City of Malibu

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GUIDELINES FOR THE PREPARATION OF COASTAL ENGINEERING REPORTS
AND PROCEDURES FOR REPORT SUBMITTAL

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1 INTRODUCTION

1.1 Purpose

These *Guidelines for the Preparation of Coastal Engineering Reports and Procedures for Report Submittal* provide the minimum standards and recommended format for the preparation of coastal engineering reports for development projects within the City of Malibu on beachfront parcels. The purpose of these guidelines is to provide the Project Coastal Engineering Consultant with the information necessary to prepare adequate and acceptable reports. It is not the intent of these guidelines to establish strict requirements for development projects; it is however intended to serve as a guide for the preparation of coastal engineering reports to meet the requirements of the City and governing codes, regulations, and policies. The guidelines are not proposed to supersede civil and coastal engineering judgment of the project's consultants; however it is expected that such judgments be thoroughly discussed within the coastal engineering report.

These guidelines are intended to facilitate the development of coastal engineering reports to meet the City's requirements such that projects are not needlessly delayed in the coastal engineering review process. It is therefore imperative that the project consultants are familiar with these guidelines and the requirements to reduce the length of review and the responses required.

These guidelines also discuss the submittal procedures for projects requiring review by the City Coastal Engineering Staff during the initial Planning Department review phase and the Building Safety review phase.

1.2 Requirement for Coastal Engineering Reports

The requirement for coastal engineering reports for development within the City of Malibu is based on the following municipal codes and planning policies:

- City of Malibu Local Coastal Program – Land Use Plan, Chapter 4 – Hazards & Shoreline/Bluff Development, Section C, paragraph 4.16
- Malibu Municipal Code – Title 15, Buildings and Construction, Chapter 15.04 (ref. California Building Code Section 1612.3.1 Design Flood Elevations)
- Malibu Municipal Code – Title 15, Buildings and Construction, Chapter 15.12
- Malibu Municipal Code – Title 16, Subdivisions, Chapter 16.24
- Malibu Municipal Code – Title 17, Zoning, Chapter 17.62

1.3 Definition of Roles

Registered and licensed professionals under contract with the City of Malibu conduct technical reviews of coastal engineering reports and plans. The City Coastal Engineering Staff consists of the City Coastal Engineer along with associated support staff.

City Coastal Engineer

At the direction of the Building Official, the City Coastal Engineering Staff reviews wave run-up reports and building plans for proposed projects. Submitted coastal engineering documents (e.g., plans, reports, etc.) are reviewed subsequent to a site reconnaissance to evaluate the site conditions and the adequacy of the Project Coastal Engineering Consultant's assessment of the project. When reports are not submitted with proposed project plans, City Coastal Engineering Staff makes a determination of the need for such reports based on the field reconnaissance or review of historical data and site photos. Emphasis is placed on the effect of wave impact on the proposed development, the effect of the proposed project on adjacent properties, coastal and local beach conditions, and inundation. City Coastal Engineering Staff reviews reports to assure compliance with these guidelines as established herein.

The City Coastal Engineering Staff prepares written comments in a coastal engineering review that discusses issues related to the coastal engineering of the proposed project. City Coastal Engineering Staff reviews and approves the project only from a coastal engineering perspective. The Building Official determines whether or not to issue a building permit for a development project.

Coastal engineering review may necessitate coordination between the City Coastal Engineering Staff and the project consultants, who may include: Coastal Engineer, Architect, Civil Engineer, Geotechnical Engineer, Wastewater System Designer, and Structural Engineer, other City departments, and local agencies. The project may also require coordination with the California Coastal Commission (CCC).

Building Official

The Building Official is responsible for determining whether or not to issue a building permit for a development project. The City Coastal Engineer provides input and advice to the City Building Official and makes recommendations to the City either to request more information or to approve the project from coastal engineering perspective. The City Coastal Engineer serves as the reviewer for the City and prepares written comments in a coastal review that discusses issues related to coastal engineering. If the City Coastal Engineer determines that there are issues that are not within their purview, they bring the issues to the attention of the Building Official, who then makes a decision on the issues in accordance with established City policies and procedures.

Project Applicant

Applicants may include architects, developers, landowners, permit specialists, homeowners, contractors, and others directly involved with the submittal of plans, reports, and documents with the payment of applicable fees. Applicants are responsible for a complete submittal of all documents needed for coastal engineering review.

Project Coastal Engineering Consultant

The Project Coastal Engineering Consultant is a civil engineering professional with experience in coastal engineering, who is registered as a Civil Engineer in the State of California and who provides coastal engineering services for the project applicant. The Project Coastal Engineering Consultant typically provides site characterization, analyses of coastal processes, and recommended resource preservation and

hazard mitigation conditions for project feasibility in accordance with these guidelines and applicable local, state, and federal laws and regulations pertaining to coastal engineering. The Project Coastal Engineering Consultant also provides review and approval of project plans, specifications, and construction sequencing.

1.4 Applicable Codes

Specific coastal development policies and implementation plans are provided in the City of Malibu Local Coastal Program (LCP) Land Use Plan (LUP) and Local Implementation Plan (LIP), respectively. The building code applicable to developments within the City of Malibu is the Malibu Building Code, which references the current County of Los Angeles Building Code with amendments (adopted from the applicable California Building Code). The Malibu Plumbing Code includes amendments applicable to coastal engineering. Unless otherwise stated, the latest version of the code adopted by the City is the applicable code in effect. Applicants and consultants may find the applicable codes on the City's web site at http://www.malibucity.org.

These guidelines do not supersede applicable Federal, State, and local codes. In particular, coastal engineering reports should comply with:

- Malibu Municipal Code – Title 15, Buildings and Construction
- City of Malibu Local Coastal Program – Land Use Plan and Local Implementation Plan (LCP-LUP and LCP-LIP)
- California Coastal Act
- State of California, Business and Professions Code

In addition to applicable codes and guidelines, applicants and consultants are encouraged to review the selected references listed in Appendix A.

If any differences exist between these coastal engineering guidelines and other references, guidelines, and codes, the more restrictive requirement governs.

1.5 Courtesy Calling

The City of Malibu's Coastal Engineering Staff has a policy of "courtesy calling" that facilitates and encourages communication between the reviewer, the Project Coastal Engineering Consultants, the applicant, and other professional consultants. This policy allows the reviewers to discuss concerns and advise the project consultants about resolving issues regarding both feasibility of the proposed development and building plan-check items. This policy helps to avoid long review processes that involve numerous written iterative responses. Consultants are urged to contact City Coastal Engineering Staff at their convenience to discuss review comments and to obtain answers to questions regarding current codes, policies, and ordinances in effect.

1.6 Counter Hours and Appointments

Public counter hours for the Coastal Engineering Staff are Tuesdays and Thursdays between 8:00 AM and 11:00 AM. Appointments are encouraged, especially for any discussions on current reviews as well as final sign off on plan-checks. Such appointments are subject to applicable review fees. Contact (310) 456-2489 extension 307 to schedule an appointment.

2 PROCEDURES - SUBMITTAL OF DOCUMENTS

2.1 Preapplication Review

City Coastal Engineering Staff recognizes that applicants may seek assurance that vacant properties are buildable from a coastal engineering perspective. With permission from the Building Official, City Coastal Engineering Staff may review projects as part of a preapplication review. Reports and a deposit are collected, and the project is reviewed only for coastal engineering feasibility. Planning stage approval cannot be granted by City Coastal Engineering Staff until a formal application for the project is submitted to the Planning Department. Please contact the City Coastal Engineer at (310) 456-2489 extension 307 regarding this matter.

2.2 Planning Stage Review

The initial step in the permitting process for proposed projects is the submittal of an application and documents to the City's Planning Department for a conformance review relative to the requirements of the Malibu LCP for Coastal Development Permits. City Coastal Engineering Staff has provided the Planning Department with categories of development projects that are subject to coastal engineering review in the planning stage. Those projects that are exempt are not forwarded to City Coastal Engineering Staff. For projects that are subject to a planning stage coastal review, the applicant receives a Coastal Engineering Review Referral Sheet from Planning Department staff. The applicant is responsible for providing the referral sheet to City Coastal Engineering Staff during public counter hours. At that time, City Coastal Engineering Staff determines the types of reports needed for review prior to planning approval.

The planning stage conformance review is performed to determine whether or not the project appears feasible from a coastal engineering perspective based on requirements and standards set forth by the City and the California Coastal Commission. The Project Coastal Engineering Consultant is responsible for providing substantial evidence to support the written findings of fact, analyses, and conclusions pertaining to coastal hazards (e.g., coastal flooding, wave action, tsunamis, erosion, and beach scour) listed in Chapter 9 of the Malibu LCP-LIP and pertaining to coastal resources (e.g., public access and sand supply) listed in Chapter 10 of the Malibu LCP-LIP, in order to obtain approvals, conditional approvals, or denials by the City.

City Coastal Engineering Staff reviews the project and the submitted documents and schedules a site reconnaissance with the applicant. A coastal engineering conformance review sheet is typically issued to the applicant within 15 working days and contains a preliminary feasibility determination. Complex sites, including multifamily, commercial, and subdivision developments may entail longer review periods depending upon the complexity of the proposed development. City Coastal Engineering Staff evaluates

the reports for completeness and conformance to these guidelines, to standards of practice, and to City, State, and Federal Codes applicable to coastal engineering. The review sheet generally recommends either: 1) approval of the project "in-concept" in the planning stage, or 2) that the project not be approved in the planning stage. Any nonconforming planning application is accompanied by a review sheet with comments to be addressed by the Project Coastal Engineering Consultant prior to planning stage approval. Review comments issued during the planning stage may include items to be addressed prior to the building plan-check stage and/or recommendations for building plan-check items.

2.3 Planning Review Submittal Requirements

When it is determined that the proposed development project is subject to review by City Coastal Engineering Staff, the applicant is responsible for submitting the following items to City Coastal Engineering Staff during public counter hours at City Hall or by appointment:

- One CD containing coastal engineering reports signed by the engineer of record with an electronic signature form. The electronic signature form is available on the City's web site (http://www.malibucity.org) or at the City Hall public counter.
- A record or "as-built" plan of existing shoreline protection devices including copies of approved plans for existing permitted shoreline protection devices if applicable.
- A copy of associated OWTS plans and documents for projects proposing a new or repaired on-site wastewater treatment system on beachfront properties.
- A copy of the completed planning application.
- One set of project plans that are submitted to the Planning Department.
- Written evidence of a review and determination from the State Lands Commission relative to the proposed project's location to or impact upon the boundary between public tidelands and private property.

The City Coastal Engineering Staff requests that coastal engineering reports, associated maps, and cross-sections be submitted on a CD in ***searchable*** PDF format and that each beach profile, map, and cross-section be shown on a single page (i.e., please do not scan maps and cross-sections in sections and show them on multiple pages). It is expected that electronic report documents and plans include a signature. Faxed reports are not accepted. Clearly labeling the CD with the following information can help prevent delays in the review process:

- Project address and Assessor's Parcel Number
- Name and address of consulting firm preparing the report
- A line to add the Project number (e.g., Planning File: _____)

Please contact City Coastal Engineering Staff at (310) 456-2489 extension 307 if there are any questions regarding these guidelines.

2.4 Building Plan-Check Stage Review

Once the project is approved by the Planning Department and a Coastal Development Permit (CDP) is issued, the applicant may submit plans to the Environmental Sustainability Department's Building Safety division for building plan-check review. During this stage of review, the Building Safety division confirms that the structural design of the proposed structures is based on the recommendations provided

by the Project Coastal Engineering Consultant and other engineering consultants. The City Coastal Engineering Staff does not evaluate structural or geotechnical stability or structural integrity of proposed residential structures or shoreline protection devices. The City Coastal Engineering Staff reviews the final plans for conformance to the minimum standards set forth in the Malibu LCP, Malibu Building Code, and Malibu Plumbing Code that pertain to mitigation of coastal hazards and minimization of impacts to coastal resources.

It is the responsibility of the applicant to provide plans to be reviewed by the City Coastal Engineering Staff for final approval from the City Coastal Engineering Staff at the public counter during counter hours, or by appointment. It is also the applicant's responsibility to provide the items listed in Section 2.5 to the City Coastal Engineering Staff prior to receiving final approval.

2.5 Building Plan-Check Submittal Requirements

City Coastal Engineering Staff reviews project plans in the building plan-check stage. Building plan-check submittals typically have the following as a minimum:

- A complete set of project plans (i.e., architectural, grading, OWTS, and shoreline protection).
- Plans and sections based on the North American Vertical Datum (NAVD 88), which is to be clearly referenced on the plans and sections.
- The name of the Project Coastal Engineering Consultant, dates of design reports used in the design, inspection recommendations, and documentation required by the building code.
- Project plans that clearly show the locations of the entire on-site wastewater treatment system, shoreline protection devices, and structures (including foundations, seawalls, tanks, stairs, etc.).
- Final plans that include a review by the Project Coastal Engineering Consultant and determination that the plans are in conformance to the recommendations of the Project Coastal Engineering Consultant.

3 GUIDELINES

The guidelines contained in the following sections have been prepared for the purpose of providing a general format and minimum standards for analysis and report preparation for preliminary coastal engineering reports and wave run-up studies for beachfront development. These guidelines are intended to aid in expediting the processing of building permits. The inclusion of appropriate discussions and comments to substantiate the conclusions and recommendations offered in the report also helps to expedite processing.

Use of these guidelines enables the applicant's Project Coastal Engineering Consultants to provide the data necessary for the design engineer/architect to more precisely understand the coastal setting and thus to best prepare a safe and cost-effective design that is compatible with inherent environs. The guidelines have been prepared to serve only as a reference during both preparation and review for those striving to assure the processing of permits in an expeditious manner. The subjects addressed in these guidelines are not meant to be all-inclusive, but to cover areas that concern the majority of projects in the City of Malibu.

The project applicant is responsible for ensuring that the proposed development meets requirements from all City agencies, specifically Environmental Health, Public Works, and Geology. In wave run-up studies, for example, there are potential limitations of development enforced by these agencies that may affect the coastal engineering review.

3.1 Types of Beachfront Projects

3.1.1 New Residential and Commercial Construction

New residential and commercial construction projects may include, but are not limited to, new single-family residences, multifamily structures, commercial/industrial buildings, detached guest houses, detached studios, and habitable park amenities (i.e., those considered habitable by the current building code). Projects involving the redevelopment of existing sites are considered new construction (for example, demolishing single-family residence and constructing a new residence). For all new construction projects, comprehensive coastal engineering reports are required that conform to the City coastal engineering guidelines and applicable codes and ordinances.

3.1.2 Remodels

Remodels may include, but are not limited to, interior remodels of existing structures such as conversions of existing buildings from one occupancy classification to another, in accordance with the current building code. Coastal engineering review requirements are partially dependent on the project characterization provided by the City Floodplain Administrator. Coastal engineering reports may be necessary if there are new foundations or changes to the structural framing of the proposed remodel or conversion. Remodels that include an enlargement of the private sewage disposal system are subject to review (see Section 3.1.4). Coastal engineering recommendations addressing modifications to existing foundations, new foundations, underpinning foundation elements, floor slabs, and structural upgrades to meet the current building code may be necessary on a case-by-case basis. It is expected that coastal engineering reports conform to these guidelines and applicable codes and ordinances.

3.1.3 Additions to Existing Structures

Coastal engineering review requirements for additions to existing structures are partially dependent upon the project characterization provided by the City Floodplain Administrator, the presence of nonconforming foundations or structural elements that may be susceptible to coastal hazards, and whether a shoreline protection device (SPD) is necessary for protection of the residence. Coastal engineering reports for such projects should include identification of coastal hazards affecting the property and design recommendations. Where an SPD is necessary for protection of the residence, an evaluation of the SPD's current condition and proposed repairs or maintenance may be necessary. For these projects the Project Coastal Engineering Consultant is responsible for preparing a site-specific wave run-up study that addresses potential wave impact and inundations to the proposed addition or proposed structural modifications. It is expected that recommendations addressing finished floor elevations, lateral position, and potential upgrades to the existing foundation be made part of the submitted report.

City Coastal Engineering Staff determines whether or not a review is required. Any addition that warrants a change to the OWTS is subject to City Coastal Engineering Staff review.

3.1.4 On-Site Wastewater Treatment Systems

New and upgraded on-site wastewater treatment systems (OWTS) on beachfront parcels are subject to review from the City Coastal Engineering Staff. The applicant needs to submit a coastal engineering report and a site-specific wave run-up report (typically prepared by the Project Coastal Engineering Consultant) that addresses the location of the OWTS. The Project Coastal Engineering Consultant evaluates the effectiveness of any existing shoreline protective device, including recommendations for any repair or for the installation of a new shoreline protective device. It is the responsibility of the applicant to provide as-built plans for existing shoreline protection devices to verify that they are adequate for the protection of a new or existing OWTS.

The Malibu LCP-LIP (Chapter 10, Section 10.4, paragraph J) requires that the OWTS be located as far landward as feasible, regardless of any existing shoreline protection devices or neighboring property design. The design and location of the OWTS is the primary consideration in the project layout.

3.1.5 Seawalls/Rock Revetments/Bulkheads

New shoreline protective devices may be constructed only to protect the property's OWTS or existing residences. As mentioned above, the City of Malibu Local Coastal Program requires that shoreline protective devices be located as far landward as feasible.

Repairs and maintenance to existing shoreline protective devices consisting of less than 20 percent of materials of a different kind may not require a Coastal Development Permit (Malibu LCP-LIP Chapter 13, Section 13.4.2). For such repair projects, the Project Coastal Engineering Consultant should provide a coastal engineering report that includes recommendations regarding the extent of repair. A full wave run-up study may be required, as determined on a case-by-case basis. Any repair consisting of more than 20 percent materials of a different kind is considered a new structure.

Improvements to existing shoreline protective devices that consist of expansion of the structure's physical limits likely need a Coastal Development Permit. Please see Chapters 10 and 13 of the Malibu LCP-LIP for specific requirements. Where there is uncertainty in a project's classification and interpretation of LCP requirements, the Planning Division is tasked with providing clarification as to the applicable LCP standards for a particular project.

3.1.6 Swimming Pools/Spas

For purposes of these guidelines a swimming pool is defined as *"...any structure intended for swimming or recreational bathing that contains water over 24" deep. This includes in-ground, above-ground, and on-ground swimming pools; hot tubs; portable and non-portable spas; and fixed in-place wading pools.*"

Proposed pools on beachfront parcels are subject to review by City Coastal Engineering Staff and need a site-specific wave run-up study prepared by the Project Coastal Engineering Consultant. City codes and ordinances require that proposed pools on the beach be supported on a pile foundation system, allowing waves to pass unimpeded beneath the bottom of the pool shell and keeping the pool wall from acting as a

seawall. It is expected that the Project Coastal Engineering Consultant provide recommendations for the bottom elevation of the pool shell and the foundation system that meet or exceed minimum LCP and building code elevation requirements.

3.1.7 Mechanical Vaults

City codes and ordinances require that proposed mechanical vaults be located as far landward as feasible, to be demonstrated to be nonhabitable, have restricted access, and meet or exceed minimum LCP and building code elevation requirements. Electrical equipment should be kept free from potential flooding or wave inundation. Mechanical vaults may not utilize existing or proposed seawalls to provide protection.

3.1.8 Basements

Basements are not allowed on beachfront parcels as stated by the Malibu LCP-LIP Chapter 3, Section 3.6, paragraph K.3.

3.1.9 Beach Access Stairs

The Malibu LCP-LIP (Chapter 10, Section 10.4, paragraph L) requires that stairs allowing beach access be designed to be removable in the event of severe wave events. Stairs may be designed to be removed below the Project Coastal Engineering Consultant's recommended lowest elevation or can be retractable. Stairs may not be constructed on a coastal bluff, nor are foundations allowed to be constructed on the beach or bluffs to support stairs.

Repair or replacement of existing stairs is subject to review by City Coastal Engineering Staff.

3.1.10 Repairs and Maintenance to Existing Structures

Projects in this category include repairs to existing structures and properties damaged by storm surges, wave action, land movement, earthquakes (e.g., ground rupture, liquefaction, seismic settlement, or lateral spread), flooding, fires, wood rot and fungi, and other natural disasters. Coastal engineering reports may be required, as determined on a case-by-case basis by City Coastal Engineering Staff in accordance with the City's current building codes and ordinances. In the report, the Project Coastal Engineering Consultant is responsible for addressing the causes and extent of damage and providing repair alternatives in accordance with standards of practice and the City's guidelines.

3.1.11 Public Access

Coastal engineering reports may be required for public access projects, as determined on a case-by-case basis by City Coastal Engineering Staff. Such projects may include but are not limited to bluff-top access for coastal viewing, recreational access, and vertical access to provide a connection between a public road, trail, or recreation area and the publicly owned shoreline, tidelands, or established lateral access. Development and construction is required to conform to the Malibu LCP-LIP. See Chapter 12 of the Malibu LCP-LIP for detailed requirements.

3.1.12 Exempt Projects

Projects that do not typically require coastal engineering reports include, but are not limited to:

- Interior remodels with no alterations to the structural framing or to the OWTS.
- Replacement of existing permitted hardscape, decking, stairs, etc., with like-for-like materials for up to 50 percent of the structure.
- Replacement of existing permitted supporting elements not founded on the beach including but not limited to grade beams, cross bracing, and connections, if the elements are being replaced with like-for-like materials.
- Second floor additions and rooftop decks that do not encroach seaward, that do not need new foundations, and that are considered unsubstantial improvements.

3.2 Types of Studies/Reports

Coastal engineering reports may be prepared by Project Coastal Engineering Consultants for a variety of scopes of services depending on the proposed development project and the stage of review. In accordance with the California Business and Professions Code, engineering reports should be prepared by a registered ***Civil Engineer*** with experience in coastal engineering. Documents that include engineering data, interpretations, or recommendations should be signed, dated, and stamped by a registered ***Civil Engineer*** (CE) with experience in coastal engineering, and should include the engineer's license number and license expiration date.

3.2.1 Feasibility/Preliminary Design/Design-Level Reports

Feasibility studies focus on the viability of the proposed development and potential impacts the proposed land uses may have on the coastal environment. Specific mitigation measures are not required at this stage of review. Feasibility studies should, however, demonstrate that potential hazards that may affect the proposed development can be mitigated, and they should demonstrate that the development will not negatively impact natural coastal processes or resources.

Design-level reports provide site-specific design recommendations associated with a specific development concept but frequently precede development of building plans. Studies at this stage involve ***specific*** design recommendations and mitigation of coastal hazards as they relate to the proposed development. For many projects the preliminary design report is intended to serve both as the feasibility design report and the design-level report. In such cases, minor or major changes can occur in development plans between the time the wave run-up report is prepared and the time of submittal.

3.2.2 Update Reports

Update reports from a Project Coastal Engineering Consultant may be necessary when:

- The scope of the project changes.
- Site conditions change.
- Previous reports are more than one year old.
- At the discretion of the Building Official.

Update reports describe the currently proposed development; include a site reconnaissance report, a plan review, and an up-to-date site plan and beach profile (see Section 4); and reference prior reports. The update report states whether the recommendations of the prior report(s) are applicable, or provides revised recommendations, as appropriate.

3.3 Change of Consultant Letters

When a change in Project Coastal Engineering Consultants occurs after the review process has been initiated or ownership of the property has changed, it is the responsibility of the new Project Coastal Engineering Consultant to provide written notification to the City. Such letters typically state that the new Project Coastal Engineering Consultant has reviewed the work by the previous Project Coastal Engineering Consultant, concurs with their recommendations and conclusions, and agrees to assume responsibility as the Project Coastal Engineering Consultant of record from this date forward. When the new consultant does not concur with the previous Project Coastal Engineering Consultants' recommendations and conclusions, additional analyses may be warranted. It is the responsibility of the new Project Coastal Engineering Consultant to provide a stamped and signed electronic copy of the notification letter to City Coastal Engineering Staff for review.

No new permits are issued for a project, and previously permitted work stops until the City is officially notified of the name, address, and telephone number of the new Project Coastal Engineering Consultant, or as otherwise approved by the Building Official.

3.4 Definitions

3.4.1 Coastal Engineering Reports

Coastal engineering reports are reports that provide recommendations for the construction of, materials to be used in, and mitigation against wave loading, overtopping discharge, and uplift forces for proposed structures and shoreline protective devices in the coastal zone. It is expected that the recommendations be based on wave run-up analyses that may be interchangeable with or incorporated into the wave run-up studies, and that the analyses and recommendations be in general accordance with those methods and guidelines set forth in the *Coastal Engineering Manual* (USACE, 2002), the *Coastal Construction Manual* (FEMA, 2011), ASCE 24 *Flood Resistant Design and Construction* (ASCE, 2006), and standards of practice for coastal engineering.

3.4.2 Wave Run-Up Study

Wave run-up studies provide a discussion of the results of site-specific analyses for wave run-up, tsunami risk, storm-scoured beach profiles, and historic and current mean high tide lines. These analyses are based upon local and regional site-specific beach profiles, maps, and studies and provide wave run-up results, impact forces, and beach scour profiles. The wave run-up study provides elevations for wave run-up based on multiple design wave and stillwater scenarios, storm surge, sea level rise, and design beach profile. The wave run-up study may be interchangeable with or incorporated into coastal engineering reports.

3.4.3 Coastal Bluffs

For the purposes of the coastal engineering review, coastal bluffs are "*an escarpment or steep face of rock, decomposed rock, or soil resulting from erosion, faulting, or folding of the land mass that has a vertical relief of 10 feet or more and is located in the coastal zone*" on beachfront parcels that are impacted by wave action. Bluffs with development located between the base of the bluff and the ocean are not considered to be impacted by wave action. Please see the Planning Department for further interpretations.

3.4.4 Building Site

The building site includes the spatial location of an actual or planned structure or set of structures on a lot or parcel of land. The building site also includes hardscape, clearances, site drainage improvements, and easements.

3.4.5 Habitable Structure

For purposes of these guidelines a habitable structure is an enclosed space usable for living or business purposes, which include but are not limited to working, sleeping, eating, cooking, recreation, office, or any combination thereof. An area that is used as storage only and that is incidental to a residential use is not considered a habitable space or structure.

4 GUIDELINES FOR COASTAL ENGINEERING REPORTS

This section provides specific guidelines related to report content for various aspects of most coastal engineering reports.

4.1 Reference Standards

It is expected that wave run-up and coastal engineering reports comply with the most recent versions of appropriate standards, codes, manuals, and professional guidelines. The citations for some of the appropriate references are included in Appendix A.

4.2 Report Organization

The Project Coastal Engineering Consultant is responsible for providing coastal engineering reports that include the following items, as appropriate, for each project. The Project Coastal Engineering Consultant determines the specific report format.

- Purpose and Scope – Clearly define the purpose and scope of the study.
- Site Description – Describe the existing site conditions, including:
  - Site location, address, and Assessor's Parcel Number.
  - Site topography.
  - Site drainage.

  - Existing structures and improvements.
  - Adjacent properties, in particular, closely located residences, shoreline protection devices, and slopes that may affect or be affected by the proposed development.
- Proposed Development – Describe the proposed development, clearly showing the proposed development on plans and cross-sections.
- Previous Coastal Engineering Data, including:
  - Date and consultant's name for previous reports prepared for the site.
  - Beach profile and other pertinent data contained within the reports.
- Coastal Engineering Analyses and Findings – Describe the project's coastal environment setting, processes, and hazards affecting the site at regional and local levels. Describe the analyses performed and the technical findings, including discussion to support the design parameters selected and validity of the model results in light of historical observations. Analyses should include discussion of the following with supporting documentation, data, and technical analysis as appropriate:
  - Project area and boundary conditions.
  - Coastal geologic conditions.
  - Littoral drift and sediment transport patterns.
  - Meteorological and hydrodynamic processes (e.g., sea level rise, wave climate, seasonal storm conditions).
  - Identification of coastal hazards affecting the site (e.g., erosion, tsunami, coastal flooding).
- Conclusions – Based on the findings and recommendations provided in the report, provide conclusions concerning the feasibility of the proposed project with respect to the following:
  - Required findings expressed in Section 9.3 of the Malibu LCP-LIP, Chapter 9 – Hazards.
  - Required findings expressed in Section 10.3 of the Malibu LCP-LIP, Chapter 10 – Shoreline and Bluff Development Ordinance.
- Recommendations – For projects where coastal hazard mitigation is necessary for feasibility, the Project Coastal Engineering Consultant is responsible for providing recommendations in support of the conclusions presented in the report. See Sections 5 and 6 for further details concerning the following:
  - Wave run-up extent and impact forces.
  - Overtopping analysis and mitigation.
  - Tsunami hazards.
  - Erosion (e.g., long term, influence of existing and proposed man-made structures, local scour due to storm conditions, and natural variation).
  - Mitigation of potential impacts on public access, sand supply, and other coastal resources.
  - Impediment of waves.
  - Finished floor elevations.
  - Location and elevations of proposed shoreline protective devices.
  - Foundation system.
  - Structure elevations and foundation systems.
  - Protection of utilities.
  - Applicable FEMA Special Flood Hazard Area designation.
  - Protection of structures against wave impact.
  - Condition of existing shoreline protection devices (e.g., bulkheads/seawalls) and their ability to protect existing and proposed on-site wastewater treatment system components.

- Figures – Include with each report:
  - Site location map.
  - Beach profile.
  - Tsunami inundation/risk maps.
- Signatures of Registered Professionals.
- References – Include as appropriate.
- Appendices – Include as appropriate.

4.3 Plans and Cross-Sections

Project Coastal Engineering Consultants are responsible for submitting plans and cross-sections (including but not limited to site location maps and beach profiles) with their reports. It is expected that the plans and cross-sections demonstrate the locations of the proposed structures or improvements, the on-site wastewater treatment system, wave run-up line and elevation, most landward mean high tide line, road right-of-way or other horizontal control marker, proposed shoreline protective device, and any shoreline protective devices on adjacent properties. It is also expected that cross-sections show the elevations of the proposed structures, shoreline protective device(s), existing topography, and the lowest anticipated design beach profile over the life of the structure.

4.3.1 Site Location Map

A site location map (to be provided for all proposed projects) has a prominent north arrow and scale, illustrates the subject site and surrounding area, and encompasses a large enough area to easily and accurately locate the site on regional maps. Site location maps incorporate:

- Site topography.
- Existing features including the planned development, drainage, and protection structures.
- Proposed project clearly shown on plans and sections.
- The entire OWTS clearly shown on plans and sections.
- Existing or proposed shoreline protective devices.
- Horizontal control (e.g., NAD83, LA County Beach Control Line).
- Elevations of top and bottom of shoreline protective devices.
- Existing shoreline protective devices on adjacent properties.
- Surveyed locations of mean high tide lines acceptable to the State Lands Commission.
- Wave run-up line.
- FEMA Special Flood Hazard Areas.
- Elevations that reference the NAVD 88 datum.

4.3.2 Beach Profile

A site-specific beach profile (to be provided with each report) includes:

- Existing or proposed structures.
- Wave run-up profile including maximum elevation and horizontal limit based on multiple design wave scenarios.
- Breaking wave height.

- Breaking wave crest elevation.
- Horizontal control (e.g., NAD83, LA County Beach Control Line).
- Road right-of-way line.
- Elevations and corresponding datum.
- Surveyed locations of mean high tide lines acceptable to the State Lands Commission.
- Design still water line elevation.
- Historical and the most recent beach profiles provided by the U.S. Army Corps of Engineers, Los Angeles County, or other entity, and the profiles' proximity to the project.

In the site-specific beach profile, the Project Coastal Engineering Consultant is responsible for using a slope and a scale sufficient to clearly depict the details of the proposed development and results of the wave run-up analyses.

4.4 Technical Documentation

For submitted technical documentation, the Project Coastal Engineering Consultant is responsible for:

- Substantiating findings, conclusions, and recommendations by data included within the report.
- Reviewing and referencing in the report any applicable regionally published (and unpublished, if available) wave run-up studies, maps, aerial photographs, and other technical documents (e.g., reports on file with the City) for the immediate area or subject property.
- Researching public (including jurisdictional) files for the surrounding area, including update reports when prepared.
- Substantiating recommendations and conclusions for site-specific analyses.
- Where professional judgment is employed to augment the data and analyses, clearly and thoroughly discussing the technical rationale to support the judgment.

4.4.1 Alternate Wave Run-Up Studies

Project applicants proposing minor property improvements or repairs may utilize mean high tide lines and wave run-up limits from previous wave run-up reports developed for properties in close proximity and with similar coastline conditions to the proposed project. The alternate wave run-up studies may not be used for design, but may be used to verify seaward limits of extensions or finished floor elevations for existing development. These projects may be reviewed over the counter with City Coastal Engineering Staff.

Projects that may use alternate wave run-up studies include but are not limited to minor deck extensions, remodels, and second level or infill seaward additions. It is the responsibility of the applicant to obtain final approval from the State Lands Commission for any seaward development.

4.4.2 Previous Coastal Engineering Data

Project Coastal Engineering Consultants are responsible for incorporating and properly referencing within the coastal engineering report any coastal engineering data previously collected for the subject site or adjacent sites and for including such data on the coastal engineering map and profile. Project Coastal Engineering Consultants should perform a diligent search for previous data, should discuss known

coastal engineering evaluations for the site, and should include copies of previous reports and data as appropriate. Project Coastal Engineering Consultants may contact the City Coastal Engineer to request available coastal engineering data for specific properties where such data is on file at the City. Consultants may also research public documents (e.g., building permits, coastal engineering reports, and geologic reports) using the Libertynet public records management database, which may be accessed through the City's website.

4.4.3 Identification and Mitigation of Coastal Hazards

The Project Coastal Engineering Consultant is responsible for describing, discussing, and evaluating potential coastal hazards (e.g., tsunamis, seiche, coastal flooding, wave action, wind, and erosion) and for either stating that each hazard is not present or providing appropriate mitigation measures for all projects (e.g., new construction, remodels, additions, swimming pools/spas, and repairs) regardless of size or scope. Discussions and evaluations of each potential coastal hazard and any proposed mitigation measures need to be adequately and clearly supported with data and appropriate analyses. Reviewers expect that the Project Coastal Engineering Consultant use the discussions and evaluations to demonstrate that the consultant has given adequate consideration to each potential coastal hazard. Additionally, it is expected that the discussions and evaluations provide information to the property owner as to which hazards are present at the subject site, which hazards are not present, and the mitigation measures that are being implemented (see Sections 4, 5, and 6). The lack of discussion and evaluation of a particular hazard is not interpreted by the reviewers as a presumption that such hazard does not exist, even if in the opinion of the reviewer a particular hazard is not present at a site. It is neither the intent nor responsibility of the reviewer to infer conclusions that a particular hazard is not present. The Project Coastal Engineering Consultant should provide appropriate statements for each of the typical coastal hazards. Reports submitted without an evaluation of and comments on potential hazards may be deemed incomplete and a response may be requested in the review.

Although the risks associated with some hazards cannot be totally eliminated, the Project Coastal Engineering Consultant should recommend risk mitigation methods that minimize the effects of the hazards (e.g., preventing structural collapse, injury, loss of life, or undue financial burden), ***and should identify in the report for the property owner the level of risk that remains for risks that are not mitigated***. Acceptable mitigation methods may include recommendations related to site layout, site drainage, maintenance practices, structural design, and obtaining appropriate insurance.

In situations where hazards are not identified at the site, the report should include statements to that effect and should provide support for making such statements.

4.4.4 Mitigation of Adverse Impacts to Coastal Resources

It is the responsibility of the Project Coastal Engineering Consultant to describe, discuss, and evaluate coastal resources (e.g., shoreline sand supply, public access) and the potential adverse impacts of the proposed project on those resources. It is expected that discussions and evaluations of coastal resources, potential adverse impacts of the proposed development, and any proposed mitigation measures be adequately and clearly supported with data and appropriate analyses. The rationale for necessitating that coastal resources and potential adverse impacts of the proposed development be discussed and evaluated is to demonstrate that the Project Coastal Engineering Consultant has given adequate consideration to

coastal resources and the mitigation measures that are being implemented. The lack of discussion and evaluation of coastal resources and the adverse impacts of the proposed development is not interpreted by the reviewers as a presumption that the proposed development does not adversely impact coastal resources, even if in the opinion of the reviewer there is no adverse impact to coastal resources. It is neither the intent nor responsibility of the reviewer to infer conclusions that a particular coastal resource is not adversely impacted by the proposed development. The Project Coastal Engineering Consultant should provide appropriate statements concerning the potential adverse impacts of the proposed development on coastal resources. Reports submitted without an evaluation and comments on coastal resources may be deemed incomplete and a response may be requested in the review.

Although the adverse impacts of the proposed development on coastal resources cannot be totally eliminated, the adverse impacts need to be mitigated to a level so that the project is consistent with the Malibu LCP-LIP Chapter 10. Acceptable mitigation methods can consist of but are not limited to recommendations related to site layout, maintenance practices, and structural design.

4.4.5 References

The Project Coastal Engineering Consultant is responsible for including in the report a statement referring to the standards and specifications used for wave run-up analyses. Referenced materials may include:

- Literature and records reviewed and cited.
- Aerial photographs or images interpreted, listing the type, date, scale, source, and index numbers, etc.
- Compiled data, maps, or plates included or referenced.
- Other data sources.

4.4.6 Computer-Assisted Analyses

For computer-assisted engineering analyses, the Project Coastal Engineering Consultant is responsible for referencing the software used, for including printouts of applicable input and output files, and for including slope configurations and any other source for input data.

5 COASTAL ENGINEERING GUIDELINES

The following sections are intended to serve as a guide to the Project Coastal Engineering Consultant as to the items that City Coastal Engineering Staff members evaluate when reviewing coastal engineering projects. The list is not intended to be exhaustive. The Project Coastal Engineering Consultant is responsible for addressing each of the applicable items with substantiating information. The lack of discussion or evaluation of particular items is not interpreted by the reviewers as a presumption that the items not addressed are unimportant or do not need mitigation, even if in the opinion of the reviewer such is the case. The Project Coastal Engineering Consultant has the responsibility to identify and discuss each issue and to provide mitigation measures as necessary.

5.1 Site Characterization

The Project Coastal Engineering Consultant is responsible for accurately characterizing the coastal factors that affect the proposed project. The USACE (2002) *Coastal Engineering Manual*, Part V - Coastal Project Planning and Design, identifies numerous factors that the Project Coastal Engineering Consultant should consider for the proposed project. In characterizing the project site, the Project Coastal Engineering Consultant is responsible for accounting for the parts of the coastal engineering system, temporal variability, and spatial variability of these factors. These factors are used in coastal hazard and coastal resource evaluations.

Some of the factors that have been identified in the *Coastal Engineering Manual* Part V that pertain specifically to the requirements of the Malibu LCP and other applicable codes include:

- Project area and boundary conditions
- Storm characteristics/meteorology
- Hydrodynamic processes (e.g., design sea state, water levels, currents)
- Seasonal variability
- Topography and bathymetry
- Geomorphology/geometry and sediment characteristics
- Littoral drift and sediment transport patterns
- Shoreline change trends
- Land/shore use

5.1.1 Project Area and Boundary Conditions

In the coastal engineering analyses for the project, the Project Coastal Engineering Consultant is responsible for identifying and considering the spatial limits of the proposed development, coastal hazards, the proposed development's influence on adjacent coastline, and the influence of existing development on the subject property.

5.1.2 Storm Characteristics/Meteorology

It is the responsibility of the Project Coastal Engineering Consultant to identify the storm types and characteristics (i.e., similar to the 1983 El Nino storm events) to which the proposed development may be subjected.

5.1.3 Hydrodynamic Processes (e.g., Design Sea State, Water Levels, Currents)

The Project Coastal Engineering Consultant is responsible for developing the design water level and wave conditions for which the proposed project is evaluated. Current Malibu LCP-LIP and municipal code standards do not specify the design water level and wave criteria needed for evaluation. Due to the numerous variables associated with the hydrodynamic conditions and other site conditions, it is difficult to calculate the joint probability of recurrence for a given set of design sea conditions. It is understood though that combining conservative estimates of tide, sea level rise, storm surge, wave height and period conditions, and storm-scoured beach profile conditions may result in estimates that are more conservative than the one-percent-annual-chance flood event. It is the consultant's responsibility to provide a

combination of design conditions that produce coastal flooding effects corresponding to a one percent or greater chance of flooding in any year with appropriate consideration also given to the other site characterization factors (e.g., beach erosion and sea level rise).

Guidance pertaining to delineating coastal flood hazard areas is provided by the FEMA (2004, Rev. 2005) *Final Draft Guidelines for Coastal Flood Hazard Analysis and Mapping for the Pacific Coast of the United States.* The USACE (2002) *Coastal Engineering Manual*, Part II-5, also provides guidance pertaining to evaluation of storm event frequency-of-occurrence relationships.

Guidelines issued by Los Angeles County (1983) specify minimum design tide and wave height and period criteria. These guidelines have been used by Project Coastal Engineering Consultants and accepted by the City of Malibu with modifications for consideration of sea level rise and storm surge.

The basis for selection of design hydrodynamic conditions should be clearly explained in the coastal engineering report. The Project Coastal Engineering Consultant should at a minimum provide an evaluation of a single design water level incorporating multiple design wave height and period combinations anticipated to occur over a given design storm duration. Analysis of shoreline protection structures should at a minimum consider the largest wave able to be supported within the breaking wave distance at the base of the structure. Analysis of single-wave, extreme event scenarios such as tsunami inundation may also be warranted depending on the evaluation of the Project Coastal Engineering Consultant.

Project Coastal Engineering Consultants are responsible for reviewing regional wave climate data and studies as they become available and for incorporating their findings as applicable.

5.1.4 Seasonal Variability

The Project Coastal Engineering Consultant should consider seasonal variation of the other factors listed herein, particularly providing differentiation between seasonal and long-term trends.

5.1.5 Topography and Bathymetry

The Project Coastal Engineering Consultant is responsible for evaluating the current and historical topographic and bathymetric conditions of the project site. Projects should include a recent site survey (i.e., dated within 24 months of project submittal). The Project Coastal Engineering Consultant should also provide supporting information, such as beach profile surveys, concerning estimated near-shore slope conditions.

Historical beach profile surveys published by Los Angeles County during the mid-1900s available to the public through Los Angeles County, the City of Malibu, or coastal engineering reports located within public records at the City should be incorporated where available into new coastal engineering reports. The applicability and significance of those profiles to proposed future development should be addressed.

The collection of new topographic and hydrographic data is often dependent upon evaluations performed under the direction of regional authorities such as FEMA, U.S. Army Corps of Engineers, or Los Angeles County. Project Coastal Engineering Consultants are responsible for reviewing regional topographic and hydrographic surveys as they become available and for incorporating them into coastal engineering reports as applicable.

5.1.6 Geomorphology/Geometry and Sediment Characteristics

The coastal engineering report should include a description of the geologic conditions at the project site. Geologic conditions need to be consistent with the interpretations and information provided by the project geologic and geotechnical consultants. The geologic conditions to be described include, but may not be limited to, identification of the type of coastline, principal features of the coastline, sediment characteristics (e.g., size, composition, shape), and stratigraphic profile.

5.1.7 Littoral Drift and Sediment Transport Patterns

The Project Coastal Engineering Consultant is responsible for providing an evaluation of the littoral processes affecting the project site. The evaluation should include a regional characterization of the littoral cell for which the project is a part, including the sources and sinks of the littoral system, long-term trends, and seasonal patterns.

The Project Coastal Engineering Consultant is responsible for including an evaluation of the site-specific littoral processes, including a description of the longshore and cross-shore sediment transport processes. The evaluation should consider the natural shoreline condition, existing development conditions, and proposed development condition.

5.1.8 Shoreline Change Trends

The coastal engineering evaluations for the proposed development should consider the long-term shoreline change trends in the evaluation of coastal hazards and impacts to coastal resources. The significance of long-term trends and differentiation between seasonal variability should be addressed. The Project Coastal Engineering Consultant is responsible for providing an estimate of current beach stability (i.e., accreting, eroding, or stable) and for providing an assessment of the potential impacts of a change in beach stability over the design life of the proposed development.

The coastal engineering report should provide a discussion of the potential hazards associated with sea level rise and should provide an estimate for the sea level rise anticipated to occur during the design life of the project in accordance with the requirements of the Malibu LCP-LIP (Chapter 10, Section 10.4, paragraph A), taking into account an acceleration of the historic rate of sea level rise. The report should address its potential impact on beach erosion, shoreline retreat, and bluff erosion rates.

5.1.9 Land/Shore Use

The Project Coastal Engineering Consultant is responsible for evaluating the potential effect of current and future land uses on the regional and site-specific coastal hazards and resources. Such effects may include, but are not limited to, the effects of dams and detention basins on sediment supply, the influence of proposed shoreline protection devices on adjacent existing development or natural beaches, construction feasibility, and site accessibility.

When preparing project recommendations, the Project Coastal Engineering Consultant should consider, to the extent feasible, information pertaining to historic surveyed mean high tide lines acceptable to the State Lands Commission, information pertaining to easements, and information pertaining to offers to dedicate.

5.2 Coastal Resources

If there is a potential for a project to create adverse impacts, the Malibu LCP-LIP Chapter 10 requires written findings of fact, analyses, and conclusions addressing impacts to coastal resources, including public access and shoreline sand supply, in support of Coastal Development Permit approvals. Coastal engineering reports need to contain substantial evidence to support the findings that are required of the City. To help support the required findings, coastal engineering reports should contain regional and site-specific characterizations of the natural coastal processes, existing processes, and the potential adverse impacts of the proposed development on coastal resources.

5.3 Coastal Hazards

If there is a potential for a project to create adverse impacts, the Malibu LCP-LIP Chapters 9 and 10 require written findings of fact, analyses, and conclusions addressing potential hazards, structural integrity, and impacts to public access and shoreline sand supply in support of Coastal Development Permit approvals. Coastal engineering reports need to contain substantial evidence to support the findings. To help support the required findings, coastal engineering reports should contain, at a minimum, a site-specific description of the following potential hazards:

- Tsunamis.
- Sea level rise.
- Coastal flooding.
- Erosion.

The framework for evaluation of coastal hazards is based generally on the guidance provided by the *Coastal Construction Manual* (FEMA, 2011). Evaluations of coastal hazards are to include the following components:

- Definition and characterization of the coastal hazards that may affect the subject property and proposed development in terms of type, severity, and frequency.
- Consideration of long- and short-term trends and cyclic variations.

- A determination as to whether extrapolation of historical trends to the future development is reasonable, along with an evaluation of particular changes to the environment, coastal system, land use, development, or other factors that may prevent extrapolation of data to the project design life.
- A forecast of the type, severity, and frequency of hazards anticipated to affect the property over the full projected 100-year economic life of the development, modified to account for deviations from historical patterns.

Based on the evaluation of coastal hazards, the coastal engineering report should provide a determination of the greatest flood hazards resulting from a one-percent-annual-chance coastal flood event to which the site may be exposed over the anticipated life of a building or development.

5.3.1 Tsunami Inundation and Risks

The Project Coastal Engineering Consultant is responsible for providing a discussion regarding the risks of potential tsunamis. This discussion should incorporate historic data, published studies, and possible mitigation against the risk. The Project Coastal Engineering Consultant should provide tsunami run-up estimates for a 100-year recurrence period.

The Malibu LCP-LIP (Chapter 9, Section 9.4, paragraph I) states that, "*where feasible, development shall be sited outside of potential tsunami inundation zones. Tsunami inundation zones shall be defined as those areas identified as such on maps released by the California Office of Emergency Services, as they become available. If no such map is available, a Registered* ***Civil Engineer*** *with coastal experience shall make a determination, through wave run-up analysis, whether the site may reasonably be expected to be subject to inundation during a tsunami. If it is not feasible to site development outside of a tsunami inundation zone, new development shall be in conformance with all of the provisions set forth in this chapter [LCP-LIP Chapter 9] with regard to Special Flood Hazard Zones. In addition, development shall be constructed to resist lateral movement due to the effect of water loading from the maximum expected tsunami, to the greatest extent feasible.*"

The Safety and Health Element of the City of Malibu General Plan (1995) includes a "Tsunamis Runup Map for 100 Year and 500 Year Recurrence" (Figure S-11).

The California Geological Survey and the California Emergency Management Agency have jointly published *Tsunami Inundation Maps for Emergency Planning* for the Topanga, Malibu Beach, Point Dume, and Triunfo Pass Quadrangles. These maps are available for review on the CGS website. The maps delineate the "*maximum considered tsunami runup from a number of extreme, yet realistic, tsunami sources.*" However, the maps are identified as being for evacuation purposes and are not applicable for other regulatory purposes.

5.3.2 Coastal Flooding Effects

The coastal engineering report should identify the potential origins, frequency, and duration of coastal flooding. The hazards should be evaluated using a site-specific wave run-up analysis for natural and developed beach profiles. The wave run-up evaluation should be used to develop recommendations for design hydrostatic and hydrodynamic forces, uplift forces, and the rate of overtopping in conjunction with minimum design load requirements set forth in the building code.

5.3.3 Erosion

It is expected that the coastal engineering report provide discussion of the potential erosion hazards to which the property may be subjected. Evaluation of the potential for erosion to occur at the site should include identification of the causes of erosion. Estimates of long-term erosion, short-term storm-induced scour, and local scour around foundations and man-made structures should be provided. The design beach profile should reflect the estimated erosion, including storm-induced scour, over the design economic life of the project.

5.3.4 Wave Run-Up Analysis

Site-specific wave run-up analyses are to be performed for new development and evaluation of existing development. The methods used to calculate wave run-up should be consistent with those methods outlined in the *Shore Protection Manual* (USACE, 1984), the *Coastal Engineering Manual* (USACE, 2002), or other published method. Wave run-up estimates based on regional evaluations are not acceptable.

A wave run-up analysis may be warranted for different shoreline profiles in order to capture the impact of variation of the beach profile on wave run-up. The following conditions should be evaluated for coastal projects:

- Undeveloped beach profile
  A wave run-up analysis should be performed for the anticipated design beach profile considering both storm scour potential and non-erodible boundaries. This profile may be appropriate in determining the location of proposed development, necessity of a shoreline protection device, the design beach profile for residential foundations, and the extents of return walls. The analysis should be performed even for heavily developed stretches of coastline where near-continuous shoreline protection exists, as there is currently no guarantee of the protection of off-site shoreline protection devices and since new development (except OWTS) is to be designed without the benefit of a shoreline protection device.
  The consultant should also evaluate the impact of a translated beach profile on the proposed development. The wave run-up most detrimental to the proposed development may not occur under fully scoured conditions.
- Developed beach profile
  A wave run-up analysis should be performed for proposed shoreline protection devices, whether a revetment, vertical structure, or alternative solution such as beach nourishment is specified.

5.3.5 Overtopping Analysis

It is expected that overtopping analysis be performed for proposed shoreline protection structures. The consultant is responsible for selecting the method of analysis and design parameters that best model the design conditions. The overtopping analysis should include at a minimum an estimate of the average overtopping discharge rate per unit length of structure under design conditions for comparison to published threshold values for overtopping discharge, such as the "Critical Values of Average Overtopping Discharges" table (Table VI-5-6 of the USACE *Coastal Engineering Manual*, 2002). For structures where overtopping is anticipated to occur during the design storm event, adequate drainage design should be provided to maintain drainage and reduce flooding of the land side of the structure for the duration of the storm event. The consultant should also provide an estimate of the maximum overtopping discharge per wave in accordance with methods published in the *Coastal Engineering Manual* (USACE, 2002) or other engineering publications, as the single-wave analysis may be a controlling factor in the design.

An estimate of the overland bore propagation should also accompany overtopping discharge analyses. The consultant should provide an evaluation of the hazards associated with overtopping on people, structures, and utilities on the landward side of shoreline protection structures and should provide mitigation as necessary.

5.4 California Building Code and FEMA Regulations for Special Flood Hazard Areas

The California Building Code and the City's Floodplain Management ordinance (Malibu Municipal Code Chapter 15.20) regulate coastal engineering aspects of residential development on the basis of mapped Special Flood Hazard Areas and other design guidelines (e.g., ASCE 7 and ASCE 24 as referenced in the building code). The City of Malibu Public Works Department is responsible for enforcing the minimum requirements of the Floodplain Management ordinance with respect to coastal development. Where flood maps do not provide flood elevation data, the Building Official has the authority to require that a flood elevation be determined according to accepted hydrologic and hydraulic engineering practices used to define special flood hazard areas. Due to the potential for variation between the Project Coastal Engineering Consultant's recommendations and minimum design standards set forth in the aforementioned codes and ordinances, there is a potential for the Project Coastal Engineering Consultant's recommendations to be more or less conservative than the minimum requirements of applicable codes. The Project Coastal Engineering Consultant is responsible for identifying the applicable codes and design guidelines regulating coastal development and for identifying the controlling constraints governing the design of the site.

5.5 Applicability of ASCE 24 and ASCE 7 to Site-Specific Coastal Engineering Reports

The preparation of site-specific coastal engineering reports that estimate one-percent-annual-chance flood events may result in coastal hazards that are more landward and more severe than shown on published community maps. Specifically, coastal hazard analyses may indicate that the technical criteria for Coastal High Hazard Areas and Coastal A Zones (ASCE 24, Section 4.1.1) are present landward of the mapped limits on published community maps. The building code requires adherence to ASCE 7 and

ASCE 24 only for flood hazard areas published on maps adopted by the community. The Project Coastal Engineering Consultant is responsible for identifying discrepancies between the published flood hazard map and the physical conditions presented in the coastal engineering analyses.

Design standards set forth in ASCE 7 and ASCE 24 are to be maintained in areas where the technical criteria for a special flood hazard area have been met but no flood elevation has been mapped.

Where it is not feasible to meet published design standards in flood hazard areas with no mapped elevation data, the coastal engineering report is to identify whether the recommendations diverge from published regulations for mapped flood hazard areas. Approval is to be issued on a case-by-case basis as an alternative design. The Project Coastal Engineering Consultant is responsible for identifying the hazards associated with the nonstandard design and for providing mitigation measures as necessary.

5.6 Coastal Engineering Conclusions

Based on the findings, analyses, and recommendations provided in the report, the Project Coastal Engineering Consultant is responsible for providing substantiated conclusions whereby the City's decision-making body can support the following:

- Required findings expressed in Section 9.3 of the Malibu LCP-LIP, Chapter 9 – Hazards.
- Required findings expressed in Section 10.3 of the Malibu LCP-LIP, Chapter 10 – Shoreline and Bluff Development Ordinance.

When a new OWTS or repair to an existing OWTS is made, the Project Coastal Engineering Consultant is also responsible for providing a substantiated conclusion that the proposed shoreline protection system is adequate to protect the OWTS.

6 COASTAL ENGINEERING RECOMMENDATIONS

6.1 Design Standards

Projects meeting the requirements of Section 1612.4 of the California Building Code are to be designed and constructed in accordance with Chapter 5 of ASCE 7 and with ASCE 24.

6.2 Foundations

6.2.1 Residential Foundations

It is the responsibility of the Project Coastal Engineering Consultant to provide recommendations for the design of residential foundations to mitigate wave impact, using the results of analyses from the wave run-up study. The Project Coastal Engineering Consultant is responsible for ensuring that development is sited out of the wave run-up zone, allowing waves to pass underneath the structure, and that foundations are designed to provide sufficient vertical and lateral support with consideration of severe erosion and the predicted scour.

6.2.2 Pool Foundations

The Project Coastal Engineering Consultant is responsible for providing specific recommendations for the design of pool foundations to mitigate wave impact, including recommended elevations for the bottom of the proposed pool shell. It is also the responsibility of the Project Coastal Engineering Consultant to ensure that pools are designed and constructed to allow waves to pass unimpeded beneath the pool shell, that the pool wall does not act as a seawall, and that foundations are designed to provide sufficient vertical and lateral support with consideration of severe erosion and the predicted scour.

6.2.3 Foundation Materials

The Project Coastal Engineering Consultant is responsible for providing recommendations as to the types of materials to be used for construction of foundation elements. It is expected that the consultant recommend materials that are the most feasible for marine conditions and that protect and extend the life of the structure(s) to the maximum extent feasible.

6.3 Finished Floor Elevations

The Project Coastal Engineering Consultant is responsible for providing recommendations for minimum finished floor elevations based on results from the wave run-up analyses. Floors and decks are to conform to this elevation restriction.

6.3.1 Lowest Horizontal Structural Member

The Project Coastal Engineering Consultant is responsible for providing a recommendation for the bottom elevations of the lowest horizontal structural members, such as grade beams and pool shell bottoms. It is important that recommendations meet or exceed the minimum applicable building code, Floodplain Management ordinance, and LCP-LIP requirements.

6.4 Shoreline Protection Devices

Proposed shoreline protection devices are to be located as far landward as feasible and are to be used only to protect existing permitted residences and new and existing on-site wastewater treatment systems. Where shoreline protective devices are necessary, the preferred method is the use of vertical walls to protect development. Rock revetments may be considered for protection along stretches of beach susceptible to beach erosion. The Project Coastal Engineering Consultant may provide specific recommendations for shoreline protective devices, but only when it has been determined that the proposed project cannot be designed or constructed without the use of such devices. The location of the shoreline protection device relative to the residence may be subject to policies of the City of Malibu Floodplain Manager.

6.4.1 Seawalls/Bulkheads

The Project Coastal Engineering Consultant is responsible for providing specific recommendations for proposed seawalls or bulkheads. These recommendations are to include, but may not be limited to, top-of-wall elevations to minimize overtopping, bottom-of-wall elevations to prevent undermining, return-wall elevations and extent, and construction materials.

6.4.2 Rock Revetments

The Project Coastal Engineering Consultant is responsible for providing recommendations for the proposed rock revetment, including but not limited to location and extent, top and bottom elevations, cross-section, type of stones and cap rock, revetment face angle, and maintenance. The rock revetment armor stone should be sized based on wave uprush and breaking wave velocity, revetment face angle, placement, specific gravity of the rock, and resistance to abrasion.

6.4.3 Existing Shoreline Protection Structures

Use of existing shoreline protection structures may be permitted, provided that the repairs and improvements to the structures comply with the requirements of the Malibu LCP-LIP. The determination as to the suitability of existing structures to protect new development (e.g., new wastewater systems associated with additions and improvements) should be based on current design standards. The Project Coastal Engineering Consultant is responsible for providing documentation in accordance with the USACE's Technical Report CERC-89-15 entitled *Criteria for Evaluating Coastal Flood-Protection Structures* (1989) when evaluating existing structures. Documentation for planning-level approval includes as-built plans and cross-sections depicting the existing structure, wave run-up analysis of the existing structure, design details, cross-section and material properties, historical maintenance and performance records, evaluation of toe protection and scour potential, structure stability, and materials.

6.4.4 Flanking Protection and Shoreline Protection Returns

Flanking protection is necessary at the ends of shoreline protection devices. Flanking protection should be provided entirely on site where feasible. Flanking protection may consist of revetment returns or return walls or other alternative to be approved on a case-by-case basis. Flanking protection should extend to the wave run-up limit for an unprotected beach condition and be of sufficient height to prevent or mitigate adverse effects of overtopping.

Off-site shoreline protection structures may not be utilized for flanking protection of on-site improvements unless the shoreline protection devices are lawfully established, certified by the Project Coastal Engineering Consultant, and otherwise conform to the Malibu LCP-LIP. The utilization of off-site means of shoreline protection should be identified by the Project Coastal Engineering Consultant in the coastal engineering report. The Project Coastal Engineering Consultant should also identify potential hazards associated with relying on off-site shoreline protection devices and should provide recommendations for monitoring of the off-site flanking protection.

Planning-level approval of off-site shoreline protection device(s) utilized for flanking protection may be contingent upon submittal of a signed and recorded "Assumption of Risk and Release" (ARR) during building plan-check review. The ARR should identify coastal engineering hazards associated with the use of off-site shoreline protection devices. Planning-level approval of off-site shoreline protection device(s) utilized for flanking protection may also be contingent upon the submittal, during building plan-check review, of a recorded covenant between the property owner and the City indicating that the off-site shoreline protection device(s) are to be monitored by a coastal engineer.

6.5 Shoring and Temporary Excavations

When a shoring system is proposed in conjunction with the installation of a permanent shoreline protection device or other structures impacted by wave action, the Project Coastal Engineering Consultant is responsible for consulting with Project Geotechnical Consultant to determine the appropriate design parameters. Developed shoring plans are to be reviewed and approved for conformance to the Project Coastal Engineering Consultant's recommendations.

Shoring systems are sometimes used as temporary support structures to retain earth until a permanent structure is completed. The Project Coastal Engineering Consultant is responsible for consulting with the Project Geotechnical Consultant on shoring design parameters for temporary shoring that is used to retain soil in conjunction with the installation of any of temporary or permanent coastal structures.

Appendix A - References

Reference Documents

City of Malibu Reference Documents

- City of Malibu General Plan, November 1995.
- Malibu Municipal Code.
- Title 26 - Building Code of the Los Angeles County Code, as amended and in effect on January 1, 2011, adopting the *California Building Code*, 2010 Edition (Part 2 of Title 24 of the California *Code of Regulations*), 2011. [Use most recent adopted version]
- City of Malibu Local Coastal Program Land Use Plan, September 13, 2002.
- City of Malibu Local Coastal Program Local Implementation Plan, September 13, 2002.

General Reference Documents of Codes, Guidelines, and Standards

- Professional Engineers Act (Business and Professions Code sections 6700-6799), as amended during the 2012 legislative session and in effect on January 1, 2013.
- Board Rules and Regulations Relating to the Practices of Professional Engineering and Professional Land Surveying (California *Code of Regulations*, Title 16, Division 5, sections 400-476), 2013.
- ASCE/SEI 7-05, *Minimum Design Loads for Buildings and Other Structures.* Reston, VA: American Society of Civil Engineers, 2005. [Use most recent version as referenced in building code]
- ASCE/SEI 24-05, *Flood Resistant Design and Construction.* Reston, VA: American Society of Civil Engineers, 2006. [Use most recent version as referenced in building code]

United States Army Corp of Engineers General Coastal Engineering References

- U.S. Army Corps of Engineers (1984), *Shore Protection Manual,* Volumes I and II (4th Edition), Washington, D.C.
- U.S. Army Corps of Engineers (1989), *Criteria For Evaluating Flood-Protection Structures,* Technical Report CERC-89-15, Washington, D.C.
- U.S. Army Corps of Engineers (1989), *Environmental Engineering for Coastal Shore Protection,* Engineer Manual 1110-2-1204, Washington, D.C.
- U.S. Army Corps of Engineers (1992), *Automated Coastal Engineering System, Technical Reference,* Washington, D.C.
- U.S. Army Corps of Engineers (1995), *Design of Coastal Revetments, Seawalls, and Bulkheads,* Engineer Manual 1110-2-1614, Washington, D.C.
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- U.S. Army Corps of Engineers (1990), *Construction with Large Stone,* Engineer Manual 1110-2-2302, Washington, D.C
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- U.S. Army Corps of Engineers (2011), *Sea-Level Change Considerations for Civil Works Programs,* Engineer Circular EC 1165-2-212, Washington, D.C.
- U.S. Army Corps of Engineers (1991), *Broken Wave Forces*, Coastal Engineering Technical Note CETN I-50, December 1991.
- U.S. Army Corps of Engineers (1990), *Wave Forces on a Wall Shoreward of the Still-Water Line*, Coastal Engineering Technical Note CETN III-29, December 1990.
- U.S. Army Corps of Engineers (1988), *Breaking Wave Forces on Walls*, Coastal Engineering Technical Note CETN-III-38, March 1988.

Federal Emergency Management Agency (FEMA) Coastal Construction References

- FEMA (2009), *2009 International Building Code [a compilation of flood resistant provisions, prepared by FEMA]*. [Use most recent version as referenced in building code]
- FEMA (2011), *Coastal Construction Manual: Principles and Practices of Planning, Siting, Designing, Constructing, and Maintaining Residential Buildings in Coastal Areas*, P-55 (4th Edition), Volumes I and II.
- FEMA (2012), *Engineering Principles and Practices of Retrofitting Floodprone Residential Structures*, P-259 (3rd Edition).
- FEMA (2004, Rev. 2005), *Final Draft Guidelines for Coastal Flood Hazard Analysis and Mapping for the Pacific Coast of the United States*.
- FEMA (2008), *Free-of-Obstruction Requirements for Buildings Located in Coastal High Hazard Areas in accordance with the National Flood Insurance Program*, Technical Bulletin 5.
- FEMA (2003), *Guidelines and Specifications for Flood Hazard Mapping Partners, Appendix D: Guidance for Coastal Flooding Analyses and Mapping*.
- FEMA (2010), *Home Builder's Guide to Coastal Construction*, P-499.
- FEMA (2009), *Local Officials Guide for Coastal Construction: Design Considerations, Regulatory Guidance, and Best Practices for Coastal Communities*, P-762.
- FEMA (1999), *Protecting Building Utilities From Flood Damage: Principles and Practices for the Design and Construction of Flood Resistant Building Utility Systems*, P-348 (Edition 1).
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- FEMA (2009), *Recommended Residential Construction for Coastal Areas: Building on Strong and Safe Foundations*, P-550 (2nd Edition).
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- California Emergency Management Agency (2009), *Tsunami Inundation Map for Emergency Planning, Topanga Quadrangle*, California Geological Survey, March 1, 2009.
- California Emergency Management Agency (2009), *Tsunami Inundation Map for Emergency Planning, Triunfo Pass Quadrangle*, California Geological Survey, March 1, 2009.
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Pertinent Websites

State and Federal Websites

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- www.bpelsg.ca.gov Department of Consumer Affairs, Board for Professional Engineers, Land Surveyors, and Geologists
- www.coastal.ca.gov California Coastal Commission
- www.dbw.ca.gov California State Parks Devision of Boating and Waterways
- http://www.fema.gov/residential-coastal-construction FEMA Residential Coastal Construction
- https://msc.fema.gov FEMA Map Service Center
- http://resources.ca.gov/ocean California Ocean Resources Management Program
- http://www.usgs.gov U.S. Geological Survey
- http://walrus.wr.usgs.gov USGS Pacific Coastal and Marine Science Center

Tsunami Hazards

- http://www.conservation.ca.gov/cgs/geologic_hazards/Tsunami/Pages/Index.aspx
  California Department of Conservation, Tsunami Inundation maps
- http://www.hazardmitigation.calema.ca.gov/hazards/natural/seismic/hazards
  California Emergency Management Agency – Hazard Mitigation
- http://www.tsunamiresearchcenter.com
  University of Southern California (USC) Tsunami Research Center
- http://www.tsunami.noaa.gov NOAA Tsunami

Professional Associations

- www.asce.org American Society of Civil Engineers (ASCE)
- www.ascelasection.org ASCE Los Angeles Section
- www.asce.org/copri/COPRIHome.aspx ASCE Coasts, Oceans, Ports & Rivers Institute
- http://http://asbpa.org The American Shore & Beach Preservation Association
- http://www.csbpa.org California Shore and Beach Preservation Association

City of Malibu

- http://www.malibucity.org City of Malibu, California
- http://qcode.us/codes/malibu-coastal/ Malibu Local Coastal Program
- http://qcode.us/codes/malibu/ Malibu Municipal Code
- http://qcode.us/codes/malibu-general-plan/ Malibu General Plan

Coastal Data

- http://www.californiacoastline.org California Coastal Records Project, an aerial photographic survey of the California Coastline
- http://cdip.ucsd.edu The Coastal Data Information Program, Integrative Oceanography Division, Scripps Institution of Oceanography
- http://tidesandcurrents.noaa.gov NOAA Tides and Currents

Design and Construction

- http://chl.erdc.usace.army.mil US Army Corps of Engineers (USACE), Coastal and Hydraulics Laboratory (CHL)
- http://chl.erdc.usace.army.mil/cem USACE CHL Coastal Engineering Manual
- http://www.iccsafe.org International Code Council (ICC)
- http://www.overtopping-manual.com/index.html HR Wallingford Ltd, Wave Overtopping
- http://www.publications.usace.army.mil/USACEPublications/EngineerManuals.aspx U.S. Army Corps of Engineers (USACE) Official Publications - Engineer Manuals
- http://journals.tdl.org/icce/index.php/icce Coastal Engineering Proceedings, International Conference on Coastal Engineering (hosted at the Texas Digital Library - Journals)