Appendix

C

Appendix C: Geotechnical and Groundwater Investigation Requirements

Feasibility of storm water infiltration is dependent on the geotechnical and groundwater conditions at the project site. The feasibility analysis must be conducted at a DMA level. This appendix is subdivided into the following:

- **Appendix C.1 Simple Feasibility Criteria**: This appendix is applicable when standard setbacks are used to make a determination that the DMA is in a **no infiltration condition**.
- **Appendix C.2 Detailed Feasibility Criteria**: This appendix can be used for feasibility determination for all DMAs.
- **Appendix C.3 Geotechnical and Groundwater Investigation Report Requirements:** This is applicable to all projects.

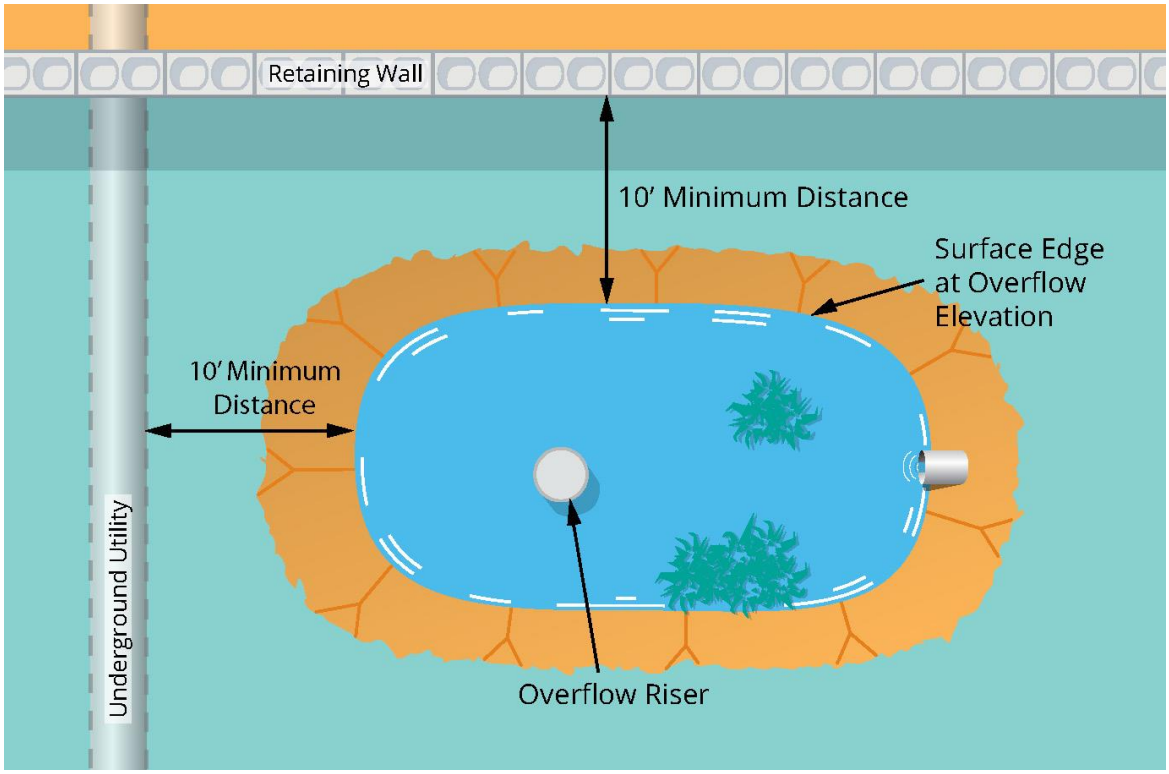
The permits required for land development and construction within the City are issued by the Development Services Department. These permits fall into two general categories: development permits, and construction permits. Development permits, or entitlements are discretionary in nature, granted at the discretion of a decision maker. Depending on the type of project, the decision maker could be City staff, a Hearing Officer, the Planning Commission, or the City Council. Examples of development permits include Coastal Development Permits, Site Development Permits, Neighborhood Development Permits, Conditional Use Permits, lot splits, condominium conversions, and Tentative Maps. Construction permits are ministerial, which means that projects found to comply with City standards and existing property entitlements can be permitted without a public hearing. Grading plans, improvement plans, and building plans are examples of ministerial permits.

C.1 Simple Feasibility Criteria

When one of the following standard setbacks cannot be avoided, the applicant can classify the DMA as no infiltration condition provided an infiltration feasibility condition letter that meets the requirements in Appendix C.1.1. is included in the SWQMP submittal.

- Full and partial infiltration BMPs shall not be placed within existing fill materials greater than 5 feet thick; or
- Full and partial infiltration BMPs shall not be proposed within 10 feet (horizontal radial distance) of existing underground utilities, structures, or retaining walls; or
- Full and partial infiltration BMPs shall not be proposed within 50 feet of a natural slope (>25%) or within a distance of 1.5H from fill slopes where H is the height of the fill slope; or
- Full and partial infiltration BMPs shall not be proposed within 100 feet of contaminated soil or groundwater sites; or
- Other physical impairments (i.e., fire road egress, public safety considerations, etc.)

The setbacks must be the closest horizontal radial distance between the surface edge (at the overflow elevation) of the BMP to existing underground utilities, structures, retaining walls; or natural slopes; or fill slopes; or contaminated soil or groundwater site. The schematic for the setbacks is shown below.



C.1.1 Infiltration Feasibility Condition Letter

The geotechnical engineer shall provide an Infiltration Feasibility Condition Letter in the SWQMP to demonstrate that the DMA is in a no infiltration condition. The letter shall be stamped/signed by a licensed geotechnical engineer who prepared the letter.

The letter shall be submitted during the discretionary phase for private projects and during the initial project submittal to the Public Works Department for public projects. The letter shall at a minimum document:

- The phase of the project in which the geotechnical engineer first analyzed the site for infiltration feasibility.
- Results of previous geotechnical analyses conducted in the project area, if any.
- The development status of the site prior to the project application (i.e., new development with raw ungraded land, or redevelopment with existing graded conditions).
- The history of design discussions for the project footprint, resulting in the final design determination.
- Full/partial infiltration BMP standard setbacks to underground utilities, structures, retaining walls, fill slopes, and natural slopes applicable to the DMA that prevent full/partial infiltration.
- The physical impairments (i.e., fire road egress, public safety considerations, etc.) that prevent full/partial infiltration.
- The consideration of site design alternatives to achieve partial/full infiltration within the DMA.
- The extent site design BMPs requirements were included in the overall design.
- Conclusion or recommendation from the geotechnical engineer regarding the DMA's infiltration condition.
- An Exhibit for all applicable DMAs that clearly labels:
    - Proposed development areas and development type.
    - All applicable features and setbacks that prevent partial or full infiltration, including underground utilities, structures, retaining walls, fill slopes, natural slopes, and existing fill materials greater than 5 feet.
    - Potential locations for structural BMPs.
    - Areas where full/partial infiltration BMPs cannot be proposed.

Completion of Worksheet **C.4-1(Form I-8A)** and/or Worksheet **C.4-2 (Form I-8B)** is not required in instances where the applicant submits an infiltration feasibility condition letter that meets the requirements in this section.

C.2 Detailed Feasibility Criteria

This appendix provides guidelines for performing and reporting feasibility analysis for infiltration with respect to geotechnical and groundwater conditions. It provides a framework for feasibility analysis at two phases of project development:

- **Planning Phase:** Simpler methods of conducting preliminary screening for feasibility; and
- **Design Phase:** When preliminary screening indicates infiltration is feasible, more rigorous analysis is needed to confirm feasibility and to develop design considerations and mitigation measures, if required.

Planning Phase At this project stage, information about the site may be limited, the proposed design features may be conceptual, and there may be an opportunity to adjust project plans to incorporate infiltration into the project layout during development. During this phase, project geotechnical consultants are typically responsible for exploring geologic conditions, performing preliminary analyses and identifying particular design aspects that require more detailed investigation at later phases. As part of this process, the role of a planning- level infiltration feasibility assessment is to reach tentative conclusions regarding where infiltration is likely feasible, possibly feasible if done carefully, or clearly infeasible. This determination can help guide the design process by influencing project layout, selection of infiltration BMPs, and identifying if more detailed studies are necessary. The purpose of the planning phase is to identify potential geotechnical and groundwater impacts resulting from infiltration and to determine which impacts may be considered fatal flaws and which impacts may be possible to mitigate with design features. Determination of acceptable risks and/or mitigation measures may involve discussions with adjacent land owners and/or utility operators, as well as coordination with other projects under planning or design in the project vicinity. Early involvement of potentially impacted parties is critical to avoid potential late-stage design changes and schedule delays and to reduce potential future liabilities.

Design Phase During this phase, potential geotechnical and groundwater impacts must be evaluated, and mitigation measures should be incorporated in the BMP design, as appropriate. Mitigation measures refer to design features or assumptions intended to reduce risks associated with storm water infiltration. While rules of thumb may be useful, if applied carefully, for the planning phase, the analyses conducted in the design phase require the involvement of a geotechnical professional familiar with the local conditions. One of the first steps in the design phase should be to determine if additional field and/o laboratory investigations are required (e.g., borings, test pits, laboratory or field testing) to further assess the geotechnical impacts of storm water infiltration. As the design of infiltration systems are highly dependent on the subsurface conditions, coordination with the storm water design team may be beneficial to limit duplicative efforts and costs.

Worksheet C.4-1 (Form I-8A) and Worksheet C.4-2 (From I-8B) are provided to document infiltration feasibility screening. Worksheet C.4.1 (Form I-8A) includes information to be evaluated by geotechnical professionals and Worksheet C.4-2 (Form I-8B) includes information to be evaluated by environmental professionals, hydrogeologists and civil engineers. These worksheets are divided into two parts:

Part 1 "Full Infiltration Feasibility Screening Criteria" is used to determine if the full design volume can be potentially infiltrated onsite.

Part 2 "Partial Infiltration versus No Infiltration Feasibility Screening Criteria" is used to determine if any amount of volume can be infiltrated. This is only used when the result of Part 1 is negative.

Note that it is not required to investigate each and every criterion in the worksheet, a single "no" answer in Part 1 and Part 2 controls the feasibility. If all the answers in Part 1 are "yes" then completion of Part 2 is not required. Note that a planning phase categorization, is typically based on initial site assessment results; therefore, it is not necessarily conclusive. Categorizations should be confirmed or revised, as necessary, based on more detailed design-level investigation and analysis during BMP design.

The applicant has discretion to implement full infiltration BMPs even in scenarios where the reliable infiltration rate is less than or equal to 0.5 inches per hour if there are no geotechnical or groundwater hazards associated with implementation of full infiltration BMPs.

C.2.1 Geotechnical Feasibility Criteria

This section is divided into seven factors that shall be considered by the project geotechnical professional, as applicable, while assessing the feasibility of infiltration related to geotechnical conditions. **Note that during the planning phase, if one or more of these factors precludes infiltration as an approach, it is not required to assess the remaining factors**. However, if proposing infiltration BMPs, then each applicable factor in this section must be addressed.

The requirements in this section (**Appendix C.2.1**) are not applicable for DMAs that are identified as no infiltration condition based on one of the setbacks listed under **Appendix C.1** and submission of the Infiltration Condition Letter with the SWQMP that meets the requirements in **Appendix C.1.1.**

C.2.1.1 Soil and Geologic Conditions

Site soils and geologic conditions influence the rate at which water can physically enter the soils. Site assessment approaches for soil and geologic conditions may consist of:

- Review of soil survey maps
- Review of available reports on local geology to identify relevant features, such as depth to bedrock, rock type, lithology, faults, and hydrostratigraphic or confining units
- Review of previous geotechnical investigations of the area
- Site-specific geotechnical and/or geologic investigations (e.g., borings, infiltration tests)

Geologic investigations should also seek to provide an assessment of whether soil infiltration properties are likely to be uniform or variable across the project site. **Appendix D** provides guidance on determining infiltration rates for planning and design phase.

C.2.1.2 Settlement and Volume Change

Settlement and volume change limits the amount of infiltration that can be allowed without resulting in adverse impacts that cannot be mitigated. Upon considering the impacts of an infiltration design, the designer must identify areas where soil settlement or heave is likely and whether these conditions would be unfavorable to existing or proposed features. Settlement refers to the condition when soils decrease in volume, and heave refers to expansion of soils or increase in volume.

There are several different mechanisms that can induce volume change due to infiltration that the professional must be aware of and consider while completing the feasibility screening including:

- Hydro collapse and calcareous soils;
- Expansive soils;
- Frost heave;
- Consolidation; and
- Liquefaction.

C.2.1.3 Slope Stability

Infiltration of storm water has the potential to result in increased risk of slope failure of nearby slopes. This shall be assessed as part of both the project planning and design phases. Many factors impact the stability of slopes, including, but not limited to, slope inclination, soil strength, unit weight, geologic structure, and seepage forces. Increases in moisture content or rising ground water in the vicinity of a slope, which may result from storm water infiltration, have the potential to change the soil strength, unit weight and to add or cause seepage forces to the slope, which may destabilize the slope. When evaluating the effect of infiltration on the slope stability, the designer must consider all types of potential slope failures.

Slopes steeper than 4:1 (horizontal to vertical) are generally not suitable for infiltration systems unless demonstrated otherwise in a geotechnical investigation report. Slope setbacks for infiltration BMPs shall be determined on an individual project basis by a qualified professional and the approval of the setbacks is at the discretion of the City Engineer. **Worksheet C.4-1 (Form I-8A)** provides standard setbacks that may be used to establish infeasibility for infiltration BMPs without performing additional analysis. As a guideline, infiltration zones shall be set back at least 50 feet or 1.5 times the height of the slope unless evaluated by the geotechnical engineer.

C.2.1.4 Utility Consideration

Utilities are either public or private infrastructure components that include underground pipelines and vaults (e.g., potable water, sewer, storm water, gas pipelines), underground wires/conduit (e.g., telephone, cable, electrical) and above ground wiring and associated structures (e.g., electrical distribution and transmission lines). Utility considerations are typically within the purview of a geotechnical site assessment and should be considered in assessing the feasibility of storm water infiltration. Infiltration has the potential to damage subsurface utilities and/or underground utilities may pose geotechnical hazards in themselves when infiltrated water is introduced. Impacts related to

storm water infiltration in the vicinity of underground utilities are not likely to cause a fatal flaw in the design, but the designer must be aware of the potential cost impacts to the design during the planning phase.

Utility setbacks should be determined on an individual project basis by a qualified professional and the approval of the setbacks is at the discretion of the City Engineer. **Worksheet C.4-1 (Form I-8A)** provides standard setbacks that may be used to establish infeasibility for infiltration BMPs without performing additional analysis.

C.2.1.5 Groundwater Mounding

Storm water infiltration and recharge to the underlying groundwater table may create a groundwater mound beneath the infiltration facility. The height and shape of the mound depends on the infiltration system design, the recharge rate, and the hydrogeologic conditions at the site, especially the horizontal hydraulic conductivity and the saturated thickness. Elevated groundwater levels can lead to a number of problems, including flooding and damage to structures and utilities through buoyancy and moisture intrusion, increase in inflow and infiltration into municipal sanitary sewer systems, and flow of water through existing utility trenches, including sewers, potentially leading to formation of sinkholes (Gobel et al. 2004). Mounding shall be considered by the geotechnical professional while performing the infiltration feasibility screening.

C.2.1.6 Retaining Walls and Foundations

Development projects may include retaining walls or foundations in close proximity to proposed infiltration BMPs. These structures are designed to withstand the forces of the earth they are retaining and other surface loading conditions such as nearby structures. Foundations include shallow foundations (spread and strip footings, mats) and deep foundations (piles, piers) and are designed to support overburden and design loads. All types of retaining walls and foundations can be impacted by increased water infiltration into the subsurface as a result of potential increases in lateral pressures and potential reductions in soil strength. The geotechnical professional should consider these factors while performing the infiltration feasibility screening.

C.2.1.7 Other Factors

While completing the feasibility screening, other factors determined by the geotechnical professional to influence the feasibility and desirability of infiltration related to geotechnical conditions shall also be considered.

C.2.1.8 Geotechnical Mitigation Measures

The following are intended as examples (not exclusive) of reasonable and not reasonable mitigation measures. Other measures may need to be considered for specific projects.

Typically, reasonable:

- Configure infiltration BMPs to infiltrate water into native soil to avoid fill or other geotechnical hazards.
- Configure site with consideration to infiltration feasibility to avoid geotechnical hazards.

- Over-excavate and backfill with permeable material below BMPs to avoid infiltration into less permeable fill. A reasonable excavation limit below the BMP is 5 feet.
- Implement selective grading practices to place permeable materials in areas of proposed BMPs.
- Inclusion of an impermeable barrier in BMP side walls (5 feet) to reduce potential for lateral water movement.
- Consider that partial infiltration BMPs have a supplemental discharge pathway (underdrains) to limit infiltration when soil infiltration capacity is exceeded.

Not typically reasonable:

- Major improvements to existing building foundations to increase structural stability, such as requiring deep foundations when such foundations would not otherwise be required.
- Inclusion of cutoff trenches and drainage features to control downslope or off-site effects of increased infiltration.
- Installing mechanical devices to pump storm water to another area on the property for the purposes of implementing pollutant control BMPs across DMAs.

C.2.2 Groundwater Quality and Water Balance Feasibility Criteria

This section is divided into seven factors that shall be considered by qualified design professionals as applicable, while assessing the feasibility of infiltration related to groundwater quality and water balance. **Note that during the planning phase, if one or more of these factors precludes infiltration as an approach, it is not necessary to assess every other factor**. However, if proposing infiltration BMPs, then every applicable factor in this section must be addressed.

The requirements in this section (**Appendix C.2.2**) are not applicable for DMAs that are identified as no infiltration condition based on one of the setbacks listed under **Appendix C.1** and submission of the Infiltration Condition Letter with the SWQMP that meets the requirements in **Appendix C.1.1**.

C.2.2.1 Soil and Groundwater Contamination

Infiltration shall be avoided in areas with:

- Physical and chemical characteristics (e.g., appropriate cation exchange capacity, organic content, clay content and infiltration rate) which are not adequate for proper infiltration durations and treatment of runoff for the protection of groundwater beneficial uses. If **ALL** of the following criteria are met, then full infiltration must be avoided:
    - Cation Exchange Capacity(CEC) < 5 milliequivalents per 100 g, as measured by the sodium acetate method (US EPA Method 9081); and,
    - United States Department of Agriculture (USDA) texture class of loamy sand or sand as determined by laboratory analysis of soil texture; and,
    - Soil organic matter content < 1% by mass as determined by loss on ignition (ASTM D2974);

  - and, A seasonally high groundwater table within 10 feet of the bottom surface of the proposed full infiltration BMP.
- Groundwater contamination and/or soil pollution, if infiltration could contribute to the movement or dispersion of soil or groundwater contamination or adversely affect ongoing clean-up efforts, either onsite or down-gradient of the project.

If infiltration is under consideration for one of the above conditions, a site-specific analysis should be conducted to determine where infiltration-based BMPs can be used without adverse impacts.

C.2.2.2 Separation to Seasonal High Groundwater

The depth to seasonally high groundwater tables (normal high depth during the wet season) beneath the base of any infiltration BMP must be greater than 10 feet for full infiltration BMPs to be allowed. The depth to groundwater requirement can be reduced from 10 feet at the discretion of the approval agency if the underlying groundwater basin does not support beneficial uses and the groundwater quality is maintained at the proposed depth. Depth to seasonally high groundwater levels can be estimated based on well level measurements or redoximorphic methods.

C.2.2.3 Wellhead Protection

Wellheads natural and man-made are water resources that may potentially be adversely impacted by storm water infiltration through the introduction of contaminants or alteration in water supply and levels. It is recommended that the locations of wells and springs be identified early in the planning phase and site design be developed to avoid infiltration in the vicinity of these resources. Infiltration BMPs must be located a minimum of 100 feet horizontally from any water supply well.

C.2.2.4 Contamination Risks from Land Use Activities

Concentration of storm water pollutants in runoff is highly dependent on the land uses and activities present in the area tributary to an infiltration BMP. Likewise, the potential for groundwater contamination due to the infiltration BMP is a function of pollutant abundance, concentration of pollutants in soluble forms, and the mobility of the pollutant in the subsurface soils. Hence, full infiltration BMPs must not be used for areas of industrial or light industrial activity.

The project applicant has an option to classify other land uses and activities that pose high threat to water quality not suitable for infiltration BMPs if source control BMPs to prevent exposure of high threat activities could not be implemented, or runoff from such activities could not be first treated or filtered to remove pollutants prior to infiltration. Approval of infeasibility due to high threat to water quality is evaluated on a case by case basis and is at the discretion of the City Engineer.

C.2.2.5 Consultation with Applicable Groundwater Agencies

Infiltration activities should be coordinated with the applicable groundwater management agency, such as groundwater providers and/or resource protection agencies, to ensure protection of groundwater quality. It is recommended that coordination be initiated early in the planning phase to determine whether specific site assessment activities apply or whether these agencies have data available that may support the planning and design phases.

C.2.2.6 Water Balance Impacts on Stream Flow

Use of infiltration systems to reduce surface water discharge volumes may result in additional volume of deeper infiltration compared to natural conditions, which may result in impacts to receiving channels associated with change in dry weather flow regimes. A relatively simple survey of hydrogeologic data (piezometer measurements, boring logs, regional groundwater maps) and downstream receiving water characteristics is generally adequate to determine whether there is potential for impacts and whether a more rigorous assessment is needed.

Where water balance conditions appear to be sensitive to development impacts and there is an elevated risk of impacts, a computational analysis may be warranted to evaluate the feasibility of infiltration. Such an analysis should account for precipitation, runoff, irrigation inputs, soil moisture retention, evapotranspiration, baseflow, and change in groundwater recharge on a long-term basis. Because water balance calculations are sensitive to the timing of precipitation versus evapotranspiration, it is most appropriate to utilize a continuous model simulation rather than basing calculations on average annual or monthly normal conditions.

The following simple screening criteria can be used to determine if a more in-depth analysis is required:

- Proposed infiltration BMP is located within 250 feet of an ephemeral or year-round stream; and,
- The proposed BMPs will be full infiltration BMPs; and,
- The seasonal high groundwater depth below the bottom surface of the infiltration BMP is less than 20 feet.

If any of the above screening criteria are not met, then infiltration is feasible. If all of the above screening criteria are met, additional investigations shall be performance by a qualified design professional.

C.2.2.7 Other Factors

While completing the feasibility screening, other factors determined by the qualified design professional to influence the feasibility of infiltration related to groundwater quality and water balance shall also be considered.

C.2.2.8 Groundwater Quality and Water Balance Mitigation Measures

The following are intended as examples (not exclusive) of reasonable and not reasonable mitigation measures. Other measures may need to be considered for specific projects.

Typically, reasonable:

- Consider site layout changes to avoid contaminated soils or soils that lack adequate treatment capacity.
- Design infiltration BMPs to include biofiltration media or an amended media layer if site soils are deemed to lack the treatment capacity to be protective of groundwater quality.

Not typically reasonable:

- Requiring cleanup of contaminated sites for the primary purpose of allowing storm water infiltration.
- Active storm water pretreatment methods.

Inclusion of cutoff trenches and drainage features to prevent groundwater migration toward contaminated sites.

C.3 Geotechnical and Groundwater Investigation Report Requirements

The geotechnical investigation report(s) addressing onsite storm water infiltration shall include the following elements, as applicable. These and other reports may need to be completed by multiple professional disciplines, depending on the issues that need be addressed for a given site. It may also be necessary to prepare separate report(s) at the planning phase and design phase of a project if the methods and timing of analyses differ.

C.3.1 Site Evaluation

Site evaluation shall identify the following:

- Areas of contaminated soil or contaminated groundwater within the site;
- "Brown fields" adjacent to the site;
- Mapped soil type(s);
- Historic high groundwater level;
- Slopes steeper than 25 percent; and
- Location of water supply wells, septic systems (and expansion area), or underground storage tanks, or permitted gray water systems within 100 feet of a proposed infiltration/ percolation BMP.

C.3.2 Field Investigation

Where the site evaluation indicates potential feasibility for onsite storm water infiltration BMPs, the following field investigations will be necessary to demonstrate suitability and to provide design recommendations.

C.3.2.1 Subsurface Exploration

Characterization of potential infiltration rates is a critical step in the categorization of the infiltration feasibility condition. Typically, subsurface exploration, sampling, and testing are necessary for characterizing infiltration rates as well as evaluating potential geologic or geotechnical hazards and constraints associated with storm water infiltration.

For the design phase, a minimum of two (2) in situ percolation or infiltration tests shall be conducted within 50-feet of each proposed full storm water infiltration BMP (also refer to Table D.3-2 as in some instances based on the test method selected more than 2 tests may be required). The tests shall be

conducted at the same elevation as the base of the proposed full infiltration BMP and be representative of the conditions below the proposed full infiltration BMP.

An exploratory excavation shall be extended to a depth of at least 10-feet below the base of a proposed full infiltration BMP to demonstrate adequate separation from groundwater.

All exploratory excavations shall be logged in detail and the logs shall be included in the geotechnical investigation report. Low permeability or impermeable materials (i.e. clay horizons) shall be identified. Indicate any obvious evidence of soil contamination.

All exploratory excavations shall be properly filled at the completion of testing.

C.3.2.2 . Material Testing and Infiltration/Percolation Testing

Various material testing and in situ infiltration testing methods and guidance for appropriate factor of safety are discussed in detail in **Appendix D.** Infiltration testing methods described in **Appendix D** include surface and shallow excavation methods and deeper subsurface tests.

C.3.2.3 Evaluation of Depth to Groundwater

An evaluation of the depth to groundwater is required to confirm the feasibility of infiltration. Full infiltration BMPs may not be feasible in high groundwater conditions (within 10 feet of the base of infiltration BMP) unless an exemption is granted by the City Engineer. The 10 feet separation is not applicable for partial infiltration condition BMPs.

C.3.3 Reporting Requirements by the Project Geotechnical Consultant

The geotechnical investigation report shall address the following key elements, and where appropriate, mitigation recommendations shall be provided.

- Identify areas of the project site where infiltration is likely to be feasible and provide justifications for selection of those areas based on soil types, slopes, proximity to existing features, etc.
- Include **Worksheet C.4-1 (Form I-8A)** completed bt the project geotechnical consultant.
    - **Note**: Form I-8A is not required for DMAs that are determined to be in a No Infiltration Condition based on **Worksheet C.4-2 (Form I-8B)** or by submitting a no infiltration condition letter that meets the requirements in **Appendix C.1.1**.
- Investigate, evaluate and estimate the vertical infiltration rates and capacities in accordance with the guidance provided in **Appendix D** which describes infiltration testing and appropriate factor of safety to be applied for infiltration testing results. The site may be broken into sub-basins based on the opinion of Geotechnical Consultant different infiltration rates.
- Describe the infiltration test results and/or correlation with published infiltration rates based on soil parameters or classification. For planning phase feasibility screening and design of partial infiltration BMPs, a factor of safety of 2 must be used. When full infiltration BMPs are proposed, the geotechnical engineer must complete Section A (Suitability Assessment) in **Worksheet D.5-1 (Form I-9)** and include it in the geotechnical report.

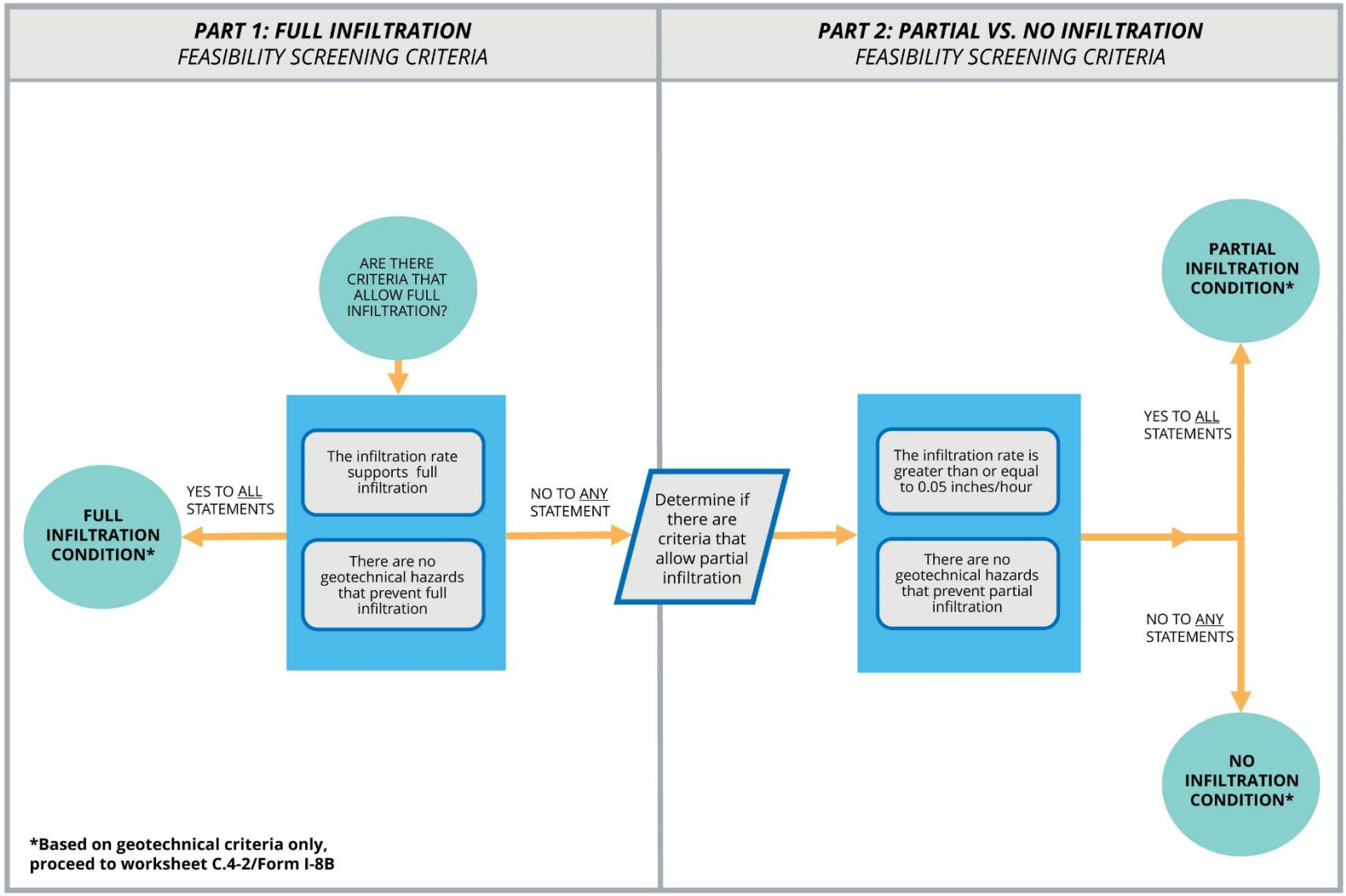
- Investigate the subsurface geological conditions and geotechnical conditions that would affect infiltration or migration of water toward structures, slopes, utilities, or other features. Provide an opinion on the anticipated flow path of infiltrated water. Indicate if the water will flow into pavement sections, utility trench bedding, wall drains, foundation drains, other permeable improvements, or daylight.
- Investigate depth to groundwater. Include an estimate of the high seasonal groundwater elevations.
- Provide the reliable infiltration rates.
- Provide a concluding opinion regarding whether or not the proposed onsite storm water infiltration BMP will result in soil piping, daylight water seepage, slope instability, or ground settlement.
- Recommend reasonable measures to substantially mitigate or avoid potentially detrimental effects of the storm water infiltration BMPs or associated soil response on existing or proposed improvements or structures, utilities, slopes or other features within
- and adjacent to the site.
- Provide guidance for the selection and location of infiltration BMPs, including the minimum separations between such infiltration BMPs and structures, streets, utilities, manufactured and existing slopes, engineered fills, utilities, or other features. Include guidance for reasonable measures that could be used to reduce the minimum separations
- or to mitigate the potential impacts of infiltration BMPs.

C.3.4 Reporting Requirements by the Project SWQMP Preparer

The project SWQMP preparer has the following responsibilities:

- Complete **Worksheet C.4-2 (Form I-8B)** and include it in the PDP SWQMP submittal.
    - Note: Form I-8B is not required for DMAs that are determined to be in a No Infiltration Condition based on **Worksheet C.4-1 (Form I-8A)** or by submitting a no infiltration condition letter that meets the requirements in **Appendix C.1.1**.
- In the PDP SWQMP provide a concluding opinion whether or not proposed infiltration BMPs will affect seasonality of ephemeral streams.
- Evaluate proposed use of the site (industrial use, residential use, etc.), soil and groundwater data and provide a concluding opinion in the PDP SWQMP whether proposed storm water infiltration could cause adverse impacts to groundwater quality, and if it does cause impacts, whether the impacts could be reasonably mitigated.
- **Worksheet C.4-3 and Worksheet D.5-1 (Form I-9)** must be completed and included it in the PDP SWQMP submittal when full infiltration BMPs are proposed.

GEOTECHNICAL SUBMITTAL FOR CATEGORIZATION OF INFILTRATION FEASIBILITY CONDITION
(Worksheet C.4-1/FORM I-8A)



Worksheet C.4-1: Categorization of Infiltration Feasibility Condition Based on Geotechnical Conditions[1]

Categorization of Infiltration Feasibility Condition based on Geotechnical Conditions	Worksheet C.4-1: Form I-8A[2]
Part 1 - Full Infiltration Feasibility Screening Criteria	
DMA(s) Being Analyzed:	**Project Phase:**
Criteria 1: Infiltration Rate Screening	

1A	Is the mapped hydrologic soil group according to the NRCS Web Soil Survey or UC Davis Soil Web Mapper Type A or B and corroborated by available site soil data[3]? ☐ Yes; the DMA may feasibly support full infiltration. Answer "Yes" to Criteria 1 Result or continue to Step 1B if the applicant elects to perform infiltration testing. ☐ No; the mapped soil types are A or B but is not corroborated by available site soil data (continue to Step 1B). ☐ No; the mapped soil types are C, D, or "urban/unclassified" and is corroborated by available site soil data. Answer "No" to Criteria 1 Result. ☐ No; the mapped soil types are C, D, or "urban/unclassified" but is not corroborated by available site soil data (continue to Step 1B).
1B	Is the reliable infiltration rate calculated using planning phase methods from Table D.3-1? ☐ Yes; Continue to Step 1C. ☐ No; Skip to Step 1D.
1C	Is the reliable infiltration rate calculated using planning phase methods from Table D.3-1 greater than 0.5 inches per hour? ☐ Yes; the DMA may feasibly support full infiltration. Answer "Yes" to Criteria 1 Result. ☐ No; full infiltration is not required. Answer "No" to Criteria 1 Result.
1D	**Infiltration Testing Method.** Is the selected infiltration testing method suitable during the design phase (see Appendix D.3)? Note: Alternative testing standards may be allowed with appropriate rationales and documentation. ☐ Yes; continue to Step 1E. ☐ No; select an appropriate infiltration testing method.

[1] Note that it is not required to investigate each and every criterion in the worksheet, a single "no" answer in Part 1, Part 2, Part 3, or Part 4 determines a full, partial, or no infiltration condition.
[2] This form must be completed each time there is a change to the site layout that would affect the infiltration feasibility condition. Previously completed forms shall be retained to document the evolution of the site storm water design.
[3] Available data includes site-specific sampling or observation of soil types or texture classes, such as obtained from borings or test pits necessary to support other design elements.

Categorization of Infiltration Feasibility Condition based on Geotechnical Conditions	Worksheet C.4-1: Form I-8A[2]
1E	**Number of Percolation/Infiltration Tests.** Does the infiltration testing method performed satisfy the minimum number of tests specified in Table D.3-2? ☐ Yes; continue to Step 1F. ☐ No; conduct appropriate number of tests.
IF	**Factor of Safety.** Is the suitable Factor of Safety selected for full infiltration design? See guidance in D.5; Tables D.5-1 and D.5-2; and Worksheet D.5-1 (Form I-9). ☐ Yes; continue to Step 1G. ☐ No; select appropriate factor of safety.
1G	**Full Infiltration Feasibility.** Is the average measured infiltration rate divided by the Factor of Safety greater than 0.5 inches per hour? ☐ Yes; answer "Yes" to Criteria 1 Result. ☐ No; answer "No" to Criteria 1 Result.
Criteria 1 Result	Is the estimated reliable infiltration rate greater than 0.5 inches per hour within the DMA where runoff can reasonably be routed to a BMP? ☐ Yes; the DMA may feasibly support full infiltration. Continue to Criteria 2. ☐ No; full infiltration is not required. Skip to Part 1 Result.
Summarize infiltration testing methods, testing locations, replicates, and results and summarize estimates of reliable infiltration rates according to procedures outlined in D.5. Documentation should be included in project geotechnical report.	

Categorization of Infiltration Feasibility Condition based on Geotechnical Conditions		Worksheet C.4-1: Form I-8A[2]	
Criteria 2: Geologic/Geotechnical Screening			
2A	If all questions in Step 2A are answered "Yes," continue to Step 2B. For any "No" answer in Step 2A answer "No" to Criteria 2, and submit an "Infiltration Feasibility Condition Letter" that meets the requirements in Appendix C.1.1. The geologic/geotechnical analyses listed in Appendix C.2.1 do not apply to the DMA because one of the following setbacks cannot be avoided and therefore result in the DMA being in a no infiltration condition. The setbacks must be the closest horizontal radial distance from the surface edge (at the overflow elevation) of the BMP.		
2A-1	Can the proposed full infiltration BMP(s) avoid areas with existing fill materials greater than 5 feet thick below the infiltrating surface?	☐ Yes	☐ No
2A-2	Can the proposed full infiltration BMP(s) avoid placement within 10 feet of existing underground utilities, structures, or retaining walls?	☐ Yes	☐ No
2A-3	Can the proposed full infiltration BMP(s) avoid placement within 50 feet of a natural slope (>25%) or within a distance of 1.5H from fill slopes where H is the height of the fill slope?	☐ Yes	☐ No
2B	When full infiltration is determined to be feasible, a geotechnical investigation report must be prepared that considers the relevant factors identified in Appendix C.2.1. If all questions in Step 2B are answered "Yes," then answer "Yes" to Criteria 2 Result. If there are "No" answers continue to Step 2C.		
2B-1	**Hydroconsolidation.** Analyze hydroconsolidation potential per approved ASTM standard due to a proposed full infiltration BMP. Can full infiltration BMPs be proposed within the DMA without increasing hydroconsolidation risks?	☐ Yes	☐ No
2B-2	**Expansive Soils.** Identify expansive soils (soils with an expansion index greater than 20) and the extent of such soils due to proposed full infiltration BMPs. Can full infiltration BMPs be proposed within the DMA without increasing expansive soil risks?	☐ Yes	☐ No
2B-3	**Liquefaction**. If applicable, identify mapped liquefaction areas. Evaluate liquefaction hazards in accordance with Section 6.4.2 of the City of San Diego's Guidelines for Geotechnical Reports (2011 or most recent edition). Liquefaction hazard assessment shall take into account any increase in groundwater elevation or groundwater mounding that could occur as a result of proposed infiltration or percolation facilities. Can full infiltration BMPs be proposed within the DMA without increasing liquefaction risks?	☐ Yes	☐ No

Categorization of Infiltration Feasibility Condition based on Geotechnical Conditions		Worksheet C.4-1: Form I-8A[2]	
2B-4	**Slope Stability**. If applicable, perform a slope stability analysis in accordance with the ASCE and Southern California Earthquake Center (2002) Recommended Procedures for Implementation of DMG Special Publication 117, Guidelines for Analyzing and Mitigating Landslide Hazards in California to determine minimum slope setbacks for full infiltration BMPs. See the City of San Diego's Guidelines for Geotechnical Reports (2011) to determine which type of slope stability analysis is required. Can full infiltration BMPs be proposed within the DMA without increasing slope stability risks?	☐ Yes	☐ No
2B-5	**Other Geotechnical Hazards.** Identify site-specific geotechnical hazards not already mentioned (refer to Appendix C.2.1). Can full infiltration BMPs be proposed within the DMA without increasing risk of geologic or geotechnical hazards not already mentioned?	☐ Yes	☐ No
2B-6	**Setbacks.** Establish setbacks from underground utilities, structures, and/or retaining walls. Reference applicable ASTM or other recognized standard in the geotechnical report. Can full infiltration BMPs be proposed within the DMA using established setbacks from underground utilities, structures, and/or retaining walls?	☐ Yes	☐ No
2C	**Mitigation Measures.** Propose mitigation measures for each geologic/geotechnical hazard identified in Step 2B. Provide a discussion of geologic/geotechnical hazards that would prevent full infiltration BMPs that cannot be reasonably mitigated in the geotechnical report. See Appendix C.2.1.8 for a list of typically reasonable and typically unreasonable mitigation measures. Can mitigation measures be proposed to allow for full infiltration BMPs? If the question in Step 2 is answered "Yes," then answer "Yes" to Criteria 2 Result. If the question in Step 2C is answered "No," then answer "No" to Criteria 2 Result.	☐ Yes	☐ No
Criteria 2 Result	Can infiltration greater than 0.5 inches per hour be allowed without increasing risk of geologic or geotechnical hazards that cannot be reasonably mitigated to an acceptable level?	☐ Yes	☐ No
Summarize findings and basis; provide references to related reports or exhibits.			

Categorization of Infiltration Feasibility Condition based on Geotechnical Conditions	Worksheet C.4-1: Form I-8A[2]
Part 1 Result – Full Infiltration Geotechnical Screening [4]	**Result**
If answers to both Criteria 1 and Criteria 2 are "Yes", a full infiltration design is potentially feasible based on Geotechnical conditions only. If either answer to Criteria 1 or Criteria 2 is "No", a full infiltration design is not required.	☐ Full infiltration Condition ☐ Complete Part 2
Part 2 – Partial vs. No Infiltration Feasibility Screening Criteria	
DMA(s) Being Analyzed:	**Project Phase:**
Criteria 3 : Infiltration Rate Screening	
3A	**NRCS Type C, D, or "urban/unclassified":** Is the mapped hydrologic soil group according to the NRCS Web Soil Survey or UC Davis Soil Web Mapper is Type C, D, or "urban/unclassified" and corroborated by available site soil data? ☐ Yes; the site is mapped as C soils and a reliable infiltration rate of 0.15 in/hr. is used to size partial infiltration BMPS. Answer "Yes" to Criteria 3 Result. ☐ Yes; the site is mapped as D soils or "urban/unclassified" and a reliable infiltration rate of 0.05 in/hr. is used to size partial infiltration BMPS. Answer "Yes" to Criteria 3 Result. ☐ No; infiltration testing is conducted (refer to Table D.3-1), continue to Step 3B.
3B	**Infiltration Testing Result:** Is the reliable infiltration rate (i.e. average measured infiltration rate/2) greater than 0.05 in/hr. and less than or equal to 0.5 in/hr? ☐ Yes; the site may support partial infiltration. Answer "Yes" to Criteria 3 Result. ☐ No; the reliable infiltration rate (i.e. average measured rate/2) is less than 0.05 in/hr., partial infiltration is not required. Answer "No" to Criteria 3 Result.
Criteria 3 Result	Is the estimated reliable infiltration rate (i.e., average measured infiltration rate/2) greater than or equal to 0.05 inches/hour and less than or equal to 0.5 inches/hour at any location within each DMA where runoff can reasonably be routed to a BMP? ☐ Yes; Continue to Criteria 4. ☐ No: Skip to Part 2 Result.

[4] To be completed using gathered site information and best professional judgement considering the definition of MEP in the MS4 Permit. Additional testing and/or studies may be required by City Engineer to substantiate findings.

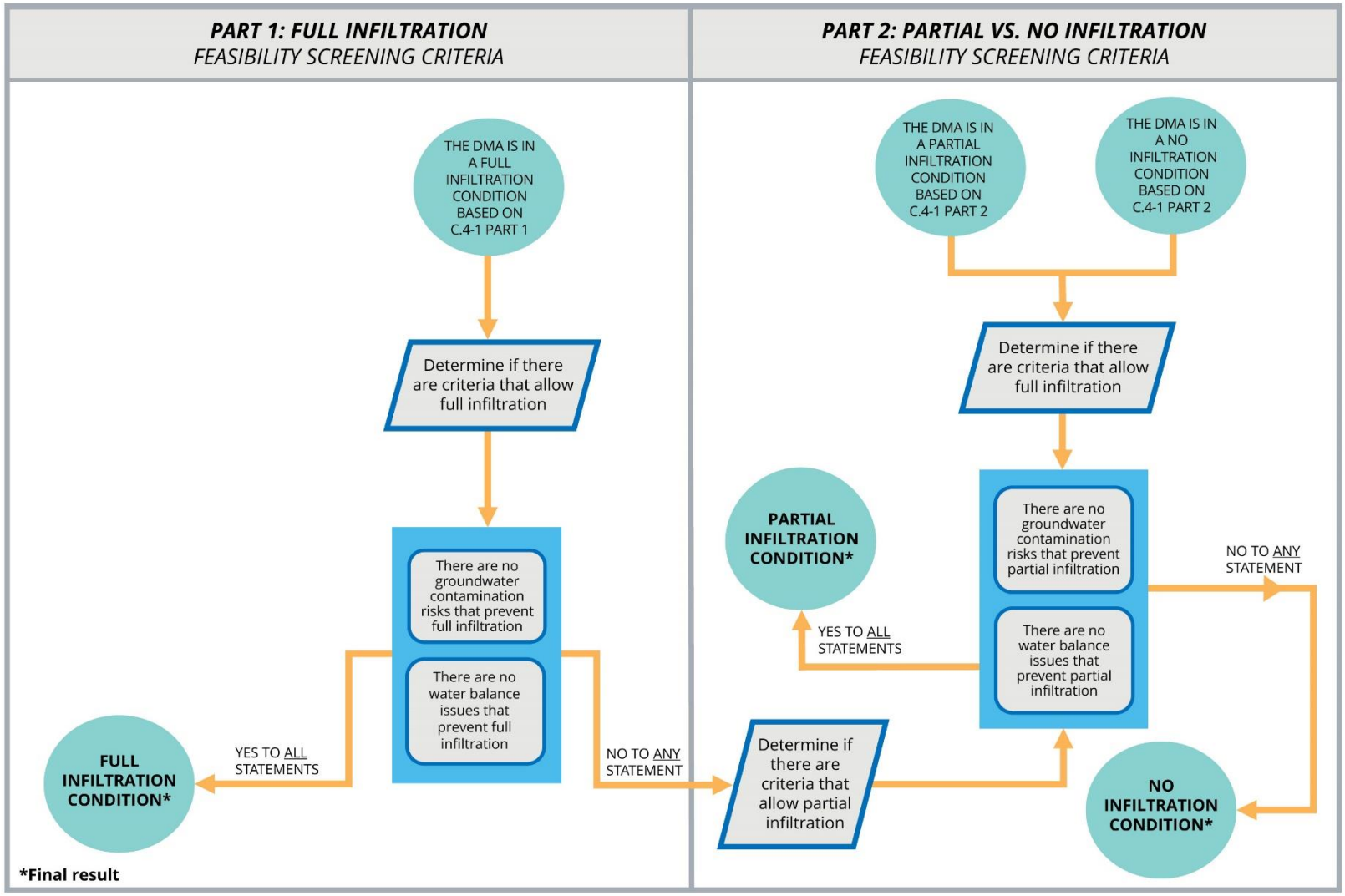
Categorization of Infiltration Feasibility Condition based on Geotechnical Conditions		Worksheet C.4-1: Form I-8A[2]	
Summarize infiltration testing and/or mapping results (i.e. soil maps and series description used for infiltration rate).			
Criteria 4: Geologic/Geotechnical Screening			
4A	If all questions in Step 4A are answered "Yes," continue to Step 2B. For any "No" answer in Step 4A answer "No" to Criteria 4 Result, and submit an "Infiltration Feasibility Condition Letter" that meets the requirements in Appendix C.1.1. The geologic/geotechnical analyses listed in Appendix C.2.1 do not apply to the DMA because one of the following setbacks cannot be avoided and therefore result in the DMA being in a no infiltration condition. The setbacks must be the closest horizontal radial distance from the surface edge (at the overflow elevation) of the BMP.		
4A-1	Can the proposed partial infiltration BMP(s) avoid areas with existing fill materials greater than 5 feet thick?	☐ Yes	☐ No
4A-2	Can the proposed partial infiltration BMP(s) avoid placement within 10 feet of existing underground utilities, structures, or retaining walls?	☐ Yes	☐ No
4A-3	Can the proposed partial infiltration BMP(s) avoid placement within 50 feet of a natural slope (>25%) or within a distance of 1.5H from fill slopes where H is the height of the fill slope?	☐ Yes	☐ No
4B	When full infiltration is determined to be feasible, a geotechnical investigation report must be prepared that considers the relevant factors identified in Appendix C.2.1 If all questions in Step 4B are answered "Yes," then answer "Yes" to Criteria 4 Result. If there are any "No" answers continue to Step 4C.		
4B-1	**Hydroconsolidation.** Analyze hydroconsolidation potential per approved ASTM standard due to a proposed full infiltration BMP. Can partial infiltration BMPs be proposed within the DMA without increasing hydroconsolidation risks?	☐ Yes	☐ No
4B-2	**Expansive Soils.** Identify expansive soils (soils with an expansion index greater than 20) and the extent of such soils due to proposed full infiltration BMPs. Can partial infiltration BMPs be proposed within the DMA without increasing expansive soil risks?	☐ Yes	☐ No

Categorization of Infiltration Feasibility Condition based on Geotechnical Conditions		Worksheet C.4-1: Form I-8A[2]	
4B-3	**Liquefaction**. If applicable, identify mapped liquefaction areas. Evaluate liquefaction hazards in accordance with Section 6.4.2 of the City of San Diego's Guidelines for Geotechnical Reports (2011). Liquefaction hazard assessment shall take into account any increase in groundwater elevation or groundwater mounding that could occur as a result of proposed infiltration or percolation facilities. Can partial infiltration BMPs be proposed within the DMA without increasing liquefaction risks?	☐ Yes	☐ No
4B-4	**Slope Stability**. If applicable, perform a slope stability analysis in accordance with the ASCE and Southern California Earthquake Center (2002) Recommended Procedures for Implementation of DMG Special Publication 117, Guidelines for Analyzing and Mitigating Landslide Hazards in California to determine minimum slope setbacks for full infiltration BMPs. See the City of San Diego's Guidelines for Geotechnical Reports (2011) to determine which type of slope stability analysis is required. Can partial infiltration BMPs be proposed within the DMA without increasing slope stability risks?	☐ Yes	☐ No
4B-5	**Other Geotechnical Hazards.** Identify site-specific geotechnical hazards not already mentioned (refer to Appendix C.2.1). Can partial infiltration BMPs be proposed within the DMA without increasing risk of geologic or geotechnical hazards not already mentioned?	☐ Yes	☐ No
4B-6	**Setbacks.** Establish setbacks from underground utilities, structures, and/or retaining walls. Reference applicable ASTM or other recognized standard in the geotechnical report. Can partial infiltration BMPs be proposed within the DMA using recommended setbacks from underground utilities, structures, and/or retaining walls?	☐ Yes	☐ No
4C	**Mitigation Measures.** Propose mitigation measures for each geologic/geotechnical hazard identified in Step 4B. Provide a discussion on geologic/geotechnical hazards that would prevent partial infiltration BMPs that cannot be reasonably mitigated in the geotechnical report. See Appendix C.2.1.8 for a list of typically reasonable and typically unreasonable mitigation measures. Can mitigation measures be proposed to allow for partial infiltration BMPs? If the question in Step 4C is answered "Yes," then answer "Yes" to Criteria 4 Result. If the question in Step 4C is answered "No," then answer "No" to Criteria 4 Result.	☐ Yes	☐ No
Criteria 4 Result	Can infiltration of greater than or equal to 0.05 inches/hour and less than or equal to 0.5 inches/hour be allowed without increasing the risk of geologic or geotechnical hazards that cannot be reasonably mitigated to an acceptable level?	☐ Yes	☐ No

Categorization of Infiltration Feasibility Condition based on Geotechnical Conditions	Worksheet C.4-1: Form I-8A[2]
Summarize findings and basis; provide references to related reports or exhibits.	
Part 2 – Partial Infiltration Geotechnical Screening Result[5]	**Result**
If answers to both Criteria 3 and Criteria 4 are "Yes", a partial infiltration design is potentially feasible based on geotechnical conditions only. If answers to either Criteria 3 or Criteria 4 is "No", then infiltration of any volume is considered to be infeasible within the site.	☐ Partial Infiltration Condition ☐ No Infiltration Condition

[5] To be completed using gathered site information and best professional judgement considering the definition of MEP in the MS4 Permit. Additional testing and/or studies may be required by City Engineer to substantiate findings.

SWQMP PREPARER SUBMITTAL FOR CATEGORIZATION OF INFILTRATION FEASIBILITY CONDITION
(Worksheet C.4-2/FORM I-8B)



Worksheet C.4-2: Categorization of Infiltration Feasibility Condition based on Groundwater and Water Balance Conditions[6]

Categorization of Infiltration Feasibility Condition based on Groundwater and Water Balance Conditions	Worksheet C.4-2: Form I-8B[7]
Part 1 - Full Infiltration Feasibility Screening Criteria	
DMA(s) Being Analyzed:	**Project Phase:**
Criteria 1: Groundwater Screening	
1A	**Groundwater Depth.** Is the depth to seasonally high groundwater tables (normal high depth during the wet season) beneath the base of any full infiltration BMP greater than 10 feet? ☐ Yes; continue to Step 1B. ☐ No; The depth to groundwater is less than or equal to 10 feet, but site layout changes or reasonable mitigation measures can be proposed to support full infiltration BMPs. Continue to step 1B. ☐ No; The depth to groundwater is less than or equal to 10 feet and site layout changes or reasonable mitigation measures cannot be proposed to support full infiltration BMPs. Answer "No" for Criteria 1 Result.
1B	**Contaminated Soil/Groundwater.** Are proposed full infiltration BMPs at least 250 feet away from contaminated soil or groundwater sites? This can be confirmed using GeoTracker (geotracker.waterboards.ca.gov) to identify open contaminated sites. The setbacks must be the closest horizontal radial distance from the surface edge (at the overflow elevation) of the BMP. ☐ Yes; continue to Step 1C. ☐ No; However, site layout changes or reasonable mitigation measures can be proposed to support full infiltration BMPs. Continue to Step 1C. ☐ No; Site layout changes or reasonable mitigation measures cannot be proposed to support full infiltration BMPs. Answer "No" to Criteria 1 Result.

[6] Note that it is not required to investigate each and every criterion in the worksheet, a single "no" answer in Part 1, Part 2, part 3, or Part 4 determines a full, partial, or no infiltration condition.
[7] This form must be completed each time there is a change to the site layout that would affect the infiltration feasibility condition. Previously completed forms shall be retained to document the evolution of the site storm water design.

Categorization of Infiltration Feasibility Condition based on Groundwater and Water Balance Conditions	Worksheet C.4-2: Form I-8B[7]
1C	**Inadequate Soil Treatment Capacity.** Are full infiltration BMPs proposed in DMA soils that have adequate soil treatment capacity? The DMA has adequate soil treatment capacity if **ALL** of the following criteria (detailed in C.2.2.1) for all soil layers beneath the infiltrating surface are met: • USDA texture class is sandy loam or loam or silt loam or silt or sandy clay loam or clay loam or silty clay loam or sandy clay or silty clay or clay; and • Cation Exchange Capacity (CEC) greater than 5 milliequivalents/100g; and • Soil organic matter is greater than 1%; and • Groundwater table is equal to or greater than 10 feet beneath the base of the full infiltration BMP. ☐ Yes; continue to Step 1D. ☐ No; However, site layout changes or reasonable mitigation measures can be proposed to support full infiltration BMPs. Continue to Step 1D. ☐ No; Site layout changes or reasonable mitigation measures cannot be proposed to support full infiltration BMPs. Answer "No" to Criteria 1 Result.
1D	**Other Groundwater Contamination Hazards.** Are there site-specific groundwater contamination hazards not already mentioned (refer to Appendix C.2.2) that can be reasonably mitigated to support full infiltration BMPs? ☐ Yes; there are other contamination hazards identified that can be mitigated. Answer "Yes" to Criteria 1 Result. ☐ No; there are other contamination hazards identified that cannot be mitigated. Answer "No" to Criteria 1 Result. ☐ N/A; no contamination hazards are identified. Answer "Yes" to Criteria 1 Result.
Criteria 1 Result	Can infiltration greater than 0.5 inches per hour be allowed without increasing risk of groundwater contamination that cannot be reasonably mitigated to an acceptable level? See Appendix C.2.2.8 for a list of typically reasonable and typically unreasonable mitigation measures. ☐ Yes; Continue to Part 1, Criteria 2. ☐ No; Continue to Part 1 Result.
Summarize groundwater quality and any mitigation measures proposed. Documentation should focus on groundwater table, mapped soil types and contaminated site locations.	

Categorization of Infiltration Feasibility Condition based on Groundwater and Water Balance Conditions	Worksheet C.4-2: Form I-8B[7]
Criteria 2: Water Balance Screening	
2A	**Ephemeral Stream Setback.** Does the proposed full infiltration BMP meet both the following? • The full infiltration BMP is located at least 250 feet away from an ephemeral stream; **AND** • The bottom surface of the full infiltration BMP is at a depth 20 feet or greater from seasonally high groundwater tables. ☐ Yes; Answer "Yes" to Criteria 2 Result. ☐ No; Continue to Step 2B.
2B	**Mitigation Measures.** Can site layout changes be proposed to support full infiltration BMPs? ☐ Yes; the site can be reconfigured to mitigate potential water balance issues. Answer "Yes" to Criteria 2 Result. ☐ No; the site cannot be reconfigured to mitigate potential water balance issues. Continue to Step 2C and provide discussion.
2C	**Additional studies.** Do additional studies support full infiltration BMPs? In the event that water balance effects are used to reject full infiltration (anticipated to be rare), additional analysis shall be completed and documented by a qualified professional indicating the site-specific information evaluated and the technical basis for this finding. ☐ Yes; Answer "Yes" to Criteria 2 Result. ☐ No; Answer "No" to Criteria 2 Result.
Criteria 2 Result	Can infiltration greater than 0.5 inches per hour be allowed without causing potential water balance issues such as change of seasonality of ephemeral streams? ☐ Yes; Continue to Part 1 Result. ☐ No; Continue to Part 1 Result.
Summarize potential water balance effects. Documentation should focus on mapping and soil data regarding proximity to ephemeral streams and groundwater depth.	

Part 1 – Full Infiltration Groundwater and Water Balance Screening Result[8]	**Result**
If answers to Criteria 1 and 2 are "Yes", a full infiltration design is potentially feasible. The feasibility screening category is Full Infiltration based on groundwater conditions. If answer to Criteria 1 or Criteria 2 is "No", infiltration may be possible to some extent but would not generally be feasible or desirable to achieve a "full infiltration" design based on groundwater conditions. Proceed to Part 2.	☐ Full Infiltration ☐ Complete Part 2

[8] To be completed using gathered site information and best professional judgement considering the definition of MEP in the MS4 Permit. Additional testing and/or studies may be required by City Engineer to substantiate findings.

Categorization of Infiltration Feasibility Condition based on Groundwater and Water Balance Conditions	Worksheet C.4-2: Form I-8B[7]
Part 2 – Partial vs. No Infiltration Feasibility Screening Criteria	
DMA(s) Being Analyzed:	**Project Phase:**
Criteria 3: Groundwater Screening	
Contaminated Soil/Groundwater. Are partial infiltration BMPs proposed at least 100 feet away from contaminated soil or groundwater sites? This can be confirmed using GeoTracker (geotracker.waterboards.ca.gov) to identify open contaminated sites. This criterion is intentionally a smaller radius than full infiltration, as the potential quantity of infiltration from partial infiltration BMPs is smaller. ☐ Yes; Answer "Yes" to Criteria 3 Result. ☐ No; However, site layout changes can be proposed to avoid contaminated soils or soils that lack adequate treatment capacity. Select "Yes" to Criteria 3 Result. It is a requirement for the SWQMP preparer to identify potential mitigation measures. ☐ No; Contaminated soils or soils that lack adequate treatment capacity cannot be avoided and partial infiltration BMPs are not feasible. Select "No" to Criteria 3 Result.	
Criteria 3 Result: Can infiltration of greater than or equal to 0.05 inches/hour and less than or equal to 0.5 inches/hour be allowed without increasing risk of groundwater contamination that cannot be reasonably mitigated to an acceptable level? ☐ Yes; Continue to Part 2, Criteria 4. ☐ No; Skip to Part 2 Result.	
Summarize findings and basis. Documentation should focus on mapped soil types and contaminated site locations.	

Categorization of Infiltration Feasibility Condition based on Groundwater and Water Balance Conditions	Worksheet C.4-2: Form I-8B[7]
Criteria 4: Water Balance Screening	
Additional studies. In the event that water balance effects are used to reject partial infiltration (anticipated to be rare), a qualified professional must provide an analysis of the incremental effects of partial infiltration BMPs on the water balance compared to incidental infiltration under a no infiltration scenario (e.g. precipitation, irrigation, etc.).	
Criteria 4 Result: Can infiltration of greater than or equal to 0.05 inches/hour and less than or equal to 0.5 inches/hour be allowed without causing potential water balance issues such as change of seasonality of ephemeral streams? ☐ Yes: Continue to Part 2 Result. ☐ No: Continue to Part 2 Result.	
Summarize potential water balance effects. Documentation should focus on mapping and soil data regarding proximity to ephemeral streams and groundwater depth.	

Part 2 – Partial Infiltration Groundwater and Water Balance Screening Result[9]	**Result**
If answers to Criteria 3 and Criteria 4 are "Yes", a partial infiltration design is potentially feasible. The feasibility screening category is Partial Infiltration based on groundwater and water balance conditions. If answer to Criteria 3 or Criteria 4 is "No", then infiltration of any volume is considered to be infeasible within the site. The feasibility screening category is No Infiltration based on groundwater or water balance condition.	☐ Partial Infiltration Condition ☐ No Infiltration Condition

[9] To be completed using gathered site information and best professional judgement considering the definition of MEP in the MS4 Permit. Additional testing and/or studies may be required by City Engineer to substantiate findings.

Worksheet C.4-3: Infiltration and Groundwater Protection for Full Infiltration BMPs

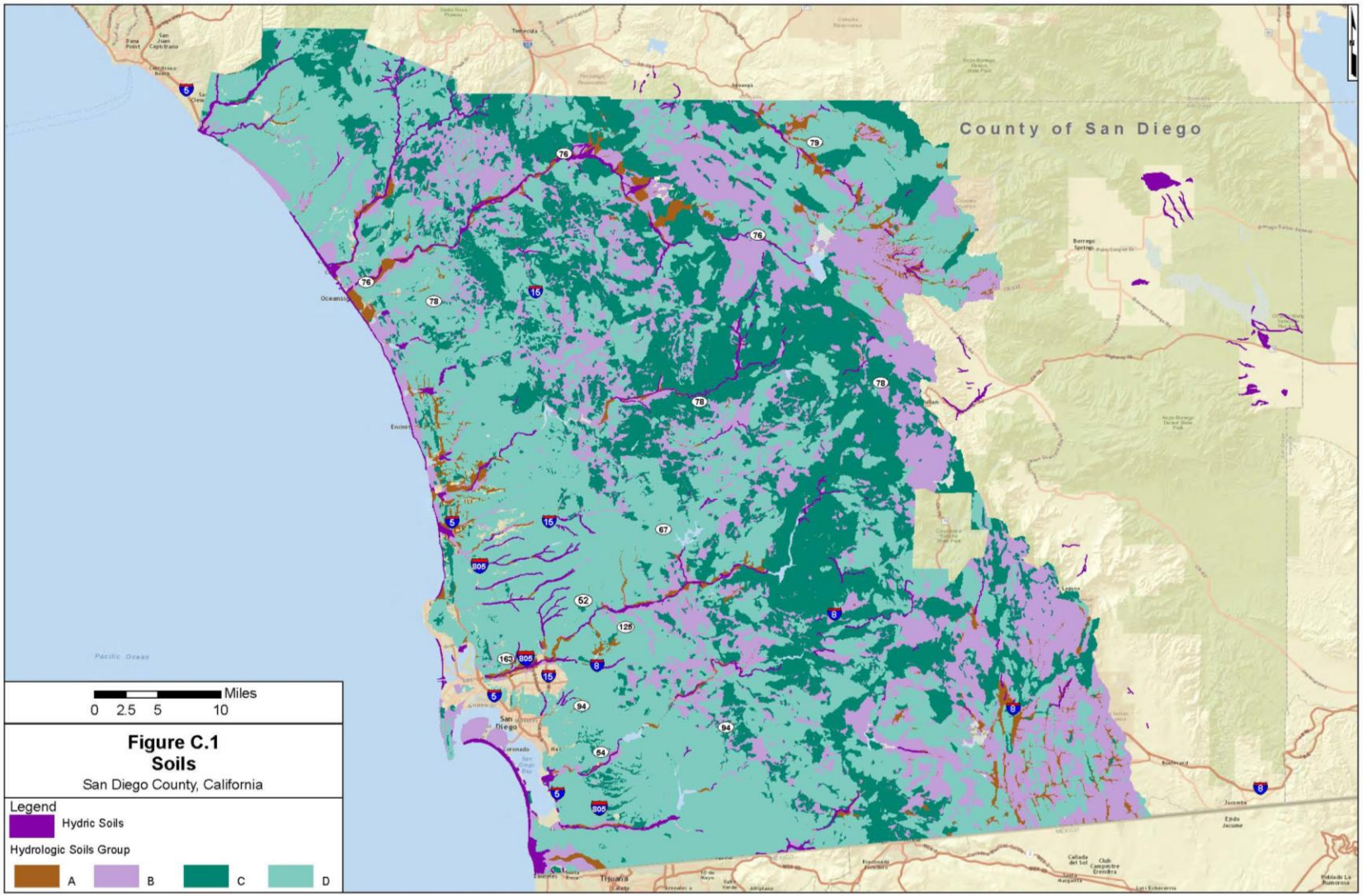
Infiltration and Groundwater Protection		Worksheet C.4-3	
Criteria	**Question**	**Yes**	**No**
1	Will the storm water runoff undergo pretreatment such as sedimentation or filtration prior to infiltration?	☐	☐
2	Are pollution prevention and source control BMPs implemented at a level appropriate to protect groundwater quality for areas draining to infiltration BMPs?	☐	☐
3	Is the vertical distance from the base of the full infiltration BMP to the seasonal high groundwater mark greater than 10 feet? This vertical distance may be reduced when the groundwater basin does not support beneficial uses and the groundwater quality is maintained	☐	☐
4	Does the soil through which infiltration is to occur have physical and chemical characteristics that are adequate for proper infiltration durations and treatment of runoff for the protection of groundwater beneficial uses? Refer to Appendix C.3.1.	☐	☐
5	Is the following statement true? Full infiltration BMPs are not used for areas of industrial or light industrial activity, and other high threat to water quality land uses and activities, unless source control BMPs to prevent exposure of high threat activities are implemented, or runoff from such activities is first treated or filtered to remove pollutants prior to infiltration.	☐	☐
6	Is the full infiltration BMP located at a distance greater than 100 feet horizontally from any water supply well?	☐	☐
Basis and Documentation: All the answers for Criteria 1 to 6 must be "Yes" for acceptance of a full infiltration BMP.			

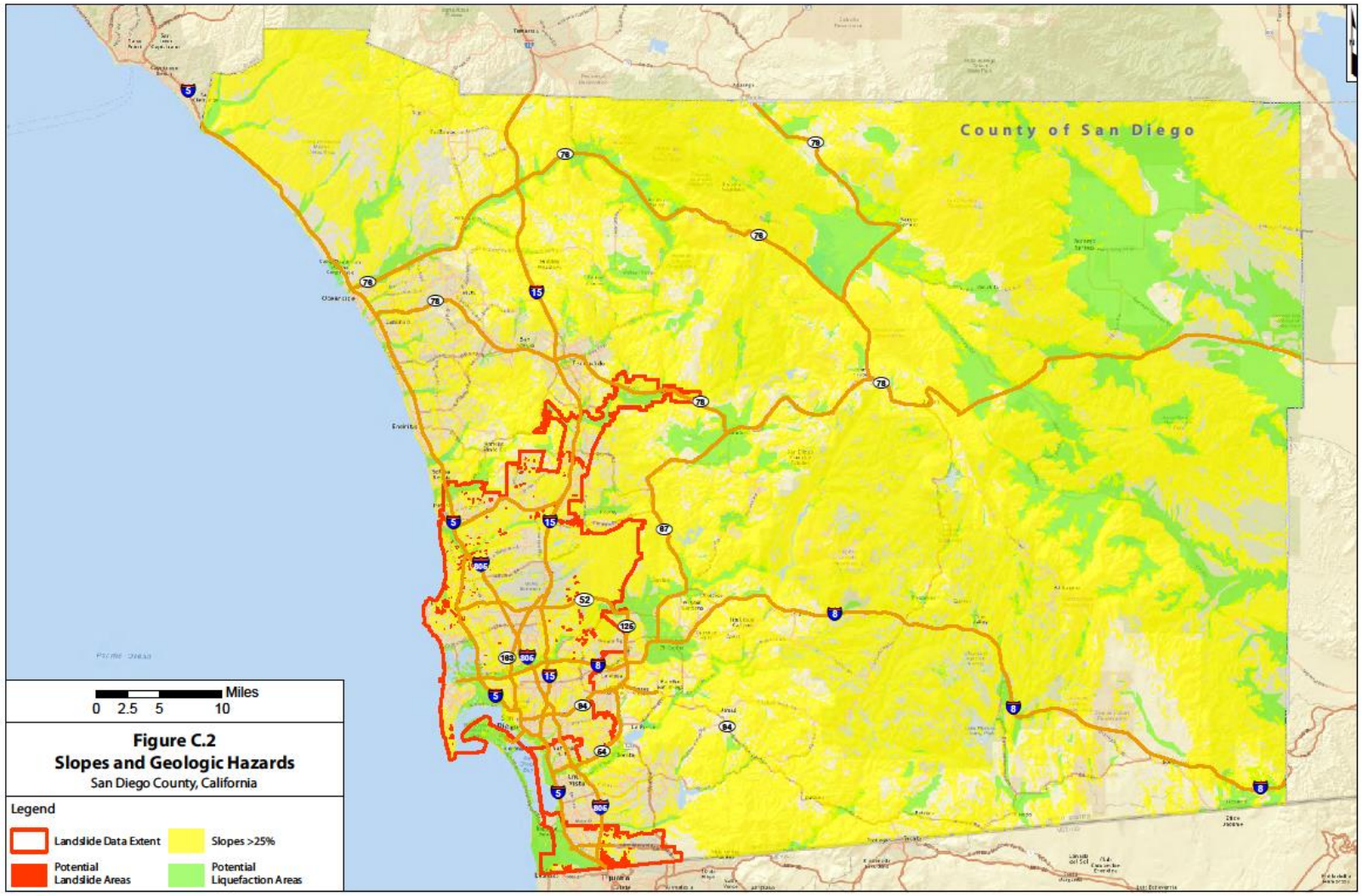
C.4 Feasibility Screening Exhibits

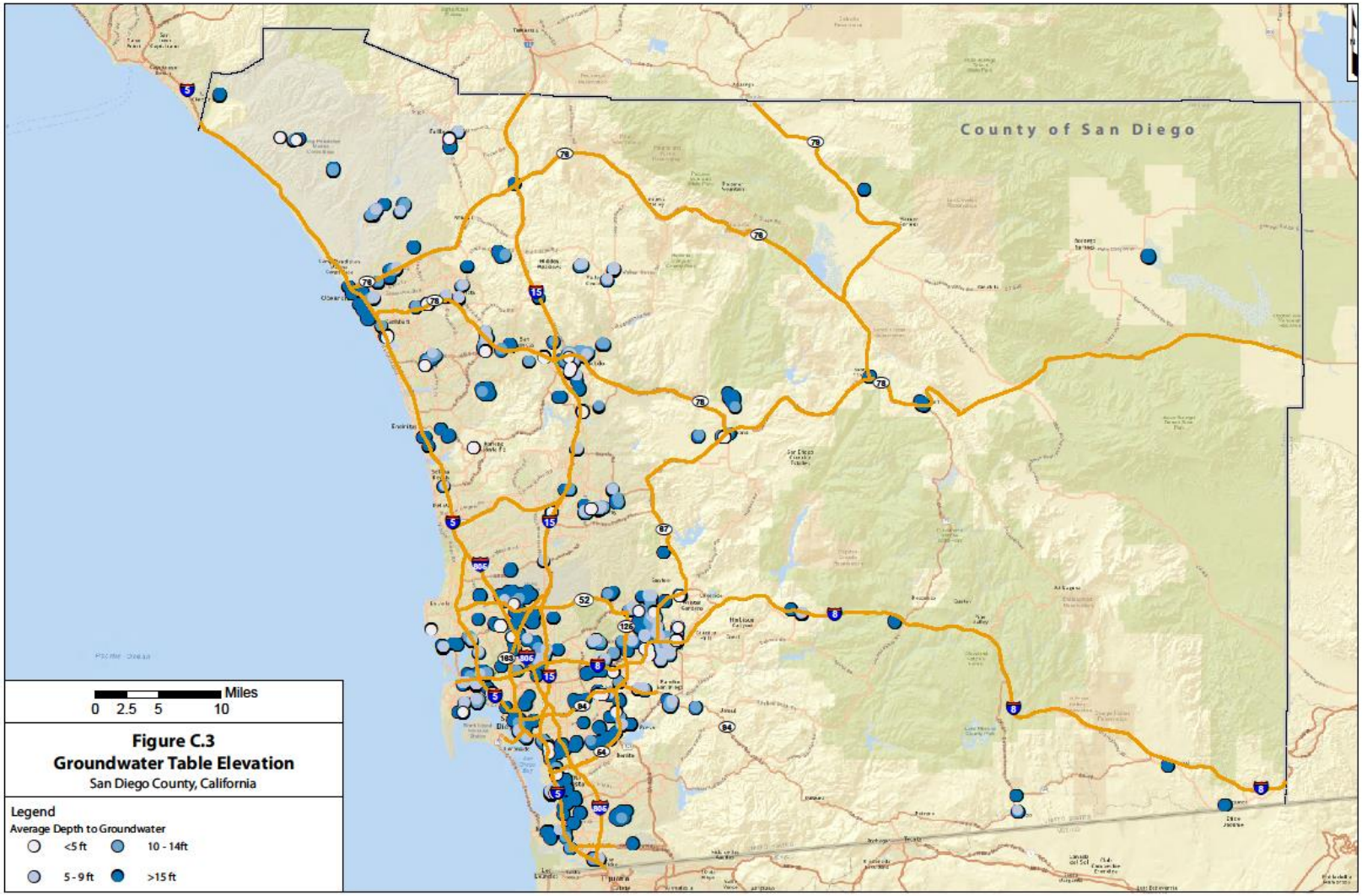
Table C.4-1 lists the feasibility screening exhibits that were generated using readily available GIS data sets to assist the project applicant during planning phase.

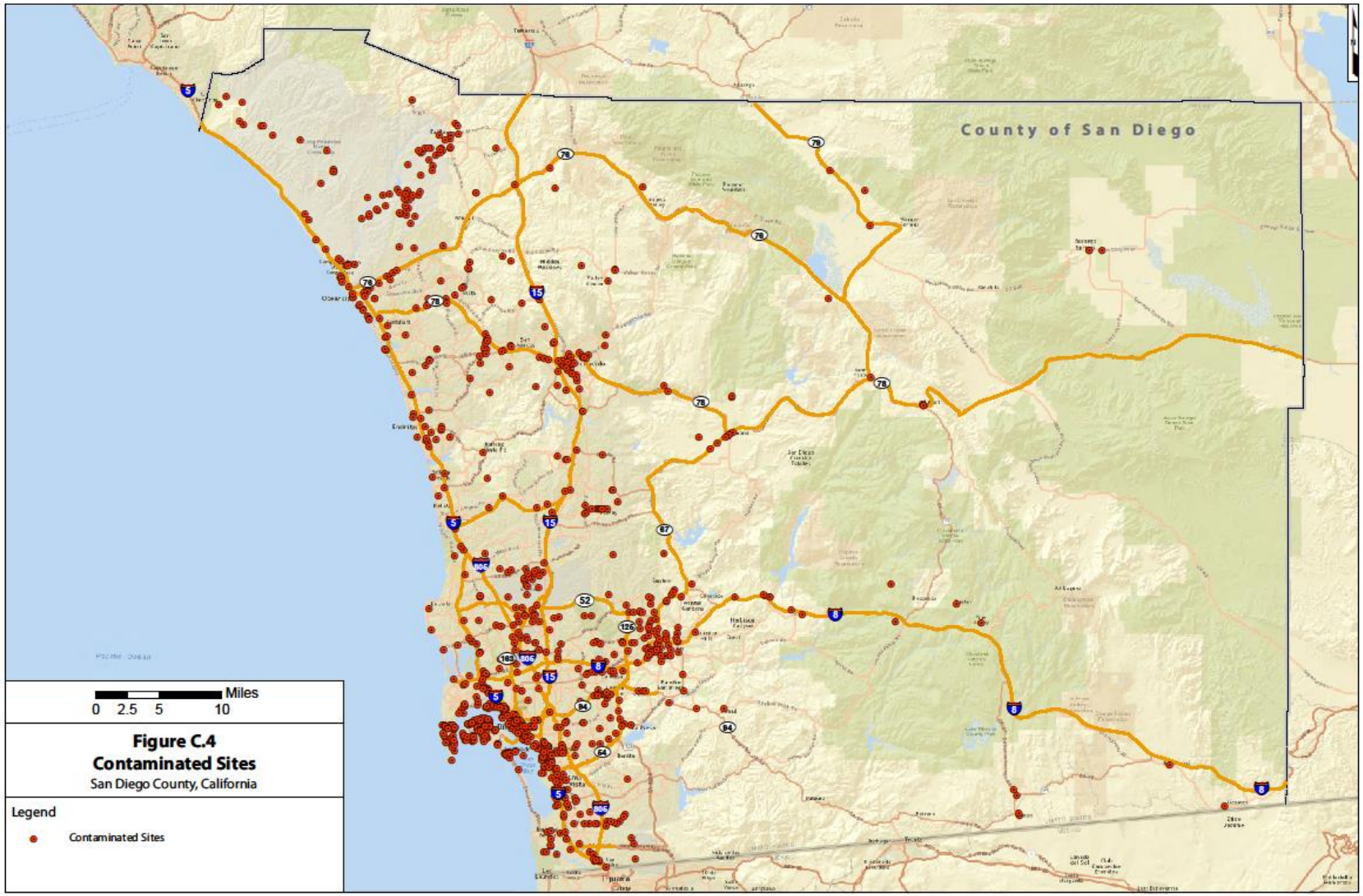
Table C.4-1: Feasibility Screening Exhibits

Figures	Layer	Data Sources
C.1 Soils	Hydrologic Soil Group – A, B, C, D	NRCS Web Soil Survey **http://websoilsurvey.sc.egov.usda.gov/**
	Hydric Soils	USDA Web Soil Survey. Hydric soils, (ratings of 100) were classified as hydric. **http://websoilsurvey.sc.egov.usda.gov/App/HomePage.htm**
C.2: Slopes and Geologic Hazards	Slopes >25%	SanGIS **http://www.sangis.org/**
	Liquefaction Potential	SanGIS **http://www.sangis.org/**
	Landslide Potential	SanGIS Geologic Hazards layer. Subset of polygons with hazard codes related to landslides was selected. This data is limited to the City of San Diego Boundary. **http://www.sangis.org/**
C.3: Groundwater Table Elevations	Groundwater Depths	GeoTracker. Data downloaded for San Diego county from 2014 and 2013. In cases where there were multiple measurements made at the same well, the average was taken over that year. **http://geotracker.waterboards.ca.gov/data_download_by_county.asp**
C.4: Contaminated Sites	Contaminated soils and/or groundwater sites	GeoTracker. Data downloaded for San Diego county and limited to active cleanup sites **http://geotracker.waterboards.ca.gov/**


County of San Diego
Miles
0 2.5 5 10
Figure C.1
Soils
San Diego County, California
Legend
Hydric Soils
Hydrologic Soils Group
A
B
C
D


County of San Diego
Miles
0 2.5 5 10
Figure C.2
Slopes and Geologic Hazards
San Diego County, California
Legend
Landslide Data Extent
Slopes >25%
Potential Landslide Areas
Potential Liquefaction Areas


County of San Diego
Miles
0 2.5 5 10
Figure C.3
Groundwater Table Elevation
San Diego County, California
Legend
Average Depth to Groundwater
<5 ft
10 - 14ft
5 - 9 ft
>15 ft


County of San Diego
Miles
0 2.5 5 10
Figure C.4
Contaminated Sites
San Diego County, California
Legend
Contaminated Sites