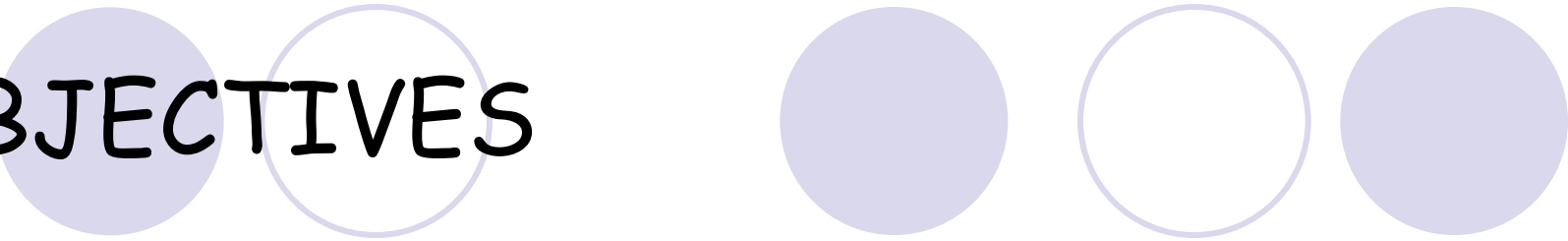


MAINTENANCE OF TRAFFIC



Or the impossible task of
pleasing everyone while keeping
them all safe

OBJECTIVES

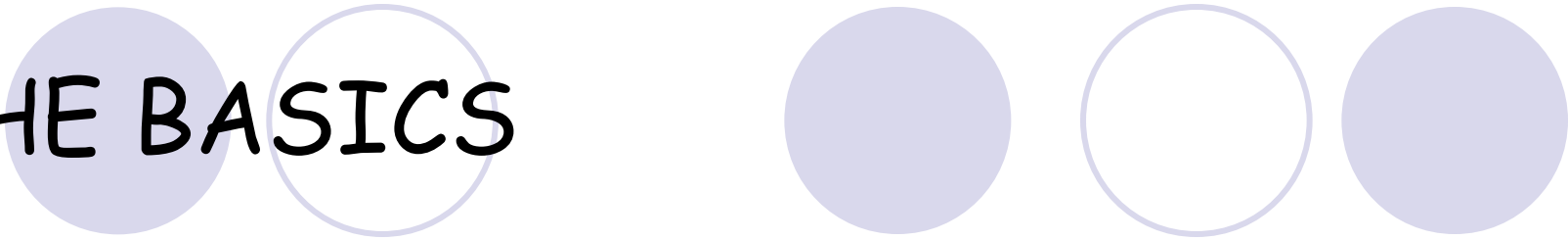
The slide features a decorative header with the word 'OBJECTIVES' in a large, black, sans-serif font. Above the text, there are five circles arranged horizontally. The first circle is solid light purple and partially overlaps the letter 'O'. The second circle is an outline of a light purple circle, partially overlapping the letter 'E'. The third circle is solid light purple. The fourth circle is an outline of a light purple circle. The fifth circle is solid light purple.

- Understand MOT principles
- Review Iowa DOT Chapter 9
- Review example set of MOT plans

MOT PRINCIPLES

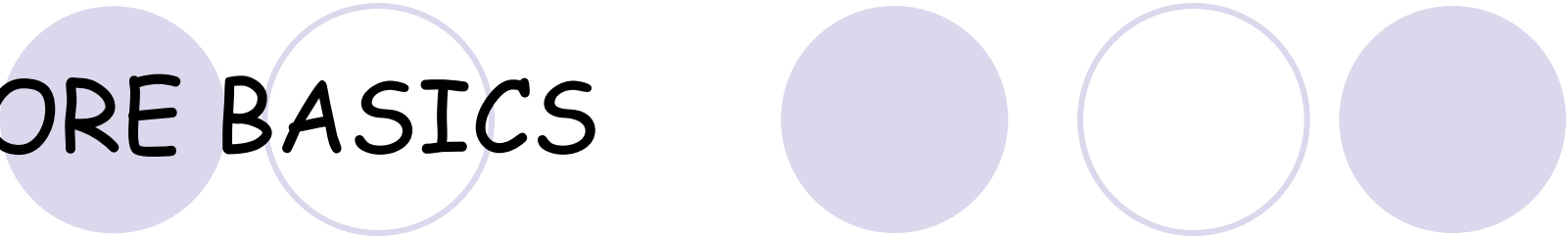
- Traffic safety must be integral part of project
- Traffic movement must be impacted as little as possible
- Provide clear and positive guidance
- Review **actual** operations

THE BASICS



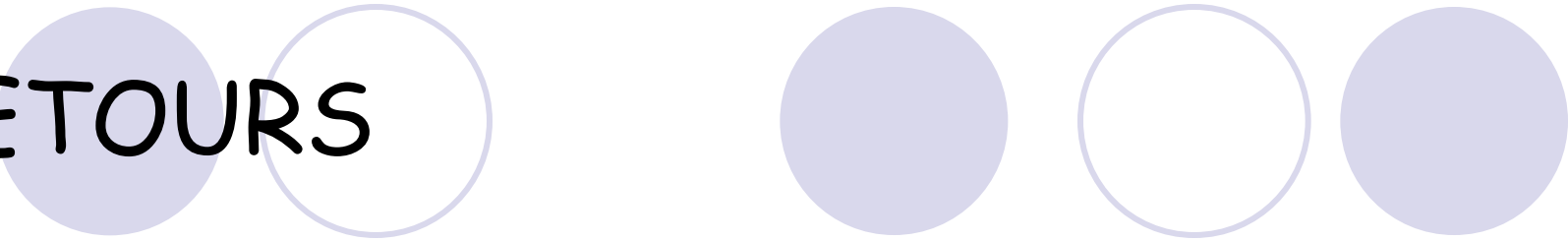
- Detour is the best (for workers and efficiency of construction)
- Keep things as close to normal as possible (normal design geometrics, etc)
- Provide room for contractor
- Appropriate traffic control devices (MUTCD)

MORE BASICS



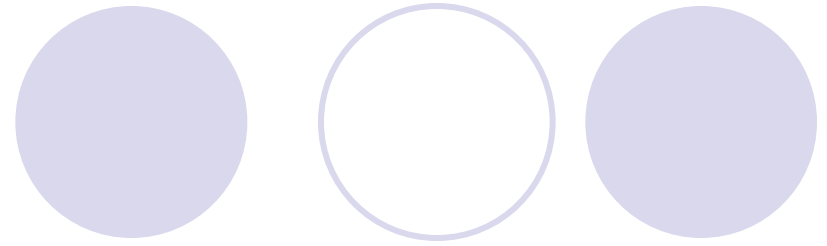
- Advance warning, both in time and location
- Avoid stops
- Separate directions if at all possible
- Removal or covering unneeded devices
- Don't forget about worker parking
- KEEP IT SIMPLE, SAM!

DETOURS



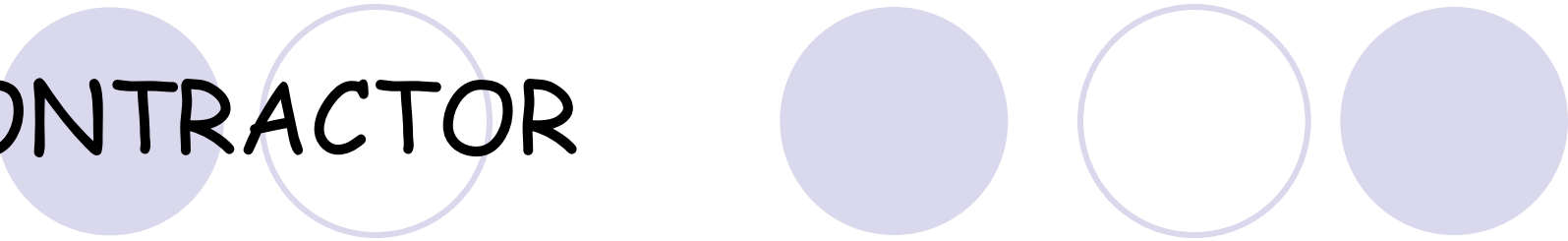
- Need to consider speed, capacity, length, and safety
- Run model to test speed, etc.
- Simplify detour (remove parking, close redundant accesses, etc)
- Physical improvements (before AND after)

GEOMETRICS

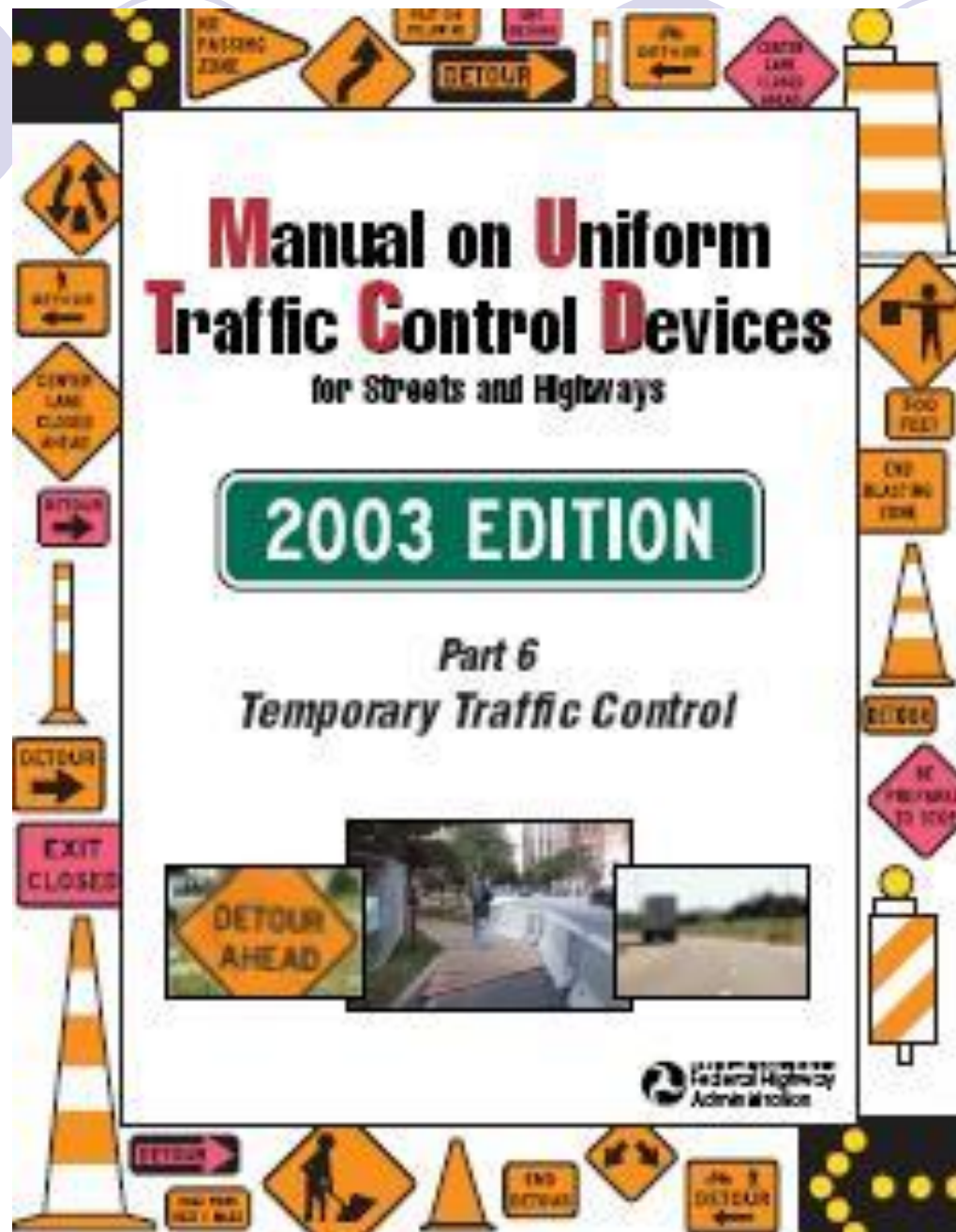


- Comparable to normal operations
- Lane shifts and closures
- Tapers for transition areas

CONTRACTOR



- He's the reason for the mess
- Adequate access and space for working
- Remove equipment when not needed
- Review of MOT plan
- Safe parking for workers (shuttle?)
- Lighting and night operations



TRAFFIC CONTROL DEVICES

- <http://mutcd.fhwa.dot.gov/pdfs/2003r1/pdf-index.htm>
- Markings
- Delineators, barriers, etc.
- Signing
- Example layouts

AREAS IN ZONE - PART I

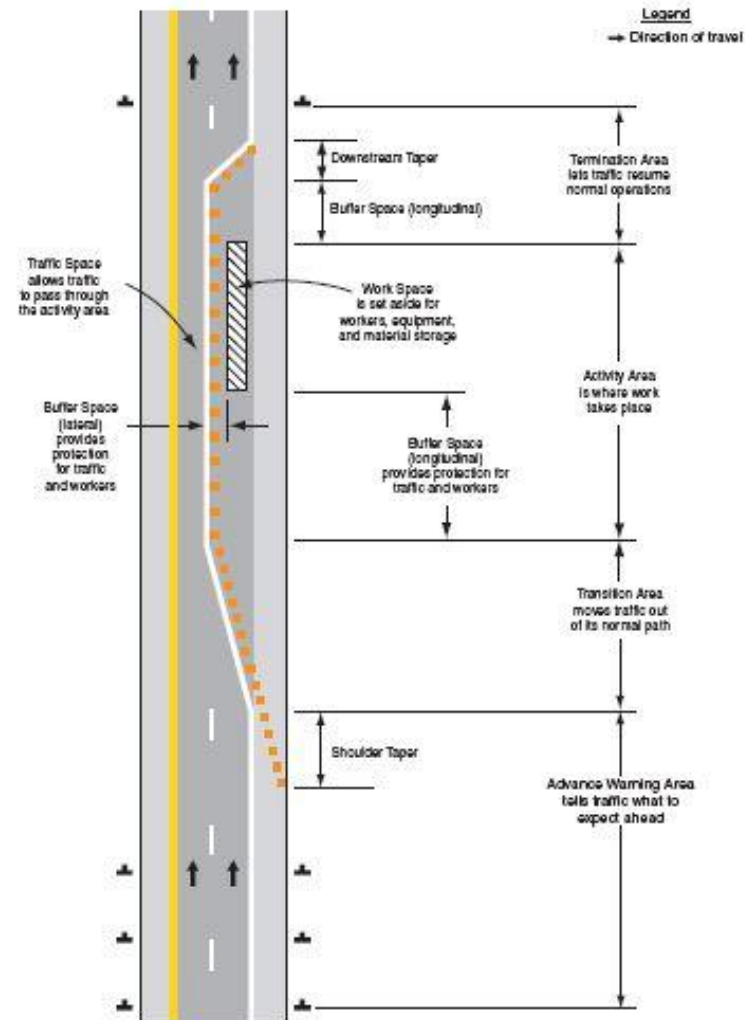
- Advance Warning Area
 - Provide time to recognize and make changes
 - Varies with speed and complexity
- Transition Area
 - For lane closure
 - Clearly defined

AREAS IN ZONE - PART II

- Activity area - where work is going on
 - Buffer space
 - Work space
- Termination area
 - Return to normal pattern

PARTS OF THE WORK ZONE

Figure 6C-1. Component Parts of a Temporary Traffic Control Zone



Source: MUTCD

TAPERS

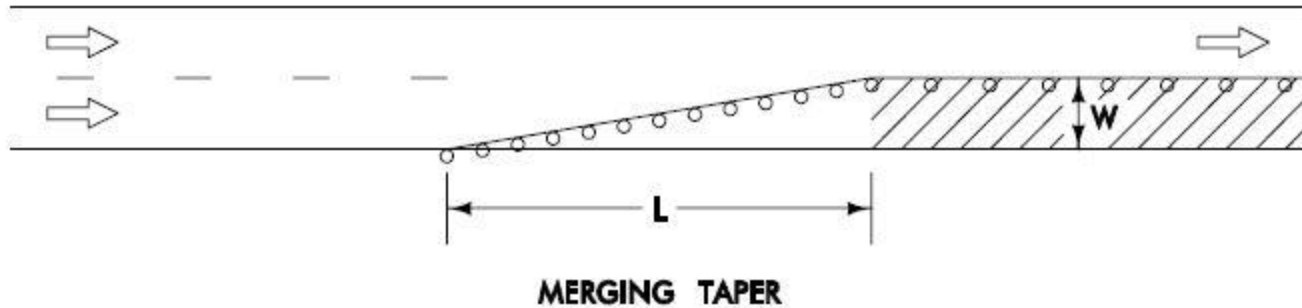


- Purpose - provides channelization
- Various types
 - Merging - to reduce number of lanes
 - Shifting - change vehicle path
 - Shoulder - closure on high-speed facility
 - Two-way - for alternating traffic

TAPERS

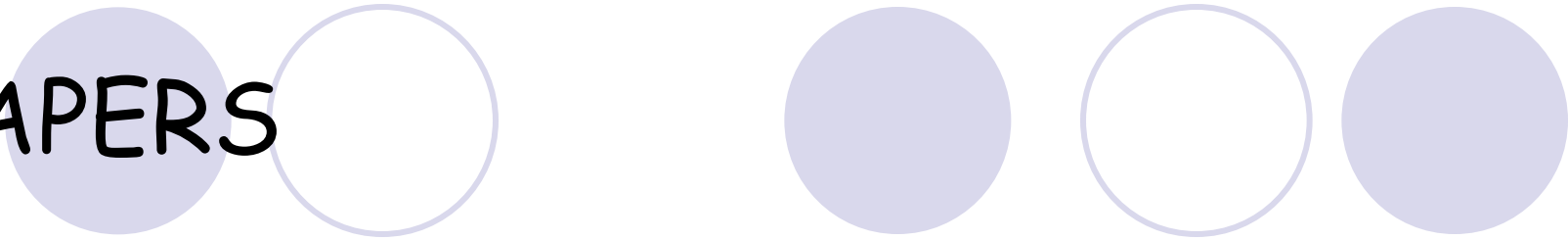
- Merging taper - minimum length
 - Speed limit ≥ 45 mph:
 - $L = W * S$ (English)
 - $L = W * S * 0.62$ (metric)
 - Speed limit < 45 mph:
 - $L = (W * S^2)/60$ (English)
 - $L = (W * S^2)/155$ (Metric)
 - L is length in feet or meters, W is lane width, and S is speed in mph or kph.

Merging taper



Source: Iowa DOT

TAPERS



- Shifting taper

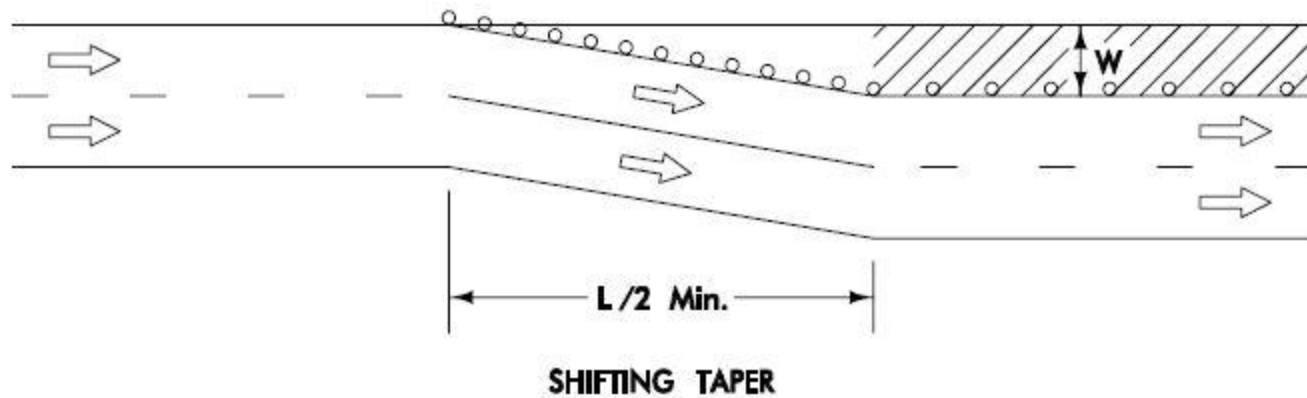
- Length (high-speed facilities):

- Minimum = merging length/2 or 200 feet (English)
- Minimum = merging length/2 or 60 meters (metric)
- Recommended = full merging length

- Length (low-speed facilities):

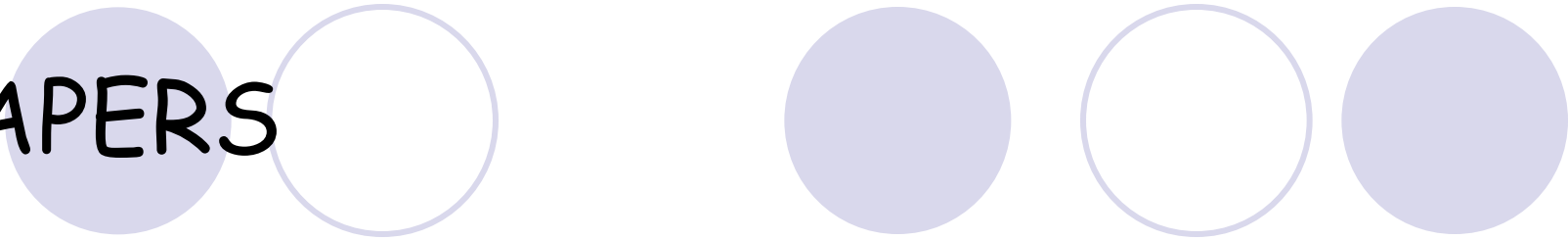
- $L/2$ (either English or metric)
- L is computed using W = amount of shift

Shifting taper



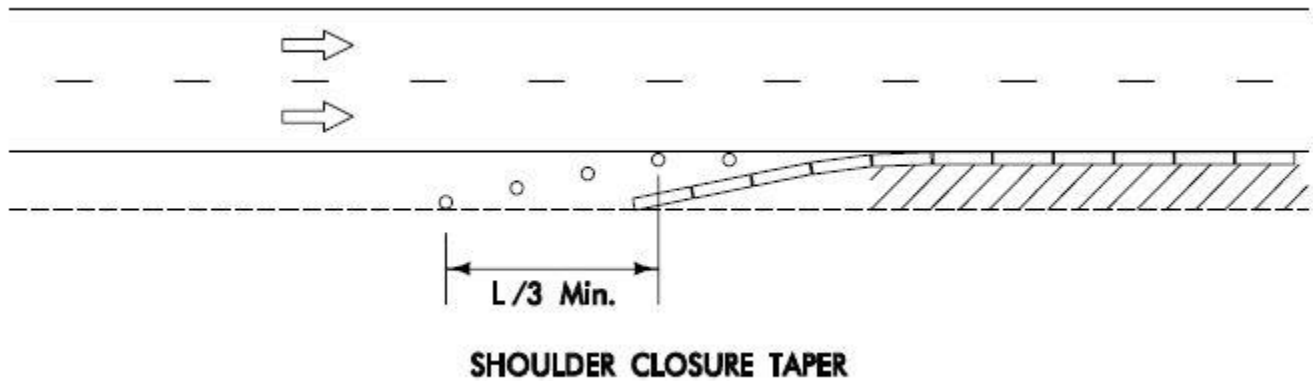
Source: Iowa DOT

TAPERS



- Shoulder taper
 - Length (high-speed facilities):
 - Minimum = merging length/3 (English)
 - Minimum = merging length/3 (metric)
 - L is computed using W = amount of shift

Shoulder taper



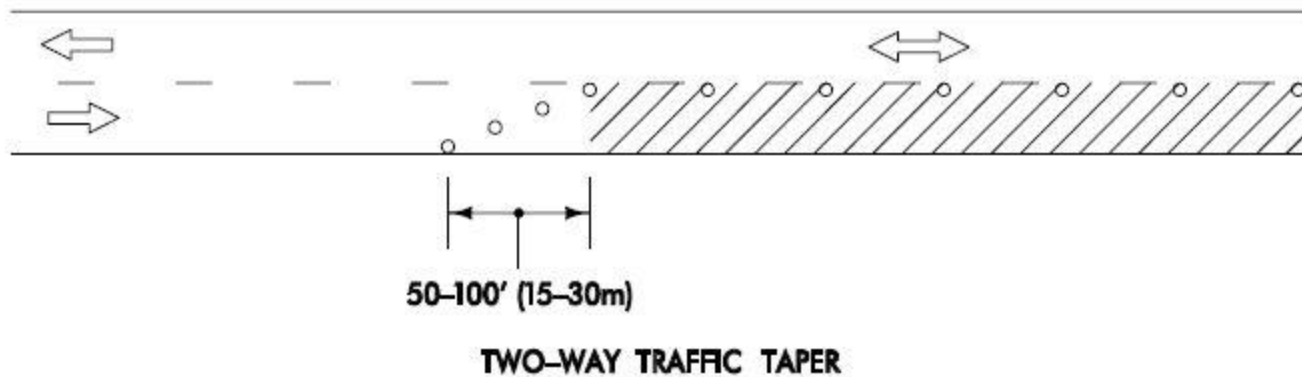
Source: Iowa DOT

TAPERS



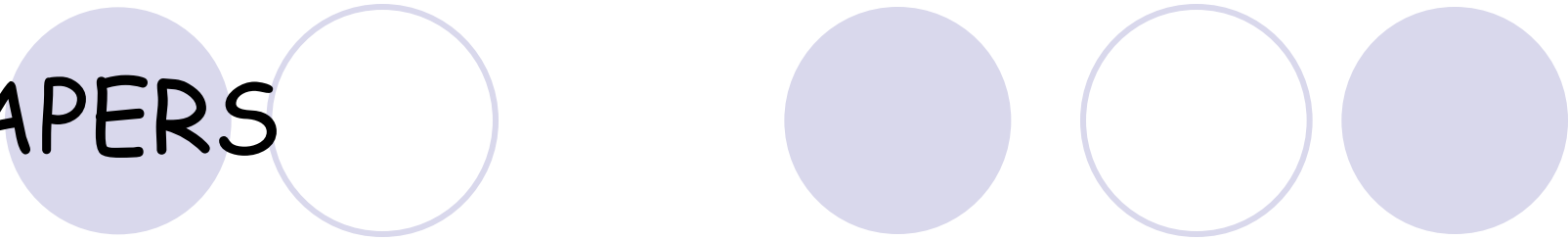
- Two-way taper
 - Length (all facilities):
 - Maximum = 100 feet (English)
 - Maximum = 30 meters (metric)
 - Short taper to discourage high-speed operation

Two-way taper



Source: Iowa DOT

TAPERS

A decorative graphic at the top of the slide consists of two rows of circles. The top row has a solid light purple circle followed by an outlined light purple circle. The bottom row has a solid light purple circle, followed by an outlined light purple circle, and then another solid light purple circle.

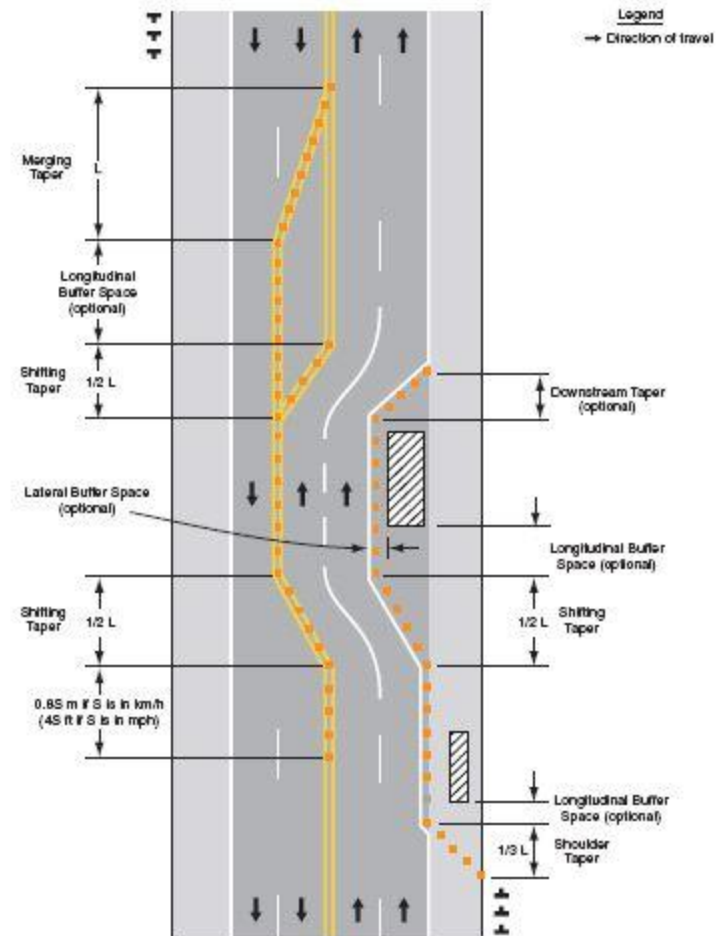
- Other issues
- Distance between tapers
- Spacing of channelizing devices:
 - Spacing (in feet) $\approx$ speed limit in mph

TAPERS

Page 6C-6

2003 Edition

Figure 6C-2. Types of Tapers and Buffer Spaces



Sees. 6C.01 to 6C.01

Source: MUTCD

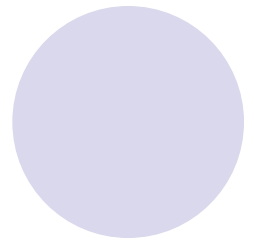
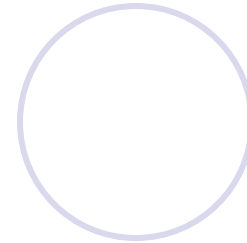
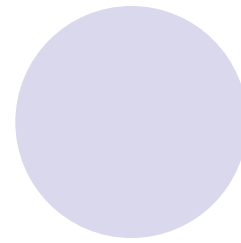
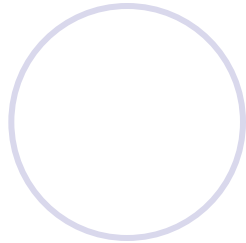
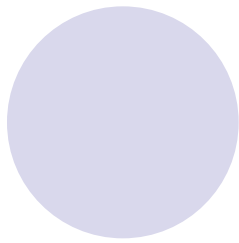
WORK-ZONE SPEED

- Signing alone not effective
- Speed consistent with geometry
- Never more than 55 mph
- 35 mph for one-lane bridges

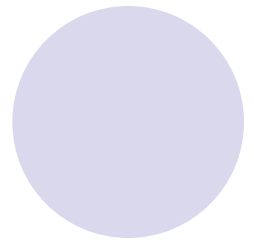
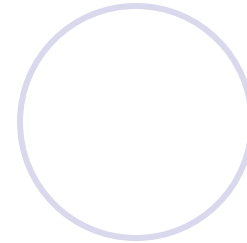
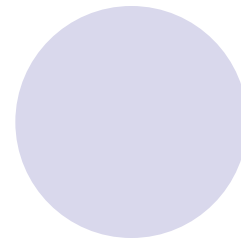
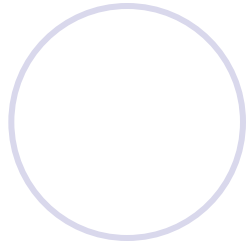
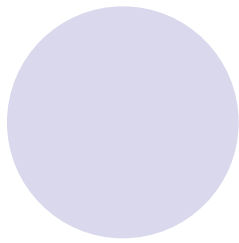
TRAFFIC CONTROL PLANS

- Level of detail depends on complexity of project
- Always include traffic control notes
- Layout plans as needed

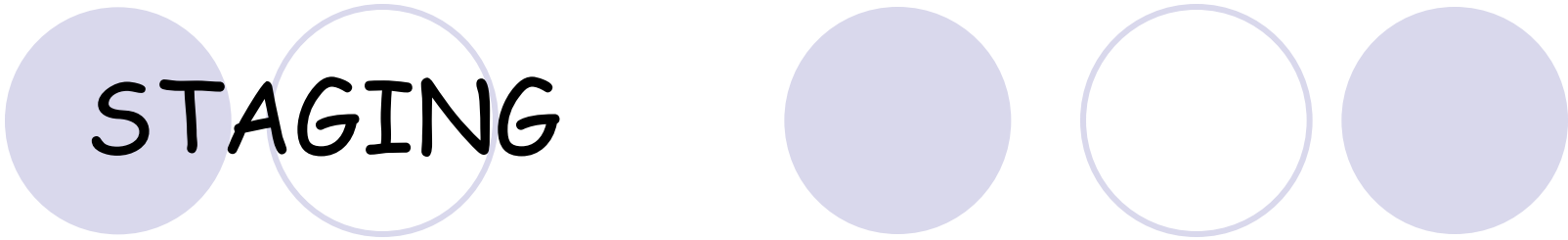
English Standard Road Plan			PDF	DGN
TC	4/17/2007	Entire TC Section	TC	
TC-1	10/17/2006	Work Not Affecting Traffic	etc01.pdf	etc01.exe
TC-30	10/17/2006	Closure of Continuous Two-Way Left Turn Lane (TWLTL)	etc30.pdf	etc30.exe
TC-61	10/17/2006	Two-Lane, Two-Way Operation	etc61.pdf	etc61.exe
TC-62	10/17/2006	Permanent Two-Lane to Four-Lane Transition	etc62.pdf	etc62.exe
TC-81	10/17/2006	Restricted Width Signing	etc81.pdf	etc81.exe
TC-202	10/17/2006	Shoulder Closure	etc202.pdf	etc202.exe
TC-203	10/17/2006	Aerial Seeding Operations	etc203.pdf	etc203.exe
TC-211	10/17/2006	Spot Location Lane Closure with Stop Signs	etc211.pdf	etc211.exe
TC-212	10/17/2006	Spot Location Lane Closure with Flaggers	etc212.pdf	etc212.exe
TC-213	10/17/2006	Lane Closure with Flaggers	etc213.pdf	etc213.exe
TC-214	10/17/2006	Lane Closure with Flaggers and Pilot Car	etc214.pdf	etc214.exe
TC-215	10/17/2006	Lane Closure with Paved Shoulder and Signals	etc215.pdf	etc215.exe
TC-216	10/17/2006	Lane Closure with Signals	etc216.pdf	etc216.exe



TC-217	10/17/2006	Lane Closure with Signals and TBR	etc217.pdf	etc217.exe
TC-228	10/17/2006	Lane Closure Utilizing Continuous Two-Way Left Turn Lane	etc228.pdf	etc228.exe
TC-231	10/17/2006	Slow Moving Vehicle Operations in the Traffic Lane	etc231.pdf	etc231.exe
TC-232	10/17/2006	Shoulder Rumble Strip Operations	etc232.pdf	etc232.exe
TC-233	10/17/2006	Pavement Marking Operations	etc233.pdf	etc233.exe
TC-251	10/17/2006	Temporary Road Closure	etc251.pdf	etc251.exe
TC-252	10/17/2006	Road Closure	etc252.pdf	etc252.exe
TC-253	10/17/2006	Paved On-Site Detour	etc253.pdf	etc253.exe
TC-271	10/17/2006	Signalized Equipment Crossing	etc271.pdf	etc271.exe
TC-272	10/17/2006	Unsignalized Equipment Crossing	etc272.pdf	etc272.exe
TC-273	10/17/2006	Construction Site Entrance	etc273.pdf	etc273.exe
TC-282	10/17/2006	Uneven Lanes	etc282.pdf	etc282.exe
TC-283	10/17/2006	Surveying Operations	etc283.pdf	etc283.exe
TC-402	10/17/2006	Shoulder Closure	etc402.pdf	etc402.exe
TC-403	10/17/2006	Aerial Seeding Operations	etc403.pdf	etc403.exe
TC-418	10/17/2006	Lane Closure on Divided Highway	etc418.pdf	etc418.exe
TC-419	10/17/2006	Lane Closure on Undivided Highway	etc419.pdf	etc419.exe



TC-420	4/17/2007	Lane Closure at Ramps	etc420.pdf	etc420.exe
TC-421	10/17/2006	Lane Closure with TBR	etc421.pdf	etc421.exe
TC-422	10/17/2006	Closure of Two Adjacent Lanes on Divided Highway	etc422.pdf	etc422.exe
TC-423	10/17/2006	Closure of Two Adjacent Lanes on Undivided Highway	etc423.pdf	etc423.exe
TC-429	10/17/2006	Closure of Continuous Two-Way Left Turn Lane and/or Adjacent Lane	etc429.pdf	etc429.exe
TC-431	10/17/2006	Slow Moving Vehicle Operating in the Traffic Lane	etc431.pdf	etc431.exe
TC-432	10/17/2006	Shoulder Rumble Strip Operations	etc432.pdf	etc432.exe
TC-433	10/17/2006	Pavement Marking Operations	etc433.pdf	etc433.exe
TC-434	10/17/2006	Shoulder Fog Sealing Operations	etc434.pdf	etc434.exe
TC-451	10/17/2006	Temporary Road Closure on Divided Highway	etc451.pdf	etc451.exe
TC-454	10/17/2006	Temporary Detour Using Ramps on Divided Highway	etc454.pdf	etc454.exe



STAGING

- Minimize disruption and loss of access
- Minimize number of stages
- Minimize temporary construction (paving, etc)
- May be more than one “right” plan

TRAFFIC CONTROL PLAN

108-23
10-24-01

TRAFFIC WILL BE MAINTAINED ON US 20 AT ALL TIMES.

TRAFFIC CONTROL ON THIS PROJECT SHALL BE IN ACCORDANCE WITH STANDARD ROAD PLANS (SRPS) AND SPECIAL SPECIFICATIONS CONTAINED IN THE PLANS. FOR ADDITIONAL COMPLEMENTARY INFORMATION, REFER TO PART 8 OF THE MANUAL ON UNIFORM TRAFFIC CONTROL DEVICES AND TO THE CURRENT STANDARD SPECIFICATIONS.

THE CONTRACTOR SHALL COORDINATE TRAFFIC CONTROL WITH THEIR PROJECTS IN THE AREA.

ALL TRAFFIC CONTROL DEVICES SHALL BE FURNISHED, ERECTED, MAINTAINED, AND REMOVED BY THE CONTRACTOR.

WHERE POSSIBLE, ALL POST-MOUNTED SIGNS SHALL BE PLACED AT LEAST 2 FEET BEYOND THE CURB OR SIDE OF SHOULDER.

THE LOCATION FOR STORAGE OF EQUIPMENT BY THE CONTRACTOR DURING NONWORKING HOURS SHALL BE AS APPROVED BY THE ENGINEER IN CHARGE OF CONSTRUCTION.

THE ENGINEER MAY REQUIRE MODIFICATIONS TO THE PRESENTED MARKING DETAILS SHOWN, CORRECTING PERMANENT EDGE LINES, CENTER LINES, OR LANE LINES SHALL BE REMOVED, AS APPLICABLE, RECONSTRUCT EDGE LINES, CENTER LINES, AND LANE LINES SHALL BE PLACED BEYOND THE ROADWAY TO BE MAINTAINED TO NORMAL TRAFFIC. THE CURRENT STANDARD SPECIFICATIONS AND SUPPLEMENTAL SPECIFICATIONS SHALL APPLY.

PROPOSED SIGN SPACING MAY BE MODIFIED AS APPROVED BY THE ENGINEER TO MEET EXISTING FIELD CONDITIONS OR TO PREVENT OBSTRUCTION OF THE MOTORIST'S VIEW OF PERMANENT MARKING.

PERMANENT MARKING THAT CONVEYS A MESSAGE CONTRARY TO THE MESSAGE OF THE TEMPORARY MARKING AND NOT USABLE TO THE WORKING CONDITIONS SHALL BE REMOVED BY THE CONTRACTOR WHEN DIRECTED BY THE ENGINEER.

PROPOSED CHANGES IN THE TRAFFIC CONTROL PLAN SHALL BE APPROVED BY THE RESIDENT ENGINEER (OR JURISDICTIONAL ENGINEER) BEFORE CHANGES ARE MADE.

STAGING NOTES

108-23A
05-24-02

TRAFFIC WILL BE MAINTAINED ON US 20 AT ALL TIMES DURING THE CONSTRUCTION OF THIS PROJECT. SWISS VALLEY ROAD AND NORTH CHICKADEE ROAD MAY BE CLOSED DURING CONSTRUCTION, BUT NOT CLOSED CONCURRENTLY. CONTRACTOR WILL MAINTAIN ACCESSIBILITY TO PROPERTIES ALONG US 20, SWISS VALLEY ROAD, COTTINGHAM ROAD, NORTH CHICKADEE ROAD, NORTH FORNITAGE ROAD, AND SOUTH FORNITAGE ROAD DURING CONSTRUCTION.

STAGE 1

BUILD 2-WAY MEDIAN OVERPASS AT STATION 941+00 AND 9502+00.

GRADE AND PAVE COTTINGHAM ROAD FROM STATION 8951+00 TO 8962+00.

SHIFT US 20 TRAFFIC TO HEAD-TO-HEAD ON EXISTING EASTBOUND LANES.

BUILD PROPOSED US 20 WESTBOUND LANES FROM STATION 943+00 TO 1044+00, RECONSTRUCT OF EXISTING MEDIAN DRAINS FOR INCREASED MEDIAN WIDTH AT EXISTING 7 ACCESS LOCATIONS.

STAGE 2

MAINTAIN 2-LANE TRAFFIC ON US 20 EXISTING OUTBOUND LANES AND PROPOSED WESTBOUND LANES.

GRADE AND PAVE SWISS VALLEY ROAD FROM STATION 5854+00 TO 5865+00. MAINTAIN TEMPORARY CONNECTION TO EXISTING SWISS VALLEY INTERSECTION WITH US 20.

GRADE AND PAVE NORTH CHICKADEE ROAD EAST AND WEST OF SWISS VALLEY ROAD.

GRADE AND PAVE SOUTH FORNITAGE ROAD. CLOSE ACCESS TO US 20 AND PERMIT TO SWISS VALLEY ROAD VIA NORTH CHICKADEE ROAD.

GRADE AND PAVE NORTH FORNITAGE ROAD FROM STATION 9990+00 TO 10000+00. CLOSE ACCESS TO US 20 AND PERMIT TO LOST CANYON OVERPASS.

STAGE 3

GRADE AND PAVE COTTINGHAM ROAD FROM STATION 8962+00 TO 8976+00.

GRADE AND PAVE NORTH FORNITAGE ROAD FROM STATION 9990+00 TO 9996+00.

SHIFT US 20 TRAFFIC TO HEAD-TO-HEAD ON PROPOSED WESTBOUND LANES.

BUILD PROPOSED US 20 EASTBOUND LANES FROM STATION 943+00 TO 1044+00. MAINTAIN ACCESS AT SWISS VALLEY INTERSECTION.

GRADE AND PAVE SWISS VALLEY ROAD OVERPASS FROM STATION 5865+00 TO 5876+00.

BUILD SWISS VALLEY INTERCHANGE RAMP.

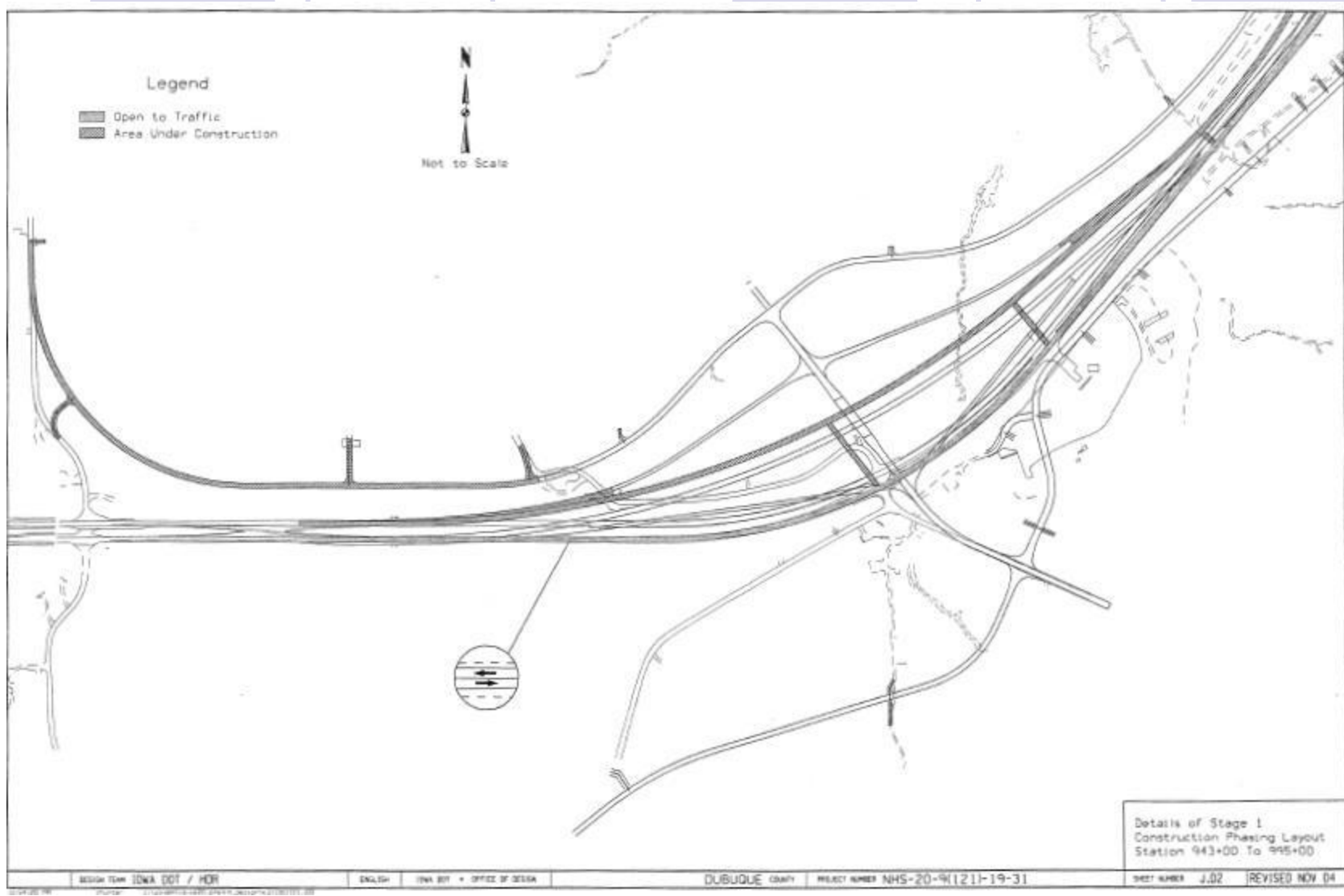
DESIGN TEAM IOWA DOT / HDR

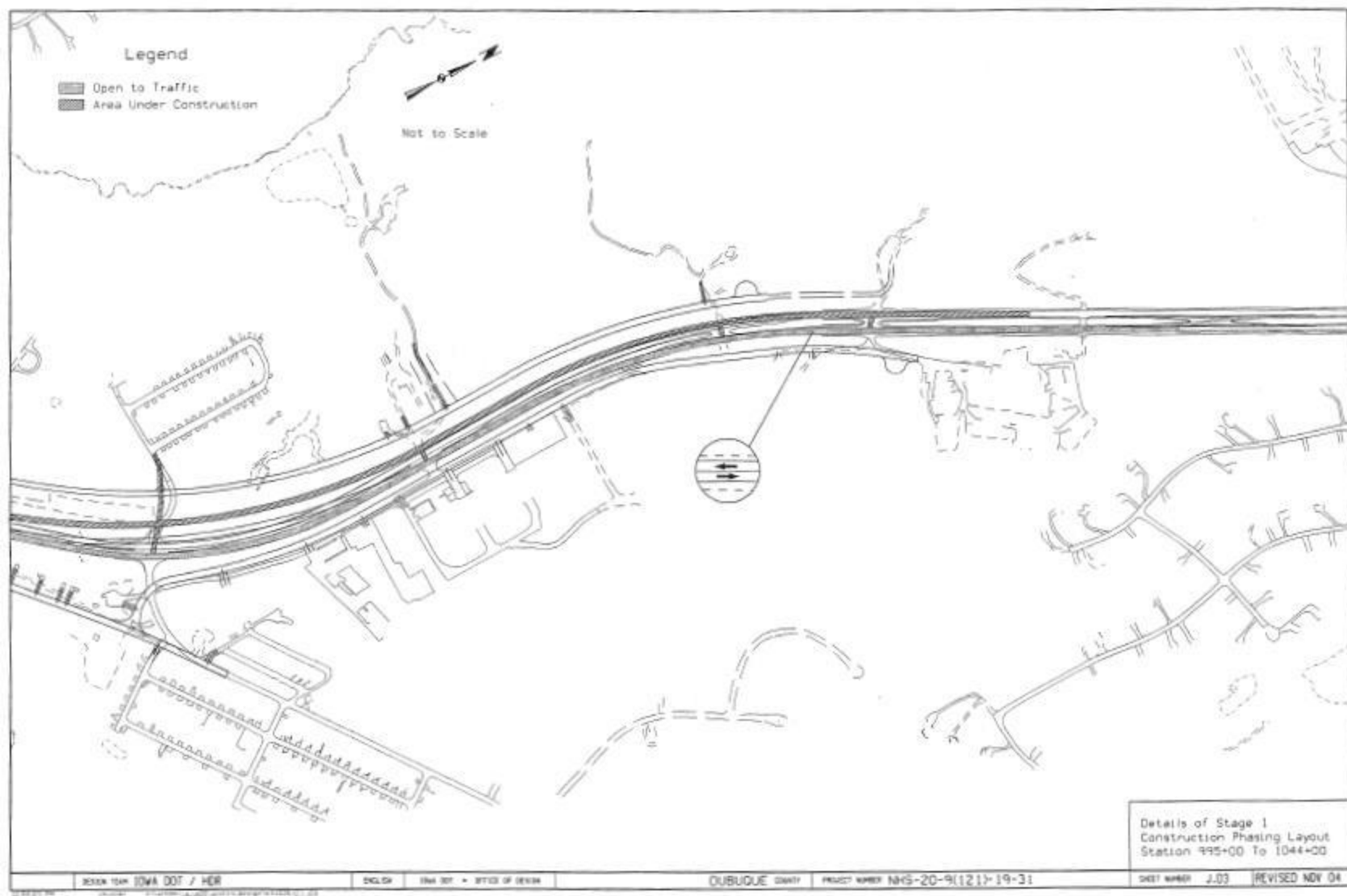
ENGINEER IOWA DOT - OFFICE OF DESIGN

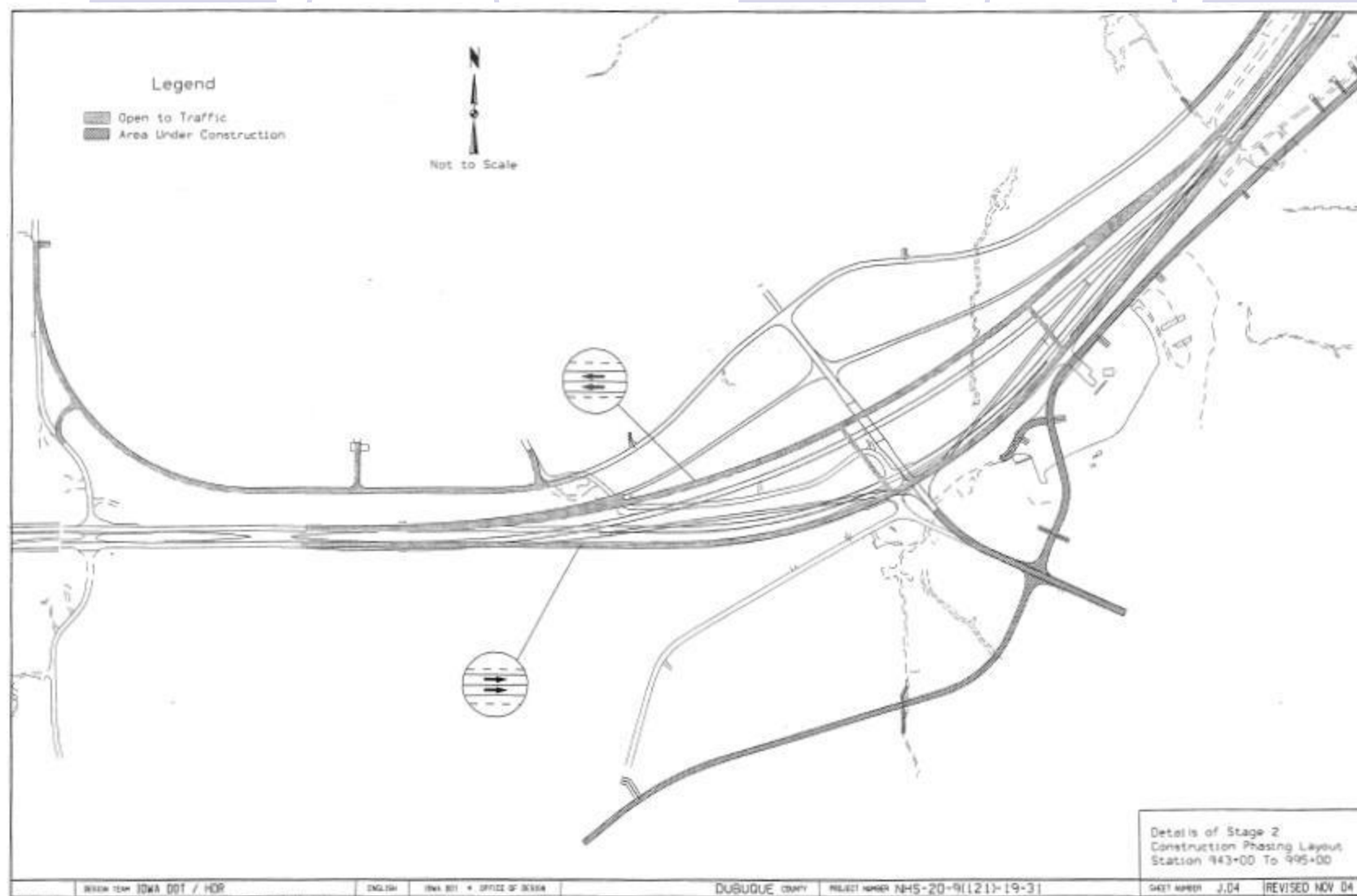
DUBUQUE COUNTY PROJECT NUMBER NHS-20-9(121)-19-31

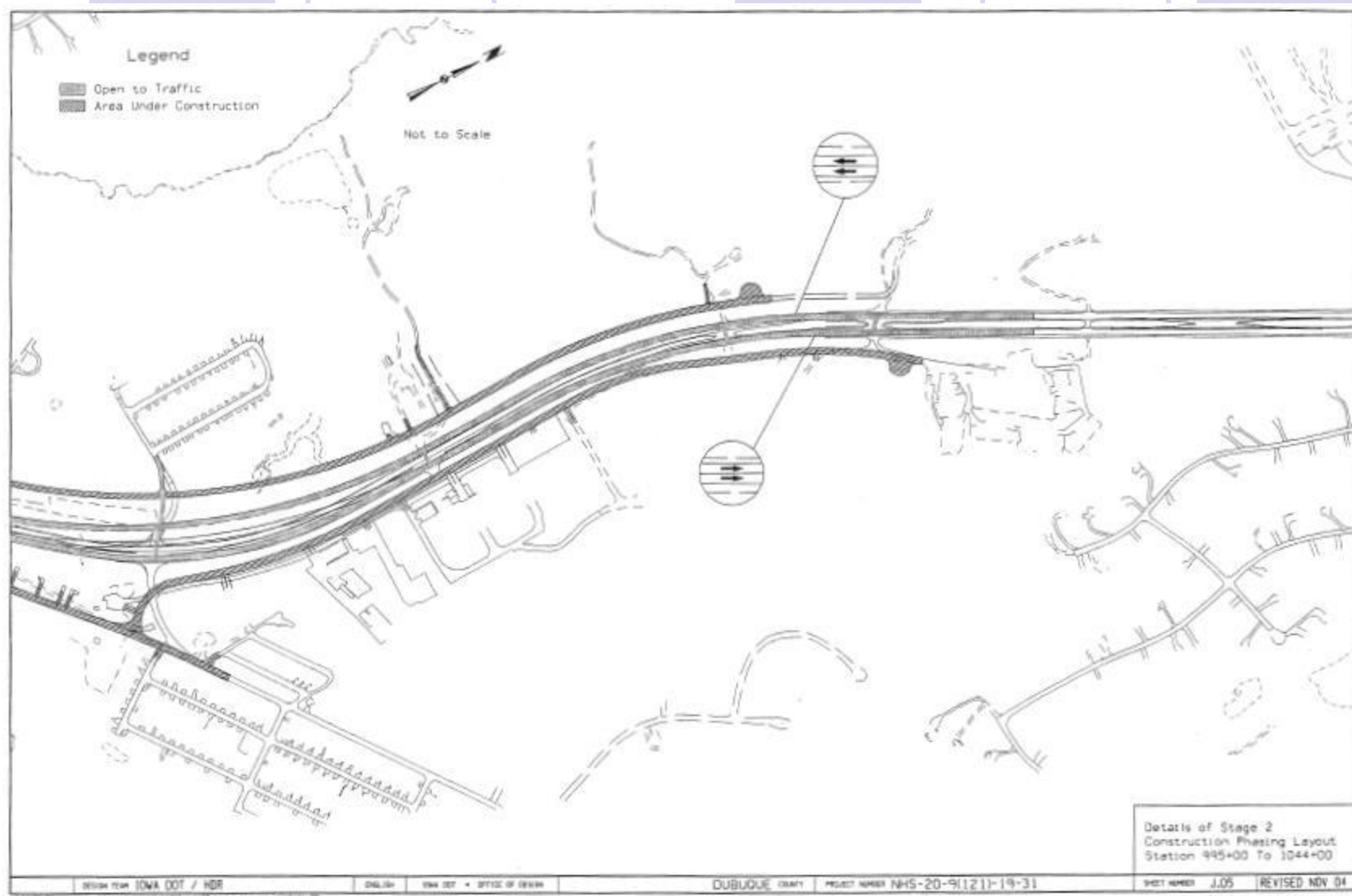
SHEET NUMBER J.01 (REVISED NOV 04)

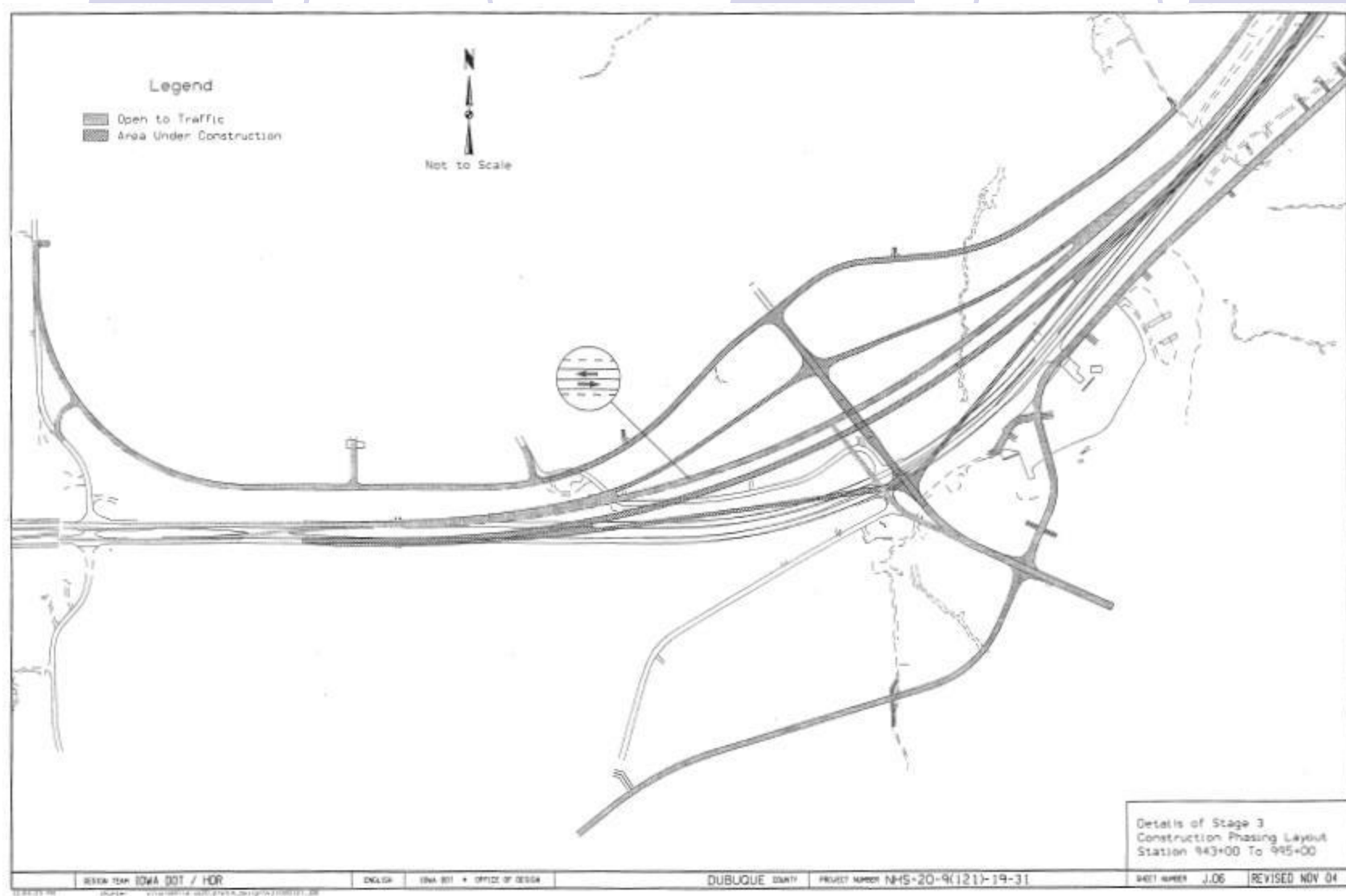
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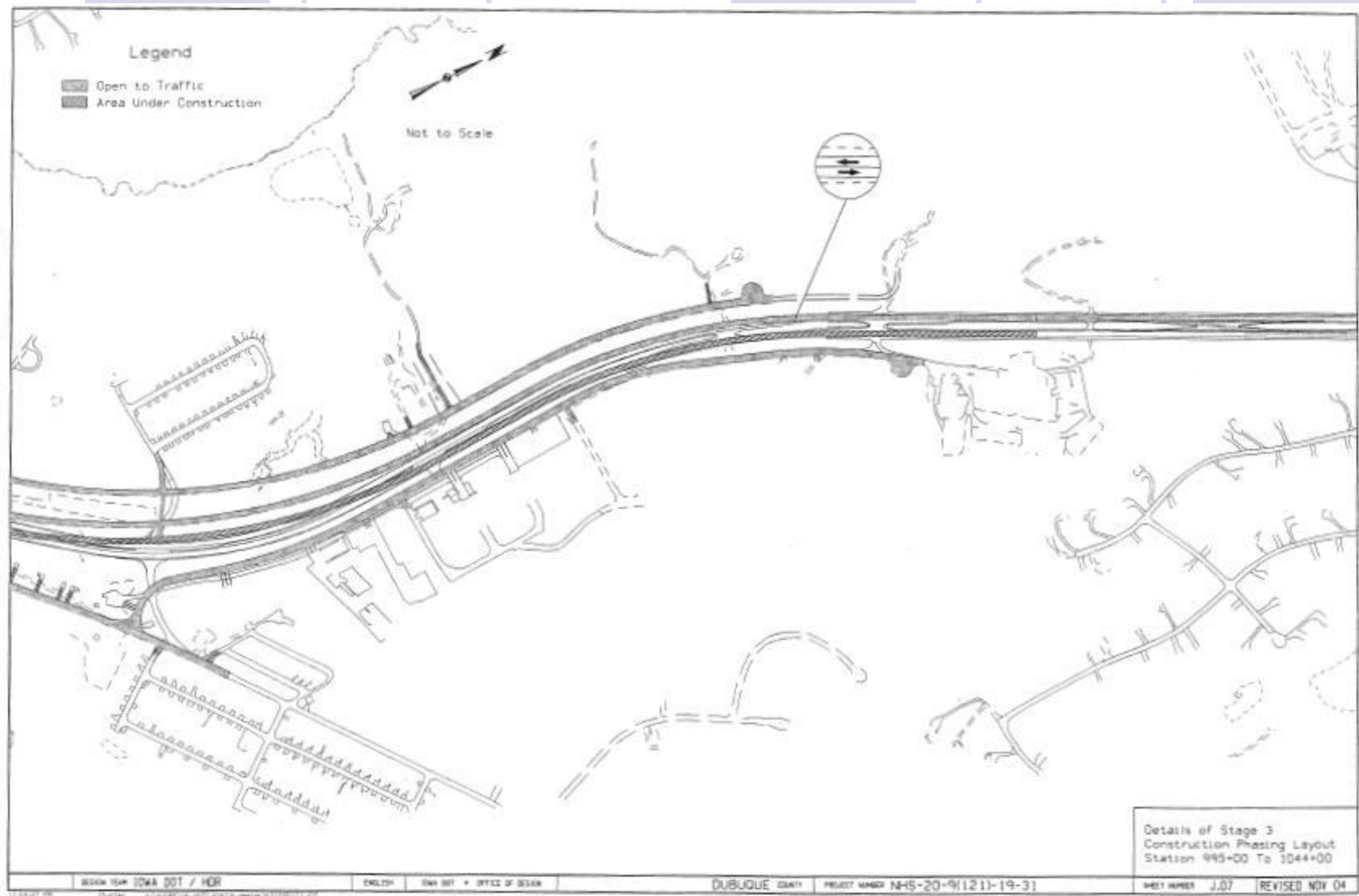












STAGING NOTES

108-28
19-27-94

Reasonable access to all properties must be maintained through project.
Refer to standard note 203-2 for other projects that need be coordinated with this staging plan.

The Contractor shall submit and maintain a detailed Schedule of Staging for Engineer's approval in accordance with 113B.02. Closure of entrance and exit ramps shall be limited to minimize inconvenience to the public.

Stage 1 Construction 2002
Construct I-35/80 Access
Construct Haul Road
Gravel Drive and Pave Future Eastbound Douglas Avenue
Construct Loop 'E'
Construct Future Eastbound Douglas Avenue Bridge
Construct relocated 111th Street
Paved construction of Ramp 'D'
Phase construction of Ramp 'D'

Stage 1 Traffic
Douglas Avenue traffic maintained on existing alignment
Temporary interruptions to Ramp 'A' traffic
Temporary interruptions to Ramp 'D' traffic

ELIM-OVER WORK 2002
Construct east and 'taper'
Construct west and 'taper'
Construct temporary tie-in Loop 'E' to I-35/80
Construct temporary connection from existing Ramp 'B'
Construct connection to truck stop
Finish Ramp 'C' connection
Finish Ramp 'D' connection

Stage 2 Traffic
Douglas Avenue traffic maintained on existing alignment
Temporary interruptions to access
Traffic moved to new alignment on the last day of Stage 2

NORTHEAST QUADRANT CONSTRUCTION

Stage 3 Construction 2002
Paved construction of Ramp 'C'
Truck stop improvements
Construct Douglas Avenue future westbound lanes
Begin Stage 4 widening of Ramp 'B'

Stage 3 Traffic
Maintain Douglas Avenue traffic on future eastbound lanes
Utilize Loop 'B' as access for east and westbound to northbound

REMOVE EXISTING BRIDGE

Stage 4 Construction
Remove existing bridge
Complete Loop 'E' taper
Construct 'B' Wall and Pave Ramp 'B'

Stage 4 Traffic
Maintain Douglas Avenue traffic on future eastbound lanes
Maintain existing Ramp 'B'
Utilize Loop 'B' as access for both east and westbound to northbound
Utilize Ramp 'D' for both east and westbound to southbound

NORTHWEST QUADRANT CONSTRUCTION 2003

Stage 5 Construction
Construct future westbound Douglas Avenue bridge
Construct Loop 'F' including taper

Stage 5 Traffic
Maintain Douglas Avenue traffic on future eastbound lanes
Utilize Loop 'B' as access for east and westbound to northbound
Utilize Ramp 'D' for both east and westbound to southbound
Utilize new Ramp 'B'

111TH TO 109TH AUXILIARY LANE CONSTRUCTION

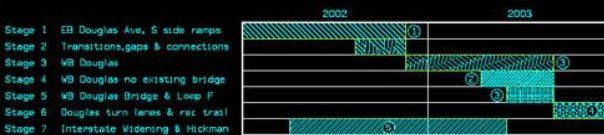
Stage 6 Construction
Construct left turn lanes on Douglas Avenue at 111th Street
Remove existing 111th Street
Construct left turn lanes on Douglas Avenue at 109th Street

Stage 6 Traffic
Switch Douglas Avenue traffic to new eastbound and westbound lanes
All ramps open

Stage 7 Construction
Construct I-35/80 Auxiliary lanes
Construct Ramp 'D' Widening
Construct Ramp 'C'

Stage 7 Traffic
I-35/80 Traffic maintained on lanes 1, 2, 3, 4
Maintain traffic on Ramp 'D'
Temporary interruptions to Ramp 'C' Traffic

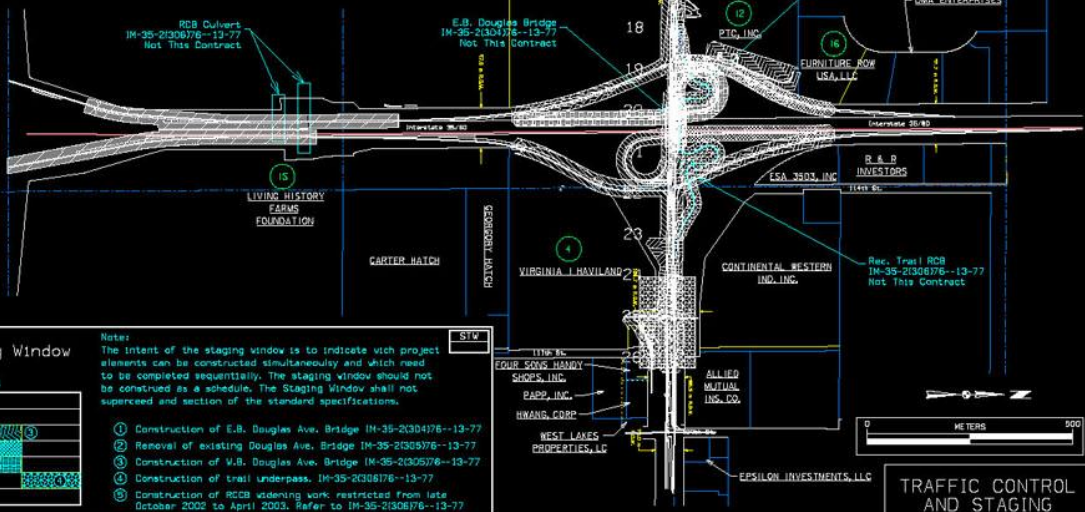
Douglas Avenue I-35/80 Interchange Construction Staging Window



TRAFFIC CONTROL NOTES

108-28
19-27-94

- Douglas Avenue through traffic shall be maintained throughout construction.
- Interstate through traffic will be maintained to a minimum two lanes in each direction throughout construction.
- Operations that require temporary short term closure of interstate or Douglas Ave through traffic such as delivery and setting of bridge span or removal of existing structures shall be accomplished as per Detail 521-108 sheet J.18. Closures shall be accomplished only upon approval of the Des Moines RCE Office and restricted to 07:00 am to 06:00 am travel periods. The contractor shall notify the Des Moines RCE Office 72 hours in advance of each proposed closure. The time and duration of the closure shall be determined by the Des Moines RCE Office.
- Traffic control on this project will be in accordance with the RS series of Standard Road Plans as referenced in the grading and per detail sheets included in the plans. For additional complimentary information refer to Part VI of the Manual of Uniform Traffic Control Devices and current Standard and Supplementary Specifications.
- All traffic control devices shall be furnished erected maintained and removed by the contractor.
- Where possible all post mounted signs shall be placed at least 0.6 meters beyond the curb or edge of shoulder.
- The location for storage of equipment by the contractor during non-working hours shall be as approved by the engineer in charge of construction.
- The Engineer may require modifications to the pavement marking details shown. Conflicting permanent edge lines, center lines or lane lines shall be removed. As applicable, permanent edge lines, center lines and lane lines shall be placed before the roadway is returned to normal traffic. The current Standard Specifications and Supplemental Specifications shall apply.
- Proposed sign spacing may be modified as approved by the Engineer to meet existing field conditions or to prevent obstruction of the motorist's view of permanent signing.
- Permanent signing that conveys a message contrary to the message of the temporary signing and not applicable to the working conditions shall be covered by the Contractor when directed by the Engineer.
- Proposed changes in the traffic control plan shall be reviewed with the Office of Construction before changes are made.
- Road Work Ahead signs shall be placed at all entrance ramps within the traffic control zone. Signs shall be erected 150 m in advance of the Entrance Ramp Tapers.
- Parking of private vehicles on Interstate right-of-way will not be allowed. Parking of unattended equipment within the median or storage of equipment within 15 meters of the edge of pavement will not be allowed.
- Contractor shall maintain traffic signal operation at signalized intersections through the use of existing temporary (at I-35/80 Douglas Avenue southbound ramp intersection), and/or proposed permanent traffic signal installation. Contractor shall provide, modify and maintain installations as necessary to maintain operations and match lane configurations of each construction stage.



DESIGN TEAM R Skogerboe / Snyder & Associates

METRIC

IOWA DOT * OFFICE OF DESIGN

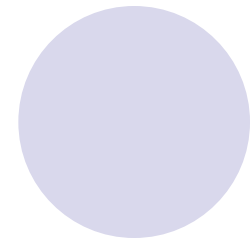
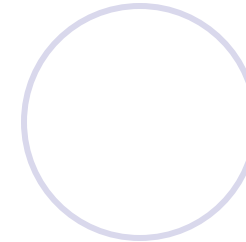
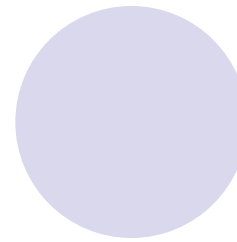
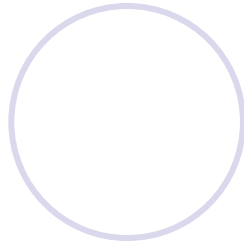
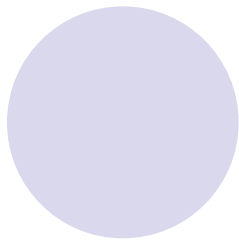
POLK

COUNTY

PROJECT NUMBER IM-35-2(269)76--13-77

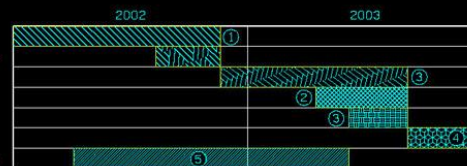
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Douglas Avenue I-35/80 Interchange Construction Staging Window

- Stage 1 EB Douglas Ave, S side ramps
- Stage 2 Transitions, gaps & connections
- Stage 3 WB Douglas
- Stage 4 WB Douglas no existing bridge
- Stage 5 WB Douglas Bridge & Loop F
- Stage 6 Douglas turn lanes & rec trail
- Stage 7 Interstate Widening & Hickman

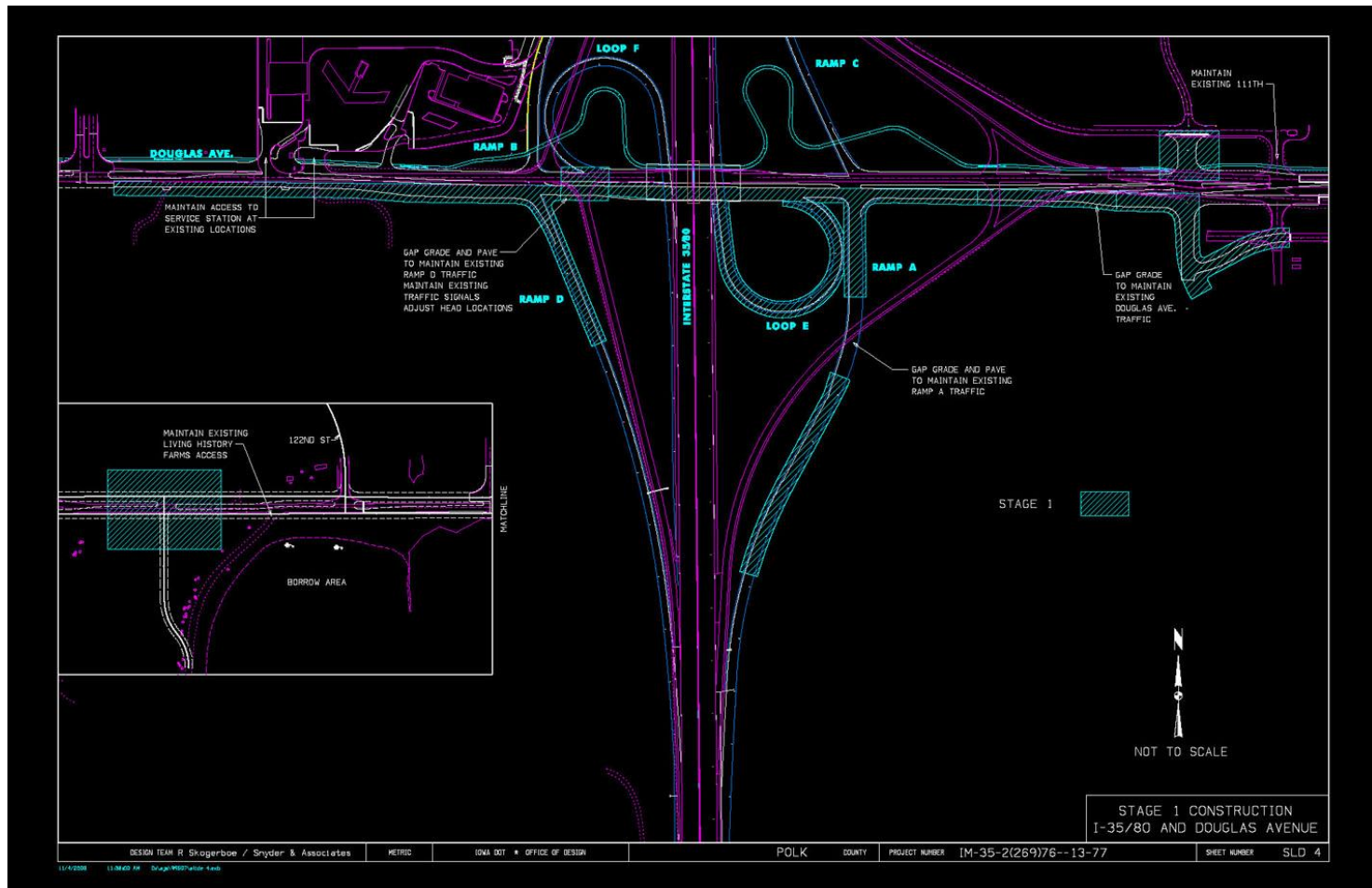
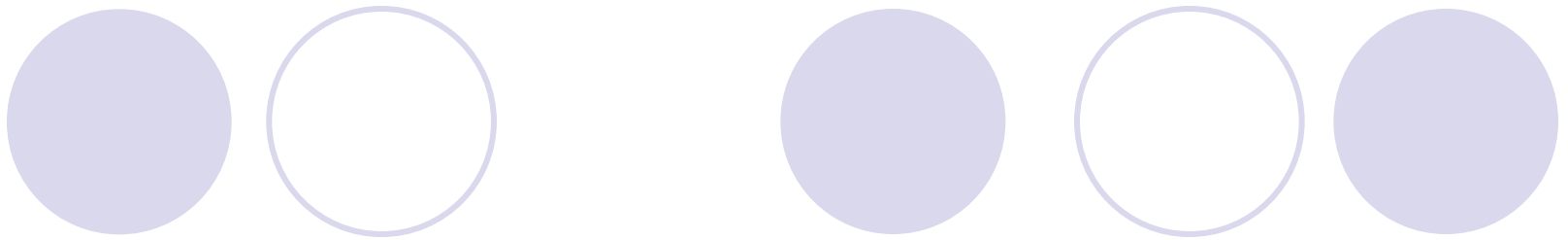


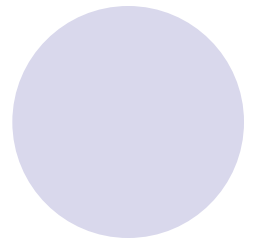
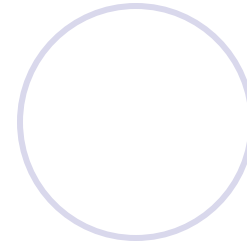
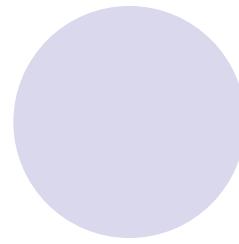
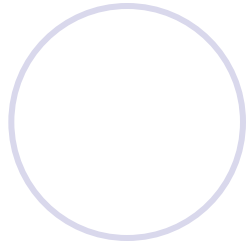
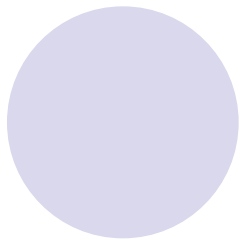
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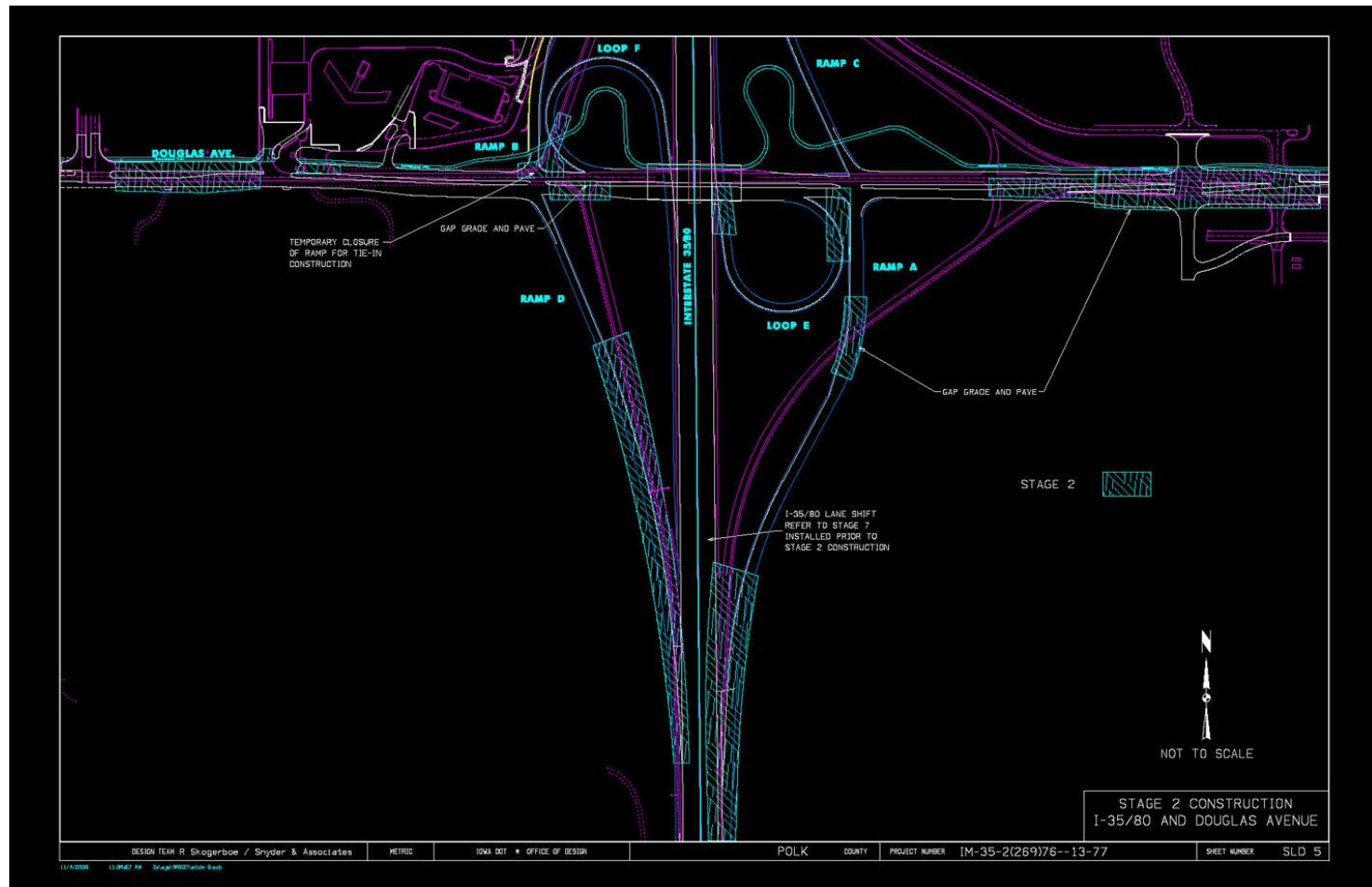
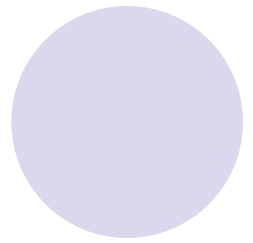
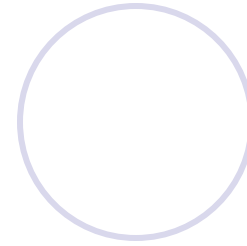
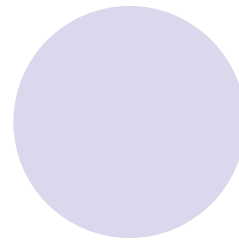
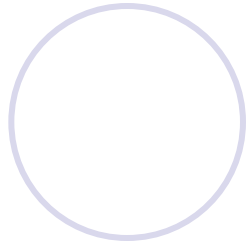
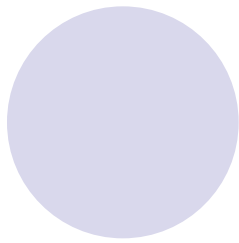
The intent of the staging window is to indicate which project elements can be constructed simultaneously and which need to be completed sequentially. The staging window should not be construed as a schedule. The Staging Window shall not supersede and section of the standard specifications.

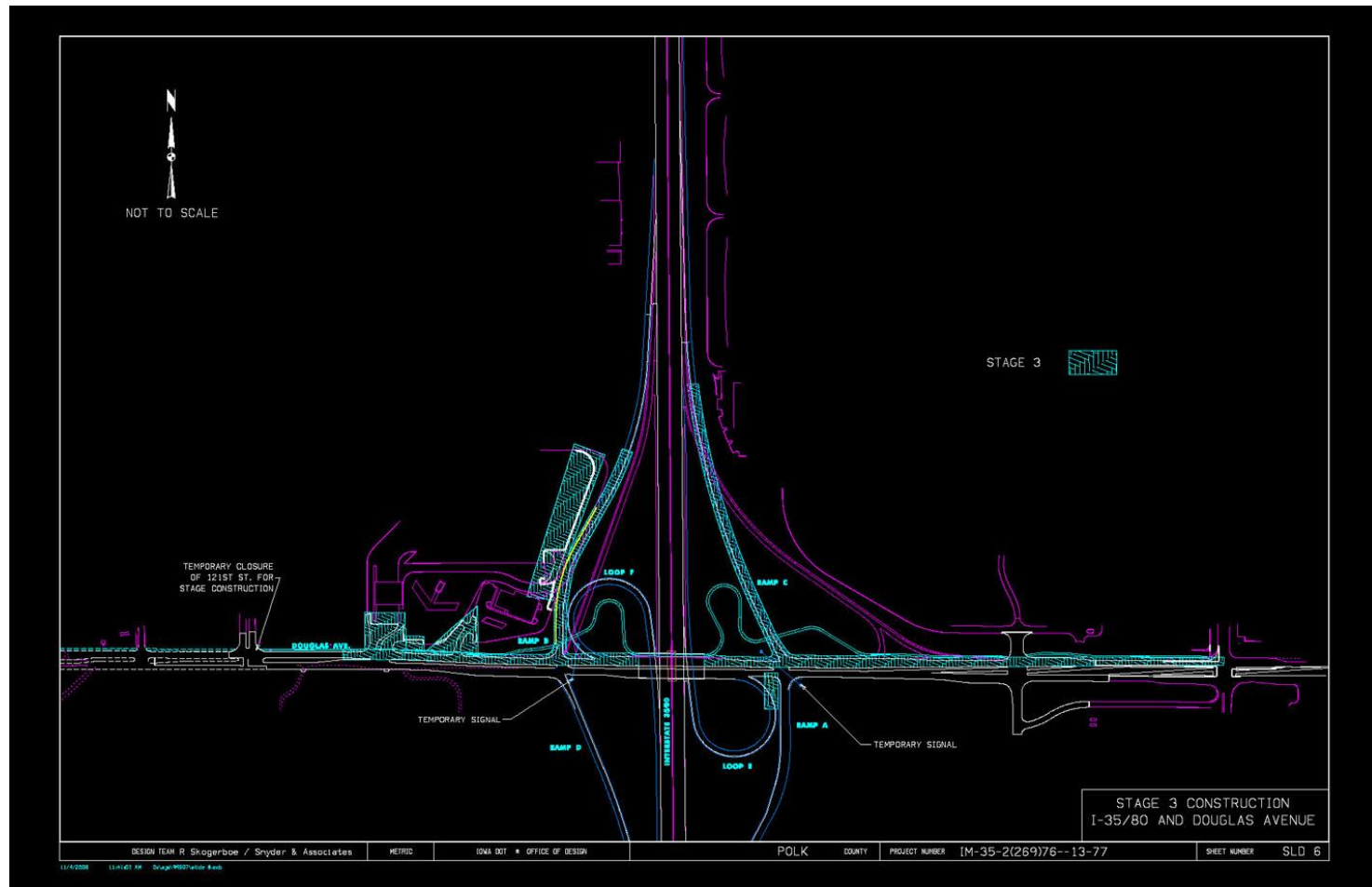
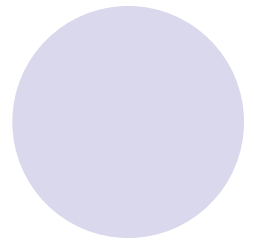
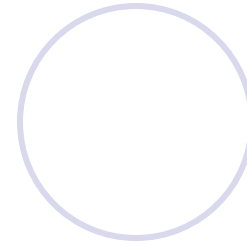
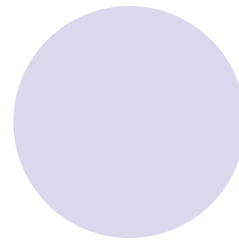
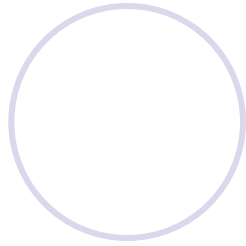
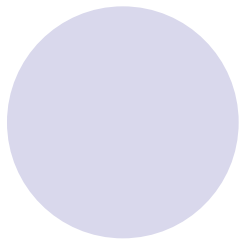
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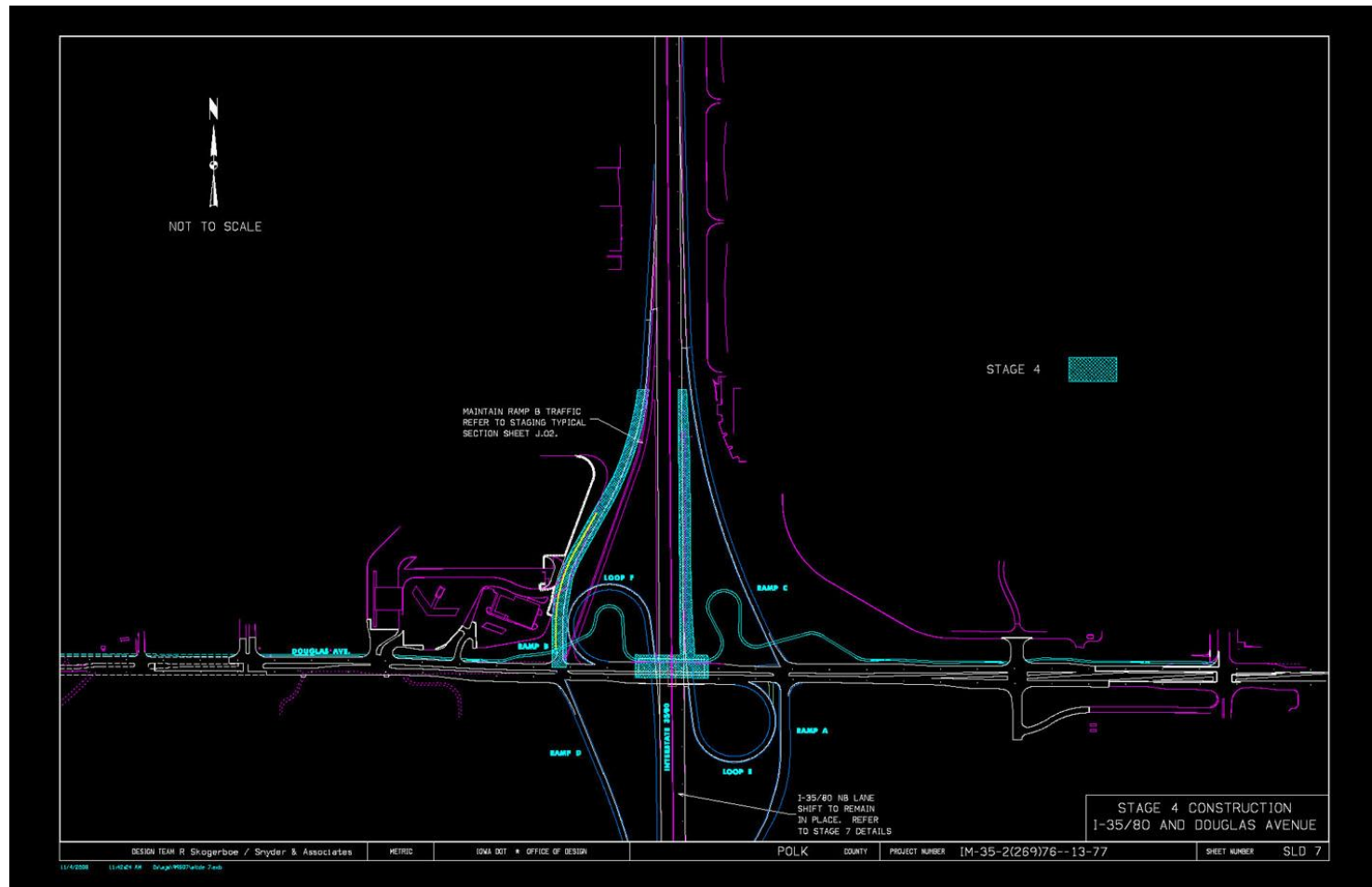
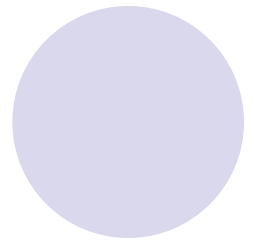
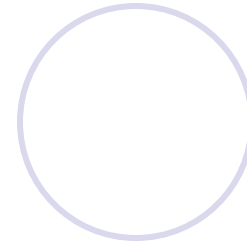
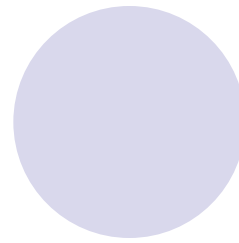
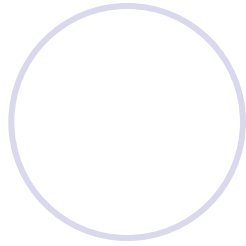
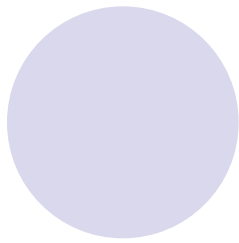
- ① Construction of E.B. Douglas Ave. Bridge IM-35-2(304)76--13-77
- ② Removal of existing Douglas Ave. Bridge IM-35-2(305)76--13-77
- ③ Construction of W.B. Douglas Ave. Bridge IM-35-2(305)76--13-77
- ④ Construction of trail underpass, IM-35-2(306)76--13-77
- ⑤ Construction of RCCB widening work restricted from late October 2002 to April 2003. Refer to IM-35-2(306)76--13-77

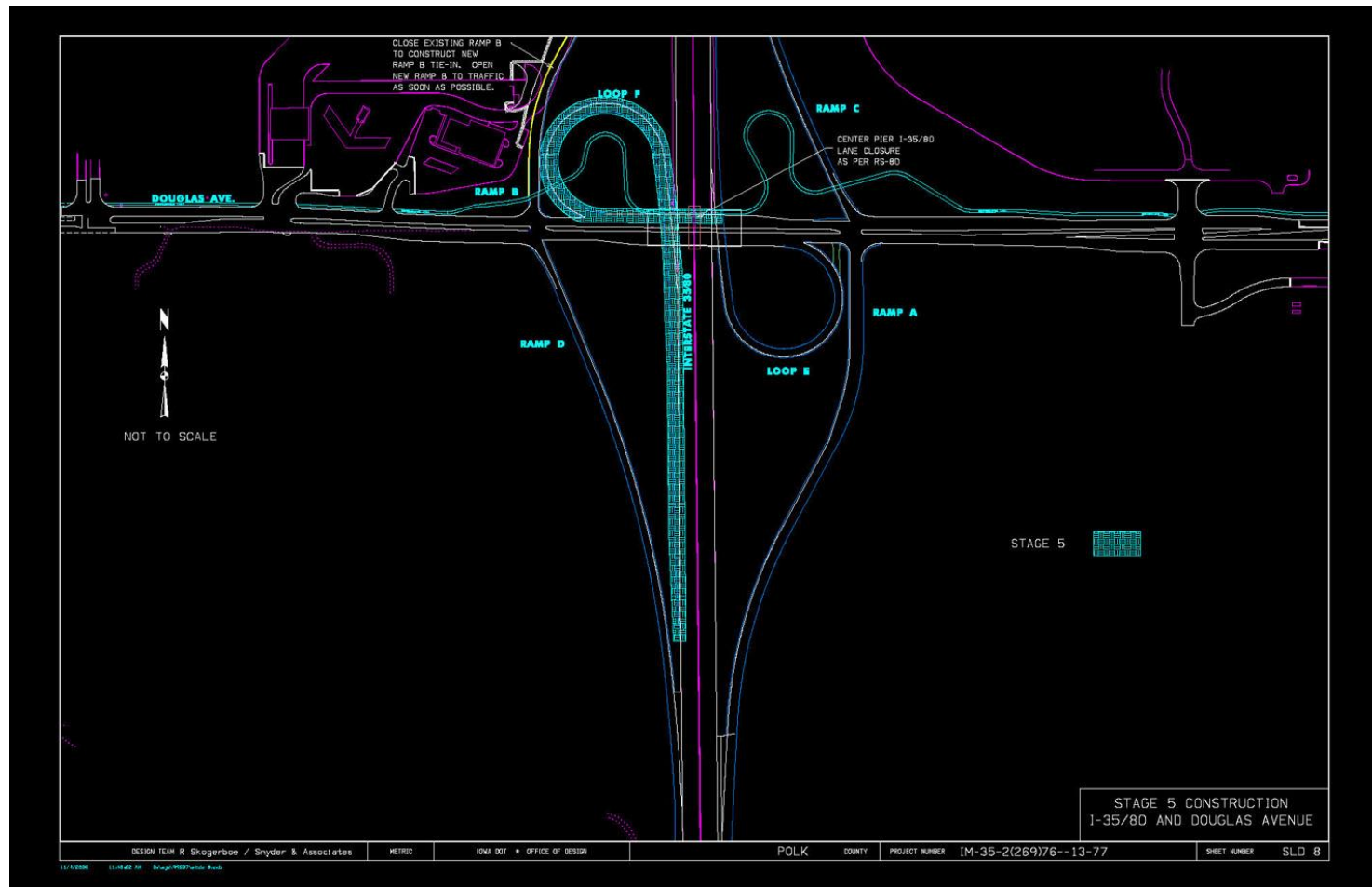
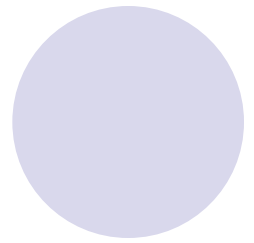
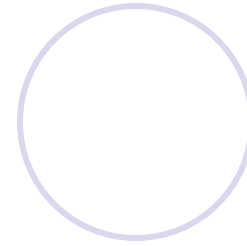
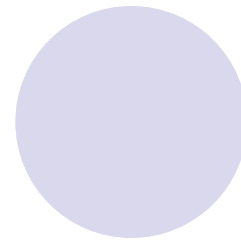
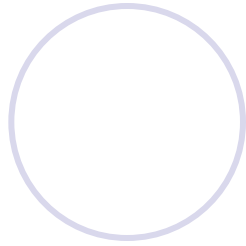
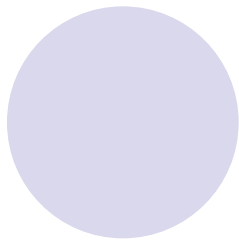


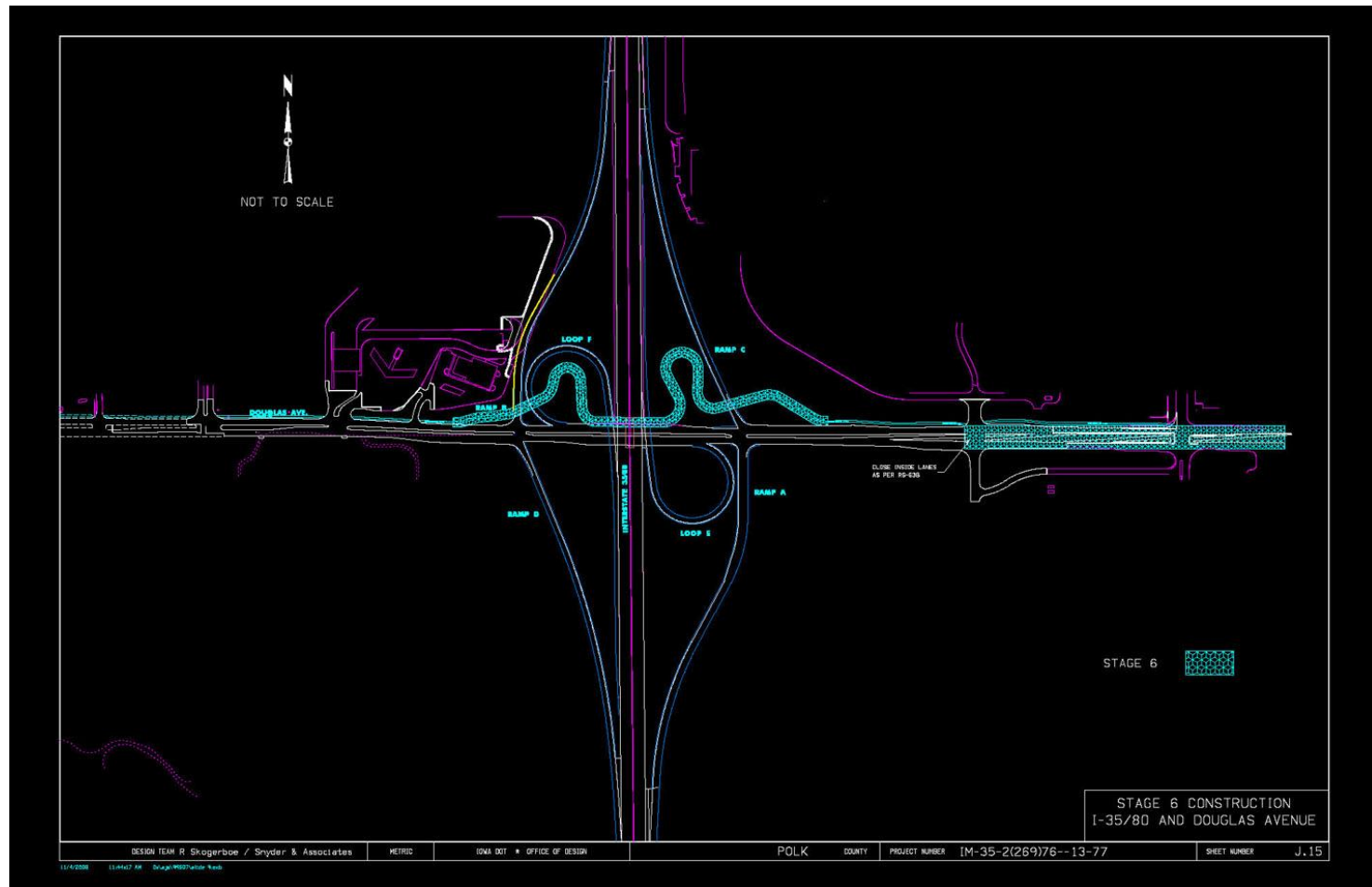
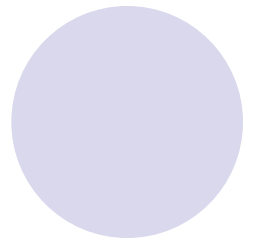
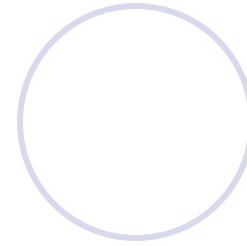
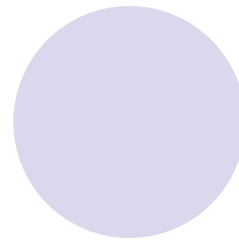
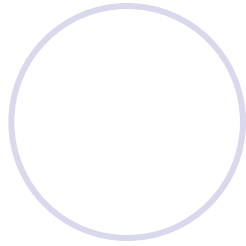
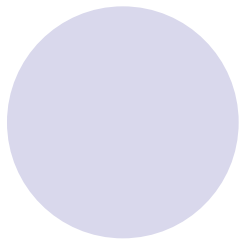




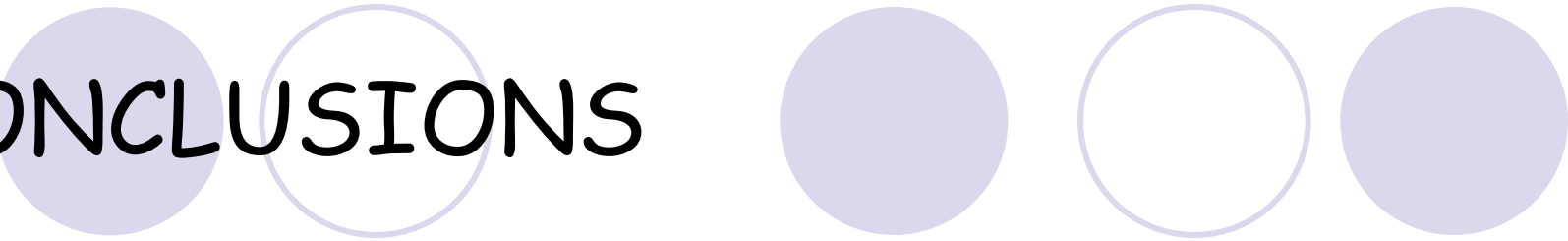








CONCLUSIONS



- Be prepared to make changes
- Always light transition and other complex areas
- Always light the travel area if night work is being done
- Be sure to have senior checker and construction staff reviews