



# Sewer Condition Assessment

E2 Consulting Engineers, Inc. (E2) has been conducting sewer system condition assessments for over 20 years. We assist our clients with evaluation of system performance, alerting them of needed upgrades and repairs. Our staff of technical specialists provide a full suite of services to meet our clients' needs, large or small.

Services include:

- Flow Monitoring
  - Rain Gauges
  - pH
  - Conductivity
  - Sampling
- Smoke Testing
  - Dye Tracing
- Manhole Inspections
- CCTV Management

## Flow Monitoring

E2 uses many different types of flow meters including Hach flow meters (such as the 900 series and FL 900's with Flo\_Dars and



Flow Monitor Installation for the City of Berkeley

telemetry), Isco 2500's, and ADS systems. All these open channel flow monitors are capable of measuring both depth and velocity. Each type of monitor includes data storage capabilities with the capability for 1-minute intervals, however 5- and 15-minute sampling intervals are preferred. E2 has also installed pH, conductivity meters and samplers in tandem with flow meters to determine flow quality for commercial and industrial clients.



E2 also uses time dwell loggers and polysonic devices for logging flows in force mains and for lift stations. To verify pump capacity, E2 performs draw down testing on the wet wells to determine accurate pump rates.

E2 can also use one-channel event recorder and tipping bucket rain gauges to continuously record rainfall data for flow-monitoring programs. These tipping bucket rain gauges are designed to close a mercury or magnetic



switch with each 0.01-inch of rainfall, allowing the data pod to record the time of the event. The following factors are considered in positioning the rain gauges for our clients:

- Accessibility for installation, data retrieval, maintenance, and removal
- Adequate distance from objects such as high structures and trees that could distort rainfall measurements
- Protection from high winds
- Security of the site to avoid theft or damage by vandalism

## Smoke Testing

E2 has a field proven smoke testing program for assessment of sewer lines. Prior to beginning smoke testing, E2 will notify Police and Fire Departments, as well as building occupants in the vicinity of the smoke tests through telephone calls, written notifications and local news outlets. Public awareness is critical for positive project completion.

For each smoke test location, E2 will use a Smoke Testing Setup Form and associated Smoke Testing Defect Forms as defects are encountered. When defects within the pipe reach are found, they are flagged, digitally photographed and documented with a sketch on a Smoked Testing Defect Form. The defect

form includes location, address or house number, data, and a schematic layout of the manhole and sewer line under testing. Measurements from at least two permanent reference points to the smoke emission point will also be included on the form.

The photos and field forms can then be linked to a GIS database. Defect reports can be generated with the defect picture and stats, which can then be tri-folded and mailed to the associated address.

Dye tracing is sometimes used at the completion of smoke testing to confirm catch basin connection by plugging the storm pipe with dyed water and verifying how storm water gets into the sanitary system. CCTV cameras are sometime used in conjunction with the dye tracing.

## Manhole Inspection

E2's field staff is NASSCO certified (National Association of Sewer Service Companies) and can use the NASSCO forms, codes, and scoring method; E2's own one-page form; or other client specified forms and codes to complete the inspection. Photographs of location, inverts, pipes and all defects can be taken and documented as part of the project record and the location recorded using E2's



Traffic Control Measures for Sewer Inspections



GPS equipment with sub-foot accuracy. All data collected can be loaded into a Microsoft Access database for easy retrieval and summaries.

## **CCTV Management**

Since 1995, E2 has routinely managed CCTV service subcontractors to provide our customers with integrated inspection reports.

## **Recent Projects**

### **Flow Monitoring Studies**

Since 2009, E2 has conducted flow monitoring studies for over 20 different customers including using hundreds of flow meters:

- City of Berkeley
- City of Albany
- City of Piedmont
- Sanitary District Number
- Oroloma sanitary District
- Stege Sanitary District
- City of San Jose
- Stanford University
- Fairfield Suisun Sanitary District
- Pebble Beach
- For the Town of Hillsborough
- City of San Mateo
- City of Burlingame
- San Mateo County
- East Bay Municipal Utility District / V&A
- Tamalpais Sanitary District
- City of Sausalito
- City of Los Angeles

### **East Bay Municipal Utility District (EBMUD) I/I Correction Program**

E2 has installed hundreds of flow meters over

a 15 year period to determine inflow and infiltration (I/I) rates. This information has been used to determine which basins needed rehabilitation. When the rehabilitation was complete, more flow metering was done to certify I/I reduction was satisfactory. E2 determined average daily flow, base flow, groundwater infiltration, rain dependent infiltration, percent of rain return and used synthetic hydrographs to normalize flow response to a 5 year design storm.

### **Smoke Testing**

Since 2009, E2 has conducted smoke testing on over 275,000 linear feet of sewers for the following customers:

- City of Emeryville
- Stege Sanitary District
- City of Albany
- Harvest properties
- City of Burlingame

### **Manhole Inspection**

Since 2002, E2 has inspected over 3,300 structures for the following customers:

- City of Burlingame
- EBMUD Interceptor
- Ross Valley Sanitary District
- Tamalpais Sanitary District
- City of Oakland
- City of Los Angeles
- Yosemite Valley
- Sacramento international airport

Rapid response to customer needs is one of E2's core strengths. Within two weeks from the start of field work, E2 inspected over 200 manholes using NASSCO codes along with photo documentation of site conditions for the City in Burlingame.