PRELIMINARY HYDROGEOLOGIC EVALUATION OF
THE GRANT COUNTY RESERVOIR AND
WATER REUSE PROJECT,
NEAR FORT BAYARD, NEW MEXICO

prepared by

JOHN SHOMAKER & ASSOCIATES, INC.
Water-Resource and Environmental Consultants
2611 Broadbent Parkway NE
Albuquerque, New Mexico 87107
505-345-3407

prepared for

Grant County
New Mexico

In Support of
AWSA Tier 2 Application

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PRELIMINARY HYDROGEOLOGIC EVALUATION OF
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1.0 INTRODUCTION

The New Mexico Interstate Stream Commission (NMISC) has been accepting and evaluating stakeholder Tier 1 proposals for use of water and funding available to New Mexico from the 2004 Arizona Water Settlements Act (AWSA). The NMISC used four criteria for evaluating and ranking the proposals:

1. Whether the proposal is for the “New Mexico Unit,” a “water utilization alternative” or both.

2. Describe how the proposal will meet a water-supply demand in the Southwest New Mexico Water Planning Region (includes Grant County).

3. Describe how the proposal considers the Gila environment and describe how any negative impacts might be mitigated.

4. Describe how the proposal considers the historic uses and future demands for water in the Southwest New Mexico Water Planning Region and the traditions, cultures, and customs affecting those uses.

Grant County submitted a Tier 1 application for the development of a water-storage facility(s) (reservoirs) in the vicinity of Fort Bayard, New Mexico (Fig. 1). The proposed facility would store treated effluent from the Bayard Regional Wastewater Treatment Plant (Baryard WWTP) and potentially capture storm-water offset by an equal amount of effluent released downstream of the storage facility. The water storage facility would be used for recreational purposes, fire suppression, irrigation of County recreational facilities, and potentially for steady release of water for downstream aquifer recharge. The proposed uses would free up potable supply by creating a new source of water.

The Grant County Tier 1 application passed all four NMISC evaluation criteria and a Tier 2 application was recommended by NMISC.
1.1 Study Area

The hydrogeologic study area includes potential water-storage facility (reservoir) sites near Fort Bayard and downstream drainages (Fig. 1). The preferred reservoir site (Site 1) is located west of Fort Bayard in Twin Sisters Creek (Fig. 1). Alternative reservoir sites include a location (Site 2) approximately 1/2 mile downstream of Site 1, and Site 3 east of Fort Bayard in Cameron Creek (Fig. 1). Potential irrigated areas include Grant County Park and Fort Bayard green ways and landscaping. Potential recharge areas include Twin Sisters Creek downstream of Reservoir Sites 1 or 2, and Cameron Creek downstream of Site 3.

1.2 Objective

This preliminary hydrogeologic evaluation is intended to address hydrologic issues described in the Tier 2 application criteria. More specifically the objectives of the preliminary hydrogeologic evaluation are to:

1. determine if the Grant County reservoir and water reuse project is feasible
2. provide recommendations for further developing the concept
3. identify any fatal flaw elements of the proposed project

1.3 Project Need

Currently about 550 acre feet per year (ac-ft/yr) of effluent from the Bayard Regional Wastewater Treatment Plant is discharged to Chino Mines Company Tailings Pond 7 (Fig. 1), and evaporated on Pond 7 or reused for mining operations. Adding effluent to Tailings Pond 7 has been allowed by the New Mexico Environment Department (NMED) issued discharge plan DP-484, but permit conditions have also required developing a way to discontinue effluent discharge to Tailings Pond 7. Furthermore, the effluent interferes with Pond 7 storage capacity and mine operations. The nearest drainage for discharge of treated effluent is Whitewater Creek, but discharge to Whitewater Creek would interfere with Chino Mines Company downstream reclamation efforts. In summary, a new point of discharge and use is required for effluent generated from the Bayard WWTP that does not include Whitewater Creek or Chino Mines Company Tailings Pond 7.
The Bayard Reuse project will develop demand for approximately 135 ac-ft/yr of effluent, and there will be more than 400 ac-ft/yr of surplus effluent for the Grant County Reservoir and water reuse project. The proposed Grant County reservoir(s) would provide a mechanism where surplus effluent could be stored and possibly reused to create a new source of water.

The primary water supply for the Village of Santa Clara and City of Bayard are municipal supply wells located southwest of Bayard (Fig. 1). The aquifer containing the supply wells is composed of alluvium and Gila Conglomerate that is limited in saturated thickness and extent. For this report, the aquifer is referred to as the Lone Mountain aquifer system. Over the past several decades groundwater pumping has been in excess of recharge and caused continuous water-level declines. Hydrographs are presented in Appendix A. Well yield declines as water-levels decline, and, overtime, the yield from supply wells will significantly decrease. Enhanced recharge and Aquifer Storage and Recovery using treated effluent from the Bayard WWTP would offset groundwater mining and create a more sustainable aquifer for the Village of Santa Clara and City of Bayard.

1.4 Project Options

The project must be able to work with existing fresh-water sources, water rights, and water-quality regulations. There are two options for making this project work when considering hydrology, water-quality regulations, and water rights:

1. Fill reservoir with treated effluent, and let storm-water runoff bypass or spill over the reservoir. The reservoir would be limited to uses allowed under NMED Class 1A or 1B reclaimed wastewater (some restricted public access). Swimming and fishing are typically not allowed with reservoirs of NMED Class 1A or 1B reclaimed wastewater. The reservoir would basically be ornamental, and the water could be used for landscape irrigation.

2. Fill reservoir with storm-water runoff, and other fresh-water sources, and discharge an equal amount of treated effluent downstream of the reservoir. The reservoir with storm water and other fresh-water sources could possibly be used for all recreational purposes.

Options 1 and 2 do not create a new surface-water diversion requiring water rights. The reservoir for Option 1 would primarily be for storage of treated effluent, whereas the reservoir for Option 2 allows for maintaining water quality for recreational uses. For both options, excess effluent is used for landscape irrigation and recharge of the Lone Mountain aquifer system.
1.5 Potential Reservoir Sites

The footprint for the three potential reservoir sites identified in the Fort Bayard area are shown on topographic maps presented as Figures 2 through 4. Maximum reservoir stage elevations were estimated from the topography, and do not take into account dam design factors. Site 2 has the potential for the largest reservoir (132.5 acres), and the topography at Site 3 limits the reservoir size to approximately 6.2 acres. Table 1 lists the estimated size, volume, and lake evaporation rate by stage elevation. Lake evaporation rate is 50 inches per year (SCS, 1972).

Table 1. Summary of estimated reservoir size, volume, stage elevation, and lake evaporation rates for proposed Sites 1, 2, and 3

<table>
<thead>
<tr>
<th>Interval</th>
<th>Acres</th>
<th>Stage</th>
<th>Stage Area (acres)</th>
<th>Incremental Volume (ac-ft)</th>
<th>Stage Volume (ac-ft)</th>
<th>Lake Evaporation (ac-ft/yr)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Upper Twin Sister Creek potential reservoir (Site 1)</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6100-6090</td>
<td>21.9</td>
<td>6,100</td>
<td>89.8</td>
<td>788.5</td>
<td>1,856.0</td>
<td>374</td>
</tr>
<tr>
<td>6090-6080</td>
<td>29.0</td>
<td>6,090</td>
<td>67.9</td>
<td>534.0</td>
<td>1,067.5</td>
<td>283</td>
</tr>
<tr>
<td>6080-6070</td>
<td>17.5</td>
<td>6,080</td>
<td>38.9</td>
<td>301.5</td>
<td>533.5</td>
<td>162</td>
</tr>
<tr>
<td>6070-6060</td>
<td>10.7</td>
<td>6,070</td>
<td>21.4</td>
<td>160.5</td>
<td>232.0</td>
<td>89</td>
</tr>
<tr>
<td>6060-6050</td>
<td>7.7</td>
<td>6,060</td>
<td>10.7</td>
<td>68.5</td>
<td>71.5</td>
<td>45</td>
</tr>
<tr>
<td>&lt;6050</td>
<td>3.0</td>
<td>6,050</td>
<td>3.0</td>
<td>3.0</td>
<td>3.0</td>
<td>13</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>89.8</td>
</tr>
<tr>
<td><strong>Lower Twin Sisters Creek potential reservoir (Site 2)</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6090-6080</td>
<td>44.0</td>
<td>6,090</td>
<td>132.5</td>
<td>1,105</td>
<td>3,297</td>
<td>552</td>
</tr>
<tr>
<td>6080-6070</td>
<td>26.2</td>
<td>6,080</td>
<td>88.5</td>
<td>754</td>
<td>2,192</td>
<td>369</td>
</tr>
<tr>
<td>6070-6060</td>
<td>16.2</td>
<td>6,070</td>
<td>62.3</td>
<td>542</td>
<td>1,438</td>
<td>260</td>
</tr>
<tr>
<td>6060-6050</td>
<td>14.6</td>
<td>6,060</td>
<td>46.2</td>
<td>388</td>
<td>896</td>
<td>192</td>
</tr>
<tr>
<td>6050-6040</td>
<td>12.7</td>
<td>6,050</td>
<td>31.5</td>
<td>252</td>
<td>507</td>
<td>131</td>
</tr>
<tr>
<td>6040-6030</td>
<td>8.3</td>
<td>6,040</td>
<td>18.8</td>
<td>146</td>
<td>256</td>
<td>78</td>
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<tr>
<td>6030-6020</td>
<td>5.4</td>
<td>6,030</td>
<td>10.5</td>
<td>77</td>
<td>109</td>
<td>44</td>
</tr>
<tr>
<td>6020-6010</td>
<td>3.8</td>
<td>6,020</td>
<td>5.0</td>
<td>31</td>
<td>32</td>
<td>21</td>
</tr>
<tr>
<td>&lt;6010</td>
<td>1.3</td>
<td>6,010</td>
<td>1.3</td>
<td>1</td>
<td>1</td>
<td>5</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>132.5</td>
</tr>
<tr>
<td><strong>Cameron Creek potential reservoir (Site 3)</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6100 to 6090</td>
<td>4.1</td>
<td>6,100</td>
<td>6.2</td>
<td>41.4</td>
<td>52.9</td>
<td>26</td>
</tr>
<tr>
<td>6090 to 6080</td>
<td>1.9</td>
<td>6,090</td>
<td>2.1</td>
<td>11.3</td>
<td>11.5</td>
<td>9</td>
</tr>
<tr>
<td>&lt;6080</td>
<td>0.2</td>
<td>6,080</td>
<td>0.2</td>
<td>0.2</td>
<td>0.2</td>
<td>1</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>6.2</td>
</tr>
</tbody>
</table>

ac-ft/yr - acre-feet per year
2.0 HYDROGEOLOGIC SETTING

The hydrogeologic setting can be generalized into two regions 1) surface-water dominated upland watersheds of Twin Sisters and Cameron Creeks with low permeability rocks, and 2) the Lone Mountain aquifer system in the lower Cameron Creek area that is composed of permeable sediments of alluvium and Gila Conglomerate. The watershed areas upstream of the potential reservoir sites are shown on Figure 1. Figure 5 shows the distribution of geologic units and the extent of the Lone Mountain aquifer system. Storm-water runoff from the upland watershed recharges the Lone Mountain aquifer system.

2.1 Precipitation and Runoff

Storm-water runoff and potential recharge can be calculated from watershed characteristics and daily precipitation statistics. Over 100 years of daily precipitation data is available from the weather station at Fort Bayard, New Mexico (Fig. 6). Average annual precipitation is 15.6 inches per year, but ranges between 7 and 31 inches per year. Daily precipitation events ranging between 0.5 and 1.5 inches occur more than four times per year, and daily precipitation events greater than 1.5 inches occur every year. The maximum daily precipitation events were 3.1 inches in 2002 and 3.55 inches in 1925.

Surface-water runoff is typically calculated from daily precipitation data, and soil conditions represented by a runoff curve number. The curve number accounts for hydrologic conditions of the soil, vegetative cover, moisture conditions, topography, and other watershed characteristics (SCS, 1973). Runoff can be estimated using the following equations:

\[ I_a = S \times 0.2 \]
\[ S = (1,000 / CN) - 10 \]
\[ Q = (P - I_a)^2 + (P - I_a + S) \]

where,

- \( I_a \) equals the initial abstraction including surface storage, interception by vegetation and infiltration prior to runoff, in inches depth over the drainage area
- \( S \) equals the potential maximum retention of water by the soil in equivalent inches depth over the drainage area
- \( CN \) equals the runoff curve number
- \( P \) equals the accumulated rainfall in inches depth over the drainage area
- \( Q \) equals the accumulate volume of runoff in inches depth over the drainage area
Considering the values calculated for \( I_a \) in Table 2, daily precipitation events greater than 0.67 inches will likely generate runoff within the Twin Sisters Creek and Cameron Creek watersheds.

**Table 2. Input variables for calculating storm-water runoff upstream of potential reservoir sites**

<table>
<thead>
<tr>
<th>parameter</th>
<th>unit</th>
<th>Twin Sister Creek watershed</th>
<th>Cameron Creek watershed</th>
</tr>
</thead>
<tbody>
<tr>
<td>CN</td>
<td>dimensionless</td>
<td>75</td>
<td>75</td>
</tr>
<tr>
<td>( S )</td>
<td>inches</td>
<td>3.33</td>
<td>3.33</td>
</tr>
<tr>
<td>( I_a )</td>
<td>inches</td>
<td>0.67</td>
<td>0.67</td>
</tr>
<tr>
<td>watershed area</td>
<td>acres</td>
<td>7,380</td>
<td>11,550</td>
</tr>
</tbody>
</table>

* Average annual storm-water runoff. Because of infrequency, the calculation does not include precipitation events greater than 1.5 inches.

Water budgets can be calculated for the proposed reservoir sites using estimates of storm-water runoff, lake evaporation, and reservoir stage-area volume. Twin Sisters watershed above potential reservoir Sites 1 and 2 generates approximately 70 ac-ft/yr of storm-water runoff, and Cameron Creek watershed above potential reservoir Site 3 generates approximately 110 ac-ft/yr of storm-water runoff. Theoretically, reservoirs will fill with storm water until inflow equals outflow (seepage and lake evaporation). Due to the low permeability rocks, seepage can be assumed to be negligible. With storm water as the only source of inflow, Sites 1 and 2 would create approximately 15 acre reservoirs, and Site 3 would fill to its maximum size of 6 acres.

### 2.2 Geologic Conditions

The geologic evaluation of the reservoir sites was based on maps prepared by Jones et al. (1970) and Skotnicki and Ferguson (2007). Excluding stream alluvium, there are three geologic units present at the proposed reservoir sites:

1. Fort Bayard Stock, a Cretaceous-age hornblende quartz diorite, a gray, medium-grained intrusive igneous rock with interlocking crystals that weathers into rusty orange sand.
2. Oligocene-age rhyolite porphyry breccia, commonly flow-banded, coarse-grained and crumbly in outcrop. The rhyolite breccia locally outcrops near Site 2.
3. Cretaceous-age Colorado Formation, likely representing the quiescent back-arc sediments to the intrusive rocks. It is composed of sandstone, shale, and conglomerate, and contains sedimentary cross-beds, concretions, and pinch-and-swell structures that are evidence of deposition and lithification. It also exhibits competent, well-defined contact metamorphosed zones with the Fort Bayard Stock that are well exposed as indicated by abundant steep structural contact measurements on geologic maps (e.g., Jones et al., 1970).

The Fort Bayard Stock, rhyolite breccias, and Colorado Formation are considered low-permeability rocks suitable for containing surface-water reservoirs. The dam and the reservoir at Sites 1 and 2 would lie on top of stream alluvium, low-permeability rocks consisting of rhyolite breccia, the Colorado Formation (shale and sandstone), and the Fort Bayard Stock (hornblende quartz diorite). The dam and reservoir at Site 3 would be on top stream alluvium along Cameron Creek and low-permeability rocks of the Colorado Formation. Site 3 would be directly upstream of a mapped mine dump (Jones et al., 1970).

The Fort Bayard stock has well defined joints that are locally mineralized and strike to the northeast. According to the most recent geologic map (Skotnicki and Ferguson, 2007), this unit in outcrop is “typically highly weathered and … rusty orange and [that] crumble[s] into sand” with common “rounded to subangular boulders on the surface.” As such this unit is an extremely poor choice for engineered structures, except if freshly exposed and not weathered. The numerous joints to the northeast also present planes of potential weakness. Site 3 in contrast, is located just 500 ft west of the contact with the Fort Bayard Stock but within the competent contact-metamorphosed Colorado Formation.


Twin Sisters Creek and Cameron Creek channels contain stream alluvium from the proposed reservoir sites, south, to the Lone Mountain aquifer system. The stream alluvium width and depth significantly varies along the channels. Stream alluvium at an exploratory well drilled near the Village of Santa Clara infiltration gallery is reported to be only 10 ft. In Cameron Creek, the stream alluvium is 26 ft thick at the Fort Bayard Hospital well (Fig. 1), and up to 50 ft in thickness downstream of the Village of Santa Clara.
The Lone Mountain aquifer system is composed of stream alluvium and Upper Gila Conglomerate as defined by Trauger (1972). The Upper Gila conglomerate is composed of weekly cemented sand and gravel with some intervals containing silt and clay. The aquifer system is bound by low-permeability rocks (Fig. 5). Well yield can be several hundred gallons per minute, but varies significantly according to saturated thickness. Figure 7 is a west to east hydrogeologic cross-section of the aquifer system.

2.3 Direction of Groundwater Flow

Regional groundwater elevation contours, direction of groundwater flow, and depth to water are shown on Figure 8. The depth to water is shallow along the major drainages where the channel has intersected the water table or where stream alluvium is saturated. The direction of groundwater flow is predominately north to south, and there does not appear to be local topographic influences on groundwater-flow direction.

2.4 Groundwater Quality

The groundwater quality is typically excellent (potable) in the stream alluvium and Gila Conglomerate, but highly variable in the lower-permeability rocks such as the Colorado Formation (Trauger, 1972). Groundwater in the Colorado Formation and igneous rocks typically contains dissolved solids leached from shale and mineralized zones.

There are several petroleum hydrocarbon contaminated sites in the vicinity of Santa Clara and City of Bayard. The New Mexico Department of Transportation, on the north side of Santa Clara near Cameron Creek, has a site currently under investigation.

2.5 Potential Recharge Zones

Potential recharge zones include stream alluvium along Twin Sisters and Cameron Creeks and where the stream alluvium overlies Gila Conglomerate. Storm-water runoff originating from Twin Sister Creek and Cameron Creek watersheds is estimated to average 180 ac-ft/yr (see Section 2.1). Some of the storm-water runoff flows past the Bayard municipal supply wells and recharges the Gila Conglomerate south of Lone Mountain.
3.0 WATER RIGHTS AND USE

3.1 Water Rights

The Mimbres Basin was originally declared by the New Mexico State Engineer in 1931. Water rights in the Mimbres Basin were adjudicated in 1974, and the adjudication decree establishes the diversion and consumptive use, along with priority date of each valid right. No new appropriations are allowed in the Mimbres Basin. For administration, the Mimbres Basin is divided into four-square-mile blocks (administrative blocks). Water rights cannot be moved out of an administrative block. For example, water rights from Fort Bayard could not be moved to the City of Bayard Lone Mountain Well Field. Table 3 is a summary of municipal and industrial water rights for the study area.

Table 3. Summary of water rights for the Tri-City area, Grant County New Mexico

<table>
<thead>
<tr>
<th>owner</th>
<th>source</th>
<th>NMOSE File No.</th>
<th>permitted diversion (ac-ft/yr)</th>
<th>estimated average diversion-* (ac-ft/yr)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fort Bayard</td>
<td>spring boxes</td>
<td>unknown</td>
<td>282.0</td>
<td>variable</td>
</tr>
<tr>
<td>Village of Santa Clara</td>
<td>infiltration gallery</td>
<td>SD-2677 and M-3127</td>
<td>241.9</td>
<td>30</td>
</tr>
<tr>
<td>City of Bayard</td>
<td>Lone Mountain aquifer system</td>
<td>M-2698 through M-2698-S-10</td>
<td>397.0</td>
<td>300</td>
</tr>
<tr>
<td>Village of Santa Clara</td>
<td>Lone Mountain aquifer system</td>
<td>M-3128 through M-3128-S-2</td>
<td>272.9</td>
<td>220</td>
</tr>
<tr>
<td>Cobre Mining Company</td>
<td>Lone Mountain aquifer system</td>
<td>M-2575 and M-2576</td>
<td>740.0</td>
<td>**-240</td>
</tr>
<tr>
<td>Town of Hurley</td>
<td>Chino’s Mimbres Basin wells</td>
<td>leased water from Chino Mines</td>
<td>-----</td>
<td>160</td>
</tr>
</tbody>
</table>

* - 1995 to 2005
** - based on periods of demand when Cobre Mine operated
NMOSE - New Mexico Office of the State Engineer
ac-ft/yr - acre-feet per year
3.2 Water Use

Water use can be divided according to source 1) Twin Sisters Creek and Cameron Creek watershed springs and infiltration gallery, and 2) supply wells in the Lone Mountain aquifer system. An estimate of average annual diversions can be referenced from Table 3.

Diversions from the Twin Sisters infiltration gallery are limited by seasonal climate conditions and highly variable. There are no available diversion data from the Fort Bayard springs.

The City of Bayard and Village of Santa Clara pump over 500 ac-ft/yr from the Lone Mountain aquifer system, and industrial well pumping adds another 240+ ac-ft/yr when Cobre Mine is operating. Groundwater pumping is likely several times in excess of potential recharge to the Lone Mountain aquifer system, causing the aquifer thickness to decrease by 1 to 2 ft/yr. Saturated thickness has decreased by one-half since pumping began (see Fig. 7 and graphs in Appendix A). Well yield and diversions from the Lone Mountain aquifer system will decrease as groundwater mining decreases saturated thickness.

4.0 HYDROLOGIC FEASIBILITY

Approximately 400 ac-ft/yr of treated effluent would be available for the Grant County reservoir and reuse project, with additional treated effluent potentially available in the future. The hydrologic feasibility involves developing a delicate balance between water rights, water demand, water supply, and water quality. Introducing reuse into the Town of Hurley area water balance will create new water and increase the sustainability of existing potable-water supplies.

4.1 Irrigation Projects

Reuse of treated effluent for landscape irrigation and recreational facilities is a common practice in New Mexico. The City of Alamogordo has a successful wastewater reuse program that allows for irrigation of the City golf course, ball fields, and green ways. The NMED has established guidelines and requirements for above-ground use of reclaimed domestic wastewater; a copy can be referenced from Appendix B. Typical requirements for irrigation projects with treated effluent include treatment process for creating NMED Class 1B or Class 2 reclaimed wastewater, distribution system, storage facility, and NMED approved application methods. The NMED will require the Grant County reservoir and reuse project to have a groundwater discharge permit. There are no significant hydrologic feasibility issues with reuse water for proposed irrigation projects.
4.2 Grant County Reservoir Project

The hydrologic feasibility of developing a reservoir largely depends on the intended use of the reservoir. Water sources to fill a reservoir include 1) storm-water runoff, 2) treated effluent, and 3) existing potable-water supply. One water source or all three water sources combined could be used for reservoir filling.

4.2.1 Reservoir Filling with Storm Water

Reservoir filling with only storm-water runoff would require an equal amount of treated effluent to be released to the drainages below the reservoirs. A reservoir in Twin Sisters Creek (Site 1 or 2) would be limited to approximately 15 acres, contain 250 ac-ft, and an evaporation rate of 70 ac-ft/yr (Table 1). The potential reservoir site in Cameron Creek (Site 3) would fill to the capacity of 53 ac-ft, have a 6-acre area, and evaporation rate of 26 ac-ft/yr (Table 1). Releases of treated effluent to the stream alluvium downstream of the reservoirs would be a minimum of 70 ac-ft/yr in Twin Sisters Creek and 26 ac-ft/yr in Cameron Creek. These low rates would readily infiltrate within a few hundred feet of the point of discharge. The constant infiltration of reclaimed influent to Twin Sisters Creek would increase the capacity of the Village of Santa Clara infiltration gallery. No significant change in the quality of water from infiltration gallery would be expected, but additional analysis would be recommended. A small reservoir in Twin Sisters Creek (Site 1 or 2) and Cameron Creek (Site 3) would be hydrologically feasible.

4.2.2 Reservoir Filling with Storm Water and Potable Water

Reservoir filling with storm water plus existing potable supply from Fort Bayard springs would increase the reservoir size for Site 1 or 2. Currently, Fort Bayard is obligated to irrigate the national cemetery adjacent to the center with 43 ac-ft/yr of potable water. Theoretically, treated effluent could be used for irrigation of the cemetery, and the potable water could be used for maintaining the reservoir at Site 1 or 2. An additional 43 ac-ft/yr to the predicted storm-water inflow would increase the reservoir size from approximately 15 to 25 acres. Referring to Table 1, a 25-acre reservoir at Site 1 or 2 would contain up to 300 ac-ft.
4.2.3 Reservoir Filling with Treated Effluent and Storm Water

Reservoir filling with treated effluent at Site 2 could maintain a maximum reservoir size of 132 acres. The reservoir capacity would be approximately 3,300 ac-ft with an evaporation rate of 550 ac-ft/yr (Table 1). Most of the available treated effluent would be used for offsetting reservoir evaporation and replacing storm water captured by the reservoir with downstream releases of treated effluent. No effluent would be available for irrigation projects and aquifer recharge. Furthermore, recreational uses for a reservoir filled primarily with treated effluent maybe restricted by the NMED (see Appendix B).

Setting aside 135 ac-ft/yr of treated effluent for irrigation projects and 300 ac-ft/yr for aquifer recharge projects would limit the amount of effluent available for reservoir filling and evaporation. With 435 ac-ft/yr of set asides, approximately 115 ac-ft/yr would be available for reservoir filling and evaporation during the first year, and 385 ac-ft/yr at full capacity of the Bayard WWTP. A maximum reservoir size of approximately 90 acres could be feasible at Site 1 or 2 when considering the 135 and 300 ac-ft/yr set aside for landscape irrigation and aquifer recharge projects.

4.3 Enhanced Aquifer Recharge

Enhanced aquifer recharge simply involves discharging treated effluent to Twin Sisters Creek and Cameron Creek, and allowing the water to infiltrate and recharge the Lone Mountain aquifer system. A system could be designed that would increase the capacity of the Village of Santa Clara infiltration gallery without impacting water quality. There appears to be adequate stream alluvium in Twin Sisters Creek, above the gallery, to allow for natural filtration of infiltrated treated effluent. The same method could apply to the Lone Mountain aquifer system where treated effluent is infiltrated along Cameron Creek below the Village of Santa Clara.

Based on known stream alluvium width and thickness, the optimum recharge quantities would be 100 ac-ft/yr for Twin Sisters Creek (approximately 2,000 ft above Village of Santa Clara infiltration gallery), and 200 ac-ft/yr for Cameron Creek south of the Village of Santa Clara.
4.4 Aquifer Storage and Recovery

Aquifer Storage and Recovery (ASR) involves the addition of a known amount of water to the aquifer system and then recovering the same amount. ASR requires obtaining a permit from the New Mexico Office of the State Engineer (NMOSE). The ASR permit application needs to be supported by the data and results from a demonstration project. It is unlikely an ASR permit application would be needed because the City of Bayard and Village of Santa Clara have more water rights than long-term water supply. Therefore, the aquifer can be recharged with treated effluent and recovered using existing water rights permits.

5.0 FINDINGS

This preliminary hydrogeologic analysis considered topography of the potential reservoir sites, estimates of storm-water runoff, geologic conditions, groundwater conditions, fresh-water sources, and water rights. The topography is suitable for all three potential reservoir sites, except than Site 3 is limited in area. The geologic units underlying the three reservoir sites consist of low-permeability rocks that would limit seepage from the reservoir footprint. No significant seepage is expected.

Average annual stormwater runoff from the watershed area above the potential reservoir sites was estimated at 70 ac-ft/yr for Twin Sisters Creek, and 110 ac-ft/yr for Cameron Creek. Managing stormwater runoff and insuring the same quantity of water continues to flow downstream of the potential reservoir sites is vital to maintain water rights and recharge for municipal water sources. The lake evaporation is estimated at 50 inches per year.

Reservoirs could be built in both Twin Sisters Creek (Sites 1 and 2) and Cameron Creek (Site 3) drainages. Potential reservoir Sites 1 and 2 are very similar, and either site would be feasible for a reservoir 15 to 90 acres in size.

Reservoir size at Site 1 or 2 would be limited by the source and quantity of water available. The best use of water sources would include reservoir filling with 1) storm water and potable water from Fort Bayard, or 2) storm water and treated effluent. The main difference between proposed water sources is the potential use allowed by the NMED (see Appendix B), and availability of water sources. Filling with fresh water sources would result in a reservoir approximately 25 acres in size, and up to a 90-acre reservoir when considering treated effluent and stormwater.
Regardless of the configuration of water sources, not all of the new water created from the treated effluent can be used to offset reservoir filling and evaporation. Table 3 lists potential uses and estimated quantity of treated effluent required for the proposed use.

**Table 4. Proposed potential uses and estimated demand for treated effluent**

<table>
<thead>
<tr>
<th>potential use</th>
<th>first year demand, ac-ft/yr</th>
<th>full build out demand, ac-ft/yr</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bayard reuse and Grant County projects landscape and park irrigation</td>
<td>135</td>
<td>135</td>
</tr>
<tr>
<td>Grant County: reservoir evaporation</td>
<td>115</td>
<td>385</td>
</tr>
<tr>
<td>Grant County: aquifer recharge</td>
<td>300</td>
<td>300</td>
</tr>
<tr>
<td>total</td>
<td>550</td>
<td>820</td>
</tr>
</tbody>
</table>

ac-ft/yr - acre-feet per year

This project would not require an aquifer storage and recovery permit application with the NMOSE because currently water rights exceed water supply. The recharge project would help the Village of Santa Clara and City of Bayard to use their existing water rights. A groundwater discharge plan permit from the NMED would likely be required for this project.

To further investigate the hydrologic feasibility of the Grant County reservoir and reuse project, recommended additional work would include quantification of existing water sources (such as Fort Bayard springs) and mapping of the stream alluvium for estimating capacity for infiltration. Furthermore, a detailed analysis to determine potential water-quality impacts to Village of Santa Clara infiltration gallery would be needed.
6.0 REFERENCES

Finch, S. and Shomaker, J., 1998, Hydrogeologic evaluation and sustainability analysis of ground-water supply for Cobre Mining Company operations, Grant County, New Mexico, 29 p.


SCS, 1972, Gross Annual Lake Evaporation Map: Soil Conservation Service map 4-R-33582, April 1972

SCS, 1973,


ILLUSTRATIONS
Figure 1. Map showing study area, Twin Sisters Creek and Cameron Creek watersheds, supply wells, and potential reservoir sites near Fort Bayard, New Mexico.
Figure 2. Land surface elevation contour map showing location of potential reservoir Site 1 near Fort Bayard, New Mexico.
Figure 3. Land surface elevation contour map showing location of potential reservoir Site 2 near Fort Bayard, New Mexico.

JOHN SHOMAKER & ASSOCIATES, INC.
Figure 4. Land surface elevation contour map showing location of potential reservoir Site 3 near Fort Bayard, New Mexico.
Figure 5. Geologic map of the study area near Fort Bayard, New Mexico.
Figure 6. Graph of daily precipitation at Fort Bayard, New Mexico.
Figure 8. Map showing groundwater-level elevation contours, direction of groundwater flow, and depth to water for the study area near Fort Bayard, New Mexico.
Appendix A.

Hydrographs for the Lone Mountain and Bayard Well Field area.
Graph showing depth to water versus time for well 18S.13W.14.24432, located in Cameron Creek drainage south of Bayard, New Mexico.
Graph showing depth to water versus time for well C-2, Lone Mountain Well Field, Santa Clara, New Mexico.
Graph showing depth to water versus time for well C-3, Lone Mountain Well Field, Santa Clara, New Mexico.
Graph showing depth to water versus time for well 18S.13W.15.44422, City of Santa Clara, New Mexico.
Appendix B.

NMED Ground Water Quality Bureau Guidance for above ground use of reclaimed domestic wastewater
NMED GROUND WATER QUALITY BUREAU GUIDANCE:

ABOVE GROUND USE OF RECLAIMED DOMESTIC WASTEWATER

January 2007

PURPOSE

This document provides guidance for the above ground use of reclaimed domestic wastewater necessary to ensure protection of public health and the environment. The New Mexico Environment Department (NMED) has developed this guidance document to promote the safe use of reclaimed wastewater to offset the use of limited potable water resources in the State. This guidance document is intended to provide direction for anyone seeking to submit an application for a Ground Water Discharge Permit that includes the above ground use of reclaimed wastewater. This document is used by NMED technical staff to ensure consistency in the application review process and in the development of permit requirements. This guidance document will also be made available to the regulated community and their consultants to provide a basis for future facility planning.

Ground Water Discharge Permit applications for above ground use of reclaimed domestic wastewater that follow this guidance document will be approved. However, applicants may make alternative demonstrations to NMED that the existing or proposed discharge of reclaimed domestic wastewater at a specific facility is protective of public health and the environment. NMED encourages the development and implementation of new processes and equipment, and will favorably consider them on a case by case basis.

The generator of the reclaimed wastewater is responsible for discharges of reclaimed wastewater unless this responsibility is assumed by a separate entity pursuant to an approved Ground Water Discharge Permit. Implementation of the requirements for existing dischargers will be determined on an individual facility basis at the time of permit renewal and/or modification.

Finally, the discharge of reclaimed wastewater may also be regulated by the New Mexico Construction Industries Division (CID). For example, the use of reclaimed wastewater for indoor plumbing (e.g., toilet flushing, fire suppression) requires approval from CID.

DEFINITIONS

The following definitions are used in this guidance document:

Agronomic Rate: the rate of application of nutrients to plants that is necessary to satisfy the plants’ nutritional requirements while strictly minimizing the amount of nutrients that run off to surface waters or which pass below the root zone of the plants.

Class 1A Reclaimed Wastewater: the highest quality reclaimed wastewater described in this guidance document and can be most broadly utilized except for direct consumption. [approved uses listed in Table 1]

Class 1B Reclaimed Wastewater: the second highest quality reclaimed wastewater described in this guidance document and is suitable for uses in which public exposure is likely. [approved uses listed in Table 1]

Class 2 Reclaimed Wastewater: reclaimed wastewater suitable for uses in which public access and exposure is restricted. [approved uses listed in Table 1]
Class 3 Reclaimed Wastewater: reclaimed wastewater suitable for uses in which public access and exposure is prohibited. [approved uses listed in Table 1]

Domestic wastewater: wastewater containing human excreta and water-carried waste from typical residential plumbing fixtures and activities, including but not limited to wastes from toilets, sinks, bath fixtures, clothes or dishwashing machines and floor drains.

Dwelling unit: a structure which contains bedrooms.

Establishment: a structure used as a place of business, education, or assembly.

Flood Irrigation: land application of reclaimed wastewater by ditches, furrows, pipelines, low flow emitters and other non-sprinkler methods.

Food Crops: any crop intended for human consumption.

Grab Sample: an individual sample collected in less than 15 minutes.

Major WWTP: any treatment plant with a maximum design capacity of 1,000,000 gallons or more per day.

Minor WWTP: any treatment plant with a maximum design capacity of less than 1,000,000 gallons per day.

Monthly Geometric Mean: value calculated by taking the sum of the logarithms (sum log x) of each of the data points from the previous calendar month, dividing the sum by the number of data points and then taking the anti-logarithm of the result ($10^y = \text{anti-logarithm of } y$).

NTU: nephelometric turbidity units, measured by a nephelometer.

Occupied establishment: any establishment that is occupied regularly at the time of irrigation.

Peak hourly flow: the highest hourly flow rate within a 24 hour period.

Reclaimed wastewater: domestic wastewater that has been treated to the specified levels for the defined uses set forth in this guidance document and other applicable local, state, or federal regulations.

Spray Irrigation: land application of reclaimed wastewater by dispersing it in the air utilizing equipment which provides a low trajectory application and which minimizes misting of the reclaimed wastewater.

3-hour Composite Sample: three effluent portions collected no closer together than one hour (collected between 8:00 am and 4:00 pm) and composited in proportion to flow.

6-hour Composite Sample: six effluent portions collected no closer together than one hour (collected between 8:00 am and 4:00 pm) and composited in proportion to flow.

24-hour Composite Sample: twenty-four effluent portions collected no closer together than one hour and composited in proportion to flow.

30-day Average:

For fecal coliform bacteria: the geometric mean of the values for all effluent samples collected during a calendar month.

For other than for fecal coliform bacteria: the arithmetic mean of the daily values for all effluent samples collected during a calendar month, calculated as the sum of all daily discharges measured during a calendar month divided by the number of daily discharges measured during that month.
BACKGROUND
This guidance document supersedes the New Mexico Environmental Improvement Division (NMEID) 1985 Policy for the Use of Domestic Wastewater Effluent for Irrigation and NMED’s 2003 Policy for the Above Ground Use of Reclaimed Domestic Wastewater. This guidance document establishes reclaimed wastewater quality levels, site restrictions, management practices, and uses for different categories of reclaimed wastewater that are approvable by NMED. Unless an alternative demonstration is proposed by the applicant and accepted by NMED, NMED will propose Ground Water Discharge Permit conditions for above ground discharges of reclaimed wastewater based on the recommendations set forth in this guidance document. While the requirements set forth in this guidance document are deemed protective of public health and the environment, the guidance document does not prevent communities from adopting more stringent requirements.

WASTEWATER TREATMENT PROCESSES
The specified quality levels for Class 1B, Class 2, and Class 3 assume a minimum of conventional secondary wastewater treatment plus disinfection. Class 1A assumes treatment to remove colloidal organic matter, color, and other substances that interfere with disinfection, thereby allowing for the use of the reclaimed wastewater for urban landscaping adjacent to dwelling units or occupied establishments.

GENERAL ABOVE GROUND USE PERMIT CONDITIONS

A. ALL APPROVED USES
1. Whenever reclaimed wastewater is used for any use approved in this guidance document, the wastewater should meet the minimum requirements set forth in this guidance document, unless a demonstration is made that an alternate requirement offers an equivalent protection of public health. The burden of proof for an alternative demonstration rests upon the discharger.
2. Whenever reclaimed wastewater other than Class 1A is used in areas with public access, it should be applied at times and in a manner that minimizes public contact.
3. Whenever reclaimed wastewater is used in areas with restricted public access, the public should be excluded from entering the area.
4. Reclaimed wastewater should only be used for soil compaction or dust control in construction areas where application procedures minimize aerosol drift to public areas.
5. Reclaimed wastewater quality requirements should be measured at the discharge point of the wastewater treatment plant.
6. Signs (in English and Spanish) should be placed at the entrance to areas receiving reclaimed wastewater, and other locations where public access may occur stating: “NOTICE – THIS AREA IS IRRIGATED WITH RECLAIMED WASTEWATER – DO NOT DRINK”; “AVISO – ESTA ÁREA ESTÁ REGADA CON AGUAS NEGRAS RECOBRADAS – NO TOMAR”. Alternate wording may be approved by NMED.
7. All piping, valves and outlets should be color-coded in purple pursuant to the latest revision of the New Mexico Plumbing and Mechanical Code to differentiate piping or fixtures used to convey reclaimed wastewater from piping or fixtures used for potable or other water. All valves, outlets, and sprinkler heads used in reclaimed wastewater systems should be of a type that can only be operated by authorized personnel. Those...
portions of reclaimed wastewater systems that are underground and were installed prior to the adoption of this guidance document are exempt from the purple color-coding requirement if all accessible portions of the reclaimed wastewater system are colored purple or clearly labeled as being part of a reclaimed wastewater distribution system.

8. Reclaimed wastewater systems should have no direct or indirect cross connections with potable water systems pursuant to the latest revision of the New Mexico Plumbing and Mechanical Code. For reclaimed wastewater systems that were installed prior to the adoption of this guidance document, the absence of cross connections may be demonstrated via hydrostatic testing or as-built drawings, supported by an affidavit under oath that no cross connection exists.

9. Above ground use of reclaimed wastewater should not result in excessive standing or pooling of wastewater, and should be applied at the appropriate agronomic rate. Irrigation should not be conducted at times when the receiving area is saturated or frozen.

10. The discharge of reclaimed wastewater should be confined to the area designated and approved for receiving the wastewater. Irrigation should be postponed at times when windy conditions may result in drift of reclaimed wastewater outside the designated area of application.

11. Treatment facilities that provide reclaimed wastewater to parks, golf courses, schools and other areas where human exposure is likely must have an emergency storage pond or alternate disposal method where reclaimed wastewater can be diverted during periods when conditions are unfavorable for approved uses or when the quality requirements defined in this guidance document cannot be met.

B. **IRRIGATION OF FOOD CROPS**

1. Reclaimed wastewater should not be used for the spray irrigation of food crops.

2. Reclaimed wastewater should not be used for surface irrigation of food crops except where there is no contact between the edible portion of the crop and the wastewater, and the wastewater should have a level of quality no less than Class 1B Reclaimed Wastewater (Table 2).

C. **IRRIGATION OF FODDER, FIBER AND SEED CROPS**

1. Reclaimed wastewater used for the irrigation of pasture to which milking cows or goats have access should have a level of quality no less than Class 2 Reclaimed Wastewater (Table 2).

2. Except pasture for milk-producing animals, reclaimed wastewater used for the irrigation of fodder, fiber and seed crops should have a level of quality no less than Class 3 Reclaimed Wastewater (Table 2).

D. **IRRIGATION OF LANDSCAPES**

1. Reclaimed wastewater used for irrigation should be applied such that direct and windblown spray is confined to the area designated and approved for application.

2. Reclaimed wastewater used for the irrigation of freeway landscapes and landscapes in other areas where the public has similarly limited access or exposure should have a level of quality no less than Class 2 Reclaimed Wastewater (Table 2). Public access to the irrigation site must be restricted during the period of application.
3. Reclaimed wastewater used for the irrigation of parks, playgrounds, schoolyards, golf courses, cemeteries and other areas where the public has similarly open access should have a level of quality no less than Class 1B Reclaimed Wastewater (Table 2), and the irrigation system should have low trajectory spray nozzles. *Areas which are spray irrigated and located within 100 feet of a dwelling unit or occupied establishment should only receive Class 1A Reclaimed Wastewater (Tables 2 & 3).*

**CLASSIFICATION AND USES OF RECLAIMED WASTEWATER**

This guidance document identifies four classes of reclaimed wastewater (Class 1A, Class 1B, Class 2, and Class 3) based on reclaimed wastewater quality and the likelihood of public exposure. Table 1 presents the approved uses.

<table>
<thead>
<tr>
<th>Class of Reclaimed Wastewater</th>
<th>Approved Uses</th>
</tr>
</thead>
<tbody>
<tr>
<td>Class 1A</td>
<td>All Class 1 uses. <em>No setback limit</em> to dwelling unit or occupied establishment.</td>
</tr>
<tr>
<td></td>
<td>Backfill around potable water pipes</td>
</tr>
<tr>
<td></td>
<td>Irrigation of food crops[^1^]</td>
</tr>
<tr>
<td>Class 1B</td>
<td>Impoundments (recreational or ornamental)</td>
</tr>
<tr>
<td></td>
<td>Irrigation of parks, school yards, golf courses[^2^]</td>
</tr>
<tr>
<td></td>
<td>Irrigation of urban landscaping[^2^]</td>
</tr>
<tr>
<td></td>
<td>Snow making</td>
</tr>
<tr>
<td></td>
<td>Street cleaning</td>
</tr>
<tr>
<td></td>
<td>Toilet flushing</td>
</tr>
<tr>
<td></td>
<td>Backfill around non-potable piping</td>
</tr>
<tr>
<td>Class 2</td>
<td>Concrete mixing</td>
</tr>
<tr>
<td></td>
<td>Dust control</td>
</tr>
<tr>
<td></td>
<td>Irrigation of fodder, fiber, and seed crops for milk-producing animals</td>
</tr>
<tr>
<td></td>
<td>Irrigation of roadway median landscapes</td>
</tr>
<tr>
<td></td>
<td>Irrigation of sod farms</td>
</tr>
<tr>
<td></td>
<td>Livestock watering</td>
</tr>
<tr>
<td></td>
<td>Soil compaction</td>
</tr>
<tr>
<td>Class 3</td>
<td>Irrigation of fodder, fiber, and seed crops for non-milk-producing animals</td>
</tr>
<tr>
<td></td>
<td>Irrigation of forest trees (silviculture)</td>
</tr>
</tbody>
</table>

[^1^] Irrigation of food crops should only be allowed for food crops when there is no contact between the edible portion of the crop and the wastewater. Spray irrigation is prohibited for food crops.

[^2^] If reclaimed wastewater is applied using spray irrigation, the setback limitation of Table 3 “Spray Irrigation” should be observed.
Class 1A reclaimed wastewater may be used for any purpose except direct consumption, food handling and processing, and spray irrigation of food crops. Class 1B reclaimed wastewater may be used where public exposure is likely, and where the appropriate setback requirements are met (Table 3, page 9). Class 2 and Class 3 reclaimed wastewater may be used where public access is restricted with correspondingly less stringent requirements for treatment and disinfection. Any reclaimed wastewater treated to higher quality than the lower classes may be used for the purposes established for the lower classes. Other uses of reclaimed wastewater not included in Table 1 will be evaluated on a case by case basis by NMED to determine the appropriate water quality classification for the given use.

**Wastewater Quality Levels and Monitoring Protocol**

This section identifies minimum wastewater quality levels and monitoring frequencies for the various classes of reclaimed wastewater. The frequency of wastewater quality monitoring is patterned after U.S. Environmental Protection Agency (USEPA) requirements for discharges of treated and disinfected wastewater to surface waters. Monitoring requirements are dependent on the quality of reclaimed wastewater produced at the treatment plant and the design capacity of the treatment plant. For example, a “major” wastewater treatment plant (having a maximum design capacity of 1 million gallons or more per day) producing Class 1A Reclaimed Wastewater has the most stringent monitoring requirements. The wastewater quality levels and monitoring frequencies for the various classes of reclaimed wastewater are presented in Table 2. In the event that a facility proposes alternative wastewater quality levels and/or monitoring frequencies, it is the responsibility of the facility owner/operator to demonstrate that the alternative proposal provides an equivalent measure of public health protection as the measures set forth in this guidance document.
<table>
<thead>
<tr>
<th>Class of Reclaimed Wastewater</th>
<th>Wastewater Quality Parameter</th>
<th>Wastewater Quality Requirements</th>
<th>Wastewater Monitoring Requirements</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>30-Day Average</td>
<td>Maximum</td>
<td>Sample Type</td>
</tr>
<tr>
<td>Class 1A</td>
<td>BOD$_5$</td>
<td>10 mg/l</td>
<td>15 mg/l</td>
</tr>
<tr>
<td></td>
<td>Turbidity</td>
<td>3 NTU</td>
<td>5 NTU</td>
</tr>
<tr>
<td></td>
<td>Fecal Coliform</td>
<td>5 per 100 ml</td>
<td>23 per 100 ml</td>
</tr>
<tr>
<td></td>
<td>TRC or UV Transmissivity</td>
<td>Monitor Only</td>
<td>Monitor Only</td>
</tr>
<tr>
<td>Class 1B</td>
<td>BOD$_5$</td>
<td>30 mg/l</td>
<td>45 mg/l</td>
</tr>
<tr>
<td></td>
<td>TSS</td>
<td>30 mg/l</td>
<td>45 mg/l</td>
</tr>
<tr>
<td></td>
<td>Fecal Coliform</td>
<td>100 organisms per 100 ml</td>
<td>200 organisms per 100 ml</td>
</tr>
<tr>
<td></td>
<td>TRC or UV Transmissivity</td>
<td>Monitor Only</td>
<td>Monitor Only</td>
</tr>
</tbody>
</table>
Table 2. Wastewater Quality Requirements and Monitoring Frequencies by Class of Reclaimed Wastewater (continued)

<table>
<thead>
<tr>
<th>Class of Reclaimed Wastewater</th>
<th>Wastewater Quality Parameter</th>
<th>Wastewater Quality Requirements</th>
<th>Wastewater Monitoring Requirements</th>
</tr>
</thead>
<tbody>
<tr>
<td>Class 2</td>
<td>BOD&lt;sub&gt;5&lt;/sub&gt;</td>
<td>30 mg/l 45 mg/l</td>
<td>Minimum of 6-hour composite for major WWTP; Grab sample for minor WWTP</td>
</tr>
<tr>
<td></td>
<td>TSS</td>
<td>30 mg/l 45 mg/l</td>
<td>Minimum of 6-hour composite for major WWTP; Grab sample for minor WWTP</td>
</tr>
<tr>
<td></td>
<td>Fecal Coliform</td>
<td>200 organisms per 100 ml 400 organisms per 100 ml</td>
<td>Grab sample at peak hourly flow</td>
</tr>
<tr>
<td></td>
<td>TRC or UV Transmissivity</td>
<td>Monitor Only Monitor Only</td>
<td>Grab sample or reading at peak hourly flow Record values at peak hourly flow when Fecal Coliform samples are collected</td>
</tr>
<tr>
<td>Class 3</td>
<td>BOD&lt;sub&gt;5&lt;/sub&gt;</td>
<td>30 mg/l 45 mg/l</td>
<td>Minimum of 3-hour composite for major WWTP; Grab sample for minor WWTP</td>
</tr>
<tr>
<td></td>
<td>TSS</td>
<td>75 mg/l 90 mg/l</td>
<td>Minimum of 3-hour composite for major WWTP; Grab sample for minor WWTP</td>
</tr>
<tr>
<td></td>
<td>Fecal Coliform</td>
<td>1,000 organisms per 100 ml 5,000 organisms per 100 ml</td>
<td>Grab sample at peak hourly flow</td>
</tr>
<tr>
<td></td>
<td>TRC or UV Transmissivity</td>
<td>Monitor Only Monitor Only</td>
<td>Grab sample or reading at peak hourly flow Record values at peak hourly flow when Fecal Coliform samples are collected</td>
</tr>
</tbody>
</table>

Note: *E. coli may be used in place of Fecal Coliform as an indicator organism, once an equivalency has been established.*
**ACCESS RESTRICTIONS AND SET-BACK REQUIREMENTS**

Table 3 presents the access controls and setback distances necessary to minimize direct and indirect public exposure to reclaimed wastewater. Setback distances recommended in this guidance document are in all cases the distance from the edge of any area receiving reclaimed wastewater to well casings, dwelling units, or occupied establishments.

*In addition to the setbacks described in Table 3, all water supply wells within 200 feet of a wetted irrigation area must be evaluated for adequate well head construction and irrigation practices to ensure protection of ground water. NMED may impose additional setbacks as needed to make certain that the application of reclaimed wastewater does not threaten ground water resources.*

<table>
<thead>
<tr>
<th>Class of Reclaimed Wastewater</th>
<th>Spray Irrigation</th>
<th>Flood Irrigation and Surface Drip Irrigation</th>
</tr>
</thead>
</table>
| **Class 1A**                 | • No access control  
• No setback to dwelling unit or occupied establishment  
• Low pressure/low trajectory irrigation system only | • No access control |
| **Class 1B**                 | • No access control; irrigate at times when public exposure is unlikely  
• 100 ft set-back from dwelling unit or occupied establishment  
• Low pressure/low trajectory irrigation system only | • No access control; irrigate at times when public exposure is unlikely |
| **Class 2**                  | • Access restricted by perimeter fencing using 4-strand barbed wire and locking gate or other NMED approved access controls  
• 100 ft set-back from dwelling unit or occupied establishment  
• Low pressure/low trajectory irrigation system only | • Access restricted by perimeter fencing using 4-strand barbed wire and locking gate, or other NMED approved access controls |
| **Class 3**                  | • Access restricted by perimeter fencing using 4-strand barbed wire and locking gate  
• 500 ft set-back from dwelling unit or occupied establishment  
• Low pressure/low trajectory irrigation system only | • Access restricted by perimeter fencing using 4-strand barbed wire and locking gate  
• 100 ft set-back to dwelling unit or occupied establishment. |