Draft Environmental Assessment

Snowflake Flood Control Project

Town of Snowflake

FEMA-1660-DR-AZ, HMGP 1660-05-04

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FEMA

Federal Emergency Management Agency
Department of Homeland Security
Region IX
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Acronyms and Abbreviations

ADEM	Arizona Division of Emergency Management
ADEQ	Arizona Department of Environmental Quality
ADOT	Arizona Department of Transportation
ADWR	Arizona Department of Water Resources
AF	acre-foot (feet)
Agreement	Programmatic Agreement
APE	area of potential effect
AZPDES	Arizona Pollutant Discharge Elimination System
BMP	best management practice
CEQ	Council on Environmental Quality
C.F.R.	Code of Federal Regulations
CLOMR	Conditional Letter of Map Revision
CWA	Clean Water Act of 1977
EA	Environmental Assessment
EO	Executive Order
EPA	U.S. Environmental Protection Agency
FEMA	U.S. Department of Homeland Security's Federal Emergency Management Agency
HMGP	Hazard Mitigation Grant Program
NAAQS	National Ambient Air Quality Standards
NEPA	National Environmental Policy Act of 1969
NESHAP	National Emissions Standards for Hazardous Air Pollutants
NFIP	National Flood Insurance Program
NRHP	National Register of Historic Places
O_3	ozone
SHPO	State Historic Preservation Officer
SR	State Route
SWPPP	Storm Water Pollution Prevention Plan
Town	Town of Snowflake
USACE	U.S. Army Corps of Engineers
U.S.C.	U.S. Code
USFWS	U.S. Fish and Wildlife Service
WOUS	waters of the United States

SECTION ONE INTRODUCTION

The Town of Snowflake (Town) in Navajo County, Arizona, has applied as a Subgrantee through the Arizona Division of Emergency Management (ADEM), to the Department of Homeland Security's Federal Emergency Management Agency (FEMA) Region IX Hazard Mitigation Grant Program (HMGP) for Federal financial assistance (Federal action) to implement a flood control project in the western portion of the Town. FEMA proposes to provide HMGP Federal financial assistance pursuant to Section 404 of the Robert T. Stafford Disaster Relief and Emergency Assistance Act of 1988 (42 U.S.C. § 5170c [2008]) and its implementing regulations (44 C.F.R. Part 206 [2009]).

FEMA has prepared this Environmental Assessment (EA) to evaluate the impacts of the Subgrantee's proposal. The EA has been prepared according to the requirements of the National Environmental Policy Act of 1969 (NEPA) (42 U.S.C. §§ 4321–5327), the Council on Environmental Quality's (CEQ's) regulations implementing NEPA (40 C.F.R. Parts 1500–1508 [2009]), and FEMA's implementing regulations (44 C.F.R. Part 10).

The EA process provides steps and procedures for evaluating the potential environmental, social, and economic impacts of the Proposed Project and its alternatives. The potential impacts of the Proposed Project and its alternatives are measured by their context and intensity, as defined in CEQ regulations. The EA process includes an opportunity for the public and local, State, and Federal agencies to provide input during a public comment period.

SECTION TWO PURPOSE OF AND NEED FOR ACTION

The objective of FEMA's HMGP is to reduce the loss of life and property due to natural disasters and to enable the implementation of long-term hazard mitigation measures during the immediate recovery from a disaster. Through this program, FEMA provides grants to local, territorial, tribal, and State governments to implement long-term hazard mitigation measures after a major disaster declaration.

From July 25 to August 4, 2006, severe storms and flooding caused at least $11 million in damage to Apache, Coconino, Gila, Graham, Greenlee, Navajo, Pima, and Pinal counties and tribal lands in these counties. The event was declared a major disaster (FEMA-1660-DR-AZ). ADEM has identified the Town as having a long history and a high risk of flood damage to critical infrastructure and is seeking an HMGP grant to address this issue. Therefore, the purpose of the Federal action is to provide HMGP Federal financial assistance to the Town, through ADEM, to protect critical community assets from recurring flood damage.

The project area is along State Route (SR) 277 from approximately milepost 332 to milepost 336 in Navajo County, Arizona (Appendix A, Figure 1). The project area is in portions of Sections 15–17 and 21 of Township 13 North, Range 21 East of the Gila and Salt River Base Line and Meridian as shown on the Second Knolls, Arizona, U.S. Geological Survey 7.5-minute topographic quadrangle. EuroFresh Farms (an agricultural tenant in the Snowflake Industrial Park), a spur of the Apache Railroad, the Snowflake Community Golf Course, and SR 277—the principal highway linking the Town with Payson and Phoenix—are within the project area. In 2002, 2003, and 2006, runoff from summer thunderstorms resulted in flooding at the EuroFresh Farms greenhouse. In 2003, summer thunderstorms flooded SR 277 and damaged portions of the Apache Railroad south of the Snowflake Industrial Park. The Town's wastewater treatment plant, which is approximately 0.5 mile east of the project area, is threatened repeatedly by floodwaters. Therefore, the importance of reducing or alleviating the risk of flooding in the project vicinity is critical.

Surface water in the project vicinity is conveyed primarily by unnamed tributaries of Cottonwood Wash, an ephemeral stream that crosses SR 277 approximately 0.8 mile east of the project limits. The unnamed tributaries generally follow drainage paths that conform to the naturally occurring low-points of the topography. The Subgrantee has documented that because of alterations to the area of the Snowflake Industrial Park—primarily due to development—the flood path is no longer confined to the natural drainage course and is continually changing directions (Town of Snowflake 2009a). Existing development, such as the elevated portion of the Apache Railroad, has hydraulically bisected the uncontrolled flows in the project vicinity into a northern drainage area and a southern drainage area. Flows for both drainage areas originate west of the project area and flow east. East of the project area both the northern and southern drainages converge and eventually drain into Cottonwood Wash.

After extensive coordination and negotiation with private entities and coordination with local, State, and Federal agencies, the Town identified the need for two major flood control projects:

the Northern Drainage Solution and the Southern Drainage Solution. The Northern Drainage Solution, privately funded by EuroFresh Farms, consists of a detention basin and modifications to drainage channels north and south of the Snowflake Industrial Park and was intended to address localized stormwater flooding originating from the northern drainage area. The Northern Drainage Solution was constructed entirely on private land; the majority of the improvements were completed in 2007. Because the northern and southern drainage areas are hydrologically separated, the Northern Drainage Solution and the Southern Drainage Solution have independent utility.

The Town has identified the need to reduce the regional flood hazard from stormwater flows associated with the southern drainage area as part of the Southern Drainage Solution. Reducing this flood hazard would help protect commercial residents and their properties, government properties, and critical facilities, such as the wastewater treatment plant. The Southern Drainage Solution is divided into Reach 1, Reach 2, and Reach 3. The Town and ADEM have requested Federal financial assistance to fund improvements to the upstream reach (Reach 1). Project components associated with Reach 2 (middle) and Reach 3 (downstream) would be funded independently. However, improvements to all three reaches would be required to address drainage issues. Therefore, the improvements associated with all three reaches are considered connected actions and do not have independent utility. Thus, the analysis presented in this EA includes the entire Southern Drainage Solution (i.e., all three reaches).

SECTION THREE ALTERNATIVE ANALYSIS

The Subgrantee's proposal would reduce the risk of loss or damage to private and public facilities from stormwater flooding through the construction of drainage improvements. The improvements would provide additional drainage features to retain, channel, and divert stormwater flows. In addition to the No Project Alternative, the Town considered six alternatives for the Southern Drainage Solution.

3.1 ALTERNATIVES CONSIDERED BUT DISMISSED

The Town of Snowflake initially analyzed five conceptual alternatives for the Southern Drainage Solution (Town of Snowflake 2004). These conceptual alternatives were designed to either pass the entire stormwater flow through the project limits (Conceptual Alternatives 1 and 2) or to attenuate peak water flows in retention basins (Conceptual Alternatives 3, 4, and 5). Conceptual Alternative 1 would consist of two channels: one channel north of SR 277 and one channel south of SR 277; Alternative 1 would require five roadway crossings. Conceptual Alternative 2 would channel flows through a single, large channel south of SR 277; this alternative would also require five roadway crossings.

Conceptual Alternatives 3, 4, and 5 would include three retention basins to attenuate stormwater flows. Conceptual Alternative 3 would place one basin north of SR 277 and two in the Snowflake Community Golf Course; channels would divert flows along both sides of the roadway from the basins to the eastern end of the project limits, where the southern channel would cross SR 277, converge with the northern channel, and outlet into a natural drainage channel north of SR 277. Conceptual Alternative 4 would divert flows under SR 277 in the western portion of the project area, and include two expanded retention basins in the golf course and an additional basin south of SR 277 and east of the golf course. Water would then be channeled along the south side of SR 277 before crossing the roadway to outlet into the natural drainage at the eastern end of the project limits. Similar to Conceptual Alternative 3, Conceptual Alternative 5 would locate one basin north of SR 277 and two basins in the golf course. However, under Alternative 5, the channel south of SR 277 would cross the roadway at Rutledge Drive and converge with a channel north of SR 277. Water would then flow in a channel that would parallel SR 277 to the east end of the project limits, where it would outlet into the natural drainage channel.

The Town evaluated Conceptual Alternatives 1 through 5 on the size of the structures; the anticipated disturbance; and compatibility with existing land use, maintenance requirements, impacts to the golf course; and the potential for the alternatives to accommodate options such as side walls to minimize the project footprint or multi-use functions (e.g., development of basins as recreational features). After its analysis, the Town determined that Conceptual Alternatives 3 and 5—both of which would include a basin north of SR 277—would have the smallest channel sizes, result in the least impact to the golf course, be the most compatible with adjacent residential areas, and have the greatest potential for future development of recreational features.

The Town developed a sixth alternative—the proposal it submitted to ADEM and FEMA—by combining elements of Conceptual Alternatives 3 and 5. During the initial drainage and environmental analysis, the sixth alternative was further refined. This alternative (the Subgrantee's proposal) is described below as Alternative 2: Proposed Project.

3.2 ALTERNATIVE 1: NO PROJECT

A No Project Alternative is required to be included in the environmental analysis and documentation under NEPA. The No Project Alternative is defined as maintaining the status quo with no FEMA financial assistance for any alternative. The No Project Alternative is used to evaluate the effects of not providing eligible assistance for the project. Thus, this alternative provides a benchmark against which other alternatives may be evaluated. For the purpose of this environmental analysis, under the No Project Alternative, it is assumed that the Town would be unable to reduce the risk from reoccurring floods to the community and critical community assets because of the lack of Federal financial assistance. Therefore, in the No Project Alternative, no improvements would be made, and the Town would continue to experience recurring flood damage.

3.3 ALTERNATIVE 2: SUBGRANTEE'S PROPOSAL (PROPOSED PROJECT)

The Southern Drainage Solution treats stormwater flows through a combination of detention basins and channelization. Figure 2 (Appendix A) shows the location of each reach. Engineering plans, details, and specifications for this alternative are provided in Appendix B.

3.3.1 Reach 1

Reach 1 is primarily on undeveloped property north of the Apache Railroad and SR 277. In the easternmost portion of this reach, the Proposed Project is within Apache Railroad and Arizona Department of Transportation's (ADOT's) SR 277 rights-of-way. The principal purpose of the work proposed in Reach 1 is to attenuate peak flows from the southern drainage area. Work in Reach 1 includes construction of two detention basins (Basins 1A and 1B) and channelization of the drainage at the Apache Railroad and SR 277 crossings. The detention basins would be constructed at the sites of existing earthen livestock ponds.

Basin 1A, the upstream basin, would be formed through construction of an earthen berm approximately 1,000 feet long, 75 feet wide at the base, 10 feet wide at the top, and 9 feet tall at its highest point. At its longest points, Basin 1A would be approximately 1,100 feet long from north to south and 1,300 feet long from east to west; Basin 1A would encompass an area of approximately 19 acres (see Sheets 2, 28, and 30 in Appendix B). The outlet would consist of a vertical-wall reinforced-concrete spillway that would be approximately 20 feet wide. The downstream base of the outlet structure would be protected by wing-walls and a grouted riprap apron. The impoundment area of Basin 1A would require excavation of approximately 72,000 cubic yards of material; the excavated material would be used to construct the earthen berms or be removed from the site. After excavation, the impoundment area would be graded to

channel the ordinary flow to the approximate location of the original watercourse; disturbed areas would be seeded with a native plant mix. Ordinary water flows would enter the basin, follow the natural watercourse, and pass unobstructed through the outlet works. However, the pass through of large flows would be constricted by the outlet structure, which would temporarily impound water in the basin. Basin 1A would be designed to hold approximately 110 acre-feet[1] (AF) during the 100-year flood event,[2] with a maximum impoundment capacity of 165 AF. Flow would exit Basin 1A into a natural drainage channel and continue approximately 1,700 linear feet downstream to Basin 1B.

Basin 1B would be formed through the construction of two earthen structures. The first structure would be an "L"-shaped earthen berm that would be approximately 100 feet wide at the base, 10 feet wide at the top, and 15 feet tall at its highest point; the structure would provide the eastern and southern boundaries of Basin 1B. The second structure would be an earthen berm that would replace an existing earthen dike at the north end of the basin; this feature would block any flows from redirecting to the north, divert water to the southeast, and maintain the northern basin embankment boundary. Basin 1B would be 1,000 feet long from north to south and 1,200 feet long from east to west at its longest points; Basin 1B would encompass an area of approximately 12 acres (see Sheets 6, 29, and 30 in Appendix B). The existing earthen dike at this site would be demolished. The outlet would consist of a vertical-wall reinforced-concrete spillway that would be approximately 8 feet wide. The downstream base of the outlet works would be protected by wing-walls and a grouted riprap apron. Selective excavation and fill of the impoundment area would occur to maximize the capacity of the basin. The impoundment area would be graded to encourage the ordinary flow to return to the approximate location of the original watercourse, and disturbed areas would be seeded with a native plant mix. Ordinary water flows would enter the basin, follow the natural watercourse, and pass unobstructed through the outlet works. Basin 1B would be designed to hold approximately 62 AF during the 100-year flood event, with a maximum impoundment capacity of 105 AF. Flow would exit Basin 1B into a natural drainage channel.

Approximately 1,300 linear feet downstream of the Basin 1B outlet, the natural drainage channel divides. One channel turns south and enters a culvert under the Apache Railroad and SR 277. The other channel would inlet over a proposed grouted riprap area (approximately 40 feet by 15 feet) and follow an existing earthen channel that parallels the northern side of the Apache Railroad. The existing channel would be excavated to a depth of approximately 3 feet, and the channel bottom would be shaped to a width of 15 feet (see Sheets 8, 9, and 10 in Appendix B). After approximately 500 linear feet, water would flow over another proposed grouted riprap area (approximately 30 feet by 15 feet at the channel bottom), after which the channel would be graded, shaped, lined with gunite, and at approximate milepost 333.59 turned to the south under the Apache Railroad and SR 277. Two concrete box culverts, each approximately 28 feet wide

[1] One acre-foot is 43,560 cubic feet and represents the volume of water sufficient to cover 1 acre of land to a depth of 1 foot.

[2] The 100-year flood event is the size of flood that has been determined to have a 1 percent chance of occurring in any given year.

by 3 feet high, would be installed in series to allow the channel to cross under the railroad (culvert length of 30 feet) and the roadway (culvert length of 60 feet). The Town would construct an approximately 40-foot-long by 30-foot-wide concrete channel to connect the culverts; the depth of this channel would vary to match the inverts of the culverts. Immediately downstream of the southern culvert (the culvert under SR 277), the channel would be reinforced with grouted riprap in an area of approximately 50 feet by 60 feet. The concrete channel would outlet water into an existing drainage channel, which would convey flows to a detention basin (i.e., Basin 2) on the Snowflake Community Golf Course. This basin would be improved as part of Reach 2.

3.3.2 Reach 2

Proposed improvements in Reach 2 would attenuate the flows exiting Reach 1 and the flows from runoff associated with unnamed watercourses to the south and west and discharge a metered flow to the eastern SR 277 crossing (Reach 3). Proposed improvements in Reach 2 would include minor channel grading and shaping, constructing two detention basins (i.e., Basin 2 and Basin 3), improvements to a low-water crossing, and landscaping. The detention basins would be constructed at existing water hazards on the golf course.

Beginning at the proposed riprap area at the downstream terminus of Reach 1, approximately 300 linear feet of the existing earthen channel would be graded and shaped (see Sheet 11 in Appendix B). The Town would demolish an existing dike and construct a new upstream earthen dike to impound water in Basin 2 (see Sheets 12 and 30 in Appendix B). The new dike would be approximately 700 feet long, 75 feet wide at the base, 5 feet wide at the top, and 10 feet tall at its highest point. Basin 2 would be approximately 1,100 feet long at both its north-south and east-west longest points; Basin 2 would encompass an area of approximately 13 acres. Flows in Basin 2 would outlet through a vertical-wall reinforced-concrete spillway that would be approximately 12 feet wide. The downstream base of the outlet would be protected by wing-walls and a grouted riprap apron. No excavation would be required in the impoundment area. A portion of an existing golf path would be demolished and reconstructed to accommodate the new drainage features. Disturbed areas would be seeded with a native plant mix except on fairways, greens, and tees. The form and lines of the basin embankments would be blended into the existing fairways. Ordinary water flows would enter the basin, follow the natural watercourse, and pass unobstructed through the outlet works. Basin 2 would be designed to hold approximately 33 AF during the 100-year flood event, with a maximum impoundment capacity of 47 AF. Flows would exit Basin 2 into a natural drainage channel, which would flow into Basin 3.

Basin 3 would be formed through the construction of an earthen dike that would be approximately 800 feet long, 50 feet wide at the base, 5 feet wide at the top, and 10 feet tall at its highest point (see Sheets 15, 30, and 31 in Appendix B). An existing dike at this location would be demolished. Basin 3 would be approximately 900 feet long from north to south and 1,800 feet long from east to west at its longest points; Basin 3 would encompass an area of approximately 14 acres. Water flows would outlet through a vertical-wall reinforced-concrete spillway that would be approximately 10 feet wide. The downstream base of the outlet works would be protected by wing-walls and a grouted riprap apron. No excavation would be required in the

impoundment area. As with Basin 2, a portion of the existing golf path would need to be demolished and reconstructed. Disturbed areas would be seeded with a native plant mix, except on fairways, greens, and tees. The form and lines of the basin embankments would be blended into the existing fairways. Ordinary water flows would enter the basin, follow the natural watercourse, and pass unobstructed through the outlet works. Basin 3 would be designed to hold approximately 44 AF during the 100-year flood event, with a maximum impoundment capacity of 54 AF. Flows would exit Basin 3 into a natural drainage channel.

Downstream of the proposed Basin 3, approximately 250 feet of the drainage channel would be graded and shaped (see Sheets 15 and 31 in Appendix B). Flows in the channel would continue downstream across an existing low-water crossing over Country Club Drive. Currently, center median island planter boxes and sidewalks on either side of the road obstruct water flows. As part of the Proposed Project, the planter boxes would be removed, the sidewalks would be depressed, and new landscaping would be installed in the center median island. East of Country Club Drive, water would enter a natural drainage, be channeled around existing residential development, and flow northeast toward SR 277.

3.3.3 Reach 3

Reach 3 is in the ADOT and Apache Railroad rights-of-way. Proposed improvements in Reach 3 would convey the metered flows exiting Reach 2 to the eastern project terminus, at the convergence with the northern drainage. Work in Reach 3 would consist of channeling flows throughout the reach, including construction of new crossings under SR 277 and the Apache Railroad.

A new 28-foot-wide by 3-foot-high by 80-foot-long concrete box culvert would be constructed to allow the channel to cross under SR 277 at milepost 334.35, approximately 300 feet west of an existing roadway drainage crossing (see Sheet 18 in Appendix B). A new channel would be graded and shaped for approximately 150 feet upstream of the proposed SR 277 crossing; the proposed channel would be up to 200 feet west of an existing channel. At the upstream end of the proposed channel, an area of approximately 70 feet by 40 feet would be reinforced with grouted riprap. The Town would also construct a small earthen berm that would be approximately 200 feet long and 18 inches high. The berm would be between the existing channel and the proposed channel to allow ordinary flows to remain in the existing channel. However, flood-level flows would overtop the proposed berm and pass into the proposed channel and box culvert. Downstream of the proposed SR 277 crossing, the proposed channel would be reinforced with grouted riprap over an area of approximately 50 feet by 50 feet. The channel, which would run parallel to and between SR 277 and the Apache Railroad, would also be graded, shaped, and lined with gunite for approximately 5,500 linear feet (see Sheets 18–27 in Appendix B). The channel width would vary, but would be an average of 25 feet at the top of the channel. Concrete box culverts would be installed at private roadway crossings. At Rutledge Drive and Industrial Way, the proposed box culverts would be approximately 28 feet wide by 3 feet high and 80 feet long and 60 feet long, respectively. ADOT drainage features along SR 277 would be reinforced with gunite and tied into the proposed gunite channel.

At the downstream terminus of Reach 3, the Town would remove four existing pipe culverts under the Apache Railroad and replace them with a concrete box culvert measuring approximately 28 feet wide by 3 feet high by 50 feet long. The proposed box culvert would outlet into a new grouted, riprap-lined, spreader discharge basin, which would encompass an area of approximately 75 feet by 75 feet.

3.3.4 General

Construction equipment would use existing access points and access roads. Staging of equipment and materials would occur on previously disturbed land owned by the Apache Railroad or the Town; if necessary, a nearby material source pit would also be used for staging. All fill material (soil and rock) required for construction would come from excavated portions of the project area (e.g., Basin 1A) or existing, licensed commercial sources. All excavated spoils are expected to be used to construct the new earthen drainage features (e.g., the berms); any excess materials would not be deposited in watercourses, wetlands, or floodplains.

The proposed culvert installation would require permits from the Apache Railroad and ADOT. The Town is responsible for coordination with, obtaining all required permits from, and implementing all measures required by the railroad and ADOT. The Apache Railroad would determine the proposed method of culvert construction under the railroad (e.g., jack-and-bore, pour-in-place). If the pour-in-place method of construction is used, railroad service would be temporarily discontinued during construction. The culverts proposed under SR 277 would be constructed using either the pour-in-place method or the pre-cast method. Regardless of which construction method is used, temporary detours would be required along sections of SR 277 during culvert installation. The detours would require temporary pavement widening along the roadway; the detours would be within existing ADOT right-of-way.

A number of utilities, including electrical, telephone, water, and gas, would need to be relocated. No loss of service to utility customers would be expected, and the Town would coordinate with all appropriate utility service providers. Also, the Town would coordinate closures of private roadway crossings with the affected landowners.

Inspection of the detention basins and channel would be conducted annually and after major storm events. Maintenance is expected to consist of the following activities:

- Removal of debris large enough to potentially create an obstruction to flow in the detention basin spillways
- Replacement or repair of scour protection features, as required to prevent undermining or erosion damage
- Inspection of the detention basin berms/dikes for settlement cracking or erosion damage that might affect the structural integrity of the constructed features and associated repair to correct such cracking and damage

- Removal of the vegetation within or immediately adjacent to drainage features that may compromise the ability of the structures to retain and convey the 100-year flood event
- Removal of large sediment deposits after substantial storm events if the deposits reduce the storage capacity of the basins or the basins' ability to attenuate the 100-year flood event peak flow
- Replacement of signs and minor improvements to access roads to ensure accessibility to the proposed drainage features
- Removal of sediment and debris from, and repairs of any cracks or deformations of, earthen and gunite-lined channels and recontouring of earthen channels to the proposed construction specifications

SECTION FOUR AFFECTED ENVIRONMENT, IMPACTS, AND MITIGATION

The analysis in this section focuses on those resource areas where some level of impact may result from the implementation of the alternatives, including land use, geology and soils, seismicity, water resources, biological resources, historic properties, air quality, noise, transportation, visual resources, recreation, and environmental justice. Based on initial analysis and the geographic setting of the project site, no other resource areas have been identified that would require further evaluation pursuant to NEPA.

4.1 LAND USE

The project area is located within the incorporated limits of the Town, on private and public lands. Private landholders include individuals and the Apache Railroad. Public lands in the project area include ADOT right-of-way along SR 277 and Town-owned and managed lands (e.g., local streets, the Snowflake Community Golf Course).

The Town's historical development pattern has been centered on SR 277 (Town of Snowflake 2007a). Land use within and adjacent to the project are includes transportation, commercial, industrial, residential, recreation, quasi-public, and grazing. Transportation uses are present along the railroad and roadways within and adjacent to the project limits. Commercial land uses are adjacent to the project area; these uses include a propane gas business, which is between the Apache Railroad and SR 277 in the western portion of the project area, and a gas station, which is south of SR 277 immediately east of Country Club Drive. Industrial uses are in the Snowflake Industrial Park and a materials source south of SR 277; both industrial areas are adjacent to the eastern portion of the project limits. Residential development is adjacent to the project limits south of SR 277 and next to the Snowflake Community Golf Course. The golf course is a recreational use within and adjacent to the project limits. A quasi-public structure, a temple, is adjacent to the project limits, between the golf course and SR 277 in the center of the project limits in Reach 2. Vacant land, which constitutes about two-thirds of the Town's total area (Town of Snowflake 200a7), is present within and adjacent to the western and eastern portions of the project area and is used for grazing.

The *Town of Snowflake General Plan (*2007a) identifies future development and growth areas within the Town. Three proposed roads (one crossing each reach) and one proposed trail cross the project limits. In the eastern portion of the project area, the Town has identified a future nine-hole golf course south of SR 277, future commercial development on both sides of the roadway, and a growth area[3] of strategic improvements and infill in the Snowflake Industrial Park. The General Plan also includes a specific action recommendation to focus efforts to facilitate infill in the Snowflake Industrial Park.

[3] The Town identified "growth areas" as "land use placement that could best utilize existing infrastructure and/or most economically help to pay for road and utility extensions" (Town of Snowflake 2007a).

4.1.1 Alternative 1: No Project

Under the No Project alternative, no improvements or construction would occur and therefore no right-of-way, easements, displacements, or relocations would be required. No change would occur to existing land use or development patterns. Because the existing land uses are expected to continue, land use within the project area would continue to be compatible with adjacent land use and consistent with the Town's General Plan. Although the No Project Alternative would not preclude future development, existing drainage problems (i.e., flooding) would continue to occur over infrastructure and land in the project vicinity. Such flooding could be an impediment to planned development in the area. However, as future development occurred, it would address localized drainage issues and therefore, this impact is anticipated to be negligible.

Therefore the No Project Alternative would result in negligible long-term indirect impacts to land use.

4.1.2 Alternative 2: Proposed Project

Implementation of the Proposed Project would not require acquisition of new right-of-way. However, in Reach 1, the Town would require a permanent drainage and access easement for approximately 38 acres of privately owned land in the western portion of the project limits, north of SR 277. This easement, which would be required primarily to construct and maintain Basins 1A and 1B, would encompass vacant land currently used for grazing. The Proposed Project would also require construction, and possibly maintenance, activities in Apache Railroad and ADOT right-of-way; approximately 5 acres of easement from the Apache Railroad and less than 1 acre of easement from ADOT would be required from these landowners. The Town would obtain all required permits for these actions. No displacements or relocations would be required for implementation of this alternative. During construction, to the extent feasible, the Town would ensure that access is maintained to all adjacent properties with current access to SR 277.

After construction is complete, current land uses would continue. The basins and drainage features in Reach 1 would be unavailable for grazing activities during major storm events and for up to 36 hours after such events. However, ample vacant land that could be used for grazing is available adjacent to the project area, so this impact is anticipated to be negligible. The basins and drainage features in Reaches 2 and 3 would be incorporated into existing features and therefore would require no changes to current land use. In the long term, the proposed improvements would improve drainage within and adjacent to the project limits, which would mitigate the risk of future flooding and therefore remove a potential impediment for future planned development and the realization of the Town's goals for land use—including the identified growth area in the Snowflake Industrial Park.

Therefore, the Proposed Project would result in negligible short-term direct impacts and long-term indirect impacts to land use.

4.2 GEOLOGY AND SOILS

The project area is in the Colorado Plateau physiographic province of Arizona. This province, which is predominately in north and northeastern Arizona, is characterized by horizontally stratified layers of sedimentary rock that erode to form canyons, mesas, plateaus, and broad escarpments (McNab and Avers 1994). Elevations in the project area range from 5,630 feet above mean sea level in the eastern end to 5,720 feet above mean sea level in the western end. The project area generally consists of shallow soils; the eastern end of the project area—in the vicinity of the Snowflake Industrial Park—has been characterized as an alluvial fan (Town of Snowflake 2009a).

The project area is in a portion of Navajo County that consists primarily of Triassic Chinle and Moenkopi geologic formations (Town of Snowflake 2007b). These sedimentary rock units were generally deposited in a braided stream environment. A Shinarump Member of the Chile Formation was observed in outcrops adjacent to the project site. The Shinarump Member is a basal conglomerate that is the oldest member of the Chile Group. Gravels and cobbles of chert and quartzite from the erosion of the Shinarump Conglomerate were observed throughout the project area. Moenkopi sandstone underlies the Shinarump and is characterized as a fine to thickly laminated sandstone with areas of thinly laminated claystone and siltstone layers.

4.2.1 Alternative 1: No Project

No ground-disturbing activities would occur as a result of the No Project Alternative. Therefore, this alternative would have no direct impact to geology or soils. However, under the No Project Alternative, the flood hazard in the project area would not be mitigated, and soil erosion as a result of flooding would continue. Because soils in the project area are relatively shallow, this impact is not anticipated to be substantial.

Therefore, the No Project Alternative would result in minor long-term indirect impacts to soil.

4.2.2 Alternative 2: Proposed Project

Construction and configuration of the earthen drainage features would require excavation, compaction, and mounding/piling of soil. The Proposed Project would rely predominately on earthmoving and topographic shaping to create the detention basins and channels to convey water flow. However, the Town has designed the project to include concrete, grout, riprap, and gunite features to manage erosion at inlets, outlets, and other scour-vulnerable sites.

During construction, activities such as grading, vegetation removal, and use and transport of heavy equipment can disturb and expose soils, resulting in an increased susceptibility to water and wind erosion. Approximately 67 acres of soil would be disturbed by construction of the Proposed Project. Areas that would be disturbed by construction activities would be stabilized with erosion-control measures. The Town would also employ best management practices (BMPs) such as installing silt fences or mulching cleared soil to eliminate or reduce soil erosion during construction. The Town would be responsible for covering spoil piles or watering existing

soils, as necessary to minimize soil loss from surface runoff and wind erosion. The Town would also implement permanent erosion-control measures, such as revegetation either with ornamental landscape (in the golf course) or with native species to stabilize soils and minimize the potential for long-term erosion. With the implementation of these measures, impacts to soils and geology as a direct result of construction would be minimal and temporary.

Long-term maintenance is anticipated to result in soil disturbance from off-road vehicle use, sediment removal, and repair of earthen drainage features. However, these activities would be short-term and intermittent. Town staff, contractors, or both would employ BMPs for maintenance activities. Implementing the Proposed Project would reduce the risk of flooding in the project area. The reduced risk of flooding would indirectly result in a lower potential for uncontrolled soil erosion or deposition as a result of unmanaged water flows.

Therefore, the Proposed Project would result in minor short-term direct impacts and minor long-term indirect impacts to geology and soils.

4.3 SEIMISITY

The Town is in a relatively inactive seismic area (Arizona Earthquake Information Center 2008). However, the National Earthquakes Hazard Reduction Program—a Federal interagency program established by the Earthquake Hazards Reduction Act of 1977—has designated Arizona as a "high risk" state for earthquakes (Bausch and Brumbaugh 1996). The maximum intensity ground shaking and earthquake damage for the Town was rated as Intensity V on the Mercalli scale. An intensity level of V is associated with a 4–4.9 magnitude earthquake and is described as being felt by nearly everyone, with an intensity that would be expected to awaken many, break some dishes and windows, and overturn unstable objects (ADEM 1999). The closest mapped Quaternary fault is approximately 25 miles southeast of the Town.

Executive Order (EO) 12699, Seismic Safety of Federal and Federally Assisted or Regulated New Building Construction, requires newly constructed buildings to meet standards for seismic safety set by the National Earthquake Hazard Reduction Program. However, EO 12699 applies only to construction of new buildings that are to be used or intended for sheltering persons or property and thus is not applicable to this project.

4.3.1 Alternative 1: No Project

Under the No Project Alternative, no impacts would occur to the existing seismicity.

4.3.2 Alternative 2: Proposed Project

Under the Proposed Project, the potential for earthquakes would remain unchanged. If the retention basins and drainage channels were to fail during an earthquake, flood hazards could impact local residents. However, this impact would be commensurate with what is currently

experienced during major storm events and any associated structural damage to the proposed features would not be anticipated to pose a major risk to the people and facilities in the vicinity.

Therefore, the Proposed Project would result in no short-term or long-term impacts to seismicity.

4.4 WATER RESOURCES

Hydrology and water resources in the project area are heavily influenced by area rainfall and geology. Precipitation is 12 inches annually. Rainfall is bimodal, occurring as winter rain and snow storms and high-intensity summer thunderstorms, with more than half of the annual precipitation falling during the summer months. Storm flows are generally transported through the project area in unnamed tributaries of Cottonwood Wash, which is east of the project limits. These tributaries form drainage paths that generally contour to the naturally occurring lowest paths of the topography. The project area crosses through four watershed sub-basins, the largest of which encompasses almost all of Reach 1 and drains an area of approximately 1.9 square miles (Town of Snowflake 2009b).

4.4.1 Water Quality and Hydrology

The Clean Water Act of 1977 (CWA) (33 U.S.C. §§ 1251 et seq. [2008]) established a mechanism for regulating discharges of pollutants into waters of the Unites States (WOUS) and quality standards for surface waters. Under Section 404 of the CWA, a permit must be obtained from the U.S. Army Corps of Engineers (USACE) prior to discharging dredged or fill materials into WOUS, unless the activity is exempt from Section 404 regulation. Section 401 of the CWA requires certification that any activity authorized under Section 404 of the CWA is in compliance with State water quality standards, effluent limits, and other applicable State laws. In Arizona, Section 401 certification is administered by the U.S. Environmental Protection Agency (EPA), the Arizona Department of Environmental Quality (ADEQ), or certain tribal governments, depending on the location and type of a permitted activity. Section 402 of the CWA established the National Pollutant Discharge Elimination System Permit Program, which permits the discharge of pollutants into surface water; on non-tribal lands in Arizona, this permit program is administered by ADEQ under the Arizona Pollutant Discharge Elimination System (AZPDES) Permit Program.

In 2005, the Los Angeles District of the USACE completed a jurisdictional delineation of the project area, at the request of the Town. The USACE determined that WOUS under the jurisdiction of the USACE were present in Reaches 1 and 2. Currently, during flood events, water flows are uncontrolled by existing drainage features, and overtopping of roadways and flooding of adjacent development occurs.

4.4.1.1 Alternative 1: No Project

The No Project Alternative would result in no change to existing water quality or hydrology, and would therefore have no impact on this resource.

4.4.1.2 Alternative 2: Proposed Project

Although ordinary water flows would pass through the proposed drainage system in the same general pattern and velocity as they currently do, implementation of the Proposed Project would result in permanent changes to drainage patterns during and immediately after major storm events. Construction of the proposed basins would result in temporary impoundment of water (estimated duration of up to 36 hours) and improved capacity in the Apache Railroad and SR 277 drainage crossings; furthermore, during large storm events, water flows would be expected to overtop the proposed berm in Reach 3, and excess water would be conveyed within the proposed channel and box culvert west of the existing SR 277 crossing. The Town submitted detailed design plans for the Proposed Project to the Arizona Department of Water Resources (ADWR). ADWR determined that the drainage features associated with the Proposed Project do not qualify as jurisdictional dams and concurred that the design of the proposed improvements would not result in a permanent water conservation pool; under ordinary storm events, water would flow unimpeded through the proposed improvements (Town of Snowflake 2009a).

To minimize potential impacts to water quality as a result of sedimentation from construction, the Town would follow BMPs such as using silt fences, covering spoil piles, watering areas of disturbed soil, staging equipment along existing roads—where feasible—and keeping equipment properly maintained. All excavated spoils from excavation, grading, or trenching are expected to be used to construct the new earthen drainage features (e.g., berms, dikes); any excess materials would be disposed of in compliance with all applicable local, State, and Federal regulations. The Town would not deposit any excess materials in watercourses, wetlands, or floodplains. If the Proposed Project were implemented, management of major stormwater flows would be improved. Therefore, sedimentation, debris, and pollutants, which currently may be washed into the drainage system from the uncontrolled flooding of adjacent properties, would be minimized.

Initial design plans and coordination with the USACE indicate that less than 1 acre of dredged or fill materials would be deposited into WOUS as a result of the Proposed Project. No staging or storage of construction equipment would occur in WOUS. The Town would be responsible for obtaining the appropriate Section 404/401 CWA permits and certifications (33 U.S.C. §§ 1344/1341 [2008]) from the USACE/ADEQ. Furthermore, based on the area of the proposed disturbance, an AZPDES permit and an associated Storm Water Pollution Prevention Plan (SWPPP) are anticipated to be required for the construction of the Proposed Project. The SWPPP would incorporate temporary erosion-control measures during construction, permanent erosion-control measures when the project is completed, and BMPs for the control and prevention of release of water pollutants. The Town would obtain the necessary permits in compliance with Section 402 of the CWA (33 U.S.C. § 1342 [2008]), which would address any pollutants that could be discharged into the water system during construction.

Periodic maintenance activities may require earthmoving, sediment removal, or ground disturbance in WOUS. The Town would obtain any required CWA permits before conducting maintenance activities and follow BMPs during the activities to minimize potential long-term impacts to water quality.

Therefore, the Proposed Project is anticipated to result in minor short-term impacts and moderate long-term direct and indirect impacts to water quality and hydrology.

4.4.2 Executive Order 11988: Floodplain Management

EO 11988 requires Federal agencies to take action to minimize occupancy and modification of floodplains. Furthermore, EO 11988 requires that Federal agencies proposing to site a project in the 100-year floodplain must consider alternatives to avoid adverse effects and incompatible development in the floodplain. FEMA's regulations implementing EO 11988 are codified at 44 C.F.R. Part 9.

The Town participates in FEMA's National Flood Insurance Program (NFIP). Thus the Town has promulgated and enforces a floodplain ordinance at least as stringent as the NFIP and its implanting regulations (44 C.F.R. Parts 59 through 77). According to the FEMA Flood Insurance Rate Maps for the Town of Snowflake, as shown on panels 04017C4025E and 04017C4038E, dated September 28, 2008, the project area is in Flood Zone X and Flood Zone A. Zone X is composed of areas determined to be outside the 500-year floodplain. Zone A is a special flood hazard area subject to inundation by the 1 percent annual chance flood, for which no base flood elevations have been determined (i.e., in a 100-year floodplain). Portions of the project area in Reaches 2 and 3 are in Zone A; the remainder of the project area is in Zone X.

4.4.2.1 Alternative 1: No Project

The No Project Alternative would not alter the existing conditions and would therefore have no impact on the floodplain.

4.4.2.2 Alternative 2: Proposed Project

In compliance with EO 11988, FEMA considered the Proposed Project's impacts to the floodplain. FEMA applies the Eight-Step Decision-Making Process to ensure that it provides Federal financial assistance for projects consistent with EO 11988. The NEPA compliance process involves essentially the same basic decision-making process to meet its objectives as the Eight-Step Decision-Making Process. Therefore, the Eight-Step Decision-Making Process has been integrated into the NEPA process.

Under current conditions, the Snowflake Industrial Park is in the 100-year floodplain. If the Proposed Project were to be implemented, the Town would construct new structures in the floodplain; however, the proposed drainage features would also remove portions of the Snowflake Industrial Park from the floodplain by diverting flow through a channel along SR 277 and by diminishing peak flows through the construction of upstream retention basins. FEMA published a cumulative, initial public notice at the declaration of FEMA-1660-DR-AZ, which included general information about FEMA's intent to carry out actions within or affecting the floodplain. To the best of FEMA's knowledge, no comments were received on the initial public notice.

The nature of the Proposed Project (i.e., flood control) requires that it occur in the floodplain. Therefore, no practicable action alternatives are available to locating the Proposed Project in the floodplain. Section 3.1 discusses the other alternatives considered to address the continued flooding in the Town. Although the Proposed Project would modify structures in, and result in modification of, the 100-year floodplain, this alternative would result in no increase in the Base Flood Elevation (Town of Snowflake 2009a). The Town has coordinated with FEMA, USACE, and ADWR to ensure that this alternative would reduce the risk of damage to critical community assets from recurring floods while not adversely affecting the floodplain. FEMA would ensure publication of a Final Public Notice in compliance with EO 11988 before implementation of the Proposed Project.

The Town has prepared a Conditional Letter of Map Revision (CLOMR)[4] for the Proposed Project. If this alternative were to be implemented, no ground-disturbing activities would occur until the CLOMR has been approved. Any future projects that may occur within this floodplain would be subject to the Town's floodplain ordinance and the NFIP.

Therefore, the Proposed Project would result in moderate long-term impacts to the floodplain; the Proposed Project would be in compliance with EO 11988.

4.4.3 Executive Order 11990: Protection of Wetlands

EO 11990, Protection of Wetlands, requires Federal agencies to take action to minimize the destruction or modification of wetlands by considering both direct and indirect impacts to wetlands. Furthermore, EO 11990 requires that Federal agencies proposing to fund a project that could adversely affect wetlands must consider alternatives to avoid such effects. FEMA's regulations implementing EO 11990 are codified at 44 C.F.R. Part 9. Work involving dredging or filling wetlands is subject to Section 404 of the CWA, as described in Section 4.4.1. According to the Town, the USACE's 2005 jurisdictional delineation completed for the project area determined that ponds on the golf course are formed through pumping groundwater to form aesthetic features and are not considered regulatory wetlands (Town of Snowflake 2009a).

4.4.3.1 Alternative 1: No Project

The No Project Alternative would not require any ground-disturbing activities and therefore would have no effect on wetlands.

[4] A CLOMR is FEMA's comment on a proposed project that would, upon construction, affect the hydrologic or hydraulic characteristics of a flooding source and thus result in the modification of the existing regulatory floodway, the effective Base Flood Elevations, or the Special Flood Hazard Area. The letter does not revise an effective NFIP map; it indicates whether the project, if built as proposed, would be recognized by FEMA (FEMA 2009).

4.4.3.2 Alternative 2: Proposed Project

The Proposed Project would not result in any modification to, occupation of, or otherwise affect wetlands. This alternative is in compliance with EO 11990 and 44 C.F.R. Part 9. The Proposed Project would have no short- or long-term impact to wetlands.

4.5 BIOLOGICAL RESOURCES

Natural vegetation in the project area is characteristic of the Plains and Great Basin Grassland communities of the Upper Sonoran Life Zone (Brown 1994). Four-wing saltbush, cholla and prickly pear cactus, grasses, and scattered juniper are common in the area. Ornamental landscaping is present in the Snowflake Community Golf Course and associated with some adjacent intermittent development.

4.5.1 Endangered Species Act

Section 7 of the Endangered Species Act of 1973 (16 U.S.C. § 1536(a)(2) [2008]) requires Federal agencies to determine whether projects that they propose to undertake or fund have any potential to affect species listed or proposed for listing as threatened or endangered or their designated critical habitat. No designated or proposed critical habitat occurs within the project area.

4.5.1.1 Alternative 1: No Project

Under the No Project Alternative, no activities would occur and therefore no effects would occur to listed, proposed, or candidate species.

4.5.1.2 Alternative 2: Proposed Project

The USACE and the Town completed a Section 7 consultation with the U.S. Fish and Wildlife Service (USFWS). In a letter dated November 25, 2005, USFWS determined that the Proposed Project would have no effect on endangered or threatened species or critical habitat (Appendix C). FEMA notified USFWS of its proposed funding of the project, and its assumption that the 2005 USFWS no effect determination was still valid in a letter dated September 23, 2008, (Appendix C). Therefore, the Proposed Project would have no impact to threatened or endangered species or their habitat, and this alternative complies with Section 7 of the Endangered Species Act.

4.5.2 General Wildlife and Vegetation

4.5.2.1 Alternative 1: No Project

Under the No Project Alternative, no ground-disturbing activities would occur, and therefore this alternative would have no effect on general wildlife and vegetation in the vicinity of the project area.

4.5.2.2 Alternative 2: Proposed Project

The Proposed Project could potentially disturb wildlife in the vicinity of the project. Small mammals, reptiles, amphibians, and insects could suffer injury or mortality from construction equipment. All animal species in the vicinity would experience harassment from noise and dust and short-term habitat loss from construction disturbance around the new drainage features. Ground disturbance would likely result in associated disturbance to vegetation. However, these impacts would be limited to the construction period and during periodic maintenance activities. Further, any incidental injury, mortality, or harassment due to noise would be generally commensurate with the existing potential for such impacts associated with the ongoing use and maintenance of the railroad, SR 277, the golf course, and the industrial activities adjacent to the project limits.

The Town would comply with the Migratory Bird Treaty Act of 1918 (16 U.S.C §§ 703–712 [2008]) for all construction-related disturbance and all applicable local and State wildlife and vegetation requirements (e.g., the Arizona Native Plant Law).

Therefore, the Proposed Project would result in minor short-term impacts to wildlife and vegetation.

4.5.3 Executive Order 13112: Invasive Species

EO 13112, Invasive Species, requires Federal agencies to prevent the introduction of invasive species; provide for their control; and minimize the economic, ecological, and human health impacts that invasive species cause. Specifically, EO 13112 requires that Federal agencies not authorize, fund, or implement actions that are likely to introduce or spread invasive species unless the agency has determined that the benefits outweigh the potential harm caused by invasive species and that all feasible and prudent measures to minimize harm have been implemented.

4.5.3.1 Alternative 1: No Project

Under the No Project Alternative, no ground-disturbing activities would occur, and therefore this alternative would have no effect on invasive species.

4.5.3.2 Alternative 2: Proposed Project

The Proposed Project has limited potential to contribute to the spread of invasive species in the project area. With the exception of Basins 1A and 1B, the majority of the proposed improvements occur within or adjacent to developed areas. With the exception of features on the golf course, any disturbed soil and vegetation would be reseeded with a native seed mix once construction is complete; in the golf course, the embankments would be blended into the existing fairways for aesthetic purposes. The Town would take measures to prevent the introduction of invasive weeds at the construction site, including cleaning all equipment before accessing the site and using only certified, weed-free erosion control and re-vegetation materials.

Routine maintenance activities could result in the spread of invasive species seed from equipment and vehicles traveling to the basins and drainage channels, particularly in Reach 1. The Town would follow BMPs to minimize the potential spread of invasive species seed from such activities.

Stormwater flows would have the potential to carry invasive species seeds during storm events. During ordinary flows, water—and any incidental vegetation or debris—would generally follow current drainage patterns. If this alternative were implemented, large storm events would be better managed in the project area.

The potential for the Proposed Project to contribute to the spread of invasive species is minimal, and this alternative would comply with EO 13112. Therefore, the Proposed Project is anticipated to result in negligible short-term direct and indirect impacts to invasive species.

4.6 HISTORIC PROPERTIES

In addition to review under NEPA, consideration of impacts to historic properties is mandated under Section 106 of the National Historic Preservation Act of 1966 (16 U.S.C. §§ 470 et seq. [2008]). Requirements include identifying significant historic properties and districts that may be affected by a Federal undertaking and mitigating adverse effects to those resources.

A record search and pedestrian surveys of the area of potential effect (APE) identified seven previously recorded historic properties within the study area: six prehistoric archaeological sites and a segment of the historical Apache Railway (FEMA 2008, 2009a, 2009b, 2010). An additional historic property was identified in the vicinity of the project, outside the APE.

4.6.1 Alternative 1: No Project

Under the No Project Alternative, no impacts would occur to historic properties because no construction or other activities would occur that could potentially disturb historic properties.

4.6.2 Alternative 2: Proposed Project

FEMA corresponded with the State Historic Preservation Officer (SHPO) and applicable tribes in a series of consultation letters, pursuant to Section 106 of the National Historic Preservation Act (Appendix C). As a result of ongoing coordination with SHPO and the applicable tribal representatives and the implementation of a testing plan to determine the National Register of Historic Places (NRHP) eligibility of the historic properties within the APE, FEMA concluded that the APE would avoid one site and encompass seven other sites—all of which FEMA has determined to be not eligible for listing on the NRHP.

Because of the absence of NRHP-listed or eligible historic properties in the APE, FEMA has determined that the project would result in "no historic properties affected." In accordance with Stipulation VII.C. of the Section 106 Programmatic Agreement (Agreement) between FEMA, the SHPO, ADEM, and the Advisory Council on Historic Preservation, executed for the Rodeo-Chediski Wildfire Disaster (FEMA-1442-DR-AZ) and extended to FEMA-1660-DR-AZ, FEMA notified the SHPO of its determination in a letter dated January 13, 2010. The SHPO concurred with FEMA's determination in a letter signed January 27, 2010 (Appendix C).

FEMA notified the Hopi, Navajo, and Zuni tribes of its determination in letters dated January 13, 2010, and provided the tribes with the preliminary report of the archaeological testing results (Appendix C). FEMA requested that the tribes provide responses within 30 days and stated that, if no comments were received after a 30-day review period, concurrence would be assumed. The Hopi Tribe concurred with FEMA's determination in a letter dated January 28, 2010; no other comments were received.

The Town would fence the construction area to ensure that any historic properties outside the APE are not impacted by project construction activities. In the event that a discovery of an artifact is made during project activities, and in compliance with Stipulation X (Unexpected Discoveries) of the Agreement, the Town would cease all activity and notify ADEM immediately. ADEM would notify FEMA and ensure that all reasonable measures are taken to avoid or minimize harm to the resource until FEMA completed additional consultation with the SHPO and the tribes. In the event that human remains are found, the Town would contact the Navajo County coroner/medical examiner. If the coroner/medical examiner determined that the human remains are or may be of Native American origin, the discovery would be treated in accordance with local and State laws.

4.7 AIR QUALITY

The Clean Air Act of 1970 (42 U.S.C. §§ 7401–7661 [2008]) is a comprehensive Federal law that regulates air emissions from area, stationary, and mobile sources. It authorizes the EPA to establish National Ambient Air Quality Standards (NAAQS) to protect public health and the environment. The NAAQS include the following five criteria pollutants: nitrogen dioxide, ozone (O_3), carbon monoxide, sulfur dioxide, and particulate matter less than 10 micrometers in diameter. In addition, new NAAQS for O_3 and particulate matter less than 2.5 micrometers in diameter have been implemented. Areas where the monitored concentration of a pollutant

exceeds the NAAQS are classified as being in nonattainment for that pollutant. If the monitored concentration is below the NAAQS, the area is classified as being in attainment for that pollutant. The project area is in Navajo County, Arizona, in EPA Region 9. The project is in an area that is in attainment for all NAAQS pollutants.

The National Emissions Standards for Hazardous Air Pollutants (NESHAP) are set by the EPA for air pollutants not covered by NAAQS that may cause adverse impacts on human health, including asbestos. Existing concrete features such as culverts, headwalls, and roadway features may contain asbestos-containing materials.

4.7.1 Alternative 1: No Project

The No Project Alternative would have no impacts to air quality because no construction or other activities resulting in air emissions or affecting attainment status would occur.

4.7.2 Alternative 2: Proposed Project

Implementation of the Proposed Project would result in localized short-term deterioration of air quality. The construction-related effects of the Proposed Project would consist of increases in fugitive dust, mobile construction equipment emissions, and motor vehicle emissions during construction. Earth-moving vehicles (e.g., dump trucks) operating at and near the construction site would generate construction-related fugitive dust. The fugitive dust would result primarily from particulate matter re-suspended by excavation and debris removal at the construction site, vehicle movement, dirt tracked onto unpaved areas at access points, and wind-blown materials. These vehicles also would release minor emissions associated with diesel and gasoline combustion, including carbon monoxide and O_3 precursors. Motor vehicles traveling through the project limits and those diverted through the temporary SR 277 detours would be operating at slower-than-normal speeds. Some temporary and short-term idling may occur to accommodate construction activities. These activities may also result in minor temporary emissions associated with diesel and gasoline combustion.

Construction activities may impact existing concrete features. The Town would complete all required NESHAP notifications and comply with all local, county, State, and Federal regulations regarding the demolition and disposal of materials.

Periodic maintenance activities would also result in temporary localized deterioration of air quality. Maintenance vehicles would be traveling along unpaved roads, which would result in increased emissions of fugitive dust and particulate matter. Air quality impacts associated with minor repairs of drainage features would be similar to those that would occur during construction, but would be of shorter duration.

To minimize the effects of the Proposed Project on air quality, the Town would maintain properly tuned mechanical equipment, minimize the idling time of support vehicles, and employ dust control measures, such as watering construction areas, as necessary during both construction and maintenance activities.

Therefore, the Proposed Project would result in minor short-term and negligible long-term impacts to air quality.

4.8 NOISE

Noise-sensitive receptors are located at land uses associated with indoor and outdoor activities that may be subject to substantial interference from noise. These land uses often include residential dwellings, hotels, hospitals, nursing homes, educational facilities, libraries, and offices. The noise sensitive land uses in or near the project area include dispersed residences, recreational activities associated with the Snowflake Community Golf Course, and with the temple south of SR 277, at the western terminus of Reach 2. Noise sources include the Apache Railroad and SR 277, which bisect the project area, and the activities associated with day-to-day operations in the Snowflake Industrial Park.

4.8.1 Alternative 1: No Project

Under the No Project Alternative, noise would remain at current levels.

4.8.2 Alternative 2: Proposed Project

The Proposed Project would result in temporary increases in noise levels associated with construction. Use of construction equipment, demolition, and construction activities would result in temporary increases of ambient noise levels. In addition, improvements under SR 277 would require detours that would temporarily divert traffic slightly (less than 30 feet) closer to residents, the temple, and the Snowflake Community Golf Course. The detours would follow the SR 277 alignment, be within the ADOT right-of-way, and are anticipated to last no more than 2 weeks. The Town would be responsible for implementing the following measures to reduce impacts from noise level increases to the extent practicable:

- The Town would post public notices that would provide advanced notification of construction.
- All mobile or fixed noise-producing construction equipment that is regulated for noise output by a local, State, or Federal agency would comply with such regulation.
- The use of noise-producing signals, including horns, whistles, alarms, and bells, would be for safety warning purposes only.
- Construction would be limited to weekdays between 7 a.m. and 7 p.m. and between 10 a.m. and 5 p.m. on weekends.
- Noise levels resulting from construction would comply with local noise ordinances.

Because the noise levels would return to pre-construction levels after the completion of the drainage improvements, no long-term noise impacts are expected.

Therefore, the Proposed Project would result in a moderate short-term direct impact to noise levels.

4.9 TRANSPORTATION

SR 277 is a major arterial road through the Town that connects with SR 77 approximately 1 mile east of the project limits. SR 277 provides ingress/egress to residences and businesses and connections to minor arterial roadways. The Apache Railroad, which is north of SR 277, provides commercial rail services through the project area. Currently, most of the roads intersecting the project limits are paved, though the majority of the local streets maintained by the Town are not paved (Town of Snowflake 2007a). According to the Town's General Plan, three proposed roads (one crossing each reach) and one proposed trail cross the project limits; each would connect with SR 277.

4.9.1 Alternative 1: No Project

No activities would occur as part of the No Project Alternative, and therefore this alternative would not directly affect transportation. Under this alternative, the periodic overtopping of roadways—including SR 277—in the project area would continue to occur during major storm events. Flooding of these roads would continue to require periodic closures, detours, and potentially hazardous driving conditions. However, these closures would only occur temporarily, during major storm events.

Therefore, the No Project Alternative would continue to have minor long-term indirect impacts to transportation.

4.9.2 Alternative 2: Proposed Project

The mobilization and demobilization of construction vehicles and equipment could slow traffic along SR 277. The slowing of traffic would occur during ingress and egress on SR 277 and would be typical of construction sites. During installation of culverts and drainage features under SR 277, detours and temporary lane closures would be required. The detours would occur within the existing ADOT right-of-way and would be immediately adjacent to the existing roadway. Therefore, no out-of-direction travel would be required. The detours would result in traffic slowing and the potential for temporary vehicle queuing during any short-term stoppage of traffic. During work within the Apache Railroad right-of-way, temporary closures of this segment of the rail line may be required. As such, additional freight vehicles may be using SR 277 during this temporary work; however, the number of additional vehicles using SR 277 is anticipated to be insignificant based on the temporary nature of the railroad restriction, the limited use of this segment of the railroad, and the existing number of freight vehicles that are currently accommodated on SR 277. Proposed modifications to the planter boxes, curb and gutter, and sidewalks along Country Club Drive may require temporary lane and sidewalk closures. Further, installation of the new drainage features would result in temporary closures of some driveways and side roads that intersect the project limits.

The Town has prepared a traffic control plan to address the potential impacts to traffic on SR 277; the traffic control plan would be approved by ADOT prior to the start of construction activities. The Town would be required to obtain all necessary permits from the railroad before implementation of this alternative. Access to adjacent properties that currently have access to roadways within the project limits would be maintained to the extent feasible during construction. The Town would coordinate with adjacent property owners prior to access or roadway closures. Also, the Town would ensure that, where feasible, existing sidewalks or other established pedestrian/bicycle paths that would be impacted by the proposed improvements are signed for potential closures in such a manner as to allow safe pedestrian/bicycle movement. The Town would provide advanced notification, signs, flag persons, and other measures to minimize disruption to motorists and residents in the project area.

If the Proposed Project were implemented, periodic ingress and egress of maintenance vehicles and equipment to repair drainage features may occur within roadways in the project limits. The ingress and egress of these vehicles may result in temporary, localized slowing of traffic. However, this impact is anticipated to be commensurate with ingress/egress of residential, commercial, industrial, and maintenance vehicles that currently use the transportation system in the project area and therefore would be negligible.

Implementation of the Proposed Project would address drainage and flooding issues in the project area. After construction, the potential for uncontrolled flows from major storm events to overtop transportation features in the project limits would be diminished. The Proposed Project would not be anticipated to preclude the future development of planned roads within the project limits.

Therefore, the Proposed Project would result in moderate short- and long-term direct and indirect impacts to transportation.

4.10 VISUAL RESOURCES

Views from the project area include foreground views of brown and tan vacant land punctuated with scattered green vegetation; linear features such as fences, utility lines, and transportation features; intermittent development consisting of generally low-lying buildings of a variety of materials, textures, and styles; and the Snowflake Community Golf Course—the green features of which provide a striking contrast to the muted tans and browns that characterize the majority of the project area. Middle ground views include the generally brown and tan undulating and vacant terrain and scattered development similar to that in the foreground. The lack of prominent topographic or tall constructed features in the project vicinity provides some vast unobstructed views of the relatively flat landscape, particularly in the western portion of the project area. Observation points in the project area are primarily from roads and from various areas of the golf course. The project limits are not on lands managed for specific visual quality objectives.

4.10.1 Alternative 1: No Project

The No Project Alternative would result in no changes to the viewshed, and therefore no impacts to visual resources would occur.

4.10.2 Alternative 2: Proposed Project

The Proposed Project would result in the construction of new features and modification to existing features in the viewshed. During and immediately after construction, portions of the work area would be noticeable to motorists and golf course users—particularly for those portions of the project immediately adjacent to SR 277 and on the golf course.

In Reach 1, the new basins and drainage improvements would be constructed primarily through modification of the existing landscape. As such, in the long term, the forms, colors, and textures would be similar to those currently present, and the new basins would generally blend with the surrounding area. The new berms would be similar to those currently on site. During and immediately after large storm events, the retained water in Basins 1A and 1B would provide areas of visual interest, because the water would contrast with the surrounding landscape. However, views of the basins from roadways and the golf course would generally be obstructed by existing topography, SR 277, and the Apache Railroad.

In Reach 2, Basins 2 and 3 would be constructed to conform to the existing topography of the golf course and would be revegetated and contoured to blend with the immediate area. The other drainage features would also generally conform to the existing colors and materials of the golf course and the existing transportation and drainage features. As with Basins 1A and 1B, when the basins are filled during and immediately after major storm events, the retained water in Basins 2 and 3 would provide areas of visual interest; however, unlike the basins in Reach 1, the basins in the golf course would be compatible and blend with the existing water features and therefore would result in a low degree of contrast.

In Reach 3, the drainage improvements would blend in form and lines with the SR 277 roadway, and after construction is complete, the proposed improvements would not be highly noticeable, because they would be below the grade of motorists and would be consistent with other existing transportation and drainage features.

Ongoing maintenance activities would result in some dust and ground disturbance that may be visible. However, this maintenance would generally occur either away from observation points or be commensurate with expected levels of ongoing maintenance and repair on golf courses and roadways.

Therefore, the Proposed Project would result in moderate short-term direct impacts and minor long-term indirect impacts to visual resources.

4.11 RECREATION

The Snowflake Community Golf Course is the only designated recreational features within or adjacent to the project limits. According to the Town, an average of 29,000 rounds of golf per year is played at the course, with the majority of these rounds played by area residents (Town of Snowflake 2009c). The course is closed during winter months, generally from October to April. The Town's Future Development Plan, a component of its General Plan, identified a proposed trail crossing SR 277 north to south at the its intersection with Potter Street; a future nine-hole golf course is south of SR 277, and an area of future commercial and recreation growth is north of SR 277, near the eastern project terminus (Town of Snowflake 2007a).

4.11.1 Alternative 1: No Project

The No Project Alternative would not require modifications to the existing conditions. Water flow from major storm events would continue to exceed the capacity of the existing drainage system, and therefore flooding of nearby properties—including the golf course—would be expected to continue under this alternative. Any damage to the recreational features from current flooding would continue.

Therefore, the No Project Alternative would result in no change to current impacts on recreation.

4.11.2 Alternative 2: Proposed Project

The Proposed Project would require construction within the existing Snowflake Community Golf Course. Construction activities are anticipated to require realignment of portions of the existing cart path and re-contouring of portions of the course to create Basins 2 and 3. If feasible, the Town anticipates completing construction of those activities that would occur on the course during winter months, when the course is closed. However, if required, construction may occur during the open season, in which case portions of the golf course would remain open to the public; in such an event, the work area would be clearly delineated by temporary fencing, flagging, warning signs, and/or other methods to ensure the safety of users. Golfers may also temporarily experience higher levels of noise and dust from construction activities.

During and immediately after major storm events, the basins at the golf course would be expected to fill with water. The filled basins may temporarily impact adjacent areas of the golf course. This impact is anticipated to be minor, because the course would likely be empty during storm events, and the system is anticipated to convey retained flows out of the project limits in less than 2 days.

If implemented, post-construction maintenance activities are expected to be a negligible increase from ongoing course maintenance and operations and would therefore not be noticeable to the public. In the long term, the increased management of stormwater flows would be expected to minimize damage to the course after major storm events.

Construction of the Proposed Project would not preclude or create an impediment to development of proposed recreational facilities in the project vicinity, as identified in the Town's General Plan. Further, Basins 1A and 1B could provide future opportunities for joint-use as recreational facilities, such as fields.

Therefore, the proposed alternative would have moderate short-term direct impacts and minor long-term indirect impacts to recreation.

4.12 ENVIRONMENTAL JUSTICE

EO 12898, Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations, requires Federal agencies to make achieving environmental justice part of their missions by identifying and addressing disproportionately high and adverse human health or environmental effects of its programs, policies, and activities on minority and low-income populations.

FEMA reviewed data available from the 2000 U.S. Census to determine the presence of low-income or minority residential populations. FEMA reviewed data for the Census Tract that encompasses the project limits and adjacent residential areas (i.e., Census Tract 9609), and compared that data to information from the Town as whole, and from Navajo County.

According to the 2000 Census, the percent of the population in Census Tract 9609 that self-reported as Hispanic or Latino; Black or African American; American Indian and Alaskan Native; Asian; Native Hawaiian and Other Pacific Islander; or Two or More Races was less than 8 percent in any given category, and less than the percentages of the comparative geographies. The percent of the population that self reported as "Other" (0.1 percent) was negligibly greater than the percent in the Town or in Navajo County (each at 0.0 percent).

The percent of the population within Census Tract 9609 with reported income below the Federal poverty level was 11.9 percent. Although this was slightly higher than the comparative percentage in the Town as a whole, it was notably less than that of Navajo County (23.4 percent). The percent of the tract's population that reported as disabled (39.6 percent), or elderly (11.2 percent) was higher than that of the Town as a whole (29.1 percent and 10.7 percent, respectively).

4.12.1 Alternative 1: No Action

Under the No Action Alternative, no construction activities, or changes to the existing conditions would occur and, therefore, there would be no impact to minority or low-income populations.

4.12.2 Alternative 2: Proposed Project

Temporary adverse impacts, such as increases in dust and noise levels, road closures and traffic slowing, and changes to the view shed associated with the Proposed Project would be predominately temporary and mitigated as discussed in previous sections of this document.

These impacts would be experienced by all nearby residents, business owners/patrons, recreating public, and motorists equally.

If implemented, the Proposed Project would result in a decrease risk of damage from flooding associated with major storm events. The increased management of stormwater flows would reduce flooding of adjacent properties—including transportation routes in the project limits. Increasing the availability of transportation routes during and immediately after major storm events could be especially beneficial to the disabled population, as it would allow increased access for emergency vehicles and to evacuation routes.

Thus, the Proposed Project would not result in disproportionately high and adverse effects on minority or low-income populations. As a result, the Proposed Project would comply with EO 12898.

4.13 CUMULATIVE IMPACTS

CEQ defines a cumulative impact as "the impact on the environment which results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions…" (40 C.F.R. Part 1508.7). Past, present, and reasonably foreseeable actions were identified based on information obtained from the Town, Navajo County, ADOT, and FEMA.

Past actions in the area include the construction, maintenance, and past use of the Apache Railroad; SR 277 and other roads in the project limits; the golf course; and commercial, residential, industrial, and quasi-public structures. Construction of the Northern Drainage Solution is also considered a past action. These past actions are assumed to create the existing affected environment. Ongoing and current projects are limited to use and maintenance of the developed facilities in the project vicinity (e.g., ongoing surfacing of Town collector and arterial roads).

Screening criteria were developed to determine which actions would be considered speculative versus "reasonably foreseeable." The criteria included specific projects for which NEPA compliance is complete or under way (based on a published notices of intent, other published scoping documents, Findings of No Significant Impact, or decision records), projects listed in short-range adopted land use or management plans, and those projects specifically identified by a land or resource managing agency to be "reasonably foreseeable."

Navajo County did not document any reasonably foreseeable future projects in the area. FEMA did not document any reasonably foreseeable future projects in the area, other than those described in Sections 1–3 and 4.1–4.12 of this EA. According to the ADOT *2010–2014 Current Five-Year Transportation Facilities Construction Program* (ADOT 2010), ADOT plans to construct a new passing lane on SR 77, approximately 5 miles northeast of the project limits. ADOT plans to complete this work during the summer of 2010 (Ed Wilson, Development Engineer, ADOT Holbrook District, verbal communication, February 3, 2010). The Town also identified a reasonably foreseeable future action immediately north of the project limits, the proposed expansion of the Northern Drainage Solution to accommodate drainage flows in the

northern channel. The Town anticipates that this project, which would be designed and funded by private individuals, would begin construction in 2011.

The potential cumulative impacts of each alternative to resource areas are discussed below. If an alternative would have no or negligible direct or indirect impacts to a resource, that alternative is assumed to not contribute to any cumulative impact on that resource and is not discussed further in this section. Therefore, because both the No Project Alternative and the Proposed Project Alternative would have no impact to seismicity; wetlands; species or habitat protected by the ESA; or historic properties, neither alternative would contribute to any cumulative impact on these resources.

Under the No Project Alternative, no construction, ground disturbance, or modification to the existing conditions would occur. As described in Sections 4.1 to 4.12, the implementation of this alternative would result in no direct or indirect impacts to land use, water quality/hydrology, floodplain, general wildlife and vegetation, invasive species, air quality, noise levels, visual resources, or recreation. Therefore, the No Project Alternative would not contribute to cumulative impacts to these resources.

The No Action Alternative would not address the existing drainage issues within the project limits. As such, the flood hazard in the project area would not be mitigated, and soil erosion as a result of flooding would continue. Also, periodic flooding of roadways in the project area would continue to require temporary, periodic closures, detours, and potentially hazardous driving conditions. Implementation of the proposed future expansion of the Northern Drainage Solution may mitigate the minor impacts to soils anticipated to continue under the No Action Alternative and help alleviate flooding along transportation features in and near the project limits. Therefore, when considered along with past, present, and reasonably foreseeable future actions, the No Action Alternative would have minor cumulative impacts to soils and transportation.

The Proposed Project would continue the pattern of developing vacant undeveloped land. Therefore, the potential cumulative impacts of the Proposed Project, when considered along with other past, present, and reasonably foreseeable future actions to land use, geology and soils, biological resources (e.g., vegetation and invasive species), air quality, and ambient noise levels were analyzed. As discussed in Section 4.1, ample vacant land is available in the project vicinity, and the Proposed Project would conform to current land uses. Although the Proposed Project may remove a potential impediment for future planned development (i.e., ongoing flooding during major storm events), the actual rate and location of future development are anticipated to be predominately influenced by economic factors unconnected to actions considered for this analysis. The Proposed Project, ongoing activities, and reasonably foreseeable future projects would all likely require some modification of soils, disturbance to vegetation and wildlife, and temporary construction impacts to air quality and noise levels similar to the impacts discussed in Sections 4.2, 4.5, 4.7, and 4.8, respectively . Ongoing and future projects would conform to local, State, and Federal regulations for impacts to natural resources (e.g., AZPDES permits, Native Plant Law). The type and nature of ongoing (i.e., road maintenance and upgrading activities) and reasonably foreseeable future actions (i.e., construction of a new passing lane and

expanded design of the Northern Drainage Solution) are anticipated to result in minor temporary impacts to air and noise quality that are typical of construction and maintenance activities. Further, the ongoing surfacing of the Town's roads and the future construction of a passing lane may result in decreased dust emissions and vehicular emissions associated with slower vehicles. These projects could have long-term beneficial impacts to air quality. Land management agencies in the project limits, such as ADOT and the Town, use BMPs to minimize impacts to natural resources. Therefore, when assessed with other past, present, and reasonably foreseeable future actions, impacts to land use, geology and soils, biological resources, air quality, and ambient noise levels are not considered substantial.

As previously discussed, the Town has documented that based on alterations of the Snowflake Industrial Park area—primarily due to development—the flood path is no longer confined to the natural drainage course and continually changes directions (Town of Snowflake 2009a). Past development occurred in the 100-year floodplain and modified natural drainage patterns, resulting in the current flooding during major storm events. The implementation of the Northern Drainage Solution—primarily completed in 2007—provided localized flood control and drainage improvements to the industrial park area. The Proposed Project, if implemented, would provide further drainage improvements to address stormwater flows associated with major storm events. Any ongoing or future projects that would affect the 100-year floodplain would require approval from FEMA and, if necessary, a revision to the Flood Insurance Rate Map. Therefore, when considered with other past, present, and reasonably foreseeable future actions such as the expansion of the Northern Drainage Solution, the Proposed Project would result in a substantial cumulative impact to hydrology and a moderate cumulative impact to the 100-year floodplain.

Implementation of the Proposed Project may result in moderate temporary impacts to transportation during construction and maintenance activities and reduce the long-term potential for uncontrolled flows from major storm events to overtop transportation features in the project limits. Maintenance and construction activities associated with other present (e.g., surfacing of Town roads) and reasonably foreseeable future actions (e.g., construction of a new passing lane on SR 77) would also be expected to result in temporary impacts to traffic that are typical of roadway improvement projects. If implemented, the Proposed Project may be constructed concurrently with some of the other planned projects in the area, which would be expected to exacerbate impacts to transportation—particularly if improvements to the two state highways occur simultaneously. However, all construction activities on State highways would only commence after approval of a traffic control plan, which would minimize impacts to motorists. In the long term, the proposed roadway and drainage improvements would be expected to improve transportation in the project vicinity. Therefore, when considered with other past, present, and reasonably foreseeable future actions, the cumulative impacts to transportation are anticipated to be moderate.

Although the Proposed Project is anticipated to result in moderate short-term direct impacts and minor long-term indirect impacts to visual resources and recreation, the location and type of work of other identified and reasonably foreseeable future actions would not be expected to result in perceptible impacts to the view shed or to recreation. Therefore, the Proposed Project is

anticipated to result in a negligible contribution to cumulative visual and recreation impacts in the project vicinity.

4.14 MITIGATION MEASURES

Mitigation measures are actions that have been identified to avoid or minimize the impacts of the alternatives on social, cultural, and natural environmental resources when appropriate. The environmental consequences of the alternatives, as described in the preceding documentation, are projected with the assumption that the applicable mitigation measures are implemented. The Subgrantee may also be required to implement additional mitigation measures based on its compliance with local, State, or other general laws, regulations, and permits, as applicable. The following measures would be required as a stipulation for receipt of Federal financial assistance from FEMA.

4.14.1 Alternative 1: No Action

No mitigation measures would be required for the implementation of this alternative.

4.14.2 Alternative 2: Proposed Project

If the Proposed Project were implemented by the Town, the following mitigation measures would be required:

- During construction, the Town would ensure that access is maintained to all adjacent properties with current access to SR 277, to the extent feasible.
- The Town would employ BMPs such as installing silt fences, mulching cleared soil, staging equipment along existing roads—where feasible—and keeping equipment properly maintained.
- The Town would be responsible for covering spoil piles or watering existing soils as necessary to minimize soil loss from surface runoff and wind erosion.
- The Town would implement permanent erosion control measures, such as revegetation either with ornamental landscape in the golf course or with native species to stabilize soils and minimize the potential for long-term erosion.
- The Town would dispose of any excess materials in compliance with all applicable local, State, and Federal regulations.
- Excess materials would not be deposited in watercourses, wetlands, or floodplains.
- No staging or storage of construction equipment would occur in WOUS.
- The Town would be responsible for obtaining the appropriate Section 404/401 CWA permits and certifications from the USACE/ADEQ.

- The Town would be responsible for obtaining the appropriate Section 402 CWA permit (33 U.S.C. § 1342 [2008]), including preparation of an SWPPP, if required.
- The Town would obtain any required CWA permits before implementing maintenance activities, and follow BMPs during maintenance actions.
- The Town would publish a Final Public Notice in compliance with EO 11988 before implementation of the Proposed Project.
- No ground-disturbing activities would occur until the CLOMR for the Proposed Project has been approved.
- The Town would comply with the Migratory Bird Treaty Act of 1918 (16 U.S.C. §§ 703–712 [2008]) for all construction-related disturbance and all applicable local or State wildlife and vegetation requirements.
- With the exception of features on the Snowflake Community Golf Course, any disturbed soil and vegetation would be reseeded with a native seed mix once construction is complete; in the golf course, the embankments would be blended into the existing fairways for aesthetic purposes.
- The Town would take measures to prevent the introduction of invasive weeds at the construction site, including cleaning all equipment prior to accessing the site and using only certified, weed-free erosion control and re-vegetation materials.
- The Town would follow BMPs to minimize the potential spread of invasive species seed from routine maintenance activities.
- The Town would fence the construction area to ensure that any historic properties outside the APE are not impacted by project construction activities.
- In the event that a discovery of an artifact is made during project activities, and in compliance with Stipulation X (Unexpected Discoveries) of the Agreement, the Town would cease all activity and notify ADEM immediately. ADEM would notify FEMA and ensure that all reasonable measures are taken to avoid or minimize harm to the resource until FEMA has completed additional consultation with the SHPO and the tribes.
- In the event that human remains are found, the Town would contact the Navajo County coroner/medical examiner. If the coroner/examiner determines that the human remains are or may be of Native American origin, the discovery would be treated in accordance with local and State laws.
- The Town would complete all required NESHAP notifications and comply with all local, county, State, and Federal regulations regarding the demolition and disposal of materials.
- The Town would maintain properly tuned mechanical equipment, minimize the idling time of support vehicles, and employ dust-control measures, such as watering construction areas, as necessary during both construction and maintenance activities.
- The Town would post public notices that would provide advance notification of construction.

- All mobile or fixed noise-producing construction equipment that is regulated for noise output by a local, State, or Federal agency would comply with such regulation.
- The use of noise-producing signals, including horns, whistles, alarms, and bells, would be for safety warning purposes only.
- Construction would be limited to weekdays between 7 a.m. and 7 p.m. and between 10 a.m. and 5 p.m. on weekends.
- Noise levels resulting from construction would comply with local noise ordinances.
- The Town would coordinate with adjacent property owners prior to any access or roadway closures.
- The Town would ensure that, where feasible, existing sidewalks or other established pedestrian/bicycle paths that would be impacted by the proposed improvements are signed for potential closures in such a manner as to allow safe pedestrian and bicycle movement.
- The Town would provide advanced notification, signs, flag persons, and other measures to minimize disruption to motorists and residents in the project area.
- If construction occurs during the golf course's open season, portions of the golf course would remain open to the public; in such an event, the work area would be clearly delineated by temporary fencing, flagging, warning signs, and/or other methods to ensure the safety of users.

4.15 IRREVERSIBLE OR IRRETRIEVABLE COMMITMENT OF RESOURCES AND SHORT-TERM USES OF THE ENVIRONMENT AND MAINTENANCE AND ENHANCEMENT OF LONG-TERM PRODUCTIVITY

4.15.1 Irreversible or Irretrievable Commitment of Resources

For the purposes of this document, irreversible commitment of resources is interpreted to mean that once resources are committed, the production or use of those resources would be lost for other purposes throughout the life of the alternative being implemented. An irretrievable commitment of resources defines those resources that are used, consumed, destroyed, or degraded during the life of the alternative that could not be retrieved or replaced during or after the life of the alternative.

The No Project Alternative would not directly require the commitment of human or fiscal resources. However, ongoing flooding of, and repair of damage to, facilities within the Town would continue, and the risk of loss of social, natural, and cultural resources as a result of flooding would continue.

The Proposed Project would require the commitment of human and fiscal resources. The additional expenditure of labor required for this alternative would predominately occur during construction. However, ongoing maintenance and associated repairs would continue throughout

the life of the alternative. Funding for the Proposed Project would not be available for other uses and would therefore be irretrievable.

Implementation of the Proposed Project would also require the commitment of natural resources. Natural resources that would be committed to the project as a result of this alternative include land, water, and vegetation. Construction of the basins and drainage features would result in the incorporation of a larger amount of land than what is currently developed in the project area. However, use of the land is consistent with the existing and planned land uses. If the features were to be demolished, the land could be reclaimed and converted back to its natural state. The Proposed Project would also require a commitment of water resources for construction purposes and periodic maintenance activities. If implemented, this alternative would permanently modify the existing drainage patters in the project area. However, if the proposed improvements were demolished at a later date, hydrologic patterns could revert to the current condition. Vegetation committed for construction and periodic maintenance of the proposed improvements would be restored after construction/maintenance activities.

Non-renewable and irretrievable fossil fuels and construction materials (e.g., cement, gunite, steel, water, petroleum, energy) would be required. Labor and materials are also irretrievably committed during the fabrication, preparation, and distribution of construction materials and equipment. However, the Proposed Project would require only a small amount of these materials, the materials are abundant, and use would not result in a measurable impact to the availability of these resources.

Although the implementation of the Proposed Project would result in the commitment of resources as described above, the alternative would result in a decreased risk of loss to critical and non-critical facilities in the Town.

4.15.2 Short-term Uses of the Environment and Maintenance and Enhancement of Long-term Productivity

Implementation of the Proposed Project would result in short-term uses of and short- and long-term impacts on the environment, as documented in Sections 4.1 through 4.12. However, these uses of the environment would be balanced by the long-term improvements to drainage patterns and the long-term reduction in the risk of damage to critical features as a result of flooding that the Proposed Project would avoid. The new facilities would enhance the long-term productivity of resources by appropriately addressing stormwater flow from major storm events. Furthermore, implementation of any of the alternatives would not preclude or alter the range of potential uses of the resources in the area.

SECTION FIVE PUBLIC PARTICIPATION AND AGENCY COORDINATION

FEMA is the lead Federal agency for conducting the NEPA compliance process for this proposal. The lead Federal agency is responsible for expediting the preparation and review of NEPA documents in a way that is responsive to the needs of Town residents while meeting the spirit and intent of NEPA and complying with all NEPA provisions. Appendix C provides applicable agency correspondence.

FEMA and the Town will circulate the Draft EA for a 30-day public comment period. The public will be notified of the availability of the Draft EA through the FEMA website, direct mailings to interested parties, and publication of a public notice in the Silver Creek Herald. During the public comment period, FEMA will accept written comments on the Draft EA addressed to FEMA Region IX Environmental Officer, 1111 Broadway, Suite 1200, Oakland, California 94607 or to fema-rix-ehp-documents@dhs.gov. At the end of this period, FEMA will review the comments and consider them in the decision-making process before notifying the public of its final determination.

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Appendix A:
Figures

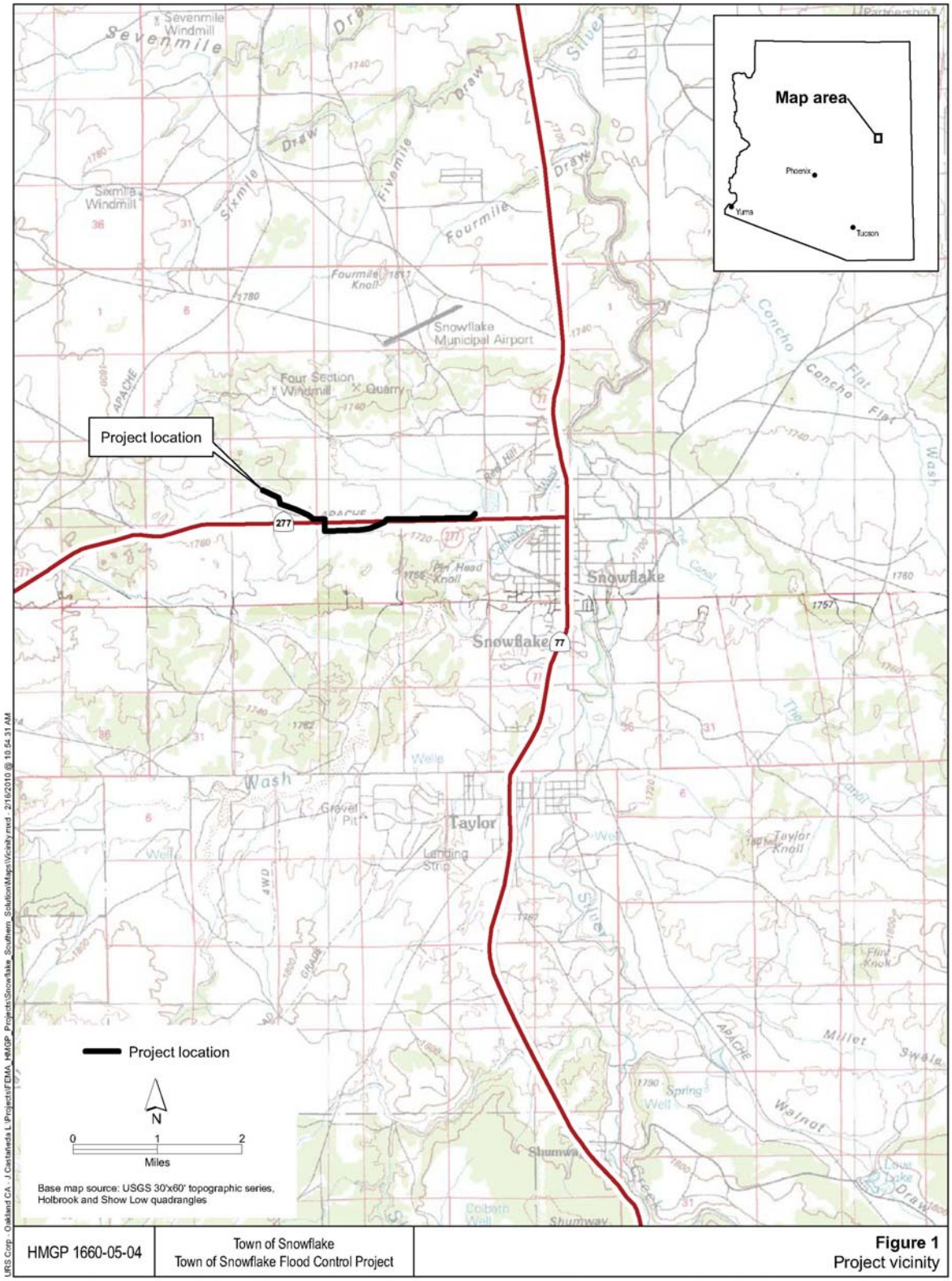


Figure 1. Project vicinity

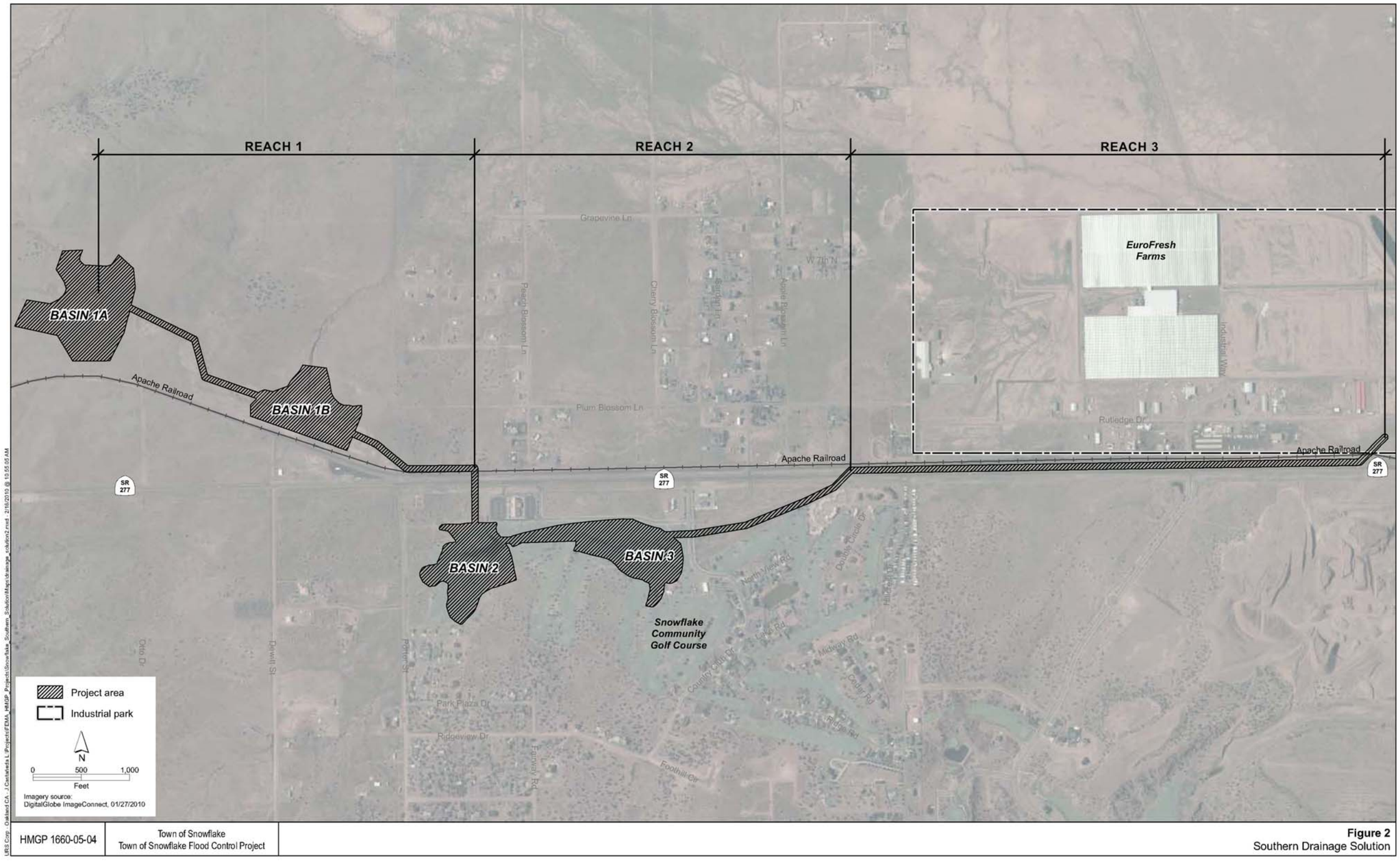


Figure 2. Southern Drainage Solution

Appendix B:
Engineering Plans, Details, and Specifications

TOWN OF SNOWFLAKE

SOUTHERN DRAINAGE SOLUTION, REACHES 1, 2 AND 3

CONTROL POINT	STATION	NORTHING	EASTING
1	1018+00	1280035.812	707435.165
2	1029+00	1279544.801	708419.495
3	1033+00	1279157.970	708521.290
4	1043+00	1278820.214	709462.524
5	1052+00	1278455.456	710285.295
6	1056+00	1278201.755	710594.545
7	1063+00	1278202.070	711294.545
8	1070+50	1277452.070	711294.545
9	1093+00	1277507.885	713543.852
10	1098+50	1277592.546	714087.297
11	1105+00	1277829.658	714692.506
12	1108+33.88	1277973.473	714993.826
13	1110+80.18	1278147.079	715168.534
14	1117+49.92	1278154.446	715838.233
15	1163+27.86	127818.981	720416.054
16	1165+98.16	1278374.664	720611.524

MAYOR
KELLY WILLIS

VICE MAYOR
KERRY BALLARD

COUNCIL
CHRIS BRIMHALL — LORRI DAVIS
SHARON TATE — CHARLIE HENDRICKSON

DEAN PORTER
TOWN MANAGER

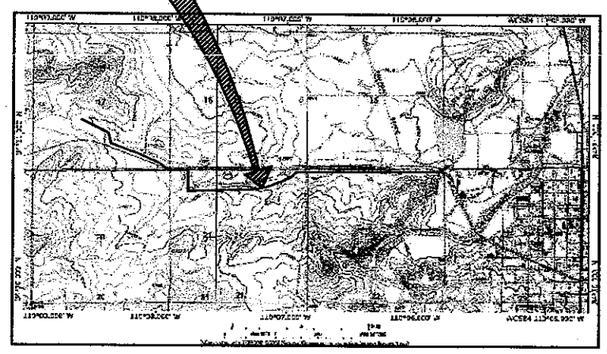
PAUL WATSON
PUBLIC WORKS DIRECTOR

GARY FENSTERMAKER
PROJECT ENGINEER

ROBERT TOY, P.E.

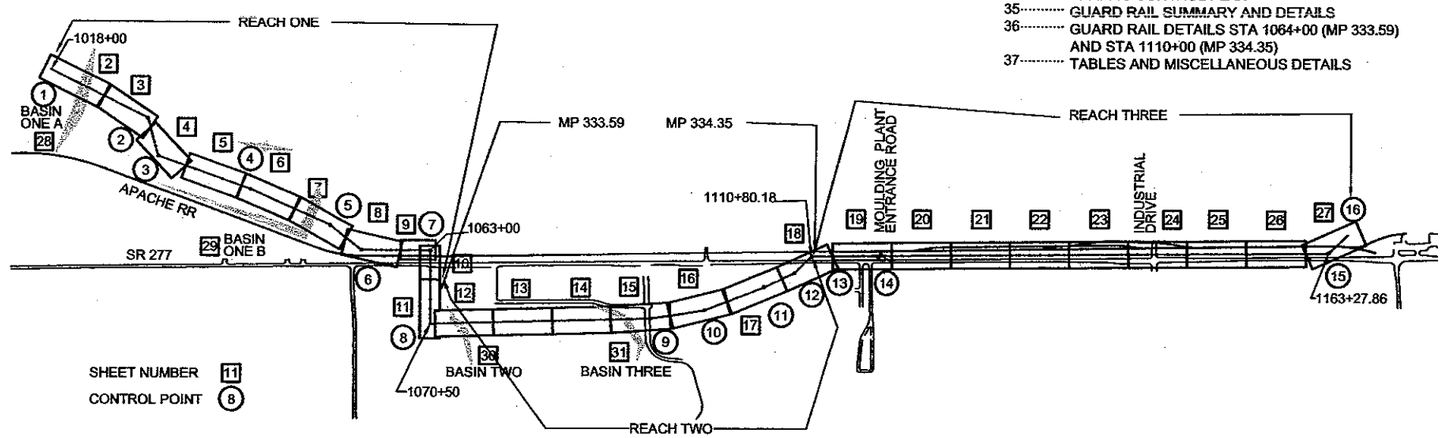
INDEX:

PROJECT



VICINITY MAP
1"=0.5 MILE

POSTED SPEED LIMIT - 45 MPH
DESIGN SPEED LIMIT - 50 MPH
DESIGN ADT - 800 - 2,000



KEY MAP - NO SCALE

NOTE:

PLANS, DETAILS AND SPECIFICATIONS AS PER "MARICOPA ASSOCIATION OF GOVERNMENTS STANDARD SPECIFICATIONS AND DETAILS FOR PUBLIC WORKS CONSTRUCTION" AND DETAILS AS PER "UNIFORM STANDARD DETAILS FOR PUBLIC WORKS CONSTRUCTION" MARICOPA ASSOCIATION OF GOVERNMENTS AND " ARIZONA DEPARTMENT OF TRANSPORTATION HIGHWAY DIVISION STANDARD DRAWINGS AND SPECIFICATIONS ".

LEGEND

Delineated Waters of the United States. No disturbance, storage, fueling, discharge (fill) or staging in this area except where discharge (fill) is specifically shown on the plans.

APPROVALS:

TOWN MANAGER — DATE

PUBLIC WORKS DIRECTOR — DATE

PROJECT ENGINEER — DATE

CLOMR SUBMITTAL REDUCED SIZE – DO NOT SCALE

YOST AND GARDNER ENGINEERS
2619 N. THIRD STREET
PHOENIX, ARIZONA 85004
PHONE: (602) 264-6424
FAX: (602) 277-6716

CONTENTS: COVER SHEET

PROJECT: SOUTHERN DRAINAGE SOLUTION
SNOWFLAKE, ARIZONA

REVISIONS

263+100

15615 CHRISTOPHER R. STEVENS
Expires 06/30/2010

DRN BY: BR
CHKD BY: JEE
JOB NO.: 8569
DATE: JUN, 2006
SHEET NO.
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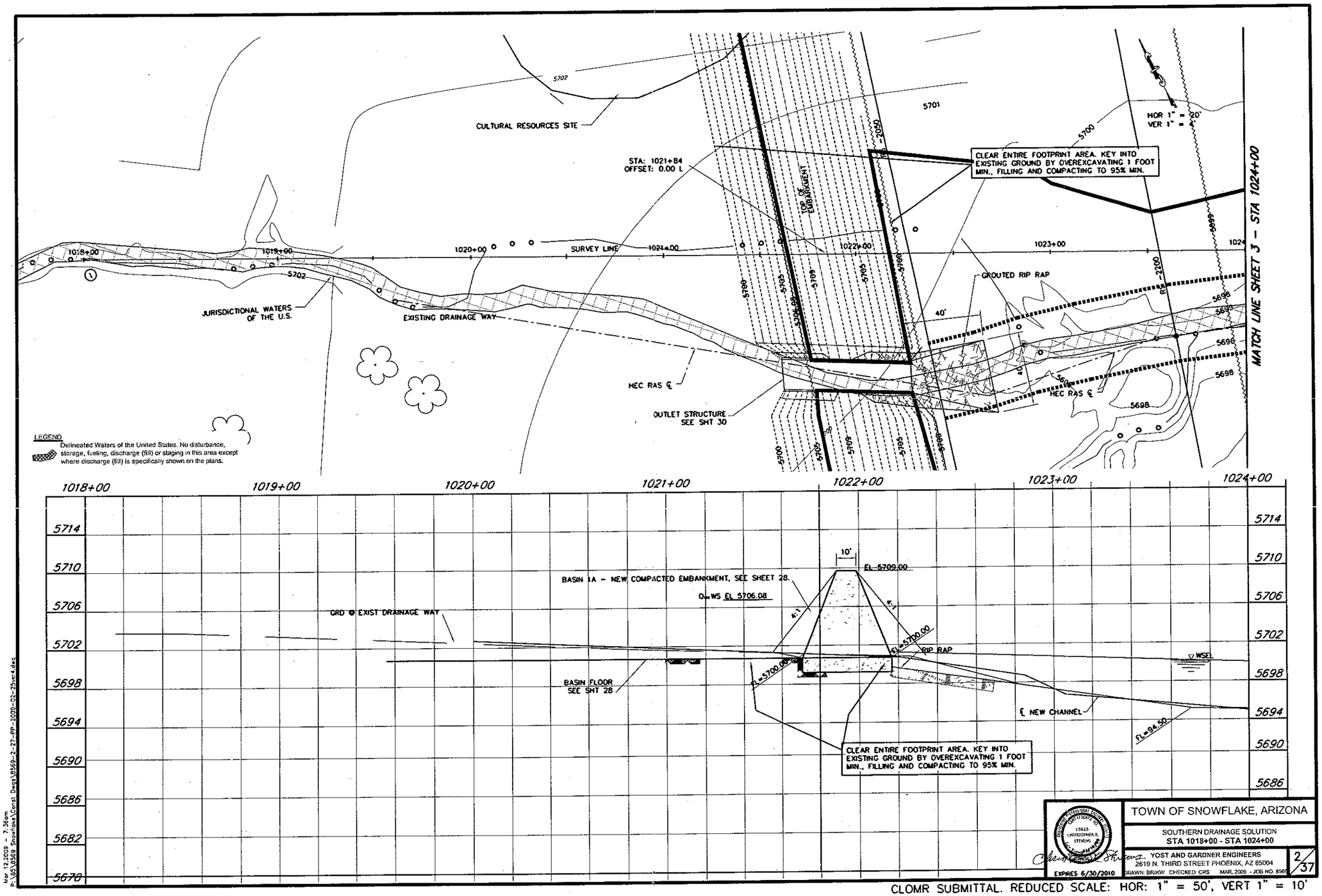

Mar 12,2009 - 7:36am
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CLOMR SUBMITTAL. REDUCED SCALE: HOR: 1" = 50', VERT 1" = 10'

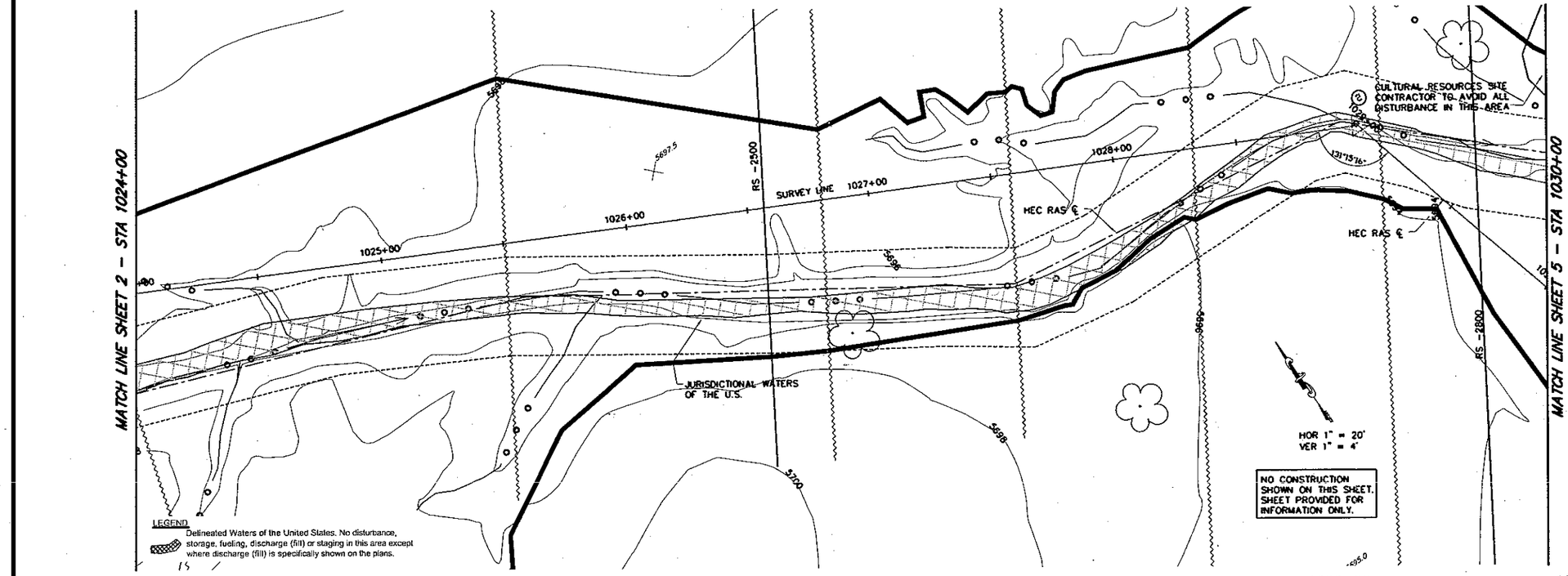
TOWN OF SNOWFLAKE, ARIZONA

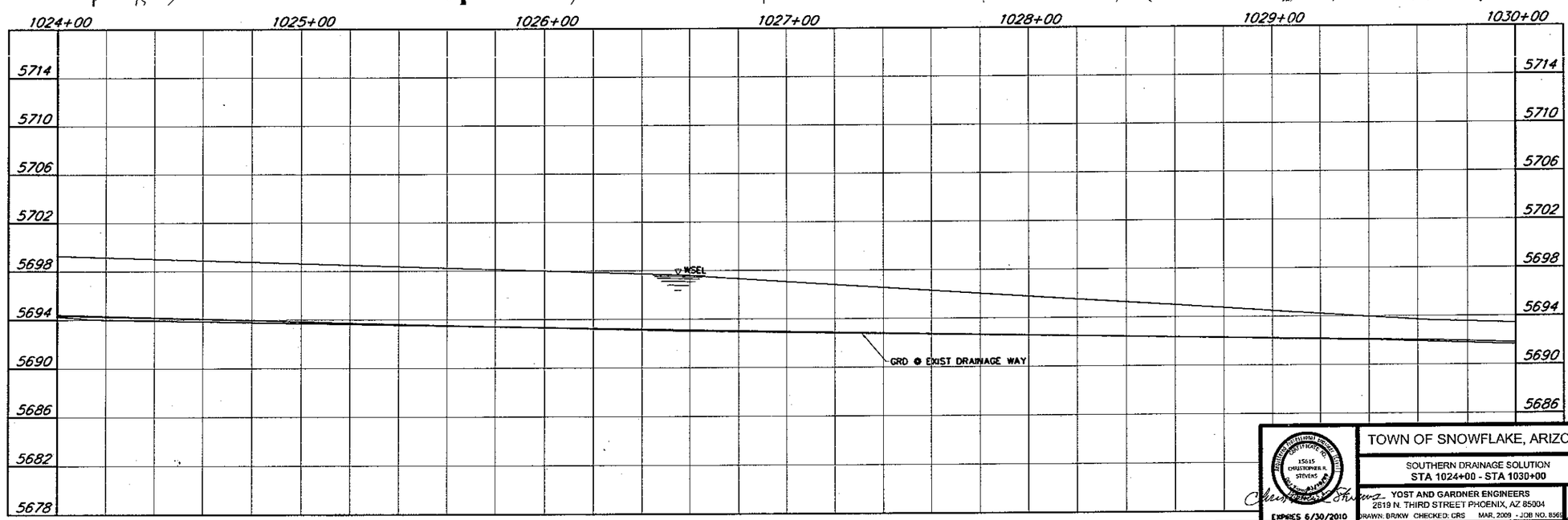
SOUTHERN DRAINAGE SOLUTION
STA 1018+00 - STA 1024+00

YOST AND GARDNER ENGINEERS
2619 N. THIRD STREET PHOENIX, AZ 85004
DRAWN: BRKW CHECKED: CRS MAR, 2009 - JOB NO. 8569

EXPIRES 6/30/2010

2/37





Mar 11, 2009 - 11:23am
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TOWN OF SNOWFLAKE, ARIZONA

SOUTHERN DRAINAGE SOLUTION
STA 1024+00 - STA 1030+00

YOST AND GARDNER ENGINEERS
2819 N. THIRD STREET PHOENIX, AZ 85004
DRAWN: BR/KW CHECKED: CRS MAR, 2009 - JOB NO. 8569

15615
CHRISTOPHER R.
STEVENS

EXPIRES 6/30/2010

3/37

CLOMR SUBMITTAL. REDUCED SCALE: HOR: 1" = 50', VERT 1" = 10'

MATCH LINE SHEET 3 - STA 1030+00

MATCH LINE SHEET 5 - STA 1030+00

EXISTING DRAINAGE WAY

SURVEY LINE

HEC RAS ℄

RS - 3200

JURISDICTIONAL WATERS OF THE U.S.

LEGEND

Delineated Waters of the United States. No disturbance, storage, fueling, discharge (fill) or staging in this area except where discharge (fill) is specifically shown on the plans.

NO CONSTRUCTION SHOWN ON THIS SHEET. SHEET PROVIDED FOR INFORMATION ONLY.

HOR 1" = 20'
VER 1" = 4'

1030+00 1031+00 1032+00 1033+00 1034+00 1035+00 1036+00

5706 5702 5698 5694 5690 5686 5682 5678 5674 5670

WSEL

GRD @ EXIST DRAINAGE WAY

CHRISTOPHER R. STEVENS 15619 REGISTERED PROFESSIONAL ENGINEER

EXPIRES 6/30/2010

TOWN OF SNOWFLAKE, ARIZONA

SOUTHERN DRAINAGE SOLUTION
STA 1030+00 - STA 1036+00

YOST AND GARDNER ENGINEERS
2619 N. THIRD STREET PHOENIX, AZ 85004
DRAWN: BR/KW CHECKED: CRS MAR. 2009 - JOB NO. 8569

4/37

CLOMR SUBMITTAL. REDUCED SCALE: HOR: 1" = 50', VERT 1" = 10'

Mar 11,2009 - 11:24am
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MATCH LINE SHEET 4 – STA 1036+00

MATCH LINE SHEET 6 – STA 1042+00

1036+00 1037+00 1038+00 1039+00 SURVEY LINE 1040+00 1041+00 1042+00

RS -3800

RS -4100

5688.6

5688

5686

HEC RAS ℄

JURISDICTIONAL WATERS OF THE U.S.

EXISTING DRAINAGE WAY

NO CONSTRUCTION SHOWN ON THIS SHEET. SHEET PROVIDED FOR INFORMATION ONLY.

HOR 1" = 20'
VER 1" = 4'

1036+00 1037+00 1038+00 1039+00 1040+00 1041+00 1042+00

5706 5702 5698 5694 5690 5686 5682 5678 5674 5670

▽ WSEL

GRD ⊕ EXIST DRAINAGE WAY

LEGEND

Delineated Waters of the United States. No disturbance, storage, fueling, discharge (fill) or staging in this area except where discharge (fill) is specifically shown on the plans.

REGISTERED PROFESSIONAL ENGINEER
15615
CHRISTOPHER R. STEVENS
EXPIRES 6/30/2010

TOWN OF SNOWFLAKE, ARIZONA

SOUTHERN DRAINAGE SOLUTION
STA 1036+00 - STA 1042+00

YOST AND GARDNER ENGINEERS
2619 N. THIRD STREET PHOENIX, AZ 85004
DRAWN: BRAKW CHECKED: CRS MAR, 2009 - JOB NO. 8565

5/37

CLOMR SUBMITTAL. REDUCED SCALE: HOR: 1" = 50', VERT 1" = 10'

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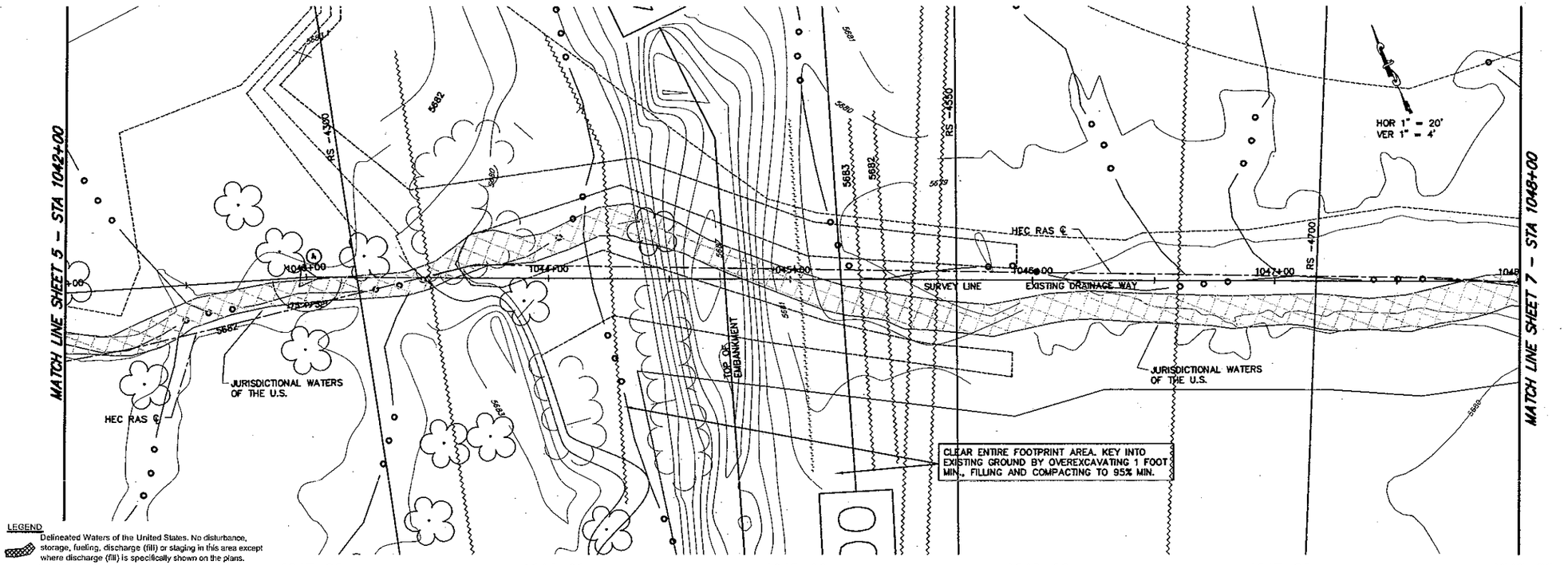


Revised. 2009–04–06, Removed extraneous notes. C.R.S.

Apr 06,2009 - 2:06pm
P:\SNOW\8568 Snowflake\Const Dwgs\8568-2-27-PP-2009-02-22wet.dwg

TOWN OF SNOWFLAKE, ARIZONA

SOUTHERN DRAINAGE SOLUTION
STA 1042+00 - STA 1048+00

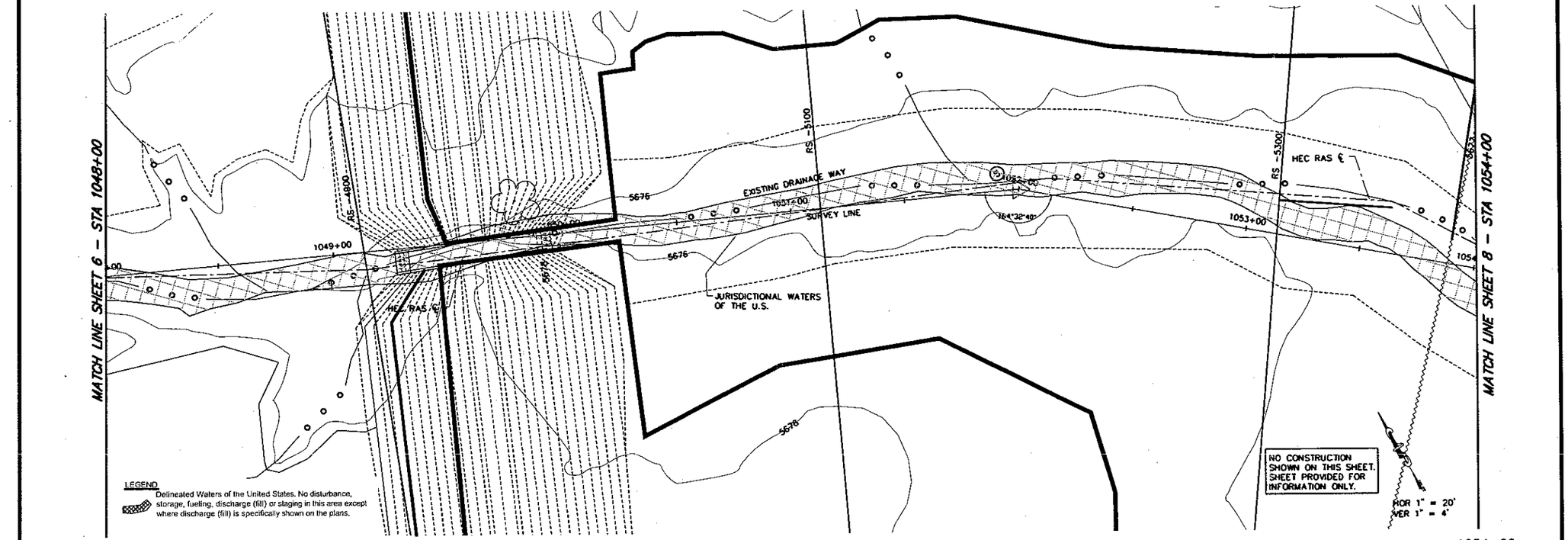
YOST AND GARDNER ENGINEERS
2619 N. THIRD STREET PHOENIX, AZ 85004

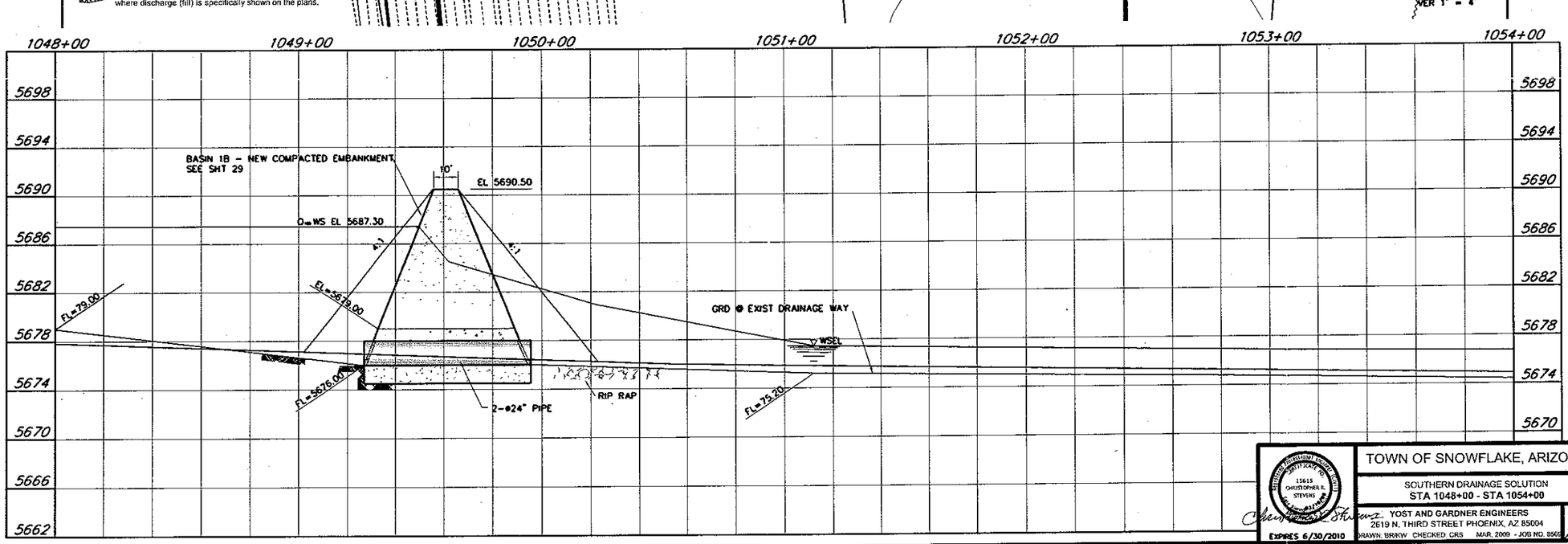
DRAWN: BR/KW CHECKED: CRS MAR, 2009 - JOB NO. 8568

EXPIRES 6/30/2010

6/37

CLOMR SUBMITTAL. REDUCED SCALE: HOR: 1" = 50', VERT 1" = 10'





Mar 11,2009 - 11:27am
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TOWN OF SNOWFLAKE, ARIZONA

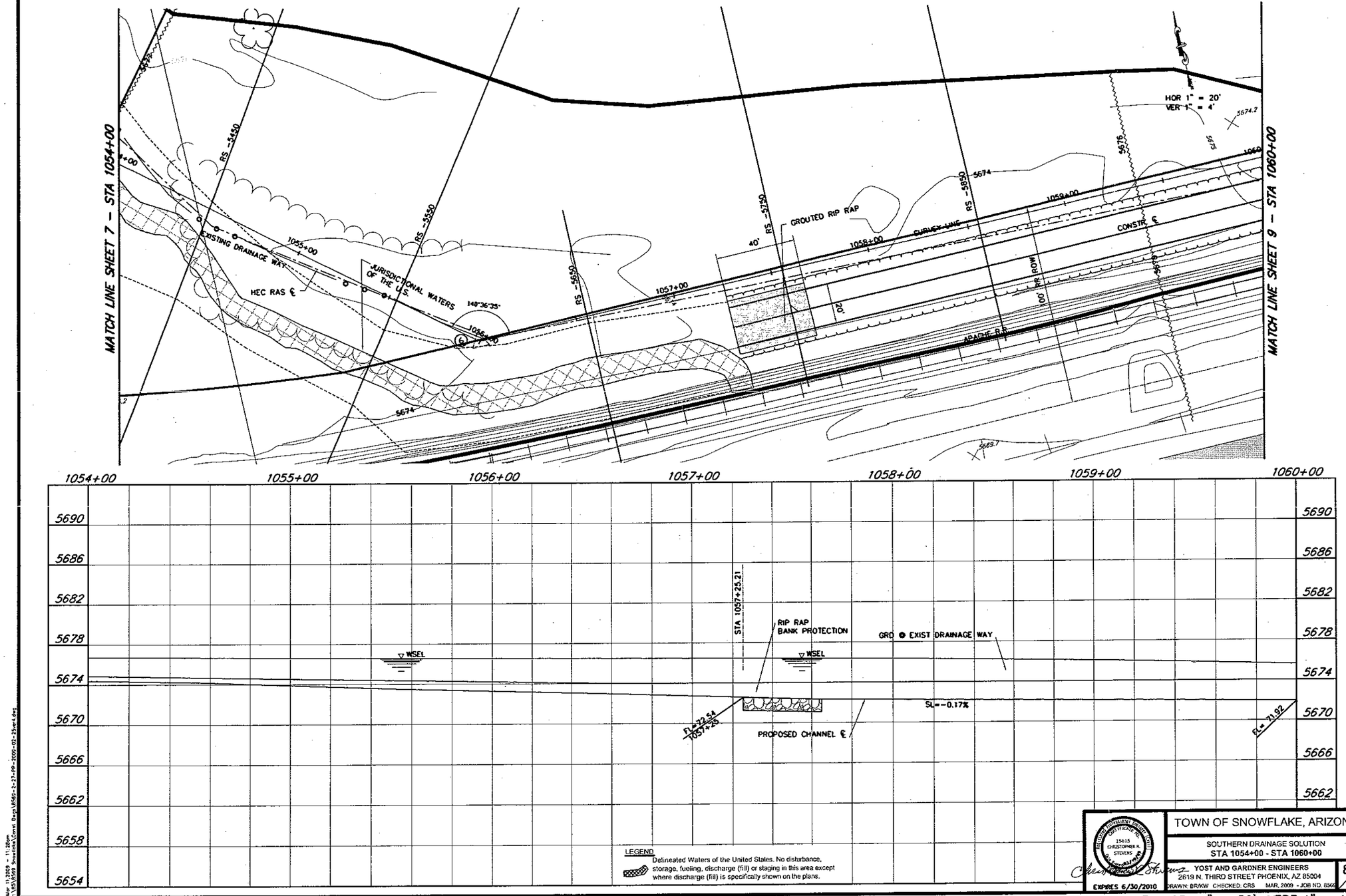
SOUTHERN DRAINAGE SOLUTION
STA 1048+00 - STA 1054+00

YOST AND GARDNER ENGINEERS
2619 N. THIRD STREET PHOENIX, AZ 85004
DRAWN: BR/KW CHECKED: CRS MAR, 2009 - JOB NO. 8505

7/37

EXPIRES 6/30/2010

CLOMR SUBMITTAL. REDUCED SCALE: HOR: 1" = 50', VERT 1" = 10'



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CHRISTOPHER R. STEVENS 15615 EXPIRES 6/30/2010

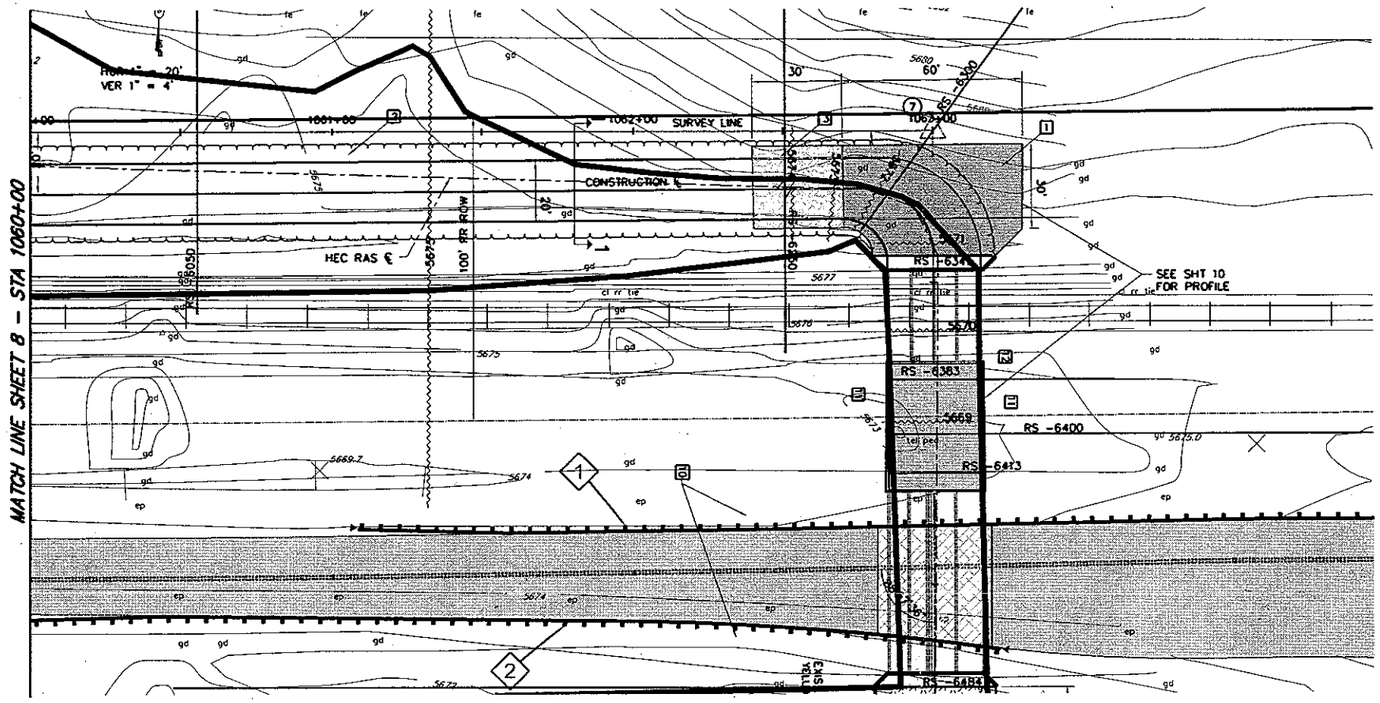
TOWN OF SNOWFLAKE, ARIZONA

SOUTHERN DRAINAGE SOLUTION
STA 1054+00 - STA 1060+00

YOST AND GARDNER ENGINEERS
2619 N. THIRD STREET PHOENIX, AZ 85004
DRAWN: BR/KW CHECKED: CRS MAR, 2009 - JOB NO. 8569

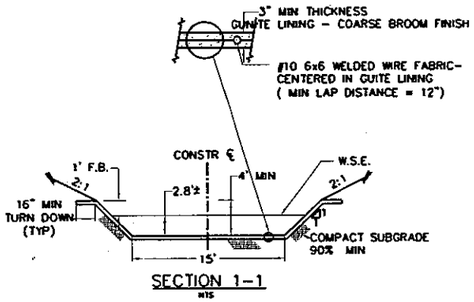
8/37

CLOMR SUBMITTAL. REDUCED SCALE: HOR: 1" = 50', VERT 1" = 10'



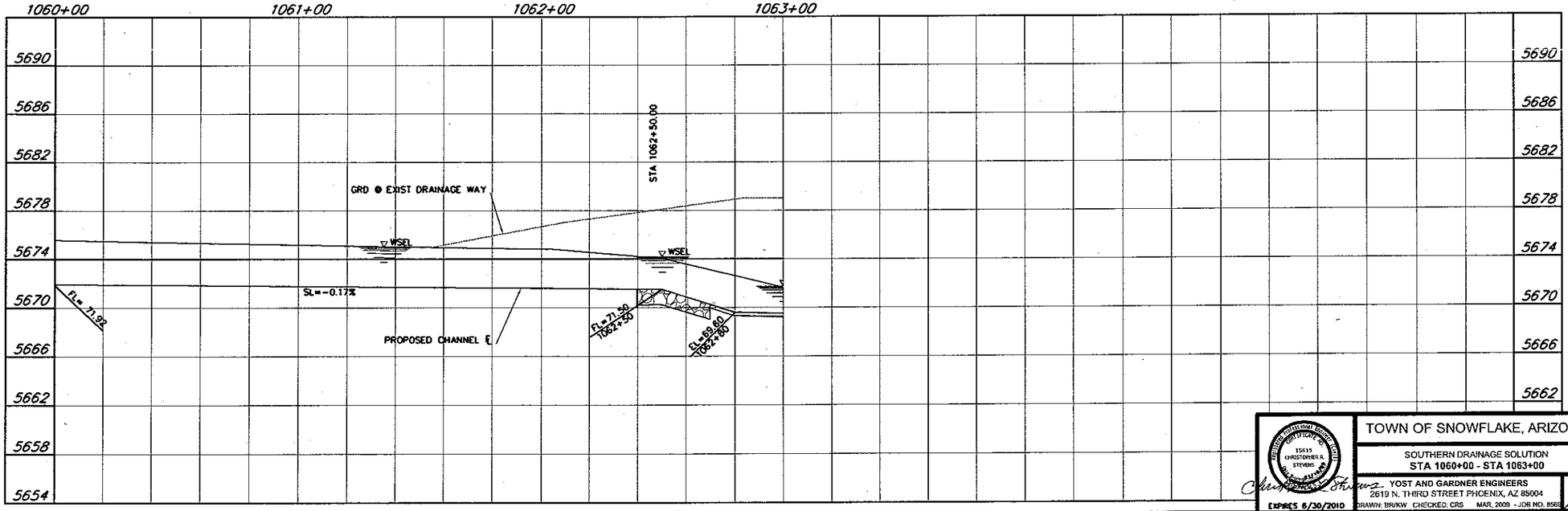
CONSTRUCTION NOTES:

1. GUNITE LINED DRAINAGE CHANNEL – SEE DTL SHT 10
2. EARTHEN CHANNEL – BID ALTERNATE, PROVIDE GUNITE LINED CHANNEL – SEE DTL THIS SHT
3. GROUTED RIP RAP –18" TYP.



SECTION 1-1
NTS

CURVE TABLE				
CURVE	RADIUS	TANGENT	LENGTH	DELTA
C1	30.95	25.70	42.90	79°24'47"



TOWN OF SNOWFLAKE, ARIZONA

SOUTHERN DRAINAGE SOLUTION
STA 1060+00 - STA 1063+00

15615 CHRISTOPHER R. STEVENS — EXPIRES 6/30/2010

YOST AND GARDNER ENGINEERS
2619 N. THIRD STREET PHOENIX, AZ 85004
DRAWN: BR/KW CHECKED: CRS MAR, 2009 - JOB NO. 8569

9/37

CLOMR SUBMITTAL. REDUCED SCALE: HOR: 1" = 50', VERT 1" = 10'

Mar 11,2009 - 12:50pm
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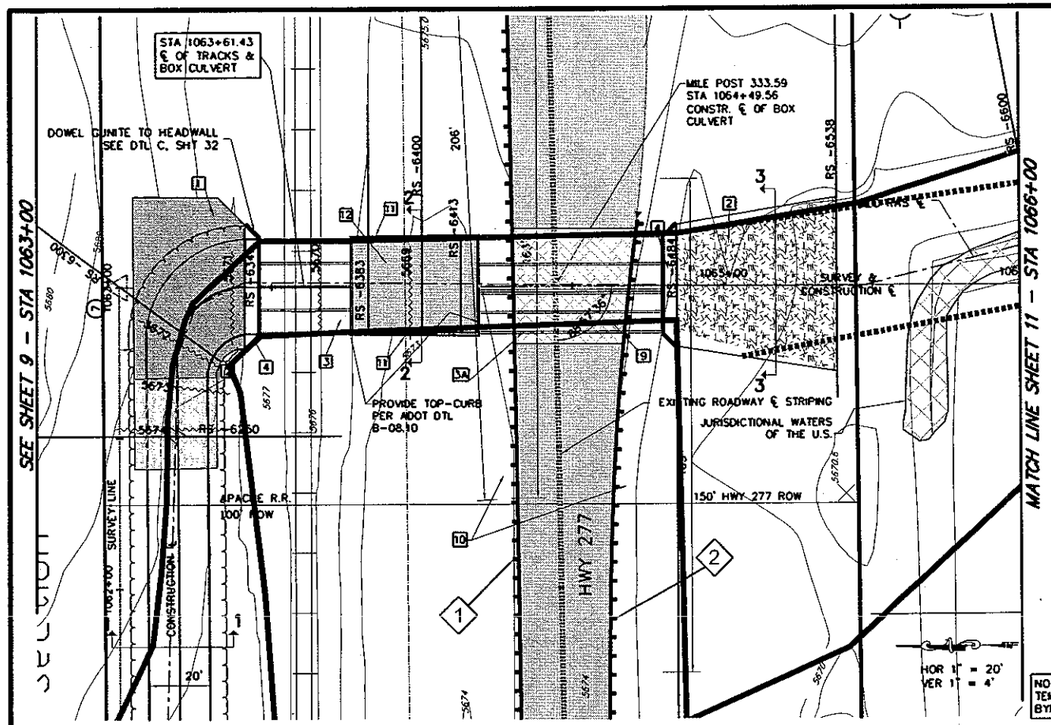
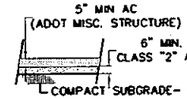


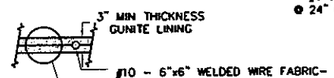
NOTE: SEE DETAILS OF TEMPORARY CONSTRUCTION BYPASS – SHEET 33

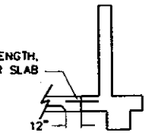
CONSTRUCTION NOTES:

1. GUNITE LINED DRAINAGE CHANNEL – SEE DTL THIS SHEET
2. GROUTED RIP RAP PER MAG DTL 555
3. CONCRETE BOX CULVERT – PER "MANUAL FOR RAILWAY ENGINEERING, CHAPTER 8, AMERICAN RAILWAY ENGINEERING AND MAINTENANCE-OF-WAY ASSOCIATION" – 4-BARREL 7' (WIDTH) x 3' (HEIGHT). SEE DTLS SHEET 33.
3A. CONCRETE BOX CULVERT – 4-BARREL (2-6'x3' AND 2-8'x3') PER ADOT STD DWG NO B-02.10 – LENGTH AS SHOWN. INLET WING WALLS DELETED – SEE DTLS SHT 32. (BID ALTERNATE NO. ONE – PRECAST BOX CULVERT).
4. INLET, OUTLET LEVEL WINGS PER ADOT STD DWG NO B-08.10. SEE SHT 32.
9. SAWCUT , REMOVE AND REPLACE EXIST A.C. PVMT. SEE DETAIL THIS SHEET.
10. TYPE 'A' GUARDRAIL PER ADOT STD DWG NO C-10.02. 50' ET-PLUS MBA POSTS AT END.
11. CANTILEVER RETAINING WALL PER ADOT STD DWG NO B-18.10. SEE SHT 30.
12. 8" THICK SLAB, ADOT CLASS S CONCRETE. REINFORCE WITH #4 @ 8" EACH WAY. THICKEN EDGE AT RETAINING WALL PER DETAIL A, THIS SHEET AND AT CULVERTS PER DETAIL B. SEE SHT 32.

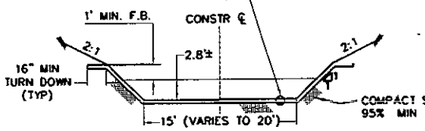


ASPHALT REPLACEMENT
N.T.S.

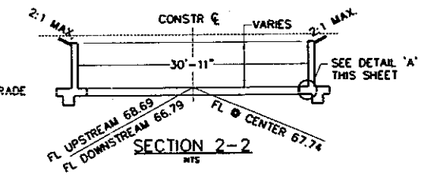




DETAIL A
N.T.S.

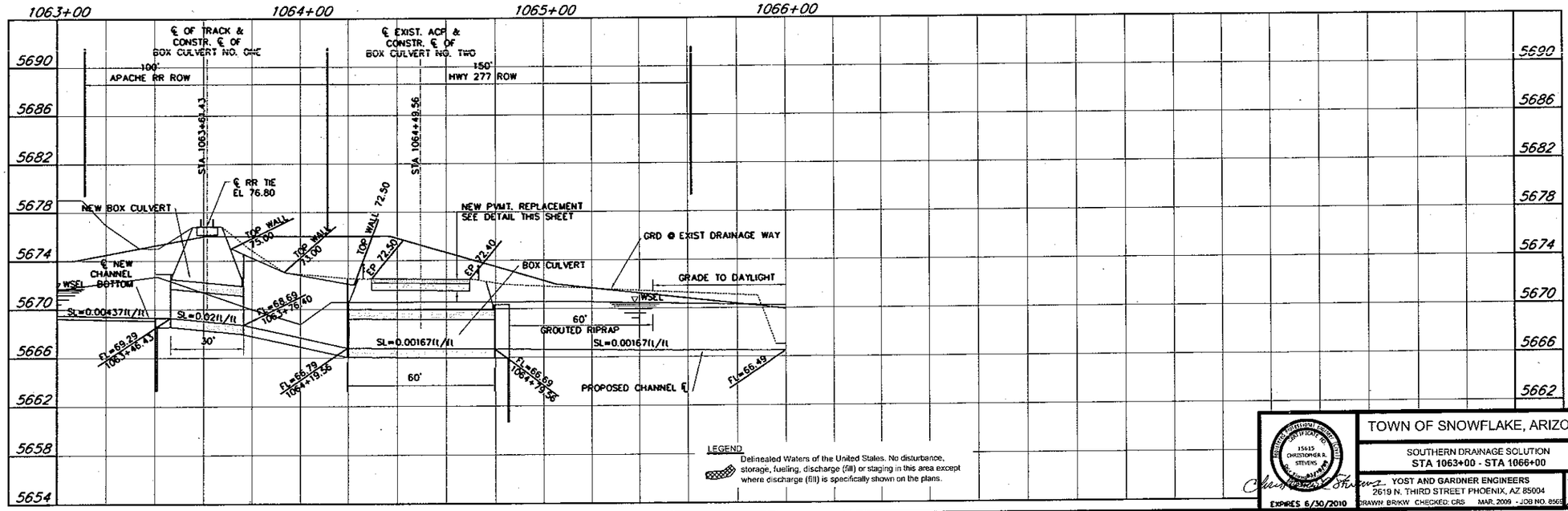


SECTION 1-1
N.T.S.



SECTION 2-2
N.T.S.

1063+00 1064+00 1065+00 1066+00



LEGEND

Delineated Waters of the United States. No disturbance, storage, fueling, discharge (fill) or staging in this area except where discharge (fill) is specifically shown on the plans.

TOWN OF SNOWFLAKE, ARIZONA

SOUTHERN DRAINAGE SOLUTION
STA 1063+00 - STA 1066+00

YOST AND GARDNER ENGINEERS
2619 N. THIRD STREET PHOENIX, AZ 85004
DRAWN: BR/KW CHECKED: CRS MAR. 2009 - JOB NO. 8569

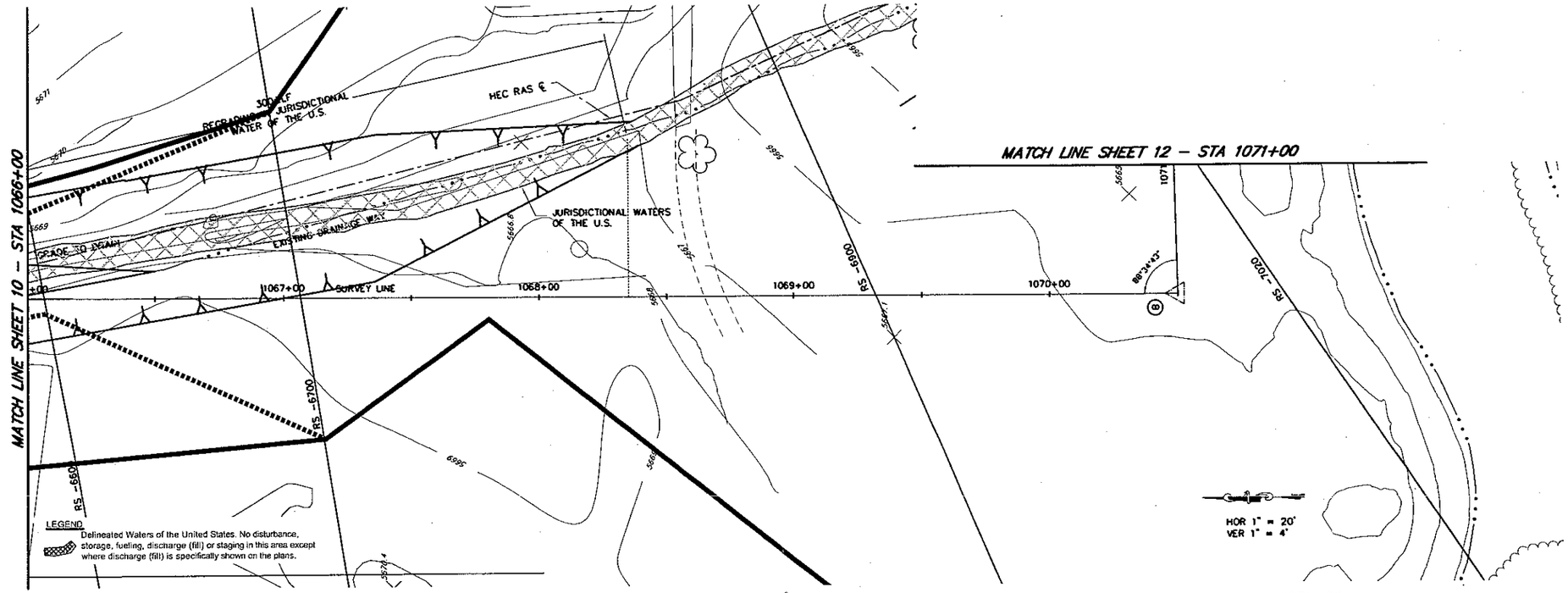
15615 CHRISTOPHER R. STEVENS
EXPIRES 6/30/2010

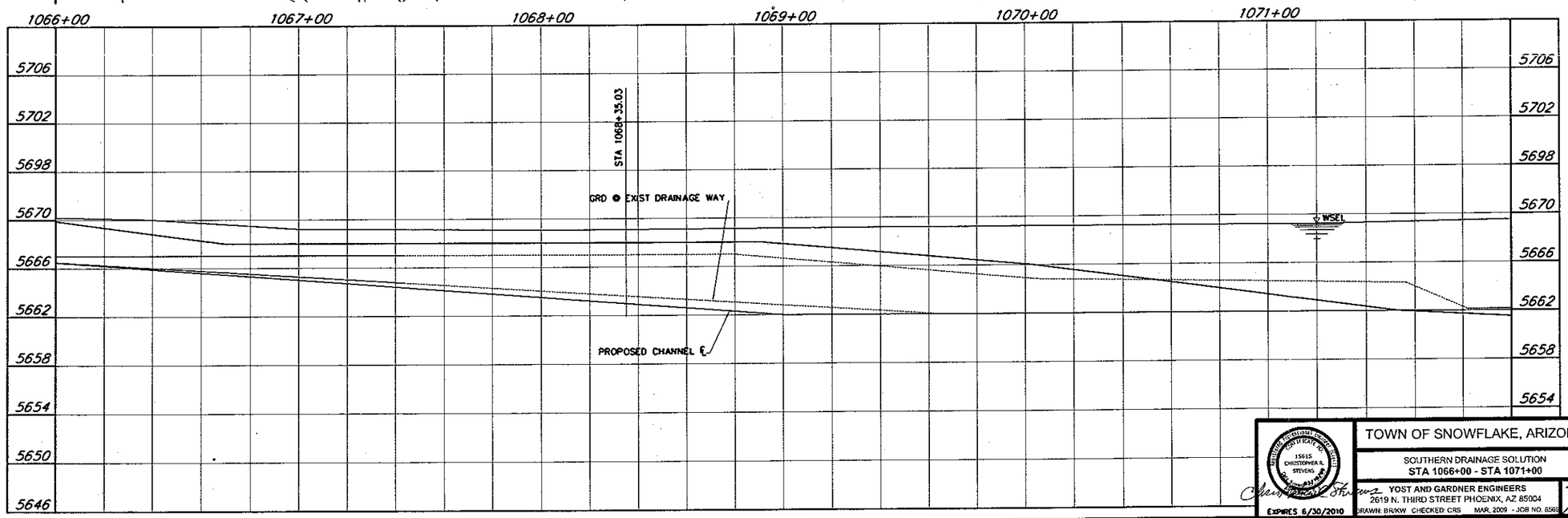
CLOMR SUBMITTAL. REDUCED SCALE: HOR: 1" = 50', VERT 1" = 10'

Mar 11, 2009 - 12:53pm
P:\85\8569 Snowflake\Const Dwgs\8569-2-27-09-03-25-ex4.dwg

MATCH LINE SHEET 10 – STA 1066+00

MATCH LINE SHEET 12 – STA 1071+00





TOWN OF SNOWFLAKE, ARIZONA

SOUTHERN DRAINAGE SOLUTION
STA 1066+00 - STA 1071+00

YOST AND GARDNER ENGINEERS
2619 N. THIRD STREET PHOENIX, AZ 85004
DRAWN: BR/KW CHECKED: CRS MAR, 2009 - JOB NO. 8569

11/37

15615 CHRISTOPHER R. STEVENS
EXPIRES 6/30/2010

CLOMR SUBMITTAL. REDUCED SCALE: HOR: 1" = 50', VERT 1" = 10'

Mar 11,2009 - 12:34pm
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MATCH LINE SHEET 11 – STA 1071+00

MATCH LINE SHEET 13 – STA 1077+00

REMOVE EXISTING OVERFLOW STRUCTURE AS NECESSARY. TIE INTO ENTRANCE OF OUTLET STRUCTURE.

GROUTED RIP RAP

OUTLET STRUCTURE SEE SHT. 30

SURVEY LINE

HEC RAS ℄

JURISDICTIONAL WATERS OF THE U.S.

EXISTING DRAINAGE WAY

RS – 7150

RS – 7250

RS – 7300

RS – 7400

RS – 7425

CLEAR ENTIRE FOOTPRINT AREA. KEY INTO EXISTING GROUND BY OVEREXCAVATING 1 FOOT MIN., FILLING AND COMPACTING TO 95% MIN.

SHAPE AND OVERSEED – SEE SEC. A–A SHT 30

1071+00 1072+00 1073+00 1074+00 1075+00 1076+00 1077+00

5682 5678 5674 5670 5666 5662 5658 5654 5650 5646

5706 5702 5698 5670 5666 5662 5658 5654

BASIN 2 – NEW COMPACTED EMBANKMENT SEE SHT. 30

EL 5671.50

100 WS EL 5669.91

WSEL

4:1

RIP RAP

EL = 5652.00

PROPOSED CHANNEL ℄

GRD ⊙ EXIST. DRAINAGE WAY

CLEAR ENTIRE FOOTPRINT AREA. KEY INTO EXISTING GROUND BY OVEREXCAVATING 1 FOOT MIN., FILLING AND COMPACTING TO 95% MIN.

LEGEND

Delineated Waters of the United States. No disturbance, storage, fueling, discharge (fill) or staging in this area except where discharge (fill) is specifically shown on the plans.

TOWN OF SNOWFLAKE, ARIZONA

SOUTHERN DRAINAGE SOLUTION

STA 1071+00 - STA 1077+00

YOST AND GARDNER ENGINEERS
2819 N. THIRD STREET PHOENIX, AZ 85004

DRAWN: BRKW CHECKED: CRS MAR. 2009 - JOB NO. 8565

12/37

EXPIRES 6/30/2010

CLOMR SUBMITTAL. REDUCED SCALE: HOR: 1" = 50', VERT 1" = 10'

Mar 11,2009 - 12:36pm
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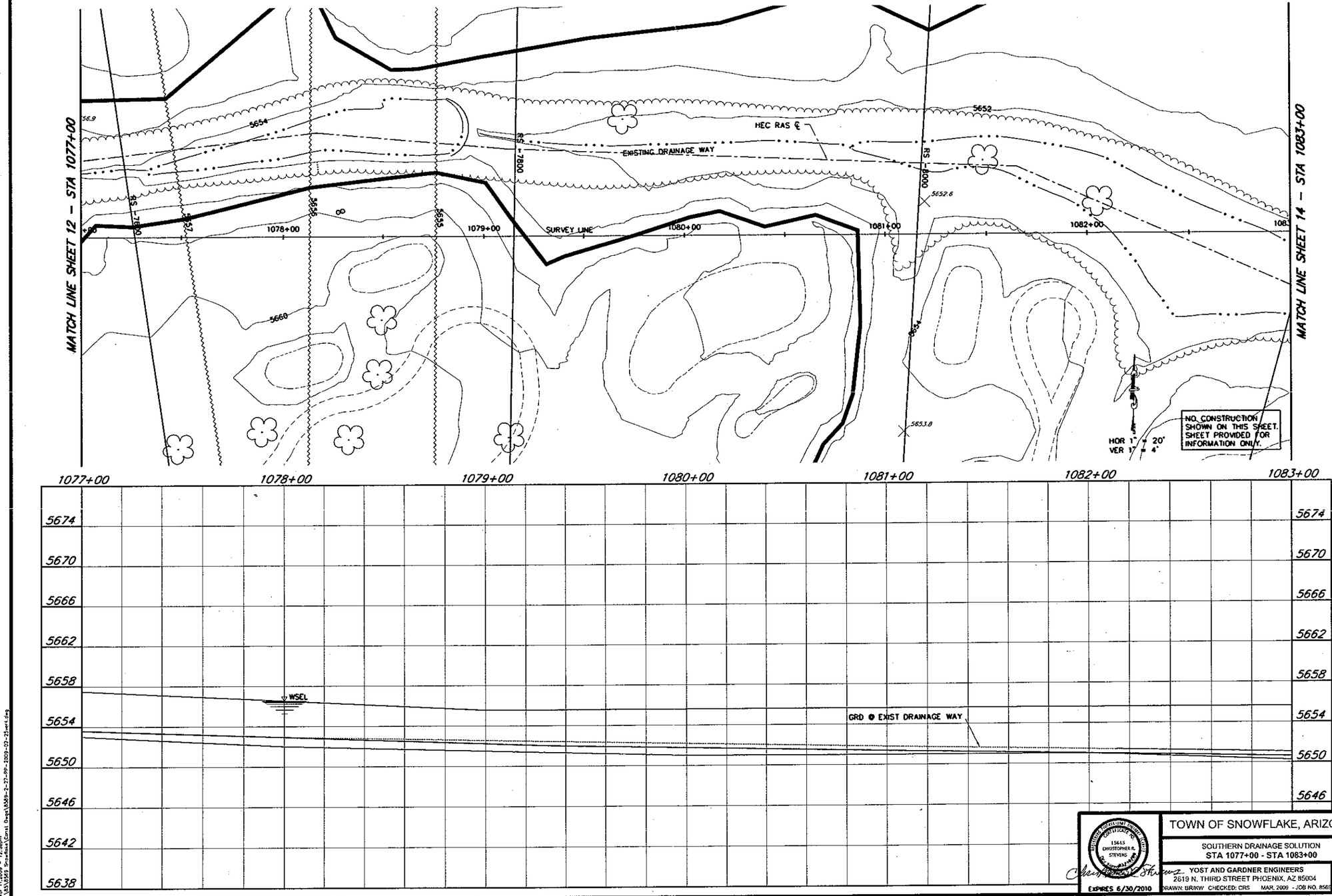

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CHRISTOPHER R. STEVENS 15615 EXPIRES 6/30/2010

TOWN OF SNOWFLAKE, ARIZONA

SOUTHERN DRAINAGE SOLUTION
STA 1077+00 - STA 1083+00

YOST AND GARDNER ENGINEERS
2619 N. THIRD STREET PHOENIX, AZ 85004
DRAWN: BR/KW CHECKED: CRS MAR, 2009 - JOB NO. 8568

13/37

CLOMR SUBMITTAL. REDUCED SCALE: HOR: 1" = 50', VERT 1" = 10'

MATCH LINE SHEET 13 – STA 1083+00

MATCH LINE SHEET 15 – STA 1089+00

RS -8200

RS -8400

RS -8600

RS -8800

SURVEY LINE

1083+00 1084+00 1085+00 1086+00 1087+00 1088+00 1089+00

5652.9

5650.4

5651.5

5654

5650

5622

HEC RAS ℄

JURISDICTIONAL WATERS OF THE U.S.

EXISTING DRAINAGE WAY

HOR 1" = 20'
VER 1" = 4'

NO CONSTRUCTION SHOWN ON THIS SHEET. SHEET PROVIDED FOR INFORMATION ONLY.

WSEL

GRD @ EXIST DRAINAGE WAY

PROPOSED CHANNEL ℄

LEGEND

Delineated Waters of the United States. No disturbance, storage, fueling, discharge (fill) or staging in this area except where discharge (fill) is specifically shown on the plans.

5674 5670 5666 5662 5658 5654 5650 5646 5642 5638

Mar 11,2009 - 12:36pm
P:\85\8585 Snowflake\Const Dwgs\8585-2-27-PP-2009-03-25ver4.dwg

CHRISTOPHER R. STEVENS 15615 REGISTERED LAND SURVEYOR

EXPIRES 6/30/2010

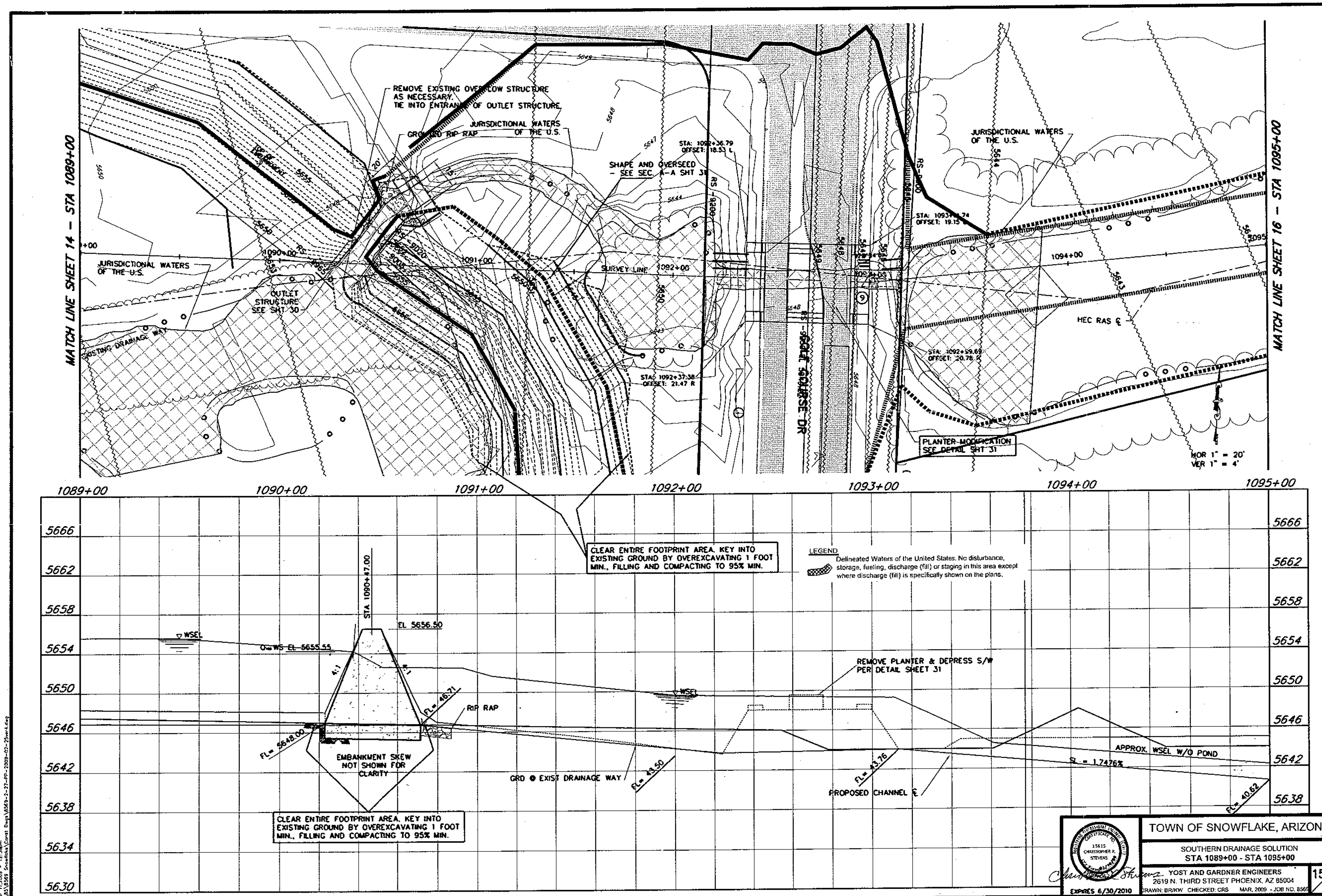
TOWN OF SNOWFLAKE, ARIZONA

SOUTHERN DRAINAGE SOLUTION
STA 1083+00 - STA 1089+00

YOST AND GARDNER ENGINEERS
2619 N. THIRD STREET PHOENIX, AZ 85004
DRAWN: BR/KW CHECKED: CRS MAR, 2009 - JOB NO. 8585

14/37

CLOMR SUBMITTAL. REDUCED SCALE: HOR: 1" = 50', VERT 1" = 10'



CLOMR SUBMITTAL. REDUCED SCALE: HOR: 1" = 50', VERT 1" = 10'

MATCH LINE SHEET 15 - STA 1095+00

MATCH LINE SHEET 17 - STA 1101+00

HEC RAS ℄

EXISTING DRAINAGE WAY

SURVEY LINE

RS 3700

RS 3550

167°27'37"

HOR 1" = 20'
VER 1" = 4'

NO CONSTRUCTION SHOWN ON THIS SHEET. SHEET PROVIDED FOR INFORMATION ONLY.

1095+00 1096+00 1097+00 1098+00 1099+00 1100+00 1101+00

5454 5650 5646 5642 5638 5634 5630 5626 5622 5618

APPROX. WSEL W/O POND

SL = 1.74.76%

FL = 40.82

WSEL

FL = 37.00
08

SL = 1.00%

GRD @ EXIST DRAINAGE WAY

SLW=0.6027%

FL = 34.50
08

FL = 29.98

TOWN OF SNOWFLAKE, ARIZONA

SOUTHERN DRAINAGE SOLUTION
STA 1095+00 - STA 1101+00

YOST AND GARDNER ENGINEERS
2619 N. THIRD STREET PHOENIX, AZ 85004
DRAWN: BR/KW CHECKED: CRS MAR, 2009 - JOB NO. 8565

16/37

EXPIRES 6/30/2010

CLOMR SUBMITTAL. REDUCED SCALE: HOR: 1" = 50', VERT 1" = 10'

Mar 11 2009 - 12:58am
P:\EV\8565 Snowflake\Const Dwgs\8565-2-27-PP-2005-09-25ver4.dwg

MATCH LINE SHEET 16 – STA 1101+00

NEXT SHEET 18 – STA 1107+00

EXISTING DRAINAGE WAY

SURVEY LINE

JURISDICTIONAL WATERS OF THE U.S.

DENSE VEGETATION

NO CONSTRUCTION SHOWN ON THIS SHEET. SHEET PROVIDED FOR INFORMATION ONLY.

HOR 1" = 50'
VER 1" = 10'

LEGEND

Delineated Waters of the United States. No disturbance, storage, fueling, discharge (fill) or staging in this area except where discharge (fill) is specifically shown on the plans.

1101+00 1102+00 1103+00 1104+00 1105+00 1106+00 1107+00

5654 5650 5646 5642 5638 5634 5630 5626 5622 5618

Ft = 29.98

S = -0.6027%

GRD @ EXIST DRAINAGE WAY

WSEL

Ft = 30.50

TOWN OF SNOWFLAKE, ARIZONA

SOUTHERN DRAINAGE SOLUTION
STA 1101+00 - STA 1107+00

YOST AND GARDNER ENGINEERS
2619 N. THIRD STREET PHOENIX, AZ 85004
DRAWN: BR/KW CHECKED: CRS MAR, 2009 - JOB NO. 8565

17/37

EXPIRES 6/30/2010

CLOMR SUBMITTAL. REDUCED SCALE: HOR: 1" = 50', VERT 1" = 10'

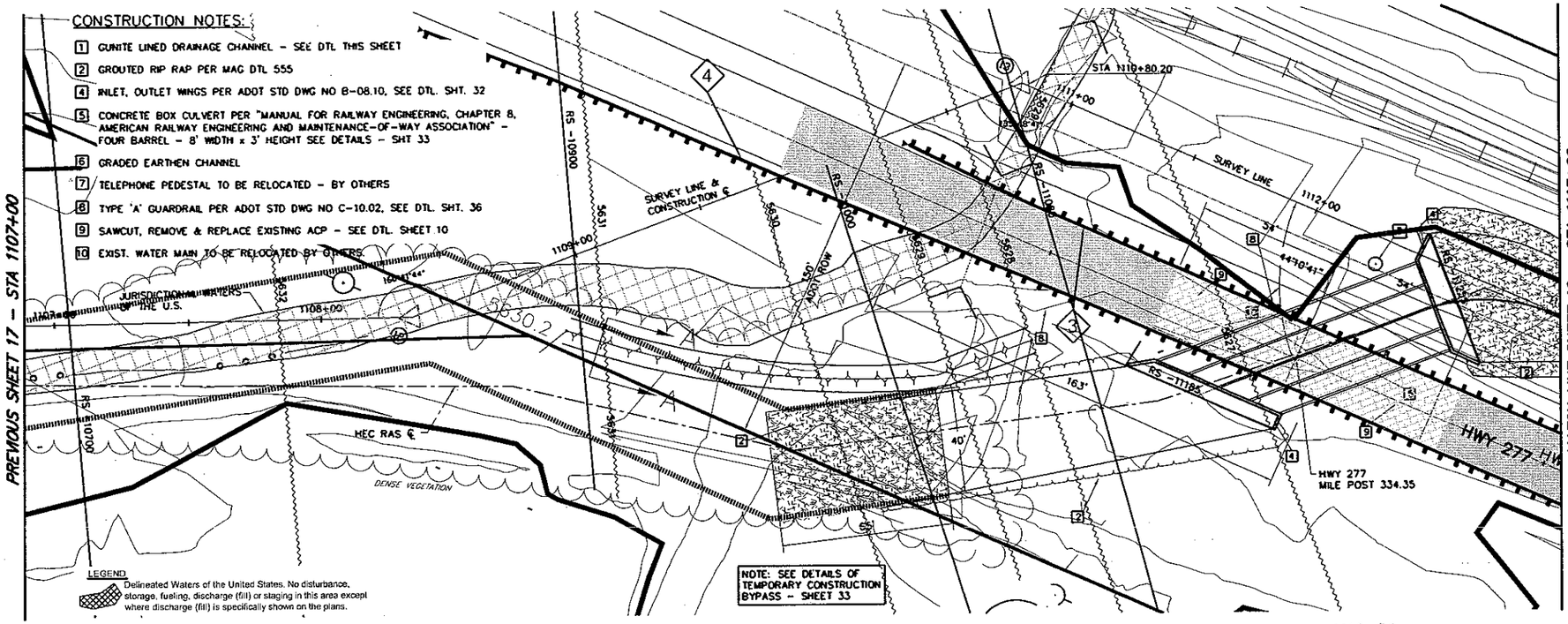
Mar 11,2009 - 1:00pm
P:\8565\8565 Snowflake\Const Dwg\8565-2-27-09-2009-03-25wer4.dwg

CONSTRUCTION NOTES:

1. GUNITE LINED DRAINAGE CHANNEL - SEE DTL THIS SHEET
2. GROUTED RIP RAP PER MAG DTL 555
4. INLET, OUTLET WINGS PER ADOT STD DWG NO B-08.10, SEE DTL. SHT. 32
5. CONCRETE BOX CULVERT PER "MANUAL FOR RAILWAY ENGINEERING, CHAPTER 8, AMERICAN RAILWAY ENGINEERING AND MAINTENANCE-OF-WAY ASSOCIATION" - FOUR BARREL - 8' WIDTH x 3' HEIGHT SEE DETAILS - SHT 33
6. GRADED EARTHEN CHANNEL
7. TELEPHONE PEDESTAL TO BE RELOCATED - BY OTHERS
8. TYPE 'A' GUARDRAIL PER ADOT STD DWG NO C-10.02, SEE DTL. SHT. 36
9. SAWCUT, REMOVE & REPLACE EXISTING ACP - SEE DTL. SHEET 10
10. EXIST. WATER MAIN TO BE RELOCATED BY OTHERS

PREVIOUS SHEET 17 - STA 1107+00

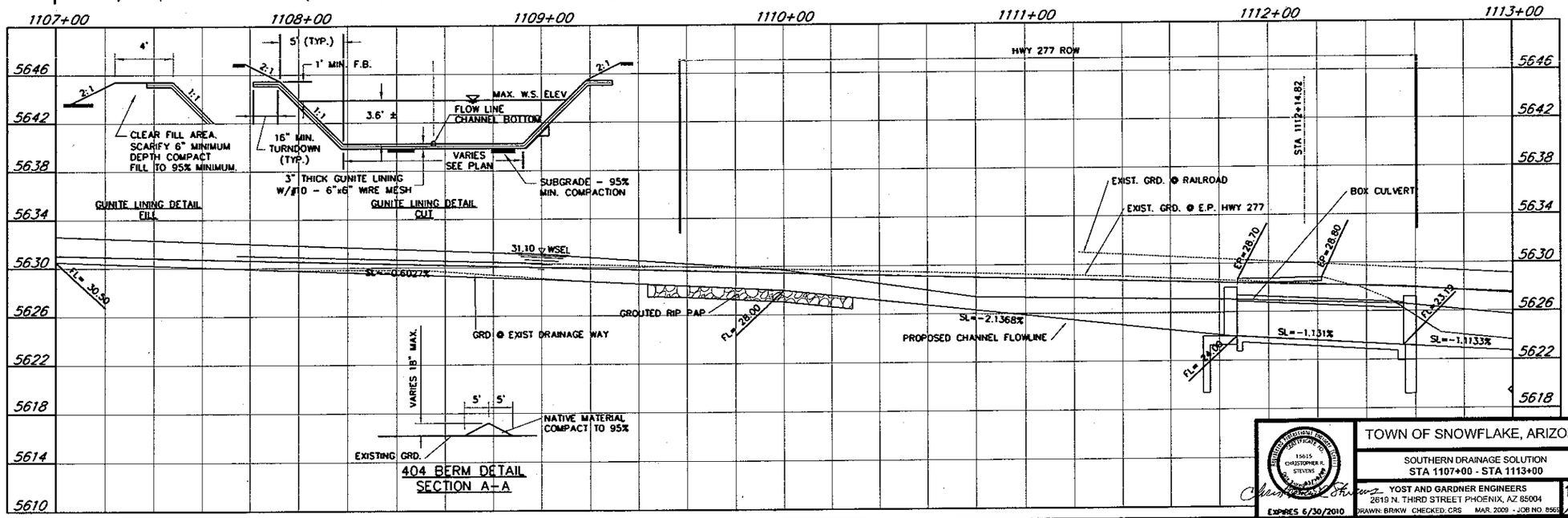
MATCH LINE SHEET 19 - STA 1113+00



LEGEND

Delineated Waters of the United States. No disturbance, storage, fueling, discharge (fill) or staging in this area except where discharge (fill) is specifically shown on the plans.

NOTE: SEE DETAILS OF TEMPORARY CONSTRUCTION BYPASS - SHEET 33



404 BERM DETAIL
SECTION A-A

TOWN OF SNOWFLAKE, ARIZONA

SOUTHERN DRAINAGE SOLUTION
STA 1107+00 - STA 1113+00

YOST AND GARDNER ENGINEERS
2619 N. THIRD STREET PHOENIX, AZ 85004
DRAWN: BRKW CHECKED: CRS MAR. 2009 - JOB NO. 8565

18/37

EXPIRES 6/30/2010

CLOMR SUBMITTAL. REDUCED SCALE: HOR: 1" = 50', VERT 1" = 10'

Mar 11,2009 - 1:00pm
P:\8565\8565 Snowflake\Const Docs\8569-2-27-09-2009-02-23-v4.dwg

MATCH LINE SHEET 18 – STA 1113+00

MATCH LINE SHEET 20 – STA 1119+00

CAUTION !! HIGH PRESSURE GAS LINES – DEPTH VARIES. CONTRACTOR TO VERIFY EXACT LOCATION AND DEPTH PRIOR TO START OF CONSTRUCTION (NON-PAY ITEM). CONTRACTOR MUST CONTACT U.E.S. 72 HRS PRIOR TO EXCAVATION

APACHE RR

DENSE VEG

HWY 277

℄ EXIST. PVMT.

CONSTRUCTION ℄ & SURVEY LINE

MOULDING PLANT ENTRANCE ROAD

SAWCUT & REMOVE 2' MIN

1117+74.81 ℄ MOULDING PLT. ENTRANCE RD.

5' MIN. SAWCUT & REMOVE

CONSTRUCTION NOTES:

1. GUNITE LINED DRAINAGE CHANNEL – SEE DTL SHEET 18
5. CONCRETE BOX CULVERT PER "MANUAL FOR RAILWAY ENGINEERING, CHAPTER 8, AMERICAN RAILWAY ENGINEERING AND MAINTENANCE-OF-WAY ASSOCIATION" FOUR BARREL – 8' WIDTH x 3' HEIGHTSEE DETAILS – SHT 33
9. SAWCUT, REMOVE & REPLACE EXISTING ACP IN KIND
10. EXIST. WATER MAIN TO BE RELOCATED BY OTHERS
11. EXIST. POWER POLES TO BE RELOCATED BY OTHERS

HOR 1" = 20'
VER 1" = 4'

GUNITE LINED DRAINAGE CHANNEL n.t.s.

EXIST GRD. ℄ RAILROAD TRACK

EXIST GRD. ℄ NORTH EDGE EXIST. ACP – HWY 277

GRD ℄ EXIST DRAINAGE WAY

PROPOSED CHANNEL FLOWLINE

WSEL

SL=-1.1133%

L= 22.46

FL= 22.46

FL=17.60

SL=-0.625%

FL=17.25

SL=-0.2487%

FL=16.77

FL= 16.59

40'

2'

℄ MOULDING PLT. ENTRANCE RD.

STA 1117+74.81 CONSTR. ℄ BOX CULVERT

4.50'

EP 23.00

EP 23.00

CAUTION !! HIGH PRESSURE 4" & 6" GAS MAINS. CONTRACTOR TO VERIFY EXACT LOCATION AND DEPTH PRIOR TO START OF CONSTRUCTION (NON-PAY ITEM) CONTRACTOR MUST CONTACT U.E.S. 72 HRS. PRIOR TO EXCAVATION

TOWN OF SNOWFLAKE, ARIZONA

SOUTHERN DRAINAGE SOLUTION
STA 1113+00 - STA 1119+00

YOST AND GARDNER ENGINEERS
2619 N. THIRD STREET PHOENIX, AZ 85004
DRAWN: BR/KW CHECKED: CRS MAR. 2009 - JOB NO. 8569

CHRISTOPHER R. STEVENS 15615 EXPIRES 6/30/2010

19/37

CLOMR SUBMITTAL. REDUCED SCALE: HOR: 1" = 50', VERT 1" = 10'

Mar 11,2009 - 1:02pm
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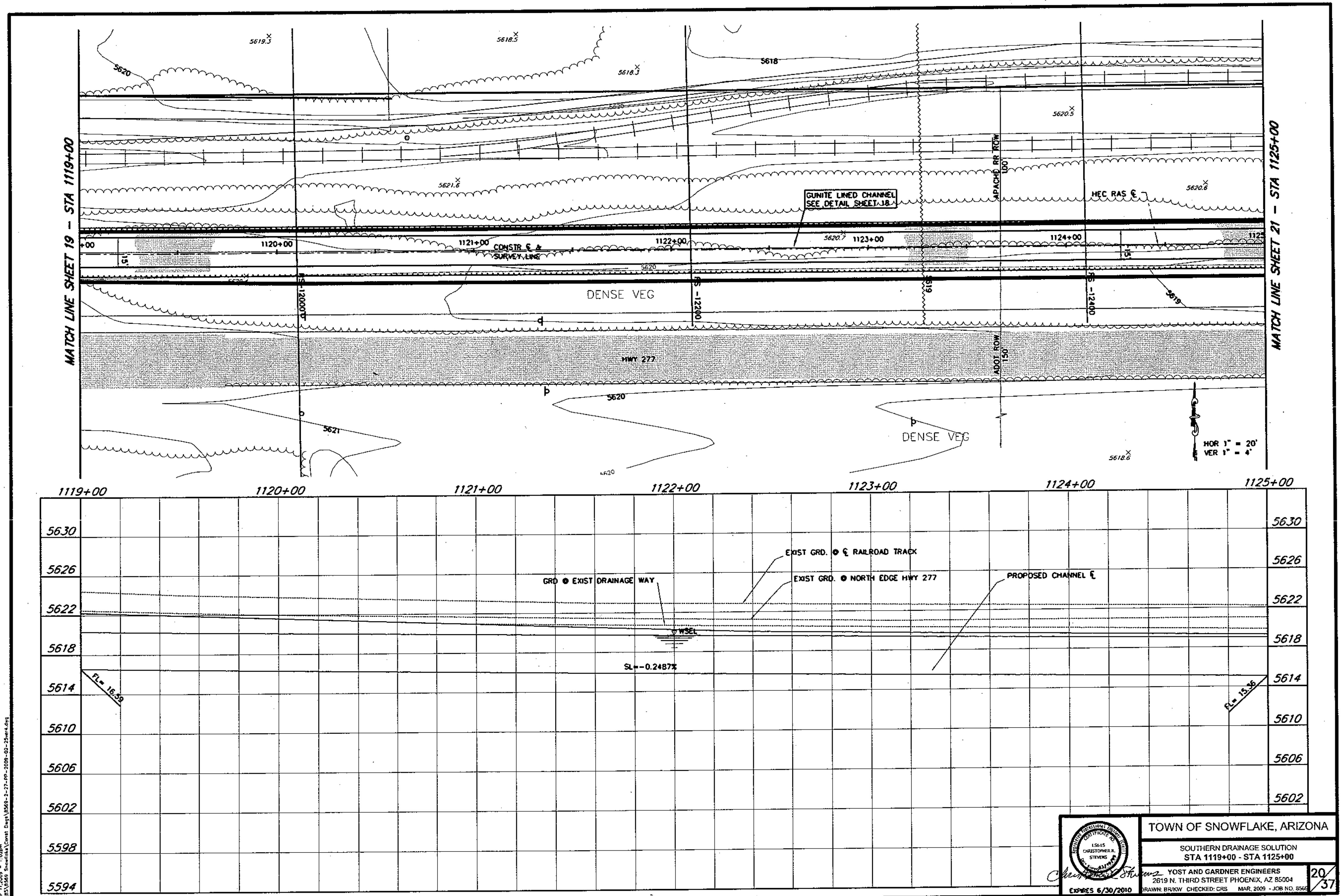

TOWN OF SNOWFLAKE, ARIZONA

SOUTHERN DRAINAGE SOLUTION
STA 1119+00 - STA 1125+00

YOST AND GARDNER ENGINEERS
2619 N. THIRD STREET PHOENIX, AZ 85004
DRAWN: BR/KW CHECKED: CRS MAR. 2009 - JOB NO. 8569

EXPIRES 6/30/2010

20/37

CLOMR SUBMITTAL. REDUCED SCALE: HOR: 1" = 50', VERT 1" = 10'

MATCH LINE SHEET 20 – STA 1125+00

MATCH LINE SHEET 22 – STA 1131+00

DENSE VEG

APACHE RR ROW 100'

HEC RAS ℄

GUNITE LINED CHANNEL SEE DETAIL SHEET 18

CONSTR ℄ & SURVEY LINE

INLET SEE DTL. BELOW

GRADE TO DRAIN

HWY 277

ADOT ROW 150'

22.29 ACP

24.32 ACP

HOR 1" = 20'
VER 1" = 4'

1125+00 1126+00 1127+00 1128+00 1129+00 1130+00 1131+00

5630 5626 5622 5618 5614 5610 5606 5602 5598 5594

GRD ⊙ EXIST DRAINAGE WAY

EXIST GRD. ⊙ ℄ RAIL ROAD

EXIST GRD. ⊙ NORTH EDGE HWY 277

SET INLET 6" MIN. BELOW ℄ AT EXISTING CULVERT AND 6" MIN. BELOW TOP OF LINING. TIE INTO CULVERT LINING.

PROPOSED CHANNEL ℄

WSEL

SL=-0.2487%

FL= 15.35

FL= 13.80

5' 16" MIN

2'

6"

CUTOFF WALL

REINFORCE INLET WITH WWF PER GUNITE CHANNEL. REINFORCE CUT OFF WITH #4 @ 10" BOTH WAYS. CONTINUE WWF INTO CUTOFF WALL. LAP 10" MIN.

INLET DETAIL

CLOMR SUBMITTAL. REDUCED SCALE: HOR: 1" = 50', VERT 1" = 10'

TOWN OF SNOWFLAKE, ARIZONA

SOUTHERN DRAINAGE SOLUTION
STA 1125+00 - STA 1131+00

YOST AND GARDNER ENGINEERS
2619 N. THIRD STREET PHOENIX, AZ 85004
DRAWN: BR/KW CHECKED: CRS MAR, 2009 - JOB NO. 8569

21/37

15615 CHRISTOPHER R. STEVENS REGISTERED PROFESSIONAL ENGINEER

EXPIRES 6/30/2010

Mar 11,2009 - 1:01pm
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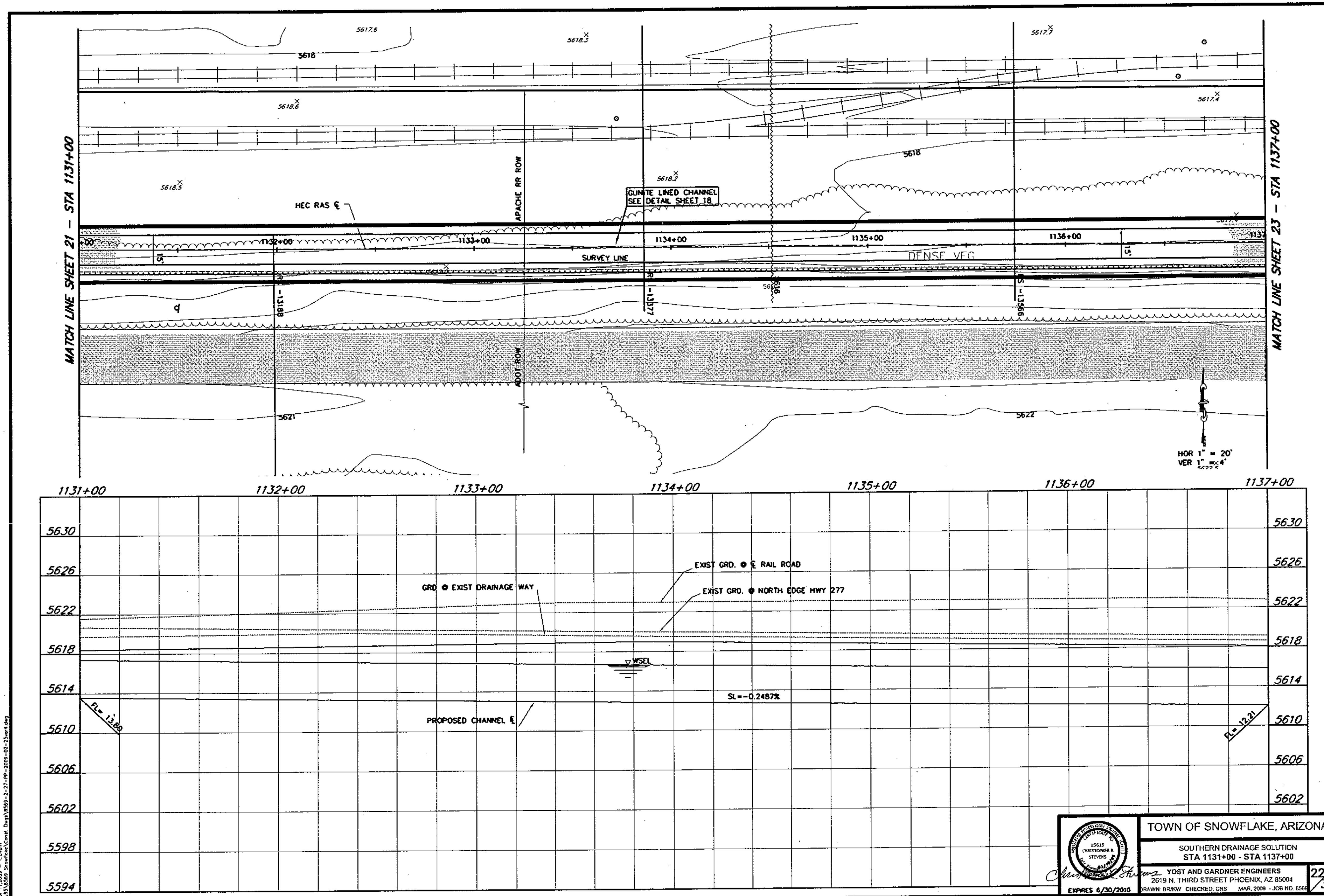


TOWN OF SNOWFLAKE, ARIZONA

SOUTHERN DRAINAGE SOLUTION
STA 1131+00 - STA 1137+00

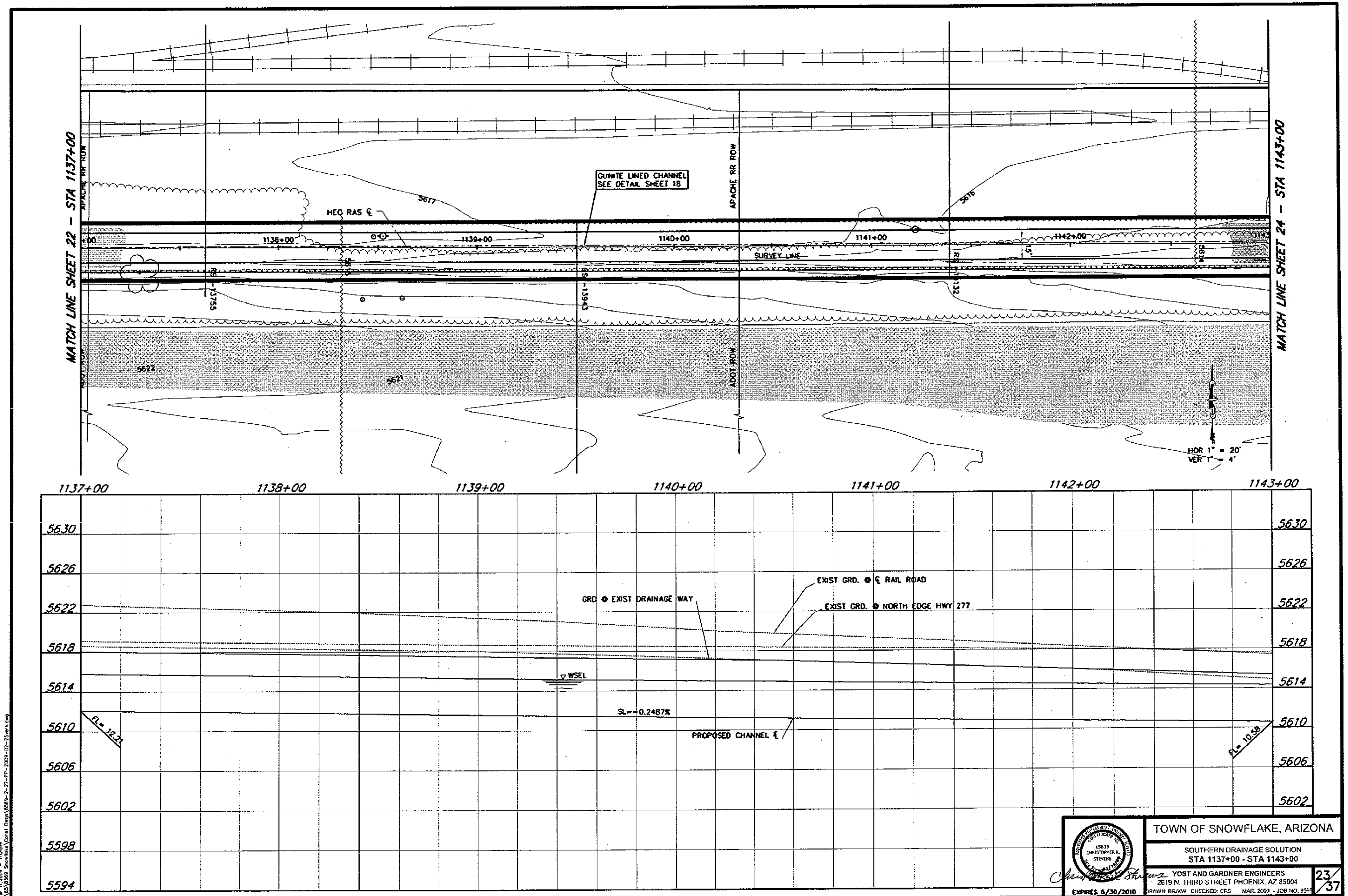
YOST AND GARDNER ENGINEERS
2619 N. THIRD STREET PHOENIX, AZ 85004

DRAWN: BR/KW CHECKED: CRS MAR. 2009 - JOB NO. 8569

EXPIRES 6/30/2010

22/37

CLOMR SUBMITTAL. REDUCED SCALE: HOR: 1" = 50', VERT 1" = 10'



CLOMR SUBMITTAL. REDUCED SCALE: HOR: 1" = 50', VERT 1" = 10'

MATCH LINE SHEET 23 – STA 1143+00

MATCH LINE SHEET 25 – STA 1149+00

INDUSTRIAL DRIVE

APACHE RR

APACHE RR ROW 100'

ADOT ROW 150'

HEC RAS ℄

NOTE: SET ℄ OF NEW PIPE 0.25' MINIMUM BELOW ℄ AT EXISTING HEADWALL

BOX CULVERT STA 1145+66.07

SEE DETAIL BELOW

℄ INDUSTRIAL DR. STA 1145+62.04

CONSTRUCTION ℄ & L SURVEY LINE

DENSE VEG

HWY 277

HOR 1" = 20'
VER 1" = 4'

CONSTRUCTION NOTES:

1. GUNITE LINED DRAINAGE CHANNEL – SEE DTL SHT 18
5A. CONCRETE BOX CULVERT – 4-BARREL (2-6'x3' AND 2-8'x3') PER ADOT STD DWG NO. B-02.10 – LENGTH AS SHOWN. (BID ALTERNATE NO. ONE – PRECAST BOX CULVERT). SEE DTL. SHT. 32
9. SAWCUT, REMOVE & REPLACE EXISTING ACP IN KIND
10. REMOVE EXISTING CULVERTS (4) (NON PAY ITEM)
11. REMOVE EXIST. HEADWALLS, INSTALL 48 L.F. NEW CMP OR RCRCP CULVERT – MATCH EXISTING SIZE.

1143+00 1144+00 1145+00 1146+00 1147+00 1148+00 1149+00

5630 5626 5622 5618 5614 5610 5606 5602 5598 5594

℄ INDUSTRIAL DRIVE

STA 1145+62.04

EP 15.00

BP 15.10

CULVERT NO. 5 – CONC. BOX CULVERT 2-6'x3' AND 2-8'x3' BARRELS

EXIST GRD. @ ℄ RAILROAD TRACK

EXIST GRD. @ NORTH EDGE ACP – HWY 277

GRD @ EXIST DRAINAGE WAY

PROPOSED CHANNEL FLOWLINE

WSEL

SL=-0.2487%

FL= 10.58

FL=10.00

SL=-3.17%

FL=08.00

63'

10.55 WSEL

SL=-0.5027%

PROPOSED CHANNEL FLOWLINE

FL= 06.41

THICKEN GUNITE AS NECESSARY TO PROVIDE 1 1/2" COVER OVER REINFORCEMENT

2 # 4 @ 45° TYPICAL

REINFORCEMENT AT PIPE INLET

CLOMR SUBMITTAL. REDUCED SCALE: HOR: 1" = 50', VERT 1" = 10'

15615 CHRISTOPHER R. STEVENS

EXPIRES 6/30/2010

TOWN OF SNOWFLAKE, ARIZONA

SOUTHERN DRAINAGE SOLUTION
STA 1143+00 - STA 1149+00

YOST AND GARDNER ENGINEERS
2619 N. THIRD STREET PHOENIX, AZ 85004
DRAWN: BR/KW CHECKED: CRS MAR, 2009 - JOB NO. 8569

24/37

May 11, 2009 - 1:06pm
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MATCH LINE SHEET 24 – STA 1149+00

MATCH LINE SHEET 26 – STA 1155+00

APACHE RR

APACHE RR ROW 100'

GUNITE LINED CHANNEL SEE DETAIL SHEET 18

SEE GUNITE LINING FILL DETAIL SHEET 18

SURVEY LINE & CONSTRUCTION ℄

HEC RAS ℄

RS - 4975

RS - 5112

RS - 5250

HWY 277

ADOT ROW 150'

SEE DT. BELOW GRADE TO DRAIN

HOR: 1" = 20'
VER: 1" = 4'

1149+00 1150+00 1151+00 1152+00 1153+00 1154+00 1155+00

5626 5622 5618 5614 5610 5606 5602 5598 5594 5590

GRD @ EXIST DRAINAGE WAY

EXIST GRD. @ ℄ RAILROAD TRACK

EXIST GRD. @ NORTH EDGE HWY 277

PROPOSED CHANNEL ℄

WSEL

SL=-0.5027%

FL= 06.42

FL= 03.45

SET INLET 6" MIN. BELOW ℄ AT EXISTING CULVERT AND 6" MIN. BELOW TOP OF LINING. TIE INTO CULVERT LINING.

5' 16" MIN 2' 6" CUTOFF WALL

REINFORCE INLET WITH WWF PER GUNITE CHANNEL. REINFORCE CUT OFF WITH #4 @ 10" BOTH WAYS. CONTINUE WWF INTO CUTOFF WALL. LAP 10" MIN.

INLET DETAIL

CLOMR SUBMITTAL. REDUCED SCALE: HOR: 1" = 50', VERT 1" = 10'

TOWN OF SNOWFLAKE, ARIZONA

SOUTHERN DRAINAGE SOLUTION
STA 1149+00 - STA 1155+00

YOST AND GARDNER ENGINEERS
2619 N. THIRD STREET PHOENIX, AZ 85004
DRAWN: BR/KW CHECKED: CRS MAR. 2009 - JOB NO. 8569

25/37

CHRISTOPHER R. STEVENS 15615 EXPIRES 6/30/2010

May 11, 2009 - 1:07pm
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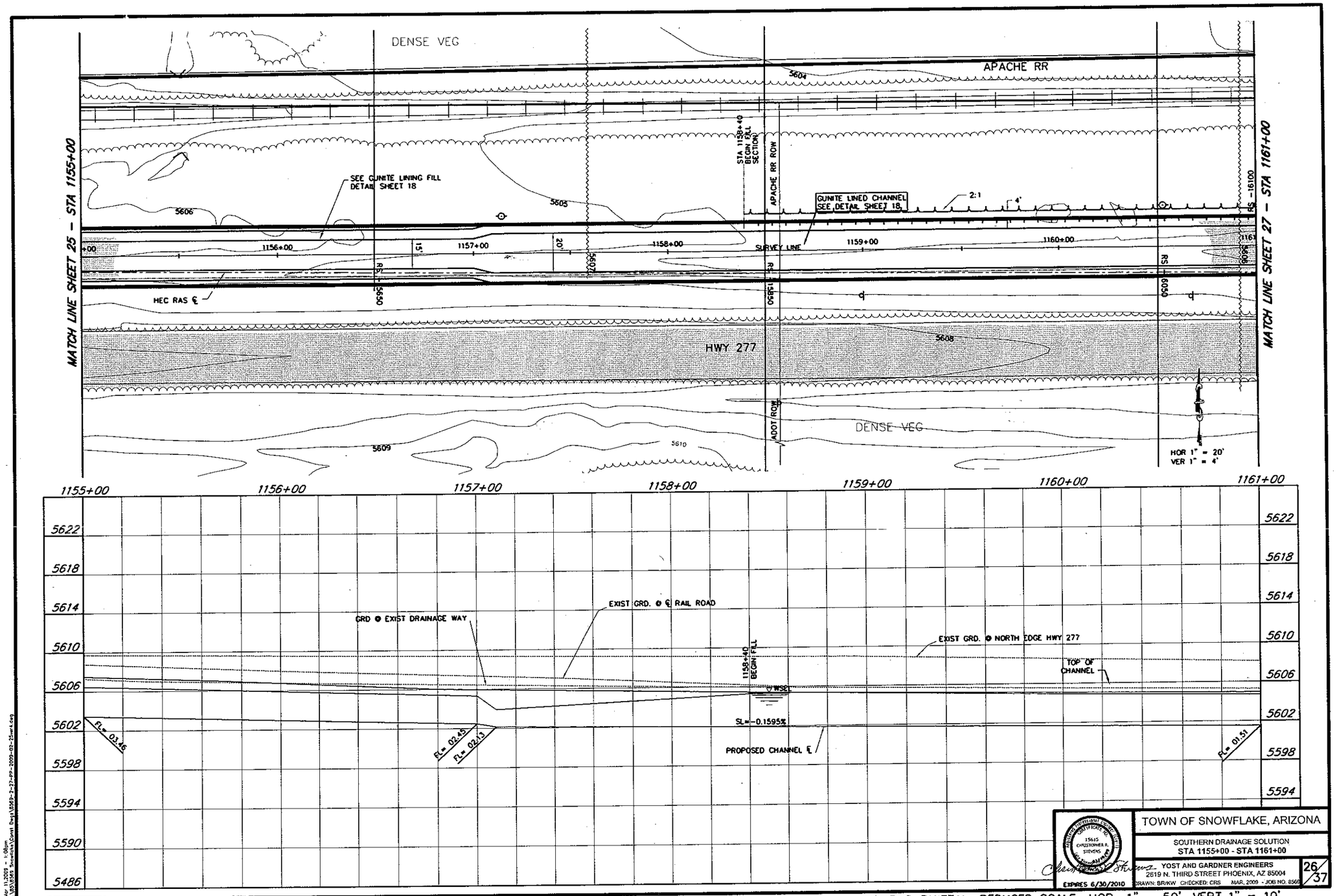

CLOMR SUBMITTAL. REDUCED SCALE: HOR: 1" = 50', VERT 1" = 10'

TOWN OF SNOWFLAKE, ARIZONA

SOUTHERN DRAINAGE SOLUTION
STA 1155+00 - STA 1161+00

YOST AND GARDNER ENGINEERS
2619 N. THIRD STREET PHOENIX, AZ 85004
DRAWN: BR/KW CHECKED: CRS MAR, 2009 - JOB NO. 8565

26/37

CHRISTOPHER R. STEVENS 15615 EXPIRES 6/30/2010

Mar 11,2009 - 11:08am
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MATCH LINE SHEET 26 – STA 1161+00

CONSTRUCTION NOTES:

3 REMOVE & DISPOSE OF EXISTING CMP CULVERTS (4), NON-PAY ITEM

4 INLET, OUTLET WINGS PER SEE DETAILS SHT 32

5A CONCRETE BOX CULVERT PER "MANUAL FOR RAILWAY ENGINEERING, CHAPTER 8, AMERICAN RAILWAY ENGINEERING AND MAINTENANCE-OF-WAY ASSOCIATION" – FOUR BARREL – 7' WIDTH x 3' HEIGHT SEE DETAILS – SHT 33

APACHE RR ROW

APACHE RR

SEE GUNITE LINING FILL DETAIL SHEET 18

END FILL SECTION

CONSTRUCTION ℄ & SURVEY LINE

HWY 277 ROW 150'

HWY 277

STA 1163+27.86

FILL SECTION

SPREADER DISCHARGE BASIN

12ø RIP-RAP

DENSEE LN

HOR 1" = 20'
VER 1" = 4'

1161+00 1162+00 1163+00 1164+00 1165+00 1166+00 1167+00

EXIST GRD. @ NORTH EDGE HWY 277

EXIST GRD. @ ℄ RAIL ROAD

GRD @ EXIST DRAINAGE WAY

FILL TO 5605.25

WSEL

SL=-0.1595%

PROPOSED CHANNEL ℄

Fl= 01.5:1

68'

STA 1164+36.98

ELEV.=5607.08

BOX CULVERT NO. 6

SL=-1.087%

Fl=01.00

Fl=00.50

46'

PROPOSED CHANNEL ℄

Fl=01.00

ELEV=5598.0

GROUTED RIP RAP

2:1

18"

SECTION A-A
N.T.S.

TOWN OF SNOWFLAKE, ARIZONA

SOUTHERN DRAINAGE SOLUTION
STA 1161+00 - STA 1167+00

YOST AND GARDNER ENGINEERS
2619 N. THIRD STREET PHOENIX, AZ 85004
DRAWN: BR/KW CHECKED: CRS MAR, 2009 - JOB NO. 8565

EXPIRES 6/30/2010

27/37

CLOMR SUBMITTAL. REDUCED SCALE: HOR: 1" = 50', VERT 1" = 10'

Mar 11,2009 - 1:09pm
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B(5699.19)

F(5700.72)

B(5700.39)

2050

5705
5709
5705
5700

A
A
C
C

B
B
B

JURISDICTIONAL WATERS OF THE US

CULTURAL RESOURCES SITE CONTRACTOR TO AVOID ALL DISTURBANCE IN THE AREA

NAVAJO RD

CONSTRUCT NEW EMBANKMENT. COMPACT 95% MINIMUM.

10'

4:1

4:1

CLEAR ENTIRE FOOTPRINT AREA. KEY INTO EXISTING GROUND BY OVEREXCAVATING 1 FOOT MIN., FILLING AND COMPACTING TO 95% MIN. (typ.)

EXIST. GROUND

SECTION A-A
SCALE 1"=20'

EXIST. GROUND

4:1

VARIES

SECTION B-B
SCALE NTS.

CONSTRUCT NEW EMBANKMENT. COMPACT 95% MINIMUM.

10'

4:1

4:1

EXIST. GROUND

SECTION C-C
SCALE 1"=20'

LEGEND

Delineated Waters of the United States. No disturbance, storage, fueling, discharge (fill) or staging in this area except where discharge (fill) is specifically shown on the plans.

EXISTING CONTOUR

FINISH CONTOUR

SCALE: 1" = 60'

0 120

60 180

TOWN OF SNOWFLAKE, ARIZONA

INDUSTRIAL PARK DRAINAGE
BASIN 1A EXCAVATION AND EMBANKMENT

YOST AND GARDNER ENGINEERS
2619 N. THIRD STREET PHOENIX, AZ 85004
DRAWN: BRKW CHECKED: CRS MAR, 2009 - JOB NO. 8569

28/37

CLOMR SUBMITTAL. REDUCED SCALE: HOR: 1" = 150' (1:2.5)

Mar 12,2009 - 9:16am
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LEGEND

Delineated Waters of the United States. No disturbance, storage, fueling, discharge (fill) or staging in this area except where discharge (fill) is specifically shown on the plans.

JURISDICTIONAL WATERS OF THE US

B(5688.95)
F(5688.96)

B(5686.38)
F(5686.38)

B(5686.40)
F(5686.40)

B(5683.74)
F(5683.74)

B(5679.05)

A
A

B
B

RS ~3500
RS ~3800
RS ~4100
RS ~4550

SECTION A–A
SCALE 1"=20'

CONSTRUCT NEW EMBANKMENT. COMPACT 95% MINIMUM.

EXIST. GROUND

SECTION B–B
SCALE 1"=20'

CLEAR ENTIRE FOOTPRINT AREA. KEY INTO EXISTING GROUND BY OVEREXCAVATING 1 FOOT MIN., FILLING AND COMPACTING TO 95% MIN.

EXIST. GROUND

SCALE: 1" = 50'

0 100
50 150

LEGEND
EXISTING CONTOUR
FINISH CONTOUR

Revised. 2009-04-06, Corrected call out for Sec A-A (Northern embankment) C.R.S.

TOWN OF SNOWFLAKE, ARIZONA

INDUSTRIAL PARK DRAINAGE
BASIN 1B EMBANKMENT

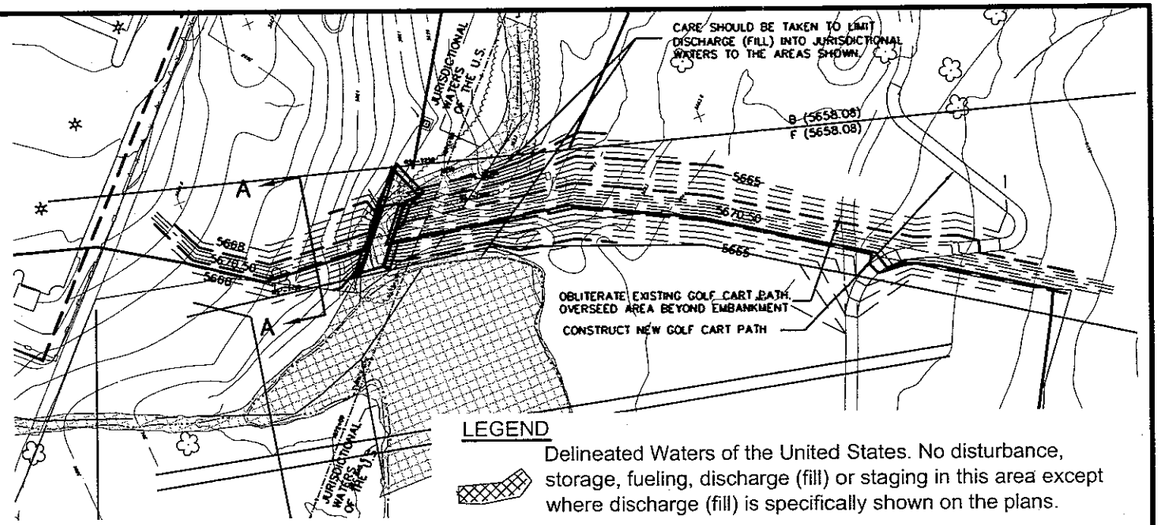
YOST AND GARDNER ENGINEERS
2619 N. THIRD STREET PHOENIX, AZ 85004
DRAWN: BR/KW CHECKED: CRS MAR, 2009 - JOB NO. 8569

LS619 CHRISTOPHER R. STEVENS REGISTERED PROFESSIONAL ENGINEER ARIZONA U.S.A.
Expires 2010-06-30

29/37

Apr 06,2009 - 1:50pm
P:\8569\Snowflake\Const Dwgs\8569-29-3]-EMBANKMENT.dwg

CLOMR SUBMITTAL. REDUCED SCALE: HOR: 1" = 120' (1:2.4)



LEGEND

Delineated Waters of the United States. No disturbance, storage, fueling, discharge (fill) or staging in this area except where discharge (fill) is specifically shown on the plans.

SCALE: 1" = 40'

0 80

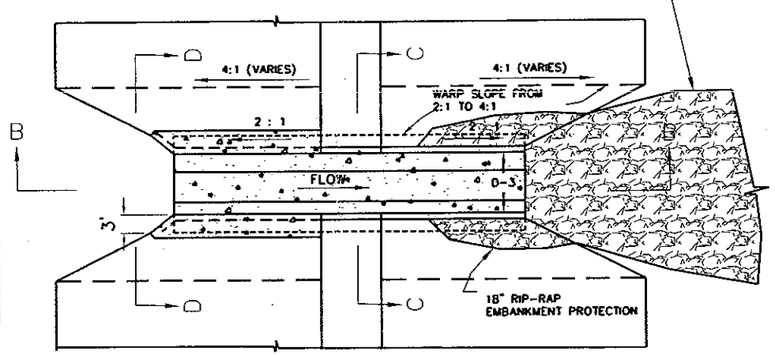
40 120

LEGEND

EXISTING CONTOUR

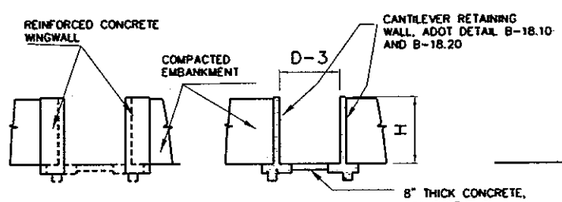
FINISH CONTOUR

18" RIP-RAP OUTLET PROTECTION. SEE INDIVIDUAL EMBANKMENT SHEETS FOR EXACT SIZE ANY LOCATION

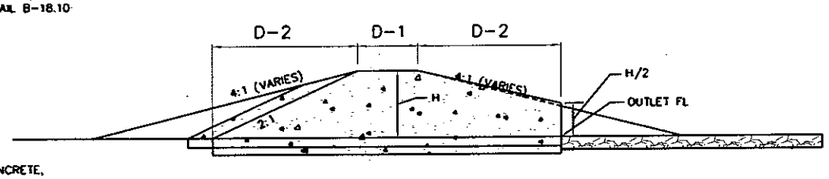


PLAN VIEW

EMBANKMENT DIMENSIONS					
BASIN	SHEET	"D-1"	"D-2"	"D-3"	"H"
1A	2	11'	28'	15'-6"	10'-6"
1B	6	13'-6"	24'	10'	10'-9"
2	12	5'-6"'	20'	12'	9'-0"
3	15	5'-6"	18'	9'-6"	9'0"



SECTION D-D SECTION C-C

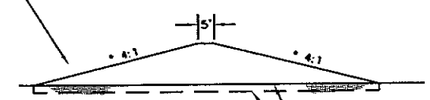


SECTION B-B

REINFORCED CONCRETE OUTLET STRUCTURE

SCALE 1"=10'

CONSTRUCT NEW EMBANKMENT. COMPACT 95% MINIMUM. CONTRACTOR TO SHAPE EMBANKMENT SLOPES TO PROVIDE VISUAL INTEREST IN GOLF COURSE AREA. SLOPES MAY BE FLATTER THAN SHOWN, BUT MAY NOT DISCHARGE IN 404 WATERS BEYOND THE EXTENT SHOWN. CONTRACTOR SHALL OVERSEED DISTURBED AREAS WITHIN THE GOLF COURSE.



CLEAR AND GRUB ENTIRE FOOTPRINT AREA. KEY INTO EXISTING GROUND BY OVEREXCAVATING 1 FOOT MIN., FILLING AND COMPACTING TO 95% MIN.

EXIST. GROUND

* VARIES - 2.25:1 MAX IN EXISTING POND AREAS

SECTION A-A

SCALE 1"=20'

TOWN OF SNOWFLAKE, ARIZONA

INDUSTRIAL PARK DRAINAGE

BASIN 2 EMBANKMENT AND OUTLET DETAILS

YOST AND GARDNER ENGINEERS

2619 N. THIRD STREET PHOENIX, AZ 85004

DRAWN: BR/KW CHECKED: CRS MAR. 2009 - JOB NO. 8565

30/37

CLOMR SUBMITTAL. REDUCED SCALE: HOR: 1" = 100' (1:2.5)

Mar 12,2009 - 9:13am
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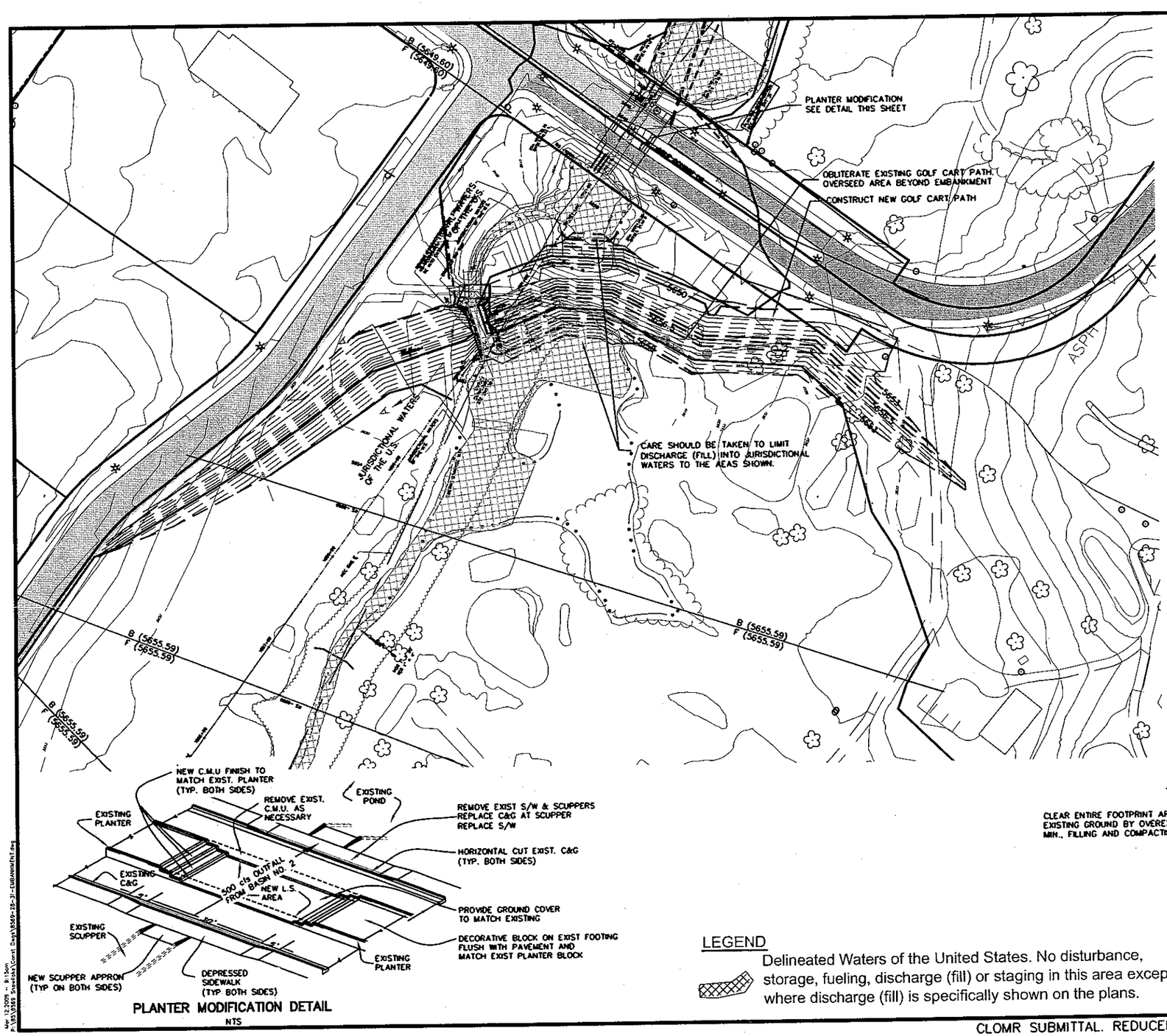
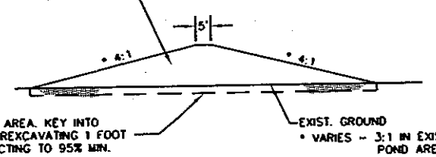


PLANTER MODIFICATION DETAIL
NTS

CONSTRUCT NEW EMBANKMENT. COMPACT 95% MINIMUM. CONTRACTOR TO SHAPE EMBANKMENT SLOPES TO PROVIDE VISUAL INTERST IN GOLF COURSE AREA. SLOPES MAY BE FLATTER THAN SHOWN, BUT MAY NOT DISCHARGE IN 404 EWATERS BEYOND THE EXTENT SHOWN. CONTRACTOR SHALL OVERSSED DISTURBED AREAS WITH IN THE GOLF COURSE.



SECTION A-A
SCALE 1"=20'

LEGEND

Delineated Waters of the United States. No disturbance, storage, fueling, discharge (fill) or staging in this area except where discharge (fill) is specifically shown on the plans.

TOWN OF SNOWFLAKE, ARIZONA

INDUSTRIAL PARK DRAINAGE
BASIN 3 EMBANKMENT

YOST AND GARDNER ENGINEERS
2619 N. THIRD STREET PHOENIX, AZ 85004
DRAWN: BROW CHECKED: CRS MAR. 2009 - JOB NO. 8565

31/37

CLOMR SUBMITTAL. REDUCED SCALE: HOR: 1" = 100' (1:2.5)

Mar 12 2009 - 9:15am
P:\8565 Snowflake\Const Dwgs\8565-22-3-CUBANKMENT.dwg