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FEB 6 2020



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

DEVELOPMENT REVIEW APPLICATION

Table with 3 columns: STAFF CONTACT (Darren Wyss), PROJECT NO(S) (MISC-20-02), NON-REFUNDABLE FEE(S) (-), REFUNDABLE DEPOSIT(S) (\$1,050), TOTAL (\$1,050)

Type of Review (Please check all that apply):

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

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: 4973 MAPLETON DR

Assessor's Map No.: 25 1E 24AC

Tax Lot(s): 902

Total Land Area: 0.4 acres

Brief Description of Proposal: REPLACE RETAINING WALL USING SHOTCRETE, PRE CON HELICAL PIERS, AND HELICAL ANCHOR TIEBACKS

Applicant Name: ELLEN RONQUILLO (please print)

Address: 13110 SW WALL ST

City State Zip: TIGARD, OR 97223

Phone: 971-205-5235

Email: eronquillo@terrafirmafs.com

Owner Name (required): BRIDGHID MCMONAGLE (please print)

Address: 4973 MAPLETON DR

City State Zip: WEST LINN, OR 97068

Phone: 206-240-4214

Email: drmcmonagle@lakeoswegohealth.com

Consultant Name: Jeff Fitch (please print)

Address: 9020 SW Washington Square Rd

City State Zip: Portland, OR 97223

Phone: 503-641-8311

Email:

- 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

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: [Signature]

Date: 1/31/20

Owner's signature (required): [Signature]

Date: 2/1/20

To whom it may concern,

The work TerraFirma performed in the floodway at 4973 Mapleton Dr. was removing an existing stacked retaining wall, and replacing it with a much safer, much more secure, and less protrusive concrete retaining wall. The existing wall was constructed with a combination of cement blocks and pressure treated lumber with minimal, if any, anchors. The impervious surface protruded anywhere from 16 inches up to 30 inches.

The new concrete retaining wall falls into the same parameters as the existing wall except instead of 16 to 30 inches of the wall surface extending into the floodplain, there is now only 8 inches of impervious wall surface. This increases the flood storage and conveyance capacity, in that location, by 50%-74%.

The wall was constructed and engineered to resist hydrodynamic and hydrostatic forces of a flood. Including: #4 reinforcing bars (ASTM A615, Grade 60) @ 12inches O.C. horizontally and vertically, 5 yards of 4000PSI concrete in accordance with ACI 318-14, and 12 helical pier anchors.

The retaining wall has 5 vertical helical piers, installed to a minimum depth of 20 feet and 3000ft-lbs of torque. This gives each Helical anchor a max load of 12,838lbs. The 7 helical tie-back piers are installed at a minimum depth of 20 feet and 2000ft-lbs of torque. This gives each tie-back pier a max load of 8,189lbs.

The work performed in the floodway was needed to replace the inadequate existing retaining wall while reducing the impervious surface in the floodway. The outcome is a considerably more substantial retaining wall that decreases impervious surface area by up to 74%.

Best Regards,

Dakota Cavens – Shotcrete Superintendent

**TERRA**FIRMA FOUNDATION SYSTEMS  
13110 SW Wall St. | Tigard, OR | 97223  
(866) 486-7196 (**Office**) | (971) 317-1647 (**Cell**)

## 27.060 APPROVAL CRITERIA

The Planning Director shall make written findings with respect to the following criteria when approving, approving with conditions, or denying an application for development in flood management areas:

A. Development, excavation, and fill shall be performed in a manner to maintain or increase flood storage and conveyance capacity and not increase design flood elevations.

The work performed was removing an existing stacked retaining wall, and replacing it with safe, durable and less protrusive, concrete retaining wall. The wall is designed to resist hydrodynamic and hydrostatic forces of a flood. The existing wall was a minimum of 16 inches thick while the new wall is only 8 inches thick. Increasing the flood storage and conveyance capacity, in that location, by more than 50%.

B. No net fill increase in any floodplain is allowed. All fill placed in a floodplain shall be balanced with an equal amount of soil material removal. Excavation areas shall not exceed fill areas by more than 50 percent of the square footage. Any excavation below the ordinary high water line shall not count toward compensating for fill.

Does not apply, as the work was simply replacing an existing retaining wall.

C. Excavation to balance a fill shall be located on the same lot or parcel as the fill unless it is not reasonable or practicable to do so. In such cases, the excavation shall be located in the same drainage basin and as close as possible to the fill site, so long as the proposed excavation and fill will not increase flood impacts for surrounding properties as determined through hydrologic and hydraulic analysis.

Does not apply, as the work was simply replacing an existing retaining wall.

D. Minimum finished floor elevations must be at least one foot above the design flood height or highest flood of record, whichever is higher, for new habitable structures in the flood area.

Does not apply, as the work was simply replacing an existing retaining wall.

E. Temporary fills permitted during construction shall be removed.

Does not apply, as the work was simply replacing an existing retaining wall.

F. Prohibit encroachments, including fill, new construction, substantial improvements, and other development in floodways unless certification by a professional civil engineer licensed to practice in the State of Oregon is provided demonstrating that encroachments shall not result in any increase in flood levels during the occurrence of the base flood discharge.

The new wall increases the flood storage capacity in the respected area by 50%

G. All proposed improvements to the floodplain or floodway which might impact the flood-carrying capacity of the river shall be designed by a professional civil engineer licensed to practice in the State of Oregon.

Wall was designed by licensed Engineer

H. New culverts, stream crossings, and transportation projects shall be designed as balanced cut and fill projects or designed not to significantly raise the design flood elevation. Such projects shall be designed to minimize the area of fill in flood management areas and to minimize erosive velocities. Stream crossings shall be as close to perpendicular to the stream as practicable. Bridges shall be used instead of culverts wherever practicable.

Does not apply, as the work was simply replacing an existing retaining wall.

I. Excavation and fill required for the construction of detention facilities or structures, and other facilities, such as levees, specifically shall be designed to reduce or mitigate flood impacts and improve water quality. Levees shall not be used to create vacant buildable land.

Does not apply, as the work was simply replacing an existing retaining wall.

J. The applicant shall provide evidence that all necessary permits have been obtained from those federal, State, or local governmental agencies from which prior approval is required. (Ord. 1522, 2005; Ord. 1635 § 15, 2014; Ord. 1636 § 25, 2014)

#### 27.070 CONSTRUCTION MATERIALS AND METHODS

A. All new construction and substantial improvements shall be constructed with materials and utility equipment resistant to flood damage using methods and practices that minimize flood damage.

Wall was constructed with reinforcing bars ASTM A615, Grade 60. All concrete in accordance with ACI 318-14. The wall is designed to resist hydrodynamic and hydrostatic forces of a flood

B. Electrical, heating, ventilation, plumbing, and air conditioning equipment and other service facilities shall be designed and/or otherwise elevated or located so as to prevent water from entering or accumulating within the components during conditions of flooding.

Does not apply, as the work was simply replacing an existing retaining wall.

C. New and replacement water supply systems shall be designed to minimize or eliminate infiltration of flood waters into the system.

Does not apply, as the work was simply replacing an existing retaining wall.

D. New and replacement sanitary sewage systems shall be designed to minimize or eliminate infiltration of flood waters into the systems and discharge from the systems into flood waters.

Does not apply, as the work was simply replacing an existing retaining wall.

E. On-site waste disposal systems shall be located to avoid impairment to them or contamination from them during flooding.

Does not apply, as the work was simply replacing an existing retaining wall.

F. All new construction and substantial improvements shall be anchored to prevent flotation, collapse, or lateral movement of the structure.

Retaining wall has 5 helical piers and 7 helical tie-back piers at a minimum depth of 10'. Rebar mat @ 12"O.C. horizontally and vertically and about 5 yards of 4000PSI concrete. The wall is designed to resist hydrodynamic and hydrostatic forces of a flood.

## 27.080 RESIDENTIAL CONSTRUCTION

A. New construction and substantial improvement of any residential structure shall have the lowest floor, including basement, elevated to at least one foot above the base flood elevation.

Does not apply, as the work was simply replacing an existing retaining wall.

B. Fully enclosed areas below the lowest floor that are subject to flooding are prohibited, or shall be designed to automatically equalize hydrostatic flood forces on exterior walls by allowing for the entry and exit of floodwaters. Designs for meeting this requirement must be certified by either a professional civil engineer or an architect licensed to practice in the State of Oregon, and must meet or exceed the following minimum criteria:

Does not apply, as the work was simply replacing an existing retaining wall.

1. A minimum of two openings having a total net area of not less than one square inch for every square foot of enclosed area subject to flooding shall be provided.

Does not apply, as the work was simply replacing an existing retaining wall.

2. The bottom of all openings shall be no higher than one foot above grade.

Does not apply, as the work was simply replacing an existing retaining wall.

3. Openings may be equipped with screens, louvers, or other coverings or devices; provided, that they permit the automatic entry or exit of floodwaters.

Does not apply, as the work was simply replacing an existing retaining wall.

4. Fully enclosed areas below the base flood elevation shall only be used for parking, access, and limited storage.

Does not apply, as the work was simply replacing an existing retaining wall.

5. Service equipment (e.g., furnaces, water heaters, washer/dryers, etc.) is not permitted below the base flood elevation.

Does not apply, as the work was simply replacing an existing retaining wall.

6. All walls, floors, and ceiling materials located below the base flood elevation must be unfinished and constructed of materials resistant to flood damage.

Does not apply, as the work was simply replacing an existing retaining wall.

C. Crawlspace. Crawlspace is a commonly used method of elevating buildings in special flood hazard areas (SFHAs) to or above the base flood elevation (BFE), and are allowed subject to the following requirements:

Section C. Crawlspace; Does not apply, as the work was simply replacing an existing retaining wall.

1. The building is subject to the Flood-Resistant Construction provisions of the Oregon Residential Specialty Code.

2. They shall be designed by a professional engineer or architect licensed to practice in the State of Oregon to meet the standards contained in the most current Federal Emergency Management Agency's (FEMA) Technical Bulletin.

3. The building must be designed and adequately anchored to resist flotation, collapse, and lateral movement of the structure resulting from hydrodynamic and hydrostatic loads, including the effects of buoyancy.

4. Flood vent openings shall be provided on at least two sides that equalize hydrostatic pressures by allowing for the automatic entry and exit of floodwaters. The total area of the flood vent openings must be no less than one square inch for each square foot of enclosed area. The bottom of each flood vent opening can be no more than one foot above the lowest adjacent exterior grade. For guidance on flood openings, see FEMA Technical Bulletin 1-93, Openings in Foundation Walls.

5. Portions of the building below the BFE must be constructed with materials resistant to flood damage. This includes not only the foundation walls (studs and sheathing), but also any joists, insulation, or other materials that extend below the BFE. For more detailed guidance on flood-resistant materials see FEMA Technical Bulletin 2-93, Flood-Resistant Materials Requirements.

6. Utility systems within the crawlspace must be elevated above BFE or designed so that floodwaters cannot enter or accumulate within the system components during flood conditions. Ductwork, in particular, must either be placed above the BFE or sealed from floodwaters. For further guidance on the placement of building utility systems in crawlspaces, see FEMA 348, Protecting Building Utilities From Flood Damage. Flood-resistant materials and utilities, access, and ventilation openings in crawlspaces are further addressed in this bulletin.

7. The interior grade of a crawlspace below the BFE must not be more than two feet below the lowest adjacent exterior grade (LAG).

8. The height of the below-grade crawlspace, measured from the interior grade of the crawlspace to the top of the crawlspace foundation wall, must not exceed four feet at any point. This limitation will also prevent these crawlspaces from being converted into habitable spaces.

9. There must be an adequate drainage system that removes floodwaters from the interior area of the crawlspace. Possible options include natural drainage through porous, well-drained soils and drainage systems such as low-point drains, perforated pipes, drainage tiles, or gravel or crushed stone drainage by gravity.

10. The velocity of floodwaters at the site should not exceed five feet per second for any crawlspace. For velocities in excess of five feet per second, other foundation types should be used.

11. For more detailed information refer to FEMA Technical Bulletin 11-01 or the most current edition.

12. The use of below-grade crawlspaces to elevate the building to one foot above the BFE may cause an increase in flood insurance premiums, which are beyond the control of the City.

D. A poured slab placed over fill can be used to elevate the lowest floor of a structure above the base flood elevation. However, when a building site is filled, it is still in the floodplain and no basements are permitted.

E. Placing a structure on piers, piles, and posts is allowed provided supporting members are designed to resist hydrostatic and hydrodynamic forces. (Ord. 1565, 2008)

McMinnagle Residence  
4973 MAPLETON DR.  
Contour Map



PROPERTY LOCATION  
MAP

McMonagle Res  
4073 MAPLETON DR



Nixon Ave

Mapleton Dr

19340

19380

19323

19381

4961

4973

4945

4981

4993

4650

4738

4970

5005

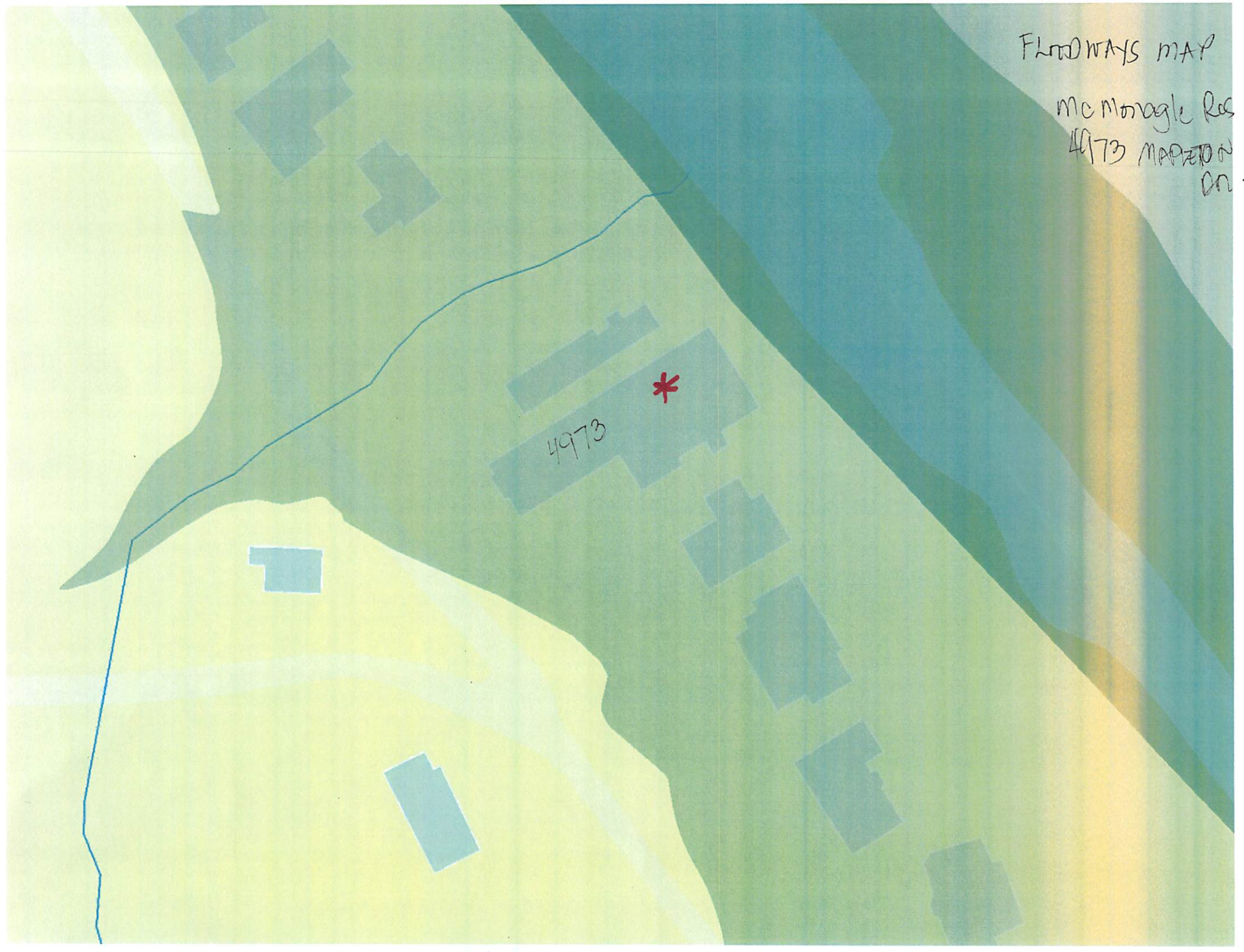
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FLOODWAYS MAP

McMongle Res  
4973 MARZON  
CN.

4973

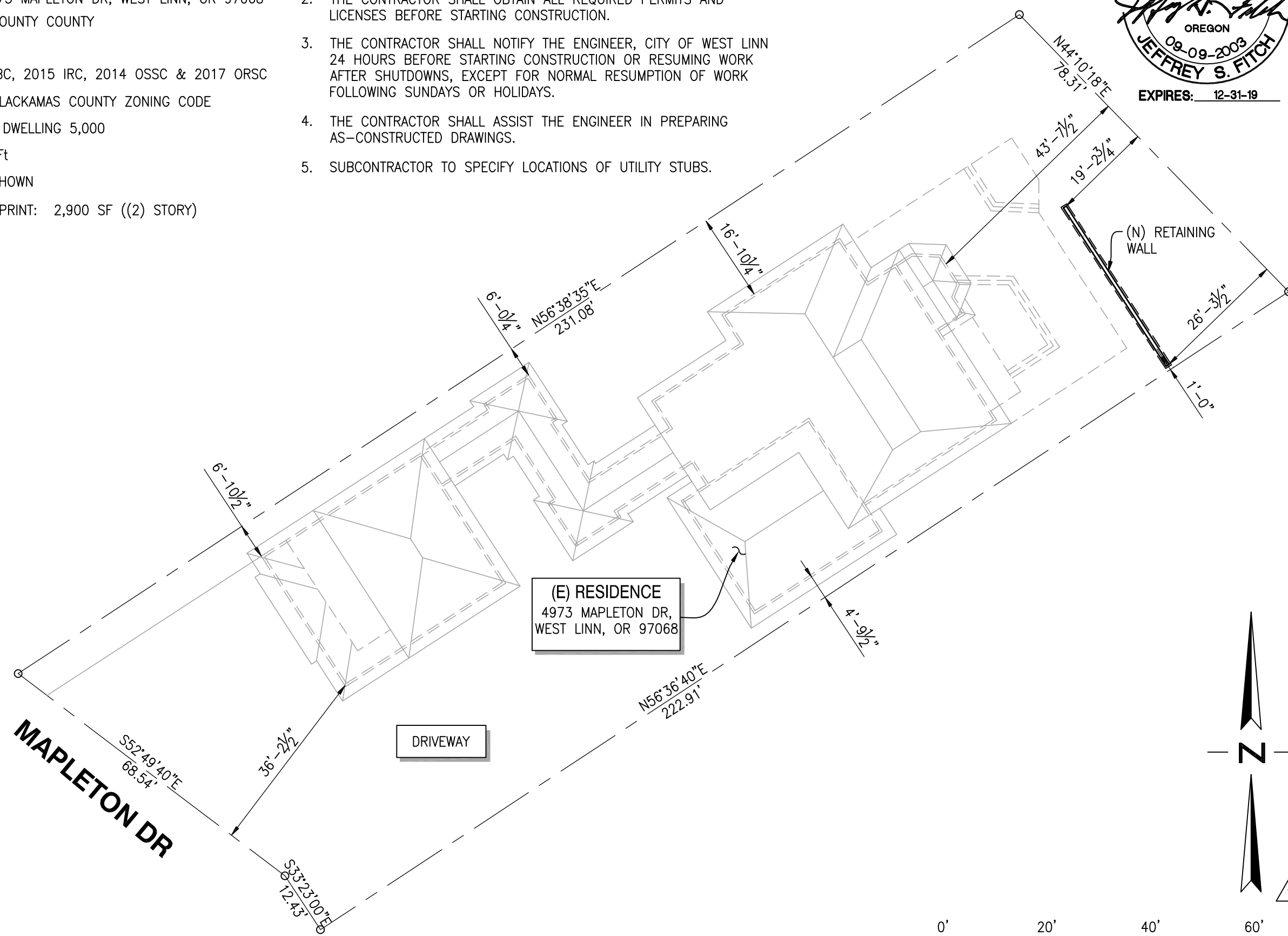


**PROJECT DATA**

- PROJECT DESCRIPTION: CONSTRUCTION OF A CONCRETE RETAINING WALL.
- PROJECT ADDRESS: 4973 MAPLETON DR, WEST LINN, OR 97068
- COUNTY: CLACKAMAS COUNTY COUNTY
- PARCEL NO: 00371190
- BUILDING CODE: 2015 IBC, 2015 IRC, 2014 OSSC & 2017 ORSC
- ZONING CODE: 2019 CLACKAMAS COUNTY ZONING CODE
- ZONING: R10 – SINGLE DWELLING 5,000
- SITE AREA: 17,424 Sq-Ft
- LOT DIMENSIONS: AS SHOWN
- EXISTING BUILDING FOOTPRINT: 2,900 SF ((2) STORY)

**SITE PLAN NOTES**

1. ALL WORK AND MATERIAL SHALL CONFORM TO THE REQUIREMENTS OF THE CITY OF WEST LINN DESIGN STANDARDS.
2. THE CONTRACTOR SHALL OBTAIN ALL REQUIRED PERMITS AND LICENSES BEFORE STARTING CONSTRUCTION.
3. THE CONTRACTOR SHALL NOTIFY THE ENGINEER, CITY OF WEST LINN 24 HOURS BEFORE STARTING CONSTRUCTION OR RESUMING WORK AFTER SHUTDOWNS, EXCEPT FOR NORMAL RESUMPTION OF WORK FOLLOWING SUNDAYS OR HOLIDAYS.
4. THE CONTRACTOR SHALL ASSIST THE ENGINEER IN PREPARING AS-CONSTRUCTED DRAWINGS.
5. SUBCONTRACTOR TO SPECIFY LOCATIONS OF UTILITY STUBS.



**TERRAFIRMA FOUNDATION SYSTEMS**  
 MCMONAGLE RESIDENCE RETAINING WALL  
 4973 MAPLETON DR  
 WEST LINN, OR 97068

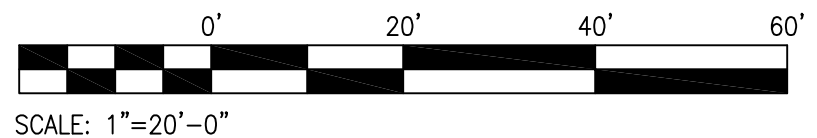
SITE PLAN

REVISIONS	
1	07-16-2019

PROJECT NO: TF19-088  
 DESIGNED BY: MEK  
 DRAWN BY: MEK  
 CHECKED BY: JLD  
 DATE: 06-19-2019

SHEET NO:  
**S1.0**

**SITE PLAN**



## GENERAL REQUIREMENTS

**GOVERNING CODE:** The "International Building Code", 2015 Edition, 2014 Oregon Structural Specialty Code and 2017 Oregon Residential Specialty Code as adopted and modified by the City of West Linn shall govern design and construction.

**REFERENCE STANDARDS:** Reference to ASTM and other standards incorporate these standards into the contract as though included in their entirety. Reference to a specific Section does not relieve the contractor from compliance with the entire standard. The latest edition of the standard shall be used unless a specific date is indicated.

**DEFINITIONS:** The following definitions cover the meanings of certain terms used in these notes:

- "Architect / Engineer" – The Architect and the Engineer-of-Record.
- "Prepared by a Specialty Structural Engineer" – Prepared by or under the direct supervision of a Specialty Structural Engineer (SSE) with a structural license issued by the State of California. Submittals shall be stamped and signed by the SSE.
- "Submit for review" – Submit to the Architect/Engineer for review prior to fabrication or construction.

**NOTE PRIORITIES:** Notes on the individual drawings govern over notes on this sheet.

**SPECIFICATIONS:** Refer to the specifications for information in addition to that contained in these notes and the structural drawings.

**STRUCTURAL DETAILS:** The structural drawings are intended to show the general character and extent of the project. They are not intended to show all details of the work. Details noted "typical" apply to similar work throughout the project unless noted separately.

**STRUCTURAL RESPONSIBILITIES:** The structural engineer is responsible for the strength and stability of the primary structure in its completed form.

**CONTRACTOR RESPONSIBILITIES:** The contractor is responsible for the means and methods of construction and all job related safety standards (i.e. OSHA). He is responsible for the strength and stability of the structure during construction. He shall provide temporary shoring, bracing and other elements required to maintain stability until the structure is complete. It is the contractor's responsibility to be familiar with the work required in the construction documents and the requirements for executing it properly. The contractor shall at his discretion employ a Oregon State registered structural engineer for design of temporary bracing and shoring.

**DISCREPANCIES:** In case of discrepancies between the specifications, reference standards and the governing code, the Architect/Engineer will determine which shall govern. Discrepancies shall be brought to the attention of the Architect/Engineer before proceeding with the work.

**SITE VERIFICATION:** The contractor shall verify all dimensions and conditions at the site. Conflicts between the drawings and actual site conditions shall be brought to the attention of the Architect/Engineer before proceeding with the work.

**CONSTRUCTION LOADS:** Loads on the structure during construction shall not exceed the design loads as noted in DESIGN REQUIREMENTS below or the capacity of partially completed construction.

**ALTERNATES:** Alternates for specified items may be submitted to the Architect/Engineer for review.

## SOILS AND FOUNDATIONS

**REFERENCE STANDARDS:** Conform to IBC Chapter 18 "Soils & Foundations."

**DESIGN SOIL VALUES (ASSUMED):**

Allowable Soil Bearing Pressure	1500 PSF
Passive Lateral Pressure	150 PSF/FT
Active Lateral Pressure (unrestrained)	40 PSF/FT
Active Lateral Pressure (restrained)	40 PSF/FT
Coefficient of Sliding Friction	0.30

**FOOTING DEPTH:** Exterior perimeter footings shall bear not less than 18 inches below finish grade, or by the geotechnical engineer and the building official. Interior footings shall bear not less than 12 inches below finish floor.

## CONCRETE REINFORCEMENT

**REFERENCE STANDARDS:** Conform to:

- (1) ACI 301-10 "Standard Specifications for Structural Concrete", Section 3 "Reinforcement and Reinforcement Supports".
- (2) ACI SP-66 "ACI Detailing Manual" including ACI 315-99 "Details and Detailing of Concrete Reinforcement".
- (3) CRSI MSP-1 "Manual of Standard Practice".
- (4) ANSI/AWS D1.4 "Structural Welding Code – Reinforcing Steel".
- (5) IBC Chapter 19, "Concrete".
- (6) ACI 318-14 and ACI 318R-14.

**SUBMITTALS:** Conform to ACI 301 Sec 3.1.1 "Submittals, data and drawings". Submit placing drawings showing fabrication dimensions and locations for placement of reinforcement and reinforcement supports.

**MATERIALS:**

Reinforcing Bars ASTM A615, Grade 60, deformed bars.

**FABRICATION:** Conform to ACI 301, Sec 3.2.2. "Fabrication", and ACI SP-66 "ACI Detailing Manual".

**WELDING:** Bars shall not be welded unless authorized. When authorized, conform to ACI 301, Sec 3.2.2.2. "Welding" and provide ASTM A706, grade 60 reinforcement.

**PLACING:** Conform to ACI 301, Sec 3.3.2 "Placement". Placing tolerances shall conform to IBC Sec 1907.5, "Placing Reinforcement."

**CONCRETE COVER:** Conform to the following cover requirements from IBC Section 1907.7 and ACI 301, Table 3.3.2.3:

Concrete cast against earth	3"
Concrete exposed to earth or weather	1½"



EXPIRES: 12-31-19



**TERRAFIRMA FOUNDATION SYSTEMS**  
 MCMONAGLE RESIDENCE RETAINING WALL  
 4973 MAPLETON DR  
 WEST LINN, OR 97068

GENERAL NOTES

REVISIONS

△	07-16-2019

PROJECT NO:  
 TF19-088  
 DESIGNED BY:  
 MEK  
 DRAWN BY:  
 MEK  
 CHECKED BY:  
 JLD  
 DATE:  
 06-19-2019

SHEET NO:

**S1.1**

## CONCRETE REINFORCEMENT (CONTINUED)

**SPLICES:** Conform to ACI 301, Sec 3.3.2.7. Refer to "Lap Splice Schedule", on S1.2 for typical splices. Splices shown on individual sheets control over the schedule. Use Class B splices unless noted. Mechanical connections may be used when approved by the Engineer.

**FIELD BENDING:** Conform to ACI 301 Sec 3.3.2.8. "Field Bending or Straightening". Bar sizes #3 through #5 may be field bent cold the first time. Other bars require preheating. Do not twist bars.

### CAST-IN-PLACE CONCRETE

**REFERENCE STANDARDS:** Conform to:

- (1) All concrete shall be mixed and placed in accordance with ACI 318-14.
- (2) ACI 301-10 "Specifications for Structural Concrete".
- (3) IBC Chapter 19 "Concrete".

**FIELD REFERENCE:** Keep in contractor's field office a copy of ACI Field Reference manual, SP-15(10), "Standard Specifications for Structural Concrete (ACI 301) with Selected ACI and ASTM References".

**CONCRETE MIXTURES:** Conform to ACI 301 Sec 4 "Concrete Mixtures".

**MATERIALS:** Conform to ACI 301 Sec 4.2.1 "Materials" for requirements for cementitious materials, aggregates, mixing water and admixtures.

**SUBMITTALS:** Provide all submittals required by ACI 301 Sec 4.1.2. Submit mix designs for each mix in the table below.

TABLE OF MIX DESIGN REQUIREMENTS					
Member Type/Location	Test (psi)	Strength Age (Days)	Max Aggr. (Inch)	Max W/C Ratio	Air Cont. (%)
Shotcrete Walls	4000	28	3/4	0.40	5

**FORMWORK:** Conform to ACI 301 Sec 2 "Formwork and Form Accessories". Removal of Forms shall conform to Sec 2.3.2 except strength indicated in Sec 2.3.2.5 shall be 0.75 f'c.

**MEASURING, MIXING, AND DELIVERY:** Conform to ACI 301 Sec 4.3.

**HANDLING, PLACING, CONSTRUCTING AND CURING:** Conform to ACI 301 Sec 5.

**EMBEDDED ITEMS:** Position and secure in place expansion joint material, anchors and other structural and non-structural embedded items before placing in concrete. Contractor shall refer to mechanical, electrical, plumbing, architectural drawings and coordinate for other embedded items.

BAR SIZE	Ld	Class B Splice
f'c = 2500psi		
#4	24	32
#5	30	32

### NOTES:

VALUES FOR UNCOATED REINFORCING AND NORMAL WEIGHT CONCRETE WITH CLEAR SPACING > db, CLEAR COVER > db AND MINIMUM STIRRUPS OR TIES THROUGHOUT Ld OR CLEAR SPACING > 2db AND CLEAR COVER > db.

## LAP SPLICE & DEVELOPMENT LENGTH SCHEDULE

SCALE: NTS

1



EXPIRES: 12-31-19



TERRAFIRMA FOUNDATION SYSTEMS  
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4973 MAPLETON DR  
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GENERAL NOTES

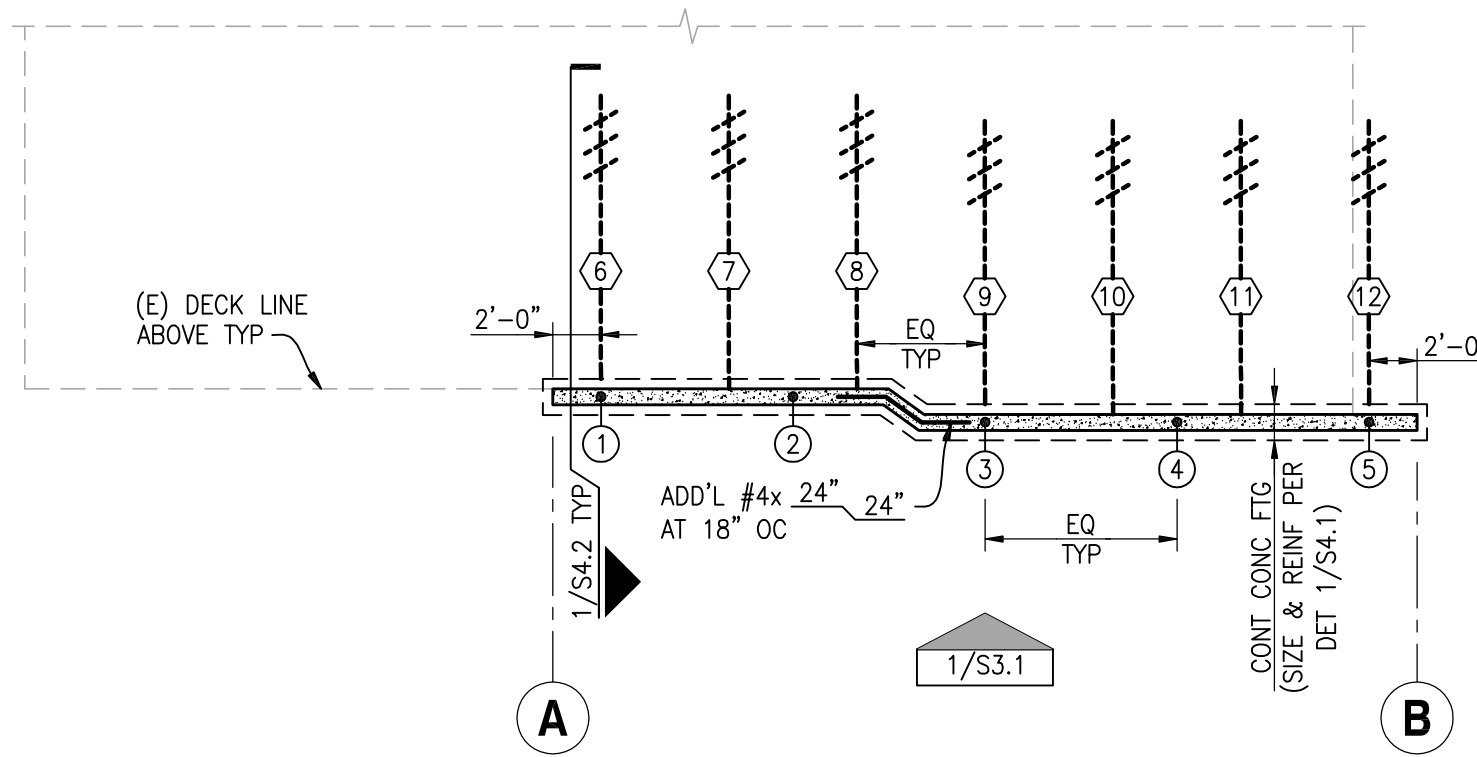
REVISIONS

1 07-16-2019

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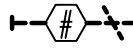
S1.2



**(N) RETAINING WALL FOUNDATION PLAN**

SCALE: 1/8" = 1'-0"

**(N) RETAINING WALL FOUNDATION PLAN NOTES:**

1. REFERENCE S1.1 & S1.2 FOR GENERAL REQUIREMENTS
2. CONTRACTOR TO NOTIFY ENGINEER OF RECORD OF DISCREPANCIES BETWEEN FIELD CONDITIONS & THOSE SHOWN IN THESE DOCUMENTS PRIOR TO CONSTRUCTION/INSTALLATION OF PIERS TYP
3.  INDICATES (N) CONC RETAINING WALL ON (N) CONC FOOTING
4.  SECTION CUT - DETAIL NUMBER/SHEET NUMBER
5.  INDICATES HA150 HELICAL LATERAL RESTRAINT SYSTEM PER DETAIL 1/S4.2

LATERAL HELICAL TIEBACK INSTALLATION NOTES:

- MAX LOAD TO ANCHOR = 8,189 LBS
- 1.5" SOLID SQUARE SHAFT TIEBACK INSTALLED AT A 30°±2° ANGLE FROM HORIZONTAL
- 0.375 THICK 8/10/12"Ø HELIX W/ 0.25" FILLET WELDS EA SIDE OF HELIX TO PIPE PILE
- MINIMUM 20'-0" INSTALLATION DEPTH & 2000 LB-FT INSTALLATION TORQUE

6.  INDICATES LOCATION OF FSI 288 HELICAL PIER W/ FSI FS288NCB NEW CONSTRUCTION BRACKET PER DETAILS ON S4.2

HELICAL PIER INSTALLATION NOTES:

- MAX LOAD TO ANCHOR = 12,838 LBS
- 2.875"Ø PIPE PILE W/ 0.276" THICK WALL
- 0.375" THICK 10/12" HELIX W/ 1/4" FILLET WELDS EACH SIDE OF HELIX TO PIER
- MINIMUM 20'-0" INSTALLATION DEPTH & 3000 FT-LB INSTALLATION TORQUE

7. TIEBACK SPACING SHALL BE AS INDICATED ON PLAN (5'-4" OC MAX)
8. MAX SPACING BETWEEN HELICAL PIERS SHALL BE 8'-0" OC
9. ALL CONSTRUCTION MATERIALS ON PLANS, ELEVATIONS & DETAILS ARE (N) UNO



EXPIRES: 12-31-19



**TERRAFIRMA FOUNDATION SYSTEMS**  
 MCMONAGLE RESIDENCE RETAINING WALL  
 4973 MAPLETON DR  
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(N) RETAINING WALL FOUNDATION PLAN

REVISIONS

1	07-16-2019
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 DESIGNED BY:  
MEK  
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MEK  
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JLD  
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06-19-2019

SHEET NO:

**S2.1**



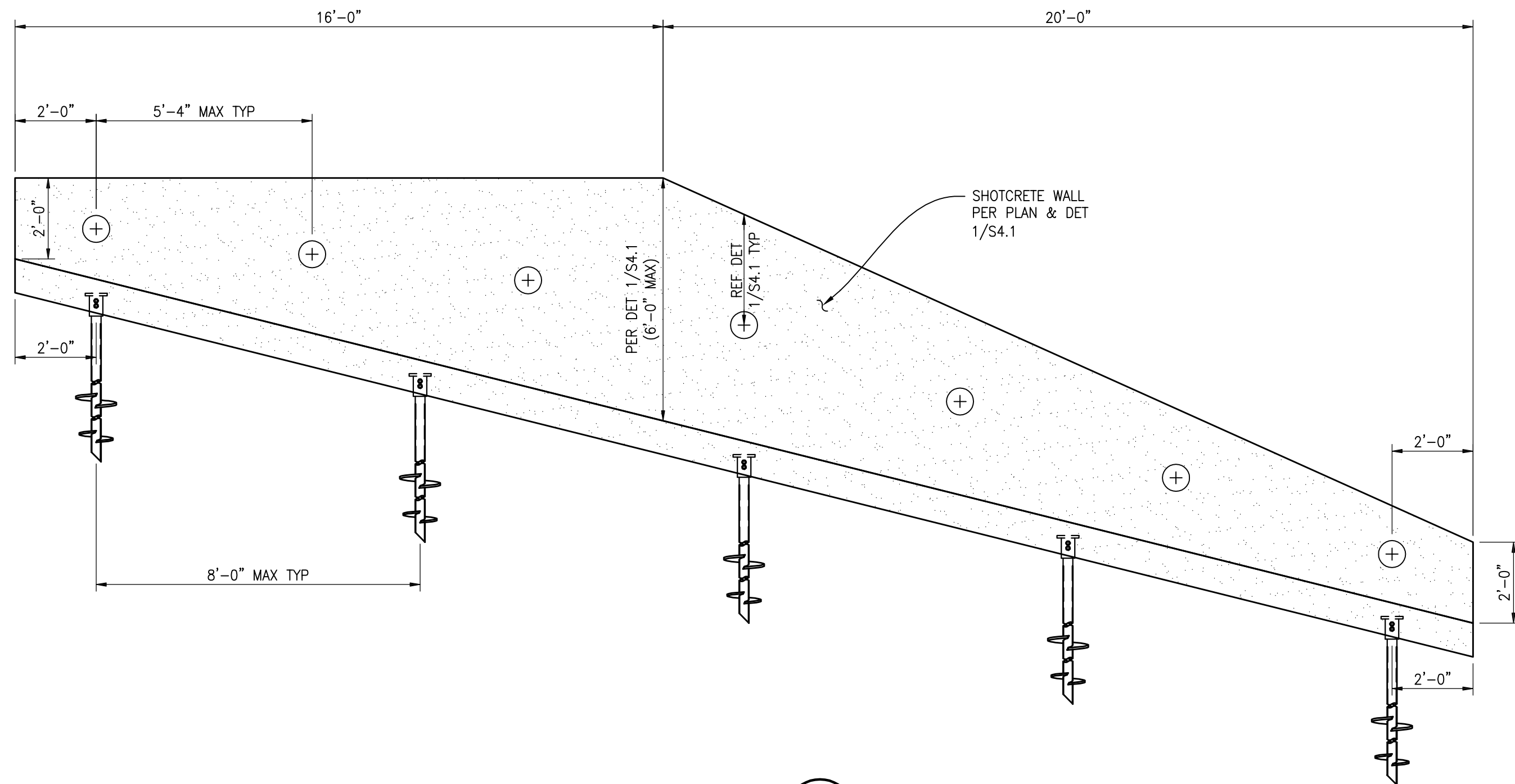
**TERRAFIRMA FOUNDATION SYSTEMS**  
 MCMONAGLE RESIDENCE RETAINING WALL  
 4973 MAPLETON DR  
 WEST LINN, OR 97068

RET WALL  
 ELEVATION

REVISIONS	
1	07-16-2019

PROJECT NO:  
 TF19-088  
 DESIGNED BY:  
 MEK  
 DRAWN BY:  
 MEK  
 CHECKED BY:  
 JLD  
 DATE:  
 06-19-2019

SHEET NO:  
**S3.1**



**(N) TIEBACK LAYOUT ELEVATION**

SCALE:  $\frac{3}{8}'' = 1'-0''$

1

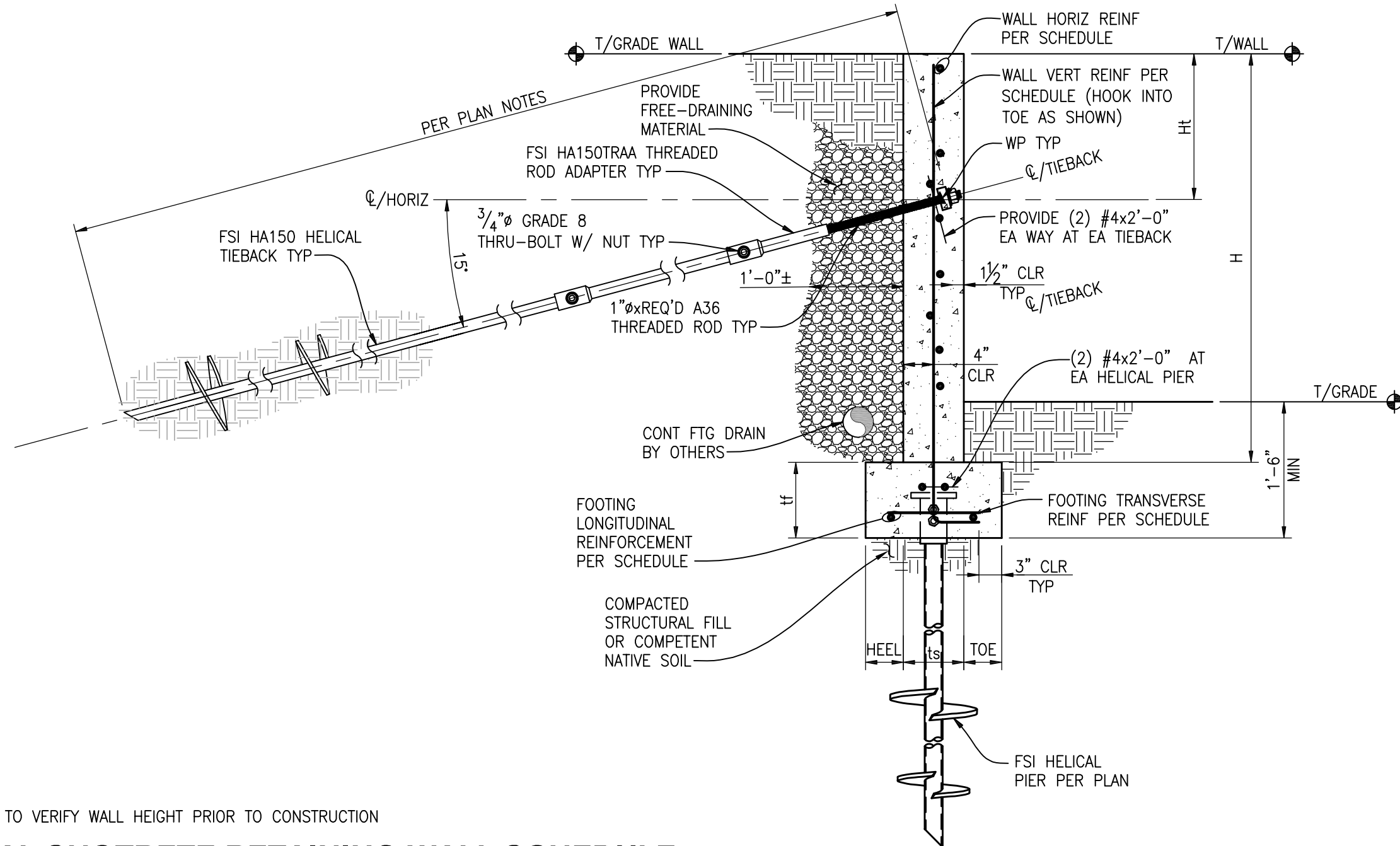
# RETAINING WALL/FOOTING SCHEDULE

WALL TYPE	H MAX	TOE	ts	HEEL	tf	WALL REINF		FOOTING REINF		Ht
						VERT	HORIZ	TRANSVERSE	LONGITUDINAL	
A	2'-0"	0'-5"	8"	0'-5"	0'-10"	#4 AT 12" OC	#4 AT 12" OC	#4 AT 12" OC	(2) #4 BOTT	1'-2"
B	3'-0"	0'-5"	8"	0'-5"	0'-10"	#4 AT 12" OC	#4 AT 12" OC	#4 AT 12" OC	(2) #4 BOTT	1'-9"
C	4'-0"	0'-5"	8"	0'-5"	0'-10"	#4 AT 12" OC	#4 AT 12" OC	#4 AT 12" OC	(2) #4 BOTT	2'-4"
D	5'-0"	0'-5"	8"	0'-5"	0'-10"	#4 AT 12" OC	#4 AT 12" OC	#4 AT 12" OC	(2) #4 BOTT	2'-11"
E	6'-0"	0'-5"	8"	0'-5"	0'-10"	#4 AT 12" OC	#4 AT 12" OC	#4 AT 12" OC	(2) #4 BOTT	3'-6"



EXPIRES: 12-31-19

**TERRAFIRMA FOUNDATION SYSTEMS**  
 MCMONAGLE RESIDENCE RETAINING WALL  
 4973 MAPLETON DR  
 WEST LINN, OR 97068



**NOTE:**  
 CONTRACTOR TO VERIFY WALL HEIGHT PRIOR TO CONSTRUCTION

## TYPICAL SHOTRETE RETAINING WALL SCHEDULE

SCALE: 3/4" = 1'-0"

1

RET WALL DETAILS

REVISIONS

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MEK  
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MEK  
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JLD  
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06-19-2019

SHEET NO:

S4.1