City of West Linn
Planning & Development · 22500 Salamo Rd #1000 · West Linn, Oregon 97068
Telephone 503.656.4211 · Fax 503.656.4106 · westlinnoregon.gov

Development Review Application

For Office Use Only

Staff Contact	Project No(s).	
Jennifer Arnold	DR-18-05	
Non-Refundable Fee(s)	Refundable Deposit(s)	Total
300	8000-	8300-

Type of Review (Please check all that apply):

Annexation (ANX)	Historic Review	Subdivision (SUB)
Appeal and Review (AP) *	Legislative Plan or Change	Temporary Uses *
Conditional Use (CUP)	Lot Line Adjustment (LLA) */**	Time Extension *
X Design Review (DR)	Minor Partition (MIP) (Preliminary Plat or Plan)	Variance (VAR)
Easement Vacation	Non-Conforming Lots, Uses & Structures	Water Resource Area Protection/Single Lot (WAP)
Extraterritorial Ext. of Utilities	Planned Unit Development (PUD)	Water Resource Area Protection/Wetland (WAP)
Final Plat or Plan (FP)	Pre-Application Conference (PA) */**	Willamette & Tualatin River Greenway (WRG)
Flood Management Area	Street Vacation	Zone Change
Hillside Protection & Erosion Control		

Home Occupation, Pre-Application, Sidewalk Use, Sign Review Permit, and Temporary Sign Permit applications require different or additional application forms, available on the City website or at City Hall.

Site Location/Address: 2180 SE 8TH COURT; WEST LINN, OREGON	Assessor's Map No.: 21E35D
	Tax Lot(s): 903
	Total Land Area: 1.044 acres
Brief Description of Proposal: WE ARE SEEKING A APPROVED TENTATIVE PLAT MINOR PARTITION. WITH AN APPROVED TENTATIVE MINOR PARTITION WE PLAN TO SUBMIT SITE AND BUILDING PERMITS FOR THE PROPOSED DEVELOPMENT AND FINALIZE THE PARTITION WITH THE BUILDING PERMIT PROCESS.	
Applicant Name: ED BRUIN Address: 735 SW 20TH PLACE, SUITE 220 City State Zip: PORTLAND, OR 97205	Phone: 503-292-7733 Email: ed@edgedevelop.com
Owner Name (required): WILLAMETTE CAPITAL INVESTMENTS, LLC Address: PO BOX 2507 City State Zip: WILSONVILLE, OR. 97070	Phone: (503) 407-8957 Email: phanlin@msn.com
Consultant Name: CHRIS DESLAURIERS, PE, WDY ENGINEERS Address: 6443 SW BEAVERTON-HILLSDALE HWY; SUITE 210 City State Zip: PORTLAND, OR 97221-4229	Phone: 503-203-8111 Ext 40 Email: chris@wdyi.com

1. All application fees are non-refundable (excluding deposit). **Any overruns to deposit will result in additional billing.**
2. The owner/applicant or their representative should be present at all public hearings.
3. A denial or approval may be reversed on appeal. No permit will be in effect until the appeal period has expired.
4. **Three (3) complete hard-copy sets (single sided) of application materials must be submitted with this application.**
   One (1) complete set of digital application materials must also be submitted on CD in PDF format.
   If large sets of plans are required in application please submit only two sets.

* No CD required / ** Only one hard-copy set needed

RECEIVED
SEP 18 2018
PLANNING & BUILDING
CITY OF WEST LINN
INT. TIME

The undersigned property owner(s) hereby authorizes the filing of this application, and authorizes on site review by authorized staff. I hereby agree to comply with all code requirements applicable to my application. Acceptance of this application does not infer a complete submittal. All amendments to the Community Development Code and to other regulations adopted after the application is approved shall be enforced where applicable. Approved applications and subsequent development is not vested under the provisions in place at the time of the initial application.

Applicant's signature — Date: 9/17/18 — Owner's signature *(required)* — Date: 9/17/18

EDGE
DEVELOPMENT

September 17, 2018

DESIGN REVIEW NARRATIVE

8th COURT DEVELOPMENT

2180 8TH COURT, WEST LINN, OR

OVERVIEW:

The applicant proposes to construct two new commercial buildings on a site currently located at 2180 8th Court in West Linn. The intent of this narrative is to receive approval to construct two building pads, reconfigure parking and relocate utilities to allow for a Lot Partition (under separate permit). The proposed lot partition will divide the lot into north and south lots, with the new lot line located at the midpoint of the existing access easement.

The project sponsor has identified a potential tenant for a 4,200 square foot building on the south lot and has included in this application architectural renderings showing how the building meets the Community Development Code standards. The north lot is proposed as a 5,000 square foot, single story building. Both structures are intended to be business or mercantile uses. The architecture for the north building has not been defined nor submitted for review under this application.

Other related permits are the Lot Partition permit and an Alternate Review application addressing the Water Resource Area bordering the north property line of the original property. The application number for the A.R. is WAP-18-02.

55.070 SUBMITTAL REQUIREMENTS

Included in this application is:

A site plan (CDC 55.120); at the original scale and one copy reduced to 11 inches by 17. One copy of all other items must be submitted.

- A pdf of the complete application.
- A grading plan (CDC 55.130);
- Architectural drawings, indicating floor plan and elevation (CDC 55.140);
- A landscape plan
- A utility plan

- A light coverage plan with photometric data
- A material board showing images of exterior building materials and colors.

55.100 APPROVAL STANDARDS – CLASS II DESIGN REVIEW

The approval authority shall make findings with respect to the following criteria when approving, approving with conditions, or denying a Class II design review application:

A. The provisions of the following chapters shall be met:

1. Chapter 34 CDC, Accessory Structures, Accessory Dwelling Units, and Accessory Uses.

No Accessory Structures, Accessory Dwelling Units, and Accessory Uses are proposed.

2. Chapter 38 CDC, Additional Yard Area Required; Exceptions to Yard Requirements; Storage in Yards; Projections into Yards.

Not applicable.

3. Chapter 40 CDC, Building Height Limitations, Exceptions.

4. Chapter 42 CDC, Clear Vision Areas.

5. Chapter 44 CDC, Fences.

6. Chapter 46 CDC, Off-Street Parking, Loading and Reservoir Areas.

7. Chapter 48 CDC, Access, Egress and Circulation.

8. Chapter 52 CDC, Signs.

9. Chapter 54 CDC, Landscaping.

B. Relationship to the natural and physical environment.

1. The buildings and other site elements shall be designed and located so that all heritage trees, as defined in the municipal code, shall be saved. Diseased heritage trees, as determined by the City Arborist, may be removed at his/her direction.

There are no heritage trees identified on the site.

3. The topography and natural drainage shall be preserved to the greatest degree possible.

The topography and natural drainage shall be preserved in areas not used for parking, building structures.

4. The structures shall not be located in areas subject to slumping and sliding. The Comprehensive Plan Background Report's Hazard Map, or updated material as available and as deemed acceptable by the Planning Director, shall be the basis for preliminary determination.

The structures are not proposed in areas subject to slumping and sliding.

5. There shall be adequate distance between on-site buildings and on-site and off-site buildings on adjoining properties to provide for adequate light and air circulation and for fire protection.

There is adequate distance between on-site buildings and on-site and off-site buildings on adjoining properties to provide for adequate light and air circulation and for fire protection

6. Architecture.

a. The proposed structure(s) scale shall be compatible with the existing structure(s) on site and on adjoining sites. Contextual design is required. Contextual design means respecting and incorporating prominent architectural styles, building lines, roof forms, rhythm of windows, building scale and massing of surrounding buildings in the proposed structure. The materials and colors shall be complementary to the surrounding buildings.

The proposed structures are single story and similar in scale with the other structures located on 8th Court. There is not a single architectural style or era to draw upon for the proposed buildings. The design intent is that the new buildings will relate and complement each other while remaining architecturally distinct.

b. While there has been discussion in Chapter 24 CDC about transition, it is appropriate that new buildings should architecturally transition in terms of bulk and mass to work with, or fit, adjacent existing buildings. This transition can be accomplished by selecting designs that "step down" or "step up" from small to big structures and vice versa (see figure below). Transitions may also take the form of carrying building patterns and lines (e.g., parapets, windows, etc.) from the existing building to the new one.

The proposed structures are not directly adjacent to any building or structure and are separated by parking or landscaping. The roof lines and massing are varied to break up the forms, and situated at an angles from the nearest structures.

c. Contrasting architecture shall only be permitted when the design is manifestly superior to adjacent architecture in terms of creativity, design, and workmanship, and/or it is adequately separated from other buildings by distance, screening, grade variations, or is part of a development site that is large enough to set its own style of architecture.

The new buildings are set at a distance from other buildings on a large site at the end of a street. The existing buildings in the proximity are not architecturally distinct or appropriate for the proposed development.

d. Human scale is a term that seeks to accommodate the users of the building and the notion that buildings should be designed around the human scale (i.e., their size and the average range of their perception). Human scale shall be accommodated in all designs by, for example, multi-light windows that are broken up into numerous panes, intimately scaled

entryways, and visual breaks (exaggerated eaves, indentations, ledges, parapets, awnings, engaged columns, etc.) in the facades of buildings, both vertically and horizontally.

The human scale is enhanced by bringing the building and its main entrance up to the edge of the sidewalk. It creates a more dramatic and interesting streetscape and improves the "height and width" ratio referenced in this section.

The south lot has two forms that are hinged around an entry courtyard wrapped with a wood trellis. The trellis creates a ceiling over the space accommodating a human scale. The courtyard is the first architectural feature noticed upon entering the site.

The north lot building has larger massing appropriate with it's proximity to the highway. Parapet lines shall be varied and metal awnings designed to meet the human scale. The entries shall be oriented to the street scape (access easement).

e. The main front elevation of commercial and office buildings shall provide at least 60 percent windows or transparency at the pedestrian level to create more interesting streetscape and window shopping opportunities. One side elevation shall provide at least 30 percent transparency. Any additional side or rear elevation, which is visible from a collector road or greater classification, shall also have at least 30 percent transparency. Transparency on other elevations is optional. The transparency is measured in lineal fashion. For example, a 100-foot-long building elevation shall have at least 60 feet (60 percent of 100 feet) in length of windows. The window height shall be, at minimum, three feet tall. The exception to transparency would be cases where demonstrated functional constraints or topography restrict that elevation from being used. When this exemption is applied to the main front elevation, the square footage of transparency that would ordinarily be required by the above formula shall be installed on the remaining elevations at pedestrian level in addition to any transparency required by a side elevation, and vice versa. The rear of the building is not required to include transparency. The transparency must be flush with the building elevation.

Both buildings, on the north and south lots, treat the access easement as the street fronting the buildings. The elevations shall be >60% transparent as demonstrated in the table on the architectural elevations. The west walls of the buildings shall also be considered front elevations for the businesses and shall meet the 60% requirement. See architectural drawings for tabulations.

The building backsides are facing north towards the highway and south towards the wooded embankment up to Willamette Falls Drive. Windows are not included in the DR package but are assumed as the design progresses and the interior program for the spaces is defined.

f. Variations in depth and roof line are encouraged for all elevations.

To vary the otherwise blank wall of most rear elevations, continuous flat elevations of over 100 feet in length should be avoided by indents or variations in the wall. The use of decorative brick, masonry, or stone insets and/or designs is encouraged. Another way to vary or soften this elevation is through terrain variations such as an undulating grass area with trees to provide vertical relief.

No walls proposed over 100'. A use of different siding materials help with the appearance on all building sides.

g. Consideration of the micro-climate (e.g., sensitivity to wind, sun angles, shade, etc.) shall be made for building users, pedestrians, and transit users, including features like awnings.

Awnings and wood trellises proposed at building entrances.

h. The vision statement identified a strong commitment to developing safe and attractive pedestrian environments with broad sidewalks, canopied with trees and awnings.

Project includes broad sidewalks on all parking area frontages and an entry plaza facing the 8th Court cul de sac.

i. Sidewalk cafes, kiosks, vendors, and street furniture are encouraged. However, at least a four-foot-wide pedestrian accessway must be maintained per Chapter 53 CDC, Sidewalk Use.

Benches are planned for the plaza area. All sidewalk widths will exceed 4 feet.

7. Transportation. The automobile shall be shifted from a dominant role, relative to other modes of transportation, by the following means:

a. Commercial and office development shall be oriented to the street. At least one public entrance shall be located facing an arterial street; or, if the project does not front on an arterial, facing a collector street; or, if the project does not front on a collector, facing the local street with highest traffic levels. Parking lots shall be placed behind or to the side of commercial and office development. When a large and/or multi-building development is occurring on a large undeveloped tract (three plus acres), it is acceptable to focus internally; however, at least 20 percent of the main adjacent right-of-way shall have buildings contiguous to it unless waived per subsection (B)(7)(c) of this section. These buildings shall be oriented to the adjacent street and include pedestrian-oriented transparencies on those elevations.

For individual buildings on smaller individual lots, at least 30 lineal feet or 50 percent of the building must be adjacent to the right-of-way unless waived per subsection (B)(7)(c) of this section. The elevations oriented to the right-of-way must incorporate pedestrian-oriented transparency.

For the purposes of this development the access easement is considered the street frontage. Accessible stalls are located in front of the buildings nearest the building entries. The streetscape is similar to a Main Street configuration with perpendicular parking stalls opposite the building walls.

b. Multi-family projects shall be required to keep the parking at the side or rear of the buildings or behind the building line of the structure as it would appear from the right-of-way inside the multi-family project. For any garage which is located behind the building line of the structure, but still facing the front of the structure, architectural features such as

patios, patio walls, trellis, porch roofs, overhangs, pergolas, etc., shall be used to downplay the visual impact of the garage, and to emphasize the rest of the house and front entry.

The parking may be positioned inside small courtyard areas around which the units are built. These courtyard spaces encourage socialization, defensible space, and can provide a central location for landscaping, particularly trees, which can provide an effective canopy and softening effect on the courtyard in only a few years. Vehicular access and driveways through these courtyard areas is permitted.

No residential buildings proposed.

c. Commercial, office, and multi-family projects shall be built as close to the adjacent main right-of-way as practical to facilitate safe pedestrian and transit access. Reduced frontages by buildings on public rights-of-way may be allowed due to extreme topographic (e.g., slope, creek, wetlands, etc.) conditions or compelling functional limitations, not just inconveniences or design challenges.

Buildings located as close to the existing pedestrian circulation system as possible. Pedestrian easements are in place to facilitate circulation from Willamette Falls Drive to the 8th Court circle.

d. Accessways, parking lots, and internal driveways shall accommodate pedestrian circulation and access by specially textured, colored, or clearly defined footpaths at least six feet wide. Paths shall be eight feet wide when abutting parking areas or travel lanes. Paths shall be separated from parking or travel lanes by either landscaping, planters, curbs, bollards, or raised surfaces. Sidewalks in front of storefronts on the arterials and main store entrances on the arterials identified in CDC 85.200(A)(3) shall be 12 feet wide to accommodate pedestrians, sidewalk sales, sidewalk cafes, etc. Sidewalks in front of storefronts and main store entrances in commercial/OBC zone development on local streets and collectors shall be eight feet wide.

Pedestrian circulation has been designed to meet criteria in 55.100.7.d

e. Paths shall provide direct routes that pedestrians will use between buildings, adjacent rights-of-way, and adjacent commercial developments. They shall be clearly identified. They shall be laid out to attract use and to discourage people from cutting through parking lots and impacting environmentally sensitive areas.

The project has two opposing buildings across the access easement with a textured crosswalk linking the two commercial buildings.

f. At least one entrance to the building shall be on the main street, or as close as possible to the main street. The entrance shall be designed to identify itself as a main point of ingress/egress.

Each commercial building has an entrance facing the access easement.

g. Where transit service exists, or is expected to exist, there shall be a main entrance within a safe and reasonable distance of the transit stop. A pathway shall be provided to facilitate a direct connection.

No transit service identified for this site.

h. Projects shall bring at least part of the project adjacent to or near the main street right-of-way in order to enhance the height-to-width ratio along that particular street. (The "height-to-width ratio" is an architectural term that emphasizes height or vertical dimension of buildings adjacent to streets. The higher and closer the building is, and the narrower the width of the street, the more attractive and intimate the streetscape becomes.) For every one foot in street width, the adjacent building ideally should be one to two feet higher. This ratio is considered ideal in framing and defining the streetscape.

The site does not front the right of way in a typical city scape way. The proposed structures are single story buildings located in a parking area, more in keeping with a shopping center than a "main street" frontage.

i. These architectural standards shall apply to public facilities such as reservoirs, water towers, treatment plants, fire stations, pump stations, power transmission facilities, etc. It is recognized that many of these facilities, due to their functional requirements, cannot readily be configured to meet these architectural standards. However, attempts shall be made to make the design sympathetic to surrounding properties by landscaping, setbacks, buffers, and all reasonable architectural means.

Not applicable

j. Parking spaces at trailheads shall be located so as to preserve the view of, and access to, the trailhead entrance from the roadway. The entrance apron to the trailhead shall be marked: "No Parking," and include design features to foster trail recognition.

Not applicable

C. Compatibility between adjoining uses, buffering, and screening.

1. In addition to the compatibility requirements contained in Chapter 24 CDC, buffering shall be provided between different types of land uses; for example, buffering between single-family homes and apartment blocks. However, no buffering is required between single-family homes and duplexes or single-family attached units. The following factors shall be considered in determining the adequacy of the type and extent of the buffer:

a. The purpose of the buffer, for example to decrease noise levels, absorb air pollution, filter dust, or to provide a visual barrier.

b. The size of the buffer required to achieve the purpose in terms of width and height.

c. The direction(s) from which buffering is needed.

d. The required density of the buffering.

e. Whether the viewer is stationary or mobile.

The site is located at the end of a cul de sac with natural screening in every direction except to the west which has adjacent commercial properties.

2. On-site screening from view from adjoining properties of such things as service areas, storage areas, and parking lots shall be provided and the following factors will be considered in determining the adequacy of the type and extent of the screening:

a. What needs to be screened?

b. The direction from which it is needed.

c. How dense the screen needs to be.

d. Whether the viewer is stationary or mobile.

e. Whether the screening needs to be year-round.

The site is located at the end of a cul de sac with natural screening in every direction except to the west which has adjacent commercial properties.

3. Rooftop air cooling and heating systems and other mechanical equipment shall be screened from view from adjoining properties.

Rooftop HVAC equipment shall be screened.

D. Privacy and noise.

1. Structures which include residential dwelling units shall provide private outdoor areas for each ground floor unit which is screened from view from adjoining units.

Not applicable

2. Residential dwelling units shall be placed on the site in areas having minimal noise exposure to the extent possible. Natural-appearing sound barriers shall be used to lessen noise impacts where noise levels exceed the noise standards contained in West Linn Municipal Code Section 5.487.

Not applicable

3. Structures or on-site activity areas which generate noise, lights, or glare shall be buffered from adjoining residential uses in accordance with the standards in subsection C of this section where applicable.

There is a full grown, mature line of trees buffering the site with the residential property to the east. No other residential lots bordering the property.

4. Businesses or activities that can reasonably be expected to generate noise in excess of the noise standards contained in West Linn Municipal Code Section 5.487 shall undertake and submit

appropriate noise studies and mitigate as necessary to comply with the code. (See CDC 55.110(B)(11) and 55.120(M).)

No excessive noise producers proposed.

If the decision-making authority reasonably believes a proposed use may generate noise exceeding the standards specified in the municipal code, then the authority may require the applicant to supply professional noise studies from time to time during the user's first year of operation to monitor compliance with City standards and permit requirements.

No excessive noise producers proposed.

E. Private outdoor area. This section only applies to multi-family projects.

1. In addition to the requirements of residential living, unit shall have an outdoor private area (patio, terrace, porch) of not less than 48 square feet in area;

2. The outdoor space shall be oriented towards the sun where possible; and

3. The area shall be screened or designed to provide privacy for the users of the space.

4. Where balconies are added to units, the balconies shall not be less than 48 square feet, if they are intended to be counted as private outdoor areas.

Not applicable

F. Shared outdoor recreation areas. This section only applies to multi-family projects and projects with 10 or more duplexes or single-family attached dwellings on lots under 4,000 square feet. In those cases, shared outdoor recreation areas are calculated on the duplexes or single-family attached dwellings only. It also applies to qualifying PUDs under the provisions of CDC 24.170.

1. In addition to the requirements of subsection E of this section, usable outdoor recreation space shall be provided in residential developments for the shared or common use of all the residents in the following amounts:

a. Studio up to and including two-bedroom units: 200 square feet per unit.

b. Three or more bedroom units: 300 square feet per unit.

2. The required recreation space may be provided as follows:

a. It may be all outdoor space; or

b. It may be part outdoor space and part indoor space; for example, an outdoor tennis court and indoor recreation room; and

c. Where some or all of the required recreation area is indoor, such as an indoor recreation room, then these indoor areas must be readily accessible to all residents of the development subject to clearly posted restrictions as to hours of operation and such regulations necessary for the safety of minors.

d. In considering the requirements of this subsection F, the emphasis shall be on usable recreation space. No single area of outdoor recreational space shall encompass an area of less than 250 square feet. All common outdoor recreational space shall be clearly delineated and readily identifiable as such. Small, marginal, and incidental lots or parcels of land are not usable recreation spaces. The location of outdoor recreation space should be integral to the overall design concept of the site and be free of hazards or constraints that would interfere with active recreation.

3. The shared space shall be readily observable to facilitate crime prevention and safety.

Not applicable

G. Demarcation of public, semi-public, and private spaces. The structures and site improvements shall be designed so that public areas such as streets or public gathering places, semi-public areas, and private outdoor areas are clearly defined in order to establish persons having a right to be in the space, to provide for crime prevention, and to establish maintenance responsibility. These areas may be defined by:

1. A deck, patio, fence, low wall, hedge, or draping vine;

2. A trellis or arbor;

3. A change in level;

4. A change in the texture of the path material;

5. Sign; or

6. Landscaping.

Use of gates to demarcate the boundary between a public street and a private access driveway is prohibited.

Not applicable

H. Public transit.

1. Provisions for public transit may be required where the site abuts an existing or planned public transit route. The required facilities shall be based on the following:

a. The location of other transit facilities in the area.

b. The size and type of the proposed development.

c. The rough proportionality between the impacts from the development and the required facility.

2. The required facilities shall be limited to such facilities as the following:

a. A waiting shelter with a bench surrounded by a three-sided covered structure, with transparency to allow easy surveillance of approaching buses.

b. A turnout area for loading and unloading designed per regional transit agency standards.

c. Hard-surface paths connecting the development to the waiting and boarding areas.

d. Regional transit agency standards shall, however, prevail if they supersede these standards.

3. The transit stop shall be located as close as possible to the main entrance to the shopping center, public or office building, or multi-family project. The entrance shall not be more than 200 feet from the transit stop with a clearly identified pedestrian link.

4. All commercial business centers (over three acres) and multi-family projects (over 40 units) may be required to provide for the relocation of transit stops to the front of the site if the existing stop is within 200 to 400 yards of the site and the exaction is roughly proportional to the impact of the development. The commercial or multi-family project may be required to provide new facilities in those cases where the nearest stop is over 400 yards away. The transit stop shall be built per subsection (H)(2) of this section.

There is no public transit serving this location.

I. Public facilities. An application may only be approved if adequate public facilities will be available to provide service to the property prior to occupancy.

1. Streets. Sufficient right-of-way and slope easement shall be dedicated to accommodate all abutting streets to be improved to the City's Improvement Standards and Specifications. The City Engineer shall determine the appropriate level of street and traffic control improvements to be required, including any off-site street and traffic control improvements, based upon the transportation analysis submitted. The City Engineer's determination of developer obligation, the extent of road improvement and City's share, if any, of improvements and the timing of improvements shall be made based upon the City's systems development charge ordinance and capital improvement program, and the rough proportionality between the impact of the development and the street improvements.

In determining the appropriate sizing of the street in commercial, office, multi-family, and public settings, the street should be the minimum necessary to accommodate anticipated traffic load and needs and should provide substantial accommodations for pedestrians and bicyclists. Road and driveway alignment should consider and mitigate impacts on adjacent properties and in neighborhoods in terms of increased traffic loads, noise, vibrations, and glare.

The realignment or redesign of roads shall consider how the proposal meets accepted engineering standards, enhances public safety, and favorably relates to adjacent lands and land uses. Consideration should also be given to selecting an alignment or design that minimizes or avoids hazard areas and loss of significant natural features (drainageways, wetlands, heavily forested areas, etc.) unless site mitigation can clearly produce a superior landscape in terms of shape, grades, and reforestation, and is fully consistent with applicable code restrictions regarding resource areas.

Streets shall be installed per Chapter 85 CDC standards. The City Engineer has the authority to require that street widths match adjacent street widths. Sidewalks shall be installed per CDC 85.200(A)(3) for commercial and office projects, and CDC 85.200(A)(16) and 92.010(H) for residential projects, and applicable provisions of this chapter. Where streets bisect or traverse water resource areas (WRAs) the street width shall be reduced to the appropriate "constrained" cross-section width indicated in the TSP or alternate configurations which are appropriate to site conditions, minimize WRA disturbance or are consistent with an adopted transportation system plan. The street design shall also be consistent with habitat friendly provisions of CDC 32.060(I).

Based upon the City Manager's or Manager's designee's determination, the applicant shall construct or cause to be constructed, or contribute a proportionate share of the costs, for all necessary off-site improvements identified by the transportation analysis commissioned to address CDC 55.125 that are required to mitigate impacts from the proposed development. Proportionate share of the costs shall be determined by the City Manager or Manager's designee, who shall assume that the proposed development provides improvements in rough proportion to identified impacts of the development.

No changes proposed to the street system serving the property.

2. Storm detention and treatment and geologic hazards. Per the submittals required by CDC 55.130 and 92.010(E), all proposed storm detention and treatment facilities must comply with the standards for the improvement of public and private drainage systems located in the West Linn Public Works Design Standards, there will be no adverse off-site impacts caused by the development (including impacts from increased intensity of runoff downstream or constrictions causing ponding upstream), and the applicant must provide sufficient factual data to support the conclusions of the submitted plan.

Per the submittals required by CDC 55.130(E), the applicant must demonstrate that the proposed methods of rendering known or potential hazard sites safe for development, including proposed geotechnical remediation, are feasible and adequate to prevent landslides or other damage to property and safety. The review authority may impose conditions, including limits on type or intensity of land use, which it determines are necessary to mitigate known risks of landslides or property damage.

3. Municipal water. A registered civil engineer shall prepare a plan for the provision of water which demonstrates to the City Engineer's satisfaction the availability of sufficient volume, capacity, and pressure to serve the proposed development's domestic, commercial, and industrial fire flows. All plans will then be reviewed by the City Engineer.

4. Sanitary sewers. A registered civil engineer shall prepare a sewerage collection system plan which demonstrates sufficient on-site capacity to serve the proposed development. The City Engineer shall determine whether the existing City system has sufficient capacity to serve the development.

5. Solid waste and recycling storage areas. Appropriately sized and located solid waste and recycling storage areas shall be provided. Metro standards shall be used.

Waste collection areas are proposed for the ends of the east side parking drive aisles. Metro design standards shall be used to design these structures.

J. Crime prevention and safety/defensible space.

1. Windows shall be located so that areas vulnerable to crime can be surveyed by the occupants.

Windows are oriented towards parking areas.

2. Interior laundry and service areas shall be located in a way that they can be observed by others.

All amenities are located in a way that they can be observed by others.

3. Mailboxes, recycling, and solid waste facilities shall be located in lighted areas having vehicular or pedestrian traffic.

Site lighting is designed for trash areas and pedestrian circulation.

4. The exterior lighting levels shall be selected and the angles shall be oriented towards areas vulnerable to crime.

Site lighting has been selected and angles have been oriented towards areas vulnerable to crime.

5. Light fixtures shall be provided in areas having heavy pedestrian or vehicular traffic and in potentially dangerous areas such as parking lots, stairs, ramps, and abrupt grade changes.

Light fixtures are shown in areas of pedestrian and vehicular traffic, and in potentially dangerous areas such as parking lots, stairs, ramps, and abrupt grade changes.

6. Fixtures shall be placed at a height so that light patterns overlap at a height of seven feet which is sufficient to illuminate a person. All commercial, industrial, residential, and public facility projects undergoing design review shall use low or high pressure sodium bulbs and be able to demonstrate effective shielding so that the light is directed downwards rather than omni-directional. Omni-directional lights of an ornamental nature may be used in general commercial districts only.

The design of the site lighting includes the selection dark sky compliant LED luminaires. The luminaires will be equipped with shields that minimize glare, reduces light trespass and skyglow. No light will be emitted about 180 degrees. The lighting has been laid out to provide overlapping vertical illumination at 7' above grade which will be sufficient to illuminate a person.

7. Lines of sight shall be reasonably established so that the development site is visible to police and residents.

Lines of sight have been established so that the development site is visible to police and occupants.

8. Security fences for utilities (e.g., power transformers, pump stations, pipeline control equipment, etc.) or wireless communication facilities may be up to eight feet tall in order to protect public safety. No variances are required regardless of location.

Not applicable.

K. Provisions for persons with disabilities.

1. The needs of a person with a disability shall be provided for. Accessible routes shall be provided between all buildings and accessible site facilities. The accessible route shall be the most practical direct route between accessible building entries, accessible site facilities, and the accessible entry to the site. An accessible route shall connect to the public right-of-way and to at least one on-site or adjacent transit stop (if the area is served by transit). All facilities shall conform to, or exceed, the Americans with Disabilities Act (ADA) standards, including those included in the Uniform Building Code.

Accessible routes are proposed between all buildings and accessible site facilities.

L. Signs.

1. Based on considerations of crime prevention and the needs of emergency vehicles, a system of signs for identifying the location of each residential unit, store, or industry shall be established.

Buildings shall be numbered for emergency identification. A monument sign is proposed at the development entry landscaping to help with way-finding.

2. The signs, graphics, and letter styles shall be designed to be compatible with surrounding development, to contribute to a sense of project identity, or, when appropriate, to reflect a sense of the history of the area and the architectural style.

Signs, graphics, and letter styles shall be designed to be compatible with surrounding development

3. The sign graphics and letter styles shall announce, inform, and designate particular areas or uses as simply and clearly as possible.

Sign graphics and letter styles shall announce, inform, and designate particular areas or uses as simply and clearly as possible.

4. The signs shall not obscure vehicle driver's sight distance.

The monument sign is not proposed in a location that would block site lines to vehicular circulation.

5. Signs indicating future use shall be installed on land dedicated for public facilities (e.g., parks, water reservoir, fire halls, etc.).

Not applicable.

6. Signs and appropriate traffic control devices and markings shall be installed or painted in the driveway and parking lot areas to identify bicycle and pedestrian routes.

Signs and appropriate traffic control devices and markings shall be installed or painted in the driveway and parking lot areas to identify bicycle and pedestrian routes.

M. Utilities. The developer shall make necessary arrangements with utility companies or other persons or corporations affected for the installation of underground lines and facilities. Electrical lines and other wires, including but not limited to communication, street lighting, and cable television, shall be placed underground, as practical. The design standards of Tables 1 and 2 above, and of subsection 5.487 of the West Linn Municipal Code relative to existing high ambient noise levels shall apply to this section.

The project shall be designed to meet the CDC standards for utilities.

N. Wireless communication facilities (WCFs). (This section only applicable to WCFs.) WCFs as defined in Chapter 57 CDC may be required to go through Class I or Class II design review. The approval criteria for Class I design review is that the visual impact of the WCF shall be minimal to the extent allowed by Chapter 57 CDC. Stealth designs shall be sufficiently camouflaged so that they are not easily seen by passersby in the public right-of-way or from any adjoining residential unit. WCFs that are classified as Class II design review must respond to all of the approval criteria of this chapter.

The project shall be designed to meet the CDC standards for WCFs.

O. Refuse and recycling standards.

1. All commercial, industrial and multi-family developments over five units requiring Class II design review shall comply with the standards set forth in these provisions. Modifications to these provisions may be permitted if the Planning Commission determines that the changes are consistent with the purpose of these provisions and the City receives written evidence from the local franchised solid waste and recycling firm that they are in agreement with the proposed modifications.

The project shall be designed to meet the CDC standards for refuse and recycling.

2. Compactors, containers, and drop boxes shall be located on a level Portland cement concrete pad, a minimum of four inches thick, at ground elevation or other location compatible with the local franchise collection firm's equipment at the time of construction. The pad shall be designed to discharge surface water runoff to avoid ponding.

The project shall be designed to meet the CDC standards for refuse pads.

3. Recycling and solid waste service areas.

The project shall be designed to meet the Recycling and solid waste standards.

a. Recycling receptacles shall be designed and located to serve the collection requirements for the specific type of material.

b. The recycling area shall be located in close proximity to the garbage container areas and be accessible to the local franchised collection firm's equipment.

c. Recycling receptacles or shelters located outside a structure shall have lids and be covered by a roof constructed of water and insect-resistive material. The maintenance of enclosures, receptacles and shelters is the responsibility of the property owner.

d. The location of the recycling area and method of storage shall be approved by the local fire marshal.

e. Recycling and solid waste service areas shall be at ground level and/or otherwise accessible to the franchised solid waste and recycling collection firm.

f. Recycling and solid waste service areas shall be used only for purposes of storing solid waste and recyclable materials and shall not be a general storage area to store personal belongings of tenants, lessees, property management or owners of the development or premises.

g. Recyclable material service areas shall be maintained in a clean and safe condition.

4. Special wastes or recyclable materials.

The project shall be designed to meet the Special wastes or recyclable materials standards.

a. Environmentally hazardous wastes defined in ORS 466.005 shall be located, prepared, stored, maintained, collected, transported, and disposed in a manner acceptable to the Oregon Department of Environmental Quality.

b. Containers used to store cooking oils, grease or animal renderings for recycling or disposal shall not be located in the principal recyclable materials or solid waste storage areas. These materials shall be stored in a separate storage area designed for such purpose.

5. Screening and buffering.

a. Enclosures shall include a curbed landscape area at least three feet in width on the sides and rear. Landscaping shall include, at a minimum, a continuous hedge maintained at a height of 36 inches.

See landscape plans.

b. Placement of enclosures adjacent to residentially zoned property and along street frontages is strongly discouraged. They shall be located so as to conceal them from public view to the maximum extent possible.

Criteria met.

c. All dumpsters and other trash containers shall be completely screened on all four sides with an enclosure that is comprised of a durable material such as masonry with a finish that

is architecturally compatible with the project. Chain link fencing, with or without slats, will not be allowed.

Trash enclosures shall be constructed with concrete masonry units designed to be compatible with primary buildings.

6. Litter receptacles.

a. Location. Litter receptacles may not encroach upon the minimum required walkway widths.

Litter receptacles shall not encroach upon the minimum required walkway widths.

b. Litter receptacles may not be located within public rights-of-way except as permitted through an agreement with the City in a manner acceptable to the City Attorney or his/her designee.

Litter receptacles shall not be located within the ROW.

c. Number. The number and location of proposed litter receptacles shall be based on the type and size of the proposed uses. However, at a minimum, for non-residential uses, at least one external litter receptacle shall be provided for every 25 parking spaces for first 100 spaces, plus one receptacle for every additional 100 spaces.

47 parking stalls are proposed. 2 litter receptacles are proposed. See landscape plans.

55.110 SITE ANALYSIS

The site analysis shall include:

A. A vicinity map showing the location of the property in relation to adjacent properties, roads, pedestrian and bike ways, transit stops and utility access. **Included on Cover Sheet.**

B. A site analysis on a drawing at a suitable scale (in order of preference, one inch equals 10 feet to one inch equals 30 feet) which shows:

1. The property boundaries, dimensions, and gross area.

2. Contour lines at the following minimum intervals:

a. Two-foot intervals for slopes from zero to 25 percent; and

b. Five- or 10-foot intervals for slopes in excess of 25 percent.

3. Tables and maps identifying acreage, location and type of development constraints due to site characteristics such as slope, drainage and geologic hazards, including a slope analysis which identifies portions of the site according to the land types (I, II, III and IV) defined in Chapter 02 CDC.

4. The location and width of adjoining streets.

5. The drainage patterns and drainage courses on the site and on adjacent lands.

6. Potential natural hazard areas including:

   a. Floodplain areas pursuant to the site's applicable FEMA Flood Map panel;

   b. Water resource areas as defined by Chapter 32 CDC;

   c. Landslide areas designated by the Natural Hazard Mitigation Plan, Map 16; and

   d. Landslide vulnerable analysis areas, designated by the Natural Hazard Mitigation Plan, Map 17.

7. Resource areas including:

   a. Wetlands;

   b. Riparian corridors;

   c. Streams, including intermittent and ephemeral streams;

   d. Habitat conservation areas; and

   e. Large rock outcroppings.

8. Potential historic landmarks and registered archaeological sites. The existence of such sites on the property shall be verified from records maintained by the Community Development Department and other recognized sources.

9. Identification information including the name and address of the owner, developer, project designer, lineal scale and north arrow.

10. Identify Type I and II lands in map form. Provide a table which identifies square footage of Type I and II lands also as percentage of total site square footage.

55.120 SITE PLAN

The submitted site plan is at the same scale as the site analysis and shows:

A. The entire property and the surrounding property to a distance sufficient to determine the relationship between the applicant's property and proposed development and adjacent property and development.

B. Boundary lines and dimensions for the perimeter of the property and the dimensions for all proposed lot or parcel lines.

C. Streams and stream corridors.

D. Identification information, including the name and address of the owner, developer, project designer, lineal scale and north arrow.

E. The location, dimensions, and names of all existing and proposed streets, public pathways, easements on adjacent properties and on the site, and all associated rights-of-way.

F. The location, dimensions and setback distances of all:

1. Existing and proposed structures, improvements, and utility facilities on site; and

2. Existing structures and driveways on adjoining properties.

G. The location and dimensions of:

1. The entrances and exits to the site;

2. The parking and circulation areas;

3. Areas for waste disposal, recycling, loading, and delivery;

4. Pedestrian and bicycle routes, including designated routes, through parking lots and to adjacent rights-of-way;

5. On-site outdoor recreation spaces and common areas;

6. All utilities, including stormwater detention and treatment; and

7. Sign locations.

H. The location of areas to be landscaped. (Ord. 1442, 1999; Ord. 1613 § 14, 2013; Ord. 1622 § 28, 2014; Ord. 1636 § 39, 2014)

55.125 TRANSPORTATION ANALYSIS

Included in DR submittal.

55.130 GRADING AND DRAINAGE PLANS

A registered civil engineer has prepared a conceptual grading plan and a storm detention and treatment plan pursuant to CDC 92.010(E), at a scale sufficient to evaluate all aspects of the proposal, and a statement that demonstrates:

A. The location and extent to which grading will take place indicating general contour lines, slope ratios, slope stabilization proposals, and location and height of retaining walls, if proposed.

B. All proposed storm detention and treatment facilities comply with the standards for the improvement of public and private drainage systems located in the West Linn Public Works Design Standards.

C. There is sufficient factual data to support the conclusions of the plan.

D. Per CDC 99.035, the Planning Director may require the information in subsections A, B and C of this section for Type IV lands if the information is needed to properly evaluate the proposed site plan.

E. **A geologic report is attached.**

F. Identification information, including the name and address of the owner, developer, project designer, and the project engineer. **Included on Cover Sheet**

55.140 ARCHITECTURAL DRAWINGS

Architectural drawings shall be submitted showing:

A. Building elevations and sections tied to curb elevation; **Shown schematically on plans. To be refined through design development.**

B. Building materials: color and type; **Shown on attached Material Board.**

C. The name of the architect or designer. **Included on Cover Sheet**

55.150 LANDSCAPE PLAN

This section does not apply to detached single-family residential subdivisions or partitions, or up to two duplexes or single-family attached dwellings.

A. The landscape plan shall be prepared and shall show the following:

1. Preliminary underground irrigation system, if proposed; **Irrigation to be design-build.**

2. The location and height of fences and other buffering of screening materials, if proposed; **No fencing currently proposed.**

3. The location of terraces, decks, patios, shelters, and play areas, if proposed; **Shown on plans.**

4. The location, size, and species of the existing and proposed plant materials, if proposed; **Shown on plans.**

5. Building and pavement outlines. **Shown on plans.**

B. The landscape plan shall be accompanied by:

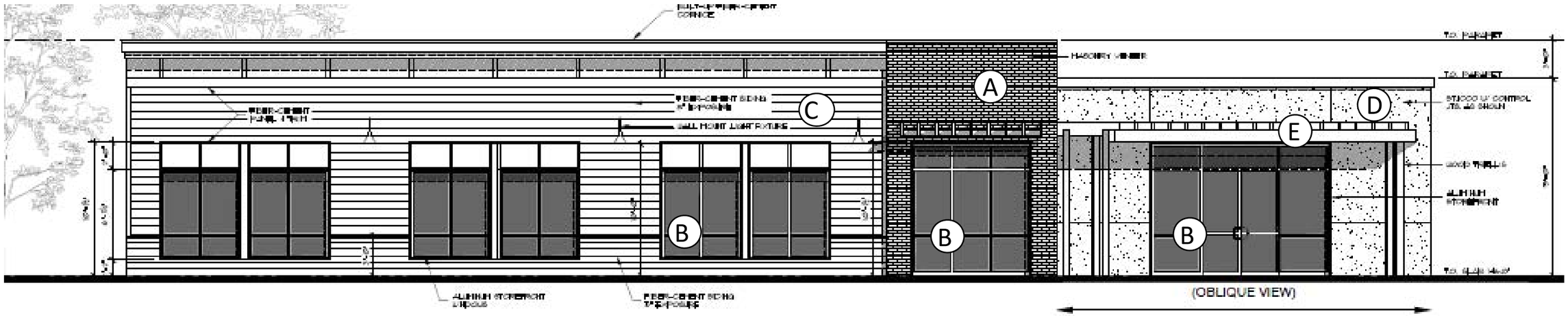
1. The erosion controls that will be used, if necessary; **See civil plans**

2. Planting list; **Shown on plans.**

3. Supplemental information as required by the Planning Director or City Arborist. **N/A**

8th COURT DEVELOPMENT

2180 8TH COURT, WEST LINN, OR



SOUTH BUILDING ELEVATION (View facing North)

NORTH ELEVATION

(A) COUNTRY LEDGESTONE.
MUTUAL MATERIALS OR SIMILAR

(B) CLEAR GLASS STOREFRONT GLAZING WITH ANODIZED ALUMINUM FRAMING. FINISH COLOR T.B.D.

(C) ARTISAN LAP SIDING.
JAMES HARDIE OR SIMILAR

(C) ARTISAN LAP SIDING.
JAMES HARDIE OR SIMILAR

EDGE DEVELOPMENT

ISELIN ARCHITECTS P.C.

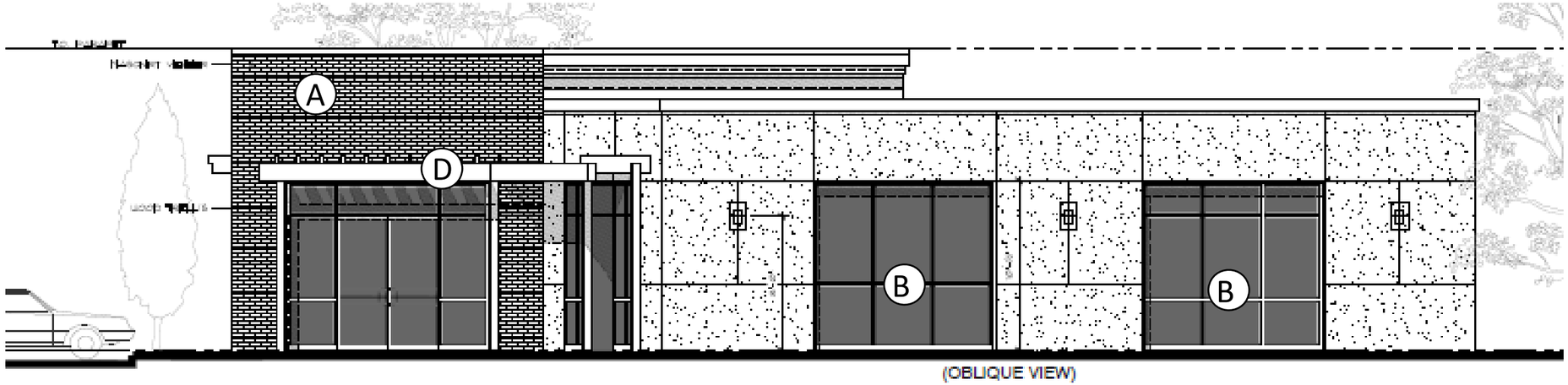
MATERIAL BOARD 1

Willamette Capital Investments, LLC

DESIGN REVIEW PACKAGE
SEPTEMBER 2018

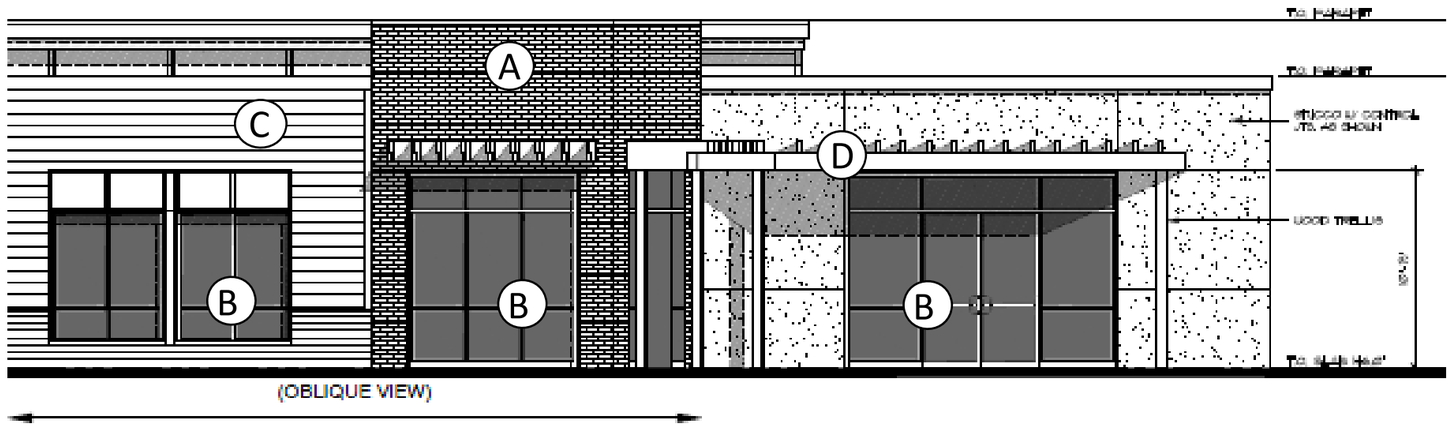
8th COURT DEVELOPMENT

2180 8TH COURT, WEST LINN, OR



WEST ELEVATION

(D) WOOD TRELLIS.
(Concept image)



PARTIAL NORTHWEST ELEVATION

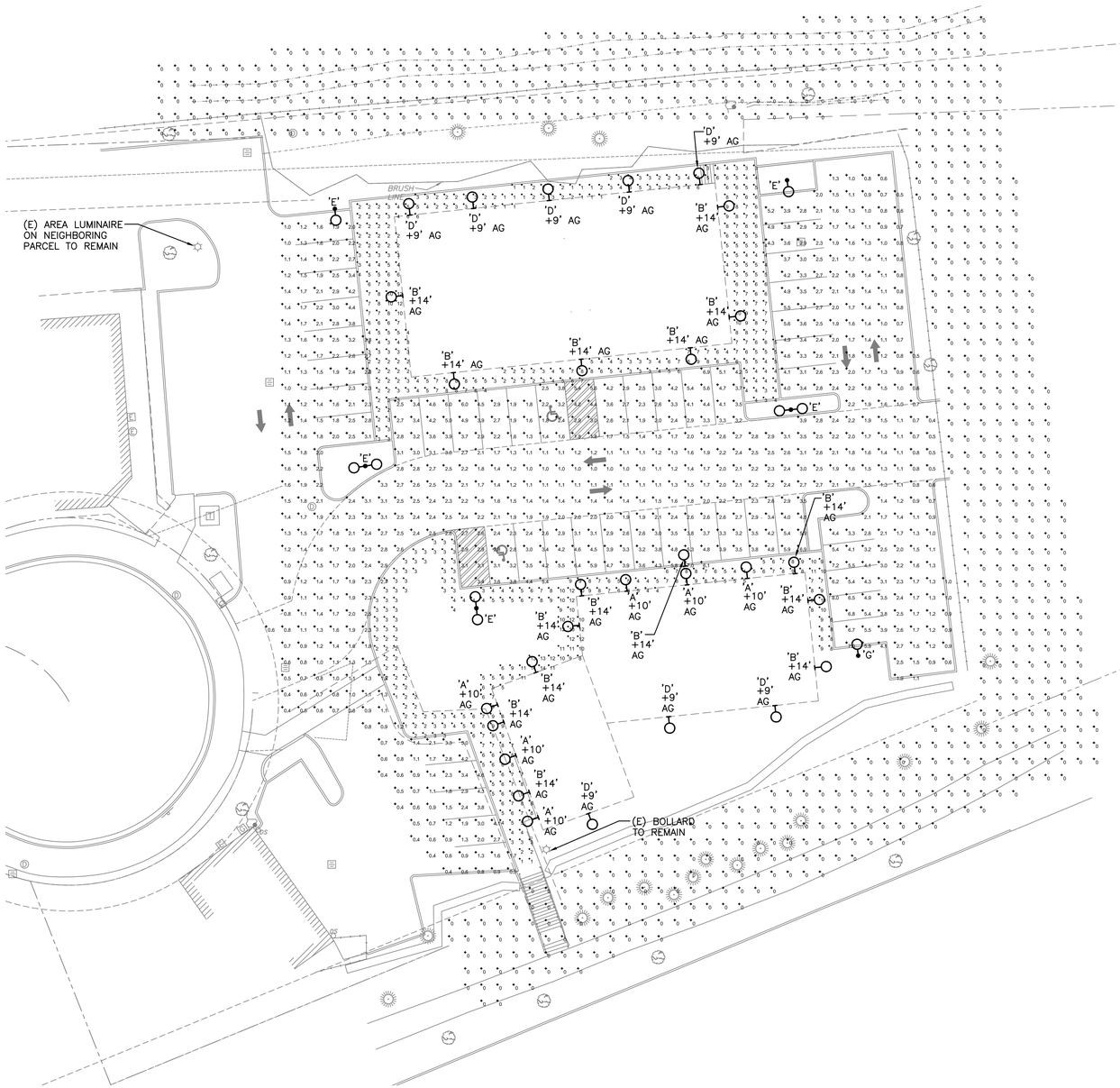
EDGE DEVELOPMENT

ISELIN ARCHITECTS P.C.

MATERIAL BOARD 2

Willamette Capital Investments, LLC

DESIGN REVIEW PACKAGE
SEPTEMBER 2018



1 / E1.0 SITE PLAN - PHOTOMETRIC
SCALE: 1" = 20'

PHOTOMETRIC TABLE

STATISTICS	DESIGN VALUES				
DESCRIPTION	SYMBOL	AVG	MAX	MIN	AVG/MIN
PARKING LOT	+	2.3 fc	8.0 fc	0.4 fc	5.8:1
WALKWAY SOUTH BLDG	+	6.0 fc	14.0 fc	1.0 fc	6:01
WALKWAY NORTH BLDG	+	5.0Cfc	12.0 fc	2.0 fc	2.5:1
BEYOND PROP BOUNDARY	+	0.0 fc	1.0 fc	0.0 fc	N/A

SYMBOL LEGEND

	POLE MOUNTED TYPE 'A' LUMINIARE TO BE INSTALLED
	POLE MOUNTED TYPE 'B' LUMINIARE TO BE INSTALLED
	WALL MOUNTED LUMINAIRE TO BE INSTALLED
A.G.	ABOVE GRADE
(E)	EXISTING
FC	FOOT CANDLE

LUMINAIRE SCHEDULE

LUMINAIRE TYPE	DESCRIPTION	LAMP TYPE	INPUT WATTS	DRIVER/ BALLAST	COLOR TEMP	MANUFACTURER AND MODEL SERIES
'A'	12" DIAMETER ARM MOUNTED LED ANGLE REFLECTOR. ALL ALUMINUM HOUSING, 90CRI, 120V AND BRONZE FINISH.	LED 1,860 LUMENS	15W	STANDARD	4,000K	TROY RLM LIGHTING: ANGLE REFLECTOR SERIES OR APPROVED.
'B'	SURFACE MOUNTED LED WALL SCONCE. ALUMINUM HOUSING, 70CRI, VISUAL COMFORT FORWARD THROW DISTRIBUTION, MVOLT AND DARK BRONZE FINISH.	LED 3,469 LUMENS	25W	STANDARD	4,000K	LITHONIA LIGHTING: WST LED SERIES OR APPROVED.
'C'	POLE MOUNTED LED LUMINAIRE. FORWARD OPTICS, TYPE 2 MEDIUM DISTRIBUTION, MVOLT, SQUARE POLE MOUNTING, TWO HEADS MOUNTED AT 180 DEGREES AND DARK BRONZE FINISH.	LED 5,593 LUMENS	49W	STANDARD	4,000K	LITHONIA LIGHTING: DSX0 SERIES OR APPROVED.
'D'	WALL MOUNT LED LUMINAIRE. MVOLT, STANDARD DISTRIBUTION AND DARK BRONZE FINISH.	LED 5,593 LUMENS	13W	STANDARD	4,000K	LITHONIA LIGHTING: OLWX1 SERIES OR APPROVED.
'E'	POLE MOUNTED LED LUMINAIRE. FORWARD OPTICS, TYPE 2 MEDIUM DISTRIBUTION, MVOLT, SQUARE POLE MOUNTING, SINGLE HEAD MOUNTING,GLARE SHIELD, HOUSE SIDE SHIELD AND DARK BRONZE FINISH.	LED 5,593 LUMENS	49W	STANDARD	4,000K	LITHONIA LIGHTING: DSX0 SERIES OR APPROVED.

NOTES:
1. ALL POLE MOUNTED LUMINAIRES HAVE A MOUNTING HEIGHT OF 20'.
2. CONTRACTOR TO RELOCATE/REUSE EXISTING 20' SQUARE POLES. CONTRACTOR TO VERIFY LUMINAIRE MOUNTING IS CONFIGURED TO PROPERLY ATTACH TO EXISTING POLE.

ISELIN ARCHITECTS P.C.
1307 Seventh Street
Oregon City, OR 97045
503-656-1942
www.iselinarchitects.com

REGISTERED PROFESSIONAL ENGINEER
88445PE
OREGON
NOV. 12, 2013
JONATHAN PATRICK LILLY
RENEWAL DATE: 12-31-2018

DESIGN REVIEW

8th Court Building Shell

2180 8th Court - South Lot
West Linn, OR 97068

PROJ. NO. : 1861
FILE :
DATE : 09/17/18

SHEET #
E1.0

SITE PLAN - PHOTOMETRIC

R&W ENGINEERING, INC.
"Engineering Integrated Solutions"
9615 S.W. Allen Boulevard
Suite 107
Beaverton, Oregon 97005
Phone: (503) 726-3321
Fax: (503) 726-3326
E-mail: rweng@rweng.com
Project No.: 1407.002.001 Contact: HEATHER HARRIS

ANGLE REFLECTOR

Aluminum Shade
with Glass and Guard Options

Catalog #:
Project: Type: A
Date: Notes:

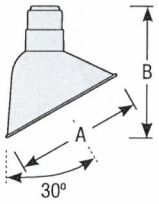
Electrical
- 120V input (277V available in arm and post option only)
- Integrated power supply allows the fixture to be connected directly into line voltage
- Pre-wired and ready for install
- LED is dimmable with Incandescent/Triac dimmers

Mounting
- 1/2" or 3/4" IP for arms. Flush mount and post available only in 1/2"

Finishes
- Shade and mounting finish options
- Available in 21 standard and 2 specialty finishes with optional coastal coating to protect finish in coastal environments (add "-C" to the finish)
- Inner shade is painted gloss white
- Consult factory for custom finish options

Optional Accessories
- Glass, Cast Guard, Wire Cage or Wire Guard options available

Listing
UL listed to US and Canadian standards for wet locations



	A	B
RA8	8"	9"
RA10	10"	11"
RA12	12"	12-1/2"

Angle Reflector Order Matrix (Example: RA10LED1127GA-2)

Diameter	Lamp / LED	Finish	Coastal Coating Option	Accessories	Mounting Type
☐ **RA8** (8") ☐ **RA10** (10") ◉ **RA12** (12")	☐ **M** (Medium Base, 100W max.) ☐ **GU2413**[1] (13W GU24 / 2700K) ☐ **GU2418**[1] (18W GU24 / 2700K) ☐ **GU2426**[1] (26W GU24 / 2700K) ☐ **GU2432**[1,2] (32W GU24 / 2700K) ☐ **GU2442**[1,2] (42W GU24 / 2700K) ☐ **LED1127**[1,3] (11W LED / 2700K / 90 CRI / 1188lm) ☐ **LED1130**[1,3] (11W LED / 3000K / 90 CRI / 1265lm) ☐ **LED1135**[1,3] (11W LED / 3500K / 90 CRI / 1305lm) ☐ **LED1140**[1,3] (11W LED / 4000K / 90 CRI / 1364lm) ☐ **LED1527**[1,3] (15W LED / 2700K / 90 CRI / 1620lm) ☐ **LED1530**[1,3] (15W LED / 3000K / 90 CRI / 1725lm) ☐ **LED1535**[1,3] (15W LED / 3500K / 90 CRI / 1780lm) ◉ **LED1540**[1,3] (15W LED / 4000K / 90 CRI / 1860lm)	☐ **ABL** (Aegean Blue) ☐ **BB** (Burnished Bronze) ☐ **BK** (Gloss Black) ☐ **BLU** (Blue) ☐ **DVG** (Dove Gray) ☐ **FLG** (Flannel Gray) ☐ **GA** (Galvanized) ☐ **LG** (Lime Green) ◉ **MB** (Matte Black) ☐ **MBL** (Midnight Blue) ☐ **PNA** (Painted Natural Aluminum) ☐ **PNC** (Painted Natural Copper) ☐ **RD** (Red) ☐ **SA** (Satin Aluminum) ☐ **SGR** (Sage Green) ☐ **SGW** (Semi Gloss White) ☐ **SND** (Sand) ☐ **SS** (Satin Silver) ☐ **TBZ** (Textured Bronze) ☐ **TGP** (Textured Graphite) ☐ **TNG** (Tangerine) ☐ **TTL** (Tahitian Teal) ☐ **WT** (Gloss White)	◉ (blank) (No coating) ☐ **-C**[4] (Coating)	☐ (blank) (No Accessories) ☐ **-CG** (Clear Glass) ◉ **-FG** (Frosted Glass) ☐ **-OG** (Opal Glass) ☐ **-CGG** (Clear Glass w/ Cast Guard) ☐ **-FGG** (Frosted Glass w/ Cast Guard) ☐ **-OGG** (Opal Glass w/ Cast Guard) ☐ **-CGWC** (Clear Glass w/ Wire Cage) ☐ **-FGWC** (Frosted Glass w/ Wire Cage) ☐ **-OGWC** (Opal Glass w/ Wire Cage) ☐ **-WG** (Wire Guard)	☐ **-2** (1/2" IP) ☐ **-3** (3/4" IP) ◉ **-F** (Flush Mount)

1. Lamp/LED included
2. Not for use in glass/cast guard/wire cage
3. Glass enclosure must be specified
4. Satin aluminum cannot be coated

KEY: Standard Finishes

- **ABL** (Aegean Blue)
- **BB** (Burnished Bronze)
- **BK** (Gloss Black)
- **BLU** (Blue)
- **DVG** (Dove Gray)
- **FLG** (Flannel Gray)
- **LG** (Lime Green)
- **MB** (Matte Black)
- **MBL** (Midnight Blue)
- **PNA** (Painted Natural Aluminum)
- **PNC** (Painted Natural Copper)
- **RD** (Red)
- **SGR** (Sage Green)
- **SGW** (Semi Gloss White)
- **SND** (Sand)
- **SS** (Satin Silver)
- **TBZ** (Textured Bronze)
- **TGP** (Textured Graphite)
- **TNG** (Tangerine)
- **TTL** (Tahitian Teal)
- **WT** (Gloss White)

Specialty Finishes

- **GA** (Galvanized)
- **SA** (Satin Aluminum)

Revised 06/01/2018

14508 Nelson Ave. City of Industry, CA 91744 • tel: 626.336.4511 • fax: 626.330.4266 • www.TroyRLM.com

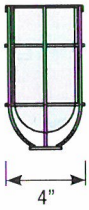
ANGLE REFLECTOR

Aluminum Shade
with Glass and Guard Options

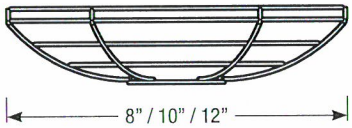
Catalog #:
Project:
Type: A
Date:
Notes:

Glass Enclosure
- Glass is available in clear (-CG), frosted (-FG) or opal (-OG)

Cast Guard with Glass Enclosure
- Cast guard can be specified in all standard and specialized finishes, and will match shade finish unless otherwise specified
  (Note: For galvanized shade finishes, cast guard is unfinished Raw Aluminum)
- Glass is available in clear (-CGG), frosted (-FGG) or opal (-OGG)



Wire Cage with Glass Enclosure
- Wire cage can be specified in all standard and specialized finishes, and will match shade finish unless otherwise specified
  (Note: For galvanized shade finishes, wire cage is finished in Painted Natural Aluminum)
- Glass is available in clear (-CGWC), frosted (-FGWC) or opal (-OGWC)



Wire Guard (-WG)
- Wire cage can be specified in all standard and specialized finishes, and will match shade finish unless otherwise specified
  (Note: For galvanized shade finishes, wire guard is finished in Painted Natural Aluminum)

Revised 06/01/2018

14508 Nelson Ave. City of Industry, CA 91744 • tel: 626.336.4511 • fax: 626.330.4266 • www.TroyRLM.com

ANGLE REFLECTOR

Aluminum Shade
with Glass and Guard Options

Catalog #:
Project:
Type: A
Date:
Notes:

Arm Mount Order Matrix (Example: 2SL30RD)

Pipe	Arm Type	Finish	Coastal Coating Option	Input Voltage
☐ 2 (1/2" IP)	☐ SL23 (Small Loop- 23")	☐ ABL (Aegean Blue)	☐ (blank) (No coating)	☐ (blank) (120V)
☐ 3 (3/4" IP)	☐ SL30 (Small Loop- 30")	☐ BB (Burnished Bronze)	☐ -C[4] (Coating)	☐ -27 (277V)
	☐ LL23 (Large Loop - 23")	☐ BK (Gloss Black)		
	☐ LL30 (Large Loop - 30")	☐ BLU (Blue)		
	☐ LC18 (Curve Arm - 18")	☐ DVG (Dove Gray)		
	☐ LC24 (Curve Arm - 24")	☐ FLG (Flannel Gray)		
	☐ LC30 (Curve Arm - 30")	☐ GA (Galvanized)		
	☐ LM18 (Miter Arm - 18")	☐ LG (Lime Green)		
	☐ LM24 (Miter Arm - 24")	☐ MB (Matte Black)		
	☐ LM30 (Miter Arm - 30")	☐ MBL (Midnight Blue)		
	☐ SA18 (Sign Arm - 18")	☐ PNA (Painted Natural Aluminum)		
	☐ SA23 (Sign Arm - 23")	☐ PNC (Painted Natural Copper)		
	☐ LSA23 (Large Loop Sign Arm - 23")	☐ RD (Red)		
	☐ LSA30 (Large Loop Sign Arm - 30")	☐ SA (Satin Aluminum)		
	☐ A6 (Straight Arm - 6")	☐ SGR (Sage Green)		
	☐ A12 (Straight Arm - 12")	☐ SGW (Semi Gloss White)		
	☐ A18 (Straight Arm - 18")	☐ SND (Sand)		
	☐ A24 (Straight Arm - 24")	☐ SS (Satin Silver)		
	☐ A30 (Straight Arm - 30")	☐ TBZ (Textured Bronze)		
	☐ MA18 (Modern Arm - 18")	☐ TGP (Textured Graphite)		
	☐ MA24 (Modern Arm - 24")	☐ TNG (Tangerine)		
	☐ MA30 (Modern Arm - 30")	☐ TTL (Tahitian Teal)		
		☐ WT (Gloss White)		

4. Satin aluminum cannot be coated

Standard Finishes

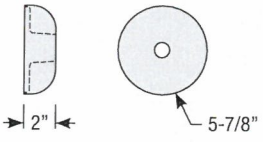
- ABL (Aegean Blue)
- BB (Burnished Bronze)
- BK (Gloss Black)
- BLU (Blue)
- DVG (Dove Gray)
- FLG (Flannel Gray)
- LG (Lime Green)
- MB (Matte Black)
- MBL (Midnight Blue)
- PNA (Painted Natural Aluminum)
- PNC (Painted Natural Copper)
- RD (Red)
- SGR (Sage Green)
- SGW (Semi Gloss White)
- SND (Sand)
- SS (Satin Silver)
- TBZ (Textured Bronze)
- TGP (Textured Graphite)
- TNG (Tangerine)
- TTL (Tahitian Teal)
- WT (Gloss White)

Specialty Finishes

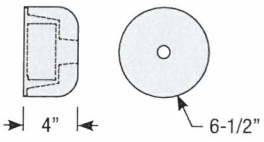
- GA (Galvanized)
- SA (Satin Aluminum)

Note: All arm mounts include canopy

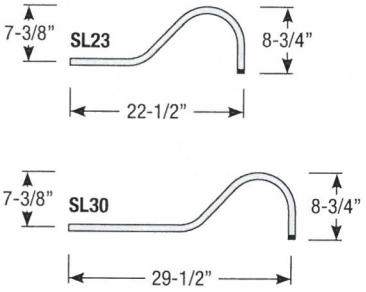
120V Canopy



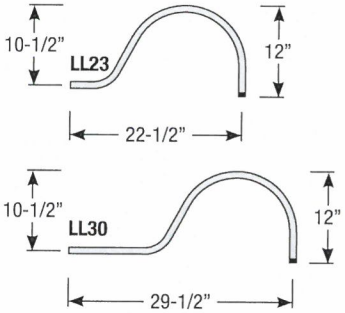
277V Canopy



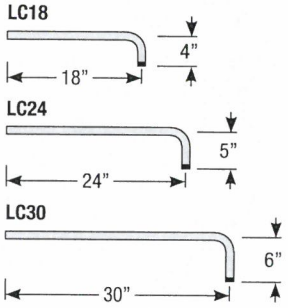
Small Loop Arm



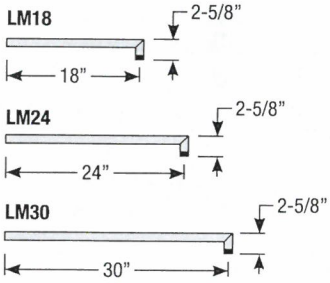
Large Loop Arm



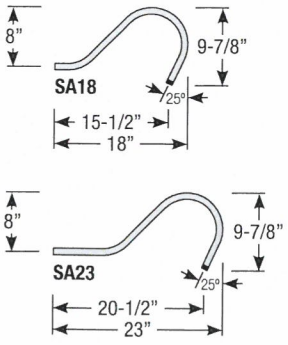
Curve Arm



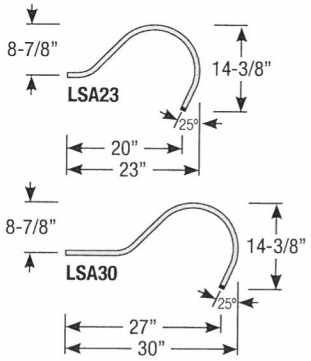
Miter Arm



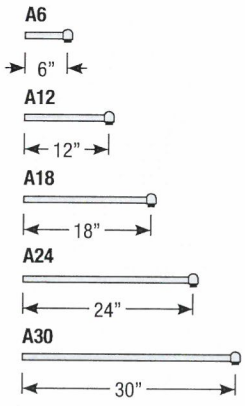
Sign Arm



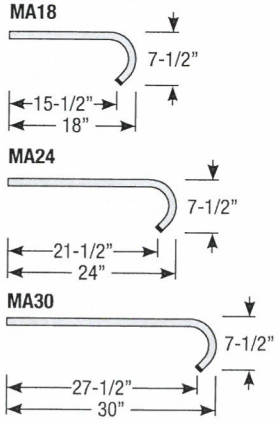
Large Loop Sign Arm



Straight Arm



Modern Arm



Revised 06/01/2018

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ANGLE REFLECTOR

Aluminum Shade
with Glass and Guard Options

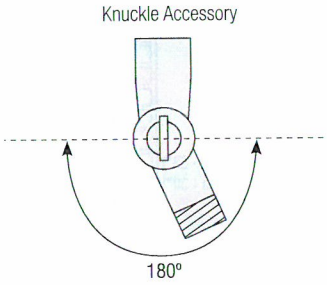
Catalog #:
Project:
Type: A
Date:
Notes:

Knuckle Accessory Order Matrix (Example: 2KNLRD)

Pipe	Finish	Finish	Coastal Coating Option
☐ **2** (1/2" IP) ☐ **3** (3/4" IP)	**KNL** (Adjustable 180° Knuckle for Arm Mounts)	☐ **ABL** (Aegean Blue) ☐ **BB** (Burnished Bronze) ☐ **BK** (Gloss Black) ☐ **BLU** (Blue) ☐ **DVG** (Dove Gray) ☐ **FLG** (Flannel Gray) ☐ **GA** (Galvanized) ☐ **LG** (Lime Green) ☐ **MB** (Matte Black) ☐ **MBL** (Midnight Blue) ☐ **PNA** (Painted Natural Aluminum) ☐ **PNC** (Painted Natural Copper) ☐ **RD** (Red) ☐ **SA** (Satin Aluminum) ☐ **SGR** (Sage Green) ☐ **SGW** (Semi Gloss White) ☐ **SND** (Sand) ☐ **SS** (Satin Silver) ☐ **TBZ** (Textured Bronze) ☐ **TGP** (Textured Graphite) ☐ **TNG** (Tangerine) ☐ **TTL** (Tahitian Teal) ☐ **WT** (Gloss White)	☐ (blank) (No coating) ☐ **-C**[4] (Coating)

4. Satin aluminum cannot be coated

Description
Adjustable knuckle for arm mounts that allow luminaire to be rotated up to 180°.



Standard Finishes

- **ABL** (Aegean Blue)
- **BB** (Burnished Bronze)
- **BK** (Gloss Black)
- **BLU** (Blue)
- **DVG** (Dove Gray)
- **FLG** (Flannel Gray)
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- **TTL** (Tahitian Teal)
- **WT** (Gloss White)

Specialty Finishes

- **GA** (Galvanized)
- **SA** (Satin Aluminum)

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ANGLE REFLECTOR

Aluminum Shade
with Glass and Guard Options

Catalog #:

Project:

Type: A

Date:

Notes:

Post / Wall Mount Order Matrix (Example: 2W1RD)

Pipe	Mount Type	Finish	Input Voltage
☐ **2** (1/2" IP)	☐ **P1** (Single Post Mount) ☐ **P2** (Double Post Mount) ☐ **W1** (Traditional Wall Mount)	☐ **ABL** (Aegean Blue) ☐ **BB** (Burnished Bronze) ☐ **BK** (Gloss Black) ☐ **BLU** (Blue) ☐ **DVG** (Dove Gray) ☐ **FLG** (Flannel Gray) ☐ **GA** (Galvanized) ☐ **LG** (Lime Green) ☐ **MB** (Matte Black) ☐ **MBL** (Midnight Blue) ☐ **PNA** (Painted Natural Aluminum) ☐ **PNC** (Painted Natural Copper) ☐ **RD** (Red) ☐ **SA** (Satin Aluminum) ☐ **SGR** (Sage Green) ☐ **SGW** (Semi Gloss White) ☐ **SND** (Sand) ☐ **SS** (Satin Silver) ☐ **TBZ** (Textured Bronze) ☐ **TGP** (Textured Graphite) ☐ **TNG** (Tangerine) ☐ **TTL** (Tahitian Teal) ☐ **WT** (Gloss White)	☐ (blank) (120V) ☐ **-27**[5] (277V)

5. Post mount only

Post Type Order Matrix (Example: P8683-96RD)

Post Type	Finish
☐ **PM4946** (Cast Aluminum Post) ☐ **P8683-96** (Cast Aluminum Base w/ 96" Aluminum Post) ☐ **P8683-120** (Cast Aluminum Base w/ 120" Aluminum Post) ☐ **P8684-96** (96" Straight Aluminum Post) ☐ **P8684-120** (120" Straight Aluminum Post) ☐ **PM8685** (Cast Aluminum Pier Mount - must be used with straight aluminum post, P8683)	☐ **ABL** (Aegean Blue) ☐ **BB** (Burnished Bronze) ☐ **BK** (Gloss Black) ☐ **BLU** (Blue) ☐ **DVG** (Dove Gray) ☐ **FLG** (Flannel Gray) ☐ **GA** (Galvanized) ☐ **LG** (Lime Green) ☐ **MB** (Matte Black) ☐ **MBL** (Midnight Blue) ☐ **PNA** (Painted Natural Aluminum) ☐ **PNC** (Painted Natural Copper) ☐ **RD** (Red) ☐ **SA** (Satin Aluminum) ☐ **SGR** (Sage Green) ☐ **SGW** (Semi Gloss White) ☐ **SND** (Sand) ☐ **SS** (Satin Silver) ☐ **TBZ** (Textured Bronze) ☐ **TGP** (Textured Graphite) ☐ **TNG** (Tangerine) ☐ **TTL** (Tahitian Teal) ☐ **WT** (Gloss White)

Standard Finishes

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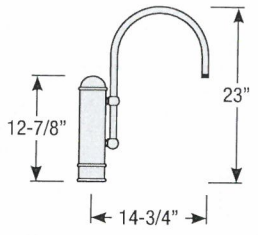
- **TTL** (Tahitian Teal)
- **WT** (Gloss White)

Specialty Finishes

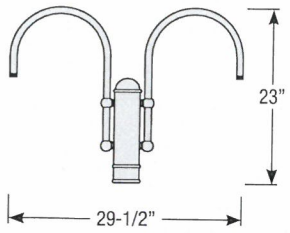
- **GA** (Galvanized)
- **SA** (Satin Aluminum)

Revised 06/01/2018

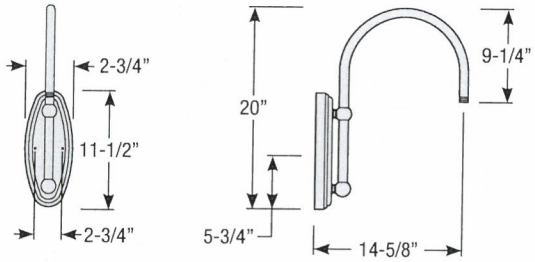
Single Post Mount



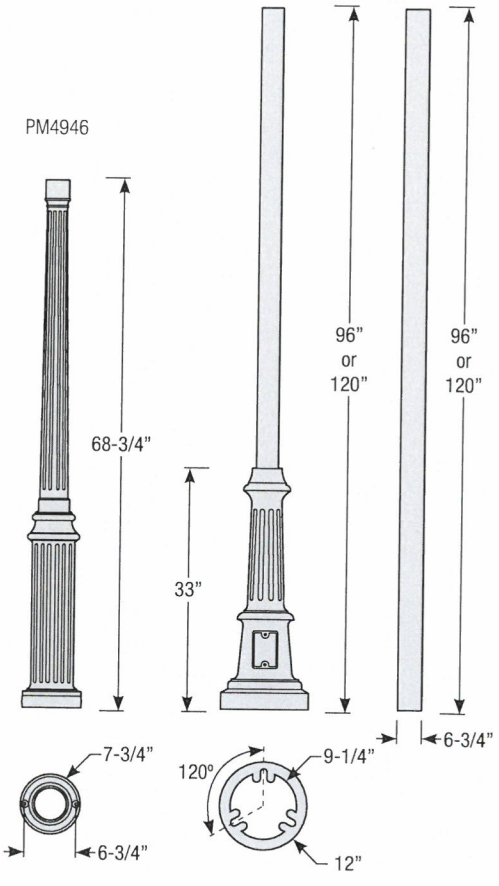
Double Post Mount



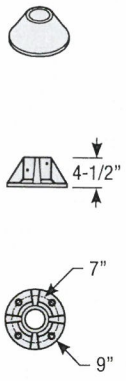
Traditional Wall Mount



P8683 P8684



P8685



Note: Must be used with aluminum post (P8684)

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WST LED

Architectural Wall Sconce

Catalog Number

Notes

Type TYPE B

Hit the Tab key or mouse over the page to see all interactive elements.

Specifications

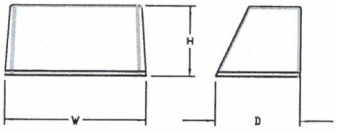
Luminaire

Height: 8-1/2" *(21.59 cm)*

Width: 17" *(43.18 cm)*

Depth: 10-3/16" *(25.9 cm)*

Weight: 20 lbs *(9.1 kg)*

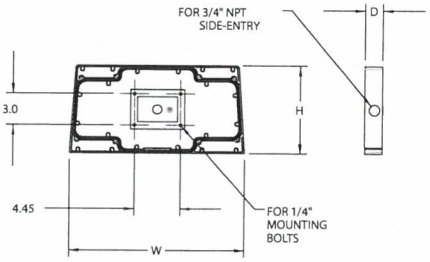


Optional Back Box (PBBW)

Height: 8.49" *(21.56 cm)*

Width: 17.01" *(43.21 cm)*

Depth: 1.70" *(4.32 cm)*

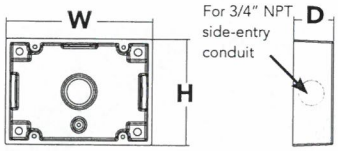


Optional Back Box (BBW)

Height: 4" *(10.2 cm)*

Width: 5-1/2" *(14.0 cm)*

Depth: 1-1/2" *(3.8 cm)*



A+ Capable Luminaire

This item is an A+ capable luminaire, which has been designed and tested to provide consistent color appearance and system-level interoperability.

- All configurations of this luminaire meet the Acuity Brands' specification for chromatic consistency
- This luminaire is A+ Certified when ordered with DTL® controls marked by a shaded background. DTL DLL equipped luminaires meet the A+ specification for luminaire to photocontrol interoperability1
- This luminaire is part of an A+ Certified solution for ROAM® or XPoint™ Wireless control networks, providing out-of-the-box control compatibility with simple commissioning, when ordered with drivers and control options marked by a shaded background[1]

To learn more about A+, visit www.acuitybrands.com/aplus.

See ordering tree for details.

A+ Certified Solutions for ROAM require the order of one ROAM node per luminaire. Sold Separately: Link to Roam; Link to DTL DLL

A+ Capable options indicated by this color background.

Ordering Information

EXAMPLE: WST LED P1 40K VF MVOLT DDBTXD

WST LED	P2	40K	VF	MVOLT	SURFACE MTG BRACKET

Series	Performance Package	Color temperature	Distribution	Voltage	Mounting
WST LED	P1 1,500 Lumen package P2 3,000 Lumen package P3 6,000 Lumen package	27K 2700 K 30K 3000 K 40K 4000 K 50K 5000 K	VF Visual comfort forward throw VW Visual comfort wide	MVOLT[1] 277[2] 120[2] 347[2] 208[2] 480[2] 240[2]	**Shipped included** (blank) Surface mounting bracket **Shipped separately** BBW Surface-mounted back box[3] PBBW Premium surface-mounted back box[3,4]

DDBXD

Options

PE	Photoelectric cell, button type[5]
PER	NEMA twist-lock receptacle only (controls ordered separate)[6]
PER5	Five-wire receptacle only (controls ordered separate)[6]
PER7	Seven-wire receptacle only (controls ordered separate)[6]
PIR	Motion/Ambient Light Sensor, 8-15' mounting height[7,8]
PIR1FC3V	Motion/ambient sensor, 8-15' mounting height, ambient sensor enabled at 1fc[7,8]
PIRH	180° motion/ambient light sensor, 15-30' mounting height[7,8]
PIRH1FC3V	Motion/ambient sensor, 15-30' mounting height, ambient sensor enabled at 1fc[7,8]
SF	Single fuse (120, 277, 347V)[2]
DF	Double fuse (208, 240, 480V)[2]
DS	Dual switching[9]
E7WH	Emergency battery backup, Non CEC compliant (7W)[10]
E7WC	Emergency battery backup, Non CEC compliant (cold, 7W)[10,11]
E7WHR	Remote emergency battery backup, Non CEC compliant (remote 7W)[10,12]
E20WH	Emergency battery pack 18W constant power, CEC compliant[10]
E20WC	Emergency battery pack -20°C 18W constant power, CEC compliant[10,11]
E23WHR	Remote emergency battery backup, Non CEC compliant (remote 20W)[10,11,13]
LCE	Left side conduit entry[14]
RCE	Right side conduit entry[14]

Shipped separately

RBPW	Retrofit back plate[3]
VG	Vandal guard[15]
WG	Wire guard[15]

Finish *(required)*

DDBXD	Dark bronze
DBLXD	Black
DNAXD	Natural aluminum
DWHXD	White
DSSXD	Sandstone
DDBTXD	Textured dark bronze
DBLBXD	Textured black
DNATXD	Textured natural aluminum
DWHGXD	Textured white
DSSTXD	Textured sandstone

Accessories

Ordered and shipped separately.

WSTVCPBBW DDBXD U	Premium Surface - mounted back box
WSBBW DDBTX U	Surface - mounted back box
RBPW DDBXD U	Retrofit back plate

NOTES

1 MVOLT driver operates on any line voltage from 120-277V (50/60 Hz).
2 Single fuse (SF) requires 120V, 277V or 347V. Double fuse (DF) requires 208V, 240V or 480V.
3 Also available as a separate accessory; see accessories information.
4 Top conduit entry standard.
5 Need to specify 120, 208, 240 or 277 voltage.
6 Photocell ordered and shipped as a separate line item from Acuity Brands Controls. Shorting Cap included.
7 Not available with VG or WG. See PER Table.
8 Reference Motion Sensor table.
9 Not available with Emergency options, PE or PER options.
10 Not available with 347/480V.
11 Battery pack rated for -20° to 40°C.
12 Comes with PBBW.
13 Warranty period is 3-years.
14 Not available with BBW.
15 Must order with fixture; not an accessory.

Emergency Battery Operation

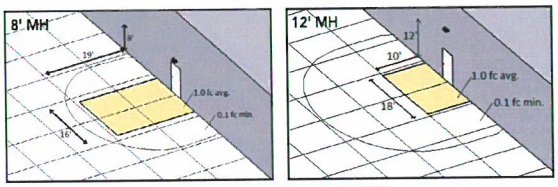
The emergency battery backup is integral to the luminaire — no external housing required! This design provides reliable emergency operation while maintaining the aesthetics of the product.

All emergency backup configurations include an independent secondary driver with an integral relay to immediately detect AC power loss, meeting interpretations of NFPA 70/NEC 2008 - 700.16

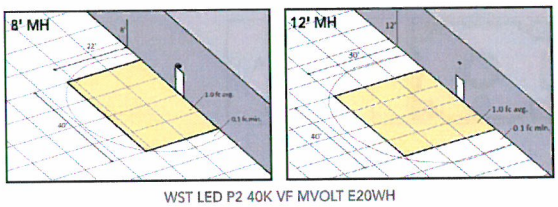
The emergency battery will power the luminaire for a minimum duration of 90 minutes (maximum duration of three hours) from the time supply power is lost, per International Building Code Section 1006 and NFPA 101 Life Safety Code Section 7.9, provided luminaires are mounted at an appropriate height and illuminate an open space with no major obstructions.

The examples below show illuminance of 1 fc average and 0.1 fc minimum of the P1 power package and VF distribution product in emergency mode.

10' x 10' Gridlines
8' and 12' Mounting Height



WST LED P1 27K VF MVOLT E7WH



WST LED P2 40K VF MVOLT E20WH

Performance Data

Lumen Ambient Temperature (LAT) Multipliers

Use these factors to determine relative lumen output for average ambient temperatures from 0-40°C (32-104°F).

Ambient		Lumen Multiplier
0°C	32°F	1.03
10°C	50°F	1.02
20°C	68°F	1.01
25°C	**77°F**	**1.00**
30°C	86°F	0.99
40°C	104°F	0.98

Projected LED Lumen Maintenance

Values calculated according to IESNA TM-21-11 methodology and valid up to 40°C.

Operating Hours	0	25,000	50,000	100,000
Lumen Maintenance Factor	1.0	>0.95	>0.92	>0.87

Electrical Load

Performance package	System Watts	Current (A)					
		120	208	240	277	347	480
P1	11	0.1	0.06	0.05	0.04	---	---
	14	---	---	---	---	0.04	0.03
P1 DS	14	0.12	0.07	0.06	0.06	---	---
P2	25	0.21	0.13	0.11	0.1	---	---
	30	---	---	---	---	0.09	0.06
P2 DS	25	0.21	0.13	0.11	0.1	---	---
P3	50	0.42	0.24	0.21	0.19	---	---
	56	---	---	---	---	0.16	0.12
P3 DS	52	0.43	0.26	0.23	0.21	---	---

Motion Sensor Default Settings

Option	Dimmed State	High Level (when triggered)	Photocell Operation	Ramp-up Time	Dwell Time	Ramp-down Time
*PIR or PIRH	3V (37%) Output	10V (100%) Output	Enabled @ 5FC	3 sec	5 min	5 min
PIR1FC3V or PIRH1FC3V	3V (37%) Output	10V (100%) Output	Enabled @ 1FC	3 sec	5 min	5 min

*for use with centrilize Dusk to Dawn

PER Table

Control	PER (3 wire)	PER5 (5 wire)		PER7 (7 wire)		
			Wire 4/Wire5		Wire 4/Wire5	Wire 6/Wire7
Photocontrol Only (On/Off)	✓	⚠	Wired to dimming leads on driver	⚠	Wired to dimming leads on driver	Wires Capped inside fixture
ROAM	⊘	✓	Wired to dimming leads on driver	⚠	Wired to dimming leads on driver	Wires Capped inside fixture
ROAM with Motion	⊘	⚠	Wired to dimming leads on driver	⚠	Wired to dimming leads on driver	Wires Capped inside fixture
Futureproof*	⊘	⚠	Wired to dimming leads on driver	✓	Wired to dimming leads on driver	Wires Capped inside fixture
Futureproof* with Motion	⊘	⚠	Wired to dimming leads on driver	✓	Wired to dimming leads on driver	Wires Capped inside fixture

✓ Recommended

⊘ Will not work

⚠ Alternate

*Futureproof means: Ability to change controls in the future.

Lumen Output

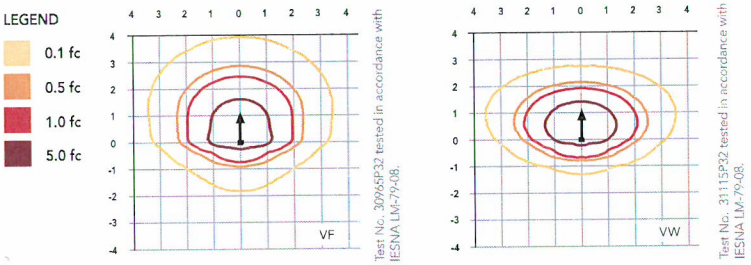
Lumen values are from photometric tests performed in accordance with IESNA LM-79-08. Data is considered to be representative of the configurations shown, within the tolerances allowed by Lighting Facts.

Performance Package	System Watts (MVOLT[1])	Dist. Type	27K (2700K, 70 CRI)					30K (3000K, 70 CRI)					40K (4000K, 70 CRI)					50K (5000K, 70 CRI)				
			Lumens	B	U	G	LPW	Lumens	B	U	G	LPW	Lumens	B	U	G	LPW	Lumens	B	U	G	LPW
P1	12W	VF	1,494	0	0	0	125	1,529	0	0	0	127	1,639	0	0	0	137	1,639	0	0	0	137
		VW	1,513	0	0	0	126	1,548	0	0	0	129	1,659	0	0	0	138	1,660	0	0	0	138
P2	25W	VF	3,163	1	0	1	127	3,237	1	0	1	129	3,469	1	0	1	139	3,468	1	0	1	139
		VW	3,201	1	0	0	128	3,276	1	0	0	131	3,512	1	0	0	140	3,512	1	0	0	140
P3	50W	VF	6,025	1	0	1	121	6,165	1	0	1	123	6,609	1	0	1	132	6,607	1	0	1	132
		VW	6,098	1	0	1	122	6,240	1	0	1	125	6,689	1	0	1	134	6,691	1	0	1	134

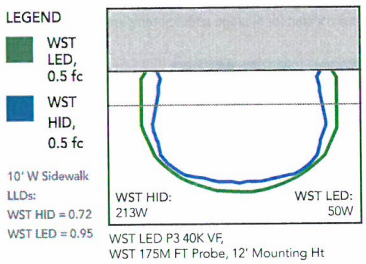
Photometric Diagrams

To see complete photometric reports or download .ies files for this product, visit Lithonia Lighting's WST LED homepage.

Isofootcandle plots for the WST LED P3 40K VF and VW. Distances are in units of mounting height (10').



Distribution overlay comparison to 175W metal halide.



WST LED P3 40K VF,
WST 175M FT Probe, 12' Mounting Ht

FEATURES & SPECIFICATIONS

INTENDED USE
The classic architectural shape of the WST LED was designed for applications such as hospitals, schools, malls, restaurants, and commercial buildings. The long life LEDs and driver make this luminaire nearly maintenance-free.

CONSTRUCTION
The single-piece die-cast aluminum housing integrates secondary heat sinks to optimize thermal transfer from the internal light engine heat sinks and promote long life. The driver is mounted in direct contact with the casting for a low operating temperature and long life. The die-cast door frame is fully gasketed with a one-piece solid silicone gasket to keep out moisture and dust, providing an IP65 rating for the luminaire.

FINISH
Exterior parts are protected by a zinc-infused Super Durable TGIC thermoset powder coat finish that provides superior resistance to corrosion and weathering. A tightly controlled multi-stage process ensures a minimum 3 mils thickness for a finish that can withstand extreme climate changes without cracking or peeling. Standard Super Durable colors include dark bronze, black, natural aluminum, sandstone and white. Available in textured and non-textured finishes.

OPTICS
Well crafted reflector optics allow the light engine to be recessed within the luminaire, providing visual comfort, superior distribution, uniformity, and spacing in wall-mount applications. The WST LED has zero uplight and qualifies as a Nighttime Friendly™ product, meaning it is consistent with the LEED® and Green Globes™ criteria for eliminating wasteful uplight.

ELECTRICAL
Light engine(s) consist of 98 high-efficacy LEDs mounted to a metal core circuit board and integral aluminum heat sinks to maximize heat dissipation and promote long life (100,000 hrs at 40°C, L87). Class 2 electronic driver has a power factor >90%, THD <20%. Easily-serviceable surge protection device meets a minimum Category B (per ANSI/IEEE C62.41.2).

INSTALLATION
A universal mounting plate with integral mounting support arms allows the fixture to hinge down for easy access while making wiring connections.

LISTINGS
CSA certified to U.S. and Canadian standards. Luminaire is IP65 rated. PIR and back box options are rated for wet location. Rated for -30°C to 40°C ambient.

DesignLights Consortium® (DLC) Premium qualified product. Not all versions of this product may be DLC Premium qualified. Please check the DLC Qualified Products List at www.designlights.org/QPL to confirm which versions are qualified.

WARRANTY
5-year limited warranty. Complete warranty terms located at: www.acuitybrands.com/CustomerResources/Terms_and_conditions.aspx.

Note: Actual performance may differ as a result of end-user environment and application. All values are design or typical values, measured under laboratory conditions at 25 °C. Specifications subject to change without notice.

D-Series Size 0
LED Area Luminaire

Catalog Number

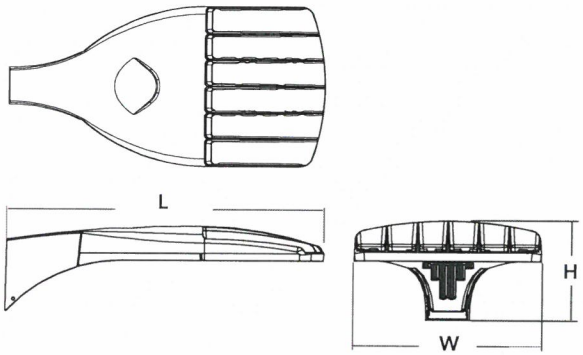
Notes

Type TYPE C

Hit the Tab key or mouse over the page to see all interactive elements.

Specifications

EPA:	0.95 ft² (.09 m²)
Length:	26" (66.0 cm)
Width:	13" (33.0 cm)
Height:	7" (17.8 cm)
Weight (max):	16 lbs (7.25 kg)



A+ Capable Luminaire

This item is an A+ capable luminaire, which has been designed and tested to provide consistent color appearance and system-level interoperability.

- All configurations of this luminaire meet the Acuity Brands' specification for chromatic consistency
- This luminaire is A+ Certified when ordered with DTL® controls marked by a shaded background. DTL DLL equipped luminaires meet the A+ specification for luminaire to photocontrol interoperability1
- This luminaire is part of an A+ Certified solution for ROAM® or XPoint™ Wireless control networks, providing out-of-the-box control compatibility with simple commissioning, when ordered with drivers and control options marked by a shaded background[1]

To learn more about A+, visit www.acuitybrands.com/aplus.

1. See ordering tree for details.
2. A+ Certified Solutions for ROAM require the order of one ROAM node per luminaire. Sold Separately: Link to Roam; Link to DTL DLL

A+ Capable options indicated by this color background.

Ordering Information

EXAMPLE: DSX0 LED P6 40K T3M MVOLT SPA DDBXD

DSX0 LED	P2	40K	T2M	MVOLT	SPA

Series	LEDs	Color temperature	Distribution	Voltage	Mounting
DSX0 LED	**Forward optics** P1 P4 P7 P2 P5 P3 P6 **Rotated optics** P10[1] P12[1] P11[1] P13[1]	30K 3000 K 40K 4000 K 50K 5000 K AMBPC Amber phosphor converted[2]	T1S Type I short T2S Type II short T2M Type II medium T3S Type III short T3M Type III medium T4M Type IV medium TFTM Forward throw medium T5VS Type V very short T5S Type V short T5M Type V medium T5W Type V wide BLC Backlight control[2,3] LCCO Left corner cutoff[2,3] RCCO Right corner cutoff[2,3]	MVOLT[4,5] 120[6] 208[5,6] 240[5,6] 277[6] 347[5,6,7] 480[5,6,7]	**Shipped included** SPA Square pole mounting RPA Round pole mounting WBA Wall bracket SPUMBA Square pole universal mounting adaptor[8] RPUMBA Round pole universal mounting adaptor[8] **Shipped separately** KMA8 DDBXD U Mast arm mounting bracket adaptor (specify finish)[9]

DDBXD

Control options			Other options	Finish (required)	
Shipped installed			**Shipped installed**	DDBXD	Dark bronze
NLTAIR2	nLight AIR generation 2 enabled[10]	PIRH1FC3V Bi-level, motion/ambient sensor, 15-30' mounting height, ambient sensor enabled at 1fc[5,13,14]	HS House-side shield[20]	DBLXD	Black
PER	NEMA twist-lock receptacle only (control ordered separate)[11]	BL30 Bi-level switched dimming, 30%[5,16,17]	SF Single fuse (120, 277, 347V)[6]	DNAXD	Natural aluminum
PER5	Five-wire receptacle only (control ordered separate)[11,12]	BL50 Bi-level switched dimming, 50%[5,16,17]	DF Double fuse (208, 240, 480V)[6]	DWHXD	White
PER7	Seven-wire receptacle only (control ordered separate)[11,12]	PNMTDD3 Part night, dim till dawn[5,18]	L90 Left rotated optics[1]	DDBTXD	Textured dark bronze
DMG	0-10V dimming extend out back of housing for external control (control ordered separate)	PNMT5D3 Part night, dim 5 hrs[5,18]	R90 Right rotated optics[1]	DBLBXD	Textured black
PIR	Bi-level, motion/ambient sensor, 8-15' mounting height, ambient sensor enabled at 5fc[5,13,14]	PNMT6D3 Part night, dim 6 hrs[5,18]	DDL Diffused drop lens[20]	DNATXD	Textured natural aluminum
PIRH	Bi-level, motion/ambient sensor, 15-30' mounting height, ambient sensor enabled at 5fc[5,13,14]	PNMT7D3 Part night, dim 7 hrs[5,18]	**Shipped separately**	DWHGXD	Textured white
PIRHN	Network, Bi-Level motion/ambient sensor[15]	FAO Field adjustable output[19]	BS Bird spikes[21]		
PIR1FC3V	Bi-level, motion/ambient sensor, 8-15' mounting height, ambient sensor enabled at 1fc[5,13,14]		EGS External glare shield[21]		

Ordering Information

Accessories

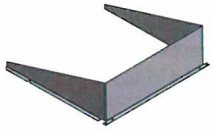
Ordered and shipped separately.

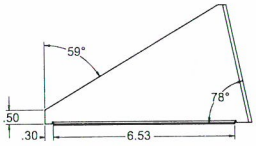
DLL127F 1.5 JU	Photocell - SSL twist-lock (120-277V) [22]
DLL347F 1.5 CUL JU	Photocell - SSL twist-lock (347V) [22]
DLL480F 1.5 CUL JU	Photocell - SSL twist-lock (480V) [22]
DSHORT SBK U	Shorting cap [22]
DSX0HS 20C U	House-side shield for 20 LED unit [20]
DSX0HS 30C U	House-side shield for 30 LED unit [20]
DSX0HS 40C U	House-side shield for 40 LED unit [20]
DSX0DDL U	Diffused drop lens (polycarbonate) [20]
PUMBA DDBXD U*	Square and round pole universal mounting bracket adaptor (specify finish) [23]
KMA8 DDBXD U	Mast arm mounting bracket adaptor (specify finish) [8]

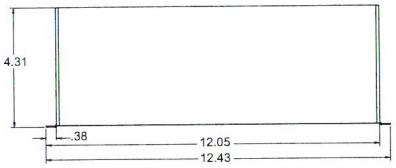
For more control options, visit DTL and ROAM online.

NOTES
1. P10, P11, P12 and P13 and rotated options (L90 or R90) only available together.
2. AMBPC is not available with BLC, LCCO, RCCO, P4, P7 or P13.
3. Not available with HS or DDL.
4. MVOLT driver operates on any line voltage from 120-277V (50/60 Hz).
5. Any PIRx with BL30, BL50 or PNMT, is not available with 208V, 240V, 347V, 480V or MVOLT. It is only available in 120V or 277V specified.
6. Single fuse (SF) requires 120V, 277V or 347V. Double fuse (DF) requires 208V, 240V or 480V.
7. Not available in P4, P7 or P13. Not available with BL30, BL50 or PNMT options.
8. Existing drilled pole only. Available as a separate combination accessory; for retrofit use only: PUMBA (finish) U; 1.5 G vibration load rating per ANCI C136.31.
9. Must order fixture with SPA mounting. Must be ordered as a separate accessory; see Accessories information. For use with 2-3/8" mast arm (not included).
10. Must be ordered with PIRHN.
11. Photocell ordered and shipped as a separate line item from Acuity Brands Controls. See accessories. Shorting Cap included.
12. If ROAM® node required, it must be ordered and shipped as a separate line item from Acuity Brands Controls. Shorting Cap included.
13. Reference Motion Sensor table on page 3.
14. Reference PER Table on page 3 to see functionality.
15. Must be ordered with NLTAIR2. For more information on nLight Air 2 visit this link.
16. Requires (2) separately switched circuits.
17. Not available with 347V, 480V or PNMT. For PER5 or PER7 see PER Table on page 3. Requires isolated neutral.
18. Not available with 347V, 480V, BL30 and BL50. For PER5 or PER7 see PER Table on page 3. Separate Dusk to Dawn required.
19. Not available with other dimming controls options.
20. Not available with BLC, LCCO and RCCO distribution. Also available as a separate accessory; see Accessories information.
21. Must be ordered with fixture for factory pre-drilling.
22. Requires luminaire to be specified with PER, PER5 or PER7 option. See PER Table on page 3.
23. For retrofit use only.

External Glare Shield

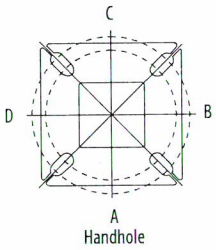


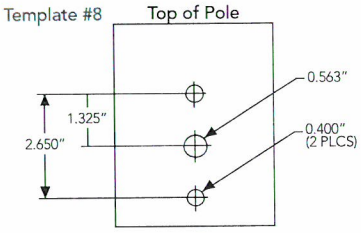




Drilling

HANDHOLE ORIENTATION





Tenon Mounting Slipfitter**

Tenon O.D.	Single Unit	2 at 180°	2 at 90°	3 at 120°	3 at 90°	4 at 90°
2-3/8"	AST20-190	AST20-280	AST20-290	AST20-320	AST20-390	AST20-490
2-7/8"	AST25-190	AST25-280	AST25-290	AST25-320	AST25-390	AST25-490
4"	AST35-190	AST35-280	AST35-290	AST35-320	AST35-390	AST35-490

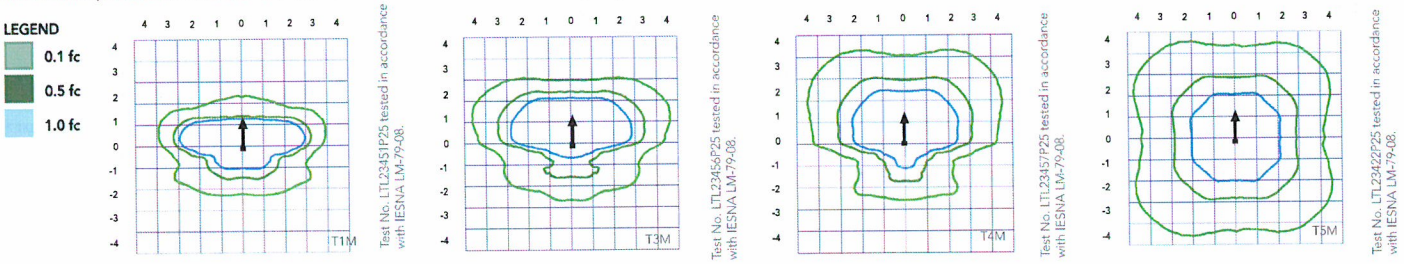
Pole drilling nomenclature: # of heads at degree from handhole (default side A)					
DM19AS	DM28AS	DM29AS	DM32AS	DM39AS	DM49AS
1 @ 90°	2 @ 280°	2 @ 90°	3 @ 120°	3 @ 90°	4 @ 90°
Side B	Side B & D	Side B & C	Round pole only	Side B, C, & D	Sides A, B, C, D
Note: Review luminaire spec sheet for specific nomenclature					

Pole top or tenon O.D.	4.5" @ 90°	4" @ 90°	3.5" @ 90°	3" @ 90°	4.5" @ 120°	4" @ 120°	3.5" @ 120°	3" @ 120°
DSX SPA	Y	Y	Y	N	-	-	-	-
DSX RPA	Y	Y	N	N	Y	Y	Y	Y
DSX SPUMBA	Y	N	N	N	-	-	-	-
DSX RPUMBA	N	N	N	N	Y	Y	Y	N
					*3 fixtures @120 require round pole top/tenon.			

Photometric Diagrams

To see complete photometric reports or download .ies files for this product, visit Lithonia Lighting's D-Series Area Size 0 homepage.

Isofootcandle plots for the DSX0 LED 40C 1000 40K. Distances are in units of mounting height (20').



Performance Data

Lumen Ambient Temperature (LAT) Multipliers

Use these factors to determine relative lumen output for average ambient temperatures from 0-40°C (32-104°F).

Ambient		Lumen Multiplier
0°C	32°F	1.04
5°C	41°F	1.04
10°C	50°F	1.03
15°C	50°F	1.02
20°C	68°F	1.01
25°C	**77°F**	**1.00**
30°C	86°F	0.99
35°C	95°F	0.98
40°C	104°F	0.97

Projected LED Lumen Maintenance

Data references the extrapolated performance projections for the platforms noted in a **25°C ambient**, based on 10,000 hours of LED testing (tested per IESNA LM-80-08 and projected per IESNA TM-21-11).

To calculate LLF, use the lumen maintenance factor that corresponds to the desired number of operating hours below. For other lumen maintenance values, contact factory.

Operating Hours	25000	50000	100000
Lumen Maintenance Factor	0.96	0.92	0.85

Electrical Load

	Performance Package	LED Count	Drive Current	Wattage	Current (A)					
					120	208	240	277	347	480
Forward Optics (Non-Rotated)	P1	20	530	38	0.32	0.18	0.15	0.15	0.10	0.08
	P2	20	700	49	0.41	0.23	0.20	0.19	0.14	0.11
	P3	20	1050	71	0.60	0.37	0.32	0.27	0.21	0.15
	P4	20	1400	92	0.77	0.45	0.39	0.35	0.28	0.20
	P5	40	700	89	0.74	0.43	0.38	0.34	0.26	0.20
	P6	40	1050	134	1.13	0.65	0.55	0.48	0.39	0.29
	P7	40	1300	166	1.38	0.80	0.69	0.60	0.50	0.37
Rotated Optics (Requires L90 or R90)	P10	30	530	53	0.45	0.26	0.23	0.21	0.16	0.12
	P11	30	700	72	0.60	0.35	0.30	0.27	0.20	0.16
	P12	30	1050	104	0.88	0.50	0.44	0.39	0.31	0.23
	P13	30	1300	128	1.08	0.62	0.54	0.48	0.37	0.27

Motion Sensor Default Settings						
Option	Dimmed State	High Level (when triggered)	Photocell Operation	Dwell Time	Ramp-up Time	Ramp-down Time
PIR or PIRH	3V (37%) Output	10V (100%) Output	Enabled @ 5FC	5 min	3 sec	5 min
*PIR1FC3V or PIRH1FC3V	3V (37%) Output	10V (100%) Output	Enabled @ 1FC	5 min	3 sec	5 min
*for use with Inline Dusk to Dawn or timer.						

PER Table						
Control	PER (3 wire)	PER5 (5 wire)		PER7 (7 wire)		
			Wire 4/Wire5		Wire 4/Wire5	Wire 6/Wire7
Photocontrol Only (On/Off)	✔	⚠	Wired to dimming leads on driver	⚠	Wired to dimming leads on driver	Wires Capped inside fixture
ROAM	⊘	✔	Wired to dimming leads on driver	⚠	Wired to dimming leads on driver	Wires Capped inside fixture
ROAM with Motion (ROAM on/off only)	⊘	⚠	Wires Capped inside fixture	⚠	Wires Capped inside fixture	Wires Capped inside fixture
Future-proof*	⊘	⚠	Wired to dimming leads on driver	✔	Wired to dimming leads on driver	Wires Capped inside fixture
Future-proof* with Motion	⊘	⚠	Wires Capped inside fixture	✔	Wires Capped inside fixture	Wires Capped inside fixture

✔ Recommended
⊘ Will not work
⚠ Alternate

*Future-proof means: Ability to change controls in the future.

Performance Data

Lumen Output

Lumen values are from photometric tests performed in accordance with IESNA LM-79-08. Data is considered to be representative of the configurations shown, within the tolerances allowed by Lighting Facts. Contact factory for performance data on any configurations not shown here.

Forward Optics

LED Count	Drive Current	Power Package	System Watts	Dist. Type	30K (3000 K, 70 CRI)					40K (4000 K, 70 CRI)					50K (5000 K, 70 CRI)					AMBPC (Amber Phosphor Converted)				
					Lumens	B	U	G	LPW	Lumens	B	U	G	LPW	Lumens	B	U	G	LPW	Lumens	B	U	G	LPW
20	530	P1	38W	T1S	4,369	1	0	1	115	4,706	1	0	1	124	4,766	1	0	1	125	2,541	1	0	1	73
				T2S	4,364	1	0	1	115	4,701	1	0	1	124	4,761	1	0	1	125	2,589	1	0	1	74
				T2M	4,387	1	0	1	115	4,726	1	0	1	124	4,785	1	0	1	126	2,539	1	0	1	73
				T3S	4,248	1	0	1	112	4,577	1	0	1	120	4,634	1	0	1	122	2,558	1	0	1	73
				T3M	4,376	1	0	1	115	4,714	1	0	1	124	4,774	1	0	1	126	2,583	1	0	1	74
				T4M	4,281	1	0	1	113	4,612	1	0	2	121	4,670	1	0	2	123	2,570	1	0	1	73
				TFTM	4,373	1	0	1	115	4,711	1	0	2	124	4,771	1	0	2	126	2,540	1	0	1	73
				T5VS	4,548	2	0	0	120	4,900	2	0	0	129	4,962	2	0	0	131	2,650	1	0	0	76
				T5S	4,552	2	0	0	120	4,904	2	0	0	129	4,966	2	0	0	131	2,690	1	0	0	77
				T5M	4,541	3	0	1	120	4,891	3	0	1	129	4,953	3	0	1	130	2,658	2	0	0	76
				T5W	4,576	3	0	2	120	4,929	3	0	2	130	4,992	3	0	2	131	2,663	2	0	1	73
				BLC	3,586	1	0	1	94	3,863	1	0	1	102	3,912	1	0	1	103					
				LCCO	2,668	1	0	1	70	2,874	1	0	2	76	2,911	1	0	2	77					
				RCCO	2,668	1	0	1	70	2,874	1	0	2	76	2,911	1	0	2	77					
20	700	P2	49W	T1S	5,570	1	0	1	114	6,001	1	0	1	122	6,077	2	0	2	124	3,144	1	0	1	70
				T2S	5,564	1	0	2	114	5,994	1	0	2	122	6,070	2	0	2	124	3,203	1	0	1	71
				T2M	5,593	1	0	1	114	6,025	1	0	1	123	6,102	1	0	1	125	3,141	1	0	1	70
				T3S	5,417	1	0	2	111	5,835	1	0	2	119	5,909	2	0	2	121	3,165	1	0	1	70
				T3M	5,580	1	0	2	114	6,011	1	0	2	123	6,087	1	0	2	124	3,196	1	0	1	71
				T4M	5,458	1	0	2	111	5,880	1	0	2	120	5,955	1	0	2	122	3,179	1	0	1	71
				TFTM	5,576	1	0	2	114	6,007	1	0	2	123	6,083	1	0	2	124	3,143	1	0	1	70
				T5VS	5,799	2	0	0	118	6,247	2	0	0	127	6,327	2	0	0	129	3,278	2	0	0	73
				T5S	5,804	2	0	0	118	6,252	2	0	0	128	6,332	2	0	1	129	3,328	2	0	0	74
				T5M	5,789	3	0	1	118	6,237	3	0	1	127	6,316	3	0	1	129	3,288	2	0	1	73
				T5W	5,834	3	0	2	119	6,285	3	0	2	128	6,364	3	0	2	130	3,295	2	0	1	73
				BLC	4,572	1	0	1	93	4,925	1	0	1	101	4,987	1	0	1	102					
				LCCO	3,402	1	0	2	69	3,665	1	0	2	75	3,711	1	0	2	76					
				RCCO	3,402	1	0	2	69	3,665	1	0	2	75	3,711	1	0	2	76					
20	1050	P3	71W	T1S	7,833	2	0	2	110	8,438	2	0	2	119	8,545	2	0	2	120					
				T2S	7,825	2	0	2	110	8,429	2	0	2	119	8,536	2	0	2	120					
				T2M	7,865	2	0	2	111	8,473	2	0	2	119	8,580	2	0	2	121					
				T3S	7,617	2	0	2	107	8,205	2	0	2	116	8,309	2	0	2	117					
				T3M	7,846	2	0	2	111	8,452	2	0	2	119	8,559	2	0	2	121					
				T4M	7,675	2	0	2	108	8,269	2	0	2	116	8,373	2	0	2	118					
				TFTM	7,841	2	0	2	110	8,447	2	0	2	119	8,554	2	0	2	120					
				T5VS	8,155	3	0	0	115	8,785	3	0	0	124	8,896	3	0	0	125					
				T5S	8,162	3	0	1	115	8,792	3	0	1	124	8,904	3	0	1	125					
				T5M	8,141	3	0	2	115	8,770	3	0	2	124	8,881	3	0	2	125					
				T5W	8,204	3	0	2	116	8,838	4	0	2	124	8,950	4	0	2	126					
				BLC	6,429	1	0	2	91	6,926	1	0	2	98	7,013	1	0	2	99					
				LCCO	4,784	1	0	2	67	5,153	1	0	2	73	5,218	1	0	2	73					
				RCCO	4,784	1	0	2	67	5,153	1	0	2	73	5,218	1	0	2	73					
20	1400	P4	92W	T1S	9,791	2	0	2	106	10,547	2	0	2	115	10,681	2	0	2	116					
				T2S	9,780	2	0	2	106	10,536	2	0	2	115	10,669	2	0	2	116					
				T2M	9,831	2	0	2	107	10,590	2	0	2	115	10,724	2	0	2	117					
				T3S	9,521	2	0	2	103	10,256	2	0	2	111	10,386	2	0	2	113					
				T3M	9,807	2	0	2	107	10,565	2	0	2	115	10,698	2	0	2	116					
				T4M	9,594	2	0	2	104	10,335	2	0	3	112	10,466	2	0	3	114					
				TFTM	9,801	2	0	2	107	10,558	2	0	2	115	10,692	2	0	2	116					
				T5VS	10,193	3	0	1	111	10,981	3	0	1	119	11,120	3	0	1	121					
				T5S	10,201	3	0	1	111	10,990	3	0	1	119	11,129	3	0	1	121					
				T5M	10,176	4	0	2	111	10,962	4	0	2	119	11,101	4	0	2	121					
				T5W	10,254	4	0	3	111	11,047	4	0	3	120	11,186	4	0	3	122					
				BLC	8,036	1	0	2	87	8,656	1	0	2	94	8,766	1	0	2	95					
				LCCO	5,979	1	0	2	65	6,441	1	0	2	70	6,523	1	0	3	71					
					5,979	1	0	2	65	6,441	1	0	2	70	6,523	1	0	3	71					

Performance Data

Lumen Output

Lumen values are from photometric tests performed in accordance with IESNA LM-79-08. Data is considered to be representative of the configurations shown, within the tolerances allowed by Lighting Facts. Contact factory for performance data on any configurations not shown here.

Forward Optics

LED Count	Drive Current	Power Package	System Watts	Dist. Type	30K (3000 K, 70 CRI)					40K (4000 K, 70 CRI)					50K (5000 K, 70 CRI)					AMBPC (Amber Phosphor Converted)				
					Lumens	B	U	G	LPW	Lumens	B	U	G	LPW	Lumens	B	U	G	LPW	Lumens	B	U	G	LPW
40	700	P5	89W	T1S	10,831	2	0	2	122	11,668	2	0	2	131	11,816	2	0	2	133					
				T2S	10,820	2	0	2	122	11,656	2	0	2	131	11,803	2	0	2	133					
				T2M	10,876	2	0	2	122	11,716	2	0	2	132	11,864	2	0	2	133					
				T3S	10,532	2	0	2	118	11,346	2	0	2	127	11,490	2	0	2	129					
				T3M	10,849	2	0	2	122	11,687	2	0	2	131	11,835	2	0	2	133					
				T4M	10,613	2	0	3	119	11,434	2	0	3	128	11,578	2	0	3	130					
				TFTM	10,842	2	0	2	122	11,680	2	0	2	131	11,828	2	0	2	133					
				T5VS	11,276	3	0	1	127	12,148	3	0	1	136	12,302	3	0	1	138					
				T5S	11,286	3	0	1	127	12,158	3	0	1	137	12,312	3	0	1	138					
				T5M	11,257	4	0	2	126	12,127	4	0	2	136	12,280	4	0	2	138					
				T5W	11,344	4	0	3	127	12,221	4	0	3	137	12,375	4	0	3	139					
				BLC	8,890	1	0	2	100	9,576	1	0	2	108	9,698	1	0	2	109					
				LCCO	6,615	1	0	3	74	7,126	1	0	3	80	7,216	1	0	3	81					
				RCCO	6,615	1	0	3	74	7,126	1	0	3	80	7,216	1	0	3	81					
40	1050	P6	134W	T1S	14,805	3	0	3	110	15,949	3	0	3	119	16,151	3	0	3	121	6,206	2	0	2	68
				T2S	14,789	3	0	3	110	15,932	3	0	3	119	16,134	3	0	3	120	6,322	2	0	2	69
				T2M	14,865	3	0	3	111	16,014	3	0	3	120	16,217	3	0	3	121	6,201	2	0	2	68
				T3S	14,396	3	0	3	107	15,509	3	0	3	116	15,705	3	0	3	117	6,247	1	0	2	69
				T3M	14,829	2	0	3	111	15,975	3	0	3	119	16,177	3	0	3	121	6,308	2	0	2	69
				T4M	14,507	2	0	3	108	15,628	3	0	3	117	15,826	3	0	3	118	6,275	1	0	2	69
				TFTM	14,820	2	0	3	111	15,965	3	0	3	119	16,167	3	0	3	121	6,203	1	0	2	68
				T5VS	15,413	4	0	1	115	16,604	4	0	1	124	16,815	4	0	1	125	6,671	2	0	0	73
				T5S	15,426	3	0	1	115	16,618	4	0	1	124	16,828	4	0	1	126	6,569	2	0	0	72
				T5M	15,387	4	0	2	115	16,576	4	0	2	124	16,786	4	0	2	125	6,491	3	0	1	71
				T5W	15,506	4	0	3	116	16,704	4	0	3	125	16,915	4	0	3	126	6,504	3	0	2	71
				BLC	12,151	1	0	2	91	13,090	1	0	2	98	13,255	1	0	2	99					
				LCCO	9,041	1	0	3	67	9,740	1	0	3	73	9,863	1	0	3	74					
				RCCO	9,041	1	0	3	67	9,740	1	0	3	73	9,863	1	0	3	74					
40	1300	P7	166W	T1S	17,023	3	0	3	103	18,338	3	0	3	110	18,570	3	0	3	112					
				T2S	17,005	3	0	3	102	18,319	3	0	3	110	18,551	3	0	3	112					
				T2M	17,092	3	0	3	103	18,413	3	0	3	111	18,646	3	0	3	112					
				T3S	16,553	3	0	3	100	17,832	3	0	3	107	18,058	3	0	3	109					
				T3M	17,051	3	0	3	103	18,369	3	0	3	111	18,601	3	0	3	112					
				T4M	16,681	3	0	3	100	17,969	3	0	3	108	18,197	3	0	3	110					
				TFTM	17,040	3	0	3	103	18,357	3	0	4	111	18,590	3	0	4	112					
				T5VS	17,723	4	0	1	107	19,092	4	0	1	115	19,334	4	0	1	116					
				T5S	17,737	4	0	2	107	19,108	4	0	2	115	19,349	4	0	2	117					
				T5M	17,692	4	0	2	107	19,059	4	0	2	115	19,301	4	0	2	116					
				T5W	17,829	5	0	3	107	19,207	5	0	3	116	19,450	5	0	3	117					
				BLC	13,971	2	0	2	84	15,051	2	0	2	91	15,241	2	0	2	92					
				LCCO	10,396	1	0	3	63	11,199	1	0	3	67	11,341	1	0	3	68					
					10,396	1	0	3	63	11,199	1	0	3	67	11,341	1	0	3	68					

Performance Data

Lumen Output

Lumen values are from photometric tests performed in accordance with IESNA LM-79-08. Data is considered to be representative of the configurations shown, within the tolerances allowed by Lighting Facts. Contact factory for performance data on any configurations not shown here.

Rotated Optics

LED Count	Drive Current	Power Package	System Watts	Dist. Type	30K (3000 K, 70 CRI)					40K (4000 K, 70 CRI)					50K (5000 K, 70 CRI)					AMBPC (Amber Phosphor Converted)				
					Lumens	B	U	G	LPW	Lumens	B	U	G	LPW	Lumens	B	U	G	LPW	Lumens	B	U	G	LPW
30	530	P10	53W	T1S	6,727	2	0	2	127	7,247	3	0	3	137	7,339	3	0	3	138					
				T2S	6,689	3	0	3	126	7,205	3	0	3	136	7,297	3	0	3	138					
				T2M	6,809	3	0	3	128	7,336	3	0	3	138	7,428	3	0	3	140					
				T3S	6,585	3	0	3	124	7,094	3	0	3	134	7,183	3	0	3	136					
				T3M	6,805	3	0	3	128	7,331	3	0	3	138	7,424	3	0	3	140					
				T4M	6,677	3	0	3	126	7,193	3	0	3	136	7,284	3	0	3	137					
				TFTM	6,850	3	0	3	129	7,379	3	0	3	139	7,472	3	0	3	141					
				T5VS	6,898	3	0	0	130	7,431	3	0	0	140	7,525	3	0	0	142					
				T5S	6,840	2	0	1	129	7,368	2	0	1	139	7,461	2	0	1	141					
				T5M	6,838	3	0	1	129	7,366	3	0	2	139	7,460	3	0	2	141					
				T5W	6,777	3	0	2	128	7,300	3	0	2	138	7,393	3	0	2	139					
				BLC	5,626	2	0	2	106	6,060	2	0	2	114	6,137	2	0	2	116					
				LCCO	4,018	1	0	2	76	4,328	1	0	2	82	4,383	1	0	2	83					
				RCCO	4,013	3	0	3	76	4,323	3	0	3	82	4,377	3	0	3	83					
30	700	P11	72W	T1S	8,594	3	0	3	119	9,258	3	0	3	129	9,376	3	0	3	130					
				T2S	8,545	3	0	3	119	9,205	3	0	3	128	9,322	3	0	3	129					
				T2M	8,699	3	0	3	121	9,371	3	0	3	130	9,490	3	0	3	132					
				T3S	8,412	3	0	3	117	9,062	3	0	3	126	9,177	3	0	3	127					
				T3M	8,694	3	0	3	121	9,366	3	0	3	130	9,484	3	0	3	132					
				T4M	8,530	3	0	3	118	9,189	3	0	3	128	9,305	3	0	3	129					
				TFTM	8,750	3	0	3	122	9,427	3	0	3	131	9,546	3	0	3	133					
				T5VS	8,812	3	0	0	122	9,493	3	0	0	132	9,613	3	0	0	134					
				T5S	8,738	3	0	1	121	9,413	3	0	1	131	9,532	3	0	1	132					
				T5M	8,736	3	0	2	121	9,411	3	0	2	131	9,530	3	0	2	132					
				T5W	8,657	4	0	2	120	9,326	4	0	2	130	9,444	4	0	2	131					
				BLC	7,187	3	0	3	100	7,742	3	0	3	108	7,840	3	0	3	109					
				LCCO	5,133	1	0	2	71	5,529	1	0	2	77	5,599	1	0	2	78					
				RCCO	5,126	3	0	3	71	5,522	3	0	3	77	5,592	3	0	3	78					
30	1050	P12	104W	T1S	12,149	3	0	3	117	13,088	3	0	3	126	13,253	3	0	3	127					
				T2S	12,079	4	0	4	116	13,012	4	0	4	125	13,177	4	0	4	127					
				T2M	12,297	3	0	3	118	13,247	3	0	3	127	13,415	3	0	3	129					
				T3S	11,891	4	0	4	114	12,810	4	0	4	123	12,972	4	0	4	125					
				T3M	12,290	3	0	3	118	13,239	4	0	4	127	13,407	4	0	4	129					
				T4M	12,058	4	0	4	116	12,990	4	0	4	125	13,154	4	0	4	126					
				TFTM	12,369	4	0	4	119	13,325	4	0	4	128	13,494	4	0	4	130					
				T5VS	12,456	3	0	1	120	13,419	3	0	1	129	13,589	4	0	1	131					
				T5S	12,351	3	0	1	119	13,306	3	0	1	128	13,474	3	0	1	130					
				T5M	12,349	4	0	2	119	13,303	4	0	2	128	13,471	4	0	2	130					
				T5W	12,238	4	0	3	118	13,183	4	0	3	127	13,350	4	0	3	128					
				BLC	10,159	3	0	3	98	10,944	3	0	3	105	11,083	3	0	3	107					
				LCCO	7,256	1	0	3	70	7,816	1	0	3	75	7,915	1	0	3	76					
				RCCO	7,246	3	0	3	70	7,806	4	0	4	75	7,905	4	0	4	76					
30	1300	P13	128W	T1S	14,438	3	0	3	113	15,554	3	0	3	122	15,751	3	0	3	123					
				T2S	14,355	4	0	4	112	15,465	4	0	4	121	15,660	4	0	4	122					
				T2M	14,614	3	0	3	114	15,744	4	0	4	123	15,943	4	0	4	125					
				T3S	14,132	4	0	4	110	15,224	4	0	4	119	15,417	4	0	4	120					
				T3M	14,606	4	0	4	114	15,735	4	0	4	123	15,934	4	0	4	124					
				T4M	14,330	4	0	4	112	15,438	4	0	4	121	15,633	4	0	4	122					
				TFTM	14,701	4	0	4	115	15,836	4	0	4	124	16,037	4	0	4	125					
				T5VS	14,804	4	0	1	116	15,948	4	0	1	125	16,150	4	0	1	126					
				T5S	14,679	3	0	1	115	15,814	3	0	1	124	16,014	3	0	1	125					
				T5M	14,676	4	0	2	115	15,810	4	0	2	124	16,010	4	0	2	125					
				T5W	14,544	4	0	3	114	15,668	4	0	3	122	15,866	4	0	3	124					
				BLC	7919	3	0	3	62	8531	3	0	3	67	8639	3	0	3	67					
				LCCO	5145	1	0	2	40	5543	1	0	2	43	5613	1	0	2	44					
					5139	3	0	3	40	5536	3	0	3	43	5606	3	0	3	44					

FEATURES & SPECIFICATIONS

INTENDED USE
The sleek design of the D-Series Size 0 reflects the embedded high performance LED technology. It is ideal for many commercial and municipal applications, such as parking lots, plazas, campuses, and pedestrian areas.

CONSTRUCTION
Single-piece die-cast aluminum housing has integral heat sink fins to optimize thermal management through conductive and convective cooling. Modular design allows for ease of maintenance and future light engine upgrades. The LED driver is mounted in direct contact with the casting to promote low operating temperature and long life. Housing is completely sealed against moisture and environmental contaminants (IP65). Low EPA (0.95 ft²) for optimized pole wind loading.

FINISH
Exterior parts are protected by a zinc-infused Super Durable TGIC thermoset powder coat finish that provides superior resistance to corrosion and weathering. A tightly controlled multi-stage process ensures a minimum 3 mils thickness for a finish that can withstand extreme climate changes without cracking or peeling. Available in both textured and non-textured finishes.

OPTICS
Precision-molded proprietary acrylic lenses are engineered for superior area lighting distribution, uniformity, and pole spacing. Light engines are available in 3000 K, 4000 K or 5000 K (70 CRI) configurations. The D-Series Size 0 has zero uplight and qualifies as a Nighttime Friendly™ product, meaning it is consistent with the LEED® and Green Globes™ criteria for eliminating wasteful uplight.

ELECTRICAL
Light engine(s) configurations consist of high-efficacy LEDs mounted to metal-core circuit boards to maximize heat dissipation and promote long life (up to L85/100,000 hours at 25°C). Class 1 electronic drivers are designed to have a power factor >90%, THD <20%, and an expected life of 100,000 hours with <1% failure rate. Easily serviceable 10kV surge protection device meets a minimum Category C Low operation (per ANSI/IEEE C62.41.2).

INSTALLATION
Included mounting block and integral arm facilitate quick and easy installation. Stainless steel bolts fasten the mounting block securely to poles and walls, enabling the D-Series Size 0 to withstand up to a 3.0 G vibration load rating per ANSI C136.31. The D-Series Size 0 utilizes the AERIS™ series pole drilling pattern (template #8). Optional terminal block and NEMA photocontrol receptacle are also available.

LISTINGS
UL Listed for wet locations. Light engines are IP66 rated; luminaire is IP65 rated. Rated for -40°C minimum ambient. U.S. Patent No. D672,492 S. International patent pending.

DesignLights Consortium® (DLC) Premium qualified product and DLC qualified product. Not all versions of this product may be DLC Premium qualified or DLC qualified. Please check the DLC Qualified Products List at www.designlights.org/QPL to confirm which versions are qualified.

International Dark-Sky Association (IDA) Fixture Seal of Approval (FSA) is available for all products on this page utilizing 3000K color temperature only.

WARRANTY
5-year limited warranty. Complete warranty terms located at:
www.acuitybrands.com/CustomerResources/Terms_and_conditions.aspx

Note: Actual performance may differ as a result of end-user environment and application. All values are design or typical values, measured under laboratory conditions at 25 °C. Specifications subject to change without notice.

OLWX1 LED
LED Wall Luminaire

Catalog Number

Notes

Type D

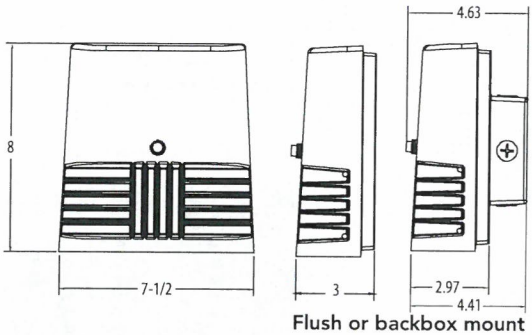
Hit the Tab key or mouse over the page to see all interactive elements.

Introduction

The OLWX1 is versatile and energy efficient. It is designed to replace up to 250W metal halide while saving over 87% in energy costs. Whether you are mounting it to a recessed junction box, conduit/ through wiring, as an up light, as a down light, or as a flood light – the OLWX1 has all applications covered.

Specifications

Width:	7-1/2" (19 cm)
Height:	8" (20.3 cm)
Depth:	3" (7.62 cm)
Weight:	5 lbs (2.27kg)



Flush or backbox mount

Ordering Information

EXAMPLE: OLWX1 LED 20W 50K

OLWX1 LED	13W	40K	MVOLT		DARK BRONZE
Series	**Performance Package**	**Color Temperature**	**Voltage**	**Controls**	**Finish**
OLWX1 LED	13W 13 watts 20W 20 watts 40W 40 watts	40K 4000 K [1] 50K 5000 K	(blank) MVOLT [2] 120 120V [3] 347 347V	(blank) None PE 120V button photocell [1,3]	(blank) Dark bronze

Accessories

Ordered and shipped separately.

OLWX1TS	Slipfitter – size 1
OLWX1YK	Yoke – size 1
OLWX1THK	Knuckle – size 1

NOTES

1 Not available with 347V option.
2 MVOLT driver operates on any line voltage from 120-277V (50/60Hz).
3 Specify 120V when ordering with photocell (PE option).

FEATURES & SPECIFICATIONS

INTENDED USE

The versatility of the OLWX1 LED combines a sleek, low-profile wall pack design with energy efficient, low maintenance LEDs for replacing up to 250W metal halide fixtures. Mounting accessories are available to convert the OLWX1 LED into an energy efficient flood light.

OLWX1 LED is ideal for outdoor applications such as building perimeters, loading areas, driveways and sign and building flood lighting.

CONSTRUCTION

Cast-aluminum housing with textured dark bronze polyester powder paint for durability. Integral heat sinks optimize thermal management through conductive and convective cooling. LEDs are protected behind a glass lens. Housing is sealed against moisture and environmental contaminants (IP65 rated). See Lighting Facts label and photometry reports for details.

ELECTRICAL

Light engine consists of 1 high-efficiency Chip On Board (COB) LED with integrated circuit board mounted directly to the housing to maximize heat dissipation and promote long life (L73/100,000 hours at 25°C). Electronic drivers have a power factor >90% and THD <20% and a minimum 2.5kV surge rating. Flood light mounting accessories include an additional 6kV surge protection device. LEDs are available in 4000K and 5000K CCTs.

INSTALLATION

Easily mounts to recessed junction boxes with the included wall mount bracket, or for surface mounting and conduit entry - with the included junction box with five 1/2" threaded conduit entry hubs. Flood light mounting accessories (sold separately) include knuckle, integral slipfitter and yoke mounting options. Each flood mount accessory comes with a top visor and vandal guard. Luminaire may be wall or ground mounted in downward or upward orientation.

LISTINGS

UL Listed to U.S. and Canadian safety standards for wet locations. Rated for -40° C minimum ambient. Tested in accordance with IESNA LM-79 and LM-80 standards. DesignLights Consortium® (DLC) qualified product. Not all versions of this product may be DLC qualified. Please check the DLC Qualified Products List at www.designlights.org to confirm which versions are qualified.

WARRANTY

5-year limited warranty. Complete warranty terms located at: www.acuitybrands.com/CustomerResources/Terms_and_conditions.aspx.

Note: Actual performance may differ as a result of end-user environment and application. All values are design or typical values, measured under laboratory conditions at 25°C. Specifications subject to change without notice.

LITHONIA LIGHTING

One Lithonia Way • Conyers, Georgia 30012 • Phone: 800.279.8041 • www.lithonia.com

Performance Data

Lumen Output

Lumen values are from photometric tests performed in accordance with IESNA LM-79-08. Data is considered to be representative of the configurations shown, within the tolerances allowed by Lighting Facts.

Fixture Model Number	CCT	System Watts	Lumens	LPW	B	U	G	CRI
OLWX1 LED 13W 40K	4000 K	14 W	1,271	91	1	0	0	>70
OLWX1 LED 13W 50K	5000 K	14 W	1,289	92	1	0	0	>80
OLWX1 LED 20W 40K	4000 K	20 W	2,697	135	1	0	0	>70
OLWX1 LED 20W 50K	5000 K	19 W	2,663	140	1	0	0	>70
OLWX1 LED 40W 40K	4000 K	39 W	4,027	101	2	0	0	>70
OLWX1 LED 40W 50K	5000 K	37 W	4,079	110	2	0	0	>70

Electrical Load

Fixture Model Number	Rated Power (watts)	Input current at given input voltage (amps)				
		120V	208V	240V	277V	347V
OLWX1 LED 13W 40K	14 W	0.12	0.07	0.06	0.06	0.04
OLWX1 LED 13W 50K	14 W	0.12	0.07	0.06	0.06	0.04
OLWX1 LED 20W 40K	20 W	0.20	0.12	0.10	0.09	0.06
OLWX1 LED 20W 50K	19 W	0.20	0.12	0.10	0.09	0.06
OLWX1 LED 40W 40K	39 W	0.37	0.21	0.19	0.16	0.11
OLWX1 LED 40W 50K	37 W	0.37	0.21	0.19	0.16	0.11

Lumen Ambient Temperature (LAT) Multipliers

Use these factors to determine relative lumen output for average ambient temperatures from 0-40°C (32-104°F).

	0°C	10°C	20°C	25°C	30°C	40°C
13W	1.06	1.03	1.01	1.00	0.99	0.96
20W	1.06	1.04	1.01	1.00	0.99	0.96
40W	1.07	1.04	1.01	1.00	0.99	0.96

Projected LED Lumen Maintenance

Data references the extrapolated performance projections in a **25°C ambient**, based on 10,000 hours of LED testing (tested per IESNA LM-80-08 and projected per IESNA TM-21-11).

To calculate LLF, use the lumen maintenance factor that corresponds to the desired number of operating hours below. For other lumen maintenance values, contact factory.

Operating Hours	0	25,000	50,000	100,000
OLWX1 LED 13W	1.00	0.92	0.85	0.73
OLWX1 LED 20W	1.00	0.92	0.85	0.73
OLWX1 LED 40W	1.00	0.94	0.88	0.79

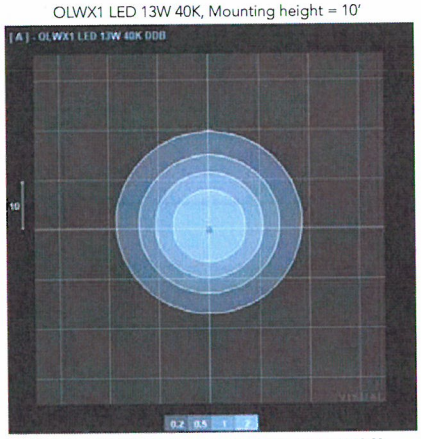
Photometric Diagrams

To see complete photometric reports or download .ies files for this product, visit the Lithonia Lighting OLWX1 LED homepage. Tested in accordance with IESNA LM-79 and LM-80 standards

LEGEND

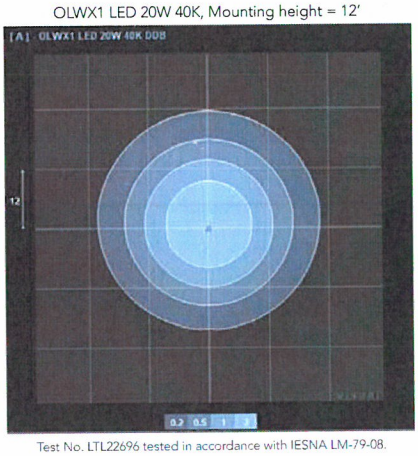
- 0.2 fc
- 0.5 fc
- 1.0 fc
- 2.0 fc

OLWX1 LED 13W 40K, Mounting height = 10'



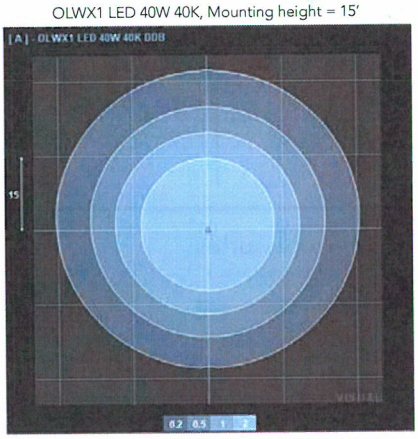
Test No. LTL22697 tested in accordance with IESNA LM-79-08.

OLWX1 LED 20W 40K, Mounting height = 12'



Test No. LTL22696 tested in accordance with IESNA LM-79-08.

OLWX1 LED 40W 40K, Mounting height = 15'



Test No. LTL22695 tested in accordance with IESNA LM-79-08.

Accessories

OLWX1TS
Slipfitter – size 1

Standard size tenon is 2 1/8".
The slip fitter has a range of 2" to 2 3/8".

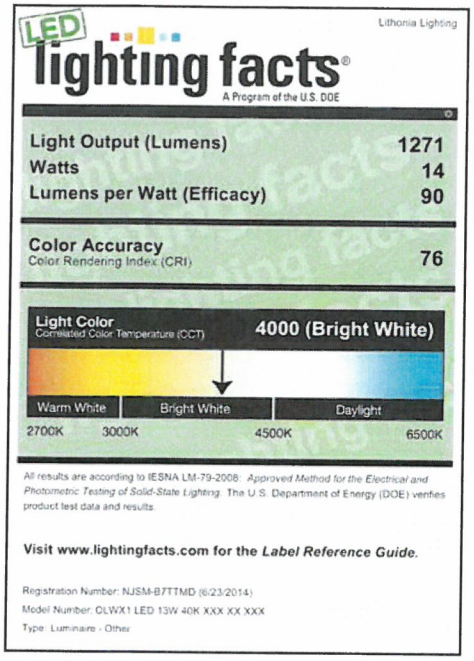
OLWX1YK
Yoke – size 1

OLWX1THK
Knuckle – size 1

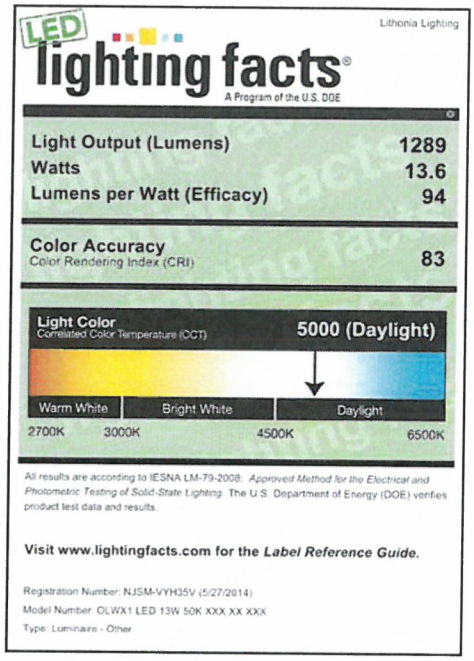
Top Visor and Vandal Guard included with accessories

Lighting Facts Labels

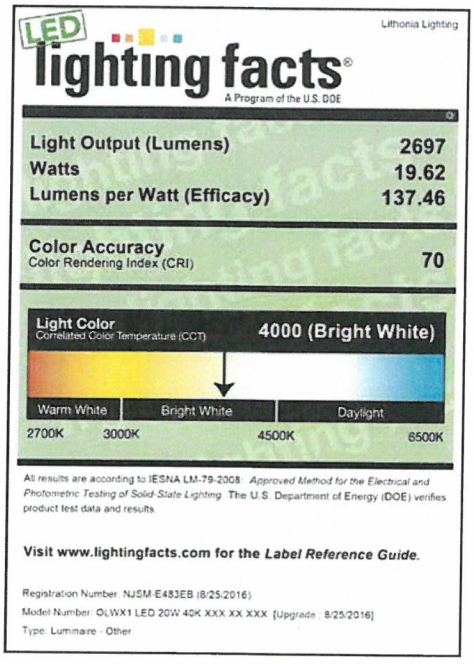
OLWX1 LED 13W 40K XXX XX XXX



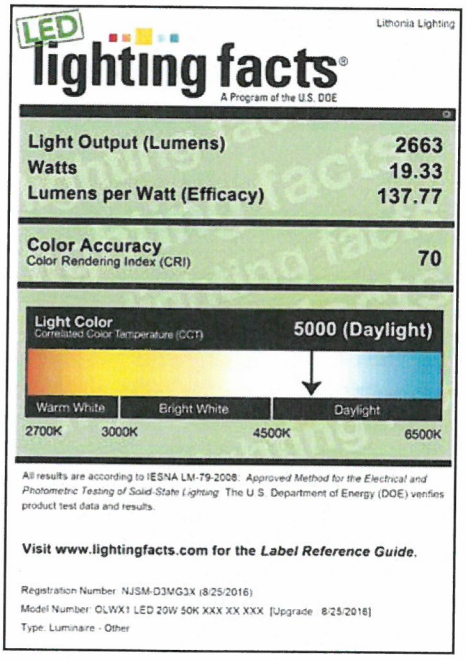
OLWX1 LED 13W 50K XXX XX XXX



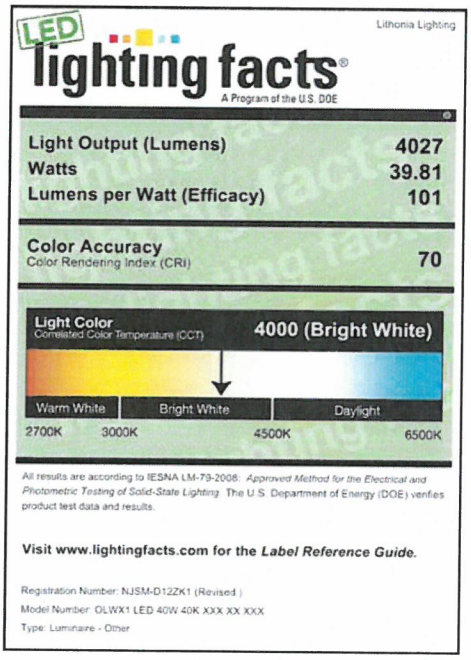
OLWX1 LED 20W 40K XXX XX XXX



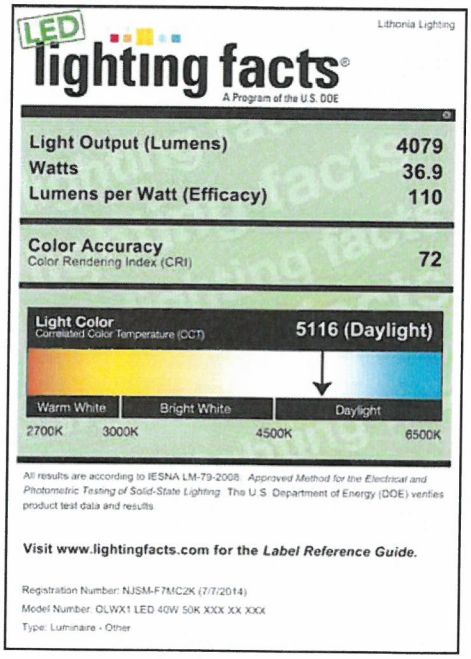
OLWX1 LED 20W 50K XXX XX XXX



OLWX1 LED 40W 40K XXX XX XXX



OLWX1 LED 40W 50K XXX XX XXX



D-Series Size 0
LED Area Luminaire

Catalog Number

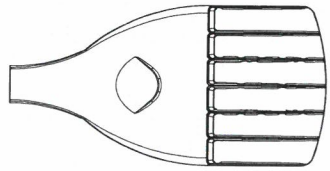
Notes

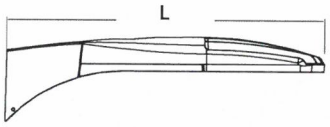
Type TYPE E

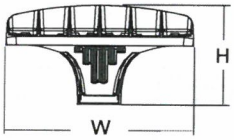
Hit the Tab key or mouse over the page to see all interactive elements.

Specifications

EPA:	0.95 ft² (.09 m²)
Length:	26" (66.0 cm)
Width:	13" (33.0 cm)
Height:	7" (17.8 cm)
Weight (max):	16 lbs (7.25 kg)







A+ Capable Luminaire

This item is an A+ capable luminaire, which has been designed and tested to provide consistent color appearance and system-level interoperability.

- All configurations of this luminaire meet the Acuity Brands' specification for chromatic consistency
- This luminaire is A+ Certified when ordered with DTL® controls marked by a shaded background. DTL DLL equipped luminaires meet the A+ specification for luminaire to photocontrol interoperability1
- This luminaire is part of an A+ Certified solution for ROAM® or XPoint™ Wireless control networks, providing out-of-the-box control compatibility with simple commissioning, when ordered with drivers and control options marked by a shaded background[1]

To learn more about A+, visit www.acuitybrands.com/aplus.

1. See ordering tree for details.
2. A+ Certified Solutions for ROAM require the order of one ROAM node per luminaire. Sold Separately: Link to Roam; Link to DTL DLL

A+ Capable options indicated by this color background.

Ordering Information

EXAMPLE: DSX0 LED P6 40K T3M MVOLT SPA DDBXD

DSX0 LED	P2	40K	T2M	MVOLT	SPA
Series	**LEDs**	**Color temperature**	**Distribution**	**Voltage**	**Mounting**
DSX0 LED	**Forward optics** P1 P4 P7 P2 P5 P3 P6 **Rotated optics** P10[1] P12[1] P11[1] P13[1]	30K 3000 K 40K 4000 K 50K 5000 K AMBPC Amber phosphor converted[2]	T1S Type I short T2S Type II short T2M Type II medium T3S Type III short T3M Type III medium T4M Type IV medium TFTM Forward throw medium T5VS Type V very short T5S Type V short T5M Type V medium T5W Type V wide BLC Backlight control[2,3] LCCO Left corner cutoff[2,3] RCCO Right corner cutoff[2,3]	MVOLT[4,5] 120[6] 208[5,6] 240[5,6] 277[6] 347[5,6,7] 480[5,6,7]	**Shipped included** SPA Square pole mounting RPA Round pole mounting WBA Wall bracket SPUMBA Square pole universal mounting adaptor[8] RPUMBA Round pole universal mounting adaptor[8] **Shipped separately** KMA8 DDBXD U Mast arm mounting bracket adaptor (specify finish)[9]

		EGS HS	DDBXD
Control options		**Other options**	**Finish** *(required)*
Shipped installed		**Shipped installed**	DDBXD Dark bronze
NLTAIR2	nLight AIR generation 2 enabled[10]	HS House-side shield[20]	DBLXD Black
PER	NEMA twist-lock receptacle only (control ordered separate)[11]	SF Single fuse (120, 277, 347V)[6]	DNAXD Natural aluminum
PER5	Five-wire receptacle only (control ordered separate)[11,12]	DF Double fuse (208, 240, 480V)[6]	DWHXD White
PER7	Seven-wire receptacle only (control ordered separate)[11,12]	L90 Left rotated optics[1]	DDBTXD Textured dark bronze
DMG	0-10V dimming extend out back of housing for external control (control ordered separate)	R90 Right rotated optics[1]	DBLBXD Textured black
PIR	Bi-level, motion/ambient sensor, 8-15' mounting height, ambient sensor enabled at 5fc[5,13,14]	DDL Diffused drop lens[20]	DNATXD Textured natural aluminum
PIRH	Bi-level, motion/ambient sensor, 15-30' mounting height, ambient sensor enabled at 5fc[5,13,14]	**Shipped separately**	DWHGXD Textured white
PIRHN	Network, Bi-Level motion/ambient sensor[15]	BS Bird spikes[21]	
PIR1FC3V	Bi-level, motion/ambient sensor, 8-15' mounting height, ambient sensor enabled at 1fc[5,13,14]	EGS External glare shield[21]	
PIRH1FC3V	Bi-level, motion/ambient sensor, 15-30' mounting height, ambient sensor enabled at 1fc[5,13,14]		
BL30	Bi-level switched dimming, 30%[5,16,17]		
BL50	Bi-level switched dimming, 50%[5,16,17]		
PNMTDD3	Part night, dim till dawn[5,18]		
PNMT5D3	Part night, dim 5 hrs[5,18]		
PNMT6D3	Part night, dim 6 hrs[5,18]		
PNMT7D3	Part night, dim 7 hrs[5,18]		
FAO	Field adjustable output[19]		

Ordering Information

Accessories

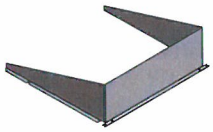
Ordered and shipped separately.

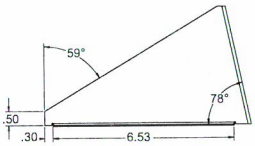
DLL127F 1.5 JU	Photocell - SSL twist-lock (120-277V) [22]
DLL347F 1.5 CUL JU	Photocell - SSL twist-lock (347V) [22]
DLL480F 1.5 CUL JU	Photocell - SSL twist-lock (480V) [22]
DSHORT SBK U	Shorting cap [22]
DSX0HS 20C U	House-side shield for 20 LED unit [20]
DSX0HS 30C U	House-side shield for 30 LED unit [20]
DSX0HS 40C U	House-side shield for 40 LED unit [20]
DSX0DDL U	Diffused drop lens (polycarbonate) [20]
PUMBA DDBXD U*	Square and round pole universal mounting bracket adaptor (specify finish) [23]
KMA8 DDBXD U	Mast arm mounting bracket adaptor (specify finish) [8]

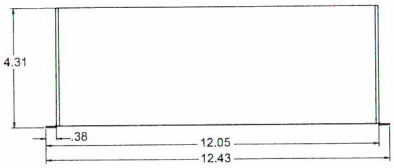
For more control options, visit DTL and ROAM online.

NOTES
1. P10, P11, P12 and P13 and rotated options (L90 or R90) only available together.
2. AMBPC is not available with BLC, LCCO, RCCO, P4, P7 or P13.
3. Not available with HS or DDL.
4. MVOLT driver operates on any line voltage from 120-277V (50/60 Hz).
5. Any PIRx with BL30, BL50 or PNMT, is not available with 208V, 240V, 347V, 480V or MVOLT. It is only available in 120V or 277V specified.
6. Single fuse (SF) requires 120V, 277V or 347V. Double fuse (DF) requires 208V, 240V or 480V.
7. Not available in P4, P7 or P13. Not available with BL30, BL50 or PNMT options.
8. Existing drilled pole only. Available as a separate combination accessory; for retrofit use only: PUMBA (finish) U; 1.5 G vibration load rating per ANCI C136.31.
9. Must order fixture with SPA mounting. Must be ordered as a separate accessory; see Accessories information. For use with 2-3/8" mast arm (not included).
10. Must be ordered with PIRHN.
11. Photocell ordered and shipped as a separate line item from Acuity Brands Controls. See accessories. Shorting Cap included.
12. If ROAM® node required, it must be ordered and shipped as a separate line item from Acuity Brands Controls. Shorting Cap included.
13. Reference Motion Sensor table on page 3.
14. Reference PER Table on page 3 to see functionality.
15. Must be ordered with NLTAIR2. For more information on nLight Air 2 visit this link.
16. Requires (2) separately switched circuits.
17. Not available with 347V, 480V or PNMT. For PER5 or PER7 see PER Table on page 3. Requires isolated neutral.
18. Not available with 347V, 480V, BL30 and BL50. For PER5 or PER7 see PER Table on page 3. Separate Dusk to Dawn required.
19. Not available with other dimming controls options.
20. Not available with BLC, LCCO and RCCO distribution. Also available as a separate accessory; see Accessories information.
21. Must be ordered with fixture for factory pre-drilling.
22. Requires luminaire to be specified with PER, PER5 or PER7 option. See PER Table on page 3.
23. For retrofit use only.

External Glare Shield

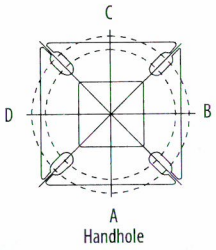


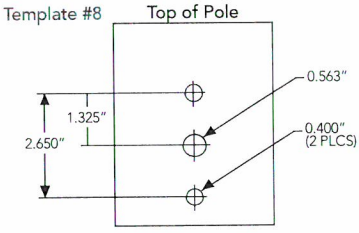




Drilling

HANDHOLE ORIENTATION





Tenon Mounting Slipfitter**

Tenon O.D.	Single Unit	2 at 180°	2 at 90°	3 at 120°	3 at 90°	4 at 90°
2-3/8"	AST20-190	AST20-280	AST20-290	AST20-320	AST20-390	AST20-490
2-7/8"	AST25-190	AST25-280	AST25-290	AST25-320	AST25-390	AST25-490
4"	AST35-190	AST35-280	AST35-290	AST35-320	AST35-390	AST35-490

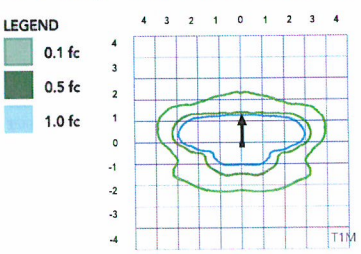
Pole drilling nomenclature: # of heads at degree from handhole (default side A)					
DM19AS	DM28AS	DM29AS	DM32AS	DM39AS	DM49AS
1 @ 90°	2 @ 280°	2 @ 90°	3 @ 120°	3 @ 90°	4 @ 90°
Side B	Side B & D	Side B & C	Round pole only	Side B, C, & D	Sides A, B, C, D
Note: Review luminaire spec sheet for specific nomenclature					

Pole top or tenon O.D.	4.5" @ 90°	4" @ 90°	3.5" @ 90°	3" @ 90°	4.5" @ 120°	4" @ 120°	3.5" @ 120°	3" @ 120°
DSX SPA	Y	Y	Y	N	-	-	-	-
DSX RPA	Y	Y	N	N	Y	Y	Y	Y
DSX SPUMBA	Y	N	N	N	-	-	-	-
DSX RPUMBA	N	N	N	N	Y	Y	Y	N
					*3 fixtures @120 require round pole top/tenon.			

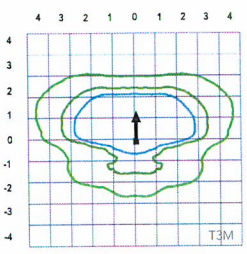
Photometric Diagrams

To see complete photometric reports or download .ies files for this product, visit Lithonia Lighting's D-Series Area Size 0 homepage.

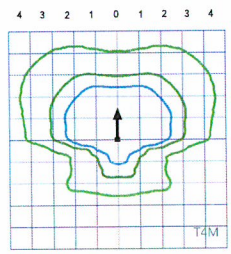
Isofootcandle plots for the DSX0 LED 40C 1000 40K. Distances are in units of mounting height (20').



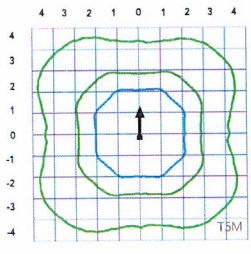
Test No. LTL23451P25 tested in accordance with IESNA LM-79-08.



Test No. LTL23456P25 tested in accordance with IESNA LM-79-08.



Test No. LTL23457P25 tested in accordance with IESNA LM-79-08.



Test No. LTL23422P25 tested in accordance with IESNA LM-79-08.

Performance Data

Lumen Ambient Temperature (LAT) Multipliers

Use these factors to determine relative lumen output for average ambient temperatures from 0-40°C (32-104°F).

Ambient		Lumen Multiplier
0°C	32°F	1.04
5°C	41°F	1.04
10°C	50°F	1.03
15°C	50°F	1.02
20°C	68°F	1.01
25°C	**77°F**	**1.00**
30°C	86°F	0.99
35°C	95°F	0.98
40°C	104°F	0.97

Projected LED Lumen Maintenance

Data references the extrapolated performance projections for the platforms noted in a **25°C ambient**, based on 10,000 hours of LED testing (tested per IESNA LM-80-08 and projected per IESNA TM-21-11).

To calculate LLF, use the lumen maintenance factor that corresponds to the desired number of operating hours below. For other lumen maintenance values, contact factory.

Operating Hours	25000	50000	100000
Lumen Maintenance Factor	0.96	0.92	0.85

Electrical Load

	Performance Package	LED Count	Drive Current	Wattage	Current (A)					
					120	208	240	277	347	480
Forward Optics (Non-Rotated)	P1	20	530	38	0.32	0.18	0.15	0.15	0.10	0.08
	P2	20	700	49	0.41	0.23	0.20	0.19	0.14	0.11
	P3	20	1050	71	0.60	0.37	0.32	0.27	0.21	0.15
	P4	20	1400	92	0.77	0.45	0.39	0.35	0.28	0.20
	P5	40	700	89	0.74	0.43	0.38	0.34	0.26	0.20
	P6	40	1050	134	1.13	0.65	0.55	0.48	0.39	0.29
	P7	40	1300	166	1.38	0.80	0.69	0.60	0.50	0.37
Rotated Optics (Requires L90 or R90)	P10	30	530	53	0.45	0.26	0.23	0.21	0.16	0.12
	P11	30	700	72	0.60	0.35	0.30	0.27	0.20	0.16
	P12	30	1050	104	0.88	0.50	0.44	0.39	0.31	0.23
	P13	30	1300	128	1.08	0.62	0.54	0.48	0.37	0.27

Motion Sensor Default Settings						
Option	Dimmed State	High Level (when triggered)	Photocell Operation	Dwell Time	Ramp-up Time	Ramp-down Time
PIR or PIRH	3V (37%) Output	10V (100%) Output	Enabled @ 5FC	5 min	3 sec	5 min
*PIR1FC3V or PIRH1FC3V	3V (37%) Output	10V (100%) Output	Enabled @ 1FC	5 min	3 sec	5 min
*for use with Inline Dusk to Dawn or timer.						

PER Table						
Control	PER (3 wire)	PER5 (5 wire)		PER7 (7 wire)		
			Wire 4/Wire5		Wire 4/Wire5	Wire 6/Wire7
Photocontrol Only (On/Off)	✔	⚠	Wired to dimming leads on driver	⚠	Wired to dimming leads on driver	Wires Capped inside fixture
ROAM	⊘	✔	Wired to dimming leads on driver	⚠	Wired to dimming leads on driver	Wires Capped inside fixture
ROAM with Motion (ROAM on/off only)	⊘	⚠	Wires Capped inside fixture	⚠	Wires Capped inside fixture	Wires Capped inside fixture
Future-proof*	⊘	⚠	Wired to dimming leads on driver	✔	Wired to dimming leads on driver	Wires Capped inside fixture
Future-proof* with Motion	⊘	⚠	Wires Capped inside fixture	✔	Wires Capped inside fixture	Wires Capped inside fixture

✔ Recommended
⊘ Will not work
⚠ Alternate

*Future-proof means: Ability to change controls in the future.

Performance Data

Lumen Output

Lumen values are from photometric tests performed in accordance with IESNA LM-79-08. Data is considered to be representative of the configurations shown, within the tolerances allowed by Lighting Facts. Contact factory for performance data on any configurations not shown here.

Forward Optics

LED Count	Drive Current	Power Package	System Watts	Dist. Type	30K (3000 K, 70 CRI)					40K (4000 K, 70 CRI)					50K (5000 K, 70 CRI)					AMBPC (Amber Phosphor Converted)				
					Lumens	B	U	G	LPW	Lumens	B	U	G	LPW	Lumens	B	U	G	LPW	Lumens	B	U	G	LPW
20	530	P1	38W	T1S	4,369	1	0	1	115	4,706	1	0	1	124	4,766	1	0	1	125	2,541	1	0	1	73
				T2S	4,364	1	0	1	115	4,701	1	0	1	124	4,761	1	0	1	125	2,589	1	0	1	74
				T2M	4,387	1	0	1	115	4,726	1	0	1	124	4,785	1	0	1	126	2,539	1	0	1	73
				T3S	4,248	1	0	1	112	4,577	1	0	1	120	4,634	1	0	1	122	2,558	1	0	1	73
				T3M	4,376	1	0	1	115	4,714	1	0	1	124	4,774	1	0	1	126	2,583	1	0	1	74
				T4M	4,281	1	0	1	113	4,612	1	0	2	121	4,670	1	0	2	123	2,570	1	0	1	73
				TFTM	4,373	1	0	1	115	4,711	1	0	2	124	4,771	1	0	2	126	2,540	1	0	1	73
				T5VS	4,548	2	0	0	120	4,900	2	0	0	129	4,962	2	0	0	131	2,650	1	0	0	76
				T5S	4,552	2	0	0	120	4,904	2	0	0	129	4,966	2	0	0	131	2,690	1	0	0	77
				T5M	4,541	3	0	1	120	4,891	3	0	1	129	4,953	3	0	1	130	2,658	2	0	0	76
				T5W	4,576	3	0	2	120	4,929	3	0	2	130	4,992	3	0	2	131	2,663	2	0	1	73
				BLC	3,586	1	0	1	94	3,863	1	0	1	102	3,912	1	0	1	103					
				LCCO	2,668	1	0	1	70	2,874	1	0	2	76	2,911	1	0	2	77					
				RCCO	2,668	1	0	1	70	2,874	1	0	2	76	2,911	1	0	2	77					
20	700	P2	49W	T1S	5,570	1	0	1	114	6,001	1	0	1	122	6,077	2	0	2	124	3,144	1	0	1	70
				T2S	5,564	1	0	2	114	5,994	1	0	2	122	6,070	2	0	2	124	3,203	1	0	1	71
				T2M	5,593	1	0	1	114	6,025	1	0	1	123	6,102	1	0	1	125	3,141	1	0	1	70
				T3S	5,417	1	0	2	111	5,835	1	0	2	119	5,909	2	0	2	121	3,165	1	0	1	70
				T3M	5,580	1	0	2	114	6,011	1	0	2	123	6,087	1	0	2	124	3,196	1	0	1	71
				T4M	5,458	1	0	2	111	5,880	1	0	2	120	5,955	1	0	2	122	3,179	1	0	1	71
				TFTM	5,576	1	0	2	114	6,007	1	0	2	123	6,083	1	0	2	124	3,143	1	0	1	70
				T5VS	5,799	2	0	0	118	6,247	2	0	0	127	6,327	2	0	0	129	3,278	2	0	0	73
				T5S	5,804	2	0	0	118	6,252	2	0	0	128	6,332	2	0	1	129	3,328	2	0	0	74
				T5M	5,789	3	0	1	118	6,237	3	0	1	127	6,316	3	0	1	129	3,288	2	0	1	73
				T5W	5,834	3	0	2	119	6,285	3	0	2	128	6,364	3	0	2	130	3,295	2	0	1	73
				BLC	4,572	1	0	1	93	4,925	1	0	1	101	4,987	1	0	1	102					
				LCCO	3,402	1	0	2	69	3,665	1	0	2	75	3,711	1	0	2	76					
				RCCO	3,402	1	0	2	69	3,665	1	0	2	75	3,711	1	0	2	76					
20	1050	P3	71W	T1S	7,833	2	0	2	110	8,438	2	0	2	119	8,545	2	0	2	120					
				T2S	7,825	2	0	2	110	8,429	2	0	2	119	8,536	2	0	2	120					
				T2M	7,865	2	0	2	111	8,473	2	0	2	119	8,580	2	0	2	121					
				T3S	7,617	2	0	2	107	8,205	2	0	2	116	8,309	2	0	2	117					
				T3M	7,846	2	0	2	111	8,452	2	0	2	119	8,559	2	0	2	121					
				T4M	7,675	2	0	2	108	8,269	2	0	2	116	8,373	2	0	2	118					
				TFTM	7,841	2	0	2	110	8,447	2	0	2	119	8,554	2	0	2	120					
				T5VS	8,155	3	0	0	115	8,785	3	0	0	124	8,896	3	0	0	125					
				T5S	8,162	3	0	1	115	8,792	3	0	1	124	8,904	3	0	1	125					
				T5M	8,141	3	0	2	115	8,770	3	0	2	124	8,881	3	0	2	125					
				T5W	8,204	3	0	2	116	8,838	4	0	2	124	8,950	4	0	2	126					
				BLC	6,429	1	0	2	91	6,926	1	0	2	98	7,013	1	0	2	99					
				LCCO	4,784	1	0	2	67	5,153	1	0	2	73	5,218	1	0	2	73					
				RCCO	4,784	1	0	2	67	5,153	1	0	2	73	5,218	1	0	2	73					
20	1400	P4	92W	T1S	9,791	2	0	2	106	10,547	2	0	2	115	10,681	2	0	2	116					
				T2S	9,780	2	0	2	106	10,536	2	0	2	115	10,669	2	0	2	116					
				T2M	9,831	2	0	2	107	10,590	2	0	2	115	10,724	2	0	2	117					
				T3S	9,521	2	0	2	103	10,256	2	0	2	111	10,386	2	0	2	113					
				T3M	9,807	2	0	2	107	10,565	2	0	2	115	10,698	2	0	2	116					
				T4M	9,594	2	0	2	104	10,335	2	0	3	112	10,466	2	0	3	114					
				TFTM	9,801	2	0	2	107	10,558	2	0	2	115	10,692	2	0	2	116					
				T5VS	10,193	3	0	1	111	10,981	3	0	1	119	11,120	3	0	1	121					
				T5S	10,201	3	0	1	111	10,990	3	0	1	119	11,129	3	0	1	121					
				T5M	10,176	4	0	2	111	10,962	4	0	2	119	11,101	4	0	2	121					
				T5W	10,254	4	0	3	111	11,047	4	0	3	120	11,186	4	0	3	122					
				BLC	8,036	1	0	2	87	8,656	1	0	2	94	8,766	1	0	2	95					
				LCCO	5,979	1	0	2	65	6,441	1	0	2	70	6,523	1	0	3	71					
					5,979	1	0	2	65	6,441	1	0	2	70	6,523	1	0	3	71					

Performance Data

Lumen Output

Lumen values are from photometric tests performed in accordance with IESNA LM-79-08. Data is considered to be representative of the configurations shown, within the tolerances allowed by Lighting Facts. Contact factory for performance data on any configurations not shown here.

Forward Optics

LED Count	Drive Current	Power Package	System Watts	Dist. Type	30K (3000 K, 70 CRI)					40K (4000 K, 70 CRI)					50K (5000 K, 70 CRI)					AMBPC (Amber Phosphor Converted)				
					Lumens	B	U	G	LPW	Lumens	B	U	G	LPW	Lumens	B	U	G	LPW	Lumens	B	U	G	LPW
40	700	P5	89W	T1S	10,831	2	0	2	122	11,668	2	0	2	131	11,816	2	0	2	133					
				T2S	10,820	2	0	2	122	11,656	2	0	2	131	11,803	2	0	2	133					
				T2M	10,876	2	0	2	122	11,716	2	0	2	132	11,864	2	0	2	133					
				T3S	10,532	2	0	2	118	11,346	2	0	2	127	11,490	2	0	2	129					
				T3M	10,849	2	0	2	122	11,687	2	0	2	131	11,835	2	0	2	133					
				T4M	10,613	2	0	3	119	11,434	2	0	3	128	11,578	2	0	3	130					
				TFTM	10,842	2	0	2	122	11,680	2	0	2	131	11,828	2	0	2	133					
				T5VS	11,276	3	0	1	127	12,148	3	0	1	136	12,302	3	0	1	138					
				T5S	11,286	3	0	1	127	12,158	3	0	1	137	12,312	3	0	1	138					
				T5M	11,257	4	0	2	126	12,127	4	0	2	136	12,280	4	0	2	138					
				T5W	11,344	4	0	3	127	12,221	4	0	3	137	12,375	4	0	3	139					
				BLC	8,890	1	0	2	100	9,576	1	0	2	108	9,698	1	0	2	109					
				LCCO	6,615	1	0	3	74	7,126	1	0	3	80	7,216	1	0	3	81					
				RCCO	6,615	1	0	3	74	7,126	1	0	3	80	7,216	1	0	3	81					
40	1050	P6	134W	T1S	14,805	3	0	3	110	15,949	3	0	3	119	16,151	3	0	3	121	6,206	2	0	2	68
				T2S	14,789	3	0	3	110	15,932	3	0	3	119	16,134	3	0	3	120	6,322	2	0	2	69
				T2M	14,865	3	0	3	111	16,014	3	0	3	120	16,217	3	0	3	121	6,201	2	0	2	68
				T3S	14,396	3	0	3	107	15,509	3	0	3	116	15,705	3	0	3	117	6,247	1	0	2	69
				T3M	14,829	2	0	3	111	15,975	3	0	3	119	16,177	3	0	3	121	6,308	2	0	2	69
				T4M	14,507	2	0	3	108	15,628	3	0	3	117	15,826	3	0	3	118	6,275	1	0	2	69
				TFTM	14,820	2	0	3	111	15,965	3	0	3	119	16,167	3	0	3	121	6,203	1	0	2	68
				T5VS	15,413	4	0	1	115	16,604	4	0	1	124	16,815	4	0	1	125	6,671	2	0	0	73
				T5S	15,426	3	0	1	115	16,618	4	0	1	124	16,828	4	0	1	126	6,569	2	0	0	72
				T5M	15,387	4	0	2	115	16,576	4	0	2	124	16,786	4	0	2	125	6,491	3	0	1	71
				T5W	15,506	4	0	3	116	16,704	4	0	3	125	16,915	4	0	3	126	6,504	3	0	2	71
				BLC	12,151	1	0	2	91	13,090	1	0	2	98	13,255	1	0	2	99					
				LCCO	9,041	1	0	3	67	9,740	1	0	3	73	9,863	1	0	3	74					
				RCCO	9,041	1	0	3	67	9,740	1	0	3	73	9,863	1	0	3	74					
40	1300	P7	166W	T1S	17,023	3	0	3	103	18,338	3	0	3	110	18,570	3	0	3	112					
				T2S	17,005	3	0	3	102	18,319	3	0	3	110	18,551	3	0	3	112					
				T2M	17,092	3	0	3	103	18,413	3	0	3	111	18,646	3	0	3	112					
				T3S	16,553	3	0	3	100	17,832	3	0	3	107	18,058	3	0	3	109					
				T3M	17,051	3	0	3	103	18,369	3	0	3	111	18,601	3	0	3	112					
				T4M	16,681	3	0	3	100	17,969	3	0	3	108	18,197	3	0	3	110					
				TFTM	17,040	3	0	3	103	18,357	3	0	4	111	18,590	3	0	4	112					
				T5VS	17,723	4	0	1	107	19,092	4	0	1	115	19,334	4	0	1	116					
				T5S	17,737	4	0	2	107	19,108	4	0	2	115	19,349	4	0	2	117					
				T5M	17,692	4	0	2	107	19,059	4	0	2	115	19,301	4	0	2	116					
				T5W	17,829	5	0	3	107	19,207	5	0	3	116	19,450	5	0	3	117					
				BLC	13,971	2	0	2	84	15,051	2	0	2	91	15,241	2	0	2	92					
				LCCO	10,396	1	0	3	63	11,199	1	0	3	67	11,341	1	0	3	68					
					10,396	1	0	3	63	11,199	1	0	3	67	11,341	1	0	3	68					

Performance Data

Lumen Output

Lumen values are from photometric tests performed in accordance with IESNA LM-79-08. Data is considered to be representative of the configurations shown, within the tolerances allowed by Lighting Facts. Contact factory for performance data on any configurations not shown here.

Rotated Optics

LED Count	Drive Current	Power Package	System Watts	Dist. Type	30K (3000 K, 70 CRI)					40K (4000 K, 70 CRI)					50K (5000 K, 70 CRI)					AMBPC (Amber Phosphor Converted)				
					Lumens	B	U	G	LPW	Lumens	B	U	G	LPW	Lumens	B	U	G	LPW	Lumens	B	U	G	LPW
30	530	P10	53W	T1S	6,727	2	0	2	127	7,247	3	0	3	137	7,339	3	0	3	138					
				T2S	6,689	3	0	3	126	7,205	3	0	3	136	7,297	3	0	3	138					
				T2M	6,809	3	0	3	128	7,336	3	0	3	138	7,428	3	0	3	140					
				T3S	6,585	3	0	3	124	7,094	3	0	3	134	7,183	3	0	3	136					
				T3M	6,805	3	0	3	128	7,331	3	0	3	138	7,424	3	0	3	140					
				T4M	6,677	3	0	3	126	7,193	3	0	3	136	7,284	3	0	3	137					
				TFTM	6,850	3	0	3	129	7,379	3	0	3	139	7,472	3	0	3	141					
				T5VS	6,898	3	0	0	130	7,431	3	0	0	140	7,525	3	0	0	142					
				T5S	6,840	2	0	1	129	7,368	2	0	1	139	7,461	2	0	1	141					
				T5M	6,838	3	0	1	129	7,366	3	0	2	139	7,460	3	0	2	141					
				T5W	6,777	3	0	2	128	7,300	3	0	2	138	7,393	3	0	2	139					
				BLC	5,626	2	0	2	106	6,060	2	0	2	114	6,137	2	0	2	116					
				LCCO	4,018	1	0	2	76	4,328	1	0	2	82	4,383	1	0	2	83					
				RCCO	4,013	3	0	3	76	4,323	3	0	3	82	4,377	3	0	3	83					
30	700	P11	72W	T1S	8,594	3	0	3	119	9,258	3	0	3	129	9,376	3	0	3	130					
				T2S	8,545	3	0	3	119	9,205	3	0	3	128	9,322	3	0	3	129					
				T2M	8,699	3	0	3	121	9,371	3	0	3	130	9,490	3	0	3	132					
				T3S	8,412	3	0	3	117	9,062	3	0	3	126	9,177	3	0	3	127					
				T3M	8,694	3	0	3	121	9,366	3	0	3	130	9,484	3	0	3	132					
				T4M	8,530	3	0	3	118	9,189	3	0	3	128	9,305	3	0	3	129					
				TFTM	8,750	3	0	3	122	9,427	3	0	3	131	9,546	3	0	3	133					
				T5VS	8,812	3	0	0	122	9,493	3	0	0	132	9,613	3	0	0	134					
				T5S	8,738	3	0	1	121	9,413	3	0	1	131	9,532	3	0	1	132					
				T5M	8,736	3	0	2	121	9,411	3	0	2	131	9,530	3	0	2	132					
				T5W	8,657	4	0	2	120	9,326	4	0	2	130	9,444	4	0	2	131					
				BLC	7,187	3	0	3	100	7,742	3	0	3	108	7,840	3	0	3	109					
				LCCO	5,133	1	0	2	71	5,529	1	0	2	77	5,599	1	0	2	78					
				RCCO	5,126	3	0	3	71	5,522	3	0	3	77	5,592	3	0	3	78					
30	1050	P12	104W	T1S	12,149	3	0	3	117	13,088	3	0	3	126	13,253	3	0	3	127					
				T2S	12,079	4	0	4	116	13,012	4	0	4	125	13,177	4	0	4	127					
				T2M	12,297	3	0	3	118	13,247	3	0	3	127	13,415	3	0	3	129					
				T3S	11,891	4	0	4	114	12,810	4	0	4	123	12,972	4	0	4	125					
				T3M	12,290	3	0	3	118	13,239	4	0	4	127	13,407	4	0	4	129					
				T4M	12,058	4	0	4	116	12,990	4	0	4	125	13,154	4	0	4	126					
				TFTM	12,369	4	0	4	119	13,325	4	0	4	128	13,494	4	0	4	130					
				T5VS	12,456	3	0	1	120	13,419	3	0	1	129	13,589	4	0	1	131					
				T5S	12,351	3	0	1	119	13,306	3	0	1	128	13,474	3	0	1	130					
				T5M	12,349	4	0	2	119	13,303	4	0	2	128	13,471	4	0	2	130					
				T5W	12,238	4	0	3	118	13,183	4	0	3	127	13,350	4	0	3	128					
				BLC	10,159	3	0	3	98	10,944	3	0	3	105	11,083	3	0	3	107					
				LCCO	7,256	1	0	3	70	7,816	1	0	3	75	7,915	1	0	3	76					
				RCCO	7,246	3	0	3	70	7,806	4	0	4	75	7,905	4	0	4	76					
30	1300	P13	128W	T1S	14,438	3	0	3	113	15,554	3	0	3	122	15,751	3	0	3	123					
				T2S	14,355	4	0	4	112	15,465	4	0	4	121	15,660	4	0	4	122					
				T2M	14,614	3	0	3	114	15,744	4	0	4	123	15,943	4	0	4	125					
				T3S	14,132	4	0	4	110	15,224	4	0	4	119	15,417	4	0	4	120					
				T3M	14,606	4	0	4	114	15,735	4	0	4	123	15,934	4	0	4	124					
				T4M	14,330	4	0	4	112	15,438	4	0	4	121	15,633	4	0	4	122					
				TFTM	14,701	4	0	4	115	15,836	4	0	4	124	16,037	4	0	4	125					
				T5VS	14,804	4	0	1	116	15,948	4	0	1	125	16,150	4	0	1	126					
				T5S	14,679	3	0	1	115	15,814	3	0	1	124	16,014	3	0	1	125					
				T5M	14,676	4	0	2	115	15,810	4	0	2	124	16,010	4	0	2	125					
				T5W	14,544	4	0	3	114	15,668	4	0	3	122	15,866	4	0	3	124					
				BLC	7919	3	0	3	62	8531	3	0	3	67	8639	3	0	3	67					
				LCCO	5145	1	0	2	40	5543	1	0	2	43	5613	1	0	2	44					
					5139	3	0	3	40	5536	3	0	3	43	5606	3	0	3	44					

FEATURES & SPECIFICATIONS

INTENDED USE
The sleek design of the D-Series Size 0 reflects the embedded high performance LED technology. It is ideal for many commercial and municipal applications, such as parking lots, plazas, campuses, and pedestrian areas.

CONSTRUCTION
Single-piece die-cast aluminum housing has integral heat sink fins to optimize thermal management through conductive and convective cooling. Modular design allows for ease of maintenance and future light engine upgrades. The LED driver is mounted in direct contact with the casting to promote low operating temperature and long life. Housing is completely sealed against moisture and environmental contaminants (IP65). Low EPA (0.95 ft^2) for optimized pole wind loading.

FINISH
Exterior parts are protected by a zinc-infused Super Durable TGIC thermoset powder coat finish that provides superior resistance to corrosion and weathering. A tightly controlled multi-stage process ensures a minimum 3 mils thickness for a finish that can withstand extreme climate changes without cracking or peeling. Available in both textured and non-textured finishes.

OPTICS
Precision-molded proprietary acrylic lenses are engineered for superior area lighting distribution, uniformity, and pole spacing. Light engines are available in 3000 K, 4000 K or 5000 K (70 CRI) configurations. The D-Series Size 0 has zero uplight and qualifies as a Nighttime Friendly™ product, meaning it is consistent with the LEED® and Green Globes™ criteria for eliminating wasteful uplight.

ELECTRICAL
Light engine(s) configurations consist of high-efficacy LEDs mounted to metal-core circuit boards to maximize heat dissipation and promote long life (up to L85/100,000 hours at 25°C). Class 1 electronic drivers are designed to have a power factor >90%, THD <20%, and an expected life of 100,000 hours with <1% failure rate. Easily serviceable 10kV surge protection device meets a minimum Category C Low operation (per ANSI/IEEE C62.41.2).

INSTALLATION
Included mounting block and integral arm facilitate quick and easy installation. Stainless steel bolts fasten the mounting block securely to poles and walls, enabling the D-Series Size 0 to withstand up to a 3.0 G vibration load rating per ANSI C136.31. The D-Series Size 0 utilizes the AERIS™ series pole drilling pattern (template #8). Optional terminal block and NEMA photocontrol receptacle are also available.

LISTINGS
UL Listed for wet locations. Light engines are IP66 rated; luminaire is IP65 rated. Rated for -40°C minimum ambient. U.S. Patent No. D672,492 S. International patent pending.

DesignLights Consortium® (DLC) Premium qualified product and DLC qualified product. Not all versions of this product may be DLC Premium qualified or DLC qualified. Please check the DLC Qualified Products List at www.designlights.org/QPL to confirm which versions are qualified.

International Dark-Sky Association (IDA) Fixture Seal of Approval (FSA) is available for all products on this page utilizing 3000K color temperature only.

WARRANTY
5-year limited warranty. Complete warranty terms located at:
www.acuitybrands.com/CustomerResources/Terms_and_conditions.aspx

Note: Actual performance may differ as a result of end-user environment and application. All values are design or typical values, measured under laboratory conditions at 25 °C. Specifications subject to change without notice.

Real-World Geotechnical Solutions
Investigation • Design • Construction Support

Geotechnical Engineering Report

8th Court Redevelopment
2180 8th Court
West Linn, Oregon 97068

GeoPacific Engineering, Inc. Job No. 18-4970
August 22, 2018

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Real-World Geotechnical Solutions
Investigation • Design • Construction Support

August 16, 2018
Project No. 18-4970

Edge Development
Mr. Ed Bruin
735 SW 20th Place, Suite 220
Portland, Oregon 97205
Phone: (503) 292-7733

SUBJECT: **GEOTECHNICAL ENGINEERING REPORT**
8TH COURT REDEVELOPMENT
8120 8TH COURT
WEST LINN, OREGON 97068

1.0 PROJECT INFORMATION

This report presents the results of a geotechnical engineering study conducted by GeoPacific Engineering, Inc. (GeoPacific) for the above-referenced projects. The purpose of our investigation was to evaluate subsurface conditions at the site, and to provide geotechnical recommendations for site development. This geotechnical study was performed in accordance with GeoPacific Proposal No. P-6617, dated May 31, 2018, and your subsequent authorization of our proposal and *General Conditions for Geotechnical Services*.

Site Location:	8120 8th Court West Linn, Oregon 97068 (see Figures 1 through 3)
Developer:	Edge Development 735 SW 20th Place, Suite 220 Portland, Oregon 97205
Jurisdictional Agency:	West Linn, Oregon
Geotechnical Engineer:	GeoPacific Engineering, Inc 14835 SW 72nd Avenue Portland, Oregon 97224 Tel (503) 598-8445 Fax (503) 941-9281

2.0 SITE AND PROJECT DESCRIPTION

The subject site is located at 8120 8th Court in West Linn, Oregon, as indicated on Figures 1 through 3. The site consists of Clackamas County Property No. 1680363, totaling approximately 1.04-acres in size. The site is bordered by Interstate 205 to the north, single family residences to the east, Willamette Falls Drive to the south, and 8th Court and commercial businesses to the west. Currently, the site is occupied by a vacant restaurant building on the southern portion of the site with parking and drive areas throughout the rest of the property. The site is vegetated with landscaping, shrubs, and medium to large trees around the perimeter of the site. Topography at the site slopes down gently to the north with site elevations ranging from approximately 141 to 147 feet above mean sea level (amsl). Along the northern property boundary, the ground surface moderately slopes down to a shallow drainage which runs to the northeast.

Based upon communication with the client, GeoPacific understands that the proposed development at the site will consist of construction of a medical facility on the southern portion of the site, and a commercial retail building on the northern portion of the site with stormwater disposal facilities, parking areas, and associated underground utility improvements.

3.0 REGIONAL GEOLOGIC SETTING

Regionally, the subject site lies within the Willamette Valley/Puget Sound lowland, a broad structural depression situated between the Coast Range on the west and the Cascade Range on the east. A series of discontinuous faults subdivide the Willamette Valley into a mosaic of fault-bounded, structural blocks (Yeats et al., 1996). Uplifted structural blocks form bedrock highlands, while down-warped structural blocks form sedimentary basins.

According to the *Geologic framework of the Willamette lowland aquifer system, Oregon and Washington, (United States Geological Survey, Gannett, M.W., and Caldwell, R.R. 1998*), the site is underlain by Quaternary-aged (last 1.6 million years) lacustrine deposits consisting of unconsolidated gravel, sand, and silt (Qs), generally referred to as the Willamette Formation, a catastrophic flood deposit associated with repeated glacial outburst flooding of the Willamette Valley (Yeats et al., 1996). The last of these outburst floods occurred about 10,000 years ago. This material is poorly to moderately sorted (Madin, 1990).

Underlying the Willamette Formation are Miocene-aged (approximately 23 to 5 million years ago) Columbia River basalt flows, which consist of phyric basalt and basaltic-andesite flows erupted eastern Oregon, Washington, and Idaho, (Tcr). The basalts are generally composed of dense, finely crystalline rock that is commonly fractured along blocky and columnar vertical joints. The *Web Soil Survey (United States Department of Agriculture, Natural Resource Conservation Service (USDA NRCS 2018 Website)*, indicates that near-surface soils consist of the Willamette and Woodburn Silt Loam soil series. Willamette and Woodburn series soils generally consist of moderately well-drained glaciolacustrine deposits.

4.0 REGIONAL SEISMIC SETTING

At least three major fault zones capable of generating damaging earthquakes are thought to exist in the vicinity of the subject site. These include the Portland Hills Fault Zone, the Gales Creek-Newberg-Mt. Angel Structural Zone, and the Cascadia Subduction Zone.

4.1 Portland Hills Fault Zone

The Portland Hills Fault Zone is a series of NW-trending faults that include the central Portland Hills Fault, the western Oatfield Fault, and the eastern East Bank Fault. These faults occur in a northwest-trending zone that varies in width between 3.5 and 5.0 miles. The combined three faults reportedly vertically displace the Columbia River Basalt by 1,130 feet and appear to control thickness changes in late Pleistocene (approx. 780,000 years) sediment (Madin, 1990). The Portland Hills Fault occurs along the Willamette River at the base of the Portland Hills, and is located approximately 4.85 miles northeast of the site. The Oatfield Fault occurs along the western side of the Portland Hills, and is located approximately 3.86 miles northeast of the site. The East Bank Fault occurs along the eastern margin of the Willamette River, and is located approximately 11.67 miles northeast of the site. The accuracy of the fault mapping is stated to be within 500 meters (Wong, et al., 2000).

According to the USGS Earthquake Hazards Program, the fault was originally mapped as a down-to-the-northeast normal fault, but has also been mapped as part of a regional-scale zone of right-lateral, oblique slip faults, and as a steep escarpment caused by asymmetrical folding above a south-west dipping, blind thrust fault. The Portland Hills fault offsets Miocene Columbia River Basalts, and Miocene to Pliocene sedimentary rocks of the Troutdale Formation. No fault scarps on surficial Quaternary deposits have been described along the fault trace, and the fault is mapped as buried by the Pleistocene aged Missoula flood deposits. No historical seismicity is correlated with the mapped portion of the Portland Hills Fault Zone, but in 1991 a M3.5 earthquake occurred on a NW-trending shear plane located 1.3 miles east of the fault (Yelin, 1992). Although there is no definitive evidence of recent activity, the Portland Hills Fault Zone is assumed to be potentially active (Geomatrix Consultants, 1995).

4.2 Gales Creek-Newberg-Mt. Angel Structural Zone

The Gales Creek-Newberg-Mt. Angel Structural Zone is a 50-mile-long zone of discontinuous, NW-trending faults that lies about 16.36 miles southwest of the subject site. These faults are recognized in the subsurface by vertical separation of the Columbia River Basalt and offset seismic reflectors in the overlying basin sediment (Yeats et al., 1996; Werner et al., 1992). A geologic reconnaissance and photogeologic analysis study conducted for the Scoggins Dam site in the Tualatin Basin revealed no evidence of deformed geomorphic surfaces along the structural zone (Unruh et al., 1994). No seismicity has been recorded on the Gales Creek Fault or Newberg Fault (the fault closest to the subject site); however, these faults are considered to be potentially active because they may connect with the seismically active Mount Angel Fault and the rupture plane of the 1993 M5.6 Scotts Mills earthquake (Werner et al. 1992; Geomatrix Consultants, 1995).

According to the USGS Earthquake Hazards Program, the Mount Angel fault is mapped as a high-angle, reverse-oblique fault, which offsets Miocene rocks of the Columbia River Basalts, and

Miocene and Pliocene sedimentary rocks. The fault appears to have controlled emplacement of the Frenchman Spring Member of the Wanapum Basalts, and thus must have a history that predates the Miocene age of these rocks. No unequivocal evidence of deformation of Quaternary deposits has been described, but a thick sequence of sediments deposited by the Missoula floods covers much of the southern part of the fault trace.

4.3 Cascadia Subduction Zone

The Cascadia Subduction Zone is a 680-mile-long zone of active tectonic convergence where oceanic crust of the Juan de Fuca Plate is subducting beneath the North American continent at a rate of 4 cm per year (Goldfinger et al., 1996). A growing body of geologic evidence suggests that prehistoric subduction zone earthquakes have occurred (Atwater, 1992; Carver, 1992; Peterson et al., 1993; Geomatrix Consultants, 1995). This evidence includes: (1) buried tidal marshes recording episodic, sudden subsidence along the coast of northern California, Oregon, and Washington, (2) burial of subsided tidal marshes by tsunami wave deposits, (3) paleoliquefaction features, and (4) geodetic uplift patterns on the Oregon coast. Radiocarbon dates on buried tidal marshes indicate a recurrence interval for major subduction zone earthquakes of 250 to 650 years with the last event occurring 300 years ago (Atwater, 1992; Carver, 1992; Peterson et al., 1993; Geomatrix Consultants, 1995). The inferred seismogenic portion of the plate interface lies approximately along the Oregon Coast at depths of between 20 and 40 kilometers below the surface.

5.0 FIELD EXPLORATION AND SUBSURFACE CONDITIONS

Our site-specific explorations for this report were conducted on July 3, 2018, and July 20, 2018. On July 3, 2018, four exploratory borings (designated B-1 through B-4) were drilled to a maximum depth of 45.6 feet below the ground surface, and one exploratory hand auger boring (designated HA-1) was advanced to a depth of 8.5 feet below the ground surface using hand equipment. On July 20, 2018, one Cone Penetration Test (CPT) was advanced to a depth of 54 feet below the ground surface.

The boreholes were drilled using a trailer-mounted drill rig using solid stem auger methods. Boring B-1 was left open for 6 hours to observe groundwater conditions with a water meter. During the drilling of borings B-1 through B-4, SPT (Standard Penetration Test) sampling was performed in general accordance with ASTM D1586 using a 2-inch outside diameter split-spoon sampler and a 140-pound automatic hammer mechanism. During the test, a sample is obtained by driving the sampler 18 inches into the soil with the hammer free-falling 30 inches. The number of blows for each 6 inches of penetration is recorded. The Standard Penetration Resistance (“N-value”) of the soil is calculated as the number of blows required for the final 12 inches of penetration. If 50 or more blows are recorded within a single 6-inch interval, the test is terminated, and the blow count is recorded as 50 blows for the number of inches driven. This resistance, or N-value, provides a measure of the relative density of granular soils and the relative consistency of cohesive soils.

Explorations were conducted under the full-time observation of a GeoPacific engineer. During the explorations, pertinent information including soil sample depths, stratigraphy, soil engineering characteristics, and groundwater occurrence was recorded. Soils were classified in accordance with the Unified Soil Classification System (USCS). Rock hardness was classified in accordance

with Table 1, modified from the ODOT Rock Hardness Classification Chart. Soil samples obtained from the explorations were placed in relatively air-tight plastic bags. At the completion of the site investigation, the borings and CPT sounding were filled with bentonite chips and the hand auger boring was loosely backfilled with onsite soils. At the ground surface, the borings B-1 through B-4 and CPT exploration CPT-1 were patched with asphaltic concrete.

Table 1 - Rock Hardness Classification Chart

ODOT Rock Hardness Rating	Field Criteria	Unconfined Compressive Strength	Typical Equipment Needed for Excavation
Extremely Soft (R0)	Indented by thumbnail	<100 psi	Small excavator
Very Soft (R1)	Scratched by thumbnail, crumbled by rock hammer	100-1,000 psi	Small excavator
Soft (R2)	Not scratched by thumbnail, indented by rock hammer	1,000-4,000 psi	Medium excavator (slow digging with small excavator)
Medium Hard (R3)	Scratched or fractured by rock hammer	4,000-8,000 psi	Medium to large excavator (slow to very slow digging), typically requires chipping with hydraulic hammer or mass excavation)
Hard (R4)	Scratched or fractured w/ difficulty	8,000-16,000 psi	Slow chipping with hydraulic hammer and/or blasting
Very Hard (R5)	Not scratched or fractured after many hammer blows	>16,000 psi	Blasting

The approximate locations of our explorations are indicated on Figures 2 and 3. It should be noted that exploration locations were located in the field by pacing or taping distances from apparent property corners and other site features shown on the plans provided. As such, the locations of the explorations should be considered approximate. Summary exploration logs are attached. The stratigraphic contacts shown on the individual exploration logs represent the approximate boundaries between soil types. The actual transitions may be more gradual. The soil and groundwater conditions depicted are only for the specific dates and locations reported, and therefore, are not necessarily representative of other locations and times. Soil and groundwater conditions encountered in the explorations are summarized below.

5.1 Soil Descriptions

Existing Pavement Section: At the locations of borings B-1 through B-4, the ground surface was underlain by an existing pavement section consisting of approximately 3 to 5 inches of asphaltic concrete underlain by 6 to 8 inches of base rock.

Undocumented Fill: Underlying the existing pavement section at the location of borings B-1 through B-4 and hand auger boring HA-1, we encountered undocumented fill soils. The undocumented fill soils generally consisted of dark brown, medium stiff, moist, moderately organic, SILT (ML). The fill material contained angular gravel, organic debris, brick and concrete debris. The undocumented fill soils observed in our explorations extended to depths ranging from

approximately 2.5 to 8 feet below the ground surface in borings B-1 through B-4, and hand auger boring HA-1 (See Figures 2 and 3). Undocumented fill depths encountered within our explorations are summarized on the attached exploration logs and below in Table 2.

Table 2 - Undocumented Fill Depths Encountered Within Explorations

Exploration Designation	Depth of Undocumented Fill (ft)
B-1	6.3
B-2	3.3
B-3	8.0
B-4	<2.5
HA-1	7.5

Laboratory soils testing of a representative sample taken at 5 feet below the ground surface in boring B-3 indicate that the organic content was 3.6 percent by weight at the location tested.

Willamette Formation: Underlying the undocumented fill material in borings B-1, B-2, and B-4 and hand auger boring HA-1, we encountered soils belonging to the Willamette Formation. The upper few feet of Willamette Formation soils consisted of brown, medium stiff to very stiff, elastic SILT (MH). The elastic silt was micaceous, exhibited orange and grey mottling, and extended to depths ranging from 5 to 10 feet below the ground surface in borings B-1, B-2, and B-4, and beyond the maximum observed depth of 8.5 feet in hand auger boring HA-1. Underlying the elastic silt in borings B-1, B-2, B-4, and the undocumented fill observed in boring B-3, soils consisted of light brown, moist, medium stiff to very stiff, sandy SILT (ML). This soil layer extended to depths ranging between 20 to 31 feet below ground surface in borings B-1, B-2, and B-3, and beyond the maximum observed depth of 11.5 feet in boring B-4. Underlying the sandy silt in borings B-1, and B-3, soils consisted of brown and gray, medium dense, moist to very moist silty SAND (SM). The sand was generally fine to medium grained with lenses of coarse grained sand. The silty sand extended to a depth of 40 feet in boring B-3, and beyond the maximum observed depth of 41.5 feet in boring B-1. Underlying the silty sand in boring B-3, soils consisted of light brown, very stiff sandy SILT (ML). The silt contained fine-grained sand, and extended to an observed depth of 45 feet in boring B-3.

At the location of cone penetration test CPT-1, soil properties were observed to a depth up to 54 feet using correlative methods and the CPT data obtained on July 20, 2018. Cone resistance observed throughout the CPT explorations generally ranged from 15 to 150 tsf, gradually increasing with depth. Utilizing Robertson (1990) methodology, CPT exploration tip resistance and skin friction ratio data correlates to silty CLAY to a depth of 10 feet below the ground surface, primarily of interchanging layers of silty SAND and very stiff fine-grained material from 10 to 20 feet below the ground surface, interchanging layers of silty SAND, sandy SILT, clayey Silt, and very stiff fine-grained material from 20 to 50 feet bgs, primarily SAND and silty Sand from 50 to 52 feet bgs, and sandy SILT which extends to an approximate depth of 53 feet bgs.

Columbia River Basalt: Underlying the Willamette Formation at the location of borings B-2, and B-3, and cone penetration test CPT-1, we encountered a zone of weathered rock which sharply graded into very dense, in-tact basalt. Borings B-2 and B-3 were terminated at depths of 20.9 and

45.6 feet below the ground surface respectively due to practical refusal of hard bedrock. Cone penetration test CPT-1 reached refusal at a depth of 54 feet on dense material which we assume to be weathered rock. The basalt was light to dark gray and displayed extremely soft (R1) to hard consistency (R4) in boring B-2, and soft (R2) to hard (R4) consistency in boring B-3 (See Table 2 for rock hardness classification). Depths to refusal encountered within our explorations are summarized on the attached exploration logs and below in Table 3.

Table 3 - Depths to Refusal Encountered Within Explorations

Exploration Designation	Depth of Refusal on Bedrock (ft)
B-2	20.9
B-3	45.6
CPT-1	54

5.2 Groundwater and Soil Moisture

On July 3, 2018, observed soil moisture conditions were generally moist in the upper 40 feet below ground surface and very moist to wet below 40 feet. Static groundwater was encountered within boring B-3 at an approximate depth of 40 feet below the ground surface. On July 20, 2018, static groundwater was observed in cone penetrometer test CPT-1 at an approximate depth of 46 feet below the ground surface. According to the Estimated Depth to Groundwater in the Portland, Oregon Area, (United States Geological Survey, Snyder, 2018 website), groundwater is present at an approximate depth of 35 to 45 feet below the ground surface. It is anticipated that groundwater conditions will vary depending on the season, local subsurface conditions, changes in site utilization, and other factors. Perched groundwater may be encountered in localized areas. Seeps and springs may exist in areas not explored, and may become evident during site grading.

6.0 CONCLUSIONS AND DESIGN RECOMMENDATIONS

Our site investigation indicates that the proposed construction appears to be geotechnically feasible, provided that the recommendations of this report are incorporated into the design and construction phases of the project.

The primary geotechnical concerns associated with development at the site are the presence of up to 8 feet of undocumented fill throughout the site. Due to the extent of undocumented fill observed onsite, we recommend that areas proposed for construction of building foundations be over-excavated to expose underlying competent native soil and either refilled structurally with engineered fill, or the foundation elements extended to depths necessary to bear directly on competent native soil. In areas where parking and drive areas are proposed and undocumented fill is present, it may be feasible to allow some of the undocumented fill soils to remain in place provided they can pass specifications for engineered fill compaction and proofrolls with fully loaded haul trucks. At a minimum, the upper portion of existing undocumented fill soils in parking and drive areas will likely need to be ripped and recompacted.

Our secondary geotechnical concern is the potential for liquefaction on the northern portion of the site. In the design earthquake event, without ground improvement, the building proposed on the northern portion of the site may experience post-liquefaction settlement and lateral spreading. At

a minimum, the building needs to be able to tolerate the estimated magnitudes of total and differential settlement without collapsing. The foundation of the building also needs to be strong enough to remain intact should the building move towards the river. If the estimated magnitudes of total and differential post-liquefaction settlement are not considered tolerable, the incorporation of ground improvement technologies, such as engineered aggregate piers, may be utilized to reduce the estimated magnitude of total vertical post-liquefaction settlement.

The following report sections provide recommendations for site development and construction in accordance with the current applicable codes and local standards of practice.

6.1 Site Preparation and Undocumented Fill Removal

The areas of proposed structures should be cleared of debris. If encountered, undocumented fill within influence zones of the proposed building footprints or other settlement-sensitive improvements, should be completely removed and replaced with engineered fill. Undocumented fill was encountered to depths ranging from 2.5 to 8 feet during our site exploration. We anticipate that areas of undocumented fill may exist throughout the site.

As mentioned above, we encountered up to 8 feet of undocumented fill within our site specific explorations. In-situ soils containing debris, trash, etc, are considered unsuitable for placement of structures and roadways, and should be removed where buildings and roadways are proposed. Some of the existing undocumented fill soils appeared to be suitable to re-use as engineered fill provided the organic and inorganic debris is thoroughly removed prior to replacement.

In areas proposed for construction of buildings, existing undocumented fill soils within the influence zones of proposed structures should be over-excavated to expose underlying native soils. The excavations should either be refilled structurally with engineered fill, or the foundations extended to depths necessary to bear directly on the native soils. Recommendations for placement of engineered fill are presented below in Section 6.2, *Engineered Fill*.

It may be feasible for undocumented fill material to remain in place below proposed parking areas, driving lanes, and other areas which are not sensitive to settlement, with the understanding that some settlement may occur as the organic material in the fill material breaks down over time. Exposed subgrade soils, including undocumented fills in the future parking lot, should be evaluated by the geotechnical engineer. For large areas, this evaluation is normally performed by proof-rolling the exposed subgrade with a fully loaded scraper or dump truck and potholing with an excavator to evaluate the buried layers of undocumented fill. For smaller areas where access is restricted, the subgrade should be evaluated by probing the soil with a steel probe. Soft/loose soils identified during subgrade preparation should be compacted to a firm and unyielding condition, over-excavated and replaced with engineered fill (as described below) or stabilized with rock prior to placement of engineered fill. The depth of over-excavation, if required, should be evaluated by the geotechnical engineer at the time of construction.

Areas proposed for construction of roadways should be ripped and tilled to a minimum depth of 12 inches bgs, then moisture conditioned to within 2 percent of optimum moisture. Following adequate tilling, removal of any debris, and moisture conditioning, the soils should be recompacted using standard compaction equipment. We recommend that engineered fill be compacted to

project specifications for engineered fill, to at least 95 percent of the maximum dry density determined by ASTM D1557 (Modified Proctor) or equivalent.

The final depth of soil removal should be determined by the geotechnical engineer or designated representative during site inspection while stripping/excavation is being performed. Stripped topsoil and moderately to highly organic fill should be removed from areas proposed for placement of engineered fill. Any remaining topsoil and organic debris should be stockpiled only in designated areas and stripping operations should be observed and documented by the geotechnical engineer or his representative.

If encountered, undocumented fills and any subsurface structures (dry wells, basements, driveway and landscaping fill, old utility lines, septic leach fields, etc.) should be completely removed and the excavations backfilled with engineered fill.

Site earthwork may be impacted by shallow groundwater and wet weather conditions. Stabilization of subgrade soils will require aeration and recompaction. If subgrade soils are found to be difficult to stabilize, over-excavation, placement of granular soils, or cement treatment of subgrade soils may be feasible options. GeoPacific should be onsite to observe preparation of subgrade soil conditions prior to placement of engineered fill.

6.2 Engineered Fill

All grading for the proposed construction should be performed as engineered grading in accordance with the applicable building code at the time of construction with the exceptions and additions noted herein. Areas proposed for fill placement should be prepared as described in the Site Preparation Recommendations section. Surface soils should then be scarified and recompacted prior to placement of structural fill. Proper test frequency and earthwork documentation usually requires daily observation and testing during stripping, rough grading, and placement of engineered fill. Imported fill material must be approved by the geotechnical engineer prior to being imported to the site. Oversize material greater than 6 inches in size should not be used within 3 feet of foundation footings, and material greater than 12 inches in diameter should not be used in engineered fill.

Engineered fill should be compacted in horizontal lifts not exceeding 8 inches using standard compaction equipment. We recommend that engineered fill be compacted to at least 95 percent of the maximum dry density determined by ASTM D1557 (Modified Proctor) or equivalent. Field density testing should conform to ASTM D2922 and D3017, or D1556. All engineered fill should be observed and tested by the project geotechnical engineer or his representative. Typically, one density test is performed for at least every 2 vertical feet of fill placed or every 500 yd3, whichever requires more testing. Because testing is performed on an on-call basis, we recommend that the earthwork contractor be held contractually responsible for test scheduling and frequency. During periods of wet-weather site earthwork may be impacted by soil moisture.

6.3 Excavating Conditions and Utility Trench Backfill

We anticipate that on-site soils can generally be excavated using conventional heavy equipment to a depth of 20 feet below the ground surface. Bedrock was encountered at a depth of 20.9 feet

below the ground surface in boring B-2. Maintenance of safe working conditions, including temporary excavation stability, is the responsibility of the contractor. Actual slope inclinations at the time of construction should be determined based on safety requirements and actual soil and groundwater conditions. All temporary cuts in excess of 4 feet in height should be sloped in accordance with U.S. Occupational Safety and Health Administration (OSHA) regulations (29 CFR Part 1926), or be shored. The existing native silt soils classify as Type B Soil and temporary excavation side slope inclinations as steep as 1H:1V. The existing native silty sand soils classify as Type C soil and temporary excavation side slope as steep as 1.5H:1V may be assumed for planning purposes. These cut slope inclinations are applicable to excavations above the water table only.

Shallow, perched groundwater may be encountered during the wet weather season and should be anticipated in excavations and utility trenches. Vibrations created by traffic and construction equipment may cause some caving and raveling of excavation walls. In such an event, lateral support for the excavation walls should be provided by the contractor to prevent loss of ground support and possible distress to existing or previously constructed structural improvements.

PVC pipe should be installed in accordance with the procedures specified in ASTM D2321 and City of West Linn standards. We recommend that structural trench backfill be compacted to at least 95 percent of the maximum dry density obtained by the Modified Proctor (ASTM D1557) or equivalent. Initial backfill lift thicknesses for a ¾"-0 crushed aggregate base may need to be as great as 4 feet to reduce the risk of flattening underlying flexible pipe. Subsequent lift thickness should not exceed 1 foot. If imported granular fill material is used, then the lifts for large vibrating plate-compaction equipment (e.g. hoe compactor attachments) may be up to 2 feet, provided that proper compaction is being achieved and each lift is tested. Use of large vibrating compaction equipment should be carefully monitored near existing structures and improvements due to the potential for vibration-induced damage.

Adequate density testing should be performed during construction to verify that the recommended relative compaction is achieved. Typically, at least one density test is taken for every 4 vertical feet of backfill on each 100-lineal-foot section of trench.

6.4 Erosion Control Considerations

During our field exploration program, we did not observe soil conditions that may be considered highly susceptible to erosion. In our opinion, the primary concern regarding erosion potential will occur during construction in areas that have been stripped of vegetation. Erosion at the site during construction can be minimized by implementing the project erosion control plan, which should include judicious use of straw wattles, fiber rolls, and silt fences. If used, these erosion control devices should remain in place throughout site preparation and construction.

Erosion and sedimentation of exposed soils can also be minimized by quickly re-vegetating exposed areas of soil, and by staging construction such that large areas of the project site are not denuded and exposed at the same time. Areas of exposed soil requiring immediate and/or temporary protection against exposure should be covered with either mulch or erosion control netting/blankets. Areas of exposed soil requiring permanent stabilization should be seeded with an approved grass seed mixture, or hydroseeded with an approved seed-mulch-fertilizer mixture.

6.5 Wet Weather Earthwork

Soils underlying the site are likely to be moisture sensitive and will be difficult to handle or traverse with construction equipment during periods of wet weather. Earthwork is typically most economical when performed under dry weather conditions. Earthwork performed during the wet-weather season will require expensive measures such as cement treatment or imported granular material to compact areas where fill may be proposed to the recommended engineering specifications. If earthwork is to be performed or fill is to be placed in wet weather or under wet conditions when soil moisture content is difficult to control, the following recommendations should be incorporated into the contract specifications:

- Earthwork should be performed in small areas to minimize exposure to wet weather. Excavation or the removal of unsuitable soils should be followed promptly by the placement and compaction of clean engineered fill. The size and type of construction equipment used may have to be limited to prevent soil disturbance. Under some circumstances, it may be necessary to excavate soils with a backhoe to minimize subgrade disturbance caused by equipment traffic;
- The ground surface within the construction area should be graded to promote run-off of surface water and to prevent the ponding of water;
- Material used as engineered fill should consist of clean, granular soil containing less than 5 percent passing the No. 200 sieve. The fines should be non-plastic. Alternatively, cement treatment of on-site soils may be performed to facilitate wet weather placement;
- The ground surface within the construction area should be sealed by a smooth drum vibratory roller, or equivalent, and under no circumstances should be left uncompacted and exposed to moisture. Soils which become too wet for compaction should be removed and replaced with clean granular materials;
- Excavation and placement of fill should be observed by the geotechnical engineer to verify that all unsuitable materials are removed, and suitable compaction and site drainage is achieved; and
- Geotextile silt fences, straw wattles, and fiber rolls should be strategically located to control erosion.

If cement or lime treatment is used to facilitate wet weather construction, GeoPacific should be contacted to provide additional recommendations and field monitoring.

6.6 Structural Foundations

As discussed in section 7 of this report titled *Seismic Design*, without ground improvement, we estimate that in the event of the design earthquake, approximately 0.4 inches of post-liquefaction settlement will occur on the northern portion of the site. We estimate that differential settlement of 0.2 inches may occur between adjacent foundation elements, or over a horizontal distance of 20 feet, whichever is less. Some lateral spreading may also occur in the northern portion of the site.

If the current estimates of total and/or differential post-liquefaction settlement and lateral spreading are determined to be tolerable by the project structural engineer, then no further study is required, and the proposed structures may be supported on shallow foundations near existing grade. If the current estimates of total and/or differential seismically induced settlement displacements are not tolerable, then the design team may consider utilizing ground improvements to lower the estimates of total and differential settlement to within tolerable limits.

During our site investigation, we observed up to 8 feet of undocumented fill underlying the ground surface on the northern portion of the site (See Figures 2 and 3), and potentially liquefiable layers between the depths of 40 to 45 feet below the ground surface at the location of cone penetrometer test CPT-1.

Due to the extent of undocumented fill observed onsite, we recommend that areas proposed for construction of building foundations be over-excavated to expose underlying competent native soil and either refilled structurally with engineered fill, or the foundation elements extended to depths necessary to bear directly on competent native soil. However, if leaving the existing undocumented fill in place is desired at the locations of the proposed structures, GeoPacific may be consulted to provide recommendations for deep foundations such as engineered aggregate piers or piles.

If the current estimates of total and/or differential post-liquefaction settlement are acceptable, the proposed structures may be supported on shallow foundations bearing on stiff, native soils and/or engineered fill, appropriately designed and constructed as recommended in this report. Foundation design, construction, and setback requirements should conform to the applicable building code at the time of construction. For maximization of bearing strength and protection against frost heave, spread footings should be embedded at a minimum depth of 18 inches below exterior grade. If soft soil conditions are encountered at footing subgrade elevation, they should be removed and replaced with compacted crushed aggregate.

Foundation excavations should be observed by the geotechnical engineer or his designated representative during construction. Final foundation subgrade recommendations and over-excavation limits should be determined during construction when the foundation subgrade soil conditions are exposed.

The anticipated allowable soil bearing pressure is 1,500 lbs/ft^2 for footings bearing on competent, native soil and/or engineered fill. The anticipated allowable soil bearing pressure is 2,000 lbs/ft^2 for footings bearing on a minimum of 6 inches of 1.5"-0 crushed aggregate compacted to at least 95 percent of the maximum dry density determined by ASTM D1557 (Modified Proctor) or equivalent. The recommended maximum allowable bearing pressure may be increased by 1/3 for short-term transient conditions such as wind and seismic loading. For loads heavier than 75 kips, the geotechnical engineer should be consulted. If heavier loads than described above are proposed, it may be necessary to over-excavate point load areas and replace with additional compacted crushed aggregate. The coefficient of friction between on-site soil and poured-in-place concrete may be taken as 0.42, which includes no factor of safety. The maximum anticipated total and differential footing movements (generally from soil expansion and/or settlement) are 1 inch and ¾ inch over a span of 20 feet, respectively. We anticipate that the majority of the estimated settlement will occur during construction, as loads are applied. Excavations near structural

footings should not extend within a 1H:1V plane projected downward from the bottom edge of footings.

Footing excavations should penetrate through topsoil and any loose soil to competent subgrade that is suitable for bearing support. All footing excavations should be trimmed neat, and all loose or softened soil should be removed from the excavation bottom prior to placing reinforcing steel bars. Due to the moisture sensitivity of on-site native soils, foundations constructed during the wet weather season may require overexcavation of footings and backfill with compacted, crushed aggregate.

Our recommendations are for construction incorporating conventional spread footing foundations. After site development, a Final Soil Engineer's Report should either confirm or modify the above recommendations.

6.7 Concrete Slab-on-Grade Floors

As described above, up to 8 feet of undocumented fill was encountered on the northern portion of the site. Undocumented fill soils encountered within our explorations will likely not be considered to be suitable to provide bearing support for the proposed structures. Areas proposed for construction of buildings should be over-excavated to expose underlying native soils and either refilled structurally with engineered fill, or the foundations extended to depths necessary to bear directly on competent native soil.

Preparation of areas beneath concrete slab-on-grade floors should be performed as recommended in the *Site Preparation Recommendations* and *Spread Foundations* sections. Care should be taken during excavation for foundations and floor slabs, to avoid disturbing subgrade soils. If subgrade soils have been adversely impacted by wet weather or otherwise disturbed, the surficial soils should be scarified to a minimum depth of 8 inches, moisture conditioned to within about 3 percent of optimum moisture content, and compacted to engineered fill specifications. Alternatively, disturbed soils may be removed, and the removal zone backfilled with additional crushed rock.

For evaluation of the concrete slab-on-grade floors using the beam on elastic foundation method, a modulus of subgrade reaction of 150 kcf (87 pci) should be assumed for the medium stiff, fine-grained soils anticipated to be present at foundation subgrade elevation following adequate site preparation as described above. This value assumes the concrete slab system is designed and constructed as recommended herein, with a minimum thickness of 8 inches of 1½"-0 crushed aggregate beneath the slab. The total thickness of crushed aggregate will be dependent on the subgrade conditions at the time of construction, and should be verified visually by proof-rolling. Under-slab aggregate should be compacted to at least 95 percent of its maximum dry density as determined by ASTM D698 (Standard Proctor) or equivalent.

In areas where moisture will be detrimental to floor coverings or equipment inside the proposed structure, appropriate vapor barrier and damp-proofing measures should be implemented. Appropriate design professionals should be consulted regarding vapor barrier and damp proofing systems, ventilation, building material selection and mold prevention issues, which are outside GeoPacific's area of expertise.

6.8 Perimeter Footing and Roof Drains

The upslope edge of perimeter footings may be provided with a drainage system consisting of 3 or 4-inch diameter, perforated, plastic pipe embedded in a minimum of 1 ft^3 per lineal foot of clean, free-draining gravel or uncompacted 3/4" - 0 rock. The drain pipe and surrounding drain rock should be wrapped in non-woven geotextile (Mirafi 140N, or approved equivalent) to minimize the potential for clogging and/or ground loss due to piping. Water collected from the footing drains should be directed into the local storm drain system or other suitable outlet. A minimum 0.5 percent fall should be maintained throughout the drain and non-perforated pipe outlet. The footing drains should include clean-outs to allow periodic maintenance and inspection. Grades around the proposed structure should be sloped such that surface water drains away from the building.

Perimeter footing drains are recommended to prevent detrimental effects of surface water runoff on foundations – not to dewater groundwater. Footing drains should not be expected to eliminate all potential sources of water entering a basement or beneath a slab-on-grade. An adequate grade to a low point outlet drain in the crawlspace is required by code. Underslab drains are sometimes added beneath the slab when placed over soils of low permeability and shallow, perched groundwater.

Down spouts and roof drains should collect roof water in a system separate from the footing drains to reduce the potential for clogging. Roof drain water should be directed to an appropriate discharge point and storm system well away from structural foundations. Grades should be sloped downward and away from buildings to reduce the potential for ponded water near structures.

6.9 Permanent Below-Grade Walls

Lateral earth pressures against below-grade retaining walls will depend upon the inclination of any adjacent slopes, type of backfill, degree of wall restraint, method of backfill placement, degree of backfill compaction, drainage provisions, and magnitude and location of any adjacent surcharge loads. At-rest soil pressure is exerted on a retaining wall when it is restrained against rotation. In contrast, active soil pressure will be exerted on a wall if its top is allowed to rotate or yield a distance of roughly 0.001 times its height or greater.

If the subject retaining walls will be free to rotate at the top, they should be designed for an active earth pressure equivalent to that generated by a fluid weighing 35 pcf for level backfill against the wall. For restrained wall, an at-rest equivalent fluid pressure of 55 pcf should be used in design, again assuming level backfill against the wall. These values assume that the recommended drainage provisions are incorporated, and hydrostatic pressures are not allowed to develop against the wall.

During a seismic event, lateral earth pressures acting on below-grade structural walls will increase by an incremental amount that corresponds to the earthquake loading. Based on the Mononobe-Okabe equation and peak horizontal accelerations appropriate for the site location, seismic loading should be modeled using the active or at-rest earth pressures recommended above, plus an incremental rectangular-shaped seismic load of magnitude 6.5H, where H is the total height of the wall.

We assume relatively level ground surface below the base of the walls. As such, we recommend passive earth pressure of 320 pcf for use in design, assuming wall footings are cast against competent native soils or engineered fill. If the ground surface slopes down and away from the base of any of the walls, a lower passive earth pressure should be used and GeoPacific should be contacted for additional recommendations.

A coefficient of friction of 0.42 may be assumed along the interface between the base of the wall footing and subgrade soils. The recommended coefficient of friction and passive earth pressure values do not include a safety factor, and an appropriate safety factor should be included in design. The upper 12 inches of soil should be neglected in passive pressure computations unless it is protected by pavement or slabs on grade.

The above recommendations for lateral earth pressures assume that the backfill behind the subsurface walls will consist of properly compacted structural fill, and no adjacent surcharge loading. If the walls will be subjected to the influence of surcharge loading within a horizontal distance equal to or less than the height of the wall, the walls should be designed for the additional horizontal pressure. For uniform surcharge pressures, a uniformly distributed lateral pressure of 0.3 times the surcharge pressure should be added. Traffic surcharges may be estimated using an additional vertical load of 250 psf (2 feet of additional fill), depending on anticipated traffic loads.

The recommended equivalent fluid densities assume a free-draining condition behind the walls so that hydrostatic pressures do not build-up. This can be accomplished by placing a 12 to 18-inch wide zone of sand and gravel containing less than 5 percent passing the No. 200 sieve against the walls. A 3-inch minimum diameter perforated, plastic drain pipe should be installed at the base of the walls and connected to a suitable discharge point to remove water in this zone of sand and gravel. The drain pipe should be wrapped in filter fabric (Mirafi 140N or other as approved by the geotechnical engineer) to minimize clogging.

Wall drains are recommended to prevent detrimental effects of surface water runoff on foundations – not to dewater groundwater. Drains should not be expected to eliminate all potential sources of water entering a basement or beneath a slab-on-grade. An adequate grade to a low point outlet drain in the crawlspace is required by code. Underslab drains are sometimes added beneath the slab when placed over soils of low permeability and shallow, perched groundwater.

Water collected from the wall drains should be directed into the local storm drain system or other suitable outlet. A minimum 0.5 percent fall should be maintained throughout the drain and non-perforated pipe outlet. Down spouts and roof drains should not be connected to the wall drains in order to reduce the potential for clogging. The drains should include clean-outs to allow periodic maintenance and inspection. Grades around the proposed structure should be sloped such that surface water drains away from the building.

GeoPacific should be contacted during construction to verify subgrade strength in wall keyway excavations, to verify that backslope soils are in accordance with our assumptions, and to take density tests on the wall backfill materials.

Structures should be located a horizontal distance of at least 1.5H away from the back of the retaining wall, where H is the total height of the wall. GeoPacific should be contacted for additional foundation recommendations where structures are located closer than 1.5H to the top of any wall.

6.10 Flexible Pavement Design

We understand that development at the site will include construction of private parking and drive areas. For the new private pavement section, we conservatively assume that the subgrade will exhibit a resilient modulus of at least 6,000, which correlates to a CBR value of 4. Based upon our understanding of the anticipated traffic which includes light-duty passenger vehicles, deliveries, and occasional fire trucks weighing up to 75,000 lbs. For design of the automobile driving lanes, we assumed an anticipated 18-kip ESAL count of approximately 60,000 over 20 years. Table 2 presents our recommended minimum dry-weather pavement section for the proposed pavement section, supporting 20 years of vehicle traffic.

Table 2 - Recommended Minimum Dry-Weather Pavement Section

Material Layer	Section Thickness (in)		Compaction Standard
	Driving Lanes	Parking Areas	
Asphaltic Concrete (AC)	3	3	91%/ 92% of Rice Density AASHTO T-209
Crushed Aggregate Base ¾"-0 (leveling course)	2	2	95% of Modified Proctor ASTM D1557
Crushed Aggregate Base 1½"-0	10	8	95% of Modified Proctor ASTM D1557
Subgrade	12	12	95% of Modified Proctor ASTM D1557 or Approved Native

Any pockets of organic debris or loose fill encountered during subgrade preparation should be removed and replaced with engineered fill (see *Site Preparation* Section). In order to verify subgrade strength, we recommend proof-rolling directly on subgrade with a loaded dump truck during dry weather and on top of base course in wet weather. Soft areas that pump, rut, or weave should be stabilized prior to paving. If pavement areas are to be constructed during wet weather, the subgrade and construction plan should be reviewed by the project geotechnical engineer at the time of construction so that condition specific recommendations can be provided. The moisture sensitive subgrade soils make the site a difficult wet weather construction project.

During placement of pavement section materials, density testing should be performed to verify compliance with project specifications. Generally, one subgrade, one base course, and one asphalt compaction test is performed for every 100 to 200 linear feet of paving.

6.11 Wet Weather Construction Pavement Section

This section presents our recommendations for wet weather pavement section and construction for new pavement sections at the project. These wet weather pavement section recommendations are intended for use in situations where it is not feasible to compact the subgrade soils to project requirements, due to wet subgrade soil conditions, and/or construction during wet weather. Based on our site review, we recommend a wet weather section with a minimum subgrade deepening of 6 to 12 inches to accommodate a working subbase of additional 1½"-0 crushed rock. Geotextile fabric, Mirafi 500x or equivalent, should be placed on subgrade soils prior to placement of base rock.

In some instances, it may be preferable to use a subbase material in combination with over-excavation and increasing the thickness of the rock section. GeoPacific should be consulted for additional recommendations regarding use of additional subbase in wet weather pavement sections if it is desired to pursue this alternative. Cement treatment of the subgrade may also be considered instead of over-excavation. However, mixing and tilling of the soil may be difficult due to the shallow observed depth of cobbles and boulders throughout the site. For planning purposes, we anticipate that treatment of the onsite soils would involve mixing cement powder to approximately 6-8 percent cement content and a mixing depth on the order of 12 to 18 inches. The mixing depth and cement content will depend upon site conditions and moisture content of the subgrade during construction.

With implementation of the above recommendations, it is our opinion that the resulting pavement section will provide equivalent or greater structural strength than the dry weather pavement section currently planned. However, it should be noted that construction in wet weather is risky and the performance of pavement subgrades depend on a number of factors including the weather conditions, the contractor's methods, and the amount of traffic the road is subjected to. There is a potential that soft spots may develop even with implementation of the wet weather provisions recommended in this letter. If soft spots in the subgrade are identified during roadway excavation, or develop prior to paving, the soft spots should be over-excavated and backfilled with additional crushed rock.

During subgrade excavation, care should be taken to avoid disturbing the subgrade soils. Removals should be performed using an excavator with a smooth-bladed bucket. Truck traffic should be limited until an adequate working surface has been established. We suggest that the crushed rock be spread using bulldozer equipment rather than dump trucks, to reduce the amount of traffic and potential disturbance of subgrade soils. Care should be taken to avoid over-compaction of the base course materials, which could create pumping, unstable subgrade soil conditions. Heavy and/or vibratory compaction efforts should be applied with caution. Following placement and compaction of the crushed rock to project specifications (95 percent of Modified Proctor), a finish proof-roll should be performed before paving.

The above recommendations are subject to field verification. GeoPacific should be on-site during construction to verify subgrade strength and to take density tests on the engineered fill, base rock and asphaltic pavement materials.

7.0 SEISMIC DESIGN

The Oregon Department of Geology and Mineral Industries (DOGAMI), Oregon HazVu: 2018 Statewide GeoHazards Viewer indicates that the site is in an area where *severe* ground shaking is anticipated during an earthquake. Structures should be designed to resist earthquake loading in accordance with the methodology described in the 2015 International Building Code (IBC) with applicable Oregon Structural Specialty Code (OSSC) revisions (current 2014). We recommend Site Class D be used for design per the OSSC, Table 1613.5.2 and as defined in ASCE 7, Chapter 20, Table 20.3-1. Design values determined for the site using the USGS (United States Geological Survey) 2018 Seismic Design Maps Summary Report are summarized in Table 3, and are based upon existing soil conditions.

Table 3 - Recommended Earthquake Ground Motion Parameters (USGS 2018)

Parameter	Value
Location (Lat, Long), degrees	45.346, -122.651
Probabilistic Ground Motion Values, 2% Probability of Exceedance in 50 yrs	
Peak Ground Acceleration PGA_M	0.447 g
Short Period, S_s	0.942 g
1.0 Sec Period, S_1	0.407 g
Soil Factors for Site Class D:	
F_a	1.123
F_v	1.593
$SD_s = 2/3 \times F_a \times S_s$	0.706 g
$SD_1 = 2/3 \times F_v \times S_1$	0.432 g
Seismic Design Category	D

7.1 Soil Liquefaction Potential

Soil liquefaction is a phenomenon wherein saturated soil deposits temporarily lose strength and behave as a liquid in response to earthquake shaking. Soil liquefaction is generally limited to loose, granular soils located below the water table. Primary factors controlling the development of liquefaction include intensity and duration of strong ground motion, characteristics of subsurface soil, in-situ stress conditions, and the depth to groundwater.

During our site investigation, we observed silty sand and sandy silt below the water table at the location of borings B-1 and B-3 at a depth of 40 to 45 feet below the ground surface. These layers are considered susceptible to liquefaction. At the location of boring B-2, we encountered bedrock at a depth of 20.9 feet below the ground surface, indicating that the soil profile in the vicinity of boring B-2 is not considered susceptible to liquefaction.

According to the Oregon HazVu: Statewide Geohazards Viewer, the subject site is regionally characterized as having moderate to high risk of soil liquefaction (DOGAMI:HazVu, 2018). We estimated soil liquefaction potential using CTP sounding, CPT-1 on the northern portion of the site. For the purposes of liquefaction analyses, we assumed groundwater at 40 feet bgs.

For the soil liquefaction analysis, we assumed seismicity parameters appropriate for the MCE design event. This level of earthquake shaking has a probability of exceedance of 2 percent in 50 years (i.e. a “2500-year” event). The commercial computer code CLiq was used for our

liquefaction analysis under the assumed conditions using the Idriss and Boulanger 2014 methodology. Results of the liquefaction potential evaluations are attached. Based on the analysis performed, potentially liquefiable zones occur predominantly in a silty sand to sandy silt layer between about 40 and 45 feet below the ground surface (see attached liquefaction analysis results).

7.2 Post-Liquefaction Settlements

Settlement of the ground surface may occur as a result of earthquake shaking, particularly in conjunction with the occurrence of soil liquefaction. We estimated seismically induced settlements using the Cliq computer program and the Idriss and Boulanger 2014 methodology. Based upon our analysis of the existing soil profile and using a site-adjusted mapped MCE geometric mean peak horizontal ground acceleration of 0.46g from the USGS Seismic Design Map tool, total vertical dynamic settlement expected due to soil liquefaction at the location of cone penetration test CPT-1 is estimated to be 0.4 inches. Our estimate of post-liquefaction settlement is summarized on Table 6.

Table 4 – Estimates of Total Vertical Settlement

CPT Designation	Estimated Total Vertical Settlement (in)
CPT-1	0.4

During our site investigation, we observed a bedrock contour sloping down to the north. We encountered bedrock at a depth of 20.9 feet at the location of boring B-2 at a depth of 54 feet at the location of cone penetrometer test CPT-1. We expect 0.4 inches of post-liquefaction settlement at the location of CPT-1, and no post-liquefaction settlement on the southern portion of the site where the depth to bedrock is less than the depth to groundwater.

Based on this evaluation, it is our opinion that the proposed building on the northern portion of the site should be designed to resist total post-liquefaction settlements up to 0.4 inches under the design earthquake scenarios. Without ground improvement, we estimate that differential settlement of 0.2 inches may occur between adjacent foundation elements or over a distance of 20 feet, whichever is less. If mat foundations are utilized, differential settlements of up to 0.4 inches are anticipated from one side of the slab to the other.

7.3 Lateral Spreading

Lateral spreads involve down-slope movement of large volumes of liquefied soil. Often, layers of non-liquefied soils overlying the liquefied material are also translated down-slope. Lateral spreads generally develop on moderate to gentle slopes and move toward a free face such as a riverbank. The site is located a horizontal distance of approximately 0.6 miles west of the Willamette River at an average slope gradient of approximately 1 percent. Seismically induced lateral spreading was calculated using the Cliq computer program and the Idriss and Boulanger 2014 methodology. Based on the results of our calculations, we anticipate that up to 8 inches of lateral spreading could occur in the northern portion of the site. We anticipate that lateral spreading will not occur in the

southern portion of the site, since we did not observe any potentially liquefiable layers in boring B-2.

Since the liquefiable layers in CPT-1 were observed at depths ranging from 40 to 45 feet below the ground surface, the expression of lateral spreading on the ground surface will likely be diminished. Due to the depth of the potentially liquefiable layer, bedrock contour sloping perpendicular to the anticipated direction of lateral spreading, and unknown factors such as the extent of liquefiable layers downslope of the subject site, a high level of uncertainty exists regarding the expression of lateral spreading which may occur in the northern portion of the subject site. Based on information obtained from Oregon Hazvu: Statewide Geohazards Viewer, risk of soil liquefaction decreases in all directions around the site. Therefore, our estimate of the magnitude of lateral spreading may be conservative.

In the northern portion of the site, lateral displacement may occur differentially across the building. For design purposes, we recommend assuming that the differential lateral displacement across the length of the building would be about one-half the total estimated lateral displacement.

The client and design team should work together to determine the maximum allowable total and differential settlements and lateral spreading that are considered to be tolerable to the proposed structure during the design seismic event. If determined necessary, the magnitudes of total and differential post-liquefaction settlement and lateral spreading may potentially be reduced to within tolerable limits with ground improvements such as deep foundations, engineered aggregate piers, or deep soil mixing. If desired, ground improvement recommendations can be provided by GeoPacific on a time and expense basis.

7.4 Other Secondary Seismic Impacts

Other potential seismic impacts include fault rupture potential, and other hazards as discussed below:

Fault Rupture Potential – Based on our review of available geologic literature, we are not aware of any mapped active (demonstrating movement in the last 10,000 years) faults on the site. During our field investigation, we did not observe any evidence of surface rupture or recent faulting. Therefore, we conclude that the potential for fault rupture on site is very low.

Seismic Induced Landslide – Site grades are generally flat to moderately sloping. The potential for slope instability and seismic induced landslide to impact the proposed building is considered low. Lateral spreading potential has been considered separately, as discussed above.

Effects of Local Geology and Topography – In our opinion, no additional seismic hazard will occur due to local geology or topography. The site is expected to have no greater seismic hazard than surrounding properties and the West Linn area in general.

8.0 UNCERTAINTIES AND LIMITATIONS

We have prepared this report for the owner and their consultants for use in design of this project only. This report should be provided in its entirety to prospective contractors for bidding and

estimating purposes; however, the conclusions and interpretations presented in this report should not be construed as a warranty of the subsurface conditions. Experience has shown that soil and groundwater conditions can vary significantly over small distances. Inconsistent conditions can occur between explorations that may not be detected by a geotechnical study. If, during future site operations, subsurface conditions are encountered which vary appreciably from those described herein, GeoPacific should be notified for review of the recommendations of this report, and revision of such if necessary.

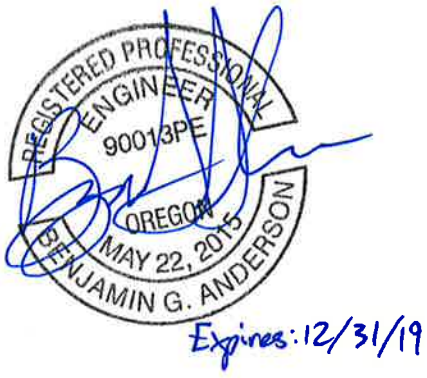
Sufficient geotechnical monitoring, testing and consultation should be provided during construction to confirm that the conditions encountered are consistent with those indicated by explorations. The checklist attached to this report outlines recommended geotechnical observations and testing for the project. Recommendations for design changes will be provided should conditions revealed during construction differ from those anticipated, and to verify that the geotechnical aspects of construction comply with the contract plans and specifications.

Within the limitations of scope, schedule and budget, GeoPacific attempted to execute these services in accordance with generally accepted professional principles and practices in the fields of geotechnical engineering and engineering geology at the time the report was prepared. No warranty, expressed or implied, is made. The scope of our work did not include environmental assessments or evaluations regarding the presence or absence of wetlands or hazardous or toxic substances in the soil, surface water, or groundwater at this site.

We appreciate this opportunity to be of service.

Sincerely,

GEOPACIFIC ENGINEERING, INC.



Thomas J. Torkelson, E.I.T.
Engineering Staff

Benjamin D. Anderson, P.E.
Senior Engineer

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CHECKLIST OF RECOMMENDED GEOTECHNICAL TESTING AND OBSERVATION

Item No.	Procedure	Timing	By Whom	Done
1	Preconstruction meeting	Prior to beginning site work	Contractor, Developer, Civil and Geotechnical Engineers	
2	Fill removal from site and/or sorting and stockpiling	Prior to mass stripping	Soil Technician/ Geotechnical Engineer	
3	Compaction testing of engineered fill (90% of Modified Proctor)	During filling, tested every 2 vertical feet	Soil Technician	
4	Compaction testing of trench backfill (95% of Standard Proctor)	During backfilling, tested every 4 vertical feet for every 200 linear feet	Soil Technician	
5	Street Subgrade Inspection (95% of Standard Proctor)	Prior to placing base course	Soil Technician	
6	Base course compaction (95% of Modified Proctor)	Prior to paving, tested every 200 linear feet	Soil Technician	
7	Asphalt Compaction (92% Rice Value)	During paving, tested every 100 linear feet	Soil Technician	
8	Final Geotechnical Engineer's Report	Completion of project	Geotechnical Engineer	

FIGURES

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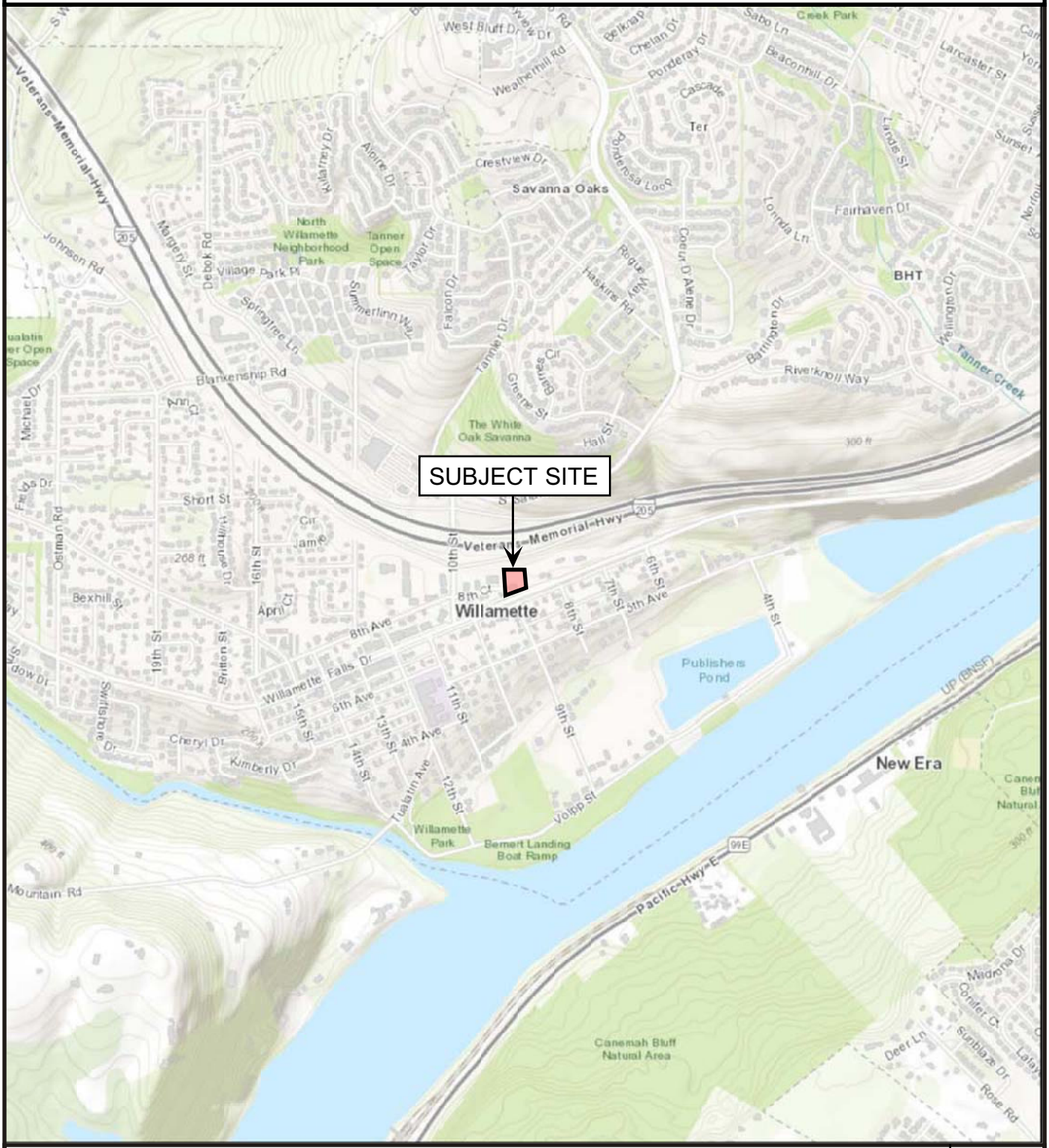
SITE VICINITY MAP



Base map: DOGAMI HAZVU Maps 2018
Date: 7/23/2018
Drawn by: TJT

Project: 8th Court Redevelopment West Linn, Oregon	Project No. 18-4970	FIGURE 1

GeoPacific Engineering, Inc.
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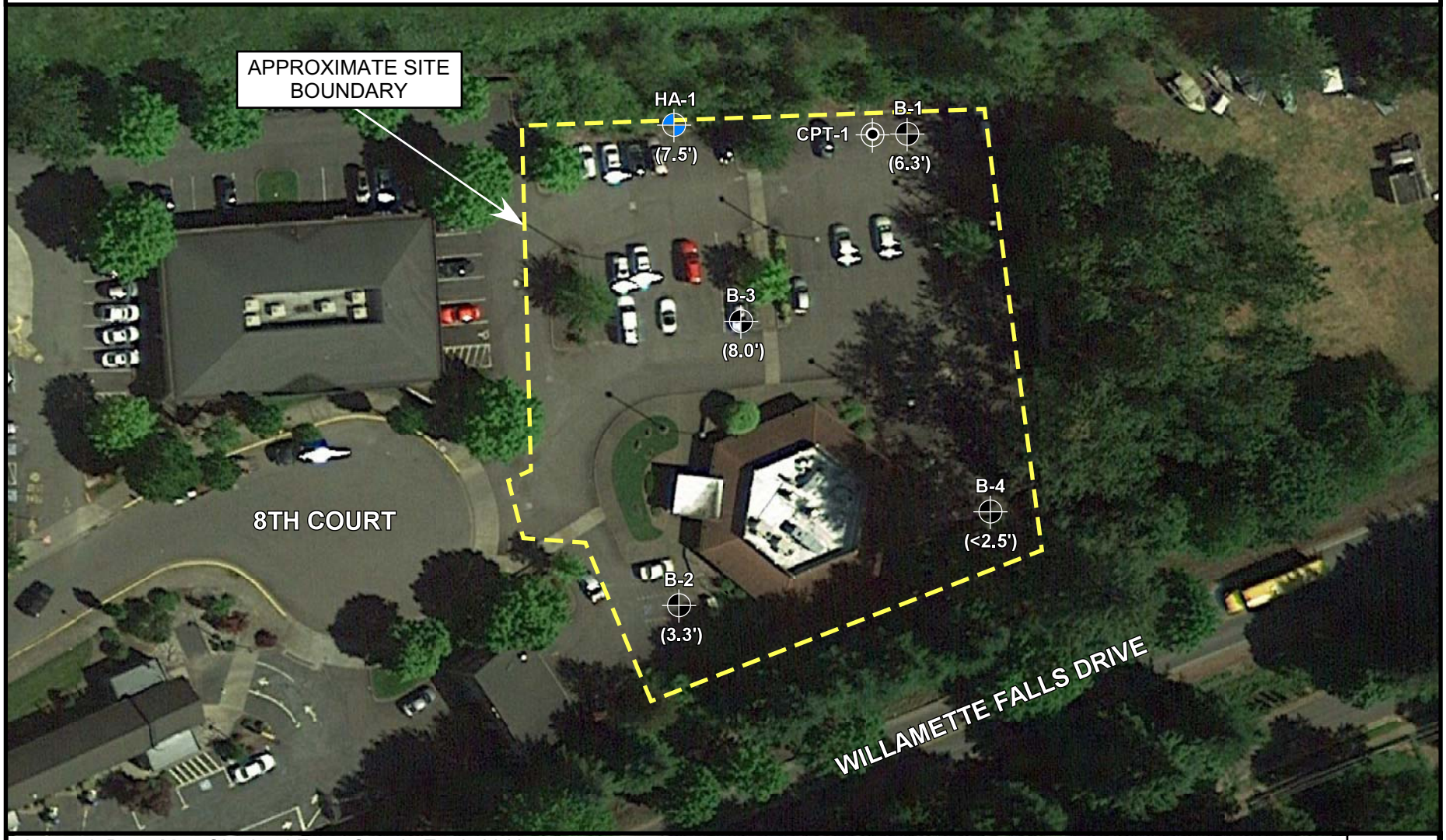
Tel: (503) 598-8445 Fax: (503) 941-9281

SITE AERIAL AND EXPLORATION LOCATIONS



Legend: Base Map Obtained From Google Earth 2018

CPT-1 CPT Designation and Approximate Location

B-1 Boring Designation and Approximate Location

HA-1 Hand Auger Designation and Approximate Location

(8.0') Observed Depth of Undocumented Fill, Feet

APPROXIMATE SCALE (FEET)
30 0 30 60

Drawn by: TJT
Date: 7/23/2018

North

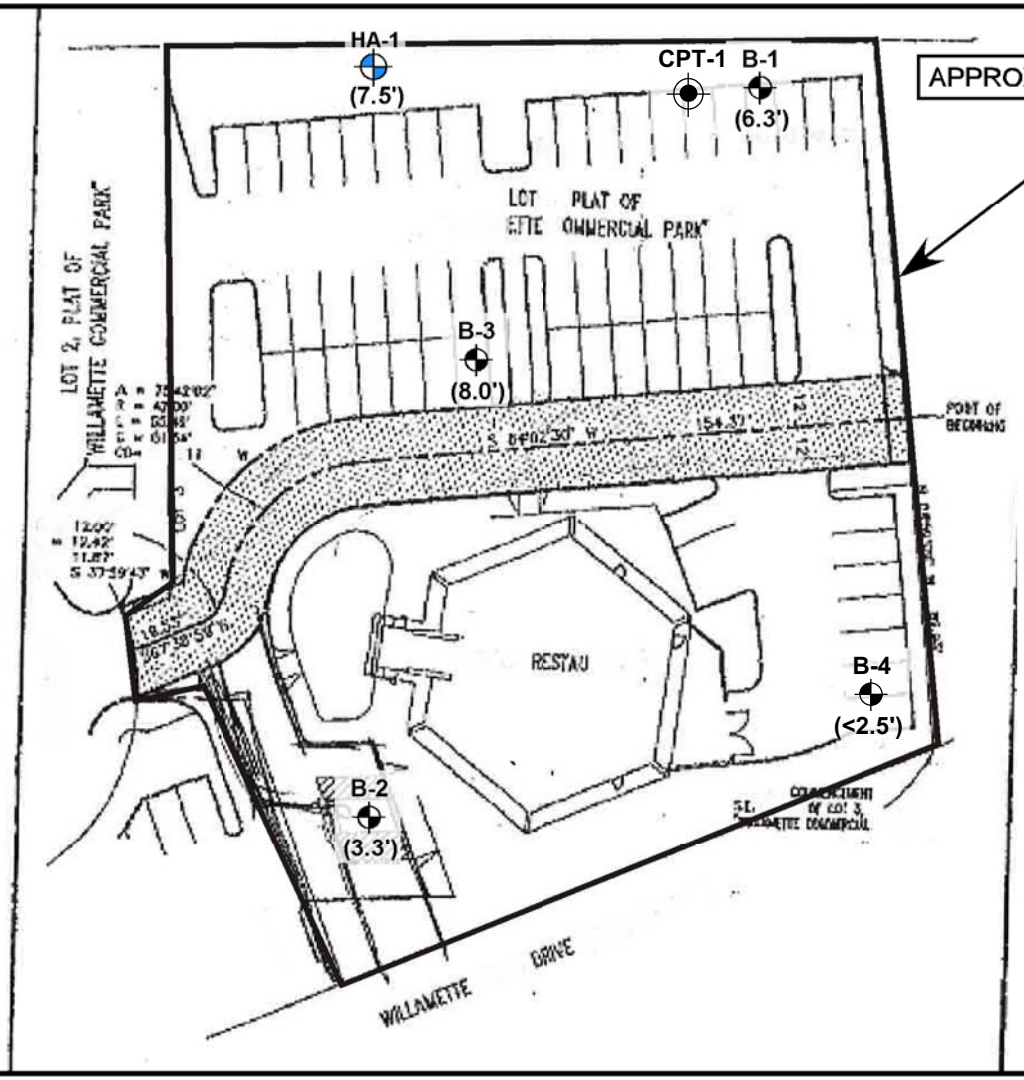
Project: 8th Court Redevelopment
2180 8th Court
West Linn, Oregon

Project No. 18-4970

FIGURE 2

GeoPacific Engineering, Inc.
14835 SW 72nd Avenue
Portland, Oregon 97224
Tel: (503) 598-8445 Fax: (503) 941-9281

SITE PLAN AND EXPLORATION LOCATIONS



Legend:

CPT-1 CPT Designation and Approximate Location

B-1 Boring Designation and Approximate Location

HA-1 Hand Auger Designation and Approximate Location

(8.0') Observed Depth of Undocumented Fill, Feet

APPROXIMATE SCALE (FEET)
25 0 25 50

Drawn by: TJT
Date: 7/23/2018

North

Project: 8th Court Redevelopment
2180 8th Court
West Linn, Oregon

Project No. 18-4970

FIGURE 3

GeoPacific Engineering, Inc.
Real-World Geotechnical Solutions
Investigation • Design • Construction Support

EXPLORATION LOGS

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Portland, Oregon 97224
Tel (503) 598-8445
Fax (503) 941-9281

GeoPacific Engineering, Inc.
14835 SW 72nd Avenue
Portland, Oregon 97224
Tel: (503) 598-8445 Fax: (503) 941-9281

BORING LOG

Project:	Project No.	Boring No.
8th Court Redevelopment 2180 8th Court West Linn, Oregon 97068	18-4970	**B-1**

Depth (ft)	Sample Type	N-Value	Passing No. 200 Sieve (%)	Moisture Content (%)	Water Bearing Zone	Material Description
						3" Asphaltic Concrete underlain by 8" of Base Rock. (Existing Pavement).
		5				SILT (ML), dark brown, medium stiff, moderately organic, with trace angular gravel, bluish gray staining, moist. (Undocumented Fill).
		5				
5		5				
		16				Elastic SILT (MH), brown, very stiff, moderate plasticity, with orange and gray mottling, micaceous, moist. (Willamette Formation).
10		27	64.9	17.9		Sandy SILT (ML), light brown, very stiff, low plasticity to non-plastic, micaceous, sand is fine grained, moist. (Willamette Formation). AASHTO Classification= A-4(1), Liquid Limit=30.2, Plasticity Index=3.1
15		18				Grades to with more sand at 15 feet bgs. Sand is inter layered, some observed cementation.
20		16				
25		12				Grades to stiff. 6 inch thick lense of silty SAND (SP) at 25 feet bgs. Sand is medium to coarse grained.
30		20				Grades to very stiff.
						Silty SAND (SM), brown and gray, medium dense, sand is fine to medium grained with thin lenses of coarse grained sand, very moist. (Willamette Formation).
35		22		26.4		
40		32	41.4	32.7		Grades to dense, wet at and light groundwater seepage at 40 feet bgs.
45						Boring Terminated at 41.5 Feet bgs. No Static Groundwater Encountered. Light Groundwater Seepage Encountered at 40 Feet bgs. Solid Stem Auger Drilling Methods. Hole Remained Open for 4 Hours After Drilling. No Caving was Observed During this Period.
50						

LEGEND

Bag Sample (100 to 1,000 g) | Split-Spoon | Shelby Tube Sample | Static Water Table at Drilling | Static Water Table (10-20-99) | Water Bearing Zone

Date Drilled: 07/03/2018
Logged By: T. Torkelson
Surface Elevation:

GeoPacific Engineering, Inc.
14835 SW 72nd Avenue
Portland, Oregon 97224
Tel: (503) 598-8445 Fax: (503) 941-9281

BORING LOG

Project:	Project No.	Boring No.
8th Court Redevelopment 2180 8th Court West Linn, Oregon 97068	18-4970	**B-2**

Depth (ft)	Sample Type	N-Value	Passing No. 200 Sieve (%)	Moisture Content (%)	Water Bearing Zone	Material Description
0						5" Asphaltic Concrete underlain by 6" of Base Rock. (Existing Pavement).
		20				SILT (ML), dark brown, very stiff, moderately organic, with trace angular gravel, bluish gray staining, moist. (Undocumented Fill).
		16				
5		9				Elastic SILT (MH), brown, very stiff, moderate plasticity, with orange and gray mottling, micaceous, moist. (Willamette Formation).
		8				Sandy SILT (ML), light brown, medium stiff, low plasticity to non-plastic, micaceous, sand is fine grained, moist. (Willamette Formation).
10		11				Grades to stiff and with more sand at 10 feet bgs.
15		9				4-inch thick silt layer containing coarse grained sand and gravel encountered at 15 feet bgs.
20		50 For 5"				Basaltic Bedrock, light to dark gray, R1 to R4, weathered basalt becoming hard at 20.5 feet bgs, moist, (Columbia River Basalt).
25						Boring Terminated at 20.9 Feet bgs Due to Practical Refusal on Basaltic Bedrock. No Static Groundwater or Seepage Encountered. Solid Stem Auger Drilling Methods. No Caving was Observed after Augers were Removed.
30						
35						
40						
45						
50						

LEGEND

Bag Sample (100 to 1,000 g) | Split-Spoon | Shelby Tube Sample | Static Water Table at Drilling | Static Water Table (10-20-99) | Water Bearing Zone

Date Drilled: 07/03/2018
Logged By: T. Torkelson
Surface Elevation:

GeoPacific Engineering, Inc.
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BORING LOG

Project:	Project No.	Boring No.
8th Court Redevelopment 2180 8th Court West Linn, Oregon 97068	18-4970	**B-3**

Depth (ft)	Sample Type	N-Value	Passing No. 200 Sieve (%)	Moisture Content (%)	Water Bearing Zone	Material Description
						3" Asphaltic Concrete underlain by 6" of Base Rock. (Existing Pavement).
		17				SILT (ML), dark brown, medium stiff, moderately organic, with trace angular gravel and brick debris, with bluish gray staining, damp to moist. (Undocumented Fill).
		13				
5		8		26.2		Organic content measured at 3.6 percent from sample taken at 5-6 feet bgs.
		15				Sandy SILT (ML), light brown, very stiff, low plasticity to non-plastic, micaceous, sand is fine grained, moist. (Willamette Formation).
10		16	64.2	14.6		
15		26				Grades to with more sand at 15 feet bgs. Some layering and cementation observed.
20		17				
25		22				6 inch thick lens of silty SAND (SP) at 25 feet bgs. Sand is medium to coarse grained.
30		16				Silty SAND (SM), brown and gray, medium dense, non-plastic, sand is fine to medium grained with thin lenses of coarse grained sand, very moist (Willamette Formation).
35		20	32.7	13.4		
40		15	67.3	32.9		Sandy SILT (ML), light brown, very stiff, non-plastic, micaceous, sand is fine grained, wet. (Willamette Formation).
45		50 For 1"				Basaltic Bedrock, light to dark gray, R2 to R4, weathered basalt sharply grades to hard at 45.5 feet bgs, moist, (Columbia River Basalt).
50						Boring Terminated at 45.6 Feet bgs. Static Groundwater Encountered at 40 Feet bgs.. Solid Stem Auger Drilling Methods. No Caving was Observed after Augers were Removed.

LEGEND

Bag Sample (100 to 1,000 g) | Split-Spoon | Shelby Tube Sample | Static Water Table at Drilling | Static Water Table (10-20-99) | Water Bearing Zone

Date Drilled: 07/03/2018
Logged By: T. Torkelson
Surface Elevation:

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BORING LOG

Project:	Project No.	Boring No.
8th Court Redevelopment 2180 8th Court West Linn, Oregon 97068	18-4970	**B-4**

Depth (ft)	Sample Type	N-Value	Passing No. 200 Sieve (%)	Moisture Content (%)	Water Bearing Zone	Material Description
0		3				3" Asphaltic Concrete underlain by 6" of Base Rock. (Existing Pavement).
		6				SILT (ML), dark brown, medium stiff, moderately organic, with trace angular gravel, bluish gray staining, moist. (Undocumented Fill).
5		6				Elastic SILT (MH), brown, medium stiff, moderate plasticity, with orange and gray mottling, micaceous, moist. (Willamette Formation).
		8				Sandy SILT (ML), light brown, medium stiff, low plasticity to non-plastic, micaceous, sand is fine grained, moist. (Willamette Formation).
10		8				Grades to with more sand at 11 feet bgs.
						Boring Terminated at 11.5 Feet bgs. No Static Groundwater or Seepage Encountered. Solid Stem Auger Drilling Methods. No Caving was Observed after Augers were Removed.
15						
20						
25						
30						
35						
40						
45						
50						

LEGEND

Bag Sample (100 to 1,000 g) | Split-Spoon | Shelby Tube Sample | Static Water Table at Drilling | Static Water Table (10-20-99) | Water Bearing Zone

Date Drilled: 07/03/2018
Logged By: T. Torkelson
Surface Elevation:

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HAND AUGER LOG

Project:	Project No.	Hand Auger No.
8th Court Redevelopment 2180 8th Court West Linn, Oregon 97068	18-4970	**HA-1**

Depth (ft)	Pocket Penetrometer (tons/ft²)	Sample Type	Passing No. 200 Sieve (%)	Moisture Content (%)	Water Bearing Zone	Material Description
1						SILT (ML), dark brown, soft, moderately organic, with angular gravel, brick, concrete and wood, debris, bluish gray staining, moist, organic odor, (Undocumented Fill).
2						
3						
4						Grades to with higher organic content and less concrete and brick debris at 3.5 feet bgs. Grades to medium stiff at 4 feet bgs.
5						
6						
7						
8		100 to 1,000 g	95.0	32.0		Elastic SILT (MH), brown, stiff, moderate plasticity, with orange and gray mottling, micaceous, moist to very moist. (Willamette Formation). AASHTO Classification= A-7-5, Liquid Limit=52.7, Plasticity Index=22.4
						Hand auger terminated at 8.5 feet bgs. No seepage or groundwater encountered. No caving observed

LEGEND

100 to 1,000 g — Bag Sample
5 Gal. Bucket — Bucket Sample
Shelby Tube Sample
Seepage
Water Bearing Zone
Water Level at Abandonment

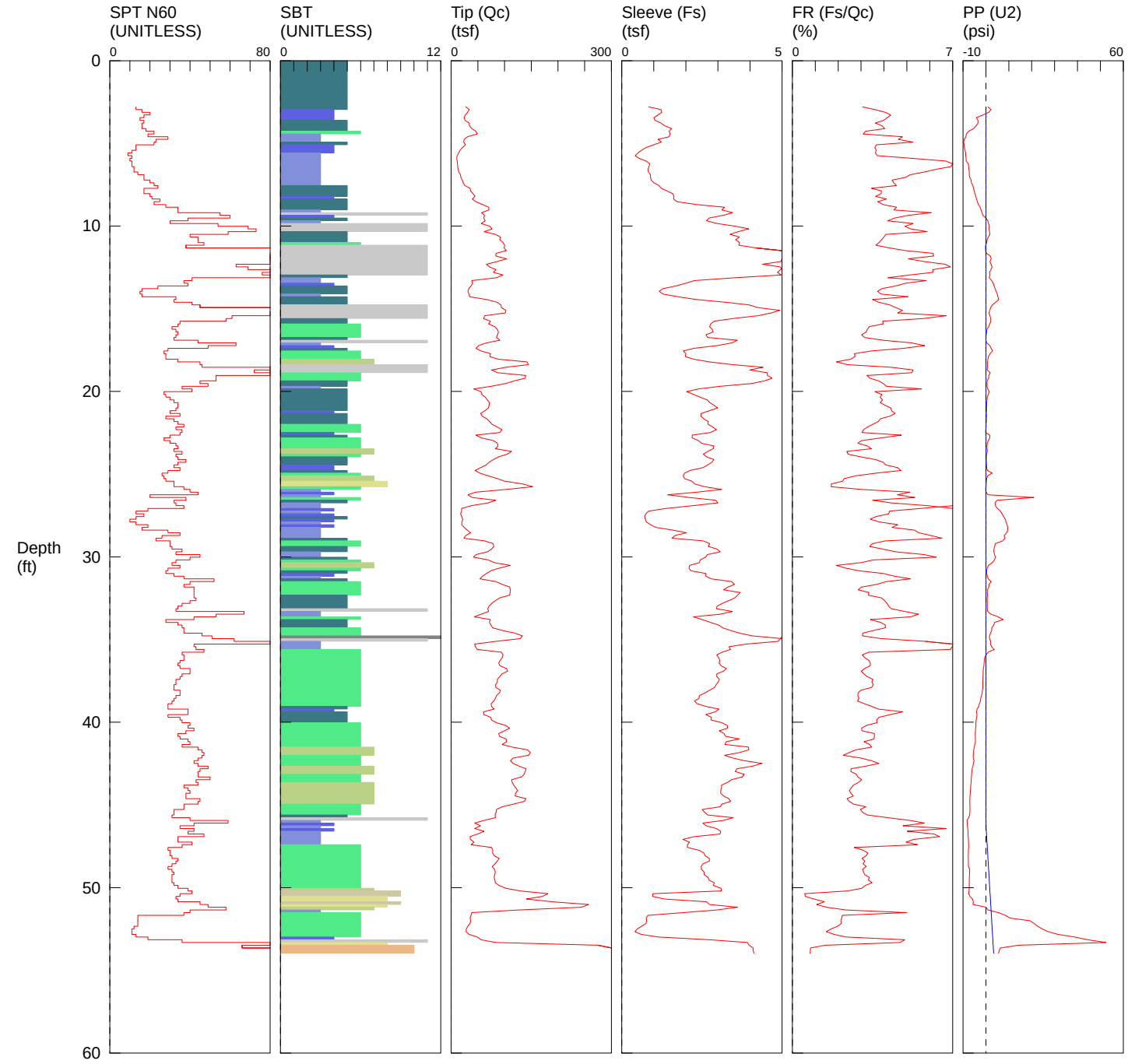
Date Excavated: 07/24/2018

Logged By: TJT

Surface Elevation:

GeoPacific / CPT-1 / 2180 8th Ct West Linn

OPERATOR: OGE BB
CONE ID: DPG1323
HOLE NUMBER: CPT-1
TEST DATE: 7/20/2018 9:17:55 AM
TOTAL DEPTH: 53.970 ft

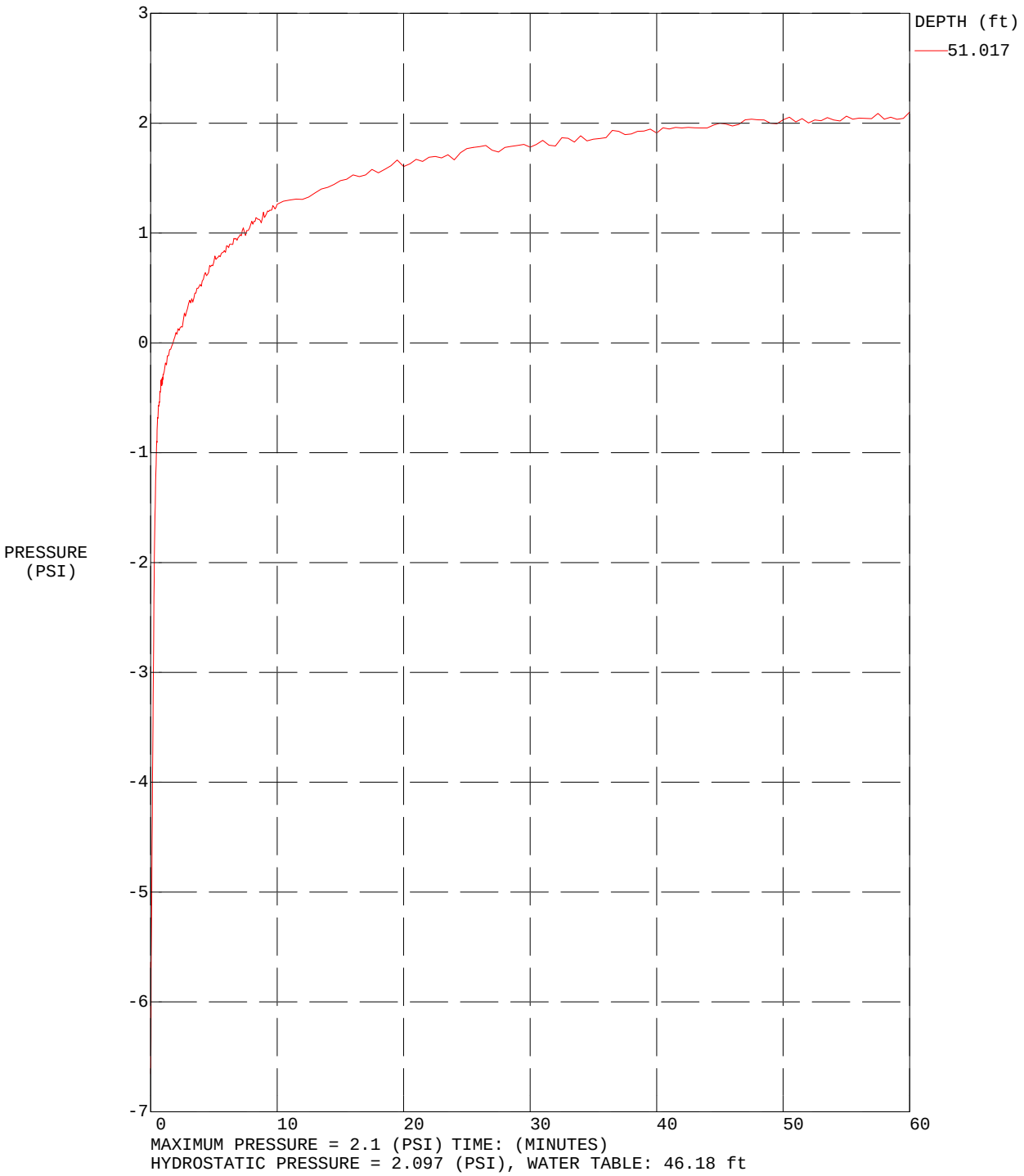


1 sensitive fine grained
2 organic material
3 clay
4 silty clay to clay
5 clayey silt to silty clay
6 sandy silt to clayey silt
7 silty sand to sandy silt
8 sand to silty sand
9 sand
10 gravelly sand to sand
11 very stiff fine grained (*)
12 sand to clayey sand (*)

*SBT/SPT CORRELATION: UBC-1983

COMMENT: GeoPacific / CPT-1 / 2180 8th Ct West Linn

TEST DATE: 7/20/2018 9:17:55 AM



GeoPacific Engineering, Inc.
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LABORATORY TESTING RESULTS

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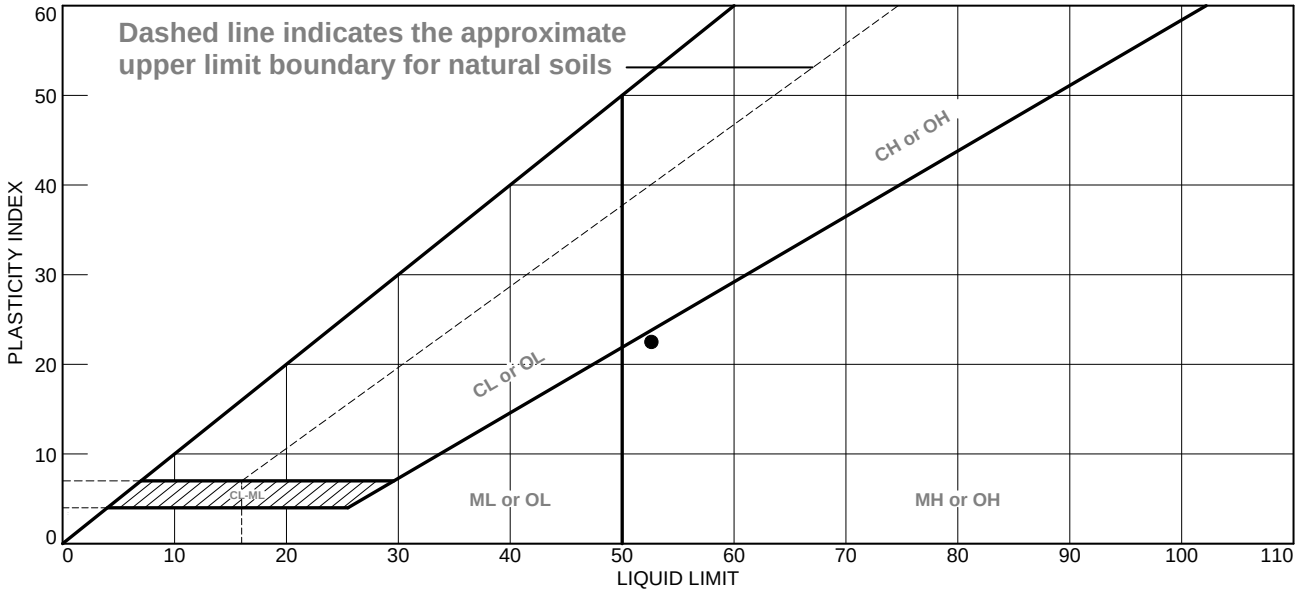
LIQUID AND PLASTIC LIMITS TEST REPORT



	MATERIAL DESCRIPTION	LL	PL	PI	%<#40	%<#200	USCS
●	Elastic Silt	52.7	30.3	22.4	99.0	95.0	MH

Project No. 18-4970 **Client:** Edge Development

Project: 8th Court Redevelopment

Location: HA-1
Sample Number: S18-201 **Depth:** 8.5'

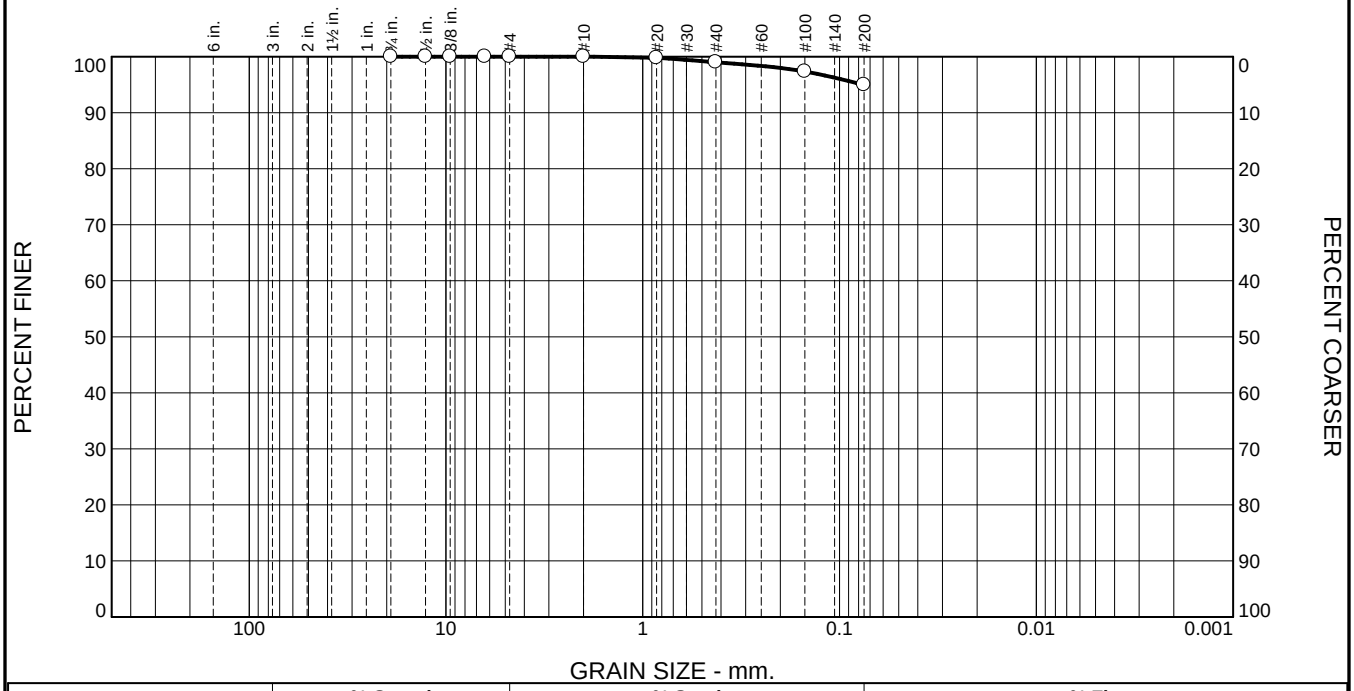
Remarks:

GEOPACIFIC ENGINEERING, INC.

Figure

Tested By: SJC

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.0	0.0	1.0	4.0	95.0	

TEST RESULTS

Opening Size	Percent Finer	Spec.* (Percent)	Pass? (X=Fail)
.75	100.0		
.5	100.0		
.375	100.0		
.25	100.0		
#4	100.0		
#10	100.0		
#20	99.8		
#40	99.0		
#100	97.3		
#200	95.0		

* (no specification provided)

Material Description

Elastic Silt

Atterberg Limits (ASTM D 4318)

PL= 30.3 **LL=** 52.7 **PI=** 22.4

Classification

USCS (D 2487)= MH **AASHTO (M 145)=** A-7-5(26)

Coefficients

D_{90}= D_{85}= D_{60}=
D_{50}= D_{30}= D_{15}=
D_{10}= C_u= C_c=

Remarks

Moisture 32.0%

Date Received: _____ **Date Tested:** 7/5/2018

Tested By: SJC

Checked By: _____

Title: _____

Location: HA-1
Sample Number: S18-201 **Depth:** 8.5'

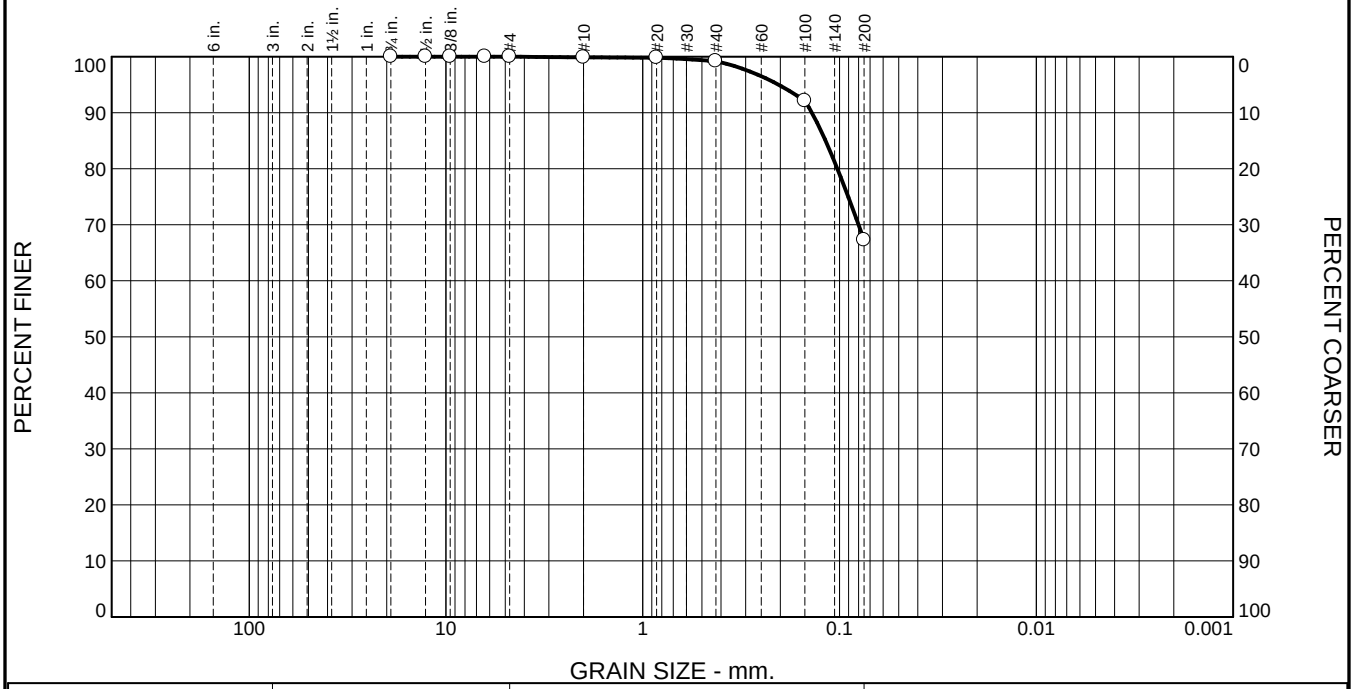
Date Sampled: 7/3/2018 TJT

GEOPACIFIC ENGINEERING, INC.

Client: Edge Development
Project: 8th Court Redevelopment

Project No: 18-4970 **Figure**

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.0	0.1	0.7	31.9	67.3	

TEST RESULTS

Opening Size	Percent Finer	Spec.* (Percent)	Pass? (X=Fail)
.75	100.0		
.5	100.0		
.375	100.0		
.25	100.0		
#4	100.0		
#10	99.9		
#20	99.8		
#40	99.2		
#100	92.1		
#200	67.3		

* (no specification provided)

Material Description

Sandy Silt

Atterberg Limits (ASTM D 4318)

PL= NP **LL=** NV **PI=** NP

Classification

USCS (D 2487)= ML **AASHTO (M 145)=** A-4(0)

Coefficients

D_{90}= 0.1381 D_{85}= 0.1177 D_{60}=
D_{50}= D_{30}= D_{15}=
D_{10}= C_u= C_c=

Remarks

Moisture 32.9%

Date Received: _____ **Date Tested:** 7/5/2018

Tested By: SJC

Checked By: _____

Title: _____

Location: B-3
Sample Number: S18-202 **Depth:** 40'

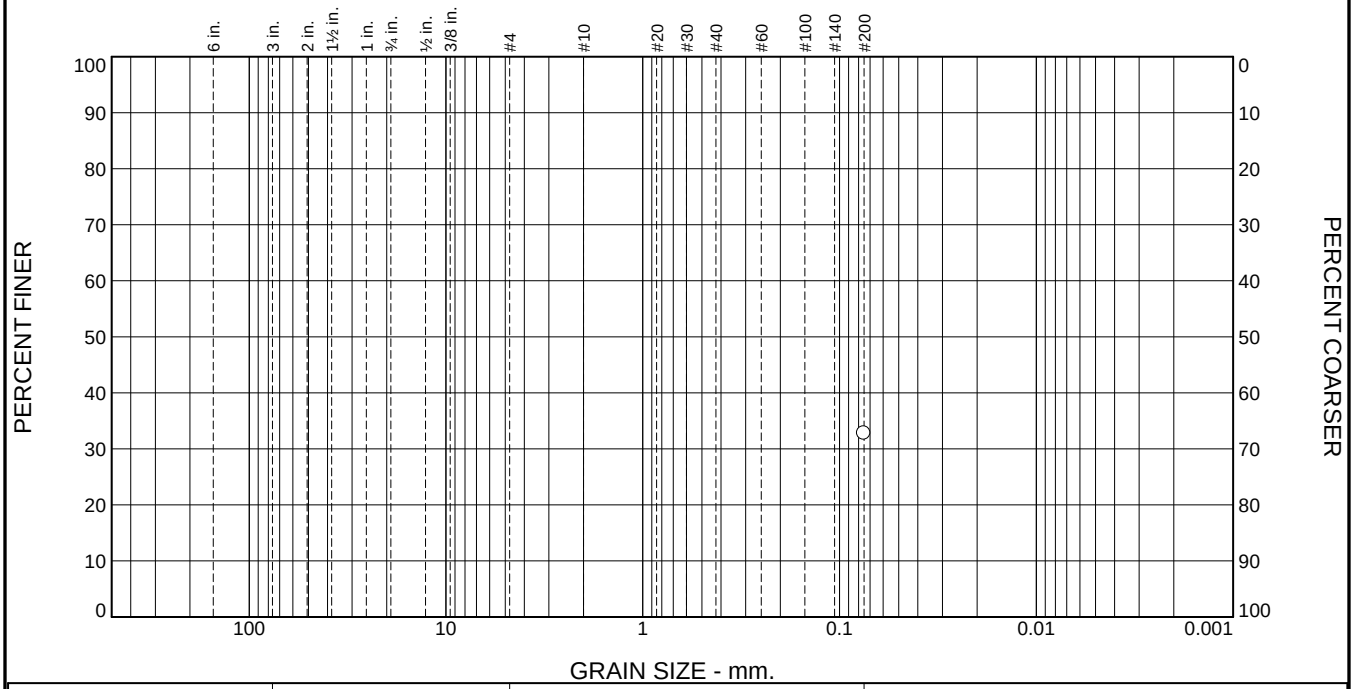
Date Sampled: 7/3/2018 TJT

GEOPACIFIC ENGINEERING, INC.

Client: Edge Development
Project: 8th Court Redevelopment

Project No: 18-4970 **Figure**

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
						32.7	

TEST RESULTS			
Opening Size	Percent Finer	Spec.* (Percent)	Pass? (X=Fail)
#200	32.7		

* (no specification provided)

Material Description

Silty Sand

Atterberg Limits (ASTM D 4318)

PL= NP **LL=** NV **PI=** NP

Classification

USCS (D 2487)= **AASHTO (M 145)=**

Coefficients

D_{90}= D_{85}= D_{60}=
D_{50}= D_{30}= D_{15}=
D_{10}= C_u= C_c=

Remarks

Moisture 13.4%

Date Received: _____ **Date Tested:** 7/5/2018

Tested By: SJC

Checked By: _____

Title: _____

Location: B-3
Sample Number: S18-203 **Depth:** 35'

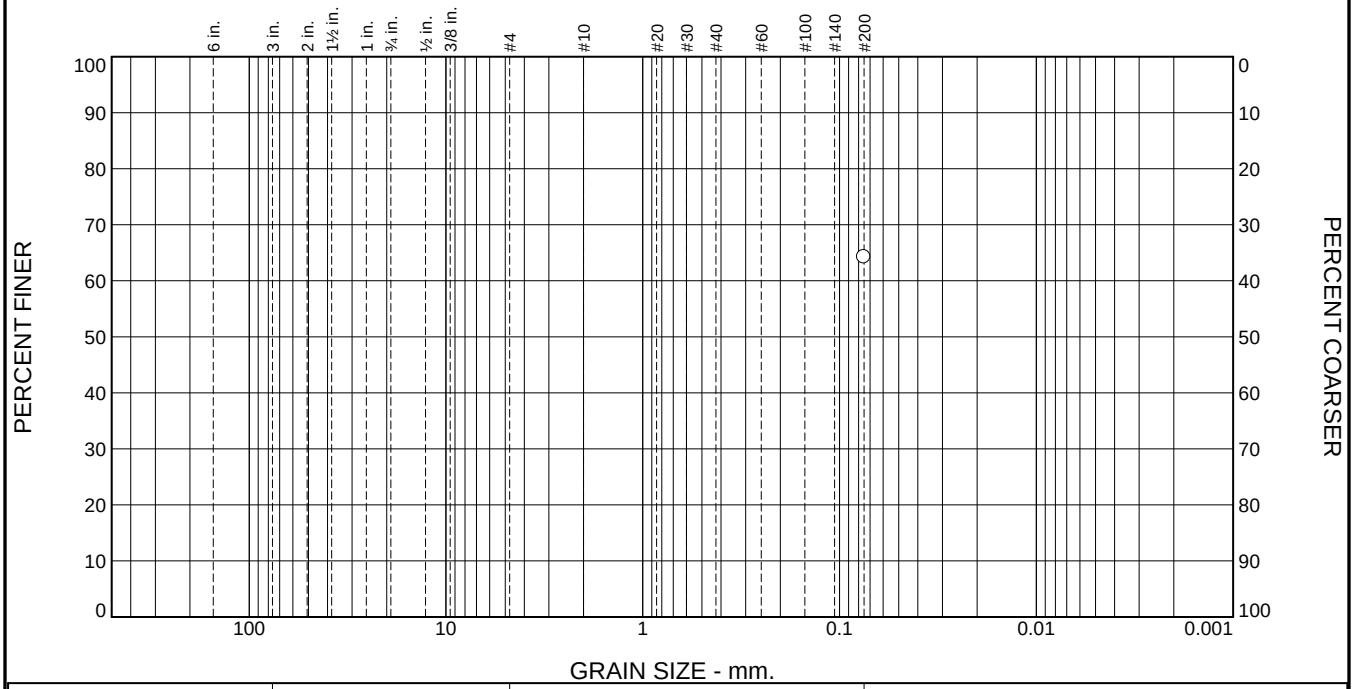
Date Sampled: 7/3/2018 TJT

GEOPACIFIC ENGINEERING, INC.

Client: Edge Development
Project: 8th Court Redevelopment

Project No: 18-4970 **Figure**

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
Silty						64.2	

TEST RESULTS

Opening Size	Percent Finer	Spec.* (Percent)	Pass? (X=Fail)
#200	64.2		

* (no specification provided)

Material Description

Sandy Silt

Atterberg Limits (ASTM D 4318)

PL= NP **LL=** NV **PI=** NP

Classification

USCS (D 2487)= **AASHTO (M 145)=**

Coefficients

D_{90}= D_{85}= D_{60}=
D_{50}= D_{30}= D_{15}=
D_{10}= C_u= C_c=

Remarks

Moisture 14.6%

Date Received: _____ **Date Tested:** 7/5/2018

Tested By: SJC

Checked By: _____

Title: _____

Location: B-3
Sample Number: S18-204 **Depth:** 10'

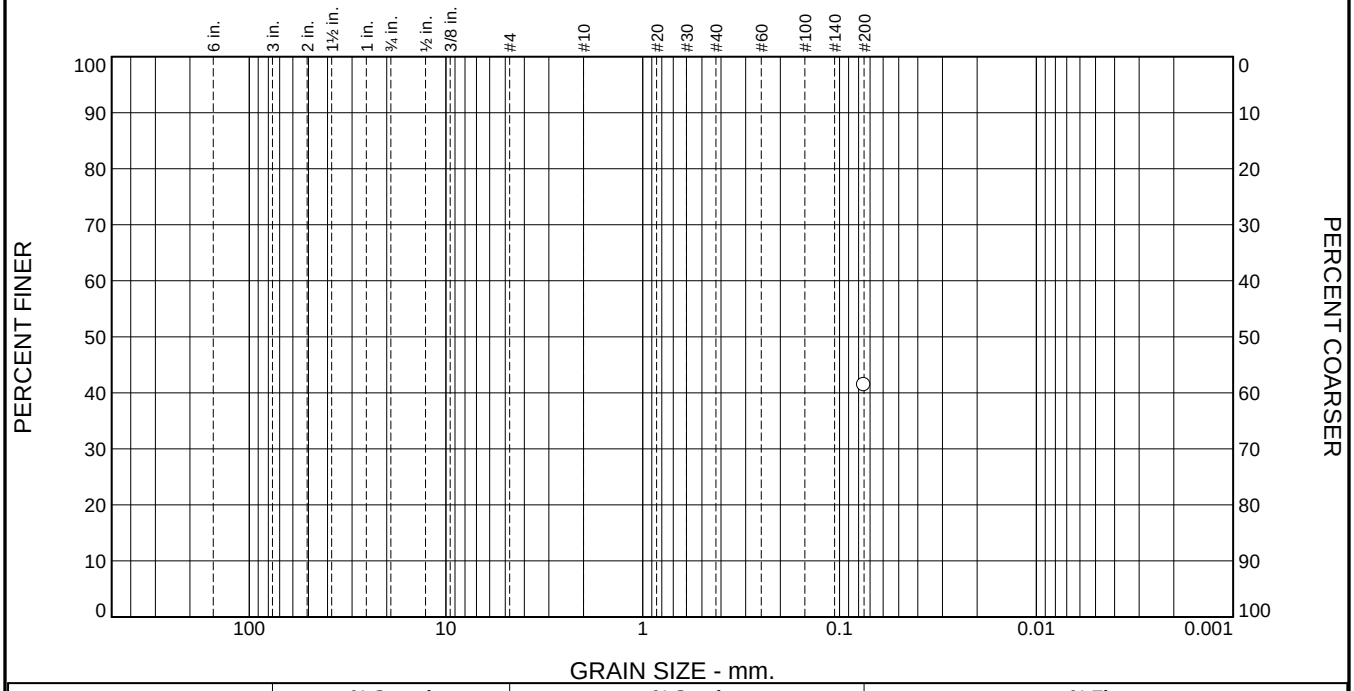
Date Sampled: 7/3/2048 TJT

GEOPACIFIC ENGINEERING, INC.

Client: Edge Development
Project: 8th Court Redevelopment

Project No: 18-4970 **Figure**

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
						41.4	

TEST RESULTS			
Opening Size	Percent Finer	Spec.* (Percent)	Pass? (X=Fail)
#200	41.4		

* (no specification provided)

Material Description

Silty Sand

Atterberg Limits (ASTM D 4318)

PL= NP **LL=** NV **PI=** NP

Classification

USCS (D 2487)= **AASHTO (M 145)=**

Coefficients

D_{90}= D_{85}= D_{60}=
D_{50}= D_{30}= D_{15}=
D_{10}= C_u= C_c=

Remarks

Moisture 32.7%

Date Received: _____ **Date Tested:** 7/5/2018

Tested By: SJC

Checked By: _____

Title: _____

Location: B-1
Sample Number: S18-205 **Depth:** 40'

Date Sampled: 7/3/2018 TJT

GEOPACIFIC ENGINEERING, INC.

Client: Edge Development
Project: 8th Court Redevelopment

Project No: 18-4970 **Figure**

Project Name:	8th Court Redevelopment		Project No.: 18-4970	Sampled By:	TJT
Sample ID: S18-206	35'			Sample Date:	7/3/2018
Location:	B-1			Tested By:	SJC
Material Type:	Silt			Tested Date:	7/5/2018

Moisture

Tare Number:	41
Tare Wt.:	517.4
Tare + Wet Soil:	843.1
Tare + Dry Soil:	775
Percent Moisture:	26.4

Organic Content ASTM D 2974 at 440°F

Tare Number:	
Tare Wt.:	
Tare + Pre-Oven:	
Tare + Post-Oven:	
Percent Organic:	

No. 200 Wash Data

Tare Number	
Tare Wt:	
Tare+Pre-Wash:	
Tare+Post-Wash:	
-#200 From Wash:	
Pre-Wash Mass:	
% Passing No. 200	

Grain Size Data

Sieve Size /(max wt individually retained)	Individual Weight Retained	Individual Weight Retained
3"		
1.5"		
1"		
3/4 / 900		
1/2 / 570		
3/8 / 550		
1/4		
#4 / 325		
#8		
#10 / 180		
#16		
#30		
#40 / 75		
#50		
#100 / 40		
#200 / 20		
Pan		

Atterberg Analysis LI

	Point 1	Point 2	Point 3	Point 4	Point 5
Tare #					
Tare Wt.					
Wet Wt					
Dry Wt					
# of Blows					

Atterberg Analysis PI

	Point 1	Point 2	Point 3
Tare #			
Tare Wt.			
Wet Wt			
Dry Wt			
# of Blows			

Project Name:	8th Court Redevelopment		Project No.: 18-4970	Sampled By:	TJT
Sample ID: S18-207	5'			Sample Date:	7/3/2018
Location:	B-3			Tested By:	SJC
Material Type:	Fill Material			Tested Date:	7/9/2018

Moisture

Tare Number:	1
Tare Wt.:	261.7
Tare + Wet Soil:	655.5
Tare + Dry Soil:	573.8
Percent Moisture:	26.2

Organic Content ASTM D 2974 at 440°F

Tare Number:	5	7
Tare Wt.:	25.81	24.98
Tare + Pre-Oven:	69.65	68.55
Tare + Post-Oven:	67.98	67.01
Percent Organic:	3.8	3.5
	Average:	3.6

No. 200 Wash Data

Tare Number	
Tare Wt:	
Tare+Pre-Wash:	
Tare+Post-Wash:	
-#200 From Wash:	
Pre-Wash Mass:	
% Passing No. 200	

Grain Size Data

Sieve Size /(max wt individually retained)	Individual Weight Retained	Individual Weight Retained
3"		
1.5"		
1"		
3/4 / 900		
1/2 / 570		
3/8 / 550		
1/4		
#4 / 325		
#8		
#10 / 180		
#16		
#30		
#40 / 75		
#50		
#100 / 40		
#200 / 20		
Pan		

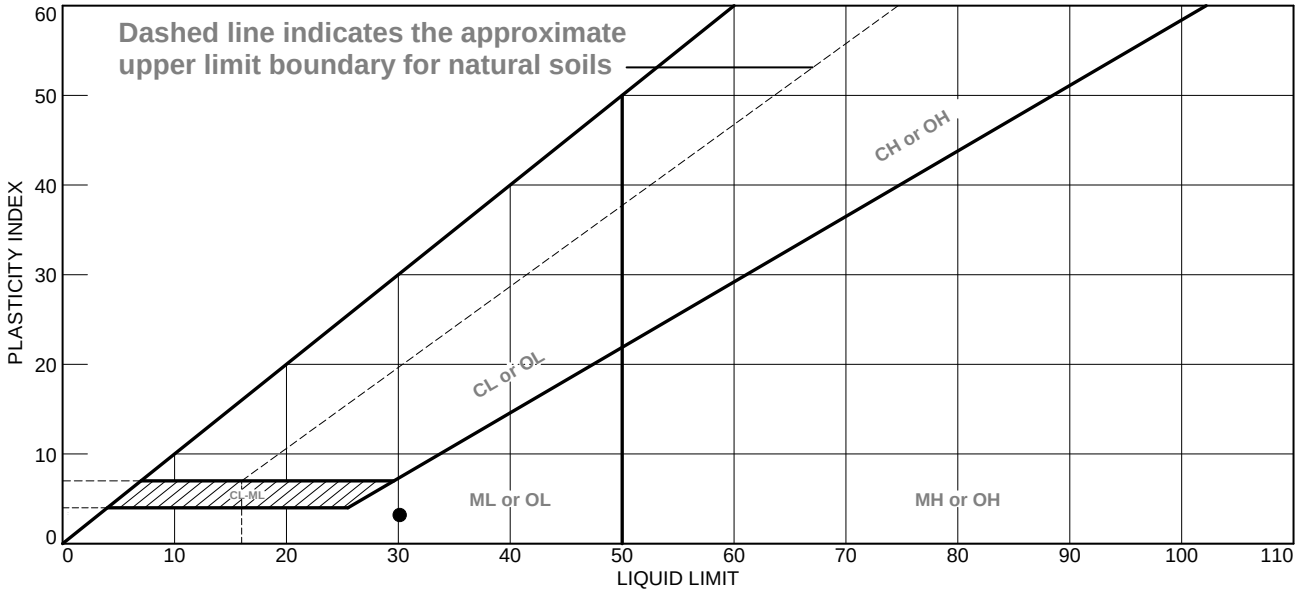
Atterberg Analysis LI

	Point 1	Point 2	Point 3	Point 4	Point 5
Tare #					
Tare Wt.					
Wet Wt					
Dry Wt					
# of Blows					

Atterberg Analysis PI

Point 1	Point 2	Point 3

LIQUID AND PLASTIC LIMITS TEST REPORT



	MATERIAL DESCRIPTION	LL	PL	PI	%<#40	%<#200	USCS
●	Sandy Silt	30.2	27.1	3.1	99.7	64.9	ML

Project No. 18-4970 **Client:** Edge Development

Project: 8th Court Redevelopment

Location: B-1
Sample Number: S18-208 **Depth:** 10'

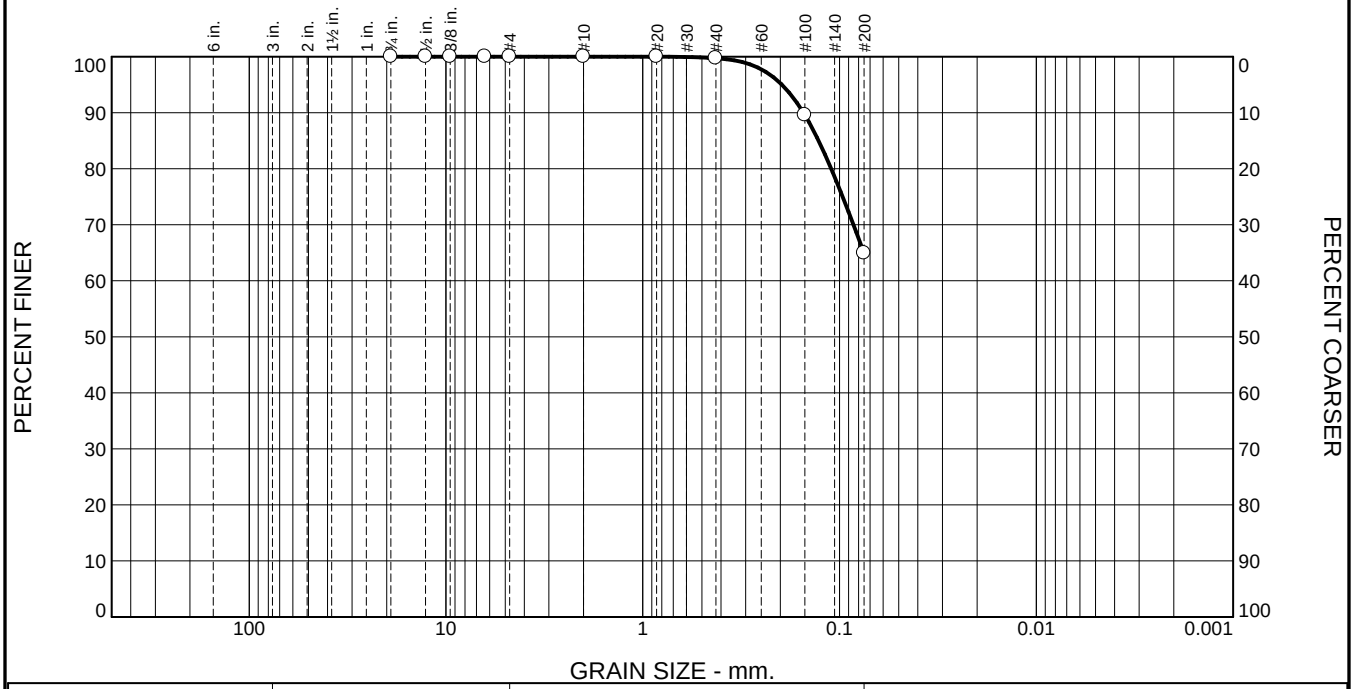
Remarks:

GEOPACIFIC ENGINEERING, INC.

Figure

Tested By: SJC

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.0	0.0	0.3	34.8	64.9	

TEST RESULTS

Opening Size	Percent Finer	Spec.* (Percent)	Pass? (X=Fail)
.75	100.0		
.5	100.0		
.375	100.0		
.25	100.0		
#4	100.0		
#10	100.0		
#20	100.0		
#40	99.7		
#100	89.6		
#200	64.9		

* (no specification provided)

Material Description

Sandy Silt

Atterberg Limits (ASTM D 4318)

PL= 27.1 **LL=** 30.2 **PI=** 3.1

Classification

USCS (D 2487)= ML **AASHTO (M 145)=** A-4(1)

Coefficients

D_{90}= 0.1524 D_{85}= 0.1278 D_{60}=
D_{50}= D_{30}= D_{15}=
D_{10}= C_u= C_c=

Remarks

Moisture 17.9%

Date Received: _____ **Date Tested:** 7/5/2018

Tested By: SJC

Checked By: _____

Title: _____

Location: B-1
Sample Number: S18-208 **Depth:** 10'

Date Sampled: 7/3/2018 TJT

GEOPACIFIC ENGINEERING, INC.

Client: Edge Development
Project: 8th Court Redevelopment

Project No: 18-4970 **Figure**

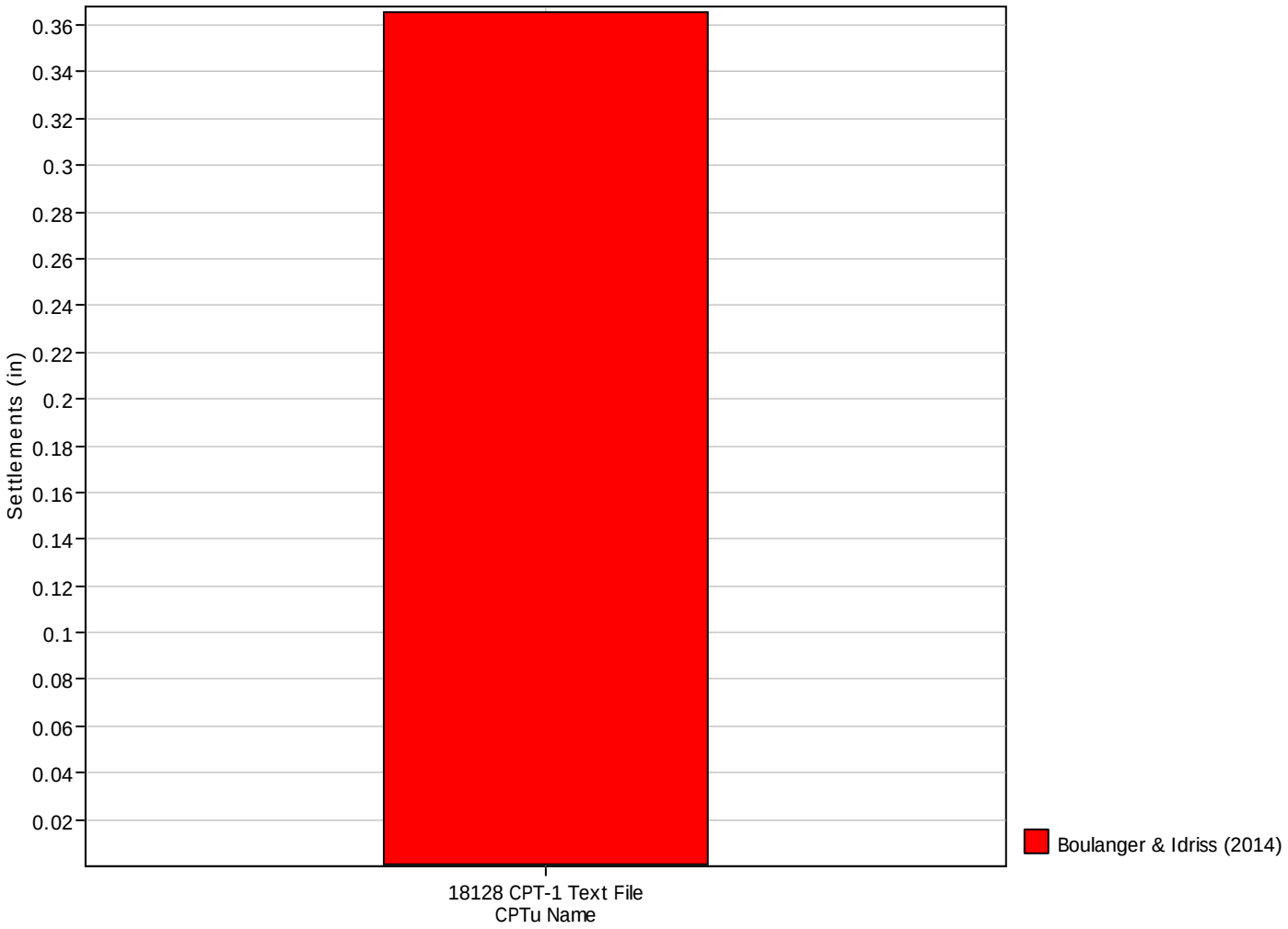
GeoPacific Engineering, Inc.
Real-World Geotechnical Solutions
Investigation • Design • Construction Support

LIQUEFACTION ASSESSMENT

14835 SW 72nd Avenue
Portland, Oregon 97224
Tel (503) 598-8445
Fax (503) 941-9281

GeoPacific Engineering, Inc.
14835 SW 72nd Ave
Portland, Oregon 97224
http://www.geopacificeng.com

Overall Parametric Assessment Method



:: CPT main liquefaction parameters details ::

CPT Name	Earthquake Mag.	Earthquake Accel.	GWT in situ (ft)	GWT earthq. (ft)
18128 CPT-1 Text Fil	9.11	0.46	40.00	40.00

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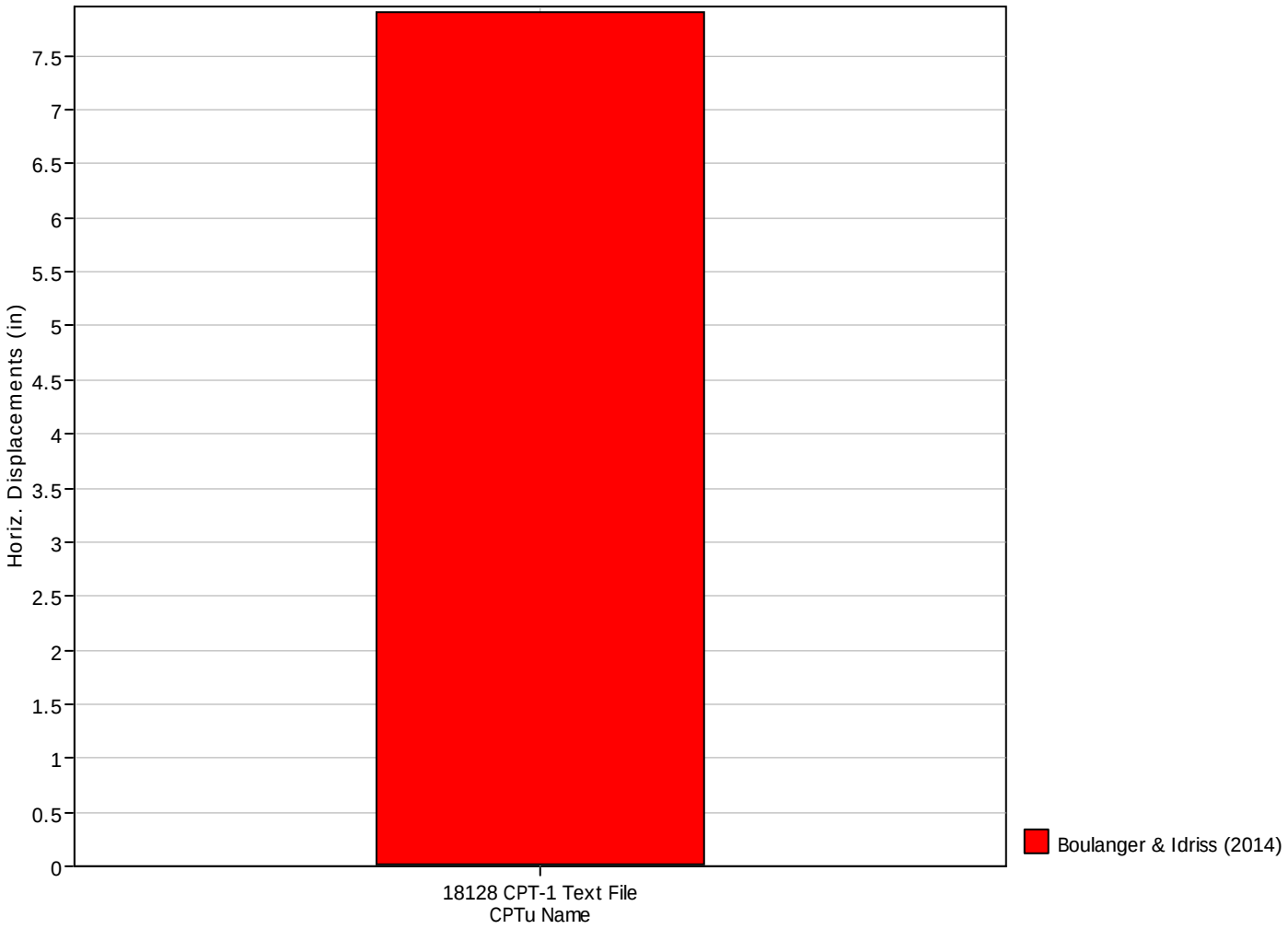
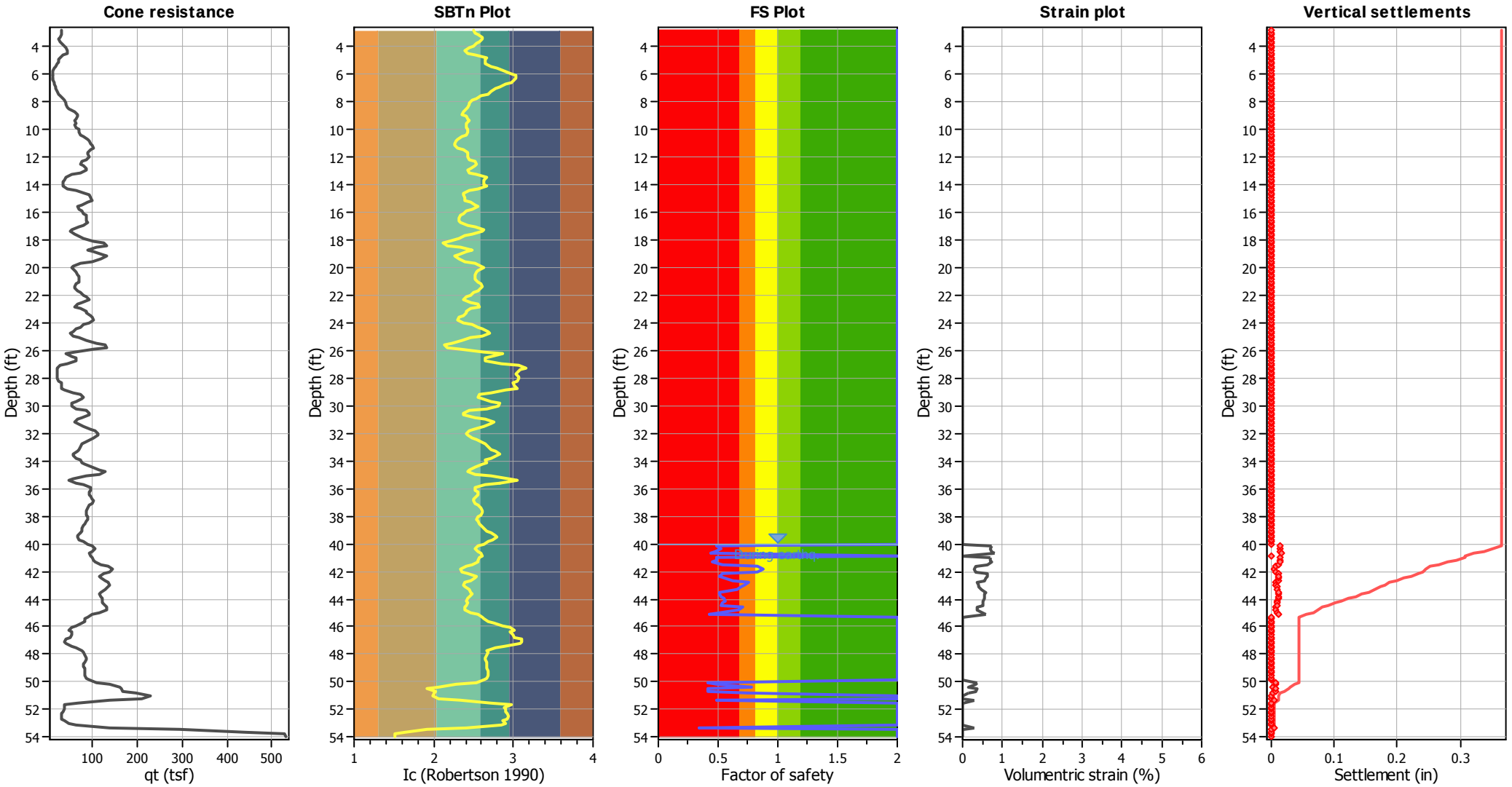
Overall Parametric Assessment Method



:: CPT main liquefaction parameters details ::

CPT Name	Earthquake Mag.	Earthquake Accel.	GWT in situ (ft)	GWT earthq. (ft)
18128 CPT-1 Text Fil	9.11	0.46	40.00	40.00

Estimation of post-earthquake settlements



Abbreviations

q_t:	Total cone resistance (cone resistance q_c corrected for pore water effects)
I_c:	Soil Behaviour Type Index
FS:	Calculated Factor of Safety against liquefaction
Volumentric strain:	Post-liquefaction volumentric strain

:: Post-earthquake settlement due to soil liquefaction ::

Depth (ft)	$q_{c1N,cs}$	FS	e_v (%)	DF	Settlement (in)	Depth (ft)	$q_{c1N,cs}$	FS	e_v (%)	DF	Settlement (in)
40.03	53.73	2.00	0.00	0.32	0.00	40.19	135.65	0.49	0.74	0.32	0.01
40.35	142.04	0.53	0.70	0.32	0.01	40.52	133.71	0.48	0.74	0.31	0.01
40.68	123.97	0.43	0.80	0.31	0.02	40.85	57.79	2.00	0.00	0.31	0.00
41.01	136.65	0.49	0.70	0.30	0.01	41.17	137.24	0.49	0.69	0.30	0.01
41.34	128.60	0.45	0.74	0.30	0.01	41.50	145.09	0.54	0.64	0.30	0.01
41.67	171.25	0.83	0.32	0.29	0.01	41.83	173.69	0.87	0.29	0.29	0.01
41.99	171.16	0.82	0.32	0.29	0.01	42.16	145.15	0.53	0.61	0.29	0.01
42.32	142.67	0.52	0.62	0.28	0.01	42.49	147.28	0.55	0.59	0.28	0.01
42.65	156.76	0.63	0.53	0.28	0.01	42.81	167.55	0.76	0.36	0.27	0.01
42.98	164.93	0.72	0.40	0.27	0.01	43.14	163.48	0.70	0.41	0.27	0.01
43.31	159.80	0.65	0.46	0.27	0.01	43.47	142.36	0.51	0.58	0.26	0.01
43.63	143.80	0.51	0.57	0.26	0.01	43.80	145.33	0.52	0.55	0.26	0.01
43.96	148.34	0.54	0.54	0.25	0.01	44.13	151.07	0.56	0.52	0.25	0.01
44.29	147.64	0.54	0.53	0.25	0.01	44.45	145.91	0.52	0.53	0.25	0.01
44.62	165.33	0.71	0.35	0.24	0.01	44.78	162.35	0.67	0.38	0.24	0.01
44.95	144.87	0.51	0.51	0.24	0.01	45.11	127.11	0.42	0.59	0.24	0.01
45.28	51.97	2.00	0.00	0.23	0.00	45.44	51.59	2.00	0.00	0.23	0.00
45.60	50.18	2.00	0.00	0.23	0.00	45.77	50.84	2.00	0.00	0.22	0.00
45.93	36.45	2.00	0.00	0.22	0.00	46.10	25.16	2.00	0.00	0.22	0.00
46.26	31.84	2.00	0.00	0.22	0.00	46.42	25.10	2.00	0.00	0.21	0.00
46.59	36.28	2.00	0.00	0.21	0.00	46.75	28.54	2.00	0.00	0.21	0.00
46.92	19.77	2.00	0.00	0.20	0.00	47.08	20.18	2.00	0.00	0.20	0.00
47.24	24.08	2.00	0.00	0.20	0.00	47.41	20.99	2.00	0.00	0.20	0.00
47.57	45.35	2.00	0.00	0.19	0.00	47.74	46.64	2.00	0.00	0.19	0.00
47.90	46.39	2.00	0.00	0.19	0.00	48.06	48.38	2.00	0.00	0.19	0.00
48.23	54.61	2.00	0.00	0.18	0.00	48.39	52.17	2.00	0.00	0.18	0.00
48.56	49.26	2.00	0.00	0.18	0.00	48.72	45.62	2.00	0.00	0.17	0.00
48.88	48.47	2.00	0.00	0.17	0.00	49.05	49.47	2.00	0.00	0.17	0.00
49.21	48.67	2.00	0.00	0.17	0.00	49.38	47.70	2.00	0.00	0.16	0.00
49.54	48.90	2.00	0.00	0.16	0.00	49.70	49.38	2.00	0.00	0.16	0.00
49.87	53.95	2.00	0.00	0.15	0.00	50.03	130.49	0.41	0.37	0.15	0.01
50.20	145.80	0.49	0.32	0.15	0.01	50.36	173.79	0.78	0.16	0.15	0.00
50.52	130.55	0.41	0.35	0.14	0.01	50.69	130.34	0.41	0.34	0.14	0.01
50.85	171.28	0.74	0.16	0.14	0.00	51.02	235.69	2.00	0.00	0.14	0.00
51.18	240.78	2.00	0.00	0.13	0.00	51.34	145.86	0.48	0.28	0.13	0.01
51.51	21.02	2.00	0.00	0.13	0.00	51.67	20.36	2.00	0.00	0.12	0.00
51.84	19.16	2.00	0.00	0.12	0.00	52.00	19.92	2.00	0.00	0.12	0.00
52.16	19.13	2.00	0.00	0.12	0.00	52.33	16.66	2.00	0.00	0.11	0.00
52.49	15.07	2.00	0.00	0.11	0.00	52.66	14.77	2.00	0.00	0.11	0.00
52.82	17.90	2.00	0.00	0.10	0.00	52.99	26.94	2.00	0.00	0.10	0.00
53.15	31.15	2.00	0.00	0.10	0.00	53.31	109.05	0.34	0.28	0.10	0.01
53.48	229.35	2.00	0.00	0.09	0.00	53.64	254.00	2.00	0.00	0.09	0.00
53.81	254.00	2.00	0.00	0.09	0.00	53.97	254.00	2.00	0.00	0.09	0.00

:: Post-earthquake settlement due to soil liquefaction :: (continued)

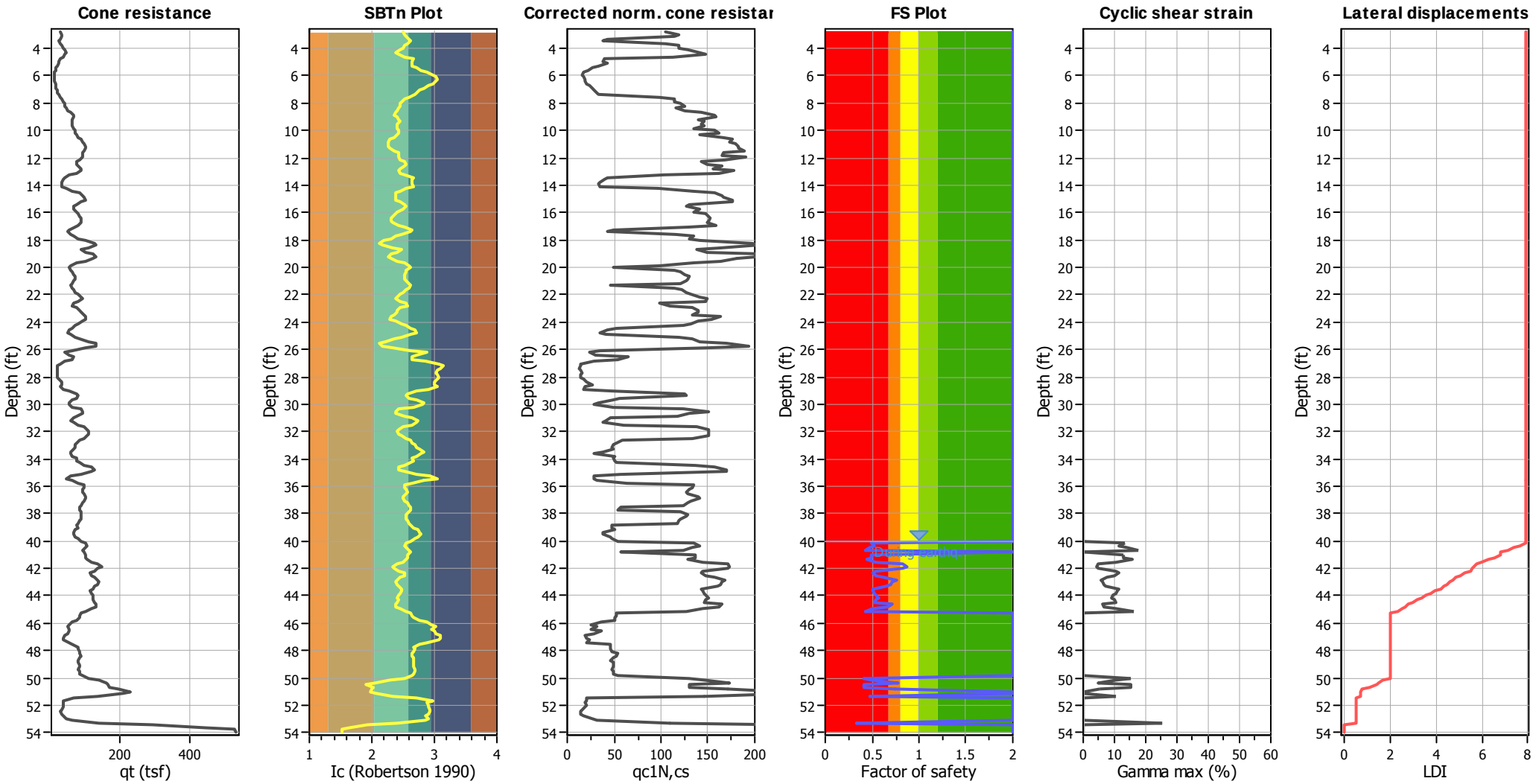
Depth (ft)	$q_{c1N,cs}$	FS	e_v (%)	DF	Settlement (in)	Depth (ft)	$q_{c1N,cs}$	FS	e_v (%)	DF	Settlement (in)

Total estimated settlement: 0.37

Abbreviations

$Q_{tn,cs}$: Equivalent clean sand normalized cone resistance
FS: Factor of safety against liquefaction
e_v (%): Post-liquefaction volumentric strain
DF: e_v depth weighting factor
Settlement: Calculated settlement

Estimation of post-earthquake lateral Displacements



Abbreviations

q_t: Total cone resistance (cone resistance q_c corrected for pore water effects)
I_c: Soil Behaviour Type Index
$q_{c1N,cs}$: Equivalent clean sand normalized CPT total cone resistance
F.S.: Factor of safety
γ_{max}: Maximum cyclic shear strain
LDI: Lateral displacement index

:: Lateral displacement index calculation ::

Depth (ft)	$q_{c1N,cs}$	$Gamma_{lim}$ (%)	FS	Fa	$Gamma_{max}$ (%)	LDI
40.03	53.73	0.00	2.00	0.00	0.00	0.00
40.19	135.65	0.13	0.49	0.43	0.13	0.26
40.35	142.04	0.11	0.53	0.35	0.11	0.22
40.52	133.71	0.14	0.48	0.45	0.14	0.28
40.68	123.97	0.18	0.43	0.56	0.18	0.35
40.85	57.79	0.00	2.00	0.00	0.00	0.00
41.01	136.65	0.13	0.49	0.41	0.13	0.26
41.17	137.24	0.13	0.49	0.41	0.13	0.25
41.34	128.60	0.16	0.45	0.51	0.16	0.31
41.50	145.09	0.11	0.54	0.31	0.11	0.21
41.67	171.25	0.05	0.83	-0.04	0.05	0.10
41.83	173.69	0.05	0.87	-0.07	0.04	0.09
41.99	171.16	0.05	0.82	-0.04	0.05	0.10
42.16	145.15	0.11	0.53	0.31	0.11	0.21
42.32	142.67	0.11	0.52	0.34	0.11	0.22
42.49	147.28	0.10	0.55	0.28	0.10	0.20
42.65	156.76	0.08	0.63	0.16	0.08	0.15
42.81	167.55	0.06	0.76	0.01	0.06	0.11
42.98	164.93	0.06	0.72	0.05	0.06	0.12
43.14	163.48	0.07	0.70	0.07	0.07	0.13
43.31	159.80	0.07	0.65	0.12	0.07	0.14
43.47	142.36	0.11	0.51	0.34	0.11	0.22
43.63	143.80	0.11	0.51	0.33	0.11	0.21
43.80	145.33	0.10	0.52	0.31	0.10	0.21
43.96	148.34	0.10	0.54	0.27	0.10	0.19
44.13	151.07	0.09	0.56	0.23	0.09	0.18
44.29	147.64	0.10	0.54	0.28	0.10	0.19
44.45	145.91	0.10	0.52	0.30	0.10	0.20
44.62	165.33	0.06	0.71	0.04	0.06	0.12
44.78	162.35	0.07	0.67	0.08	0.07	0.13
44.95	144.87	0.11	0.51	0.31	0.11	0.21
45.11	127.11	0.16	0.42	0.53	0.16	0.32
45.28	51.97	0.00	2.00	0.00	0.00	0.00
45.44	51.59	0.00	2.00	0.00	0.00	0.00
45.60	50.18	0.00	2.00	0.00	0.00	0.00
45.77	50.84	0.00	2.00	0.00	0.00	0.00
45.93	36.45	0.00	2.00	0.00	0.00	0.00
46.10	25.16	0.00	2.00	0.00	0.00	0.00
46.26	31.84	0.00	2.00	0.00	0.00	0.00
46.42	25.10	0.00	2.00	0.00	0.00	0.00
46.59	36.28	0.00	2.00	0.00	0.00	0.00
46.75	28.54	0.00	2.00	0.00	0.00	0.00
46.92	19.77	0.00	2.00	0.00	0.00	0.00
47.08	20.18	0.00	2.00	0.00	0.00	0.00
47.24	24.08	0.00	2.00	0.00	0.00	0.00
47.41	20.99	0.00	2.00	0.00	0.00	0.00
47.57	45.35	0.00	2.00	0.00	0.00	0.00
47.74	46.64	0.00	2.00	0.00	0.00	0.00

:: Estimation of post-earthquake lateral Displacements :: (continued)

Depth (ft)	$q_{c1N,cs}$	$Gamma_{lim}$ (%)	FS	Fa	$Gamma_{max}$ (%)	LDI
47.90	46.39	0.00	2.00	0.00	0.00	0.00
48.06	48.38	0.00	2.00	0.00	0.00	0.00
48.23	54.61	0.00	2.00	0.00	0.00	0.00
48.39	52.17	0.00	2.00	0.00	0.00	0.00
48.56	49.26	0.00	2.00	0.00	0.00	0.00
48.72	45.62	0.00	2.00	0.00	0.00	0.00
48.88	48.47	0.00	2.00	0.00	0.00	0.00
49.05	49.47	0.00	2.00	0.00	0.00	0.00
49.21	48.67	0.00	2.00	0.00	0.00	0.00
49.38	47.70	0.00	2.00	0.00	0.00	0.00
49.54	48.90	0.00	2.00	0.00	0.00	0.00
49.70	49.38	0.00	2.00	0.00	0.00	0.00
49.87	53.95	0.00	2.00	0.00	0.00	0.00
50.03	130.49	0.15	0.41	0.49	0.15	0.30
50.20	145.80	0.10	0.49	0.30	0.10	0.20
50.36	173.79	0.05	0.78	-0.07	0.05	0.10
50.52	130.55	0.15	0.41	0.49	0.15	0.30
50.69	130.34	0.15	0.41	0.49	0.15	0.30
50.85	171.28	0.05	0.74	-0.04	0.05	0.10
51.02	235.69	0.01	2.00	-0.99	0.00	0.00
51.18	240.78	0.00	2.00	-1.07	0.00	0.00
51.34	145.86	0.10	0.48	0.30	0.10	0.20
51.51	21.02	0.00	2.00	0.00	0.00	0.00
51.67	20.36	0.00	2.00	0.00	0.00	0.00
51.84	19.16	0.00	2.00	0.00	0.00	0.00
52.00	19.92	0.00	2.00	0.00	0.00	0.00
52.16	19.13	0.00	2.00	0.00	0.00	0.00
52.33	16.66	0.00	2.00	0.00	0.00	0.00
52.49	15.07	0.00	2.00	0.00	0.00	0.00
52.66	14.77	0.00	2.00	0.00	0.00	0.00
52.82	17.90	0.00	2.00	0.00	0.00	0.00
52.99	26.94	0.00	2.00	0.00	0.00	0.00
53.15	31.15	0.00	2.00	0.00	0.00	0.00
53.31	109.05	0.25	0.34	0.71	0.25	0.50
53.48	229.35	0.01	2.00	-0.89	0.00	0.00
53.64	254.00	0.00	2.00	-1.28	0.00	0.00
53.81	254.00	0.00	2.00	-1.28	0.00	0.00
53.97	254.00	0.00	2.00	-1.28	0.00	0.00

Total estimated displacement: 7.90

Abbreviations

Depth: Depth of test point
$q_{c1N,cs}$: Adjusted and corrected cone resistance due to fines
$Gamma_{lim}$: Limiting shear strain
FS: Calculated factor of safety against liquefaction
Fa:
$Gamma_{max}$: Maximum cyclic shear strain
Lat. disp.: Lateral displacement

:: Strength loss calculation Idriss & Boulanger (2008) ::

Depth (ft)	q_t (tsf)	Q_{tn}	K_c	$Q_{tn,cs}$	I_c	$S_{u(liq)}/\sigma'_v$	$S_{u(peak)}/\sigma'_v$
2.79	29.51	47.14	2.76	130.15	2.50	N/A	N/A
2.95	30.65	48.96	2.85	139.50	2.52	N/A	N/A
3.12	30.36	48.48	3.03	146.75	2.55	N/A	N/A
3.28	27.04	43.14	3.33	143.66	2.60	N/A	N/A
3.44	25.48	40.61	3.44	139.69	2.62	N/A	N/A
3.61	27.89	44.46	3.15	140.12	2.57	N/A	N/A
3.77	31.23	49.82	2.93	146.05	2.53	N/A	N/A
3.94	35.41	56.52	2.75	155.32	2.50	N/A	N/A
4.10	39.58	63.20	2.51	158.77	2.45	N/A	N/A
4.26	44.46	71.03	2.26	160.56	2.39	N/A	N/A
4.43	41.82	66.77	2.39	159.80	2.42	N/A	N/A
4.59	34.55	55.08	2.83	155.90	2.51	N/A	N/A
4.76	26.08	41.44	3.75	155.34	2.66	N/A	N/A
4.92	24.83	39.42	3.67	144.78	2.65	N/A	N/A
5.08	23.73	37.64	3.62	136.40	2.65	N/A	N/A
5.25	21.51	34.06	3.57	121.57	2.64	N/A	N/A
5.41	17.14	27.02	4.09	110.60	2.71	N/A	N/A
5.58	13.86	21.74	4.69	102.07	2.79	N/A	N/A
5.74	11.73	18.29	5.53	101.12	2.88	N/A	N/A
5.91	10.87	16.91	6.47	109.49	2.98	N/A	N/A
6.07	11.08	17.23	7.11	122.48	3.03	N/A	N/A
6.23	11.71	18.22	7.16	130.35	3.04	N/A	N/A
6.40	12.27	19.11	6.90	131.90	3.01	N/A	N/A
6.56	13.10	20.42	6.39	130.56	2.97	N/A	N/A
6.73	14.81	23.15	5.66	131.09	2.90	N/A	N/A
6.89	16.50	25.86	5.11	132.17	2.84	N/A	N/A
7.05	18.73	29.42	4.52	132.96	2.77	N/A	N/A
7.22	20.48	32.22	4.17	134.50	2.72	N/A	N/A
7.38	22.96	36.19	3.85	139.35	2.68	N/A	N/A
7.55	27.82	43.98	3.26	143.53	2.59	N/A	N/A
7.71	32.38	51.30	2.93	150.18	2.53	N/A	N/A
7.87	37.53	59.55	2.63	156.83	2.47	N/A	N/A
8.04	40.58	64.43	2.54	163.64	2.45	N/A	N/A
8.20	41.67	66.16	2.53	167.43	2.45	N/A	N/A
8.37	43.43	68.98	2.46	169.39	2.43	N/A	N/A
8.53	48.25	76.71	2.37	181.44	2.41	N/A	N/A
8.69	58.51	93.18	2.21	206.23	2.38	N/A	N/A
8.86	66.67	106.27	2.14	227.13	2.35	N/A	N/A
9.02	65.98	105.14	2.32	244.45	2.40	N/A	N/A
9.19	63.36	100.70	2.43	244.46	2.43	N/A	N/A
9.35	60.17	94.62	2.52	238.03	2.45	N/A	N/A
9.51	62.34	95.57	2.32	221.43	2.40	N/A	N/A
9.68	60.40	91.57	2.38	217.91	2.42	N/A	N/A
9.84	64.21	95.98	2.38	227.98	2.42	N/A	N/A
10.01	68.55	101.30	2.41	244.51	2.42	N/A	N/A
10.17	70.29	102.64	2.45	251.64	2.43	N/A	N/A
10.34	73.70	105.51	2.33	245.45	2.40	N/A	N/A
10.50	78.77	110.37	2.15	237.68	2.36	N/A	N/A

:: Strength loss calculation (Idriss & Boulanger (2008) :: (continued)

Depth (ft)	q_t (tsf)	Q_{tn}	K_c	$Q_{tn,cs}$	I_c	$S_{u(liq)}/\sigma'_v$	$S_{u(peak)}/\sigma'_v$
10.66	88.57	121.03	1.92	232.61	2.29	N/A	N/A
10.83	93.39	125.67	1.86	234.31	2.27	N/A	N/A
10.99	96.15	127.53	1.82	232.27	2.26	N/A	N/A
11.15	98.72	129.57	1.84	238.46	2.26	N/A	N/A
11.32	100.72	131.33	1.93	253.95	2.30	N/A	N/A
11.48	95.40	124.33	2.19	271.73	2.37	N/A	N/A
11.65	90.30	117.23	2.42	283.31	2.42	N/A	N/A
11.81	90.43	116.05	2.44	282.99	2.43	N/A	N/A
11.97	91.15	115.46	2.41	278.37	2.42	N/A	N/A
12.14	85.27	107.04	2.52	269.89	2.45	N/A	N/A
12.30	74.62	93.36	2.89	269.83	2.52	N/A	N/A
12.47	73.92	91.51	2.96	271.04	2.54	N/A	N/A
12.63	78.32	95.61	2.85	272.73	2.52	N/A	N/A
12.79	86.83	104.17	2.57	267.51	2.46	N/A	N/A
12.96	87.03	102.82	2.40	246.96	2.42	N/A	N/A
13.12	73.58	86.14	2.54	218.90	2.45	N/A	N/A
13.29	54.66	63.56	2.93	186.00	2.53	N/A	N/A
13.45	38.83	44.92	3.69	165.70	2.66	N/A	N/A
13.62	36.91	42.11	3.55	149.60	2.64	N/A	N/A
13.78	33.95	38.23	3.56	135.94	2.64	N/A	N/A
13.94	32.61	36.30	3.54	128.61	2.63	N/A	N/A
14.11	33.22	36.67	3.72	136.46	2.66	N/A	N/A
14.27	44.93	49.04	3.04	149.19	2.55	N/A	N/A
14.44	62.45	67.36	2.53	170.09	2.45	N/A	N/A
14.60	81.93	87.38	2.20	192.22	2.37	N/A	N/A
14.76	91.09	96.33	2.19	211.43	2.37	N/A	N/A
14.93	96.68	101.40	2.24	227.60	2.38	N/A	N/A
15.09	99.41	103.32	2.26	233.13	2.39	N/A	N/A
15.26	89.13	91.96	2.55	234.63	2.46	N/A	N/A
15.42	75.10	76.81	2.89	222.32	2.52	N/A	N/A
15.58	65.69	66.49	3.08	204.68	2.56	N/A	N/A
15.75	67.97	68.04	2.72	185.13	2.49	N/A	N/A
15.91	74.98	74.29	2.34	173.62	2.41	N/A	N/A
16.08	79.31	77.88	2.20	171.33	2.37	N/A	N/A
16.24	85.44	83.20	2.05	170.72	2.33	N/A	N/A
16.40	87.17	84.17	2.00	168.67	2.32	N/A	N/A
16.57	86.71	83.04	2.00	166.42	2.32	N/A	N/A
16.73	87.57	83.22	2.09	173.90	2.34	N/A	N/A
16.90	80.74	76.05	2.41	183.17	2.42	N/A	N/A
17.06	69.65	64.92	2.91	188.86	2.53	N/A	N/A
17.22	54.67	50.29	3.54	177.90	2.63	N/A	N/A
17.39	51.19	46.61	3.43	159.68	2.62	N/A	N/A
17.55	58.64	53.14	2.70	143.74	2.49	N/A	N/A
17.72	67.36	60.78	2.27	137.86	2.39	N/A	N/A
17.88	78.00	70.08	2.00	140.15	2.32	N/A	N/A
18.05	100.78	90.40	1.65	149.08	2.19	N/A	N/A
18.21	124.84	111.62	1.50	167.26	2.12	N/A	N/A
18.37	129.64	114.98	1.61	185.46	2.18	N/A	N/A

:: Strength loss calculation (Idriss & Boulanger (2008) :: (continued)

Depth (ft)	q_t (tsf)	Q_{tn}	K_c	$Q_{tn,cs}$	I_c	$S_{u(liq)}/\sigma'_v$	$S_{u(peak)}/\sigma'_v$
18.54	107.47	94.00	2.06	193.82	2.33	N/A	N/A
18.70	88.36	76.11	2.71	205.95	2.49	N/A	N/A
18.86	100.82	86.54	2.36	203.94	2.41	N/A	N/A
19.03	121.78	104.37	1.99	207.67	2.31	N/A	N/A
19.19	132.24	112.85	1.83	206.58	2.26	N/A	N/A
19.36	119.66	101.03	1.99	201.21	2.31	N/A	N/A
19.52	98.38	81.93	2.29	187.46	2.39	N/A	N/A
19.68	72.99	59.66	2.87	171.25	2.52	N/A	N/A
19.85	57.81	46.48	3.29	152.83	2.59	N/A	N/A
20.01	52.07	41.35	3.49	144.40	2.63	N/A	N/A
20.18	59.15	46.99	3.03	142.34	2.55	N/A	N/A
20.34	63.00	49.77	2.98	148.26	2.54	N/A	N/A
20.50	67.76	53.30	2.85	152.17	2.52	N/A	N/A
20.67	70.23	54.89	2.84	155.77	2.51	N/A	N/A
20.83	70.83	54.92	2.89	158.54	2.52	N/A	N/A
21.00	67.95	52.14	3.04	158.53	2.55	N/A	N/A
21.16	62.62	47.47	3.27	155.16	2.59	N/A	N/A
21.32	58.76	44.07	3.40	150.04	2.61	N/A	N/A
21.49	59.98	44.74	3.30	147.41	2.59	N/A	N/A
21.65	65.58	48.86	3.03	147.91	2.55	N/A	N/A
21.82	71.74	53.41	2.78	148.45	2.50	N/A	N/A
21.98	78.22	58.18	2.57	149.53	2.46	N/A	N/A
22.15	85.95	63.91	2.36	150.63	2.41	N/A	N/A
22.31	90.84	67.37	2.23	150.45	2.38	N/A	N/A
22.47	77.51	56.48	2.57	145.32	2.46	N/A	N/A
22.64	64.64	46.17	3.02	139.41	2.55	N/A	N/A
22.80	60.69	42.86	3.17	135.89	2.57	N/A	N/A
22.97	74.18	52.97	2.57	135.92	2.46	N/A	N/A
23.13	84.61	60.56	2.33	141.05	2.40	N/A	N/A
23.29	85.69	60.87	2.38	144.84	2.42	N/A	N/A
23.46	94.45	67.21	2.17	145.72	2.36	N/A	N/A
23.62	100.08	71.28	2.00	142.33	2.31	N/A	N/A
23.79	102.24	72.60	1.93	140.18	2.29	N/A	N/A
23.95	90.97	63.38	2.23	141.43	2.38	N/A	N/A
24.11	79.70	54.33	2.66	144.62	2.48	N/A	N/A
24.28	71.98	48.19	3.03	145.85	2.55	N/A	N/A
24.44	63.98	42.05	3.42	143.79	2.61	N/A	N/A
24.61	55.30	35.61	3.89	138.38	2.68	N/A	N/A
24.77	51.16	32.55	4.04	131.43	2.71	N/A	N/A
24.93	55.91	35.89	3.44	123.50	2.62	N/A	N/A
25.10	69.76	45.79	2.60	119.03	2.47	N/A	N/A
25.26	85.33	56.92	2.11	120.00	2.35	N/A	N/A
25.43	106.84	72.58	1.72	124.52	2.22	N/A	N/A
25.59	128.94	88.63	1.51	133.56	2.13	N/A	N/A
25.75	130.15	88.51	1.58	139.89	2.16	N/A	N/A
25.92	100.75	66.01	2.07	136.44	2.34	N/A	N/A
26.08	60.28	37.01	3.50	129.49	2.63	N/A	N/A
26.25	38.97	22.69	5.41	122.82	2.87	N/A	N/A

:: Strength loss calculation (Idriss & Boulanger (2008) :: (continued)

Depth (ft)	q_t (tsf)	Q_{tn}	K_c	$Q_{tn,cs}$	I_c	$S_{u(liq)}/\sigma'_v$	$S_{u(peak)}/\sigma'_v$
26.41	51.57	30.66	4.12	126.21	2.72	N/A	N/A
26.57	64.43	38.82	3.57	138.67	2.64	N/A	N/A
26.74	63.86	38.15	3.66	139.52	2.65	N/A	N/A
26.90	42.53	24.22	5.29	128.06	2.86	N/A	N/A
27.07	25.89	14.26	7.50	106.92	3.07	N/A	N/A
27.23	19.12	10.21	8.63	88.09	3.15	N/A	N/A
27.39	19.14	10.16	7.78	79.09	3.09	N/A	N/A
27.56	19.76	10.46	7.41	77.47	3.06	N/A	N/A
27.72	20.56	10.86	7.15	77.61	3.04	N/A	N/A
27.89	20.57	10.79	7.42	80.08	3.06	N/A	N/A
28.05	21.48	11.25	7.50	84.39	3.07	N/A	N/A
28.21	24.74	13.03	7.28	94.80	3.05	N/A	N/A
28.38	30.40	16.15	6.64	107.15	2.99	N/A	N/A
28.54	31.41	16.61	6.81	113.06	3.01	N/A	N/A
28.71	29.43	15.41	7.30	112.47	3.05	N/A	N/A
28.87	38.04	20.10	5.81	116.75	2.91	N/A	N/A
29.04	55.03	29.76	4.17	124.10	2.72	N/A	N/A
29.20	73.65	41.16	3.19	131.32	2.58	N/A	N/A
29.36	77.96	43.56	3.08	134.12	2.56	N/A	N/A
29.53	74.46	40.93	3.35	136.96	2.60	N/A	N/A
29.69	63.32	33.65	4.10	137.84	2.71	N/A	N/A
29.86	52.03	26.88	5.06	136.15	2.83	N/A	N/A
30.02	52.46	26.95	4.83	130.26	2.81	N/A	N/A
30.18	63.86	33.72	3.75	126.28	2.66	N/A	N/A
30.35	86.80	48.31	2.47	119.30	2.44	N/A	N/A
30.51	93.68	52.75	2.20	115.93	2.37	N/A	N/A
30.68	91.55	51.21	2.21	113.41	2.38	N/A	N/A
30.84	76.75	41.14	2.87	118.27	2.52	N/A	N/A
31.00	66.33	34.23	3.61	123.71	2.64	N/A	N/A
31.17	59.56	29.75	4.35	129.49	2.75	N/A	N/A
31.33	65.42	32.82	4.11	135.03	2.72	N/A	N/A
31.50	77.79	39.78	3.53	140.27	2.63	N/A	N/A
31.66	96.40	50.78	2.80	141.97	2.51	N/A	N/A
31.82	105.40	56.22	2.48	139.23	2.44	N/A	N/A
31.99	110.26	58.88	2.38	139.99	2.42	N/A	N/A
32.15	110.08	58.31	2.43	141.79	2.43	N/A	N/A
32.32	103.50	53.76	2.68	144.23	2.48	N/A	N/A
32.48	94.30	47.99	2.96	142.02	2.54	N/A	N/A
32.64	83.15	41.23	3.38	139.26	2.61	N/A	N/A
32.81	76.49	37.26	3.64	135.51	2.65	N/A	N/A
32.97	71.68	34.38	3.86	132.80	2.68	N/A	N/A
33.14	69.85	33.03	4.09	134.96	2.71	N/A	N/A
33.30	64.84	30.05	4.52	135.82	2.77	N/A	N/A
33.47	56.55	25.94	5.07	131.64	2.83	N/A	N/A
33.63	57.63	26.32	4.69	123.47	2.79	N/A	N/A
33.79	62.93	28.96	4.14	120.00	2.72	N/A	N/A
33.96	73.30	34.36	3.64	124.94	2.65	N/A	N/A
34.12	74.62	34.69	3.73	129.40	2.66	N/A	N/A

:: Strength loss calculation (Idriss & Boulanger (2008) :: (continued)

Depth (ft)	q_t (tsf)	Q_{tn}	K_c	$Q_{tn,cs}$	I_c	$S_{u(liq)}/\sigma'_v$	$S_{u(peak)}/\sigma'_v$
34.28	82.76	38.87	3.42	132.96	2.62	N/A	N/A
34.45	97.81	47.04	2.89	136.06	2.52	N/A	N/A
34.61	116.31	57.21	2.47	141.06	2.44	N/A	N/A
34.78	127.49	62.75	2.40	150.87	2.42	N/A	N/A
34.94	115.57	54.98	2.88	158.27	2.52	N/A	N/A
35.10	85.87	38.17	4.16	158.66	2.72	N/A	N/A
35.27	57.77	25.07	6.06	151.87	2.94	N/A	N/A
35.43	46.19	19.74	7.21	142.36	3.04	N/A	N/A
35.60	62.83	27.09	4.99	135.08	2.82	N/A	N/A
35.76	80.08	35.51	3.66	129.83	2.65	N/A	N/A
35.92	95.59	44.03	2.86	125.86	2.52	N/A	N/A
36.09	94.81	43.40	2.88	125.08	2.52	N/A	N/A
36.25	92.14	41.65	3.01	125.46	2.55	N/A	N/A
36.42	90.66	40.58	3.10	125.83	2.56	N/A	N/A
36.58	94.66	42.47	2.98	126.73	2.54	N/A	N/A
36.74	100.20	45.24	2.81	127.13	2.51	N/A	N/A
36.91	101.42	45.74	2.75	125.88	2.50	N/A	N/A
37.07	97.12	43.28	2.86	123.79	2.52	N/A	N/A
37.24	90.77	39.66	3.10	122.98	2.56	N/A	N/A
37.40	87.98	37.94	3.25	123.18	2.59	N/A	N/A
37.57	85.47	36.42	3.38	122.93	2.61	N/A	N/A
37.73	84.45	35.75	3.40	121.69	2.61	N/A	N/A
37.89	86.13	36.55	3.27	119.52	2.59	N/A	N/A
38.06	88.59	37.81	3.09	116.73	2.56	N/A	N/A
38.22	89.05	38.08	2.97	113.13	2.54	N/A	N/A
38.39	86.05	36.47	3.03	110.64	2.55	N/A	N/A
38.55	82.42	34.53	3.13	108.16	2.57	N/A	N/A
38.71	79.01	32.62	3.30	107.62	2.60	N/A	N/A
38.88	76.73	31.18	3.50	109.20	2.63	N/A	N/A
39.04	76.99	30.83	3.71	114.42	2.66	N/A	N/A
39.21	72.28	28.27	4.19	118.52	2.73	N/A	N/A
39.37	67.41	26.18	4.55	119.12	2.77	N/A	N/A
39.53	65.23	25.19	4.67	117.57	2.79	N/A	N/A
39.70	70.29	27.10	4.26	115.49	2.74	N/A	N/A
39.86	78.04	30.26	3.89	117.80	2.69	N/A	N/A
40.03	87.31	34.52	3.49	120.41	2.63	0.13	2.40
40.19	98.52	39.84	3.09	123.01	2.56	0.15	0.71
40.35	103.78	42.46	2.88	122.17	2.52	0.16	0.71
40.52	99.52	40.22	3.02	121.56	2.55	0.15	0.71
40.68	93.23	36.97	3.28	121.37	2.59	0.14	0.70
40.85	94.15	37.06	3.38	125.14	2.61	0.14	2.57
41.01	99.11	39.40	3.18	125.19	2.58	0.16	0.70
41.17	100.70	40.10	3.11	124.83	2.56	0.16	0.71
41.34	104.36	41.71	3.03	126.25	2.55	0.14	0.71
41.50	117.32	47.85	2.72	129.95	2.49	0.17	0.73
41.67	135.02	56.74	2.33	132.40	2.41	0.23	0.75
41.83	145.27	62.52	2.06	128.59	2.33	0.23	0.76
41.99	136.38	57.91	2.16	125.21	2.36	0.23	0.75

:: Strength loss calculation (Idriss & Boulanger (2008) :: (continued)

Depth (ft)	q_t (tsf)	Q_{tn}	K_c	$Q_{tn,cs}$	I_c	$S_{u(liq)}/\sigma'_v$	$S_{u(peak)}/\sigma'_v$
42.16	123.91	51.06	2.46	125.58	2.43	0.17	0.74
42.32	114.30	45.45	2.91	132.35	2.53	0.17	0.72
42.49	118.01	46.92	2.89	135.58	2.52	0.18	0.73
42.65	127.78	51.84	2.58	133.98	2.46	0.19	0.74
42.81	135.40	56.15	2.30	129.30	2.40	0.22	0.75
42.98	138.51	57.80	2.21	127.81	2.37	0.21	0.75
43.14	135.58	56.02	2.29	128.47	2.40	0.21	0.75
43.31	127.03	51.47	2.48	127.53	2.44	0.20	0.74
43.47	119.62	47.85	2.60	124.39	2.47	0.16	0.73
43.63	114.75	45.60	2.64	120.54	2.47	0.17	0.72
43.80	117.35	46.98	2.52	118.52	2.45	0.17	0.73
43.96	120.58	48.67	2.41	117.22	2.42	0.17	0.73
44.13	121.78	49.18	2.38	116.92	2.42	0.18	0.73
44.29	121.32	48.79	2.40	117.18	2.42	0.17	0.73
44.45	126.61	51.22	2.32	118.62	2.40	0.17	0.74
44.62	132.10	53.73	2.24	120.43	2.38	0.21	0.74
44.78	131.14	53.13	2.26	119.95	2.39	0.20	0.74
44.95	116.42	45.64	2.59	118.10	2.46	0.17	0.72
45.11	99.00	37.43	3.02	112.94	2.55	0.14	0.70
45.28	88.15	32.40	3.39	109.80	2.61	0.13	2.26
45.44	83.58	30.35	3.53	107.26	2.63	0.13	2.13
45.60	83.01	29.59	3.83	113.36	2.68	0.13	2.11
45.77	75.49	26.72	4.43	118.40	2.76	0.13	1.91
45.93	62.75	21.98	5.43	119.27	2.87	0.10	1.57
46.10	53.25	18.45	6.21	114.56	2.95	0.08	1.32
46.26	47.33	16.25	6.97	113.29	3.02	0.09	1.16
46.42	53.21	18.36	6.35	116.61	2.96	0.08	1.31
46.59	51.55	17.71	6.74	119.36	3.00	0.09	1.26
46.75	48.67	16.63	6.91	114.93	3.02	0.08	1.19
46.92	40.16	13.50	7.91	106.80	3.10	0.07	0.96
47.08	37.81	12.62	7.92	99.96	3.10	0.07	0.90
47.24	38.55	12.86	7.65	98.42	3.08	0.08	0.92
47.41	51.80	17.62	5.61	98.89	2.89	0.08	1.26
47.57	63.61	21.84	4.56	99.53	2.77	0.12	1.56
47.74	76.99	26.61	3.80	101.10	2.67	0.12	1.90
47.90	78.62	27.13	3.86	104.73	2.68	0.12	1.94
48.06	82.58	28.60	3.72	106.38	2.66	0.12	2.04
48.23	85.50	29.75	3.61	107.27	2.64	0.13	2.11
48.39	86.00	29.96	3.56	106.77	2.64	0.13	2.11
48.56	81.68	28.04	3.75	105.18	2.67	0.12	2.00
48.72	79.93	27.32	3.79	103.59	2.67	0.12	1.95
48.88	80.11	27.33	3.80	103.74	2.67	0.12	1.95
49.05	81.69	27.88	3.73	104.12	2.66	0.13	1.99
49.21	81.37	27.66	3.81	105.43	2.67	0.12	1.98
49.38	81.14	27.52	3.87	106.46	2.68	0.12	1.97
49.54	81.56	27.62	3.93	108.49	2.69	0.12	1.97
49.70	84.72	28.67	3.80	109.03	2.67	0.13	2.05
49.87	91.55	31.38	3.53	110.90	2.63	0.13	2.21

:: Strength loss calculation (Idriss & Boulanger (2008) :: (continued)

Depth (ft)	q_t (tsf)	Q_{tn}	K_c	$Q_{tn,cs}$	I_c	$S_{u(liq)}/\sigma'_v$	$S_{u(peak)}/\sigma'_v$
50.03	106.94	38.20	2.92	111.71	2.53	0.15	0.70
50.20	137.39	54.34	1.87	101.58	2.27	0.16	0.74
50.36	160.24	68.99	1.38	95.05	2.05	0.23	0.78
50.52	164.24	74.58	1.20	89.44	1.91	0.16	0.79
50.69	166.99	72.66	1.33	96.40	2.02	0.14	0.78
50.85	195.76	85.84	1.30	111.90	2.00	0.24	0.81
51.02	230.06	101.66	1.28	130.13	1.98	0.83	0.83
51.18	209.08	89.31	1.39	124.51	2.06	0.81	0.81
51.34	136.24	51.81	2.09	108.10	2.34	0.17	0.74
51.51	67.47	22.11	4.11	90.95	2.72	0.08	1.58
51.67	37.25	11.68	6.48	75.63	2.98	0.07	0.83
51.84	36.67	11.46	5.58	63.98	2.89	0.08	0.82
52.00	36.07	11.23	5.64	63.31	2.89	0.08	0.80
52.16	34.70	10.74	5.74	61.69	2.90	0.08	0.77
52.33	31.92	9.77	5.96	58.22	2.93	0.07	0.70
52.49	29.43	8.91	6.05	53.85	2.93	0.07	0.64
52.66	30.24	9.17	5.86	53.70	2.92	0.07	0.65
52.82	37.12	11.49	5.35	61.50	2.86	0.08	0.82
52.99	46.50	14.65	5.69	83.31	2.90	0.09	1.05
53.15	63.23	20.29	5.23	106.13	2.85	0.09	1.45
53.31	138.52	50.23	2.36	118.45	2.41	0.11	0.73
53.48	293.06	130.23	1.21	157.32	1.92	0.87	0.87
53.64	440.53	219.05	1.00	219.05	1.64	0.94	0.94
53.81	526.63	274.43	1.00	274.43	1.52	0.98	0.98
53.97	531.14	276.91	1.00	276.91	1.51	0.98	0.98

Abbreviations

q_t: Total cone resistance
K_c: Cone resistance correction factor due to fines
$Q_{tn,cs}$: Adjusted and corrected cone resistance due to fines
I_c: Soil behavior type index
$S_{u(liq)}/\sigma'_v$: Calculated liquefied undrained strength ratio
$S_{u(peak)}/\sigma'_v$: Calculated peak undrained strength ratio

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Investigation • Design • Construction Support

SITE RESEARCH

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USGS Design Maps Summary Report

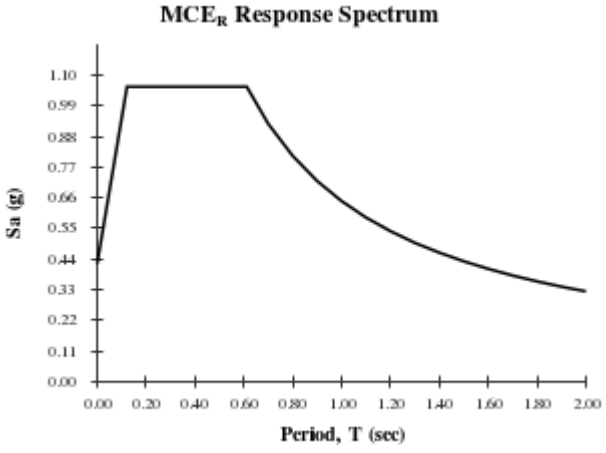
User–Specified Input

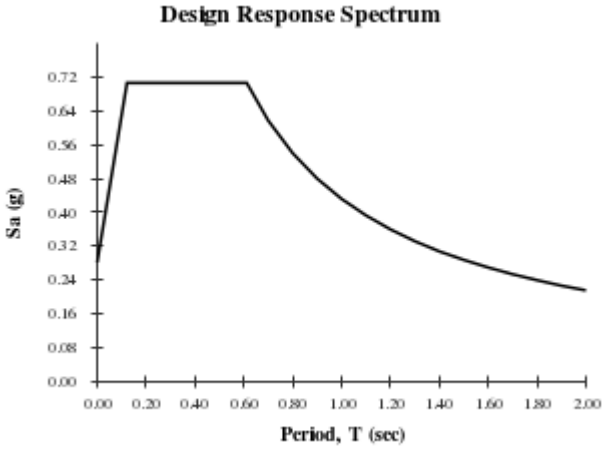
Report Title	18-4970 Wed July 25, 2018 22:28:38 UTC
Building Code Reference Document	ASCE 7-10 Standard (which utilizes USGS hazard data available in 2008)
Site Coordinates	45.34592°N, 122.65094°W
Site Soil Classification	Site Class D – "Stiff Soil"
Risk Category	I/II/III

USGS–Provided Output

S_S =	0.942 g	S_{MS} =	1.058 g	S_{DS} =	0.706 g
S_1 =	0.407 g	S_{M1} =	0.648 g	S_{D1} =	0.432 g

For information on how the SS and S1 values above have been calculated from probabilistic (risk-targeted) and deterministic ground motions in the direction of maximum horizontal response, please return to the application and select the "2009 NEHRP" building code reference document.





For PGA_M, T_L, C_{RS}, and C_{R1} values, please view the detailed report.

Design Maps Detailed Report

ASCE 7-10 Standard (45.34592°N, 122.65094°W)

Site Class D – "Stiff Soil", Risk Category I/II/III

Section 11.4.1 — Mapped Acceleration Parameters

Note: Ground motion values provided below are for the direction of maximum horizontal spectral response acceleration. They have been converted from corresponding geometric mean ground motions computed by the USGS by applying factors of 1.1 (to obtain S_S) and 1.3 (to obtain S_1). Maps in the 2010 ASCE-7 Standard are provided for Site Class B. Adjustments for other Site Classes are made, as needed, in Section 11.4.3.

From Figure 22-1 [1]	S_S = 0.942 g
From Figure 22-2 [2]	S_1 = 0.407 g

Section 11.4.2 — Site Class

The authority having jurisdiction (not the USGS), site-specific geotechnical data, and/or the default has classified the site as Site Class D, based on the site soil properties in accordance with Chapter 20.

Table 20.3–1 Site Classification

Site Class	$\overline{v}_s$	$\overline{N}$ or $\overline{N}_{ch}$	$\overline{s}_u$
A. Hard Rock	>5,000 ft/s	N/A	N/A
B. Rock	2,500 to 5,000 ft/s	N/A	N/A
C. Very dense soil and soft rock	1,200 to 2,500 ft/s	>50	>2,000 psf
D. Stiff Soil	600 to 1,200 ft/s	15 to 50	1,000 to 2,000 psf
E. Soft clay soil	<600 ft/s	<15	<1,000 psf
	Any profile with more than 10 ft of soil having the characteristics: • Plasticity index PI > 20, • Moisture content w ≥ 40%, and • Undrained shear strength $\overline{s}_u$ < 500 psf		
F. Soils requiring site response analysis in accordance with Section 21.1	See Section 20.3.1		

For SI: 1ft/s = 0.3048 m/s 1lb/ft² = 0.0479 kN/m²

Section 11.4.3 — Site Coefficients and Risk–Targeted Maximum Considered Earthquake (MCE_R) Spectral Response Acceleration Parameters

Table 11.4–1: Site Coefficient F_a

Site Class	Mapped MCE_R Spectral Response Acceleration Parameter at Short Period				
	$S_S \leq 0.25$	$S_S = 0.50$	$S_S = 0.75$	$S_S = 1.00$	$S_S \geq 1.25$
A	0.8	0.8	0.8	0.8	0.8
B	1.0	1.0	1.0	1.0	1.0
C	1.2	1.2	1.1	1.0	1.0
D	1.6	1.4	1.2	1.1	1.0
E	2.5	1.7	1.2	0.9	0.9
F	See Section 11.4.7 of ASCE 7				

Note: Use straight–line interpolation for intermediate values of S_S

For Site Class = D and S_S = 0.942 g, F_a = 1.123

Table 11.4–2: Site Coefficient F_v

Site Class	Mapped MCE_R Spectral Response Acceleration Parameter at 1–s Period				
	$S_1 \leq 0.10$	$S_1 = 0.20$	$S_1 = 0.30$	$S_1 = 0.40$	$S_1 \geq 0.50$
A	0.8	0.8	0.8	0.8	0.8
B	1.0	1.0	1.0	1.0	1.0
C	1.7	1.6	1.5	1.4	1.3
D	2.4	2.0	1.8	1.6	1.5
E	3.5	3.2	2.8	2.4	2.4
F	See Section 11.4.7 of ASCE 7				

Note: Use straight–line interpolation for intermediate values of S_1

For Site Class = D and S_1 = 0.407 g, F_v = 1.593

Equation (11.4–1): $S_{MS} = F_a S_S = 1.123 \times 0.942 = 1.058$ g

---

Equation (11.4–2): $S_{M1} = F_v S_1 = 1.593 \times 0.407 = 0.648$ g

---

Section 11.4.4 — Design Spectral Acceleration Parameters

Equation (11.4–3): $S_{DS} = \frac{2}{3} S_{MS} = \frac{2}{3} \times 1.058 = 0.706$ g

---

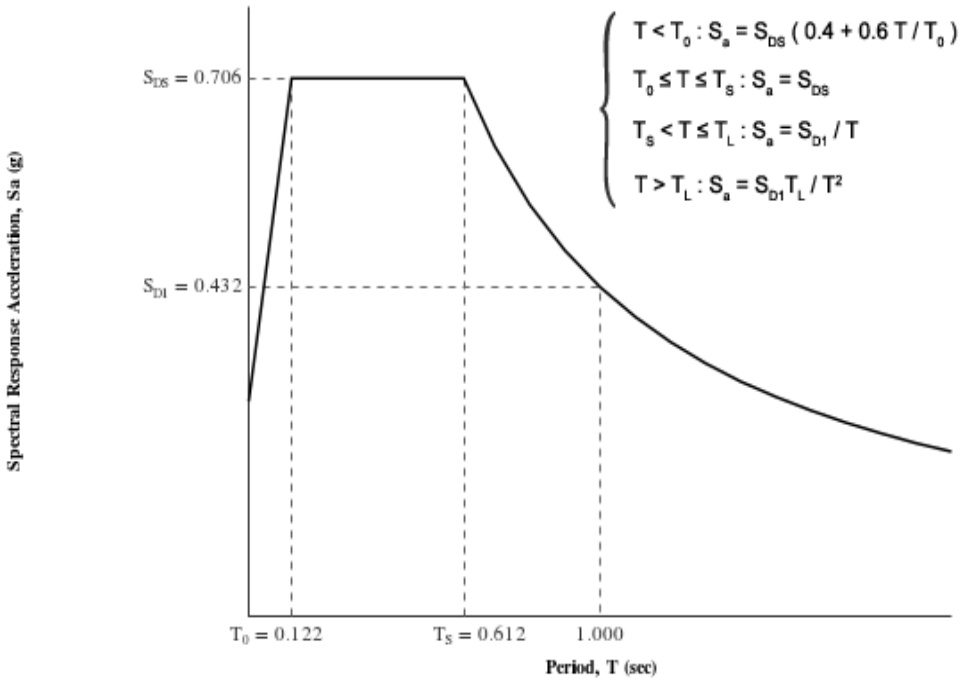
Equation (11.4–4): $S_{D1} = \frac{2}{3} S_{M1} = \frac{2}{3} \times 0.648 = 0.432$ g

---

Section 11.4.5 — Design Response Spectrum

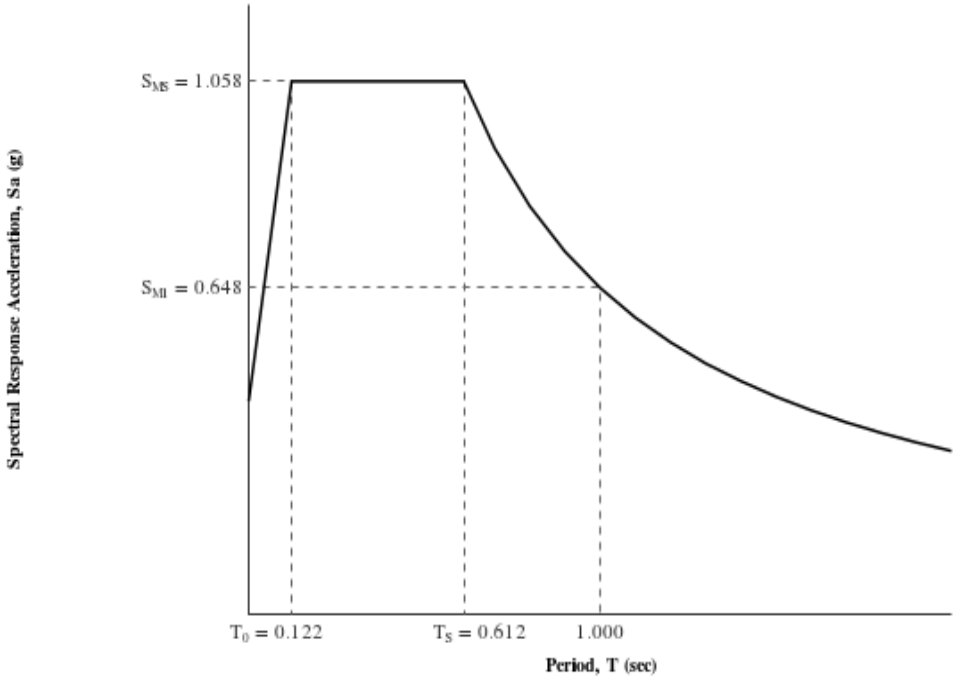
From Figure 22-12 [3] $T_L = 16$ seconds

Figure 11.4–1: Design Response Spectrum



Section 11.4.6 — Risk-Targeted Maximum Considered Earthquake (MCE_R) Response Spectrum

The MCE_R Response Spectrum is determined by multiplying the design response spectrum above by 1.5.



Section 11.8.3 — Additional Geotechnical Investigation Report Requirements for Seismic Design Categories D through F

From Figure 22-7 [4] PGA = 0.411

Equation (11.8–1): $PGA_M = F_{PGA}PGA = 1.089 \times 0.411 = 0.447$ g

Table 11.8–1: Site Coefficient F_{PGA}

Site Class	Mapped MCE Geometric Mean Peak Ground Acceleration, PGA				
	PGA ≤ 0.10	PGA = 0.20	PGA = 0.30	PGA = 0.40	PGA ≥ 0.50
A	0.8	0.8	0.8	0.8	0.8
B	1.0	1.0	1.0	1.0	1.0
C	1.2	1.2	1.1	1.0	1.0
D	1.6	1.4	1.2	1.1	1.0
E	2.5	1.7	1.2	0.9	0.9
F	See Section 11.4.7 of ASCE 7				

Note: Use straight–line interpolation for intermediate values of PGA

For Site Class = D and PGA = 0.411 g, F_{PGA} = 1.089

Section 21.2.1.1 — Method 1 (from Chapter 21 – Site-Specific Ground Motion Procedures for Seismic Design)

From Figure 22-17 [5] C_{RS} = 0.903

From Figure 22-18 [6] C_{R1} = 0.872

Section 11.6 — Seismic Design Category

Table 11.6-1 Seismic Design Category Based on Short Period Response Acceleration Parameter

VALUE OF S_{DS}	RISK CATEGORY		
	I or II	III	IV
$S_{DS} < 0.167g$	A	A	A
$0.167g \le S_{DS} < 0.33g$	B	B	C
$0.33g \le S_{DS} < 0.50g$	C	C	D
$0.50g \le S_{DS}$	D	D	D

For Risk Category = I and S_{DS} = 0.706 g, Seismic Design Category = D

Table 11.6-2 Seismic Design Category Based on 1-S Period Response Acceleration Parameter

VALUE OF S_{D1}	RISK CATEGORY		
	I or II	III	IV
$S_{D1} < 0.067g$	A	A	A
$0.067g \le S_{D1} < 0.133g$	B	B	C
$0.133g \le S_{D1} < 0.20g$	C	C	D
$0.20g \le S_{D1}$	D	D	D

For Risk Category = I and S_{D1} = 0.432 g, Seismic Design Category = D

Note: When S_1 is greater than or equal to 0.75g, the Seismic Design Category is **E** for buildings in Risk Categories I, II, and III, and **F** for those in Risk Category IV, irrespective of the above.

Seismic Design Category ≡ "the more severe design category in accordance with Table 11.6-1 or 11.6-2" = D

Note: See Section 11.6 for alternative approaches to calculating Seismic Design Category.

References

1. *Figure 22-1*: https://earthquake.usgs.gov/hazards/designmaps/downloads/pdfs/2010_ASCE-7_Figure_22-1.pdf
2. *Figure 22-2*: https://earthquake.usgs.gov/hazards/designmaps/downloads/pdfs/2010_ASCE-7_Figure_22-2.pdf
3. *Figure 22-12*: https://earthquake.usgs.gov/hazards/designmaps/downloads/pdfs/2010_ASCE-7_Figure_22-12.pdf
4. *Figure 22-7*: https://earthquake.usgs.gov/hazards/designmaps/downloads/pdfs/2010_ASCE-7_Figure_22-7.pdf
5. *Figure 22-17*: https://earthquake.usgs.gov/hazards/designmaps/downloads/pdfs/2010_ASCE-7_Figure_22-17.pdf
6. *Figure 22-18*: https://earthquake.usgs.gov/hazards/designmaps/downloads/pdfs/2010_ASCE-7_Figure_22-18.pdf

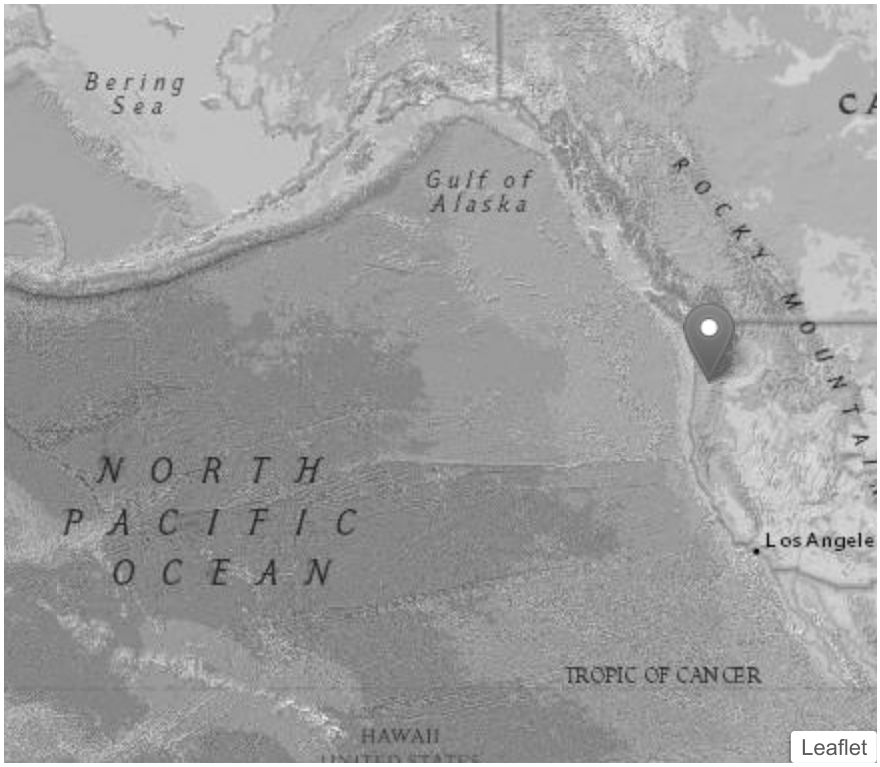
U.S. Geological Survey - Earthquake Hazards Program

Due to insufficient resources and the recent development of similar web tools by third parties, this spring the USGS will be streamlining the two U.S. Seismic Design Maps web applications, including the one below. Whereas the current applications each interact with users through a graphical user interface (GUI), the new web services will receive the inputs (e.g. latitude and longitude) in the form of a web address and return the outputs (e.g. S_{DS} and S_{D1}) in text form, without supplementary graphics. Though designed primarily to be read by the aforementioned third-party web GUIs, the text outputs are also human-readable. To preview the new web services, please click here. Step-by-step instructions for using one of these web services, namely that for the recently published 2016 ASCE 7 Standard, are posted here.

18-4970 8TH Court

Latitude = 45.346°N, Longitude = 122.650°W

Location



Reference Document

2015 NEHRP Provisions

Site Class

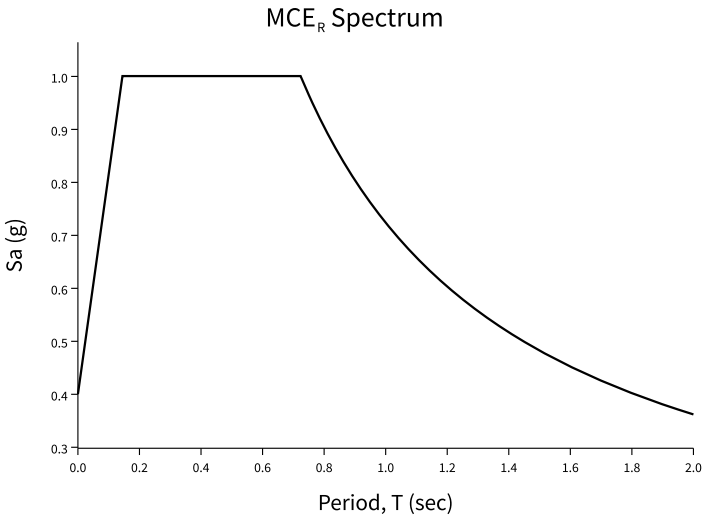
D (default): Stiff Soil

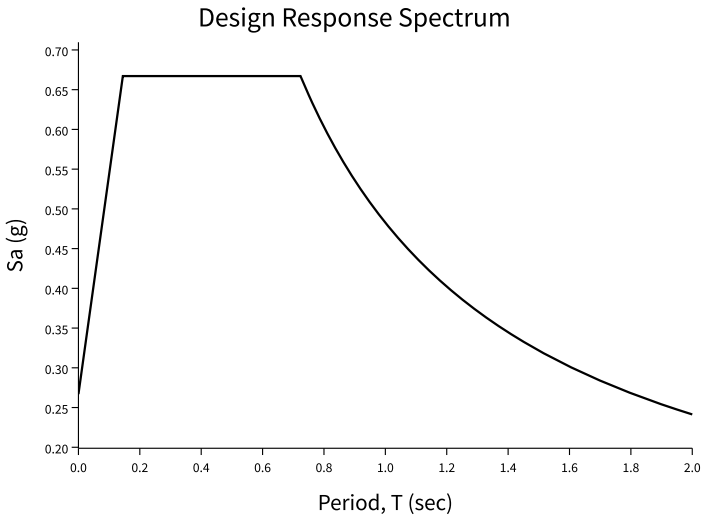
Risk Category

I or II or III

S_S =	0.834 g	**S_{MS} =**	1.001 g	**S_{DS} =**	0.667 g
S_1 =	0.376 g	**S_{M1} =**	0.724 g[1]	**S_{D1} =**	0.483 g[1]

[1] Since the Site Class is D and $S_1 \geq 0.2$ g, site-specific ground motions might be required. See Section 11.4.7 of the 2015 NEHRP Provisions.


MCE$_R$ Spectrum
Sa (g)
1.0
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.0
0.2
0.4
0.6
0.8
1.0
1.2
1.4
1.6
1.8
2.0
Period, T (sec)


Design Response Spectrum
Sa (g)
0.70
0.65
0.60
0.55
0.50
0.45
0.40
0.35
0.30
0.25
0.20
0.0
0.2
0.4
0.6
0.8
1.0
1.2
1.4
1.6
1.8
2.0
Period, T (sec)

Mapped Acceleration Parameters, Long-Period Transition Periods, and Risk Coefficients

Note: The S_S and S_1 ground motion maps provided below are for the direction of maximmum horizontal spectral response acceleration. They have been converted from corresponding geometric mean ground motions computed by the USGS by applying factors of 1.1 (to obtain S_S) 1.3 (to obtain S_1).

- FIGURE 22-1 S_S Risk-Targeted Maximum Considered Earthquake (MCE_R) Ground Motion Parameter for the Conterminous United States for 0.2 s Spectral Response Acceleration (5% of Critical Damping), Site Class B
- FIGURE 22-2 S_1 Risk-Targeted Maximum Considered Earthquake (MCE_R) Ground Motion Parameter for the Conterminous United States for 1.0 s Spectral Response Acceleration (5% of Critical Damping), Site Class B
- FIGURE 22-9 Maximum Considered Earthquake Geometric Mean (MCE_G) PGA, %g, Site Class B for the Conterminous United States
- FIGURE 22-14 Mapped Long-Period Transition Period, T_L (s), for the Conterminous United States
- FIGURE 22-18 Mapped Risk Coefficient at 0.2 s Spectral Response Period, C_{RS}
- FIGURE 22-19 Mapped Risk Coefficient at 1.0 s Spectral Response Period, C_{R1}

Site Class

The authority having jurisdiction (not the USGS), site-specific geotechnical data, and/or the default has classified the site class as Site Class , based on the site soil properties in accordance with Chapter 20.

Table 20.3-1 Site Classification

Site Class	$\bar{v}_S$	$\bar{N}$ or $\bar{N}_{ch}$	$\bar{s}_u$
A. Hard Rock	>5,000 ft/s	N/A	N/A
B. Rock	2,500 to 5,000 ft/s	N/A	N/A
C. Very dense soil and soft rock	1,200 to 2,500 ft/s	>50	>2,000 psf
D. Stiff Soil	600 to 1,200 ft/s	15 to 50	1,000 to 2,000 psf
E. Soft clay soil	<600 ft/s	<15	<1,000 psf
	Any profile with more than 10 ft of soil having the characteristics: • Plasticity index PI > 20 • Moisture content w ≥ 40%, and • Undrained shear strength $\bar{s}_u$ < 500 psf		
F. Soils requiring site response analysis in accordance with Section 21.1	See Section 20.3.1		
For SI: 1ft/s = 0.3048 m/s 1lb/ft^2 = 0.0479 kN/m^2			

Site Coefficients and Risk-Targeted Maximum Considered Earthquake (MCE_R) Spectral Response Acceleration Parameters

Risk-targeted Ground Motion (0.2 s)	$C_{RS}S_{SUH} = 0.891 \times 0.936 = 0.834$ g
Deterministic Ground Motion (0.2 s)	$S_{SD} = 1.500$ g
	$S_S \equiv$ "Lesser of $C_{RS}S_{SUH}$ and S_{SD}" = 0.834 g
Risk-targeted Ground Motion (1.0 s)	$C_{R1}S_{1UH} = 0.865 \times 0.435 = 0.376$ g
Deterministic Ground Motion (1.0 s)	$S_{1D} = 0.600$ g
	$S_1 \equiv$ "Lesser of $C_{R1}S_{1UH}$ and S_{1D}" = 0.376 g

Table 11.4-1: Site Coefficient F_a

Site Class	Spectral Reponse Acceleration Parameter at Short Period					
	$S_S \leq 0.25$	$S_S = 0.50$	$S_S = 0.75$	$S_S = 1.00$	$S_S = 1.25$	$S_S \geq 1.50$
A	0.8	0.8	0.8	0.8	0.8	0.8
B (measured)	0.9	0.9	0.9	0.9	0.9	0.9
B (unmeasured)	1.0	1.0	1.0	1.0	1.0	1.0
C	1.3	1.3	1.2	1.2	1.2	1.2
D (determined)	1.6	1.4	1.2	1.1	1.0	1.0
D (default)	1.6	1.4	1.2	1.2	1.2	1.2
E	2.4	1.7	1.3	1.2 *	1.2 *	1.2 *
F	See Section 11.4.7					

* For Site Class E and $S_S \geq 1.0$ g, see the requirements for site-specific ground motions in Section 11.4.7 of the 2015 NEHRP Provisions. Here the exception to those requirements allowing F_a to be taken as equal to that of Site Class C has been invoked.

Note: Use straight-line interpolation for intermediate values of S_S.

Note: Where Site Class B is selected, but site-specific velocity measurements are not made, the value of F_a shall be taken as 1.0 per Section 11.4.2.

Note: Where Site Class D is selected as the default site class per Section 11.4.2, the value of F_a shall not be less than 1.2 per Section 11.4.3.

For Site Class = D (default) and S_S = 0.834 g, F_a = 1.200

Table 11.4-2: Site Coefficient F_v

Site Class	Spectral Response Acceleration Parameter at 1-Second Period					
	$S_1 \leq 0.10$	$S_1 = 0.20$	$S_1 = 0.30$	$S_1 = 0.40$	$S_1 = 0.50$	$S_1 \geq 0.60$
A	0.8	0.8	0.8	0.8	0.8	0.8
B (measured)	0.8	0.8	0.8	0.8	0.8	0.8
B (unmeasured)	1.0	1.0	1.0	1.0	1.0	1.0
C	1.5	1.5	1.5	1.5	1.5	1.4
D (determined)	2.4	2.2 [1]	2.0 [1]	1.9 [1]	1.8 [1]	1.7 [1]
D (default)	2.4	2.2 [1]	2.0 [1]	1.9 [1]	1.8 [1]	1.7 [1]
E	4.2	3.3 [1]	2.8 [1]	2.4 [1]	2.2 [1]	2.0 [1]
F	See Section 11.4.7					

[1] For Site Class D or E and $S_1 \geq 0.2$ g, site-specific ground motions might be required. See Section 11.4.7 of the 2015 NEHRP Provisions.

Note: Use straight-line interpolation for intermediate values of S_1.

Note: Where Site Class B is selected, but site-specific velocity measurements are not made, the value of F_v shall be taken as 1.0 per Section 11.4.2.

For Site Class = D (default) and $S_1 = 0.376$ g, $F_v = 1.924$

Site-adjusted MCE_R (0.2 s)

$$S_{MS} = F_a S_S = 1.200 \times 0.834 = 1.001 \text{ g}$$

Site-adjusted MCE_R (1.0 s)

$$S_{M1} = F_v S_1 = 1.924 \times 0.376 = 0.724 \text{ g}$$

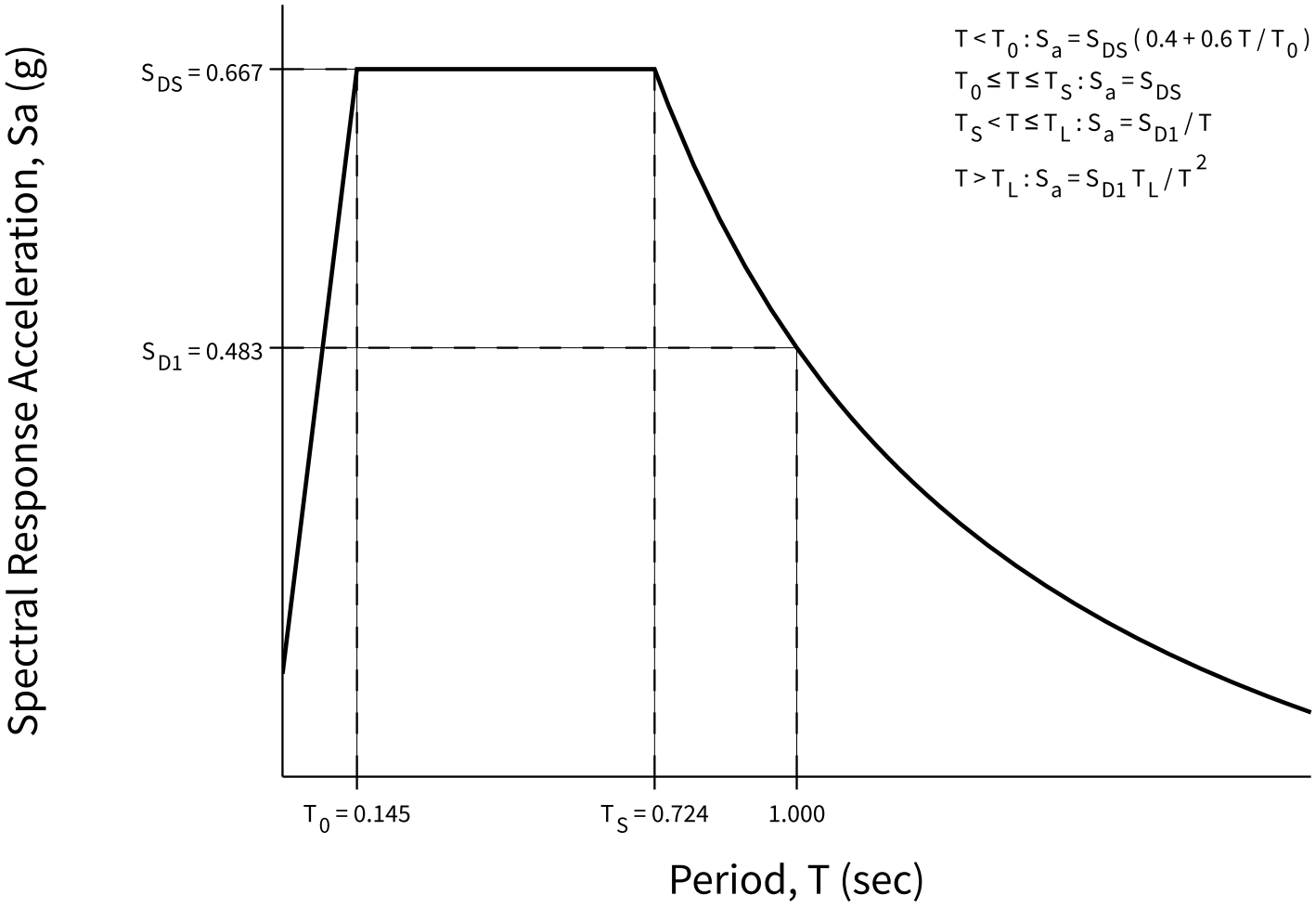
Design Spectral Acceleration Parameters

Design Ground Motion (0.2 s)	$S_{DS} = ⅔\ S_{MS} = ⅔ \times 1.001 = 0.667$ g
Design Ground Motion (1.0 s)	$S_{D1} = ⅔\ S_{M1} = ⅔ \times 0.724 = 0.483$ g

Design Response Spectrum

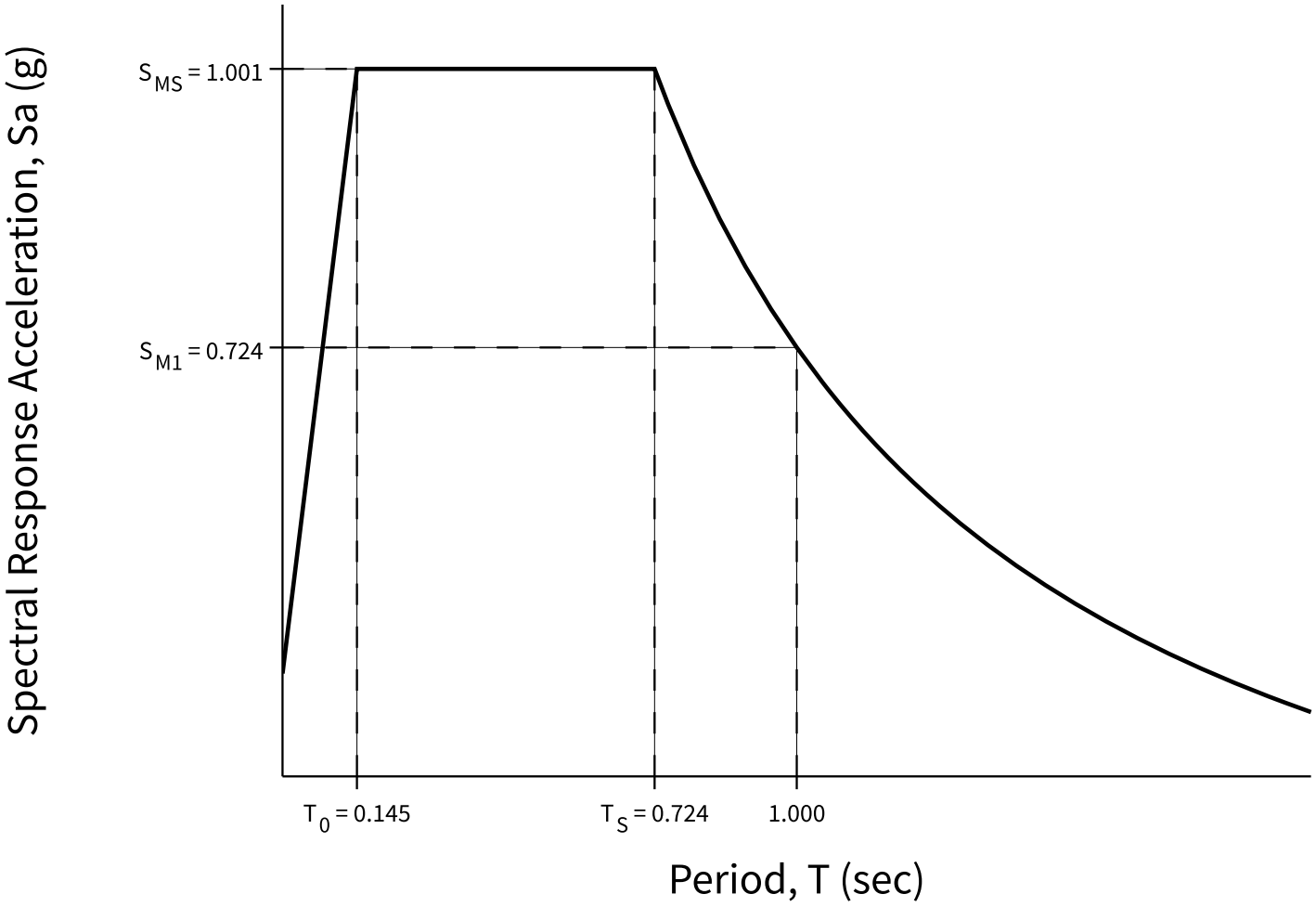
Long-Period Transition Period = T_L = 16 s

Figure 11.4-1: Design Response Spectrum


Spectral Response Acceleration, Sa (g)
$S_{DS} = 0.667$
$S_{D1} = 0.483$
$T < T_0 : S_a = S_{DS}(0.4 + 0.6\,T / T_0)$
$T_0 \le T \le T_S : S_a = S_{DS}$
$T_S < T \le T_L : S_a = S_{D1} / T$
$T > T_L : S_a = S_{D1}\,T_L / T^2$
$T_0 = 0.145$
$T_S = 0.724$
1.000
Period, T (sec)

MCE_R Response Spectrum

The MCE_R response spectrum is determined by multiplying the design response spectrum above by 1.5.



Additional Geotechnical Investigation Report Requirements for Seismic Design Categories D through F

Table 11.8-1: Site Coefficient for F_{PGA}

Site Class	Mapped MCE Geometric Mean (MCE_G) Peak Ground Acceleration					
	PGA ≤ 0.10	PGA = 0.20	PGA = 0.30	PGA = 0.40	PGA = 0.50	PGA ≥ 0.60
A	0.8	0.8	0.8	0.8	0.8	0.8
B (measured)	0.9	0.9	0.9	0.9	0.9	0.9
B (unmeasured)	1.0	1.0	1.0	1.0	1.0	1.0
C	1.3	1.2	1.2	1.2	1.2	1.2
D (determined)	1.6	1.4	1.3	1.2	1.1	1.1
D (default)	1.6	1.4	1.3	1.2	1.2	1.2
E	2.4	1.9	1.6	1.4	1.2	1.1
F	See Section 11.4.7					

Note: Use straight-line interpolation for intermediate values of PGA

Note: Where Site Class D is selected as the default site class per Section 11.4.2, the value of F_{pga} shall not be less than 1.2.

For Site Class = D (default) and PGA = 0.376 g, $F_{PGA} = 1.224$

Mapped MCE_G

PGA = 0.376 g

Site-adjusted MCE_G

$PGA_M = F_{PGA}PGA = 1.224 \times 0.376 = 0.460$ g

Summary statistics for, Deaggregation: Total

Deaggregation targets

Return period: 2475 yrs
Exceedance rate: 0.0004040404 yr^{-1}
PGA ground motion: 0.38787598 g

Recovered targets

Return period: 2503.542 yrs
Exceedance rate: 0.00039943409 yr^{-1}

Totals

Binned: 100 %
Residual: 0 %
Trace: 0.61 %

Mean (for all sources)

r: 54.65 km
m: 7.55
ε_0: 0.87 σ

Mode (largest r-m bin)

r: 83.56 km
m: 9.34
ε_0: 0.65 σ
Contribution: 10.11 %

Mode (largest ε_0 bin)

r: 83.53 km
m: 9.01
ε_0: 0.72 σ
Contribution: 7.05 %

Discretization

r: min = 0.0, max = 1000.0, Δ = 20.0 km
m: min = 4.4, max = 9.4, Δ = 0.2
ε: min = -3.0, max = 3.0, Δ = 0.5 σ

Epsilon keys

ε0: [-∞ .. -2.5)
ε1: [-2.5 .. -2.0)
ε2: [-2.0 .. -1.5)
ε3: [-1.5 .. -1.0)
ε4: [-1.0 .. -0.5)
ε5: [-0.5 .. 0.0)
ε6: [0.0 .. 0.5)
ε7: [0.5 .. 1.0)
ε8: [1.0 .. 1.5)
ε9: [1.5 .. 2.0)
ε10: [2.0 .. 2.5)
ε11: [2.5 .. +∞]

Deaggregation Contributors

Source Set ↳ Source	Type	r	m	ε_0	lon	lat	az	%
sub0_ch_bot.in	Interface							23.94
Cascadia Megathrust - whole CSZ Characteristic		83.56	9.11	0.78	123.599°W	45.501°N	283.46	23.94
sub0_ch_mid.in	Interface							9.24
Cascadia Megathrust - whole CSZ Characteristic		134.01	8.93	1.52	124.330°W	45.489°N	277.52	9.24
coastalOR_deep.in	Slab							7.24
Geologic Model Partial Rupture	Fault							6.63
Portland Hills		8.67	6.77	0.03	122.566°W	45.386°N	55.75	6.28
Geologic Model Full Rupture	Fault							5.03
Portland Hills		6.89	7.00	-0.44	122.566°W	45.386°N	55.75	4.73
Geologic Model Small Mag	Fault							4.74
Bolton		2.85	6.15	-0.19	122.616°W	45.365°N	50.61	3.76
WUSmap_2014_fixSm.ch.in (opt)	Grid							4.69
PointSourceFinite: -122.649, 45.404		7.73	5.99	0.77	122.649°W	45.404°N	0.00	1.47
PointSourceFinite: -122.649, 45.413		8.68	5.81	1.05	122.649°W	45.413°N	0.00	1.06
noPuget_2014_fixSm.ch.in (opt)	Grid							4.69
PointSourceFinite: -122.649, 45.404		7.73	5.99	0.77	122.649°W	45.404°N	0.00	1.47
PointSourceFinite: -122.649, 45.413		8.68	5.81	1.05	122.649°W	45.413°N	0.00	1.06
WUSmap_2014_fixSm.gr.in (opt)	Grid							4.40
PointSourceFinite: -122.649, 45.404		7.73	5.99	0.77	122.649°W	45.404°N	0.00	1.47
noPuget_2014_fixSm.gr.in (opt)	Grid							4.40
PointSourceFinite: -122.649, 45.404		7.73	5.99	0.77	122.649°W	45.404°N	0.00	1.47
sub0_ch_top.in	Interface							2.05
Cascadia Megathrust - whole CSZ Characteristic		149.89	8.83	1.78	124.549°W	45.485°N	276.61	2.05
coastalOR_deep.in	Slab							1.77
sub2_ch_bot.in	Interface							1.48
Cascadia Megathrust - Goldfinger Case C Characteristic		95.79	8.74	1.16	123.702°W	45.000°N	245.39	1.48
WUSmap_2014_fixSm_M8.in (opt)	Grid							1.37
noPuget_2014_fixSm_M8.in (opt)	Grid							1.37
Zeng Model Partial Rupture	Fault							1.22
Portland Hills		8.67	6.77	0.03	122.566°W	45.386°N	55.75	1.16
Zeng Model Small Mag	Fault							1.09

Source Set ↳ Source	Type	r	m	ε_0	lon	lat	az	%
sub1_ch_bot.in	Interface							1.06
Cascadia Megathrust - Goldfinger Case B Characteristic		82.93	8.86	0.90	123.599°W	45.501°N	283.46	1.06

GeoPacific Engineering, Inc.
Real-World Geotechnical Solutions
Investigation • Design • Construction Support

PHOTOGRAPHIC LOG

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8TH COURT REDEVELOPMENT
GEOTECHNICAL SITE INVESTIGATION
PHOTOGRAPHIC LOG

View of Site from 8TH Court, Facing East

Boring B-1, Facing West

8TH COURT REDEVELOPMENT
GEOTECHNICAL SITE INVESTIGATION
PHOTOGRAPHIC LOG

Boring B-1, Contact to Native Soil at 6.3 feet bgs.

Boring B-1, Potentially Liquefiable Soil at 40 Feet bgs

8TH COURT REDEVELOPMENT
GEOTECHNICAL SITE INVESTIGATION
PHOTOGRAPHIC LOG

Boring B-2, Bedrock Encountered at 20.9 Feet bgs

Boring B-3, Contact to Native Soil at 8.0 Feet bgs

8TH COURT REDEVELOPMENT
GEOTECHNICAL SITE INVESTIGATION
PHOTOGRAPHIC LOG

Boring B-3, Potentially Liquefiable Soil at 40 Feet bgs

WDY Structural • Civil Engineers

PRELIMINARY STORM DRAINAGE CALCULATIONS

FOR

8th Court Commercial

2180 8th CT
WEST LINN, OR 97068

September 13, 2018

TABLE OF CONTENTS/INCLUSIONS:

WDY Structural • Civil Engineers

Edge Development
735 SW 20th Place, Suite 220
Portland, OR 97205

September 13, 2018

RE: 8th Court Commercial Preliminary "Storm Drainage Narrative"

Dear Mr. Bruin,

At your request, WDY, Inc. has completed the following storm drainage calculations for 2180 8th Court in West Linn, Oregon. The purpose of this report is to design a stormwater detention system using HDPE detention pipe and a detention control manhole and to design water quality treatment using BayFilter catch basins. The storm drainage detention design is per the City of West Linn's Design Standards for Storm Drain Requirements. The water quality standards were per the 2016 City of Portland's Stormwater Management Manual (SWMM) which the City of West Linn accepts for water quality design standards.

Site Existing Conditions

The existing site is one tax lot that consists of a building, concrete walkways, ac parking and landscaping. The south property line is a steeply sloping bank into the site that has an existing rock retaining wall at the base of the slope. The north lot area is ac pavement with landscaping islands. The north property line has a sloping bank away from the site that drains into an existing drainage ditch and wetland buffer. The remaining area of the lot is generally flat with the overall slopes from the south to the north.

Proposed New Site Development:

The proposed development is to separate the property into two tax lots with a 24 ft wide shared and public access easement that runs through the middle of the site. There will be buildings surrounded by concrete walkways, ac pavement parking and some landscaping areas. The total impervious area to be designed for is 36,298 sf and the pervious area is 9,179 sf.

The site limits the water quality and detention design to be an underground system. The area to the south of the site is a steeply sloping bank and there is an existing rock retaining wall at the toe of the bank. The area to the north of the site is steeply sloping into a drainage ditch. There is also a dense brush line that abuts a wetland buffer in this area. In the middle of the site, there is a 24 ft wide public access easement that will connect the existing property from the west to the east property for future development purposes.

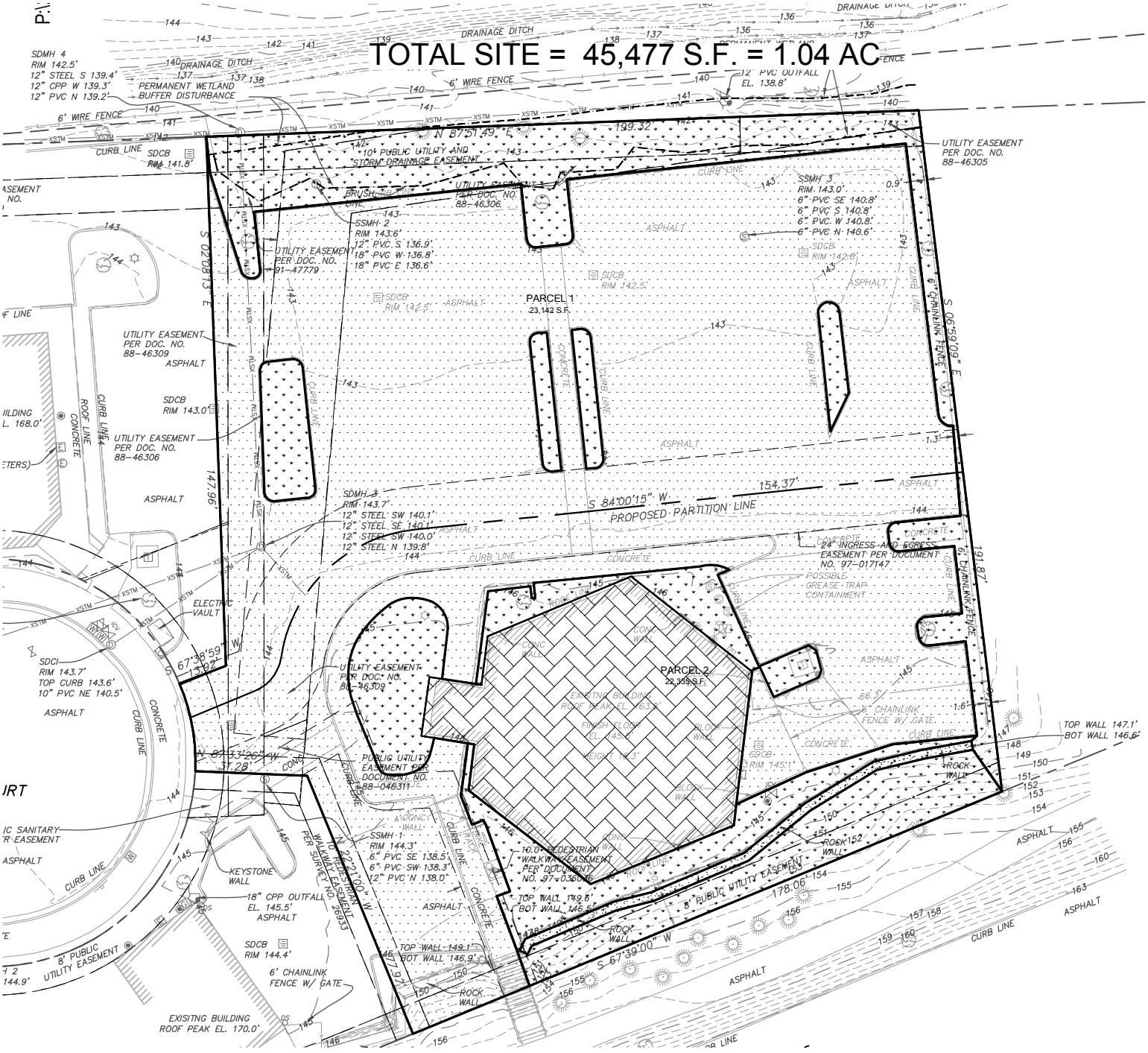
The stormwater mitigation plan is to capture stormwater runoff in BayFilter catch basins that will treat the stormwater runoff for water quality. Any roof stormwater will be collected via downspouts and routed to the BayFilter catch basins. The area on the west side of the property will be directed to existing catch basins to the west that are near or right at the property line of the site. Although this water cannot be collected, it was accounted for the water quality and detention design of the stormwater runoff. After being treated for in water quality, the runoff will then be directed to 30" diameter HDPE detention pipes. A detention control manhole will release the stormwater runoff to the north of the site into the existing drainage way.

The stormwater detention design for the underground system was per the City of West Linn and City of Portland's stormwater standards and design guidelines. The City of West Linn requires the 2, 5, 10 and 25-year post developed stormwater runoff rates to the be detained to their respective pre-developed runoff rates. The water quality requirement is per the City of Portland which is to treat 90 percent of the average annual runoff volume. This is achieved by treating the predetermined runoff rate from a 0.83 inch over 24-hour volume storm.

The detention and water quality have been designed for with the BayFilter catch basins, the 30” diameter HDPE detention pipe and the detention control manhole. Conveyance calculations have also been designed for the overall site runoff. See the attached pages for the tributary area maps, design standards, water quality and conveyance calculations, analysis print-outs and the BayFilter catch basin detail. HydroCAD version 10.00 was used for the analysis of the storm drainage design.

Sincerely,

Chris Deslauriers, P.E.



EXISTING CONCRETE & PAVEMENT
40,011 SF
CN=98

EXISTING ROOF
5,106 SF
CN=98

EXISTING LANDSCAPING
10,572 SF
CN=86

N

EXISTING CONDITIONS MAP

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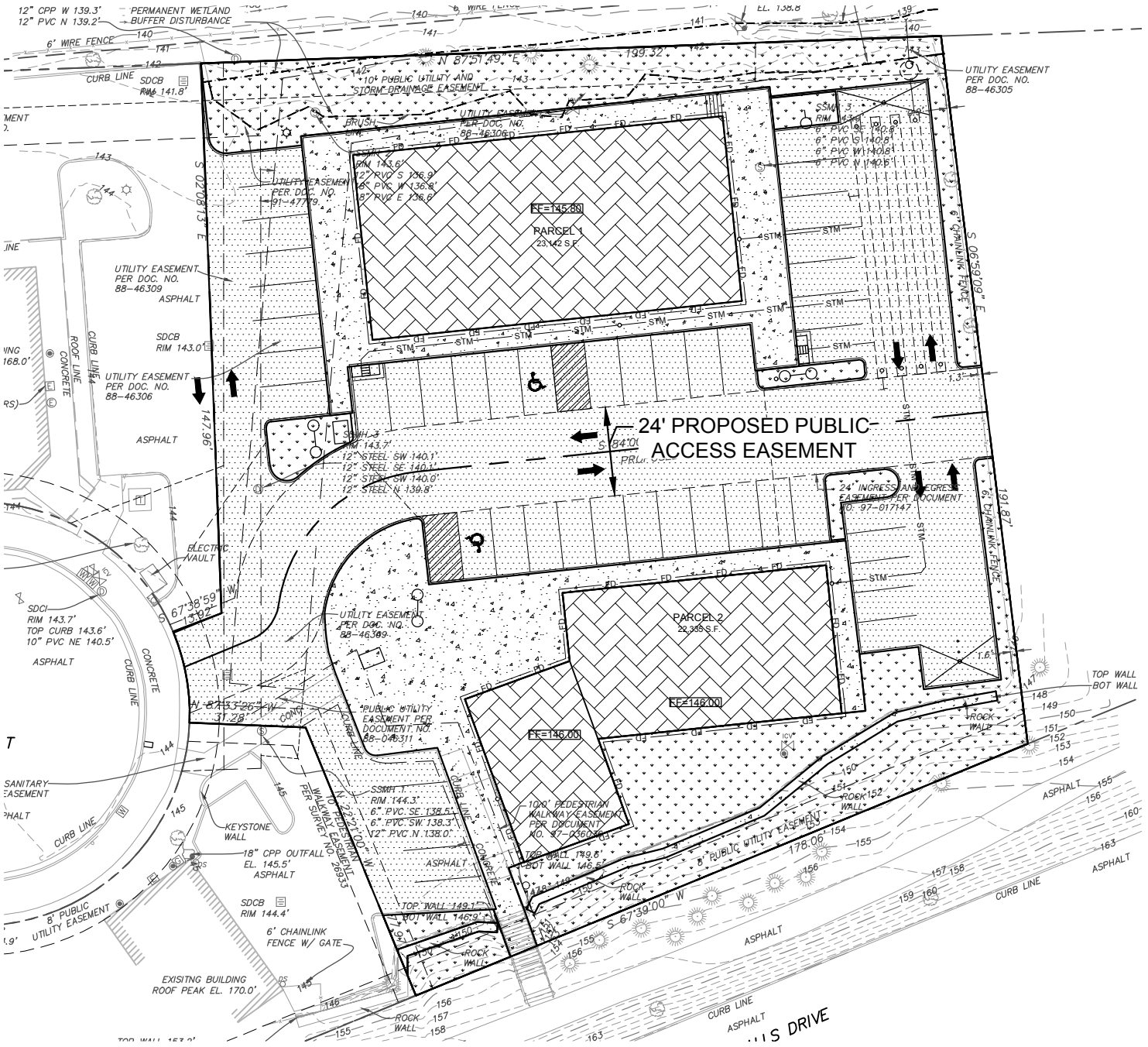
SCALE: 1" = 40'-0"

Job Name: 8TH COURT COMMERCIAL **Date:** SEPT 2018

Job No.: 18116 **Drawn:** RMK

Client: EDGE DEVELOPMENT **Sheet:** STM-3

TOTAL SITE = 45,477 S.F. = 1.04 AC



PROPOSED PAVEMENT 19,535 SF CN=98	PROPOSED CONCRETE 7,563 SF CN=98	PROPOSED ROOF 9,200 SF CN=98	PROPOSED LANDSCAPING 9,179 SF CN=86

N

PROPOSED AREA MAP

WDY

Structural · Civil Engineers

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SCALE: 1" = 40'-0"

Job Name: 8TH COURT COMMERCIAL **Date:** SEPT 2018

Job No.: 18116 **Drawn:** RMK

Client: EDGE DEVELOPMENT **Sheet:** STM-4

SITE STORM DRAINAGE DESIGN CRITERIA

- Design Manuals:
  - Water quality and detention designed per City of West Linn's Design Standards for Storm Drain Requirements.
  - The City of West Linn accepts the City of Portland's Stormwater Management Manual (SWMM) for water quality standards.
- Santa Barbara Unit Hydrograph Method NRCS Type 1A 24-hour storm distribution design per BES and City of Portland's 2016 SWMM Table A-1: Rainfall Depths

Storm Event	Rainfall Depth
2-yr	2.4 in
5-yr	2.9 in
10-yr	3.4 in
25-yr	3.9 in
100-yr	4.4 in
Water Quality	0.83 in

- Pre-developed Conditions
  - USDA Web Soil Survey Existing Hydrologic Soil Group C Woodburn Silt Loam, Open Space, Assumed Poor Condition Grass Cover <50%; Curve Number (CN) = 86
- Proposed Conditions
  - Impervious areas are analyzed with runoff CN = 98
  - Landscaping areas are analyzed with CN = 86
- Detention Design: the design for detention facilities per the City of West Linn's Design Standards are to detain flows as follows:
  - 2 year post-developed → 2 year pre-developed
  - 5 year post-developed → 5 year pre-developed
  - 10 year post-developed → 10 year pre-developed
  - 25 year post-developed → 25 year pre-developed
  - Convey the 100-yr storm
  - See STM-9 for Tc calculations (5 minute minimum per City of West Linn Design Standards, Formula per City of Portland BES and 2016 City of Portland's SWMM)
- Water Quality Design: the design for water quality adheres to the 2016 City of Portland's SWMM:
  - Treat 90 percent of the average annual runoff volume
  - Predetermined water quality storm intensity volume of 0.83 inch over 24 hours

TRIBUTARY AREAS

- Total Area = 45,477 sf = 1.04 sf
- Existing Conditions
  - Impervious = 34,905 sf
    - AC & Concrete = 40,011 sf
    - Roof = 5,106 sf
  - Pervious = 10,572 sf
- Proposed Conditions
  - Impervious Area = 36,298 sf
    - Pavement = 19,535, sf
    - Concrete = 7,563 sf
    - Roof = 9,200 sf
  - Pervious Area (Landscaping & Native) = 9,179 sf

SUMMARY OF STORM DESIGN

- Summary of Detention Design Release Rates

Storm Even	Pre-Developed Runoff	Post-Developed Runoff	Target Rate	Discharge to Drainage Ditch*	Peak Elevation
2-yr	0.24 cfs	0.52 cfs	0.24 cfs	0.24 cfs	140.73 ft
5-yr	0.34 cfs	0.64 cfs	0.34 cfs	0.34 cfs	141.06 ft
10-yr	0.45 cfs	0.67 cfs	0.45 cfs	0.42 cfs	141.44 ft
25-yr	0.56 cfs	0.89 cfs	0.56 cfs	0.56 cfs	141.89 ft
100-yr	0.67 cfs	1.02 cfs	N/A	1.20 cfs	142.10 ft

*The Discharge to Drainage Ditch is the rate at which water is being released into the existing drainage ditch.

- See HydroCAD print-outs for supporting information of storm design.

WATER QUALITY CALCULATIONS

- Per 2016 City of Portland's SWMM
  - Treat 90 percent of the average annual runoff volume
  - Predetermined volume of 0.83 inch over 24 hours
- Water Quality Runoff Rate per HydroCAD = 0.12 cfs

  Washington State GULD Requirements:
  - Maximum flow rate per cartridges = 0.70 GPM/sf of cartridge filter area
  - BaySaver BayFilter Cartridges have 45 sf of filter area per cartridge
  - Therefore, the maximum flow rate per cartridge is:
    - 0.70 GPM/sf * 45 sf = 31.5 GPM
  - However, the maximum flow from the manufacturer per cartridge is which will be used in design:
    - 16.88 GPM
  - WQ flow:
    - 0.12 cfs * 60 sec/min x 7.48 gal/ft^3 = 53.9 GPM
    - 53.9 GPM/16.88 GPM = 3.19 cartridges
  - (4) BayFilter Cartridges are needed
- **(2) BayFilter Cartridges are in each catch basin, therefore (2) Catch Basins are required**

CONVEYANCE CALCULATIONS

- Pipe Capacity Equation
  - $Q_{max} = \frac{1.486 \times A \times R^{2/3} \times S^{1/2}}{n}$
  - A = Area; R = Hydraulic Radius; S = Slope; n = Manning's Roughness Coefficient

- **Conveyance for Entire Site Runoff**
  - 8" dia. where n = 0.013, A = 0.785 sf, R = 0.250 ft, S = 0.01
  - Q_{max} = 1.21 cfs > $Q_{100\text{-}yr}$= 1.02 cfs OK
  - 8" dia. pipe size (min) at 1.0% slope (min) for entire site stormwater runoff conveyance

TIME OF CONCENTRATION

- **Time of Concentration T_c for Pre-Developed Conditions:**

  Pre-Developed Sheet Flow:
  L = 150’ $T_1 = \frac{0.42\,(0.24 \times 150)^{0.8}}{1.58 \times (0.05)^{0.4}}$ = 15.5 MIN
  P = 1.58 in
  S = 5%
  n = 0.24

  Pre-Developed Shallow Flow:
  L = 100’ $T_2 = \frac{100}{60 \times 3.75}$ = 0.44 MIN
  V = 3.75 fps
  S = 5%

  Pre-Developed Tc = 15.5 + 0.44 = 15.94 min; Use 16 MIN

- **Time of Concentration T_c for Post-Developed Conditions:**

  Post-Developed Sheet Flow:
  L =100’ $T_1 = \frac{0.42\,(0.011 \times 100)^{0.8}}{1.58 \times (0.02)^{0.4}}$ = 1.37 MIN
  P = 1.58 in
  S = 2.0%
  n = 0.011

  Post-Developed Pipe Flow:
  L = 40’ $T_2 = \frac{40}{60 \times 4.05}$ = 0.16 MIN
  V = 4.05 fps
  S = 2.0%
  6” dia. pipe
  n=0.013

  Post-Developed Tc = 1.37 + 0.16 = 1.53 min; Use 5 MIN

Summary for Subcatchment 1S: Pre-Developed

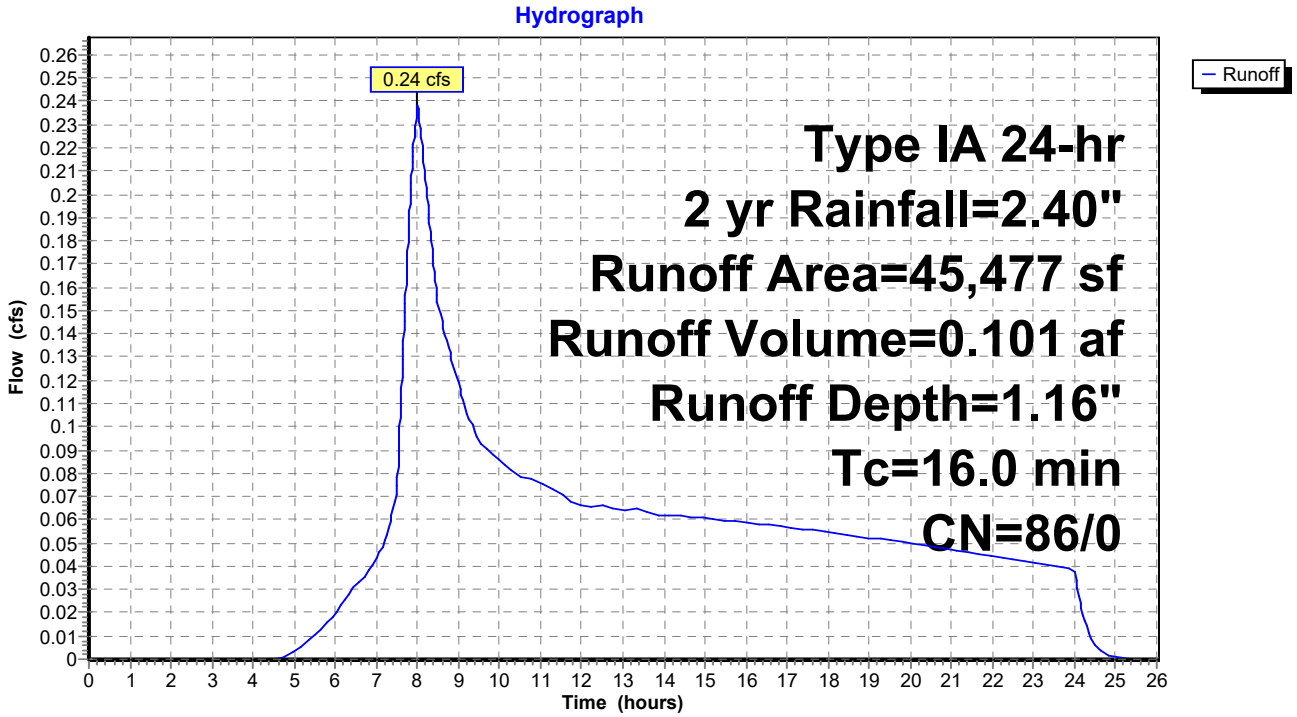
Runoff = 0.24 cfs @ 8.00 hrs, Volume= 0.101 af, Depth= 1.16"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-26.00 hrs, dt= 0.01 hrs
Type IA 24-hr 2 yr Rainfall=2.40"

	Area (sf)	CN	Description
*	45,477	86	Pre-developed
	45,477	86	100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
16.0					**Direct Entry, Sheet + Shallow Flow**

Subcatchment 1S: Pre-Developed



PRE-DEVELOPED

Summary for Subcatchment 1S: Pre-Developed

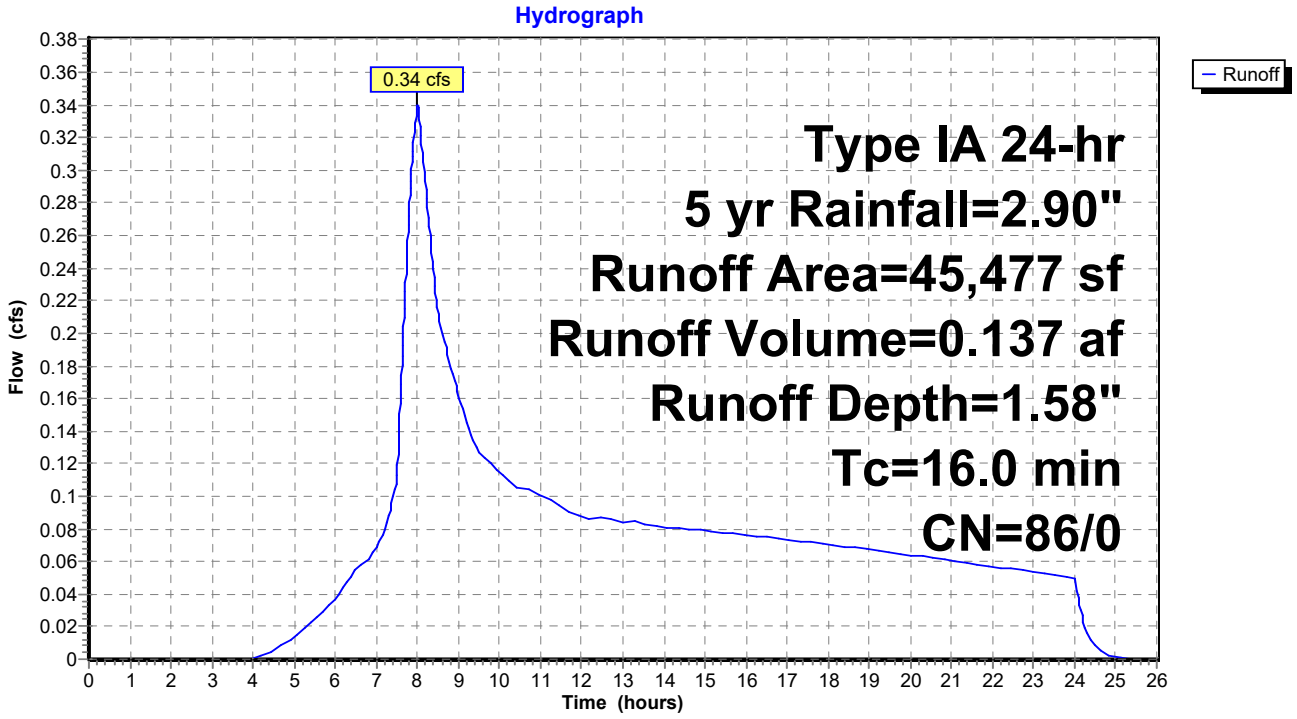
Runoff = 0.34 cfs @ 8.00 hrs, Volume= 0.137 af, Depth= 1.58"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-26.00 hrs, dt= 0.01 hrs
Type IA 24-hr 5 yr Rainfall=2.90"

	Area (sf)	CN	Description
*	45,477	86	Pre-developed
	45,477	86	100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
16.0					**Direct Entry, Sheet + Shallow Flow**

Subcatchment 1S: Pre-Developed



Summary for Subcatchment 1S: Pre-Developed

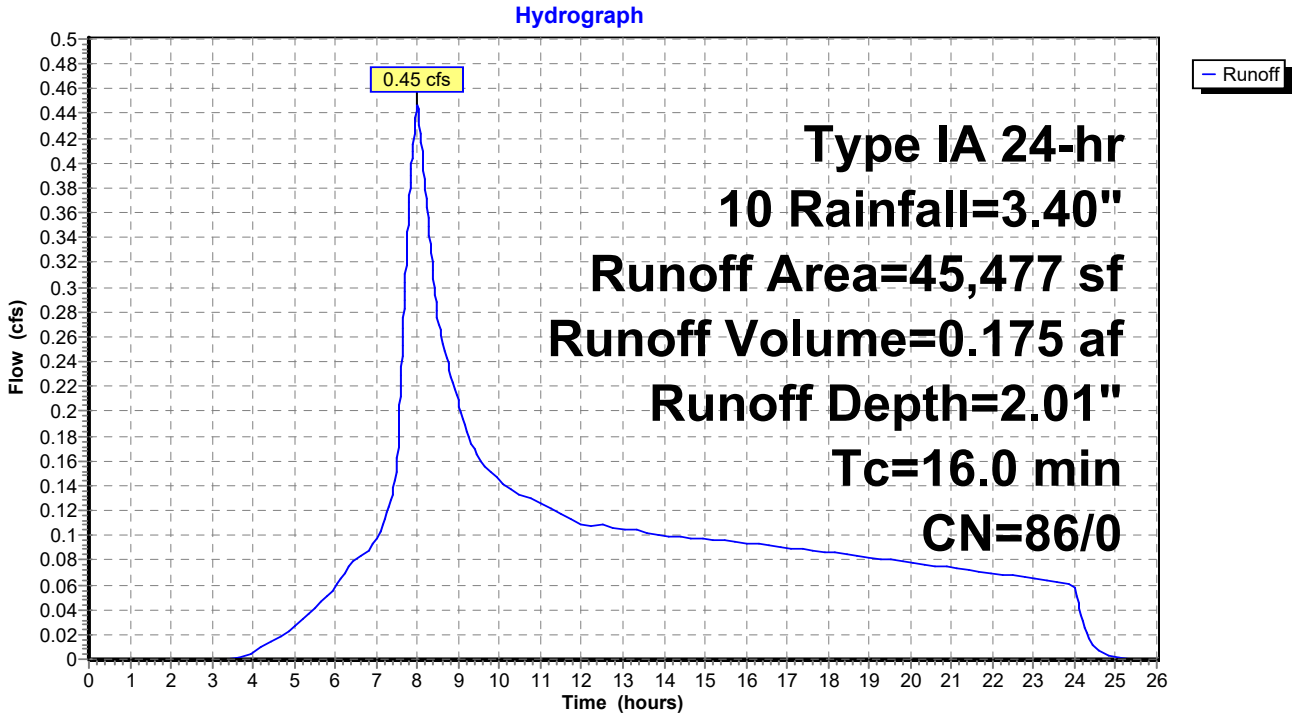
Runoff = 0.45 cfs @ 8.00 hrs, Volume= 0.175 af, Depth= 2.01"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-26.00 hrs, dt= 0.01 hrs
Type IA 24-hr 10 Rainfall=3.40"

	Area (sf)	CN	Description
*	45,477	86	Pre-developed
	45,477	86	100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
16.0					**Direct Entry, Sheet + Shallow Flow**

Subcatchment 1S: Pre-Developed



Summary for Subcatchment 1S: Pre-Developed

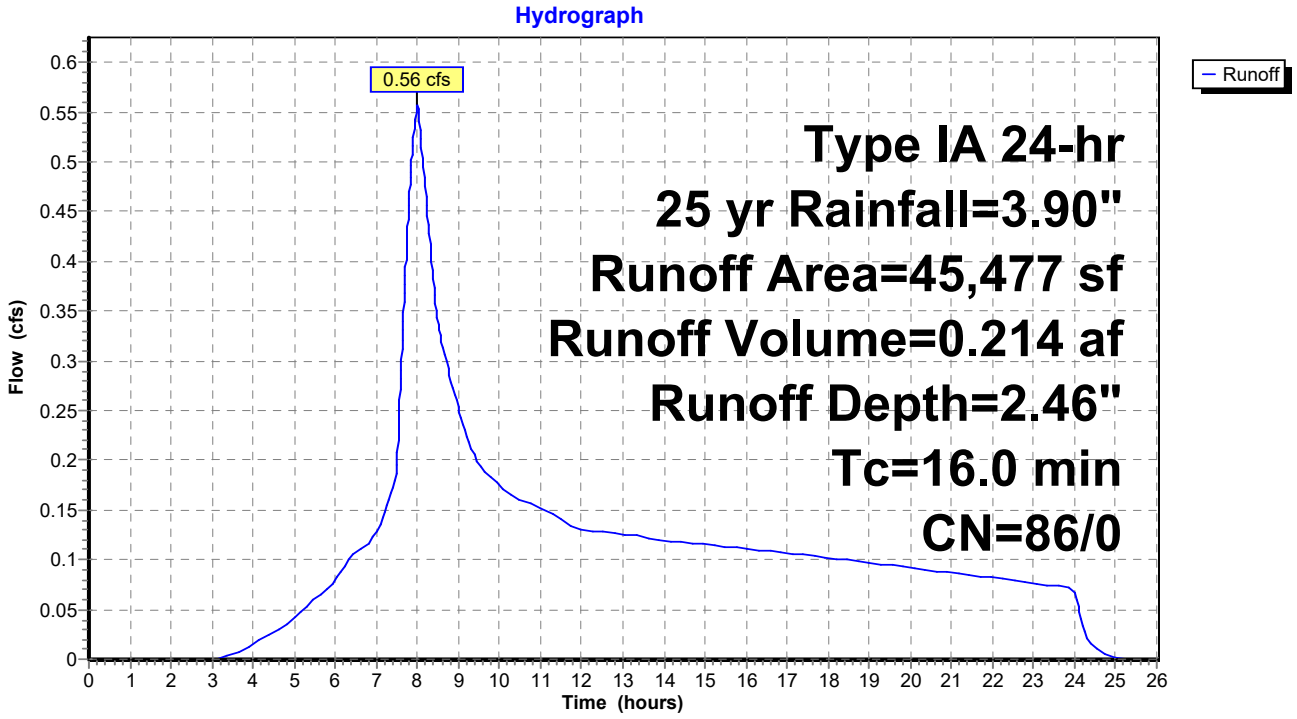
Runoff = 0.56 cfs @ 8.00 hrs, Volume= 0.214 af, Depth= 2.46"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-26.00 hrs, dt= 0.01 hrs
Type IA 24-hr 25 yr Rainfall=3.90"

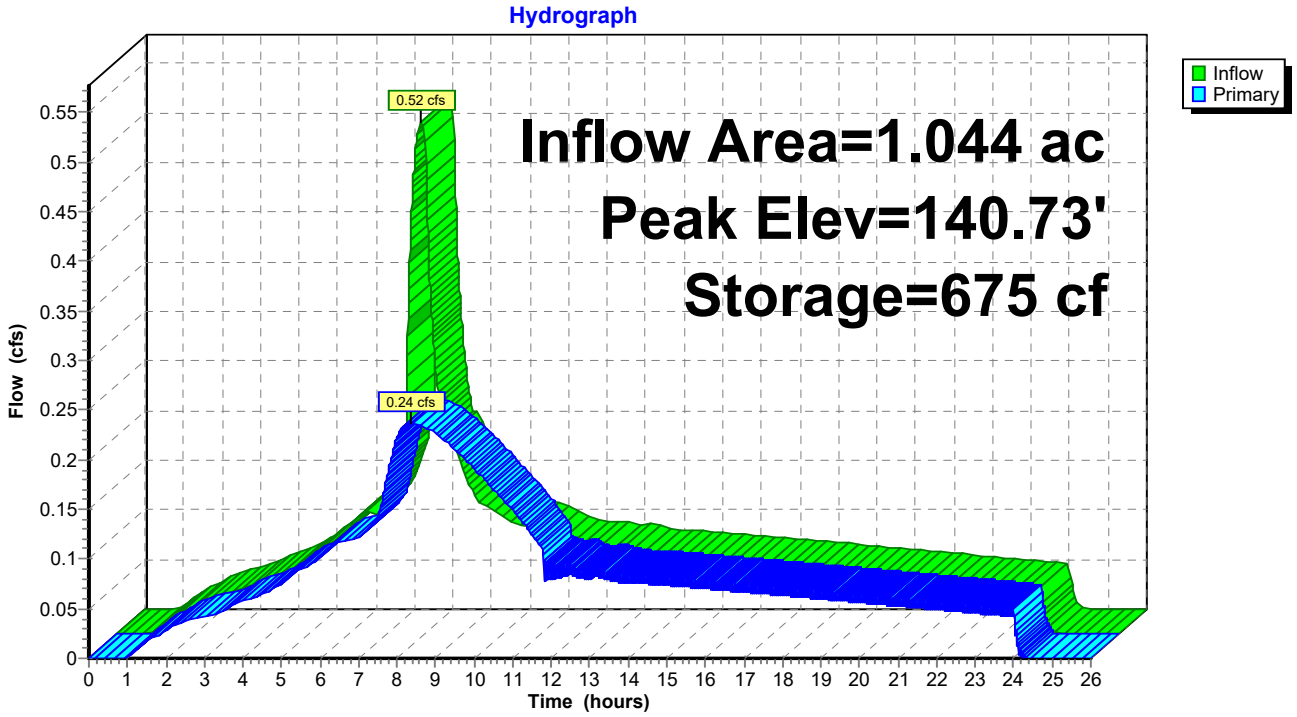
	Area (sf)	CN	Description
*	45,477	86	Pre-developed
	45,477	86	100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
16.0					**Direct Entry, Sheet + Shallow Flow**

Subcatchment 1S: Pre-Developed



Pond 1P: 30" Detention Pipe



POST DEVELOPED

Summary for Pond 1P: 30" Detention Pipe

[58] Hint: Peaked 96.03' above defined flood level
[87] Warning: Oscillations may require Finer Routing or smaller dt

Inflow Area = 1.044 ac, 79.82% Impervious, Inflow Depth = 1.97" for 2 yr event
Inflow = 0.52 cfs @ 7.89 hrs, Volume= 0.171 af
Outflow = 0.24 cfs @ 8.35 hrs, Volume= 0.171 af, Atten= 54%, Lag= 27.7 min
Primary = 0.24 cfs @ 8.35 hrs, Volume= 0.171 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-26.00 hrs, dt= 0.01 hrs / 9
Peak Elev= 140.73' @ 8.35 hrs Surf.Area= 700 sf Storage= 675 cf
Flood Elev= 44.70' Surf.Area= 0 sf Storage= 0 cf

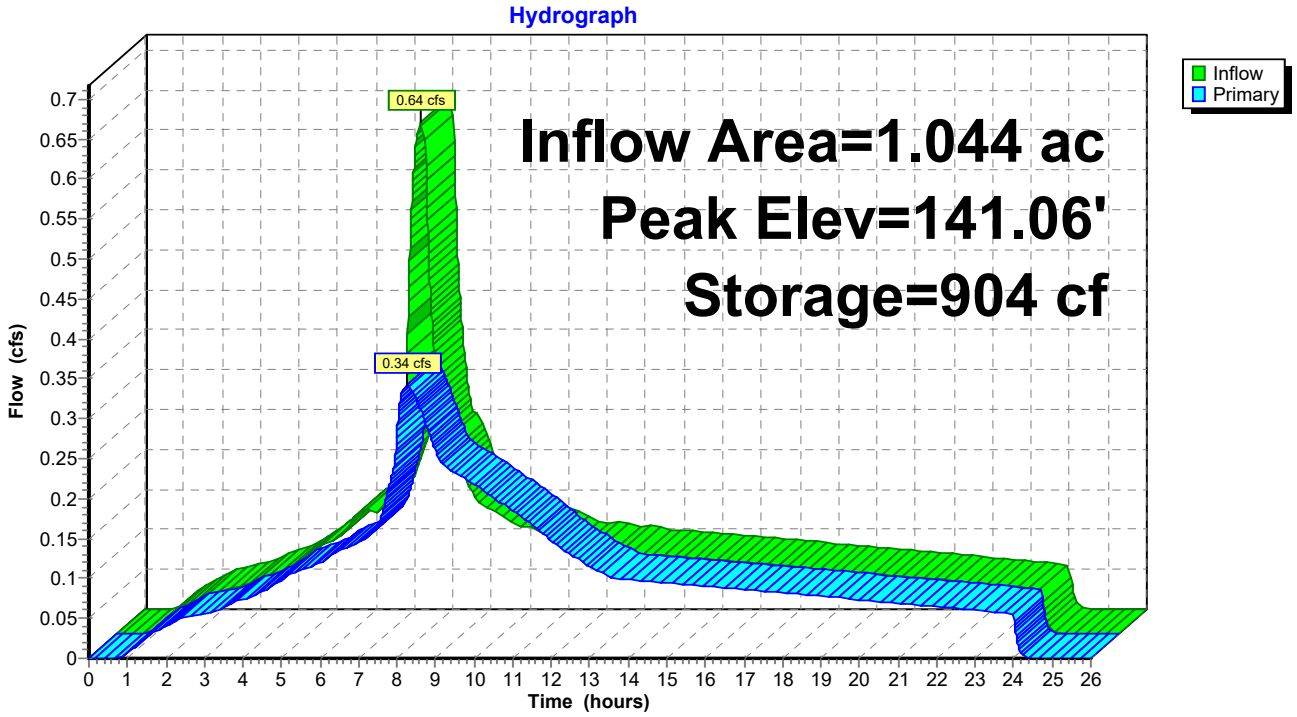
Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 12.0 min (701.6 - 689.7)

Volume	Invert	Avail.Storage	Storage Description
#1	139.50'	1,374 cf	**30.0" D x 280.0'L Pipe Storage**

Device	Routing	Invert	Outlet Devices
#1	Primary	139.20'	**10.0" Round Culvert Out from Detention MH** L= 40.0' Ke= 0.500 Inlet / Outlet Invert= 139.20' / 138.80' S= 0.0100 '/' Cc= 0.900 n= 0.011, Flow Area= 0.55 sf
#2	Device 1	139.20'	**2.7" Horiz. Orifice 1 - 2 yr** C= 0.600 Limited to weir flow at low heads
#3	Device 1	140.75'	**2.6" Vert. Orifice 2 - 10 yr** C= 0.600
#4	Device 1	141.45'	**2.0" Vert. Orifice 3 - 25 yr** C= 0.600
#5	Device 1	141.90'	**8.0" Horiz. Overflow** C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=0.24 cfs @ 8.35 hrs HW=140.73' (Free Discharge)
└**1=Culvert Out from Detention MH** (Passes 0.24 cfs of 2.77 cfs potential flow)
  ├**2=Orifice 1 - 2 yr** (Orifice Controls 0.24 cfs @ 5.96 fps)
  ├**3=Orifice 2 - 10 yr** (Controls 0.00 cfs)
  ├**4=Orifice 3 - 25 yr** (Controls 0.00 cfs)
  └**5=Overflow** (Controls 0.00 cfs)

Pond 1P: 30" Detention Pipe



Summary for Pond 1P: 30" Detention Pipe

[58] Hint: Peaked 96.36' above defined flood level

Inflow Area = 1.044 ac, 79.82% Impervious, Inflow Depth = 2.45" for 5 yr event
Inflow = 0.64 cfs @ 7.89 hrs, Volume= 0.213 af
Outflow = 0.34 cfs @ 8.26 hrs, Volume= 0.213 af, Atten= 47%, Lag= 22.0 min
Primary = 0.34 cfs @ 8.26 hrs, Volume= 0.213 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-26.00 hrs, dt= 0.01 hrs / 9
Peak Elev= 141.06' @ 8.26 hrs Surf.Area= 678 sf Storage= 904 cf
Flood Elev= 44.70' Surf.Area= 0 sf Storage= 0 cf

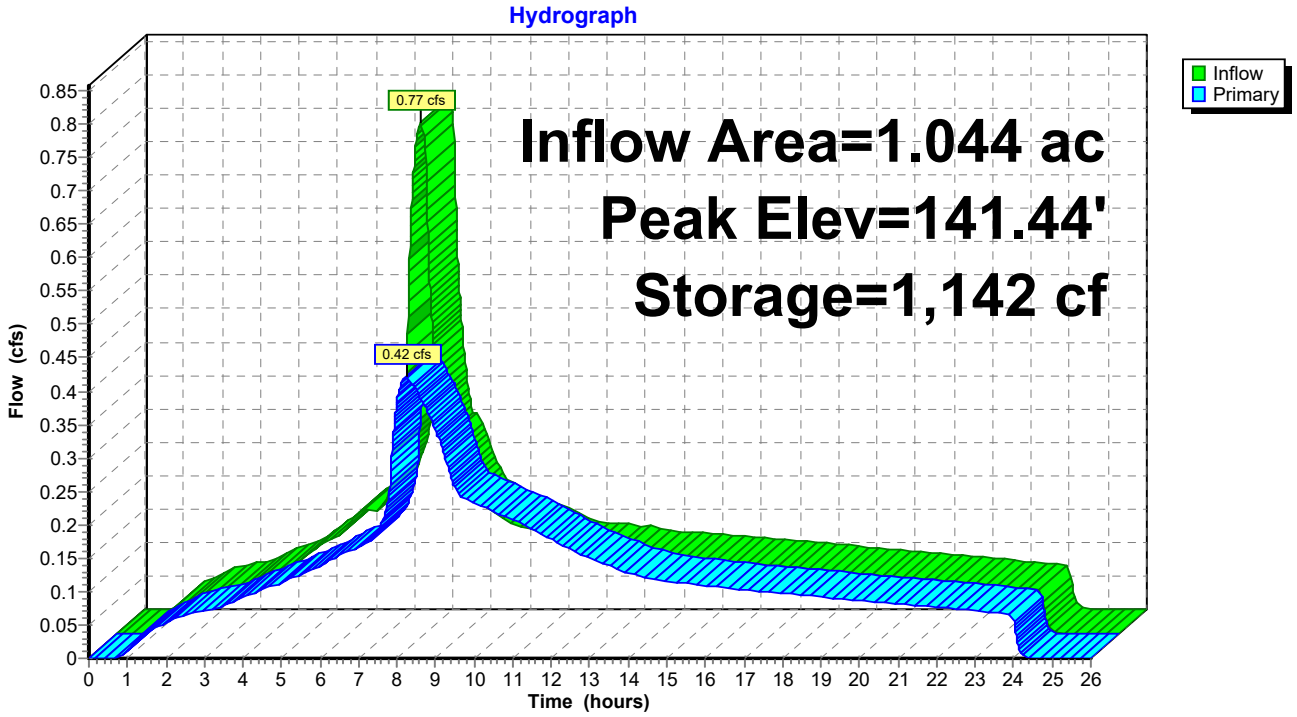
Plug-Flow detention time= 15.6 min calculated for 0.213 af (100% of inflow)
Center-of-Mass det. time= 15.6 min (699.1 - 683.5)

Volume	Invert	Avail.Storage	Storage Description
#1	139.50'	1,374 cf	**30.0" D x 280.0'L Pipe Storage**

Device	Routing	Invert	Outlet Devices
#1	Primary	139.20'	**10.0" Round Culvert Out from Detention MH** L= 40.0' Ke= 0.500 Inlet / Outlet Invert= 139.20' / 138.80' S= 0.0100 '/' Cc= 0.900 n= 0.011, Flow Area= 0.55 sf
#2	Device 1	139.20'	**2.7" Horiz. Orifice 1 - 2 yr** C= 0.600 Limited to weir flow at low heads
#3	Device 1	140.75'	**2.6" Vert. Orifice 2 - 10 yr** C= 0.600
#4	Device 1	141.45'	**2.0" Vert. Orifice 3 - 25 yr** C= 0.600
#5	Device 1	141.90'	**8.0" Horiz. Overflow** C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=0.34 cfs @ 8.26 hrs HW=141.06' (Free Discharge)
└**1=Culvert Out from Detention MH** (Passes 0.34 cfs of 3.16 cfs potential flow)
  ├**2=Orifice 1 - 2 yr** (Orifice Controls 0.26 cfs @ 6.57 fps)
  ├**3=Orifice 2 - 10 yr** (Orifice Controls 0.08 cfs @ 2.17 fps)
  ├**4=Orifice 3 - 25 yr** (Controls 0.00 cfs)
  └**5=Overflow** (Controls 0.00 cfs)

Pond 1P: 30" Detention Pipe



Summary for Pond 1P: 30" Detention Pipe

[58] Hint: Peaked 96.74' above defined flood level

Inflow Area = 1.044 ac, 79.82% Impervious, Inflow Depth = 2.93" for 10 event
Inflow = 0.77 cfs @ 7.89 hrs, Volume= 0.255 af
Outflow = 0.42 cfs @ 8.24 hrs, Volume= 0.255 af, Atten= 45%, Lag= 20.9 min
Primary = 0.42 cfs @ 8.24 hrs, Volume= 0.255 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-26.00 hrs, dt= 0.01 hrs / 9
Peak Elev= 141.44' @ 8.24 hrs Surf.Area= 585 sf Storage= 1,142 cf
Flood Elev= 44.70' Surf.Area= 0 sf Storage= 0 cf

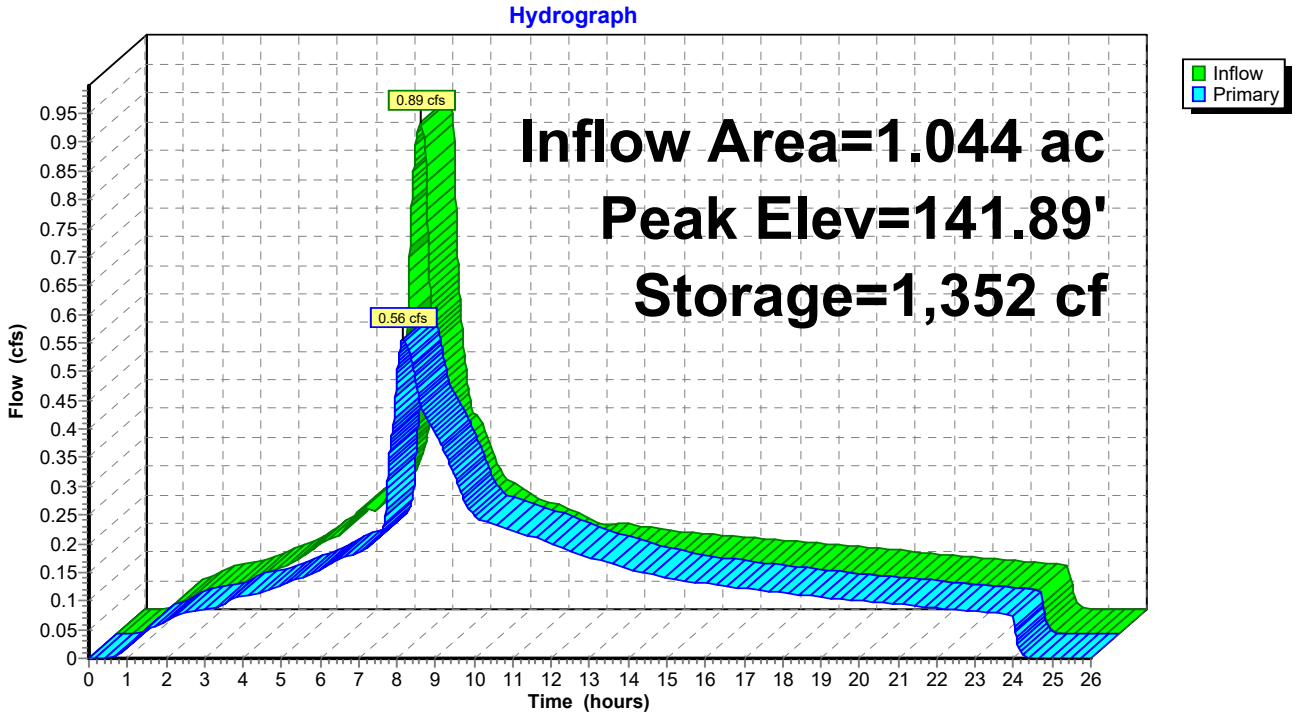
Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 18.8 min (697.5 - 678.7)

Volume	Invert	Avail.Storage	Storage Description
#1	139.50'	1,374 cf	**30.0" D x 280.0'L Pipe Storage**

Device	Routing	Invert	Outlet Devices
#1	Primary	139.20'	**10.0" Round Culvert Out from Detention MH** L= 40.0' Ke= 0.500 Inlet / Outlet Invert= 139.20' / 138.80' S= 0.0100 '/' Cc= 0.900 n= 0.011, Flow Area= 0.55 sf
#2	Device 1	139.20'	**2.7" Horiz. Orifice 1 - 2 yr** C= 0.600 Limited to weir flow at low heads
#3	Device 1	140.75'	**2.6" Vert. Orifice 2 - 10 yr** C= 0.600
#4	Device 1	141.45'	**2.0" Vert. Orifice 3 - 25 yr** C= 0.600
#5	Device 1	141.90'	**8.0" Horiz. Overflow** C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=0.42 cfs @ 8.24 hrs HW=141.44' (Free Discharge)
└**1=Culvert Out from Detention MH** (Passes 0.42 cfs of 3.54 cfs potential flow)
  ├**2=Orifice 1 - 2 yr** (Orifice Controls 0.29 cfs @ 7.20 fps)
  ├**3=Orifice 2 - 10 yr** (Orifice Controls 0.13 cfs @ 3.66 fps)
  ├**4=Orifice 3 - 25 yr** (Controls 0.00 cfs)
  └**5=Overflow** (Controls 0.00 cfs)

Pond 1P: 30" Detention Pipe



Summary for Pond 1P: 30" Detention Pipe

[58] Hint: Peaked 97.19' above defined flood level

Inflow Area = 1.044 ac, 79.82% Impervious, Inflow Depth = 3.42" for 25 yr event
Inflow = 0.89 cfs @ 7.89 hrs, Volume= 0.298 af
Outflow = 0.56 cfs @ 8.17 hrs, Volume= 0.298 af, Atten= 38%, Lag= 16.9 min
Primary = 0.56 cfs @ 8.17 hrs, Volume= 0.298 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-26.00 hrs, dt= 0.01 hrs / 9
Peak Elev= 141.89' @ 8.17 hrs Surf.Area= 291 sf Storage= 1,352 cf
Flood Elev= 44.70' Surf.Area= 0 sf Storage= 0 cf

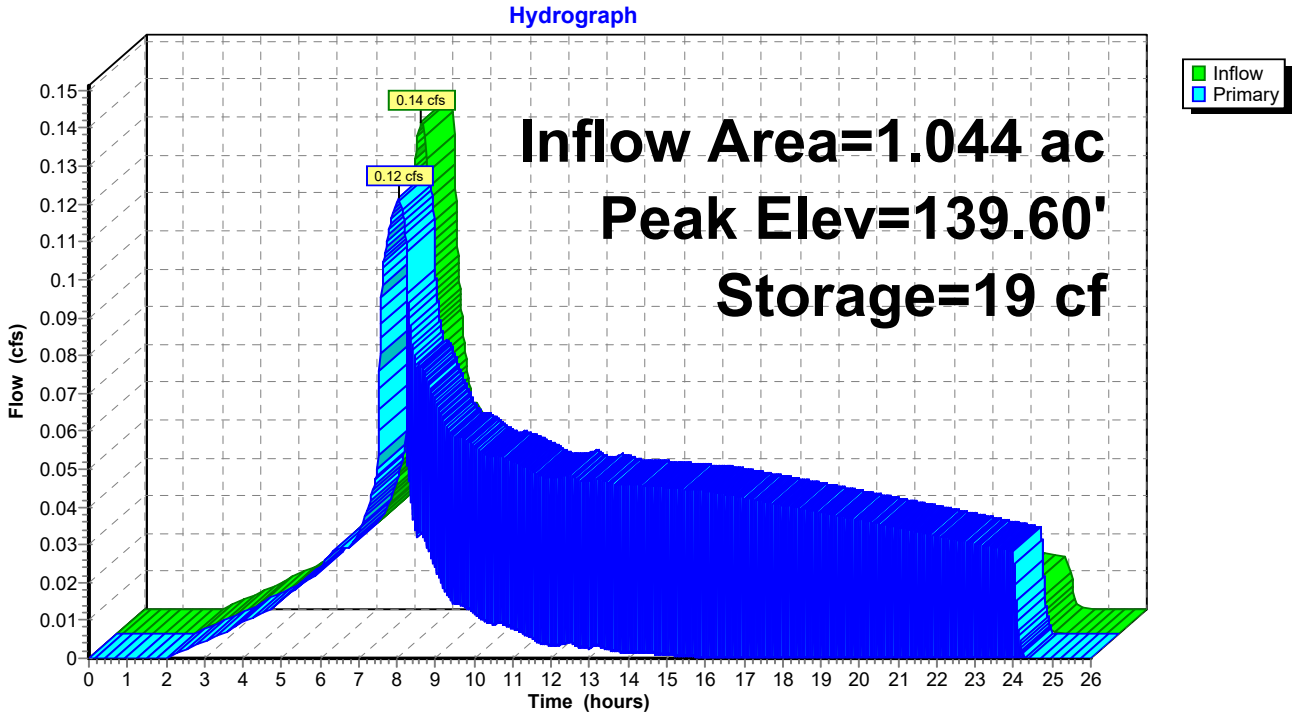
Plug-Flow detention time= 21.8 min calculated for 0.298 af (100% of inflow)
Center-of-Mass det. time= 21.8 min (696.6 - 674.8)

Volume	Invert	Avail.Storage	Storage Description
#1	139.50'	1,374 cf	**30.0" D x 280.0'L Pipe Storage**

Device	Routing	Invert	Outlet Devices
#1	Primary	139.20'	**10.0" Round Culvert Out from Detention MH** L= 40.0' Ke= 0.500 Inlet / Outlet Invert= 139.20' / 138.80' S= 0.0100 '/' Cc= 0.900 n= 0.011, Flow Area= 0.55 sf
#2	Device 1	139.20'	**2.7" Horiz. Orifice 1 - 2 yr** C= 0.600 Limited to weir flow at low heads
#3	Device 1	140.75'	**2.6" Vert. Orifice 2 - 10 yr** C= 0.600
#4	Device 1	141.45'	**2.0" Vert. Orifice 3 - 25 yr** C= 0.600
#5	Device 1	141.90'	**8.0" Horiz. Overflow** C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=0.56 cfs @ 8.17 hrs HW=141.89' (Free Discharge)
└**1=Culvert Out from Detention MH** (Passes 0.56 cfs of 3.96 cfs potential flow)
  ├**2=Orifice 1 - 2 yr** (Orifice Controls 0.31 cfs @ 7.89 fps)
  ├**3=Orifice 2 - 10 yr** (Orifice Controls 0.18 cfs @ 4.88 fps)
  ├**4=Orifice 3 - 25 yr** (Orifice Controls 0.06 cfs @ 2.86 fps)
  └**5=Overflow** (Controls 0.00 cfs)

Pond 1P: 30" Detention Pipe



CONVEYANCE FLOW=0.12 CFS

Summary for Pond 1P: 30" Detention Pipe

[58] Hint: Peaked 94.90' above defined flood level
[87] Warning: Oscillations may require Finer Routing or smaller dt

Inflow Area = 1.044 ac, 79.82% Impervious, Inflow Depth = 0.52" for WQVOL event
Inflow = 0.14 cfs @ 7.91 hrs, Volume= 0.046 af
Outflow = 0.12 cfs @ 8.03 hrs, Volume= 0.046 af, Atten= 10%, Lag= 7.0 min
Primary = 0.12 cfs @ 8.03 hrs, Volume= 0.046 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-26.00 hrs, dt= 0.01 hrs / 9
Peak Elev= 139.60' @ 8.03 hrs Surf.Area= 278 sf Storage= 19 cf
Flood Elev= 44.70' Surf.Area= 0 sf Storage= 0 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 0.3 min (735.3 - 735.0)

Volume	Invert	Avail.Storage	Storage Description
#1	139.50'	1,374 cf	**30.0" D x 280.0'L Pipe Storage**

Device	Routing	Invert	Outlet Devices
#1	Primary	139.20'	**10.0" Round Culvert Out from Detention MH** L= 40.0' Ke= 0.500 Inlet / Outlet Invert= 139.20' / 138.80' S= 0.0100 '/' Cc= 0.900 n= 0.011, Flow Area= 0.55 sf
#2	Device 1	139.20'	**2.7" Horiz. Orifice 1 - 2 yr** C= 0.600 Limited to weir flow at low heads
#3	Device 1	140.75'	**2.6" Vert. Orifice 2 - 10 yr** C= 0.600
#4	Device 1	141.45'	**2.0" Vert. Orifice 3 - 25 yr** C= 0.600
#5	Device 1	141.90'	**8.0" Horiz. Overflow** C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=0.12 cfs @ 8.03 hrs HW=139.60' (Free Discharge)
└**1=Culvert Out from Detention MH** (Passes 0.12 cfs of 0.56 cfs potential flow)
  ├**2=Orifice 1 - 2 yr** (Orifice Controls 0.12 cfs @ 3.06 fps)
  ├**3=Orifice 2 - 10 yr** (Controls 0.00 cfs)
  ├**4=Orifice 3 - 25 yr** (Controls 0.00 cfs)
  └**5=Overflow** (Controls 0.00 cfs)

Summary for Subcatchment 2S: Post-Developed

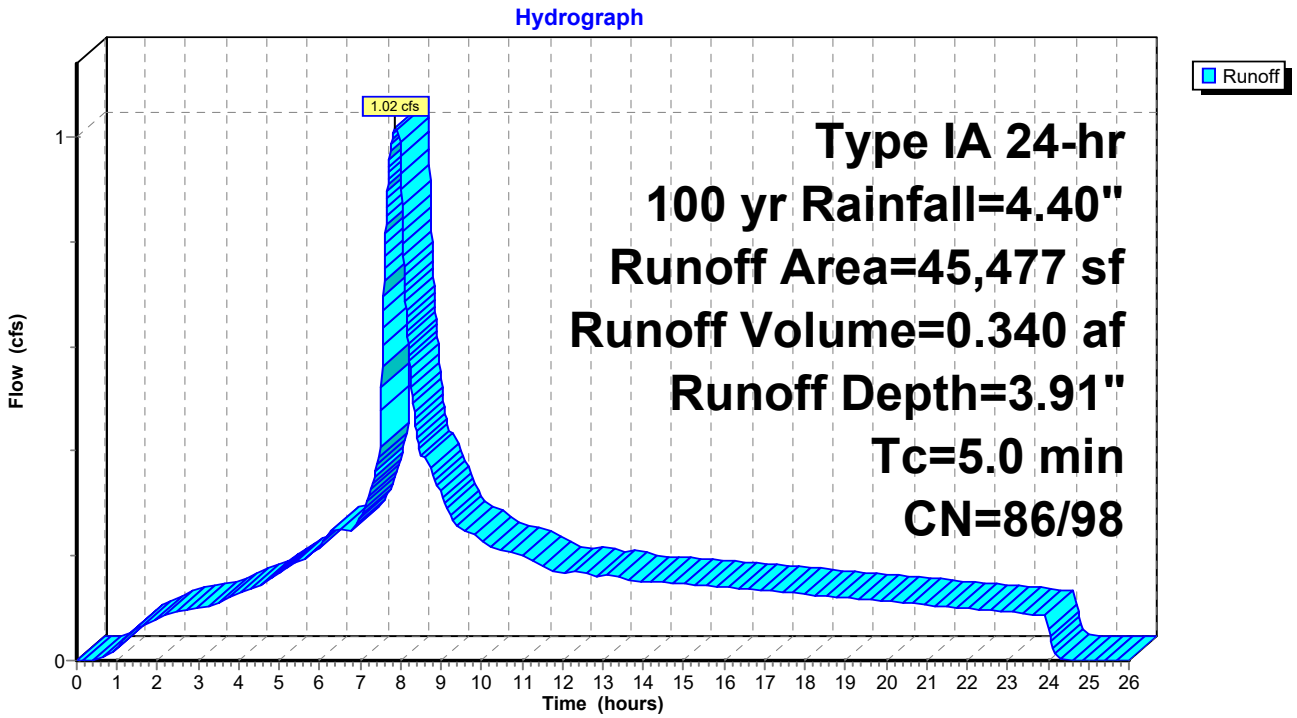
Runoff = 1.02 cfs @ 7.88 hrs, Volume= 0.340 af, Depth= 3.91"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-26.00 hrs, dt= 0.01 hrs
Type IA 24-hr 100 yr Rainfall=4.40"

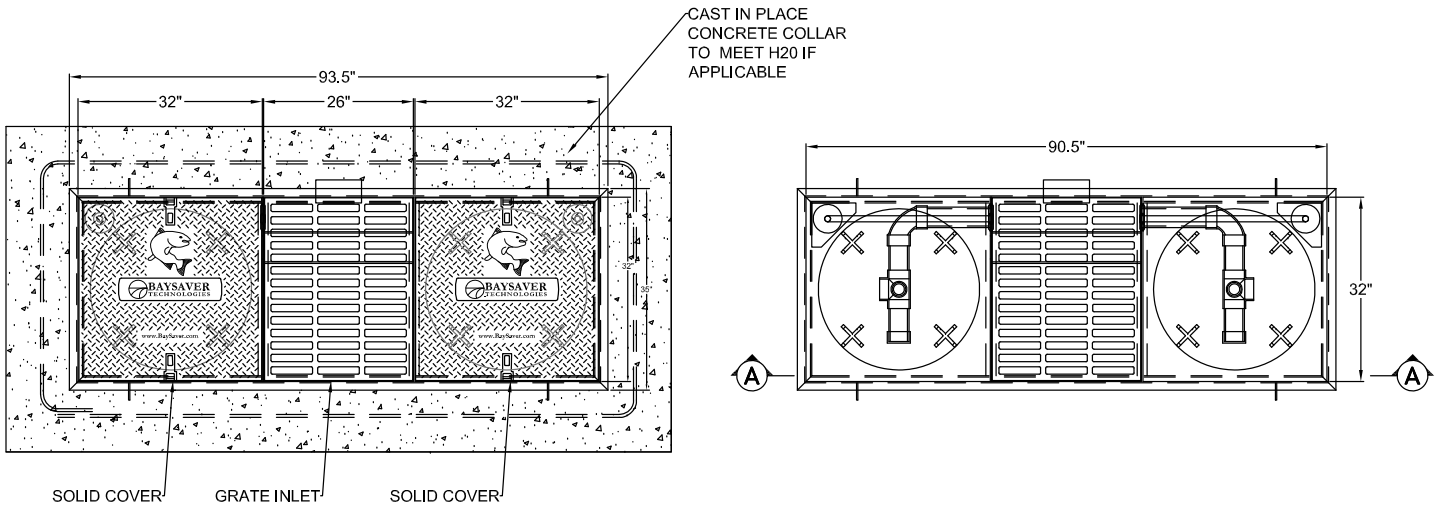
	Area (sf)	CN	Description
*	19,535	98	Pavement Impervious
*	7,563	98	Concrete Impervious
*	9,200	98	Roof Impervious
*	9,179	86	Landscaping Pervious
	45,477	96	Weighted Average
	9,179	86	20.18% Pervious Area
	36,298	98	79.82% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					**Direct Entry,**

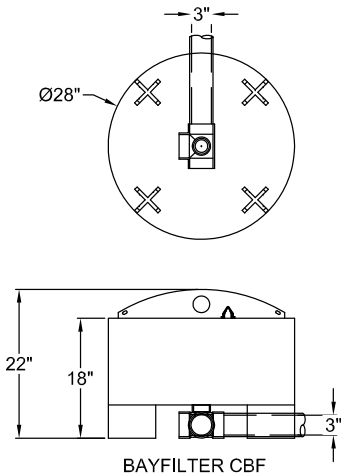
Subcatchment 2S: Post-Developed



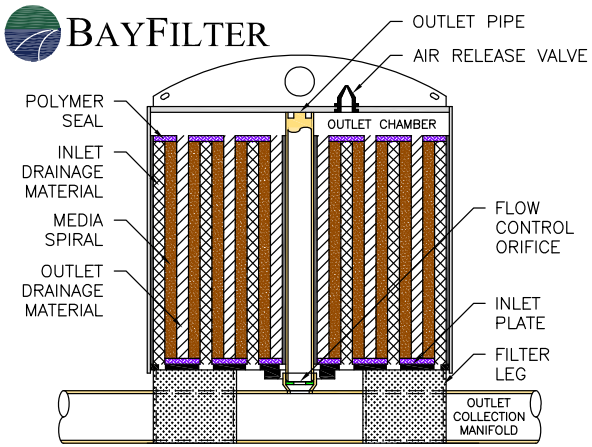
CONVEYANCE FLOW=1.02 CFS



PLAN VIEW

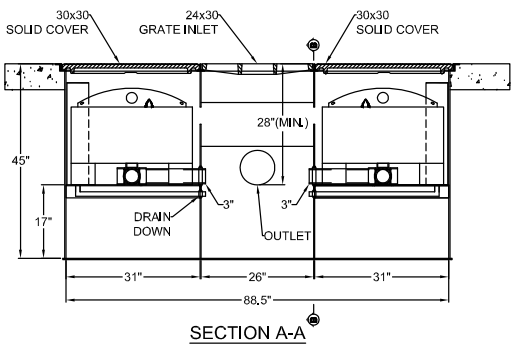


BAYFILTER CBF

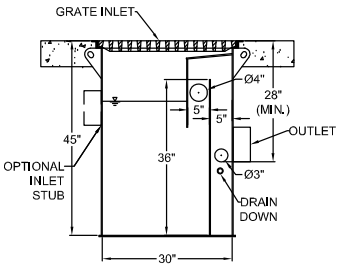


BAYFILTER CBF-4	
PROJECT	
LOCATION	
WATER QUALITY FLOW	33.75 GPM
DRAINAGE AREA	
CARTRIDGE DESIGN FLOW RATE	16.88 GPM
# BAYFILTER CARTRIDGES	2
TREATED SEDIMENT CAPACITY	350 LBS

THE BAYFILTER STORMWATER MANAGEMENT SYSTEM IS A STORMWATER FILTRATION DEVICE DESIGNED TO REMOVE FINE SEDIMENTS, HEAVY METALS, AND PHOSPORUS. THE BAYFILTER SYSTEM RELIES ON A SPIRAL WOUND MEDIA FILTER CARTRIDGE WITH APPROXIMATELY 45 SQUARE FEET OF FILTRATION AREA. THE FILTER CARTRIDGES REMOVE POLLUTANTS FROM RUNOFF BY FILTRATION (INTERCEPTION/ATTACHMENT) AND ADSORPTION.



SECTION A-A



SECTION B-B

REV	DRW	CHK	DESCRIPTION

DATE: --- DRAWN: ---
PROJECT #: --- CHECKED: ---

BAYSAVER TECHNOLOGIES
1030 Deer Hollow Drive 1-800-BAYSAVER
Mount Airy, MD 21771 1-800-229-7283

ADS
4640 TRUEMAN BLVD
HILLIARD, OH 43026
1-800-733-7473

SHEET
--- OF ---

STM-25

Technical Memorandum

REGISTERED PROFESSIONAL ENGINEER
83582PE
OREGON
DEC. 17, 2014
WILLIAM R. FARLEY
RENEWS: 12/31/2019

LANCASTER ENGINEERING
321 SW 4th Ave., Suite 400
Portland, OR 97204
phone: 503.248.0313
fax: 503.248.9251
lancasterengineering.com

To: Ed Bruin

From: William R. Farley, PE

Date: September 14, 2018

Subject: 2180 8th Court
Transportation Analysis Letter

Introduction

This memorandum evaluates the transportation impacts related to the partitioning and redevelopment of approximately 1.4 acres located at 2180 8th Court in West Linn, Oregon. The partition will divide the site into a 0.53-acre northern property and a 0.51-acre southern property and remove an existing building that was previously a Shari's restaurant. The northern property will then be developed with a 5,000 square-foot retail/office building while the southern property will be developed with a 2,800 square-foot medical office and a 1,400 square-foot retail/office building.

The purpose of this report is to determine whether the transportation system within the vicinity of the site is capable of safely and efficiently supporting the existing and proposed uses. Detailed information regarding trip generation calculations and safety analyses is included within the technical appendix.

Location Description

The subject site is located at the eastern end of the cul-de-sac for 8th Court in West Linn, Oregon. The site is bounded by Interstate 205 to the north, Willamette Falls Drive to the south, retail land uses to the west, and residential property to the east. Upon partitioning, an easement will be provided along the shared property line that extends from the cul-de-sac on 8th Court to the eastern property line.

10th Street is classified as a Minor Arterial by the City of West Linn. It is a three-four lane roadway that connects between Willamette Falls Drive to the south and Salamo Road/Blankenship Road to the north, while providing access to Interstate 205. Curbs and sidewalks are provided on both sides of the street.

8th Court is classified as a Local street by the City of West Linn. It is a two-lane roadway with one lane in each direction that extends from 10th Street approximately 425 feet before ending in a cul-de-sac. Curbs and sidewalks are provided on both sides of the street. On-street parking is not permitted on either side.

The intersection of 10th Street at 8th Street/8th Court is a four-legged intersection under two-way stop control for the eastbound and westbound approaches. The northbound approach on 10th Street has a single, shared lane for all turning movements; however, a left-turn restriction is signed for the hours between 4:00 PM and

6:00 PM. The southbound approach on 10th and the eastbound approach on 8th Street each have a shared through/right-turn lane and a dedicated left-turn lane. The westbound approach on 8th Court has a dedicated right-turn lane and a shared through/left-turn lane. Crosswalks are marked across the eastern, western, and southern legs of the intersection.

Figure 1 below provides an aerial image of the nearby vicinity with the project site outlined in yellow (image from PortlandMaps).

Figure 1: Aerial photo of site vicinity.

Trip Generation

Following the partitioning of the subject property, the 3,600 square-foot restaurant previously occupied by Shari's will be replaced with a 2,800 square-foot medical office, a 1,400 square-foot retail/office building, and a 5,000 square-foot retail/office building. While it is currently known that the medical office space will be leased by a dentist, tenants for the retail/office space have not been identified.

To estimate the number of trips that will be generated by the existing restaurant and the proposed medical office, trip rates from *Trip Generation Manual*[1] were used. Data from land-use code 932, *High-Turnover (Sit-Down) Restaurant*, was used to estimate the trip generation of the existing restaurant building while land-use code 720, *Medical-Dental Office Building*, was used to estimate the trip generation of the proposed medical office. Both trip generation estimates were calculated based on rates corresponding to the gross-floor area of the land use.

Typically land uses such as restaurants attract pass-by and diverted-link trips. Pass-by trips are those that leave an adjacent roadway to patronize a land use and then continue in their original direction of travel. Similar to pass-by trips, diverted-link trips are trips that divert from a nearby roadway not adjacent to the site to patronize the land use before continuing to their original destination. Pass-by trips do not add additional vehicles to the surrounding transportation system; however, they do impact turning movements at site access intersections. Diverted-link trips may add turning movements at both site accesses and other nearby intersections.

Since the subject site is at the end of a cul-de-sac on 8th Court, the existing restaurant would not have been able to attract a significant number of pass-by trips. Therefore, it is expected that any non-primary trips were attracted from 10th Street or other nearby roadway, which added turning movements at the intersection of 10th Street and 8th Court. Accordingly, no reductions in trip generation were accounted for in the calculations for the existing restaurant.

The trip generation calculations show that replacing the existing 3,600 square-foot restaurant building with a 2,800 square-foot medical office will reduce the site's trip generation by 28 trips during the morning peak hour, 25 trips during the evening peak hour, and 306 daily trips.

Based on the trip generation calculations, the occupancy of a dental office is projected to generate less trips than the Shari's restaurant. Accordingly, no traffic impacts are anticipated with the construction of the 2,800 square-foot medical office.

Table 1 on the following page offers a summary of the trip generation calculations. Detailed trip generation worksheets are included in the technical appendix to this report.

[1] Institute of Transportation Engineers (ITE), *Trip Generation Manual*, 10th Edition, 2017.

Table 1: Trip Generation Summary

	ITE Code	Size	Morning Peak Hour			Evening Peak Hour			Weekday
			Enter	Exit	Total	Enter	Exit	Total	Total
Existing									
Restaurant	932	3,600 SF	20	16	36	22	13	35	404
Proposed									
Medical Office	720	2,800 SF	6	2	8	3	7	10	98
Net Change in Trips			**-14**	**-14**	**-28**	**-19**	**-6**	**-25**	**-306**

Although the tenants of the retail/office space are currently unknown, the trip generation of the remaining 6,400 square-foot of retail/office space was estimated assuming it will be leased as offices. To estimate the possible trip generation, data from land-use code 710, *General Office Building*, was referenced based on gross-floor area.

With 2,800 square-feet of medical office and 6,400 square-feet of general office, the site is expected to generate a total of 16 trips during the morning peak hour, 18 trips during the evening peak hour, and 160 daily trips. When compared to the existing restaurant, the site will still generate 20 less trips during the morning peak hour, 17 less trips during the evening peak hour, and 244 less daily trips. Accordingly, no traffic impacts are anticipated with the development if the site is leased to office and medical/dental office uses.

Table 2 on the following page summarizes the trip generation calculations assuming the retail/office space is leased by office uses.

Table 2: Trip Generation Summary

	ITE Code	Size	Morning Peak Hour			Evening Peak Hour			Weekday
			Enter	Exit	Total	Enter	Exit	Total	Total
Existing									
Restaurant	932	3,600 SF	20	16	36	22	13	35	404
Proposed									
Medical Office	720	2,800 SF	6	2	8	3	7	10	98
Office Building (South)	710	1,400 SF	2	0	2	0	2	2	14
Office Building (North)	710	5,000 SF	5	1	6	1	5	6	48
Net Change in Trips			**-7**	**-13**	**-20**	**-18**	**1**	**-17**	**-244**

Since it is difficult to estimate the trip generation of the site with the varying number of retail uses that could occupy the space, it is recommended that, if a retail use is to occupy the site, additional analysis be conducted to evaluate the site's impacts on the local transportation system.

Site Circulation & Parking

With the partitioning of the subject site, a 24-foot access easement will be provided from the cul-de-sac on 8th Court to the eastern property line. This easement will provide access to a shared parking aisle with adjacent properties to the west as well as 90-degree parking along the face of each building and 90-degree parking in an eastern lot on each property.

Vehicles entering the site are anticipated to slow as they transition from 8th Court into the parking lot and remain slow as they round a "S" curve into the parking aisle. Both properties will provide 11 parking stalls and 1 accessible stall along this parking aisle. If the driver chooses, or if these spaces are full, the vehicle can travel to the eastern part of either site and enter into a parking area on the side of either building. Additional parking spaces are available along the aisles shared with adjacent properties at the entrance to the site.

Figure 2 shows the circulation of a "P" design vehicle through the site into the parking area on the eastern side of the southern property prior to backing into a space. It should be noted that circulation with the "P" design vehicle is a conservative analysis and that most late-model vehicles are significantly smaller in size and have improve maneuverability.

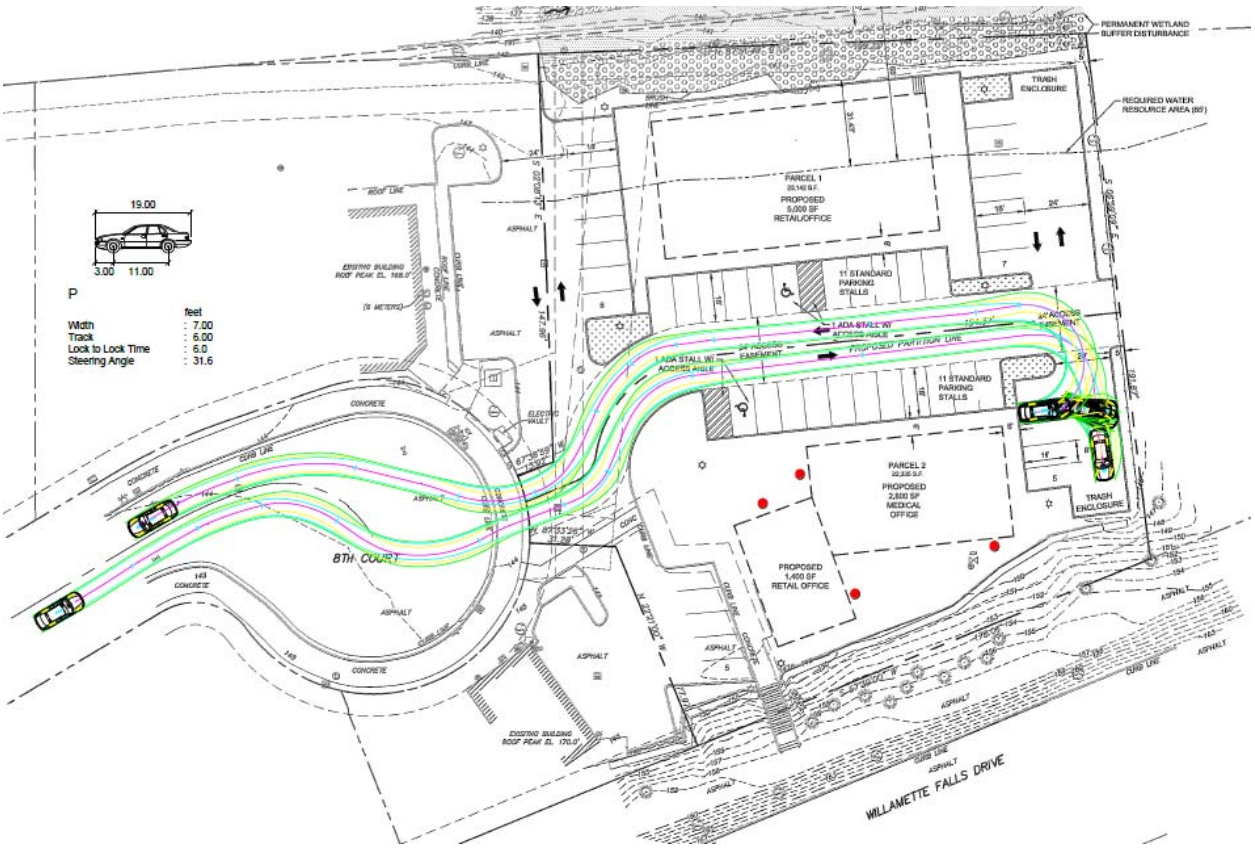


Figure 2: Circulation of "P" design vehicle on the site.

Due to the configuration of the site's access, it is anticipated that vehicles traveling along the parking on the face of each building will be traveling at a slow speeds. If visibility along the inside of the "S" corner and entering the parking areas on the eastern side of the property are maintained, it is anticipated that a vehicle exiting a parking stall will be able to see oncoming traffic for sufficient distance in order to ensure they can safely back into the drive aisle; or that an entering vehicle will be able to observe a backing vehicle with enough time to slow or come to a stop.

Because the site is located at the eastern end of cul-de-sac without a through path to another street, it is anticipated that the property will serve minimal pedestrian and bicycle traffic. Regardless, pedestrians and bicyclists who travel from the street to the site and pedestrians who travel from within the parking area itself should be considered in the design.

The proposed site plan shows a concrete path being maintained from the previous restaurant use that connects the sidewalk on 8th Court and the southern building. This feature, in addition to slow vehicular travel speeds at the site access, are anticipated to allow pedestrians to safely navigate the site. The slow vehicular speeds also allow bicyclists to safely share the drive aisle with motor vehicles.

Traffic Impact Analysis Requirements

Per Section 85.170.B.2.c.1) of the City's Development Code, a Traffic Impact Analysis is required under the following conditions:

(A) When the development application proposes a change in zoning or an amendment to the Comprehensive Plan; or

(B) When the Oregon Department of Transportation states the development action may have operation or safety concerns along a State highway; and

(C) The development causes one or more of the following effects:

(1) Increases site traffic volumes by at least 250 average daily trips; or

(2) Increases the use of adjacent streets by vehicles exceeding the 20,000-pound gros vehicle weights by 10 vehicles or more per day; or

(3) Has an access that does not meet minimum intersection sight distance requirements, or is located where vehicles entering/leaving the property are restricted; or

(4) Has an access that does not meet the access spacing standard of the roadway; or

(5) A change in internal traffic patterns that may cause safety problems.

The proposed development is an allowed use under the existing zoning and does not alter the zoning designation or amend the Comprehensive Plan. Criteria (A) is not triggered.

Although located near the Interstate 205 ramps onto 10th Street, the proposed development of the 2,800 square-foot of medical office is projected to have less of an impact on the system than the existing restaurant use. If the additoinal retail/office space is used for office uses, the subject property is anticipated to generate less trips than the existing use of the site. Also, additional truck traffic is not expected for any of the uses on the site.

Access to the site is located at the end of the cul-de-sac on 8th Court. Based on the location of the access, the visibility of oncoming traffic is expected to be adequate with no obstructions and traffic entering/exiting the site will remain unrestricted so not to create queuing issues onto the public street. The access is located at least 50 feet from the adjacent access in the cul-de-sac meeting the City's standards for Local Commercial

Streets. The parking layout of the site is similar to the existing use on the site and is not expected to cause safety problems.

Per the requirements in the City's Development Code, a Traffic Impact Analysis is not required for the partition of the property, removal of the restaurant, and development of 2,800 square feet of medical office and 6,400 square feet of office space. If retail uses are proposed to occupy any of the retail/office space, it is recommended that trip generation be evaluated to ensure a Traffic Impact Analysis is not required.

Conclusions

The proposed partition and development of a 2,800 square-foot medical office at 2180 8th Court is projected to have less traffic impacts than the previous restaurant use on the subject site. If used for office, the 1,400 square-foot building on the southern lot and the 5,000 square-foot building on the northern lot will not contribute more traffic than what the site previously generated. If either space is considered for a retail use, it is recommended that additional analysis be conducted to evaluate whether occupancy will have any off-site impacts.

Based on the proposed parking configuration, it is anticipated that vehicles will be able to circulate the site in an efficient manner. Speeds of entering traffic are anticipated to be slow enough for pedestrians and bicyclists to safely utilize the parking area to reach destinations within the site. The provided site plan also shows the maintaining of a pedestrian walkway from the sidewalk to the southern building.

Per the City of West Linn's Development Code, a Traffic Impact Analysis is not required for the partitioning of the property, removal of the existing restaurant, and development of 2,800 square feet of medical office and 6,400 square feet of office space. If retail uses are proposed to occupy any of the retail/office space, it is recommended that the site's trip generation be evaluated to ensure a Traffic Impact Analysis is not required.

If you have any questions or concerns regarding this memorandum, please don't hesitate in contacting us.

Appendix

TRIP GENERATION CALCULATIONS

Land Use: High-Turnover (Sit-Down) Restaurant
Land Use Code: 932
Setting/Location General Urban/Suburban
Variable: 1,000 Sq. Ft. Gross Floor Area
Variable Quantity: 3.6

AM PEAK HOUR

Trip Rate: 9.94

	Enter	Exit	Total
Directional Distribution	55%	45%	
Trip Ends	**20**	**16**	**36**

PM PEAK HOUR

Trip Rate: 9.77

	Enter	Exit	Total
Directional Distribution	62%	38%	
Trip Ends	**22**	**13**	**35**

WEEKDAY

Trip Rate: 112.18

	Enter	Exit	Total
Directional Distribution	50%	50%	
Trip Ends	**202**	**202**	**404**

SATURDAY

Trip Rate: 122.40

	Enter	Exit	Total
Directional Distribution	50%	50%	
Trip Ends	**220**	**220**	**440**

Source: TRIP GENERATION, Tenth Edition

TRIP GENERATION CALCULATIONS

Land Use: Medical-Dental Office Building
Land Use Code: 720
Setting/Location General Urban/Suburban
Variable: 1,000 Sq Ft Gross Floor Area
Variable Quantity: 2.8

AM PEAK HOUR

Trip Rate: 2.78

	Enter	Exit	Total
Directional Distribution	78%	22%	
Trip Ends	**6**	**2**	**8**

PM PEAK HOUR

Trip Rate: 3.46

	Enter	Exit	Total
Directional Distribution	28%	72%	
Trip Ends	**3**	**7**	**10**

WEEKDAY

Trip Rate: 34.80

	Enter	Exit	Total
Directional Distribution	50%	50%	
Trip Ends	**49**	**49**	**98**

SATURDAY

Trip Rate: 8.57

	Enter	Exit	Total
Directional Distribution	50%	50%	
Trip Ends	**12**	**12**	**24**

Source: TRIP GENERATION, Tenth Edition

TRIP GENERATION CALCULATIONS

Land Use: General Office Building
Land Use Code: 710
Setting/Location General Urban/Suburban
Variable: 1000 Sq Ft Gross Floor Area
Variable Value: 1.4

AM PEAK HOUR

Trip Rate: 1.16

	Enter	Exit	Total
Directional Distribution	86%	14%	
Trip Ends	**2**	**0**	**2**

PM PEAK HOUR

Trip Rate: 1.15

	Enter	Exit	Total
Directional Distribution	16%	84%	
Trip Ends	**0**	**2**	**2**

WEEKDAY

Trip Rate: 9.74

	Enter	Exit	Total
Directional Distribution	50%	50%	
Trip Ends	**7**	**7**	**14**

SATURDAY

Trip Rate: 2.21

	Enter	Exit	Total
Directional Distribution	50%	50%	
Trip Ends	**2**	**2**	**4**

Source: TRIP GENERATION, Tenth Edition

TRIP GENERATION CALCULATIONS

Land Use: General Office Building
Land Use Code: 710
Setting/Location General Urban/Suburban
Variable: 1000 Sq Ft Gross Floor Area
Variable Value: 5.0

AM PEAK HOUR

Trip Rate: 1.16

	Enter	Exit	Total
Directional Distribution	86%	14%	
Trip Ends	**5**	**1**	**6**

PM PEAK HOUR

Trip Rate: 1.15

	Enter	Exit	Total
Directional Distribution	16%	84%	
Trip Ends	**1**	**5**	**6**

WEEKDAY

Trip Rate: 9.74

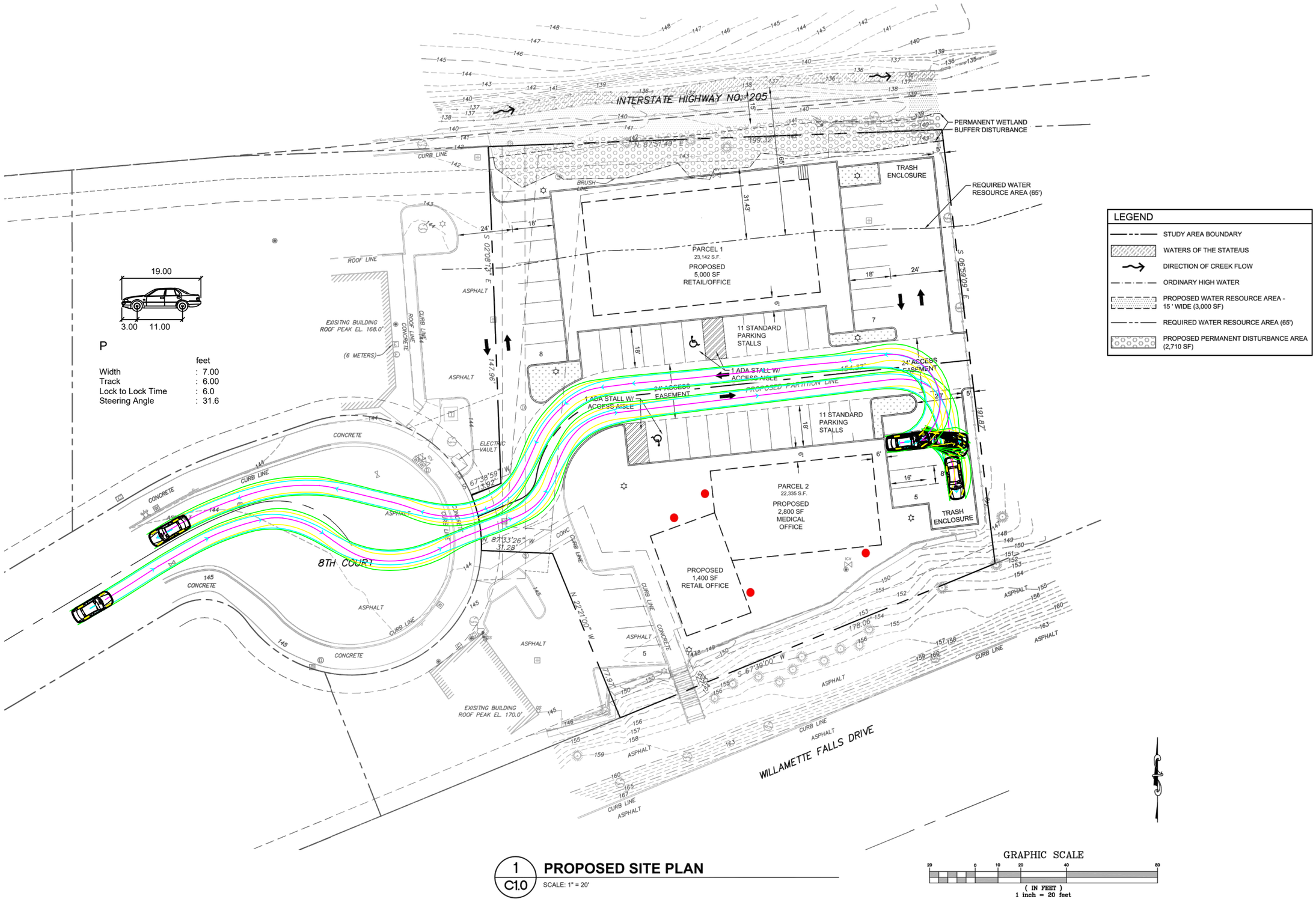
	Enter	Exit	Total
Directional Distribution	50%	50%	
Trip Ends	**24**	**24**	**48**

SATURDAY

Trip Rate: 2.21

	Enter	Exit	Total
Directional Distribution	50%	50%	
Trip Ends	**6**	**6**	**12**

Source: TRIP GENERATION, Tenth Edition



1 / C1.0 **PROPOSED SITE PLAN**

SCALE: 1" = 20'

PRELIMINARY NOT FOR CONSTRUCTION

04/05/19

CHRIS J. DESLAURIERS

RENEWS: 12-31-2019

WDY
Structural - Civil Engineers
6443 SW Beaverton-Hillsdale Hwy, suite 210 Portland, OR 97221
ph:503.203.8111 fx:503.203.8122 www.wdyi.com

8TH COURT COMMERCIAL

2180 8TH COURT
WEST LINN, OR 97068

MINOR PARTITION

REVISIONS			
	DATE:	08-10-2018	DRAWN: JAM
	JOB NUMBER:	18116	CHECKED: CJD

SHEET

C1.0

1 OF 1

8th COURT BUILDING SHELL

West Linn, OR

PROJECT TEAM

OWNER
WILLAMETTE CAPITAL INVESTMENTS, LLC
PO BOX 2507, WILSONVILLE, OR 97070
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PHANLIN@MSN.COM

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EDGE DEVELOPMENT
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PORTLAND, OR 97205
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DWIGHT.MASON@DMSTRUCTURAL.COM

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HHARRIS@RWENG.COM

TRAFFIC ENGINEER
LANCASTER ENGINEERING
321 SW 4TH AVENUE, SUITE 400
PORTLAND, OR 97204
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GEOTECHNICAL ENGINEER
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14835 SW 72ND AVE
PORTLAND, OR 97224
CONTACT: BEN ANDERSON
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BANDERSON@GEOPACIFICENG.COM

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SHAPIRO/DIDWAY LANDSCAPE ARCHITECTURE
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STEVE@SHAPIRO-LA.COM

CIVIL ENGINEER
WDY STRUCTURAL-CIVIL ENGINEERS
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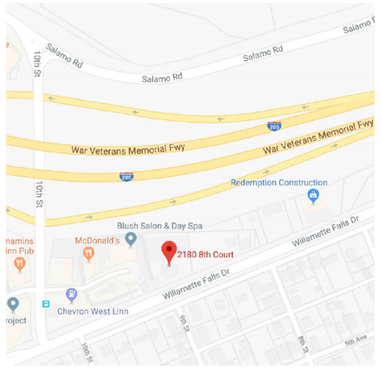
PORTLAND, OR 97221
CONTACT: CHRIS DESLAURIERS
P. (503) 203-8122
CHRIS@WDYI.COM

LAND SURVEYOR
CENTERLINE CONCEPTS LAND SURVEYING, INC.
19376 MOLALLA AVE, SUITE 120
OREGON CITY, OR 97045
P. (503) 650-0188

PROJECT INFORMATION

PROJECT DESCRIPTION	NEW COMMERCIAL OFFICE/RETAIL BUILDING SHELL (INTERIOR IMPROVEMENTS UNDER SEPARATE PERMIT)	
PROPERTY LOCATION	2180 8th COURT WEST LINN, OR 97068	
	PARCEL 2	
COUNTY	CLACKAMAS	
SITE AREA	22,335 SF	
BUILDING AREA	TENANT 1	2,777 SF
	TENANT 2	1,494 SF
	TOTAL	4,271 SF
ZONING	GC, GENERAL COMMERCIAL	
BUILDING OCCUPANCY	B, OFFICE M, MERCANTILE	
CONSTRUCTION TYPE	V-B, NON-SPRINKLERED	

DRAWING INDEX



VICINITY MAP
NTS

ISELIN ARCHITECTS P.C.
1307 Seventh Street
Oregon City, OR 97045
503-656-1942
www.iselinarchitects.com

•NOT FOR• PRELIMINARY CONSTRUCTION

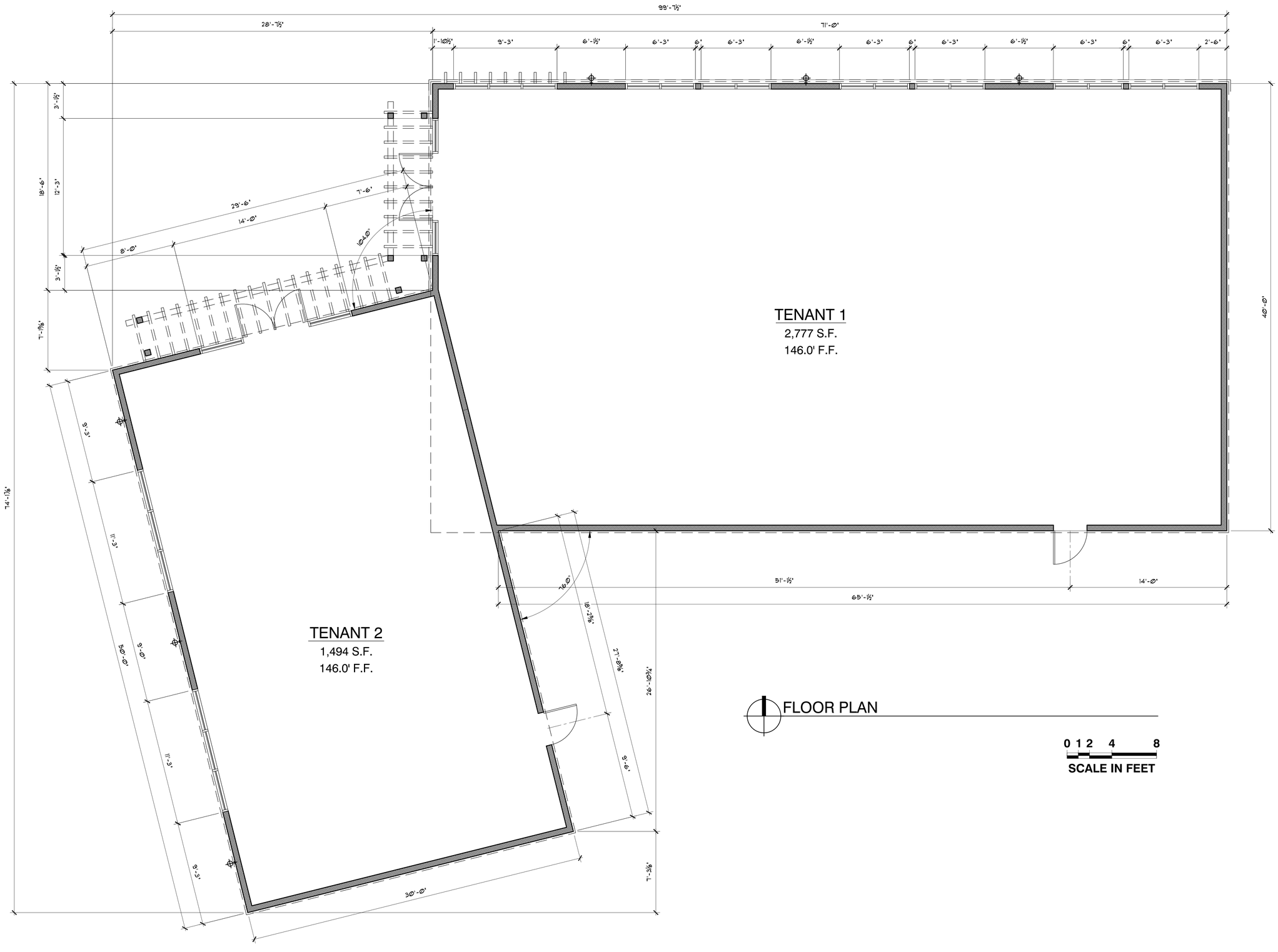
DESIGN REVIEW

8th Court Building Shell
2180 8th Court - South Lot
West Linn, OR 97068

PROJ. NO. : 1861
FILE : A-COV
DATE : 09/17/18

SHEET #
A1.0

COVER SHEET



FLOOR PLAN

0 1 2 4 8

SCALE IN FEET

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PRELIMINARY
CONSTRUCTION

DESIGN REVIEW

8th Court Building Shell

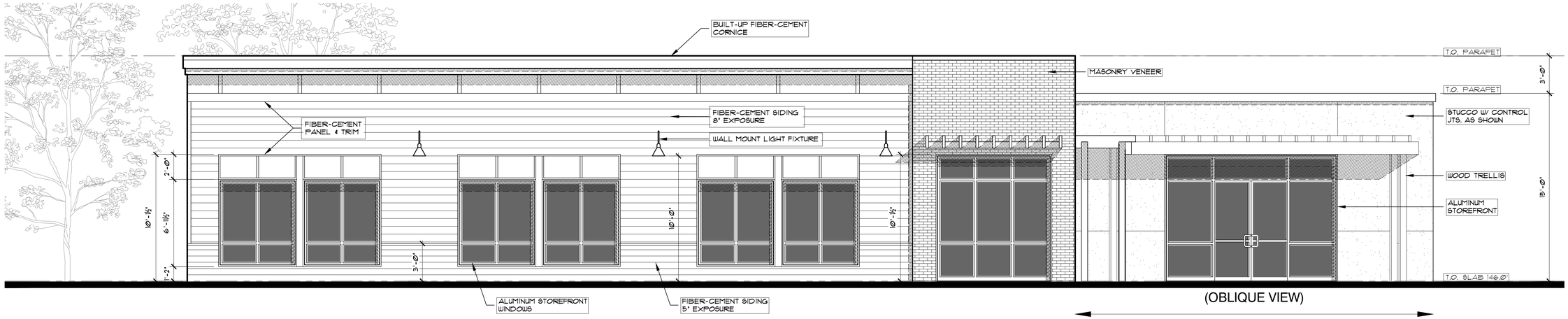
2180 8th Court - South Lot
West Linn, OR 97068

PROJ. NO. :	1861
FILE :	A-FP
DATE :	09/17/18

SHEET #

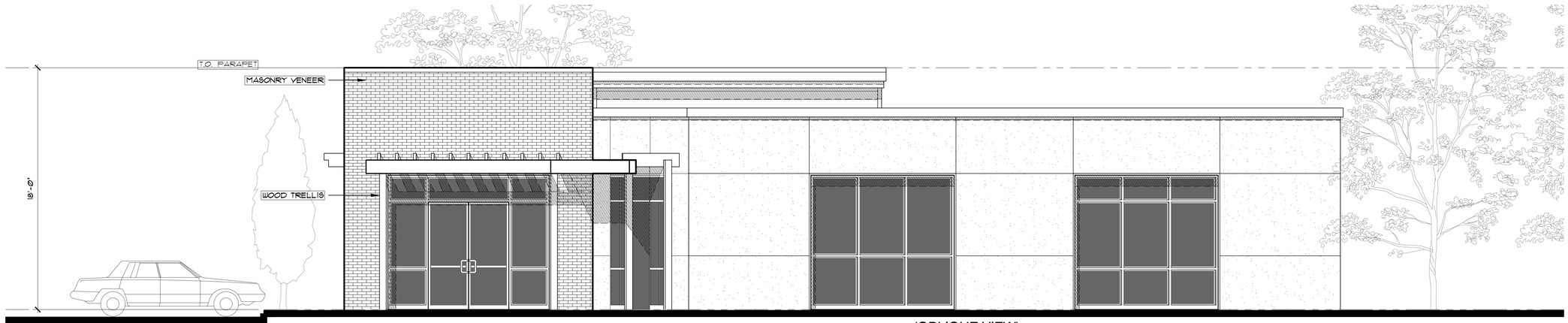
A1.1

FLOOR PLAN



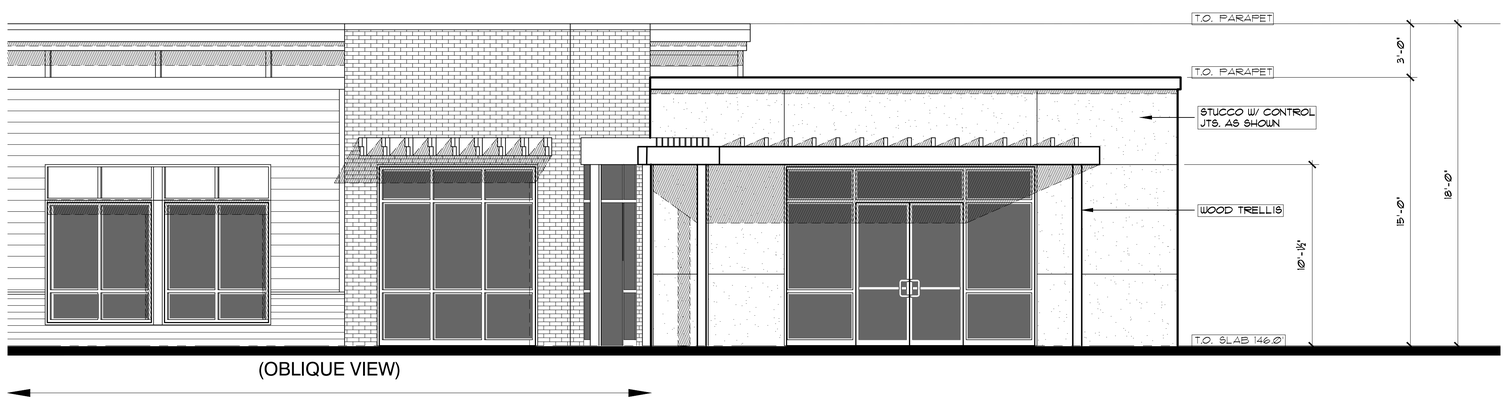
NORTH ELEVATION

1/4" = 1'-0"



WEST ELEVATION

1/4" = 1'-0"



PARTIAL NORTHWEST ELEVATION

1/4" = 1'-0"

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PRELIMINARY
CONSTRUCTION

DESIGN REVIEW

8th Court Building Shell

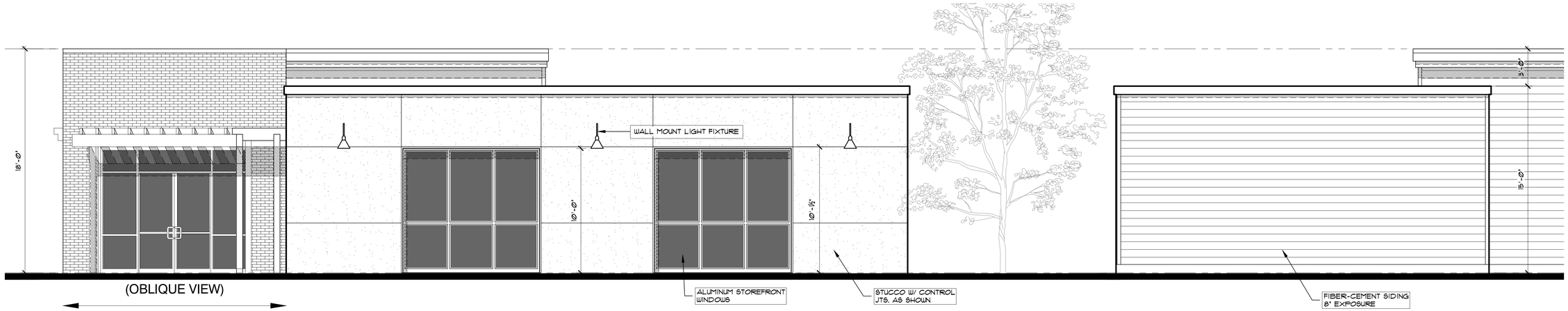
2180 8th Court - South Lot
West Linn, OR 97068

PROJ. NO. : 1861
FILE : A-ELV
DATE : 09/17/18

SHEET #

A2.1

BUILDING ELEVATIONS

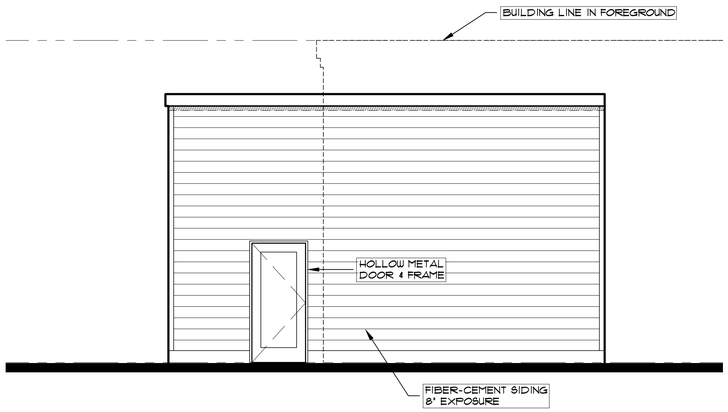


SOUTHWEST ELEVATION

1/4" = 1'-0"

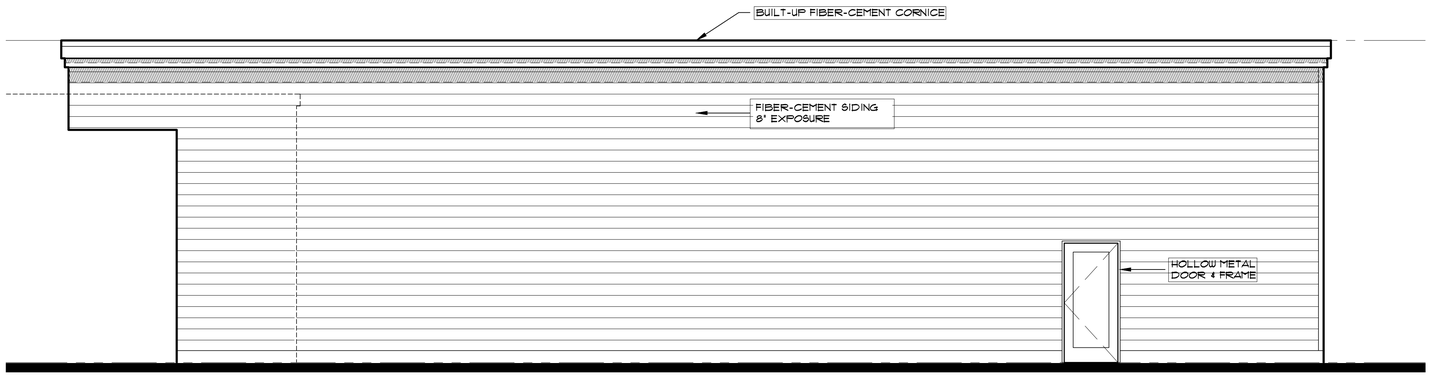
PARTIAL SOUTHEAST ELEVATION

1/4" = 1'-0"



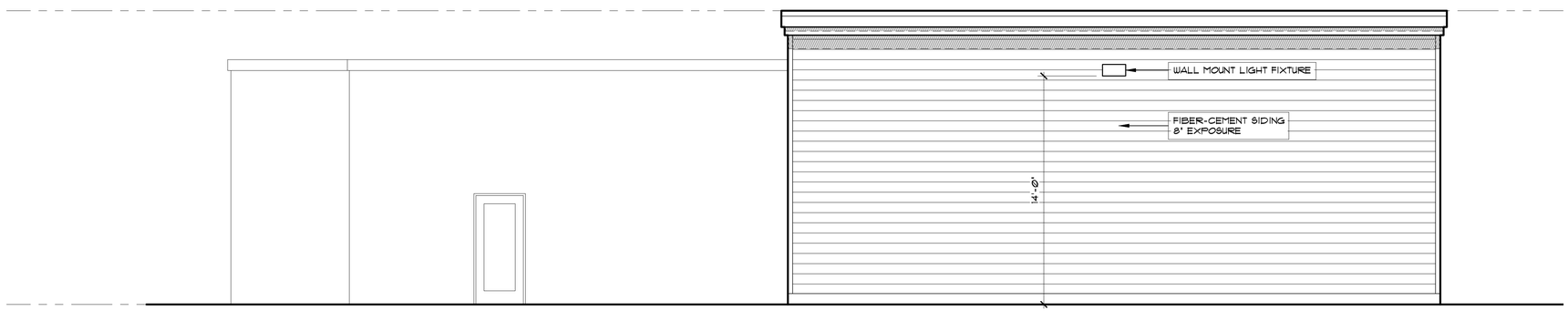
NORTHEAST ELEVATION

1/4" = 1'-0"



SOUTH ELEVATION

1/4" = 1'-0"



EAST ELEVATION

1/4" = 1'-0"

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503-656-1942
www.iselinarchitects.com

•NOT FOR• PRELIMINARY CONSTRUCTION

DESIGN REVIEW

8th Court Building Shell

2180 8th Court - South Lot
West Linn, OR 97068

PROJ. NO. :	1861
FILE :	A-ELV
DATE :	09/17/18

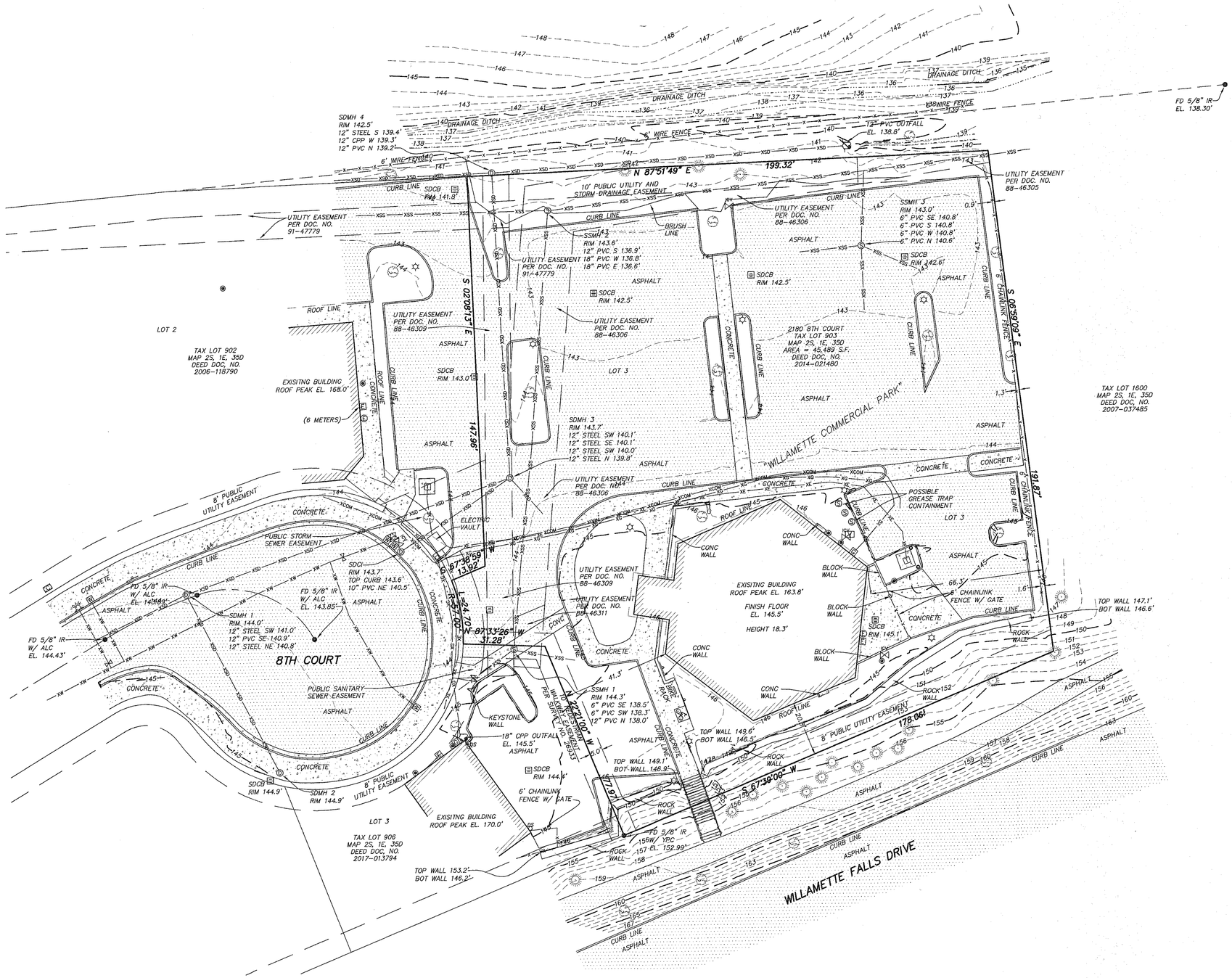
SHEET #

A2.2

BUILDING ELEVATIONS

EXISTING CONDITIONS MAP

TAX LOT 903, MAP 2S, 1E, 35D
LOCATED IN THE S.E. 1/4 SECTION 35, T.2S., R.1E., W.M.,
CITY OF WEST LINN, CLACKAMAS COUNTY, OREGON
MARCH 7, 2018 SCALE 1"=20'



SURVEY NOTES:

THE DATUM FOR THIS SURVEY IS BASED UPON A STATIC GPS OBSERVATION OF LOCAL CONTROL POINTS, PROCESSED THROUGH OPUS. DATUM IS NAVD 88.

A TRIMBLE S6-SERIES ROBOTIC INSTRUMENT WAS USED TO COMPLETE A CLOSED LOOP FIELD TRAVERSE.

THE BASIS OF BEARINGS FOR THIS SURVEY IS PER MONUMENTS FOUND AND HELD PER THE PLAT OF "WILLAMETTE COMMERCIAL PARK", RECORDS OF CLACKAMAS COUNTY.

THE PURPOSE OF THIS SURVEY IS TO RESOLVE AND DETERMINE THE PERIMETER BOUNDARY OF THE SUBJECT PROPERTY, TO SHOW ALL PERTINENT BOUNDARY ISSUES AND ENCROACHMENTS. NO PROPERTY CORNERS WERE SET IN THIS SURVEY.

NO WARRANTIES ARE MADE AS TO MATTERS OF UNWRITTEN TITLE, SUCH AS ADVERSE POSSESSION, ESTOPPEL, ACQUIESCENCE, ETC.

NO TITLE REPORT WAS SUPPLIED OR USED IN THE PREPARATION OF THIS MAP.

THE UNDERGROUND UTILITIES AS SHOWN ON THIS MAP HAVE BEEN LOCATED FROM FIELD SURVEY OF ABOVE GROUND STRUCTURES AND AS MARKED BY OTHERS. THE SURVEYOR MAKES NO GUARANTEE THAT THE UNDERGROUND UTILITIES SHOWN COMPRISE ALL SUCH UTILITIES IN THE AREA, EITHER IN SERVICE OR ABANDONED. THE SURVEYOR FURTHER DOES NOT WARRANT THAT THE UNDERGROUND UTILITIES ARE IN THE EXACT LOCATION INDICATED, ALTHOUGH HE DOES CERTIFY THAT THEY ARE LOCATED AS ACCURATELY AS POSSIBLE FROM INFORMATION AVAILABLE. THE SURVEYOR HAS NOT PHYSICALLY LOCATED THE UNDERGROUND UTILITIES. SUBSURFACE AND ENVIRONMENTAL CONDITIONS WERE NOT EXAMINED OR CONSIDERED AS A PART OF THIS SURVEY. NO STATEMENT IS MADE CONCERNING THE EXISTENCE OF UNDERGROUND OR OVERHEAD CONTAINERS OR FACILITIES THAT MAY AFFECT THE USE OR DEVELOPMENT OF THIS TRACT. THIS SURVEY DOES NOT CONSTITUTE A TITLE SEARCH BY SURVEYOR.

EASEMENTS SHOWN WITHOUT DOCUMENT NUMBER ARE PER THE PLAT OF "WILLAMETTE COMMERCIAL PARK"

LEGEND:

Some Symbols shown may not be used on map

- DECIDUOUS TREE W/ TREE TAG
- EVERGREEN TREE W/ TREE TAG
- STORM SEWER MANHOLE
- CATCH BASIN
- SANITARY SEWER CLEANOUT
- SANITARY SEWER MANHOLE
- WATER VALVE
- WATER METER
- FIRE HYDRANT
- GAS VALVE
- GAS METER
- BOLLARD
- SIGN
- MAILBOX
- COMMUNICATIONS PEDESTAL
- COMMUNICATIONS MANHOLE
- COMMUNICATIONS BOX
- STORM OUTFALL
- FOUND MONUMENT
- DS DOWN SPOUT TO STORM SYSTEM
- IRRIGATION CONTROL VALVE
- FI = FIR TREE
- PI = PINE TREE
- CE = CEDAR TREE
- DE = DECIDUOUS TREE
- UTILITY AND LIGHT POLE
- UTILITY POLE
- LIGHT POLE
- GUY WIRE
- ELECTRIC BOX
- ELECTRIC METER
- ELECTRICAL POWER PEDESTAL
- ELECTRIC CONNECTION
- HEAT PUMP
- XOH — OVERHEAD LINE
- XG — GAS LINE
- XE — ELECTRICAL LINE
- XCOM — COMMUNICATIONS LINE
- XSS — SANITARY SEWER LINE
- XSD — STORM DRAIN LINE
- XW — WATER LINE
- X — FENCELINE
- UTILITY RISER
- ELECTRIC TRANSFORMER
- 3' X 7' BIKE LOCKER
- UNKNOWN UTILITY VAULT
- FD = FOUND
- IR = IRON ROD
- YPC = YELLOW PLASTIC CAP
- ALC = ALUMINUM CAP

GRAPHIC SCALE

20 0 10 20 40

(IN FEET)
1 INCH = 20 FT.

SIGNED ON: 15 MAR 18

REGISTERED PROFESSIONAL LAND SURVEYOR
OREGON
JULY 13, 2004
TOBY G. BOLDEN
60377LS
RENEWS: DECEMBER 31, 2019

CENTERLINE CONCEPTS
LAND SURVEYING, INC.
19376 MOLALLA AVE., SUITE 120
OREGON CITY, OREGON 97045
PHONE 503.650.0188 FAX 503.650.0189

Plotted: M: \PROJECTS\EDGE DEV-8TH CT-2180\dwg\ECM.dwg

CIVIL NOTES

01.0 GENERAL

1. THESE NOTES SET MINIMUM STANDARDS FOR CONSTRUCTION. THE DRAWINGS GOVERN OVER THE GENERAL NOTES TO THE EXTENT SHOWN.
2. CONTRACTOR SHALL VERIFY ALL DIMENSIONS AND CONDITIONS ON DRAWINGS AND IN FIELD. NOTIFY OWNER'S REPRESENTATIVE OF ANY DISCREPANCIES PRIOR TO PROCEEDING WITH WORK.
3. CONTRACTOR SHALL BE SOLELY RESPONSIBLE TO PROVIDE FOR ALL NECESSARY TRAFFIC CONTROL PLANS, TEMPORARY SHORING AND OTHER INCIDENTAL WORK NEEDED FOR THE COMPLETION OF THE WORK.
4. WHERE REFERENCE IS MADE TO IBC, ASTM, AISC, ACI OR OTHER STANDARDS, THE LATEST ISSUE AT THE BUILDING PERMIT DATE SHALL APPLY.
5. ALL WORK AND MATERIALS SHALL BE IN COMPLIANCE WITH THE PROJECT SPECIFICATIONS, THE "INTERNATIONAL BUILDING CODE" (IBC), THE INTERNATIONAL PLUMBING CODE (IPC) AND THE PROVISIONS OF "STANDARD SPECIFICATIONS FOR HIGHWAY CONSTRUCTION", 2018 EDITION, OREGON STATE HIGHWAY DIVISION (OSHD), AS AMENDED BY ALL OTHER STATE AND LOCAL CODES, JURISDICTIONS, PERMITS, AND BUILDING REQUIREMENTS THAT APPLY. THE CONTRACTOR SHALL OBTAIN ALL APPLICABLE CONSTRUCTION PERMITS AND SUBMIT TRAFFIC CONTROL PLANS PRIOR TO PROCEEDING WITH WORK.
6. EXISTING UTILITIES , SITE AND TOPOGRAPHIC INFORMATION SHOWN HEREON ARE BASED ON RECORD DRAWINGS PROVIDED BY OR MADE AVAILABLE BY THE OWNER. THE CONTRACTOR IS REQUIRED TO FIELD VERIFY THE LOCATION OF EXISTING FEATURES AND UTILITIES PRIOR TO CONSTRUCTION, AND SHALL ARRANGE FOR THE RELOCATION OF ANY IN CONFLICT WITH THE PROPOSED WORK. MINOR ADJUSTMENTS BASED ON FIELD CONDITIONS SHALL BE MADE BY THE CONTRACTOR AT NO ADDITIONAL COST TO THE OWNER. LOCAL COUNTY AND CITY RECORD DRAWINGS SHOULD BE REVIEWED BY THE CONTRACTOR FOR THIS PURPOSE. THE EXISTENCE AND LOCATION OF EXISTING FEATURES ARE NOT GUARANTEED. ADDITIONAL UNDERGROUND UTILITIES MAY EXIST. THE ENGINEER ASSUMES NO RESPONSIBILITY FOR THE ACCURACY OR COMPLETENESS OF INFORMATION OBTAINED FROM RECORD DRAWINGS OR INFORMATION PROVIDED BY OTHERS, IMPLIED OR OTHERWISE.
7. ATTENTION EXCAVATORS: OREGON LAW REQUIRES YOU TO FOLLOW RULES ADOPTED BY OREGON UTILITY NOTIFICATION CENTER. THOSE RULES ARE SET FORTH BY OAR 952-001-0010 THROUGH OAR 952-001-0090. YOU MAY OBTAIN COPIES OF THESE RULES FROM THE CENTER BY CALLING (503) 232-1987. IF YOU HAVE ANY QUESTIONS ABOUT THE RULES, YOU MAY CONTACT THE CALL CENTER. YOU MUST NOTIFY THE CENTER AT LEAST 2 BUSINESS DAYS, BUT NOT MORE THAN 10 BUSINESS DAYS, BEFORE COMMENCING AN EXCAVATION. CALL (800) 332-2344.
8. CONTRACTOR SHALL CAREFULLY MAINTAIN BENCHMARKS, PROPERTY CORNERS, MONUMENTS, AND OTHER REFERENCE POINTS. IF SUCH POINTS ARE DISTURBED OR DESTROYED BY CONSTRUCTION ACTIVITIES, THE CONTRACTOR SHALL PAY FOR THEIR REPLACEMENT BY EMPLOYING A PROFESSIONAL LAND SURVEYOR TO RESET PROPERTY CORNERS AND OTHER SUCH MONUMENTS.
9. CONTRACTOR TO COORDINATE AND PROVIDE INSTALLATION AS NECESSARY OF ALL PUBLIC AND PRIVATE UTILITIES FOR THIS PROJECT INCLUDING WATER SERVICE, SANITARY SEWER SERVICE, STORM DRAIN, ELECTRIC POWER, COMMUNICATIONS, CABLE TV, NATURAL GAS, STREET LIGHTS, ETC.
10. CONTRACTOR TO MAINTAIN ONE COMPLETE SET OF APPROVED DRAWINGS ON SITE FOR THE SOLE PURPOSE OF CONTRACTOR RECORDING AS-BUILT INSTALLATION OF IMPROVEMENTS. SUBMIT AS-BUILT PLANS TO OWNER.
11. ALL CONSTRUCTION ACTIVITY SHALL BE DONE IN A SAFE AND NEAT MANNER AND UNDER OBSERVATION BY CITY FORCES.
12. THE CONTRACTOR SHALL BE SOLELY RESPONSIBLE FOR COMPLYING WITH ALL CONSTRUCTION SAFETY, HEALTH AND OTHER RULES AND REGULATIONS FROM OSHA, DEQ, STATE, AND LOCAL REGULATING AGENCIES FOR SAFETY AND INSTALLATION OF THE WORK INCLUDING BUT NOT LIMITED TO SHORING, BRACING, ERECTION / INSTALLATION, FALL PROTECTION, GUARDRAILS, ETC.
13. ALL SEWER TRENCH LINES AND EXCAVATIONS SHALL BE PROPERLY SHORED AND BRACED TO PREVENT CAVING. UNUSUALLY DEEP EXCAVATIONS MAY REQUIRE EXTRA SHORING AND BRACING. ALL SHEETING, SHORING, AND BRACING OF TRENCHES SHALL CONFORM TO OREGON OCCUPATIONAL SAFETY AND HEALTH DIVISION (OSHA) REGULATIONS AND THE CITY OR COUNTY STANDARD CONSTRUCTION SPECIFICATIONS.
14. ALL UNDERGROUND UTILITIES SHALL BE INSTALLED PRIOR TO CONSTRUCTION OF CURBS, RETAINING WALLS, OR PAVEMENT.
15. ALL WATER AND SEWERAGE APPURTENANCES SHALL CONFORM TO APWA, OREGON CHAPTER, "STANDARDS SPECIFICATIONS FOR PUBLIC WORKS CONSTRUCTION"; THE APPROVED CONSTRUCTION DRAWINGS; AND CITY OF WEST LINN REQUIREMENTS.
17. EXISTING TOPOGRAPHY, UTILITIES, AND ELEVATION DATUM ARE BASED ON THE OWNER'S TOPOGRAPHIC SURVEY PROVIDED BY THE OWNER/DEVELOPER. THE EXISTENCE AND LOCATION OF EXISTING FEATURES ARE NOT GUARANTEED. ADDITIONAL UNDERGROUND UTILITIES MAY EXIST. THE ENGINEER/WDY ASSUMES NO RESPONSIBILITY FOR THE ACCURACY OR COMPLETENESS OF INFORMATION PROVIDED BY OTHERS, IMPLIED OR OTHERWISE.
18. DETAILS SHOWN ON THE DRAWINGS ARE INTENDED TO APPLY AT ALL SIMILAR CONDITIONS AND LOCATIONS.
19. DO NOT SCALE INFORMATION FROM DRAWINGS.
20. CONTRACTOR TO REMOVE FROM SITE EXCESS SOIL OR OTHER MATERIALS NOT REUSABLE FOR THIS PROJECT, AND COMPLY WITH ALL RECOMMENDATIONS OF THE PROJECT GEOTECHNICAL REPORT.
21. APPROPRIATE BENCHING OF FILLS IS REQUIRED FOR FILLS OVER 5 FEET IN HEIGHT ON SLOPES IN EXCESS OF 5 HORIZONTAL TO 1 VERTICAL. THE GEOTECHNICAL ENGINEER SHALL INSPECT BENCHES PRIOR TO FILL PLACEMENT.
22. CUT AND FILL SLOPES SHALL BE PROTECTED FROM EROSION. SUCH CONTROL MAY CONSIST OF APPROPRIATE REVEGETATION OR OTHER ACCEPTABLE MEANS AND METHODS. EROSION CONTROL MEASURES SHALL BE IN PLACE PRIOR TO EARTHWORK OR SITE STRIPPING.
23. MATERIAL IN SOFT SPOTS WITHIN 5 FEET OF RIGHT-OF-WAYS, PAVEMENTS OR BUILDINGS SHALL BE REMOVED TO THE DEPTH REQUIRED TO PROVIDE A FIRM SUBGRADE AND SHALL BE REPLACED WITH 1-1/2" - 0" CRUSHED ROCK COMPACTED TO 95% PER ASTM D1557.
24. THE NATIVE SUBGRADE SURFACE SHALL BE APPROVED BEFORE SCARIFYING OR PLACING ANY FILL OR BASE ROCK BY THE SOILS ENGINEER. THE UPPER 8 INCHES OF NATIVE SUBGRADE IS TO BE SCARIFIED, DRIED AND RECOMPACTED TO 90% MAXIMUM DRY DENSITY PER ASTM D698. PLACE GEOTEXTILE FABRIC (MIRAFI 500X, PROPEX GEOTEX 200ST, CONTECH C200 OR EQUAL) BELOW ALL VEHICULAR PAVEMENT. FOR WET WEATHER CONSTRUCTION (AS DETERMINED BY THE GEOTECHNICAL ENGINEER) A WORKING BLANKET OF PIT RUN OR CRUSHED ROCK IS TO BE LAID OVER GEOTEXTILE FABRIC. ON-SITE COMPACTION TESTS AND DEFLECTION TEST(S) PERFORMED WITH A 50,000 LB. VEHICLE MUST BE PERFORMED AND WITNESSED BY THE GEOTECHNICAL ENGINEER. NO DEFLECTION IS ALLOWED AND ALL BUILDING AND PAVEMENT AREAS MUST BE PROOF-ROLLED. DURING WET WEATHER CONSTRUCTION (AS DETERMINED BY THE SOILS ENGINEER), PROVIDE THE PROOF-ROLL TEST OVER THE BASE ROCK SURFACES PRIOR TO PLACEMENT OF ANY PAVEMENT.
25. CRUSHED ROCK BASE MATERIAL AND PIPE ZONE MATERIAL SHALL BE CRUSHED ROCK CONFORMING TO OREGON DEPARTMENT OF TRANSPORTATION (ODOT) SECTION 00640 AND 00641 AND BE COMPACTED TO 95% OF MAXIMUM DENSITY AS DETERMINED IN ACCORDANCE WITH ASTM D1557.
26. 3/4 " - 0" CRUSHED ROCK PIPE ZONE AND BACKFILL MATERIAL IS REQUIRED FOR ALL UTILITY LINES, CONDUITS AND LEVELING COURSES. REFER TO THE TYPICAL UTILITY CONDUIT TRENCH AND PAVEMENT DETAILS.
27. ASPHALTIC CONCRETE (A.C.) PAVEMENT SHALL BE A LEVEL 4 HMAC SUPER PAVE WITH AN ASPHALT CONTENT PER OREGON DOT CLASSIFICATION AND APPRVED JMFM FOR ALL LIFTS. PAVEMENT SHALL BE PLACED ONLY ON DRY, CLEAN AND PROPERLY PREPARED SURFACES, AND WHEN CONDITIONS MEET THE SPECIFICATIONS AS SET FORTH IN THE MOST RECENT EDITION OF THE OREGON DOT SPECIFICATIONS. ALL NEW PAVEMENT AREAS SHALL CONFORM TO THE TYPICAL PAVEMENT SECTION DETAIL. ALL A.C. PAVEMENT TO BE COMPACTED TO 91% OF MAXIMUM DENSITY PER ASTM D2041 FOR FIRST LIFTS LESS THAN 3-INCHES AND 92% COMPACTION SHALL BE REQUIRED FOR SUBSEQUENT LIFTS.
28. PERVIOUS ASPHALTIC CONCRETE PAVEMENT SHALL HAVE AGGREGATE AND ASPHALTIC MATERIALS IN ACCORDANCE WITH APPLICABLE STATE OF OREGON DOT SPECIFICATIONS FOR AN OPEN GRADED, 12.5MM GRADED MIX. PROVIDE 5.5% TO 5.7% ASPHALT CONTENT.
29. ALL JOINTS BETWEEN A.C AND CONCRETE STRUCTURES MUST BE TACKED WITH BITUMASTIC. NO EXCEPTIONS ALLOWED.
30. ALL PORTLAND CEMENT CONCRETE PAVEMENT SHALL HAVE A 28 DAY MINIMUM ULTIMATE STRENGTH OF 4000 PSI. PROVIDE A MINIMUM OF (4) TEST CYLINDERS IN ACCORDANCE WITH CURRENT IBC AT EACH POUR.
   A. MINIMUM MIX REQUIREMENTS:
      I. CEMENT CONTENT PER YARD: 5 SACKS.
      II. MAXIMUM WATER/CEMENT RATIO: 0.45. FLY ASH MEETING ASTM C618 AND WITH LOSS ON IGNITION LESS THAN 3% MAY BE ADDED TO THE CEMENT, BUT NOT MORE THAN 15% BY WEIGHT.
      III. SLUMP: 3 INCH TO 4 INCH. DEVIATING FROM DESIGN SLUMP +1/2 INCH TO -1 INCH. WHEN CONCRETE IS TO BE PUMPED, ADD PLASTICIZERS MEETING ASTM C494 AND PROVIDE A NEW MIX DESIGN. DO NOT ADD WATER.
      IV. ADMIX: PROVIDE WATER REDUCING ADMIX (MASTER BUILDERS) AND REDUCE WATER USED BY 10% MINIMUM FOR ALL SLABS.
      V. AIR ENTRAINMENT: PER ACI 301 AND 306 AT ALL EXTERIOR SLABS AND FLAT WORK, 5.5% AIR MINIMUM.
      VI. ALL ADMIXTURES TO BE COMPATIBLE FROM SAME MANUFACTURER.
   B. PLACE AND CURE ALL CONCRETE PER ACI CODES AND STANDARDS.
   C. SLEEVES, PIPES OR CONDUITS OF ALUMINUM SHALL NOT BE EMBEDDED IN STRUCTURAL CONCRETE UNLESS EFFECTIVELY COATED.
   D. PROVIDE CONTROL JOINTS IN ALL SLABS ON GRADE AS SHOWN ON PLANS. IN AREAS WHERE JOINTS ARE NOT SHOWN, INSTALL IN SQUARE PATTERN AT 15' ON CENTER EACH WAY MAXIMUM. INSTALL JOINTS AT ALL RE-ENTRANT CORNERS.
   E. PROVIDE 1/4" PREMOLDED EXPANSION JOINT MATERIAL BETWEEN SLABS AND WALLS THAT ARE NOT DOWELED TOGETHER, AND AROUND COLUMNS THAT DO NOT HAVE SLAB BLOCKOUTS.
31. ON-SITE HANDICAP/DISABILITY ACCESS ROUTES SHALL COMPLY WITH THE AMERICANS WITH DISABILITIES ACT (ADA), STATE AND LOCAL REGULATIONS. NOTIFY ARCHITECT AND ENGINEER PRIOR TO INSTALLING FINISH PAVEMENT IN CONFLICT WITH ADA REQUIREMENTS. IN GENERAL:
   A. MAXIMUM CROSS SLOPE OF ANY PAVEMENT PERPENDICULAR TO DIRECTION OF TRAVEL IS 2.0%.
   B. MAXIMUM SLOPE OF WALKWAYS IN DIRECTION OF TRAVEL IS 5.0%.
   C. FOR RAMPS, THE MAXIMUM SLOPE IS 8.33% AND MAXIMUM RISE BETWEEN LANDINGS IS 30 INCHES, HANDRAILS ARE REQUIRED EACH SIDE OF ALL RAMPS WITH SLOPE GREATER THAN 5%.
   D. MAXIMUM SLOPE OF CURB RAMPS AND WINGS OF CURB RAMPS IS 8.33%. THE MAXIMUM LENGTH OF A CURB RAMP IS 6 FEET.
   E. PROVIDE FINISH PAVEMENT SURFACE TEXTURES IN ACCORDANCE WITH ADA.
   F. STRAIGHT GRADE FINISH PAVEMENT AND TOP OF CURB ELEVATIONS BETWEEN GIVEN ELEVATION POINTS. BLEND FINISH GRADES AT GRADE BREAKS.
32. PAVEMENT MARKINGS ON AC PAVEMENT SHALL BE MPI #32 ALKYD PAINT. INSTALL PER MANUFACTURERS RECOMMENDATIONS. VERIFY PAINT LOCATIONS, COLORS AND STENCILS WITH ARCHITECT.
33. ADA STALL PAVEMENT STENCILS SHALL BE THERMOPLASTIC STENCIL INSTALLED PER MANUFACTURES RECOMMENDATIONS.

02.0 CLEARING AND GRUBBING

1. ALL CONSTRUCTION AND MATERIALS WITHIN THE PUBLIC RIGHT-OF-WAY SHALL CONFORM TO THESE PLANS AND THE APPLICABLE REQUIREMENTS OF CITY OF , STATE OF OREGON AND "EROSION PREVENTION AND SEDIMENTATION CONTROL MANUAL", DECEMBER 2000 EDITION, WASHINGTON COUNTY R+O #00-7.
2. NOTIFY ARCHITECT 2 BUSINESS DAYS BEFORE COMMENCING WORK.
3. CONTRACTOR SHALL REMOVE ALL TREES, SHRUBS, RUBBISH, AND MAN-MADE STRUCTURES INCLUDING BUT NOT LIMITED TO CONCRETE SLABS, WALLS, VAULTS, FOOTINGS, ASPHALTIC PAVED SURFACES, GRAVELED AREAS, SHED OR OTHER FREE-STANDING BUILDINGS (CONSTRUCTED OF WOOD, CONCRETE, METAL, ETC.) FOUNDATIONS, FENCES, RAILINGS, MACHINERY, ETC. WITHIN THE CLEARING LIMITS. THE ITEMS LISTED ABOVE SHALL BE DISPOSED OF OFF-SITE. IT SHALL BE THE CONTRACTORS RESPONSIBILITY TO CONFIRM THE NUMBER AND TYPE OF STRUCTURES TO BE REMOVED. CONTRACTOR SHALL OBTAIN ALL NECESSARY DEMOLITION AND WORK PERMITS.
4. ALL BURIED STRUCTURES (I.E. TANKS, LEACH LINES, DRAIN TILE, AND PIPES) NOT DESIGNATED TO REMAIN ON THE SITE, SHALL BE REMOVED AND THE RESULTING EXCAVATIONS SHALL BE PROPERLY INSPECTED, BACKFILLED AND COMPACTED PRIOR TO ANY GRADING OR FILLING OPERATIONS. THIS IS TO INCLUDE STUMPS AND ROOTBALLS OF TREES TO BE REMOVED FROM THE SITE. NOTIFY CITY FOR INSPECTIONS AS REQUIRED.
5. THE AREA OF THE SITE DESIGNATED ON THE PLAN TO BE REGRADED OR PAVED SHALL BE STRIPPED TO REMOVE ALL ORGANIC MATERIAL DOWN TO FIRM SUBGRADE. THE CONTRACTOR SHALL BE RESPONSIBLE FOR PROTECTING SUBGRADE SOILS FROM OVERWORKING AND PROVIDE REPAIR TO DAMAGED SUBGRADE AT NO ADDITIONAL COST TO THE OWNER.
6. ALL UNSUITABLE MATERIAL (SOIL AND VEGETATION) REMOVED DURING THE CLEARING AND GRUBBING OPERATIONS SHALL BE REMOVED BY THE CONTRACTOR AND LEGALLY DISPOSED OF IN A SUITABLE LOCATION.
7. EXCAVATORS MUST COMPLY WITH ALL PROVISIONS OF ORS 757.541 TO 757.571 INCLUDING NOTIFICATION OF ALL OWNERS OF UNDERGROUND FACILITIES AT USA LOCATES (681-7044), AT LEAST 48 BUSINESS HOURS, BUT NOT MORE THAN 10 BUSINESS DAYS BEFORE COMMENCING AN EXCAVATION.
8. ALL EMBANKMENTS REQUIRED SHALL BE STRUCTURAL FILL MEETING THE REQUIREMENTS AND SPECIFICATIONS OF IBC CHAPTER 18.
9. ALL EXCESS MATERIAL NOT UTILIZED ON-SITE SHALL BE LEGALLY DISPOSED OF BY THE CONTRACTOR.
10. TREES NOT DESIGNATED TO BE REMOVED BY THE ARCHITECT SHALL BE PROTECTED AT ALL TIMES.
11. SAWCUT STRAIGHT LINES TO MATCH EXISTING PAVEMENT WITH THE NEW PAVEMENT.
12. CONTRACTOR SHALL PROVIDE AND MAINTAIN ADEQUATE TRAFFIC CONTROL ALONG THE EXISTING ROADS AS REQUIRED BY THE CITY OF .

03.0 PRIVATE UTILITIES

1. CONTRACTOR TO PROVIDE UTILITY SUBMITTALS FOR REVIEW PRIOR TO INSTALLATION OF ALL PROPOSED UTILITY PIPES, CONDUITS, MANHOLES, BENDS/FITTINGS AND ALL OTHER SYSTEM APPURTENANCES.
2. SANITARY SEWER, STORM DRAIN AND WATER LINES IN PRIVATE PROPERTY SHALL BE PRIVATELY OWNED, MAINTAINED AND OPERATED. PROVIDE TRACER WIRE AND WARNING TAPE FOR ALL PLASTIC UTILITY LINES.
3. ALL PRIVATE CATCH BASINS, AREA DRAINS, STORM DRAIN PIPE, SANITARY SEWER PIPE AND WATER PIPE AND APPURTENANCES SHALL MEET THE REQUIREMENTS OF THE LATEST INTERNATIONAL PLUMBING CODE AS APPLICABLE.
4. ALL CONNECTIONS TO EXISTING PUBLIC STORM SEWER, SANITARY SEWER AND WATER MAINS REQUIRE ISSUANCE OF A PUBLIC WORKS PERMIT AND INSPECTION BY THE CITY OF .... AND THE .... WATER DISTRICT AS APPLICABLE.
5. PRIVATE SANITARY SEWER LATERALS SHALL COMPLY WITH THE REFERENCED PUBLIC STANDARDS AND DRAWINGS FOR PUBLIC SANITARY SEWER. LAY THE 'T' AT A 2% SLOPE.
6. CAST IRON SANITARY OR STORM DRAIN PIPE AND JOINTS SHALL BE HUBLESS, SERVICE WEIGHT, AND MEET THE REQUIREMENTS OF CISPI 301. JOINTS SHALL BE MECHANICAL CLAMP RING TYPE, STAINLESS STEEL EXPANDING AND CONTRACTING SLEEVES WITH FULL CIRCLE NEOPRENE RIBBED GASKETS FOR POSITIVE SEAL. COUPLINGS AND SHIELDS TO BEAR THE MANUFACTURER'S REGISTERED INSIGNIA. INSTALL IN ACCORDANCE WITH MANUFACTURER'S RECOMMENDATION.
7. PVC SANITARY SEWER OR STORM DRAIN PIPE SHALL BE ASTM D3034, SDR-35. COMPATIBLE ASTM D3034 FITTINGS MUST BE USED WITH ASTM D3034 PIPE. ALL ASTM D3034 PIPE USED MUST BE OF WATER-TIGHT JOINTS AND TESTED FOR ROUNDNESS AFTER BACKFILL. PROVIDE PRESSURE TEST. PROVIDE TV VIDEO TAPE IF SO REQUIRED BY THE JURISDCITION HAVING AUTHORITY.
8. PERFORATED PVC SEPTIC DRAINFIELD PIPE SHALL BE PER ASTM D2729 WITH SOLVENT WELD JOINTS.
9. PVC SANITARY SEWER PRESSURE (FORCE MAIN) PIPE SHALL BE SCHEDULE 40 PER ASTM D1784 WITH SOLVENT WELD JOINTS PER ASTM D1785.
10. HIGH DENSITY POLYETHYLENE (HDPE) STORM DRAIN PIPE AND ASSOCIATED HDPE FITTINGS SHALL MEET THE REQUIREMENTS OF ASTM D 3350 OR ASTM 1248, TYPE III, CLASS C, CATEGORY 4, GRADE P33. 4 INCH TO 10 INCH PIPE SHALL MEET AASHTO M252 TYPE S; 12 INCH TO 36 INCH PIPE SHALL MEET AASHTO M294 TYPE S; 42 INCH TO 48 INCH SHALL MEET AASHTO MP6-95, TYPE S; AND 54 INCH TO 60 INCH SHALL MEET AASHTO M294, TYPE S. JOINTS SHALL BE BELL AND SPIGOT COUPLINGS, OR EQUIVALENT, AND CONFORM TO ASTM D3212. INSTALLATION SHALL BE IN ACCORDANCE WITH ASTM D2321 WITH EXCEPTION THAT MINIMUM COVER IN TRAFFIC AREAS SHALL BE 18 INCHES.
11. ABS SCHEDULE 40 SOLID WALL PLASTIC PIPE AND FITTINGS MEETING REQUIREMENTS OF ASTM D 2661 JOINED WITH PIPE CEMENT MEETING REQUIREMENTS OF ASTM 2235.
12. DUCTILE IRON PIPE: AWWA C-151, CLASS 52, WITH GASKETED BELL & SPIGOT JOINTS, SEAL COATED PER AWWA C-104.
13. GALVANIZED STEEL PIPE SHALL BE OF SCHEDULE 40 CONFORMING TO ASTM A120 AND AWWA C800 ZINC-COATED INSIDE AND OUTSIDE BY THE HOT-DIP PROCESS CONFORMING TO ASTM B6 AND ASTM A120.
14. REINFORCED CONCRETE STORM DRAIN PIPE AND FITTINGS SHALL CONFORM TO THE REQUIREMENTS OF ASTM C76, CLASS IV. PROVIDE WATER TIGHT JOINTS USING RUBBER RING GASKETS.
15. BURIED EXTERIOR PERFORATED FOUNDATION DRAIN PIPE WITH CONTINUOUS FILTER FABRIC SOCK SHALL BE "ADS DRAINGUARD" OR PVC SCHED 40 PERFORATED PIPE WITH SOLVENT WELD JOINTS. INSTALL DRAIN PIPE AT 0.5% SLOPE UP FROM BOTTOM OF FOOTING IN EACH DIRECTION AROUND THE BLDG FROM THE BACKWATER VALVE(S) CONNECTION LOCATION(S) TO THE SITE STORM DRAINAGE SYSTEM. PROVIDE FILTER FABRIC WRAP AROUND A 24 INCH WIDE X 24 INCH HIGH (MIN.) CLEAN DRAIN ROCK BACKFILL SECTION AT PERIMETER OF BUILDING FOUNDATION. LAP FILTER FABRIC 12 INCHES OVER TOP OF DRAIN ROCK SECTION. TOP OF DRAIN ROCK TO BE 9 INCHES BELOW FINISH GRADE BESIDE BUILDING. SEE DWGS FOR TYPICAL FNDN DRAIN INSTALLATION DETAIL.
16. ABS OR PVC FOUNDATION DRAIN BACKWATER VALVES SHALL BE HORIZONTAL TYPE SIMILAR TO ASME A112.14.1, WITH REMOVABLE COVER AND SWING CHECK VALVE WITH GASKET. SEE DWGS FOR INSTALLATION DETAIL.
17. PERFORATED DRAIN PIPE LOCATED UNDER BUILDING SLAB SHALL BE PVC, SCHED 40 PERFORATED DRAIN PIPE PER ASTM D2729 WITH SOLVENT WELD JOINTS AND CONTINUOUS FILTER FABRIC SOCK COVER.
18. GEOCOMPOSITE DRAINAGE FABRIC SHALL BE "AQUADRAIN 15X, "MIRADRAIN 6200XL", OR ENGINEER PRE-APPROVED EQUAL.
19. AREA DRAINS IN LANDSCAPE AREAS SHALL BE 15"X15" TURF & LANDSCAPE AREA DRAINS MANUFACTURED BY THE 'LYNCH CO." WITH 4 INCH DIAMETER TRAPPED NO-HUB CONNECTION OUTLETS, EXTENSIONS AND GRATES WITH BARS AT 1 -1/4 INCH ON CENTER FOR COMPLETE ASSEMBLY.
20. EXTERIOR AREA DRAINS IN CONCRETE PAVEMENT AREAS SHALL BE "SMITH" FLOOR DRAINS WITH 12 INCH DIAMETER TOPS, DEEP BODY SEDIMENT BUCKETS, 4 INCH DIAMETER TRAPPED NO-HUB CONNECTION OUTLETS, EXTENSIONS AND GRATES FOR COMPLETE ASSEMBLY.
21. EXTERIOR CLEANOUTS IN WALKWAYS SHALL BE J.R. SMITH 4023-U WITH HEAVY DUTY NICKEL BRONZE TOP, TAPER HEAD, ABS PLUG AND TOP SECURED WITH VANDAL PROOF SCREWS, FLUSH AT FINISH GRADE.
22. ALL SEWER LINES SHALL BE LAID IN A STRAIGHT ALIGNMENT AND IN A UNIFORM GRADE BETWEEN MANHOLES, CLEANOUTS OR OTHER STRUCTURES.
23. DUCTILE IRON WATER PIPE SHALL BE AWWA C-151, CLASS 52 WITH CEMENT MORTAR LINING AND SEAL COATED PER AWWA C-104. FITTINGS SHALL BE PER AWWA C-110 AND GASKETS PER AWWA C-111; JOINT RESTRAINING DEVICES PER EBAA IRON, INC.
24. PVC WATER PIPE (4" TO 12" DIAMETER) SHALL BE AWWA C900, CLASS 150. ELASTOMERIC JOINTS SHALL BE PER ASTM D3139, RUBBER GASKETS PER ASTM F477 AND ASTM D1869. INSTALLATION SHALL BE PER AWWA C605 AND PIPE MANUFACTURER'S PRINTED RECOMMENDATIONS AND INSTRUCTIONS. JOINT RESTRAINING DEVICES PER EBAA IRON, INC.
25. PVC WATER PIPE (3/4" TO 2-1/2" DIAMETER) SHALL CONFORM WITH ASTM D2241, 160 PSI PIPE. JOINTS SHALL BE SOLVENT CEMENT WELDED CONFORMING WITH ASTM D2672 OR ASTM 03036. SOLVENT CEMENT SHALL CONFORM TO ASTM D 2564.
26. COPPER WATER PIPE (3/4 INCH TO 2-1/2 INCH DIAMETER) SHALL BE TYPE 'K' HARD TEMPERED COPPER PER ANSI H23.1 WITH WROUGHT COPPER SOLDER JOINT FITTINGS PER ANSI B16.22.
27. INSTALL ALL PLASTIC PIPE AND FITTINGS IN ACCORDANCE WITH ASTM D2321.
28. PROVIDE A DOUBLE CHECK VALVE ASSEMBLY IN AN ACCESSIBLE ROOM, CONCRETE BOX OR VAULT WITH OPENABLE LID(S) FOR ALL WATER SERVICE LINES 1 INCH AND LARGER. PROVIDE DETECTOR CHECK PLUMBING AND METER AT DOUBLE CHECK ASSEMBLIES FOR FIRE SERVICE LINES.
29. PROVIDE A PRESSURE REDUCING VALVE ASSEMBLY (INCLUDING GATE VALVES IMMEDIATELY UP AND DOWNSTREAM) IN AN ACCESSIBLE ROOM, CONCRETE BOX OR VAULT WITH OPENABLE LID(S) FOR ALL WATER SERVICE LINES WHERE MAXIMUM STATIC PRESSURE IS OR EXCEEDS EIGHTY (80) PSI. VALVES SHALL BE SET TO SUSTAIN A MAXIMUM PRESSURE OF 60 PSI AND SHALL BE OF A PRESSURE RATING TO ACCOMMODATE THE UPSTREAM PRESSURE INCLUDING AN ALLOWANCE OF 100 PSI FOR SURGE. VALVE SHALL BE CLAYTON 90-01 SERIES AS MANUFACTURED BY CAL-VAL CO., NEWPORT BEACH, CA OR WATER DISTRICT PRE-APPROVED.
30. ALL ELBOWS, BENDS, TEES, CROSSES AND DEAD ENDS ON WATER PIPES 3 INCHES AND LARGER IN SIZE SHALL BE PROVIDED WITH CONCRETE THRUST BLOCKS.
31. A MINIMUM DEPTH OF 30 INCHES IN PRIVATE LANDSCAPE AREAS AND 36 INCHES IN PRIVATE STREETS FROM FINISHED GRADE TO THE TOP OF WATER PIPE IS REQUIRED.
32. BLOW-OFF ASSEMBLIES ARE REQUIRED AT ALL DEAD-END PRIVATE WATER LINES.
33. ALL PRIVATE WATER LINES SHALL BE FLUSHED, PRESSURE TESTED AND DISINFECTED PER AWWA C600, SECTION 4 AND AWWA C601.
34. ALL WATER LINE CROSSINGS WITH SANITARY SEWER SHALL COMPLY WITH APPLICABLE DEQ AND OREGON STATE HEALTH DIVISION RULES AND REGULATIONS RELATING TO VERTICAL AND HORIZONTAL SEPARATION.
35. ALL NEW AND EXISTING MANHOLE RIMS, CATCH BASIN RIMS, CLEAN-OUTS AND OTHER INCIDENTAL STRUCTURES SHALL BE LOCATED AND ADJUSTED TO FINISH GRADE OR AS OTHERWISE INDICATED ON THE DRAWINGS.
36. PRECAST CONCRETE UTILITY VAULTS:
   A. REINFORCED PRECAST CONCRETE UTILITY VAULTS SHALL BE APPROVED BY THE OREGON STATE PLUMBING BOARD. PROVIDE COMPLETE ASSEMBLIES FOR INSTALLATION INCLUDING INLET AND OUTLET PIPING.
   B. GRADE RINGS: PROVIDE MANUFACTURER'S STANDARD PRECAST CONCRETE GRADE RINGS FOR ADJUSTING VAULT LIDS TO FINISH GRADE.
   C. MINIMUM STRUCTURAL REQUIREMENTS:
      I. CONCRETE: 28 DAY COMPRESSIVE STRENGTH FC = 4500 PSI
      II. REBAR: ASTM A-615 GRADE 60.
      III. MESH: ASTM A185 GRADE 65.
      IV. STEEL: ASTM A36 GRADE 36.
      V. GALVANIZING: ASTM A-123-89 AND A-153-87 (HOT DIPPED).
      VI. STEEL DESIGN: AISC MANUAL OF STEEL CONSTRUCTION, 9TH EDITION.
      VII. CONCRETE DESIGN: ACI-318-89 BUILDING CODE.
         - ASTM C-857 MINIMUM STRUCTURAL DESIGN.
         - LOADING FOR UNDERGROUND PRECAST CONCRETE UTILITY STRUCTURES.
      VIII. LOADS: AASHTO H-20 16 KIP WHEEL LOAD WITH 30% IMPACT (10"X20" FOOTPRINT)
         - AASHTO LIVE LOAD SURCHARGE (2' SOIL) 8' DEPTH
         - EFFECTIVE SOIL PRESSURE ABOVE WATER TABLE - 80 P.C.F.
         - EFFECTIVE SOIL PRESSURE ABOVE WATER TABLE - 45 P.C.F.
      IX. SOIL COVER: 1'-6" MINIMUM WITH WATER TABLE 3'-0" BELOW FINISHED GRADE.
         - 5'0" MAXIMUM WITH WATER TABLE 3'-0" BELOW FINISHED GRADE
         - 0' MINIMUM WITH WATER TABLE BELOW BOTTOM OF VAULT.
         - 5'-0" MAXIMUM WITH WATER TABLE BELOW BOTTOM OF VAULT.
   D. ACCEPTABLE MANUFACTURERS:
      I. UTILITY VAULT COMPANY, WILSONVILLE, OREGON
      II. ENGINEER PRE-APPROVED EQUAL MEETING SAME OR BETTER REQUIREMENTS.

12.0 CONSTRUCTION OBSERVATION, INSPECTION AND TESTING

12.1 GENERAL

1. INDEPENDENT TESTING LAB TO BE RETAINED BY OWNER TO PROVIDE INSPECTIONS AND SPECIAL INSPECTIONS AS DESCRIBED HEREIN.
2. CONTRACTOR IS RESPONSIBLE TO COORDINATE AND PROVIDE ON SITE ACCESS TO ALL REQUIRED INSPECTIONS AND NOTIFY GEOTECHNICAL ENGINEER AND TESTING LABS IN TIME TO MAKE SUCH INSPECTIONS AND ALL NECESSARY REINSPECTIONS.
3. CONTRACTOR: DO NOT COVER WORK REQUIRED TO BE INSPECTED OR REINSPECTED PRIOR TO INSPECTION BEING MADE. IF WORK IS COVERED, UNCOVER AS NECESSARY.
4. INSPECTORS SHALL PROMPTLY NOTIFY THE CONTRACTOR PRIOR TO LEAVING THE SITE AND OWNER'S REPRESENTATIVE OF SUBSTANDARD WORK AND PROVIDE A COPY OF ALL REPORTS TO THE OWNER, ARCHITECT, ENGINEER, CONTRACTOR, AND BUILDING OFFICIAL.
5. CONTRACTOR TO NOTIFY CIVIL ENGINEER WHEN UTILITY WORK BEGINS AND FOR OBSERVATION OF BASE ROCK PRIOR TO PLACING FINISH CURBS OR PAVEMENTS.

12.2 SPECIAL INSPECTIONS

1. REQUIRED SPECIAL INSPECTIONS SHALL BE PERFORMED BY AN INDEPENDENT SPECIAL INSPECTOR PER SECTION 1701 OF THE INTERNATIONAL BUILDING CODE (IBC) FOR THE FOLLOWING:
   A. SOILS:
      I. FOUNDATION EXCAVATION TO BE OBSERVED BY OWNER'S GEOTECHNICAL ENGINEER FOR FIELD VERIFYING FOUNDATION DRAINAGE AND DEWATERING RECOMMENDATIONS.
      II. NATIVE SUBGRADE SURFACE TO BE PROOF-ROLLED AND OBSERVED BY THE OWNER'S GEOTECHNICAL ENGINEER OR HIS REPRESENTATIVE PRIOR TO PLACEMENT OF ALL FILL OR BASE ROCK MATERIALS UNDER OR WITHIN 5 FEET OF ALL PAVEMENT AND BUILDING AREAS. DURING WET WEATHER CONSTRUCTION WHEN PROOF-ROLL OF NATIVE SUBGRADE MAY NOT BE APPROPRIATE (AS DETERMINED BY GEOTECHNICAL ENGINEER), PROVIDE PROOF-ROLL OF ALL BASE ROCK SURFACES PRIOR TO PLACEMENT OF ANY FINISH PAVEMENTS.
      III. DURING THE PLACEMENT OF ALL FILL, INCLUDING TRENCH BACKFILL AND BASE BELOW PAVEMENTS AND BUILDINGS, GEOTECHNICAL ENGINEER OR HIS REPRESENTATIVE TO VERIFY THAT MINIMUM COMPACTION REQUIREMENTS ARE MET. PROVIDE TEST FOR EACH 40 CUBIC YARDS PLACED.
      IV. GEOTECHNICAL ENGINEER OR HIS REPRESENTATIVE TO OBSERVE ALL PROOF ROLLS.
         CONTACT: **GEOPACIFIC ENGINEERING, INC.**
         14835 SW 72ND AVE
         PORTLAND, OREGON 97224
         (503) 598-8445
   B. PAVEMENTS:
      I. VERIFY COMPACTION OF ASPHALT PAVEMENTS.
      II. VERIFY ULTIMATE STRENGTH, REINFORCEMENT SIZE, PLACEMENT AND GRADE OF CONCRETE PAVEMENTS.
   C. STORM DRAIN AND SANITARY PIPE:
      I. CONTRACTOR TO PROVIDE HYDROSTATIC OR AIR TESTING OF ALL PIPES, JOINTS, MANHOLES, ETC. AS REQUIRED BY LOCAL AND STATE JURISDICTIONS.
      II. OBSERVE DEFLECTION TEST PERFORMED BY CONTRACTOR FOR ALL FLEXIBLE STORM AND SANITARY PIPE. DEFLECTION TEST TO BE IN ACCORDANCE WITH OREGON CHAPTER APWA 303.9.
   D. STORM DRAIN DRYWELLS:
      I. VERIFICATION OF DEPTH INTO FREE DRAINING LAYER BY PROJECT GEOTECHNICAL ENGINEER.
      II. INFILTRATION TESTING OF SOIL IN IMMEDIATE LOCATION OF NEW DRYWELL AT A DEPTH OF 10 FEET BELOW GROUND SURFACE IN ACCORDANCE WITH CITY OF PORTLAND FALLING HEAD TESTING CRITERIA PRIOR TO INSTALLATION OF DRYWELL. IF TEST YIELDS AN INSITU RATE OF LESS THAN 6.7 INCHES PER HOUR A THIRD DRYWELL PERFORATION SECTION MUST BE INSTALLED. CONTACT E.O.R. AND PROVIDE TEST RESULTS AND OBTAIN WRITTEN NOTICE PRIOR TO PROCEEDING WITH DRYWELL INSTALLATION.
      III. VERIFICATION OF OPEN GRADED DRAIN ROCK BACKFILL.

CIVIL DRAWINGS	
Sheet No.	TITLE
C1.0	CIVIL NOTES
C2.0	DIMENSIONED SITE PLAN
C2.1	ESC PLAN
C2.2	UTILITY PLAN
C2.3	GRADING PLAN
C3.0	CIVIL DETAILS
C3.1	CIVIL DETAILS
C3.2	CIVIL DETAILS

REGISTERED PROFESSIONAL ENGINEER
80058PE
OREGON
CHRIS J. DESLAURIERS
PRELIMINARY NOT FOR CONSTRUCTION
09/13/18
RENEWS: 12-31-2019

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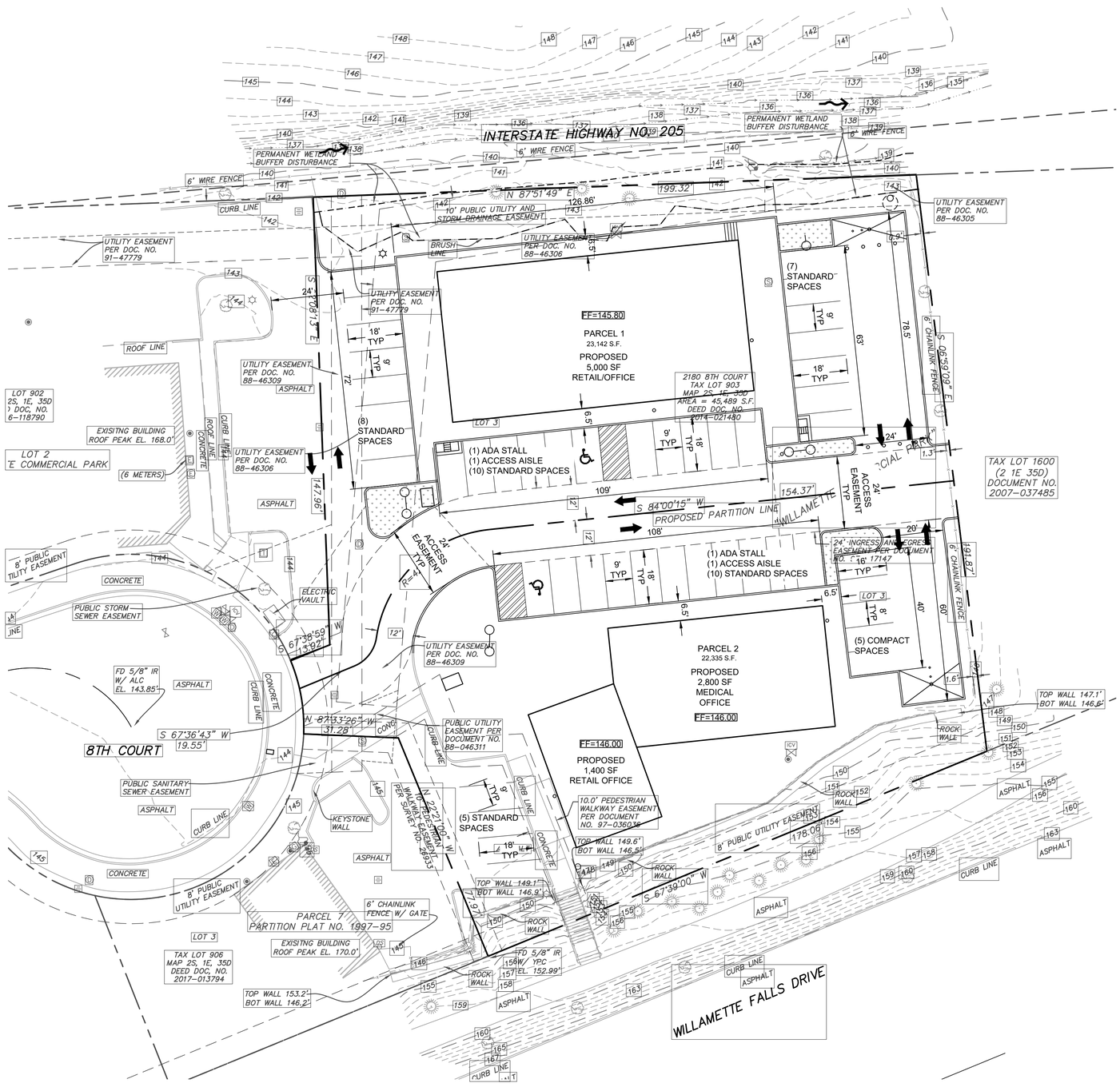
8TH COURT COMMERCIAL
2180 8TH COURT
WEST LINN, OR 97068

CIVIL NOTES

REVISIONS

DATE: 09-13-2018 DRAWN: RMK
JOB NUMBER: 18116 CHECKED: CJD

SHEET
C1.0



1 / C2.0 **DIMENSIONED SITE PLAN**

SCALE: 1" = 20'

PRELIMINARY NOT FOR CONSTRUCTION

CHRIS J. DESLAURIERS — OREGON — 09/13/18

RENEWS: 12-31-2019

WDY
Structural • Civil Engineers
6443 SW Beaverton-Hillsdale Hwy, suite 210 Portland, OR 97221
ph:503.203.8111 fx:503.203.8122 www.wdyi.com

8TH COURT COMMERCIAL

2180 8TH COURT
WEST LINN, OR 97068

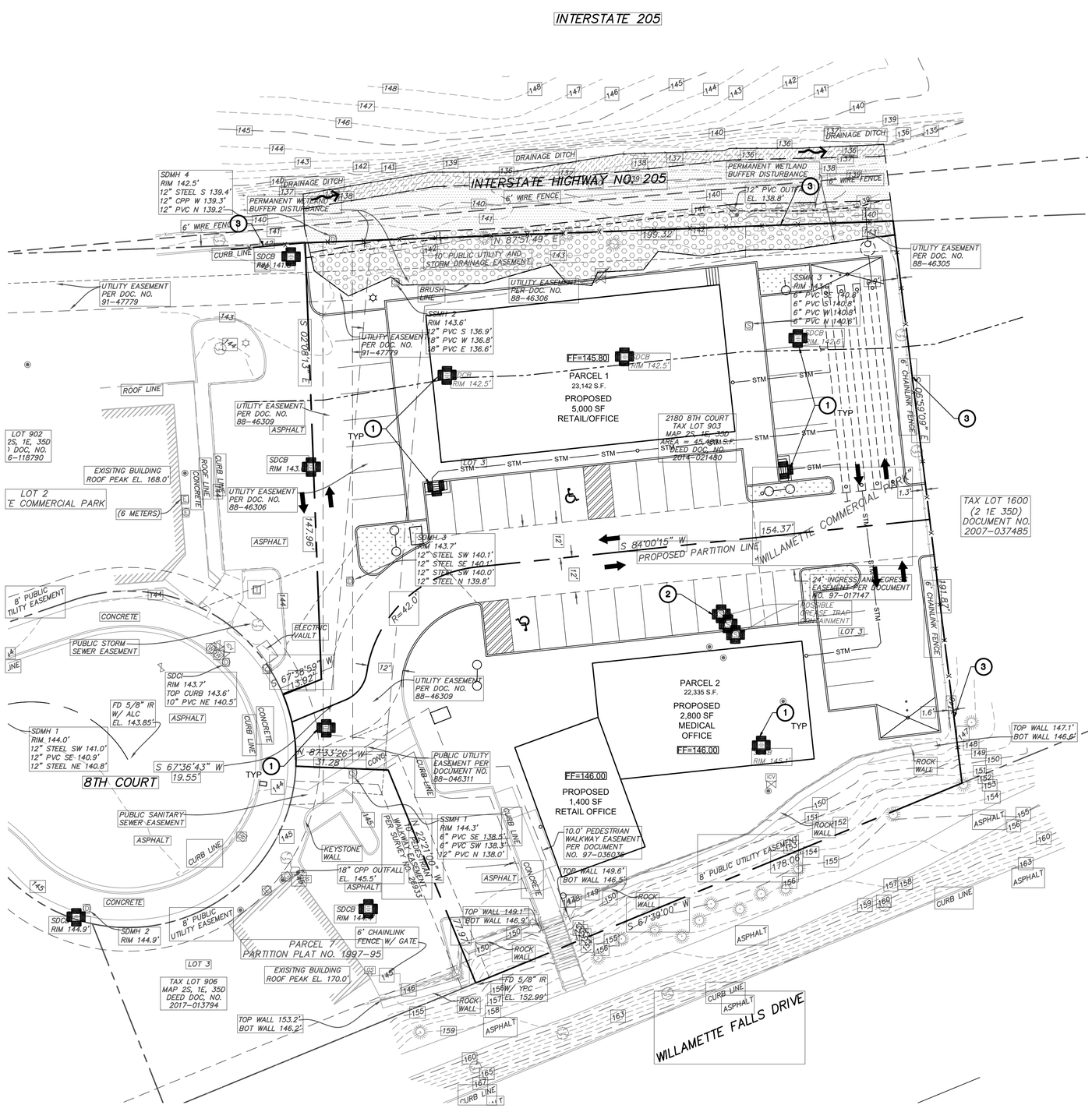
DIMENSIONED SITE PLAN

REVISIONS

DRAWN:	RMK
CHECKED:	CJD
DATE:	09-13-2018
JOB NUMBER:	18116

SHEET

C2.0



KEYNOTES FOR THIS SHEET

MARK	DESCRIPTION
1	NEW BIOBAGS AND SILT SACKS IN NEW AND EXISTING CATCH BASINS, TYP.
2	NEW BIOBAGS IN POSSIBLE GREASE TRAPS.
3	NEW SEDIMENT FENCE.

GENERAL NOTE:

THIS ESC PLAN IS SHOWN FOR CLARITY. A 1200-C APPLICATION AND DRAWINGS WILL BE SUBMITTED PER DEQ REQUIREMENTS.

LEGEND

- STUDY AREA BOUNDARY
- WATERS OF THE STATE/US
- DIRECTION OF CREEK FLOW
- PROPOSED WATER RESOURCE AREA - 15 ' WIDE (3,000 SF)
- REQUIRED WATER RESOURCE AREA (65')
- PROPOSED PERMANENT DISTURBANCE AREA (2,710 SF)

GRAPHIC SCALE

20 0 10 20 40 80

(IN FEET)

1 inch = 20 feet

1 / C2.1 **ESC PLAN**

SCALE: 1" = 20'

REGISTERED PROFESSIONAL ENGINEER — OREGON — CHRIS J. DESLAURIERS — 09/13/18

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RENEWS: 12-31-2019

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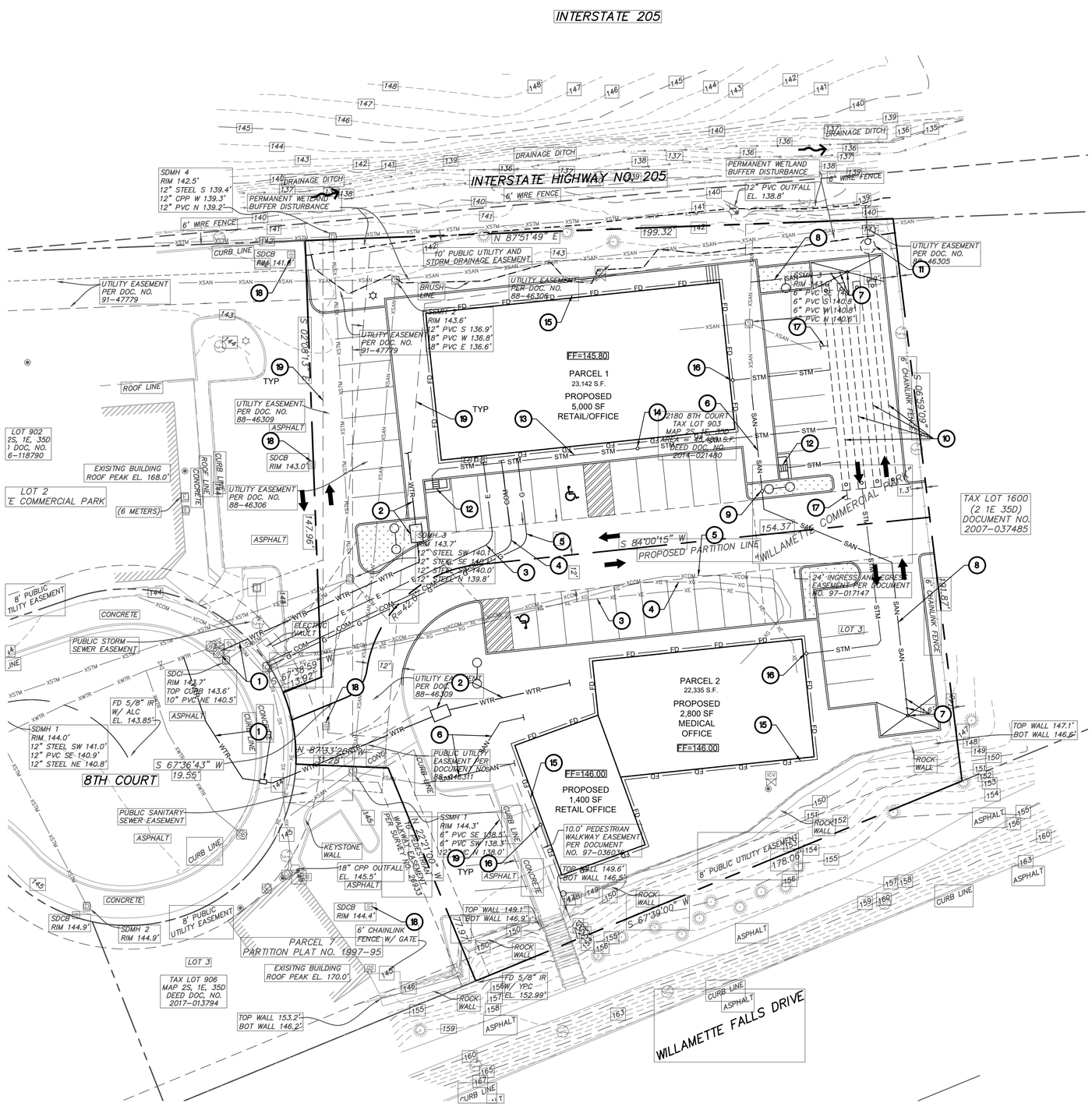
ESC PLAN

REVISIONS			
		DRAWN:	RMK
DATE:	09-13-2018	CHECKED:	CJD
JOB NUMBER:	18116		

SHEET

C2.1

3 OF 8



KEYNOTES FOR THIS SHEET

MARK	DESCRIPTION
1	NEW OR EXISTING DOMESTIC WATER METER AND LATERAL.
2	NEW DCVA AND DOMESTIC WATER LATERAL TO BUILDING.
3	NEW OR EXISTING ELECTRICAL SERVICE TO BUILDING.
4	NEW OR EXISTING DATA/COMM SERVICES TO BUILDING.
5	NEW OR EXISTING GAS SERVICE TO BUILDING.
6	EXTEND EXISTING 6" PVC ASTM C-3034 SDR-35 SANITARY SEWER LATERAL.
7	NEW SANITARY SEWER FLOOR DRAIN, CLEANOUT AND B.W.V. AT TRASH ENCLOSURE.
8	NEW 4" PVC ASTM C-3034 SDR-35 SANITARY SEWER PIPE AT 2.0% (MIN) SLOPE.
9	NEW STANDARD SANITARY SEWER CLEANOUT.
10	NEW 280 L.F. 30" DIA. HDPE DETENTION PIPE WITH INSPECTION PORTS.
11	NEW DETENTION CONTROL MANHOLE.
12	NEW WATER QUALITY BAYSAVER BAYFILTER CATCH BASIN.
13	NEW 6" STM PIPE AT S=1.0% (MIN).
14	NEW STANDARD STORM CLEANOUT.
15	NEW FOUNDATION DRAIN.
16	NEW FOUNDATION DRAIN CLEANOUT WITH RECTOR-SEAL BACKWATER VALVE ASSEMBLY.
17	NEW STM DOWNSPOUT CONNECTIONS TO 30" DIA. HDPE DETENTION PIPE.
18	EXISTING CATCH BASIN TO REMAIN.
19	EXISTING UTILITY, DRAINAGE AND WALKWAY EASEMENTS TO REMAIN, TYP.

1 / C2.2 **UTILITY PLAN**

SCALE: 1" = 20'

GRAPHIC SCALE

20 0 10 20 40 80

(IN FEET)

1 inch = 20 feet

PRELIMINARY NOT FOR CONSTRUCTION

REGISTERED PROFESSIONAL ENGINEER — OREGON — CHRIS J. DESLAURIERS — 09/13/18

RENEWS: 12-31-2019

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UTILITY PLAN

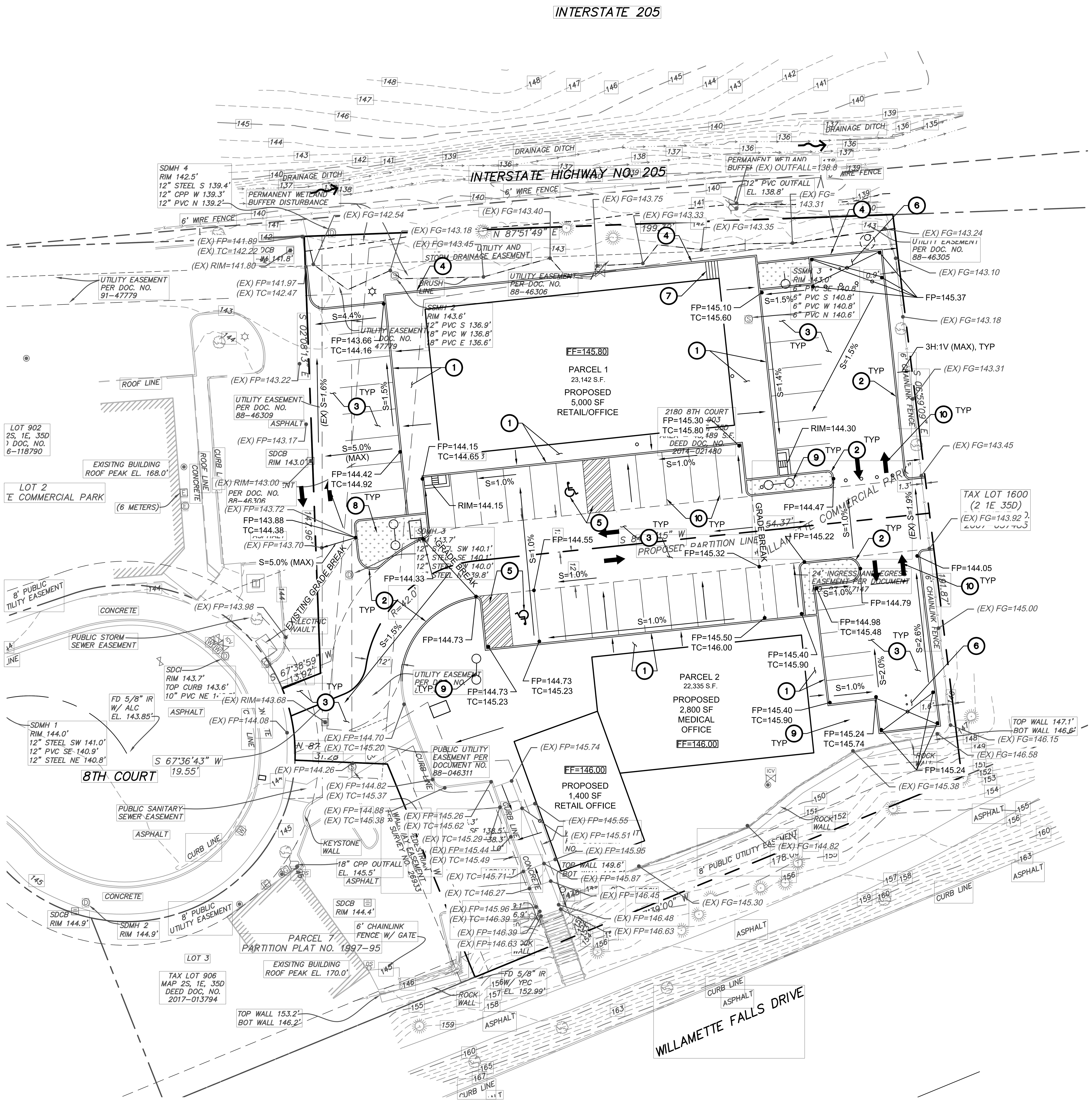
REVISIONS

DATE:	09-13-2018
JOB NUMBER:	18116
DRAWN:	RMK
CHECKED:	CJD

SHEET

C2.2

4 OF 8



KEYNOTES FOR THIS SHEET
MARK - DESCRIPTION
(1) NEW CONCRETE SIDEWALK AND CURB.
(2) NEW 6" CONCRETE CURB, TYP.
(3) NEW A.C. PAVEMENT, TYP.
(4) NEW GEO BLOCK RETAINING WALL.
(5) NEW ADA PARKING.
(6) NEW TRASH ENCLOSURE.
(7) NEW STAIRS.
(8) NEW LANDSCAPING, TYP.
(9) NEW LIGHT, TYP.
(10) NEW STRIPING, TYP.

1
C2.3
GRADING PLAN
SCALE: 1" = 20'

GRAPHIC SCALE
20 0 10 20 40 80
(IN FEET)
1 inch = 20 feet

PRELIMINARY
NOT FOR
CONSTRUCTION
09/13/18
RENEWS: 12-31-2019

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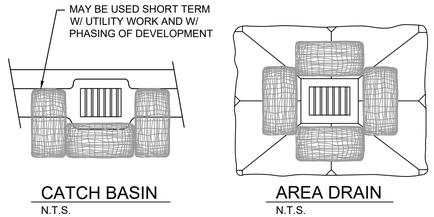
GRADING PLAN

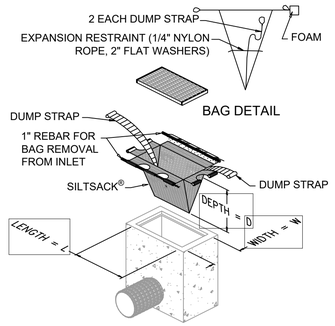
REVISIONS

DATE:	09-13-2018
DRAWN:	RMK
JOB NUMBER:	18116
CHECKED:	CJD

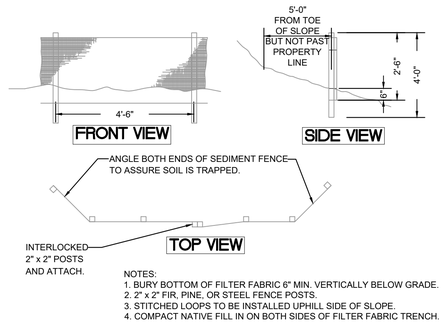
SHEET
C2.3
5 OF 8



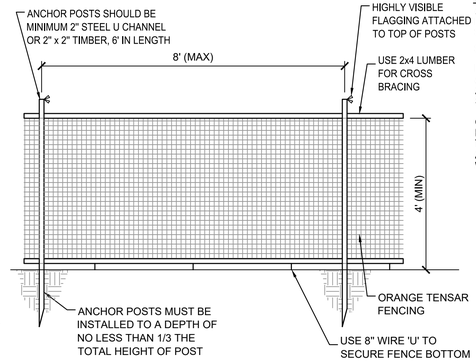
1 C3.0 **BIOFILTER BAGS - TEMPORARY**
N.T.S.



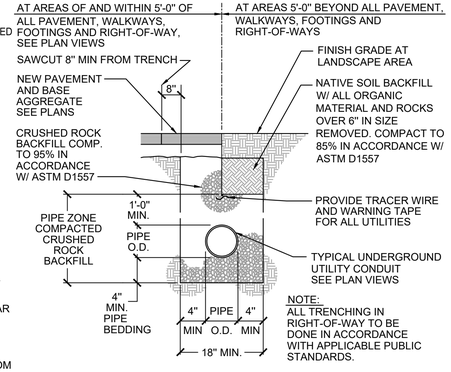
2 C3.0 **FILTER BAG INLET**
N.T.S.



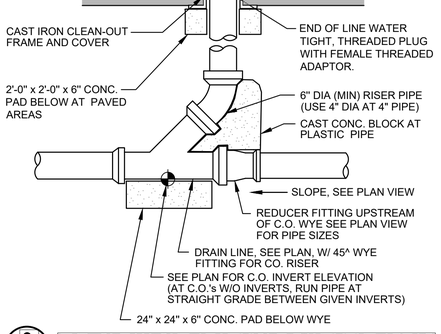
3 C3.0 **SEDIMENT FENCE**
N.T.S.



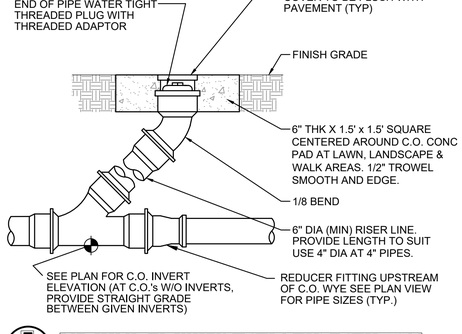
4 C3.0 **TREE PROTECTION FENCE**
N.T.S.



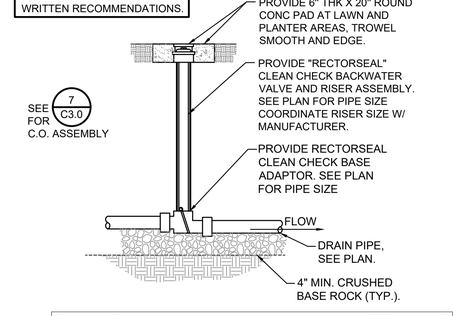
5 C3.0 **TYPICAL UTILITY TRENCH SECTION**
1" = 1'-0"



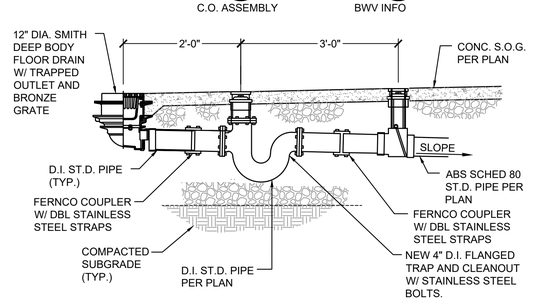
6 C3.0 **TYP. CLEAN OUT AT VEHICLE PAVEMENT AREAS**
N.T.S.



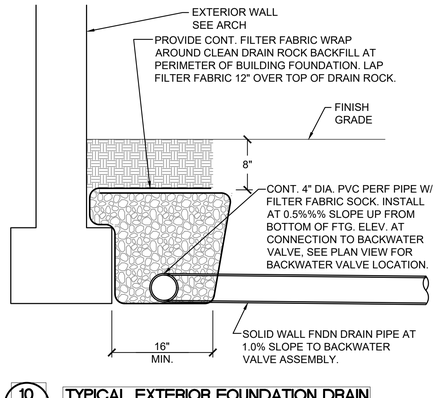
7 C3.0 **CLEANOUT AT WALKS, SLABS AND PLANTERS**
1" = 1'-0"



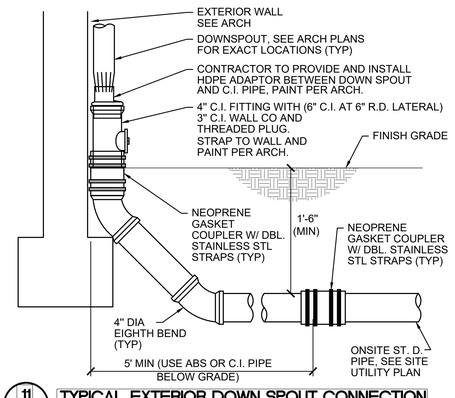
8 C3.0 **RECTORSEAL "CLEAN CHECK" BACKWATER VALVE ASSEMBLY FOR FOUNDATION DRAIN (TYP)**
1/2" = 1'-0"



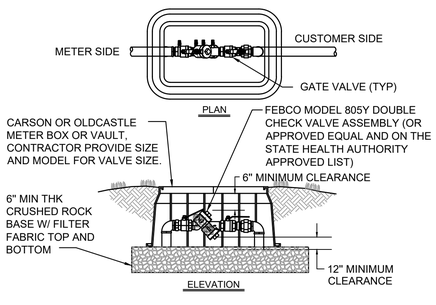
9 C3.0 **BACKWATER VALVE AND S.S. TRAP ASSEMBLY**
1/2" = 1'-0"



10 C3.0 **TYPICAL EXTERIOR FOUNDATION DRAIN**
1" = 1'-0"



11 C3.0 **TYPICAL EXTERIOR DOWN SPOUT CONNECTION**
N.T.S.



INSTALLATION SHOWN IS ONLY A SUGGESTION. THE DISTANCE FROM BOTTOM OF DEVICE TO FINISH GRADE, FREEZE PROTECTION AND CLEARANCE FOR TESTING AND REPAIR ARE THE MAJOR CONSIDERATIONS FOR INSTALLATION. VERIFY ALL INSTALLATION REQUIREMENTS W/ WATER DISTRICT JURISDICTION. BRASS PLUGS TO BE INSTALLED IN TEST COCKS OF BELOW GROUND INSTALLATIONS.

12 C3.0 **1", 1 1/2" & 2" DOUBLE CHECK INSTALLATION**
N.T.S.

REGISTERED PROFESSIONAL ENGINEER
OREGON
JULY 17, 2001
CHRIS J. DESLAURIERS
RENEWS: 12-31-2019

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09/13/18

8TH COURT COMMERCIAL
2180 8TH COURT
WEST LINN, OR 97068
CIVIL DETAILS

REVISIONS			
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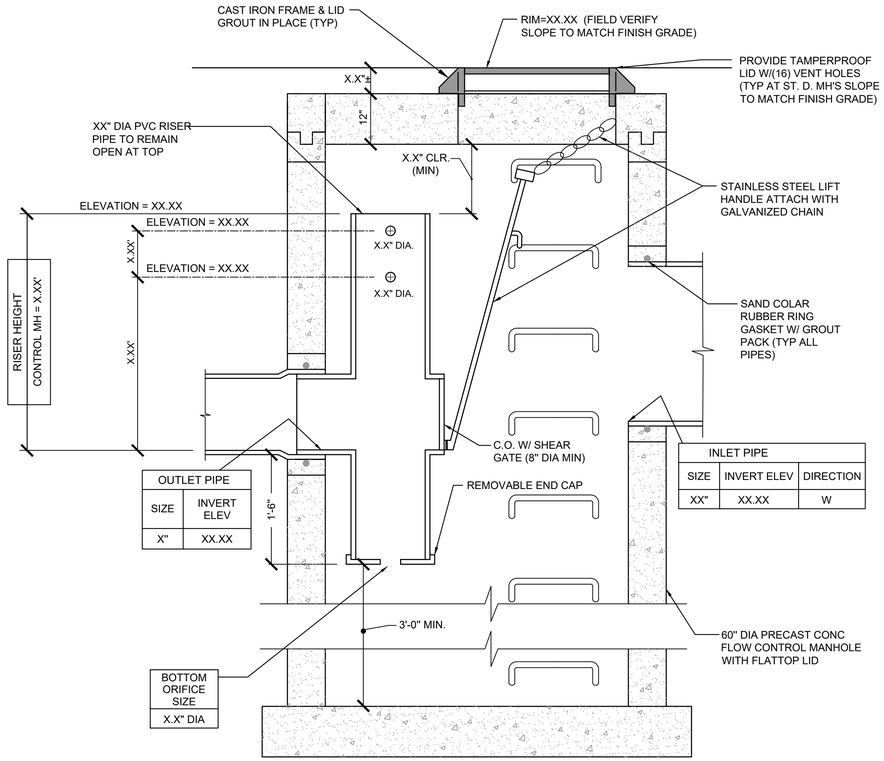
SHEET
C3.0
6 OF 8

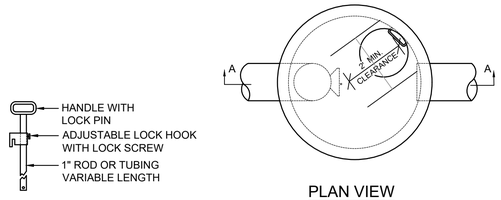


1 C3.1 60" DIA. PRIVATE STORM DRAIN DETENTION OUTLET CONTROL MANHOLE

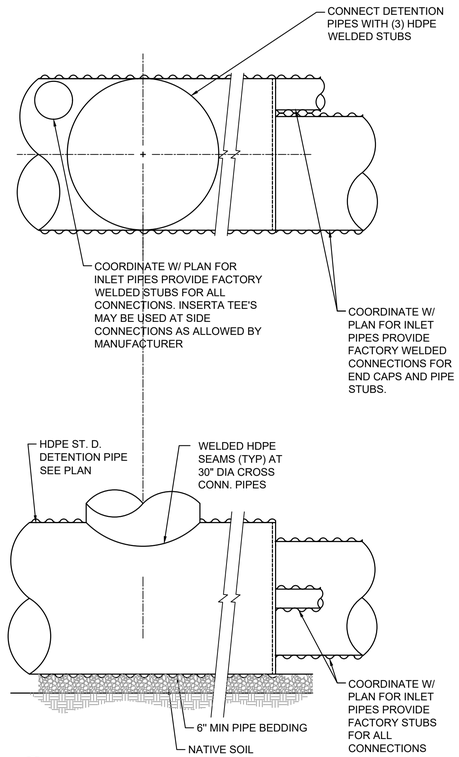
N.T.S.

MH-DetentionControl

NOTE: ALTERNATES ARE ACCEPTABLE PROVIDED MATERIAL SPECIFICATIONS ARE MET AND FLANGE BOLT PATTERN MATCHES.

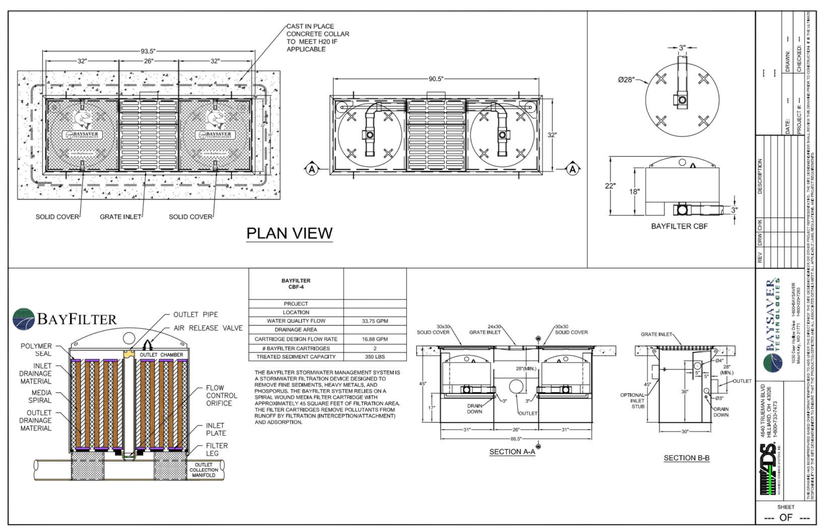


CLEANOUT/SHEAR GATE



2 C3.1 DETENTION PIPE DETAILS

1/2"=1'-0"



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CIVIL DETAILS

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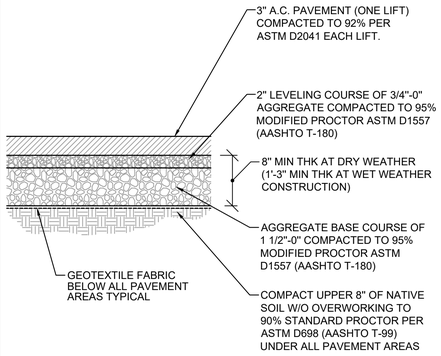
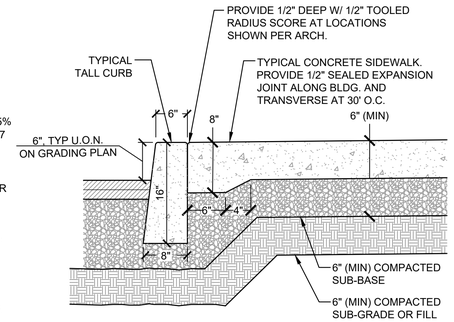
SHEET

C3.1

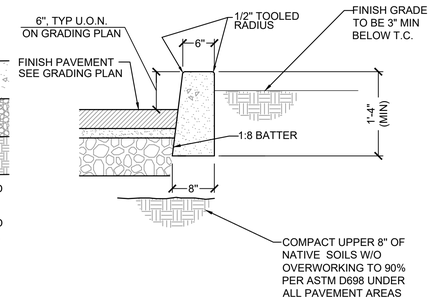
7 OF 8



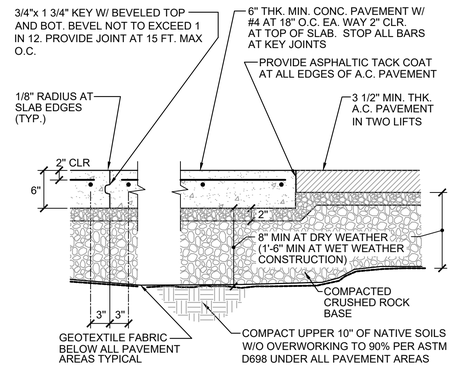
1 C3.2 **TYPICAL ASPHALTIC PAVEMENT SECTION**
1" = 1'-0"



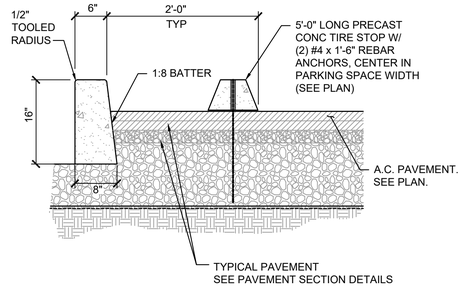
2 C3.2 **TYPICAL CONCRETE WALK**
N.T.S.



3 C3.2 **TYPICAL FULL DEPTH CONCRETE CURB**
N.T.S.



4 C3.2 **TYP. CONCRETE / ASPHALTIC PAVEMENT SECTION**
1" = 1'-0"



5 C3.2 **CONCRETE TIRE STOP**
1" = 1'-0"

6 C3.2 **ADA PARKING STALL**
N.T.S.

7 C3.2 **ADA ACCESSIBLE PARKING SIGNS**
N.T.S.

NOTE: UNITS ARE DESCRIBED IN INCHES

PROPORTIONS

DISPLAY CONDITIONS

NOTE: CHARACTERS SHALL CONTRAST WITH THEIR BACKGROUNDS: LIGHT ON DARK SURFACES AND DARK ON LIGHT BACKGROUND PER ANSI STANDARD A117.1 1998

8 C3.2 **ADA ACCESSIBLE SYMBOLS**
N.T.S.

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ph:503.203.8111 fx:503.203.8122 www.wdyi.com

8TH COURT COMMERCIAL

2180 8TH COURT
WEST LINN, OR 97068

CIVIL DETAILS

REVISIONS			
		DRAWN:	RMK
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JOB NUMBER:	18116		

SHEET

C3.2

8 OF 8

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1204 SE Water Ave
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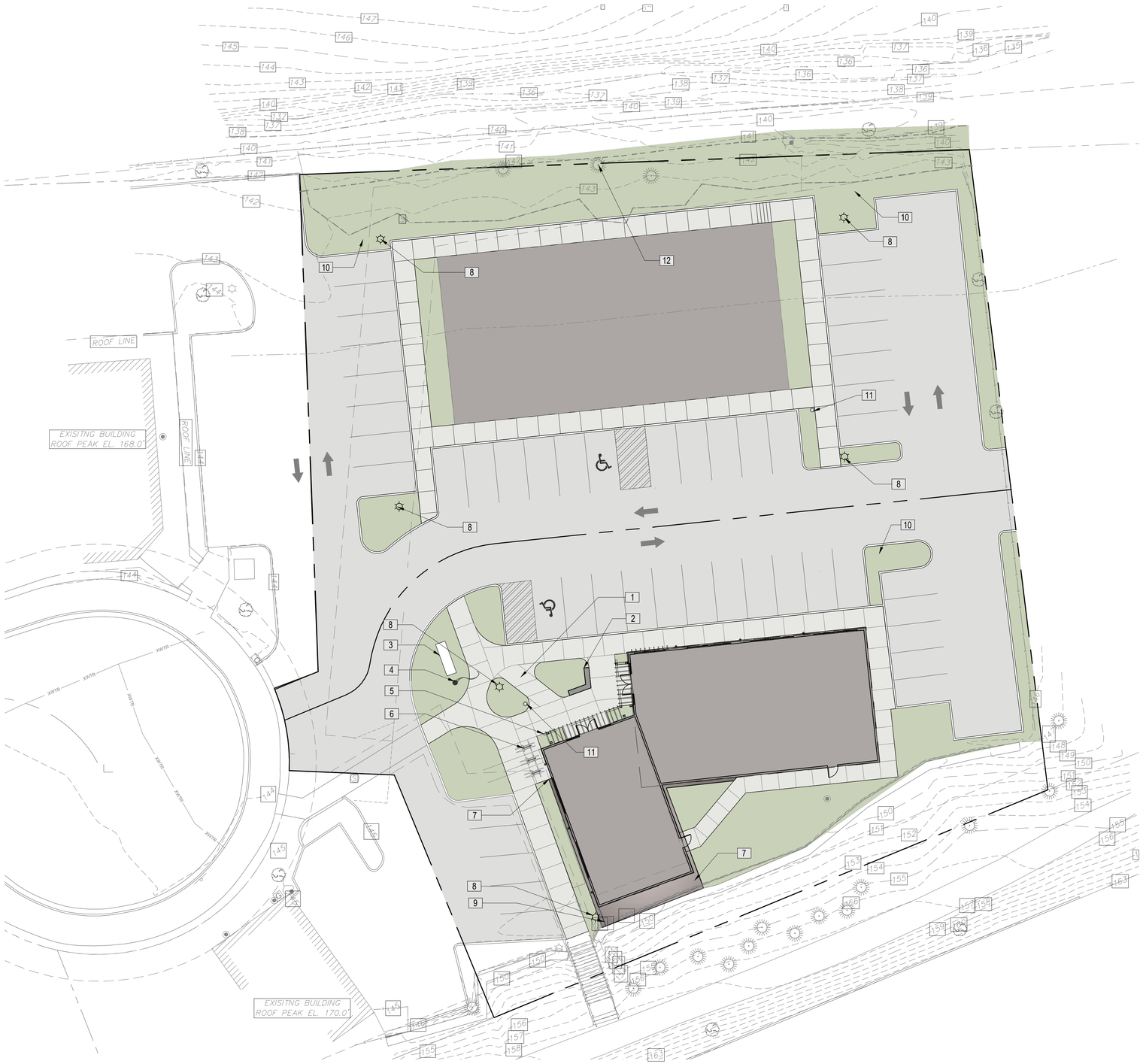
t. 503.232.0520
www.shapirodidway.com



1 LANDSCAPE SITE PLAN

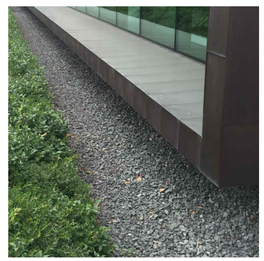
REFERENCE NOTES SCHEDULE

SYMBOL	DESCRIPTION
1	CONCRETE PLAZA WITH PLANTINGS
2	SEAT WALL
3	MONUMENT SIGN PER ARCHITECT
4	FLAGPOLE
5	TRELLIS
6	BIKE RACK
7	12" MAINTENANCE EDGE
8	LIGHTPOLE PER ELECTRICAL (TYP)
9	6' CEDAR FENCE
10	PLANT BED (TYP)
11	TRASH RECEPTACLE (TYP)
12	EXISTING TREE TO REMAIN (TYP)

CONCRETE PLAZA WITH PLANTINGS


SEAT WALL


BIKE RACK


MAINTENANCE EDGE


TRASH RECEPTACLE

ISELIN ARCHITECTS P.C.
1307 Seventh Street
Oregon City, OR 97045
503-656-1942
www.iselinarchitects.com

NOT FOR PRELIMINARY CONSTRUCTION

DESIGN REVIEW

8th Court Building Shell
2180 8th Court - South Lot
West Linn, OR 97068

PROJ. NO. : 1861
FILE :
DATE : 09/17/18

SHEET #
L1.01

LANDSCAPE SITE PLAN

SHAPIRO / DIDWAY
1204 SE Water Ave
Portland, Oregon 97214
t. 503.232.0520
www.shapirodidway.com

1 PLANTING PLAN

PLANT SCHEDULE

TREES	CODE	BOTANICAL NAME	CONT
	CF	CARPINUS BETULUS `FRANZ FONTAINE` FRANZ FONTAINE HORNBEAM	15 GAL
	GT	GLEDITSIA TRIACANTHOS HONEY LOCUST	15 GAL
	ZG	ZELKOVA SERRATA `GREEN VASE` SAWLEAF ZELKOVA	15 GAL

SHRUBS	CODE	BOTANICAL NAME	SIZE
	APA	ACER CIRCINATUM `PACIFIC FIRE` VINE MAPLE	24"BOX
	CKA	CALAMAGROSTIS X ACUTIFLORA `KARL FOERSTER` FEATHER REED GRASS	5 GAL
	DOD	DAPHNE ODORA WINTER DAPHNE	5 GAL
	HYQ	HYDRANGEA QUERCIFOLIA `RUBY SLIPPERS` RUBY SLIPPERS HYDRANGEA	5 GAL
	ICA	ILEX X MESERVEAE `CASTLE WALL` CASTLE WALL HOLLY	5 GAL

SHRUB AREAS	CODE	BOTANICAL NAME	CONT	SPACING
	MAAQ	MAHONIA AQUIFOLIUM OREGON GRAPE	1 GAL	36" o.c.
	MRE	MAHONIA REPENS CREEPING MAHONIA	5 GAL	18" o.c.
	RSA2	RIBES SANGUINEUM RED FLOWERING CURRANT	1 GAL	48" o.c.
	SAHO	SARCOCOCCA HOOKERIANA HUMILIS SWEET BOX	2 GAL	36" o.c.
	SYAL	SYMPHORICARPOS ALBUS COMMON WHITE SNOWBERRY	1 GAL	48" o.c.

GROUND COVERS	CODE	BOTANICAL NAME	CONT	SPACING
	CAMO	CAREX MORROWII `AUREA-VARIEGATA` VARIEGATED JAPANESE SEDGE	1 GAL	30" o.c.
	LIMU	LIRIOPE MUSCARI LILY TURF	1 GAL	18" o.c.
	NATE	NASSELLA TENUISSIMA TEXAS NEEDLE GRASS	1 GAL	30" o.c.
	POMU	POLYSTICHUM MUNITUM WESTERN SWORD FERN	1 GAL	36" o.c.

WATER RESOURCE MITIGATION PLANTING
3,000 SQ FT. SEE PLANTING TYPICAL & PLANT SCHEDULE (L3.02)
-

GROUNDCOVER MIX
HELLEBORUS X `IVORY PRINCE` / IVORY PRINCE HELLEBORE
LIRIOPE MUSCARI `BIG BLUE` / BIG BLUE LILYTURF

MITIGATION SEED MIX
BROMUS CARINATUS / CALIFORNIA BROME-GRASS
ELYMUS GLAUCUS / BLUE WILDRYE
HORDEUM BRACHYANTHERUM / MEADOW BARLEY

ISELIN ARCHITECTS P.C.
1307 Seventh Street
Oregon City, OR 97045
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NOT FOR PRELIMINARY CONSTRUCTION

DESIGN REVIEW

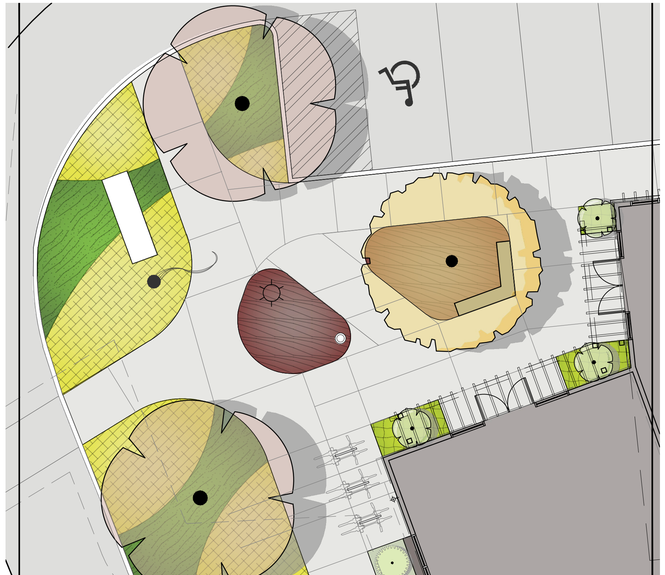
8th Court Building Shell
2180 8th Court - South Lot
West Linn, OR 97068

PROJ. NO. : 1861
FILE :
DATE : 09/17/18

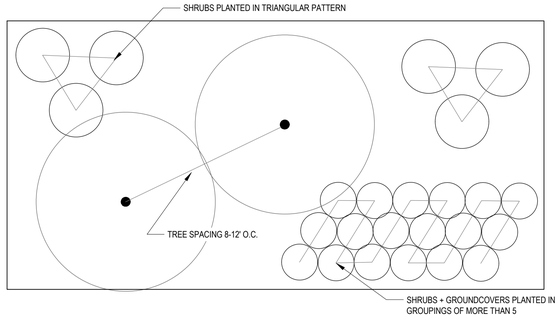
SHEET #
L1.02

PLANTING PLAN

SHAPIRO / DIDWAY
1204 SE Water Ave
Portland, Oregon 97214
t. 503.232.0520
www.shapirodidway.com



1 PLAZA ENLARGEMENT



2 WATER RESOURCE AREA* MITIGATION PLANTING, TYPICAL

* WATER RESOURCE AREA (WRA) ENHANCEMENTS ARE BASED ON CRITERIA LISTED IN "WETLAND REPORT" (5/30/2018) PRELIMINARY A˙SSESSMENT OF THE SITE CONDUCTED BY PACIFIC HABITAT SERVICES (PHS) TO COMPLY WITH THE PROVISIONS IN THE ALTERNATE REVIEW PROCESS (CDC 32.070). ALL ENHANCEMENTS TO MEET MINIMUM APPROVED CRITERIA.

Plant List for Retained WRA (3,000 square feet);

Botanical Name	Common Name	Sizes (Height or gallon)	Planting density (on center)	Quantity
Trees				
Acer macrophyllum	Big leaf maple	≥0.5" inch caliper	8-12'	5
Pseudotsuga menziesii	Douglas fir	≥0.5" inch caliper	8-12'	5
Quercus garryana	Oregon white oak	1 gal	8-12'	5
Thuja plicata	Western red cedar	≥0.5" inch caliper	8-12'	5
			Total	**20**
Shrubs/Groundcover				
Amelanchier alnifolia	serviceberry	≥1 gallon	5'	20
Mahonia aquifolium	Oregon grape	≥1 gallon	5'	20
Polystichum munitum	Sword fern	≥1 gallon	5'	20
Sambucus racemosa	Red elderberry	≥1 gallon	5'	20
Symphoricarpos albus	Snowberry	≥1 gallon	5'	20
			Total	**100**

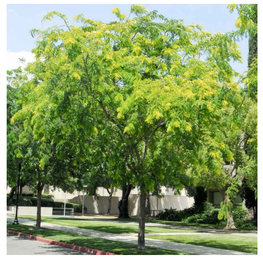
Grass seed mix to be applied at the rate of 1 pound per 1000 square feet;
- Hobbs and Hopkins 'PT 400 Native Upland mix' (or equivalent):
  Blue Wildrye (*Elymus glaucus*)
  Meadow Barley (*Hordeum brachyantherum*)
  California Brome (*Bromus carinatus*)

3 WATER RESOURCE AREA MITIGATION PLANTING LIST

TREES


GREEN VASE ZELKOVA

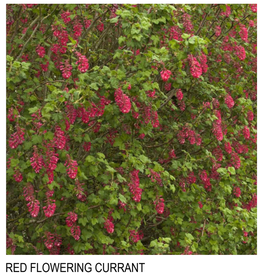

FF - FRANZ FONTAINE HORNBEAM


HONEY LOCUST


VINE MAPLE

SHRUBS & GROUNDCOVERS


VARIEGATED JAPANESE SEDGE


RED FLOWERING CURRANT


WINTER DAPHNE


WESTERN SWORDFERN

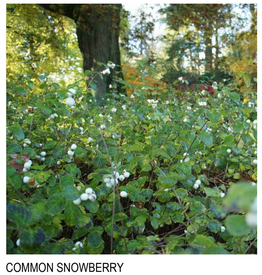

CASTLE WALL HOLLY


OREGON GRAPE

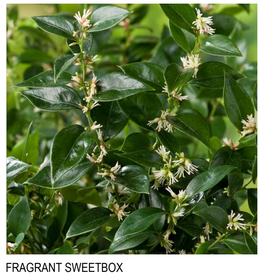

LILY TURF


CREEPING MAHONIA

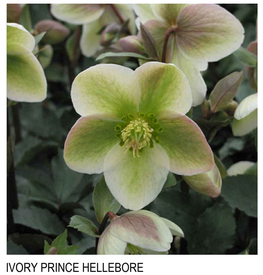

KARL FOERSTER FEATHER REED GRASS


COMMON SNOWBERRY


RUBY SLIPPERS OAKLEAF HYDRANGEA


FRAGRANT SWEETBOX


MEXICAN FEATHER GRASS


IVORY PRINCE HELLEBORE

4 PLANT PALETTE

ISELIN ARCHITECTS P.C.
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www.iselinarchitects.com

NOT FOR PRELIMINARY CONSTRUCTION

DESIGN REVIEW

8th Court Building Shell
2180 8th Court - South Lot
West Linn, OR 97068

PROJ. NO. : 1861
FILE :
DATE : 09/17/18

SHEET #
L1.03

ENLARGEMENTS & PLANT PALETTE