2013 Training
Hawaii Well Construction & Pump Installation Standards - HWCPIS

1st Annual Joint State Water Conference
January 14-18, 2013
Roy Hardy, P.E.
Hydrologic Program Manager
Commission on Water Resource Management
roy.hardy@hawaii.gov  808-587-0274
Commission on Water Resource Management

Ke Kahuwai Pono
“The trustee who oversees the rightful sharing of water.”
Small Private Well - Aquaholic (2-1122-006)
Sea Life Park A - Saltwater Well (3-1940-002)
Kahaluu DMW (8-3457-004)
Training Outline

Authority & Purpose

Background & Scope

HWCPIS Considerations

• Regulatory
• Well Construction Details
• Pump Installation Details
• Reporting Responsibilities
Training Outline

Authority & Purpose

Background & Scope

HWCPIS Considerations

- Regulatory
- Well Construction Details
- Pump Installation Details
- Reporting Responsibilities
Authority & Purpose

- **HRS 174C-86**: The Commission shall adopt minimum standards for well construction and pump installation... to ensure safe and sanitary maintenance and operation wells, to prevent waste, and to prevent contamination of ground water.

- **HAR 13-168-14**: Requires the Commission to adopt minimum standards for:
  - Well construction
  - Pump and pumping equipment installation, repairs, and replacements, and specifications
  - Abandonment and permanent sealing of wells
Authority & Purpose

- **HRS 174C-86**: The Commission shall adopt minimum standards for well construction and pump installation to ensure safe and sanitary maintenance and operation wells, to prevent waste, and to prevent contamination of ground water.

- **HAR 13-168-14**: Further, as amended in 1997 when standards were first adopted:
  
  ✓ Incorporated into administrative rules by reference
The reasons for well standards are to:

- protect aquifers
- prevent well contamination
- maintain resource sustainability
Training Outline

Authority & Purpose

Background & Scope

HWCPIS Considerations

- Regulatory
- Well Construction Details
- Pump Installation Details
- Reporting Responsibilities
Background

- CWRM adopted first HWCPIS in 1997
- Updated in 2004, & new Commission policy to review and update every 5 years
- CWRM staff behind but working on update
  - Increase ease of use and clarity
  - Address comments, concerns, and FAQs from water resource professionals and contractors
  - Refine minimum requirements for well construction to ensure water resources are protected
Scope - Training

Free Online Training for Homeowners with Water Wells
Scope - Training “Construction”
Training Outline

Authority & Purpose

Background & Scope

HWCPIS Considerations

- Regulatory
- Well Construction Details
- Pump Installation Details
- Reporting Responsibilities
Training Outline

Authority & Purpose

Background & Scope

HWCPIS Considerations

- Regulatory
- Well Construction Details
- Pump Installation Details
- Reporting Responsibilities
Regulatory Considerations

CWRM Standards and Permits

- **Well Construction Permit**
  - Required statewide (production, permanent monitor, or sealing of these wells)
  - C-57 license required (DCCA) & **WCP issued to C-57**
  - New or modification construction
  - Not required for geotechnical holes (structural), test borings, temporary monitoring wells, injection & dry wells - (DOH & County), or geothermal wells (DLNR)

- **Pump Installation Permit**
  - Required statewide
  - C-57, C-57a, or A license required (DCCA) & **PIP issued to licensed contractor**
  - New or increases in existing pump capacity
  - Not required for new pumps with same capacity as existing pump in well or routine maintenance
CWRM Standards and Permits

- Ground Water Use Permits
  - GWUP issued to well owner
  - Required in designated Ground Water Management Areas
    - All of Oahu except Waianae area
    - Entire island of Molokai
    - Iao Aquifer on Maui
  - Can drill exploratory well (WCP) without GWUP
  - No PIP without GWUP
Regulatory Considerations

CWRM Standards and Permits

- Routine Maintenance
  - No WCP or PIP required
  - Appropriate completion reports are required – typically pump restoration
Regulatory Considerations

CWRM Standards and Permits

- **Emergencies**
  - Not addressed in HRS or HAR
  - However, by reference in HWCPIS – allowable to do emergency work without permit so long as CWRM immediately notified and within 60 days of completion report submitted
  - Emergency - to prevent or minimize loss of life, risk to public health and safety, or damage to property
  - If permit required and not an emergency, CWRM may levy fines of up to $5,000/day.
Regulatory Considerations

Other standards may apply

- Other governmental agencies in Hawaii have critical roles in preventing contamination of water resources, aquifer protection, and maintaining safe drinking water sources
  - State Department of Health (DOH)
  - County Hawaii Water System Standards (2002 – as amended)

- Professional and trade organizations
  - AWWA, ASTM, NSF, ANSI

- More stringent controls than minimum standards may be required to achieve water resource protection goals
Regulatory Considerations

Other standards may apply
Department of Health – Well Construction

DOH permits and requirements

✓ **NPDES general permit** for “treated wastewater effluent” associated with drilling activities
  - Authority: § 11-55, App. I, HAR
  - Well drilling slurries, lubricating fluids wastewater, well purge wastewater
  - Notice of Intent & filing fees to DOH for coverage under general permit
  - Well construction permit holder responsible to comply

✓ **Regulation of construction noise**
Table 2. Well Permits and Reports Required

<table>
<thead>
<tr>
<th>Well Type</th>
<th>Proposed Activity</th>
<th>Permit Requirements</th>
<th>Applicable Well Standards</th>
</tr>
</thead>
<tbody>
<tr>
<td>Injection Well</td>
<td>Construct; Operate; Modify; Abandon/Seal.</td>
<td>Underground Injection Control (UIC)</td>
<td>Refer to Chap. 11-23, HAR State Department of Health Chapter 11-23, HAR</td>
</tr>
<tr>
<td>Geothermal Well</td>
<td>Drill; Modify; Modify use; Abandon/seal.</td>
<td>Geothermal</td>
<td>Refer to Chap. 13-183, HAR State Department of Land &amp; Natural Resources Chapter 13-183, HAR</td>
</tr>
<tr>
<td>Test Boring</td>
<td>Excavate/drill. Abandon/seal.</td>
<td>None</td>
<td>None</td>
</tr>
<tr>
<td>Drainage walls</td>
<td>Construct; Operate; Modify; Abandon/Seal.</td>
<td>Underground Injection Control (UIC)</td>
<td>Refer to Chap. 11-23, HAR State Department of Health Chapter 11-23, HAR</td>
</tr>
</tbody>
</table>

Note: (1) New water wells to be used to supply a public water system must meet the requirements of Chapter 11-20, entitled, “Rules Relating to Potable Water Systems” of the State Department of Health. (2) Test borings related to UIC and/or environmental monitoring or remediation are subject to the State Department of Health. HAR = Hawaii Administrative Rule.
Training Outline

Authority & Purpose

Background & Scope

HWCPIS Considerations

- Regulatory
- Well Construction Details
- Pump Installation Details
- Reporting Responsibilities
Well Construction Details

- Location
- Depth limitations
- Pump Tests
- Casing
- Grouting Annulus
- Well Pad
- Benchmarks
- Capping
- Water Level Measurement
  Access
- Sealing/Abandonment
Well Construction Details

- Location

Shall be sited away or upgradient from pollution sources

- Public wells (15 connections or 25 individuals – DOH definition)
  - 1000 ft. from pollution source
  - SWAP considerations
- Private wells – at their own risk

DOH review considered

- Environmental Management Division
  - CWB, SDWB, WWB, also HEERO
- SWAP – Source Water Assessment Program - long list of risk levels and capture zone delineations
Well Construction Details

- Depth limitations

Only one aquifer can be tapped at a time:

- Prevents cross-contamination between aquifers

Basal aquifers ¼ depth limitation

- Optimization & prevention of upconing contamination

Saltwater wells must go to ≥ 17,000 ppm cl-
### Well Construction Details

**Pump Tests**

To assess behavior of the source
- Local well & aquifer sustainability

**Step-Drawdown for wells ≥ 70 gpm**
- Determine well specific capacity & hydraulic conductivity
- Chloride sensitivity to pumping

**Constant Rate for wells ≥ 50 gpm**
- Determine aquifer storage coefficient & boundaries (streams)
- Chloride sensitivity to pumping

<table>
<thead>
<tr>
<th>Proposed Use of Well</th>
<th>Proposed Capacity (gpm)</th>
<th>Minimum Test Period (hours)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Non-Public Water Supply</td>
<td>0 - 50</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>51 - 100</td>
<td>8</td>
</tr>
<tr>
<td></td>
<td>101 - 300</td>
<td>24</td>
</tr>
<tr>
<td></td>
<td>301 - 700</td>
<td>48</td>
</tr>
<tr>
<td></td>
<td>701 - 1000</td>
<td>72</td>
</tr>
<tr>
<td></td>
<td>1001+</td>
<td>96</td>
</tr>
<tr>
<td>Public Water Supply</td>
<td>96</td>
<td></td>
</tr>
</tbody>
</table>
Well Construction Details

- Casing

**Materials allowed**
- ✔ Carbon Steel
- ✔ Stainless Steel
- ✔ ABS
- ✔ PVC
- ✔ Thermoset

*No Minimum Casing Diameters for Water Supply Wells.*
- ✔ The driller or consultant can determine the proper diameter for the casing

**Length/Depth of Solid Casing**
- ✔ ≥ 90% depth to water (unconfined)
- ✔ Enough to prevent leakage (confined)
- ✔ Saltwater Wells: all the way to saltwater (≥ 17,000 ppm cl-)

*Top of casing ≥2 ft. above 100-yr flood elev when capped*
Well Construction Details

- Grouting Annulus

Materials allowed
- Neat cement
- Concrete
- Cement-bentonite
- Sand-cement slurry
- Bentonite
- Cement must conform to ASTM C150 Type I

Minimum Annulus Width
- Positive Displacement (1.5-inch annulus)
- Non-positive Displacement (2-inch annulus)
- Public System Non-positive Displacement (3-inch annulus)

Minimum Depth of Grout
- 70% depth to water or 500 ft., whichever is less.
- Enough to prevent leakage (confined/perched aquifers)
- Saltwater Wells: all the way to saltwater (≥17,000 ppm cl-)
Well Construction Details

- Grouting Annulus

Rock/Gravel Pack
- Locally produced
- Basaltic
- Larger than slotted casing openings
- Disinfected before placement
  (drenched with 100 mg/l chlorine solution)

Placement of Grout
- Soon as possible after casing installed
- Positive Displacement
- Non-positive Displacement
  - (tremie pipe freefall [gravity])
  - (freefall ok for ≤ 20 ft. below ground surface)
- 200 ft. lift limit for PVC casing
Well Construction Details

- **Well Pad**

  *To Protect Well Head*

  **Concrete Base**
  - Water tight contact with annular seal & casing
  - ≥ 4 inches thick
  - Slope away from casing

  **Pits or Vaults**
  - Should be avoided

  **Protection from Vehicles**
  - Shall install steel posts or equivalent where there is significant traffic
Well Construction Details

- **Benchmarks**

  *To provide for accurate*
  - ✓ Elevations
  - ✓ Well Dimensions
  - ✓ Aquifer information
  - ✓ Well number ID

  **Marks required on all wells**

- **Elevation Survey**

  ✓ Public water supply wells
  ✓ Private
  - ≥ 70 gpm pump capacity
  - Deferred for ≤ 70 gpm pump capacity
  ✓ Not required for saltwater wells
  ✓ Licensed surveyor (DCCA)
Well Construction Details

- **Capping**
  
  To prevent unauthorized entry into non-pumping wells

  **Required**
  - Lockable Cover
  - Or
  - Casing Cap
    - 1 ½ - inch diameter

  **Sanitary cap (optional)**

  **If Vented**
  - ≥ 1 ft. above ground
  - turned down
  - screened
Well Construction Details

- Water Level Measurement Access

Required for

✓ Public water supply wells
✓ Wells with ≥ 70 gpm capacity
✓ Wells with casing diameter ≥ 6 in. I.D.

Methods

✓ Airline
✓ Sounding /chase tube (≥ ¾ in. I.D.)
✓ Permanent transducer
✓ Others must be approved by Chairperson
Well Construction Details

- Sealing/Abandonment

**Materials allowed:**
- Neat cement
- Concrete
- Cement-bentonite
- Sand-cement slurry
- Bentonite – not allowed for brackish or salt wells
- Cement must conform to ASTM C150 Type I
- In extreme cases gravel allowed with approved variance

Material used depends on section of well

Casing must be perforated if no record of grouted annulus

Entire length of hole must be filled

Special attention to artesian well situations
- Video logs, Packers, discussion with staff
Training Outline

Authority & Purpose

Background & Scope

HWCPIS Considerations

- Regulatory
- Well Construction Details
- Pump Installation Details
- Reporting Responsibilities
Pump Installation Details

- Pump Types
- Mercury seals not allowed
- Cross Connections
- Flow Meters
Pump Installation Details

- Pump Types
  - Must conform to ANSI/AWWA E101-88
    - Vertical turbine pump-line shaft
    - Submersible
    - Centrifugal

- Lubrication
  - Water preferred
  - Oil – conforms to USDA or FDA food contact grade

- Mounting
  - Reinforced pad may be required
  - Effective seal between pad and all pumping equipment
Pump Installation Details

- Mercury Seals not are allowed
Pump Installation Details

- Cross Connections

  Must eliminate potable and non-potable cross connections
  - Backflow preventors
  - Air Gaps

Chemigation
  - Backflow prevention acceptable to DOH in accordance with 149A-31(6) HRS
Pump Installation Details

- **Flow Meters**

  All non-saltwater pumping wells require a totalizer installed at manufacturer’s specifications:

  - To track stresses placed on the public trust resource
  - To meet well owner pumping report required by rule, under HAR 13-168-7 – Report of Water Use
  - If owner refuses to allow contractor to install we allow contractor to finish but well owner must install and report installation before using well.
Training Outline

Authority & Purpose

Background & Scope

HWCPIS Considerations

- Regulatory
- Well Construction Details
- Pump Installation Details
- Reporting Responsibilities
Reporting Responsibilities

- Well Construction Report
- Pump Installation Report
- Meter Installation Report
- Certificates of Completion
Reporting Responsibilities

- **Well Completion Report**

  Must submit to Commission within 60-days of completion

  Use online forms
Reporting Responsibilities

- Pump Installation Report

*Must submit to Commission within 60-days of completion*

*Use online forms*
Reporting Responsibilities

- Certificates of Completion

**Certificate of Well Construction Completion**
- Acceptable WCR - to contractor
- CWCC – to landowner of well
  - Landowner becomes responsible for sealing

**Certificate of Pump Installation Completion**
- Acceptable PIR – to contractor
- CPIC – to well owner operator
  - Well owner responsible for pumpage reports
- Not issued if meter not installed where required
  - Well cannot be pumped
  - CPIC when well owner submits acceptable meter installation report
MAHALO

see http://hawaii.gov/dlnr/cwrm/