

**PALM SPRINGS, NEVADA STYLE?
COYOTE SPRINGS NEVADA IMPLEMENTS SUSTAINABLE WASTEWATER
TREATMENT AND REUSE TO REDUCE COSTS AND
ACCELERATE THE SCHEDULE**

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ABSTRACT

The Coyote Springs community is being developed on the largest private landholding in Southern Nevada in a valley of the Mojave Desert about 60 miles northeast of Las Vegas. This 42,800 acre parcel is being transformed into a new city that could ultimately include up to 159,000 homes and 16 golf courses. Construction is currently underway on the first 6,881 acres of the 13,100 acres within Clark County.

The water resources available in the Coyote Springs Valley are limited, and the demands for these resources are not confined to the Coyote Springs development. Limited water resources led to the incorporation of several sustainable and low-impact concepts into the design of this development; maintaining open space – especially natural open space; sharing water resources with the environment; optimizing available water resources with stormwater wetlands and 100% treated wastewater reuse; and providing decentralized water and wastewater infrastructure.

Implementation of sustainable concepts shortened the schedule for developing the Coyote Springs community. A major conservation land set-aside and the allocation of some water rights for endangered species protection resulted in Federal approval of the project. Reusing 100% of the wastewater on site greatly simplified the State approval process as a National Pollutant Discharge Elimination System Permit was not required. Finally, a decentralized and phased approach to providing stormwater and wastewater infrastructure using the design-build delivery method greatly compressed the schedule – smaller, distributed facilities that match the pace of development can be designed and constructed more quickly than large facilities built for the ultimate capacity of the development.

Implementation of sustainable concepts produced cost savings as well. Stormwater wetlands were less expensive than a conventional stormwater system. Reusing 100% of the wastewater on site was less expensive than acquiring new water rights for an equivalent volume of water. And decentralized water and wastewater infrastructure, constructed to match the pace of

development, was much less expensive than providing facilities sized for the ultimate capacity of the development.

KEYWORDS

Sustainable development, low impact development, smart growth, reclaimed water, water reuse, recycle, planning, wastewater, design-build, membrane bioreactors.

BACKGROUND

The site for the 42,800 acre Coyote Springs development, located approximately 60 miles northeast of Las Vegas, is currently the largest single private landholding in southern Nevada. It consists of 13,100 acres in northern Clark County, with the remainder in adjacent southern Lincoln County. The development is bounded by State Route 168 to the south, the Meadow Valley Mountains to the east, and US 93 to the west. The only infrastructure within the development prior to 2005 was a single water well.

View of Future Wastewater Treatment Facility



The community is being developed jointly between Coyote Springs Investments (CSI), the Master Developer, and Pardee Homes, the homebuilding division of the Weyerhaeuser Company (collectively the “developers”). Both are committed to transforming this initial parcel of land into a master planned community to rival any in the country. Homes are expected to be occupied as early as the end of 2007. Two aspects of the Coyote Springs site led the developers to investigate low-impact land development and sustainable water resource practices. First, it is part of the Mojave Desert, one of the hottest and driest places in the world, with very limited water resources. Second, it is located outside of the urban growth area of southern Nevada (Las

Vegas and surrounding communities). This meant the developers had to develop their own water sources; and they had to provide for water treatment and distribution, stormwater control, and wastewater collection and treatment, and reuse distribution facilities. The sustainable practices to be implemented include low-impact development; the stewardship of existing water resources; beneficially reusing stormwater runoff and 100% of the wastewater produced; and providing decentralized wastewater collection, treatment, reuse and stormwater facilities.

LOW IMPACT DEVELOPMENT

The first phase of the development consists of a 6,881 acre community with up to 29,000 residential dwelling units located entirely within Clark County. The remaining acreage in Clark County (47%) will consist of the 6,219 acre Coyote Springs Resource Management Area. This area was provided to protect the existing natural resources and removed Federal opposition to the remaining land being used for a residential community. Dedicated parks and open space within the development consist of another 580 acres. Golf course and lake area was not included in the 580 acres. The resource management area, combined with the dedicated open space provided within the community, together result in only 48% of the land being developed for residential communities and commercial uses. This is in sharp contrast to nearby Las Vegas, where 3,000 and 4,000 square foot lots for new single-family residences are common.

STEWARDSHIP OF EXISTING WATER RESOURCES

The Coyote Springs development area was named for the valley that contains it. Three mountain ranges (Delamar, Meadow Valley and the Sheep Range) define the valley which is drained by the Pahranaagat Wash, an ephemeral desert dry wash. Approximately sixteen miles “downstream” of the development is the Moapa Valley National Wildlife Refuge, established to protect the Moapa Dace, an endangered fish that lives in the Muddy Springs and the headwaters of the Muddy River. The Muddy River discharges into Lake Mead, a reservoir of the Colorado River.

Existing water resources consist of precipitation and groundwater; there are no surface water sources. The Coyote Springs Valley is located in the Mojave Desert and this area typically receives only 4 - 10 inches of precipitation per year; the surrounding mountains generally receive the greater amounts. Snow commonly occurs during the winter in the higher reaches of the Sheep and Delamar Ranges and only rarely elsewhere. Localized storms, primarily in July and August, provide most of the summer precipitation, and these storms generally produce stormwater runoff due to the impermeability of the desert soils.

The Coyote Springs groundwater basin is designated as Basin No. 210 by the Nevada State Water Engineer. There is 16,100 acre-feet per year (AFY) of groundwater that is currently permitted for diversion by the State Engineer, and the ownership of this water is divided between the developers (4,600 AFY), Nevada Power Company (2,500 AFY), and the Southern Nevada Water Authority (SNWA) (9,000 AFY). The ultimate capacity of this groundwater basin is unknown and will be determined after a two-year pumping test of valley water wells. However,

there are pending applications for an additional 136,095 AFY of groundwater rights in Basin No. 210 from the developers, SNWA, and the Moapa Valley Water District. It is currently anticipated that the water not allocated to the developers will be exported to sustain development in Las Vegas and the Moapa Valley.

The developers have agreed to assign 10% of their permitted water rights, or 460 AFY, for the preservation of the Moapa Dace, leaving them with 4,140 AFY of permitted water rights for the first phase of their development. The developers have also agreed to donate a portion of any additional water rights they receive for this purpose, reinforcing their commitment to act as stewards of the available water resources.

STORMWATER AND WASTEWATER REUSE

Stormwater Reuse

As mentioned previously, the limited summer precipitation generally produces runoff. If this stormwater runoff was collected and conveyed offsite to the nearest surface water body in the conventional manner, it would have no irrigation value to the development. At the same time, the developers would incur maximum expense for the infrastructure that would be required to control the runoff, as it is not uncommon for the total annual precipitation to occur in one or two storm events. The developers have chosen instead to capture stormwater in a unique series of constructed wetlands that parallel the Pahranaagat Wash. The captured stormwater could be used to partially sustain the wetlands, possibly irrigate common areas, or be combined with rapid infiltration basins to replenish area groundwater. The 100 acre wetland system is expected to cost less than a conventional stormwater collection and conveyance system, and could have the added benefits of cleansing and reusing the stormwater.

Wastewater Reuse

Coyote Springs will feature public open space, parks, and up to 16 golf courses, much of which will require irrigation. The lack of precipitation, combined with an evaporation rate that approaches ten feet per year, results in a huge deficiency for any outdoor water use. To satisfy some of the irrigation demands, a development goal was to beneficially reuse 100% of the wastewater effluent produced. This goal had two purposes – to conserve a scarce and valuable resource and to avoid a National Pollutant Discharge Elimination System (NPDES) permit for discharge outside of the development, which could potentially affect the Coyote Springs Resource Management Area and/or the Moapa Dace downstream. To maximize the opportunities for reuse, all wastewater will be treated to the State of Nevada Category A Reuse Water standards. This requires a minimum of secondary treatment and disinfection to less than 2.2 MPN/100 mL as a 30 day geometric mean for total coliform.

Several water balance calculations were conducted to assess the feasibility of beneficially reusing 100% of the wastewater produced from the Clark County portion of the development on Clark County demands. Based on this analysis, it appears that this goal is easily achievable during summer when irrigation demands are at their peak. Seasonal decreases in irrigation demands could require effluent storage in ponds, rapid infiltration basins, or the stormwater wetlands when irrigation demand is reduced. However, it is likely that development will be

occurring on the Lincoln County portion of Coyote Springs prior to reuse supply exceeding demand in Clark County. Lincoln County demands would therefore beneficially reuse any “excess” Clark County supply.

DECENTRALIZATION OF WASTEWATER COLLECTION, TREATMENT, REUSE, AND STORMWATER FACILITIES

Decentralized systems for collecting, treating, and reusing wastewater and stormwater were chosen because decentralized systems have many advantages over centralized systems for this development.

Some of the disadvantages identified with a centralized system include:

- Oversized Facilities. The initial stormwater and wastewater collection systems and some treatment and reuse facilities would have to be very large to accommodate a huge range of flow. For wastewater in particular, flow would range from essentially zero flow in the fall of 2007 to potentially more than 40 mgd at buildout of the entire 43,000 acre site. In addition to the cost of tying up funds unproductively, certain problems can be expected; a large treatment facility with very little flow would be difficult to operate, and large-diameter sanitary sewers with minimal flow could be a source of odors and potential corrosion in the wastewater collection system.
- Plant Footprint. A single large treatment facility would eventually occupy a significant amount of land area to accommodate ultimate capacity. A large facility will be difficult to make inconspicuous in a residential development, and the cost of controlling noise and odors would likely increase significantly because they would be more concentrated.
- Project Lead Time. Larger facilities take longer to construct, a definite disadvantage when you are in the business of home construction where revenue is not realized until buyers occupy their new homes.

Conversely, the following identifies some of the advantages of decentralized facilities.

- Capacity Based on Development. The capacity of the facilities can be matched to the pace of development. By moving these facility costs to the future, the initial capital outlay for decentralized facilities are reduced.
- Pipeline Sizing. The localized stormwater system and the wastewater collection system can also be sized for an incrementally developing area. The resulting smaller sizes of pipelines will reduce costs and improve velocities, minimizing potential problems with sediment deposition and odor generation in wastewater collection systems.
- Plant Footprints. Several distributed smaller treatment facilities can be more easily integrated into the residential character of this community. Facilities with capacities of 2

to 5 mgd can be enclosed in structures with outside facades that are compatible with surrounding structures. Noise and odors are also more easily addressed.

SCHEDULE AND COST SAVINGS

Schedule advances were made and significant cost savings were realized because the low impact and sustainable concepts were implemented. Some specific examples:

- The 6,219 acre Coyote Springs Resource Management Area and the allocation of 460 AFY of water rights for the Moapa Dace resulted in approval of a Clean Water Act 404 Permit in only nine months and provided a tremendous amenity for the community.
- Reusing 100% of the wastewater on site greatly simplified the state approval process as a NPDES Permit was not required. It is estimated that at least 18 months was removed from the project schedule by this approach. Utilizing this valuable resource was less expensive than acquiring a similar quantity of new water rights, assuming new water rights are even available in the future. If water rights are restricted in the future, then wastewater reuse may serve to extend the capacity of the community.
- The initial wastewater treatment facility is expected to cost approximately \$25 million and was designed in five months. A centralized facility for 40 mgd would have cost at least 10 times that amount and would have taken much longer to design.

PROJECT STATUS

The first golf course, a Jack Nicklaus signature course named Bear Trail, is under construction. The initial 2.1 mgd wastewater treatment facility will utilize activated sludge with membrane bioreactors. Construction of this facility will begin in August 2006, and it will begin operating in October 2007. In order to meet this ambitious schedule, the design-build project delivery method was necessary. The first treatment plant site will allow for expansion of up to 10 mgd.

View of Bear Trail Golf Course under Construction



CONCLUSION

The Coyote Springs community is an excellent example of the balance that needs to occur between competing interests in planning for a new city in an environmentally harsh and sensitive area. In this example, several low-impact and sustainable development concepts were reviewed with respect to water resources. These concepts included balancing open space with developable, revenue-producing land; balancing water for development in Coyote Springs versus development in Las Vegas and the Moapa Valley versus environmental water demands; extending available water resources through reuse; and decentralization to reduce the infrastructure impacts. Results of this balance include a development with at least 52% open space; a significant portion of the available water remaining in the area between the allocation of water for endangered species protection and the beneficial reuse of stormwater and 100% of the treated wastewater produced; and a decentralized stormwater and wastewater collection, treatment, and reclaimed water system that matches the pace of development. Direct benefits to the water related infrastructure from these efforts included a compression of the schedule for planning, design, and construction and significant cost savings.