Planting prototypes for extraction operations in Marana, Arizona

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in collaboration with the Arizona Rock Products Association
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ARIZONA ROCK PRODUCTS ASSOCIATION

Participating Companies (in alphabetical order)

ARIZONA PORTLAND CEMENT COMPANY
CEMEX USA
CPC SOUTHWEST MATERIALS
GRANITE CONSTRUCTION, INC.
VULCAN MATERIALS

INTRODUCTION

This document is a collaboration between Arizona Rock Products Association (ARPA) and the University of Arizona School of Landscape Architecture to provide prototypical strategies for revegetating buffer areas, consisting predominately of berms and property access easements, around active quarries. These strategies focus on addressing and increasing aesthetic and environmental quality of these areas.

The strategies proposed offer flexible alternatives that can be applied to many different situations ARPA facilities may face. To organize applicability and scheme selection, each alternative is considered in the light of relative implementation costs and its potential initial impact / establishment time. For instance, some schemes may involve a higher initial cost but offer a more immediate visual impact for situations with a pressing need to minimize view of berms. Other schemes may pair a lower initial cost with a longer establishment time for situations where immediate results are less necessary, such as a remote plant that may experience adjacent development 5 or more years down the road. Suggestions for the placement of each strategy relative to adjacent land use and potential pros and cons for each strategy are also discussed in the document.

PLANTING ALTERNATIVE A

RELATIVE COST	**LOW / MEDIUM**
TIMEFRAME TO MATURITY	**3-5 YEARS**
AESTHETICS	**DESIGNED**

DESCRIPTION

Alternative A emphasizes a low-to-moderate level of implementation costs for a moderate amount of initial impact. Large trees are planted at a regular interval of 40' on center to create an overstory canopy and provide some immediate massing to minimize view of berms. A seed mix is also hydroseeded onto the berm to create opportunities for ongoing naturalization. This establishment period for understory plants will lengthen the maturation period and reduce the initial aesthetics for the site. Overtime, the hydroseed will help fill in gaps in the planting and provide a more naturalized feel to the landscape. This vegetation infill will provide neighboring land uses the sense of looking out into the natural desert. This strategy could also be used with decorative rock as a substitute for a seed mix, providing a mature canopy for visual cover and the decorative rock for added aesthetic interest.

SUGGESTED PLACEMENT:

Adjacent to:

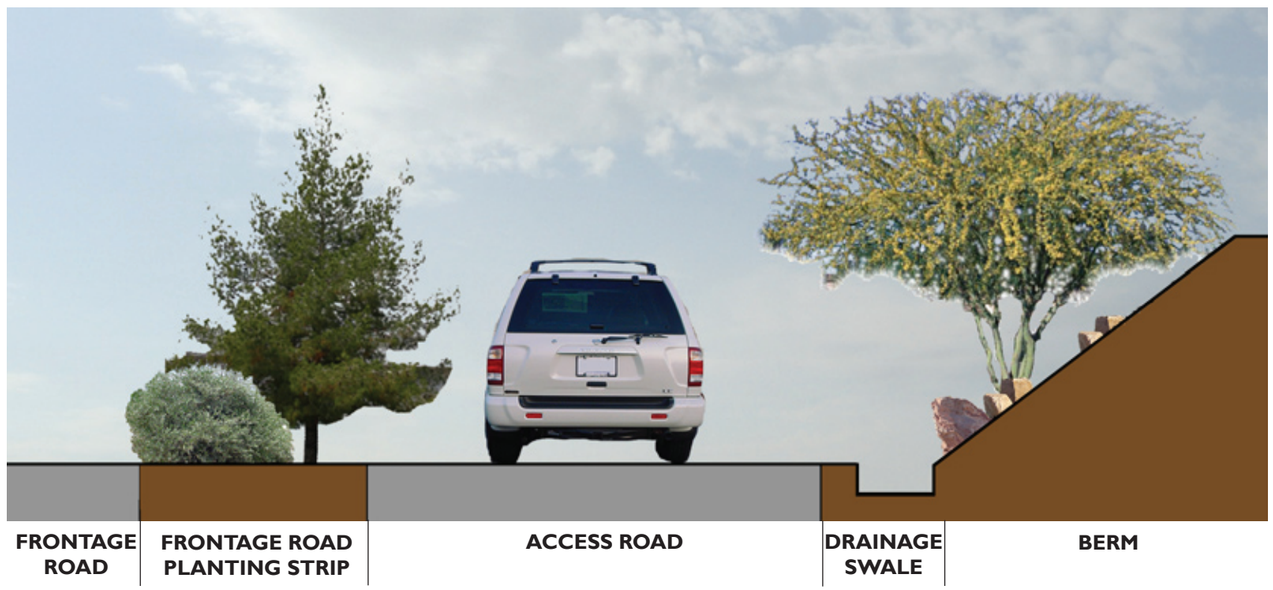
- interstate
- two-lane roads

FEATURES

- low maintenance
- low particulate mitigation
- low habitat creation
- low erosion control
- low initial impact
- low to medium cost

EXISTING CONDITION

PERSPECTIVE OF TREATMENT



SECTION SCALE 1/8" = 1' 0"

PLANTING KEY

- Large Tree
- Medium Tree
- Large Shrub
- Medium Shrub
- Small Shrub
- Seed Mix

PLAN VIEW
SCALE 1" = 30' 0"

Existing Condition

Year 1

PLANTING SCHEDULE

LARGE TREE (15 Gallon)
- *Parkinsonia florida*, Blue Palo Verde **
- *Prosopis velutina*, Velvet Mesquite

SEED MIX (optional application)
- *Ambrosia deltoidea*, Triangleleaf Bur-sage
- *Atriplex canescens*, 4-wing Saltbush
- *Baileya multiradiata*, Desert Marigold
- *Calliandra eriophylla*, Fairy Duster
- *Dyssodia pentachaeta*, Dogweed
- *Encelia farinosa*, Brittlebush **
- *Phacelia campanularia*, Desert Bluebells
- *Senna covesii*, Desert Senna **

Fairy Duster

Brittlebush

Desert Marigold

** *plant species not suited for elevations above 4,000'*
images from http://ag.arizona.edu/pima/gardening/aridplants/aridplant_botindex.html#botE

Year 3

Year 5

PLANTING ALTERNATIVE B

DESCRIPTION

Alternative B emphasizes a moderate-to-high level of implementation costs with a high level of initial impact. It provides a more manicured landscape akin to the Tangerine Rd. exit from I-10 that was suggested as a landscape model for buffer areas by the town of Marana. Drifts of rockwork provide accents and irrigation retention for large trees and masses of shrubs. The trees are specified at an interval of 40' on center, with massing of shrubs in between to create visual interest and screening. No revegetation seed mix is specified in this case to maintain a more intentional design outcome. Despite this, the scheme will still require some maintenance (pruning and weed removal) over time to maintain its more manicured aesthetics. The intent is that neighboring land uses will be viewing a design similar to subdivision or commercial area peripheral plantings that create a nicely designed, relatively porous buffer.

SUGGESTED PLACEMENT

Adjacent to:

- interstate
- two-lane roads

FEATURES

- high maintenance
- medium particulate mitigation
- low habitat creation
- low erosion control
- high initial impact
- medium to high cost

EXISTING CONDITION

PERSPECTIVE OF TREATMENT

SECTION SCALE 1/8" = 1' 0"

RELATIVE COST	**MEDIUM / HIGH**
TIMEFRAME TO MATURITY	**3-5 YEARS**
AESTHETICS	**DESIGNED**

PLANTING KEY

- Large Tree
- Medium Tree
- Large Shrub
- Medium Shrub
- Small Shrub
- Seed Mix

PLAN VIEW
SCALE 1" = 30' 0"

Existing Condition

Year 1

PLANTING SCHEDULE

LARGE TREE (15 Gallon)
- *Parkinsonia florida*, Blue Palo Verde **
- *Prosopis velutina*, Velvet Mesquite

MEDIUM TREE (5 Gallon)
- *Acacia constricta*, Whitethorn Acacia
- *Acacia greggii*, Cat-claw Acacia
- *Chilopsis linearis*, Desert Willow **
- *Parkinsonia microphylla*, Foothills Palo Verde **

LARGE SHRUB (1 Gallon)
- *Atriplex canescens*, 4-wing Saltbush
- *Celtis pallida*, Desert Hackberry **
- *Dodonea viscosa*, Hopbush
- *Larrea tridentata*, Creosote
- *Lycium fremontii*, Wolfberry **
- *Simmondsia chinensis*, Jojoba

MEDIUM SHRUB (1 Gallon)
- *Calliandra eriophylla*, Fairy Duster
- *Dalea frutescens*, Black Dalea
- *Dalea pulchra*, Bush Dalea

SMALL SHRUBS / ACCENTS (1 Gallon)
- *Ambrosia deltoidea*, Triangleleaf Bur-sage
- *Hesperaloe parviflora*, Red Yucca
- *Hesperaloe funifera*, Giant Yucca
- *Nolina microcarpa,* beargrass
- *Yucca elata*, Soaptree Yucca

Hopbush

Creosote

*** plant species not suited for elevations above 4,000'*
images from http://ag.arizona.edu/pima/gardening/aridplants/aridplant_botindex.html#botE

Year 3

Year 5

PLANTING ALTERNATIVE C

DESCRIPTION

Alternative C provides the highest implementation costs and level of immediate impact of all of the alternatives. This scheme incorporates all three vegetative strategies outlined in this document to create an immediate, natural looking screen. Both large and medium sized trees are paired with massings of shrubs to create planting modules that can be repeated throughout the length of the berm. These modules will create a relatively dense initial screen during implementation. A revegetation seed mix is also incorporated to ensure that gaps are filled in over time by advantageous native species. Within a few years, it is our intent that the berm will appear to be very well naturalized and neighboring land uses will feel as though they are viewing the natural desert.

SUGGESTED PLACEMENT

Adjacent to:

- open spaces
- natural areas
- walkways
- two-lane roads

FEATURES

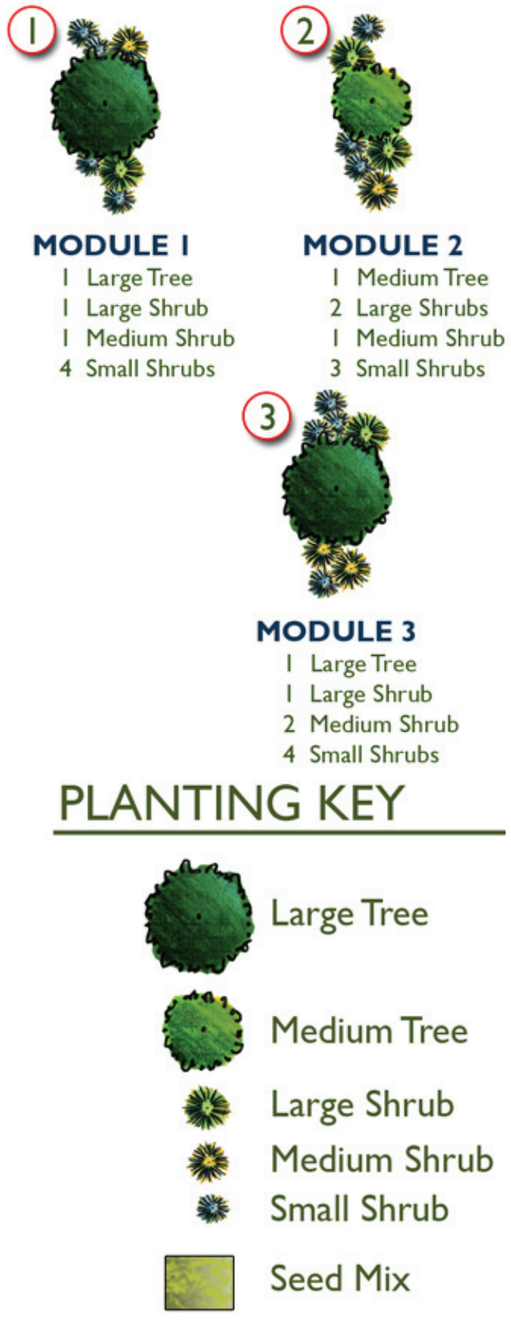
- low maintanence
- high particulate mitigation
- high habitat creation
- medium / high erosion control
- high initial impact
- high cost

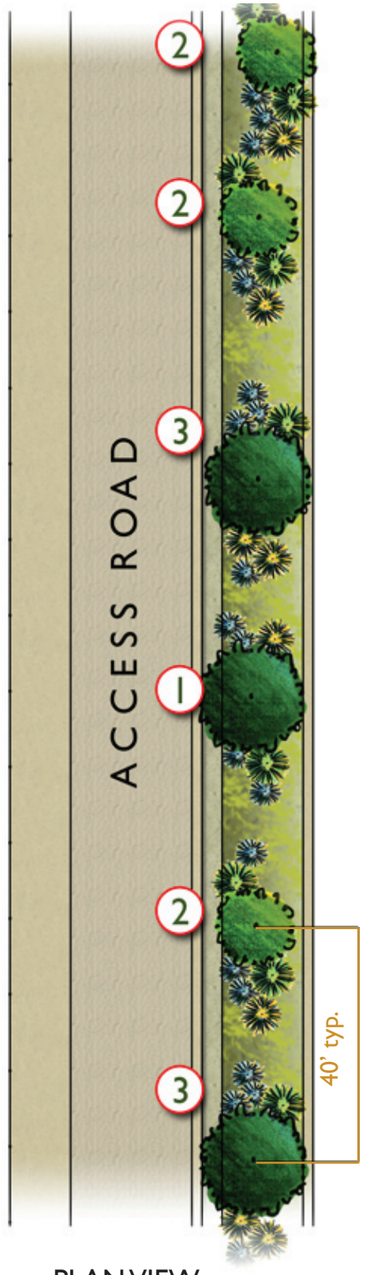
RELATIVE COST	**HIGH**
TIMEFRAME TO MATURITY	**3-5 YEARS**
AESTHETICS	**NATURAL**

EXISTING CONDITION

PERSPECTIVE OF TREATMENT

SECTION SCALE 1/8" = 1' 0"





PLAN VIEW
SCALE 1" = 30' 0"

Existing Condition

Year 1

PLANTING SCHEDULE

LARGE TREE (15 Gallon)
- *Parkinsonia florida*, Blue Palo Verde **
- *Prosopis velutina*, Velvet Mesquite

MEDIUM TREE (5 Gallon)
- *Acacia constricta*, Whitethorn Acacia
- *Acacia greggii*, Cat-claw Acacia
- *Chilopsis linearis*, Desert Willow **
- *Parkinsonia microphylla*, Foothills Palo Verde **

LARGE SHRUB (1 Gallon)
- *Atriplex canescens*, 4-wing Saltbush
- *Celtis pallida*, Desert Hackberry **
- *Dodonea viscosa*, Hopbush
- *Larrea tridentata*, Creosote
- *Lycium fremontii*, Wolfberry **
- *Simmondsia chinensis*, Jojoba

MEDIUM SHRUB (1 Gallon)
- *Calliandra eriophylla*, Fairy Duster
- *Dalea frutescens*, Black Dalea
- *Dalea pulchra*, Bush Dalea

SMALL SHRUBS / ACCENTS (1 Gallon)
- *Ambrosia deltoidea*, Triangleleaf Bur-sage
- *Hesperaloe parviflora*, Red Yucca
- *Hesperaloe funifera*, Giant Yucca
- *Nolina microcarpa,* beargrass
- *Yucca elata*, Soaptree Yucca

SEED MIX
- *Ambrosia deltoidea*, Triangleleaf Bur-sage
- *Atriplex canescens*, 4-wing Saltbush
- *Baileya multiradiata*, Desert Marigold
- *Calliandra eriophylla*, Fairy Duster
- *Dyssodia pentachaeta*, Dogweed
- *Encelia farinosa*, Brittlebush **
- *Phacelia campanularia*, Desert Bluebells
- *Senna covesii*, Desert Senna **

Beargrass

Foothills Palo Verde

Dogweed

** *plant species not suited for elevations above 4,000'*
images from http://ag.arizona.edu/pima/gardening/aridplants/aridplant_botindex.html#botE

Year 3

Year 5

PLANTING ALTERNATIVE D

DESCRIPTION

Alternative D provides a hybrid scheme that has a moderate implementation cost with a low-to-moderate level of initial impact. Large trees are spaced 80' apart on center, twice as far away as in the other three schemes. While this does reduce cost it also reduces the screening impact of the scheme. Massings of shrubs fill in the space in between trees, and a revegetation seed mix is specified to fill in remaining gaps in the planting over time. Initially, neighboring land uses will feel as though they are looking out on a porous designed landscape, but with time, this view will transform into a more natural looking landscape as the seed mix matures and plants become established.

RELATIVE COST	**LOW / MEDIUM**
TIMEFRAME TO MATURITY	**3-5 YEARS**
AESTHETICS	**NATURAL**

SUGGESTED PLACEMENT

Adjacent to:

- open spaces
- natural areas

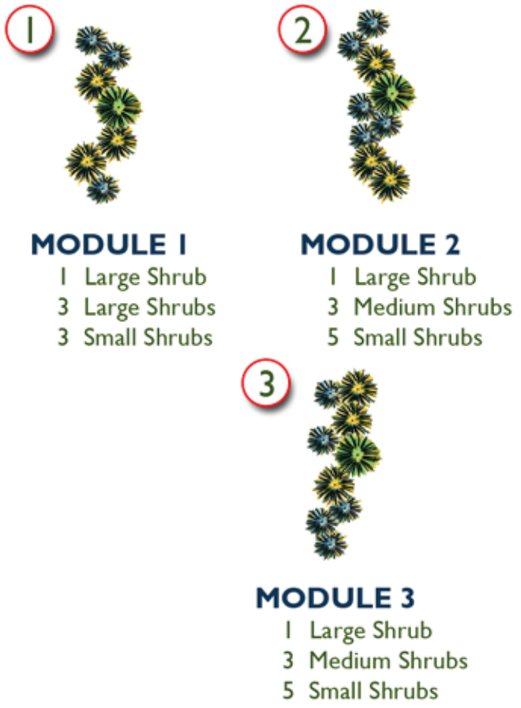
FEATURES

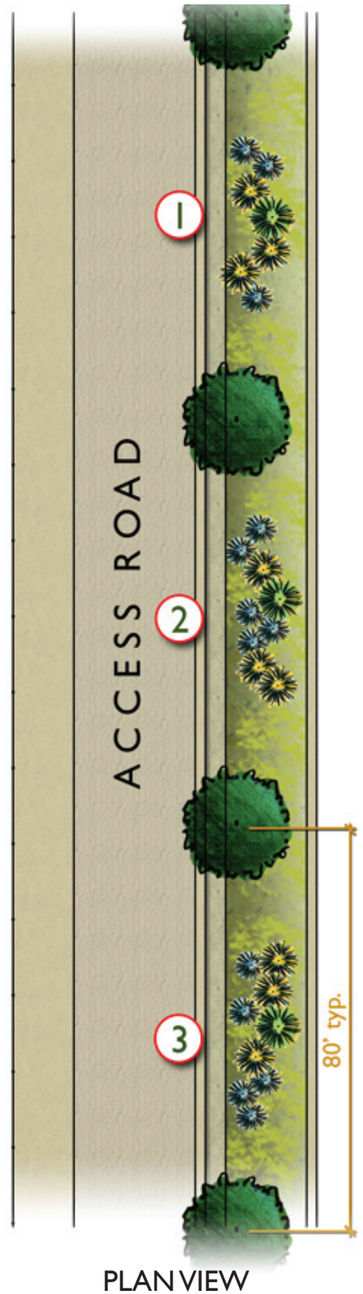
- medium habitat creation
- medium particulate mitigation
- medium / high erosion control
- medium maintenance
- low to medium cost
- low to medium initial impact

EXISTING CONDITION

PERSPECTIVE OF TREATMENT

SECTION SCALE 1/8" = 1' 0"





PLAN VIEW
SCALE 1" = 30' 0"

Existing Condition

Year 1

PLANTING SCHEDULE

LARGE TREE (15 Gallon)
- *Parkinsonia florida*, Blue Palo Verde **
- *Prosopis velutina*, Velvet Mesquite

LARGE SHRUB (1 Gallon)
- *Atriplex canescens*, 4-wing Saltbush
- *Celtis pallida*, Desert Hackberry **
- *Dodonea viscosa*, Hopbush
- *Larrea tridentata*, Creosote
- *Lycium fremontii*, Wolfberry **
- *Simmondsia chinensis*, Jojoba

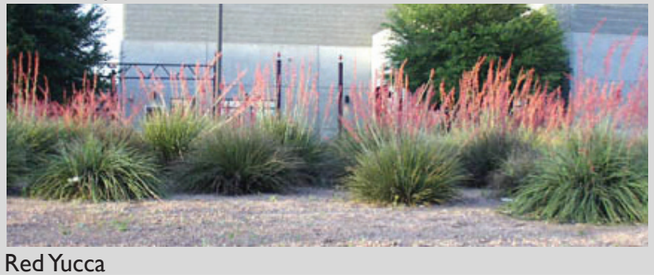
MEDIUM SHRUB (1 Gallon)
- *Calliandra eriophylla*, Fairy Duster
- *Dalea frutescens*, Black Dalea
- *Dalea pulchra*, Bush Dalea

SMALL SHRUBS / ACCENTS (1 Gallon)
- *Ambrosia deltoidea*, Triangleleaf Bur-sage
- *Hesperaloe parviflora*, Red Yucca
- *Hesperaloe funifera*, Giant Yucca
- *Nolina microcarpa,* beargrass
- *Yucca elata*, Soaptree Yucca

SEED MIX
- *Ambrosia deltoidea*, Triangleleaf Bur-sage
- *Atriplex canescens*, 4-wing Saltbush
- *Baileya multiradiata*, Desert Marigold
- *Calliandra eriophylla*, Fairy Duster
- *Dyssodia pentachaeta*, Dogweed
- *Encelia farinosa*, Brittlebush **
- *Phacelia campanularia*, Desert Bluebells
- *Senna covesii*, Desert Senna **

Wolfberry

Triangleleaf Bur-sage



Red Yucca

*** plant species not suited for elevations above 4,000'*

images from http://ag.arizona.edu/pima/gardening/aridplants/aridplant_botindex.html#botE

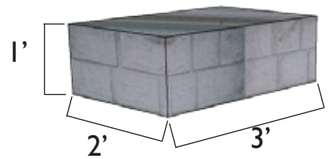
Year 3

Year 5

ENTRY FEATURES

DESCRIPTION

Another component of this project was designing different entry feature options to help augment aesthetic appeal in these areas, providing improved identification for Arizona Rock Products Association facilities. The following three entry treatments outline different sign possibilities and associated plant groupings. The materials chosen were considered readily available and relatively cost effective. The base unit for the signs, as displayed below, is one of the concrete block products created by ARPA members. These concrete blocks provide a substantial looking and easily joined material for the structure of the sign. Aluminum or powder-coated steel is suggested for the actual signs themselves. Unique identifiers such as corporate logos could be affixed to the sign. The plant symbols are similar to those used in the berm alternatives on the previous pages. A modified plant list is provided below.



BLOCK UNIT

SAMPLE BLOCK PRODUCTS

PLANTING SCHEDULE

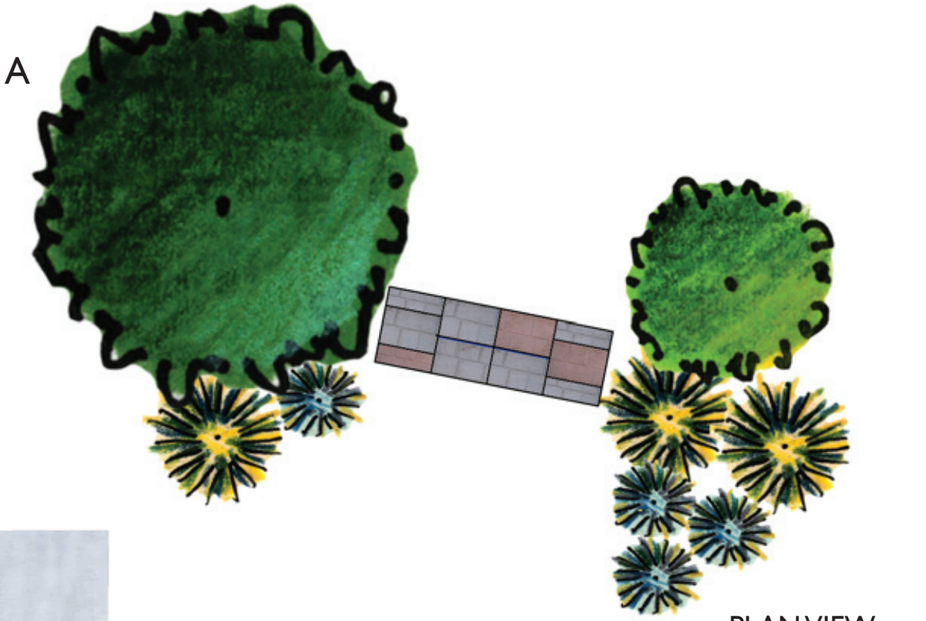
LARGE TREE (15 Gallon)
- *Parkinsonia florida*, Blue Palo Verde
- *Prosopis velutina*, Velvet Mesquite

MEDIUM TREE (5 Gallon)
- *Acacia constricta*, Cat-claw Acacia
- *Acacia greggii*, Whitethorn Acacia
- *Chilopsis linearis*, Desert Willow
- *Fouquieria splendens*, Ocotillo
- *Parkinsonia microphylla*, Foothills Palo Verde

MEDIUM SHRUB (1 Gallon)
- *Calliandra eriophylla*, Fairy Duster
- *Dalea frutescens*, Black Dalea
- *Dalea pulchra*, Bush Dalea

SMALL SHRUBS / ACCENTS (1 Gallon)
- *Ambrosia deltoidea*, Triangleleaf Bur-sage
- *Hesperaloe parviflora*, Red Yucca
- *Hesperaloe funifera*, Giant Yucca
- *Nolina microcarpa,* beargrass
- *Opuntia englemanii*, Prickly Pear
- *Yucca elata*, Soaptree Yucca

ENTRY TREATMENT A



PLAN VIEW
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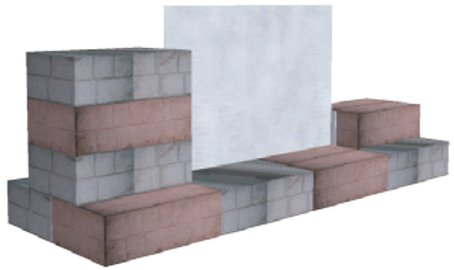
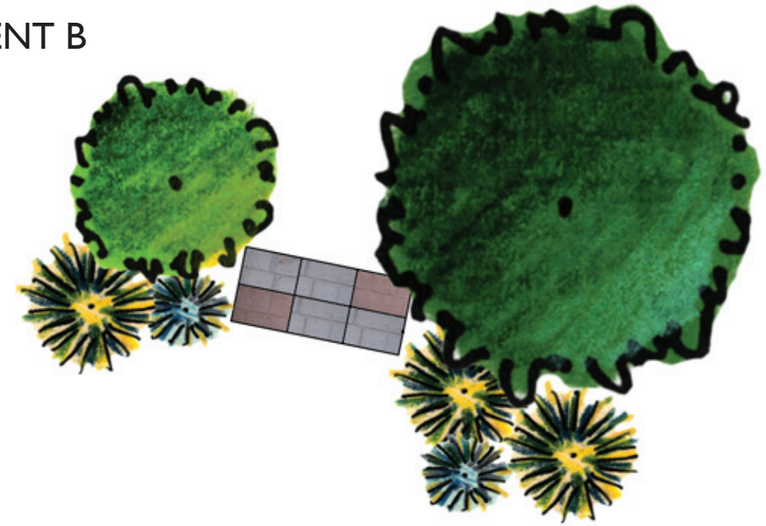
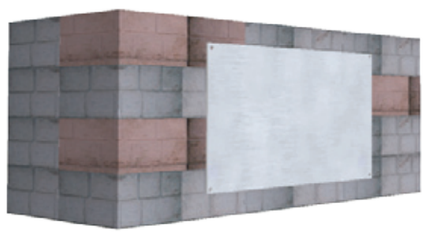


VIEW OF ENTRY SIGN

VIEW OF ENTRY

ENTRY TREATMENT B



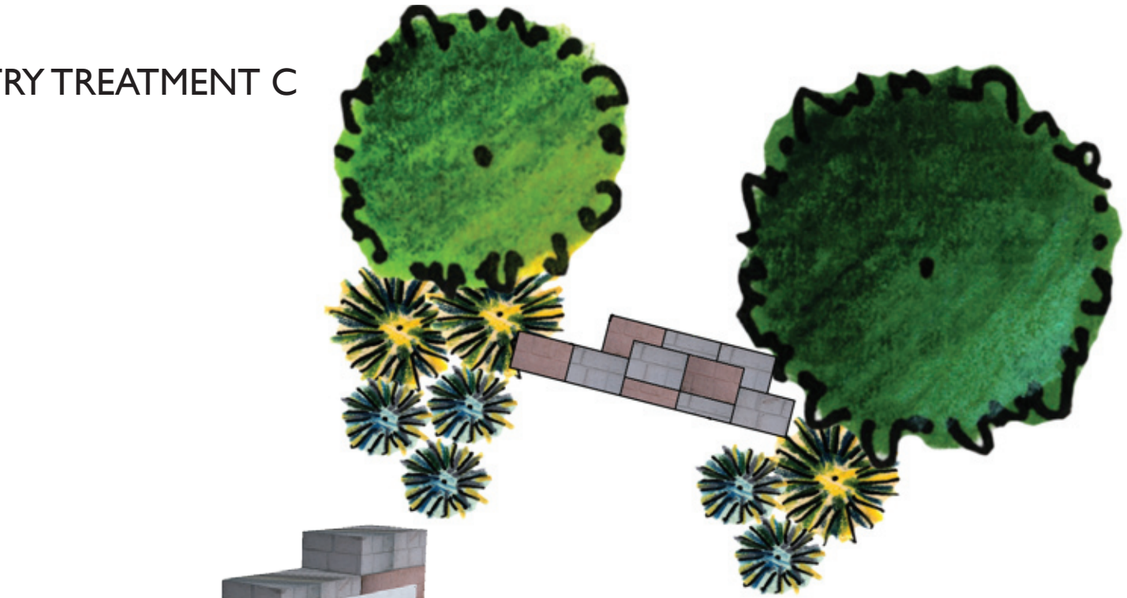


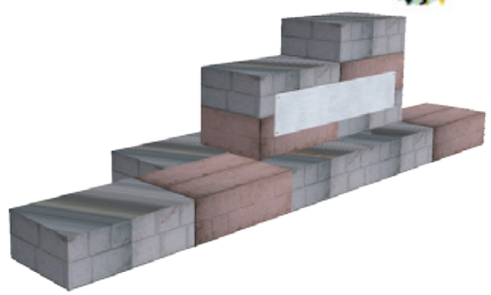
PLAN VIEW
SCALE 1/8" = 1'0"

VIEW OF ENTRY SIGN

VIEW OF ENTRY

ENTRY TREATMENT C





PLAN VIEW
SCALE 1/8" = 1'0"

VIEW OF ENTRY SIGN

VIEW OF ENTRY

FURTHER RECOMMENDATIONS

FRONTAGE ROAD TREATMENTS

Another important design consideration for concealing relatively large berms is addition of vegetation screens along the frontage road easement. Because of the diverse nature of the existing frontage road treatments, it is difficult to provide a set of recommendations as have been provided for berms. In some cases, there is an existing mix of non-native vegetation such as oleander and pine trees creating a screen for passing traffic. In other cases, the berms are screened by existing native vegetation.

Prior to changes in frontage road treatments, it is suggested that operators of facilities evaluate effectiveness of the existing screen and maintain those plantings that are providing a relatively successful visual screen. Whether native or non-native, it appears ineffective (costs and time) to remove functioning screens. Regenerating an effective screen from native vegetation would take a number of years, and its initial porosity may elicit complaints from neighboring land uses.

For those locations where an effective screen is not in place, we recommend adapting the four alternatives presented earlier for berms. Providing a mix of native trees and shrubs will help soften the edge, add to the visual richness of the facility's edge, and ultimately screen berms. A successful minimum application would be using Alternative A to create a row of regular trees with the potential for gradual infill of native shrubs, grasses, and succulents from the optional seed mix.

View of a native plant buffer along Avra Valley Road that provides a good screen of the dirt access road.

View from a berm of pines and oleander forming a visual barrier for passing traffic on the adjacent frontage road.

IRRIGATION

All of the plants specified in this document are low-water, drought tolerant native species that, in general, can successfully survive without supplemental irrigation once they are established. However, some irrigation will be necessary during the 5 year establishment period outlined for each scheme to get the plants established. More regular watering is recommended during the initial years with less regular watering by the final year of irrigation to encourage plants to adapt to natural conditions. Deep watering is also recommended to help encourage a more prolific root system for the plants. These more extensive roots will help decrease erosion of the berm, and aid plant survival once the irrigation is reduced or eliminated.

For the most effective results, drip irrigation is recommended to improve water efficiency and provide deeper watering cycles. If possible, we recommend installing different lines for trees and shrubs to allow for different water regimes for each. Trees would likely require longer but less frequent irrigation while shrubs might require shorter by more frequent irrigation. It is also possible that after the five years, certain shrub species might still require supplemental water once a month to ensure their survival.

To reduce irrigation needs, it is suggested that whenever possible, microbasins are implemented to harvest rain water for plants. While this may not be easily attained along berm slopes, it would be effective to reshape the lower part of these areas and along the frontage road for water catchment purposes.

Micro-basins collect and hold extra water for plants during a rain event in front of the new College of Architecture and Landscape Architecture Building on the University of Arizona campus.