Recycling Construction Demolition Debris for Stormwater Management

BMP Case Studies:

South Shore High School Demolition & Rosenblum Park

Presented by:
Nicholas Smith, PE, CFM, CPESC

Primera

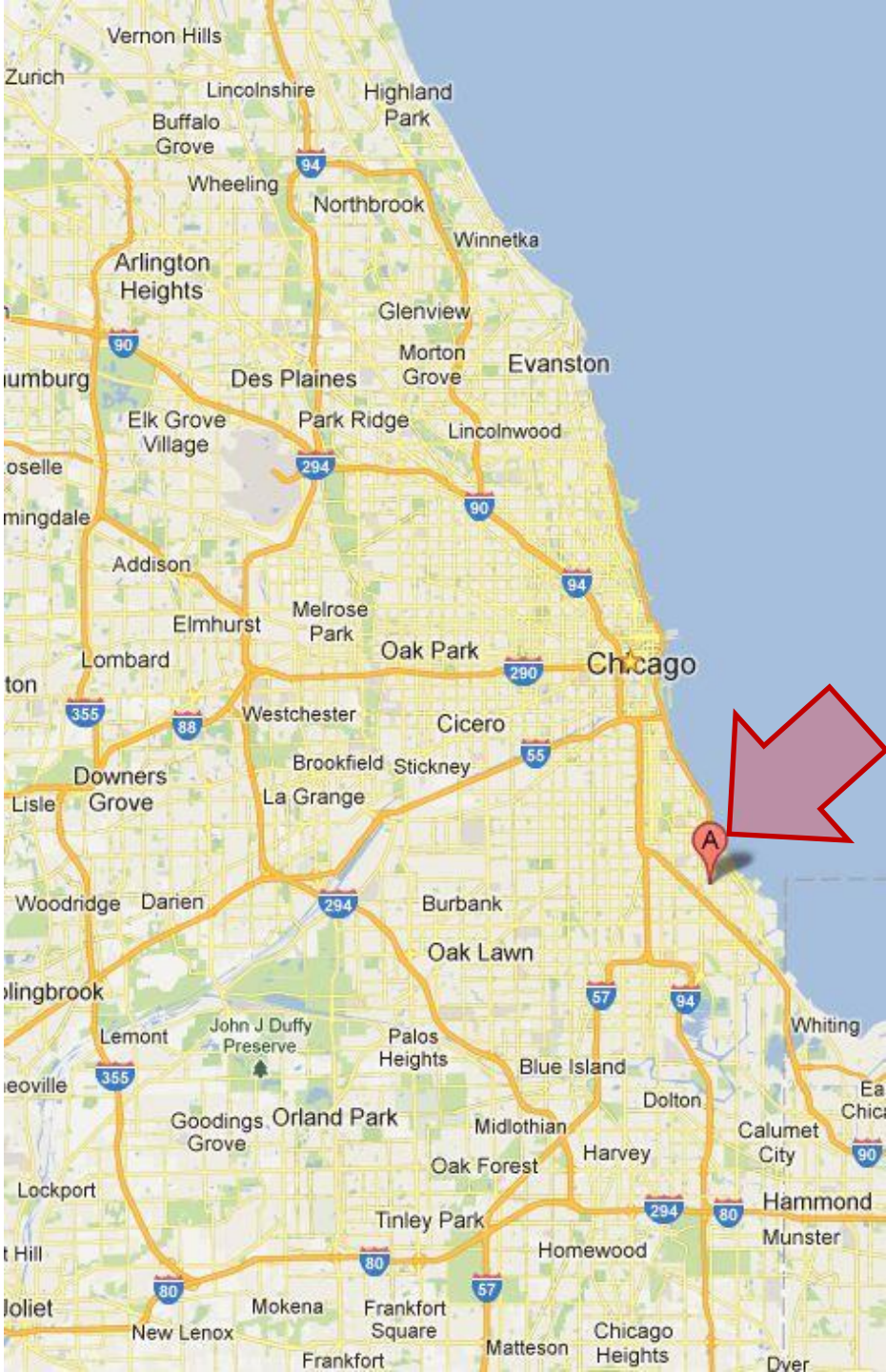
Objective

- Recycling Concrete Aggregate (RCA) for stormwater management
  - Sustainable
  - Cost Effective
  - Maximizes Usable Land
  - Fine Particle Deposits
  - Sedimentation Considerations

Primera

Location

- South Shore Neighborhood of Chicago
- Loose to Medium Dense Brown Sand
- Infiltration Rate: 2.5 in/hr



Project Background

Site:

South Shore High School

Building Footprint:

50,000 sq.ft.

Concrete Debris Estimate:

20,000 cu.yd.

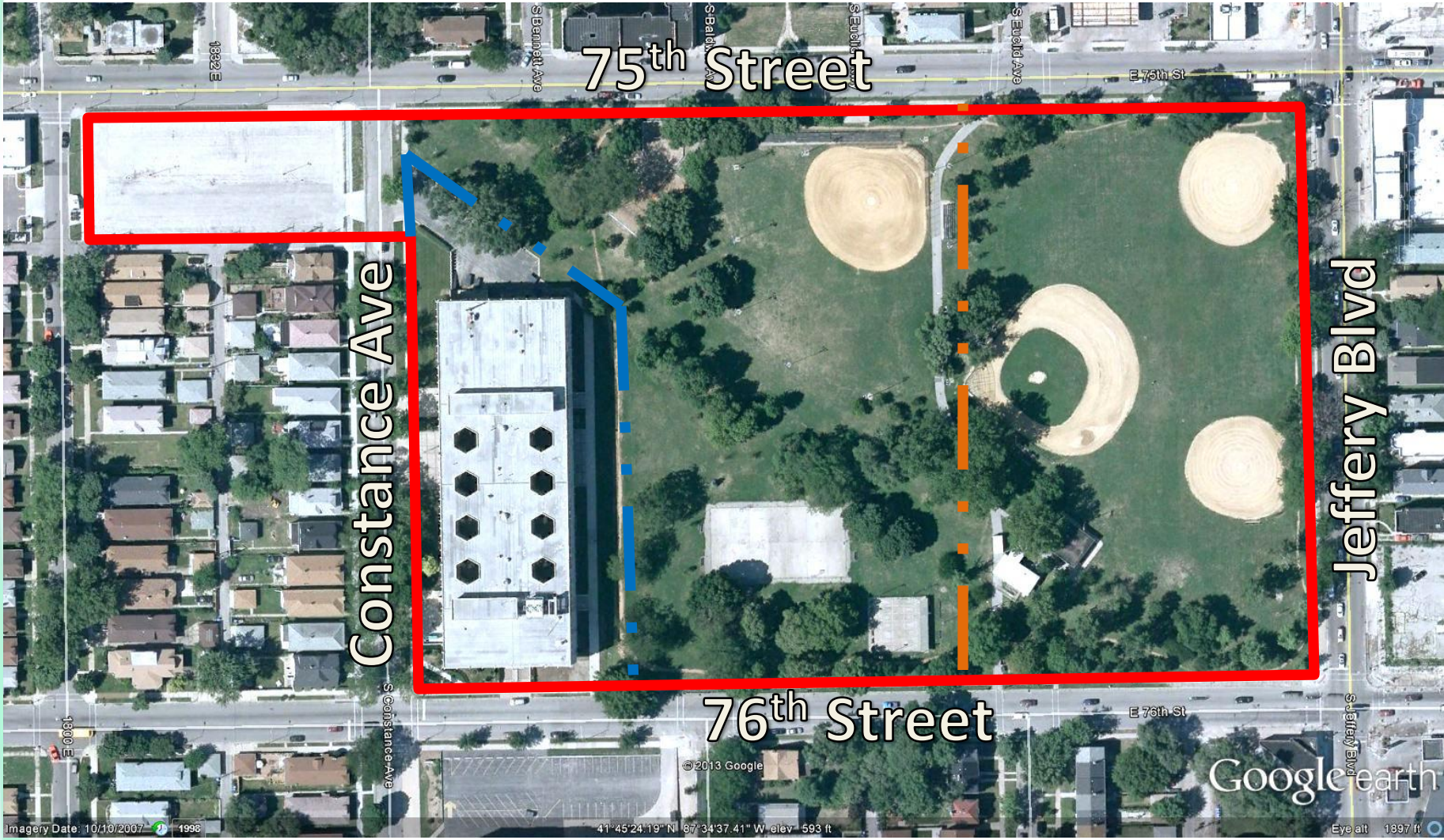
Primera

Project Background

- Client - Public Building Commission of Chicago
- Permitting Agency - City of Chicago DWM
- Demolition Budget - $3.5 Million
- Construction Costs - $2.5 Million
- Improvements Area - 9.7 acres
- Required Detention - 1.5 acre-ft
- Storage Provided - 2.5 acre-ft

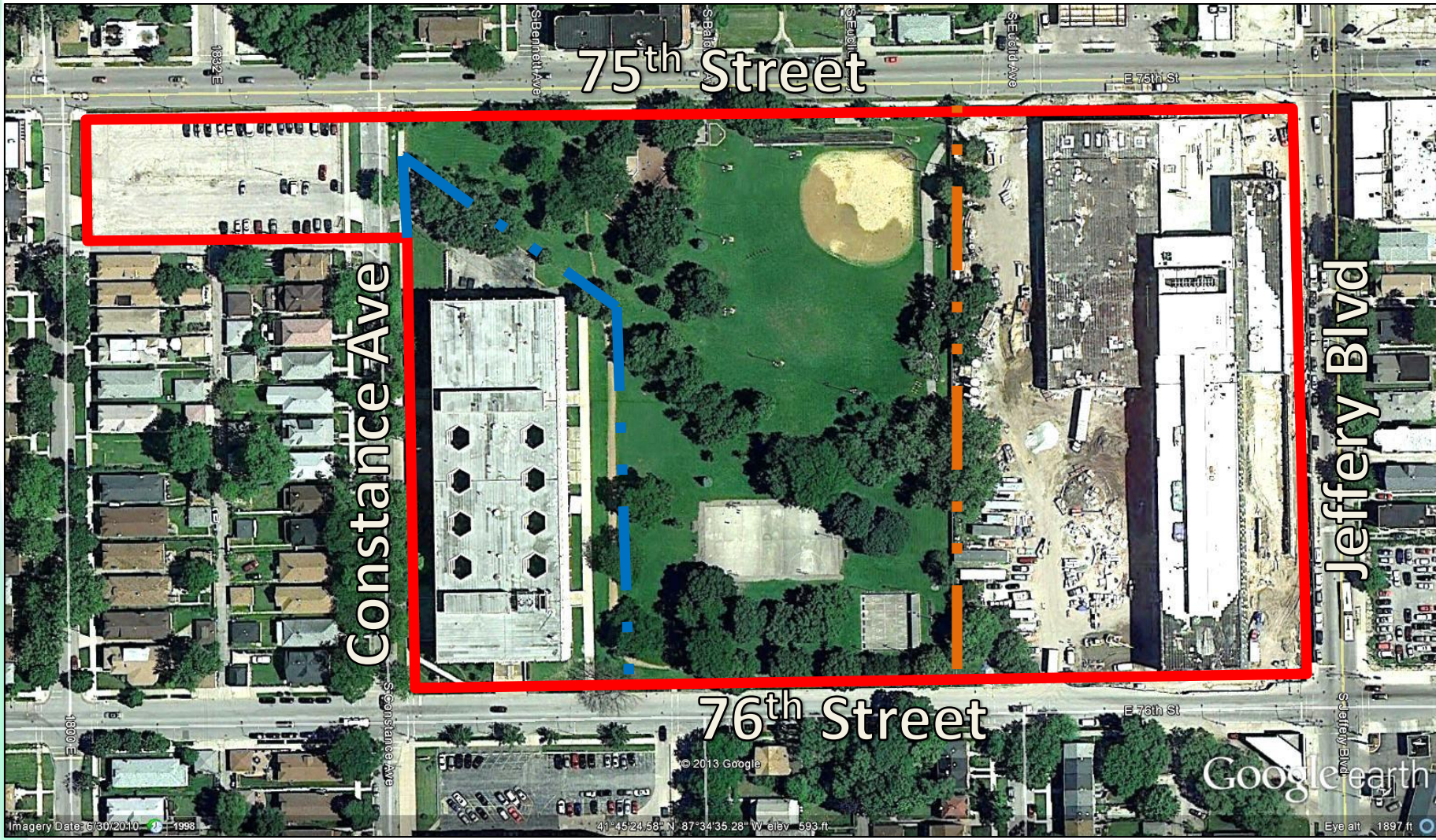
Primera

2008



Primera

2010



Primera

Traditional Building Demolition

- Salvage
- Recycle
- Bury
- Landfill
- CCDD

Primera

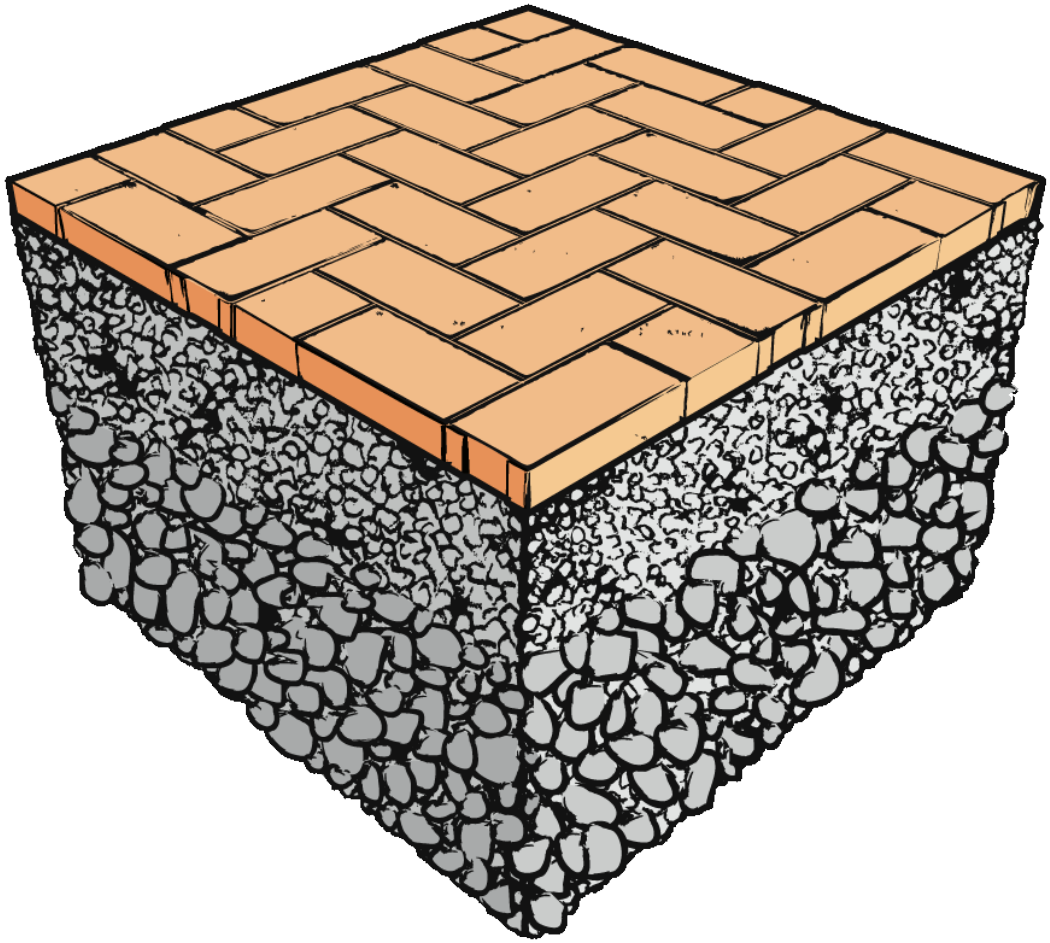
CCDD

- Clean Construction or Demolition Debris revisions
- Resulting in high export cost
- Critical to balance the concrete and earthwork

Primera

Detention in Stone

- Utilized a void ratio of 38% for CA-1
- Validated by field tests



Primera

Recycled Concrete Aggregate

- Reduces the need for gravel mining
- Reduces hauling costs
- Reduce the concrete debris to CCDD
- On-site Crushing and Screening equipment becoming more common
- Versatile enough to be substituted for many virgin stone applications
- Cost effective at 2,000 cu.yd.

Primera

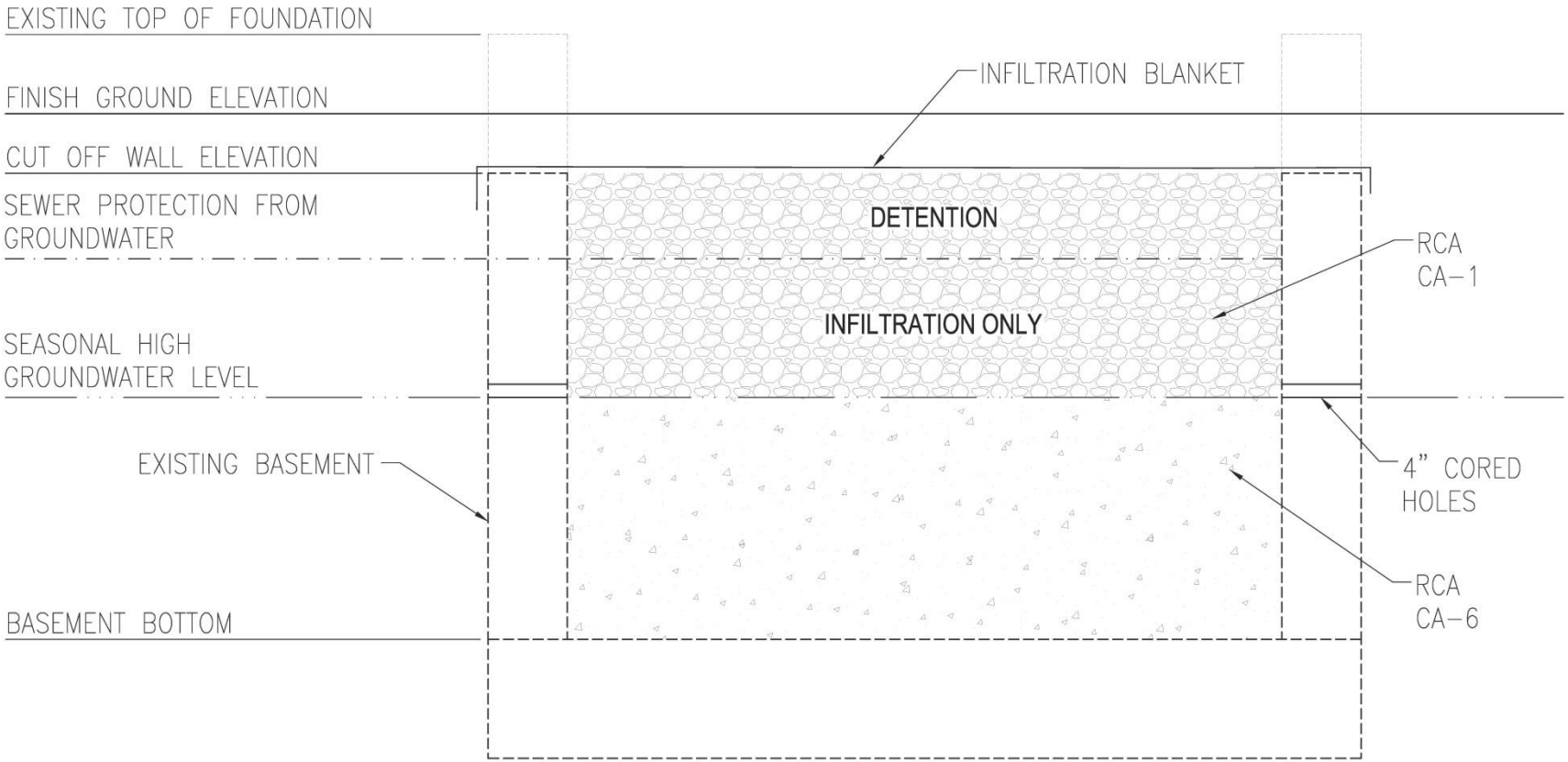
Complications of using RCA

- Leaching results in high pH
- Fine particle are self-cementing

Infiltration Basin

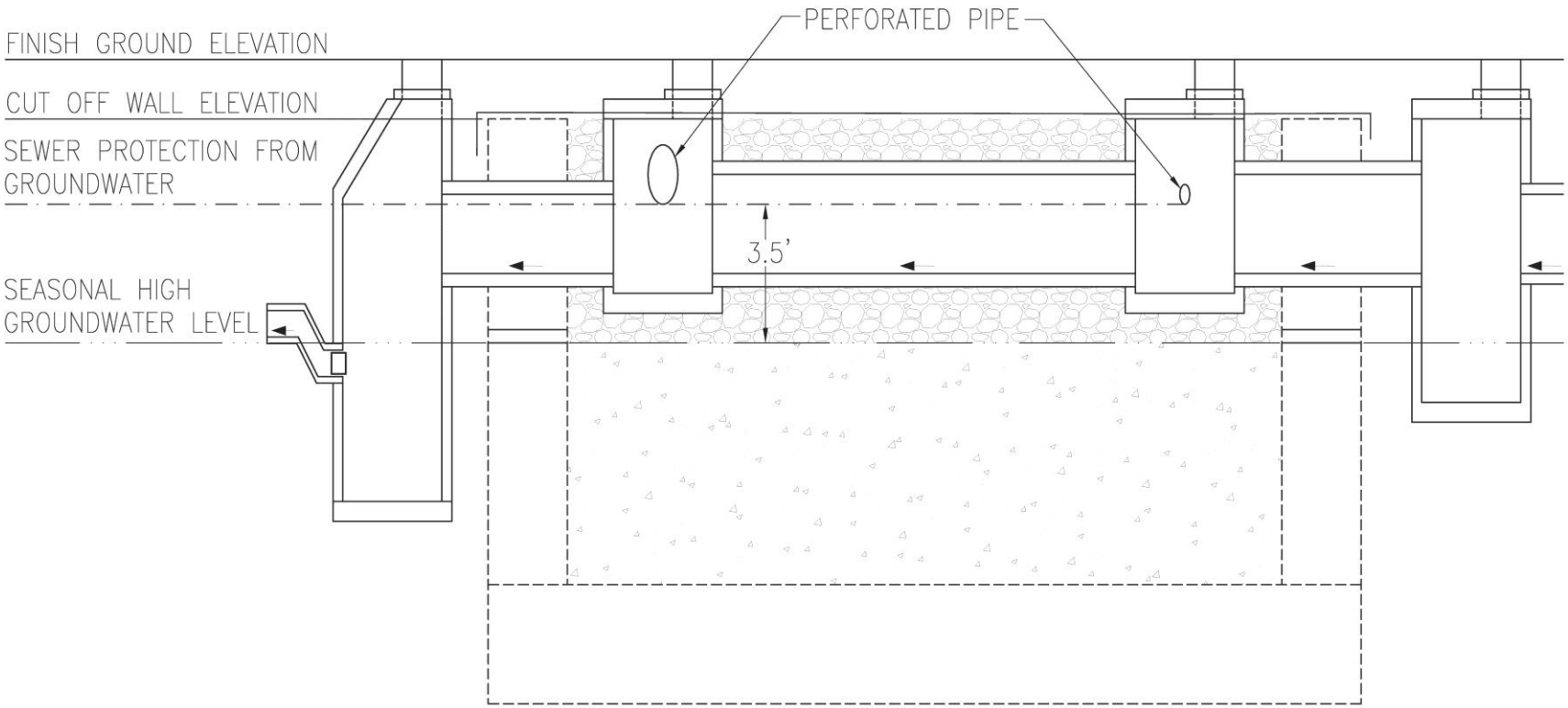
Primera

Infiltration Basin Design



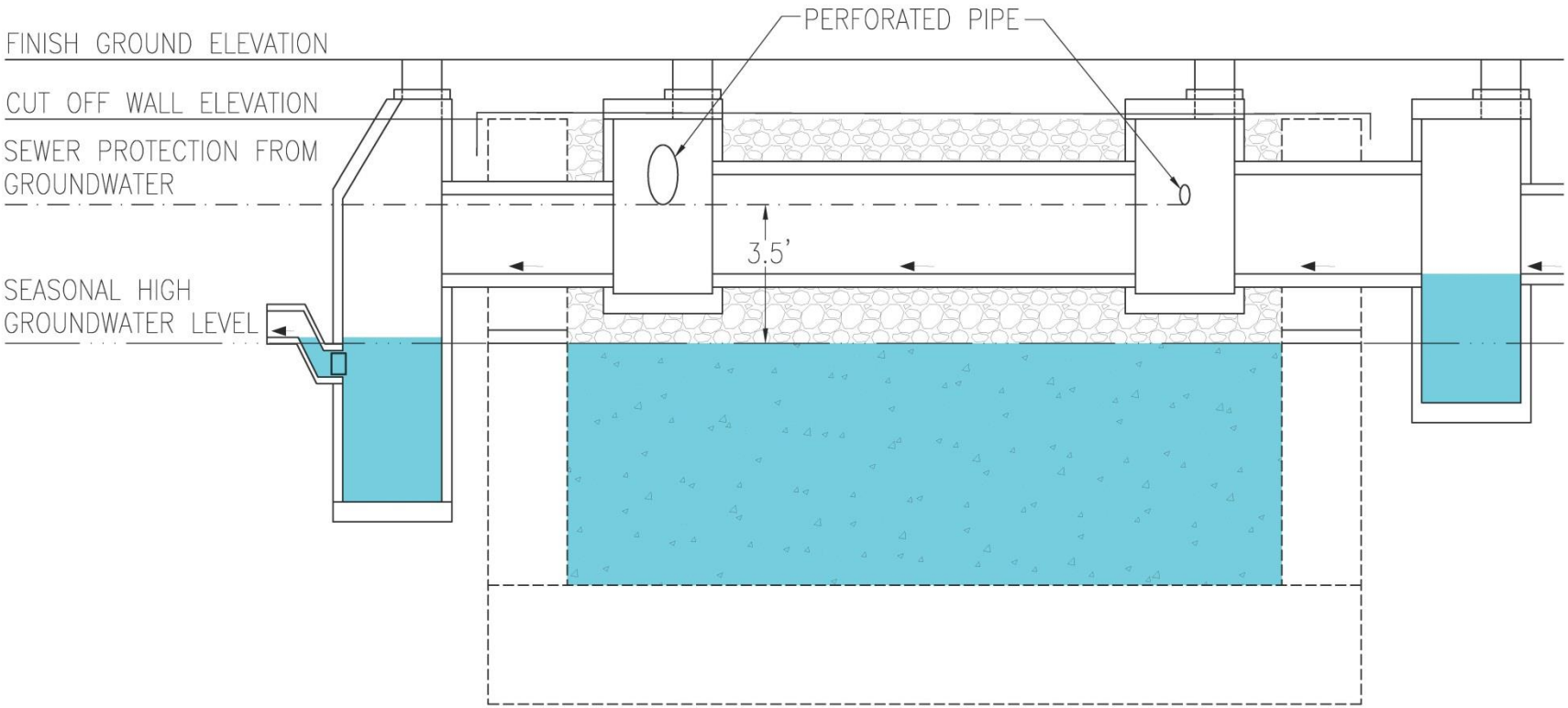
Primera

Basin Drainage Design



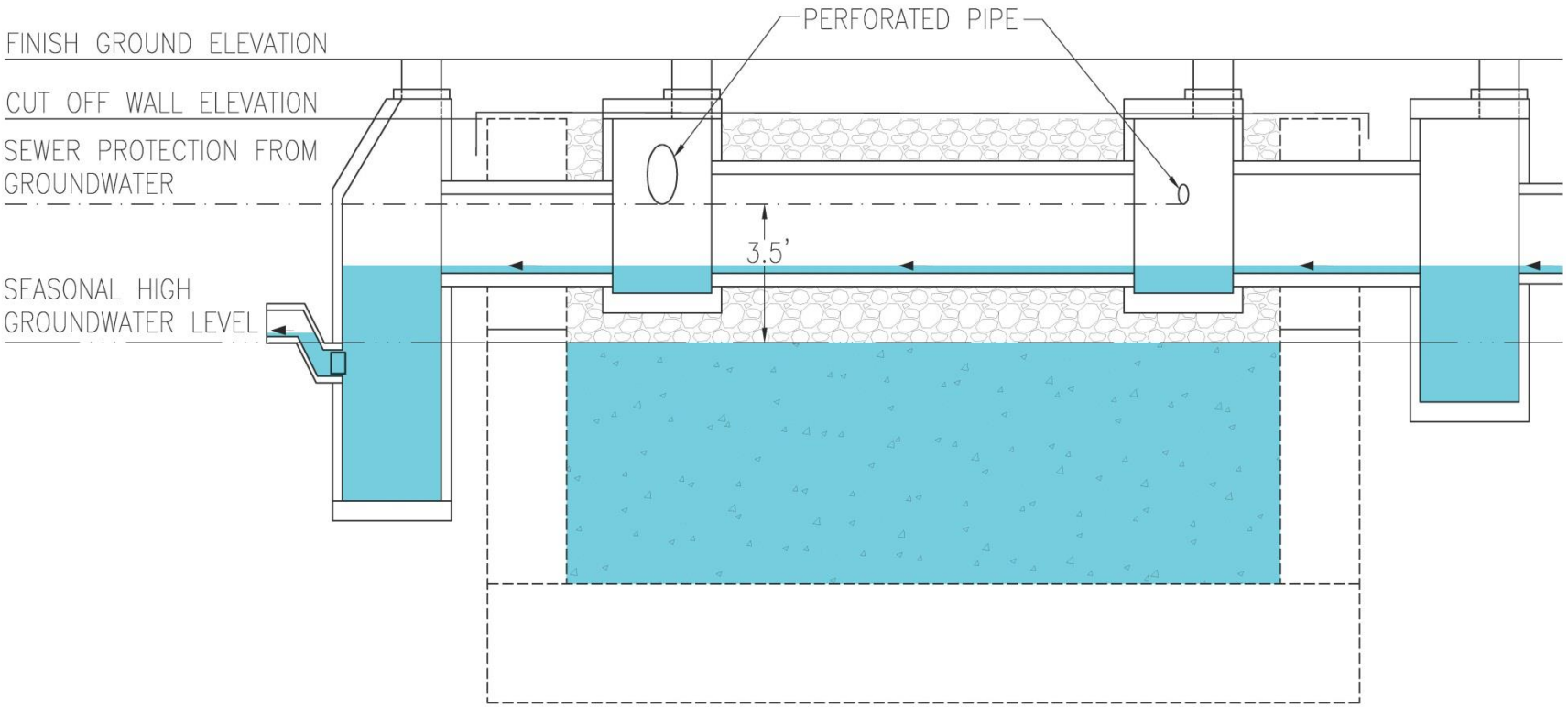
Primera

Basin Drainage Design



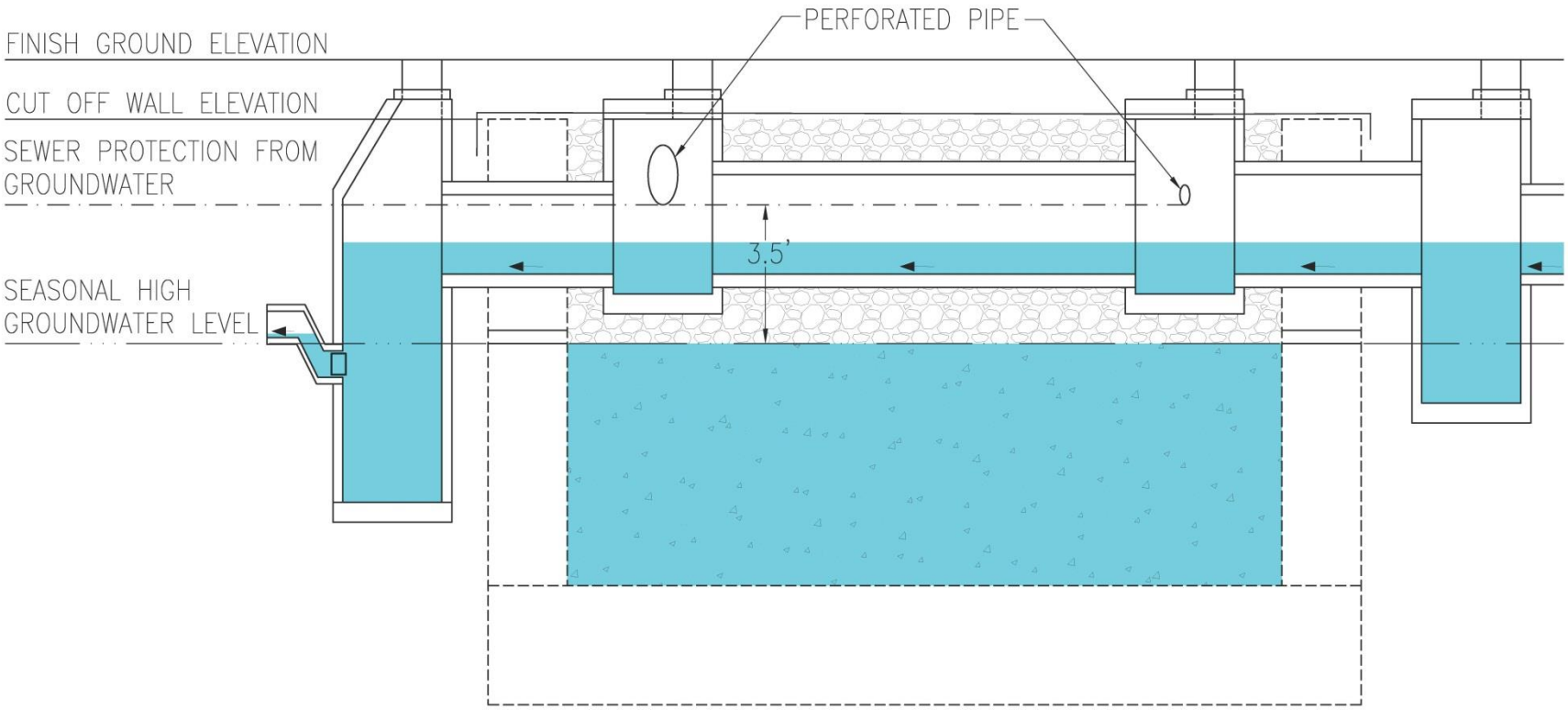
Primera

Basin Drainage Design



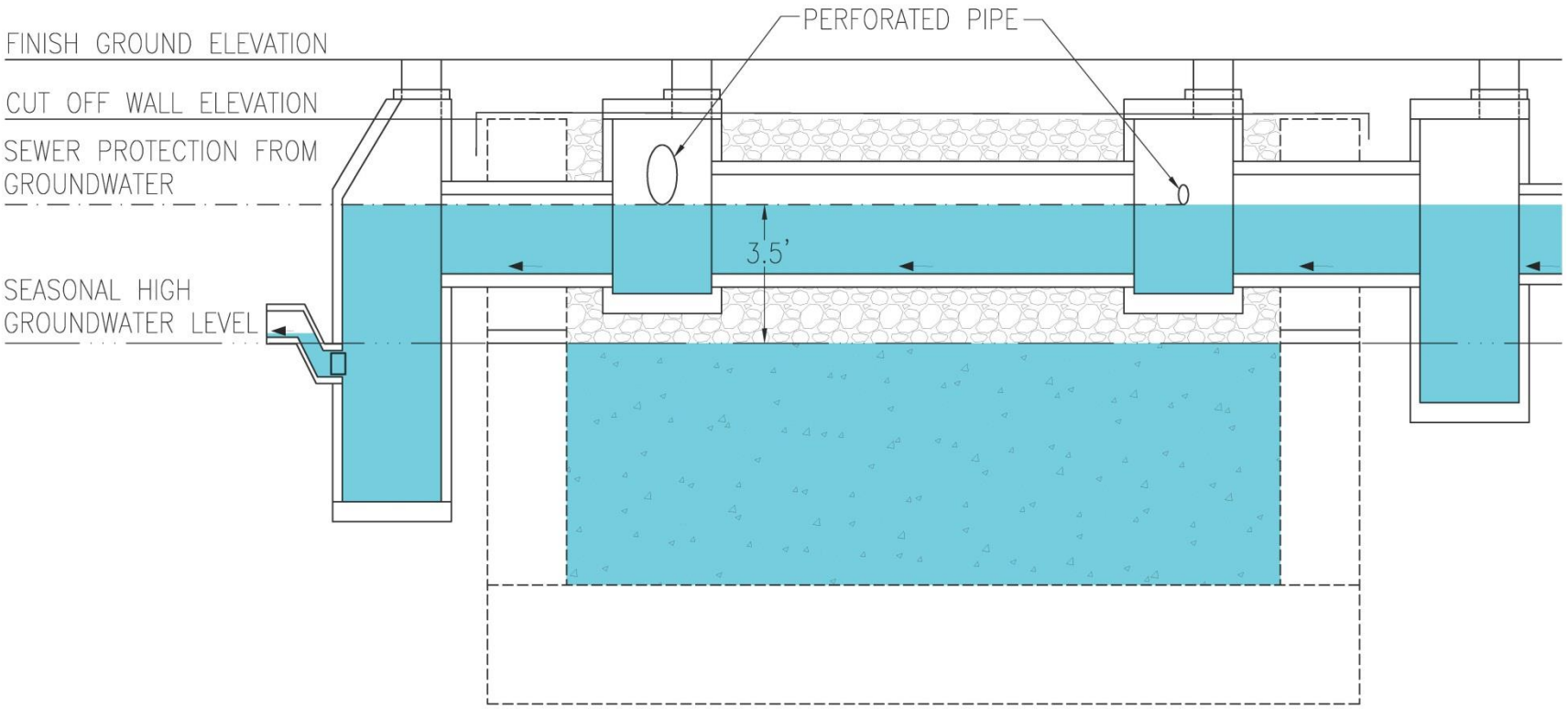
Primera

Basin Drainage Design



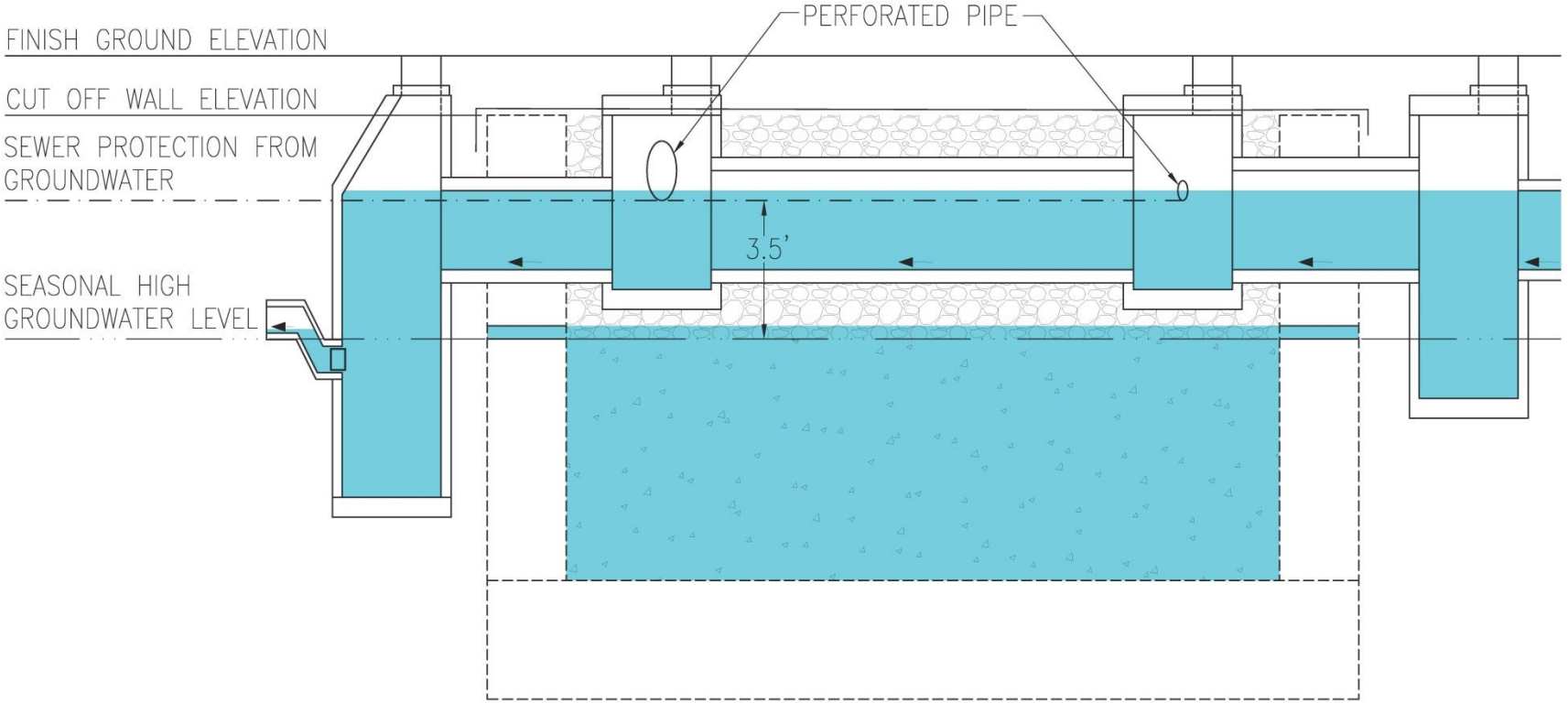
Primera

Basin Drainage Design



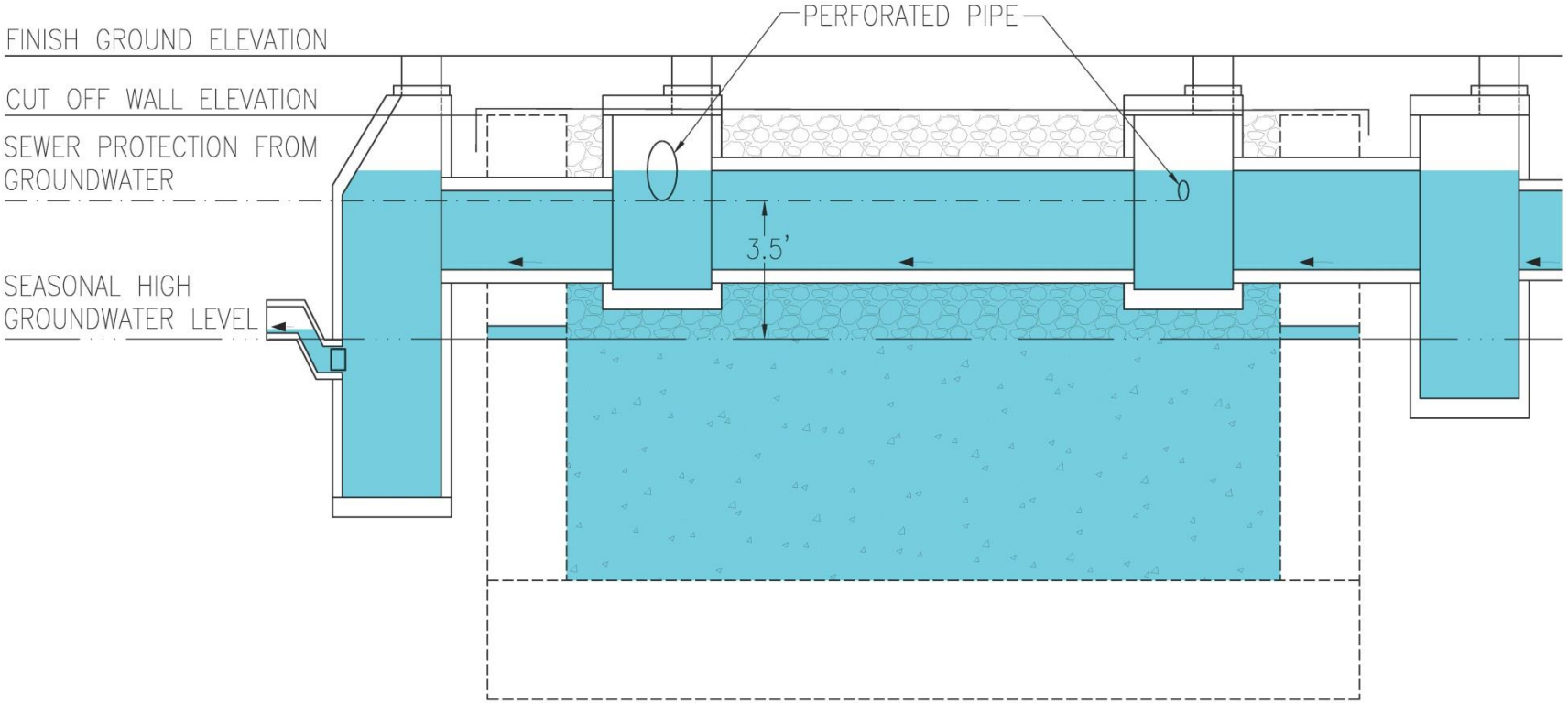
Primera

Basin Drainage Design



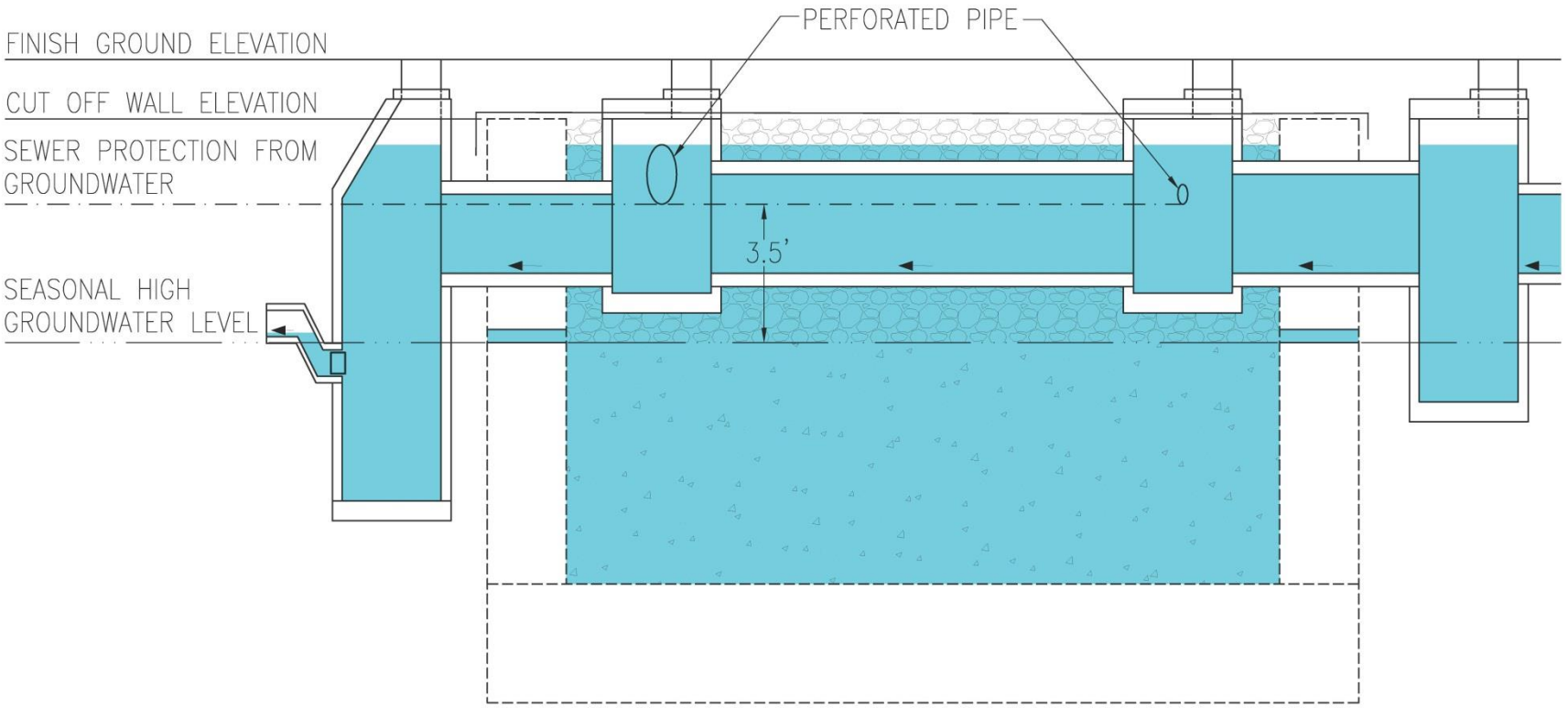
Primera

Basin Drainage Design



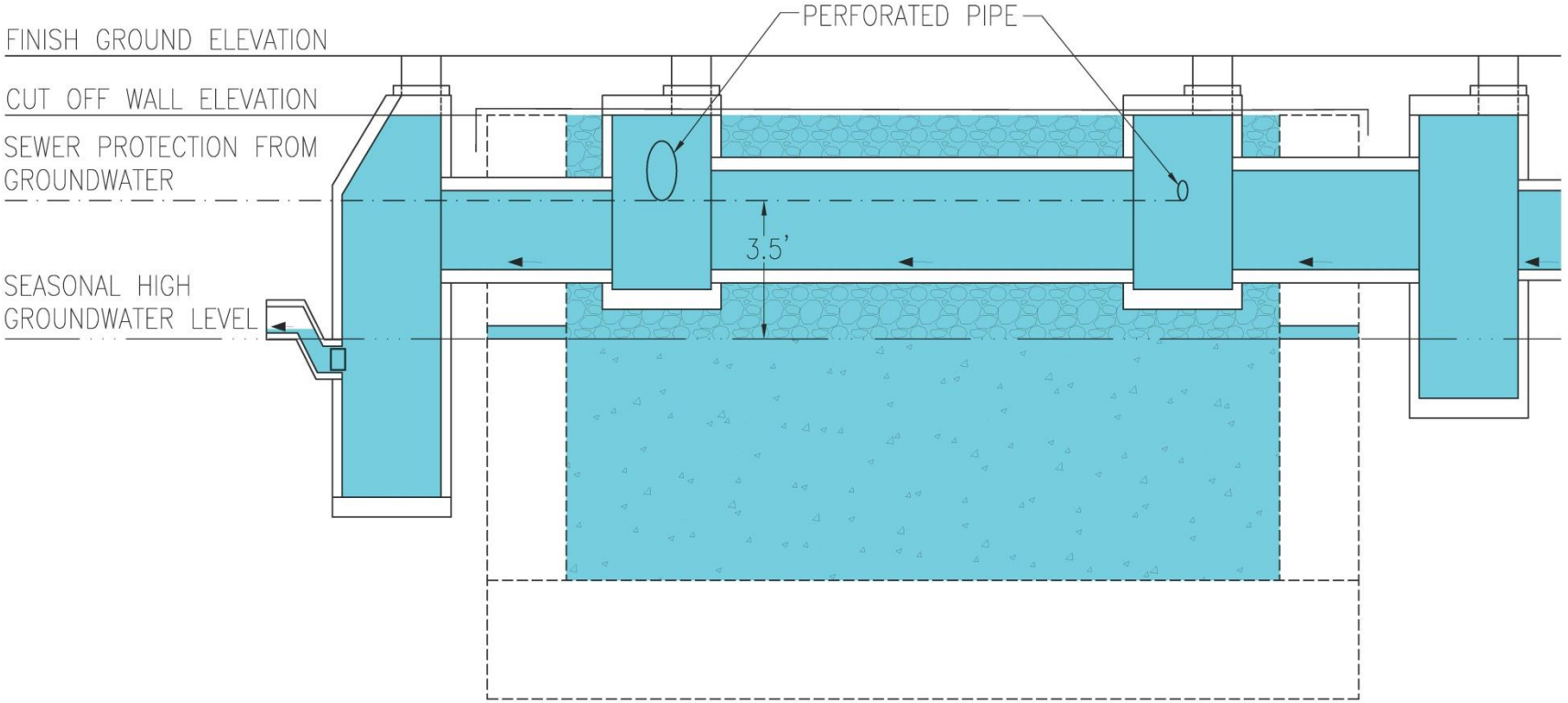
Primera

Basin Drainage Design



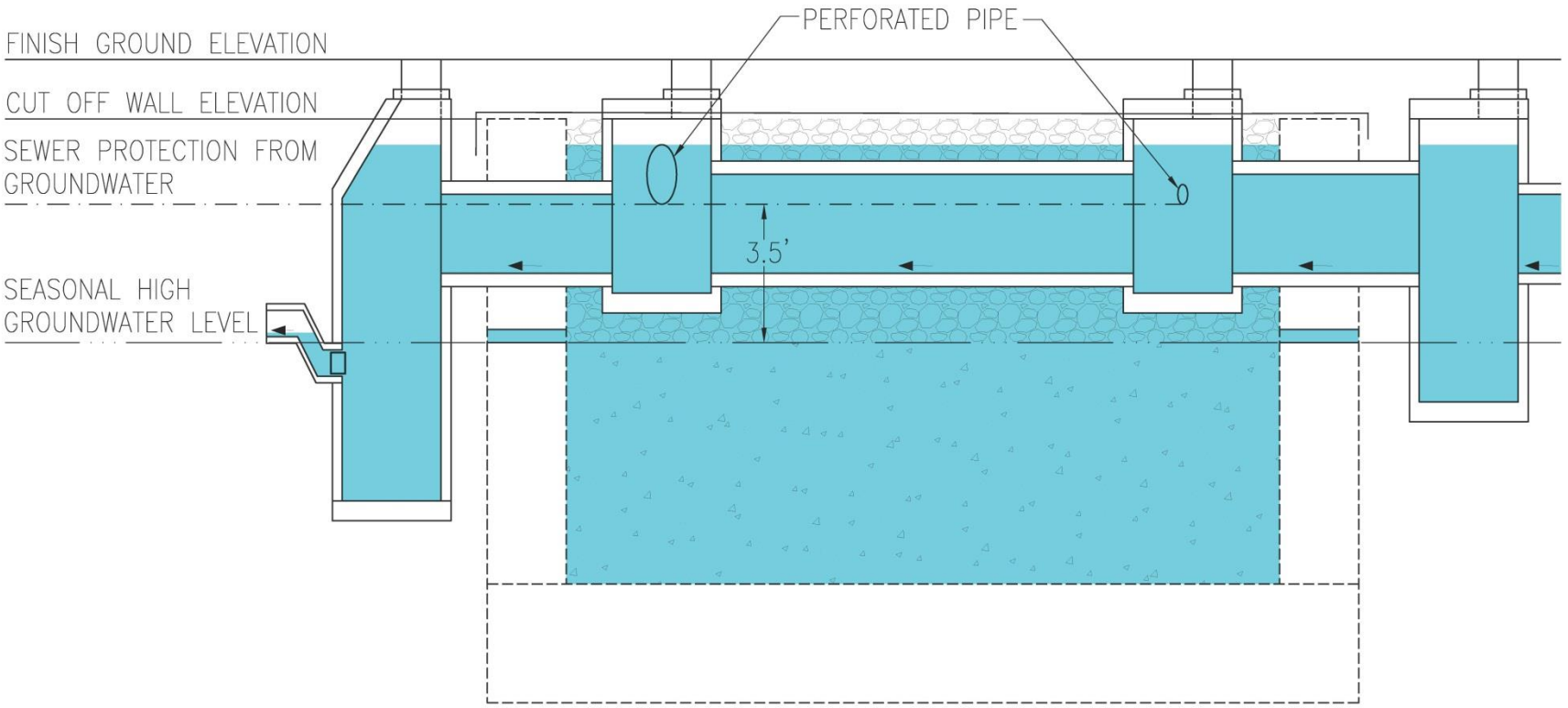
Primera

Basin Drainage Design



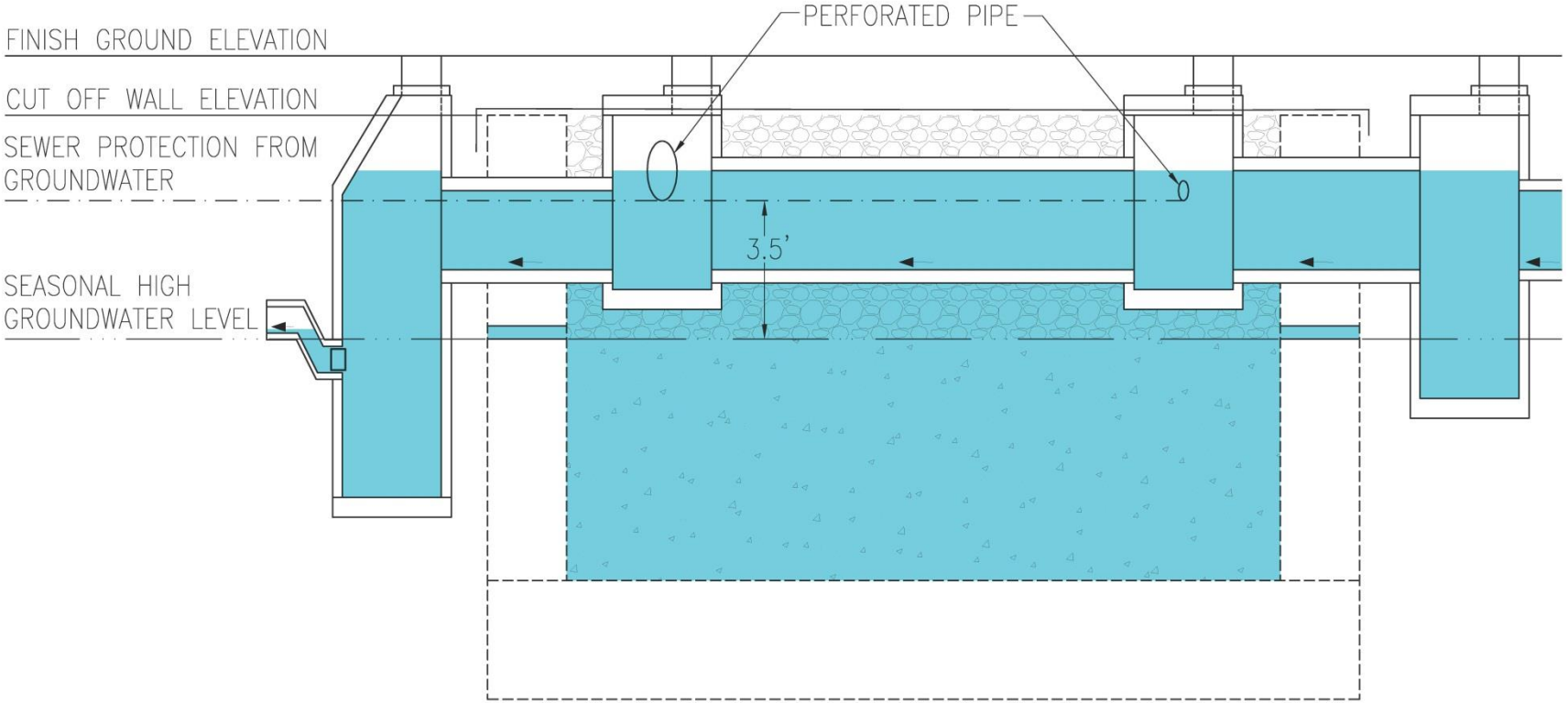
Primera

Basin Drainage Design



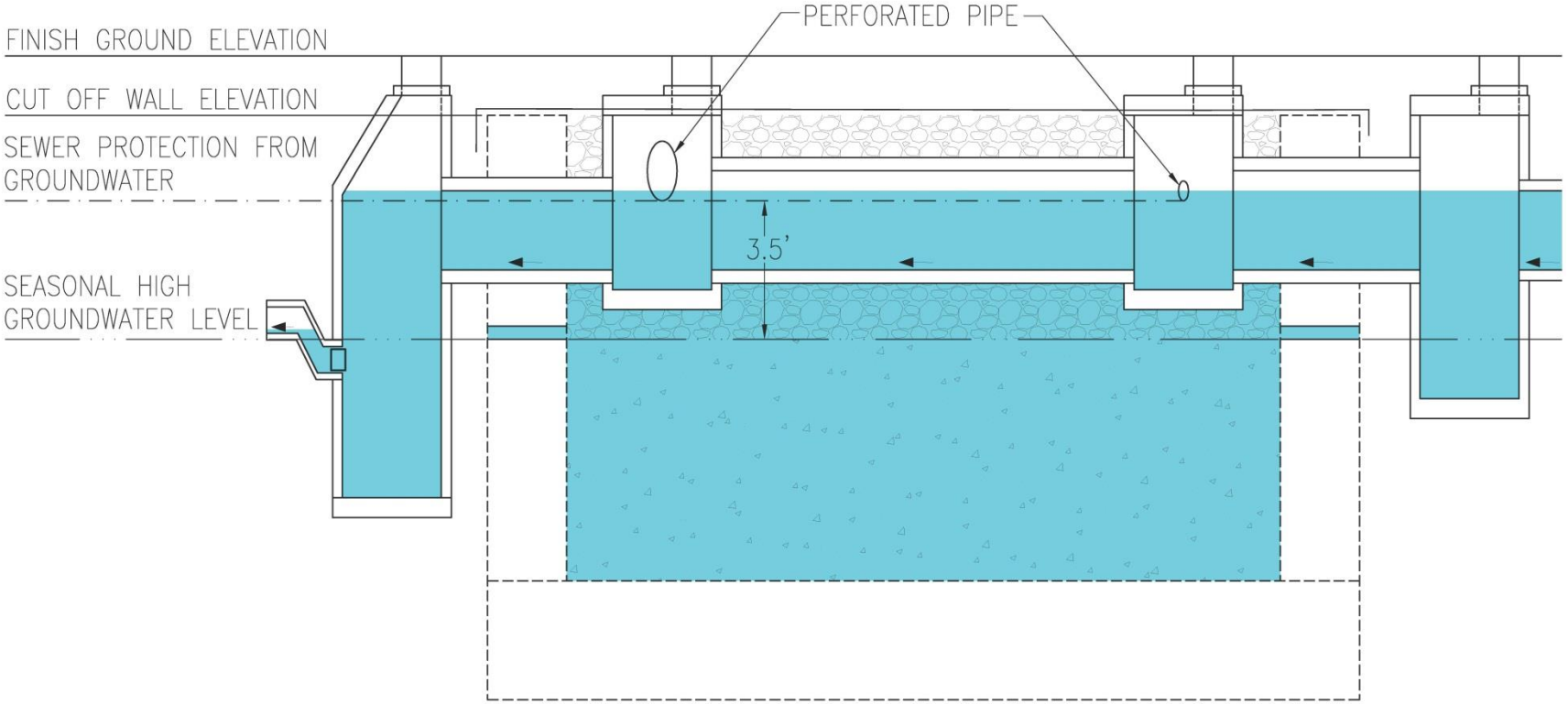
Primera

Basin Drainage Design



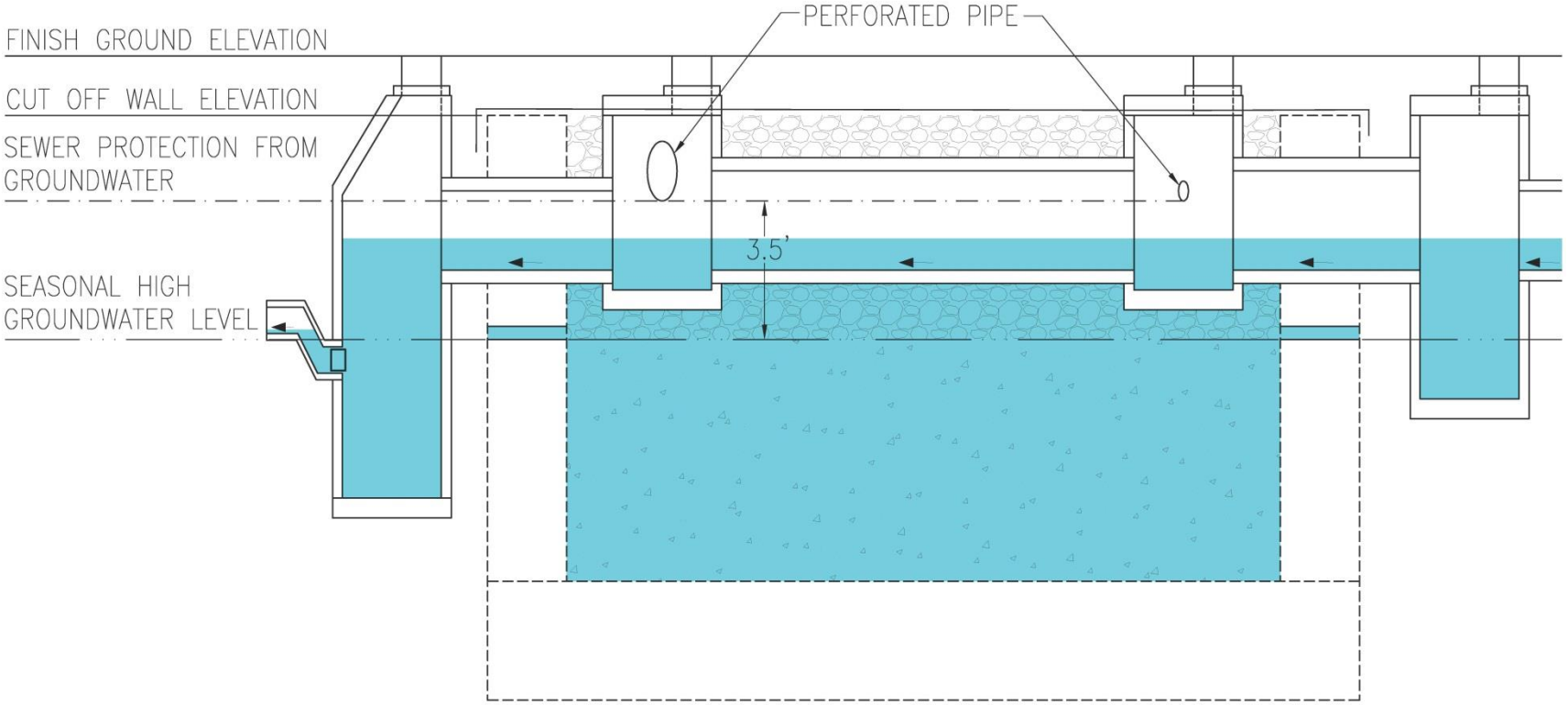
Primera

Basin Drainage Design



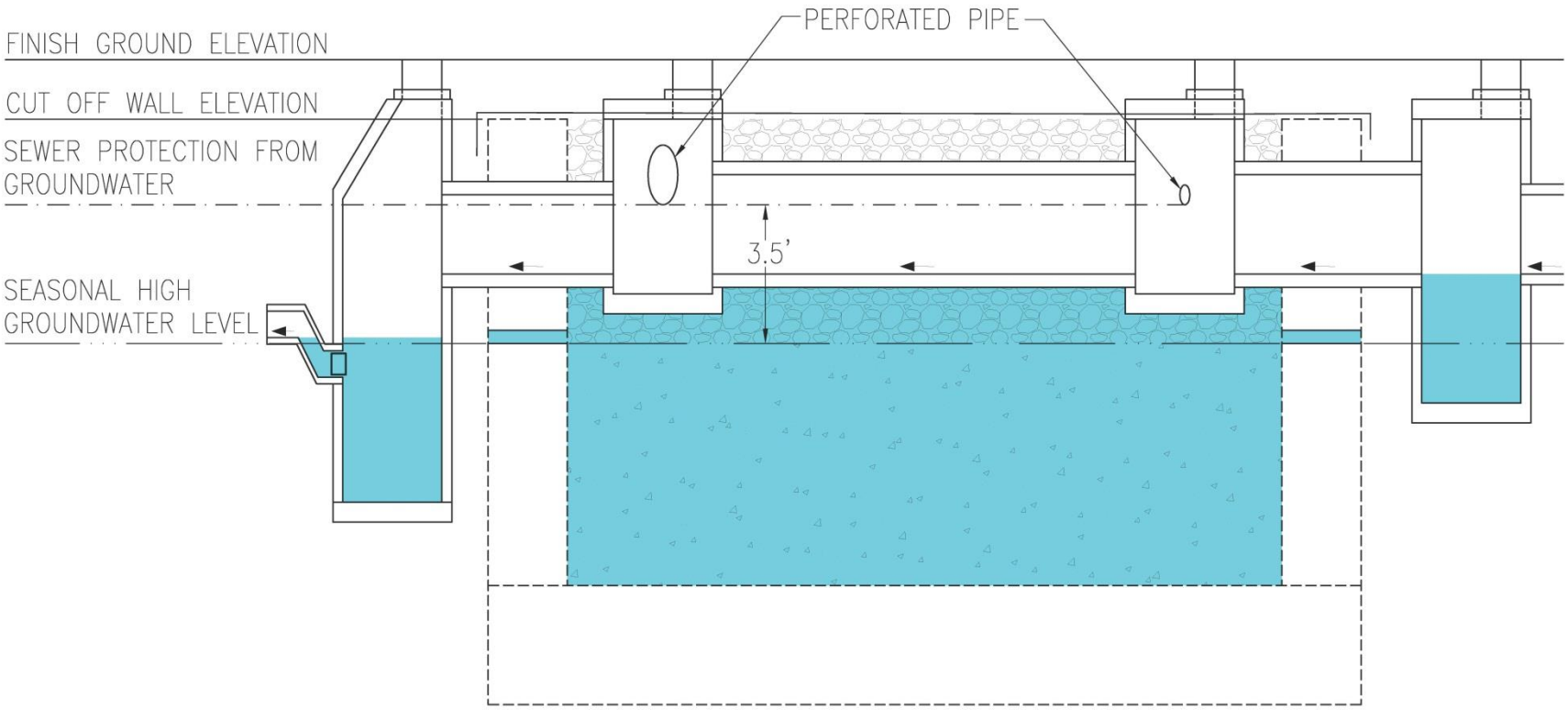
Primera

Basin Drainage Design



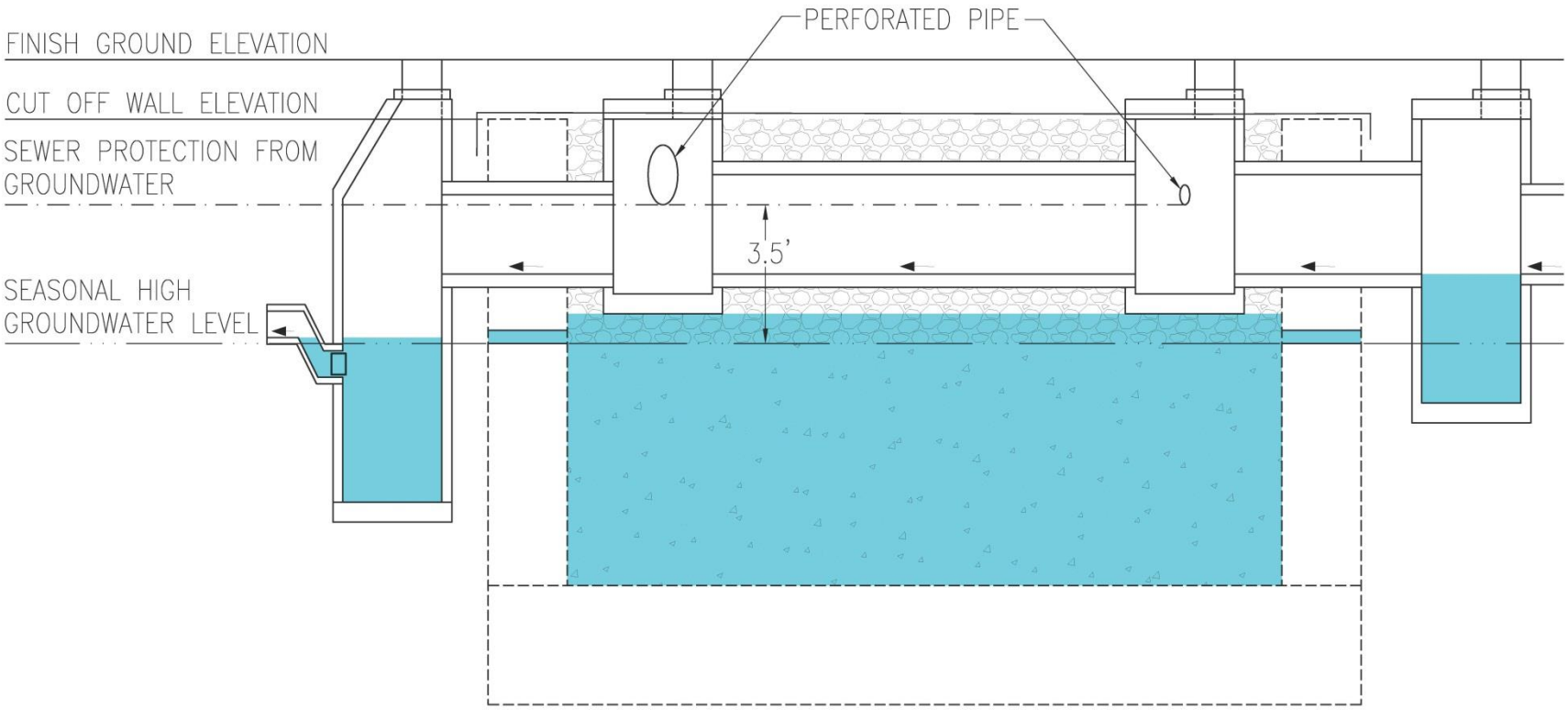
Primera

Basin Drainage Design



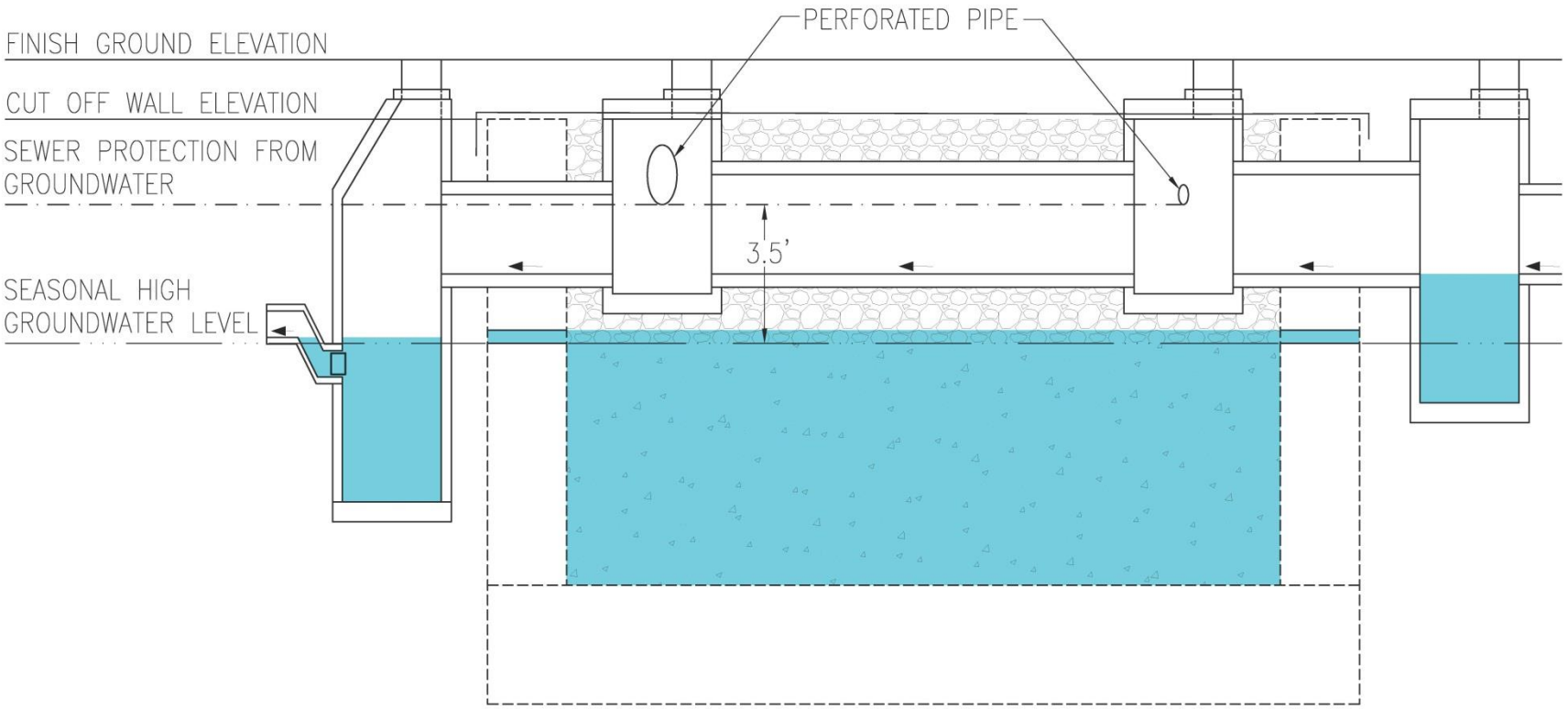
Primera

Basin Drainage Design



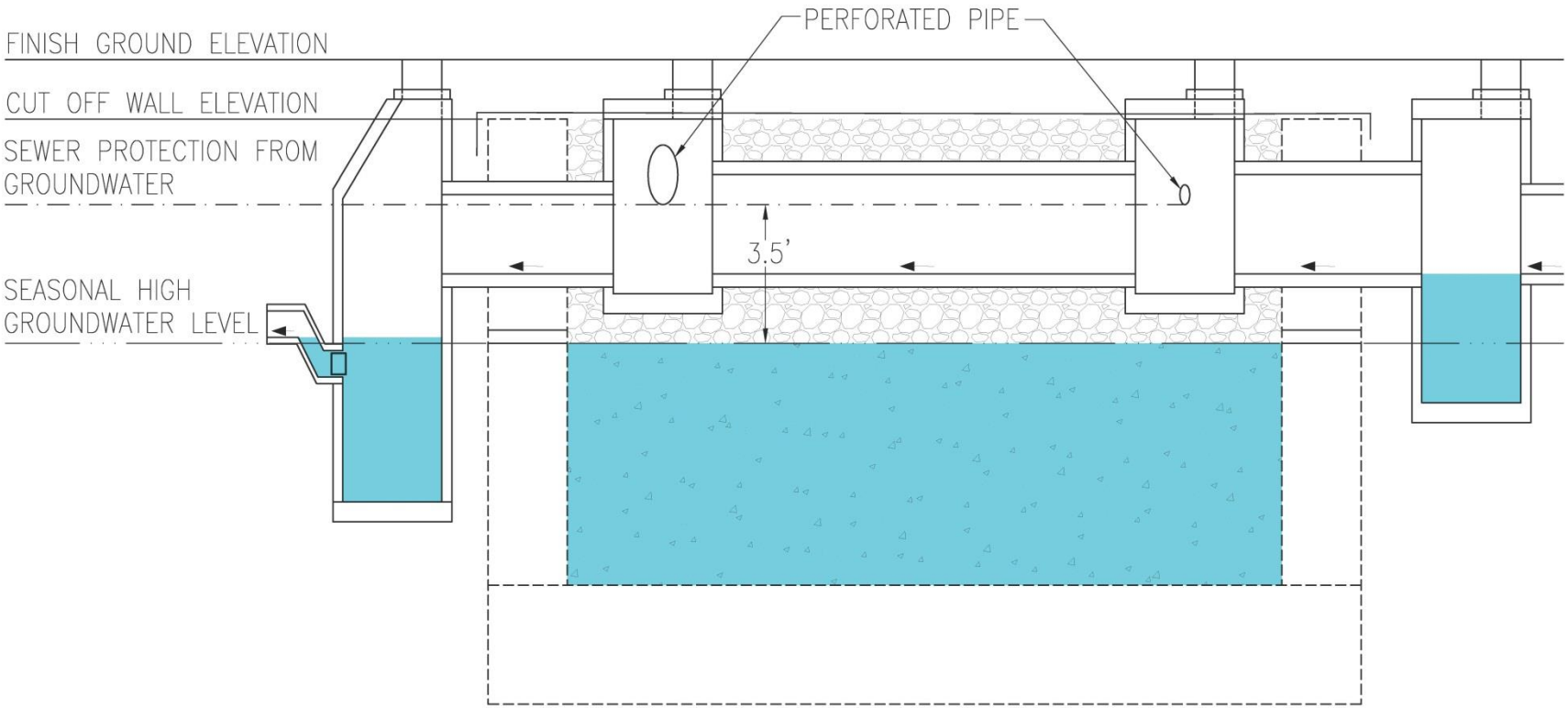
Primera

Basin Drainage Design



Primera

Basin Drainage Design



Primera

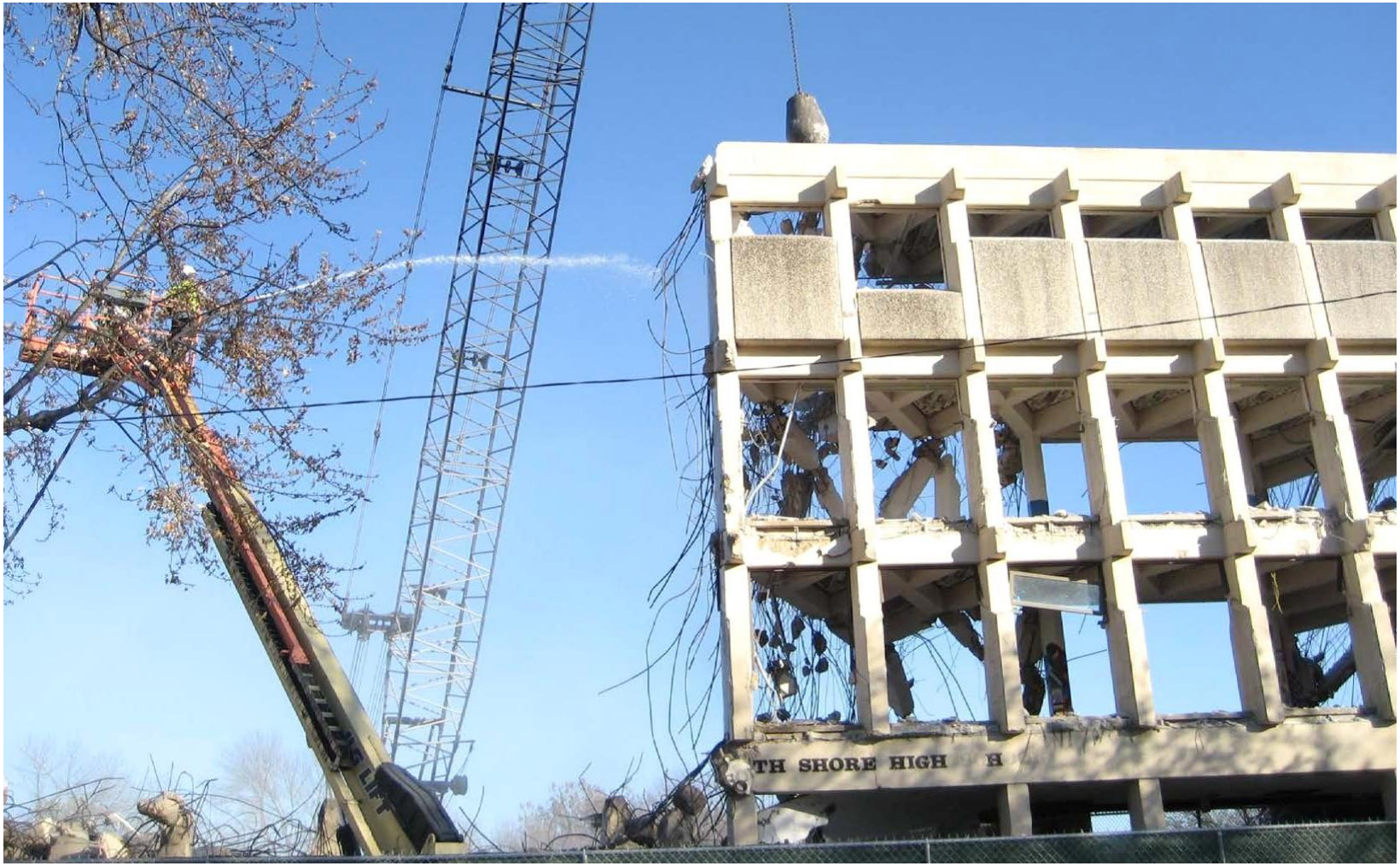
Abatement

Primera

Demolition

Primera

Demolition



Primera

Recycle

Primera

Excavation

Primera

Excavation

Primera

On-Site Crushing and Screening

Primera

On-Site Crushing and Screening

Primera

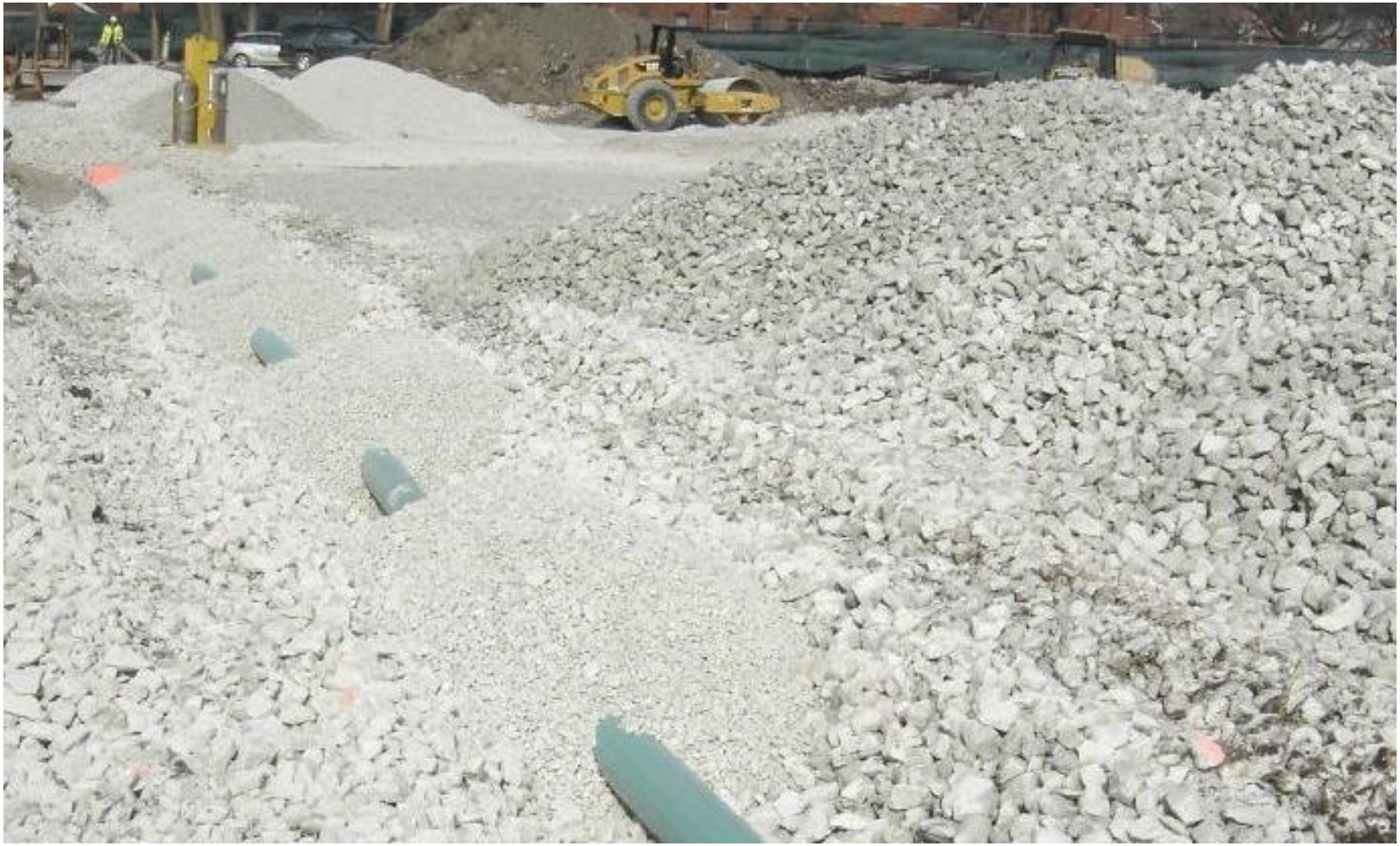
Backfill and Compaction

Primera

Backfill and Compaction

Primera

Stormwater Distribution



Primera

Compact and Cover

Primera

Park Improvements

Primera

Park Improvements

Primera

Park Improvements

Primera

Conclusion

- RCA reduces the concrete debris to CCDD facilities and hauling costs
- As stormwater management it will maximize usable land
- Design considerations must be made for fine particle deposits and sedimentation

Primera

References

- http://www.epa.state.il.us/land/ccdd/index.html
- http://www.fhwa.dot.gov/legsregs/directives/policy/recmatpolicy.htm
- http://www.concreterecycling.org/
- Arm, M. Self-cementing properties of crushed demolished concrete in unbound layers: results from triaxial tests and field tests. Waste Management 21 (2001), p.235-239.
- Poon, C., et al. The cause and influence of self-cementing properties of fine recycled concrete aggregates on the properties of unbound sub-base. Waste Management 26 (2006), p1166-1172.
- Engelsen, C., et al. Field site leaching from recycled concrete aggregates applied as sub-base material in road construction. Science of the Total Environment (2012), p.86-97.

Primera

Questions

Contact:

Nicholas Smith, PE, CFM, CPESC

nsmith@primerachicago.com

Primera 25 YEARS
1987 - 2012