

## **Preliminary Low Impact Development Plan**

**Prepared for:  
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8951 Research Drive  
Irvine, CA 92618  
Contact: Chris Borland  
(949) 698-8442**

**Property:  
APN 8165-008-014  
11733 Florence Ave  
Santa Fe Springs, California  
TTM 83383**

**Prepared by:  
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**Prepared: February 2021**

## **Receipt of WDID**

REPLACE THIS SHEET

*To be provided prior to final approval*

## **Notice of Intent**

REPLACE THIS SHEET

*To be provided prior to final approval*

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**Owner/Developer  
Approval and Certification  
of the  
Preliminary Low Impact Development Plan**

Project Name: **11733 Florence Avenue**  
Project Number: **Tentative Tract Map 83383**  
Project Address: **APN 8008-017-014**  
**11733 Florence Avenue**  
**Santa Fe Springs, California**

This Low Impact Development Plan (LID) for 11733 Florence Avenue development has been prepared for Melia Homes by KES Technologies. It is intended to comply with the requirements of the County of Los Angeles' requirements.

The undersigned is authorized to approve implementation of provisions of this plan as appropriate, and will strive to have the plan carried out by successors consistent with the County of Los Angeles per the County of Los Angeles Low Impact Development Plan and the intent of the NPDES storm water requirements.

"I certify under penalty of law that this document and all attachments were prepared under my jurisdiction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system or those persons directly responsible for gathered the information, to the best of my knowledge and belief, the information submitted is true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations."

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**PRELIMINARY - NOT FOR APPROVAL**

Owner/Developer Signature

Date

Owner/Developer's Name and Title

Telephone Number

## **Section 200**

### **A. Contact Information/List of Responsible Parties**

The property contact information is:

**Chris Borland  
(949) 698-8442  
Melia Homes  
8951 Research Drive  
Irvine, CA 92618**

The property owner shall have primary responsibility and significant authority for the implementation, maintenance, and inspection of the property BMPs. Duties of the Owner include but are not limited to:

- Implementing all elements of the LID, including but not limited to:
  - o Implementation of prompt and effective erosion and sediment control measures
  - o Implementing all non-storm water management, and materials and waste management activities, such as: monitoring, discharges, general site clean-up; vehicle and equipment cleaning, spill control; ensuring that no materials other than storm water are discharged in quantities which will have an adverse effect on receiving waters or storm drain systems, etc.
- Pre-storm inspections
- Storm event inspections
- Post-storm inspections
- Routine inspections as described in the LID
- Ensuring elimination of all unauthorized discharges
- The Owner shall be assigned authority to mobilize crews in order to make immediate repairs to the control measures.
- Coordinate all of the necessary corrections/repairs are made immediately, and that the project complies with the LID at all times.
- Managing and report any Illicit Connections or Illegal Discharges.

## **Section 300**

### **A. References**

The following documents are made a part of this LID Plan by reference:

- Project plans and specifications for County of Los Angeles, City of Santa Fe Springs, prepared by KES Technologies as named in this report.
- State Water Resources Control Board (SWRCB) Order No. 2013-0001-DWQ, February 5, 2013.
- National Pollutant Discharge Elimination System (NPDES) Municipal Separate Storm Sewer System (MS4) (General Permit No. CAS004001, Order No. R4-2012-0175).
- California Stormwater BMP Handbook – Construction, November 2009.
- California Stormwater BMP Handbook – New Development and Redevelopment, January 2003.
- County of Los Angeles Department of Public Works LID Standards Manual, February 2014

## **Section 400 – Body of Preliminary LID Plan**

### **A. Objectives**

This Preliminary Low Impact Development (LID) Plan has eight main objectives:

- 1) Identify all pollutant sources, including sources of sediment that may affect the quality of storm water discharges associated with daily use / activity (storm water discharges) from the property site.
- 2) Identify non-storm water discharges.
- 3) Identify, construct, implement and maintain Best Management Practices (BMPs) to reduce or eliminate pollutants in storm water discharges and authorized non-storm water discharges from the property site.
- 4) Develop a maintenance schedule for BMPs designed to reduce or eliminate pollutants.
- 5) Determination of the peak storm water runoff discharge rate.
- 6) Conserve natural and landscaped areas.
- 7) Provide storm drain system stenciling and signage.
- 8) Design standards for structural or treatment control BMPs.

### **B. Project Background and Description**

The proposed site is located at 11733 Florence Ave, in the City of Santa Fe Springs, County of Los Angeles. The site is bordered by Florence Ave to the south, single family homes to the west, an elementary school track and field to the north, and a church to the east as well as some townhouses. Existing site condition consists of a 3.02 net acre parcel used for a church and parking lot.

The project proposes to create a residential row townhome community from an existing church and parking lot. This project proposes approximately 63 residential dwelling units (a density of 21 du/acre) within (11) 3-story buildings. No community Amenities/facilities are proposed.

### **C. Project Vicinity**

The subject project is located at 11733 Florence Avenue, in the City of Santa Fe Springs, Los Angeles County, California. The site is bordered by Florence Ave to the south, single family homes to the west, an elementary school track and field to the north, and a church to the east as well as some townhouses.

Please refer to Figures 1 & 2 for Vicinity and Location maps.

### **D. Site Drainage Condition**

Approximately 16% of the site generally flows over land towards Florence Ave (Subarea X1). The remaining 84% (Subarea X2) flows towards the site's northeast corner, onto the adjacent property. Offsite, this flow is contained within a 62' long 3' wide concrete gutter which directs the flows to a School District maintenance lot within curb and gutter, and ultimately to a 14' Los Angeles County Flood Control District (LACFCD) catch basin located at the intersection of a frontage road and Pioneer Blvd. The runoff then

continues in an 18" Reinforced Concrete Pipe (RCP) before connecting to a 51" RCP "BI 7302 - Line B" and continues south. At the intersection of Pioneer Blvd and Florence, the flow joins LACFCD 10'x10" Reinforced Concrete Box (RCB) "BI 5905 – Norwalk". Stormwater runoff tributary to Florence Ave is conveyed as street flow within the existing curb/gutter in the westerly direction and enters an existing 14' LACFCD catch basin located approximately 80 feet west of the site. Stormwater runoff enters this existing catch basin, continues within an existing LACFCD 21" RCP, connecting into the existing LACFCD RCB "BI 5905 – Norwalk", then to LACFCD RCB "BI 1110 - Hud 2 - Line A", on to the San Gabriel River Reach 1, proceeding through the San Gabriel River Estuary, then to the San Pedro Bay before eventually discharge into the Pacific Ocean.

San Gabriel River (Reach 1), San Gabriel River Estuary, and the San Pedro Bay are listed in the most recent 303(d) list of impaired water bodies.

- San Gabriel River Reach 1 is listed for:
  - Coliform Bacteria (TMDL required)
  - pH (TMDL required)
  - Water Temperature
- San Gabriel River Estuary is listed for:
  - Copper (USEPA TMDL approved)
  - Dioxin (TMDL required)
  - Nickel (TMDL required)
  - Dissolved Oxygen (TMDL required)
- The San Pedro Bay is listed for:
  - Chlordane (TMDL required)
  - DDT[tissue and sediment] (TMDL required)
  - PCBs (TMDL required)
  - Sediment Toxicity (TMDL required)

The project site is not located in or directly adjacent to, nor discharging directly to any Significant Ecological Areas (SEA).

Currently, the pre-developed condition has 19% (0.42 acres) pervious area and 81% (2.60 acres) impervious area and is occupied by a church, and open space landscape and asphalt parking areas. All 3.02 acres within the project site will be developed. The proposed developed condition has 25% (0.75 acres) pervious area and 75% (2.27 acres) impervious area. Impervious coverage includes roof tops, drive aisles, and sidewalk/ hardscape areas. The proposed project will reduce the overall impervious footprint by 11% (0.33 acres).

Area square footage breakdown of the proposed developed condition is as follows:

OVERALL (ONSITE ONLY)

Pervious Landscape Area = 32,484 sf

Impervious Building Area = 46,488 sf

Impervious Asphalt Street = 39,608 sf

Walkways and Miscellaneous Concrete/Hardscape = 12,981 sf

Per review of Hydromodification Analysis, the proposed project is exempt for hydromodification implementation as the proposed site decreases impervious area in comparison to pre-project conditions. Furthermore, the project is designed to retain on-site through infiltration of the SWQDv.

Project proposes one MaxWell Plus dual-drywell system with the addition of 460 feet of solid wall storage pipe. While landscape and roof top drainage is collected and conveyed to onsite catch basins or detention piping, drive aisle flows are also collected within the same catch basins. From the catch basins, drainage is sent to storage piping and then on to the MaxWell Plus system, entering a settling chamber which is equipped with a screen and shield which contains hydrocarbons in an absorbent hydrocarbon capture pillow and other floating constituents while also settling silt, sediment, and debris. The flows then continue on to the infiltration process.

In the case that overflow occurs, the northern portion of the site will proceed to spill out and sheet flow offsite on to Lake Center Athletic Park via parkway drain located near the northeasterly corner of the project site. In the case that overflow occurs for the southern portion of the site, the catch basins will fill up and proceed to spill out to Florence Ave via parkway drains.

An area of approximately 275 sf located at the drive aisle entrance cannot be treated by LID BMPs due to the grading constraints imposed by the connection to the existing Florence Ave. Heightening grade to achieve flow towards the project site would create a steep slope condition to the driveway grade along Florence Ave. An inlet to pick up the flows in this area would not yield enough pipe cover at further lengths of a pipe to reach the proposed drywell systems. This untreated area makes up only 0.2% of the project site.

Melia Homes will be developing the site as units for sale. A Homeowners Association (HOA) will be responsible for the maintenance of the project upon completion of construction.

#### **E. LID Project Types, Characteristics, & Activities**

This proposed development of approximately 63 residential townhomes is subject to the Los Angeles County Department of Public Works' (LACDPW) requirement for the LID Plan under the "Redevelopment" category. According to the LACDPW Low Impact Development Standards Manual, "Redevelopment" as it applies to the project site means projects replacing 5,000 square feet or more of impervious surface on a previously developed site (church with 10,000 square feet or more of surface area).

#### **F. Pollutant Source Identification and BMP Selection**

The following is a list of materials or practices that may potentially contribute to pollutants, other than sediment, to storm water runoff from the project site.

- Vehicle fluids, including oil, grease, petroleum, and coolants from personal vehicles

- Landscaping materials and wastes (topsoil, plant materials, herbicides, fertilizers, mulch, pesticides)
- General trash debris and litter
- Pet waste (bacteria/ fecal coliforms)

Typical pollutants of concern for Multi-Family Residential include Suspended Solids, Cadmium, Chromium, Copper, and Zinc.

#### **G. Source Control BMPs-Structural**

The County of Los Angeles Low Impact Development Standards Manual lists preference for selection of BMPs which includes retention-based stormwater quality control measures, bio-filtration, vegetation-based storm quality control measures, and/or treatment-based stormwater quality control measures. This project employs the use of two types of stormwater quality control measures. Specifically, the project has selected: “retention-based storm water quality control measures” through the use of dry well systems at two locations and detention storm drain pipe as the primary BMPs.

The onsite runoff for the majority of the site will flow towards the curb and gutter located in the drive aisles throughout the site and be conveyed into catch basins and drop inlets (3 total). The runoff in these catch basins which will connect to one (1) MaxWell Plus dual-drywell system via proposed storm drain piping. This drywell system is located within the drive aisle and parking areas. The proposed project storm drain system will not be connecting to any existing storm drain systems but rather to only the onsite systems. Runoff will flow towards detention storm drain pipe for infiltration by the Drywell.

As infiltration is the primary mechanism for reducing stormwater runoff for all retention based stormwater quality control measures (with the exception of harvest and reuse control measures), this control measures was utilized in those areas where site soils are conducive to this type of BMP according to the soils engineer. Refer to the Preliminary Geotechnical Report located in the Appendix.

Harvest and reuse measures are considered as infeasible for this type of development due to the cost of providing cisterns and pumps throughout the site as being cost prohibitive and is only effective during the rainy season. Additionally, with site landscaping at approximately only 25% of the project site, the demand for grey water from harvest and reuse measures is relatively low making this type of control measure ineffective. The infiltration measures proposed are preferential to harvest and reuse.

The implementation of a vegetation-based storm quality measures were not considered as retention based stormwater quality control measures (infiltration) is deemed as the primary mechanism per the LA County LID Manual. Additionally, the high density of the project and its discontinuous nature of open space areas blocked by patio fencing, walkways, and building area make it very difficult to implement this type of BMP. The large imperviousness of the project would yield larger biofiltration and vegetation based BMPs unfit for this project site. However, where feasible, roof gutters will discharge to

landscape areas using splash blocks which would in turn create a passive bio treatment in the smaller planter/landscape areas surrounding the building. The majority of runoff is expected to be tributary to the proposed onsite drywell system with the remaining runoff tributary to perforated storm drain pipe.

Structural BMPs shall be installed by Melia Homes, the owner, through the construction and development of the project; planting and irrigation systems shall be designed by licensed landscape architects and installed by qualified contractors to specifications and standards of the County of Los Angeles and City of Santa Fe Springs. Structural BMPs must be accessible for inspection by County of Los Angeles personnel during regular business hours. The structural BMPs used for this project are summarized below.

Project proponents shall implement Site Design concepts that achieve each of the following:

- Minimize Urban Runoff
- Minimize Impervious Footprint
- Conserve Natural Areas
- Minimize Directly Connected Impervious Areas (DCIAs)

The following tables identify the site design and source control BMPs and how each are implemented to achieve each Site Design concept.

**Table-1:** Site Design BMPs

| BMP   | TECHNIQUE                        | INCLUDED? |    | BRIEF DESCRIPTION OF METHOD                |
|-------|----------------------------------|-----------|----|--------------------------------------------|
|       |                                  | YES       | NO |                                            |
| SD-10 | Site Design & Landscape Planning | X         |    | Designed by a Licensed Landscape Architect |
| SD-11 | Roof Runoff Controls             | X         |    | Splash blocks to landscape areas           |
| SD-12 | Efficient Irrigation             | X         |    | Designed by a licensed contractor          |
| SD-13 | Storm Drain Signage              | X         |    | See Appendix B                             |
| SD-20 | Pervious Pavements               |           | X  | Other infiltration methods are used        |
| SD-21 | Alternative Building Materials   |           | X  | Not Applicable                             |
| SD-30 | Fueling Areas                    |           | X  | Not Applicable                             |
| SD-31 | Maintenance Bays & Docks         |           | X  | Not Applicable                             |
|       | Marinas, Boatyards and Ports     |           | X  | Not Applicable                             |
| SD-32 | Trash Storage Areas              |           | X  | Not Applicable                             |
| SD-33 | Vehicle Washing Areas            |           | X  | Not Applicable                             |

| BMP   | TECHNIQUE                      | INCLUDED? |    | BRIEF DESCRIPTION OF METHOD |
|-------|--------------------------------|-----------|----|-----------------------------|
|       |                                | YES       | NO |                             |
| SD-34 | Outdoor Material Storage Areas |           | X  | Not Applicable              |
| SD-35 | Outdoor Work Areas             |           | X  | Not Applicable              |
| SD-36 | Outdoor Processing Areas       |           | X  | Not Applicable              |

### Site Design & Landscape Planning

Landscape areas have been incorporated wherever possible within the project. All proposed landscaping shall be low water using planting and drought tolerant. Landscaping areas shall be depressed to retain all irrigation and storm water runoff percolation. Directly connected impervious areas have been minimized by limiting sidewalks and patios to the minimum necessary for proper use.

### Roof Runoff Controls

All roof runoff will be collected and directed to splash blocks then on to grass or landscaping before discharge to an area drain system. The area drain system will be directed to the treatment system on site.

### Efficient Irrigation

As part of the design of all common area landscape irrigation shall employ water conservation principals, including, but not limited to, such provisions as water sensors, programmable irrigation times (for short cycles), etc., will be used. Such common areas will be maintained by Melia Homes and/or the HOA.

### Storm Drain Signage

Storm Drain Signage will be provided on all proposed on-site catch basins to prevent residents from discarding pollutants to the storm drain system and potentially obstructing the proposed BMP treatment facility. The placard or stencil will indicate the ultimate destination of the runoff entering the device. This stencil shall be weatherproof and visible at all times. Melia Homes and/or the HOA will be responsible for maintaining the signage after the construction is completed. See Appendix B for an example.

**Table-2:** Source Control BMPs

| BMP   | TECHNIQUE                            | INCLUDED? |    | BRIEF DESCRIPTION OF METHOD |
|-------|--------------------------------------|-----------|----|-----------------------------|
|       |                                      | YES       | NO |                             |
| SC-10 | Non-Stormwater Discharges            | X         |    | Educational handouts        |
| SC-11 | Spill Prevention Control and Cleanup | X         |    | Educational handouts        |

| BMP   | TECHNIQUE                              | INCLUDED? |    | BRIEF DESCRIPTION OF METHOD |
|-------|----------------------------------------|-----------|----|-----------------------------|
|       |                                        | YES       | NO |                             |
| SC-20 | Vehicle and Equipment Fueling          |           | X  | Not Applicable              |
| SC-21 | Vehicle and Equipment Cleaning         |           | X  | Not Applicable              |
| SC-22 | Vehicle and Equipment Repair           |           | X  | Not Applicable              |
| SC-30 | Outdoor Loading / Unloading            |           | X  | Not Applicable              |
| SC-31 | Outdoor Container Storage              |           | X  | Not Applicable              |
| SC-32 | Outdoor Equipment Maintenance          |           | X  | Not Applicable              |
| SC-33 | Outdoor Storage of Raw Materials       |           | X  | Not Applicable              |
| SC-34 | Waste Handling and Disposal            |           | X  | Not Applicable              |
| SC-43 | Parking Areas/Storage Area Maintenance | X         |    | Regular sweeping            |
| SC-44 | Drainage System Maintenance            | X         |    | See Appendix C              |
| SC-60 | Housekeeping Practices                 | X         |    | Educational handouts        |

### **Non-Stormwater Discharges**

Melia Homes and/or the HOA shall provide environmental awareness educational materials to both owners and its employees/contractors which describe the types of non-stormwater discharges that may pose environmental concern such as paint, oil, fuel, chemicals, etc. These educational materials will describe things such as the chemicals limited to the property as well as the forbiddance of discharge of these wastes into drains, sinks, toilets, gutters, or catch basins. These materials will be given to new owners, new employees, and additionally as needed. Employees of Melia Homes and/or the HOA will undergo training upon initial hire. Employees shall also note any violations by homeowners, tenants, or occupants and report those violations to Melia Homes and/or the HOA for investigation.

### **Spill Prevention Control and Cleanup**

Melia Homes and/or the HOA shall provide environmental awareness educational materials to both owners and its employees/contractors which describe the prevention of and mitigation of spills to storm drain systems. These educational materials will describe things such procedures for containment, storage, and disposal activities. Additionally stenciling on storm drain catch basins (as described above in the Site Design BMP section) will serve as a reminder for no discharge of wastes into the storm

drain system. These materials will be given to new owners, new employees, and additionally as needed. Employees of Melia Homes and/or the HOA will undergo training upon initial hire. Employees shall also note any violations by homeowners, tenants, or occupants and report those violations to the HOA for investigation.

### **Parking Area Maintenance**

Melia Homes and/or the HOA shall have all parking areas and drive aisles within the project swept regularly through its landscaping or other maintenance contractor. Debris, sediment and trash picked up during sweeping operations will be deposited offsite. This procedure will be intensified to twice a week around October 1<sup>st</sup> of each year prior to the “first flush” storm.

### **Drainage System Maintenance**

Melia Homes and/or the HOA will maintain the drainage systems, which may include but may not be limited to catch basins and drywell systems. Melia Homes and/or the HOA is required to have catch basins inspected and, if necessary, cleaned prior to the storm season, no later than October 15th each year prior to the “first flush” storm. These duties may be contracted out to the landscaper and/or maintenance firm hired by Melia Homes and/or the HOA. Please see Section 400.J for maintenance program. Maintenance operations should be logged on forms in Appendix C.

### **Housekeeping Practices**

Melia Homes and/or the HOA shall provide environmental awareness educational materials to both owners and its employees/contractors which describe techniques which promote efficient and safe housekeeping practices such as storage, use, and cleanup when handling potentially harmful materials. These materials will be given to new owners, new employees, and additionally as needed. Employees of Melia Homes and/or the HOA will undergo training upon initial hire. Educational material and training should include pollution prevention techniques, how to handle potentially harmful materials, proper use of pesticides, and techniques in spill containment and cleanup.

**Table-3:** Treatment BMPs

| <b>BMP</b> | <b>NAME</b>                       | <b>INCLUDED?</b> |           | <b>IF NOT APPLICABLE, STATE BRIEF REASON</b> |
|------------|-----------------------------------|------------------|-----------|----------------------------------------------|
|            |                                   | <b>YES</b>       | <b>NO</b> |                                              |
| BIO-1      | Biofiltration                     |                  | X         | Used alternative method.                     |
| RET-1      | Bioretention                      |                  | X         | Used alternative method.                     |
| RET-2      | Infiltration Basin                |                  | X         | Used alternative method.                     |
| RET-3      | Infiltration Trench               |                  | X         | Used alternative method.                     |
| RET-4      | Dry Well                          | X                |           |                                              |
| RET-5      | Permeable Pavement w/o Underdrain |                  | X         | Used alternative method.                     |

| BMP   | NAME                                   | INCLUDED? |    | IF NOT APPLICABLE, STATE BRIEF REASON |
|-------|----------------------------------------|-----------|----|---------------------------------------|
|       |                                        | YES       | NO |                                       |
| RET-6 | Rain Barrel/ Cistern                   |           | X  | Used alternative method.              |
| VEG-1 | Green Roof                             |           | X  | Used alternative method.              |
| VEG-2 | Stormwater Planter                     |           | X  | Used alternative method.              |
| VEG-3 | Tree well Filter                       |           | X  | Used alternative method.              |
| VEG-4 | Vegetated Swales                       |           | X  | Used alternative method.              |
| VEG-5 | Vegetated Filter Strip                 |           | X  | Used alternative method.              |
| T-1   | Sand Filter                            |           | X  | Used alternative method.              |
| T-2   | Constructed Wetland                    |           | X  | Used alternative method.              |
| T-3   | Extended Detention Basin               |           | X  | Used alternative method.              |
| T-4   | Wet Pond                               |           | X  | Used alternative method.              |
| T-5   | Permeable Pavement w/o Underdrain      |           | X  | Used alternative method.              |
| T-6   | Proprietary Treatment Control Measures | X         |    | OldCastle FloGard Catch Basin Filters |

**Table-4: Infiltration Sizing Chart**

| No.           | Type    | Description                     | Size/Depth                                                   | 96-Hr Treatment Volume                                 | Treatment Volume Required |
|---------------|---------|---------------------------------|--------------------------------------------------------------|--------------------------------------------------------|---------------------------|
| DMA           | Chamber | (1) MaxWell Plus Drywell System | 35' deep, 4' dia. chamber with 500 feet of 54" storage pipe. | 7,970 CF (volume provided by Drywell and storage pipe) | 4,511 CF                  |
| <b>TOTAL=</b> |         |                                 |                                                              | 7,970 CF                                               | 7,840 CF                  |

***Dry Well (MaxWell Plus System)***

The project will implement the use of one Dual 35' deep MaxWell Plus drywell system. These treatment control BMPs are designed to handle lower-flow storm events or the first flush portion of larger storm events. This system will handle the SWQDv as shown in Table 4 with the addition of 500 feet of storage pipe (non-infiltrating) See Appendix A for drywell volume calculations and SWQDv calculations for the DMA.

The MaxWell Plus drywells will be installed within drive aisle areas well over 15' setback from any building foundations or property lines. Drainage from roof tops and landscape areas will be collected through area drains and piped to catch basin systems which will convey flows directly into detention piping prior to entering the MaxWell system. Drainage tributary to the drive aisles will also convey flows to the same catch basin systems which also connect to detention piping prior to entry to the MaxWell system. Within the MaxWell Plus system, nuisance water enter a settling chamber which contains a screen and shield which blocks the passage of hydrocarbons and other floating constituents, containing them in the settling chamber. Additionally, silt, sediment, and debris settle within the settling chamber. Also equipped in the settling chamber is an absorbent hydrocarbon capture pillow which will soak up oil and grease, additional hydrocarbons, and liquid organic compounds.

Because the MaxWell system infiltrates runoff, the Geotechnical Engineer must perform an in-situ infiltration test before installation of the product. The geotechnical investigation supports the use of drywells as an effective BMP that will provide water quality benefits and promote infiltration. A copy of the Geotechnical Report has been provided for reference in Appendix D. Additional information for the MaxWell Plus drywell system has been provided for reference in Appendix E. All infiltration tests for determining the infiltration feasibility must be performed per L.A. County GMED Policy GS 200.1. (See Section 4.1 of County of Los Angeles Department of Public Works Low Impact Development Standards Manual).

#### **H. Non-Structural BMPs**

Non-structural BMPs are generally managerial, educational, inspection and/ or maintenance oriented. These items consist of educating employees and occupants, developing and implementing Melia Homes and/or the HOA guidelines, implementing BMPs and enforcing Code requirements. Non-structural BMPs used for this project are summarized below:

##### ***Education for Employees and Occupants***

Practical informational materials will be provided to homeowners, Melia Homes and/or the HOA and employees/contractors on general good housekeeping practices that contribute to protection of storm water quality. Among other things, these materials will describe the use of chemicals (including household type) that should be limited to the property, with no discharge of specified wastes via hosing or other direct discharge to gutters, catch basins and storm drains.

Initially, Melia Homes will provide these materials. Thereafter, such materials will be available through the HOA education program. This program must be maintained, enforced, and updated periodically by the HOA.

##### ***Activity Restrictions***

Activities on this site will be limited to activities related to residential living. The project's Development Agreement(s) will outline the activities that are restricted on the property.

Such activities related to the LID include car washing, car maintenance and disposal of used motor fluids, pet waste cleanup, and trash container areas.

### ***Common Area Landscape Management***

Management programs will be designed and established by Melia Homes and/or the HOA, who will maintain the common areas within the project site. These programs will include how to mitigate the potential dangers of fertilizer and pesticide usage, require that fertilizer and pesticide usage shall be consistent with County guidelines, discuss utilization of water-efficient landscaping practices, require that maintenance be consistent with any Los Angeles county water conservation resolutions, and detail proper disposal of landscape wastes.

Ongoing maintenance will be consistent with the State of California Model Water-Efficient Landscape Ordinance. All proposed landscaping shall be low water using planting and drought tolerant. Landscaping areas shall be depressed to retain all irrigation and storm water runoff and promote percolation.

Fertilizer and pesticide usage shall be consistent with County Management Guidelines for use of Fertilizers and Pesticides.

### ***BMP Maintenance***

Melia Homes and/or the HOA will be responsible for implementing each of the BMPs detailed in this plan. Melia Homes and/or the HOA will also be responsible for cleaning and maintaining the BMPs on a regular basis. Maintenance operations should be logged in Appendix C.

### ***Common Area Litter Control***

Melia Homes and/or the HOA will be required to implement trash management and litter control procedures in the common areas aimed at reducing pollution of drainage water. Melia Homes and/or the HOA may also contract with their landscape maintenance firm to provide this service during regularly scheduled maintenance, which should consist of litter patrol, emptying of trash receptacles in common areas, and noting trash disposal violations and reporting the violations to the HOA for remediation.

### ***Employee/Contractor/Homeowner Training***

A training program will be established as it would apply to future employees, contractors, and homeowners to inform and train in maintenance activities regarding the impact of dumping oil, paints, solvents, or other potentially harmful chemicals into storm drains; the proper use of fertilizers and pesticides in landscaping maintenance practices; and the impacts of littering and improper water disposal.

HOA will conduct the training program which will include targeted training sessions with specific construction disciplines (landscaping, concrete finishers, painters, etc.).

The project's Development Agreement(s) will include provisions for future employee/contractor training programs conducted on a yearly based prior to the rainy season.

### ***Catch Basin Inspection***

Melia Homes and/or the HOA will maintain the drainage systems, including catch basins and culverts. Melia Homes and/or the HOA is required to have catch basins inspected and, if necessary, cleaned prior to the storm season, no later than October 15th each year prior to the “first flush” storm. These duties may be contracted out to the landscape maintenance firm hired by Melia Homes and/or the HOA. Please see Appendix C for maintenance program. Maintenance operations should be logged in Appendix C.

### ***Street Sweeping Private Streets***

Melia Homes and/or the HOA shall have all streets lots swept on a weekly basis. This procedure will be intensified around October 15<sup>th</sup> of each year prior to the “first flush” storm.

## **I. BMP Maintenance, Inspection, and Repair**

Inspections will be conducted as follows:

- Annually prior to the start of the rainy season
- Every (1) month during rainy season
- At any other time(s) or intervals of time specified in the contract documents or per manufacturer’s instructions.

An inspection form shall be completed at least once per year prior to the start of the rainy season. This inspection check sheet (see Appendix C) shall be included in this report and kept onsite at all times. The check sheet should be filled out completely and clearly indicate any BMPs that are in need of repair or maintenance. These repairs and/or maintenance procedures shall be carried out at the soonest possible time.

A legible log shall be kept on site to record the inspection of the storm water pollution abatement control measures. The record must contain the following information: (i) type of maintenance activities or source-control practices; (ii) date the activities are completed; and (iii) the name of the operator performing the activities. During transfer of ownership/operation of the facility, the current owner must notify the new owner/operator of the BMPs and the associated maintenance activities that also transfer to the new owner/operator of the property. See Appendix C.

## **J. Inspection, Maintenance, and Responsibility for BMPs**

The following tables show the lists of the post-construction BMPs (routine non-structural and structural), the required ongoing maintenance, the inspection and maintenance frequency, the inspection criteria, and the entity or party responsible for implementation, maintenance, and/or inspection.

**Table-5:** Non-Structural BMP Maintenance Responsibility/Frequency Matrix

| <b>BMP</b>                                 | <b>RESPONSIBILITY</b>                                                                                                                           | <b>FREQUENCY</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
|--------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Homeowner Education, Activity Restrictions | Melia Homes and/or HOA will provide educational materials. Those materials and responsibilities must be passed onto subsequent property owners. | Continuous. CCRs to be provided to homeowners at the time they purchase the property and updates provided by the HOA as they occur.                                                                                                                                                                                                                                                                                                                                                                                                   |
| Common Area Landscape Management           | Melia Homes and/or HOA through it's landscape maintenance contractor                                                                            | Monthly during regular maintenance and use with management guidelines for use of fertilizers and pesticides.                                                                                                                                                                                                                                                                                                                                                                                                                          |
| Trash Enclosures                           | Melia Homes and/or HOA through its landscape maintenance contractor and trash collection service provider.                                      | Weekly inspections of trash enclosures. Ensure lids are closed and pick up of any excess trash on the ground, noting trash disposal violations to the HOA for remediation.                                                                                                                                                                                                                                                                                                                                                            |
| Parking Areas and Drives Management        | Melia Homes and/or HOA through it's landscape maintenance contractor                                                                            | The project drive aisles and parking stalls are to be swept on a routine scheduled basis to facilitate the pickup of trash and debris (plant or otherwise) and to remove excessive oil, grease and build-up. During sweeping, debris is to be removed from the drives and then scrubbed and rinsed. This sweeping schedule will be at a minimum occurrence of once a month and as necessary to rid / reduce active pollutants from the pavement areas. This maintenance requirement will be listed in the provisions of this project. |
| Common Area Litter Control                 | Melia Homes and/or HOA through its landscape maintenance contractor.                                                                            | Weekly inspection and pick up any excess trash on the ground, noting trash disposal violations to the HOA for remediation.                                                                                                                                                                                                                                                                                                                                                                                                            |
| Employee Training                          | Melia Homes and/or HOA will train the landscape contractors after construction. HOA will be required by the provisions to train staff.          | Yearly for maintenance personnel and employees to include the educational materials contained in the approved LID.                                                                                                                                                                                                                                                                                                                                                                                                                    |
| Common Area Catch Basin Inspection         | Melia Homes and/or HOA through it's landscape maintenance contractor for common areas and storm drain facilities.                               | Inspect basins and clean debris and silt in bottom of catch basins once per year and after each storm event. Cleaning should also be done on or about October 1 of each year, prior to "first flush" storm.                                                                                                                                                                                                                                                                                                                           |

**Table-6:** Structural BMP Maintenance Responsibility/Frequency Matrix

| <b>BMP</b>                                    | <b>RESPONSIBILITY</b>                                                                                                             | <b>FREQUENCY</b>                                                                                                                                                                                                                                                                                                                                                                                                                                    |
|-----------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Common Area Efficient Irrigation              | Melia Homes and/or HOA through it's landscape contractors after construction                                                      | Once a week, in conjunction with maintenance activities. Verify that runoff minimizing landscape design continues to function by checking that water sensors are functioning properly, that irrigation heads are adjusted properly to eliminate overspray to hardscape areas, and to verify that irrigation timing and cycle lengths are adjusted in accordance with water demands, given time of year, weather and day or night time temperatures. |
| Common Area Runoff Efficient Landscape Design | Melia Homes and/or HOA through it's landscaping contractors                                                                       | Once a week in conjunction with maintenance activities and prior to finalizing any replanting schemes. Verify that plants continue to be grouped according to similar water requirements in order to reduce excess irrigation runoff.                                                                                                                                                                                                               |
| Catch Basin Stenciling                        | Melia Homes and/or HOA providing maintenance                                                                                      | A warning stencil will be painted on top and in view with the words:<br><p style="text-align: center;">"No-Dumping – Drains to Ocean"</p> At all catch basin, drain inlets draining to the street or storm drain system. See Appendix "B" (example). Once every 6 months, inspect for re-stenciling needs. Re-stencil as needed immediately.                                                                                                        |
| MaxWell Drywell System                        | Melia Homes and/or HOA to maintain or appoint a professional contractor after construction. Refer to manufacturer recommendations | Drywell inlet maintenance will conform to the manufacturer's specifications. Please see Appendix E. Torrent Resources may be contacted at 661-947-9836.                                                                                                                                                                                                                                                                                             |
| OldCastle FloGard Catch Basin Insert          | Melia Homes and/or HOA                                                                                                            | Conduct regular inspections, cleanings, and filter replacements per manufacturer's recommendations.                                                                                                                                                                                                                                                                                                                                                 |
| Detention Pipe                                | Melia Homes and/or HOA providing maintenance                                                                                      | Regular maintenance once a year and monthly inspections during rainy season of detention pipe.                                                                                                                                                                                                                                                                                                                                                      |

**K. Operation/Maintenance Funding after Project Completion**

The post-construction BMPs as described above will be funded and maintained by:

**Company Name  
Street Address  
City, State, Zip  
Contact Name  
Telephone**

- Maintenance and requirements of the maintenance for the properties will be listed in the Development Agreement(s) of this project and will be the responsibility of the property owner at all times. The agreement(s) will be recorded to the property at the County Recorder's Office and be included on the Title report of these properties.
- Maintenance and Operational responsibility will require transfer to the HOA upon selection through the project's entirety.

**Figure -1:**  
**Project Vicinity Map**

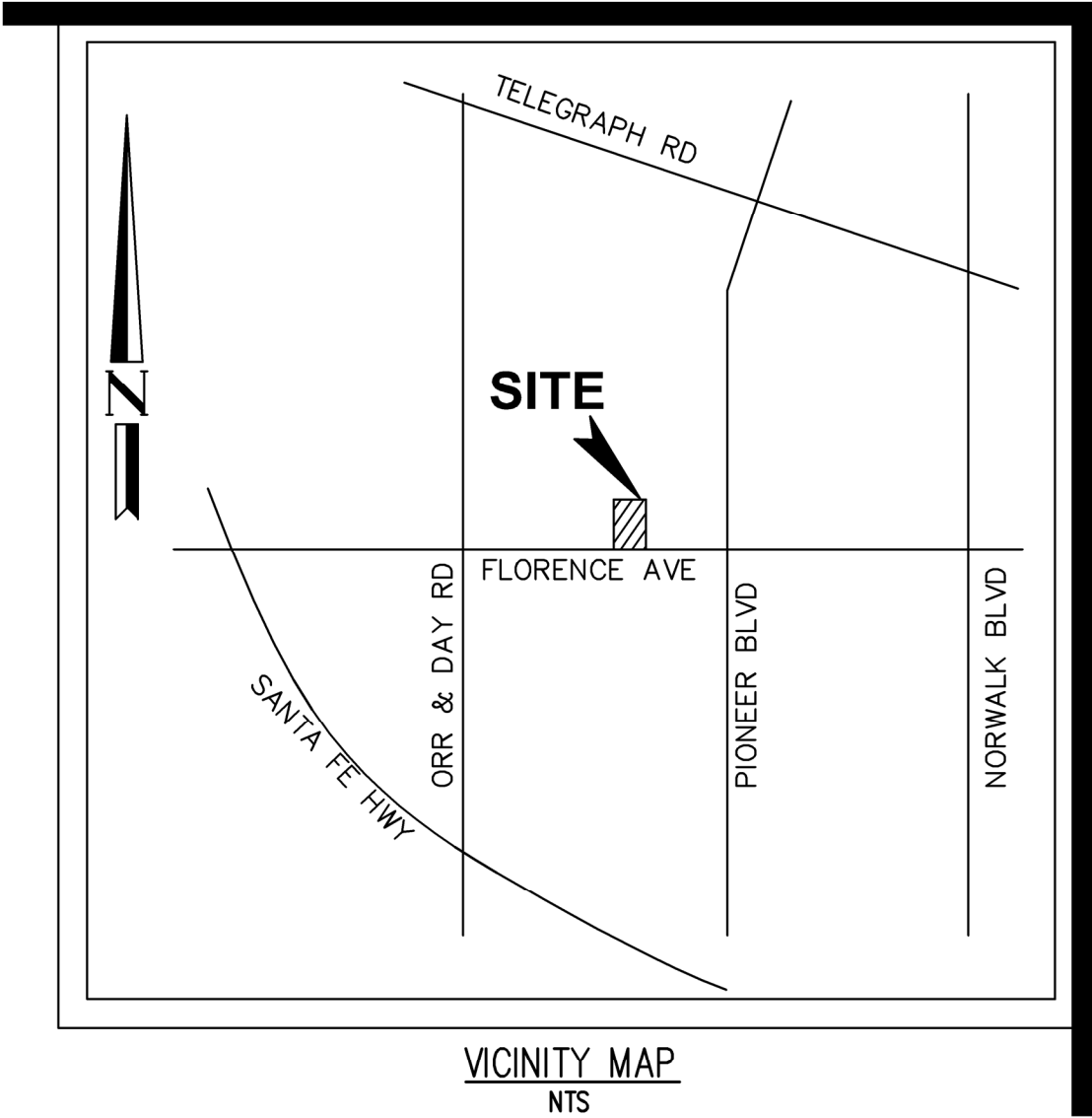


**Figure -2:**  
**Project Location Map**

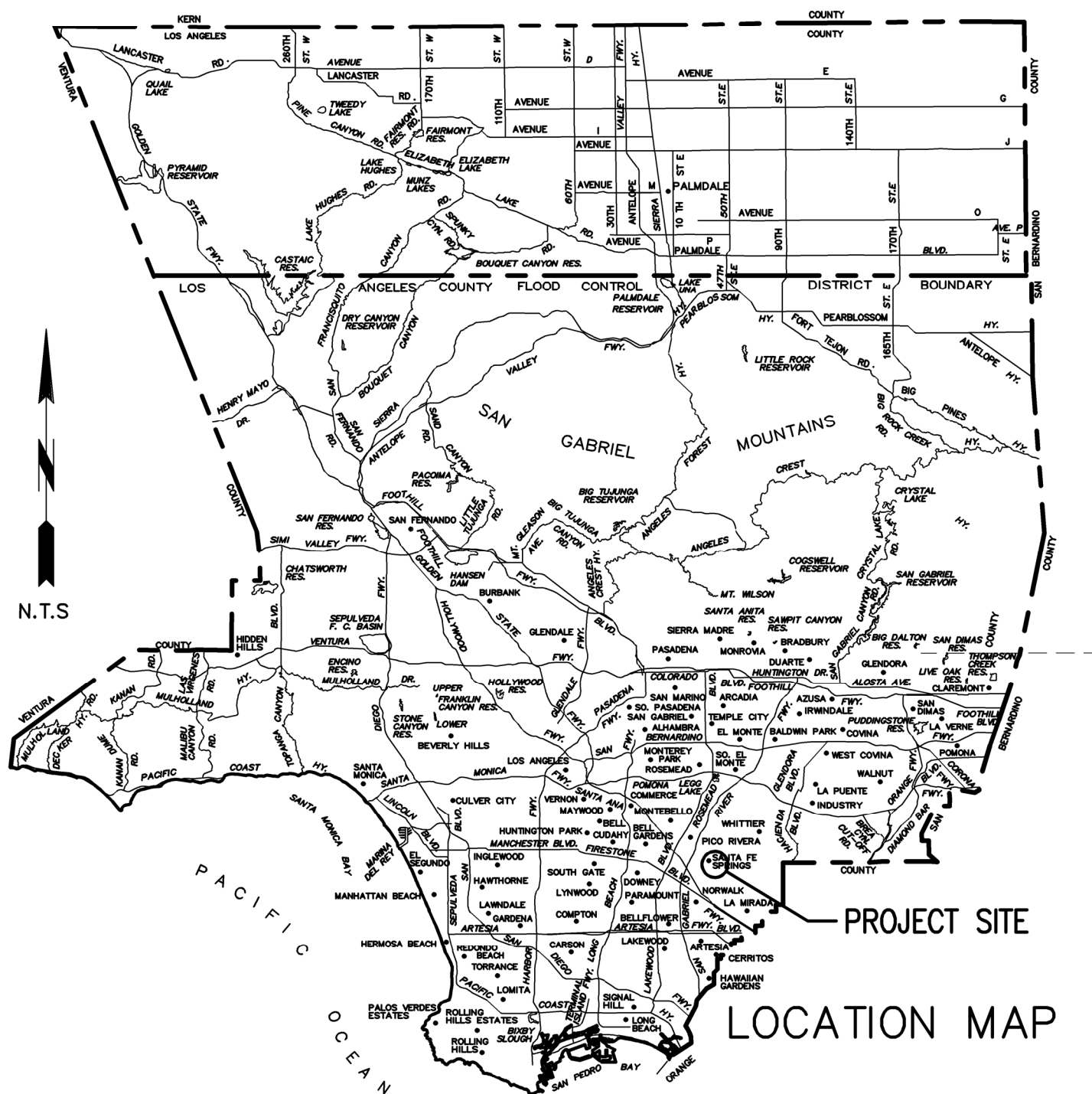
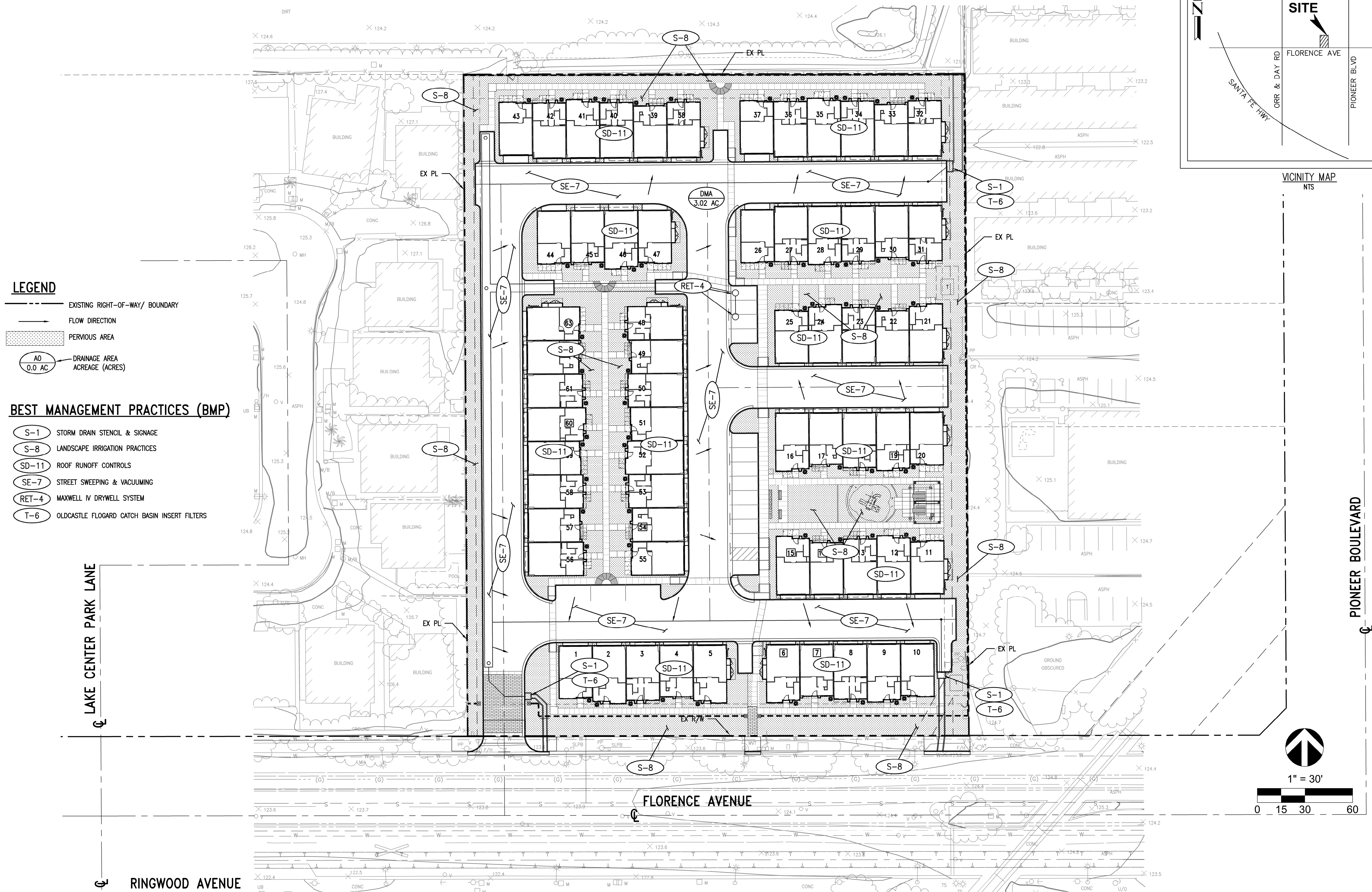


**Figure -3:**  
**Project BMPs Exhibit**

BMP EXHIBIT

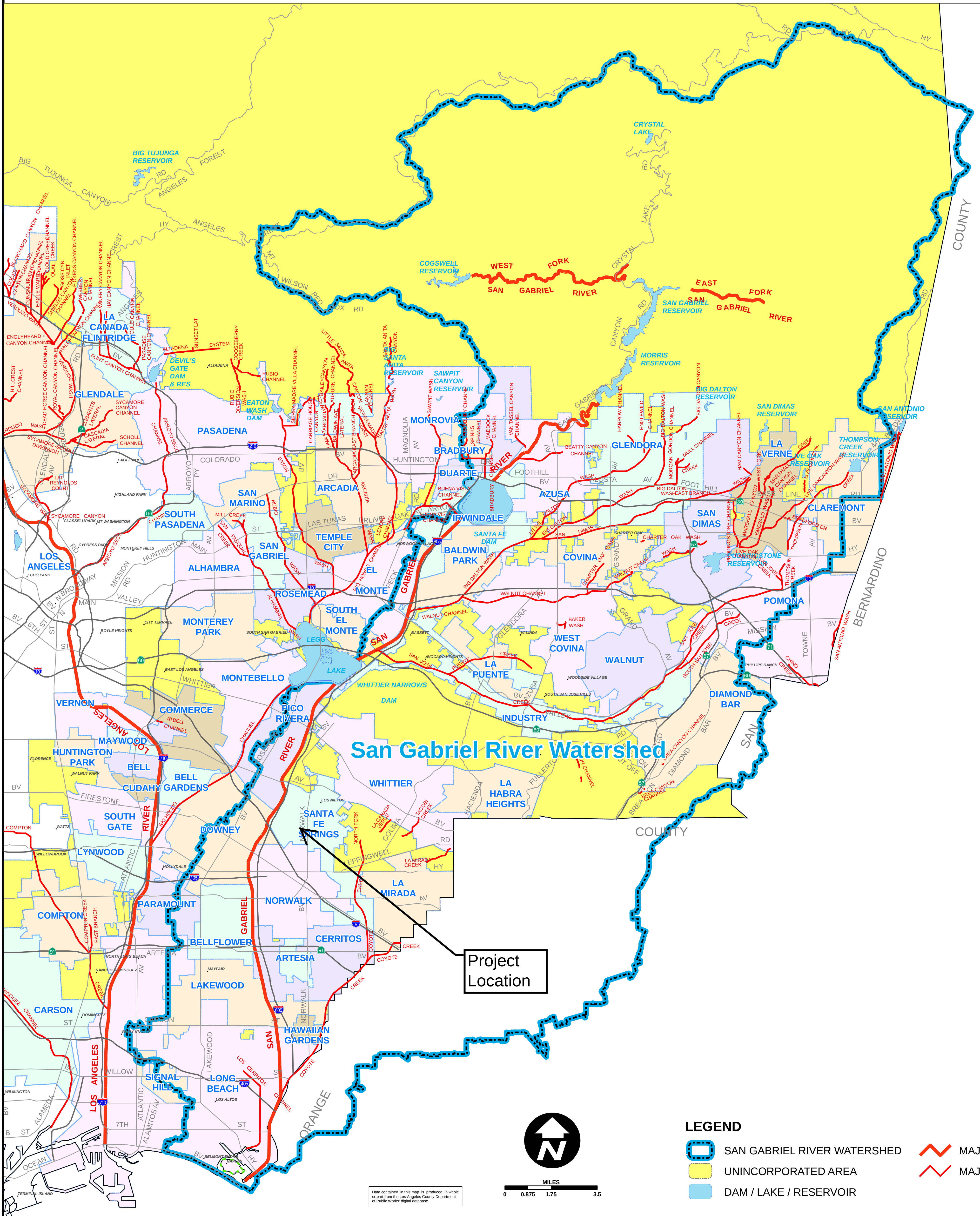


- LEGEND**
- EXISTING RIGHT-OF-WAY/ BOUNDARY
  - FLOW DIRECTION
  - PERVIOUS AREA
  - AD 0.0 AC DRAINAGE AREA ACREAGE (ACRES)
- BEST MANAGEMENT PRACTICES (BMP)**
- S-1 STORM DRAIN STENCIL & SIGNAGE
  - S-8 LANDSCAPE IRRIGATION PRACTICES
  - SD-11 ROOF RUNOFF CONTROLS
  - SE-7 STREET SWEEPING & VACUUMING
  - RET-4 MAXWELL IV DRYWELL SYSTEM
  - T-6 OLDCASTLE FLOGARD CATCH BASIN INSERT FILTERS

**DIGALERT**  
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TOLL FREE 1-800-227-2600  
A PUBLIC SERVICE BY UNDERGROUND SERVICE ALERT

| REVISIONS |      |    |             | DESIGNED BY |      | PLAN PREPARED BY:<br>KES TECHNOLOGIES INC<br>CIVIL ENGINEERING<br>LAND PLANNING AND SURVEYING<br>1 VENTURE STE 130<br>IRVINE, CALIFORNIA 92618<br>PHONE (949) 339-5331 | DRAWING NO. |  |
|-----------|------|----|-------------|-------------|------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------|--|
| NO.       | DATE | BY | DESCRIPTION | APPR.       | DATE |                                                                                                                                                                        | REV.        |  |
|           |      |    |             |             |      |                                                                                                                                                                        |             |  |
|           |      |    |             |             |      |                                                                                                                                                                        |             |  |
|           |      |    |             |             |      |                                                                                                                                                                        |             |  |
|           |      |    |             |             |      | BMP EXHIBIT<br>LOW IMPACT DEVELOPMENT<br>TENTATIVE TRACT 83383 - 11733 FLORENCE AVE<br>DEPARTMENT OF PUBLIC WORKS<br>CITY OF SANTA FE SPRINGS                          |             |  |
|           |      |    |             |             |      | SHEET 1 OF 1                                                                                                                                                           |             |  |

**Figure -4:**  
**Impaired Waters**



**Appendix A:**  
**Volume and Flow Rate Calculations and Hydrologic Report**

85<sup>th</sup> Percentile SWQDv = 4,511 + 1,833 + 1,496 = **7,840 cu ft.** ✓

0.75 inch Storm SWQDv = 3,697 + 1,503 + 1,226 = **6,426 cu ft.**

Proposed Water Quality Treatment Device Volume Capacity

MaxWell Plus Drywell (35' depth) = 327 cu ft. x 2 = 654 cu ft.

Detention Pipe Volumes

460' long 54" detention pipe =  $\pi \times 2^2 \times 460 = 7,316$  cu ft.

Total volume captured: 654 + 7,316 = 7,970 cu ft. > 7,840 cu ft. ✓

**Appendix B:**  
**“NO DUMPING – DRAINS TO OCEAN” Stencil Example**



Sample Stencil 1



Sample Stencil 2

**Appendix C:**  
**BMP Maintenance, Inspection, and Repair Log and Checklist**



## Description and Purpose

Street sweeping and vacuuming includes use of self-propelled and walk-behind equipment to remove sediment from streets and roadways, and to clean paved surfaces in preparation for final paving. Sweeping and vacuuming prevents sediment from the project site from entering storm drains or receiving waters.

## Suitable Applications

Sweeping and vacuuming are suitable anywhere sediment is tracked from the project site onto public or private paved streets and roads, typically at points of egress. Sweeping and vacuuming are also applicable during preparation of paved surfaces for final paving.

## Limitations

Sweeping and vacuuming may not be effective when sediment is wet or when tracked soil is caked (caked soil may need to be scraped loose).

## Implementation

- Controlling the number of points where vehicles can leave the site will allow sweeping and vacuuming efforts to be focused, and perhaps save money.
- Inspect potential sediment tracking locations daily.
- Visible sediment tracking should be swept or vacuumed on a daily basis.

## Objectives

|    |                                                  |                                     |
|----|--------------------------------------------------|-------------------------------------|
| EC | Erosion Control                                  |                                     |
| SE | Sediment Control                                 | <input checked="" type="checkbox"/> |
| TR | Tracking Control                                 | <input checked="" type="checkbox"/> |
| WE | Wind Erosion Control                             |                                     |
| NS | Non-Stormwater Management Control                |                                     |
| WM | Waste Management and Materials Pollution Control |                                     |

### Legend:

- ☒ Primary Objective
- ☒ Secondary Objective

## Targeted Constituents

|                |                                     |
|----------------|-------------------------------------|
| Sediment       | <input checked="" type="checkbox"/> |
| Nutrients      |                                     |
| Trash          | <input checked="" type="checkbox"/> |
| Metals         |                                     |
| Bacteria       |                                     |
| Oil and Grease | <input checked="" type="checkbox"/> |
| Organics       |                                     |

## Potential Alternatives

None



# SE-7 Street Sweeping and Vacuuming

---

- Do not use kick brooms or sweeper attachments. These tend to spread the dirt rather than remove it.
- If not mixed with debris or trash, consider incorporating the removed sediment back into the project

## Costs

Rental rates for self-propelled sweepers vary depending on hopper size and duration of rental. Expect rental rates from \$58/hour (3 yd<sup>3</sup> hopper) to \$88/hour (9 yd<sup>3</sup> hopper), plus operator costs. Hourly production rates vary with the amount of area to be swept and amount of sediment. Match the hopper size to the area and expect sediment load to minimize time spent dumping.

## Inspection and Maintenance

- Inspect BMPs prior to forecast rain, daily during extended rain events, after rain events, weekly during the rainy season, and at two-week intervals during the non-rainy season.
- When actively in use, points of ingress and egress must be inspected daily.
- When tracked or spilled sediment is observed outside the construction limits, it must be removed at least daily. More frequent removal, even continuous removal, may be required in some jurisdictions.
- Be careful not to sweep up any unknown substance or any object that may be potentially hazardous.
- Adjust brooms frequently; maximize efficiency of sweeping operations.
- After sweeping is finished, properly dispose of sweeper wastes at an approved dumpsite.

## References

Stormwater Quality Handbooks - Construction Site Best Management Practices (BMPs) Manual, State of California Department of Transportation (Caltrans), November 2000.

Labor Surcharge and Equipment Rental Rates, State of California Department of Transportation (Caltrans), April 1, 2002 – March 31, 2003.



Rain Garden

## Design Objectives

- ☒ Maximize Infiltration
- ☒ Provide Retention
- ☒ Slow Runoff
  - Minimize Impervious Land Coverage
  - Prohibit Dumping of Improper Materials
- ☒ Contain Pollutants
  - Collect and Convey

## Description

Various roof runoff controls are available to address stormwater that drains off rooftops. The objective is to reduce the total volume and rate of runoff from individual lots, and retain the pollutants on site that may be picked up from roofing materials and atmospheric deposition. Roof runoff controls consist of directing the roof runoff away from paved areas and mitigating flow to the storm drain system through one of several general approaches: cisterns or rain barrels; dry wells or infiltration trenches; pop-up emitters, and foundation planting. The first three approaches require the roof runoff to be contained in a gutter and downspout system. Foundation planting provides a vegetated strip under the drip line of the roof.

## Approach

Design of individual lots for single-family homes as well as lots for higher density residential and commercial structures should consider site design provisions for containing and infiltrating roof runoff or directing roof runoff to vegetative swales or buffer areas. Retained water can be reused for watering gardens, lawns, and trees. Benefits to the environment include reduced demand for potable water used for irrigation, improved stormwater quality, increased groundwater recharge, decreased runoff volume and peak flows, and decreased flooding potential.

## Suitable Applications

Appropriate applications include residential, commercial and industrial areas planned for development or redevelopment.

## Design Considerations

### *Designing New Installations*

#### *Cisterns or Rain Barrels*

One method of addressing roof runoff is to direct roof downspouts to cisterns or rain barrels. A cistern is an above ground storage vessel with either a manually operated valve or a permanently open outlet. Roof runoff is temporarily stored and then released for irrigation or infiltration between storms. The number of rain



barrels needed is a function of the rooftop area. Some low impact developers recommend that every house have at least 2 rain barrels, with a minimum storage capacity of 1000 liters. Roof barrels serve several purposes including mitigating the first flush from the roof which has a high volume, amount of contaminants, and thermal load. Several types of rain barrels are commercially available. Consideration must be given to selecting rain barrels that are vector proof and childproof. In addition, some barrels are designed with a bypass valve that filters out grit and other contaminants and routes overflow to a soak-away pit or rain garden.

If the cistern has an operable valve, the valve can be closed to store stormwater for irrigation or infiltration between storms. This system requires continual monitoring by the resident or grounds crews, but provides greater flexibility in water storage and metering. If a cistern is provided with an operable valve and water is stored inside for long periods, the cistern must be covered to prevent mosquitoes from breeding.

A cistern system with a permanently open outlet can also provide for metering stormwater runoff. If the cistern outlet is significantly smaller than the size of the downspout inlet (say 1/4 to 1/2 inch diameter), runoff will build up inside the cistern during storms, and will empty out slowly after peak intensities subside. This is a feasible way to mitigate the peak flow increases caused by rooftop impervious land coverage, especially for the frequent, small storms.

#### *Dry wells and Infiltration Trenches*

Roof downspouts can be directed to dry wells or infiltration trenches. A dry well is constructed by excavating a hole in the ground and filling it with an open graded aggregate, and allowing the water to fill the dry well and infiltrate after the storm event. An underground connection from the downspout conveys water into the dry well, allowing it to be stored in the voids. To minimize sedimentation from lateral soil movement, the sides and top of the stone storage matrix can be wrapped in a permeable filter fabric, though the bottom may remain open. A perforated observation pipe can be inserted vertically into the dry well to allow for inspection and maintenance.

In practice, dry wells receiving runoff from single roof downspouts have been successful over long periods because they contain very little sediment. They must be sized according to the amount of rooftop runoff received, but are typically 4 to 5 feet square, and 2 to 3 feet deep, with a minimum of 1-foot soil cover over the top (maximum depth of 10 feet).

To protect the foundation, dry wells must be set away from the building at least 10 feet. They must be installed in solids that accommodate infiltration. In poorly drained soils, dry wells have very limited feasibility.

Infiltration trenches function in a similar manner and would be particularly effective for larger roof areas. An infiltration trench is a long, narrow, rock-filled trench with no outlet that receives stormwater runoff. These are described under Treatment Controls.

#### *Pop-up Drainage Emitter*

Roof downspouts can be directed to an underground pipe that daylights some distance from the building foundation, releasing the roof runoff through a pop-up emitter. Similar to a pop-up irrigation head, the emitter only opens when there is flow from the roof. The emitter remains flush to the ground during dry periods, for ease of lawn or landscape maintenance.

## *Foundation Planting*

Landscape planting can be provided around the base to allow increased opportunities for stormwater infiltration and protect the soil from erosion caused by concentrated sheet flow coming off the roof. Foundation plantings can reduce the physical impact of water on the soil and provide a subsurface matrix of roots that encourage infiltration. These plantings must be sturdy enough to tolerate the heavy runoff sheet flows, and periodic soil saturation.

## ***Redeveloping Existing Installations***

Various jurisdictional stormwater management and mitigation plans (SUSMP, WQMP, etc.) define “redevelopment” in terms of amounts of additional impervious area, increases in gross floor area and/or exterior construction, and land disturbing activities with structural or impervious surfaces. The definition of “redevelopment” must be consulted to determine whether or not the requirements for new development apply to areas intended for redevelopment. If the definition applies, the steps outlined under “designing new installations” above should be followed.

## **Supplemental Information**

### ***Examples***

- City of Ottawa’s Water Links Surface –Water Quality Protection Program
- City of Toronto Downspout Disconnection Program
- City of Boston, MA, Rain Barrel Demonstration Program

### **Other Resources**

Hager, Marty Catherine, Stormwater, “Low-Impact Development”, January/February 2003.  
[www.stormh2o.com](http://www.stormh2o.com)

Low Impact Urban Design Tools, Low Impact Development Design Center, Beltsville, MD.  
[www.lid-stormwater.net](http://www.lid-stormwater.net)

Start at the Source, Bay Area Stormwater Management Agencies Association, 1999 Edition

## **S-8: Landscape Irrigation Practices**

### **Purpose**

Irrigation runoff provides a pathway for pollutants (i.e., nutrients, bacteria, organics, sediment) to enter the storm drain system. By effectively irrigating, less runoff is produced resulting in less potential for pollutants to enter the storm drain system.

### **General Guidance**

- Do not allow irrigation runoff from the landscaped area to drain directly to storm drain system.
- Minimize use of fertilizer, pesticides, and herbicides on landscaped areas.
- Plan sites with sufficient landscaped area and dispersal capacity (e.g., ability to receive irrigation water without generating runoff).
- Consult a landscape professional regarding appropriate plants, fertilizer, mulching applications, and irrigation requirements (if any) to ensure healthy vegetation growth.

### **Design Specifications**

- Choose plants that minimize the need for fertilizer and pesticides.
- Group plants with similar water requirements and water accordingly.
- Use mulch to minimize evaporation and erosion.
- Include a vegetative boundary around project site to act as a filter.
- Design the irrigation system to only water areas that need it.
- Install an approved subsurface drip, pop-up, or other irrigation system.<sup>1</sup> The irrigation system should employ effective energy dissipation and uniform flow spreading methods to prevent erosion and facilitate efficient dispersion.
- Install rain sensors to shut off the irrigation system during and after storm events.
- Include pressure sensors to shut off flow-through system in case of sudden pressure drop. A sudden pressure drop may indicate a broken irrigation head or water line.
- If the hydraulic conductivity in the soil is not sufficient for the necessary water application rate, implement soil amendments to avoid potential geotechnical hazards (i.e., liquefaction, landslide, collapsible soils, and expansive soils).

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<sup>1</sup> If alternative distribution systems (e.g., spray irrigation) are approved, the County will establish guidelines to implement these new systems.

## **S-8: Landscape Irrigation Practices**

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- For sites located on or within 50 feet of a steep slope (15% or greater), do not irrigate landscape within three days of a storm event to avoid potential geotechnical instability.<sup>2</sup>
- Implement Integrated Pest Management practices.

For additional guidelines and requirements, refer to the Los Angeles County Department of Health Services.

### **Maintenance Requirements**

Maintain irrigation areas to remove trash and debris and loose vegetation. Rehabilitate areas of bare soil. If a rain or pressure sensor is installed, it should be checked periodically to ensure proper function. Inspect and maintain irrigation equipment and components to ensure proper functionality. Clean equipment as necessary to prevent algae growth and vector breeding. Maintenance agreements between LACDPW and the owner/operator may be required. Failure to properly maintain building and property may subject the property owner to citation.

---

<sup>2</sup> As determined by the City of Los Angeles, Building and Safety Division

## **S-1: Storm Drain Message and Signage**

### **Purpose**

Waste material dumped into storm drain inlets can adversely impact surface and ground waters. In fact, any material discharged into the storm drain system has the potential to significantly impact downstream receiving waters. Storm drain messages have become a popular method of alerting and reminding the public about the effects of and the prohibitions against waste disposal into the storm drain system. The signs are typically stenciled or affixed near the storm drain inlet or catch basin. The message simply informs the public that dumping of wastes into storm drain inlets is prohibited and/or that the drain ultimately discharges into receiving waters.

### **General Guidance**

- The signs must be placed so they are easily visible to the public.
- Be aware that signs placed on sidewalk will be worn by foot traffic.

### **Design Specifications**

- Signs with language and/or graphical icons that prohibit illegal dumping, must be posted at designated public access points along channels and streams within the project area. Consult with Los Angeles County Department of Public Works (LACDPW) staff to determine specific signage requirements for channels and streams.
- Storm drain message markers, placards, concrete stamps, or stenciled language/icons (e.g., “No Dumping – Drains to the Ocean”) are required at all storm drain inlets and catch basins within the project area to discourage illegal or inadvertent dumping. Signs should be placed in clear sight facing anyone approaching the storm drain inlet or catch basin from either side (see Figure D-1 and Figure D-2). LACDPW staff should be contacted to determine specific requirements for types of signs and methods of application. A stencil can be purchased for a nominal fee from LACDPW Building and Safety Office by calling (626) 458-3171. All storm drain inlet and catch basin locations must be identified on the project site map.

### **Maintenance Requirements**

Legibility and visibility of markers and signs should be maintained (e.g., signs should be repainted or replaced as necessary). If required by LACDPW, the owner/operator or homeowner’s association shall enter into a maintenance agreement with the agency or record a deed restriction upon the property title to maintain the legibility of placards and signs.

## S-1: Storm Drain Message and Signage

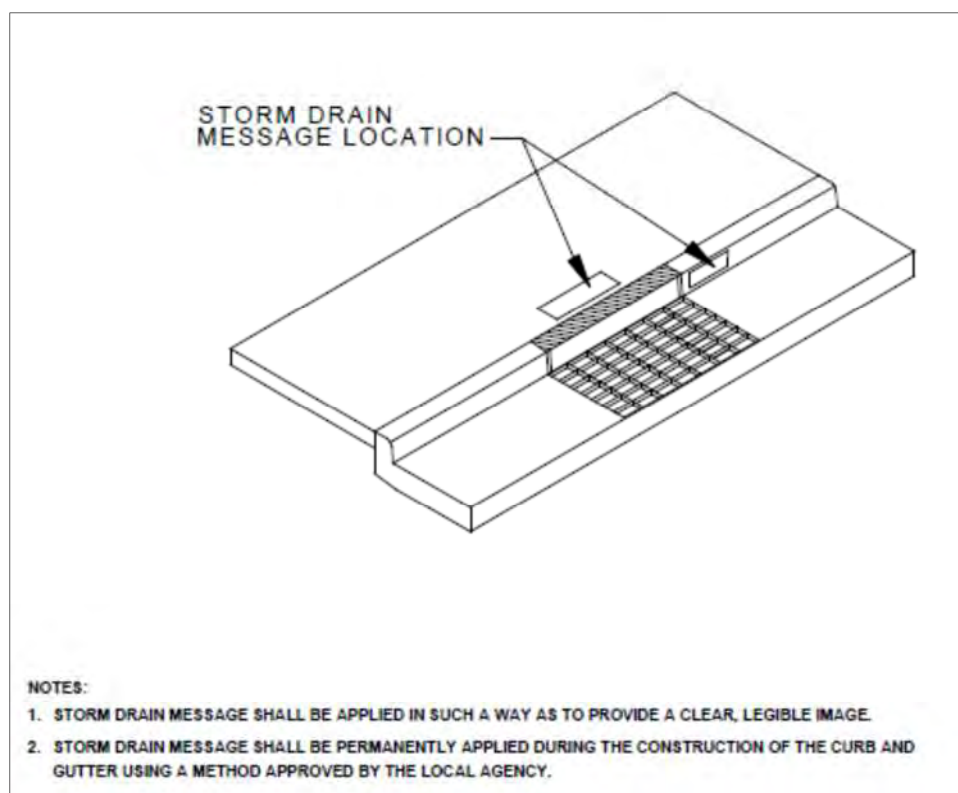


Figure D-1. Storm Drain Message Location – Curb Type Inlet

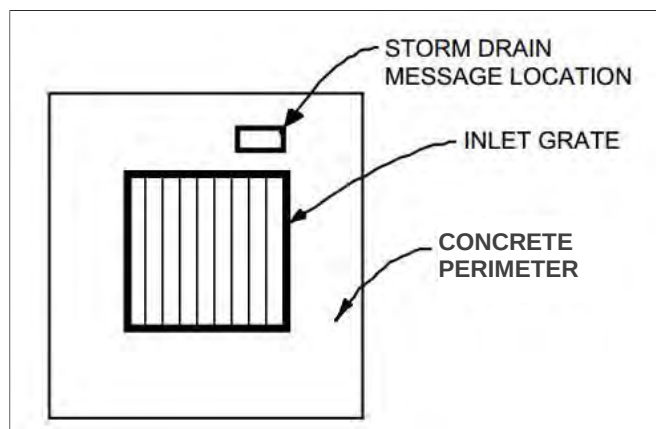


Figure D-2. Storm Drain Message Location – Catch Basin/Area Type Inlet



# **FLOGARD+PLUS® CATCH BASIN INSERT FILTER**

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## Inspection and Maintenance Guide

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A division of  
Oldcastle Precast

## **SCOPE:**

Federal, State and Local Clean Water Act regulations and those of insurance carriers require that stormwater filtration systems be maintained and serviced on a recurring basis. The intent of the regulations is to ensure that the systems, on a continuing basis, efficiently remove pollutants from stormwater runoff thereby preventing pollution of the nation's water resources. These specifications apply to the FloGard+Plus® Catch Basin Insert Filter.

## **RECOMMENDED FREQUENCY OF SERVICE:**

Drainage Protection Systems (DPS) recommends that installed FloGard+Plus Catch Basin Insert Filters be serviced on a recurring basis. Ultimately, the frequency depends on the amount of runoff, pollutant loading and interference from debris (leaves, vegetation, cans, paper, etc.); however, it is recommended that each installation be serviced a minimum of three times per year, with a change of filter medium once per year. DPS technicians are available to do an onsite evaluation, upon request.

## **RECOMMENDED TIMING OF SERVICE:**

DPS guidelines for the timing of service are as follows:

1. For areas with a definite rainy season: Prior to, during and following the rainy season.
2. For areas subject to year-round rainfall: On a recurring basis (at least three times per year).
3. For areas with winter snow and summer rain: Prior to and just after the snow season and during the summer rain season.
4. For installed devices not subject to the elements (washracks, parking garages, etc.): On a recurring basis (no less than three times per year).

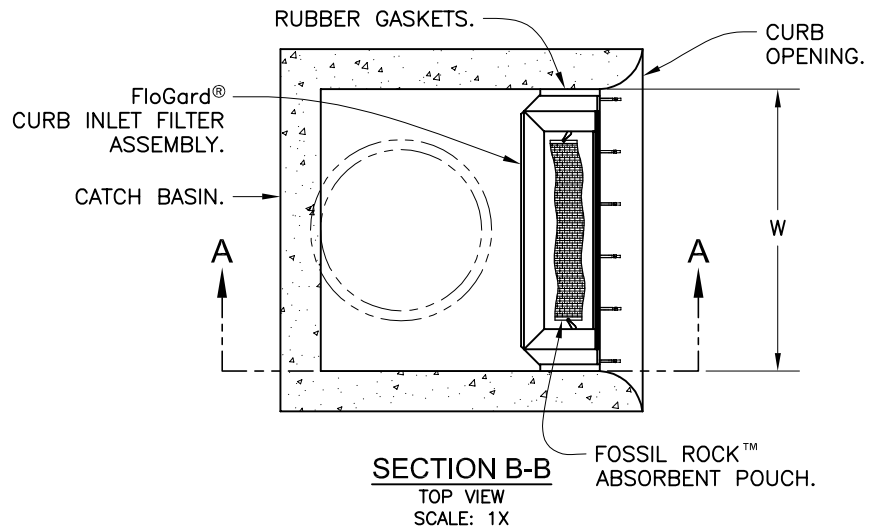
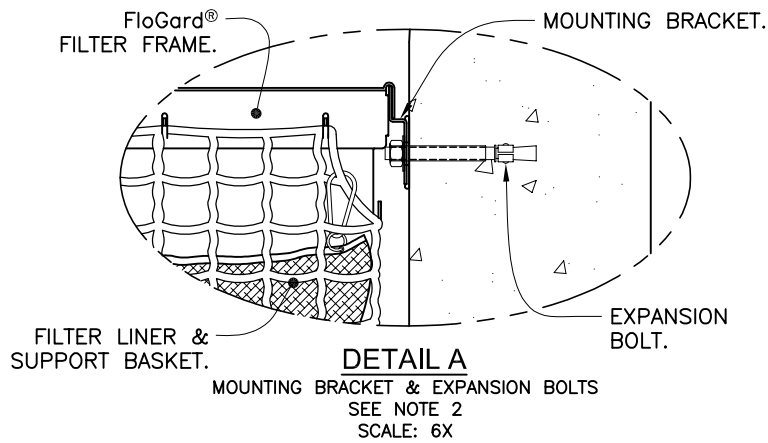
## **SERVICE PROCEDURES:**

1. The catch basin grate shall be removed and set to one side. The catch basin shall be visually inspected for defects and possible illegal dumping. If illegal dumping has occurred, the proper authorities and property owner representative shall be notified as soon as practicable.
2. Using an industrial vacuum, the collected materials shall be removed from the liner. (Note: DPS uses a truck-mounted vacuum for servicing FloGard+Plus catch basin inserts.)
3. When all of the collected materials have been removed, the filter medium pouches shall be removed by unsnapping the tether from the D-ring and set to one side. The filter liner, gaskets, stainless steel frame and mounting brackets, etc., shall be inspected for continued serviceability. Minor damage or defects found shall be corrected on-the-spot and a notation made on the Maintenance Record. More extensive deficiencies that affect the efficiency of the filter (torn liner, etc.), if approved by the customer representative, will be corrected and an invoice submitted to the representative along with the Maintenance Record.
4. The filter medium pouches shall be inspected for defects and continued serviceability and replaced as necessary and the pouch tethers re-attached to the liner's D-ring. See below.
5. The grate shall be replaced.

## **REPLACEMENT AND DISPOSAL OF EXPOSED FILTER MEDIUM AND COLLECTED DEBRIS**

The frequency of filter medium exchange will be in accordance with the existing DPS-Customer Maintenance Contract. DPS recommends that the medium be changed at least once per year. During the appropriate service, or if so determined by the service technician during a non-scheduled service, the filter medium will be replaced with new material. Once the exposed pouches and debris have been removed, DPS has possession and must dispose of it in accordance with local, state and federal agency requirements.

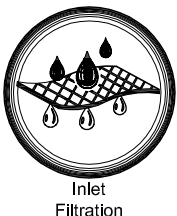
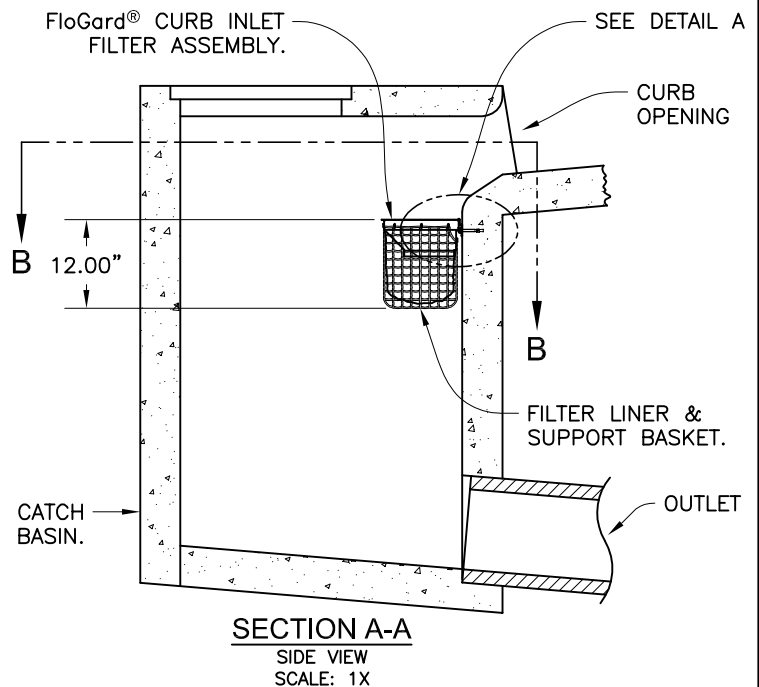
**DPS also has the capability of servicing all manner of storm drain filters, catch basin inserts and catch basins without inserts, underground oil/water separators, stormwater interceptors and other such devices. All DPS personnel are highly qualified technicians and are confined space trained and certified. Call us at (888) 950-8826 for further information and assistance.**



| SPECIFIER CHART |                          |                              |                                |                              |
|-----------------|--------------------------|------------------------------|--------------------------------|------------------------------|
| MODEL NO.       | Curb Opening Width - W - | Storage Capacity - Cu. Ft. - | Filtered Flow Rate - GPM/CFS - | Bypass Flow Rate - GPM/CFS - |
| FGP-24CI        | 2.0' (24")               | .95                          | 338 / .75                      | 2,513 / 5.6                  |
| FGP-30CI        | 2.5' (30")               | 1.20                         | 450 / 1.00                     | 3,008 / 6.7                  |
| FGP-36CI        | 3.0' (36")               | 1.50                         | 563 / 1.25                     | 3,547 / 7.9                  |
| FGP-42CI        | 3.5' (42")               | 1.80                         | 675 / 1.50                     | 3,951 / 8.8                  |
| FGP-48CI        | 4.0' (48")               | 2.10                         | 768 / 1.76                     | 4,445 / 9.9                  |
| FGP-5.0CI       | 5.0' (60")               | 2.40                         | 900 / 2.00                     | 5,208 / 11.6                 |
| FGP-6.0CI       | 6.0' (72")               | 3.05                         | 1,126 / 2.51                   | 6,196 / 13.8                 |
| FGP-7.0CI       | 7.0' (84")               | 3.65                         | 1,350 / 3.01                   | 7,139 / 15.9                 |
| FGP-8.0CI       | 8.0' (96")               | 4.25                         | 1,576 / 3.51                   | 8,082 / 18.0                 |
| FGP-10.0CI      | 10.0' (120")             | 4.85                         | 1,800 / 4.01                   | 9,833 / 21.9                 |
| FGP-12.0CI      | 12.0' (144")             | 6.10                         | 2,252 / 5.02                   | 11,764 / 26.2                |
| FGP-14.0CI      | 14.0' (168")             | 7.30                         | 2,700 / 6.02                   | 13,515 / 30.1                |
| FGP-16.0CI      | 16.0' (192")             | 8.55                         | 3,152 / 7.02                   | 15,446 / 34.4                |
| FGP-18.0CI      | 18.0' (216")             | 9.45                         | 3,490 / 7.78                   | 17,152 / 38.2                |
| FGP-21.0CI      | 21.0' (252")             | 10.95                        | 4,050 / 9.02                   | 19,891 / 44.3                |
| FGP-28.0CI      | 28.0' (336")             | 14.60                        | 5,400 / 12.03                  | 26,311 / 58.6                |

## NOTES:

1. Filter insert shall have a high flow bypass feature.
2. Filter support frame shall be constructed from stainless steel Type 304.
3. Filter medium shall be *Fossil Rock™*, installed and maintained in accordance with manufacturer specifications.
4. Storage capacity reflects 80% of maximum solids collection prior to impeding filtering bypass.



**FloGard®**  
**Catch Basin Insert Filter**  
**Curb Inlet Style**



**Oldcastle®**  
**Stormwater Solutions**

7921 Southpark Plaza, Suite 200 | Littleton, CO | 80120 | Ph: 800.579.8819 | oldcastlestormwater.com

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|-------------------------|----------|--------------------------------|--------------------|--------------|
| DRAWING NO.<br>FGP-0002 | REV<br>E | ECO<br>ECO-0127<br>JPR 5/18/15 | DATE<br>JPR 1/3/06 | SHEET 1 OF 1 |
|-------------------------|----------|--------------------------------|--------------------|--------------|

**Appendix D:**  
**Geotechnical Investigation for Proposed Water Quality Improvements**

December 10, 2020  
J.N.: 2931.00

Mr. Chris Borland  
Melia Homes  
8951 Research Drive  
Irvine, CA 92618

**Subject: Preliminary Geotechnical Investigation, Proposed Residential Development,  
11733 Florence Street, Santa Fe Springs, California**

Dear Mr. Borland,

Pursuant to your request, ***Albus & Associates, Inc.*** is pleased to present to you our preliminary geotechnical investigation report, for the proposed development at the subject site. This report presents the results of our aerial photo and literature review, subsurface exploration, laboratory testing, and engineering analyses. Conclusions relevant to the feasibility of the proposed site development are also presented herein based on the findings of our work.

We appreciate this opportunity to be of service to you. If you should have any questions regarding the contents of this report, please do not hesitate to call.

Sincerely,

**ALBUS & ASSOCIATES, INC.**



David E. Albus  
Principal Engineer

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## FIGURES AND PLATES

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Plate 1 - Geotechnical Map

## APPENDICES

### APPENDIX A - EXPLORATION LOGS

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Table B – Summary of Laboratory Test Results

Plate B-1 – Grain Size Distribution Plot

Plates B-2 through B-4 – Consolidation Plots

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## **1.0 INTRODUCTION**

### **2.1 PURPOSE AND SCOPE**

The purposes of our preliminary geotechnical investigation were to evaluate geotechnical conditions within the project area and to provide conclusions and recommendations relevant to the design and construction of the proposed improvements at the subject site. The scope of this investigation included the following:

- Review of the historical aerial photographs
- Review of published geologic and seismic data for the site and surrounding area
- Exploratory drilling and soil sampling
- Laboratory testing of selected soil samples
- Engineering analyses of data obtained from our review, exploration, and laboratory testing
- Evaluation of site seismicity, liquefaction potential, and settlement potential
- Preparation of this report

### **2.2 SITE LOCATION AND DESCRIPTION**

The site is located at the address of 11733 Florence Street within the city of Santa Fe Springs, California. The site is bordered by residential properties to the west and east, East Florence Ave to the south, and a track field to the north. The location of the site and its relationship to the surrounding areas is shown on Figure 1, Site Location Map.

The project site and overall property is relatively flat with elevations ranging from 123 to 125 feet above mean sea level (based on Google Earth). The site appears to drain generally north away from Florence Ave towards a V-ditch along the northern boundary outside the property. However, portions of the site may still flow south towards Florence Ave. The site is currently occupied by a church within the center and southern portion of the site. The front of the site has two entryways with grass and large trees along Florence Ave. The remainder of the site is covered in pavement for associated church parking. Hardscaping around the church exists with additional vegetation. Within the parking areas are concrete dividers for parking bays and associated lighting. A small storage building exists in the northeast corner of the site as well. Masonry block walls run along the west and east property boundaries with chain link fencing along the northern boundary. The southern entryways are bordered by heavy wrought iron gates.



N



**FIGURE 1**  
**SITE LOCATION MAP**

**11733 Florence Street**  
**Santa Fe Springs, California**

**NOT TO SCALE**

## **2.3 PROPOSED DEVELOPMENT**

Based on our understanding, site development is anticipated to consist of 63 three-story, multi-family townhomes at grade. Associated interior driveways, decorative hardscape, parking areas and underground utilities are also anticipated.

No grading or structural plans were available in preparing this proposal. However, we anticipate demolition of existing site improvements and some minor cut and filling of the site will be required to achieve future surface configuration and we expect future foundation loads will be moderate. All structures are anticipated to be at grade.

## **2.0 INVESTIGATION**

### **2.1 RESEARCH**

We have reviewed the referenced geologic publications and maps (see references). Data from these sources were utilized to develop some of the findings and conclusions presented herein.

We have also reviewed available historical aerial photographs. The aerial photos indicate that in 1927, the site had not been developed and appears to have been used for agriculture. By 1953, the site and the surrounding areas were no longer purposed for agriculture and a structure appears to be in the southern portion of the site with an associated driveway from Florence Ave. By 1967, the site appears to have been redeveloped into its current configuration and has remained relatively unchanged since 2020.

## **2.2 SUBSURFACE EXPLORATION**

Subsurface exploration for this investigation was conducted on November 6, 2020 and consisted of the drilling of five (5) soil borings to depths ranging from approximately 16.5 to 51.5 feet below the existing ground surface (bgs). The borings were drilled using a truck-mounted, continuous flight, hollow-stem-auger drill rig. A representative of Albus & Associates, Inc. logged the exploratory borings. Visual and tactile identifications were made of the materials encountered, and their descriptions are presented in the Exploration Logs in Appendix A. The approximate locations of the exploratory excavations completed by this firm are shown on the enclosed Geotechnical Map, Plate 1.

Bulk, relatively undisturbed and Standard Penetration Test (SPT) samples were obtained at selected depths within the exploratory borings for subsequent laboratory testing. Relatively undisturbed samples were obtained using a 3-inch O.D., 2.5-inch I.D., California split-spoon soil sampler lined with brass rings. SPT samples were obtained from the boring using a standard, unlined SPT soil sampler. During each sampling interval, the sampler was driven 18 inches with successive drops of a 140-pound automatic hammer falling 30 inches. The number of blows required to advance the sampler was recorded for each six inches of advancement. The total blow count for the lower 12 inches of advancement per soil sample is recorded on the exploration log. Samples were placed in sealed containers or plastic bags and transported to our laboratory for analyses. The borings were backfilled with auger cuttings upon completion of sampling.

Two additional borings (P-1 and P-2) were drilled adjacent to boring B-1 for percolation testing. Details and results of percolation tests are reported under a separate cover.

## **2.3 LABORATORY TESTING**

Selected samples obtained from our subsurface exploration were tested in our soil laboratory. Tests consisted of in-situ moisture content and dry density, maximum dry density and optimum moisture content, expansion index, soluble sulfate content, direct shear, consolidation/collapse potential, grain-size distribution analysis, Atterberg limits, passing 200, and corrosivity testing (pH, chloride, and resistivity). A description of laboratory test criteria and test results are presented in Appendix B.

## **3.0 SUBSURFACE CONDITIONS**

### **3.1 SOIL CONDITIONS**

Descriptions of the earth materials encountered during our investigation are summarized below and are presented in detail on the Exploration Logs presented in Appendix A.

Soil materials encountered on site generally consisted of alluvial deposits to the maximum depth explored (51.5 feet). Fills up to about 2 feet thick appear to be present on site due to raising the site as part of the development for the current church development. Old asphalt was encountered at 2 feet within B-2 and this boring was located near the old driveway to the original farmhouse.

Review of the Diblee Map for the Whittier and La Habra Quadrangles shows the site is designated as Quaternary Alluvium and falls within a flood plain and would have been subjected to seasonally-deposited materials associated with heavy rains from nearby mountain ranges to the north. As such, the alluvium was interbedded and typically consisted of silty sands, sands with silt, gravelly sands, and silty clays to the maximum depth explored (51.5 feet).

### **3.2 GROUNDWATER**

Groundwater was not encountered during this firm's subsurface exploration to a depth of 51.5 feet. The CDMG Special Report 037 suggests that historic high groundwater for the subject site is 10 feet. However, review of the Los Angeles County groundwater level data for the nearby well 1617N indicates that groundwater for the area has been below 60 feet since at least 1949. Well readings have been recorded from 10/11/1949 to 11/30/2018, and during this period, groundwater has fluctuated, but remained at least 60 feet below ground surface. The last recorded reading at the time of this report was March 28, 2012 and indicated a depth of 114 feet.

### **3.3 FAULTING**

Based on our review of the referenced publications and seismic data, no active faults are known to project through or immediately adjacent the subject sites and the sites do not lie within an "Earthquake Fault Zone" as defined by the State of California in Earthquake Fault Zoning Act. Table 3.1 presents a summary of known seismically active faults within 10 miles of the sites based on the 2008 USGS National Seismic Hazard Maps.

## **4.0 ANALYSES**

### **4.1 SEISMICITY**

2019 CBC requires seismic parameters in accordance with ASCE 7-16. Unless noted otherwise, all section numbers cited in the following refer to the sections in ASCE 7-16.

Per Section 20.3 the project site was designated as Site Class D. We used the OSHPD seismic hazard tool to obtain the basic mapped acceleration parameters, including short periods ( $S_s$ ) and 1-second period ( $S_1$ )  $MCE_R$  Spectral Response Accelerations. Section 11.4.8 requires site-specific ground hazard analysis for structures on Site Class E with  $S_s$  greater than or equal to 1.0 or Site Class D or E with  $S_1$  greater than or equal to 0.2. Based on the mapped values of  $S_s$  and  $S_1$  the project site falls within this category, requiring site specific hazard analysis in accordance with Section 21.2.

**TABLE 3.1**  
**Summary of Faults**

| Name                                 | Dist.<br>(miles) | Slip Rate<br>(mm/yr.) | Preferred<br>Dip<br>(degrees) | Slip Sense  | Rupture<br>Top<br>(km) | Fault<br>Length<br>(km) |
|--------------------------------------|------------------|-----------------------|-------------------------------|-------------|------------------------|-------------------------|
| Puente Hills (Santa Fe Springs)      | 1.39             | 0.7                   | 29                            | thrust      | 2.8                    | 11                      |
| Puente Hills (LA)                    | 3.38             | 0.7                   | 27                            | thrust      | 2.1                    | 22                      |
| Puente Hills (Coyote Hills)          | 3.71             | 0.7                   | 26                            | thrust      | 2.8                    | 17                      |
| Elsinore;W                           | 4.54             | 2.5                   | 75                            | strike slip | 0                      | 46                      |
| Elsinore;W+GI+T+J                    | 4.54             | n/a                   | 84                            | strike slip | 0                      | 199                     |
| Elsinore;W+GI+T+J+CM                 | 4.54             | n/a                   | 84                            | strike slip | 0                      | 241                     |
| Elsinore;W+GI                        | 4.54             | n/a                   | 81                            | strike slip | 0                      | 83                      |
| Elsinore;W+GI+T                      | 4.54             | n/a                   | 84                            | strike slip | 0                      | 124                     |
| Elysian Park (Upper)                 | 9.06             | 1.3                   | 50                            | reverse     | 3                      | 20                      |
| Newport Inglewood Connected<br>alt 2 | 9.67             | 1.3                   | 90                            | strike slip | 0                      | 208                     |

However, “A ground motion hazard analysis is not required for structures where: Structures on Site Class D sites with  $S_1$  greater than or equal to 0.2, provided the value of the seismic response coefficient  $C_s$  is determined by Eq. (12.8-2) for values of  $T \leq 1.5T_s$  and taken as equal to 1.5 times the value computed in accordance with either Eq. (12.8-3) for  $T_L \geq T > 1.5T_s$  or Eq. (12.8-4) for  $T > T_L$ .” Assuming this exception is met for this project, a ground motion hazard analysis is not required and mapped seismic values can be used. Should this exception not be met, a ground motion hazard analysis is required to determine the Design response spectra for the proposed structures at this site. Both mapped and site specific seismic design parameters are provided in this report as presented in Section 6.2. Details of a ground motion hazard analysis are explained below.

According to Section 21.2.3 (Supplement 1), the site-specific Risk Targeted Maximum Considered Earthquake (MCE<sub>R</sub>) spectral response acceleration at any period is the lesser of the probabilistic and the deterministic response accelerations, subject to the exception specified in the same section. The probabilistic response spectrum was developed using the computer program OpenSHA (Field et al., 2013), which implements Method 1 as described on Section 21.2.1.1. Fault Models 3.1 and 3.2 from the Third Uniform California Earthquake Rupture Forecast (UCERF3) were used as the earthquake rupture forecast models for the PSHA. In addition to known fault sources, background seismicity was also included in the PSHA. The ground motion Prediction Equations (GMPEs) selected for use in this analysis are those developed for the Pacific Earthquake Engineering Research Center (PEER) Next Generation Attenuation (NGA) West 2 project. Four GMPEs - Abrahamson et al. (2014), Boore et al. (2014), Campbell and Bozorgnia (2014), and Chiou and Youngs (2014) were used to perform the analysis.

In accordance with Section 21.2.2 (Supplement 1), the deterministic spectral response acceleration at each period was calculated as the 84<sup>th</sup> percentile, 5% damped response acceleration, using NGA-West2 GMPE Worksheet. For this, the information from at least three causative faults with the greatest contribution per deaggregation analysis were used and the larger acceleration spectrum among these was selected as the deterministic response spectrum. The deterministic spectrum was adjusted per requirements in Section 21.2.2 (Supplement 1) where applicable. Both probabilistic and deterministic spectra were subjected to the maximum direction scale factors specified in Section 21.2 to produce the maximum acceleration spectra.

Design response spectrum was developed by subjecting the site-specific  $MCE_R$  response spectrum to the provisions outlined in Section 21.3. This process included comparison with 80% code-based design spectrum determined in accordance with Section 11.4.6. The short period and long period site coefficient ( $F_a$  and  $F_v$ , respectively) were determined per Section 21.3 in conjunction with Table 11.4-1. Site specific design acceleration parameters ( $S_{MS}$ ,  $S_{M1}$ ,  $S_{DS}$ , and  $S_{D1}$ ) were calculated according to Section 21.4.

Per Section 11.2 (definitions on Page 79 of ASCE7-16) for evaluation of liquefaction, lateral spreading, seismic settlements, and other soil-related issues, Maximum Considered Earthquake Geometric Mean ( $MCE_G$ ) peak ground acceleration  $PGAM$  shall be used. The site-specific  $PGAM$  is calculated per Section 21.5.3, as the lesser of the probabilistic  $PGAM$  (Section 21.5.1) and deterministic  $PGAM$  (Section 21.5.2), but no less than 80% site modified peak ground acceleration,  $PGAM$ , obtained from OSHPD seismic hazard tool. From our analyses, we obtain a  $PGAM$  of 0.805g.

## 4.2 STATIC SETTLEMENT

Laboratory testing of alluvial materials suggests site soils are somewhat overconsolidated. The over consolidation ratio (OCR) was interpreted to range from about 3 to 6 in the upper 10 feet. Two analyses were performed to evaluate settlement of the structures. The first model was based on a conventional shallow strip footing 1.2 feet wide and a wall load of 3,000 psf. This model yielded a total settlement of 0.9 inches. The second model was based on a post-tension foundation assuming an effective width of 3 feet and a wall load of 3, 000 plf. This model yielded a total settlement of 0.6 inches. Both analysis assume the upper 2 feet of existing fill soils would be removed and replaced as compacted fill.

## 4.3 LIQUEFACTION

Engineering research of soil liquefaction potential (Youd, et al., 2001) indicates that generally three basic factors must exist concurrently in order for liquefaction to occur. These factors include:

- A source of ground shaking, such as an earthquake, capable of generating soil mass distortions.
- A relatively loose silty and/or sandy soil.
- A relative shallow groundwater table (within approximately 50 feet below ground surface) or completely saturated soil conditions that will allow positive pore pressure generation.

The site is located within a State-designated zone of potentially liquefiable soils. However,

groundwater was not encountered to the maximum depth of 51.5 feet drilled during out site exploration. Furthermore, groundwater well measurements by the Los Angeles County in the vicinity of the project site since the 1940's indicates that groundwater has been deeper than 50 feet for more than 70 years. Therefore, historical high groundwater is anticipated to be deeper than 50 feet below the ground surface. As a result, the potential for liquefaction to occur beneath the site is considered very low.

## **5.0 CONCLUSIONS**

### **5.1 FEASIBILITY OF PROPOSED DEVELOPMENT**

From a geotechnical point of view, the proposed site development is considered feasible provided the recommendations presented in this report are incorporated into the design and construction of the project. Furthermore, it is also our opinion that the proposed development will not adversely impact the stability of adjoining properties. Key issues that could have significant fiscal impacts on the geotechnical aspects of the proposed site development are discussed in the following sections of this report.

### **5.2 GEOLOGIC HAZARDS**

#### **5.2.1 Ground Rupture**

No known active faults are known to project through the subject sites nor do the sites lie within the boundaries of an "Earthquake Fault Zone" as defined by the State of California in the Alquist-Priolo Earthquake Fault Zoning Act. The closest known active fault is the Puente Hills (Santa Fe Springs) fault located approximately 1.39 miles away. Therefore, potential for ground rupture due to an earthquake beneath the sites is considered low.

#### **5.2.2 Ground Shaking**

The site is situated in a seismically active area that has historically been affected by generally moderate to occasionally high levels of ground motion. The site lies in relatively close proximity to several seismically active faults; therefore, during the life of the proposed improvements, the property will probably experience similar moderate to occasionally high ground shaking from these fault zones, as well as some background shaking from other seismically active areas of the Southern California region. Design and construction in accordance with the current California Building Code (CBC) requirements is anticipated to address the issues related to potential ground shaking.

#### **5.2.3 Landsliding**

Geologic hazards associated with landsliding are not anticipated at the site since the site is relatively level.

#### **5.2.4 Liquefaction**

Engineering research of soil liquefaction potential (Youd, et al., 2001) indicates that generally three basic factors must exist concurrently in order for liquefaction to occur. These factors include:

- A source of ground shaking, such as an earthquake, capable of generating soil mass distortions.
- A relatively loose silty and/or sandy soil.

- A relative shallow groundwater table (within approximately 50 feet below ground surface) or completely saturated soil conditions that will allow positive pore pressure generation.

The depth to historical groundwater measurements by the Los Angeles County in the vicinity of the site is greater than 50 feet below the ground surface (well 1617N). As such, the potential for liquefaction at the site is considered low.

### **5.3 STATIC SETTLEMENT**

Analyses were performed to evaluate potential for static settlement of the underlying alluvium. Our analyses were based on the results of consolidation tests performed on selected samples from our borings as well as the correlations between deformation properties (elastic modulus) and the onsite soil properties as represented by standard penetration test blow counts corrected for hammer efficiency ( $N_{60}$ ).

Provided site grading is performed in accordance with the recommendations provided herein and based on the anticipated relatively light foundation loads, total and differential static settlement is not anticipated to exceed 1 inch and ½-inch over 30 feet, respectively, for the proposed residential structure. The estimated magnitudes of static settlements are considered within tolerable limits for the proposed structure.

### **5.4 EXCAVATION AND MATERIAL CHARACTERISTICS**

Onsite earth materials are anticipated to be relatively easy to excavate with conventional heavy earthmoving equipment. The site earth materials are generally considered suitable for reuse as fill provided they are cleared on deleterious debris and oversized rocks (greater than 4 inches in greatest dimension). If encountered, portions of concrete debris and asphalt can likely be reduced in size (4" minus) and incorporated within fill soils during earthwork operations.

Temporary construction slopes will be required to complete removal of unsuitable soils and for construction of underground utilities. Such excavations will require laybacks where they are surcharged or where they exceed 4 feet in height.

The site was previously developed with a farm house and other out structures. Past land use may have constructed an onsite septic system. If onsite disposal systems, clarifiers, and other underground improvements are present beneath the site, these improvements will require proper abandonment or removal per the City guidelines and recommendations of the geotechnical consultant during site grading.

### **5.5 SHRINKAGE AND SUBSIDENCE**

Volumetric changes in earth quantities will occur when excavated onsite soil materials are replaced as properly compacted fill. We estimate that the existing surficial soils will shrink approximately 21 to 27 percent when removed and replaced as compacted fill. Subsidence due to reprocessing of removal bottoms is anticipated to be on the order of 0.15 ft.. The estimates of shrinkage and subsidence are intended as an aid for project engineers in determining earthwork quantities. However, these estimates

should be used with some caution since they are not absolute values. Contingencies should be made for balancing earthwork quantities based on actual shrinkage and subsidence that occurs during the grading process.

## **5.6 SOIL EXPANSION**

Based on our laboratory test results and the USCS visual manual classification, the near-surface soils are generally anticipated to possess a **Low** expansion potential. Additional testing for soil expansion will be required prior to construction of foundations and other concrete work to confirm these conditions.

## **6.0 RECOMMENDATIONS**

### **6.1 EARTHWORK**

#### **6.1.1 General Earthwork and Grading Specifications**

All earthwork and grading should be performed in accordance with applicable requirements of Cal/OSHA, applicable specifications of the Grading Codes of the City of Santa Fe Springs, California in addition to the recommendations presented herein.

#### **6.1.2 Pre-Grade Meeting and Geotechnical Observation**

Prior to commencement of grading, we recommend a meeting be held between the developer, City Inspector, grading contractor, civil engineer, and geotechnical consultant to discuss the proposed grading and construction logistics. We also recommend a geotechnical consultant be retained to provide soil engineering and engineering geologic services during site grading and foundation construction. This is to observe compliance with the design specifications and recommendations and to allow for design changes in the event that subsurface conditions differ from those anticipated. If conditions are encountered that appear to be different than those indicated in this report, the project geotechnical consultant should be notified immediately. Design and construction revisions may be required.

#### **6.1.3 Site Clearing**

Areas to be graded should be cleared of vegetation, existing asphalt, underground improvements to be abandoned and deleterious materials. Existing underground utility lines within the project area that will be protected in place and that fall within a 1 to 1 (H:V) plane projected down from the edges of footings may be subject to surcharge loads. Under such conditions, this office should be made aware of these conditions for evaluation of potential surcharging. Supplemental recommendations may be required to protect such improvements in place.

The project geotechnical consultant should be notified at the appropriate times to provide observation services during clearing operations to verify compliance with the above recommendations. Voids created by clearing and excavation should be left open for observation by the geotechnical consultant. Should any unusual soil conditions or subsurface structures be encountered during site clearing or grading that are not described or anticipated herein, these conditions should be brought to the immediate attention of the project geotechnical consultant for corrective recommendations as needed.

Temporary construction equipment (office trailers, power poles, etc.) should be positioned to allow adequate room for clearing and recommended ground preparation to be performed for proposed structures, pavements, and hardscapes.

#### **6.1.4 Ground Preparation**

In general, the artificial fill is considered unsuitable for support of the proposed development. Artificial fill is estimated to typically be 2 feet thick. These materials should be removed from within the limits of residential structures and retaining walls. The removals should extend a minimum distance of 5 feet beyond the foundations. Artificial fill should also be removed to a minimum depth of 1 foot below subgrade for pavement and screen walls. Such removals should extend at least 2 feet beyond the edges of pavement and footings. In addition to the general removal of existing fills, the alluvial soils should be over-excavated to a minimum depth of 1 foot below the bottoms of footings for the residential buildings.

The actual depth of removal should be determined by the geotechnical consultant during grading. All removal excavations should be evaluated by the geotechnical consultant during grading to confirm the exposed conditions are as anticipated and to provide supplemental recommendations if required.

The grading contractor should take appropriate measures when excavating adjacent any existing improvements to remain in-place to avoid disturbing or compromising support of existing structures.

Following removals and overexcavation, the exposed grade should first be scarified to a depth of 6 inches, brought to at least 110 percent of the optimum moisture content, and then compacted to at least 90 percent of the laboratory standard (ASTM D 1557).

#### **6.1.5 Fill Placement**

Materials excavated from the site may be reused as fill provided they are free of deleterious materials and particles greater than 4 inches in maximum dimension (oversized materials). Asphaltic and concrete debris generated during site demolition or encountered within the existing fill can be incorporated within new fill soils during earthwork operations provided they are reduced to no more than 4 inches in maximum dimension. Such materials should be mixed thoroughly with fill soils to prevent nesting. All fill should be placed in lifts no greater than 8 inches in loose thickness, moisture conditioned to at least the optimum moisture content, then compacted in place to at least 90 percent of the laboratory standard. Each lift should be treated in a similar manner. Subsequent lifts should not be placed until the project geotechnical consultant has approved the preceding lift.

#### **6.1.6 Import Materials**

If import materials are required to achieve the proposed finish grades, the proposed import soils should have an Expansion Index (EI, ASTM D 4829) less than 21 and possess negligible soluble sulfate concentrations. Import sources should be indicated to the geotechnical consultant prior to hauling the materials to the site so that appropriate testing and evaluation of the fill materials can be performed in advance.

### 6.1.7 Temporary Excavations

Temporary construction slopes in site materials that are not surcharged may be cut vertically up to a height of 4 feet. Temporary excavations greater than 4 feet but no greater than 10 feet in height that are not surcharged should be laid back at a maximum gradient of 1:1 (H:V) or properly shored.

Excavations should not be left open for prolonged periods of time. The project geotechnical consultant should observe all temporary cuts to confirm anticipated conditions and to provide alternate recommendations if conditions dictate. All excavations should conform to the requirements of Cal/OSHA. Based on the anticipated removal depths discussed herein and the current minimum setback of 15 feet for buildings from property lines, we anticipate that removals can be accomplished with open cuts. However, if deeper removals are required during grading or final building locations are closer to property lines and thereby result in insufficient room for recommended lay back cuts, shoring or slot cutting methods may be required. Additional recommendations for such conditions can be provided after reviewing final site plans and during grading.

## 6.2 SEISMIC DESIGN PARAMETERS

### 6.2.1 Mapped Seismic Design Parameters

For design of the project in accordance with Chapter 16 of the 2019 CBC, the mapped seismic parameters may be taken as presented in the tables below.

**TABLE 6.1**  
**2019 CBC Mapped Seismic Design Parameters**

| Parameter                                                                   | Value |
|-----------------------------------------------------------------------------|-------|
| Site Class                                                                  | D     |
| Mapped $MCE_R$ Spectral Response Acceleration, short periods, $S_S$         | 1.707 |
| Mapped $MCE_R$ Spectral Response Acceleration, at 1-sec. period, $S_1$      | 0.611 |
| Site Coefficient, $F_a$                                                     | 1.0   |
| Site Coefficient, $F_v$                                                     | 1.7*  |
| Adjusted $MCE_R$ Spectral Response Acceleration, short periods, $S_{MS}$    | 1.707 |
| Adjusted $MCE_R$ Spectral Response Acceleration, at 1-sec. period, $S_{M1}$ | 1.039 |
| Design Spectral Response Acceleration, short periods, $S_{DS}$              | 1.138 |
| Design Spectral Response Acceleration, at 1-sec. period, $S_{D1}$           | 0.692 |
| Long-Period Transition Period, $T_L$ (sec.)                                 | 8     |
| Seismic Design Category for Risk Categories I-IV                            | II    |

$MCE_R$  = Risk-Targeted Maximum Considered Earthquake

\*According to Section 11.4.8 in ASCE 7-16, “a ground motion hazard analysis shall be performed in accordance with Section 21.2 for the following structures on Site Class D and E sites with  $S_1$  greater than or equal to 0.2.” However, “A ground motion hazard analysis is not required for structures where: Structures on Site Class D sites with  $S_1$  greater than or equal to 0.2, provided the value of the seismic response coefficient  $C_s$  is determined by Eq. (12.8-2) for values of  $T \leq 1.5T_s$  and taken as equal to 1.5

times the value computed in accordance with either Eq. (12.8-3) for  $T_L \geq T > 1.5T_s$  or Eq. (12.8-4) for  $T > T_L$ .” The  $F_v$  value of 1.7 above from Table 11.4-2 assumes that this exception is met and that a ground motion hazard analysis is not required. Should this exception not be met, the site-specific seismic design parameters provided in the next section should be used.

### 6.2.2 Site-Specific Seismic Design Parameters

In addition to the Code Spectra parameters presented in Table 6.1, we have performed a site-specific ground motion hazard analysis in accordance with Chapter 21 of ASCE 7-16 to obtain site-specific seismic design acceleration parameters, the risk-targeted maximum considered earthquake response spectrum, and the design earthquake response spectrum. The site-specific seismic design parameters are presented below.

**TABLE 6.2**  
**2019 CBC Site Specific Seismic Design Parameters**

| Parameter                                                               | Value |
|-------------------------------------------------------------------------|-------|
| Site Class                                                              | D     |
| Mapped MCE Spectral Response Acceleration, short periods, $S_s$         | 1.707 |
| Mapped MCE Spectral Response Acceleration, at 1-sec. period, $S_1$      | 0.611 |
| Site Coefficient, $F_a$                                                 | 1.0   |
| Site Coefficient, $F_v$                                                 | 2.5   |
| Adjusted MCE Spectral Response Acceleration, short periods, $S_{MS}$    | 1.898 |
| Adjusted MCE Spectral Response Acceleration, at 1-sec. period, $S_{M1}$ | 1.222 |
| Design Spectral Response Acceleration, short periods, $S_{DS}$          | 1.266 |
| Design Spectral Response Acceleration, at 1-sec. period, $S_{D1}$       | 0.815 |

MCE = Maximum Considered Earthquake

## 6.3 CONVENTIONAL FOUNDATION DESIGN

### 6.3.1 General

The following design parameters are provided to assist the project structural engineer to design foundations for structures at the site. These design parameters are based on typical site materials encountered during subsurface exploration and are provided for preliminary design and estimating purposes. The project geotechnical consultant should provide final design parameters following observation and testing of site materials during grading. Depending on actual materials encountered during site grading, the design parameters presented herein may require modification.

### 6.3.2 Soil Expansion

The recommendations presented herein are based on soils with a **Low** expansion potential. Following site grading, additional testing of site soils should be performed by the project geotechnical consultant to confirm the basis of these recommendations. If site soils with higher expansion potentials are encountered or imported to the site, the recommendations contained herein may require modification.

### **6.3.3 Static and Seismic Settlement**

Based on anticipated foundation loads and provided that the recommendations for ground preparation in this report are followed, total and differential static settlement are anticipated to be less than 1 inch and ½ inch over 30 feet, respectively. These values are considered within tolerable limits of proposed structures and site improvements. Design of the structures should consider these maximum anticipated settlements.

### **6.3.4 Allowable Bearing Value**

Foundations may utilize a bearing value of 2,000 pounds per square foot (psf) for continuous and pad footings a minimum width of 12 inches and founded at a minimum depth of 12 inches below the lowest adjacent grade. This value may be increased by 300 psf and 800 psf for each additional foot in width and depth, respectively, up to a maximum value of 3,500 psf. Recommended allowable bearing values include both dead and live loads, and may be increased by one-third for wind and seismic forces.

### **6.3.5 Lateral Resistance**

A passive earth pressure of 220 pounds per square foot per foot of depth (psf/ft) up to a maximum value of 1,000 pounds per square foot (psf) may be used to determine lateral bearing for footings. This value may be increased by one-third when designing for wind and seismic forces. A coefficient of friction of 0.35 times the dead load forces may also be used between concrete and the supporting soils to determine lateral sliding resistance. No increase in the coefficient of friction should be used when designing for wind and seismic forces.

The above values are based on footings placed directly against compacted fill or competent native soils. In the case where footing sides are formed, all backfill against the footings should be compacted to at least 90 percent of the laboratory standard.

### **6.3.6 Footing and Slab on Grade**

Exterior and interior building footings should be founded at a minimum depth of 12 inches and 12 inches, respectively, below the lowest adjacent grade. All continuous footings should be reinforced with a minimum of two No. 4 bars, one top and one bottom. The structural engineer may require different reinforcement and should dictate if greater than the recommendations provided herein.

Interior isolated pad footings should be a minimum of 24 inches square and founded at minimum depths of 12 inches below the lowest adjacent final grade. Exterior isolated pad footings intended for support of patio covers or similar construction should be a minimum of 24 inches square and founded at a minimum depth of 12 inches below the lowest adjacent final grade.

Interior concrete slabs constructed on grade should be a minimum 4 inches thick and should be reinforced with No. 3 bars spaced 18 inches on center, each way. Care should be taken to ensure the placement of reinforcement at mid-slab height. The structural engineer may recommend a greater slab thickness and reinforcement based on proposed use and loading conditions and such recommendations should govern if greater than the recommendations presented herein.

Concrete floor slabs in areas to receive carpet, tile, or other moisture sensitive coverings should be underlain with a minimum of 10-mil moisture vapor retarder conforming to ASTM E 1745-11, Class

A. The membrane should be properly lapped, sealed, and underlain with at least 2 inches of sand having a SE no less than 30. One inch of this sand may be placed over the membrane to aid in the curing of the concrete. This vapor retarder system is anticipated to be suitable for most flooring finishes that can accommodate some vapor emissions. However, this system may emit more than 4 pounds of water per 1000 sq. ft. and therefore, may not be suitable for all flooring finishes. Additional steps should be taken if such vapor emission levels are too high for anticipated flooring finishes.

Special consideration should be given to slabs in areas to receive ceramic tile or other rigid, crack-sensitive floor coverings. Design and construction of such areas should mitigate hairline cracking as recommended by the structural engineer.

For design of the slab in accordance with the WRI, an effective Plastic Index (PI) of 19 should be used in design. This value includes factors for ground slope and overconsolidation. The beams should be reinforced with a minimum of one No. 4 bar near the bottom and one near the top. Beams should be spaced at a maximum spacing of 21 feet in each direction. From our preliminary calculations, beams spaced at 20 feet on center and having a depth of 12 inches below the bottom of slab meet the minimum requirements of the WRI.

### **6.3.7 Post-Tensioned Slab on Grade**

As an alternative, a post-tension foundation system can be used for support of the proposed buildings. Perimeter edge beams for the post-tensioned slabs should have a minimum effective width of 12 inches and be founded at a minimum depth of 12 inches below the lowest adjacent final ground surface. Where a post-tensioned mat is utilized, the exterior edge of the mat should be embedded at least 8 inches below the lowest adjacent grade. The thickness of the floor slab/mat should be determined by the project structural engineer; however, we recommend a minimum slab thickness of 4 inches.

Concrete floor slabs in areas to receive carpet, tile, or other moisture sensitive coverings should be underlain with a minimum of 10-mil moisture vapor retarder conforming to ASTM E 1745, Class A. The membrane should be properly lapped, sealed, and underlain within a layer of sand at least 4 inches thick. One inch of sand may be placed over the membrane to aid in the curing of the concrete. The sand should have a SE no less than 30. This vapor retarder system is anticipated to be suitable for most flooring finishes that can accommodate some vapor emissions. However, this system may emit more than 4 pounds of water per 1000 sq. ft. and therefore, may not be suitable for all flooring finishes. Additional steps should be taken if such vapor emission levels are too high for anticipated flooring finishes. Where a mat is utilized, the sand may be reduced to 1 inch provided the mat is at least 8 inches thick.

Prior to placing concrete, subgrade soils below slab-on-grade/mat areas should be thoroughly moistened to provide moisture contents that are at least 110 percent of the optimum moisture content to a depth of 12 inches.

Based on the guidelines provided in the “Design of Post-Tensioned Slabs-on-Ground” 3rd Edition by Post-Tensioning Institute, the  $e_m$  and  $y_m$  values are summarized in Table 6.2 below.

**TABLE 6.2**  
**PTI Design Parameters**

| Parameter                                      | Value        |
|------------------------------------------------|--------------|
| Edge Lift Moisture Variation Distance, $e_m$   | 3.9 feet     |
| Edge Lift, $y_m$                               | 0.970 inches |
| Center Lift Moisture Variation Distance, $e_m$ | 7.0 feet     |
| Center Lift, $y_m$                             | 0.613 inches |

### 6.3.8 Foundation Observations

Foundation excavation should be observed by the project geotechnical consultant to verify that they have been excavated into competent bearing soils and to the minimum embedment recommended above. These observations should be performed prior to placement of forms or reinforcement. The excavations should be trimmed neat, level and square. Loose, sloughed or moisture-softened materials and debris should be removed prior to placing concrete.

## 6.4 RETAINING AND SCREENING WALLS

### 6.4.1 General

The following preliminary design and construction recommendations are provided for general retaining and screen walls supported by engineered compacted fill or competent native soils. Final wall designs specific to the site development should be provided for review once completed. The structural engineer and architect should provide appropriate recommendations for sealing at all joints and applying moisture-proofing material on the back of the walls.

### 6.4.2 Allowable Bearing Value and Lateral Resistance

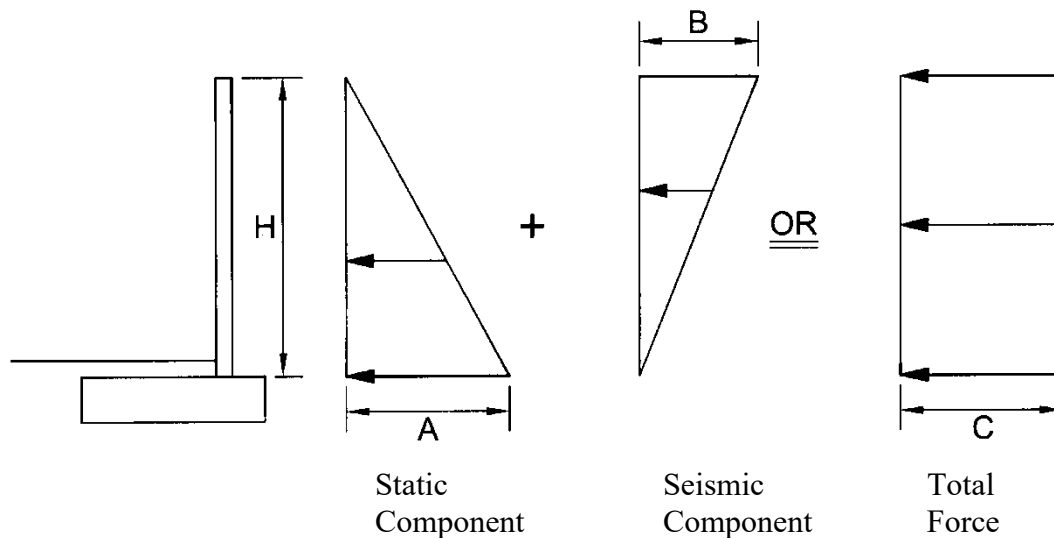
Design of retaining and screen walls may utilize the bearing and lateral resistance values provided in Section 6.4.4 and **Error! Reference source not found..** The passive earth pressure for walls along property lines, where lateral removals are likely restricted should be reduced by 50%.

### 6.4.3 Active Earth Pressures

Static and seismic earth pressures for level and 2:1 (H:V) backfill conditions are provided in Table 6.3. Seismic earth pressures provided herein are based on the method provided by Seed & Whitman (1970) using a peak ground acceleration (PGA) of 0.45 g for 10% probability of exceedance in 50 years. As indicated in Section 1803.5.12 of the 2019 CBC, retaining walls supporting 6 feet of backfill or less are not required to be designed for seismic earth pressures. The values provided in the following table do not consider hydrostatic pressure. Retaining walls should also be designed to support adjacent surcharge loads imposed by other nearby footings or traffic loads in addition to the earth pressure.

**TABLE 6.3**

**SEISMIC EARTH PRESSURES**  
**Pressure Diagram**



**Pressure Values**  
**Walls Up To 10 Feet High**

| Value    | Backfill Condition |             |
|----------|--------------------|-------------|
|          | Level              | 2H:1V Slope |
| <b>A</b> | 39H                | 72H         |
| <b>B</b> | 14H                | 14H         |
| <b>C</b> | 27H                | 43H         |

Note:  
 H is in feet and resulting pressure is in psf. Design may utilize either the sum of the static component and the seismic component force diagrams or the total force diagram above. SEAOSC has suggested using a load factor of 1.7 for the static component and 1.0 for the seismic component. The actual load factors should be determined by the structural engineer.

#### 6.4.4 Drainage and Moisture-Proofing

Retaining walls should be constructed with a perforated pipe and gravel subdrain to prevent entrapment of water in the backfill. The perforated pipe should consist of 4-inch-diameter, ABS SDR-35 or PVC Schedule 40 with the perforations laid down. The pipe should be embedded in  $\frac{3}{4}$ - to  $1\frac{1}{2}$ -inch open-graded gravel wrapped in filter fabric. The gravel should be at least one foot wide and extend at least one foot up the wall above the footing and drainage outlet. Drainage gravel and piping should not be placed below outlets and weepholes. Filter fabric should consist of Mirafi 140N, or equal. Outlet pipes should be directed to positive drainage devices.

The use of weepholes may be considered in locations where aesthetic issues from potential nuisance water are not a concern. Weepholes should be 2 inches in diameter and provided at least every 6 feet on center. Where weepholes are used, perforated pipe may be omitted from the gravel subdrain.

Retaining walls supporting backfill should also be coated with a moisture-proofing compound or covered with such material to inhibit infiltration of moisture through the walls. Moisture-proofing material should cover any portion of the back of wall that will be in contact with soil and should lap over and onto the top of footing. A drainage panel should be provided between the soil backfill and water proofing. The panel should extend from the top of the backdrain gravel up to within 12 inches of finish grade. The top of footing should be finished smooth with a trowel to inhibit the infiltration of water through the wall. The project structural engineer should provide specific recommendations for moisture-proofing, water stops, and joint details.

#### **6.4.5 Foundation Observations**

Footing excavations should be observed by the project geotechnical consultant to verify that they have been excavated into competent bearing soils and to the minimum embedment recommended herein. These observations should be performed prior to placement of forms or reinforcement. The excavations should be trimmed neat, level and square. Loose, sloughed or moisture-softened materials and debris should be removed prior to placing concrete.

### **6.5 EXTERIOR FLATWORK**

Exterior flatwork should be a minimum 4 inches thick. Cold joints or saw cuts should be provided at least every 7 feet in each direction. Flatwork having a minimum dimension more than 7 feet should be reinforced with No. 3 bars spaced 18 inches center to center each way or 6-inch by 6-inch, W4 by W4 welded wire mesh. Special jointing detail should be provided in areas of block-outs, notches, or other irregularities to avoid cracking at points of high stress. Subgrade soils below flatwork should be thoroughly moistened to at least 120 percent of the optimum moisture content to a depth of 12 inches. Moistening should be accomplished by lightly spraying the area over a period of a few days just prior to pouring concrete. The geotechnical consultant should observe and verify the density and moisture content of subgrade soils prior to pouring concrete to ensure that the required compaction and pre-moistening recommendations have been met.

Drainage from flatwork areas should be directed to local area drains and/or other appropriate collection devices designed to carry runoff water to the street or other approved drainage structures. The concrete flatwork should also be sloped at a minimum gradient of 1 percent away from building foundations and retaining walls.

### **6.6 CONCRETE MIX DESIGN**

Laboratory testing of near-surface soils for soluble sulfate content indicates soluble sulfate concentration of 0.001%. We recommend following the procedures provided in ACI 318, Section 4.3, Table 4.3.1 for **negligible** sulfate exposure. Upon completion of rough grading, an evaluation of as-graded conditions and further laboratory testing should be completed for the site to confirm or modify the recommendations provided in this section.

## 6.7 CORROSION

Results of preliminary testing of soils for pH, chloride, and minimum resistivity indicate the site is potentially **Corrosive** to metals that are in contact or close proximity to onsite soils. As such, specific recommendations should be obtained from a corrosion specialist if construction will include metals that will be near or in direct contact with site soils.

## 6.8 PRELIMINARY PAVEMENT DESIGN

### 6.8.1 Preliminary Pavement Structural Sections

Based on the soil conditions present at the site and an estimated traffic index, preliminary pavement sections are provided in the table below. An assumed “R-value” of 30 was used for the near-surface soil in this preliminary pavement design. The sections provided below are for planning purposes only and should be re-evaluated subsequent to site grading. Final pavement sections should be based on actual R-value testing of in-place soils and analysis of anticipated traffic.

**TABLE 6.4**  
**PRELIMINARY PAVEMENT STRUCTURAL SECTIONS**

| Location             | Traffic Index | AC (inches) | Concrete Pavers (mm) | PCC (inches) | AB (inches) |
|----------------------|---------------|-------------|----------------------|--------------|-------------|
| Entry Way and Drives | 5.5           | 3.0         | --                   | --           | 8.0         |
|                      |               | 4.0         |                      |              | 5.0         |
|                      |               | --          | --                   | 6.5          | --          |
|                      |               | --          | 80.0                 | --           | 8.0         |
| Parking Stalls       | --            | 3.0         | --                   | --           | 5.0         |

### 6.8.2 Subgrade Preparation

Prior to placement of paving elements, subgrade soils should be scarified 6 inches, moisture-conditioned to above the optimum moisture content then compacted to at least 90 percent of the maximum dry density determined in accordance with ASTM D1557. Areas observed to pump or yield under vehicle traffic should be removed and replaced with firm and unyielding engineered compacted soil or aggregate base materials.

### 6.8.3 Aggregate Base

Aggregate base materials should be Crushed Aggregate Base or Crushed Miscellaneous Base conforming to Section 200-2 of the Standard Specification for Public Works Construction (Greenbook) or Class 2 Aggregate Base conforming to the Caltrans' Standard Specifications. The materials should be moisture conditioned to slightly over the optimum moisture content then compacted to at least 95 percent of ASTM D 1557.

#### 6.8.4 Asphaltic Concrete

Paving asphalt should be PG 64-10 conforming to the requirements of Section 203-1 of the Greenbook. Asphalt concrete materials should conform to Section 203-6 and construction should conform to Section 302 of the Greenbook.

#### 6.8.5 Concrete Paver

Concrete pavers should conform to the requirements of ASTM C 936. Construction of the pavers, including bedding sand, should follow manufacturer's specifications. Typical thickness of bedding sand is about 1 inch. The gradation of bedding sand should meet the requirement in Table 6.5.

**TABLE 6.5**  
**Gradation for Sand Bedding**

| Sieve Size      | Percent Passing |
|-----------------|-----------------|
| $\frac{3}{8}$ " | 100             |
| <b>No. 4</b>    | 95 - 100        |
| <b>No. 8</b>    | 80 - 100        |
| <b>No. 16</b>   | 50 - 85         |
| <b>No. 30</b>   | 25 - 60         |
| <b>No. 50</b>   | 5 - 30          |
| <b>No. 100</b>  | 0 - 10          |
| <b>No. 200</b>  | 0 - 1           |

#### 6.8.6 Portland Cement Concrete

Portland cement concrete used to construct concrete paving should conform to Section 201 of the Greenbook and should have a minimum compressive strength of 3,250 pounds per square inch (psi) at 28 days. Reinforcement and jointing of concrete pavement sections should be designed according to the minimum recommendations provided by the Portland Cement Association (PCA). For rigid pavement, transverse and longitudinal contraction joints should be provided at spacing no greater than 15 feet. Score joints may be constructed by saw cutting to a depth of  $\frac{1}{4}$  of the slab thickness. Expansion/cold joints may be used in lieu of score joints. Such joints should be properly sealed. Where traffic will traverse over cold joints without keyways or dowels or edges of concrete paving, the edges should be thickened by 20% of the design thickness toward the edge over a horizontal distance of 5 feet.

### 6.9 POST GRADING CONSIDERATIONS

#### 6.9.1 Site Drainage and Irrigation

The ground immediately adjacent to foundations should be provided with positive drainage away from the structures in accordance with 2019 CBC, Section 1804.4. No rain or excess water should be allowed to pond against structures such as walls, foundations, flatwork, etc.

Excessive irrigation water can be detrimental to the performance of the proposed site development. Water applied in excess of the needs of vegetation will tend to percolate into the ground. Such percolation can lead to nuisance seepage and shallow perched groundwater. Seepage can form on

slope faces, on the faces of retaining walls, in streets, or other low-lying areas. These conditions could lead to adverse effects such as the formation of stagnant water that breeds insects, distress or damage of trees, surface erosion, slope instability, discoloration and salt buildup on wall faces, and premature failure of pavement. Excessive watering can also lead to elevated vapor emissions within buildings that can damage flooring finishes or lead to mold growth inside the home.

Key factors that can help mitigate the potential for adverse effects of overwatering include the judicious use of water for irrigation, use of irrigation systems that are appropriate for the type of vegetation and geometric configuration of the planted area, the use of soil amendments to enhance moisture retention, use of low-water demand vegetation, regular use of appropriate fertilizers, and seasonal adjustments of irrigation systems to match the water requirements of vegetation. Specific recommendations should be provided by a landscape architect or other knowledgeable professional.

### 6.9.2 Utility Trenches

Trench excavations should be constructed in accordance with the recommendations contained in Section **Error! Reference source not found.** of this report. Trench excavations must also conform to the requirements of Cal/OSHA.

Trench backfill materials and compaction criteria should conform to the requirements of the local municipalities. As a minimum, utility trench backfill should be compacted to at least 90 percent of the laboratory standard. Materials placed within the pipe zone (6 inches below and 12 inches above the pipe) should consist of particles no greater than  $\frac{3}{4}$  inches and have a SE of at least 30. The materials within the pipe zone should be moisture-conditioned and compacted by hand-operated compaction equipment. Above the pipe zone ( $>1$  foot above pipe), the backfill may consist of general fill materials. Trench backfill should be moisture-conditioned to slightly over the optimum moisture content, placed in lifts no greater than 12 inches in thickness, and then mechanically compacted with appropriate equipment to at least 90 percent of the laboratory standard. For trenches with sloped walls, backfill material should be placed in lifts no greater than 8 inches in loose thickness, and then compacted by rolling with a sheepsfoot roller or similar equipment. The project geotechnical consultant should perform density testing along with probing to verify that adequate compaction has been achieved.

Within shallow trenches (less than 18 inches deep) where pipes may be damaged by heavy compaction equipment, imported clean sand having a SE of 30 or greater may be utilized. The sand should be placed in the trench, thoroughly watered, and then compacted with a vibratory compactor. For utility trenches located below a 1:1 (H:V) plane projecting downward from the outside edge of the adjacent footing base or crossing footing trenches, concrete or slurry should be used as trench backfill.

## 6.10 PLAN REVIEW AND CONSTRUCTION SERVICES

We recommend **Albus & Associates, Inc.** be engaged to review any future development plans, including civil plans (grading plans), foundation plans, and proposed structural loads, prior to construction. This is to verify that the assumptions of this report are valid and that the preliminary conclusions and recommendations contained in this report have been properly interpreted and are incorporated into the project plans and specifications. If we are not provided the opportunity to review these documents, we take no responsibility for misinterpretation of our preliminary conclusions and recommendations.

We recommend that a geotechnical consultant be retained to provide soil engineering services during construction of the project. These services are to observe compliance with the design, specifications or recommendations, and to allow design changes in the event that subsurface conditions differ from those anticipated prior to the start of construction.

If the project plans change significantly from the assumed development described herein, the project geotechnical consultant should review our preliminary design recommendations and their applicability to the revised construction. If conditions are encountered during construction that appear to be different than those indicated in this report or subsequent design reports, the project geotechnical consultant should be notified immediately. Design and construction revisions may be required.

## 7.0 LIMITATIONS

This report is based on the proposed development and geotechnical data as described herein. The materials encountered on the project site and utilized in our laboratory testing for this investigation are believed representative of the total project area, and the conclusions and recommendations contained in this report are presented on that basis. However, soil and bedrock materials can vary in characteristics between points of exploration, both laterally and vertically, and those variations could affect the conclusions and recommendations contained herein. As such, observation and testing by a geotechnical consultant during the grading and construction phases of the project are essential to confirming the basis of this report.

This report has been prepared consistent with that level of care being provided by other professionals providing similar services at the same locale and time period. The contents of this report are professional opinions and as such, are not to be considered a guaranty or warranty.

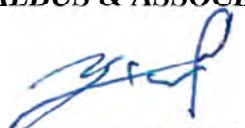
This report should be reviewed and updated after a period of one year or if the site ownership or project concept changes from that described herein.

This report has been prepared for the exclusive use of **Melia Homes** and their project consultants in the planning and design of the proposed development. This report has not been prepared for use by parties or projects other than those named or described herein. This report may not contain sufficient information for other parties or other purposes.

This report is subject to review by the controlling governmental agency.

Respectfully submitted,

**ALBUS & ASSOCIATES, INC.**

  
Eung Jin Jeon, Ph.D.  
Associate Engineer  
G.E. 3097



  
David E. Albus  
Principal Engineer  
G.E. 2455



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**ALBUS & ASSOCIATES, INC.**

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**APPENDIX A**  
**EXPLORATION LOGS**

## Field Identification Sheet



Light gray



Gray



Dark gray



Gray Brown



Light brown



Brown



Dark Brown



Olive brown



Olive



Yellow



Yellowish brown



Yellowish red



Red



Reddish Brown



Tan

### Description Order:

Description, Color, Moisture, Density, Grain Size, Additional Description

| Description | %     | Example         |
|-------------|-------|-----------------|
|             | 0-5   | Sand            |
| trace       | 5-15  | Sand trace Silt |
| with        | 15-30 | Sand with Silt  |
|             | 30+   | Silty Sand      |

### More Examples

Sand with Silt trace Clay

Sand trace Silt and Clay

Sand with Silt and Clay

Gravelly Sand with Silt trace Clay

Silty Clay with Sand trace Gravel

### Moisture

|            |                    |
|------------|--------------------|
| Dry        | absence of water   |
| Damp       | below optimum      |
| Moist      | near optimum       |
| Very Moist | above optimum      |
| Wet        | free water visible |

### Density (Navfac)

| Coarse grained soils | SPT   | CA    |
|----------------------|-------|-------|
| Very Loose           | 0-3   | 0-5   |
| Loose                | 3-8   | 5-13  |
| Medium Dense         | 8-14  | 13-22 |
| Dense                | 14-25 | 22-40 |
| Very Dense           | 25>   | 40>   |

### Fine grained soils

|              |       |       |
|--------------|-------|-------|
| Very Soft    | 2<    | 0-3   |
| Soft         | 2-4   | 3-6   |
| Medium Stiff | 4-8   | 6-13  |
| Stiff        | 8-15  | 13-24 |
| Very Stiff   | 15-30 | 24-48 |
| Hard         | 30>   | 48>   |

### Grain Size

| Description | Sieve Size    | Approx. Size           |
|-------------|---------------|------------------------|
| Boulders    | >12"          | Larger than basketball |
| Cobbles     | 3-12"         | Fist to basketball     |
| Gravel      | coarse 3/4-3" | Thumb to Fist          |
|             | fine #4-3/4"  | Pea to Thumb           |
| Sand        | coarse #10-4  | Rock Salt to Pea       |
|             | medium #40-10 | Sugar to Rock Salt     |
|             | fine #200-40  | Flour to Sugar         |
| Fines       | Pass #200     | Smaller than Flour     |

### Additional Description (ie. roots, pinhole pores, debris, etc.)

Trace 5%

Moderate 15%

Abundant 30%



# EXPLORATION LOG

| Project:                                                                                                                                                               |                |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |       | Location:            |              |                            |                         |                    |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------|----------------------|--------------|----------------------------|-------------------------|--------------------|
| Address:                                                                                                                                                               |                |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |       | Elevation:           |              |                            |                         |                    |
| Job Number:                                                                                                                                                            |                | Client:                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |       | Date:                |              |                            |                         |                    |
| Drill Method:                                                                                                                                                          |                | Driving Weight:                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |       | Logged By:           |              |                            |                         |                    |
| Depth<br>(feet)                                                                                                                                                        | Lith-<br>ology | Material Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | Water | Samples              |              | Laboratory Tests           |                         |                    |
|                                                                                                                                                                        |                |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |       | Blows<br>Per<br>Foot | Core<br>Bulk | Moisture<br>Content<br>(%) | Dry<br>Density<br>(pcf) | Other<br>Lab Tests |
| <div style="text-align: center;">5</div> <div style="text-align: center;">10</div> <div style="text-align: center;">15</div> <div style="text-align: center;">20</div> |                | <p><b><u>EXPLANATION</u></b></p> <p>Solid lines separate geologic units and/or material types.</p> <p>Dashed lines indicate unknown depth of geologic unit change or material type change.</p> <p><b>Solid black rectangle</b> in Core column represents California Split Spoon sampler (2.5in ID, 3in OD).</p> <p><b>Double triangle</b> in core column represents SPT sampler.</p> <p><b>Vertical Lines</b> in core column represents Shelby sampler.</p> <p><b>Solid black rectangle</b> in Bulk column represents large bag sample.</p> <p><b><u>Other Laboratory Tests:</u></b><br/>           Max = Maximum Dry Density/Optimum Moisture Content<br/>           EI = Expansion Index<br/>           SO4 = Soluble Sulfate Content<br/>           DSR = Direct Shear, Remolded<br/>           DS = Direct Shear, Undisturbed<br/>           SA = Sieve Analysis (1" through #200 sieve)<br/>           Hydro = Particle Size Analysis (SA with Hydrometer)<br/>           200 = Percent Passing #200 Sieve<br/>           Consol = Consolidation<br/>           SE = Sand Equivalent<br/>           Rval = R-Value<br/>           ATT = Atterberg Limits</p> |       |                      |              |                            |                         |                    |
|                                                                                                                                                                        |                |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |       |                      |              |                            |                         |                    |
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|                                                                                                                                                                        |                |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |       |                      |              |                            |                         |                    |
|                                                                                                                                                                        |                |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |       |                      |              |                            |                         |                    |

**Albus & Associates, Inc.**
Plate A-1

# EXPLORATION LOG

| Project: Melia Florence Site                            |                |                                                                                                                                          |                                 |                      |      | Location: B-1      |                            |                         |                    |                                     |  |
|---------------------------------------------------------|----------------|------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------|----------------------|------|--------------------|----------------------------|-------------------------|--------------------|-------------------------------------|--|
| Address: 11733 Florence Ave, Santa Fe Springs, CA 90670 |                |                                                                                                                                          |                                 |                      |      | Elevation: 125     |                            |                         |                    |                                     |  |
| Job Number: 2931.00                                     |                |                                                                                                                                          | Client: Melia Homes             |                      |      | Date: 11/6/2020    |                            |                         |                    |                                     |  |
| Drill Method: Hollow-Stem Auger                         |                |                                                                                                                                          | Driving Weight: 140 lbs / 30 in |                      |      | Logged By: ddalbus |                            |                         |                    |                                     |  |
| Depth<br>(feet)                                         | Lith-<br>ology | Material Description                                                                                                                     | Water                           | Samples              |      |                    | Laboratory Tests           |                         |                    |                                     |  |
|                                                         |                |                                                                                                                                          |                                 | Blows<br>Per<br>Foot | Core | Bulk               | Moisture<br>Content<br>(%) | Dry<br>Density<br>(pcf) | Other<br>Lab Tests |                                     |  |
| 5                                                       |                | asphalt = 5", no base                                                                                                                    |                                 |                      |      |                    |                            |                         |                    | Max EI<br>SO4 DS<br>pH Resist<br>Ch |  |
|                                                         |                | <b>ALLUVIUM (Qal)</b><br><u>Silty Clay with Sand (CL)</u> : Grayish brown, damp, fine grained sand, trace pinhole pores                  |                                 |                      |      |                    |                            |                         | Consol             |                                     |  |
|                                                         |                | @ 2 ft, medium stiff, trace pinhole pores                                                                                                |                                 |                      |      |                    |                            |                         |                    |                                     |  |
|                                                         |                | @ 4 ft, moist, medium stiff, becomes moist, trace pinhole pores and rootlets                                                             |                                 |                      |      |                    |                            |                         |                    |                                     |  |
| 10                                                      |                | @ 6 ft, stiff, trace pinhole pores and rootlets                                                                                          |                                 |                      |      |                    |                            |                         |                    | 200                                 |  |
|                                                         |                | <u>Silty Sand (SM)</u> : Grayish brown to light brown, damp, medium dense, fine to medium grained sand, trace pinhole pores and rootlets |                                 |                      |      |                    |                            |                         |                    |                                     |  |
|                                                         |                | <u>Silty Clay (CL)</u> : Grayish brown, very moist, medium stiff, trace pinhole pores                                                    |                                 |                      |      |                    |                            |                         |                    |                                     |  |
|                                                         |                | @ 15 ft, very stiff                                                                                                                      |                                 |                      |      |                    |                            |                         |                    |                                     |  |
| 15                                                      |                | <u>Sand with Silt (SP)</u> : Grayish brown, moist, medium dense, fine to medium grained sand                                             |                                 |                      |      |                    |                            |                         |                    | ATT<br>200                          |  |
|                                                         |                | <u>Clayey Silt (ML)</u> : Gray, moist, very stiff                                                                                        |                                 |                      |      |                    |                            |                         |                    |                                     |  |
|                                                         |                | <u>Sand trace Silt (SP)</u> : Light reddish brown, moist, medium dense, fine to coarse grained sand                                      |                                 |                      |      |                    |                            |                         |                    |                                     |  |
|                                                         |                |                                                                                                                                          |                                 |                      |      |                    |                            |                         |                    |                                     |  |

Albus & Associates, Inc.

Plate A-2

# EXPLORATION LOG

|                                                         |  |                                 |                |                    |  |
|---------------------------------------------------------|--|---------------------------------|----------------|--------------------|--|
| Project: Melia Florence Site                            |  |                                 | Location: B-1  |                    |  |
| Address: 11733 Florence Ave, Santa Fe Springs, CA 90670 |  |                                 | Elevation: 125 |                    |  |
| Job Number: 2931.00                                     |  | Client: Melia Homes             |                | Date: 11/6/2020    |  |
| Drill Method: Hollow-Stem Auger                         |  | Driving Weight: 140 lbs / 30 in |                | Logged By: ddalbus |  |

| Depth<br>(feet) | Lith-<br>ology | Material Description                                                                                                                   | Water | Samples              |                                                                                       |      | Laboratory Tests           |                         |                    |
|-----------------|----------------|----------------------------------------------------------------------------------------------------------------------------------------|-------|----------------------|---------------------------------------------------------------------------------------|------|----------------------------|-------------------------|--------------------|
|                 |                |                                                                                                                                        |       | Blows<br>Per<br>Foot | Core                                                                                  | Bulk | Moisture<br>Content<br>(%) | Dry<br>Density<br>(pcf) | Other<br>Lab Tests |
|                 |                | <u>Sand with Gravel (SP):</u> Light grayish brown, damp to moist, very dense, fine to coarse grained sand                              |       | 47                   |    |      |                            |                         | SA                 |
| 30              |                | @ 30 ft, light reddish brown                                                                                                           |       | 42                   |    |      |                            |                         |                    |
| 35              |                | <u>Sandy Clay with Gravel (CL):</u> Light reddish brown to grayish brown, moist, very stiff, fine to coarse grained sand               |       | 13                   |  |      |                            |                         | 200 ATT            |
| 40              |                | <u>Gravelly Sand (SP):</u> Light grayish brown, damp, very dense, fine to coarse grained sand                                          |       | 80                   |  |      |                            |                         |                    |
| 45              |                | <u>Silty Clay / Gravelly Sand (CL/SP):</u> Light reddish brown to grayish brown, moist, hard / very dense, fine to coarse grained sand |       | 54                   |  |      |                            |                         |                    |

# EXPLORATION LOG

|                                                         |  |  |                                 |  |                |                    |  |  |  |
|---------------------------------------------------------|--|--|---------------------------------|--|----------------|--------------------|--|--|--|
| Project: Melia Florence Site                            |  |  |                                 |  | Location: B-1  |                    |  |  |  |
| Address: 11733 Florence Ave, Santa Fe Springs, CA 90670 |  |  |                                 |  | Elevation: 125 |                    |  |  |  |
| Job Number: 2931.00                                     |  |  | Client: Melia Homes             |  |                | Date: 11/6/2020    |  |  |  |
| Drill Method: Hollow-Stem Auger                         |  |  | Driving Weight: 140 lbs / 30 in |  |                | Logged By: ddalbus |  |  |  |

| Depth<br>(feet) | Lith-<br>ology                                                                    | Material Description                                                                                                                                                                                 | Water | Samples              |                                                                                     | Laboratory Tests |                            |                         |
|-----------------|-----------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------|----------------------|-------------------------------------------------------------------------------------|------------------|----------------------------|-------------------------|
|                 |                                                                                   |                                                                                                                                                                                                      |       | Blows<br>Per<br>Foot | Core                                                                                | Bulk             | Moisture<br>Content<br>(%) | Dry<br>Density<br>(pcf) |
|                 |  | <p><u>Silty Clay / Sand (CL)</u>: Grayish brown to light gray, damp to moist, hard / dense, fine to medium grained sand</p>                                                                          |       | 26                   |  |                  |                            |                         |
|                 |                                                                                   | <p>Total Depth 51.5 feet</p> <p>No Groundwater</p> <p>Boring backfilled with soil cuttings and capped with asphalt</p> <p>Percolation Wells (10ft offset)</p> <p>P-1 and P-2</p> <p>25 feet deep</p> |       |                      |                                                                                     |                  |                            |                         |

**Albus & Associates, Inc.**
Plate A-4

# EXPLORATION LOG

| Project: Melia Florence Site                            |                |                                                                                                                                     |       | Location: B-2        |      |      |                            |                         |                    |
|---------------------------------------------------------|----------------|-------------------------------------------------------------------------------------------------------------------------------------|-------|----------------------|------|------|----------------------------|-------------------------|--------------------|
| Address: 11733 Florence Ave, Santa Fe Springs, CA 90670 |                |                                                                                                                                     |       | Elevation: 124       |      |      |                            |                         |                    |
| Job Number: 2931.00                                     |                | Client: Melia Homes                                                                                                                 |       | Date: 11/6/2020      |      |      |                            |                         |                    |
| Drill Method: Hollow-Stem Auger                         |                | Driving Weight: 140 lbs / 30 in                                                                                                     |       | Logged By: ddalbus   |      |      |                            |                         |                    |
| Depth<br>(feet)                                         | Lith-<br>ology | Material Description                                                                                                                | Water | Samples              |      |      | Laboratory Tests           |                         |                    |
|                                                         |                |                                                                                                                                     |       | Blows<br>Per<br>Foot | Core | Bulk | Moisture<br>Content<br>(%) | Dry<br>Density<br>(pcf) | Other<br>Lab Tests |
|                                                         |                | asphalt = 5 in, no base                                                                                                             |       |                      |      |      |                            |                         |                    |
|                                                         |                | <b>ARTIFICIAL FILL (Af)</b>                                                                                                         |       |                      |      |      |                            |                         |                    |
|                                                         |                | <u>Silt with Clay (ML)</u> : Grayish brown, moist                                                                                   |       |                      |      |      |                            |                         |                    |
|                                                         |                | @ 2 ft, encountered old asphalt debris, possible old driveway                                                                       |       | 11                   |      |      | 18.7                       | 90.8                    |                    |
|                                                         |                | <b>ALLUVIUM (Qal)</b>                                                                                                               |       |                      |      |      |                            |                         |                    |
|                                                         |                | <u>Silt with Clay (ML)</u> : Grayish brown, moist, medium stiff                                                                     |       | 11                   |      |      | 9.6                        | 92.2                    |                    |
| 5                                                       |                | <u>Silty Sand/ Sandy Silt trace Clay (SM/ML)</u> : Light gray to grayish brown, moist, loose/medium stiff, fine grained sand        |       | 7                    |      |      | 26.9                       | 87.9                    |                    |
|                                                         |                | <u>Silt with Clay and Sand (ML)</u> : Light gray to grayish brown, very moist, medium stiff, fine grained sand, trace pinhole pores |       |                      |      |      |                            |                         |                    |
| 10                                                      |                | <u>Silty Clay (CL)</u> : Grayish brown, very moist, medium stiff                                                                    |       | 9                    |      |      | 40.9                       | 77.6                    |                    |
|                                                         |                | @ 10 ft, medium stiff, trace pinhole pores, remnants of decayed roots and ash                                                       |       |                      |      |      |                            |                         |                    |
| 15                                                      |                | @ 15 ft, stiff                                                                                                                      |       | 7                    |      |      |                            |                         |                    |
|                                                         |                | Total Depth 16.5 feet<br>No Groundwater<br>Boring backfilled with soil cuttings and capped with asphalt                             |       |                      |      |      |                            |                         |                    |

Albus & Associates, Inc.

Plate A-5

# EXPLORATION LOG

| Project: Melia Florence Site                            |                |                                                                                                                      |                                 |                      | Location: B-3  |                    |                            |                         |                    |
|---------------------------------------------------------|----------------|----------------------------------------------------------------------------------------------------------------------|---------------------------------|----------------------|----------------|--------------------|----------------------------|-------------------------|--------------------|
| Address: 11733 Florence Ave, Santa Fe Springs, CA 90670 |                |                                                                                                                      |                                 |                      | Elevation: 123 |                    |                            |                         |                    |
| Job Number: 2931.00                                     |                |                                                                                                                      | Client: Melia Homes             |                      |                | Date: 11/6/2020    |                            |                         |                    |
| Drill Method: Hollow-Stem Auger                         |                |                                                                                                                      | Driving Weight: 140 lbs / 30 in |                      |                | Logged By: ddalbus |                            |                         |                    |
| Depth<br>(feet)                                         | Lith-<br>ology | Material Description                                                                                                 | Water                           | Samples              |                |                    | Laboratory Tests           |                         |                    |
|                                                         |                |                                                                                                                      |                                 | Blows<br>Per<br>Foot | Core           | Bulk               | Moisture<br>Content<br>(%) | Dry<br>Density<br>(pcf) | Other<br>Lab Tests |
|                                                         |                | asphalt = 4.5 in, no base                                                                                            |                                 |                      |                |                    |                            |                         |                    |
|                                                         |                | <b>ALLUVIUM (Qal)</b>                                                                                                |                                 |                      |                |                    |                            |                         |                    |
|                                                         |                | <u>Silty Sand / Sandy Silt with Clay (SM/ML):</u> Grayish brown, very moist, loose / medium stiff, fine grained sand |                                 | 6                    |                |                    | 22.8                       | 84.5                    |                    |
|                                                         |                | <u>Silty Clay (CL):</u> Grayish brown, moist, medium stiff                                                           |                                 | 9                    |                |                    | 9.9                        | 80.4                    |                    |
| 5                                                       |                | <u>Silty Sand / Sandy Silt with Clay (SM/ML):</u> Grayish brown, moist, loose / medium stiff, trace pinhole pores    |                                 | 7                    |                |                    | 37.1                       | 80.3                    | Consol             |
|                                                         |                | <u>Silty Clay (CL):</u> Grayish brown, very moist, medium stiff, trace rootlets and pinhole pores                    |                                 |                      |                |                    |                            |                         |                    |
| 10                                                      |                |                                                                                                                      |                                 | 7                    |                |                    | 34.4                       | 81.3                    |                    |
|                                                         |                |                                                                                                                      |                                 |                      |                |                    |                            |                         |                    |
| 15                                                      |                | @ 15 ft, hard                                                                                                        |                                 | 21                   |                |                    |                            |                         |                    |
|                                                         |                | Total Depth 16.5 feet<br>No Groundwater<br>Boring backfilled with soil cuttings and capped with asphalt              |                                 |                      |                |                    |                            |                         |                    |

Albus & Associates, Inc.

Plate A-6

# EXPLORATION LOG

| Project: Melia Florence Site                            |                |                                                                                                                                      |                                 |                      |      | Location: B-4      |                            |                         |                    |     |  |
|---------------------------------------------------------|----------------|--------------------------------------------------------------------------------------------------------------------------------------|---------------------------------|----------------------|------|--------------------|----------------------------|-------------------------|--------------------|-----|--|
| Address: 11733 Florence Ave, Santa Fe Springs, CA 90670 |                |                                                                                                                                      |                                 |                      |      | Elevation: 124     |                            |                         |                    |     |  |
| Job Number: 2931.00                                     |                |                                                                                                                                      | Client: Melia Homes             |                      |      | Date: 11/6/2020    |                            |                         |                    |     |  |
| Drill Method: Hollow-Stem Auger                         |                |                                                                                                                                      | Driving Weight: 140 lbs / 30 in |                      |      | Logged By: ddalbus |                            |                         |                    |     |  |
| Depth<br>(feet)                                         | Lith-<br>ology | Material Description                                                                                                                 | Water                           | Samples              |      |                    | Laboratory Tests           |                         |                    |     |  |
|                                                         |                |                                                                                                                                      |                                 | Blows<br>Per<br>Foot | Core | Bulk               | Moisture<br>Content<br>(%) | Dry<br>Density<br>(pcf) | Other<br>Lab Tests |     |  |
|                                                         |                | asphalt = 5in, no base                                                                                                               |                                 |                      |      |                    |                            |                         |                    |     |  |
|                                                         |                | <b>ALLUVIUM (Qal)</b>                                                                                                                |                                 |                      |      |                    |                            |                         |                    |     |  |
|                                                         |                | <u>Silty Sand/ Sandy Silt trace Clay (SM/ML):</u> Grayish brown, moist, loose / medium stiff, fine grained sand, trace pinhole pores |                                 | 8                    |      |                    | 16.5                       | 98.7                    |                    |     |  |
|                                                         |                | @ 4 ft, trace pinhole pores and rootlets                                                                                             |                                 | 7                    |      |                    | 18.7                       | 84.2                    |                    |     |  |
| 5                                                       |                |                                                                                                                                      |                                 |                      |      |                    |                            |                         |                    |     |  |
|                                                         |                | <u>Sand trace Silt (SP):</u> Grayish brown, damp, loose, fine grained sand                                                           |                                 | 9                    |      |                    | 5.7                        | 91.5                    |                    |     |  |
|                                                         |                |                                                                                                                                      |                                 |                      |      |                    |                            |                         |                    |     |  |
| 10                                                      |                |                                                                                                                                      |                                 | 8                    |      |                    | 44.5                       | 75.6                    | Consol<br>ATT      |     |  |
|                                                         |                | <u>Sandy Silt with Clay (ML):</u> Grayish brown, very moist to wet, medium stiff, decaying rootlets, ash                             |                                 |                      |      |                    |                            |                         |                    |     |  |
|                                                         |                |                                                                                                                                      |                                 |                      |      |                    |                            |                         |                    |     |  |
| 15                                                      |                |                                                                                                                                      |                                 | 25                   |      |                    |                            |                         |                    |     |  |
|                                                         |                | <u>Sand with Gravel (SP):</u> Light gray, dry to damp, dense, fine to coarse grained sand                                            |                                 |                      |      |                    |                            |                         |                    | 200 |  |
|                                                         |                | Total Depth 16.5 feet<br>No Groundwater<br>Boring backfilled with soil cuttings and capped with asphalt                              |                                 |                      |      |                    |                            |                         |                    |     |  |

Albus & Associates, Inc.

Plate A-7

# EXPLORATION LOG

| Project: Melia Florence Site                            |                |                                                                                                                    |                                 |                      |      | Location: B-5      |                            |                         |                    |  |  |
|---------------------------------------------------------|----------------|--------------------------------------------------------------------------------------------------------------------|---------------------------------|----------------------|------|--------------------|----------------------------|-------------------------|--------------------|--|--|
| Address: 11733 Florence Ave, Santa Fe Springs, CA 90670 |                |                                                                                                                    |                                 |                      |      | Elevation: 125     |                            |                         |                    |  |  |
| Job Number: 2931.00                                     |                |                                                                                                                    | Client: Melia Homes             |                      |      | Date: 11/6/2020    |                            |                         |                    |  |  |
| Drill Method: Hollow-Stem Auger                         |                |                                                                                                                    | Driving Weight: 140 lbs / 30 in |                      |      | Logged By: ddalbus |                            |                         |                    |  |  |
| Depth<br>(feet)                                         | Lith-<br>ology | Material Description                                                                                               | Water                           | Samples              |      |                    | Laboratory Tests           |                         |                    |  |  |
|                                                         |                |                                                                                                                    |                                 | Blows<br>Per<br>Foot | Core | Bulk               | Moisture<br>Content<br>(%) | Dry<br>Density<br>(pcf) | Other<br>Lab Tests |  |  |
|                                                         |                | asphalt = 5in, no base                                                                                             |                                 |                      |      |                    |                            |                         |                    |  |  |
|                                                         |                | <b>ALLUVIUM (Qal)</b>                                                                                              |                                 |                      |      |                    |                            |                         |                    |  |  |
|                                                         |                | <u>Sand with Silt (SM)</u> : Light grayish brown, moist, medium dense, fine grained sand, trace pinhole pores      |                                 | 13                   |      |                    | 17.8                       | 89.3                    |                    |  |  |
|                                                         |                | @ 4 ft, dry to damp, medium dense, trace pinhole pores                                                             |                                 | 15                   |      |                    | 3.7                        | 96.3                    | 200                |  |  |
| 5                                                       |                | <u>Sand (SP)</u> : Light gray, damp, medium dense, fine grained sand                                               |                                 | 13                   |      |                    | 4.8                        | 84.2                    | DS                 |  |  |
|                                                         |                | @ 6 ft, loose                                                                                                      |                                 |                      |      |                    |                            |                         |                    |  |  |
| 10                                                      |                | <u>Sandy Silt trace Clay (ML)</u> : Grayish brown, damp to moist, very stiff, fine grained sand, decaying rootlets |                                 | 17                   |      |                    | 15.3                       | 99                      |                    |  |  |
|                                                         |                |                                                                                                                    |                                 |                      |      |                    |                            |                         |                    |  |  |
| 15                                                      |                |                                                                                                                    |                                 | 12                   |      |                    |                            |                         |                    |  |  |
|                                                         |                | Total Depth 16.5 feet<br>No Groundwater<br>Boring backfilled with soil cuttings and capped with asphalt            |                                 |                      |      |                    |                            |                         |                    |  |  |

Albus & Associates, Inc.

Plate A-8

**APPENDIX B**

**LABORATORY TEST RESULTS**

## **LABORATORY TESTING PROGRAM**

### **Soil Classification**

Soils encountered within the exploratory borings were initially classified in the field in general accordance with the visual-manual procedures of the Unified Soil Classification System (ASTM D 2488). The samples were re-examined in the laboratory and classifications reviewed and then revised where appropriate. The assigned group symbols are presented on the Exploration Logs provided in Appendix A.

### **In-Situ Moisture Content and Dry Density**

Moisture content and dry density of in-place soil materials were determined in representative strata. Test data are summarized on the Exploration Logs, Appendix A.

### **Maximum Dry Density and Optimum Moisture Content**

Maximum dry density and optimum moisture content were performed on a representative sample of the site materials obtained from our field explorations. The test was performed in accordance with ASTM D 1557. Pertinent test values are given in Table B-1.

### **Expansion Potential**

Expansion index testing was performed on a selected sample. The test was performed in accordance with ASTM D4829. The test result and expansion potential are presented on Table B-1.

### **Soluble Sulfate Content**

A chemical analysis was performed on a selected sample to determine soluble sulfate content. This test was performed in our soil laboratory in accordance with California Test Method No 417. The test result is included on Table B-1.

### **Atterberg Limits**

Atterberg Limits (Liquid Limit, Plastic Limit, and Plasticity Index) were performed in accordance with Test Method ASTM D 4318. Pertinent test values are presented within Table B-1.

### **Particle Size Analyses**

Particle size analyses were performed on representative samples of site materials in accordance with ASTM D 422. The results are presented graphically on the attached Plate B-1.

### **Consolidation**

Consolidation tests were performed for selected soil samples in general conformance with ASTM D 2435. Axial loads were applied in several increments to a laterally restrained 1-inch-high sample. Loads were applied in geometric progression by doubling the previous load, and the resulting deformations were recorded at selected time intervals. The specific test samples were inundated at selected loads to evaluate the effects of a sudden increase in moisture content (hydro-consolidation potential). Results of the tests are graphically presented on Plates B-5 to B-6.

**Direct Shear**

The Coulomb shear strength parameters, angle of internal friction and cohesion, were determined for a bulk sample and intact samples obtained from one our borings. The tests were performed in general conformance with Test Method ASTM D 3080. The bulk sample was remolded to 90 percent of maximum dry density and at the optimum moisture content. Three specimens were prepared for each test, artificially saturated, and then sheared under varied loads at an appropriate constant rate of strain. Results are graphically presented on Plate B-6.

**Corrosion**

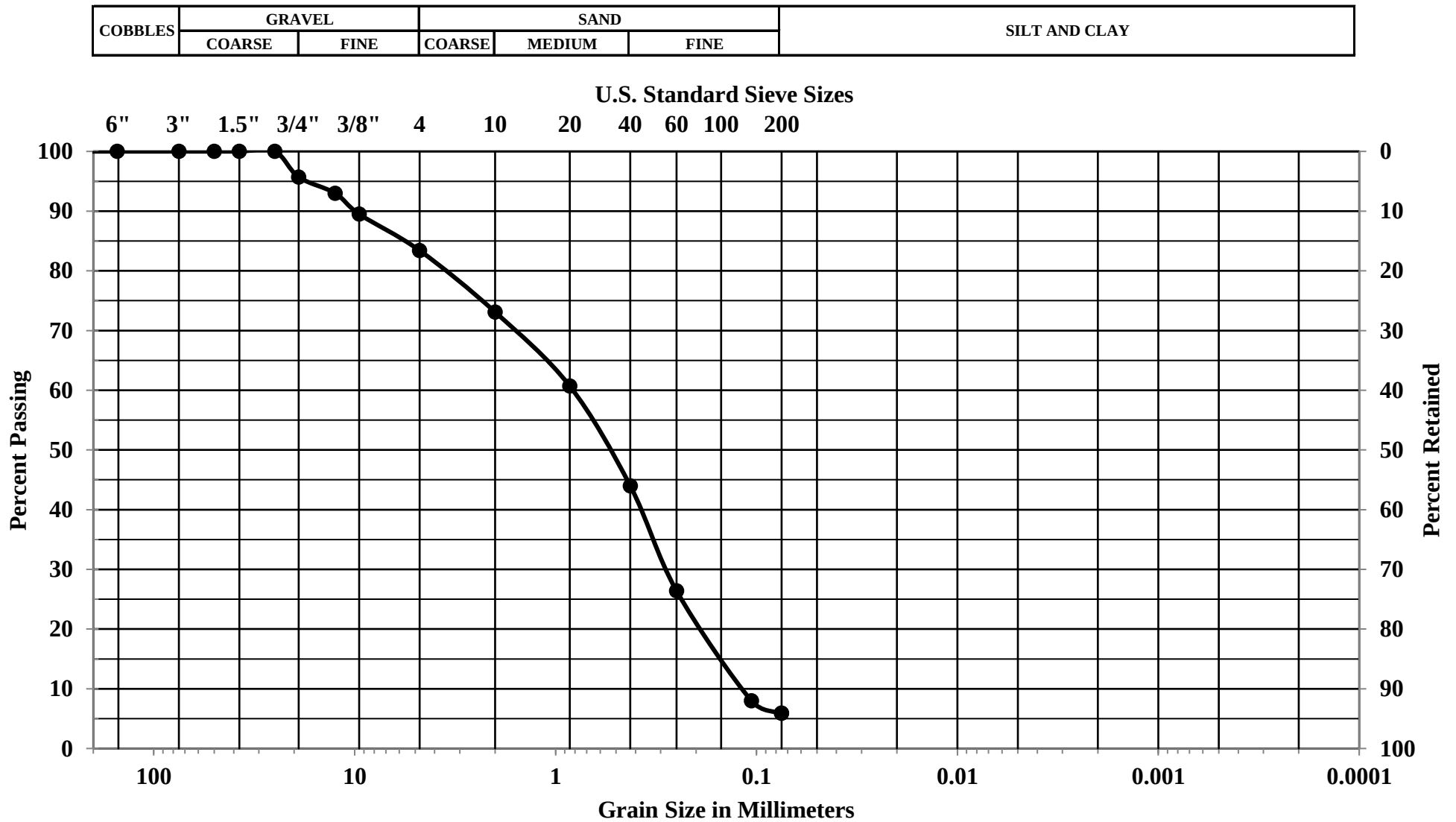
Select samples were tested for minimum resistivity, chloride, pH in accordance with California Test Method 643. Results of these tests are provided in Table B-1.

**TABLE B-1  
SUMMARY OF LABORATORY TEST RESULTS**

| Boring No. | Sample Depth (ft.) | Soil Description                 | Test Results                                                                                                                                                                                            |                                                                          |
|------------|--------------------|----------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------|
| B-1        | 0-5                | Silty Sand trace Clay and Gravel | Maximum Dry Density (pcf):<br>Optimum Moisture (%):<br>Expansion Index:<br>Expansion Potential:<br>Soluble Sulfate Content (%):<br>Sulfate Exposure:<br>Resistivity (ohm-cm):<br>Chloride (ppm):<br>pH: | 125<br>11.5<br>41<br>Low<br>0.001<br>Negligible<br>3500<br>12.75<br>8.07 |
| B-1        | 15.7               | Sand with Silt                   | Passing No. 200 Sieve:                                                                                                                                                                                  | 19 %                                                                     |
| B-1        | 20                 | Clayey Silt                      | Liquid Limit:<br>Plastic Index:                                                                                                                                                                         | 48.4<br>10.2                                                             |
| B-1        | 20.7               | Sand trace Silt                  | Passing No. 200 Sieve:                                                                                                                                                                                  | 9.9%                                                                     |
| B-1        | 25                 | Sand trace Silt                  | Passing No. 200 Sieve:                                                                                                                                                                                  | 6 %                                                                      |
| B-1        | 35                 | Sandy Clay with Gravel           | Liquid Limit:<br>Plastic Index:                                                                                                                                                                         | 32.1<br>9.5                                                              |
| B-4        | 10                 | Sandy Silt with Clay             | Liquid Limit:<br>Plastic Index:                                                                                                                                                                         | 49.5<br>19.5                                                             |
| B-4        | 15                 | Sand with Gravel                 | Passing No. 200 Sieve:                                                                                                                                                                                  | 3.4%                                                                     |
| B-5        | 4                  | Silty Sand                       | Passing No. 200 Sieve:                                                                                                                                                                                  | 18.2%                                                                    |

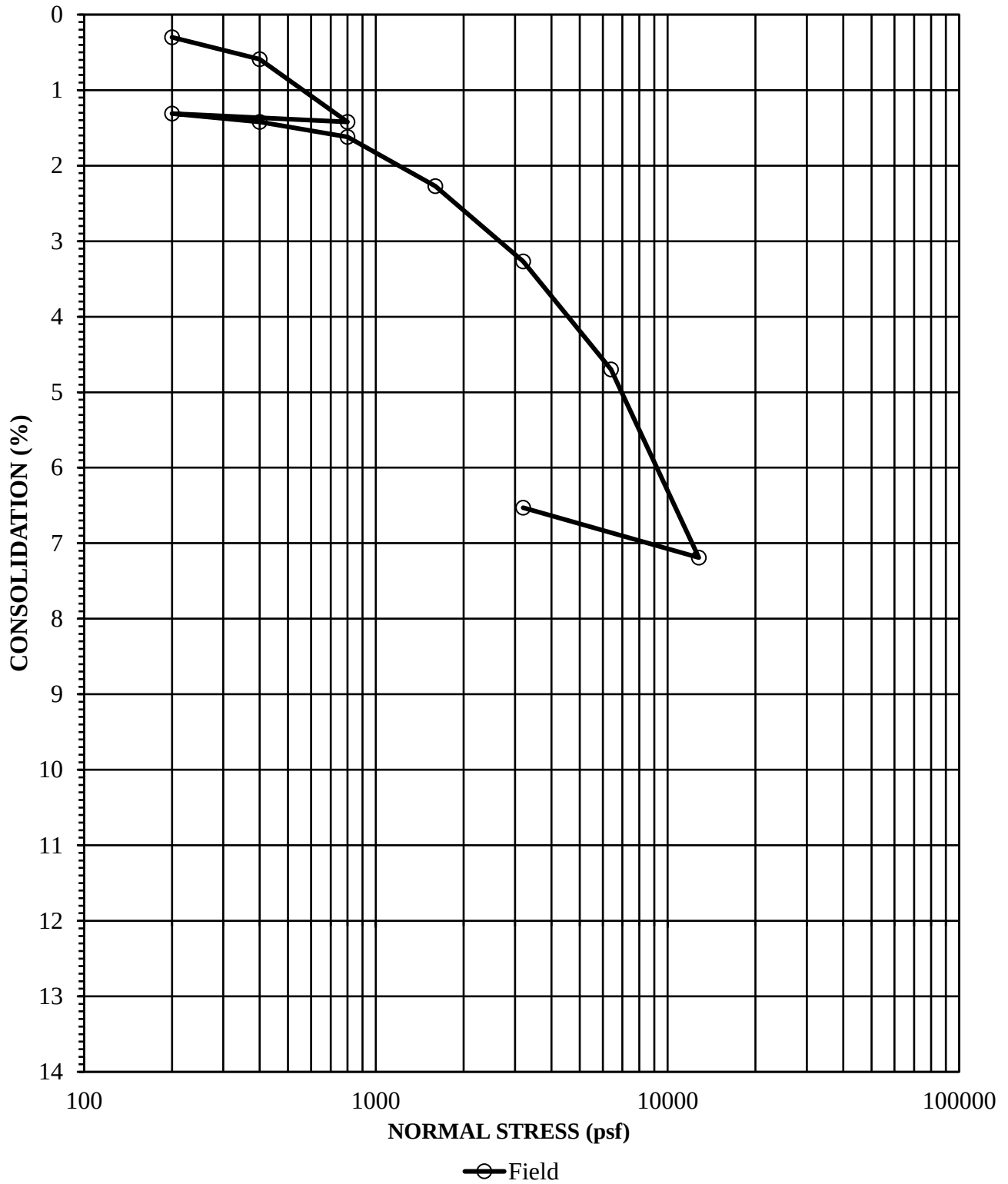
Note: Additional laboratory test results are provided on the boring logs provided in Appendix A.

# GRAIN SIZE DISTRIBUTION



| Job Number | Location | Depth | Description           |
|------------|----------|-------|-----------------------|
| 2931.00    | B-1      | 25    | Sand with Gravel (SW) |

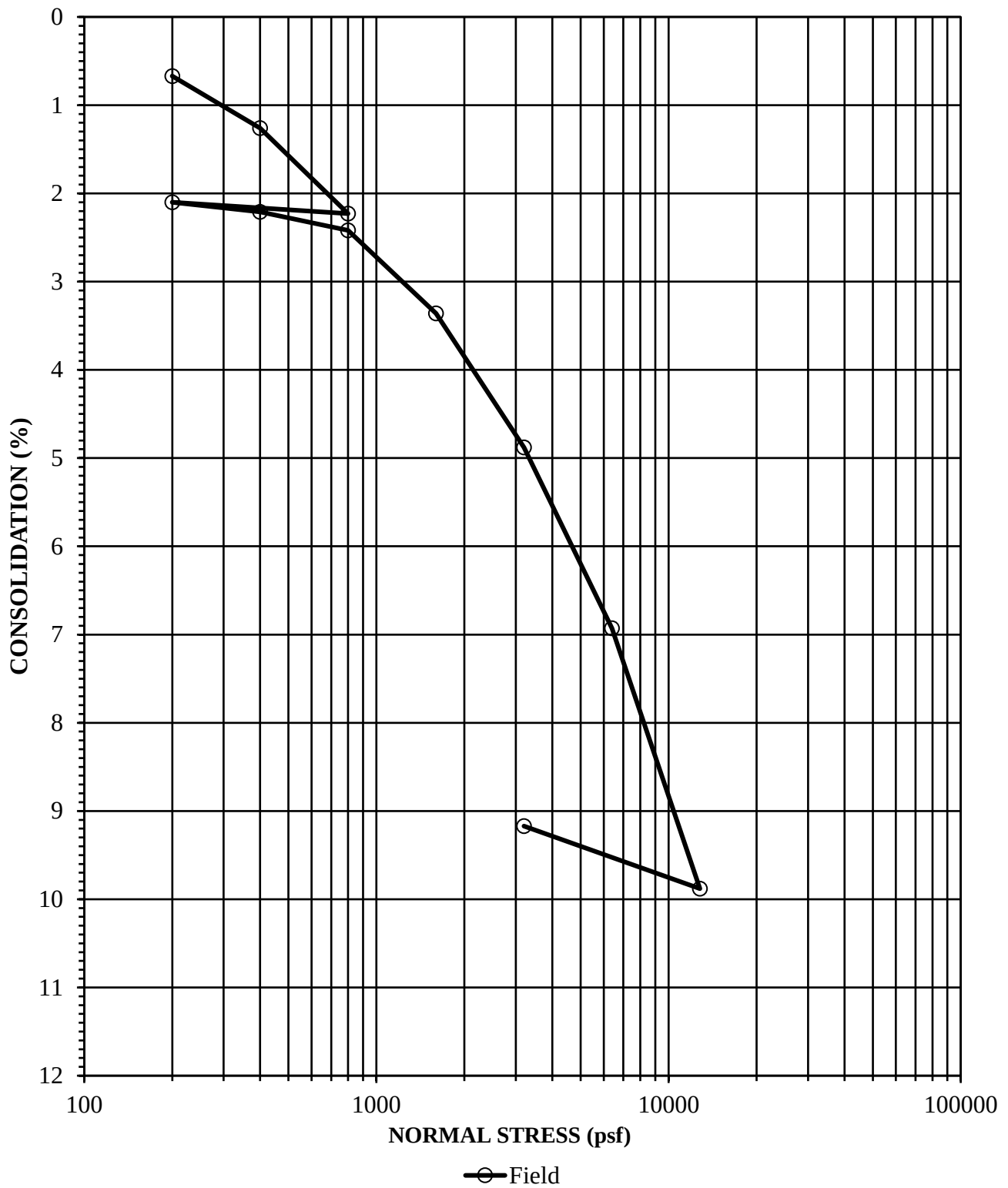
# CONSOLIDATION



| Job Number | Location | Depth | Description          |
|------------|----------|-------|----------------------|
| 2931.00    | B-1      | 4     | Silty Clay with Sand |

| Initial Dry Density (pcf) | Initial Moisture Content (%) | Final Moisture Content (%) |
|---------------------------|------------------------------|----------------------------|
| 86.4                      | 28                           | 26.4                       |

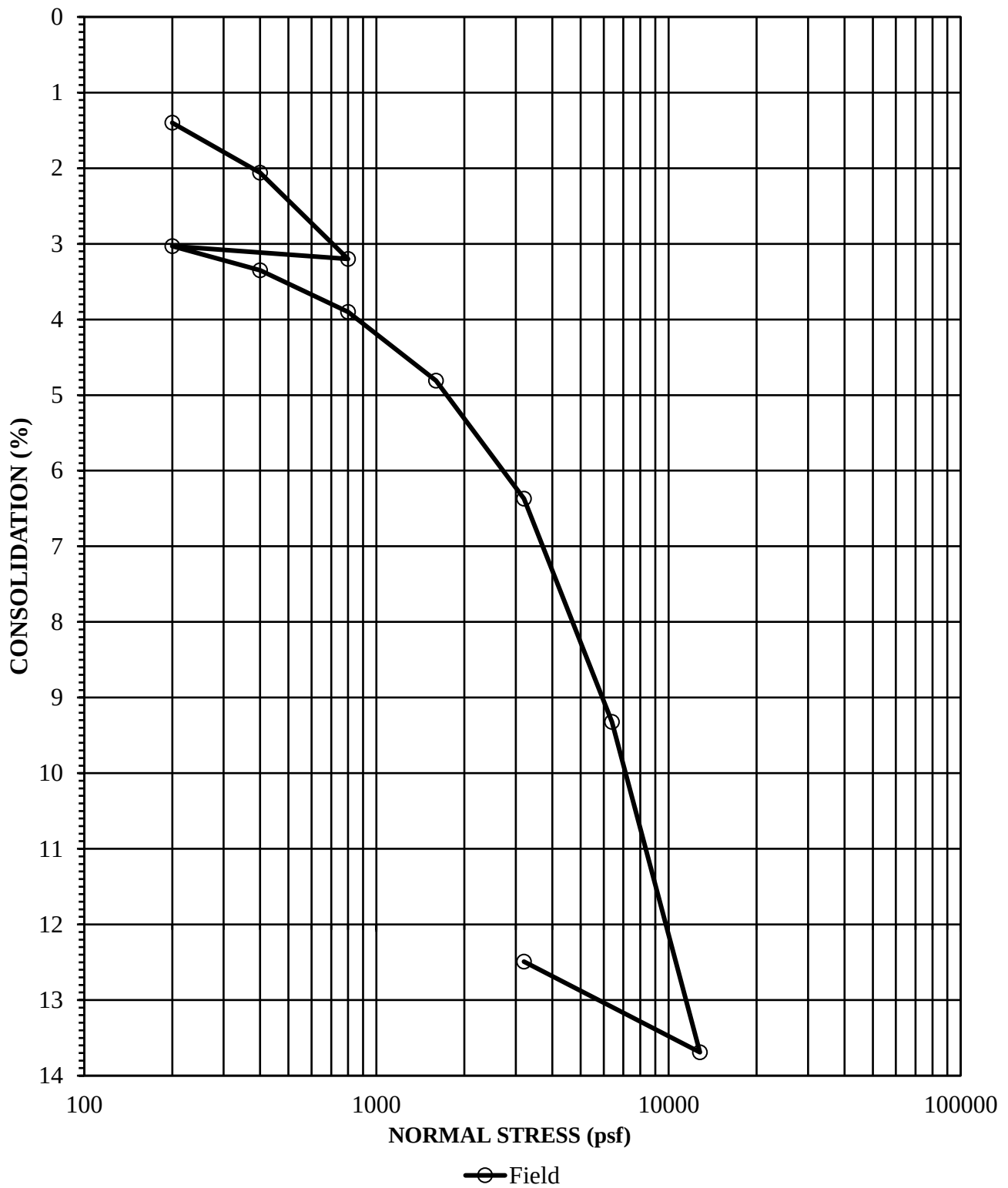
# CONSOLIDATION



| Job Number | Location | Depth | Description |
|------------|----------|-------|-------------|
| 2931.00    | B-3      | 6     | Silty Clay  |

| Initial Dry Density (pcf) | Initial Moisture Content (%) | Final Moisture Content (%) |
|---------------------------|------------------------------|----------------------------|
| 81.6                      | 35.5                         | 30.2                       |

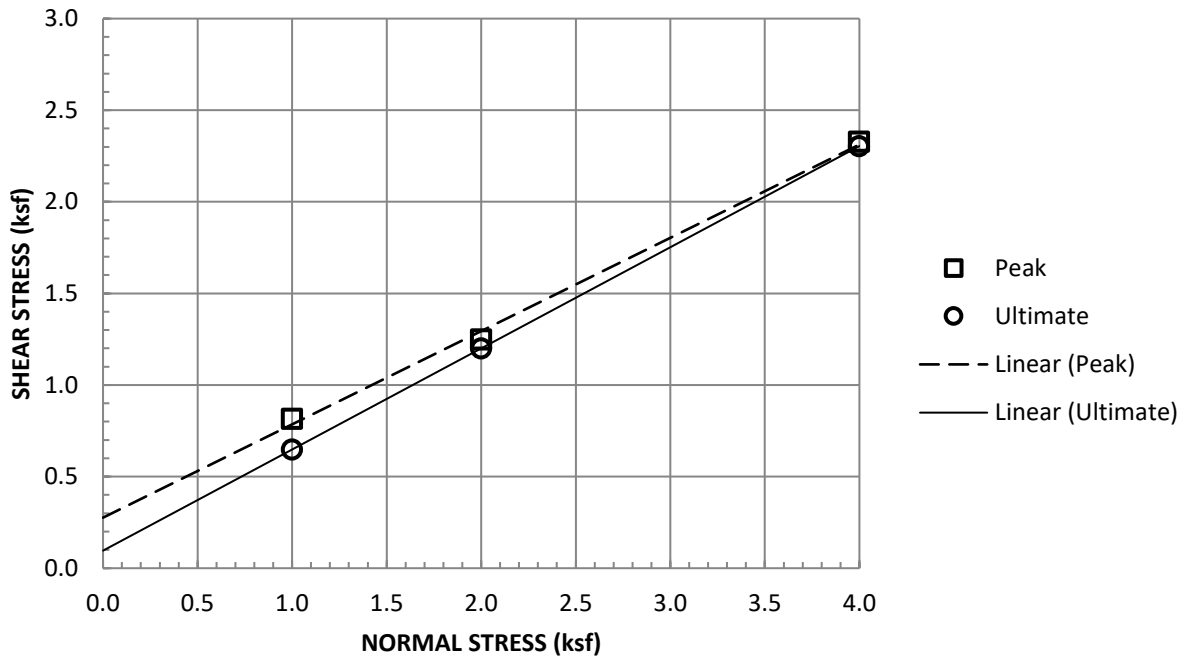
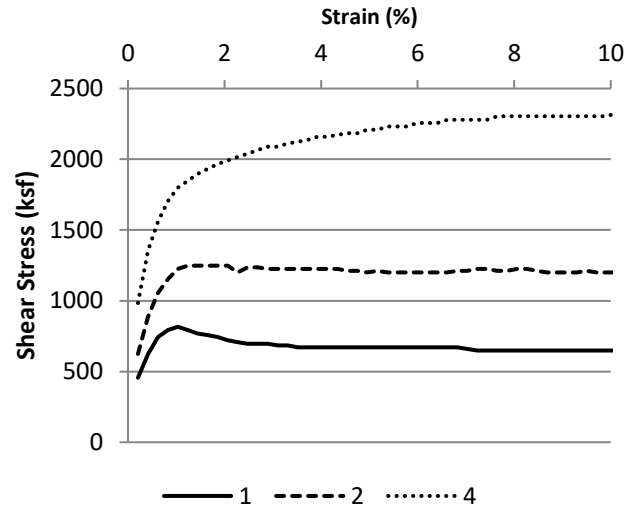
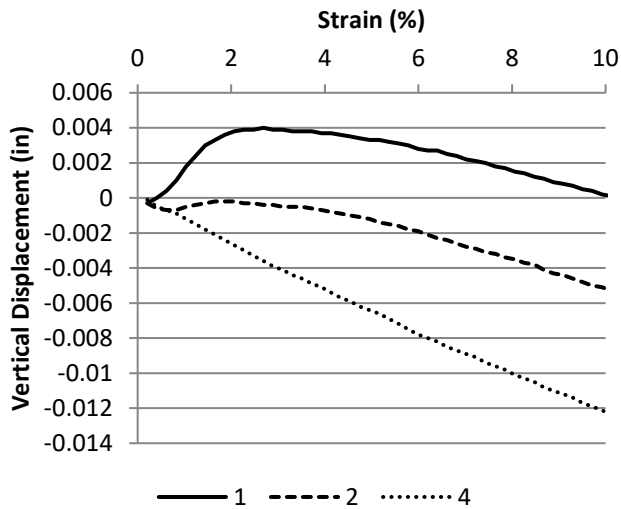
# CONSOLIDATION



| Job Number | Location | Depth | Description           |
|------------|----------|-------|-----------------------|
| 2931.00    | B-4      | 10    | Sandy Silt trace Clay |

| Initial Dry Density (pcf) | Initial Moisture Content (%) | Final Moisture Content (%) |
|---------------------------|------------------------------|----------------------------|
| 78.2                      | 42.6                         | 36                         |

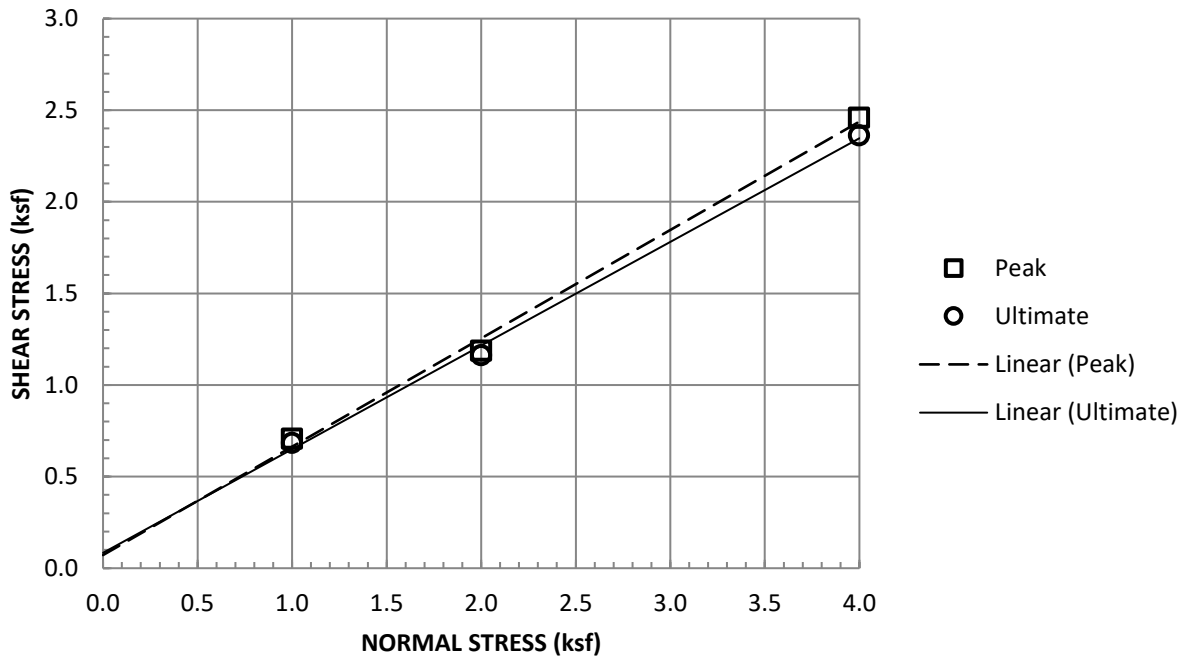
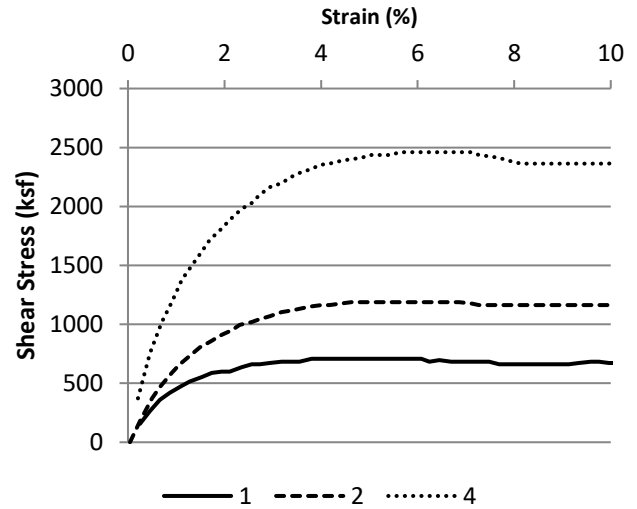
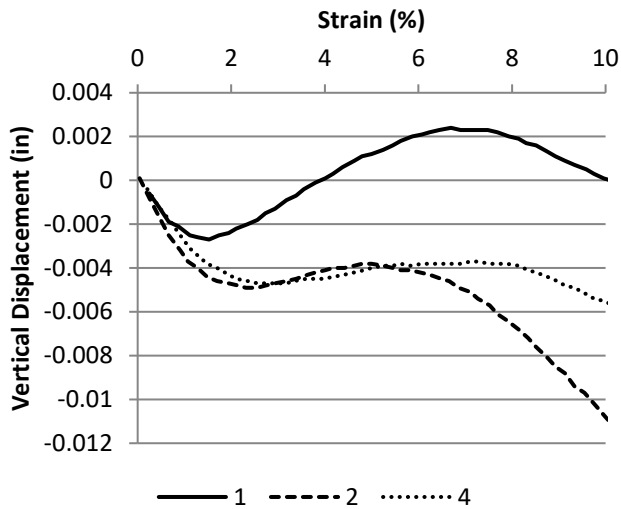
## DIRECT SHEAR



|                              |                     |       |       |
|------------------------------|---------------------|-------|-------|
| Sample Type:                 | Remolded, Saturated |       |       |
| Normal Stress (ksf)          | 1                   | 2     | 4     |
| Peak Shear Stress (ksf)      | 0.816               | 1.248 | 2.328 |
| Peak Displacement (in)       | 0.004               | 0.006 | 0.013 |
| Ultimate Shear Stress (ksf)  | 0.648               | 1.2   | 2.304 |
| Ultimate Displacement (in)   | 0.25                | 0.25  | 0.25  |
| Initial Dry Density (pcf)    | 112.5               | 112.5 | 112.5 |
| Initial Moisture Content (%) | 11.5                | 11.5  | 11.5  |
| Final Moisture Content (%)   | 16.6                | 16.7  | 16.8  |
| Strain Rate (in/min)         | 0.01                |       |       |

| Job Number | Location | Depth | Description          |
|------------|----------|-------|----------------------|
| 2931.00    | B-1      | 0-5   | Silty Sand with Clay |

## DIRECT SHEAR



|                              |                        |       |       |
|------------------------------|------------------------|-------|-------|
| Sample Type:                 | Undisturbed, Saturated |       |       |
| Normal Stress (ksf)          | 1                      | 2     | 4     |
| Peak Shear Stress (ksf)      | 0.708                  | 1.188 | 2.46  |
| Peak Displacement (in)       | 0.003                  | 0.011 | 0.006 |
| Ultimate Shear Stress (ksf)  | 0.684                  | 1.164 | 2.364 |
| Ultimate Displacement (in)   | 0.25                   | 0.24  | 0.25  |
| Initial Dry Density (pcf)    | 86.2                   | 86.2  | 86.1  |
| Initial Moisture Content (%) | 4.8                    | 4.8   | 4.8   |
| Final Moisture Content (%)   | 29.6                   | 30    | 30.4  |
| Strain Rate (in/min)         | 0.005                  |       |       |

| Job Number | Location | Depth | Description |
|------------|----------|-------|-------------|
| 2931.00    | B-5      | 6     | Sand        |

**Appendix E:**  
**MaxWell Plus System**

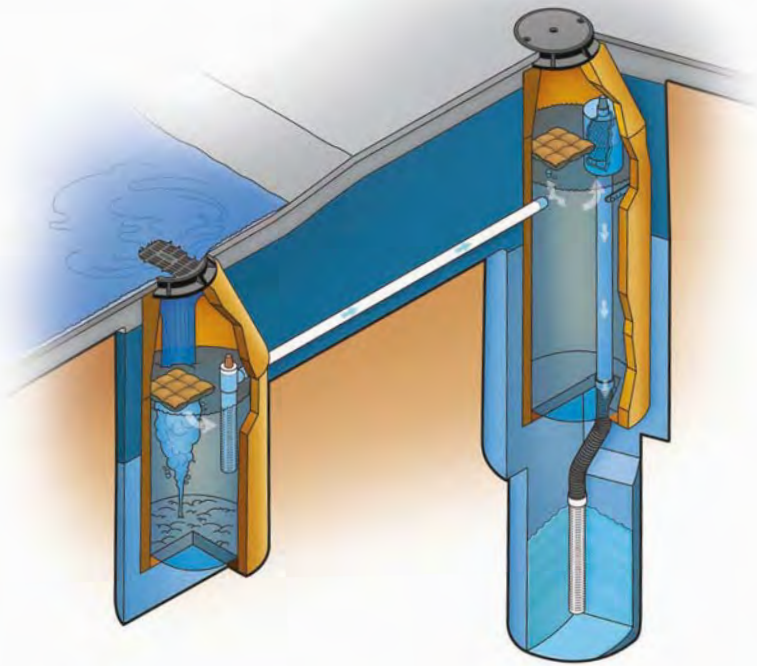
# MaxWell® Plus

## DRAINAGE SYSTEM

Product Information and Design Features



The **MaxWell® Plus**, as manufactured and installed exclusively by Torrent Resources Incorporated, is the industry standard for draining large paved surfaces, nuisance water and other demanding applications. This patented system incorporates state-of-the-art pre-treatment technology.



### THE ULTIMATE IN DESIGN

Since 1974, nearly 65,000 MaxWell® Systems have proven their value as a cost-effective solution in a wide variety of drainage applications. They are accepted by state and municipal agencies and are a standard detail in numerous drainage manuals. Many municipalities have recognized the inherent benefits of the MaxWell Plus and now require it for drainage of all paved surfaces.

### SUPERIOR PRE-TREATMENT

Industry research, together with Torrent Resources' own experience, have shown that initial storm drainage flows have the greatest impact on system performance. This "first flush" occurs during the first few minutes of runoff, and carries the majority of sediment and debris. Larger paved surfaces or connecting pipes from catch basins, underground storage, etc. can also generate high peak flows which may strain system function. In addition, nuisance water flows require controlled processing separate from normal storm runoff demands.

In the **MaxWell® Plus**, preliminary treatment is provided through collection and separation in deep large-volume settling chambers. The standard MaxWell Plus System has over 2,500 gallons of capacity to contain sediment and debris carried by incoming water. Floating trash, paper, pavement oil, etc. are effectively stopped by the **PureFlo®** Debris Shields in each chamber. These shielding devices are equipped with an effective screen to filter suspended material and are vented to prevent siphoning of floating surface debris as the system drains.

### EFFECTIVE PROCESSING

Incoming water from the surface grated inlets or connecting pipes is received in the Primary Settling Chamber where silt and other heavy particles settle to the bottom. A PureFlo Debris Shield ensures containment by trapping floating debris and pavement oil. The pre-treated flow is then regulated to a design rate of up to 0.25cfs and directed to a Secondary Settling Chamber. The settling and containment process is repeated, thereby effectively achieving controlled, uniform treatment. The system is drained as water rises under the PureFlo Debris Shield and spills into the top of the overflow pipe. The drainage assembly returns the cleaned water into the surrounding soil through the **FloFast®** Drainage Screen.

### ABSORBENT TECHNOLOGY

Both MaxWell Plus settling chambers are equipped with absorbent sponges to provide prompt removal of pavement oils. These floating pillow-like devices are 100% water repellent and literally wick petrochemical compounds from the water. Each sponge has a capacity of up to 128 ounces to accommodate effective, long-term treatment. The absorbent is completely inert and will safely remove runoff constituents down to rainbow sheens that are typically no more than one molecule thick.

### SECURITY FEATURES

MaxWell Plus Systems include bolted, theft-deterrent, cast iron gratings and covers as standard security features. Special inset castings which are resistant to loosening from accidental impact are available for use in landscaped applications. Machined mating surfaces and "Storm Water Only" wording are standard.

### THE MAXWELL FIVE-YEAR WARRANTY

*Innovative engineering, quality materials and exacting construction are standard with every MaxWell System designed, manufactured and installed by Torrent Resources Incorporated. The MaxWell Drainage Systems Warranty is the best in the industry and guarantees against failures due to workmanship or materials for a period of five years from date of completion.*

# MAXWELL® PLUS DRAINAGE SYSTEM DETAIL AND SPECIFICATIONS

## CALCULATING MAXWELL PLUS REQUIREMENTS:

The type of property, soil permeability, rainfall intensity and local drainage ordinances determine the number and design of MaxWell Systems. For general applications draining retained stormwater, use one standard **MaxWell® Plus** per the instructions below for up to 5 acres of landscaped contributory area, and up to 2 acres of paved surface. To drain nuisance water flows in storm runoff systems, add a remote inlet to the system. For smaller drainage needs, refer to our **MaxWell® IV**. For industrial drainage, our **Envibro® System** may be recommended. For additional considerations, please refer to “**Design Suggestions For Retention And Drainage Systems**” or consult our Design Staff.

## COMPLETING THE MAXWELL PLUS DRAWING

To apply the MaxWell Plus drawing to your specific project, simply fill in the blue boxes per the following instructions. For assistance, please consult our Design Staff.

### PRIMARY SETTLING CHAMBER DEPTH

The overall depth of the Primary Settling Chamber is determined by the amount of surface area being drained. Use a standard depth of **15 feet** for the initial acre of contributory drainage area, **plus 2 feet** for each additional acre, up to the design limits of the property type noted in “Calculating MaxWell Plus Requirements” noted above. Other conditions that would require increased chamber depths are property usage, maintenance scheduling, and severe or unusual service conditions. Connecting pipe depth may dictate deeper chambers so as to maintain the effectiveness of the settling process. Maximum chamber depth is 25 feet. A pump and lift station is recommended for systems with deeper requirements.

### ESTIMATED TOTAL DEPTH

The Estimated Total Depth is the approximate total system depth required to achieve 10 continuous feet of penetration into permeable soils, based upon known soil information. Torrent utilizes specialized “**crowd**” equipped rigs to get through the difficult cemented soil and to reach clean drainage soils at depths up to **180 feet**. An extensive drilling log database is available to use as a reference.

### SETTLING CHAMBER DEPTH

On MaxWell Plus Systems of over 30 feet overall depth and up to 0.25cfs design rate, the standard Settling Chamber Depth is **18 feet**. Maximum chamber depth is 25 feet.

### OVERFLOW HEIGHT

The Overflow Height and Secondary Settling Chamber Depth determine the effectiveness of the settling process. The higher the overflow pipe, the deeper the chamber, the greater the settling capacity. An overflow height of **13 feet** is used with the standard settling chamber depth of **18 feet**.

### DRAINAGE PIPE

This dimension also applies to the **PureFlo®** Debris Shields, the **FloFast®** Drainage Screen, and fittings. The size is based upon system design rates, multiple primary settling chambers, soil conditions, and need for adequate venting. Choices are 6", 8", or 12" diameter. Refer to our company's “**Design Suggestions for Retention and Drainage Systems**” for recommendations on which size best matches your application.

### BOLTED RING & GRATE/COVER

Standard models are quality cast iron and available to fit 24" Ø or 30" Ø manhole openings. All units are bolted in two locations with wording “Storm Water Only” in raised letters. For other surface treatments, please refer to “Design Suggestions for Retention and Drainage Systems.”

### INLET PIPE INVERT

Pipes up to 12" in diameter from catch basins, underground storage, etc. may be connected into the primary settling chamber. Larger pipe diameters dictate the use of manhole material for the primary settling chamber with 48" grates on the cone. Inverts deeper than 5 feet will require additional depth in both system settling chambers to maintain respective effective settling capacities.

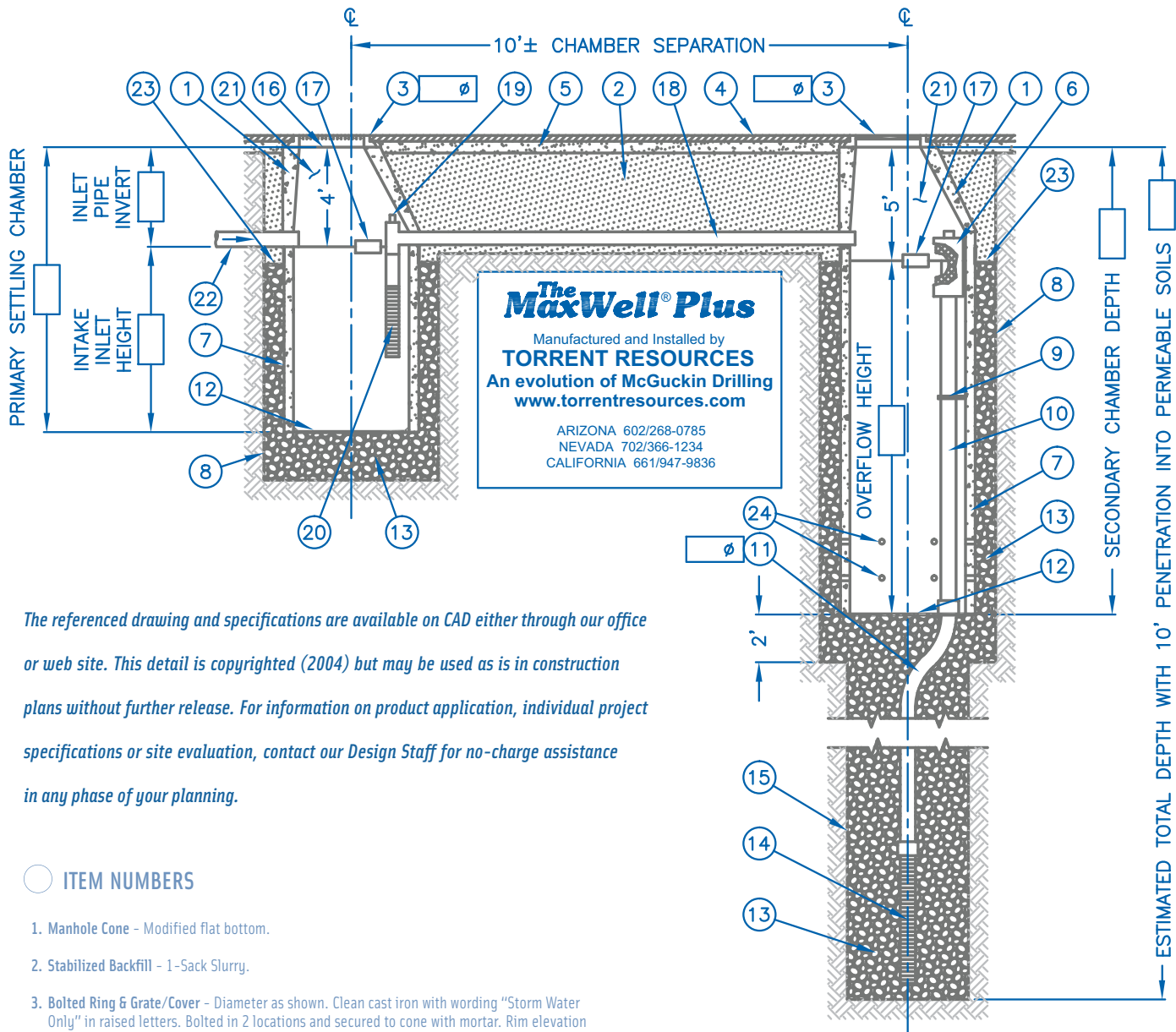
### INTAKE INLET HEIGHT

The Intake Inlet Height determines the effectiveness of the settling process in the Primary Settling Chamber. A minimum inlet height of **11 feet** is used with the standard primary settling chamber depth of 15 feet. Greater inlet heights would be required with increased system demands as noted in Primary Settling Chamber Depth. Freeboard Depth Varies with inlet pipe elevation. Increase primary/secondary settling chamber depths as needed to maintain all inlet pipe elevations above connector pipe overflow.

### CHAMBER SEPARATION

The standard separation between chambers is **10 feet** from center to center. Soil conditions and deeper inverts may dictate required variations in chamber separation.

# The MaxWell® Plus Drainage System Detail And Specifications



AZ Lic. ROC070465 A, ROC047067 B-4, ADWR 363  
CA Lic. 528080, C-42, HAZ.  
NV Lic. 0035350 A - NM Lic. 90504 GF04

## ITEM NUMBERS

1. Manhole Cone - Modified flat bottom.
2. Stabilized Backfill - 1-Sack Slurry.
3. Bolted Ring & Grate/Cover - Diameter as shown. Clean cast iron with wording "Storm Water Only" in raised letters. Bolted in 2 locations and secured to cone with mortar. Rim elevation  $\pm 0.02'$  of plans.
4. Graded Basin or Paving (by Others).
5. Compacted Base Material (by Others).
6. PureFlo® Debris Shield - Rolled 16 Ga. steel X 24" length with vented anti-siphon and internal .265" Max. SWO flattened expanded steel screen X 12" length. Fusion bonded epoxy coated.
7. Pre-cast Liner - 4000 PSI concrete 48" ID. X 54" OD. Center in hole and align sections to maximize bearing surface.
8. Min. 6' Ø Drilled Shaft.
9. Support Bracket - Formed 12 Ga. steel. Fusion bonded epoxy coated.
10. Overflow Pipe - Sch. 40 PVC mated to drainage pipe at base seal.
11. Drainage Pipe - ADS highway grade with TRI-A coupler. Suspend pipe during backfill operations to prevent buckling or breakage. Diameter as noted.
12. Base Seal - Geotextile or concrete slurry.
13. Rock - Washed, sized between 3/8" and 1-1/2" to best complement soil conditions.
14. FloFast® Drainage Screen - Sch. 40 PVC 0.120" slotted well screen with 32 slots per row/ft. Diameter varies 120" overall length with TRI-B coupler.
15. Min. 4' Ø Shaft - Drilled to maintain permeability of drainage soils.
16. Fabric Seal - U.V. Resistant Geotextile - To be removed by customer at project completion.
17. Absorbent - Hydrophobic Petrochemical Sponge. Min 128 oz. capacity.
18. Connector Pipe - 4" Ø Sch. 40 PVC.
19. Anti-Siphon Vent with flow regulator.
20. Intake Screen - Sch. 40 PVC 0.120" modified slotted well screen with 32 slots per row/ft. 48" overall length with TRI-C end cap.
21. Freeboard Depth Varies with inlet pipe elevation. Increase primary/secondary settling chamber depths as needed to maintain all inlet pipe elevations above connector pipe overflow.
22. Optional Inlet Pipe (by Others).
23. Moisture Membrane - 6 mil. Plastic. Place securely against eccentric cone and hole sidewall. Used in lieu of slurry in landscaped areas.
24. Eight - (8) perforations per foot, 2 row minimum.

The referenced drawing and specifications are available on CAD either through our office or web site. This detail is copyrighted (2004) but may be used as is in construction plans without further release. For information on product application, individual project specifications or site evaluation, contact our Design Staff for no-charge assistance in any phase of your planning.

## INDUSTRY SERVICES

### *Site Drainage Systems*

- Stormwater Drywells
- French Drains
- Piping
- Drainage Appurtenances
- Pump Systems

### *Technical Analysis*

- Design Review
- Percolation Testing
- Geologic Database
- ADEQ Drywell Registration

### *Recharge Systems*

- Municipal/Private Recharge Wells
- Injection Wells & Galleries

### *Environmental Applications*

- Pattern Drilling/Soil Remediation
- Drainage Rehabilitation
- Drywell Abandonments
- OSHA HAZMAT-Certified

### *Drainage Renovation*

- Problem Assessment
- Site Redesign/Modification
- System Retrofit

### *Drainage Maintenance*

- Preventive Maintenance
- Service Contracts
- Drywell Cleaning

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**Appendix F:**  
**O&M Plan**

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## OPERATION & MAINTENANCE PLAN FOR FILTER INSERT

The maintenance program will include the following key components:

**1. REGULAR SWEEPING AND REMOVAL OF DEBRIS:**

Vehicle parking lot will be swept on a regular basis. Sediment and debris (litter, leaves, papers and cans, etc.) within the area, especially around the drainage inlet, will be collected and removed. The frequency of sweeping will be based on the amount of sediment and debris generated.

**2. REGULAR INSPECTIONS:**

The catch basin, downspout, or trench drain filter insert will be inspected on a regular basis. The frequency of inspection will be based on pollutant loading, amount of debris, leaves, etc., and amount of runoff. At a minimum, there will be three inspections per year.

**3. CONDUCT OF THE VISUAL INSPECTION:**

- a. Broom sweep around the inlet and remove the inlet grate.
- b. Inspect the filter liner for serviceability. If called for, the filter body will be replaced.
- c. Check the condition of the adsorbent pouches and visually check the condition of the enclosed adsorbent. If the surface of the granules is more than 50% coated with a dark gray or black substance, the pouches will be replaced with new ones.
- d. Check for loose or missing nuts (on some models) and gaps between the filter and the inlet wall, which would allow bypass of the filter during low flows.
- e. The filter components will be replaced in the inlet and the grate replaced.

**4. CLEANING OUT THE FILTER INSERT:**

Regardless of the model of filter insert, the devices must be cleaned out on a recurring basis. The manufacturer recommends at least three cleanings per year – more in high exposure areas. For the Flo-Gard+Plus filters, the filter must be cleaned when the solids level reaches close to the full tip.

- a. The Standard Filter, in most cases, can be cleaned out by removing the device from the inlet and dumping the contents into a DOT approved drum for later disposal. If the oil-absorbant pouches need to be changed, the time to change them is immediately after dumping and before the filter is replaced in the inlet.
- b. Because of weight, method of installation and so forth, some filter inserts will be cleaned with the aid of a vactor truck. If necessary, the oil-absorbant pouches will be changed after the pollutants have been removed and as the filter is being returned to service.

**5. MAINTENANCE LOG:**

Keep a log of all inspections and maintenance performed on the catch basins, trench drains, and filter inserts. Keep this log on-site.

---

# CATCH BASIN MAINTENANCE RECORD

| SITE INFORMATION    |                |
|---------------------|----------------|
| Contact:            | Phone: (     ) |
| Project Name:       |                |
| Address:            |                |
| Filter No. & Model: |                |

| SERVICE INFORMATION                           |                                       |
|-----------------------------------------------|---------------------------------------|
| Date of Service:                              | By:                                   |
| <input type="checkbox"/> Inspection           | <input type="checkbox"/> Clean Debris |
| <input type="checkbox"/> Replace Pouch        | <input type="checkbox"/> Replace Rock |
| <input type="checkbox"/> Clean Silt/Sediment  |                                       |
| <input type="checkbox"/> Repair/Replace Parts |                                       |
| Comments:                                     |                                       |
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|                                               |                                       |
|                                               |                                       |
| Approval Signature:                           |                                       |

| SITE INFORMATION    |                |
|---------------------|----------------|
| Contact:            | Phone: (     ) |
| Project Name:       |                |
| Address:            |                |
| Filter No. & Model: |                |

| SERVICE INFORMATION                           |                                       |
|-----------------------------------------------|---------------------------------------|
| Date of Service:                              | By:                                   |
| <input type="checkbox"/> Inspection           | <input type="checkbox"/> Clean Debris |
| <input type="checkbox"/> Replace Pouch        | <input type="checkbox"/> Replace Rock |
| <input type="checkbox"/> Clean Silt/Sediment  |                                       |
| <input type="checkbox"/> Repair/Replace Parts |                                       |
| Comments:                                     |                                       |
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|                                               |                                       |
| Approval Signature:                           |                                       |

## OPERATION AND MAINTENANCE OF *MaxWell*® DRYWELL

The Operation and Maintenance Format will include the following key components:

### 1.) Inspection Guidelines:

#### New installations

Newly installed systems should receive a thorough visual examination following the first several significant rainfall events. This assessment will assure that there is no standing water, and that runoff or nuisance water flows are being eliminated within the allowable 48 hour draw-down timeframe.

#### Ongoing Operations

At a minimum, the drainage structures should be inspected annually, and within 48 hours following a significant storm event to ensure that there is no standing water in the chambers.

### 2.) Maintenance Format:

After the first 12-months of entering service, it is recommended that an initial cleaning be undertaken. This will help to establish the amount of accumulated particulate matter and debris to be expected on a yearly basis. Thereafter, the systems should receive inspection at least annually, and cleaning should be undertaken when the evaluation reveals that 15% or more of the original chamber volume is occupied by silt and sediment.

During the maintenance operation, all screens and filters should be serviced and the floating absorbent blankets replaced, along with the geo-textile fabric at the bottom of the chambers. Should repair be needed, descriptions of deficiencies and estimated costs for suggested corrections should be provided. The above information shall be submitted in writing to the Owner at the conclusion of the maintenance service. Replacement is recommended for drywells that no longer dispose of ponded water within 48 hours after cleaning.

### 3.) Maintenance Records:

A written log shall be kept on-site of all inspections and maintenance performed on the drainage systems.

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