



HYDINFRA CAPABILITIES

If a database doesn't have a good way to access the data, you might as well have paper records. Mn/DOT IT people have helped us develop several ways for anyone in Mn/DOT to access the HydInfra data. These tools allow users to get the data by themselves, when they need it. See also diagram [HydInfra's Moving Parts from a User's Standpoint](#).

Get data out of HydInfra

The best methods for users to access the data are:

- 1) **Web-based Crystal Reports** that tap the database for Maintenance repairs or Construction project design (see HydInfra Web-based [Pipe Suggested Repair Method report](#) screen shot). Batch upload reports allow inspectors to monitor incoming data files
- 2) **Web-based Geocortex map service** used by Maintenance for locating and fixing pipes, and that others use for Hazardous Spills outfall locations, or storm drainage system location. (see "[MnDOT Storm Drain Geocortex Map Service](#) screen shot)
- 3) **ArcMap with HydInfra Tools** used by Designers to
 - a. Connect to spatial database from ArcCatalog
 - b. Query from the database and export to Excel
 - c. Map storm drain features for display or export to Microstation for construction projects (see [HydInfra Storm Drain networks in ArcMap](#))
 - d. Export data to Excel for further calculations
- 4) **Oracle Forms** are the last resort, and only for the elite users, but even Forms have been designed to interact with ArcMap and correlate with the online Reports for infrequent, but necessary editing.
- 5) **HydInfra intranet and internet webpages**
 - a. Get annual summary information for pipe inspections and repairs, used in Maintenance' "Drainage Performance Measures"
 - b. Get training information and help-sheets for inspection and data use

Get data into HydInfra:

- 1) **Web-based data upload site** is available externally for Mn/DOT Inspectors and hydraulic designers, or outside contractors
 - a. Accepts formats:

- "[Published Format](#)" -- csv upload
 - for Geopak-exported project design data,
 - ArcPad field inspection files exported to csv format (this export to csv also allows for some semi-customized data dictionaries, developed with and for Metro District)
 - data from other origins
- "hif" csv format, (a subset of Published Format data) from
 - Trimble TerraSync sf/cor field data files
 - editable pdf form for pipe repair data, entered by Maintenance people on web-based pdf form, exports to hif format

b) Sends automated email messages with the upload status and error messages

c) Correlates with online Batch Report and Oracle Form to review uploads

- 2) **Batch Update** protocol for simple changes to a large set of features, for example Pipes Removed or highways turned over to a County (Turnback)
- 3) **ArcMap with HydInfra Tools** can create new features, especially Ponds, Outfalls, storm drain networks
- 4) **Oracle Forms**, again, the last resort for inputting data, but can edit data or create new features or activities and inspections on existing features

HydInfra in Project Scoping and Planning Maintenance and Repairs

Crystal Reports and ArcMap are the primary methods that Hydraulics and Maintenance people use to search for pipes in need of repair. A new "Pipe Suggested Repair Methods" Report sorts bad pipes (condition 3 or 4) into repair method categories. The sorting process is based on flowcharts ([Steel Pipe Suggested Repairs flowchart](#) and [Concrete Pipe Suggested Repairs flowchart](#)) that use the pipe's size, shape, material and cover, plus several inspection flags, to assign a possible method of repair. An ArcMap Model was also developed to sort pipes into repair methods, to export to Excel for further examination.

HydInfra database maintained by the Central Office, but owned by Districts

The HydInfra database is maintained by the statewide Central Office but the data is "owned" by each of 8 Districts. The Districts have their own inspectors, anywhere from 2 to 20 people, including Maintenance and Hydraulics people and some Student Workers. Each District has at least one Key Expert who processes and uploads data and supervises field Inspectors. Two people in the Bridge Hydraulics group do HydInfra training, development and day to day support for the Districts' Inspectors, Hydraulic designers/data users and Maintenance people who repair culverts, ponds and other storm drain-related features.

IT people in the Central Office keep the Oracle database, web-based Crystal Reports, and online data upload website functioning. The Geocortex map service was developed by Metro District and C.O. GIS. HydInfra program updates are mostly done through contract.

HydInfra Information is Available on the Internet

HydInfra program information: <http://www.dot.state.mn.us/bridge/hydraulics/hydinfra/index.html>

HydInfra Inspector Webpage: <http://www.dot.state.mn.us/bridge/hydraulics/hydinfra/inspector.html>

HYDINFRA WEB-BASED CRYSTAL REPORT: PIPE SUGGESTED REPAIR METHOD

A data view that has been developed for Crystal Reports uses a sorting process, based on Suggested Repair Flowcharts, to assign a preliminary suggested repair method for pipes.

Pipe ID	Hwy	Ref Pt.	Material	RoadType	Shape	Span	Rise	Units	Length	Units	Cover	SpanFt	Cond	Condition Rating	Needs Repair	Repair Under Road	Deformed	Holes	Piping	Misalignment	Joints Separation	Cracks	Spalling / Flaking	Pitting / Rusting	Infiltration	Road Void	Road Stress	Exposed Corrosion	Losses	Standing Water	Plugged	Silt Present	Needs Clean	Inspect Date	Comment	Last Act	Act Date	Repair
Slipline																																						
Hwy 1																																						
615759	1	187.083	Corg. Mtl (CMP)	Centerline	Round	24	24	Inches	46	Feet	2 - 6 Feet	2.00	3	N	N	N	N	N	N	N	N	N	Y	N	N	Y	NN	Y	N	Y	Y	Y	10/11/2007		Discover	10/11/2007	Slipline	
615774	1	192.776	Corg. Mtl (CMP)	Centerline	Round	24	24	Inches	53	Feet	2 - 6 Feet	2.00	3	N	N	Y	N	N	N	N	N	Y	N	N	N	Y	NN	Y	N	Y	Y	Y	10/11/2007	starting to rust threw bottom at inlet	Discover	10/11/2007	Slipline	
615786	1	197.213	Corg. Mtl (CMP)	Centerline	Round	30	30	Inches	79	Feet	2 - 6 Feet	2.50	3	N	N	Y	N	N	N	N	Y	N	N	N	N	N	NN	Y	N	Y	Y	Y	10/12/2007	could easily take a liner	Discover	10/12/2007	Slipline	
640752	1	214.588	Corg. Mtl (CMP)	Centerline	Round	18	18	Inches	40	Feet	0 - 2 Feet	1.50	4	Y	N	N	Y	N	N	N	N	Y	N	N	N	Y	NN	Y	Y	Y	Y	Y	08/12/2008		Discover	08/12/2008	Slipline	
642381	1	214.588	Corg. Mtl (CMP)	Centerline	Round	18	18	Inches	40	Feet	0 - 2 Feet	1.50	4	Y	N	N	Y	N	N	N	N	Y	N	N	N	Y	NN	Y	Y	Y	Y	Y	08/12/2008		Discover	08/12/2008	Slipline	
591417	1	226.998	Corg. Mtl (CMP)	Centerline	Round	18	18	Inches	41	Feet	2 - 6 Feet	1.50	3	Y	N	N	Y	N	N	N	N	Y	Y	N	N	Y	NN	N	N	Y	Y	Y	07/19/2006		Discover	07/19/2006	Slipline	
635066	1	245.847	Corg. Mtl (CMP)	Centerline	Round	24	24	Inches	90	Feet	2 - 6 Feet	2.00	4	Y	N	N	Y	Y	N	N	N	N	Y	Y	N	NN	Y	N	Y	Y	Y	07/08/2008	bottom completely rusted out	Discover	07/08/2008	Slipline		
635069	1	246.446	Corg. Mtl (CMP)	Centerline	Round	24	24	Inches	70	Feet	2 - 6 Feet	2.00	4	Y	N	N	Y	N	N	N	N	Y	Y	N	NN	Y	N	Y	Y	Y	07/08/2008	rusted and holes in bottom	Discover	07/08/2008	Slipline			
635070	1	247.315	Corg. Mtl (CMP)	Centerline	Round	24	24	Inches	78	Feet	2 - 6 Feet	2.00	4	Y	N	N	Y	N	N	N	N	Y	Y	N	NN	Y	N	Y	Y	Y	07/09/2008	outlet end of pipe is damaged	Discover	07/09/2008	Slipline			
635072	1	247.721	Corg. Mtl (CMP)	Centerline	Round	24	24	Inches	88	Feet	2 - 6 Feet	2.00	4	Y	N	N	Y	Y	N	N	N	Y	Y	N	NN	Y	N	Y	Y	Y	07/09/2008		Discover	07/09/2008	Slipline			
635077	1	251.972	Corg. Mtl (CMP)	Centerline	Round	24	24	Inches	63	Feet	2 - 6 Feet	2.00	4	Y	N	N	Y	N	N	N	N	Y	Y	N	NN	Y	N	Y	Y	Y	07/09/2008		Discover	07/09/2008	Slipline			
679929	1	255.196	Corg. Mtl (CMP)	Centerline	Round	24	24	Inches	50	Feet	2 - 6 Feet	2.00	4	Y	Y	N	Y	N	N	Y	N	Y	Y	Y	NN	Y	N	N	N	N	07/23/2009		Discover	07/23/2009	Slipline			
635089	1	257.755	Corg. Mtl (CMP)	Centerline	Round	24	24	Inches	52	Feet	2 - 6 Feet	2.00	4	Y	N	N	Y	N	N	N	N	Y	Y	Y	Y	Y	Y	Y	N	N	Y	Y	07/10/2008	bottom rusted out at inlet 12 inches of bottom of pipe pitting and rusting	Discover	07/10/2008	Slipline	

HYDINFRA STORM DRAIN NETWORKS IN ARCMAP

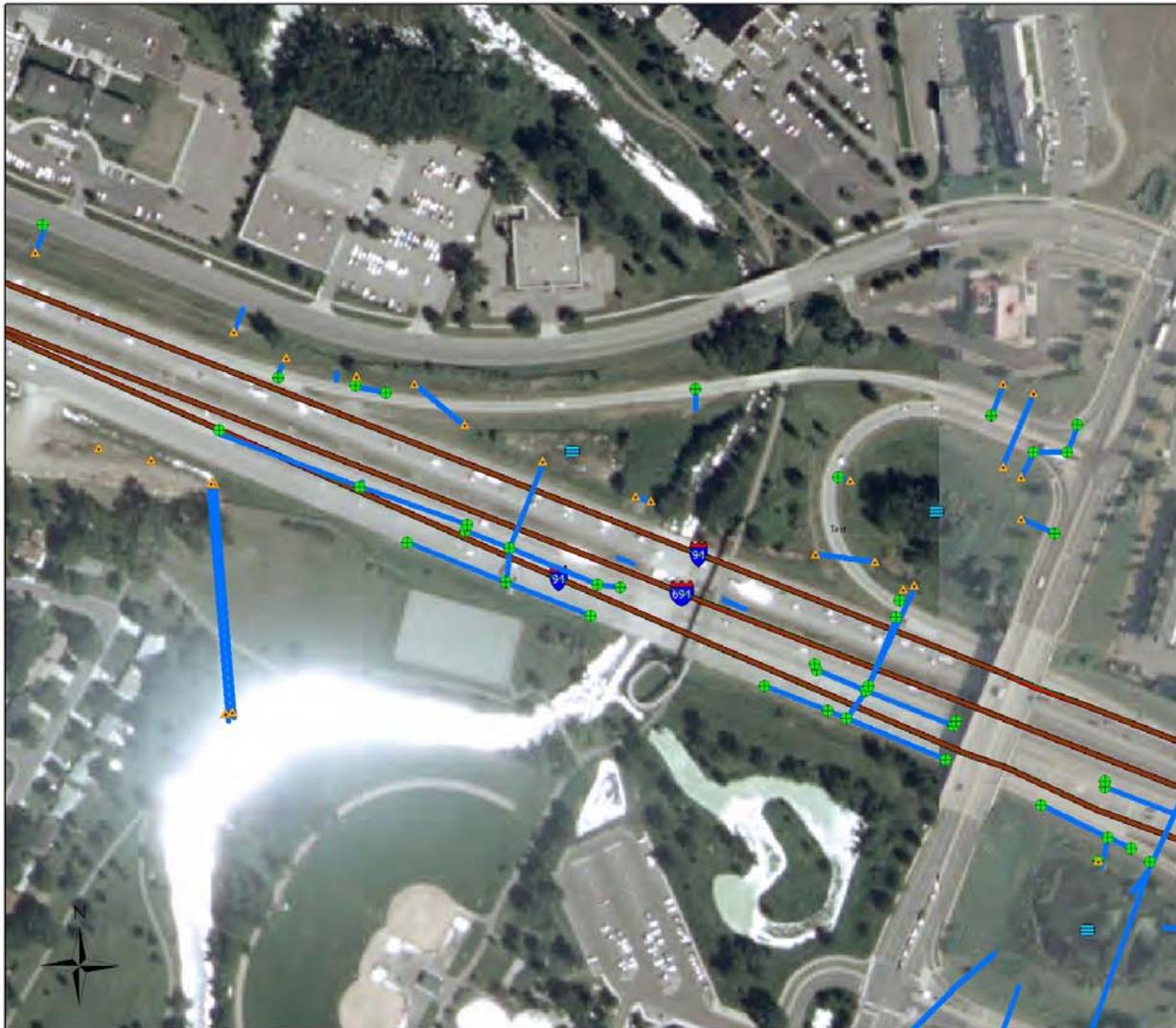


HydInfra Storm Drain Network Illustration

0 45 90 180 270 360 Feet

Legend

- Pipes
 - Structures
 - ▲ Special Structures
- ### Ponds
- Infiltration
 - Filter Infiltrate
 - Dry
 - Wet
 - Unknown



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MNDOT STORM DRAIN GEOCORTEX MAP SERVICE

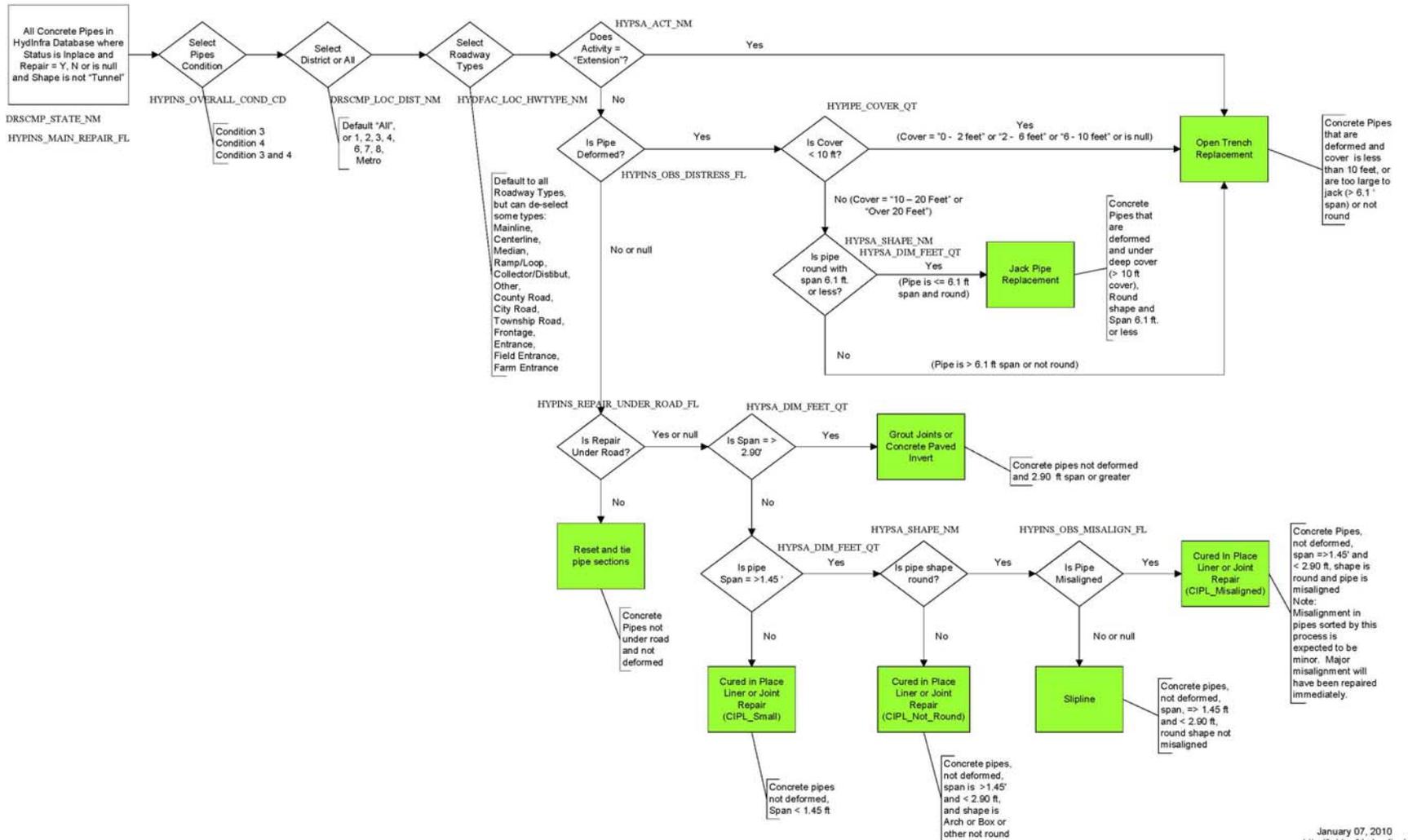
The screenshot displays the Mndot WRE web application in a Windows Internet Explorer browser. The browser's address bar shows the URL <http://gisservices.dot.state.mn.us/mndot-wre/>. The page header features the Minnesota Department of Transportation logo and navigation links for Home, A to Z, Getting Around, and 511 Traveler Info. The main interface includes a Toolbox with navigation tools (Out, Pan, Full, Back, Forward, Identify, Measure, Query) and a Help button. On the left, a Layer List panel is visible, showing the following layers and their status:

- Pipe Condition: (Info icon)
- 4 - Very Poor: (Red arrow icon)
- 3 - Poor: (Orange arrow icon)
- 2 - Fair: (Blue arrow icon)
- 1 - Excellent: (Green arrow icon)
- 0 - Not able to rate: (Grey arrow icon)
- No Inspection: (Blue arrow icon)
- Pipes: (Info icon)
- Bridge Culverts: (Info icon)
- Drainage Membranes & Drain: (Info icon)
- Outfalls HYD: (Info icon)
- Monitored Wetlands: (Info icon)
- WDs and WMOs: (Info icon)
- Hydrologic Features: (Info icon)
- Transportation: (Info icon)
- Boundaries: (Info icon)
- Imagery: (Info icon)
- FSA MN_2008: (Info icon)
- Red: Band_1: (Info icon)
- Green: Band_2: (Info icon)

The main map area shows an aerial view of a rural landscape with a network of storm drains overlaid. The drains are color-coded according to their condition: red (Very Poor), orange (Poor), blue (Fair), and green (Excellent). Several drain segments are labeled with IDs: 202834, 204006, 204009, 204013, 204016, 204020, 204023, 204026, and 204030. The map also shows major roads, including Interstate 90 and State Highway 12, and a local road labeled 'Wiscord Twp 11'. A scale bar at the bottom indicates a scale of 1:17870, with a distance of 3368 feet. The map coordinates are x=607917.560 and y=4866936.671. The browser's status bar at the bottom shows 'Internet' and a zoom level of 100%.

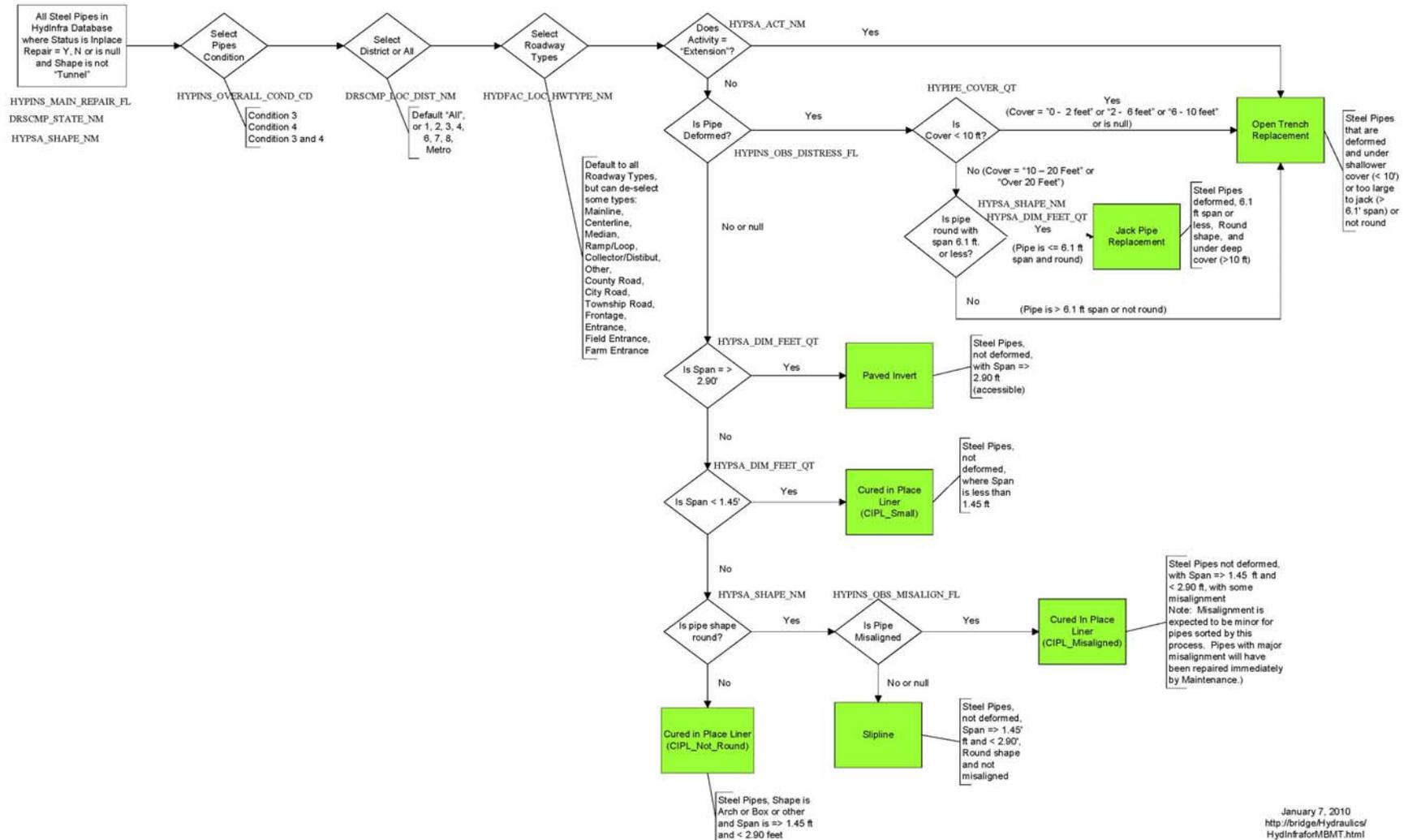
FLOWCHART OF SUGGESTED REPAIRS FOR CONCRETE PIPES

HydInfra Report for Suggested Repairs for Concrete Pipes



FLOWCHART OF SUGGESTED REPAIRS FOR STEEL PIPES

HydInfra Report for Suggested Repairs for Steel Pipes



Data Input Formats:

- [Published Format CSV](#) (nearly all data fields)
 - HyiHelp suite creates Data Map , updates hyd_csv.xls, and Excel add-in (gp2hyi.xla) to make up “Published Format” used in:
 - ArcPad GPS field collection to CSV – WRE ArcMap Models and process
 - Trimble TerraSync to CSV – Metro Maintenance/WRE ArcMap Models and editing process
 - Geopak Drainage design data capture
 - Published format for various data inputs and updates (like new ponds)
 - Excel Forms to Published Format (fields limit 20?) for simple updates
- [Hif CSV format](#) (subset of fields)
 - Trimble TerraSync data dictionaries for GPS field data collection to hif
 - Trimble TerraSync data dictionaries used inside office to input data from paper notes to
 - Editable PDF Form (web-accessed) to hif
- [ArcMap Hydinfra Tools](#) (very small subset of fields)
 - create and move features
- [Batch Update SQL](#)(very very small subset of fields)
 - simple limited edits to multiple features
- [Oracle Forms](#) (has everything but awkward to use) tgt database, testkey password tester
 - Create new features, inspections, activities and all edits including delete
- **SQL**
 - far beyond user’s capabilities

Data Uploaders’ Tools:

- [Web-site external access for data upload](#)
 - Test upload site: hydinfra, hyd1infra
 - MnDOT and Consultant Inspectors
- **Notification Methods**
 - Emails to uploader with message about upload, accept or reject (reject includes correction instructions)
 - Outlook *DOT_HydInfra mailbox that users can proxy to and read error messages that were not received
 - [Crystal Reports](#) (online) for District’s uploaded batches

Data Upload Support Tools:

- [FTP site](#) with uploaded hif files
- Outlook HydInfra Mailbox, *DOT_Hydinfra, with upload, accept and reject emails
- Pathfinder Office customized export formats (csv, ArcMap, mdb, dbase, kml/kmz) and data dictionary improvements
- Excel [hif file headers](#) to check upload
- [HyiHelp](#) feature field, attribute lists
- [Oracle Forms](#)– Batch and Geotable
- [ArcMap Hydinfra Tools](#) Query Geotable and Push to Geotable
- Crystal Reports customized reports

Data Extraction Methods:

- [Crystal Reports](#) (available to all)
 - Standardized Web-based reports
 - Multi-step export for field TerraSync waypoints or “Import” files
- [WRE’s Geocortex map service](#) (available to all)
 - Create maps
 - Export data
- [ArcMap HydInfra](#) (available to some)
 - Standardized data queries
 - Export to Excel
 - Export to shapefile or personal geodatabase
 - Export ArcPad WRE field data
 - Convert to CAD
- [ArcMap database connection hydinfra.sde](#) (available to some)
 - TEST Service
sde:oracle10G:/;local=tgt.world, user: testkey, tester
 - All fields available for selection
- **Crystal Reports Customized** (available to few)
 - All fields available for selection

HydInfra’s Moving Parts from a User’s Standpoint

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