INITIAL STUDY

APPENDIX F: HYDROLOGICAL EVALUATION

HYDROLOGY EVALUATION

PROPOSED COMMERCIAL DEVELOPMENT
6103 WEST MELROSE AVENUE
LOS ANGELES, CALIFORNIA
TRACT: 4427, LOT: 21-23, ARB: 1 & 2

GEOCON
CONSULTANTS, INC.

GEOTECHNICAL
ENVIRONMENTAL
MATERIALS

PREPARED FOR

BARDAS INVESTMENT GROUP
WEST HOLLYWOOD, CALIFORNIA

GEOCON PROJECT NO. W1153-06-01

FEBRUARY 2022

GEOCON
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Project No. W1153-06-01
February 7, 2022

Bardas Investment Group
c/o Mr. David Stafford Searock
Stafford CM 690 E. Green Street, Suite 201
Pasadena, CA 91101

Subject: HYDROLOGY EVALUATION
PROPOSED COMMERCIAL DEVELOPMENT
6103 WEST MELROSE AVENUE
LOS ANGELES, CALIFORNIA
TRACT: 4427, LOTS: 21-23, ARB 1 & 2

Dear Mr. Stafford:

In accordance with your direction, we have completed a Hydrology Evaluation for the proposed commercial development located at 6103 West Melrose Avenue in the City of Los Angeles, California. As part of this scope of work, we also completed a Dewatering Analysis, which is included as Attachment A of the Hydrology Evaluation. These two documents identify the potential hydrologic impacts of the project and appropriate design and mitigation components to address those potential impacts, consistent with state and local requirements. If you have any questions regarding this report, or if we may be of further service, please contact the undersigned.

Sincerely,

GEOCON CONSULTANTS, INC.

REGISTERED GEOLOGIST ANDREW A. KOPANIA EXP. 4/30/2022 No. 4711 STATE OF CALIFORNIA

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HYDROLOGY EVALUATION

1.0 INTRODUCTION AND METHODOLOGY

This report has been prepared for Bardas Investment Group to identify hydrologic conditions associated with the proposed commercial development at 6103 West Melrose Avenue in Los Angeles, California (the "project site"). Figure 1 shows the project vicinity. The information presented in Sections 2.0 and 3.0 related to the proposed project and existing site conditions was obtained primarily from the current draft version of the Initial Study/Mitigated Negative Declaration (IS/MND) for the project.

The evaluations presented in this report are based primarily on the following documents:

- County of Los Angeles, Department of Public Works, Hydrology Manual (January 2006) https://dpw.lacounty.gov/wrd/publication/engineering/2006_Hydrology_Manual/2006%20Hydrology%20Manual-Entire.pdf
- City of Los Angeles, L.A. CEQA Thresholds Guide (2006) http://planning.lacity.org/Documents/MajorProjects/CEQAThresholdsGuide.pdf
- County of Los Angeles, Department of Public Works, Low Impact Development Standards Manual (February 2014) http://dpw.lacounty.gov/ldd/lib/fp/Hydrology/Low%20Impact%20Development%20Standards%20Manual.pdf
- County of Los Angeles, Department of Public Works, Analysis of 85th Percentile 24-hour Rainfall Depth Analysis Within the County of Los Angeles (February 2004) http://ladpw.org/wrd/Publication/engineering/Final_Report-Probability_Analysis_of_85th_Percentile_24-hr_Rainfall1.pdf
- Los Angeles County Hydrology Map, https://dpw.lacounty.gov/wrd/hydrologygis/
- County of Los Angeles, Department of Public Works, HydroCalc program http://dpw.lacounty.gov/wmd/dsp_LowImpactDevelopment.cfm

All internet citations listed in this report were accessed multiple times during the weeks of January 24 and January 31, 2022.

2.0 PROJECT DESCRIPTION

As shown on Figure 2, the approximately 45,136 square-foot project site is currently developed with three buildings and two surface parking lots:

- An approximately 8,473 square-foot commercial building fronting West Melrose Avenue;
- Two existing office buildings and a small parking lot on the northern part of the site along North Seward Street, which occupy approximately 17,134 square feet; and
- An approximately 19,529 square-foot open parking area between the buildings to the north and south.

Proposed project activities involve demolition of the existing building on West Melrose Avenue and the parking lot between the existing buildings, excavation of a two-level subterranean parking garage, and the construction of a new five-story, approximately 77'-9"-foot tall, 67,889 square-foot office building. The existing buildings and parking lot on the northern part of the site would be retained as part of the project. Excavation for the subterranean parking garage would extend to a depth of approximately 35 feet below ground surface (ft bgs). The total area of disturbance during demolition and construction is approximately 28,000 square feet, or 0.643 acres. Figure 3 shows the proposed project improvements on the south part of the project site.

Project site improvements would also include landscape planting at grade along the facades on West Melrose Avenue and North Seward Street as well as on the upper-level terraces, along with landscape planting on the north side of the building in and near the shared plaza. This shared plaza between the new and existing office buildings to the north would be delineated from the surface parking area through landscape plantings as well as ground pavers. Landscape plantings would also occur along North Seward Street and West Melrose Avenue. New street trees would be provided in accordance with City of Loas Angeles recommendations, per the requirements of the Bureau of Street Services, Urban Forestry Division. Existing trees will be replaced at a ratio of 2:1 with a minimum 24-inch box replacement tree (four trees). In addition, one tree per 500 square feet of planting area will be provided (8 trees per 3,797 square foot planting area). Thus a total of 12 trees will be provided as part of the Project. The project would also provide an additional 2,870 square feet of landscaped area. The net 6,667 square feet of tree planting and landscaped areas indicate that the fraction of impervious surface cover on the southern approximately 28,000 square foot area to be improved would be approximately 76 percent, if appropriate low-impact development stormwater quality control measures are implemented (see Section 5.2).

The roof, balcony and plaza deck drains will feed into a rainwater harvesting cistern with a capacity of approximately 10,000 gallons. The harvested rainwater would be used exclusively for irrigation of the on-site landscaping. The irrigation system would be designed to meet or exceed the state Model Water Efficient Landscape Ordinance (MWELO). The system would utilize a dedicated landscape water meter and automatic weather-based controllers with electronically operated control valves and seasonal irrigation schedules. All areas will include high efficiency irrigation emitters, including micro spray and drip irrigation. Bubblers may be used for trees or shrubs where drip irrigation is not feasible.

This analysis assumes that project construction would occur over approximately 20-22 months. Construction activities would be undertaken in four main steps: (1) demolition; (2) grading, excavation, and foundations; (3) building construction; and (4) finishing and architectural coatings. Construction activities would be performed in accordance with all applicable state and federal laws and City codes and policies with respect to building construction and activities. Temporary shoring with tie backs or rakers would be used for excavation of the garage. Approximately 29,400 cubic yards (cy) of soil would be excavated and removed from the project site, requiring approximately 2,000 truckloads averaging 14 cubic yards per load.

3.0 EXISTING SITE CONDITIONS (ENVIRONMENTAL SETTING)

The Project Site is comprised of three parcels with Assessor's Parcel Numbers 5533- 037-005, 5533-037-024, 5533-037-023 that are rectangular in shape and total 45,136 square feet in area (see Figure 2). The ground surface elevation at the project site is approximately 270 feet above sea level. The surface slopes approximately two feet over 350 feet (0.006 ft/ft) toward the southwest. In addition to the existing improvements described above, the project site contains landscaping and six non-protected trees (two street trees and four trees located on-site). It is preliminarily estimated that the fraction of impervious cover on the southern approximately 28,000 square foot area to be improved is at least 95 percent.

The project site is not located within a Hillside Area, a Bureau of Engineering (BOE) designated Special Grading Area, Flood Zone, Watercourse, Hazardous Waste zone, a High Wind Velocity zone, Landslide area, Preliminary Fault Rupture Study Area, a Tsunami Inundation Zone, Liquefaction zone, or Alquist-Priolo Fault zone. However, according to the California Department of Water Resources, Division of Safety of Dams (https://fmds.water.ca.gov/webgis/?appid=dam_prototype_v2 , accessed February 1, 2022), the site is located within the breach inundation area for the Mulholland Dam, which is located approximately 2.35 miles north of the project site.

The project site generally does not have stormwater quality control measures in its existing condition.

4.0 REGULATORY SETTING

Construction and operation of the project may potentially affect stormwater runoff and the presence of pollutants, including sediment, in that runoff. State and local regulatory programs that may apply to the project are summarized below.

The total disturbance area during construction would be less than one acre. Thus, construction storm water regulations and the need for a storm water pollution prevention plan (SWPPP) do not apply directly to the project. However, construction activities may be subject to the requirements of the Los Angeles Regional Water Quality Control Board Order No. R4-2012-0175, National Pollutant Discharge Elimination System (NPDES) No. CAS00400, effective December 28, 2012, Waste Discharge Requirements for Municipal Separate Storm Sewer System (MS4) Discharges within the Coastal Watersheds of Los Angeles County (the "Los Angeles County MS4 Permit"), which controls the quality of runoff entering municipal storm drains in the County. Section VI.D.8, of this Permit, Development Construction Program, requires Permittees (which include the City of Los Angeles) to enforce implementation of stormwater best management practices (BMPs), including, but not limited to, approval of an Erosion and Sediment Control Plan (ESCP) for all construction activities within their jurisdiction. Thus, the construction contractor for the project would be required to implement BMPs that meet or exceed federal, state, and local guidelines for storm water treatment to control erosion and to protect the quality of surface water runoff during the construction period. BMPs may include containing storm water within the construction area during subsurface excavation, installing sediment filters around the construction area and on drop inlets, use of truck tire cleaning grids, covering trucks before soil is hauled offsite, sweeping the streets around the project site, disposing of waste in accordance with applicable laws and regulations, promptly cleaning up leaks and spills, and maintaining all equipment in good working order.

Section VI.D.7, Planning and Land Development Program, of the Los Angeles County MS4 Permit is applicable to land-disturbing activities that result in the creation or addition or replacement of 5,000 square feet or more of impervious surface area on an already developed site. The project qualifies as a "Designated Project" under the Los Angeles County Department of Public Works (LACDPW) Low Impact Development (LID) standards because more than 5,000 square feet of impervious surface would be replaced. Surface water drainage, collection, treatment and conveyance are regulated by the City of Los Angeles. Per the City's Special Order No. 007-1299, December 3, 1999, the City has adopted the LACDPW Hydrology Manual as its basis of design for storm drainage facilities. The Planning and Land Development Program requires, among other things, that projects retain on site the runoff volume from: (a) the 0.75-inch, 24-hour rainfall event; or (b) the 85th percentile, 24-hour rainfall event, whichever is greater. These runoff volumes are calculated using LACDPW-defined methods.

The Project will also be subject to the BMP requirements of the Standard Urban Stormwater Mitigation Plan (SUSMP) adopted by the Regional Water Quality Control Board for the Los Angeles Region. As a permittee, the City of Los Angeles is responsible for implementing the requirements of the County-wide SUSMP within the City, which may include a project-specific SUSMP. In addition, the Project would be subject to the provisions of the City's Low Impact Development (LID) Ordinance, which is designed to mitigate the impacts of increases in runoff and stormwater pollution as close to the source as possible. The LID Ordinance would require the Project to incorporate LID standards and practices to encourage the beneficial use of rainwater and urban runoff to reduce stormwater runoff.

5.0 PROJECT EFFECTS

The project has the potential to effect hydrology and water quality during construction and after the project is completed and operational. The construction effects would be temporary while the operational effects would potentially occur throughout the life of the proposed improvements to be installed at the site.

5.1 During Construction

Potential effects related to hydrology and water quality during construction could result in an increase in storm water runoff from the site or a decrease in the quality of that runoff. These effects may occur during demolition, excavation, or construction. During demolition and construction, these effects can be reduced by using appropriate BMPs, such as:

- Dust control measures to reduce offsite deposition of fine sediment;
- Installation of sediment filters on drop inlets near the site on West Melrose Avenue and North Seward Street;
- Use of truck tire cleaning grids to reduce track out;
- Tarping trucks that are transporting excavated soil offsite;
- Regular street sweeping around the site, if track out or dust accumulation occurs;
- Proper vehicle and equipment maintenance to reduce leaks and spills; and
- Compliance with proper procedures for use and disposal of hazardous substances.

During the period when excavation is occurring at the site, runoff could also be reduced substantially by retaining storm water within the disturbance area.

Dewatering would be required to reach the full excavation depth and allow construction of the subterranean parking garage. The dewatering would produce groundwater that would need to be discharged to a nearby storm sewer or sanitary sewer inlet in accordance with the proper permits from the Regional Water Quality Control Board and the City and/or County of Los Angeles. A dewatering analysis is provided in Attachment A of this report. The dewatering analysis identifies the quantity of water that might be produced, the magnitude and extent of the temporary drawdown of the groundwater surface around the project site, and the potential for the dewatering to produce contamination from nearby sites.

It should be noted that a dewatering contractor has not yet been retained to complete field studies and dewatering system design. Therefore, our dewatering analysis is based on the information available at the time it was prepared and our experience working with dewatering contractors, especially in this area of the Los Angeles basin. The final dewatering design should be prepared by an experienced dewatering contractor. If that design deviates substantially from the assumptions used in this analysis, then this analysis should be updated before excavation begins to verify that the conclusions and findings are still valid.

Our dewatering analysis presumes that dewatering for the project would occur within fine-grained soils using trenches within the shored excavation. Since field or laboratory measurements that can be used to provide a site-specific estimate of the hydraulic conductivity have not yet been conducted by a dewatering contractor, a range of empirical estimates for the soil properties was used for our evaluation. In addition, our analysis is based on the reported historic high groundwater level of 15 ft bgs.

We conducted dewatering simulations using three different transmissivity values, as described in more detail in Attachment A. The stabilized dewatering rates after one year of dewatering are estimated to range from 0.5 gallons per minute (gpm) for the low transmissivity case, to 2 gpm for the middle transmissivity case, to 12 gpm for the high transmissivity case. These low pumping rates are due to the fine-grained nature of the soils beneath the project site.

The effective drawdown is estimated to range from 2.9 to 8.1 feet at the edge of the excavation, depending on the actual soil properties beneath the project site. At the center line of North Seward Avenue, the drawdown after one year of dewatering is estimated to potentially range from 2.0 feet to 7.5 feet. At the east side of North Seward Street and at the center line of West Melrose Avenue, the drawdown after one year of dewatering is estimated to range from 1.3 feet to 7.0 feet. If the dewatering duration is shorter or longer than one year, the drawdowns would be proportionally smaller or larger, respectively, than those described for one year of dewatering. Additional details and discussion are presented in Attachment A.

Based on the parameters identified in the dewatering simulations, our analysis estimates that the capture zone during dewatering could range from 43 feet to 212 feet from the edge of the excavation after one year of dewatering to as much as 53 feet to 260 feet from the edge of the excavation if dewatering occurs for 18 months, depending on the actual hydraulic conductivity of the fine-grained saturated soils beneath the project site.

The California State Water Resources Control Board maintains the Geotracker website, which identifies active and closed contamination sites throughout California. Our review of Geotracker indicates that there are no currently active groundwater contamination sites within 1,500 feet of the project site. Residual contamination may be present at two closed sites located approximately 1,000 feet north of the project site and six closed sites located 1,500 feet to the east and to the west of the project site. The concentration levels of any residual contamination at these closed sites are not indicative of the presence of persistent contaminant plumes.

While there are no identified contaminant plumes within at least 1,500 feet of the project site, there is the potential that groundwater beneath the project site may contain low levels of residual fuel hydrocarbons and/or dry cleaning-related chemicals. If such chemicals are present in the water pumped from the excavation during dewatering, then contaminant treatment would be required to meet the discharge requirements of permits from the Regional Water Quality Control Board and City or County of Los Angeles.

5.2 Completed Project

As discussed in Section 4.0, the project qualifies as a "Designated Project" under the LACDPW LID standards because more than 5,000 square feet of impervious surface on a site that was previously developed will be replaced. The LACDPW Hydrology Manual (2006) requires projects to have drainage facilities that meet the Urban Flood level of protection. The Urban Flood is runoff from a 25-year frequency design storm falling on a saturated watershed. The City also considers the 50-year frequency design storm event to analyze potential impacts on surface water hydrology as a result of development. Thus, to provide a more conservative analysis, this report uses the larger storm event (the 50-year, 24-hour storm) as the design storm event for evaluation of potential impacts. According to the Los Angeles County hydrology map, cited in Section 1.0, above, the 50-year, 24-hour storm event has a magnitude of 5.81 inches and will be used as the design storm event for evaluation of potential impacts.

The LID documents also specify that the design storm event for development of BMPs for the site is the greater of the 0.75-inch, 24-hour rain event or the 85th percentile 24-hour rain event. The 85th percentile, 24-hour rain event for the Site is 1.01 inches, as shown on the isohyetal map in the LACDPW Analysis of 85th Percentile 24-hour Rainfall Depth document cited in Section 1.0, above. Thus, the 85th percentile 24-hour rain event will be used as the design storm event for development of BMPs. The runoff from this storm event is referred to as the stormwater quality design volume (SWQDv). The City and County LID standards provide stormwater management requirements for "Designated Projects" and include items such as management of the SWQDv on-site using infiltration, evapotranspiration, stormwater runoff harvesting and re-use, or a combination of these methods.

Since the project site is much less than 40 acres, the LACDPW HydroCalc software program was used to identify rainfall intensities, times of concentration, peak flow rates, and the total 24-hour runoff for both the 50-year, 24-hour storm event and the 85th percentile, 24-hour storm event. Table 1 shows the results produced by HydroCalc for existing (baseline) conditions and proposed project conditions. Appendix B includes the HydroCalc output files for the 50-year, 24-hour storm event model evaluations while Appendix C includes the HydroCalc output files for the 85th percentile, 24-hour storm event model evaluations. The percent impervious areas for existing and proposed conditions are described above, in Sections 3.0 and 2.0, respectively.

For the 50-year, 24-hour design storm event, the time of concentration and the peak flow rate are the same due to the very small project area. However, the peak runoff decreases by more than 10 percent, from 88,144 gallons to 79,049 gallons, due to the decrease from 95 percent to 76 percent of the area that would be impervious as a result of the project. As discussed above, the 50-year, 24-hour event is used to determine the size of the drainage facilities to meet the Urban Flood level of protection and to evaluate potential impacts. Since the project design incorporates a system to harvest up to 10,000 gallons of rainwater, the stormwater drainage system for the project would need to be designed to convey approximately 69,049 gallons over a 24-hour period, at a peak rate of 2.01 cubic feet per second. Since the runoff from the project would be less than that from existing, or baseline, conditions, there would be a less than significant impact related to drainage and stormwater runoff per the applicable CEQA threshold.

For the 85th percentile, 24-hour design storm event, the time of concentration and the peak flow rate are effectively the same due to the very small project area. However, the SWQDv decreases by over 25 percent, from 15,080 gallons to 12,574 gallons, due to the decrease from 95 percent to 76 percent of the area that would be impervious as a result of the project/ As discussed above, the project must manage the SWQDv using infiltration, evapotranspiration, stormwater runoff harvesting and re-use, or a combination of these methods. The project design already includes a runoff harvesting and re-use system which would address up to 10,000 gallons. Thus, the project would need to develop additional LID management methods to address the additional 2,574 gallons of the SWQDv not addressed by the harvesting and re-use system. Appendices E and G of the LACDPW LID Standards Manual describe a range of BMPs and source control measures that could be used to filter the stormwater runoff before discharge offsite. These methods include additional rainwater harvesting, flow-through planters, tree-well filters, and use of permeable pavement at ground level to promote percolation to the subsurface, among others.

TABLE 1
Hydrology Parameters and HydroCalc Results
6103 West Melrose Avenue
Los Angeles, California

Site Parameters				50-yr 24-hr rain event (L.A. CEQA Threshold)					
Scenario	**Area (acres)**	**Slope**	**Percent Impervious**	**Rainfall Depth (in)**	**Peak Intensity (in/hr)**	**Time of Conc. (Cd, minutes)**	**Peak Flow Rate (cubic feet per second)**	**Peak Runoff (cubic feet)**	**Peak Runoff (gallons)**
Existing Condition	0.643	0.006	95	5.81	3.47	5	2.01	11,784	88,144
Proposed Condition	0.643	0.006	76	5.81	3.47	5	2.01	10,568	79,049
Site Parameters				**85th Percentile 24-hr event (LID Manual)**					
Scenario	**Area (acres)**	**Slope**	**Percent Impervious**	**Rainfall Depth (in)**	**Peak Intensity (in/hr)**	**Time of Conc. (Cd, minutes)**	**Peak Flow Rate (cubic feet per second)**	**SWQDv (cubic feet)**	**SWQDv (gallons)**
Existing Condition	0.643	0.006	95	1.01	0.37	14	0.21	2,016	15,080
Proposed Condition	0.643	0.006	76	1.01	0.37	14	0.20	1,681	12,574

6.0 CONCLUSIONS AND RECOMMENDATIONS

Proposed construction activities could have temporary effects related to hydrology and water quality while the completed project could have operational effects throughout the life of the improvements. Demolition, excavation, and construction of new facilities could result in an increase in storm water runoff from the site or a decrease in the quality of that runoff. During demolition and construction, these effects can be reduced by using appropriate BMPs, such as:

- Dust control measures to reduce offsite deposition of fine sediment;
- Installation of sediment filters on drop inlets near the site on West Melrose Avenue and North Seward Street;
- Use of truck tire cleaning grids to reduce track out;
- Tarping trucks that are transporting excavated soil offsite;
- Regular street sweeping around the site, if track out or dust accumulation occurs;
- Proper vehicle and equipment maintenance to reduce leaks and spills; and
- Compliance with proper procedures for use and disposal of hazardous substances.

During the period when excavation is occurring at the site, runoff could also be reduced substantially by retaining storm water within the disturbance area.

Dewatering would be required to reach the full excavation depth and allow construction of the subterranean parking garage. Due to the fine-grained soils beneath the project site, dewatering is assumed to occur using interior trenches within the shored excavation and not using perimeter dewatering wells. The dewatering would produce groundwater that would need to be discharged to a nearby storm sewer or sanitary sewer inlet in accordance with the proper permits from the Regional Water Quality Control Board and the City and/or County of Los Angeles.

Due to the fine-grained, low permeability nature of the soils beneath the project site, dewatering rates would be relatively small, ranging from 0.5 gpm to 12 gpm, with a median value of approximately two gpm. The effective drawdowns after one year of dewatering are estimated to range from 2.9 to 8.1 feet at the edge of the excavation, from 2.0 feet to 7.5 feet along the centerline of North Seward Street, and from 1.3 feet to 7.0 feet at the east side of North Seward Street and at the center line of West Melrose Avenue. The range in the estimated drawdowns is due to the uncertainty in the aquifer properties in the soils at the site given the current limited data available. If the dewatering duration is shorter or longer than one year, the drawdowns would be proportionally smaller or larger, respectively, than those described for one year of dewatering.

There are no identified contaminant plumes within at least 1,500 feet of the project site. However, there is the potential that groundwater beneath the project site may contain low levels of residual fuel hydrocarbons and/or dry cleaning-related chemicals. If such chemicals are present in the water pumped from the excavation during dewatering, then contaminant treatment would be required to meet the discharge requirements of permits from the Regional Water Quality Control Board and City or County of Los Angeles.

The project is a “Designated Project” under the LACDPW LID standards and must have drainage facilities that meet the Urban Flood level of protection. The project must also include stormwater management facilities that are capable of containing or treating the SWQDv.

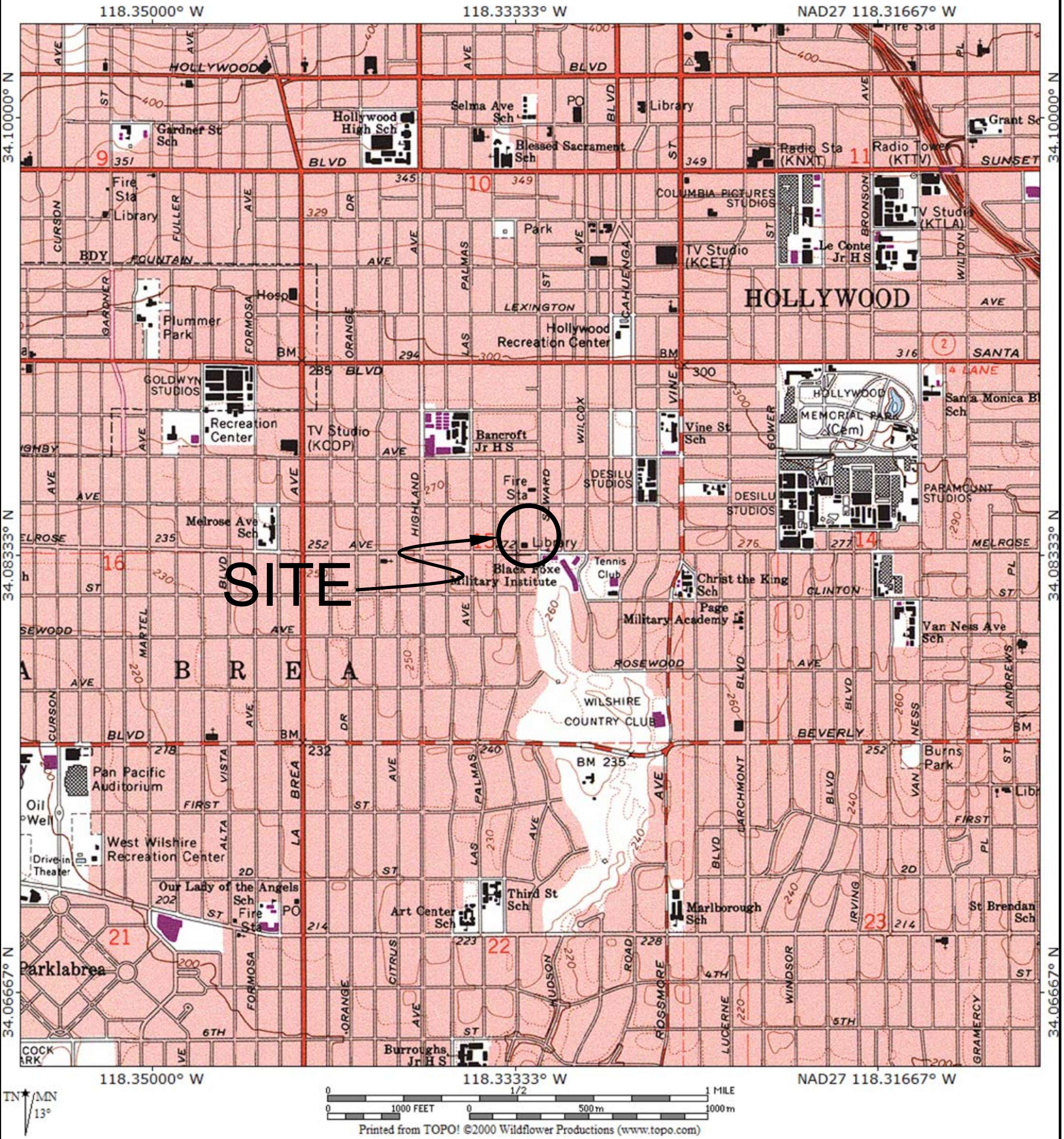
Based on the LID standards and HydroCalc model output, the peak runoff from the 50-year, 24-hour event (the Urban Flood design storm event) decreases by more than 10 percent, from 88,144 gallons to 79,049 gallons. Since the project design incorporates a system to harvest up to 10,000 gallons of rainwater, the stormwater drainage system for the project would need to be designed to convey approximately 69,049 gallons over a 24-hour period, at a peak rate of 2.01 cubic feet per second. Since the runoff from the project would be less than that from existing, or baseline, conditions, there would be a less than significant impact related to drainage and stormwater runoff per the applicable CEQA threshold.

For the 85th percentile, 24-hour design storm event, the SWQDv decreases by over 25 percent, from 15,080 gallons to 12,574 gallons. Since the project design already includes a runoff harvesting and re-use system which would address up to 10,000 gallons, the project would need to develop additional LID management methods to address the additional 2,574 gallons of the SWQDv not addressed by the harvesting and re-use system. Appropriate BMPs and source control measures may include additional rainwater harvesting, flow-through planters, tree-well filters, and use of permeable pavement at ground level, among others, consistent with the LACDPW LID Standards Manual.

Incorporating the measures described above would prevent or mitigate any potential impacts related to hydrology and water quality and comply with Regional Water Quality Control Board, County, and City requirements related to stormwater management and treatment.

7.0 CLOSURE

This Hydrology Report has been prepared to support permitting requirements for the project. This analysis did not include subsurface exploration, field testing, or laboratory testing. This analysis is based upon information collected by others along with data and analysis methods prescribed in the County of Los Angeles, Department of Public Works, Hydrology Manual; the County of Los Angeles, Department of Public Works, Low Impact Development Standards Manual; the County of Los Angeles, Department of Public Works, Analysis of 85th Percentile 24-hour Rainfall Depth Analysis Within the County of Los Angeles; the Los Angeles County Hydrology Map; and the County of Los Angeles, Department of Public Works, HydroCalc program. This report does not provide any final designs or specifications. Our professional services were performed, our findings obtained, and our recommendations prepared in accordance with generally accepted geotechnical engineering and hydrogeologic principles and practices used in this area at this time. We make no warranty, express or implied.



REFERENCE: U.S.G.S. TOPOGRAPHIC MAPS, 7.5 MINUTE SERIES, HOLLYWOOD, CA QUADRANGLE

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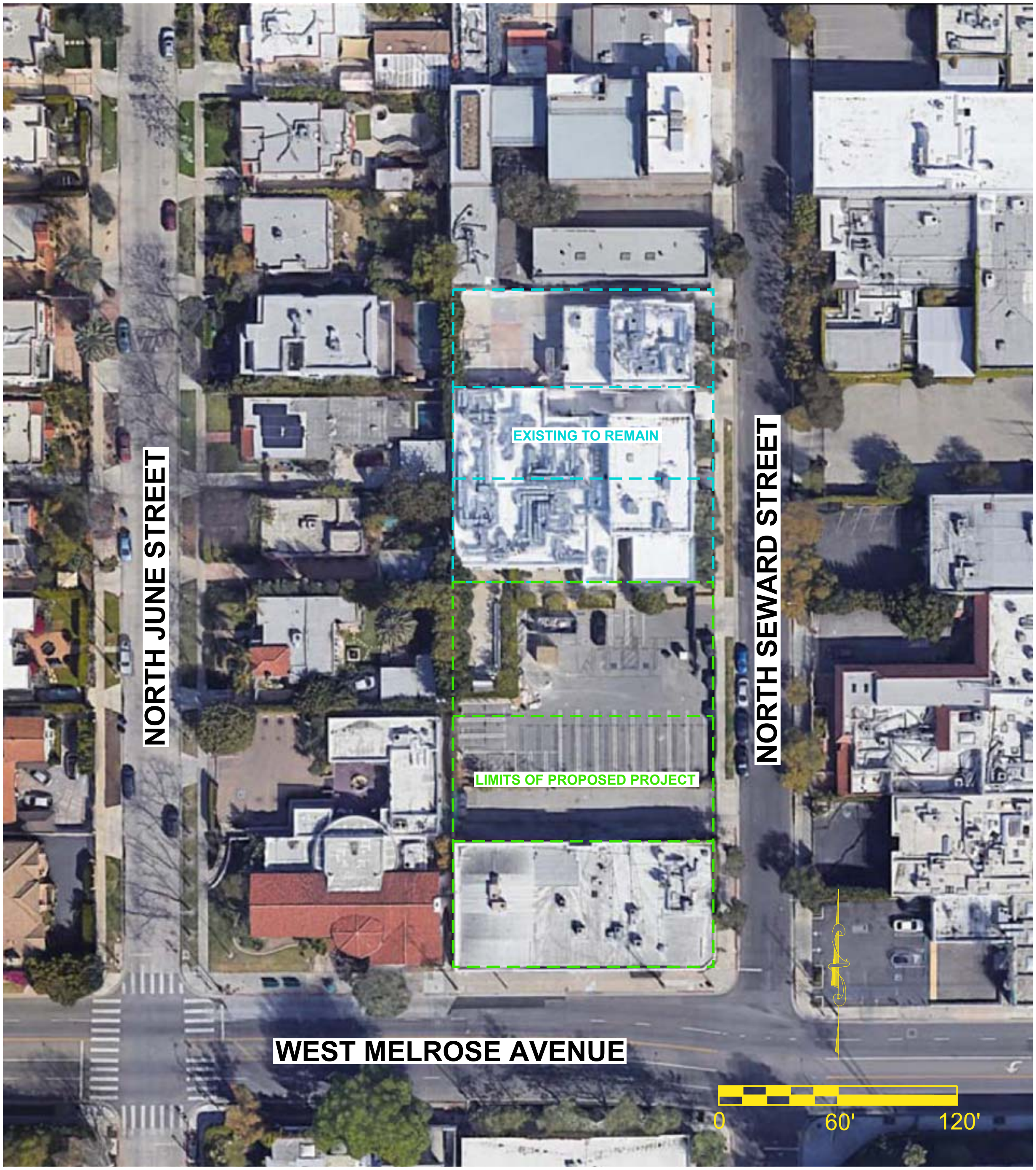
VICINITY MAP

6103 WEST MELROSE AVENUE
LOS ANGELES, CALIFORNIA

DRAFTED BY: JA	CHECKED BY: PZ	FEB. 2022	PROJECT NO. W1153-06-01	FIG. 1



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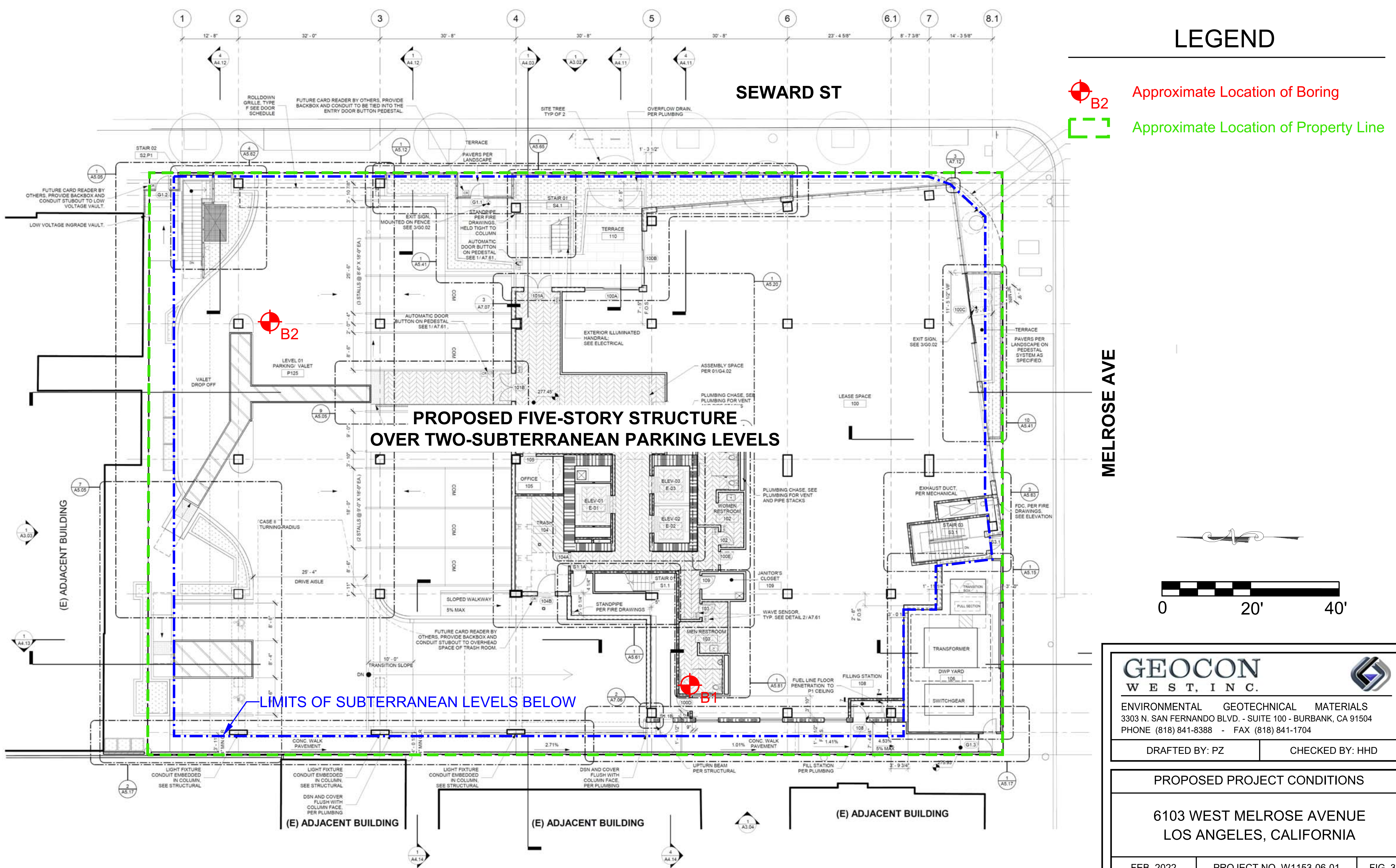
EXISTING SITE CONDITIONS

6103 WEST MELROSE AVENUE
LOS ANGELES, CALIFORNIA

FEB. 2022	PROJECT NO. W1153-06-01	FIG. 2



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PROPOSED PROJECT CONDITIONS

6103 WEST MELROSE AVENUE
LOS ANGELES, CALIFORNIA

FEB. 2022	PROJECT NO. W1153-06-01	FIG. 3

ATTACHMENT A

DEWATERING ANALYSIS
PROPOSED COMMERCIAL DEVELOPMENT
6103 WEST MELROSE AVENUE, LOS ANGELES, CALIFORNIA
TRACT: 4427, LOT: 21-23, ARB: 1 & 2

DEWATERING ANALYSIS

PROPOSED COMMERCIAL DEVELOPMENT
6103 WEST MELROSE AVENUE
LOS ANGELES, CALIFORNIA
TRACT: 4427, LOTS: 21-23, ARB: 1 & 2

PREPARED FOR

BARDAS INVESTMENT GROUP
WEST HOLLYWOOD, CALIFORNIA

GEOCON PROJECT NO. W1153-06-01

FEBRUARY 2022

GEOCON
CONSULTANTS, INC.

GEOTECHNICAL
ENVIRONMENTAL
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Project No. W1153-06-01
February 7, 2022

Bardas Investment Group
c/o Mr. David Stafford Searock
Stafford CM 690 E. Green Street, Suite 201
Pasadena, CA 91101

Subject: DEWATERING ANALYSIS
PROPOSED COMMERCIAL DEVELOPMENT
6103 WEST MELROSE AVENUE
LOS ANGELES, CALIFORNIA
TRACT: 4427, LOTS: 21-23, ARB 1 & 2

Dear Mr. Stafford:

In accordance with your direction, we have completed the following Dewatering Analysis for the proposed commercial development located at 6103 West Melrose Avenue in the City of Los Angeles, California. The Dewatering Analysis was prepared to support, and is Attachment A of, the Hydrology Evaluation for the proposed development project. If you have any questions regarding this report, or if we may be of further service, please contact the undersigned.

Sincerely,

GEOCON CONSULTANTS, INC.

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DEWATERING ANALYSIS

1.0 INTRODUCTION

Geocon Consultants, Inc. has performed this evaluation to support the Hydrology Evaluation for the proposed commercial development at 6103 West Melrose Avenue in Los Angeles, California (the "project"). A dewatering contractor has not yet been retained to complete field studies and dewatering system design. Therefore, this analysis is based on the information available at the time it was prepared to support the evaluations presented in the Hydrology Evaluation related to potential impacts of the project on hydrology and water quality. Presented below are a summary of hydrogeologic conditions in the project vicinity, a description of the dewatering simulation methodology and results, estimation of capture zones, an analysis of potential groundwater contamination sites in the vicinity of the project, and conclusions regarding the effects of dewatering, including the potential for mobilization of off-site contaminant plumes within the drawdown radius of dewatering.

2.0 HYDROGEOLOGIC CONDITIONS

In March 2020, Geocon West, Inc. had two eight-inch diameter borings excavated within the existing parking lot area of the project site using a truck-mounted hollow-stem auger drilling machine (Geocon West, Inc., 2021). Boring B-1 was drilled to a total depth of 45.5 feet below ground surface (ft bgs). Boring B-2 was drilled to a total depth of 50.5 ft bgs. The soils encountered in the borings consisted of clayey sand, silt, sandy silt, silty clay, sandy clay and clay to the total depth drilled. Perched groundwater was reported at approximately 32 ft bgs in both borings. In Boring B-1, the perched groundwater was encountered within a silt unit that is at least 20 feet thick. In Boring B-2, the perched groundwater was encountered near the bottom of a 3.5-foot thick clayey sand layer overlying a 10-foot thick stiff clay unit.

Based on a review of the Seismic Hazard Zone Report for the Hollywood Quadrangle (California Division of Mines and Geology, 1998), the historically highest groundwater level in the area is approximately 15 ft bgs. Groundwater information presented in the 1998 Seismic Hazard Zone Report is generated from data collected in the early 1900s to the late 1990s. The Los Angeles County Department of Public Works (LACDPW) has maintained various wells in the vicinity of the subject site over the past 90 years. The closest active groundwater well to the site is Well No. 2642M, which is approximately 1.2 miles to the west of the project site (LACDPW, 2022). Review of the monitoring data from Well 2642M indicates that the depth to groundwater has varied from about 12 ft bgs to 15 ft bgs since 1984. Furthermore, as discussed in more detail below, the depth to groundwater in 2014 to 2016 at contaminant sites in the project vicinity was 18 ft bgs. Thus, the historic high groundwater level identified in the Seismic Hazard Zone Report for the site area appears to also be representative of current conditions.

Excavation at the project site would extend to a maximum depth of 35 ft bgs. To provide a conservative (i.e., overly protective) analysis of the drawdown conditions at the site, this evaluation is based on the historic high groundwater level of 15 ft bgs, as opposed to the perched water level observed in the geotechnical borings performed in 2021.

As previously stated, a dewatering contractor has not yet been retained to conduct field studies that would provide data that could be used to estimate aquifer properties that are necessary to evaluate the effects of dewatering, such as the hydraulic conductivity. However, the hydraulic conductivity of the saturated layers beneath the site can be estimated based on empirical relationships based on material types (Freeze and Cherry, 1979; Domenico and Schwartz, 1990). Table 1 presents a range of potential hydraulic conductivity values for the clayey sand, silts, and clays that are present beneath the site, based on the empirical relationships cited above and professional judgment based on test pumping at other sites in the Los Angeles basin where similar materials have been encountered at similar depths. The low range of the hydraulic conductivities listed in Table 1 represents silty clays while the high range represents clayey sand (see Appendix A). The analytical simulations of drawdown are based on the transmissivity, which is the product of the hydraulic conductivity multiplied by the saturated thickness of the dewatered zone, as shown in Table 1.

TABLE 1
Hydraulic Conductivity Estimates[1] and Transmissivity Values
6103 West Melrose Avenue, Los Angeles, California

Hydraulic Conductivity (K)		Saturated Thickness	Transmissivity (T)
cm/sec	ft/d	ft	ft^2/d
1.00E-05	0.03	20	0.57
1.00E-04	0.28	20	5.7
1.00E-03	2.83	20	57

1 Using empirical relationships and best professional judgment based on conditions at other sites in the Los Angeles basin

3.0 DEWATERING SIMULATIONS

We prepared an analytical model to simulate the drawdown that would occur due to dewatering. The drawdown simulations were prepared for two purposes. The first was to provide an estimate of the volume of water that would be pumped and the amount of drawdown that would occur in the fine-grained soils under the public roads adjacent to the south and east sides of the project site. The second was to verify the appropriate aquifer parameters to estimate the capture zone radius of the dewatering to evaluate the effect on any known contaminant plumes.

The analysis presented below is based on our experience working with dewatering contractors, especially in this area of the Los Angeles basin. However, the final dewatering design should be prepared by an experienced dewatering contractor. If that design deviates substantially from the assumptions used in this analysis, then this analysis should be updated before excavation begins to verify that the conclusions and findings are still valid.

In coarser-grained and more permeable soils than those that exist at this site, dewatering is often conducted using perimeter wells to "pre-dewater" the excavation area and prevent groundwater from entering the excavation. The perimeter wells are typically located outside of the shoring and extend up to 10 feet below the maximum excavation depth. Operation of the perimeter dewatering wells creates a series of overlapping drawdown cones caused by dropping the water table to a depth lower than the bottom of the excavation. As a result, the total decrease in the water table outside of the excavation is relatively large, as shown on the top part of Figure 1.

In contrast, dewatering of the finer-grained soils at this site is anticipated to only require internal trenches because the fine-grained soils are not amenable to pre-dewatering using perimeter extraction wells. The internal trenches act like French drains and remove the water from the soils beneath the floor of the excavation. They also intercept groundwater that flows under the shoring due to the differential pressure between the water level outside of the shoring and the dewatered excavation, as shown on the lower part of Figure 1.

As discussed above, the hydraulic conductivity of the soils beneath the project site is relatively low. As a result of the low hydraulic conductivity, the rate of groundwater flow is also low. Furthermore, for the groundwater outside of the shoring to enter the excavation, there has to be a downward vertical component of flow on the outside of the shoring and then vertical upward flow under the excavation floor inside of the shoring, as illustrated on Figure 1. It is well-documented that the vertical hydraulic conductivity of native geologic materials is typically one-tenth of the horizontal hydraulic conductivity (Freeze & Cherry, 1979; Domenico & Schwartz, 1990). Thus, the rate at which groundwater moves vertically outside of the shoring system and under the excavation floor would be approximately one-tenth of the rate at which groundwater would move horizontally under the same gradient. However, the analytical evaluation conducted for this dewatering analysis was intentionally developed to be overly conservative, meaning that the approach was designed to over-estimate the drawdown. This conservative approach was accomplished by using the horizontal hydraulic conductivities and transmissivities identified for the surrounding soils, as shown in Table 1. Use of the horizontal aquifer properties, as opposed to the vertical aquifer properties, would tend to over-estimate the resulting flows and drawdowns by as much as a factor of 10 for dewatering systems that use interior trenches and do not use perimeter dewatering wells. In either case, the volume of groundwater that flows under the shoring is much less than the volume of groundwater that is removed by perimeter dewatering wells, such that the drawdown that occurs outside of the shoring is much less in cases where only trenches can be used during excavation, as shown on Figure 1.

Excavation and dewatering would only occur on the southern area of the project site, covering approximately 28,000 square feet. Excavation and dewatering would not be conducted on the northern part of the project site, where the existing buildings would be retained.

The dewatering trenches would extend two feet below the excavation floor. It is anticipated that saturated soils would first be encountered at approximately 15 ft bgs, as discussed above. As the excavation proceeds, shoring would be installed around the perimeter to support the side walls. The shoring would also reduce the amount of seepage into the excavation. The dewatering trench would be extended deeper as the floor of the excavation is advanced. The maximum excavation depth is assumed to be 35 ft bgs and the lowest dewatering trenches would reach 37 ft bgs.

Our analytical evaluation is based on the Thiem equation (Domenico and Schwartz, 1990). If the transmissivity of the aquifer is known, the Thiem Equation provides the difference between the drawdowns at any two specified locations away from the dewatering source. Drawdowns were estimated for various distances from the edge of the excavation, with critical distances including the centerline of North Seward Street (approximately 25 feet), the east side of North Seward Street and the centerline of West Melrose Avenue (approximately 50 feet), and the south side of West Melrose Avenue (approximately 100 feet).

The analytical evaluation was conducted for the three different transmissivity values shown in Table 1. The stabilized dewatering rates after one year of dewatering range from 0.5 gallons per minute (gpm) for the low transmissivity case, to 2 gpm for the middle transmissivity case, to 12 gpm for the high transmissivity case. These low pumping rates are due to the fine-grained nature of the soils beneath the project site. The Thiem equation results are presented in Table 2. Figure 2 shows the profile of the drawdown surface relative to the excavation.

TABLE 2
Projected Drawdowns Outside the Edge of Excavation Based on Thiem Equation
6103 West Melrose Avenue, Los Angeles, California

Distance from Edge of Excavation (feet)	Drawdown (feet)		
	Low T	Mid T	High T
0	2.9	6.0	8.1
25	2.0	5.3	7.5
50	1.3	4.8	7.0
100	0.2	3.8	6.2
250	0.0	2.1	4.7
500	0.0	0.4	3.3

4.0 CAPTURE ZONE RADIUS

As described by Landmeyer (1994), there are a range of methods that can be used to estimate the capture zone that results from pumping of an aquifer. As confirmed by the drawdown analysis presented above, dewatering at the project site during excavation and construction of the foundation will produce drawdowns in the surrounding saturated soils that mimic the effects of pumping from one or a series of wells. Therefore, capture zone estimation methods related to aquifer pumping can be used to identify the potential radius of influence that the dewatering may have on groundwater contaminant plumes.

A common method to estimate the capture zone is based on a volumetric flow equation. This method is used by the U.S. Environmental Protection Agency (U.S. EPA, 1987) to establish wellhead protection areas around groundwater supply wells. The volumetric flow equation is:

$r = (Qt/\pi nH)^{0.5}$

where:

- r is the radius of the capture zone;
- Q is the pumping rate in cubic feet per day (ft^3/d);
- t is the time over which pumping occurs, in days;
- n is the porosity of the aquifer; and
- H is the screened interval of the pumping well, in feet.

Using the dewatering parameters described above, capture zones for the low, middle, and high transmissivity cases were calculated based on a dewatering duration of one year. The calculated capture zones range from 43 feet for the low transmissivity case, to 86 feet for the middle transmissivity case, to 212 feet for the high transmissivity case. If the dewatering period occurred for 18 months, the capture zone distance would increase by approximately 25 percent for each case, to 53 feet, 106 feet, and 260 feet, respectively.

5.0 OFF-SITE CONTAMINANT PLUMES

Information from the California State Water Resources Control Board's Geotracker website (SWRCB, 2022) was used to identify sites with past or current groundwater contamination in the vicinity of the project site. There are two closed spill, leak, investigation and cleanup (SLIC) sites located approximately 1,000 feet north of the project site, as shown in Table 3. A closed site is a facility for which the Regional Water Quality Control Board has determined that further regulatory oversight is no longer necessary. Groundwater was present at those two sites at a depth of approximately 18 ft bgs in 2014-2016, with a reported groundwater flow direction toward the south. Residual diesel and perchloroethylene (PCE) contaminants were reported in the groundwater, which was interpreted to be sourced from another location farther to the north. In urban settings, PCE contamination is most often associated with old dry cleaning facilities. The most recent maximum contaminant concentrations at the two identified closed SLIC sites are shown in Table 3.

TABLE 3
Geotracker Sites Within 1,000 Feet of 6103 West Melrose Avenue
Los Angeles, California

Site Name	Address	Depth to Groundwater	Water Sample Depths	Known Contaminants and Highest Most Recent Concentrations	Date of Last Sampling	Status	Closure Date
Laser Pacific Media	823-835 N. Seward	18 ft bgs	Wells screened 15-25 ft bgs	TPHd=370 ug/L 1,1-DCE=6.6 ug/L PCE=30 ug/L	2012	Closed SLIC site	7/25/2012
845 Seward St, LLC	843-845 N. Seward	18 ft bgs	Geoprobe 20 ft bgs	PCE=29.7 ug/L TCE=3.19 ug/L cis-1,2-DCE=2.63 ug/L	2014	Closed SLIC site	8/18/2016

NR = Not reported on Geotracker
ND = Not detected above the reporting limit
LUST = Leaking underground storage tank
TPHg = Total petroleum hydrocarbons as gasoline
TCE = trichloroethylene
PCE = perchloroethylene
MTBE = Methyl tertiary butyl ether

There are also six closed leaking underground storage tank (LUST) sites approximately 1,500 feet from the project site (SWRCB, 2022). Three of those sites are located to the east, along Cahuenga Boulevard. and three of those sites are located to the west, at North Highland Avenue. Closed LUST sites are typically existing or former gas stations or automotive repair facilities, with residual levels of fuel hydrocarbons remaining in the groundwater.

The available information from the Geotracker website (SWRCB, 2022) indicates that any remaining residual contaminant levels in groundwater are very low and do not indicate the presence of any persistent contamination plumes. In addition, the nearest known contaminant sites are located much farther from the project site than the range of capture zone radii calculated for the dewatering at the project site. Specifically, the capture zone is estimated to potentially extend a distance between 43 feet and 260 feet from the site, while the nearest identified contaminant sites are 1,000 feet to 1,500 feet from the project site. However, there is the potential that groundwater beneath the project site may contain low levels of residual fuel hydrocarbons and/or PCE-related chemicals due to the ubiquitous nature of these contaminants in the groundwater in this area of Los Angeles. If such contamination is present within the capture zone from the project site dewatering, it would not be expected to exceed the concentration ranges reported in Table 3.

6.0 CONCLUSIONS

This analysis presumes that dewatering for the 6103 West Melrose Avenue project would occur within fine-grained soils using trenches within the shored excavation. Since field or laboratory measurements that can be used to provide a site-specific estimate of the hydraulic conductivity have not yet been conducted by a dewatering contractor, a range of empirical estimates for the soil properties was used for this evaluation. In addition, this analysis is based on the reported historic high groundwater level of 15 ft bgs. If, at the time of construction, the groundwater level is comparable to that encountered in the 2021 geotechnical borings, then the amount of dewatering and the resultant drawdowns would be substantially less than those identified in this analysis.

It is assumed that dewatering at the project site would occur primarily within fine-grained soils using trenches inside of the shoring. We conducted dewatering simulations using a range of transmissivities. The effective drawdown is estimated to range from 2.9 to 8.1 feet at the shoring. At the center line of North Seward Avenue, the drawdown after one year of dewatering is estimated to potentially range from 2.0 feet to 7.5 feet. At the east side of North Seward Street and at the center line of West Melrose Avenue, the drawdown after one year of dewatering is estimated to range from 1.3 feet to 7.0 feet. If the dewatering duration is shorter or longer than one year, the drawdowns would be proportionally smaller or larger, respectively, than those described for one year of dewatering.

Based on the parameters identified in the dewatering simulations, our analysis estimates that the capture zone during dewatering could range from 43 feet to 212 feet from the edge of shoring after one year of dewatering to as much as 53 feet to 260 feet from the edge of shoring if dewatering occurs for 18 months, depending on the actual hydraulic conductivity of the fine-grained saturated soils beneath the project site.

Our review of Geotracker indicates that there are no currently active groundwater contamination sites within 1,500 feet of the project site. Residual contamination at two closed SLIC sites located approximately 1,000 feet north of the project site and six closed LUST sites located 1,500 feet to the east and the west of the project site. The concentration levels of any residual contamination is not indicative of the presence of persistent contaminant plumes. While there are no identified contaminant plumes within at least 1,500 feet of the project site, there is the potential that groundwater beneath the project site may contain low levels of residual fuel hydrocarbons and/or PCE-related chemicals. If such chemicals are present in the water pumped from the excavation during dewatering, then contaminant treatment would be required to meet the discharge requirements of permits from the Regional Water Quality Control Board and City or County of Los Angeles.

7.0 CLOSURE

The conclusions presented in this Dewatering Analysis are based on our review of information collected by others as referenced herein. This analysis did not include subsurface exploration, field testing, or laboratory testing. In addition, a dewatering contractor has not yet been retained to complete field studies and dewatering system design. Therefore, this analysis is based on the information available at the time it was prepared to support the evaluations presented in the Hydrology Evaluation related to potential impacts of the project on hydrology and water quality. Once the dewatering design is completed by a qualified dewatering contractor, this Dewatering Analysis should be reviewed and, if appropriate, revised to incorporate the field data and information developed by the dewatering contractor.

Our professional services were performed, our findings obtained, and our recommendations prepared in accordance with generally accepted geotechnical engineering and hydrogeologic principles and practices used in this area at this time. We make no warranty, express or implied.

8.0 REFERENCES CITED

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Thomasson, H.G., Jr., Olmsted, F.H., and LeRoux, E.F., 1960, Geology, Water Resources and Usable Groundwater Storage Capacity of Part of Solano County, California. U.S. Geological Survey Water Supply Paper 1464.

U.S. Environmental Protection Agency (U.S. EPA), 1987, Guidelines for the delineation of wellhead protection areas: Office of Ground-Water Protection, U.S. Environmental Protection Agency 203 p.

APPENDIX A

Empirical Hydraulic Conductivity Ranges from Freeze and Cherry (1979)

Table 2.2 Range of Values of Hydraulic Conductivity and Permeability

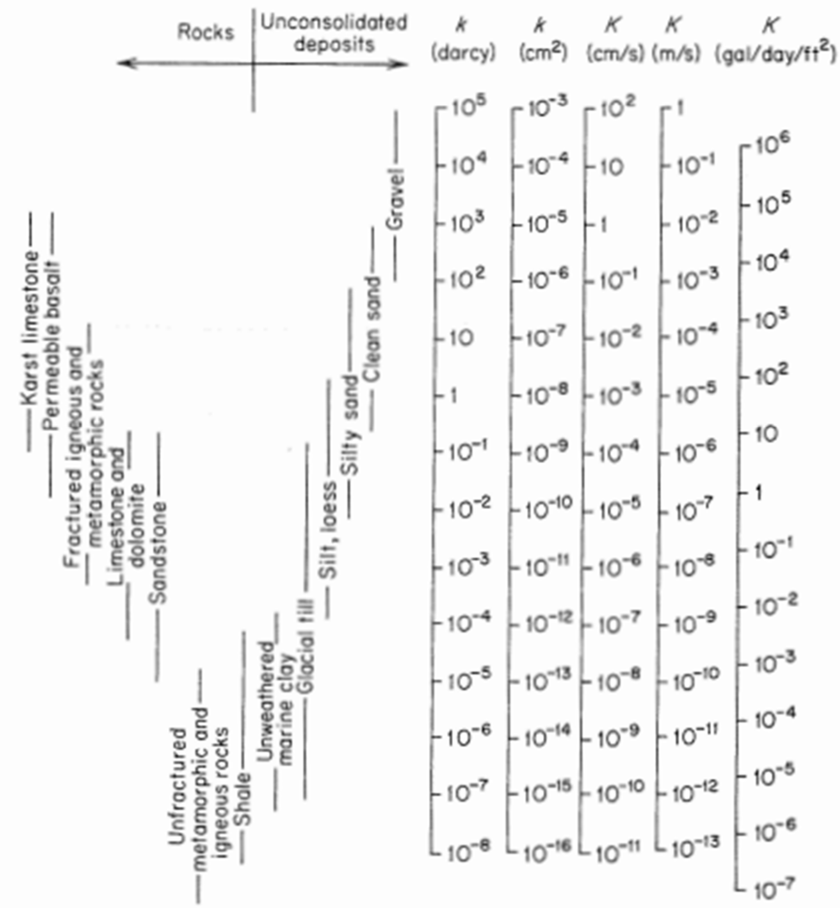
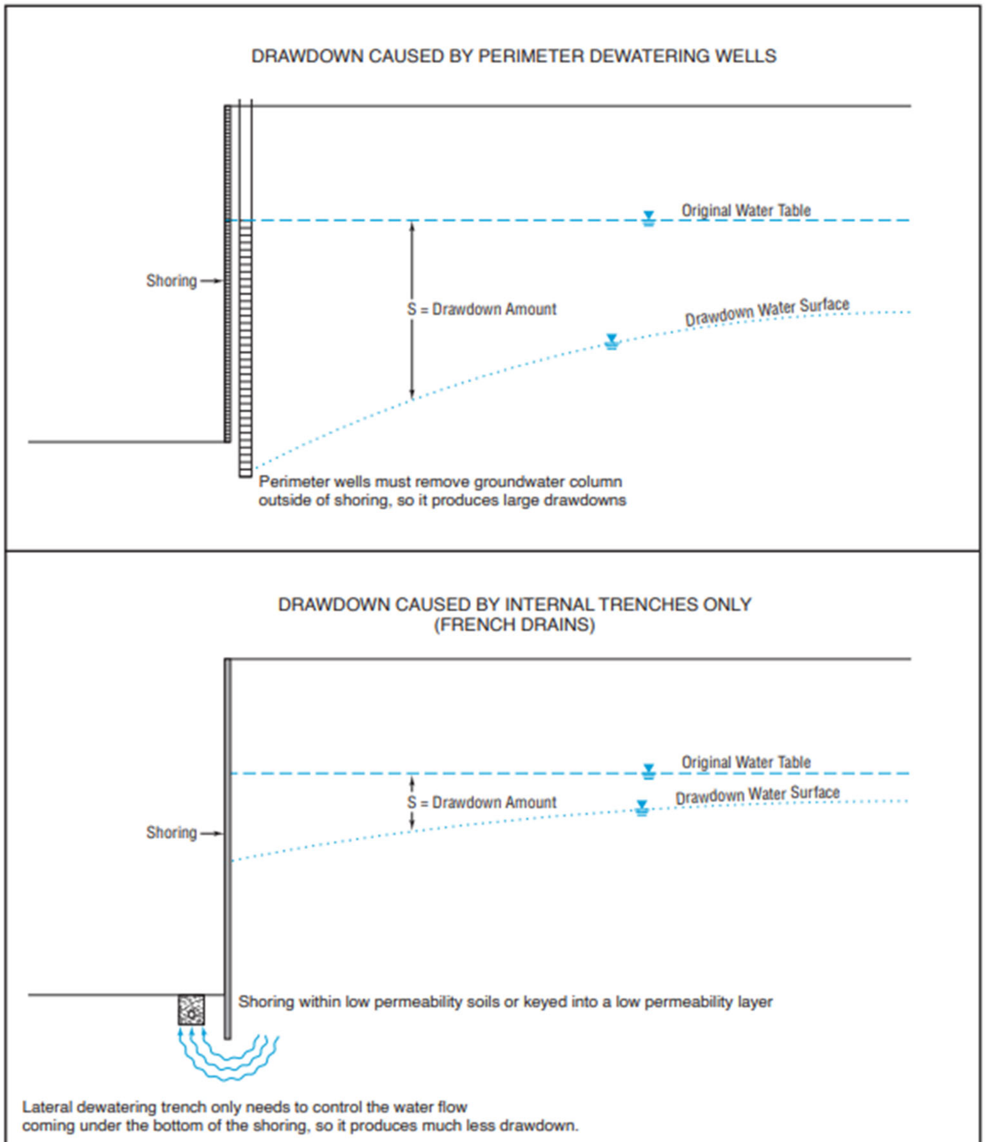


Table 2.3 Conversion Factors for Permeability and Hydraulic Conductivity Units

	Permeability, k*			Hydraulic conductivity, K		
	cm^2	ft^2	darcy	m/s	ft/s	gal/day/ft^2
cm^2	1	1.08×10^{-3}	1.01×10^{8}	9.80×10^{2}	3.22×10^{3}	1.85×10^{9}
ft^2	9.29×10^{2}	1	9.42×10^{10}	9.11×10^{5}	2.99×10^{6}	1.71×10^{12}
darcy	9.87×10^{-9}	1.06×10^{-11}	1	9.66×10^{-6}	3.17×10^{-5}	1.82×10^{1}
m/s	1.02×10^{-3}	1.10×10^{-6}	1.04×10^{5}	1	3.28	2.12×10^{6}
ft/s	3.11×10^{-4}	3.35×10^{-7}	3.15×10^{4}	3.05×10^{-1}	1	5.74×10^{5}
gal/day/ft^2	5.42×10^{-10}	5.83×10^{-13}	5.49×10^{-2}	4.72×10^{-7}	1.74×10^{-6}	1

*To obtain k in ft^2, multiply k in cm^2 by 1.08×10^{-3}.

FIGURE 1



DEWATERING DRAWDOWN COMPARISON

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January 2022

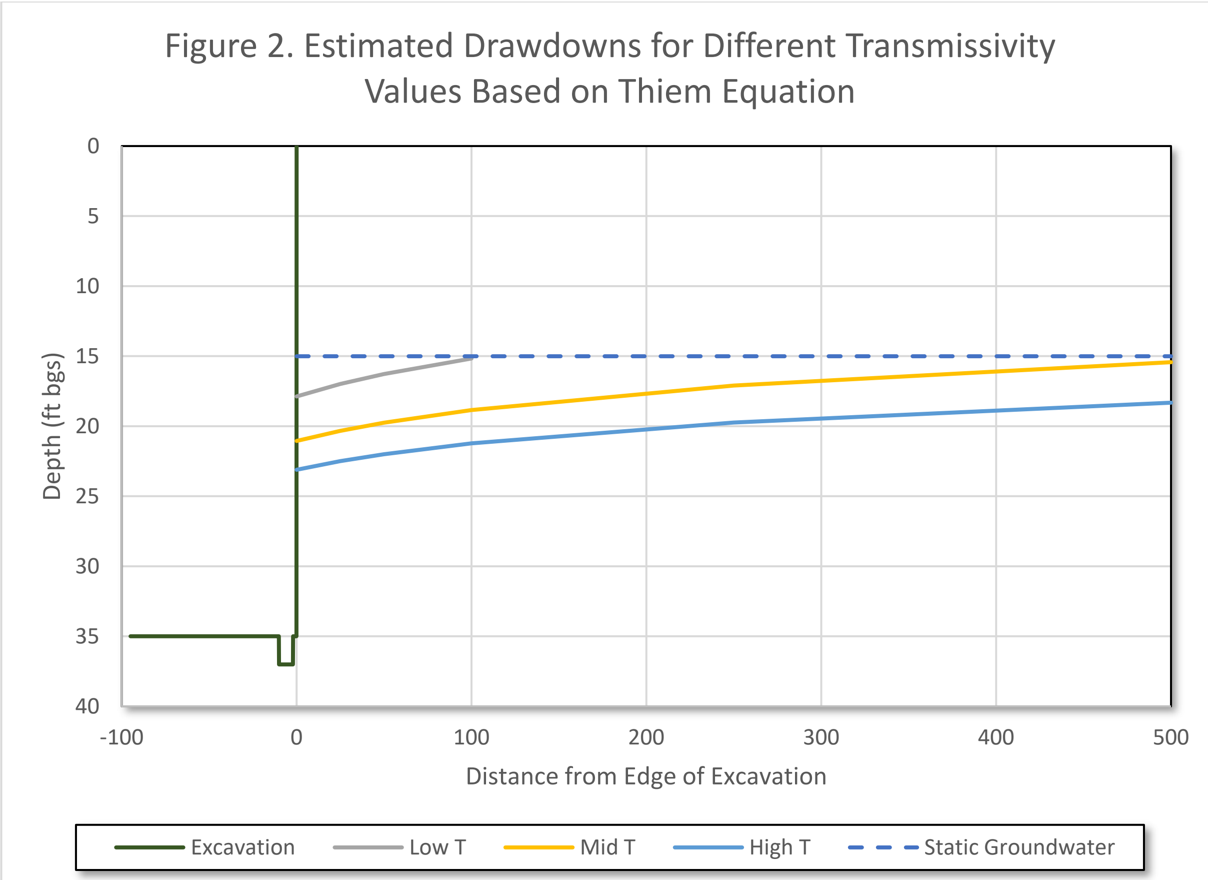


Figure 2. Estimated Drawdowns for Different Transmissivity Values Based on Thiem Equation
Depth (ft bgs)
0
5
10
15
20
25
30
35
40
-100
0
100
200
300
400
500
Distance from Edge of Excavation
Excavation
Low T
Mid T
High T
Static Groundwater

ATTACHMENT B

HYDROCALC MODEL OUTPUT FOR 50-YEAR 24-HOUR DESIGN STORM EVENT

Peak Flow Hydrologic Analysis

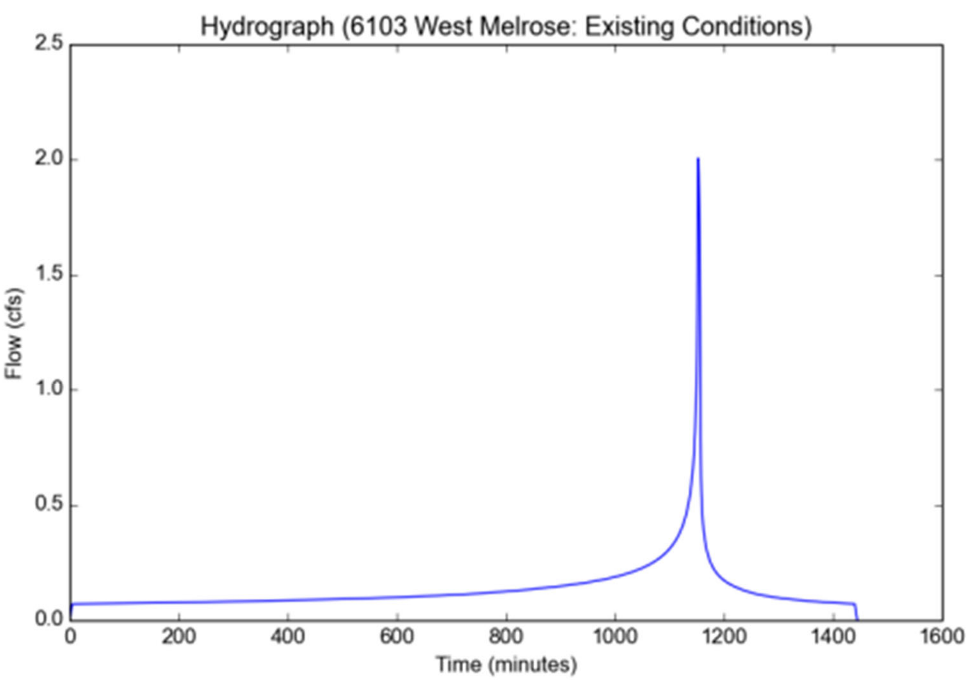
File location: C:/Users/akopa/OneDrive/Documents/Geocon/6103 Melrose W1153-06-01/Hydrocalc - Existing Conditions - 50 yr.pdf
Version: HydroCalc 1.0.3

Input Parameters

Project Name	6103 West Melrose
Subarea ID	Existing Conditions
Area (ac)	0.643
Flow Path Length (ft)	190.0
Flow Path Slope (vft/hft)	0.006
50-yr Rainfall Depth (in)	5.81
Percent Impervious	0.95
Soil Type	12
Design Storm Frequency	50-yr
Fire Factor	0
LID	False

Output Results

Modeled (50-yr) Rainfall Depth (in)	5.81
Peak Intensity (in/hr)	3.4664
Undeveloped Runoff Coefficient (Cu)	0.9
Developed Runoff Coefficient (Cd)	0.9
Time of Concentration (min)	5.0
Clear Peak Flow Rate (cfs)	2.006
Burned Peak Flow Rate (cfs)	2.006
24-Hr Clear Runoff Volume (ac-ft)	0.2705
24-Hr Clear Runoff Volume (cu-ft)	11784.0169



Peak Flow Hydrologic Analysis

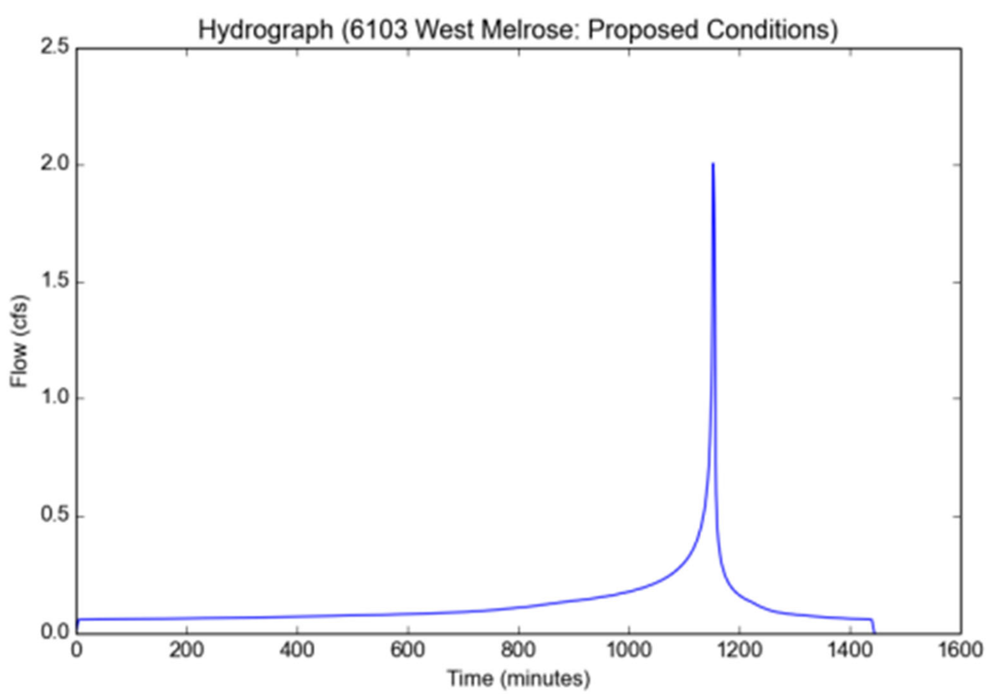
File location: C:/Users/akopa/OneDrive/Documents/Geocon/6103 Melrose W1153-06-01/Hydrocalc - Proposed Conditions - 50 yr.pdf
Version: HydroCalc 1.0.3

Input Parameters

Project Name	6103 West Melrose
Subarea ID	Proposed Conditions
Area (ac)	0.643
Flow Path Length (ft)	190.0
Flow Path Slope (vft/hft)	0.006
50-yr Rainfall Depth (in)	5.81
Percent Impervious	0.76
Soil Type	12
Design Storm Frequency	50-yr
Fire Factor	0
LID	False

Output Results

Modeled (50-yr) Rainfall Depth (in)	5.81
Peak Intensity (in/hr)	3.4664
Undeveloped Runoff Coefficient (Cu)	0.9
Developed Runoff Coefficient (Cd)	0.9
Time of Concentration (min)	5.0
Clear Peak Flow Rate (cfs)	2.006
Burned Peak Flow Rate (cfs)	2.006
24-Hr Clear Runoff Volume (ac-ft)	0.2426
24-Hr Clear Runoff Volume (cu-ft)	10567.7278



ATTACHMENT C

HYDROCALC MODEL OUTPUT FOR 85TH PERCENTILE 24-HOUR RAIN EVENT

Peak Flow Hydrologic Analysis

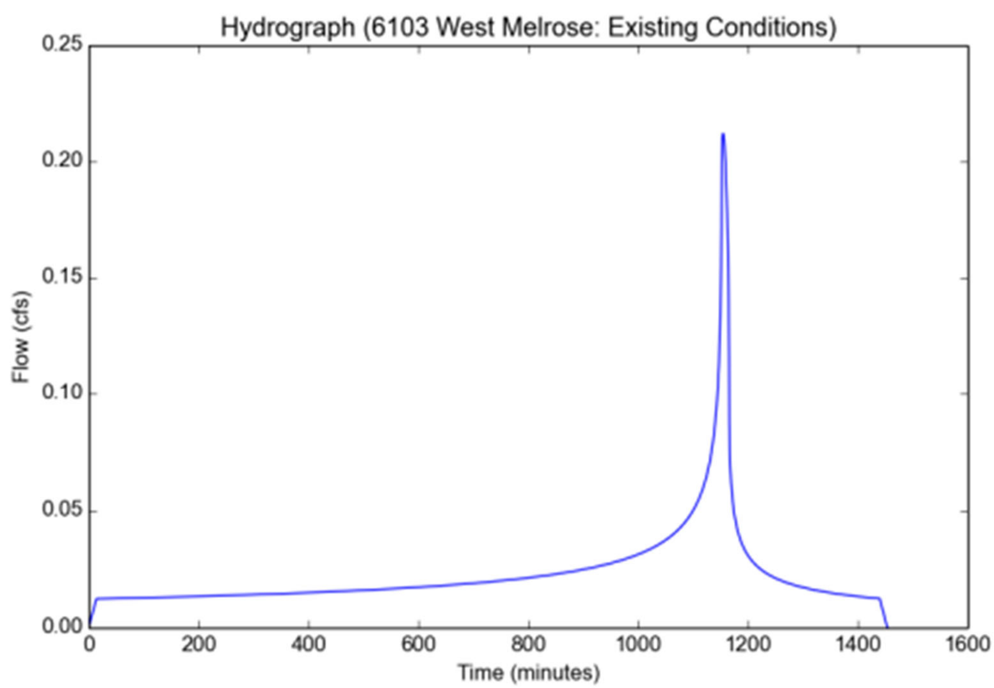
File location: C:/Users/akopa/OneDrive/Documents/Geocon/6103 Melrose W1153-06-01/Hydrocalc - Existing Conditions - 85th ptile.pdf
Version: HydroCalc 1.0.3

Input Parameters

Project Name	6103 West Melrose
Subarea ID	Existing Conditions
Area (ac)	0.643
Flow Path Length (ft)	190.0
Flow Path Slope (vft/hft)	0.006
85th Percentile Rainfall Depth (in)	1.01
Percent Impervious	0.95
Soil Type	12
Design Storm Frequency	85th percentile storm
Fire Factor	0
LID	True

Output Results

Modeled (85th percentile storm) Rainfall Depth (in)	1.01
Peak Intensity (in/hr)	0.3714
Undeveloped Runoff Coefficient (Cu)	0.6537
Developed Runoff Coefficient (Cd)	0.8877
Time of Concentration (min)	14.0
Clear Peak Flow Rate (cfs)	0.212
Burned Peak Flow Rate (cfs)	0.212
24-Hr Clear Runoff Volume (ac-ft)	0.0463
24-Hr Clear Runoff Volume (cu-ft)	2016.0396



Peak Flow Hydrologic Analysis

File location: C:/Users/akopa/OneDrive/Documents/Geocon/6103 Melrose W1153-06-01/Hydrocalc - Proposed Conditions - 85th ptile.pdf
Version: HydroCalc 1.0.3

Input Parameters

Project Name	6103 West Melrose
Subarea ID	Proposed Conditions
Area (ac)	0.643
Flow Path Length (ft)	190.0
Flow Path Slope (vft/hft)	0.006
85th Percentile Rainfall Depth (in)	1.01
Percent Impervious	0.76
Soil Type	12
Design Storm Frequency	85th percentile storm
Fire Factor	0
LID	True

Output Results

Modeled (85th percentile storm) Rainfall Depth (in)	1.01
Peak Intensity (in/hr)	0.3714
Undeveloped Runoff Coefficient (Cu)	0.6537
Developed Runoff Coefficient (Cd)	0.8409
Time of Concentration (min)	14.0
Clear Peak Flow Rate (cfs)	0.2008
Burned Peak Flow Rate (cfs)	0.2008
24-Hr Clear Runoff Volume (ac-ft)	0.0386
24-Hr Clear Runoff Volume (cu-ft)	1681.1881