Solid Waste Industry Group

Sanitation Districts of Los Angeles County
San Bernardino County Department of Public Works Solid Waste Division
Ventura Regional Sanitation District
OC Waste & Recycling
Rural Counties' Environmental Services Joint Powers Authority
Riverside County Waste Management Department
Salinas Valley Solid Waste Authority
Kern County Waste Management Department
Fresno County Public Works & Planning
Monterey Regional Waste Management District
League of California Cities
California State Association of Counties
Solid Waste Association of North America, California Chapters
City of Sunnyvale
City of Santa Cruz
Lassen Regional Solid Waste Management Authority
Tulare County Resource Management Agency Solid Waste Division
Waste Management
Republic Services
Waste Connections
Recology

October 18, 2010

Mr. Watson Gin
Project Manager
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Dear Mr. Gin:

CalRecycle's Proposed Best Management Practices (BMPs) for
Preparing Site-Specific Non-Water Quality Corrective Action Plans

The Solid Waste Industry Group (SWIG) appreciates the opportunity to further comment on CalRecycle's guidance document for preparing site-specific non-water quality corrective action (CA) plans. The purpose of the CA plan is to estimate the cost of any non-water quality CA that may occur in the future as a result of a reasonably foreseeable catastrophic event. The extent of repairs (corrective action) that the landfill operator is to assume depends on the severity of the hypothetical catastrophe. CalRecycle has proposed catastrophes (causal events) so extreme and so improbable that they are not, by any

measure, "reasonably foreseeable." The financial assurance regulations that were adopted by CalRecycle in 2009 mandate that the CA plans be based on what is "reasonably foreseeable" and site-specific. The signatories to this letter, which collectively represent the vast majority of the solid waste management infrastructure in California, find these causal events (presented in the guidance document as BMPs) unacceptable. We instead propose alternative BMPs for each causal event (summarized in Attachment 1 and discussed below).

Our previous comment letter dated October 4, 2010 focused solely on the seismic portion of the guidance document, proposing an alternative BMP for earthquakes that reflect the current standard of practice for evaluating seismic hazards for most civil and structural engineering design projects in California. This comment letter addresses all the remaining BMPs, which incorrectly assume that what is theoretically possible – no matter how improbable or remote – is reasonably foreseeable.

What is Reasonably Foreseeable?

Reasonably foreseeable is what is likely or can be predicted to occur in the not too distant future with some degree of certainty based on empirical, historical, or scientific evidence. It is not of such low probability that the chances of it occurring at any given moment are extremely remote, becoming speculative in nature. Any of the following criteria can be used to disqualify a causal event from being considered reasonably foreseeable:

- *Extreme Uncertainty in Quantification or Estimate is Questionable* – The event is so improbable and such an outlier that there is very poor accuracy or tremendous uncertainty in quantifying the impact. An example is the 1,000-year 24-hour storm, where in October 2007 the National Oceanic and Atmospheric Administration (NOAA) considered discontinuing the publication of 1,000-year precipitation frequency estimates because of the "severe uncertainty associated with computing such extreme events."[1]

- *Extremely Low Probability of Occurrence* – The severity of certain types of causal events (earthquakes, precipitation, and floods) is determined by the probability of such an event occurring in any given year. As the probability of it occurring approaches zero, however, the causal event is so improbable and so infrequent that it can no longer be considered reasonably foreseeable. It is instead considered an "extreme event" that is extremely unlikely to occur and too speculative to predict. For example, there is a 0.1 % chance of a 1,000-year 24-hour storm occurring in any given year. In other words, there is a 99.9% chance of it not occurring. Such a storm is considered an extreme event, not a reasonably foreseeable event. As another example, the Federal Emergency Management Agency (FEMA) defines an "extreme flood as a 0.2% chance of exceedance (500-year flood)."[2]

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[1] 2008 California Extreme Precipitation Symposium, Presentation on Updating California Precipitation Frequency Estimates by the Chief of Hydrologic Science and Modeling Branch of NOAA

[2] 2007 California Extreme Precipitation Symposium, Presentation on Extreme Flood Concepts, An Historical Perspective, by a Senior Advisor for Institute for Water Resources, U.S. Army Corps of Engineers

- *Ignores Fact or Real Cases of Epic Catastrophic Events (in California)* – There are several real cases in which severe fires have impacted landfills. While these fires may have destroyed homes and structures, the damage to the landfill was minimal. Landfills often act as a firebreak given the significant surface area with dirt. For example, the fire that impacted Olinda Alpha Landfill in Orange County primarily damaged the landfill gas collection header pipes around the perimeter of the landfill. While it was one of the largest fires in Orange County's history, about 20 percent of these landfill structures were lost or damaged. Assuming greater losses, as proposed in the guidance document, lacks credibility in face of historical facts or actual cases. Consequently, hypothetical causal events that are contradictory to fact cannot, by any measure, be considered "reasonably foreseeable."

Proposed Alternative BMPs

The overall framework that we propose for developing site-specific non-water quality CA cost estimates is summarized in Attachment 1. SWIG proposes two tiers of evaluation for each causal event:

- *Landfill Design Requiring No Corrective Action Cost Estimate* – Should the landfill feature be designed to a standard above or sufficient to withstand a reasonably foreseeable causal event, then it will be assumed that no damage or a de minimus amount of damage would occur. Consequently, no non-water quality CA cost estimate would be required for that causal event.

- *Reasonably Foreseeable Causal Event Exceeding Class III Landfill Design Standard* – Should the landfill feature not be designed as stated above, then a non-water quality CA would be estimated based on a reasonably foreseeable causal event impacting the landfill that exceeds the existing Title 27 minimum design standard for Class III landfills. SWIG proposes a range of what is reasonably foreseeable for that causal event, which allows for the third party expert or consultant to determine what specific causal event is appropriate for the landfill given site-specific characteristics and hazards.

The following are the specific causal events/BMPs that we propose:

Precipitation

For rain events or precipitation, we propose a 24-hour storm with a return period ranging from 200 to 500 years as the reasonably foreseeable causal event. The third party consultant would determine the specific return period based on site-specific characteristics and hazards, some of which may include risk factors from the AB 2296 Study[3]. Should the landfill drainage system be designed to accommodate a storm event greater than a 500-year 24-hour storm, then no corrective action cost estimate would be required. This BMP framework is presented in the table below.

[3] Study to Identify Potential Long-Term Threats and Financial Assurance Mechanisms for Long-Term Postclosure Maintenance and Corrective Action at Solid Waste Landfills, November 2007.

Existing Class III Design Standard	Reasonably Foreseeable Causal Event for which Corrective Action Costs are to be Estimated	Landfill Design Standard in which a Corrective Action Cost Estimate is Not Required
100-Year 24-Hour Storm	200 to 500 year 24-hour storm, depending on the results of a site-specific hazard analysis	Greater than 500-year 24-hour storm

CalRecycle staff proposes a 1,000-year 24-hour storm as the BMP primarily because the Central Valley Regional Water Quality Control Board (Regional Board) included the rainfall estimate of such a storm in the waste discharge requirements (WDRs) for a couple of Class II disposal facilities. These are not Class III municipal solid waste (MSW) landfills. Furthermore, according to a technical paper written by Dana Woodall and Jay Lund of the University of California, Davis, which was published in the Journal of Contemporary Water Research and Education, "the Central Valley level of protection standard is a rain event with a return period ranging from a 200 to 500 years."[4]

A 1,000-year 24-hour storm is an extreme event where there is tremendous uncertainty in estimating the amount of rainfall. As stated above, in 2007, NOAA considered discontinuing the publication of 1,000-year precipitation frequency estimates because of the "severe uncertainty associated with computing such extreme events." Consequently, just because a rainfall estimate of such a storm is included in a WDR it does not mean it is accurate or meaningful. A 1,000-year 24-hour storm is not a reasonably foreseeable causal event.

Site-specific characteristics need to be considered in the CA plans. In California, the average annual precipitation varies greatly across the state. Some regions have very arid climates while others are prone to wet weather. In a 2003 CalRecycle report[5] the contractor (Geosyntec) found that about 75 percent of the 224 landfills surveyed are located in areas with an average annual precipitation of less than 20 inches. Only 8 landfills are located in areas with relatively high precipitation (50 inches per year or greater).

Flood

For floods, we propose a BMP framework where the reasonably foreseeable causal event is commensurate with the FEMA flood risk designation for the area where the landfill is located. For landfills located in an area designed by FEMA as low risk, the causal event would be a 100-year flood. This would not exceed the Class III design standard, so no corrective action cost estimate would be required. For landfills located in an area designated by FEMA as moderate risk, the causal event would be a flood with a return period ranging from 200 to 500 years. The third-party consultant would determine the specific return period based on site-specific characteristics and hazards, some of which may include risk factors from the AB 2296 Study. For landfills located in high flood risk

[4] *Dutch Flood Policy Innovations for California*, by Dana L. Woodall and Jay R. Lund, published in Journal of Contemporary Waste Research & Education, Issue 141, Pages 45-59, March 2009

[5] Landfill Facility Compliance Study Phase I Report – Results of Screening Analyses of 224 California MSW Landfills, 2003 CalRecycle Report written by Geosyntec under contract

areas, the causal event is a 500-year flood. If the elevation of the landfill is above the 500-year flood plain, then no corrective action cost estimate is required. It will be assumed that no damage or a de minimus amount of damage would occur. A 200-year flood would be used for undesignated FEMA areas. This BMP framework is presented in the table below.

Existing Class III Design Standard	Reasonably Foreseeable Causal Event for which Corrective Action Costs are to be Estimated	Landfill Design Standard in which a Corrective Action Cost Estimate is Not Required
100-Year Flood	• 100-year flood for landfills in areas designated by FEMA as low risk, so a de minimus amount of damage is assumed • 200-year flood for landfill in areas undesignated by FEMA • 200 to 500-year flood for landfills in areas designated by FEMA as moderate risk, depending on site-specific hazard analysis • 500-year flood for landfills in areas designated by FEMA as high risk	Elevation of landfill is above the 500-year flood plain

CalRecycle staff proposes that a 500-year flood be the causal event. As indicated above, FEMA considers a 500-year flood an "extreme flood," where in any given year there is a 0.2% chance of it occurring. This flood event should not be considered reasonably foreseeable. The causal event should instead be commensurate with the level of flood risk.

Our proposed BMP for floods exceeds current design standards. The 100-year storm is typically used for designing flood control protection from major storms and is the current design standard for Class III landfills under Title 27. In an October 7, 2008 presentation to the National Committee on Levee Safety, Dr. Gerry Galloway of the Water Policy Collaborative recommended that a 200-year flood be the standard of flood protection by 2030 in order to provide the "highest level of risk reduction feasible to existing urban areas."[6]

Fire

For fires, we propose a BMP framework that is commensurate with the fire risk and reflective of real cases of epic catastrophic fires in California. As mentioned above, the fire that impacted Olinda Alpha Landfill in Orange County primarily damaged the landfill gas collection header pipes around the perimeter of the landfill. While it was one of the largest fires in Orange County's history, only about 20 percent of these surface structures were destroyed or damaged. The BMP for catastrophic fires should be in line with these facts. Additionally, the California Department of Forestry and Fires (Cal Fire) and local

[6] Background presentation to National Committee on Levee Safety (Hhttp://www.nfrmp.us/ncls/docs/Gerry_Galloway_History_of_Levees.pdfH)

agencies have developed hazard maps that show low, moderate, high, or very high fire risk zones. The zones are reflective of the fire risk. The table below presents the BMP framework we propose, which takes into consideration all the above.

Existing Class III Design Standard	Reasonably Foreseeable Causal Event for which Corrective Action Costs are to be Estimated	Landfill Design Standard in which a Corrective Action Cost Estimate is Not Required
Not applicable	• For landfills in areas designated as moderate risk, it will be assumed that 10% of the combustible surface structures within 100 feet of landfill perimeter[7] are destroyed • For landfills in areas designated as high risk, it will be assumed that 20% of the combustible surface structures within 200 feet of landfill perimeter are destroyed • For landfills in areas designated as very high risk, it will be assumed that 30% of the combustible surface structures within 300 feet of landfill perimeter are destroyed	For landfills in areas designated as low fire risk, no corrective action estimate is required

CalRecycle's proposed BMP assumes that up to 80 percent of the combustible surface structures within 300 feet of the landfill cell boundaries would be destroyed. This level of destruction exceeds real cases of catastrophic fires impacting landfills in California. Furthermore, CalRecycle staff proposes a 20 percent contingency to replace surface structures even if the landfill is not located in any fire hazard zone. This is certainly not reasonably foreseeable.

Seiche

CalRecycle staff proposes that a seiche be a reasonably foreseeable causal event for a landfill that is located within ½ mile of a lake or bay. Given that the only known occurrence of seiche in California was during prehistoric times around Lake Tahoe, seiches are not reasonably foreseeable.

Tsunami

Tsunamis should only be a reasonably causal event if the landfill is located in tsunami inundation zone as designated by the California Department of Conservation or local emergency agency and the topography between the landfill and the coastline is not higher than the predicted wave height. This BMP framework is shown in the table below.

[7] Permitted facility boundary

Existing Class III Design Standard	Reasonably Foreseeable Causal Event for which Corrective Action Costs are to be Estimated	Landfill Design Standard in which a Corrective Action Cost Estimate is Not Required
Not applicable	If the landfill is located in a tsunami inundation zone as designated by the California Department of Conservation or local emergency agency and the topography between the landfill and the coastline is not higher than the predicted wave height, then a tsunami is a potential causal event.	Landfill is not located in a tsunami inundation zone

Site-Specific Hazard Analysis

The financial assurance regulations that were adopted by CalRecycle allow for site-specific factors, hazards, or characteristics to be considered when developing the non-water quality CA cost estimate. Certain factors, such as immediate proximity to a fault and soils subject to liquefaction, increase the seismic hazard or risk for the landfill. The third party consultant preparing the CA plan should take this into account when selecting the specific return period for the potential earthquake impacting the landfill.

The risk factors contained in the AB 2296 Study, however, should not be the driving criteria for selecting a specific causal event or return period. It was the opinion of many stakeholders at the time that the AB 2296 risk factors were essentially worthless as a risk measurement tool. The risk factors were overly simplistic, unrelated to landfill integrity, not based on any engineering or science, and had no direct connection to a release or probability of CA.[8]

As indicated above, SWIG is proposing a CA estimation framework where the causal events that are used are both site-specific and reasonably foreseeable, and that they are commensurate with the risk level for that landfill. As currently proposed by CalRecycle, this is not the case. Your consideration of our proposed framework and specific BMPs is very much appreciated.

Yours very truly,

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[8] See Sanitation Districts of Los Angeles County letter dated November 1, 2007 to Ms. Bobbie Garcia of CalRecycle on Draft Report to Identify Potential Long-Term Threats and Financial Assurance Mechanisms for Long-Term Postclosure Maintenance and Corrective Action at Solid Waste Landfills

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Attachment 1
Causal Event BMPs Proposed by SWIG

Type of Causal Event	Existing Class III Landfill Design Standard	Reasonably Foreseeable Causal Event for which Corrective Action Costs are to be Estimated	Landfill Design Standard in which a Corrective Action Cost Estimate is Not Required
Earthquake	Maximum Probable Earthquake (MPE) In 100 Year Period	For final refuse-fill slope or final cover systems not designed to the MCE, operators would evaluate the potential damage caused by a seismic event with a return period ranging from 200 to 475 years using the probabilistic method. The third party involved in developing the corrective action plan would determine the specific return period after evaluating all site-specific factors, some of which may include risk factors identified in the AB 2296 study.	Maximum Credible Earthquake (MCE): If the landfill's final refuse-fill slope or final cover systems are designed to the MCE, then no corrective action cost estimation or analysis is required.
Precipitation	100-Year 24-Hour Storm	200 to 500 year 24-hour storm, depending on results of a site-specific hazard analysis	Drainage capacity greater than 500-year 24-hour storm
Flood	100-Year Flood	• 100-year flood for landfills in areas designated by FEMA as low risk, so a de minimus amount of damage is assumed • 200-year flood for landfill in areas undesignated by FEMA • 200 to 500-year flood for landfills in areas designated by FEMA as moderate risk, depending on site-specific hazard analysis • 500-year flood for landfills in areas designated by FEMA as high risk	Elevation of landfill is above the 500-year flood plain
Fire	Not applicable	• For landfills in areas designated as moderate risk, it will be assumed that 10% of the combustible surface structures within 100 feet of landfill perimeter are destroyed • For landfills in areas designated as high risk, it will be assumed that 20% of the combustible surface structures within 200 feet of landfill perimeter are destroyed • For landfills in areas designated as very high risk, it will be assumed that 30% of the combustible surface structures within 300 feet of landfill perimeter are destroyed	For landfills in areas designated as low fire risk, no corrective action estimate is required

Tsunami	Not applicable	If the landfill is located in a tsunami inundation zone as designated by the California Department of Conservation or local emergency agency and the topography between the landfill and the coastline is not higher than the predicted wave height, then a tsunami is a potential causal event.	Landfill is not located in a tsunami inundation zone
Seiche is not a reasonable foreseeable event			

Best Management Practices (BMPs) for
Site-specific Non-water Release Corrective Action Plans
(Discussion Draft November 2010)

California Department of Resources Recycling and Recovery (CalRecycle)

Introduction

The owners and operators of all disposal facilities that were or are required to be permitted as solid waste landfills and have been or will be operated on or after July 1, 1991, are required to provide financial assurance for corrective action based on the highest amount of either the water release corrective action or non-water release corrective action. The regulations allow a landfill owner or operator to determine the value of the non-water release corrective action fund through one of three methods: the site-specific non-water release Corrective Action Plan (CA Plan); the cost for replacement of the final cover; or the closure cost estimate for the landfill. If a landfill owner or operator selects to prepare a CA Plan, the CA Plan must be updated in accordance with the regulations. (http://www.calrecycle.ca.gov/lea/Regs/Implement/Postclosure/default.htm)

This document provides the best management practices (BMPs) to assist owners and operators in developing sound cost estimates for correction action in the CA Plan. The BMPs will also assist CalRecycle and local enforcement agencies in minimizing resources needed for the regulatory review of the CA Plan. The CA Plan is required to provide an assessment of the reasonably foreseeable impacts due to causal events and the costs to remediate the reasonably foreseeable impacts. Specific causal events identified in the regulations include earthquake, flood, precipitation, tsunami, seiche and fire. This document encompasses:

- Definition and characterization of causal events;
- Consideration of what impacts ought to be considered for each causal event;
- Requirements for containment and environmental monitoring and control systems to be maintained to standards;
- Known releases;
- Requirement to use a third party to develop the CA Plans; and
- Frequently asked questions.

The BMPs do not change the required minimum standards for the siting, design, and operation of a landfill and do not provide recommendations on the methods for determination of the potential damage, required corrective action activities, and associated costs. It is expected that standard practices and methods will continued to be used to determine the potential damage, the required corrective action activities, and associated costs. As a result of the causal event, the CA Plan must contain evaluations of the potential impacts and associated corrective action activities as shown in Table 1.

The BMPs also do not address potential releases to groundwater or surface water from the disposal site that should be part of the water release corrective action plan which is under the jurisdiction of the Regional Water Quality Control Boards.

General Scope and Applicability of BMPs

Best management practices (BMPs) are practical and effective processes, practices, or techniques to achieve a desired outcome. They are offered as "good ideas" that may need to be adjusted to account for individual needs or site-specific circumstances. BMPs are **not** rules, regulations, or mandatory standards. The scope of the BMPs is guidance for preparing the site-specific non-water release CA Plan prepared in lieu of using the cost estimates for final cover replacement. (http://www.calrecycle.ca.gov/Laws/Rulemaking/Postclosure/Phase2/default.htm)

The desired outcome for the BMPs for the CA Plan is to develop cost estimates based on sound science, engineering, and professional standards of practice to establish financial assurances ensuring that known or reasonably foreseeable corrective actions at solid waste landfills are accounted for with minimal financial risk to the State.

Technical Advisory Group

A technical advisory group (TAG) was established to assist CalRecycle staff in the development of the draft BMPs by providing comments, recommendations, and technical analysis and information. The TAG is comprised of stakeholder groups including local enforcement agency, environmental community, Air Resources Board, State Water Resources Control Board, and technical experts in the following areas: seismic, slope/soil stability, landfill cap design and repair, systems for monitoring and collecting landfill gases, leachate systems, erosion due to storms and flooding, and landfill fires.

What is Correction Action?

Corrective Action means an activity, including restoring the integrity or establishing the adequacy of a damaged or inadequate containment structure or environmental monitoring or control system, to bring a landfill into compliance with the applicable minimum standards, prevent a reasonably foreseeable release, or remediate a known release to the environment. Examples of the structures and systems (as required by Titles 14 and 27) that may need corrective action would include, but not limited to, the cap and cover system, landfill gas monitoring and collection system, slopes, roads, run-on and run-off control (drainage) systems, vegetation and irrigation systems, and environmental monitoring and control systems.

Corrective action does not include routine maintenance. Routine maintenance is required to be addressed the postclosure maintenance plans. A postclosure maintenance plan is required to include activities and associated costs for the maintenance and for replacement (when the useful life ends) of equipment and structures, including the final cover. Equipment and structures would include the monitoring and control systems for landfill gas, and leachate and drainage systems (27 CCR 21815 and 21840). These activities and estimates are required to be addressed in

the CA Plan to ensure that all necessary replacement costs are accounted for and if the item is considered routine postclosure maintenance and not corrective action.

What needs to be in a CA Plan?

The CA Plan must include the following, pursuant to 27 CCR 22102:

- An evaluation of the known or reasonably foreseeable non-water release corrective action needed as a result of each known or reasonably foreseeable causal event;

- Cost estimates, prepared pursuant to 27 CCR 22101(c)-(f), for all known or reasonably foreseeable corrective actions described in the plan. The cost estimate with the highest amount must be used to determine the amount of financial assurance required pursuant to 27 CCR 22221(b)(2);

- An evaluation of the long-term performance of the final cover system to ensure that it will continue to meet the requirements of 27 CCR 21140 without the need for corrective action; and

- Provisions to restore the integrity or establish the adequacy of a damaged or inadequate containment structure or environmental monitoring or control system, to bring a landfill into compliance with the applicable requirements.

The CA Plan must contain an evaluation of each corrective action needed as a result of each causal event. A CA Plan is required, pursuant to 27 CCR 22102(c), to be prepared by a licensed third-party professional. The potential impacts requiring corrective action due to each causal event are identified in Table 1. Each evaluation needs to include the methodology used and assumptions; address how the systems and structures identified in the tables below will be affected; the corrective action needed to restore the systems and structures (as described in Table 2) to the minimum standards; and the associated costs. Attachment 1 is an example of how the costs can be summarized for each system or structure; a sheet would be used to address each causal event.

Table 1

Causal Event 27 CCR §22100(c)(2)	Potential Impact Requiring Corrective Action §22100(c)(1)	Design Standards Title 27 CCR
Earthquake (seismic shaking, liquefaction, ground rupture)	Slope or containment failure with or without breach of cover system, including waste exposure; damage to environmental monitoring and control systems (gas, leachate, drainage).	Class III- MPE; not on Holocene fault; Class II/I- MCE and >200' from Holocene fault.
Flooding (regional flood inundation)	Inundation/washout of monitoring and control systems; erosion; slope failure; increased leachate/gas generation with potential for public contact.	Class III/II/I- 100-year flood.
Precipitation (high intensity storm event)	Washout of monitoring and control systems; erosion; waste exposure; slope failure.	Class III- 100-year 24-hour Class II- 1000-year 24-hour Class I- Probable Maximum Precipitation (PMP)
Tsunami (seismic sea wave) **Seiche** (natural wave in lake or bay)	Similar to Earthquake, Flooding, Precipitation causal events.	NA
Fire (surface wildfire or subsurface landfill fire)	Destruction of monitoring and control systems and release of gas and leachate; subsurface fire may also cause collapse and breach of cover systems and related systems damage.	NA
Degraded/inadequate containment or environmental monitoring and control system	Containment systems and/or monitoring and control systems no longer capable of meeting applicable performance standards. Requires partial or complete replacement and/or upgrade and repair.	Title 27 CCR

Table 2

Seismic Event Non-Water Release Corrective Action Component		Description of Activity	Notes
Cover System	Final Cover Vegetative Layer; Daily and Intermediate Cover	Earthwork and grading to cover waste and repair cracks, settlement, and slope failures. Replacement of vegetative layer.	Estimated quantities (acreage, cubic yards) based on total percentage of landfill footprint estimated to be damaged. Include mobilization, material acquisition, placement, construction surveys, and grading plan costs.
	Final Cover Barrier Layer	Removal and replacement of geosynthetic components (drainage, liner, gas collection) and reconstruction of compacted clay components.	Not applicable to monolithic systems or if site is active and estimates based on active site configuration. *De Minimis* if permanent deformation is ≤ 12 inches. Requires site-specific engineering plans and specifications and construction quality assurance. Estimate quantities based on portion of system breached and requiring repair.
Landfill Gas Collection and Control System	Extraction wells	Repair and/or removal and replacement of damaged collection system components and repair and restart of treatment device.	Not applicable to sites where landfill gas systems not required. Include disconnect/reconnect of gas collection system to allow for cover repair. Estimate number of wells, connector components, and linear feet of piping to be replaced and unit costs. Evaluate added lump sum operations and maintenance cost to immediately repair and restart treatment system.
	Header piping and connections		
	Flare or other treatment devices		
Drainage System	Open channels, pipes, downdrains, basins, appurtenances	Repair and/or removal and replacement of damaged structures.	Coordinate with cover system repair activities. Estimate as percentage damaged of total linear foot or lump sum drainage structures.
Erosion Control	Soil fills and cover	Seed/mulch and other erosion control structures to prevent erosion of soil exposed from corrective action grading activities.	Estimate acreage of disturbed area and unit costs; add lump sum or number/unit cost of erosion control structures. Include landscaping and irrigation systems if applicable.

BMPs for Causal Events and Known Releases

The following BMPs provide recommendations on how to evaluate the corrective action due to each reasonably foreseeable causal event in the CA Plan. Causal events include earthquakes, flooding, tsunami, seiche, fire, and precipitation.

The specific location, design, operation, and maintenance of a landfill are critical factors in determining the impacts, if any, as a result of a causal event. Solid waste landfills, as

well as all required structures, are required to be designed and engineered to minimum standards. To determine what corrective action is necessary, the evaluation must determine if the present design of the landfill can withstand each foreseeable causal event.

For each causal event, the BMP identifies the criteria when the causal event is not considered reasonably foreseeable (and the evaluation is not required) and the description of the causal event that needs to be evaluated in the CA plan. Staff considered the following in development of the BMPs:

- The causal event cannot be the required minimum design standards or siting requirements in Title 27 CCR,
- There is documentation that the causal event has occurred in California,
- Consistent with the State-of-the-practice methodology, or
- Evaluations by other governmental agencies on the likelihood that a causal event would occur in California

Known Release

If there is a known corrective action due to a known release, the CA Plan must address the known corrective action and associated costs. The most likely known non-water corrective action is likely to address a long-term landfill gas violation.

State regulations (27 CCR 20917-20945) require all active solid waste landfills to have landfill gas monitoring systems to comply with the more definitive closed site standards. Furthermore, the California Air Resources Board regulations, "Methane Emissions from Municipal Solid Waste Landfills" which was effective on June 17, 2010, require the monitoring and control systems at solid waste landfills to control methane emissions. Compliance with these requirements should minimize reasonably foreseeable landfill gas releases. However, should postclosure land use change, property boundaries be rezoned toward the fill area, or offsite land use is changed to more sensitive use, additional landfill gas monitoring and control measures and financial assurances may be required in the CA Plan. Additionally, landfills with long-term landfill gas violations are required to address the gas violations as a 'known release' in the CA Plan.

Landfills with known corrective action may be on the Inventory of Facilities Violating State Minimum Standards (see: http://www.calrecycle.ca.gov/SWFacilities/Enforcement/Inventory/Default.aspx).

Earthquakes

An earthquake is a reasonably foreseeable causal event in California. The Working Group on California Earthquake Probabilities predicts that California has more than a 99% probability of an earthquake with a magnitude of 6.7 or greater in the next 30 years. Earthquakes can cause damage to a landfill and associated structures due to ground motion, liquefaction, or fault rupture. Fortunately, there are very few disposal

facilities that are located within 200 feet of Holocene fault zones where fault rupture would likely result in the need for substantial reconstruction corrective action activities and costs.

Design standards are used to ensure that a structure is designed to withstand the ground movement and shaking resulting from a certain size earthquake taking into consideration the proximity and the geology between the location of the structure and faults. Pursuant to 27 CCR 20370, a Class III landfill must be designed to withstand the Maximum Probable Earthquake (MPE) and Class I and II landfills must be designed to withstand the Maximum Credible Earthquake (MCE). The Los Angeles Regional Water Quality Control Board (RWQCB) has required some Class III landfills to be designed to the MCE.

Use of the MPE or MCE is considered to be a deterministic seismic hazard analysis. The probabilistic seismic hazard analysis is referenced in recent building codes and the California Department of Water Resources (DWR) and consultants have stated that the probabilistic approach represents the state-of-the-practice for seismic evaluations. A critical factor in the probabilistic approach is the return period used in the analysis. The longer the return period, the likelihood of occurrence decreases while the magnitude of the earthquake increases. The California Building Code use the 475-year return period for the design of most buildings; for hospitals a 950-year return period is used for collapse prevention and a 2475-year return period is used for critical facilities.

Liquefaction

Another concern associated with earthquakes is when liquefaction occurs, when loose granular materials such as sands and silts below the water table behave like a liquid when shaken by an earthquake. The concern arises from the possibility of liquefaction in the soils which support the landfill structure. Soils in the state of liquefaction can liquefy and lose their ability to support structures or experience a loss of bearing strength. The landfill structure itself is composed of compacted soils and should not be saturated with water. The California Geological Survey and U.S. Geological Survey (USGS) have identified areas of California that are susceptible to liquefaction and landslides due to earthquakes. If a landfill in located within a "Seismic Hazard Zone", a site specific evaluation should be conducted for liquefaction and landslides.

BMP

CalRecycle staff considered the two approaches to assess impacts of earthquakes, the deterministic approach as used in the regulations and the probabilistic approach which is the state-of-the-practice. The BMP for an earthquake as a causal event allows for use of both approaches and takes into consideration the potential risk posed by a landfill in determining the return interval for a probabilistic evaluation. The BMP for an earthquake as a causal event is comprised of four elements to address the potential for ground motion, liquefaction and fault rupture.

(1) If a landfill is designed to the MCE or probabilistic evaluation using a 2475-year return period resulting in ≤ 12 inches of permanent deformation, the required corrective action is considered de minimus for ground motion and the cost estimate for correction action is not required.
(2) If the required correction action is not considered de minimus, an evaluation is required to determine the potential damage due to ground motion, the required corrective action, and the associated costs. The evaluation will compare the design of the landfill to the MCE or use a probabilistic evaluation using the return periods in the table below.

Seismic Design Standard	De Minimus Corrective Action Cost Estimate	Landfill Risk Category	Probabilistic Ground Motions for Estimating Corrective Action Costs
MPE	MCE or 2475-yr return period design event; and ≤ 12 inches permanent deformation.	Low (≤35)	200-year return period
		Medium (36-69)	475-year return period
		High (≥ 70)	475 to 950-year return period

(3) If the landfill is located in a Seismic Hazard Zone, the CA Plan must evaluate the potential effects of liquefaction; and identify the required correction action and costs.

(4) If the landfill is located within 200 feet of a Holocene fault, the CA Plan must evaluate for the potential damage from fault ruptures, identify the required correction and costs.

To determine the landfill risk, the CA Plan may use the method to rank the potential relative risk for a landfill that was developed as part of study conduct by ICF to assess the potential fiscal and environmental risks posed by landfills. Other methods may be used to determine the potential risk of a landfill. The ICF method considers 13 major characteristics as shown in Attachment 2 and assigns a value for each factor depending on the characteristics of the landfill. The methodology is contained in Chapter 5 of the 'Study To Identify Potential Long-Term Threats And Financial Assurance Mechanisms For Long-Term Postclosure Maintenance And Corrective Action At Solid Waste Landfills, November 26, 2007'.
(http://www.calrecycle.ca.gov/archive/IWMBMtgDocs/mtgdocs/2007/12/00022762.pdf)

Flooding

Flooding is a reasonably foreseeable causal event, based on the document, "California's Top 15 Weather Events of 1900's" by the National Weather Service Forecast Office (http://nimbo.wrh.noaa.gov/pqr/paststorms/california10.php). Nine of the 15 events were associated with flooding. Potential damage at a landfills caused by a flood include inundation or washout of slopes, drainage systems, and other structures, including soil erosion or structure failure due to the force of the moving water. The location, elevation of the landfill, design (including the capacity of the drainage control system) and the level of maintenance of the run-on and run-off control systems are major factors in determining if a flood will adversely affect the landfill.

Examples of the type of non-water release damages that may result from a flood include severe erosion, destabilization of the landfill, and significance subsidence as discovered at the Crown Vantage Landfill in Alexandria Township, New Jersey. The Crown Vantage Landfill operated in the 1970s, is on the national Priorities List, and would not meet applicable siting criteria and the minimum standards. More information on this landfill and the efforts of USEPA to stabilize the landfill can be obtained from http://nlquery.epa.gov/epasearch/epasearch?typeofsearch=area&querytext=crown+vantage&submit=Go&fld=oerrpage&areaname=Superfund&areacontacts=http%3A%2F%2Fwww.epa.gov%2Fsuperfund%2Fcontacts%2Findex.htm&areasearchurl=&result_template=epafiles_default.xsl&filter=sample3filt.hts

The required design standards for a solid waste landfill to address flooding are:

> 27 CCR 20260 (c): New Class III and existing Class II-2 landfills shall be designed, constructed, operated, and maintained to prevent inundation or washout due to floods with a 100-year return period. MSW landfills are also subject to any more flood plain and wetland siting requirements referenced in SWRCB Resolution No.93-62 (i.e., see s 258.11, 258.12, and 258.16 of 40CFR258).

The Federal Emergency Management Agency (FEMA) has defined that moderate flood hazards are in areas between the 100-year and 500-year flood and minimal flood hazards are areas above the depth of the 500-year flood (Reference: 'Definitions of FEMA Flood Zone Designations'). Flood zone maps may be obtained from the local flood control agency or the FEMA website at: www.fema.gov .

BMP

CalRecycle staff relied on the FEMA definitions for the flood zone designations to determine minimal and moderate flood hazards.

5	null

The BMP for the flood as a causal event is:

- Flooding is not considered a reasonable foreseeable causal event if the landfill is not located in the 500-year flood zone or the lowest elevation of the landfill perimeter is higher than the predicted elevation of the 500-year flood.

- For the purposes of determining corrective action, any landfill located within the 500-year flood zone needs to assess the potential damage resulting from the 500-year flood.

The evaluation for the flood as a causal event needs to include documentation if the location of the landfill is outside of the 500-year flood zone, shown as C or X (unshaded area) on the flood map. If the landfill is within the 500-year flood zone, the evaluation needs to include a comparison of the predicted elevation of the flood waters to the elevation of the lowest point of the landfill perimeter and an assessment of the potential for erosion and saturation due to the force of moving water or standing water. Such an evaluation needs to assess the potential impacts of the flood causal event as identified in Table 1, considering the capacity of the run-on and run-off control systems and the maintenance of the system to minimize blockage. If the capacity of the system is exceeded, an assessment of the potential soil erosion and impacts on the stability of slopes and supporting soils, damage to structures associated with environmental monitoring or control systems, and the landfill cover; and associated costs for replacement or repair need to be included.

Tsunamis

Tsunamis are sea waves that may be generated by an earthquake, landslide, or volcanic eruption or even by a large meteor hitting the ocean. The California coast has experienced several tsunamis, some causing significant damage. It is anticipated that the types of damage caused by a tsunami would be similar to those resulting from a flood. The most devastating tsunami to affect California in recent history was from the magnitude 9.2 Alaskan earthquake of 1964. Areas of northern California experienced a six-meter (20-foot) tsunami wave that flooded low-lying communities, such as Crescent City, and river valleys, killing 11 people. Tsunamis are considered a reasonable foreseeable causal event as evidenced by historic tsunamis in California.

The regulations, 27 CCR 20240 (f), allows new and existing Class II units to be located in areas subject to tsunamis if the units are designed, constructed, and maintained to preclude failure due to the event. There is not a similar provision for Class III landfills.

BMP

CalRecycle staff relied on the evaluation by the Department of Conservation to identify areas of California that may be inundated by a tsunami and considered the siting requirements for Class II units.

The BMP for the tsunami as a causal event is:

- Tsunamis are not considered a reasonable foreseeable causal event if the landfill is located in an area that is not designated to be prone to be inundated by a tsunami by the Department of Conservation or local emergency response agency.

- For landfills located in an area that is prone to be inundated by a tsunami, the CA Plan needs to address the potential impacts and damage that may result.

The evaluation for the tsunami causal event needs to include documentation that the landfill is not located in an area designated by the Department of Conservation or local emergency response agency. If the landfill is located in an area that may be inundated by a tsunami, the evaluation needs to include the predicted height of the waves and duration, with an assessment of the potential impacts of the predicted waves given the elevation of the landfill as identified in Table 1. The assessment should address the potential impacts with consideration of the amount of water and the velocity of the water in regards to erosion, instability of slopes, and damage to structures associated with environmental monitoring or control, and the landfill cover; and associated costs for replacement or repair.

Seiche

A seiche is a wave on the surface of a lake or landlocked bay caused by atmospheric or seismic disturbances and may be defined as an occasional rhythmic oscillation of water above and below the mean level of lakes or seas, lasting from a few minutes to an hour or more. Seiches are uncommon but have been known to have occurred on Lake Tahoe and the Great Lakes. Damages anticipated to result from a seiche would be similar to those from a flood or tsunami. In a 2003 report prepared by GeoSyntec Consultants, Inc, it was reported that eight landfills were located near a bay or estuary. The report can be downloaded at:
http://www.calrecycle.ca.gov/Publications/default.asp?pubid=1046

The regulations, 27 CCR 20240 (f) allows new and existing Class II units to be located in areas subject to seiches if the units are designed, constructed and maintained to preclude failure due to the event. There is not a similar provision for Class III units.

BMP

CalRecycle considered that a landfill needs to be in the proximity of a lake or landlocked bay to be affected by a seiche.

The BMP for the seiche as a causal event is:

- Seiche is not a reasonable foreseeable causal event, if the landfill is located greater than ½ mile away from a lake or a landlocked bay.
- A landfill that is located within ½ mile of a lake or landlocked bay needs to identify the height of the wave and evaluate if the wave will inundate the landfill and cause any damage.

The evaluation for the seiche causal event needs to include documentation that the landfill is not located within ½ mile of a lake or landlocked bay.

If the landfill is located within ½ mile of a lake or landlocked, the evaluation needs to include the predicted height of the waves and duration, with an assessment of the potential impacts of the predicted waves given the elevation of the landfill. The assessment should address the potential impacts as identified in Table 1 with consideration of the amount of water and the velocity of the water in regards to erosion, instability of slopes, and damage to structures associated with environmental monitoring or control, and the landfill cover; and associated costs for replacement or repair.

Precipitation

There are case studies that document damages to landfills caused by storms. Damage to the cover, displacement or exposure of waste, damage and clogging of the drainage system, and failure or erosion of slopes and roads can occur due to erosion of soil and inundation by water (Sunrise Mountain in Nevada, Jim Hogg County Landfill in Texas, and the Anderson report). In the fall of 2001 Jim Hogg County experienced several major rain events that caused serious flooding in the area. The floodwaters cut a trench, approximately 1200 feet long, 30 feet wide and 15 feet deep through a disposal area of the landfill, displacing approximately 12,000 tons of waste material. These examples were primarily of closed landfills that may not have been maintained, but they are indications that storms are capable of causing significant damage to a landfill. Although every landfill is unique in its design and location, precipitation is a reasonable foreseeable causal event.

Landfills are required to maintain systems to control run-on and run-off due to precipitation during its active life and into the postclosure period. The systems are required to protect against a 100-year, 24-hour storm event (Class III landfills). Class I landfills are required to be designed to withstand the Probable Maximum Precipitation rain event and Class II landfills are designed to withstand the 1000-year, 24-hour rain event. The 1000-year, 24-hour storm event is also used by DWR as a design standard for some dams. (http://www.water.ca.gov/damsafety/docs/fitz-paper.pdf

The Department of Water Resources, Bulletin 69-95, California High Water, October 2003) documents that 1000-year 24 hour storm events have occurred in California on several occasions, thus the 1000-year 24-hour storm event is a reasonably foreseeable causal event. (http://www.water.ca.gov/floodmgmt/docs/Bul69-95/00-bull69-95front.pdf)

BMP

CalRecycle staff considered that 1000-year 24-hour storm events have occurred in California and some solid waste landfills are Class II landfills that are designed to withstand the 1000-year 24-hour storm event. The BMP for precipitation as a causal event is the 1000-year 24-hour storm event.

The evaluation for the precipitation causal event needs to include documentation for determination of the 1000-year, 24–hour precipitation event. The evaluation needs to include the assessment of the capacity of the drainage system to properly manage the

estimated quantity of water. If the capacity of the drainage system is exceeded, the assessment should address the potential impacts regards to erosion, instability of slopes, run-off, and damage to structures associated with environmental monitoring or control and the landfill cover, and associated costs for replacement or repair

Fires

Fires at a landfill are a reasonable foreseeable event and can be caused by either subsurface fires or wild fires. The intensity of a fire is influence by the location of the landfill, topography, weather conditions, management of wastes that are still smoldering, and, vegetation type and density to fuel a fire. The recovery efforts to extinguish the fire and extent at which structural damage can be minimized is dependent on accessibility by fire fighting personnel, availability of fire suppressant equipment, establishment of fire breaks, and exposure of environmental systems.

Subsurface fires

The most common cause of subsurface landfill fires is intrusion of oxygen into the waste prism, which increases the aerobic decomposition, resulting in the generation of methane and increased temperatures creating "hot spots" that ignites the methane gas resulting in a fire. Subsurface fires can cause damage to the landfill gas collection systems and potentially the intermediate and final cover. A landfill's joint technical document and/or postclosure maintenance plan may contain provisions to prevent, monitor, and remediate subsurface fires. If not, subsurface fires should be addressed in the CA Plan.

Wild Fires

Wild fires have been documented to destroy or damage all or portions of the landfill gas collection and monitoring systems, vegetation and irrigation systems designed to protect the cap and cover, drainage systems, and utility conveyance systems. The potential damage is dependent on mitigating circumstances such as whether the structures are buried to be protected from fires and if there are engineered mitigation measures such as fire breaks to protect against surface fires.

Staff received information on three recent fires at landfills in California, at the Olinda Alpha Landfill in November 2008, Simi Valley Landfill in 2003 and Sunshine Canyon in November 2008. The damage caused by the fires varied significantly, from as little as $500 to over $2 million in damages. The information showed that highly combustible materials exposed to the fire were damaged or destroyed. At the Olinda Alpha Landfill, the fire encroached on the eastern and southern perimeter of the landfill destroying aboveground landfill gas collection system piping and wellheads. . Subsequent to the fire, the replaced landfill gas piping system was buried below surface to be protected against future fires. It is interesting to note that although the fire burned for several days, other portions of the landfill did not sustain damage. The interior of the landfill was unaffected due to fire breaks and lack of vegetation. The potential damage to a landfill

caused by fires can vary significantly depending on location, terrain, weather conditions, design, and if there are mitigation factors.

BMP

CalRecycle staff considered the evaluation by California Department of Forestry and Fire Protection (CalFire) and local fire agencies on the potential fire hazard for various portions of California, information on three recent landfill surface fires, and information on the CalRecycle website and in the literature regarding subsurface fires. The potential for surface fires is dependent on the location of the landfill to moderate and very high/high fire hazard zones, as well as the design of the landfill. The design may mitigate the potential for surface fires or resulting damage through the installation of engineered fire breaks or by burying combustible structures. Other mitigating circumstances may include a vegetation control program or having firefighting equipment, water tanks, and trained fire fighting staff at the landfill.

The BMP for a fire as a causal event is that landfills located within or adjacent to fire hazard zones determined by Cal Fire, federal or the local fire control agency as moderate/medium, and high or very high must evaluate the potential damage to surface structures that are required by Title 14 or Title 27, vegetation and irrigation systems, and utilities; and other potential impacts as identified in Table 1.

- It is recommended that a baseline assumption that 50%* of the combustible surface structures within 300 feet* zone at or near the landfill cell boundaries are destroyed if the landfill is located in a high or very high fire hazard zone.

- It is recommended that a baseline assumption that 25%* of the combustible surface structures within 200 feet* zone at or near the landfill cell boundaries are destroyed if the landfill is located in a moderate/medium fire hazard zone.

- For landfills not located in the above zones, a contingency of 5%* of the combustible surface structures within 50 feet* at or near the landfill cell boundaries are destroyed.

*The percentage of structures potentially destroyed and extent at which the fire spreads should be discounted if there are engineered systems to mitigate surface fires such as berms or fire breaks; combustible structures are buried; on-site personnel trained in fighting fires with the proper equipment and vehicles; or if there is routine maintenance in place to remove vegetation and ground debris that would provide fuel to the fire; or different climatic and topographic environments than the baseline scenario. Conversely, the extent of combustible structures potentially destroyed should be increased if there is substantial vegetation and ground debris at the landfill interior that would fuel a fire; this may be the situation for a closed landfill that does not have a maintenance plan to control vegetation density.

The CA plan may also need to address the potential for a subsurface fire. Subsurface fires that are already included in the joint technical document or postclosure maintenance plan will not need to be addressed in the CA plan; the BMP for the subsurface fire is to provide the costs necessary to employ one of several methods to extinguish a subsurface fire (as discussed at CalRecycle's website) or to provide a contingency of 5% to repair the cover and landfill gas collection system.

Evaluation of the Final Cover System

The regulations (27 CCR 22102(a)(3)), also require that the CA Plan, including updates and revisions, contain an evaluation of the long-term performance of the final cover system to ensure that the final cover system will continue to meet the requirements of 27 CCR 21140 without corrective action. Should the final cover no longer comply with 27 CCR 21140, repair or partial to complete replacement may be required. The permeability of final cover systems will likely degrade with time depending on the site and design and potentially to a less protective permeability level than the original design standard. Under such circumstances, non-water release corrective action would not be required unless the degradation results in violation of the applicable 27 CCR 21140 final cover performance standards.

The requirements of 27 CCR 21140 are:

> (a) The final cover shall function with minimum maintenance and provide waste containment to protect public health and safety by controlling at a minimum, vectors, fire, odor, and litter and landfill gas migration. The final cover shall also be compatible with postclosure land use.
>
> (b) In proposing a final cover design meeting the requirements under 27 CCR 21090, the owner or operator shall assure that the proposal meets the requirements of this. Alternative final cover designs shall meet the performance requirements of (a) and, for MSWLF units, 40 CFR 258.60(b); shall be approved by the enforcement agency for aspects of (a).
>
> (c) The EA may require additional thickness, quality, and type of final cover depending on, but not limited to the following:
> (1) A need to control landfill gas emissions and fires;
> (2) The future reuse of the site; and
> (3) Provide access to all areas of the site as needed for inspection of monitoring and control facilities, etc.

Degraded/Inadequate Containment or Environmental Monitoring and Control Systems

The regulations require that each CA Plan provide an analysis of the adequacy of the design, capacity, or component useful life of the containment or environmental

monitoring and control systems as a causal event. Containment systems (e.g., final cover) and monitoring and control systems (e.g., landfill gas, leachate, and drainage systems) may significantly degrade or have inadequate design to prevent leachate, gas, or waste releases.

Repair or replacement of these systems or components will be required as part of the CA Plan if needed for compliance with applicable performance standards. Applicable standards include: 27 CCR 20917-20945 (landfill gas) for all sites; for active sites, 27 CCR 21600(b) (4) (design), 20790 (leachate), 20820 (drainage); and for closed sites, 27 CCR 21140-21160 (final cover, grading, stability, leachate) and CCR 21190 (postclosure land use).

Active vs. Closed Landfills

The financial assurance requirements for corrective action apply to active, closed, and closing solid waste landfills. It may be appropriate to have the CA Plan address the planned closed landfill configuration as defined in the closure and postclosure maintenance plans for the landfill if the landfill is active because of the anticipated long-term or indefinite postclosure maintenance period (when causal events are most likely to occur). Under this approach the operator would need to demonstrate that the landfill configuration at any time during its active life would not result in a higher CA Plan cost estimate than the closed landfill configuration.

Alternatively, the operator may submit a CA Plan for the active landfill configuration as described in the Joint Technical Document, scaling back from full build out to progressive cumulative development phases provided the CA Plan addresses the configuration prior to the next plan update. Under this approach, updated CA Plan and significantly higher financial assurances would be required for new development phases and upon submittal of final closure and postclosure maintenance plans.

Frequently Asked Questions

A set of frequently asked questions regarding the CA Plan and its preparation (CA Plans are required to be prepared by licensed third-party professionals pursuant to 27 CCR 22102(c)) and the responses are provided below:

1. In practice the "entity responsible for the design of the solid waste landfill" usually comprises a team of firms, consisting of a primary consultant, subconsultants, and contractors. The "entity" or engineer of record (PE or CEG) that signs off on the JTD/Closure Plan is typically the primary consultant. In this scenario, would the subconsultants and contractors be excluded from being on the third party team?

   No. The regulations would only exclude the entity (primary consulting firm) and the engineer of record (PE or CEG).

2. We have had a case where a firm who designed our landfills and is the engineer of record was recently purchased as a subsidiary of another company. Would the parent company be excluded from being a third party preparer despite not being involved in the design work?

   No, the regulations would not exclude the parent company from being a third party preparer. The only regulatory restriction related to subsidiary/parental relationships is that associated with the owner/operator (27 CCR 22102(c) (1) (D)).

3. Similarly to number 2, a parent company who designed the landfill acquires a firm that was clearly eligible to be a third party preparer prior to the acquisition. Does the firm lose its eligibility status under the new ownership?

   This one depends on the meaning of "acquires."

   If the acquired firm remains a separate entity it would not lose its eligibility.

   If the acquired firm is subsumed by the "entity responsible for the design of the solid waste landfill" the acquired firm would lose its eligibility.

4. 27 CCR 22102 refers to the entity/engineer of record in the JTD/Closure Plan of the most recent SWFP. Throughout the life of a landfill, many different entities/engineers may have played a role in the design of the landfill and signed off on the JTD. Does the phrase "most recently issued SWFP" mean that previous entities/engineers that are not referenced in the most recently issued SWFP are now eligible third party preparers?

   Yes, previous entities/engineers not referenced in the most recently issued SWFP would be eligible.

5. The design engineer of record would be excluded from being a third party preparer. However, that engineer does not work alone. Would an individual from the design team be eligible as third party preparers assuming they left the entity and worked for another firm? Likewise, if the design engineer of record sought opportunities at another firm, could he/she be on the third party team provided this individual did not sign off on the corrective action plan.

   Yes to both. An individual from the design team would be eligible as a third party preparer assuming they left the entity and worked for another firm. Likewise, if the design engineer of record sought opportunities at another firm, he/she could be on the third party team provided this individual did not sign off on the corrective action plan.

6. Although 27 CCR 22102 explicitly refers to the JTD and Closure Plan, we assume that the entity/engineer of record for third party eligibility determination also extends to the PCMP. Is this correct?

Yes. Although 27 CCR 22102 does not explicitly refer to PCM plans it does reference 27 CCR 21780, which applies to both closure and PCM plans

7. Should the non-water release Corrective Action Plan address impacts on groundwater or water quality?

No, the regulations require a separate water release corrective action plan and a non-water release corrective action plan. LEA, CalRecycle, and the Regional Water Quality Control Board will jointly respond to an event at a solid waste landfill. In the situation that an event results in a release that affects water quality, LEA and CalRecycle will refer any water problems to the Regional Water Quality Control Board who will be the lead agency to oversee the release (LEAs and CalRecycle do not have authority to address water quality issues).

8. What is the timeframe to be addressed as part of the corrective action (what is considered long term)?

The requirements for providing financial assurance for corrective action are in effect during the entire period that the landfill is active and/or subject to postclosure maintenance requirements.

9. How are engineering flaws or failures addressed as part of corrective action?

The regulations require that if an operator chooses to use the non-water release site-specific correction action plan, the plan must contain an analysis of the containment and environmental monitoring and control systems for adequacy with the applicable standards. If the there are engineering flaws or failures that would prevent compliance with the applicable standards, the plan would need to address how the standards would be satisfied either through repair or replacement of the systems. If engineering flaws or

failures require corrective action, the funds if needed may be used to remediate the flaws or failures.

10. How does one calculate the change from the MPE to the MCE?

An analysis needs to be completed to estimate the amount of deformation and ground acceleration based on each event and compare that to the design of the landfill to determine if there will be any damage and, if yes, to what extent. It is not the intent of BMPs to recommend a methodology for this analysis. Methodologies that are standard practice will be considered acceptable.

Attachment 1

Suggested Cost Estimating Tool
For Each Causal Event

Damage	Landfill Cover Corrective Action	Drainage System Corrective Action	Gas Collection System Corrective Action	Gas Monitoring System Corrective Action	Leachate Collection System Corrective Action	Site Security Corrective Action	Other Landfill Infrastructure Corrective Action
100%	$ (AA)	$	$	$	$	$	$
90%	$	$	$	$	$	$	$
80%	$	$	$	$	$	$	$
70%	$	$	$	$	$	$	$
60%	$	$	$	$	$	$	$
50%	$	$	$	$	$	$	$
40%	$	$	$	$	$	$	$
30%	$	$	$	$	$	$	$
20%	$	$	$	$	$	$	$
10%	$	$	$	$	$	$	$

AA-Title 27, 22101(b) (1) which is the cost of complete replacement of the final cover.

Attachment 2

Landfill Risk Scoring Factors and Weightings

	Factor	Level of Risk			Value			
		High	Medium	Low	Highest Risk	Medium Risk	Lowest Risk	Highest Risk
1	Proximity to Urban Population	In urban area	[illegible]	Not in urban area	10	[illegible]	0	10
2	Permitted Capacity	Greater than 30,000,000 cu yd	500,000 to 30,000,000 cu yd	Less than 500,000 cu yd	10	5	0	10
3	Type of Waste in Place	Pre-Subtitle D, co-disposal waste	MSW	Monofill, C&D	6	4	2	
4	Hydrogeology (proximity of landfill)	Less than 50 ft	50 to 100 ft	Greater than 100 ft	10	5	0	10
5	Seismic Characteristics	No design	Most Probable Earthquake; below 1.5 factor of safety, but at least 1.3	Max Credible Earthquake; 1.5 or above factor of safety	6	4	2	
6	Rainfall Intensity	Not designed for 100 year/24 hour storm	100 year/24 hour storm	1000 year/24 hour storm	10	5	0	10
7	Floodplain (from base of landfill)	Within 100 year floodplain	Location within 500 feet of 100 year floodplain	Location not within 500 feet of 100 year floodplain	6	4	2	
8	Proximity to Sensitive Habitat	Sensitive species at location		No sensitive species at location	6		2	
9	Compliance Status	Current CA, cleanup or abatement orders	Past history of CA or ongoing/repeat violations	Compliant	8	5	2	
10	Engineering Controls	Combination of Subtitle D equivalent solid non-Subtitle D equivalent design, or non-Subtitle D design	Subtitle D equivalent design	Above-Subtitle D design	10	5	0	10
11	Liquids Management/Landfill Bioreactor Technology	Neither	Permitted leachate recirculation	Bioreactor permitted	6	4	2	
12	Slope Stability	Side Slopes 2:1 or steeper, or history of slope failure	Side Slopes between 2:1 and 4:1	Side Slope shallower than 4:1	8	5	2	
13	Fire (intrusion from off site)	Adjacent Land Area with high fire hazard potential	Adjacent Land Area with moderate fire hazard potential	Adjacent Land Area with low fire hazard	4	3	2	
					100	49	18	50

The methodology is contained in Chapter 5 of the 'Study To Identify Potential Long-Term Threats And Financial Assurance Mechanisms For Long-Term Postclosure Maintenance And Corrective Action At Solid Waste Landfills, November 26, 2007' http://www.calrecycle.ca.gov/archive/IWMBMtgDocs/mtgdocs/2007/12/00022762.pdf

PROPOSED BMPs for CAUSAL EVENTS

Earthquake as the Causal Event

Minimum 27 CCR Seismic Design Event	*De Minimus* Corrective Action Cost Estimate[1]	Landfill Risk Category[2]	Probabilistic Ground Motions for Estimating Corrective Action Costs
MPE	MCE or 2475-yr return period design event; and ≤ 12 inches permanent deformation.	Low	200-year return period
		Medium	475-year return period
		High	475 to 950-year return period

Flood as the Causal Event

Design Standard	Staff Proposed BMP	Staff Proposed BMP
100-year Flood	For the purposes of determining corrective action, any landfill located within the 500-year flood zone needs to assess the potential damage resulting from the 500-year flood	Flooding is not considered a reasonable foreseeable causal event if the landfill is not located in the 500-year flood zone or the elevation of the landfill is above the depth of the flood event.

Precipitation as the Causal Event

Design Standard	Staff Proposed BMP
100-year, 24-hour storm event	1000-year, 24-hour storm event

Tsunami as the Causal Event

Design Standard	Staff Proposed BMP	Staff Proposed BMP
None	For landfills located in an area that is prone to be inundated by a tsunami, the CA Plan needs to address the potential impacts and damage that may result	Tsunamis are not considered a reasonable foreseeable causal event if the landfill is located in an area that is not designated to be prone to be inundated by a tsunami by the Department of Conservation or local emergency response agency.

Seiche as the Causal Event

Design Standard	Staff Proposed BMP	Staff Proposed BMP
None	Landfill that located within ½ mile of a lake or landlocked bay needs to identify the height of the wave and evaluate if the wave will inundate the landfill and cause any damage.	Seiche is not a reasonable foreseeable causal event, if the landfill is located greater than ½ mile away from a lake or a landlocked bay

Fire as the Causal Event

Design Standard	Staff Proposed BMP (also see footnote)
None	It is recommended: 1-that an assumption that 50% of the combustible surface structures within 300 feet of the landfill cell boundaries are destroyed if the landfill is located in a very high fire hazard zone, 2- that an assumption that 25% of the combustible surface structures within 200 feet of the landfill cell boundaries are destroyed if the landfill is located in a moderate/medium fire hazard zone 3-for landfills not located in the above zones, a contingency of 5% of the combustible surface structures within 50 feet of the landfill cell.

The CA plan also needs to address the potential for a subsurface fire; the BMP for the subsurface fire is to provide the costs necessary to employ one of methods to extinguish a subsurface fire (as discussed at CalRecycle's website) or to provide a contingency of 5% to repair the cover and landfill gas system.
The percentage of structures potentially destroyed should reduced if there are engineered systems to mitigate surface fires such as berms or fire breaks, structures are buried, onsite fire fighting resources, or if there is no vegetation to sustain a fire. The percentage of structure potentially destroyed should be increased if there is substantial vegetation at the landfill that would fuel a fire; this may be the situation for a closed landfill that does not maintain vegetation growth.