Appendix H-2: Update of EIR-Level Geotechnical Study

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January 31, 2024
J.N. 20-252

PSIP WR GREEN RIVER, LLC
c/o Western Realco
500 Newport Center Drive, Suite #630
Newport Beach, California 92660

Attention: Mr. Jeremy Mape

Subject: **Update of EIR-Level Geotechnical Study, Proposed Green River Ranch Business Park Development, Southwest of Green River and Dominguez Roads, City of Corona, Riverside County, California**

References: See Attached List

Dear Mr. Mape:

Petra Geosciences, Inc. (Petra) has prepared this letter in accordance with the request of Ms. Kimberly Thienes (T&B Planning, Inc.), to provide an update to the EIR-Level Geotechnical Study prepared by this firm in 2020 (Reference No. 3). Petra reviewed the Parcel Map Precise Plan prepared by KWC Engineers, (dated June 12, 2020) as the basis for project development for our previous EIR-Level study. Petra has now reviewed the latest revised grading plans prepared by KWC Engineers, Tentative Tract Map No. 37963, Precise Plan (dated February 2, 2023), for this update to our EIR-Level Geotechnical Study.

In addition, our EIR-Level Geotechnical Study (Reference No. 3) utilized seismic design parameters based on the 2019 California Building Code (CBC). Therefore, updated seismic design parameter recommendations based on the current 2022 CBC are presented at this time. The updated recommendations presented herein supersede the previous seismic design parameters presented in the referenced report.

PREVIOUS INVESTIGATIONS

A previous Geologic/Geotechnical Feasibility Level Study of the property was performed by Neblett & Associates, Inc. (Neblett, 1999). Neblett performed their geologic and geotechnical assessment of the property for the development of proposed retail, commercial, and industrial buildings in the northern portion of the site and equestrian estate lots in the southern portion of the property. Neblett's field work consisted of 6 rotary wash borings drilled to depths of up to 77 feet, 12 exploratory test pits excavated to depths of up to 16 feet, and cursory geologic field mapping.

Petra performed a Draft Due Diligence/Feasibility Level Geotechnical Assessment Report (Petra, 2019) for a proposed commercial warehouse/office building development to be located within the northern portion of the site. The subsurface field investigation included the excavation of 9 exploratory test pits to depths ranging between 10½ to 15½ feet, 3 exploratory bucket auger borings to depths ranging between 57 and 87 feet and 3 hollow-stem borings (advanced primarily for percolation testing) drilled to depths between 8 and 20 feet. All of the bucket auger borings were down-hole logged by a geologist.

Petra performed an EIR-Level Geotechnical Study in 2020 (Petra, 2020), that presented our findings and opinions with respect to the geotechnical feasibility of the proposed project and constraints that may have an impact on the development of the subject property. The design concept for this study was presented as the Parcel Map Precise Plan prepared by KWC Engineers, (dated June 12, 2020). Our evaluation for this study was based on our review of these grading plans, published geotechnical maps and literature pertinent to the area of the subject site, previous limited subsurface investigation (see above), and our previous experience with similar projects in the area.

LOCATION AND SITE DESCRIPTION

The site to be developed is part of a local specific plan. The specific plan has a total of 6 planning areas. The area to be developed consists of Planning areas 1, 2, and 3 out of the 6 planning areas shown on the figure below which was provided by T&B Planning.

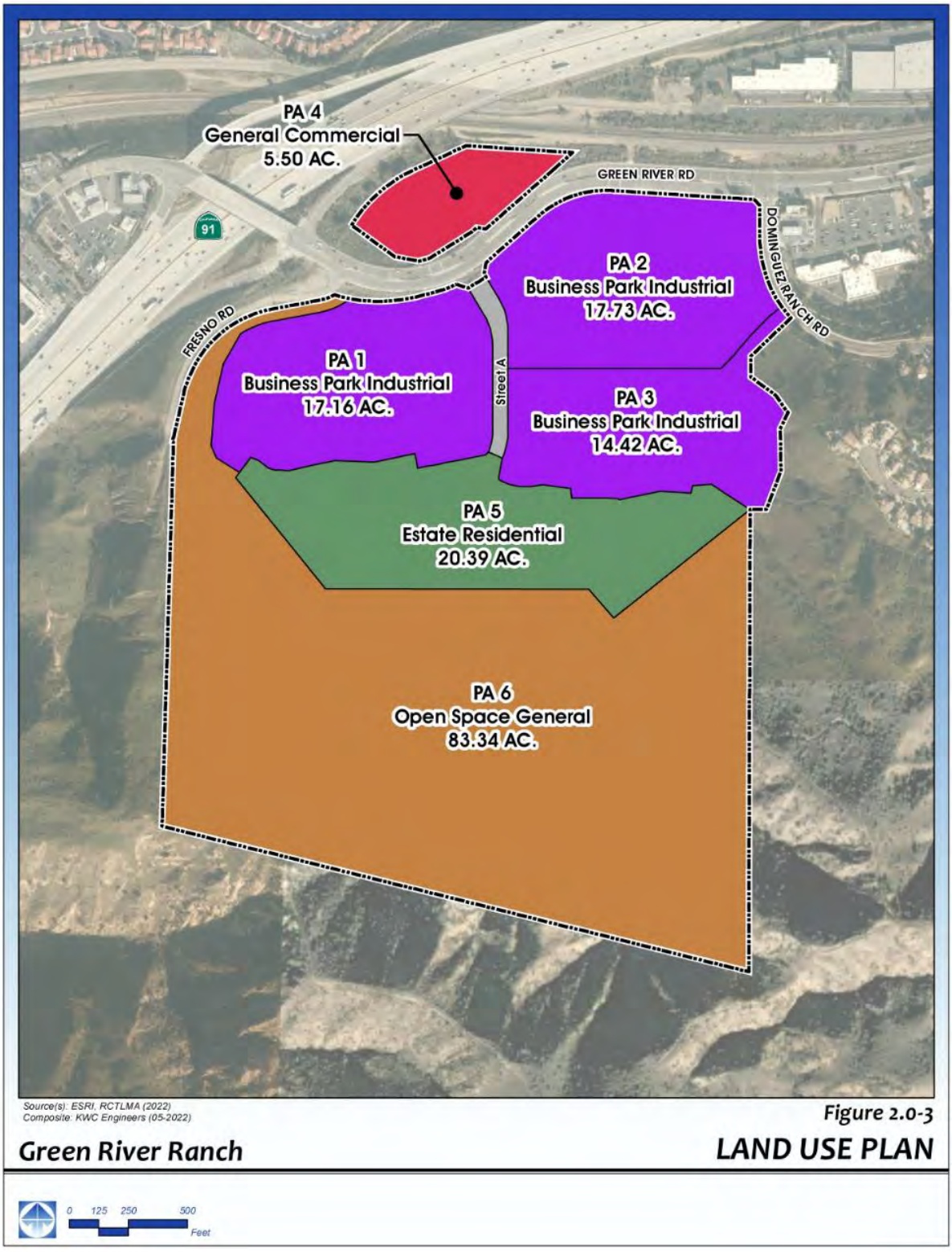

Figure 1 – Planning Area Map

The subject property is located on the south side of Green River Drive between Fresno Road on the west and Dominguez Ranch Road on the east and extends approximately 1,800 feet to the south into the foothills of the Santa Ana Mountains. Elevations onsite range from approximately 1,110 +/- feet in the southwest corner of the property to 515 +/- feet in the northeast corner of the property with a maximum relief of roughly 595 +/-feet. Generally, the southern portion of the site is undeveloped hillside terrain with natural slopes ascending to the south at slope ratios ranging from 4:1 to 1.5:1 (horizontal to vertical). The northerly portion of the site is relatively flat with a slight gradient to the north.

A site reconnaissance was performed by a representative of Petra on January 24, 2024. Existing improvements at the time of our site reconnaissance include a concrete building slab with an associated asphalt access drive/parking area located adjacent to Green River Road, an empty concrete-lined reservoir and water tank located on the northeastern side of the property, power lines along the eastern property and chain link/barb wire fences generally located around the perimeter of the property. Vegetation mostly consists of a variety of native grasses and bushes with a few mature trees in canyon areas and at the north end of the site. Drainage is provided by several relatively large and steep natural canyons descending from the south that transition to a sheet-flow dominated drainage in the flatter portion of the site which similarly drains to the north. A storm drain inlet is located at the northeast corner of the property, adjacent to Green River Road.

PROPOSED DEVELOPMENT AND GRADING

The current area under consideration is planning areas PA 1, 2 and 3 and the northwesterly portion of PA 6 (See Figure 1 – Planning Area Map). Based on a review of the Tentative Tract Map No. 37963, Precise Plan, prepared by KWC Engineers (2/2/23) only the northern 49.3 acres of the property are proposed to be developed into five large building pads at this time. KWC's updated grading plan indicates that previous Parcel Building Numbers 1 through 5 have been changed to Lot Building Numbers 1 through 5. Previous Parcel 6 (future estate residential) has been changed to Lot 6 (open space) and Lot 7 (future residential). Lot A is Street A and Lot B is a proposed street R/W dedication. Planning area 4 (general commercial) located north of Green River Road, is not a part of the current proposed development phase.

Associated improvements include an access street, parking lots, planters, and above- and below-ground utilities. Design cuts and fills of up to approximately 87 and 49 feet, respectively are anticipated to achieve design grades. Fill slopes ranging up to approximately 50 feet in height are proposed along the northern property line while cut and fill slopes up to about 180 and 50 feet are proposed south of the proposed building pads, respectively. Surface drainage above the graded slopes will runoff into proposed basins and be collected by terrace drains on the graded slopes and ultimately into storm drains.

Approximate proposed building pad elevations are in Table 1, below.

TABLE 1

Location	Pad Elevations (ft)
Lot 1 Bldg. 1	576-581
Lot 2 Bldg. 2	563-566
Lot 3 Bldg. 3	563-566
Lot 4 Bldg. 4	572-574
Lot 5 Bldg. 5	572-574

Specific Items of Update to EIR-Level Geotechnical Study

General

The current Precise Plan (KWC, 2023) are found to have been prepared in accordance with the applicable recommendations of our previous report and are considered acceptable from a geotechnical point of view. Furthermore, the findings and conclusions of our previous report (Petra, 2020) remain applicable to proposed grading and construction with the following updated or rephrased recommendations.

California Building Code (CBC)

The current 2022 revision of the CBC is in effect and has been adopted by the City of Corona. Wherever referenced within the EIR-Level Geotechnical Study (Petra, 2020) as *California Building Code (CBC), 2019, it* should be removed and replaced/updated as *California Building Code (CBC), 2022.* This includes the *Seismic Design Parameters.*

Grading Plan Review

Based on our review of the current 40-scale, Tentative Tract Map No. 37963, Precise Plan for the subject site prepared by KWC Engineers (2/2/23), the grading plans are essentially the same as the previous 40-scale grading plans prepared by KWC Engineers that we reviewed as part of the preparation of our previous EIR-Level Geotechnical Study in 2020 (Petra, 2020). The proposed layout of the parcels, streets and slopes are in substantial conformance to the 40-scale grading plans previously reviewed with the exception of the following changes:

- Parcel Building Numbers 1 through 6 have been changed to Lot Building Numbers 1 through 6.
- Lot 1 & Slopes
    - Lot 1 building & loading-dock footprint realigned approximately 40 feet to the south.
    - Roadway area between loading-docks and toe of slope reduced by approximately 60 feet.
    - The toe and top of the southerly ascending slope realigned approximately 25 feet to the north.
    - Increase in size of Basin 1 above Lot 1.
    - Parking/drive area west of Lot 1 realigned/reduced in size with associated increase of westerly Lot 6 open space area adjacent to Fresno Road.
    - North facing slope north of Lot 1 realigned slightly to the south with associated increase of northerly Lot 6 open space at toe of slope.
    - Exit onto Fresno Road has been eliminated.
- Lot 4 Slope
    - Increase in size of Basin 2 above Lot 4.

In summary, as noted above, the *Tentative Tract Map No. 37963, Precise Plan* for the subject site prepared by *KWC Engineers (2/2/23)*, are essentially the same as the previous 40-scale grading plans we reviewed as part of the preparation of our previous EIR-Level Geotechnical Study in 2020 (Petra, 2020). Furthermore, the findings, recommendations and conclusions of our previous report as updated herein remain applicable to proposed grading and construction, with the exception of the updated seismic and foundation design parameters as related to the adoption of the 2022 CBC found later in this report.

2022 CBC Seismic Design Parameters

Seismic Design Parameters

Earthquake loads on earthen structures and buildings are a function of ground acceleration which may be determined from the site-specific ground motion analysis. Alternatively, a design response spectrum can be developed for certain sites based on the code guidelines. To provide the design team with the parameters necessary to construct the design acceleration response spectrum for this project, we used two computer applications. Specifically, the first computer application, which was jointly developed by Structural Engineering Association of California (SEAOC) and California's Office of Statewide Health Planning and Development (OSHPD), the SEA/OSHPD Seismic Design Maps Tool website, https://seismicmaps.org, is used to calculate the ground motion parameters. The second computer application, the United Stated Geological Survey (USGS) Unified Hazard Tool website, https://earthquake.usgs.gov/hazards/interactive/, is used to estimate the earthquake magnitude and the distance to surface projection of the fault.

To run the above computer applications, site latitude and longitude, seismic risk category and knowledge of site class are required. The site class definition depends on the direct measurement and the ASCE 7-16 recommended procedure for calculating average small-strain shear wave velocity, Vs30, within the upper 30 meters (approximately 100 feet) of site soils.

A seismic risk category of II was assigned to the proposed buildings in accordance with 2022 CBC, Table 1604.5. No shear wave velocity measurement was performed at the site, however, the subsurface materials at the site appear to exhibit the characteristics of stiff soils condition for Site Class D designation. Therefore, an average shear wave velocity of 259 meter per second (850 feet per second) for the upper 100 feet was assigned to the site based on engineering judgment and geophysical experience. As such, in accordance with ASCE 7-16, Table 20.3-1, Site Class D (D- Default as per SEA/OSHPD software) has been assigned to the subject site.

The following table, Table 2, provides parameters required to construct the Seismic Response Coefficient – Natural Period, Cs – T, curve based on ASCE 7-16, Article 12.8 guidelines.

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TABLE 2

Seismic Design Parameters

Ground Motion Parameters		Specific Reference	Parameter Value	Unit
Site Latitude (North)		-	33.8777	°
Site Longitude (West)		-	-117.6531	°
Site Class Definition		Section 1613.2.2 (1), Chapter 20 (2)	D-Default (4)	-
Assumed Seismic Risk Category		Table 1604.5 (1)	II	-
M_w - Earthquake Magnitude		USGS Unified Hazard Tool (3)	7.26 (3)	-
R – Distance to Surface Projection of Fault		USGS Unified Hazard Tool (3)	2.26 (3)	km
S_s - Mapped Spectral Response Acceleration Short Period (0.2 second)		Figure 1613.2.1(1) (1)	2.187 (4)	g
S_1 - Mapped Spectral Response Acceleration Long Period (1.0 second)		Figure 1613.2.1(3) (1)	0.774(4)	g
F_a – Short Period (0.2 second) Site Coefficient		Table 1613.2.3(1) (1)	1.2 (4)	-
F_v – Long Period (1.0 second) Site Coefficient		Table 1613.2.3(2) (1)	Null (4)	-
S_{MS} – MCE_R Spectral Response Acceleration Parameter Adjusted for Site Class Effect (0.2 second)		Equation 16-20 (1)	2.625 (4)	g
S_{M1} - MCE_R Spectral Response Acceleration Parameter Adjusted for Site Class Effect (1.0 second)		Equation 16-21 (1)	Null (4)	g
S_{DS} - Design Spectral Response Acceleration at 0.2-s		Equation 16-22 (1)	1.75 (4)	g
S_{D1} - Design Spectral Response Acceleration at 1-s		Equation 16-23 (1)	Null (4)	g
Domain of Constant Acceleration	$T_s = S_{D1}/S_{DS}$	Section 11.4.6 (2)	Null	s
	$T_o = 0.2\ S_{D1}/S_{DS}$	Section 11.4.6 (2)	Null	s
T_L - Long Period Transition Period		Figure 22-14 (2)	8 (4)	s
PGA - Peak Ground Acceleration Maximum Considered Earthquake Geometric Mean, MCE_G (*)		Figure 22-9 (2)	0.927	g
F_{PGA} - Site Coefficient Adjusted for Site Class Effect (2)		Table 11.8-1 (2)	1.2 (4)	-
PGA_M –Peak Ground Acceleration (2) Adjusted for Site Class Effect		Equation 11.8-1 (2)	1.112 (4)	g
Design PGA ≈ (⅔ PGA_M) - Slope Stability (†)		Similar to Eqs. 16-22 & 16-23 (2)	0.741	g
Design PGA ≈ (0.4 S_{DS}) – Short Retaining Walls (‡)		Equation 11.4-5 (2)	0.7	g
C_{RS} - Short Period Risk Coefficient		Figure 22-18A (2)	0.905 (4)	-
C_{R1} - Long Period Risk Coefficient		Figure 22-19A (2)	0.903 (4)	-
SDC - Seismic Design Category (§)		Section 1613.2.5 (1)	Null (4)	-

References:
(1) California Building Code (CBC), 2022, California Code of Regulations, Title 24, Part 2, Volume I and II.
(2) American Society of Civil Engineers/Structural Engineering Institute (ASCE/SEI), 2016, Minimum Design Loads and Associated Criteria for Buildings and Other Structures, Standards 7-16.
(3) USGS Unified Hazard Tool - https://earthquake.usgs.gov/hazards/interactive/ [Dynamic: Conterminous U.S. 2014 (update) (v4.2.0)]
(4) SEAOC/OSHPD Seismic Design Map Application – https://seismicmaps.org [Reference: ASCE 7-16]
Related References:
Federal Emergency Management Agency (FEMA), 2015, NEHRP (National Earthquake Hazards Reduction Program) Recommended Seismic Provision for New Building and Other Structures (FEMA P-1050).

Notes:
* PGA Calculated at the MCE return period of 2475 years (2 percent chance of exceedance in 50 years).
† PGA Calculated at the Design Level of ⅔ of MCE; approximately equivalent to a return period of 475 years (10 percent chance of exceedance in 50 years).
‡ PGA Calculated for short, stubby retaining walls with an infinitesimal (zero) fundamental period.
§ The designation provided herein may be superseded by the structural engineer in accordance with Section 1613.2.5.1, if applicable.

Discussion

Owing to the characteristics of the subsurface soils, as defined by Site Class D-Stiff Soil designation, and proximity of the site to the sources of major ground shaking, the site is expected to experience strong ground shaking during its anticipated life span. Under these circumstances, where the code-specified design response spectrum may not adequately characterize site response, the 2019 CBC typically requires a site-specific seismic response analysis to be performed. This requirement is signified/identified by the "null" values that are output using SEA/OSHPD software in determination of short period, but mostly, in determination of long period seismic parameters, see Table 1.

For conditions where a "null" value is reported for the site, a variety of design approaches are permitted by 2019 CBC and ASCE 7-16 in lieu of a site-specific seismic hazard analysis. For any specific site, these alternative design approaches, which include Equivalent Lateral Force (ELF) procedure, Modal Response Spectrum Analysis (MRSA) procedure, Linear Response History Analysis (LRHA) procedure and Simplified Design procedure, among other methods, are expected to provide results that may or may not be more economical than those that are obtained if a site-specific seismic hazards analysis is performed. These design approaches and their limitations should be evaluated by the project structural engineer.

Discussion – Seismic Design Category

Please note that the Seismic Design Category, SDC, is also designated as "null" in Table 1. For Risk Category I, II or III structures, where the mapped spectral response acceleration parameter at 1 – second period, S1, is greater than or equal to 0.75, the 2022 CBC, Section 1613.2.5 requires that these structures be assigned to Seismic Design Category E.

Discussion – Equivalent Lateral Force Method

As stated herein, the subject site is considered to be within a Site Class D-Stiff Soil. Per ASCE 7-16 Supplement 3, a site-specific ground motion hazard analysis is not required for structures on Site Class D-Stiff Soil with S1 > 0.2 provided that the value of the parameter SM1 determined by Eq. (11.4-2) is increased by 50 percent for all applications of SM1and structural design is performed in accordance with Equivalent Lateral Force (ELF) procedure

CONCLUSIONS

Based on the results of our review of available geotechnical literature, maps and reports (Neblett, 1999), the results of our limited subsurface investigation, and on our review of our previous EIR-Level Geotechnical Study (Petra, 2020), and the updated Tentative Tract Map No. 37963, Precise Plan, prepared by KWC Engineers (2/2/23), it is our opinion that development of the subject site with the proposed business development structures is feasible from a geotechnical standpoint. In addition, with the implementation of the mitigation measures/performance standards described in our EIR-Level Geotechnical Study in 2020 (Petra, 2020), and the final recommendations to be provided in a future comprehensive design-phase geotechnical report, the potentially significant geologic and seismic impacts identified would be reduced to a less-than-significant level.

REPORT LIMITATIONS

This report is based on the proposed project and geotechnical data as described herein. The materials encountered on the project site, described in other literature, and utilized in our analysis are assumed to be representative of the entire project site, and the conclusions and recommendations contained in this report are presented on that basis. However, the engineering characteristics of soil materials typically vary between points of exploration, both laterally and vertically, and those variations could affect the conclusions and recommendations contained herein.

This report has been prepared consistent with that level of care being provided by other professionals providing similar services at the same locale and time period. The contents of this report are professional opinions and as such, are not to be considered a guarantee or warranty. This report should be reviewed and updated after a period of one year or if the general project design concept changes from that described herein.

This report should be reviewed and updated after a period of one year or if the project concept changes from that described herein. This report has not been prepared for use by parties or projects other than those named or described herein as it may not contain sufficient information for other parties or other purposes.

This opportunity to be of service is sincerely appreciated. If you have any additional questions or concerns, please feel free contact this office.

Respectfully submitted,

PETRA GEOSCIENCES, INC.

1/31/24

J. Montgomery Schultz
Principal Engineer
GE 2941

REGISTERED PROFESSIONAL ENGINEER
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Attachment: References

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REFERENCES

KWC Engineering, 2023, Green River Ranch Business Park Tentative Tract Map No. 37963 Precise Plan, J.N. 19.1886.2, dated February 2.

Neblett & Associates, Inc., 1999, Geologic/Geotechnical Feasibility Level Study, Green River Ranch, "Concept Plan A", 91 Freeway at Green River Road, County of Riverside, California; Project No. 206, dated January 12.

Petra Geosciences, Inc., 2019, Draft Due Diligence/Feasibility Level Geotechnical Assessment, Proposed Green River Ranch Commercial Development, Southwest of Green River and Dominguez Roads, City of Corona, Riverside County, California; J.N. 19-286, dated December 20.

_____, 2020, EIR-Level Geotechnical Study, Proposed Green River Ranch Business Park Development, Southwest of Green River and Dominguez Roads, City of Corona, Riverside County, California; J.N. 20-252, dated August 12.