIGN:	EL
DRAWN:	SM
CHECKED:	BN
APPROVED:	--
DATE:	4/5/22

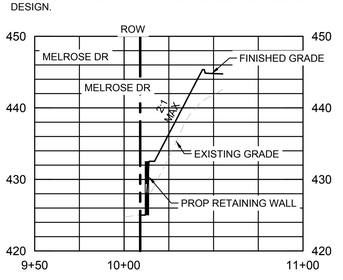
CITY OF OCEANSIDE

EXISTING CONDITIONS PLAN

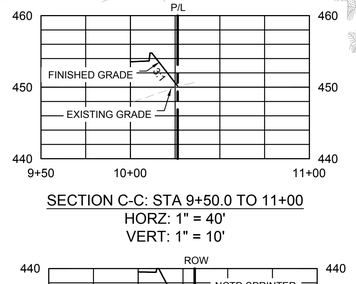
C-1

GRADING NOTES

1. PROPOSED PRIVATE 12" HDPE STORM DRAIN
2. PROPOSED BIOFILTRATION RAISED PLANTER OVERFLOW
3. PROPOSED PRIVATE 10" PVC FIRE SERVICE
4. PROPOSED PRIVATE 2" DOMESTIC WATER SERVICE
5. PROPOSED PRIVATE 8" PVC SEWER
6. PROPOSED PRIVATE 6" PVC SEWER
7. PROPOSED RETAINING WALL
8. PROPOSED DOMESTIC WATER EASEMENT
9. RELOCATE EXIST. WATER BLOW-OFF
10. PROPOSED PRIVATE 18" HDPE STORM DRAIN
11. PROPOSED FENCE PER LANDSCAPE
12. PROPOSED BIOFILTRATION RAISED PLANTER BMP
13. PROPOSED UNDERGROUND STORMWATER VAULT
14. PROPOSED PRIVATE STORM DRAIN CLEANOUT
15. CONNECT TO EXIST. STORM DRAIN INLET
16. PROPOSED PRIVATE 10" RPDA
17. PROPOSED BUILDING POINT OF CONNECTION
18. PROPOSED 1.5" DOMESTIC METER AND BACKFLOW
19. CONNECT TO EXIST. 12" PUBLIC WATER MAIN
20. CONNECT TO EXIST. 8" PUBLIC SEWER MAIN
21. PROPOSED PRIVATE 6" BUILDING FIRE SERVICE WITH PIV AND FDC
22. PROPOSED PRIVATE 6" FIRE HYDRANT AND SERVICE
23. PROPOSED PRIVATE SEWER MANHOLE
24. PROPOSED PRIVATE 24" HDPE STORM DRAIN
25. PROPOSED PRIVATE 30" HDPE STORM DRAIN
26. ADA SIDEWALK TO BE PROVIDED IN FINAL DESIGN. ANY MODIFICATION TO EXISTING UTILITIES TO ACCOMMODATE SIDEWALK WILL BE PROVIDED IN FINAL DESIGN.



SECTION A-A: STA 9+50.0 TO 11+00
HORZ: 1" = 40'
VERT: 1" = 10'



SECTION C-C: STA 9+50.0 TO 11+00
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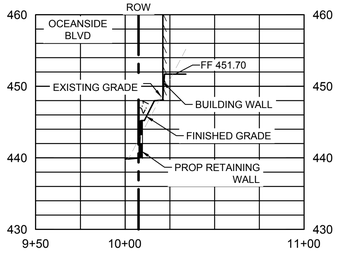
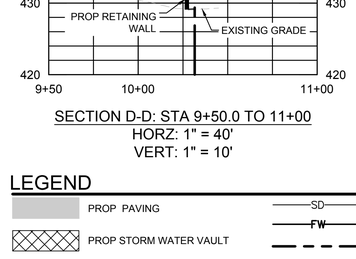
VERT: 1" = 10'



SECTION B-B: STA 9+50.0 TO 11+00
HORZ: 1" = 40'
VERT: 1" = 10'



SECTION D-D: STA 9+50.0 TO 11+00
HORZ: 1" = 40'
VERT: 1" = 10'

LEGEND

- PROP PAVING
- PROP STORM WATER VAULT
- BUILDING OUTLINE
- RETAINING WALL
- BIOFILTRATION PLANTERS BMP
- MODULAR WETLAND SYSTEM
- SD — PROP PRIVATE STORM DRAIN
- FW — PROP PRIVATE FIRE SERVICE
- PROJECT BOUNDARY
- PROP CONCRETE SIDEWALK
- PROP FENCE
- SITE TRIANGLE
- LINE OF SIGHT

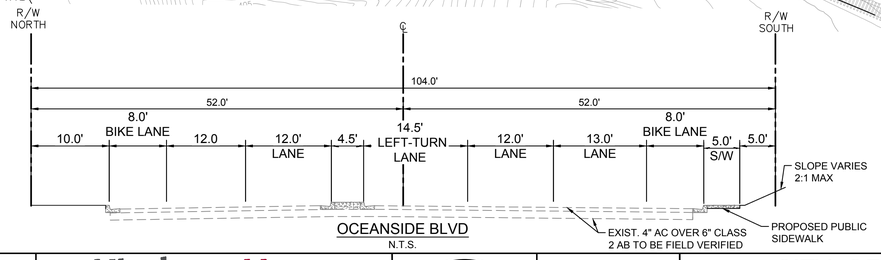
SITE DATA

LOT AREA = 322,275 SF (7.40 AC)
BUILDING COVERAGE = 104,523 SF
LOT COVERAGE = 32.4%
PAVED AREA = 135,734 SF (3.12 AC) , 42.1%
PERMEABLE SURFACE AREA = 82,018 SF (1.88 AC), 25.5%
FRONT SETBACK = 10'
CORNER SIDE SETBACK = 10'
REAR SETBACK = 10'
RESIDENTIAL SIDE SET BACK = 10'
SITE IN ZONE X PER FEMA PANEL MAP NO. PANEL MAP NO. 06073C0757G, EFF. 5/16/2021

EARTH WORK

CUT 22,700 CY
FILL 65,000 CY

NET 42,300 CY FILL



OCEANSIDE BLVD
N.T.S.

CITY PROJECT# D21-00011

REVISIONS				
SHT.	DESCRIPTION	DATE	BY	APRD

APPROVALS

	INITIAL	DATE
PROJECT ENG.		

Kimley»Horn

401 B STREET, SUITE 600, SAN DIEGO, CA 92101
PHONE: 619-234-9411

PREPARED BY: _____ R.C.E. NO.: _____
FIRST LASTNAME DATE: 4/5/2022

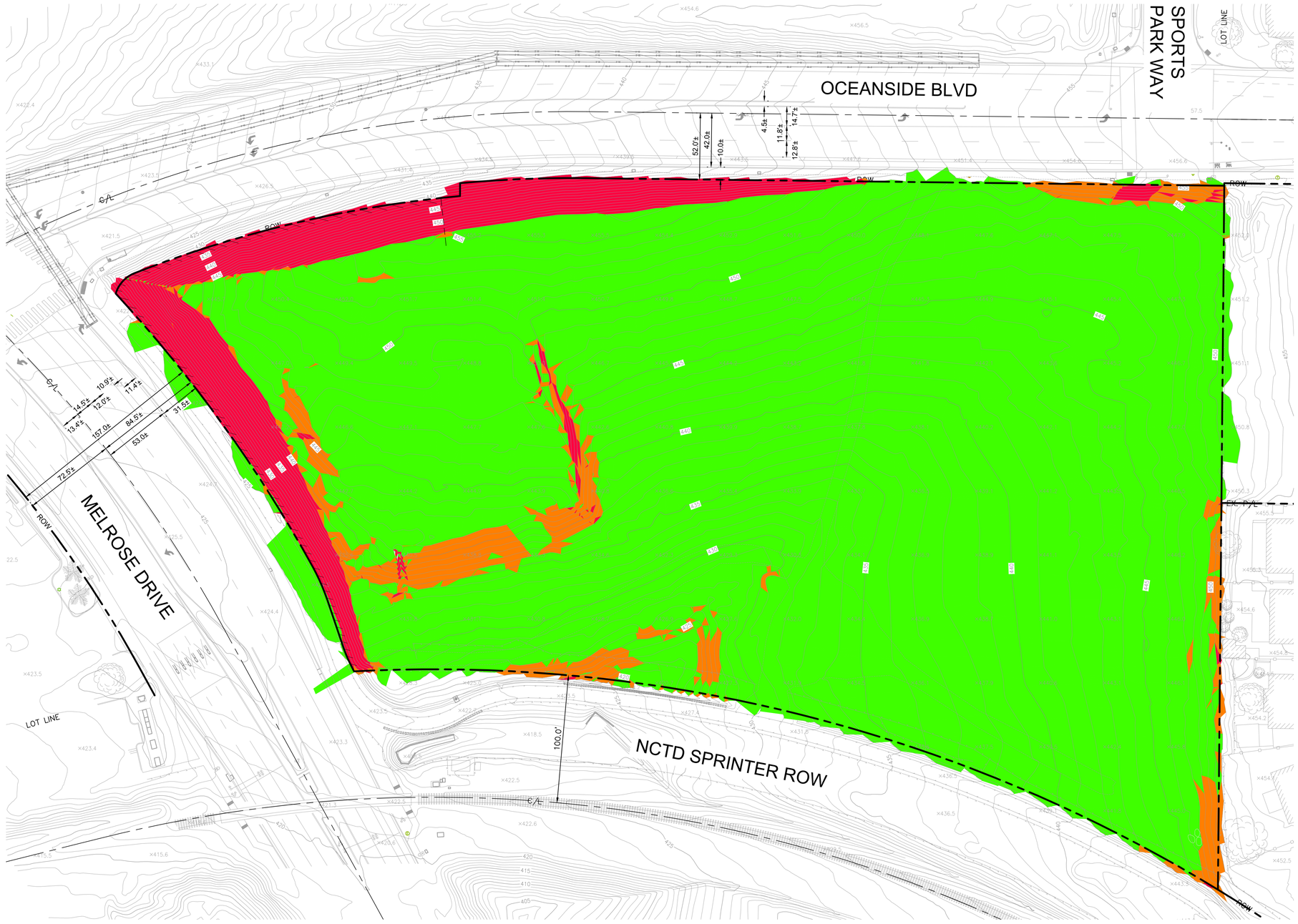
REGISTERED PROFESSIONAL ENGINEER — ERIN L. LEE — No. 92949 — CIVIL — STATE OF CALIFORNIA

SCALE:	AS SHOWN
DESIGN:	EL
DRAWN:	SM
CHECKED:	BN
APPROVED:	--
DATE:	4/5/22

CITY OF OCEANSIDE

CONCEPTUAL GRADING PLAN

C-2



Slopes Table				
Number	Minimum Slope	Maximum Slope	Area	Color
1	0.00%	20.00%	1025465.87	
2	20.00%	40.00%	97560.44	
3	40.00%	100.00%	71855.47	

CITY PROJECT# D21-00011

REVISIONS					
⚠	SHT.	DESCRIPTION	DATE	BY	APRD

APPROVALS			
		INITIAL	DATE
	PROJECT ENG.		

Kimley»Horn

401 B STREET, SUITE 600, SAN DIEGO, CA 92101
PHONE: 619-234-9411

PREPARED BY: _____ R.C.E. NO.: _____
FIRST LASTNAME DATE: 4/5/2022

REGISTERED PROFESSIONAL ENGINEER — ERIN L. LEE — No. 92949 — CIVIL — STATE OF CALIFORNIA

SCALE:	AS SHOWN
DESIGN:	EL
DRAWN:	SM
CHECKED:	BN
APPROVED:	--
DATE:	4/5/22

CITY OF OCEANSIDE

SLOPE ANALYSIS PLAN

C-3

ATTACHMENT 5
Drainage Report

This is the cover sheet for Attachment 5.

MODERA MELROSE

PROJECT NO. D21-00011

Drainage Report

MELROSE DRIVE AT OCEANSIDE BOULEVARD
OCEANSIDE, CA 92056
APN: 161-030-23 & 161-030-24

DECEMBER 2021

Applicant:

MILL CREEK RESIDENTIAL TRUST
949 SOUTH COAST DRIVE, SUITE 400
COSTA MESA, CA 92626
CONTACT: JOHN COLLETTI
714.800.1387

Prepared By:

KIMLEY-HORN AND ASSOCIATES, INC.
401 B STREET, SUITE 600
SAN DIEGO, CA 92101
(619)234-9411

This Drainage Report has been prepared by Kimley-Horn and Associates, Inc. under the direct supervision of the following Registered Civil engineer. The undersigned attests to the technical data contained in this study, and to the qualifications of technical specialists providing engineering computations upon which the recommendations and conclusions are based.

04/05/2022

Registered Civil Engineer

Date

Contents

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Appendices

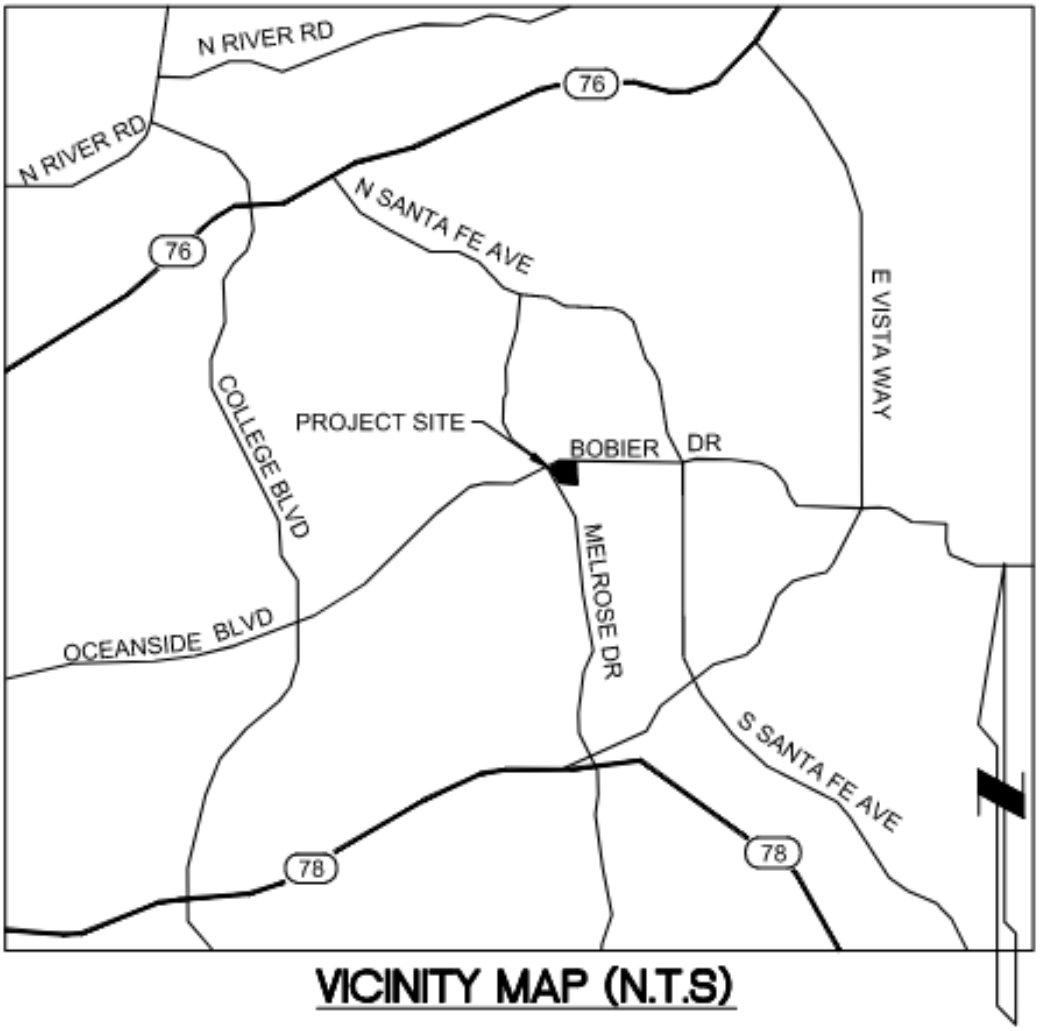
Exhibits

1 INTRODUCTION

1.1 PROJECT DESCRIPTION

The Modera Melrose project consists of mixed use commercial and multifamily development on approximately 7.43-acres located in Oceanside, California. The 7.43-acre property is bounded by Oceanside Boulevard to the north, Melrose Drive to the west, residential to the east, and the NCTD Sprinter Line and a bike path to the south, see **Figure 1-1** for the Vicinity Map. The property's Assessor Parcel Numbers are 161-030-23 and 161-030-24. The project includes the grading of the existing parcel for commercial and multifamily development along with parking areas, landscape areas, and open space areas. The purpose of this report is to present the hydrology analysis and drainage calculations for the design of the Modera Melrose project.

Figure 1–1 Vicinity Map



2 PROJECT SETTING

2.1 TOPOGRAPHY

Topographic information for the project was obtained from an aerial survey by C&V Consulting in February 2020. The project is located on the USGS San Luis Rey quadrangle map, see **Appendix A**. The project is located within the Carlsbad watershed with onsite slopes starting in the northeast corner (approximate elevation 455) flowing southwest towards the bike path and NCTD Sprinter line (approximate elevation 420) where runoff enters the existing storm drain system by culverts and headwalls south of the bike trail.

2.2 PRECIPITATION

Storm intensity values were taken from the County of San Diego Hydrology Manual, 2003. The design storm was the 50-year and 100-year rainfall event calculated from the County of San Diego Hydrology Manual Rainfall Isopluvials and Figure 3-1 (see **Appendix C**) and determined to be 2.7 inches for the 50-year 6-hour event and 3.1 for the 100-year 6-hour event.

2.3 SOIL TYPES

The condition and type of soil are major factors affecting infiltration and runoff. The Natural Resources Conservation Service (NRCS) has classified soils into four general categories for comparing infiltration and runoff rates. The categories are based on properties that influence runoff, such as water infiltration rate, texture, natural discharge and moisture condition. The runoff potential is based on the amount storm water runoff at the end of a long duration storm that occurs after the soil is saturated.

Soil types were determined using the United States Department of Agriculture (USDA) Web Soil Survey. The project site consists of a mix of type A and type D soils. Hydrologic soil group D soils have a very slow infiltration rate when thoroughly wet. These consist chiefly of clays that have a high shrink-swell potential, soils that have a high-water table, soils that have a claypan or clay layer at or near the surface, and soils that are shallow over nearly impervious material. These soils have a very slow rate of water transmission. See **Appendix B** for soils information. While A type soils exist on a majority of the site, the preliminary geotechnical report deem infiltration infeasible.

2.4 LAND USE

The zoning of the project site is Neighborhood Commercial (CN). The land use designation is Commercial.

2.5 GROUNDWATER

Based on the Geotechnical Investigation dated January 26, 2021 by Geocon, Inc. at bore hole depths ranging from 10.2’ to 19.8’, groundwater was not encountered onsite. Groundwater elevations may fluctuate seasonally.

2.6 FEMA MAPPING

The project site is not located in a flood zone mapped by the FEMA Flood Insurance Rate Map (FIRM). See **Appendix G** for FEMA map.

3 HYDROLOGIC ANALYSIS

3.1 METHODOLOGY

The Modified Rational Method was used to analyze the hydrology for the project. This methodology is typically used for small basins less than 500 acres in size because a uniform rainfall distribution is assumed for the entire duration. Drainage calculations comply with the requirements outlined in the County of San Diego Hydrology Manual, 2003. The San Diego County Advanced Engineering Software (AES) computer program was used for the Modified Rational Method analysis to calculate peak flow for the 100-year storm event under existing and proposed conditions. This program uses parameters from the County of San Diego Hydrology Manual to estimate times of concentration and peak flow rates.

3.1.1 GEOMETRY

Sub-basin boundaries, initial subareas, and flow paths were delineated for each sub-basin with AutoCAD Civil 3D software. These hydrologic parameters are shown for existing conditions and proposed conditions in **Exhibit A** and **Exhibit B**. Point elevations and surfaces within Civil 3D were also used to determine flow path slopes and estimate the shape of routing reaches. A summary of the existing condition and proposed condition inputs into the AES models are included in **Appendix A.** Topography for the project area was obtained from an aerial survey flown by C&V Consulting in 2020 and is based on the mean sea level (NAVD 88).

3.1.2 INTENSITY AND TIME OF CONCENTRATION

Rainfall data for frequency events were taken from the County of San Diego Hydrology Manual Rainfall Isopluvials to determine the appropriate precipitation for the project site. This duration precipitation value was then inputted directly into AES for each frequency event. AES software was used to calculate the appropriate time of concentration for each sub-basin The AES software then calculates an intensity based on the calculated time of concentration.

3.1.3 RUNOFF COEFFICIENT AND LOSS RATES

AES software was used to calculate loss rates and subsequent runoff coefficients for each sub-basin based on land use type, and hydrologic soil group. The existing conditions land utilized for the model was undeveloped natural grass. The proposed conditions land use is neighborhood commercial, which is defined as 80% impervious and a runoff coefficient of 0.79. Hydrologic soil group D was used for the entire site.

3.2 EXISTING CONDITIONS

The project site has been previously graded but is currently vacant. Overland runoff flows from the northeast corner to the southwest towards the bike path and NCTD sprinter line where runoff enters the existing storm drain system by culverts and headwalls south of the bike path.

Runoff coefficients for the existing site was based on the County of San Diego Hydrology Manual and is identified below in **Table 3-1** for undeveloped sites. See **Exhibit A** for **Existing Drainage Exhibit.** The hydrology model results are presented in **Appendix D.**

Table 3–1 Existing Conditions Hydrology

POC	Runoff Coefficient	Area (acres)	Flow Rate (cfs)
			100 Year
1	0.35	8.5	15.4
2	0.35	2.6	9.2
Total		11.1	24.6

3.3 PROPOSED CONDITIONS

Proposed hydrologic calculations have been prepared for the project. Tributary areas were delineated based on proposed grading for the project. The final development will be approximately 74% impervious area and 26% landscape. The San Diego County Advanced Engineering Software (AES) computer program was used for the Modified Rational Method analysis to calculate peak flow for the 100-year storm event under proposed conditions. Runoff generated from the site will be collected by Modular Wetland Systems or raised planters for water quality treatment then is collected and conveyed through an underground storm drain system, and discharge into onsite underground detention basin to meet hydromodification and detention requirements. The Modular Wetland Systems and raised planters will be designed to filter and treat the water quality storm event volume by means of biofiltration as documented in the project specific SWQMP.

The project will have two discharge locations – the same locations as the existing conditions.

POC 2 collects runoff from the northern landscaped slope that flows into the existing gutter in Oceanside Blvd and N Melrose Dr, where it enters the public storm drain system by the existing curb inlet at the southeast corner of Oceanside Blvd and Melrose Drive. The storm drain flows north and discharges in the East Channel Creek where it flows north to San Luis Rey River where it ultimately discharges into the Pacific Ocean.

POC 1 collects the rest of the site's runoff where it enters the City of Vista's public storm drain system by the existing headwall. The public storm system conveys flows south and discharges into Loma Alta Creek flowing west to ultimately discharge into the Pacific Ocean.

With the project site being 74% impervious the Runoff Coefficient used in the AES calculations was 0.79 which matches closely to the Table A-1 of the San Diego Drainage Design Manual Neighborhood Commercial land use with 80% impervious carrying a runoff coefficient of 0.79. See **Exhibit B** for **Proposed Drainage Exhibit.** The hydrology model results are presented in **Appendix E.**

Table 3–2 Proposed Conditions Hydrology

POC	Runoff Coefficient	Area (acres)	Flow Rate (cfs)
			100 Year
1	0.79	8.6	36.8
2	0.79	2.4	8.7
Total		11.0	45.5

4 HYDRAULIC ANALYSIS

4.1 METHODOLOGY

Drainage structures were designed for the Modera Melrose project according to the procedures and methodologies outlined in the County of San Diego Drainage Design Manual, 2003. The proposed drainage network is included on the **Proposed Drainage Exhibit**, **Exhibit B**.

4.1.1 STORM DRAIN DESIGN

The storm drain network pipe sizes were estimated for preliminary design utilizing the AES computer program for non-pressure pipe flow included in the **Proposed Condition Hydrology Calculations**, see **Appendix E**. The Modified Rational Method was used to calculate peak flow for the 100-year storm event.

4.1.2 DETENTION BASIN CALCULATIONS

The development of this site results in an increase of peak discharge runoff. One underground detention basin is proposed to mitigate the peak flows by storing stormwater runoff and controlling the release of flow. The project is required to mitigate for downstream hydromodification and detain for the 100-year peak flow rate. The project specific Stormwater Quality Management Plan (SWQMP) determined the storage volume and outlet orifice required to mitigate for hydromodification. Orifice calculations were prepared to determine the size of the outlets to meet hydromodification requirements and are used in the flood routing for the peak storm events. See **Appendix F** for the outlet rating curves for each basin. See project specific SWQMP for hydromodification compliance documentation.

To size the peak attenuation volume required, the Rational Method hydrology results were input into Rick Rat Hydrographs to develop a hydrograph. The proposed hydrograph was routed using Hydraflow Hydrographs Computer Software with the calculated orifice sizes and a riser structure to determine peak flow rates and maximum elevation in the underground basin. See **Appendix F** for detention basin calculations and **Table 4-1** summarizing the basin routing results. The project peak flow rates are less than the pre-project peak flow rate for all storm events per the criteria above.

Table 4–1 Proposed Detention Basin Summary

Storm Event	Proposed Runoff into Basin	Proposed Released Out of Basin	Runoff Detained in Basin
(yr)	Q (cfs)	Q (cfs)	Q (cfs)
100	32.6	1.2	30.1
Basin Volume Provided (cubic feet)			49,864 cf

The underground detention tank mitigates the project site runoff to less than pre-project flows, producing mitigated runoff less than the existing runoff at POC 1. Because the area being routed to discharge location 3 increased, the existing City of Vista pipe from discharge location 3 to POC 1 will need to be upsized from a 12” pipe to an 18” pipe, see **Appendix F** for Flowmaster results. Nothing downstream of POC 1 will be negatively affected by the project since the proposed flows at POC 1 are less than the

existing flows at POC 1. The area of runoff going to POC 2 has decreased causing the flows to decrease at POC 2 in the proposed condition as well. **Table 4-2** summarizes this in a comparison table.

The velocity was calculated using the Flowmaster program analyzing the existing pipe at each Point of Connection. The program uses input parameters such as pipe slope, discharge, roughness coefficient, and diameter to calculate the velocity of flows within the pipe. See **Appendix F** for printout and **Table 4-2** for a summary of the results.

Table 4–2 Comparison Table

POC	Existing TC (min)	Existing Q100 (cfs)	Existing V100 (fps)	Proposed TC (min)	Proposed Q100 (cfs)	Proposed V100 (fps)
1	12	13.8	19.7	6.7	8.1*	16.3*
2	13.1	9.2	11.9	13.0	8.7	11.7
**Mitigated runoff from the underground detention basin*						

4.1.3 INLET DESIGN

Inlet design will be provided during final design.

5 WATER QUALITY

5.1 POST CONSTRUCTION BMP

A project specific Storm Water Quality Management Plan (SWQMP) has been prepared. Biofiltration raised planter areas and Modular Wetland Systems are proposed throughout the project to provide stormwater treatment for the pollutants discharged from the proposed improvements. Biofiltration areas and MWS were incorporated into the project where it was practical. These BMPs are a mitigation measure for stormwater runoff treatment. Biofiltration calculations are provided in the project specific SWQMP.

5.2 EROSION AND SEDIMENTATION

The proposed commercial site will be approximately 74% impervious with landscaped slopes and parkway landscaped areas. Graded and disturbed areas will be re-vegetated and landscaped to minimize erosion. The post construction site will have minimal risks of erosion occurring given proper plant establishment and transport of sediments downstream will be significantly reduced by means of pretreatment and onsite biofiltration basins. It will be critical to maintain construction site BMP's throughout the construction duration.

6 DRAINAGE IMPROVEMENTS

This drainage study was prepared to document the storm drain design for Modera Melrose. The project includes the construction of commercial and multi-family buildings, associated parking, landscaping, and utilities. The drainage improvements throughout the project consist of installing inlets, storm drain facilities, biofiltration basins (standard and proprietary), and an underground stormwater detention tank.

The proposed drainage improvements are designed to mitigate flood and water quality impacts such that no adjacent properties will be negatively impacted from runoff generated by the development of this project. This Drainage Study documents that this project does not create any negative drainage impacts to any adjacent properties.

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APPENDICES

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APPENDIX A

USGS MAP

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USGS
science for a changing world

U.S. DEPARTMENT OF THE INTERIOR
U.S. GEOLOGICAL SURVEY

The National Map
US Topo

SAN LUIS REY QUADRANGLE
CALIFORNIA-SAN DIEGO CO.
7.5-MINUTE SERIES

Project Site

Produced by the United States Geological Survey
North American Datum of 1983 (NAD83)
World Geodetic System of 1984 (WGS84). Projection and
1 000-meter grid: Universal Transverse Mercator, Zone 11S
10 000-foot ticks: California Coordinate System of 1983 (zone 6)

This map is not a legal document. Boundaries may be generalized for this map scale. Private lands within government reservations may not be shown. Obtain permission before entering private lands.

Imagery	NAIP,	May 2012
Roads	HERE, ©2013 -	2014
Names	GNIS,	2015
Hydrography	National Hydrography Dataset,	2012
Contours	National Elevation Dataset,	2006
Boundaries	Multiple sources; see metadata file	1972 - 2015
Public Land Survey System	BLM,	2011

UTM GRID AND 2015 MAGNETIC NORTH DECLINATION AT CENTER OF SHEET
MN 11° 53′ 211 MILS
GN 0° 10′ 3 MILS

U.S. National Grid
100,000-m Square ID: MS
Grid Zone Designation: 11S

SCALE 1:24 000
1 0.5 0 KILOMETERS 1 2
1000 500 0 METERS 1000 2000
1 0.5 0 MILES 1
1000 0 1000 2000 3000 4000 5000 6000 7000 8000 9000 10000 FEET

CONTOUR INTERVAL 20 FEET
NORTH AMERICAN VERTICAL DATUM OF 1988

This map was produced to conform with the National Geospatial Program US Topo Product Standard, 2011.
A metadata file associated with this product is draft version 0.6.18

CALIFORNIA
QUADRANGLE LOCATION

ROAD CLASSIFICATION
Expressway
Secondary Hwy
Ramp
Local Connector
Local Road
4WD
Interstate Route
US Route
State Route

1	2	3
4		5
6	7	8

ADJOINING QUADRANGLES
1 Las Pulgas Canyon
2 Morro Hill
3 Bonsall
4 Oceanside
5 San Marcos
6
7 Encinitas
8 Rancho Santa Fe

SAN LUIS REY, CA
2015

NSN. 7643016357641
NGA REF NO. USGSX24K39666

APPENDIX B

SOIL INFORMATION

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Map Scale: 1:1,880 if printed on A landscape (11" x 8.5") sheet.

N

Meters: 0 25 50 100 150

Feet: 0 50 100 200 300

Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 11N WGS84

MAP LEGEND

Area of Interest (AOI)
- Area of Interest (AOI)

Soils
- Soil Map Unit Polygons
- Soil Map Unit Lines
- Soil Map Unit Points

Special Point Features
- Blowout
- Borrow Pit
- Clay Spot
- Closed Depression
- Gravel Pit
- Gravelly Spot
- Landfill
- Lava Flow
- Marsh or swamp
- Mine or Quarry
- Miscellaneous Water
- Perennial Water
- Rock Outcrop
- Saline Spot
- Sandy Spot
- Severely Eroded Spot
- Sinkhole
- Slide or Slip
- Sodic Spot
- Spoil Area
- Stony Spot
- Very Stony Spot
- Wet Spot
- Other
- Special Line Features

Water Features
- Streams and Canals

Transportation
- Rails
- Interstate Highways
- US Routes
- Major Roads
- Local Roads

Background
- Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:24,000.

Warning: Soil Map may not be valid at this scale.

Enlargement of maps beyond the scale of mapping can cause misunderstanding of the detail of mapping and accuracy of soil line placement. The maps do not show the small areas of contrasting soils that could have been shown at a more detailed scale.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL:
Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: San Diego County Area, California
Survey Area Data: Version 15, May 27, 2020

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Jan 24, 2020—Feb 12, 2020

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Map Unit Legend

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
DaC	Diablo clay, 2 to 9 percent slopes	3.1	26.1%
LeD2	Las Flores loamy fine sand, 9 to 15 percent slopes, eroded	0.0	0.0%
TuB	Tujunga sand, 0 to 5 percent slopes	8.8	73.9%
Totals for Area of Interest		**11.9**	**100.0%**

San Diego County Area, California

LeD2—Las Flores loamy fine sand, 9 to 15 percent slopes, eroded

Map Unit Setting

National map unit symbol: hbdc
Elevation: 700 feet
Mean annual precipitation: 12 inches
Mean annual air temperature: 61 degrees F
Frost-free period: 300 to 340 days
Farmland classification: Farmland of statewide importance

Map Unit Composition

Las flores and similar soils: 85 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Las Flores

Setting

Landform: Hillslopes
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Side slope
Down-slope shape: Convex
Across-slope shape: Convex
Parent material: Residuum weathered from siliceous calcareous sandstone

Typical profile

H1 - 0 to 14 inches: loamy fine sand
H2 - 14 to 22 inches: sandy clay, clay
H2 - 14 to 22 inches: sandy clay, clay
H3 - 22 to 38 inches: loamy coarse sand
H3 - 22 to 38 inches: weathered bedrock
H4 - 38 to 48 inches:
H5 - 48 to 52 inches:

Properties and qualities

Slope: 9 to 15 percent
Depth to restrictive feature: More than 80 inches; More than 80 inches; 40 to 60 inches to paralithic bedrock
Drainage class: Moderately well drained
Runoff class: Very high
Capacity of the most limiting layer to transmit water (Ksat): Very low to moderately low (0.00 to 0.06 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Sodium adsorption ratio, maximum: 30.0
Available water capacity: Very low (about 1.3 inches)

Interpretive groups

Land capability classification (irrigated): 4e
Land capability classification (nonirrigated): 4e
Hydrologic Soil Group: D
Ecological site: R019XD061CA
Hydric soil rating: No

Minor Components

Linne

Percent of map unit: 5 percent
Hydric soil rating: No

Huerhuero

Percent of map unit: 5 percent
Hydric soil rating: No

Diablo

Percent of map unit: 5 percent
Hydric soil rating: No

Data Source Information

Soil Survey Area: San Diego County Area, California
Survey Area Data: Version 15, May 27, 2020

San Diego County Area, California

TuB—Tujunga sand, 0 to 5 percent slopes

Map Unit Setting

National map unit symbol: hbh0
Elevation: 10 to 2,500 feet
Mean annual precipitation: 10 to 25 inches
Mean annual air temperature: 59 to 64 degrees F
Frost-free period: 280 to 350 days
Farmland classification: Farmland of statewide importance

Map Unit Composition

Tujunga and similar soils: 85 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Tujunga

Setting

Landform: Flood plains
Landform position (three-dimensional): Riser, flat
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Alluvium derived from granite

Typical profile

H1 - 0 to 14 inches: sand
H2 - 14 to 34 inches: loamy sand, fine sand, sand
H2 - 14 to 34 inches: stratified gravelly sand to gravelly loamy sand
H2 - 14 to 34 inches:
H3 - 34 to 60 inches:

Properties and qualities

Slope: 0 to 5 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Somewhat excessively drained
Runoff class: Negligible
Capacity of the most limiting layer to transmit water (Ksat): High to very high (5.95 to 19.98 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: Rare
Frequency of ponding: None
Available water capacity: Moderate (about 6.7 inches)

Interpretive groups

Land capability classification (irrigated): 3s
Land capability classification (nonirrigated): 4e
Hydrologic Soil Group: A
Ecological site: R019XD035CA
Hydric soil rating: No

Minor Components

Grangeville
Percent of map unit: 5 percent
Hydric soil rating: No

Ramona
Percent of map unit: 5 percent
Hydric soil rating: No

Visalia
Percent of map unit: 2 percent
Hydric soil rating: No

Riverwash
Percent of map unit: 2 percent
Landform: Drainageways
Hydric soil rating: Yes

Unnamed
Percent of map unit: 1 percent
Landform: Flood plains
Hydric soil rating: Yes

Data Source Information

Soil Survey Area: San Diego County Area, California
Survey Area Data: Version 15, May 27, 2020

San Diego County Area, California

DaC—Diablo clay, 2 to 9 percent slopes

Map Unit Setting

National map unit symbol: hbb8
Elevation: 30 to 3,000 feet
Mean annual precipitation: 12 to 35 inches
Mean annual air temperature: 57 to 61 degrees F
Frost-free period: 200 to 320 days
Farmland classification: Farmland of statewide importance

Map Unit Composition

Diablo and similar soils: 85 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Diablo

Setting

Landform: Hillslopes
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Side slope
Down-slope shape: Convex
Across-slope shape: Convex
Parent material: Calcareous sandstone and shale

Typical profile

H1 - 0 to 15 inches: clay
H2 - 15 to 32 inches: clay, silty clay loam
H2 - 15 to 32 inches: weathered bedrock
H3 - 32 to 36 inches:

Properties and qualities

Slope: 2 to 9 percent
Depth to restrictive feature: 24 to 40 inches to paralithic bedrock
Drainage class: Well drained
Runoff class: Very high
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to moderately high (0.06 to 0.20 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum content: 10 percent
Available water capacity: Moderate (about 7.7 inches)

Interpretive groups

Land capability classification (irrigated): 3e
Land capability classification (nonirrigated): 3e
Hydrologic Soil Group: D
Hydric soil rating: No

Minor Components

Altamont
Percent of map unit: 10 percent
Hydric soil rating: No

Linne
Percent of map unit: 3 percent
Hydric soil rating: No

Olivenhain
Percent of map unit: 2 percent
Hydric soil rating: No

Data Source Information

Soil Survey Area: San Diego County Area, California
Survey Area Data: Version 15, May 27, 2020

APPENDIX C

HYDROLOGY MANUAL EXCERPTS

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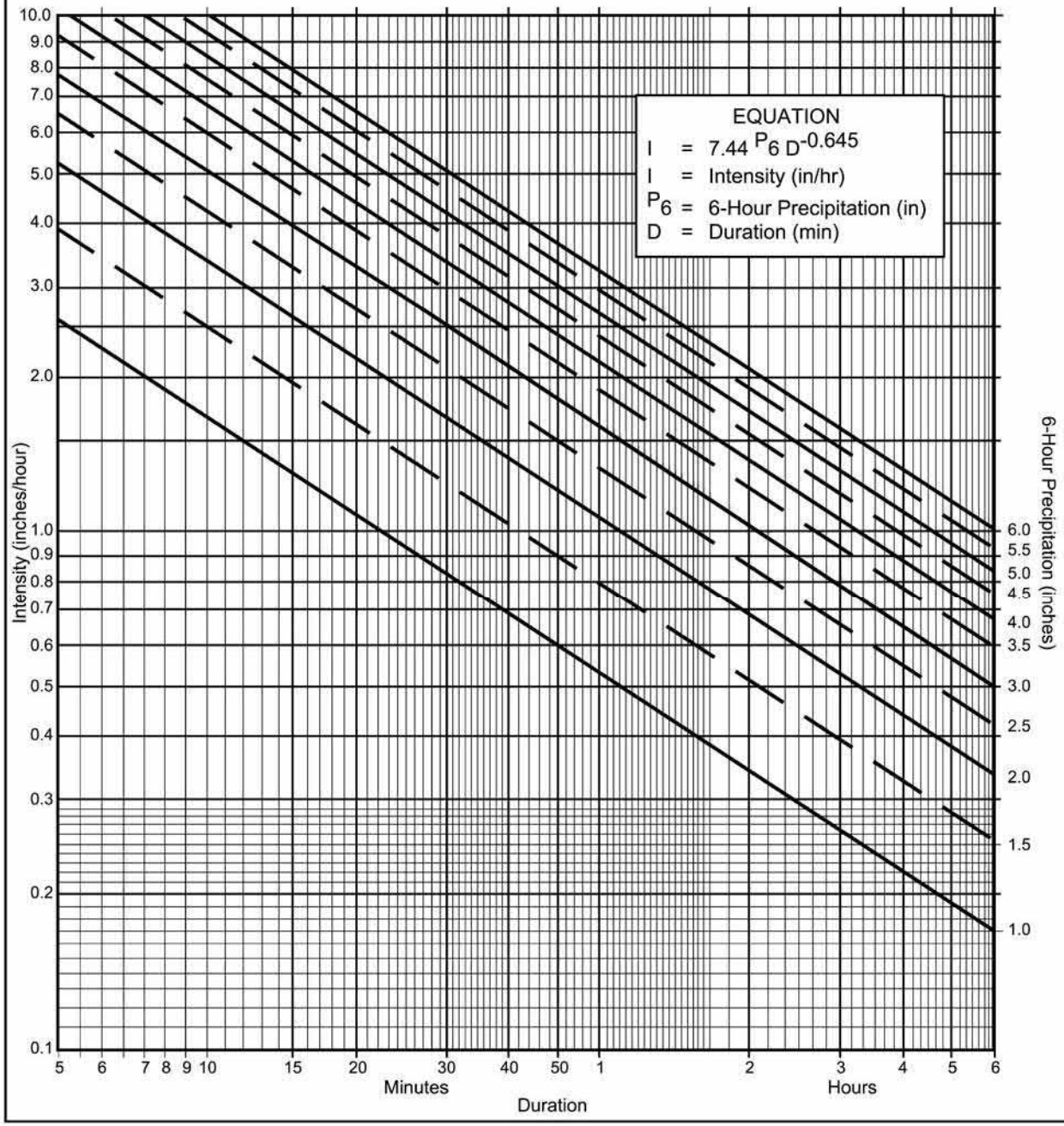

Directions for Application:

(1) From precipitation maps determine 6 hr and 24 hr amounts for the selected frequency. These maps are included in the County Hydrology Manual (10, 50, and 100 yr maps included in the Design and Procedure Manual).

(2) Adjust 6 hr precipitation (if necessary) so that it is within the range of 45% to 65% of the 24 hr precipitation (not applicaple to Desert).

(3) Plot 6 hr precipitation on the right side of the chart.

(4) Draw a line through the point parallel to the plotted lines.

(5) This line is the intensity-duration curve for the location being analyzed.

Application Form:

(a) Selected frequency 50 year

(b) P_6 = 2.7 in., P_{24} = 4.9, $\frac{P_6}{P_{24}}$ = 55 %(2)

(c) Adjusted P_6(2) = 2.7 in.

(d) t_x = _____ min.

(e) I = _____ in./hr.

Note: This chart replaces the Intensity-Duration-Frequency curves used since 1965.

P6	1	1.5	2	2.5	3	3.5	4	4.5	5	5.5	6
Duration	I	I	I	I	I	I	I	I	I	I	I
5	2.63	3.95	5.27	6.59	7.90	9.22	10.54	11.86	13.17	14.49	15.81
7	2.12	3.18	4.24	5.30	6.36	7.42	8.48	9.54	10.60	11.66	12.72
10	1.68	2.53	3.37	4.21	5.05	5.90	6.74	7.58	8.42	9.27	10.11
15	1.30	1.95	2.59	3.24	3.89	4.54	5.19	5.84	6.49	7.13	7.78
20	1.08	1.62	2.15	2.69	3.23	3.77	4.31	4.85	5.39	5.93	6.46
25	0.93	1.40	1.87	2.33	2.80	3.27	3.73	4.20	4.67	5.13	5.60
30	0.83	1.24	1.66	2.07	2.49	2.90	3.32	3.73	4.15	4.56	4.98
40	0.69	1.03	1.38	1.72	2.07	2.41	2.76	3.10	3.45	3.79	4.13
50	0.60	0.90	1.19	1.49	1.79	2.09	2.39	2.69	2.98	3.28	3.58
60	0.53	0.80	1.06	1.33	1.59	1.86	2.12	2.39	2.65	2.92	3.18
90	0.41	0.61	0.82	1.02	1.23	1.43	1.63	1.84	2.04	2.25	2.45
120	0.34	0.51	0.68	0.85	1.02	1.19	1.36	1.53	1.70	1.87	2.04
150	0.29	0.44	0.59	0.73	0.88	1.03	1.18	1.32	1.47	1.62	1.76
180	0.26	0.39	0.52	0.65	0.78	0.91	1.04	1.18	1.31	1.44	1.57
240	0.22	0.33	0.43	0.54	0.65	0.76	0.87	0.98	1.08	1.19	1.30
300	0.19	0.28	0.38	0.47	0.56	0.66	0.75	0.85	0.94	1.03	1.13
360	0.17	0.25	0.33	0.42	0.50	0.58	0.67	0.75	0.84	0.92	1.00

Intensity-Duration Design Chart - Template

FIGURE 3-1

County of San Diego Hydrology Manual

Rainfall Isopluvials

50 Year Rainfall Event - 6 Hours

Isopluvial (inches)

Orange County

Riverside County

Project Site 2.7

Pacific Ocean

Imperial County

Mexico

OCEANSIDE
VISTA
CARLSBAD
ESCONDIDO
ENCINITAS
SOLANA BEACH
DEL MAR
POWAY
S.D. COUNTY
SANTEE
SAN DIEGO
EL CAJON
LA MESA
LEMON GROVE
CORONADO
SD
CHULA VISTA
IMPERIAL BEACH

117°30' 117°15' 117°00' 116°45' 116°30' 116°15'
33°30' 33°15' 33°00' 32°45' 32°30'

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County of San Diego Hydrology Manual

Rainfall Isopluvials

50 Year Rainfall Event - 24 Hours

Isopluvial (inches)

Orange County

Riverside County

Imperial County

Pacific Ocean

Mexico

Project Site 4.9

OCEANSIDE
VISTA
CARLSBAD
ESCONDIDO
ENCINITAS
SOLANA BEACH
DEL MAR
POWAY
S.D. COUNTY
SANTEE
SAN DIEGO
EL CAJON
LA MESA
LEMON GROVE
CORONADO
SD
CHULA VISTA
IMPERIAL BEACH

117°30' 117°15' 117°00' 116°45' 116°30' 116°15'

33°30' 33°15' 33°00' 32°45' 32°30'

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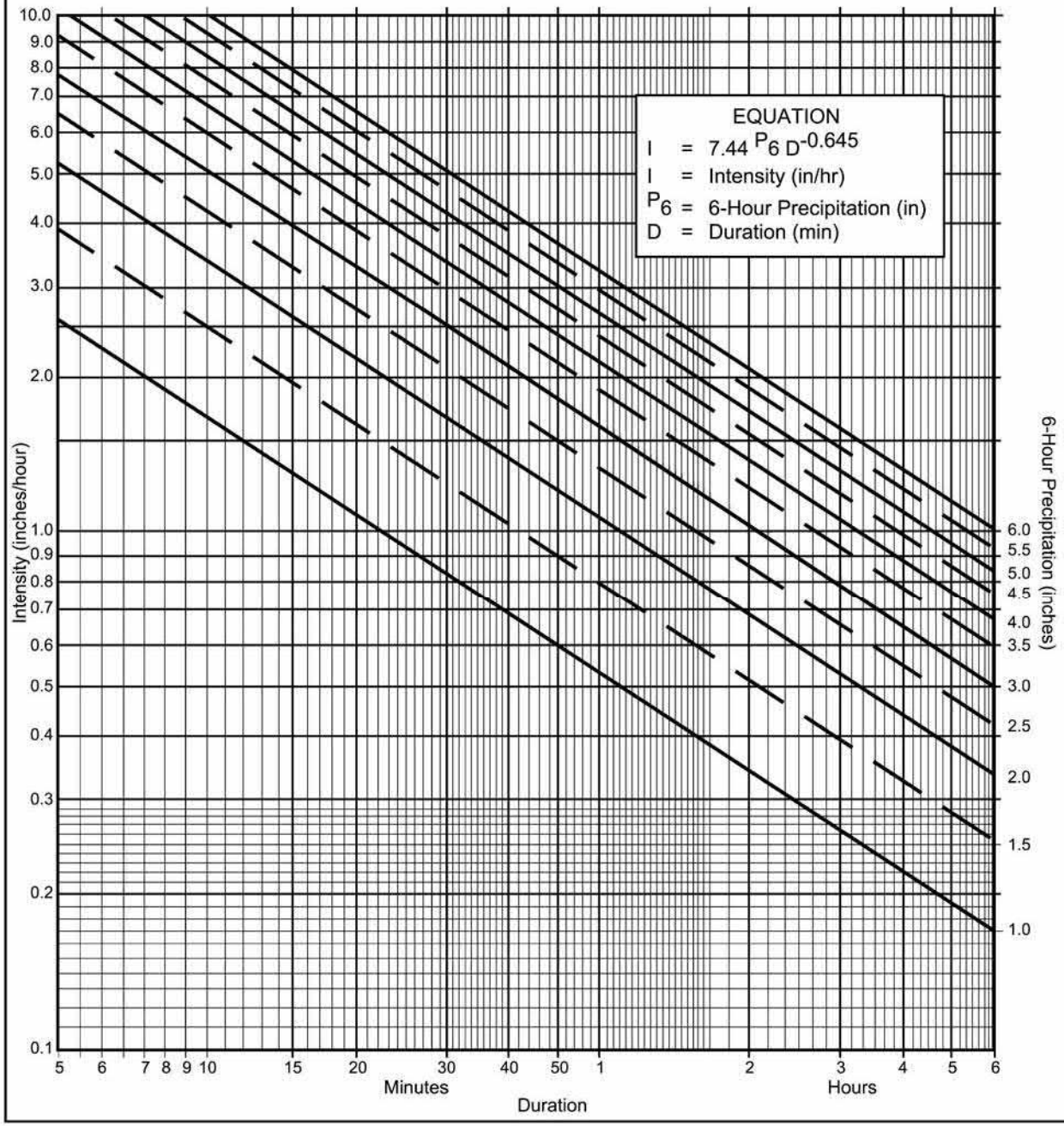
3 0 3 Miles



Directions for Application:

(1) From precipitation maps determine 6 hr and 24 hr amounts for the selected frequency. These maps are included in the County Hydrology Manual (10, 50, and 100 yr maps included in the Design and Procedure Manual).

(2) Adjust 6 hr precipitation (if necessary) so that it is within the range of 45% to 65% of the 24 hr precipitation (not applicaple to Desert).

(3) Plot 6 hr precipitation on the right side of the chart.

(4) Draw a line through the point parallel to the plotted lines.

(5) This line is the intensity-duration curve for the location being analyzed.

Application Form:

(a) Selected frequency 100 year

(b) P_6 = 3.1 in., P_{24} = 5.4, $\frac{P_6}{P_{24}}$ = 57 %(2)

(c) Adjusted P_6(2) = 3.1 in.

(d) t_x = _____ min.

(e) I = _____ in./hr.

Note: This chart replaces the Intensity-Duration-Frequency curves used since 1965.

P6	1	1.5	2	2.5	3	3.5	4	4.5	5	5.5	6
Duration	I	I	I	I	I	I	I	I	I	I	I
5	2.63	3.95	5.27	6.59	7.90	9.22	10.54	11.86	13.17	14.49	15.81
7	2.12	3.18	4.24	5.30	6.36	7.42	8.48	9.54	10.60	11.66	12.72
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20	1.08	1.62	2.15	2.69	3.23	3.77	4.31	4.85	5.39	5.93	6.46
25	0.93	1.40	1.87	2.33	2.80	3.27	3.73	4.20	4.67	5.13	5.60
30	0.83	1.24	1.66	2.07	2.49	2.90	3.32	3.73	4.15	4.56	4.98
40	0.69	1.03	1.38	1.72	2.07	2.41	2.76	3.10	3.45	3.79	4.13
50	0.60	0.90	1.19	1.49	1.79	2.09	2.39	2.69	2.98	3.28	3.58
60	0.53	0.80	1.06	1.33	1.59	1.86	2.12	2.39	2.65	2.92	3.18
90	0.41	0.61	0.82	1.02	1.23	1.43	1.63	1.84	2.04	2.25	2.45
120	0.34	0.51	0.68	0.85	1.02	1.19	1.36	1.53	1.70	1.87	2.04
150	0.29	0.44	0.59	0.73	0.88	1.03	1.18	1.32	1.47	1.62	1.76
180	0.26	0.39	0.52	0.65	0.78	0.91	1.04	1.18	1.31	1.44	1.57
240	0.22	0.33	0.43	0.54	0.65	0.76	0.87	0.98	1.08	1.19	1.30
300	0.19	0.28	0.38	0.47	0.56	0.66	0.75	0.85	0.94	1.03	1.13
360	0.17	0.25	0.33	0.42	0.50	0.58	0.67	0.75	0.84	0.92	1.00

Intensity-Duration Design Chart - Template

FIGURE 3-1

County of San Diego Hydrology Manual

Rainfall Isopluvials

100 Year Rainfall Event - 6 Hours

Isopluvial (inches)

Orange County

Riverside County

Imperial County

Pacific Ocean

Mexico

Project Site 3.1

OCEANSIDE
VISTA
CARLSBAD
ESCONDIDO
ENCINITAS
SOLANA BEACH
DEL MAR
POWAY
S.D. COUNTY
SANTEE
SAN DIEGO
EL CAJON
LA MESA
LEMON GROVE
CORONADO
SD
CHULA VISTA
IMPERIAL BEACH

117°30' 117°15' 117°00' 116°45' 116°30' 116°15'
33°30' 33°15' 33°00' 32°45' 32°30'

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County of San Diego Hydrology Manual

Rainfall Isopluvials

100 Year Rainfall Event - 24 Hours

Isopluvial (inches)

Orange County

Riverside County

Imperial County

Pacific Ocean

Mexico

Project Site 5.4

OCEANSIDE
VISTA
CARLSBAD
ESCONDIDO
ENCINITAS
SOLANA BEACH
POWAY
S.D. COUNTY
DEL MAR
SANTEE
SAN DIEGO
EL CAJON
LA MESA
LEMON GROVE
CORONADO
SD
CHULA VISTA
IMPERIAL BEACH

117°30' 117°15' 117°00' 116°45' 116°30' 116°15'
33°30' 33°15' 33°00' 32°45' 32°30'

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N W E S

3 0 3 Miles

APPENDIX D

EXISTING CONDITION HYDROLOGY CALCULATIONS

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            RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM PACKAGE
            Reference: SAN DIEGO COUNTY FLOOD CONTROL DISTRICT
                         2003,1985,1981 HYDROLOGY MANUAL
          (c) Copyright 1982-2011 Advanced Engineering Software (aes)
              Ver. 18.0 Release Date: 07/01/2011  License ID 1499

                           Analysis prepared by:

                       Kimley-Horn and Associates, Inc.
                              765 The City Drive
                                  Suite 200
                               Orange, CA 92868

 ************************** DESCRIPTION OF STUDY **************************
* MODERA MELROSE                                                         *
* EXISTING 100 YR RATIONAL METHOD                                        *
* OCTOBER 2021 ELL                                                       *
 ************************************************************************

  FILE NAME: MOD100EX.DAT
  TIME/DATE OF STUDY: 12:57 10/05/2021
------------------------------------------------------------------------
  USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
------------------------------------------------------------------------
  2003 SAN DIEGO MANUAL CRITERIA

  USER SPECIFIED STORM EVENT(YEAR) = 100.00
  6-HOUR DURATION PRECIPITATION (INCHES) =   3.100
  SPECIFIED MINIMUM PIPE SIZE(INCH) =  12.00
  SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.95
  SAN DIEGO HYDROLOGY MANUAL "C"-VALUES USED FOR RATIONAL METHOD
  NOTE: USE MODIFIED RATIONAL METHOD PROCEDURES FOR CONFLUENCE ANALYSIS
  *USER-DEFINED STREET-SECTIONS FOR COUPLED PIPEFLOW AND STREETFLOW MODEL*
     HALF-  CROWN TO   STREET-CROSSFALL:   CURB  GUTTER-GEOMETRIES:  MANNING
     WIDTH  CROSSFALL  IN-  / OUT-/PARK-  HEIGHT  WIDTH  LIP   HIKE  FACTOR
NO.   (FT)     (FT)    SIDE / SIDE/ WAY    (FT)    (FT)  (FT)  (FT)    (n)
===  =====  =========  =================  ======  ===== ====== ===== =======
  1   30.0     20.0    0.018/0.018/0.020   0.50    1.50 0.0313 0.125 0.0150

  GLOBAL STREET FLOW-DEPTH CONSTRAINTS:
    1. Relative Flow-Depth =  0.50 FEET
       as (Maximum Allowable Street Flow Depth) - (Top-of-Curb)
    2. (Depth)*(Velocity) Constraint = 10.0 (FT*FT/S)
  *SIZE PIPE WITH A FLOW CAPACITY GREATER THAN
   OR EQUAL TO THE UPSTREAM TRIBUTARY PIPE.*

************************************************************************
  FLOW PROCESS FROM NODE    100.00 TO NODE    101.00 IS CODE =  21
------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
========================================================================
  USER-SPECIFIED RUNOFF COEFFICIENT = .3500
  S.C.S. CURVE NUMBER (AMC II) =  88
  INITIAL SUBAREA FLOW-LENGTH(FEET) =    55.00
  UPSTREAM ELEVATION(FEET) =    467.00
  DOWNSTREAM ELEVATION(FEET) =    462.87
  ELEVATION DIFFERENCE(FEET) =      4.13
  SUBAREA OVERLAND TIME OF FLOW(MIN.) =    5.113
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  8.051
  SUBAREA RUNOFF(CFS) =      0.28
  TOTAL AREA(ACRES) =      0.10   TOTAL RUNOFF(CFS) =      0.28

************************************************************************
  FLOW PROCESS FROM NODE    101.00 TO NODE    102.00 IS CODE =  51
------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
========================================================================
```

```
  ELEVATION DATA: UPSTREAM(FEET) =    462.87  DOWNSTREAM(FEET) =    416.00
  CHANNEL LENGTH THRU SUBAREA(FEET) =   908.00   CHANNEL SLOPE =  0.0516
  CHANNEL BASE(FEET) =    0.00   "Z" FACTOR =  99.000
  MANNING'S FACTOR = 0.030   MAXIMUM DEPTH(FEET) =   0.50
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  4.644
  USER-SPECIFIED RUNOFF COEFFICIENT = .3500
  S.C.S. CURVE NUMBER (AMC II) =  88
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       6.34
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   2.20
  AVERAGE FLOW DEPTH(FEET) =   0.17   TRAVEL TIME(MIN.) =   6.89
  Tc(MIN.) =   12.00
  SUBAREA AREA(ACRES) =     7.10       SUBAREA RUNOFF(CFS) =   11.54
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.350
  TOTAL AREA(ACRES) =        7.2         PEAK FLOW RATE(CFS) =      11.70

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.22   FLOW VELOCITY(FEET/SEC.) =   2.52
  LONGEST FLOWPATH FROM NODE    100.00 TO NODE    102.00 =     963.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    102.00 TO NODE    102.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  4.644
  USER-SPECIFIED RUNOFF COEFFICIENT = .3500
  S.C.S. CURVE NUMBER (AMC II) =  88
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.3500
  SUBAREA AREA(ACRES) =    0.64   SUBAREA RUNOFF(CFS) =    1.04
  TOTAL AREA(ACRES) =        7.8   TOTAL RUNOFF(CFS) =      12.74
  TC(MIN.) =   12.00

****************************************************************************
  FLOW PROCESS FROM NODE    102.00 TO NODE    102.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  4.644
  USER-SPECIFIED RUNOFF COEFFICIENT = .8700
  S.C.S. CURVE NUMBER (AMC II) =  98
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.3909
  SUBAREA AREA(ACRES) =    0.67   SUBAREA RUNOFF(CFS) =    2.71
  TOTAL AREA(ACRES) =        8.5   TOTAL RUNOFF(CFS) =      15.45
  TC(MIN.) =   12.00

****************************************************************************
  FLOW PROCESS FROM NODE    200.00 TO NODE    201.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  USER-SPECIFIED RUNOFF COEFFICIENT = .3500
  S.C.S. CURVE NUMBER (AMC II) =  88
  INITIAL SUBAREA FLOW-LENGTH(FEET) =    55.00
  UPSTREAM ELEVATION(FEET) =    466.09
  DOWNSTREAM ELEVATION(FEET) =    464.87
  ELEVATION DIFFERENCE(FEET) =      1.22
  SUBAREA OVERLAND TIME OF FLOW(MIN.) =    7.677
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  6.194
  SUBAREA RUNOFF(CFS) =      0.22
  TOTAL AREA(ACRES) =      0.10   TOTAL RUNOFF(CFS) =      0.22

****************************************************************************
  FLOW PROCESS FROM NODE    201.00 TO NODE    202.00 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    464.87  DOWNSTREAM(FEET) =    458.10
  CHANNEL LENGTH THRU SUBAREA(FEET) =    93.00   CHANNEL SLOPE =  0.0728
  CHANNEL BASE(FEET) =    0.00   "Z" FACTOR =  99.000
  MANNING'S FACTOR = 0.030   MAXIMUM DEPTH(FEET) =   0.50
```

```
 100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  5.614
 USER-SPECIFIED RUNOFF COEFFICIENT = .3500
 S.C.S. CURVE NUMBER (AMC II) =  88
 TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       0.38
 TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   1.23
 AVERAGE FLOW DEPTH(FEET) =   0.06   TRAVEL TIME(MIN.) =   1.26
 Tc(MIN.) =    8.94
 SUBAREA AREA(ACRES) =     0.17       SUBAREA RUNOFF(CFS) =    0.33
 AREA-AVERAGE RUNOFF COEFFICIENT =  0.350
 TOTAL AREA(ACRES) =        0.3         PEAK FLOW RATE(CFS) =       0.53

 END OF SUBAREA CHANNEL FLOW HYDRAULICS:
 DEPTH(FEET) =  0.06   FLOW VELOCITY(FEET/SEC.) =   1.31
 LONGEST FLOWPATH FROM NODE    200.00 TO NODE    202.00 =     148.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE    202.00 TO NODE    203.00 IS CODE =  62
----------------------------------------------------------------------------
 >>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>>(STREET TABLE SECTION #  1 USED)<<<<<
============================================================================
 UPSTREAM ELEVATION(FEET) =  458.10  DOWNSTREAM ELEVATION(FEET) =  422.00
 STREET LENGTH(FEET) =   923.00   CURB HEIGHT(INCHES) =  6.0
 STREET HALFWIDTH(FEET) = 30.00

 DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) =  20.00
 INSIDE STREET CROSSFALL(DECIMAL) =  0.018
 OUTSIDE STREET CROSSFALL(DECIMAL)  =  0.018

 SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF =  2
 STREET PARKWAY CROSSFALL(DECIMAL)  =  0.020
 Manning's FRICTION FACTOR for Streetflow Section(curb-to-curb) =   0.0150
 Manning's FRICTION FACTOR for Back-of-Walk Flow Section =   0.0200

   **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       4.82
   STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
   STREET FLOW DEPTH(FEET) =  0.27
   HALFSTREET FLOOD WIDTH(FEET) =    7.71
   AVERAGE FLOW VELOCITY(FEET/SEC.) =    3.70
   PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =    0.99
 STREET FLOW TRAVEL TIME(MIN.) =   4.15   Tc(MIN.) =   13.09
  100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  4.390
 USER-SPECIFIED RUNOFF COEFFICIENT = .8700
 S.C.S. CURVE NUMBER (AMC II) =  98
 AREA-AVERAGE RUNOFF COEFFICIENT =  0.815
 SUBAREA AREA(ACRES) =    2.30      SUBAREA RUNOFF(CFS) =    8.78
 TOTAL AREA(ACRES) =        2.6        PEAK FLOW RATE(CFS) =       9.20

 END OF SUBAREA STREET FLOW HYDRAULICS:
 DEPTH(FEET) = 0.31   HALFSTREET FLOOD WIDTH(FEET) =  10.35
 FLOW VELOCITY(FEET/SEC.) =  4.27   DEPTH*VELOCITY(FT*FT/SEC.) =   1.34
 LONGEST FLOWPATH FROM NODE    200.00 TO NODE    203.00 =    1071.00 FEET.
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 END OF STUDY SUMMARY:
 TOTAL AREA(ACRES)     =        2.6  TC(MIN.) =     13.09
 PEAK FLOW RATE(CFS)   =       9.20
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 END OF RATIONAL METHOD ANALYSIS
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