Meeting Agenda

I. Introductions

II. Project Implementation

III. Groundwater Injection Studies and Findings
   • Model Update
   • Salt and Nutrient Management Plan
   • Ocean Water Quality Analysis

IV. CEQA/EIR Analysis

V. Conclusions
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V. Conclusions
Project Implementation

• Phase 1 Project
  ▪ Wastewater collection system
  ▪ Civic Center Wastewater Treatment Facility
  ▪ Recycled water distribution pipeline

• Phase 2 Project
  ▪ Wastewater collection system pipeline extension
  ▪ Civic Center Wastewater Treatment Facility expansion
  ▪ Recycled water distribution pipeline

• Phase 3 Project
  ▪ Wastewater collection system pipeline extension
  ▪ Recycled water distribution pipeline
Project Phasing
Priorities for Reuse

1. Maximize reuse for landscape irrigation
2. Maximize reuse for other non-potable uses
3. Groundwater injection
4. Winter Canyon percolation
Meeting Agenda

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## Checkpoints to Project Implementation

<table>
<thead>
<tr>
<th>Checkpoint</th>
<th>Yes</th>
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<tbody>
<tr>
<td>1. Has recycled water reuse been maximized?</td>
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<td>6. Is the project permittable?</td>
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</table>
2013 Field Program

- 9 additional monitoring wells (7 to bedrock; 2 shallow alluvium)
- Shoreline Resistivity Survey
- Pumping and Injection Testing
- Groundwater Model Update (in progress)
Additional Monitoring Wells

Key
- Red: New Monitoring Well
- Green: Existing Test Well
Electrical Resistivity Survey
Injection Testing

• Step-Injection Testing
• 24-hour Continuous Injection Testing
• 7-day Continuous Injection Testing
Modeling Strategy to Support Design and Analysis

Groundwater Injection Analysis (MODFLOW)

Injectate

Flow into & out of groundwater basin

Salt-Nutrient Loading and Mixing Models

Nutrient Loading

Percolation

Mixing

Analytical Ocean Diffusion Analysis
Sources and Sinks for Groundwater Flow System

Groundwater Inflows
Groundwater Outflows

*All outflow to the Lagoon is from the Civic Center Alluvial Plain

Source: Melibu16_PEST
Cross Section A-A'

Legend

North

- CL, ML/CL, CL, ML, CH
- ML, ML-SC, ML-SC
- SM, SM-SC, SC-SC, SC
- SP, SW, SW-SC, SP-SC
- GM, OP, OW, OP-OW
- BR

Note: Purple lines indicate layer extent and green line indicates coverage of offshore survey.

Note: Black arrow indicates location of shoreline geophysical survey.

Cross-Section A-A'
Malibu Centralized Wastewater Project
Civic Center Area
Malibu, CA

8/8/2013

Figure 2
Groundwater Model (MODFLOW) Update

- Update Hydrogeology
- Calibration
- Scenario Planning and Analysis
- Sensitivity Analyses
Model Calibration Strategy

• Compare model-calculated ground water elevations to field measurements for transient simulation 2003-2012

• Compare model-calculated hydraulic responses with field observations during injection testing
Recalibration Shows Good Results

- Residual Mean = 0.19 ft
- Absolute Residual Mean = 1.47 ft
- Sum of Squares = 1.49e4 ft²
- Number of Observations = 3513
- Number of Locations = 101
Model Application Runs

- Effects of proposed injection on groundwater elevations
- Maximum injection rates
- Effects of proposed percolation in Winter Canyon
Model Simulation Period

Annual Precipitation (inches)

Total Annual Precipitation (inches)

Water Year


0 5 10 15 20 25 30 35
Scenarios Evaluated

• Baseline (current conditions)

• All disposal to injection (no percolation or irrigation)
  ▪ Phase 1
  ▪ Phase 2
  ▪ Phase 3

• All disposal to injection and Winter Canyon percolation
  ▪ Phase 1
  ▪ Phase 2
  ▪ Phase 3
Possible Injection Well Locations
Model Results Demonstrate Sufficient Injection Capacity

<table>
<thead>
<tr>
<th>Particles to Lagoon?</th>
<th>Phase 1</th>
<th>Phase 2</th>
<th>Phase 3</th>
</tr>
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<tbody>
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### Design Requirements

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<th>Phase 3</th>
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<tr>
<td>Total Recycled Water Produced - No Irrigation (gpd)</td>
<td>191,000</td>
<td>361,000</td>
<td>507,000</td>
</tr>
<tr>
<td>Estimated Annual Reuse for Irrigation (gpd)</td>
<td>68,000</td>
<td>176,000</td>
<td>299,000</td>
</tr>
<tr>
<td>Needed Injection Rate (gpd)</td>
<td>123,000</td>
<td>185,000</td>
<td>208,000</td>
</tr>
</tbody>
</table>

### Model Results (assuming no reuse for irrigation)

<table>
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<th>Phase 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Available Injection Capacity (gpd)</td>
<td>311,135</td>
<td>497,642</td>
<td>611,654</td>
</tr>
<tr>
<td>Percent Factor of Safety</td>
<td>252%</td>
<td>269%</td>
<td>295%</td>
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Model Results Demonstrate Sufficient Injection Capacity

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<td>295%</td>
</tr>
<tr>
<td>Winter Canyon Backup Percolation Capacity (gpd)</td>
<td>50,000</td>
<td>100,000</td>
<td>100,000</td>
</tr>
</tbody>
</table>
Groundwater Elevation Analysis Locations

Mounding Analysis Location

Limiting Constraints

Scale (feet)
0 500 1000
Mounding Analysis – Location 1
(Project lowers groundwater elevations)

Groundwater Elevation (ft NAVD88)

Model Time (days)

Constraint 1
Row 200 Col 118

Constraint 5 feet below land surface

Land Surface

Base Constraint
Mounding Analysis – Location 1
(Project lowers groundwater elevations)

- **Groundwater Elevation (ft NAVD88)**
- **Model Time (days)**

**Constraint 1**
Row 200 Col 118

- Land Surface
- Base Constraint
- Base (Current)

**Constraint 5 feet below land surface**
Mounding Analysis – Location 1
(Project lowers groundwater elevations)

![Graph showing groundwater elevation over model time for different constraints, including Land Surface, Base Constraint, Base (Current), and Phase 1. Constraint 1 is a horizontal line at 14.00 ft NAVD88, and Constraint 5 feet below land surface is shown in a different color.](image-url)
Mounding Analysis – Location 1
(Project lowers groundwater elevations)

Constraint 1
Row 200 Col 118

Constraint 5 feet below land surface

Groundwater Elevation (ft NAVD88)

Model Time (days)
Mounding Analysis – Location 1
(Project lowers groundwater elevations)

![Graph showing groundwater elevation changes over time, with constraints and phases indicated.]

- **Constraint 1**
  - Row 200 Col 118
- **Constraint 5 feet below land surface**

**Axes:**
- **Y-axis:** Groundwater Elevation (ft NAVD88)
- **X-axis:** Model Time (days)

**Legend:**
- Land Surface
- Base Constraint
- Base (Current)
- Phase 1
- Phase 2
- Phase 3
Mounding Analysis – Location 2
(Project lowers groundwater elevations)

Constraint 2
Row 183 Col 118

Constraint 5 feet below land surface

Groundwater Elevation (ft NAVD88)

Model Time (days)

Land Surface
Base Constraint

Draft
Mounding Analysis – Location 2
(Project lowers groundwater elevations)

Groundwater Elevation (ft NAVD88)

Model Time (days)

Constraint 2
Row 183 Col 118

Constraint 5 feet below land surface

- Land Surface
- Base Constraint
- Base (Current)
Mounding Analysis – Location 2
(Project lowers groundwater elevations)

Groundwater Elevation (ft NAVD88)

Model Time (days)

Constraint 2
Row 183 Col 118
Constraint 5 feet below land surface

- Land Surface
- Base Constraint
- Base (Current)
- Phase 1
Mounding Analysis – Location 2
(Project lowers groundwater elevations)

Constraint 2
Row 183 Col 118

Constraint 5 feet below land surface

Groundwater Elevation (ft NAVD88)

Model Time (days)

- Land Surface
- Base Constraint
- Base (Current)
- Phase 1
- Phase 2
Mounding Analysis – Location 2
(Project lowers groundwater elevations)
Mounding Analysis – Location 14
(Project lowers groundwater elevations)

Constraint 14
Row 167 Col 168

Constraint 2 feet below land surface

Groundwater Elevation (ft NAVD88)

Model Time (days)
Mounding Analysis – Location 14
(Project lowers groundwater elevations)

Constraint 14
Row 167 Col 168

Groundwater Elevation (ft NAVD88)

Model Time (days)

Constraint 2 feet below land surface

- Land Surface
- Base Constraint
- Base (Current)
Mounding Analysis – Location 14
(Project lowers groundwater elevations)

Constraint 14
Row 167 Col 168

Groundwater Elevation (ft NAVD88)

Model Time (days)

- Land Surface
- Base Constraint
- Base (Current)
- Phase 1

Constraint 2 feet below land surface

Draft
Mounding Analysis – Location 14
(Project lowers groundwater elevations)

Constraint 14
Row 167 Col 168

Groundwater Elevation (ft NAVD88)

Model Time (days)

Land Surface
Base Constraint
Base (Current)
Phase 1
Phase 2

Constraint 2 feet below land surface
Mounding Analysis – Location 14
(Project lowers groundwater elevations)
Land Surface at Limiting Location – Post Development

Constraint 37
Mounding Analysis – Location 37
(Project lowers groundwater elevations)

Groundwater Elevation (ft NAVD88) vs. Model Time (days)

- Constraint 37
  Row 159 Col 163

- Constraint 1 foot below land surface

- Land Surface – PD
- Land Surface
- Constraint – PD
- Base Constraint

Draft
Mounding Analysis – Location 37
(Project lowers groundwater elevations)

Constraint 37
Row 159 Col 163

Groundwater Elevation (ft NAVD88)

Model Time (days)
Mounding Analysis – Location 37
(Project lowers groundwater elevations)

Constraint 37
Row 159 Col 163

Groundwater Elevation (ft NAVD88)

Model Time (days)

Constraint 1 foot below land surface

Land Surface – PD
Constraint – PD
Base (Current)
Mounding Analysis – Location 37
(Project lowers groundwater elevations)

Groundwater Elevation (ft NAVD88)

Model Time (days)

Constraint 37
Row 159 Col 163

Constraint 1 foot below land surface

- Land Surface – PD
- Constraint – PD
- Base (Current)
- Phase 1

Draft
Mounding Analysis – Location 37
(Project lowers groundwater elevations)

Groundwater Elevation (ft NAVD88)

Model Time (days)

Constraint 37
Row 159 Col 163

Constraint 1 foot below land surface

- Land Surface – PD
- Constraint – PD
- Base (Current)
- Phase 1
- Phase 2

Draft
Mounding Analysis – Location 37
(Project lowers groundwater elevations)

Constraint 37
Row 159 Col 163
Constraint 1 foot below land surface

Groundwater Elevation (ft NAVD88)
Model Time (days)
Groundwater Elevation Analysis Locations

Mounding Analysis Location
Limiting Constraints

Scale (feet)
0 500 1000
Mounding Analysis – Location 12
(Project lowers groundwater elevations)

Groundwater Elevation (ft NAVD88)

Model Time (days)

Constraint 12
Row 200 Col 168

Constraint 5 feet below land surface

- Land Surface
- Base Constraint

Draft
Mounding Analysis – Location 12
(Project lowers groundwater elevations)

Groundwater Elevation (ft NAVD88)

Model Time (days)

Constraint 12
Row 200 Col 168

Constraint 5 feet below land surface

- Land Surface
- Base Constraint
- Base (Current)
Mounding Analysis – Location 12
(Project lowers groundwater elevations)

Groundwater Elevation (ft NAVD88)

Model Time (days)

Constraint 12
Row 200 Col 168

Constraint 5 feet below land surface

- **Land Surface**
- **Base Constraint**
- **Base (Current)**
- **Phase 1**

Draft
Mounding Analysis – Location 12
(Project lowers groundwater elevations)

Constraint 12
Row 200 Col 168
Constraint 5 feet below land surface

- Land Surface
- Base Constraint
- Base (Current)
- Phase 1
- Phase 2

Groundwater Elevation (ft NAVD88)
Model Time (days)
Mounding Analysis – Location 12
(Project lowers groundwater elevations)

Constraint 12
Row 200 Col 168

Groundwater Elevation (ft NAVD88)

Model Time (days)

Constraint 5 feet below land surface

- Land Surface
- Base Constraint
- Base (Current)
- Phase 1
- Phase 2
- Phase 3
Constraint 31
Row 133 Col 218

Constraint 5 feet below land surface

Groundwater Elevation (ft NAVD88)

Model Time (days)
Mounding Analysis – Location 31

Constraint 31
Row 133 Col 218

Groundwater Elevation (ft NAVD88) vs Model Time (days)

Constraint 5 feet below land surface

- Land Surface
- Base Constraint
- Base (Current)
Mounding Analysis – Location 31

Constraint 31
Row 133 Col 218

Groundwater Elevation (ft NAVD88)

Model Time (days)

Constraint 5 feet below land surface

Land Surface
Base Constraint
Base (Current)
Phase 1

Draft
Mounding Analysis – Location 31

Constraint 31
Row 133 Col 218

Constraint 5 feet below land surface

Groundwater Elevation (ft NAVD88)

Model Time (days)

Land Surface
Base Constraint
Base (Current)
Phase 1
Phase 2

Draft
Mounding Analysis – Location 31

Constraint 31
Row 133 Col 218

Model Time (days)

Groundwater Elevation (ft NAVD88)

Constraint 5 feet below land surface

- Land Surface
- Base Constraint
- Base (Current)
- Phase 1
- Phase 2
- Phase 3

Draft
Mounding Analysis – Location 45
(Project lowers groundwater elevations)

Constraint 45
Row 209 Col 227

Groundwater Elevation (ft NAVD88)

Model Time (days)

Constraint 1 foot below land surface

Land Surface

Base Constraint

Draft
Mounding Analysis – Location 45
(Project lowers groundwater elevations)

Constraint 45
Row 209 Col 227

Groundwater Elevation (ft NAVD88)

Constraint 1 foot below land surface

Model Time (days)

Land Surface
Base Constraint
Base (Current)
Mounding Analysis – Location 45
(Project lowers groundwater elevations)

Constraint 45
Row 209 Col 227

Groundwater Elevation (ft NAVD88)

Model Time (days)

Constraint 1 foot below land surface

Land Surface
Base Constraint
Base (Current)
Phase 1

Draft
Mounding Analysis – Location 45
(Project lowers groundwater elevations)

Constraint 45
Row 209 Col 227

Constraint 1 foot below land surface

Groundwater Elevation (ft NAVD88)

Model Time (days)

Legend:
- Land Surface
- Base Constraint
- Base (Current)
- Phase 1
- Phase 2

Draft
Mounding Analysis – Location 45
(Project lowers groundwater elevations)

Constraint 45
Row 209 Col 227

Groundwater Elevation (ft NAVD88)

Model Time (days)

Constraint 1 foot below land surface

- Land Surface
- Base Constraint
- Base (Current)
- Phase 1
- Phase 2
- Phase 3

Draft
Flow Analysis – Where does the injected water go?

- Used MODPATH6 for particle tracking
- Simulated flow paths of injected water
- Used MODFLOW results as basis
Phase 1 – Flow Location
(no flow to Lagoon or Creek)
Phase 2 – Flow Location
(no flow to Lagoon or Creek)

Phase 2 - Injection Only
497,642 gal/day
Phase 3 – Flow Location
(no flow to Lagoon or Creek)
Winter Canyon Percolation Modeling Goals

• Evaluate the impacts of percolation in Winter Canyon while injecting in Civic Center
• Focus on potential mounding effects at base of Canyon (mounding analysis locations 1 and 2)
• Goal is to determine if Winter Canyon percolation can be conducted jointly with injection or as back-up
Winter Canyon Percolation Modeling Results

- Winter Canyon percolation is backup to Civic Center injection
- Can percolate 50,000 gpd in Phase 1
- Can percolate 100,000 gpd in Phases 2 and 3
Groundwater Model

Conclusions

• Groundwater Basin has sufficient injection capacity for all project phases

• Injection capacity has large safety factor

• Groundwater levels are presently close to land surface elevations in several locations

• Project will lower groundwater levels
Next Steps in Groundwater Modeling

• Sensitivity Analysis
  ▪ Lower hydraulic conductivity and storage coefficient for Civic Center Gravels
  ▪ Higher hydraulic conductivity for Low Permeability Layer

• Sea Level Rise Evaluation
Model Strategy to Support Design and Analysis

Groundwater Injection Analysis (MODFLOW)

Salt-Nutrient Loading and Mixing Models

Analytical Ocean Diffusion Analysis

Injectate

Flow into & out of groundwater basin

Nutrient Loading

Percolation

Mixing
Salt-Nutrient Loading and Mixing Models

- Allows for estimate of assimilative capacity used by Project
- Results feed into ocean water quality analysis
- Utilizes water balance components from MODFLOW model
- Being conducted ‘as we speak’
- Results will simulate changes in groundwater quality
Loading Approach Uses Land Use and Applied Water

List of Land Uses
- Agricultural Commodities
- Apartments
- Auto Sales
- Banks
- Burial Property
- City Government Properties
- Clubs/Lodge Halls
- County Government Properties
- Dance Halls (Private)
- Duplexes and Doubles
- Federal Government Properties
- Field Crops
- Food Stores
- Golf Courses (Private)
- Hardwoods and Chaparral
- Homes
- Horse Ranches
- Hospitals (Private)
- Hotels
- Irrigated Dairies
- Irrigated Orchards
- Irrigated Pastures
- Irrigated Poultry Ranches
- Irrigated Vineyards
- Light Manufacturing
- Lumber
- Mfg Home/Trailer Parks
- Mineral Processing
- Miscellaneous Commercial Spaces
- Miscellaneous Industrial
- Motels
- Non-irrigated Agriculture
- Nurseries
- Office Buildings
- Orchards
- Orphanages
- Outdoor Recreational Facilities (Private)
- Park (Private)
- Park/Other Recreational Facility (City)
- Park/Other Recreational Facility (County)
- Park/Other Recreational Facility (State)
- Parking Lots (Private)
- Pastures
- Processing Plants
- Professional Buildings
- Religious Properties
- Residential Common Areas
- Restaurants and Bars
- Roadways
- Rural Residences
- School District Property
- Schools
- Service Shops
- Service Stations
- Shopping Centers
- Single Family Dwellings
- Special Districts Properties
- Specialty Farms
- State Government Properties
- Store and Office Combinations/Single Story
- Stores
- Theaters
- Three and Four Unit Complexes
- Tidelands
- Transitional Use
- Utilities
- Vacant Commercial Land
- Vacant Industrial Land
- Vacant Residential Land
- Volunteer Fire Departments
- Warehouses
- Wastelands
- Water Sources
- Wildlife Habitats
- Water Treatment
- Waste Water Treatment
- Water Sources

Landuse Factors
- Crop Coefficient
- Irrigation
- Fertilizer/Amendment (Salts)
- Livestock (Salts)
- Fertilizer/Amendment (Nutrients)
- Livestock (Nutrients)
- Uptake/Offtake (Nutrients)
- Other losses (Nutrients)
- Municipal Inputs (Salts)
- Municipal Inputs (Nutrients)
- Water Sources
Basin Characteristics are Analyzed to Yield Load Estimates

Related Factors and Attributes

- Precipitation and Applied Water Demand
- Runoff
- Water Demand
- Recharge/Storage
- ET
- Salt Load
- Nutrient Load
Mixing Modeling Results - Example

- Evaluate future scenario based on projected land and water use
- Compare projected future concentrations to Water Quality Objectives
Model Strategy to Support Design and Analysis

- Groundwater Injection Analysis (MODFLOW)
- Salt-Nutrient Loading and Mixing Models
- Analytical Ocean Diffusion Analysis

Injectate

Flow into & out of groundwater basin
Ocean Water Quality Analysis

- Compare nitrate load from groundwater basin with Project to that from Hyperion
- Consider Ocean Plan water quality objectives
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IV. CEQA/EIR Analysis

V. Conclusions
EIR Status

• Biology/Habitat, Tree and Cultural Surveys completed

• Presently completing impacts analysis

• Work on design aspects of project – architecture and landscape architecture

• Anticipated release date for Draft EIR – April 14, 2014
Plant Site View Perspectives

View 1 – Plant Site as seen from Condos

View 2 – Plant Site as seen from Pacific Coast Highway (PCH)

View 3 – Plant Site as seen from Intersection of PCH and Civic Center Way
Plant Site – 5-years Post-Construction

View 1 – Plant Site as seen from Condos View 3 – Plant Site as seen from Intersection of PCH and Civic Center Way

View 2 – Plant Site as seen from Pacific Coast Highway (PCH)
Plant Site – Landscape at Maturity

View 1 – Plant Site as seen from Condos
View 2 – Plant Site as seen from Pacific Coast Highway (PCH)
View 3 – Plant Site as seen from Intersection of PCH and Civic Center Way

Draft
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<td>5. Will there be ocean water quality impacts?</td>
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<td>6. Is the project permittable?</td>
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● - in progress
Questions?
Stakeholder Meeting
Civic Center Wastewater Treatment Facility

February 27, 2014
Malibu Fluvial history - old bedrock configuration
Data Analysis Activities

- Hydrostratigraphy analysis
- Groundwater level data compilation and analysis
- Hydraulic testing data evaluation
- Data collection and analysis for model input
Hydrostratigraphy Update
Groundwater Level Data Analysis

Drawdown MW-6

![Graph showing groundwater level data from July to October 2013. The graph includes data on baro-corrected water level, projected tide, testing, and drawdown. Key events marked include MW-03 and MW-02 tests, pump steps, and 24-hour and 7-day periods.](image)
Model File Update

- Water Use
- Lagoon Stage and Creek Flows
- Groundwater Elevation
- Bedrock Depth and Stratigraphy
- Other (ET, precipitation, etc.)
Basin Water Use

Figure 2: Study Area Parcels and Landmarks
Hydrology Study of Cumulative Impacts for the Civic Center Area
City of Malibu, California

Parcel Boundaries, Los Angeles County Assessor, Active Model Ernest, McDonald Montsrey Assoc., Basin Area and Study Area, Stone.
Lagoon Stage
# Malibu Groundwater Injection Feasibility, Phase 3

City of Malibu, California

## Summary of Malibu Lagoon Barrier Beach Conditions by Year

<table>
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<tr>
<th>Year</th>
<th>Barrier Beach Breached, Creek Open</th>
<th>Barrier Beach Intact, Creek Closed</th>
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<tbody>
<tr>
<td>2003</td>
<td>January 1-July 9; November 4-December 31</td>
<td>July 10-November 3</td>
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<tr>
<td>2004</td>
<td>January 1-May 1; June 3-June 21; October 19-December 31</td>
<td>May 2-June 2; June 22-October 18</td>
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<td>2005</td>
<td>January 1-August 15; September 13-December 31</td>
<td>August 16-September 12</td>
</tr>
<tr>
<td>2006</td>
<td>January 1-June 10; August 23-October 28; November 30-December 31</td>
<td>June 11-August 22; October 29-November 29</td>
</tr>
<tr>
<td>2007</td>
<td>January 1-April 26; October 20-November 2; December 2-December 31</td>
<td>April 29-October 19; November 3-December 1</td>
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<tr>
<td>2008</td>
<td>January 1-May 17; May 29-June 29; November 26-December 31</td>
<td>May 18-May 28; June 30-November 25</td>
</tr>
<tr>
<td>2009</td>
<td>January 1-April 18; May 2-June 18; October 15-November 1; December 2-December 31</td>
<td>April 19-May 1; June 19-October 14; November 2-December 1</td>
</tr>
<tr>
<td>2010</td>
<td>January 1-April 27; May 5-May 11; May 22-June 8; October 8-October 26; November 3-December 31</td>
<td>April 28-May 4; May 12-May 21; June 9-October 7; October 27-November 2</td>
</tr>
<tr>
<td>2011</td>
<td>January 1-June 26; October 7-December 31</td>
<td>June 27-October 6</td>
</tr>
<tr>
<td>2012</td>
<td>January 1-May 14; June 10-June 22; December 2-December 31</td>
<td>May 15-June 9; June 23-December 1</td>
</tr>
<tr>
<td>2013</td>
<td>January 1-February 28; March 8-March 20; March 27-April 8; May 17-June 17; September 30</td>
<td>March 21-March 6; April 9-May 16; June 18-September 30</td>
</tr>
</tbody>
</table>

Source: LA County lifeguard daily records, 2003-September 2013.

Path: C:\Proj-12\WRM\2012-007 Malibu Deep Inj Support\Data\Lagoon Breach-Flood Dates\Lagoon Open-Closed Dates.xls

Date: 10/2/2013 amn
Groundwater Elevation

Figure 2.7 - Hydrograph and location for well SMBRP-10C_4458021007
Figure 2.7 - Hydrograph and location for well LAMW-3_4458021013

Water Level Elevation*

- Malibu Lagoon Stage
- Groundwater Level in Well*

Data Sources (from Stone Environmental):

Water Levels:
- Malibu Wells gdb 2013 10 04 mdb, Table tblWaterLevels
- Malibu Wells gdb 2013 10 04 mdb, Table tblWaterLevels_Transducers

Well Construction:
- Malibu Wells gdb 2013 10 04 mdb, Table Wells 082026

Specifically [qryWaterLevels_Master-Text-Rounded-Justified_v5.txt from A Macreillis 10/24/2013 4:32 PM]

Malibu Lagoon Stage:
Bedrock and Hydrostratigraphic Mapping
Numerical Codes

- **MODFLOW-2005**  USGS code for simulation of 3-D groundwater flow

- **MODPATH6**  USGS code for particle tracking

- **SEAWAT**  USGS code for simulation of salt/fresh water interface

- **GMW-2005**  USGS code for groundwater management using optimization

- **PEST**  Numerical code for parameter estimation and sensitivity analysis
Upland Runoff Recharge -- Map showing extent of contributing upland areas
Selected locations within the study area
Figure 1. Map showing numerical model extent and boundary conditions for model layer 1.
Recharge from onsite waste dispersal
Recharge from excess irrigation
Model recharge from precipitation and upland runoff
Calculated vs. observed water level at SMBRP-11 for the period 2003-2009
Collection system service area Phase 1