Department of Health Care Access and Information
2020 West El Camino Avenue, Suite 800
Sacramento, CA 95833
hcai.ca.gov

Hospital Building Safety Board
Ad hoc Educational Opportunities to Advance Structural Health Monitoring by Hospitals Subcommittee

AGENDA
January 29, 2026
10:00 a.m. – 4:00 p.m.

The Subcommittee may not discuss or act on any matter raised during the public comment section that is not included on this agenda, except to place the matter on a future meeting agenda. (Government Code §§ 11125, 11125.7, subd. (a).)

Locations:
2020 West El Camino Ave, Conference Room 930, Sacramento, CA 95833
355 South Grand Avenue, Conference Room 2000, Los Angeles, CA 90071
Teams Meeting Access; Meeting ID: 293 367 320 635 16; Passcode: Be3Nx6gu
Call in: (916) 535-0978; Phone Conference ID: 291 957 248#

Item #1 Call to Order and Welcome
Facilitator: Martin Hudson, PhD, PE, GE, Principal Geotechnical Engineer, Hudson Geotechnics, Inc.; Subcommittee Chair (or designee)

Item #2 Roll Call and Meeting Advisories/Expectations
Facilitator: Veronica Yuke, HCAI; HBSB Executive Director (or designee)

Item #3 Review of introductory materials
- Discuss subcommittee goals and objectives as presented at the December 2025 Full Board meeting
- Review and discuss notes and outcomes from recent Full Board and Instrumentation Committee meetings for understanding of needs
- Review the Seismic Instrumentation of Healthcare Facilities white paper
- Discussion and public comment

Facilitator: Martin Hudson (or designee)

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Subcommittee Goals and Objectives

- December 2025 full board meeting
  - 2026 objectives of instrumentation committee include potential re-write of white paper or addendum
  - Re-write/addendum to include recent examples of new instrumentation and implementation
  - “Accessibility” of white paper to be improved

Review and Discuss Notes and Outcomes

Per prior board meetings and Instrumentation Committee meetings, what are the needs that this ad-hoc subcommittee can fulfill

- 10/28/25 instrumentation committee
  - Recent real-time data streaming installations – 23 free field stations at hospitals and 2 hospitals with real-time data acquisition (Santa Rosa Kaiser and Lancaster Antelope Valley)
  - Real-time monitoring expansion and data visualization being implemented by HCAi
  - Within 60 to 90 seconds, free-field waveform data available
  - Antelope telemetry system is recently available
  - Golden Gate Bridge generates drift ratio calculations and notifications within 3 minutes of M4.3 earthquake
  - Working prototype and application would more effectively communicate value compared to revised white paper alone.
  - White paper revisions could include the recent applications (such as Santa Rosa Kaiser, Lancaster Antelope Valley and Golden Gate bridge), and what data is obtained.
  - White paper revisions could include reframing content in “accessible language”
  - Should revisions be a re-write or an addendum?

- Existing visual inspections are relatively slow → real-time objective for health using instrumentation
- Minutes vs. days for decisions:
  - Operate
  - Reduce services
  - Evacuate
- Modest cost → high ROI for resilience

Why Critical – Historical Damage

- California hospitals repeatedly damaged
- 1906 SF: Agnew Mental Institution
- 1925 Santa Barbara: St. Francis Hospital
- 1933 Long Beach: Seaside Hospital
- 1971 San Fernando: Olive View (demolished)
- 1994 Northridge: Kaiser Granada Hills + nonstructural failures in HSSA-compliant buildings

Key issues

- Structural often ok → nonstructural/contents force evacuation
- Visual inspection delays critical patient redirection

Figure 1. Damage to the San Jose Agnew Mental institution during the 1906 San Francisco earthquake.[1]

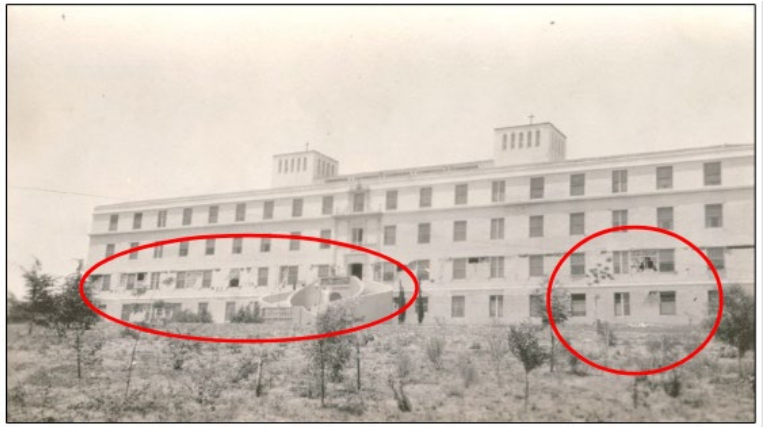


Figure 2. Damage to the Santa Barbara St. Francis hospital during the 1925 Santa Barbara earthquake.[2]

Figure 5. Damage to the Kaiser Permanente clinic building in Granada Hills during the 1994 Northridge earthquake.[5]

Current Status

- **Very limited coverage**
- ~90 buildings instrumented (CSMIP/HCAI since 1984)
- ~3% of total CA hospital buildings (≈3,000+ licensed; ~330 acute care with EDs in recent data)
- Mandatory only for: seismic isolation, energy dissipation, alternate compliance systems
- Most use accelerometers
- HCAI funds ~2 existing buildings/year + new innovative systems
- Data → currently used to improve codes, design, future performance

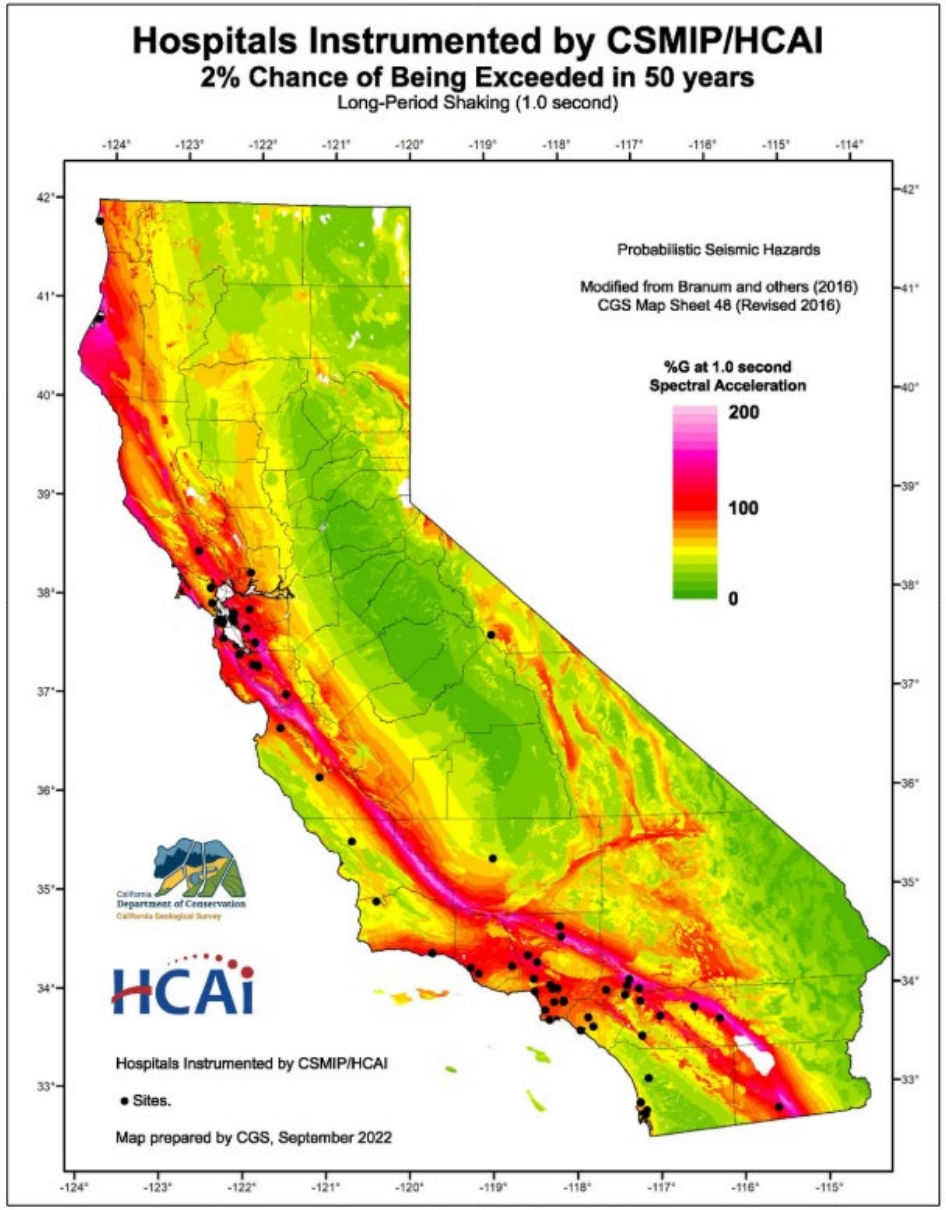


Figure 9. *Locations of the instrumented hospital buildings (black dots). The base map is the seismic hazard map of the California. Colors on this map display the levels of horizontal shaking that have a 2 percent probability of exceedance in a 50-year period.*

Proven Value – 1994 Northridge Example

- Olive View–UCLA / Sylmar County Hospital
- Excellent structural performance (isolated)
- Severe nonstructural + contents damage → months closed
- Recorded: peak roof accel ~1.53g, drifts up to ~34 cm
- **Modern insight**
- Real-time max floor accel + story drift → fragility functions (FEMA P-58 / Hazus)
- Est. damage states: structural, nonstructural, equipment
- **Threshold examples**
- Drift <0.5–0.8% → likely safe continue
- 1.0–1.5% → yellow/caution
- 1.8–2.5% or accel >1.0–1.5g → high nonstructural risk

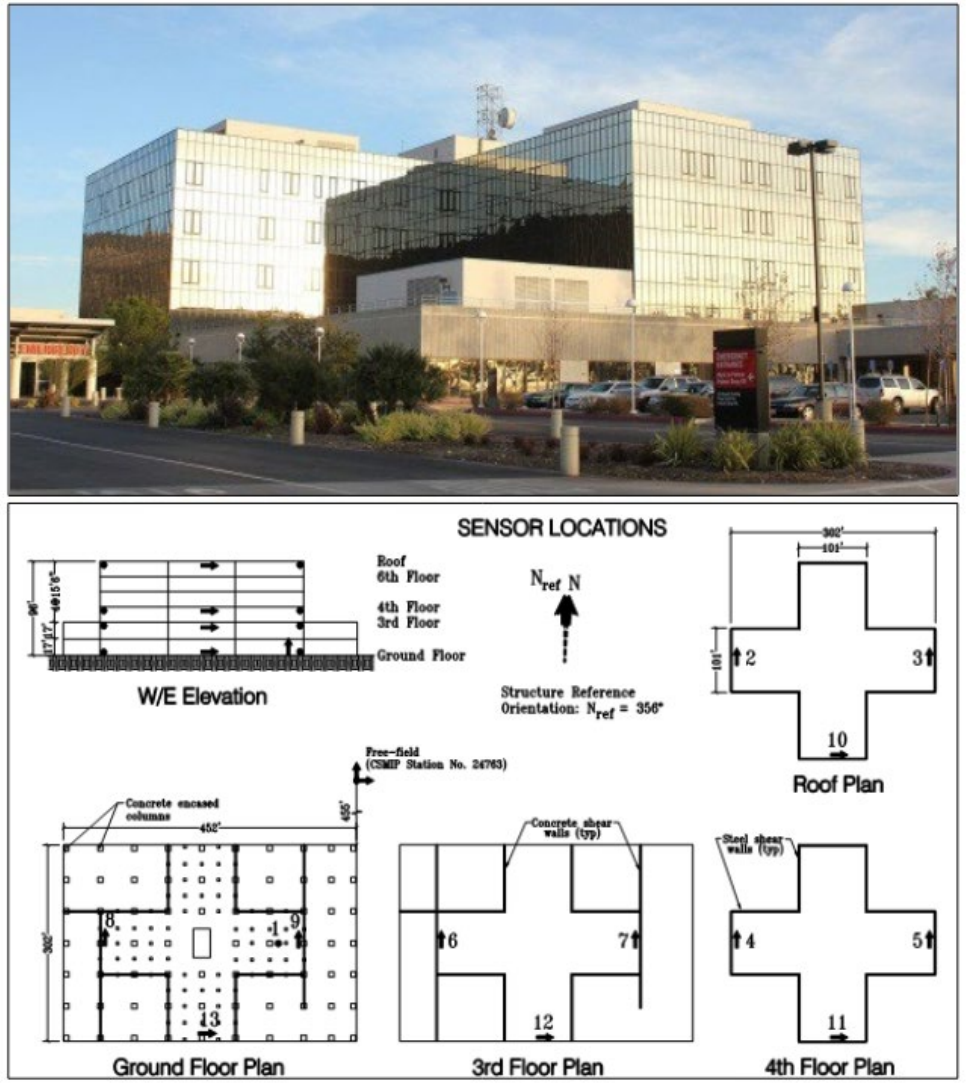


Figure 7. Photo (top) and sensor lay out diagram (bottom) of the six-story Olive View-UCLA Medical Center (New Sylmar County Hospital). Arrows in the schematic diagram show the locations and indicate the directional sensitivity of the strong-motion sensors (accelerometers). The sensors are connected to a central data acquisition system in the building.[6]

Example at Olive View for accuracy of existing analytical tools

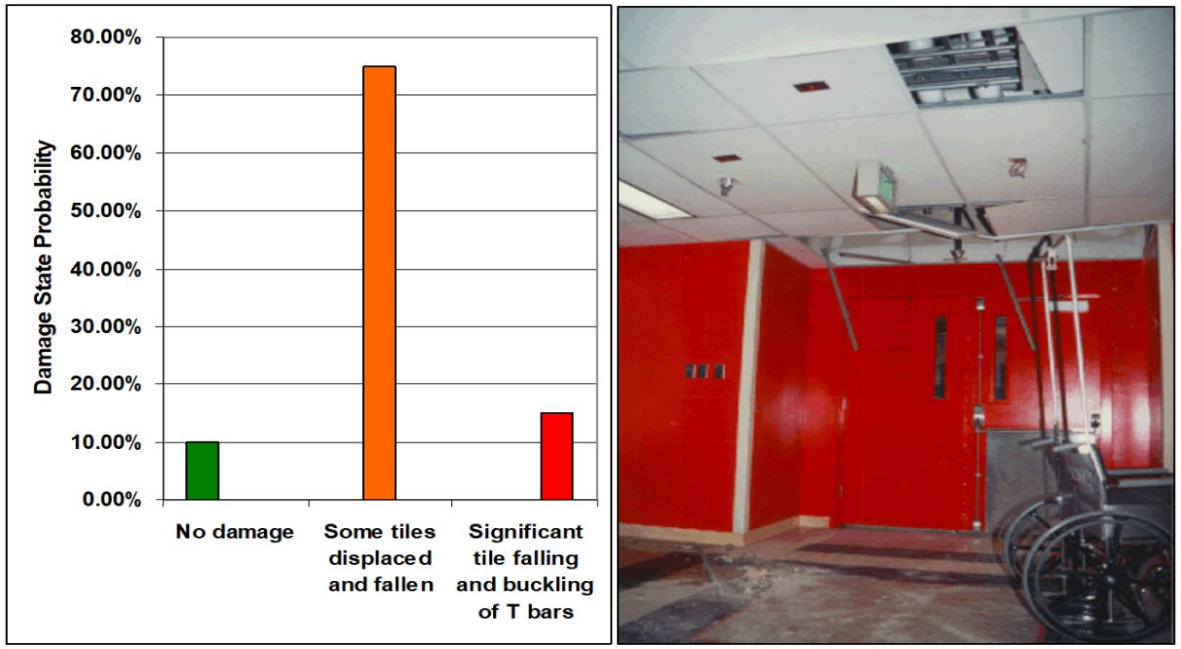


Figure 15. *Instrumentation indicates displaced suspended ceiling tiles on the first floor of the new Sylmar County Hospital following the 1994 Northridge earthquake using a relevant and readily available FEMA-P58 fragility function.*[18]

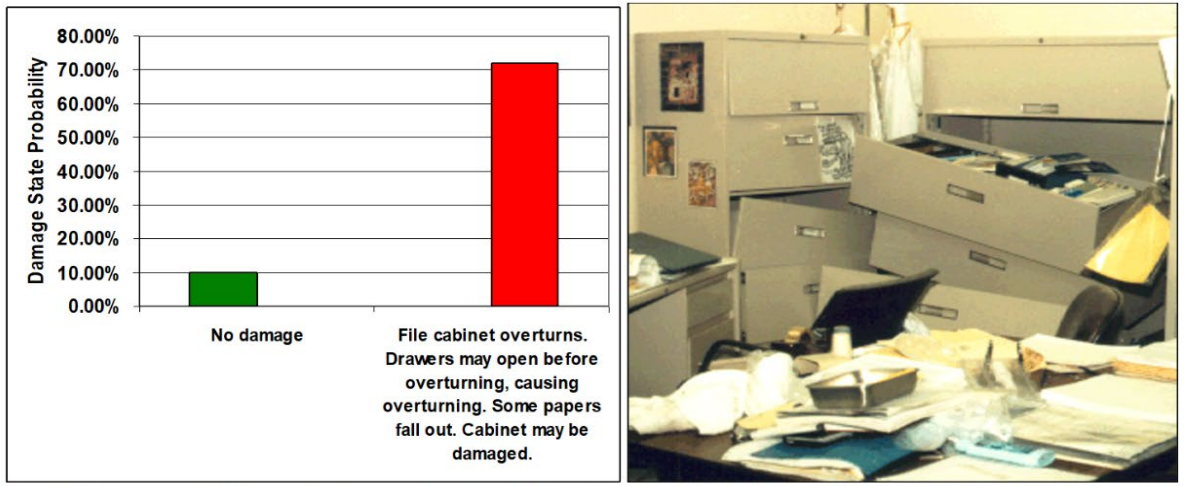


Figure 16. *Instrumentation indicates overturning of file cabinets on the 6th floor of the new Sylmar County Hospital following the 1994 Northridge earthquake using a relevant and readily available FEMA-P58 fragility function.*[19]

Real-Time “Black Box” Vision

- Shift: delayed data → instant alerts
- On-site/cloud processing of sensor data
- Immediate max accel + story drift to fragility curves
- Auto notifications (email/SMS/dashboard) to admin/engineers
- **Decisions in minutes**
- **Benefits**
  - Avoid unnecessary evacuations
  - Prevent undetected hazards
  - Periodic condition assessment for repairs/retrofitting

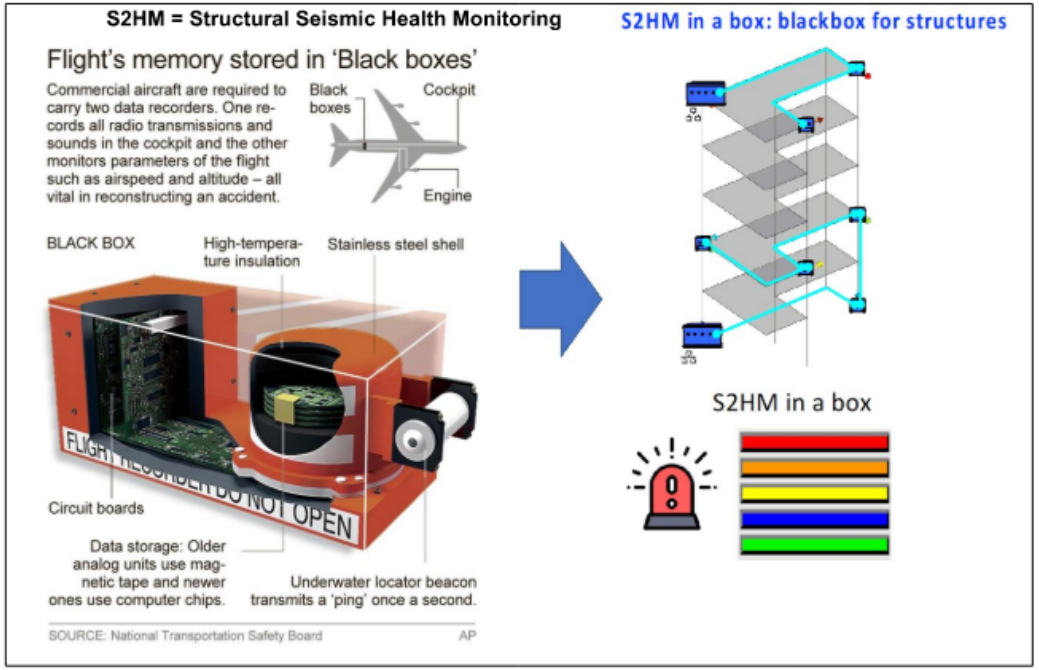
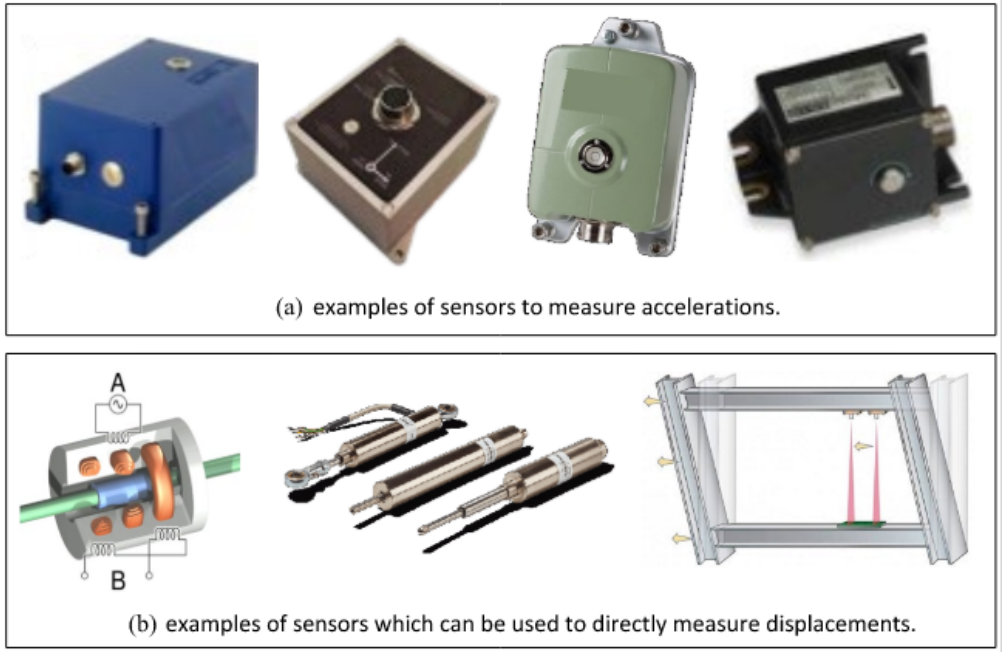


Figure 17. The concept of “black boxes” for buildings (Courtesy of Talhan Biro).[20]

Implementation Paths & Sensor Layouts Path A: Traditional High-Res

- **Path A: Traditional High-Res**
  - Force-balance tri-axial accel (e.g., Kinemetrics)
  - 8–20 sensors/building, wired, central DAQ
  - High-quality, long-life (>20 yrs)
- **Path B: Modern Low-Cost (Recommended)**
  - Class C MEMS accel (smartphone-grade)
  - 10–30+ sensors, wireless/PoE
  - On-site/cloud real-time drift/accel calc + alerts



(a) examples of sensors to measure accelerations.

(b) examples of sensors which can be used to directly measure displacements.

Figure 6. Sensors that have been and can be installed at hospitals for seismic instrumentation and structural health monitoring.

White Paper Summary and Action Items

- Current instrumentation benefits include future improvements to design/construction
- Technology exists with less expensive sensors to economically instrument a building for structural health
- Use of low-cost instrumentation in a structural health monitoring system could be used to rapidly make decisions about post-earthquake operations
- Hospitals should consider the benefits of instrumentation installation

Item #4 Discuss approach to address goals and objectives of the ad hoc subcommittee

- Are the subcommittee goals and objectives appropriate?
- What deliverable(s) will support the subcommittee delivering on the stated goals and objectives?
- Assignments for delivering materials
- Discussion and public comment

Facilitator: Courtney Johnson, PG, CEG, Principal Geologist, Slate Geotechnical Consultants; Subcommittee Vice-Chair (or designee)

Item #5 Determine schedule and plan for future meetings

- Discussion and public input

Facilitator: Courtney Johnson (or designee)

Item #6 Comments from the Public/Subcommittee Members on Issues not on this Agenda

The Subcommittee will receive comments from the Public/Subcommittee Members. Matters raised at this time may be taken under consideration for placement on a subsequent agenda.

Facilitator: Martin Hudson(or designee)

Item #7 Adjournment