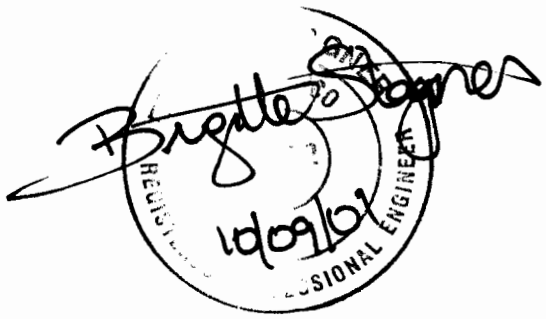
# Drainage Report

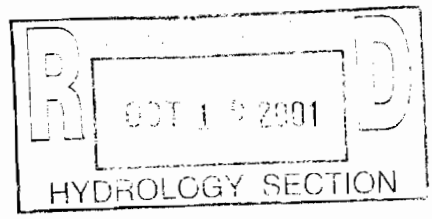
# for

# Lowe's of NW Albuquerque

**Albuquerque, New Mexico**

**October 2001**



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WCEA Project No. X0-218-022

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*Introduction*

The purpose of this report is to clarify all drainage issues, both existing and proposed, relating to the proposed development of a Lowe's Home Improvement Warehouse. The project site is located in the southwestern corner of the intersection at NMSR 528 and Coors Boulevard in Albuquerque, New Mexico. The site is comprised of 36.34 acres, which are currently undeveloped. The proposed development will include a Lowe's Home Improvement Warehouse with all associated parking and landscaping improvements. The Lowe's will be situated within 17.59 acres located in the central portion of the properties being acquired for the project. The Lowe's will consist of a 135,198 square-foot main building and a 42,224 square-foot garden center.

This report will also include the hydrologic and hydraulic analyses related to the proposed storm drain within Lowe's Avenue. This storm drain will collect flows from the majority of the project site as well as flows from several surrounding tracts of land. The surrounding tracts of land include the US West site along Coors Blvd, Coors Blvd itself, the Harkins Theaters lot, and the lot designated C-2.

*Methodology*

AHYMO was used to determine the post-development flows and route those flows through the proposed system of detention ponds and storm drains. The rainfall distribution used was based on the NOAA Atlas 2. The runoff hydrographs were determined using the COMPUTE NM HYD command and the four associated land treatments. Times of concentration for the various sub-basins were calculated using the UPLAND/LAG TIME method throughout the analyses. All flows were routed through the appropriate storm drains and detention ponds using the ROUTE and ROUTE RESERVOIR commands, respectively. Detention ponds were initially sized based on the procedures outlined in Chapter 22, Part A, of the City of Albuquerque Development Process Manual. The stage-storage relationships of the given ponds were then determined using this information and the proposed outlet structures. The stage-storage relationships were then entered into the AHYMO input file. AHYMO input and summary information can be found in Appendix C.

The allowable discharge from the project site was based on the North Coors Drainage Management Plan (Wilson & Company, 1994). The allowable discharge per acre was found to be 1.43 cfs/acre, but was later reduced to approximately 1.2 cfs/acre due to the direct discharge of flows from certain sub-basins into the Calabacillas Outlet.

The proposed storm drain passing along Lowe's Avenue, under Coors Blvd, and into the Corrales Main canal was initially designed using StormCAD®. After the preliminary pipe sizes were obtained, the peak flows determined using AHYMO were applied to the design and the HGL was determined. A spreadsheet outlining the specific elevation of the HGL at various points is included in Appendix B. Copies of the Storm Drain Plan and Profile sheets are also included in this report (Appendix D).

*Existing Conditions*

The project site consists of undeveloped lands with sandy soils. Groundcover consists of various grasses and shrubs moderately spaced throughout the area. Slopes are generally gentle and drain towards the east or the south. The project falls within an area previously designated by the North Coors Drainage Management Plan to drain into the Corrales Main Canal by way of the Calabacillas Outfall (Appendix A – Figures 1 & 2).

The most recent report addressing flows in the Corrales Main Canal in the vicinity of the Calabacillas Outlet is the *Final Hydraulic Calculations for the North Coors Drainage Management Plan: Calabacillas Outlet*, by Wilson & Company, dated May 1994. In this report, Wilson & Company outlines the tributary areas contributing flows to the outlet (Appendix A – Figure 3) and also performs an analysis of the canal using HEC-2. The HEC-2 output found in the report reflects an increase in the flow rate of the canal at station 510+00 of 85 cfs (Appendix A – Figure 4). Figure 3 in Appendix A, taken from the Wilson & Company report, lists the stationing of the Calabacillas Outlet as 510+27. This is the most definitive proof of the allowable discharge to the outlet. Given the tributary area and the discharge to the outlet listed in the report, the allowable discharge is therefore 1.43 cfs/acre (Appendix A – Figure 5).

Currently, there is a temporary retention pond located on one of the properties being acquired for the project. This pond will need to be relocated and redesigned to perform as a detention pond. The pond currently collects all the flows from a vacant Walmart store that is adjacent to the project site. The Walmart store sits on 9.5 acres and consists of approximately 85% Type D land use and 15% Type B land use. The existing flow being generated by this lot is 38.02 cfs for a 100-yr/24-hr storm (Appendix B).

Upon reviewing the Preliminary Drainage Report for the Alameda Boulevard Project (Wilson & Company, February 1991), it was determined that the existing Walmart was included in the hydrologic calculations used to size the storm drain running along Alameda and draining into the Rio Grande at station 31+50 (Appendix A – Figure 6). Basin 3.1.1 (Appendix A – Figure 7) is an area of approximately 26 acres that encompasses the existing Walmart site. Appendix 1 (Appendix A – Figure 8) of the Preliminary Drainage Report contains the HYMO output that analyzes the runoff from this basin as well as Basin 3.1.2. These basins are outlined in the North Coors Drainage Management Plan Volume IV D (Appendix A – Figure 7). According to the Alameda Drainage Report, Basin 3.1.1 produces 88.06 cfs of runoff. This runoff is then routed through a detention pond that allows a peak discharge of 26.13 cfs. The total storage of the detention pond was found to be 1.6089 ac-ft. The hydrograph from the outlet works of the detention pond is then added to the hydrograph representing the runoff from Basin 3.1.2 and the various roadway flows. The overall discharge from these areas into the Alameda storm sewer is 46.5 cfs. This overall discharge was then used in the design of the storm drain system running along Alameda Blvd. and discharging into the Rio Grande (Appendix A – Figure 6).

The existing Walmart makes up approximately 36% of Basin 3.1.1. The Rembe properties cover approximately 26% of 3.1.1 and also drain into the Alameda storm drain. Assuming a linear relationship between runoff and the area within Basin 3.1.1, the allowable discharge from the existing Walmart and the Rembe Properties should be 16.3 cfs.

The record drawings (Appendix A – Figure 9) obtained from the NMSHTD District 3 office (Project Number SP-PM 4020(204)) show that the storm drain was rerouted to the Corrales Main Canal at station 17+55. Due to the fact that all curb inlets originally proposed in the Preliminary Drainage Report were located upstream from the Corrales Main Canal, the tributary area draining to the storm drain system remained the same. Therefore the design flows associated with the storm drain remained the same. Based on this analysis, the flows originating from the existing Walmart site can discharge into the Alameda storm drain system.

***Proposed Conditions***

It is being proposed that the majority of the properties being acquired for this project will drain into the three detention ponds on site. An additional detention pond, pond 4, will be required to detain flows originating from the Harkins lot and the lot designated C-2. The onsite ponds were designed based on the assumption that future developments will result in an 85% Type D land use and 15% Type B land use throughout all properties. Pond 4 was designed to be a temporary detention pond and therefore only detains the existing flows. Another factor in the design was the allowable discharge rates for the Alameda storm sewer, the Calabacillas Outfall, and the Corrales Main Canal. The resulting ponds were designated Pond 1, Pond 2, Pond 3, and Pond 4 (Appendix D). Calculation sheets may be found in Appendix B.

Pond 1 was designed to replace the temporary retention pond onsite, but act as a detention pond. Pond 1 collects the flows originating from the vacant Walmart as well as the two proposed lots adjacent to NM 528 and discharges directly to the existing Alameda storm sewer. Pond 1 was designed to detain all flows from the lots adjacent to NM 528, but only a portion of the flows generated by the vacant Walmart. The remaining flows associated with the Walmart site were originally attenuated by an onsite detention pond located near the center of the parking area (Appendix A – Figure 10). This detention pond had a volume of 0.315 acft. The flows to be detained by Pond 1 resulted in a required volume of 1.32 acft (Appendix B).

Pond 2 was designed to collect the flows from Basins 4, 5, 6, 7, 8, and 9. Flows generated within these basins are collected by storm drains and then passed into pond 2. The various storm drains are outlined in the Grading and Drainage sheets attached (Appendix D). The volume required for pond 2 is 1.37 ac-ft.

Pond 3 was designed to detain flows originating from Basin 3 alone. The required volume for pond 3 is 0.66 ac-ft.

Pond 4 was designed to detain flows originating from the Harkins Theaters lot and the lot designated C-2. The required volume for this pond is 0.33 ac-ft.

The remaining areas (Basin 10, Coors Blvd, and the US West site) (Appendix C) will not drain into the proposed detention ponds. Basin 10 will drain into drop inlets along Lowe's Avenue and directly into the proposed storm sewer passing beneath Coors Blvd. Flows generated within the section of Coors Blvd adjacent to the project site will drain directly into the proposed storm drain by means of drop inlets within the right-of-way. The US West site will also drain into the proposed storm drain by means of these drop inlets.

Based on the direct discharge to the Corrales Main Canal of flows originating from Basin 10, the US West site, and Coors Blvd, the discharge rate per acre allowed for the project site is reduced from 1.43 cfs/acre to 1.20 cfs/acre. This revised allowable discharge rate is used in the calculations determining the volume of the detention ponds on site (Appendix B).

# Areas and Allowable Discharge Rates for Parcels Draining to AMAFCA Outfal

| Tract | Area Draining to Outfall (acres) | Percent of Total Area (%) | Total Area of Tract (acres) | Allowable Discharge (cfs/acre) | Allowab e Discharge (cfs) |
|---|---|---|---|---|---|
| C-2 | 6.20 | 10% | 6.20 | 1.43 | 8.88 |
| Cooper Tract | 16.10 | 27% | 16.10 | 1.43 | 23.05 |
| Tabet | 28.00 | 47% | 28.90 | 1.43 | 40.09 |
| Rembe | 6.80 | 11% | 9.60 | 1.43 | 9.74 |
| NW Alameda | 1.06 | 2% | 1.06 | 1.43 | 1.52 |
| US West Site | 1.20 | 2% | 1.20 | 1.43 | 1.72 |
| TOTAL AREA | 59.36 | | | TOTAL DISCHARGE | 85 |

FIGURE 5

GRAPHIC REPRESENTATION ON NEXT PAGE

## Lowe's of NW Albuquerque

X0218022

*Detetion Pond Design*

9/11/01

### Given

***Proposed Conditions - Discharge Rates***

| Basin | Q, cfs |
|---|---|
| 1 | 38.02 |
| 2 | 28.41 |
| 3 | 34.12 |
| 4 | 28.70 |
| 5 | 4.82 |
| 6 | 28.37 |
| 7 | 6.25 |
| 8 | 4.54 |
| 9 | 2.94 |
| 10 | 7.16 |

### Assumptions

All Basins will reach peak flow at the same time. Tc = 0.2

### Find

Determine the surface area required for the detention ponds given an allowable discharge rate of 1.20 cfs/acre. Basin 10 will discharge directly into the Corrales Main Canal.

### Solution

| Basin | Acreage | $Q_{ALLOWABLE}$, cfs |
|---|---|---|
| 1 | 9.46 | 11.35 |
| 2 | 7.07 | 28.41* |
| 3 | 8.49 | 10.19 |
| 4 | 7.14 | 8.57 |
| 5 | 1.20 | 1.44 |
| 6 | 6.86 | 8.23 |
| 7 | 2.39 | 2.87 |
| 8 | 1.13 | 1.36 |
| 9 | 0.73 | 0.88 |

*Basin 2 discharges directly to the Alameda Storm Sewer.

**Lowe's of NW Albuquerque**
X0218022
9/11/01

**Given**

| | | | |
|---|---|---|---|
| T1 | 100 | T2 | 100 |
| t1 | 6 | t2 | 24 |

**$t_C$, min** 12

**Lowe's Property**

**Pond 1**

| Basin | Area | $A_D$, % | Qpeak | $E_6$ | $E_{24}$ | $t_B$, min | $Dur_{PEAK}$ |
|---|---|---|---|---|---|---|---|
| 1 | 9.46 | 85% | 38.02 | 1.78 | 2.51 | 66.21 | 12.75 |
| 2 | 7.07 | 85% | 28.41 | 1.78 | 2.51 | 66.22 | 12.75 |

**Pond 2**

| Basin | Area | $A_D$, % | Qpeak | $E_6$ | $E_{24}$ | $t_B$, min | $Dur_{PEAK}$ |
|---|---|---|---|---|---|---|---|
| 4 | 7.14 | 80% | 28.70 | 1.66 | 2.35 | 62.02 | 12.00 |
| 5 | 1.20 | 85% | 4.82 | 1.78 | 2.51 | 66.21 | 12.75 |
| 6 | 6.86 | 90% | 28.37 | 1.82 | 2.57 | 65.17 | 13.50 |
| 7 | 2.39 | 25% | 6.25 | 1.00 | 1.41 | 64.28 | 3.75 |
| 8 | 1.13 | 85% | 4.54 | 1.78 | 2.51 | 66.24 | 12.75 |
| 9 | 0.73 | 85% | 2.94 | 1.78 | 2.51 | 66.21 | 12.75 |
| | 19.45 | | | | | | |

**Pond 3**

| Basin | Area | $A_D$, % | Qpeak | $E_6$ | $E_{24}$ | $t_B$, min | $Dur_{PEAK}$ |
|---|---|---|---|---|---|---|---|
| 3 | 8.49 | 85% | 34.12 | 1.78 | 2.51 | 66.21 | 12.75 |

$t_P$, min 9.93

**Check**

| Basin | Area | $A_D$, % | Qpeak | $E_6$ | $E_{24}$ | $t_B$, min | $Dur_{PEAK}$ |
|---|---|---|---|---|---|---|---|
| Walmart | 28.18 | 85% | 110.7 | 1.775 | 2.51 | 68.03 | 12.75 |

**Lowe's of NW Albuquerque**
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**Lowe's Properties**

**Pond 1**

| Basin | Qpeak | tP | DurPEAK | tB | Qallowed | tp-all | Storage, cf | Storage, acft |
|---|---|---|---|---|---|---|---|---|
| 1 | 38.02 | 9.93 | 12.75 | 66.21 | 9.50 | 30.17 | 36724.92 | 0.843 |
| 2 | 28.41 | 9.93 | 12.75 | 66.22 | 4.43 | 35.20 | 34494.16 | 0.792 |

**Total Storage, acft** 1.32 (Basin 1 Storage minus the parking lot storage of 0.315 acft.)

**Pond 2**

| Basin | Qpeak | tP | DurPEAK | tB | Qallowed | tp-all | Storage, cf | Storage, acft |
|---|---|---|---|---|---|---|---|---|
| 4 | 28.70 | 9.93 | 12.00 | 62.02 | 8.57 | 25.16 | 22437.11 | 0.515 |
| 5 | 4.82 | 9.93 | 12.75 | 66.21 | 1.44 | 27.57 | 4091.83 | 0.094 |
| 6 | 28.37 | 9.93 | 13.50 | 65.17 | 8.23 | 26.75 | 24320.91 | 0.558 |
| 7 | 6.25 | 9.93 | 3.75 | 64.28 | 2.87 | 22.82 | 2696.03 | 0.062 |
| 8 | 4.54 | 9.93 | 12.75 | 66.24 | 1.36 | 27.58 | 3852.51 | 0.088 |
| 9 | 2.94 | 9.93 | 12.75 | 66.21 | 0.88 | 27.57 | 2496.00 | 0.057 |
| | | | | | 23.34 | | | |

**Total Storage, acft** 1.37

**Pond 3 (Offsite)**

| Basin | Qpeak | tP | DurPEAK | tB | Qallowed | tp-all | Storage, cf | Storage, acft |
|---|---|---|---|---|---|---|---|---|
| 3 | 34.12 | 9.93 | 12.75 | 66.21 | 10.19 | 27.57 | 28948.63 | 0.665 |

**Total Storage, acft** 0.66

**Note**

Pond 3 will be a temporary pond that detains flows from Basin 3. The volume for this pond is based off a 1.20 cfs/acre allowable discharge.

**Check**

| Basin | Qpeak | tP | DurPEAK | tB | Qallowed | tp-all | Storage, cf | Storage, acft |
|---|---|---|---|---|---|---|---|---|
| Walmart | 110.702 | 9.93 | 12.75 | 68.03 | 40.30 | 25.23 | 80217.4336 | 1.842 |

## Lowe's of NW Albuquerque

X0218022

*Harkins Detetion Pond Design*

9/12/01

### Given

***Proposed Conditions - Discharge Rates***

| Basin | Q, cfs |
|---|---|
| Harkins | 32.68 |
| C-2 | 12.59 |

### Assumptions

All Basins will reach peak flow at the same time. Tc = 0.2

### Find

Determine the surface area required for the detention ponds given an allowable discharge rate of 1.17 cfs/acre.

### Solution

| Basin | Acreage | $Q_{ALLOWABLE}$, cfs |
|---|---|---|
| Harkins | 16.10 | 18.84 |
| C-2 | 6.20 | 7.25 |

**Lowe's of NW Albuquerque**
X0218022
*Harkins Detetion Pond Design*
9/12/01

**Given**

| | | | |
|---|---|---|---|
| T1 | 100 | T2 | 100 |
| t1 | 6 | t2 | 24 |

**$t_C$, min** 12

**Lowe's Property**

**Pond 4**

| Basin | Area | $A_D$, % | Qpeak | $E_6$ | $E_{24}$ | $t_B$, min | $Dur_{PEAK}$ |
|---|---|---|---|---|---|---|---|
| Harkins | 16.10 | 0% | 32.68 | 0.67 | 0.95 | 59.01 | 0.00 |
| C-2 | 6.20 | 0% | 12.59 | 0.67 | 0.95 | 59.01 | 0.00 |
| | 22.30 | | | | | | |

**Lowe's of NW Albuquerque**
X0218022
*Harkins Detetion Pond Design*
9/12/01

**Lowe's Properties**

**Pond 4**

| Basin | Qpeak | tP | DurPEAK | tB | Qallowed | tp-all | Storage, cf | Storage, acft |
|---|---|---|---|---|---|---|---|---|
| Harkins | 32.683 | 0.27 | 0.00 | 59.01 | 18.84 | 24.73 | 10270.43 | 0.236 |
| C-2 | 12.586 | 0.27 | 0.00 | 59.01 | 7.25 | 24.73 | 3955.07 | 0.091 |

| | | |
|---|---|---|
| Total Detention | 0.33 | acft |

**Note**

Pond 4 will be a temporary pond that detains flows from Basin 3. The volume for this pond is based off a 1.17 cfs/acre allowable discharge.

Pond 5 will be a temporary pond that detains flows from Basin 11 & 12 (Harkins and C-2). The volume for this pond is based off a 1.20 cfs/acre allowable discharge.

## Lowe's of NW Albuquerque

X0218022
HGL Information
10/9/01

| Point of Interest | Station | $Q_{PEAK}$ | Inv. Elev | HGL | Surface Elev |
|---|---|---|---|---|---|
| Outlet | - | 73.78 | 4997.83 | 5001.85 | 5004 |
| Bend | - | 73.78 | 4998.06 | 5001.96/5002.12 | 5004.1 |
| MH-1 | 2220.35 | 73.78 | 5008.86 | 5011.46/5012.03 | 5020.34 |
| MH-2 | 2196.36 | 73.78 | 5011.33 | 5012.01/5012.58 | 5021.31 |
| MH-3 | 2199.21 | 73.78 | 5012.39 | 5014.89/5015.80 | 5020.21 |
| DI-1 | 2181.89 | 3.85 | 5013.10 | 5018.33 | 5021.58 |
| MH-4 | 2078.00 | 70.77 | 5013.10 | 5015.88/5016.24 | 5022.00 |
| DI-2 | 2103.89 | 7.26 | 5016.75 | 5017.79 | 5021.75 |
| DI-3 | 2070.09 | 1.13 | 5018.40 | 5018.8 | 5022.15 |
| DI-4 | 2118.64 | 5.45 | 5016.05 | 5016.95 | 5022.05 |
| MH-5 | 1833.05 | 60.86 | 5014.33 | 5016.68/5017.16 | 5029.50 |
| Pond 2 | 1735.93 | 22.46 | 5018.40 | 5020.04 | 5023.00 |
| MH-6 | 1513.08 | 40.57 | 5018.29 | 5019.96/5020.01 | 5030.00 |
| MH-7 | 1213.37 | 40.73 | 5020.12 | 5022.94/5024 | 5033.98 |
| Pond 4 | 1123.03 | 26.48 | 5026.00 | 5025.98/5027.24 | 5031.00 |
| MH-8 | 904.91 | 15.05 | 5021.87 | 5024.78/5024.87 | 5031.68 |
| DI-5 | 892.13 | 1.38 | 5027.22 | 5024.87/5024.88 | 5031.22 |
| DI-6 | 892.13 | 1.38 | 5027.22 | 5024.87/5024.88 | 5031.22 |
| MH-9 | 819.60 | 12.25 | 5022.30 | 5024.95/5025.21 | 5030.80 |
| Pond 3 | 764.11 | 9.97 | 5026.00 | 5026.57/5027.13 | 5031.00 |
| DI-7 | 751.34 | 2.74 | 5025.40 | 5026.03/5026.24 | 5031.00 |
| DI-8 | 751.34 | 1.38 | 5026.00 | 5026.44 | 5031.57 |

| Design water surface elevations for the various ponds | |
|---|---|
| Pond 2 | 5022.40 |
| Pond 3 | 5027.50 |
| Pond 4 | 5032.00 |

Controlling WSEL

## Lowe's of NW Albuquerque

X0218022
HGL Information
10/9/01

| Point of Interest | Station | $Q_{PEAK}$ | Inv. Elev | HGL | Surface Elev |
|---|---|---|---|---|---|
| Outlet | - | 73.78 | 4997.83 | 5001.85 | 5004 |
| Bend | - | 73.78 | 4998.06 | 5001.96/5002.12 | 5004.1 |
| MH-1 | 2220.35 | 73.78 | 5008.86 | 5011.46/5012.03 | 5020.34 |
| MH-2 | 2196.36 | 73.78 | 5011.33 | 5012.01/5012.58 | 5021.31 |
| MH-3 | 2199.21 | 73.78 | 5012.39 | 5014.89/5015.80 | 5020.21 |
| DI-1 | 2181.89 | 3.85 | 5013.10 | 5018.33 | 5021.58 |
| MH-4 | 2078.00 | 70.77 | 5013.10 | 5015.88/5016.24 | 5022.00 |
| DI-2 | 2103.89 | 7.26 | 5016.75 | 5017.79 | 5021.75 |
| DI-3 | 2070.09 | 1.13 | 5018.40 | 5018.8 | 5022.15 |
| DI-4 | 2118.64 | 5.45 | 5016.05 | 5016.95 | 5022.05 |
| MH-5 | 1833.05 | 60.86 | 5014.33 | 5016.68/5017.16 | 5029.50 |
| Pond 2 | 1735.93 | 22.46 | 5018.40 | 5020.04 | 5023.00 |
| MH-6 | 1513.08 | 40.57 | 5018.29 | 5019.96/5020.01 | 5030.00 |
| MH-7 | 1213.37 | 40.73 | 5020.12 | 5022.94/5024 | 5033.98 |
| Pond 4 | 1123.03 | 26.48 | 5026.00 | 5025.98/5027.24 | 5031.00 |
| MH-8 | 904.91 | 15.05 | 5021.87 | 5024.78/5024.87 | 5031.68 |
| DI-5 | 892.13 | 1.38 | 5027.22 | 5024.87/5024.88 | 5031.22 |
| DI-6 | 892.13 | 1.38 | 5027.22 | 5024.87/5024.88 | 5031.22 |
| MH-9 | 819.60 | 12.25 | 5022.30 | 5024.95/5025.21 | 5030.80 |
| Pond 3 | 764.11 | 9.97 | 5026.00 | 5026.57/5027.13 | 5031.00 |
| DI-7 | 751.34 | 2.74 | 5025.40 | 5026.03/5026.24 | 5031.00 |
| DI-8 | 751.34 | 1.38 | 5026.00 | 5026.44 | 5031.57 |

| Design water surface elevations for the various ponds | |
|---|---|
| Pond 2 | 5022.40 |
| Pond 3 | 5027.50 |
| Pond 4 | 5032.00 |

Controlling WSEL