COMMONWEALTH OF MASSACHUSETTS
DEPARTMENT OF PUBLIC UTILITIES

RESPONSE OF COLUMBIA GAS OF MASSACHUSETTS TO THE
FIRST SET OF INFORMATION REQUESTS FROM THE D.P.U.
PIPELINE ENGINEERING AND SAFETY DIVISION

D.P.U. 19-PL-07 – Merrimack Valley Incident (9/13/18)

Date: September 10, 2019

Responsible: Robert V. Mooney, VP Engineering and Construction

IR-PL-1-1: Please provide a detailed description of your Design Capital Project Workflow, including the following:

a) Constructability/safety review;
b) Gas systems planning review;
c) Capital design order checklist; and
d) Capital project examination workflow.

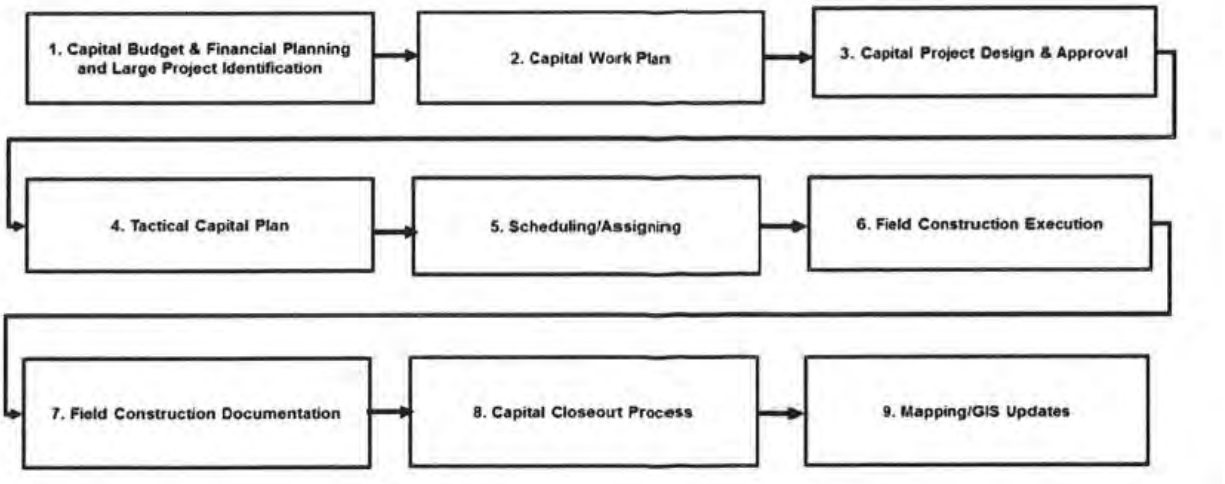
Response:

Below please find a description of Columbia Gas of Massachusetts' Design Capital Project Workflow that was in place at the time of the development and execution of the South Union Street project.

Design Capital Project Work Flow

Project work flow for Columbia Gas of Massachusetts is closely tied to the capital execution process as shown in Figure 1 - CDC Construction Process. Capital work flow processes 1 and 2 establish the capital budget and allocation. For the purposes of describing execution, project level work flow process 3 and 4 define the project level design, approval, resource planning and scheduling. Process 5 through 7 defines field execution accountability, approval and activity details. Process 8 and 9 define the project close out process including mapping.

Figure 1. CDC Construction Process



Capital project design and approval is based on the capital budget funding requirements as shown in Figure 2.

Figure 2.

NISOURCE Capital Project Approval for Replacement and Maintenance Projects								
Project Type	<100K	$100K up to $250K	$250K to $1M	$1M up to $1.5M	$1.5M up to $5M	>$5M	>$75M	>$150M
Replacement and Maintenance Design Capital Projects	Field Engineer	Leader of Field Engineer	Manager of Engineering	Director of Engineering	VP of Engineering	State President Senior VP EVP Safety, Capital & Tech Services CFO CEO Executive Governance Committee	Board of Directors Finance Committee	Full Board of Directors

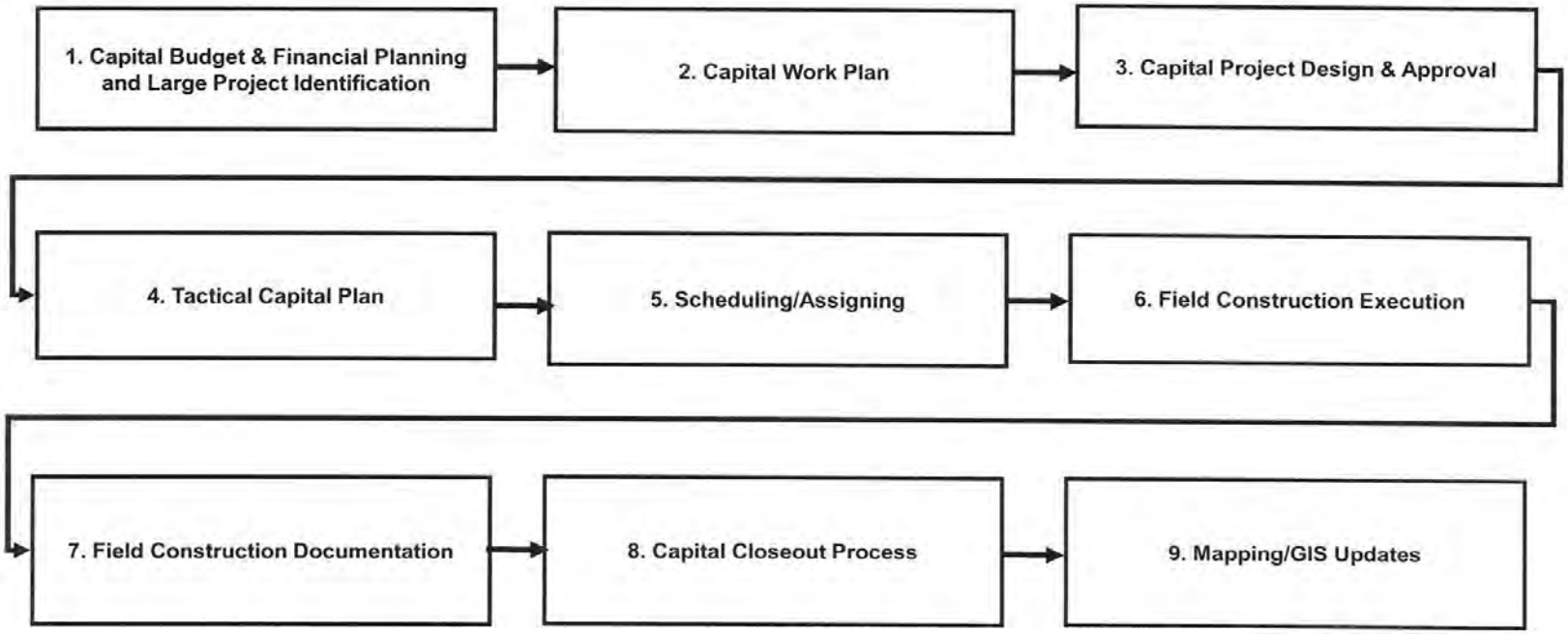
Note: Project design detail review and approval is performed at the field level with engineer, engineering leader, construction leader and/or operations leader as appropriate and based on the project size. Plan review and approval occurs up to the manager level based on the project size.

Capital project execution, activity detail, and activity accountability and approval work flows are provided in the CDC Construction Process Maps at Attachment IR-PL-1-1 (a) for each block provided in Figure 1. The following attachments provide field-level detail for project design and approval and project execution work flows:

- Attachment IR-PL-1-1 (b) - Capital Design Job Order Checklist, responsive to IR-PL-1-1(c)
- Attachment IR-PL-1-1 (c) – Gas Systems Planning Review Templates, responsive to IR-PL-1-1(b)
- Attachment IR-PL-1-1 (d) - Constructability / Safety Review, responsive to IR-PL-1-1(a)
- Attachment IR-PL-1-1 (e) - Capital Project Execution Work Flow, responsive to IR-PL-1-1(d)

The “Capital Design Job Order Checklist” details the individual steps and activities, accountabilities, and approvals performed and obtained by the field engineer during the project design and approval process. The Gas Systems Planning team performs hydraulic modeling of system flows and pressures and uses the “Gas Systems Planning Review Templates” to communicate recommendations to Field Engineering to ensure proper facilities sizing. The “Constructability / Safety Review” documents a collaborative discussion between the project engineer and the construction leader during which they review the scope and details of a project before construction to ensure there is clear understanding of the construction expectations, ensure project construction is aligned with design, and close any gaps that exist between engineering design and construction. The constructability review is the last step prior to project release. The “Capital Project Execution Work Flow” provides the activity detail, handoffs, accountability and approval that occur throughout the construction process from the time a project is released until it is completed and submitted to the GIS Capital Closeout team for project closeout and mapping.

CDC Construction Process: High Level Process Map



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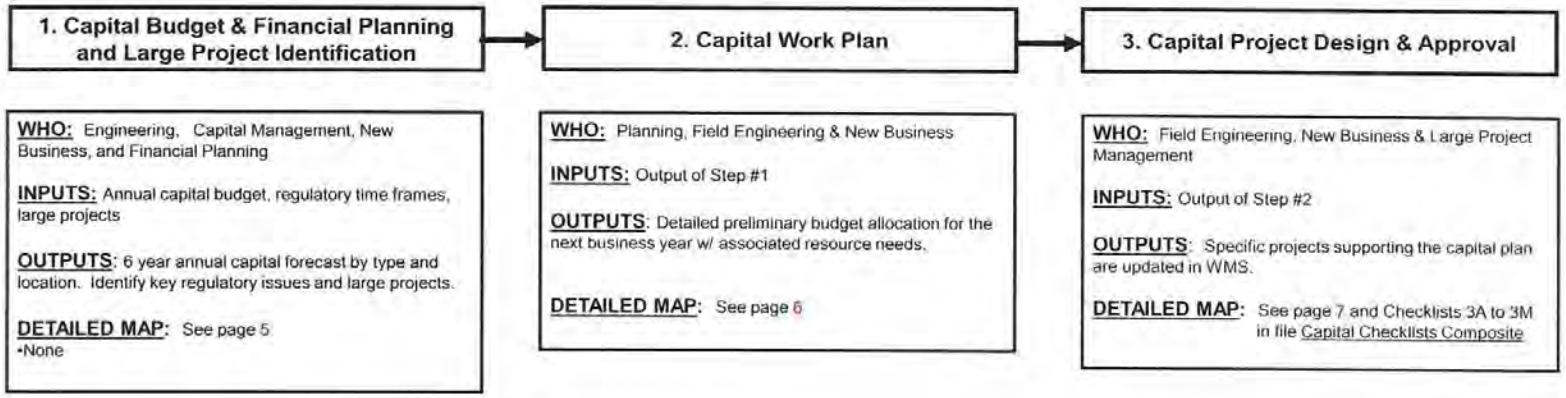
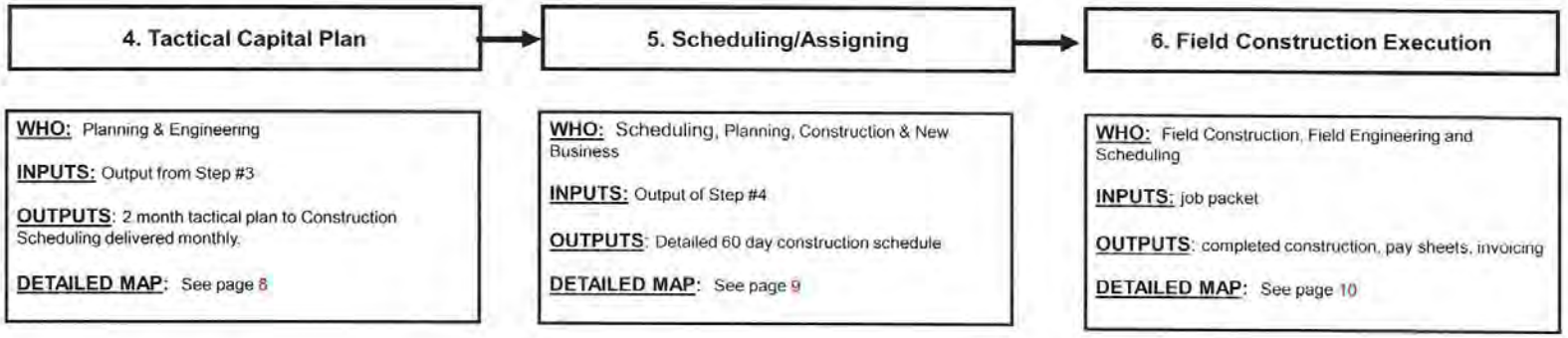
CDC Capital Execution High Level Process Maps



CDC Capital Execution High Level Process Maps



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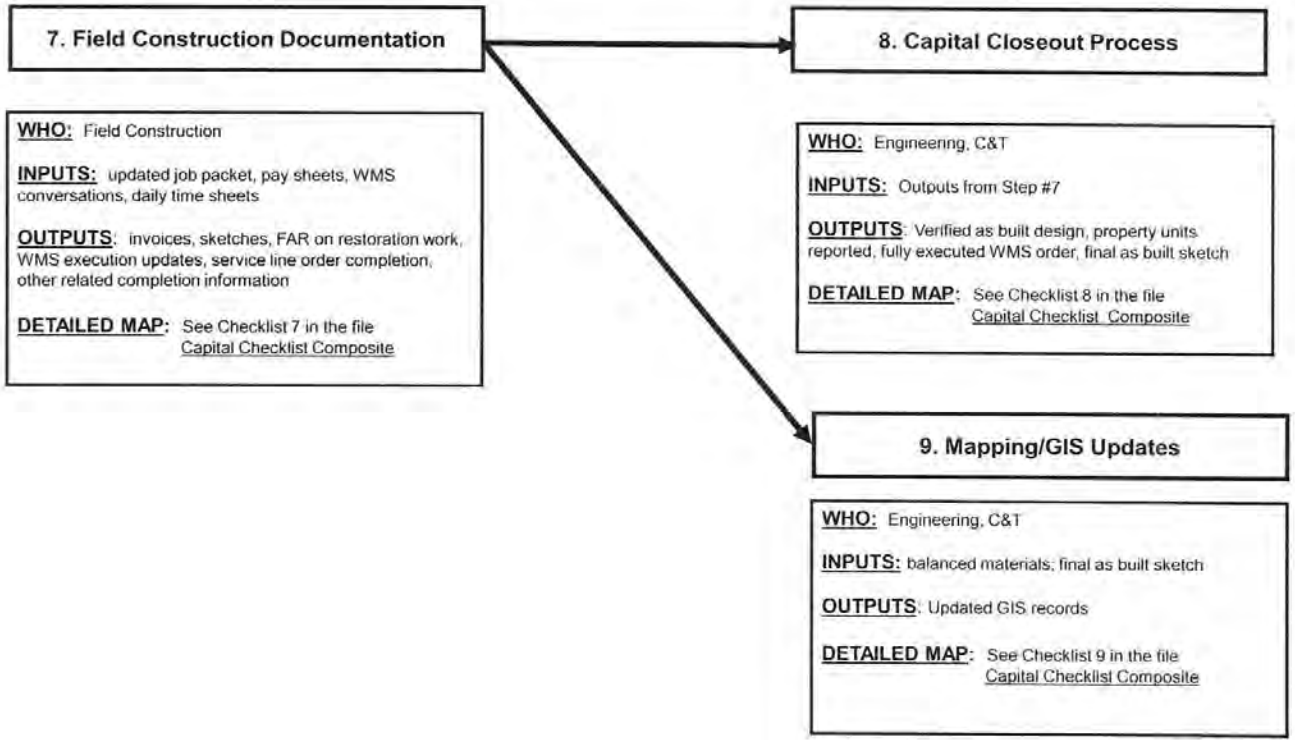
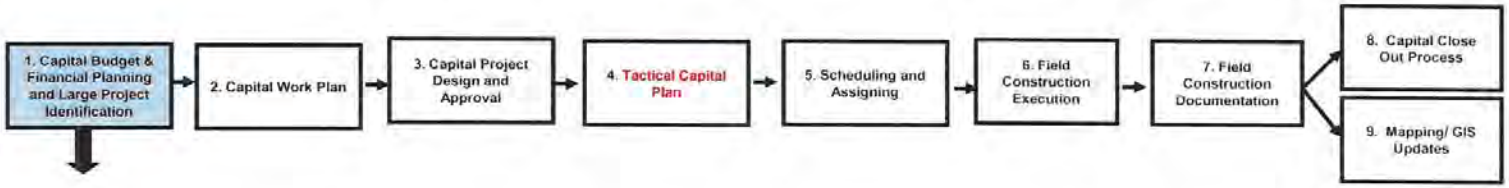
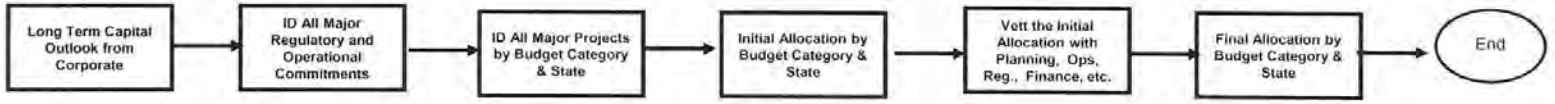
CDC Capital Execution High Level Process Maps



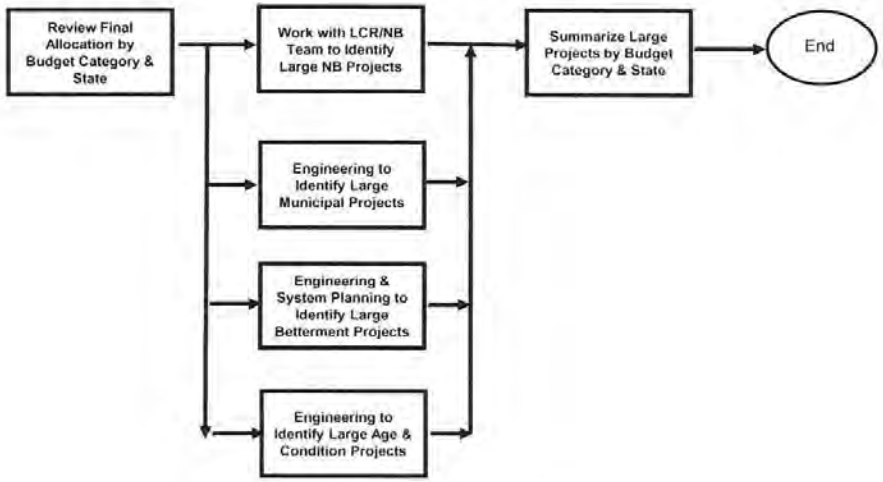
CDC Construction Process Mid Level Process Maps



Capital Budget



Major Project Identification



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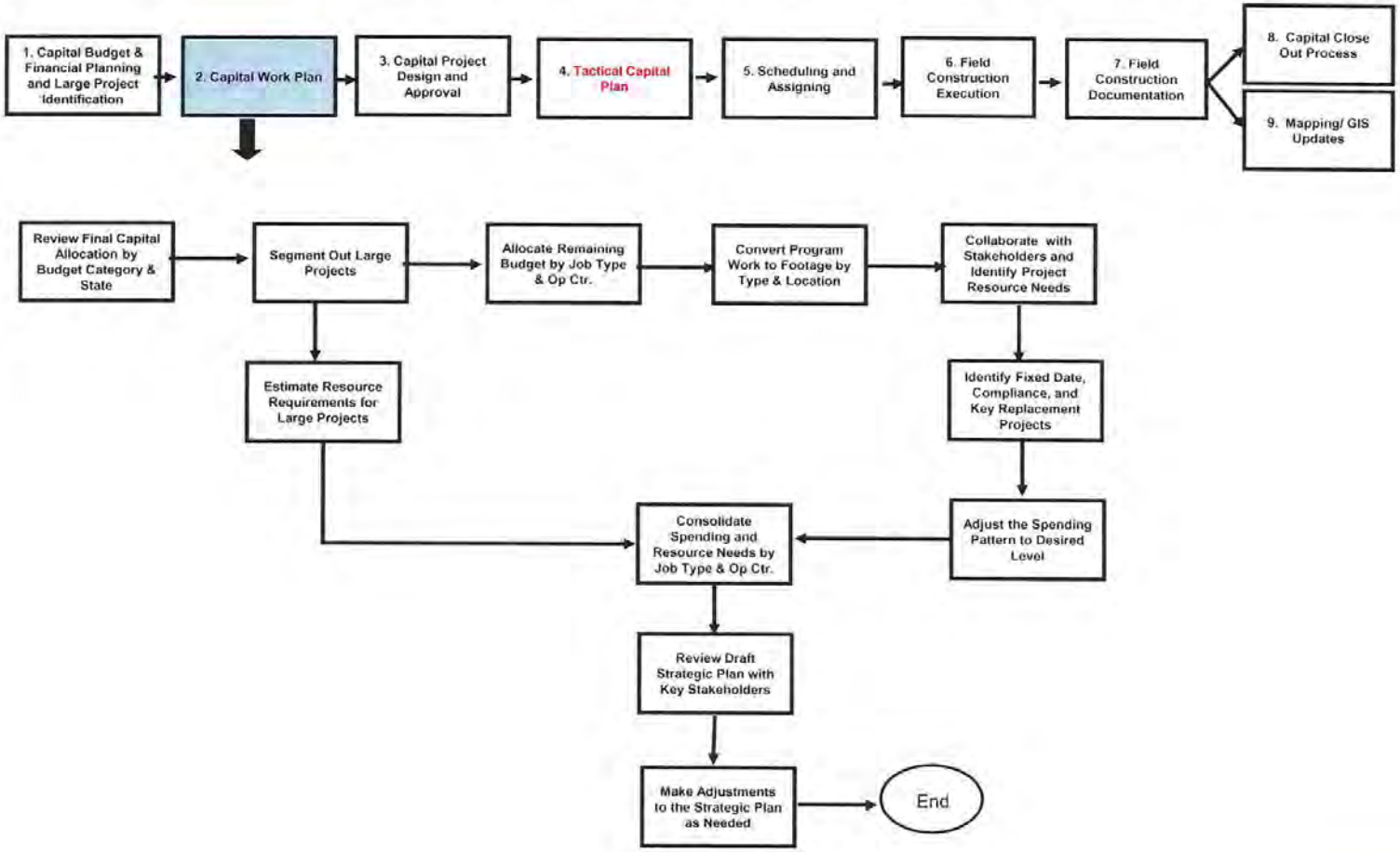
CDC Construction Process Mid Level Process Maps



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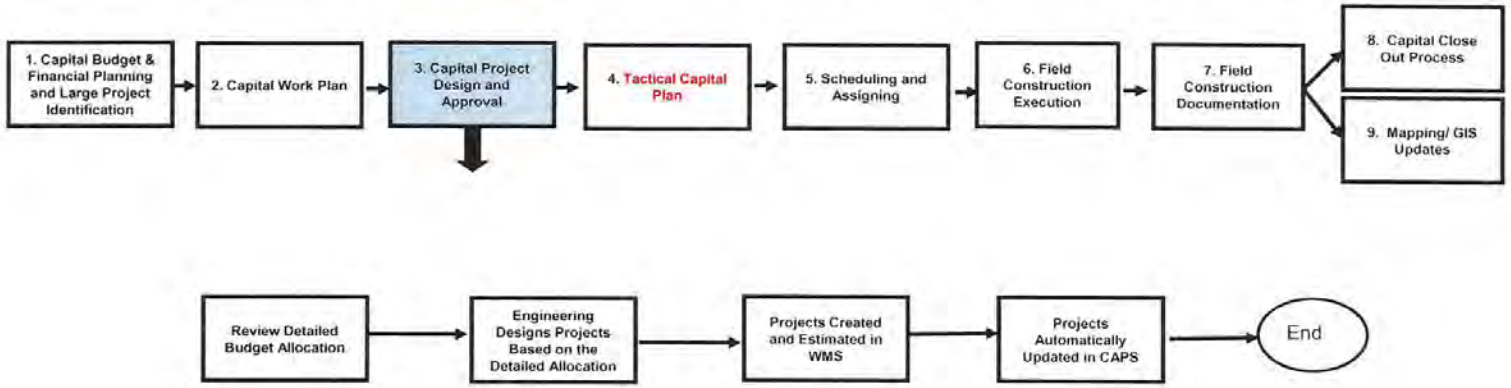
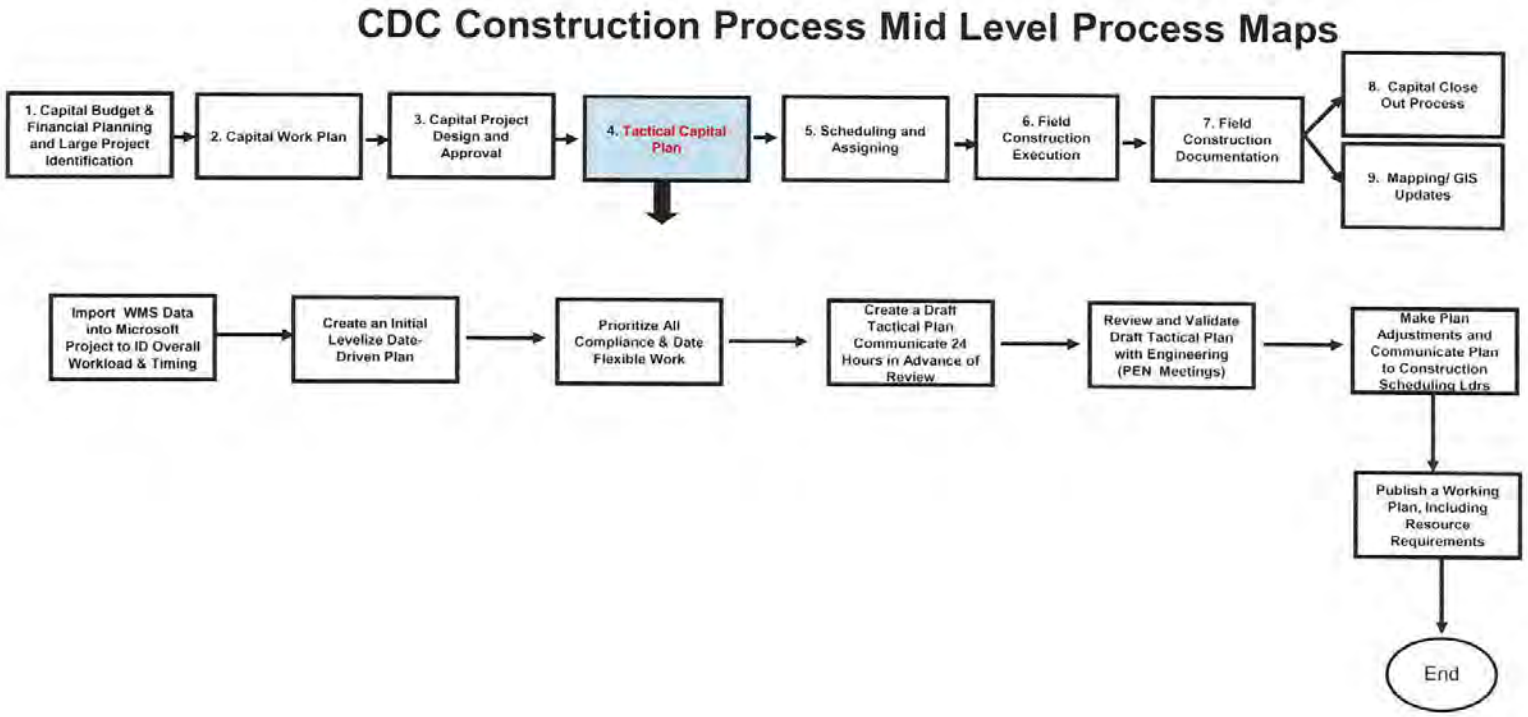
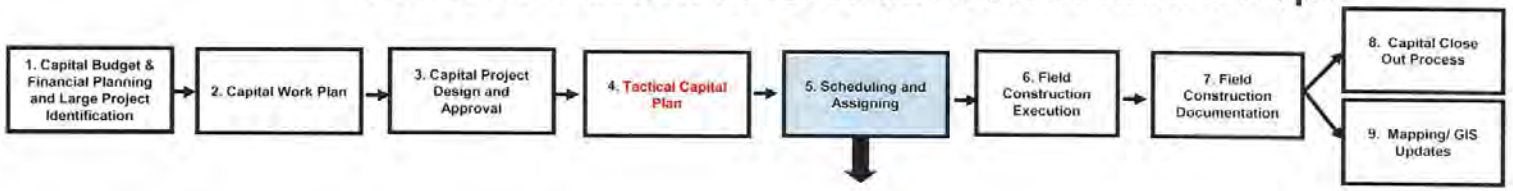
CDC Construction Process Mid Level Process Maps

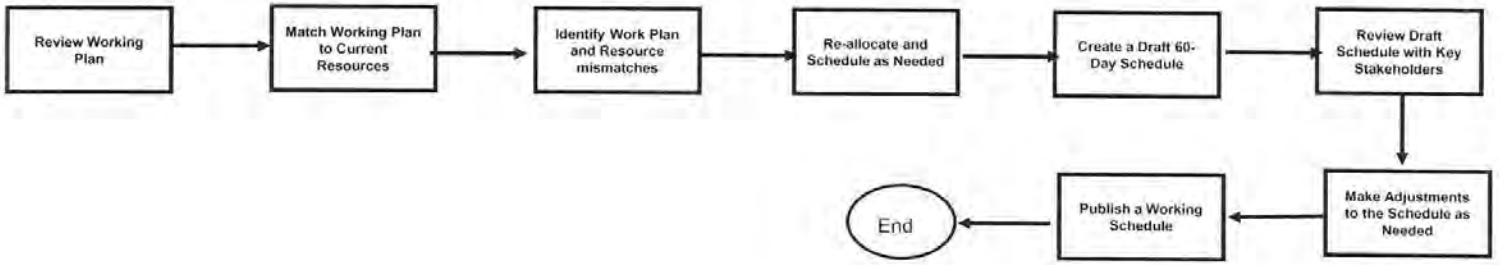



CDC Construction Process Mid Level Process Maps
1. Capital Budget & Financial Planning and Large Project Identification
2. Capital Work Plan
3. Capital Project Design and Approval
4. Tactical Capital Plan
5. Scheduling and Assigning
6. Field Construction Execution
7. Field Construction Documentation
8. Capital Close Out Process
9. Mapping/ GIS Updates
Import WMS Data into Microsoft Project to ID Overall Workload & Timing
Create an Initial Levelize Date-Driven Plan
Prioritize All Compliance & Date Flexible Work
Create a Draft Tactical Plan Communicate 24 Hours in Advance of Review
Review and Validate Draft Tactical Plan with Engineering (PEN Meetings)
Make Plan Adjustments and Communicate Plan to Construction Scheduling Ldrs
Publish a Working Plan, Including Resource Requirements
End

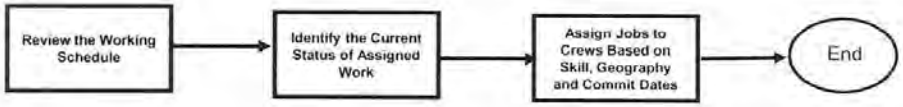
CDC Construction Process Mid Level Process Maps



Scheduling (for planned capital work)

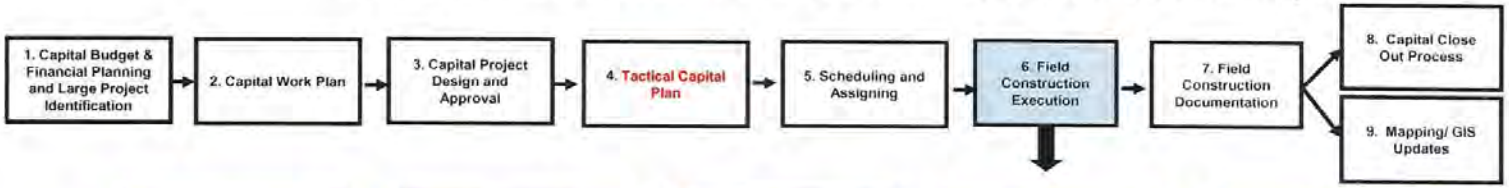


Assigning (1)



(1) Each crew should have 2 to 3 jobs into the future (6 weeks of work minimum)

CDC Construction Process Mid Level Process Maps



Review Project

- Review permit and ROW Requirements
- Review Tie-In Plan
- Review Services Requirements
- Review all other JO Packet items as needed
- Coordinate with Field Engineer for additional information requirements as required
- FLL Coordinates with IC to recommend a Coord to assign to project

Perform Pre-Construction Review

- Evaluate Site/Pre-Marking
- Determine special requirements (e.g. sub-contractors, traffic control, boring, etc)
- Perform community Outreach (e.g. road closures, customer notifications)
- Attend/Schedule Coordination meetings with involved parties (e.g. contractor, DOT, sewer contractor, municipal authorities, etc.)
- Walk job with contractor as required
- Manage material (e.g. deliveries/locations, service material, track back-ordered material)
- Review estimate
- Coordinate with local operations (uprates and tie-ins)
- Design Services (e.g. customer contacts, account for all customers, determine material requirements)

Coordinate Work

- Staking ROW
- Coordinate/Review construction crew's work plan (e.g. traffic control, day or night work, sequence of work, use of company resources)
- Schedule welders and tie-in/stopple crews. IC assigns the welders.
- Coordinate dig and backfill requirements
- Ensure one calls are made
- Manage material (e.g. material delivery locations, back-order status, stone & sand storage)
- Coordinate customer notifications/meter move-outs

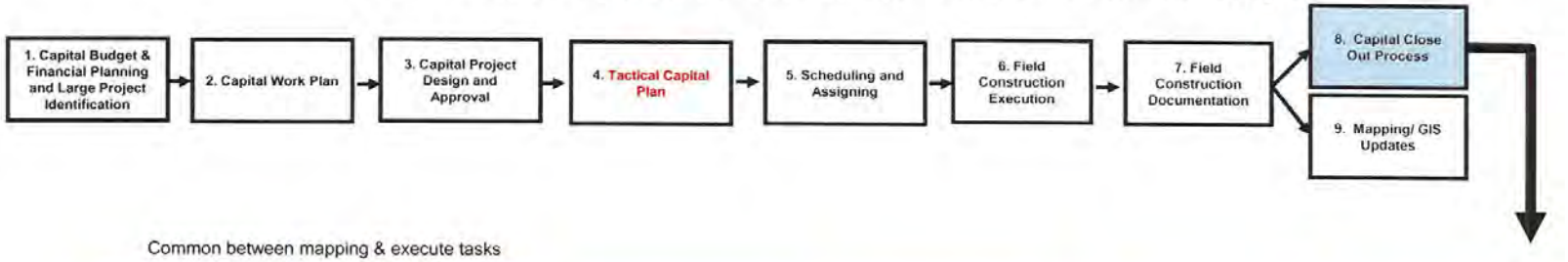
Perform Construction

- Manage Material
- Manage construction crews
  - ✓ perform QA/QC
  - ✓ monitor progress
- Manage scope changes
- Manage community and public relations
- Perform daily reporting and accounting
- Manage restoration
- Manage tie-ins
- Manage/coordinate re-lights and meter move outs

Complete Project

- Complete Job Orders (service Line Orders, Leak Orders, Hand-off Tap Cards)
- Finalize Invoices
- Final Mark Out (flagging)
- Complete As Builots (sketches, red lines)
- Manager Restoration
- Manage Material (balancing, excess material)
- Community outreach
- Post construction walk through (barrier protection, within 30 days after completion, meters painted, and restoration complete)
- All records put in packet for filing
- Complete Job Order Completion Checklist

CDC Construction Process Mid Level Process Maps



Common between mapping & execute tasks

Receive JO Packet

- **Measure**: JO turn-In Cycle Time:
- 2012 Goal :10 Day Average

Review JO Packet Data

- Check for required items (pipe exposure, pressure test records, as-built, etc)
- Return to Construction if required items are not included

Q/A & WMS Updates

- Confirm as-built installation, materials and testing are consistent with design
- Complete WMS Conversations: 1,4,5,7,8,9,10,11
- Validate WMS, As-Built, Plant Accounting entries
- Send requests to Construction for clarification of irregularities found

WMS Execute

- **Measure**: Days To Execute
- 2012 Goal :90% Executed within 75 Days
- 2011 Results: 95% Executed within 75 Days (Note: 2011 % based upon incomplete data)

Complete Related Tasks

- Create RTs
- Create valve record cards
- Order building tags

File JO Packet In Local Op-Center

- Continue on to mapping process (if not already mapped)
- Send original JO to archive (if already mapped)

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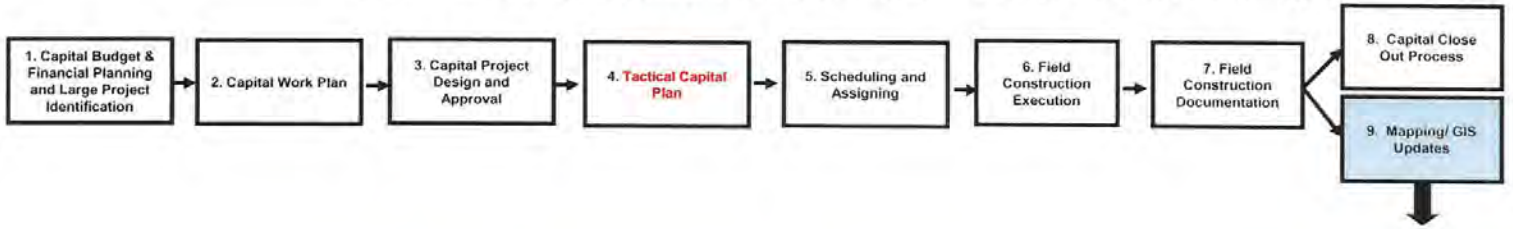
CDC Construction Process Mid Level Process Maps



Develop Supporting Data

- Land base corrections
- Additional land base
- New map sheets

Map in GIS

- Create new Gas features
- Abandon existing Gas features
- Generate "Map Revision" requests for any unsupplied swing-ties

Update JO Polygon

- Capital Work Area polygons are used to track unmapped JOs
- Once the JO has been mapped, the polygon is removed from GIS

QA/QC

- Automated QA/QC process runs against all edited data
- Validation against both GIS rules and business rules

Post GIS Update to DB

- **Measure**: Days To Map
- 2012 Goal :90% Mapped within 60 Days
- 2011 Results: 41% Mapped within 60 Days.
- Data is immediately available for use once posted
- Continue on to execute process (if not already executed)
- Send original JO to archive (if already executed)

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Gas Distribution

CAPITAL DESIGN JOB ORDER CHECKLIST
For use by Columbia Engineering Team

Project ID: / Job Order Number: 18-0842741-00

Tasks to be completed by Engineering Team before releasing WMS JO to Construction Services

Item	Complete	Not Applicable
Load Studies: Confirm with Engineer or Gas Systems Planning that the proposed main is properly sized. Notes: **Accountability/Approval - Gas System Planning / Field Engineer**	☐	☐
Evaluate the need for a non-primary relief valve (aka secondary relief valve) or changes to exsiting M&R settings. If needed, add the steps to the Project's plans. NOTE: "PRV" is Primary Relief Valve, *not* Pressure Relief Valve. Notes: **Accoutability/Approval - Field Engineer**	☐	☐
Engineering (e.g., Field Engineering, Design Engineering, Gas Systems Planning) has checked SCADA for all potentially affected monitoring points. When found, Field Engineering shall notifiy and/or consult with Gas Control when planning changes that may impact Gas Control operations (e.g., temporary flow patterns, new facilities, significant purging activities). Notes: **Accountability/Approval - Field Engineer**	☐	☐
* AutoCAD Drawing: Create plan/drawing of proposed work and in accordance with company standards. If job spans multiple taxing districts or map numbers, add break points on AutoCAD plan/drawing, and include taxing district or map numbers. Notes: **Accountability/Approval - Field Engineer**	☐	
* Save AutoCAD Drawing in both PDF and DWG format to the WMSDocs JO Workspace, and classify the documents as shown in the WMSDocs Quick Reference Guide. Notes: **Accountability/Approval - Field Engineer**	☐	☐
* On 555 projects include meter location information for commercial and multi-family accounts. Notes: **Accountability/Approval - Field Engineer**	☐	☐
Reimbursable: If JO is reimbursable, flag WMS and complete the billing information as required. * Obtain signed agreements as necessary. Notes: **Accountability/Approval - Field Engineer**	☐	☐
* If all PEIF answers are "NO" add the Basic ECP template, edit, and save to WMSDocs. * If any PEIF answer is "YES" or "UNSURE", initiate WMSDocs Workflow to the appropriate individuals. Notes: **Accountability/Approval - Field Engineer**	☐	☐
* Ensure completion of the Sewer Locate Process and provide all information to Construction Services when available. Obtain signatures (digital for Engineering and Company representatives, wet signatures for Video Crew foreman and Contractor foreman) as needed. Obtain sewer maps and/or records and file in WMSDocs as required. Specify file names, document types and workspace locations in Notes section of Engineering Design Phase. Notes: **Accountability/Approval - Field Engineer**	☐	☐
Railroad Crossing: When applicable gather all of the required information pertaining to the proposed railroad crossing and forward the information to the Field Engineering Leader so that the PUC railroad crossing application can be completed and submitted as required. Notes: **Accountability/Approval - Field Engineer Leader/Company Officer**	☐	☐
Update Optimain project status to "Authorized." Notes: **Accountability/Approval - Field Engineer**	☐	☐
* Corrosion Information: Obtain Completed Corrosion Recommendation Form from Corrosion Technician and plan for suggested materials in WMS. Notes: **Accountability/Approval - Corrosion Tech**	☐	☐
WMS Accounting Proj Code: On job order creation, ensure that the correct Accounting Project Code is selected for your respective state's requirements. Notes: **Accountability/Approval - Field Engineer**	☐	☐

Last updated: 04/14/2018

CAPITAL DESIGN JOB ORDER CHECKLIST
For use by Columbia Engineering Team

Item	Complete	Not Applicable
WMS Job Summary: (Install / abandon, footage, size/material of pipe) entered in Job Summary field. Notes: **Accountability/Approval - Field Engineer**	☐	☐
WMS Material List. Plan for all material in UJP, F13. List all special order materials (non-stock symbol number) and the associated costs. List special orders on the "comments" screen. Notes: **Accountability/Approval - Field Engineer**	☐	☐
WMS Labor: Use the "Job Duration Estimating Tool to create labor estimate and enter results on the Labor screen in UJP, F14. Notes: **Accountability/Approval - Field Engineer**	☐	☐
WMS Contract: Create contract estimates for as many contractors as needed (pipeline, restoration, land services, staking, etc.) in UJP, F15. Notes: **Accountability/Approval - Field Engineer**	☐	☐
WMS Other Costs: Complete truck hours, misc. costs, permit costs, right-of-way costs, etc. in UJP, F16. Re-set hold flag if needed. Notes: **Accountability/Approval - Field Engineer**	☐	☐
WMS Land Services: Create land services request if needed in UJP, F17. Initiate a WMSDocs Workflow Request for Land Services Department with details. Re-set hold flag if needed. Notes: **Accountability/Approval - Field Engineer**	☐	☐
WMS Comments screen: Enter JO comments. Follow Comments Prioritization recommendations. Notes: **Accountability/Approval - Field Engineer**	☐	☐
WMS Commit Date: Enter a commit date if no commit date is automatically set from associated DPI's. This commit date should include time for installation of new main, service replacements, and abandonment of old pipe. Notes: **Accountability/Approval - Field Engineer**	☐	☐
WMS Welder: If company welder is required, set the "welder" flag to a "Y". Use the "comments" screen to note how many days the welder is needed. Notes: **Accountability/Approval - Field Engineer**	☐	☐
Create any other additional or related Projects & Job Orders as necessary (abandons, 555, 559, 561, designed capital services, etc.). Notes: **Accountability/Approval - Field Engineer**	☐	☐
Schedule and conduct Constructability / Safety Review with construction for all JO's >=$25k, or unusual (e.g. high pressure steel, major road crossings, stream crossings, significant elevation changes, other as determined by engineer). Notes: **Accountability/Approval - Field Engineer and Construction Leader**	☐	☐
* State Commission Notice: When applicable notify engineer or submit Notification. Notes: **Accountability/Approval - Field Engineer/Engineering Leader**	☐	☐
* Verify that all related open DPI's have been associated to the JO and upload the DPI copy to the WMSDocs JO Workspace (include Grade 3 DPI's). Notes: **Accountability/Approval - Field Engineer**	☐	☐
WorkPrep Header page has been filled out and all permits or Right of Ways needing obtained prior to construction have been obtained and entered in WorkPrep (UWP). Notes: **Accountability/Approval - Field Engineer**	☐	☐
* Service Line Data: Gather customer listing / service line information from Distribution Launch Pad; Engineering Main Line Reports Notes: **Accountability/Approval - Field Engineer**	☐	☐
* Tie-In/Odorant Monitoring/Pressure Test Plans: Create drawing and written plan for tie-in, testing, abandoning and purging of mains. Utilize the "Odorant Absorption Pipe Surface" spreadsheet to determine the total internal surface area of the proposed installation; include calculation sheet in written plan. Recommend additional/subsequent odorant test(s) as necessary. If additional/subsequent odorant monitoring tests are needed, a copy of the documentation chart shall be included with the tie-in plan, including a sketch with Recommended Test Locations. Notes: **Accountability/Approval - Field Engineer/Construction Leader via Constructability Review Process**	☐	☐

Last updated: 04/14/2018

CAPITAL DESIGN JOB ORDER CHECKLIST
For use by Columbia Engineering Team

Item	Complete	Not Applicable
Create the capital work order polygon(s) within GIS representing install and retirement JO's and include the WMSDocs Link. Notes: **Accountability/Approval - Field Engineer**	☐	☐
Verify that the Design-Certification Section of the Job Order Approval has been wet-signed and scanned to the appropriate JO workspace. Classify Document as shown in WMSDocs Quick Reference Guide. Notes: **Accountability/Approval - Field Engineer/Engineering Leader**	☐	☐
* Verify that both the Job Order Approval(s) and PDF Proposed Job Order Drawing(s) have been approved using WMSDocs Approval Workflows. Classify Documents as shown in WMSDocs Quick Reference Guide. Set "Verbal Approval" Flag if appropriate and note verbal approval details in comments. Notes: **Accountability/Approval - Field Engineer/Based on Capital Approval Level**	☐	[redacted]
Verify status of all WMS hold flags. Notes: **Accountability/Approval - Field Engineer**	☐	☐
Approve JO in WMS and send JO "release" Email to scheduler. Notes: **Accountability/Approval - Field Engineer/based on Capital Approval Level**	☐	☐
When all engineering-related hold flags have been removed, submit the JO to scheduling in WMSDocs. Notes: **Accountability/Approval - Field Engineer**	☐	☐
Send email of proposed AutoCAD Drawing, as applicable to: 'CDC Damage Prevention 811 Coverage Update' Mgr Operations Center — Gas Systems Planning Planning Leader — Ldr Front Line Construction Services Scheduling Leader — Corrosion Technician Leader Field Operations — Sr Operations Support Specialist Leader M&R — New Business Representative Notes: **Accountability/Approval - Field Engineer**	☐	☐
Determine if any single-fed or multi-fed systems without a pressure gauge have been created. If so, notify FLL of M&R to determine the need for ERX and/or Relief Valve. Update or create MAOP worksheets accordingly (located under Category "Forms": GS 1660.020-1). Notes: **Accountability/Approval - Field Engineer**	☐	☐
During the design phase assure the following has happened: • Synergi or similar approved hydraulic analysis tools was used to ensure any replacement or abandonment creating significant changes to system operation was evaluated. • GASCalc or similar approved station equipment evaluation tools were used to ensure any replacement or abandonment impacting measurement and regulation was evaluated (i.e.: PODs, district staions, customer settings) Take action as needed to address findings from Synergi, GASCalc, (etc). Plan for pressure monitoring during construction and/or abandonment to ensure the MAOP/MOP are not exceeded. Notes: **System Capacity Calculation - Accountability/Approval - Field Engineer and Engineering Leader for large projects**	☐	[redacted]
Include total project cost and number of customers affected in the WMS Project ID Update (UPI) comments screen for projects over 500 feet or any coded AMRCB—this information is required to be entered in the specific format shown below (no letters or other characters are to be used): COMMENTS COST: $750,000 CUSTOMERS: 150 Notes: **Accountability/Approval - Field Engineer**	☐	☐

Last updated: 04/14/2018

CAPITAL DESIGN JOB ORDER CHECKLIST
For use by Columbia Engineering Team

Job Order Number: 18-0842741-00

MAOP Documentation	
Does this project involve changes to a system maximum allowable operating pressure (MAOP) or maximum operating pressure (MOP) via uprate, downrate, system split, combination, or creation?	
☐ Yes	☐ No
If the answer to the above question is "yes," then ensure that all applicable documentation is created/updated upon execution of the job orders to reflect any MAOP and/or MOP changes. Refer to Gas Standard 1660.020 "Documentation of Maximum Allowable Operating Pressure" Section 4. 'Changes to MAOP or MOP' for more information. *When changes are made to the MAOP and/or MOP by uprating, derating, separating or combining a piping system(s), Field Engineering should ensure the completion of the following, as necessary.* *a) Establish the appropriate MAOP(s) and/or MOP* *b) Update the MAOP and/or MOP piping system records.* *c) Update the related customer computer database (e.g. DIS or GIS).* *d) Notify Gas Systems Planning to update the model.* *e) Notify the appropriate measurement and regulation personnel to update the necessary regulator and meter station records (e.g. regulators supplying the affect system, as well as regulators supplied by the affected system.* *f) For distribution owned transmission lines, complete a class location review according to the Company's applicable gas standards.*	

* : To be filed in WMSDocs Workspace(s)

Items listed below are in addition to required workspace items specified above.

WMSDocs Workspace Items	Complete	Not Applicable
Verify all applicable items are included in the correct Project level or Job Order level workspace(s). Move documents from other workspace(s) as needed.	☐	☐
Copy of WMS printout (crew copy)	☐	☐
GIS prints showing work area limits of affected pipe	☐	☐
All permits, easement completion letters, and right of ways as applicable	☐	☐
Valve location record form with new valve number assigned	☐	☐
Construction Job Order Checklist Form	☐	☐
Detailed plans, drawings, or plats as applicable	☐	☐
Blank test point sheet for each TS to be installed on metallic pipe	☐	☐
Material JO's or special order material information	☐	☐
Special instructions or information	☐	☐
This Engineering Checklist Form	☐	☐

Digital Signature: **Accountability/Approval - Field Engineer** **Date:**

(project engineer)

* To be filed in WMSDocs Workspace(s)

Gas Systems Planning Review New Business

Project Name: _____

Field Engineer: _____

Date: _____

Town: _____

# of New Meters: _____

Load Per Meter: _____

NLTS #: _____

Engineering Comments:

Street Name	Proposed Size	Length	From	To	Node Name

Systems Planning Reviewed by: _____

Date: _____

Node Name: _____

Systems Planning Comments:

Gas Systems Planning Review Replacement

Project Name: _____

Field Engineer: _____

Date: _____

Town: _____

Engineering Comments:

Street Name	Proposed Size	Length	From	To	Pipe Name

Gas Systems Planning Reviewed by: _____

Date: _____

Systems Planning Comments:

For Capital Designed Job Orders
For use by Columbia Engineering Team

Constructability / Safety Review

Design to Build - Build as Designed

Project ID: 18-55675 / Job Order Number: 18-0843242-00

€ Project Scope

- Notes:

€ Route and Drawings

- Special Considerations
- Primary Construction Method(s)
- Notes:
- Permits
- ROW and Staking Requirement

€ Tie-in Locaitons, Designs, and Sequencing

- Notes:

€ Route and Drawings

- Special Fittings
- All Estimated Materials
- Notes:
- Long Lead-time Items
- Other

€ Units for Estimate

- Labor
- Fill
- Restoration/Paving
- Survey Requirements
- Service Replacements/Tie-overs
- Notes:
- Tie-ins
- Traffic Control
- Shoring
- Test Holes
- Meter Moveouts

€ Duration

- Working Hours
- Who is on Jobsite
- Notes:
- Number of Crews
- Special Conditions

Last updated: 04/14/2018

For Capital Designed Job Orders
For use by Columbia Engineering Team

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€ Land Services Requirements (permits, private ROW, etc.)

- Notes:

€ Safety

- Excavation Safety
- Tie-in Locations
- Contact Corporate Security prior to start
- Notes:
- Traffic Control
- Operability/Damage Prevention

€ Pressure Monitoring Control Considerations

- Known concerns to monitor
- High and Low Pressure safety limits
  - ie: if pressure rises/falls beyond these points, contact M&R
- M&R Station abandonments
- Pressure check locations
- Non-Primary relief valves needed
- Notes:

€ Field Visit Needed? (☐ Yes / ☐ No)

€ Comments / Adjustments

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Last updated: 04/14/2018

For Capital Designed Job Orders
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Constructability / Safety Review for

Project ID: 18-55675

Job Order Number: 18-0843242-00

Has been completed and agreed upon by the following:

Signed, Field Engineering	(Printed Name)	Date
Signed, Construction Services	(Printed Name)	Date
Signed, Contractor's Foreman (Contractor's Foreman only needs to sign when applicable)	(Printed Name)	Date
Signed, M&R (M&R Services only needs to sign when applicable)	(Printed Name)	Date
Signed, Land Services (Land Services only needs to sign when applicable)	(Printed Name)	Date

This document is to be completed with notes, signed, then filed into the applicable WMSDocs Project Workspace

CONSTRUCTION PROJECT – PROCESS FLOW

1. Field Engineer and Construction Leader/Specialist
    a. Pre-project design review – review project scope
2. Field Engineer
    a. Submits permit and permit maps to town/city DPW for review and approval process
3. Field Engineer and Construction Leader/Specialist
    a. Constructability review
        i. Review and sign off on the following items:
            1. Project scope
            2. Traffic plans
            3. Safety
            4. Duration
            5. Materials estimated
            6. Tie in plans
            7. Environmental and State Road work, if applicable
            8. Permit status
            9. Service counts
            10. Misc. items – school zones, state roads, digging conditions, etc.
4. Field Engineer
    a. Receives approved permit and releases project packet to Construction and Scheduling
5. Scheduler
    a. Orders materials in WMS
6. Construction Leader/Specialist
    a. Reviews project packet with Inspector
7. Construction Leader/Specialist
    a. Walks project with local DPW inspector, Police and Contractor Supervisor to confirm/mark main locations and discuss traffic plan
8. Scheduler/Construction Leader
    a. Assigns contractor crew to project
9. Construction Specialist
    a. Premarks the project and calls in Dig Safe
10. Construction Specialist
    a. Project packet is split up into the following smaller packets:
        i. Contract locator packets
            1. Project scope map
            2. Customer service list
            3. Copies of service cards
        ii. Contract Foreman/Supervisor
            1. Project scope map
            2. Customer service list
            3. Copy of tie in/abandonment plans
            4. Copy of Dig Safe numbers

iii. Pipefitter (both Company and Contractor)
    1. Project scope map
    2. Customer service list
iv. Sewer Locate
    1. Project scope map
    2. Customer service list
v. Inspector
    1. Project scope map
    2. Customer service list
    3. Copy of tie in/abandonment plans
    4. Copy of Dig Safe numbers
    5. Copy of approved road opening permit
    6. Copy of approved environmental permit, if applicable
    7. Valve sheets
    8. Job order print outs
    9. ECP form
    10. Corrosion form
    11. Copy of DPIs, if applicable
    12. Construction checklist
    13. Odorization form, if applicable
    14. Sewer locate form

11. Contractor - Contract Locators
    a. Mark out mains and services within the scope of the project
12. Construction Leader/Specialist
    a. Requests road opening permit from city/town
13. Contractor
    a. If environmental is applicable, contractor sets up environmental protection based on conservation's requirements and it must be inspected before a project starts and after it ends
14. Construction Specialist
    a. Coordinate with sewer locate company
    b. Sewer locate calls and schedules police details to scope sewer mains, drains and laterals within the scope of the project
15. Contractor/Company Pipefitter (depends who is assigned to the project)
    a. Pipefitters begin to walk and knock to schedule prepipes
16. Contractor
    a. Calls for police details
    b. Provides town notifications daily (Andover, North Andover and Methuen; Engineering updates Lawrence weekly)
17. Scheduler/Construction Leader/Specialist and Contractor
    a. Once notification is made to the towns and Dig Safe is good, construction begins
18. Construction Leader/Specialist
    a. Weekly updates with Inspectors regarding project status/needs

19. Inspector
    a. Once project is complete, Inspector needs to ensure the following items are completed and in packet for Capital Close Out and completed in WMS:
        i. Conversations #1, #2, #4, #5, #6, #7 (if applicable), and #11 in WMS are complete
        ii. Final map has all new main installation drawn in RED, existing main in BLUE and retired main in GREEN; all necessary swing ties, measurements off houses/structures, marker ball locations, corrosion control features such as test stations, insulators, rectifiers, and anodes. Signed, dated and the word "COMPLETED" on final map/sketches with a north arrow
        iii. Valve sheets with sketch and swing ties to newly installed valves; control of flow and location
        iv. Signed tie in plans (signed by Inspector and Foreman)
        v. Signed job order print outs
        vi. Signed corrosion forms
        vii. Test station forms with wire drawings, if applicable
        viii. Completed DPIs both in written form and in conversation #7 of WMS, if applicable
        ix. Signed and dated construction checklist
        x. Pressure test charts with the back data complete (i.e., date, time, footage, pipe size, etc)
        xi. Complete soap test form – for any fittings
20. Construction Specialist
    a. Does final check through of completed Capital Close Out packet submitted by Inspector, scans all documentation and uploads and updates metadata and status to "COMPLETE" in WMS Docs; submits final package electronically to Capital Close Out and drops off physical packet to Capital Close Out Dept